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LAB N° 0168 L

Independent Testing Laboratory
Accredited by ACCREDIA according to UNI CEI EN ISO/IEC 17025 accreditation n. 0168 L

TEST REPORT
Nr. R21021001

Federal Communication Commission (FCC)

Report Reference No. .....:	R21021001
Date of issue: .....:	27.05.2021
Total number pages: .....:	92
Applicant´s name .....:	Imet S.r.l.
Address .....:	Via Ronche, 93 – 33077 Sacile (PN) – 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 .....:	2021-04

General disclaimer:

The test results presented in this report relate only to the object tested.
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Test item description .....:	2,4 GHz RF Transceiver module
Trademark .....:	Imet
Manufacturer .....:	Imet S.r.l.
Model / Type reference .....:	B033
FCC ID .....:	2AYRTB033
Rating(s) .....:	3,7 Vdc from battery

Report

Tested by (name + signature).....:	G. Gandini	.....
Approved by (name + signature) .....:	R. Beghetto	.....

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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	27.05.2021	--

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Testing and sampling:	
Date of receipt of test item	02.02.2021
Testing start date	16.04.2021
Testing end date	26.05.2021
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 P210120
General remarks:	
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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.	

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

Description .....:	2,4 GHz RF Transceiver module						
Model Number .....:	B033						
FCC ID .....:	2AYRTB033						
Serial Number .....:	--						
Brand name .....:	Imet						
Frequency band .....:	2400 – 2483,5 MHz						
Nominal frequencies .....:	F_L: 2404 MHz		F_M: 2440 MHz		F_H: 2479 MHz		
Test power supply.....:		Voltage and Frequency	Reference poles				
			N	L1	L2	L3	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 3,7 V from battery					☐
Test configuration .....:	☐	Table top equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Module					
Type of equipment .....:	☒	Transmitter unit					
	☒	Receiver unit					
Type of station .....:	☐	Portable station					
	☒	Mobile station					
Operating modes .....:	No.	Operating mode of test item					
	1	EUT in continuous transmission at maximum power					

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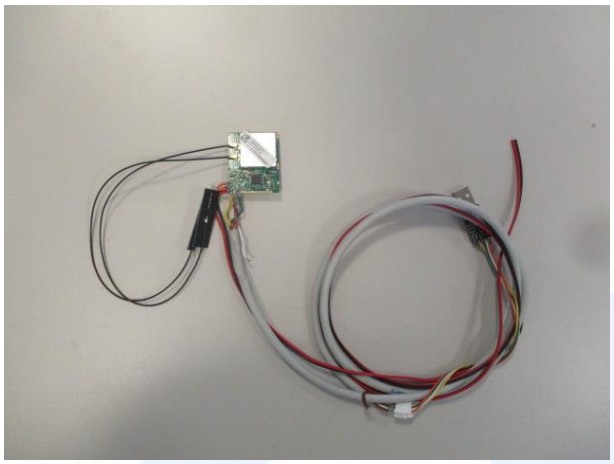
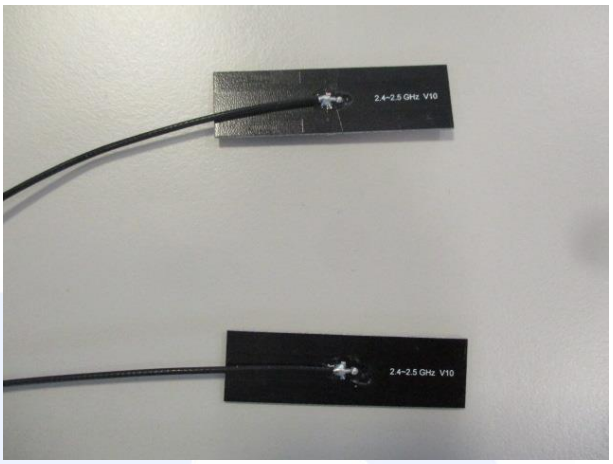
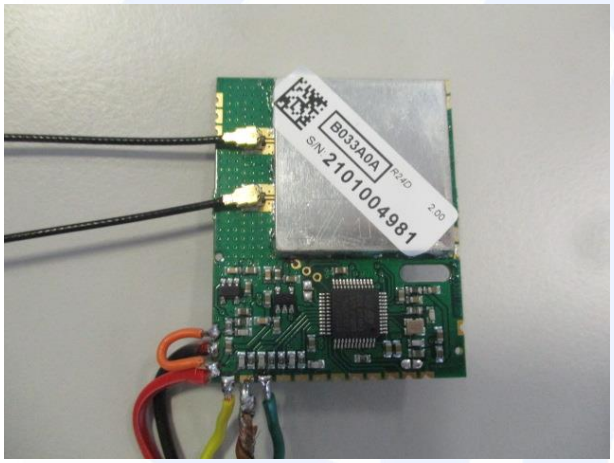
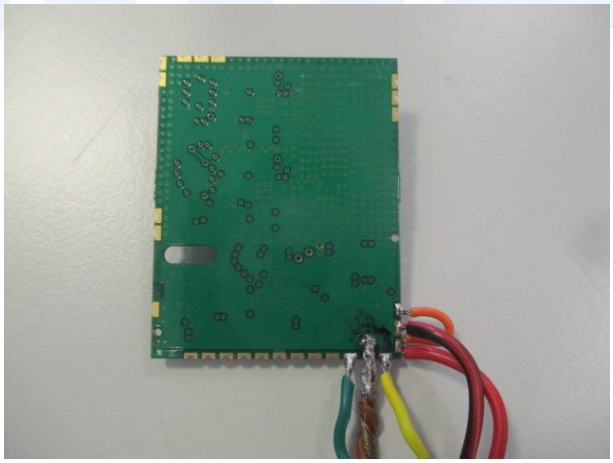
6.1 Photos of the test item









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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)

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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

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8 Test conditions

8.1 General

<table>
<tr><td rowspan="4">Environmental reference conditions.....:</td><td colspan="3">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:</td></tr>
<tr><td>Temperature</td><td>Humidity</td><td>Atmospheric pressure</td></tr>
<tr><td>15 °C – 35 °C</td><td>30 % - 60 %</td><td>800 hPa – 1060 hPa</td></tr>
<tr><td colspan="3">If explicitly required in the basic standard or applied product standard the climatic values are recorded and documented separately in this test report.</td></tr>
<tr><td>Measurement uncertainties .....:</td><td colspan="3">Attachment 1</td></tr>
</table>

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9 Test results

9.1 Antenna requirements

Tested by ..... :	G. Gandini	
Test date ..... :	16.04.2021	
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 ..... :	2 dBi	
External R.F. power amplifier ..... :	Not Present	

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9.2 Emissions in restricted frequency bands and in unrestricted frequency bands

Tested by ..... :	G. Gandini	
Test date ..... :	16.04.2021	
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(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
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 ≥ 1000 MHz)			
Frequency (MHz)	*Test distance (m)*	*AV limits [dB(µV/m)]*	*Peak limits [dB(µV/m)]*
> 1000	3	54	74

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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:

a) 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
b) 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.
c) In either case, attenuation to levels below the 15.209 general radiated emissions limits is not required

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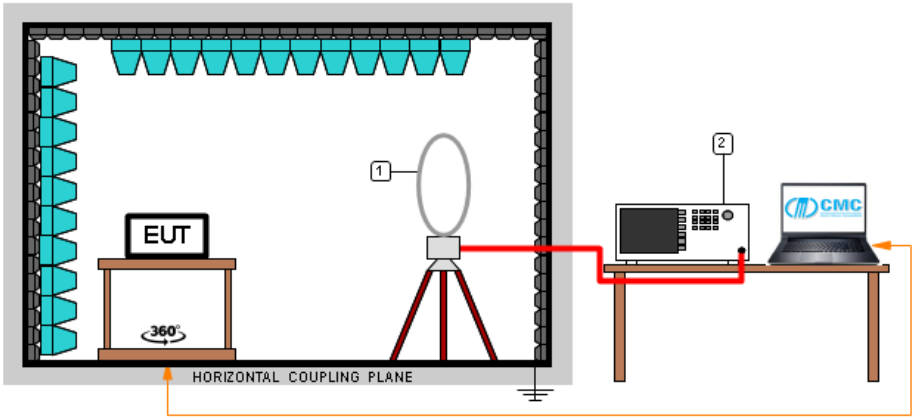
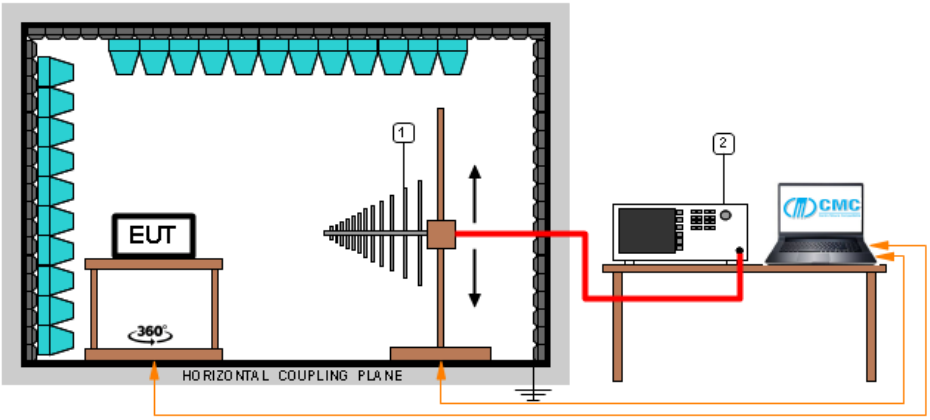
Test setup

Frequency ≤ 30 MHz



Test setup PE004_01				
Nr.	*Id. Number*	*Manufacturer*	*Model*	*Description*
2	CMC S353	Rohde & Schwarz	ESW26	EMI Test Receiver 1 Hz - 26.5 GHz
2	CMC S164	Rohde & Schwarz	ESU26	EMC receiver
1	CMC S127	Schaffner	HLA6120	Loop Antenna 9kHz - 30MHz

Frequency ≤ 1 GHz



Test setup PE004_02				
Nr.	*Id. Number*	*Manufacturer*	*Model*	*Description*
2	CMC S353	Rohde & Schwarz	ESW26	EMI Test Receiver 1 Hz - 26.5 GHz
2	CMC S164	Rohde & Schwarz	ESU26	EMC receiver
1	CMC S271	Schwarzbeck	BBA 9106 + VHBB 9124	Broadband Antenna

Test setup PE004_03				
Nr.	*Id. Number*	*Manufacturer*	*Model*	*Description*
2	CMC S353	Rohde & Schwarz	ESW26	EMI Test Receiver 1 Hz - 26.5 GHz
2	CMC S164	Rohde & Schwarz	ESU26	EMC receiver
1	CMC S287	Schwarzbeck	VUSLP 9111B	Broadband Antenna

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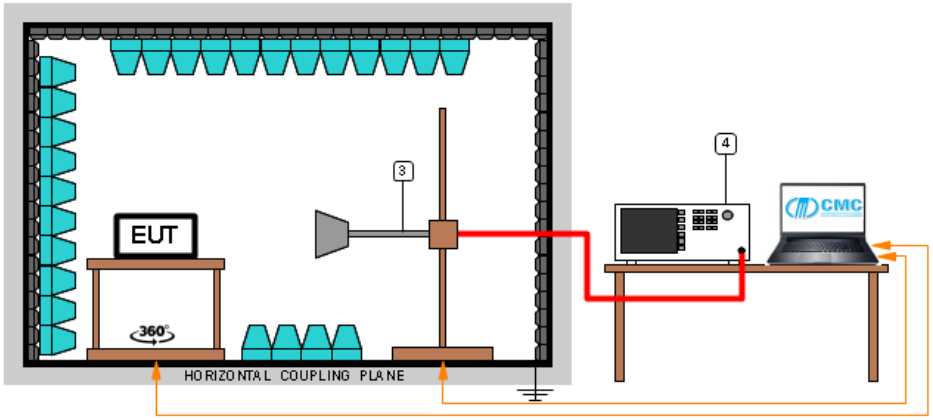
Frequency > 1 GHz



Test setup PE004_04				
Nr.	*Id. Number*	*Manufacturer*	*Model*	*Description*
4	CMC S353	Rohde & Schwarz	ESW26	EMI Test Receiver 1 Hz - 26.5 GHz
4	CMC S164	Rohde & Schwarz	ESU26	EMC receiver
3	CMC S108	Emco	3115	Waveguide antenna

Test setup PE004_05				
Nr.	*Id. Number*	*Manufacturer*	*Model*	*Description*
4	CMC S353	Rohde & Schwarz	ESW26	EMI Test Receiver 1 Hz - 26.5 GHz
4	CMC S164	Rohde & Schwarz	ESU26	EMC receiver
3	CMC S290	Schwarzbeck	BBHA 9170	Horn Antenna (15-40 GHz)

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Result

Chip A

Transmission frequency (MHz)	*Polarization*	*Frequency Range (MHz)*	*Graphs*	*Result*
2404	V	1000 – 3000	G21021001	P
2404	H	1000 – 3000	G21021002	P
2440	H	1000 – 3000	G21021003	P
2440	V	1000 – 3000	G21021004	P
2479	V	1000 – 3000	G21021005	P
2479	H	1000 – 3000	G21021006	P
Worst case	V	300 – 1000	G21021019	P
Worst case	H	300 – 1000	G21021020	P
Worst case	H	30 – 300	G21021025	P
Worst case	V	30 – 300	G21021026	P
Worst case	Loop	0,009 – 30	G21021027	P
2404	V	3000 – 18000	G21021067	P
2404	H	3000 – 18000	G21021068	P
2440	H	3000 – 18000	G21021069	P
2440	V	3000 – 18000	G21021070	P
2479	V	3000 – 18000	G21021071	P
2479	H	3000 – 18000	G21021072	P
2404	V	18000 – 26000	G21021085	P
2404	H	18000 – 26000	G21021086	P
2440	H	18000 – 26000	G21021087	P
2440	V	18000 – 26000	G21021088	P
2479	V	18000 – 26000	G21021089	P
2479	H	18000 – 26000	G21021090	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 40log(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 20log(test distance/10) based on the measuring distance provided by the standard.
Peaks above the limits are caused by the nominal transmitting frequencies

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Chip B

Transmission frequency (MHz)	*Polarization*	*Frequency Range (MHz)*	*Graphs*	*Result*
2479	V	1000 – 3000	G21021013	P
2479	H	1000 – 3000	G21021014	P
2440	H	1000 – 3000	G21021015	P
2440	V	1000 – 3000	G21021016	P
2404	V	1000 – 3000	G21021017	P
2404	H	1000 – 3000	G21021018	P
Worst case	H	300 – 1000	G21021021	P
Worst case	V	300 – 1000	G21021022	P
Worst case	V	30 – 300	G21021023	P
Worst case	H	30 – 300	G21021024	P
Worst case	Loop	0,009 – 30	G21021028	P
2404	H	3000 – 18000	G21021073	P
2404	V	3000 – 18000	G21021074	P
2440	V	3000 – 18000	G21021075	P
2440	H	3000 – 18000	G21021076	P
2479	H	3000 – 18000	G21021077	P
2479	V	3000 – 18000	G21021078	P
2404	V	18000 – 26000	G21021079	P
2404	H	18000 – 26000	G21021080	P
2440	H	18000 – 26000	G21021081	P
2440	V	18000 – 26000	G21021082	P
2479	V	18000 – 26000	G21021083	P
2479	H	18000 – 26000	G21021084	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 40log(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 20log(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

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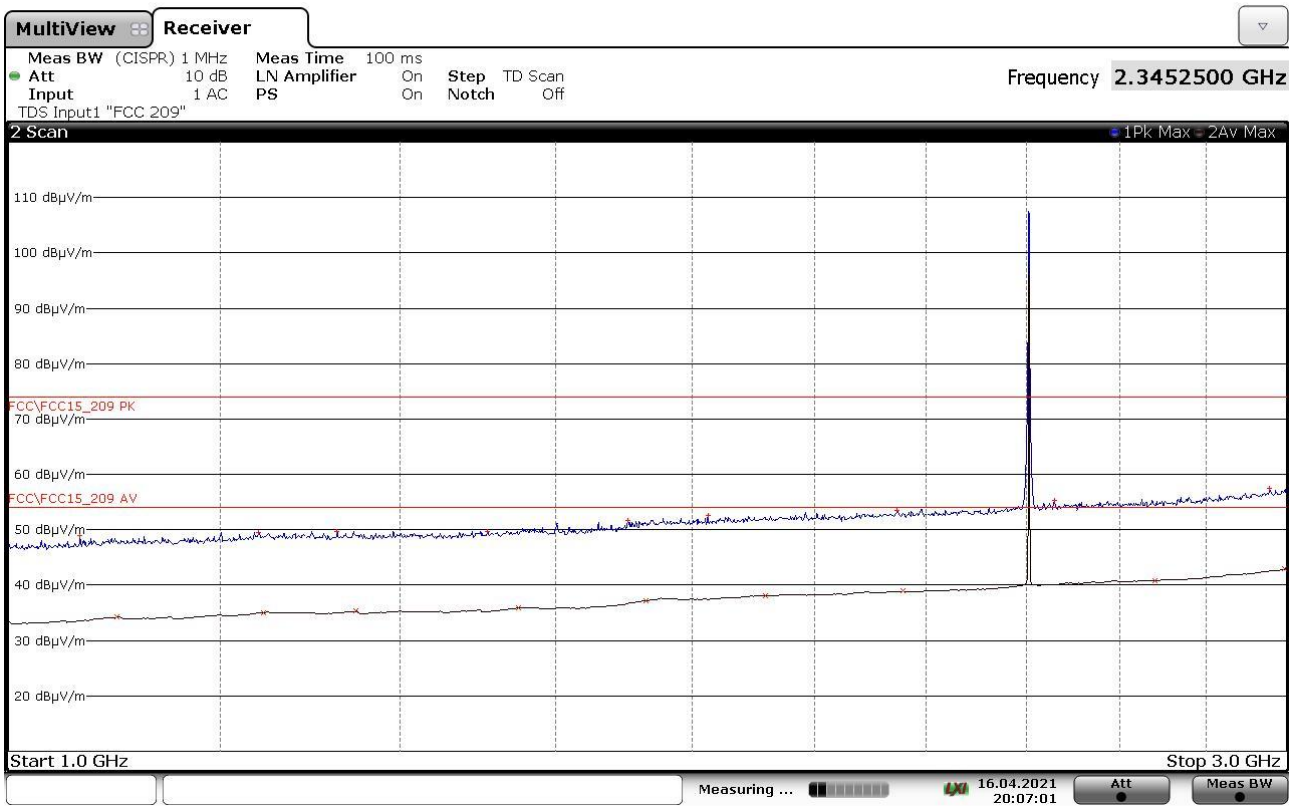
Graphs

Gandini 21021001



FINAL RESULT TABLE					
MAX PEAK			AVERAGE		
Freq Hz	Lev dBuV/m	Margin dB	Freq Hz	Lev dBuV/m	Margin dB
1063250000	+48,91	-25,07	1098000000	+34,27	-19,71
1239750000	+49,45	-24,53	1245500000	+35,02	-18,96
1326500000	+49,73	-24,25	1348250000	+35,29	-18,69
1509250000	+49,76	-24,22	1549750000	+35,92	-18,06
1703500000	+51,68	-22,30	1729750000	+37,18	-16,80
1824250000	+52,55	-21,43	1917250000	+38,16	-15,82
2147000000	+53,44	-20,54	2157250000	+38,92	-15,06
2457250000	+55,39	-18,59	2679500000	+40,87	-13,11
2956500000	+57,43	-16,55	2995750000	+42,90	-11,08

21021001_2

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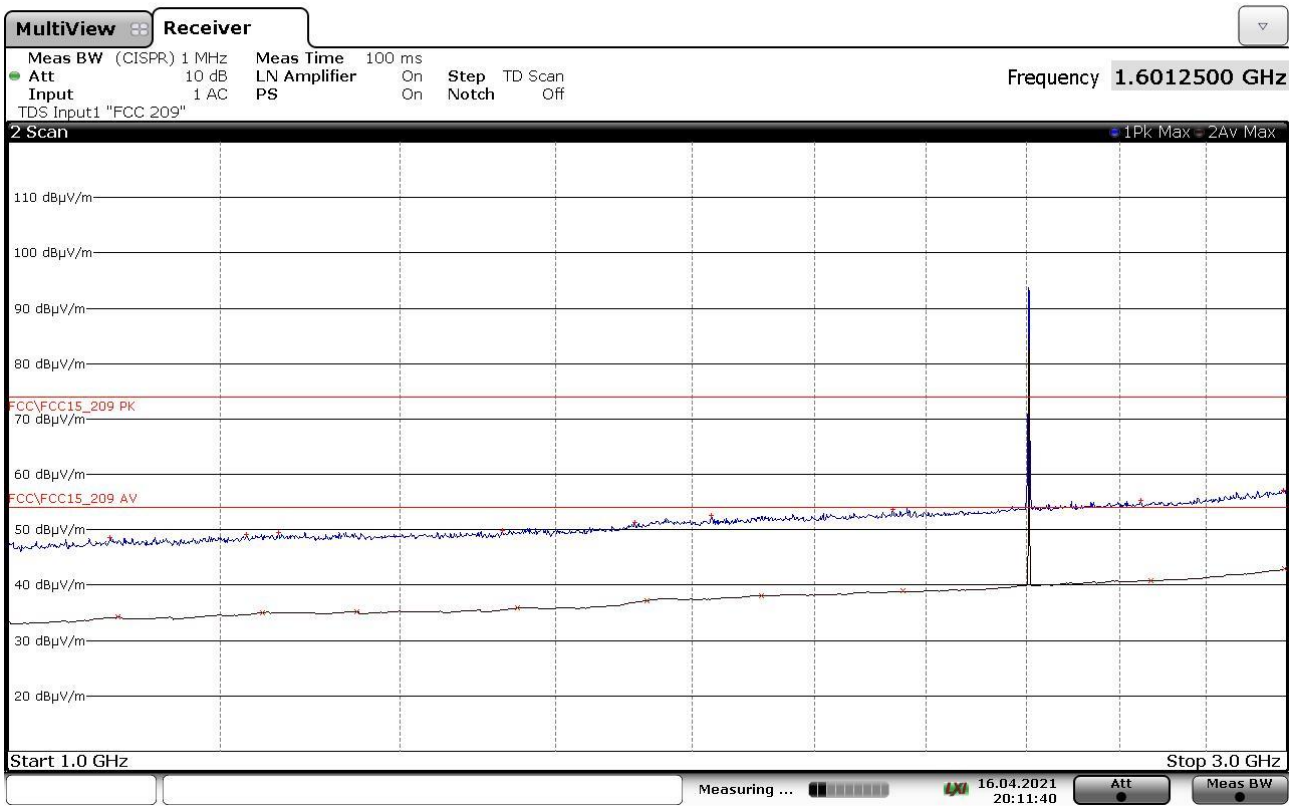
Gandini 21021002



FINAL RESULT TABLE

MAX PEAK			AVERAGE		
Freq Hz	Lev dBuV/m	Margin dB	Freq Hz	Lev dBuV/m	Margin dB
1091500000	+48,52	-25,46	1098250000	+34,26	-19,72
1226750000	+49,14	-24,84	1244000000	+35,01	-18,97
1261500000	+49,57	-24,41	1348750000	+35,28	-18,70
1528750000	+49,95	-24,03	1548500000	+35,91	-18,07
1712750000	+51,24	-22,74	1731000000	+37,17	-16,81
1830000000	+52,58	-21,40	1910500000	+38,15	-15,83
2138250000	+53,63	-20,35	2157500000	+38,91	-15,07
2646250000	+55,35	-18,63	2669750000	+40,87	-13,11
2992500000	+57,20	-16,78	2995000000	+42,91	-11,07

21021002_2

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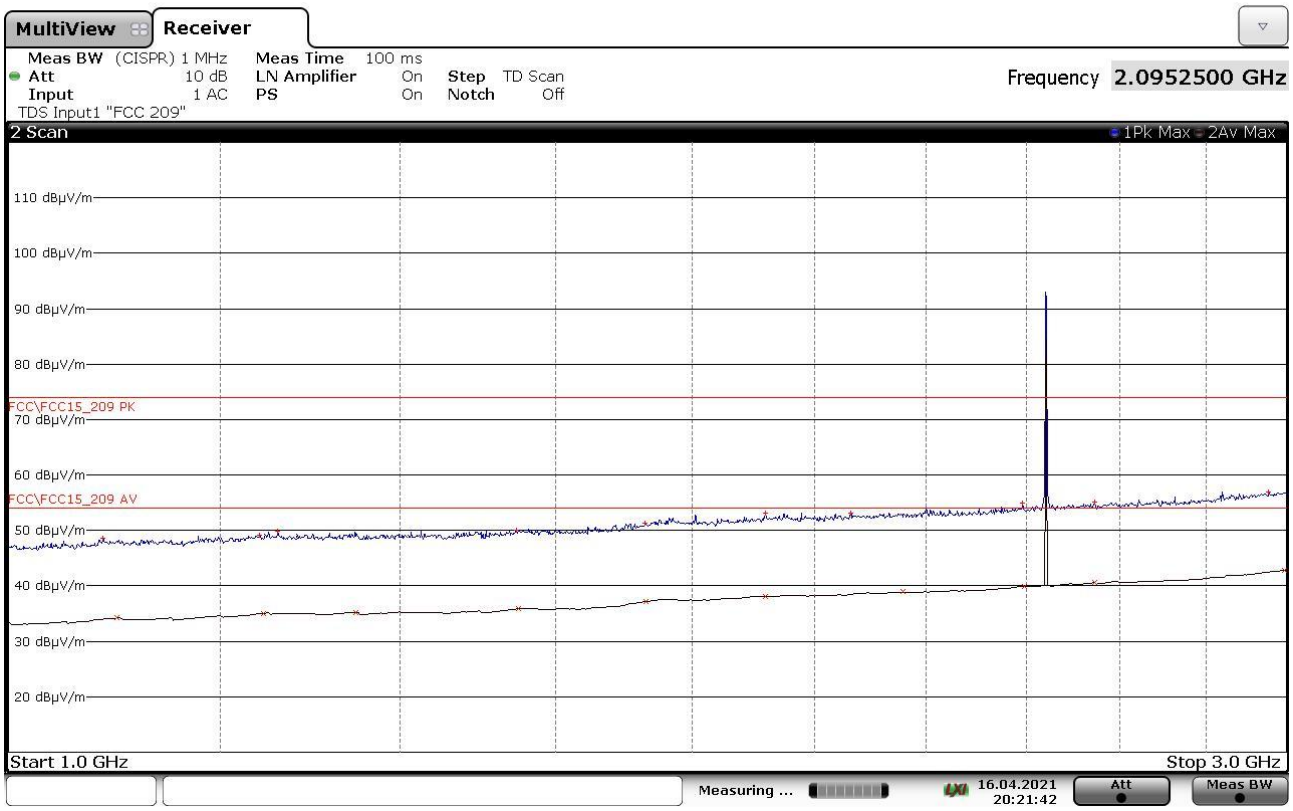
Gandini 21021003



FINAL RESULT TABLE

MAX PEAK			AVERAGE		
Freq Hz	Lev dBuV/m	Margin dB	Freq Hz	Lev dBuV/m	Margin dB
1084750000	+48,64	-25,34	1098000000	+34,25	-19,73
1241250000	+49,08	-24,90	1245000000	+35,00	-18,98
1260250000	+49,89	-24,09	1348250000	+35,28	-18,70
1547250000	+50,09	-23,89	1550000000	+35,91	-18,07
1728750000	+51,28	-22,70	1730250000	+37,16	-16,82
1916750000	+53,12	-20,86	1916750000	+38,16	-15,82
2063500000	+53,17	-20,81	2157000000	+38,91	-15,07
2390750000	+54,91	-19,07	2394750000	+39,96	-14,02
2544250000	+55,19	-18,79	2543250000	+40,68	-13,30
2954750000	+56,98	-17,00	2995250000	+42,89	-11,09

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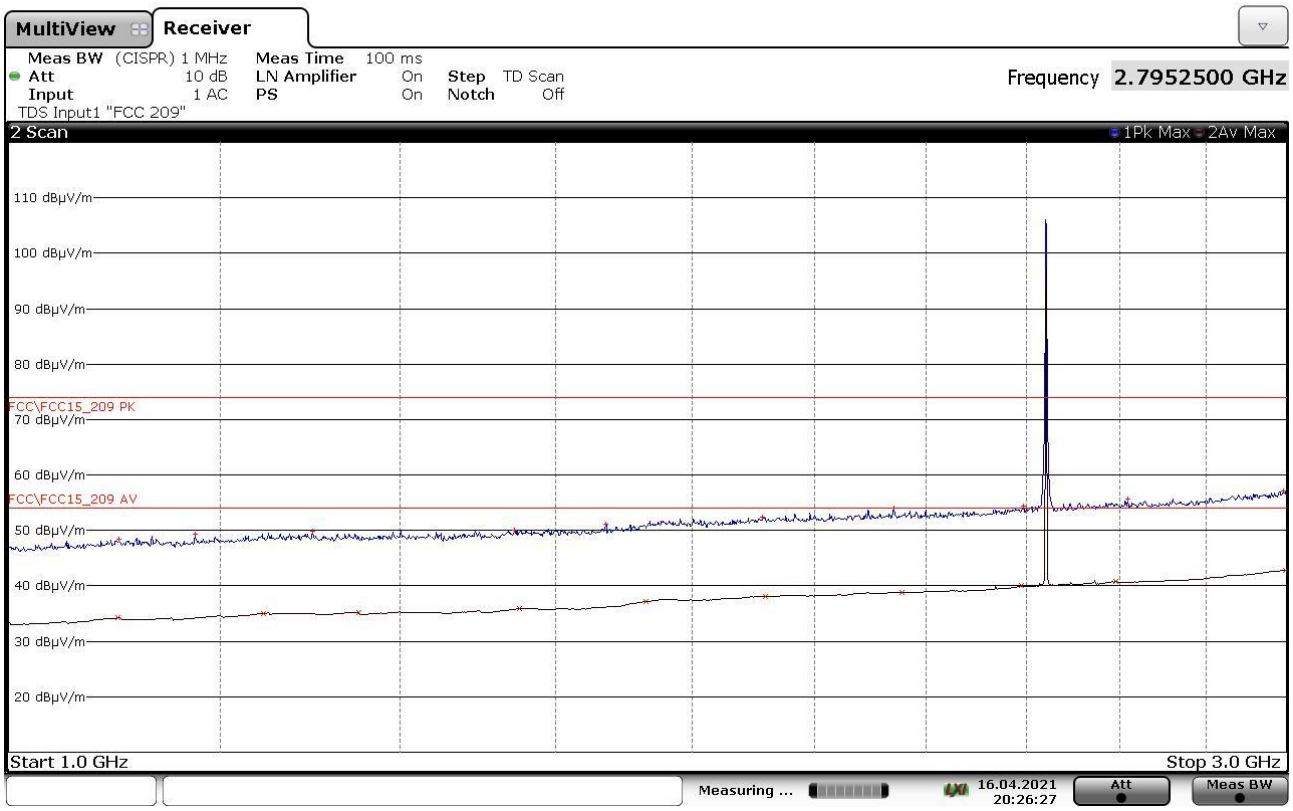
Gandini 21021004



FINAL RESULT TABLE

MAX PEAK			AVERAGE		
Freq Hz	Lev dBuV/m	Margin dB	Freq Hz	Lev dBuV/m	Margin dB
1099750000	+48,37	-25,61	1098250000	+34,24	-19,74
1174250000	+49,34	-24,64	1245250000	+34,99	-18,99
1298750000	+49,83	-24,15	1351000000	+35,26	-18,72
1545250000	+50,02	-23,96	1551000000	+35,90	-18,08
1671750000	+51,18	-22,80	1730500000	+37,16	-16,82
1911500000	+52,32	-21,66	1917000000	+38,15	-15,83
2140500000	+54,09	-19,89	2156500000	+38,89	-15,09
2393500000	+54,31	-19,67	2388000000	+40,13	-13,85
2617000000	+55,69	-18,29	2591250000	+40,81	-13,17
2991250000	+57,03	-16,95	2996250000	+42,89	-11,09

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