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Ericsson AB Niklas Warnström PDU HW Torshamnsgatan 21 164 83 Stockholm

Radio measurements on RD 2242 B17 with FCC ID: TA8AKRY901326-1 (9 appendices)

Test object

Product name: RD 2242 B17 Product number: KRY 901 326/1, R1B, see appendix 1 for details.

Summary

Standar	rd	Compliant	Appendix	
FCC CFR 47				
2.1046	RF power output	Yes	2	
2.1046	RF power output, radiated	Yes	3	
2.1049	Occupied bandwidth	Yes	4	
2.1051	Band edge	Yes	5	
2.1051	Spurious emission at antenna terminals	Yes	6	
2.1053	Field strength of spurious radiation	Yes	7	
2.1055	Frequency stability	Yes	8	

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Electronics - EMC Performed by

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Appendix 1

Description of the test object

Radio equipment:	RD 2242 B17 Product number: KRY 901 326/1 FCC ID: TA8AKRY901326-1
Tested configuration:	LTE single RAT
Frequency bands:	TX: 734 – 745 MHz RX: 704 – 715 MHz
Antenna ports:	2 TX/RX ports, (internally connected to integrated Omni directional antenna elements)
RF configuration:	Single carrier, multi carrier, TX-diversity and MIMO 2x2
Nominal output power per antenna port:	Single carrier: 1 x 17 dBm (1 x 50mW) Multi carrier: 2 x 14 dBm (2 x 25mW)
RF power Tolerance:	$\pm 2 \text{ dB}$
Antenna type:	Omni directional antenna
Antenna gain:	-2.6 dBi
Channel bandwidths:	Singel carrier: 5 MHz, 10 MHz Multi carrier: 5 MHz
Modulations:	QPSK, 16QAM and 64QAM
Nominal supply voltage:	-48VDC



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Operation mode during measurements

Measurements were performed with the test object transmitting test models as defined in 3GPP TS 36.141. Test model E-TM1.1 represent QPSK modulation, test model E-TM3.2 represent 16QAM modulation and test model E-TM3.1 represent 64QAM modulation.

The settings below were deemed representative for all traffic scenarios when settings with different modulations, channel bandwidths, number of carriers and RF configurations has been tested to find the worst case setting. All measurements were performed with the test object configured for maximum transmit power. The settings below were used for all measurements if not otherwise noted.

MIMO mode, single carrier: E-TM1.1 MIMO mode, multi carrier: 2 carriers E-TM1.1

Cable configurations between RD and IRU

The cables, used during tests, correspond to minimum and maximum length, according to table 8 in Exhibit 12 – Technical Circuit Description for FCC ID: TA8AKRY901326-1. The following cable configurations has been used:

RDI Cable 20m: total cabel length 20m patch cables included.

RDI Cable 52m: total cabel length 52m patch cables included.

RDI Cable 100m: total cabel length 100m patch cables included.

Patch cable	Cat 6a Schneider Electric Actassi CL-MNC6A
RDI cable	Cat 6a Schneider Electric Actassi CL-MXC6A

Conducted measurements

The conducted measurements were performed on RD 2242 B17 with product number KRY 901 326/1.

The test object was mounted in a fixture powered by the RDI LAN cable. All TX parameters were measured at port RF B with port RF A terminated into 50 ohm. Complete measurements were made on RF B with additional measurements on RF A to verify that the ports are identical.

Radiated measurements

The test object was mounted in a fixture and powered by the RDI LAN cable. In field strength of spurios radition both RF ports were terminated into 50 ohm. For RF power output measurement the internal antenna was used.

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Appendix 1

Purpose of test

The purpose of the tests is to verify compliance to the performance characteristics specified in applicable items of FCC CFR 47.

References

Measurements were done according to relevant parts of the following standards:

3GPP TS 36.141, version 11.4.0 ANSI 63.4-2009 ANSI/TIA/EIA-603-C-2004 CFR 47 part 2, December 16th , 2013 CFR 47 part 27, December 16th, 2013



Appendix 1

Measurement equipment

	Calibration Due	SP number
Test site Tesla	2017-01	503 881
R&S ESU 26	2015-05	901 553
R&S ESI 26	2015-07	503 292
R&S FSQ 40	2015-07	504 143
R&S FSW 43	2015-07	902 073
R&S FSIQ 40	2015-07	503 738
Control computer with	-	503 899
R&S software EMC32 version 8.52.0		
High pass filter	2015-01	BX40074
High pass filter	2015-07	901 501
High pass filter	2015-07	901 502
High pass filter	2015-07	504 199
High pass filter	2015-07	901 373
High pass filter	2016-07	503 739
High pass filter	2015-07	503 740
RF attenuator	2016-07	503 248
RF attenuator	2016-06	503 249
RF attenuator	2015-08	504 159
RF attenuator	2015-07	900 233
RF attenuator	2015-06	901 384
RF attenuator	2014-11	901 508
Chase Bilog Antenna CBL 6111A	2014-10	503 182
EMCO Horn Antenna 3115	2016-09	502 175
µComp Nordic, Low Noise Amplifier	2015-01	901 545
Flann STD Gain Horn Antenna 16240-25	-	503 939
Flann STD Gain Horn Antenna 18240-25	-	503 900
Flann STD Gain Horn Antenna 20240-20	-	503 674
Miteq, Low Noise Amplifier	2015-08	503 285
Schwarzbeck preamplifier BBV 9742	2015-01	504 085
Temperature and humidity meter, Testo 635	2015-03	504 203
Temperature and humidity meter, Testo 625	2015-06	504 188
Temperature Chamber	-	503 360
Multimeter Fluke 87	2015-08	502 190



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 2014-10-15.

Manufacturer's representative

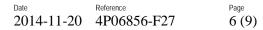
Christer Gustavsson, Ericsson AB.

Test engineers

Andreas Johnson, Tomas Lennhager, Maulo Rivera, Tomas Isbring, Patric Augustsson, Jörgen Wassholm and Rolf Kühn, SP.

Test participants

David Travis and Berkin Can, Ericsson AB.





Appendix 1

EARFCN	Frequency	BW	Symbolic	Comment
Downlink	[MHz]	[MHz]	name	
5755	736.5	5	B5	TX bottom frequency 5 MHz BW configuration
5780	739.0	10	B10	TX bottom frequency 10MHz BW configurations
5785	739.5	5	M5	TX mid frequency 5MHz BW configurations
5785	739.5	10	M10	TX mid frequency 10MHz BW configurations
5815	742.5	5	T5	TX top frequency 5 MHz BW configuration
5790	740.0	10	T10	TX top frequency 10MHz BW configurations
5755	736.5	5	2B5	2 carrier TX bottom frequency 5 MHz BW
5805	741.5	5		configuration.
5760	737.0	5	2M5	2 carrier TX mid frequency 5 MHz BW
5810	742.0	5		configuration.
5765	737.5	5	2T5	2 carrier TX top frequency 5 MHz BW
5815	742.5	5		configuration.

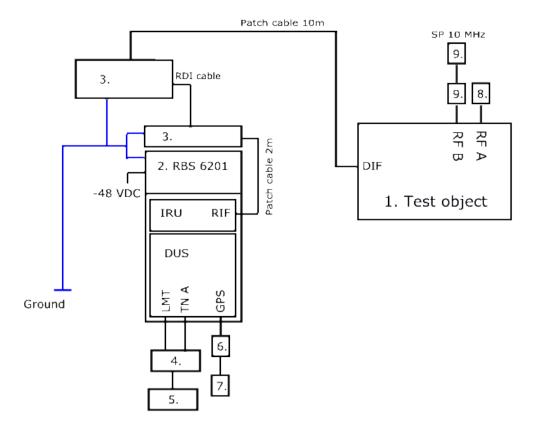
Test frequencies during measurements

All RX frequencies were configured 30 MHz below the corresponding TX frequency according the applicable duplex offset for the operating band.





Test setup conducted measurements



Test object

1.	RD 2242 B17, KRY 901 326/1, revision R1B, s/n: C828326007
	software CXP901 3268/14, revision R59BK with
	FCC ID: TA8AKRY901326-1

Associated equipment:

2.	RBS 6201:
	DUS 41 01, KDU 137 624/1, revision R5A/A, s/n: D16G937758
	IRU 2242, KRC 161 444/1, revision R1B, s/n: C828361595
3.	Patch panel, BGK 901 55/1, revision R1A, s/n: -
6.	GPS 02 01, NCD 901 41/1, revision R1D, s/n: TU8K474887
7.	GPS Active Antenna, KRE 101 2082/1

Functional test equipment

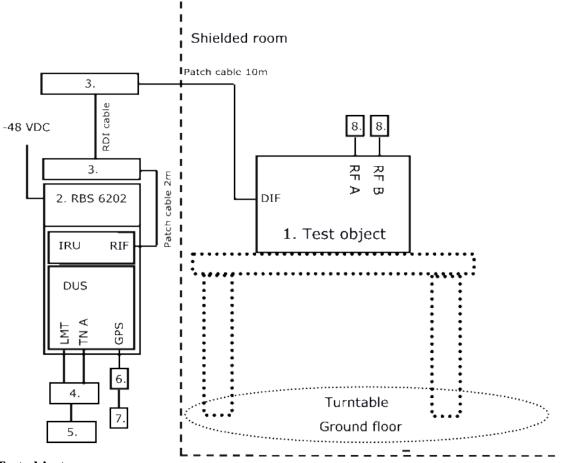
4.	Switch Netgear GSM 7224, BAMS – 1001356228

- 5. Laptop EliteBook 8540w, BAMS 1001052032
- 8. Attenuator/ Terminator 50 ohm
- 9. SP test instrument according measurement equipment list



Test setup radiated measurements

I



Test object:

1.	RD 2242 B17, KRY 901 326/1, revision R1B, s/n: C828326007
	with software: CXP901 3268/14, revision R59BK
	FCC ID: TA8AKRY901326-1

Associated equipment:

2.	RBS 6202:
	DUS 41 01, KDU 137 624/1, revision R5A/A, s/n: D16G937758
	IRU 2242, KRC 161 444/1, revision R1B, s/n: C828361595
3.	Patch panel, BGK 901 55/1, revision R1A, s/n: -
6.	GPS 02 01, NCD 901 41/1, revision R1D, s/n: TU8K388084
7.	GPS Active Antenna, KRE 101 2082/1

Functional test equipment:

4.	Switch Netgear GSM 7224, BAMS – 1001356228
5.	Laptop EliteBook 8540w, BAMS – 1001052032
8.	Attenuator/ Terminator 50 ohm



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Appendix 1

Interfaces:	Type of port:
Antenna port (A), hirose connector	Antenna
Antenna port (B), hirose connector	Antenna
DIF, Patch cable Cat 6a Schneider Electric Actassi CL-MNC6A	Signal
RDI, Cat 6a Schneider Electric Actassi CL-MXC6A	Signal

RBS software:

Product number	Revision
CXP 102 051/22	R34X



RF power output measurements according to CFR 47 §27.50

Date	Temperature	Humidity
2014-10-17	$18 \ ^{\circ}C \pm 3^{\circ}C$	40 % ± 5%
2014-10-21	$22 \ ^{\circ}C \pm 3 \ ^{\circ}C$	$38\% \pm 5\%$
2014-10-29	$23 \ ^{\circ}C \pm 3 \ ^{\circ}C$	45 % ± 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	SP number
R&S FSW	902 073
RF attenuator	900 691
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 1.1 dB

Results

Configuration: RDI Cable 20m

MIMO mode, single carrier Rated output power level at RF connector 1x 17 dBm.

<u>`</u>	Output power CCDF				
Carrier BW	Symbolic		[RMS dBm/ PAR	dB]	
[MHz]	name	Port RF A	Port RF B	Total power ¹⁾	
5	B5	16.98/ 6.82	17.18/ 6.86	20.09	
5	M5	16.94/ 6.86	16.83/ 6.84	19.90	
10	M10	16.93/ 6.86	17.36/ 6.88	20.16	
5	T5	16.71/ 6.88	16.37/ 6.90	19.55	

¹): Summed output power according to FCC KDB662911 Multiple transmitter output v02r01. Note: The PAR value is the 0.1 % Peak to Average Ratio.

MIMO mode, multi Carrier

Rated output power 2 x 14.0 dBm per RF port. Output power CCDF Total power¹⁾ Carrier BW [RMS dBm] Symbolic [RMS dBm] [MHz] name Port RF A Port RF B 5 2B5 16.92 17.02 19.98 5 2T5 16.77 19.84 16.89

¹⁾: Summed output power according to FCC KDB662911 Multiple transmitter output v02r01.



Single carrier, MIMO

Output power per 1 MHz				
Carrier BW	Symbolic	lic [RMS dBm]		Total power ¹⁾
[MHz]	name	Port RF A	Port RF B	[RMS dBm]
5	B5	11.07	11.24	14.24
5	M5	11.13	11.06	14.13
10	M10	8.10	8.22	11.22
5	T5	11.22	10.96	14.22

¹): Measured according to FCC KDB662911 D01 Multiple Transmitter Output v02r01. Method E), 2), c). "Measure and add 10 log(N_{Ant})".

Configuration: RDI Cable 52m

MIMO mode, single carrier Rated output power level at RF connector 1x 17 dBm.

Output power CCDF						
Carrier BW	Symbolic	[RMS dBm/ PAR dB]			ymbolic [RMS	dB]
[MHz]	name	Port RF A	Port RF B	Total power ¹⁾		
5	B5	16.71/ 6.80	16.93/ 6.84	19.83		
5	M5	16.68/ 6.82	16.86/ 6.86	19.78		
10	M10	16.66/ 6.84	16.88/ 6.88	19.78		
5	T5	16.60/ 6.86	16.56/ 6.90	19.59		

¹): Summed output power according to FCC KDB662911 Multiple transmitter output v02r01. Note: The PAR value is the 0.1 % Peak to Average Ratio.

Output power 2 x 14.0 dBm per RF port.					
Carrier BW	Symbolic				
[MHz]	name	Port RF A	Port RF B	[RMS dBm]	
5	2B5	16.44	16.79	19.63	
5	2T5	16.28	16.58	19.44	

MIMO mode, multi Carrier Rated output power 2 x 14.0 dBm per RF port

¹: Summed output power according to FCC KDB662911 Multiple transmitter output v02r01.



Single carrier, MIMO

Output power per 1 MHz				
Carrier BW Symbolic		[RMS dBm]		Total power ¹⁾
[MHz]	name	Port RF A	Port RF B	[RMS dBm]
5	B5	10.82	11.19	14.19
5	M5	10.89	10.61	13.89
10	M10	8.21	8.21	11.21
5	T5	10.98	10.96	13.98

¹): Measured according to FCC KDB662911 D01 Multiple Transmitter Output v02r01. Method E), 2), c). "Measure and add 10 log(N_{Ant})".

Configuration: RDI Cable 100m

MIMO mode, single carrier

Rated output power level at RF connector 1x 17 dBm.

Output power CCDF				
Carrier BW	Symbolic	[RMS dBm/ PAR dB]		
[MHz]	name	Port RF A	Port RF B	Total power ¹⁾
5	B5	16.10/ 6.80	16.27/ 6.84	19.20
5	M5	16.04/ 6.82	16.49/ 6.86	19.28
10	M10	16.20/ 6.86	16.47/ 6.88	19.35
5	T5	16.02/ 6.84	16.23/ 6.90	19.14

¹): Summed output power according to FCC KDB662911 Multiple transmitter output v02r01. Note: The PAR value is the 0.1 % Peak to Average Ratio.

MIMO mode, multi Carrier

Rated output power 2 x 14.0 dBm per RF port.

	Output power CCDF				
Carrier BW	Symbolic	[RMS o	Total power ¹⁾		
[MHz]	name	Port RF A	Port RF B	[RMS dBm]	
5	2B5	16.39	16.39	19.40	
5	2T5	16.14	16.22	19.19	

¹: Summed output power according to FCC KDB662911 Multiple transmitter output v02r01.



Appendix 2

Single carrier, MIMO

Output power per 1 MHz				
Carrier BW Symbolic		[RMS dBm]		Total power ¹⁾
[MHz]	name	Port RF A	Port RF B	[RMS dBm]
5	B5	11.12	10.68	14.11
5	M5	10.77	10.36	13.77
10	M10	7.92	7.51	10.92
5	T5	10.71	10.35	13.71

¹): Measured according to FCC KDB662911 D01 Multiple Transmitter Output v02r01. Method E), 2), c). "Measure and add 10 log(N_{Ant})".

Limits

§ 27.50 (c) (3): Base stations transmitting in the 698 –746 MHz band with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz.

Complies?	Yes



RF power output measurements according to CFR 47 §27.50, radiated

Date	Temperature	Humidity
2014-10-20	$23 \text{ °C} \pm 3 \text{ °C}$	47 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.4-2009.

The test was performed with continuous transmission.

The test of radiated emission was performed in a semi anechoic chamber. The measurements were performed with both horizontal and vertical polarizations of the antenna. The antenna distance was 3.0 m.

The fundamental was scanned with PEAK-detector with the antenna height was varied between 1-4 m and the turntable was rotated between 0-360 degrees for maximum response. The carrier power was measured with RMS- detector activated with a RBW of 1 MHz. The output power was verified with the substitution method .The antenna distance during the measurements was 3.0 m.

Measurement equipment

Measurement equipment	SP number
Semi anechoic chamber	503 881
R&S ESU 26	901 553
EMC 32 ver. 8.52.0	503 899
Schwarzbeck dipol	500 593
R&S SMB 100A	900 120
Attenuator	BX41643
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty:

3.2 dB



Appendix 3

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The test set-up during the effective radiated output power measurements is shown in the picture below, side mounted.



The test set-up during the effective radiated output power measurements is shown in the picture below, upright mounted.





Appendix 3

Results

Upright mounted

Bandwidth configuration [MHz]	Tested frequency B		Tested fr N		Tested frequency T		
	Vertical/Horizontal RMS power (ERP)dBm/ MHzmW/ MHz0.4/ 3.01.1/ 2.0			Vertical/Horizontal RMS power (ERP)		Vertical/Horizontal RMS power (ERP)	
			dBm/ MHz	mW/ MHz	dBm/ MHz	mW/ MHz	
5			-0.9/ 2.9	0.8/ 1.9	-3.3/ 2.1	0.5/ 1.6	
10			-3.4/ 0.1	0.5/ 1.0	-	-	

Side mounted

Bandwidth configuration [MHz]	Tested frequency B		Tested fr N		Tested frequency T			
	Vertical/Horizontal RMS power (ERP) dBm/ MHz mW/ MHz			Vertical/Horizontal RMS power (ERP)		Vertical/Horizontal RMS power (ERP)		
			dBm/ MHz	mW/ MHz	dBm/ MHz	mW/ MHz		
5	1.6/ 2.1 1.4/ 1.6		0.6/ 1.9 1.1/ 1.5		0.5/ 1.3	1.1/ 1.3		
10			-1.4/ -0.9	0.7/ 0.8	_	_		

§ 27.50 (c) (3): Base stations transmitting in the 698 –746 MHz band with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz.

Complies?	Yes
	105



Occupied bandwidth measurements according to CFR 47 2.1049

Date	Temperature	Humidity
2014-10-21	$22 \ ^{\circ}C \pm 3 \ ^{\circ}C$	38 % ± 5%
2014-10-22	$23 \ ^{\circ}C \pm 3 \ ^{\circ}C$	34 % ± 5%
2014-10-23	$23 \ ^{\circ}C \pm 3 \ ^{\circ}C$	31 % ± 5%

Test set-up and procedure

The measurements were made per definition in §2.1049. The output was connected to a signal analyzer with the RMS detector activated. The signal analyzer was connected to an external 10 MHz reference standard during the measurements.

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

Measurement uncertainty: 3.7 dB



Appendix 4

Results

Configuration: RDI Cable 20m

MIMO mode, Single carrier

Diagram	BW configuration [MHz]	Tested frequency	Tested Port	Occupied BW (99%) [MHz]
1	5	B5	RF A	4.48
2	10	B10	RF A	8.93
3	5	M5	RF A	4.48
4	10	M10	RF A	8.93
5	5	T5	RF A	4.47
6	10	T10	RF A	8.93

Configuration: RDI Cable 100m

MIMO mode, Single carrier

Diagram	BW configuration [MHz]	Tested frequency	Tested Port	Occupied BW (99%) [MHz]
7	5	B5	RF A	4.48
8	10	B10	RF A	8.93
9	5	M5	RF A	4.48
10	10	M10	RF A	8.93
11	5	T5	RF A	4.47
12	10	T10	RF A	8.93



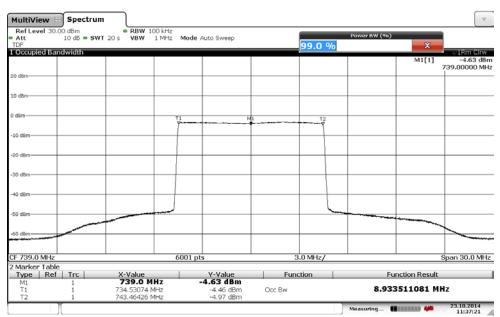
Appendix 4

Diagram 1:

Ref Level 30.0	,	BBW	FO LUE							~
Ref Level 30.0 Att				Iode Auto Sweep				Marker 1		
DF						736.	5 MHz		×	
Occupied Ban	dwidth						_			IRm Clrv
									M1[1]	-6.12 dE 736.50000 M
dam										130,30000 M
doni										
d8m										
18m			T1	M		Т2				+
			Ŷ			+ ' ę				
) d8m						+ +				
d8m							\vdash		<u> </u>	
d8m										
dam-										
GBM										
) dBm			and the second							
	and the second s									
rd8m										+
736.5 MHz			60	01 pts		L.5 MHz/			1	Span 15.0 M
Marker Table										
Type Ref	Trc	X-Value	_	Y-Value	Fun	ction		Fu	nction Result	
M1	1	736.5 M		-6.12 dBm						
T1 T2	1	734.26037		-5.58 dBm -5.96 dBm	Occ Bw			4.470	5753874 M	HZ
12	1	/30./3/13	MHZ	-3.96 dBm						22.10.2014

Date: 22.0CT.2014 09:18:05

Diagram 2:



Date: 23.0CT.2014 11:37:21



Appendix 4

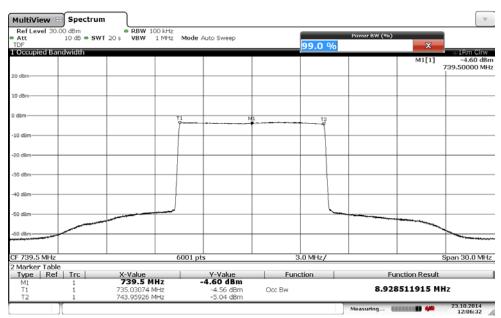
Diagram 3:

MultiView 😁 Spectrum ~
 Ref Level 30.00 dbm
 = RBW
 50 kHz

 • Att
 10 db = SWT 20 s
 VBW 500 kHz
 Mode Auto Sweep
 Power BW (%) 99.0 % N 1 Occupied Bandwidth 01Rm Clrw -6.43 dBm 739.50000 MHz м1[1] in de 60 d8r CF 739.5 MHz 6001 p Span 15.0 MHz MH2 2 Marker Table Type | Ref | Trc | Function Result Function X-Value 739.5 MHz Y-Value -6.43 dBm M1 T1 Occ Bw 4.479253458 MHz 737.26287 MHz 741.74213 MHz -5.86 dBm -5.78 dBm 22.10.2014 09:21:16 Measuring

Date: 22.0CT.2014 09:21:16

Diagram 4:



Date: 23.0CT.2014 12:06:33



Appendix 4

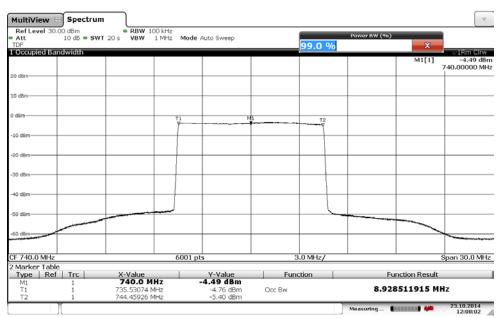
Diagram 5:

MultiView 😁 Spectrum ~
 Ref Level 30.00 dbm
 = RBW
 50 kHz

 • Att
 10 db = SWT 20 s
 VBW 500 kHz
 Mode Auto Sweep
 Power BW (%) 99.0 % ~ 1 Occupied Bandwidth -6.34 dBm 742.50000 MHz M1[1] in de 12 60 d8r CF 742.5 MHz 6001 p Span 15.0 MHz MHz 2 Marker Table Type | Ref | Trc | Function Result Function X-Value 742.5 MHz Y-Value -6.34 dBm M1 T1 Occ Bw 4.474254291 MHz 740.26037 MHz 744.73463 MHz -5.98 dBm -6.52 dBm 22.10.2014 09:40:44 deasuring ...

Date: 22.0CT.2014 09:40:44

Diagram 6:



Date: 23.0CT.2014 12:08:03



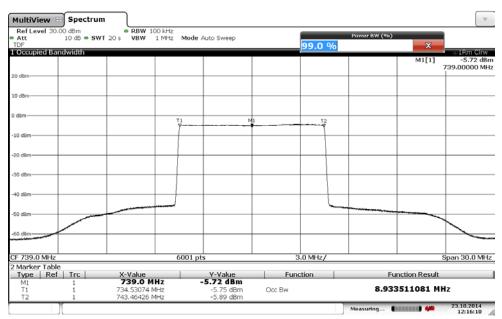
Appendix 4

Diagram 7:

AultiView		 RBW 50 kHz 						
Att	10 dB = SWT	20 s VBW 500 kHz	Mode Auto Sweep		99.0 %	Power BW	(%) X	
Occupied Ba	nawiath						M1[1]	0 1Rm Clrw -7.38 dBr
								736.50000 MH
0 dam								
d8m								
d8m								
		Ţ	1 M	1	T2			
		7			America			
0 d8m								
) d8m							_	+
0 d8m					1			+
					1			
0 d8m								
) d8m		in an annual start			μ · ·	-		
		and a second sec					and the state of t	
2 DBm								
736.5 MHz		6	001 pts	1	.5 MHz/			Span 15.0 M
Marker Tabl								
Type Re M1	f Trc	X-Value 736.5 MHz	Y-Value -7.38 dBm	Fund	ction		Function Result	
M1 T1	1	734.26287 MHz	-6.76 dBm	Occ Bw		4	.476753874 N	Hz
T2	î	738.73963 MHz	-6.90 dBm	000011		-		
	Y							21.10.2014

Date: 21.0CT.2014 15:46:32

Diagram 8:



Date: 23.0CT.2014 12:16:11





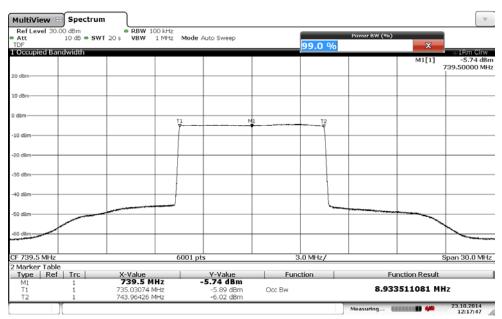
Appendix 4

Diagram 9:

MultiView											~
Ref Level 30 Att TDF	10 dB • SWT	20 s RBW 20 s VBW 5		Mode A.	ito Sweep		99.0	%	Power BW (%)	x	
Occupied Ba	andwidth			_							2 ⊜ 1Rm Clrw -7.00 dBr
										M1[1]	-7.00 dBr 739.50000 MH
0 d8m											
0 d8m											
u dem-											
dBm			T	1	м		T:	2			
			7	·			1	7			
10 d8m			1								
			1 1					1			
0 d8m			+ +				<u> </u>	<u> </u>			
								{			
0 d8m			- 1					1			
			1 1					1			
40 d8m											
								1			
50 d8m			L _/					L.			
ou dam	and the second s							-		-	
											and the second second second
50 d8m											
F 739.5 MHz			6	001 pts		1	.5 MHz/	/			Span 15.0 MH
Marker Tab	le										
Type Re		X-Value			Y-Value	Fun	tion		Fu	nction Result	
M1	1	739.5 M		-7	.00 dBm	One Buy			4 47	9253458 M	U 7
T1 T2	1	737.26287			-6.29 dBm -5.97 dBm	Occ Bw			4.47	7233436 M	n 2
1.6	- 	1-11/12101			oran april				Measuring		21.10.2014

Date: 21.0CT.2014 15:51:17

Diagram 10:



Date: 23.0CT.2014 12:17:46



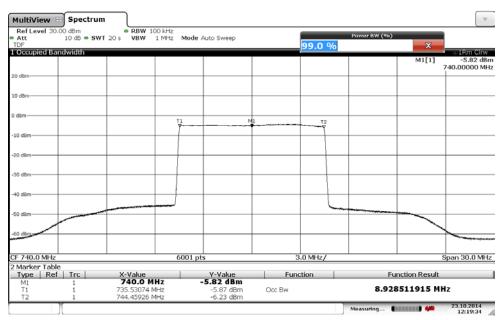
Appendix 4

Diagram 11:

MultiView	J .									~
Ref Level 30. Att TDF	10 dB • SWT	• RBW 5		ode Auto Sweep		99.0	%	Power BW (%)	×	
Occupied Ba	ndwidth								M1[1]	0 1Rm Clrw -6.31 dBn
									witil	742.50000 MH
20 d8m										+
0 d8m										
dBm			T1	M		T				
			÷-			+'ë	5			
10 d8m						1				
20 d8m			1							
30 d8m										
30 dem-										
40 d8m										
50 d8m			~							
	****						-		-	
50 d8m										
F 742.5 MHz			600)1 pts		L.5 MHz/	,			Span 15.0 MH
Marker Tabl	e									
Type Ref		X-Value		Y-Value	Fun	ction		Fu	nction Result	
M1 T1	1	742.5 M 740.26287 N		-6.31 dBm -6.30 dBm	Occ Bw			4.471	754708 M	Hz
T2	î	744.73463 N		-6.57 dBm	000 011					
	Y							Measuring		21.10.2014

Date: 21.0CT.2014 15:53:36

Diagram 12:



Date: 23.0CT.2014 12:19:34



Band edge measurements according to CFR 47 2.1051

Date	Temperature	Humidity
2014-10-22	$23 \ ^{\circ}C \pm 3 \ ^{\circ}C$	$34 \% \pm 5\%$

Test set-up and procedure

The measurements were made per definition in CFR 47 §27.53 The test object was connected to a spectrum analyzer with the RMS detector activated. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements.

The measurements were made as defined in §27.53 (g). The FCC rules, specifying a RBW of at least 30k up to 100 kHz away from the band edges and a RBW of 100 kHz for measurements of emissions more than 100 kHz away from the band edges.

A resolution bandwidth of 100 kHz was used at the band edges up to 10 MHz from the band edges.

Before comparing the results to the limit, 3 dB [10 log (2)] should be added according to method 2 "measure and add 10 log(N_{ANT})" of FCC KDB662911 D01 Multiple Transmitter Output v02r01.

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

Measurement uncertainty: 3.7 dB



Results

Configuration: RDI Cable 20m

MIMO mode, single carrier

Diagram	BW configuration [MHz]	Tested frequency	Tested Port
1	5	B5	RF A
2	10	B10	RF A
3	5	T5	RF A
4	10	T10	RF A

MIMO mode, multi carrier

Diagram	BW configuration [MHz]	Testedfrequency	Tested Port
5	5	2B5	RF A
6	5	2T5	RF A

Configuration: RDI Cable 100m

MIMO mode, single carrier

Diagram	BW configuration [MHz]	Tested frequency	Tested Port
7	5	B5	RF A
8	10	B10	RF A
9	5	T5	RF A
10	10	T10	RF A

MIMO mode, multi carrier

Diagram	BW configuration	Testedfrequency	Tested Port
	[MHz]		
11	5	2B5	RF A
12	5	2T5	RF A

Limits

CFR 47 § 27.53 (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.

|--|



Appendix 5

Diagram 1:

Frequency Sweep				M1[1]	 1Rm Max -43.29 dBr
				#0	734.00000 MH
HD dBm					
0 dBm					
20 dBm				 	
10 dBm					_
) dBm				 -	
10 d8m-					
H1 -13.000) dBm				
30 d8m					
40 dBm					
				 - J	
50 dBm			 		
60 dêm					
724.0 MHz		4001 pt	1.2 MHz		736.0 MH

Diagram 2:

	Sweep			M1[1]	01Rm -48.03
0 d8m		 		#0	734.00000
0 dBm		 			
0 dBm					
) dem					
dBm					
.0 d8m	H1 -13.000 dBm	 			
0 d8m	H1 -13.000 dBm				
0 d8m		 			
0 d8m					
0 dBm			 	M1	/

Date: 22.0CT.2014 12:12:44



Appendix 5

Diagram 3:

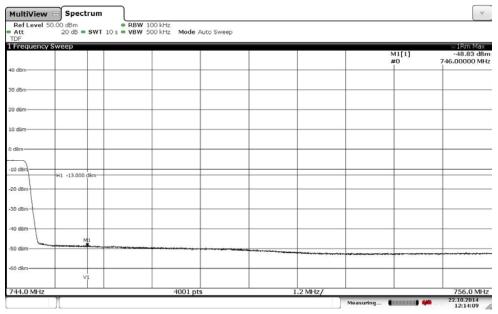
V MultiView 🕀 Spectrum
 Ref Level
 50.00 dBm
 RBW
 100 kHz

 Att
 20 dB
 SWT
 10 s
 VBW
 500 kHz
 Mode Auto Sweep

 TDF
 Trequency Sweep
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 Frequency Sweep
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 <t 1Rm Max M1[1] #0 -47.89 dBm 746.00000 MHz 20 di 0 dF -10 d8n 1 -13.00 -20 d8m 30 dBr 40 dBr -50 dBr 60 de 756.0 MHz 22.10.2014 12:07:25 744.0 MH; 4001 pts .2 MHz

Date: 22.0CT.2014 12:07:25

Diagram 4:



Date: 22.0CT.2014 12:14:09



Appendix 5

Diagram 5:

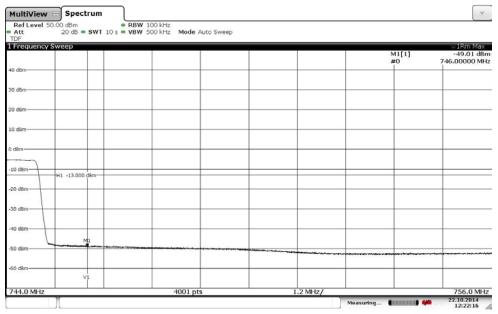
V MultiView 🕀 Spectrum
 Ref Level
 50.00 dBm
 BBW
 100 kHz

 Att
 20 dB
 SWT
 10 s
 VBW
 500 kHz
 Mode Auto Sweep

 TDF
 Trequency Sweep
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 1Rm Max M1[1] #0 -45.40 dBm 734.00000 MHz 10 d H1 -13.000 dBm 20 de 10 d 40 d 50 d 60 de 736.0 MHz 2.10.2014 12:20:36 724.0 MH; 4001 pts .2 MHz

Date: 22.0CT.2014 12:20:36

Diagram 6:



Date: 22.0CT.2014 12:22:15



Appendix 5

Diagram 7:

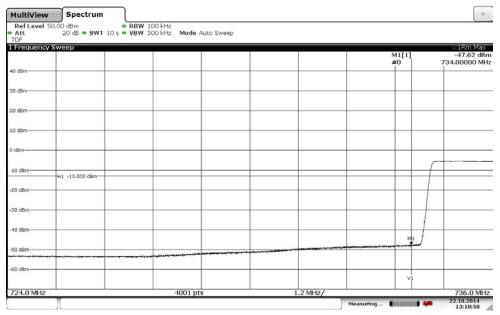
V MultiView 🕀 Spectrum
 Ref Level
 50.00 dBm
 BBW
 100 kHz

 Att
 20 dB
 SWT
 10 s
 VBW
 500 kHz
 Mode Auto Sweep

 TDF
 Trequency Sweep
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 1Rm Max M1[1] #0 -44.18 dBm 734.00000 MHz 10 d H1 -13.000 dBm 20 d 20 4 40 d 50 d 60 de 736.0 MHz 2.10.2014 13:07:33 724.0 MH; 4001 pts 2 MHz

Date: 22.0CT.2014 13:07:34

Diagram 8:



Date: 22.0CT.2014 13:10:50



Appendix 5

Diagram 9:

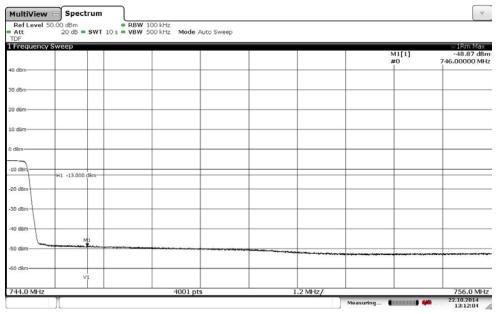
V MultiView 🕀 Spectrum
 Ref Level
 50.00 dBm
 RBW
 100 kHz

 Att
 20 dB
 SWT
 10 s
 VBW
 500 kHz
 Mode Auto Sweep

 TDF
 Trequency Sweep
 1
 Frequency Sweep
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 <t 1Rm Max M1[1] #0 -48.41 dBm 746.00000 MHz 20 di 0 dF -10 d8n 1 -13.00 -20 d8m 30 dBr 40 dBr -50 dBr 60 de 756.0 MHz 2.10.2014 13:09:45 744.0 MH; 4001 pts .2 MHz

Date: 22.0CT.2014 13:08:45

Diagram 10:



Date: 22.0CT.2014 13:12:04



Appendix 5

Diagram 11:

Frequency S	weep						IRm Max
						M1[1] #0	-45.90 dBr 734.00000 MH
0 d8m				 			
0 dBm				 	_	 	
0 dBm				 _		+	
0 d8m				 			
) dBm							
10 d8m						ſ	
20 d8m	H1 -13.000 dBm						
30 dBm							
40 d8m						ML	
50 dBm		*****		 			
60 d8m				 		 VI	
724.0 MHz			4001 p		1.2 MHz/		736.0 MH

Diagram 12:

	weep					M1[1]	© 1Rm Max -48.81 dB
						#0	746.00000 MH
d8m							
d8m						-	
d@m					 		
d@m		_			 		
m					 		
meb			 				
0 dBm	H1 -13.000 d	Bm					
0 dBm							
D dBm	M						
) dam			 	 	 		

Date: 22.0CT.2014 12:35:03

Page 8 (8)



Conducted spurious emission measurements according to CFR 47 §27.53

Date	Temperature	Humidity
2014-10-22	$23 \text{ °C} \pm 3 \text{ °C}$	$34\% \pm 5\%$

Test set-up and procedure

The measurements were made per definition in §27.53. 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, 3 dB [10 log (2)] should be added according to method 2 "measure and add 10 log(N_{ANT})" of FCC KDB662911 D01 Multiple Transmitter Output v02r01.

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

Measurement uncertainty: 3.7 dB



Appendix 6

Results

Configuration: RDI Cable 20m

MIMO mode, Single carrier

Diagram	BW configuration [MHz]	Tested frequency	Tested Port
1 a+b	5	B5	RF A
2 a+b	5	M5	RF A
3 a+b	10	M10	RF A
4 a+b	5	T5	RF A

MIMO mode, multi carrier

Diagram	BW configuration [MHz]	Symbolic name	Tested Port
5 a+b+c	5	2B5	RF A
6 a+b+c	5	2M5	RF A
7 a+b+c	5	2T5	RF A

Configuration: RDI Cable 100m

MIMO mode, Single carrier

Diagram	BW configuration [MHz]	Tested frequency	Tested Port
8 a+b	5	В5	RF A
9 a+b	5	M5	RF A
10 a+b	5	M5	RF B
10 a+b	10	M10	RF A
11 a+b	5	T5	RF A

MIMO mode, multi carrier

Diagram	BW configuration [MHz]	Symbolic name	Tested Port
12 a+b+c	5	2B5	RF A
13 a+b+c	5	2M5	RF A
14 a+b+c	5	2T5	RF A

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



Appendix 6

Page

3 (24)

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 745 MHz. The measurements were made up to 8 GHz (10x745 MHz = 7.45 GHz).

Limits

CFR 47 § 27.53 (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 per 100 kHz RBW.

Complies?	Yes



Appendix 6

Diagram 1a:

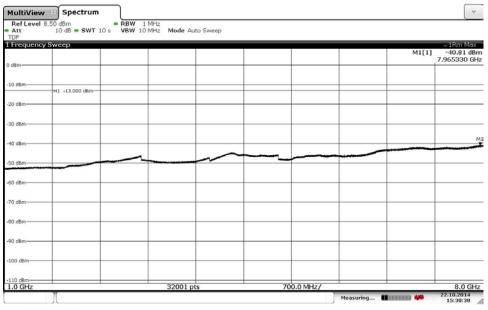
 MultiView
 Spectrum

 Ref Level 50.00 dbm
 • RBW 1 MHz

 * Att
 20 dB • SWT 30 s

 * UDF
 VBW 10 MHz
 ~ 1 Frequency Sweep n Max м1[1] 8.35 dBm 736.5000 MHz -40.69 dBm 992.8280 MHz M2[1] 40 di 30 dBr 20 dBr 10 dB 10 d H1 -13.000 dBm 20 dB 30 de M2 5008 60 dBr 9.0 kHz 32001 100.0 MHz/ 1.0 GHz Measuring... 🚺 🗰 🗰 22.10.2014 15:29:38 Date: 22.0CT.2014 15:29:38

Diagram 1b:



Date: 22.0CT.2014 15:30:38



Appendix 6

Diagram 2a:

 MultiView
 Spectrum

 Ref Level 50.00 dbm
 # RBW 1 MHz

 * Att
 20 dB = SWT 30 s

 * DFP
 VBW 10 MHz

 I Frequency Sweep
 V Max M1[1] 8.03 dBm 739.5000 MHz M2[1] -40.69 dBm 998.0160 MHz M1[1] 40 di 30 dB 20 dBr 10 dB 10 d H1 -13.000 dBm 20 dB 30 de 50 d 60 dB an 999.991 MHz CF 500.0045 MH 32001 p 100.0 MHz/ Measuring... 🔳 💷 🗰 22.10.2014 15:33:16 Date: 22.0CT.2014 15:33:16

Diagram 2b:

Att	50 dBm • RB 10 dB • SWT 10 s VB	W 1 MHz W 10 MHz Mode Auto Swe	ep		
TDF					
Frequency	Sweep				M1[1] -40.77 dB
dan					7.979990 Gł
d8m					
0 dBm					
o dom	H1 -13.000 dBm				
0 dBm					
0 dBm					
10 dBm					
i0 dBm	and the second designed to the second designe				
i0 dBm					
10 dBm					
u dBm					
10 dBm					
0 dBm					
100 dBm					
10 dBm	+	32001 pts		0.0 MHz/	8.0 GH

Date: 22.0CT.2014 15:31:51



Appendix 6

Diagram 3a:

 MultiView
 Spectrum

 Ref Level 50.00 dbm
 # RBW 1 MHz

 * Att
 20 dB = SWT 30 s

 * DFP
 VBW 10 MHz

 I Frequency Sweep
 V May 42[1] -40.71 dBm 994.1410 MHz 4.99 dBm 739.5000 MHz M1[1] 40 di 30 dB 20 dBr 10 dB М. 3 10 d H1 -13.000 dBm 20 dB 30 de MZ 50 d 60 dB 32001 p 100.0 MHz/ 1.0 GHz 9.0 kHz 22.10.2014 15:40:58 Measuring... 🚺 🗰 🗰 Date: 22.0CT.2014 15:40:59

Diagram 3b:

TDF	10 dB - SWI 10 s VB	W 1 MHz W 10 MHz Mode Auto St	weep		
Frequency	Sweep				⊜ 1Rm Ma>
					M1[1] -40.65 dB 7.982390 G
d8m					
0 dBm	H1 -13.000 dBm				
0 dBm	H1 -13.000 08m				
0 dBm-					
0 dBm				 	
50 dBm				 	
i0 dBm					
0 dBm-					
0 dBm					
0 dBm					
.00 dBm					

Date: 22.0CT.2014 15:39:52



Appendix 6

Diagram 4a:

 MultiView
 Spectrum

 Ref Level 50.00 dbm
 # RBW 1 MHz

 * Att
 20 dB = SWT 30 s

 * DFP
 VBW 10 MHz

 I Frequency Sweep
 V n Max M1[1] 8.14 dBm 742.5000 MHz M2[1] -40.67 dBm 997.6090 MHz м1[1] 40 di 30 dB 20 dBr 10 dB 10 d H1 -13.000 dBm 20 dB 30 de 50 d 60 dB 1.0 GHz 32001 p 100.0 MHz/ 9.0 kHz Measuring... 🔳 💷 🗰 22.10.2014 15:37:08 Date: 22.0CT.2014 15:37:09

Diagram 4b:

Ref Level 8.50 dBm Att 10 dB = SV	• RBW 1 VT 10 s VBW 10	MHz MHz Mode Auto St	waan				
DF	1 103 101 10	INTE MORE ALLO ST	neep				
Frequency Sweep							 1Rm Max
						M1[1]	-40.80 dBi 7.974950 GH
d8m							1137 4500 01
0 dBm H1 -13.000 dB							
0 dBm							
0 dBm							
+0 dBm							
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io ubin							
i0 dBm							
10 dBm							
0 dBm							
0 dBm							
00 dBm							
10 dBm .0 GHz		32001 pts		700.0 MHz/	-		8.0 GH
.0 GHZ		32001 pts		700.0 MHZ/			22.10.2014

Date: 22.0CT.2014 15:37:48



Appendix 6

Diagram 5a:

MultiView	Spectrum									~
Ref Level 50.0 Att TDF	0 dBm 20 dB • SWT	30 s VBW 10	1 MHz 0 MHz Mo	de Auto Sweep						
1 Frequency Sw	/eep									⇒1Rm Max
									M1[1]	5.25 dBm
40 dBm-										736.5000 MHz
10 0011									M2[1]	5.45 dBm 741.5000 MHz
30 dBm						-				741.3000 MH2
20 dBm-										
10 dBm							MA2			
							TT I			
0 d8m-										
1 mil 20							1 11			
-10 dBm	1 -13.000 dBm									
-20 dBm-										
-30 dBm										
-SO GBIN										
-40 dBm							/			M
							_			
50 dBm										
9										
-60 dBm							_			
9.0 kHz		1	3200	01 pts	10	0.0 MHz/				1.0 GHz
2 Marker Table										
	Trc	X-Value		Y-Value	Euno	tion		Funct	ion Result	
M1	1	736.5 MH	z	5.25 dBm						
M2	1	741.5 MH		5.45 dBm						
M3	1 1	996.922 MH	z	-40.75 dBm						
							Measuri	ng EXXX		22.10.2014 14:58:35

Date: 22.0CT.2014 14:58:35

Diagram 5b:

TDF								
0 dBm	veep						M2[1]	734.00000 MH
0 dBm								
d8m			M2	ма				
10 dBm	H1 -13.000 dBm-							<u> </u>
0 dBm-					_			-
0 dBm								
0 dBm		ML	- V			M4		
0 dBm								1
50 dBm								
70 dBm		VI				-v2		
26.0 MHz			6001 pts	2.	.8 MHz/			754.0 MH
Marker Table Type Ref		X-Value	Y-Value	Func	tion		Function Result	
M1 M2 M3	1 1 1	734.0 MHz 736.5 MHz 741.5 MHz 746.0 MHz	-46.19 dBm -5.52 dBm -4.94 dBm -50.74 dBm	Punc			Function Result	

Date: 22.0CT.2014 14:59:38



^{Page} 9 (24)



Appendix 6

Diagram 5c:

Ref Level 8.50 dBm Att 10 dB = SWT 1	 RBW 1 MHz 0 s VBW 10 MHz 	Mode Auto S	Sweep				
IDF Frequency Sweep							1Rm Max
						M1[1]	-40.81 dBr
d8m							7.969700 GH
0 dBm							
H1 -13.000 dBm						 	
0 dBm							
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10 dBm							
o obii							
i0 dBm							
00 dBm							
10 dBm							
.0 GHz		32001 pts		70	0.0 MHz/		8.0 GH

Date: 22.0CT.2014 14:57:24

ORT



Appendix 6

Diagram 6a:

1ultiView	B Spectrum						~
Ref Level 50 Att	0.00 dBm	RBW 1 MHz So s VBW 10 MHz	Mode Auto Sweep				
DF		SO'S VEW TO MHZ	Mode Auto Sweep				
Frequency:	Sweep						a 1Rm Max
						M1[1]	4.91 dBr 737.0000 MH
) dBm						M2[1]	5.18 dBr
10							742.0000 MH
d8m-							
dBm							
dBm					M12		
8m					M		
8m-							
dBm							
	H1 -13.000 dBm						
dBm-							
dBm-							
GDIN							
dBm							1
dBm							
dBm							
/ upin							
0 kHz		3	32001 pts	100.0 MHz/			1.0 GHz
Marker Tab			1				
Type Re M1	f Trc	X-Value 737.0 MHz	Y-Value 4.91 dBm	Function	Fu	nction Result	
M2	î	742.0 MHz	5.18 dBm				
M3	1	996.766 MHz	-40.69 dBm				
	1				Measuring		22.10.2014 15:04:14

Date: 22.0CT.2014 15:04:14

Diagram 6b:

F requency Sweep				≎1Rm Max
dBm				M1[1] -48.96 dBn 734.00000 MH M2[1] -5.64 dBn 737.00000 MH
dBm				
18m		M2	M3	
) dBm				
) dBm				
) dBm				
) dBm	M			
) dBm	M1		M4	Weldering and the second se
(Barnan and a starting an				
) dBm	VI			
26.0 MHz		001 pts	2.8 MHz/	754.0 MH
			•	

Date: 22.0CT.2014 15:03:06



SP SP SP

Appendix 6

Page 11 (24)

Diagram 6c:

 MultiView
 Spectrum

 Ref Level 8.50 dbm
 • RBW 1 MHz

 • Att
 10 dB • SWT 10 s

 • VBW 10 MHz
 Mode Auto Sweep

 • Hrequency Sweep
 • Hrequency Sweep
 V im Max M1[1] -40.73 dBm 7.977140 GHz -10 dBr H1 -13.000 dBm -20 dBr -30 dBr -40 dBr SO dBr -60 dBn -70 dBr 80 dB 90 dB 100 di 1.0 GHz 32001 pts 700.0 MHz/ 8.0 GHz Measuring... 🚺 🗰 🦇 22.10.2014 15:05:06

Date: 22.0CT.2014 15:05:06

vence

Appendix 6

Diagram 7a:

 MultiView
 Spectrum

 Ref Level 50.00 dbm
 • RBW 1 MHz

 * Att
 20 dB • SWT 30 s

 * UDF
 VBW 10 MHz
 V 1 Frequency Sweep n Max M1[1] 4.97 dBm 737.5000 MHz 5.18 dBm 742.5000 MHz M2[1] 30 dBn 10 di M 1 -13.000 dBr 20 dB 30 dBr M3 40 d 50 000 -60 dBm
 9.0 kHz

 2 Marker Table

 Type
 Ref

 M1
 1

 M2
 1

 M3
 1
 32001 pt 100.0 MHz/ 1.0 GHz Y-Value 4.97 dBm 5.18 dBm -40.65 dBm X-Value 737.5 MHz 742.5 MHz 991.485 MHz Function Function Result 1 Measuring... 🚺 22.10.2014 15:21:01

Date: 22.0CT.2014 15:21:01

Diagram 7b:

					A 18m Max M1[1] -49.26 dBr 734.00000 MH
dBm				++	M2[1] -5.67 dBr 737.50000 MH
dBm					737.50000 MH
dBm					
8m		M2	M3		
I dBm-					
H1 -13.0	00 dBm				
I dBm-					
dBm	M1				
i dBm-		<u>ب</u>		M4	
Barran					
dBm					
26.0 MHz	vi	6001 pts	2.8 MHz/		754.0 MH
Aarker Table		6001 pts	2.0 MH2/		734.0 MH

Date: 22.0CT.2014 15:14:31



Appendix 6

Page 13 (24)

Diagram 7c:

Att 10 dB	SWT 10 s VBW	1 MHz 10 MHz Mode Auto Sweep			
TDF					
Frequency Sweep					⊖1Rm Max
					M1[1] -40.77 dBr 7.995300 GH
d8m-					7.993300 GH
LO dBm					
H1 -13.	000 dBm				
0 dBm					
0 060					
30 dBm-					
10 dBm					
		-		the second se	
50 dBm	and the state of t				
60 dBm					
70 dBm					
80 dBm					
ou dbm					
90 dBm					
100 dBm					
110 dBm					
1.0 GHz		32001 pts	700	.0 MHz/	8.0 GH

Date: 22.0CT.2014 15:21:58



Appendix 6

Diagram 8a:

1 Frequency	Sweep						⇒ 1Rm Max
40 dBm						M2[1]	-40.73 dBn 995.4530 MH
∋0 dBm							
20 dBm							
10 dBm					MI		
0 d8m							
-10 dBm	H1 -13.000 dBm						
20 dBm				 			
30 dBm							
40 dBm				 			D
50 dBm							
60 dBm							
			pts	0.0 MHz/			1.0 GHz

Diagram 8b:

Ref Level 8	3.50 dBm 10 dB = SWT 10 s VB	W 1 MHz			
Att	10 dB = SWT 10 s VB	W 10 MHz Mode Auto Sweep			
Frequency	Sweep				⊕ 1Rm Max
				M1	[1] -40.79 dBr 7.969920 GH
d8m					7.969920 00
LO dBm					
	H1 -13.000 dBm				
0 dBm-					
0 dBm-					
0 dBm					
o ubiii		-			
i0 dBm					
0 dBm					
0 dBm					
0 dBm					
0 dBm					
00 dBm					
10 dBm					
.0 GHz		32001 pts	700.0 MHz/		8.0 GH

Date: 22.0CT.2014 14:12:41



Appendix 6

Diagram 9a:

 MultiView
 Spectrum

 Ref Level 50.00 dbm
 # RBW 1 MHz

 * Att
 20 dB = SWT 30 s

 * DFP
 VBW 10 MHz

 I Frequency Sweep
 V Max м1[1] 8.03 dBm 739.5000 MHz -40.69 dBm 998.0160 MHz M2[1] 40 d 30 dB 20 dBr 10 dB 10 d H1 -13.000 dBm to de 30 de 50 d 60 dB an 999.991 MHz CF 500.0045 MH 32001 p 100.0 MHz/ Measuring... 🔳 💷 🗰 22.10.2014 15:33:16 Date: 22.0CT.2014 15:33:16

Diagram 9b:

Att	50 dBm • RB 10 dB • SWT 10 s VB	W 1 MHz W 10 MHz Mode Auto Swe	ep		
TDF					
Frequency	Sweep				M1[1] -40.77 dB
dan					7.979990 Gł
d8m					
0 dBm					
o dom	H1 -13.000 dBm				
0 dBm					
0 dBm-					
10 dBm					
i0 dBm	and the second designed to the second designe				
i0 dBm					
10 dBm					
u dBm					
10 dBm					
0 dBm					
100 dBm					
10 dBm	+	32001 pts		0.0 MHz/	8.0 GH

Date: 22.0CT.2014 15:31:51



Appendix 6

Diagram 10a:

 MultiView
 Spectrum

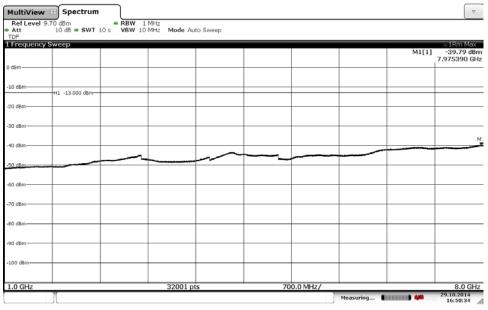
 Ref Level 51.20 dbm
 • RBW 1 MHz

 • Att
 20 dB • SWT 30 s

 • UBW
 10 MHz

 Mode Auto Sweep
 ♥ n Max м1[1] 10.42 dBm 739.5000 MHz -40.79 dBm 988.8600 MHz M2[1] 40 di 30 dB 20 dB M1 H1 -13.000 dBm 20 d 30 d 50-6 60 dB 1.0 GHz 9.0 kHz 32001 100.0 MHz/ 29.10.2014 16:48:43 Measuring... Date: 29.0CT.2014 16:48:43

Diagram 10b:



Date: 29.0CT.2014 16:50:34



Appendix 6

Diagram 11a:

Frequency S	weep						M2[1]	-40.71 dBm
								994.1410 MH
0 dBm					-		M1[1]	4.99 dBn 739.5000 MH
0 dBm-					_			
0 dBm					-			
0 dBm		 			<u> </u>			
					Ř	5		
) d8m					tí			
10 dBm								
	H1 -13.000 dBm							
20 dBm					+			
30 dBm					\square			
40 dBm		 	 					
50 dBm-					_			
\bigcirc								
60 dBm								
		32001		0.0 MHz/				1.0 GHz

Diagram 11b:

Att	.50 dBm • RB 10 dB • SWT 10 s VB	W 10 MHz Mode Auto Sweep		
TDF Frequency	Cureen			⊜1Rm Max
rrequency	Sweep			M1[1] -40.65 dBr 7.982390 GH
d8m				7.982390 GF
10 dBm				
	H1 -13.000 dBm			
0 dBm				
0 dBm-				
0 dBm				
o obiii		-		
i0 dBm-				
0 dBm				
0 dBm				
0 dBm				
0 dBm				
00 dBm				
10 dBm			700.0 MHz/	

Date: 22.0CT.2014 15:39:52



Appendix 6

Diagram 12a:

MultiView 🕀 Spectrum V Ref Level 50. • Att 00 dBm 20 dB • SWT 30 s • RBW 1 MHz VBW 10 MHz Mode Auto Sweep TDF 1 Frequency Sweep 8.14 dBm 742.5000 MHz -40.67 dBm 997.6090 MHz M1[1] M2[1] 40 dB an de H1 -13.000 dBm 10 d 60 d 100.0 MHz/ 1.0 GHz 2.10.2014 15:37:08 32001 pt).0 kH

Date: 22.0CT.2014 15:37:09

Diagram 12b:

Frequency	Sweep					ା Rm Max
					M1[1]	-40.80 dB 7.974950 GH
d8m-						
0 dBm		 		 		
	H1 -13.000 dBm					
dBm						
) dBm						
dBm			-		 	
) dBm		 	~			
) dBm						
dbm						
) dBm						
) dBm						
) dBm	+					
10 dBm		 				

Date: 22.0CT.2014 15:37:48



Appendix 6

Diagram 13a:

~ MultiView 🕀 Spectrum Ref Level 50 Att 00 dBm • RBW 1 MHz 20 dB • SWT 30 s • VBW 10 MHz Mode Auto Sweep Marker 3 997.766 MHz TDF 1 Frequency Sv X M3[1] -40.67 dBm 997.7660 MHz M1[1] 4.87 dBm 736.5000 MHz in de 10 dB M 10 dB 41 -13.000 dBm 20 dB 30 d 10 d 50 000 -60 dBn 9.0 kHz 2 Marker Table Type | Ref | Trc | 32001 pts 100.0 MHz/ 1.0 GHz X-Value 736.5 MHz 741.5 MHz 997.766 MHz Y-Value 4.87 dBm 5.28 dBm -40.67 dBm Function Function Result M1 M2 M3 22.10.2014 14:26:55 Measuring... 🚺 🗰 🚧

Date: 22.0CT.2014 14:26:55

Diagram 13b:

					⊜1Rm Max
				M:	1[1] -47.52 dBr 734.00000 MH
dBm				M	2[1] -6.03 dBr 736.50000 MH
dBm					730.30000 MH
dBm					
18m-		M2	M3		
0 dBm	.000 dBm				
0 dBm	1000 dem				
0 dBm					
0 dBm					
0 dBm				M4	
					-
0 dBm					
0 dBm					
	vi				
26.0 MHz Marker Table		6001 pts	2.8 MHz/		754.0 MH
	c X-Value	Y-Value	Function	Function Re	esult
Type Ref Tr	734.0 MHz	-47.52 dBn			

Date: 22.0CT.2014 14:36:25





Appendix 6

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Diagram 13c:

 MultiView
 Spectrum

 Ref Level 8.50 dbm
 • RBW 1 MHz

 • Att
 10 dB • SWT 10 s

 • VBW 10 MHz
 Mode Auto Sweep

 • Hrequency Sweep
 • Hrequency Sweep
 ♥ m Max -40.74 dBm 7.943240 GHz M1[1] -10 dBr H1 -13.000 dBm -20 dBr -30 dBr -40 dBr SO dBr -60 dBn -70 dBr 80 dB 90 dB 100 di 1.0 GHz 32001 pts 700.0 MHz/ 8.0 GHz Measuring... 🚺 🗰 🦇 22.10.2014 14:38:04

Date: 22.0CT.2014 14:38:04



Appendix 6

Diagram 14a:

MultiView	B Spectrum	"						♥
Ref Level 50 Att TDF	0.00 dBm 20 dB • SW	T 30 s RBW 1 M VBW 10 M	Hz Hz Mode Auto Sweep					
1 Frequency S	Sweep							⇒1Rm Max
							M3[1]	-40.71 dBm
40 dBm								999.4220 MHz
40 GBII							M1[1]	3.20 dBm
30 dBm-								737.0000 MHz
30 0Bm								
20 dBm-								
20 000								
10 dBm-								
						M ²		
0 d8m								
						1 (1		
-10 dBm								
	H1 -13.000 dBm-					+ 11		
-20 dBm								
-30 dBm-								
-40 dBm				-		+ /		M
50 dBm								
0								
-60 dBm								
9.0 kHz	1		32001 pts	100).0 MHz/		1	1.0 GHz
			32001 pts	100	.0 141127			1.0 GHz
2 Marker Tabl Type Ref		X-Value	Y-Value	Funct	tion	E.	Inction Result	
M1	1	737.0 MHz	3.20 dBm	Funct	lon	FU	incuon result	
M2	1	742.0 MHz	5.16 dBm					
M3	1	999.422 MHz	-40.71 dBm					
	T					Measuring		22.10.2014
	1					measuring		14:41:04

Date: 22.0CT.2014 14:41:04

Diagram 14b:

DF Frequency Sweep				⇒ 1Rm Max
l dBm				M3[1] -5.40 dBr 742.00000 MH M1[1] -49.22 dBr 734.00000 MH
dBm				
d8m		M2	M3	
0 dBm	n			
0 dBm				
0 dBm	Ma		M4-	
0 dBm				
0 dBm-	vi		v2	
26.0 MHz	6	001 pts	2.8 MHz/	754.0 MH
Marker Table Type Ref Trc	X-Value	Y-Value	Function	Function Result

Date: 22.0CT.2014 14:46:20



Appendix 6

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Diagram 14c:

 MultiView
 Spectrum

 Ref Level 8.50 dbm
 • RBW 1 MHz

 • Att
 10 dB • SWT 10 s

 • VBW 10 MHz
 Mode Auto Sweep

 • Hrequency Sweep
 • Hrequency Sweep
 ♥ km Max M1[1] -40.82 dBm 7.958990 GHz -10 dBr H1 -13.000 dBm -20 dBr -30 dBr -40 dBr SO dBr -60 dBn -70 dBr 80 dB 90 dB 100 di 1.0 GHz 32001 pts 700.0 MHz/ 8.0 GHz Measuring... 🚺 🗰 🦇 22.10.2014 14:39:49

Date: 22.0CT.2014 14:39:49

727

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Appendix 6

Diagram 15a:

Ref Level 50.0 Att DF	00 dBm								~
DF	20 dB . SW1	• RBW 1 30 s VBW 10	MHz MHz Mode	Auto Sweep					
Frequency Sv	weep								IRm Max
								M3[1]	-40.73 dBr 986.6100 MH
) dBm								M1[1]	4.41 dBr
									737.5000 MH
) dBm						-			
) dBm-									
dBm									
dom							NM2		
18m				_			P		
D dBm	H1 -13.000 dBm-								
	H1 -13.000 dBm								
0 dBm-									
) dBm									
J GBm									
dBm									M3
0 dBm				++					
~									
D dBm									
.0 kHz		· · ·	32001	pts	10	0.0 MHz/	· · · · · · · · · · · · · · · · · · ·		1.0 GHz
Marker Table									
Type Ref	Trc	X-Value 737.5 MHz		Y-Value 4.41 dBm	Fund	tion	FL	Inction Result	
M1 M2	1	742.5 MHz		4.82 dBm					
M3	î	986.61 MHz		-40.73 dBm					
	T.						Measuring		22.10.2014 14:51:33

Date: 22.0CT.2014 14:51:32

Diagram 15b:

30 dBm								101613 10.0	n Max
								734.0000 M2[1] -6.2	20 dBr
0 dBm								737.5000	00 MH
0 dBm									
d8m-				M2	M3				
0 dBm	10.000 /0-		-	+					
0 dBm-	1 -13.000 dBm								
0 dBm									
10 dBm					Ψ				
50 dBm		M1				L	M4		
0.dBrown									
70 dBm			<u> </u>				V2		
206.01411-		vi	6001		L,			75.4	0.1411
			6001	pts		2.8 MHZ/		734.	UMH
726.0 MHz 2 Marker Table Type Ref	Trc	VI I X-Value	6001	pts Y-Value		2.8 MHz/		754 unction Result	ŀ.,

Date: 22.0CT.2014 14:50:10





Appendix 6

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Diagram 15c:

 MultiView
 Spectrum

 Ref Level 8.50 dbm
 • RBW 1 MHz

 • Att
 10 dB • SWT 10 s

 • VBW 10 MHz
 Mode Auto Sweep

 • Trep
 • Hrequency Sweep
 V 1Rm Max M1[1] -40.65 dBm 7.976050 GHz -10 dBr H1 -13.000 dBm -20 dBr -30 dBr -40 dBr SO dB -60 dBn -70 dBr 80 dB 90 dB 100 di 1.0 GHz 32001 pts 700.0 MHz/ 8.0 GHz Measuring... 🔳 💷 🗰 22.10.2014 14:52:20

Date: 22.0CT.2014 14:52:20





Appendix 7

Field strength of spurious radiation measurements according to 47 CFR 27.53 (f)

Date	Temperature	Humidity
2014-10-17	$23 \text{ °C} \pm 3 \text{ °C}$	35 % ± 5 %

Test set-up and procedure

The test sites are listed at FCC, Columbia with registration number: 93866. 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 - 8 GHz.

In the frequency range 30 MHz - 8 GHz the measurement was performed in power with a RBW of 1 MHz. A propagation loss in free space was calculated. The used formula was

 $\gamma = 20 \log \left(\frac{4\pi D}{\lambda}\right)$, γ 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 is measured in eight directions with the antenna at three heights, 1.0 m, 1.5 m and 2.0. For measurements > 1 GHz the test object was measured in seventeen directions with the antenna at 1.0 m in height.
- 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 the standard.



Appendix 7

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



Measurement equipment

Measurement equipment	SP number
Semi anechoic chamber	503 881
R&S ESU 26	901 553
EMC 32 ver. 8.52.0	503 899
Chase Bilog Antenna CBL 6111A	503 182
EMCO Horn Antenna 3115	502 175
High pass filter, RLC Electronics	901 373
µComp Nordic, Low Noise Amplifier	901 545
Testo 625 temperature and humidity meter	504 188



Appendix 7

Tested configurations

B5
M5
M 10
Т5
2M5

Results, representing worst case

M, BW: 5 MHz Diagram 1 a-b

	Spurious emission level (dBm)				
Frequency (MHz)					
30-8000	All emission > 20 dB below limit	All emission > 20 dB below limit			

Measurement uncertainty:

3.2 dB up to 18 GHz

Limits

CFR 47 §27.53 (f)

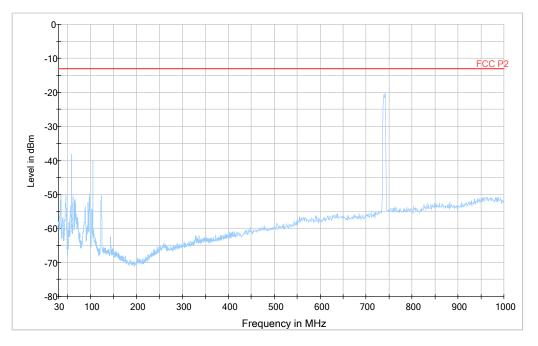
Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P) dB$, resulting in a limit of -13 dBm per 100 kHz RBW.

Complies?	Yes
-----------	-----



Appendix 7





Note: The emission at 739.5 MHz is the carriers frequency and shall be ignored in the context.

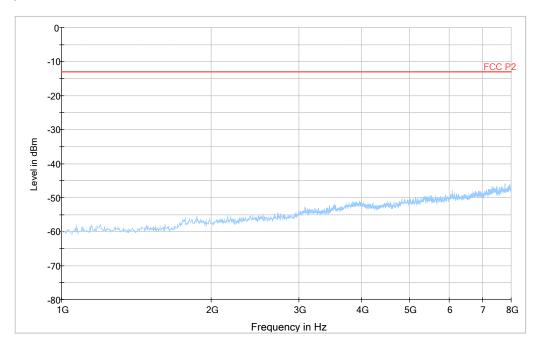


Diagram 1b:





Appendix 8

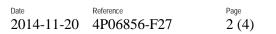
Frequency stability measurements according to CFR 47 § 27.54

Date	Temperature	Humidity
2014-10-22	$23 \ ^{\circ}C \pm 3 \ ^{\circ}C$	$34\% \pm 5\%$

Test set-up and procedure

The measurement was made per 3GPP TS 36.141. The output was connected to a spectrum analyser. The spectrum analyser was connected to an external 10 MHz reference standard during the measurements.

Measurement equipment	SP number
R&S FSQ 40	504 143
RF attenuator	900 233
RF Terminator	-
Temperature Chamber	503 360
Testo 635, temperature and humidity meter	504 203
Multimeter Fluke 87	502 190



Appendix 8

Results

Maximum output power at mid channel (M). Channel Bandwidth 5 MHz. Rated output power level at connector RF A (maximum): 17 dBm.

Configuration: RDI Cable 100m

Test conditions		Frequency error (Hz)
Supply voltage DC (V)	T (°C)	Test model E-TM1.1
-48.0	+20	-17
-55.2	+20	-16
-40.8	+20	-22
-48.0	+30	-22
-48.0	+40	-19
-48.0	+50	-19
-48.0	+10	-17
-48.0	0	-18
-48.0	-10	-14
-48.0	-20	-13
-48.0	-30	-16
Maximum freq. error (Hz)		22
Measurement uncertainty		$< \pm 1 \times 10^{-7}$

Measurements according to 3GPP TS 36.141.



Appendix 8

Results

Maximum output power at mid channel (M). Channel Bandwidth 5 MHz. Rated output power level at connector RF A (maximum): 17 dBm.

Configuration: RDI Cable 20m

Test conditions		Frequency margin to band edge at -16 dBm				
Supply voltage	Temp [°C].	Carrier Bandwidth [MHz]	Test frequency Symbolic name B5		Test freque	ency Symbolic name T5
DC [V]			fL [MHz]	Offset to lower band edge (>2110 MHz) [kHz]	fH [MHz]	Offset to upper band edge (<2155 MHz) [kHz]
-48.0	+20	5	734.207	207	744.789	1211
-48.0	+20	10	734.426	426	744.568	1432

Configuration: RDI Cable 100m

Test conditions		Frequency margin to band edge at -16 dBm				
Supply voltage	Temp [°C].	Carrier Bandwidth [MHz]	Test frequency Symbolic name B5		Test freque	ency Symbolic name T5
DC [V]			fL [MHz]	Offset to lower band edge (>2110 MHz) [kHz]	fH [MHz]	Offset to upper band edge (<2155 MHz) [kHz]
-48.0	+20	5	734.208	208	744.789	1211
-48.0	+20	10	734.428	428	744.567	1433

Measurements according to FCC CFR 47 § 27.54

The frequency error results clearly shows that the frequency stability is good enough to ensure that the transmitted carrier stay within the operating band.





Appendix 8

Remark

It was deemed sufficient to test one combination of TX frequency, channel bandwidth configuration and test model (modulation), as all combinations share a common internal reference to derive the TX frequency from.

Limits

CFR 47 § 27.54 Frequency stability

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

Complies?	Yes
compiles.	105



Appendix 9

External photos Top side

Bottom side



Side

Label

