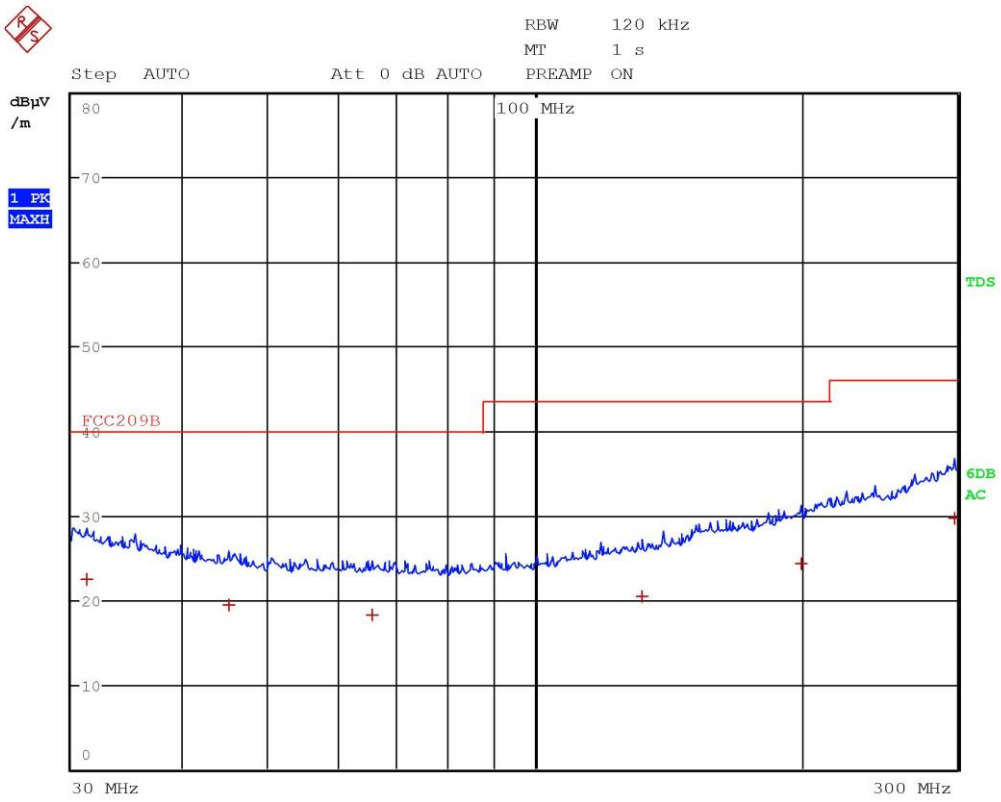


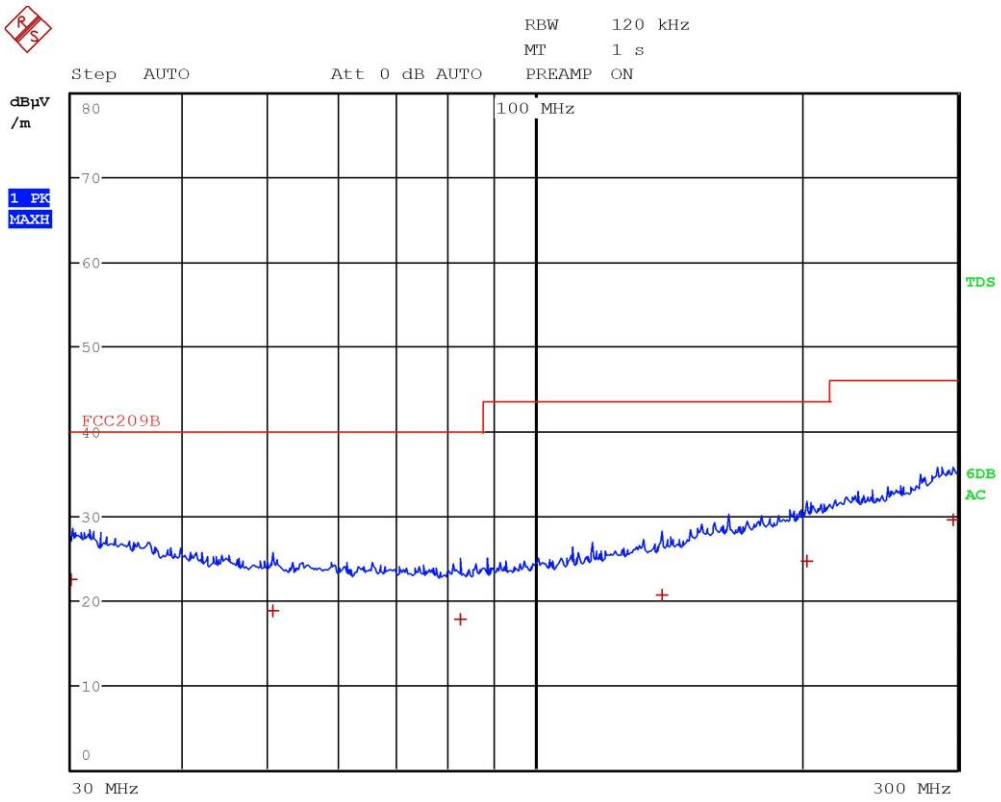
Gandini 17227637-Horiz-Fmin

EDIT PEAK LIST (Final Measurement Results)

Trace1:	FCC209B
Trace2:	---
Trace3:	---

TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
1 Quasi Peak	31.24 MHz	22.43	-17.56
1 Quasi Peak	45.16 MHz	19.39	-20.60
1 Quasi Peak	65.6 MHz	18.28	-21.72
1 Quasi Peak	132 MHz	20.47	-23.04
1 Quasi Peak	199.76 MHz	24.29	-19.22
1 Quasi Peak	298.24 MHz	29.60	-16.41

Gandini 17227637-Horiz-Fmin



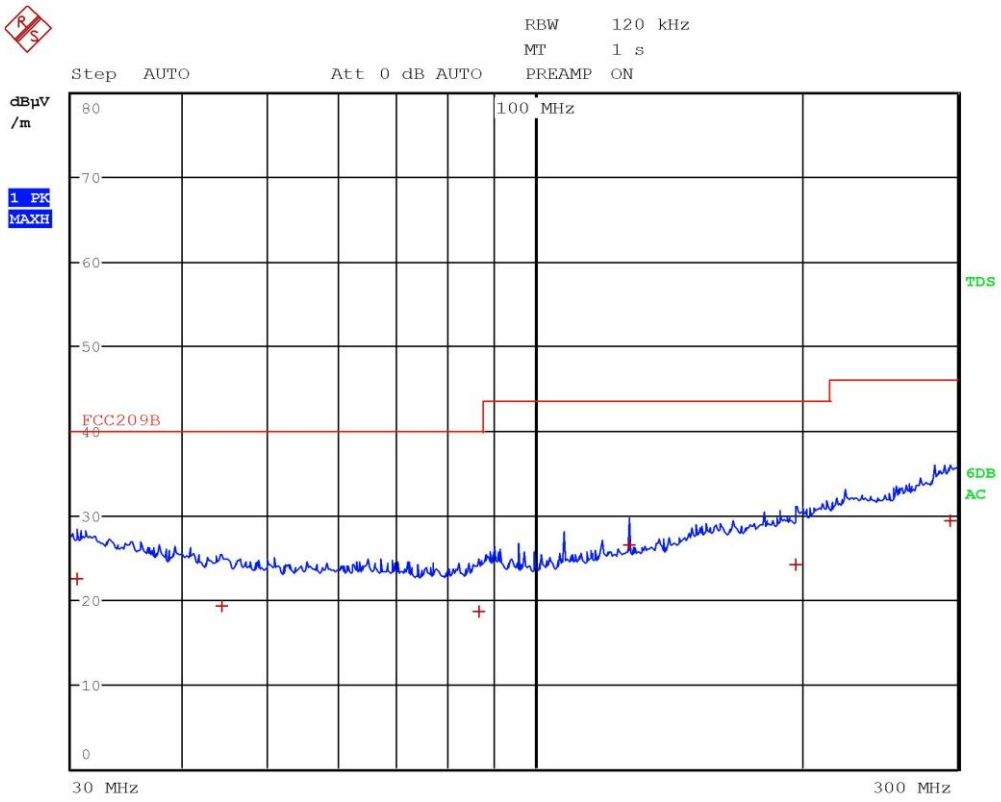
Gandini 17227638-Horiz-Fmid

EDIT PEAK LIST (Final Measurement Results)

Trace1:	FCC209B
Trace2:	---
Trace3:	---

TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
1 Quasi Peak	30.04 MHz	22.45	-17.54
1 Quasi Peak	50.68 MHz	18.76	-21.23
1 Quasi Peak	82.52 MHz	17.77	-22.22
1 Quasi Peak	139.12 MHz	20.67	-22.84
1 Quasi Peak	202.92 MHz	24.60	-18.91
1 Quasi Peak	297.16 MHz	29.48	-16.53

Gandini 17227638-Horiz-Fmid



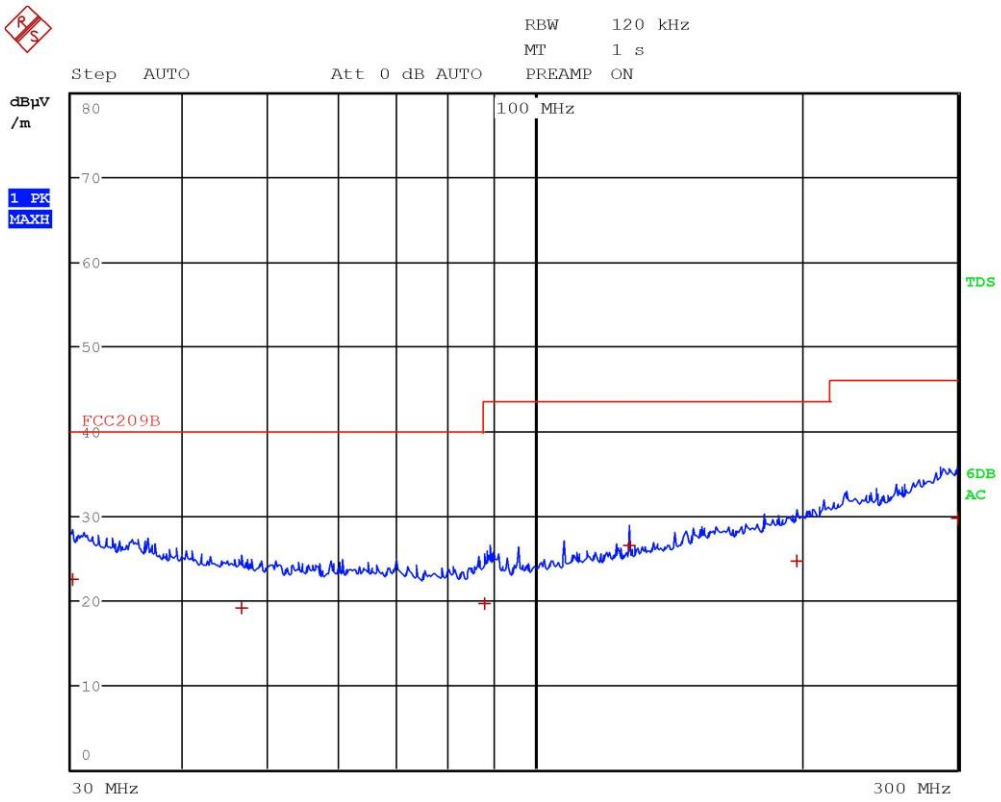
Gandini 17227639-Vert-Fmid

EDIT PEAK LIST (Final Measurement Results)

Trace1:	FCC209B
Trace2:	---
Trace3:	---

TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
1 Quasi Peak	30.4 MHz	22.47	-17.52
1 Quasi Peak	44.36 MHz	19.30	-20.69
1 Quasi Peak	86.52 MHz	18.63	-21.36
1 Quasi Peak	128 MHz	26.44	-17.07
1 Quasi Peak	197.2 MHz	24.14	-19.37
1 Quasi Peak	294.88 MHz	29.26	-16.75

Gandini 17227639-Vert-Fmid



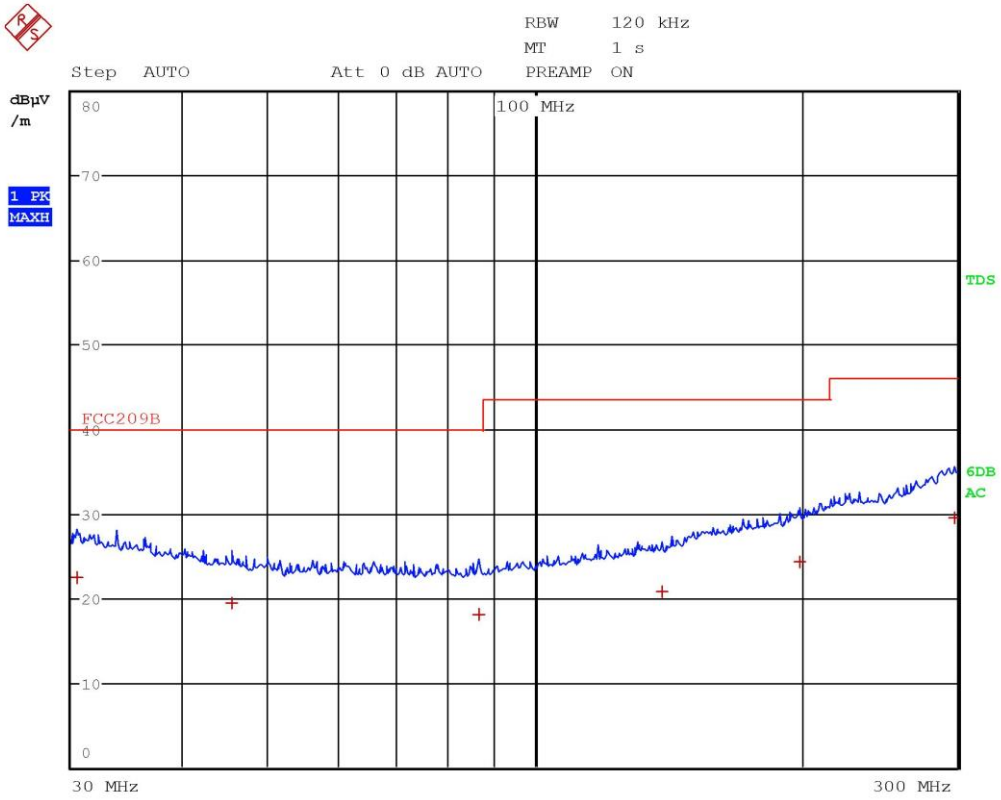
Gandini 17227640-Vert-Fmax

EDIT PEAK LIST (Final Measurement Results)

Trace1:	FCC209B
Trace2:	---
Trace3:	---

TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
1 Quasi Peak	30.08 MHz	22.44	-17.55
1 Quasi Peak	46.6 MHz	19.08	-20.91
1 Quasi Peak	87.88 MHz	19.49	-20.50
1 Quasi Peak	128 MHz	26.48	-17.04
1 Quasi Peak	197.88 MHz	24.59	-18.92
1 Quasi Peak	299.88 MHz	29.70	-16.31

Gandini 17227640-Vert-Fmax



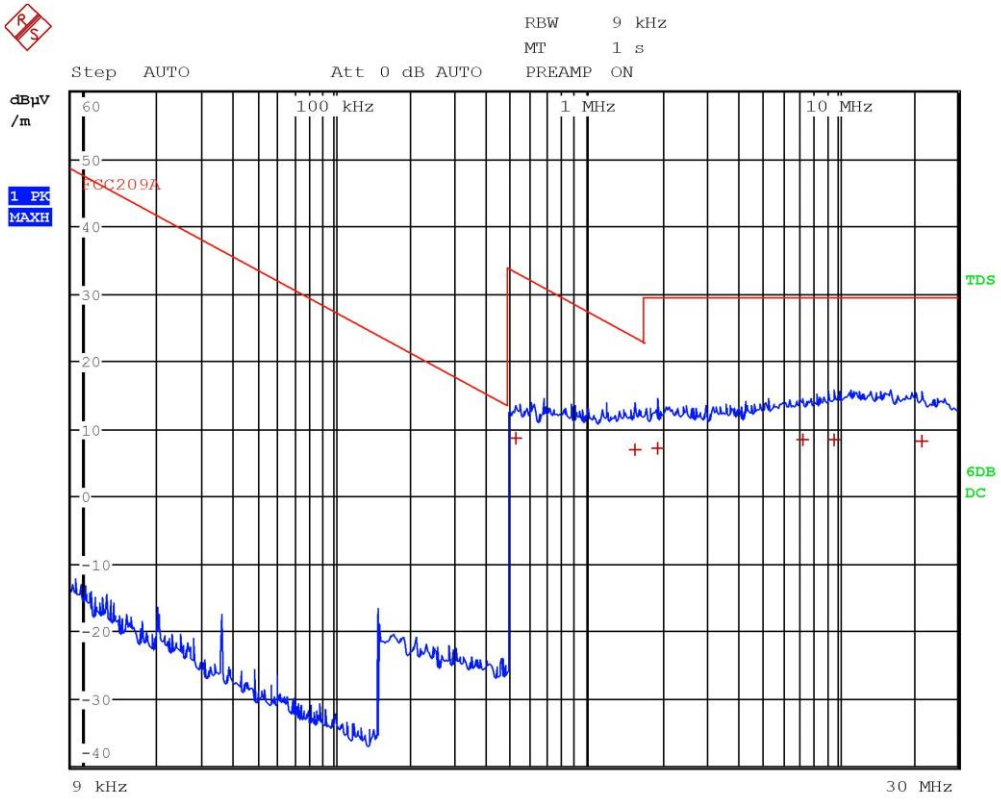
Gandini 17227641-Horiz-Fmax

EDIT PEAK LIST (Final Measurement Results)

Trace1:	FCC209B
Trace2:	---
Trace3:	---

TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
1 Quasi Peak	30.4 MHz	22.51	-17.48
1 Quasi Peak	45.44 MHz	19.45	-20.54
1 Quasi Peak	86.56 MHz	18.01	-21.98
1 Quasi Peak	139 MHz	20.69	-22.82
1 Quasi Peak	198.96 MHz	24.32	-19.19
1 Quasi Peak	297.6 MHz	29.52	-16.49

Gandini 17227641-Horiz-Fmax



Gandini 17227642-Loop-TxRx

EDIT PEAK LIST (Final Measurement Results)

Trace1:	FCC209A
Trace2:	---
Trace3:	---

TRACE	FREQUENCY	LEVEL dBµV/m	DELTA LIMIT dB
1 Quasi Peak	522 kHz	8.73	-24.51
1 Quasi Peak	1.558 MHz	7.01	-16.73
1 Quasi Peak	1.918 MHz	7.18	-22.35
1 Quasi Peak	7.234 MHz	8.32	-21.21
1 Quasi Peak	9.682 MHz	8.42	-21.11
1 Quasi Peak	21.562 MHz	8.15	-21.38

Gandini 17227642-Loop-TxRx

Result: The requirements are met

11.4 20 dB bandwidth

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

Test configuration and test method

Test site:
Laboratory

Auxiliary equipment:
See clause 4 of this test report

EUT exercising

See clause 4 of this test report

Test equipment used

CMC S108, CMC S136, CMC S227
Measurement uncertainty: See clause 7 of this test report

Test specification

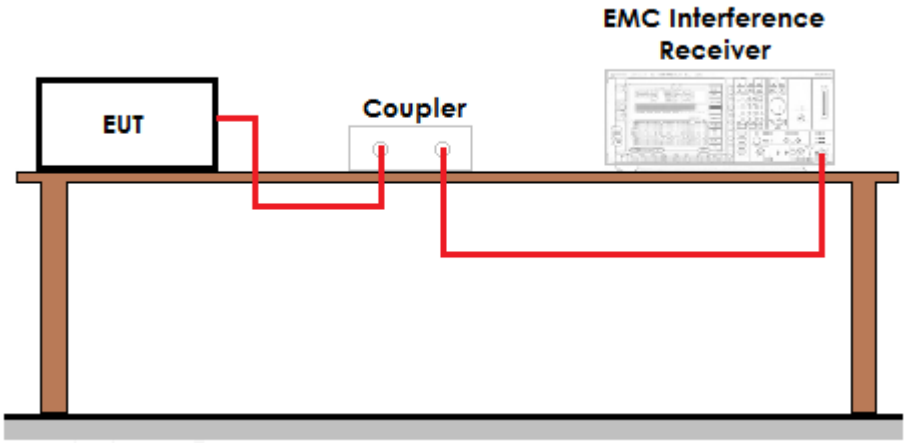
See FCC Part 15.247

Environmental conditions

Temperature (°C)	*Atmospheric pressure (kPa)*	*Relative humidity (%)*
22	100	45

Acceptance limits: the maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz

Setup



Result

Frequency (MHz)	*Graphs*	*20 dB bandwidth (kHz)*	*Maximum allowed 20 dB bandwidth (kHz)*	*Results*
915,05	G17227602	17,133	500	Complies
921,40	G17227612	17,183	500	Complies
927,80	G17227611	17,283	500	Complies

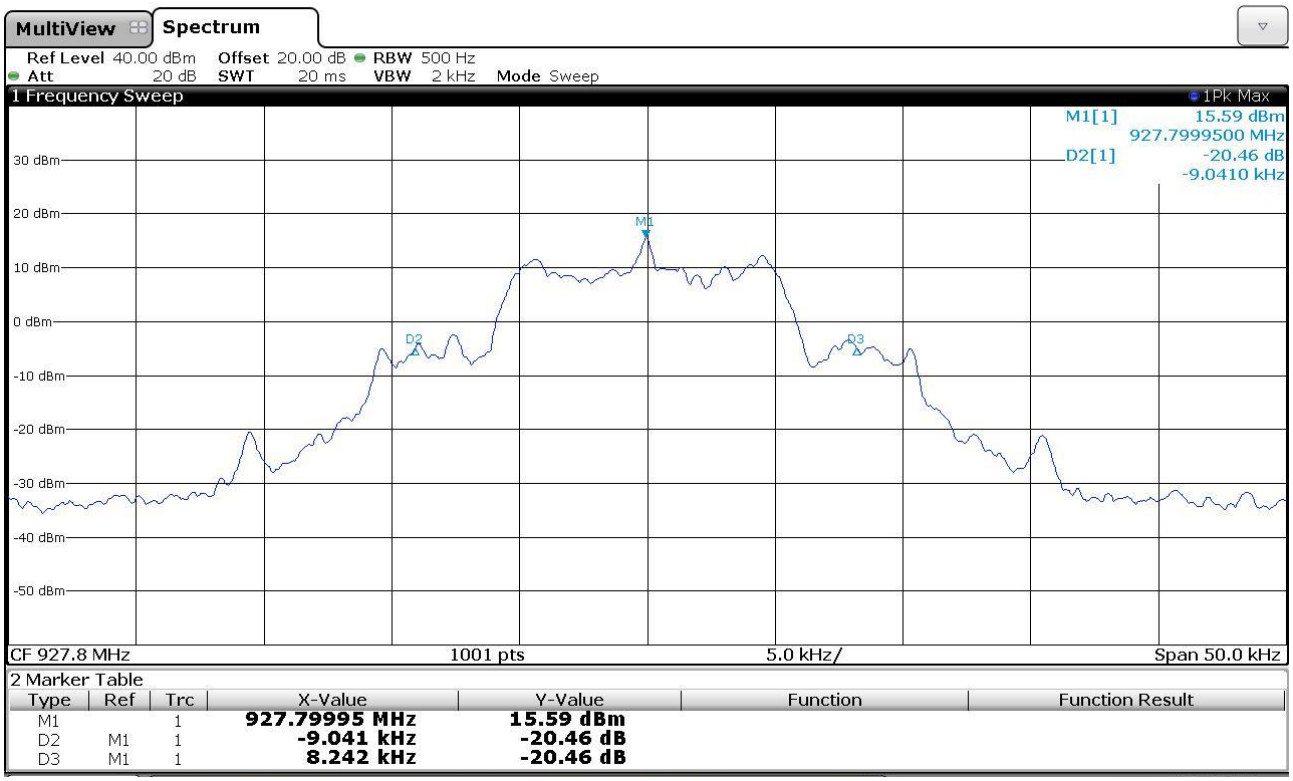
Graphs

Gandini 17227602

2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**915.0502498 MHz**	**15.80 dBm**		
D2	M1	1	**-8.841 kHz**	**-20.47 dB**		
D3	M1	1	**8.292 kHz**	**-20.80 dB**		

Gandini 17227611



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**927.79995 MHz**	**15.59 dBm**		
D2	M1	1	**-9.041 kHz**	**-20.46 dB**		
D3	M1	1	**8.242 kHz**	**-20.46 dB**		

Gandini 17227612

Result: The requirements are met

11.5 Channel separation

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

Test configuration and test method

Test site:
Laboratory

Auxiliary equipment:
See clause 4 of this test report

EUT exercising

See clause 4 of this test report

Test equipment used

CMC S108, CMC S136, CMC S227
Measurement uncertainty: See clause 7 of this test report

Test specification

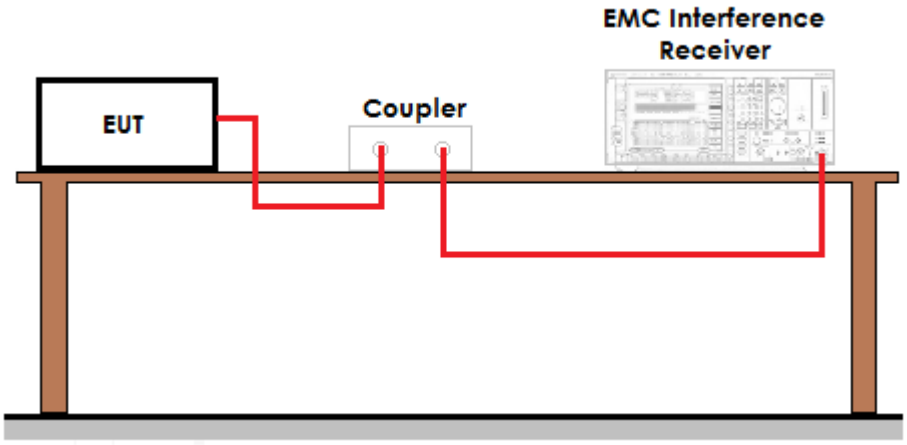
See FCC Part 15.247

Environmental conditions

Temperature (°C)	*Atmospheric pressure (kPa)*	*Relative humidity (%)*
20	100	42

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

Setup

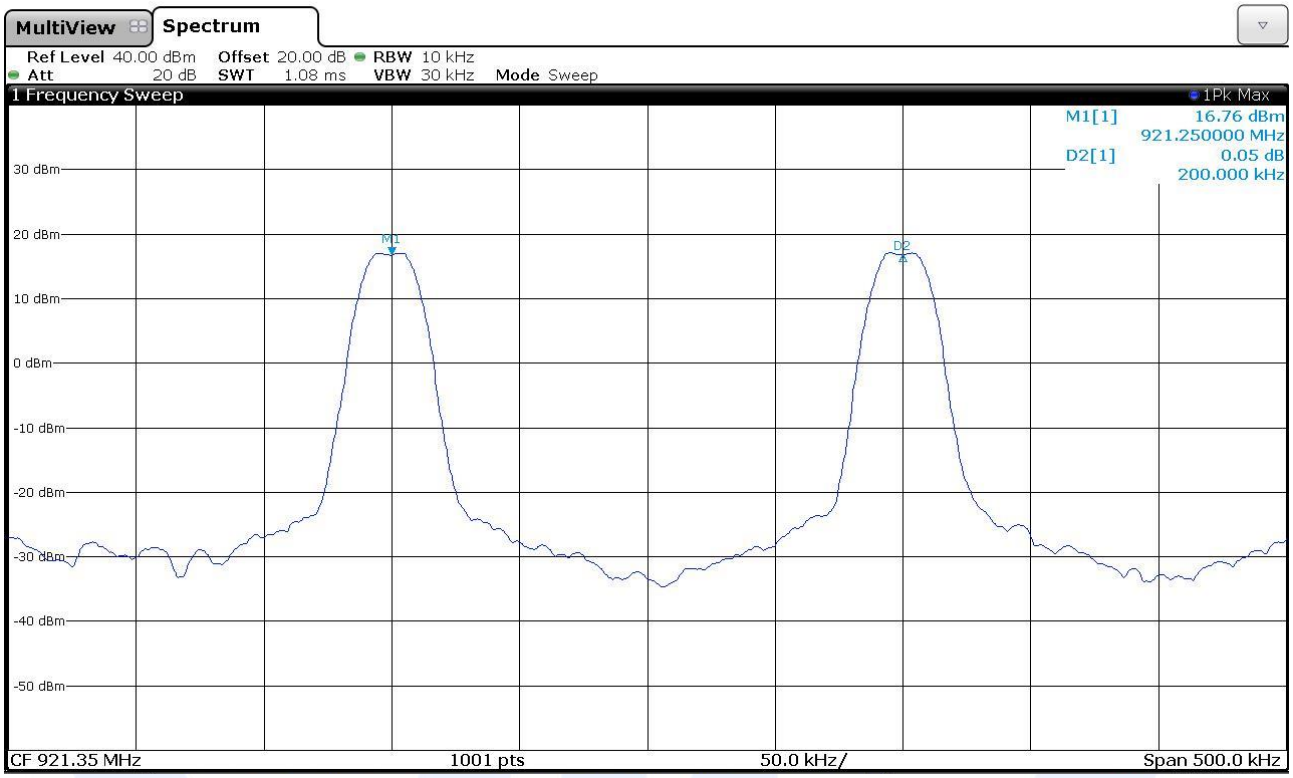


Result

Frequency band (MHz)	*Graphs*	*Channel separation (kHz)*	*Minimum channel separation required (kHz)*	*Results*
902 – 928	G17227615	200	25	Complies

Graphs

Gandini 17227615



Result: The requirements are met

11.6 Number of hopping channels

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

Test configuration and test method

Test site:
Laboratory

Auxiliary equipment:
See clause 4 of this test report

EUT exercising

See clause 4 of this test report

Test equipment used

CMC S108, CMC S136, CMC S227
Measurement uncertainty: See clause 7 of this test report

Test specification

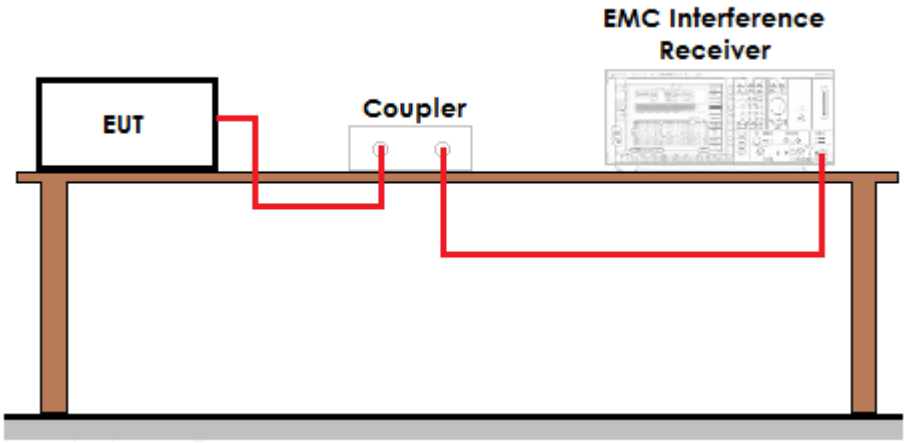
See FCC Part 15.247

Environmental conditions

Temperature (°C)	*Atmospheric pressure (kPa)*	*Relative humidity (%)*
20	100	42

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

Setup

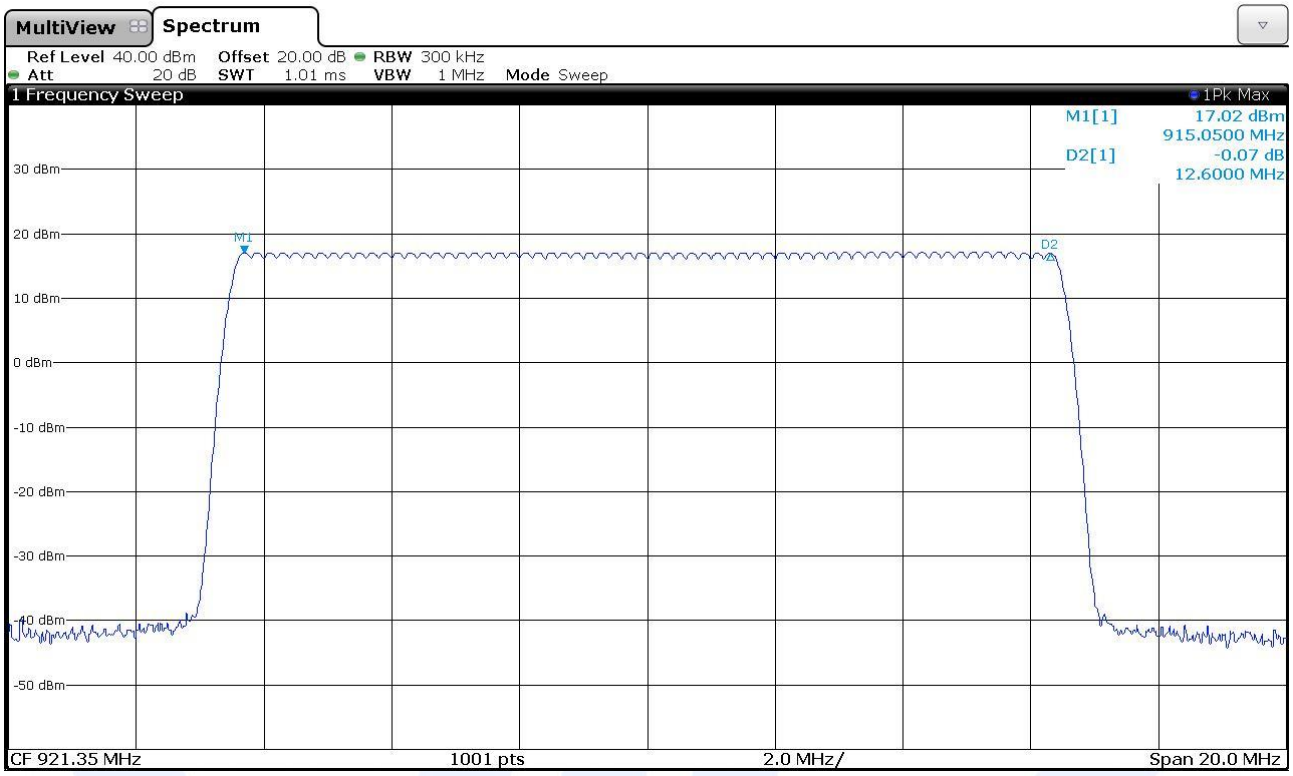


Result

Frequency band (MHz)	*Graphs*	*Number of hopping channels*	*Minimum number of hopping channels required*	*Results*
902 – 928	G17227614	64	50	Complies

Graphs

Gandini 17227614



Result: The requirements are met

11.7 Time of occupancy

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

Test configuration and test method

Test site:
Laboratory

Auxiliary equipment:
See clause 4 of this test report

EUT exercising

See clause 4 of this test report

Test equipment used

CMC S108, CMC S136, CMC S227
Measurement uncertainty: See clause 7 of this test report

Test specification

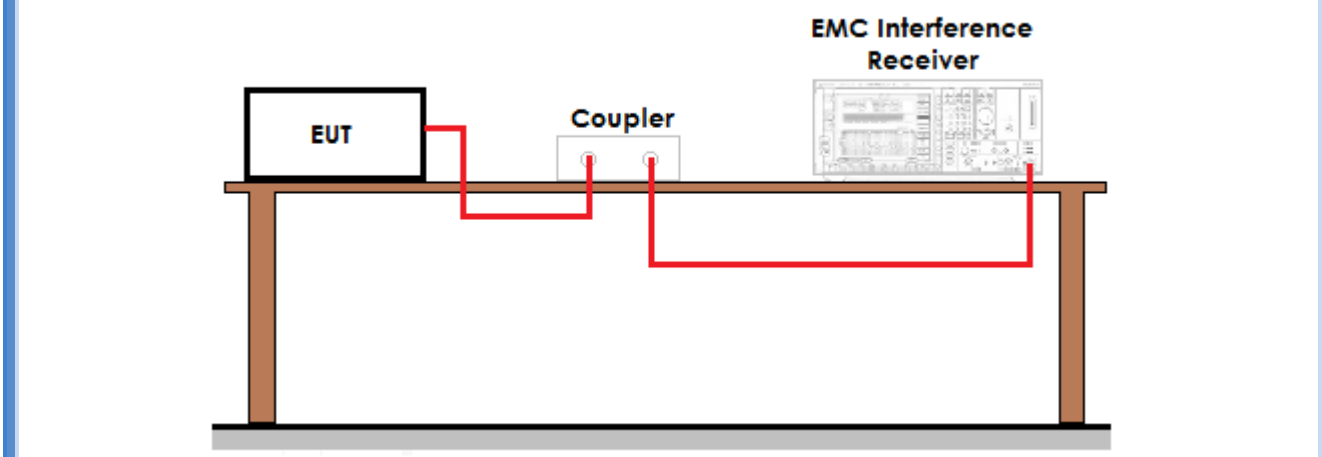
See FCC Part 15.247

Environmental conditions

Temperature (°C)	*Atmospheric pressure (kPa)*	*Relative humidity (%)*
22	100	42

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

Setup



Result

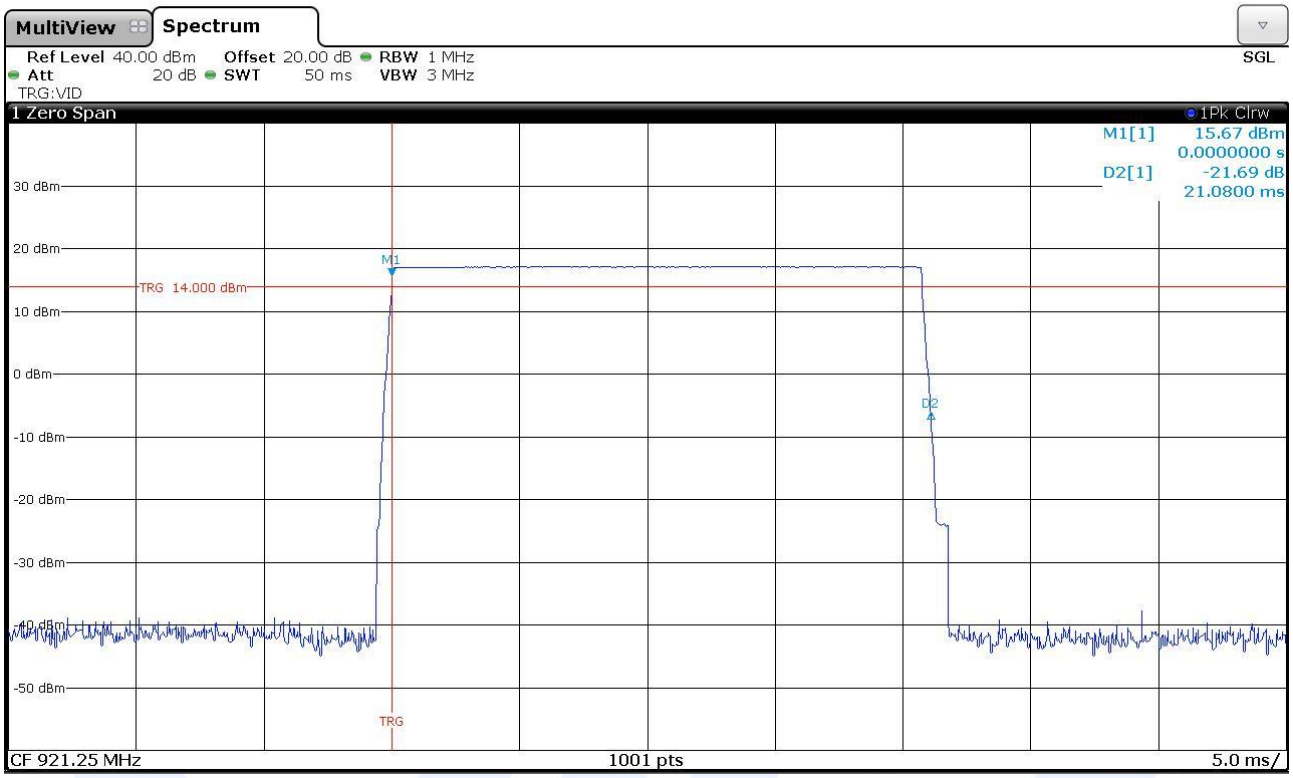
Frequency (MHz)	*Graphs*	*Dwell time (ms)*
921,25	G17227616	21,08

Frequency (MHz)	*Time between 2 transmission on different channels*		*Number of transmissions on a period of 20 s*
921,25	G17227617	58,2 ms	20 s / 58,2 ms / 64 = 5,37

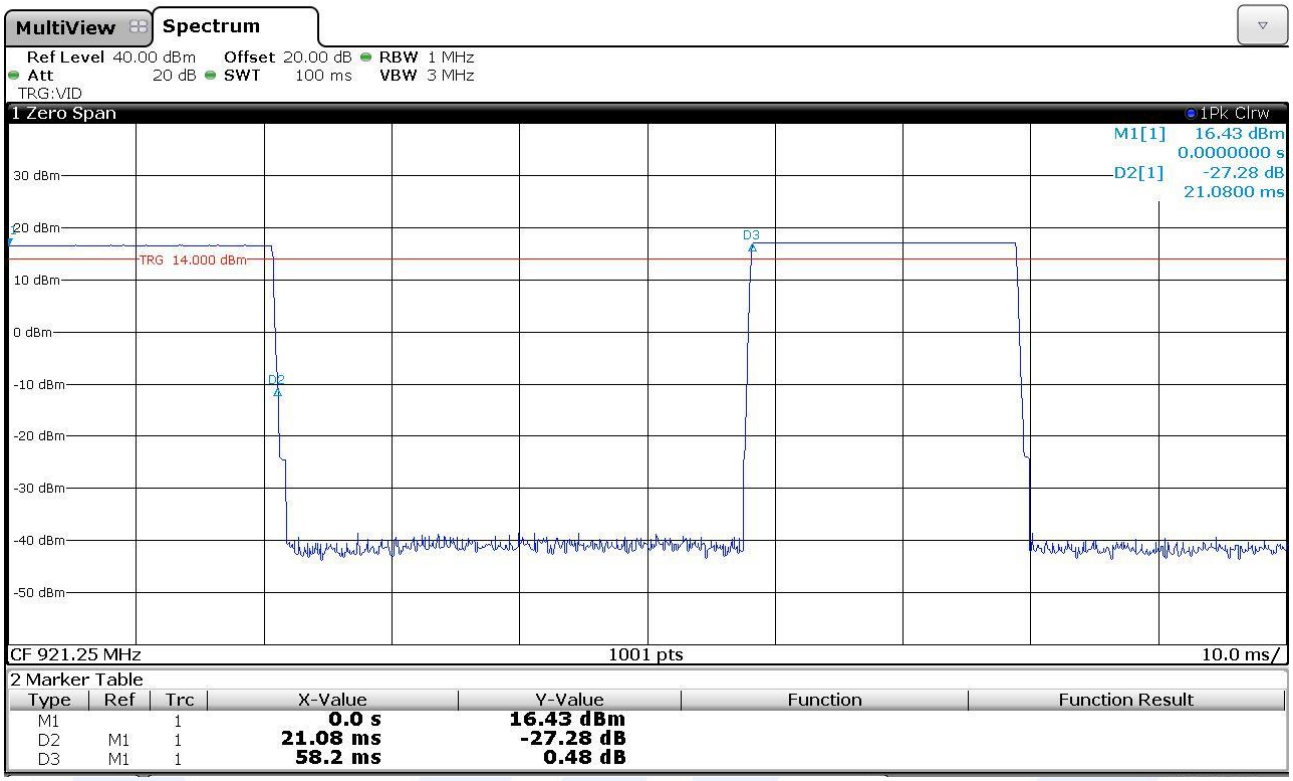
Time of occupancy (Dwell time x Nr. transmissions)	***Maximum allowed time of occupancy***	***Results***
113,19 ms	400 ms	Complies

Graphs

Gandini 17227616



Gandini 17227617



Result: The requirements are met

11.8 Band edge

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

Test configuration and test method

Test site:
Laboratory

Auxiliary equipment:
See clause 4 of this test report

EUT exercising

See clause 4 of this test report

Test equipment used

CMC S108, CMC S136, CMC S227
Measurement uncertainty: See clause 7 of this test report

Test specification

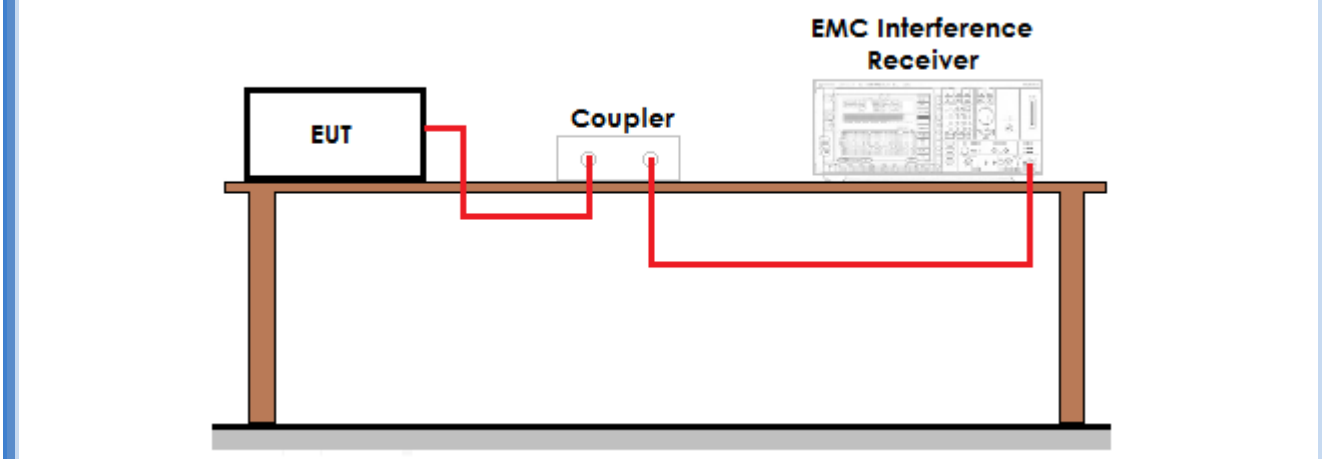
See FCC Part 15.247

Environmental conditions

Temperature (°C)	*Atmospheric pressure (kPa)*	*Relative humidity (%)*
22	100	45

Acceptance limits: operation within the band 900 – 928 MHz

Setup



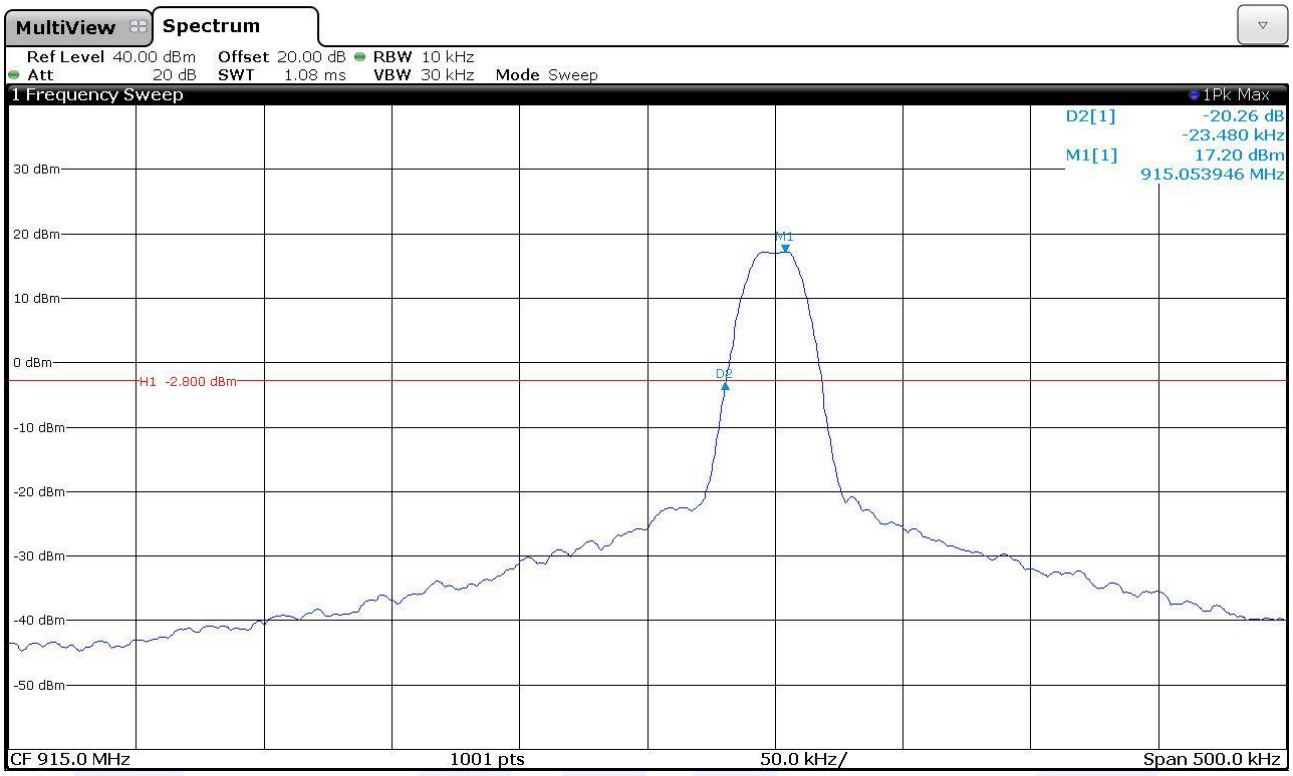
Result

Frequency (MHz)	*Graph(s) – Hopping*	*Results*	
915,05	G17227618 G17227619	F_L: 915,0326 MHz	Complies
927,80	G17227618 G17227620	F_H: 927,8350 MHz	Complies

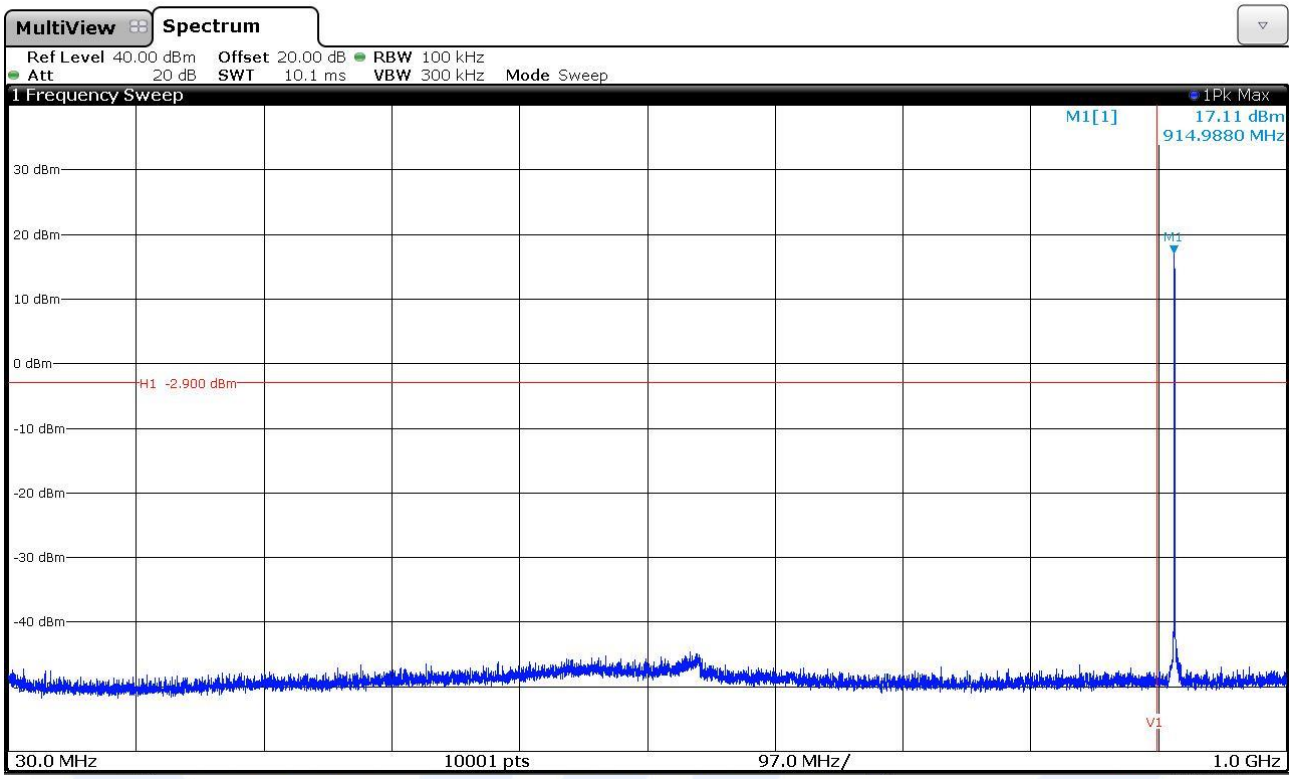
Frequency (MHz)	*Graph(s) – No hopping*	*Results*	
915,05	G17227604 G17227605	F_L: 915,030470 MHz	Complies
927,80	G17227608 G17227606 G17227607	F_H: 927,817560 MHz	Complies

Graphs

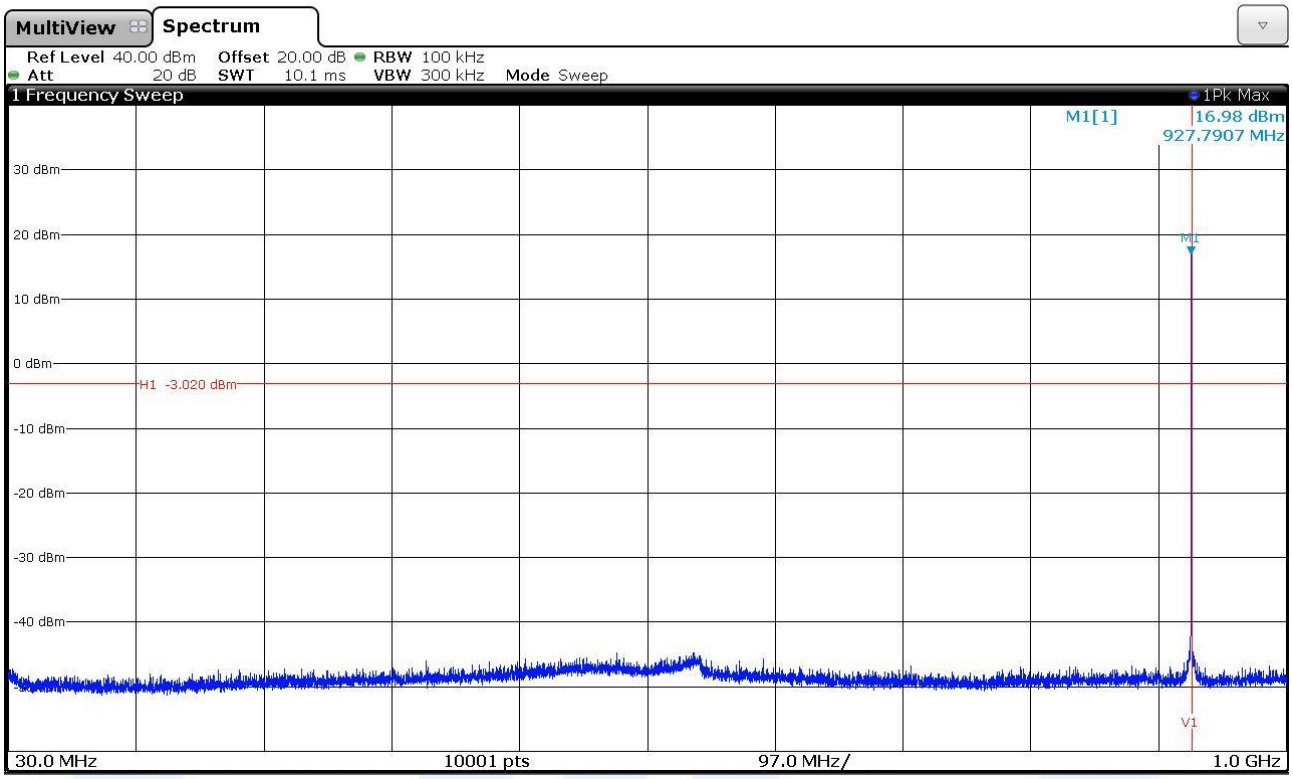
Gandini 17227604



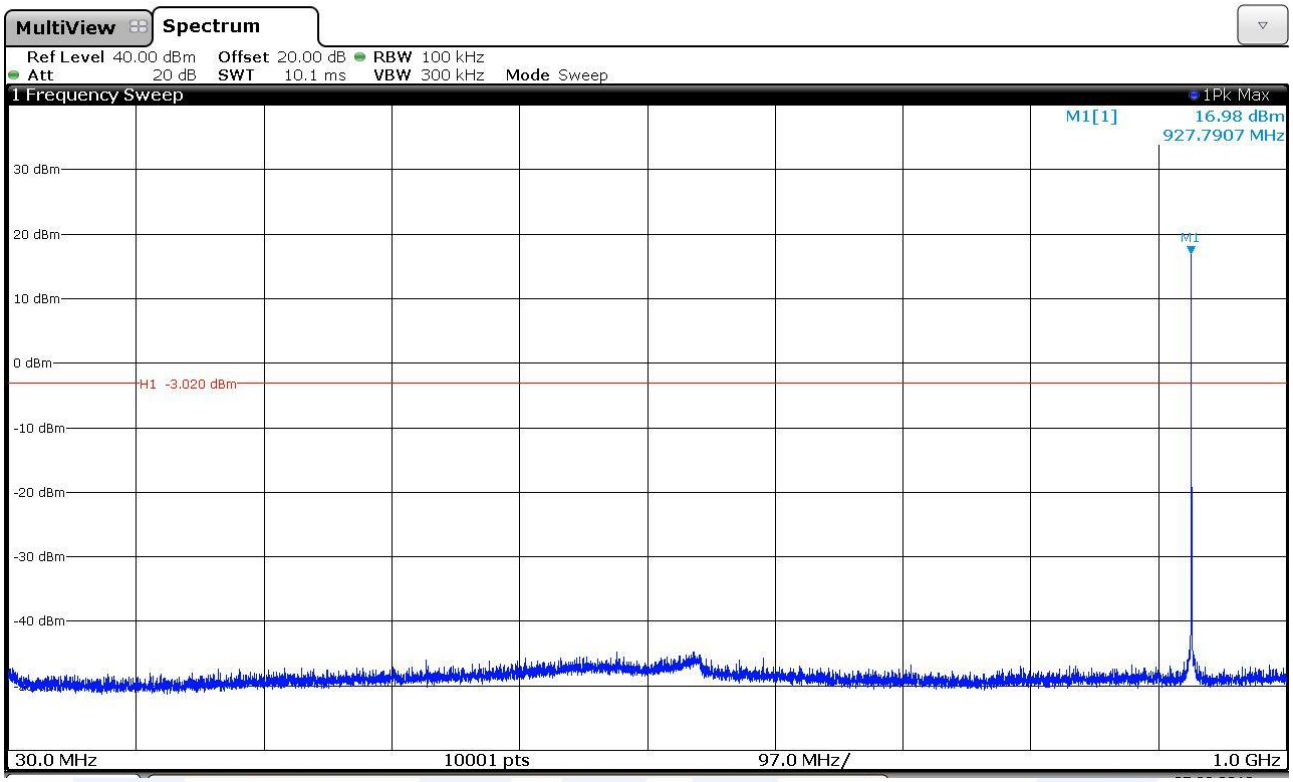
Gandini 17227605



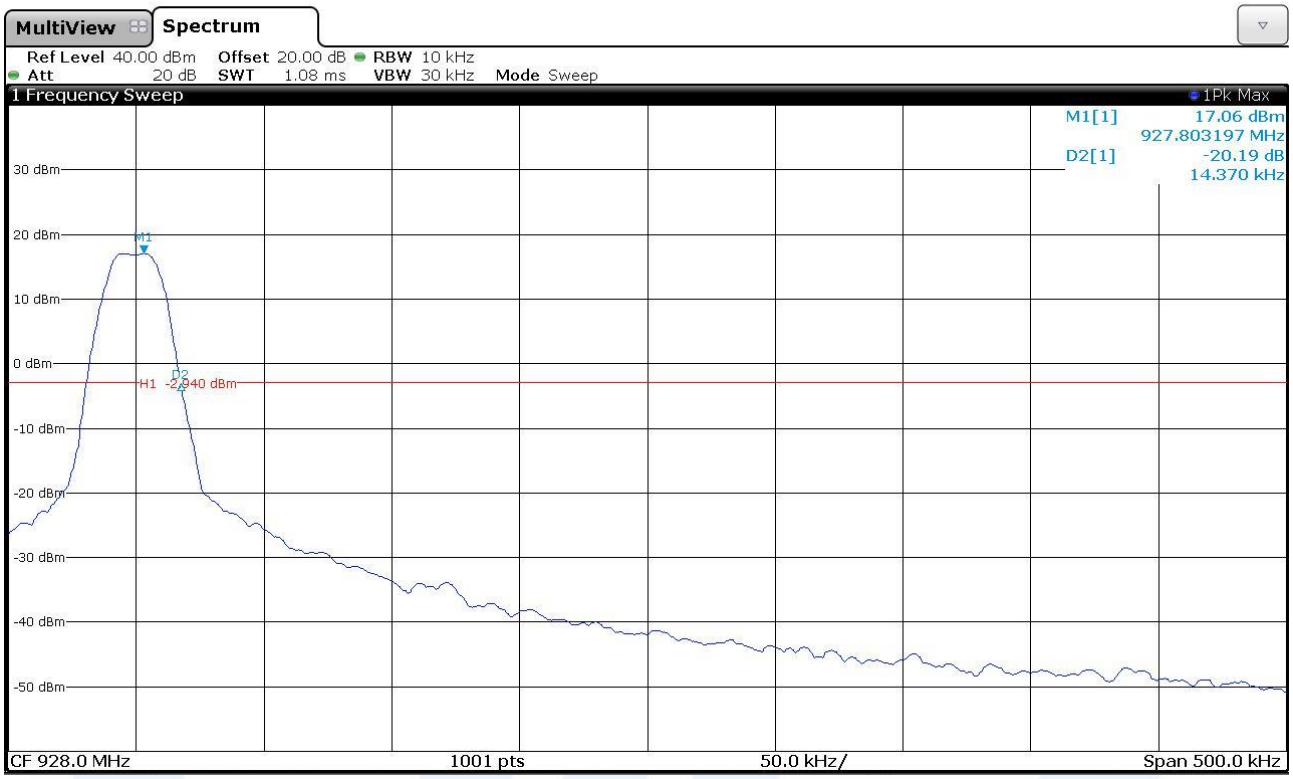
Gandini 17227606



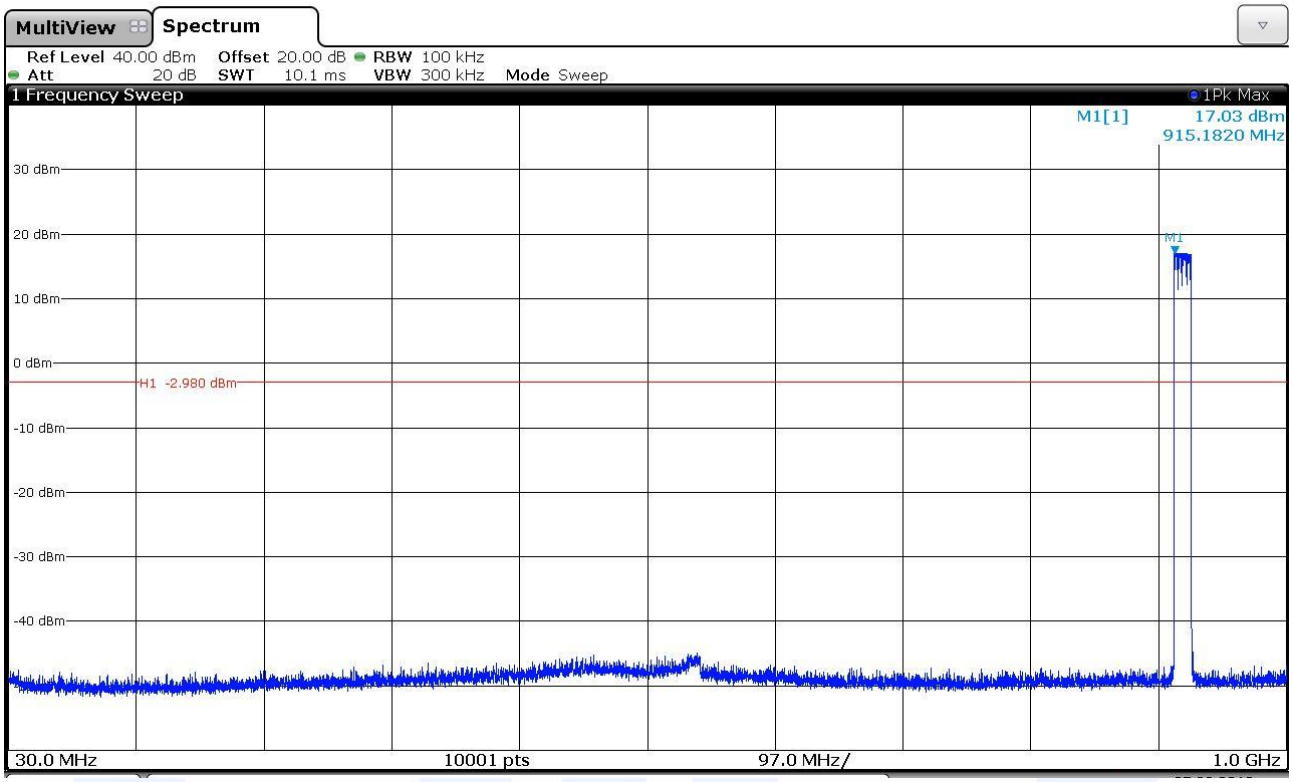
Gandini 17227607



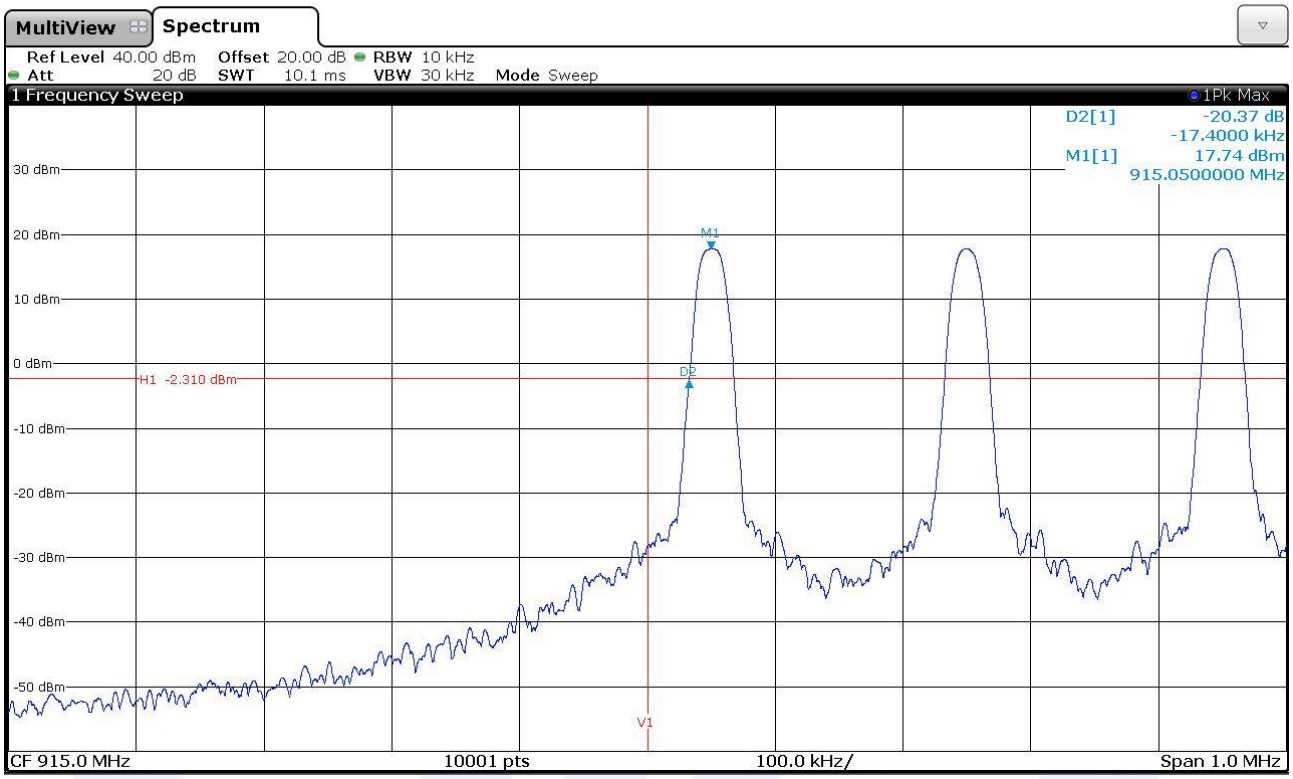
Gandini 17227608



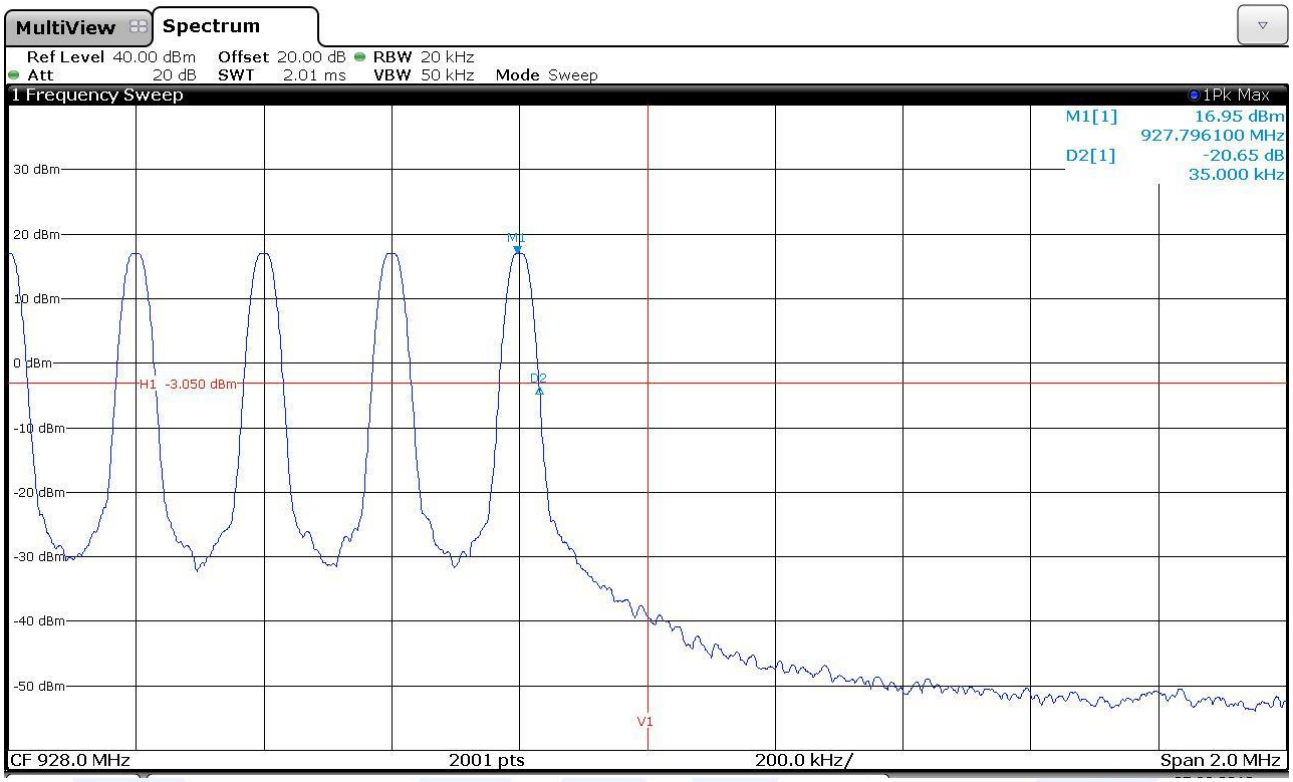
Gandini 17227618



Gandini 17227619



Gandini 17227620



Result: The requirements are met

11.9 Peak Output Power

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

Test configuration and test method

Test site:
Laboratory

Auxiliary equipment:
See clause 4 of this test report

EUT exercising

See clause 4 of this test report

Test equipment used

CMC S108, CMC S136, CMC S164
Measurement uncertainty: See clause 7 of this test report

Test specification

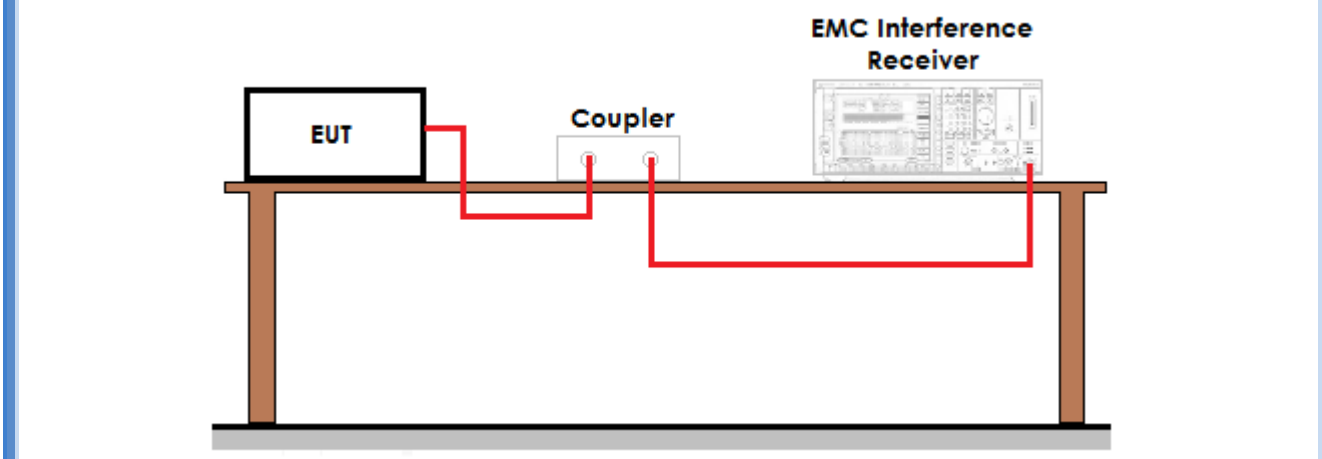
Port: Antenna

Environmental conditions

Temperature (°C)	*Atmospheric pressure (kPa)*	*Relative humidity (%)*
20	100	45

Acceptance limits: for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt

Setup

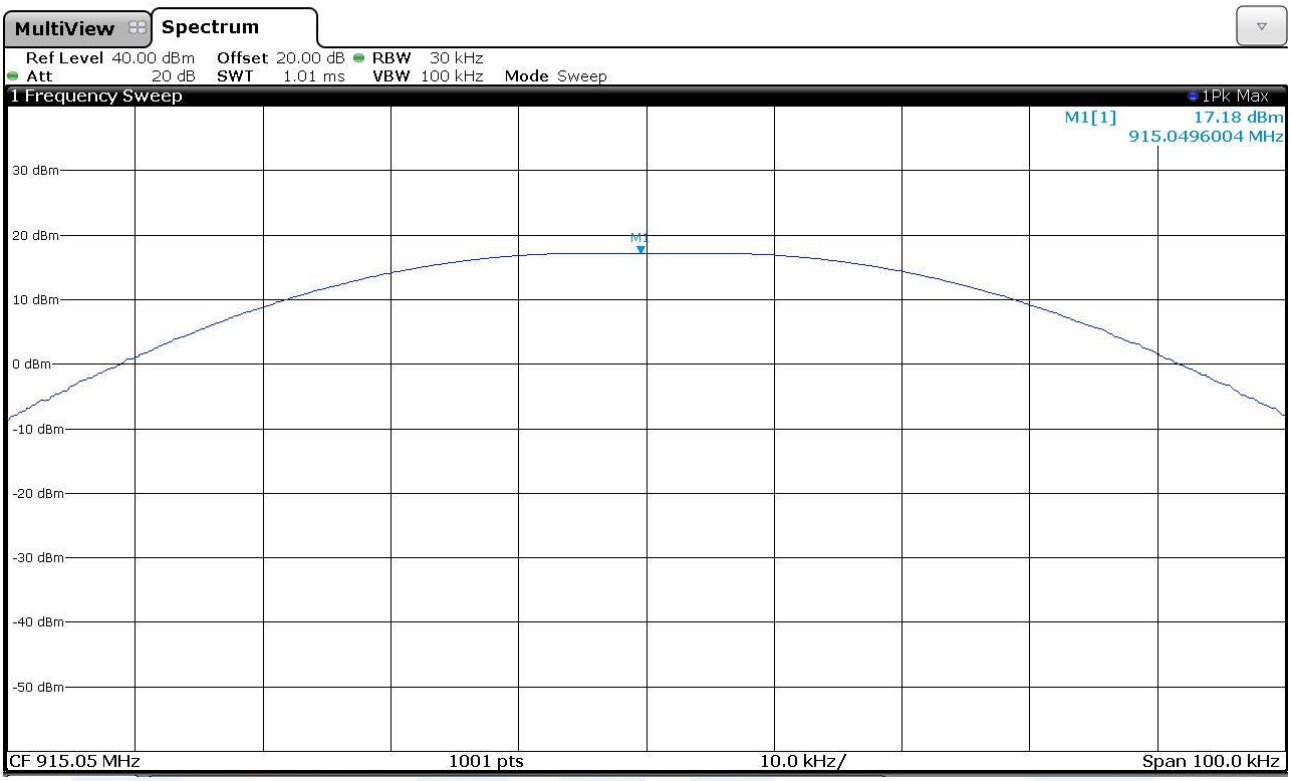


Result

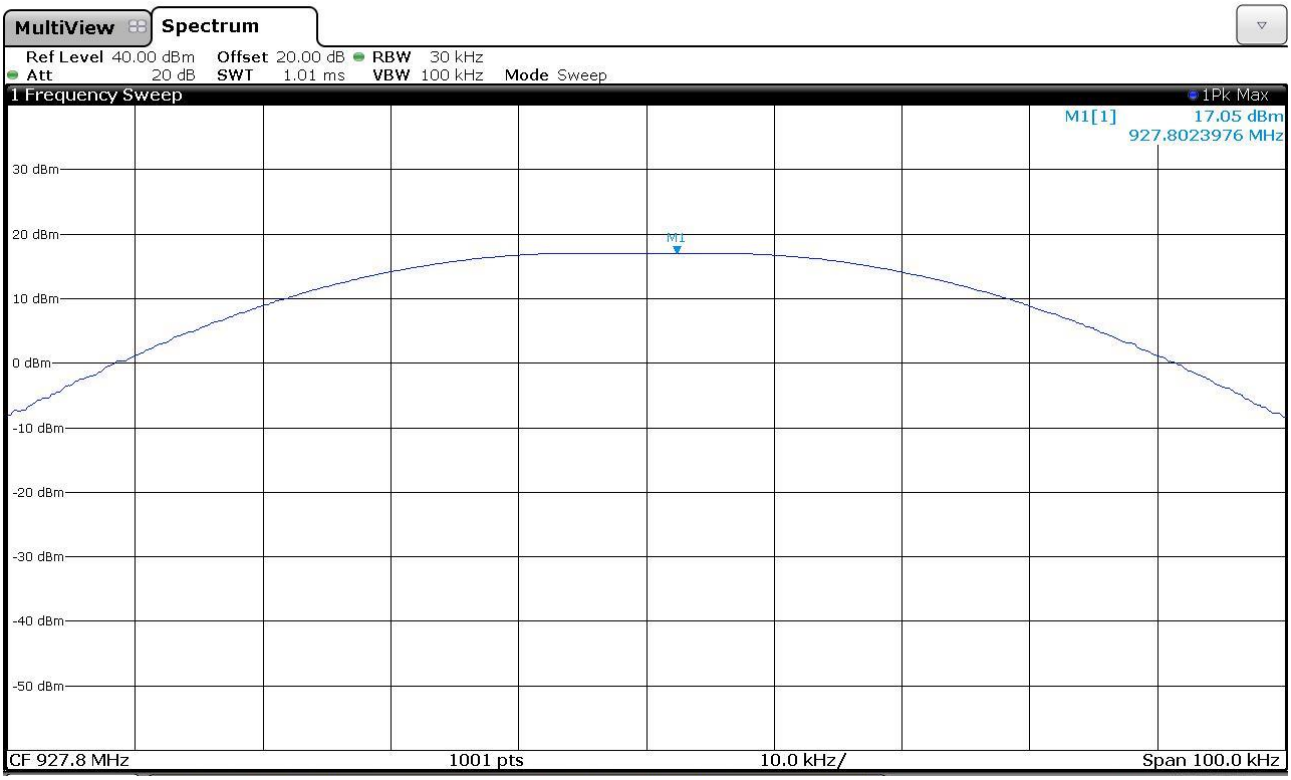
Frequency (MHz)	*Graphs*	*Conducted measured level (dBm)*	*Conducted power level (mW)*	*Calculated radiated level (dBµV/m)*
915,0496	G17227603	17,18	52,24	114,41
921,3964	G17227621	17,03	50,47	114,26
927,8024	G17227609	17,05	50,70	114,28

Graphs

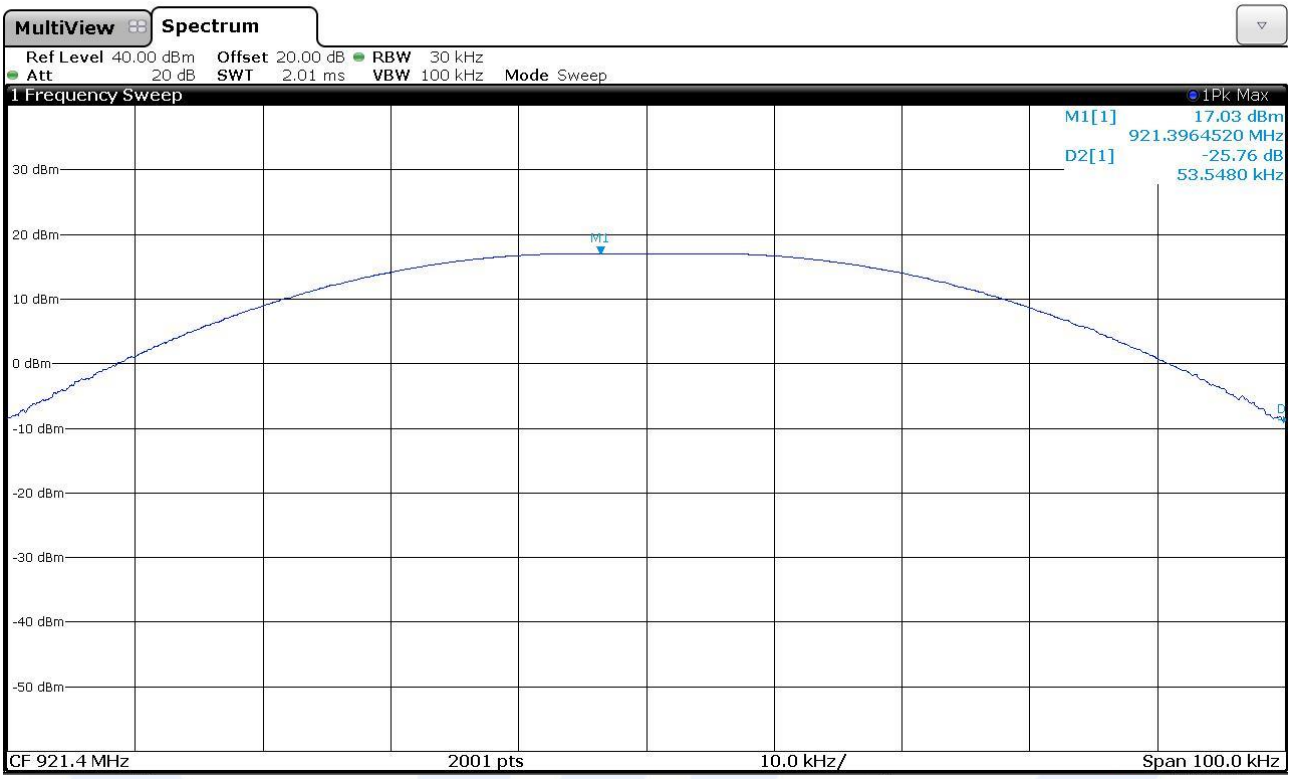
Gandini 17227603



Gandini 17227609



Gandini 17227621



Result: The requirements are met

11.10 Spurious Emission

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.205 and 15.209
- DA 00-705
- Internal procedure PM001
- See clause 4 of this test report

Test configuration and test method

Test site:
Semi-anechoic chamber

Auxiliary equipment:
See clause 4 of this test report

EUT exercising

See clause 4 of this test report

Test equipment used

CMC S108, CMC S136, CMC S164
Measurement uncertainty: See clause 7 of this test report

Test specification

Port: Enclosure
Frequency range: 0,009 MHz – 10000 MHz
Antenna polarization: Horizontal (H) – Vertical (V)
10 m for frequencies ≤ 30 MHz
3 m for frequencies > 30 MHz

Environmental conditions

Temperature (°C)	*Atmospheric pressure (kPa)*	*Relative humidity (%)*
22	100	45

Acceptance limits

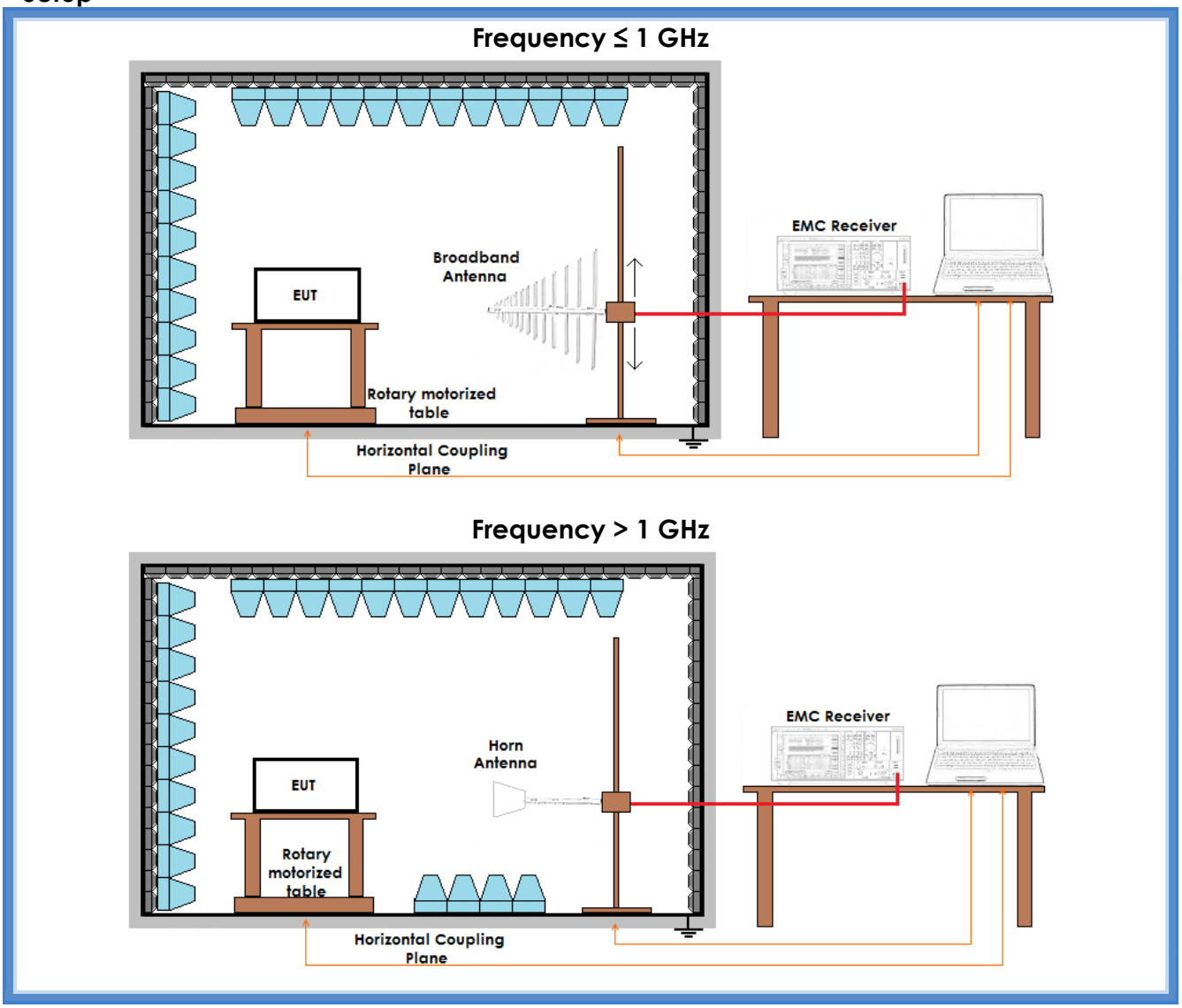
Acceptance limits for emissions in restricted frequency bands		
Frequency (MHz)	*AV limits [dB(µV/m)]*	*Peak limits [dB(µV/m)]*
> 1000	54	74

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.

Setup



Result – AV detector

Harmonic	Lowest channel		Medium channel		Highest channel		Results
	Level (dBµV/m)	Limits (dBµV/m)	Level (dBµV/m)	Limits (dBµV/m)	Level (dBµV/m)	Limits (dBµV/m)	
II	41,77	54,00	39,79	54,00	39,22	54,00	Complies
III	More than 20 dB below limit	54,00	More than 20 dB below limit	54,00	43,00	54,00	Complies
IV	More than 20 dB below limit	54,00	More than 20 dB below limit	54,00	More than 20 dB below limit	54,00	Complies
V	44,90	54,00	45,37	54,00	45,76	54,00	Complies
VI	42,56	54,00	44,60	54,00	44,99	54,00	Complies
VII	43,10	54,00	44,88	54,00	More than 20 dB below limit	54,00	Complies
VIII	47,99	54,00	48,54	54,00	46,06	54,00	Complies
IX	49,85	54,00	47,71	54,00	More than 20 dB below limit	54,00	Complies
X	50,36	54,00	50,62	54,00	51,24	54,00	Complies

Remarks: EUT was tested in 3 orthogonal planes. The results in this table show the highest values. No spurious other then harmonics have been found. The results have been extrapolated to the specified distance using an extrapolation factor. For all harmonics it was considered the limit of 54 dBµV/m as a worse case.

Result – Peak detector

Harmonic	Lowest channel		Medium channel		Highest channel		Results
	Level (dBµV/m)	Limits (dBµV/m)	Level (dBµV/m)	Limits (dBµV/m)	Level (dBµV/m)	Limits (dBµV/m)	
II	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	Complies
III	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	Complies
IV	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	Complies
V	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	Complies
VI	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	Complies
VII	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	Complies
VIII	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	Complies
IX	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	Complies
X	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	More than 20 dB below limit	74,00	Complies

Remarks: EUT was tested in 3 orthogonal planes. The results in this table show the highest values. No spurious other then harmonics have been found. The results have been extrapolated to the specified distance using an extrapolation factor. For all harmonics it was considered the limit of 74 dBµV/m as a worse case.

Result: The requirements are met

11.11 Maximum permissible exposure

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 1.1310
- Internal procedure PM001
- See clause 4 of this test report

Test configuration

Test site:
Laboratory

Auxiliary equipment:
See clause 4 of this test report

EUT exercising

See clause 4 of this test report

Test equipment used

CMC S108, CMC S136, CMC S164
Measurement uncertainty: See clause 7 of this test report

Test specification

Port: Antenna

Acceptance limits	1 mW/cm^2 max at 20 cm of distance

Result

Power Density Limit (mW/cm2)	*Maximum Output Power (mW)*	*Antenna Gain (G)*	*Power Density at 20 cm (mW/cm2)*	*Remarks*
1,00	52,24	1,585 (2 dBi)	1,65E-02	--
Remarks: Power Density = (P x G) / (4πR^2)				

Result: The requirements are met