

RADIO TEST REPORT

No. 1124792-1, Ed. 1

EQUIPMENT UNDER TEST

Equipment: RFID Reader
Type / model: LR-6
Manufacturer: TagMaster AB
Tested by request of: TagMaster AB

SUMMARY



The equipment complies with selected requirements of the following standards:

47 CFR, Part 15, Subpart B and subpart C (2011) section 15.245 and 15.247

Test methods according to ANSI C63.10-2009

Date of issue: 2012-01-30

Tested by:

Åke Carlson
Stefan Andersson

Approved by:



Niklas Boström

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REVISION HISTORY

Edition	Date	Description
1	2012-01-30	First release

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1. CLIENT INFORMATION

The EUT has been tested by request of

Company: TagMaster AB
Kronobergsgränd 1
164 87 Kista
SWEDEN
Name of contact: Johan Franzén

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT according to the manufacturer/client declaration

Equipment: RFID Reader
Type/Model: LR-6
Brand name: TagMaster
Serial number: -
Manufacturer: TagMaster AB
Rating/Supplying voltage: 24 V DC
Rating RF output power: 10 mW or 500 mW
Antenna gain: 7 dBi
External antenna connector: No
Operating temperature range: -40 to +70 °C
Frequency range: 2400 – 2483,5 MHz (FHSS)
2435 – 2465 MHz (CW)
Number of channels: 400 (FHSS)
93 (CW)
Channel spacing: 200 kHz (FHSS)
300 kHz (CW)
Modulation characteristics: CW / FHSS
Stand by mode supported: No

2.2 Additional information

The LR-6 radio module is according to the client identical to the radio module in models S1566 and HR-2. On request of the client are overview sweep of the radiated spurious emission also performed on S1566 and HR-2.

3. TEST SPECIFICATIONS

3.1 Standards

FCC 47 CFR part 15 (2011) Subpart C – Intentional Radiators; §15.245 Operation within the bands 902-928 MHz, 2435 – 2465MHz, 5785 – 5815 MHz, 10500-10550 MHz and 24075-24175, §15.247 Operation within the bands 902-928 MHz, 2400 – 2483.5 MHz and 5725 – 5850 MHz.

ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices

3.2 Additions, deviations and exclusions from standards

No additions, deviations or exclusions have been made from standards.

3.3 Test set-up

Measurement set-ups for the test of out-of-band spurious emissions test are described in corresponding sections. During other tests the EUT was connected to the spectrum analyzer by cable.

3.4 Operating environment

If not additionally specified, the tests were performed under the following environmental conditions:

Air temperature:	20-25 °C
Relative humidity:	25-65 %

4. TEST PLAN

The results in this report apply only to the sample tested.

FCC reference	IC reference	Test	Result	Note
15.247(b)	RSS-210 A8.4 (1)	Peak output power	PASS	
15.247(a)	RSS-210 A8.1 (c)	6 dB Bandwidth	NT	1
15.247(a)	RSS-210 A8.1 (b)	Spectral power density	NT	1
15.247(d)	RSS-210 A8.5	Band edge compliance	PASS	
15.247(d)	RSS-210 A8.5	Out of band spurious emissions, radiated	PASS	2, 3, 4
15.247(d)	RSS-210 A8.5	Out of band spurious emissions, conducted	NT	1
15B	RSS-Gen Table 1	Out of band spurious emissions, radiated	NT	1
15B	RSS-Gen Table 2	Conducted emission at AC port	NA	

NT = not tested

NA = not applicable

Note 1

Not tested, on request of the client.

Note 2

Tested on 1 channel (middle), on request of the client.

Note 3

Additional overview sweep for S1566 and HR-2 have been performed in the frequency band 1 – 26 GHz.

Note 4

The measured result is below the upper limit, but by a margin less than half of the uncertainty interval. It is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance is more probable than non-compliance

5. PEAK OUTPUT POWER

5.1 Test protocol

Date of test: 2012-03-02

EUT mode of operation: continuous TX. Modulation on

Spectrum analyzer settings:

Span: 5 MHz
 RBW: 5 MHz
 VBW: 5 MHz
 Sweep time: Auto
 Detector: Peak
 Trace: Max Hold

10 mW

Channel (MHz)	Plot	Measured (dBm)	Limit value (dBm)
Low	P5.1	-	29
Middle		10.2	
High		-	

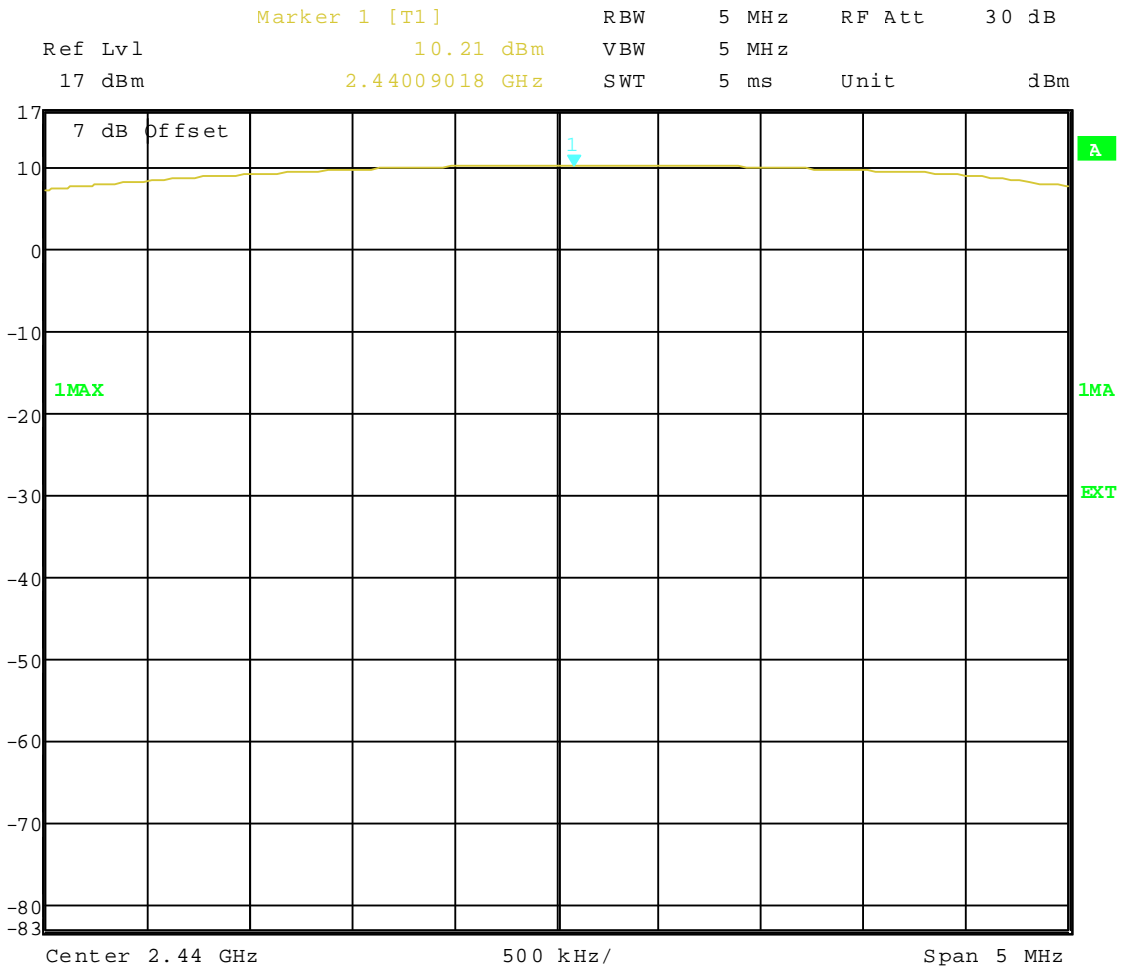
500 mW

Channel (MHz)	Plot	Measured (dBm)	Limit value (dBm)
Low	P5.2	-	29
Middle		24.2	
High		-	

Measurement results are corrected for attenuation in the set-up configuration.
 Example calculation:

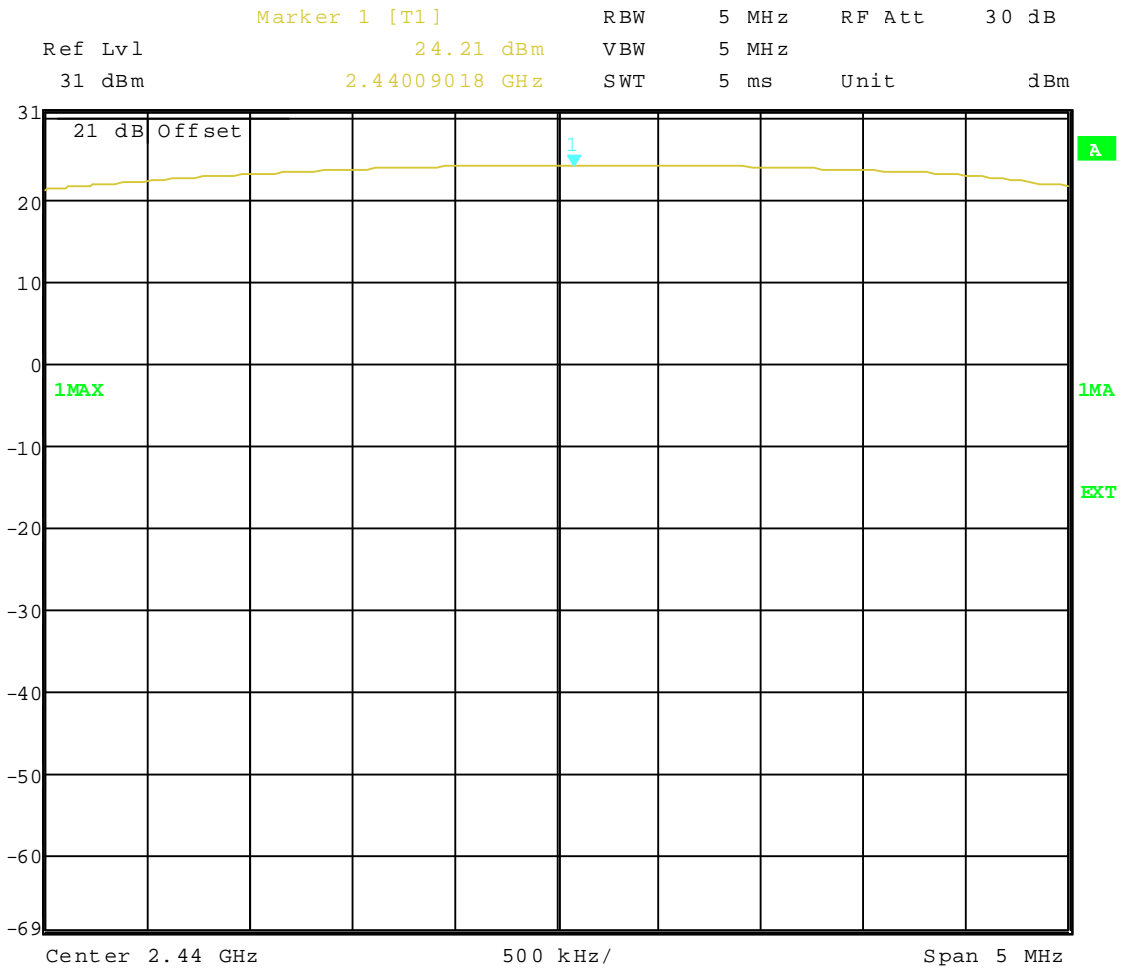
Peak output power [dBm] = Analyser reading [dBm] + cable loss [dB]

PLOT P5.1



Date: 2.MAR.2012 10:31:24

PLOT P5.2



Date: 2.MAR.2012 10:32:21

BAND EDGE COMPLIANCE

6.1 Test protocol

Date of test: 2012-01-03

CW

EUT mode of operation: continuous TX. Modulation on

Spectrum analyzer settings:

RBW: 100 kHz

VBW: 300 kHz

Sweep time: Auto

Detector: Peak

Trace: Max Hold

Channel	Plot	Results	Limit value (dBc)
Low	plot P6.1- P6.2	PASS	50
High	plot P6.3 – P6.4	PASS	50

FHSS

EUT mode of operation: continuous TX. Modulation on

Spectrum analyzer settings:

RBW: 100 kHz

VBW: 300 kHz

Sweep time: Auto

Detector: Peak

Trace: Max Hold

Channel	Plot	Results	Limit value
Low	plot P6.5	PASS	20 dBc
High	Band 2483.5 – 2485.3 ; Peak: ≤ 50.5 dB(μ V/m) AV: ≤ 50.5 dB(μ V/m) Note 1	PASS	Peak: 74.0 dB(μ V/m) AV: 54 dB(μ V/m)

Note 1

Measured according to ANSI C63.10-2009 paragraph 6.9.3.

- a) Measured output level = 105.0 dB μ V/m
- b) Δ = 54.5 dB
- c) Peak level = measured output level – Δ , (105.0 – 54.5 = 50.5 dB μ V/m)

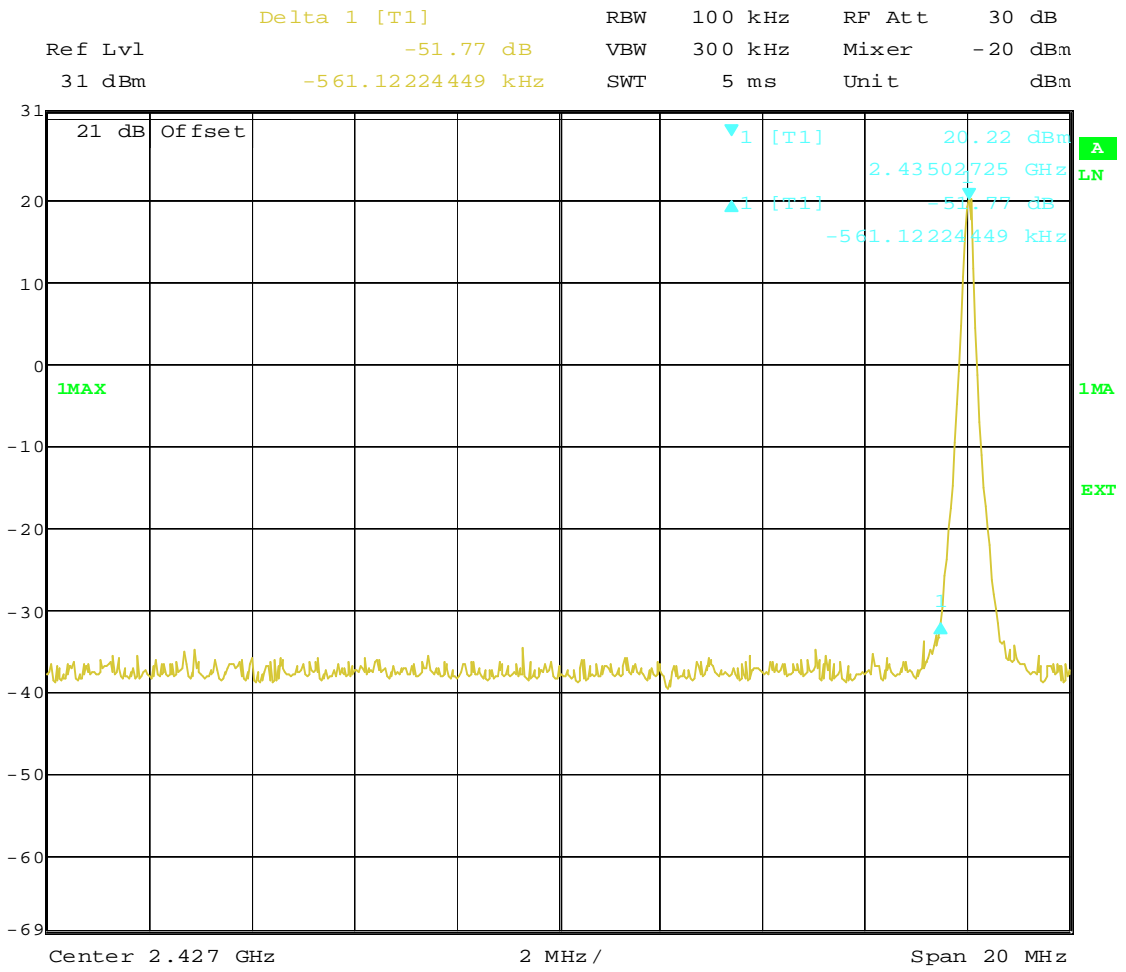
Measurement results are corrected for attenuation in the set-up configuration and antenna gain declared by the manufacturer.

Example calculation:

Measured level [dB μ V/m] = Analyser reading [dB μ V] + cable loss [dB] – preamplifier gain [dB] + antenna factor [dB/m]

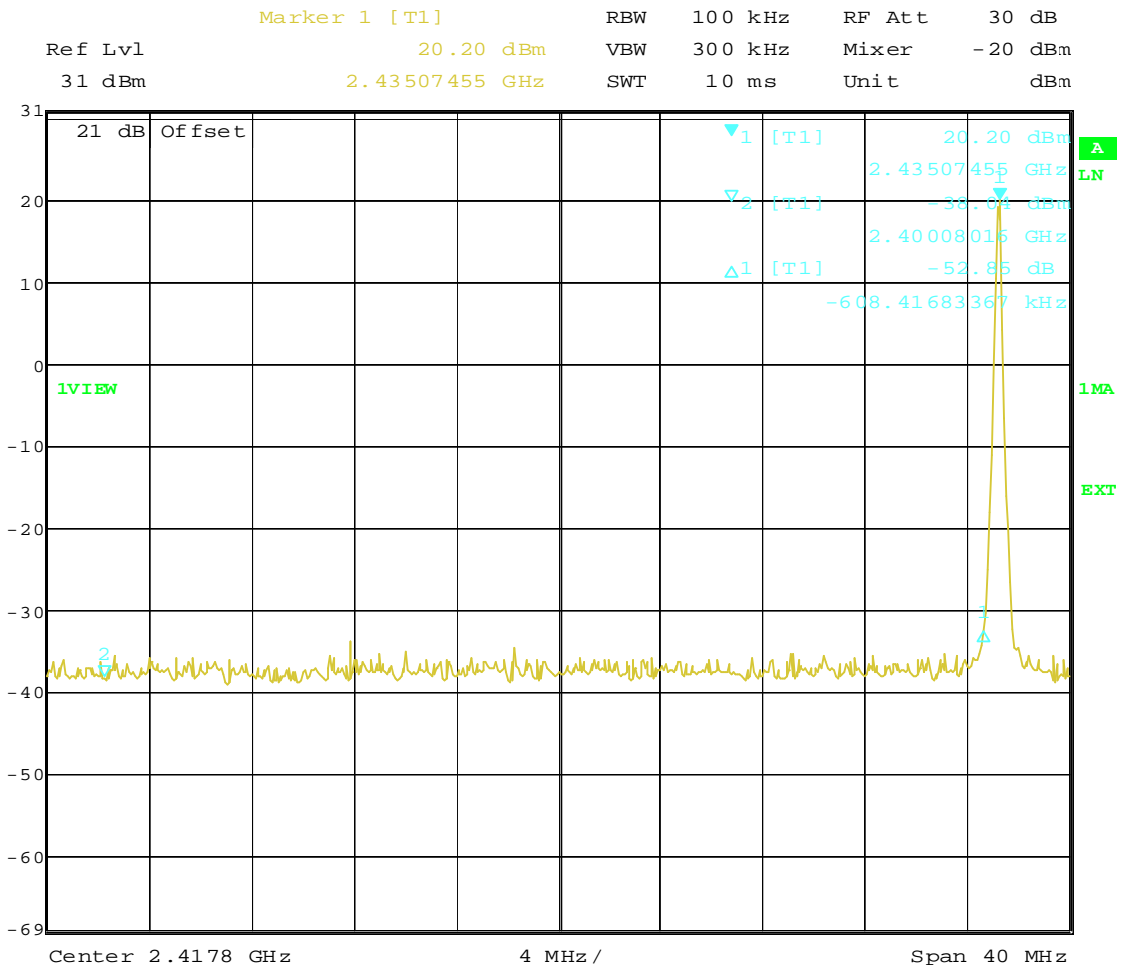
* Measured according to ANSI C63.10-2009 paragraph 6.9.3

Plot P6.1



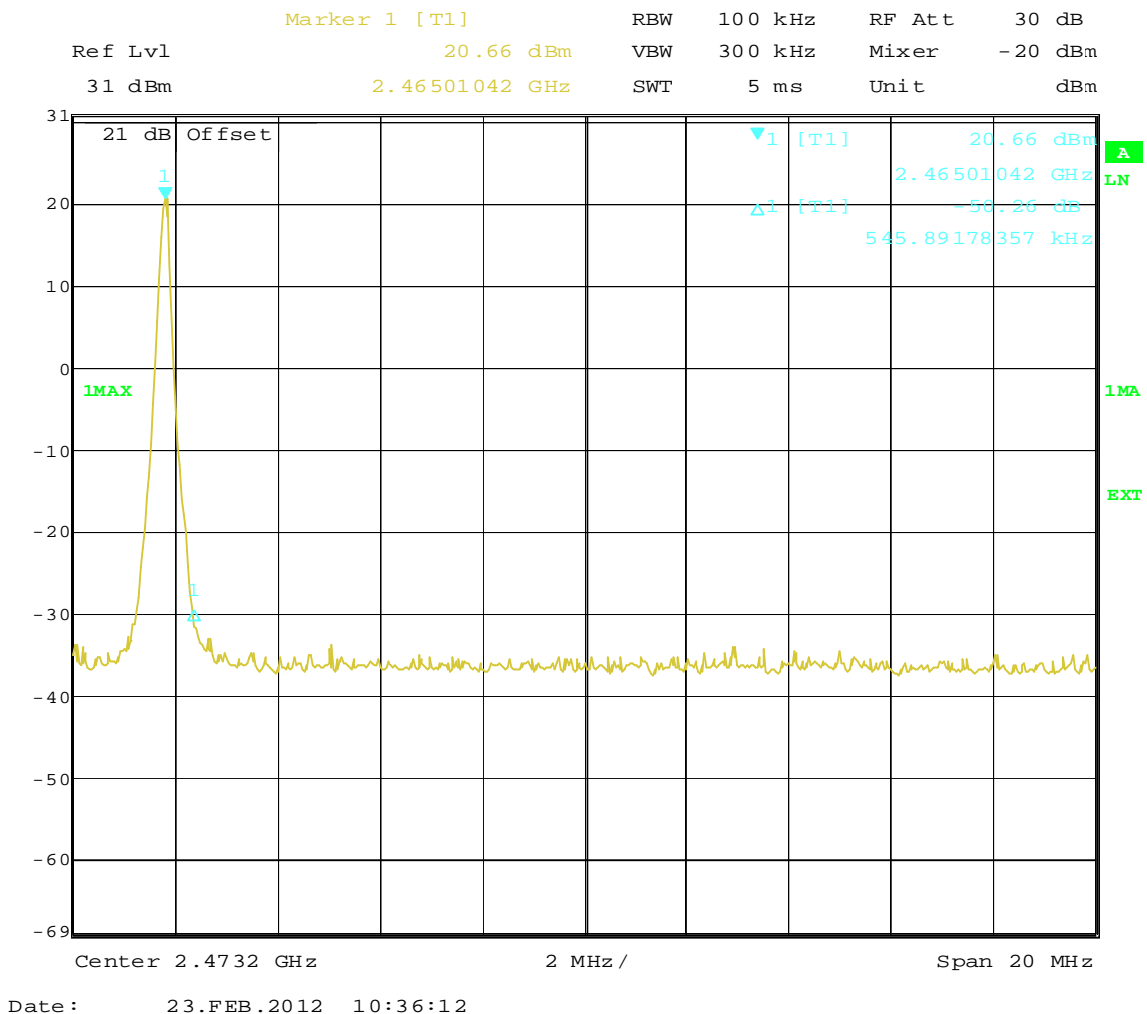
Date: 23.FEB.2012 10:29:02

Plot P6.2



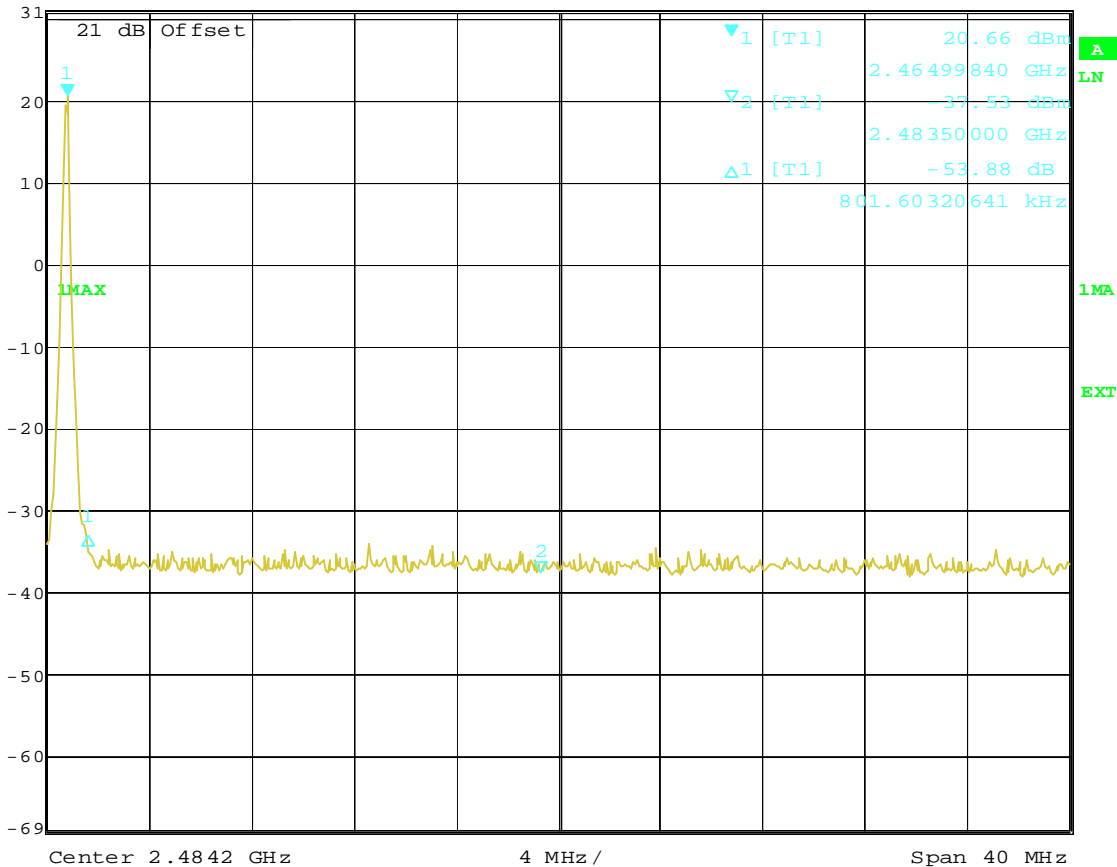
Date: 23.FEB.2012 10:30:40

Plot P6.3



Plot P6.4

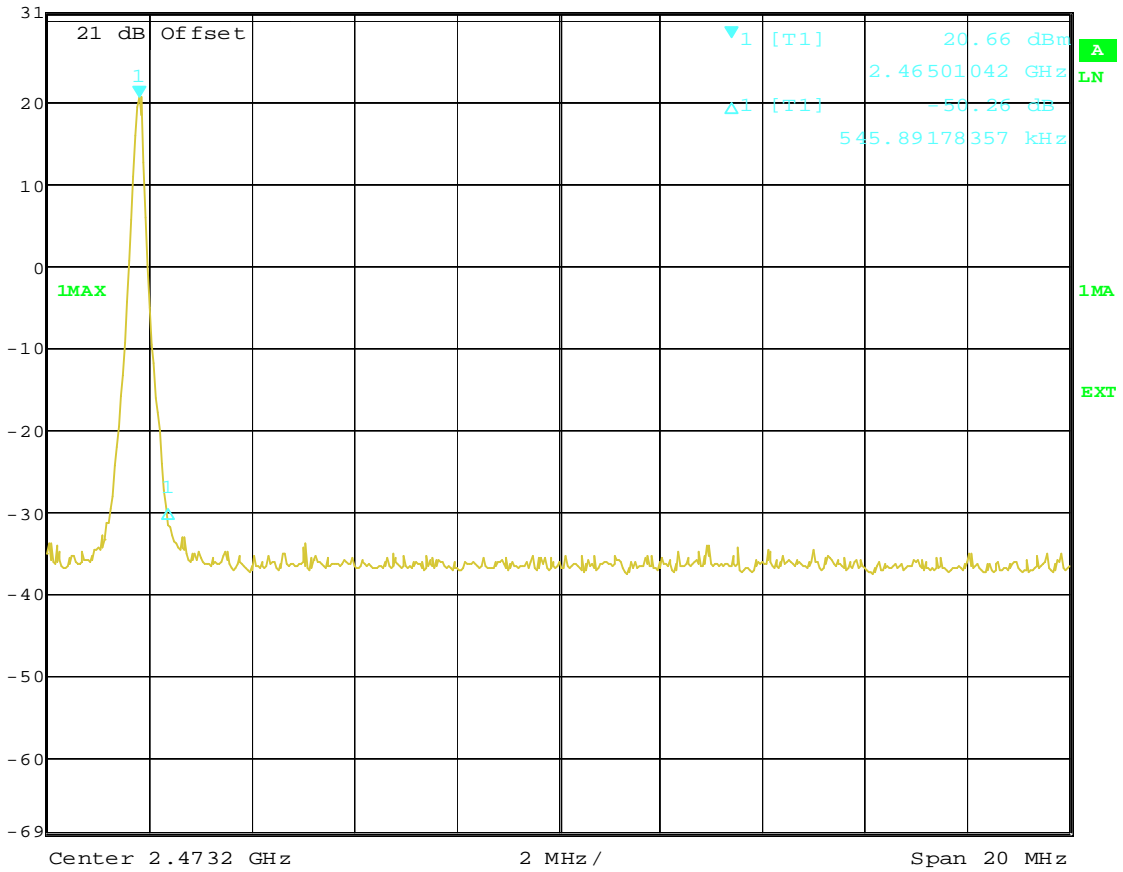
Marker 1 [T1] RBW 100 kHz RF Att 30 dB
 Ref Lvl 20.66 dBm VBW 300 kHz Mixer -20 dBm
 31 dBm 2.46499840 GHz SWT 10 ms Unit dBm



Date: 23.FEB.2012 10:34:25

Plot
P6.5

Marker 1 [T1] RBW 100 kHz RF Att 30 dB
 Ref Lvl 20.66 dBm VBW 300 kHz Mixer -20 dBm
 31 dBm 2.46501042 GHz SWT 5 ms Unit dBm



Date: 23.FEB.2012 10:36:12

9. RADIATED SPURIOUS EMISSIONS

9.1 Operating environment

Temperature: 20-25 °C (10 – 40 °C)
Relative Humidity: 25-45 % (10 - 90 %)

9.2 Measurement uncertainty

Radiated disturbance electric field intensity, 30 – 1000 MHz: ± 4,6 dB
Radiated disturbance electric field intensity, 1000 – 26000 MHz: ± 6,0 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.

Measurement uncertainty is calculated in accordance with EA-4/02-1997.
The measurement uncertainty is given with a confidence of 95%.

9.3 Test equipment

Spurious emission 30 – 26000 MHz

Test site : Big chamber

Equipment	Manufacturer	Type	SEMKO No.
Equipment	Manufacturer	Type	SEMKO No.
<i>Test site: Semi-anechoic shielded chamber</i>			30300
Software:	Rohde & Schwarz	EMC 32	
Measurement receiver:	Rohde & Schwarz	ESU 40	13178
Antenna, bilog:	Chase	CBL6111B	12474

Overview sweep 1-26 GHz

Test site: Radio anechoic shielded chamber

			12285
Software:	Rohde & Schwarz	ES-K1, V1.70	
Signal analyser:	Rohde & Schwarz	FSIQ 40	40023
Preamplifier:	MITEQ	AFS6/AFS44	12335
Antennas:			
Double Ridge Guide Horn:	EMCO	3115	4936
Horn antenna:	EMCO	3160-08	30099
Horn antenna:	EMCO	3160-09	30101
High pass filter	K & L	4410-X4500/18000-0	5133
Band rejection filter	K & L	6N45-2450/T 100-0/0	12389
Transformer	Tufvassons	AFM-1500	30317

9.4 Measurement set-up

Test site: Big semi anechoic shielded chamber (30 – 1000 MHz)

The EUT was placed on a non-metallic table, 1.5 m above the floor. The radiated power was measured at a distance of 3 m. An overview sweep with peak detection was performed with the measurement receiver in max-hold and with the antenna placed 1.5 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps. The specified test mode was enabled.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed in a semi anechoic chamber. With the EUT and antenna in the worst-case configuration new peak measurements were carried out.

Test setup photo,

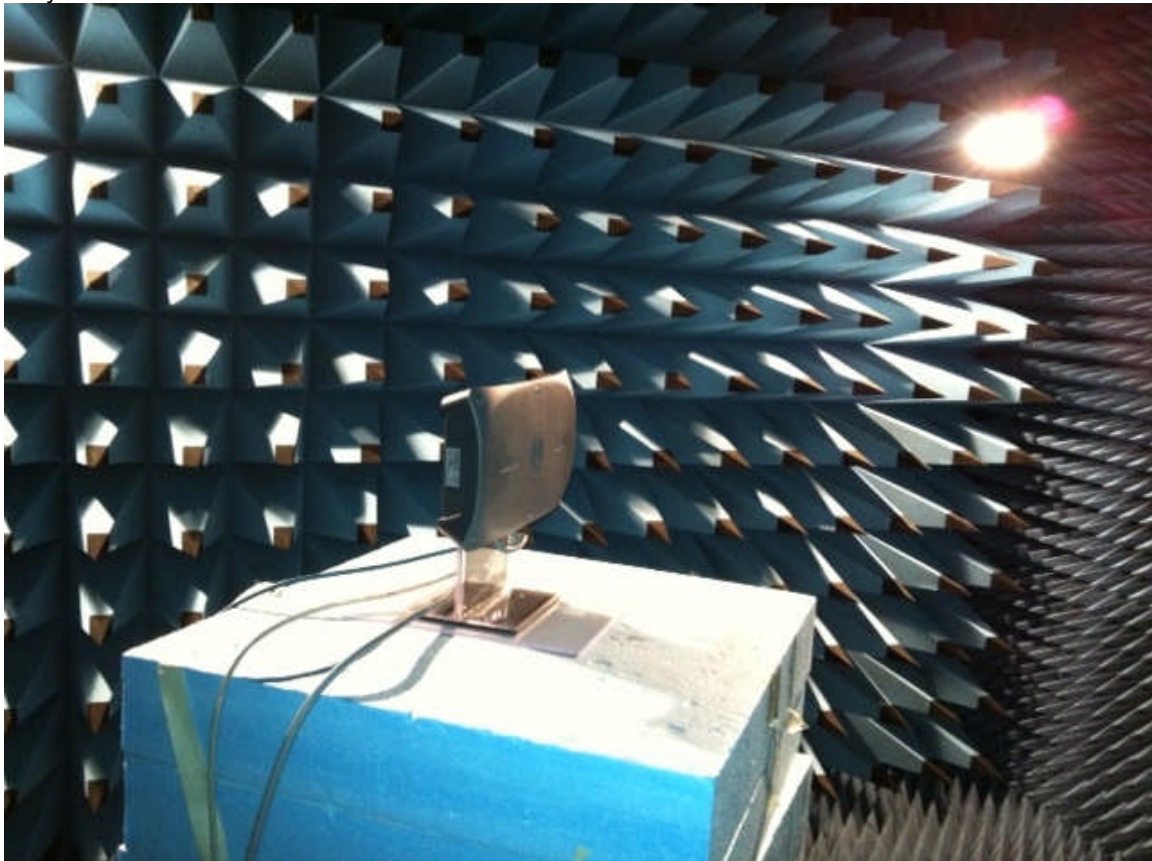


Test site: Big anechoic shielded chamber (1 – 10 GHz)

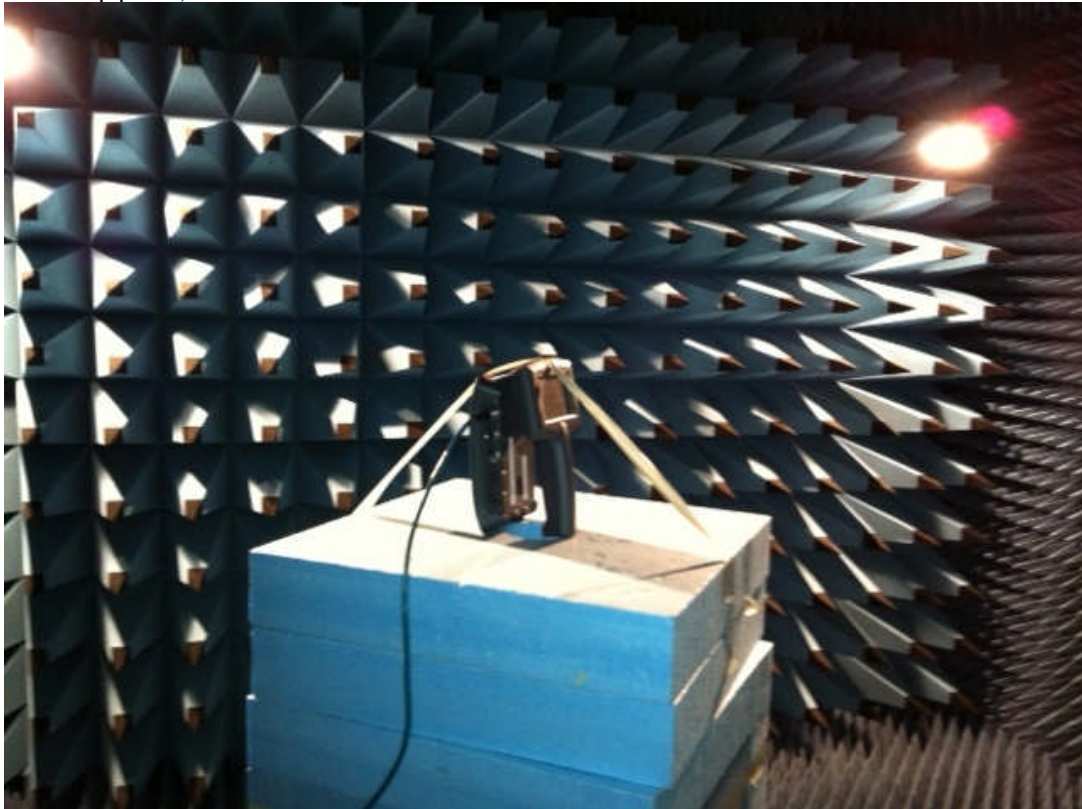
The overview sweep where made in a fully anechoic shielded chamber. In the fully anechoic shielded chamber the EUT was placed on a non-metallic table, 1.5 m above the floor. The radiated power was measured at a distance of 3 m. An overview sweep with peak detection was performed with the measurement receiver in max-hold and with the antenna placed 1.5 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps. The specified test mode was enabled.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new peak measurements were carried out in a semi anechoic chamber

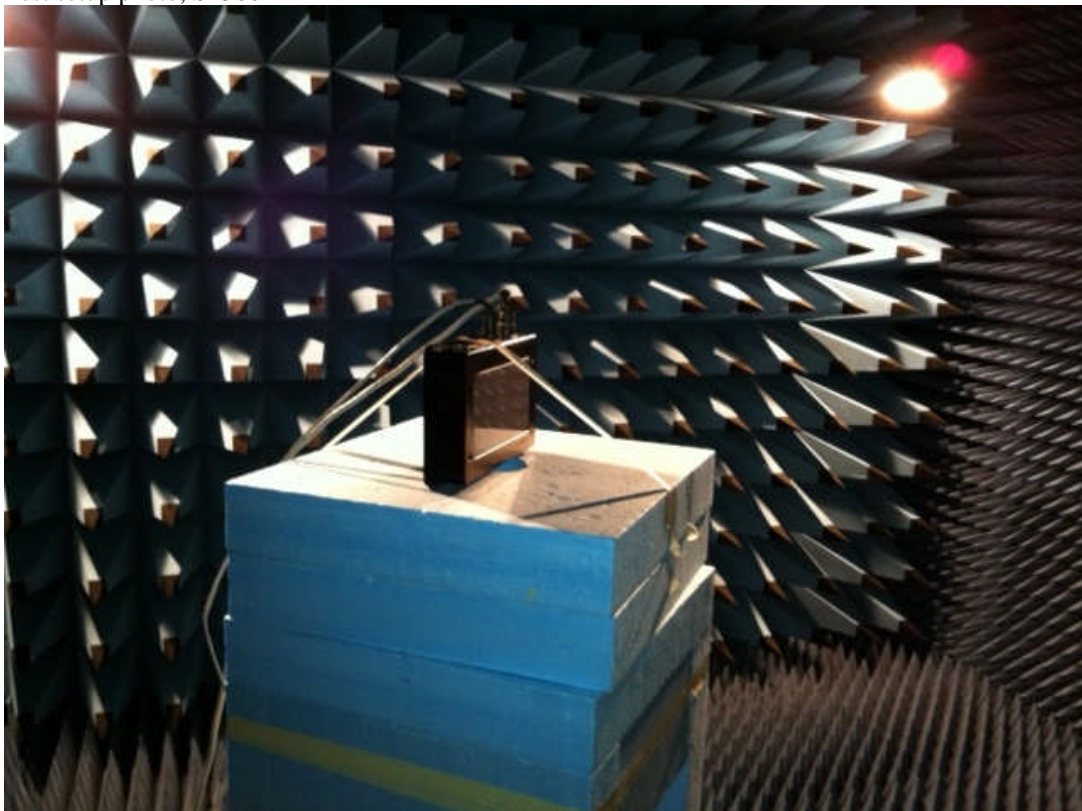
Test set-up photo,
Fully anechoic chamber:



Test setup photo, HR-2



Test setup photo, S1566



1 – 26 GHz semi anechoic chamber



9.5 Test protocol

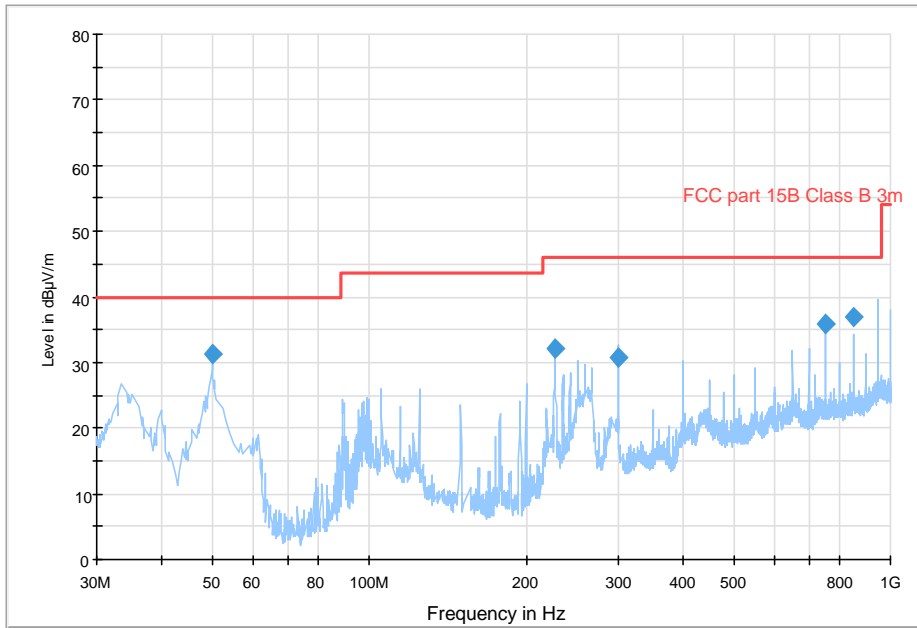
Semi-anechoic shielded chamber

Date of test: 2012-01-02

LR-6

30 – 1000 MHz, max peak at a distance of 3 m on the middle TX channel

FCC 30 - 1000 MHz FCC class B 3m



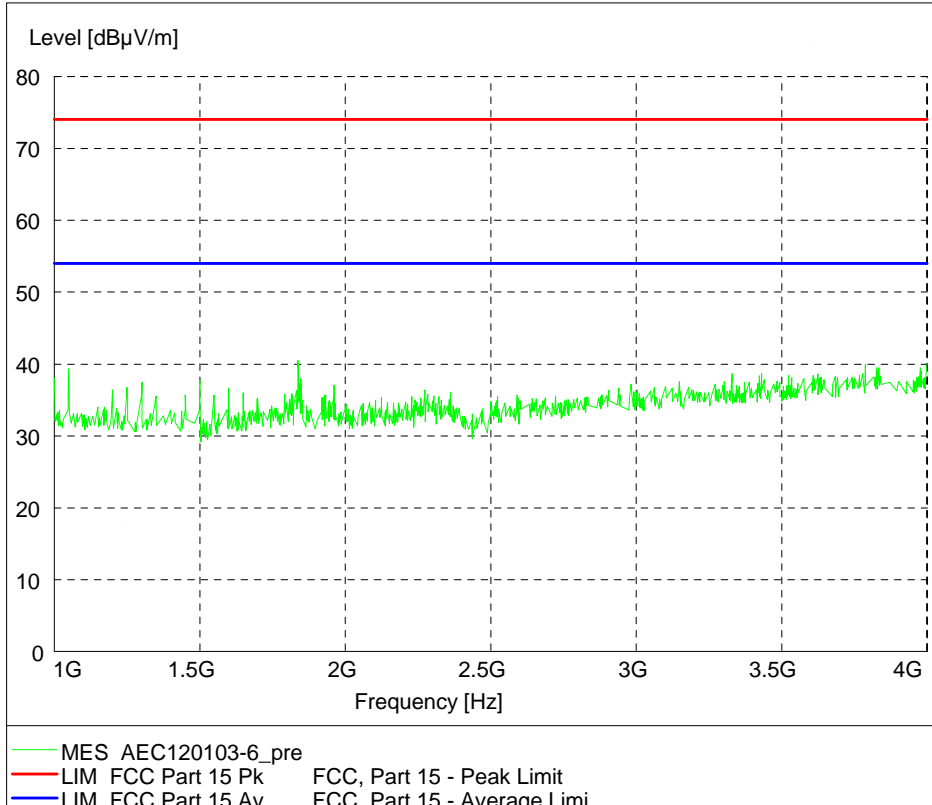
Radio anechoic shielded chamber

Date of test: 2012-01-03

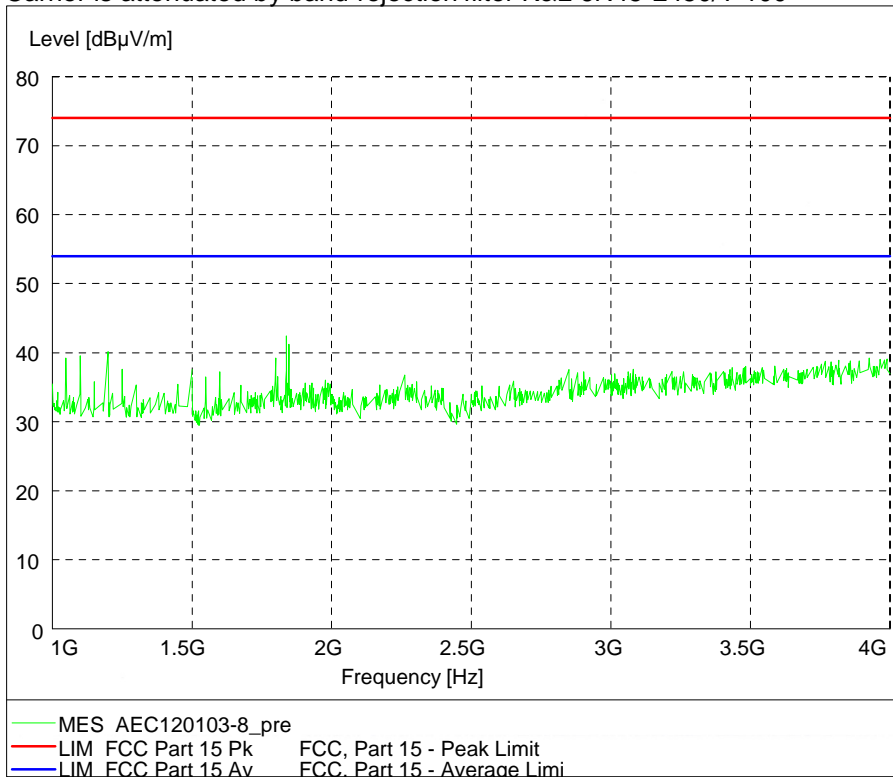
LR-6

1000 – 4000 MHz, max peak at a distance of 3 m on the middle TX channel

Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0



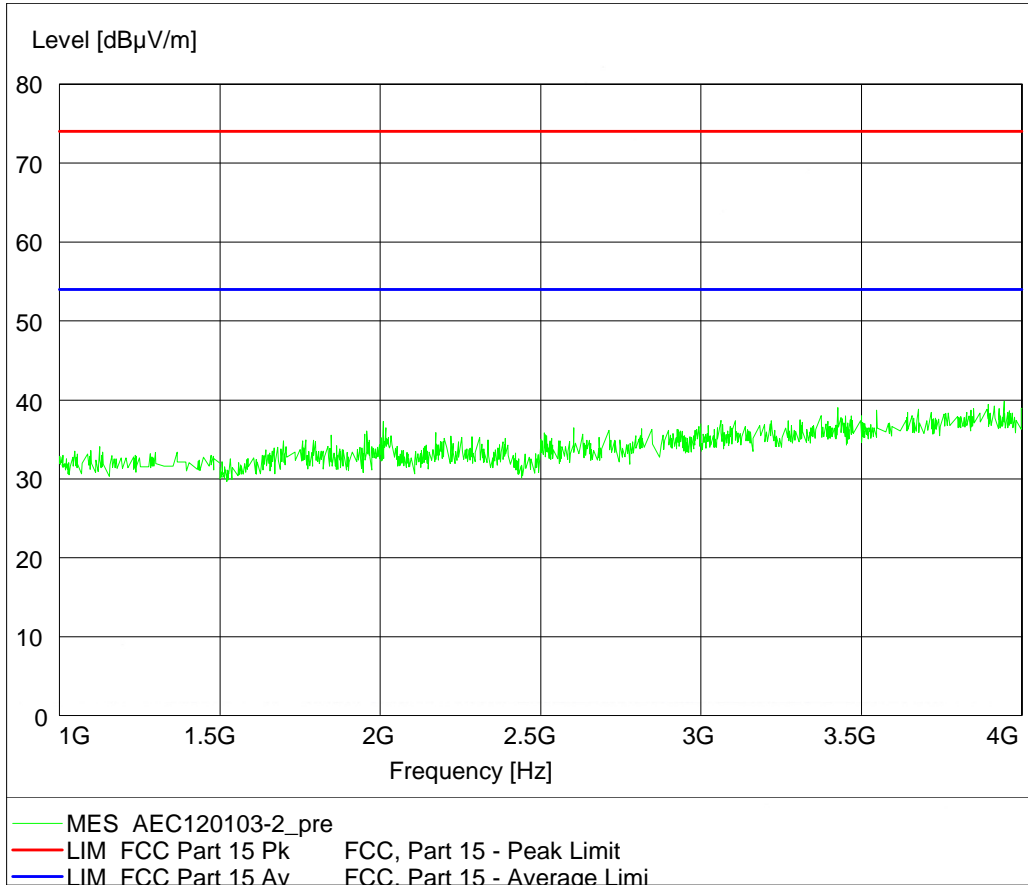
HR-2
1000 – 4000 MHz, max peak at a distance of 3 m on the middle TX channel
Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-



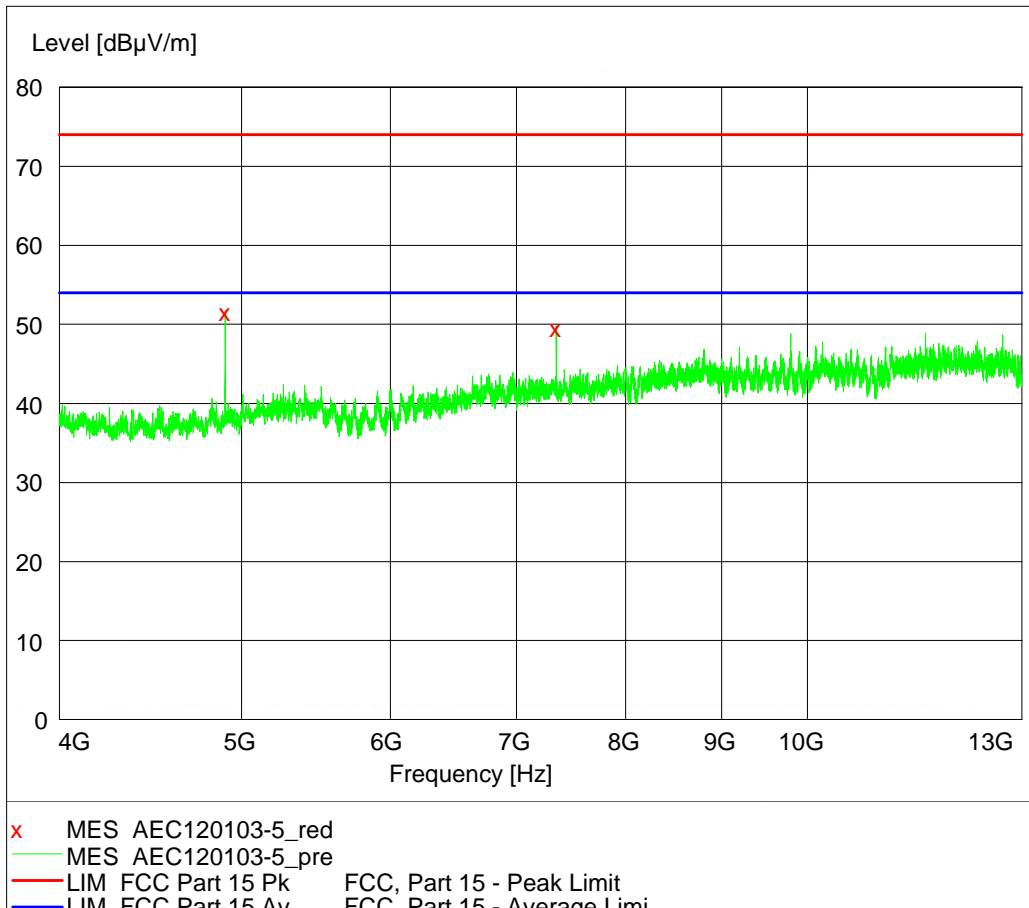
S1566

1000 – 4000 MHz, max peak at a distance of 3 m on the middle TX channel

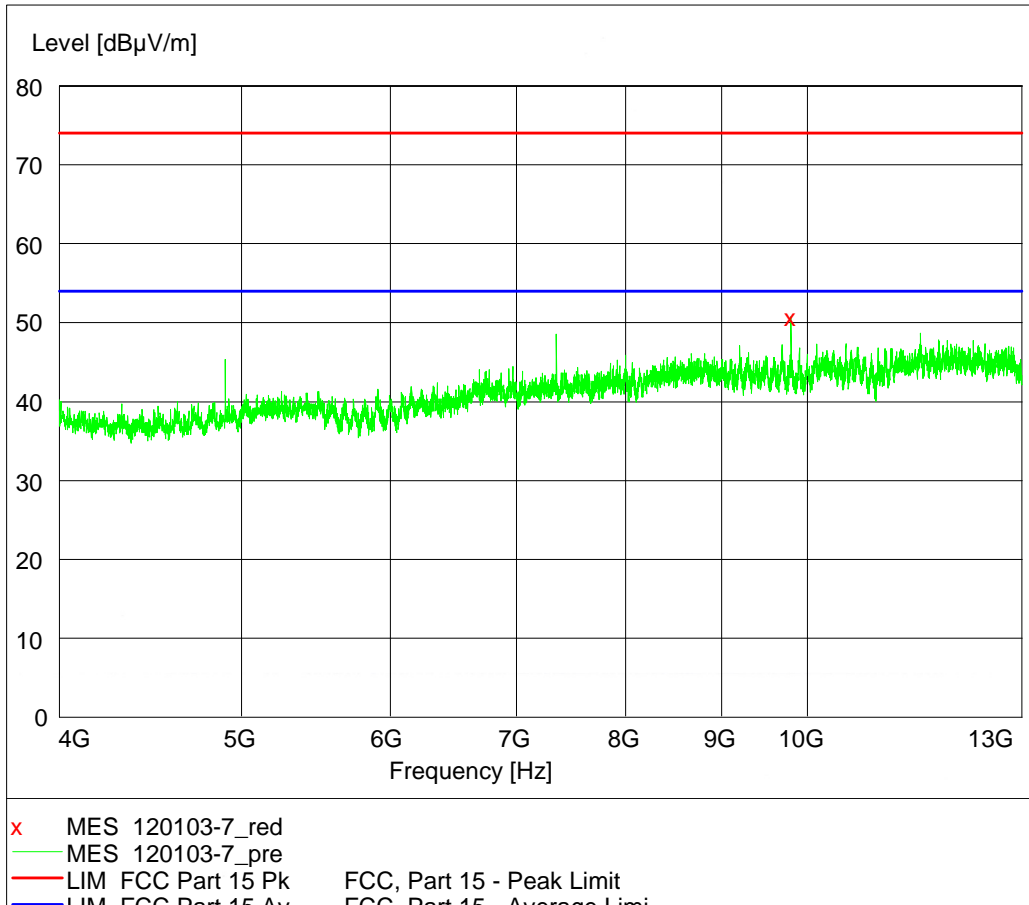
Carrier is attenuated by band rejection filter K&L 6N45-2450/T 100-0/0



LR-6
 4000 – 13000 MHz, max peak at a distance of 3 m on the middle TX channel
 Emissions below 4000 MHz are attenuated by high-pass filter K&L 4410-X4500/18000-0



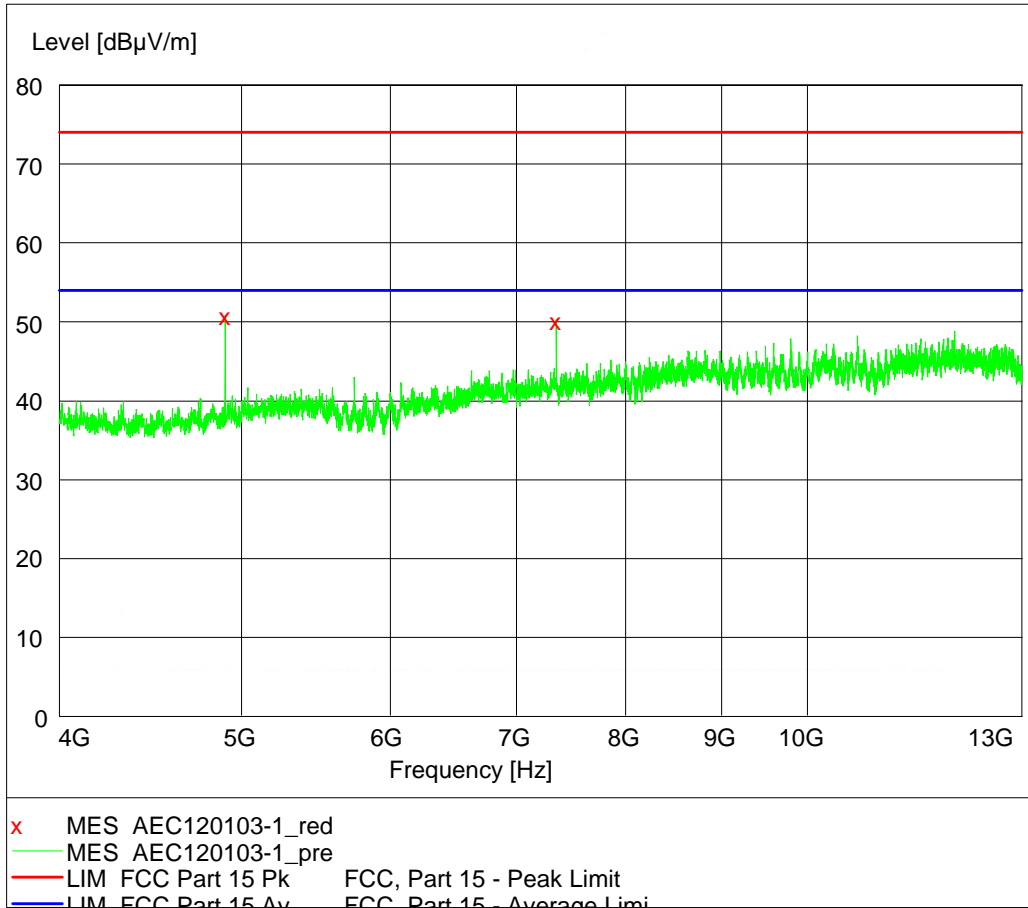
HR-2
4000 – 13000 MHz, max peak at a distance of 3 m on the middle TX channel
Emissions below 4000 MHz are attenuated by high-pass filter K&L 4410-X4500/18000-0



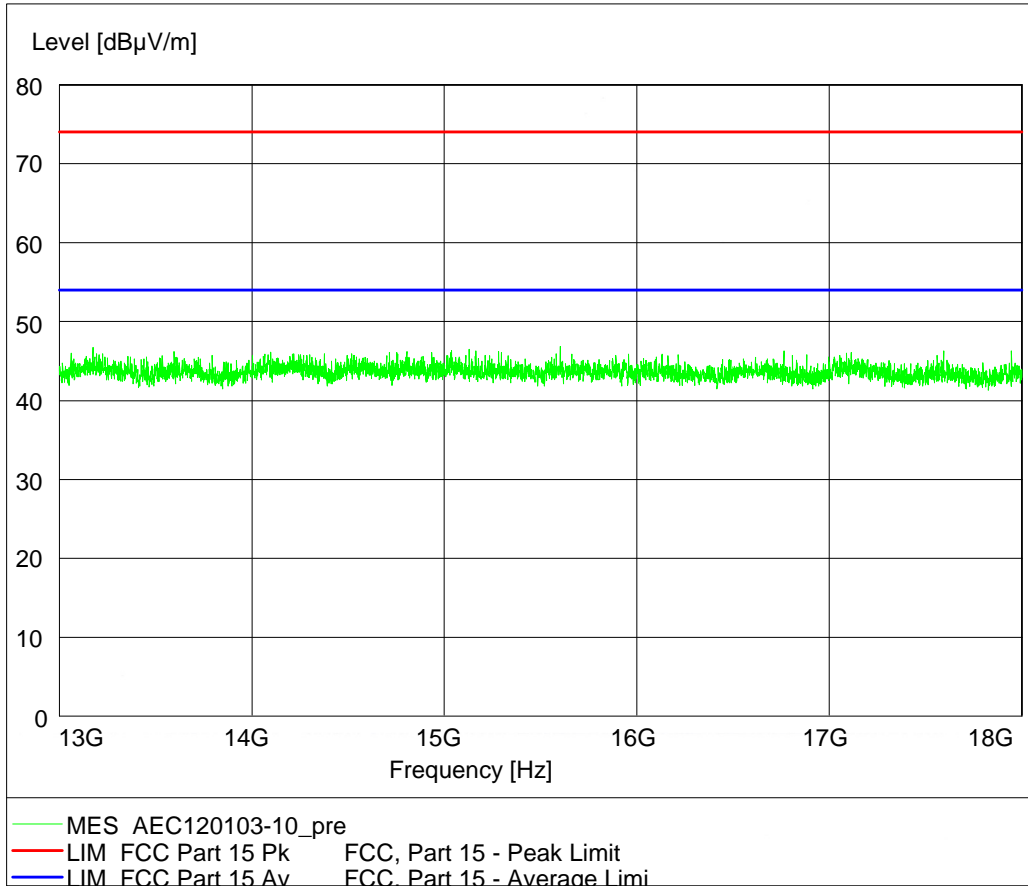
S1566

4000 – 13000 MHz, max peak at a distance of 3 m on the middle TX channel

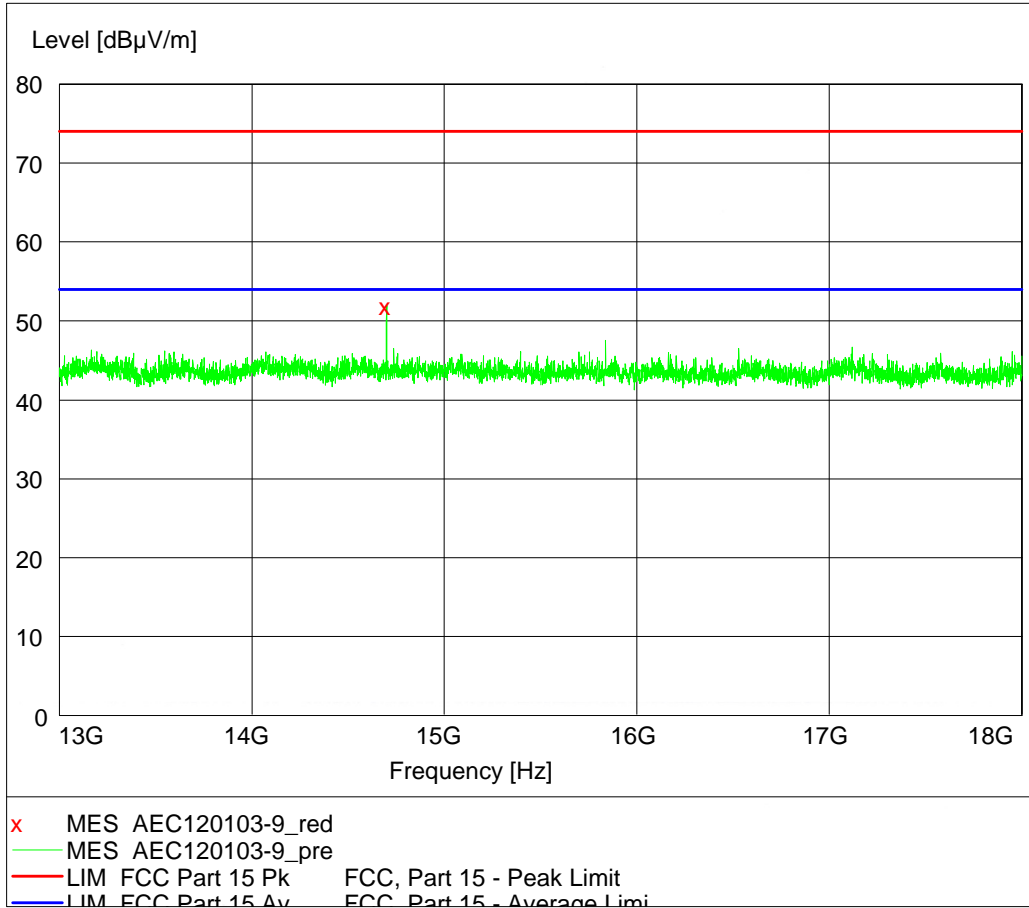
Emissions below 4000 MHz are attenuated by high-pass filter K&L 4410-X4500/18000-0



LR-6
13000 – 18000 MHz, max peak at a distance of 3 m on the middle TX channel

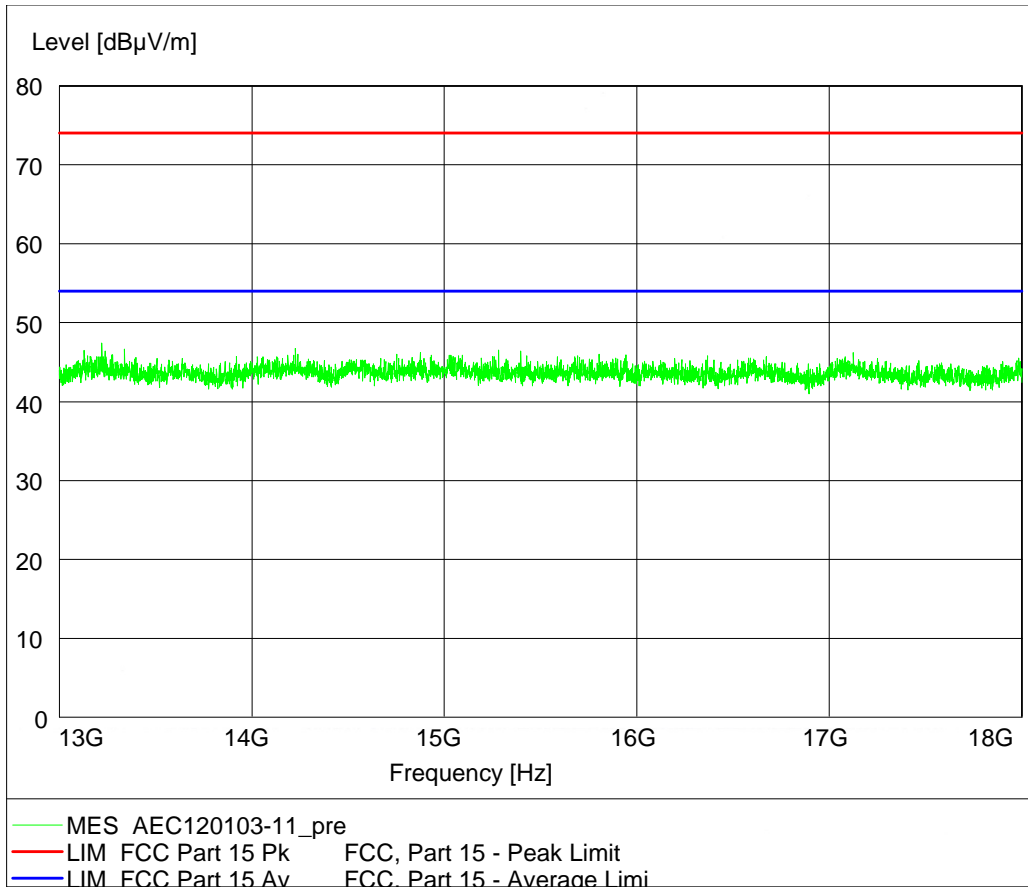


HR-2
13000 – 18000 MHz, max peak at a distance of 3 m on the middle TX channel

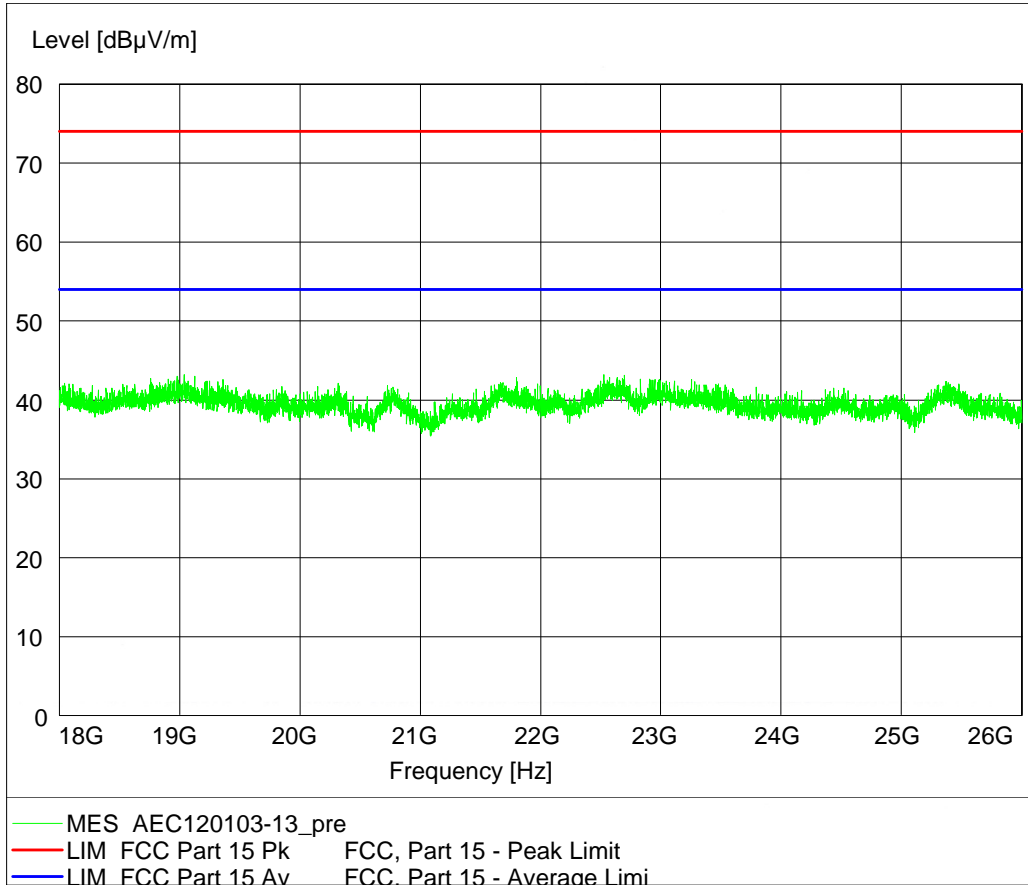


S1566

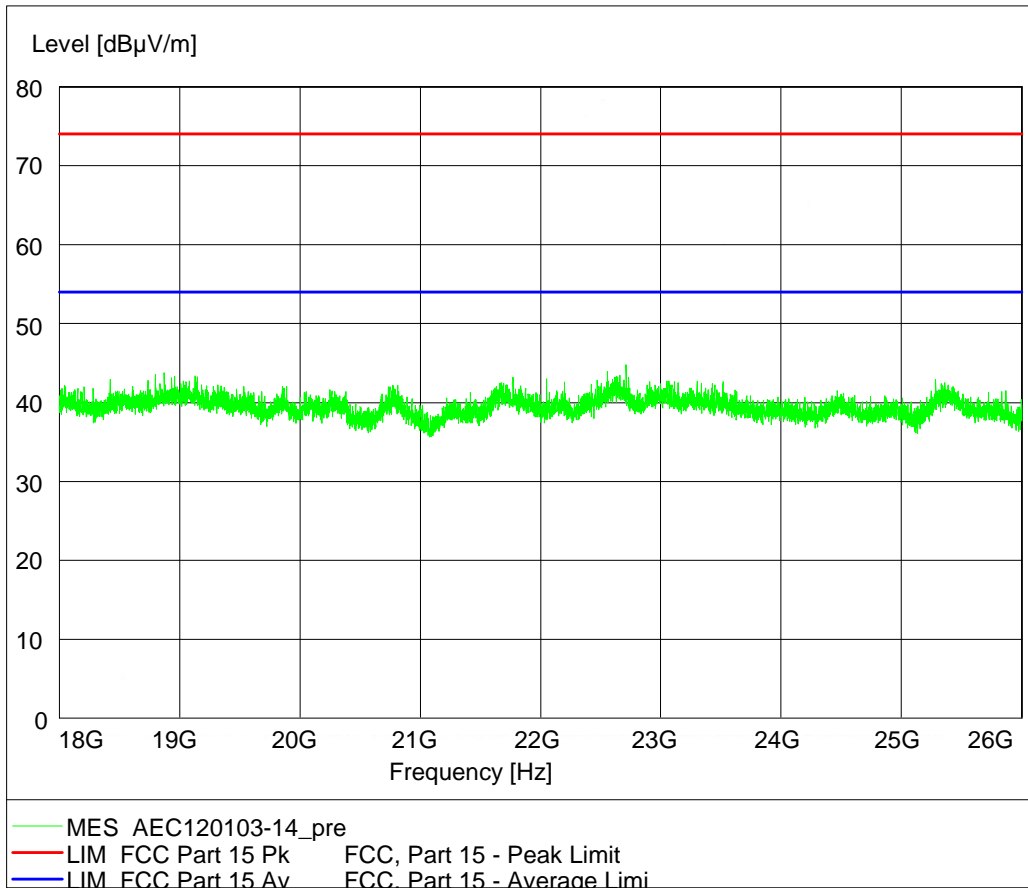
13000 – 18000 MHz, max peak at a distance of 3 m on the middle TX channel



LR-6
18000 – 26000 MHz, max peak at a distance of 3 m on the middle TX channel

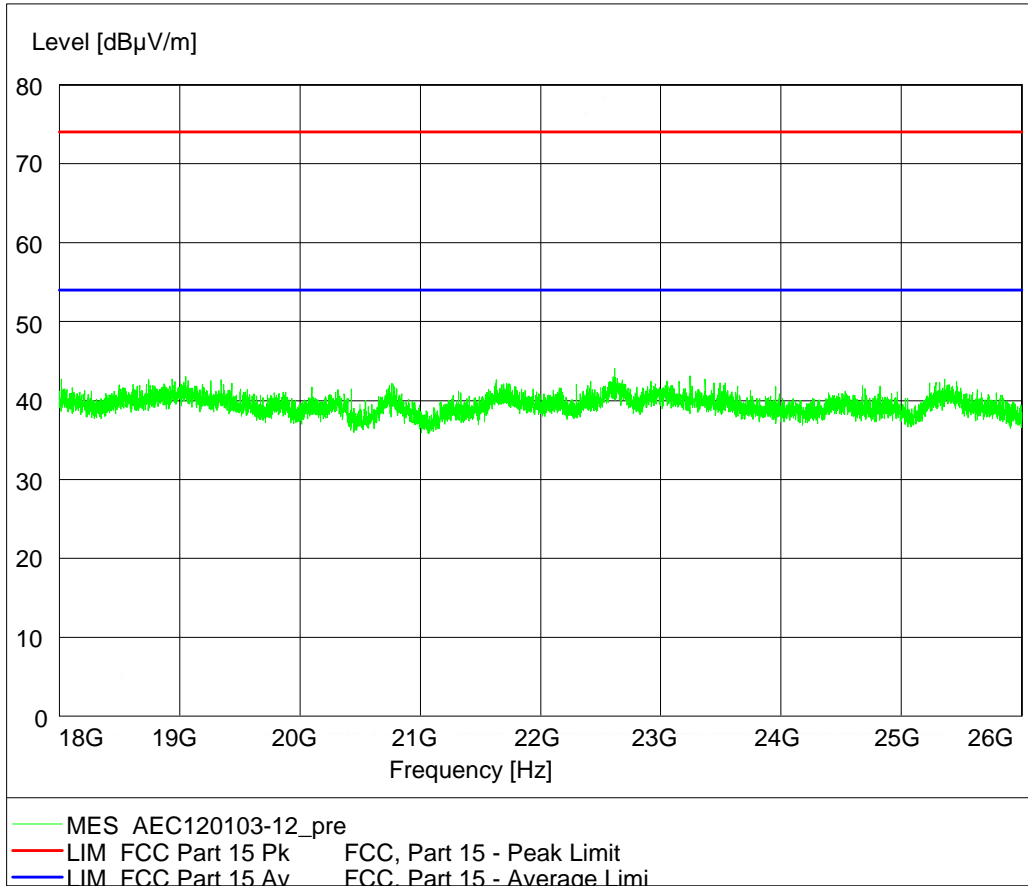


HR-2
18000 – 26000 MHz, max peak at a distance of 3 m on the middle TX channel



S1566

18000 – 26000 MHz, max peak at a distance of 3 m on the middle TX channel



Data summary
LR-6

Field strength of spurious emissions middle channel					
Frequency [MHz]	Measured level		Limit		Note
	QP/Peak [dB(μV/m)]	AV [dB(μV/m)]	Peak [dB(μV/m)]	AV [dB(μV/m)]	
50.00	31.2	-	40.0	-	
227.61	32.1	-	46.0	-	
299.99	30.8	-	46.0	-	
750.00	35.9	-	46.0	-	
849.99	37.1	-	46.0	-	
4899.80	53.8	53.8	74.0	54.0	1
7349.80	40.8	40.8	74.0	54.0	
18000 - 26000	-	-	74.0	54.0	No peaks above noise floor

Note 1

The measured result is below the upper limit, but by a margin less than half of the uncertainty interval. It is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance is more probable than non-compliance

Example calculation:

Measured level [dBμV/m] = Analyser reading [dBμV] + cable loss [dB] – preamplifier gain [dB] + antenna factor [1/m]

APPENDIX – PHOTOS OF THE EUT

LR 6

