Laboratories GSD SRL

CE MARKING

ELECTROMAGNETIC COMPATIBILITY
ELECTRICAL SAFETY
LASER SPECTROSCOPY
ENVIRONMENTAL PHYSICS

G.S.D. S.r.l.
Certified in accordance with
UNI EN ISO 9001:2008
by
TÜV Rheinland Italia S.r.l.
Certificate N. 39 00 1850509

G.S.D. Srl PISA - Italy	***Test Report n. FCC-17179B***	Rev. 01

Manufacturer	**Astrel Instruments s.r.l.**
Address	Via Appia Nuova 868 00178 Roma Italy
Product Name	**AST8300**
Testing Laboratory Name	**G.S.D. S.r.l.**
Address	Via Marmiceto, 8 56121 Ospedaletto Pisa (PI) Italy
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	FCC Listed: Registration Number: 424037
Location and Date of Issue	Pisa, 2017 May 02

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SENIOR EMC TEST MANAGER
Dr. Gian Luca Genovesi

QUALITY MANAGER
Dr. David Pelliccia

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Report Revision History

Revision details

Date	***Page No.(s)***	***Details***
2017 March 30	20	Rev. 00 First Issue
2017 May 02	20	Rev. 01 Second Issue – Pag3. FCC ID inserted

1. MANUFACTURER AND EUT IDENTIFICATION [1]

Manufacturer	**Astrel Instruments s.r.l..**
Address	Via Appia Nuova 868 00178 Roma Italy
Product Name	**AST8300**
Date of reception	**2017 February 28**
Sampling	**Laboratory sample for certification**
Test Item Description	**CCD Astrocamera**
Nominal Input Voltage	**Dedicated Power Supply**
FCC ID	**2AKOS-ASTCCDCAM01**

[1] A detailed documentation is preserved in the internal fascicle.

Fig. 1.1
Equipment Photo

2. REFERENCE STANDARDS

Tests and measurements are performed accordingly to the reference standards given in the table below:

TEST	***STANDARD***
Emissions: Radiated – Section 15.109	FCC Rules ad Regulations, Title 47 Part 15 – Sub part C ANSI C63.4 2014 – American National Standard for Methods of Measuring of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz – 40 GHz
Emissions: Conducted – Section 15.107	FCC Rules ad Regulations, Title 47 Part 15 – Sub part C ANSI C63.4 2014 – American National Standard for Methods of Measuring of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz – 40 GHz

3. TEST GENERALITY, RESULT, CONDITION, MEASUREMENT UNCERTAINTY

Sub-part 2.1033(b)

Test And Measurement Data

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2 and the following individual Parts: 15.109; Unintentional Radiators

Standard Test Conditions and Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing:
In accordance with ANSI C63.4-2009, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104 °F) unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.
Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures.
All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.
Measurement results, unless otherwise noted, are worst-case measurements.

Summary of Test Results

TEST	*RESULT*
Emissions: conducted *Section 15.107*	*Pass*
Emissions: radiated *Section 15.109*	*Pass*

Measurement uncertainty

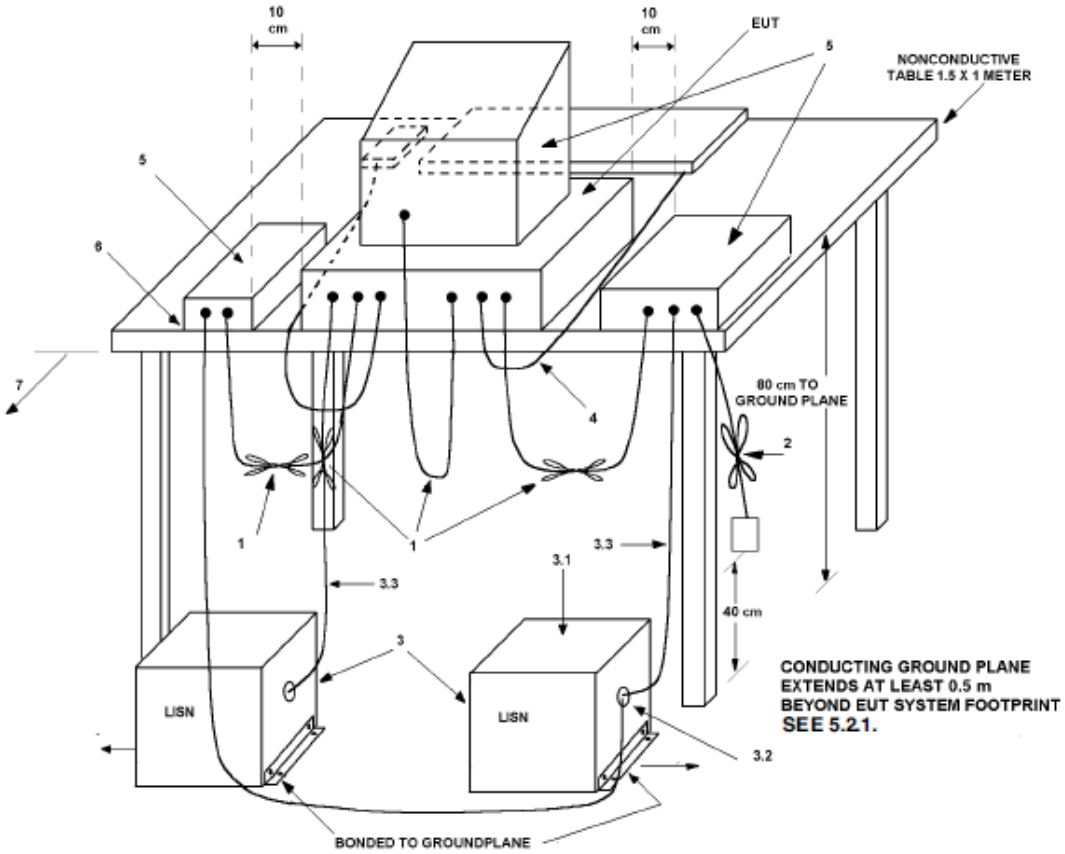
TEST	*EXPANDED UNCERTAINTY*
Conducted Emission – 50Ω/50µH (150 kHz - 30 MHz)	± 3.5 dB
Radiated Emission – (Semianechoic Room) (30 MHz - 18 GHz)	± 4.7 dB

Climatic Conditions

PARAMETER	*VALUE*
Temperature	(293 ± 3) K
Relative humidity	(50 ± 5) %

Extensions

The results refer only to the sampled EUT and under the specified conditions.



Conducted and Radiated EUT Test Set-up example (ANSI C63.4 2014)

4. RADIATED EMISSIONS

In the following table you can find the limits established by the reference standard:

FREQUENCY RANGE *(MHz)*	***Field Strenght*** *QUASI-PEAK LIMITS* *[dB (μV/m)]*
30 ÷ 88	40
88 ÷ 216	43,5
216 ÷ 960	46
Above 960	54

Test Equipment

EQUIPMENT	MANUFACTURER	MODEL	CAL. DUE
EMI Receiver	HP	HP8546A	01/2018
EMI Receiver Filter Section	HP	HP85460A	01/2018
Anechoic Chamber	Comtest	CSA01	01/2018
Bilog Antenna	Schaffner	CBL6112B	01/2018
Horn Antenna	EMCO	3115	01/2018
Controller	Deisel	HD100	01/2018
Turn Table	Deisel	MA240	01/2018
LISN	GSD	NTW06	01/2018

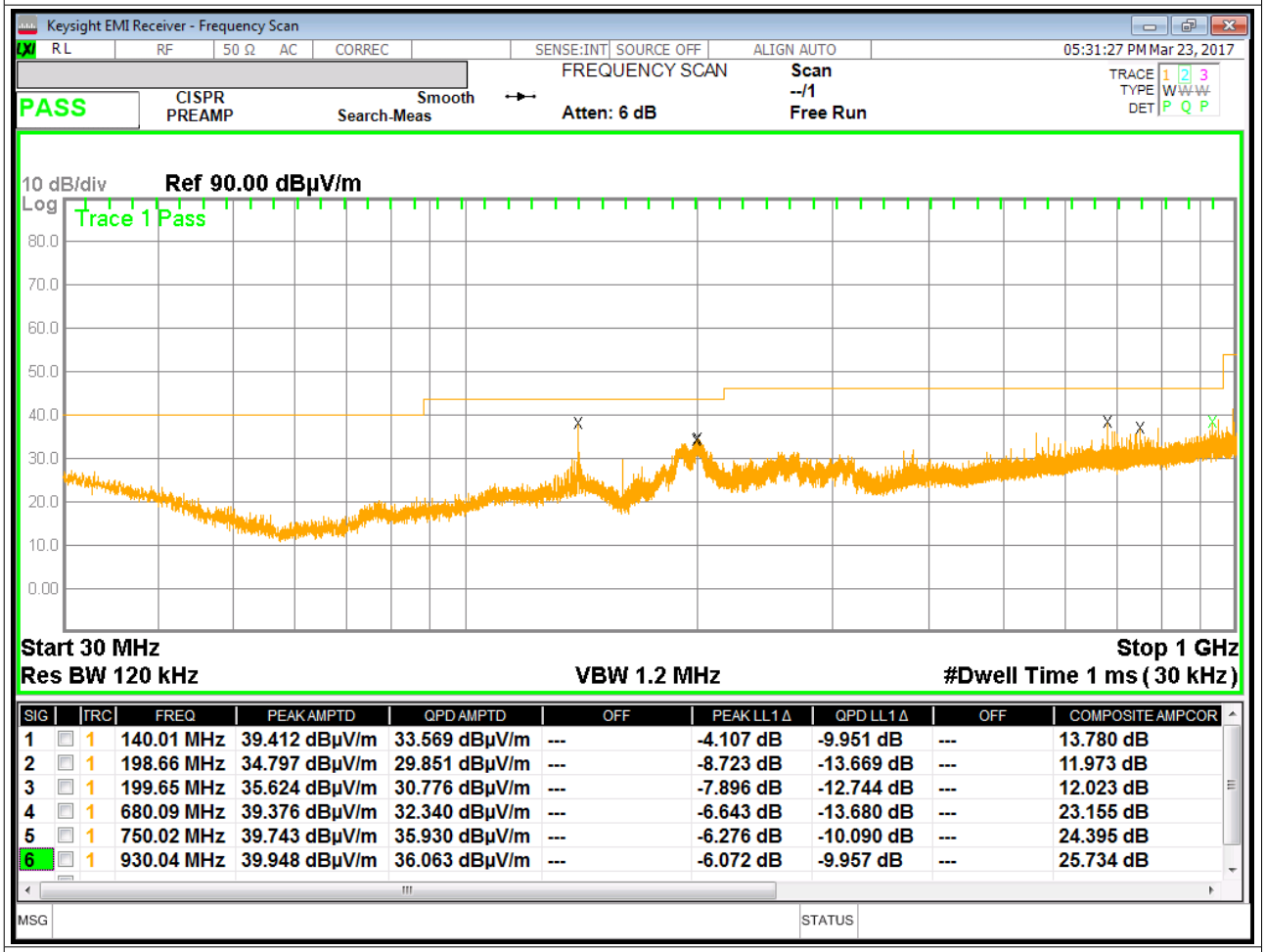
Test procedure: RE22R02

Notes

Azimuth position EUT-Antenna corresponding to 0° identifies the rotating table orientation (TT) in which the instrument to be tested shows the front part turned towards the antenna. Positive grades individuate clockwise rotations of TT when this one is observed from the top. For negative degrees, TT rotation is anticlockwise.
Antenna height respect to the mass plane is conventionally individuated with: MA=XXX where XXX indicates the height (always positive for e>100) expressed in cm.
Antenna horizontal polarisation is indicated by POL=H.
Antenna vertical polarisation is indicated by POL=V.
EUT was tested in the three ortogonal planes.

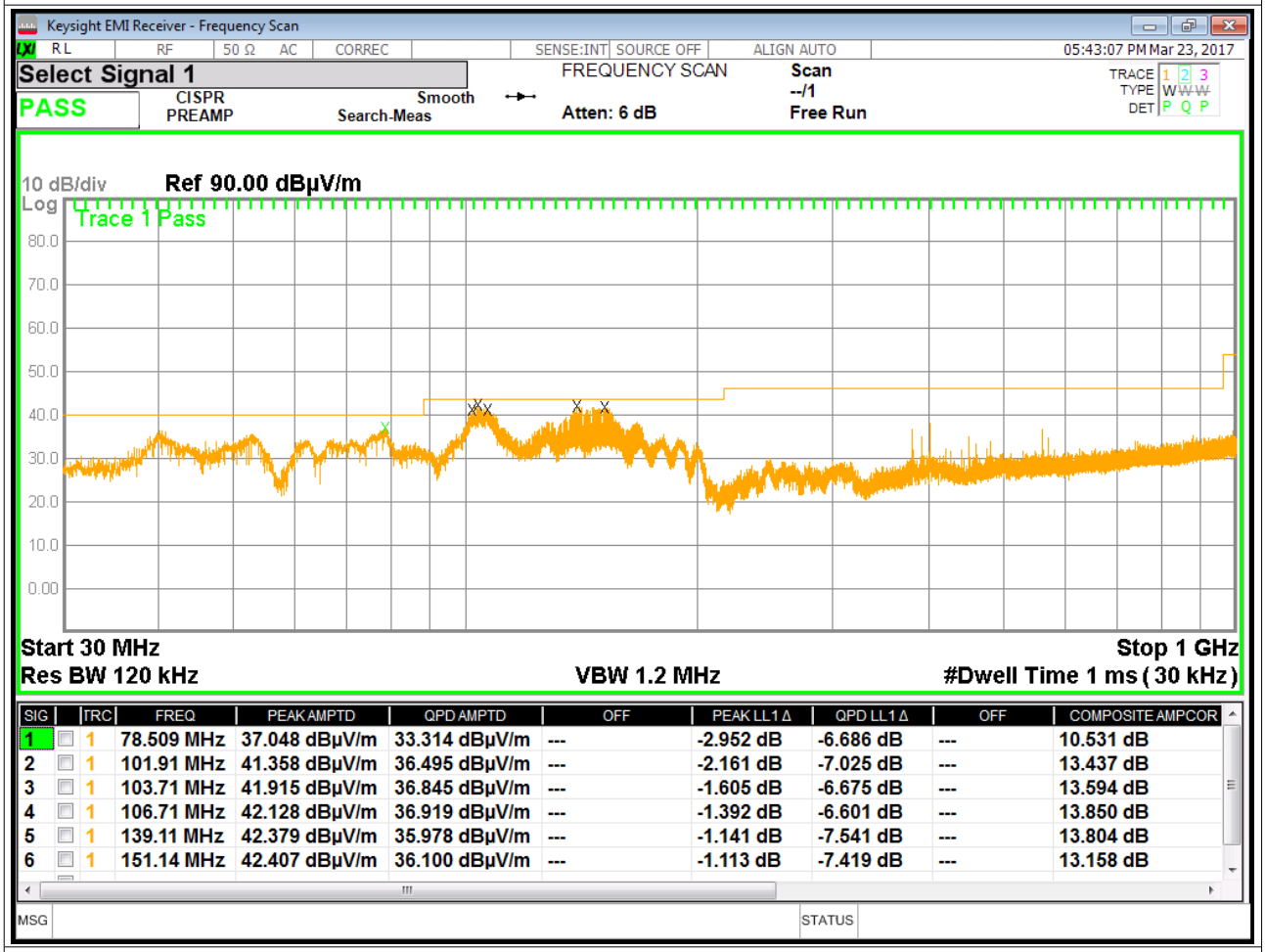
Results and conclusions

In all the operative conditions, equipment complied with the standard limits. Graphics in following figures show the most significant registrations of the performed measurements.



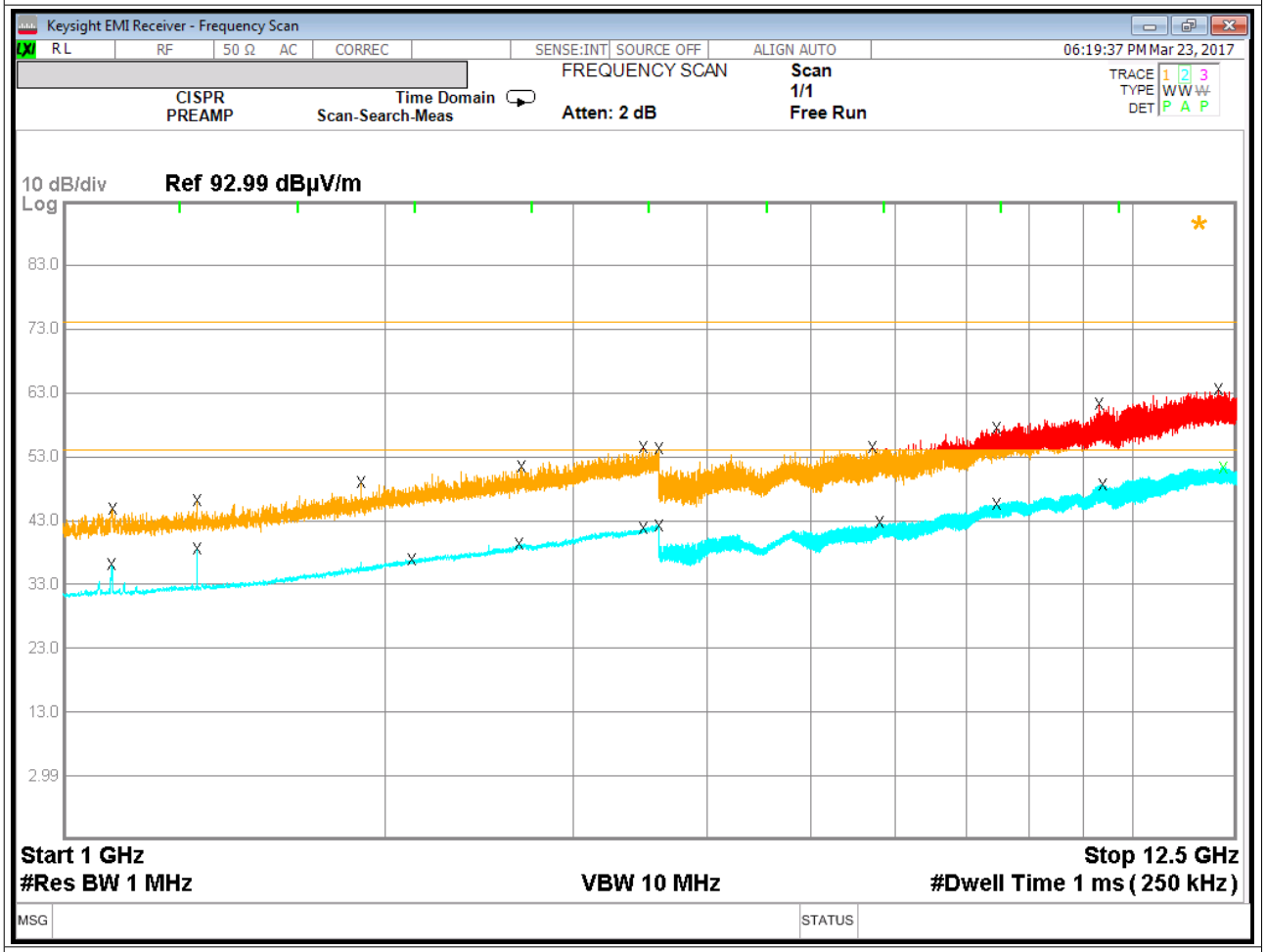
SIG	TRC	FREQ	PEAK AMPTD	QPD AMPTD	OFF	PEAK LL1 Δ	QPD LL1 Δ	OFF	COMPOSITE AMPCOR
1	1	140.01 MHz	39.412 dBµV/m	33.569 dBµV/m	---	-4.107 dB	-9.951 dB	---	13.780 dB
2	1	198.66 MHz	34.797 dBµV/m	29.851 dBµV/m	---	-8.723 dB	-13.669 dB	---	11.973 dB
3	1	199.65 MHz	35.624 dBµV/m	30.776 dBµV/m	---	-7.896 dB	-12.744 dB	---	12.023 dB
4	1	680.09 MHz	39.376 dBµV/m	32.340 dBµV/m	---	-6.643 dB	-13.680 dB	---	23.155 dB
5	1	750.02 MHz	39.743 dBµV/m	35.930 dBµV/m	---	-6.276 dB	-10.090 dB	---	24.395 dB
6	1	930.04 MHz	39.948 dBµV/m	36.063 dBµV/m	---	-6.072 dB	-9.957 dB	---	25.734 dB

POL H

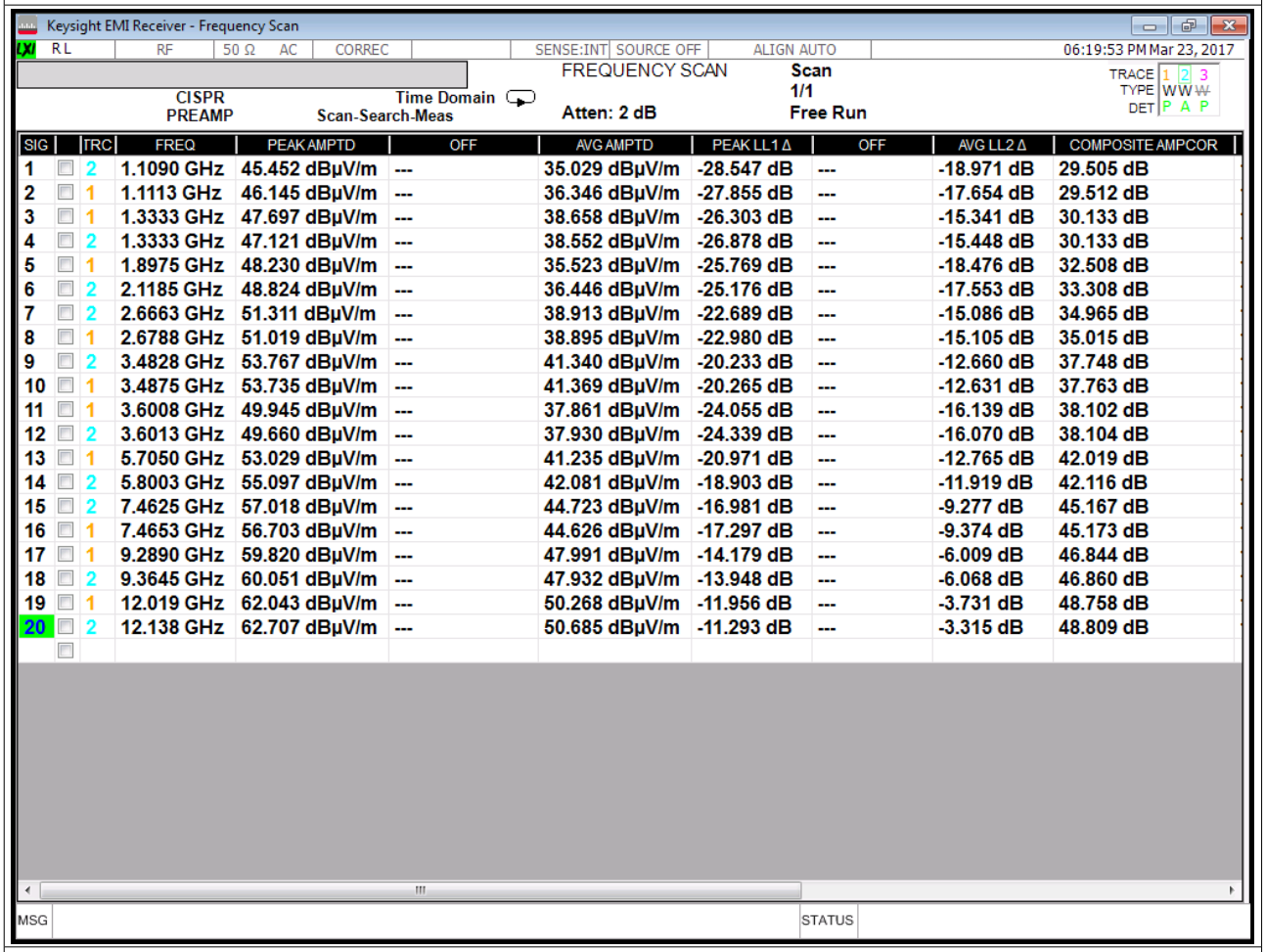


SIG	TRC	FREQ	PEAK AMPTD	QPD AMPTD	OFF	PEAK LL1 Δ	QPD LL1 Δ	OFF	COMPOSITE AMPCOR
1	1	78.509 MHz	37.048 dBµV/m	33.314 dBµV/m	---	-2.952 dB	-6.686 dB	---	10.531 dB
2	1	101.91 MHz	41.358 dBµV/m	36.495 dBµV/m	---	-2.161 dB	-7.025 dB	---	13.437 dB
3	1	103.71 MHz	41.915 dBµV/m	36.845 dBµV/m	---	-1.605 dB	-6.675 dB	---	13.594 dB
4	1	106.71 MHz	42.128 dBµV/m	36.919 dBµV/m	---	-1.392 dB	-6.601 dB	---	13.850 dB
5	1	139.11 MHz	42.379 dBµV/m	35.978 dBµV/m	---	-1.141 dB	-7.541 dB	---	13.804 dB
6	1	151.14 MHz	42.407 dBµV/m	36.100 dBµV/m	---	-1.113 dB	-7.419 dB	---	13.158 dB

POL V

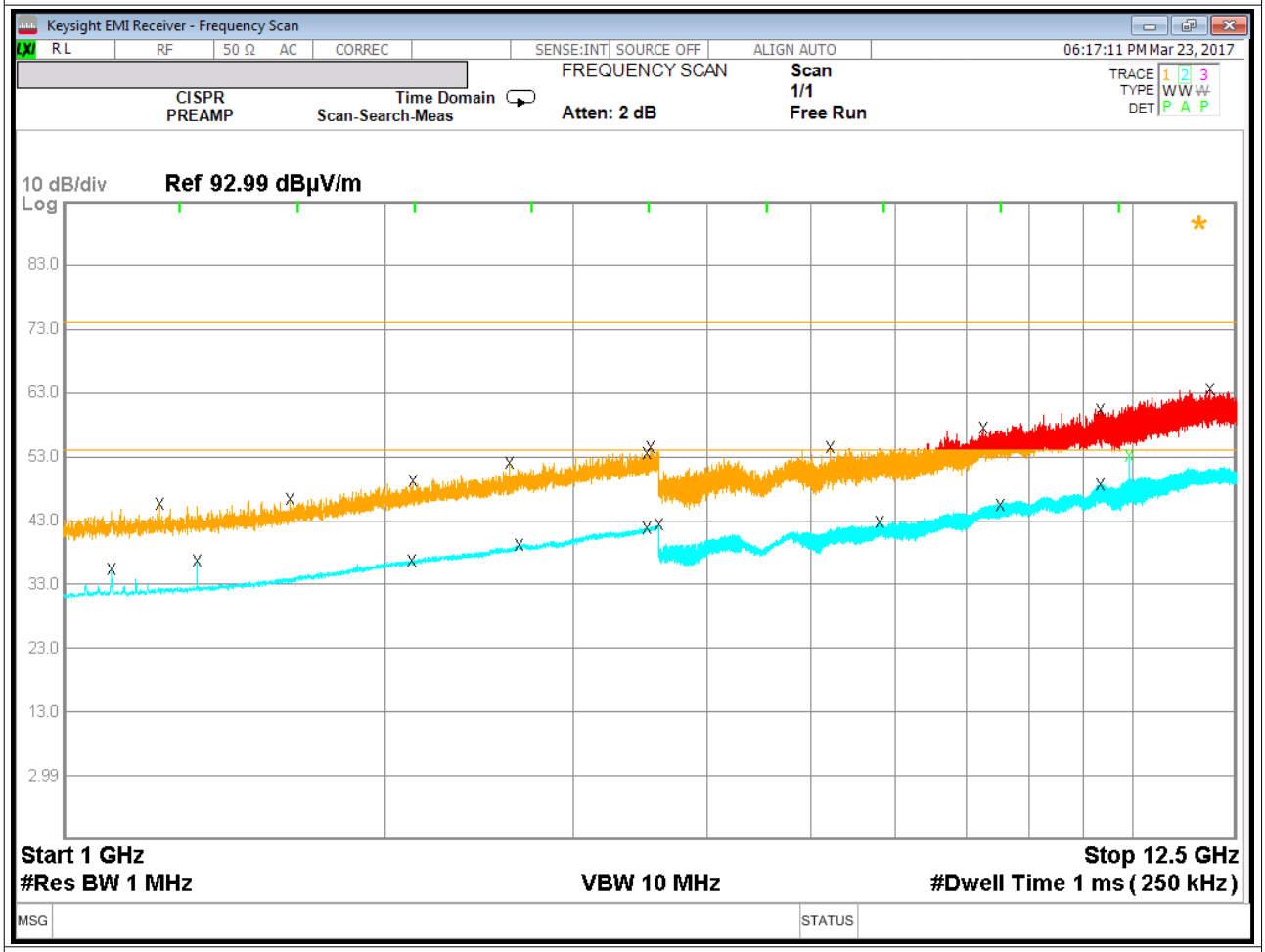

Keysight EMI Receiver - Frequency Scan
RL
RF
50 Ω
AC
CORREC
SENSE:INT
SOURCE OFF
ALIGN AUTO
06:19:37 PM Mar 23, 2017
FREQUENCY SCAN
Scan
1/1
Free Run
CISPR
PREAMP
Time Domain
Scan-Search-Meas
Atten: 2 dB
TRACE 1 2 3
TYPE WWW
DET P A P
10 dB/div
Log
Ref 92.99 dBµV/m
83.0
73.0
63.0
53.0
43.0
33.0
23.0
13.0
2.99
Start 1 GHz
#Res BW 1 MHz
VBW 10 MHz
Stop 12.5 GHz
#Dwell Time 1 ms (250 kHz)
MSG
STATUS

POL V

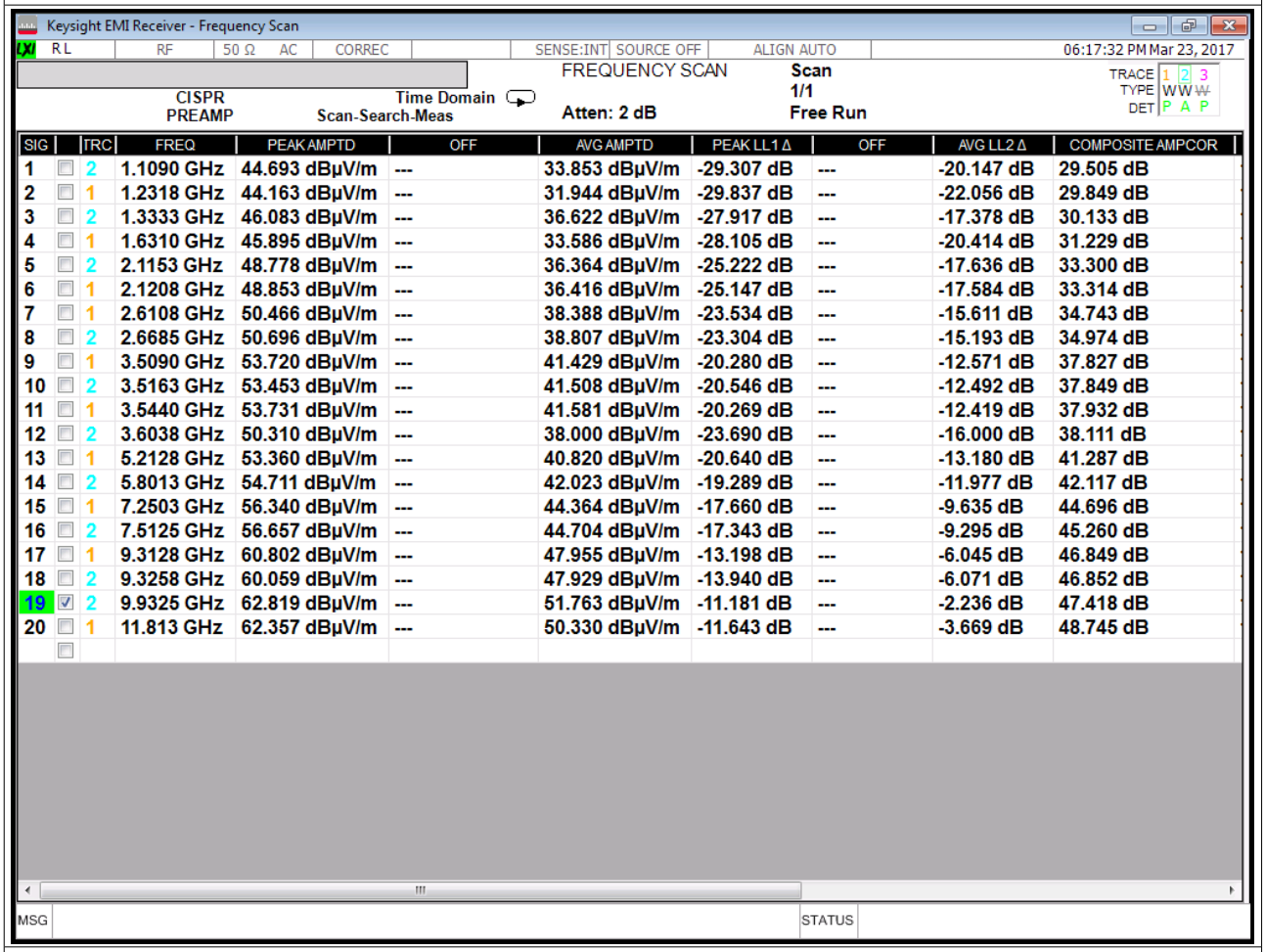


SIG		TRC	FREQ	PEAK AMPTD	OFF	AVG AMPTD	PEAK LL1 Δ	OFF	AVG LL2 Δ	COMPOSITE AMPCOR
1		2	1.1090 GHz	45.452 dBµV/m	---	35.029 dBµV/m	-28.547 dB	---	-18.971 dB	29.505 dB
2		1	1.1113 GHz	46.145 dBµV/m	---	36.346 dBµV/m	-27.855 dB	---	-17.654 dB	29.512 dB
3		1	1.3333 GHz	47.697 dBµV/m	---	38.658 dBµV/m	-26.303 dB	---	-15.341 dB	30.133 dB
4		2	1.3333 GHz	47.121 dBµV/m	---	38.552 dBµV/m	-26.878 dB	---	-15.448 dB	30.133 dB
5		1	1.8975 GHz	48.230 dBµV/m	---	35.523 dBµV/m	-25.769 dB	---	-18.476 dB	32.508 dB
6		2	2.1185 GHz	48.824 dBµV/m	---	36.446 dBµV/m	-25.176 dB	---	-17.553 dB	33.308 dB
7		2	2.6663 GHz	51.311 dBµV/m	---	38.913 dBµV/m	-22.689 dB	---	-15.086 dB	34.965 dB
8		1	2.6788 GHz	51.019 dBµV/m	---	38.895 dBµV/m	-22.980 dB	---	-15.105 dB	35.015 dB
9		2	3.4828 GHz	53.767 dBµV/m	---	41.340 dBµV/m	-20.233 dB	---	-12.660 dB	37.748 dB
10		1	3.4875 GHz	53.735 dBµV/m	---	41.369 dBµV/m	-20.265 dB	---	-12.631 dB	37.763 dB
11		1	3.6008 GHz	49.945 dBµV/m	---	37.861 dBµV/m	-24.055 dB	---	-16.139 dB	38.102 dB
12		2	3.6013 GHz	49.660 dBµV/m	---	37.930 dBµV/m	-24.339 dB	---	-16.070 dB	38.104 dB
13		1	5.7050 GHz	53.029 dBµV/m	---	41.235 dBµV/m	-20.971 dB	---	-12.765 dB	42.019 dB
14		2	5.8003 GHz	55.097 dBµV/m	---	42.081 dBµV/m	-18.903 dB	---	-11.919 dB	42.116 dB
15		2	7.4625 GHz	57.018 dBµV/m	---	44.723 dBµV/m	-16.981 dB	---	-9.277 dB	45.167 dB
16		1	7.4653 GHz	56.703 dBµV/m	---	44.626 dBµV/m	-17.297 dB	---	-9.374 dB	45.173 dB
17		1	9.2890 GHz	59.820 dBµV/m	---	47.991 dBµV/m	-14.179 dB	---	-6.009 dB	46.844 dB
18		2	9.3645 GHz	60.051 dBµV/m	---	47.932 dBµV/m	-13.948 dB	---	-6.068 dB	46.860 dB
19		1	12.019 GHz	62.043 dBµV/m	---	50.268 dBµV/m	-11.956 dB	---	-3.731 dB	48.758 dB
20		2	12.138 GHz	62.707 dBµV/m	---	50.685 dBµV/m	-11.293 dB	---	-3.315 dB	48.809 dB

POL V


Keysight EMI Receiver - Frequency Scan
RL
RF
50 Ω
AC
CORREC
SENSE:INT
SOURCE OFF
ALIGN AUTO
06:17:11 PM Mar 23, 2017
FREQUENCY SCAN
Scan
1/1
Free Run
CISPR
PREAMP
Time Domain
Scan-Search-Meas
Atten: 2 dB
TRACE 1 2 3
TYPE WWW
DET P A P
10 dB/div
Log
Ref 92.99 dBµV/m
83.0
73.0
63.0
53.0
43.0
33.0
23.0
13.0
2.99
Start 1 GHz
#Res BW 1 MHz
VBW 10 MHz
Stop 12.5 GHz
#Dwell Time 1 ms (250 kHz)
MSG
STATUS

POL H



SIG		TRC	FREQ	PEAK AMPTD	OFF	AVG AMPTD	PEAK LL1 Δ	OFF	AVG LL2 Δ	COMPOSITE AMPCOR
1		2	1.1090 GHz	44.693 dBµV/m	---	33.853 dBµV/m	-29.307 dB	---	-20.147 dB	29.505 dB
2		1	1.2318 GHz	44.163 dBµV/m	---	31.944 dBµV/m	-29.837 dB	---	-22.056 dB	29.849 dB
3		2	1.3333 GHz	46.083 dBµV/m	---	36.622 dBµV/m	-27.917 dB	---	-17.378 dB	30.133 dB
4		1	1.6310 GHz	45.895 dBµV/m	---	33.586 dBµV/m	-28.105 dB	---	-20.414 dB	31.229 dB
5		2	2.1153 GHz	48.778 dBµV/m	---	36.364 dBµV/m	-25.222 dB	---	-17.636 dB	33.300 dB
6		1	2.1208 GHz	48.853 dBµV/m	---	36.416 dBµV/m	-25.147 dB	---	-17.584 dB	33.314 dB
7		1	2.6108 GHz	50.466 dBµV/m	---	38.388 dBµV/m	-23.534 dB	---	-15.611 dB	34.743 dB
8		2	2.6685 GHz	50.696 dBµV/m	---	38.807 dBµV/m	-23.304 dB	---	-15.193 dB	34.974 dB
9		1	3.5090 GHz	53.720 dBµV/m	---	41.429 dBµV/m	-20.280 dB	---	-12.571 dB	37.827 dB
10		2	3.5163 GHz	53.453 dBµV/m	---	41.508 dBµV/m	-20.546 dB	---	-12.492 dB	37.849 dB
11		1	3.5440 GHz	53.731 dBµV/m	---	41.581 dBµV/m	-20.269 dB	---	-12.419 dB	37.932 dB
12		2	3.6038 GHz	50.310 dBµV/m	---	38.000 dBµV/m	-23.690 dB	---	-16.000 dB	38.111 dB
13		1	5.2128 GHz	53.360 dBµV/m	---	40.820 dBµV/m	-20.640 dB	---	-13.180 dB	41.287 dB
14		2	5.8013 GHz	54.711 dBµV/m	---	42.023 dBµV/m	-19.289 dB	---	-11.977 dB	42.117 dB
15		1	7.2503 GHz	56.340 dBµV/m	---	44.364 dBµV/m	-17.660 dB	---	-9.635 dB	44.696 dB
16		2	7.5125 GHz	56.657 dBµV/m	---	44.704 dBµV/m	-17.343 dB	---	-9.295 dB	45.260 dB
17		1	9.3128 GHz	60.802 dBµV/m	---	47.955 dBµV/m	-13.198 dB	---	-6.045 dB	46.849 dB
18		2	9.3258 GHz	60.059 dBµV/m	---	47.929 dBµV/m	-13.940 dB	---	-6.071 dB	46.852 dB
19	☑	2	9.9325 GHz	62.819 dBµV/m	---	51.763 dBµV/m	-11.181 dB	---	-2.236 dB	47.418 dB
20		1	11.813 GHz	62.357 dBµV/m	---	50.330 dBµV/m	-11.643 dB	---	-3.669 dB	48.745 dB

POL H

5. POWERLINE CONDUCTED EMISSIONS

Equipment shall meet the limits below when using a CISPR16 quasi-peak and average detector receivers.

FCC, 15.107

FREQUENCY RANGE (MHz)	*QUASI-PEAK LIMIT* [dB (µV)]	*AVERAGE LIMIT* [dB (µV)]
0.15 ÷ 0.50	66 ÷ 56(*)	56 ÷ 46(*)
0.50 ÷ 5	56	46
5 ÷ 30	60	50

(*) *Limit decreasing linearly with logarithm of frequency*

Test Equipment

EQUIPMENT	MANUFACTURER	MODEL	CAL. DUE
EMI Receiver	HP	HP8546A	
EMI Receiver Filter Section	HP	HP85460A	
Screened Room	GSD	CSC01	
Transient Limiter	HP	11947A	01/2018
LISN	GSD	GSDA01	01/2018

Test procedure: CE22R01

The EUT power cable was connected to a LISN and the monitored output of the LISN was connected to a spectrum analyzer by a transient limiter. The conducted emissions from 150 kHz to 30 MHz were monitored and compared to the specification limits

Test method

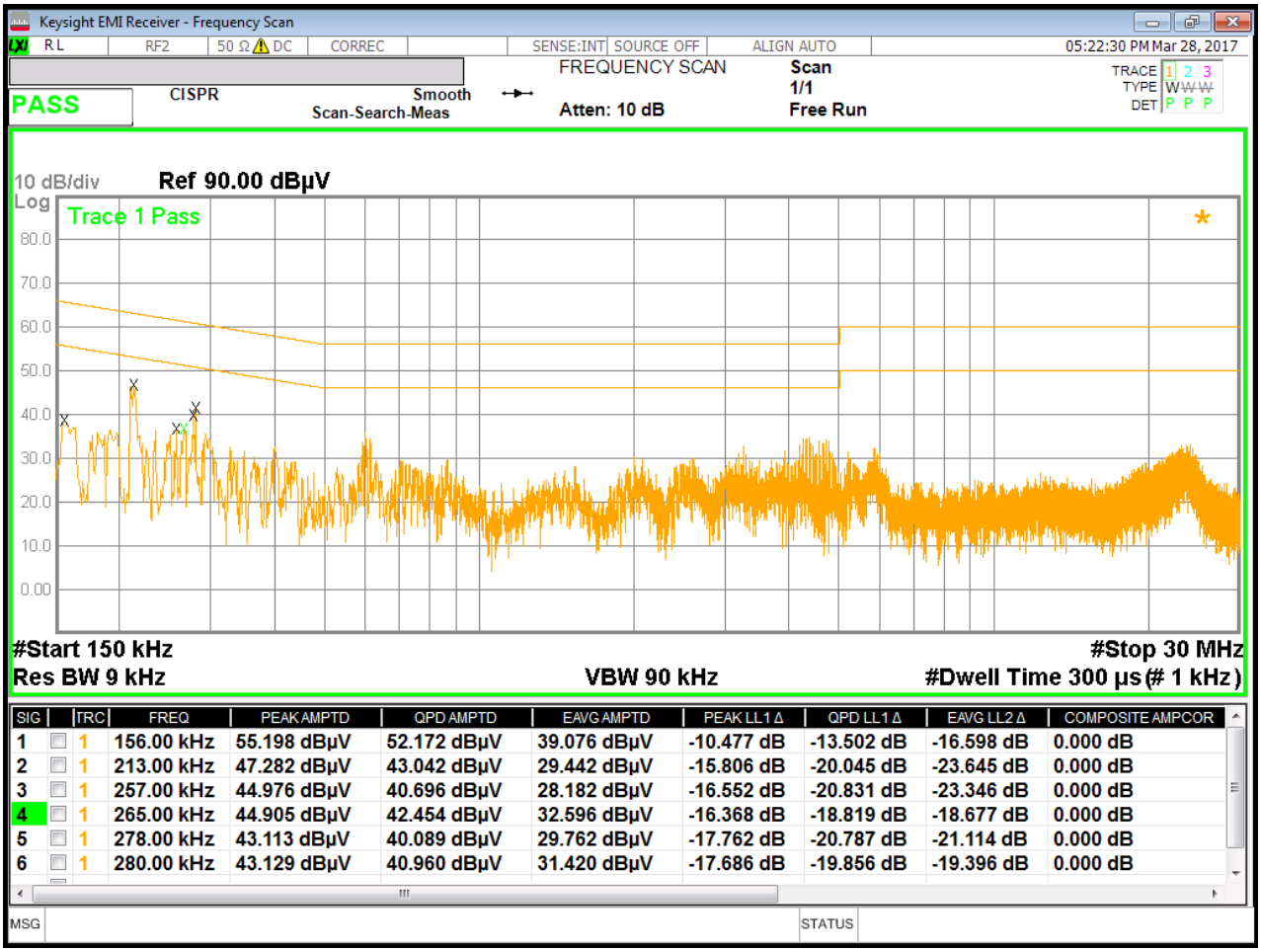
Test method was in accordance with the reference standard.

EUT modes of operations were tested in order to achieve the maximum level of emission.

Results

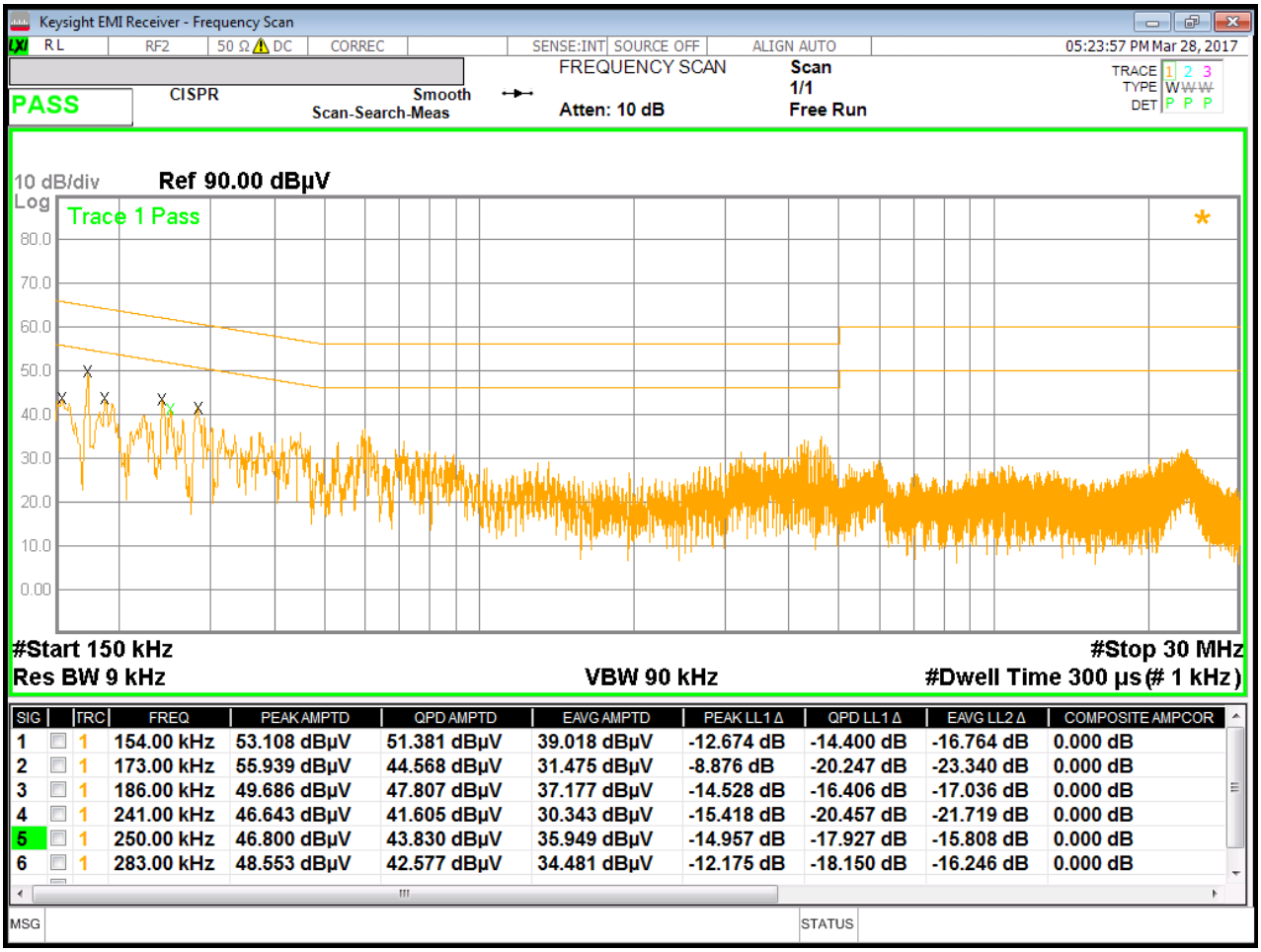
Equipment complied with the test specification limits.

Graphics in following figures show some registrations of the frequency spectrum of the conducted emissions.



SIG	TRC	FREQ	PEAK AMPTD	QPD AMPTD	EAVG AMPTD	PEAK LL1 Δ	QPD LL1 Δ	EAVG LL2 Δ	COMPOSITE AMPCOR
1	1	156.00 kHz	55.198 dBµV	52.172 dBµV	39.076 dBµV	-10.477 dB	-13.502 dB	-16.598 dB	0.000 dB
2	1	213.00 kHz	47.282 dBµV	43.042 dBµV	29.442 dBµV	-15.806 dB	-20.045 dB	-23.645 dB	0.000 dB
3	1	257.00 kHz	44.976 dBµV	40.696 dBµV	28.182 dBµV	-16.552 dB	-20.831 dB	-23.346 dB	0.000 dB
4	1	265.00 kHz	44.905 dBµV	42.454 dBµV	32.596 dBµV	-16.368 dB	-18.819 dB	-18.677 dB	0.000 dB
5	1	278.00 kHz	43.113 dBµV	40.089 dBµV	29.762 dBµV	-17.762 dB	-20.787 dB	-21.114 dB	0.000 dB
6	1	280.00 kHz	43.129 dBµV	40.960 dBµV	31.420 dBµV	-17.686 dB	-19.856 dB	-19.396 dB	0.000 dB

Line 2
EUT mode: Connected to PC by Ethernet



SIG	TRC	FREQ	PEAK AMPTD	QPD AMPTD	EAVG AMPTD	PEAK LL1 Δ	QPD LL1 Δ	EAVG LL2 Δ	COMPOSITE AMPCOR
1	1	154.00 kHz	53.108 dBµV	51.381 dBµV	39.018 dBµV	-12.674 dB	-14.400 dB	-16.764 dB	0.000 dB
2	1	173.00 kHz	55.939 dBµV	44.568 dBµV	31.475 dBµV	-8.876 dB	-20.247 dB	-23.340 dB	0.000 dB
3	1	186.00 kHz	49.686 dBµV	47.807 dBµV	37.177 dBµV	-14.528 dB	-16.406 dB	-17.036 dB	0.000 dB
4	1	241.00 kHz	46.643 dBµV	41.605 dBµV	30.343 dBµV	-15.418 dB	-20.457 dB	-21.719 dB	0.000 dB
5	1	250.00 kHz	46.800 dBµV	43.830 dBµV	35.949 dBµV	-14.957 dB	-17.927 dB	-15.808 dB	0.000 dB
6	1	283.00 kHz	48.553 dBµV	42.577 dBµV	34.481 dBµV	-12.175 dB	-18.150 dB	-16.246 dB	0.000 dB

Line 1

6. PHOTO

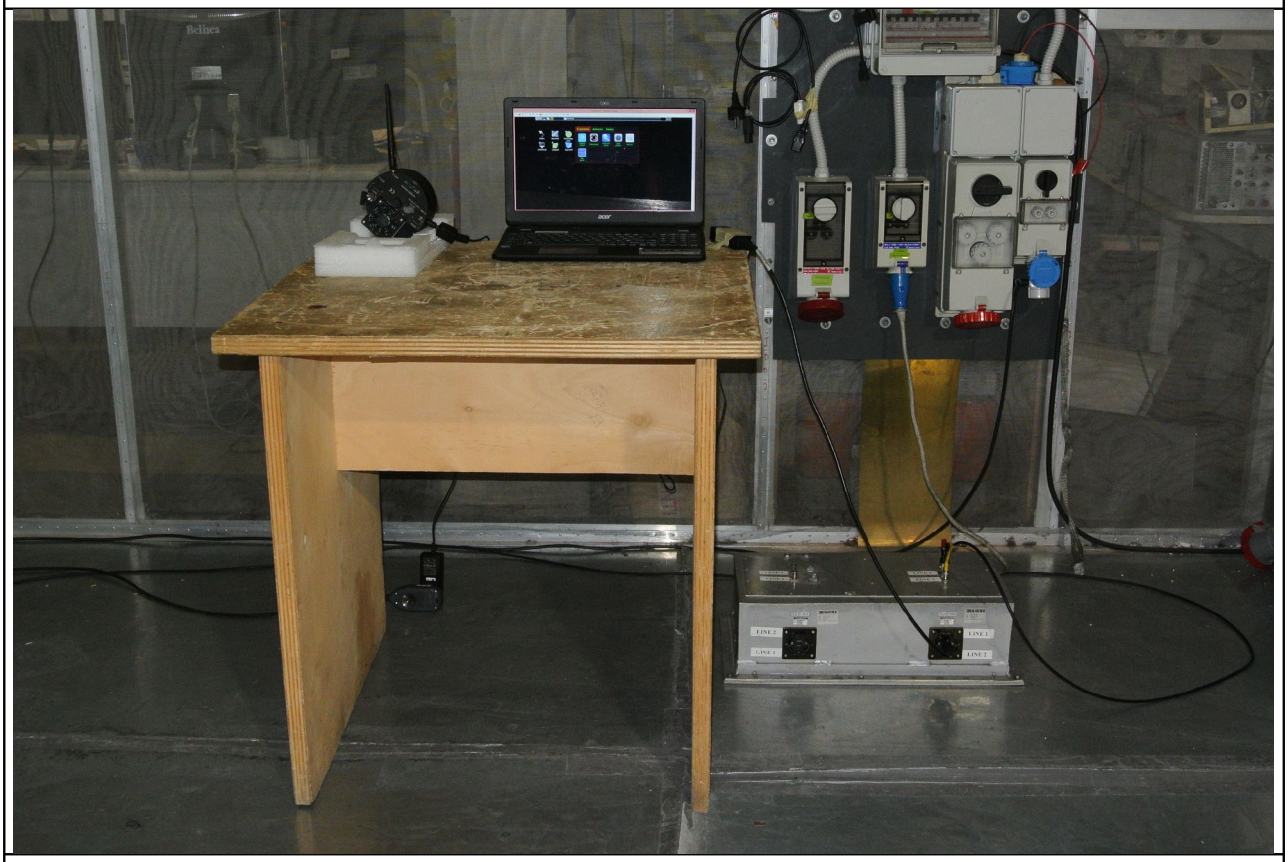


Fig. 6.1
Conducted Emissions Test Set-up

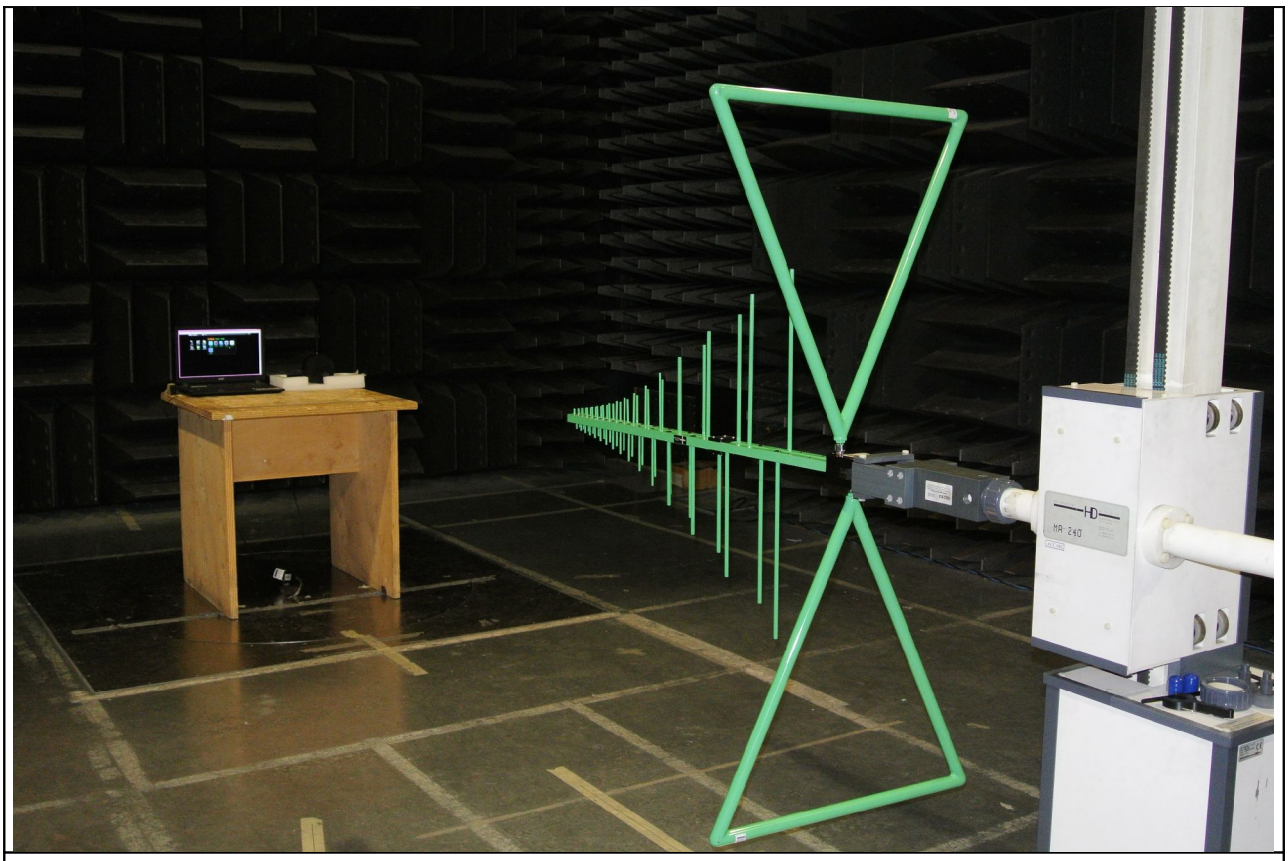


Fig. 6.2

Radiated Emissions Test Set-up

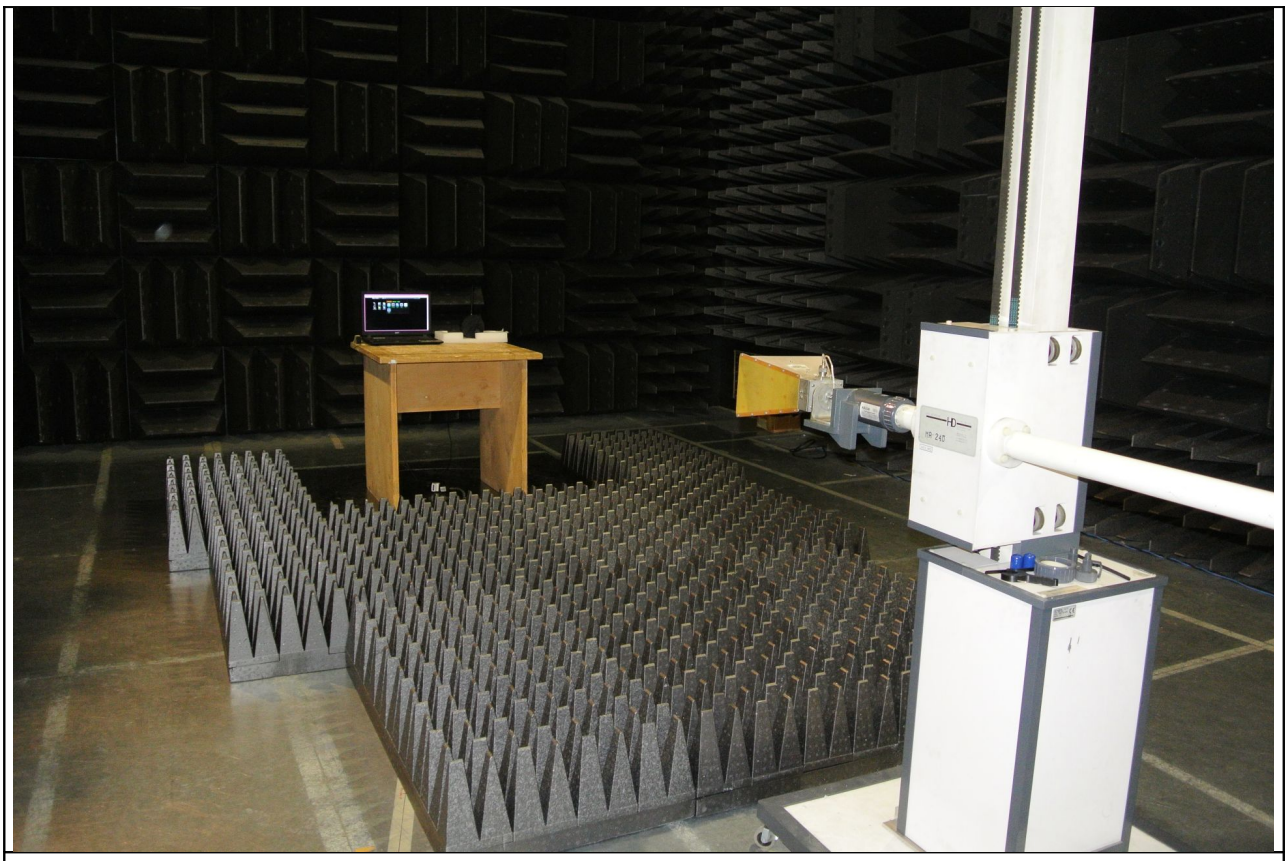


Fig. 6.3
Radiated Emissions Test Set-up