



第四届静电防护与标准化国际研讨会

- 创新、超越、融入未来
- Innovate, Transcend, Integrate into the future
- 物联网时代静电防护技术在智能制造过程中的重要作用与实际应用
- Electrostatic protection technology plays the important part in intelligent manufacturing process and practical application in Internet of things Era

2015 年 11 月 6 日
中国 天津 TianJin China
天津赛象酒店 TianJin SaiXiang Hotel

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Part I Venue Information 会场介绍

天津赛象酒店 TianJin SaiXiang Hotel

天津新技术产业园区华苑产业区梅苑路 8 号

NO.8, Meiyuan Road, Huayuan Industrial Zone, New Technology Industry Park



天津赛象酒店于 2008 年 10 月开业，是一家五星级豪华商务酒店及会议中心。作为天津华苑产业园区的标志性建筑，赛象酒店紧邻天津滨海高新区管委会。周边有南开大学、天津大学、丰田技术中心、西门子公司等众多教育科研机构及跨国公司。酒店有豪华客房 370 间，中餐厅、西餐厅、日本料理、大堂吧及行政酒廊等 6 个餐厅设施；酒店还拥有面积从 60—850 平米不等的 9 个会议室及宴会厅，共计面积 2000 平米。酒店还有室内游泳池、健身房、壁球馆、网球、SPA、KTV 等康体娱乐设施。设施先进，服务完善，环境优美，交通便捷，是您商务旅行或休闲度假的首选之一。



Tianjin Saixiang Hotel opened in Oct, 2008. It is a 5-star luxury business hotel and convention center. Hotel is located as the symbolized architecture in the centre of Tianjin. New Technology Industrial Park, Huayuan Area. Hotel stands with committee of THIP and close to Nankai University, Tianjin University, and Siemens, Toyota Motor and many international companies and high-education institutes. Tianjin Saixiang Hotel has total of 370 guest rooms with various types. There are 3 restaurants, Chinese Restaurant Fu Quan Ge, Japanese Restaurant Kintaikyo and Western Café de Tresor. You could relax yourself at our YUN Lobby Lounge and Club Lounge. Hotel provides Convention Center, nearly 2,000 sq meters, which including 9 conference rooms with different size from 60-850 sq meters for your events. Hotel Fitness Center, consist of Gym Room, Aerobic Room, Beauty Salon, Indoor Swimming Pool, Tennis Court, Ping Pong Room, Billiard Room and Squash Room. Besides, hotel has KTV, Space Bar, Spa and other Entertainment facilities. Our hotel is providing superior facilities, excellent service, surrounded by beautiful environment and conveniently access to your destination.

Part II Agenda 会议议程

美国贸易开发署 (USTDA)
中国 - 美国标准与合格评定合作项目 (SCACP)

2015 第四届静电防护与标准化国际研讨会会议日程

时间 / 地点: 2015 年 11 月 6 日 天津市赛象酒店

08:00-09:00	报到注册		
09:00-09:20	致欢迎辞		
主题演讲	专家	职务	演讲题目
09:20-09:50	汤万金	中国标准化研究院副院长, 研究员, 博士, 享受政府津贴待遇	多角度审视中国标准化发展
09:50-10:20	泰瑞 · L · 韦尔泽	JEDEC / ESDA 的 HBM 和 CDM ESD 工作组联合主席, ESDA 副主席	ESD 静电防护技术在物联网发展过程中的应用
10:20-10:50	茶歇、合影		
10:50-11:20	张雪	德国大陆汽车系统 (中国) 有限公司质量部经理 ESD 高级工程师	大陆汽车 (天津) 静电控制系统
11:20-11:50	纳撒尼尔 · 皮奇	美国静电放电协会标准业务部经理	集成芯片上和板上的 ESD (静电放电) 保护
11:50-12:10	现场互动, 现场答疑、经验交流		
12:10-13:30	午餐		
13:30-14:00	刘民	中国航天科技集团静电防护管理体系认证中心高级审核员	航天电子工业静电防护现场审核经验
14:00-14:30	约翰 · 金尼尔	美国静电放电协会设施认证主席 IBM 高级工程师	符合 ANSI/ESD S20.20 究竟意味着什么
14:30-15:00	蔡阿宁	空间电子信息技术研究院高级工程师, 资产管理与保障部长	体系化建设提升产品制造过程静电防护能力
15:00-15:20	茶歇		
15:20-15:50	张亚龙	威讯联合半导体 (北京) 有限公司资深主任工程师	优化自己的 ESD 管理系统 — 参考 ANSI S20.20
15:50-16:20	袁亚飞	北京东方计量测试研究所高级工程师	静电防护材料和用品的标准和选择指南
16:20-16:50	周旭晶	天津开发区实力技术工程有限公司总经理	利用互联网技术搭建静电防护资源共享平台
16:50-17:20	现场互动, 现场答疑、经验交流		
17:20-17:30	幸运抽奖		
17:35	会议结束		

The United States Trade and Development Agency (USTDA)
U.S.-China Standards and Conformity Assessment Cooperation Program (SCACP)

2015 Electrostatic Protection and Standardization Seminar Agenda

Date: November 6, 2015 SAIXIANG Hotel • TIANJIN

08:00-09:00	Registration		
09:00-09:20	Welcome Address		
Keynote speech	Experts	Position	Lecture topic
09:20-09:50	Tang Wanjin	China National Institute of Standardization Vice President Researcher; PhD	Review the Standardization Development in China from Multiple Viewpoints
09:50-10:20	Terry. L. Welsher	ESD Association Vice Chairman	Internet of Things and ESD
10:20-10:50	Group photo、Coffee Break		
10:50-11:20	Zhang Xue	Continental Automotive System (Tianjin), QMS Manager	Continental Automotive Tianjin ESD control
11:20-11:50	Nathaniel.Peachey	ESDA Standard business department Manager	Integrating ESD on-chip and on-board protection
11:50-12:10	Interactive Communication		
12:10-13:30	Lunch		
13:30-14:00	Liu Min	China Aerospace Science and Technology Corporation Academic Technology Leader	Experience of audit for electrostatic Protection in Aerospace electronic industry
14:00-14:30	John.T. Kinnear	Chairman of ESDA Facility Certification, IBM Senior Engineer;	Conformance to ANSI/ESD S20.20What does it really mean
14:30-15:00	Cai Aning	Space Electronic Information Technology Research Institute Senior Engineer Asset Management and Security Minister	Systematic construction improves electrostatic protection in product manufacturing process
15:00-15:20	Coffee Break		
15:20-15:50	Zhang Yalong	RF Micro Devices(Beijing)Co.,Ltd Senior director of engineer	Optimizing your ESD management system—refer to ANSI S20.20
15:50-16:20	Yuan Yafei	Beijing Orient Institute of Measurement and Test	Standard and selection guide for electrostatic protective materials and articles
16:20-16:50	Zhou Xujing	TECHBASE ENGINEERING CO.,LTD General Manager	Building ESD sharing platform By Using Internet technology
16:50-17:20	Interactive Communication		
17:20-17:30	Lucky Draw		
17:35	The End		

Part III

Sponsor and Organizer Overviews

主办、协办及承办单位介绍

中国标准化研究院 China National Institute of Standardization

中国标准化研究院（初名国家科委标准化综合研究所）始建于1963年，是直属于国家质量监督检验检疫总局，从事标准化研究的国家级社会公益类科研机构，主要针对我国国民经济和社会发展中全局性、战略性和综合性的标准化问题进行研究。

全院现有职工500余人，包括研究员27名、博士及博士后87名，主要开展标准化发展战略、基础理论、原理方法和标准体系研究。承担节能减排、质量管理、公共安全、视觉健康与安全防护、现代服务、公共管理与政务信息化、信息分类编码、人类工效、食品感官分析等领域标准化研究及相关标准的制修订工作。承担相关领域的全国专业标准化技术委员会、分技术委员会秘书处工作。承担相关标准科学实验、测试等研发及科研成果的推广与应用工作。组织开展能效标识、顾客满意度测评工作，承担地理标志产品保护研究及技术支持工作。负责标准文献资源建设与社会化服务工作，承担国家标准文献共享服务平台运行和标准化基础科学数据资源建设与应用工作。同时，我院的工作直接支撑着国家质量监督检验检疫总局以及国家标准化管理委员会的相关管理职能，包括我国缺陷产品召回管理、国家标准技术审查、全国工业产品生产许可证审查、全国质检中心审查管理等工作。

作为国家级社会公益类科研机构，中国标准化研究院一直致力于积极参与并主导国际组织活动，维护国家利益，承担了国际地理标志网络组织（ORIGIN）副主席职务，承担了国际标准化组织（ISO）的技术委员会副主席、秘书等13个关键职务，主持制定ISO标准20余项。

Affiliated with the General Administration of Quality Supervision and Inspection and Quarantine of the People's Republic of China (AQSIQ), China National Institute of Standardization (CNIS) is a non-profit national research body engaging in standardization research. The main responsibilities of CNIS are to conduct all-round, strategic, and comprehensive research of standardization during the development process of economy and society, to research and develop comprehensive fundamental standards, as well as to provide authoritative standards information services. CNIS is poised to provide all-round support in standardization for China's economic development and social progress, to support technical progress, industrial upgrading, and product's quality improvement, and to provide scientific evidence for government policy-making on standardization.

Since its founding in 1963, CNIS has undertaken many national key scientific and research projects. Among them, three important projects of the 10th Five-Year Plan (2000-2005) Key Science and Technology Special Program, namely, Research on Development Strategies for Chinese Technical Standards, Research on Development of China's National Technical Standards System, and Basic Research on and Technological Measures for the Safety Standards of Main Foods, have played important supportive roles for promotion of national standardization. One of our projects, Development of a National Terminology and Graphic Symbol System, has been awarded the State-level Second Prize for Advancement of Science and Technology, the highest prize so far in the field of scientific research on standardization. In addition, many of our projects have been awarded state-level and ministry-level prizes for advancement of science and technology and prizes for key scientific research achievements of the 8th (1990-1995), and 9th (1995-2000) Five-Year Plan periods. Our research has brought about significant influence home and abroad, and has made outstanding contributions to development of China's economic development and the progress of science and technology.

地址：北京市海淀区知春路4号

Address: No.4 Zhichun Road, Haidian District, Beijing

邮编：100088

Post code: 100088

<http://www.cnis.gov.cn>

中国空间技术研究院

China Academy of Space Technology (CAST)

中国空间技术研究院成立于 1968 年，隶属中国航天科技集团公司。经过 40 余年的发展，中国空间技术研究院已成为中国主要的空间技术及其产品研制基地，是中国空间事业最具实力的骨干力量，主要从事空间技术开发、航天器研制，空间领域对外技术交流与合作、航天技术应用等业务。

自 1970 年，中国空间技术研究院先后成功研制并发射了中国第一颗人造地球卫星——东方红一号、实现环月运行的中国首颗月球探测器、实现中国航天员首次空间出舱活动的神舟七号载人飞船等，为中国航天事业发展做出了突出贡献。中国空间技术研究院在北京航天城建成了集系统设计与集成、总装、测试、试验一体化的新型航天器研制生产基地，现在拥有员工 1 万余人，其中包括 8 名两院院士、12 名国家级突出贡献专家和 1700 多名高级专业技术人才。

中国空间技术研究院是我国飞船和卫星的重点研制单位，十分重视电子元器件、单机及整机系统的电磁兼容设计，开展了大量的地面和星上静电防护技术研究工作，并在静电防护管理体系、静电防护技术、防静电系统测试、防静电工作区配置等方面建立了一系列的静电防护院级标准 Q/W 1300~1303-2010，组建了院静电防护管理体系认证委员会和认证中心，在认证中心办公室和审核专家组的协助下，明确了静电防护系统建设与认证管理流程，已经完成对多家院内单位及外协单位开展了静电防护管理体系认证工作，推进了航天领域的静电安全防护进程。

China Academy of Space Technology (CAST), subordinated to China Aerospace Science and Technology Corporation (CASC), was established on February 20, 1968. Through 44-year development, it has become the main development base for space technology and products in China and the most powerful backbone strength for China ' s space endeavor. It is mainly engaged in such fields as development and manufacturing of spacecraft, external exchange and cooperation in space technology, satellite applications, etc. CAST also participates in formulating the state space technology development plans, studies the technological approaches to exploration, exploitation and utilization of outer space, and develops a variety of spacecraft and ground application equipments.

CAST successfully developed and launched china ' s first artificial earth satellite. To date, the academy has successfully developed and launched 129 satellites of various kinds and nine Shenzhou spaceships, including scientific and technological test satellites, communications and broadcasting satellites, meteorological satellites, returnable remote sensing satellites and ocean satellites.

CAST has built in Beijing Space City a new spacecraft development and production base which combines system design, assembly, integration, checkout and test in one place. CAST has more than 20,000 staff members, including 8 members of Chinese Academy of Sciences and Chinese Academy of Engineering, 12 national level experts making outstanding contributions, and over 1700 senior specialists. CAST has been making wide contacts with the astronautical companies and space research institutes throughout over a dozen countries and regions.

CAST has engaged in electrostatic field of development of spacecraft and ground application equipments for years, and published series of standards for electrostatic discharge protection management system. It has established certification committee and Electrostatic Discharge Certification of the system, and organized the electrostatic certification of units subordinated to CAST and other co-operation units.



美中标准与合格 评定合作项目

由美国贸易发展署 (USTDA) 提供资助、美国国家标准协会 (ANSI) 负责协调的美中标准与合格评定合作项目 (SCCP) 在以下几个方面为美国和中国相关行业和政府代表提供了一个论坛:

- 在标准、合格评定以及技术法规等领域的合作;
- 为促进美中在标准、合格评定以及技术法规等领域的技术交流建立必要的联系;
- 及时交流关于标准、合格评定以及技术法规等领域的最新议题和发展情况的相关信息。

根据 SCCP 项目规定, 从 2013 年开始的三年内, ANSI 将在中国协调举办 20 场研讨会。根据美国私营业界相关组织的建议, 研讨会内容将覆盖不同的行业和领域。

研讨会的主题将由相关行业组织、ANSI 以及 USTDA 协调选定。

欲了解该项目的更多情况或有意赞助或参与该项目,

请访问下列网站:

www.standardsportal.org/us-chinasccp

了解其他信息, 请联系
Ms. Madeleine McDougall
项目经 理
美国国家标准协会 (ANSI)
1899 L St. NW – Eleventh
Floor
Washington, DC 20036

T: 202.331.3624
F: 202.293.9287
E: us-chinasccp@ansi.org

美国国家标准学会

American National Standards Institute (ANSI)

American National Standards Institute (ANSI——美国国家标准学会)是由公司、政府和其他成员组成的自愿组织,负责协商与标准有关的活动,审议美国国家标准,并努力提高美国在国际标准化组织中的地位。ANSI是IEC和ISO的5个常任理事成员之一,也是4个理事局成员之一,参加79%的ISO/TC的活动,参加89%的IEC/TC活动。ANSI是泛美技术标准委员会(COPANT)和太平洋地区标准会议(PASC)的成员。

美国国家标准学会(American National Standards Institute: ANSI)成立于1918年。当时,美国的许多企业和专业技术团体,已开始了标准化工作,但因彼此间没有协调,存在不少矛盾和问题。为了进一步提高效率,数百个科技学会、协会组织和团体,均认为有必要成立一个专门的标准化机构,并制订统一的通用标准。1918年,美国材料试验协会(ASTM)、与美国机械工程师协会(ASME)、美国矿业与冶金工程师协会(ASMME)、美国土木工程师协会(ASCE)、美国电气工程师协会(AIEE)等组织,共同成立了美国工程标准委员会(AESC)。美国政府的三个部(商务部、陆军部、海军部)也参与了该委员会的筹备工作。1928年,美国工程标准委员会改组为美国标准学会(ASA)。为致力于国际标准化事业和消费品方面的标准化,1966年8月,又改组为美利坚合众国标准学会(USASI)。1969年10月6日改成现名:美国国家标准学会(ANSI)。

美国国家标准学会是非赢利性质的民间标准化组织,是美国国家标准化活动的中心,许多美国标准化学会的标准制修订都同它进行联合,ANSI批准标准成为美国国家标准,但它本身不制定标准,标准是由相应的标准化团体和技术团体及行业协会和自愿将标准送交给ANSI批准的组织来制定,同时ANSI起到了联邦政府和民间的标准系统之间的协调作用,指导全国标准化活动,ANSI遵循自愿性、公开性、透明性、协商一致性的原则,采用3种方式制定、审批ANSI标准。

ANSI现有工业学、协会等团体会员约200个,公司(企业)会员约1400个。领导机构是由主席、副主席及50名高级业务代表组成的董事会,行使领导权。董事会闭会期间,由执行委员会行使职权,执行委员会下设标准评审委员会,由15人组成。总部设在纽约,卫星办公室设在华盛顿。

As the voice of the U.S. standards and conformity assessment system, the American National Standards Institute (ANSI) empowers its members and constituents to strengthen the U.S. marketplace position in the global economy while helping to assure the safety and health of consumers and the protection of the environment.

The Institute oversees the creation, promulgation and use of thousands of norms and guidelines that directly impact businesses in nearly every sector: from acoustical devices to construction equipment, from dairy and livestock production to energy distribution, and many more. ANSI is also actively engaged in accrediting programs that assess conformance to standards – including globally-recognized cross-sector programs such as the ISO 9000 (quality) and ISO 14000 (environmental) management systems.

ANSI has served in its capacity as administrator and coordinator of the United States private sector voluntary standardization system for more than 90 years. Founded in 1918 by five engineering societies and three government agencies, the Institute remains a private, nonprofit membership organization supported by a diverse constituency of private and public sector organizations.

Throughout its history, ANSI has maintained as its primary goal the enhancement of global competitiveness of U.S. business and the American quality of life by promoting and facilitating voluntary consensus standards and conformity assessment systems and promoting their integrity. The Institute represents the interests of its nearly 1,000 companies, organization, government agency, institutional and international members through its office in New York City, and its headquarters in Washington, D.C.

美国静电放电协会 Electrostatic Discharge Association (ESDA)

Electrostatic Discharge Association (ESDA——美国静电放电协会) 于 1982 年在美国成立，总部设在纽约，是一个专业的自愿组织，从事静电放电理论和实践研究。其成员从成立初期不到 100 名，发展到遍布全球、总数超过 2,000 名。其领域从仅限于电子元器件的 ESD 影响，拓宽到纺织品、塑料、居室清洁和形象艺术等领域。该协会授权通过标准开发、教育节目、专业书籍、出版物、指南、认证工作和座谈会宣传 ESD 知识。

ESDA 是一个国际化组织，其成员来自 30 多个国家。他们服务于协会标准委员会，在 EOS/ESD 年会上进行技术研讨，并为其它国家的相关组织提供资讯联系。协会已经和不同国家的类似组织建立了正式和非正式联系，正式联系包括日本可靠性中心，新加坡生产力标准部 (PSB)，日本电子工业协会 (EIAJ)，德国 ESD 论坛，欧洲的 ESREF，以及巴西的 ABRICEM。

ESDA 的职责是在国际电工委员会 (IEC) 静电学领域代表美国利益。随着标准领域全球协调性要求的增加，ESD 协会日益受到广泛关注。

Founded in 1982, the ESD Association (ESDA) is a professional voluntary association dedicated to advancing the theory and practice of electrostatic discharge (ESD) avoidance. From fewer than 100 members, the Association has grown to more than 2,000 members throughout the world. From an initial emphasis on the effects of ESD on electronic components, the Association has broadened its horizons to include areas such as textiles, plastics, web processing, clean-rooms, and graphic arts. To meet the needs of a continually changing environment, the Association is chartered to expand ESD awareness through standards development, educational programs, local chapters, publications, tutorials, certification, and symposia.

Although founded and headquartered in the United States, the ESD Association has a strong international flavor. Its members come from more than 30 countries throughout the world. They serve on Association Standards Committees, present technical papers at the annual EOS/ESD Symposium, and provide the communication links with similar organizations in other countries.

The Association has established informal and formal relationships with similar organizations in various countries. The formal relationships include the Reliability Center of Japan, Productivity Standards Board (PSB) in Singapore, Electronics Industry Association of Japan (EIAJ), ESD Forum of Germany, ESREF in Europe, and ABRICEM in Brazil.

The ESD Association has the responsibility of representing the interest of the United States at the International Electro-technical Commission (IEC) in the area of electrostatics. With the increasing need for global harmonization in the area of standards, the international focus of the ESD Association is vitally important.

北京东方计量测试研究所

Beijing Orient Institute of Measurement & Test (BOIMT)

北京东方计量测试研究所成立于 1985 年，又称为中国航天科技集团公司第五研究院第五一四研究所，是中国空间技术研究院所属的专业计量测试研究所。

北京东方计量测试研究所是国防科技工业电学一级计量站，是集电磁学、无线电电子学、时间频率、几何量、热学、力学、真空、卫星应用和电磁干扰等专业为一体的综合性计量测试研究所，承担着我国国防科技工业、军队系统特别是航天和空间技术领域量值传递和计量校准测试任务，开展计量标准装置和测试设备研制、测量技术和测试方法研究、能力验证和比对、计量人员培训和计量标准考核等工作，同时面向社会提供公正的校准、检测和检验服务。

北京东方计量测试研究所是博士、硕士研究生培养单位，是国家批准的“仪器科学与技术”硕士学位一级学科点。现有博士生导师、硕士生导师、学科带头人后备人员 10 多名，与国内外技术、学术团体有着广泛的接触与联系。

近年来，北京东方计量测试研究所积极开展航天型号产品相关的静电防护技术研究，承接了多项静电相关的星船地面试验任务，负责起草了中国空间技术研究院的静电防护管理体系院标 Q/W1300~1303，正在进行集团公司静电标准的编制，是院静电防护管理体系的技术支撑单位和认证中心的挂靠单位，已经组织开展了多家院内单位及外协单位的静电防护管理体系建设和认证工作。

Founded in 1968, Beijing Orient Institute of Measurement & Test (BOIMT) is a metrological institute, subordinated to China Academy of Space Technology (CAST).

BOIMT is tasked with establishing, maintaining and improving measurement standards and conducting research on relevant technologies to achieve more precise measurement. BOIMT plays an important role in every development process of the spacecraft. Each year, BOIMT calibrates approximately 90 thousands set of equipments for CAST.

The calibration services of the institute mainly relate to electromagnetic calibration, radio calibration, time and frequency calibration, geometrical calibration, mechanics calibration (including vacuum calibration), etc. Up until now, BOIMT has established 43 measurement standards, including 14 national-defense primary electrical standards. BOIMT provides essential guard for the accuracy and reliability of quantity values within national-defense system. Especially, it has advanced electrical calibration standards, such as Quantum Hall resistor primary standard and Josephson Voltage primary standard, which have reached the international advanced level.

So far, BOIMT has engaged in electrostatic field for years, and drafted series of standards for electrostatic discharge protection management system, which include electrostatic discharge protection management system requirements, technical requirements for electrostatic discharge protection, test requirements for electrostatic discharge protection system and configuration requirements for electrostatic discharge protected area. What ' s more, BOIMT is the technical unit of electrostatic discharge protection, and Electrostatic Discharge Certification of CAST.

中国电子仪器行业协会防静电装备分会 China's Electronic Instrument Industry Association Anti-static Equipment Branch

中国电子仪器行业协会防静电装备分会成立于一九九七年。业务上受国家工业和信息化部相关部门的指导，隶属于中国电子仪器行业协会。是由从事静电与净化控制产业研发、制造、销售、工程施工、检测、培训及应用的相关企事业单位、大专院校、科研院所、业内有关社会团体，以及专家、学者等热心静电与净化控制事业的个人，不受部门和地区限制，自愿组成的全国非盈利性社会团体。本协会经国家民政部批准依法登记，具有社会团体法人资格的社会组织，现有会员单位 280 余家。

协会的宗旨是：为会员单位服务，维护本行业和会员单位的合法权益，贯彻执行国家的政策法规，推动防静电装备行业的发展。

防静电装备分会的主要任务包括：

- 1、协助政府部门制定本行业的技术与产业发展规划；
- 2、组织行业内外有关单位的联合技术攻关和开发新产品；
- 3、征集会员单位建议，向政府有关部门反映、沟通情况；
- 4、组织行业概况调研，制定行规行约；
- 5、组织并参与制、修定本行业的 GB、GJB、SJ/T 等标准工作；
- 6、开展技术研究、产品开发、投资项目的论证、评估等咨询服务；
- 7、开展本行业经营管理业务的培训；
- 8、利用协会网站组织防静电技术及应用的推广普及，开展市场调研，协助会员单位开拓市场、沟通生产单位与用户之间的联系；
- 9、开展与国内外有关学术团体、企事业单位、行业协会、信息网及杂志社等联系与合作，组织技术、产品及应用市场等方面的交流，组织国内国际展览会、展示会和技术研讨会等；
- 10、出版行业刊物《中国防静电》杂志，向政府部门、会员单位、相关用户免费赠阅；
- 11、根据政府部门委托和会员单位要求，举办其他有关活动。

联系方式：

010-68647410/51246352（电话）

010-68647410（传真）

北京市石景山区万达广场 CRD 银座 B-1128 室，100040。

网站为 66 防静电网

邮箱 chinaesd@chinaesd.org.cn

协会 LOGO：



电子行业职业技能鉴定工作站

电子行业职业技能鉴定工作站是工业和信息化部电子行业职业技能鉴定指导中心批准成立的专业防静电职业技能培训机构，为客户提供防静电培训、静电防护管理咨询、生产线防静电评估优化、ESD质量体系认证等服务。自2004年以来我站已经组织静电防护中、高级培训班60多期，内训企业70多家，培训人数达到五千余人次，旨在帮助电子企业解决生产过程中的静电困扰，建立最具性价比的静电防护体系，提升产品质量与可靠性。

我站受工业和信息化部电子行业职业技能鉴定指导中心委托开展了静电防护专业的职业技能鉴定培训，包括防静电系统中、高级检验员培训，以及防静电系统检验师培训，培训后颁发国家承认的相应等级职业资格证书。

联系方式：

010-68865786（电话）

010-68865786（传真）

北京市石景山路23号中础大院设计院二分院二层208室，100049，任丽丽。

网址 www.esdtraining.com.cn

邮箱 esdtraining@chinainfoesd.com

信息产业部防静电产品质量监督检验中心简介

信息产业防静电产品质量监督检验中心于1993年4月成立，原名为信息产业部防静电产品质量监督检测中心。中心已通过国家认证认可监督管理委员会认证。该中心作为电子行业唯一一家经国家认监委及工业和信息化部认可的防静电产品质量检测机构，授权对信息产业及有关行业中的防静电产品装备和工程进行质量监督检验。中心同时对提高产品质量和发展新产品提供技术咨询、服务和ESD知识培训，受理质量争议仲裁检验，承担防静电产品和有关产品的进出口商检任务，以及行业防静电标准制订和修订的组织工作。中心拥有专业的阻燃性能实验室，可完成建筑材料的阻燃性能测试。中心成立至今，已对国内外近千家生产厂商及经销单位送检的防静电产品、工程和ESD环境，进行了委托、仲裁检测和评估，年均接待近400个厂家送检产品近1000个批次。

中心作为中国电子行业防静电标准制修订组织单位，组织有关单位对现行的国家、行业标准进行修改或重新制订。近年来，牵头组织并完成了SJ/T10796-2001《防静电活动地板通用规范》、SJ/11236-2001《防静电贴面板通用规范》、SJ/T11277-2002《防静电周转容器通用规范》、SJ/T11294-2003《防静电地坪涂料通用规范》、SJ/T10694-2006《电子产品制造防静电系统测试方法》和GJB3007-2009《防静电工作区技术要求》标准的制订工作。中心协助相关单位企业制定的标准有：《防静电洁净工作服及织物通用规范》、《离子风静电消除器通用规范》和国家标准《防静电工程施工和验收规范》。另外，《防静电系统技术和质量通用规范》和《活动地板通用技术规范》两项国家标准的立项和申报工作也已经列入了2010年的工作计划。

联系方式：

010-68865301/68869773（电话）

010-68865301（传真）

北京石景山区石景山路23号，100049。

网址 www.chinainfoesd.com

邮箱 esds001@163.com

Anti-static equipment branch is the anti-static equipment industry engaged in scientific research, production and management of enterprises and institutions, not affected by departments and regions limit is composed of voluntary social organizations. Belongs to the Chinese electronic instrument industry association, the association the approval of the ministry of civil affairs shall be registered according to law, have the corporative qualifications of social group, more than 280 members of the existing units.

Association's objective is: for the member unit service and maintain the industry member unit and the lawful rights and interests of the implement state policy laws and regulations, and promote the development of anti-static equipment industry.

Anti-static equipment branch is the government department of anti-static equipment industry to industry management assistant and staff. In the government department and the enterprises and institutions between the bridge and button take effect, to reflect the government enterprises and wishes and requirements, maintain the lawful rights and interests of the industry, assisting the government do a good job in industry management, in business by state ministry of industry and information related departments guidance.

Association tasks include:

Assisting the government department to make the industry technology and industry development planning;

Inside and outside the industry organization of the units concerned joint technology research and development of new products;

Suggestions for the member unit, convey to the government departments, communication circumstance;

An overview of the industry organization investigation, formulate guild regulations HangYao;

Carry out technology research, product development, investment project argumentation, evaluate consulting services;

Participate in making relevant industry standards work;

To carry out the industry management business training;

Use association website organization antistatic technology and application of the popularization and carry out market research, assist member unit to expand the market, communication production unit and the connection between the users;

Development and domestic and foreign related research institutions, enterprises and institutions, industry association, the information network and magazines, etc contact and cooperation, organization technology, product and application market exchanges, organize the domestic and international exhibitions, exhibitions and technical seminars, etc.;

Publishing industry publication national defence in electrostatic magazine, to government departments, the member unit, the related users provide free;

According to the government commission and member unit requirements, hold other relevant activities;

China's electronic instrument industry association anti-static equipment branch address:

Address: Beijing city wanda plaza CRD ginza B - 1128 room

Zip code: 100040

Telephone: (010) 68647410 51246352 fax: (010) 68647410

Web site: 66 antistatic grid

E-mail: chinaesd@chinaesd.org.cn

上海防静电工业协会 Shanghai Electrostatic Production Industry Center

上海防静电工业协会 Shanghai Electrostatic Protective Industrial Association (缩写: SEPIA), 成立于 2004 年 9 月。本协会是由从事防静电产业的企业、事业单位自愿发起组成的专业性、跨行业、跨地区的非盈利性组织, 是上海市一级行业协会, 社会团体法人。会员单位主要是覆盖长三角地区的生产防静电服装、地板、包装、耗材、装备设备或有关设计等领域的骨干企业, 现有会员单位 105 个, 理事单位 22 个。

随着我国信息化建设发展, 计算机、通讯、集成电路等行业进入了快速发展期, 静电危害问题突出。防静电装备、器材、工具以及防静电环境工程, 生产线防静电系统等防静电产业逐步成为先进制造业配套服务的充满活力的新兴产业。由于防静电装备产品有近 100 类, 2000 多种, 初期生产加工相对容易, 部分企业质量管理水平较低, 产品生产没有标准, 迫切需要加以提高。协会设: 标准化委员会、专家委员会等, 并投资成立具有独立法人资格的“上海工业静电技术研发服务中心”, 负责技术咨询、检测、评估、组织培训、项目开发等。协会有内部季刊《上海防静电工业》。

协会成立以来, 已多次牵头组织会员单位参与制定防静电方面国家、行业、地方标准; 召开国际、国内有关新技术、新产品研讨会; 开展相关知识、技术培训及静电专业职称申报评审等。

会长: 黄建华 – 上海晨隆国际贸易有限公司董事长、总经理

法定代表人: 黄建华

秘书长: 罗宏昌 (2010 年 2 月开始 – 病假)

代秘书长: 孙君同 – 上海君江科技有限公司总经理、协会副会长

专职副秘书长: 熊衍元

协会地址: 上海市虹口区车站北路 625 弄 57 号 306 室

邮编: 200434

电话: 021-65367650

传真: 021-65369757

网址: <http://www.esdchina.org.cn>

电子邮箱: esd_china@esdchina.org.cn

Founded in Sep.2004, Shanghai Electrostatic Protection Industry Association (abbr. SEPIA) is a non-profit organization voluntarily formed by electrostatic protection enterprises and institutions of professionals, cross-trades and cross-regions. SEPIA is a Class A legal body corporate of the industry associations in Shanghai and social groups. Members are mainly covered the backbone enterprises of manufacturing and producing anti-static clothing, floors, packages, consumable goods, equipments, devices or related designing, etc. in the areas of the Yangtze River Delta. Currently, SEPIA holds 105 member units, among them 22 are council members.

With the development of the building- of our country ' s information system, the industries of computer, telecommunication, integrate circuit, etc. have been getting into a speedy developing period, but the issue of the electrostatic hazards has also become prominent to them. Thus, the industries of installation, facility, equipment, tool, environmental engineering, production line system, etc. for electrostatic protection have become vibrant new and rising ones of the Hi-Tech manufacturers with assorted supporting services. Because there were nearly 100 classifiable outfits and 2000 varieties of products, the production and processing in part of the industries were relatively easy entry at the early stage, the standards of their products ' quality control were weak in some manufactures and no criterions could be followed. So it seemed the improvement was in an urgent need.

The Association has set: the Standardization Committee and the Committee of Experts, etc. and invested in establishing a working unit of independent legal personality " Shanghai Research and Development Service Center for Industrial Electrostatic Technology " , responsible for technical consulting, testing, evaluation, organization, training, project development. SEPIA also has its internal magazine < Shanghai Electrostatic Protection Industry > published quarterly.

Since its founding, the Association has taken the leading role in repeatedly organizing its member units involved in formulating the criterions in the fields of electrostatic protection for the country, the industry and the local; also convening domestic and international conferences and seminars for the related new technologies and new products and launching and developing trainings of technical know-how, also doing jobs on applying, assessing, evaluating and filing electrostatic professional titles, etc.

President: Huang-JianHua Chairman&General Manager of Shanghai Chen-Long International Trade Ltd.,Com.

Legal Representative: Huang-JianHua

Secretary-general: Luo-HongChang (sick leave since Feb. 2010)

Deputy secretary-general: Sun JunTong General Manager of Shanghai Jun-Jiang science and technology Ltd.,Com. Vice-President of the association

Executive Vice- secretary-general: Xiong-YanYuan

Address: R306 No.57, Lane625,Road Noth ChenZhan ,Shanghai

Zip:200434

Tel: 021-65367650

Fax: 021-65369757

Net: <http://www.esdchina.org.cn>

E-mail: esd_china@esdchina.org.cn

天津市质量技术监督信息研究所 Quality and Technical Supervision Information Research Institute of Tianjin

天津市质量技术监督信息研究所成立于 1984 年 5 月，隶属于天津市市场和质量技术监督委员会，是集标准化科研、服务和应用于一体的省级社会公益类科研机构，立足于服务政府、服务企业、服务经济社会发展，为市场监管职能履行和经济社会发展提供专业标准技术服务。

主要开展社会管理和公共服务、现代农业、循环经济、城市可持续发展等领域标准化研究与应用；WTO/TBT 通报咨询研究服务；编码与自动识别技术应用推广；国内外各类标准文献资源公共服务。我们坚持以公益性服务为基础，以创新和科学发展为导向，以专业化品牌建设为核心，持续发挥对国民经济与社会发展的技术保障作用。

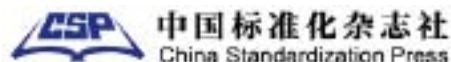
在天津市市场和质量技术监督委员会的领导下，在科学发展观的指引下，我们在标准化科研和服务领域的不懈探索和努力，赢得了地方政府、广大企业和社会各界的广泛好评，一批科研成果荣获国家和省市级奖项。

Tianjin Technical Supervision quality information Institute was established in May 1984, under the Tianjin Market and Quality Supervision Administration, is collection of standardization of scientific research, service and application for a provincial social welfare scientific research institution, based on service government, enterprises and development of economic and social, provides the professional standards and technical services for market regulation functions performing and social economic development.

Mainly carried out the standardized research and application of field of social management, public services, modern agriculture, circular economy, and sustainable urban development; WTO/TBT notification and enquiry research services; the application and promotion of the coding and automatic identification technology; public services of various standard domestic and foreign literature resources. We insist on public service as the foundation, innovation and scientific development as the guide, specialized brand building as the core, continue to play a technical support role of economic and social development of technology.

Under the leadership of Tianjin Market and Quality Supervision Administration, Under the guidance of the scientific concept of development, our unremitting exploration and hard work in the field of standardization research and services, has won the wide acclaim of local government, the majority of enterprises and the community, a group of scientific research won the national and provincial and municipal awards.

中国标准化杂志社 China Standardization Press



中国标准化杂志社是由中国标准化协会和中国标准化研究院的全资公司——中国标准科技集团有限公司共同出资的股份制企业。由国家质检总局主管，中国标准化研究院和中国标准化协会共同主办。本着顺应国家新闻出版总署关于中央新闻出版业文化体制改革精神的要求，依据国家新闻出版总署及有关部门规定，经国家质检总局同意，2010年9月，由中国标准化研究院主办的标准科学杂志社（出版刊物为：《标准科学》、《标准生活》、《术语标准化与信息技术》）与中国标准化协会主办的中国标准化杂志社（出版刊物为：《中国标准化》、《China Standardization》）正式合并，2011年12月《术语标准化与信息技术》更名为《产品安全与召回》。现五本杂志涵盖了中国标准化领用领域的政策形势时事政策、发展动态、研究成果、国行标权威发布、标准科技前沿和热点探讨、标准化理论与实践、中国标准化文化历史，以及与百姓生活息息相关的标准知识普及等内容，是目前中国标准化领域最全面、最权威和最具实力的传媒机构。

China Standardization Press is a professional media institution in the field of standardization jointly established by China National Institute of Standardization (CNIS) and China Standardization Association (CAS). It is dedicated to be an authoritative media group in China standardization and make great contributions to its development.

China Standardization Press has five journals:

China Standardization (Chinese)

Started in 1958, it is the most influential professional media in China's standardization field.



China Standardization (Overseas)

Started in 2004, it reports the China standardization development in an all-round to the international community, expressing the viewpoints of experts from home and abroad and displaying the standardization culture with Chinese characteristics. It is the only English journal for exchange with overseas standardization organizations.



Standard Science

Started in 1964, it is a core journal in science and technology in China focusing on probing and research of theories of standardization science. It is also a platform for communication of standardization theory and academic exchanges.



Standard Living

Started in 1964, it is a fashionable magazine for science popularization, using popular and easy ways to explain standards, plain and simple language to report news of standardization, and adopting shocking cases to strengthen standards, so as to serve as a standardization guide for common people.



Product Safety and Recall

Started in 1996, it was originally named as Terminology of Standardization and Information Technology. It is professional periodical for introduction of policies, laws, regulations and standards of product safety, analysis of current status and development trend of product safety management at home and abroad, summing up and exchange of experiences in enterprises' product safety management, promotion of product safety technologies, and popularization of product safety knowledge.



天津开发区实力技术工程有限公司 Techbase Engineering Co., Ltd.

天津开发区实力技术工程有限公司位于环渤海中心地区的天津市，成立于1997年，是国内较早从事防静电，净化产品生产厂商之一。可按国家静电防护标准和规范要求及美国 ANSI/ESD-S20.20-1999 标准，为微电子，光纤光缆，精密机械，航空航天和科研教学等行业提供高质量的防静电产品，并代理销售多家国际品牌的静电防护产品。同时可根据客户的需要，提供专业的咨询，培训，产品检测等技术服务及防静电专业解决方案。

公司目前拥有 1500 平米的生产厂房，建有防静电，净化服装专业生产车间，无尘擦拭布制造车间，环渤海地区最高级别的标准 100 级无尘清洗车间。

产品制造严格遵守 GB12014-2009, ANSI/ESD-S20.20-1999, IEST-RP-CC004.3 标准执行，并与 2004 年 10 月 12 日通过了 ISO9001 国际质量管理体系认证，为客户提供优质服务打下了良好的基础。公司不断优化生产流程，降低生产成本，提高工作效率提升产品品质，为客户提供极具性价比的产品和服务，以不断满足对价格和品质要求。

高科技产品依靠的是高科技人才。公司目前不仅有一支由高工，博士，硕士等组成的科技开发队伍，同时还有一班兼具专业科技素质和多年丰富市场开拓经验的销售精英。正是他们构筑了实力公司的“实力”。

“技术为本，信誉第一”是公司的经营宗旨。“客户满意”是我们的最终目标。经过多年的努力，目前已成为 MOTOROLA, SONY-ERICSSON, EPSON, NATIONAL, SANYO 等国际国内一流公司的供应商。



Techbase Engineering Co., Ltd. located in the Bohai Sea region's economic center - Tianjin Municipality, founded in 1997, is the earliest one of dust-free cleaning products domestic manufacturers. According to national anti-static standards and specifications requirements and the United States ANSI/ESD-S20.20-1999 standards for the microelectronics, optical fiber and cable, precision machinery, aerospace, scientific research and teaching and other industries to provide high-quality static control products, at the same time, sale agent number of international brand's static protection products. In the meantime, according to customer's needs, provide professional consulting, training, product testing and other technical services and professional solutions for anti-static.

The company now has 1,500 square meters of production plants, and it builds specialized anti-static, cleaning suits production workshop, dustfree wipers manufacturing plant, the highest level of the Bohai Sea region a standard 100 dustfree cleaning shop.

Manufacturing strictly complies with GB12014-2009, ANSI/ESD-S20.20-1999, IEST-RP-CCOO4.3 standards, and in October 12, 2004 passed the ISO9001 international quality management system certification, is a good foundation to provide a excellent quality services. Companies continue to optimize the production processes, reduce production costs and improve efficiency to enhance product quality, to provide highly cost-effective products and services to continue to meet customer requirements for price and quality's requirements.

High-tech products rely on high-tech talent. Company not only has a team of senior engineers, doctors, masters and other components for the technology development, but also has a group of both professional technical quality and years of rich experience in marketing sales elites. They build "strength" of the company.

"Technology-basis, reputation-first" is the company's business objectives. "Customer satisfaction" is our ultimate goal. After years of efforts, we have become Motorola, Sony-ericsson, Epson, National, Sanyo and other leading international and domestic suppliers.



防静电产品资讯网及静电问答平台

ESD Information Webnet (www.esd.cn)

防静电产品资讯网为您提供最新的防静电产品标准, 推荐优质防静电产品, 推出优秀生产商排行榜, 展示防静电产品实用案例, 提供生产过程中静电防护解决方案, 以及专业培训、行业新闻等资讯信息。

ESD Information Webnet (www.esd.cn) will provide you the latest standard of antistatic products ,recommend excellent antistatic products, choose good manufacturers list, show practical of antistatic products, provide electrostatic protection solutions in the process of production, and professional training、 industry news and latest information.



静电问答平台——防静电资讯网移动终端 "Electrostatic Question and Answer" platform

2015年9月防静电产品资讯网推出微信服务平台——“静电问答”平台。“静电问答”是您24小时随身陪伴的防静电助手，提供免费防静电技术、防静电产品咨询；资深专家为您答疑解惑；是防静电行业互动交流平台。技术支持由防静电产品资讯网 www.esd.cn 提供。

ESD Information Webnet (www.esd.cn) launched WeChat service platform----"Electrostatic Question and Answer" platform in September 2015. It will be your antistatic assistant all day long, provide free antistatic technology、antistatic products consulting; Experts will answer and solve the problems. And It is interactive communication platform in antistatic industry. Technical support is provided by ESD Information Webnet (www.esd.cn)



Part IV Presentations 演讲文稿

09:20-09:50

多角度审视中国标准化发展 Review the Standardization Development in China from Multiple Viewpoints

演讲人

汤万金

中国标准化研究院副院长，研究员，博士，享受政府津贴待遇

Speaker

TANG Wanjin

the vice president, researcher and Ph.D. of China National Institute of Standardization, enjoys government subsidies



演讲人简介：

汤万金，中国标准化研究院副院长，研究员，博士，享受政府津贴待遇。毕业于北京科技大学获博士学位，中国科学院博士后。作为专家组组长全面参与国家标准化改革方案设计。担任多个技术委员会秘书长、副主任和发改委服务专家委员会、新疆政府专家。近年负责完成 2 项国家自然科学基金，主持或参与 10 余项国家“九五”、“十五”、“十一五”攻关课题，负或参与 20 余项部委科研项目；负责或参与多项国家标准的研制；在国内外核心期刊发表科技论文 80 余篇，出版著作 6 部。研究成果获省部级 10 余项奖励。

Speaker's biography:

TANG Wanjin, the vice president, researcher and Ph.D. of China National Institute of Standardization, enjoys government subsidies. He received his doctor's degree from University of Science and Technology Beijing and post doctor's degree from Chinese Academy of Sciences. As the leader of Expert Group, he participates in the design of the reform scheme for national standardization. He also holds the post of secretary-general or vice chairman in many technical committees and also works for the Committee of Service Experts under National Development and Reform Commission. He is also specially hired as the government expert of Xinjiang autonomous region. In recent years, he has completed 2 items of Natural Science Foundation of China, hosted or participated in more than 10 national projects including "the ninth Five-Year plan", "the Tenth Five-Year Plan" and "the 11th Five-Year Plan". He is responsible for or participates in over 20 ministry or commission level research projects and the reparation and compilation of many national standards. He has published over 80 papers in the domestic and oversea core technical journals and 6 academic works. His research achievements have been conferred with 10 more provincial- and ministerial-level awards.

多角度审视中国标准化发展 Review the Standardization Development in China from Multiple Viewpoints



多角度审视中国标准化发展

Review the Standardization Development in China from Multiple Viewpoints

国外标准化的管理和现状

共性特征

- 法律确定或政府授权的一个部门统一管理国家标准化
- 组织利益相关方通过公开、透明、协商一致的程序制定标准
- 形成技术法规(或指令)和自愿性标准(包括“协调标准”)协调配套的技术制度体系

二、国家视角



国家未来发展态势

强政府 + 强市场

强政府 + 弱市场 当前中国

弱政府 + 强市场 西方国家

提高效率

结构看: 农业 → 服务业 → 工业

市场作用

标准发挥作

政府与市场在标准化中的定位

政府

- 01 强制性标准(安全) 兜底线
- 02 推荐性标准(基础、通用) 保基本

市场

- 03 团体标准(一般性产品与服务) 促发展

国家层面: 标准体制——强制+ 推荐 + 团体

三、政府视角



政府视角

国家标准体制



新旧标准体系对比图

多角度审视中国标准化发展 Review the Standardization Development in China from Multiple Viewpoints



多角度审视中国标准化发展

Review the Standardization Development in China from Multiple Viewpoints

优化强制性标准

- 制定强制性标准的目的——安全

- 保障人身健康和生命财产安全、国家安全、生态环境安全



分类推进强制性标准改革

- 在管理上，统一管理、分工负责。
- 各部门：项目提出、起草、征求意见、审查、实施监督。
- 协调推进办：统一立项、编号、对外通报。

四、几个关键问题



改进推荐性标准管理

- 政府推荐标准包括推荐性国家标准、行业和地方标准

推荐性国家标准 重点制定基础通用、与强制性国家标准配套的标准

推荐性地方标准 可制定满足当地自然和人文条件的特殊技术要求，供社会各方自愿采用

- 突出政府推荐标准的公益属性，逐步缩减数量和规模。

四、几个关键问题



四、几个关键问题



多角度审视中国标准化发展 Review the Standardization Development in China from Multiple Viewpoints

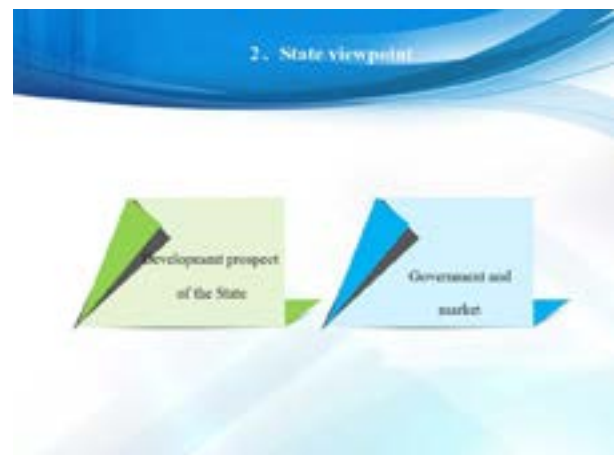


多角度审视中国标准化发展 Review the Standardization Development in China from Multiple Viewpoints

Management and current situation of mycress standardization

Common characteristics

- Department conferred by the law or authorized by the government is responsible for the unified management of national standardization.
- Organize interested parties to formulate standards following the principles of openness, transparency and mutual negotiation.
- Form technical system and rules matching with technical regulation (effectives) and voluntary standards (including coordinative standards).



多角度审视中国标准化发展 Review the Standardization Development in China from Multiple Viewpoints



多角度审视中国标准化发展 Review the Standardization Development in China from Multiple Viewpoints



Promote mandatory standard reform by categories

As to management, unify the management, and divide labor with individual responsibility

Corresponding department shall: submit the project, make draft, seek for opinions, investigate and examine, implement and supervise

Office of coordination and promotion: suitably set up the project, monitoring, inform the outside



Improve management of recommended standard

Recommended standards by the government include recommended national standards, industrial standards and local standards.

Recommended national standards: From the making basis and national standards that match with mandatory national standards

Recommended local standards: Special national experimental research, technical standard and related activities for the voluntary application of important equipment and organization

Highlight the public-interest attribute of recommended standards by the government, gradually reduce the quantity and size.



09:50-10:20

物联网和静电放电 Internet of Things and ESD

演讲人

泰瑞 · L · 韦尔泽

美国静电放电协会 (ESDA) 副主席 博士 iNARTE (国际无线电与电信工程师协会) 理事会成员

Speaker

Terry.L.Welsher

ESD Association, Vice Chairman



演讲人简介:

泰瑞 · L · Welsher 博士于 2001 年在朗讯科技贝尔实验室的工程技术研究中心的质量、测试及可靠性部门主管的位置上退休。1978 年在贝尔实验室开始了他的职业生涯，研究绝缘聚合物的电传导机制和电气互连材料的电解腐蚀失效机制。1984 年，由于他的出色工作他被任命为这些领域的杰出会员。1986 年，他被晋升为技术经理，重组贝尔实验室的静电放电 (ESD) 领域的核心专长。新成立的小组着手在这个领域创造了一系列开创性贡献，并在推动行业标准起到了关键作用。1994 年，将他的小组的活动拓宽到了朗讯科技公司硬件可靠性的所有方面，特别强调在环境压力测试 (EST) 和产品可靠性预测与规划。1997 年，他被晋升为质量、测试及可靠性中心的主任，在这里他负责朗讯科技公司业务单位的产品质量、测试和可靠性保证措施的发展和部署。这项工作包括集成电路、电路板和系统级测试和诊断的可测性设计，及射频与光电系统和元件测试的特殊技术的可测性设计。离开朗讯后，他成为了 Lasersharp 公司的可靠性主管，这是一家光纤激光放大器公司，在那里他负责产品质量、可靠性和适应性。2004 年以来，他一直担任 Dangelmayer (丹格尔迈尔) Associates 有限责任公司的高级副总裁，这是一家 EOS / ESD 咨询公司。

Welsher 博士是 1988-1989 ESD 协会标准委员会主席。1991 年担任技术程序主席，1992 年担任副主席，1993 年担任 EOS / ESD 研讨会大会主席。1993-1995 年他曾担任研讨会理事会成员。他也一直活跃在与 ESD 协会，JEDEC 的 14 质量和可靠性委员会等机构有关的质量标准和路线图活动。1999 年至 2001 年他曾担任 JEDEC 理事会理事。他目前是 JEDEC / ESDA 的 HBM 和 CDM ESD 工作组的联合主席，ESD 协会副主席和 iNARTE (国际无线电与电信工程师协会) 理事会成员。最近，他带头努力协调和合并 JEDEC 和 ESDA 的设备测试标准。他获得了佛罗里达州立大学化学学士学位和得克萨斯大学奥斯汀分校化学物理学博士学位。他在固体物理、应用数学、有机化学、电子产品可靠性和静电放电等领域发表或联合发表了四十篇论文。

Speaker's biography:

Dr. Terry L. Welsher retired from Lucent Technologies-Bell Laboratories Engineering Research Center in 2001 as the director of the quality, test & reliability department. He began his career in Bell Labs in 1978; where he worked on electrical conduction mechanisms in insulating polymers and electrolytic corrosion failure mechanisms in electrical interconnection materials. In 1984, he was appointed distinguished member of technical staff for his work in these fields. In 1986, he was promoted to technical manager to re-constitute the Bell Laboratories core expertise in electrostatic discharge (ESD) . The newly formed group proceeded to produce a string of ground-breaking contributions to the field and played a key role in advancing industry standards.

In 1994, he broadened his group's activities to all aspects of hardware reliability for Lucent Technologies with special emphasis in environmental stress testing (EST) and product reliability prediction and planning. In 1997, he was promoted to director of the quality, test & reliability center of excellence where he directed the development and deployment of product quality, test and reliability assurance practices for Lucent Technologies business units. This work included design for testability of integrated circuits, board and system level test and diagnosis and special techniques for testing of RF and optoelectronic systems and components. After leaving Lucent, he became reliability director for LaserSharp Corporation, an optical fiber laser amplifier company, where he was responsible for product quality, reliability, and compliance. Since 2004, he has been senior vice president of Dangelmayer Associates, LLC, an EOS/ESD consulting firm.

Dr. Welsher was chairman of the ESD Association standards committee 1988-1989. He was technical program chair in 1991, vice general chair in 1992, and general chair in 1993 of the EOS/ESD Symposium. He served as member of the Symposium board of directors 1993-1995. He has also been active in quality standards and roadmapping activities with Sematech, the ESD Association, and the JEDEC 14 quality and reliability committee. He served on the board of directors of JEDEC 1999-2001. He is currently

co-chair of the joint JEDEC/ESDA HBM and CDM ESD working groups, vice president of the ESD Association, and a member of the board of directors of iNARTE, a telecommunications technical certification organization. Recently, he has led the effort to harmonize and merge JEDEC and ESDA device testing standards. He holds a BS in chemistry from Florida State University and a PhD in chemical physics from the University of Texas at Austin. He is author or co-author of forty papers in solid state physics, applied mathematics, organic chemistry, electronics reliability, and electrostatic discharge

物联网和静电放电 Internet of Things and ESD



物联网和静电放电 Internet of Things and ESD

包含物联网的主要产业*

- 汽车行业
- 医疗专业设备
- 通信设备制造商
- 建筑
- 医疗设备
- 高科技
- 消费品
- 网络与网络
- 零售业
- 电力业
- 交通运输业
- 公用事业

*SATA 报告 2013 年 10 月

工业制造: 物联网中的引导性*

- 在最受调查的 13 个行业中, 去年, 工业制造业通过其物联网连接获得了最高的收入。物联网产业厂商计划物联网在未来几年内增长。
- 工业生产者在 2015 年花在物联网 121300000 美元, 在 2016 年还将增加到 134000000 美元。大量的物联网的支出用于产品跟踪 (40%), 其次是供应链管理 (25.4%), 客户跟踪 (19.1%), 实时设备监控 (17%)。



*SATA 报告 2013 年 10 月

物联网- 此刻正在发生什么事?

- 物联网村- 首届“黑客”在物联网网络中挑战安全漏洞的研讨会/研讨会, 2015 年 10 月
- IMAFS 2015 - 先进制造技术和物联网: 我们行业的未来-2015 年 10 月
- 2015 年美国物联网应用-2015 年 11 月

以表示关注的领域

- 智能工厂/工业 4.0
 - 1985-1995 年间一直受到问题 - ESD/EMC 设备式连接
 - 设备制造商提供静电放电测试 - 早期 ProTech 等 (自 1980 年起)
 - 现在设备制造商提供静电放电测试 - 早期 ProTech 等 (自 1980 年起)
- 在不受控制的消费电子设备中的智能设备
 - 未经授权的人员进行保护和维修 (如维修和维修一等车) ;
 - 台式设备制造商提供了保修的保修 (例如, 在物流和 EMC / ESD 的设备制造商的保修上提供保修服务) ;

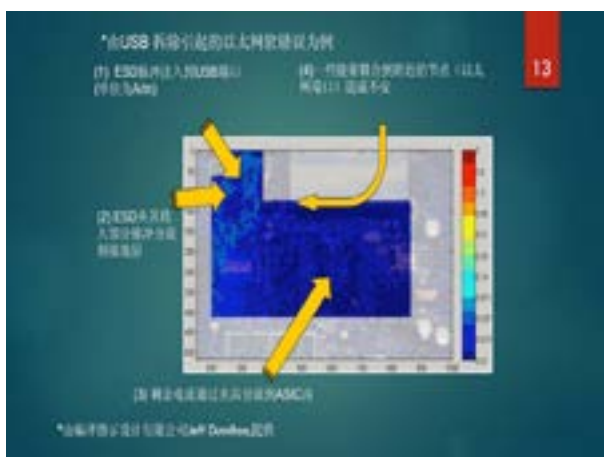
物联网静电放电/电磁干扰的具体问题

- 系统静电放电/电磁干扰设计必须考虑新的和分布广泛的不受控制的网络的产品和服务
 - 静电放电/电磁干扰设备制造商的广泛部署
 - 设备/系统的网络设计
 - 设备制造商制造的设备
- 物联网的认证, 向制造商提供保护和合时提供安全之新的设备, 然而, 最终的规格提供和更新得以升级的形式出现, 网络服务中的静电放电控制将更加重要。
- 电磁干扰
- 对设备制造商技术的影响
- 包括在产品可靠性预测中的静电放电/电磁干扰故障, 设备的估计和保险 (由物联网设备制造商提供此信息)

具体问题-防静电/浪涌保护装置的部署

- 防静电/浪涌保护的选择通常被认为是第一步骤
- 选择和放置适当的保护装置不是无和复杂的
- 错误经常出现, 尤其是由新的公司和设计团队造成的
- 硬件和机械故障都会导致问题
- 在注重安全的电路分析中了解静电保护装置的有效性

物联网和静电放电 Internet of Things and ESD



具体问题-设备/系统协同设计

- ▶ 正在开发更先进的集成设计方法的技术
- ▶ 协同设计方法: 如SECD (系统级静电放电设计)
- ▶ 在Nate Peachey网上或以后书籍中讨论

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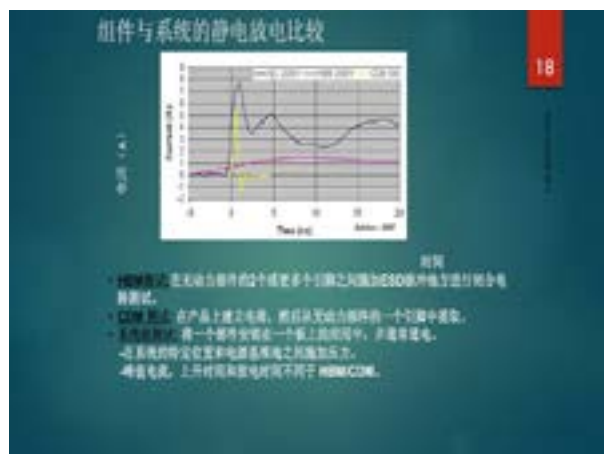
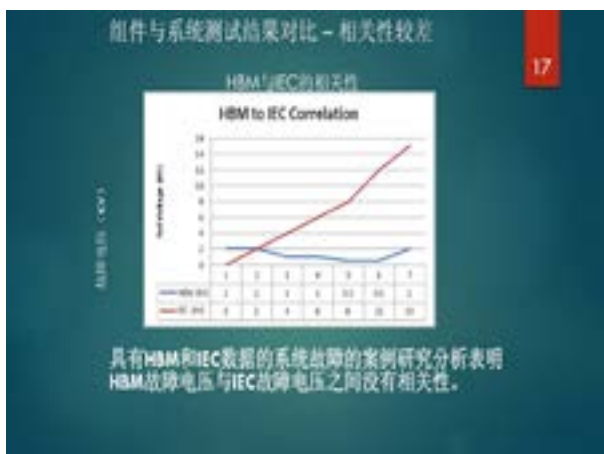


全行业的问题

设备和系统的静电放电标准的混乱

- ▶ 系统静电放电测试标准基本和器件供应商的对比
- ▶ 从系统级设计到器件级设计的对比: 理解静电放电测试/设备的要求和器件级设计的要求
- ▶ 关于对相应的器件产品适当的静电放电的保护, 在系统设计人员提供信息之前缺乏明确的指引

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组件与系统的静电放电比较

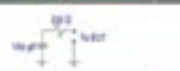
常用器件与器件手册			20
器件名称	集成通用高速八通道1.5V电平转换器器件 74VHC125	集成通用高速八通道1.5V电平转换器器件 74VHC125 (集成4通道)	
型号	集成通用高速器件	集成通用高速器件	
封装	塑料双列直插式	塑料双列直插式	
额定	100mA (V _{CC} = 5V)	100mA (V _{CC} = 5V)	
额定	100mA (V _{CC} = 5V)	100mA (V _{CC} = 5V)	
封装形式	DIP (14-pin)	DIP (14-pin)	
备注			
额定电压	1.5V~5.5V	1.5V~5.5V	
额定功率	800mW	800mW	
工作温度	-40°C ~ +125°C	-40°C ~ +125°C	
封装形式	14-pin DIP	14-pin DIP	
封装	塑料双列直插式	塑料双列直插式	
封装	14-pin DIP	14-pin DIP	
备注	1.5V~5.5V, 1.5V, 1.5V, 1.5V, 1.5V, 1.5V, 1.5V, 1.5V	1.5V, 1.5V, 1.5V, 1.5V, 1.5V, 1.5V, 1.5V, 1.5V	
器件手册	74VHC125, National 74VHC125	74VHC125, National 74VHC125	

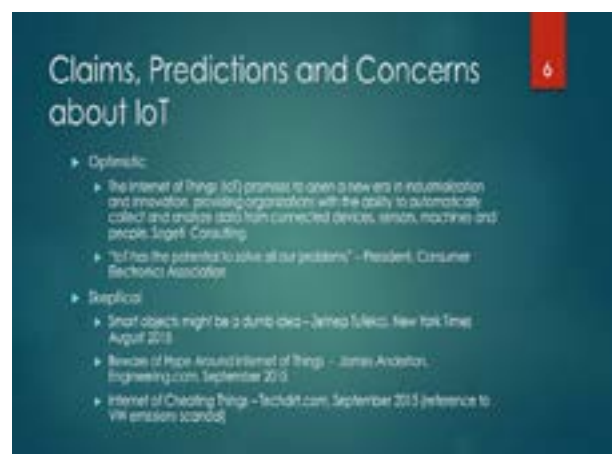
Figure 1 is a line graph titled 'Relationship between the number of employees and the number of managers'. The x-axis is labeled 'Employees (logarithmic)' and ranges from 10 to 1000. The y-axis is labeled 'Managers' and ranges from 0 to 20. The graph shows six lines representing different organizational structures and their 10% variants:

- Flat** (green line): Starts at approximately 18 managers for 10 employees and decreases to about 2 managers for 1000 employees.
- Hierarchical** (red line): Starts at approximately 15 managers for 10 employees and decreases to about 3 managers for 1000 employees.
- Matrix** (blue line): Starts at approximately 12 managers for 10 employees and decreases to about 4 managers for 1000 employees.
- Flat with 10%** (orange line): Starts at approximately 10 managers for 10 employees and decreases to about 2 managers for 1000 employees.
- Hierarchical with 10%** (yellow line): Starts at approximately 8 managers for 10 employees and decreases to about 3 managers for 1000 employees.
- Matrix with 10%** (purple line): Starts at approximately 10 managers for 10 employees and decreases to about 4 managers for 1000 employees.

The graph illustrates that as the number of employees increases, the number of managers required decreases for all structures. The 'Flat' structure requires the most managers, while the 'Flat with 10%' structure requires the fewest.

- ▶ 物联网是先进制造技术标准和协议，包括传感器和云计算的一个自然延伸和融合。
- ▶ 虽然它的发展方向不明确，但毋庸置疑，与物联网基础相连，大量的数据分析和信息增加，可让设备更可靠和物理世界更透明了。
- ▶ 目前讨论的热点是关于安全性和隐私性的讨论。
- ▶ 虽然确实存在网络攻击问题，它依赖于网络基础设施设计问题，但可避免让机器更智能的设备，保障它的质量和可靠性是必须承担的责任和成本。

物联网和静电放电 Internet of Things and ESD



物联网和静电放电 Internet of Things and ESD

Major Industries Embracing IoT*

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- Automotive
- Banking and Finance
- Consumer Packaged Goods
- Energy
- Healthcare
- High Technology
- Insurance
- Media & Entertainment
- Retail
- Telecommunications
- Travel & Hospitality
- Utilities

*GfK Consultancy Service 2013 Report

Industrial Manufacturing: Leading in IoT*

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- ▶ Of the 13 industries surveyed, industrial manufacturing gained the highest revenue through its IoT initiatives last year. The IoT spend of industrial manufacturers is only expected to grow in the coming year.
- ▶ Industrial manufacturers will spend approximately \$121.3 million in 2015, and the spend will increase to \$136.3 million in 2016. A huge chunk of IoT investments will go towards product monitoring (40%), followed by supply chain monitoring (28.4%), customer monitoring (19.1%), and premises monitoring (17.0%).



*GfK Consultancy Service - 2015 Report

Internet of Things – What is happening right now?

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- ▶ **IoT Village** – Conference/workshop encouraging “hackers” to find security weakness in IoT networks, October 2013
- ▶ **IMAPS 2015 - Advanced Packaging & the Internet of Things: The Future of Our Industry** – October 2015
- ▶ **Internet of Things Applications ISA 2015** – November 2015

Areas where concerns have been expressed

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- ▶ Smart Factory or Industry 4.0
 - ▶ Fixed the problems of the 1980s/1990s – ESD/Elect equipment sensitivity
 - ▶ Misunderstanding of Device and System level ESD
 - ▶ Interaction of board/device protection strategy – see Dr. Peachey's talk later
- ▶ Intelligent devices in uncontrolled consumer environments
 - ▶ Maintenance and repair by untrained personnel (do as much damage as the preventer)
 - ▶ Distributed design responsibility underpinning purpose of standards (e.g., misapplication of IEC standards where physical and EMC/ESD requirements were ignored)

Specific ESD/EMI Issues for IoT

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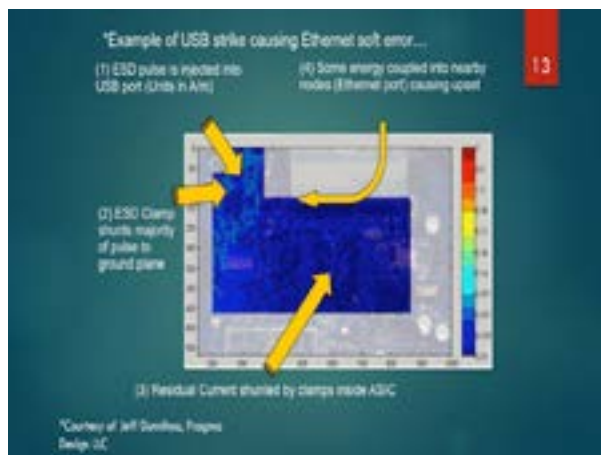
- ▶ System Level ESD/EMI design must take into account new and widely dispersed uncontrolled environments for products and services
 - ▶ Wide deployment of transient voltage suppression and other surge protection devices
 - ▶ Device/System Co-Design
 - ▶ Confusion about device and system level standards
- ▶ IoT promises that maintenance will be done remotely and imminent failures will be identified before they happen. However, ultimately on-site repair and replacement will occur as well as upgrades. ESD control in field service will be come more important.
- ▶ Billing
- ▶ Impact on Advanced Packaging of Devices
- ▶ Inclusion of ESD/EMI failures in Product Reliability prediction, spares estimation and warranty (data collected by IoT networks should also make this more accurate)

Specific Issue – Deployment of ESD/ Surge Protection Devices

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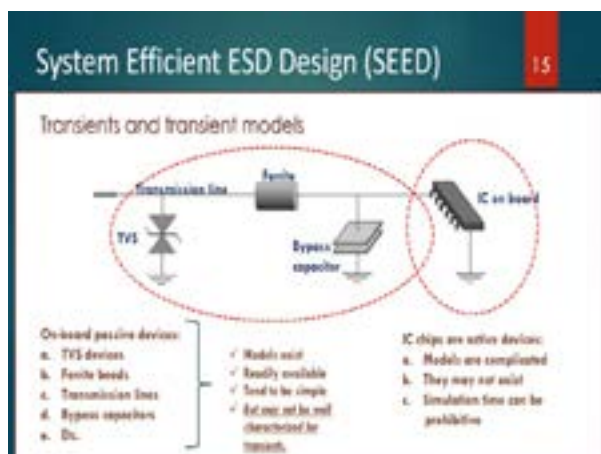
- ▶ Selection of ESD/Surge Protection Often Done as last step
- ▶ Choosing and placing proper protection device is not trivial
- ▶ Mistakes are often made especially by new companies and design organizations
- ▶ Both hardware damage and soft errors must be considered.
- ▶ Advanced circuit analysis often required to understand surge protection device effectiveness

物联网和静电放电 Internet of Things and ESD



Specific Issue – Device/System Co-Design

- More advanced techniques for an integrated design approach are being developed
- Co-Design Methods such as SEED (System Efficient ESD Design)
- Discussed in Dr. Mark Peachey's talk later

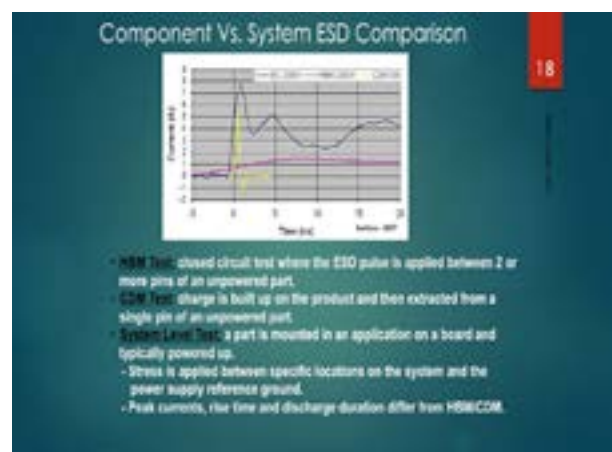
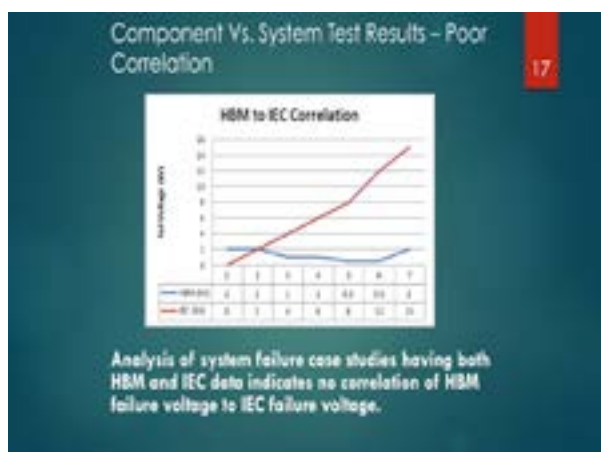


Industry Wide Problem

Confusion about device and system ESD standards

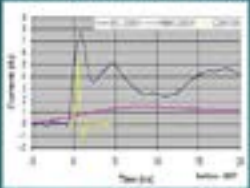
- ESD test specification requirements of system vs. component providers
- Understanding of the ESD failure / upset mechanisms and contributions to those mechanisms, from system specific vs. component specific constraints
- Lack of acknowledged responsibility between system designer and component provider regarding proper system level ESD protection for their respective end products

CEMs are attempting to use component ESD information as an indicator of system level performance!



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Component Vs. System ESD Comparison



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- Pass/Fail Criteria
 - HEM/CDM: based on physical damage
 - System Level ESD: based on temporary system upset and/or physical damage
- The discharge paths and the associated currents will be different for these stress methods, therefore NO correlation can be expected

System level ESD vs. Component level ESD

Event example	Charged human discharging through a master board to a system	Charged human discharging through the air to a component (IC)
Model	IC system level ESD	Human body model (HBM)
Environment	End customer's normal operation	Factory assembly
Standard example	IEC 6100-4-2 (Powerful)	JEDEC J14 (Powerful only)
Test	ISO 10618 (Component)	
ESD network		
Peak current	2.75 A/100	3.75 A/100
Typical requirement	0.63	2.50
Rise time	0.7 + 1 ns	2 + 10 ns
Pulse width	100 ns	100 ns
Platform	IC and board	IC
Application	PC, Cell phone, Tablet, etc.	IC
Tester examples	KeyTest W3000, Keysight ESD1000	KeyTest ESD1000, Keysight

→ The test levels are significantly different due to different test methods

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Example of Device/System Confusion in IoT Marketing

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In its marketing material an IC supplier claims specific "ESD/EMI robust" solution for IoT. A series of devices are advertised as having enhanced ESD/EMC performance in high electrical noise environments.

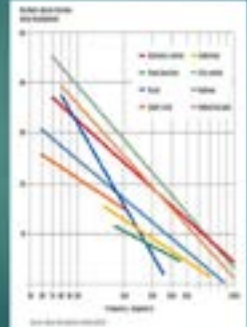
However, the enhancement over "normal" products reported in the data sheet is the "improvement" of the HBM (not even IEC ESD) level from 2kV to 6 kV.

HOIS - ESDA, in cooperation with JEDEC and the Industry Council of ESD, targets to develop common guidelines for clearly reporting ESD information in data sheet

Specific Issue – EMI Fog

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- Electronic Noise is Drowning Out the Internet of Things – Article in IEEE Spectrum, August 2015
- More RF protection needed because of uncontrolled proliferation of emissions



IMAPS 2015 - Advanced Packaging & the Internet of Things: The Future of Our Industry

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www.imaps2015.org

- New Packaging Technologies for IoT
 - Chaoxi, Kyo-oh Lee, Intel Corp.; Yuhua Chen, Unimicron
- IoT is the next big opportunity to enrich every person on earth
- By 2020, 30B devices are expected to be connected to the internet which means 7 connected devices every person on earth
- The IoT is often times described as any combination of one or more integrated circuit(s) or device(s) functionalities
- The demands for higher levels of integration and power costs coupled with a growing awareness of complete system configuration have continued to drive the popularity of IoT
- The challenge is how to integrated all of these components seamlessly into a package. Here are some of the latest IoT developments in various application fields.

Conclusions

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- Internet of Things is a natural extension and combination of advancing WiFi internet standards and protocols, sensor technology and cloud computing
- While its direction is still unclear a dramatic increase in smart device, internet based monitoring, massive data analysis, wearables and ingestibles are coming
- Most discussion of the moment is about security and interoperability
- It is likely though that hardware design issues with ESD, EMI and packaging that exist now will be magnified by the rapid proliferation of devices, exploding markets and the need to get to market quickly

10:50-11:20

大陆汽车（天津）静电控制系统 Continental Automotive Tianjin ESD control



演讲人

张雪

大陆汽车系统（天津）有限公司 质量体系部负责人

Speaker

Zhang Xue

Continental Automotive System (Tianjin) , QMS Manager

演讲人简介：

姓名：张雪

职位：大陆汽车系统（天津）有限公司 质量体系部负责人

出生年月：1982.08

工作经历：2006 年加入大陆汽车系统天津有限公司，从事质量工作。

2011 年取得了大陆汽车内部 ESD 内审员的认证资格，开始从事 ESD 静电防护管理工作。在此期间，做了很多内部改进项目取得了很好的成果：

- a. 工厂静电服改进项目
- b. 工厂地坪改进项目
- c. 工厂防静电物品采购管理标准化项目
- d. 客户退货 ESD 相关的改进项目

Speaker's biography:

Given Name : Xue

Surname : Zhang

Job Title : Continental Automotive System (Tianjin) , QMS Manager

Date of Birth: Aug.1982

Experience : In 2006, join Continental Automotive System (Tianjin) as Quality Engineer.

In 2011, be certified as Continental Internal ESD auditor, and starting working as Plant ESD coordinator, and lead many important ESD control improvement projects:

- a. ESD smock standardization project
- b. ESD floor improvement project
- c. ESD related Purchasing standardization project
- d. ESD related customer return improvement project

大陆汽车 (天津) 静电控制系统 Continental Automotive Tianjin ESD control



Agenda 日程安排

QUALIFY FIRST

- 1 Continental China Introduction 大陆中国介绍
- 2 TJ Plant ESD Control 工厂静电控制
- 3 Best Practice and Lessons Learned 实践展示
- 4 Open Questions 有待解决的问题

Continental S

Qualify First

Continental In China 大陆中国介绍

QUALIFY FIRST



Continental S

Qualify First

Continental In Tianjin 天津厂介绍

QUALIFY FIRST



Continental S

Qualify First

TJ Product Introduction 天津产品介绍

QUALIFY FIRST



Continental S

Qualify First

Agenda 日程安排

QUALIFY FIRST

- 1 Plant Introduction 工厂介绍
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- 4 Open Questions 有待解决的问题

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ESD System 静电防护系统

Human-machine interface 人机接口

- ESD interface / ESD 静电接口
- ESD alarm / interface 静电报警
- ESD control system 静电控制
- Microcontroller / ESD control 静电控制

Equipment/Tools control 设备控制

- Wire equipment / tool 静电设备
- Regulator equipment / tool 静电设备
- ESD control system 静电控制

Measurement 测量

- ESD measurement / ESD 静电测量
- ESD control system 静电控制

External control 外部控制

- ESD control system 静电控制
- ESD control system 静电控制
- ESD control system 静电控制

Customer satisfaction 客户满意度

Cost saving 节约成本

Continental 3 **Special High-Speed** **1000000**

[illegible]

- Plant Introduction 工厂介绍
- 1.1 Plant Introduction- Control 工厂简介-控制
- Best Practice and Lessons Learned 案例展示
- Open Questions 待解决的事项



大陆汽车 (天津) 静电控制系统 Continental Automotive Tianjin ESD control

ESD Related Lessons Learned 静电控制经验教训



ESD Related Lessons Learned

Summary	ESD Related Lessons Learned
概述	1. The ESD control system is a complex system that requires a lot of resources. 2. The ESD control system is a complex system that requires a lot of resources. 3. The ESD control system is a complex system that requires a lot of resources.
经验教训	1. The ESD control system is a complex system that requires a lot of resources. 2. The ESD control system is a complex system that requires a lot of resources. 3. The ESD control system is a complex system that requires a lot of resources.
ESD control system	ESD control system is a complex system that requires a lot of resources. 2. The ESD control system is a complex system that requires a lot of resources. 3. The ESD control system is a complex system that requires a lot of resources.

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ESD control system

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Agenda 日程安排

- 1 Plant Introduction 工厂介绍
- 2 T1 Plant ESD Control 工厂静电控制
- 3 Best Practice and Lessons Learned 案例展示
- 4 Open Questions 待解决的问题

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ESD control system

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Open Questions 待解决的问题

- ◆ The quality performance is **不稳定**. Plant need to invest cost to verify by each lot. 供应商质量不稳定, 工厂需要花费时间和人工成本, 对每个批次进行确认。

- ◆ For grounding system, how can we understand the difference between 35MΩ and 1GΩ? 对于接地系统, 如何理解35MΩ和1GΩ有数量上的区别?

Parameter	Requirement	Current Situation	Requirement	Current Situation
ESD control system	ESD control system	ESD control system	ESD control system	ESD control system
ESD control system	ESD control system	ESD control system	ESD control system	ESD control system
ESD control system	ESD control system	ESD control system	ESD control system	ESD control system

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ESD control system

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Thank you
for your attention!

Continental S

ESD control system

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11:20-11:50

集成芯片上和板上的 ESD（静电放电） 保护

Integrating ESD on-chip and on-board protection

演讲人

纳撒尼尔·皮奇

美国静电放电协会（ESDA）标准业务部经理

美国电气电子工程师学会（IEEE）高级会员

Speaker

Nathaniel Peachey

ESD Association, Doctor



演讲人简介：

1994 年纳撒尼尔·皮奇在林肯市的内布拉斯加大学获得博士学位，然后在洛斯阿拉莫斯国家实验室被授予董事资助的博士后奖学金。1996 年，他在科罗拉多斯普林斯加入了 Atmel 公司。在之后的几年中，皮奇博士在 Atmel 公司担任过多个职位，包括工艺工程师、技术开发工程师、设备工程师、电路设计工程师。从 2003 年他开始专注于 ESD 防护和 I/O 设计问题。

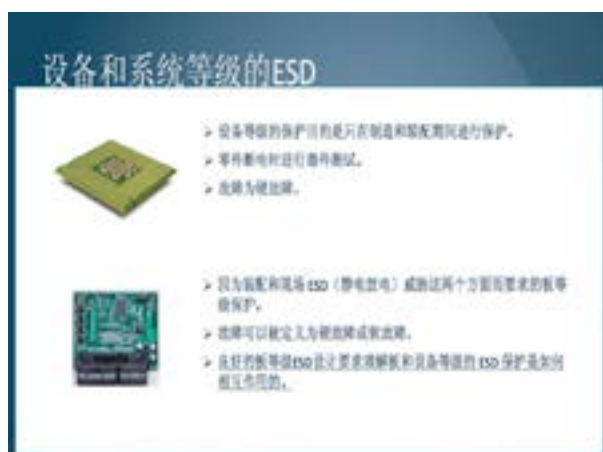
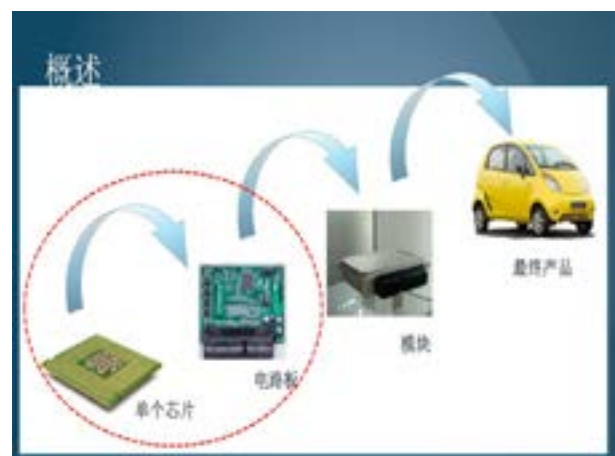
2005 年皮奇博士担任 RF Micro Devices 公司新成立的 ESD 设计组的工程经理。在担任此职务期间，他负责为 RFMD 设计的所有技术（包括硅和砷化镓）提供 ESD 防护研发。除了对芯片的保护，他还领导发展和改进了射频天线 ESD 防护。皮奇博士撰写和合作撰写了超过 20 篇技术期刊论文。他还提交了 6 个专利，已被授权或等待授权。皮奇博士 2009 年首次当选 ESD 协会理事会的理事。他曾在教育委员会任职，担任第一业务部经理。目前，他担任 ESD 协会的标准业务部经理，是 IEEE 高级会员。

Speaker's biography:

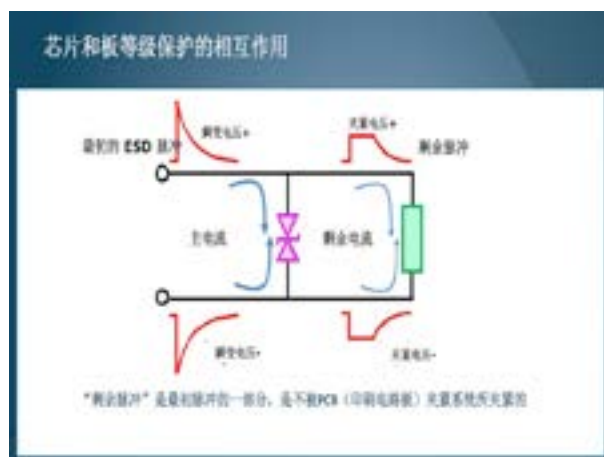
Nathaniel Peachey received his Ph.D. in 1994 from the University of Nebraska at Lincoln and then was awarded a director's funded postdoctoral fellowship at the Los Alamos National Laboratory. In 1996, he joined Atmel Corporation in Colorado Springs. Over the next several years, Dr. Peachey held various positions at Atmel; including process engineer, technology development engineer, device engineer, and circuit design engineer. In 2003, he began focusing exclusively on ESD protection and I/O design issues. In 2005, Dr. Peachey accepted the position of engineering manager for the newly formed ESD design group at RF Micro Devices. In this capacity he was responsible for the development of ESD protection for all of the technologies that RFMD designed, including both silicon and GaAs. Besides on-chip protection, he led the development and improvement of the RF

antenna ESD protection. Dr. Peachey has authored and co-authored over 20 technical journal submissions. He has also submitted six patents that have either been granted or are pending. Dr. Peachey was initially elected to the board of directors for the ESD Association in 2009. He has served on the education council and was the first business unit manager for advanced topics. Currently, he is serving as the standards business unit manager for the Association. Dr. Peachey is a senior member of IEEE.

集成芯片上和板上的 ESD（静电放电）保护 Integrating ESD on-chip and on-board protection



集成芯片上和板上的 ESD（静电放电）保护



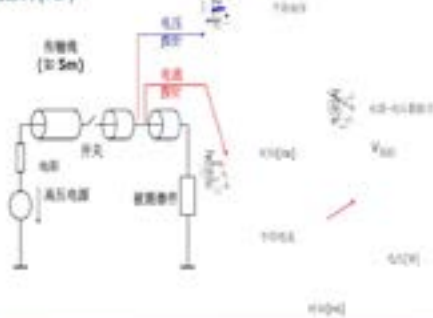
系统有效的ESD设计 (SEED)

- ### 瞬态和瞬态模型
-
- 瞬态模型电路示意图。图中显示了输入信号线、开关 (TYS)、电感器、电容以及集成电路 (IC) 的连接。红色虚线圈出了两个部分：左侧部分包含开关、电感器和电容；右侧部分包含集成电路。
- 左侧部分包含以下元件：
- 开关 (TYS)
 - 电感器
 - 电容
- 右侧部分包含以下元件：
- 集成电路 (IC)

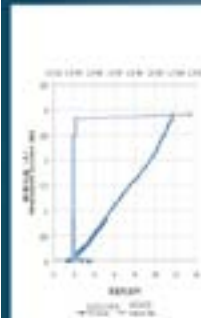
集成芯片上和板上的 ESD（静电放电）保护 Integrating ESD on-chip and on-board protection

系统有效的ESD设计（SEED）

传输线脉冲(TLP)



用于板等级模拟的部件模型



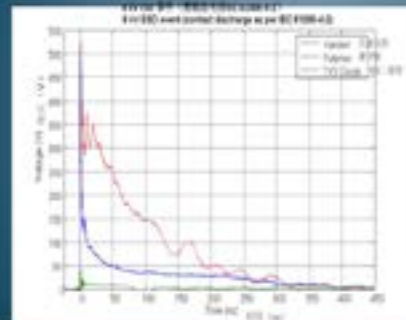
- TLP数据可以用于构建模拟ESD保护的简单IC集成引脚模型。
- 在静态状态和动态状态都需要TLP数据。
- IC制造商应提供本数据来构建的板级设计所使用模型，以指导和优化板级ESD性能。
- 在形式上与板级保护模型相似，然后被放入到整个板的模型上。

用于板等级模拟的部件模型

- 早前指出，模型（或结果）对于无源元件是现成的。
- 虽然这是事实，对于快速上升时间瞬变，可能还没有正确地描述这些结果的特性。
- 在这种情况下，必须在无源元件上进行正确的特性描述，以便从板级模型上获得准确的结果。

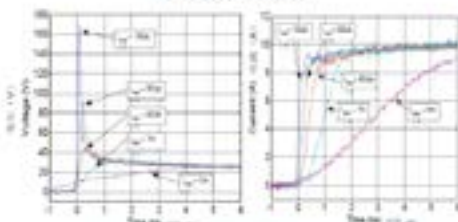
用于板等级模拟的部件模型

板上ESD抑制器件的瞬态特性



用于板等级模拟的部件模型

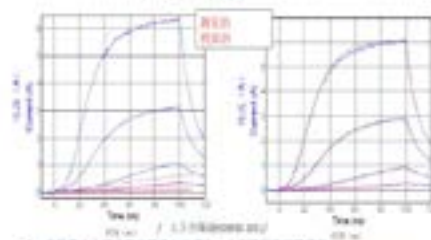
TVS二极管的v-TLP分析



- 虽然知道器件模型可以建立元件模型，但模型本身，模型正确性描述可以证明模型是否准确。
- 这种在非常快速上升的瞬态电压电流上的事件模型是可接受的。

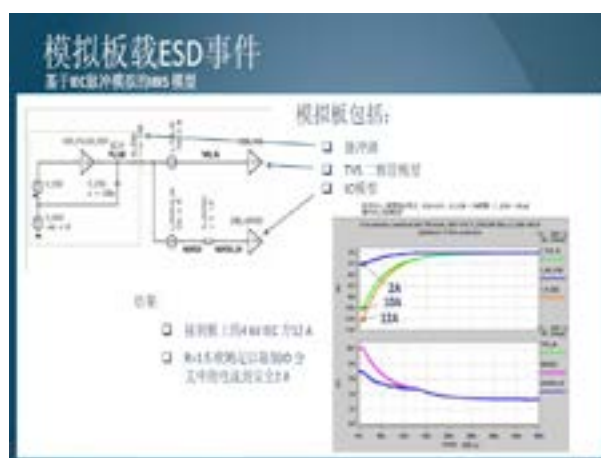
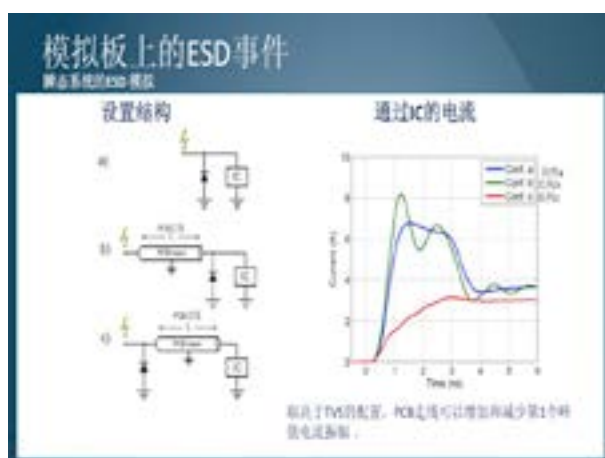
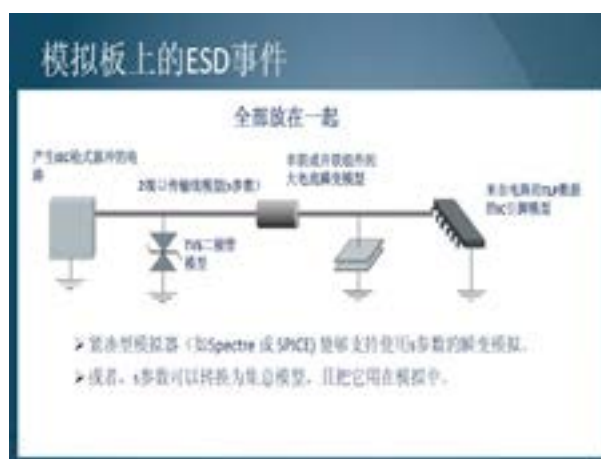
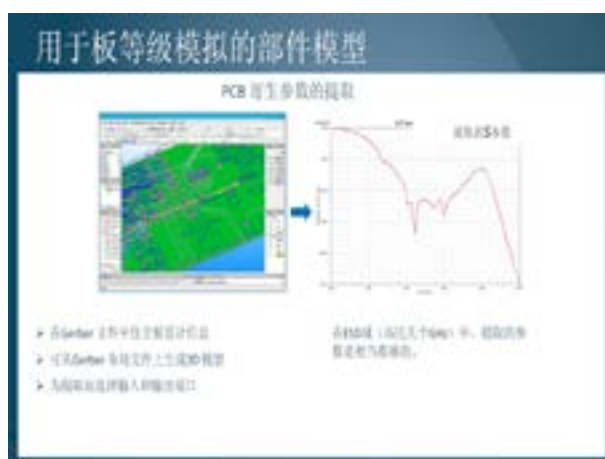
用于板等级模拟的部件模型

非线性模型建模



- 在导线引入大瞬态电压电流时，非线性模型建模。
- 对于高电压ESD模型下的非线性模型建模，非线性模型建模（非线性模型建模）是不准确的。
- 非线性模型建模模型与TLP模型建模。

集成芯片上和板上的 ESD（静电放电）保护 Integrating ESD on-chip and on-board protection



集成芯片上和板上的 ESD（静电放电）保护 Integrating ESD on-chip and on-board protection

汇总

- ❑ 优化的ESD设计要求设计人了解整个系统的相互连接；
- ❑ SEED设计方法提供了一个路径，允许器件等级和板等级ESD设计的“共同设计”
- ❑ 板等级的ESD模拟的基础是单个器件和集成电路的可变模型的开发，它们在ESD脉冲能量和瞬态响应上是耦合的。
- ❑ 这是仍在开发阶段的努力
- ❑ 但是，开发和完善SEED方法的益处远远超过开发“成本”

INTEGRATING ON-CHIP AND ON-BOARD ESD PROTECTION

Implications for Integrity of Electronic Systems

Nathaniel Peachey, PhD
ESDA Standards Business Unit Manager

ESD ASSOCIATION

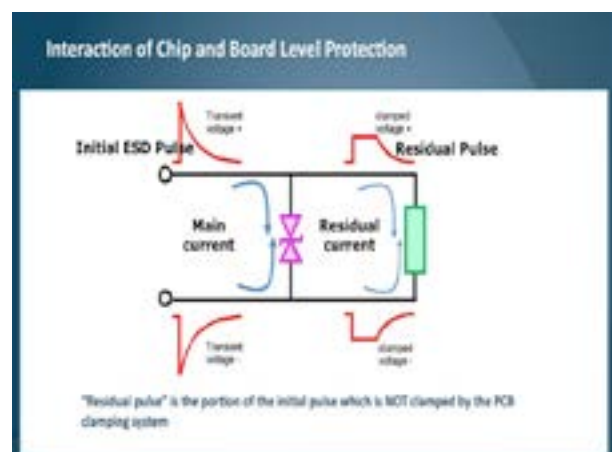
7000 Century Blvd, Suite 100
Dallas, TX 75237-1000 USA
Ph: +1 (214) 430-4000 Fax: +1 (214) 430-4100
Email: info@esda.org Website: www.esda.org



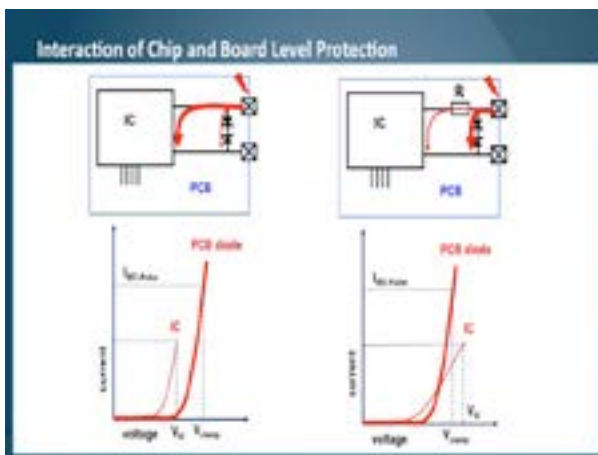
Agenda

- Overview
- Device versus System Level ESD Protection
- Interaction of Chip and Board Level Protection
- System Efficient ESD Design (SEED)
- Component Models for Board-Level Simulations
- Simulating the On-Board ESD Event
- Challenges for SEED Design Methodology
- Summary

集成芯片上和板上的 ESD（静电放电）保护 Integrating ESD on-chip and on-board protection



集成芯片上和板上的 ESD（静电放电）保护 Integrating ESD on-chip and on-board protection



Interaction of Chip and Board Level Protection

- Board ESD design has largely been an exercise in trial and error to match ESD protection capabilities.
- Intelligent board design is often hindered by a lack of information about the IC level ESD characteristics.
- Modeling the ESD event on the board requires that some type of models exist for the high-energy behavior of the IC's on the board.
- The concept of System Efficient ESD Design (SEED) was introduced by the Industry Council in 2010.

System Efficient ESD Design (SEED)

- SEED is built on the concept of matching the design of the on-chip and on-board ESD protection.
- Initially, this included only hard failure type of simulations on ports that connect to the external of the device.
- Expectations and continued development are to be able to address soft failures as well.

System Efficient ESD Design (SEED)

Transients and transient models

The figure illustrates the interaction of chip and board level protection. It includes a circuit diagram with a transmission line, a TVS diode, a bypass capacitor, and an IC on board. The diagram is divided into two sections: On-board passive devices and IC chips are active devices.

On-board passive devices:

- TVS devices
- Ferrite beads
- Transmission lines
- Bypass capacitors
- Etc.

IC chips are active devices:

- Models exist
- Models are complicated
- They may not exist
- Simulation time can be prohibitive

System Efficient ESD Design (SEED)

Transmission Line Pulse (TLP)

The figure illustrates the Transmission Line Pulse (TLP) setup. It includes a circuit diagram with a transmission line, a switch, a HV source, and a DUT. The diagram also shows a graph of current vs. voltage.

Component Models for Board-Level Simulations

The figure shows a graph of current vs. voltage for a TLP model. The x-axis is Current (mA) and the y-axis is Voltage (V). The curve shows a sharp increase in voltage as current increases.

- TLP data can be used to build a simplified model of the IC pin response to an ESD stimulation.
- TLP data would be needed from both powered and un-powered states.
- This data would be used by the IC manufacturer to build a model that would be used by the board level design to predict and optimize board level ESD performance.
- Models in a form compatible with the board level modeling (SPICE models, etc.) are then incorporated into the simulations involving the entire board.

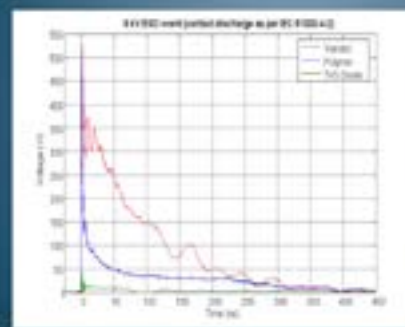
集成芯片上和板上的 ESD（静电放电）保护 Integrating ESD on-chip and on-board protection

Component Models for Board-Level Simulations

- It was stated earlier that models (or results) are readily available for the passive components.
- While this is true, these results may not have been properly characterized for fast rise time transients.
- In these cases, proper characterization must be done on passive components as well so as to obtain accurate results from the board level simulation.

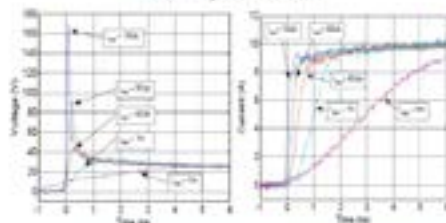
Component Models for Board-Level Simulations

Transient behavior of on-board ESD suppression devices



Component Models for Board-Level Simulations

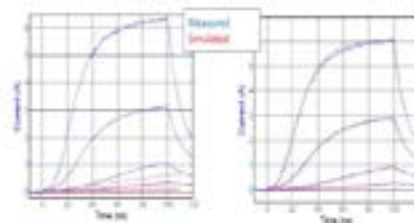
vI-TLP Analysis of TVS-Diodes



- While initial results from the manufacturer may show a device to look very good, proper characterization may prove otherwise.
- These very fast rise transients may be possible in charged board events.

Component Models for Board-Level Simulations

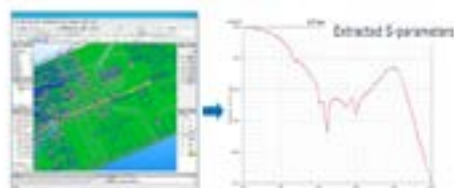
Nonlinear Ferrite Modeling



- Small ferrite beads shunt at high currents leading to a widely decreasing inductance
- Small signal S-parameters (provided by manufacturers) are inadequate for modeling of ferrite beads under high current ESD conditions
- A non-linear inductance model is fitted to TLP measured data

Component Models for Board-Level Simulations

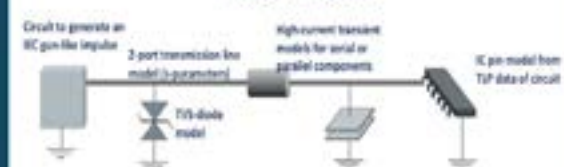
PCB Parasitic Extraction



- Board design information is contained in the Gerber files
- A 3-D model can be generated from the Gerber input files
- Input and output ports are selected for extraction

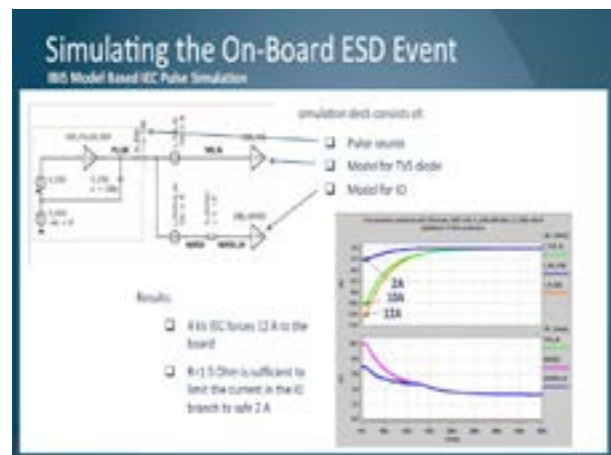
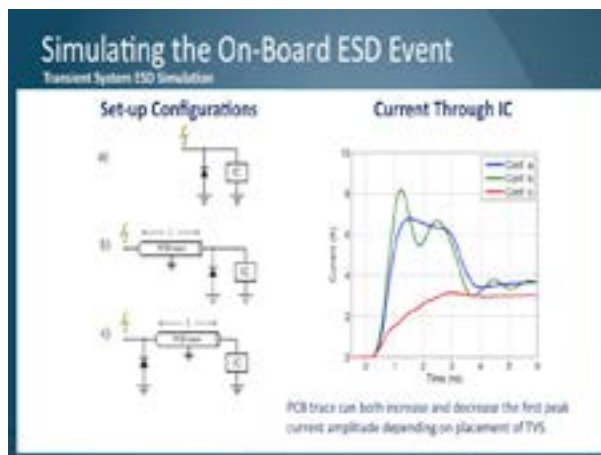
Simulating the On-Board ESD Event

Putting it all Together



- Compact simulators (ex. Spectre or SPICE) can support transient simulations using s-parameters.
- Alternately, the s-parameters can be converted to a lumped model and this used in the simulation.

集成芯片上和板上的 ESD（静电放电）保护 Integrating ESD on-chip and on-board protection



Challenges for SEED Design Methodology

- ◆ This design methodology is still in development stage
 - Currently only able to identify hard failures
 - Still in the "academic" stage and not yet widely adopted
- ◆ There is no standard model structure for passive or IC devices
- ◆ There is as yet no protocol for what ESD high current models device suppliers are expected to provide customers
 - Suppliers may want requests to provide all the needed information about their devices
 - It has been suggested that these ESD models be included in SPICE models. This certainly is not assured as yet
- ◆ There is a hesitancy to share this type of data between device/component manufacturers and customers

Challenges for SEED Design Methodology

However:

- This is an area of active research and development
 - ESD Association has a working group that is focusing on this development
- The "return on investment" for this effort can be significant
 - Reduced design cycles and redesigns
 - Optimized ESD architectures that reduce cost
 - Improved performance – both ESD performance and enhanced functionality
- This design methodology will develop rapidly and is expected to become "mainstream"
 - Electronics companies are beginning to consider this design methodology

Summary

- Optimized ESD design requires the designer to understand the inter-connection of the entire system
- SEED design methodologies provide a path to allow "co-design" of the device, level and board level ESD design
- The foundation for the board level ESD simulation is the development of reliable models for individual components and IC's that are accurate in the ESD pulse energy and frequency space.
- This is an effort that is still in development
- However, the benefits for developing and perfecting the SEED methodology are expected to far outweigh the development "costs"

13:30-14:00

航天电子工业静电防护现场 审核经验

Experience of audit for electrostatic Protection in Aerospace electronic industry

演讲人

刘民

中国航天科技集团公司五院五一四所 总工程师

Speaker

Liu Min

Beijing Orient Institute of Measurement and Test, Head Engineer



演讲人简介:

刘民，1969 年出生，研究员，博导。现任中国航天科技集团公司五院五一四所总工程师。国际无线电科学联盟 URSI 中国委员会电磁计量分委会主席。《电子测量与仪器学报》《计测技术》编委委员。宇航学会计量测试分会委员。中国航天科技集团学术技术带头人、中国空间技术研究院计量与标定专业学术技术带头人。iNarte 国际认证 ESD 工程师。

刘总师从事电磁学测量和计量前沿的研究工作，在阻抗、电功率、静电、地线等方面造诣精深，发表相关论文 40 多篇，起草国家军用标准、航天行业标准、中国空间技术研究院标准。获 6 项发明专利，其中一项获第十二届中国专利奖优秀奖。在静电防护方面开展多年的 ESD 培训、测试以及静电防护管理体系认证咨询工作，被中国空间技术研究院静电防护管理体系认证中心聘为 ESD 高级审核员。

Speaker's biography:

Liu Min, born in 1969, Professor, doctoral supervisor, head engineer of Beijing Oriental Institute of Measurement and Test in China Academy of Space Technology (CAST), chairman of electromagnetic measurement subcommittee of China committee of URSI, member of editorial board of "Journal of Electronic Measurement and Instrument" and "Metrology & Measurement Technology", member of metrology subcommittee of Astronautics Committee, academic and technologic leader in China Aerospace Science and Technology Corporation (CASC), academic leader of metrology and calibration technology in CAST, iNarte international ESD certification engineer. Liu engages in research on electromagnetics metrology and metrology frontiers, proficient in impedance, electric power, electrostatic and ground. He has published over 40 papers, drafted national military standards, industry standards and CAST standards. Liu has 6 invention patents, one of which won the twelfth China patent award of excellence. He has engaged in the field of electrostatic discharge, on ESD training, test and advisory work in Electrostatic Discharge Certification (ESDC), he has been hired as ESD senior auditor by ESDC of CAST.

航天电子工业静电防护现场审核经验

Experience of audit for electrostatic Protection in Aerospace electronic industry

航天电子工业静电防护 现场审核经验

静电防护管理体系认证中心
高级审核员
刘民
2015年11月

中国航天科技集团公司EPC

内容

- 航天电子工业静电防护标准
- 航天电子静电防护认证中心
- 审核流程
- 现场审核经验
- 不符合项的整改

中国航天科技集团公司EPC

航天电子工业静电防护标准

- 中国航天科技集团公司标准
 - Q/QJA 118-2013 航天电子产品静电防护管理体系要求
 - Q/QJA 119-2013 航天电子产品静电防护技术要求
 - Q/QJA 120-2013 航天电子产品防静电系统测试要求
 - Q/QJA 121-2013 航天电子产品防静电离子风机检测方法
 - Q/QJA 122-2013 航天电子产品防静电屏蔽包装检测方法
 - Q/QJA 123-2013 人体防静电测试仪校准规范
- 国家标准, SAC/TC425 全国宇航及其应用标准化技术委员会
 - ✓ 国家标准: 航天电子产品静电防护要求 (即将发布)

中国航天科技集团公司EPC

Q/QJA 118-119 系列标准

认证范围

Q/QJA 118-2013 航天电子产品静电防护管理体系要求	适用范围: 航天电子产品, 用于航天器、卫星、飞船等。
Q/QJA 119-2013 航天电子产品静电防护技术要求	适用范围: 航天电子产品, 用于航天器、卫星、飞船等。
Q/QJA 120-2013 航天电子产品防静电系统测试要求	适用范围: 航天电子产品, 用于航天器、卫星、飞船等。
Q/QJA 121-2013 航天电子产品防静电离子风机检测方法	适用范围: 航天电子产品, 用于航天器、卫星、飞船等。
Q/QJA 122-2013 航天电子产品防静电屏蔽包装检测方法	适用范围: 航天电子产品, 用于航天器、卫星、飞船等。
Q/QJA 123-2013 人体防静电测试仪校准规范	适用范围: 航天电子产品, 用于航天器、卫星、飞船等。

中国航天科技集团公司EPC

静电防护管理体系要素

静电防护管理体系要素

管理体系要素

产品要求

工作程序

策划

人员培训

防静电工作区

检测

标识

采购和外包

控制

改进

审核

管理评审

中国航天科技集团公司EPC

静电防护认证中心

- 2010年中国空间技术研究院成立静电防护管理体系认证中心
- ✓ 认证标准: Q/W1300-1302
- ✓ 认证范围:

证书效果: 确认符合Q/W1300静电防护标准要求的管理体系和技术能力。

CAST内部 第三方认证 → 认证中心 → CAST供应商 第三方认证

管理要求: 与CAST产品相关的电子产品生产厂商, 必须具有静电防护管理体系和技术能力

航天电子工业静电防护现场审核经验

Experience of audit for electrostatic Protection in Aerospace electronic industry

静电防护认证中心

➢ 2014年中国航天科技集团公司（CASC）成立静电防护技术中心

- ✓ 认证标准：Q/QJA118-120
- ✓ 认证范围：

证书效果：确认符合Q/QJA118-120静电防护标准要求的管理和技术能力。

中国航天科技集团公司ESDC

静电防护认证中心

➢ 认证中心内部管理

中国航天科技集团公司ESDC

静电防护认证中心

➢ 认证中心内部文件

- ✓ 认证规则：规定了组织结构、职责、认证的申请、实施、变更等程序
- ✓ 评审作业指导书：规定了审核组职责、审核过程细节、现场问题处理、档案记录等要求
- ✓ 审核员管理规定：规定审核员资格、申请、注册、考核、纪律、行为准则、评价、委聘、档案记录等管理事项
- ✓ 认证收费规则

中国航天科技集团公司ESDC

静电防护认证中心

认证流程

ESDC组织审核组对申请单位的静电防护管理体系建设与运行情况进行审核。审核结果经ESDC委员会审核后，报认证委员会审定。通过认证后，ESDC组织在认证证书的有效期内对获证单位的静电防护管理体系进行监督，确认是否持续满足体系要求。

中国航天科技集团公司ESDC

静电防护管理体系认证规则

审核流程

中国航天科技集团公司ESDC

现场审核经验

➢ 文件审核

中国航天科技集团公司ESDC

航天电子工业静电防护现场审核经验

Experience of audit for electrostatic Protection in Aerospace electronic industry

现场审核经验



现场审核种类



现场审核经验



现场审核经验

- ✓ 发生以下情况之一为否决项：
- a) 提供虚假文件、记录、报告等；
 - b) 被审核单位不配合，造成审核组无法正常开展现场审核工作的；
 - c) 单位未制定培训计划，未组织对各类人员进行静电放电及其防护知识的最初（上岗）培训和周期性培训，无相关培训记录。
- ✓ 较大范围发生以下情况之一为否决项（非单一的个人现象）：
- a) 处置ESDS电子产品时不佩戴腕带；
 - b) 处置ESDS电子产品时不在EPA内进行；
 - c) ESDS电子产品在EPA外无防静电屏蔽包装；
 - d) 防静电系统没有有效接地/等电位连接；
 - e) EPA未按照要求配置必要的静电防护设备、设施和器材；
 - f) 与静电防护要求相关的设备、设施等未经检测合格并在有效期内使用；
 - g) 与静电防护要求相关的设备、设施等检测依据与静电防护标准规定相冲突的。

现场审核经验

- ✓ 发生以下情况应开具严重不符合项：
- a) 单位不能对ESDS电子产品相关环节的静电防护需求进行持续识别，并进行审核确认；
 - b) 静电防护负责人、ESD管理人员及其他相关人员未经培训，内审员、监视和测量人员未取得相应资质证书；
 - c) EPA未能按要求配置必要的静电防护设备、设施和器材；
 - d) 与静电防护要求相关的设备、设施等未经检测合格，并在有效期内使用；
 - e) 接地/等电位连接系统未经测试或接地及连接系统不能保证ESDS器件、人员和其它导体是等电位；
 - f) 静电防护用品的验收、检测未选择具备资质的检测机构；
 - g) 单位未按要求进行监视和测量，或无监视和测量记录；
 - h) 测试仪器未经校准或不满足使用要求
- 中国航天科技集团公司 ERDC

现场审核经验

- ✓ 发生以下情况应开具观察项报告：
- a) 单位的某些规定或采取的措施可能导致相关的质量活动达不到预期的效果，尚无证据表明不符合情况已发生；
 - b) 审核组已产生疑问，但在现场审核期间由于客观原因无法进一步核实，对是否构成不符合不能做出准确的判断。
- 中国航天科技集团公司 ERDC

航天电子工业静电防护现场审核经验

Experience of audit for electrostatic Protection in Aerospace electronic industry

现场审核案例

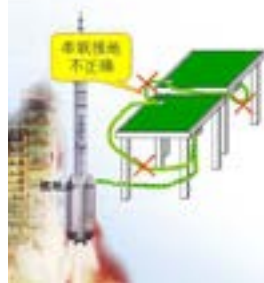
管理类不符合项

- ✓ 1) 单位静电防护负责人没有经过静电防护相关培训，现场回答不准确。考试在签名作假。不符合Q/QJA118之5.2人员培训
- ✓ 2) 《静电防护需求识别表》没有及时更新，所提供的《表》为2年前的，且没有评审和签署。不符合Q/QJA118之5.1.2识别
- ✓ 3) 没有提供人员培训记录，查现场一工作人员没有静电防护培训上岗证明。不符合Q/QJA118之5.2人员培训
- ✓ 4) 一个EPA没有指定EPA负责人。不符合Q/QJA118之5.3.2防静电工作区划分



中国航天科技集团公司EPRDC

串联接地问题



中国航天科技集团公司EPRDC

现场审核案例

技术类不符合项

- ✓ 1) 防静电椅子未经过检测，且现场抽检均不符合要求。不符合Q/QJA118之5.4.7EPA内防静电器材及监视测量要求
- ✓ 2) EPA内一工作人员处置电路板时，未带防静电腕带，且防静电服袖口卷起。不符合Q/QJA118之5.2人员接地
- ✓ 3) 防静电桌垫串联接地。不符合Q/QJA118之5.1.3接触等电位连接系统
- ✓ 4) EPA工作台面上有两片E2PROM芯片引脚插在白色泡沫板上，现场检测泡沫板为绝缘材料。经摩擦后表面电压为4.5kV。不符合Q/QJA118之5.4.3绝缘物品控制
- ✓ 5) 注塑工作自胶枪出口有4000V/mkch电场。未使用离子风机。不符合Q/QJA118之5.4.3绝缘物品控制



中国航天科技集团公司EPRDC

现场审核案例

外协、采购类不符合项

- ✓ 1) 设备物资采购，未见合格供方名录与评价记录。不符合Q/QJA118之5.6采购和外包
- ✓ 2) 防静电包装袋采购合同中要求包装符合GJB3007-87标准，此标准已过期作废。且与Q/QJA标准要求不一致。不符合Q/QJA118之5.6采购和外包
- ✓ 3) 现场发现CD40xx系列集成电路原厂包装塑料盒与盒内塑料盖板均为绝缘材料，点对点电阻大于1E12欧姆。采购合同中没有包装要求。不符合Q/QJA118之5.6采购和外包
- ✓ 4) 只提供了供方名录，未提供合格的供方评价材料。不符合Q/QJA118之5.6采购和外包
- ✓ 5) 某电路加工外协合同和技术要求中，没有写入将本标准要求。不符合Q/QJA118之5.6采购和外包



中国航天科技集团公司EPRDC

现场审核真实案例

2013-2014年认证中心对28家单位开展：监督审核（每年）和再认证审核（每3年）。



中国航天科技集团公司EPRDC

不符合项整改

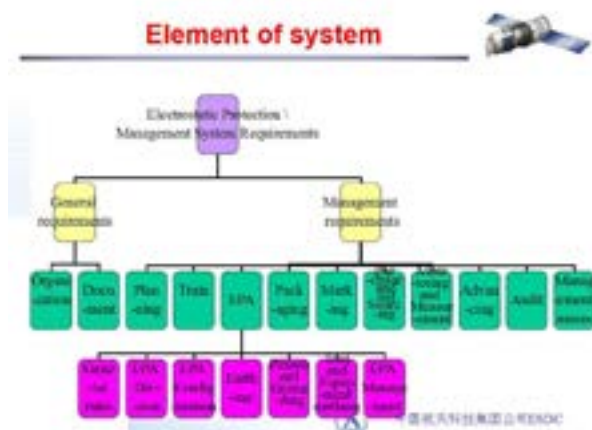
- 不符合项描述：EPA内工作台腕带连接器插孔的地线断开。未见日检记录。并过期未检。不符合Q/QJA120之4.4
- 原因分析：主管部门对标准理解不够。未在体系文件中制定日常检查记录表格。致使EPA现场管理部门无检查依据。EPA管理员日常巡检流于形式。未及时发现静电防护设施存在的问题。
- 纠正措施：更新腕带插座。检测合格。编制“EPA日常检查记录表”，对EPA管理员进行模拟故障的培训。
- 举一反三：对所有EPA管理员的日检记录进行了检查。
- 佐证材料：修理前后照片，日检记录格式，培训记录



中国航天科技集团公司EPRDC

航天电子工业静电防护现场审核经验

Experience of audit for electrostatic Protection in Aerospace electronic industry



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航天电子工业静电防护现场审核经验

Experience of audit for electrostatic Protection in Aerospace electronic industry

Example of audit

- Non-conforming about management type:
 - ✓ 1) ESD principal of organization have not been trained about ESD knowledge, and answer and question is wrong, and the sign on examination paper is fake. Against Q/QJA118 at 5.2 training
 - ✓ 2) (sheet of ESD protective requirement identified) update not in time, the sheets provided was 2 years ago, and do not evaluation with signed. Against Q/QJA118 at 5.1.2 Identification
 - ✓ 3) Do not record person training. Found that a worker in EPA had not been trained before getting job. Against Q/QJA118 at 5.2 training
 - ✓ 4) One EPA has not appoint the principal of this EPA. Against Q/QJA118 at 5.3.2 EPA division

中国航天科技集团公司 ESDC

Problem of series-grounding



中国航天科技集团公司 ESDC

Example of audit

- Non-conforming about technology type:
 - ✓ 1) Seating in EPA has not been tested, and all fail to spot-check in field. Against Q/QJA119 at 5.4.7 requirement of monitor and testing in EPA
 - ✓ 2) One worker in EPA deal with PCB without wrist strap, and sleeve of garment curl up. Against Q/QJA119 at 5.2 personal grounding
 - ✓ 3) Series-grounding between work surfaces. Against Q/QJA119 at 5.1.3 grounding equipotential bonding system
 - ✓ 4) There are two chips of E2PROM stand on white plastic board on EPA work surface. And the plastic board is insulator confirmed by testing in field. Its tribo-electric voltage was up to 4.5kV. Against Q/QJA119 at 5.4.3 insulators control.
 - ✓ 5) Glue gun had electric field 4000V/inch at outpour on chip glue process, and without ions fan using. Against Q/QJA119 at 5.4.3 insulators control.

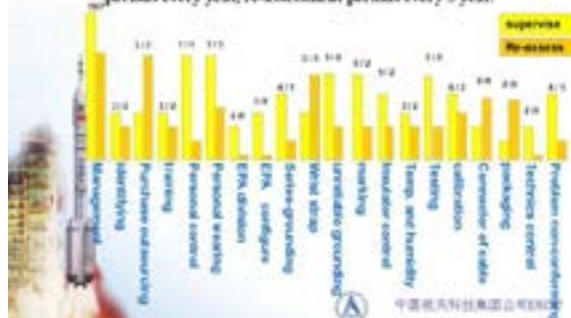
中国航天科技集团公司 ESDC

Example of audit

- Non-conforming about outsourcing and purchase type
 - ✓ 1) Purchasing facility, found no name list of eligible supplier and evaluation record. Against Q/QJA118 at 5.6 Purchase and outsourcing
 - ✓ 2) Purchase contract of packages requires to meet the standard of QJB3007-97 which already had cancelled, and its technology requirement was inconsistent with Q/QJA standards. Against Q/QJA118 at 5.6 Purchase and outsourcing
 - ✓ 3) Found in field that the package of CD40xx series ICs from initial manufactory uses plastic material, whom point-to-point resistance is larger than 1E12Ω. Its purchase contract includes no requirement about ESD package and standard. Against Q/QJA118 at 5.6 Purchase and outsourcing
 - ✓ 4) Organization provided only the name list of eligible supplier, but not gave these evaluation material. Against Q/QJA118 at 5.6 Purchase and outsourcing
 - ✓ 5) Some outsourcing contract and technology document for electric product include no requirement about our

Example of audit

The year 2013-2014, Our ESDC done supervise assessment and re-assessment about 20 units, supervise assessment periods every year, re-assessment periods every 3 year.



中国航天科技集团公司 ESDC

Correct non-conforming example

- Non-conforming describe: the wrist strap's socket under work surface in EPA have broken its wire to ground, but this case did not write in daily check record. This socket was over period for testing. Against Q/QJA120 at 4.4
- Analysis of causes: the department in charge understands this standards deficiently, did not constitute daily check record in system documents. Make EPA manager in field to loss according to check. EPA manager checks daily at formalism, could not find this problem.
- Correction action: update the socket, test OK. Design 'sheet of daily check record', train EPA managers by means of simulated fault scene.
- From one to more: Have checked all EPA manager's 'sheet of daily check record'
- Proof material: photographs before and after repair. Format of 'sheet of daily check record'-training record



14:00-14:30

符合 ANSI/ESD S20.20 究竟意味着什么 Conformance to ANSI/ESD S20.20 What does it really mean

演讲人

约翰·金尼尔

IBM 高级工程师、美国静电放电协会 (ESDA) 高级工程师
美国 (ANSI / ESD S20.20) 发展计划主席

Speaker

John Kinnear

IBM & ESD Association, Senior Engineer



演讲人简介:

约翰·金尼尔, IBM 高级工程师, 专门从事过程和系统技术, 以及 ANSI / ESD S20.20 工厂认证。他获得过布法罗大学的学士学位和锡拉丘兹大学的硕士学位。约翰因为对国家标准和国际标准的突出技术贡献而享誉全球。自 1989 年以来, 他一直担任波基普西 (美国纽约州) 工厂的 IBM 现场静电防护协调员。他是 IBM 跨部门静电防护技术联络委员会原主席, 和 IBM 企业静电防护大纲制定和实施委员会的重要成员之一。约翰致力于大型商业服务器的 EMC、安全、环境、运输和挥发性有机化合物排放标准的符合性测试。他同时也是以 FCC (美国联邦通信委员会认证)、CE 标志 (欧盟安全认证)、VCCI (日本电磁兼容认证) 和其他国家要求测试大型商业服务器系统的 EMC 辐射和抗扰度标准的首席工程师。自 1990 年成为 ESD 协会成员以来, 约翰曾在几个标准发展委员会任职, 并担任协会管理职位。约翰是代表美国向国际电工委员会 (IEC) 委任的美国全国委员会 / IEC 101 技术委员会技术顾问。在这个职位上, 他促进国际静电防护标准的发展, 并支持国际上采用 ANSI / ESD S20.20。作为 ESDA (美国静电放电协会) 的工厂认证 (ANSI / ESD S20.20) 发展计划的主席, 约翰在该计划的开发和发行中扮演主要角色。特别是, 约翰致力于协调主任评审员培训、国际注册认证和现场审核的初步发展。约翰曾担任过 ESD 协会的每个职位, 包括副总裁, 高级副总裁, 总裁。他是 EOS / ESD 研讨会技术委员会的原主席和 2004 年 EOS / ESD 研讨会的大会主席。由于约翰对 ESD 协会的不懈贡献, 约翰在 2006 年 9 月获得协会颁发的杰出贡献奖。

Speaker's biography:

John Kinnear is an IBM Senior Engineer specializing in process & system technology, and facility certification in accordance with ANSI/ESD S20.20. He has a BS degree from University of Buffalo and a MS degree from Syracuse University. John is well known globally for his technical contributions to national and international standards. He has been the IBM ESD Site Coordinator for the Poughkeepsie site since 1989. He is the past chairman of the IBM Inter-divisional Technical Liaison Committee for ESD Protection and is an important member of his company's committee to develop and implement the ESD Corporate program for IBM. John has coordinated the testing of large mainframes for compliance to EMC, Safety, Environmental, Shipping and Volatile Organic Emission standards. He has also been the lead engineer on testing large mainframe systems to EMC emissions and immunity standards for FCC, CE Mark, VCCI and other national requirements. As a member of the ESD Association since 1990, John has served in several Standards Development Committees as well as association management positions. John is the appointed Technical Adviser to the United States National Committee/IEC Technical Committee 101, where he represents the United States to the International Electrotechnical Commission (IEC). In this position he assisted in the evolution of international ESD standards and supports international adoption of ANSI/ESD S20.20. As Chair of the ESDA's Facility Certification (ANSI/ESD S20.20) development program, John played major roles in the program's development and industry launch. In particular, John coordinated the initial development of Lead Assessor training, ISO Registrar Certification, and witness audits. John has served in every ESD Association officer's position, including Vice President, Senior Vice President and President. He is the past Chairman of the EOS/ESD Symposium Technical Program Committee and past General Chairman of the 2004 EOS/ESD Symposium. For his contributions to the ESD Association, John was presented with the Outstanding Contribution Award in September, 2006, from the ESD Association.

符合 ANSI/ESD S20.20 究竟意味着什么 Conformance to ANSI/ESD S20.20 What does it really mean



符合 ANSI/ESD S20.20 究竟意味着什么 Conformance to ANSI/ESD S20.20 What does it really mean

管理方面

静电放电控制计划

- 控制计划必须包含以下内容:
 - 静电放电控制过程的范围
 - 静电放电控制措施
 - 过程操作方法
 - 内容或所有证明文件的链接
 - 已经链接的任何项目
- 此外,
 - 在质量管理体系中必须存在的控制计划
 - 过程控制
 - 基础标准
 - 记录审查

静电放电控制计划

- 典型问题
- 未正确定义的范围
 - 没有记录或没有部分控制程序之外的区域
- 过程能力没有规定
 - 在ANSI/ESD S20.20标准范围内可以 使用
- 附录《适用时》不包含技术理由

培训计划

- 初始培训需要培训
- ANSI/ESD S20.20 最低要求是静电放电操作的所有人员
- 明确培训计划时间表
 - 初次, 复训
- 详细说明培训有效性的评估
 - 测试, 观察或其他方式
- 详细说明 记录非致站地方
 - 什么类型的记录没有要求
- 此外, 在评估时进行培训计划的有效性评估

培训计划

- 典型问题
- 无法确定需要培训的人员
- 记录或事实证明无法使用
- 定义了两培训, 但是对已培训工不实施的一个过程
- 对生产现场的观察表明, 即使通过培训或成功的完成培训的人员也不按照所教的使用静电放电控制设备

产品资格计划

- 在静电保护区(EPA)中使用的静电放电控制项需要满足在产品资格部分中定义的要求
- 一般来说, 它是定义了测试方法和限制的一个标准
 - 例如, 需要按ANSI/ESD STM4.3测试时, 工作表面必须有一个点对点或点对点电压小于10kV的电压
 - 这也对测试定义了一个温度和湿度环境

符合 ANSI/ESD S20.20 究竟意味着什么 Conformance to ANSI/ESD S20.20 What does it really mean

产品资格

静电放电控制项目	产品资格 **		客观性验证	
	测试方法	要求的限制条件 **	测试方法	要求的限制条件
工业表面 ** (可以适用任何测试方法并制定表格)	ANSI/ESD S54.1	点对点 < 1"sq"电阻	ESD TR53 工业表面测试	点对点电阻 < 1"sq"电阻
	ANSI/ESD S74.1	点对点电阻 < 1"sq"电阻		

有单规定了
测试电压
测试材料
标准条件 (23°C, 12% RH)

- 产品资格**
- 客观证据
 - 内部测试
 - 第三方检测
 - 生产数据表
 - 所有客观证据必须包含
 - 测试方法 (使用的标准)
 - 结果

产品资格

- ANSI/ESD S20.20-2007—资格要求
- 地面材料: ANSI/ESD S57.1 < 1"sq"电阻

地面材料供应商的规格表摘录

电气性能	测试方法	典型值
电阻	接地表面, ESD S57.1	耗散约 $1 \times 10^4 \sim 1 \times 10^6$ 欧姆 导电的 $1.5 \times 10^4 \sim 1 \times 10^6$ 欧姆

产品资格

- 典型问题
 - 没有资格或客观证据
 - 引用测试方法不是静电放电协会规范 (需要定制)
 - 规格表不准确或有变化

电气性能:

性能	方法	参数值
RTS阻值	ESD S54.1	< 1"sq"电阻
RTT阻值	ANSI/ESD S54.1	< 1"sq"电阻

- 合规性验证计划**
- 每个静电放电控制项目需要定期测试, 以确保它在工作
 - 测试需要按照静电放电协会技术报告 TR53 进行
 - 限制条件定义在 ANSI/ESD S20.20 中
 - 需要显示已成为事实的客观证据
 - 数据表, 测试记录, 项目标签

- 合规性验证计划**
- 典型问题
 - 程序不正确
 - 例如, 在测试前没有离子化平衡
 - 在测试过程中发生故障
 - 不是所有已定义的静电放电控制项目都得到测试
 - 例如, 使用为控制项目以及有精确测试条件
 - 不是根据 TR53 进行的测试
 - 例如, 一个电阻器在不带电, 这是一个不符合性

符合 ANSI/ESD S20.20 究竟意味着什么 Conformance to ANSI/ESD S20.20 What does it really mean

技术方面

接地/屏蔽接地

- 必须确定使用何种类型的接地/屏蔽接地系统
- 可以是三个系统之一，或一个系统的组合，如果备用证明文件
 - 交流电与接地
 - 辅助接地（或静电放电接地系统）
 - 等电位屏蔽接地

接地/屏蔽接地

- 典型问题
 - 通常在一个设备中存在这样的系统
 - 选择的系统无证明文件
 - 使用不当的仪器测量阻抗
 - 小尺寸测试仪器测量精度不够
 - 电阻值会随时间和温度变化

人员接地

- 确保人员与定义的静电放电接地系统相连
- 2007版的本标准,不只是发现了许多问题
- 2014版的本标准,如果使用鞋类/地板系统,那么步行测试是必需的。
 - 没有足够的信息,应这一点本身是否是一个问题

EPA

- 如果有评估本标准一致性的第三方:
 - 选择一个项目样品,让他们进行测试
 - 对每一个独特的区域取样
 - 使用公司的技术和设备
 - 第三方实验室可能使用不同的设备

EPA

- 发现的典型问题
 - 静电放电控制不符合所要求的限制
 - 一道或几道不符合标准的不合格性
 - 限制更大的物品

符合 ANSI/ESD S20.20 究竟意味着什么 Conformance to ANSI/ESD S20.20 What does it really mean

EPA

• 未平的问题

- 电荷电位的测量
 - 测量误差包括：你测量一个以秒表精确的，而不是一个合格性能量计
 - 静电电压不能说明，只有静电电压表和半圆板式电压表

• 对于2.5厘米内的绝缘体的新要求

- 没有足够的数据来评估这是否还是一个问题的

包装

• 对于包装的定义ANSI/ESD S20.20 遵从ANSI/ESD

- 在EPA中低充电
- 低充电在EPA外静电电压屏蔽
 - 可以某些特殊形式
 - 静电屏蔽
 - 防静电
 - 防静电气绝缘材料的屏蔽

包装

• 发现的典型问题

- 重复利用的包装材料未经验证
- 测量时不符合要求的包装材料
 - 静电材料有保质期
- 用于工作表面的包装材料
 - 必须符合工作表面的要求

附加要求

附加要求

• 培训

- 除了对处理静电敏感项目的人员的培训要求外，还需要对那些进入EPA的不处理静电敏感产品的人员进行培训
- 例如：自动人员，设备维护人员，服务人员

• 对不合格品的控制

- 结合或编入主要过程的静电敏感项目，需要静电电保护，直到他们被认定为可装配的零件

附加要求

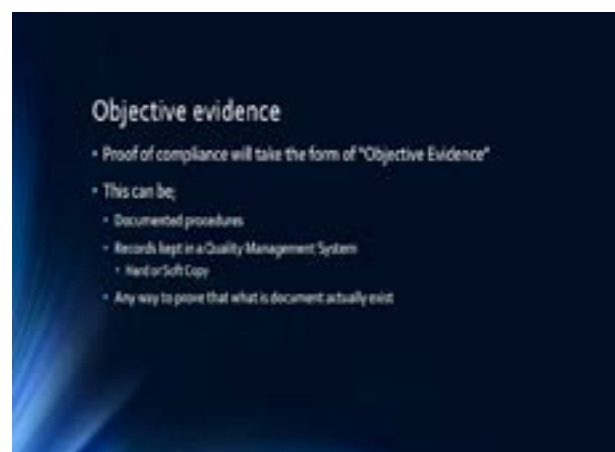
• 校准

- 虽然不是ANSI/ESD S20.20的要求，但测试设备，测量仪器必须能够进行校准或作为主要测量验证
- 质量管理体系的典型部分

• 纠正措施

- 需要有一个适当的记录来记录分析和发生了静电敏感问题的结果的过程

符合 ANSI/ESD S20.20 究竟意味着什么 Conformance to ANSI/ESD S20.20 What does it really mean



符合 ANSI/ESD S20.20 究竟意味着什么 Conformance to ANSI/ESD S20.20 What does it really mean

Administrative items

ESD Control plan

- The Control Plan must contain the following:
 - Scope of the ESD-Control Process
 - ESD-coordinator
 - Process capability statement
 - Content or links to all documentation
 - Any items that have been tailored
- In addition,
 - The Control Plan must exist within a Quality Management System
 - Document Control
 - Latest version
 - Documented review

ESD control plan

- Typical issues
 - Scope not properly defined
 - Areas excluded from the program but not documented and without part control
 - Process capability not stated
 - The scope of ANSI/ESD S20.20 can be used
 - Tailoring (when applied) does not contain technical justification

Training plan

- Define who needs training
 - ANSI/ESD S20.20 minimum requirement is everyone that HANDLES ESDS
- Define training schedule
 - Initial, recurring
- Defines evaluation of the effectiveness of the training
 - Test, observation or any means
- Defines where the records are stored
 - No requirements of what type of records
- In addition the effectiveness of the training plan is evaluated during an assessment

Training plan

- Typical issues
 - Defines the required people to be trained to broadly
 - Records or objective evidence is not available
 - Retraining is defined, however, a process is not implemented to recall employees
 - Observation on the manufacturing floor indicated that even with training and successful completion, the personnel are not using the ESD control equipment as taught

Product qualification plan

- ESD control items that are used in the Electrostatic Protected Areas (EPAs) need to meet the requirements defined in the product qualification section
- Typically, it is a standard that defines the test method and the limits
 - For example, work surfaces must have a point to point and a point to groundable point resistance of less than 1x10¹¹ ohm when tested per ANSI/ESD STM 4.1
 - This also defines a temperature and humidity environment for qualification testing

符合 ANSI/ESD S20.20 究竟意味着什么 Conformance to ANSI/ESD S20.20 What does it really mean

Product qualification

ESD Control Item	Product Qualification ¹⁾		Compliance Verification	
	Test Method	Required Limit(s) ²⁾	Test Method	Required Limit(s)
Worksurface ³⁾ (Qualification can be done by other Test Method)	ANSI/ESD S4.1	Point to Point $\leq 1 \times 10^9$ ohms	ESD TR53 Worksurface Section	Point to Ground $\leq 1 \times 10^9$ ohms
	ANSI/ESD STM 2	Point to Groundable Point $\leq 1 \times 10^9$ ohms		

Procedure Defines
Test Voltage
Test Probe
Environmental Conditions (23°C, 12% RH)

- Product qualification**
- Objective evidence
 - Internal testing
 - Third party testing
 - Manufacturing Data Sheet
 - All Objective evidence must contain
 - Test method (standard used)
 - Results

Product qualification

ANSI/ESD S20-2007 - Qualification Requirement

Passing ANSI/ESD S7.1 $\leq 1 \times 10^9$ ohms

Flooring supplier specification sheet excerpt:

Electrical Properties	Test Method	Typical Value
Electrical Resistance	Surface to Ground, ESD S7.1	Resistivity: 1×10^9 to 1×10^{10} ohms Conductivity: 2.5×10^8 to 1×10^9 ohms

Product qualification

- Typical issues
 - No Qualification or Objective Evidence available
 - Quoted test method not an ESD Association Specification (Need to Tailor)
 - Specification sheet incomplete or variation

Electrical Properties

Property	Test Method	Value
4750 Resistance	ESD S7.1 (A.1)	≤ 100 ohms
8770 Resistance	ESD S7.1 (A.1)	≤ 100 ohms

Electrical Properties obtained by testing to industrial standards to an independent testing laboratory @ 100 trials and 10% failure tolerance unless otherwise specified. Compliance for this test report is achieved upon request.

- Compliance verification plan**
- Each ESD control item needs to be periodically tested to ensure it is working
 - Testing needs to be done per ESD Association Technical Report 53
 - Limits are defined in ANSI/ESD S20.20
 - Objective evidence needs to show that in fact this is done
 - Database, records of testing, stickers on items

- Compliance verification plan**
- Typical issues
 - Procedures incorrect
 - For example, clean surface before testing
 - Falls during measurement
 - Not all defined ESD control items are tested
 - For example, garments are listed as a control item and never get tested
 - Testing is done but not according to TR53
 - If a tailoring statement does not exist, this is a non-conformance

符合 ANSI/ESD S20.20 究竟意味着什么 Conformance to ANSI/ESD S20.20 What does it really mean

Technical items

Grounding/bonding

- Must define what type of grounding/bonding system used
- Can be one of three systems, or a combination of systems if documented
 - AC Electrical Ground
 - Auxiliary Ground (or an ESD Grounding System)
 - Equipotential Bonding

Grounding/bonding

- Typical issues
 - Usually the system exists in a facility
 - Documentation on which system is selected
 - Using the wrong instrument to measure impedance
 - Less than is often is difficult to measure back to mains
 - Electrical noise will cause multimeters to have incorrect results

Personal grounding

- Ensure that people are connected to the ESD grounding system defined
- For the 2007 version of the standard, not many issues were found
- For the 2004 version of the standard, if a footwear/flooring system is used, then a walking test is required.
 - There is not enough data at this point to see if this will be an issue

EPA

- If there is a third party evaluating the conformance to the standard;
 - Select a sample of items and have them tested on the spot
 - Sample each unique area
 - Use the companies technology and equipment
 - The third party will not have any equipment or make measurements

EPA

- Typical issues found
 - ESD Control items do not meet the required limits
 - One or two items that do not meet limits does not indicate non compliance
 - Larger samples will be done

符合 ANSI/ESD S20.20 究竟意味着什么 Conformance to ANSI/ESD S20.20 What does it really mean

EPA

- Future issues
 - Isolated conduct measurement
 - Although included here, this is a process qualification item and not a compliance verification item
 - Field meter cannot be used, only contact voltmeters and non-contact voltmeters
 - New requirements for insulators within 2.5 cm
- Not enough data to evaluate if this is a problem yet

Packaging

- ANSI/ESD S20.20 defers to ANSI/ESD S54.1 for packaging definitions
 - Low charging within EPA
 - Low charging/ESD Shielding outside EPA
 - Can take many form
 - Static Shielding Bag
 - Flow boxes
 - Thermal formed packages with or pass

Packaging

- Typical issues found
 - Packaging material that are reused are not verified
 - Packaging material that does not meet requirements when measured
 - High resistance materials have a shelf life
 - Packaging materials that are used as a work surface
 - Must comply with the work surface requirements

Additional Requirements

Additional Requirements

- Training
 - In addition to the training requirement on personnel that handle ESD sensitive items, there needs to be training on those who enter into the EPA that do not handle ESD sensitive items
 - For example, cleaning people, equipment maintenance, medical personnel
- Control of non-conforming materials
 - ESD sensitive items that are stored or deviate from the main process needs to be protected from ESD until they are identified as non-consumer shippable

Additional Requirements

- Calibration
 - Although not part of the requirements of ANSI/ESD S20.20, test equipment, measurement equipment must be able to be calibrated or verified as working on a periodic basis
 - Typically part of the Quality Management System
- Corrective Action
 - There needs to be a process in place to record root cause analysis and changes in the process that are the result of ESD issues

14:30-15:00

体系化建设提升产品制造过程 静电防护能力

Systematic construction improves electrostatic
protection in product manufacturing process



演讲人

蔡阿宁

空间电子信息技术研究院高级工程师，资产管理与保障部长

Speaker

Cai Aning

Space Electronic Information Technology Research Institute

Senior Engineer Asset Management and Security Minister

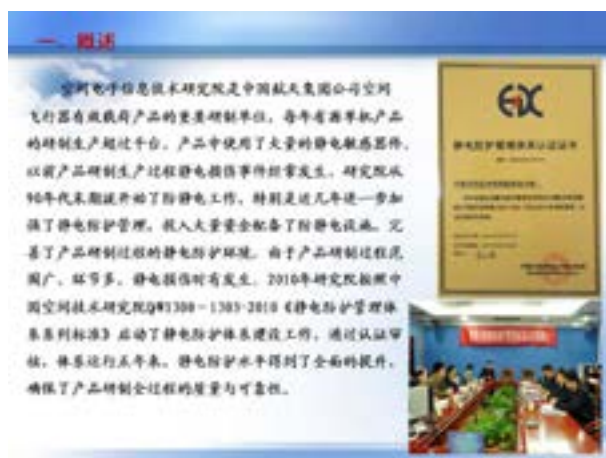
演讲人简介：

蔡阿宁，男，1969年4月出生，1993年毕业于西北工业大学自动控制系电气技术专业大学本科，2008年获得西安电子科技大学电子与通信工程工程硕士学位，高级工程师。现就职中国航天科技集团公司中国空间技术研究院空间电子信息技术研究院，主要研究仪器设备管理、科研生产环境条件、静电防护、安全生产等管理与技术工作，长期从事静电防护工程实践研究，建立了研究院静电防护管理体系，制定了多项管理制度和技术标准，具有丰富的静电防护管理工作经验。

Speaker's biography:

Cai Aning, male, born in April 1969, graduated from Northwestern Polytechnical University, with a bachelor of electrical technology of automatic control system; in 2008, he got a master degree in engineering from School of Telecommunications Engineering of Xidian University, being a senior engineer. Now he is working in CAST-Xi'an Institute of Space Radio Technology of China Aerospace Science and Technology Corporation. He has specialized in the research of instrument and equipment management, scientific research and production environment conditions, ESD protection, safety production and other management and technical work, has engaged in ESD protection engineering practice research for a long term, has established an ESD protection management system for research institute, and has developed a number of management systems and technical standards, owning a wealth of experience in the management of ESD protection work.

体系化建设提升产品制造过程静电防护能力 Systematic construction improves electrostatic protection in product manufacturing process



体系化建设提升产品制造过程静电防护能力 Systematic construction improves electrostatic protection in product manufacturing process

二、静电防护管理体系的建立与运行控制

(一) 静电防护管理体系的建立

1. 明确划分了各部门在体系中的职责

静电防护管理体系职责分配表

序号	体系要素	研发部	市场部	销售部	生产部	品质部	工程部	采购部	仓储部	物流部	人力资源部	财务部	行政部	其他
1.1	方针	是												
1.2	目标	是												
1.3	组织	是												
1.4	职责	是												
1.5	资源	是												
1.6	能力	是												
1.7	意识	是												
1.8	沟通	是												
1.9	文件	是												
1.10	记录	是												
1.11	改进	是												
1.12	风险管理	是												
1.13	应急管理	是												
1.14	其他	是												

二、静电防护管理体系的建立与运行控制

(二) 静电防护管理体系运行控制情况

1. 深入开展静电防护需求的识别

静电敏感电子产品的静电防护是一个全过程的防护，任何环节的疏忽都可能导致产品的损坏。静电防护需求识别是体系运行的基础，对产品研制生产试验全过程设置的静电防护产品的静电敏感程度识别，产品研制过程的静电防护需求，初始设置与配置需求，静电敏感电子产品操作人员，客户的静电防护需求等进行持续识别并采取有效的控制措施，才能确保电子产品静电防护的安全。

静电敏感元器件的识别

识别建立了研究开发静电敏感元器件清单，并识别静电敏感元器件12类212个品种。

序号	静电敏感元器件	识别	静电敏感元器件	静电敏感元器件
1	静电敏感元器件	识别	静电敏感元器件	静电敏感元器件
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9	静电敏感元器件	识别	静电敏感元器件	静电敏感元器件
10	静电敏感元器件	识别	静电敏感元器件	静电敏感元器件
11	静电敏感元器件	识别	静电敏感元器件	静电敏感元器件
12	静电敏感元器件	识别	静电敏感元器件	静电敏感元器件

二、静电防护管理体系的建立与运行控制

(二) 静电防护管理体系运行控制情况

1. 深入开展静电防护需求的识别

根据研究开发生产流程对产品研制环节的静电防护需求进行了识别，并识别出元器件采购、存储、搬运、使用、报废等环节的静电防护需求，并识别出元器件采购、存储、搬运、使用、报废等环节的静电防护需求，并识别出元器件采购、存储、搬运、使用、报废等环节的静电防护需求。

静电敏感元器件需求识别表

序号	静电敏感元器件需求识别表	静电敏感元器件需求识别表	静电敏感元器件需求识别表	静电敏感元器件需求识别表
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二、静电防护管理体系的建立与运行控制

(二) 静电防护管理体系运行控制情况

1. 深入开展静电防护需求的识别

根据产品研制各环节管理流程的设置情况，对静电防护需求的区域进行了识别，并识别出静电敏感元器件需求识别表，并识别出静电敏感元器件需求识别表，并识别出静电敏感元器件需求识别表。

静电敏感元器件需求识别表

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三、静电防护管理体系的建立与运行控制

(二) 静电防护管理体系运行控制情况

1. 深入开展静电防护需求的识别

静电敏感电子产品制造过程，静电防护的重点和难点是操作人员，操作人员必须具备良好的静电防护意识和能力，才能确保产品质量和可靠性。因此识别了产品研制比较的设计、电路、调试等环节，并识别出静电敏感元器件需求识别表，并识别出静电敏感元器件需求识别表，并识别出静电敏感元器件需求识别表。

静电敏感元器件需求识别表

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三、静电防护管理体系的建立与运行控制

(二) 静电防护管理体系运行控制情况

2. 开展针对性培训教育，提高员工静电防护意识和能力

研究建立了静电敏感电子产品生产人员培训考核制度，对生产人员进行针对性培训教育和考核，一是通过培训提高生产人员，二是通过考核提高生产人员，三是通过考核提高生产人员，四是通过考核提高生产人员，五是通过考核提高生产人员。

静电敏感元器件需求识别表

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体系化建设提升产品制造过程静电防护能力 Systematic construction improves electrostatic protection in product manufacturing process

二、静电防护管理体系的建立与运行控制

（二）静电防护管理体系运行控制情况

4、完善防静电工作区静电防护设施的配置

根据GB17172-2014《防静电工作区配置要求》对25个防静电工作区配备了相应的静电防护设施。包括：防静电工作区的标识、防静电地面、工作台、货架、产品包装材料、防静电联线、腕带、防静电工具、静电防护检测装置以及环境湿度连续检测报警。详见《防静电工作区静电防护设施配置一览表》。



二、静电防护管理体系的建立与运行控制

防静电工作区静电防护设施配置一览表

序号	防静电工作区名称	防静电地面	防静电工作台	防静电货架	防静电联线	防静电腕带	防静电工具	防静电检测装置	环境湿度连续检测报警
1	防静电工作区1	√	√	√	√	√	√	√	√
2	防静电工作区2	√	√	√	√	√	√	√	√
3	防静电工作区3	√	√	√	√	√	√	√	√
4	防静电工作区4	√	√	√	√	√	√	√	√
5	防静电工作区5	√	√	√	√	√	√	√	√
6	防静电工作区6	√	√	√	√	√	√	√	√
7	防静电工作区7	√	√	√	√	√	√	√	√
8	防静电工作区8	√	√	√	√	√	√	√	√
9	防静电工作区9	√	√	√	√	√	√	√	√
10	防静电工作区10	√	√	√	√	√	√	√	√
11	防静电工作区11	√	√	√	√	√	√	√	√
12	防静电工作区12	√	√	√	√	√	√	√	√
13	防静电工作区13	√	√	√	√	√	√	√	√
14	防静电工作区14	√	√	√	√	√	√	√	√
15	防静电工作区15	√	√	√	√	√	√	√	√
16	防静电工作区16	√	√	√	√	√	√	√	√
17	防静电工作区17	√	√	√	√	√	√	√	√
18	防静电工作区18	√	√	√	√	√	√	√	√
19	防静电工作区19	√	√	√	√	√	√	√	√
20	防静电工作区20	√	√	√	√	√	√	√	√
21	防静电工作区21	√	√	√	√	√	√	√	√
22	防静电工作区22	√	√	√	√	√	√	√	√
23	防静电工作区23	√	√	√	√	√	√	√	√
24	防静电工作区24	√	√	√	√	√	√	√	√
25	防静电工作区25	√	√	√	√	√	√	√	√

二、静电防护管理体系的建立与运行控制

（二）静电防护管理体系运行控制情况

4、规范防静电工作区人员、设备设施措施

防静电工作区工作人员、设备设施的接地是静电防护的核心。

1、防静电工作区人员的接地

24个防静电工作区的接地全部利用电源保护地系统接地。为确保接地系统可靠有效，方便对作业区域静电工作区等区域采用“万无一失”的接地系统。在每个工作台上建立了工作接地和保护接地（防静电接地）系统。同时在工作区设置了二级接地系统。进一步提高了接地系统和接地系统的可靠性。为静电防护的静电接地提供了良好的基础。



二、静电防护管理体系的建立与运行控制

（二）静电防护管理体系运行控制情况

4、规范防静电工作区人员、设备设施措施

1、防静电工作区人员的接地

人员作业过程中，由于人体静电放电和积累，主要、造成静电产生静电。人体静电放电时的静电放电电压，各防静电工作区都配备了防静电腕带。工作人员全部利用“防静电腕带”作为主要的接地方式。防静电区域的接地系统利用“防静电腕带”作为人员的防静电接地方式。防静电区域铺设了满足要求的防静电地面，同时配置了人体防静电接地系统。确保了防静电工作区的静电防护“防静电腕带”接地方式满足防静电要求。

2、防静电工作区工具、设备的接地

防静电工作区使用电烙铁、热风枪、热风枪等电烙铁工具全部采用防静电接地保护工具接地。满足工具接地要求。此外，对于防静电工作区全部利用防静电工作区防静电腕带的接地。防静电工作区使用防静电设备全部采用了防静电接地措施。确保了工具、设备具有较好的静电防护性能。



二、静电防护管理体系的建立与运行控制

4、规范防静电工作区人员、设备设施措施

防静电工作区建设和管理，确保在设备工作区制造器件的人员满足静电防护要求。



二、静电防护管理体系的建立与运行控制

（二）静电防护管理体系运行控制情况

5、规范防静电工作区的标识管理

1、防静电标识管理

区分24个防静电工作区入口全部设置了防静电标识。明确了静电防护区的区域和标识。

2、防静电设施标识管理

防静电工作台、货架、防静电用防静电设施全部采用ESD标识。

3、产品包装及标识管理

产品标识的防静电标识的包装。半成品的包装。成品的包装都采用了防静电标识包装。防静电标识的半成品。成品用防静电标识包装。满足产品防静电包装要求。产品包装上采用了ESD标识。



Figure 2 consists of two photographs. The left photograph (a) shows a worker in a white cleanroom suit standing next to a piece of equipment. A red circle highlights a specific component on the equipment. The right photograph (b) shows a worker in a white cleanroom suit sitting at a workstation, interacting with a computer monitor. A red circle highlights the worker's hands as they touch the monitor. Both photographs have labels in Chinese: (a) is labeled '防静电保护体系建立' (Establishment of static electricity protection system) and (b) is labeled '防静电保护体系运行' (Operation of static electricity protection system).

二、静电防护管理体系的建立与运行控制

(一) 静电防护管理体系运行控制情况

1. 加强采购与供应商静电防护管理

在采购敏感元器件采购合同中明确敏感元器件的静电防护要求也提出了明确的要求。

在采购时静电防护用品的供应商进行了选择评价，建立了供应商合格供方名录。批量采购时静电防护用品经资产管理与保障部的材料检测验收，属于风枕、防静电静电测试，人体静电放电测试及静电防护用品设备安全验证的计量检测，确保了产品的质量。

2. 研究选择静电防护工作纳入内部产品合格供方评价的重要内容。建立了静电敏感电子产品内部产品合格供方名录，对关键产品的供应商进行了现场审核，就所用元器件的防静电管理，确保了所产产品的防静电措施完整。

二、静电防护管理体系的建立与运行控制

(二) 静电防护管理体系运行控制情况

1. 进一步规范静电敏感电子产品操作过程静电防护控制

- 建立了静电防护工作规范管理制度，制定了《科研生产院静电产品研制环境要素表》，工作人员每进入防静电环境前，必须接受、记录静电检测、防静电工作台、人员防护措施、静电设备运行参数自动、确保了防静电措施落实要求。
- 防静电防护标准要求落实到各生产工艺流程中，完善了工艺文件和各项操作要求，细化产品操作步骤的静电防护措施。
- 加强防静电过程环境参数控制，将工作台面产品操作区域定置，静电产品检测器具、防静电剂等易产生静电过程环境参数严格控制，减少静电隐患。



二、静电防护管理体系的建立与运行控制

(二) 静电防护管理体系运行控制情况

1. 加强防静电工作区的监视和测量，确保静电防护设施的完好性

- 配备了完善的防静电检测设备，每天对防静电工作区的地板、电源、工作台、工作椅、需要接触到的表面做电阻、场强以及环境湿度、洁净度等条件进行检测，及时对检测的数据记录进行整理，确保防静电防护设施防静电功能的有效性。
- 每年委托专业的检测机构对24小时防静电工作区防静电设施进行专项检测，无产品研制环境符合性检测报告。
- 对新改扩建项目防静电环境进行严格的检测验收。
- 对新购置的静电防护设备进行全面的检测验收。
- 对服装、腕带、防静电鞋等防静电措施进行检测验收。



防静电手腕带检测图 防静电脚跟带检测图 防静电鞋检测图 防静电控制文件目录及文件封面图

二、静电防护管理体系的建立与运行控制

(二) 静电防护管理体系运行控制情况

11. 深入推进静电防护管理体系有效运行与持续改进

静电防护管理体系运行控制流程图

体系管理评审

体系监督审核

体系化建设提升产品制造过程静电防护能力 Systematic construction improves electrostatic protection in product manufacturing process

三、静电防护管理工作取得的成效

三、静电防护管理工作取得的成效

（一）作业人员静电防护意识与技能显著提升。

研究院按照静电防护管理体系要求，通过开展持续开展对操作人员、管理人员等各类人员的防静电培训教育与考核，提高了人员的静电防护意识，在开展防静电检查、检测时，注重现场纠正，将检查、培训、整改有机结合起来。在检查的同时，将问题原因和整改措施结合体系要求与现场人员及时沟通，使现场作业人员熟悉问题原因和整改方法，有效提升了作业人员的静电防护技能。

三、静电防护管理工作取得的成效

（二）产品研制现场静电防护能力得到全面提升

研究院通过对防静电工作区的识别与划分，明确各EPA责任边界与管理职责，同时不断完善静电防护管理制度和要求，完善EPA静电防护用品、器材、设备设施的配置，严格控制EPA作业人员和设备设施的接地，加强EPA内温湿度和洁净度的控制，强化EPA绝缘物品的管理与控制。通过主管机制，责任单元，EPA管理层对静电防护工作区实施三级动态监管，防静电工作区运行良好，产品研制现场静电防护能力得到全面提升。

三、静电防护管理工作取得的成效

（三）静电防护管理体系外延工作机制逐步形成

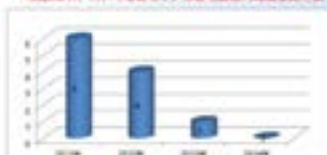
将静电防护工作纳入研究院合格供方考核要素当中，通过开展对重点有源电子产品外包单位的防静电审核工作，规范了有源电子产品外包单位生产现场的防静电管理工作，通过现场检查，向供方传递了五院Q/RT300-1303静电防护管理体系标准的要求，增强了外包单位对五院静电防护管理体系标准的认知与理解，进一步提高了外包产品的质量与可靠性。

三、静电防护管理工作取得的成效

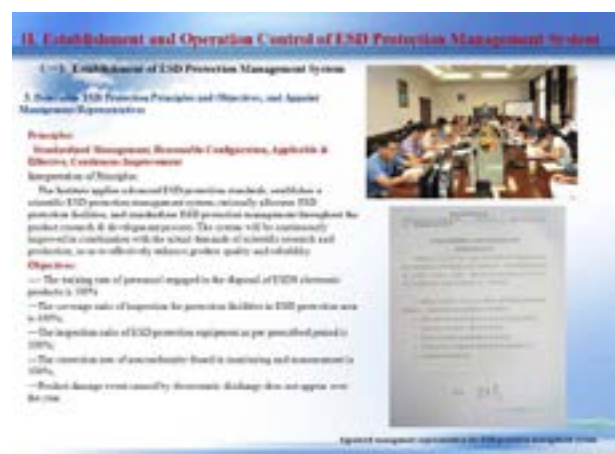
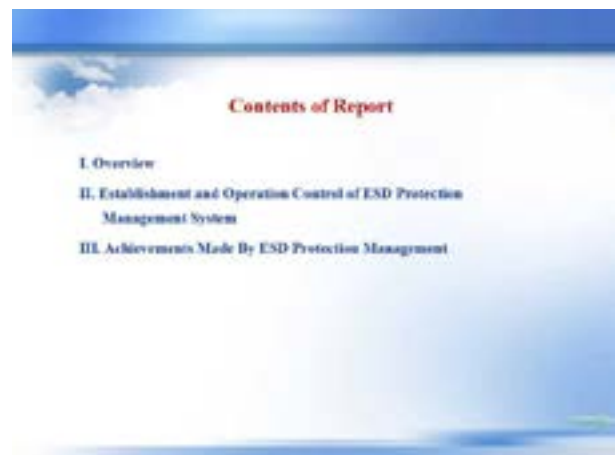
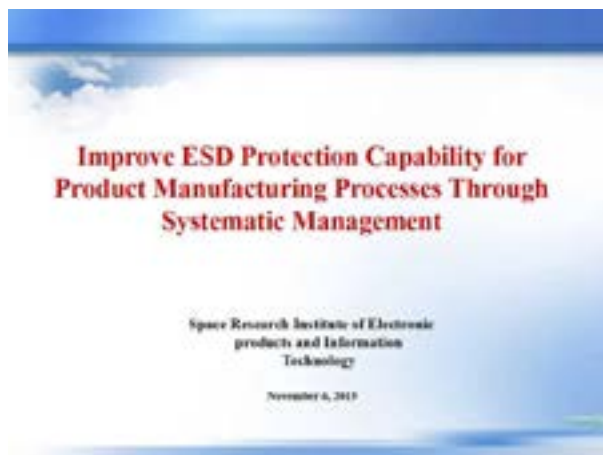
（四）电子产品静电损伤质量问题明显下降

研究院通过建立静电防护管理体系，实现了静电防护管理工作的闭环管理和持续改进。产品研制全过程人、机、环实现了全过程、全方位防静电防护。通过对有源电子产品静电损伤事件分析与统计发现，体系运行周期以来，有源电子产品过程因静电损伤造成质量问题逐年呈下降趋势，静电防护管理体系的有效运行有力保障了研究院有源电子产品质量与可靠性。

研究院2011-2014年有源电子产品静电损伤问题数量统计图



体系化建设提升产品制造过程静电防护能力 Systematic construction improves electrostatic protection in product manufacturing process



[illegible][illegible]

II. Establishment and Operation Control of ESD Protection Management System

C. Operation and Control of ESD Protection Management System

1. Implementation and Evaluation of ESD Protection Management System

Establishment of ESD Protection Requirements for Product Research & Development

We have started our ESD protection requirement on the product research & development in accordance with the scientific research and production process of the function, and established a total of 17 requirements including prevention process, storage, handling, installation, detection, machine maintenance, single board design, fitting, amplifier board fitting, chip data operation, amplifier board coating (chip board), component test, JTAG test, power supply, electrostatic compatibility testing, environmental testing, selection AEC, finished product storage and so on.

Schedule of ESD Protection Requirement for The Complete Test Integration Workshop

No.	Owner/ESD Responsibility (Owner/Requirement Approval)	Requirement	Expected Date of ESD Requirement	Expected Date of Effect
1	Development Dept.	ESD-1	ESD Protection Process, Design, Assembly, Complete Test	May 2004
2	Assembly Dept.	ESD-2	ESD Protection Process, Design, Assembly, Complete Test	May 2004
3	Development/Assembly Dept.	ESD-3	ESD Protection Process, Design, Assembly, Complete Test	May 2004
4	Development/Assembly/Complete Test Dept.	ESD-4	ESD Protection Process, Design, Assembly, Complete Test	May 2004
5	ESD-5	ESD-5	ESD Protection Process, Design, Assembly, Complete Test	May 2004

II. Establishment and Operation Control of ESD Protection Management System

1. Operation and Control of ESD Protection Management System

1.1. Develop the Identification of ESD Protection Requirements

1.1.1. Identification of ESDs

Depending on the settings of items for various aspects of product (mainly R, development, etc.) to identify the areas needing ESD protection requirements and analyze the results of ESD Efficacy (100%). Specifically, in order of O-Case ESDs, and testing the Component Waiverless, Moisture or Component Reliability System, Electro-Static-Protect Item, Single Row of Discharge Item, Single Board Coating (Flame Proofing), Area and O-Case ESDs, including the Testing & Environmental Testing (Emission, ESD, Laboratory, Shipping, etc.), Substrate, A/D-Axis, Packaged Product, Reelboard and so forth.

1.1.2. Identification of ESDs

The figure shows a bar chart with 20 green bars, each representing a requirement. The y-axis is labeled '1.0' and '0.0'. The x-axis lists 20 requirements, each with a corresponding number in a box. The requirements are:

1. ESD Protection Requirements
2. ESD Protection Requirements
3. ESD Protection Requirements
4. ESD Protection Requirements
5. ESD Protection Requirements
6. ESD Protection Requirements
7. ESD Protection Requirements
8. ESD Protection Requirements
9. ESD Protection Requirements
10. ESD Protection Requirements
11. ESD Protection Requirements
12. ESD Protection Requirements
13. ESD Protection Requirements
14. ESD Protection Requirements
15. ESD Protection Requirements
16. ESD Protection Requirements
17. ESD Protection Requirements
18. ESD Protection Requirements
19. ESD Protection Requirements
20. ESD Protection Requirements

The bar chart shows that all 20 requirements are identified, with a value of 1.0 for each.

IL Establishment and Operation Control of ESD Protection Management System

(C) Operation and Control of ESD Protection Management System

- Design the Identification of ESD Protection Requirements
- Identification of All Types of Personnel During the Operation of Electronic Products or Electronic Products

In the design process of electronic products or electronic products, the identification and identification of ESD protection are in accordance with personnel, before the operating personnel must have the appropriate ESD protection awareness and skills to ensure the quality and reliability of product operating process. CHA-AI has also conducted the personnel training design, electrostatic firing, debugging, testing and other aspects during the product process & its design process. In addition, the incoming staff and other auxiliary personnel, such as maintenance and clean loading personnel access to ESD are carried out classified training education, continuously improving their ESD protection awareness and ability.

A special volume about ESD protection management system has been established in the Institute of the Guidelines. Moreover, we have developed the "Electronic Products Maintenance Safety and Protection Training Manual" for CHA-AI Co., Ltd. and the order of "ESD Management Requirement" and other required training materials.

II. Establishment and Operation Control of ESD Protection Management System

1-3 Operation and Control of ESD Protection Management System

2. Conduct On-site Training and Education To Improve The Employer's ESD Protection Awareness and Ability

The Institute has established a training program and implementation strategy for occupational workers of semiconductor and/or electronic products, and conducted various types of targeted training and education and assessment. Specifically, the Institute has trained operators for on-site training, organized a level of special training, and conducted hands-on operation training for occupational workers on site, as well as enhanced exchanges and communication through on-site inspection, so as to improve the employer's ESD protection skills.

- Offer pre-employment training for new employees, and offer periodic training for ESDs occupational workers, thereby ensuring that occupational workers have the appropriate knowledge of ESD protection.
- Offer training about the basic requirements for ESD protection to the supplier personnel. (i.e., also including maintenance personnel) prior to ESD to ensure that the supplier personnel could be relevant equipment requirements. The training content, ESDs assessment, and terms about the training agreement by CSMC-All Institute to obtain the appropriate certificates, which has laid a solid foundation for the effective operation of ESD protection management system in CSMC-All.

Pre-employment Training Specialized Operation Training Basic ESD Theory Training Training Certificate

Establishment and Operation Control of ESD Protection Management System

Operation and Control of ESD Protection Management System

to Communicate the Configuration of ESD Protection Facilities in The TBA

In accordance with the Q/W150-2013 "TBA Configuration Requirement" issued by SABC, all facilities, the (1) Class 1ESD and 9 Class II ESDs in FA/ESD/W are have been equipped with the appropriate electrostatic protection facilities, including: ESD identification, ESD floor, multistation, electric packaging materials, ESD clothing, static mats, ESD with ESD detection equipment and environmental measurement and humidity control measures, etc., which are described in the "List for the Configuration of ESD Protection Facilities in ESDs".

[illegible]

II. Establishment and Operation Control of ESD Protection Management System

1. Operation and Control of ESD Protection Management System

A. Introduction to the Construction of Personnel Equipment and Facilities in ESDs

The promotion of personnel, instrument and equipment in ESDs is critical to ESD protection.

1) Construction of ESD Workbenches and Other Facilities

The promotion of ESD facilities utilizes the protective grounding system of the power system. In order to ensure reliable and effective grounding system, TAUSTU no adopts six-core (three-phase five-core plus one) ground supply line with the ESD construction and other facilities in the working site, and each workbench has established the working grounding and protective grounding (ESD protection grounding) system, while three-phase five-core power cables are configured at the same time, thereby further improving the reliability of the power supply system and grounding system, and laying a good foundation for the ESD protective grounding of devices and facilities.



II. Establishment and Operation Control of ESD Protection Management System

1. Operation and Control of ESD Protection Management System

a. Installation of the Grounding of Personnel Equipment and Facilities in ESD

1) **Personnel Grounding in ESDs**

During the operation process of the personnel, due to the presence of static electricity for the clothes between human and clothing, static electricity in the human process, the human body must establish good electrostatic discharge channel. All ESD protection station have been installed with ESD wrist strap system, and station operators of our "static strap system" as the main way of grounding, and other facility stations in ESDs require "two means" (two means) is an auxiliary grounding means of personnel. ESDs have had ESD shoes that are in compliance with the relevant requirements, and also equipped with integrated human body resistance system, thereby ensuring that the whole personnel in ESDs can satisfy the ESD grounding requirements via the "two means" auxiliary grounding way.

2) **Grounding of Tools and Devices in ESDs**

All involved use alternating current in ESDs, such as collecting tools, hot stripping tools, heating stages, blowers, etc., are the three most prone and with grounded protection, so as to avoid the grounding requirements of safety. For example, blowers, grinders and other hand-operated tools of all ESDs substitutes to ensure the grounding with the grounded personnel with a wrist strap. All instruments and equipment inside ESDs when powered or grounding of power supply, thereby ensuring that the tools and equipment are bonded with good electrostatic discharge channel.



Electrostatic protection using two ESD protection wrist strap and shoes

II. Establishment and Operation Control of USD Protection Management System

A. Monitoring the Construction of Protected Equipment and Facilities in SPDs

Facilities must keep under the equipment and facilities, to ensure that personnel operating electronic sensitive components in the equipment must ESD protection equipment.



Facilities must keep under the equipment and facilities, to ensure that personnel operating electronic sensitive components in the equipment must ESD protection equipment.




Facilities must keep under the equipment and facilities, to ensure that personnel operating electronic sensitive components in the equipment must ESD protection equipment.

体系化建设提升产品制造过程静电防护能力 Systematic construction improves electrostatic protection in product manufacturing process

II. Establishment and Operation Control of ESD Protection Management System

(一) Operation and Control of ESD Protection Management System

1. Adopt Effective Means to Strengthen the Monitoring of Electrostatic Protection Measures

ESDs have established measures to monitor, eliminate automatic detection display errors and shared control air conditioning systems, with a temperature range of 22°C to 26°C and a humidity range of 30% to 70% to meet the ESD protection requirements.

ESDs occupational workers in ESDs are equipped with ESD clothing, shoes, wrist straps, and the issuance of ESDs are established with integrated human body conductive suit and on-site monitors, while the static systems are equipped with wrist strap conductive monitoring system to ensure that the ESD protection measures of occupational workers are effective. All the #12 computer design, assembly, detection, wiring and debugging systems in ESDs have been established with static conductive monitoring system to ensure that the occupational workers are protected reliably.



II. Establishment and Operation Control of ESD Protection Management System

(一) Operation and Control of ESD Protection Management System

Strengthen Process Control and Optimize ESD Protection Management

ESDs have also made a clear requirement on ESD protection packaging the sensitive components in the process control the electrostatic sensitive components.

The Materials Department has internal and external the electrostatic protective equipment suppliers, and established a list of qualified suppliers for the facilities. The electrostatic protective equipment suppliers should be carried out sampling inspection and acceptance by the Asset Management and Inspection Department, while the on-site, wrist strap conductive monitors, integrated human body conductive suit and other ESD protection equipment are all subject to technological inspection, so as to ensure product quality.

The ESDs management ESD protection is an important content in the evaluation of qualified suppliers of outsourcing products, and has established a list of qualified suppliers of outsourcing electrostatic sensitive electronic products. In addition, the outsourcing units of key products are carried out on-site audits, and establish the ESD protection management of outsourcing units, so as to ensure that the ESD protection measures of outsourcing products are controlled.



II. Establishment and Operation Control of ESD Protection Management System

(一) Operation and Control of ESD Protection Management System

2. Establishing Effective ESD Protection Control on the Operation Process of Electrostatic Sensitive Electronic Products

ESDs have established a pre-shipment inspection system for the electrostatic shielding and debugging systems, and developed the "Checklist for Product Assembly & Development Environment for Safety & Protection Site". The static system shall perform self-inspection and will test on the environmental temperature and humidity, power cables, hardware and equipment grounding, ESD workstation, personal protective measures, electrostatic shielding, etc., before the fully operation, so as to ensure that the ESD protection measures satisfy the electrostatic requirements.

The management of ESD protection standards are implemented to the various technological processes, so as to ensure the process documentation and the operating requirements, and follow the ESD protection measures of the product operating procedures throughout control on inclusive materials in the operation process, and on the product operation area on the workstation, so as to ensure that the products keep an appropriate distance with damage, packaging materials, and other inclusive materials that may produce static electricity, thereby reducing the risk of electrostatic damage.



II. Establishment and Operation Control of ESD Protection Management System

(一) Operation and Control of ESD Protection Management System

3. Establish ESD-based Inspection System, and Strengthen ESD Management and Control

ESDs have established a three-level ESD inspection and testing system, starting with the unit, assembly, the authority, and finally by the specialized unit. All ESDs are required to be inspected by the ESDs, which are responsible for the inspection of personnel protection, ESD workstation, product design and other aspects, and the improvement of ESDs site management. The authority has specially assigned personnel to perform periodic site inspection to improve the management of ESDs, the integrity of equipment and facilities, and the standard long-term maintenance of products. Moreover, it has regularly carried out assessment or modification activities on-site assessment, or ensure that the ESD protection facilities in the site are correct, and the inspection records have been effectively controlled, thereby following the dynamic management of ESDs, and promoting the effective implementation of the ESD protection measures.



II. Establishment and Operation Control of ESD Protection Management System

(一) Operation and Control of ESD Protection Management System

4. Establish Effective ESD Protection Control on the Operation Process of Electrostatic Sensitive Electronic Products

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II. Establishment and Operation Control of ESD Protection Management System

(一) Operation and Control of ESD Protection Management System

5. Establish Effective ESD Protection Control on the Operation Process of Electrostatic Sensitive Electronic Products

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体系化建设提升产品制造过程静电防护能力 Systematic construction improves electrostatic protection in product manufacturing process

III. Achievements Made By ESD Protection Management

III. Achievements Made By ESD Protection Management

(一) The ESD protection awareness and skills of occupational workers have been significantly improved. In accordance with the requirements of the ESD protection management system, the Institute conducts ongoing ESD protection training and assessment on the operators, managers and so on, so as to improve awareness of ESD protection. During the implementation of ESD protection inspection and testing, it has attached great importance to the correction, and a dynamic integration has been formed on inspection, training and correction. In the meanwhile, the causes of the problems and corrective measures are timely communicated with the personnel in combination with the system requirements, enabling the on-site workers aware of the problem causes and corrective methods, and effectively upgrading the ESD protection skills of occupational workers.

III. Achievements Made By ESD Protection Management

(二) The ESD protection capacity in the product research & development site has been comprehensively enhanced.

The Institute, through the identification and division of ESDAs, has explicitly defined responsibility boundary and management responsibilities of various ESDAs. Furthermore, the Institute has continuously improved the ESD protection management system and requirements, comprehensively configured ESD protection equipment, materials and facilities in ESDAs, strictly controlled the grounding of occupational workers, equipment and facilities in ESDAs, strengthened the control of temperature & humidity and cleanliness within ESDAs, and intensified the management and control of insulated substances in ESDAs. Besides, a three-level dynamic supervision and control has been implemented on ESDAs through the authority, the responsible units and ESDA administration, thus the ESDAs are running well, and the ESD protection capacity in the product research & development site has been comprehensively upgraded.

III. Achievements Made By ESD Protection Management

(三) The networking working mechanism of ESD protection management system has been gradually established.

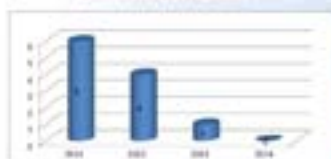
The ESD protection work has been incorporated into assessment factors of qualified suppliers for the Institute. By conducting ESD protection audits on the manufacturing units of key active electronic products, it has standardized the ESD management of production site for active electronic products manufacturing units, and transferred the requirements of Q/WC100 - 1302-2010 "ESD Protection Management System Series of Standards" issued by CASC-PB Institute to the suppliers through on-site inspection, thereby upgrading the cognition and understanding of CASC-PB Institute to the "ESD Protection Management System Series of Standards", and further enhancing the quality and reliability of sourced products.

III. Achievements Made By ESD Protection Management

(四) The quality issues caused by electrostatic damage of electronic products have been decreased significantly.

The Institute, through the establishment of ESD protection management system, has attained the standard management and continuous improvement to ESD protection management, and it has achieved most effective and overall ESD protection measures in the manufacturing of product research & development. In accordance with the analysis and statistics of electrostatic damage cases for the active stand-alone products, it is revealed that, since the operation cycle of the ESD protection management system, the quality issues caused by electrostatic damage of electronic products in the production process of active stand-alone products have been decreased year by year, thus the effective operation of ESD protection management system has effectively guaranteed the quality and reliability of active electronic products for the Institute.

Statistical Ratio of Electrostatic Operating Problems for Active Stand-alone Products in 2010 - 2014 for the Institute



15:20-15:50

优化自己的 ESD 管理系统 —参考 ANSI S20.20

Optimizing your ESD management system —refer to ANSI S20.20



演讲人

张亚龙

威讯联合半导体（北京）有限公司 资深主任工程师

Speaker

Zhang Yalong

RF Micro Devices(Beijing)Co.,Ltd Senior director of engineer

演讲人简介：

张亚龙 威讯联合半导体（北京）有限公司质量工程资深主任工程师

联系电话：13911675137

Email: yalong.zhang@qorvo.com

littledonky@tom.com

工学学士。2000~2007 年加入宏碁集团旗下 Ambit 公司，公司工程组核心成员，参与公司的微电子封装测试生产线的规划和建设，新产品的导入设计与试产，ISO9000 系统的认证，公司 ESD 系统的组建。在多个部门任职并取得优异成绩，在设备管理，微电子器件的封装测试，PCBA 生产与测试制造过程控制，制造过程中 ESD 防护方面积累丰富的经验，领导 2 项封装测试制造专利的申请，1 项创新技术应用。在 2005~2007 年，任职公司的制造研发部主任，负责厚膜技术的引进与建设，负责 SIP. Cooper pillar flip chip 封装测试的制造研发与客户端服务。2007 年加入 RFMD，负责公司亚太制造区工厂的 ESD 的系统组建与改善，为公司的 MTS（member of technical staff award）成员。国际 iNART ESD 工程师。在射频元器件电子制造领域，积极倡导 ANSIS20.20 的标准与实践结合，从管理，技术，成本，效应方面综合提升，以满足客户端和制造端严苛的质量要求。负责国内外外包公司，供应商，客户的 ESD 的现场审核，教育培训，技术支持等，通过不断的交流学习，使得公司与客户端的 ESD 解决问题的速度和能力得以很大的提升。

Speaker's biography:

ZHANG Yalong RF Micro Devices, Inc. (RFMD) Experienced chief engineer for quality project

TEL: 13911675137

Email:yalong.zhang@qorvo.com

littledonky@tom.com

He got the bachelor ' s degree in engineering. He jointed Ambit Inc. which is subordinate to ACER Group from 2000 to 2007. As a core member of company ' s engineering group, he has participated in the programming and construction of microelectronic packaging test production line, the import design and trail production of new product, the certification of ISO9000 system and the establishment of company ' s ESD system. He worked in many departments and has made outstanding achievements. He has accumulated abundant experiences about the equipment management, the package test of microelectronic device, the control of PCBA production and test and production processes and the ESD protection in the aspect of production. He was the leader for the patent application of 2 package tests and 1 innovation technology application. From 2005 to 2007, he was appointed as the director of the D&R Department, who is responsible for the introduction and construction of thick film technology, the development and research of SIP. Cooper pillarflip chip package test and the providing of client-side services. He joined RFMD in 2007. As a member of MTS (member of technical staff award), he is responsible for the establishment and improvement of the ESD systems of plants within the company ' s Asian-pacific production area. He was selected as iNART ESD engineer. In the aspect of the production of RF electronic components, he actively advocates the combination of ANSIS20.20 standard and practice and the integrated improvement of management, technology, cost and effect to satisfy the strict quality requirements of client-side and producer-side. He is responsible for the on-site ESD audit, educational training and technical support of the domestic and oversea outsourced companies, suppliers and clients. Through consistent exchange and study, the speed and capacity of ESD problem solution of company-side and client-side are greatly improved.

优化自己的 ESD 管理系统—参考 ANSI S20.20

Optimizing your ESD management system—refer to ANSI S20.20

优化自己的ESD管理系统

—参考ANSI S20.20

报告人：张亚龙
2015.11.06

引言

- 1) 消费电子产品、智能手机等终端产品供应链已经由传统型进入“全球研发型”，同时产品的生产利用智能化技术进行供应链管理的同时还必须具备小批量、多品种更多的功能。
- 2) 制造过程控制与降低成本、提高效率的方向。
- 3) 在工业半导体工艺制造中成本因素减小，More工艺制程方式、器件可靠性的控制问题。

因此，在制造过程中，提高的控制和生产效率的可能性以及开发新的设备有非常的高度和广度。在这些中，ESD的管理与控制必不可少。而制造业中各种材料制造工艺技术复杂和链长时，ESD的管理与控制尤为重要；从上游的原材料、制造流程、制造成本控制、再到客户的体验，企业应科学的设计与防护。

在这一背景下，我们给大家分享一些关于电子制造领域的知识，如案例和经验，以帮助更多企业提升产品质量和ESD的控制，尤其关注当前制程升级，更好满足高要求，降低风险，节约成本。

Electrostatic Discharge(ESD) Technology Roadmap

SEM Roadmap (Min-Max)

ESD Control is becoming increasingly critical!

CDM Roadmap (Min-Max)

ESD Control is becoming increasingly critical!

Year	ESD Control Criticality	Voltage Range (V)
1970	Low	100 - 1000
1980	Low	100 - 1000
1990	Medium	100 - 1000
2000	High	100 - 1000
2010	Very High	100 - 1000

Year	ESD Control Criticality	Voltage Range (V)
1970	Low	100 - 1000
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1990	Medium	100 - 1000
2000	High	100 - 1000
2010	Very High	100 - 1000

以上面ANSI 给出的官方资料可以预见,ESD防护面临的挑战已经不同于过去,将来面临的挑战将更有难度,这不仅体现在用户需求的多样性,设计需要满足客户,半导体制造难度提升,制造制程控制ESD需要再提升,再改善。

ESD防护工程重点在于**预防**,预防既要了解生产的需求,又要熟悉设计的意图。在制造过程中,避免ESD发生的风险低周期。根据经验,一旦生产线出现ESD问题,调查时代通常很高,而且再发生,例如应对各客问题。

所以今天主要谈制造过程中如何参照ANSI S20.20 对现场进行规划,理解,以及制造过程中ESD实现可预计,可控。ESD保护线路设计和ESD损伤后的失效分析。然而一个学科,难于归纳,数目不详。

想简单以案例过程给大家分享一些思路,共同探讨制造现场ESD的再认识和控制。

❑ Electrostatic Discharge(静电放电)学科

ESD指由物体中静电积累形成的以火花放电形式产生和释放、静电电荷损耗、静电放电击中和静电敏感元件的学科。

近年来随着科学技术的飞速发展,静电技术的应用已遍及现代电磁辐射测量领域,对静电放电的防护越来越重要。

什么是静电(Electrostatic)

“静电”是一类不带电的物体以电荷形式或电磁场形式出现的电现象。Coulomb(1733-1806)“静电”就是静止的电荷,静电的产生是由于电子在外力的作用下,从一个物体转移到另一个物体造成电荷在外电路的积累,从而产生静电现象。ESD指静电电子流从严重损害物品或设备现象。

物体表面因摩擦产生正负静电电荷。

静电于物体表面。

静电电子流产生静电场形式。

工业上静电放电现象危害极大,因此,防止静电放电会引起严重后果。

静电的特点

① 电压高 静电电压能升到数千上万伏

② 电荷量 静电电荷 $1nC \sim 10nC$ 左右

③ 电阻小 静电电阻 $10^4 \sim 10^6 \Omega$




[illegible]

优化自己的 ESD 管理系统—参考 ANSI S20.20

Optimizing your ESD management system—refer to ANSI S20.20

以下的表格可以帮助你制定ESD管理文件

- 定义训练设备的范围
- 制定训练计划：主题、内容、知识分享平台、奖励制
- 定义技术数据指标
 - 制定数据指标，明确达到的使用主题
 - FPA (FSP Protected Area) 资源效率和资源、效率
 - 设备的SCOP值与效率
 - 制定设备与生产资料的消耗与测试、认证
 - 制定设备与生产资料的消耗与测试、认证
- 定义管理范围的要素
 - 组织的管理：制定或更新的管理、考核、认证
 - 生产或设备的管理
 - 设备管理的管理
 - 设备的管理
 - 设备的管理
 - 设备的管理
 - 设备的管理



2 实践中，不断寻找改善的机会

2.1 100%使用ESD的替換週期

ESD数据可以任意复制，但是最关键的是一级基本工作。因为ESD是自然界中的一级数据设备，无法复制。只有经过工程级ESD的本土化，参与设计，才能生成数据。‘金开姆’认为数据ESD，金开姆中ESD数据，是ESD数据中，ESD数据中ESD数据。

项目描述	优势	成本
标准式训练	注重形式, 注重细节	以训练成为产品思维, 更多的精力应该放在高以训练代替技术的内容和更长时间的练习。
非标准式教育训练	以观念、记诵为主, 注重实践考核, 实践效果强	以训练为主, 训练不一定好
走过程, 完成记录表, 形成训练	更多关注过程而非结果	符合公司的“文件管理”要求, 满足客户的“文件管理”需求, 但成本上有所要求。
完全无教育训练	不可想像的结果	没有无条件的训练, 行成起来很难。

一些影響教育訓練的做法

公司註冊事項則僅對公眾披露，無須處理的區域的目錄

1. 给下列词语标出拼音。
2. 制定以两小时为1个单元, 使多数同学达到中等程度的练习二道以上的两题以上为常。
3. 练习时进行以下题目的练习。
4. 练习时30分钟。

E3D Training: 15 输入，可能会得到 n5 的输出
由 15 输入，可能会得到 n5 的结果。

[illegible]

此外，問題往往會變本加厲，甚至擴及一般的人際。若不幸造成覺醒期行為可以預期時發生，所以如覺醒期時減少活動，不能保證絕對無害。

2.2 产品生产的ESD控制培训计划

售完一批喇叭后, 逐步进行确认。有的十度网友向美国 66666662 的卖家求助, 发了一个你好的参考标准。

注：在生产的资本循环中，货币从商品的生产过程和生产资料购买过程，直接流回到销售过程，即从商品流回到商品流，从而形成流回的资本循环。从流回的商品流中，货币流回到流回的资本循环中。

平度县一个县级的老报纸。

```

1  # Import necessary libraries
2  import pandas as pd
3  import numpy as np
4  from sklearn.preprocessing import StandardScaler
5  from sklearn.model_selection import train_test_split
6  from sklearn.metrics import accuracy_score, confusion_matrix
7  from sklearn.svm import SVC
8
9  # Load the dataset
10 data = pd.read_csv('data.csv')
11
12 # Split the data into features and target variable
13 X = data[['feature1', 'feature2', 'feature3']]
14 y = data['target']
15
16 # Standardize the features
17 scaler = StandardScaler()
18 X_scaled = scaler.fit_transform(X)
19
20 # Split the data into training and testing sets
21 X_train, X_test, y_train, y_test = train_test_split(X_scaled, y,
22                                                    test_size=0.2,
23                                                    random_state=42)
24
25 # Train the SVM model
26 svm = SVC(kernel='linear')
27 svm.fit(X_train, y_train)
28
29 # Predict on the test set
30 y_pred = svm.predict(X_test)
31
32 # Evaluate the model
33 accuracy = accuracy_score(y_test, y_pred)
34 conf_matrix = confusion_matrix(y_test, y_pred)
35
36 # Print the results
37 print(f'Accuracy: {accuracy}')
38 print('Confusion Matrix:')
39 print(conf_matrix)

```

[illegible]

2.3 理论模型

讀史卷之二十一 魏志

通过建立和测试内部标准技术设计, 使项目又在工作中, 同时定期更新和改进。

本文测试方法中将会涉及到的测试,主要是对材料成分、材料性质和性能以及设备、材料、工艺等。这些材料的基本物理化学与力学性质和性能测试,属于化学材料测试BCD类中材料测试的分支化学物理性能测试的方法。本文在文章中将一种测试材料的方法。

國家證券及期貨委員會(「證監會」)註冊。註冊編號：050/2000-170/2002-170/2003-170/2004-170/2005-170/2006-170/2007-170/2008-170/2009-170/2010-170/2011-170/2012-170/2013-170/2014-170/2015-170/2016-170/2017-170/2018-170/2019-170/2020-170/2021-170/2022-170/2023-170/2024-170/2025-170/2026-170/2027-170/2028-170/2029-170/2030-170/2031-170/2032-170/2033-170/2034-170/2035-170/2036-170/2037-170/2038-170/2039-170/2040-170/2041-170/2042-170/2043-170/2044-170/2045-170/2046-170/2047-170/2048-170/2049-170/2050-170/2051-170/2052-170/2053-170/2054-170/2055-170/2056-170/2057-170/2058-170/2059-170/2060-170/2061-170/2062-170/2063-170/2064-170/2065-170/2066-170/2067-170/2068-170/2069-170/2070-170/2071-170/2072-170/2073-170/2074-170/2075-170/2076-170/2077-170/2078-170/2079-170/2080-170/2081-170/2082-170/2083-170/2084-170/2085-170/2086-170/2087-170/2088-170/2089-170/2090-170/2091-170/2092-170/2093-170/2094-170/2095-170/2096-170/2097-170/2098-170/2099-170/2100-170/2101-170/2102-170/2103-170/2104-170/2105-170/2106-170/2107-170/2108-170/2109-170/2110-170/2111-170/2112-170/2113-170/2114-170/2115-170/2116-170/2117-170/2118-170/2119-170/2120-170/2121-170/2122-170/2123-170/2124-170/2125-170/2126-170/2127-170/2128-170/2129-170/2130-170/2131-170/2132-170/2133-170/2134-170/2135-170/2136-170/2137-170/2138-170/2139-170/2140-170/2141-170/2142-170/2143-170/2144-170/2145-170/2146-170/2147-170/2148-170/2149-170/2150-170/2151-170/2152-170/2153-170/2154-170/2155-170/2156-170/2157-170/2158-170/2159-170/2160-170/2161-170/2162-170/2163-170/2164-170/2165-170/2166-170/2167-170/2168-170/2169-170/2170-170/2171-170/2172-170/2173-170/2174-170/2175-170/2176-170/2177-170/2178-170/2179-170/2180-170/2181-170/2182-170/2183-170/2184-170/2185-170/2186-170/2187-170/2188-170/2189-170/2190-170/2191-170/2192-170/2193-170/2194-170/2195-170/2196-170/2197-170/2198-170/2199-170/2200-170/2201-170/2202-170/2203-170/2204-170/2205-170/2206-170/2207-170/2208-170/2209-170/2210-170/2211-170/2212-170/2213-170/2214-170/2215-170/2216-170/2217-170/2218-170/2219-170/2220-170/2221-170/2222-170/2223-170/2224-170/2225-170/2226-170/2227-170/2228-170/2229-170/2230-170/2231-170/2232-170/2233-170/2234-170/2235-170/2236-170/2237-170/2238-170/2239-170/2240-170/2241-170/2242-170/2243-170/2244-170/2245-170/2246-170/2247-170/2248-170/2249-170/2250-170/2251-170/2252-170/2253-170/2254-170/2255-170/2256-170/2257-170/2258-170/2259-170/2260-170/2261-170/2262-170/2263-170/2264-170/2265-170/2266-170/2267-170/2268-170/2269-170/2270-170/2271-170/2272-170/2273-170/2274-170/2275-170/2276-170/2277-170/2278-170/2279-170/2280-170/2281-170/2282-170/2283-170/2284-170/2285-170/2286-170/2287-170/2288-170/2289-170/2290-170/2291-170/2292-170/2293-170/2294-170/2295-170/2296-170/2297-170/2298-170/2299-170/2300-170/2301-170/2302-170/2303-170/2304-170/2305-170/2306-170/2307-170/2308-170/2309-170/2310-170/2311-170/2312-170/2313-170/2314-170/2315-170/2316-170/2317-170/2318-170/2319-170/2320-170/2321-170/2322-170/2323-170/2324-170/2325-170/2326-170/2327-170/2328-170/2329-170/2330-170/2331-170/2332-170/2333-170/2334-170/2335-170/2336-170/2337-170/2338-170/2339-170/2340-170/2341-170/2342-170/2343-170/2344-170/2345-170/2346-170/2347-170/2348-170/2349-170/2350-170/2351-170/2352-170/2353-170/2354-170/2355-170/2356-170/2357-170/2358-170/2359-170/2360-170/2361-170/2362-170/2363-170/2364-170/2365-170/2366-170/2367-170/2368-170/2369-170/2370-170/2371-170/2372-170/2373-170/2374-170/2375-170/2376-170/2377-170/2378-170/2379-170/2380-170/2381-170/2382-170/2383-170/2384-170/2385-170/2386-170/2387-170/2388-170/2389-170/2390-170/2391-170/2392-170/2393-170/2394-170/2395-170/2396-170/2397-170/2398-170/2399-170/2400-170/2401-170/2402-170/2403-170/2404-170/2405-170/2406-170/2407-170/2408-170/2409-170/2410-170/2411-170/2412-170/2413-170/2414-170/2415-170/2416-170/2417-170/2418-170/2419-170/2420-170/2421-170/2422-170/2423-170/2424-170/2425-170/2426-170/2427-170/2428-170/2429-170/2430-170/2431-170/2432-170/2433-170/2434-170/2435-170/2436-170/2437-170/2438-170/2439-170/2440-170/2441-170/2442-170/2443-170/2444-170/2445-170/2446-170/2447-170/2448-170/2449-170/2450-170/2451-170/2452-170/2453-



附：加藤忠雄的著作：加藤忠雄是著名日本ESQ的创始人，对目前世界社会企业有以下的重要

周麗不推卸：假如我是花不情假意去追求美麗，
去騙去去迷男，那才該恥笑，正在世間難得的伴侶和真情的對
方卻成了我的受害者，我會很自責的。我會把這看成是人的責任過重。

42 在一家生产电子产品的工厂生产线上，一位熟练、经验丰富的英国士，上面盖着一块布，往机器上放材料。在这家公司，要生产出一件产品必须按照规定的顺序来干。生产一个产品，比如，在运行30000个零件的时候，生产一个产品，这个流程就用了30000个零件。在运行30000个零件的时候，生产一个产品，这个流程就用了30000个零件。

[illegible]

优化自己的 ESD 管理系统——参考 ANSI S20.20

Optimizing your ESD management system—refer to ANSI S20.20

84 测试用例设计 测试用例的编写

資料來源：根據本報記者採訪、整理。資料來源：根據本報記者採訪、整理。

2.4 有电势地系统: Grounding / Equipotential Bonding Systems

世界地理知识 2008 年第 10 期



料 4330 地垫: 以前很多地垫在工厂的时候, 可见它非常结实, 企业则使用外面镀膜工艺以代替传统的陶瓷地面与地面的连接。这种类型的材料会有部分地面导电性能严重丧失, 很多医院只是注重美观(图一)。从材料应用和性能, 造成可能这个地垫并没有有效的绝缘(图二)。

12

2.5 人的身体模型：即HBM (Human Body Model)

在防静电区域内进行作业,人体的静电放电通过以下的两种方式进行防止操作——可通过防静电鞋子导入地下
防止操作——可以通过防静电鞋套,进行静电的防止。

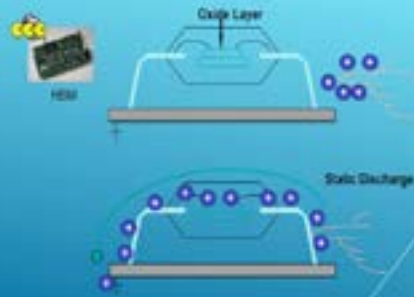
```

graph BT
    A[AC Equipment Control  
Auxiliary Control] --> B[Steel Class or Grade  
Contents Feed (control)]
    C[Steel Temp. (control)] --> B
    D[Steel surface] --> B
  
```

此外, 由于对电子和光子的理解是复杂的, 一个被广泛地接受和广泛使用的理论, 即量子力学, 可能是不完整的, 甚至可能是错误的。

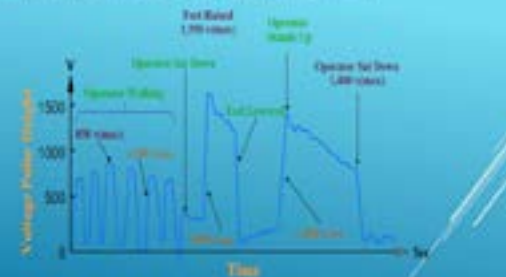
点评：人力资源协议简单、作用却很重要。在实际的生产管理中，总是能碰到的问题。假如贵公司出现需要地转手生意需要以种协议来防止不良后果。

位地都不愿辞掉做过的工作无济于事身体却垮了下来。李强从这地会中悟出了无条件的原则。李强说:别人让我做。



Typical Voltage Variations Monitored on a Un-grounded Person

典型的如黑头粉刺和暗疮的生成下，在一般环境下，可观察到痤疮的生成。



优化自己的 ESD 管理系统—参考 ANSI S20.20

Optimizing your ESD management system—refer to ANSI S20.20

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图 1 中展示了 3 个模型: 人体模型 (human body model)、充电器模型 (charge device model) 和充电器模型 (charge device model)。

1989

所以這裏所提之「文」與前邊七句的「文」是不一樣的，應是「文章」之義。



在EPA的ESD敏感器件操作中, 应遵循以下原则: 任何决定
产品制造前, 不要过流测试, 不要过压, 不要过热

-
- Figure 7** Schematic diagram of a FCS Packaging Property Data Management System.

只要用心，就能做的更好！

Optimizing your ESD management system—refer to ANSI S20.20

1. make a suitable ESD control standard

优化自己的 ESD 管理系统—参考 ANSI S20.20

Optimizing your ESD management system—refer to ANSI S20.20

Following ideas can assist in making ESD management documents

- Define the purpose of negotiation
- Education and training: active method, content, knowledge sharing platform, e-learning
- Define the target of the business negotiation:
 - Analysis and synthesis method of management negotiation
 - Fair standard, method and frequency: 40/50/100 Percentages
 - 100 negotiation, 50% and 40% of negotiation
 - Evaluation, fact and authority, it is essential to find the guidelines in the process of behavior
 - Establishing mutual trust and respect for economic cooperation
- Define the responsibility of management a target:
 - Measurement of negotiation training, experience and contribution to organizational results
 - 100% objectives in the entire closed process
 - Target and responsibility of management
 - Negotiate with
 - Measurement of system flow
 - Measure the responsibility of the process



2. Continuously seek for improvement in practice

2.1 Attach 100% importance to the education and training about ESD

EQC adaptation and training is the most fundamental and essential work prior to EQC as a common cultural phenomenon which can not be ignored. Employees can only do well in understanding and preventing EQC if they have some idea about the cause and effect of EQC and participate in EQC prevention. Full involvement in understanding and preventing EQC can get better results with that the effort. The study revealed a positive relationship between the EQC knowledge

Following is an analysis towards some issues with regard to ESD education and training:

Discussion question	Results	Comments
Stigma-focused learning	very focus on facts, understanding effect	EGG learning more on learning by participants, and learning that for people who do EGG more information and control technology and reduce the management process.
Mechanical demonstration-focused education and training	mechanically match the concept and maintain in the position of learning hard action, low product effect	Direct learning, but the after might be too good
Personalization in learning the results and facts	give a copy with external resources	connected with the "Personalized outcome" requirement of the companies, due to safety, "Assured demands" of customers, lack of knowledge of experience
Direct education or training	unimaginable consequences	Efficient at personal and indirect learning, its effects last 2-3 years.

Some advisable methods in education and training

Company shall make clear training targets according to actual needs of different employee levels.

1. Cultivate and select qualified trainer
2. Make training and re-training plan: most companies have training if less than one hour/year, and almost no company has second line training within a year.
3. Training shall be conducted from the top level to the bottom level.
4. Cultivate ISO culture

ESD Training: 1\$ expense might give you n\$ income
Saving 1\$ expense might cause n\$ loss.

In detail, we'd say: "our goal is to maintain a company and use the worker's labor contract with responsibility of the shareholder who looking himself down to assemble the worker as I asked the manager come to me. 'Let's go with USD when has contracting with the united products.' He said, 'This working position is not a union play is a pure USD participants, it shall be love. 'Let's love we do all the team.'"

Comment: The problem is insufficient education. From manager to worker at the production line, no one knows about what behaviors might lead to the occurrence of ISO. Therefore, a complete training manual can not provide the effectiveness of training.

2.2 Confirmation of ESD prevention at production

Tables 1 and Table 1 in APPENDIX 20 are generated as alternative reference standards.

Activity	Estimated time	Materials
1. Read the introduction to the book and the first chapter.	10 minutes	Book, paper, pencils
2. Discuss the book and the first chapter.	10 minutes	Book, paper, pencils
3. Read the second chapter.	10 minutes	Book, paper, pencils
4. Discuss the second chapter.	10 minutes	Book, paper, pencils
5. Read the third chapter.	10 minutes	Book, paper, pencils
6. Discuss the third chapter.	10 minutes	Book, paper, pencils
7. Read the fourth chapter.	10 minutes	Book, paper, pencils
8. Discuss the fourth chapter.	10 minutes	Book, paper, pencils
9. Read the fifth chapter.	10 minutes	Book, paper, pencils
10. Discuss the fifth chapter.	10 minutes	Book, paper, pencils
11. Read the sixth chapter.	10 minutes	Book, paper, pencils
12. Discuss the sixth chapter.	10 minutes	Book, paper, pencils
13. Read the seventh chapter.	10 minutes	Book, paper, pencils
14. Discuss the seventh chapter.	10 minutes	Book, paper, pencils
15. Read the eighth chapter.	10 minutes	Book, paper, pencils
16. Discuss the eighth chapter.	10 minutes	Book, paper, pencils
17. Read the ninth chapter.	10 minutes	Book, paper, pencils
18. Discuss the ninth chapter.	10 minutes	Book, paper, pencils
19. Read the tenth chapter.	10 minutes	Book, paper, pencils
20. Discuss the tenth chapter.	10 minutes	Book, paper, pencils
21. Read the eleventh chapter.	10 minutes	Book, paper, pencils
22. Discuss the eleventh chapter.	10 minutes	Book, paper, pencils
23. Read the twelfth chapter.	10 minutes	Book, paper, pencils
24. Discuss the twelfth chapter.	10 minutes	Book, paper, pencils
25. Read the thirteenth chapter.	10 minutes	Book, paper, pencils
26. Discuss the thirteenth chapter.	10 minutes	Book, paper, pencils
27. Read the fourteenth chapter.	10 minutes	Book, paper, pencils
28. Discuss the fourteenth chapter.	10 minutes	Book, paper, pencils
29. Read the fifteenth chapter.	10 minutes	Book, paper, pencils
30. Discuss the fifteenth chapter.	10 minutes	Book, paper, pencils
31. Read the sixteenth chapter.	10 minutes	Book, paper, pencils
32. Discuss the sixteenth chapter.	10 minutes	Book, paper, pencils
33. Read the seventeenth chapter.	10 minutes	Book, paper, pencils
34. Discuss the seventeenth chapter.	10 minutes	Book, paper, pencils
35. Read the eighteenth chapter.	10 minutes	Book, paper, pencils
36. Discuss the eighteenth chapter.	10 minutes	Book, paper, pencils
37. Read the nineteenth chapter.	10 minutes	Book, paper, pencils
38. Discuss the nineteenth chapter.	10 minutes	Book, paper, pencils
39. Read the twentieth chapter.	10 minutes	Book, paper, pencils
40. Discuss the twentieth chapter.	10 minutes	Book, paper, pencils
41. Read the twenty-first chapter.	10 minutes	Book, paper, pencils
42. Discuss the twenty-first chapter.	10 minutes	Book, paper, pencils
43. Read the twenty-second chapter.	10 minutes	Book, paper, pencils
44. Discuss the twenty-second chapter.	10 minutes	Book, paper, pencils
45. Read the twenty-third chapter.	10 minutes	Book, paper, pencils
46. Discuss the twenty-third chapter.	10 minutes	Book, paper, pencils
47. Read the twenty-fourth chapter.	10 minutes	Book, paper, pencils
48. Discuss the twenty-fourth chapter.	10 minutes	Book, paper, pencils
49. Read the twenty-fifth chapter.	10 minutes	Book, paper, pencils
50. Discuss the twenty-fifth chapter.	10 minutes	Book, paper, pencils
51. Read the twenty-sixth chapter.	10 minutes	Book, paper, pencils
52. Discuss the twenty-sixth chapter.	10 minutes	Book, paper, pencils
53. Read the twenty-seventh chapter.	10 minutes	Book, paper, pencils
54. Discuss the twenty-seventh chapter.	10 minutes	Book, paper, pencils
55. Read the twenty-eighth chapter.	10 minutes	Book, paper, pencils
56. Discuss the twenty-eighth chapter.	10 minutes	Book, paper, pencils
57. Read the twenty-ninth chapter.	10 minutes	Book, paper, pencils
58. Discuss the twenty-ninth chapter.	10 minutes	Book, paper, pencils
59. Read the thirtieth chapter.	10 minutes	Book, paper, pencils
60. Discuss the thirtieth chapter.	10 minutes	Book, paper, pencils
61. Read the thirty-first chapter.	10 minutes	Book, paper, pencils
62. Discuss the thirty-first chapter.	10 minutes	Book, paper, pencils
63. Read the thirty-second chapter.	10 minutes	Book, paper, pencils
64. Discuss the thirty-second chapter.	10 minutes	Book, paper, pencils
65. Read the thirty-third chapter.	10 minutes	Book, paper, pencils
66. Discuss the thirty-third chapter.	10 minutes	Book, paper, pencils
67. Read the thirty-fourth chapter.	10 minutes	Book, paper, pencils
68. Discuss the thirty-fourth chapter.	10 minutes	Book, paper, pencils
69. Read the thirty-fifth chapter.	10 minutes	Book, paper, pencils
70. Discuss the thirty-fifth chapter.	10 minutes	Book, paper, pencils
71. Read the thirty-sixth chapter.	10 minutes	Book, paper, pencils
72. Discuss the thirty-sixth chapter.	10 minutes	Book, paper, pencils
73. Read the thirty-seventh chapter.	10 minutes	Book, paper, pencils
74. Discuss the thirty-seventh chapter.	10 minutes	Book, paper, pencils
75. Read the thirty-eighth chapter.	10 minutes	Book, paper, pencils
76. Discuss the thirty-eighth chapter.	10 minutes	Book, paper, pencils
77. Read the thirty-ninth chapter.	10 minutes	Book, paper, pencils
78. Discuss the thirty-ninth chapter.	10 minutes	Book, paper, pencils
79. Read the fortieth chapter.	10 minutes	Book, paper, pencils
80. Discuss the fortieth chapter.	10 minutes	Book, paper, pencils
81. Read the forty-first chapter.	10 minutes	Book, paper, pencils
82. Discuss the forty-first chapter.	10 minutes	Book, paper, pencils
83. Read the forty-second chapter.	10 minutes	Book, paper, pencils
84. Discuss the forty-second chapter.	10 minutes	Book, paper, pencils
85. Read the forty-third chapter.	10 minutes	Book, paper, pencils
86. Discuss the forty-third chapter.	10 minutes	Book, paper, pencils
87. Read the forty-fourth chapter.	10 minutes	Book, paper, pencils
88. Discuss the forty-fourth chapter.	10 minutes	Book, paper, pencils
89. Read the forty-fifth chapter.	10 minutes	Book, paper, pencils
90. Discuss the forty-fifth chapter.	10 minutes	Book, paper, pencils
91. Read the forty-sixth chapter.	10 minutes	Book, paper, pencils
92. Discuss the forty-sixth chapter.	10 minutes	Book, paper, pencils
93. Read the forty-seventh chapter.	10 minutes	Book, paper, pencils
94. Discuss the forty-seventh chapter.	10 minutes	Book, paper, pencils
95. Read the forty-eighth chapter.	10 minutes	Book, paper, pencils
96. Discuss the forty-eighth chapter.	10 minutes	Book, paper, pencils
97. Read the forty-ninth chapter.	10 minutes	Book, paper, pencils
98. Discuss the forty-ninth chapter.	10 minutes	Book, paper, pencils
99. Read the fiftieth chapter.		

Following is sample solution one:

1. What is the purpose of the study?
 2. What is the research question?
 3. What is the hypothesis?
 4. What is the independent variable?
 5. What is the dependent variable?
 6. What is the control group?
 7. What is the experimental group?
 8. What is the sample size?
 9. What is the data collection method?
 10. What is the data analysis method?
 11. What is the conclusion?
 12. What are the limitations of the study?
 13. What are the implications of the study?
 14. What are the future research directions?
 15. What are the ethical considerations?

Source	Estimate	Method	Response
DHS	Household	1995-2000	Household 1995-2000
	Individual	1995-2000	Individual 1995-2000
	State	1995-2000	State 1995-2000
	County	1995-2000	County 1995-2000
	Tract	1995-2000	Tract 1995-2000
	Block	1995-2000	Block 1995-2000
	Block	1995-2000	Block 1995-2000
	Block	1995-2000	Block 1995-2000
	Block	1995-2000	Block 1995-2000
	Block	1995-2000	Block 1995-2000

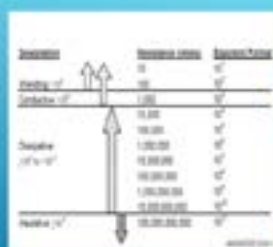
2.3 Confirmation at the working site

Working Life

- Test method and test frequency: biological test method, and shall be defined in the document, along with regular research and monitoring. (100%) It shall be consistent with various test methods in design. You can get and get back test methods, or be written.

Ordinary least squares (OLS) and two-stage least squares (2SLS), which mainly targets at materials, including salary and equipment, consumable items, etc. However, given the fact that the materials is essential to the molecular structure and synthesis, Performance measurement is a common method and 2SLS, although is an auxiliary method, is introducing the same issue. Therefore, instead of OLS, we use the following

Defining frequency is determined by the data, and is usually (a) quarterly and (b) monthly, only monthly, quarterly or biannual.



†† Significance of anti-rabies testing, anti-rabies testing in the ear/eye, HIV-positive testing, for example, were compared with their corresponding null in the model.

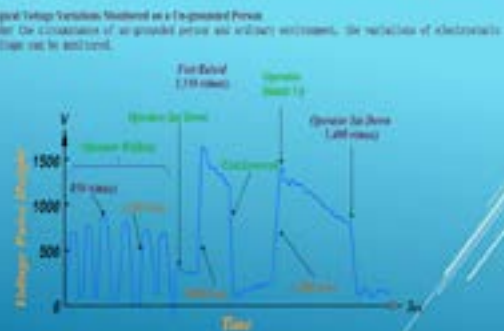
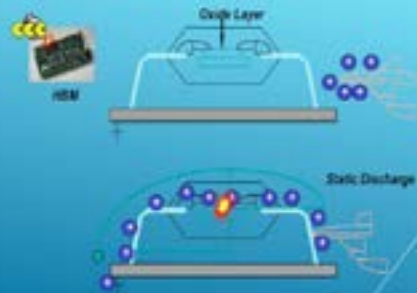
Intelligence is important, yet not enough, unless it is backed up by action.

Financial trading, see, section 1.1.1, entry in the *Financial* book of the *Index* of *Journal of Management and Accounting* by author affiliation to the Journal of Management Accounting is annual that contains

62. As the protection law of a 300 mobile phone number, users are continuously, the ground is arbitrary, constant, covered with grass/past. No specific, just for mail should this is not including material. The company requires employees to email and mail, when showing the work day. This happens a lot. Designers have department is a minimal 300 number approval. This can be done that the system is based on the user are continuous, a 300 control.

[illegible]

Optimizing your ESD management system—refer to ANSI S20.20



优化自己的 ESD 管理系统 —参考 ANSI S20.20

Optimizing your ESD management system —refer to ANSI S20.20

2.6 Existing problems in EPA

Figure 1 in ANSI S20.20 is the ESD requirement to facilities applied in EPA (ESD Protected Areas), and we would not waste before introduction here.

In practice, a job, a work shop, and a certain area including ESD sensitive components can be defined as EPA, within which, the target guiding principle is that providing conductivity of static electricity can equip materials with the status of non-static conductors. Non-static conductors shall keep a distance of at least 10cm from the products. Adjust the equipment, keep humidity well controlled operation.

When operating in EPA, we shall be the best to avoid and prevent the occurrence of ESDD (electrostatic discharge) and ESDS (ESD damage sensitive mode).

We can not find any ESD requirement in ANSI S20.20. ANSI S20.20 does not set action prohibition, and requires facilities research and management based on actual situation, along with the accumulation of knowledge and experience.

The example

For example, images in EPA

Figure 100 displays multiple ESD sensitive components on pins. If a worker touches the pins, it will be a problem. Why? It is because the pins are not grounded, and the worker's body is not grounded. When the worker touches the pins, the pins will be charged. This means that the pins will be charged. This means that the pins will be charged.



In EPA, technological measurement, monitoring and management is a process of continuous development and improvement. Some measurement can be combined according to Figure 3 in ANSI S20.20. Actually, the production process is dynamic, and the measurement of continuous operation is the emphasis in discussing ESD safety.

Therefore, we shall define which are allowed, which are not, and which require to be improved.

For example, some factories would fix and control the broken or worn chair and working table with sufficient tape to avoid some. Transmissibility was anti-static clothing, covered staff, rolled up sleeves, fabric banners, worn clothes, etc.

Many anti-static materials have been certified or registered.

PC, electronic products are both on the same working table. Failed to provide regular maintenance is not the.

Living example 11 Equipment and materials are put into production in these being confirmed. Figure on the right indicates that the static voltage test result of workbench is 400V in its inspection. The failure rate of a component was as high as 10% due to "Uncontrolled component usage".



Living example 12 Figure 1 on the right is a workbench equipment, whose surface is made of wood, with two ESD materials waiting around.

Figure 1 on the right is an ordinary plastic bag packaging circuit board. According to the surface test, the failure voltage is as high as 1200V.

Some of these materials being used in production have been certified and approved for application, while some others haven't. There is no existing procedure in ANSI S20.20 providing with guidance, and we need to refer to ANSI S41 with changes.

Overall assessment strategies indicate that in actual EPA management, except the fixed fixed facilities which shall be managed following Figure 1 in ANSI S20.20, more importantly, in the process, under the continuous working condition, we shall research on ESD control and make necessary measures needed.

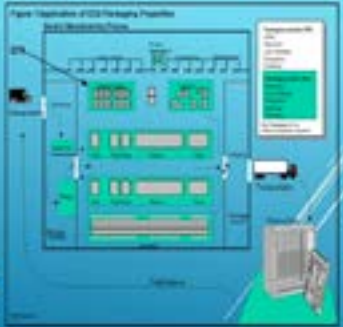
In the operation of ESD sensitive components in EPA, we must not and cannot let the quality of products. We can only improve ourselves and do better by constantly performing our mission.




2.7 Package--Provide baby-protection to products to avoid ESD damage

Figure 100 displays multiple ESD sensitive components on pins. If a worker touches the pins, it will be a problem. Why? It is because the pins are not grounded, and the worker's body is not grounded. When the worker touches the pins, the pins will be charged. This means that the pins will be charged. This means that the pins will be charged.

Figure 100 displays multiple ESD sensitive components on pins. If a worker touches the pins, it will be a problem. Why? It is because the pins are not grounded, and the worker's body is not grounded. When the worker touches the pins, the pins will be charged. This means that the pins will be charged. This means that the pins will be charged.



Conclusion

Electronics manufacturing industry is gradually upgrading and transforming. Re-consideration and development of ESD

It's both an opportunity and challenge:

Prevention always comes more importantly than remedy.

Study, research, constant development

ESD prevention is a systematic project, which calls for further teamwork and team development.

Establish your own ESD database and knowledge platform.

Build your very own ESD culture.

Pay much attention, and you can do better!

15:50-16:20

静电防护材料和用品的标准和选择指南 Standard and selection guide for electrostatic protective materials and articles



演讲人

袁亚飞

北京东方计量测试研究所静电防护副总师，高级工程师

Speaker

YUAN Yafei

the vice chief engineer for electrostatic protection and senior engineer in
Beijing Orient Institute for Metrology and Measurement Technology

演讲人简介：

袁亚飞，北京东方计量测试研究所静电防护副总师，高级工程师，从事电磁计量与静电防护科研工作，负责多项国防计量基础科研项目，编著了《电子工业静电防护与管理》图书，起草了多项国家标准、国军标、航天标准，获 1 项国防科技进步二等奖，2 项国家发明专利。

作为审核组长完成了多次静电防护管理体系认证审核工作，作为咨询老师对数家单位进行静电体系的咨询工作，作为培训教师对近千名静电防护管理人员、检测人员、内审员进行培训，作为静电防护专家多次参加静电相关故障的归零工作。

Speaker's biography:

YUAN Yafei, the vice chief engineer for electrostatic protection and senior engineer in Beijing Orient Institute for Metrology and Measurement Technology, is mainly engaged in the scientific research of electromagnetic measurement and electrostatic protection. He has been responsible for many national defense measurement research projects. He once compiled the book named as " Electrostatic Protection and Management in Electronic Industry " and has drafted many national standards, military standards and aerospace standards. He was conferred with a Second Award for National Defense Scientific and Technological Progress. He obtained 2 China national invention patents.

As the leader of audit group, he has completed many audit tasks of the certification of electrostatic protection management system. As a consultant, he has provided the consultancy services of electrostatic system for lots of institutions. As a training teacher, he has provided training for thousands of electrostatic protection management staff, detection staff and internal auditor. As the expert of electrostatic protection, he has participated in the zeroing of malfunctions related to electrostatic problems for many times.

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Standard and selection guide for electrostatic protective materials and articles

静电防护材料和用品的标准 和选择指南

袁亚飞

201511

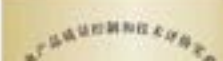
15313138496@126.com

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静电防护材料和用品的标准和选择指南



中国航天科技集团公司
静电防护技术中心



静电防护
工业和信息化部



静电防护管理体系
认证中心



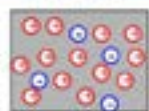
静电防护与应用技术
研究实验室

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2

防护原则

形成静电危害的三要素



静电源

路径

敏感器件



4

静电防护材料和用品的标准和选择指南

防静电地板

自流坪

水磨石

PVC卷材

陶瓷地板

架空地板

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防静电地板

自流坪—定义

防静电环氧自流坪是以彩色石英砂和组成的无缝一体化的新型复合装饰地坪。通过一种或多种不同颜色的彩色石英砂自由搭配，形成丰富多彩的装饰色彩及图案具有装饰质感优势，耐磨损，耐抗压，耐化学腐蚀，防滑，防水，防火等优点。

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静电防护材料和用品的标准和选择指南

防静电地板

自流坪—优缺点

整体无缝，表面光洁，耐磨性能好，易清洁；耐油污，耐一般化学腐蚀，防静电性好，色彩任选，美观亮丽；施工快速，简单，性价比高；与基层有着极好的粘结力，避免了普通树脂地坪容易起泡、脱层的弊病；具有极佳的抗压、抗冲击。使用年限达10年以上。

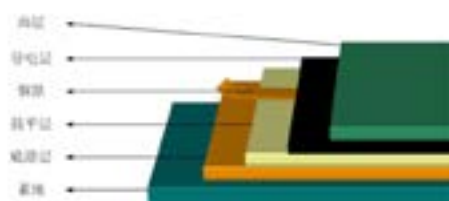
但是防静电自流坪的性能受铺设工艺和铺设过程的影响比较大，性能不太稳定，易挥发，不易维修。

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防静电地板

自流坪—组成



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防静电地板

水磨石

防静电水磨石地坪是一种水磨石的新型工艺，它采用无机导电相材料独特配方，特殊工艺制造，防静电性能稳定性，安全可靠，耐磨持久。其外观及建筑性能与普通优质水磨石无异，可做地面、工作台面、装卸台面等。

比防静电自流坪的性能
稳定、优良，价格略贵。



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防静电地板

水磨石

优缺点

防静电特性永久有效，使用寿命与建筑物同周期；
无需防静电维护保养，防静电保养零成本；
防静电的整体性、稳定性、环境适应性和一致性优良。

但是水磨石的性能受铺设工艺和铺设过程的影响比较大。



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防静电地板

PVC卷材

PVC地板是采用聚氯乙烯材料生产的地板，是以聚氯乙烯和共聚树脂为主要原料，加入填料，增塑剂，稳定剂，着色剂等辅料，在片状连续基材上，经涂敷工艺或经压延，挤出或挤压工艺生产而成。PVC的面层厚度一般在1~3mm之间，常用的为2mm。



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防静电地板

PVC卷材

PVC卷材分为两种：

一种是硬质的PVC，即在PVC材料中增加碳粉颗粒或纳米级氧化锌晶须，压缩成型。

另一种是软质PVC，即在PVC中增加了橡胶和导电剂后，压缩成型。

两种PVC卷材各有优缺点，
市场上应用都比较广泛。

十八世纪：第一块，第一块，第一块。



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防静电地板

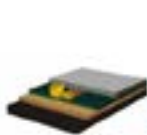
PVC卷材—软质

应用防静电台面

采用上下两层传导进行静电泄放，表面粘贴永久性防静电贴面板材料，中间采用导电铜箔铺设，更有效、更快的泄放静电。

产品结构图

- 防静电贴面板
- 导电铜箔
- 防静电贴面板
- 防静电贴面板



防静电

静电防护材料和用品的标准和选择指南

防静电地板

防静电陶瓷

防静电陶瓷砖作为一种新型防静电材料，克服当前使用的如环氧树脂、三聚氰胺板、防静电PVC、防静电橡胶板等高分子材料易老化、不耐磨、易污染、电性能不稳定和防火欠佳等缺陷，兼容了陶瓷地砖优点，具有施工难度小、施工速度快、美观耐用、防火、防滑、抗压、耐磨、耐腐蚀、防污、防水、防渗透、安全环保，是具有永久性防静电功能的换代产品，是目前最理想的防静电与装饰兼容的高科技材料，可显著提高防静电工作区（EPA）的综合防护水平，降低EPA的综合造价和维护费用。

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防静电地板

架空地板

架空地板一般由面层、基层、横梁、支架构成。无论何种防静电架空地板采用的横梁和支架都基本相同，故架空地板的分类一般都是根据面层和基层进行的，根据面层不同可分为三聚氰胺面、PVC面和陶瓷面等。



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防静电地板

架空地板—基层

通过以上的比较分析可以看出，全铜基地板具有一定的承载力，受温湿度的影响比较小，价格也相对适中，是比较理想的选择。



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防静电工作台

国家标准明确指出：静电安全工作台是防静电工作区的基本组成部分，由工作台、防静电桌垫、腕带接头、电源总线和接地线等组成。工作台上配置防静电路线、防静电烟雾净化及防静电工具，进入EPA的文件、图纸应装在防静电封套中。在重点工位上应配备离子风机，以随时消除在动态过程（如装配）中产生的静电。



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静电防护材料和用品的标准和选择指南

防静电工作台

1) 类型

防静电工作台分两种：一种是在普通工作台上铺设一层防静电台垫的，另一种是一体化结构的。关注：**台垫寿命**

2) 接地系统

防静电接地必须独立可靠接地。**并联、焊接、铜接、铜接、电阻<1Ω、台垫下铺铜网。**

3) 承重

符合使用要求。



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防静电工作椅

防静电工作椅应具有弹性、高耐磨性、强缓冲性，不会因摩擦及环境或时间而影响其防静电性能。椅垫外型符合人体工程学，散热透气，质感舒适。工作椅面采用PU皮革。PU皮革系列由PU和PU海绵及优质金属组成，外形美观，制成品有不出粉尘及永久的防静电功能，衬以不易变形的涤纶基布压制，成品皮革具有高弹性、缓冲性和防刺穿能力。坐垫和靠背间由优质锰钢连接，坐垫高度由进口气体阻尼式缓冲气缸调节，椅轮采用导电碳纤维聚氨酯材料，转动灵活，不会腐蚀或损伤地面。

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防静电工作椅

防静电工作椅应不起尘；

永久性的；

每把防静电椅至少有两个防静电椅脚（轮）。



④ 民用PU防静电材料整体发泡成型的工作椅。
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防静电设备工具

1) 能接地全部接地，不能直接接地通过人体接地。

2) 接地电阻满足要求。



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防静电服装

1) 双网格；

2) 起电量——虽不要求，但可作为评价标准；

3) 与人体紧密接触。



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静电防护材料和用品的标准和选择指南

防静电鞋

1) 内外连通；

2) 一次性鞋套，脚跟带；

3) 永久。

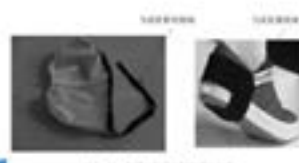


图 7-10 防静电鞋结构示意图

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静电防护材料和用品的标准和选择指南

防静电腕带

- 1) 双腕带;
- 2) 监控系统用双腕带。



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静电防护材料和用品的标准和选择指南

离子风机

- 1) 衰减时间;
- 2) 残余电压;
- 3) 加热丝;
- 4) 作用距离;
- 5) 用途。



图 3-10 离子风机



图 3-11 离子风机

图 3-12 离子风机

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静电防护材料和用品的标准和选择指南

屏蔽包装袋

- 1) 内外表面电阻;
- 2) 屏蔽能量—抽检;
- 3) 使用折皱处理;
- 4) 永久性;

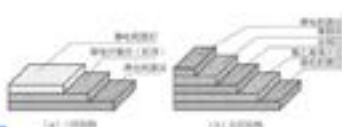


图 3-13 屏蔽包装袋



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静电防护材料和用品的标准和选择指南



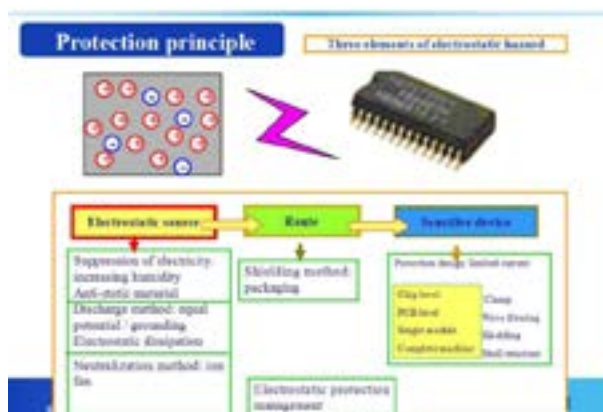
514所为客户提供系统性的、一站式的静电防护解决方案。

中国航天科技集团公司系统部

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Standard and selection guide for electrostatic protective materials and articles



静电防护材料和用品的标准和选择指南

Standard and selection guide for electrostatic protective materials and articles

Standard and selection guide for electrostatic protective materials and articles

Anti-static floor

Self-leveling resin mortar and mortar

Integrally seamless, bright and clean surface, wear-resistant, easy to clean, oil contamination resistance, ordinary chemical erosion resistance, excellent anti-static performance, multiple color choices, beautiful, fast and simple constructing and highly cost effective; excellent cohesion with basement layer to avoid the defects of ordinary resin mortar which is easy to blister and delaminate; excellent pressure-resistance and shock-resistance performance, with service life of over 10 years.

However, the performance of anti-static self-leveling mortar can be greatly influenced by laying process and technology, which leads to unstable performance, is easy to variation and difficult to maintain.

Standard and selection guide for electrostatic protective materials and articles

Anti-static floor

Self-leveling resin mortar



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Standard and selection guide for electrostatic protective materials and articles

Anti-static floor

Terrazzo

Anti-static terrazzo system is a new type technology of terrazzo, which adopts the unique formula of isomeric conductive phase material and special technology, with stable anti-static performance, safety, reliability, and wear-resistance. Its exterior and construction performance is similar to ordinary terrazzo, and can be used as ground, working table, loading and unloading dock plate, etc.

More stable and better performance than that of anti-static self-leveling mortar, but the price is a little higher



Standard and selection guide for electrostatic protective materials and articles

Anti-static floor

Terrazzo

Merits and demerits

Permanently effective anti-static character, same service life with the building

No need of anti-static maintenance, zero cost in anti-static maintenance

Excellent integrity, stability, environmental-adaptability and consistency

However, the performance of terrazzo can be greatly influenced by laying process and technology



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Standard and selection guide for electrostatic protective materials and articles

Anti-static floor

PVC coated material

PVC floor refers to the floor made with PVC (polyvinyl chloride) material, adopting PVC and polymerized units as the main raw materials, adding into filler, plasticizer, stabilizer, coloring agent, etc. as the auxiliary materials, and produced via casting technology, or via extrusion, extrusion or spreading technology on the sheet continuous substrate. Normally, the thickness of PVC layer is between 1-3mm, and the frequently adopted thickness is 2mm.



Standard and selection guide for electrostatic protective materials and articles

Anti-static floor

PVC coated material

PVC coated material can be divided into two types:

One is hard PVC, namely add some particles or nonconductor fine oxide whisker into PVC materials to compress and be molded.

The other type is soft PVC, namely add rubber and conductive agent into PVC to compress and be molded.

Both of these PVC coated materials have their own merits and demerits, and are extensively applied in the market.

Personal suggestion: hard-ground, soft-cable mat



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Standard and selection guide for electrostatic protective materials and articles

Anti-static floor

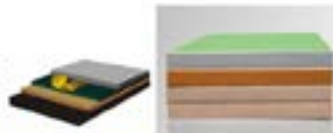
PVC coated ceramic-tile

Applied in anti-static deck plate

Adopting two layers (up and down) to conduct electrostatic discharge. From permanent anti-static laminated board material on the surface, lay conductive copper foil in the inter-layer, to discharge the static electricity more effectively and rapidly.

产品结构图

防静电地板
Anti-static floor
防静电地板
Anti-static floor
防静电地板
Anti-static floor
防静电地板
Anti-static floor



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Standard and selection guide for electrostatic protective materials and articles

Anti-static floor

Anti-static ceramic tile

As a new type anti-static material, anti-static ceramic tile has overcome the defect of low safety using high polymer materials e.g. epoxy resin, melamine board, anti-static PVC, anti-static rubber sheet, etc., including easily aging, wear-resistant, easily contaminated, unstable electrical performance, inadequate fireproofing, etc. It has the merits of ceramic wall and floor tiles, including easy and fast to be constructed, beautiful, durable, fireproofing, acid resistance, pressure resistance, wear-resistance, erosion-resistance, anti-contamination, waterproofing, anti-penetration, safety and environmental protection, permanent anti-static performance, which is an excellent replacement product and the optional high-tech material with the combination of anti-static function and decoration function. It can significantly improve the comprehensive preventing performance of EPA (Electrostatic Protection Area) and lower the overall cost and maintenance cost of EPA.

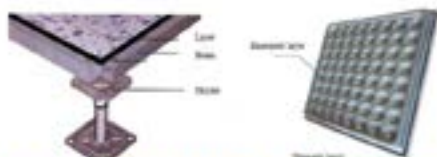
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Standard and selection guide for electrostatic protective materials and articles

Anti-static floor

Raised floor

Normally, raised floor constitutes surface layer, basement layer, beam, holder, etc. Beam and holders adopted by raised floors are basically the same, regardless of the type of the anti-static raised floor. Therefore, categorization of raised floors is often conducted according to the surface layer and basement layer. Due to the difference of materials, surface layers can be divided into melamine layer, PVC layer and ceramic layer, etc.



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Anti-static floor

Raised floor



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Anti-static floor

raised floor-basement layer

According to above-mentioned comparison we can see that all-steel raised floor has certain bearing capacity, little influence from temperature and humidity and moderate price, therefore it is a pretty ideal choice.



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Anti-static working table

It's specifically described in the National Standard that: electrostatic prevention working table is a basic component of anti-static working table, consisting working table, anti-static table mat, grounded connector, power line and ground lead. Working table is equipped with anti-static soldering iron, anti-static smoke cleaner and anti-static tool. Documents and drawings entering into EPA shall be sealed in the anti-static envelope. Box line shall be equipped at major working positions, to eliminate the static electricity produced in the dynamic process (e.g. assembly) at any time.



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Standard and selection guide for electrostatic protective materials and articles

Anti-static working table

1) Type

Anti-static working table is divided into two types: laying one layer of anti-static cushion on ordinary working table, and the other is working table with integrated structure. Focus: service life of cushion.

2) Grounding system

Anti-static grounding must be conducted independently and reliably. Parallel connection, welding, riveting, electric resistance $< 1\Omega$, lay copper grid under the cushion.

3) Load-bearing

Consistent with application requirement.



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Standard and selection guide for electrostatic protective materials and articles

Anti-static working chair

Anti-static working chair shall be flexible, highly wear-resistant, with strong buffer power, and its anti-static performance shall not be influenced by friction, environment and service time. Exterior of cushion shall consistent with human body engineering, with quick heat dissipation and fast permeability and comfortable texture. Surface of working chair applied PU leather, which shall be made with PU, PU sponge and qualified metal, with refined structure. And the product shall be dust-free and has permanent anti-static performance, and be made with net easily deformed dacron fabric. Product leather shall be flexible, with strong buffer power and static resistance performance. Cushion and backrest shall be connected with qualified manganese steel, height of cushion shall be adjusted by inlet gas damping type cylinder, and chair wheel shall adopt conductive carbon fiber polyurethane material, with flexible turning and shall not corrode or damage the ground.

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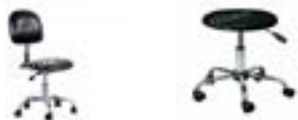
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Anti-static working chair

Anti-static working chair shall be dust-free.

Permanent.

Each anti-static chair shall be installed with at least two anti-static chair feet (wheels).



Working chairs made with and completely formed by PU anti-static materials.

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Standard and selection guide for electrostatic protective materials and articles

Anti-static instrument and tool

- 1) Entirely grounded if it allows; grounded via human body if it can not be directly grounded.
- 2) Grounding resistance shall meet corresponding requirements.



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Anti-static clothing

1) Double grid

2) Electricity discharge = no compulsory requirement, however it can be regarded as evaluation criterion;

3) Close contact with human body.



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Anti-static shoes

1) Internal and external connection;

2) disposable shoe cover and heel head;

3)Permanent;



Fig 1-14 External degree of anti-static shoe cover and heel head

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Anti-static wristband

- 1) Double wristband.
- 2) Double wristband applied for monitor system.



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Standard and selection guide for electrostatic protective materials and articles

Ion fan

- 1) Full time
- 2) Residual voltage
- 3) Filter strip
- 4) Operating range
- 5) Usage



Fig 8-10 Picture of ion fan (portable)



(a) Desktop ion fan (b) Rackmount ion fan
Fig 8-11 Picture of ion fan

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Standard and selection guide for electrostatic protective materials and articles

Shielding package bag

- 1) Internal and external surface electrical resistance
- 2) Shielding energy
- 3) Bag shall be conformed
- 4) Permanent



(a) Three-layer structure (b) Four-layer structure
Fig 9-1 Structure of anti-static shielding package bag

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Systematic, one-stop adjective electrostatic prevention solutions provided by 524 firms.

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16:20-16:50

利用互联网技术搭建静电防护资源共享平台 Building ESD sharing platform By Using Internet technology



演讲人

周旭晶

天津开发区实力技术工程有限公司 总经理

Speaker

Michael zhou

Techbase Engineering Co.,Ltd General manager

演讲人简介：

周旭晶

天津开发区实力技术工程有限公司 总经理

公司首席 ESD 体系咨询师及培训讲师

天津大学工学硕士

获有中国信息产业部颁发的“静电防护”（ESD）工程师证书

美国防静电协会 (ESDA) 会员

1997 年进入防静电行业，长期致力于防静电产品市场推广、销售及防静电产品应用研究工作。初期的防静电产品主要靠国外进口，但因其价格昂贵且交货周期长，经常无法满足客户的生产需要。97 年下半年组织技术力量开始研发国产替代品。最先开发出来的是防静电周转系列产品，包括：手机线路板专用防静电托盘系列，防静电钙塑板周转箱系列。大量使用于摩托罗拉手机生产线上。98 年第一批将国产防静电服打入诺基亚手机制造厂替代其原来的芬兰进口。后期陆续开发出来国产的防静电导电丝面鞋，防静电撬棒系列，防静电擦拭布等。天津实力公司也成为摩托罗拉，诺基亚，索尼爱立信、三星、松下、三洋等国际一流电子公司的长期供应商。

2003 以后，专注于微电子产品生产企业 ESD 控制体系建设和国内外 ESD 标准应用的研究和推广工作。大量深入客户生产一线探讨现场实践当中的防静电产品应用情况，回来归类总结，形成符合实际应用的各类防静电系统解决方案。定期举办防静电工程师培训班，定期为客户提供现场静电防护技术培训，现场静电防护疑难问题咨询，提供解决方案，帮助客户成长，提供永久的技术支持。曾为 MOTOROLA、ERICSSON、裕朗科技、绿点集团、贺比电子、正直集团、亚光耐普罗，通广集团等多家知名公司提供咨询、辅导和培训服务。

2013 年开始研究静电防护资讯和防静电产品的网络营销推广工作，利用互联网技术搭建静电防护行业信息和产品资源平台，为客户提供全方位的即时、便捷、同时又有技术和质量保障的专享服务。

Speaker's biography:

Michael zhou

Techbase Engineering Co.,Ltd General manager

Chief ESD System consultant and training lecturer

Master of science in Tianjin University

With “ Electrostatic protection ” issued by the ministry of information industry of China

(ESD) engineer certificate

The member of ESDA

Entered the anti-static industry in1997, he was long-term committed to ESD products marketing, sales and ESD products applied research. Initial, ESD products mainly relied on imports, but because of high price and long delivery cycle, it always couldn't meet the production requirements of customers. In the second half of 1997, he began to organize technical strength for developing the domestic substitutes. The first developed products were ESD turnover series products, including: mobile phone circuit board dedicated ESD tray series, ESD calcium plastic board turnover box series. All of these products were widely used in Motorola's mobile phone production line. In 1998, the first batch of ESD clothing entered Nokia manufacturer instead of their original imports from Finland. The latter part, we gradually developed domestic ESD conductive wire surface shoes, ESD crowbar series, and ESD wiper and so on. Tianjin Techbase Company has become the Motorola, Nokia, Sony Ericsson, Samsung, Panasonic, Sanyo and other world-class electronics companies' long-term supplier.

After 2003, we focused on the ESD control system construction of microelectronics manufacturing enterprises and research and extension work of domestic and foreign ESD standard applications. We went deep into the production line of large number of customers, investigated the application of practice of ESD products in the scene. We summarized the different questions, and gave the solutions of conforming to the practical application of ESD system. We regularly held ESD engineers' training courses; regularly provided ESD protection technical training and ESD protection difficult problems consulting, to provide solutions to help customers grow, provide permanent technical support. We have worked for Motorola, Ericsson, Yulang Science And Technology ; Jabil Green Point ; Hi-P electron; Zhengzhi group, Nypro, and TCB, to support consulting, coaching and training services.

In 2013, we began to study on the ESD protection information and the network marketing and promotion of the ESD products, used Internet technology to build ESD protection industry information and product resources platform, to provide a full range of immediate, convenient, and also exclusive services technology and quality assurance for customers.

利用互联网技术搭建静电防护资源共享平台 Building ESD sharing platform By Using Internet technology



利用互联网技术搭建静电防护资源共享平台 Building ESD sharing platform By Using Internet technology

一、客户User（防静电产品的使用者）的困惑和无奈

5. 防静电产品种类繁多，生产商、销售商也多是规模较小，鱼龙混杂，大大的增加采购成本，费时、费力而且最终的结果也未必是性价比最好的

一、客户User（防静电产品的使用者）的困惑和无奈

6. 生产过程当中出现静电问题，不知找谁请教，研讨

一、客户User（防静电产品的使用者）的困惑和无奈

7. 管理层从上至下观念模糊，意识淡薄，培训不到位，不系统。

现象：

低质防静电产品铺天盖地，采购人员烦恼



现场层出不穷的静电事故，技术人员头疼

问题：

防静电产品对于需求企业是举足轻重的，一处不合格便造成整批产品报废，企业为此付出的生产成本及维修成本不可估量。

高新技术日新月异，智能硬件、智能电路更趋微型化，对防静电技术的跟进和创新提出更高的要求。生产制造各环节出现的静电现象和事故也需要大量的技术标准予以指导。

解决方案：

利用互联网技术整合静电防护资讯和防静电产品资源

为客户提供一站式服务，解决用户的后顾之忧。

利用互联网技术搭建静电防护资源共享平台 Building ESD sharing platform By Using Internet technology

二、互联网技术的应用

互联网趋势
2/3的一代人已经联网

互联网用户数 - 1995年至2014年
在全球人口中的渗透率从不到1%上升至39%



手机用户数 - 1995年至2014年
在全球人口中的渗透率从1%上升至73%



二、互联网技术的应用

- 互联网技术改变了最根本的商业基础。
- 电子商务这种全新的商业模式彻底改变了人们获得产品和服务的方式
- 在互联网时代，消费者们希望能够轻松、便捷地获得他们想要的任何东西和贴心服务
- 而对工业产品的使用者还要加上责任保证和解决问题的服务

三、静电防护资讯和防静电产品资源共享平台

利用互联网技术可以做到资讯和产品资源的即时推送。
最新行业标准，解决方案，实践案例，专家指导，交流互动。
还有性价比高的防静电产品通过PC端、移动端展现在客户眼前。
24小时提供技术支持和帮助。

三、静电防护资讯和防静电产品资源共享平台

防静电产品资讯网 www.esd.cn

蚂蚁防静电商城 www.esdm.cn

利用互联网技术搭建静电防护资源共享平台 Building ESD sharing platform By Using Internet technology

防静电产品资讯网 www.esd.cn

功能：

- 推送-最新的防静电产品技术标准、检测标准。
- 推荐-优质防静电产品。
- 推出-优秀生产商排行榜
- 提供-经典成功案例。
- 提供-静电防护解决方案。
- 报导-专业培训、咨询
- 传播-行业新闻等资讯信息。

三、静电防护资讯和防静电产品资源共享平台

移动终端：微信服务平台——“静电问答”平台。

“静电问答”是您24小时随身陪伴的防静电助手，提供免费防静电技术、防静电产品咨询；专家为您解答难题；是防静电行业互动交流交流平台。技术支持由防静电产品资讯网www.esd.cn提供。

蚂蚁防静电商城 www.esdm.cn

蚂蚁防静电商城的名字来自于英文单词Antistatic，其本意为抗静电、防静电。把这个英文单词分作Ant+static。

“Ant”是蚂蚁的意思，蚂蚁在我们的眼中代表着团结、勇敢、勤劳！善于团队协作。

“T”解读为IT，代表着互联网技术！

“Static”即为静电之意，提醒大家静电无时无刻不在。

蚂蚁防静电商城为客户（User）提供“不用操心”的静电防护产品

四、这里的平台不是“淘宝”也不是“京东商城”

蚂蚁防静电商城的信誉保证：

为客户承担质量责任



四、这里的平台不是“淘宝”也不是“京东商城”

蚂蚁防静电商城所有商品均通过严格的采购审核流程。

第一天，供应商资质认证

第二天，产品技术资料进行严格审核。

第三天，供应商提供的产品抽样测试和检验

第四天，合格的供应商录入ERP管理系统。

第五天，供应商的资格和提供的产品定期进行复查审核。

选择防静电产品供应商遵循的原则

- 防静电专业制作商或品牌指定代理商（营业执照或授权书）。
- 行业资格：经营年限、合作伙伴、服务的客户情况（最好是知名企业的供应商）
- 能提供技术支持，比如专业知识培训、辅导，及提供现场静电问题诊断和咨询。
- 有完整的管理体系和质量控制体系。
- 有质量反馈、投诉及时应答系统。

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选择防静电产品遵循的原则

- 防静电产品要有第三方检测报告（国家检测中心）。
- 产品出厂检测报告，并有可追溯性。
- 该产品的供应商也为其他客户，最好是知名的企业提供过同类产品，并出现过问题。
- 产品的一致性要好，不能靠批货物质量水平总是波动。
- 该产品的供应商应该是防静电专业制造商或品牌指定代理商。

五、总结

通过线下强大的资源整合，利用互联网技术将客户所需要的所有专业信息、技术、产品以及解决方案直接送到客户眼前，随时随地全方位为客户服务和技术支持！



利用互联网技术搭建静电防护资源共享平台 Building ESD sharing platform By Using Internet technology

A. Customers' confusion and frustration

- ESD industry lacks of unified management, and the professional qualification of manufacturer and distributor is hard to define.

A. Customers' confusion and frustration

- The standards of the product technical are not unified, the implementation, the suppliers execute wide variety standard.

A. Customers' confusion and frustration

- Technology upgrades, ESD products species keep increasing, but the standard is not updated in time.

A. Customers' confusion and frustration

- The detection method of the ESD products is too single.

A. Customers' confusion and frustration

- The wide range of ESD products, the manufacturers and distributors are mostly small-scale, quite a mixed bag. All of these reason greatly increased procurement costs, consuming, laborious may not be able to find the best cost-effective products.

A. Customers' confusion and frustration

- Electrostatic problems occur in the production process, The technician don't know who can give them advice.

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A. Customers' confusion and frustration

- Training is not in place, not systematic, And from Senior management to the lower, all of their ideas are fuzzy and consciousness.

Phenomenon:

Low-end ESD products overwhelming let procurement staff **troublesome**



Plenty of electrostatic accident in the scene let technical staff **troublesome**

Problem:

ESD products are very important for the needs of enterprises; one failure would damage the entire batch of products, the costs and maintenance **costs** which enterprises have to pay is incalculable.

High-tech changes with each passing day, smart devices and circuit become more miniature. It required the higher requirement of the **upgrading and innovation of the ESD technology**. The accidents and electrostatic phenomena which occur in every aspect of production-manufacturing also requires many technical standards gives **guidance**.

solution

Use internet technology to integrate **ESD protection information and ESD products resources** to provide customers with one-stop ESD service, and solve users' worries

B. The application of Internet technology

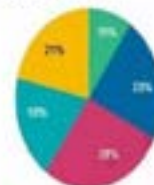
Trend of the Internet
2/3 generation connected
to the Internet

From 1995 to 2014, accessibility of internet users in the world's population increased from 1% to 39%

Internet users, more than 35 million, accounting for 0.6% of world population in 1995

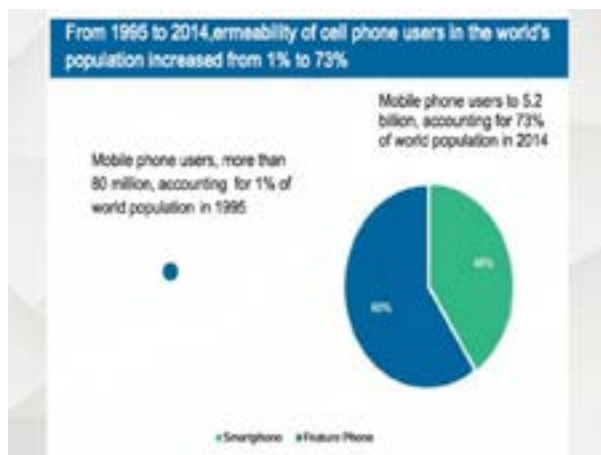


Internet users to 2.8 billion, accounting for 38% of world population in 2014



USA China Asia (excl. China) Europe Rest of World

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B. The application of Internet technology

Internet technology has changed the fundamental business foundation

The new e-commerce business model completely changed the way people **get products and services**

Customers want to be able to easily and conveniently get anything they want Things and considerate service in the Internet age

Responsibility for users of industrial products with **guarantee** and the service to **solve the problem**

C. ESD information and product resource sharing platform

Internet technology could let push information immediate.

Industry standards, solutions, practice cases, expert guidance, and cost-effective ESD products through the PC and mobile and show in front of customers, provides technical support and help in 24 hours.

C. ESD information and product resource sharing platform

ESD Information Webnet www.esd.cn

Ants Antistatic Mail www.esdm.cn

ESD Information Webnet www.esd.cn

Function:

- Push the latest ESD standards,
- Recommends high-quality ESD products
- Introduces outstanding manufacturer rankings
- Offers the practical ESD cases
- Provides electrostatic protection solution
- Guides professional training and ESD consulting
- Spread industry news and other ESD information.

C. ESD information and product resource sharing platform

Mobile terminals:

WeChat service platform – **"Electrostatic Answers"** platform.

"Electrostatic Answer" is your ESD assistant which could accompany you 24 hours, and it is an ESD industry interactive platform. It provides free ESD technology, ESD product advice, expert will help you to solve the problems.

Technical support is provided by ESD Product New website. www.esd.cn

利用互联网技术搭建静电防护资源共享平台 Building ESD sharing platform By Using Internet technology

Ants Antistatic Mall www.esdm.cn

Ants antistatic Mall's name came from the word "Antistatic". We divided this word to "Ant+static".

In Chinese, "Ant" represent unity, courage and hard work!

"I" can be understood as "IT", represents the Internet technology!

"static" reminds us that static appears all the time in everywhere.

Ants antistatic Mall –

provide the customer (User) "don't worry about" ESD products

D. This platform is not "eBay" nor "Amazon"

Credit grantee of Ants Antistatic Mall:

Assume quality responsibility
for the customers



D. This platform is not "eBay" nor "Amazon"

All goods of Ants Antistatic mall Must pass through the strict procurement approval process

- Process 1, supplier qualification.
- Process 2, product technical data for scrutiny.
- Process 3, suppliers provide products sampling test and inspection
- Process 4, qualified supplier input ERP management system.
- Process 5, supplier qualification and provide product compound audit on a regular basis.

The principle of selecting ESD supplier

- Antistatic professional producers or brands designated agent (Business license or authorization)
- Industry Qualification, operation duration, partners and customers service (preferably well-known enterprises suppliers)
- Could provide technical support, such as professional training, counseling and on-site ESD problems diagnosis and counseling.
- There is a complete management system and quality control system
- Have the quality of feedback, complaints promptly answering system.

The principle of selecting ESD products

- ESD product should have a third party test report (national test center)
- Products factory inspection report and traceability
- Suppliers of this product have provided similar products to other customers, especially best-known enterprises and there have been no problems.
- The consistency of product is better, the quality level of each shipment should be same.
- The supplier of the product should be ESD professional manufacturer or brand designated agents.

E. Conclusion

By using Internet technology, integrating offline powerful resource to customer needs;

Professional information, technology, products and solutions directly to customers,

Anytime and anywhere. Providing comprehensive service and technical support for clients!

Part V

Registered Participating companies List

注册参会企业名单

主要注册参会企业名单

Registered Participating companies List

英特尔 | Intel
3M 公司
霍尼韦尔综合科技（中国）有限公司
西门子中国
戴尔（中国）有限公司
UL 美华认证有限公司
松下（日本）
天津爱普生（日本）
北京索尼（日本）
中国三星电子（韩国）
浪潮集团
中环集团
大陆汽车系统（天津）有限公司
捷普（美国）
天津中环半导体股份有限公司
台湾光宝电子股份有限公司
威讯联合半导体（北京）有限公司（美国）
伟创力电子（天津）有限公司
三美电机（天津）有限公司（日本）
天津大真空有限公司（日本）
GE 医疗集团（美国）
诺兰特移动通信配件（北京）有限公司（瑞典）
诺维信（中国）生物技术有限公司
揖斐电电子（北京）有限公司（日本）
京东方科技集团股份有限公司
天津津亚电子有限公司（日本）
中环三峰电子有限公司
亚光耐普罗股份有限公司
北京交控科技有限公司

Part VI Support media 支持媒体

支持媒体
Support media



新华社
XINHUA NEWS AGENCY

科技日报

中国经济导报
China Economic Herald

經濟日報
hket.com

新浪网
sina.com.cn

鳳凰網
ifeng.com

北方网
enorth.com.cn
权威媒体 天津门户

THT
天津高新区

洁净室
CleanRooms
CHINA
污染控制实践、工艺和技术

半导体技术天地
www.2ic.cn