

The World's First System-level  
Electromagnetic Immunity Scanner

# .SmartScan

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# SmartScan

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Unprecedented IC and system level EMC evaluation equipment that can pin-point problem spots of a board/system or pins of IC. You will enjoy the benefit of saving resources and shortening lead time in product development and qualification.

#### General Description

With the increasing sophistication and finer geometry, integrated circuits ("ICs") and systems are becoming more susceptible to EMC failures, and yet, today's EMC, especially ESD, correction still resorts to blinded trial-and-error; there is no convenient way to identify the source of an EMC failure. Having to rely on such brute-force method, system manufacturers are faced with excessive correction costs, high system development cost, extensive engineering hours, and worse yet, delayed product launch.

SmartScan is the world's first system-level electromagnetic immunity evaluation tool that can pinpoint the exact spot on a board/system that is prone to EMC failure. This is made possible by SmartScan's (a) consistent results between system test and test of ICs mounted on the board ("Test Versatility"), (b) consistent measurements between test trials ("Test Repeatability"), and (c) ability to drill EMC testing down to a pin on an IC ("Test Precision").



#### Operation Principles

An ESD event radiates electromagnetic interference in two forms, E-field and H-field. When the fields are coupled into a board trace or IC pin, a current is produced. If the current is sufficiently large and lasts for a sizable duration, it can cause IC damage. Such damage can easily be identified visually.

Unfortunately, some currents cause a momentary malfunction of the system without IC damage. Such malfunction may be as crippling as IC damage but identifying the area affected is extremely difficult. The spots where the induced current couples with the system can be anywhere since radiated fields can travel freely within the system's enclosure.

#### Executive Members

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Ph.D from Korea Univ., Korea  
IC ESD design expert  
More than 15 years of experience  
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##### Pommerenke, David

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Research and development  
US representative in the ICET778 ESD  
working group

##### Min, Kyungjin "Jin"

Ph.D from North Carolina State Univ.  
System integration and development  
Member of ESDA Standard Working  
Group Committee

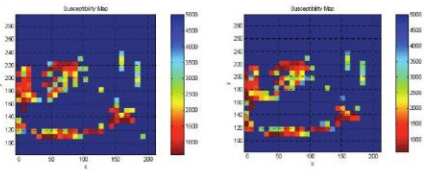
#### Susceptibility Scanning

SmartScan produces localized electromagnetic interference and scans the entire breadth of the subjected board/system and tracks the system's response to electromagnetic interference. Specifically, the scanning consists of the following four steps:

- 1 E-field and H-field radiations with different polarization are generated from TLP.
- 2 E-field and H-field radiations are delivered to the tested system (or IC) through specially designed probes.
- 3 The effect of electromagnetic interference is monitored by API's proprietary ESD failure detection system.
- 4 API's proprietary algorithm analyzes the results generated by the ESD failure detection system and generates an electromagnetic susceptibility map of the tested system.

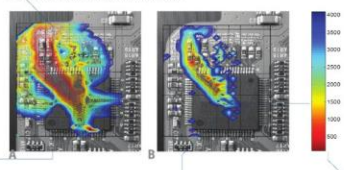
a

**Sample Output Files**  
Two electromagnetic susceptibility maps below illustrate SmartScan showing consistent measurements between two different trials; Test Repeatability.



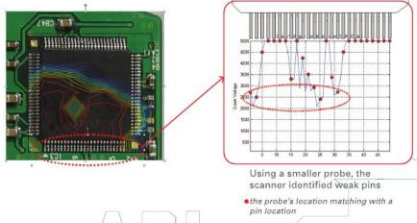
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**Sample Output Files**  
SmartScan scanning two functionally compatible ICs mounted on same board. The test result shows that the IC from supplier "B" is better than the IC from supplier "A" with respect to electromagnetic immunity.



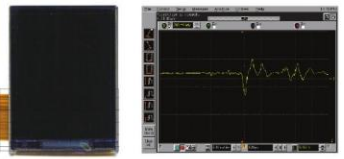
b

**Sample Output Files**  
Identifying weak pins from weak area



d

**Sample Output Files**  
SmartScan scanning cell phone display



API Products(SmartScan Families)-Susceptibility Scanner

**SmartScan BASIC**

The BASIC is manually operated system for performing susceptibility scanning at the system level. This system includes:

- 4kV pulse generator for ESD susceptibility testing
- 4kV Probes: 5mm Flat H Field Probe, 1mm Vertical H Field Probe, 5mm E Field Probe



**SmartScan AUTOSCAN**

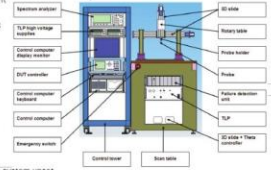
The AUTOSCAN is an automated scanner providing both control and analysis capability to identify susceptibility problems and includes:

- 4kV pulse generator for ESD susceptibility testing
- Full 3 dimensional scanner table under software control (X and Y motion clearance = 20cm; Z = 10cm)
- Basic analysis software
- Internal controller and display
- Alignment Probe
- 4kV Probes: 5mm Flat H Field Probe, 1mm Vertical H Field Probe, 5mm E Field Probe

**SmartScan PROFESSIONAL**

The PROFESSIONAL is the most sophisticated automatic scanning system for susceptibility with the highest level of control and analysis. Included with this systems:

- 8kV pulse generator using dual supplies for ESD susceptibility testing
- Full 3 dimensional scanner table under computer control including Phi control (X and Y motion clearance = 40cm; Z = 20cm)
- Failure Detection Unit for monitoring EUT voltage and current
- Software monitoring of the EUT
- Resonance Scanning to identify resonant circuits and nodes
- Camera for monitoring probe locations and software
- analysis of sensitive sites
- EMI Scanning
- On site installation and training
- Alignment Probe
- Resonance Scanning Probe
- 8kV Probe Set: 5mm Flat H Field Probe, 50mm H Field Loop Probe, 1mm Vertical H Field Probe, 5mm E Field Probe, 50mm E Field Probe
- EUT Reset control to re-boot the EUT if necessary following system upset

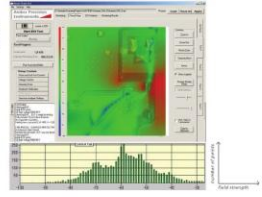


SmartScan can be converted to EMI scanner without any hardware change. Just one click to change the scan option from Immunity to EMI scan.

**SmartScan AUTOSCAN EMI**

The AUTOSCAN EMI is an automated EMI scanner providing both control and analysis capability to identify sources of EMI from boards and systems. This unit includes:

- Full 3 dimensional scanner table under software control (X and Y motion clearance = 40cm; Z = 20cm)
- EMI analysis software
- Internal controller and display
- Alignment Probe
- EMI Probes: 5mm Flat H Field Probe, 1mm Vertical H Field Probe, 5mm E Field Probe



**SmartScan System Configurations in Tabular Form:**

	BASIC	AUTOSCAN	AutoScan EMI	PROFESSIONAL
4kV generator	Included	Included	Optional	Included
4kV Basic Probe Set (1mm and 5mm E&H probes)	Included	Included	Optional	Included
3 Dimensional Scanner Table w/o Phi control	Included	Included	Included	Included
Basic Analysis Software	Included	Optional	Included	Included
EMI Analysis Software	Optional	Optional	Included	Included
Internal Controller and Display	Included	Included	Included	Included
Alignment Probe	Optional	Included	Included	Included
8kV single supply generator	Optional	Optional	Optional	Included
8kV dual supply generator	Optional	Optional	Optional	Included
3 Dimensional Scanner Table with Phi control	Optional	Optional	Optional	Included
Failure Detection Unit for monitoring EUT V&I	Optional	Optional	Optional	Included
Software monitoring of EUT	Optional	Optional	Optional	Included
Resonance Scanning	Optional	Optional	Optional	Included
EUT Reset control to re-boot EUT	Optional	Optional	Optional	Included
Camera for monitoring Probe locations in software	Optional	Optional	Optional	Included
EMI Scanning optional Agilent Analyzer	Optional	Optional	Optional	Included
EMI site installation and training	Optional	Optional	Optional	Included
8kV Basic Probe Set (1mm and 5mm E&H probes)	Optional	Optional	Optional	Included
8kV Basic Probe Set (1mm and 5mm E&H probes)	Optional	Optional	Optional	Included
8kV Expanded Probe set (adds 50mm probes)	Optional	Optional	Optional	Optional
Calibration Board for field probes	Optional	Optional	Optional	Optional
High Voltage Power Attenuator	Optional	Optional	Optional	Optional
Sine Wave scanning to 6GHz	Optional	Optional	Optional	Optional
EFT Scanning	Optional	Optional	Optional	Optional
Expanded 3 Dimensional scanner for large systems	Optional	Optional	Optional	Optional