

TEST REPORT

Nr. R24028701

Federal Communication Commission (FCC)

Report Reference No.	R24028701
Date of issue:	10.09.2024
Total number pages:	95
Customer name	Embit S.r.l.
Address	Via Emilia Est, 911 – 41122 Modena (MO) – Italy
Test specification:	
Standard(s)	FCC Rules & Regulations, Title 47:2023 Part 15 paragraph(s): 203, 204, 205, 207, 209, 215 and 247 Tests details at page 7
Non-standard test method	N/A
Test Report Form No.	15-247_Hopping_DEKRA
Test Report Form(s) Originator ...	DEKRA Testing and Certification S.r.l.
Master TRF	2024-04
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 DEKRA Testing and Certification S.r.l.	
(*) Test item description	EMB-LR1303-mPCIe LoRaWAN Gateway Module
(*) Trademark	Embit
(*) Manufacturer	Embit S.r.l.
(*) Model / Type reference	EMB-LR1303-mPCIe-USB-915MHz
(*) FCC ID	Z7HEMBLR1302
(*) Rating(s)	120 V ~ 60 Hz single-phase
Report	
Tested by (name + signature)	C. Panozzo
Approved by (name + signature)	F. Marenda

(*) information provided by the customer

1 Summary

1	Summary.....	2
2	Reference standard(s)	3
3	List of attachments.....	3
4	Deviation(s) from test specification	3
5	Testing location.....	3
6	General description of tested item and testing condition(s)	5
6.1	Photos of the test item.....	6
7	Verdict summary section	7
8	Test conditions	8
8.1	General	8
9	Test results	9
9.1	Conducted emission	9
9.2	Emissions in restricted frequency bands and in unrestricted frequency bands	28
9.4	Peak Output Power	89

2 Reference standard(s)	
FCC Rules and Regulation Title 47 part 15:2023 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
3 List of attachments	
Attachment 1: Measurement uncertainty, judgement of compliance and quality manual references	
4 Deviation(s) from test specification	
None	
5 Testing location	
DEKRA Testing and Certification S.r.l. Via della Fisica, 20 – 36016 Thiene (VI) – Italy Test site facility's FCC registration number: 182474	

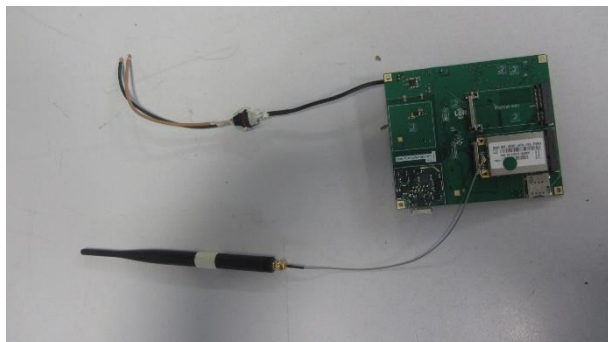
Revision index	Date	Change history
1.0	10.09.2024	--

Testing and sampling:	
Date of receipt of test item	12.02.2024
Testing start date	05.03.2024
Testing end date	09.09.2024
Sampling procedure	Sample used for testing chosen by the customer; DEKRA Testing and Certification S.r.l. cannot be considered responsible for the selection of the sample
Internal identification	Adhesive label with the product number P240143
General remarks:	
This report shall not be reproduced, except in full, without the written approval of DEKRA Testing and Certification S.r.l. 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. Tests reported in this test report marked by wording: “Test not accredited by ACCREDIA” are not part of the ACCREDIA accreditation of this laboratory.	
Possible test case verdicts:	
Test case does not apply to the test object:	N/A (Not Applicable)
Test object meets the requirement:	P (Pass)
Test object does not meet the requirement:	F (Fail)
Test object was not evaluated for the requirement:	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	EMB-LR1303-mPCIe LoRaWAN Gateway Module						
Model Number	EMB-LR1303-mPCIe-USB-915MHz						
FCC ID	Z7HEMBLR1302						
Serial Number	--						
Brand name	Embit						
Frequency band	902 – 928 MHz						
Nominal frequencies (LoRa 125 kHz)	F _L : 903,90 MHz	F _M : 904,50 MHz			F _H : 905,30 MHz		
Nominal frequencies (LoRa 500 kHz)	F _L : 923,30 MHz	F _M : 925,00 MHz			F _H : 927,50 MHz		
Test power supply		Voltage and Frequency	Reference poles				
			N	L1	L2	L3	PE
	☒	AC: 120 V, 60 Hz	☒	☒	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☐	DC:					
Software release	rlz_010000_CoreCell_USB.bin						
Type of equipment	☒ Transmitter unit ☒ Receiver unit						
Type of station	☐ Portable station ☒ Mobile station						
Test arrangements of EUT	<i>Intended operational arrangement(s) of EUT</i>			<i>Test arrangement (see basic standard)</i>			
	☒ Table-top only			Table-top			
	☐ Floor-standing only			Floor-standing			
	☐ Can be floor-standing or table-top			Table-top			
	☐ Rack mounted			In rack or table-top			
	☐ Other, for example wall mounted, ceiling mounted, handheld, body worn			Table-top			
Operating modes	No.	Operating mode of test item					
	1	EUT in continuous transmission at maximum power					
Declination of responsibility	Information relating to the description of the sample, components list, and software/hardware version (if reported) are provided by the customer. DEKRA Testing and Certification S.r.l. cannot be considered responsible for this information, for any other document sent by the customer and for any difference between the software version present in the tested sample and that present in the object intended for final sale. In some cases, the software in the tested sample is in a version dedicated exclusively to the test, and therefore does not represent the software installed in the final version of the product.						

6.1 Photos of the test item



7 Verdict summary section

FCC Rules & Regulations, Title 47:2023 Part 15 paragraph(s): 203, 204, 205, 207, 209, 215 and 247			
Clause	Requirement – Test case	Basic standard	Verdict
Part 15.247 (a) (1)	Pseudo randomly ordered list of hopping frequencies	--	N/E
Part 15.203	Antenna requirements	ANSI C63.10	N/E
Part 15.207	Conducted emissions	ANSI C63.10	P
Part 15.209	Radiated emissions and spurious emissions	ANSI C63.10	P
Part 15.247	20 dB Bandwidth	ANSI C63.10	N/E
Part 15.247	Channel Separation	ANSI C63.10	N/E
Part 15.247	Number of Hopping Channel	ANSI C63.10	N/E
Part 15.247	Time of occupancy	ANSI C63.10	N/E
Part 15.247	Band edge	ANSI C63.10	N/E
Part 15.209 and 15.247	Peak Output Power	ANSI C63.10	P

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. Environmental conditions have been monitored with the following instrument.																			
	<table><tr><td><i>Id. Number</i></td><td><i>Manufacturer</i></td><td><i>Model</i></td><td><i>Serial number</i></td><td><i>Description</i></td><td><i>Last calibration date</i></td><td><i>Calibration expiration</i></td></tr><tr><td>CMC S302</td><td>Testo</td><td>175H1</td><td>40370182610</td><td>Data Logger</td><td>May 2023</td><td>May 2024</td></tr></table>							<i>Id. Number</i>	<i>Manufacturer</i>	<i>Model</i>	<i>Serial number</i>	<i>Description</i>	<i>Last calibration date</i>	<i>Calibration expiration</i>	CMC S302	Testo	175H1	40370182610	Data Logger	May 2023
<i>Id. Number</i>	<i>Manufacturer</i>	<i>Model</i>	<i>Serial number</i>	<i>Description</i>	<i>Last calibration date</i>	<i>Calibration expiration</i>														
CMC S302	Testo	175H1	40370182610	Data Logger	May 2023	May 2024														
Measurement uncertainties :	Attachment 1																			

9 Test results

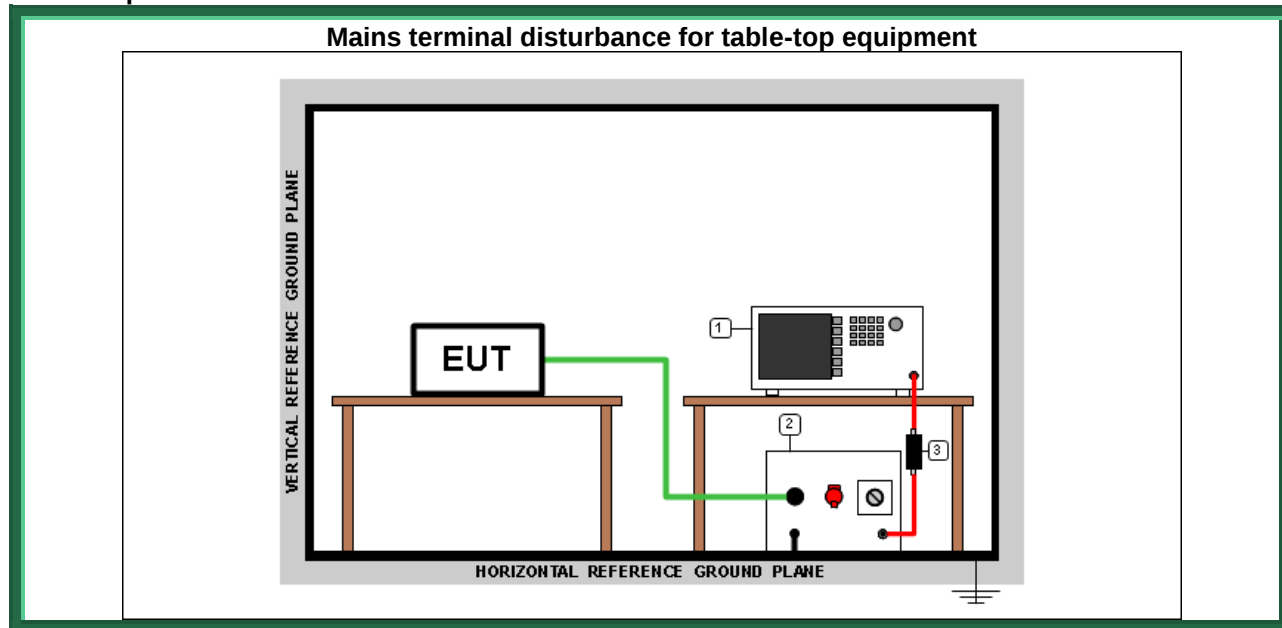
9.1 Conducted emission

Tested by	C. Panozzo	
Test date	03.05.2024	
Test location (stand).....	Shielded chamber (CMC A001)	
Basic standard(s)	ANSI C63.10 cl. 6.2	
Product standard(s).....	FCC Rules and Regulation; Titles 47 Part. 15.207	
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.....	☒	Artificial mains network, 50 μ H/50 Ω LISN
	☐	Other:

Acceptance limits

Frequency range (MHz)	<i>dB(μV) Quasi-peak</i>	<i>dB(μV) Average</i>
0,15 to 0,50	66 to 56	56 to 46
0,5 to 5	56	46
5 to 30	60	50

Test setup



Test setup PE001_01

Nr.	Id. Number	Manufacturer	Model	Serial number	Description	Last calibration date	Calibration expiration
3	CMC S010	Rohde & Schwarz	ESH3-Z2	--	Pulse limiter	January 2024	January 2025
2	CMC S200	Schwarzbeck	NSLK 8128	8128-273	V-LISN	January 2024	January 2025
1	CMC S206	Rohde & Schwarz	ESCI 7	100781	EMC Receiver 9KHz-7GHz	December 2023	December 2024

Result – LoRa 125 kHz, spread factor 7

Transmission channel (MHz)	Line	Frequency Range (MHz)	Graphs	Result
904,50	N	0,15 – 30	G24028792	P
904,50	L1	0,15 – 30	G24028793	P

Result – LoRa 125 kHz, spread factor 10

Transmission channel (MHz)	Line	Frequency Range (MHz)	Graphs	Result
903,90	L1	0,15 – 30	G24028794	P
903,90	N	0,15 – 30	G24028795	P

Result – LoRa 500 kHz, spread factor 7

Transmission channel (MHz)	Line	Frequency Range (MHz)	Graphs	Result
927,50	N	0,15 – 30	G24028796	P
927,50	L1	0,15 – 30	G24028797	P

Result – LoRa 500 kHz, spread factor 12

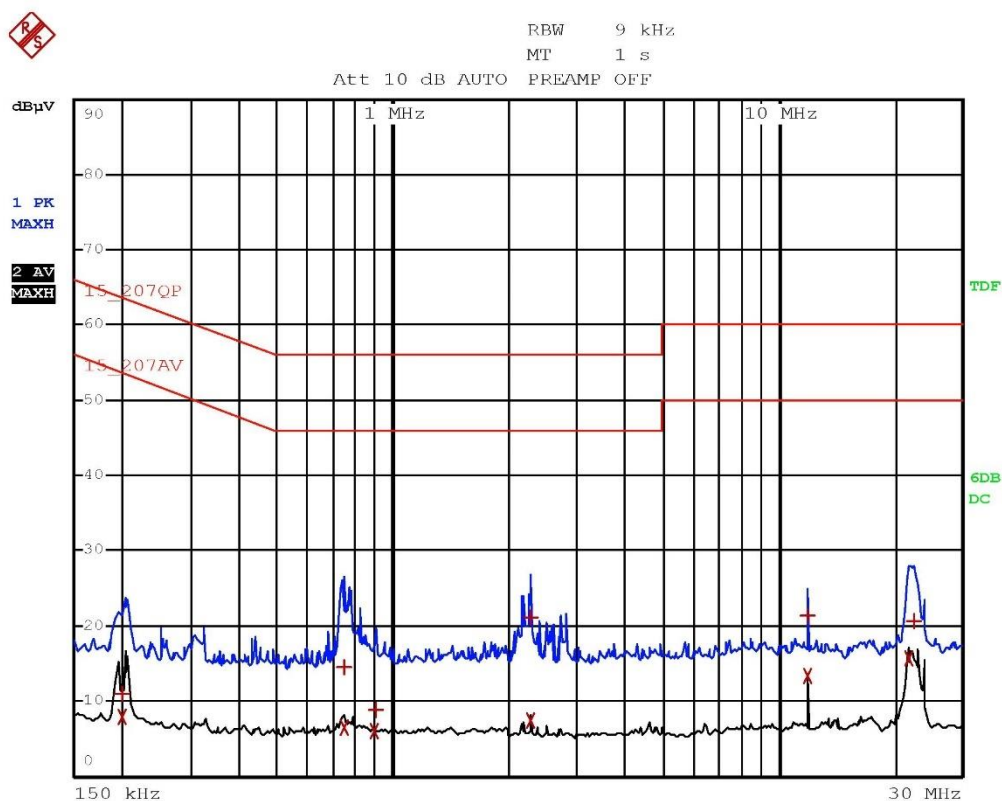
<i>Transmission channel (MHz)</i>	<i>Line</i>	<i>Frequency Range (MHz)</i>	<i>Graphs</i>	<i>Result</i>
927,50	L1	0,15 – 30	G24028798	P
927,50	N	0,15 – 30	G24028799	P

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

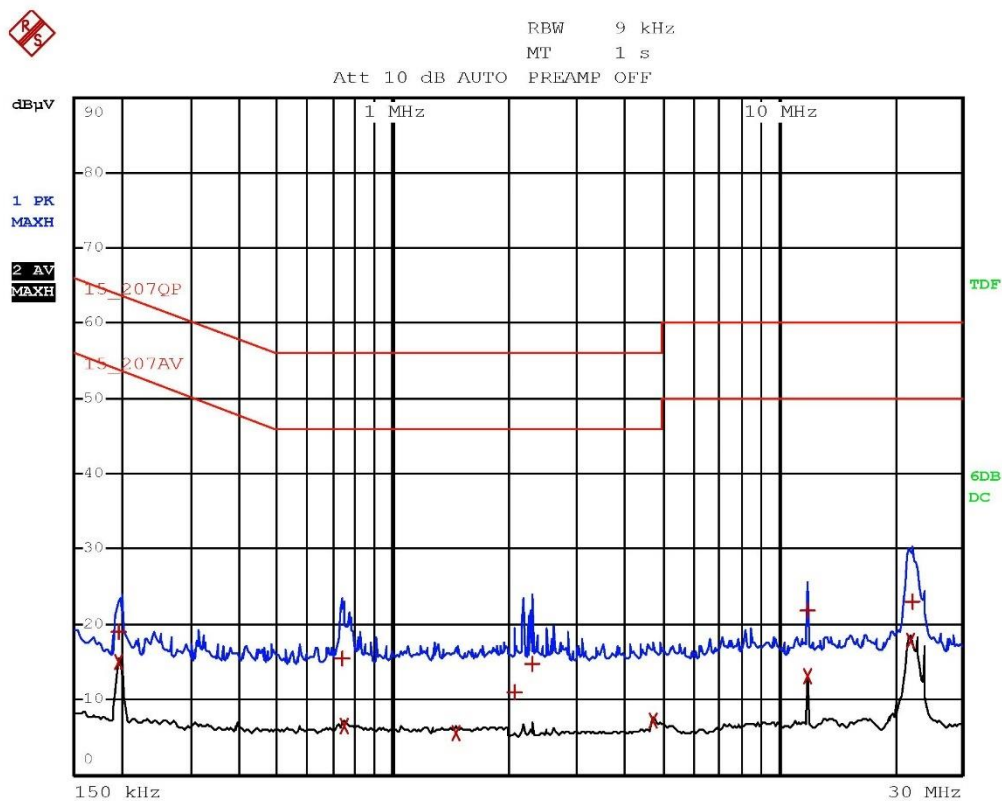
Graphs



Panozzo 24028792

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	15_207QP			
Trace2:	15_207AV			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB	
1 Quasi Peak	202 kHz	11.05	-52.47	
2 Average	202 kHz	7.88	-45.64	
1 Quasi Peak	746 kHz	14.51	-41.48	
2 Average	750 kHz	6.61	-39.38	
2 Average	894 kHz	5.98	-40.02	
1 Quasi Peak	906 kHz	8.92	-47.07	
1 Quasi Peak	2.282 MHz	21.16	-34.83	
2 Average	2.282 MHz	7.35	-38.64	
1 Quasi Peak	11.946 MHz	21.49	-38.50	
2 Average	11.946 MHz	13.34	-36.65	
2 Average	21.906 MHz	15.59	-34.40	
1 Quasi Peak	22.462 MHz	20.66	-39.33	

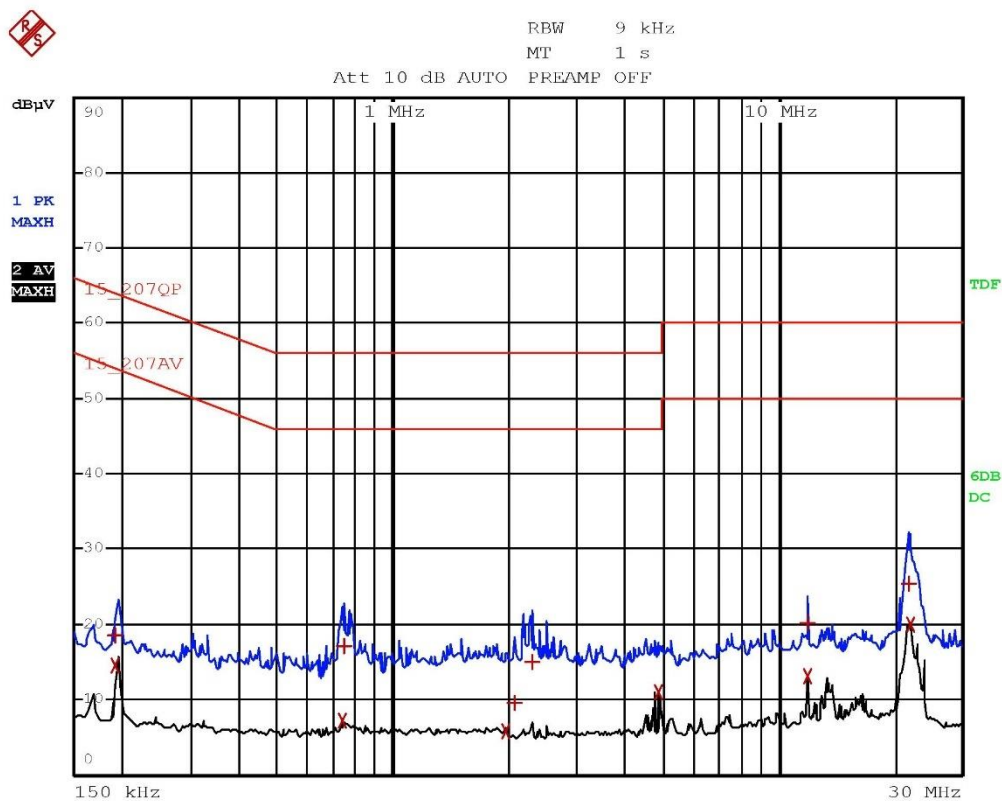
Panozzo 24028792



Panozzo 24028793

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	15_207QP			
Trace2:	15_207AV			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB	
1 Quasi Peak	198 kHz	19.02	-44.66	
2 Average	198 kHz	15.05	-38.63	
1 Quasi Peak	742 kHz	15.38	-40.61	
2 Average	750 kHz	6.60	-39.39	
2 Average	1.462 MHz	5.50	-40.49	
1 Quasi Peak	2.082 MHz	10.93	-45.06	
1 Quasi Peak	2.302 MHz	14.70	-41.29	
2 Average	4.738 MHz	7.25	-38.74	
1 Quasi Peak	11.95 MHz	21.75	-38.24	
2 Average	11.95 MHz	12.99	-37.00	
2 Average	22.03 MHz	17.77	-32.22	
1 Quasi Peak	22.238 MHz	22.97	-37.02	

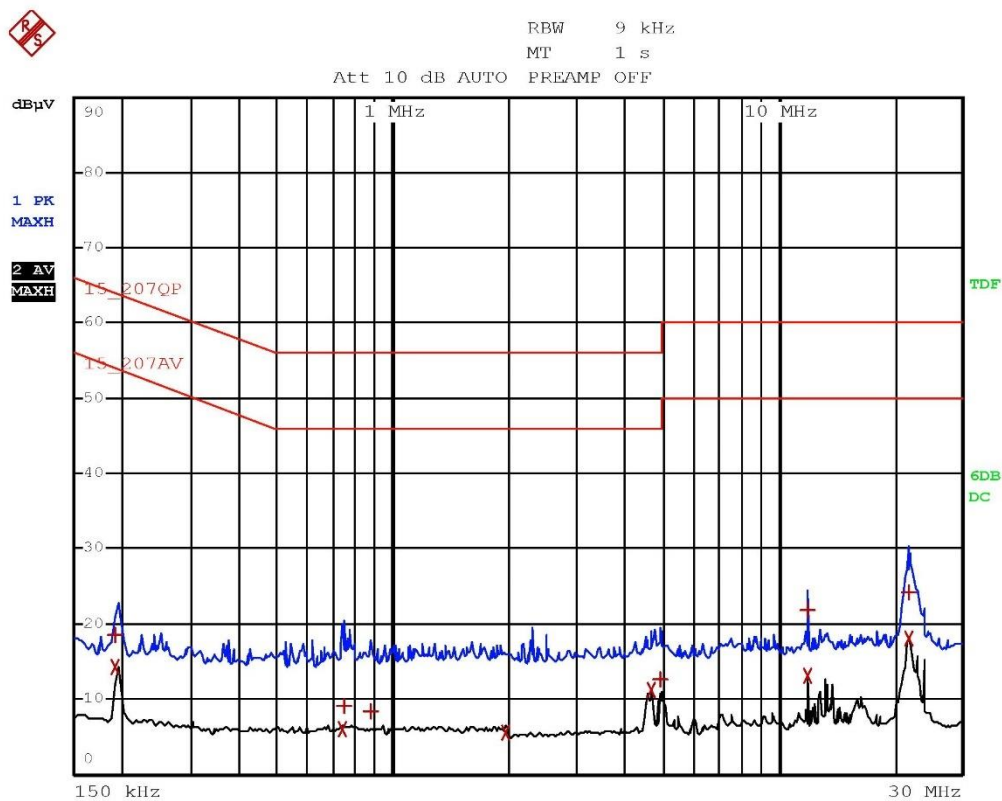
Panozzo 24028793



Panozzo 24028794

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	15_207QP			
Trace2:	15_207AV			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB	
1 Quasi Peak	194 kHz	18.60	-45.26	
2 Average	194 kHz	14.60	-39.26	
2 Average	742 kHz	7.17	-38.82	
1 Quasi Peak	746 kHz	17.11	-38.88	
2 Average	1.966 MHz	5.78	-40.21	
1 Quasi Peak	2.082 MHz	9.67	-46.32	
1 Quasi Peak	2.298 MHz	14.96	-41.03	
2 Average	4.878 MHz	10.87	-35.12	
1 Quasi Peak	11.946 MHz	20.10	-39.89	
2 Average	11.95 MHz	13.10	-36.89	
1 Quasi Peak	21.79 MHz	25.43	-34.56	
2 Average	22.03 MHz	20.02	-29.97	

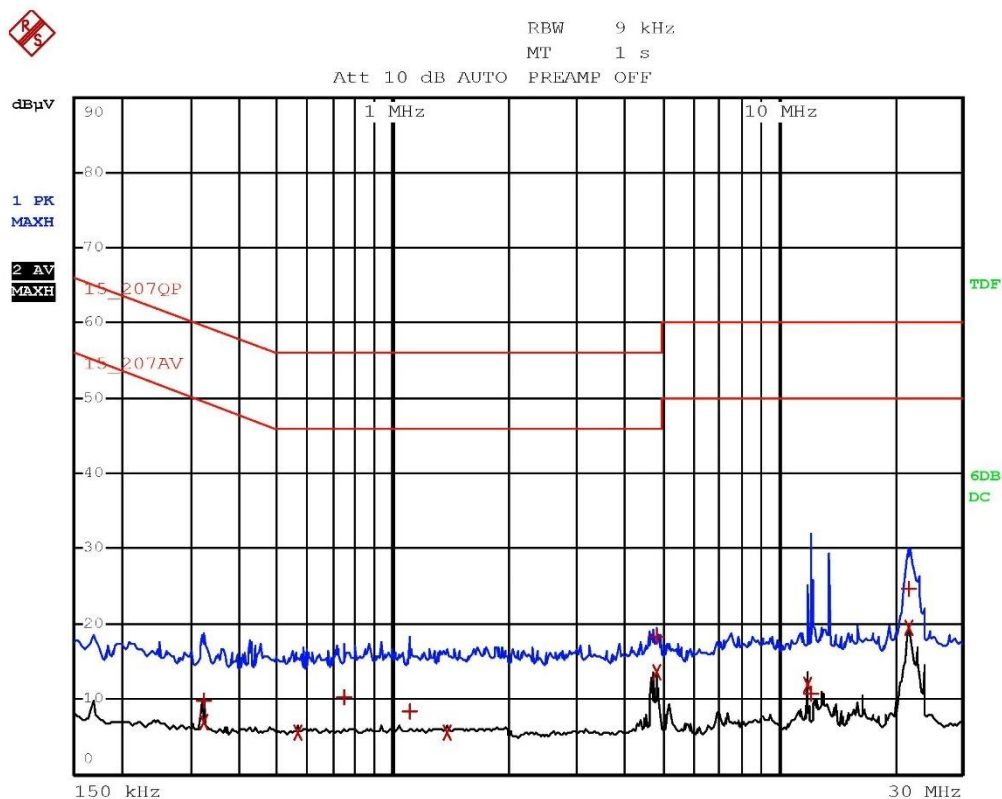
Panozzo 24028794



Panozzo 24028795

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	15_207QP			
Trace2:	15_207AV			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB	
1 Quasi Peak	194 kHz	18.65	-45.20	
2 Average	194 kHz	14.37	-39.48	
2 Average	738 kHz	6.10	-39.89	
1 Quasi Peak	750 kHz	9.08	-46.91	
1 Quasi Peak	878 kHz	8.40	-47.59	
2 Average	1.97 MHz	5.48	-40.51	
2 Average	4.686 MHz	11.33	-34.66	
1 Quasi Peak	4.946 MHz	12.75	-43.24	
1 Quasi Peak	11.95 MHz	21.91	-38.09	
2 Average	11.95 MHz	13.09	-36.90	
1 Quasi Peak	21.906 MHz	24.19	-35.80	
2 Average	21.91 MHz	18.10	-31.89	

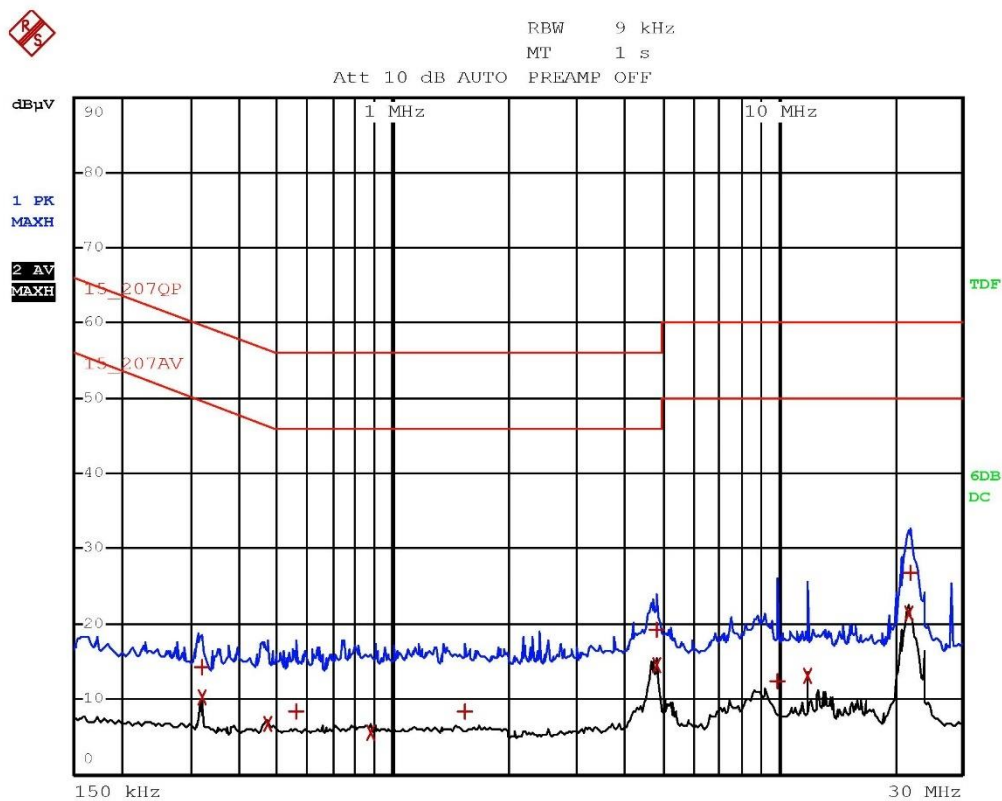
Panozzo 24028795



Panozzo 24028796

EDIT PEAK LIST (Final Measurement Results)			
Trace1:	15_207QP		
Trace2:	15_207AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1 Quasi Peak	322 kHz	9.86	-49.78
2 Average	322 kHz	6.92	-42.72
2 Average	566 kHz	5.53	-40.46
1 Quasi Peak	746 kHz	10.16	-45.83
1 Quasi Peak	1.102 MHz	8.31	-47.68
2 Average	1.39 MHz	5.58	-40.41
1 Quasi Peak	4.822 MHz	18.28	-37.71
2 Average	4.822 MHz	13.58	-32.41
2 Average	11.954 MHz	11.84	-38.15
1 Quasi Peak	12.23 MHz	10.63	-49.36
1 Quasi Peak	21.898 MHz	24.75	-35.24
2 Average	21.91 MHz	19.60	-30.39

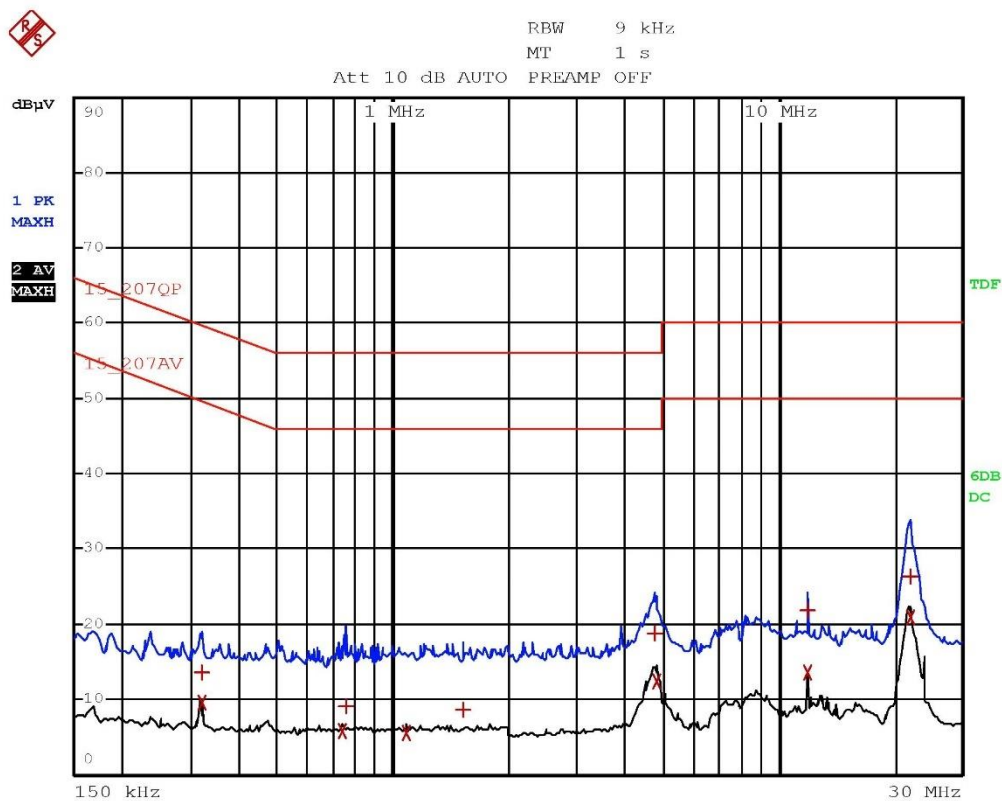
Panozzo 24028796



Panozzo 24028797

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	15_207QP			
Trace2:	15_207AV			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB	
1 Quasi Peak	318 kHz	14.33	-45.42	
2 Average	318 kHz	10.19	-39.56	
2 Average	470 kHz	6.61	-39.90	
1 Quasi Peak	558 kHz	8.49	-47.50	
2 Average	878 kHz	5.59	-40.40	
1 Quasi Peak	1.546 MHz	8.49	-47.50	
1 Quasi Peak	4.822 MHz	19.23	-36.76	
2 Average	4.822 MHz	14.62	-31.37	
1 Quasi Peak	9.918 MHz	12.48	-47.52	
2 Average	11.95 MHz	13.18	-36.81	
2 Average	21.926 MHz	21.35	-28.64	
1 Quasi Peak	21.95 MHz	26.80	-33.19	

Panozzo 24028797



Panozzo 24028798

EDIT PEAK LIST (Final Measurement Results)			
Trace1:	15_207QP		
Trace2:	15_207AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
1 Quasi Peak	318 kHz	13.54	-46.21
2 Average	318 kHz	9.63	-40.12
2 Average	742 kHz	5.83	-40.16
1 Quasi Peak	754 kHz	9.16	-46.83
2 Average	1.082 MHz	5.54	-40.45
1 Quasi Peak	1.526 MHz	8.58	-47.42
1 Quasi Peak	4.818 MHz	18.76	-37.23
2 Average	4.822 MHz	12.38	-33.61
1 Quasi Peak	11.95 MHz	21.81	-38.18
2 Average	11.95 MHz	13.47	-36.52
1 Quasi Peak	22.002 MHz	26.34	-33.65
2 Average	22.058 MHz	20.80	-29.19

Panozzo 24028798