

RAPPORTO DI PROVA

TEST REPORT

Rif. / Ref. n.	FCCTR_179694_2	Data Emissione /Issue Date:	20/01/2022	Pagine / Pages:	31
Scopo delle prove Test object	Prove di tipo in accordo alla Norma Type test according to standards 47 CFR FCC part 15.249				
Richiedente Applicant	Meta System S.p.A. Via Galimberti 5 - 42124 Reggio Emilia – Italy Tel.: +39 0522364256				
Marchio commerciale Trade mark					
Fabbricante Manufacturer	Meta System S.p.A.				
Prodotto Product	Volumetric alarm sensor				
Modello testato Testing model	Sensor ITS/TPS				
Identificativo FCC FCC ID	P30100202				
Data ricevimento campioni Date of test samples receipt	27/05/2021				
Campioni verificati No. of tested samples	1 – Sampled by the Manufacturer				
Data verifiche Testing date	From 07/06/2021 to 22/06/2021 From 14/01/2022 to 19/01/2022				
Sito di prova Testing site	PRSLAB S.r.l. Unipersonale - Via Campagna 92 - 22020 Faloppio - Como - Italy				
Esito delle valutazioni Assessment results	CONFORME / COMPLIANT				
Verifiche effettuate da Verifications carried out by	Daniele AOSANI Tecnico Laboratorio Laboratory Engineer				
Approvato Approved by	Riccardo PFEIFFER Responsabile Laboratorio 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

Il campione è stato fornito dal cliente ed i risultati si riferiscono al campione così come ricevuto

The sample has been provided by the customer and the results apply to the sample as received

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0. RELEASE CONTROL RECORD

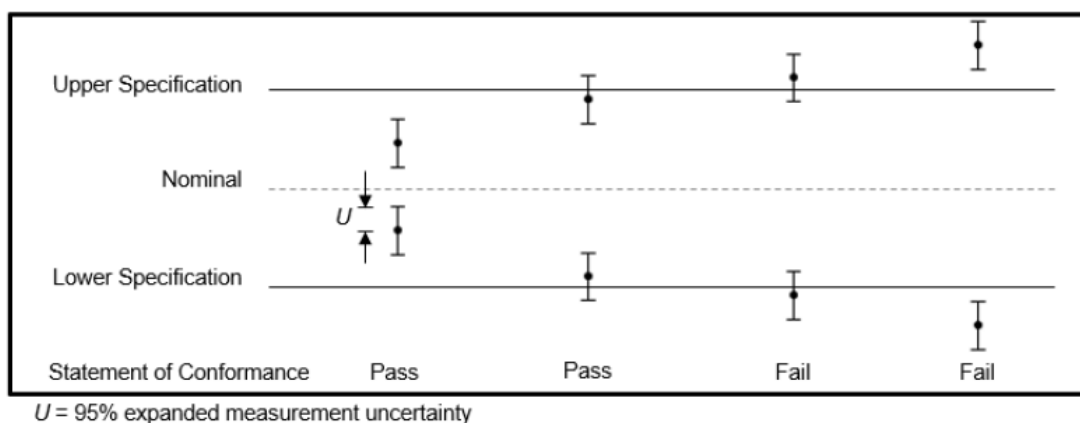
TEST REPORT NUMBER	REASON OF CHANGE	DATE OF ISSUE
FCCTR_179694_0	Original release	19/07/2021
FCCTR_179694_1	Some editorial changes	10/09/2021
FCCTR_179694_2	Added Duty Cycle plots and fundamental emission plot	20/01/2022

This document is valid in last revision that deletes and replaces the previous one

1. DECISION RULE

PRSLAB specifies that, if the decision rules of conformity of the test results are not indicated in detail in the standard/s object of tests, it takes as a decision rule for the declaration of conformity the simple binary system ($w = 0$) stated in the ILAC-G8-09:2019 document.

The decision rule is applicable for all parts of standard



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, $AL=TL$.

Definitions

- Guard Band (w): interval between a tolerance limit and a corresponding acceptance limit where length $w=|TL-AL|$.
- Tolerance Limit (TL) (Specification Limit): specified upper or lower bound of permissible values of a property.
- Acceptance Limit (AL): specified upper or lower bound of permissible measured quantity values.

2. INFORMATION PROVIDED BY CUSTOMER

- None

3. GENERAL REMARKS

- None

4. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)

4.1 EUT Identification

DESCRIPTION	Volumetric alarm sensor
MODEL NAME	Sensor ITS/TPS
FCC ID	P3O100202
SERIAL NO.	Prototype
PRS LAB INTERNAL REFERENCE	BC 184/2021 1/1
TRADEMARK	
MANUFACTURER	Meta System S.p.A.
COUNTRY OF MANUFACTURER	Italy
SINGLE UNIT OR SYSTEM	Single
POWER SOURCE	Vehicle battery
SUPPLY VOLTAGE	12V 
MAX ABSORBED CURRENT	6mA
HW VERSION	11/38
SW VERSION	11/21.00
DIMENSIONS	See photography documentation
EUT STANDING	Vehicle

4.2 RF technical data

CHIP TYPE	---
FREQUENCY BAND	5.725 ÷ 5.875GHz
CARRIER FREQUENCY	5763.5MHz
AVERAGE CARRIER POWER (MEASURED-DC CORRECTION)	69,9dBμV/m @3m
NUMBER OF CHANNELS	1
EUT CLASSIFICATION	Vehicle
RECEIVER CATEGORY	Only TX
TYPE OF MODULATION	Pulse modulation: - Pulse width 150ns - Duty Cycle 11%
ANTENNA	Patch antenna soldered on the PCB at 90°
ANTENNA GAIN	---

4.3 Ports identification

	PORT	DESCRIPTION	CONNECTION	NOTES
☒	Enclosure	Plastic	Snaps	---
☐	AC Power input	Port not present	---	---
☒	DC Power input	12Vdc	Cable	>3mt
☒	Signal/Control port	LIN	Cable	>3mt
☐	Telecomm. port	Port not present	---	---
☐	Antenna Port	Internal	---	---

Note:

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

4.4 Modifications incorporated in E.U.T.

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

- None

4.5 Auxiliary equipment

- None

5. 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 pulsed transmission, according to table in section 4.2

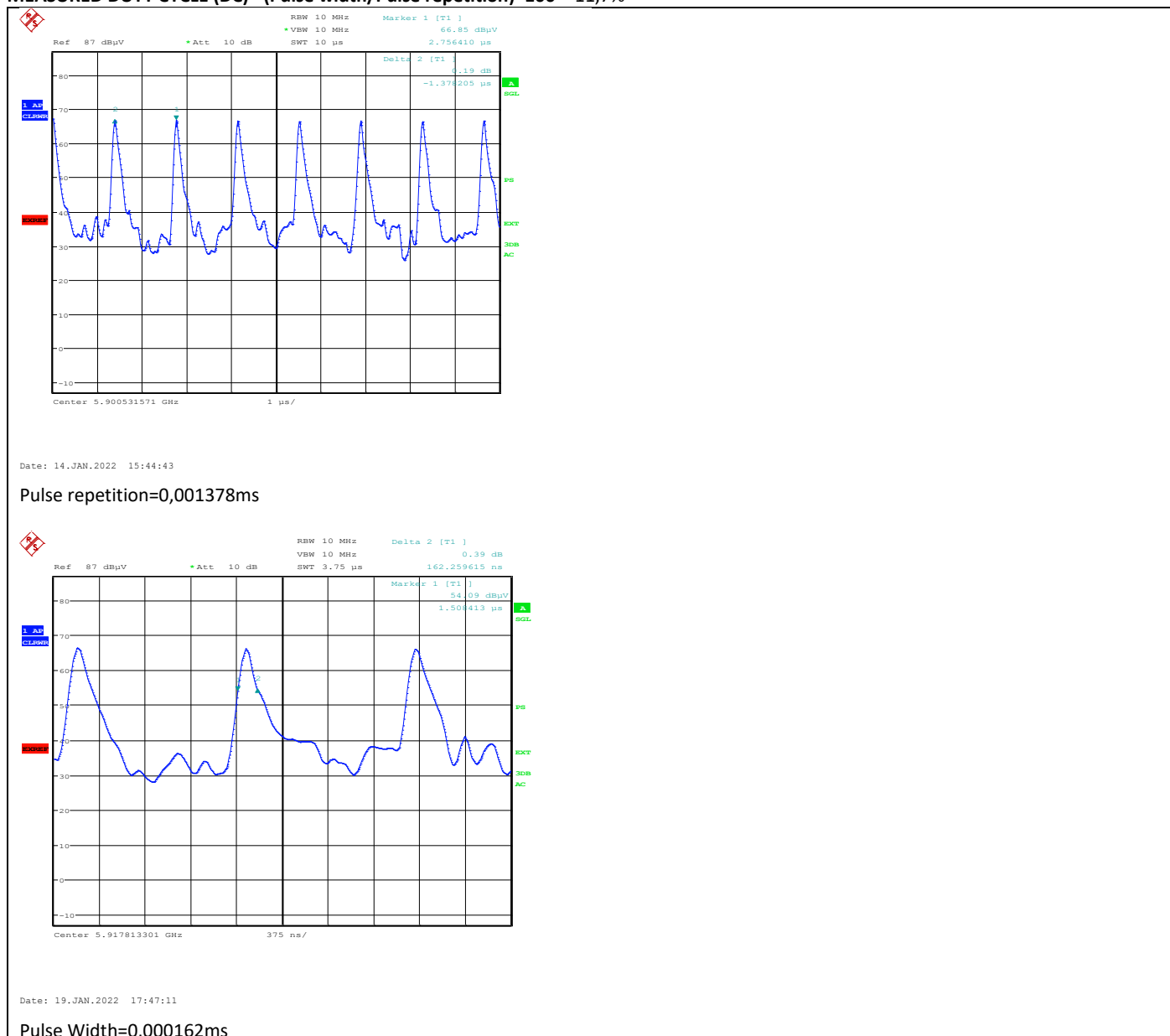
Note:

The timing of the continuous transmission and the usual standard operating condition is the same and it is illustrated in the following measurement: According to CFR 47 Part 15.35 c) *Unless otherwise specified, e.g., §§15.255(b), and 15.256(l)(5), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.*

Starting from the duty cycle declared by the manufacturer and measured by the lab used to calculate the correction factor for field strength measurements results:

DECLARED DUTY CYCLE = 11%

MEASURED DUTY CYCLE (DC)= (Pulse width/Pulse repetition)*100 = 11,7%



and so the correction factor results:

CORRECTION FACTOR: $20 \cdot \log(1/DC) = 20 \cdot \log(1/0,117) 18,63\text{dB}$

Special Test Software: None

Special Hardware Used: None

Transmitter Test Antenna: The EUT has been tested with the antenna fitted in a manner typical of normal intended

6. REFERENCE STANDARDS

REFERENCE STANDARD	DESCRIPTION
Cfr 47 part 15 subpart C par. 15.249	Radio Frequency Devices – Intentional Radiators Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz.
ANSI C63.10:2013	American National Standard for Testing Unlicensed Wireless Devices
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.
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

7. SUMMARY OF TEST RESULTS

EUT PORT	DESCRIPTION OF PHENOMENA	BASIC STANDARD	OPERATING CONDITION	RESULTS
Enclosure	Antenna requirement	FCC Part 15 §15.203	---	Compliant
	20 dB Bandwidth	FCC Part 15 §15.215 (c) (2)	#1	Within the limits
	Band-Edge	FCC Part 15 § 15.205	#1	Within the limits
	Radiated Emissions and Outside of Band Emissions	FCC Part 15 § 15.209 § 15.249 (d)	#1	Within the limits
AC power input	Conducted Emissions	FCC Part 15 §15.207 (a)	Not Applicable ¹	

¹Port not present, EUT is powered by vehicle battery.

8. UNITS OF MEASUREMENTS

Conducted EMI Data is in dBμV; dB referenced to one microvolt

Radiated EMI Data is in dBμV/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.

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

9. LIST OF INSTRUMENTS USED

Instrument	Manufacturer	Model	Serial n°	Calibrated on	Due to
MXE Emi Receiver	Keysight	N9038A	MY57290150	06/2021	06/2022
Loop antenna	Rohde & Schwarz	HFH 2-Z2	841801/012	03/2020	03/2023
Bi-log antenna	Chase	CBL6111C	2717	03/2019	03/2022
Horn antenna	Electro Metrics	EM-6961	100437	10/2020	10/2023
Horn antenna + Low Noise Preamplifier	Bonn Elektronik	BLMA 1840-1A	262WL80452	03/2021	03/2023
Semi-Anechoic Chamber	Siemens	B83117-D6019-T232	003-005-134/94C	02/2021	02/2022
Software EMC	Rohde & Schwarz	EMC32-E	V 8.40.0	N.A.	

10. TEST RESULTS

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TEST 1.	ANTENNA REQUIREMENTS
REFERENCE DOCUMENT	According to §15.203 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 an Patch antenna soldered on the PCB at 90°
RESULT: COMPLIANT

TEST 2.	20dB CHANNEL BANDWIDTH
REFERENCE DOCUMENT	According to §15.215(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

• TEST SETUP	ANSI C63.10:2013 section 6.9.2
• TEST LOCATION	Radio test area
• TEST METHOD	ANSI C63.10:2013 section 6.9.2
• TYPE OF MEASUREMENT	Radiated
• TEST EQUIPMENT USED FOR TEST	MXE Emi Receiver Keysight mod. N9038
• 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

RESULT: WITHIN THE LIMITS

MEASUREMENT PARAMETER

Resolution bandwidth	3MHz
Video bandwidth	10MHz
Span	200MHz
Sweep time	Auto couple
Detector	Peak
Trace-Mode	Max. hold

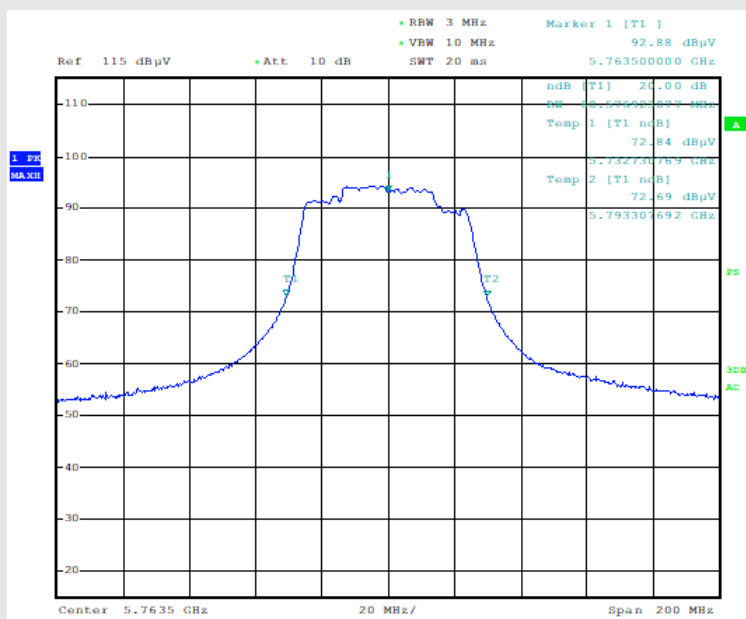
TEST DESCRIPTION

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down/99%BW one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

MEASUREMENT RESULT

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Permitted band (MHz)	Verdict
---	5763.5	5732.7 – 5793.3	5725 - 5850	Within the limits

20dB Bandwidth



TEST 3.	BAND-EDGE
REFERENCE DOCUMENT	According to §15.249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

• TEST SETUP	ANSI C63.10:2013 section 6.10
• TEST LOCATION	Radio test area
• TEST METHOD	ANSI C63.10:2013 section 6.10
• TYPE OF MEASUREMENT	Radiated
• TEST EQUIPMENT USED FOR TEST	MXE Emi Receiver Keysight mod. N9038
• 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

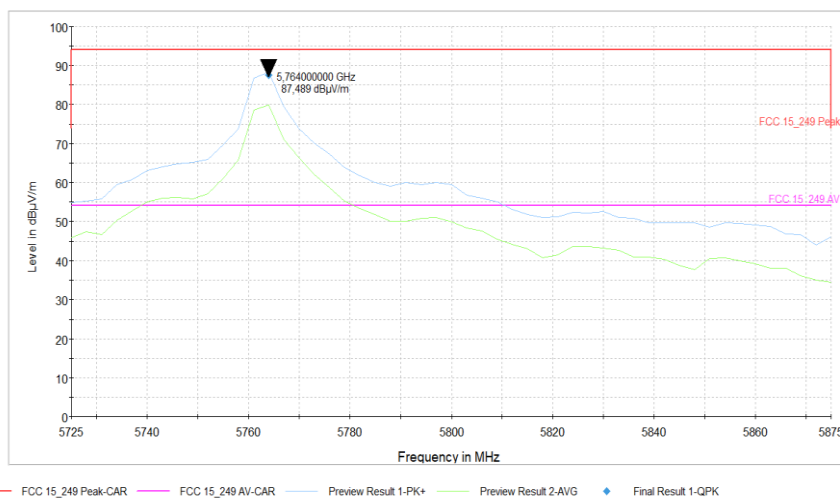
RESULT: WITHIN THE LIMITS

MEASUREMENT PARAMETER

Resolution bandwidth	1MHz
Video bandwidth	3MHz
Sweep time	Auto couple
Detector	Peak
Trace-Mode	Max. hold

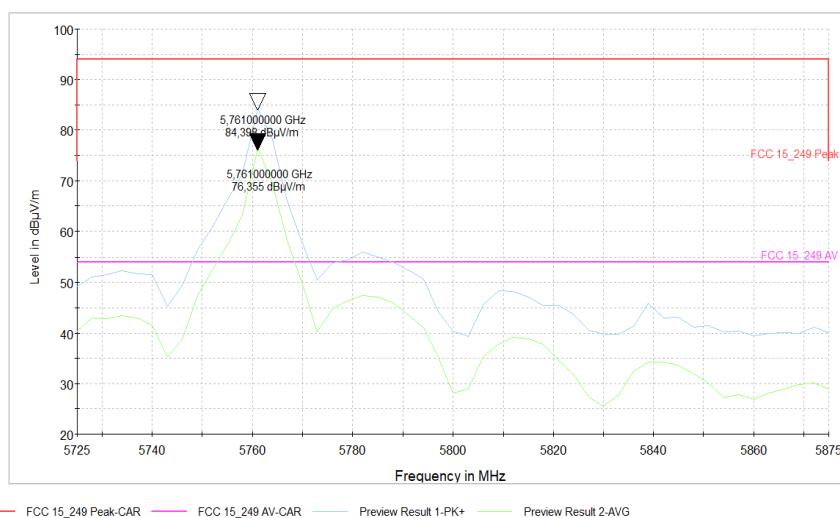
MEASUREMENT RESULT

VERTICAL



BAND-EDGE

HORIZONTAL



TEST 4.	RADIATED SPURIOUS EMISSIONS
REFERENCE DOCUMENT	According to §15.249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

• TEST SETUP	ANSI C63.10:2013 section 6.4, 6.5 & 6.6
• TEST LOCATION	Semi-anechoic chamber with measure distance at 3 meters
• TYPE OF MEASUREMENT	Radiated
• TEST METHOD	ANSI C63.10:2013 section 6.4, 6.5 & 6.6
• TEST EQUIPMENT USED FOR TEST	MXE Emi Receiver Keysight mod. N9038 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 SW Rohde & Schwarz EMC32-E
• 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 = 5,86 dB Expanded uncertainty 1GHz – 18GHz = 5,3 dB Expanded uncertainty 18GHz – 40GHz = 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

RESULT: WITHIN THE LIMITS

MEASUREMENT PARAMETER 9kHz – 30MHz

Resolution bandwidth:	200Hz
Video bandwidth:	1kHz
Span:	See plots below
Sweep time	Auto couple
Detector:	Peak
Trace-Mode:	Max. hold

MEASUREMENT PARAMETER 30MHz – 1GHz

Resolution bandwidth:	100kHz
Video bandwidth:	300kHz
Span:	See plots below
Sweep time	Auto couple
Detector:	Peak
Trace-Mode:	Max. hold

MEASUREMENT PARAMETER 1GHz - 10GHz

Resolution bandwidth:	1MHz
Video bandwidth:	3MHz
Span:	See plots below
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 below 1 GHz, the table height is 80 cm above the reference ground plane.

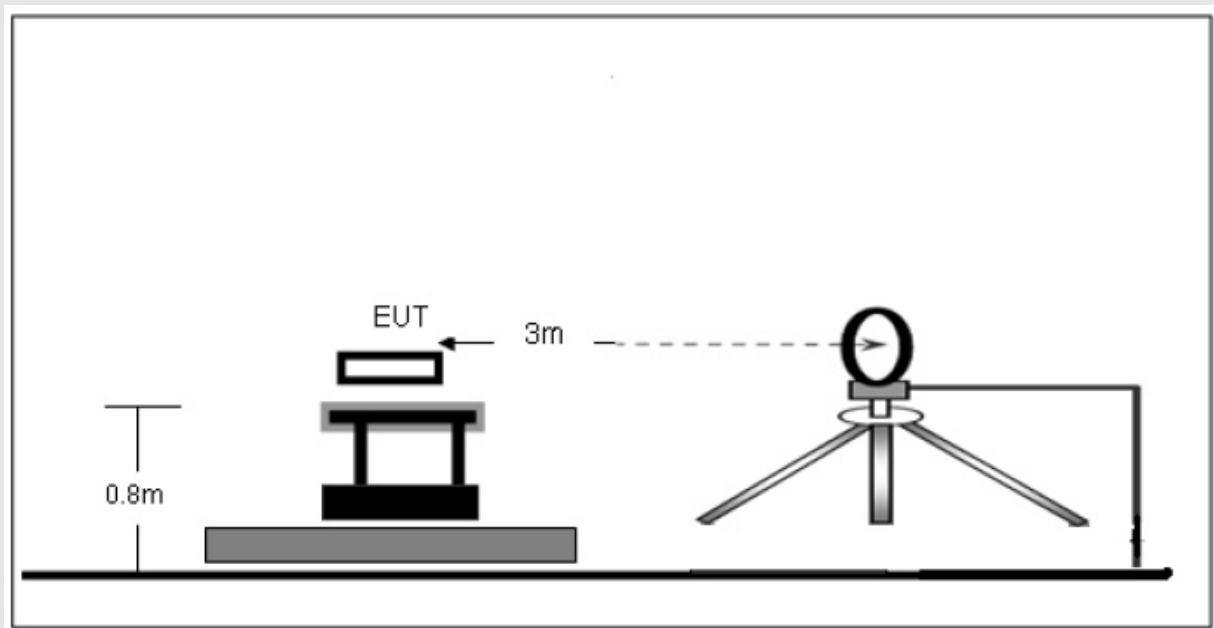
For emission measurements above 1 GHz, the table height is 1.5 m

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.

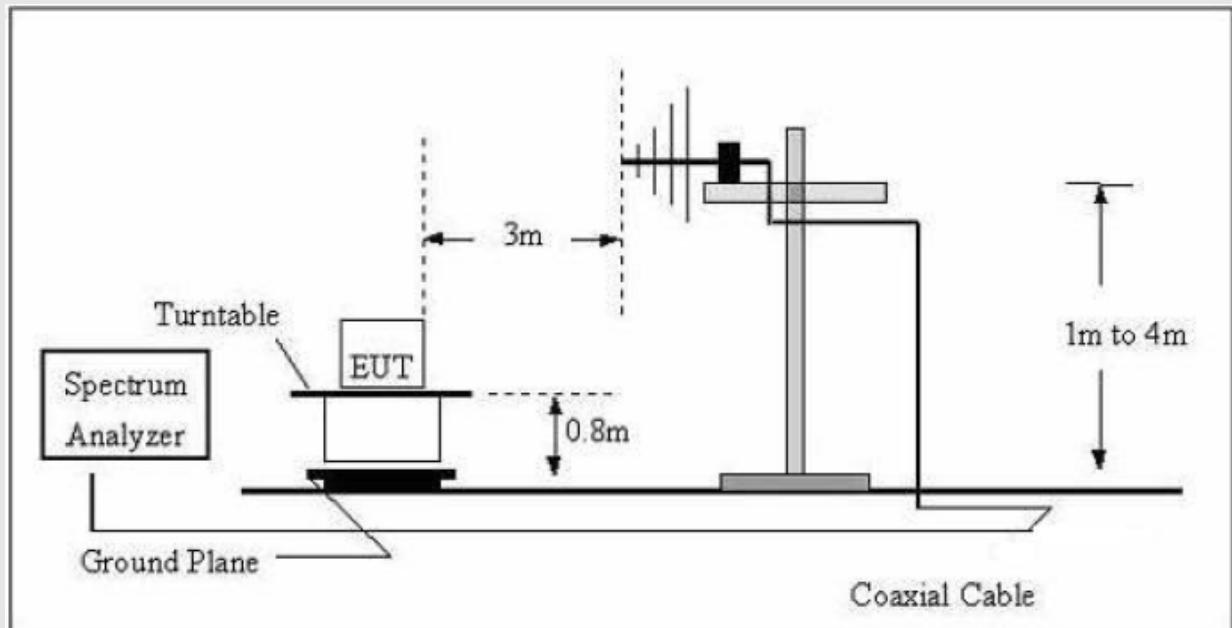
This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

TEST SETUP BLOCK DIAGRAM

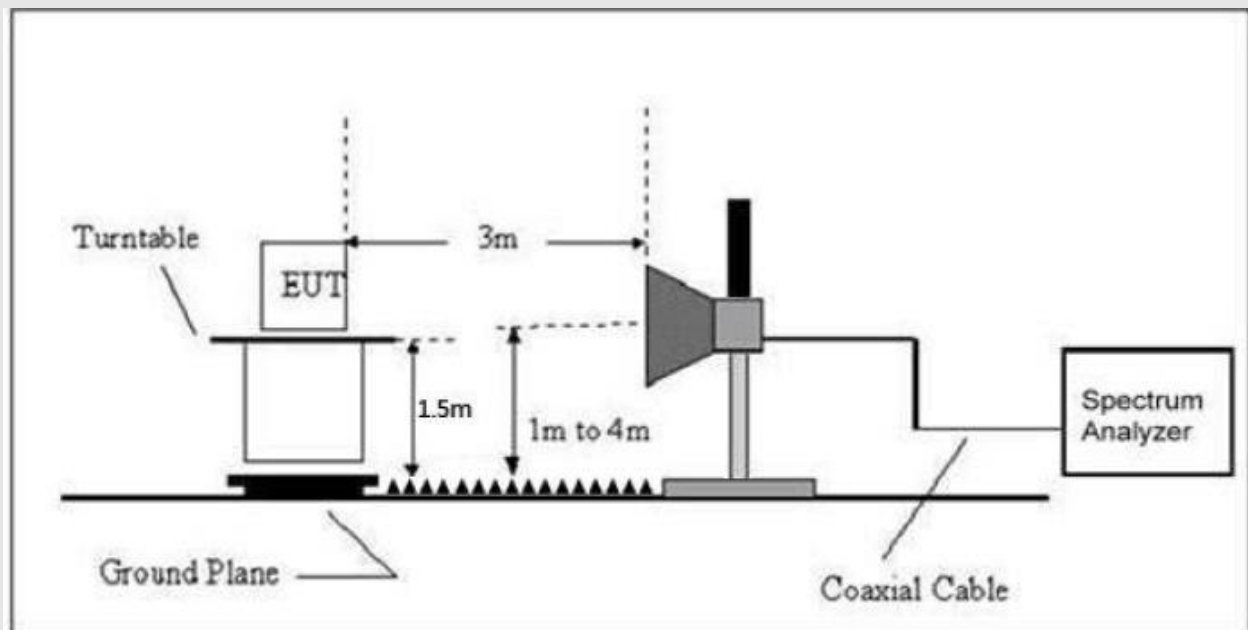
Radiated Emissions Test Setup – Below 30MHz



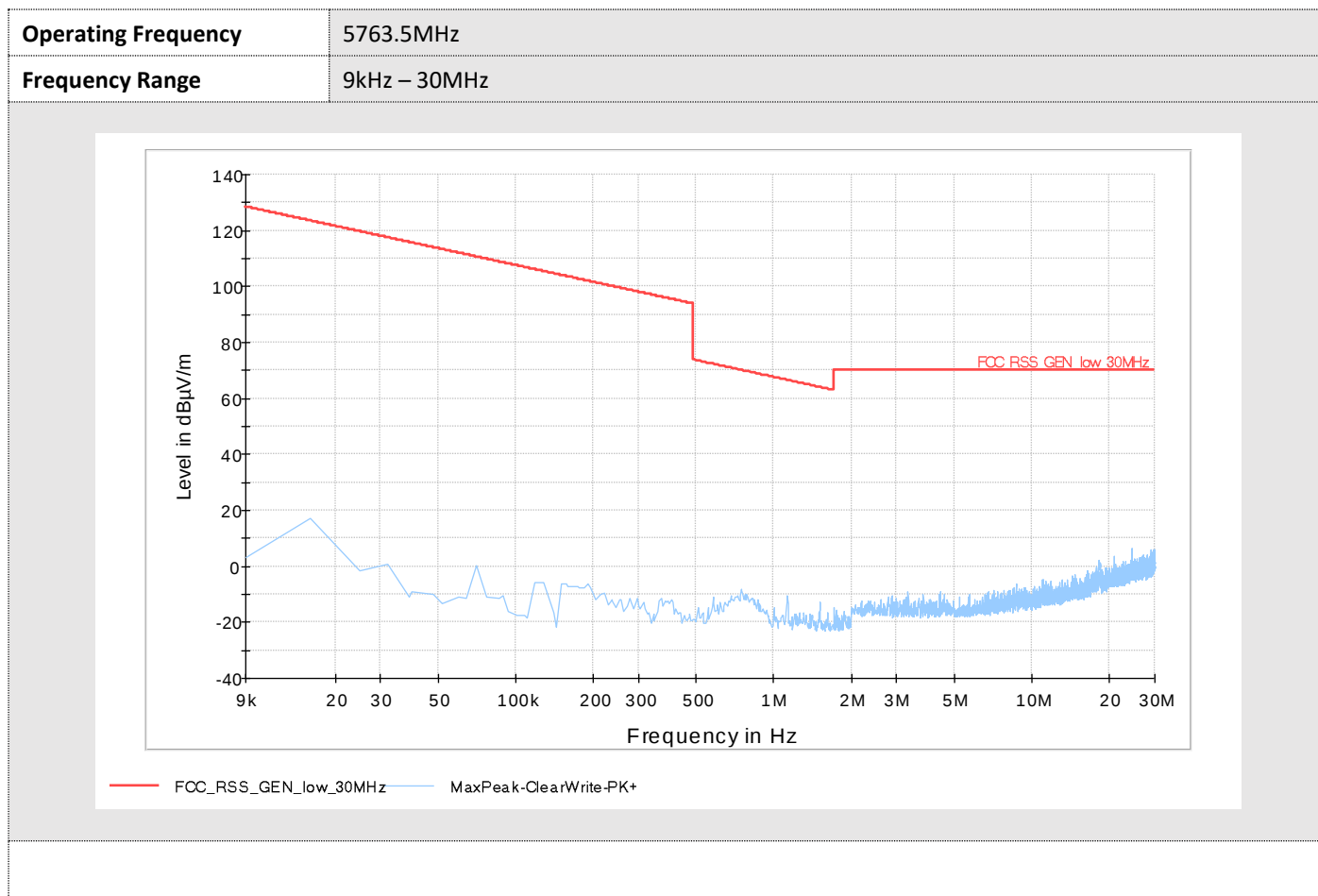
Radiated Emissions Test Setup – From 30MHz to 1GHz



Radiated Emissions Test Setup – Above 1GHz

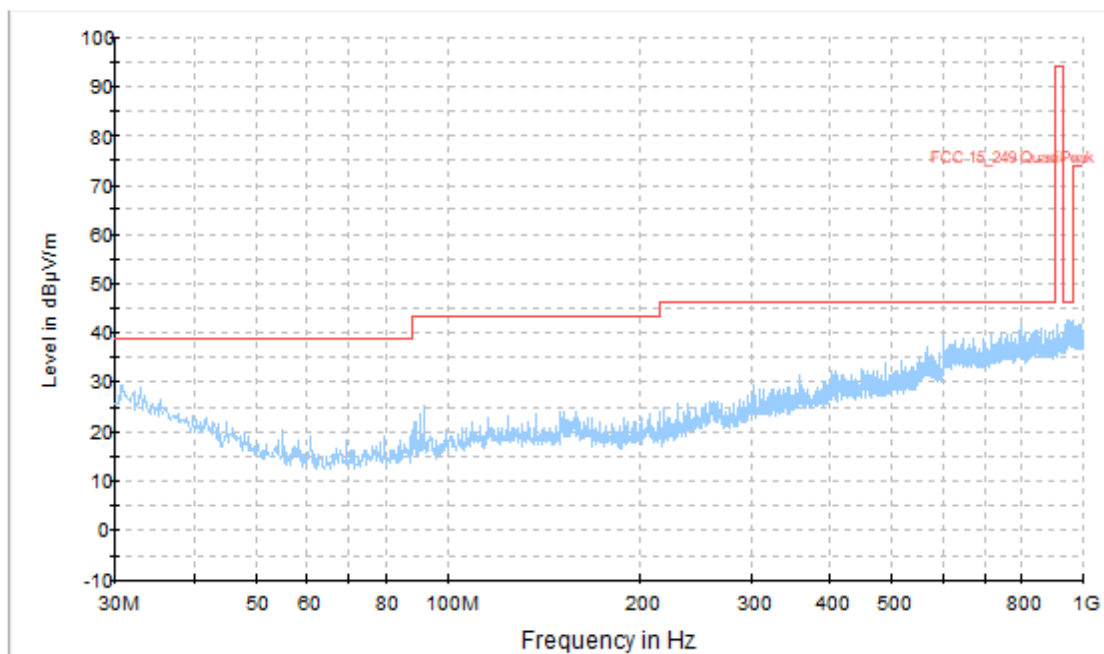


MEASUREMENT RESULT



Frequency Range 30MHz – 1GHz

Polarization Vertical

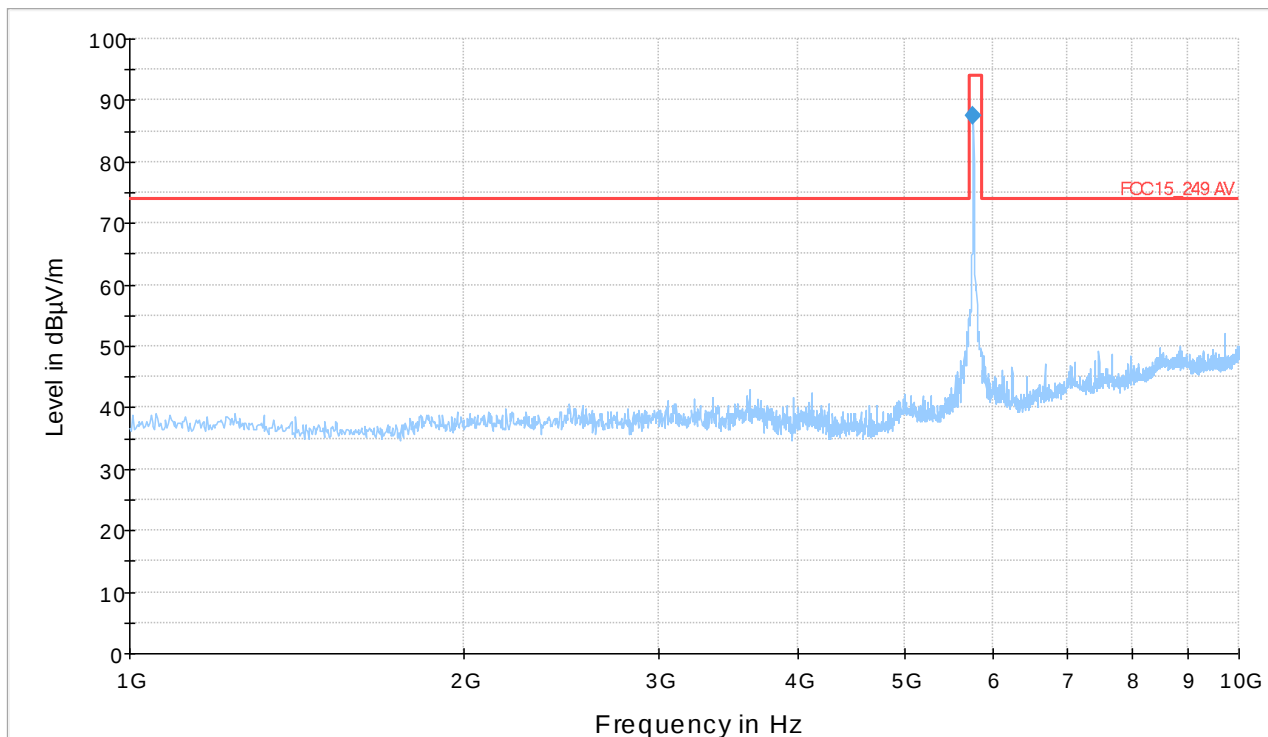


— FCC 15_249 QuasiPeak — MaxPeak-ClearWrite-PK+

Frequency Range 1GHz – 10GHz

Polarization Vertical

Emissione Radiata_FCC



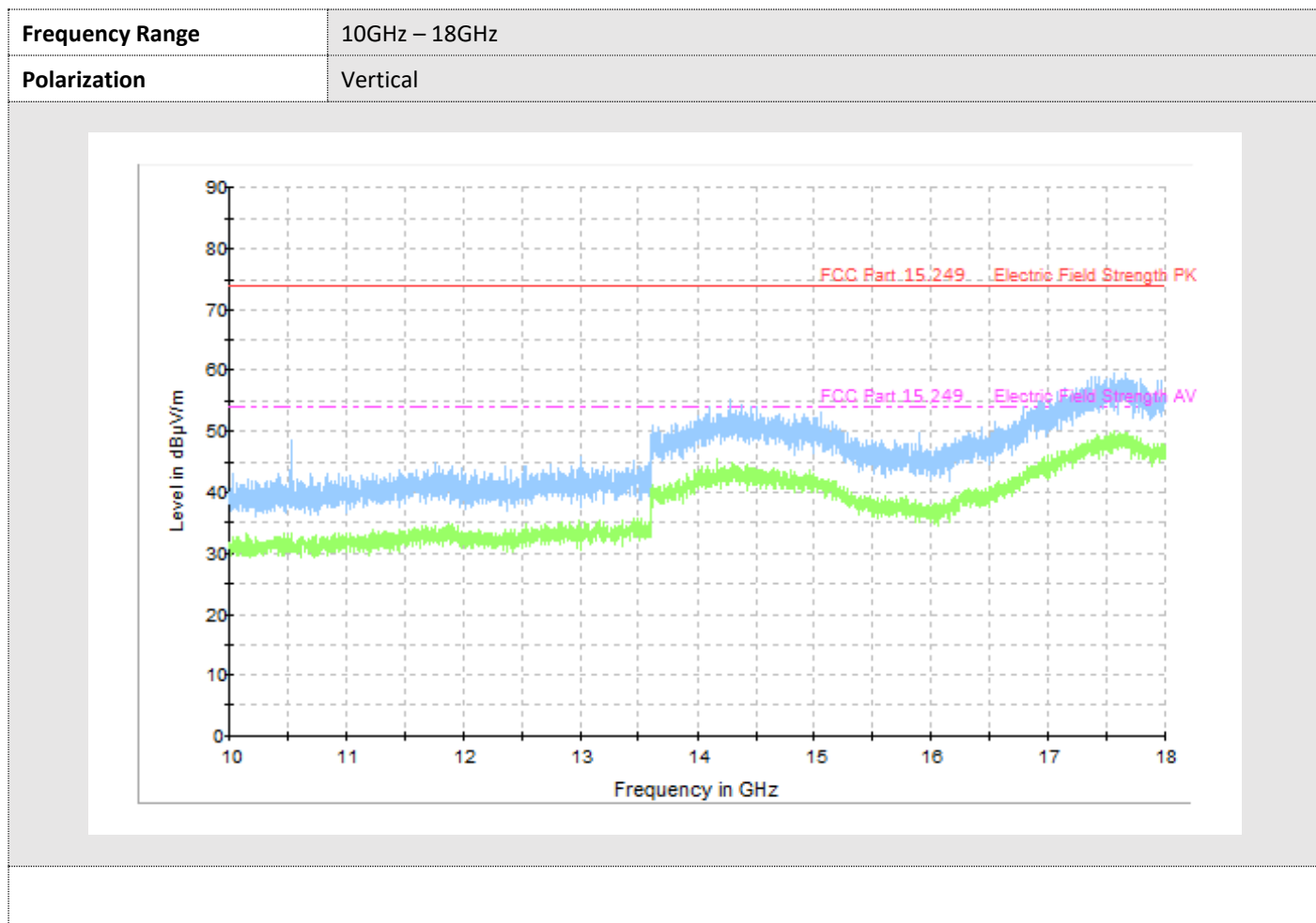
— FCC 15_249 Peak-CAR — PreviewResult 1-PK+ ◆ Final Result1-QPK

Final Result Peak

Frequency (MHz)	Field strength peak (dBμV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)
5764.00	87.5	108.0	-8.0	26.5	104

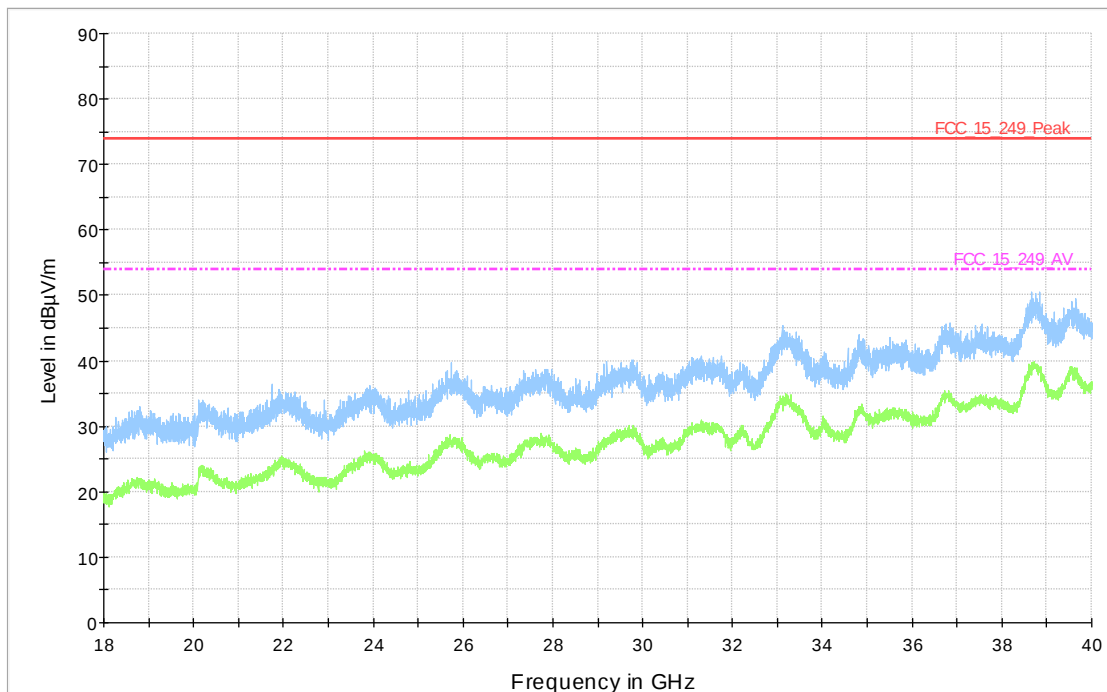
Final Result Average

Frequency (MHz)	Field strength peak (dBμV/m)	Height (cm)	Azimuth (deg)	Duty Cycle correction (dB)	Field strength Average = Total peak- duty cycle (dBμV/m)	Margin (dB)	Limit (dBμV/m)
5764.00	87.5	108.0	-8.0	-18.63	68.87	25.13	94



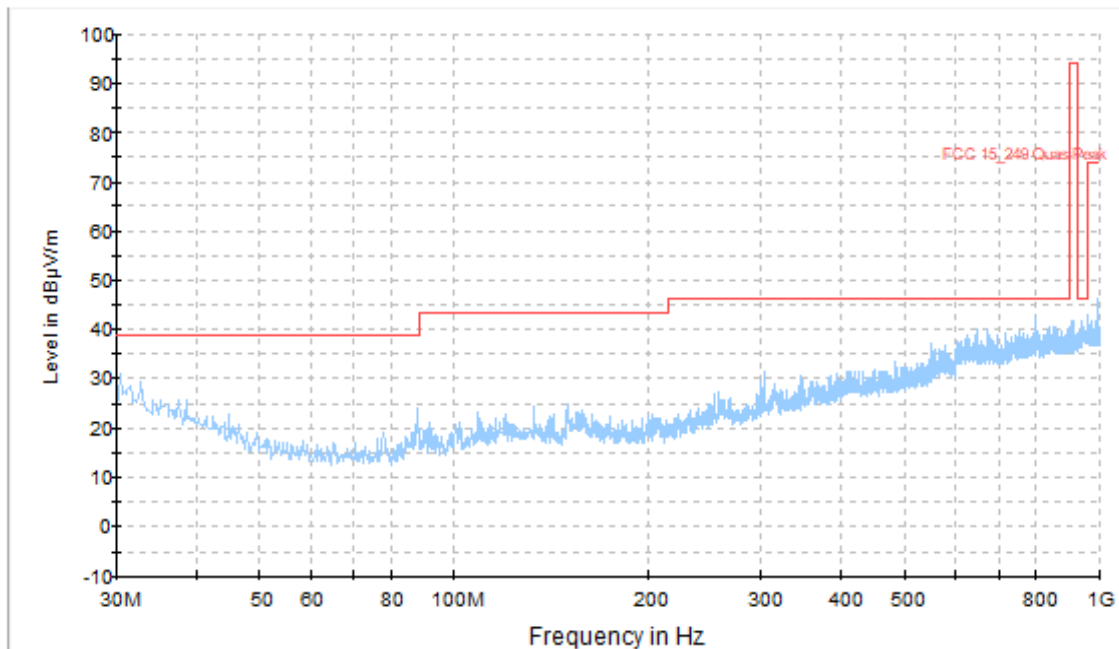
Frequency Range 18GHz – 40GHz

Polarization Vertical



Frequency Range 30MHz – 1GHz

Polarization Horizontal

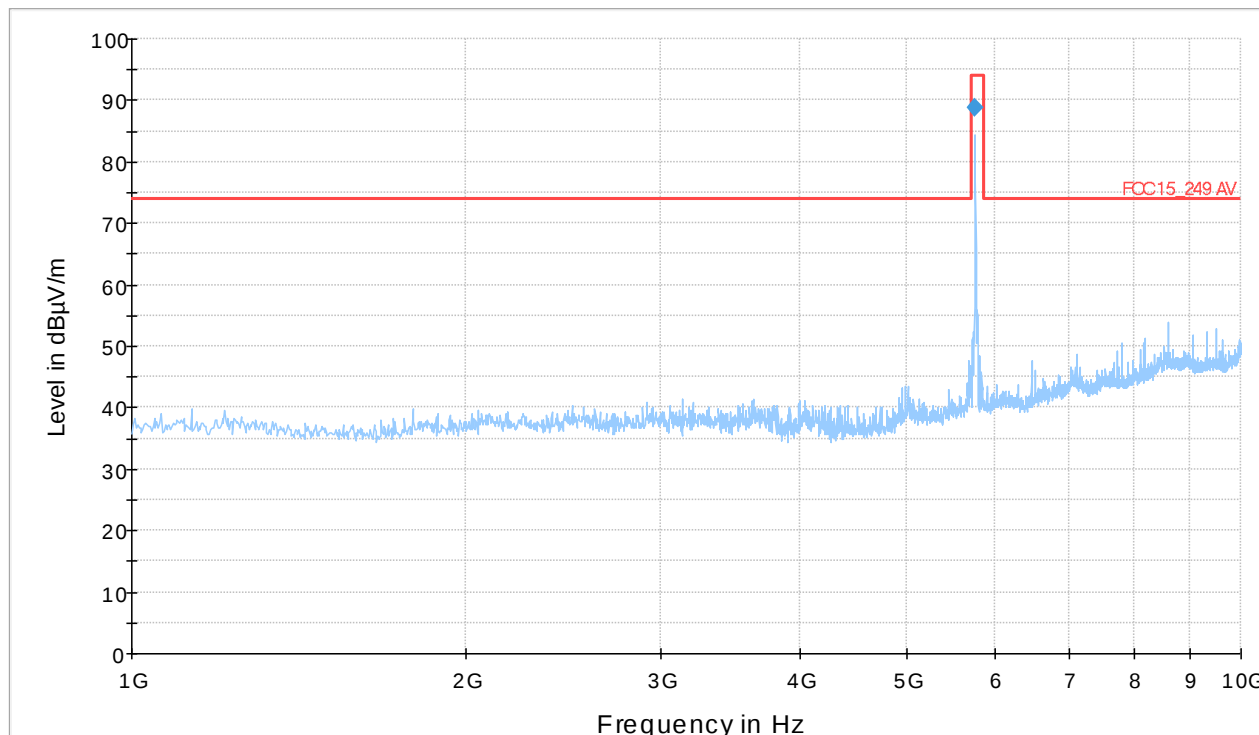


— FCC 15_249 QuasiPeak — MaxPeak-ClearWrite-PK+

Frequency Range 1GHz – 10GHz

Polarization Horizontal

Emissione Radiata_FCC



— FCC 15_249 Peak-CAR — PreviewResult 1-PK+ ◆ Final Result1-QPK

Final Result Peak

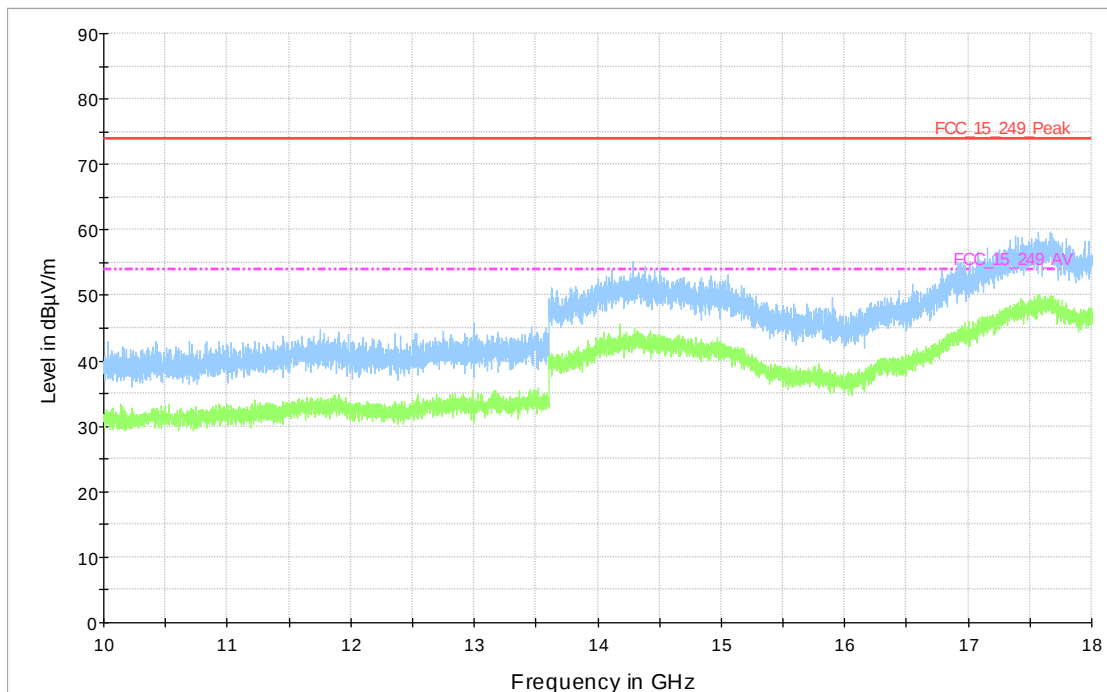
Frequency (MHz)	Field strength peak (dBμV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)
5761.00	88.7	108.0	-8.0	25.3	114

Final Result Average

Frequency (MHz)	Field strength peak (dBμV/m)	Height (cm)	Azimuth (deg)	Duty Cycle correction (dB)	Field strength Average = Total peak- duty cycle (dBμV/m)	Margin (dB)	Limit (dBμV/m)
5761.00	88.5	108.0	-8.0	-18.63	69.87	24.13	94

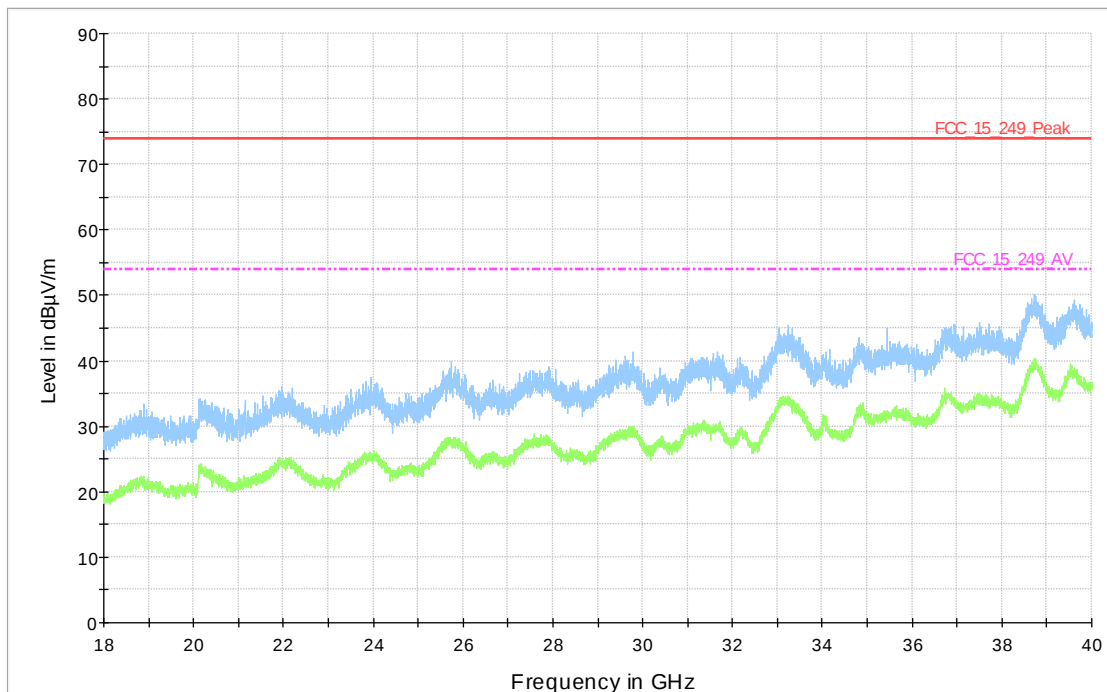
Frequency Range 10GHz – 18GHz

Polarization Horizontal



Frequency Range 18GHz – 40GHz

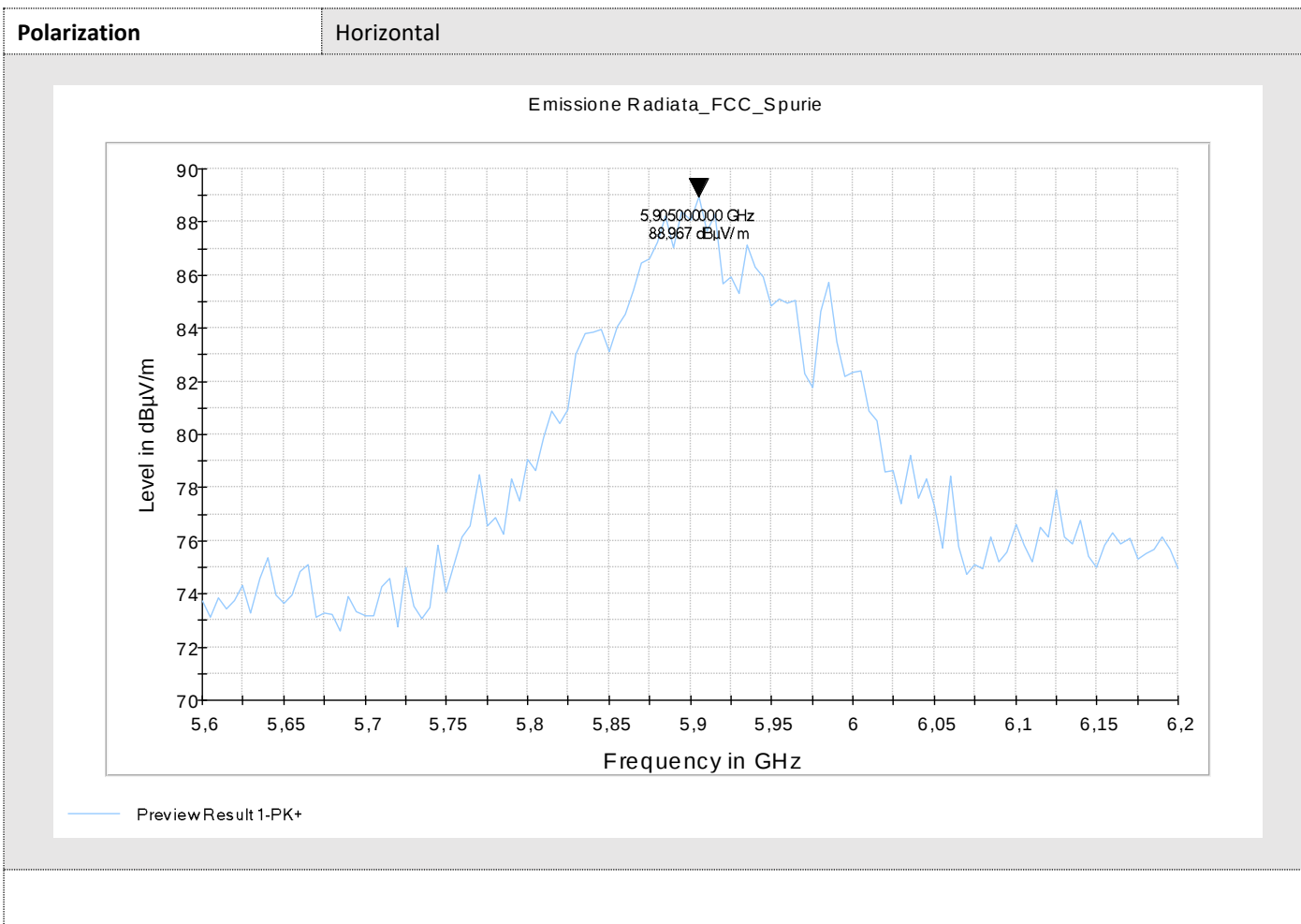
Polarization Vertical



FUNDAMENTAL EMISSION MEASURE - PARAMETERS

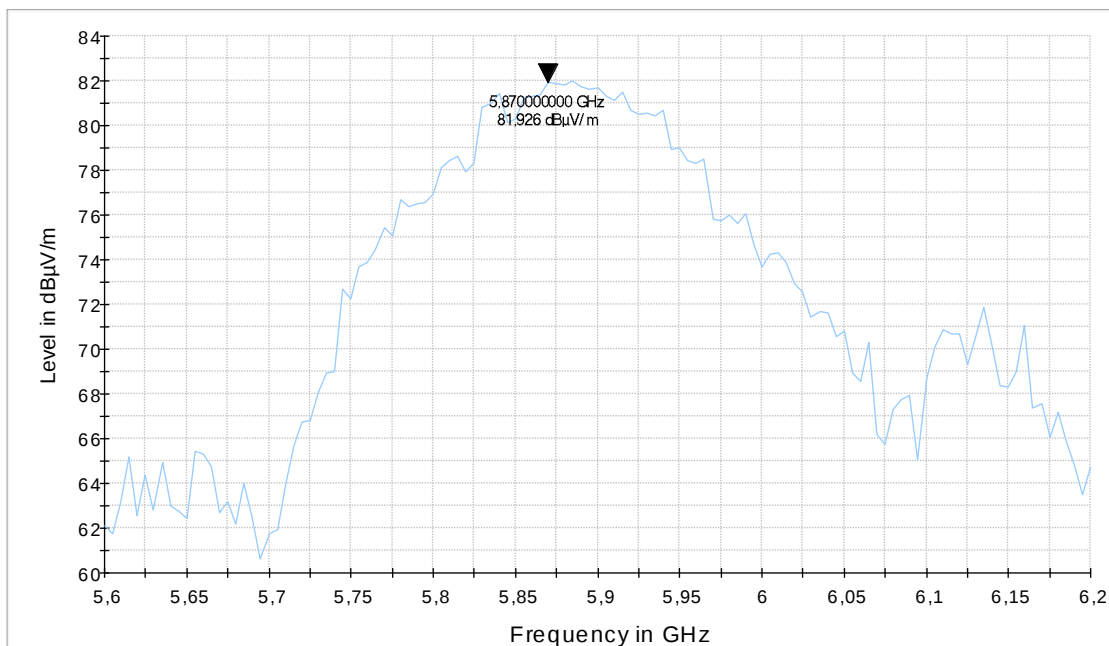
Resolution bandwidth:	10MHz
Video bandwidth:	10MHz
Span:	See plots below
Sweep time	Auto couple
Detector:	Peak
Trace-Mode:	Max. hold

Note: RBW of 1 MHz is less than the main lobe width. Therefore these measurements must be made using "Pulsed RF Agilent 150-2" test method with the spectrum analyzer configured for pulse spectrum. When the bandwidth (RBW) equals 1/2 of the main lobe width the displayed amplitude is practically the peak amplitude of the signal



Polarization	Vertical
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Emissione Radiata_FCC_Spurie



PreviewResult 1-PK+

END OF TEST REPORT