



TEST REPORT nr. R19132401

Federal Communication Commission (FCC)

Test item

Description: TRANSCEIVER UNIT
Trademark: AUTEC
Model/Type: Model J8P Type NJ555
FCC ID: OQA-J8PNJ555

Test Specification

Standard: FCC Rules & Regulations, Title 47:2018
Part 15 paragraph(s): 203, 204, 205, 207, 209 and 247

Client's name: AUTEC S.r.l.
Address: Via Pomaroli, 65 – 36030 Caldogno (VI) – ITALY

Manufacturer's name : Same as client
Address: --

Report

Tested by: G. Gandini
Approved by: R. Beghetto – Laboratory Manager
Date of issue: 21.10.19
Contents: 93 pages

Giovanni Gandini
.....
R. Beghetto
.....

This test report shall not be reproduced except in full without the written approval of CMC.
The test results presented in this report relate only to the item tested.



Index

1. SUMMARY.....	3
2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT).....	4
2.1 TEST SITE	4
3. TESTING AND SAMPLING.....	4
4. OPERATIVE CONDITIONS.....	4
5. PHOTOGRAPH(S) OF EUT.....	5
5.1 PHOTOGRAPH(S) OF EUT	5
6. EQUIPMENT LIST.....	9
7. MEASUREMENT UNCERTAINTY.....	10
8. REFERENCE DOCUMENTS.....	12
9. DEVIATION FROM TEST SPECIFICATION.....	13
10. TEST CASE VERDICTS.....	13
11. RESULTS.....	14
11.1 ANTENNA REQUIREMENTS	15
11.2 RADIATED EMISSIONS AND SPURIOUS EMISSIONS	16
11.3 20 DB BANDWIDTH.....	70
11.4 CHANNEL SEPARATION	74
11.5 NUMBER OF HOPPING CHANNELS	77
11.6 TIME OF OCCUPANCY	80
11.7 BAND EDGE.....	84
11.8 PEAK OUTPUT POWER	90



1. Summary

Standard:

FCC Rules & Regulations, Title 47:2018

Part 15 paragraph(s): 203, 204, 205, 207, 209 and 247

Test specifications	Environmental Phenomena	Tests sequence	Result
Part 15.247 (a) (1)	Pseudo randomly ordered list of hopping frequencies	1	Complies
Part 15.203	Antenna requirements	2	Complies
Part 15.207	Conducted emissions	--	N.A. (+)
Part 15.209	Radiated emissions and spurious emission	3	Complies
Part 15.247	20 dB Bandwidth	4	Complies
Part 15.247	Channel Separation	5	Complies
Part 15.247	Number of Hopping Channel	6	Complies
Part 15.247	Time of occupancy	7	Complies
Part 15.247	Band edge	8	Complies
Part 15.209 and 15.247	Peak Output Power	9	Complies

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

The Test Report was given to the Client representatives for necessary documentation of ratification of the tested equipment and it is valid for the FCC certification

2. Description of Equipment under test (EUT)

Power supply	: 7,2 Vdc from battery
Type of equipment	: ☒ Transmitter Unit
	: ☒ Receiver Unit
Type of station	: ☐ Fixed station
	: ☒ Portable station
	: ☐ Mobile station
Frequency band.....	: 902 – 928 MHz
Nominal frequencies	: F_L : 915,075 MHz F_M : 921,425 MHz F_H : 927,825 MHz
Pseudo randomly ordered list of hopping frequencies	: See document j8p_nj555_operational_description-rev0

2.1 Test Site

Company: CMC Centro Misure Compatibilità S.r.l.
Address: Via della Fisica, 20
36016 Thiene (VI) – ITALY
Test site facility's FCC registration number: 182474

3. Testing and sampling

Date of receipt of test item	: 03.06.19
Testing start date	: 26.06.19
Testing end date	: 06.08.19
Samples tested nr.....	: 1
Sampling procedure.	: Equipment used for testing was picked up by the manufacturer, at the end of the production process with random criterion
Internal identification	: adhesive label with the product number P190712

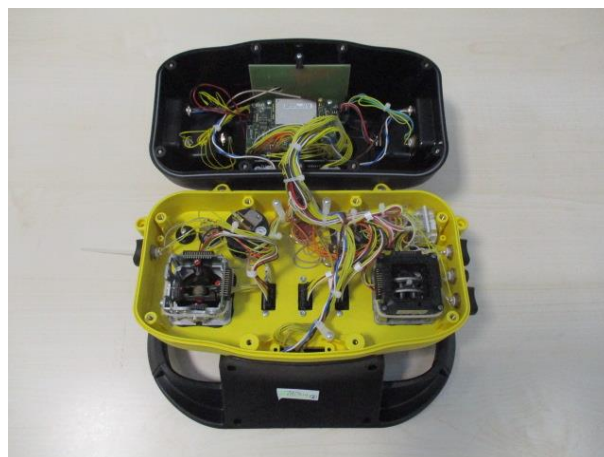
4. Operative conditions

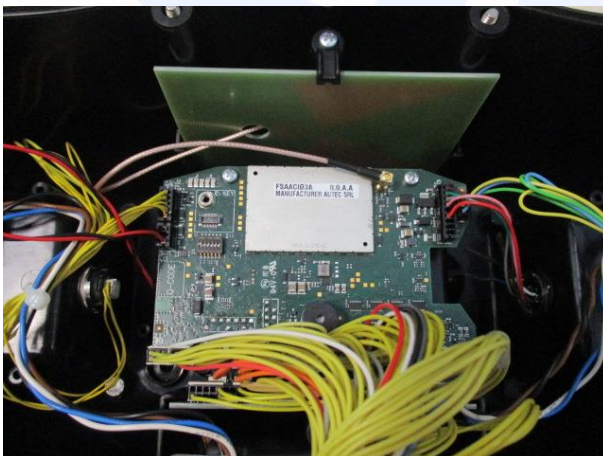
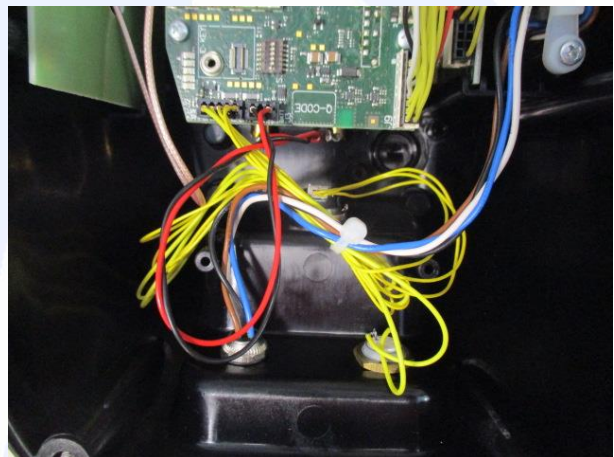
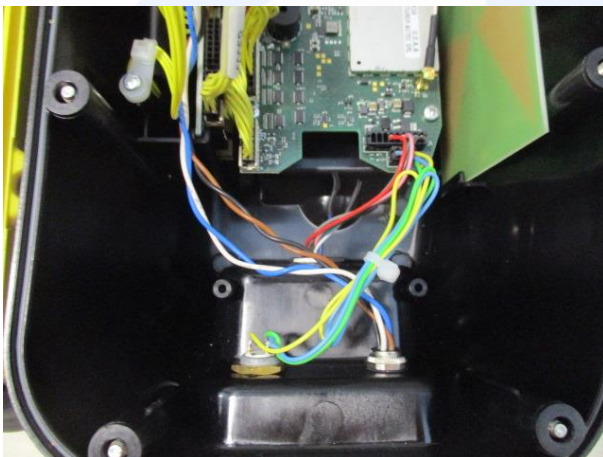
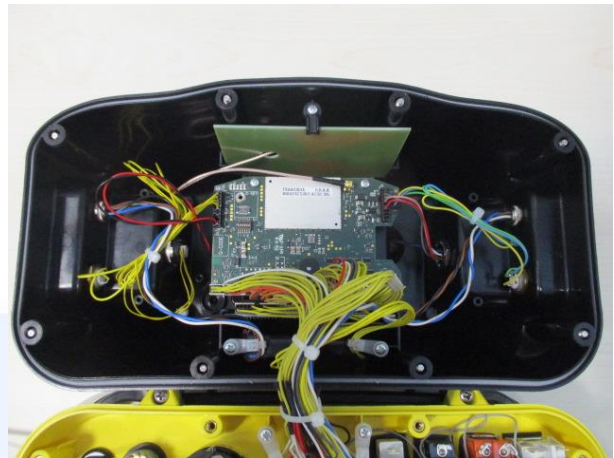
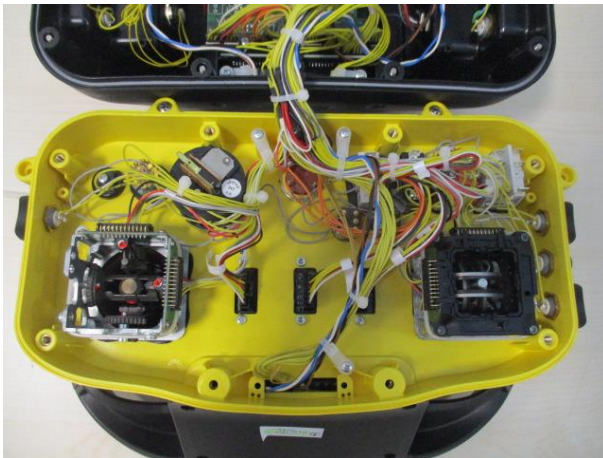
EUT exercising: EUT in continuous transmission at maximum power
Auxiliary equipment: Transceiver unit Model CRP

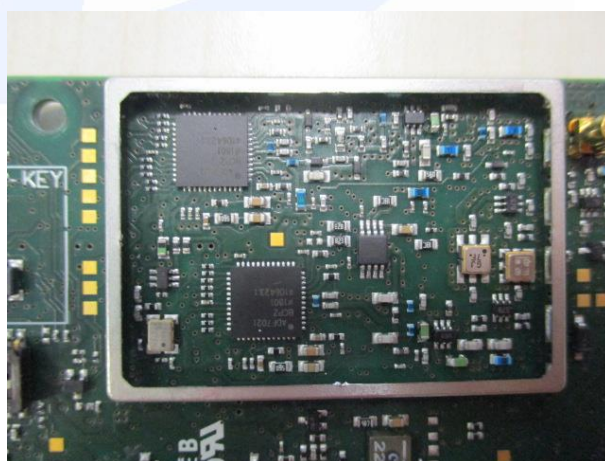
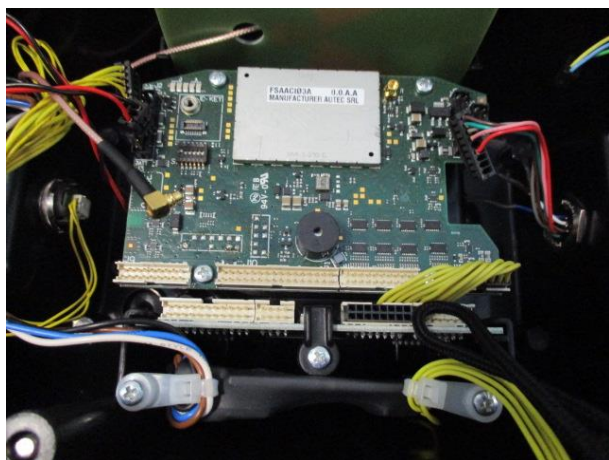


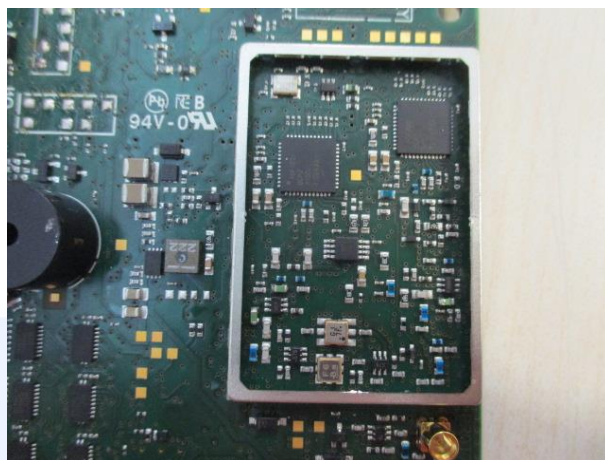
5. Photograph(s) of EUT

5.1 Photograph(s) of EUT











6. Equipment list

<i>Id. number</i>	<i>Manufacturer</i>	<i>Model</i>	<i>Description</i>	<i>Serial number</i>	<i>Last calibration</i>	<i>Due date calibration</i>
CMC S108	EMCO	3115	Horn Antenna	9811-5622	June '16	June '19
CMC S127	Schaffner	HLA6120	Loop Antenna	1191	November '18	November '23
CMC S164	Rohde & Schwarz	ESU26	EMC interference receiver	100052	January '19	January '20
CMC S227	Rohde & Schwarz	ESR7	EMI Test Receiver 7GHz	101121	January '19	January '20
CMC S260	CMC	Wfr_N	Shielded Cable	Wfr_ant10-1	November '18	November '19
CMC S261	CMC	Wfr_N	Shielded Cable	Wfr_ant20-1	November '18	November '19
CMC S262	CMC	Wfr_N_fix	Shielded Cable	Wfr_fix32-1	November '18	November '19
CMC S263	CMC	Wfr_N_fix	Shielded Cable	Wfr_fix31-1	November '18	November '19
CMC S264	CMC	Wfr_N	Shielded Cable	Wfr_ext03-1	November '18	November '19
CMC S271	Schwarzbeck	BBA 9106 + VHBB 9124	Biconical Antenna (30-300MHz)	831	June '16	June '19
CMC S287	Schwarzbeck	VUSLP 9111B	Log-periodic Antenna (200 MHz-3GHz)	9111B-203	June '16	June '19
CMC S288	CMC	W_sma_white	Joint Shielded Cable	W_001	November '18	November '19



7. Measurement uncertainty

Test	Test Setup	Expanded uncertainty	Note
Conducted emission CISPR 16 LISN 50uH 0,009-0,0150MHz	PE001_01	3,4 dB	1
Conducted emission CISPR 16 LISN 50uH 0,150-30,0MHz	PE001_01	3,0 dB	1
Conducted emission CISPR 16 Voltage Probe 0,15-30MHz	PE001_02	2,9 dB	1
Conducted emission CISPR 16 Current Probe 0,15-30MHz	PE001_03	2,6 dB	1
Conducted emission CISPR 16 ISN 0,15-30MHz	PE001_04	4,7 dB	1
Clic CISPR 16 LISN 50uH 0,150-30,0MHz	PE001_05	3,1 dB	1
Disturbance Power 30-300 MHz	PE002_01	3,6 dB	1
Radiated Emission LAS 0,15-30MHz	PE003_01	2,0 dB	1
Radiated Emission CISPR 16 Loop Ant. 0,15-30MHz	PE004_01	4,0 dB	1
Radiated Emission CISPR 16 Bicon. Ant. 30-300MHz	PE004_02	3,9 dB	1
Radiated Emission CISPR 16 LogP. Ant. 300-1000MHz	PE004_03	3,8 dB	1
Radiated Emission CISPR 16 Horn Ant. 1-18GHz	PE004_04	4,2 dB	1
Human Exposure to electromagnetic fields	PE005_01	23,6 %	1
Harmonic current emissions test	PE006_01	10 mA + 2,6 %	1
Voltage fluctuation and flicker test	PE007_01	4,8 %	1
Radiated Immunity 80MHz-6GHz	PE102_XX	2,1 dB 0,82 V/m a 3V/m	1
Conducted Immunity 0,15-230MHz	PE105_XX	1,2 dB 0,44 V a 3V	1
AC Magnetic field	PE106_01	1,55 % 0,15 A/m a 10A/m	1
Pulse Magnetic field	PE107_01	6,25 % 18,7 A/m a 300A/m	1
Dumped Magnetic field	PE108_01	6,25 % 1,87 A/m a 30A/m	1
Common mode conducted immunity	PE112_01	2,21 % 0,22 V a 10V	1



Test	Test Setup	Expanded uncertainty	Note
Power/Spurious 9kHz-30MHz	PR001_01	4,0 dB	1
Power/Spurious ERP 30-1000MHz d=10m	PR001_02+03	4,7 dB	1
Misura della potenza EIRP 1-18GHz d=3m	PR001_04	4,7 dB	1
Misura della potenza EIRP 18-40GHz d=3m	PR001_05	5,4 dB	1
Frequency error	PR002_01+02	< 1x10 ⁻⁷	1
Timing zero span (1001pts.)	PR002_01+02	0,2 % SWT	1
Modulation bandwidth	PR002_01+02	< 1x10 ⁻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
Rev_19_02 date 27/03/2019			

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



8. Reference documents

Reference no.	Description
FCC Rules and Regulation Title 47 part 15:2018 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
Internal Procedure PM001 rev. 3.0 (Quality Manual)	Measure Procedure
Internal procedure INC_M rev. 9.1 (Quality Manual)	Measurement uncertainty calculation



9. Deviation from test specification

None

10. Test case verdicts

Test case does not apply to the test object : N.A.

Test item does meet the requirement : Complies

Test item does not meet the requirement : Does not comply

Test not performed : N.E.

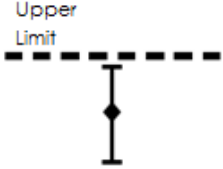
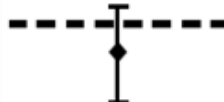
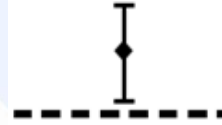


11. Results

In this clause tests results are reported.

Measurement uncertainty is in accordance with document CMC INC_M rev. 9.1.

Judgement of compliance:

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

In agreement with ILAC-G8: 03/2009 Guidelines on the Reporting of Compliance with Specification.



11.1 Antenna requirements

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.203 and 15.204
- 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

--
Measurement uncertainty: See clause 7 of this test report

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, or § 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 § 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	External R.F. power amplifier	Gain	Remarks
Dedicated antenna	Not Present	2 dBi	--



11.2 Radiated emissions and spurious emissions

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part. 15.209
- 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 S127, CMC S164, CMC S271, CMC S287
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 $\leq$ 30 MHz
3 m for frequencies $>$ 30 MHz

Environmental conditions

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

Acceptance limits

Frequency range (MHz)	Test distance (m)	Limits [dB(μ V/m)]
0,009 to 0,490	300	48,5 to 13,8
0,490 to 1,705	30	33,8 to 22,9
1,705 to 30	30	29,5
30 to 88	3	40
88 to 216	3	43,5
216 to 960	3	46,0
Above 960	3	53,9

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, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. The results have been extrapolated to the specified distance using an extrapolation factor



Acceptance limits for emissions in restricted frequency bands

Frequency (MHz)	Test distance (m)	AV limits [dB(μV/m)]	Peak limits [dB(μV/m)]
Above 1000	3	54	74

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, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. The results have been extrapolated to the specified distance using an extrapolation factor

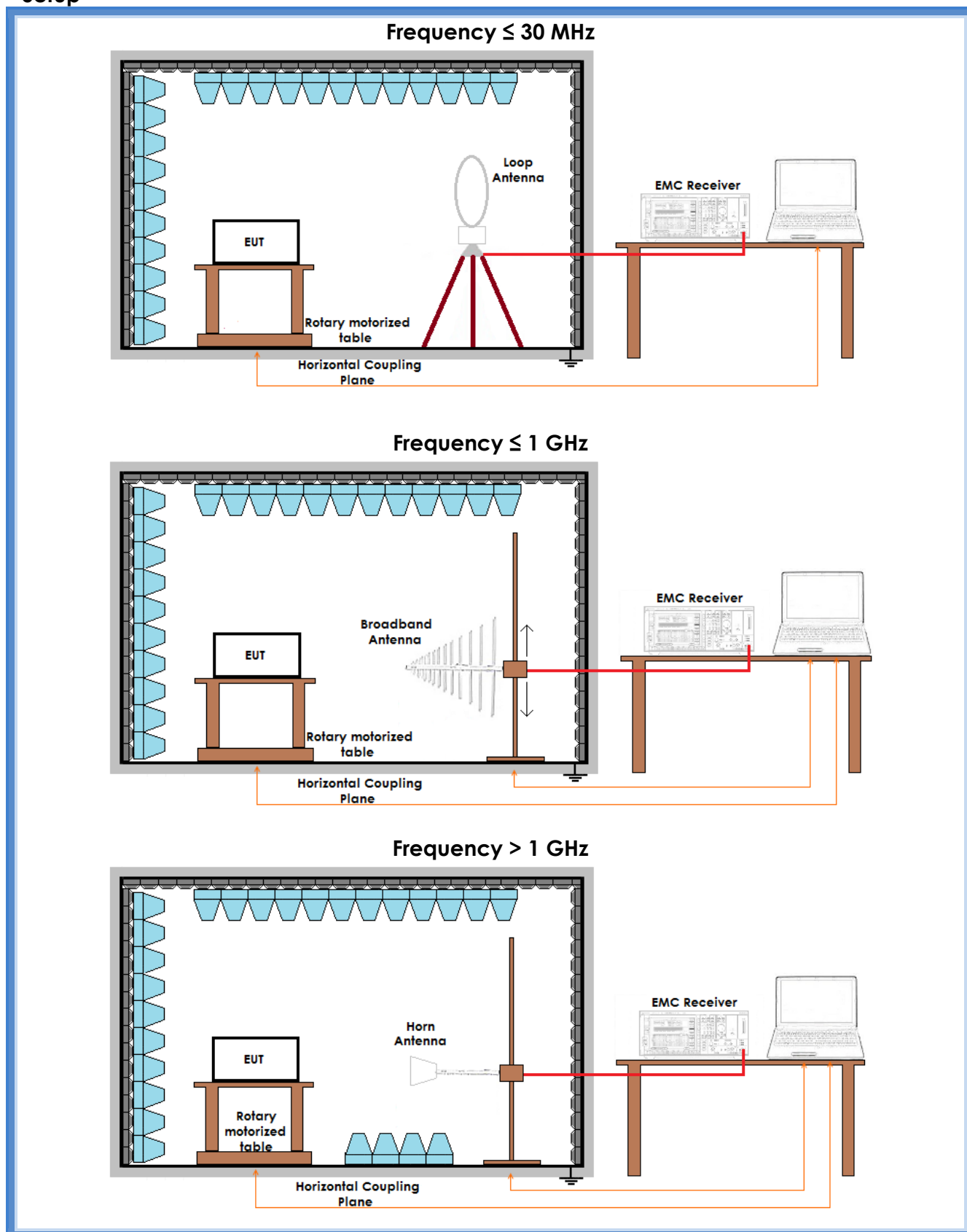
The restricted frequency bands are listed in the following table

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

Polarization	Frequency Range (MHz)	Graphs	Remarks	Result
H	30 – 300	G19132401	Lowest channel	Complies
V	30 – 300	G19132402	Lowest channel	Complies
V	30 – 300	G19132403	Medium channel	Complies
H	30 – 300	G19132404	Medium channel	Complies
H	30 – 300	G19132405	Highest channel	Complies
V	30 – 300	G19132406	Highest channel	Complies
H	300 – 1000	G19132407	Lowest channel	Complies
V	300 – 1000	G19132408	Lowest channel	Complies
V	300 – 1000	G19132409	Medium channel	Complies
H	300 – 1000	G19132410	Medium channel	Complies
H	300 – 1000	G19132411	Highest channel	Complies
V	300 – 1000	G19132412	Highest channel	Complies
V	3300 – 10000	G19132413	Lowest channel	Complies
H	3300 – 10000	G19132414	Lowest channel	Complies
H	3300 – 10000	G19132415	Medium channel	Complies
V	3300 – 10000	G19132416	Medium channel	Complies
V	3300 – 10000	G19132417	Highest channel	Complies
H	3300 – 10000	G19132418	Highest channel	Complies
H	1000 – 3300	G19132419	Lowest channel	Complies
V	1000 – 3300	G19132420	Lowest channel	Complies
V	1000 – 3300	G19132421	Medium channel	Complies
H	1000 – 3300	G19132422	Medium channel	Complies
H	1000 – 3300	G19132423	Highest channel	Complies
V	1000 – 3300	G19132424	Highest channel	Complies
Loop	0,009 – 30	G19132425	Worst case	Complies

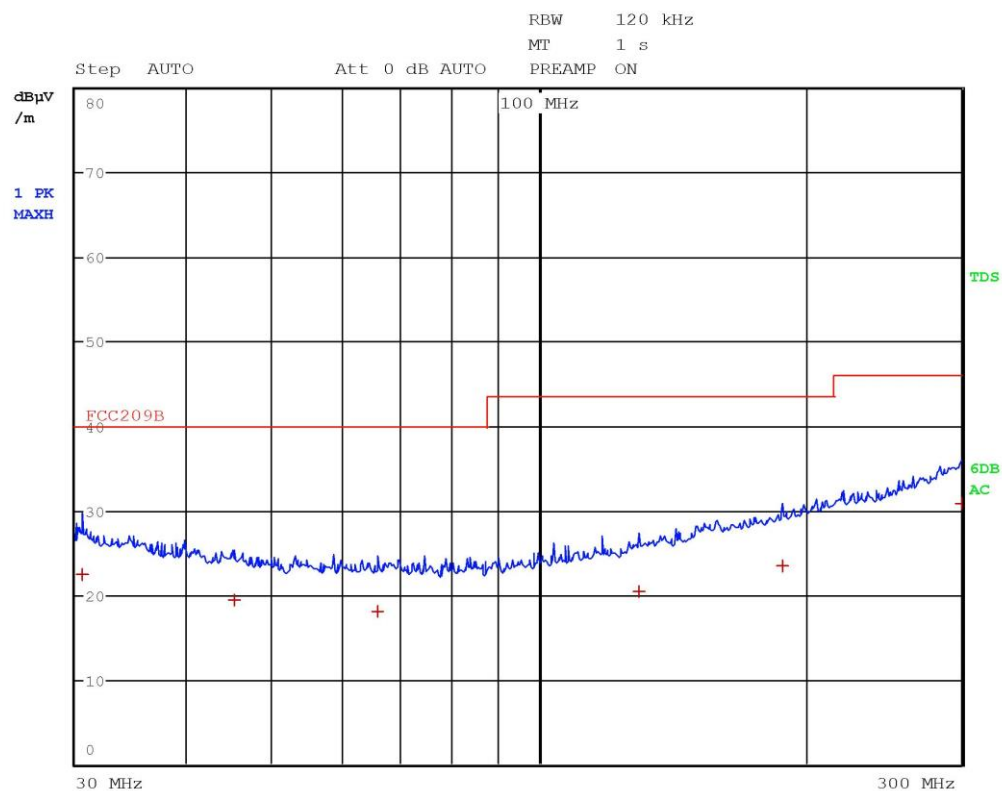
Remarks: EUT was tested in 3 orthogonal planes, graphs are related to the highest detected levels. Measurements at frequencies lower than 30 MHz have been performed with an EUT – antenna distance of 10 m. Measured values have been corrected with conversion factor $40\log(\text{test distance}/10)$ based 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

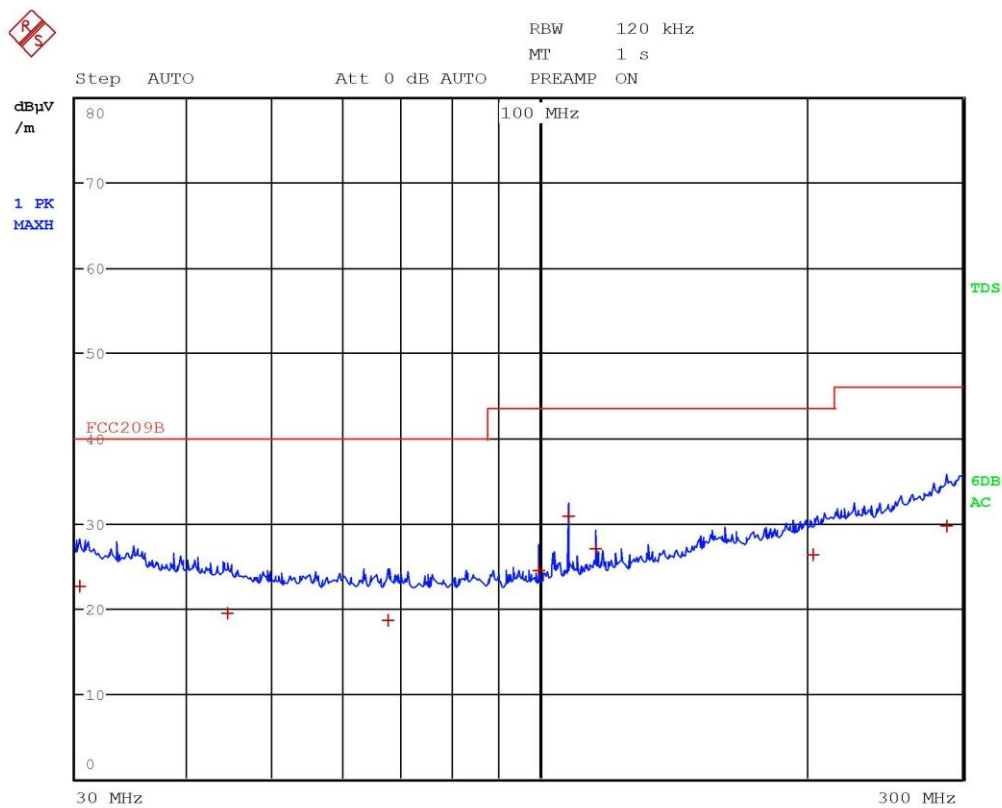


Gandini 19132401



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	30.56 MHz	22.50	-17.49
1 Quasi Peak	45.24 MHz	19.49	-20.50
1 Quasi Peak	65.76 MHz	18.06	-21.93
1 Quasi Peak	129.56 MHz	20.37	-23.14
1 Quasi Peak	188.12 MHz	23.52	-19.99
1 Quasi Peak	300 MHz	30.86	-15.15

Gandini 19132401

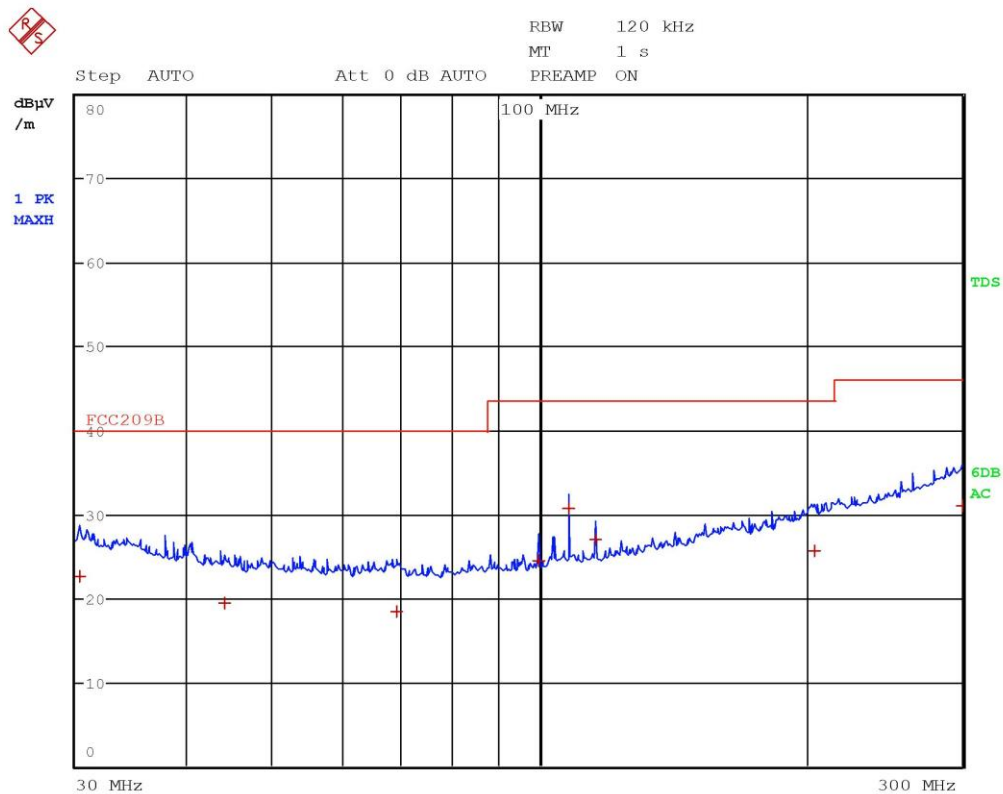


Gandini 19132402



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	30.32 MHz	22.52	-17.47
1 Quasi Peak	44.44 MHz	19.46	-20.54
1 Quasi Peak	67.52 MHz	18.56	-21.43
1 Quasi Peak	99.84 MHz	24.53	-18.99
1 Quasi Peak	107.808012821 MHz	30.76	-12.75
1 Quasi Peak	115.8 MHz	26.98	-16.53
1 Quasi Peak	204 MHz	26.28	-17.23
1 Quasi Peak	288.04 MHz	29.62	-16.39

Gandini 19132402



Gandini 19132403

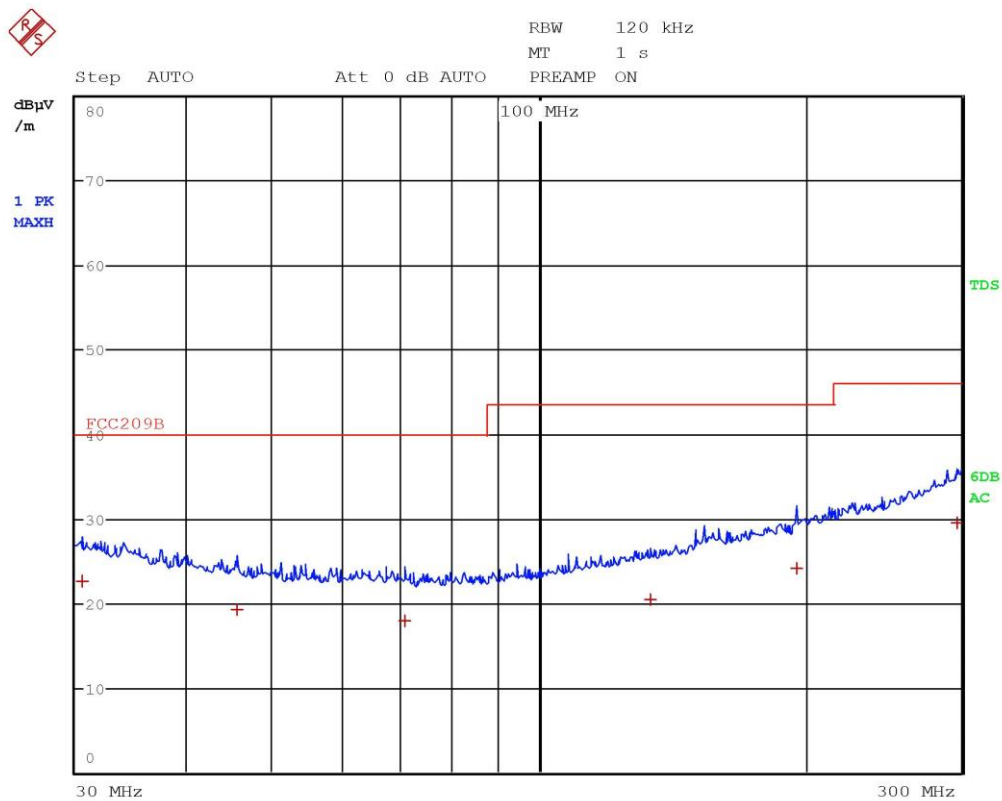


PEAK FREQUENCY

4

EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	30.32 MHz	22.54	-17.45
1 Quasi Peak	44.2 MHz	19.46	-20.53
1 Quasi Peak	69 MHz	18.45	-21.54
1 Quasi Peak	99.8 MHz	24.44	-19.07
1 Quasi Peak	107.8 MHz	30.65	-12.87
1 Quasi Peak	115.8 MHz	27.00	-16.51
1 Quasi Peak	204.04 MHz	25.62	-17.89
1 Quasi Peak	299.96 MHz	31.03	-14.98

Gandini 19132403

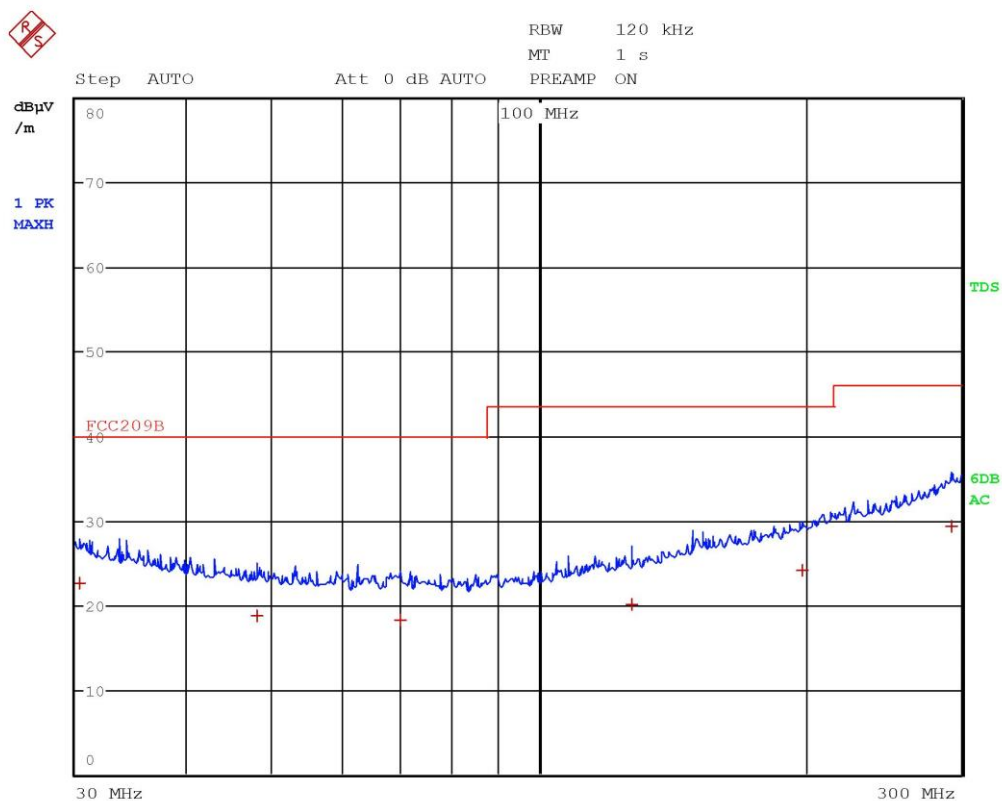


Gandini 19132404



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	30.52 MHz	22.52	-17.47
1 Quasi Peak	45.6 MHz	19.26	-20.73
1 Quasi Peak	70.56 MHz	17.95	-22.04
1 Quasi Peak	133.52 MHz	20.46	-23.05
1 Quasi Peak	195.4 MHz	24.09	-19.43
1 Quasi Peak	296.52 MHz	29.47	-16.54

Gandini 19132404

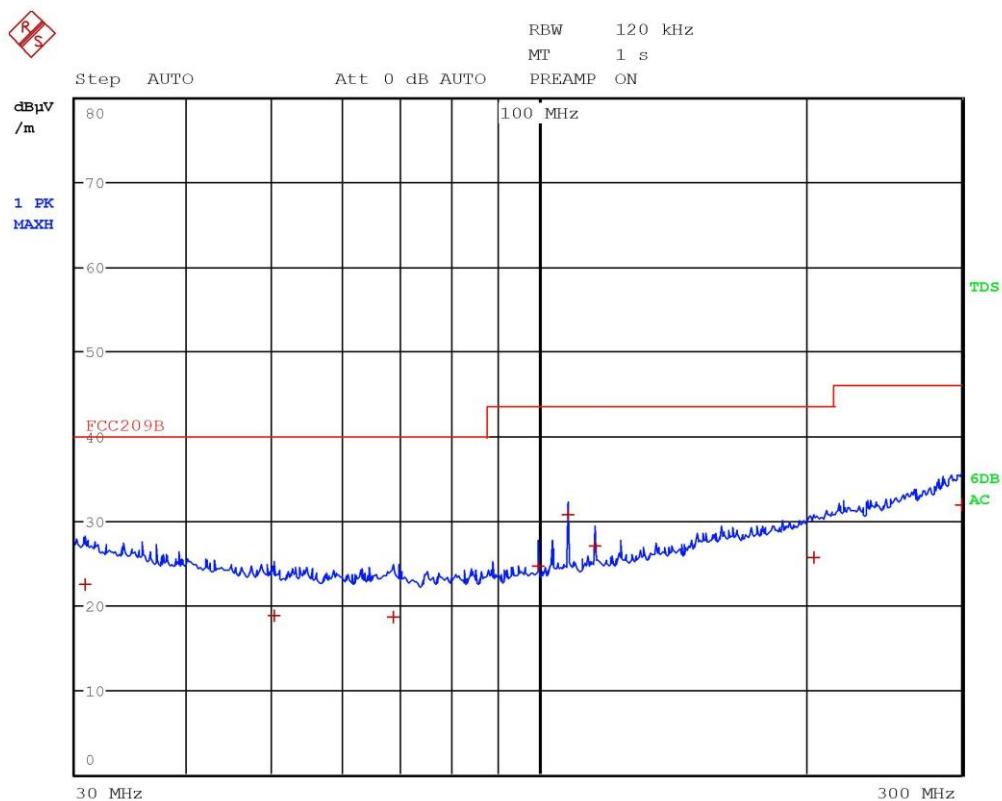


Gandini 19132405



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	30.28 MHz	22.59	-17.40
1 Quasi Peak	48 MHz	18.68	-21.32
1 Quasi Peak	69.88 MHz	18.15	-21.84
1 Quasi Peak	127.48 MHz	20.06	-23.45
1 Quasi Peak	198.48 MHz	24.18	-19.33
1 Quasi Peak	292.04 MHz	29.31	-16.70

Gandini 19132405



Gandini 19132406



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	30.72 MHz	22.43	-17.56
1 Quasi Peak	50.28 MHz	18.74	-21.25
1 Quasi Peak	68.48 MHz	18.52	-21.47
1 Quasi Peak	99.84 MHz	24.68	-18.83
1 Quasi Peak	107.8 MHz	30.59	-12.93
1 Quasi Peak	115.8 MHz	26.98	-16.53
1 Quasi Peak	204.04 MHz	25.56	-17.95
1 Quasi Peak	300 MHz	31.86	-14.16

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