



TEST REPORT Nr. R20181501

Federal Communication Commission (FCC)

Report Reference No.	R20181501
Date of issue:	25.01.2021
Total number pages:	66
Applicant's name	Intercomp S.p.A.
Address	Via della Scienza, 27, 37139 Verona (VR) - Italy
Test specification:	
Standards	FCC Rules & Regulations, Title 47:2019 Part 15 paragraph(s): 203, 204, 205, 207, 209, 215 and 247
Non-standard test method	N/A
Test Report Form No.	15-247_DTSCMC
Test Report Form(s) Originator ..	CMC Centro Misure Compatibilità S.r.l.
Master TRF	2021-01
General disclaimer:	
The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of CMC Centro Misure Compatibilità S.r.l.	
Test item description	LoRa WAN magnetic sensor for parked vehicles detection for inground installation
Trademark	Intercomp
Manufacturer	Intercomp S.p.A.
Model / Type reference	Ecoh-915
FCC ID	2AUT7ECOH-915
Rating(s)	3,6 Vdc from battery
Report	
Tested by (name + signature)	G. Gandini
Approved by (name + signature)	R. Beghetto



1 Summary

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2 Reference standard	
FCC Rules and Regulation Title 47 part 15:2019	--
3 List of attachments	
Attachment 1: Instruments list, measurement uncertainty, judgement of compliance and quality manual references	
4 Deviation(s) from test specification	
None	
5 Testing location	
CMC Centro Misure Compatibilità 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	25.01.2021	--



Testing and sampling:	
Date of receipt of test item	05.10.2020
Testing start date	11.11.2020
Testing end date	19.01.2021
Sampling procedure.....	Equipment used for testing was picked up by the manufacturer, at the end of the production process with random criterion. The results relate to the sample as it has been received.
Internal identification	Adhesive label with the product number P200985
General remarks:	
This 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 object tested. “(see appended table)”: refers to a table appended to the report. Throughout this report a comma is used as the decimal separator.	
Possible test case verdicts:	
Test case does not apply to the test object:	N/A (Not Applicable)
Test object does meet the requirement:	P (Pass)
Test object does not meet the requirement:	F (Fail)
Test object does not performed:	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.	

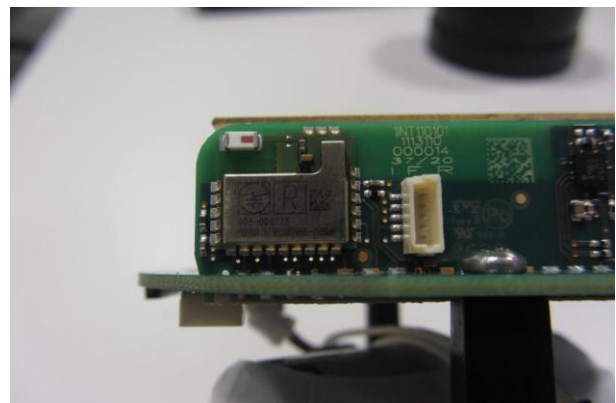
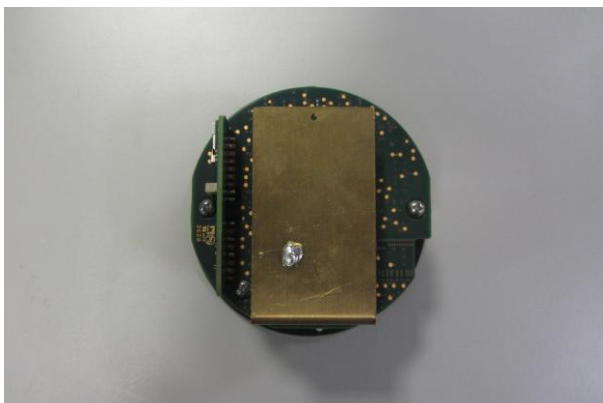
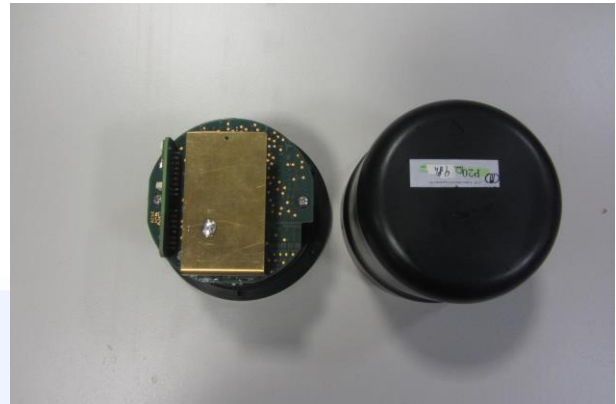


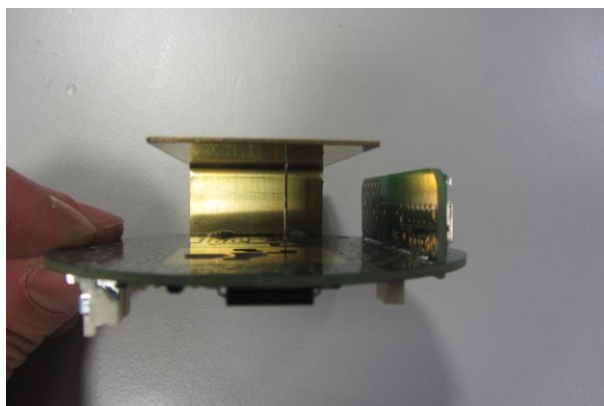
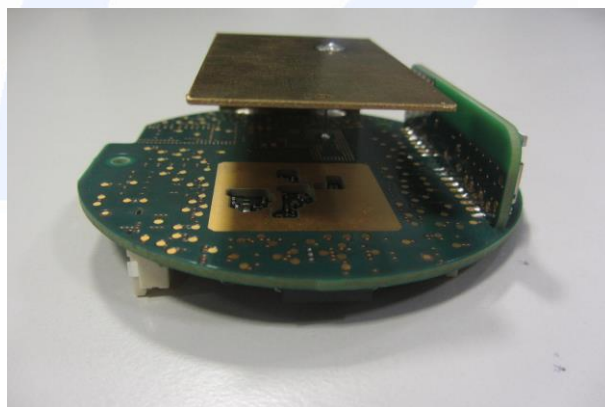
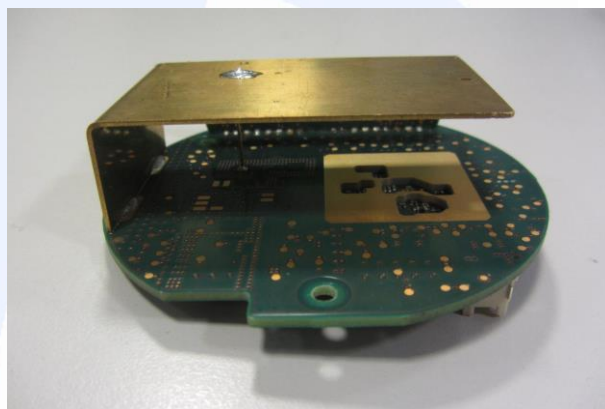
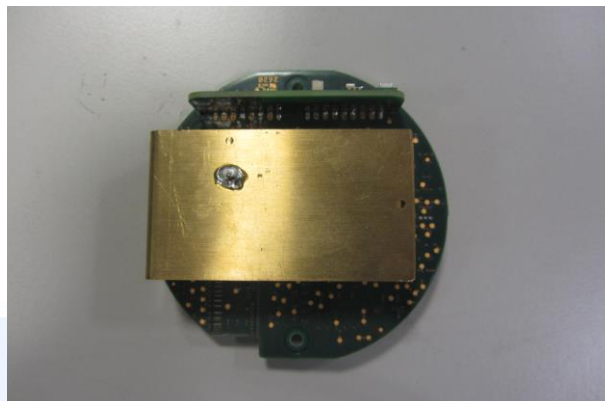
6 General description of tested item and testing condition(s)

Description	LoRa WAN magnetic sensor for parked vehicles detection for inground installation						
Model Number	Ecoh-915						
FCC ID	2AUT7ECOH-915						
Serial Number	--						
Brand name	Intercomp						
Frequency band	902 – 928 MHz						
Nominal frequencies	F _L : 903,00 MHz		F _M : 907,80 MHz		F _H : 914,20 MHz		
Test power supply.....		Voltage and Frequency	Reference poles				
			N	L1	L2	L3	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 3,6 V from battery					☐
Software version	0.0.0						
Test configuration	☒	Table top equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
Type of equipment	☒	Transmitter unit					
	☐	Receiver unit					
Type of station	☒	Fixed station					
	☐	Portable station					
	☐	Mobile station					
Operating modes	No.	Operating mode of test item					
	1	EUT in continuous transmission at maximum power					



6.1 Photos of the test item







7 Verdict summary section

FCC Rules & Regulations, Title 47:2019 Part 15 paragraph(s): 203, 204, 205, 207, 209, 215 and 247			
Clause	Requirement – Test case	Basic standard	Verdict
Part 15.203	Antenna requirements	--	P
Part 15.207	Conducted emissions	ANSI C63.10	N/A (+)
Part 15.209	Emissions in restricted frequency bands and in unrestricted frequency bands	ANSI C63.10	P
Part 15.247 (a) (2)	DTS bandwidth	ANSI C63.10	P
Part 15.215 (c)	20 dB bandwidth	ANSI C63.10	P
Part 15.247 (d)	Band edge	ANSI C63.10	P
Part 15.209 and 15.247	Fundamental emission output power	ANSI C63.10	P
Part 15.209 and 15.247	Maximum power spectral density level in the fundamental emission	ANSI C63.10	P

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



Normative references	
Reference no.	Description
FCC Rules and Regulation Title 47 part 15:2019	--
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



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.		
Measurement uncertainties	Attachment 1		



9 Test results

9.1 Antenna requirements

Tested by	G. Gandini	
Test date	11.11.2020	
Reference standards	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
	☒	Dedicated antenna
Antenna gain.....	-6 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	11.11.2020	
Test location (stand)	Semi-anechoic chamber (CMC A070)	
Reference standards	FCC Rules and Regulation; Titles 47 Part. 15.209 ANSI C63.10 cl. 6.3, 6.4, 6.5 and 6.6	
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	SAC with measurement distance [m]: 10	
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	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
960 to 1000	3	54

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 results 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			

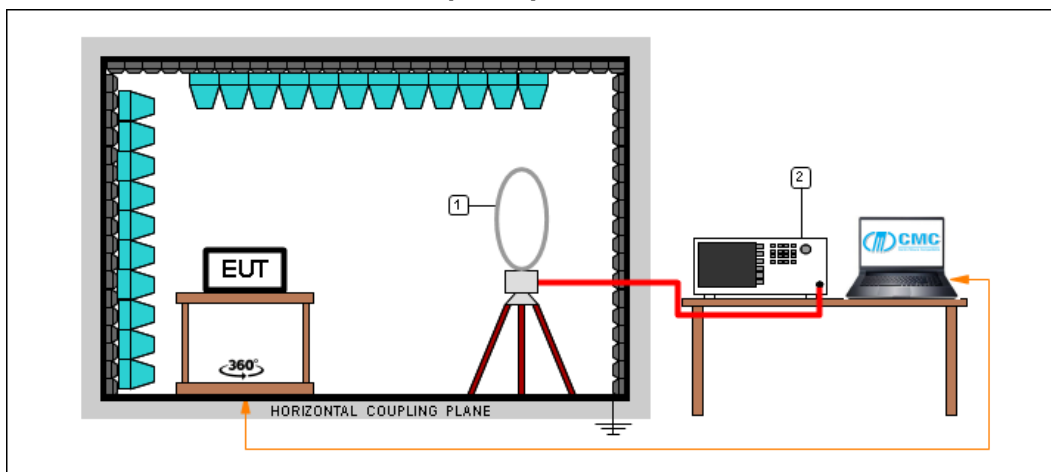
Acceptance limits for emissions in non-restricted frequency bands (according to ANSI C63.10 cl. 11.11.1)

The DTS rules specify that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions:

- If the maximum peak conducted output power procedure was used to demonstrate compliance as described in 9.1, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz
- If maximum conducted (average) output power was used to demonstrate compliance as described in 9.2, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz.
- In either case, attenuation to levels below the 15.209 general radiated emissions limits is not required

Test setup

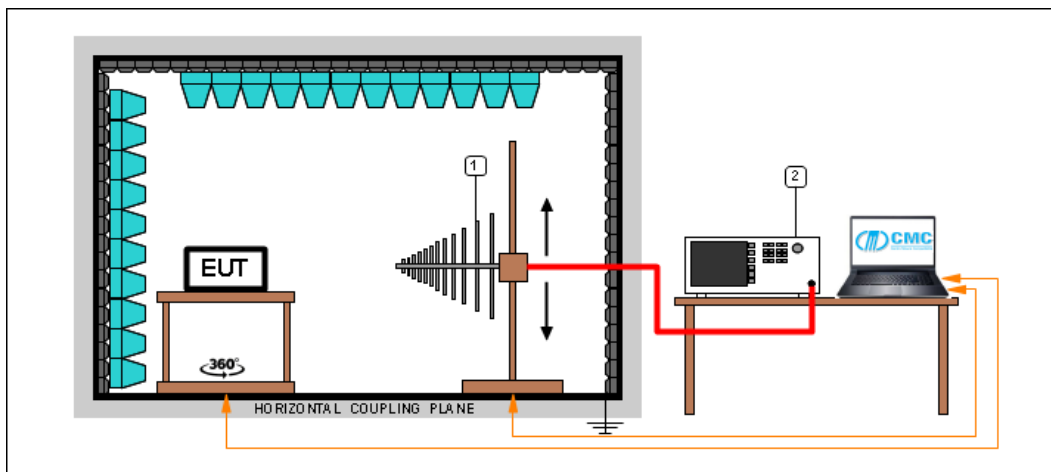
Frequency ≤ 30 MHz



Test setup PE004_01

Nr.	Id. Number	Manufacturer	Model	Description
2	CMC S164	Rohde & Schwarz	ESU26	Receiver 20 Hz - 26.5 GHz
1	CMC S127	Schaffner	HLA6120	Loop Antenna 9kHz - 30MHz

Frequency ≤ 1 GHz



Test setup PE004_02

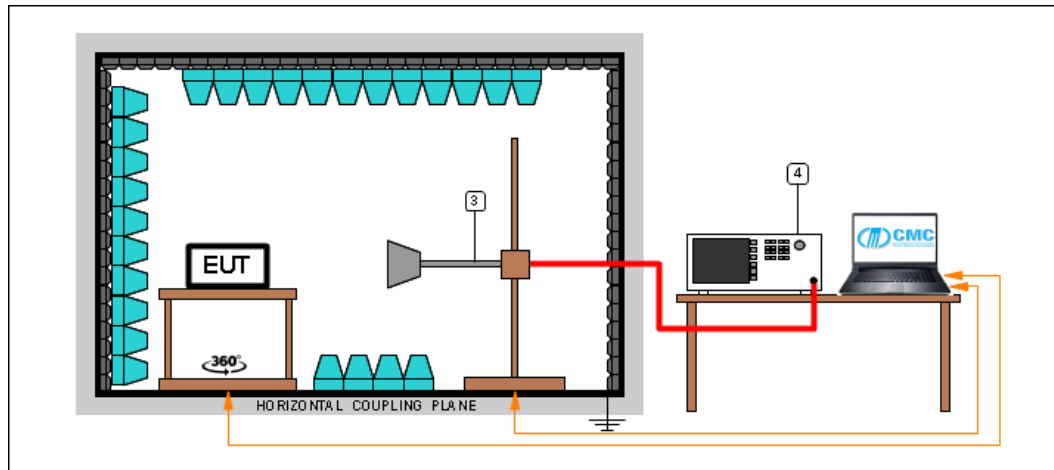
Nr.	Id. Number	Manufacturer	Model	Description
2	CMC S164	Rohde & Schwarz	ESU26	Receiver 20 Hz - 26.5 GHz
1	CMC S271	Schwarzbeck	BBA 9106 + VHBB 9124	Broadband Antenna

Test setup PE004_03

Nr.	Id. Number	Manufacturer	Model	Description
2	CMC S164	Rohde & Schwarz	ESU26	Receiver 20 Hz - 26.5 GHz
1	CMC S287	Schwarzbeck	VUSLP 9111B	Broadband Antenna



Frequency > 1 GHz



Test setup PE004_04

Nr.	Id. Number	Manufacturer	Model	Description
4	CMC S164	Rohde & Schwarz	ESU26	Receiver 20 Hz - 26.5 GHz
3	CMC S108	Emco	3115	Waveguide antenna



Result

Nominal frequency (MHz)	Polarization	Frequency Range (MHz)	Graphs	Result
903,00	H	1000 – 10000	G20181507	P
903,00	V	1000 – 10000	G20181508	P
907,80	V	1000 – 10000	G20181509	P
907,80	H	1000 – 10000	G20181510	P
914,20	H	1000 – 10000	G20181511	P
914,20	V	1000 – 10000	G20181512	P
903,00	H	300 – 1000	G20181519	P
903,00	V	300 – 1000	G20181520	P
907,80	V	300 – 1000	G20181521	P
907,80	H	300 – 1000	G20181522	P
914,20	H	300 – 1000	G20181523	P
914,20	V	300 – 1000	G20181524	P
Worst case	V	30 – 300	G20181525	P
Worst case	H	30 – 300	G20181526	P
Worst case	Loop	0,009 – 30	G20181530	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

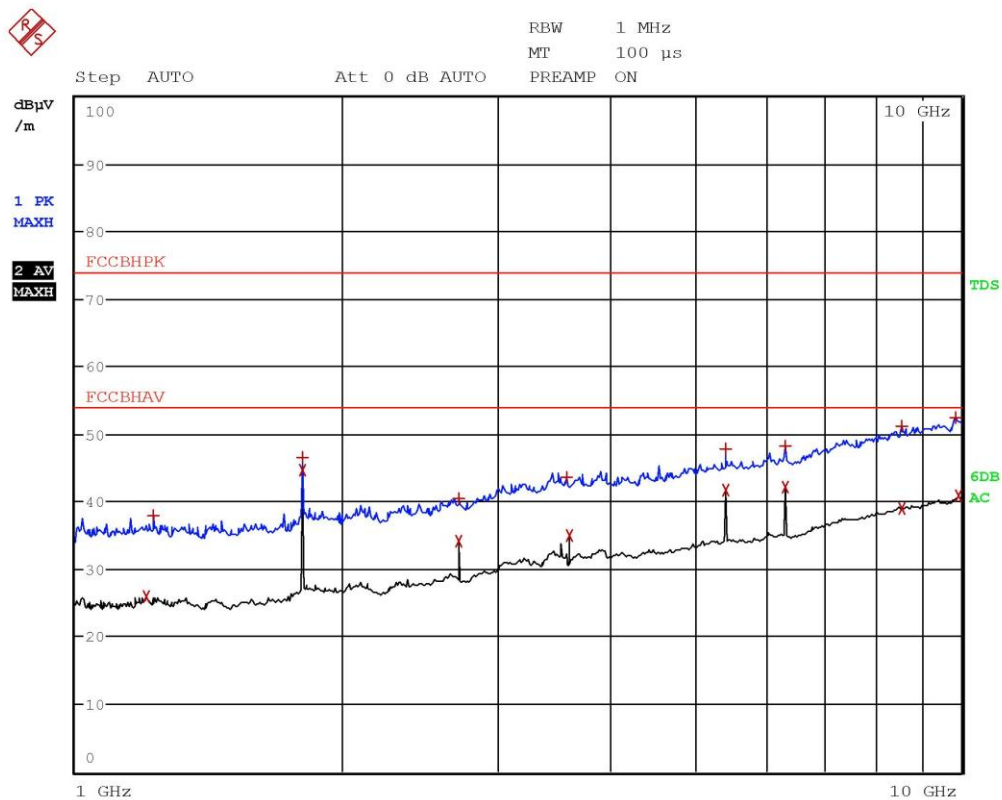
Graphs Legend

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

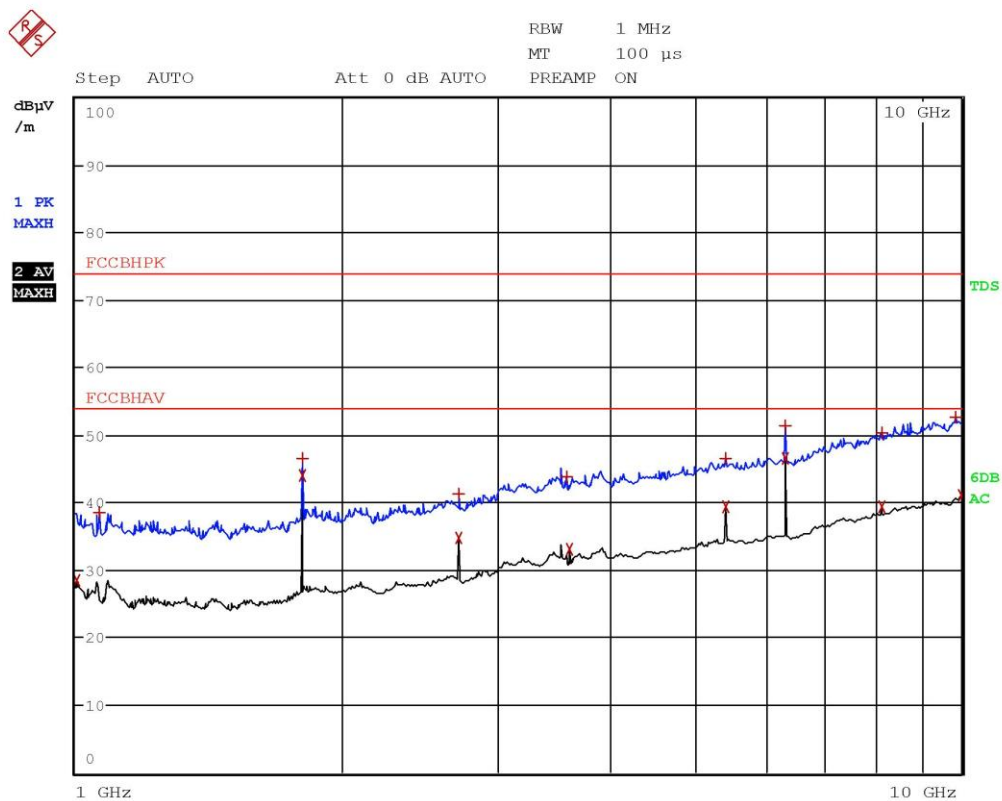


Gandini 20181507



EDIT PEAK LIST (Prescan Results)			
Trace1:	FCCBHPK		
Trace2:	FCCBHAV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
2 Average	1.2016 GHz	25.93	-28.05
1 Max Peak	1.2256 GHz	37.95	-36.02
1 Max Peak	1.806 GHz	46.48	-27.49
2 Average	1.806 GHz	44.62	-9.36
2 Average	2.7084 GHz	34.06	-19.91
1 Max Peak	2.7084 GHz	40.49	-33.48
1 Max Peak	3.5992 GHz	43.62	-30.35
2 Average	3.6116 GHz	35.01	-18.96
1 Max Peak	5.4176 GHz	47.89	-26.08
2 Average	5.418 GHz	41.62	-12.35
1 Max Peak	6.3208 GHz	48.22	-25.75
2 Average	6.3208 GHz	42.16	-11.82
2 Average	8.552 GHz	38.91	-15.06
1 Max Peak	8.5772 GHz	51.21	-22.76
1 Max Peak	9.8624 GHz	52.33	-21.64
2 Average	9.9248 GHz	40.83	-13.15

Gandini 20181507

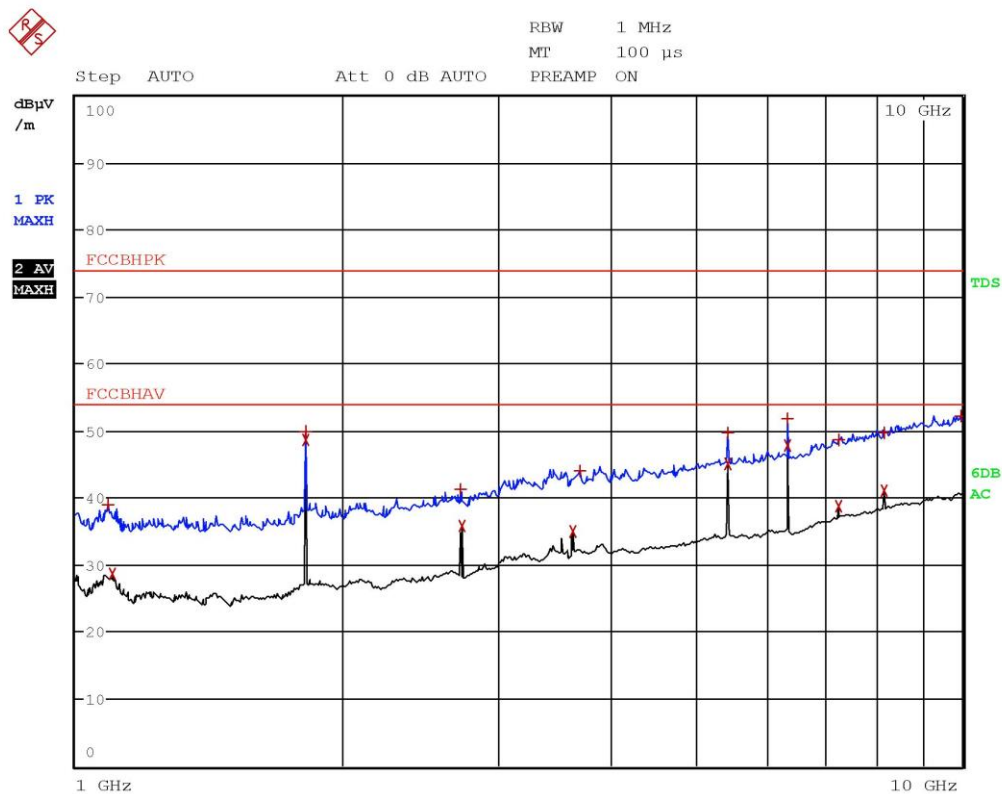


Gandini 20181508



EDIT PEAK LIST (Prescan Results)			
Trace1:	FCCBHPK		
Trace2:	FCCBHAV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
2 Average	1.0048 GHz	28.48	-25.49
1 Max Peak	1.0624 GHz	38.59	-35.38
1 Max Peak	1.806 GHz	46.44	-27.53
2 Average	1.806 GHz	43.97	-10.00
2 Average	2.7096 GHz	34.70	-19.27
1 Max Peak	2.7096 GHz	41.32	-32.65
1 Max Peak	3.5952 GHz	43.83	-30.14
2 Average	3.6128 GHz	32.99	-20.98
2 Average	5.4176 GHz	39.39	-14.58
1 Max Peak	5.418 GHz	46.50	-27.48
2 Average	6.32 GHz	46.55	-7.42
1 Max Peak	6.3212 GHz	51.42	-22.55
2 Average	8.1272 GHz	39.43	-14.54
1 Max Peak	8.136 GHz	50.21	-23.76
1 Max Peak	9.8376 GHz	52.52	-21.45
2 Average	9.9816 GHz	41.09	-12.88

Gandini 20181508

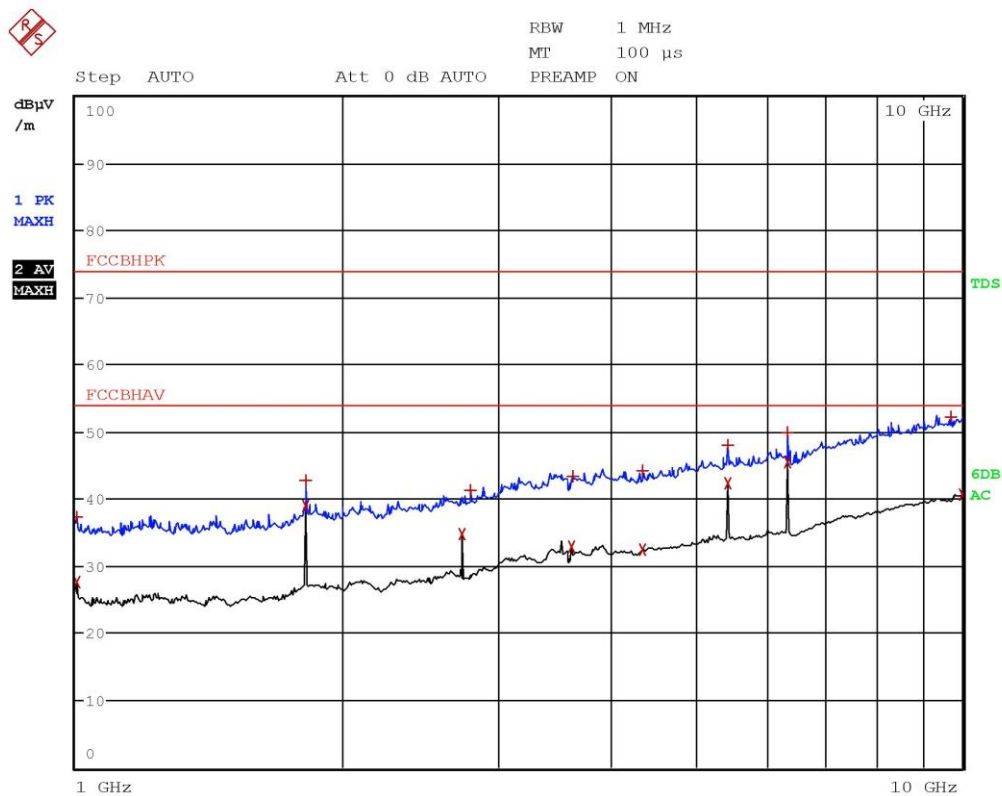


Gandini 20181509



EDIT PEAK LIST (Prescan Results)			
Trace1:	FCCBHPK		
Trace2:	FCCBHAV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Max Peak	1.09 GHz	38.88	-35.09
2 Average	1.0996 GHz	28.66	-25.31
1 Max Peak	1.8152 GHz	49.97	-24.00
2 Average	1.8156 GHz	48.54	-5.43
1 Max Peak	2.7228 GHz	41.33	-32.64
2 Average	2.7232 GHz	35.85	-18.12
2 Average	3.6316 GHz	34.93	-19.04
1 Max Peak	3.7088 GHz	44.00	-29.97
1 Max Peak	5.4456 GHz	49.76	-24.21
2 Average	5.448 GHz	45.07	-8.90
1 Max Peak	6.3536 GHz	51.74	-22.23
2 Average	6.3556 GHz	47.80	-6.17
1 Max Peak	7.258 GHz	48.71	-25.26
2 Average	7.2616 GHz	38.68	-15.29
2 Average	8.1712 GHz	41.17	-12.80
1 Max Peak	8.1736 GHz	49.71	-24.26
1 Max Peak	9.9628 GHz	52.19	-21.78

Gandini 20181509

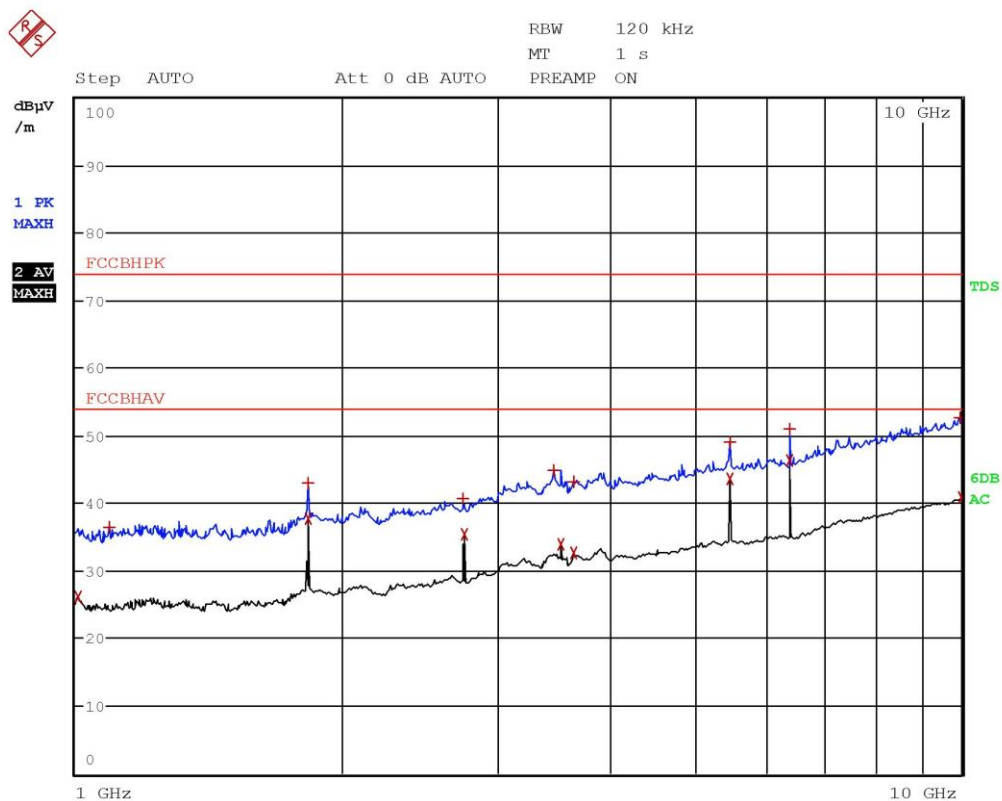


Gandini 20181510



EDIT PEAK LIST (Prescan Results)			
Trace1:	FCCBHPK		
Trace2:	FCCBHAV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Max Peak	1.0032 GHz	37.22	-36.75
2 Average	1.0036 GHz	27.63	-26.34
2 Average	1.8156 GHz	38.92	-15.05
1 Max Peak	1.816 GHz	42.84	-31.13
2 Average	2.724 GHz	34.85	-19.12
1 Max Peak	2.79 GHz	41.35	-32.62
2 Average	3.6304 GHz	32.94	-21.04
1 Max Peak	3.6432 GHz	43.46	-30.51
1 Max Peak	4.3604 GHz	44.14	-29.83
2 Average	4.3636 GHz	32.42	-21.55
2 Average	5.4472 GHz	42.33	-11.64
1 Max Peak	5.4472 GHz	48.02	-25.95
2 Average	6.354 GHz	45.53	-8.45
1 Max Peak	6.3548 GHz	49.86	-24.11
1 Max Peak	9.7172 GHz	52.30	-21.67
2 Average	9.9988 GHz	40.74	-13.23

Gandini 20181510

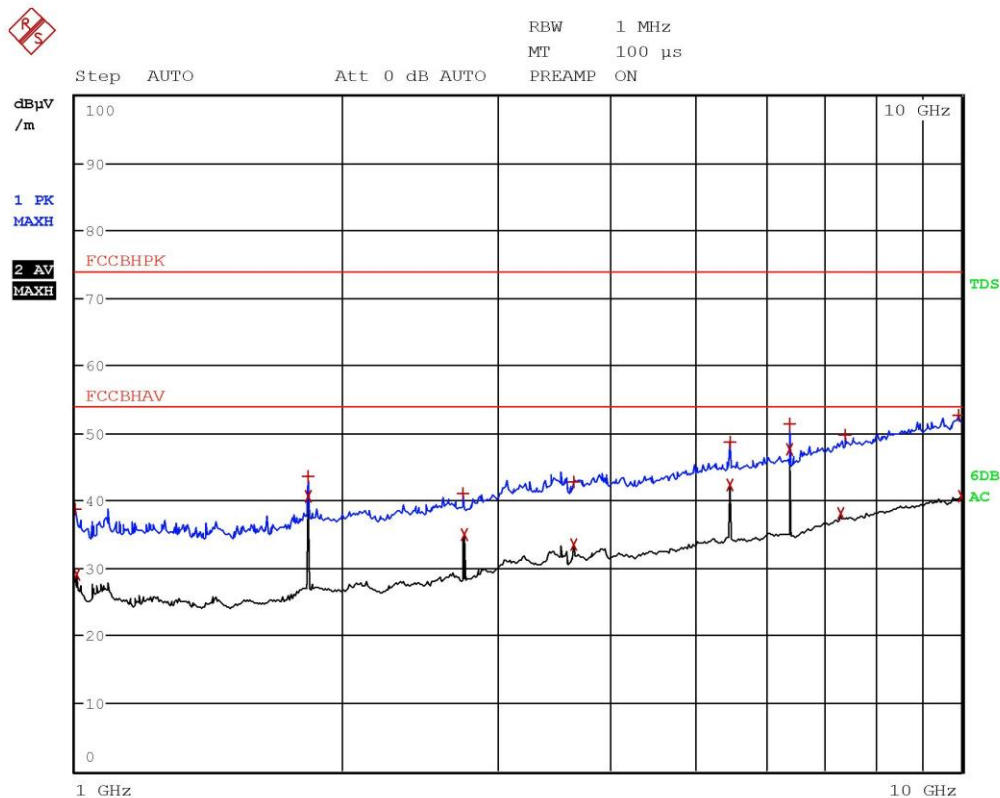


Gandini 20181511



EDIT PEAK LIST (Prescan Results)			
Trace1:	FCCBHPK		
Trace2:	FCCBHAV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
2 Average	1.0056 GHz	26.23	-27.75
1 Max Peak	1.0904 GHz	36.46	-37.51
1 Max Peak	1.828 GHz	42.96	-31.01
2 Average	1.8284 GHz	37.62	-16.35
1 Max Peak	2.7428 GHz	40.67	-33.30
2 Average	2.7432 GHz	35.50	-18.47
1 Max Peak	3.468 GHz	44.91	-29.06
2 Average	3.5356 GHz	33.90	-20.07
1 Max Peak	3.6484 GHz	43.15	-30.82
2 Average	3.6564 GHz	32.74	-21.23
2 Average	5.4852 GHz	43.50	-10.47
1 Max Peak	5.4852 GHz	49.09	-24.88
1 Max Peak	6.3996 GHz	50.86	-23.11
2 Average	6.4 GHz	46.40	-7.57
1 Max Peak	9.976 GHz	52.67	-21.30
2 Average	9.9828 GHz	40.96	-13.01

Gandini 20181511

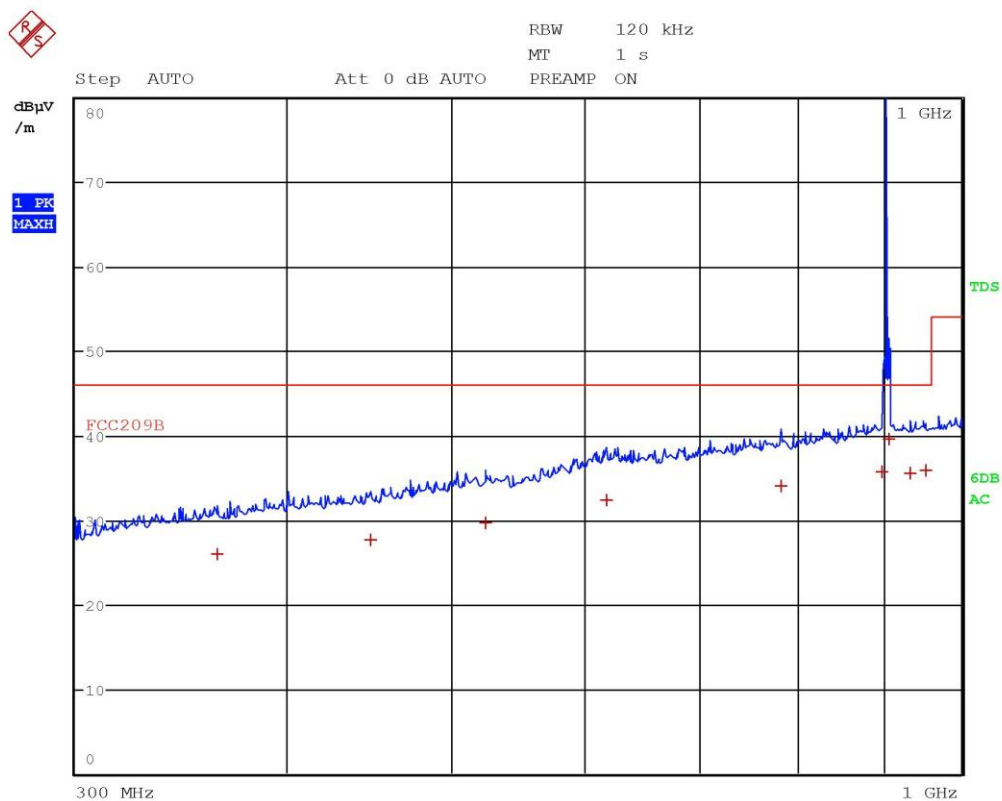


Gandini 20181512



EDIT PEAK LIST (Prescan Results)			
Trace1:	FCCBHPK		
Trace2:	FCCBHAV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Max Peak	1.0004 GHz	38.84	-35.13
2 Average	1.0036 GHz	28.99	-24.98
1 Max Peak	1.8284 GHz	43.49	-30.48
2 Average	1.8284 GHz	40.60	-13.37
1 Max Peak	2.7428 GHz	41.10	-32.87
2 Average	2.7432 GHz	34.99	-18.98
1 Max Peak	3.648 GHz	42.83	-31.14
2 Average	3.658 GHz	33.44	-20.53
1 Max Peak	5.484 GHz	48.53	-25.44
2 Average	5.4844 GHz	42.35	-11.62
1 Max Peak	6.3992 GHz	51.33	-22.64
2 Average	6.3992 GHz	47.52	-6.45
2 Average	7.3128 GHz	38.21	-15.76
1 Max Peak	7.3924 GHz	49.67	-24.30
1 Max Peak	9.908 GHz	52.60	-21.37
2 Average	9.9956 GHz	40.60	-13.37

Gandini 20181512

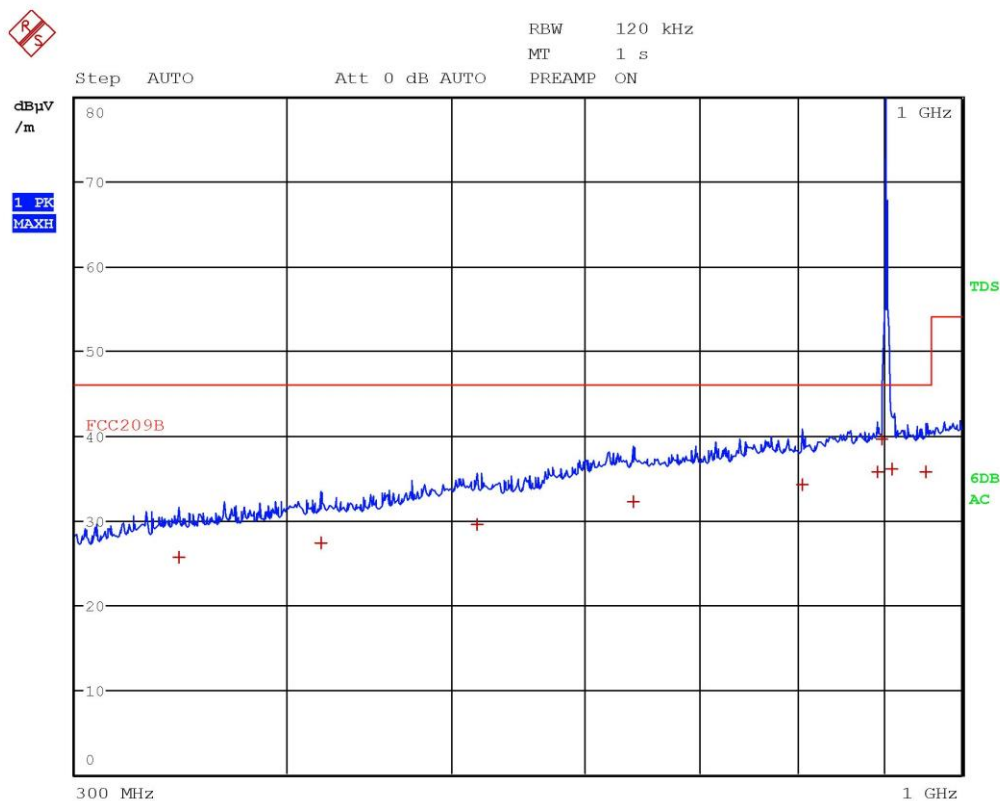


Gandini 20181519



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	363.84 MHz	25.92	-20.09
1 Quasi Peak	447.96 MHz	27.63	-18.38
1 Quasi Peak	523.8 MHz	29.65	-16.36
1 Quasi Peak	617.76 MHz	32.41	-13.60
1 Quasi Peak	783.08 MHz	34.00	-12.01
1 Quasi Peak	897.08 MHz	35.76	-10.25
1 Quasi Peak	906.2 MHz	39.57	-6.44
1 Quasi Peak	932.2 MHz	35.60	-10.42
1 Quasi Peak	953.48 MHz	35.83	-10.18

Gandini 20181519

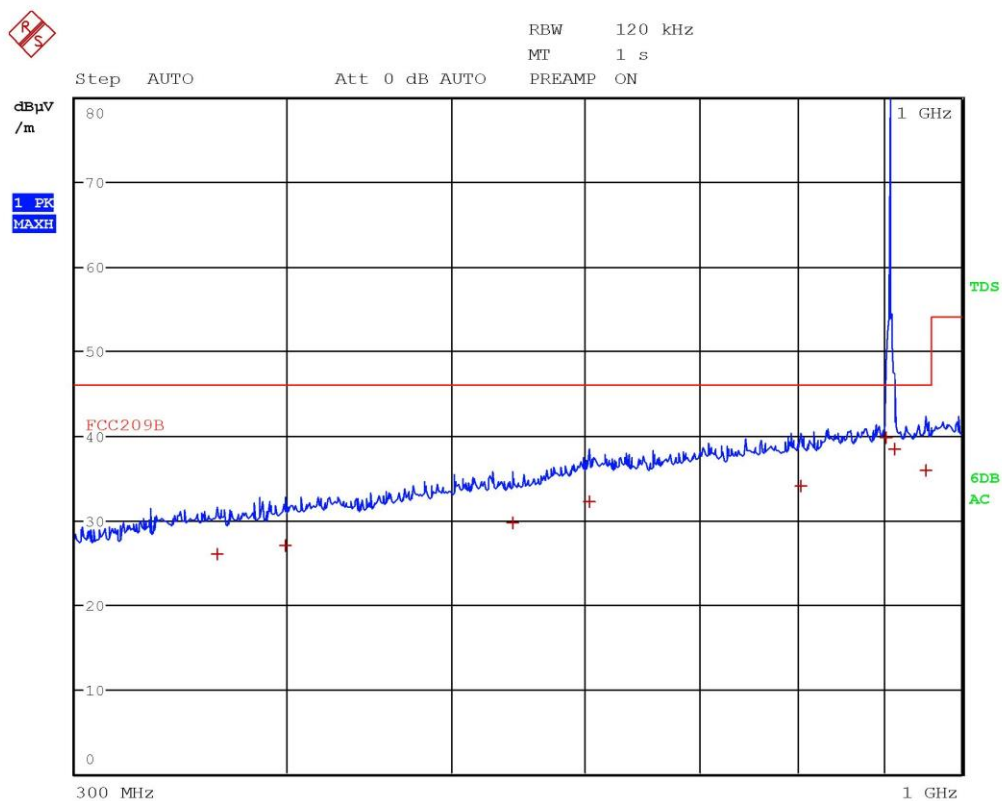


Gandini 20181520



EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC209B		
Trace2:	---		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB
1 Quasi Peak	345.36 MHz	25.67	-20.34
1 Quasi Peak	418.88 MHz	27.33	-18.68
1 Quasi Peak	518.36 MHz	29.55	-16.46
1 Quasi Peak	639.88 MHz	32.26	-13.75
1 Quasi Peak	804.88 MHz	34.13	-11.88
1 Quasi Peak	893.16 MHz	35.67	-10.34
1 Quasi Peak	898.4 MHz	39.58	-6.43
1 Quasi Peak	909.2 MHz	35.98	-10.03
1 Quasi Peak	952.08 MHz	35.78	-10.23

Gandini 20181520



Gandini 20181521