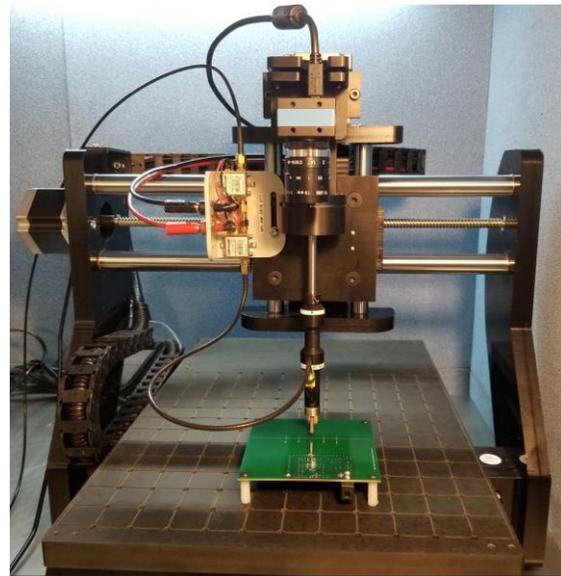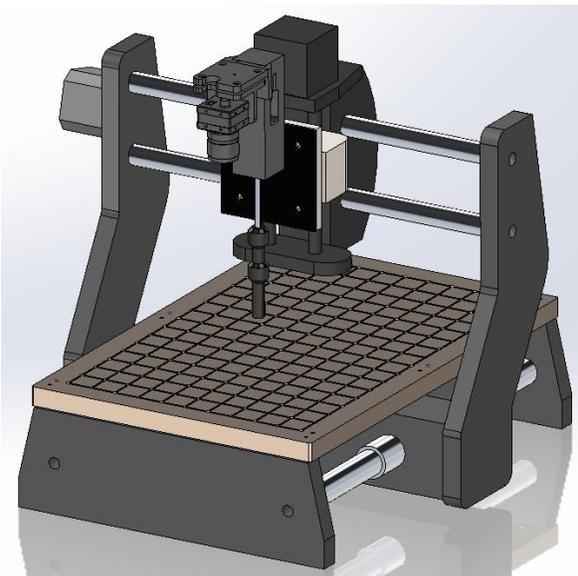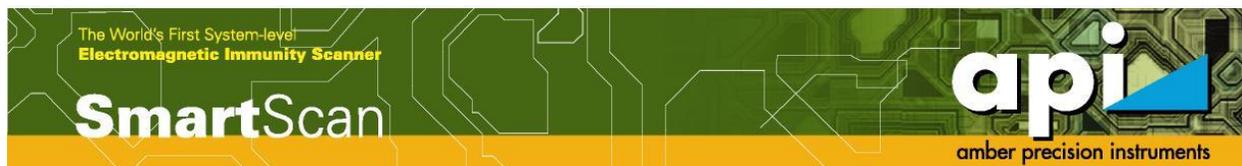# *SmartScan-L* Specifications

Amber Precision Instruments, Inc.
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API is a research-oriented EMC solution provider and a near field scanner manufacturer providing measurement technologies to resolve urgent and long-sought-after industry solutions. API offers various scan technologies, both in emission and immunity areas, to understand EMC characteristics of electronics. *SmartScan* is a proprietary EMC scanner system name by API and is the name of the software that operates the SmartScan system.
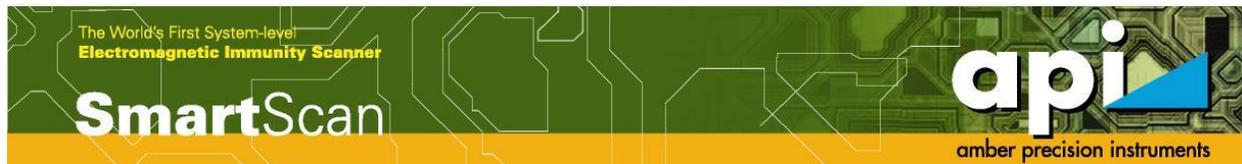
SmartScan-L is a slide based, rather than robot-based, economical version of SmartScan. *SmartScan-L* is still equipped with all the hardware and software features that robot-based SmartScan offers (except what cannot be achieved due to the limitations of the slide).
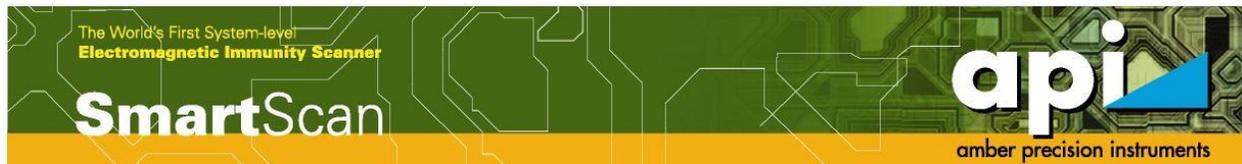
I. Hardware Specifications

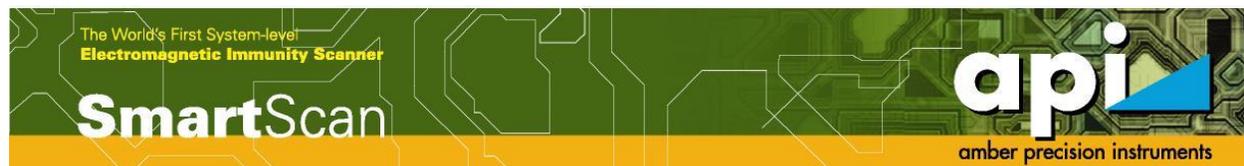| Categories	Descriptions
Platform	- Tabletop - WxDxH = 45 cm x 45 cm x 60 cm (17.8" x 17.8" x 23.6") - Power supply requirement: 110V ~ 230V, 50 ~ 60Hz AC; 15 A - Power consumption: < 1 kW (peak consumption, 1.5 kW) - Weight: 20 Kg
Probe positioning	- XYZ slide - 0 degree and 90 degree two position z-axis rotation manually or optional motor driven - 7 cm up / down z-stroke - Positioning accuracy: 0.1mm
Telescopic Z-motion	- It exerts only the probe weight to the DUT surface even after the probe tip touches the DUT surface - Z-motion clearance: 5 cm
Scan plate	- 3/4" thick Stonewood (non-conducting paper and resin material) - Max. scan area: 30 cm X 30 cm (900 cm^2)
Integrated camera	- Camera: ImagingSource DFX72BUC02 - Lens: Pantax C1614-M - It takes DUT pictures and the images are automatically imported to SmartScan. All scan points / areas are defined over the picture and scan results are superimposed over the picture point by point in real time.
Touch sensor	- Automatic height detection of DUT and elements on DUT, which enables constant height scan from DUT element's surface
Other	- System operation computer and monitor - Easy mount and demount RF amplifier bracket - DC power supply cable for the RF amps - One integrated camera with a 16mm C-mount lens to take DUT pictures - Telescopic probe mounting ball-spline (5 cm of Z-direction clearance)

II. Software Features

Categories	Descriptions

Scan technologies	- Integration of multiple scan technologies in the same hardware and software platform
	
	 - Emission scan technology options
	   o Electro-magnetic Interference (EMI) scan
	   o Field calculation
	   o Phase measurement (broad band/narrow band, automated)
	   o NF to FF transformation
	   o Emission Source Microscopy (ESM)
	
	 - Immunity scan technology options
	   o Electro-static Discharge scan (ESD)
	   o RF Immunity (RFI) scan
	   o Current spreading scan (CSP)
	   o Resonance scan (RS)

Scan Area Editor (SAE)	- DUT picture taking with the integrated camera. The picture is automatically imported to **SmartScan-L** for scan area definition
	 - Scan areas are defined over either
	   o a DUT picture that is taken by the integrated camera
	   o an imported DUT picture
	   o imported ODB++ files (optional item)
	
	 - Multiple scan area shapes (points, lines, rectangles); any shape scan area or contour with multiple heights. Multiple scan areas with different heights can be defined
	 - Repositioning of defined scan areas
	
	 - Flexible scan area adjustment
	   o shape or size can be adjusted by grabbing a corner point or a boundary line and repositioning.
	   o scan of some points can be skipped by cutting out those points or area
	
	 - Scan step definition by arrays or distances between scan points
	 - Stitching multiple shots - When a DUT is too large to capture with one

camera shot, then the SW takes multiple shots of partial DUT, and stitch them together to generate one whole DUT picture

- PCB layout importing (optional) - scan areas can be defined and results can be shown over an imported PCB layout files (ODB++)

- Scan height control:
  o Constant height scan from a reference height
  o Constant height scan from top of PCB components

Field components	- Selection of fields in X direction, Y direction or successive scan of both directions without user's interruption - 0 degree (X-direction) or 90 degree (Y-direction) two positions
X-Y offset correction	- There can be some offset between the designated scan points and real probe landing coordinates. The offset can be adjusted by mechanical offset correction module, only one adjustment for every and all scan points.
Instrument setting	- Key parameters of instruments, such as, SA, VNA, oscilloscope, signal generator or TLP can be set from SmartScan - Or using existing instrument settings by-passing SmartScan
Set-up wizard	- Guides a user to complete a scan set-up step by step not to make mistakes or omitting steps. The software does not allow a scan to start unless every necessary step has been defined
Component library	- S21 of each hardware component, such as amps, cables, etc., are stored in the library. The data can be pulled out to make loss or gain corrections to the measured numbers - Quick system factor can be made by combining the S21's (optional) - Frequency response of each provided probe is stored here
Post-processing	- Equations can be written with trigonometric, exponential, logarithmic or other common mathematical operators, and applied to existing data (optional) - System factors can be applied for absolute field calculation at a certain electrical height (optional)

- Two or three field components can be merged to find magnitude
- Raw data in test file format can be exported for further analysis

Data visualization	- Laying measured values over the DUT picture - Point - Color coded value at each measurement point - Surface - interpolation between points to show smooth transition and distribution of measured quantity - 3D plots - Peak search - Tracking points - Transparency control to see DUT below the measured data
Drivers	- One spectrum analyzer and one VNA driver (for system factor extraction) - Drivers for most R&S and KeySight SA and VNA models are available. - If a driver is not readily available, API writes a driver for the user specific SA or VNA model
Component Library	- S21 storage for each cable, connector, amp and probe - System factor or probe factor storage
Post-processing support	- Export of measured data in txt format - MATLAB support (scanned data can be directly saved in MATLAB. optional)
Field calculation (optional)	- Field calculation options up to 6 GHz, 18 GHz or 40 GHz - System factor and probe factor extraction
Graphic tools (optional)	- Plots from multiple projects can be shown at one graphic window. - Each plot can be turned on and off
PCB layout import	- ODB++ format import for scan points assignment
Others	- Test set-up wizard - Continuous run of multiple scan projects

- Automatic report generation (requires MS Words or Excel) in user defined template

III. EMI Scan Specific Items (6 GHz model)

Categories	Descriptions
RF amplifiers	- Two model "ZX60-6013E+" amplifiers from Mini-Circuit - (20 MHz ~ 6 GHz, NF=3.3, 15 dB gain at 1 GHz)
Cables, connectors, other parts	- One 120" double shielded coax cable with SMA-M and precision N-male connectors - One 26" doubled shielded coax cable with SMA-male at both ends - One 12" double shielded coax cable with SMA-male at both ends

Probes	- Standard probes: Hx-2mm (up to 9 GHz)
	                                    Hx-5mm (up to 4 GHz)
	                                    Hz-4mm (up to 4 GHz)

IV. Mini-Chamber

- L x W x H = 100 cm X 80 cm X 80 cm
- Two USB-2.0, one AC power filters and two 3.5mm SMA connects on side panel