



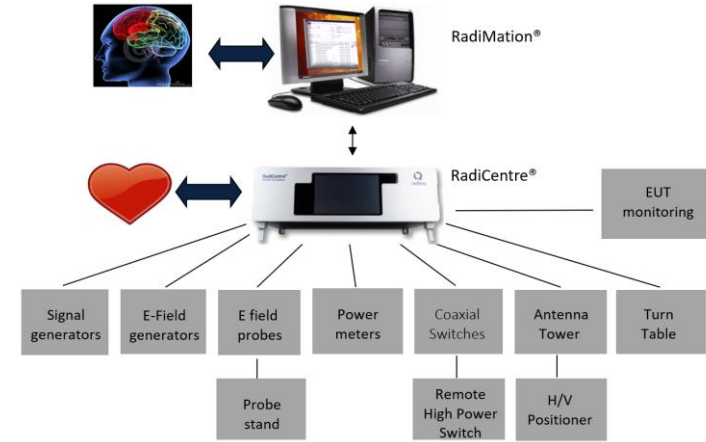
RadiMation®

the brains of the automation



RadiMation

- Device drivers
- RadiMation 2023.1
- RadiMation 2023.2
- RadiMation 2024.1
- RadiMation 2024....
- Integration with other systems
- Lab management





Device drivers

- Auto detect device drivers
- Checking device drivers
- Rigol RSA-series (GPSA- and EMI-mode)
- Gauss Instruments TDEMI
- New R&S, AR, Maturo, ... devices
- +250 drivers. In total 6135 drivers





Auto detect device drivers

- Wizard for adding devices to configuration
- Scans VXI-11 (LAN), GPIB, USB
- Raditeq devices
 - Directly connected to PC
 - Single slot RadiCentre 1
 - Multislot RadiCentre
 - RadiCentre Ultra
- Also other brands that support '*IDN?'
- Automatic creation of device driver



Checking device drivers

- Ensures that correct device is controlled
- Option detection
- Checks system errors
- Checks if the setting is correctly set
- Verifies that device is in correct state
 - 'EUT ON' / Turntable referenced
- Workaround for known problems
- Ensures quality of automated test



RadiMation 2023.1

- EUT status controller interface →
- Calibration import tool
- Speed improvement of cable corrections
- Parallel measurement of field probes
- Separate X-, Y- and Z-axis correction →
- Total: 205 improvements, including 20 drivers



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EUT status controller

- Provides information over TCP/IP to program
- Example Python script available on GitHub
- Changes in frequency, start of dwell time
- EUT information provided
- Test information can be updated
 - Operating mode
 - Temperature / humidity / pressure

Separate X-, Y- and Z-axis correction

Correction File

Frequency (M...	X-axis correct...	Y-axis correct...	Z-axis correct...
300 MHz	1.01	1	1
350 MHz	0.98	0.99	0.98
400 MHz	0.99	1	0.99
450 MHz	1.02	1.04	1.02
500 MHz	1.04	1.05	1.04
550 MHz	0.99	1	0.99
600 MHz	1	1.01	1
650 MHz	1.01	1.03	1.02
700 MHz	1.03	1.01	1.02
750 MHz	1	0.99	0.98
800 MHz	0.99	1	0.99
850 MHz	1.03	1.05	1.05
900 MHz	1.05	1.04	1.04
950 MHz	1.02	1.03	1.02
1 GHz	1	1	1
1.2 GHz	1.01	1.06	1.02
1.4 GHz	1.01	1.04	1.03
1.6 GHz	1.02	1.04	1.03
1.8 GHz	0.93	0.94	0.92
2 GHz	0.93	0.96	0.93
2.2 GHz	0.95	0.95	0.95
2.4 GHz	0.92	0.92	0.93
2.6 GHz	0.92	0.99	0.94

Frequency Interpolation: ☒ Logarithmic ☐ Linear

Value Interpolation: ☐ Logarithmic ☒ Linear

- Correction file with X-, Y- and Z-axis factors
- Correction with single column still working
- Select as correction in driver settings
- Working in multiband and singleband
- Additional graphs and table for axis values
- Drivers optimized to use single request



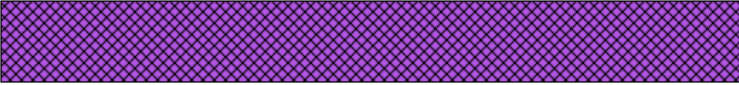
RadiMation 2023.2

- Increased average noise floor
- Probe positioner for UFA
- UFA calibration export tool
- Application notes
- Total: 324 improvements, including 47 drivers



Probe positioner for UFA

Bands



Location type: **Field-Distribution**

Frequency Range

Start: 80 MHz
Stop: 1 GHz

Forward **Backward**

Frequency Step

Stepsize: Logarithmic: 1 % **Config**

Dwell Time

Dwell time: 2 s

Frequency Change Mode

Change mode: Constant **Config**

Modulation

Modulation: None **Config**

Test Site

Test Equipment: FAR 3 - RI (80 - 1000 MHz)

Location Settings

Antenna

Distance: 3 m
Antenna Polarization: Both

Antenna Tower

Max Height: 1.55 m
Min Height: 1.55 m
Steps: 1

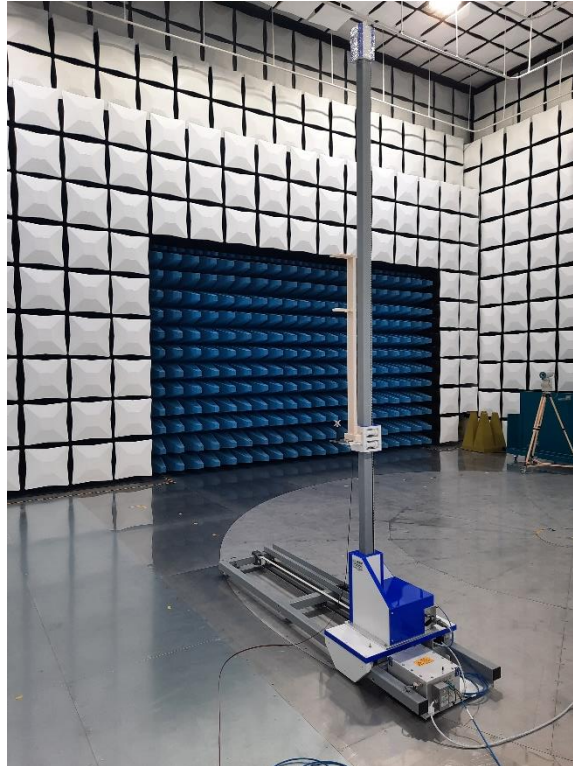
Probe positioner

Start X: -75 cm
End X: 75 cm
Steps X axis: 4
Start Y: 80 cm
End Y: 2.3 m
Steps Y axis: 4

- Automatic movement of probe
- For example 16 point calibration
- Other than 4x4 layouts possible
- Horizontal and/or vertical polarization
- Multiple probes in positioner
- Export of all CAL files at once



Probe positioner for UFA



- Maturo FPP
- Manual controlled
- Others
 - Innco FSM
 - MVG FPP

UFA calibration export

Graph Export

Select the export type
Select the format to which the data should be exported

Clipboard

CSV

Reference Line

Ambient Line

CAL-file

Directory: U:\RadMaton\CAL_File\

Name: FAR 3 - point

Columns

Test End Date	Add >>	Name
Current Date		Export order Number
Test Level Name		Antenna polarization
Test Level Tolerance		Test Level Value
Test Level Variance		Test Start Date
Test site		
Probe Number		
Frequency band		
Frequency step		
Distance		
Antenna distance		
Modulation Name		
Horizontal position		
Vertical position		
Antenna height		

<< Remove

12 calibration files will be exported with the names:

- U:\RadMaton\CAL_File\FAR 3 - point 1 Horizontal 1 Vm 2023-08-22T163228.cal
- U:\RadMaton\CAL_File\FAR 3 - point 2 Horizontal 1 Vm 2023-08-22T163228.cal
- U:\RadMaton\CAL_File\FAR 3 - point 3 Horizontal 1 Vm 2023-08-22T163228.cal
- U:\RadMaton\CAL_File\FAR 3 - point 4 Horizontal 1 Vm 2023-08-22T163228.cal
- U:\RadMaton\CAL_File\FAR 3 - point 5 Horizontal 1 Vm 2023-08-22T163228.cal
- U:\RadMaton\CAL_File\FAR 3 - point 6 Horizontal 1 Vm 2023-08-22T163228.cal
- U:\RadMaton\CAL_File\FAR 3 - point 7 Horizontal 1 Vm 2023-08-22T163228.cal
- U:\RadMaton\CAL_File\FAR 3 - point 8 Horizontal 1 Vm 2023-08-22T163228.cal
- U:\RadMaton\CAL_File\FAR 3 - point 9 Horizontal 1 Vm 2023-08-22T163228.cal
- U:\RadMaton\CAL_File\FAR 3 - point 10 Horizontal 1 Vm 2023-08-22T163228.cal
- U:\RadMaton\CAL_File\FAR 3 - point 11 Horizontal 1 Vm 2023-08-22T163228.cal
- U:\RadMaton\CAL_File\FAR 3 - point 12 Horizontal 1 Vm 2023-08-22T163228.cal

< Back Export Cancel

- Using the 'Export' wizard
- Directory location can be specified
- Name can be specified
 - Fixed part
 - 'variables' related to actual data
- All CAL files exported at once
- Export settings are remembered



RadiWiki application notes

- Explain specific tests
- [145](#): MIL-STD-461 RE102
- [147](#): MIL-STD-461 RE101
- [148](#): MIL-STD-461 CE101
- [149](#): MIL-STD-461 CE102
- [154](#): MIL-STD-461 CS114
- [155](#): MIL-STD-461 CS109
- [157](#): MIL-STD-461 RS103



RadiWiki application notes

- Explain general topics
- [150](#): UFA with field probe positioner
- [151](#): Graph export to CAL files
- [152](#): Backup of important RadiMation files
- [153](#): Multi axis field corrections
- [156](#): Radiated emission substitution method
- Summary of standard, link to application note



RadiMation 2024.1

- Reverberation chamber
- UFA (G)TEM
- Fixes red-cross controls
- On/Off button not toggling
- General fixes and speed improvements





Reverberation

- Tuned mode and stirrer mode (with multiple stirrers)
- Multiple standards
 - IEC 61000-4-21
 - MIL-STD-461G
 - RTCA DO-160G
 - ISO 11452-11 / ISO 11451-5
- Multiband immunity, supporting multiple bands



Reverberation

- Unloaded and loaded calibration
 - IL – Insertion Loss
 - AVF – Antenna Validation factor
 - LUF – Lowest Usable Frequency
- Loaded validation
 - CVF – Chamber Validation Factor
 - CLF – Chamber Loading Factor
 - Q – chamber Quality factor
 - Chamber time constant
- Substitution



Reverberation calibration

600 MHz-2 GHz, 12 tuned moded - Radiated Immunity reverberation chamber calibration

Description: 600 MHz-2 GHz, 12 tuned moded

Bands

+ Add
Duplicate
Remove

Frequency Range

Start: 600 MHz
Stop: 2 GHz
Forward Backward

Frequency Step

Stepsize: Logarithmic: 2 % Config

Test Site

Test Equipment: Reverb Chamber 3

Location Settings

Stirrer

Start Mode: 0 degrees
End Mode: 360 degrees
Steps: 12

Fieldprobe

Positions: 8

Allowed deviation

U:\...\Allowed R...n deviation.COR

Test Level

Description	Type
100W forward	Testlevel

+ Add Edit Delete

Inputs

Description	Type
Electrical Field probe	Input
received Power	Input

+ Add Edit Delete

Start Test
Cancel
Environment
Note
Units
Reporting
General Info
Limit lines

Reverberation validation

600 MHz-2 GHz, 12 tuned moded validation - Radiated Immunity reverberation chamber validation

Description: 600 MHz-2 GHz, 12 tuned moded validation

Bands

Description	Type
100 forward	Testlevel

+ Add Duplicate Remove

Frequency Range

Start: 600 MHz

Stop: 2 GHz

Forward Backward

Frequency Step

Stepsize: Logarithmic: 2 %

Config

Test Site

Test Equipment: Reverb Chamber 3

Location Settings

Calibration: U:\...\Reverberati...2 stirrer, 2.CAL

Stirrer

Start Mode: 0 degrees

End Mode: 360 degrees

Steps: 12

Fieldprobe

Positions: 8

Allowed deviation

U:\...\Allowed R...n deviation.COR

Chamber size

Width: 90 cm

Length: 90 cm

Height: 1.5 m

Test Level

Description	Type
100 forward	Testlevel

+ Add Edit Delete

Inputs

Description	Type
Electrical Field probe	Input
received Power	Input

+ Add Edit Delete

Start Test

Cancel

Environment

Note

Units

Reporting

General Info

Limit lines



Reverberation substitution

600 Mhz-2GHz, 12 tuned moded substitution - Radiated Immunity reverberation chamber substitution

Description: 600 Mhz-2GHz, 12 tuned moded substitution

Bands

Start: 600 MHz
Stop: 2 GHz
Forward Backward

Frequency Step
Stepsize: Logarithmic: 2 %

Dwell Time
Dwell time: 2 s

Frequency Change Mode
Change mode: Constant

Modulation
Modulation: PM: 50 %, 1 kHz

Test Site
Test Equipment: Reverb Chamber 3

Location Settings
Stirrer
Start Mode: 0 degrees
End Mode: 360 degrees
Steps: 12

Test Level

Description	Type
Electrical Field substitution method	Testlevel

+ Add Edit Delete

Inputs

Description	Type
Electrical Field probe	Input

+ Add Edit Delete

Start Test

Cancel

Environment

Note

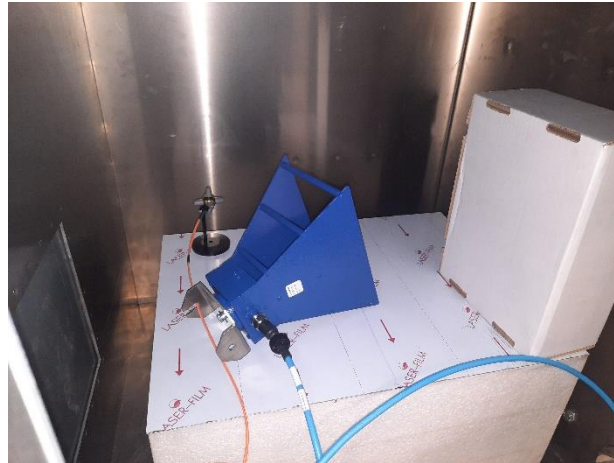
Units

Reporting

General Info

Limit lines

Reverberation





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UFA (G)TEM

- Keep 75% of points is difficult for 5 points (keep 3.75 points??)
- IEC 61000-4-20: statistical: standard deviation
- Cross polarity requirement
 - Also 75% of points have a secondary field > 6 dB lower than primary field
 - Rayleigh distribution
- 5% of frequencies allowed to use extended tolerance



UFA (G)TEM

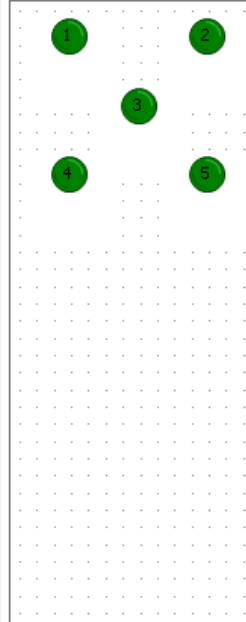
5 point GTEM calculation - Radiated Immunity Uniform Field Area calculation

Description: 5 point GTEM calculation

Calibrations

Point	File	Status
1	Range 2 80MHz - 1GHz\Pos 1 80MHz - 1G...	✓
2	Range 2 80MHz - 1GHz\Pos 2 80MHz - 1G...	✓
3	Range 2 80MHz - 1GHz\Pos 3 80MHz - 1G...	✓
4	Range 2 80MHz - 1GHz\Pos 4 80MHz - 1G...	✓
5	Range 2 80MHz - 1GHz\Pos 5 80MHz - 1G...	✓

Point Setup



Point Settings

Calculation Method:
IEC 61000-4-20:2022 (...)

Probability percentage
75%

Accepted tolerance
6 dB

Accepted extended tolerance
10 dB

Extended tolerance percentage
5 %

TEM mode verification

Cross-polar probability percentage
75%

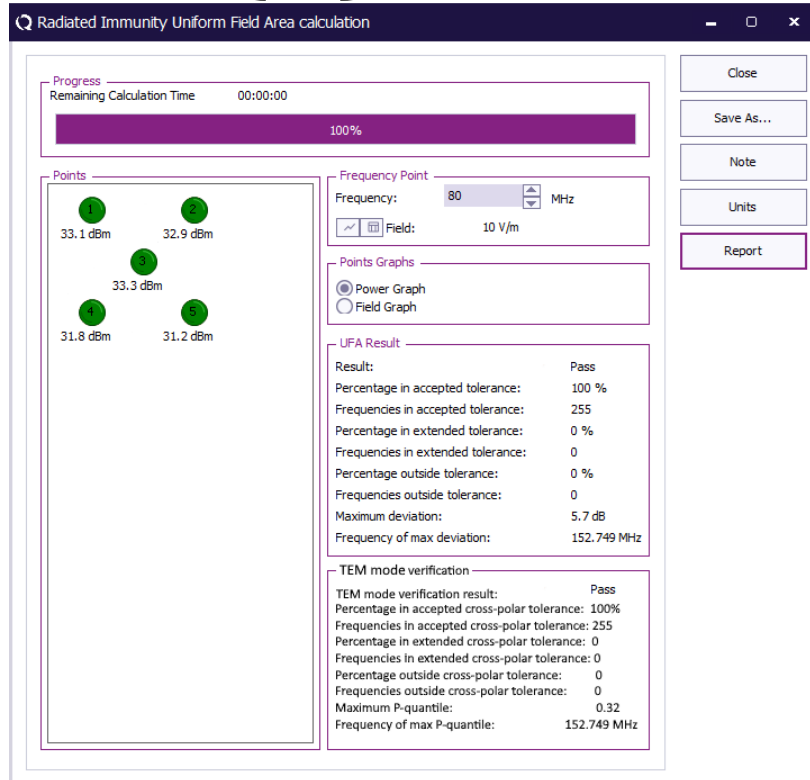
Cross-polar accepted tolerance
6 dB

Cross-polar accepted extended tolerance
2 dB

Cross-polar extended tolerance percentage
5 %



UFA (G)TEM





Calibration on specific axis

- 'Level on' axis can be specified
- Isotropic / X- / Y- / Z-axis
- No need anymore for multiple field probes

The screenshot shows the 'Q1 point calibration - Radiated Immunity Calibration' window. It has a dark blue header bar with the title and standard window controls. The main area is divided into several sections: 'Description' (1 point calibration), 'Frequency' (with 'Frequency Range' selected, showing Start: 80 MHz and End: 1000 MHz), 'Field' (with Field: 3 V/m, Tolerance: 0.5 dB, and Level on: Y-axis selected), 'Antenna' (with Distance: 3 m and Polarization: Horizontal selected), 'Calibration Method' (with Forward Power (P fwd) selected), and 'Test site' (with Test equipment: Immunity and Test engineer: Lab manager). On the right side, there is a vertical column of buttons: 'Run Calibration', 'Cancel', 'Environment', 'Amplifier', 'Note', 'Field Probes', 'Units', and 'General Info'.



RadiMation 2024.....

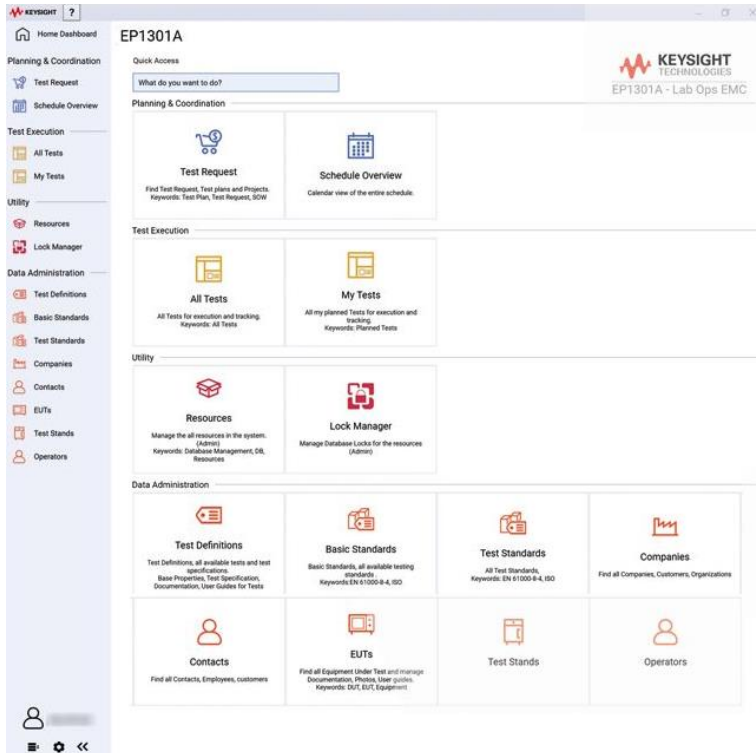
- Fast stirrer reverberation
 - ISO 11451-5
 - 8 field probes simultaneously
 - Closed loop field regulation
- Broadband noise
 - AWGN: Additive White Gaussian Noise
 - BL(W)N: Band Limited (White) Noise
 - IEC 61000-4-41



Integration

- Exchange information with other systems
- Retrieve EUT information from database
- Communicate with EUT monitoring software
- Store raw measurement results in database
- Available solutions:
 - Configurable device drivers
 - EUT Controller Interface (ECI)
 - Command line: run sequence / generate report
 - C# API

Keysight LabOps management



- EP1300A PathWave Lab Operations for EMC Test
- Quotation
- Resource and project planning
- Device management
- Automatically create EUT files
- Store test results
- Automatic report from RadiMation and LabOps



RadiMation

- Stable and easy to use EMC test software
- Flexible in test configuration and procedure
- Better support of standards and methods
- Improved device drivers, optimal performance
- Documentation in application notes
- Powerful integration features other systems

**Constantly adding improvements for a
flexible, powerful, full-compliant and
easy to use EMC test automation software**