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Reference 7P06127-LG Page 1 (27) SP Testing

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# Radio measurements on Radio 4415 B2 B25 equipment with FCC ID TA8AKRC161636 and IC: 287AB-AS161636

Product name: Radio 4415 B2 B25 Product number: KRC 161 636/1

#### **RISE Research Institutes of Sweden AB**

**Electronics - EMC** 

Performed by

Examined by

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Summary
Description of the test object
Purpose of test
Operation modes during measurements
Conducted measurements
Radiated measurements
References
Measurement equipment
Uncertainties
Reservation
Delivery of test object
Manufacturer's representative
Test engineers
Test participant(-s)
Test frequencies used for radiated and conducted measurements7
Test setup: conducted measurements
Test setup: radiated measurements
RF power output measurements according to CFR 47 §24.232 / IC RSS-133 6.4, conducted 11
Test set-up and procedure
Results
Remark
Limits
Conducted spurious emission measurements according to CFR 47 §24.238 / IC RSS-133 6.2
Test set-up and procedure
Results
Remark
Limits
Field strength of spurious radiation measurements according to CFR 47 §2.1053 / IC RSS-133 6.5
Measurement equipment
Results
Results   22     Limits   22



## Summary

Standard Listed part of	Compliant
FCC CFR 47 part 24/ RSS 133, RSS-Gen	
2.1046/ 6.4 RF power output, conducted	Yes
2.1051/ 6.2 Spurious emission at antenna terminals	Yes
2.1053/ 6.5 Field strength of spurious radiation	Yes





## Description of the test object

Equipment:	Radio equipment Radio 4415 B2 B25 Product number KRC 161 636/1 FCC ID: TA8AKRC161636 IC: 287AB-AS161636
HVIN:	AS161636
Hardware revision state:	R1B
Tested configuration:	Multi RAT LTE+GSM
Frequency range:	TX: 1930 – 1990 MHz RX: 1850 – 1910 MHz
IBW:	40 MHz
Output power:	Max 40 W/ antenna port
Antenna ports:	4 TX / 4 RX ports
Antenna:	No dedicated antenna, handled during licensing
RF configurations:	LTE: 1-5 carriers/ port GSM: 1-4 carriers/ port (max 10 carriers/ unit) Max 6 carriers/ port
	LTE: TX Diversity, 2x2 MIMO, 4x4 MIMO, and NB IoT in-band operation. Carrier Aggregation (CA) inter-band <sup>1</sup> and intra-band. GSM: Single antenna, dual TX.
	Contiguous Spectrum (CS), Non-Contiguous Spectrum (NCS)
Channel bandwidths:	LTE: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz GSM: 200 kHz
Modulations:	LTE: QPSK, 16QAM, 64QAM and 256QAM GSM: GMSK, AQPSK and 8PSK
RF power Tolerance:	+0.6/ -2.5 dB
CPRI Speed	Up to 10.1 Gbit/s
Nominal supply voltage:	-48VDC

<sup>1</sup>Carrier Aggregation (CA) inter-band requires an additional unit operating on the other band.

The information above is supplied by the manufacturer.



## Purpose of test

The purpose of the tests is to verify compliance to the performance characteristics specified in applicable items of FCC CFR 47 Industry Canada RSS-133 and RSS-Gen.

## **Operation modes during measurements**

LTE measurements were performed with the test object transmitting test models as defined in 3GPP TS 37.141. Test model E-TM1.1 was used to represent QPSK, test model E-TM3.2 to represent 16QAM, test model E-TM3.1 to represent 64QAM modulation and E-TM3.1A to represent 256QAM modulation. All measurements were performed with the test object configured for maximum transmit power.

GSM measurements were performed with the test object transmitting following modulations: GMSK, AQPSK, 8-PSK.

Unless otherwise stated, all measurements were performed with the test object transmitting pseudorandom data in all timeslots and settings for maximum transmitter output power applicable for each configuration.

The measured configurations covers worst case settings.

## **Conducted measurements**

The test object was supplied with -48 VDC by an external power supply. Additional connections are documented in the set-up drawings for conducted measurements.

## **Radiated measurements**

The test object was powered with -48 VDC by an external power supply. Additional connections are documented in the set-up drawings for radiated measurements.

## References

Measurements were done according to relevant parts of the following standards: ANSI C63.4-2014 CFR 47 part 2, April 2017 CFR 47 part 24, April 2017 ANSI C63.26-2015 KDB 662911 D01 Multiple Transmitter Output v02r02 KDB 971168 D01 Power Meas License Digital Systems v02r02 KDB 971168 D03 IM Emission Repeater Amp v01 3GPP TS 36 141 version 13.6.0 3GPP TS 37.141, version 13.5.0 RSS-Gen Issue 4 RSS-133 Issue 6



## Measurement equipment

	Calibration Due	RISE number
Test site Tesla	2019-12	503 881
R&S ESU 40	2018-07	901 385
R&S FSQ 40	2018-07	504 143
R&S FSW 43	2018-08	902 073
Control computer with	-	BX62351
R&S software EMC32 version 10.20.01		
High pass filter 3-26.5 GHz	2017-12	BX40074
High pass filter 3-26.5 GHz	2018-06	901 502
RF attenuator Weinschel WA73-20-11	2018-05	900 691
Coaxial cable Sucoflex 102EA	2018-05	BX50191
Coaxial cable Sucoflex 102EA	2018-05	BX50236
ETS Lindgren BiConiLog Antenna 3142E	2019-03	BX61914
EMCO Horn Antenna 3115	2019-12	502 175
µComp Nordic, Low Noise Amplifier	2017-12	901 545
Temperature and humidity meter, Testo 635	2018-06	504 203
Temperature and humidity meter, Testo 625	2018-06	504 188

## Uncertainties

Measurement and test instrument uncertainties are described in the quality assurance documentation "SP-QD 10885". The uncertainties are calculated with a coverage factor k=2 (95% level of confidence).

Compliance evaluation is based on a shared risk principle with respect to the measurement uncertainty.

## Reservation

The test results in this report apply only to the particular test object as declared in the report.

## **Delivery of test object**

The test object was delivered: 2017-09-07.

## Manufacturer's representative

Mikael Jansson, Ericsson AB.

## **Test engineers**

Tomas Isbring for radiated tests, RISE Tomas Lennhager and Andreas Johnson for conducted tests, RISE.

## Test participant(-s)

None.

Page

7 (27)



## Test frequencies used for radiated and conducted measurements

TX test frequencies, conducted measurements:

Symbolic name: 2G1L

by moone nu	me. 2011			
	Frequency	EARFCN/	Bandwidth	Test model
	[MHz]	ARFCN	[MHz]	
GSM	1930.4	513	0.2	GMSK
GSM	1931.0	516	0.2	GMSK
LTE	1967.5	975	5.0	E-TM1.1

Symbolic name: 3G3L-L

	Frequency	EARFCN/	Bandwidth	Test model
	[MHz]	ARFCN	[MHz]	
GSM	1930.4	513	0.2	GMSK
LTE	1933.0	630	5.0	E-TM1.1
GSM	1947.8	600	0.2	GMSK
LTE	1950.4	804	5.0	E-TM1.1
GSM	1965.0	686	0.2	GMSK
LTE	1967.6	976	5.0	E-TM1.1

#### Symbolic name: 3G3L-H

	Frequency	EARFCN/	Bandwidth	Test model
	[MHz]	ARFCN	[MHz]	
GSM	1950.4	613	0.2	GMSK
LTE	1953.0	830	5.0	E-TM1.1
GSM	1967.8	700	0.2	GMSK
LTE	1970.4	1004	5.0	E-TM1.1
GSM	1984.8	785	0.2	GMSK
LTE	1987.4	1174	5.0	E-TM1.1

TX test frequencies, radiated measurements:

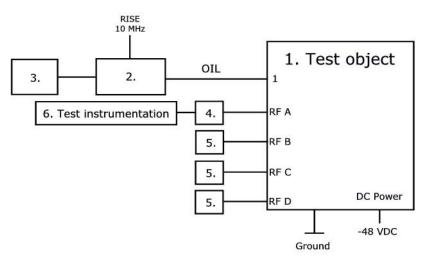
Symbolic name: 1L2G

-	Frequency	EARFCN/	Bandwidth	Test model
	[MHz]	ARFCN	[MHz]	
LTE	1970.7	1007	1.4	E-TM1.1
GSM	1989.4	808	0.2	GMSK
GSM	1989.6	809	0.2	GMSK

All RX frequencies were configured 80 MHz above the corresponding TX frequency according the applicable duplex offset for the operating band.



## Test setup: conducted measurements



#### Test object:

1.	Radio 4415 B2 B25, KRC 161 636/1, rev. R1B, s/n: D16W963153
	With Radio Software: CXP 901 7316/7, rev. R67HA. FCC ID: TA8AKRC161636 and
	IC: 287AB-AS161636

#### Associated equipment:

2.	Testing Equipment:
	CT10, LPC 102 467/1, rev. R1C, s/n: T01F375047, BAMS – 1001466801
	with software CXA 104 446/1, rev. R8AA

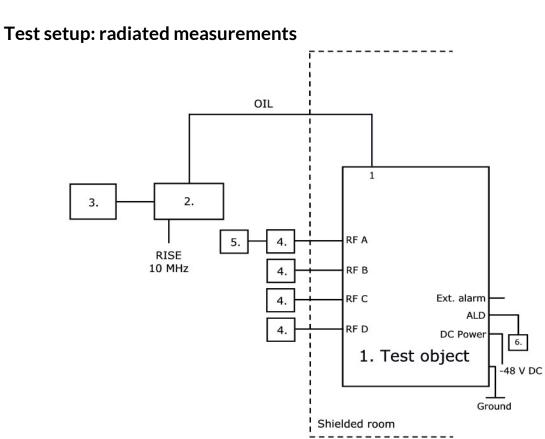
#### **Functional test equipment:**

3.	Computer, HP EliteBook 8560w, BAMS - 1001236851
4.	RF Attenuator: RISE number: 900 691
5.	Terminator, 50 ohm
6.	RISE Test Instrumentation according to measurement equipment list for each test.
	The signal analyzer was connected to the RISE 10 MHz reference standard during all
	measurements.

Date 2017-10-23

Reference 7P06127-LG Page 9 (27)





 I.
 Radio 4415 B2 B25, KRC 161 636/1, rev. R1B, s/n: D16W963156

 With Radio Software: CXP 901 7316/7, rev. R67HA. FCC ID: TA8AKRC161636 and IC: 287AB-AS161636

#### **Associated equipment:**

2.	Testing Equipment:
	CT10, LPC 102 467/1, rev. R1C, s/n: T01F375046, BAMS – 1001466800
	with software CXA 104 446/1, rev. R8AA

#### **Functional test equipment:**

3.	Computer, HP EliteBook 8560w, BAMS - 1001236854
4.	Attenuator
5.	R&S ESIB 26, RISE no: 503 292, for supervision purpose only
6.	ALD Control, Andrew, model: ATM200-A20, s/n: DESA101412073



Reference Date 2017-10-23 7P06127-LG Page 10 (27)



Interfaces:	
Power input configuration DC: -48 VDC	Power
RF A, 4.3-10 connector, combined TX/RX	Antenna
RF B, 4.3-10 connector, combined TX/RX	Antenna
RF C, 4.3-10 connector, combined TX/RX	Antenna
RF D, 4.3-10 connector, combined TX/RX	Antenna
1, Optical Interface Link, single mode opto fibre	Signal
2, Optical Interface Link, not used in this configuration	Signal
EXT Alarm, shielded multi-wire	Signal
ALD, shielded multi-wire	Signal
Ground wire	Ground



## RF power output measurements according to CFR 47 §24.232 / IC RSS-133 6.4, conducted

Date	Temperature	Humidity
2017-10-15	23 °C ± 3 °C	36 % ± 5 %

#### Test set-up and procedure

The test object was connected to a signal analyser measuring peak and RMS output power in CDF mode. A resolution bandwidth of 80 MHz was used.

Measurement equipment	RISE number
R&S FSW 43	902 073
RF attenuator	900 691
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 1.1 dB

#### Results

Single carrier ETM 1.1 QPSK

Rated output power level at each RF port: 46 dBm.

Symbolic name		Total power <sup>1)</sup> [RMS dBm]			
	Port RF A	Port RF B	Port RF C	Port RF D	
2G1L	44.86/7.04	44.96/ 7.02	44.83/ 7.02	44.83/ 7.00	50.89
3G3L-L	45.05/7.74	45.22/ 7.74	45.05/7.74	45.04/ 7.74	51.11

<sup>1)</sup>: summed output power according to FCC KDB662911 Multiple transmitter output. Note: The PAR value is the 0.1 % Peak to Average Ratio.



#### Remark

ERP/EIRP compliance is addressed at the time of licensing, as required by the responsible FCC/IC Bureau(s). Licensee's are required to take into account maximum antenna gain used in combination with above power settings to prevent the radiated output power to exceed the limits.

#### Limits

- \$24.232 The maximum output power may not exceed 3280 W/MHz (EIRP). The Peak to Average Ratio (PAR) may not exceed 13 dB.
- RSS-133 Base station transmitters operating in the band 1930-1995 MHz shall not have output power exceeding 100 watts. When the transmitter power is measured in terms of average value, the peak-to-average ratio(PAR) of the power shall not exceed 13 dB

There is no EIRP limit specified for base station equipment in the RSS-133.

EIRP compliance is addressed at the time of licensing, as required by the responsible IC Bureau. Licensee's are required to take into account the antenna gain to get the maximum usable power settings to prevent the radiated output power to exceed the EIRP limits specified in SRSP-510



## Conducted spurious emission measurements according to CFR 47 §24.238 / IC RSS-133 6.2

Date	Temperature	Humidity
2017-10-15	$23 \degree C \pm 3 \degree C$	36 % ± 5 %

#### Test set-up and procedure

The measurements were made per definition in §24.238. The output was connected to a spectrum analyzer with a RBW setting of 1 MHz and RMS detector activated. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements.

Before comparing the results to the limit, 6 dB [10 log (4)] to cover 4x4 MIMO, should be added according to method c "measure and add 10 log( $N_{ANT}$ )" of FCC KDB662911 D01 Multiple Transmitter Output.

Measurement equipment	RISE number
R&S FSW 43	902 073
RF attenuator	900 691
HP filter	BX40074
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

#### Results

Diagram	Symbolic name	Tested Port
1 a+b+c	2G1L	RF B
2 a+b+c	3G3L-L	RF B
3 a+b+c	3G3L-H	RF B

Note: Measurements were limited to port RF B due to the measurement result in single RAT mode that shows that the ports are electrical identical as declared by the client.

#### Remark

The emission at 9 kHz on the plots was not generated by the test object. A complementary measurement with a smaller RBW showed that it was related to the LO feed-through.

The highest fundamental frequency is 1990 MHz. The measurements were made up to 20 GHz (10x1990 MHz = 19900 MHz).

#### Limits

CFR 47 §24.238 and RSS-133 6.5

Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P) dB$ , resulting in a limit of -13 dBm per 1 MHz RBW.

1	C 1' 9	V	
	Complies?	res	

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Date 2017-10-23

Reference 7P06127-LG Page 14 (27)



Level 50.00 dbm         30.80 + SWI 40 ms         FBW         Mode Auto Sweep         Count 100, 00/200, 00		Zoom	9k3GHz	3-20GHz	(XX)			
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	agram 1b: Niew E ccpf Level 50.00 dBm 30 dB • 1 aquency Sweep	Zoom • RBW	() 9k3GHz 100 kHz	표 3-20GHz		Measuring	M4[1]	• 1Rm 23.58 1.9675000 -24.74
	agram 1b:           view 10 ccDF           I Level 50.00 dBm           30 dB * 1           30 dB * 1           n           n           n           n           n           n           n           n	Zoom • RBW	() 9k3GHz 100 kHz	표 3-20GHz		Measuring	M4[1]	• 18m 1 23.58 1.9675000 -24.74
	8         15.10.2017           agram 1b:         View 10 ccDF           I Level 50.00 dBm         30 dB * 1           30 dB * 1         30 dB * 1           m         1           m         1           m         1           m         1           m         1           m         1           m         1           m         1           m         1	Zoom • RBW	() 9k3GHz 100 kHz	표 3-20GHz		Measuring	M4[1]	• 18m 1 23.58 1.9675000 -24.74
<sup>m</sup>	6 15.10.2017           agram 1b:           View E: CCDF           It evel 50.00 dBm           30 dB * 1           30 dB * 1	Zoom • RBW	() 9k3GHz 100 kHz	표 3-20GHz		Measuring	M4[1]	• 18m 1 23.58 1.9675000 -24.74
	36         15.10.2017           agram 1b:         CCDF           It level 50.00 dBm         30 dB * 1           30 dB * 1         30 dB * 1           m         30 dB * 1	Zoom • RBW	() 9k3GHz 100 kHz	표 3-20GHz		Measuring	M4[1]	• 18m 1 23.58 1.9675000 -24.74
73 GHz 10001 pts 15.0 MHz/ Span 150.0	36         15.10.2017           agram 1b:         CCDF           It level 50.00 dBm         30 dB * 1           30 dB * 1         30 dB * 1           m         30 dB * 1	Zoom • RBW	() 9k3GHz 100 kHz	표 3-20GHz		Measuring	M4[1]	<ul> <li>■ 15.1</li> <li>■ 18 m N</li> <li>■ 23.58</li> <li>■ 23.58</li> <li>■ 29675000</li> <li>-24.74</li> <li>¬53000000</li> </ul>
93 GHZ 10001 pts 15.0 MHZ/ Span 150.0	6         15.10.2017           agram 1b:         View 10 CCDF           It evel 50.00 dBm         30 dB * 1           30 dB * 1         30 dB * 1           30 dB * 1         30 dB * 1           10         30 dB * 1           11         30 dB * 1           12         30 dB * 1           13         30 dB * 1           14         30 dB * 1           15         30 dB * 1           16         30 dB * 1           17         30 dB * 1           18         30 dB * 1           18         30 dB * 1           18         30 dB * 1	Zoom • RBW	() 9k3GHz 100 kHz	표 3-20GHz		Measuring	M4[1]	• 18m 1 23.58 1.9675000 -24.74
	26     15.10.2017       agram 1b:     1000000000000000000000000000000000000	Zoom • RBW	Sk3GHz     Mode Au	Ito Sweep		Measuring	M4[1] M1[1]	• 19m i 23.58 1.9675000 -24.74 1.9300000
Def Tes V Velue V Velue Exection Exection	36         15.10.2017           agram 1b:         Wiew 10 CCDF           Itevel 50.00 dBm         30 dB * 1           30 dB * 1         30 dB * 1           agram         Bm           Bm         Bm	Zoom • RBW	() 9k3GHz 100 kHz	Ito Sweep	E	Measuring	M4[1] M1[1]	• 19m i 23.58 1.9675000 -24.74 1.9300000
1 1.93 GHz -24.74 dBm 1 1.9304 GHz 37.68 dBm 1 1.931 GHz 38.00 dBm	36     15.10.2017       agram 1b:	Zoom RBW SWT 10 s VBW	9k3GHz     100 kHz     1 MHz     Mode Au	3-20GHz  ito Sweep	15.0 MHz/	Measuring	M4[1]	• 1 fm 1 23.58 1.9675000 -24.74 7.9300000
1.931 GHz 38.00 dBm 1.9675 GHz 23.58 dBm	36     15.10.2017       agram 1b:	Zoom • RBW SWT 10 5 VBW	9k3GHz     100 kHz     1 MHz     Mode Au	3-20GHz ito Sweep	15.0 MHz/	Measuring	M4[1]	• 1 fm 1 23.58 1.9675000 -24.74 7.9300000

15:14:14 15.10.2017

Note: Due to the use of reduced measurement bandwidth the limit should be adjusted by 10 dB to -23 dBm.

Date 2017-10-23

Reference 7P06127-LG Page 15 (27)



#### Diagram 1c:

MultiView 🔠		Zoom	9k3GHz	3-20	3Hz 🖾				
Ref Level 40 Att TDF			V 1 MHz V 10 MHz Mod	e Auto Sweep				с	ount 100/100
Frequency S	Sweep								1Rm Avg
								M1[1]	-38.01 dBm 16.598589 GHz
10 dBm									
20 dBm									
10 dBm									
0 dBm									
10 dBm									
-20 dBm	41 -13.000 dBm								
-30 dBm								1	
40 dBm								~~~~	
50 dBm									
60 dBm									
70 dBm									
						7.015/			
3.0 GHz			100001 p	ts	1	.7 GHz/			20.0 GHz
							Measuring.		15:10:2017

15:17:26 15.10.2017

Date 2017-10-23

Reference 7P06127-LG Page 16 (27)



Ref Level 50.00 dBm              • RBW 1 MHz             Att 30 dB • SWT 40 ms VBW 10 MHz Mode Auto Sweep DP Frequency Sweep             0 dBm             0 dBm             0 dBm             0 dBm             0 dBm             0 dBm             10 dBm	-2.9839220 0
DF Frequency Sweep	• 1Rm Av 1] -29.73 di -2.9839220 di 1] -29.60 di
D dBm     Image: second s	L] -29.73 d 2.9839220 C L] -29.60 d
dam	L] -29.60 d
dum	
d8m	
Bm-         Image: Constraint of the second of the sec	
D dBm 1 = 13.000 dBm  D dBm	
14 - 13.000 dem	+
NU NU	
	+
dBm	
dBm-	-
dūm	
dBm-	
0 kHz 32001 pts 300.0 MHz/	3.0 G
Aarker Table Type   Ref   Trc   X-Value   Y-Value   Function   Function	Decult
Ype         Ref         Francion         Francion         Francion           M1         1         1.926344 GHz         -29.60 dBm         -29.60 dBm           M2         1         1.9304 GHz         36.98 dBm	Result
iagram 2b:	
ultiView 🗄 CCDF 🖾 Zoom 🖾 9k3GHz 🖾 3-20GHz 🖾	
ultiView ⊕ CCDF ⊠ Zoom ⊠ 9k3GHz ⊠ 3-20GHz ⊠ Ref Level 50.00 dBm ● RBW 100 kHz Att 30 dB ● SWT 10 s VBW 1 MHz Mode Auto Sweep	
ultiView         CCDF         Zoom         9k3GHz         Z-20GHz         Z           Ref Level         50.00 dBm         •         RBW         100 HHz         S         Ref Level         So dB •         SWT 10 s         VBW         1 MHz         Mode Auto Sweep         DF         Frequency Sweep         Fr	• 1Rm Ma
ultiView ⊕ CCDF 🛞 Zoom 🛞 9k3GHz 🖾 3-20GHz 🖾 Ref Level 50.00 dBm = RBW 100 kHz Att 30 dB = SWT 10 s VBW 1 MHz Mode Auto Sweep Frequency Sweep	l] -39.63 d
altiView 🕄 CCDF 🖾 Zoom 🖾 9k3GHz 🖾 3-20GHz 🗷 Ref Level 50.00 dBm • RBW 100 kHz Att 30 dB • SWT 10 s • RBW 100 kHz F Frequency Sweep dBm	L] -39.63 d -1.9900000 C L] -27.60 d
Autoriew         CCDF         Zoorn         Source         9k3GHz         Source         Source </td <td>1] -39.63 dl</td>	1] -39.63 dl
Autoriew         CCDF         Zoorn         ⊠         9k3GHz         ∑         3-20GHz         ⊠           Ref Level 50.00 dBm         ● RBW         100 kHz         Node Auto Sweep         ● <t< td=""><td>L] -39.63 d -1.9900000 C L] -27.60 d</td></t<>	L] -39.63 d -1.9900000 C L] -27.60 d
AltView         CCDF         Zoom         Source         9k3GHz         3-20GHz         Source           Kef Level 50.00 dBm              • PBW 100 kHz              • PBW 100 kHz         Mode Auto Sweep              • Frequency Sweep              • Mathematical Mode Auto Sweep            dBm              • Mathematical Mode Auto Sweep               • Mathematical Mode Auto Sweep               • Mathematical Mode Auto Sweep            dBm                • Mathematical Mode Auto Sweep               • Mathematical Mode Auto Sweep               • Mathematical Mode Auto Sweep            dBm                • Mathematical Auto Sweep               • Mathematical Auto               • Mathematical Auto               • Mathematical Auto            dBm              • Mathematical Auto                • Mathemat	L] -39.63 d -1.9900000 G L] -27.60 d
AltView         CCDF         Zoom         Source         9k3GHz         Source         Source         Source         Ms	L] -39.63 d -1.9900000 G L] -27.60 d
Autorities         CCDF         Zoom         Source         9k3GHz         Source         Mail         Ms         <	L] -39.63 d -1.9900000 G L] -27.60 d
Autorities         CCDF         Zoom         South         9k3GHz         South	L] -39.63 d -1.9900000 G L] -27.60 d
Att         Soom         Soom         Sood         Sood <ths< td=""><td>L] -39.63 d -1.9900000 G L] -27.60 d</td></ths<>	L] -39.63 d -1.9900000 G L] -27.60 d
Autoview         CCDF         Zoom         South         9k3GHz         South         <	L] -39.63 d -1.9900000 G L] -27.60 d
Validitiew         CCDF         Zoom         Source         9k3GHz         Source         Mail         Ms         <	L] -39.63 d -1.9900000 G L] -27.60 d
AultiView         CCDF         Zoom         Sk3GHz         S 3-20GHz         S           Ref Level 50.00 dBm              • RBW 100 kHz Att              • RBW 100 kHz Mt         • RBW 100 kHz WBW         • Mode Auto Sweep           Frequency Sweep              • Mat              Mat              Mat              M8[1]                 • dBm              • Mat              • Mat              Mat              M8[1]                 • dBm              • Mat              • Mat              Mat              Mat                • dBm              • Mat              • Mat              Mat               • dBm             • Mat             • Mat             • Mat             • Mat             • Mat             • Mat               • dBm             • Mat             • Mat             • Mat             • Mat             • Mat             • Mat               • dBm             • Mat             • Mat             • Mat             • Mat             • Mat               • dBm             • Mat             • Mat             • Mat             • Mat               • dBm             • Mat             • Mat             • Mat             • Mat               • dBm             • Mat	L] -39.63 d -1.9900000 G L] -27.60 d
AultiView         CCDF         Zoom         Signature         9k3GHz         Signature         Signature </td <td>L] -39.63 d -1.9900000 G L] -27.60 d</td>	L] -39.63 d -1.9900000 G L] -27.60 d
Nultiview         CCDF         Zoom         Xi Sight Z         3-20GHz         Xi           Ref Level 50.00 dBm              • RBW 100 kHz Att              • RBW 100 kHz Att              • RBW 100 kHz Mit Z              • Mode Auto Sweep DF              • Ma              Ma              Ma              Ms[: • Ma]              • Ma]              • Ma]	1] -39.63 dl -39.60000 € 1.9900000 € 1.9200000 € 1.9300000 € 
Nultiview         CCDF         Zoom         Sight z         Si	1] -39.63 dl -39.60000 € 1.9900000 € 1.9200000 € 1.9300000 € 
Nultiview         CCDF         Zoom         Source         9k3GHz         Source         Source </td <td>1] -39.63 dl -39.60000 € 1.9900000 € 1.9200000 € 1.9300000 € </td>	1] -39.63 dl -39.60000 € 1.9900000 € 1.9200000 € 1.9300000 € 
Validity/view         CCDF         Zoom         Source         9k3GHz         Source         3ource         Ref           Ref Level 50.00 dBm              • RBW 100 kHz Att              • RBW 100 kHz Mode Auto Sweep              • Mal              Mode              Mode Auto Sweep            offer              • IMHz         Mode Auto Sweep               • Mal              Mode              Mill()            offer              • IMHz              • Mode Auto Sweep               • Mal              Mode           offer              • IMHz              • Mode Auto Sweep               • Mal              Mill()            offer              • Mal              • Mal              • Mal              Mill()            offer              • Mal              • Mal              • Mal              • Mal           offer              • Mal              • Mal              • Mal              • Mal           offer              • Mal              • Mal              • Mal           offer              • Mal              • Mal              •	1] -39.63 dl -39.60000 € 1.9900000 € 1.9200000 € 1.9300000 € 

15:44:47 15.10.2017

Note: Due to the use of reduced measurement bandwidth the limit should be adjusted by 10 dB to -23 dBm.

Date 2017-10-23

Reference 7P06127-LG Page 17 (27)



## Diagram 2c:

MultiView 🖽	CCDF 2	Zoom	9k3GHz	3-20	GHz 🖾			_ ▽
Ref Level 40. Att DF	00 dBm 10 dB = SW1	• RB 200 ms • VB	W 1 MHz W 10 MHz Mod	e Auto Sweep			c	ount 100/100
Frequency S	weep							1Rm Avg
							M1[1]	-37.90 dBm
								16.590769 GHz
0 dBm								
0 dBm			-					
) dBm								
dBm								
10 dBm								
	H1 -13.000 dBm -							
20 dBm								
30 dBm								
							1	
40 dBm								
+u upm							 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
50 dBm		1						
50 dBm								
70 dBm			+					
.0 GHz			100001	ots	1	.7 GHz/		20.0 GHz
	Y						 	15.10.2017

15:48:39 15.10.2017

Date 2017-10-23

Reference 7P06127-LG Page 18 (27)



#### Diagram 3a:

tt 30 dB ● F	SWT 40 ms VBW							
requency Sweep							M8[1]	<ul> <li>1Rm Avg</li> <li>-29.53 dB</li> </ul>
IBm					MMG			-29.55 dB
Bm					1447		M1[1]	-30,44 dB
Bm								.9300000 G
3m								
m								
dBm			_					
iBm-	_		_					
dBm					Mal			
dBm	· · · · · · · · · · · · · · · · · · ·							
1								
dBm								
dBm								
kHz		3200	1 pts		300.0 MHz/			3.0 Gł
arker Table								
/pe   Ref   Trc   /1 1	X-Value	H7	Y-Value -30.44 dBm		Function		Function Re	esult
42 1	1.93 G 1.9504 G 1.953 G	Hz	37.48 dBm 31.11 dBm 37.55 dBm					
1 <u>1</u> 14 1	1.953 G	HZ HZ	31.11 dBm 37.55 dBm					
45 1	1.9704 G	Hz	31.03 dBm					
46 1 47 1	1.9848 G 1.9874 G 2.975954 G	HZ HZ	37.40 dBm 30.92 dBm					
		47	-29.53 dBm					
1 307 15.10.2017 agram 3b: ttiView € CCDF ef Level 50.00 dBm	Zoom • RBW 1	S 9k3GH	lz 🖾 3-20	GHz 🕅	2	Measuring		15:50
agram 3b:	Zoom	S 9k3GH		GHz 🕅	2	Measuring		15:50
M8 1 107 15.10.2017 103 agram 3b: 107 15.10.2017 10 agram 3b: 10 ccdF ef Level 50.00 dBm tt 30 dB Bm	Zoom • RBW 1	S 9k3GH	lz 🖾 3-20	GHz 🕅	2	Measuring		1559
M8 1 407 15.10.2017 agram 3b: tiView EP CCDF ef Level 50.00 dBm t 30 dB • cquiency Sweep	Zoom • RBW 1	S 9k3GH	lz 🖾 3-20	GHz 🖾		Measuring	м7[1]	• 1Rm Mar 20.38 dB
M8 1 407 15.10.2017 agram 3b: tiView EP CCDF ef Level 50.00 dBm tr 30 dB • cquency sweep Bm	Zoom • RBW 1	S 9k3GH	lz 🖾 3-20	GHz 🖾		Measuring	M7[1]	• 1Rm Ma: 20.38 dB 98740000 G
A8 1 A7 15.10.2017 agram 3b: tiView CCDF of Level 50.00 dBm cquency Sweep bm am	Zoom • RBW 1	(30) 9k3GH 00 kHz 1 MHz Moo	lz 🖾 3-20	GHz X		Measuring	M7[1] 	• 1Rm Ma 20.39 dE 98740000 G -40.06 dE
A8 1 A7 15.10.2017 agram 3b: tiView CCDF of Level 50.00 dBm cquency Sweep bm am	Zoom • RBW 1	(30) 9k3GH 00 kHz 1 MHz Moo	Iz 🖾 3-20 de Auto Sweep				M7[1] 	• 1Rm Ma 20.39 dE 98740000 G -40.06 dE
A8 1 67 15.10.2017 agram 3b: tiView E CCDF of Level Sood dBm at 30 dB • equency Sweep Bm bm	Zoom • RBW 1	(30) 9k3GH 00 kHz 1 MHz Moo	Iz 🖾 3-20 de Auto Sweep				M7[1] 	• 1Rm Ma 20.39 dE 98740000 G -40.06 dE
A8 1 67 15.10.2017 agram 3b: tiView E ccDF of Level So 00 dBm at 30 dB • equency Sweep Bm Bm Bm	Zoom • RBW 1	(30) 9k3GH 00 kHz 1 MHz Moo	Iz 🖾 3-20 de Auto Sweep				M7[1] 	• 1Rm Ma 20.39 dE 98740000 G -40.06 dE
A8 1 67 15.10.2017 agram 3b: tiView E CCDF of Level So 00 dBm at 30 dB • equency Sweep Bm m	Zoom • RBW 1	(30) 9k3GH 00 kHz 1 MHz Moo	Iz 🖾 3-20 de Auto Sweep				M7[1] 	• 1Rm Ma 20.39 dE 98740000 G -40.06 dE
A8 1 67 15.10.2017 agram 3b: tiView E CCDF of Level So.00 dBm agram 30 dB • equency Sweep Bm Bm Bm Bm	Zoom • RBW 1	(30) 9k3GH 00 kHz 1 MHz Moo	Iz 🖾 3-20 de Auto Sweep				M7[1] 	• 1Rm Mar 20.38 dB 98740000 G -40.06 dB
16         1           07         15.10.2017           agram 3b:         1           tiView         CCDF           ttevel 50.00 dBm         30 dB •           agram 3b:         1           thevel 50.00 dBm         30 dB •           agram 3b:         1           thevel 50.00 dBm         30 dB •           agram 3b:         1           thevel 50.00 dBm         1           thevel 50.00 dBm         1           thevel 50.00 dBm         1           agram 3b:         1           thevel 50.00 dBm         1           thevel 50.00 dBm         1           agram 3b;         1           thevel 50.00 dBm         1           agram 3b;         1           thevel 50.00 dBm         1	Zoom • RBW 1	(30) 9k3GH 00 kHz 1 MHz Moo	Iz 🖾 3-20 de Auto Sweep				M7[1] 	• 1Rm Ma 20.39 dE 98740000 G -40.06 dE
48         1           07         15.10.2017           agram 3b:         1           tiview         CCDF           flevel 50.00 dBm           att         30 dB           equency Sweep           am	Zoom • RBW 1	(30) 9k3GH 00 kHz 1 MHz Moo	Iz 🖾 3-20 de Auto Sweep				M7[1] 	• 1Rm Mar 20.38 dB 98740000 G -40.06 dB
48         1           07         15.10.2017           agram 3b:         1           tiview         ccDF           cflevel 50.00 dBm           att         30 dB           cquency Sweep           am	Zoom • RBW 1	(30) 9k3GH 00 kHz 1 MHz Moo	Iz 🖾 3-20 de Auto Sweep				M7[1] 	• 1Rm Mar 20.38 dB 98740000 G -40.06 dB
48         1           07         15.10.2017           agram 3b:         1           tiview         CCDF           cftLevel 50.00 dBm           add address           add address <td>Zoom • RBW 1</td> <td>(30) 9k3GH 00 kHz 1 MHz Moo</td> <td>Iz 🖾 3-20 de Auto Sweep</td> <td></td> <td></td> <td></td> <td>M7[1] </td> <td>• 1Rm Ma 20.39 dE 98740000 G -40.06 dE</td>	Zoom • RBW 1	(30) 9k3GH 00 kHz 1 MHz Moo	Iz 🖾 3-20 de Auto Sweep				M7[1] 	• 1Rm Ma 20.39 dE 98740000 G -40.06 dE
48         1           607         15.10.2017           agram 3b:         1           tiview         CCDF           eff Level 50.00 dBm         30 dB •           ccquency Sweep         1           bm         1           bm         1           dBm         1           dBm         1           dBm         1           dBm         1           dBm         1           dBm         1	Zoom • RBW 1	(30) 9k3GH 00 kHz 1 MHz Moo	Iz 🖾 3-20 de Auto Sweep				M7[1] 	• 1Rm Mar 20.38 dB 98740000 G -40.06 dB
A8 1 107 15.10.2017 agram 3b: tiview C CCDF of Level 50.00 dBm ccturency Sweep Bm Bm Bm Bm Bm Bm Bm Bm Bm Bm	Zoom • RBW 1	(%)     (	Iz 🖾 3-20 de Auto Sweep				M7(1) 	<ul> <li>Irm Ma</li> <li>1558</li> <li>1558</li> <li>20,33 de</li> <li>20,33 de</li> <li>36740000 G</li> <li>-40.06 de</li> <li>33000000 G</li> <li>3000000 G</li> <li>-40.06 de</li> <li>3000000 G</li> <li>-40.06 de</li> <li>-40.06 de</li> </ul>
M8         1           07         15.10.2017           agram 3b:         1           tiview C ccpF         CcpF           eff Level 50.00 dBm         30 dB *           cquercy Swacp         8m           Bm         8m           Bm         1           dBm         1	Zoom • RBW 1	(30) 9k3GH 00 kHz 1 MHz Moo	Iz 🖾 3-20 de Auto Sweep		10.0 MH2/		M7(1) 	• 110m Mai 20.38 de 96740000 G -40.06 de 93000000 G
M8         1           07         15.10.2017           agram 3b:         1           tiview C ccDF         CcDF           eff Level 50.00 dBm         30 dB =           ecquency Sweep         8m           Bm         30 dB =           dBm         4m	Zoom     RBW 1     WT 10 5     VBW	BK3GH     SGH	Iz II pts				M7(1) 	• 1Pm Ma 20.39 db 987-40000 G -40.06 db 3000000 G
M8         1           507         15.10.2017           agram 3b:         1           tiview         CCDF           eff Level 50.00 dBm         30 dB *           equency sweep         8m           Bm         30 dB *           dBm         90           Bm         <	Zoom     RBW 1     SWT 10 s     VBW	(x) 9k3GH     (x) 9k3GH	iz 🖾 3-20 de Auto Sweep		10.0 MHz/		M7[1] F- M1[1] I.	• 1Pm Ma 20.39 db 987-40000 G -40.06 db 3000000 G
M8     1       107     15.10.2017       agram 3b:       tivlew C ccpF       eff Level 50.00 dBm       addm       addm       dBm       dBm </td <td>Zoom     RBW 1     SWT 10 s     VBW</td> <td>(x) 9k3GH     (x) 9k3GH</td> <td>iz 🖾 3-20 de Auto Sweep</td> <td></td> <td>10.0 MHz/</td> <td></td> <td>M7[1] F- M1[1] I.</td> <td>• 1Pm Ma 20.39 db 987-40000 G -40.06 db 3000000 G</td>	Zoom     RBW 1     SWT 10 s     VBW	(x) 9k3GH     (x) 9k3GH	iz 🖾 3-20 de Auto Sweep		10.0 MHz/		M7[1] F- M1[1] I.	• 1Pm Ma 20.39 db 987-40000 G -40.06 db 3000000 G
M8 1  507 15.10.2017  agram 3b: tiview C CCDF eff Level 50.00 dBm eff Level 50.00 dBm Bm B	Zoom RBW 1 SWT 10 s VBW XBW X-Value 1.93 GH 1.9504 GH 1.9678 GH	Image: Second state         Image: Second state           Image: Second state         Image: Second state <td>Iz 🖾 3-20 de Auto Sweep</td> <td></td> <td>10.0 MHz/</td> <td></td> <td>M7[1] F- M1[1] I.</td> <td>• 1Pm Ma 20.39 db 987-40000 G -40.06 db 3000000 G</td>	Iz 🖾 3-20 de Auto Sweep		10.0 MHz/		M7[1] F- M1[1] I.	• 1Pm Ma 20.39 db 987-40000 G -40.06 db 3000000 G
448     1       107     15.10.2017       agram 3b:     1       1087     15.10.2017       agram 3b:     1	Zoom • R8W 1 • R8W	Image: Second state         Image: Second state           Image: Second state         Image: Second state <td>Iz 🖾 3-20 de Auto Sweep M3 </td> <td></td> <td>10.0 MHz/</td> <td></td> <td>M7[1] F- M1[1] I.</td> <td>• 1 Pan Ma 20.38 db 987-10000 G -40.06 db 3000000 G</td>	Iz 🖾 3-20 de Auto Sweep M3 		10.0 MHz/		M7[1] F- M1[1] I.	• 1 Pan Ma 20.38 db 987-10000 G -40.06 db 3000000 G

Note: Due to the use of reduced measurement bandwidth the limit should be adjusted by 10 dB to -23 dBm.

Date 2017-10-23

Reference 7P06127-LG Page 19 (27)



#### Diagram 3c:

lultiView 🖽	CCDF 2	Zoom	9k3GHz	3-20	GHz 🖾				$\nabla$
Ref Level 40 Att DF	.00 dBm 10 dB • SW	T200 ms VBV	V 1 MHz V 10 MHz Mod	e Auto Sweep				c	Count 100/100
Frequency S	weep								1Rm Avg
								M1[1]	-38.00 dBm
					1				16.599609 GH
dBm									
					1				
dBm									
					1				
dBm									
					1				
1Bm									
					1				
0 dBm	H1 -13.000 dBm								
0 dBm									
					1				
0 dBm									<u> </u>
					1			¥	
0 dBm								~~~~	and the second dates
) dBm	and the second designed to the second designe	1							
					1				
) dBm									
0 dBm									<u> </u>
.0 GHz			100001 p	ots	-	1.7 GHz/			20.0 GHz
	Y						Mansuring		15.10.2017

15:59:33 15.10.2017



## Field strength of spurious radiation measurements according to CFR 47 §2.1053 / IC RSS-133 6.5

Date	Temperature	Humidity
2017-09-14	$22 \ ^{\circ}C \pm 3 \ ^{\circ}C$	45 % ± 5 %
2017-10-04	$23 \ ^{\circ}C \pm 3 \ ^{\circ}C$	38 % ± 5 %
2017-10-05	$22 \ ^{\circ}C \pm 3 \ ^{\circ}C$	34 % ± 5 %

The test site conform to the site validation criterion specified in ANSI C63.4 2014. The test site complies with RSS-Gen, Industry Canada file no. 3482A-1.

The measurements were performed with both horizontal and vertical polarization of the antenna. The antenna distance was 3 m in the frequency range 30 MHz - 18 GHz and 1 m in the frequency range 18 GHz - 20 GHz.

RF absorbers were covering a floor area in the frequency range 1 GHz – 18 GHz to comply with site validation requirements according to ANSI C63.4-2014.

The EUT was placed 0.8 m above reference ground plane in frequency range 30 MHz - 1 GHz and 1.5 m above reference ground plane in frequency range 1 GHz - 20 GHz.

The measurement was performed with a RBW of 1 MHz.

A propagation loss in free space was calculated. The used formula was

 $\gamma = 20 \log \left(\frac{4\pi D}{\lambda}\right)$ ,  $\gamma$  is the propagation loss and *D* is the antenna distance.

The measurement procedure was as the following:

- 1. A pre-measurement is performed with peak detector. For measurement < 1 GHz the test object was measured in eight directions with the antenna at three heights, 1.0 m, 1.5 m and 2.0 m. For measurements > 1 GHz the test object was measured in seventeen directions with the antenna height 1.0 m, 1.5 m and 2m.
- 2. Spurious radiation on frequencies closer than 20 dB to the limit in the pre-measurement is scanned 0-360 degrees and the antenna is scanned 1- 4 m for maximum response. The emission is then measured with the RMS detector and the RMS value is reported. Frequencies closer than 10 dB to the limit when measured with the RMS detector were measured with the substitution method according to ANSI 63.26.

Date 2017-10-23

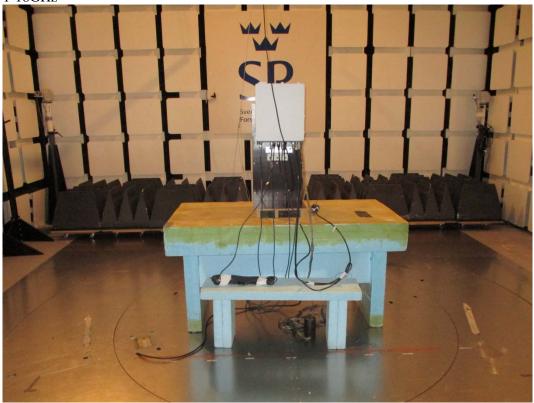
Reference 7P06127-LG Page 21 (27)



The test set-up during the spurious radiation measurements is shown in the picture below: 30-1000 MHz



1-18GHz



Measurement equipment	RISE number
Semi anechoic chamber Tesla	503 881
R&S ESU 40	901 385
EMC 32 ver. 10.20.01	BX62351
ETS Lindgren BiConiLog 3142E	BX61914
ETS Lindgren Horn Antenna 3115	502 175
Flann STD Gain Horn Antenna 20240-20	503 674
µComp Nordic, Low Noise Amplifier	901 545
Miteq, Low Noise Amplifier	503 278
HP Filter 3-26.5 GHz	901 502
Temperature and humidity meter, Testo 625	504 188

Date

2017-10-23

Reference

7P06127-LG

#### Results

Tested configurations: 1L2G

representing worst case: Symbolic name 1L2G, Diagram 1 a-d

	Spurious emission level (dBm)					
Frequency (MHz)	Vertical	Horizontal				
30-20000	All emission > 20 dB below limit	All emission > 20 dB below limit				

Measurement uncertainty: 3.1 dB

#### Limits

CFR 47 §24.238 and IC RSS-133 6.5

(g) Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P) dB$ , resulting in a limit of -13 dBm.

Complies? Yes

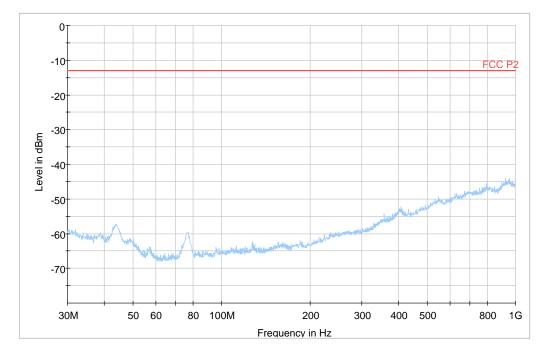


Date 2017-10-23

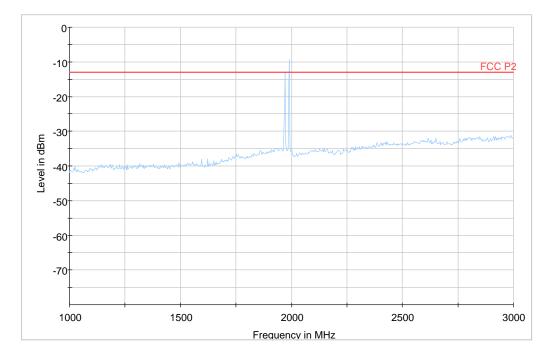
Reference 7P06127-LG Page 23 (27)



#### Diagram 1a:







Note: The emission between 1970 – 1990 MHz is the carrier frequency and shall be ignored in the context.

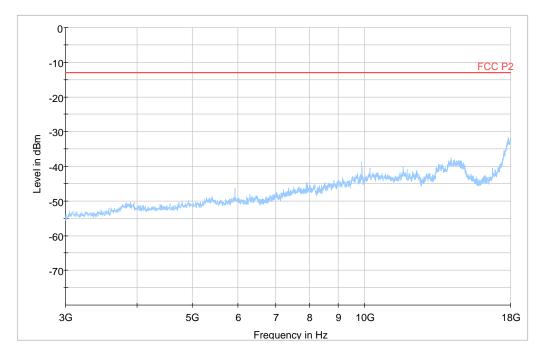


Date 2017-10-23

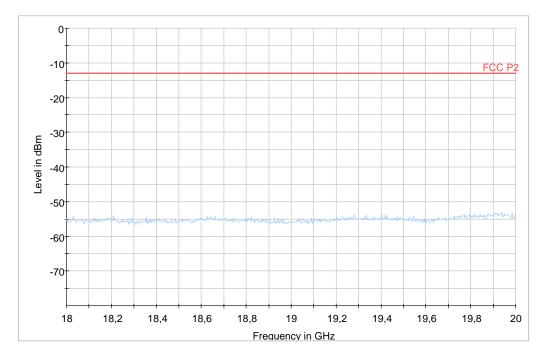
Reference 7P06127-LG Page 24 (27)



#### Diagram 1c:







Date 2017-10-23

Reference 7P06127-LG Page 25 (27)



## Photos of test object





Left side



Right side





Date 2017-10-23

Reference 7P06127-LG Page 26 (27)



#### Bottom side



Top side





Reference 7P06127-LG Page 27 (27)



SE

Radiated measurements:

Radio label:



SFP module:



Conducted measurements:

Radio label:



SFP module:

