

TEST REPORT

Nr. R24159101

Federal Communication Commission (FCC)

Report Reference No.	R24159101
Date of issue:	17.09.2024
Total number pages:	59
Customer name	Autec S.r.l.
Address	Via Pomaroli, 65 - 36030 Caldogno (VI) - Italy
Test specification:	
Standard(s)	FCC Rules & Regulations, Title 47:2023 Part 15 paragraph(s): 203, 204, 205, 207, 209, 215 and 247
Non-standard test method	N/A
Test Report Form No.	15-247_Hopping_DEKRA
Test Report Form(s) Originator ...	DEKRA Testing and Certification S.r.l.
Master TRF	2024-09
General disclaimer:	
The test Verdict presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of DEKRA Testing and Certification S.r.l.	
(*) Test item description	Remote station
(*) Trademark	Autec
(*) Manufacturer	Autec S.r.l.
(*) Model / Type reference	Model J9A Type VZ9QH
(*) FCC ID	OQA-J9AVZ0QH
(*) Rating(s)	7,2 V battery supplied
Report	
Tested by (name + signature)	G. Gandini
Approved by (name + signature)	F. Marenda

(*) information provided by the customer

1 Summary

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2 Reference standard(s)	
FCC Rules and Regulation Title 47 part 15:2023 KDB 558074 D01 15.247 Meas Guidance v05r02	-- Guidance for compliance measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices operating under section 15.247 of the FCC rules
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
ANSI C63.10:2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
3 List of attachments	
Attachment 1: Measurement uncertainty, judgement of compliance and quality manual references	
4 Deviation(s) from test specification	
None	
5 Testing location	
DEKRA Testing and Certification S.r.l. Via della Fisica, 20 – 36016 Thiene (VI) – Italy Test site facility's FCC registration number: 182474	

Revision index	Date	Change history
1.0	17.09.2024	--

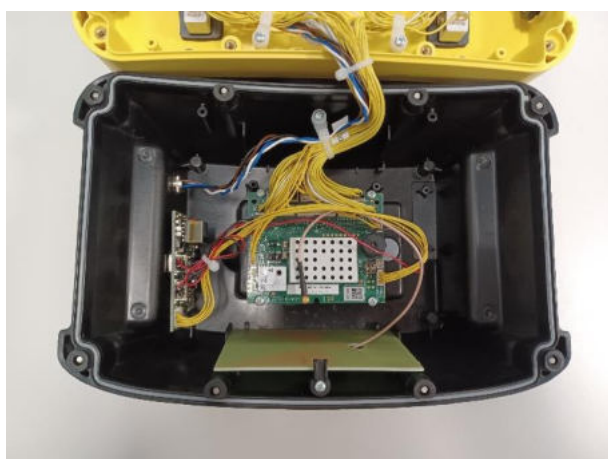
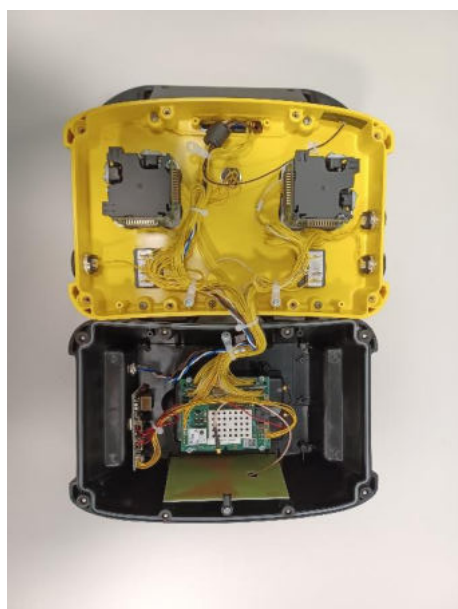
Testing and sampling:	
Date of receipt of test item	31.05.2024
Testing start date	02.09.2024
Testing end date	02.09.2024
Sampling procedure	Sample used for testing chosen by the customer; DEKRA Testing and Certification S.r.l. cannot be considered responsible for the selection of the sample
Internal identification.....	Adhesive label with the product number P240537
General remarks:	
This report shall not be reproduced, except in full, without the written approval of DEKRA Testing and Certification S.r.l. The test Verdict presented in this report relate only to the object tested. “(see appended table)”: refers to a table appended to the report. Throughout this report a comma is used as the decimal separator. Tests reported in this test report marked by wording: “Test not accredited by ACCREDIA” are not part of the ACCREDIA accreditation of this laboratory.	
Possible test case verdicts:	
Test case does not apply to the test object:	N/A (Not Applicable)
Test object meets the requirement:	P (Pass)
Test object does not meet the requirement:	F (Fail)
Test object was not evaluated for the requirement:	N/E (Not Executed)
Definition of symbols used in this test report:	
☒ Indicates that the listed condition, standard or equipment is applicable for this report. ☐ Indicates that the listed condition, standard or equipment is not applicable for this report.	

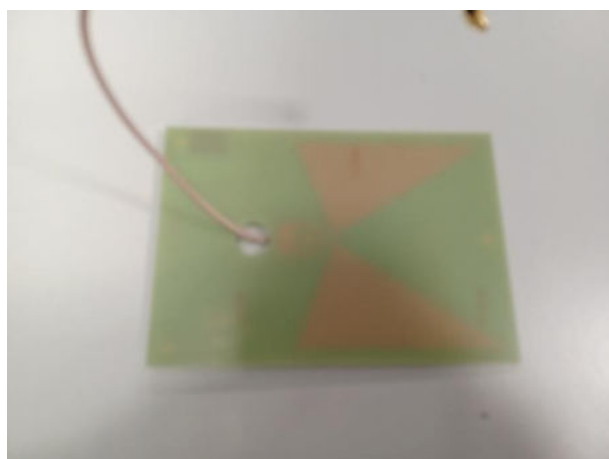
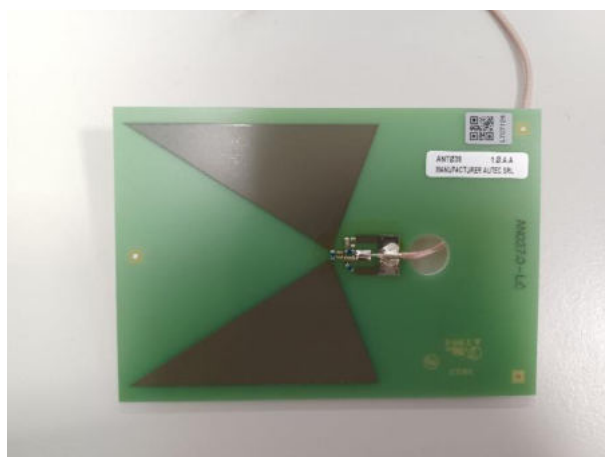
6 General description of tested item and testing condition(s)

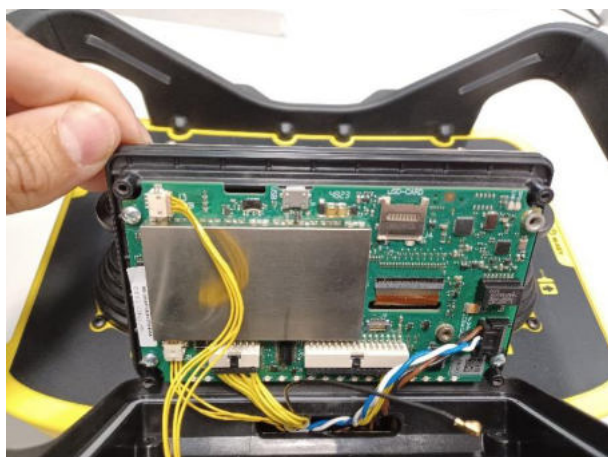
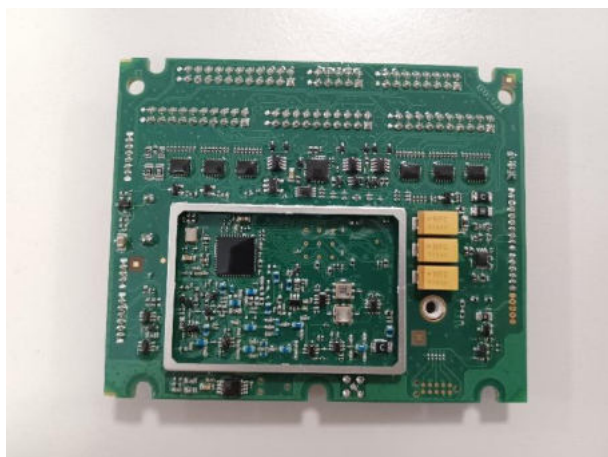
Description	Remote station								
Model Number	Model J9A Type VZ9QH								
FCC ID	OQA-J9AVZ0QH								
Serial Number	--								
Brand name	Autec								
Frequency band	902 – 928 MHz								
Nominal frequencies	FL: 915,050 MHz		FM: 921,400 MHz		FH: 927,800 MHz				
Test power supply	Voltage and Frequency			Reference poles					
				N	L1	L2	L3	PE	
	☐	AC:		☐	☐	☐	☐	☐	
	☐	AC:		☐	☐	☐	☐	☐	
	☒	DC: 7,2 V battery supplied						☐	
Pseudo randomly ordered list of hopping frequencies	See document j9a_vz9qh_operational_description-rev.00								
Type of equipment	☒ Transmitter unit ☒ Receiver unit								
Type of station	☒ Portable station ☐ Mobile station								
Test arrangements of EUT	<i>Intended operational arrangement(s) of EUT</i>			<i>Test arrangement (see basic standard)</i>					
	☐	Table-top only		Table-top					
	☐	Floor-standing only		Floor-standing					
	☐	Can be floor-standing or table-top		Table-top					
	☐	Rack mounted		In rack or table-top					
	☒	Other, for example wall mounted, ceiling mounted, handheld, body worn		Table-top					
Operating modes	No.	Operating mode of test item							
	1	EUT in continuous transmission at maximum power							
Auxiliary equipment (not part of the test item)	Accessory			Type	Manufacturer				
	Gateway VIDEO			PAU	Autec				
Declination of responsibility	Information relating to the description of the sample, components list, and software/hardware version (if reported) are provided by the customer. DEKRA Testing and Certification S.r.l. cannot be considered responsible for this information, for any other document sent by the customer and for any difference between the software version present in the tested sample and that present in the object intended for final sale. In some cases, the software in the tested sample is in a version dedicated exclusively to the test, and therefore does not represent the software installed in the final version of the product.								

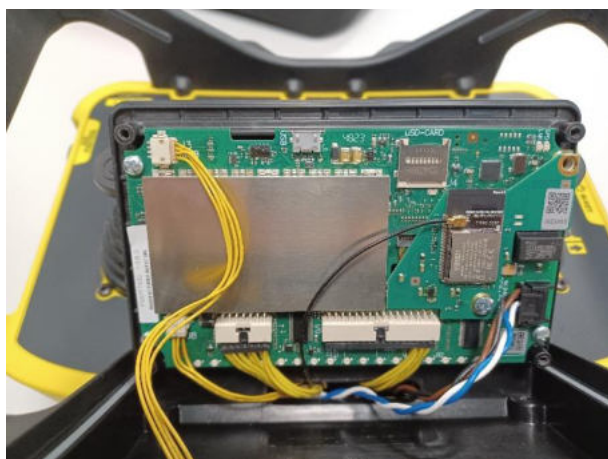
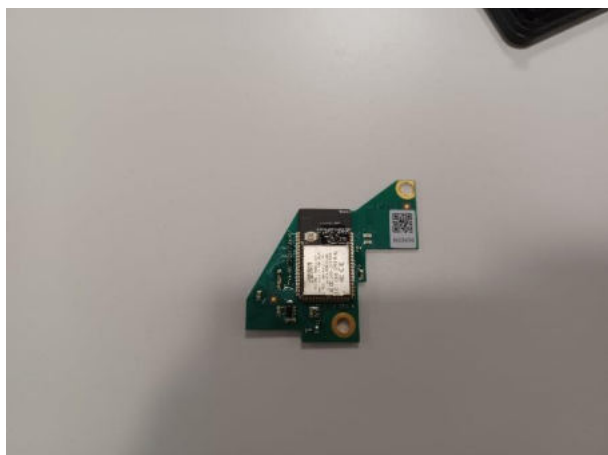
6.1 Photos of the test item













7 Verdict summary section

FCC Rules & Regulations, Title 47:2023 Part 15 paragraph(s): 203, 204, 205, 207, 209, 215 and 247			
Clause	Requirement – Test case	Basic standard	Verdict
Part 15.247 (a) (1)	Pseudo randomly ordered list of hopping frequencies	--	P
Part 15.203	Antenna requirements	ANSI C63.10	P
Part 15.207	Conducted emissions	ANSI C63.10	N/A (+)
Part 15.209	Radiated emissions and spurious emissions	ANSI C63.10	P
Part 15.247	20 dB Bandwidth	ANSI C63.10	P
Part 15.247	Channel Separation	ANSI C63.10	P
Part 15.247	Number of Hopping Channel	ANSI C63.10	P
Part 15.247	Time of occupancy	ANSI C63.10	P
Part 15.247	Band edge	ANSI C63.10	P
Part 15.209 and 15.247	Peak Output Power	ANSI C63.10	P

(+) Devices which only employ battery power. See FCC Part 15.207 (c)

8 Test conditions

8.1 General

Environmental reference conditions.....:	The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:																			
	Temperature		Humidity		Atmospheric pressure															
	15 °C – 35 °C		30 % - 60 %		800 hPa – 1060 hPa															
	If explicitly required in the basic standard or applied product standard the climatic values are recorded and documented separately in this test report. Environmental conditions have been monitored with the following instrument.																			
	<table><tr><td><i>Id. Number</i></td><td><i>Manufacturer</i></td><td><i>Model</i></td><td><i>Serial number</i></td><td><i>Description</i></td><td><i>Last calibration date</i></td><td><i>Calibration expiration</i></td></tr><tr><td>CMC S302</td><td>Testo</td><td>175H1</td><td>40370182 610</td><td>Data Logger</td><td>May 2024</td><td>May 2025</td></tr></table>							<i>Id. Number</i>	<i>Manufacturer</i>	<i>Model</i>	<i>Serial number</i>	<i>Description</i>	<i>Last calibration date</i>	<i>Calibration expiration</i>	CMC S302	Testo	175H1	40370182 610	Data Logger	May 2024
<i>Id. Number</i>	<i>Manufacturer</i>	<i>Model</i>	<i>Serial number</i>	<i>Description</i>	<i>Last calibration date</i>	<i>Calibration expiration</i>														
CMC S302	Testo	175H1	40370182 610	Data Logger	May 2024	May 2025														
Measurement uncertainties	Attachment 1																			

9 Test results

9.1 Antenna requirements

Tested by	G. Gandini	
Test date	02.09.2024	
Basic standard(s)	FCC Rules and Regulation; Titles 47 Part. 15.203 and 15.204	
Test specification	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 §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. 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 § 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 type	☒	Integral antenna
	☐	External antenna
Antenna gain	-0,35 dBi	
External R.F. power amplifier	Not Present	

9.2 Emissions in restricted frequency bands and in unrestricted frequency bands

Tested by	G. Gandini	
Test date	02.09.2024	
Test location (stand)	Semi-anechoic chamber (CMC A070)	
Basic standard(s)	ANSI C63.10 cl. 6.3, 6.4, 6.5 and 6.6	
Product standard(s)	FCC Rules and Regulation; Titles 47 Part. 15.209	
Test set-up description	☒	Table top equipment set-up (80 cm above the reference ground plane)
	☐	Floor standing equipment set-up (insulating material up to 12 mm thick)
	☐	False floor installation equipment set-up (insulating material up to 34 cm above the reference ground plane)
Supplementary test set-up description	--	
Test method applied	OATS or SAC with measurement distance [m]: 10 m for frequencies below 1 GHz 3 m for frequencies above 1 GHz	
Supplementary information	--	

Acceptance limits

Acceptance limits for emissions in restricted frequency bands ($f < 1000$ MHz)		
Frequency range (MHz)	Test distance (m)	Limits [dB(μ V/m)]
0,009 to 0,490	300	$20\log(2400/F(\text{kHz}))$
0,490 to 1,705	30	$20\log(24000/F(\text{kHz}))$
1,705 to 30	30	$20\log(30)$
30 to 88	3	$20\log(100)^{**}$
88 to 216	3	$20\log(150)^{**}$
216 to 960	3	$20\log(200)^{**}$
Above 960	3	$20\log(500)$

** : except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54 – 72 MHz, 76 – 88 MHz, 174 – 216 MHz or 470 – 806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

Perimeter protection systems may operate in the 54 – 72 MHz and 76 – 88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.

Remarks: the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9 – 90 kHz and 110 – 490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector. The Verdict have been extrapolated to the specified distance using an extrapolation factor.

Acceptance limits for emissions in restricted frequency bands ($f \geq 1000$ MHz)			
Frequency (MHz)	Test distance (m)	AV limits [dB(μ V/m)]	Peak limits [dB(μ V/m)]
> 1000	3	54	74

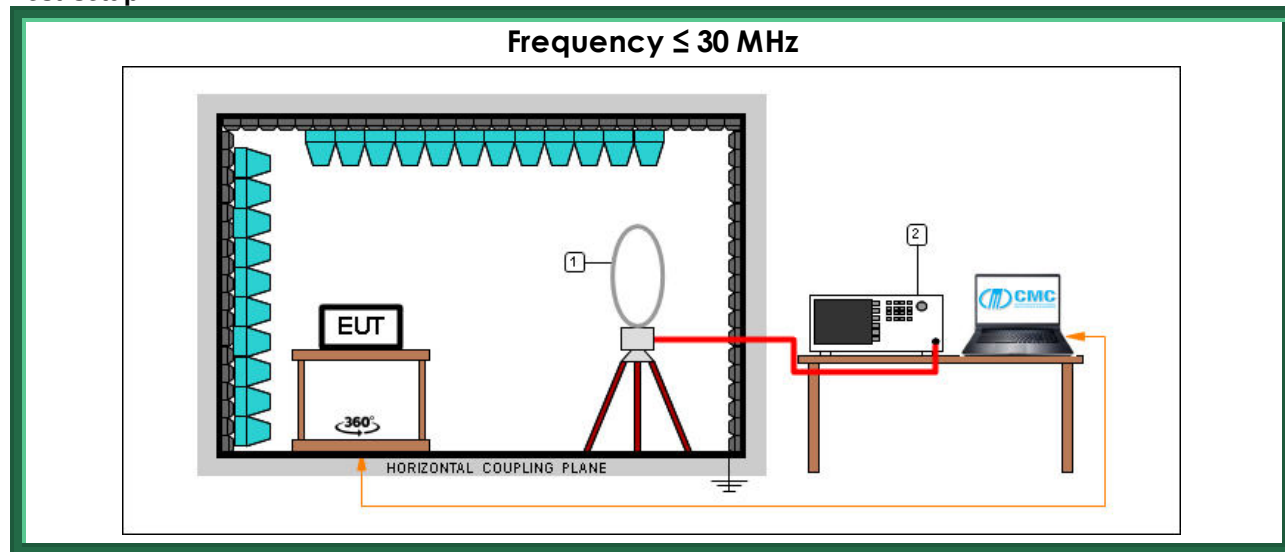
The restricted frequency bands are listed in the following table:

MHz	MHz	MHz	GHz
0,090 – 0,110	16,42 – 16,423	399,9 – 410	4,5 – 5,15
0,495 – 0,505	16,69475 – 16,69525	608 – 614	5,35 – 5,46
2,1735 – 2,1905	16,80425 – 16,80475	960 – 1240	7,25 – 7,75
4,125 – 4,128	25,5 – 25,67	1300 – 1427	8,025 – 8,5
4,17725 – 4,17775	37,5 – 38,25	1435 – 1626,5	9,0 – 9,2
4,20725 – 4,20775	73 – 74,6	1645,5 – 1646,5	9,3 – 9,5
6,215 – 6,218	74,8 – 75,2	1660 – 1710	10,6 – 12,7
6,26775 – 6,26825	108 – 121,94	1718,8 – 1722,2	13,25 – 13,4
6,31175 – 6,31225	123 – 138	2200 – 2300	14,47 – 14,5
8,291 – 8,294	149,9 – 150,05	2310 – 2390	15,35 – 16,2
8,362 – 8,366	156,52475 – 156,52525	2483,5 – 2500	17,7 – 21,4
8,37625 – 8,38675	156,7 – 156,9	2690 – 2900	22,01 – 23,12
8,41425 – 8,41475	162,0125 – 167,17	3260 – 3267	23,6 – 24,0
12,29 – 12,293	167,72 – 173,2	3332 – 3339	31,2 – 31,8
12,51975 – 12,52025	240 – 285	3345,8 – 3358	36,43 – 36,5
12,57675 – 12,57725	322 – 335,4	3600 – 4400	Above 38,6
13,36 – 13,41			

Acceptance limits for emissions in non-restricted frequency bands

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.

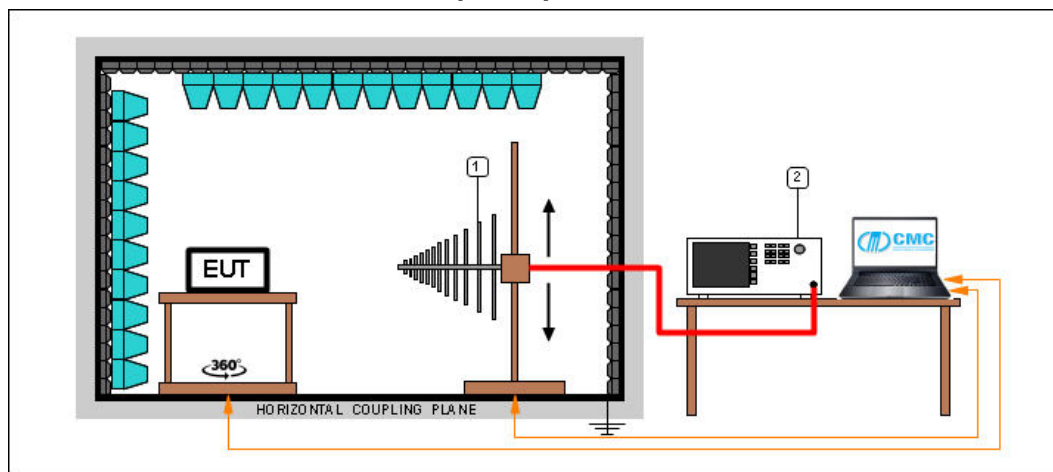
Test setup



Test setup PE004_01

Nr.	Id. Number	Manufacturer	Model	Serial number	Description	Last calibration date	Calibration expiration
2	CMC S353	Rohde & Schwarz	ESW26	101492	Emi Test Receiver	December 2023	December 2024
1	CMC S127	Schaffner	HLA6120	1191	Loop Antenna 9kHz - 30MHz	May 2024	May 2025
--	CMC A105	Frankonia	FC06	FC06.1-2017-073	Turntable & Antenna mast controller (Software V02.05.013)	No calibration required	No calibration required

Frequency ≤ 1 GHz



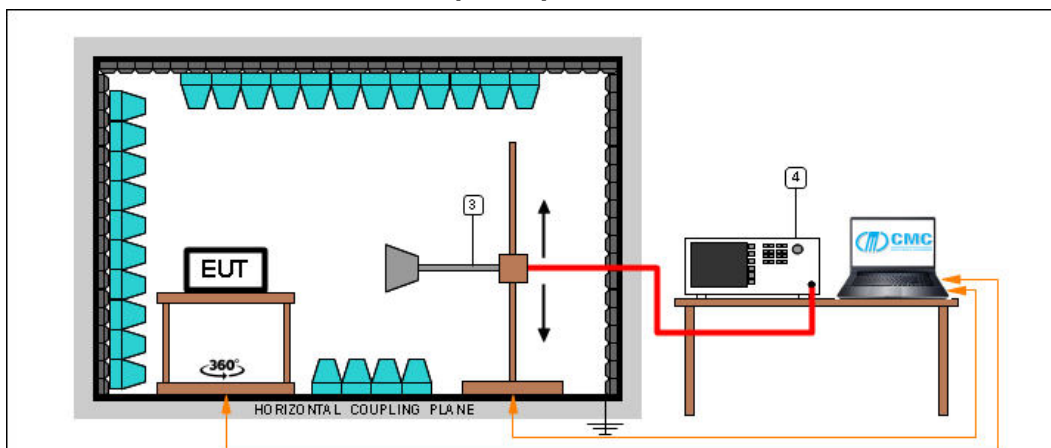
Test setup PE004_02

Nr.	Id. Number	Manufacturer	Model	Serial number	Description	Last calibration date	Calibration expiration
2	CMC S353	Rohde & Schwarz	ESW26	101492	Emi Test Receiver	December 2023	December 2024
1	CMC S271	Schwarzbeck	BBA 9106 + VHBB 9124	831	Broadband Antenna	August 2022	August 2025
--	CMC A105	Frankonia	FC06	FC06.1-2017-073	Turntable & Antenna mast controller (Software V02.05.013)	No calibration required	No calibration required

Test setup PE004_03

Nr.	Id. Number	Manufacturer	Model	Serial number	Description	Last calibration date	Calibration expiration
2	CMC S353	Rohde & Schwarz	ESW26	101492	Emi Test Receiver	December 2023	December 2024
1	CMC S287	Schwarzbeck	VUSLP 9111B	9111B-203	Broadband Antenna	August 2022	August 2025
--	CMC A105	Frankonia	FC06	FC06.1-2017-073	Turntable & Antenna mast controller (Software V02.05.013)	No calibration required	No calibration required

Frequency > 1 GHz



Test setup PE004_04

Nr.	Id. Number	Manufacturer	Model	Serial number	Description	Last calibration date	Calibration expiration
4	CMC S353	Rohde & Schwarz	ESW26	101492	Emi Test Receiver	December 2023	December 2024
3	CMC S108	Emco	3115	9811-5622	Waveguide antenna	August 2022	August 2025
--	CMC A105	Frankonia	FC06	FC06.1-2017-073	Turntable & Antenna mast controller (Software V02.05.013)	No calibration required	No calibration required

Test setup PE004_05

Nr.	Id. Number	Manufacturer	Model	Serial number	Description	Last calibration date	Calibration expiration
4	CMC S353	Rohde & Schwarz	ESW26	101492	Emi Test Receiver	December 2023	December 2024
3	CMC S290	Schwarzbeck	BBHA 9170	733	Horn Antenna	October 2021	October 2026
--	CMC A105	Frankonia	FC06	FC06.1-2017-073	Turntable & Antenna mast controller (Software V02.05.013)	No calibration required	No calibration required

Result

Transmission frequency (MHz)	Polarization	Frequency Range (MHz)	Graphs	Verdict
Worst case	V	30 – 300	G24159101	P
Worst case	H	30 – 300	G24159102	P
Fmin	H	300 – 1000	G24159103	P
Fmin	V	300 – 1000	G24159104	P
Fmid	V	300 – 1000	G24159105	P
Fmid	H	300 – 1000	G24159106	P
Fmax	H	300 – 1000	G24159107	P
Fmax	V	300 – 1000	G24159108	P
Worst case	Loop	0,009 – 30	G24159109	P
Fmax	V	1000 – 10000	G24159110	P
Fmax	H	1000 – 10000	G24159111	P
Fmid	H	1000 – 10000	G24159112	P
Fmid	V	1000 – 10000	G24159113	P
Fmin	V	1000 – 10000	G24159114	P
Fmin	H	1000 – 10000	G24159115	P

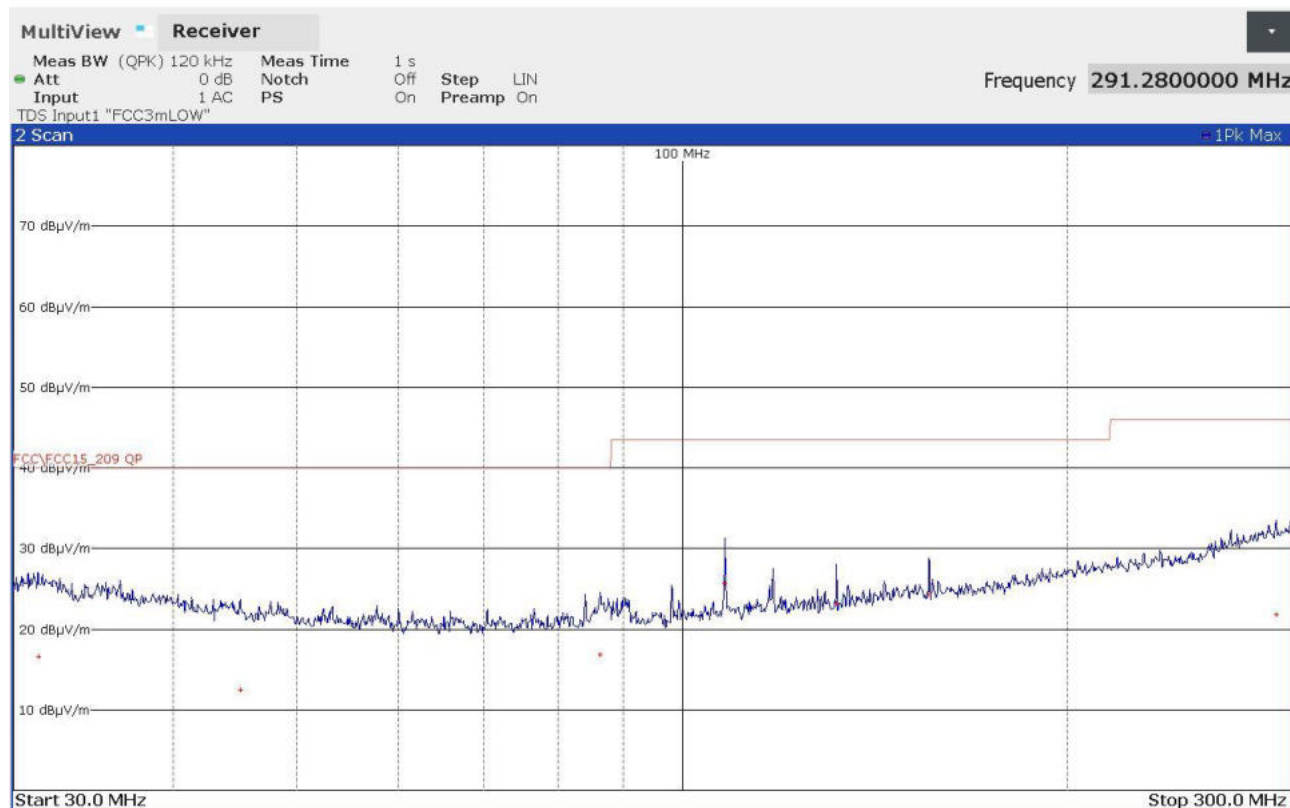
Remarks: EUT was tested in 3 orthogonal planes, graphs are related to the highest detected levels. Measurements at frequencies lower than 30 MHz have been performed with an EUT – antenna distance of 10 m. Measured values have been corrected with conversion factor $40\log(\text{test distance}/10)$ based on the measuring distance provided by the standard. Measurements at frequencies higher than 30 MHz and lower than 1000 MHz have been performed with an EUT – antenna distance of 10 m. Measured values have been corrected with conversion factor $20\log(\text{test distance}/10)$ based on the measuring distance provided by the standard. Peaks above the limits are caused by the nominal transmitting frequencies.

Graphs Legend

PK: Peak; QP [1s] (quasi-peak at 1 second) values are marked with a +
AV: Average; AV [1s] (average at 1 second) values are marked with a X

Graphs

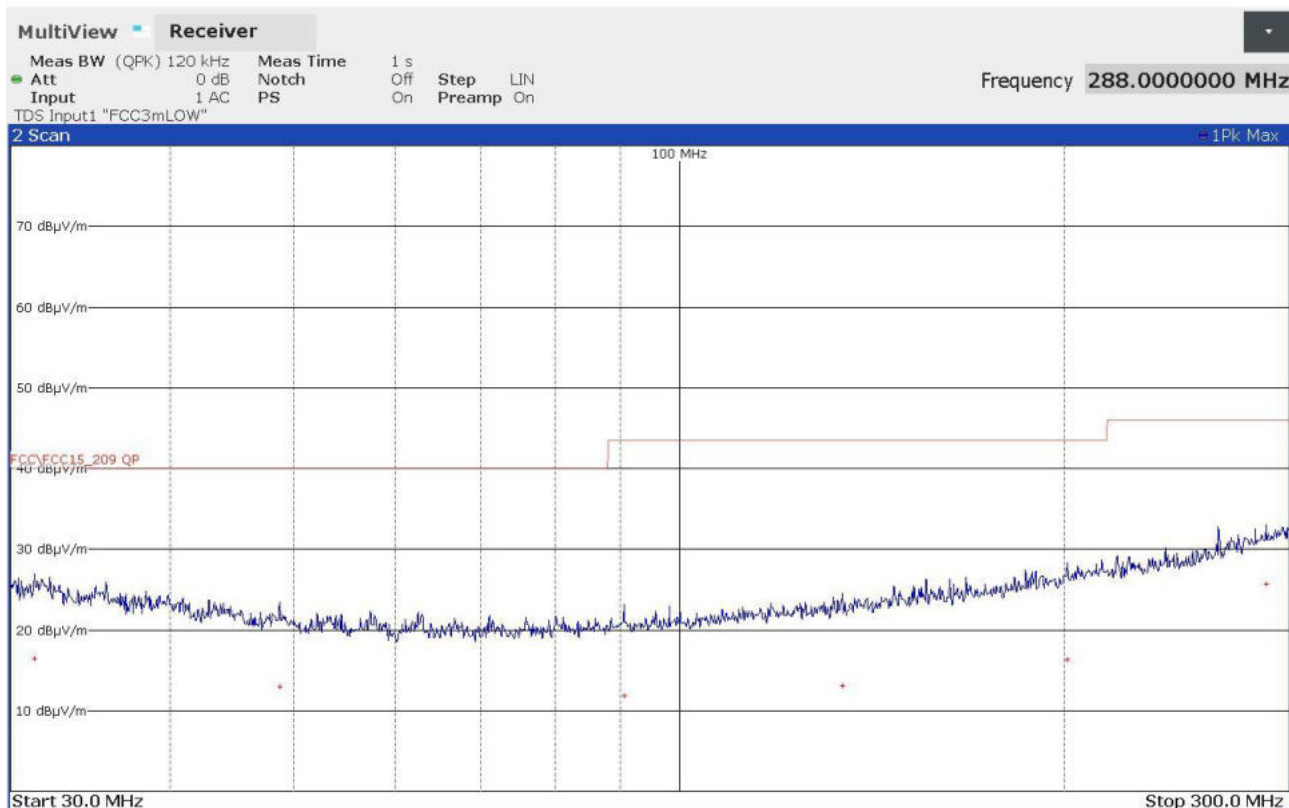
Segalla 24159101


FINAL RESULT TABLE
QUASI PEAK

Freq Hz	Lev dBuV/m	Margin dB
31360000	+16,57	-23,43
45120000	+12,50	-27,50
86320000	+16,83	-23,17
107960000	+25,63	-17,89
132000000	+23,23	-20,29
156000000	+24,31	-19,21
291280000	+21,82	-24,20

24159101_2

Segalla 24159102



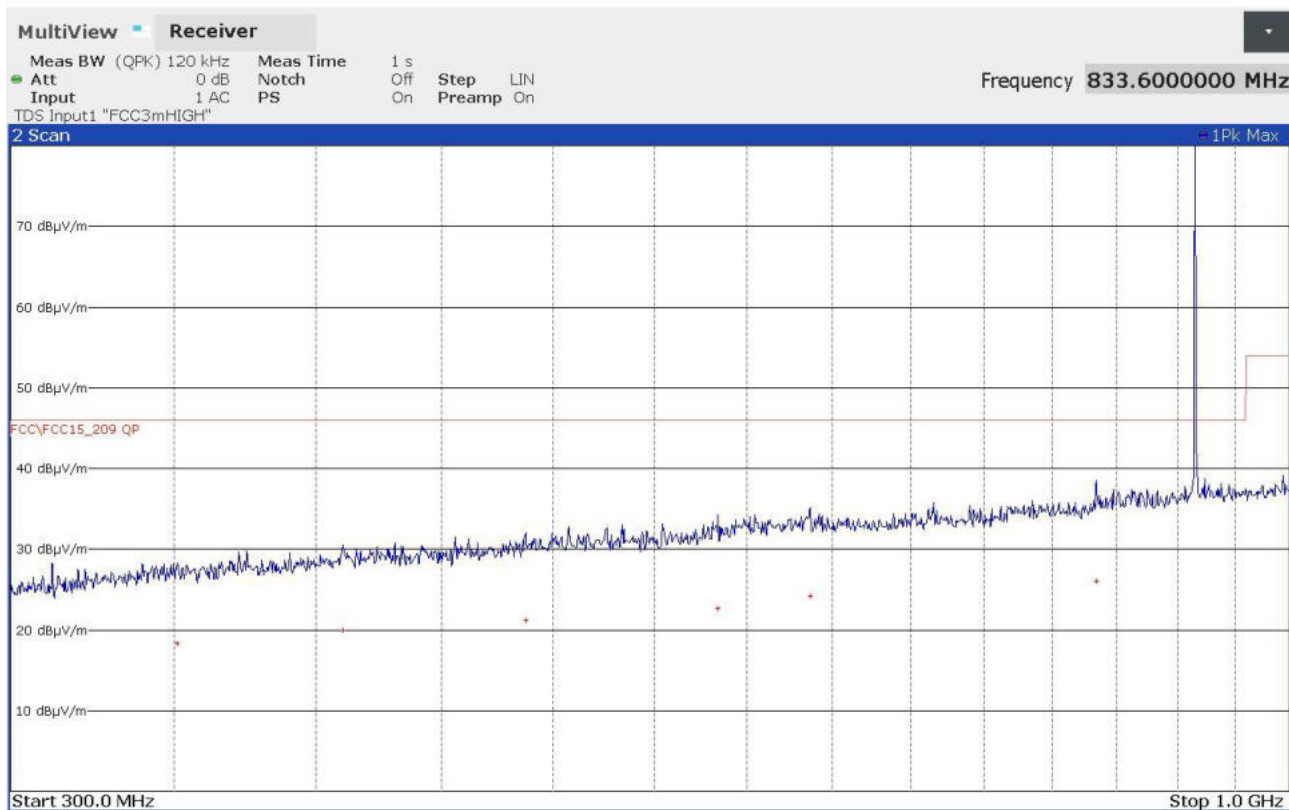
FINAL RESULT TABLE

QUASI PEAK

Freq Hz	Lev dBuV/m	Margin dB
31320000	+16,48	-23,52
48680000	+13,01	-26,99
90600000	+11,80	-31,72
134200000	+13,05	-30,47
201240000	+16,33	-27,19
288000000	+25,69	-20,33

24159102_2

Segalla 24159103



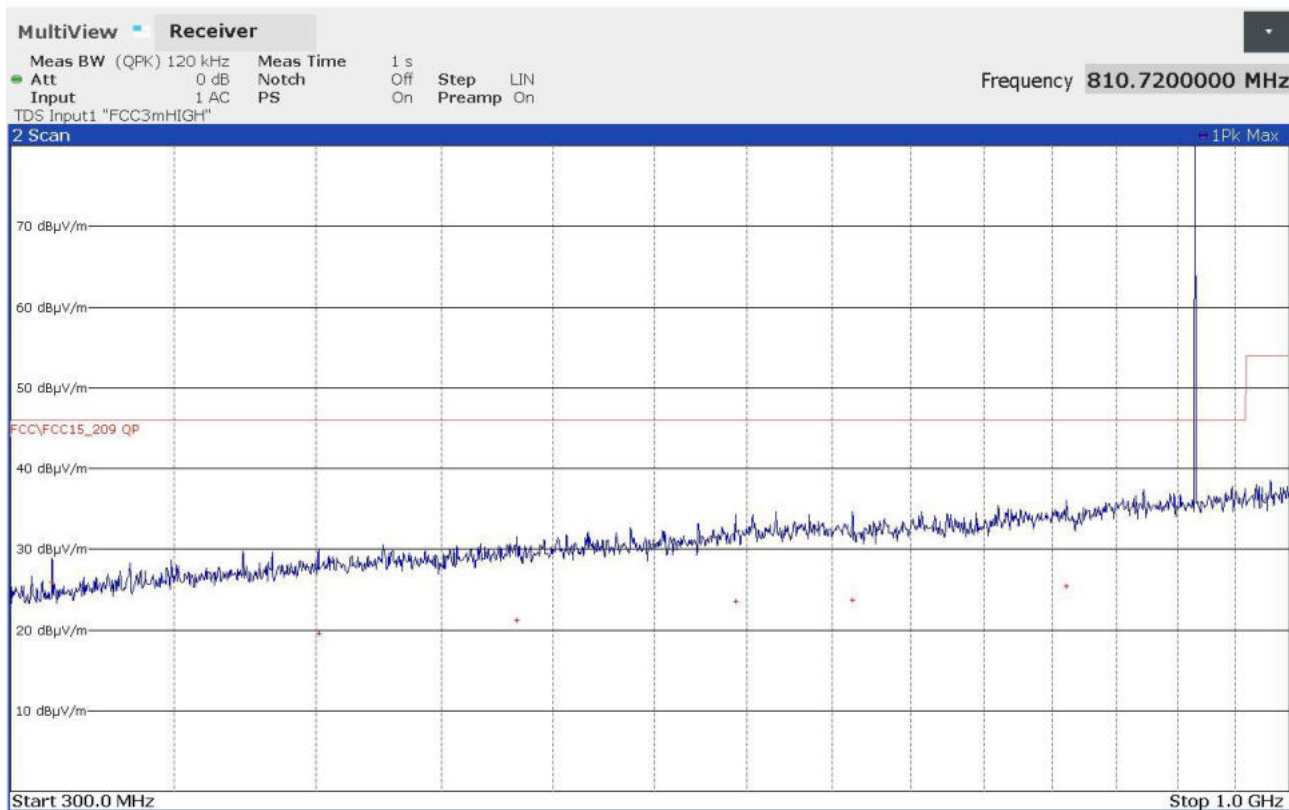
FINAL RESULT TABLE

QUASI PEAK

Freq Hz	Lev dBuV/m	Margin dB
351080000	+18,38	-27,64
410200000	+19,93	-26,09
487240000	+21,22	-24,80
583760000	+22,71	-23,31
636720000	+24,14	-21,88
833600000	+26,01	-20,01

24159103_2

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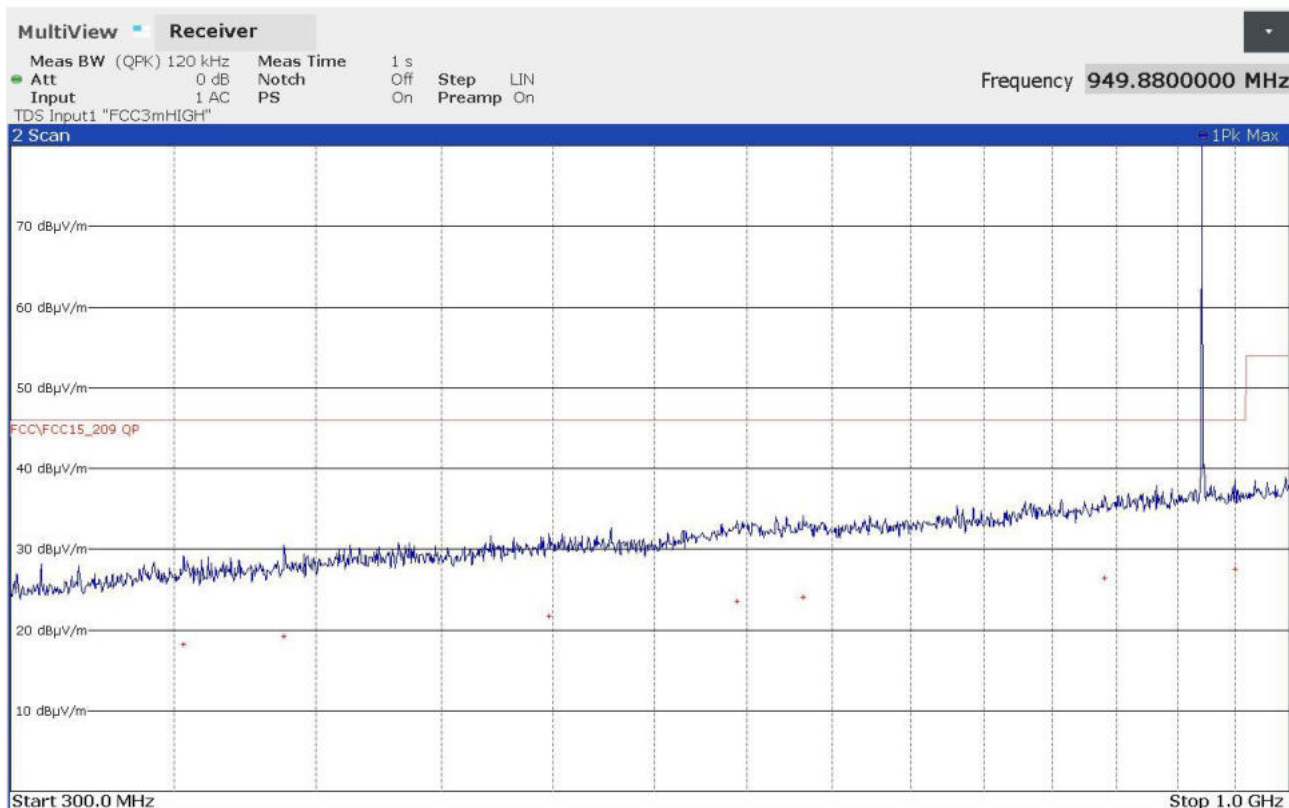
FINAL RESULT TABLE

QUASI PEAK

Freq Hz	Lev dBuV/m	Margin dB
312000000	+25,94	-20,08
400920000	+19,62	-26,40
483200000	+21,16	-24,86
593800000	+23,51	-22,51
663000000	+23,65	-22,37
810720000	+25,42	-20,60

24159104_2

Segalla 24159105



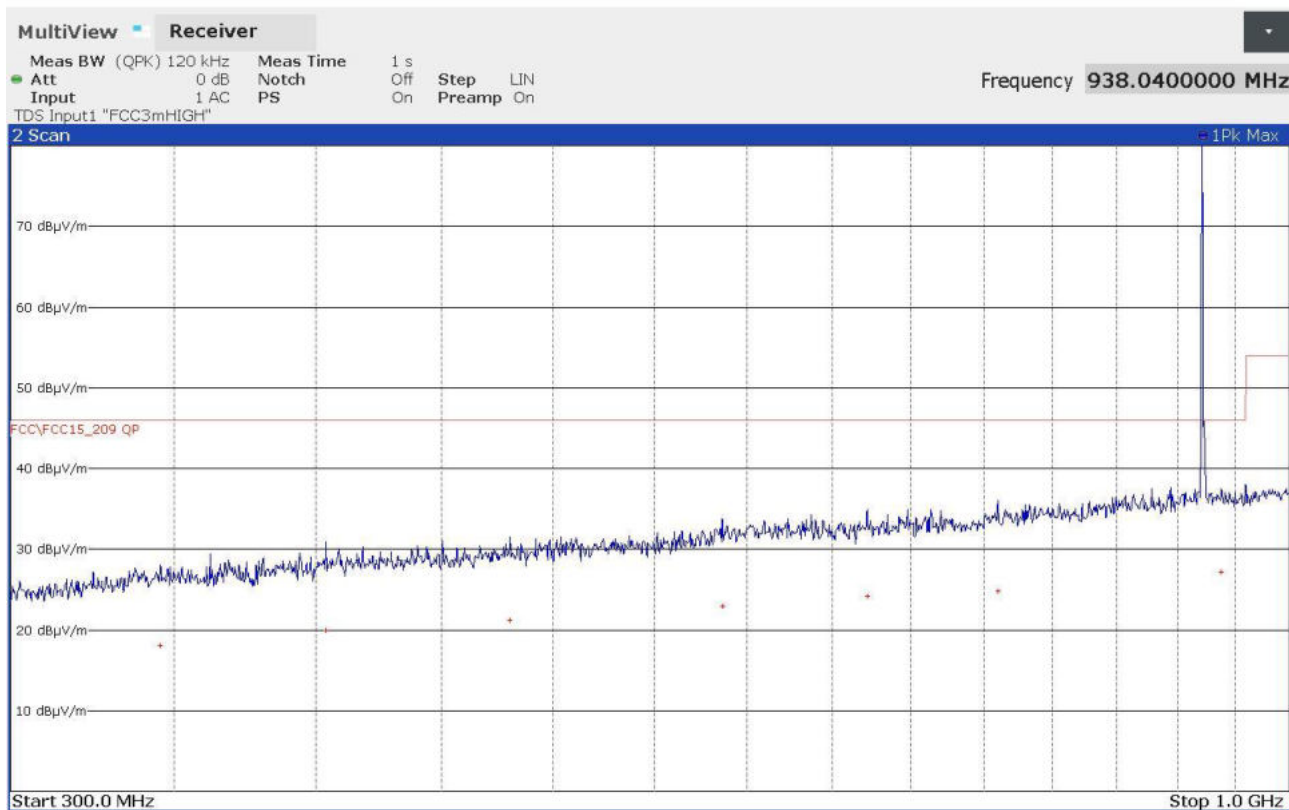
FINAL RESULT TABLE

QUASI PEAK

Freq Hz	Lev dBuV/m	Margin dB
353160000	+18,14	-27,88
388040000	+19,18	-26,84
498280000	+21,74	-24,28
594400000	+23,55	-22,47
632560000	+24,08	-21,94
840400000	+26,42	-19,60
949880000	+27,54	-18,48

24159105_2

Segalla 24159106



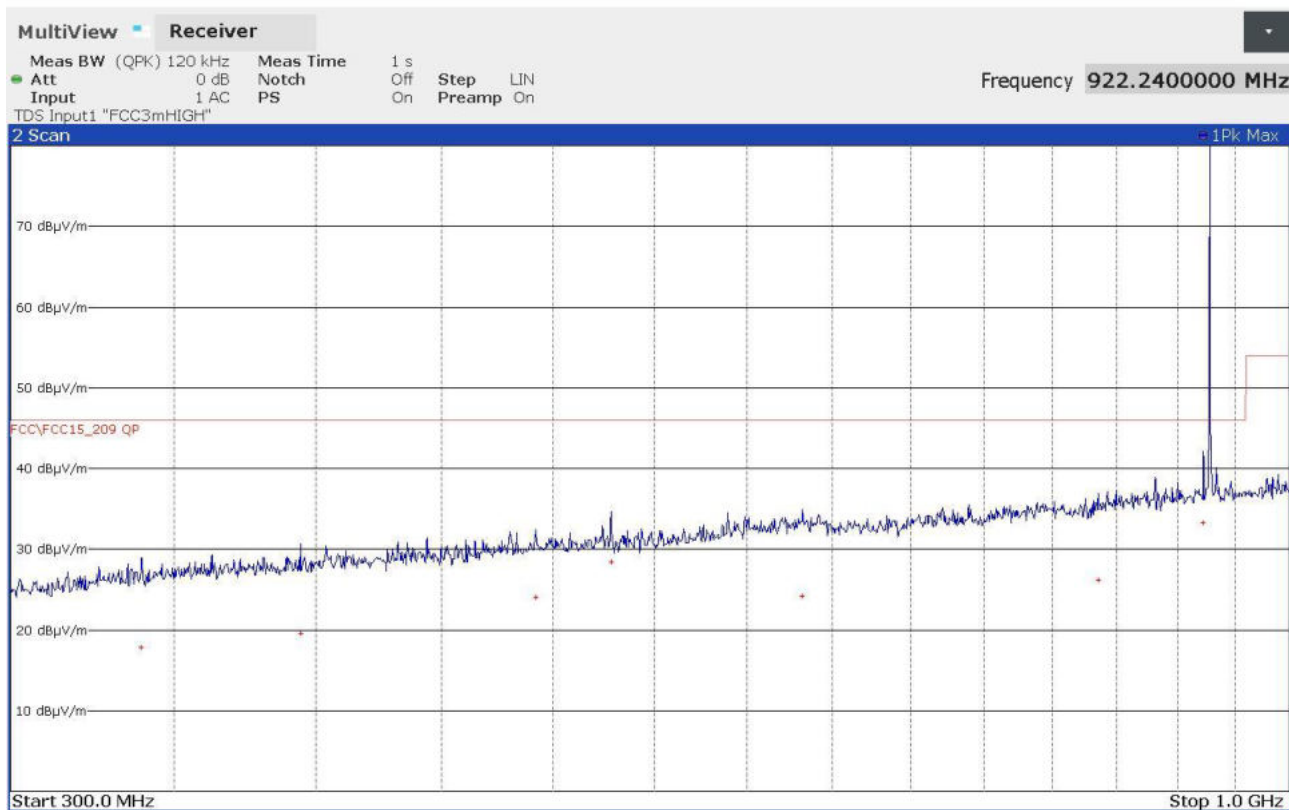
FINAL RESULT TABLE

QUASI PEAK

Freq Hz	Lev dBuV/m	Margin dB
345520000	+18,10	-27,92
403840000	+19,93	-26,09
480120000	+21,19	-24,83
586320000	+22,97	-23,05
671920000	+24,16	-21,86
759920000	+24,77	-21,25
938040000	+27,22	-18,80

24159106_2

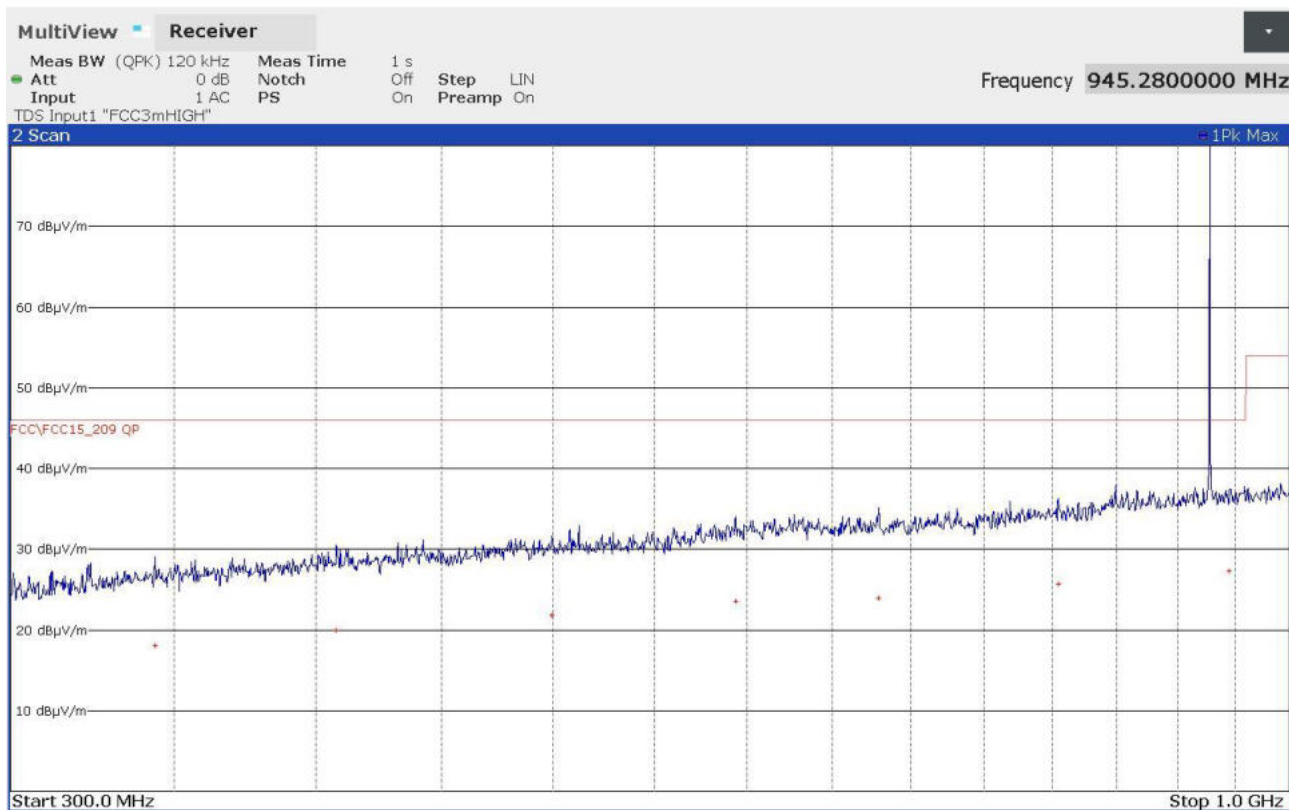
Segalla 24159107


FINAL RESULT TABLE
QUASI PEAK

Freq Hz	Lev dBuV/m	Margin dB
339400000	+17,88	-28,14
394400000	+19,55	-26,47
492000000	+24,01	-22,01
528000000	+28,35	-17,67
632160000	+24,23	-21,79
835280000	+26,23	-19,79
922240000	+33,26	-12,76

24159107_2

Segalla 24159108



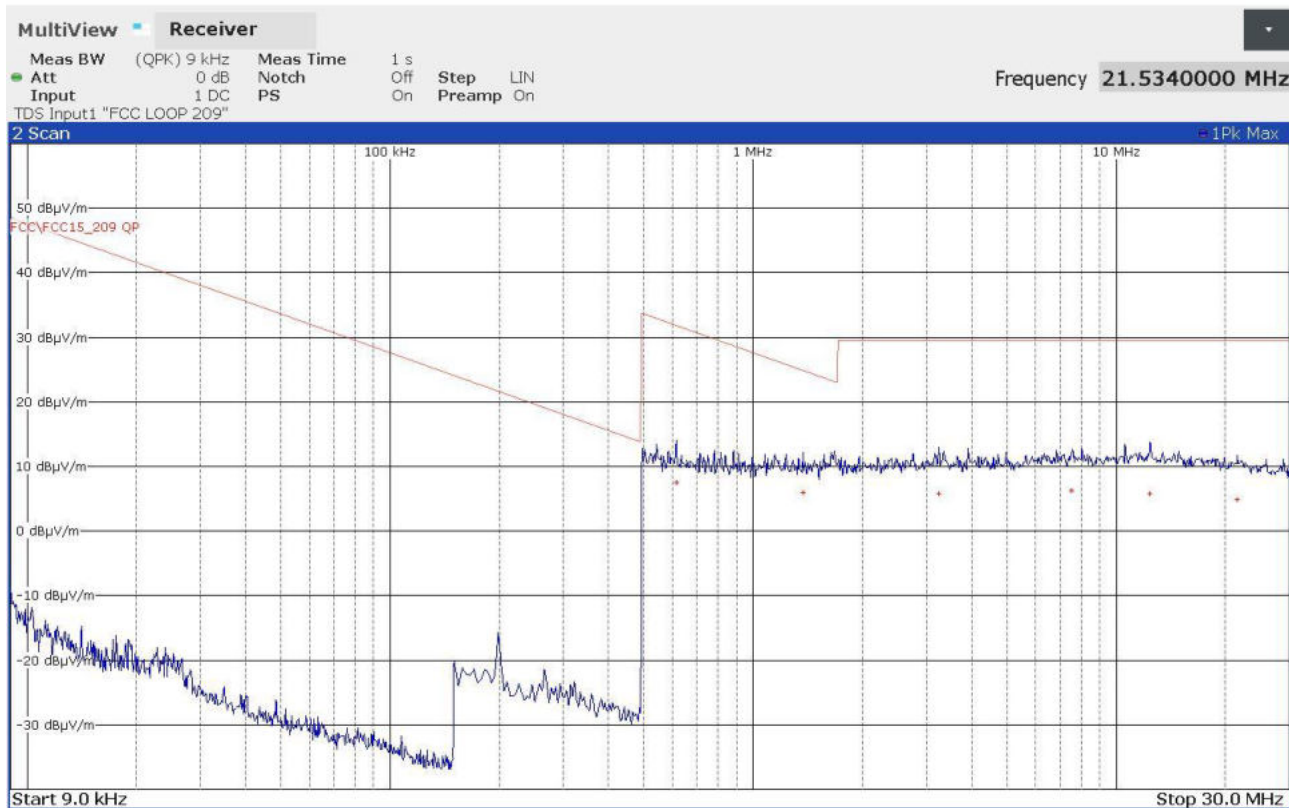
FINAL RESULT TABLE

QUASI PEAK

Freq Hz	Lev dBuV/m	Margin dB
343680000	+18,04	-27,98
407720000	+19,91	-26,11
499560000	+21,75	-24,27
593640000	+23,51	-22,51
679320000	+23,94	-22,08
804160000	+25,64	-20,38
945280000	+27,23	-18,79

24159108_2

Segalla 24159109



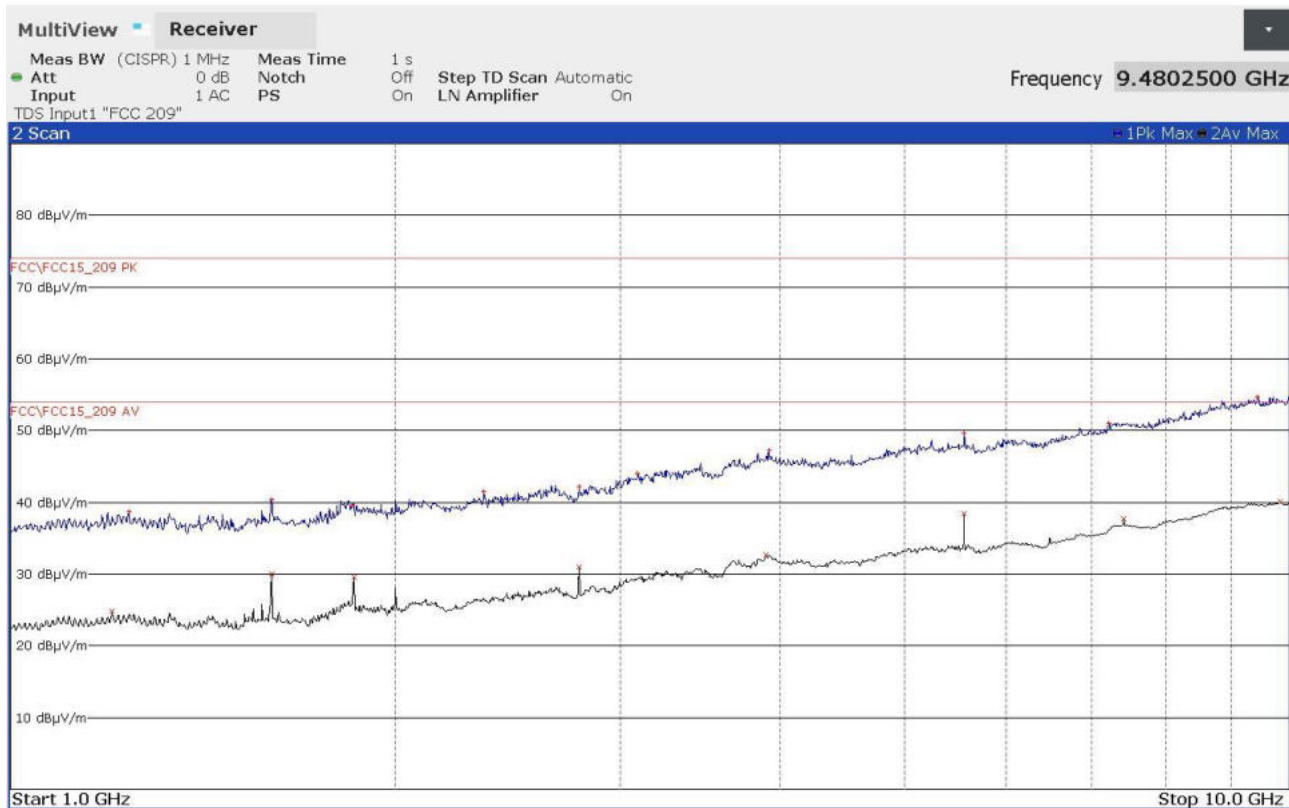
FINAL RESULT TABLE

QUASI PEAK

Freq Hz	Lev dBuV/m	Margin dB
614000	+7,54	-24,30
1374000	+5,90	-18,94
3250000	+5,76	-23,78
7534000	+6,26	-23,28
12406000	+5,75	-23,79
21534000	+4,90	-24,64

24159109_2

Segalla 24159110

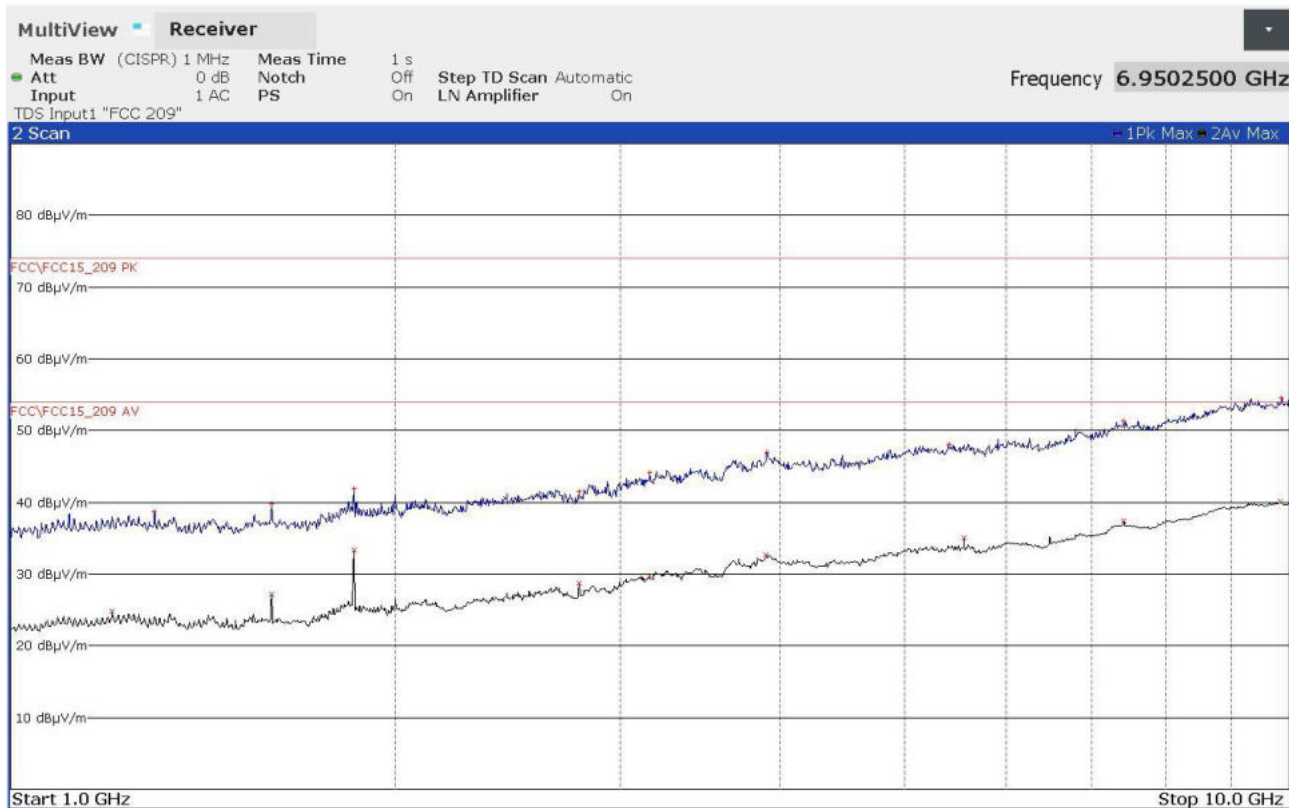


FINAL RESULT TABLE

MAX PEAK			AVERAGE		
Freq Hz	Lev dBuV/m	Margin dB	Freq Hz	Lev dBuV/m	Margin dB
1237500000	+38,69	-35,29	1201000000	+24,86	-29,12
1601500000	+40,39	-33,59	1600750000	+29,94	-24,04
1850250000	+39,51	-34,47	1855500000	+29,59	-24,39
2343250000	+41,54	-32,44	2783500000	+30,92	-23,06
2783500000	+42,13	-31,85	3899750000	+32,62	-21,36
3094000000	+44,00	-29,98	5566750000	+38,46	-15,52
3915500000	+47,28	-26,70	7422500000	+37,66	-16,32
5567000000	+49,59	-24,39	9830250000	+40,07	-13,91
7224000000	+51,09	-22,89			
9445000000	+54,67	-19,31			

24159110_2

Segalla 24159111

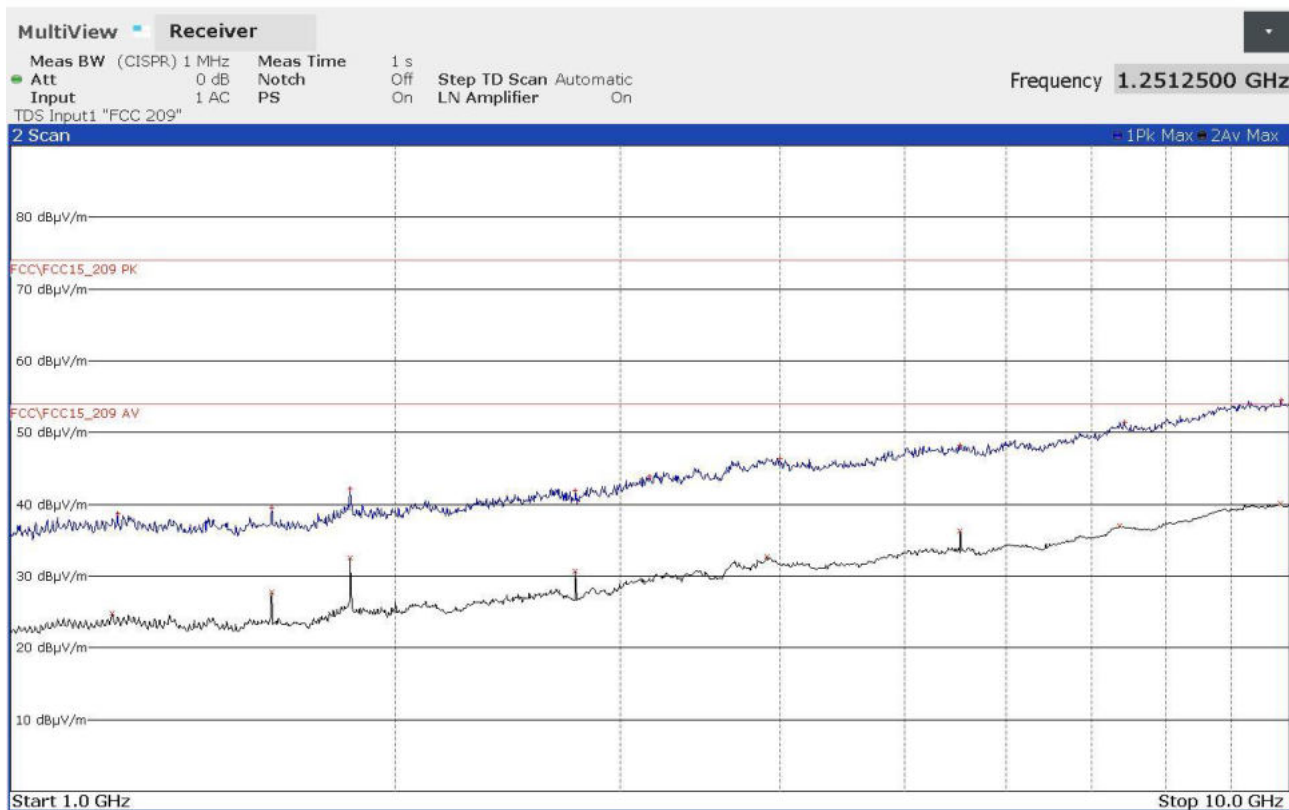


FINAL RESULT TABLE

MAX PEAK			AVERAGE		
Freq Hz	Lev dBuV/m	Margin dB	Freq Hz	Lev dBuV/m	Margin dB
1296250000	+38,76	-35,22	1201000000	+24,84	-29,14
1601250000	+39,85	-34,13	1601250000	+27,13	-26,85
1855500000	+41,91	-32,07	1855500000	+33,35	-20,63
2783500000	+41,43	-32,55	2783500000	+28,72	-25,26
3161250000	+44,21	-29,77	3157750000	+29,70	-24,28
3900750000	+46,98	-27,00	3899750000	+32,61	-21,37
5414000000	+48,08	-25,90	5566750000	+35,01	-18,97
7425500000	+51,24	-22,74	7422500000	+37,42	-16,56
9865000000	+54,52	-19,46	9830750000	+40,07	-13,91

24159111_2

Segalla 24159112

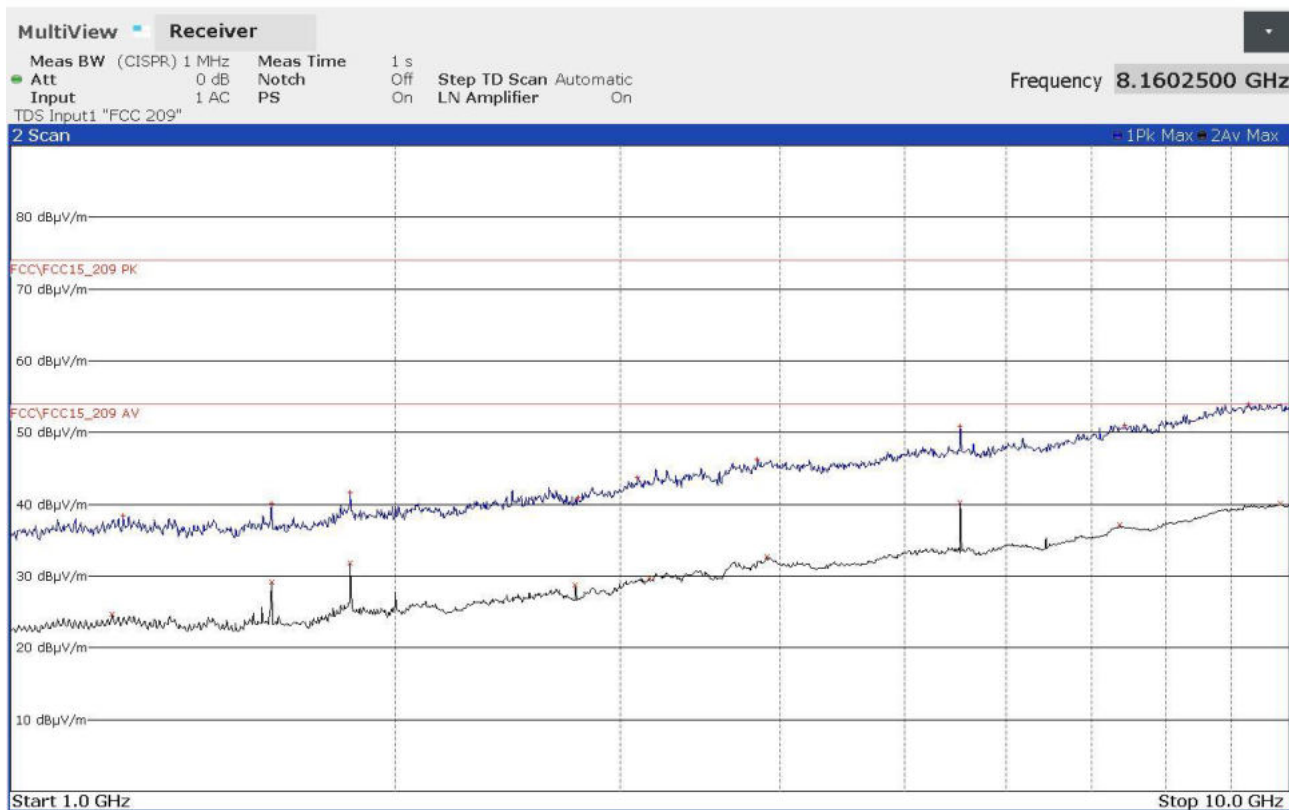


FINAL RESULT TABLE

MAX PEAK			AVERAGE		
Freq Hz	Lev dBuV/m	Margin dB	Freq Hz	Lev dBuV/m	Margin dB
1212500000	+38,63	-35,35	1200750000	+24,82	-29,16
1601500000	+39,58	-34,40	1601250000	+27,81	-26,17
1842750000	+42,13	-31,85	1842750000	+32,52	-21,46
2764250000	+41,93	-32,05	2764250000	+30,66	-23,32
3157000000	+43,82	-30,16	3900750000	+32,61	-21,37
3995750000	+46,44	-27,54	5528500000	+36,36	-17,62
5528250000	+48,27	-25,71	7371250000	+36,98	-17,00
7427500000	+51,47	-22,51	9830000000	+40,06	-13,92
9847500000	+54,48	-19,50			

24159112_2

Segalla 24159113

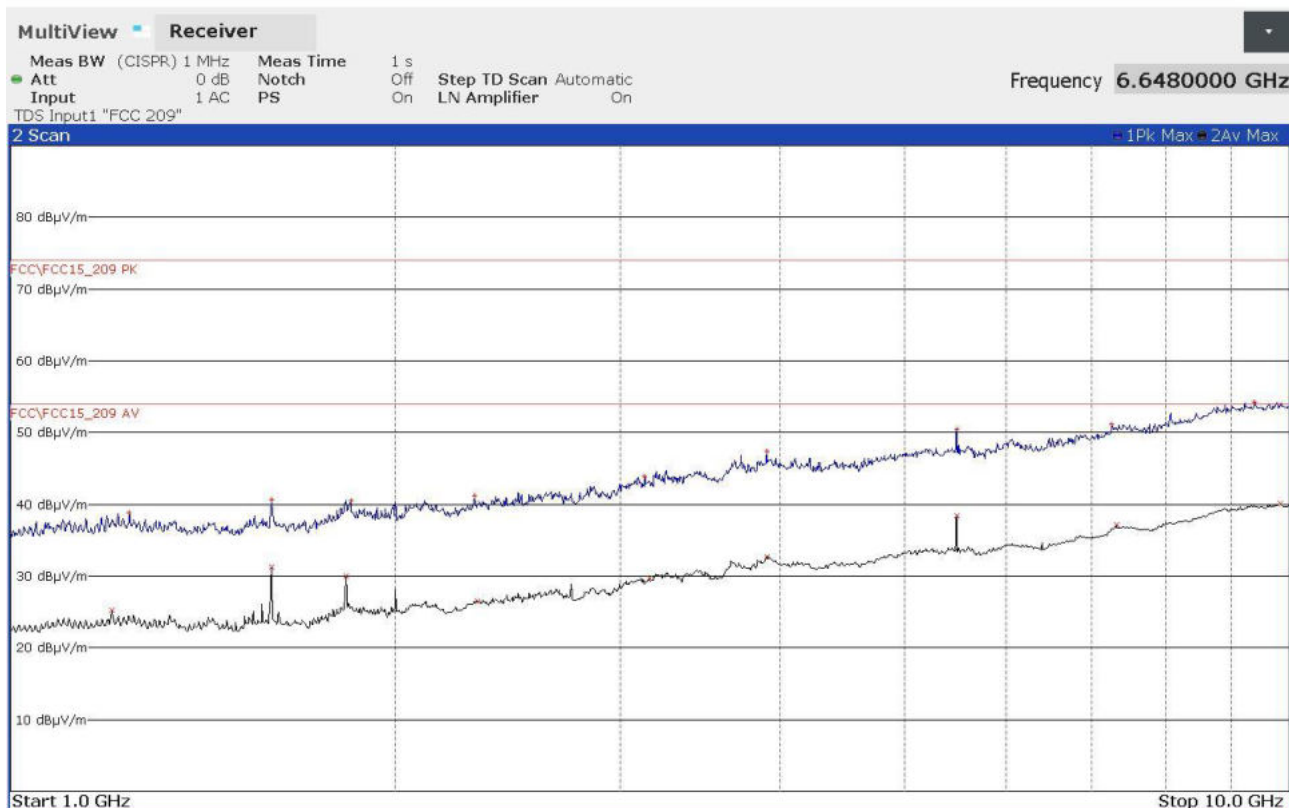


FINAL RESULT TABLE

MAX PEAK			AVERAGE		
Freq Hz	Lev dBuV/m	Margin dB	Freq Hz	Lev dBuV/m	Margin dB
1224500000	+38,44	-35,54	1201000000	+24,74	-29,24
1599750000	+40,10	-33,88	1601000000	+29,17	-24,81
1842750000	+41,66	-32,32	1842750000	+31,79	-22,19
2776250000	+40,95	-33,03	2764250000	+28,80	-25,18
3094000000	+43,73	-30,25	3158500000	+29,73	-24,25
3836000000	+46,31	-27,67	3900750000	+32,61	-21,37
5528500000	+50,93	-23,05	5528500000	+40,24	-13,74
7433250000	+51,02	-22,96	7371250000	+37,17	-16,81
9286250000	+54,01	-19,97	9830000000	+40,08	-13,90

24159113_2

Segalla 24159114

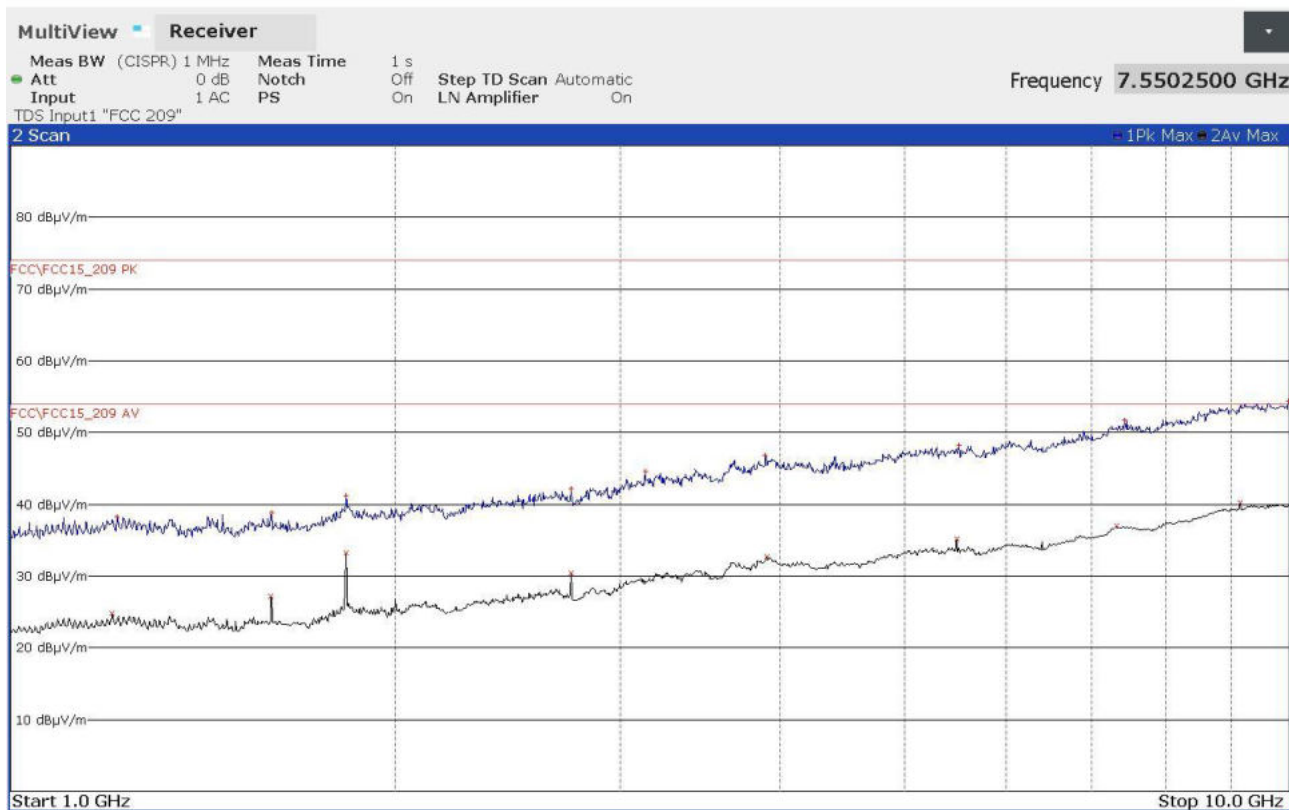


FINAL RESULT TABLE

MAX PEAK			AVERAGE		
Freq Hz	Lev dBuV/m	Margin dB	Freq Hz	Lev dBuV/m	Margin dB
1238500000	+38,90	-35,08	1199750000	+25,20	-28,78
1600250000	+40,67	-33,31	1599750000	+31,28	-22,70
1844750000	+40,45	-33,53	1830000000	+30,00	-23,98
2306000000	+41,15	-32,83	2317000000	+26,47	-27,51
3133500000	+43,88	-30,10	3158750000	+29,75	-24,23
3903250000	+47,33	-26,65	3900750000	+32,65	-21,33
5490250000	+50,40	-23,58	5490250000	+38,44	-15,54
7264500000	+51,12	-22,86	7320500000	+37,15	-16,83
9389500000	+54,25	-19,73	9830500000	+40,08	-13,90

24159114_2

Segalla 24159115



FINAL RESULT TABLE

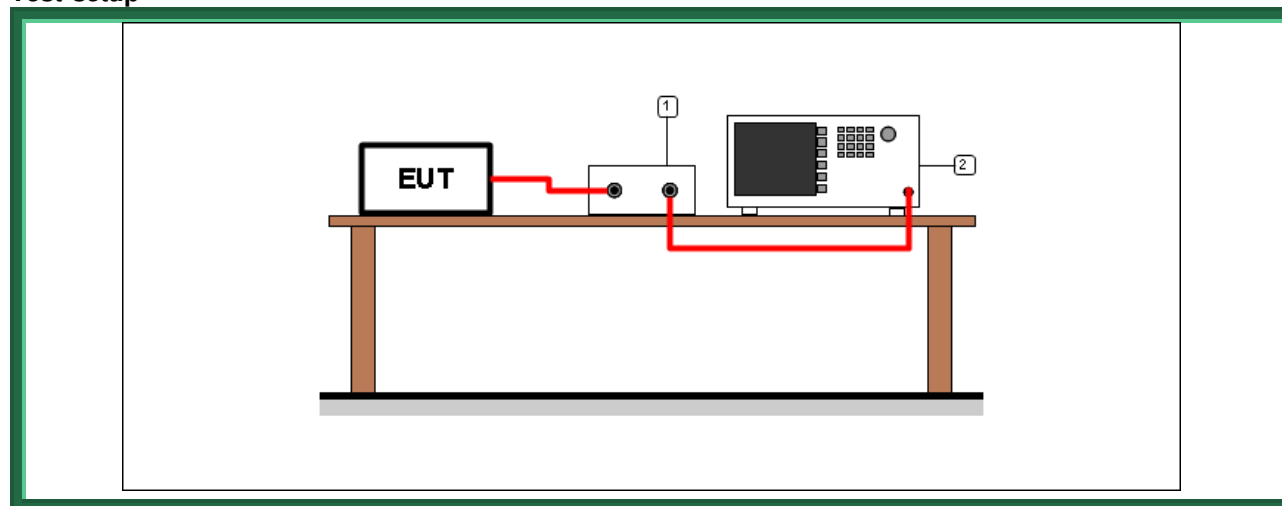
MAX PEAK			AVERAGE		
Freq Hz	Lev dBuV/m	Margin dB	Freq Hz	Lev dBuV/m	Margin dB
1212250000	+38,24	-35,74	1201000000	+24,79	-29,19
1599250000	+38,82	-35,16	1599000000	+27,14	-26,84
1830000000	+41,20	-32,78	1830000000	+33,24	-20,74
2745000000	+42,23	-31,75	2745000000	+30,49	-23,49
3135750000	+44,56	-29,42	3901000000	+32,61	-21,37
3889250000	+46,81	-27,17	5490250000	+35,19	-18,79
5512750000	+48,18	-25,80	7320500000	+36,98	-17,00
7431750000	+51,69	-22,29	9150500000	+40,25	-13,73
9978250000	+54,34	-19,64			

24159115_2

9.3 20 dB bandwidth

Tested by	G. Gandini
Test date	02.09.2024
Test location (stand)	Laboratory
Basic standard(s)	ANSI C63.10 cl. 7.8.7
Product standard(s)	FCC Rules and Regulation; Titles 47 Part. 15.215 (c)
Supplementary test set-up description	--
Supplementary information	--

Test setup



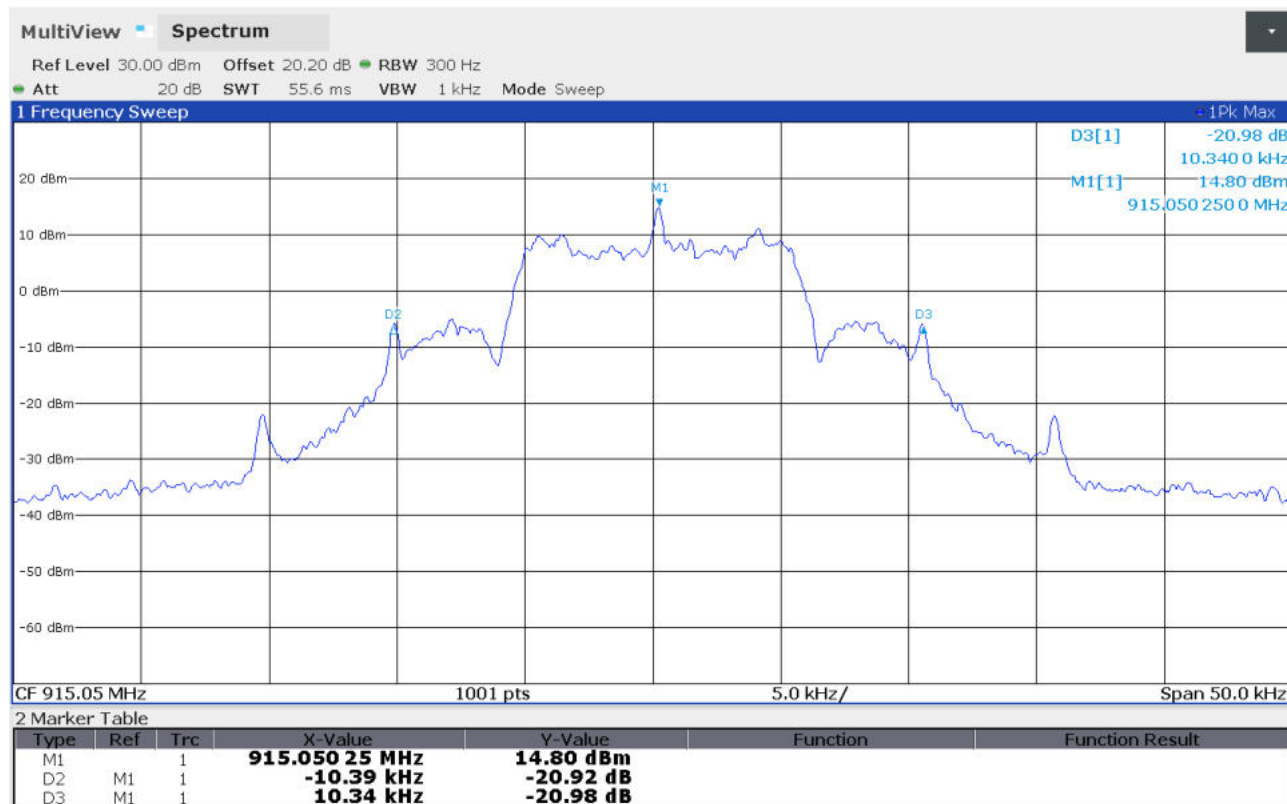
Test setup PR002_01							
Nr.	Id. Number	Manufacturer	Model	Serial number	Description	Last calibration date	Calibration expiration
2	CMC S295	Rohde & Schwarz	FSW43	104059	Spectrum Analyzer 43GHz	January 2023	January 2026
1	--	--	--	--	Cable + attenuator	Calibrated before the test	Calibrated before the test

Result

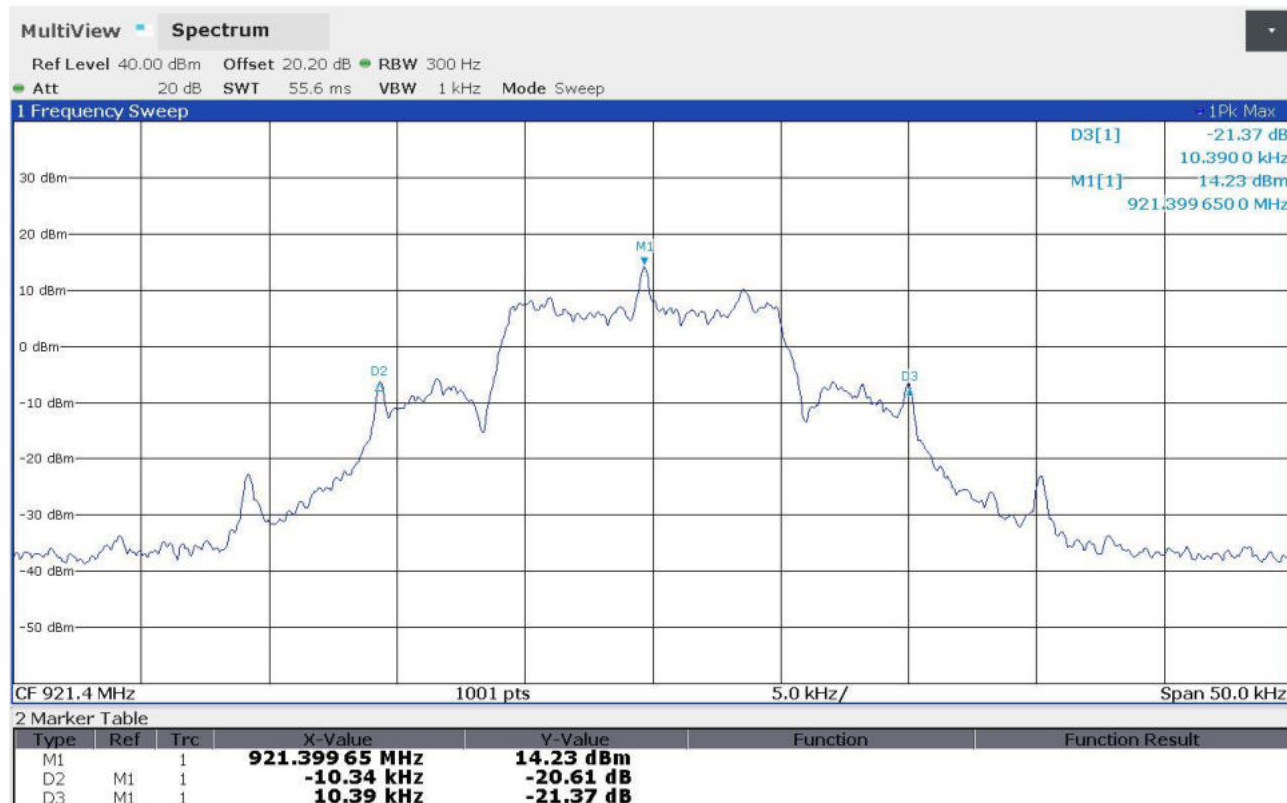
Transmission frequency (MHz)	Graphs	20 dB bandwidth (kHz)
915,050	G24159116	20,73
921,400	G24159120	20,73
927,800	G24159123	20,73

Graphs

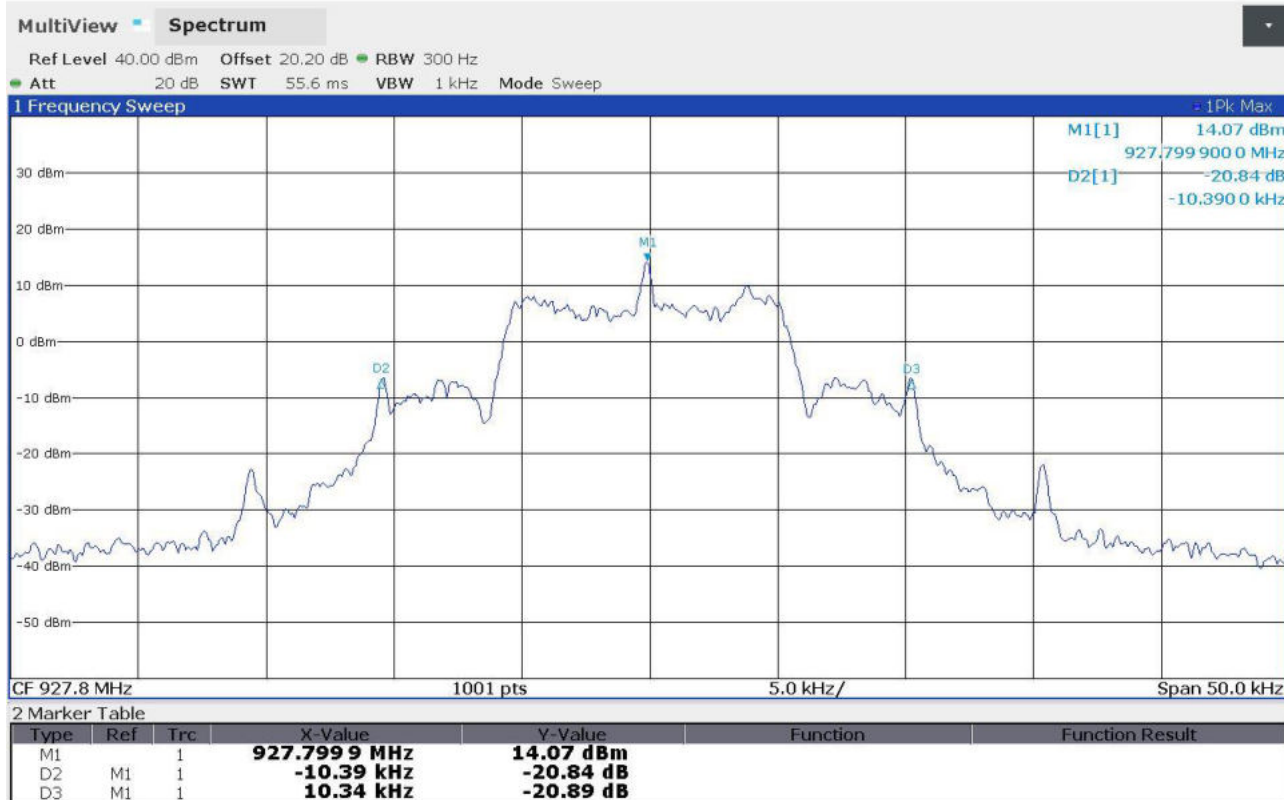
Segalla 24159116



Segalla 24159120



Segalla 24159123



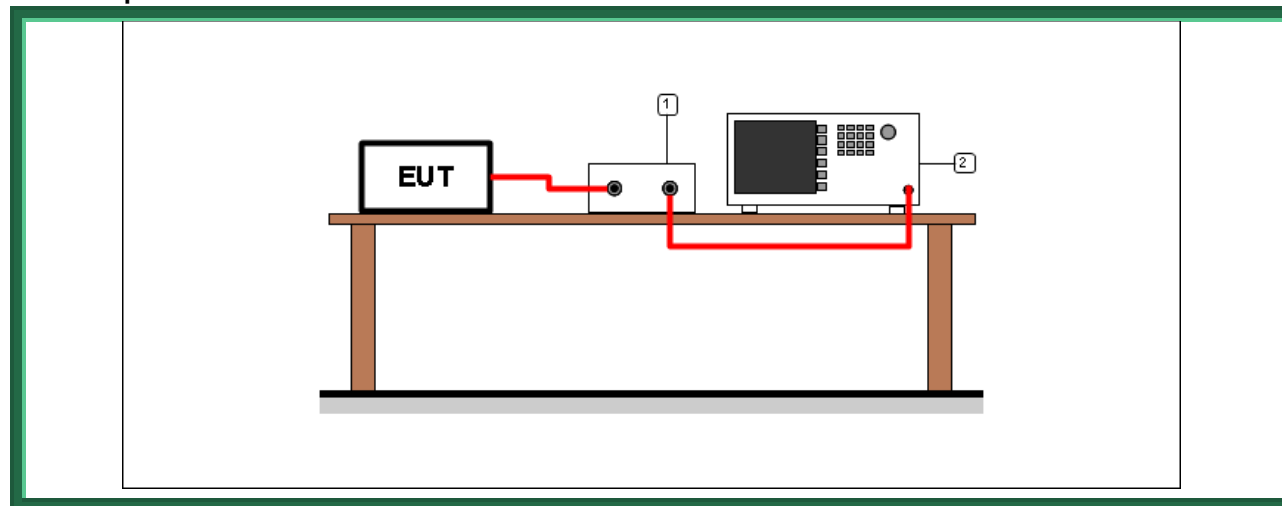
9.4 Channel separation

Tested by	G. Gandini
Test date	02.09.2024
Test location (stand)	Laboratory
Basic standard(s)	KDB 558074 D01 15.247 Meas Guidance v05r02 cl. 9 b) ANSI C63.10 cl. 7.8.2
Product standard(s)	FCC Rules and Regulation; Titles 47 Part. 15.247
Supplementary test set-up description	--
Supplementary information	--

Acceptance limits

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Test setup



Test setup PR002_01

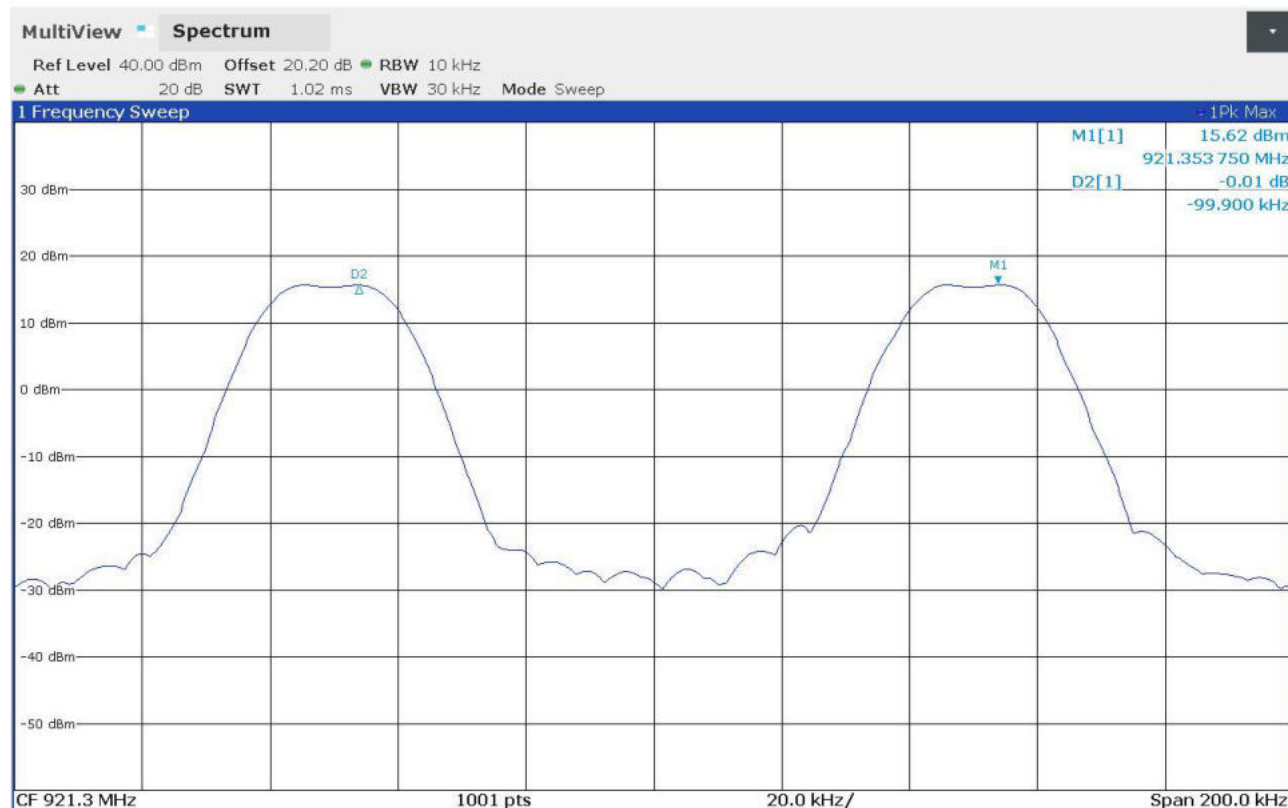
Nr.	Id. Number	Manufacturer	Model	Serial number	Description	Last calibration date	Calibration expiration
2	CMC S295	Rohde & Schwarz	FSW43	104059	Spectrum Analyzer 43GHz	January 2023	January 2026
1	--	--	--	--	Cable + attenuator	Calibrated before the test	Calibrated before the test

Result

<i>Frequency band (MHz)</i>	<i>Graphs</i>	<i>Channel separation (kHz)</i>	<i>Minimum channel separation required (kHz)</i>	<i>Verdict</i>
902 – 928	G24159129	99,9	25	P

Graphs

Segalla 24159129



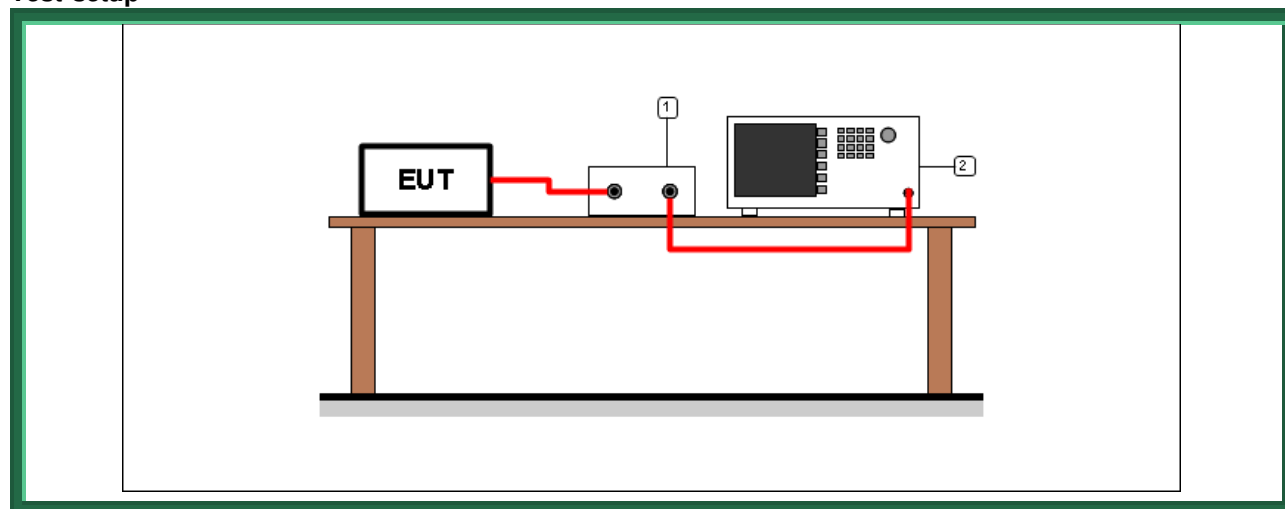
9.5 Number of hopping channels

Tested by	G. Gandini
Test date	02.09.2024
Test location (stand).....	Laboratory
Basic standard(s)	KDB 558074 D01 15.247 Meas Guidance v05r02 cl. 9 b) ANSI C63.10 cl. 7.8.3
Product standard(s).....	FCC Rules and Regulation; Titles 47 Part. 15.247
Supplementary test set-up description.....	--
Supplementary information	--

Acceptance limits

For frequency hopping systems operating in the 902 – 928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0,4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0,4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test setup



Test setup PR002_01

Nr.	Id. Number	Manufacturer	Model	Serial number	Description	Last calibration date	Calibration expiration
2	CMC S295	Rohde & Schwarz	FSW43	104059	Spectrum Analyzer 43GHz	January 2023	January 2026
1	--	--	--	--	Cable + attenuator	Calibrated before the test	Calibrated before the test

Result

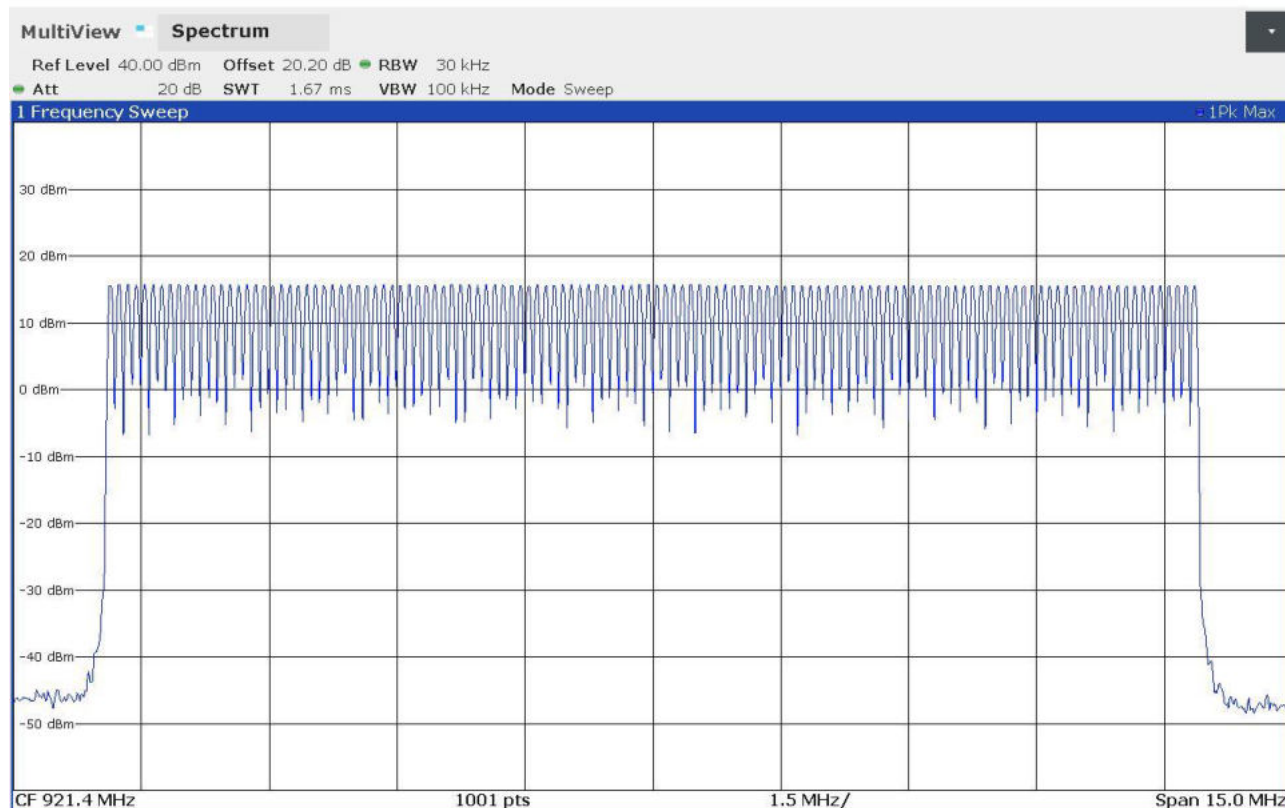
<i>Frequency band (MHz)</i>	<i>Graphs</i>	<i>Number of hopping channels</i>	<i>Minimum number of hopping channels required</i>	<i>Verdict</i>
902 – 928	G24159130 G24159131 G24159132	128	50	P

Remarks by the customer: for laboratory tests a special programming is provided; anyway we deem it representative of any real world hopping sequence that can be programmed into the devices. First, special programming allows fixed frequency measurements at min, med and max operating frequency; this is not available for series production units, but is required for testing.

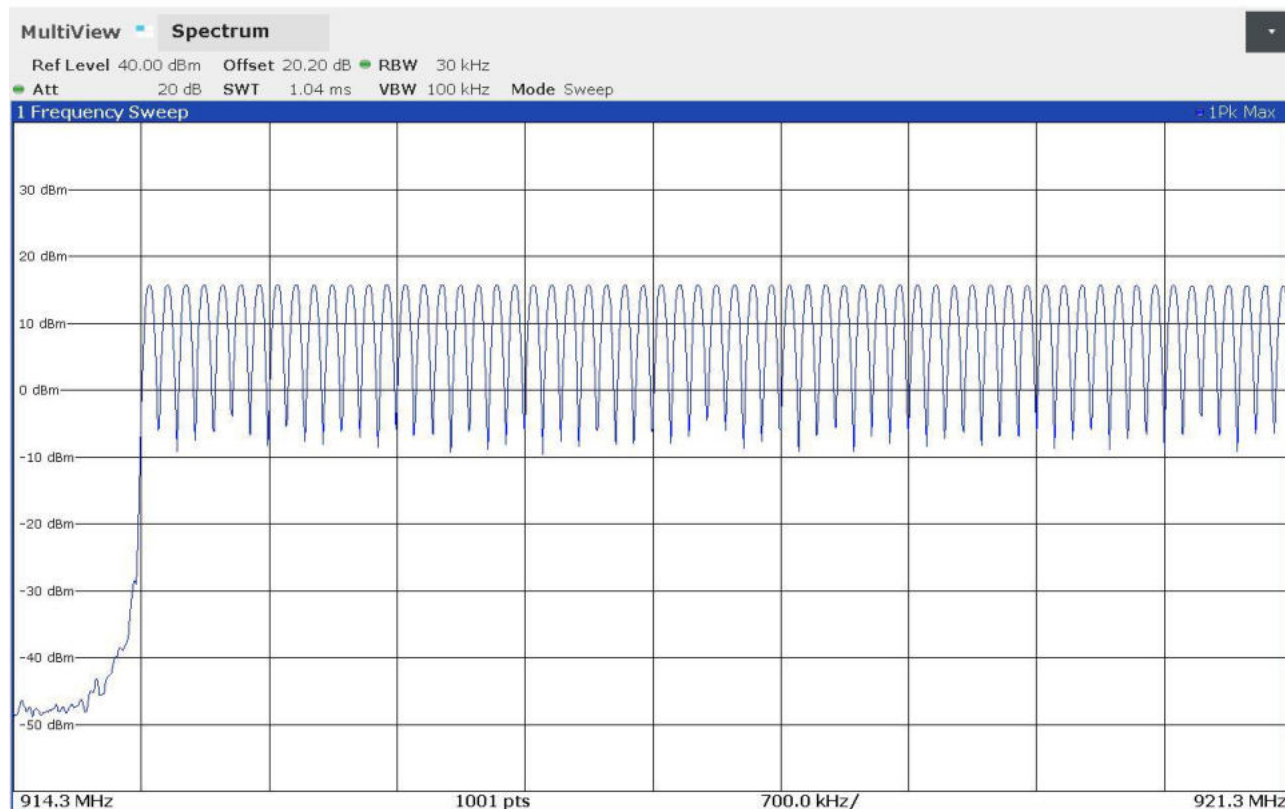
Then two evenly spaced hopping sequences of 64 channels are provided, one including the min freq channel at 915,050 MHz, the other including the max freq channel at 927,800 MHz. Although they are not available for series production units, both these hopping sequences are suitable for valid measurements of FH timing parameters. In fact, FH Timing parameters measurements is not dependent on channel positioning.

Graphs

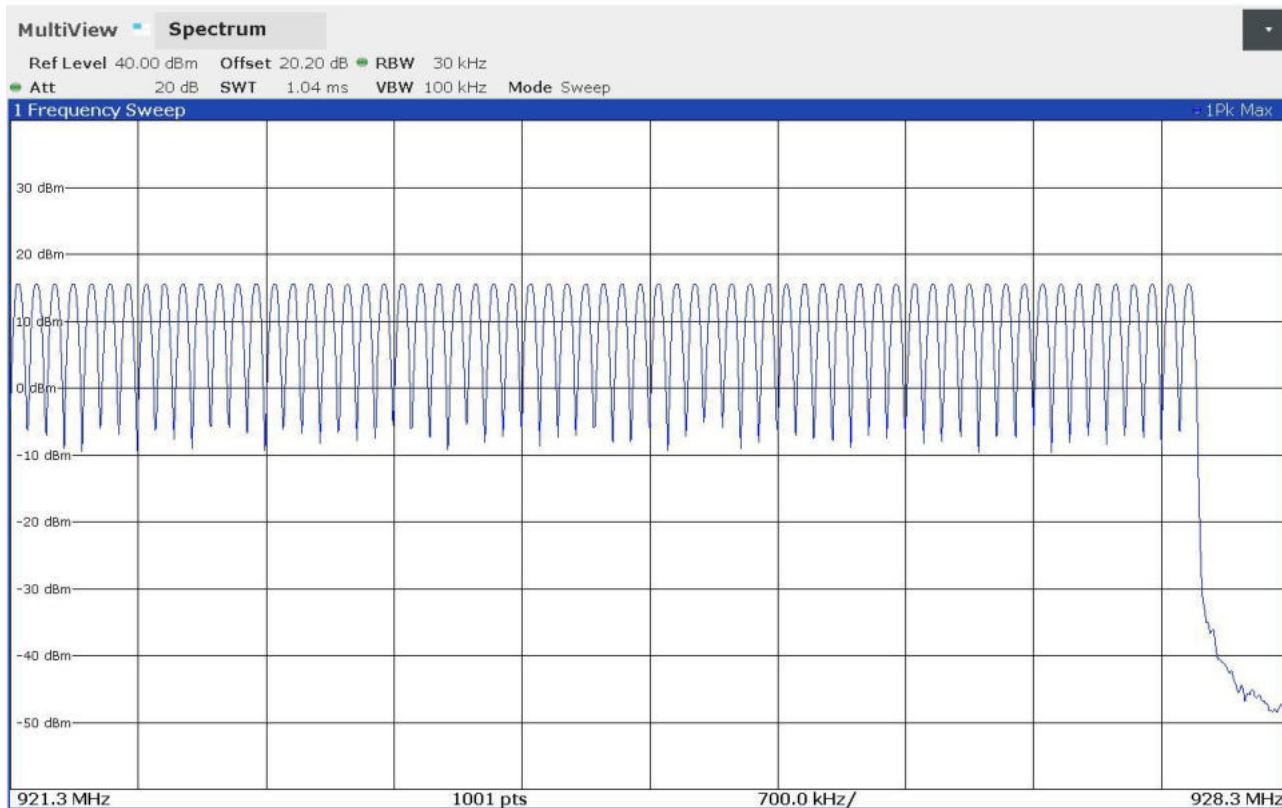
Segalla 24159130



Segalla 24159131



Segalla 24159132



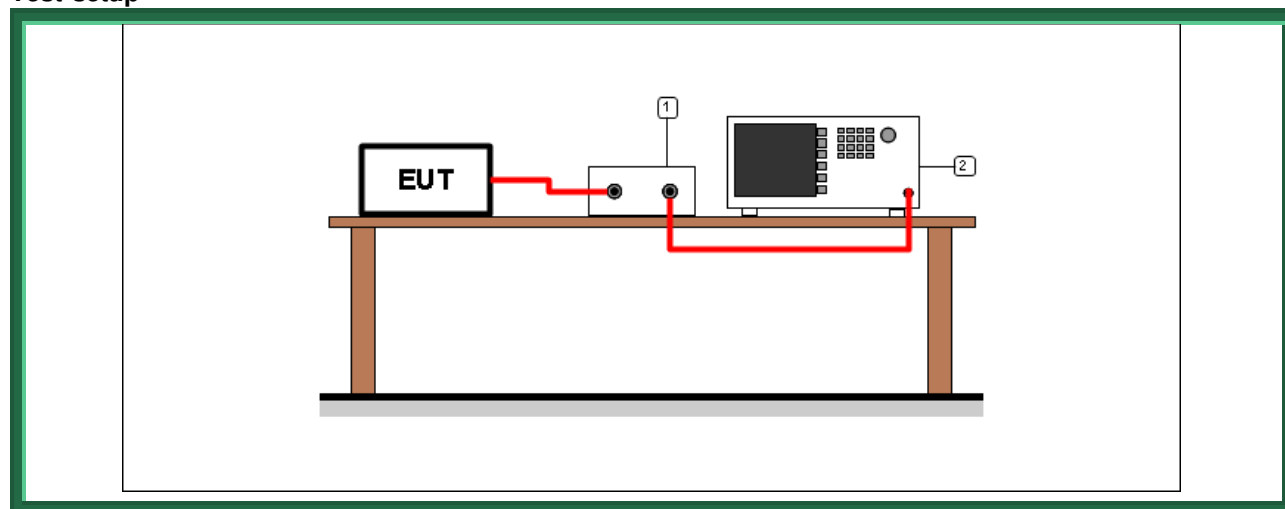
9.6 Time of occupancy

Tested by	G. Gandini
Test date	02.09.2024
Test location (stand)	Laboratory
Basic standard(s)	KDB 558074 D01 15.247 Meas Guidance v05r02 cl. 9 b) ANSI C63.10 cl. 7.8.4
Product standard(s)	FCC Rules and Regulation; Titles 47 Part. 15.247
Supplementary test set-up description	--
Supplementary information	--

Acceptance limits

For frequency hopping systems operating in the 902 – 928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0,4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0,4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test setup



Test setup PR002_01

Nr.	Id. Number	Manufacturer	Model	Serial number	Description	Last calibration date	Calibration expiration
2	CMC S295	Rohde & Schwarz	FSW43	104059	Spectrum Analyzer 43GHz	January 2023	January 2026
1	--	--	--	--	Cable + attenuator	Calibrated before the test	Calibrated before the test

Result

<i>Transmission frequency (MHz)</i>	<i>Graphs</i>	<i>Dwell time (ms)</i>
921,350	G24159133	24,10

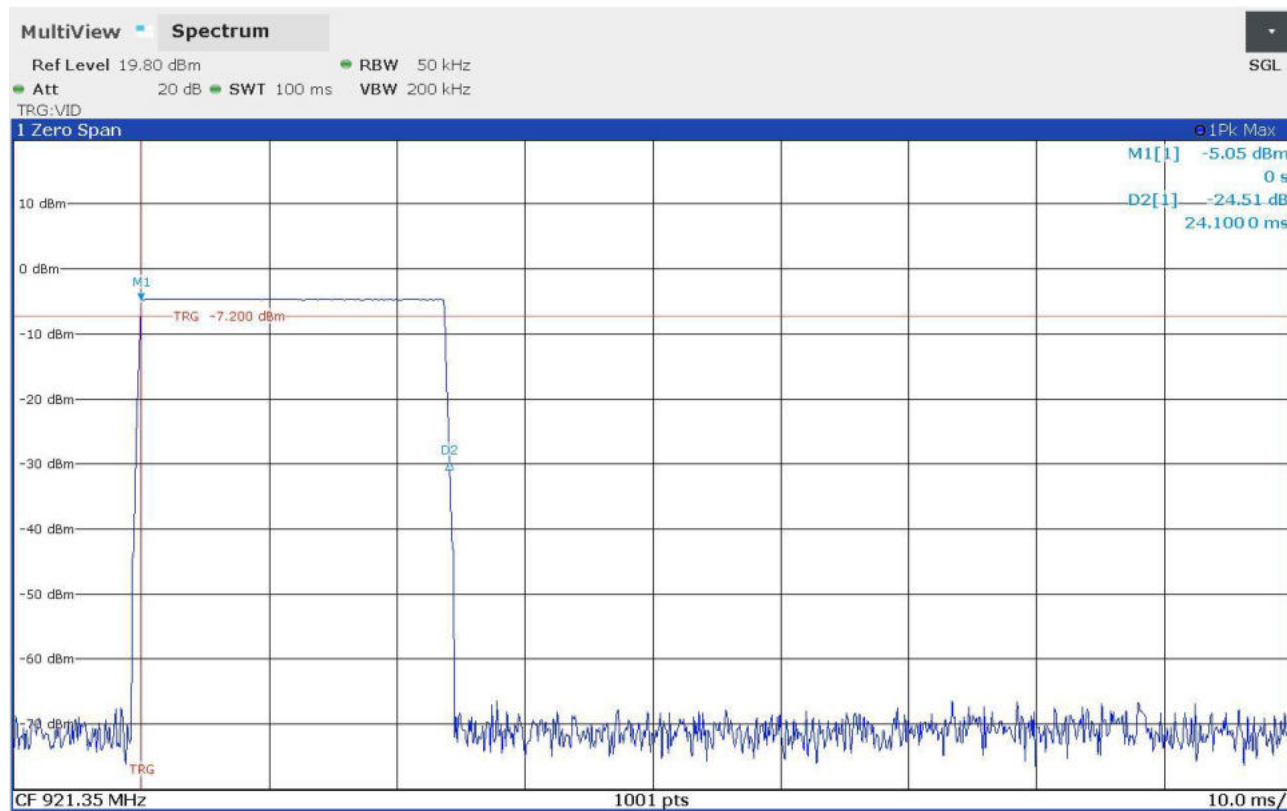
<i>Transmission frequency (MHz)</i>	<i>Graphs</i>	<i>Number of transmissions</i>	<i>Period</i>
921,350	G24159133	4	20 s

Remarks: only the highest peaks have been considered. The lowest peaks are due to the auxiliary receiver unit.

<i>Time of occupancy (Dwell time x Nr. transmissions)</i>	<i>Maximum allowed time of occupancy</i>	<i>Verdict</i>
96,40	400 ms	P

Graphs

Segalla 24159133



9.7 Band edge

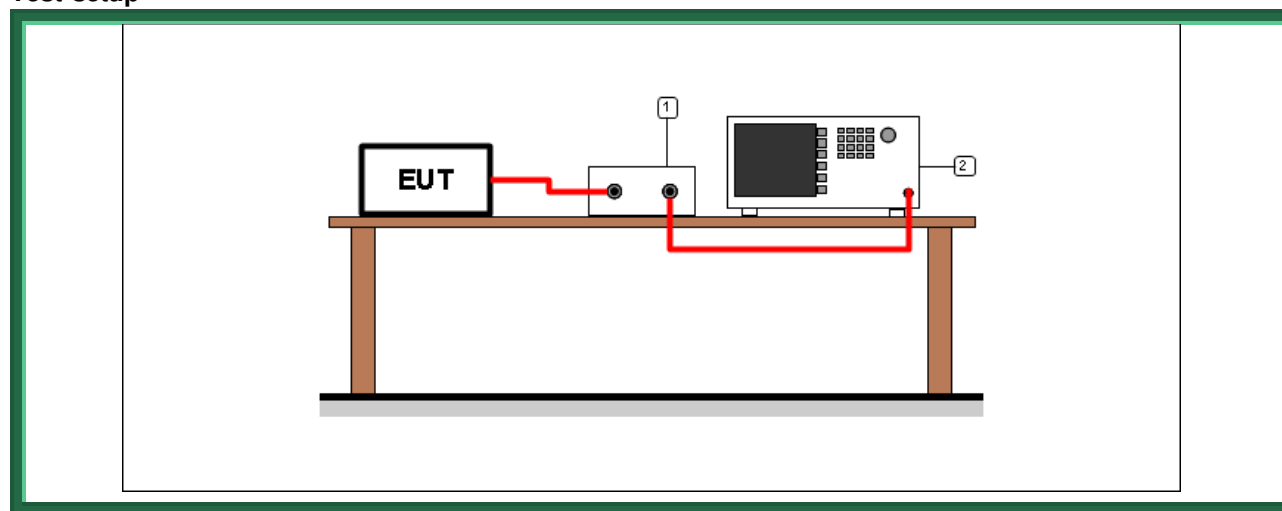
Tested by	G. Gandini
Test date	02.09.2024
Test location (stand)	Laboratory
Basic standard(s)	ANSI C63.10 cl. 7.8.6
Product standard(s)	FCC Rules and Regulation; Titles 47 Part. 15.247
Supplementary test set-up description	--
Supplementary information	--

Acceptance limits

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 P 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)).

Operation within the band 902 – 928 MHz $\pm$ RBW/2

Test setup



Test setup PR002_01							
Nr.	Id. Number	Manufacturer	Model	Serial number	Description	Last calibration date	Calibration expiration
2	CMC S295	Rohde & Schwarz	FSW43	104059	Spectrum Analyzer 43GHz	January 2023	January 2026
1	--	--	--	--	Cable + attenuator	Calibrated before the test	Calibrated before the test

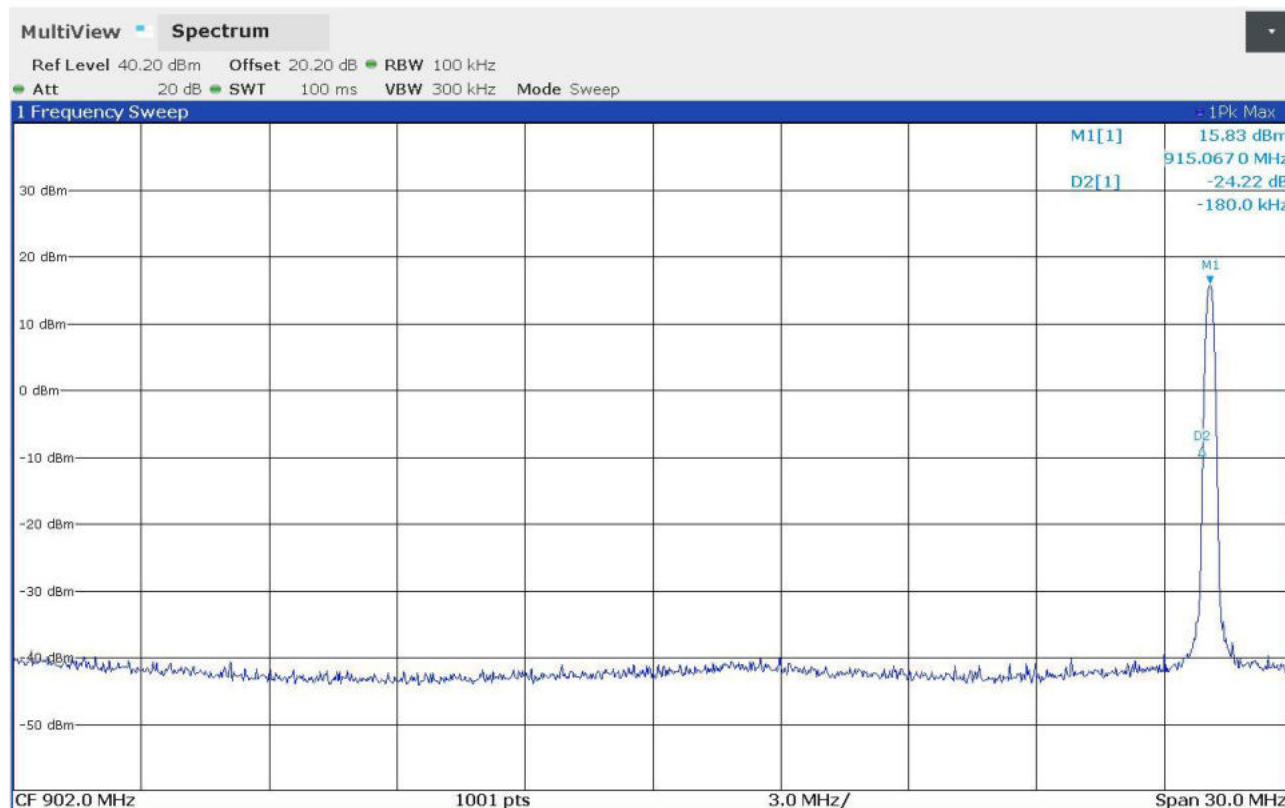
Result

<i>Transmission frequency (MHz)</i>	<i>Bandwidth</i>	<i>Graph(s) – Hopping</i>	<i>Absolute power (dBm)</i>	<i>Power limit (dBm)</i>	<i>Frequency</i>	<i>Verdict</i>
915,050	100 kHz	G24159128	-9,55	-4,20	FL: 914,888 MHz	P
927,800	100 kHz	G24159127	-5,21	-4,48	FH: 927,937 MHz	P

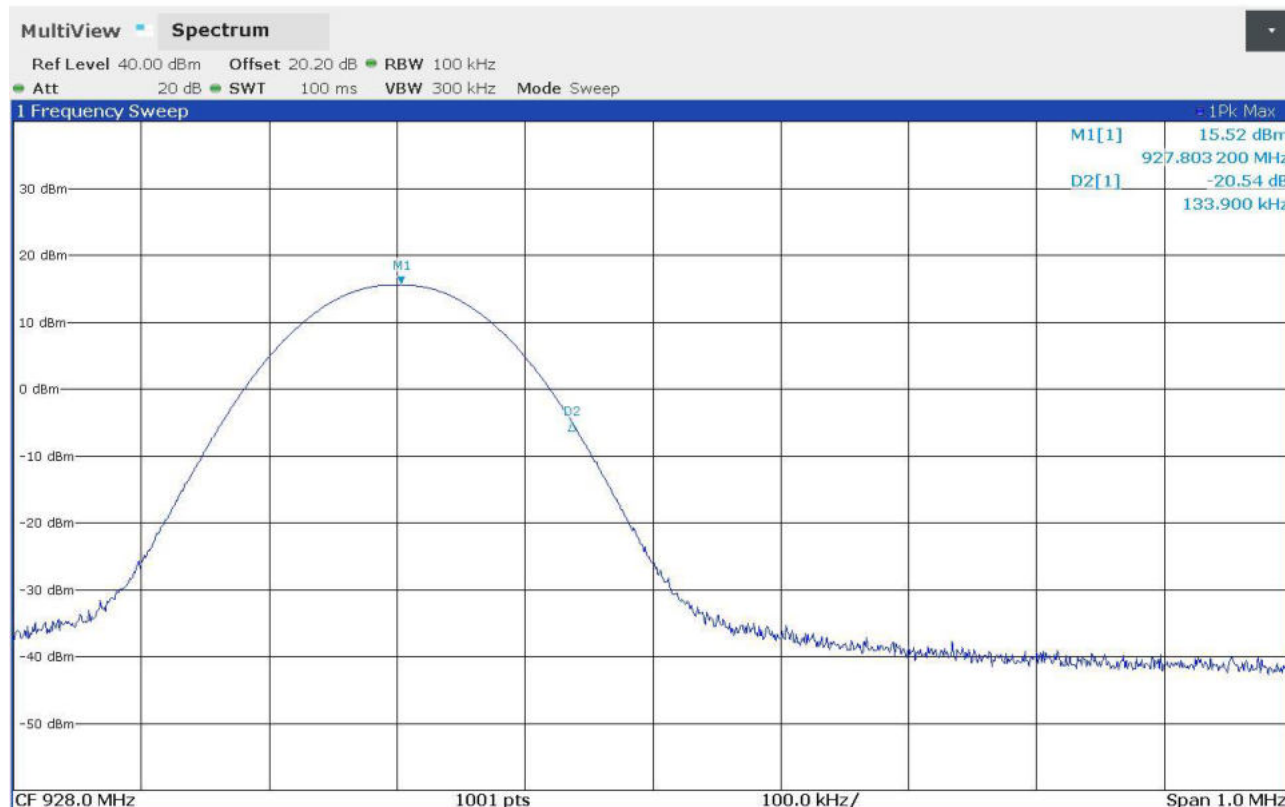
<i>Transmission frequency (MHz)</i>	<i>Bandwidth</i>	<i>Graph(s) – No hopping</i>	<i>Absolute power (dBm)</i>	<i>Power limit (dBm)</i>	<i>Frequency</i>	<i>Verdict</i>
915,050	100 kHz	G24159119	-8,39	-4,17	FL: 914,887 MHz	P
927,800	100 kHz	G24159126	-5,02	-4,48	FH: 927,937 MHz	P

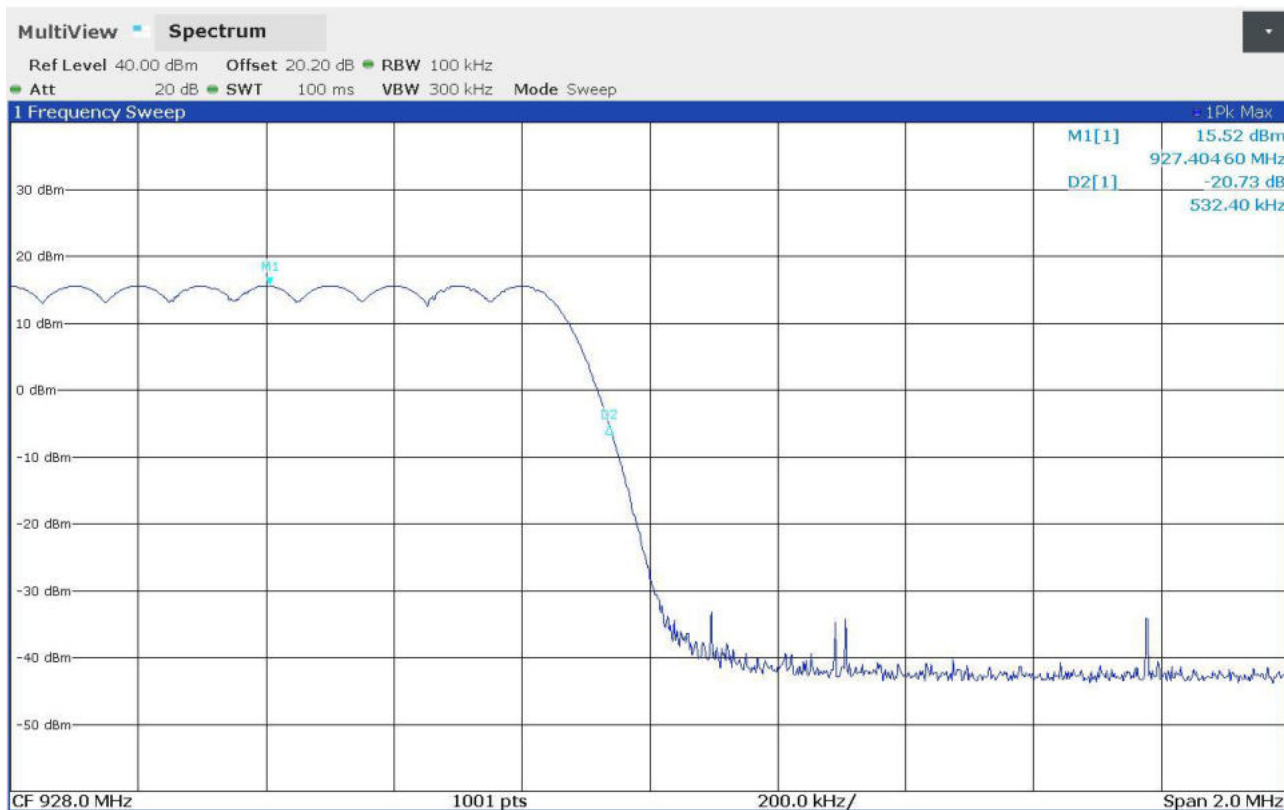
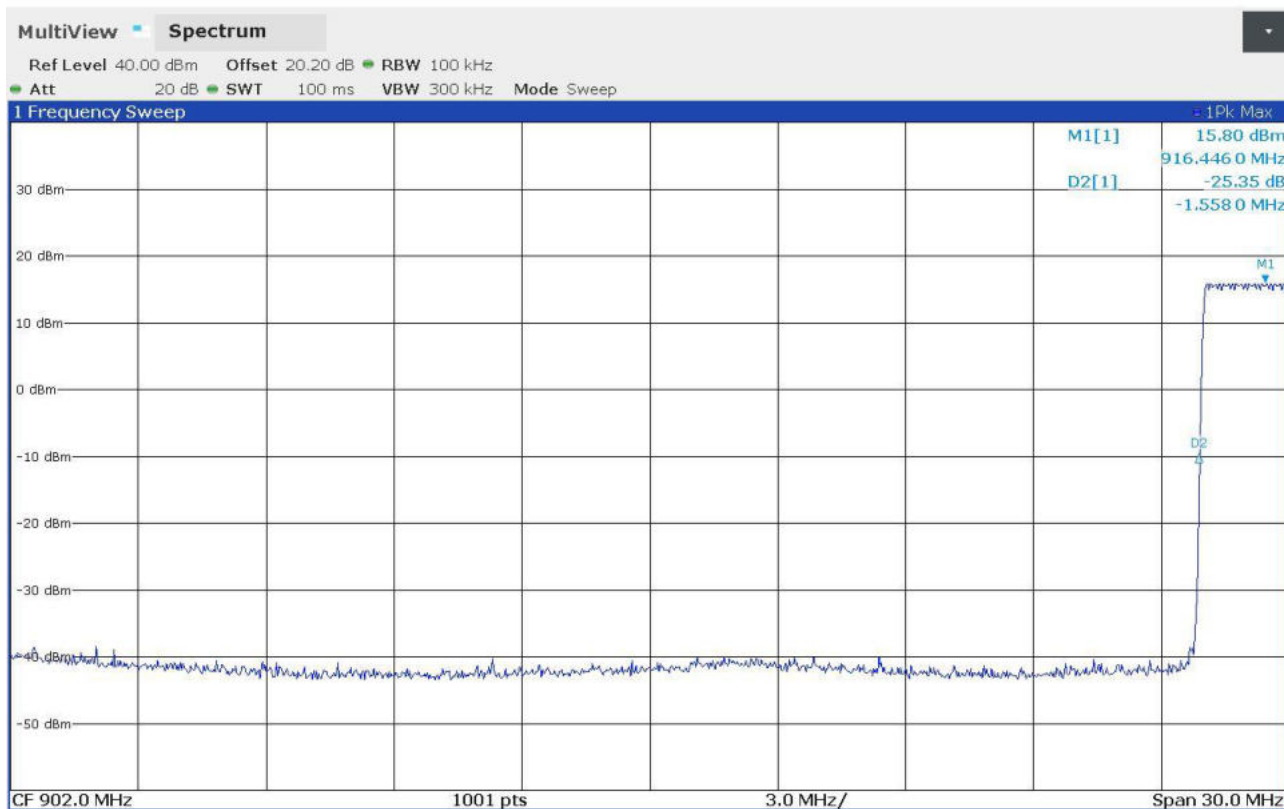
Graphs

Segalla 24159119



Segalla 24159126



Segalla 24159127

Segalla 24159128


9.8 Peak Output Power

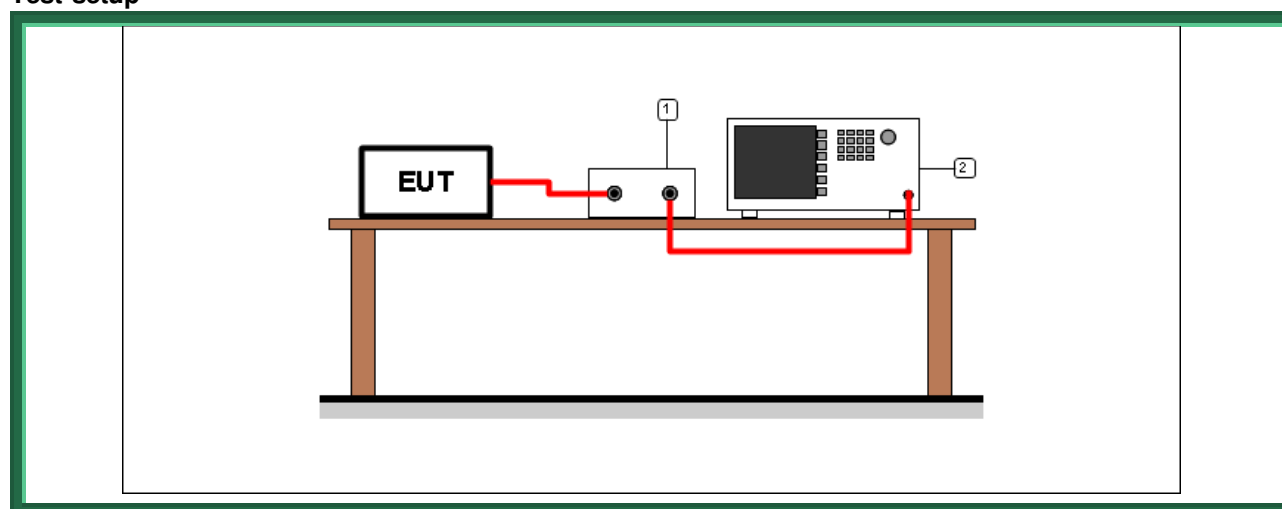
Tested by	G. Gandini
Test date	02.09.2024
Test location (stand)	Laboratory
Basic standard(s)	KDB 558074 D01 15.247 Meas Guidance v05r02 cl. 2.2 ANSI C63.10 cl. 7.8.5
Product standard(s)	FCC Rules and Regulation; Titles 47 Part. 15.247
Supplementary test set-up description	--
Supplementary information	--

Acceptance limits

For frequency hopping systems operating in the 2400–2483,5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483,5 MHz band: 0,125 watts.

For frequency hopping systems operating in the 902–928 MHz band: 1 watt for systems employing at least 50 hopping channels; and 0,25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels.

Test setup



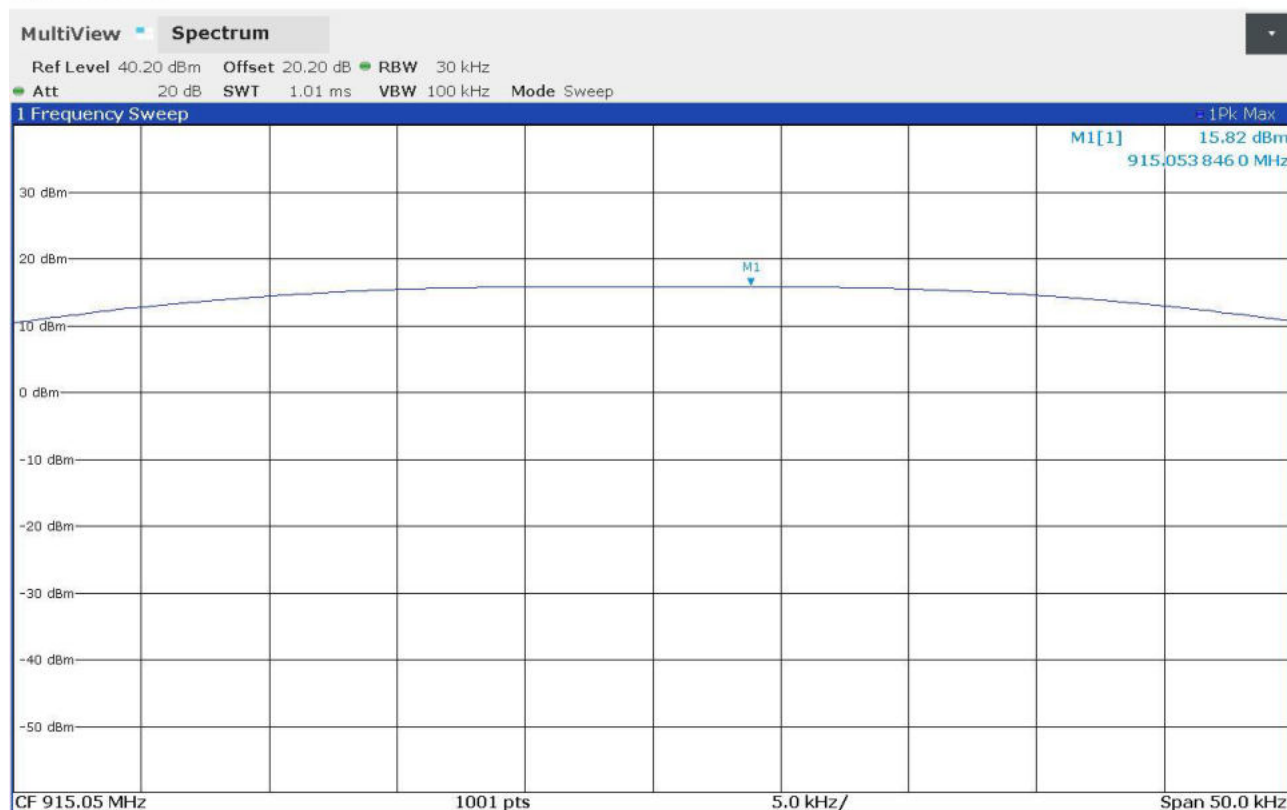
Test setup PR002_01							
Nr.	Id. Number	Manufacturer	Model	Serial number	Description	Last calibration date	Calibration expiration
2	CMC S295	Rohde & Schwarz	FSW43	104059	Spectrum Analyzer 43GHz	January 2023	January 2026
1	--	--	--	--	Cable + attenuator	Calibrated before the test	Calibrated before the test

Result

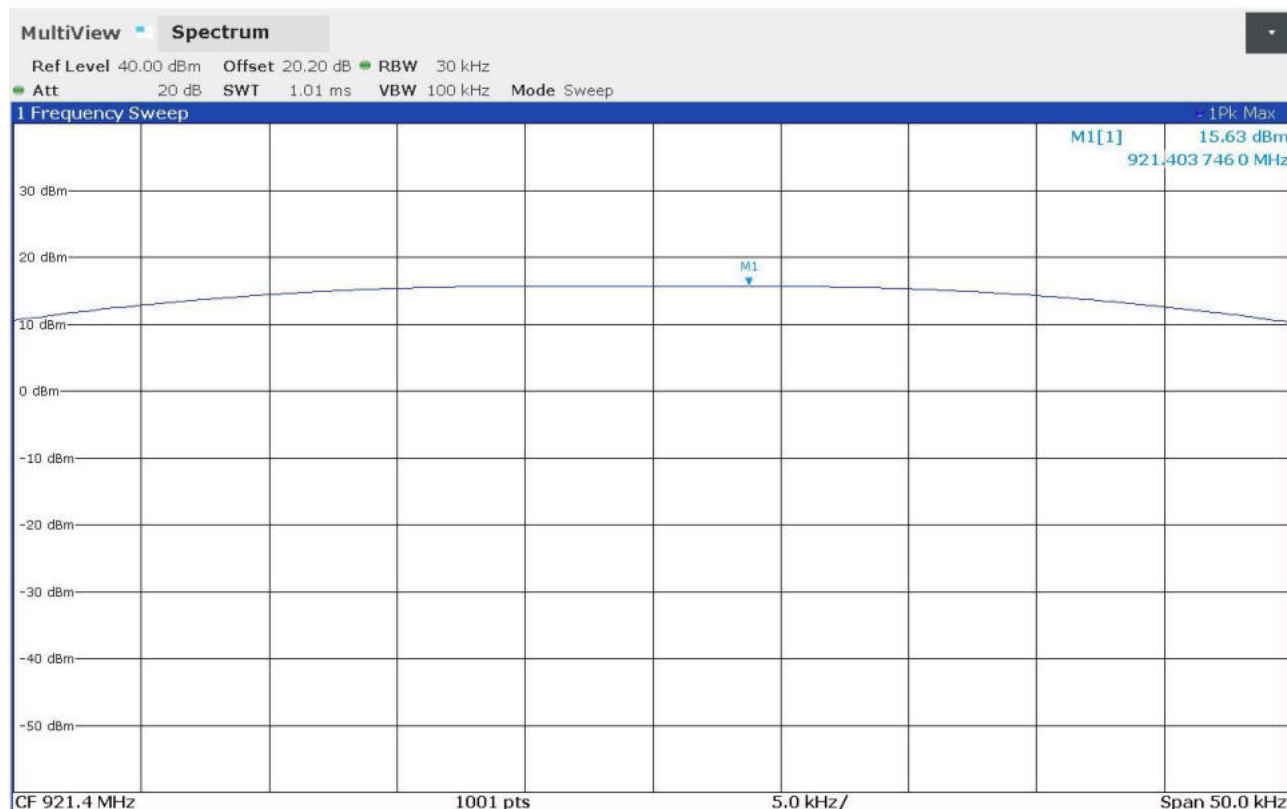
<i>Transmission frequency (MHz)</i>	<i>Graphs</i>	<i>Peak Output Power (dBm)</i>	<i>Peak Output Power (mW)</i>	<i>Limit (mW)</i>	<i>Verdict</i>
915,050	G24159118	15,82	38,19	1000	P
921,400	G24159122	15,63	36,56	1000	P
927,800	G24159125	15,51	35,56	1000	P

Graphs

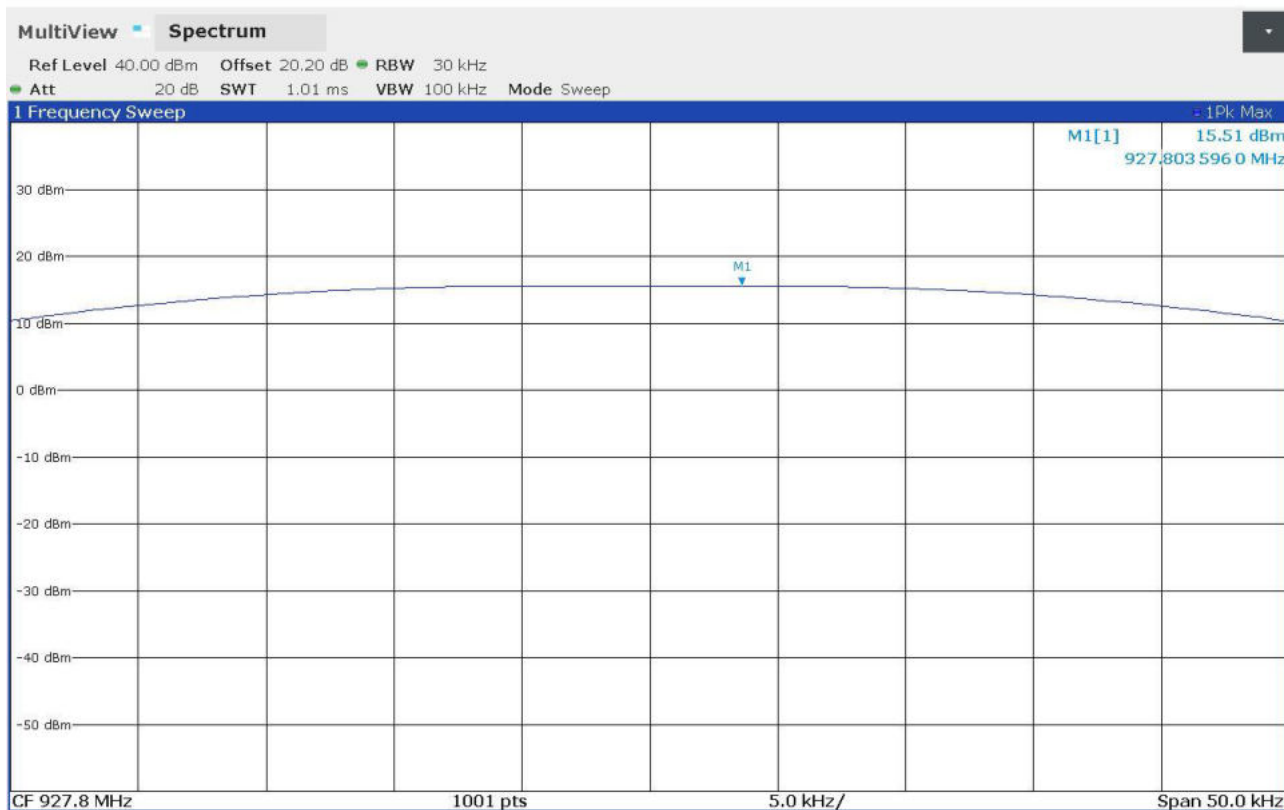
Segalla 24159118



Segalla 24159122



Segalla 24159125



Attachment 1

Measurement uncertainty

Test	Test Setup	Expanded uncertainty			Note
Conducted emission CISPR 16 LISN 50uH 0,009-0,0150 MHz	PE001_01			3,6 dB	1
Conducted emission CISPR 16 LISN 50uH 0,150-30,0 MHz	PE001_01			2,9 dB	1
Conducted emission CISPR 16 Voltage Probe 0,15-30 MHz	PE001_02			2,3 dB	1
Conducted emission CISPR 16 Current Probe 0,15-30 MHz	PE001_03			2,5 dB	1
Conducted emission CISPR 16 ISN 0,15-30 MHz	PE001_04			4,7 dB	1
Clic CISPR 16 LISN 50uH 0,150-30,0 MHz	PE001_05			2,9 dB	1
Radiated Emission CDNE 30-300 MHz	PE001_06			3,3 dB	1
Disturbance Power 30-300 MHz	PE002_X1			3,8 dB	1
Radiated Emission LAS 0,15-30 MHz	PE003_01			2,0 dB	1
Radiated Emission CISPR 16 Loop Ant. 0,15-30 MHz	PE004_X1			4,1 dB	1
Radiated Emission CISPR 16 Bicon. Ant. 30-300 MHz	PE004_X2			4,7 dB	1
Radiated Emission CISPR 16 LogP. Ant. 300-1000 MHz	PE004_X3			4,6 dB	1
Radiated Emission CISPR 16 Horn Ant. 1-18 GHz	PE004_X4			4,7 dB	1
Human Exposure to electromagnetic fields	PE005_01			14,2 %	1
Harmonics	PE006_01	10 mA	+	2,9 %	1
Flicker	PE007_01			3,40 %	1
Radiated Immunity 80 MHz - 6 GHz	PE102_XX	2,26 dB		0,89 V/m a 3V/m	1
Conducted Immunity 0,15 - 230 MHz	PE105_XX	1,26 dB		0,47 V a 3V	1
AC Magnetic field	PE106_01	1,55 %		0,15 A/m a 10A/m	1
Pulse Magnetic field	PE107_01	6,21 %		18,6 A/m a 300A/m	1
Dumped Magnetic field	PE108_01	6,21 %		1,86 A/m a 30A/m	1
Common mode conducted immunity	PE112_01	2,11 %		0,21 V a 10V	1

Attachment 1

Test	Test Setup	Expanded uncertainty	Note
Power/Spurious 9kHz-30MHz	PR001_X1	4,1 dB	1
Power/Spurious ERP 30-1000MHz d=10m/3m	PR001_X2+X3	4,8 dB	1
Misura della potenza EIRP 1-18GHz d=3m	PR001_X4+X5	4,7 dB	1
Misura della potenza EIRP 18-40GHz d=3m	PR001_X6	5,1 dB	1
Frequency error	PR002_01+02	$< 1 \times 10^{-7}$	1
Timing zero span (1001pts.)	PR002_01+02	0,2 % SWT	1
Modulation bandwidth	PR002_01+02	$< 1 \times 10^{-7}$	1
Conducted RF power and spurious emission	PR002_01+02	1,1 dB	1
Adjacent channel power	PR002_01+02	1,1 dB	1
Blocking	PR002_01+02	1,1 dB	1

Test	Test Setup	Expanded uncertainty	Note
Electrostatic discharge immunity test	PE101_0X		2
Electrical fast transients / burst immunity test	PE103_0X		2
Surge immunity test	PE104_0X		2
Short interruption immunity test	PE109_01		2
Ring Wave immunity test	PE110_01		2
Low frequency immunity test	PE111_01		2
Dumped Oscillatory immunity test	PE113_01		2
Rev 24_01 date 03/02/2024			

Note 1:

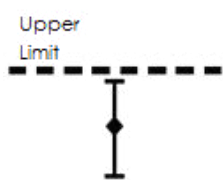
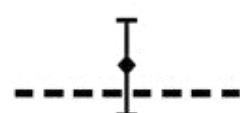
The expanded uncertainty reported according to the document EA-4-02 is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of $p = 95\%$

Note 2:

It has been demonstrated that the used test equipment meets the specified requirements in the standard with at least a 95% confidence, covering factor $k=2$

Attachment 1

Judgement of compliance

Case 1	Case 2	Case 3	Case 4
 The sample complies with the requirements. The measurement results is within the specification limit when the measurement uncertainty is taken into account.	 The sample complies with the requirements. It is not possible to state compliance using a 95% coverage probability for the expanded uncertainty although the measurement result is below the limit.	 The sample does not comply with the requirements. It is not possible to state compliance using a 95% coverage probability for the expanded uncertainty also the measurement result is upper the limit.	 The sample does not comply with the requirements. The measurement results is outside the specification limit when the measurement uncertainty is taken into account.

In agreement with ILAC-G8:09/2019 cl.4.2.1 Guidelines on Decision Rules and Statements of Conformity

Quality manual references – Internal procedure

Internal Procedure PM001 rev. 4.0 (Quality Manual)	Measure procedure
Internal Procedure INC_M rev. 10.0 (Quality Manual)	Measurement uncertainty calculation