



TEST REPORT nr. R18197401

Federal Communication Commission (FCC)

Test item

Description: TRANSCEIVER UNIT
Trademark: AUTEC
Model/Type: Model J2F Type NZ322
FCC ID: OQA-J2FNZ322

Test Specification

Standard: FCC Rules & Regulations, Title 47:2017
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: 08.01.19
Contents: 85 pages

G. 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.



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1. Summary

Standard:

FCC Rules & Regulations, Title 47:2017

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	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
Part 15.209	Spurious emission	10	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

Serial Number : --

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 j2f_nz322_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	: 11.09.18
Testing start date	: 02.10.18
Testing end date	: 18.12.18
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 P181090

4. Operative conditions

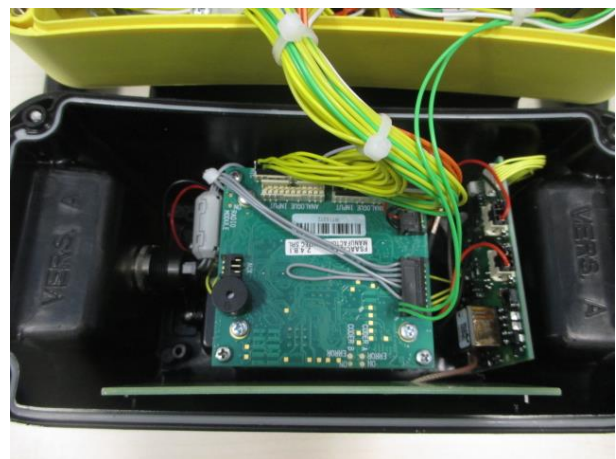
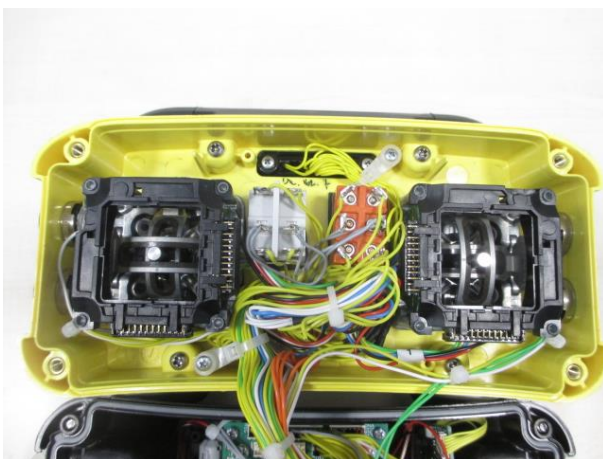
EUT exercising: EUT in continuous transmission at maximum power

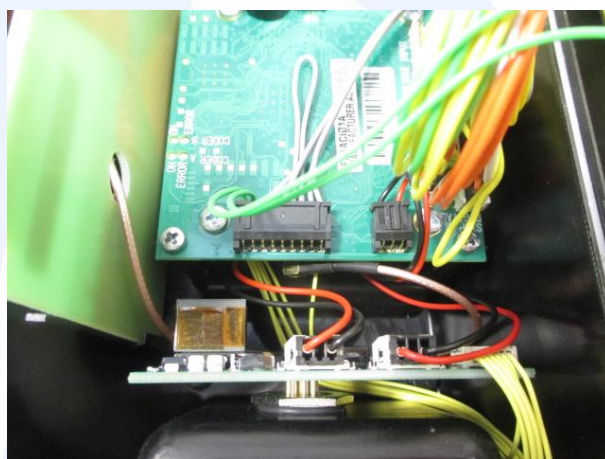
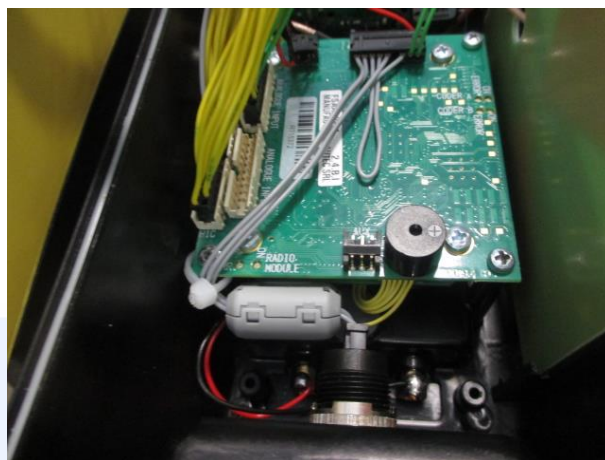


5. Photograph(s) of EUT

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 S010	Rohde & Schwarz	ESH3-Z2	Impulses Limiting Device	---	January '18	January '19
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 '18	January '19
CMC S200	Schwarzbeck	NSLK 8128	V-LISN	8128-273	January '18	January '19
CMC S227	Rohde & Schwarz	ESR7	EMI Test Receiver 7GHz	101121	January '18	January '19
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	2,8 dB	1
Conducted emission CISPR 16 Voltage Probe 0,15-30MHz	PE001_02	2,6 dB	1
Conducted emission CISPR 16 Current Probe 0,15-30MHz	PE001_03	2,2 dB	1
Conducted emission CISPR 16 ISN 0,15-30MHz	PE001_04	4,5 dB	1
Clic CISPR 16 LISN 50uH 0,150-30,0MHz	PE001_05	3,1 dB	1
Disturbance Power 30-300 MHz	PE002_01	3,4 dB	1
Radiated Emission LAS 0,15-30MHz	PE003_01	1,5 dB	1
Radiated Emission CISPR 16 Loop Ant. 0,15-30MHz	PE004_01	3,8 dB	1
Radiated Emission CISPR 16 Bicon. Ant. 30-300MHz	PE004_02	3,3 dB	1
Radiated Emission CISPR 16 LogP. Ant. 300-1000MHz	PE004_03	3,1 dB	1
Radiated Emission CISPR 16 Horn Ant. 1-18GHz	PE004_04	3,6 dB	1
Human Exposure to electromagnetic fields	PE005_01	15,0 %	1
Harmonic current emissions test	PE006_01	10 mA + 1,6 %	1
Voltage fluctuation and flicker test	PE007_01	4,2 %	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	6,24 % 18,7 A/m a 300A/m	1
Dumped Magnetic field	PE108_01	6,24 % 1,87 A/m a 30A/m	1
Common mode conducted immunity	PE112_01	2,20 % 0,22 V a 10V	1



Test	Test Setup	Expanded uncertainty	Note
Power/Spurious 9kHz-30MHz	PR001_01	3,8 dB	1
Power/Spurious ERP 30-1000MHz d=10m	PR001_02+03	4,3 dB	1
Misura della potenza EIRP 1-18GHz d=3m	PR001_04	4,3 dB	1
Misura della potenza EIRP 18-40GHz d=3m	PR001_05	5,5 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	1,2 dB	1
Adjacent channel power	PR002_01+02	1,2 dB	1
Blocking	PR002_01+02	1,2 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_18_01 date 30/01/2018			

Note 1:

The expanded uncertainty reported according to EN55016-4-2:2011 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 15:2017 KDB 558074 D01 15.247 Meas Guidance v05	-- 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.

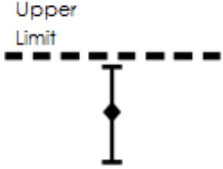
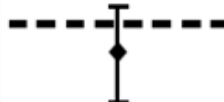
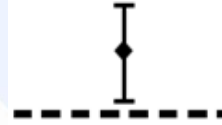


11. Results

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.

Result

Antenna Type	External R.F. power amplifier	Gain	Remarks	Results
Integral antenna	Not Present	2 dBi	--	Complies

Result: The requirements are met



11.2 Radiated 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 ≤ 30 MHz
3 m for frequencies > 30 MHz

Environmental conditions

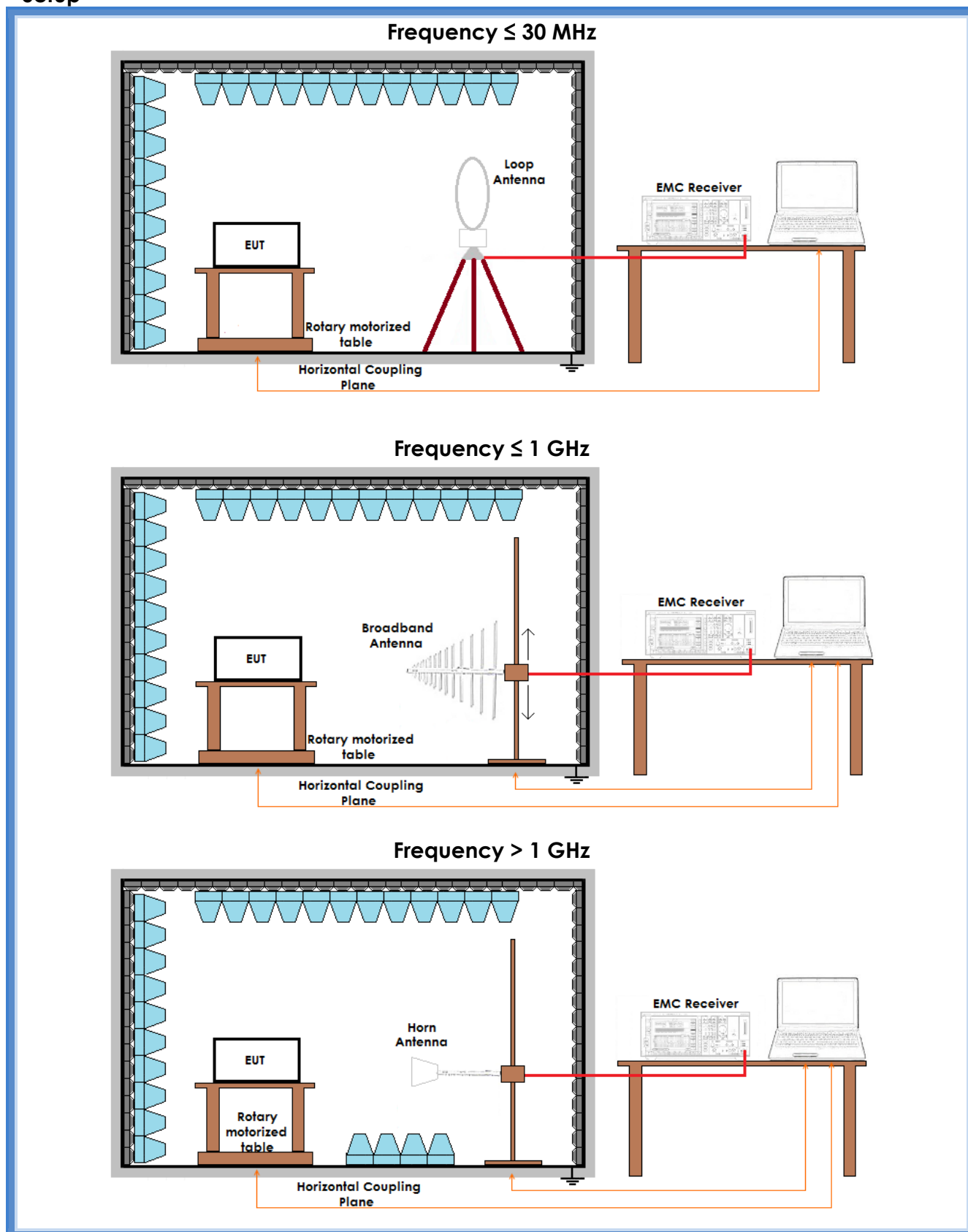
Temperature (°C)	Atmospheric pressure (kPa)	Relative humidity (%)
22	100	45

Acceptance limits

Frequency range (MHz)	Test distance (m)	Limits [dB(μV/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	
	Test distance (m)	Linear average detector [dB(μV/m)]	Peak detector [dB(μV/m)]
Above 1000	3	53,9	73,9

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

Setup





Result

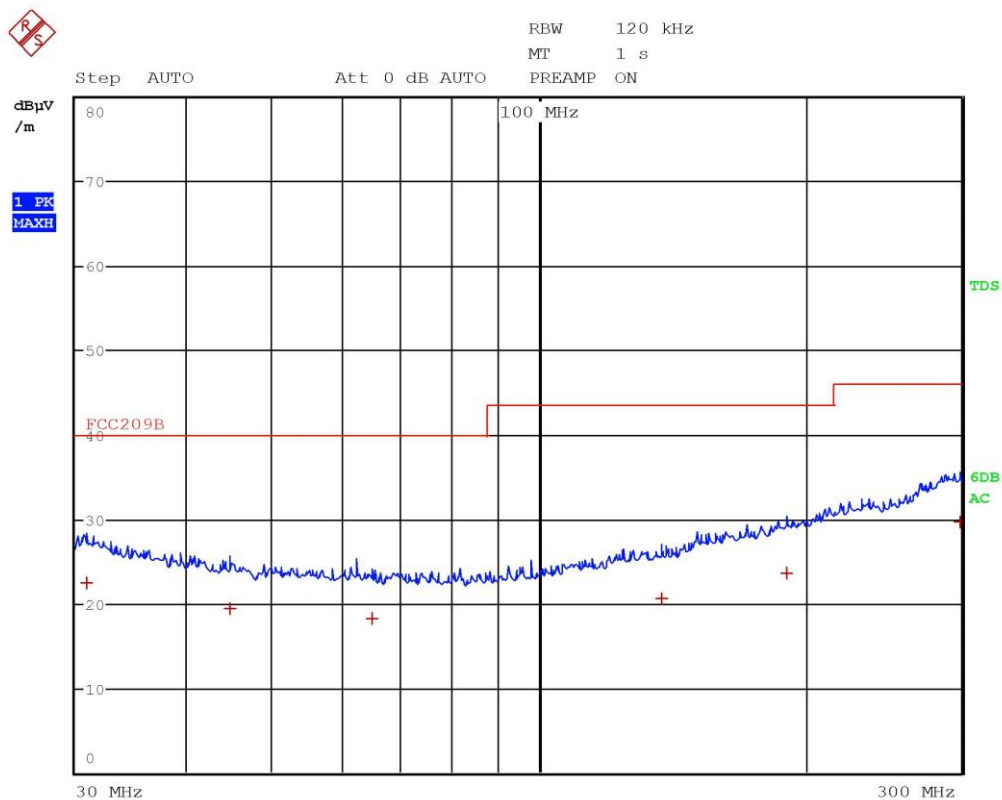
Polarization	Frequency Range (MHz)	Graphs	Remarks	Result
H	30 – 300	G18197401	Lowest channel	Complies
V	30 – 300	G18197402	Lowest channel	Complies
V	30 – 300	G18197403	Medium channel	Complies
H	30 – 300	G18197404	Medium channel	Complies
H	30 – 300	G18197405	Highest channel	Complies
V	30 – 300	G18197406	Highest channel	Complies
V	300 – 1000	G18197407	Lowest channel	Complies
H	300 – 1000	G18197408	Lowest channel	Complies
H	300 – 1000	G18197409	Medium channel	Complies
V	300 – 1000	G18197410	Medium channel	Complies
V	300 – 1000	G18197411	Highest channel	Complies
H	300 – 1000	G18197412	Highest channel	Complies
Loop	0,009 – 30	G18197419	Worst case	Complies
H	1000 – 10000	G18197450	Lowest channel	Complies
V	1000 – 10000	G18197451	Lowest channel	Complies
V	1000 – 10000	G18197452	Medium channel	Complies
H	1000 – 10000	G18197453	Medium channel	Complies
H	1000 – 10000	G18197454	Highest channel	Complies
V	1000 – 10000	G18197455	Highest channel	Complies
Remarks: Measurements at frequencies lower than 1000 MHz have been performed with an EUT – antenna distance of 10 m. Measured values have been corrected with different conversion factors, 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

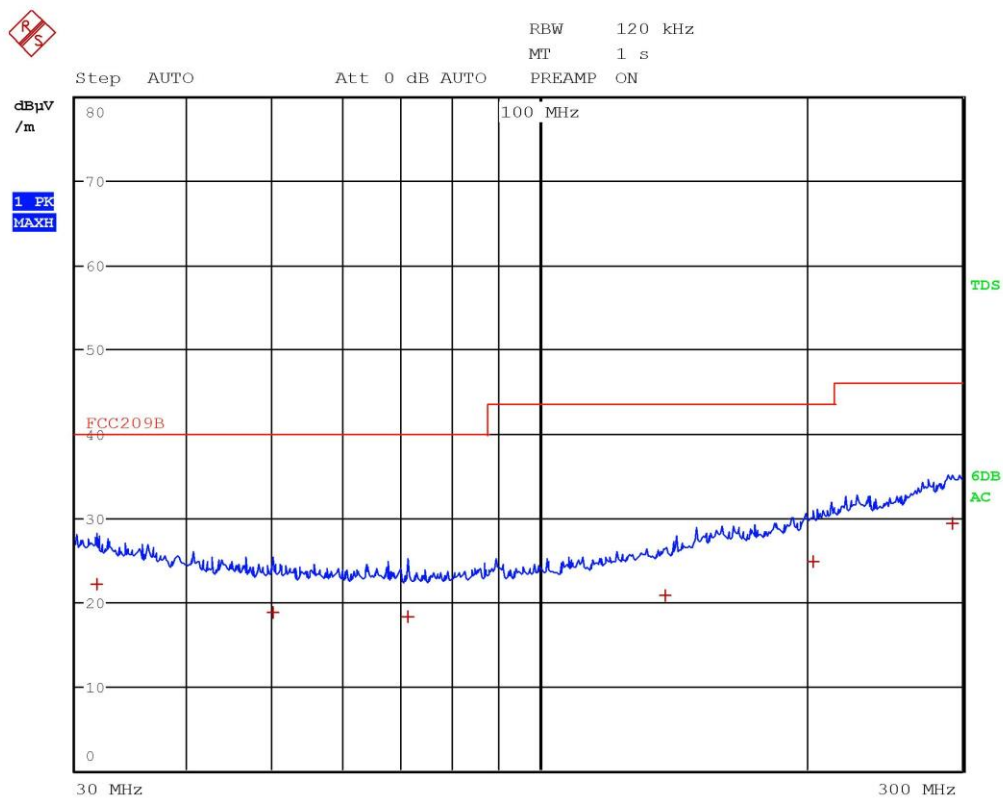


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EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	30.84 MHz	22.45	-17.54
1 Quasi Peak	44.76 MHz	19.33	-20.66
1 Quasi Peak	64.72 MHz	18.28	-21.71
1 Quasi Peak	137.48 MHz	20.66	-22.85
1 Quasi Peak	190.24 MHz	23.55	-19.96
1 Quasi Peak	299.4 MHz	29.70	-16.31

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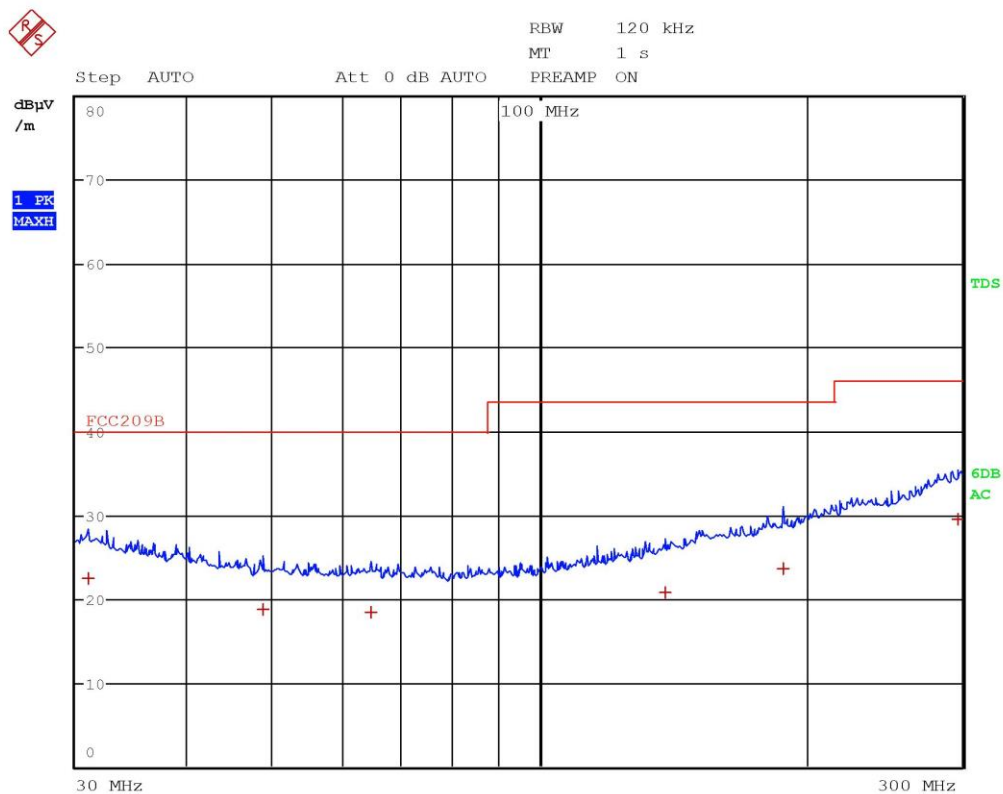


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EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	31.72 MHz	22.12	-17.87
1 Quasi Peak	50.04 MHz	18.75	-21.24
1 Quasi Peak	71.16 MHz	18.16	-21.83
1 Quasi Peak	138.48 MHz	20.71	-22.80
1 Quasi Peak	203.8 MHz	24.76	-18.75
1 Quasi Peak	291.88 MHz	29.25	-16.76

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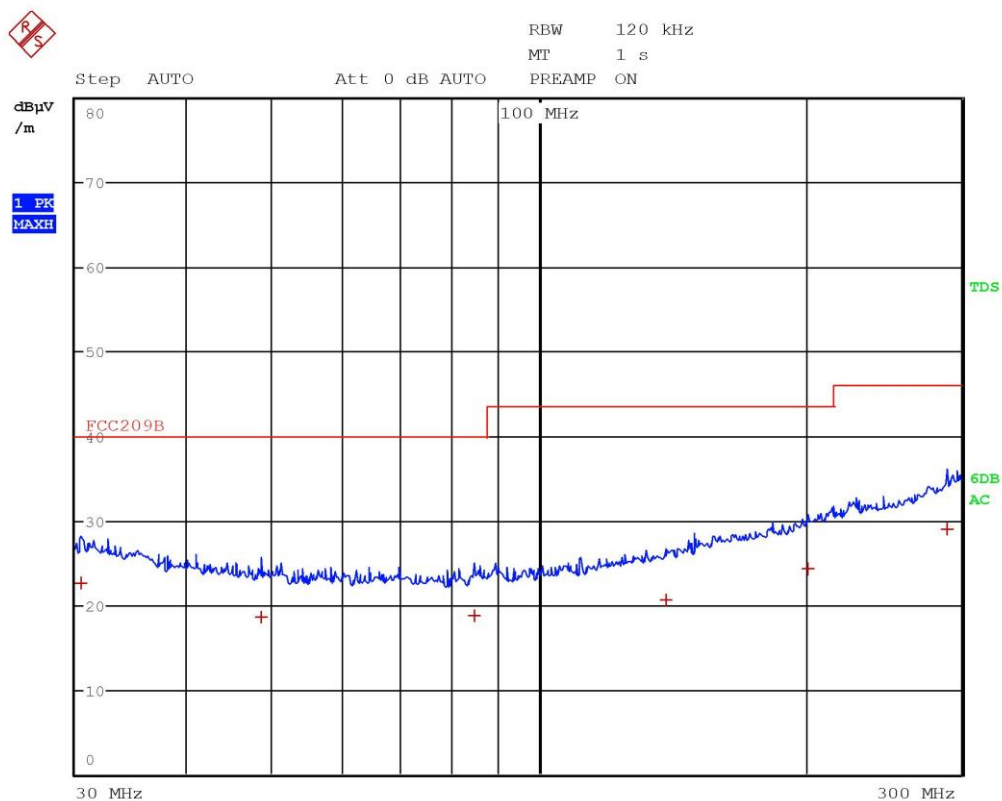


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EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	31 MHz	22.45	-17.55
1 Quasi Peak	48.84 MHz	18.76	-21.23
1 Quasi Peak	64.68 MHz	18.31	-21.68
1 Quasi Peak	138.6 MHz	20.68	-22.83
1 Quasi Peak	188.2 MHz	23.61	-19.90
1 Quasi Peak	296.6 MHz	29.44	-16.57

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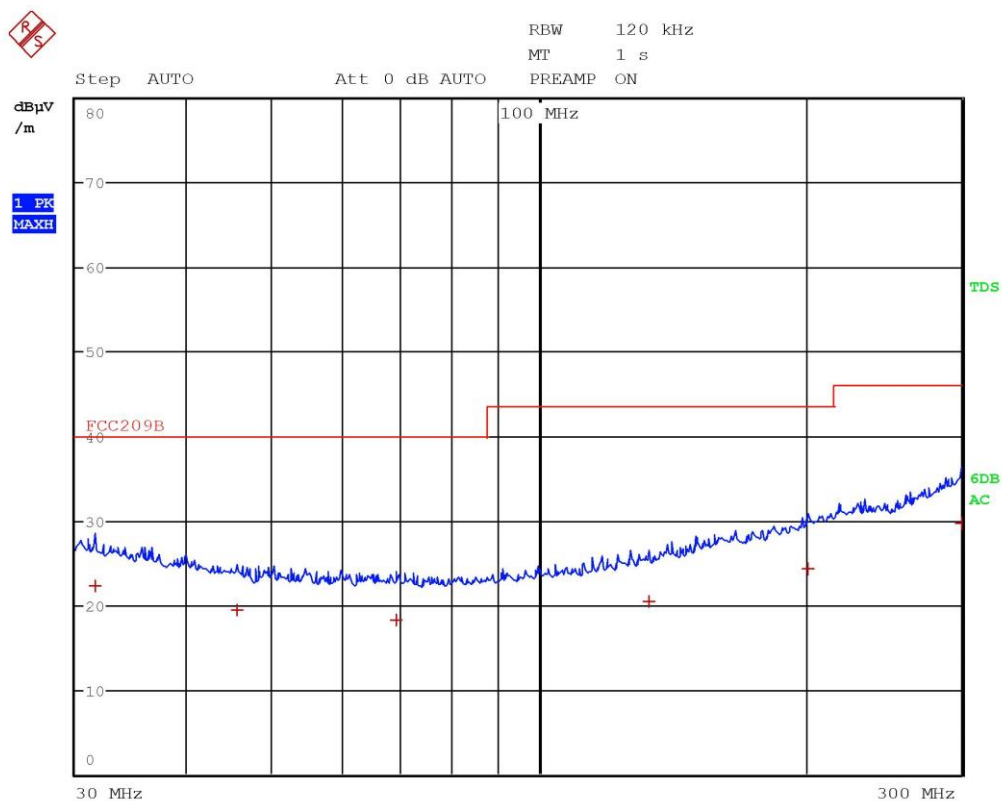


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EDIT PEAK LIST (Final Measurement Results)			
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Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	30.4 MHz	22.53	-17.46
1 Quasi Peak	48.56 MHz	18.63	-21.36
1 Quasi Peak	84.52 MHz	18.79	-21.20
1 Quasi Peak	139.24 MHz	20.64	-22.87
1 Quasi Peak	201.32 MHz	24.27	-19.24
1 Quasi Peak	289.56 MHz	29.03	-16.98

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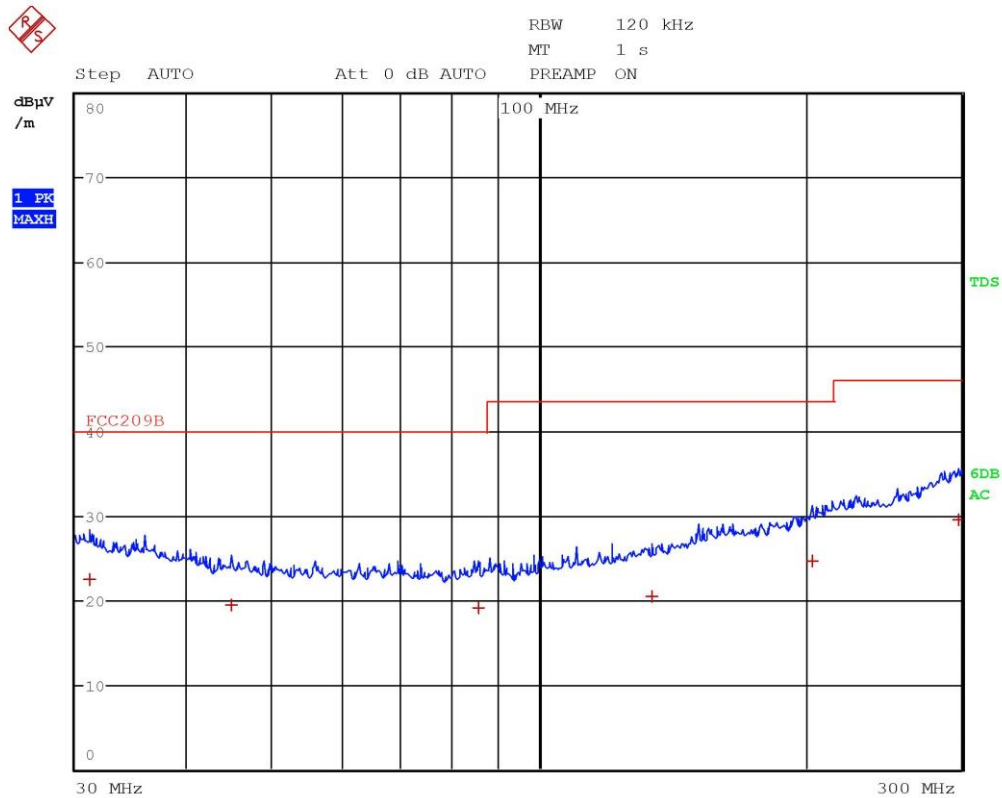


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EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	31.52 MHz	22.30	-17.69
1 Quasi Peak	45.64 MHz	19.34	-20.65
1 Quasi Peak	68.92 MHz	18.22	-21.77
1 Quasi Peak	133.2 MHz	20.41	-23.10
1 Quasi Peak	201.4 MHz	24.25	-19.26
1 Quasi Peak	299.72 MHz	29.62	-16.39

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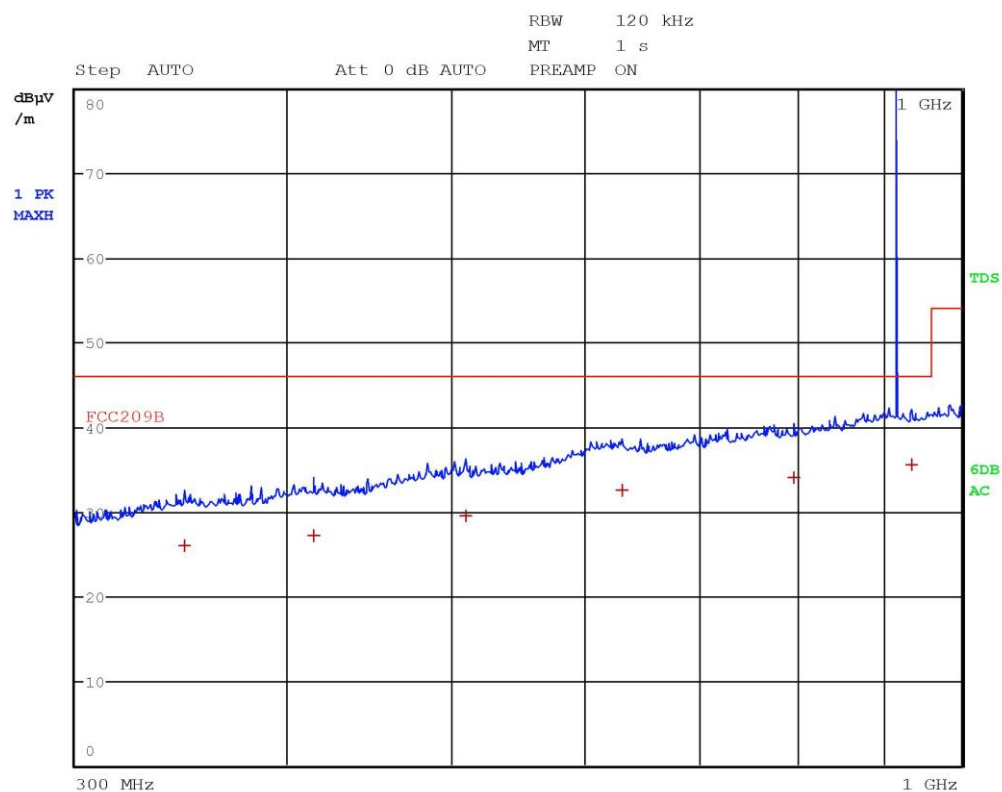


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EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	31.04 MHz	22.47	-17.52
1 Quasi Peak	45 MHz	19.44	-20.55
1 Quasi Peak	85.44 MHz	19.07	-20.92
1 Quasi Peak	134.24 MHz	20.35	-23.16
1 Quasi Peak	203.36 MHz	24.68	-18.83
1 Quasi Peak	297.24 MHz	29.48	-16.53

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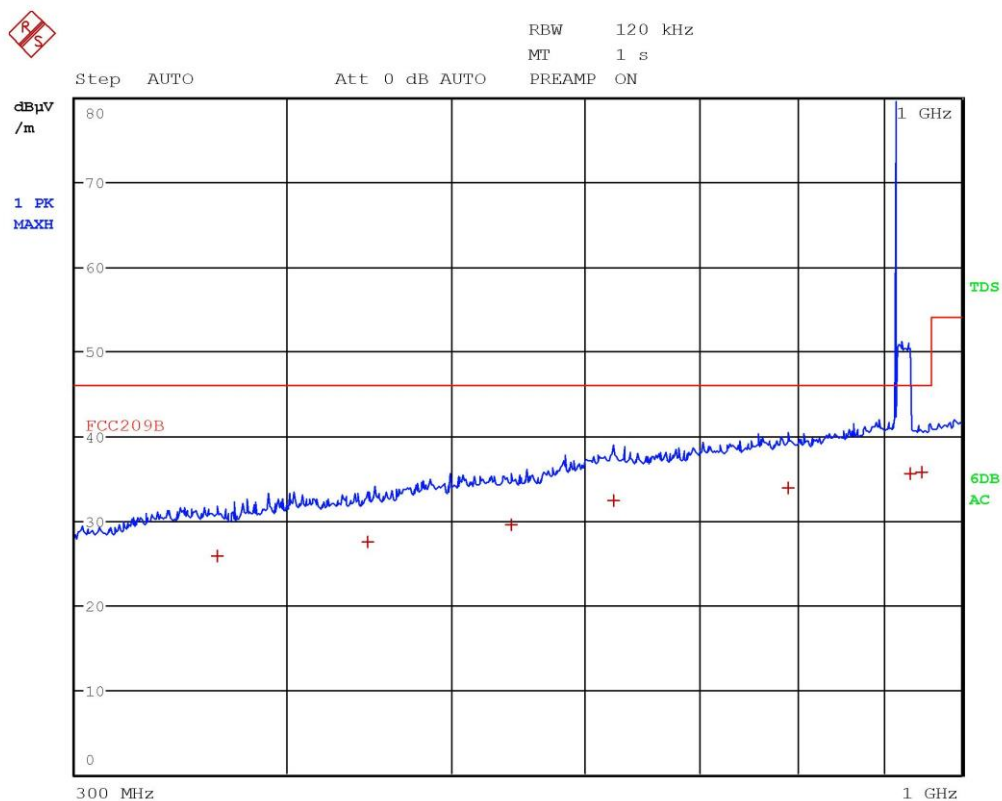


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EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	347.96 MHz	25.91	-20.10
1 Quasi Peak	414.88 MHz	27.21	-18.80
1 Quasi Peak	509.96 MHz	29.48	-16.53
1 Quasi Peak	630.96 MHz	32.46	-13.55
1 Quasi Peak	796.92 MHz	34.05	-11.96
1 Quasi Peak	935.12 MHz	35.62	-10.39

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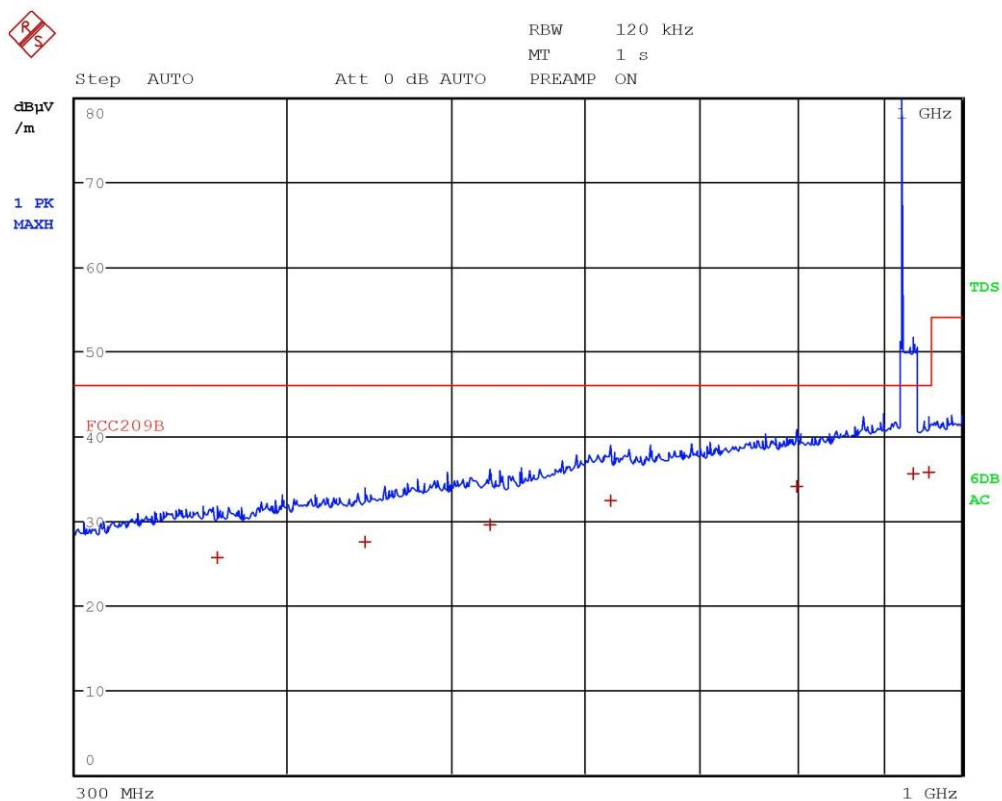


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EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	364 MHz	25.73	-20.28
1 Quasi Peak	446.2 MHz	27.53	-18.48
1 Quasi Peak	542.68 MHz	29.50	-16.51
1 Quasi Peak	623.8 MHz	32.38	-13.63
1 Quasi Peak	789.52 MHz	33.86	-12.15
1 Quasi Peak	931.96 MHz	35.48	-10.53
1 Quasi Peak	946.72 MHz	35.64	-10.37

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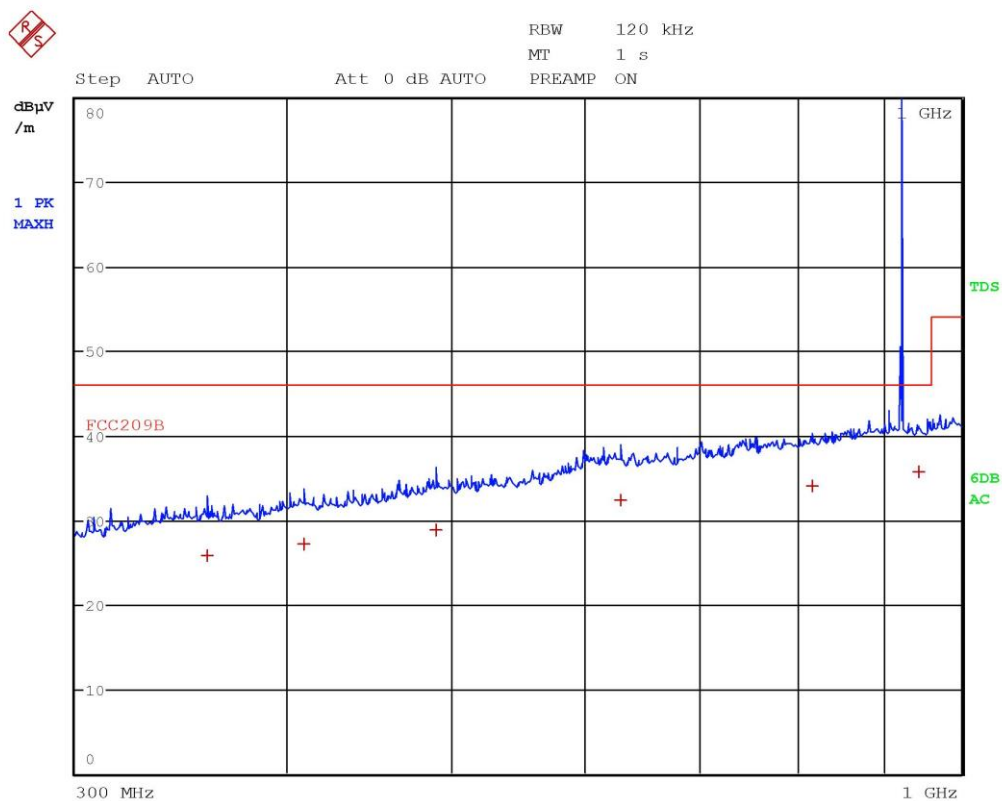


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EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	363.6 MHz	25.71	-20.30
1 Quasi Peak	444.32 MHz	27.50	-18.51
1 Quasi Peak	526.64 MHz	29.55	-16.46
1 Quasi Peak	621.28 MHz	32.42	-13.59
1 Quasi Peak	799.92 MHz	33.99	-12.02
1 Quasi Peak	936.6 MHz	35.56	-10.45
1 Quasi Peak	957.16 MHz	35.75	-10.26

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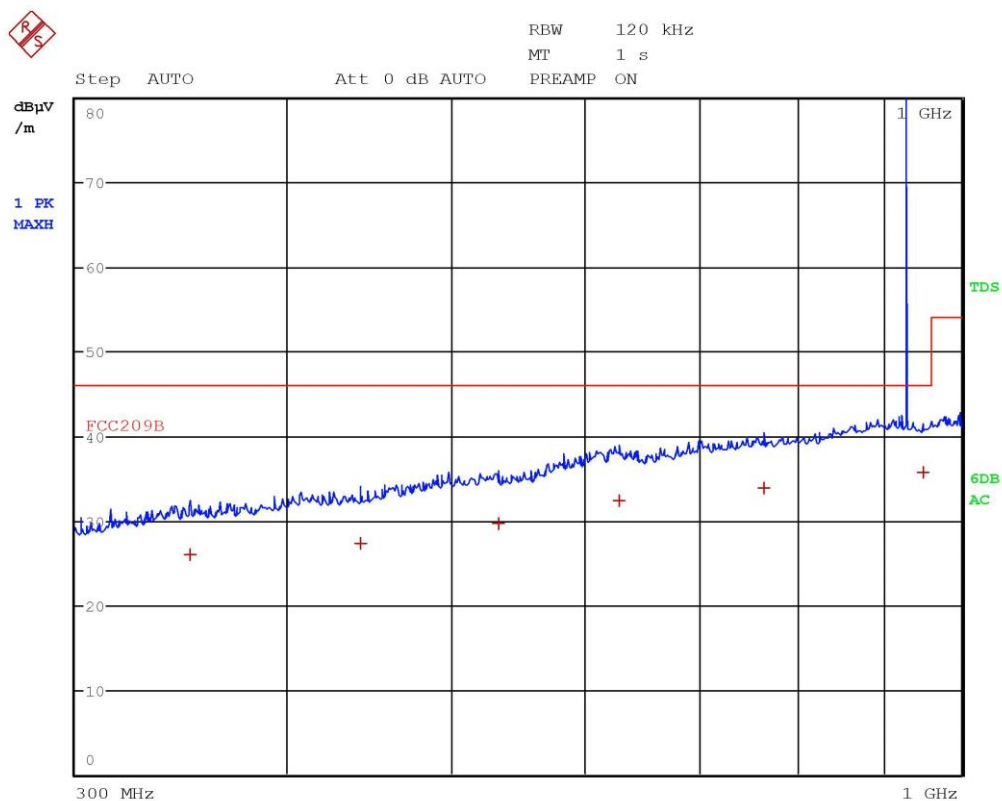


Gandini 18197410



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	358.96 MHz	25.81	-20.20
1 Quasi Peak	409.64 MHz	27.18	-18.83
1 Quasi Peak	489.92 MHz	28.90	-17.11
1 Quasi Peak	629.24 MHz	32.32	-13.69
1 Quasi Peak	816.52 MHz	34.04	-11.97
1 Quasi Peak	944.16 MHz	35.63	-10.38

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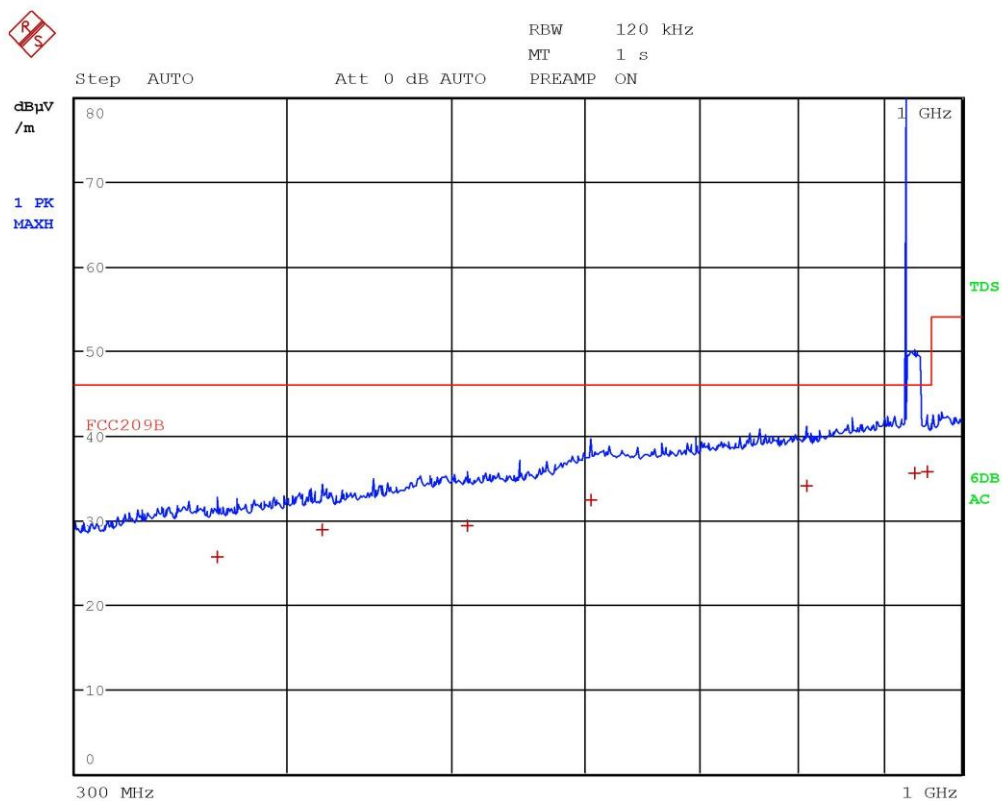


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EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	351 MHz	25.98	-20.03
1 Quasi Peak	441.76 MHz	27.30	-18.71
1 Quasi Peak	532.96 MHz	29.61	-16.40
1 Quasi Peak	628.12 MHz	32.31	-13.70
1 Quasi Peak	764.04 MHz	33.78	-12.23
1 Quasi Peak	948.4 MHz	35.64	-10.37

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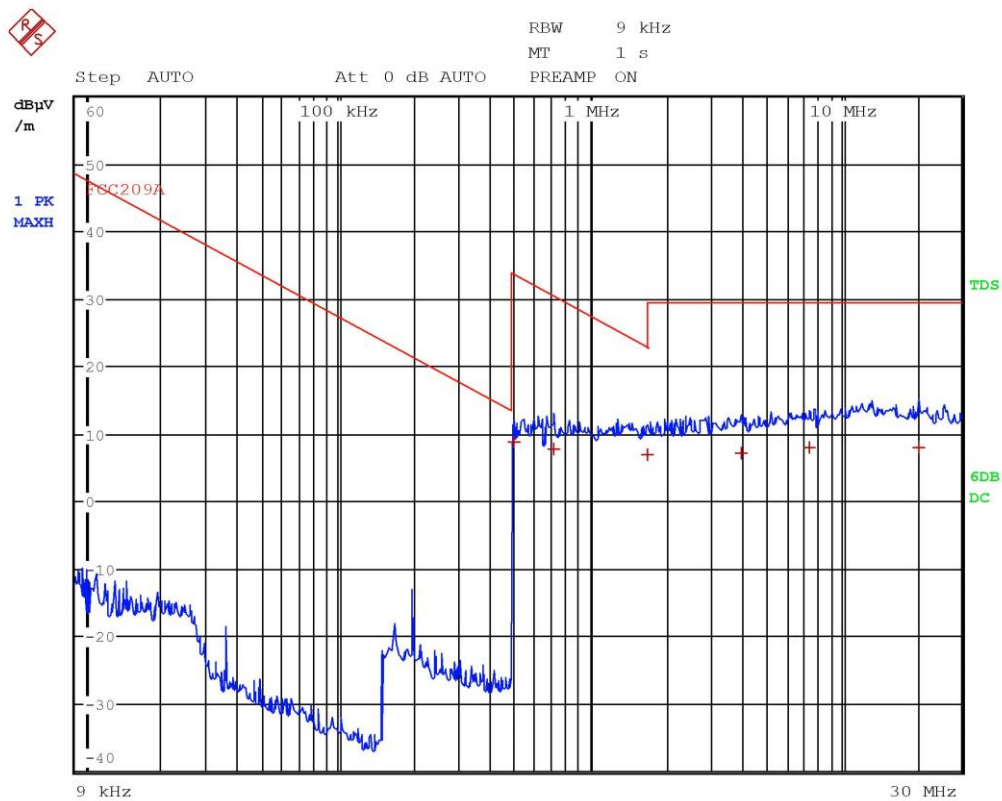


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EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	363.48 MHz	25.69	-20.32
1 Quasi Peak	420.04 MHz	28.88	-17.13
1 Quasi Peak	510.8 MHz	29.28	-16.73
1 Quasi Peak	603.96 MHz	32.28	-13.74
1 Quasi Peak	811 MHz	34.08	-11.93
1 Quasi Peak	938.84 MHz	35.57	-10.44
1 Quasi Peak	954.6 MHz	35.77	-10.24

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