RADIO REPORT

FCC 47 CFR Part 22H, FCC 47 CFR Part 24E

ISED Canada RSS-132 Issue 4, ISED RSS-133, Issue 7

Report Reference No	G0M-2403-2480-TFCMOCORSEGSM-V02
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	 DAkkS - Registration number : D-PL-12092-01-03 (ISED) ISED Testing Laboratory site: 3470A DAkkS - Registration number : D-PL-12092-01-04 (FCC) FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	BIOTRONIK SE & Co. KG
Address	Woermannkehre 1 12359 Berlin GERMANY
Test Specification	47 CFR Part 22H 47 CFR Part 24E ISED RSS-132, Issue 4: 2023-01 ISED RSS-133, Issue 7: 2024-07
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	CardioMessenger Smart / Telemonitorig System
Model(s)	CardioMessenger Smart 4G
Additional Model(s)	None
Brand Name(s)	BIOTRONIK
Hardware Version(s)	CardioMessenger Smart 4G mit LP1 Rev Cx
Software Version(s)	ULP_HIGH_1_37_0, ULP_LOW_1_17_0, M0C.400005, SMARTAPP 1.x
FCC ID	QRI-CMSMART4GWW2
IC	4708A-CMSMART4GWW2
Test Result	**PASSED**

Possible test case verdicts:		
Required by standard but not tested	N/T	
Not required by standard	N/R	
Not applicable to EUT	N/A	
Test object does meet the requirement	P(PASS)	
Test object does not meet the requirement	F(FAIL)	
Testing:		
Test Lab Temperature	20 °C – 23 °C	
Test Lab Humidity	32 % – 38 %	
Date of receipt of test item	See test sample identification table on page 6	
Report:		
Compiled by	Azamat Ibraimov	
Tested by (+ signature) (Responsible for Test)	Azamat Ibraimov	
Approved by (+ signature) (Senior Radio Expert)	Radwan Jaafar	
Date of Issue	2025-05-09	
Total number of pages	51	
General Remarks:		
The test results presented in this report relate only to the object tested. **The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.** This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.		
Additional Comments:		
None		

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2025-02-07	Initial Release	--
02	2025-05-09	Replaced document: G0M-2403-2480-TFCMOCORSEGSM-V01 Replaced by: G0M-2403-2480-TFCMOCORSEGSM-V02 Reason: Standard on first page changed into ISED RSS-133, Issue 7 Updated references in “Result Summary” to be in line with RSS-132, Issue 4 and RSS-133, Issue 7 also added references for FCC Part 2 and left out test cases. Edited “Note 1” at “Result Summary” page to list correct reference reports and added further explanations. Updated standard references for test case “Radiated power”, updated power limit for GSM850 to 3 Watt ERP according to RSS-132, Issue 4, corrected mistake in table header for second output power result table, recalculated radiated output power with the correct antenna gain, recalculated margins to the new limits, values converted from EIRP to ERP for GSM850. Inserted FCC Part 2 references for test case “Transmitter radiated emissions”.	Florian Voigt

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
EUT	Equipment Under Test
FCC	Federal Communications Commission
ISED	Innovation, Science and Economic Development Canada
RBW	Resolution bandwidth
RMS	Root mean square
VBW	Video bandwidth
V_{NOM}	Nominal supply voltage

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1 Equipment (Test Item) Under Test

Description	CardioMessenger Smart / Telemonitorig System			
Model	CardioMessenger Smart 4G			
Additional Model(s)	None			
Brand Name(s)	BIOTRONIK			
Sample Identification	EUT #	Sample-ID	Serial Number	Date of receipt
	EUT 1	49480	91189526	2024-08-01
	EUT 2 (cond.)	48020	91244954	2024-03-18
Hardware Version(s)	CardioMessenger Smart 4G mit LP1 Rev Cx			
Software Version(s)	ULP_HIGH_1_37_0, ULP_LOW_1_17_0, M0C.400005, SMARTAPP 1.x			
PMN	CardioMessenger Smart 4G			
HVIN	CMSMART4GWW2			
FVIN	N/A			
HMN	N/A			
IC	4708A-CMSMART4GWW2			
FCC ID	QRI-CMSMART4GWW2			
Equipment type	End Product			
Radio type	Transceiver			
Radio technologies	GSM			
GSM frequency bands	GSM 850 : UL = 824 - 849 MHz DL = 869 – 894 MHz GSM 1900 : UL = 1850 – 1910 MHz DL = 1930 – 1990 MHz			
GSM Modulations	GMSK, 8-PSK			
Number of modules	1			
Radio Module	Type	LTE Cat M1/NB2 module		
	Model	ME910G1-WW		
	Manufacturer	Telit Cinterion		
	HW Version	HW1.0		
	SW Version	M0C.400005		
	FCC-ID	RI7ME910G1WW		
	IC	5131A-ME910G1WW		
Antenna	Type	Integrated		
	Model	Not specified		
	Manufacturer	BIOTRONIK		
	Gain(measured)	GSM850: 1.89 dBi GSM1900: 3.73 dBi		
Supply Voltage	V_{NOM}	5 V DC via external AC/DC adaptor (for battery charging) 3.7 V DC via internal rechargeable lithium battery		
AC/DC-Adaptor	Model	GTM96180-1107-2.0	FW8000	
	Vendor	GlobTek	Friwo	
	Input	100-240 VAC	100-240 VAC	
	Output	5 VDC	5 VDC	
Manufacturer	BIOTRONIK SE & Co. KG Woermannkehre 1 12359 Berlin GERMANY			

1.1 Photos – Equipment External

EUT front

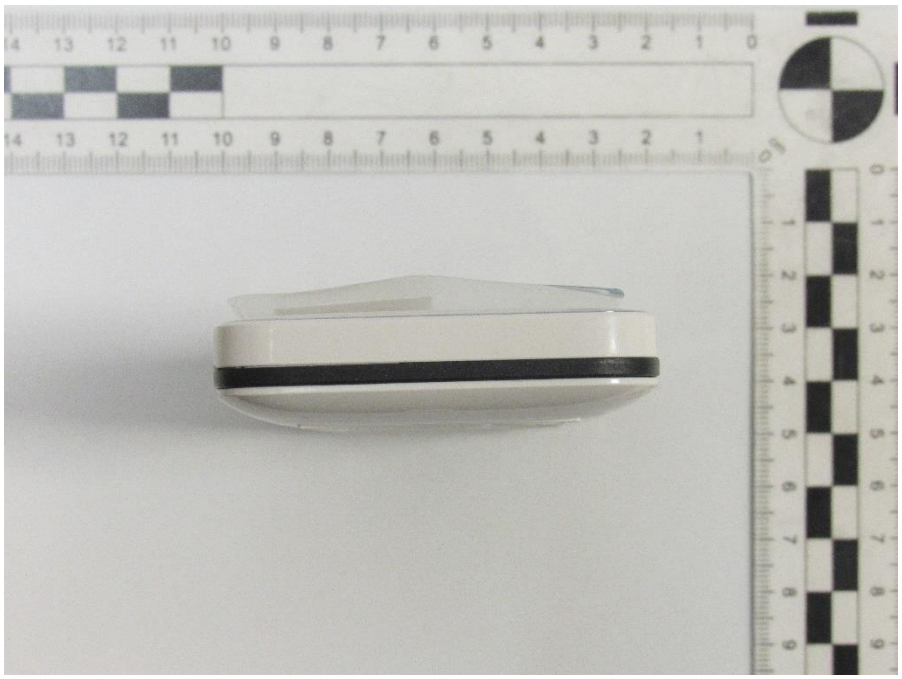
EUT back

EUT perspective 1

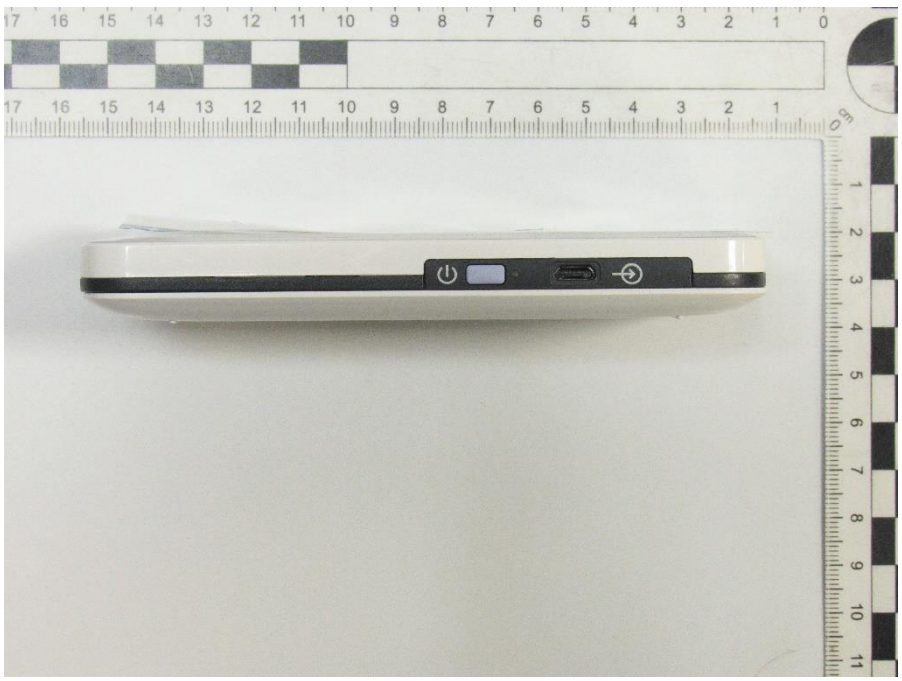

EUT perspective 2


EUT top

EUT bottom



EUT right



EUT left

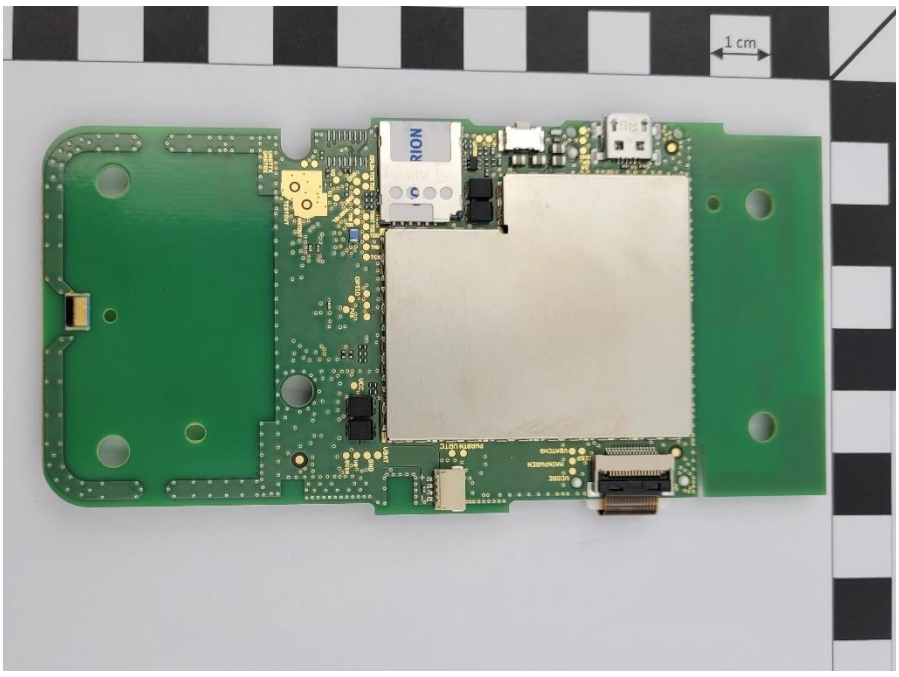
EUT label with FCC & IC IDs

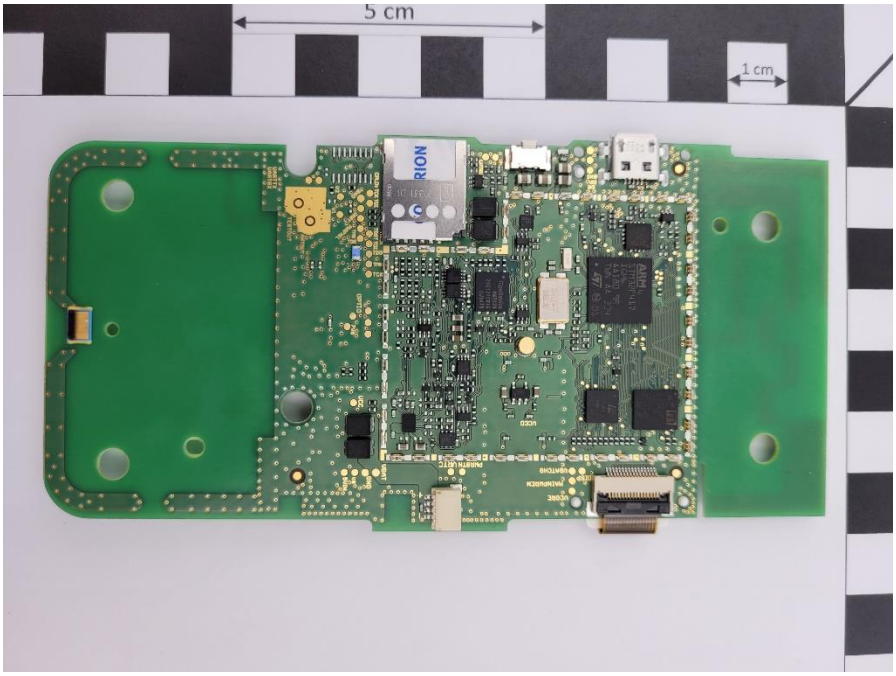
EUT conducted sample

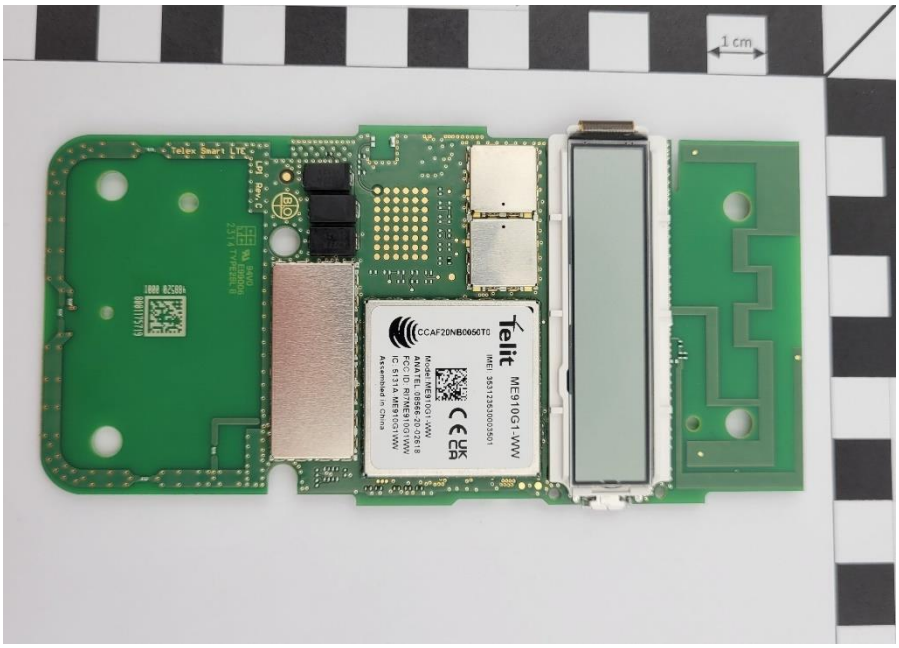
AC/DC adapter 1

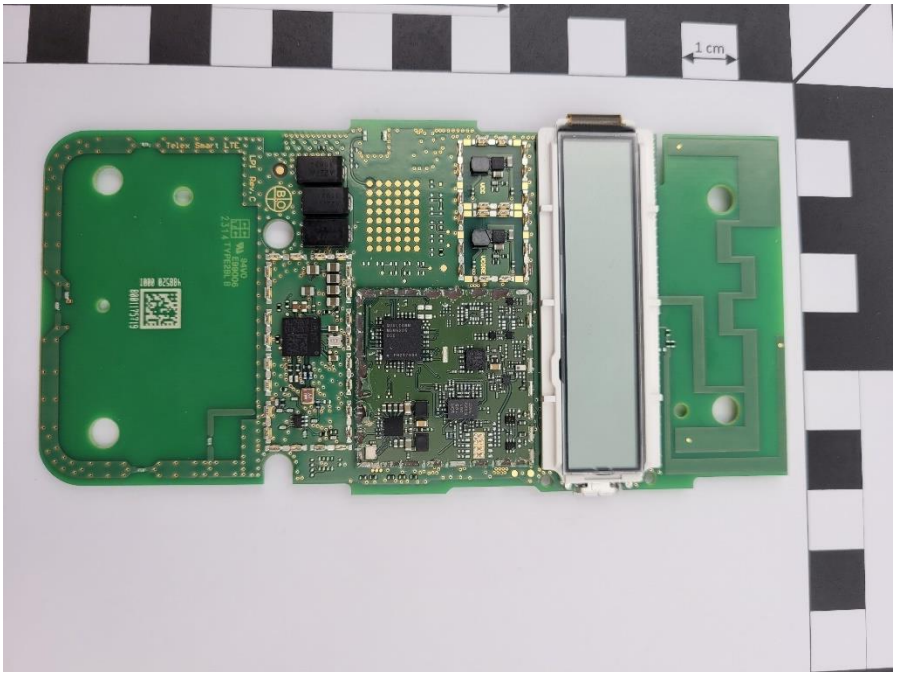
AC/DC adapter 2

1.2 Photos – Equipment Internal

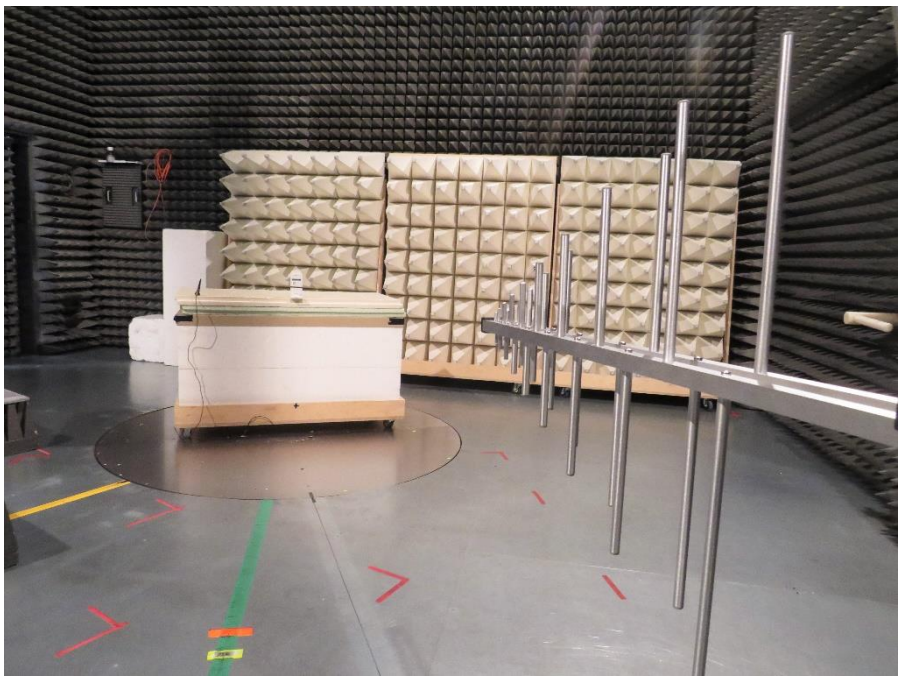
PCB backside (photo from customer)


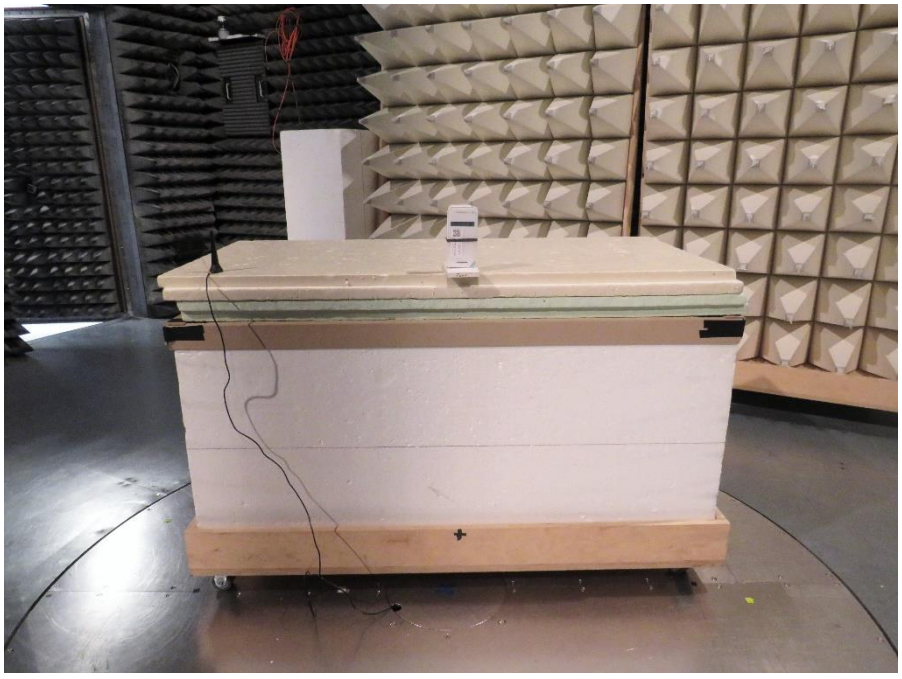
PCB backside without shielding (photo from customer)


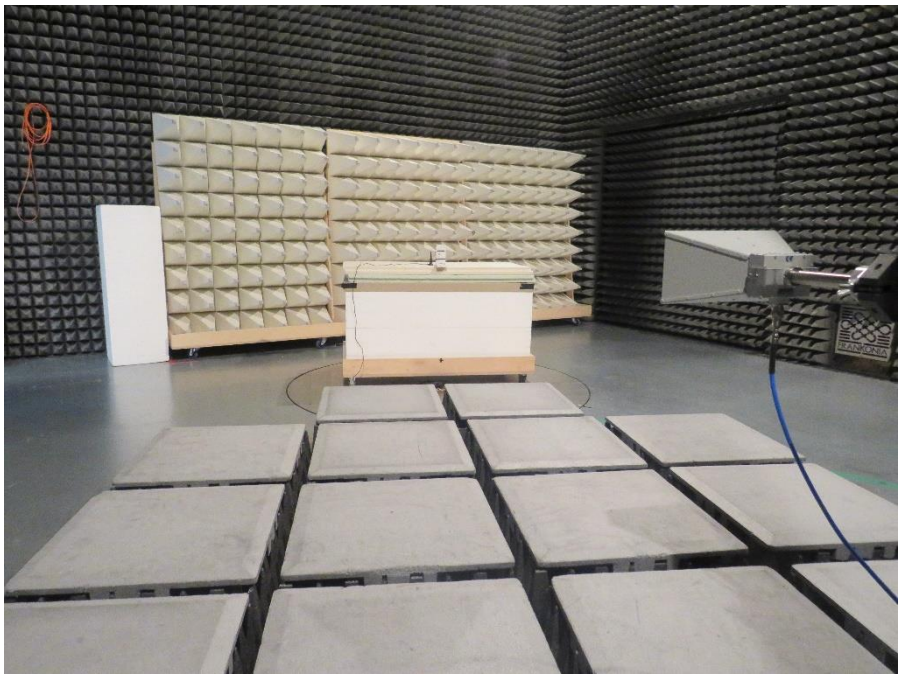
PCB frontside (photo from customer)


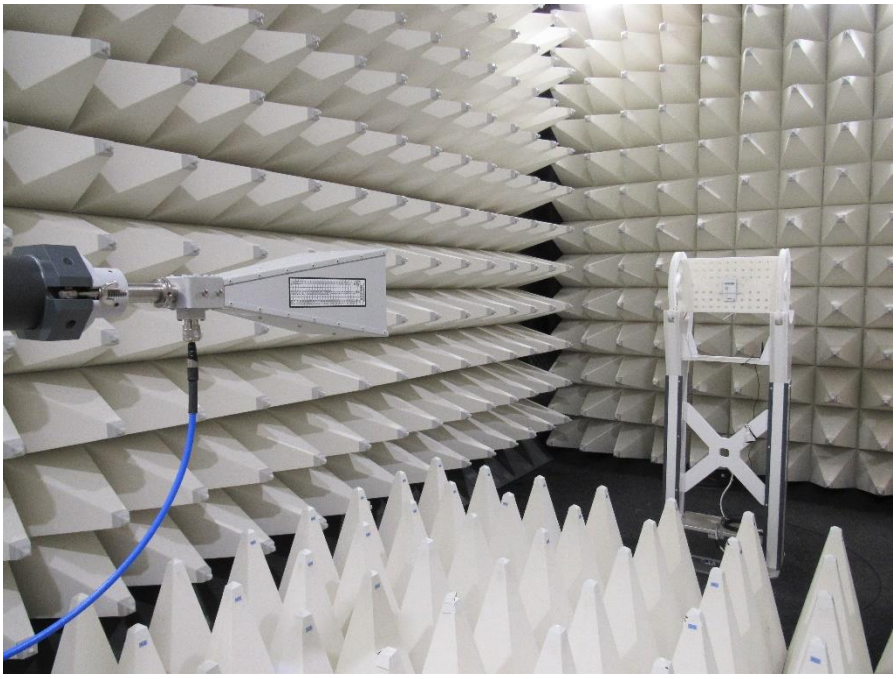
PCB frontside without shielding (photo from customer)


1.3 Photos – Test Setup

Test Setup radiated emissions below 1 GHz


EUT Setup radiated emissions below 1 GHz


Test Setup radiated emissions idle mode above 1 GHz


Test Setup radiated emissions traffic mode above 1 GHz


1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
SIM	Communication Tester	R&S	CMW500	Base Station Simulator
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
Comment: --				

1.5 Test Modes

Mode	Description
GSM850 / GMSK	Channel = 128 Mode = Transmit Power = Maximum Modulation = GMSK Number of time slots = 1 Duty cycle = 12.5 %
GSM1900 / GMSK	Channel = 512 Mode = Transmit Power = Maximum Modulation = GMSK Number of time slots = 1 Duty cycle = 12.5 %
Receive	Modulation = GMSK Number of time slots = 1
Comment: Above worst-case scenarios were found in the module test report referenced in the result summary page.	

1.6 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyzer in dBµV. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

Reading on Analyzer (dBµV) + A.F. (dB/m) = Net field strength (dBµV/m)

Net:

This is the net field strength measurement (as shown above).

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Field strength limit:

This is the FCC Class B radiated emission limit (in units of dBµV/m). The FCC limits are given in units of µV/m. The following formula is used to convert the units of µV/m to dBµV/m:

Field strength limit (dBµV/m) = 20 · log (µV/m)

Example only for radiated field strength:

Reading + AF	= Net Reading	:	Net reading	- Field strength limit	= Margin
+21.5 dBµV	+ 26 dB/m	:	47.5 dBµV/m	- 57.0 dBµV/m	= -9.5

Di:

This is the measurement distance between the test sample and the measurement antenna in meter (m)

ERP:

This is the emitted power by the test sample as Effective Radiated Power (dBm)

EIRP:

This is the emitted power by the test sample as Effective Isotropic Radiated Power (dBm)

Calculation of measurement result:

ERP = Net field strength (dBµV/m) + 20 · log(Di) - 106.95
EIRP = Net field strength (dBµV/m) + 20 · log(Di) - 104.8

P_{Watt}:

This is power in Watts

P_{dBm}:

This is power in dBm. $P_{dBm} = 10 \cdot \log(P_{Watt} / 1000)$

Power limit:

This is the radiated emission limit expressed in P_{dBm}. FCC limits are typically given as an attenuation of carrier power in dB by the formula $x + 10 \cdot \log(P_{Watt})$

Calculation example of emission limit:

Assuming x = 43
Power-Limit = P_{dBm} - 43 + 10 · log(P_{Watt})
Power-Limit = 30 dBm - 43 + 10 · log(1 W) = -13 dBm

Example only for radiated power:

Reading + AF	= Net Reading
+21.5 dBµV + 26 dB/m	= 47.5 dBµV/m
Net Reading + 20 · log(Di) - 104.8	= EIRP
47.5 dBµV/m + 20 · log(3 m) - 104.8	= -47.8 dBm
EIRP - Power limit	= Margin
-47.8 dBm - (-13dBm)	= -34.8 dB

1.7 Measurement Uncertainties

Test case	Maximum measurement uncertainty
Radiated power	1.77 dB
Transmitter out-of-band unwanted emissions	0.662 dB
Transmitter conducted emissions	4.25 dB
Transmitter radiated emissions	5.95 dB
Receiver radiated emissions	5.95 dB

2 Result Summary

Test Summary				
Product Standard Reference	**Requirement**	**Reference Method**	**Result**	**Remarks**
47 CFR §2.1046 47 CFR §22.913 47 CFR §24.232 ISED RSS-132 §5.4 ISED RSS-133 §5.5	Radiated power	ANSI C63.26 KDB 971168	PASS	--
47 CFR §2.1055 47 CFR §22.355 47 CFR §24.235 ISED RSS-132 §5.3 ISED RSS-133 §5.4	Frequency stability	ANSI C63.26 KDB 971168	N/T	Note 1
47 CFR §2.1047 ISED RSS-132 §5.2 ISED RSS-133 §5.3	Modulation characteristics	ANSI C63.26 KDB 971168	N/T	Note 1
47 CFR §2.1049 RSS-Gen §6.7	Occupied Bandwidth	ANSI C63.26 KDB 971168	N/T	Note 1
47 CFR §2.1051 47 CFR §22.917 47 CFR §24.238	Transmitter out-of-band unwanted emissions	ANSI C63.26:2015, Section 5.7	N/T	Note 1
ISED RSS-132 §5.5 ISED RSS-133 §5.6	Transmitter out-of-band unwanted emissions	ANSI C63.26:2015, Section 5.7	PASS	--
47 CFR §2.1051 47 CFR §2.1057 47 CFR §22.917 47 CFR §24.238 ISED RSS-132 §5.5 ISED RSS-133 §5.6	Transmitter conducted emissions	ANSI C63.26 KDB 971168	N/T	Note 1
47 CFR §2.1053 47 CFR §2.1057 47 CFR §22.917 47 CFR §24.238 ISED RSS-132 §5.5 ISED RSS-133 §5.6	Transmitter radiated emissions	ANSI C63.26 KDB 971168	PASS	--
ISED RSS-132 §3.4 ISED RSS-133 §3.4 ISED RSS-Gen §7	Receiver conducted emissions	ANSI C63.26 KDB 971168	N/T	Note 1
ISED RSS-132 §3.4 ISED RSS-133 §3.4 ISED RSS-Gen §7	Receiver radiated emissions	ANSI C63.26 KDB 971168	PASS	--
Note 1: Not conducted tests are covered by the measurements in the original module certification test report with report number “STS1912245W03” issued on 2020-03-05 by test lab SHENZHEN STS TEST SERVICES CO., LTD, Add. : A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District, Bao’an District, Shenzhen. The data is used from the original module certification test report as mentioned above. The data referenced accurately represents the device's operation. The non-retested test results of original module certification report were reviewed by lab and found to be still acceptable for RSS-132, Issue 4 and RSS-133, Issue 7.				
Comment: The Decision Rule is applied on the basis of ETSI TR 102 273 and ETSI TR 100 028. These standards provide guidance on how to calculate and apply measurement uncertainty whilst providing maximum uncertainties allowance. In all cases due consideration will be given to ILAC-G8:09/2019. Where a result is considered conditional in respect of its proximity to the limit line, the customer would be made aware of situation so that they can make an informed decision on how to proceed.				

Possible Test Case Verdicts	
PASS	Test object does meet the requirements
FAIL	Test object does not meet the requirements
N/T	Required by standard but not tested
N/R	Not required by standard for the test object

3 Test Conditions and Results

3.1 Test Conditions and Results - Radiated power

3.1.1 Information

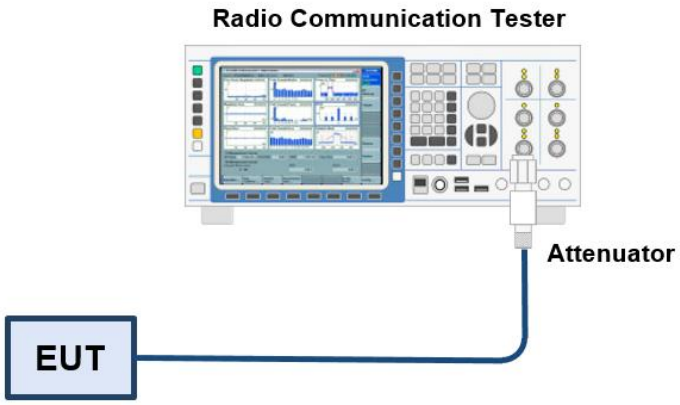
Test Information	
Reference	47 CFR §2.1046 47 CFR §22.913 47 CFR §24.232 ISED RSS-132 §5.4 ISED RSS-133 §5.5
Measurement Method	FCC KDB 971168 D01 Section 5 ANSI C63.26-2015 5.2
Operator	Azamat Ibraimov
Date	2024-08-15

3.1.2 Limits

Limits - Portable equipment					
Band	Frequency range [MHz]	Power limit [dBm ERP]	Power limit [W ERP]	Power limit [dBm EIRP]	Power limit [W EIRP]
GSM850	824 - 849	34.77	3	-	-
GSM1900	1850 - 1910	-	-	33	2

3.1.3 Setup

Test Setup



3.1.4 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Wideband radio communication tester	R&S	CMW500	EF00677	2024-05	2025-05
Attenuator 10 dB	Narda	---	---	N/R	N/R
Cable 0.5M	Gigalane	1730	EF00779	2024-04	2025-04

3.1.5 Procedure

Test Procedure
1. The conducted output power for each radio band is measured
2. The antenna gain for the corresponding transmission frequency is added to the conducted output power
3. The calculated radiated power is compared to the transmitter output power limit

3.1.6 Results

Test Results GSM 850						
Mode	Channel	Conducted power [dBm]	Radiated power [dBm ERP]	Limit [dBm ERP]	Margin [dB]	Result
GPRS 850	128	31.31	31.05	34.77	-03.72	PASS
GPRS 850	190	31.15	30.89	34.77	-03.88	PASS
GPRS 850	251	30.97	30.71	34.77	-04.06	PASS
EGPRS 850	128	31.27	31.01	34.77	-03.76	PASS
EGPRS 850	190	31.12	30.86	34.77	-03.91	PASS
EGPRS 850	251	30.91	30.65	34.77	-04.12	PASS

Test Results GSM 1900						
Mode	Channel	Conducted power [dBm]	Radiated power [dBm EIRP]	Limit [dBm EIRP]	Margin [dB]	Result
GPRS 1900	512	28.56	32.29	33	-0.71	PASS
GPRS 1900	661	28.57	32.30	33	-0.70	PASS
GPRS 1900	810	28.61	32.34	33	-0.66	PASS
EGPRS 1900	512	28.45	32.18	33	-0.82	PASS
EGPRS 1900	661	28.50	32.23	33	-0.77	PASS
EGPRS 1900	810	28.58	32.31	33	-0.69	PASS

3.2 Test Conditions and Results - Transmitter out-of-band unwanted emissions

3.2.1 Information

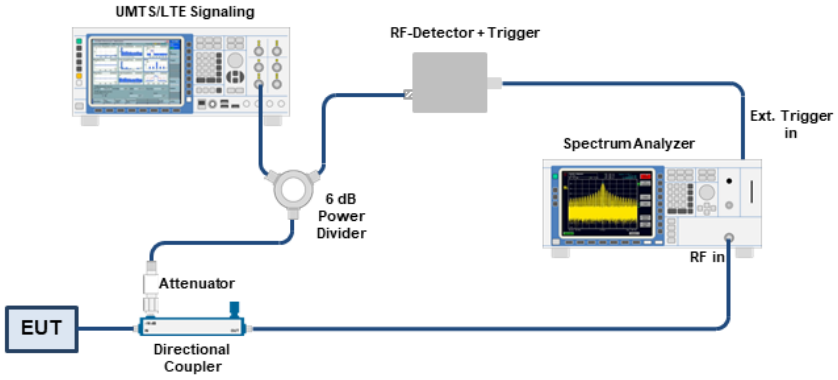
Test Information	
Reference	ISED RSS-132 §5.5, ISED RSS-133 §5.6
Measurement Method	ANSI C63.4-2014 5.7.3
Operator	Azamat Ibraimov
Date	2024-08-15

3.2.2 Limits

Limits				
Band	Frequency range [MHz]	Bandwidth	Attenuation [dB]	Limit [dBm]
GSM 850	-	100 kHz	$43+Log_{10}(P[W])$	-13
GSM 1900	-	1 MHz	$43+Log_{10}(P[W])$	-13

3.2.3 Setup

Test Setup



3.2.4 Equipment

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum analyzer	R&S	FSU26	EF01407	2024-07	2025-07
Wideband radio communication tester	R&S	CMW500	EF00677	2024-05	2025-05
Cable 1M	Gigalane	1730	EF00779	2024-04	2025-04
Cable 0.5M	Gigalane	1730	EF00779	2024-04	2025-04
Cable 0.3M	Gigalane	1536	EF00779	2024-04	2025-04
Dual directional coupler 0,5 - 18,5 GHz	Alltest	1850 Krytar	EF01539	2024-06	2025-06
Attenuator 10 dB	Narda	---	---	N/R	N/R
Attenuator 20 dB	Narda	---	---	N/R	N/R
6 dB coupler	Suhner	4901.19.A	---	N/R	N/R
Trigger Box	Eurofins	---	EF01747	N/R	N/R

3.2.5 Procedure

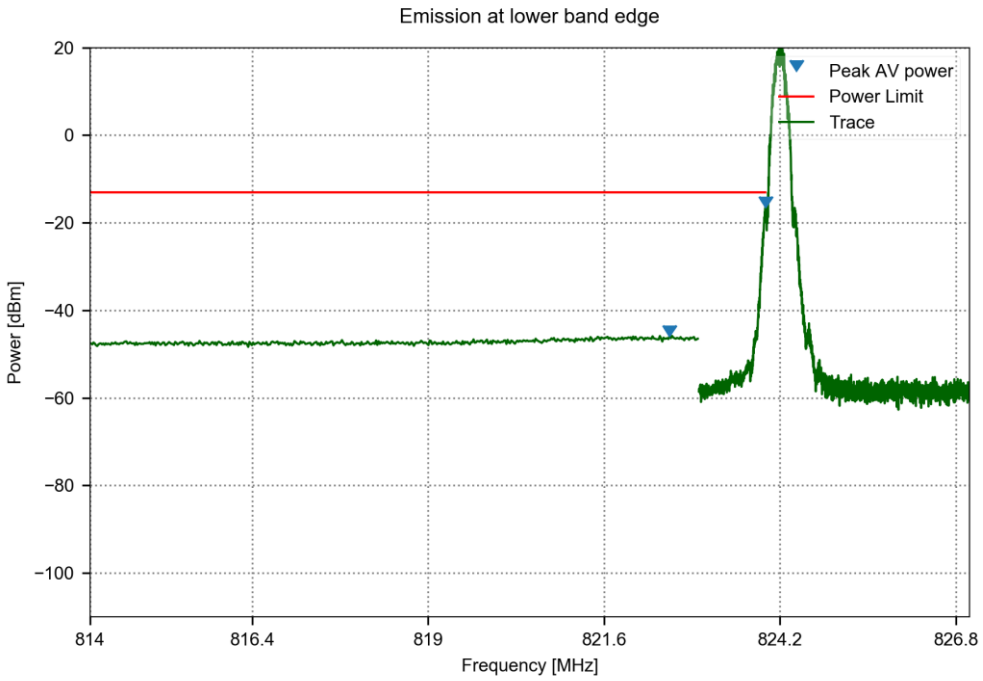
Test Procedure
1. EUT is connected to test equipment as shown in figure Setup. 2. Base station simulator is setup with the test specific parameters to signal a mobile network cell 3. The spectrum analyzer is set to RMS detection and its test/band specific bandwidths. Spectrum analyzer is set to external triggering and a gated level trigger is enabled. 4. EUT has connected to base station simulator and a single sweep per measured segment is taken with spectrum analyzer. For some measurements spectrum analyzer is set up to use the channel power measurement function (integration). 5. All measurements are recorded and merged into a graphic.

3.2.6 Results

Test Results				
Band	Channel	Modulation	Environmental Conditions	Result
GPRS 850	128	GMSK	V_{NOM} / T_{NOM}	PASS
GPRS 850	251	GMSK	V_{NOM} / T_{NOM}	PASS
EGPRS 850	128	8-PSK	V_{NOM} / T_{NOM}	PASS
EGPRS 850	251	8-PSK	V_{NOM} / T_{NOM}	PASS
GPRS 1900	128	GMSK	V_{NOM} / T_{NOM}	PASS
GPRS 1900	251	GMSK	V_{NOM} / T_{NOM}	PASS
EGPRS 1900	128	8-PSK	V_{NOM} / T_{NOM}	PASS
EGPRS 1900	251	8-PSK	V_{NOM} / T_{NOM}	PASS

Band edge compliance

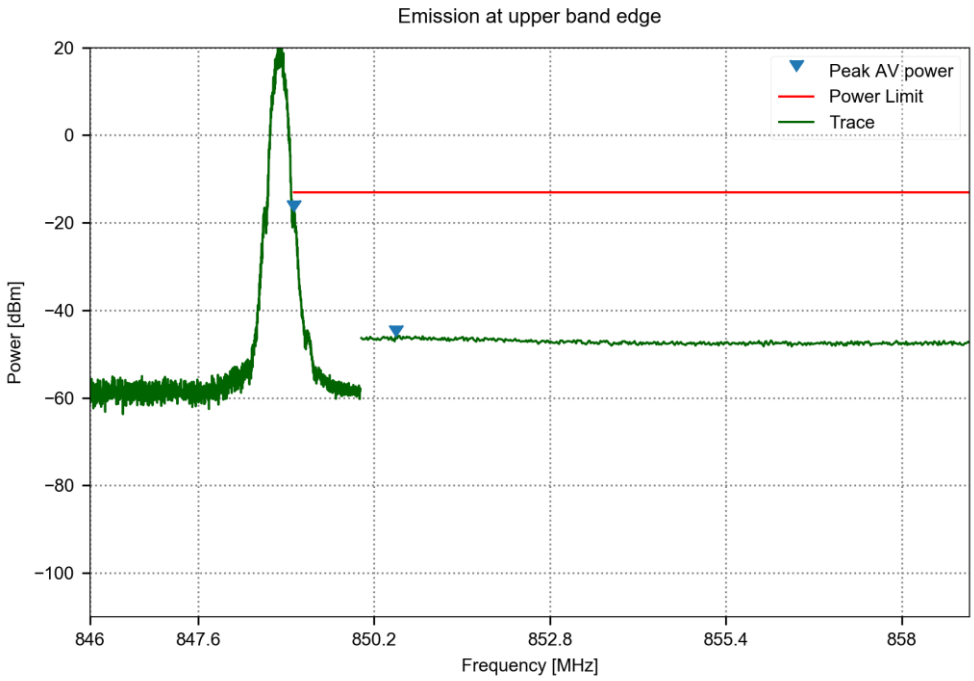
Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart / Telemonitorig System
Model:	CardioMessenger Smart 4G
Test Sample ID:	48020
Reference Standards:	47 CFR Part 22H; RSS-132, Issue 4
Reference Method:	ANSI C63.26:2015, Section 5.7
Operator:	Azamat Ibraimov
Test Date:	2024-08-15
Test Site:	Eurofins Product Service GmbH
Band, Channel, Modulation:	FDD5, 128, GMSK
Emission bandwidth:	300.0 kHz
Time slot configuration:	1 Slots
Min. out of band margin:	-3.35 dB, 823.986 MHz
Verdict:	PASS



Frequency Range [MHz]	Highest Emission Frequency [MHz]	Highest Emission [dBm]	Measurement Bandwidth [kHz]	Limit [dBm]	Margin [dB]	Sweep points	Sweep time [s]	Detector
814.0 - 823.0	822.57	-45.83	100.0	-13	-32.83	501	1.0	RMS
823.0 - 824.0	823.99	-16.35	10.0	-13	-3.35	501	1.0	RMS

Band edge compliance

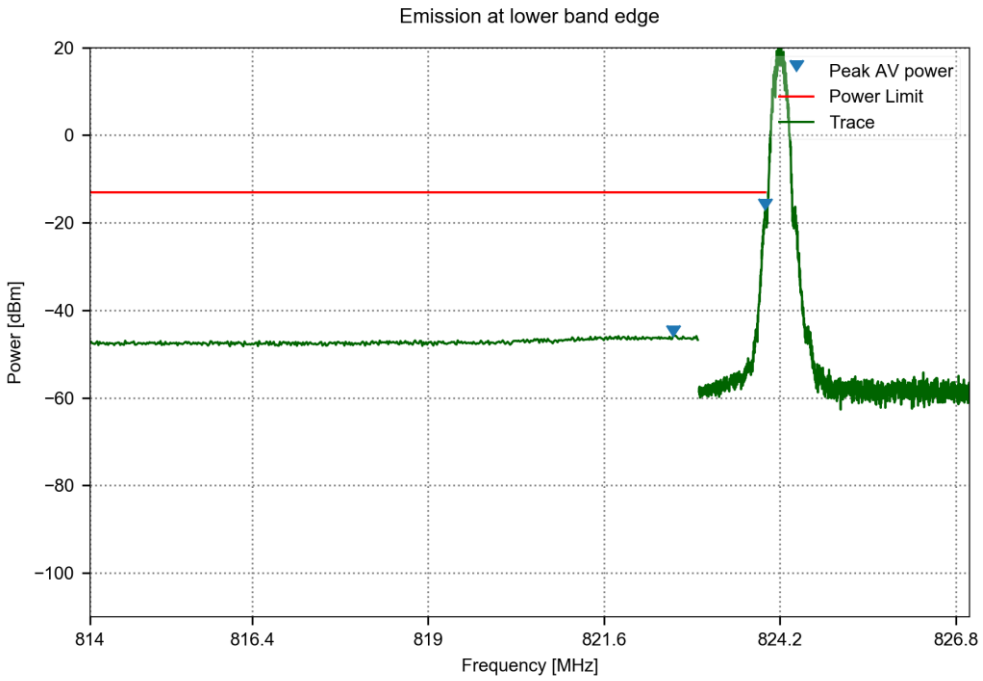
Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart / Telemonitorig System
Model:	CardioMessenger Smart 4G
Test Sample ID:	48020
Reference Standards:	47 CFR Part 22H; RSS-132, Issue 4
Reference Method:	ANSI C63.26:2015, Section 5.7
Operator:	Azamat Ibraimov
Test Date:	2024-08-15
Test Site:	Eurofins Product Service GmbH
Band, Channel, Modulation:	FDD5, 251, GMSK
Emission bandwidth:	300.0 kHz
Time slot configuration:	1 Slots
Min. out of band margin:	-4.24 dB, 849.012 MHz
Verdict:	PASS



Frequency Range [MHz]	Highest Emission Frequency [MHz]	Highest Emission [dBm]	Measurement Bandwidth [kHz]	Limit [dBm]	Margin [dB]	Sweep points	Sweep time [s]	Detector
849.0 - 850.0	849.01	-17.24	10.0	-13	-4.24	501	1.0	RMS
850.0 - 859.0	850.52	-45.84	100.0	-13	-32.84	501	1.0	RMS

Band edge compliance

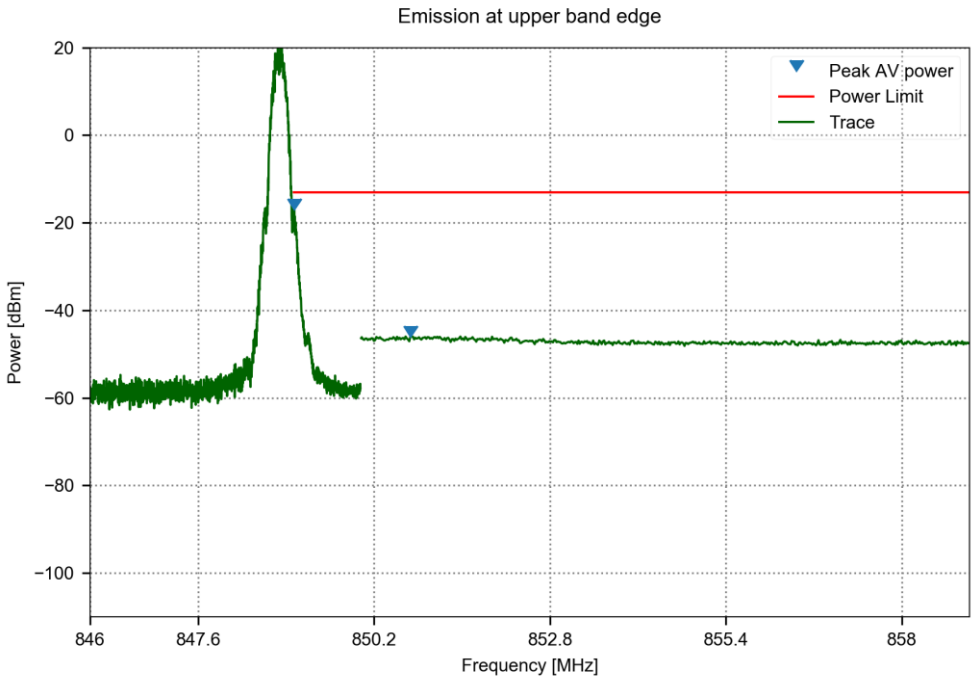
Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart / Telemonitorig System
Model:	CardioMessenger Smart 4G
Test Sample ID:	48020
Reference Standards:	47 CFR Part 22H; RSS-132, Issue 4
Reference Method:	ANSI C63.26:2015, Section 5.7
Operator:	Azamat Ibraimov
Test Date:	2024-08-15
Test Site:	Eurofins Product Service GmbH
Band, Channel, Modulation:	FDD5, 128, 8-PSK
Emission bandwidth:	300.0 kHz
Time slot configuration:	1 Slots
Min. out of band margin:	-3.85 dB, 823.984 MHz
Verdict:	PASS



Frequency Range [MHz]	Highest Emission Frequency [MHz]	Highest Emission [dBm]	Measurement Bandwidth [kHz]	Limit [dBm]	Margin [dB]	Sweep points	Sweep time [s]	Detector
814.0 - 823.0	822.62	-45.78	100.0	-13	-32.78	501	1.0	RMS
823.0 - 824.0	823.98	-16.85	10.0	-13	-3.85	501	1.0	RMS

Band edge compliance

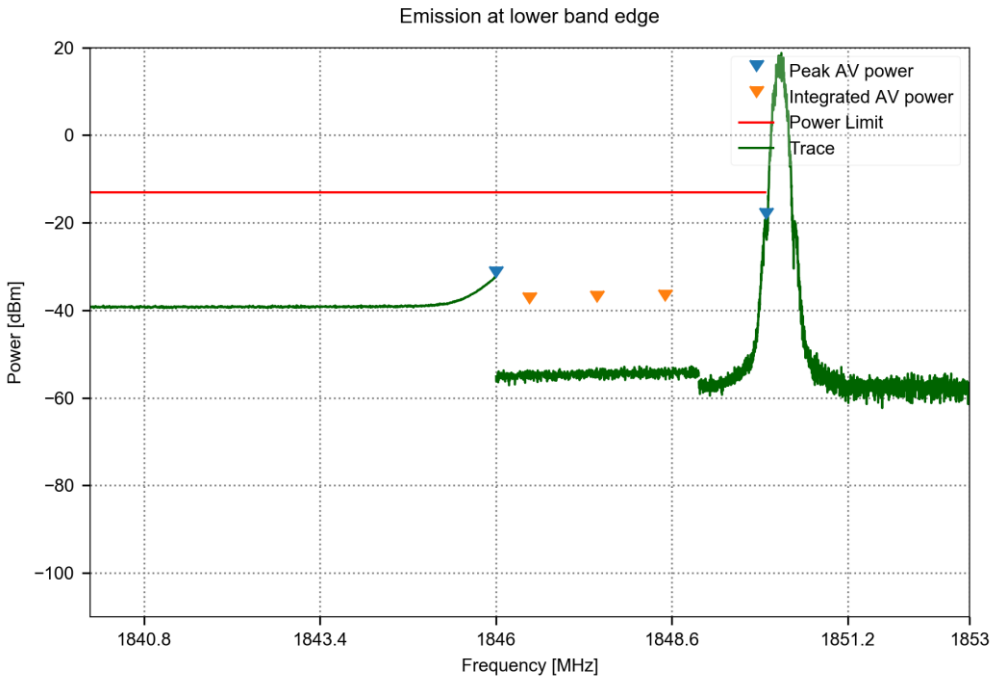
Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart / Telemonitorig System
Model:	CardioMessenger Smart 4G
Test Sample ID:	48020
Reference Standards:	47 CFR Part 22H; RSS-132, Issue 4
Reference Method:	ANSI C63.26:2015, Section 5.7
Operator:	Azamat Ibraimov
Test Date:	2024-08-15
Test Site:	Eurofins Product Service GmbH
Band, Channel, Modulation:	FDD5, 251, 8-PSK
Emission bandwidth:	300.0 kHz
Time slot configuration:	1 Slots
Min. out of band margin:	-3.86 dB, 849.02 MHz
Verdict:	PASS



Frequency Range [MHz]	Highest Emission Frequency [MHz]	Highest Emission [dBm]	Measurement Bandwidth [kHz]	Limit [dBm]	Margin [dB]	Sweep points	Sweep time [s]	Detector
849.0 - 850.0	849.02	-16.86	10.0	-13	-3.86	501	1.0	RMS
850.0 - 859.0	850.74	-45.95	100.0	-13	-32.95	501	1.0	RMS

Band edge compliance

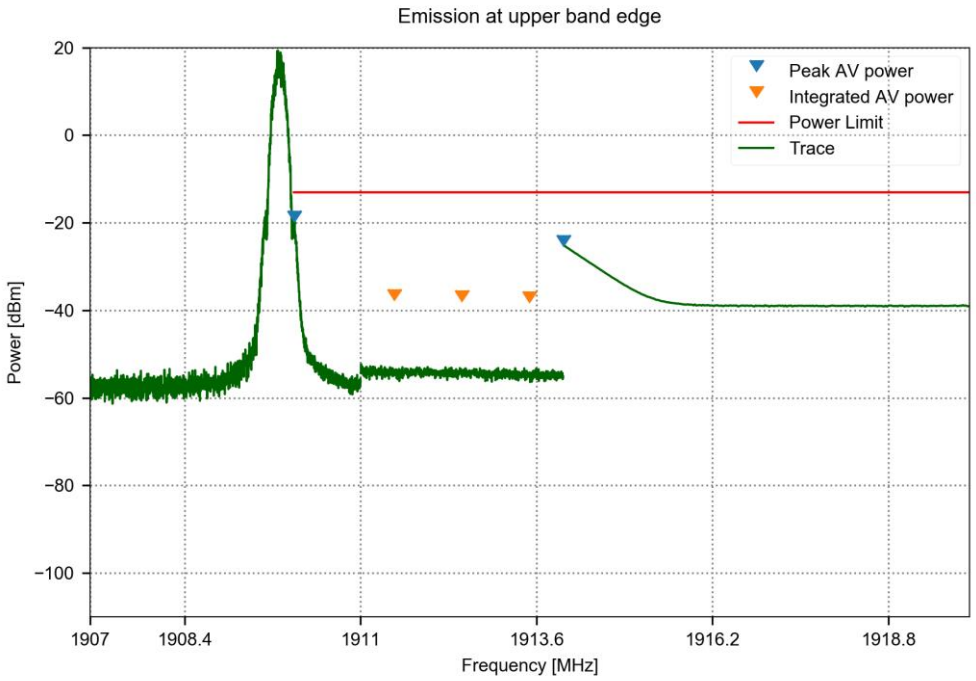
Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart / Telemonitorig System
Model:	CardioMessenger Smart 4G
Test Sample ID:	48020
Reference Standards:	47 CFR Part 24E, ISED RSS-133, Issue 6 Amendment 1
Reference Method:	ANSI C63.26:2015, Section 5.7
Operator:	Azamat Ibraimov
Test Date:	2024-08-15
Test Site:	Eurofins Product Service GmbH
Band, Channel, Modulation:	FDD2, 512, GMSK
Emission bandwidth:	300.0 kHz
Time slot configuration:	1 Slots
Min. out of band margin:	-6.05 dB, 1850.0 MHz
Verdict:	PASS



Frequency Range [MHz]	Highest Emission Frequency [MHz]	Highest Emission [dBm]	Measurement Bandwidth [kHz]	Limit [dBm]	Margin [dB]	Sweep points	Sweep time [s]	Detector
1840.0 - 1846.0	1846.0	-32.4	1000.0	-13	-19.4	1001	1.0	RMS
1846.0 - 1847.0	1846.5	-38.32	20.0	-13	-25.32	301	1.0	RMS, Integrated
1847.0 - 1848.0	1847.5	-37.92	20.0	-13	-24.92	301	1.0	RMS, Integrated
1848.0 - 1849.0	1848.5	-37.67	20.0	-13	-24.67	301	1.0	RMS, Integrated
1849.0 - 1850.0	1850.0	-19.05	10.0	-13	-6.05	501	1.0	RMS

Band edge compliance

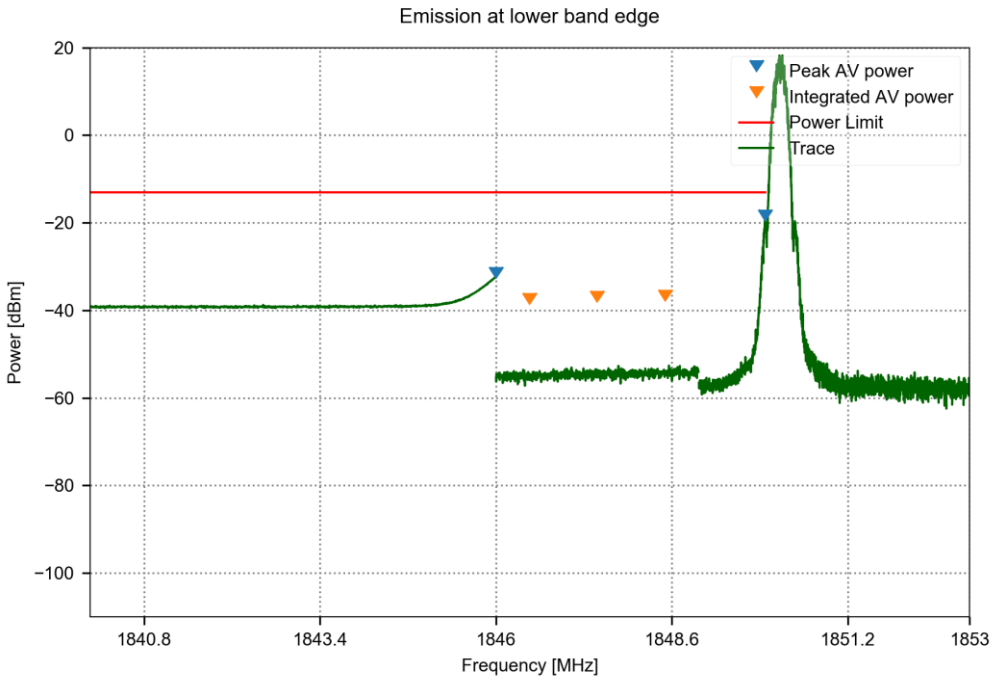
Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart / Telemonitorig System
Model:	CardioMessenger Smart 4G
Test Sample ID:	48020
Reference Standards:	47 CFR Part 24E, ISED RSS-133, Issue 6 Amendment 1
Reference Method:	ANSI C63.26:2015, Section 5.7
Operator:	Azamat Ibraimov
Test Date:	2024-08-15
Test Site:	Eurofins Product Service GmbH
Band, Channel, Modulation:	FDD2, 810, GMSK
Emission bandwidth:	300.0 kHz
Time slot configuration:	1 Slots
Min. out of band margin:	-6.6 dB, 1910.026 MHz
Verdict:	PASS



Frequency Range [MHz]	Highest Emission Frequency [MHz]	Highest Emission [dBm]	Measurement Bandwidth [kHz]	Limit [dBm]	Margin [dB]	Sweep points	Sweep time [s]	Detector
1910.0 - 1911.0	1910.03	-19.6	10.0	-13	-6.6	501	1.0	RMS
1911.0 - 1912.0	1911.5	-37.5	20.0	-13	-24.5	301	1.0	RMS, Integrated
1912.0 - 1913.0	1912.5	-37.73	20.0	-13	-24.73	301	1.0	RMS, Integrated
1913.0 - 1914.0	1913.5	-38.09	20.0	-13	-25.09	301	1.0	RMS, Integrated
1914.0 - 1920.0	1914.0	-25.15	1000.0	-13	-12.15	301	1.0	RMS

Band edge compliance

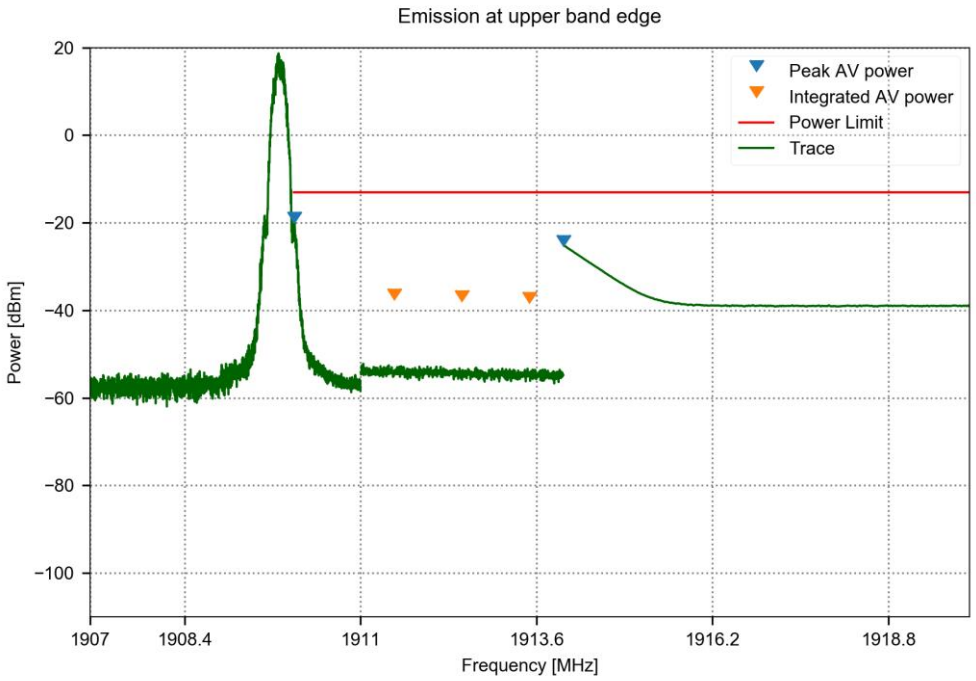
Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart / Telemonitorig System
Model:	CardioMessenger Smart 4G
Test Sample ID:	48020
Reference Standards:	47 CFR Part 24E, ISED RSS-133, Issue 6 Amendment 1
Reference Method:	ANSI C63.26:2015, Section 5.7
Operator:	Azamat Ibraimov
Test Date:	2024-08-15
Test Site:	Eurofins Product Service GmbH
Band, Channel, Modulation:	FDD2, 512, 8-PSK
Emission bandwidth:	300.0 kHz
Time slot configuration:	1 Slots
Min. out of band margin:	-6.4 dB, 1849.978 MHz
Verdict:	PASS



Frequency Range [MHz]	Highest Emission Frequency [MHz]	Highest Emission [dBm]	Measurement Bandwidth [kHz]	Limit [dBm]	Margin [dB]	Sweep points	Sweep time [s]	Detector
1840.0 - 1846.0	1846.0	-32.41	1000.0	-13	-19.41	1001	1.0	RMS
1846.0 - 1847.0	1846.5	-38.35	20.0	-13	-25.35	301	1.0	RMS, Integrated
1847.0 - 1848.0	1847.5	-37.95	20.0	-13	-24.95	301	1.0	RMS, Integrated
1848.0 - 1849.0	1848.5	-37.66	20.0	-13	-24.66	301	1.0	RMS, Integrated
1849.0 - 1850.0	1849.98	-19.4	10.0	-13	-6.4	501	1.0	RMS

Band edge compliance

Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart / Telemonitorig System
Model:	CardioMessenger Smart 4G
Test Sample ID:	48020
Reference Standards:	47 CFR Part 24E, ISED RSS-133, Issue 6 Amendment 1
Reference Method:	ANSI C63.26:2015, Section 5.7
Operator:	Azamat Ibraimov
Test Date:	2024-08-15
Test Site:	Eurofins Product Service GmbH
Band, Channel, Modulation:	FDD2, 810, 8-PSK
Emission bandwidth:	300.0 kHz
Time slot configuration:	1 Slots
Min. out of band margin:	-6.81 dB, 1910.024 MHz
Verdict:	PASS



Frequency Range [MHz]	Highest Emission Frequency [MHz]	Highest Emission [dBm]	Measurement Bandwidth [kHz]	Limit [dBm]	Margin [dB]	Sweep points	Sweep time [s]	Detector
1910.0 - 1911.0	1910.02	-19.81	10.0	-13	-6.81	501	1.0	RMS
1911.0 - 1912.0	1911.5	-37.46	20.0	-13	-24.46	301	1.0	RMS, Integrated
1912.0 - 1913.0	1912.5	-37.81	20.0	-13	-24.81	301	1.0	RMS, Integrated
1913.0 - 1914.0	1913.5	-38.12	20.0	-13	-25.12	301	1.0	RMS, Integrated
1914.0 - 1920.0	1914.0	-25.13	1000.0	-13	-12.13	301	1.0	RMS

3.3 Test Conditions and Results - Transmitter radiated emissions

3.3.1 Information

Test Information	
Reference	47 CFR §2.1053 47 CFR §2.1057 47 CFR §22.917 47 CFR §24.238 ISED RSS-132 §5.5 ISED RSS-133 §5.6
Measurement Method	FCC KDB 971168 D01 Section 7 ANSI C63.26-2015 5.5
Operator	Azamat Ibraimov
Date	2024-08-02 - 2024-08-05

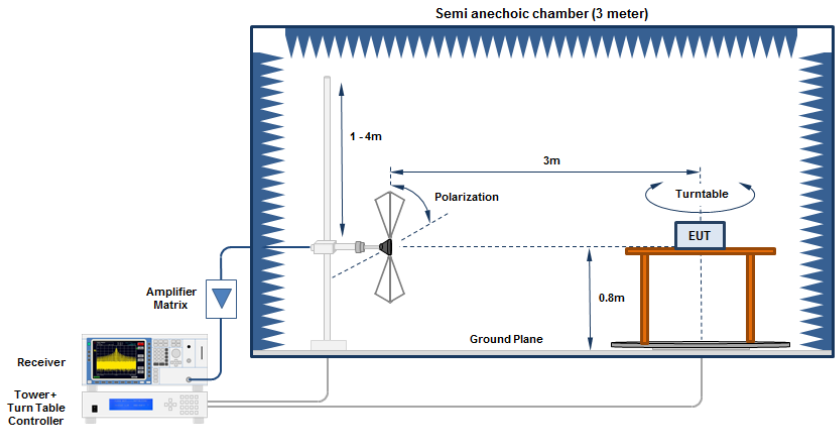
3.3.2 Limits

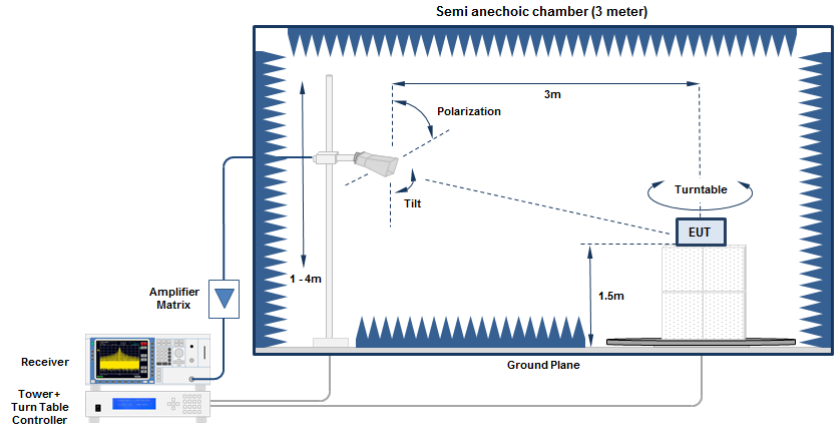
Limits FCC				
Band	Frequency range [MHz]	Bandwidth	Attenuation [dB]	Limit [dBm EIRP]
GSM850	-	100 kHz / 1 MHz	$43+10 \cdot \log_{10}(P[W])$	-13
GSM1900	-	1 MHz	$43+10 \cdot \log_{10}(P[W])$	-13

Limits ISED				
Band	Frequency range [MHz]	Bandwidth	Attenuation [dB]	Limit [dBm EIRP]
GSM850	-	100 kHz	$43+10 \cdot \log_{10}(P[W])$	-13
GSM1900	-	1 MHz	$43+10 \cdot \log_{10}(P[W])$	-13

3.3.3 Setup

Test Setup 30 - 1000 MHz



Test Setup > 1 GHz


3.3.4 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2023.2.6

Test Equipment 30 - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2022-11	2025-11
Test Receiver	Rohde & Schwarz	ESW44	EF01856	2024-04	2025-04
Antenna	Schwarzbeck	VULB 9168	EF01824	2022-10	2025-10

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic chamber	Frankonia	AC2	EF01616	2023-12	2024-12
Spectrum Analyser	R&S	FSW 43	EF00896	2024-07	2025-07
Antenna	Schwarzbeck	BBHA 9120B	EF01678	2024-05	2027-05
Double Ridged Waveguide Horn Antenna	Schwarzbeck	HWRD 650 (6,5-18GHz)	EF01679	2024-05	2027-05

3.3.5 Procedure

Test Procedure 30 - 1000 MHz
1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground
2. EUT set to test mode
3. The receiver is set to peak detection with max hold
4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m
5. All significant emissions are measured again using the corresponding final detector

Test Procedure > 1 GHz
1. EUT is placed on a non conducting support at the center of a turn table 1.5 m above the ground
2. EUT set to test mode
3. The receiver is set to peak detection with max hold
4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m
5. All significant emissions are measured again using the corresponding final detector

3.3.6 Results

Test Results				
Band	Mode	Channel	Environmental Conditions	Result
GSM 850	GMSK	128	V_{NOM} / T_{NOM}	PASS
GSM 1900	GMSK	512	V_{NOM} / T_{NOM}	PASS

3.4 Test Conditions and Results - Receiver radiated emissions

3.4.1 Information

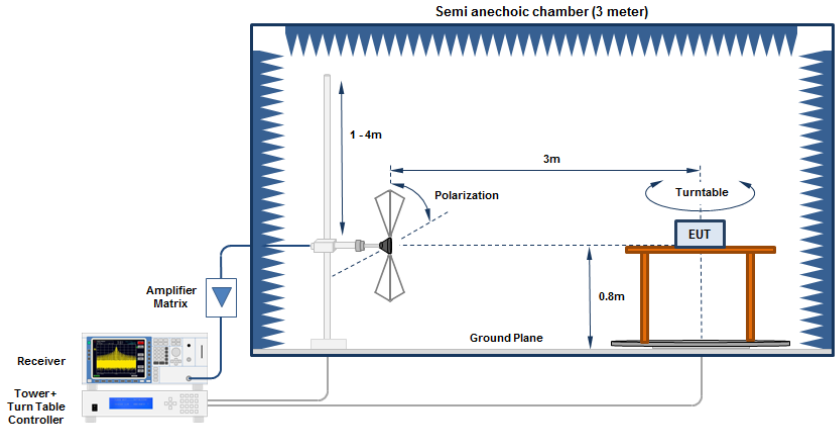
Test Information	
Reference	ISED RSS-132 §3.4 ISED RSS-133 §3.4 ISED RSS-Gen §7.3
Measurement Method	ANSI C63.4-2014 8.1-8.3
Operator	Azamat Ibraimov
Date	2024-08-05 - 2024-08-06

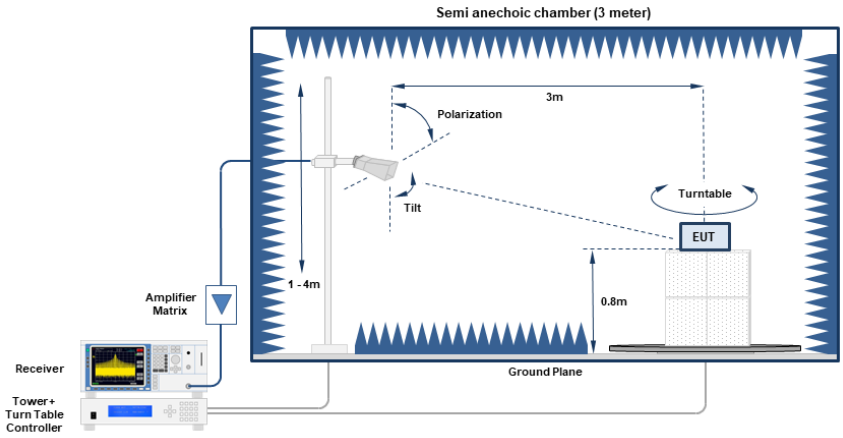
3.4.2 Limits

Limits			
Frequency range [MHz]	Bandwidth	Detector	Limit [dBµV/m @ 3 m]
30 - 88	100 kHz	Quasi-peak	40
88 - 216	100 kHz	Quasi-peak	43.5
216 - 960	100 kHz	Quasi-peak	46
960 - 1000	100 kHz	Quasi-peak	54
> 1000	1 MHz	Average	54

3.4.3 Setup

Test Setup 30 - 1000 MHz



Test Setup > 1 GHz


3.4.4 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	RadiMation	2023.2.6

Test Equipment 30 - 1000 MHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic Chamber	Frankonia	AC1	EF00062	2022-11	2025-11
Test Receiver	Rohde & Schwarz	ESW44	EF01856	2024-04	2025-04
Antenna	Schwarzbeck	VULB 9168	EF01824	2022-10	2025-10

Test Equipment > 1 GHz					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Semi-Anechoic chamber	Frankonia	AC 1	EF01011	2023-11	2024-11
Test Receiver	Rohde & Schwarz	ESW44	EF01856	2024-04	2025-04
Horn antenna	Schwarzbeck	BBHA 9120D	EF01561	2021-11	2024-11
Double Ridged Waveguide Horn Antenna	Schwarzbeck	HWRD 650 (6,5-18GHz)	EF01679	2024-05	2027-05

3.4.5 Procedure

Test Procedure 30 - 1000 MHz
1. EUT is placed on a non conducting support at the center of a turn table 0.8 m above the ground 2. EUT set to test mode 3. The receiver is set to peak detection with max hold 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m 5. All significant emissions are measured again using the corresponding final detector

Test Procedure > 1 GHz
1. EUT is placed on a non conducting support at the center of a turn table 1.5 m above the ground 2. EUT set to test mode 3. The receiver is set to peak detection with max hold 4. The EUT is rotated through 360° and the height of the antenna is varied from 1 m to 4 m 5. All significant emissions are measured again using the corresponding final detector

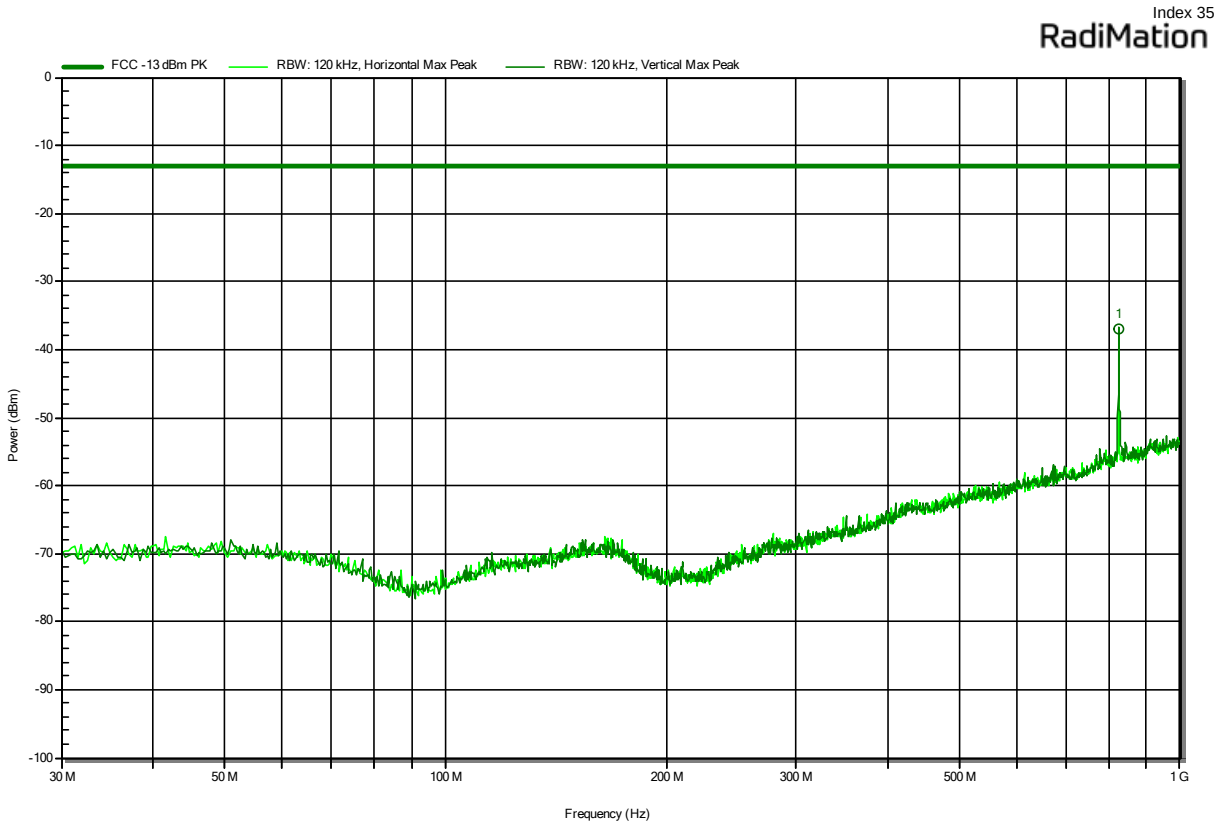
3.4.6 Results

Test Results				
Band	Mode	Channel	Environmental Conditions	Result
GSM 850	GMSK	128	V_{NOM} / T_{NOM}	PASS
GSM 1900	GMSK	512	V_{NOM} / T_{NOM}	PASS

ANNEX A Transmitter radiated emissions

Radiated Spurious Emissions according to 47 CFR Part 22 Subpart H, 47 CFR Part 24 Subpart E

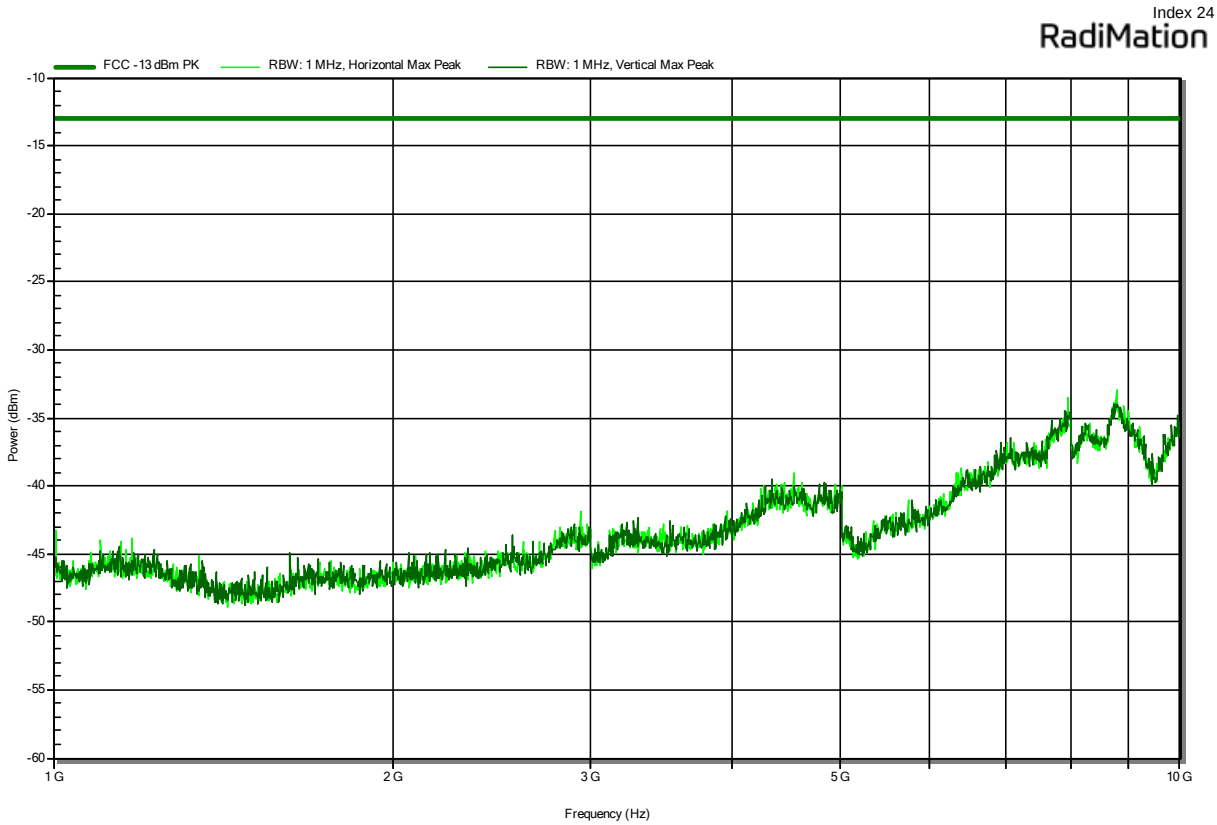
Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart 4G
Model:	CardioMessenger Smart / Telemonitorig System
Test Sample ID:	48016
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Ibraimov
Measurement software:	RadiMation, version 2023.2.6
Test Conditions:	Tnom: 25 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck VULB 9168
Measurement distance:	3 m
Mode:	Tx; GPRS 850, CH 128, Gamma 3, Slot 3
Test Date:	2024-08-05
Note:	uplink with notch filter



Peak Number	Frequency (MHz)	Peak (dBm)	Peak Limit (dBm)	Peak Difference (dB)	Peak Status	Polarization
1	824.43	-36.9	-13	-23.91	Pass	Vertical

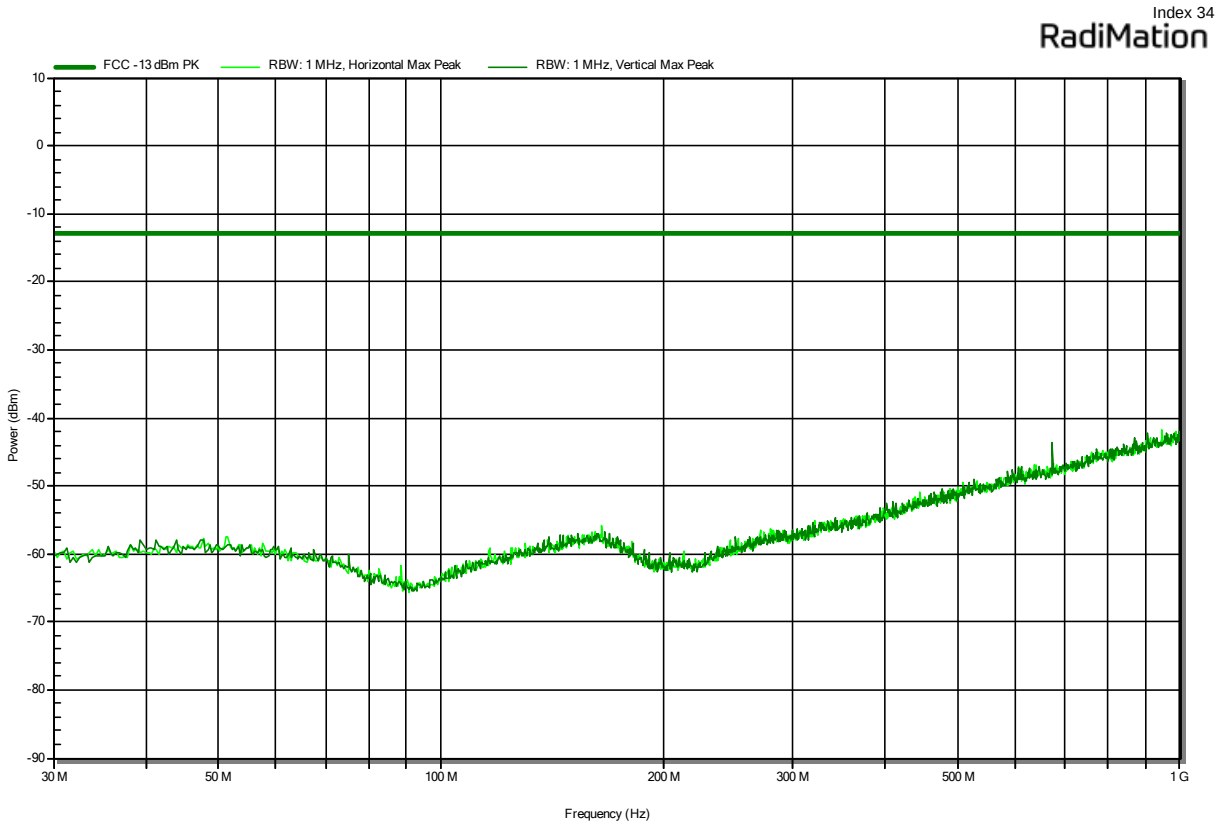
Radiated Spurious Emissions according to 47 CFR Part 22 Subpart H, 47 CFR Part 24 Subpart E

Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart 4G
Model:	CardioMessenger Smart / Telemonitorig System
Test Sample ID:	48016
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Ibraimov
Measurement software:	RadiMation, version 2024.1.3
Test Conditions:	Tnom: 25 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120B
Measurement distance:	3 m
Mode:	Tx; GPRS 850, CH 128, Gamma 3, Slot 3
Test Date:	2024-08-02



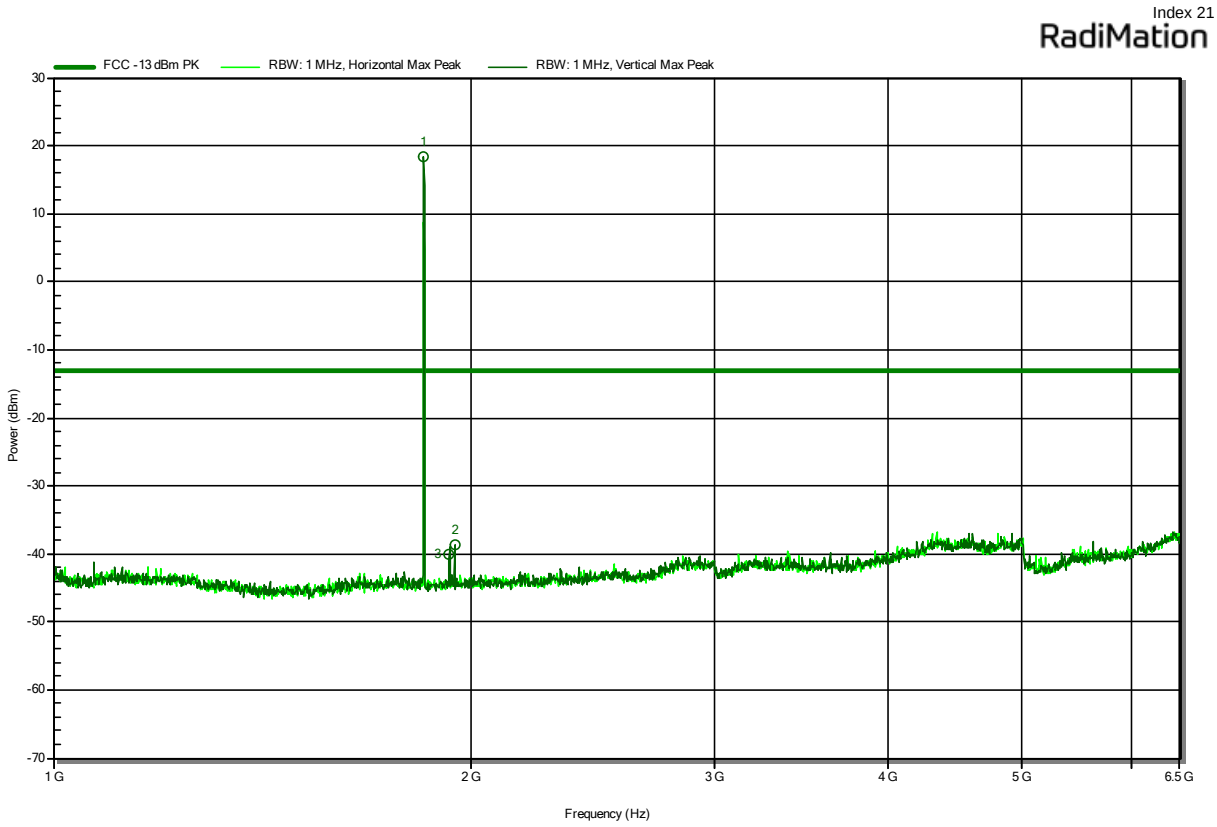
Radiated Spurious Emissions according to 47 CFR Part 22 Subpart H, 47 CFR Part 24 Subpart E

Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart 4G
Model:	CardioMessenger Smart / Telemonitorig System
Test Sample ID:	48016
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Ibraimov
Measurement software:	RadiMation, version 2023.2.6
Test Conditions:	Tnom: 25 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck VULB 9168
Measurement distance:	3 m
Mode:	Tx; GPRS 1900, CH 512, Gamma 3, Slot 3
Test Date:	2024-08-05



Radiated Spurious Emissions according to 47 CFR Part 22 Subpart H, 47 CFR Part 24 Subpart E

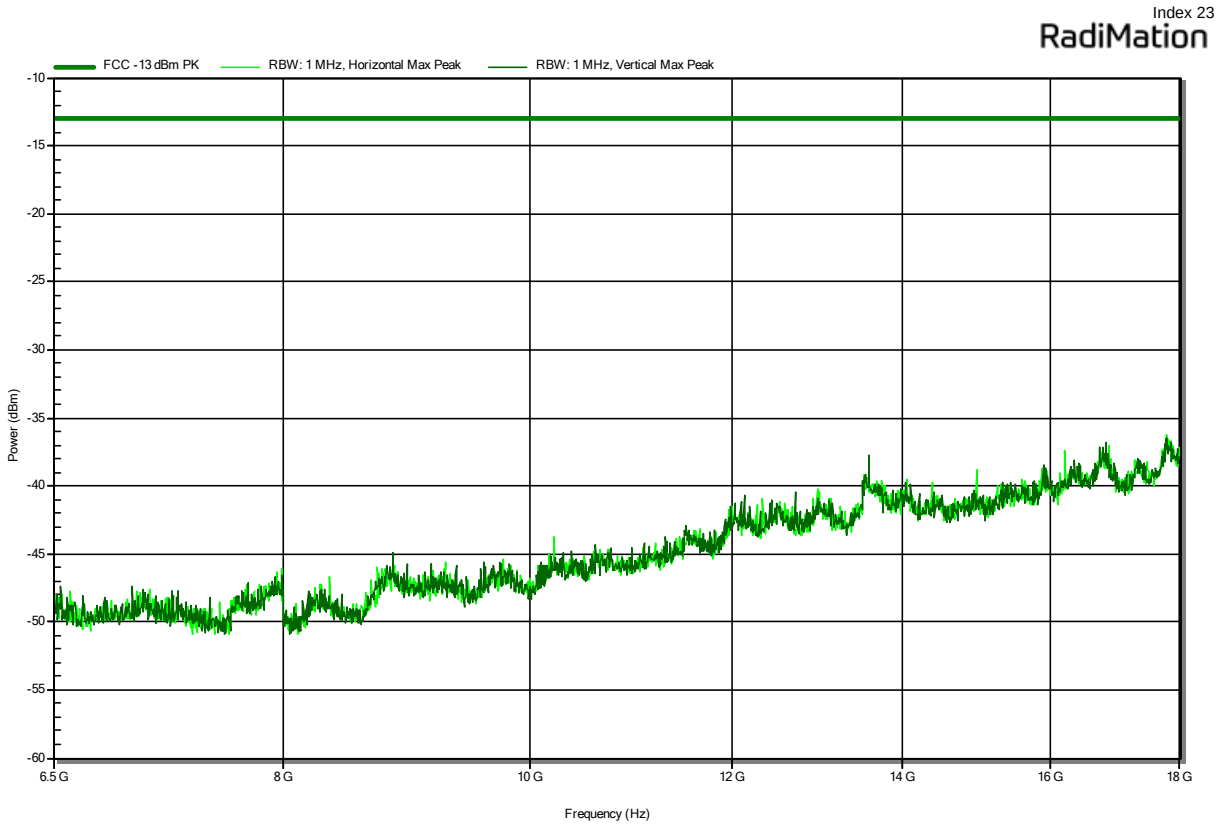
Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart 4G
Model:	CardioMessenger Smart / Telemonitorig System
Test Sample ID:	48016
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Ibraimov
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 25 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120B
Measurement distance:	3 m
Mode:	Tx; GPRS 1900, CH 512, Gamma 3, Slot 3
Test Date:	2024-08-02



Peak Number	Frequency (MHz)	Peak (dBm)	Peak (dBm)	Limit	Peak Difference (dB)	Peak Status	Polarization
1	1850.117	18.3	-13		31.34	Uplink	Vertical
2	1947.833	-38.7	-13		-25.74	Pass	Vertical
3	1930.05	-40.2	-13		-27.19	Pass	Vertical

Radiated Spurious Emissions according to 47 CFR Part 22 Subpart H, 47 CFR Part 24 Subpart E

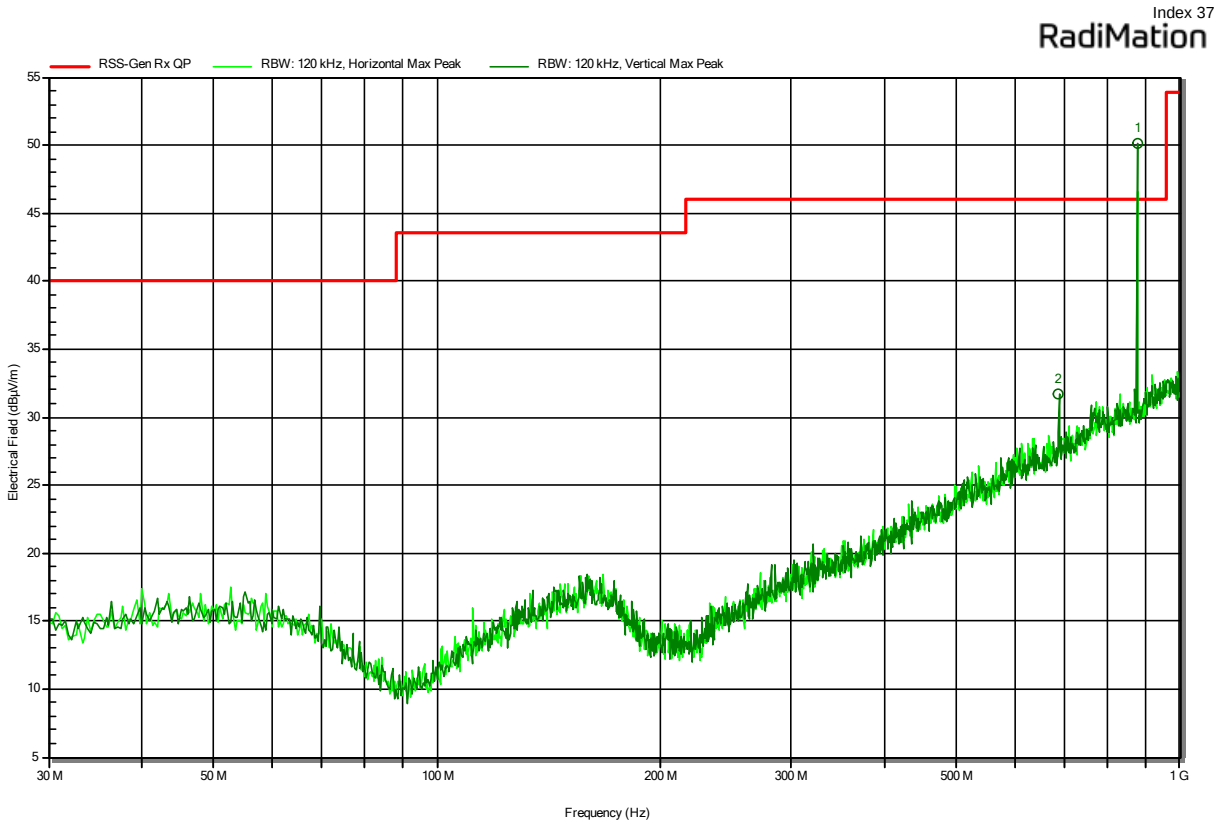
Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart 4G
Model:	CardioMessenger Smart / Telemonitorig System
Test Sample ID:	48016
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Ibraimov
Measurement software:	RadiMation, version 2020.1.8
Test Conditions:	Tnom: 25 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck HWRD 650
Measurement distance:	3 m
Mode:	Tx; GPRS 1900, CH 512, Gamma 0, Slot 3
Test Date:	2024-08-02



ANNEX B Receiver radiated emissions

Radiated Spurious Emissions according to RSS-Gen Issue 5, RSS-133, Issue 6, RSS-132, Issue 4

Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart / Telemonitorig System
Model:	CardioMessenger Smart 4G
Test Sample ID:	49480
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Ibraimov
Measurement software:	RadiMation, version 2023.2.6
Test Conditions:	Tnom: 25 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck VULB 9168
Measurement distance:	3 m
Mode:	Rx; GPRS 850, CH 128, idle mode
Test Date:	2024-08-05



Peak Number	Frequency (MHz)	Peak (dBµV/m)	Peak Limit (dBµV/m)	Peak Difference (dB)	Peak Status	Polarization
1	876.1633	50.1	46	4.08	Downlink	Vertical
2	687.0133	31.7	46	-14.27	Pass	Vertical

Radiated Spurious Emissions according to RSS-Gen Issue 5, RSS-133, Issue 6, RSS-132, Issue 4

Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart / Telemonitorig System
Model:	CardioMessenger Smart 4G
Test Sample ID:	49480
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Ibraimov
Measurement software:	RadiMation, version 2023.2.6
Test Conditions:	Tnom: 25 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120D
Measurement distance:	3 m
Mode:	Rx; GPRS 850, CH 128, idle mode
Test Date:	2024-08-06

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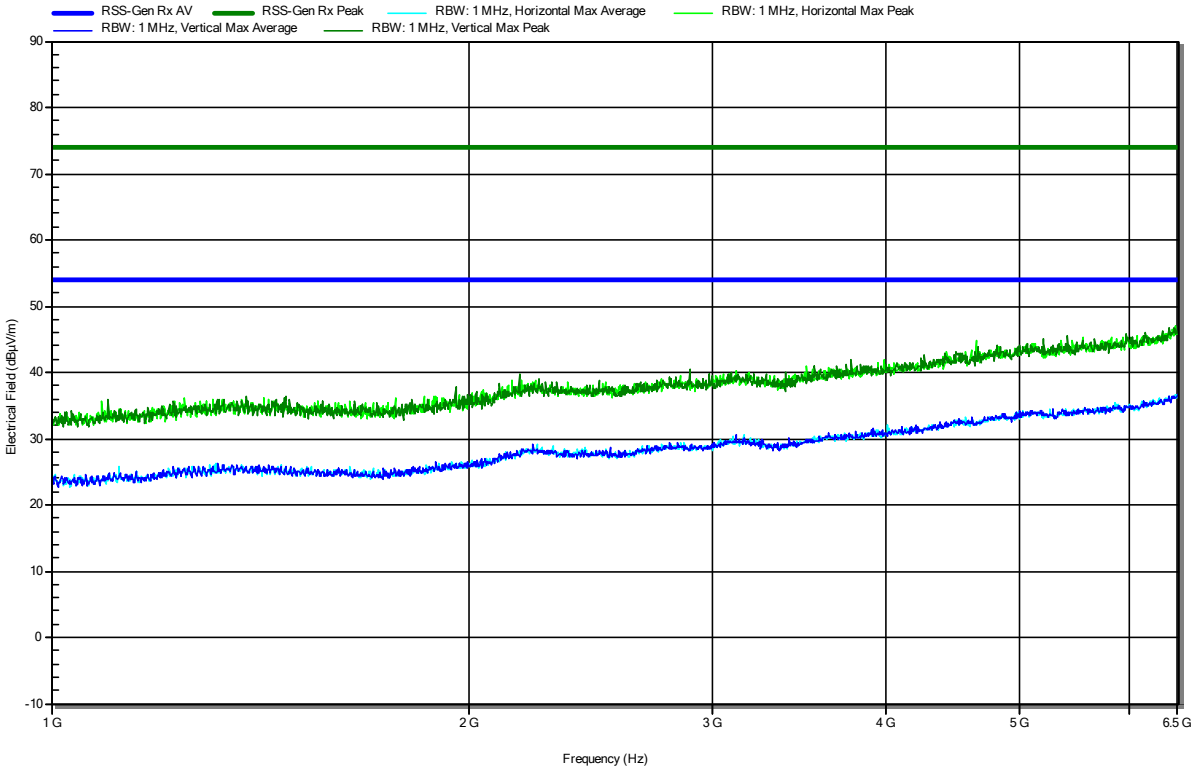
RadiMation



Radiated Spurious Emissions according to RSS-Gen Issue 5, RSS-133, Issue 6, RSS-132, Issue 4

Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart / Telemonitorig System
Model:	CardioMessenger Smart 4G
Test Sample ID:	49480
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Ibraimov
Measurement software:	RadiMation, version 2023.2.6
Test Conditions:	Tnom: 25 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck HWRD 650
Measurement distance:	3 m
Mode:	Rx; GPRS 850, CH 128, idle mode
Test Date:	2024-08-06

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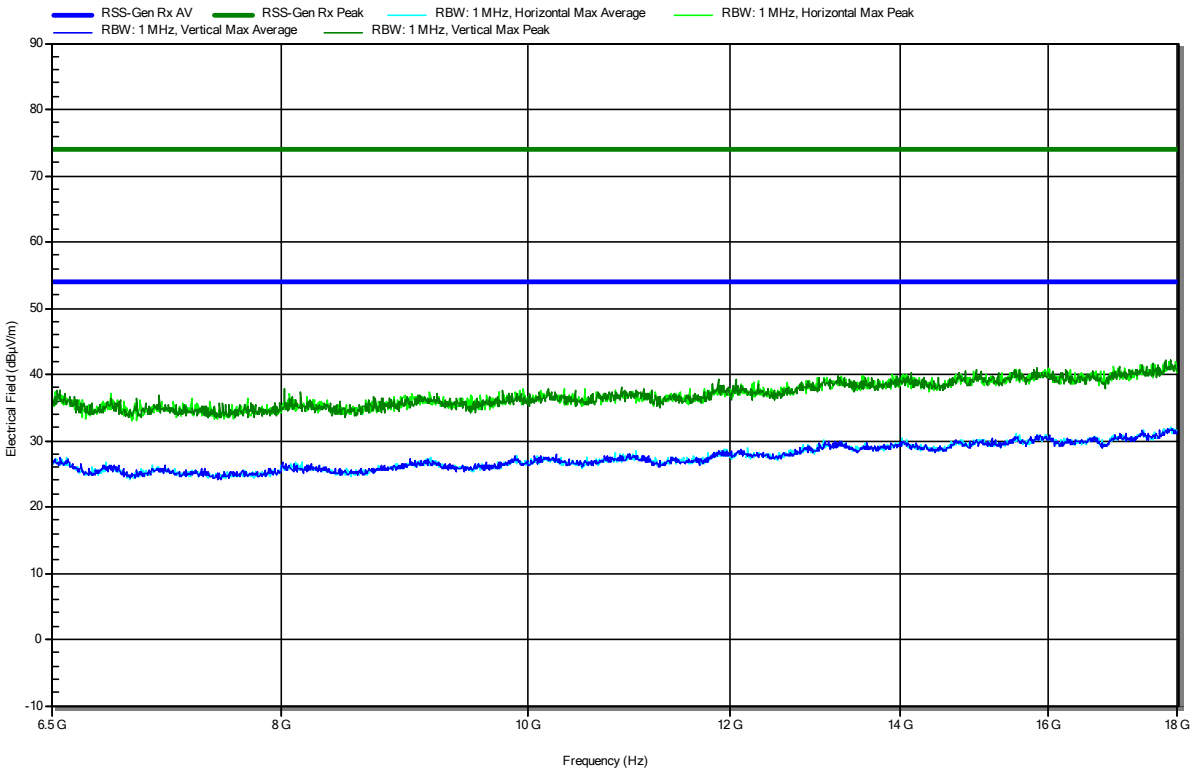
RadiMation



Radiated Spurious Emissions according to RSS-Gen Issue 5, RSS-133, Issue 6, RSS-132, Issue 4

Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart / Telemonitorig System
Model:	CardioMessenger Smart 4G
Test Sample ID:	49480
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Ibraimov
Measurement software:	RadiMation, version 2023.2.6
Test Conditions:	Tnom: 25 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck VULB 9168
Measurement distance:	3 m
Mode:	Rx; GPRS 1900, CH 512, idle mode
Test Date:	2024-08-05
Note:	

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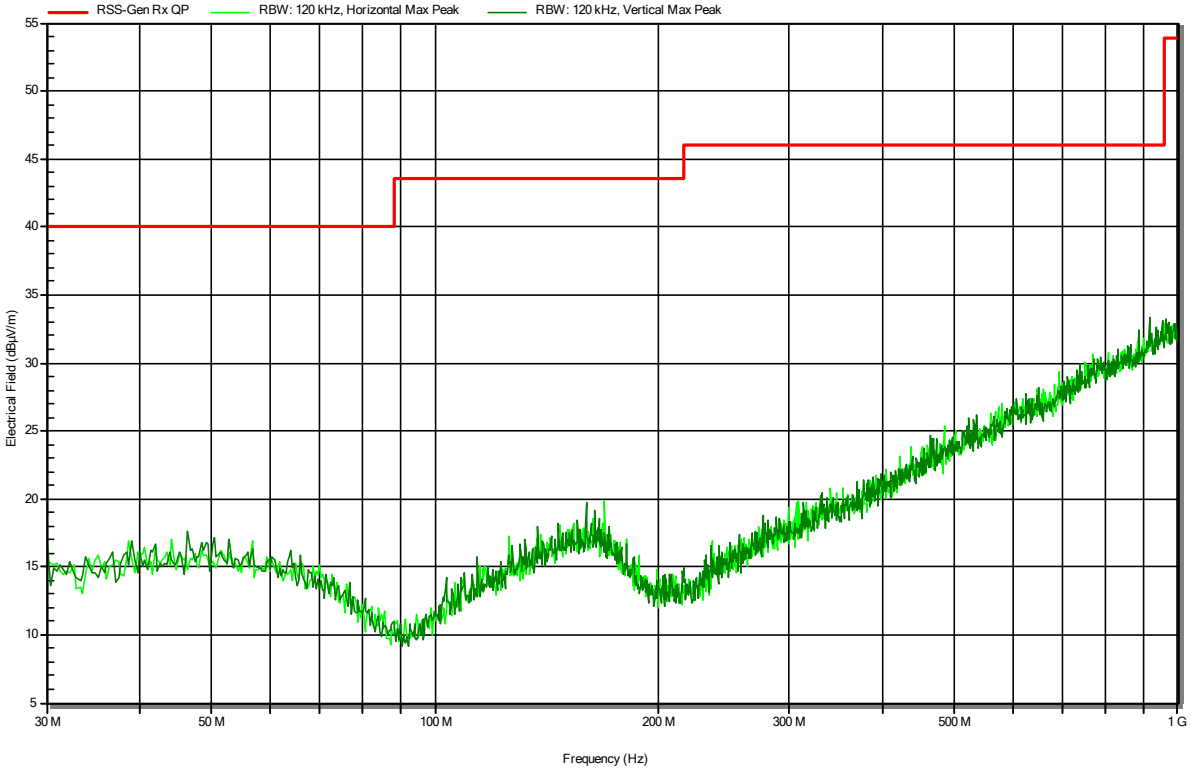
RadiMation



Radiated Spurious Emissions according to RSS-Gen Issue 5, RSS-133, Issue 6, RSS-132, Issue 4

Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart / Telemonitorig System
Model:	CardioMessenger Smart 4G
Test Sample ID:	49480
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Ibraimov
Measurement software:	RadiMation, version 2023.2.6
Test Conditions:	Tnom: 25 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck BBHA 9120D
Measurement distance:	3 m
Mode:	Rx; GPRS 1900, CH 512, idle mode
Test Date:	2024-08-06

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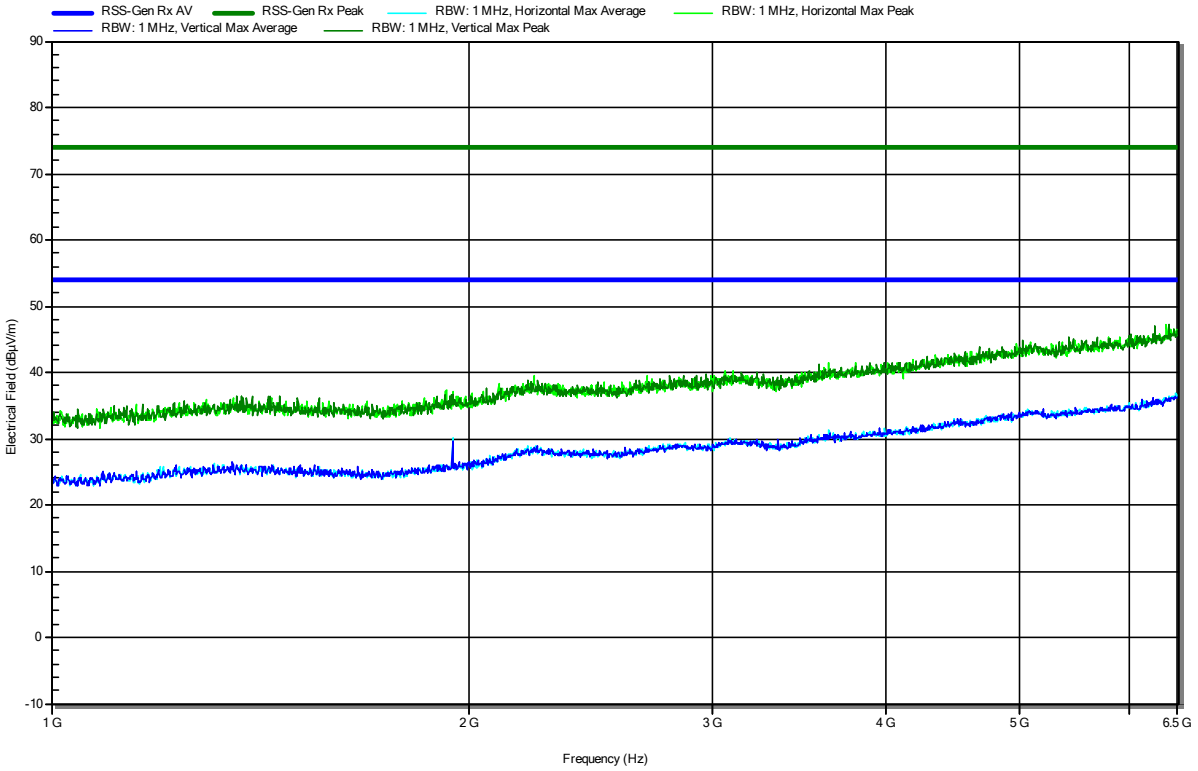
RadiMation



Radiated Spurious Emissions according to RSS-Gen Issue 5, RSS-133, Issue 6, RSS-132, Issue 4

Project Number:	G0M-2403-2480
Applicant:	BIOTRONIK SE & Co. KG
Model Description:	CardioMessenger Smart / Telemonitorig System
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Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Ibraimov
Measurement software:	RadiMation, version 2023.2.6
Test Conditions:	Tnom: 25 °Celsius, Vnom: 3.7 VDC
Antenna:	Schwarzbeck HWRD 650
Measurement distance:	3 m
Mode:	Rx; GPRS 1900, CH 512, idle mode
Test Date:	2024-08-06

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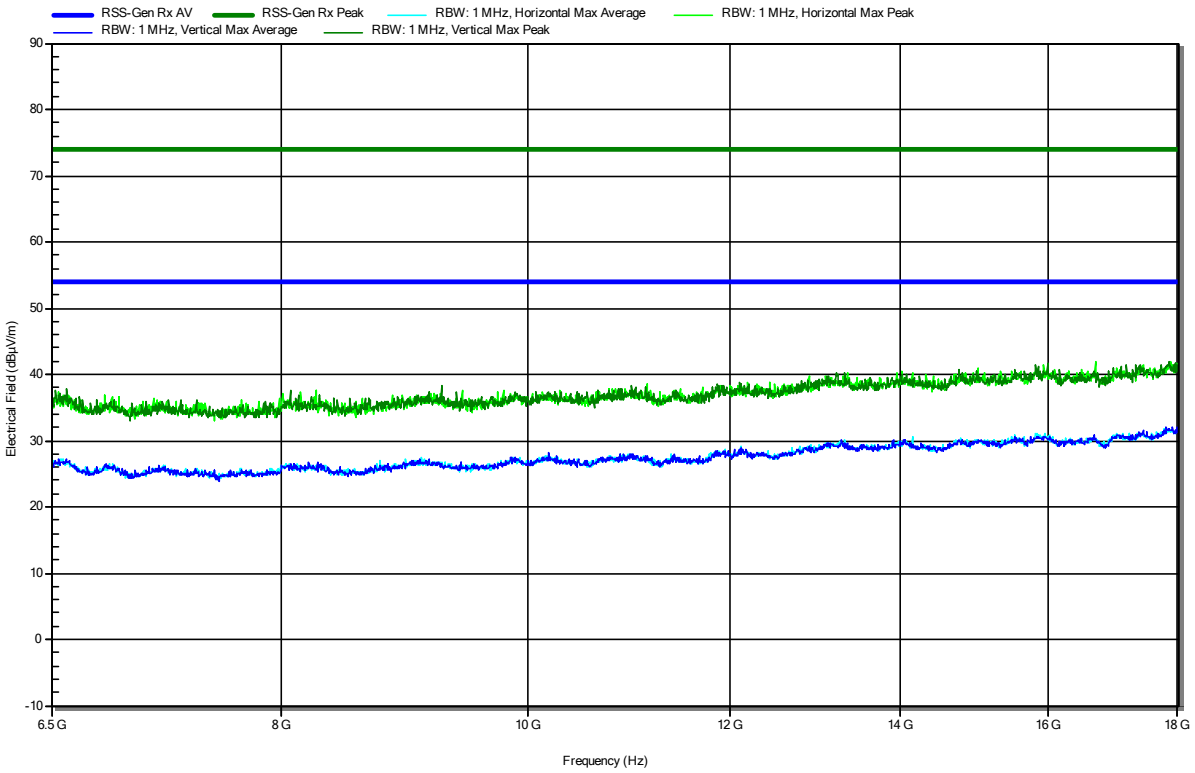
RadiMation



=== End of test report ===