

RAPPORTO DI PROVA

TEST REPORT

Rif. / Ref. n.	FCCTR_177285-1	Data Emissione /Issue Date:	29/04/2020	Pagine / Pages:	62
Scopo delle prove <i>Test object</i>	Prove di tipo in accordo alla Norma <i>Type test according to standards</i> 47 CFR FCC part 15.247; RSS-GEN Issue 5; RSS 247 Issue 2				
Richiedente <i>Applicant</i>	B810 S.r.l. Via E. Lazzaretti 2 - 42122 Reggio Emilia - Italy Tel.: +39 0522 510200				
Marchio commerciale <i>Trade mark</i>					
Fabbricante <i>Manufacturer</i>	GEOX S.p.A. Via Feltrina Centro 16 – 31044 Montebelluna – Treviso – Italy Tel.: +39 0423 2822				
Prodotto <i>Product</i>	BLE communication device				
Modello testato <i>Tested model</i>	JR PLAYKIX HW				
Identificativo FCC <i>FCC ID</i>	2AQ7NPKIXH				
Identificativo IC <i>IC ID</i>	24328-PKIXH				
Data ricevimento campioni <i>Date of test samples receipt</i>	05/12/2019				
Campioni verificati <i>No. of tested samples</i>	1 – Sampled by the Manufacturer				
Data verifiche <i>Testing date</i>	05-09/12/2019				
Sito di prova <i>Testing site</i>	PRSLAB S.r.l. Unipersonale - Via Campagna 92 - 22020 Faloppio - Como - Italy				
Esito delle valutazioni <i>Assessment results</i>	CONFORME / COMPLIANT				
Verifiche effettuate da <i>Verifications carried out by</i>	Daniele AOSANI Tecnico laboratorio EMC & RADIO EMC & RADIO Test Engineer				
Approvato <i>Approved by</i>	Riccardo PFEIFFER Responsabile laboratori EMC & RADIO EMC & RADIO Laboratory manager				

I risultati delle prove riportati nel presente rapporto di prova si riferiscono solo ai campioni esaminati.

The test results reported in this test report shall refer only to the samples tested.

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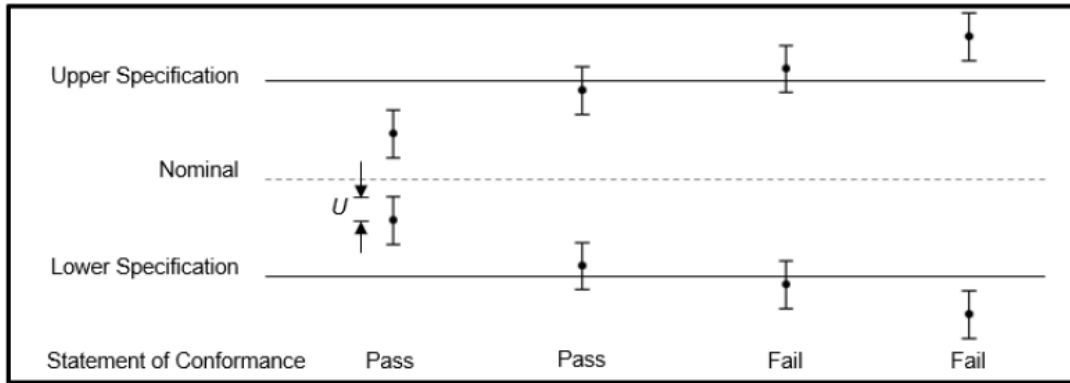
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0. RELEASE CONTROL RECORD

TEST REPORT NUMBER	REASON OF CHANGE	DATE OF ISSUE
FCCTR_177285-0	Original release	18/02/2020
FCCTR_177285-1	Added some Band Edge plots at page 24	29/04/2020

1. DECISION RULE

PRSLAB, for declaration of conformity related to measurement result, use a simple binary statement ($w=0$), as indicated in the document ILAC-G8-09:2019




$U = 95\%$ expanded measurement uncertainty

Statements of conformity are reported as:

- Pass - the measured value is below the acceptance limit, $AL=TL$.
- Fail - the measured value is above the acceptance limit, $AL=TL$.

2. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)

2.1 EUT Identification

DESCRIPTION	BLE communication device
MODEL NAME	JR PLAYKIX HW
FCC ID	2AQ7NPKIXH
IC ID	24328-PKIXH
PRODUCT CODE	P124XMOVE
SERIAL NO.	00000299
TRADEMARK	
MANUFACTURER	GEOX S.p.A.
COUNTRY OF MANUFACTURER	Italy
SINGLE UNIT OR SYSTEM	Single
POWER SOURCE	Internal lithium battery CR2477
SUPPLY VOLTAGE	3Vdc
BATTERY CAPACITY	950mAh
HW VERSION	2.0
SW VERSION	01.04.10
OPERATING TEMPERATURE	-10°C ÷ +50°C
DIMENSIONS	32 x 32 x 17 mm
EUT STANDING	Mounted in the shoes

2.2 Bluetooth module technical data

CHIP MANUFACTURER	
CHIP TYPE	nRF52832
ETS CATEGORY	Bluetooth Low Energy
RF CATEGORY	Transceiver
FREQUENCY BAND	2400 – 2483.5MHz
NUMBER OF CHANNELS	40
CHANNEL BANDWIDTH	2MHz
CHANNEL SEPARATION	2MHz
TRANSFER RATE	1Mbps
SENSITIVITY	-96dBm
TYPE OF MODULATION	GSFK
ANTENNA TYPE	PCB printed
ANTENNA GAIN	---

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

2.3 Channel List Bluetooth Low Energy

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY	CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

2.4 Ports identification

PORT	DESCRIPTION	CONNECTION	NOTES
<input checked="" type="checkbox"/> Enclosure	Plastic	Snaps	---
<input type="checkbox"/> AC Power input	Port not present	---	---
<input type="checkbox"/> DC Power input	Internal battery	---	---
<input type="checkbox"/> Signal/Control port	Port not present	---	---
<input type="checkbox"/> Telecomm. port	Port not present	---	---
<input type="checkbox"/> Antenna Port	PCB printed	---	---

Note:

During the tests all cables must be what provided the manufacturer or the same that used in the real employment of the EUT.

2.5 Modifications incorporated in E.U.T.

The following items are the modifications introduced in the equipment under test:

- None

2.6 Auxiliary equipment

- Laboratory Tablet to set BLE channels.

3. OPERATING MODES AND TEST 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: Special software by the Applicant to operate the EUT at each channel frequency continuously. For example, the transmitter will be operated at each of the lowest, middle and highest frequencies individually continuously during testing.

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.

4. REFERENCE STANDARDS

REFERENCE STANDARD	DESCRIPTION
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
KDB 558074 D01	Guidance for performing Compliance measurements on Digital Transmission Systems (DTS) Operating under §15.247
RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus
RSS-247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
ANSI C63.10:2013	American National Standard for Testing Unlicensed Wireless Devices
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
Title 47 Part 1 Subpart I § 1.1310	Procedures Implementing the National Environmental Policy Act of 1969. Radiofrequency radiation exposure limits.
Title 47 Part 2 Subpart J § 2.1091	Radiofrequency radiation exposure evaluation: mobile devices.

5. UNITS OF MEASUREMENTS

Radiated EMI Data is in dB μ V/m; dB/m referenced to one microvolt per meter

Sample Calculation:

RFS = Radiated Field Strength,
FSM = Field Strength Measured,
A.F. = Receive antenna factor,
Gain = amplification gains and/or cable losses.

$RFS (dB\mu V/m @ 3m) = FSM (dB\mu V) + A.F. (dB/m) - Gain (dB)$

6. SUMMARY OF TEST RESULTS

EUT PORT	DESCRIPTION OF PHENOMENA	BASIC STANDARD	OPERATING CONDITION	RESULTS
Enclosure	Radiated Emissions	FCC Part 15 §15.205 §15.209 §15.247 (d) ICES 003	#1, #2, #3	Within the limits
Antenna port	Antenna requirement	FCC Part 15 §15.203 RSS-247	---	Compliant
	Maximum Peak Output Power	FCC Part 15 §15.247 (b) (3) RSS-247	#1, #2, #3	Within the limits
	6 dB Bandwidth	FCC Part 15 §15.247 (a) (2) RSS-247	#1, #2, #3	Within the limits
	Power Spectral Density	FCC Part 15 §15.247 (e) RSS-247	#1, #2, #3	Within the limits
	Band-Edge	FCC Part 15 § 15.247 (d) RSS-247	#1, #3	Within the limits
	RF radiated Spurious Emissions at the Transmitter Antenna Terminal	FCC Part 15 § 15.247 (d) RSS-247	#1, #2, #3	Within the limits
	Frequency Stability	RSS-Gen	#1, #2, #3	Compliant

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

7. MEASUREMENT UNCERTAINTY

PARAMETER	EXPANDED UNCERTAINTY
Occupied channel BW	3,41 %
RF Output Power, conducted	2,56 dB
Power spectral density, conducted	3,41 dB
All Emissions Radiated	3,41 dB
Temperature	1,09 °C
Humidity	2,64 %
DC Voltage	0,06 V
AC Voltage	0,3 V
Time	0,12 s
Uncertainty confidence level: = 95% (k=2)	

8. LIST OF INSTRUMENTS USED

Instrument	Manufacturer	Model	Serial n°	Calibrated on	Due to
Emi Receiver / Analyzer	Rohde & Schwarz	ESU40	100111	05/2019	05/2020
Loop antenna	Rohde & Schwarz	HFH 2-Z2	841801/012	03/2017	03/2020
Bi-Log antenna	Chase	CBL6111C	2717	03/2019	03/2022
Horn antenna	Electro Metrics	EM-6961	100437	06/2017	06/2020
Horn antenna + Low Noise Preamplifier	Bonn Electronic	BLMA 1840-1A	262WL80452	03/2019	03/2022
Power sensor	Keysight	U2022XA + U2032A	MY57030003	05/2018	05/2020
Semi-Anechoic Chamber	Siemens	B83117-D6019- T232	003-005-134/94C	02/2019	02/2020

9. TEST RESULTS

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TEST 1.

ANTENNA REQUIREMENTS

REFERENCE DOCUMENT

According to §15.203 / 15.204 & RSS-247

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 Requirements

The EUT has a PCB antenna

RESULT: COMPLIANT

TEST 2.

MAXIMUM PEAK OUTPUT POWER

REFERENCE DOCUMENT

According to §15.247(b) (3) & RSS-247

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	Acc. to reference document
• 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
• TEST EQUIPMENT USED FOR TEST	EMI Receiver Rodhe & Schwarz mod. ESU40 Horn antenna Electro Metrics mod. EM-6961 Power Sensor Keysight mod. U2022XA + U2032A
• TEST PERFORMED BY	Daniele Aosani

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

OPERATING CONDITION :#1, #2, #3 Duty Cycle 100%

RESULT: **WITHIN THE LIMITS**

MEASUREMENT PARAMETER

Resolution bandwidth	RBW \geq DTS bandwidth
Video bandwidth	VBW \geq 3 x RBW
Span	span \geq 3 x RBW
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 - controlled 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.

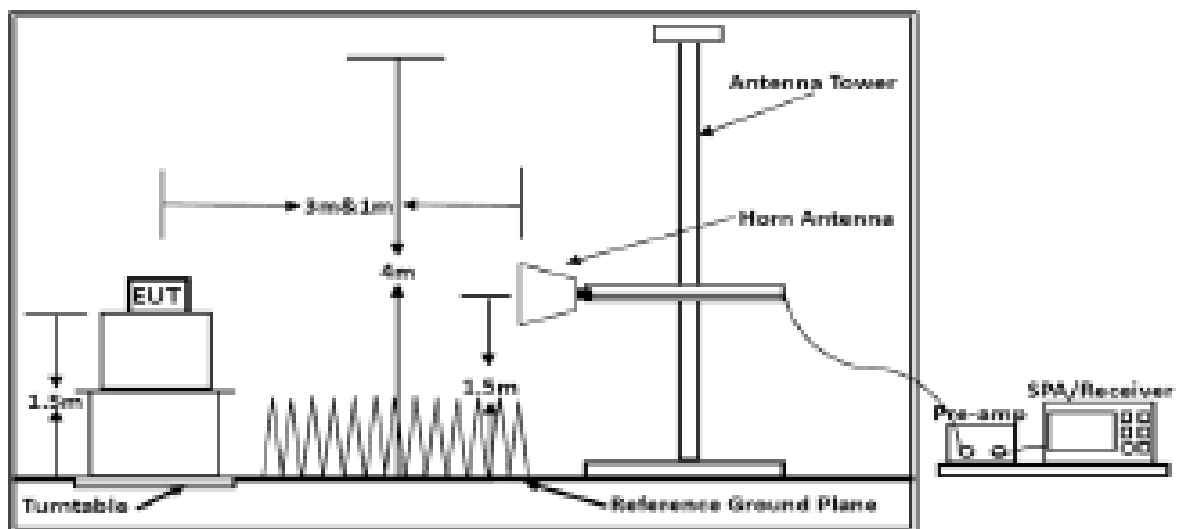
The EUT is placed at test table.

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



Above 1GHz

Channel	Frequency (MHz)	EIRP (dBm)	Antenna Gain	Max Conducted Output power	Limit (dBm)	Result
0	2402	0.80	0	0.80	30	WITHIN THE LIMITS
19	2440	1.00	0	1.00		
39	2480	1.40	0	1.40		
Incertezza di misura / Measurement Uncertainty : ± 3 dB						
Note: ---						

TEST 3.

OCCUPIED CHANNEL BANDWIDTH

REFERENCE DOCUMENT

RSS-GEN

• TEST SETUP	Acc. to reference document
• TEST LOCATION	Radio test area
• TEST METHOD	RSS-GEN section 6.7
• TYPE OF MEASUREMENT	Radiated
• TEST EQUIPMENT USED FOR TEST	Spectrum Analyzer R&S mod. ESU40
• TEST PERFORMED BY	Daniele Aosani

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

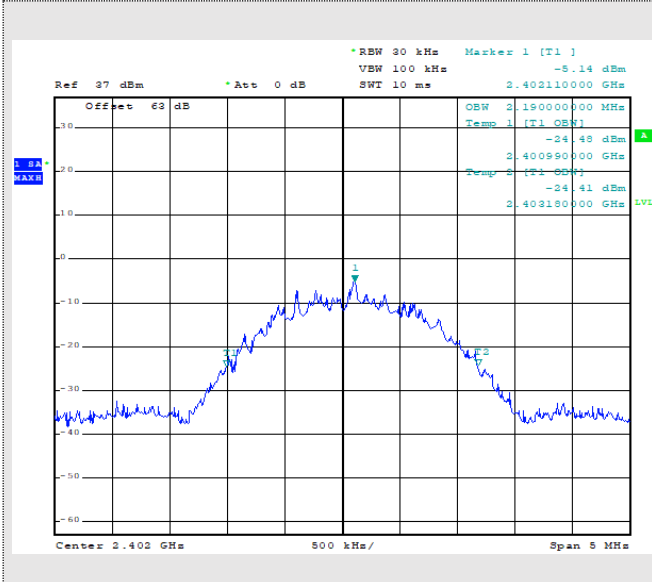
OPERATING CONDITION :#1, #2, #3 Duty Cycle 100%

RESULT: **WITHIN THE LIMITS**

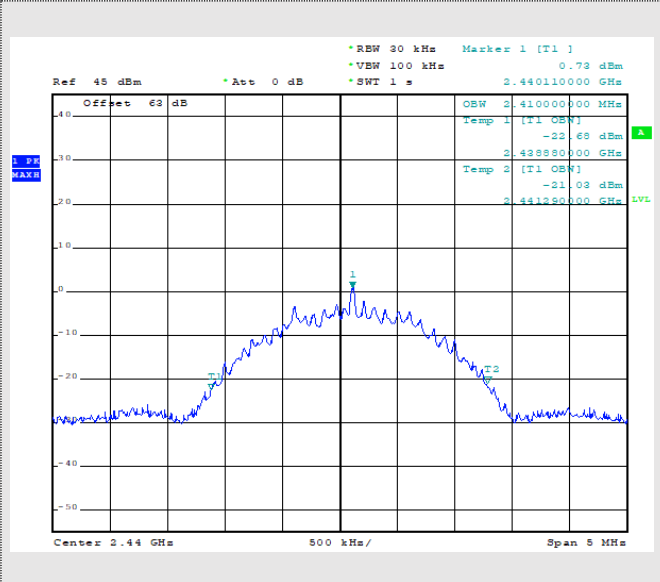
Measurement Result

Occupied Bandwidth

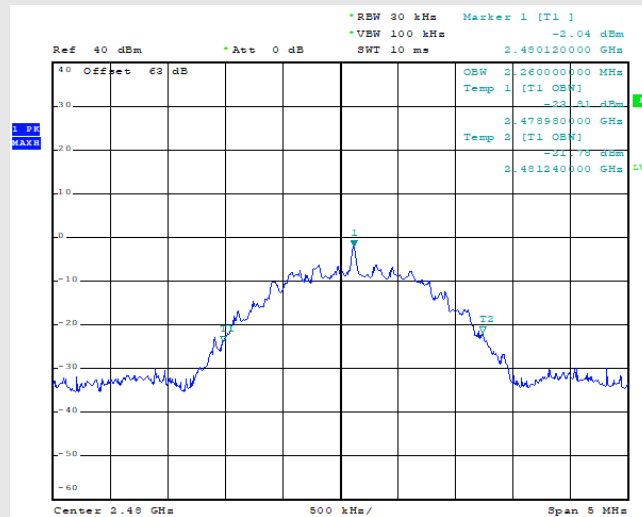
Channel 0



Channel 19



Channel 39



Channel	Frequency (MHz)	Occupied BW 99% (MHz)	LIMIT	RESULT
0	2402	2.19	The Occupied Channel Bandwidth shall fall completely within the band 2400-2483.5MHz	COMPLIANT
19	2440	2.41		COMPLIANT
39	2480	2.26		COMPLIANT

TEST 4.

6dB CHANNEL BANDWIDTH

REFERENCE DOCUMENT

According to §15,247(a)(2) / RSS-247 & RSS-247

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	Acc. to reference document
• TEST LOCATION	Radio test area
• TEST METHOD	KDB 558074 D01 par. 8.2 DTS Bandwidth Option 2
• TYPE OF MEASUREMENT	Radiated
• TEST EQUIPMENT USED FOR TEST	Spectrum Analyzer R&S mod. ESU40
• TEST PERFORMED BY	Daniele Aosani

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

OPERATING CONDITION :#1, #2, #3 Duty Cycle 100%

RESULT: **WITHIN THE LIMITS**

MEASUREMENT PARAMETER

Resolution bandwidth	100kHz
Video bandwidth	300kHz
Span	5MHz
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

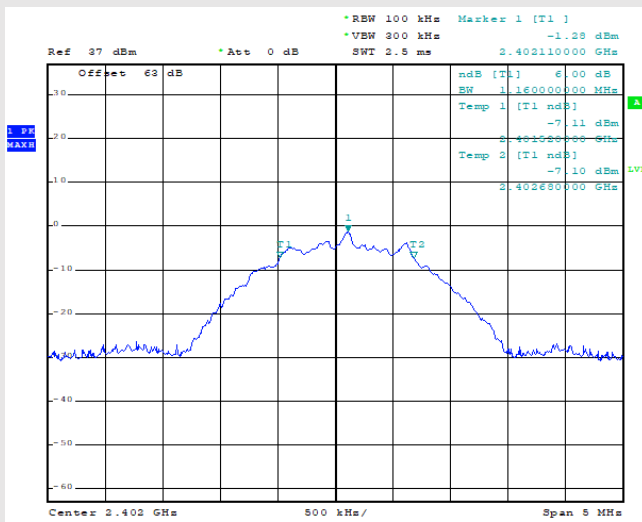
Measurement Result

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	OBW* (MHz)	Verdict
0	2402	1.16	2.19	Within the limits
19	2440	1.19	2.41	
39	2480	1.16	2.26	

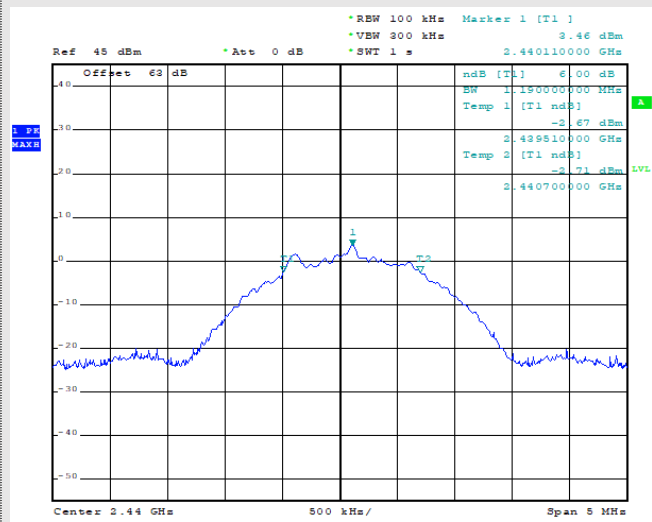
*For this values see test 3 of this document.

6dB Bandwidth

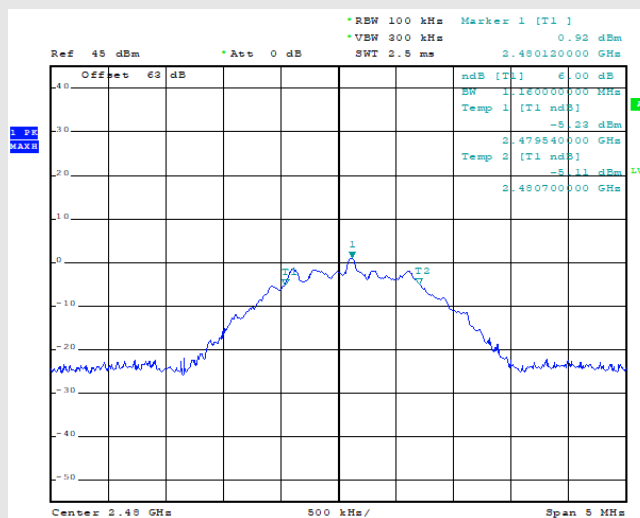
Channel 0



Channel 19



Channel 39



TEST 5.

BAND-EDGE

REFERENCE DOCUMENT

According to §15,247(d) & RSS-247

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	Acc. to reference document
• TEST LOCATION	Radio test area
• TYPE OF MEASUREMENT	Radiated
• TEST EQUIPMENT USED FOR TEST	Spectrum Analyzer R&S mod. ESU40
• TEST PERFORMED BY	Daniele Aosani

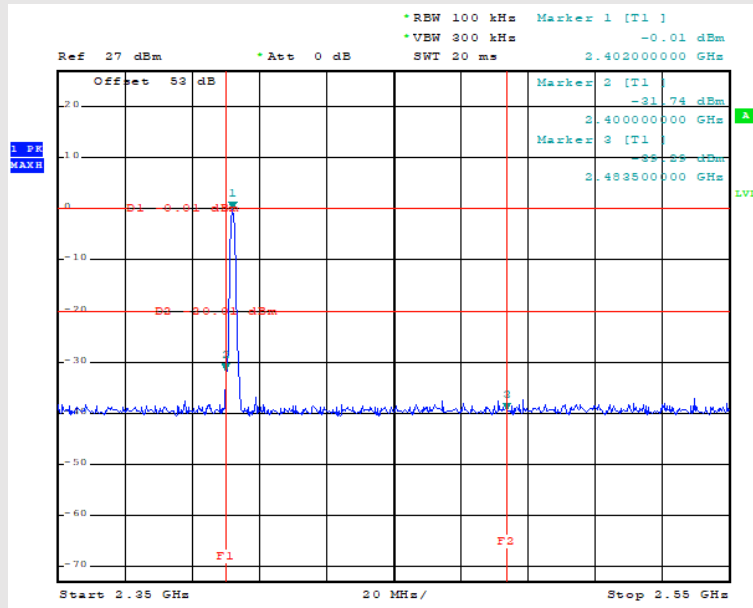
TEST CONDITIONS	REQUIRED	MEASURED
Ambient temperature	23°C ± 5°C	24 °C
Ambient humidity	25 - 75%rH	45%
Pressure	85 - 106kPa (860mbar - 1060mbar)	960 mbar

OPERATING CONDITION :#1, #3 Duty Cycle 100%

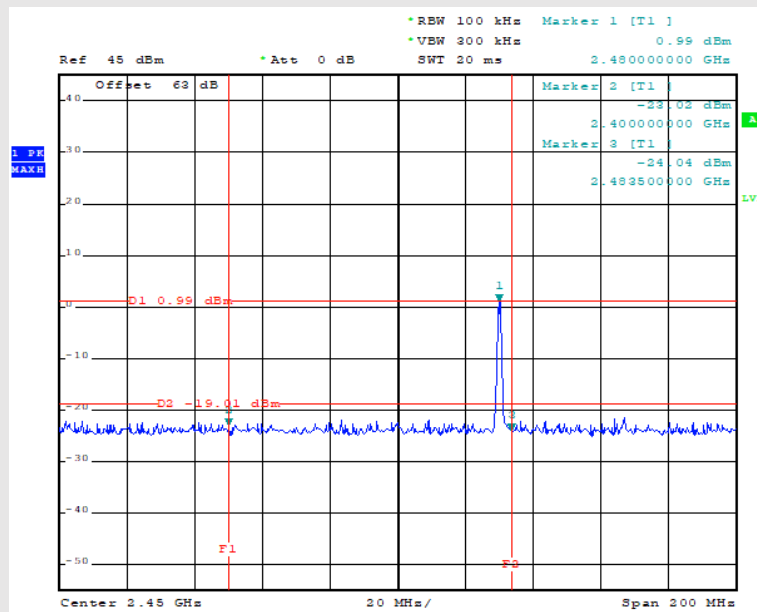
RESULT: WITHIN THE LIMITS

Measurement Result

**LOWER BAND-EDGE
CH 0**

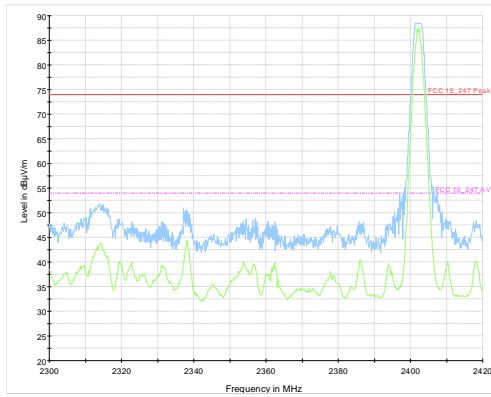


**UPPER BAND-EDGE
CH 39**

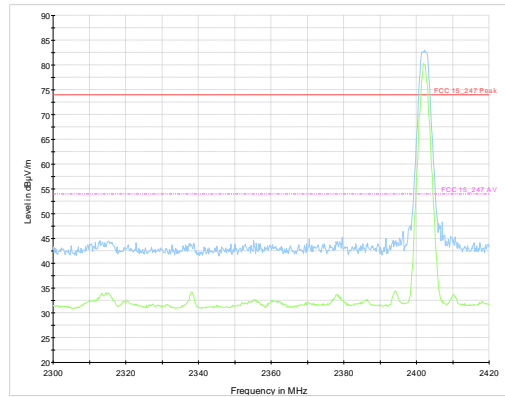


Measurement Result

LOWER BAND-EDGE
CH 0
RBW: 1MHz
VBW: 3 MHz

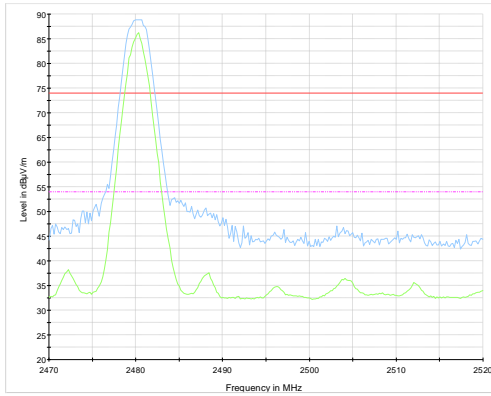


Horizontal Antenna Polarization

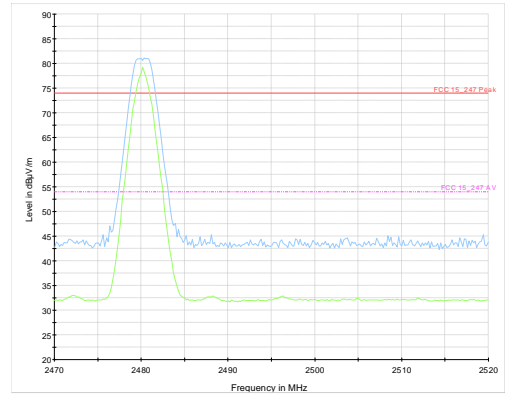


Vertical Antenna Polarization

UPPER BAND-EDGE
CH 39
RBW: 1MHz
VBW: 3 MHz



Horizontal Antenna Polarization



Vertical Antenna Polarization

TEST 6.

POWER SPECTRAL DENSITY

REFERENCE DOCUMENT

According to §15,247) (e) & RSS-247

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	Acc. to reference document
• TEST LOCATION	Radio test area
• TEST METHOD	KDB 558074 D01 par. 10.2 Method PKPSD (peak PSD)
• TYPE OF MEASUREMENT	Radiated
• TEST EQUIPMENT USED FOR TEST	Spectrum Analyzer R&S mod. ESU40
• TEST PERFORMED BY	Daniele Aosani

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

OPERATING CONDITION :#1, #2, #3 Duty Cycle 100%

RESULT: **WITHIN THE LIMITS**

MEASUREMENT PARAMETER

Resolution bandwidth	100kHz
Video bandwidth	300kHz
Span	2MHz
Sweep time	Auto couple
Detector	RMS
Trace-Mode	Max. hold

TEST DESCRIPTION

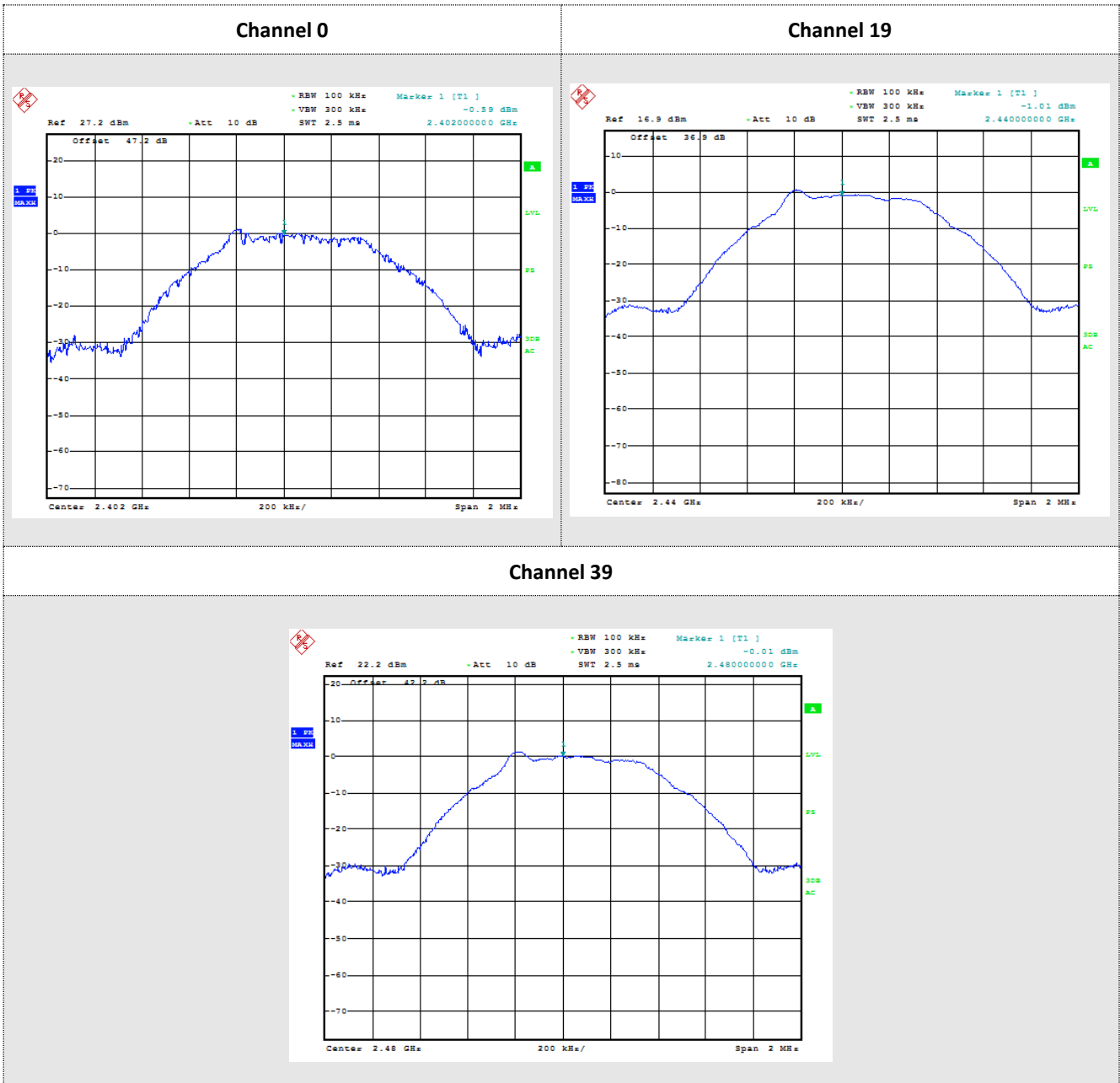
Allow trace to fully stabilize.
Use the peak marker function to determine the maximum amplitude level within the RBW.
If measured value exceeds limit, reduce RBW (no less than 3 kHz or 100kHz if a RMS detector was used) and repeat

Measurement Result

Channel	Frequency (MHz)	PSD (dBm/100kHz)	Limit (dBm/100kHz)	Margin (dB)	Result
0	2402	-0.59	8	8.59	WITHIN THE LIMITS
19	2440	-1.01	8	9.01	
39	2480	-0.01	8	8.01	

Incertezza di misura / Measurement Uncertainty : ± 1 dB

GRAPHICS



TEST 7.

RF RADIATED SPURIOUS EMISSIONS AT THE TRANSMITTER ANTENNA TERMINAL

REFERENCE DOCUMENT

According to §15,247) d) & RSS-247

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	Acc. to reference document
• TEST LOCATION	Semi-anechoic chamber with measure distance at 3 meters
• TYPE OF MEASUREMENT	Radiated
• TEST METHOD	KDB 558074 D01 par. 11.0
• TEST EQUIPMENT USED FOR TEST	EMI Receiver Rodhe & Schwarz mod. ESU40 Bi-log antenna CHASE mod. CBL6111A Horn antenna Electro Metrics mod. EM-6961
• TEST PERFORMED BY	Daniele Aosani
• UNCERTAINTY OF MEASURE:	Combined uncertainty = $\pm 1,75$ dB Total uncertainty = (k=2) $\pm 3,5$ dB

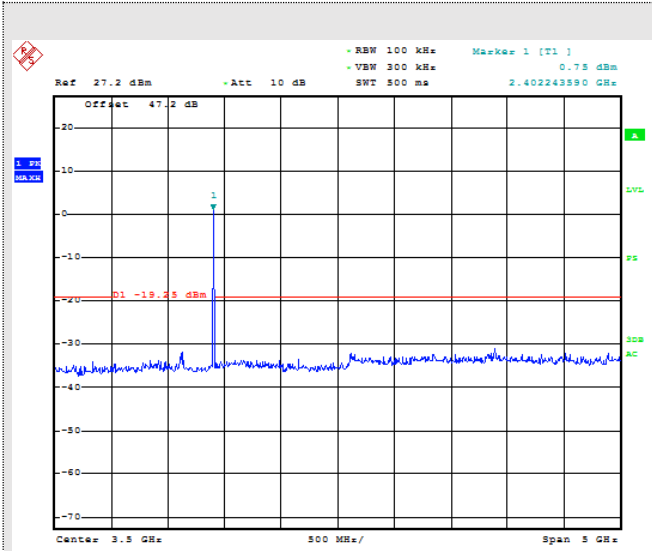
TEST CONDITIONS	REQUIRED	MEASURED
Ambient temperature	23°C \pm 5°C	24 °C
Ambient humidity	25 - 75%rH	45%
Pressure	85 - 106kPa (860mbar - 1060mbar)	960 mbar

OPERATING CONDITION :#1, #2, #3 Duty Cycle 100%

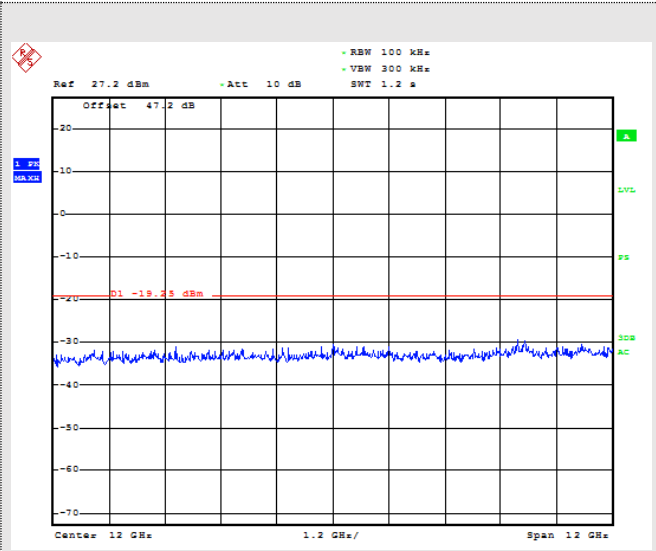
RESULT: **WITHIN THE LIMITS**

Channel 0

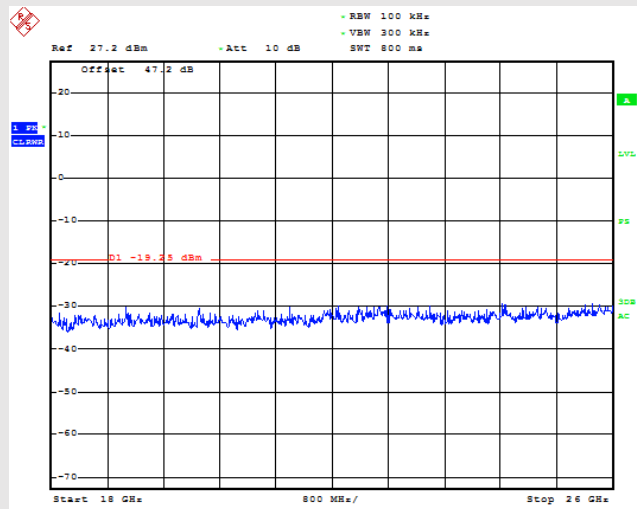
1-6GHz



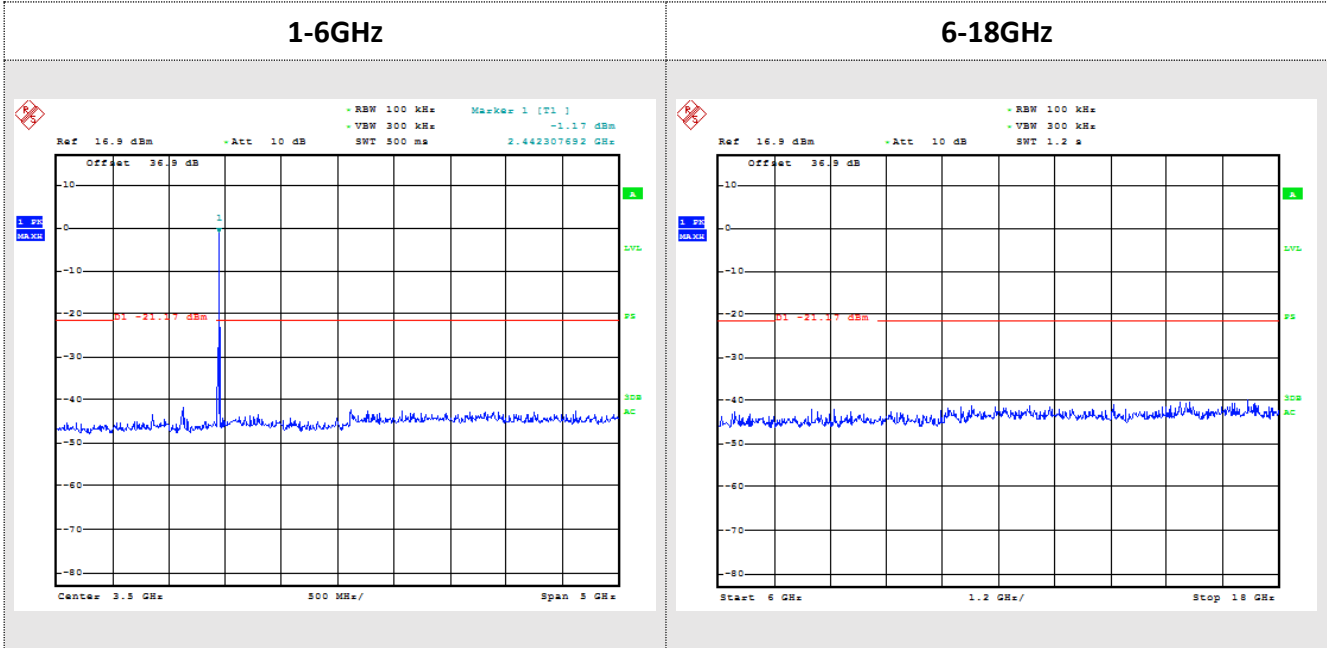
6-18GHz



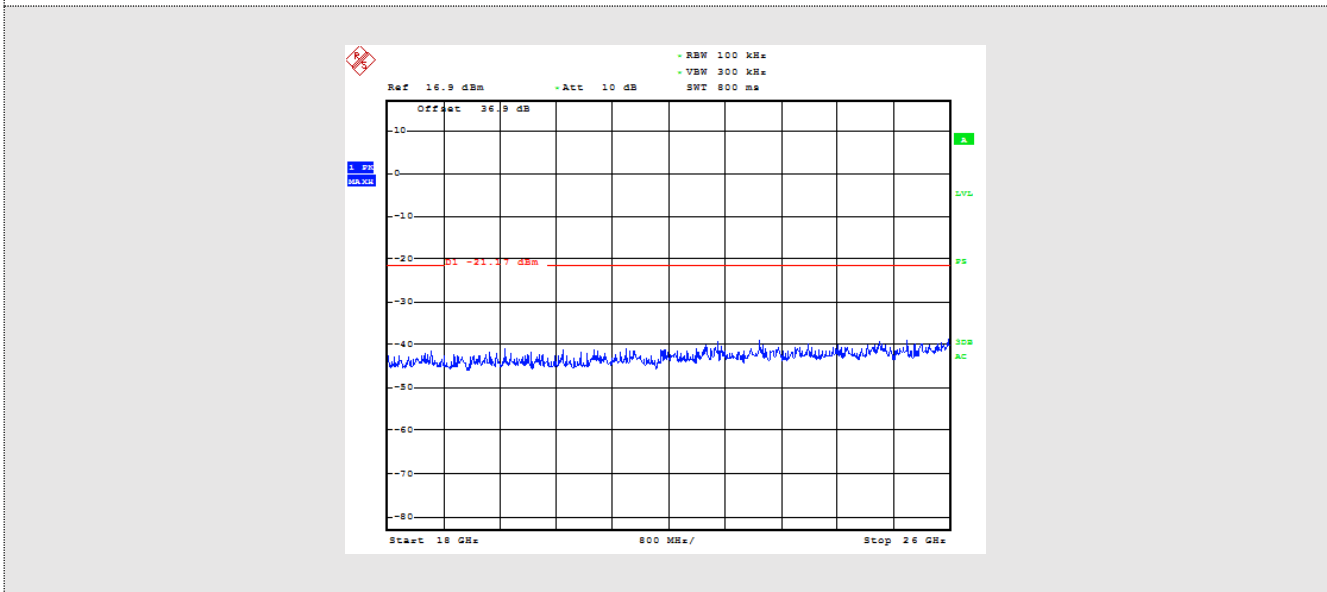
18-26GHz



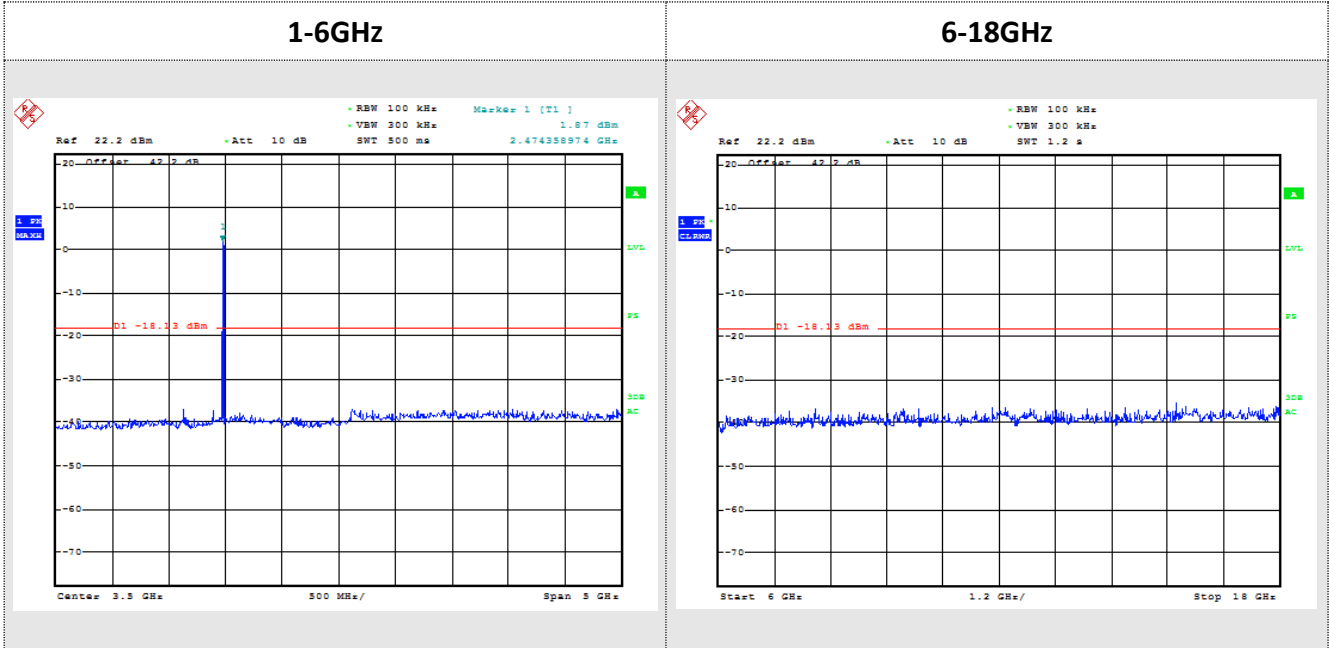
Channel 19



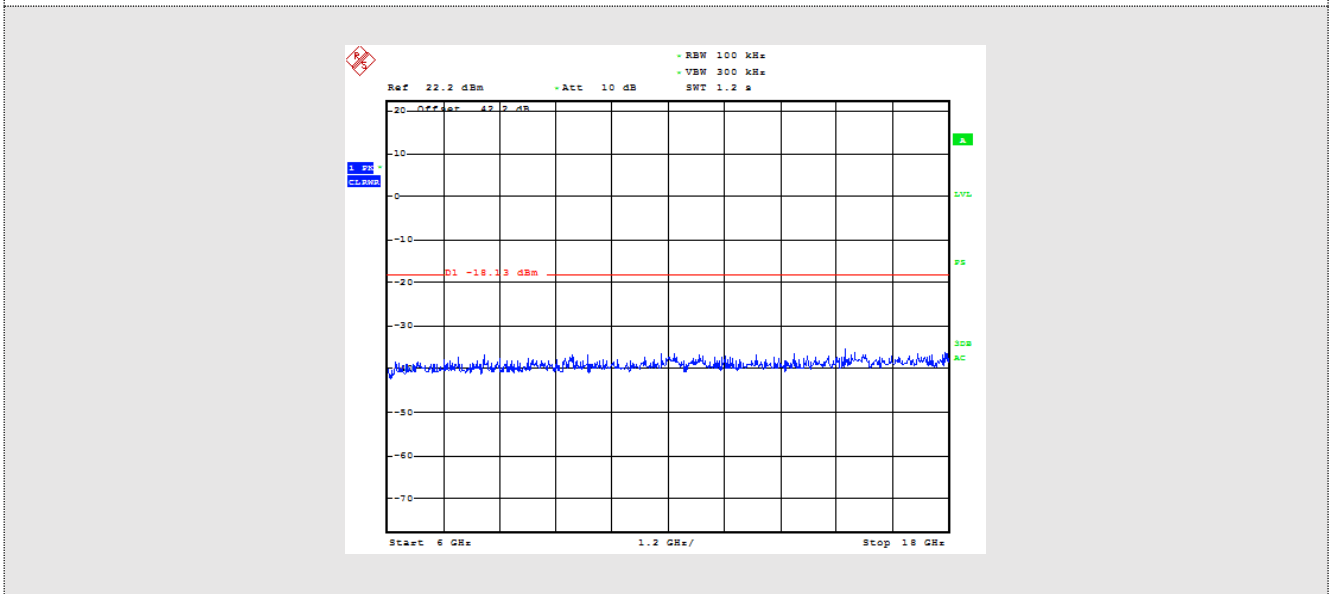
18-26GHz



Channel 39



18-26GHz



TEST 8.

RADIATED EMISSION 9kHz ÷ 10th HARMONIC

REFERENCE DOCUMENT

FCC Cfr 47 part 15 - Subpart B - §15.209

• TEST SETUP	Acc. to reference document
• TEST LOCATION	Semi-anechoic chamber with measure distance at 3 meters
• TYPE OF MEASUREMENT	Radiated
• TEST EQUIPMENT USED FOR TEST	EMI Receiver Rodhe & Schwarz mod. ESU40 Loop Antenna Rohde & Schwarz mod. HFH 2-Z2 Bi-log antenna Chase mod. CBL6111C Horn antenna Electro Metrics mod. EM-6961 Horn antenna + Low Noise Preamplifier Bonn Elektronik mod. BLMA 1840-1A
• TEST PERFORMED BY	Daniele Aosani
• UNCERTAINTY OF MEASURE:	Level of confidence = 95% (k=2) Expanded uncertainty 9kHz – 30MHz = 4,24 dB Expanded uncertainty 30MHz – 1GHz = 4,85 dB Expanded uncertainty 1GHz – 18GHz = 6,02 dB Expanded uncertainty 18GHz – 26GHz = 5,82 dB

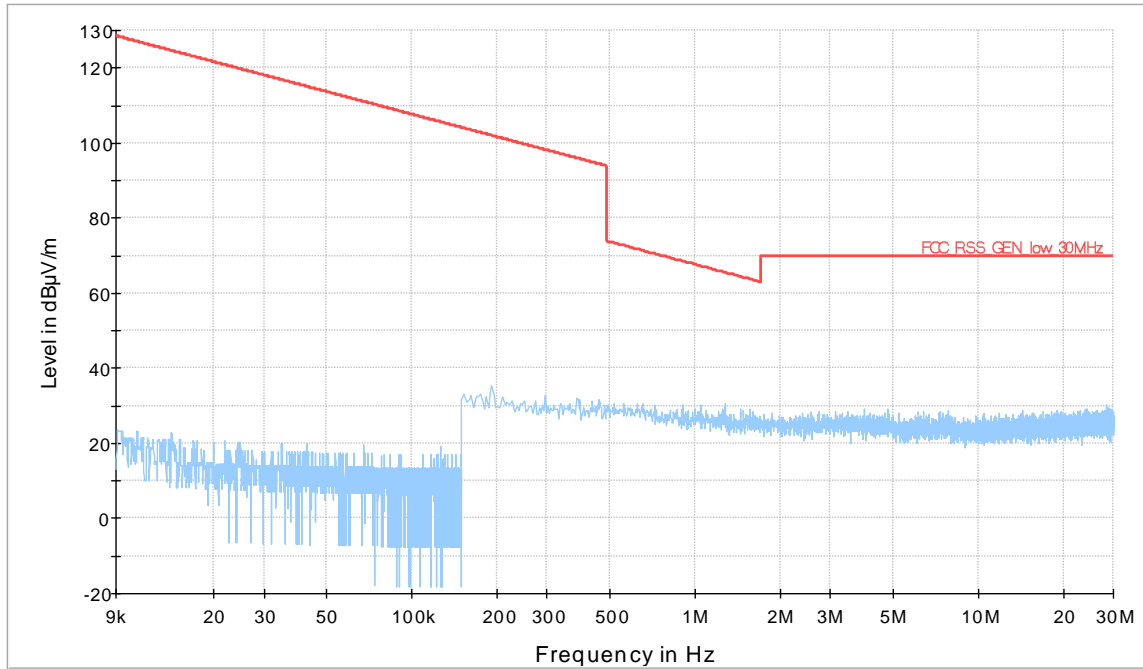
TEST CONDITIONS	REQUIRED	MEASURED
Ambient temperature	23°C ± 5°C	24 °C
Ambient humidity	25 - 75%rH	45%
Pressure	85 - 106kPa (860mbar - 1060mbar)	960 mbar

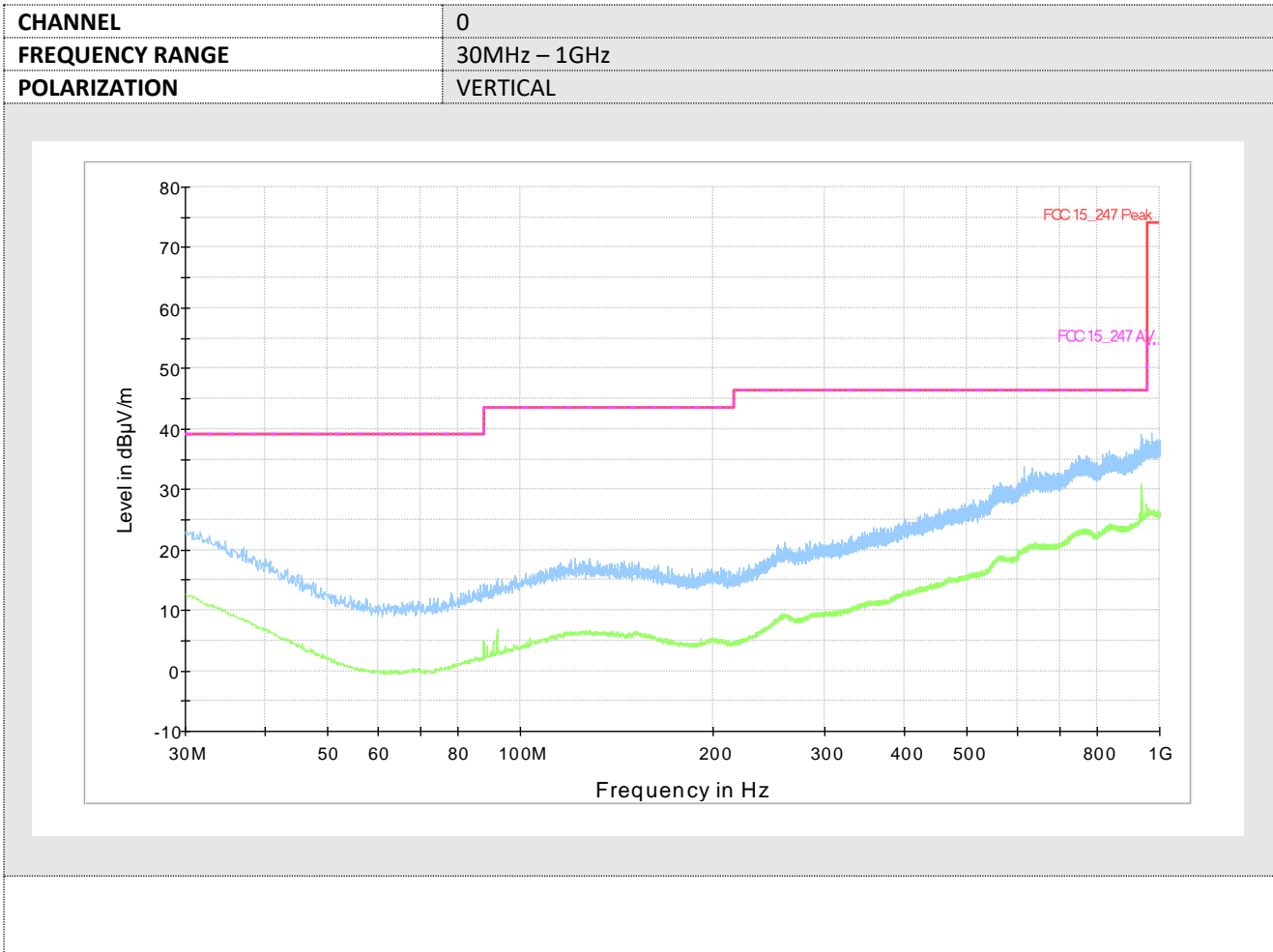
OPERATING CONDITION :#1, #2, #3 Duty Cycle 100%

RESULT: **WITHIN THE LIMITS**

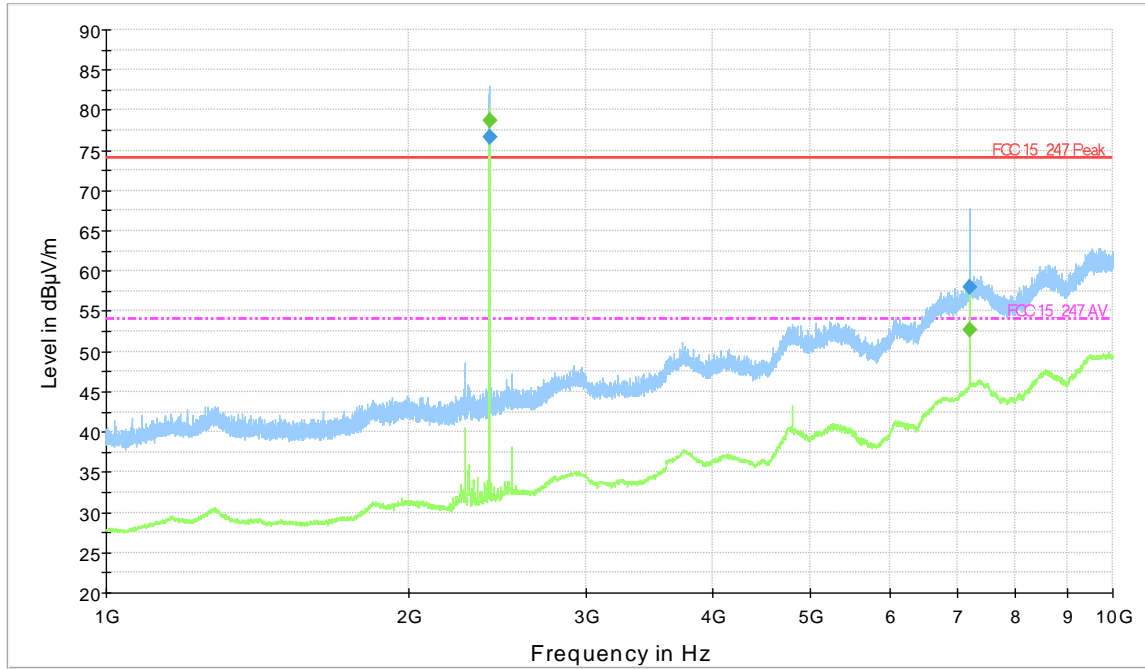
CHANNEL	0
FREQUENCY RANGE	9kHz - 30MHz
POLARIZATION	VERTICAL

EMI_RAD_9k_30M_sweep_dBuV m





CHANNEL	0
FREQUENCY RANGE	1-10GHz
POLARIZATION	VERTICAL



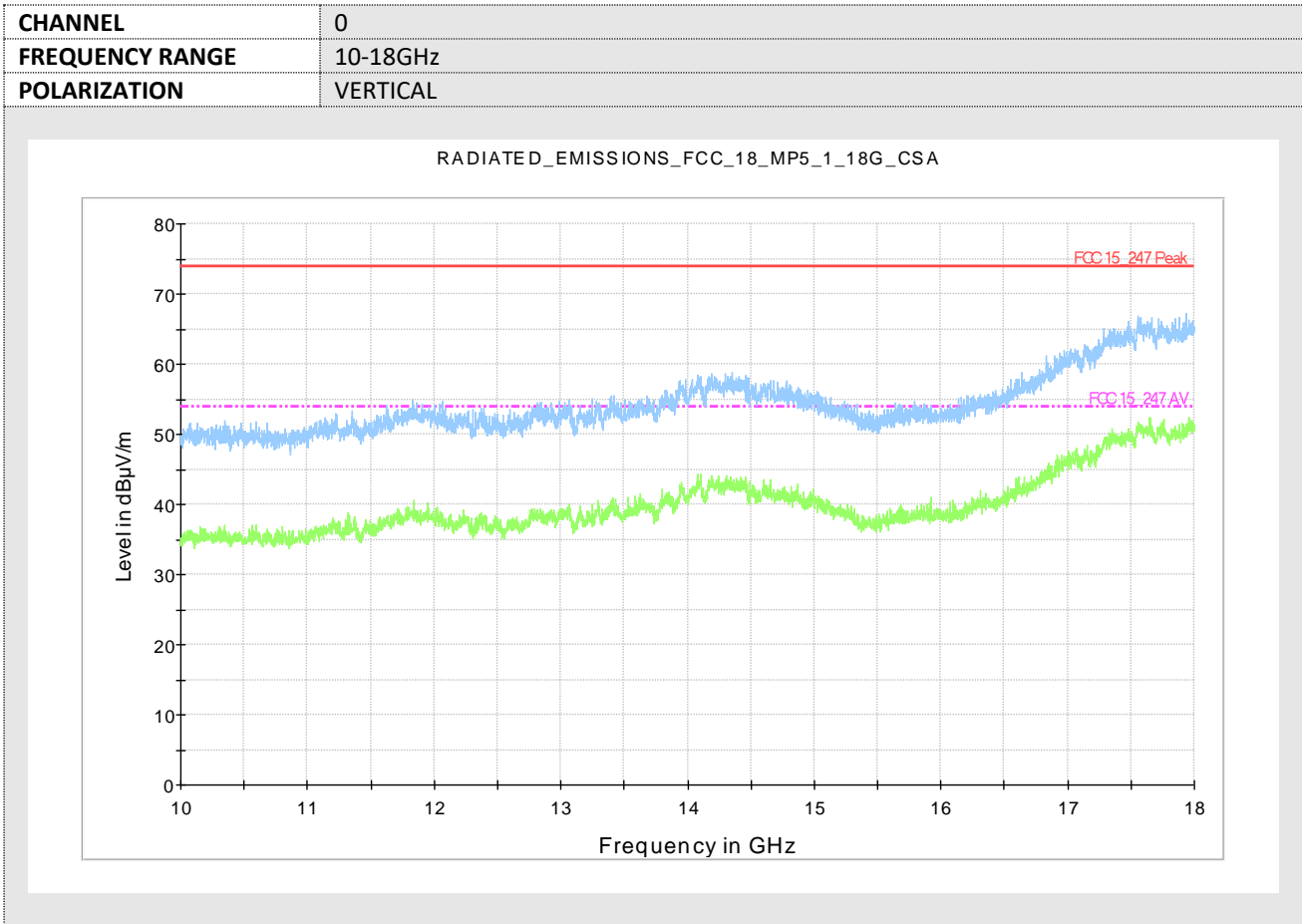
Final Result Peak

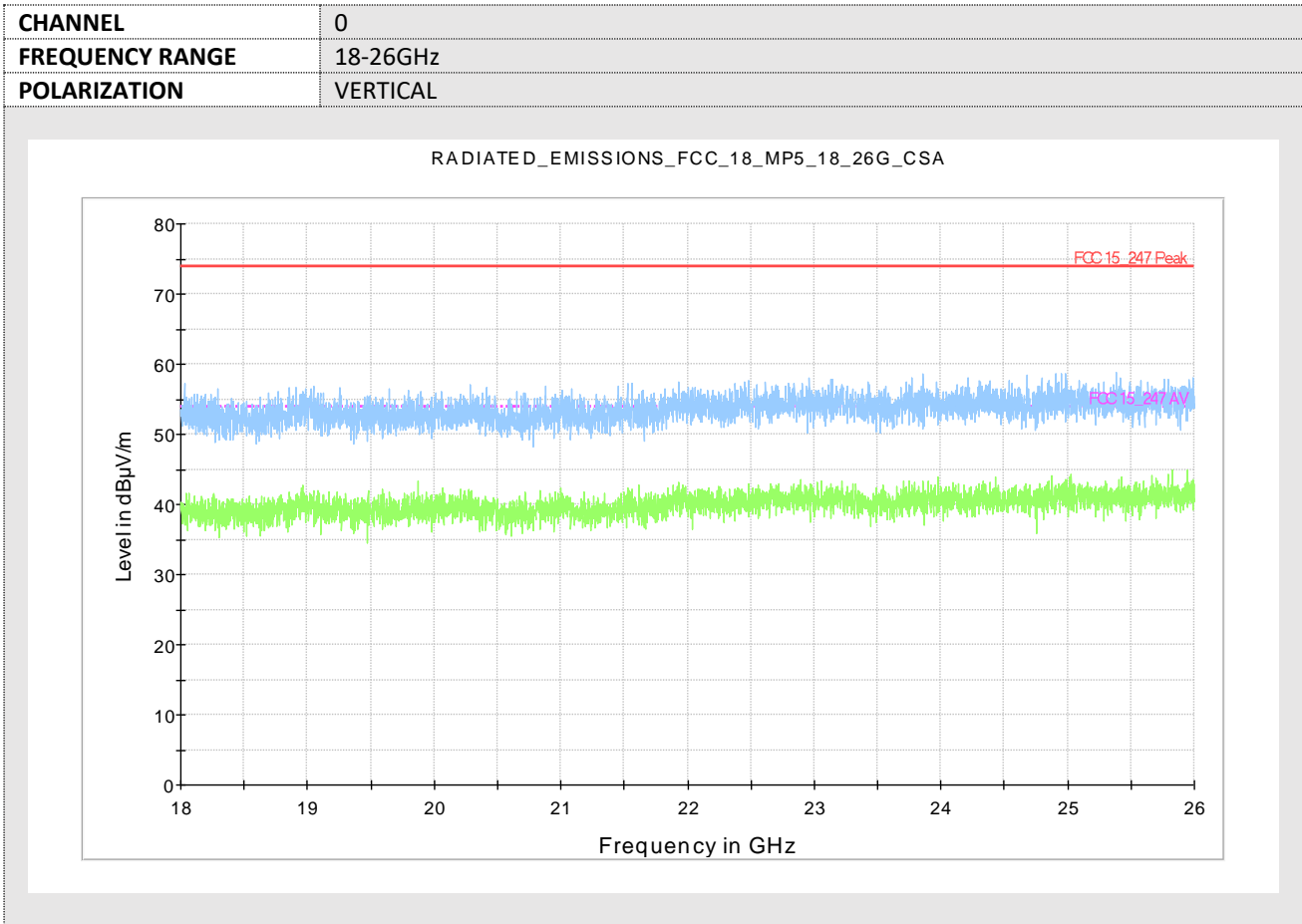
Frequency (MHz)	Peak (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2402.200000	76.7	255.1	90.0	-2.70	74.00
7204.960000	58.0	106.8	0.0	16.00	74.00

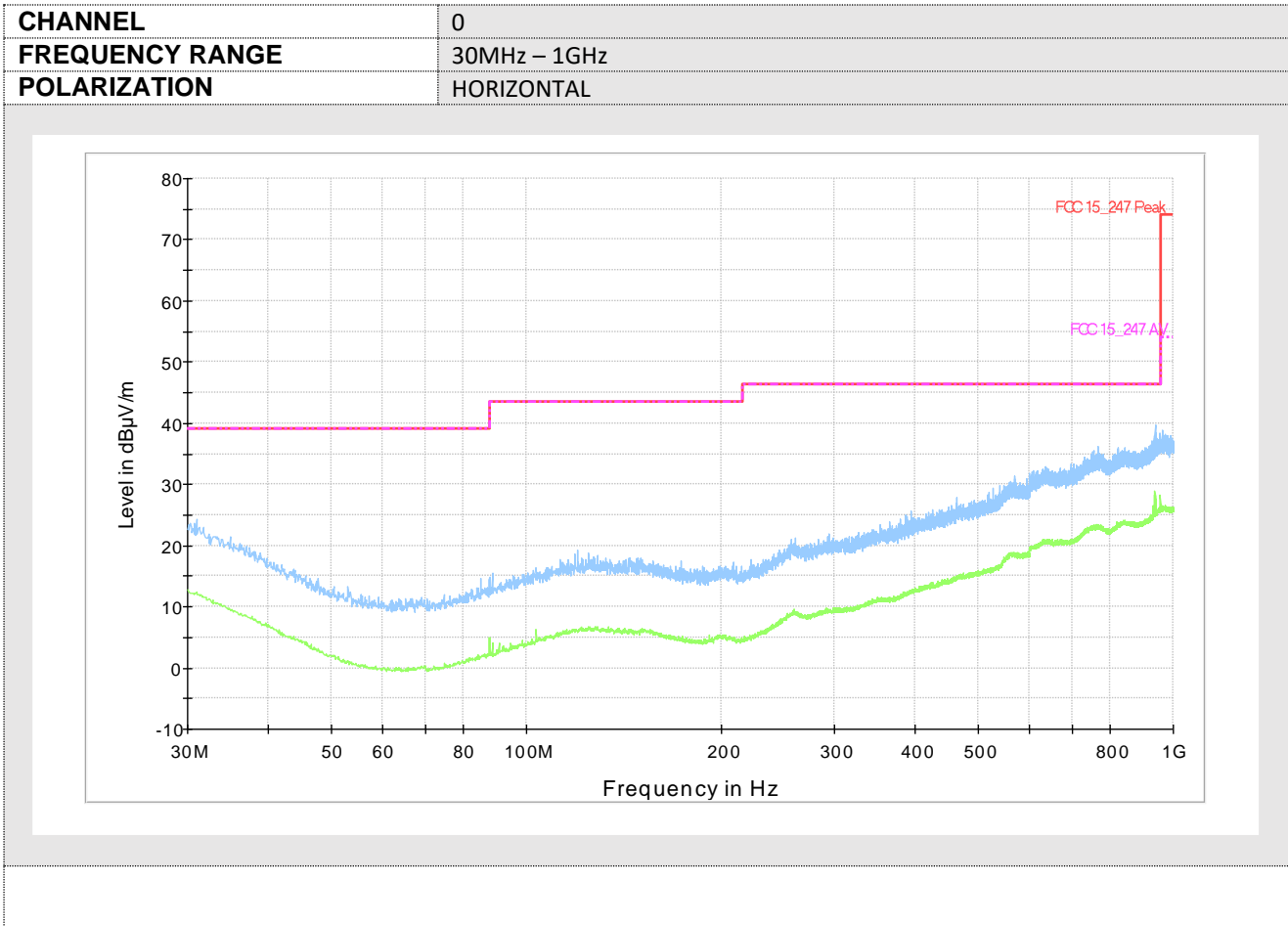
Final Result Average

Frequency (MHz)	Average (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2402.200000	78.7	255.1	90.0	-24.70	54.00
7204.960000	52.7	106.8	0.0	0.30	54.00

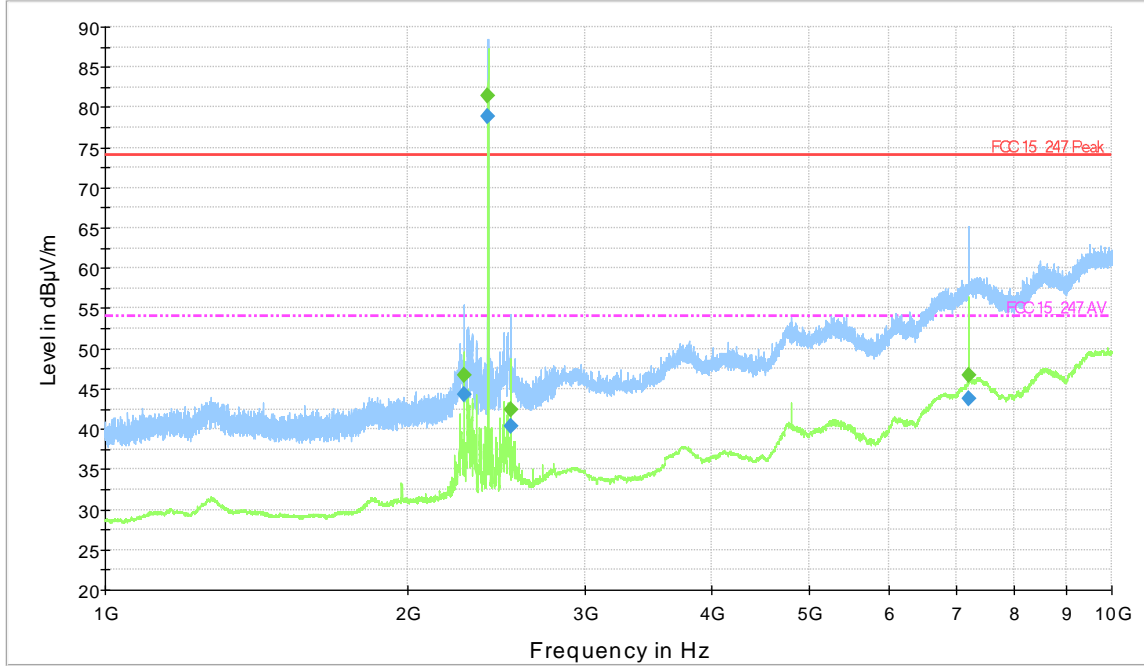
*Peaks out of limits are due to the BLE carrier.







CHANNEL	0
FREQUENCY RANGE	1-10GHz
POLARIZATION	HORIZONTAL



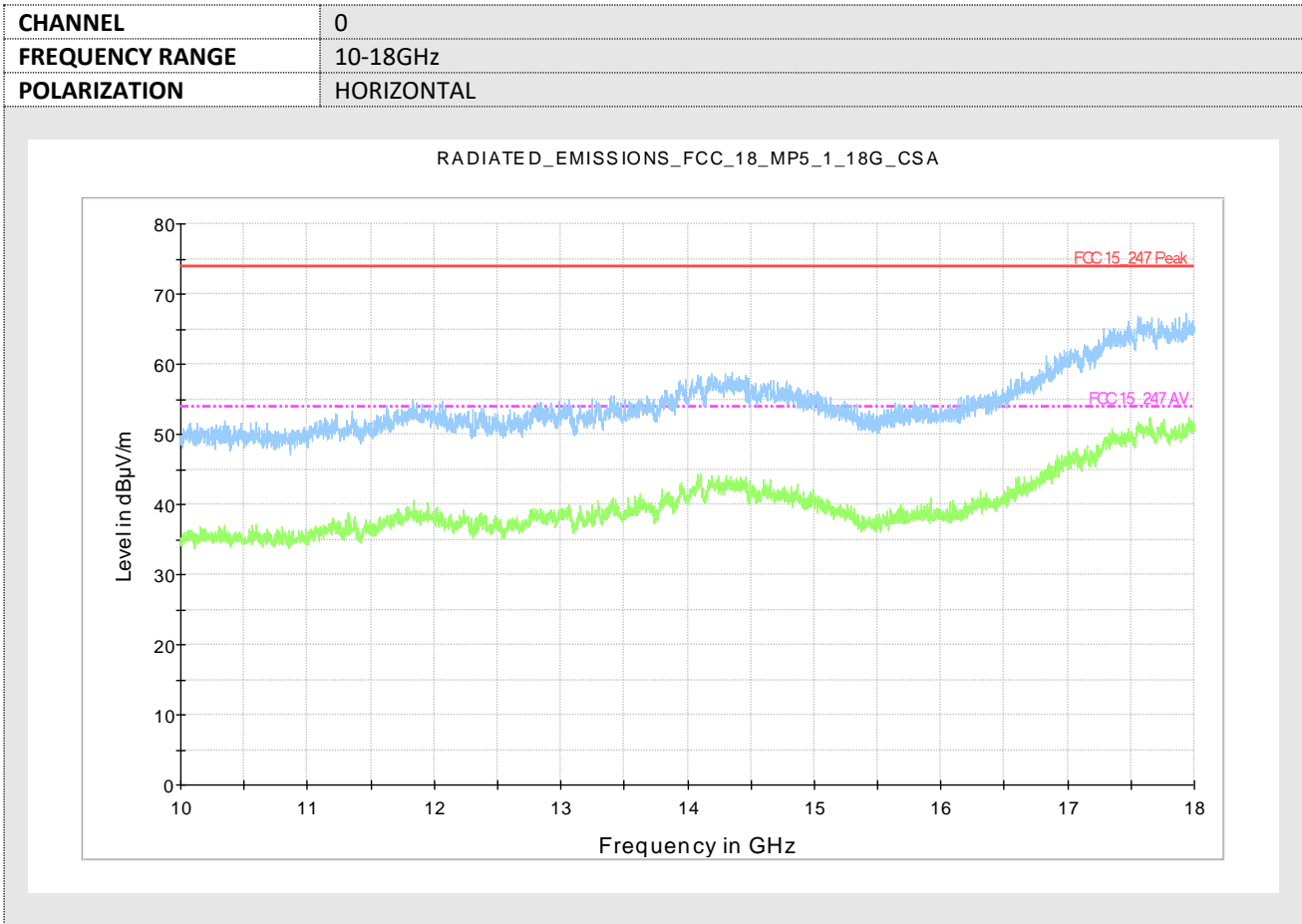
Final Result Peak

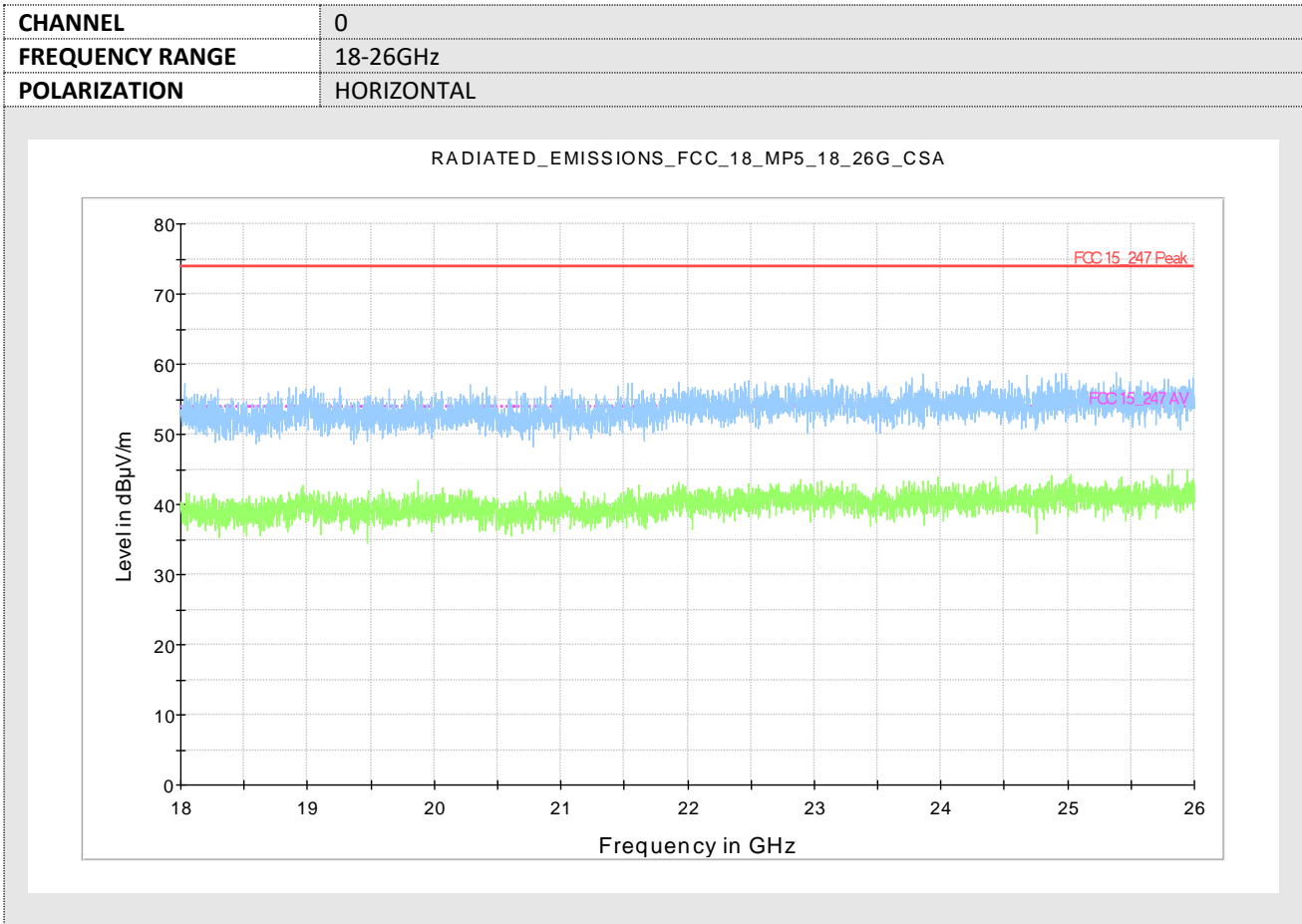
Frequency (MHz)	Peak (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2274.040000	44.4	106.8	0.0	29.60	74.00
2401.300000	78.8	106.8	180.0	-4.80	74.00
2530.360000	40.3	106.8	0.0	33.70	74.00
7206.400000	43.8	254.9	90.0	30.20	74.00

Final Result Average

Frequency (MHz)	Average (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2274.040000	46.7	106.8	0.0	7.30	54.00
2401.300000	81.5	106.8	180.0	-27.50	54.00
2530.360000	42.4	106.8	0.0	11.60	54.00
7204.960000	46.8	254.9	90.0	7.20	54.00

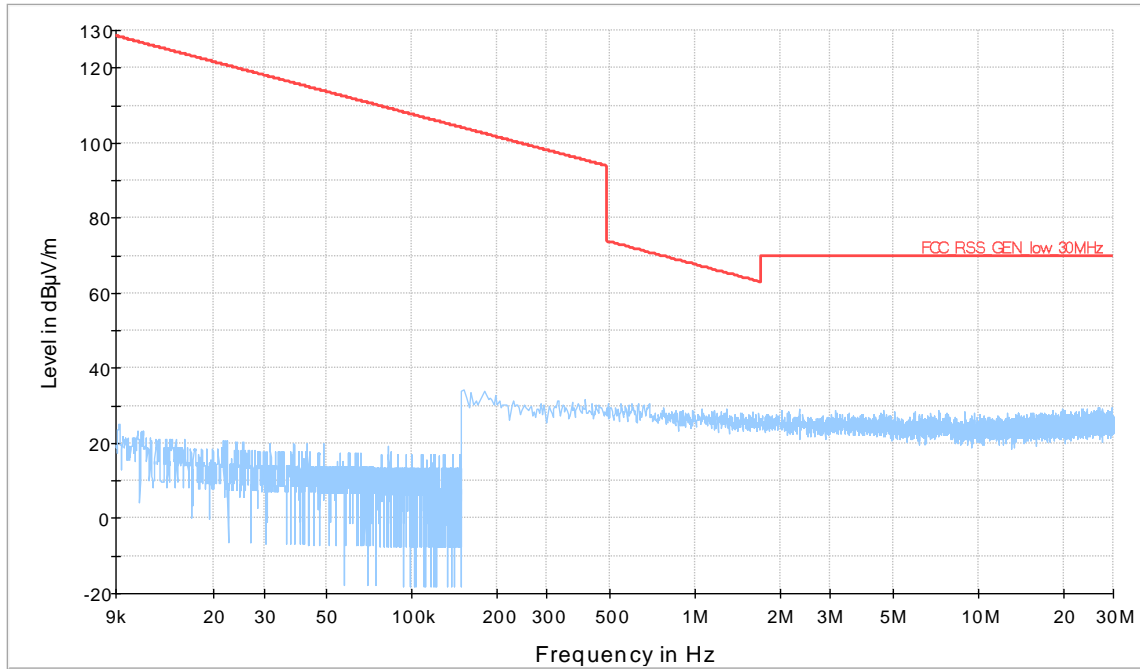
*Peaks out of limits are due to the BLE carrier

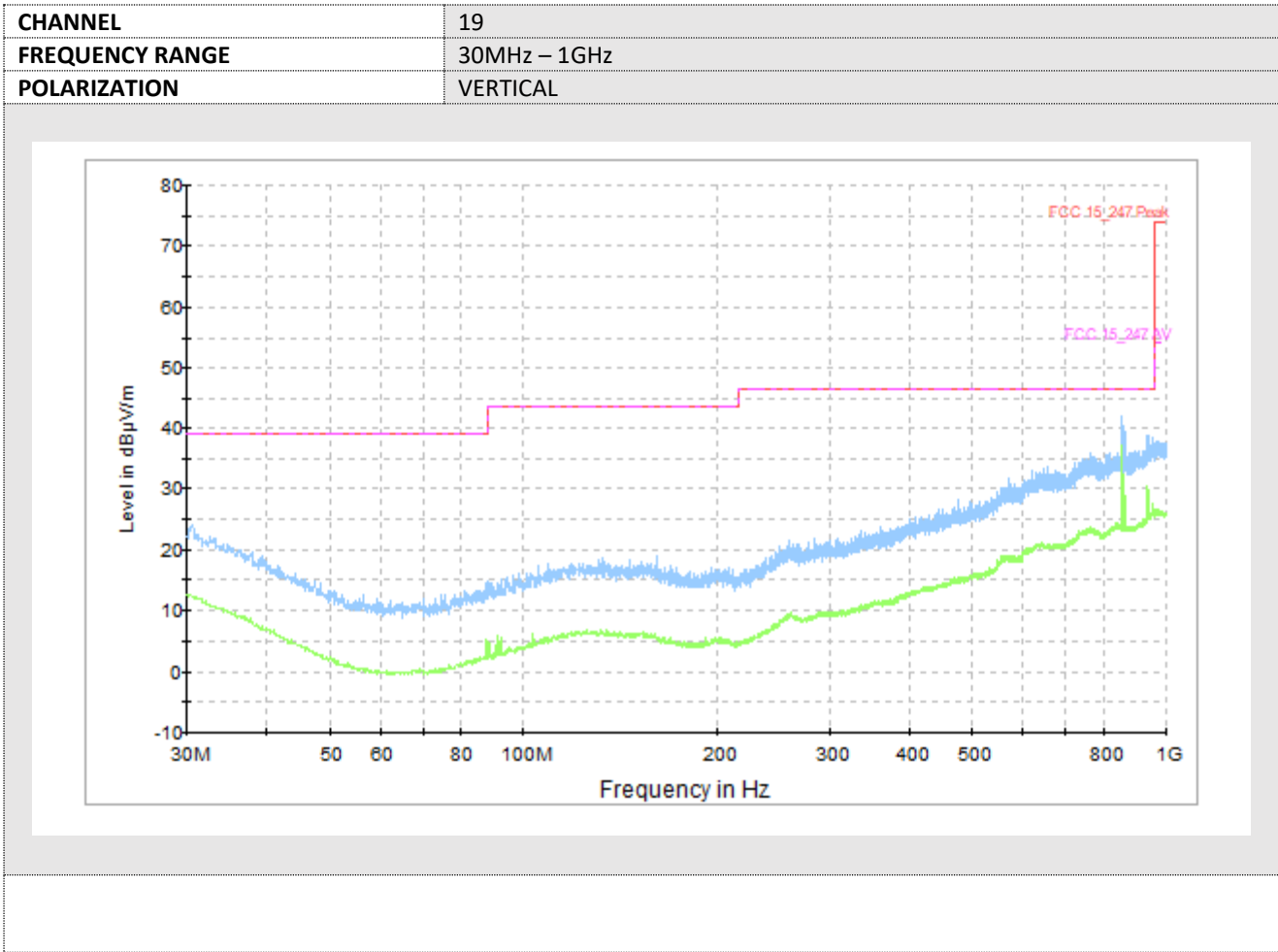




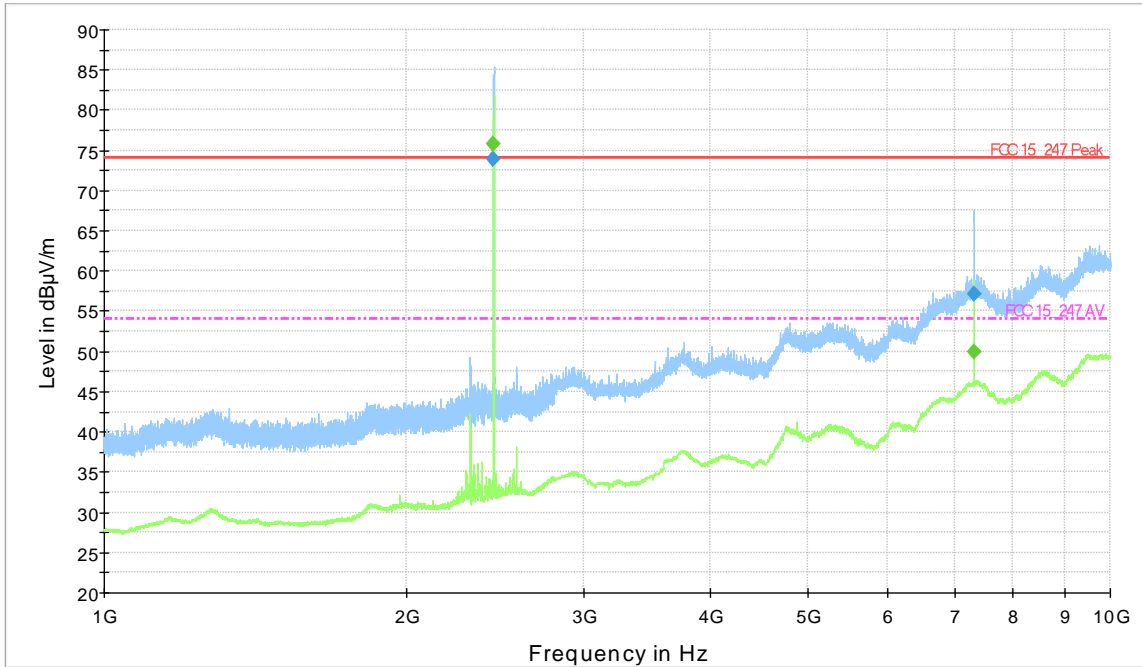
CHANNEL	19
FREQUENCY RANGE	9kHz - 30MHz
POLARIZATION	VERTICAL

EMI_RAD_9k_30M_sweep_dBuV m





CHANNEL	19
FREQUENCY RANGE	1-10GHz
POLARIZATION	VERTICAL



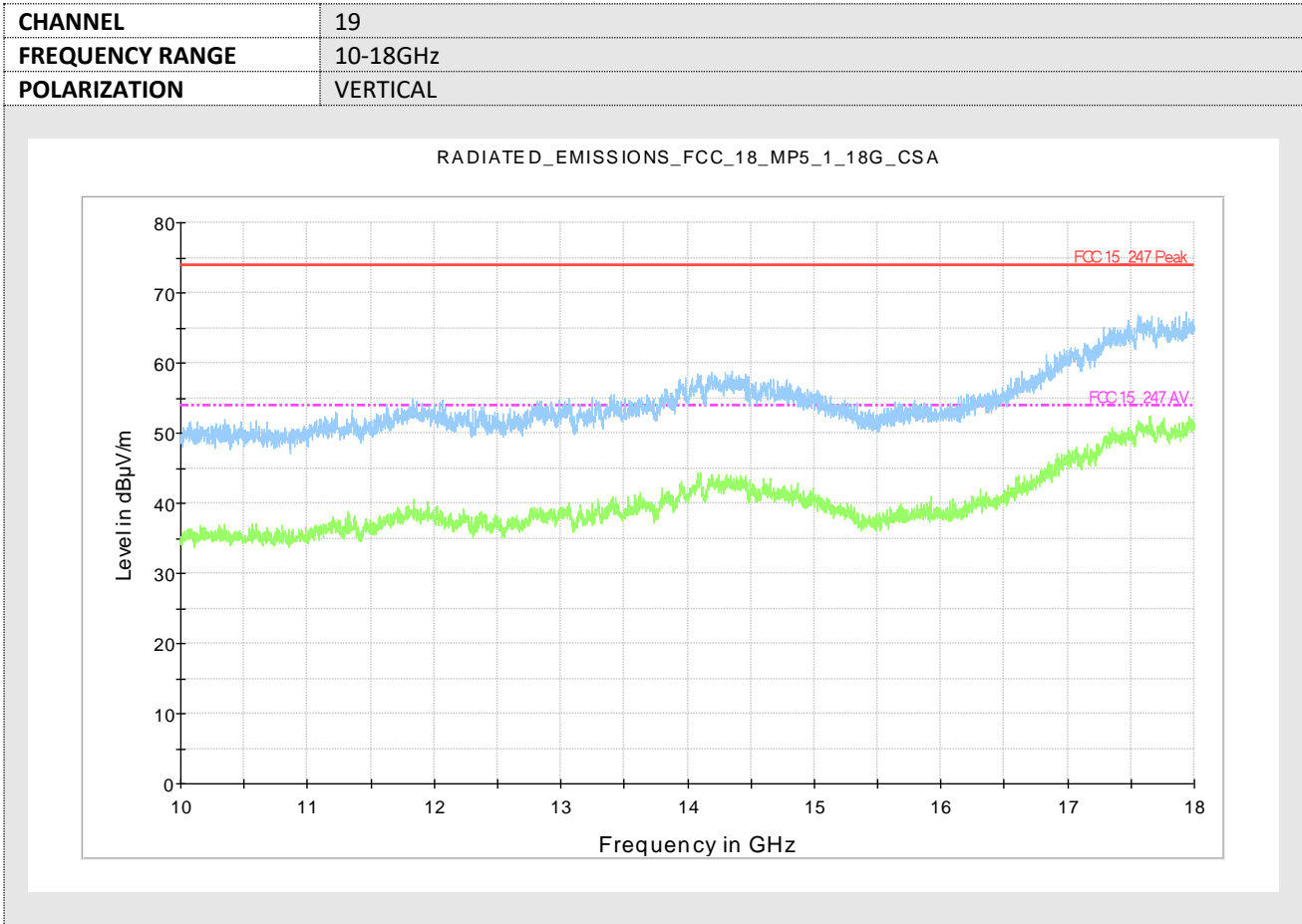
Final Result Peak

Frequency (MHz)	QuasiPeak (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2439.460000	73.9	254.9	270.0	0.10	74.00
7318.720000	57.1	106.9	180.0	16.90	74.00

Final Result Average

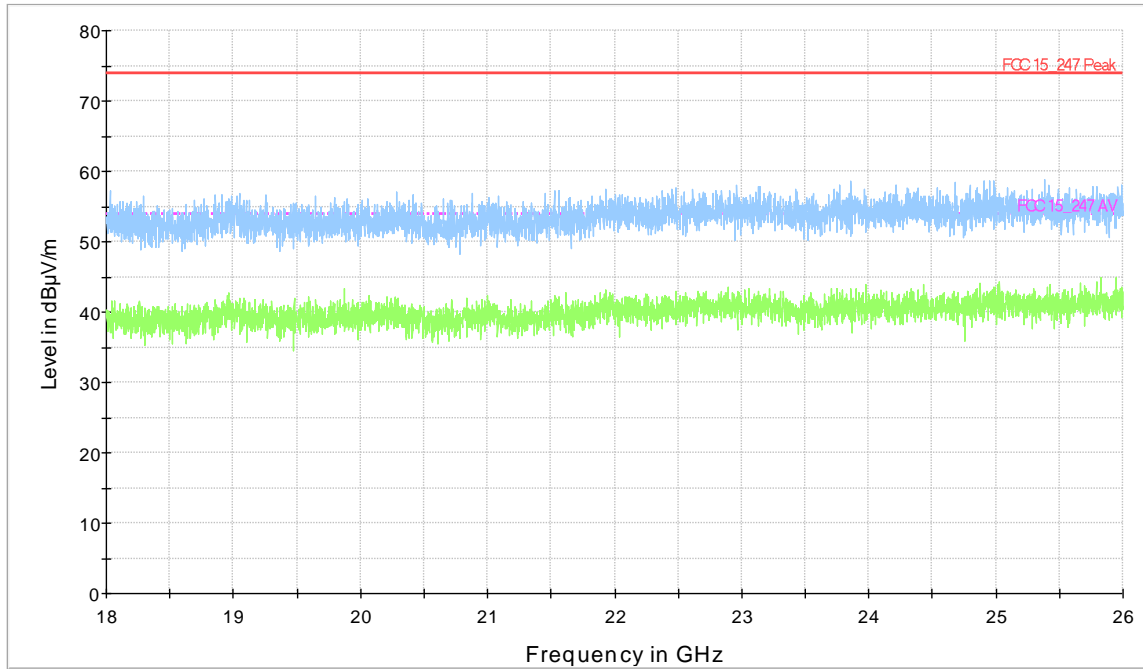
Frequency (MHz)	Average (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2439.460000	75.8	254.9	270.0	-21.80	54.00
7321.600000	50.0	106.9	0.0	4.00	54.00

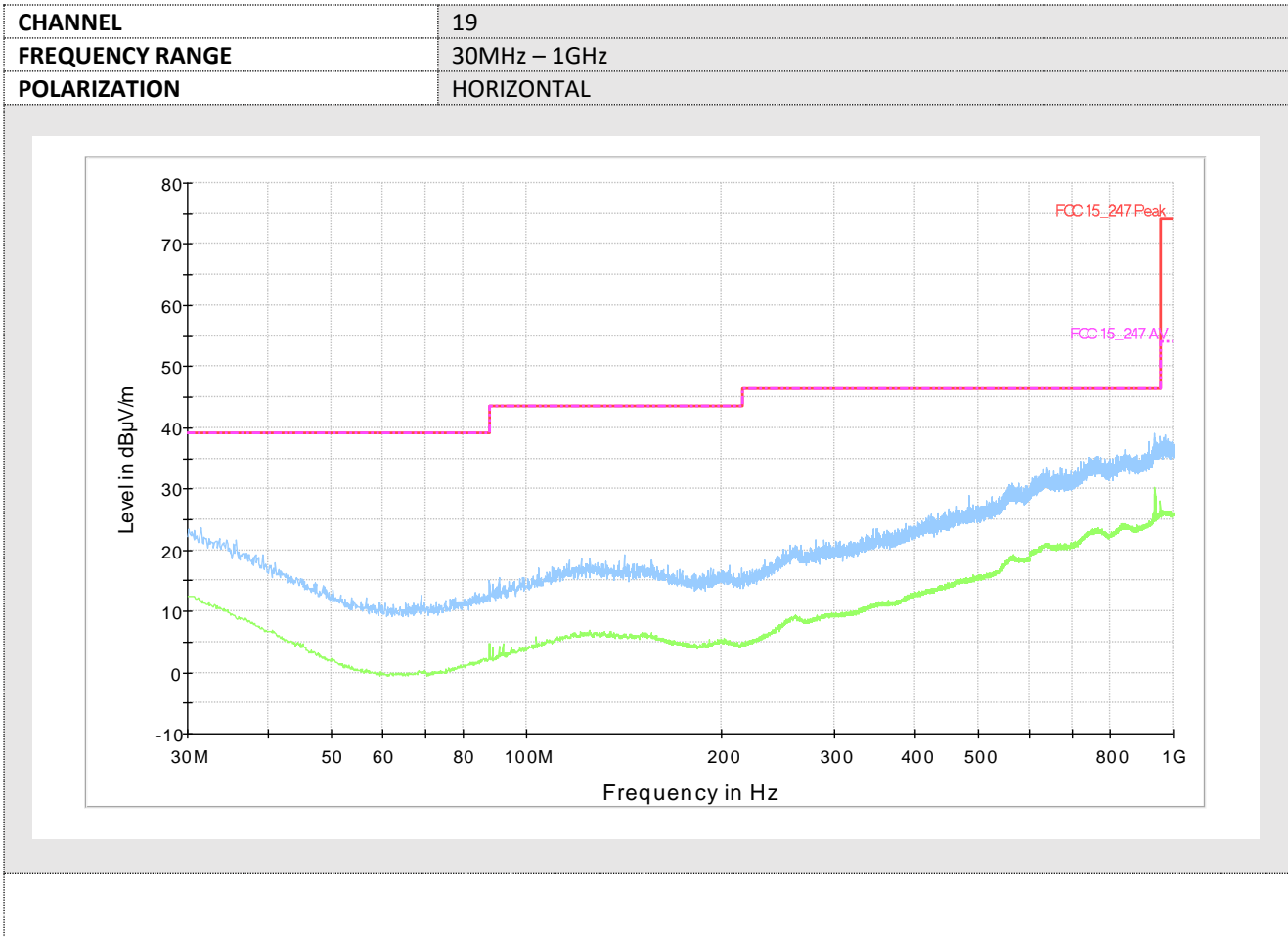
*Peaks out of limits are due to the BLE carrier



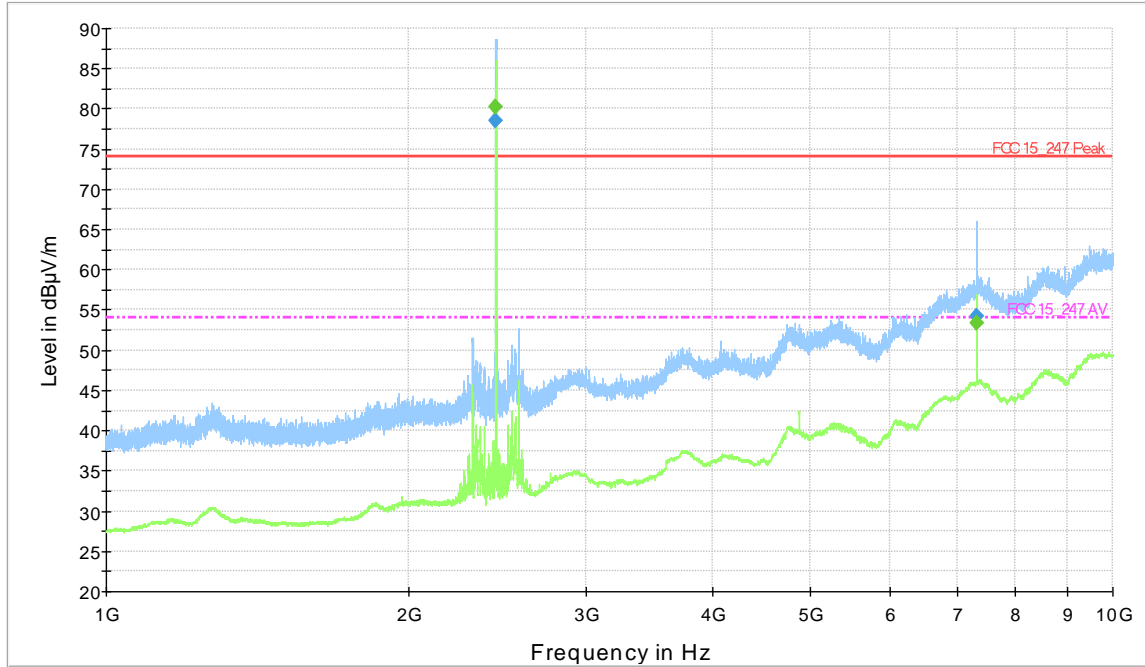
CHANNEL	19
FREQUENCY RANGE	18-26GHz
POLARIZATION	VERTICAL

RADIATED_EMISSIONS_FCC_18_MP5_18_26G_CSA





CHANNEL	19
FREQUENCY RANGE	1-10GHz
POLARIZATION	HORIZONTAL



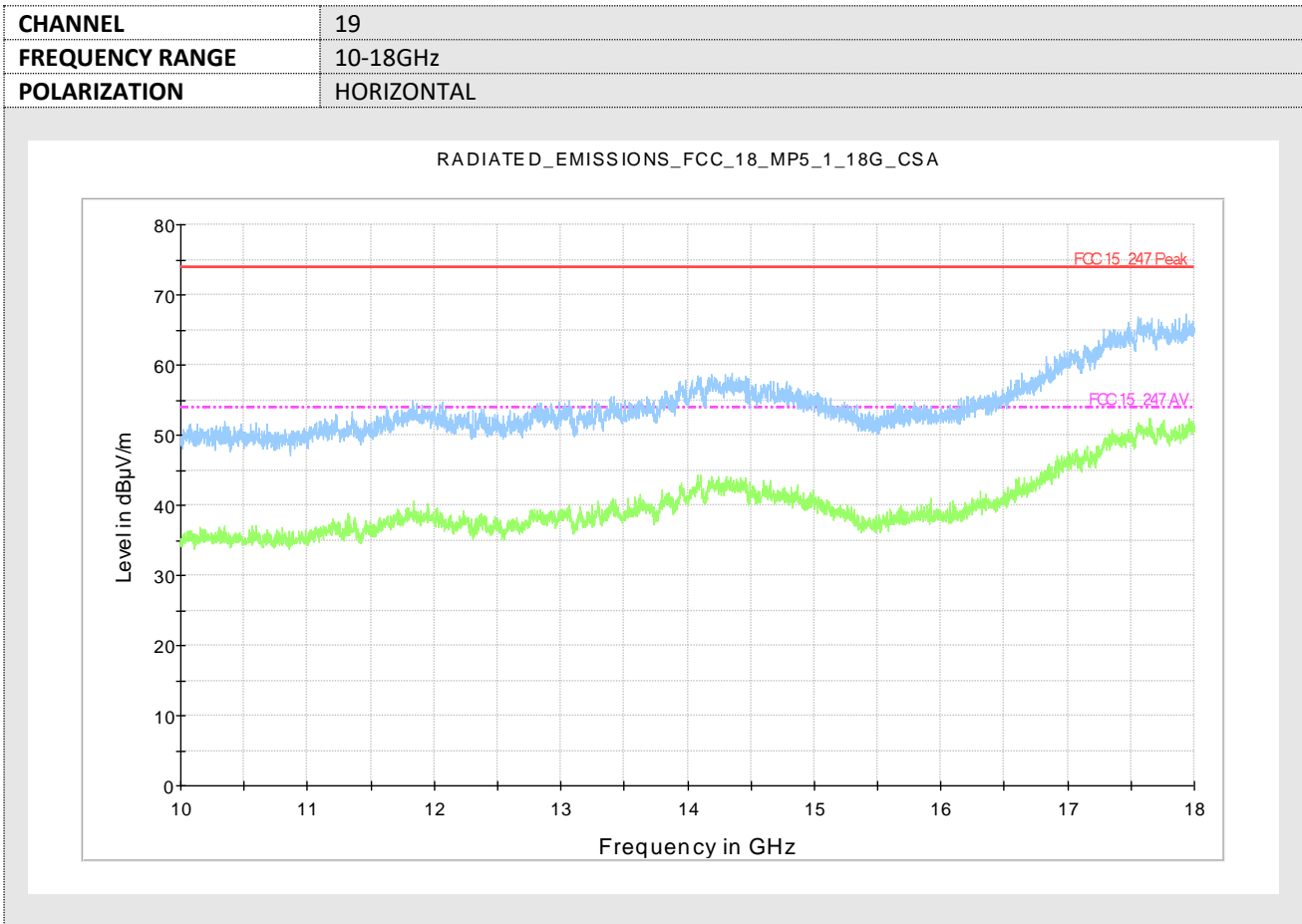
Final Result Peak

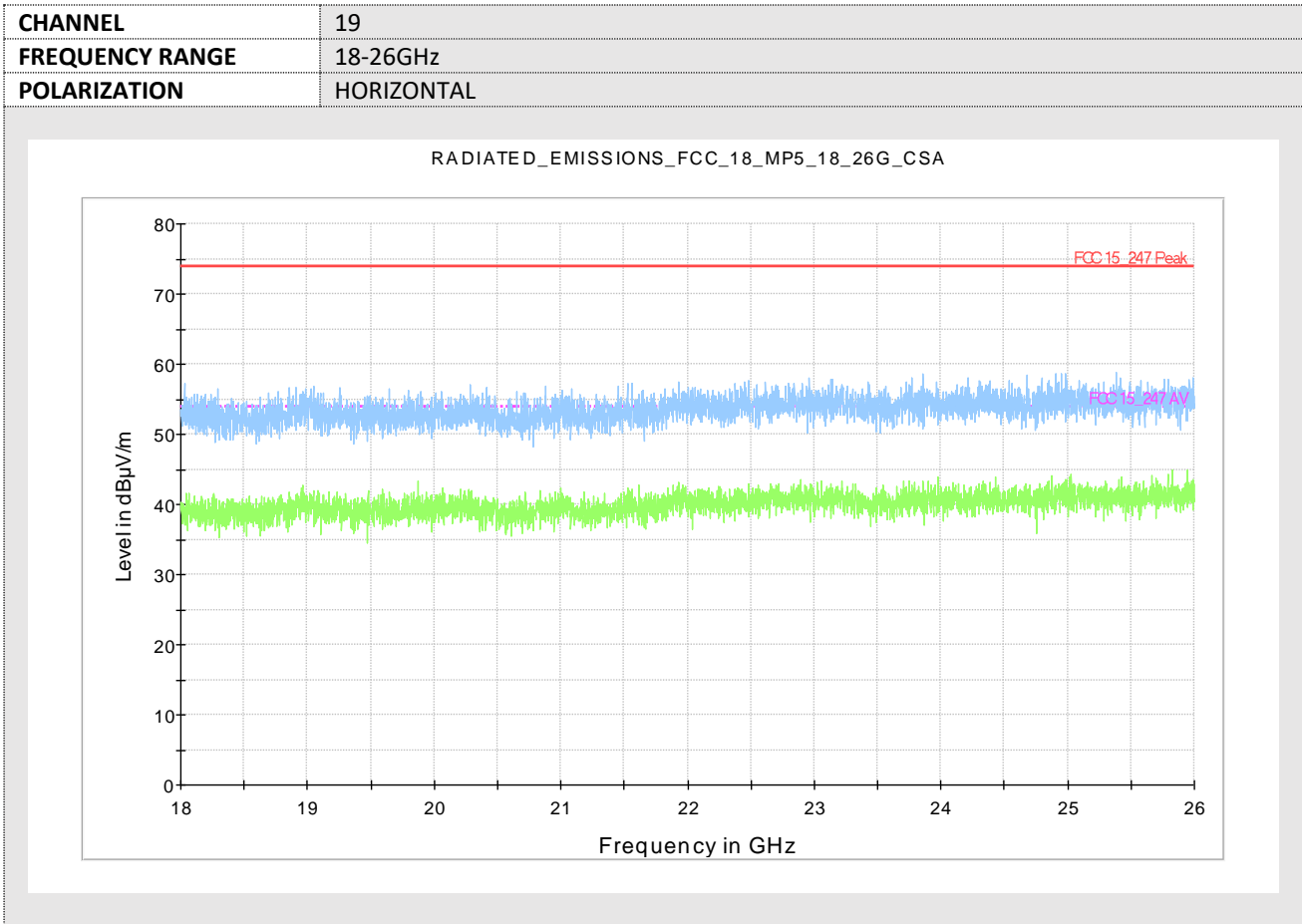
Frequency (MHz)	Peak (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2439.460000	78.5	254.8	180.0	-4.50	74.00
7322.320000	48.4	106.8	0.0	25.60	74.00

Final Result Average

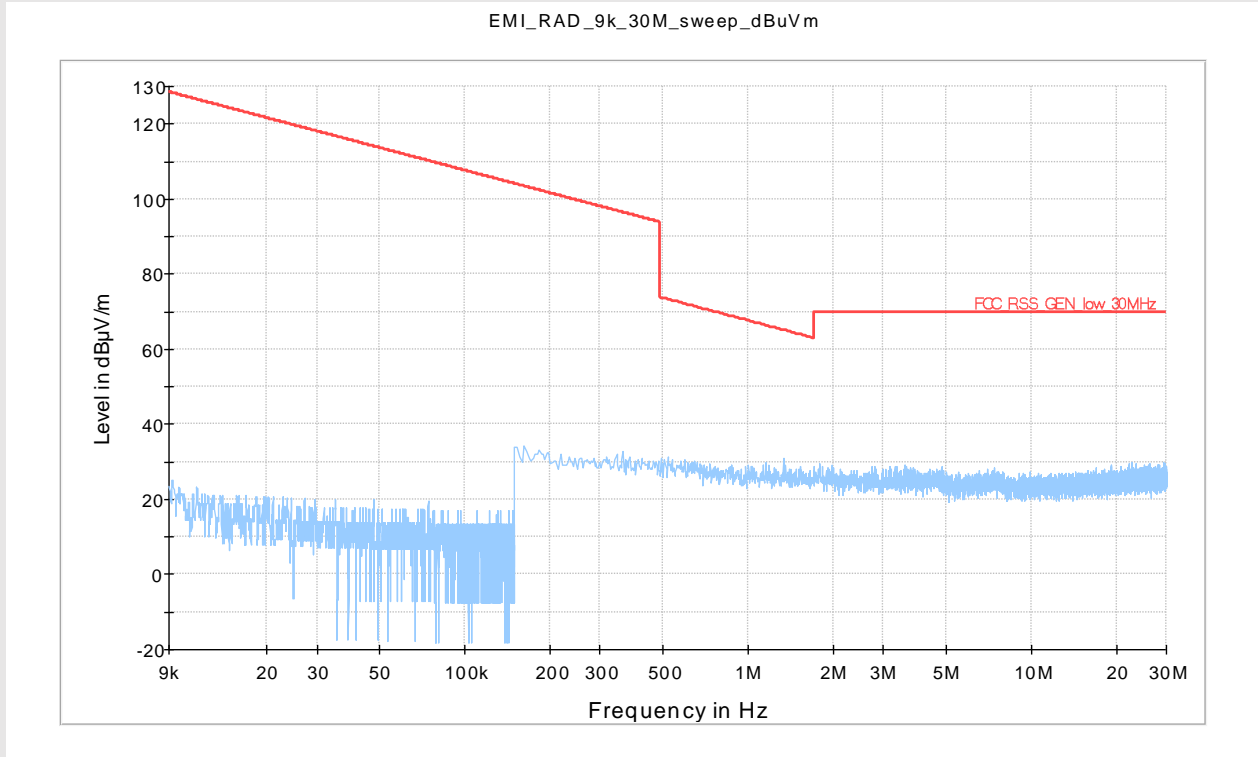
Frequency (MHz)	Average (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2439.460000	80.3	254.8	180.0	-26.30	54.00
7321.600000	53.4	106.8	0.0	0.60	54.00

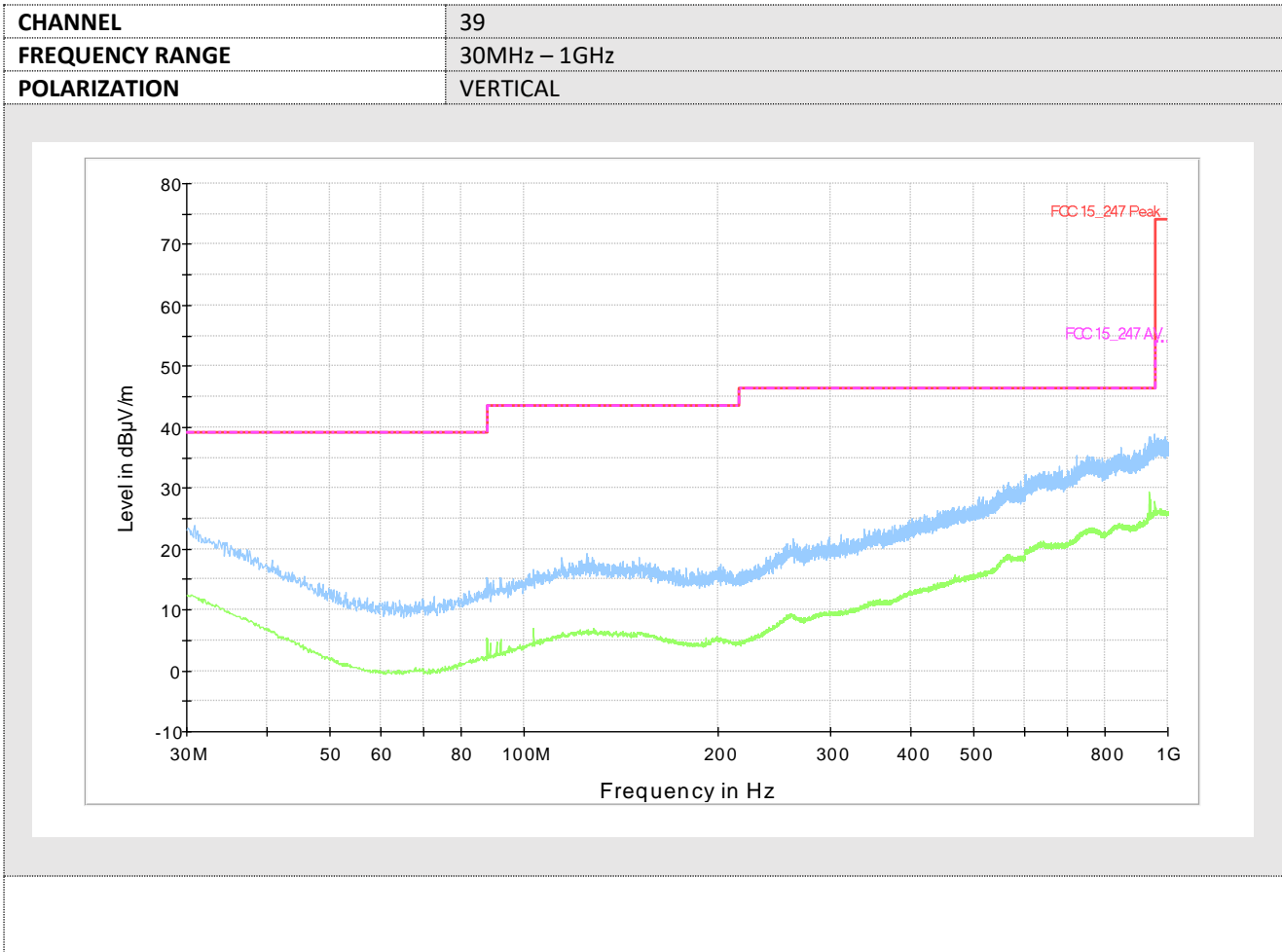
*Peaks out of limits are due to the BLE carrier



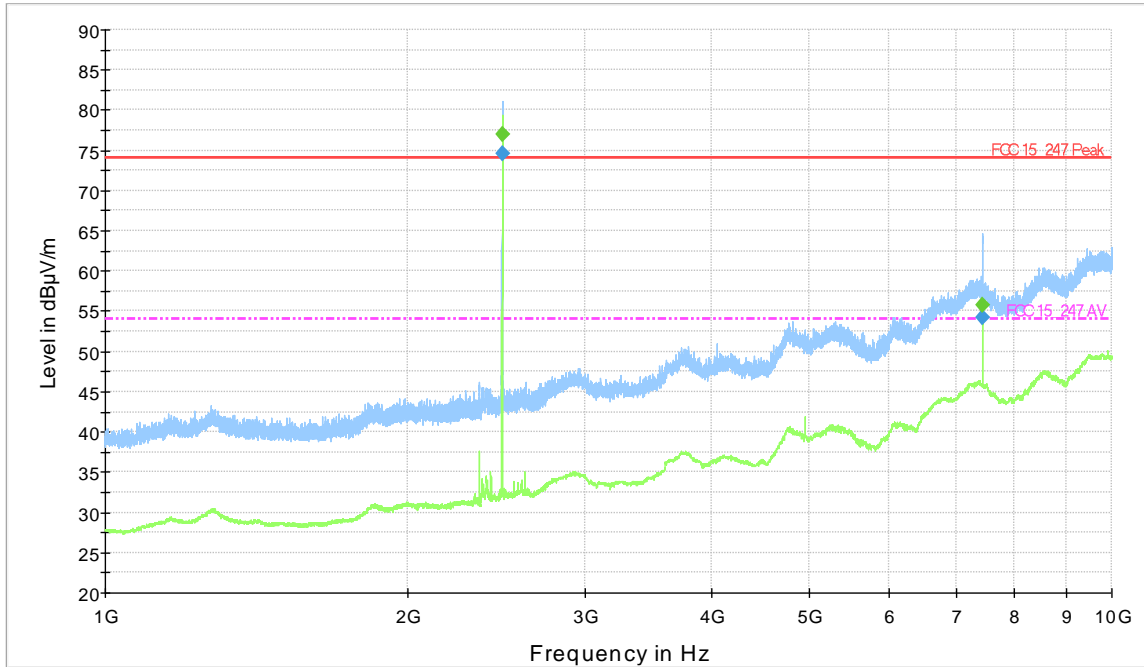


CHANNEL	39
FREQUENCY RANGE	9kHz - 30MHz
POLARIZATION	VERTICAL





CHANNEL	39
FREQUENCY RANGE	1-10GHz
POLARIZATION	VERTICAL



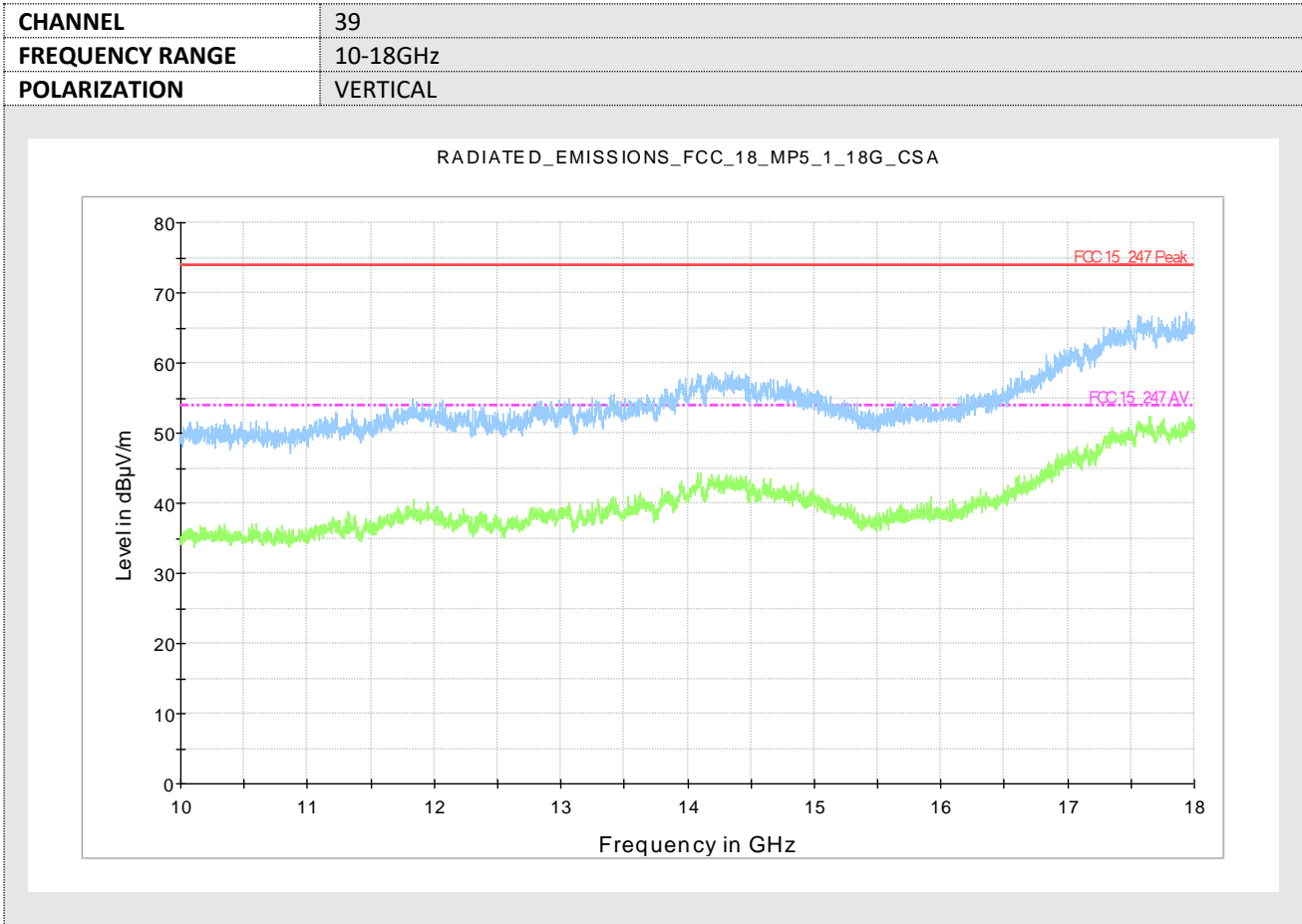
Final Result Peak

Frequency (MHz)	QuasiPeak (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2479.960000	74.7	254.9	90.0	-0.70	74.00
7438.960000	54.2	106.8	90.0	19.80	74.00

Final Result Average

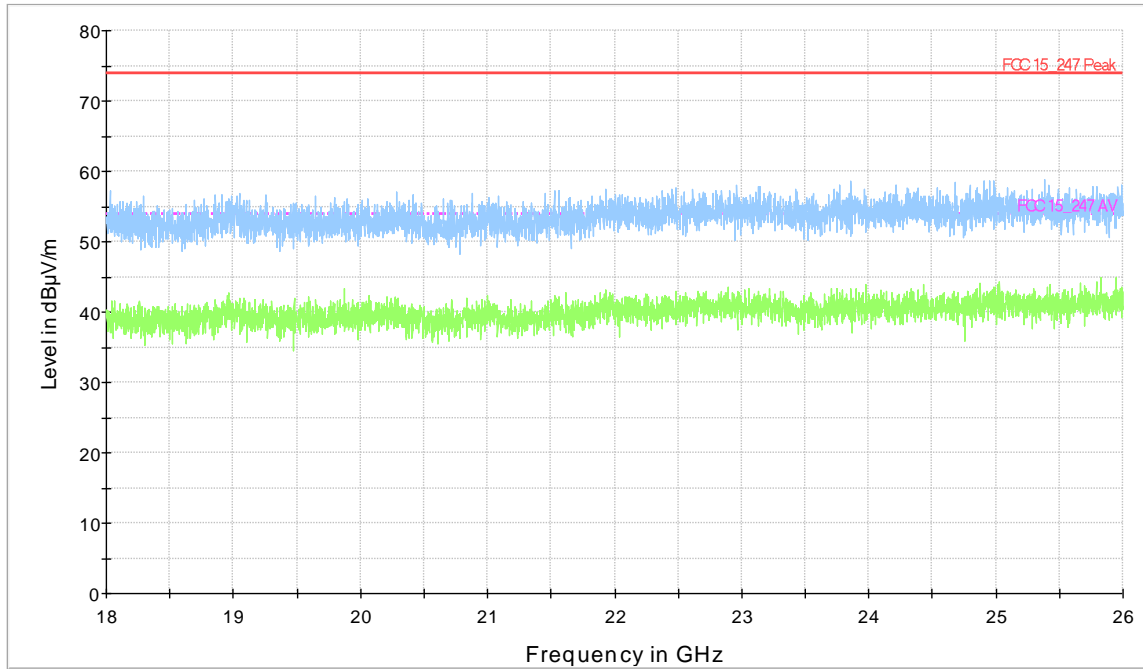
Frequency (MHz)	Average (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2479.960000	77.0	254.9	90.0	-23.00	54.00
7438.960000	55.7	106.8	90.0	-1.70	54.00

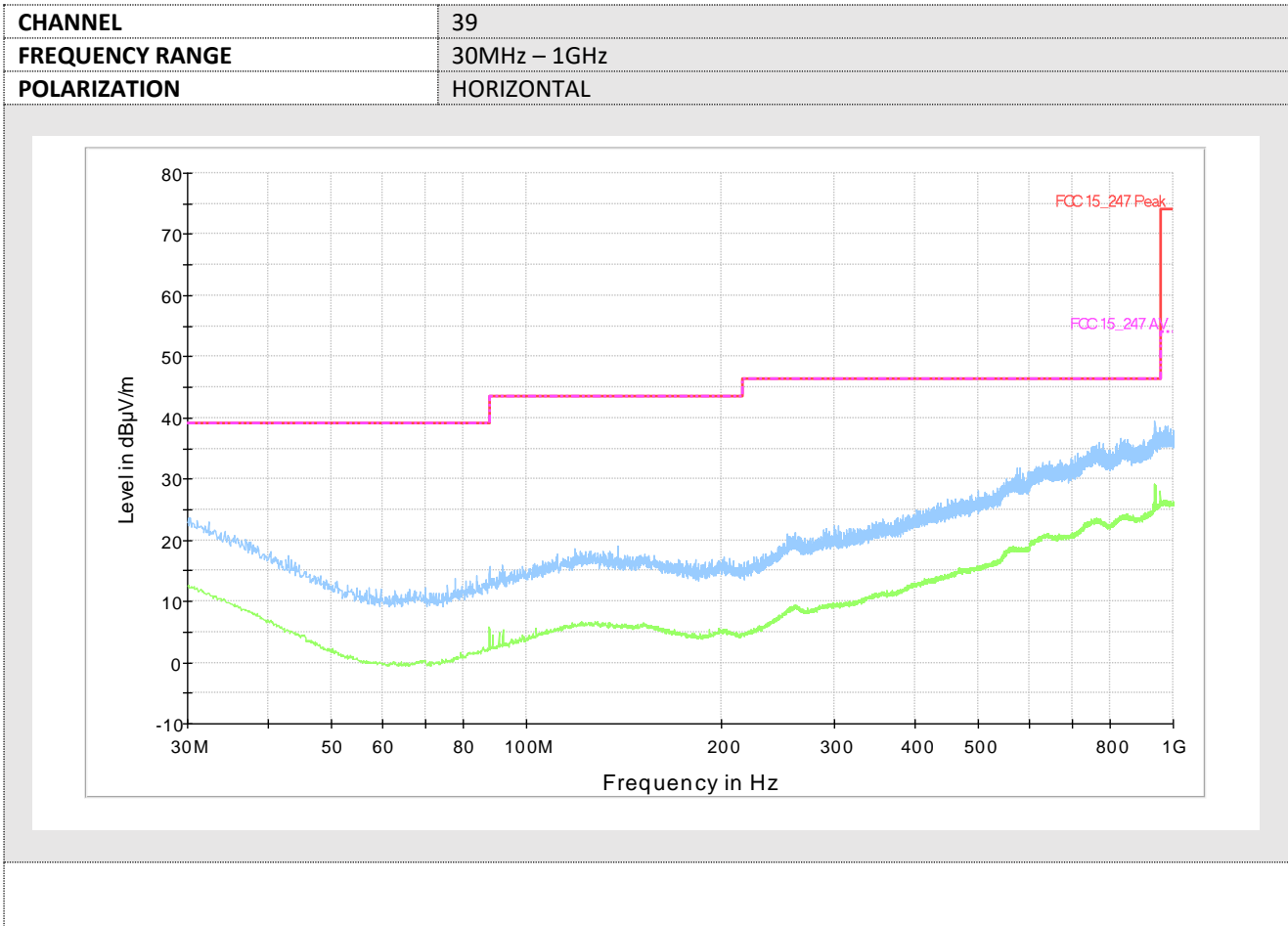
*Peaks out of limits are due to the BLE carrier



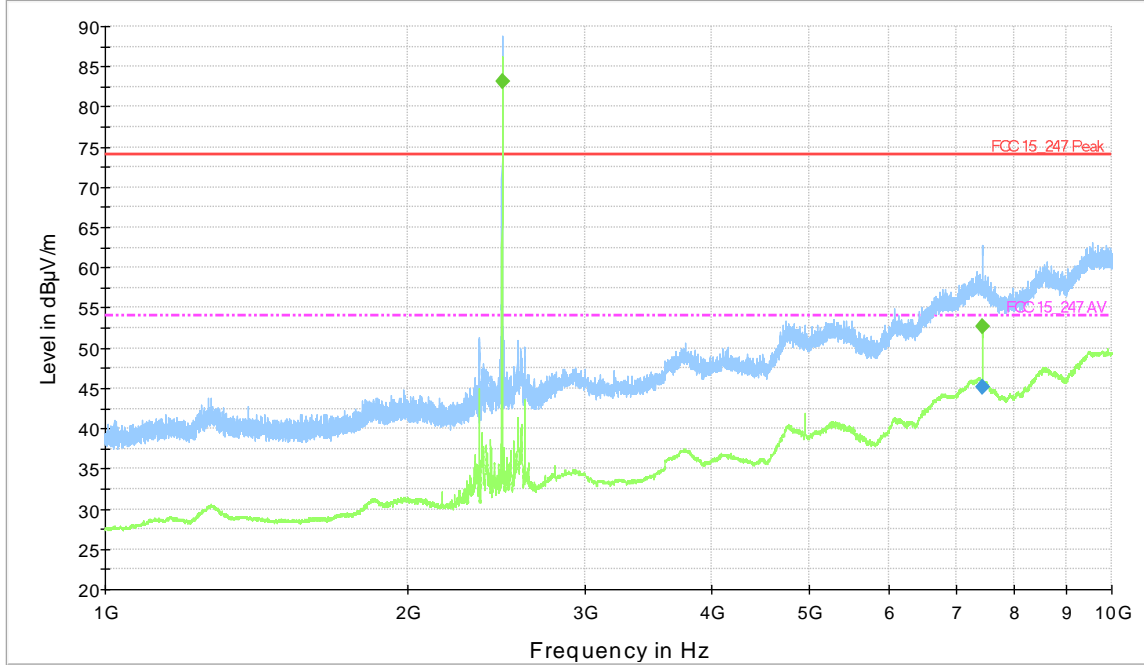
CHANNEL	39
FREQUENCY RANGE	18-26GHz
POLARIZATION	VERTICAL

RADIATED_EMISSIONS_FCC_18_MP5_18_26G_CSA





CHANNEL	39
FREQUENCY RANGE	1-10GHz
POLARIZATION	HORIZONTAL



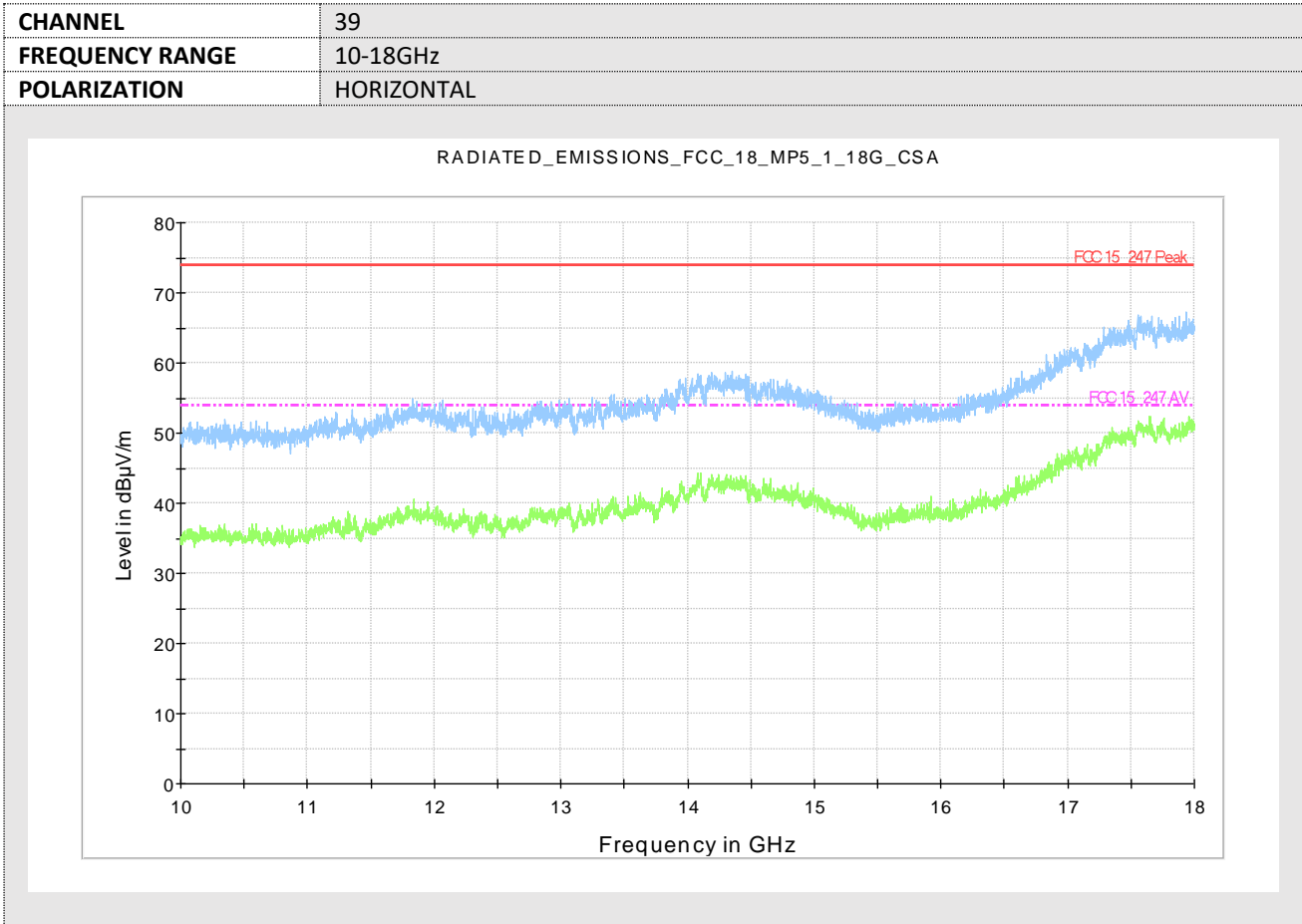
Final Result Peak

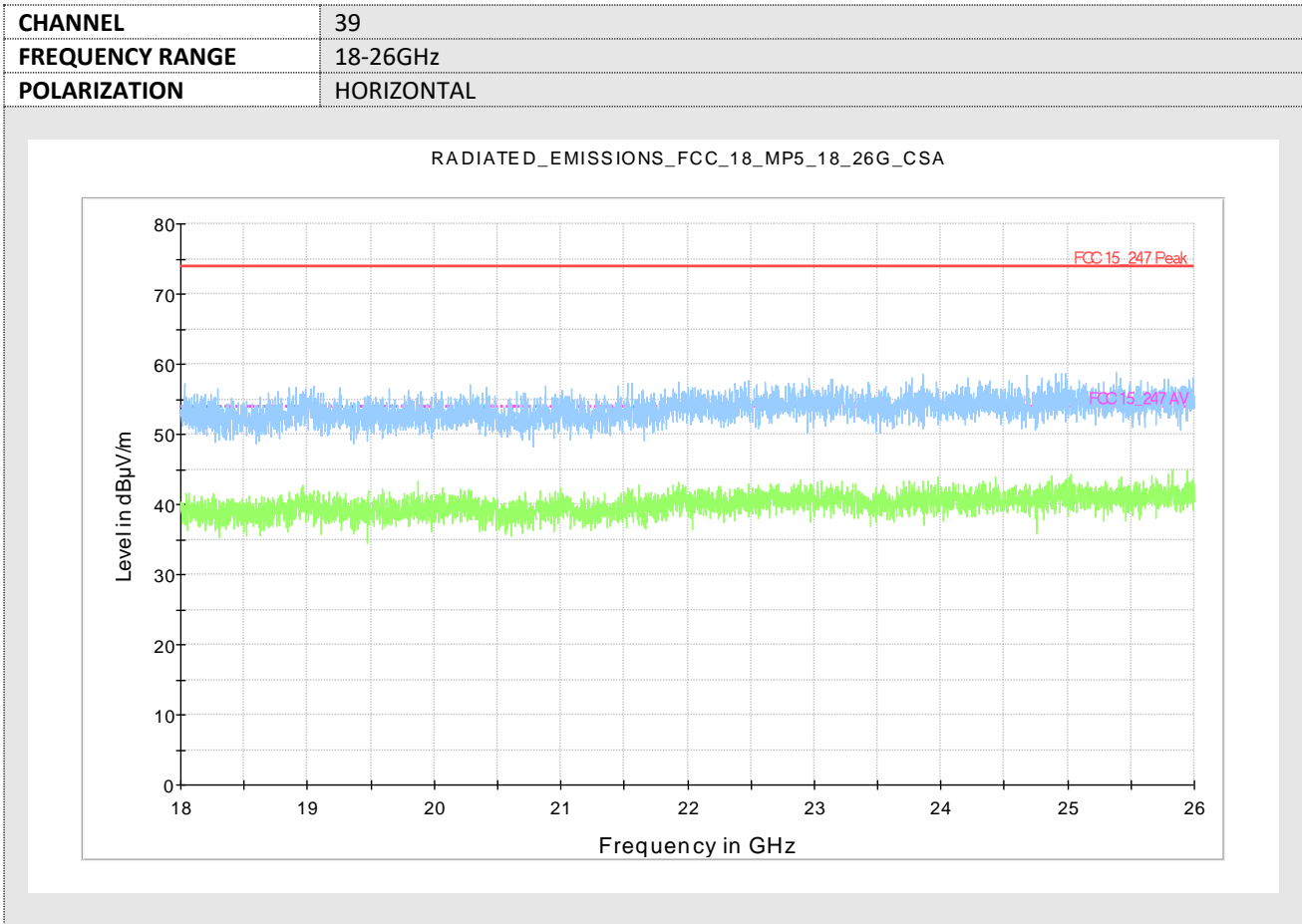
Frequency (MHz)	Peak (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2480.500000	83.2	106.9	0.0	-9.20	74.00
7438.240000	45.2	106.8	0.0	28.80	74.00

Final Result Average

Frequency (MHz)	Average (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2480.500000	83.2	106.9	0.0	-29.20	54.00
7441.840000	52.7	106.8	0.0	1.30	54.00

*Peaks out of limits are due to the BLE carrier





TEST 9.

TRANSMITTER FREQUENCY STABILITY

REFERENCE DOCUMENT

RSS-GEN

• TEST SETUP	Acc. to reference document
• TEST LOCATION	Radio test area
• TEST METHOD	RSS-GEN
• TEST EQUIPMENT USED FOR TEST	EMI Receiver Rodhe & Schwarz mod. ESU40
• TEST PERFORMED BY	Daniele Aosani

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

OPERATING CONDITION :#1, #2, #3 Duty Cycle 100%

RESULT: **COMPLIANT**

Measurement Result

Channel	Voltage (V)	Temperature (°C)	Frequency (MHz)	Variation at the reference value (MHz)	Maximum variation (MHz)	Result
0	3	+20	2402.064	---	±1	COMPLIANT
		+5	2402.077	+0.013		
		+40	2402.051	-0.013		
	2	+20	2402.064	0		
19	3	+20	2440.064	---	±1	COMPLIANT
		+5	2440.070	+0.006		
		+40	2440.045	-0.019		
	2	+20	2440.064	0		
39	3	+20	2480.058	---	±1	COMPLIANT
		+5	2480.070	+0.012		
		+40	2480.051	-0.007		
	2	+20	2480.064	+0.006		

END OF TEST REPORT