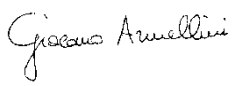
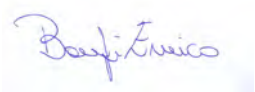
TEST REPORT

APPLICANT	Openmatics s.r.o. Poděbradova 2842/1, 301 00 Plzeň, Czech Republic Telephon: +42 0371150807	
APPLICANT REFEREE	Jan Beseda (jan.beseda@zf.com)	
EUT DESCRIPTION	**Bluetooth telemetry device**	
EUT MODEL	**deTAGtive logistics TAG 2**	
EUT PART NUMBER	**0501.222.811**	
EUT FCC ID	**2AIQK-TAG2**	
EUT TRADEMARK	deTAGtive	
MANUFACTURER	Openmatics s.r.o	
REFERENCE STANDARDS	**47 CFR FCC part 15.247**	
TEST REPORT NUMBER	FCCTR_161298-3	
TEST REPORT ISSUE DATE	22/09/2017	
TESTING LABORATORY	Prima Ricerca & Sviluppo S.r.l. Via Campagna, 92 -22020 Faloppio (Co) – Italy FCC test registration number: 421808	
TESTING LOCATION	As Above	
DATE OF TEST SAMPLE RECEIPT	21/06/2016	
DATE OF TEST	28-29/07/2016, 22/06/2017	
TESTED BY	Giacomo ARMELLINI Responsabile Laboratorio EMC e RADIO/ *EMC and RADIO Laboratory Manager*	
APPROVED BY	Enrico BANFI Coordinatore Laboratori / *Laboratory Manager*	

The test results reported in this test report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample may be said to have be obtained.
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0. CONTENTS

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1. RELEASE CONTROL RECORD

TEST REPORT NUMBER	REASON OF CHANGE	DATE OF ISSUE
FCCTR_161298-0	Original release	28/09/2016
FCCTR_161298-1	Editorial Change	22/06/2017

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2. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)

2.1 Identification

Trademark:	deTAGtive
Manufacturer:	OPENMATICS s.r.o.
Type of Equipment :	Bluetooth telemetry device
Model name:	deTAGtive logistics TAG 2
Part Number	0501.222.811
Serial number :	H236.00.000.402
FCC ID	2AIQK-TAG2
Country of manufacturer:	Czech Republic
Marking Label	

2.2 Technical data

Product type:	Radio Equipment
Radio type:	Intentional radiators
Product description / application	Bluetooth telemetry device
Power supply requirements :	3V (internal battery)
Operating Frequency range	2400-2483.5MHz
Operating Frequency:	From 2402MHz to 2480MHz
Channel bandwidth	2MHz
Channel spacing	2MHz
Number of Channel	40
Modulation Type	GFSK
Antenna Type	Texas Instruments Integrated PCB 2.4 GHz Inverted F Antenna
Antenna Gain	+3.3dB

Note: FCC classifies Bluetooth LE as a system using digital modulation techniques.

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2.3 Ports identification

This section contains descriptions of all signal ports and AC/DC power input/output ports, the length and the type of the cable provided by manufacturer needed for the tests. Moreover it is specified if the ports are ever or optionally connected.

Port		Description	Connection
1	**Enclosure**	Plastic	Snaps
2	**AC Power Supply**	Port Not present	-----
3	**DC power supply**	Port Not present (internal battery)	-----
4	**Signal lines**	Port Not present	-----
5	**Telecomm. Lines**	Port Not present	-----
6	**Antenna port**	Port Not present	-----
Note: During the tests all cables must be what provided the manufacturer or the same that used in the real employment of the EUT.			

2.4 Auxiliary equipment

- None

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3. OPERATING TEST MODES AND CONDITIONS

In the following table there are the operating conditions adopted during tests identified by an indicator (#..) at which has been referred the item “Operating condition of the equipment under test”

Operating condition	*Description*
#1	*Continuous transmission, modulated carrier, on channel 0*
#2	*Continuous transmission, modulated carrier, on channel 19*
#3	*Continuous transmission, modulated carrier, on channel 39*

Special Test Software:

the Applicant provided an App on auxiliary tablet in order to set the EUT in continuous transmission mode on the lowest middle and highest channel

Special Hardware Used: None

Transmitter Test Antenna: The EUT has been tested with the antenna fitted in a manner typical of normal intended use as integral antenna equipment as described with the test results.

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4. REFERENCE STANDARD / DOCUMENT FOR PERFORMED TESTS

Cfr 47 part 15 subpart C par. 15.247	Radio Frequency Devices – Intentional Radiators Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz
ANSI C63.10:2013	American National Standard for Testing Unlicensed Wireless Devices
558074 D01 DTS Meas Guidance v04	Guidance for performing Compliance measurements on Digital Transmission Systems (DTS) Operating under §15.247

5. SUMMARY OF TEST RESULTS

Port	Phenomena	Basic standard	Operating condition[1]	Result
Antenna port	Antenna requirement	FCC Part 15 §15.203, §15.204	---	Compliant
	Maximum Peak Output Power	FCC Part 15 §15.247 (b) (3)	#1, #2, #3	Within the limit
	6 dB Bandwidth	FCC Part 15 §15.247 (a) (2)	#1, #2, #3	Within the limit
	Power Spectral Density	FCC Part 15 §15.247 (e)	#1, #2, #3	Within the limit
	Band-Edge	FCC Part 15 § 15.247 (d)	#1,#3	Within the limit
	RF radiated Spurious Emissions at the Transmitter Antenna Terminal	FCC Part 15 § 15.247 (d) (§§15.205, 15.207, 15. 209)	#1, #3	Within the limit

Note: FCC classifies Bluetooth LE as a system using digital modulation techniques.

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6. TEST RESULTS

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TEST 1.

ANTENNA REQUIREMENTS

REFERENCE DOCUMENT

According to §15.203 / 15.204

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sec. 15.211, Sec. 15.213, Sec. 15.217, Sec. 15.219, or Sec. 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Sec. 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded

Antenna requirement
The EUT have an integrated PCB wired antenna
RESULT: COMPLIANT

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TEST 2.

MAXIMUM PEAK OUTPUT POWER

REFERENCE DOCUMENT

According to §15.247(b) (3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

TEST SETUP	In according to ref std
TEST LOCATION	Semi Anechoic Chamber / Radio test Area
TEST METHOD	KDB 558074 D01 par. 9.1.1 Maximum peak conducted output power KDB 558074 D01 sec 3 par. 2
TYPE OF MEASUREMENT	RADIATED
TEST EQUIPMENT	Emi Receiver / Spectrum Analyzer Rohde&Schwarz mod. ESU40 Horn Antenna EMCO-6961
TEST PERFORMED BY	Giacomo Armellini
TESTING DATE	22 June 2017

TEST CONDITIONS:			**MEASURED**
Ambient temperature :	23℃ ± 5℃		24℃
Ambient humidity :	25 – 75 %rH		45%
Pressure :	85 – 106 kPa	(860 mbar – 1060 mbar)	960mbar

OPERATING CONDITION	#1, #2, #3 DUTY CYCLE 100%

TEST RESULT	**WITHIN THE LIMITS**

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MEASUREMENT PARAMETER	
Resolution bandwidth:	1MHz
Video bandwidth:	3MHz
Span:	4MHz
Sweep time	Auto couple
Detector:	Peak
Trace-Mode:	Max. hold

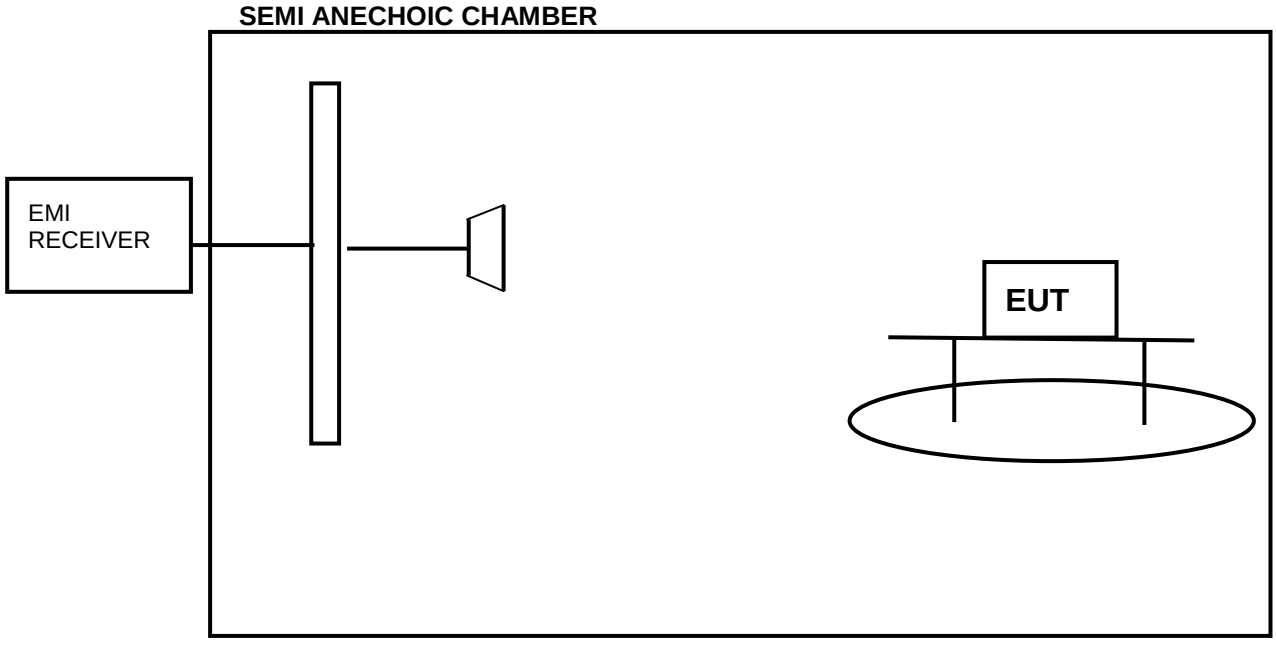
TEST DESCRIPTION

Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously - rotating, remotely - control led turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency.
The EUT is placed at test table.
For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m

Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m~4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3m.

This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

TEST SETUP BLOCK DIAGRAM



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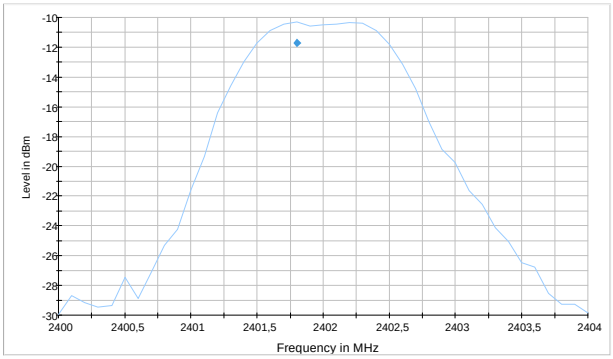
Channel	Frequency (MHz)	EIRP (dBm)	Antenna Gain	Max Conducted Output power	Limit (dBm)	Result
0	2402	-8.36	+3.3	-11.66	30	WITHIN THE LIMITS
19	2440	-6.06	+3.3	-9.36		
39	2480	-10.16	+3.3	-13.46		
Incertezza di misura / Measurement Uncertainty : ± 3 dB						
Note: none						

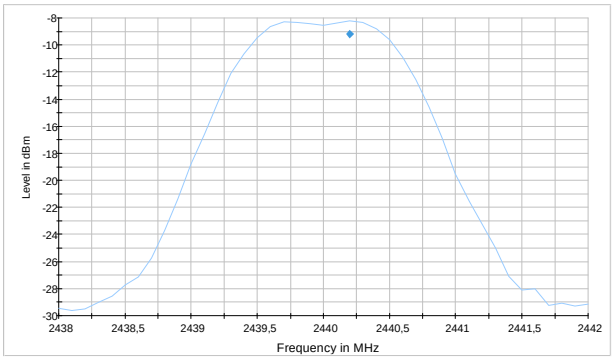
GRAPHICS

Ch 0 – Freq 2402MHz



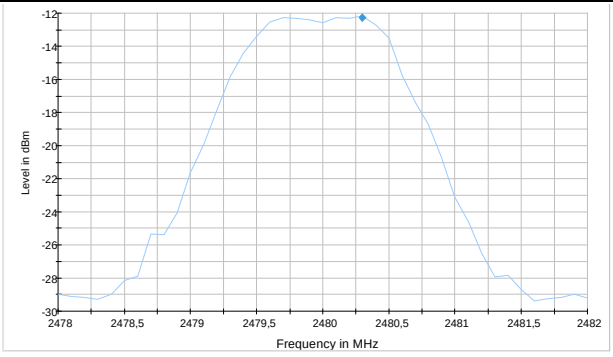
Frequency (MHz)	ERP (dBm)	EIRP (dBm)	Height (cm)	Pol.	Azimuth (deg)
2401.800000	-10.5	-8.36	118.0	V	158.0

Ch 19 – Freq 2440MHz



Frequency (MHz)	ERP (dBm)	EIRP (dBm)	Height (cm)	Pol.	Azimuth (deg)
2439.700000	-8.2	-6.06	102.0	V	101.0

Ch 39 - Freq 2480MHz



Frequency (MHz)	ERP (dBm)	EIRP (dBm)	Height (cm)	Pol.	Azimuth (deg)
2480.300000	-12.3	-10.16	102.0	V	90.0

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TEST 3.

6dB CHANNEL BANDWIDTH

REFERENCE DOCUMENT

According to §15,247(a)(2), Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483,5 MHz, and 5725-5850 MHz bands, The minimum 6 dB bandwidth shall be at least 500 kHz,

TEST SETUP	In according to ref std
TEST LOCATION	Semi Anechoic Chamber
TEST METHOD	KDB 558074 D01 par. 8.2 DTS Bandwidth Option 2
TYPE OF MEASUREMENT	RADIATED
TEST EQUIPMENT	Emi Receiver / Spectrum Analyzer Rohde&Schwarz mod. ESU40 Horn Antenna EMCO-6961
TEST PERFORMED BY	Giacomo Armellini
TESTING DATE	28 July 2016

TEST CONDITIONS:			**MEASURED**
Ambient temperature :	23℃ ± 5℃		24℃
Ambient humidity :	25 - 75 %rH		45%
Pressure :	85 - 106 kPa	(860 mbar - 1060 mbar)	960mbar

OPERATING CONDITION	#1, #2, #3

TEST RESULT	**WITHIN THE LIMITS**

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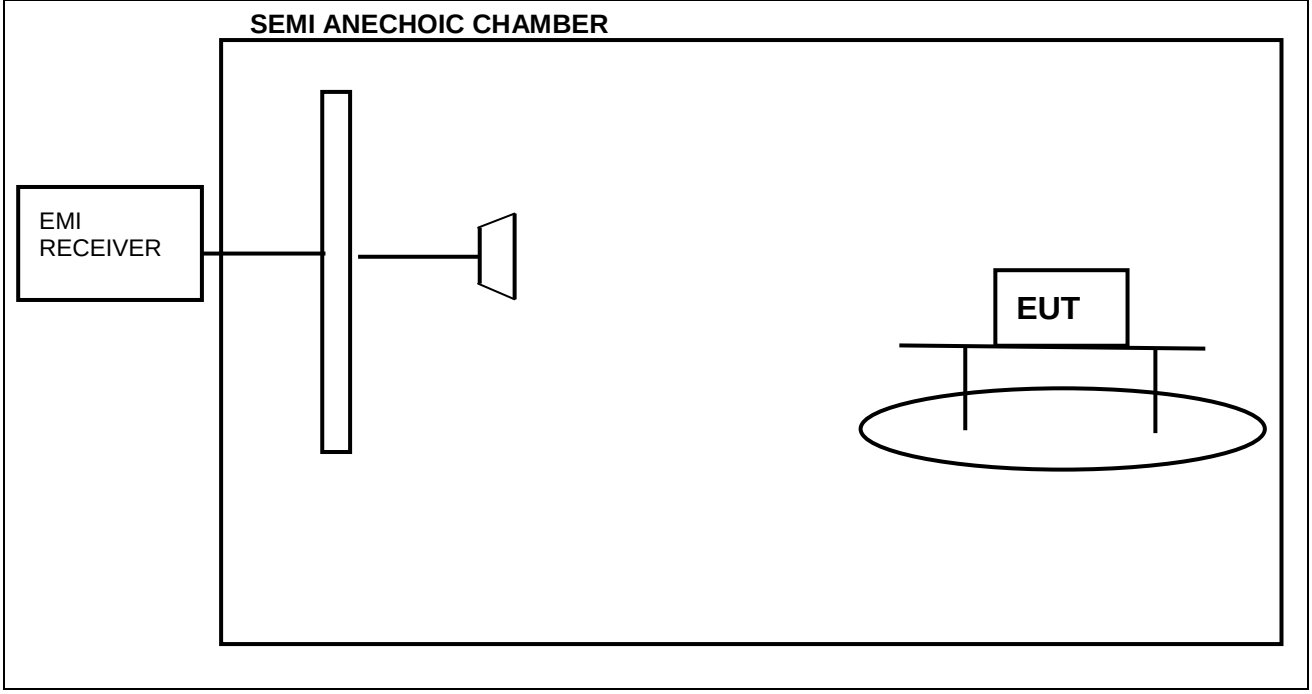
MEASUREMENT PARAMETER	
Resolution bandwidth:	100kHz
Video bandwidth:	300kHz
Span:	10MHz
Sweep time	Auto couple
Detector:	Peak
Trace-Mode:	Max. hold

TEST DESCRIPTION
Allow the trace to stabilize. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

TEST SETUP BLOCK DIAGRAM



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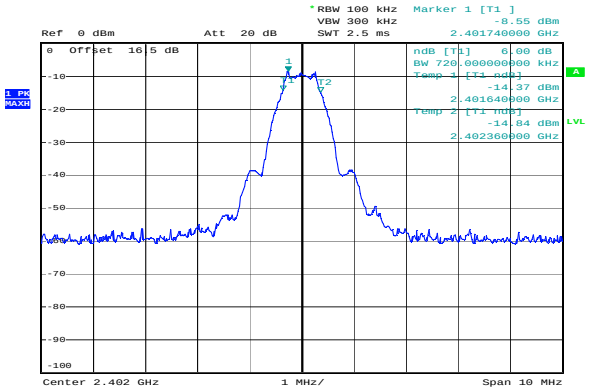
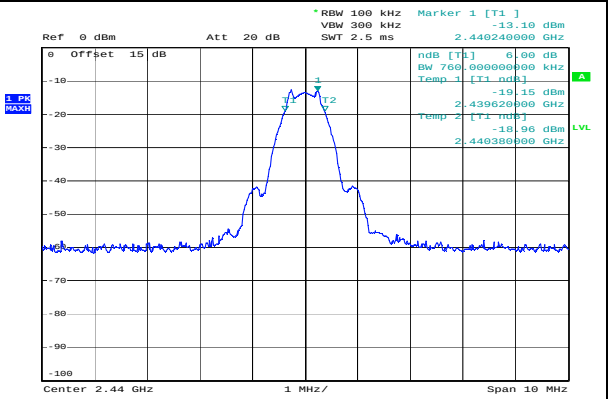
Measurement Result

Channel	Frequency (MHz)	6dB Channel Bandwidth (kHz)	Limit (kHz)	Result
0	2402	720	>500	**WITHIN THE LIMITS**
19	2440	760		
39	2480	740		
Incertezza di misura / Measurement Uncertainty : ±1 KHz				

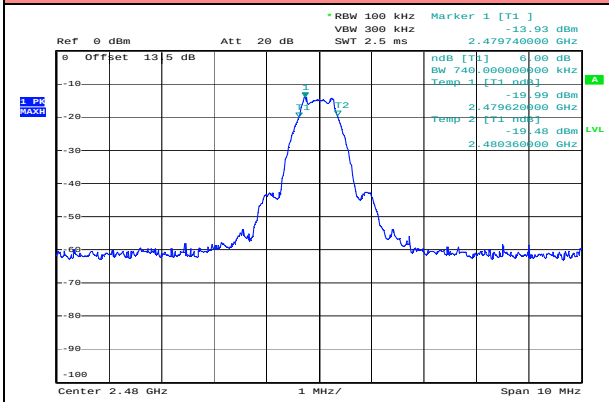
Ch 0



Ch 19



Ch 39



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TEST 4.

POWER SPECTRAL DENSITY

REFERENCE DOCUMENT

According to §15,247) (e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission, This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section, The same method of determining the conducted output power shall be used to determine the power spectral density,

TEST SETUP	In according to ref std
TEST LOCATION	Semi Anechoic Chamber
TYPE OF MEASUREMENT	RADIATED
TEST METHOD	KDB 558074 D01 par. 10.2 Method PKPSD (peak PSD)
TEST EQUIPMENT	Spectrum Analyzer Rohde&Schwarz mod. FSP40
TEST PERFORMED BY	Giacomo Armellini
TESTING DATE	29 July 2016

TEST CONDITIONS:			**MEASURED**
Ambient temperature :	23℃ ± 5℃		24℃
Ambient humidity :	25 - 75 %rH		45%
Pressure :	85 - 106 kPa	(860 mbar - 1060 mbar)	960mbar

OPERATING CONDITION	#1, #2, #3

TEST RESULT	**WITHIN THE LIMITS**

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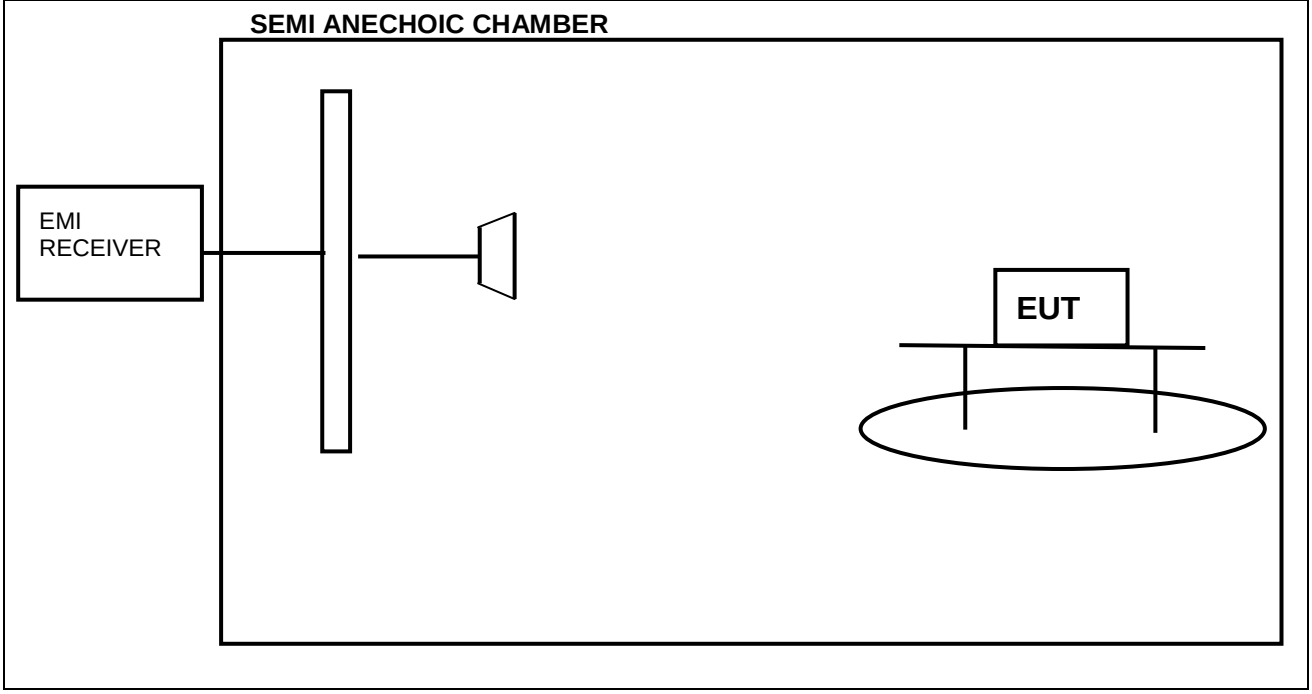
MEASUREMENT PARAMETER	
Resolution bandwidth:	100kHz
Video bandwidth:	300kHz
Span:	1MHz
Sweep time	Auto couple
Detector:	Peak
Trace-Mode:	Max. hold

TEST DESCRIPTION
Allow trace to fully stabilize. Use the peak marker function to determine the maximum amplitude level within the RBW. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat

TEST SETUP BLOCK DIAGRAM



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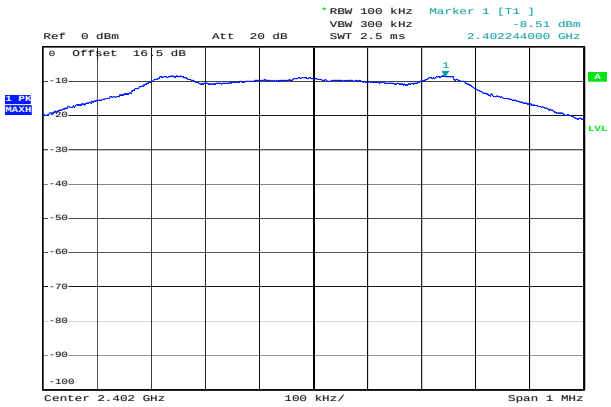
Measurement Result

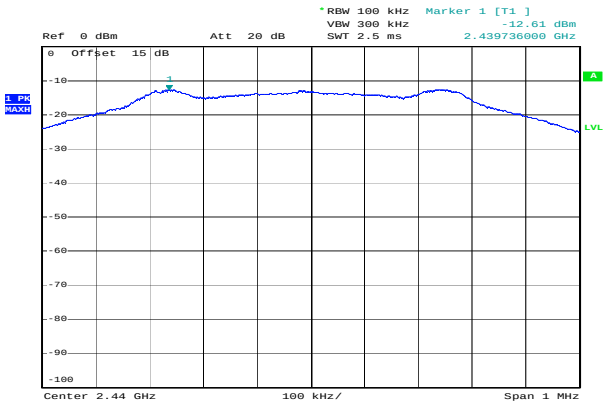
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)	Result
0	2402	-8.51	8	16.51	WITHIN THE LIMITS
19	2440	-12.61	8	20.61	
39	2480	-14.21	8	22.21	
	Incertezza di misura / Measurement Uncertainty : ±1dB				

GRAPHICS

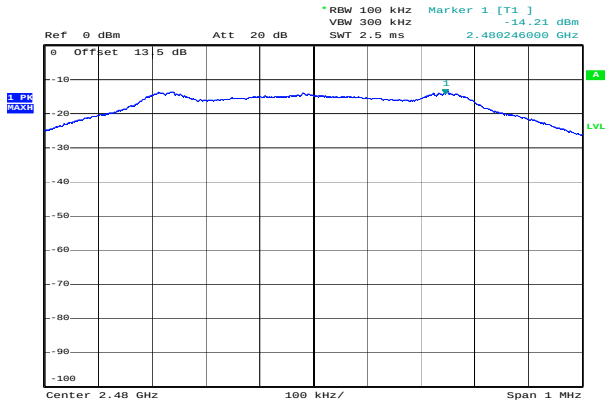
Ch0



Ch19



Ch39



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TEST 5.	RADIATED EMISSIONS IN RESTRICTED FREQUENCY BANDS

REFERENCE DOCUMENT

According to §15,247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits, If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB, Attenuation below the general limits specified in Sec, 15,209(a) is not required, In addition, radiated emissions which fall in the restricted bands, as defined in Sec, 15,205(a), must also comply with the radiated emission limits specified in Sec, 15,209(a) (see Sec, 15,205(c)),

TEST SETUP	In according to ref std
TEST LOCATION	Semi Anechoic Chamber
TEST METHOD	KDB 558074 D01 par. 12
TYPE OF MEASUREMENT	RADIATED
TEST EQUIPMENT	Emi Receiver / Spectrum Analyzer Rohde&Schwarz mod. ESU40 Loop Antenna R&S HFH2-Z2 Bilog Antenna CBL6111C Horn Antenna EMCO-6961
TEST PERFORMED BY	Giacomo Armellini
TESTING DATE	28-29 July 2017

TEST CONDITIONS:			**MEASURED**
Ambient temperature :	23℃ ± 5℃		24℃
Ambient humidity :	25 - 75 %rH		45%
Pressure :	85 - 106 kPa	(860 mbar - 1060 mbar)	960mbar

OPERATING CONDITION	#1, #3

TEST RESULT	**WITHIN THE LIMITS**

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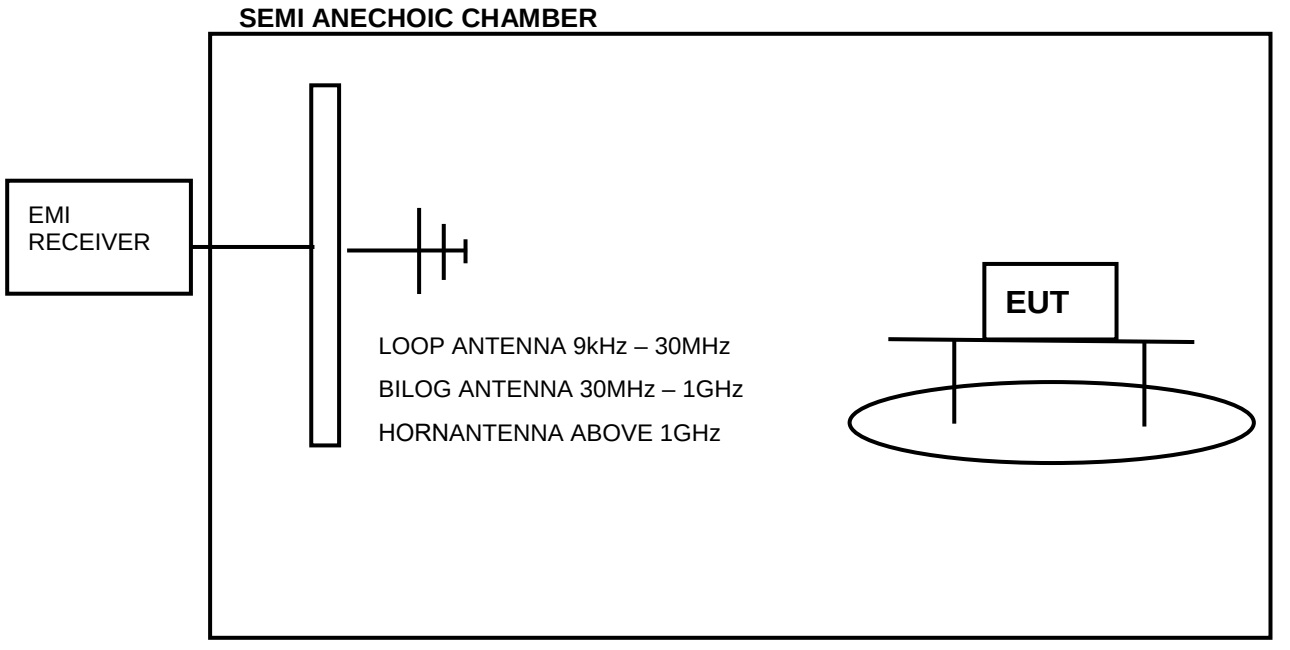
MEASUREMENT PARAMETER	
Detector:	Peak / Quasi Peak / Average
Resolution bandwidth:	300Hz (f<150kHz) 10kHz (150kHz< f< 30MHz) 100kHz (30MHz< f <1GHz) 1MHz (f>1GHz)
Video bandwidth:	1kHz (f<150kHz) 30kHz (150kHz< f< 30MHz) 300kHz (30MHz< f <1GHz) 3MHz (f>1GHz)
Span:	see plots
Trace-Mode:	Max. hold

TEST DESCRIPTION

Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously - rotating, remotely - control led turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency.
The EUT is placed at test table.
For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m~4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3m.
This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

TEST SETUP BLOCK DIAGRAM



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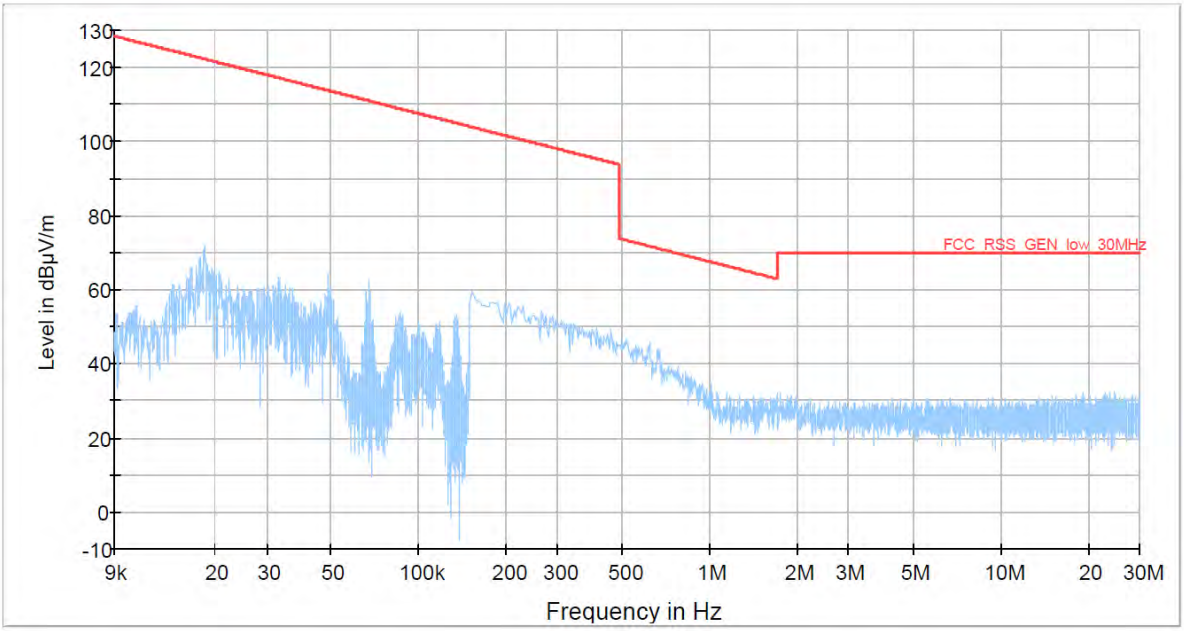
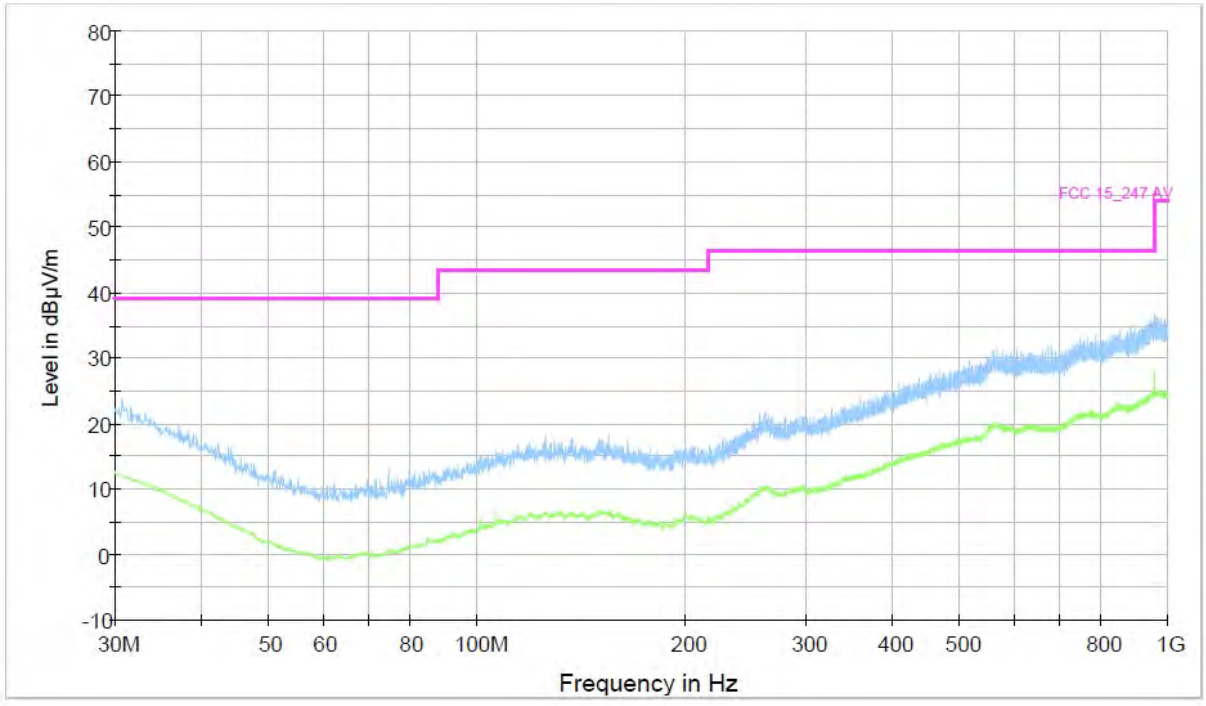
FREQUENCY RANGE 9kHz - 30MHz CH0

VERTICAL POLARIZATION



FREQUENCY RANGE 30MHz – 1GHz CH0

VERTICAL POLARIZATION



Blue trace Peak detector, Green trace average detector,

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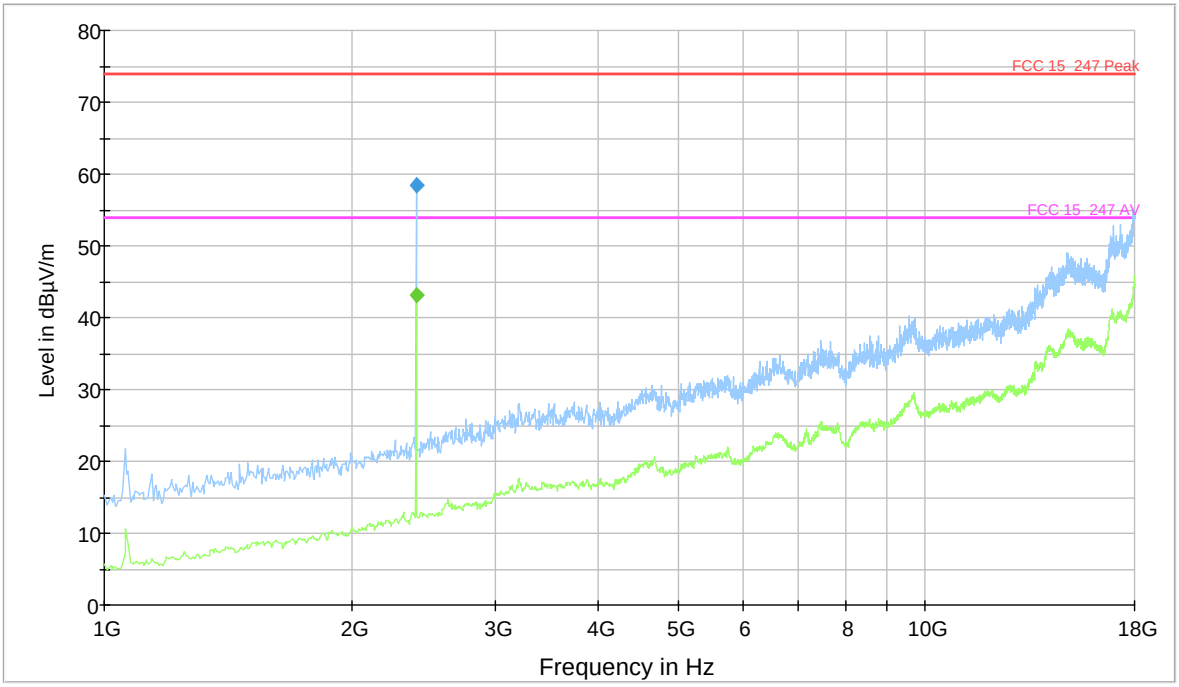
FREQUENCY RANGE 1GHz-18GHz CH0

VERTICAL POLARIZATION



Blue trace Peak detector, Blue Marker Quasi-Peak detector; Green trace average detector, Green Marker average detector

Final Result Average

Frequency (MHz)	Average (dBµV/m)	Polarization	Margin (dB)	Limit (dBµV/m)	Comment
2400.375000	43.1	V	10.90	54.00	CARRIER

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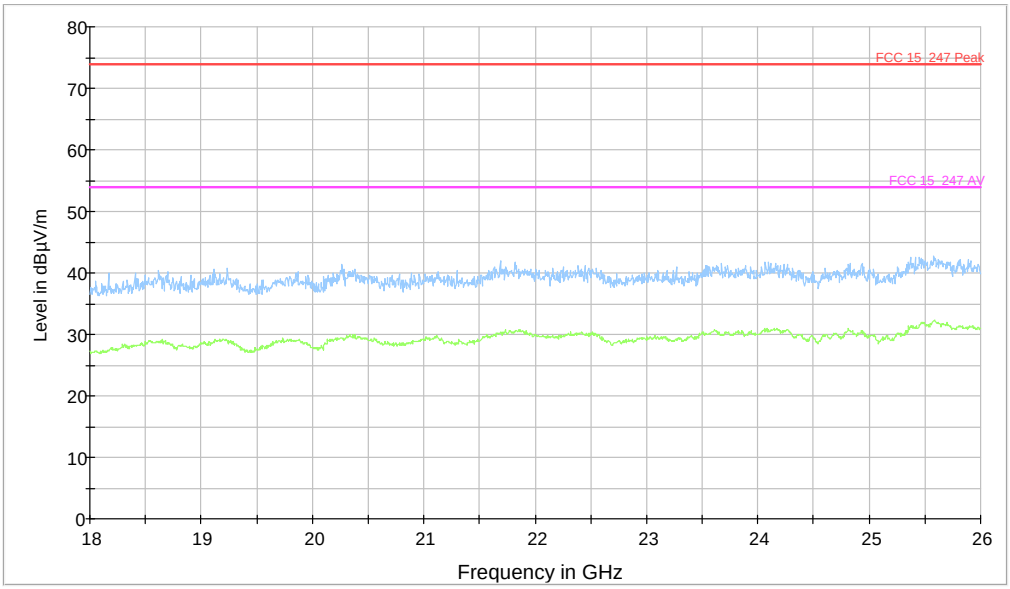
FREQUENCY RANGE 18GHz to 26GHz CH0

VERTICAL POLARIZATION



Blue trace Peak detector, Green trace average detector

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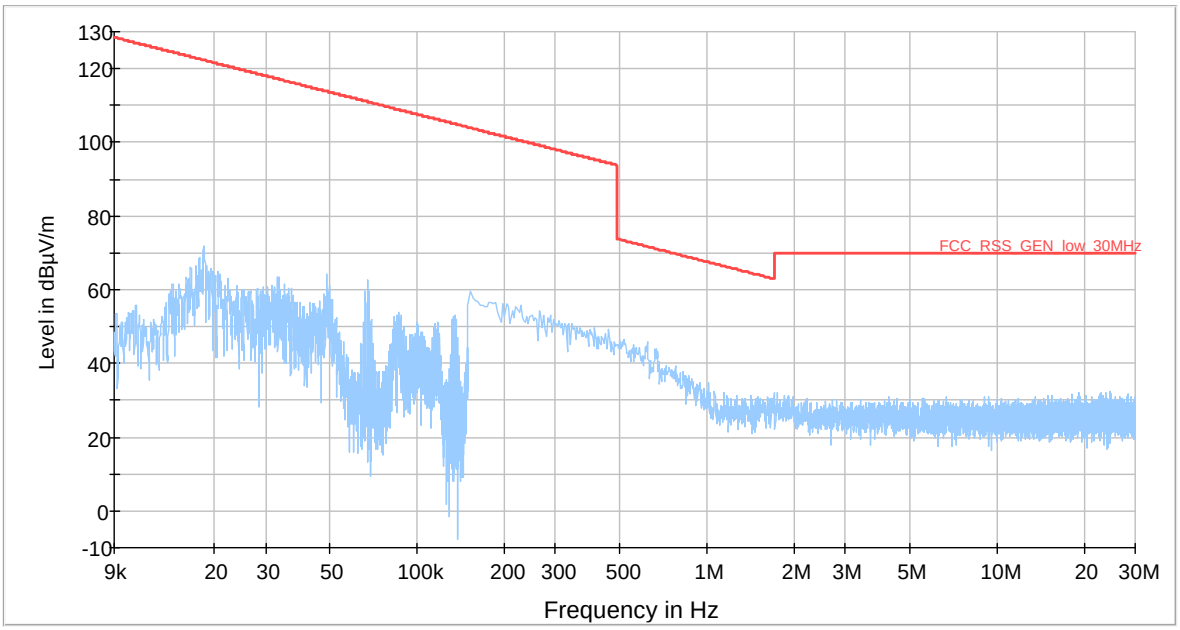
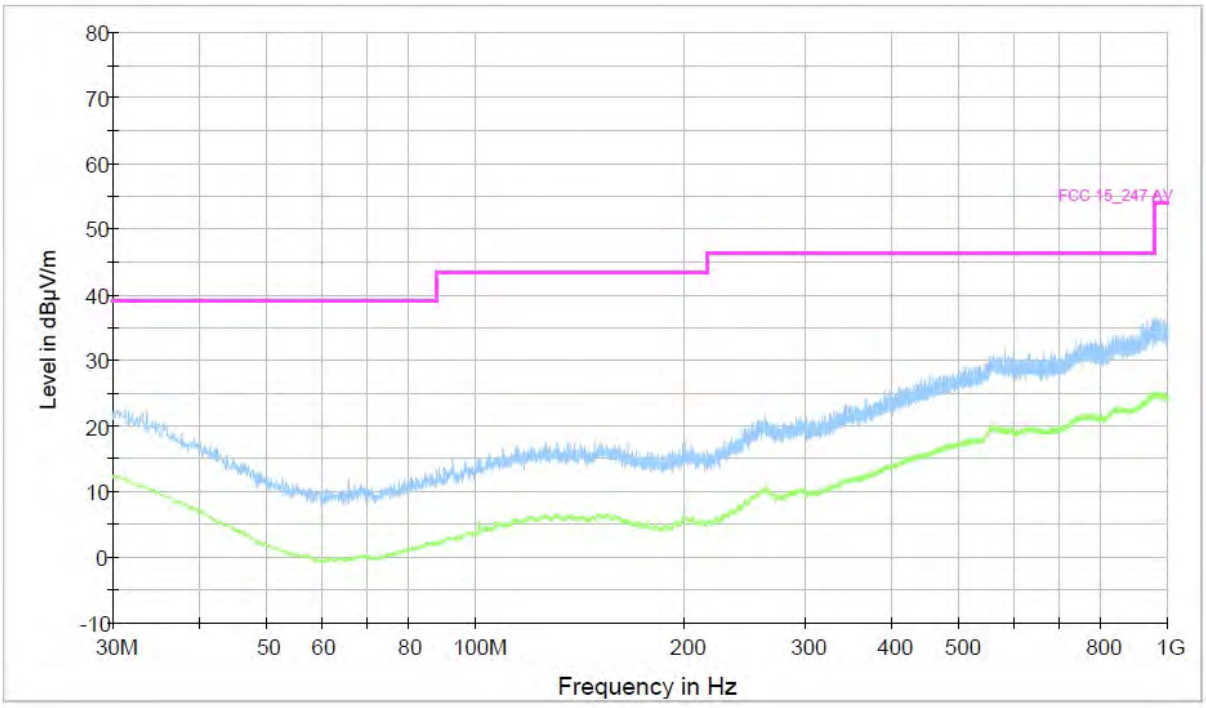
FREQUENCY RANGE 9kHz - 30MHz CH0

HORIZONTAL POLARIZATION



FREQUENCY RANGE 30MHz – 1GHz CH0

HORIZONTAL POLARIZATION



Blue trace Peak detector, Green trace average detector,

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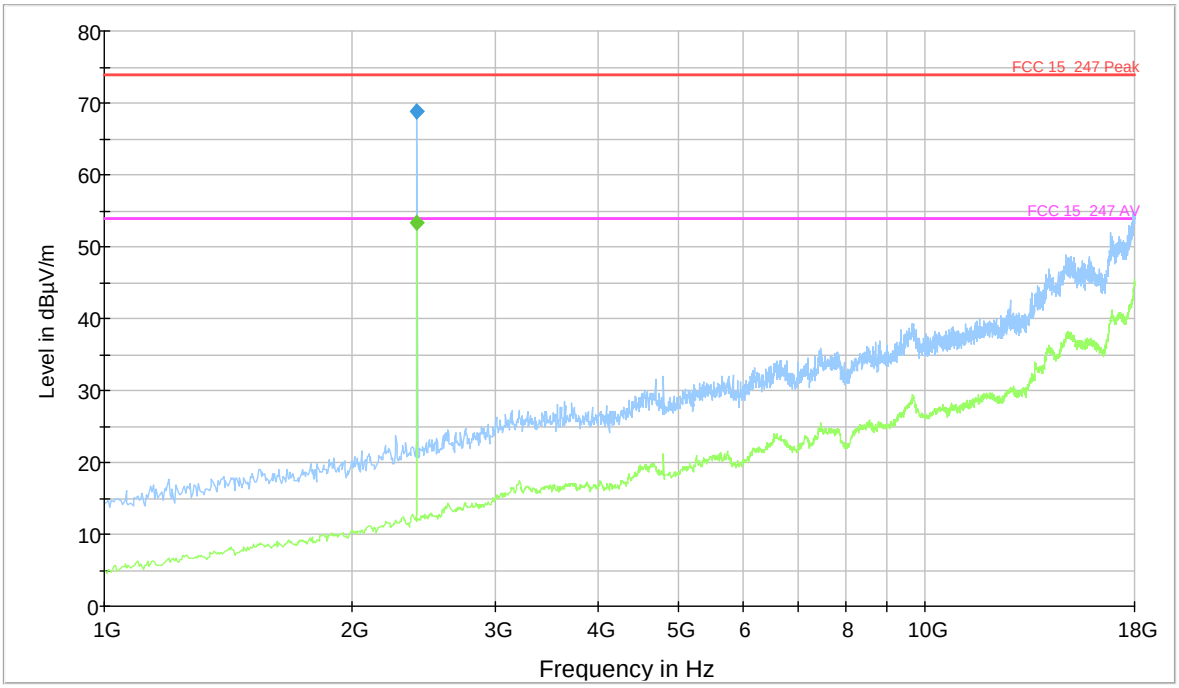
FREQUENCY RANGE 1GHz-18GHz CH0

HORIZONTAL POLARIZATION



Blue trace Peak detector, Blue Marker Quasi-Peak detector; Green trace average detector, Green Marker average detector

Final Result - Average

Frequency (MHz)	Average	Polarization	Margin (dB)	Limit (dBµV/m)	Comment
2400.375000	53.3	H	0.70	54.00	CARRIER

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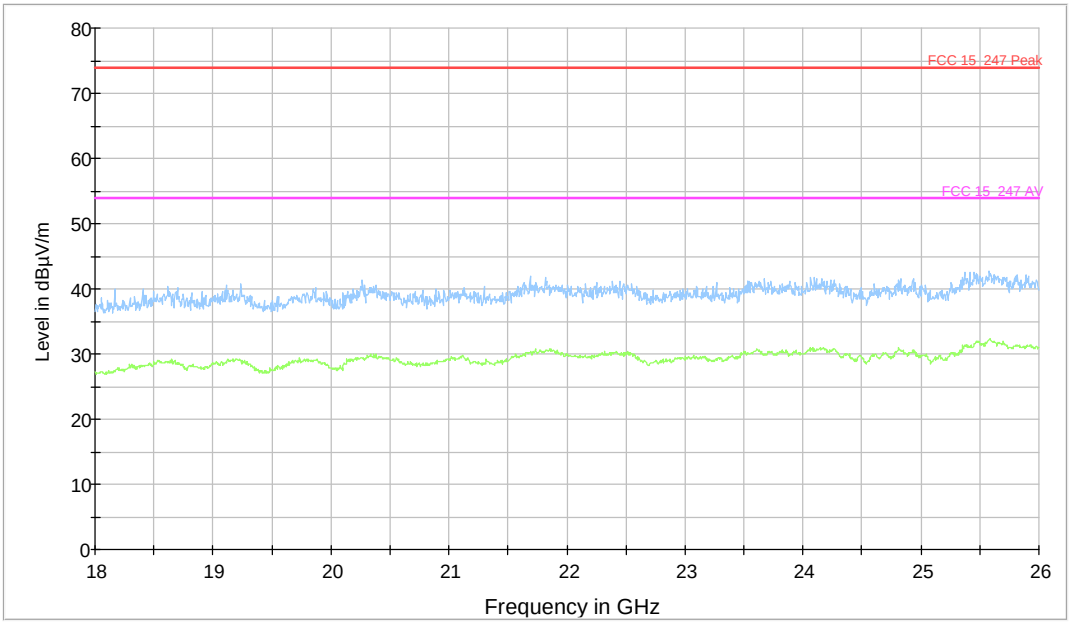
FREQUENCY RANGE 18GHz to 26GHz CH0

HORIZONTAL POLARIZATION



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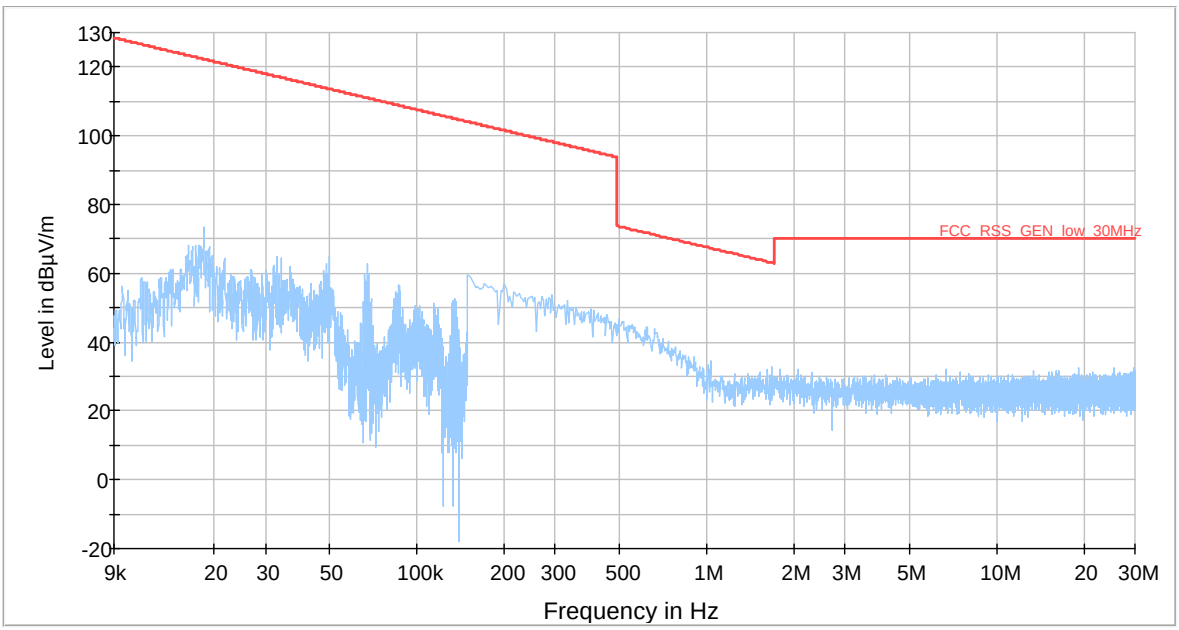
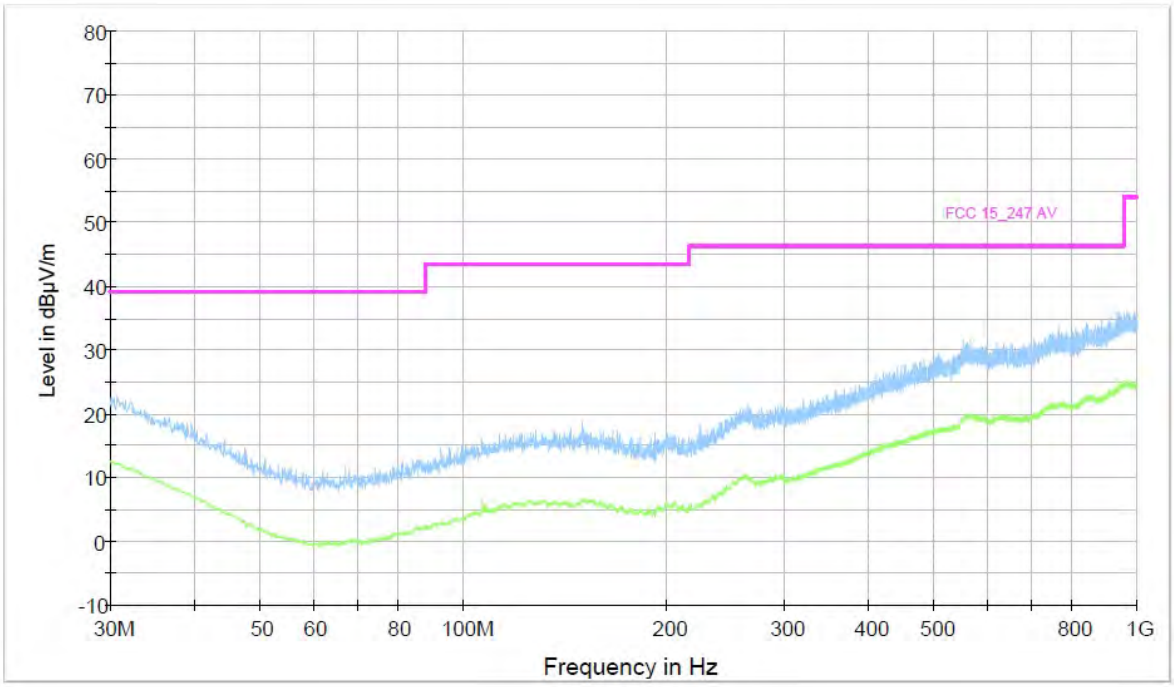
FREQUENCY RANGE 9kHz - 30MHz CH 39
VERTICAL POLARIZATION



FREQUENCY RANGE 30MHz – 1GHz CH 39

VERTICAL POLARIZATION



Blue trace Peak detector, Green trace average detector

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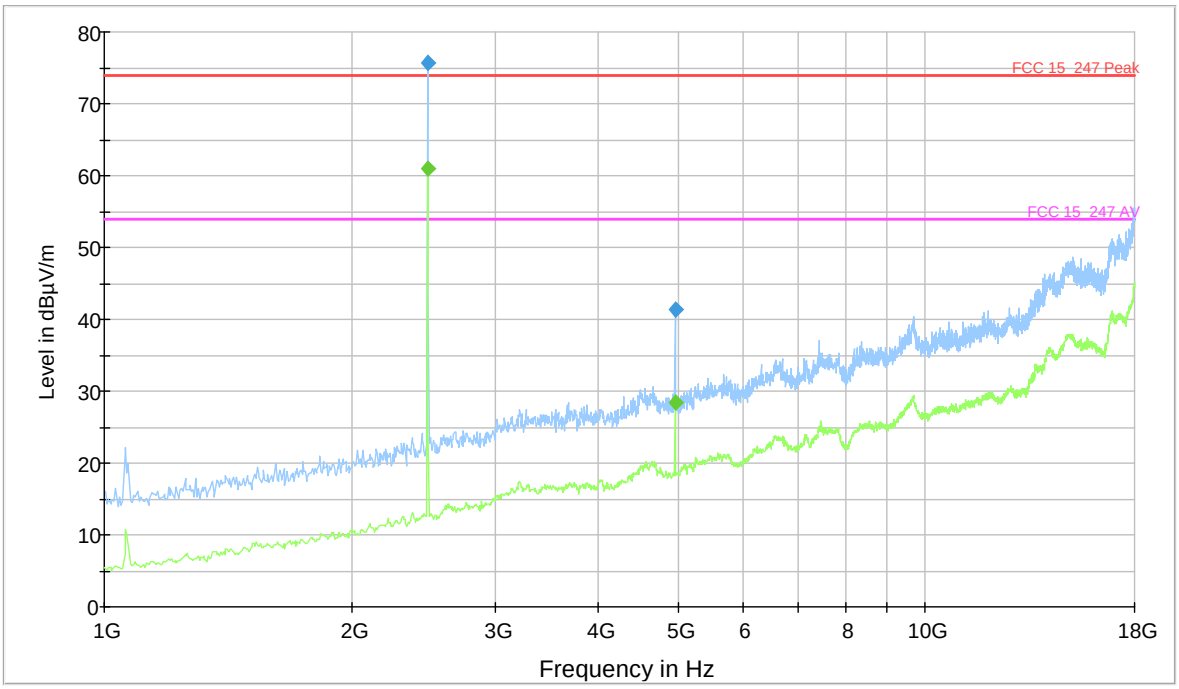
FREQUENCY RANGE 1GHz-18GHz CH 39

VERTICAL POLARIZATION

FCC_15_247_SPURIOUS_TX_SWEEP_FSP



Blue trace Peak detector, Blue Marker Quasi-Peak detector; Green trace average detector, Green Marker average detector

Frequency (MHz)	Average (dBµV/m)	Polarization	Margin (dB)	Limit (dBµV/m)	Comment
2479.000000	61.0	V	-7.00	54.00	CARRIER
4958.875000	28.4	V	25.60	54.00	

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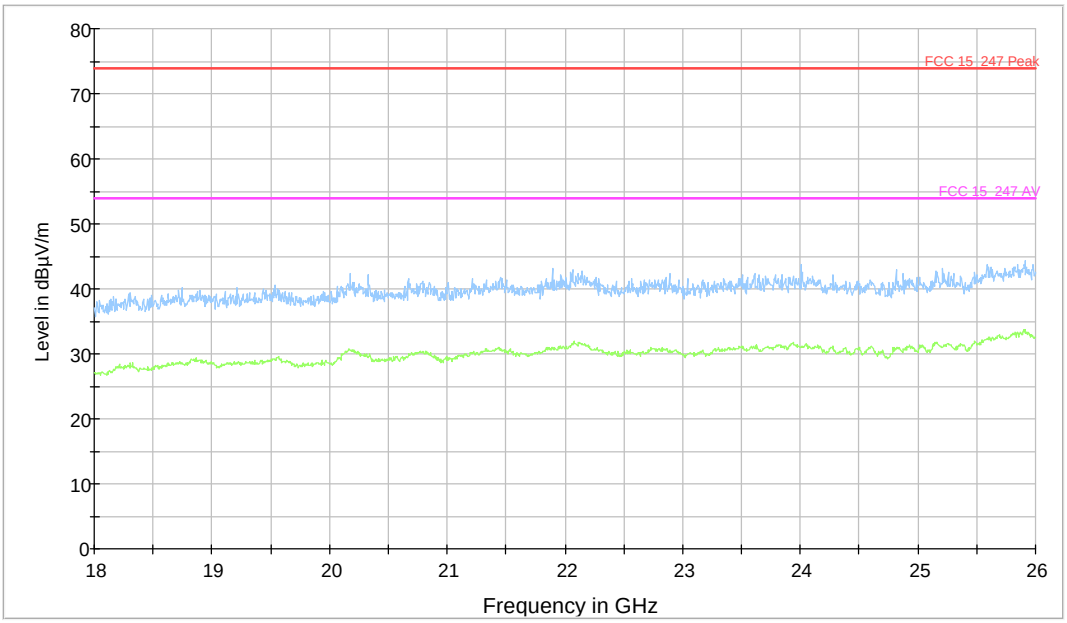
FREQUENCY RANGE 18GHz to 26GHz

VERTICAL POLARIZATION



Blue trace Peak detector, Green trace average detector

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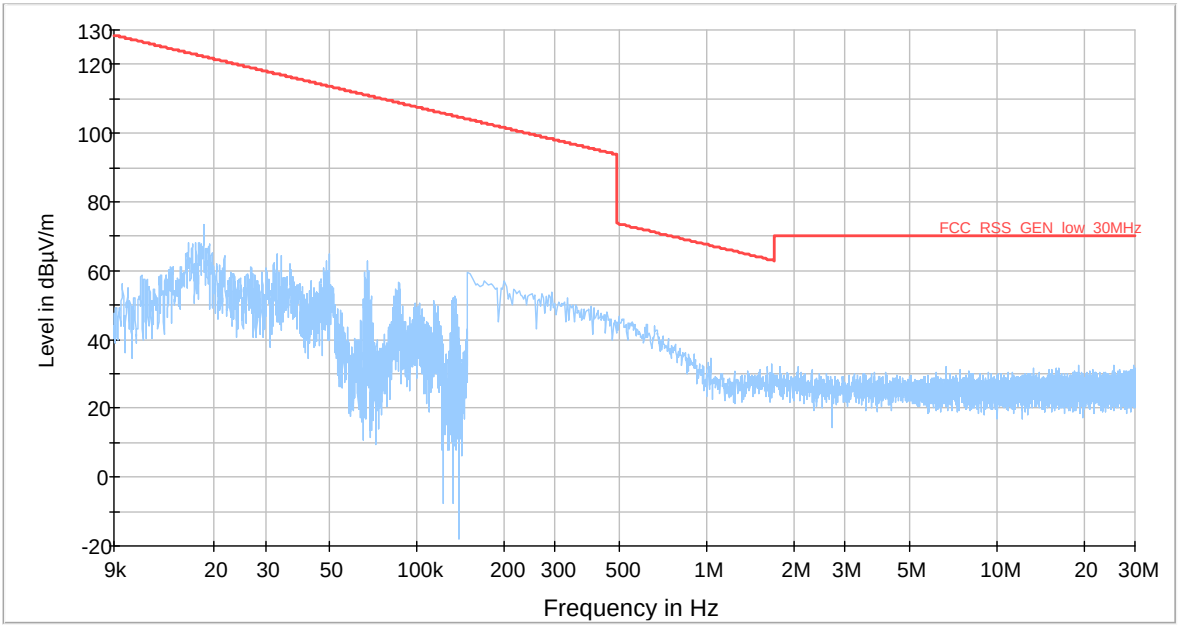
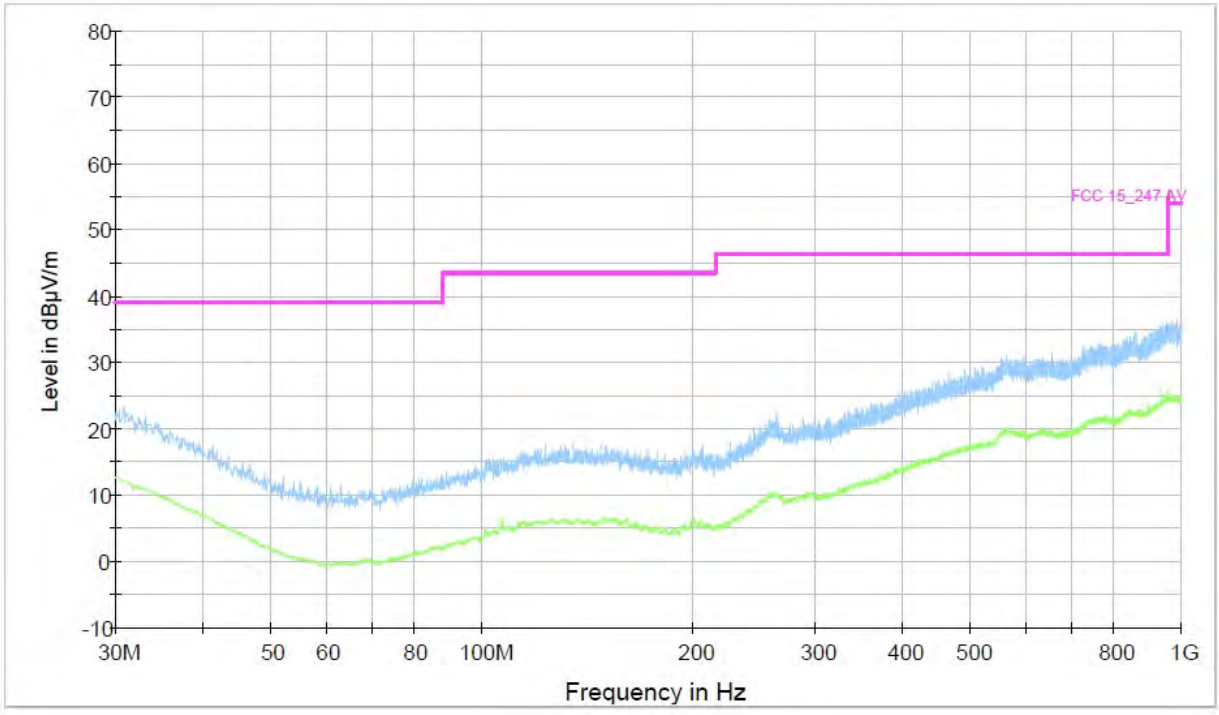
FREQUENCY RANGE 9kHz - 30MHz CH 39
HORIZONTAL POLARIZATION



FREQUENCY RANGE 30MHz – 1GHz CH 39

HORIZONTAL POLARIZATION



Blue trace Peak detector, Green trace average detector

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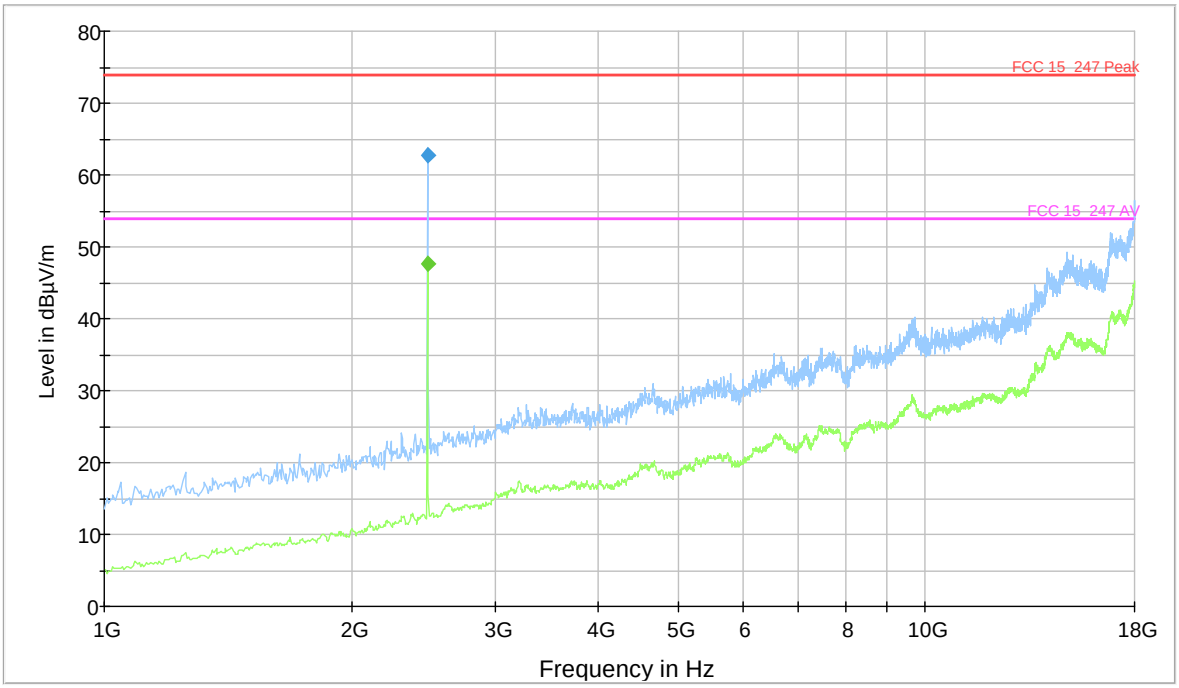
FREQUENCY RANGE 1GHz-18GHz CH 39

HORIZONTAL POLARIZATION



Blue trace Peak detector, Blue Marker Quasi-Peak detector; Green trace average detector, Green Marker average detector

Final Result Average

Frequency (MHz)	Average (dBµV/m)	Polarization	Margin (dB)	Limit (dBµV/m)	Comment
2479.000000	47.6	H	6.40	54.00	CARRIER

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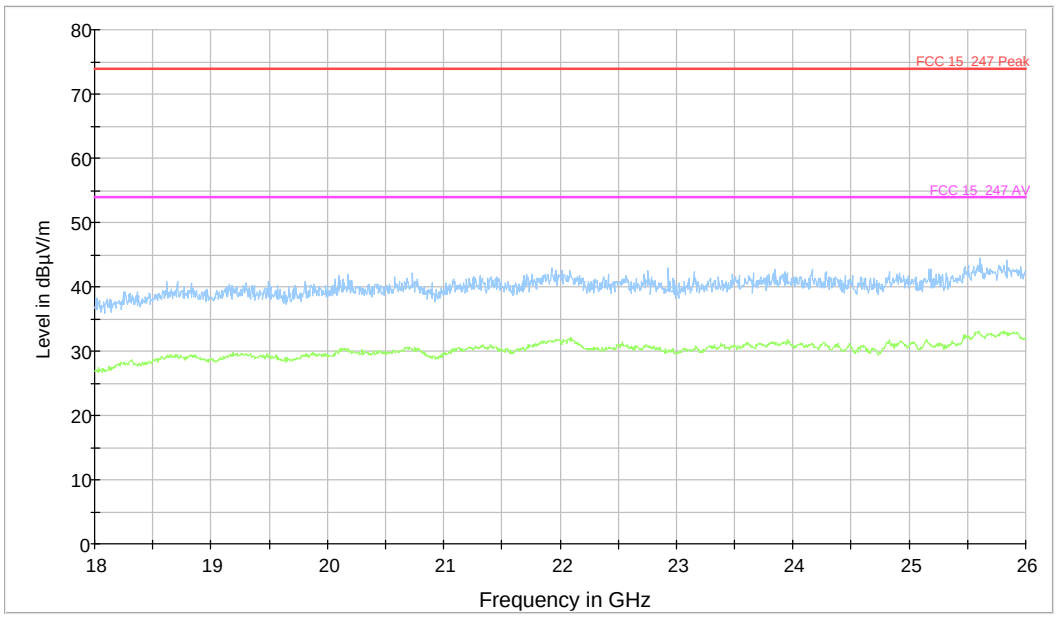
FREQUENCY RANGE 18GHz to 26GHz CH 39

HORIZONTAL POLARIZATION



Blue trace Peak detector, Green trace average detector

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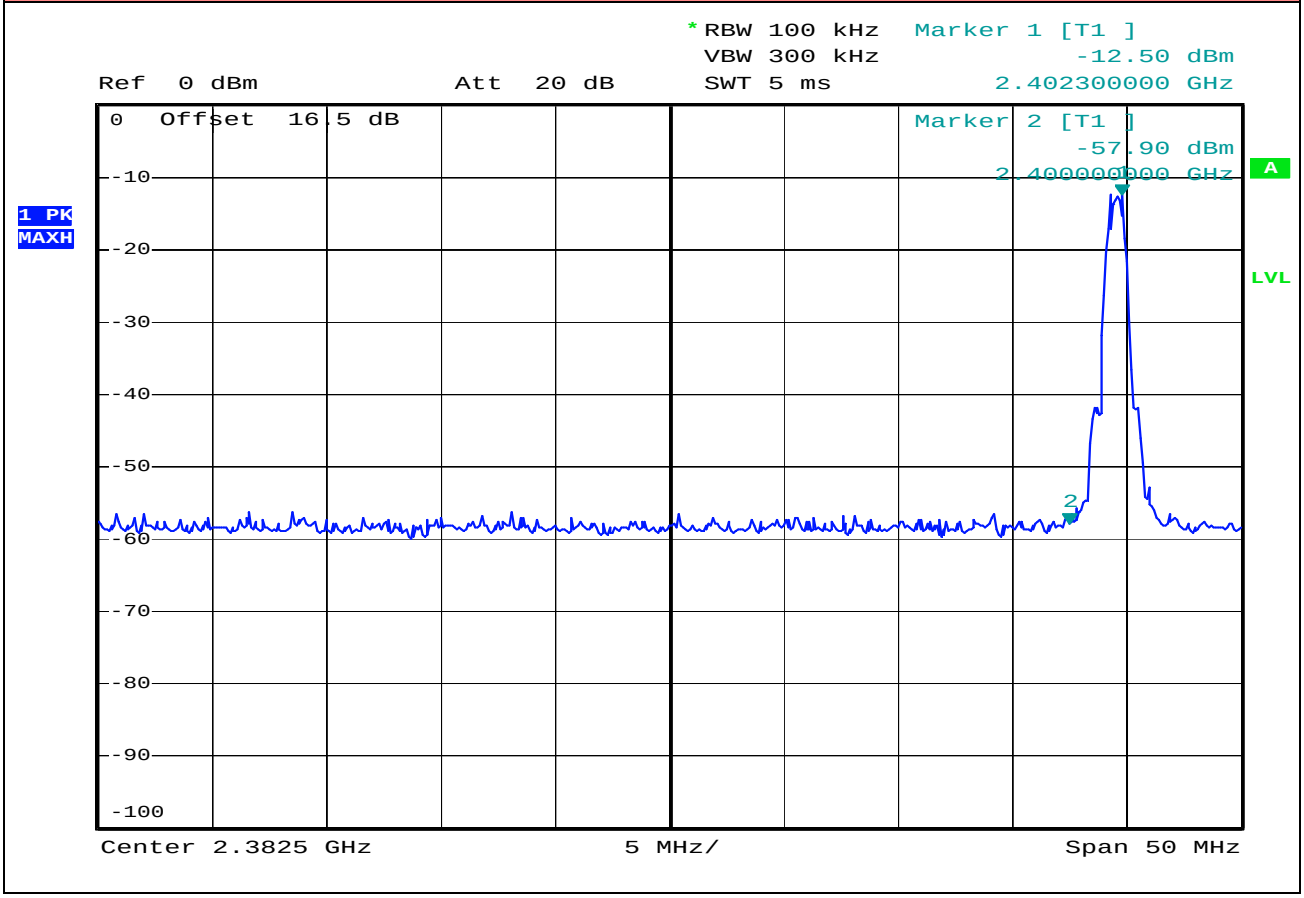
Lower Band Edge



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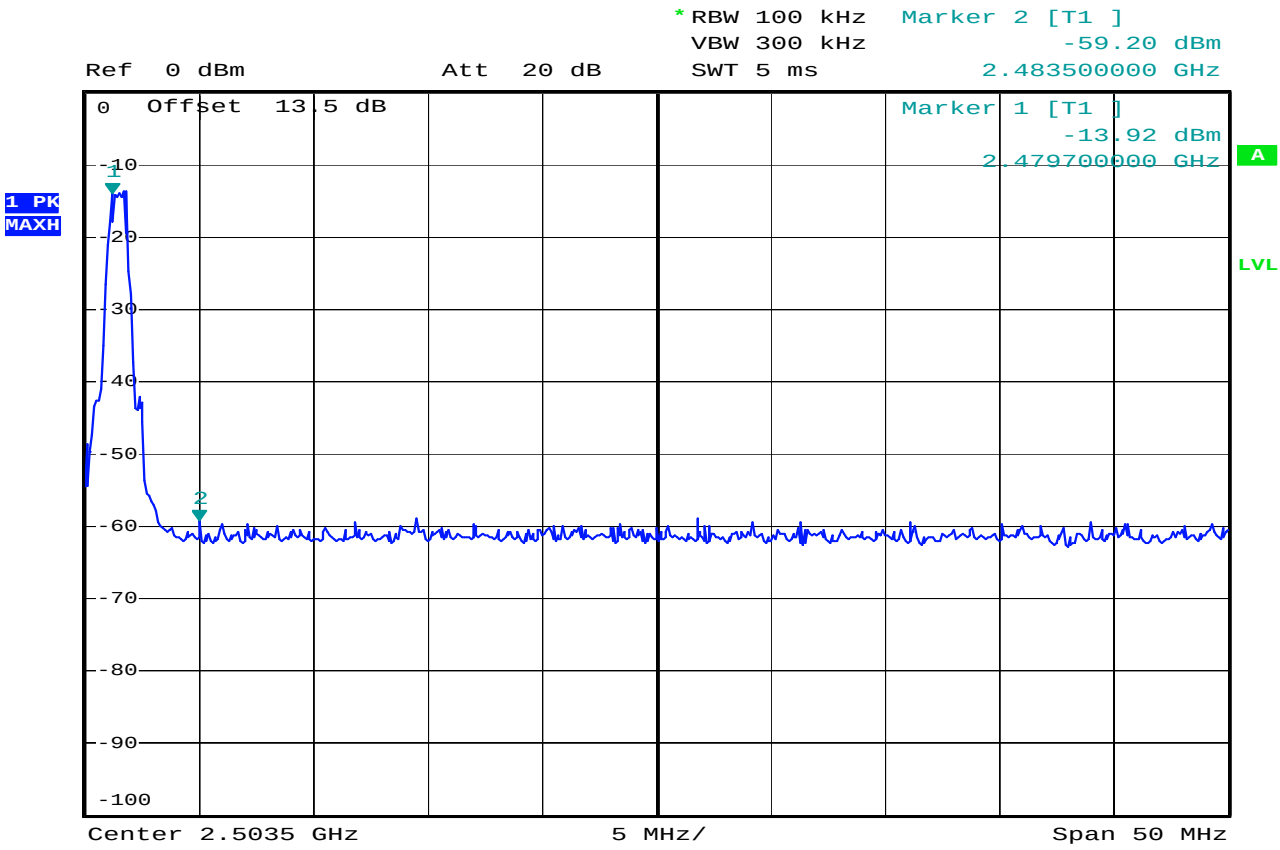
Upper Band Edge



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TEST 6. RADIATED EMISSIONS IN NON RESTRICTED FREQUENCY BANDS

REFERENCE DOCUMENT

According to §15,247) d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 Db below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 Db instead of 20 Db. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

TEST SETUP	In according to ref std
TEST LOCATION	Semi Anechoic Chamber
TYPE OF MEASUREMENT	RADIATED
TEST METHOD	KDB 558074 D01 par. 11.0
TEST EQUIPMENT	Emi Receiver / Spectrum Analyzer Rohde&Schwarz mod. ESU40 Loop Antenna R&S HFH2-Z2 Bilog Antenna CBL6111C Horn Antenna EMCO-6961
TEST PERFORMED BY	Giacomo Armellini
TESTING DATE	29 July 2016 – 22 June 2017
UNCERTAINTY OF MEASURE:	Combined uncertainty = ± 1,75 dB Total uncertainty = (k=2) ± 3,5 dB

TEST CONDITIONS:			**MEASURED**
Ambient temperature :	23℃ ± 5℃		24℃
Ambient humidity :	25 - 75 %rH		45%
Pressure :	85 - 106 kPa	(860 mbar - 1060 mbar)	960mbar

OPERATING CONDITION	#1, #3

TEST RESULT	**WITHIN THE LIMITS**

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MEASUREMENT PARAMETER	
Detector:	Peak / Quasi Peak
Resolution bandwidth:	100kHz
Video bandwidth:	300 kHz
Span:	see plots
Trace-Mode:	Max. hold

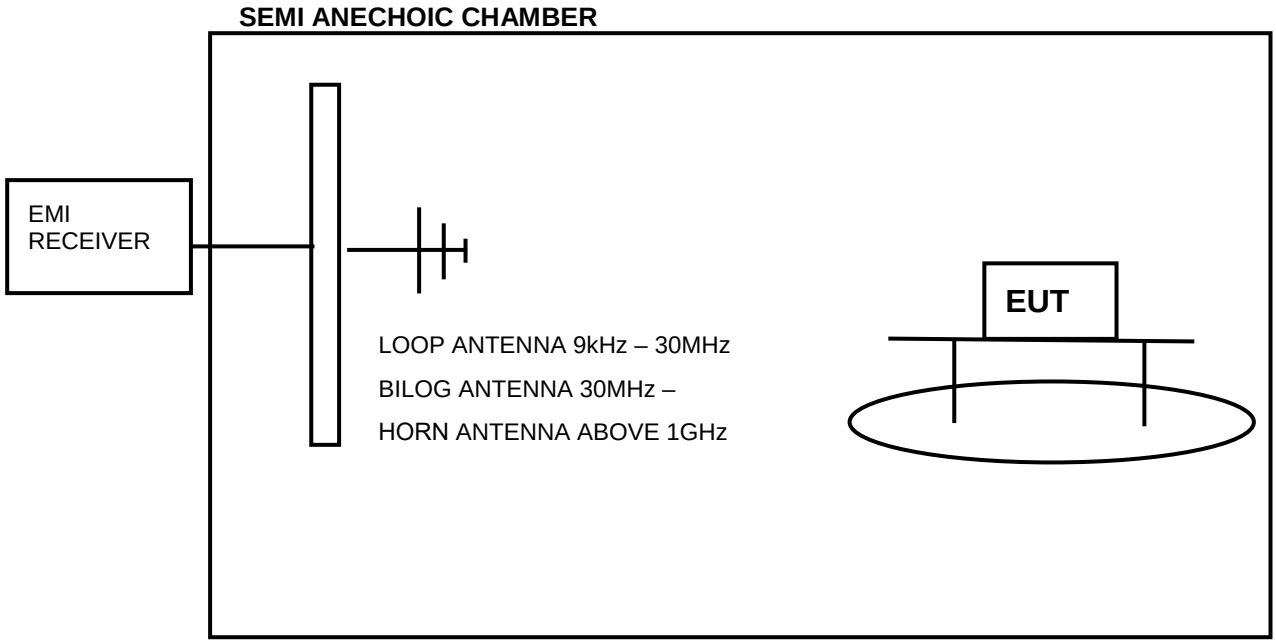
TEST DESCRIPTION

Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously - rotating, remotely - control led turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency.
The EUT is placed at test table.
For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m

Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m~4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3m.

This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

TEST SETUP BLOCK DIAGRAM



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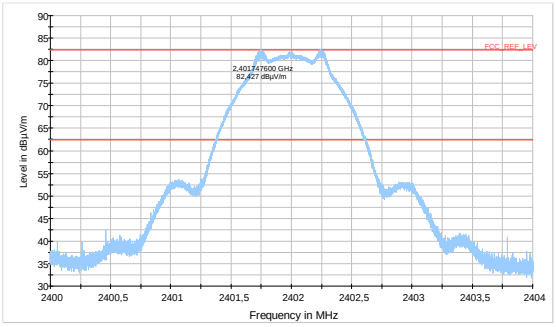
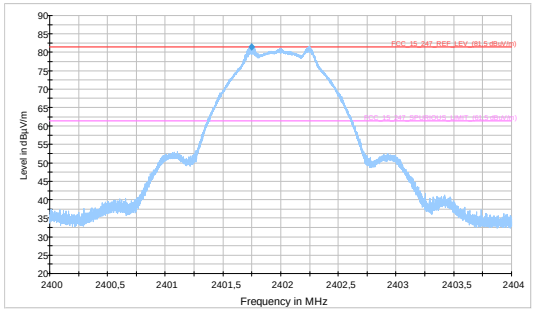
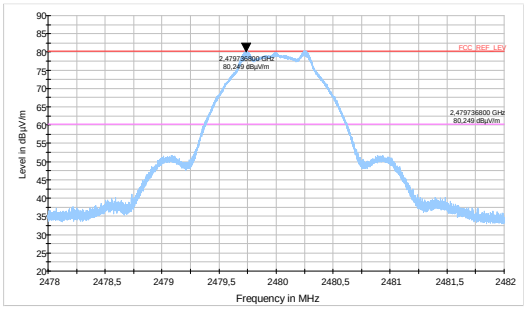
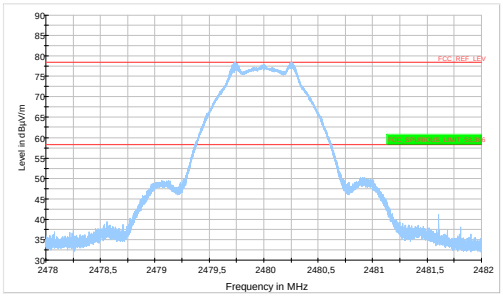
REFERENCE LEVEL MEASUREMENTS

CH 0 VERTICAL POLARIZATION	CH 0 HORIZONTAL POLARIZATION
REF LEVEL: 82.427 dBuV/m **SPURIOUS LIMIT:** 62.427 dBuV/m	**REF LEVEL:** 81.5 dBuV/m **SPURIOUS LIMIT:** 61.5 dBuV/m
	
CH 39 VERTICAL POLARIZATION	**CH 39 HORIZONTAL POLARIZATION**
REF LEVEL: 80.249 dBuV/m **SPURIOUS LIMIT:** 60.249 dBuV/m	**REF LEVEL:** 78.366 dBuV/m **SPURIOUS LIMIT:** 58.366 dBuV/m
	

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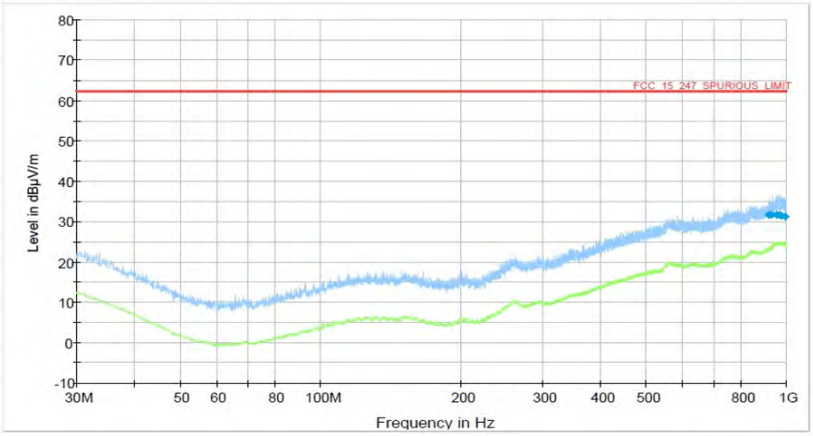
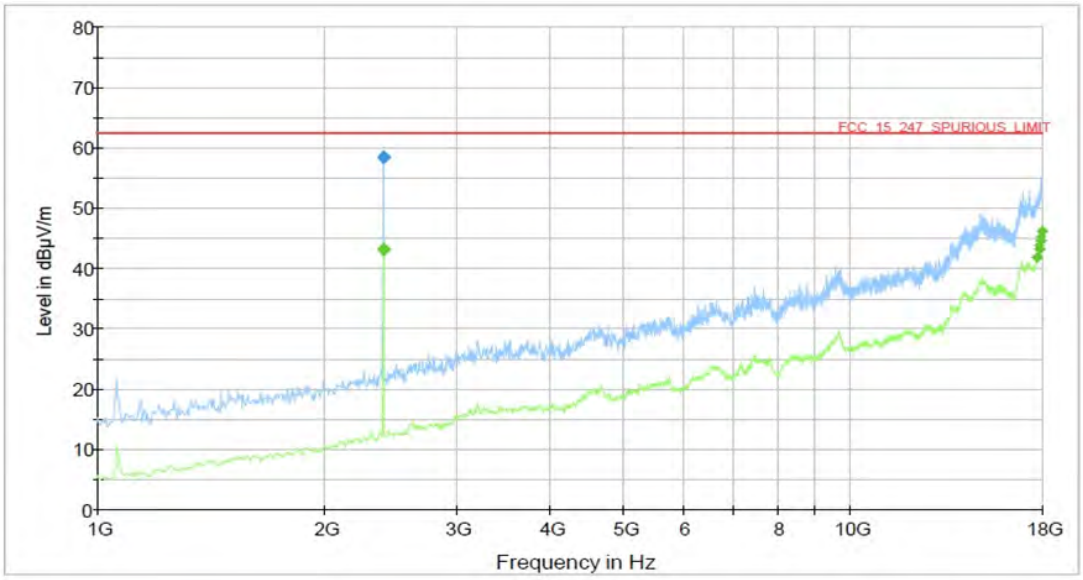
FREQUENCY RANGE 30MHz – 1GHz CH0 VERTICAL POLARIZATION



Frequency (MHz)	Quasi-Peak (dBµV/m)	Polarization	Margin (dB)	Limit (dBµV/m)	Comment
962.025	32.2	V	30.227	62.427	
962.375	32.2	V	30.227	62.427	
978.445	32.1	V	30.327	62.427	
980.355	32.1	V	30.327	62.427	
987.245	32.0	V	30.427	62.427	
998.360	31.8	V	30.627	62.427	

Blue trace Peak detector, Green trace average detector,

FREQUENCY RANGE 1GHz-18GHz CH0 VERTICAL POLARIZATION



Blue trace Peak detector, Blue Marker Quasi-Peak detector; Green trace average detector, Green Marker average detector

Final Result Average

Frequency (MHz)	Average (dBµV/m)	Polarization	Margin (dB)	Limit (dBµV/m)	Comment
2400.375	43.1	V	19,327	62,427	CARRIER
17880.225	41.8	V	20627	62427	
17925.455	42.6	V	19827	62427	
17955.31	44.6	V	17827	62427	
17985.45	45.2	V	17227	62427	
18000	46.3	V	16127	62427	

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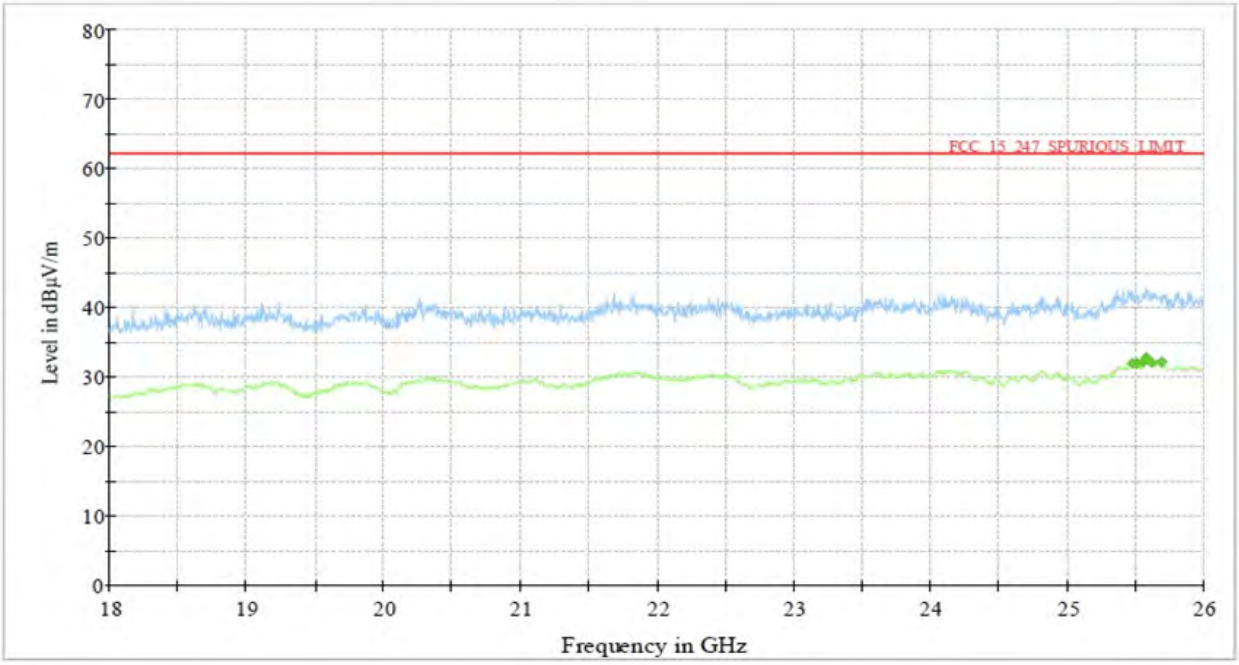
FREQUENCY RANGE 18GHz to 26GHz CH0

VERTICAL POLARIZATION



Blue trace Peak detector, Green trace average detector

Frequency (MHz)	Average (dBµV/m)	Polarization	Margin (dB)	Limit (dBµV/m)	Comment
25492.15	32.3	V	30.127	62.427	
25510.545	32.3	V	30.127	62.427	
25535.375	32.3	V	30.127	62.427	
25550.225	32.5	V	29.927	62.427	
25610.265	32.3	V	30.127	62.427	
25630.875	32.4	V	30.027	62.427	

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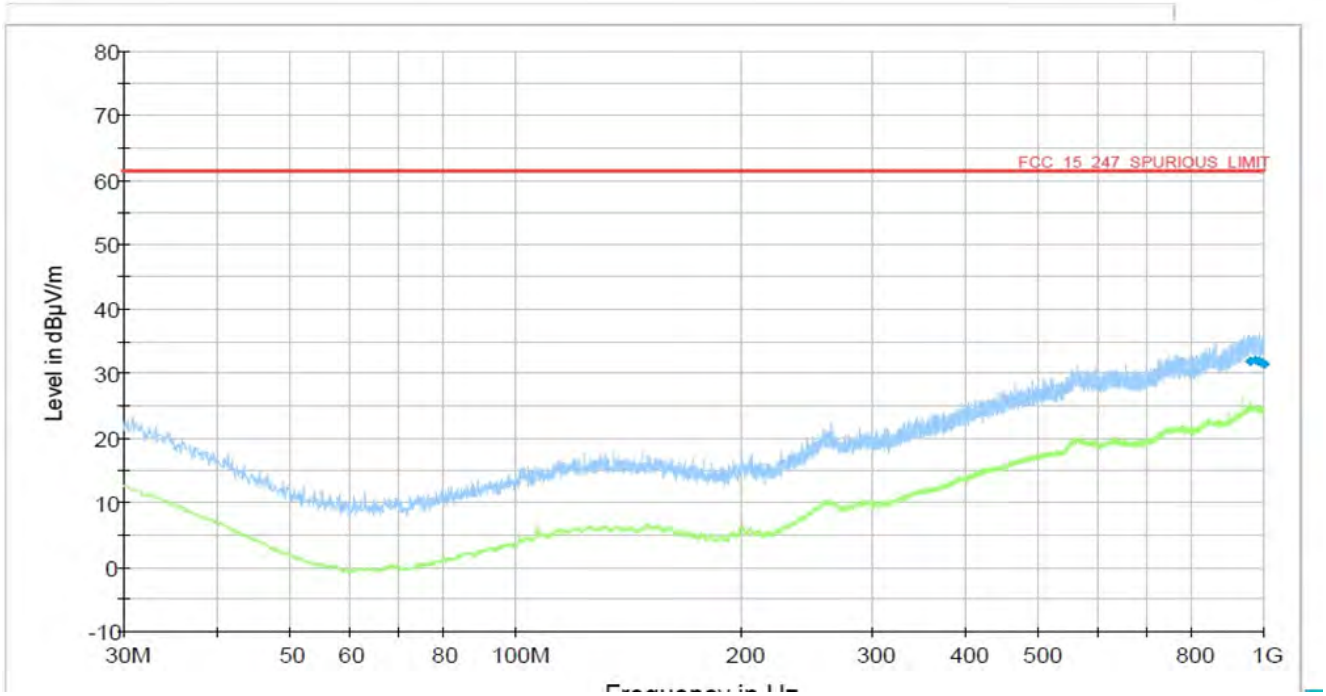
FREQUENCY RANGE 30MHz – 1GHz CH0 HORIZONTAL POLARIZATION



Blue trace Peak detector, Green trace average detector,

Frequency (MHz)	Quasi-Peak (dBµV/m)	Polarization	Margin (dB)	Limit (dBµV/m)	Comment
960.025	32.2	H	29.3	61.5	
965.375	32.3	H	29.2	61.5	
972.575	32.2	H	29.3	61.5	
987.225	32.1	H	29.4	61.5	
995.375	32.1	H	29.4	61.5	
999.875	31.9	H	29.6	61.5	

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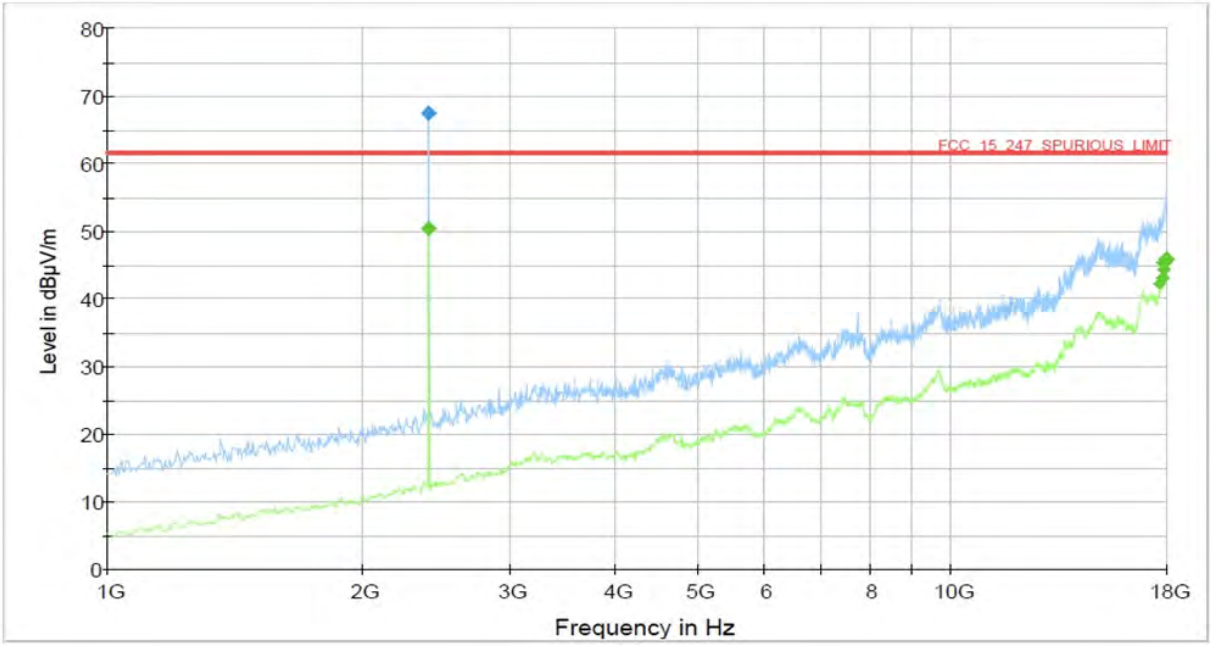
FREQUENCY RANGE 1GHz-18GHz CH0 HORIZONTAL POLARIZATION



Blue trace Peak detector, Blue Marker Quasi-Peak detector; Green trace average detector, Green Marker average detector

Final Result - Average

Frequency (MHz)	Average (dBµV/m)	Polarization	Margin (dB)	Limit (dBµV/m)	Comment
2400.375	50.8	H	10.7	61.5	CARRIER
17882.345	41.8	H	19.7	61.5	
17984.365	42.6	H	18.9	61.5	
17990.455	44.7	H	16.8	61.5	
17990.475	45.2	H	16.3	61.5	
18000	45.9	H	15.6	61.5	

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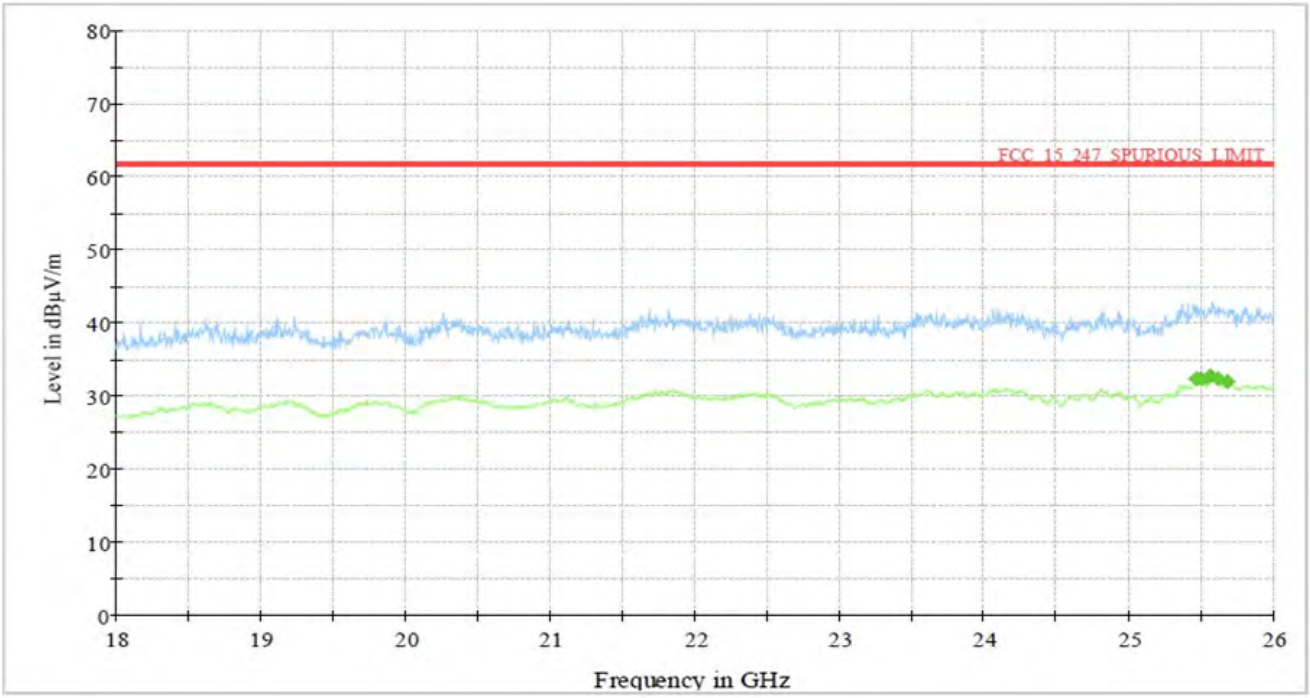
FREQUENCY RANGE 18GHz to 26GHz CH0

HORIZONTAL POLARIZATION



Frequency (MHz)	Average (dBµV/m)	Polarization	Margin (dB)	Limit (dBµV/m)	Comment
25485.655	32.3	H	29.2	61.5	
25495.115	32.2	H	29.3	61.5	
25510.265	32.2	H	29.3	61.5	
25550.225	32.5	H	29	61.5	
25620.115	32.3	H	29.2	61.5	
25635.275	32.1	H	29.4	61.5	

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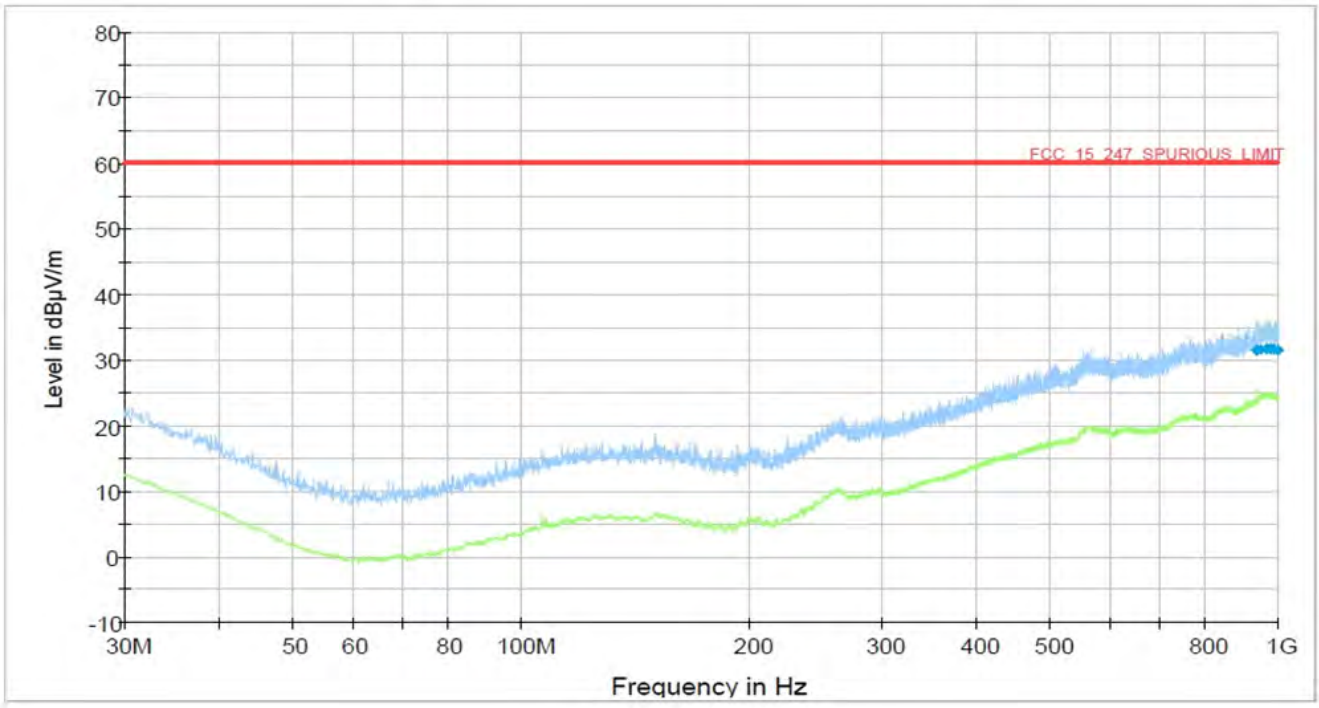
FREQUENCY RANGE 30MHz – 1GHz CH 39 VERTICAL POLARIZATION



Blue trace Peak detector, Green trace average detector

Frequency (MHz)	Quasi-Peak (dBµV/m)	Polarization	Margin (dB)	Limit (dBµV/m)	Comment
952.285	31.8	V	28.449	60.249	
975.265	31.9	V	28.349	60.249	
985.115	32	V	28.249	60.249	
991.175	32	V	28.249	60.249	
995.225	32	V	28.249	60.249	
1000	31.9	V	28.349	60.249	

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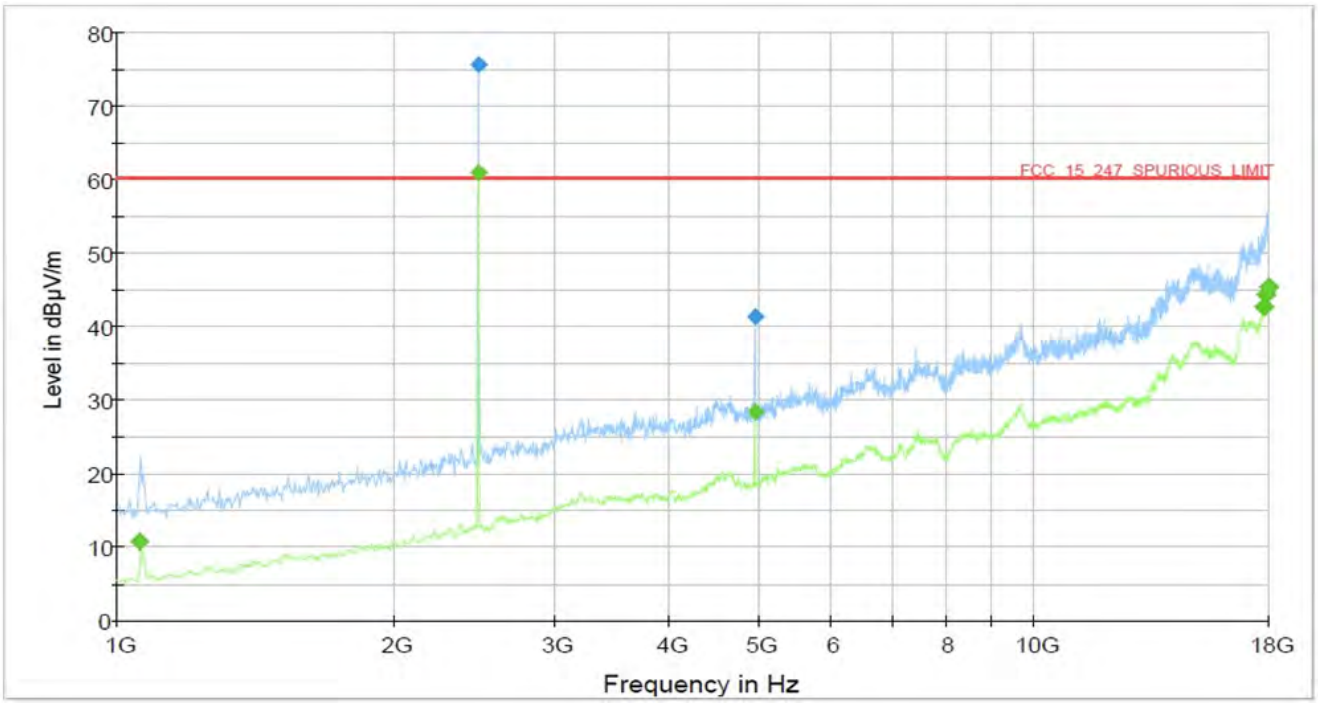
FREQUENCY RANGE 1GHz-18GHz CH 39 VERTICAL POLARIZATION



Blue trace Peak detector, Blue Marker Quasi-Peak detector; Green trace average detector, Green Marker average detector

Frequency (MHz)	Average (dBµV/m)	Polarization	Margin (dB)	Limit (dBµV/m)	Comment
1225.265	11.8	V	48.449	60.249	
2479	61	V	-0.751	60.249	CARRIER
4958.875	28.4	V	31.849	60.249	2nd harmonic
17982.655	42.5	V	17.749	60.249	
17990.115	44.8	V	15.449	60.249	
18000	45.3	V	14.949	60.249	

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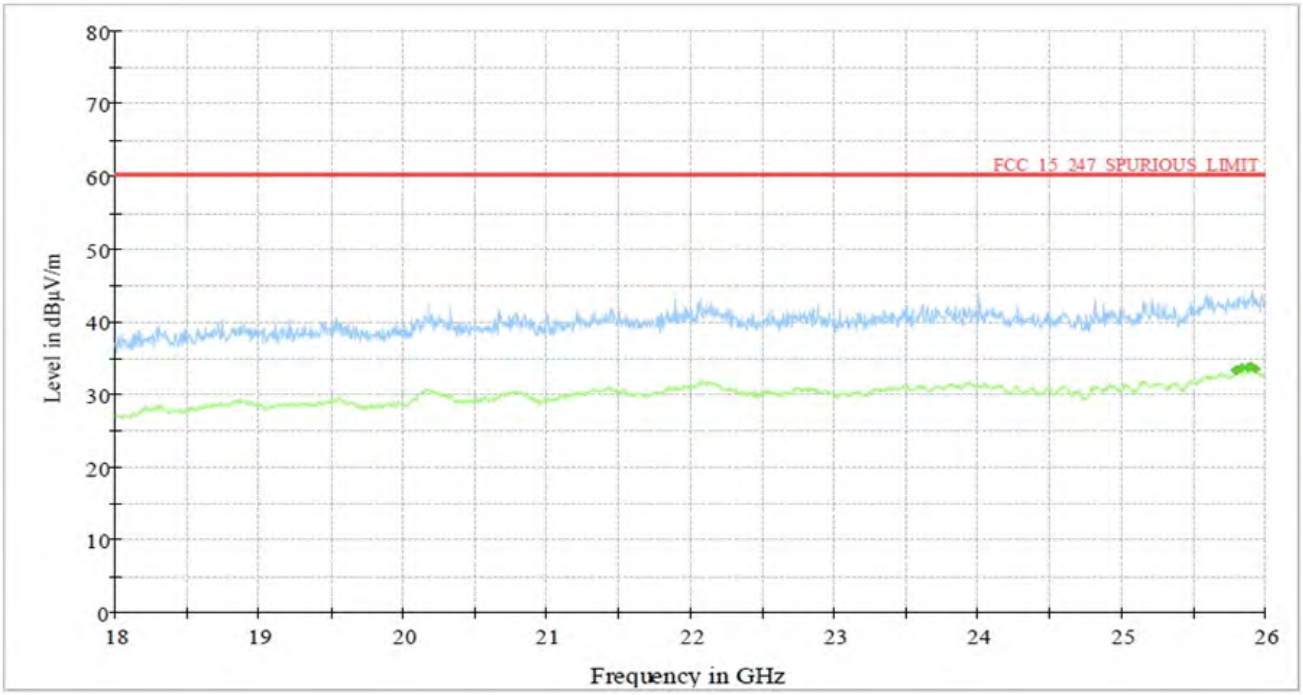
FREQUENCY RANGE 18GHz to 26GHz CH 39 VERTICAL POLARIZATION



Blue trace Peak detector, Green trace average detector

Frequency (MHz)	Average (dBµV/m)	Polarization	Margin (dB)	Limit (dBµV/m)	Comment
25785.225	33.1	V	27.149	60.249	
25790.125	33.2	V	27.049	60.249	
25802.155	33.3	V	26.949	60.249	
25865.325	33.3	V	26.949	60.249	
25870.11	33.5	V	26.749	60.249	
25902.22	33.4	V	26.849	60.249	

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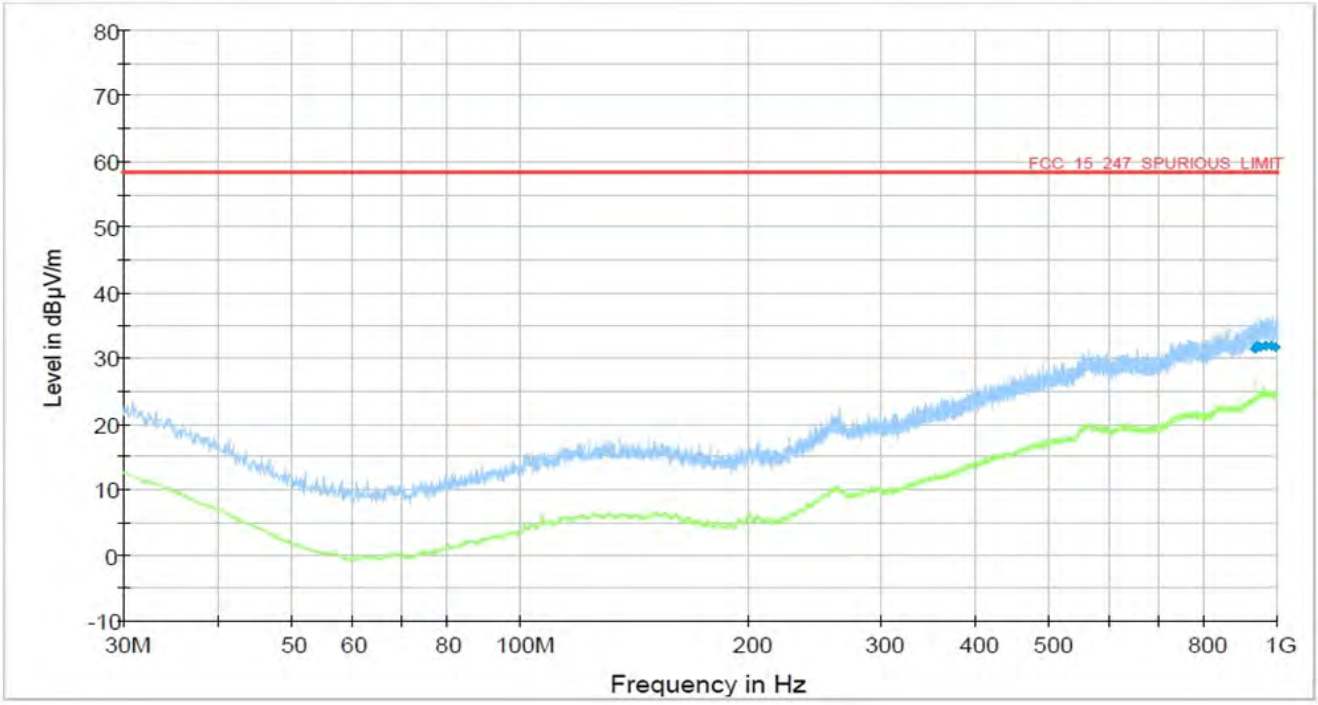
FREQUENCY RANGE 30MHz – 1GHz CH 39 HORIZONTAL POLARIZATION



Blue trace Peak detector, Green trace average detector

Frequency (MHz)	Quasi-Peak (dBµV/m)	Polarization	Margin (dB)	Limit (dBµV/m)	Comment
950.655	31,6	H	26.766	58.366	
955.135	31,9	H	26.466	58.366	
961.545	32	H	26.366	58.366	
985.265	32	H	26.366	58.366	
995.425	32	H	26.366	58.366	
999.875	31,8	H	26.566	58.366	

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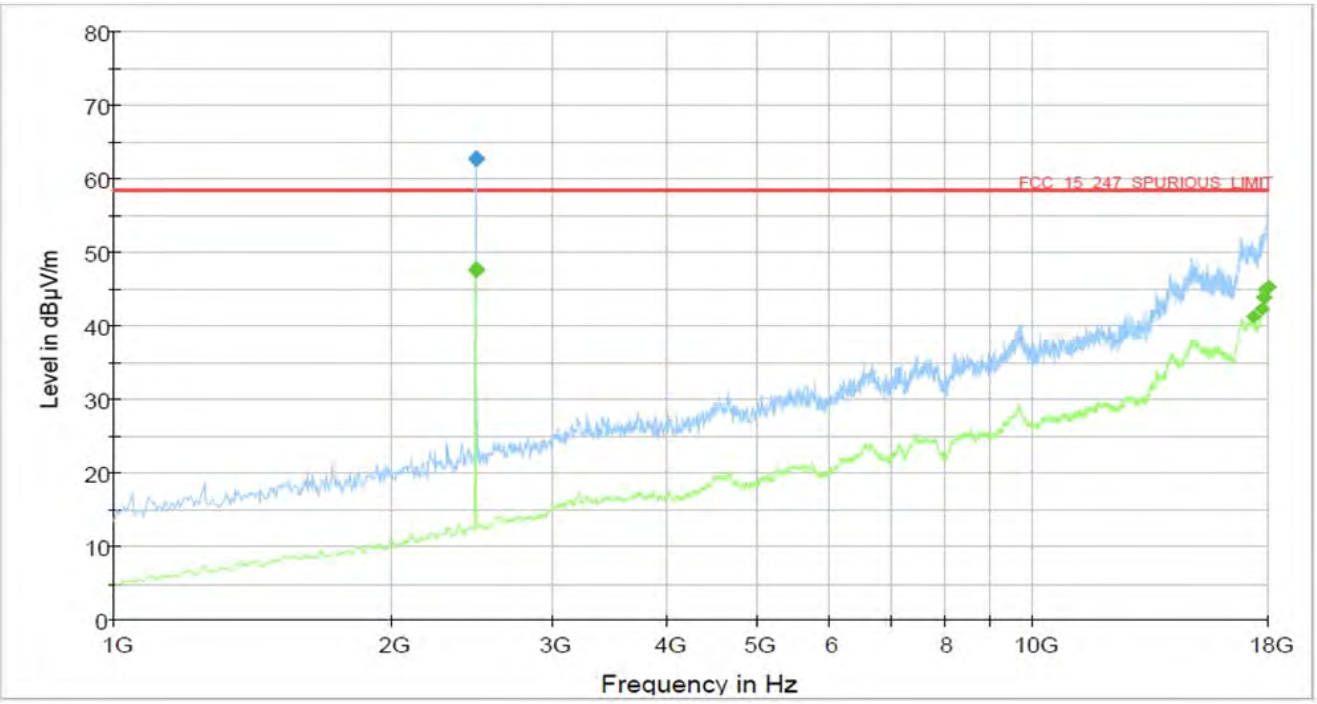
FREQUENCY RANGE 1GHz-18GHz CH 39 HORIZONTAL POLARIZATION



Frequency (MHz)	Average (dBµV/m)	Polarization	Margin (dB)	Limit (dBµV/m)	Comment
2479	47.6	H	10.766	58.366	CARRIER
17855.275	41.8	H	16.566	58.366	
17958.415	42.6	H	15.766	58.366	
17965.655	44.7	H	13.666	58.366	
17970.325	45.2	H	13.166	58.366	
18000	45.9	H	12.466	58.366	

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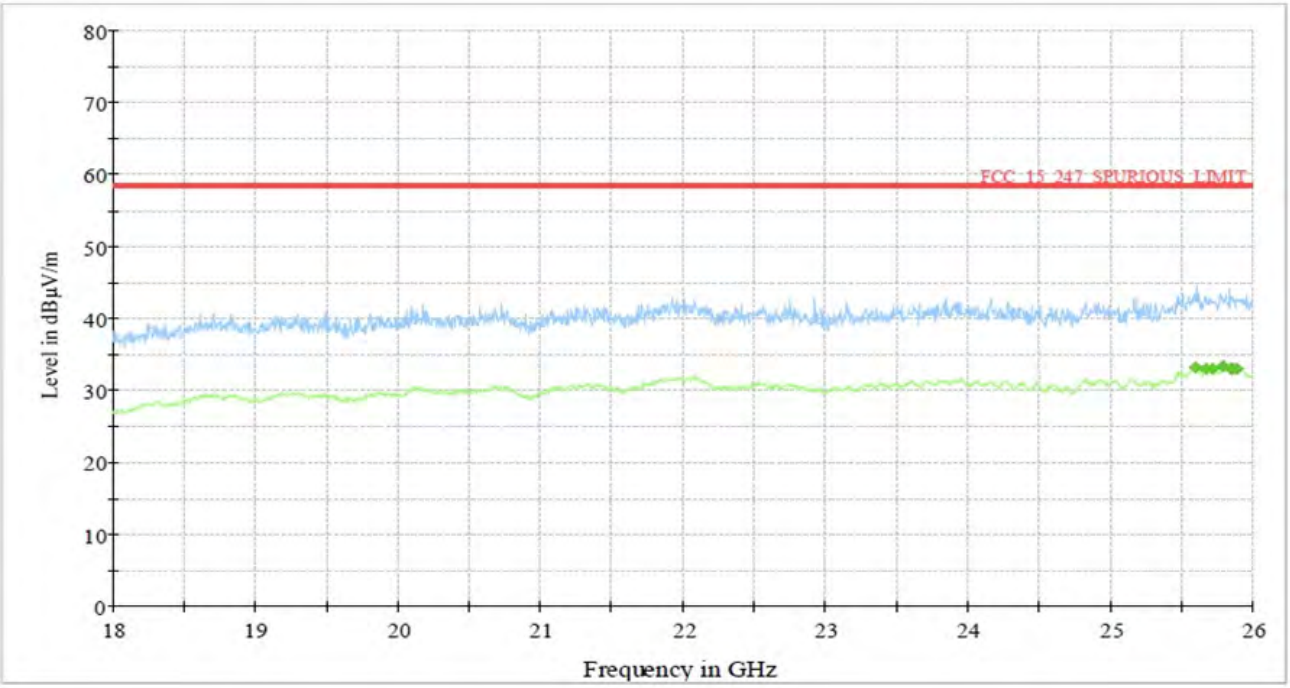
FREQUENCY RANGE 18GHz to 26GHz CH 39

HORIZONTAL POLARIZATION



Blue trace Peak detector, Green trace average detector

Frequency (MHz)	Average (dBµV/m)	Polarization	Margin (dB)	Limit (dBµV/m)	Comment
25625.415	33.1	H	25.266	58.366	
25685.335	32.8	H	25.566	58.366	
25705.265	32.8	H	25.566	58.366	
25735.115	33.1	H	25.266	58.366	
25782.365	32.8	H	25.566	58.366	
25875.115	32.8	H	25.566	58.366	

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7. LIST OF EQUIPMENT USED

EQUIPMENT	MANUFACTURER	MODEL	SERIAL Nr.	CAL. DUE
EMI TEST RECEIVER 20Hz - 40GHz	Rohde & Schwarz	ESU40	100111	MAR. 2018
RF SEMI-ANECHOIC CHAMBER (CSSA)	Siemens	B83117-D6019-T232	003-005-134/94C	Jan 2018
BILOG ANTENNA	Chase	CBL6111C	2717	May 2018
LOG PERIODIC ANTENNA BROAD BAND 1-26,5GHz	Rohde & Schwarz	HL050	100437	Jun 2018
LOOP ANTENNA	Rohde & Schwarz	HFH2-Z2	841801/012	Aug 17
SPECTRUM ANALYZER	Rohde & Schwarz	FSP40	100038	Jun 2018
TUNABLE NOTCH FILTER	Wainwright	WRCT2200/2500-5/40-10SK	5	Nov 2017
HIGH PASS FILTER	Wainwright	WHNX 2,8/18G-10SS	1	Nov 2017
DOUBLE RIDGED HORN ANTENNA 1-18 GHz	Electrometrics	EM-6961	6278	May 2018
Programmable Step Attenuator, DC-26.5GHz, 1-11dB	HP/Agilent	84904K	2214832	Feb 2018

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