

Report Reference ID:	296393-2TRFWL	
Test specification:	Title 47 – Telecommunication Chapter I – Federal Communications Commission Subchapter B – Common carrier services Part 27 – Miscellaneous wireless communications services	
Applicant:	TEKO Telecom Srl. Via Meucci, 24/a I-40024 Castel S. Pietro Terme (BO) (Italy)	
Apparatus:	Very High Power Module Amplifier	
Model:	MVHPA0001TDD2G5	
FCC ID:	XM2-VHPA25	

Testing laboratory:

	Name and title	Date	
Tested by:	avioni &	2015-11-12	
	G. Curioni, Wireless/EMC Specialist		
Reviewed by:	Builue P. Barbieri Wireless/EMC Specialist 2015-1		

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Section 1: Report summary

1.1 Test specification		
Specifications	Part 27 – Miscellaneous wireless communications services	

1.2 Statement of compliance			
Compliance	In the configuration tested the EUT was found compliant Yes No This report contains an assessment of apparatus against specifications based upon tests carried out on samples submitted at Nemko Canada Inc. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 27. Radiated tests were conducted in accordance with ANSI C63.4-2003.		

1.3 Exclusion	ons
Exclusions	None

1.4 Registration number

Test site FCC	176392 (3 m Semi anechoic chamber)
ID number	

1.5 Test report revision history		
Revision #	Details of changes made to test report	
TRF Original report issued		
R1TRF		

1.6 Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

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Section 2: Summary of test results

Part Methods		Test description	Verdict
	§ 935210 D05v01 (3.2)	AGC threshold	Pass
	§ 935210 D05v01 (3.3)	Out of band rejection	Pass
§2.1049	§ 935210 D05v01 (3.4)	Occupied bandwidth Pass	
§27.50(h)	§ 935210 D05v01 (3.5)	Peak output power at RF antenna connector	
§27.53(m)	§ 935210 D05v01 (3.6)	Spurious emissions at RF antenna connector, Pas	
§27.53(m)	§ 935210 D05v01 (3.8)	Radiated spurious emissionsPass	
§27.54	§ 935210 D05v01 (3.7)	Frequency stability N//	
Notes:			



Section 3: Equipment under test (EUT) and application details

3.1 Applicant details			
Applicant	Name:	Teko Telecom Srl	
complete	Federal		
business name	Registration	0018963462	
	Number (FRN):		
	Grantee code	XM2	
Mailing address	Address:	Via Meucci, 24/a	
	City:	Castel S. Pietro Terme	
	Province/State:	Bologna	
	Post code:	40024	
	Country:	Italy	

3.2 Modular ed	quipment	
a) Single modular	Single modular approval	
approval	Yes 🗌 No 🖂	
b) Limited single	Limited single modular approval	
modular approval	Yes 🗌 No 🖂	

3.3 Product details		
FCC ID	Grantee code:	XM2
	Product code:	-VHPA25
Equipment class	B2I	
Description of	Booster	
product as it is	Model	MVHPA0001TDD2G5
marketed	name/number:	
	Serial number:	1001420001

3.4 Application	n purpc	ose
Type of	\boxtimes	Original certification
application		Change in identification of presently authorized equipment
		Original FCC ID: Grant date:
		Class II permissive change or modification of presently authorized
		equipment



Section 3: Equipment under test

3.5 Composite/related equipment		
a) Composite equipment	The EUT is a composite device subject to an additional equipment authorization	
equipment	Yes 🗌 No 🖂	
b) Related	The EUT is part of a system that operates with, or is marketed with,	
equipment	another device that requires an equipment authorization	
	Yes 🗌 No 🖂	
c) Related FCC ID	If either of the above is "yes":	
	has been granted under the FCC ID(s) listed below:	
	is in the process of being filled under the FCC ID(s) listed below:	
	is pending with the FCC ID(s) listed below:	
	has a mix of pending and granted statues under the FCC ID(s)	
	listed below:	
	i FCC ID:	
	ii FCC ID:	

3.6 Sample information	
Receipt date:	2015-11-09
Nemko sample ID number:	

3.7 EUT technical specifications		
Operating band:	Down Link – Up Link: 2496–2690 MHz	
Operating frequency:	Wideband	
Modulation type:	LTE-TDD (QAM and QPSK)	
Occupied bandwidth:	LTE: 5 MHz, 10 MHz, 15 MHz, 20 MHz	
Channel spacing:	standard	
Emission designator:	LTE: D7W	
RF Output	Down Link: 43dBm (20W) Up Link: N.A. (The EUT does not transmit over the air in the up-link direction)	
Gain	Down Link: 48dB Up Link: N.A. (The EUT does not transmit over the air in the up-link direction)	
Antenna type:	External Antenna is not provided, equipment that has an external 50 Ω RF connector	
Power source:	28-30 Vdc	



Section 3: Equipment under test

3.8 Accessories and support equipment

The following information identifies accessories used to exercise the EUT during testing:

Item # 1	
Type of equipment:	Power Supply
Brand name:	TDK Lambda
Model name or number:	Z36-24-L-E
Serial number:	LOC-535A218-0001
Nemko sample number:	
Connection port:	To supply amplifier
Cable length and type:	
Item # 2	
Type of equipment:	Power supply
Brand name:	DF
Model name or number:	DF1731SB
Serial number:	na
Nemko sample number:	na
Connection port:	To supply cooling fan of heatsink
Cable length and type:	
Item # 3	
Type of equipment:	
Brand name:	
Model name or number:	
Serial number:	
Nemko sample number:	
Connection port:	
Cable length and type:	
Item # 4	
Type of equipment:	
Brand name:	
Model name or number:	
Serial number:	
Nemko sample number:	
Connection port:	
Cable length and type:	



3.9 Operation	of the EUT during testing
Details:	In down-link direction, normal working at max gain with max RF power output.
3.10 EUT setup	
	High Power Amplifier is the EUT and it is intended for mounting in Remote ce Front-End (optical system with Master Unit that includes only
management module	and optical module, to convert RF signal in optical signal in down link
	sa optical signal in RF signal in up link direction). As described in ion", master unit is connected directly to base station, so the system doesn't
	nt (under another FCC ID) to exercise the EUT. Signal generator is linked
directly to the RF inpu	ut connector
Test setup for outpu	ut power, occupied bandwidth, spurious emissions:
Signal	
	modulated EUT Spectrum Analyzer
Procedure	
	odulated generator to the input of the EUT, so that the EUT works at the
0	nput level to the EUT until reach the maximum output power. Connect the other the RF output connector of the EUT.



Section 4: Engineering considerations

Modifications Modification	
	ons performed to the EUT during this assessment Yes , performed by Client or Nemko Details:

4.2 Deviations	from laboratory tests procedures
Deviations	Deviations from laboratory test procedures
	None 🖂 Yes 🗌 - details are listed below:

4.3 Technical	judgment
Judgment	None



Section 5: Test conditions

5.1 Deviations from laboratory tests procedures

No deviations were made from laboratory test procedures.

5.2 Test condit	tions, power source and ambient temperatures
Normal temperature, humidity and air pressure test conditions	Temperature: 15–30 °C Relative humidity: 20–75 % Air pressure: 86–106 kPa
	When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.
Power supply range:	The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ± 5 %, for which the equipment was designed.



Section 5: Test conditions, continued

5.3 Measurement uncertainty

Nemko S.p.A. measurement uncertainty has been calculated using the standard CISPR 16-4-2 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modeling – Uncertainty in EMC measurements". All calculations can be found in Nemko S.p.A. document WML1002.

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next cal.
Vector Signal Generator	Agilent	N5172B EXG	MY53051238	Jan 2018
/ector Signal Generator	Agilent	E4438C ESG	MY45094485	Ago 2016
Spectrum Analyzer	Agilent	N9030A PXA	MY53120882	Jun 2016
Network Analyzer	Agilent	E5071C ENA	MY46106183	Jun 2016
/-network	R&S	ESH2-Z5	872 460/041	11/2016
rilog Broad Band Intenna 25-2000 MHz	Schwarzbeck	VULB 9168	VULB 9168-242	06/2018
Frilog Broad Band Antenna 25-8000 MHz	Schwarzbeck	VULB 9162	VULB 9162-25	07/2018
Antenna 1-18 GHz	Schwarzbeck	STLP 9148	STPL 9148-123	06/2018
Double ridge vaveguide horn	RFspin	DRH40	061106A40	08/2016
Preamplifier 18-40 GHz	Miteq	JS44	1648665	11/2015
roadband preamplifier -18 GHz	Schwarzbeck	BBV 9718	9718-137	10/2016
MI receiver 20 Hz ÷ 8 Hz	R&S	ESU8	100202	04/2016
EMI receiver 20 Hz ÷ 3 GHz	R&S	ESCI	100888	09/2016
Hydraulic revolving Platform	Nemko	RTPL 01	4.233	NCR
Turning-table	R&S	HCT	835 803/03	NCR
Antenna mast	R&S	НСМ	836 529/05	NCR
Controller	R&S	HCC	836 620/7	NCR
Spectrum Analyzer kHz ÷ 40GHz	R&S	FSEK	848255/005	11/2016
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530	09/2016
Shielded room	Siemens	10m control room	1947	NCR
emi-anechoic hamber	Nemko	10m semi-anechoic chamber	70	NCR
bielded Room	Siemens	3m semi-anechoic chamber	3	NCR
Motor controller	Emco	1051-25	9012-1559	NCR
lotor controller	Emco	1061-1.521	9012-1508	NCR
Antenna Tower	Emco	2071-2	9601-1940	NCR
Controller pole/table	Emco	2090	9511-1099	NCR

Note: N/A = Not Applicable, NCR = No Cal Required, COU = CAL On Use (*) Equipment supplied by manufacturer's



Appendix A: Test results

Clause 935210 D05v01 (3.2) AGC threshold

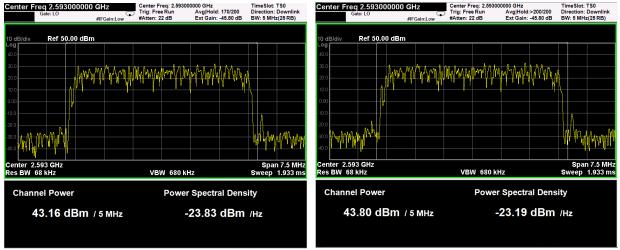
Measure of EUT AGC Threshold

Test date: 2015-11-09 Test results: Pass

Special notes

- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)

Test data



AWGN signal, nominal input signal

AWGN signal, nominal input signal +1 dB



Clause 935210 D05v01 (3.3) Out of band rejection

Out of Band Rejection – Test for rejection of out of band signals.

Test date: 2015-11-09 Test results: Pass Special notes

Test data

_

Marker 3 2.706400	000000 GHz PNO: Fast C IFGain:Low	Trig: Free Run Atten: 16 dB	NAvg Type: Log-Pwr Avg[Hold:>100/100	TRACE 123456 Type WHWWWWW DET PPNNNN
Ref Offset 4 10 dB/div Ref 50.00			М	kr3 2.706 4 GHz 22.347 dBm
40.0		<u>لاًا</u>		
30.0	2		3	
20.0				
0.00				
-10.0	الكر كم معمد ويسر	Mal provide production	Harspipin Ummer	
200 MAANMAN	internation and the second		Participation in the second	ili sedi dinakan dalah
-40.0				
Center 2.5930 GHz Res BW 3.0 MHz	#VB	W 8.0 MHz	Sweep /	Span 700.0 MHz 1.000 ms (1001 pts)
MKR MODE TRC SCL	X	Y	FUNCTION FUNCTION WIDTH	FUNCTION VALUE
1 N 1 f 2 N 2 f 3 N 2 f 4	2.520 9 GHz 2.482 5 GHz 2.706 4 GHz	42,418 dBm 22,855 dBm 22,347 dBm		
. 6				



Clause 2.1049 Occupied bandwidth

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

Test date: 2015-11-09

Test results: Pass

Special notes

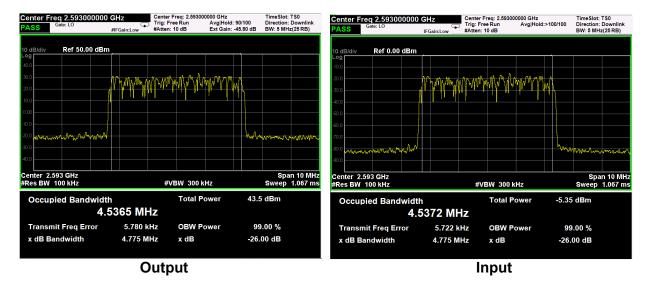
- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)



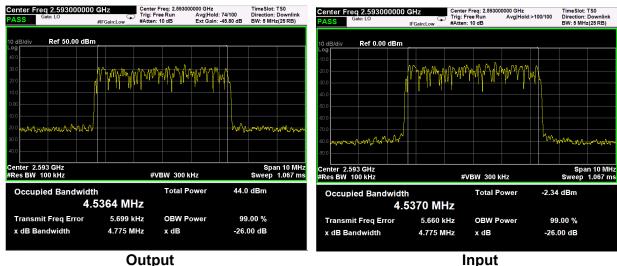
Clause 2.1049 Occupied bandwidth, continued

Test data

AWGN signal, nominal input signal



AWGN signal, nominal input signal + 3dB





Clause 27.50(h) Peak output power at RF antenna connector

§ 27.50(h) The following power limits shall apply in the BRS and EBS:

(1) Main, booster and base stations.

(i) The maximum EIRP of a main, booster or base station shall not exceed 33 dBW + $10\log(X/Y)$ dBW, where X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition, except as provided in paragraph (h)(1)(ii) of this section.

(ii) If a main or booster station sectorizes or otherwise uses one or more transmitting antennas with a non-omnidirectional horizontal plane radiation pattern, the maximum EIRP in dBW in a given direction shall be determined by the following formula: EIRP = 33 dBW + 10 log(X/Y) dBW + 10 log (360/beamwidth) dBW, where X is the actual channel width in MHz, Y is either (i) 6 MHz if prior to transition or the station is in the MBS following transition or (ii) 5.5 MHz if the station is in the LBS and UBS following transition, and beamwidth is the total horizontal plane beamwidth of the individual transmitting antenna for the station or any sector measured at the half-power points.

Test date: 2015-11-09

Test results: Pass

Special notes

- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)

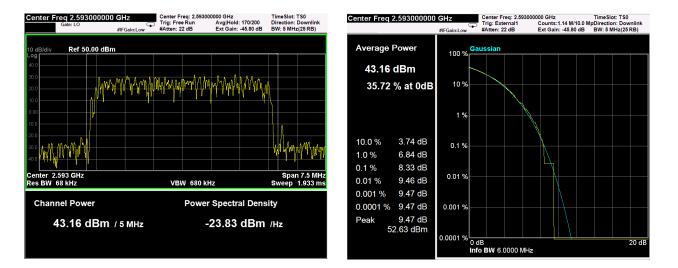


Clause 27.50(h) Peak output power at RF antenna connector

Test data

AWGN signal, nominal input signal

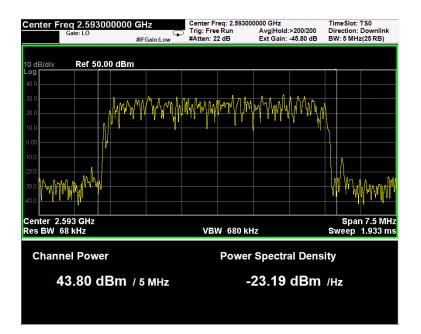
Test data						
Direction	Modulation	Frequency (MHz)	RF output Power (dBm)	RF output channel Power (W)	RF output Power (W/MHz)	PAR (dB)
Down-link	AWGN (LTE, 5MHz)	2593.0	43.16	20.70	4.14	9.47



PAR measure is performed by the "CCDF" function installed on Spectrum analyzer that provides average power (the same measured with "Channel power" function), peak power and PAR.

AWGN signal, nominal input signal + 3dB

Test data					
Direction	Modulation	Frequency (MHz)	RF output Power (dBm)	RF output channel Power (W)	RF output Power (W/MHz)
Down-link	AWGN (LTE, 5MHz)	2355.0	43,80	24,00	4,8



Clause 27.53(m) Spurious emissions at RF antenna connector, continued

(m) For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts in accordance with the standards below. If a licensee has multiple contiguous channels, out-of-band emissions shall be measured from the upper and lower edges of the contiguous channels.

(2) For digital base stations, the attenuation shall be not less than 43 + 10 log (P) dB, unless a documented interference complaint is received from an adjacent channel licensee with an overlapping Geographic Service Area. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS No. 1 on the same terms and conditions as adjacent channel BRS or EBS licensees. Provided that a documented interference complaint cannot be mutually resolved between the parties prior to the applicable deadline, then the following additional attenuation requirements shall apply:

(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed; for mobile digital stations, in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified: or 1 megahertz or 2 percent for mobile digital stations, except in the band 2495-2496 MHz). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

Test date: 2015-11-09 Test results: Pass

Special notes

- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)



Clause 27.53 (m) Spurious emissions at RF antenna connector, continued

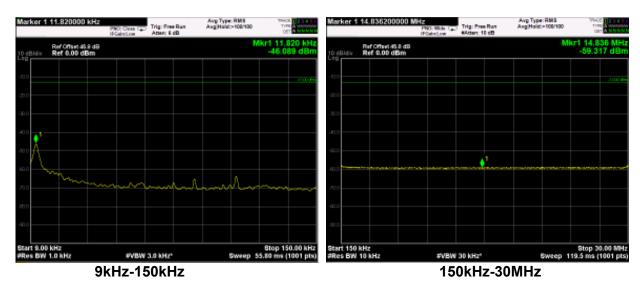
Test data			
See Plots below			
Spurious emissions me	asurement results:		
Frequency (MHz)	Spurious emission (dBm)	Limit (dBm)	Margin (dB)
Low channel			
First channel	Negligible	-13	
Mid channel			
2593 MHz	Negligible	-13	
High channel			
Last channel	Negligible	-13	

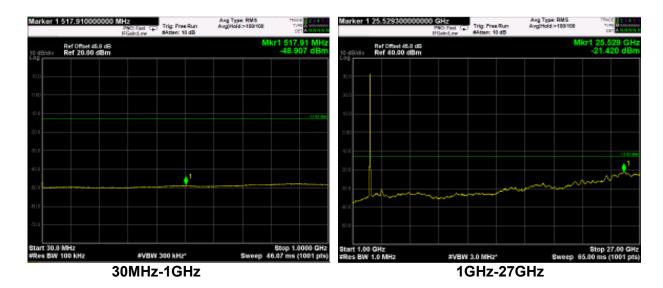


Test data, continued: spurious emissions at antenna terminal

AWGN signal

(Plots are referred to modulated carrier at the Middle Channel)

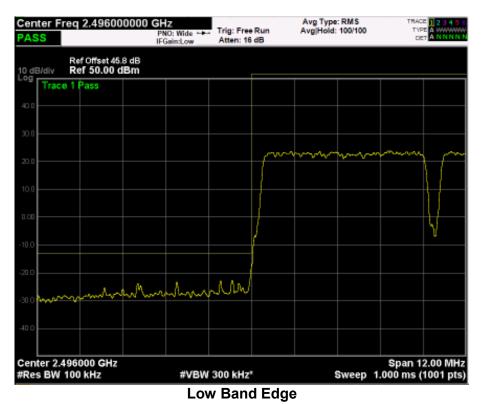






Test data, continued: band edges Inter modulation

AWGN signal, nominal input signal



Avg Type: RMS Avg|Hold: 100/100 Center Freq 2.496000000 GHz TRACE Trig: Free Run Atten: 16 dB TYP PNO: Wide ++-IFGain:Low PASS Ref Offset 45.8 dB Ref 50.00 dBm 10 dB/div Trace 1 Pass manhout LA Center 2.496000 GHz #Res BW 100 kHz Span 12.00 MHz Sweep 1.000 ms (1001 pts) #VBW 300 kHz* Low Band Edge

AWGN signal, nominal input signal + 3dB



High Band Edge



Clause 27.53(m) Radiated Spurious emissions

(m) For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts in accordance with the standards below. If a licensee has multiple contiguous channels, out-of-band emissions shall be measured from the upper and lower edges of the contiguous channels.

(2) For digital base stations, the attenuation shall be not less than 43 + 10 log (P) dB, unless a documented interference complaint is received from an adjacent channel licensee with an overlapping Geographic Service Area. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS No. 1 on the same terms and conditions as adjacent channel BRS or EBS licensees. Provided that a documented interference complaint cannot be mutually resolved between the parties prior to the applicable deadline, then the following additional attenuation requirements shall apply:

(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed; for mobile digital stations, in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified; or 1 megahertz or 2 percent for mobile digital stations, except in the band 2495-2496 MHz). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

Test date: 2015-11-09/10 Test results: Pass

Special notes



Clause 27.53(m) Radiated spurious emissions, continued

Test data

The D.U.T. was positioned according to the radiated emissions set-up

The D.U.T. antenna connector was terminated by a 50 Ω shielded dummy load.

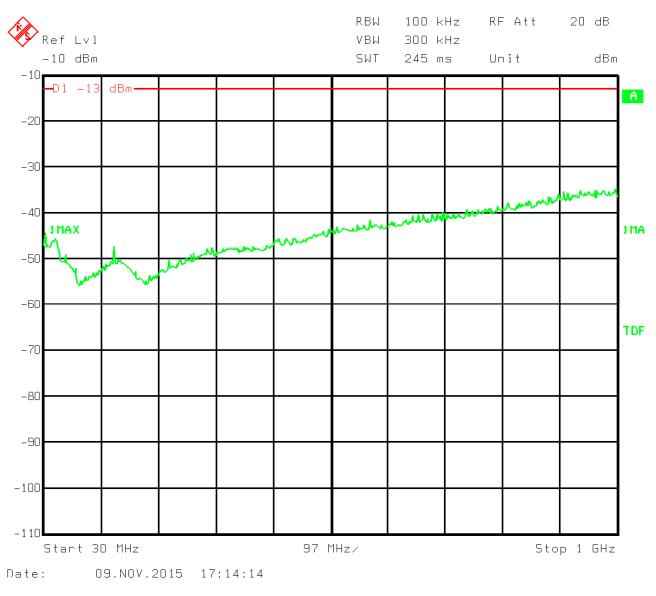
The spectrum was searched from 30 MHz to 1 GHz (RBW 100 kHz) & 1 GHz (RBW 1 MHz) to the tenth harmonic of the carrier.

There were no emissions detected above the noise floor which was at least 20 dB below the specification limit.

Spurious emissions measurement results:

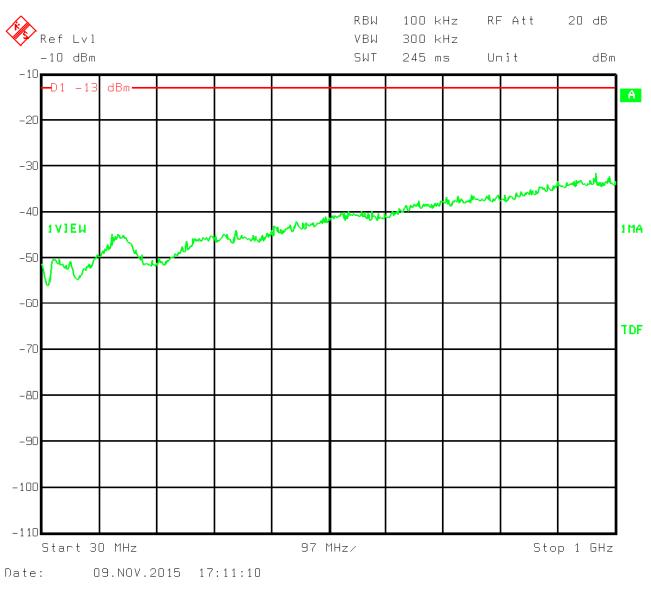
Spurious errission	is measurement rest	JII.5.		
Frequency (MHz)	Polarization. V/H	Field strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Low channel	V/11			
Mid channel		ſ	1	1
High channel				
Note: Field strengt where applicable.	th includes correction	n factor of antenna,	cable loss, amplifier	, and attenuators





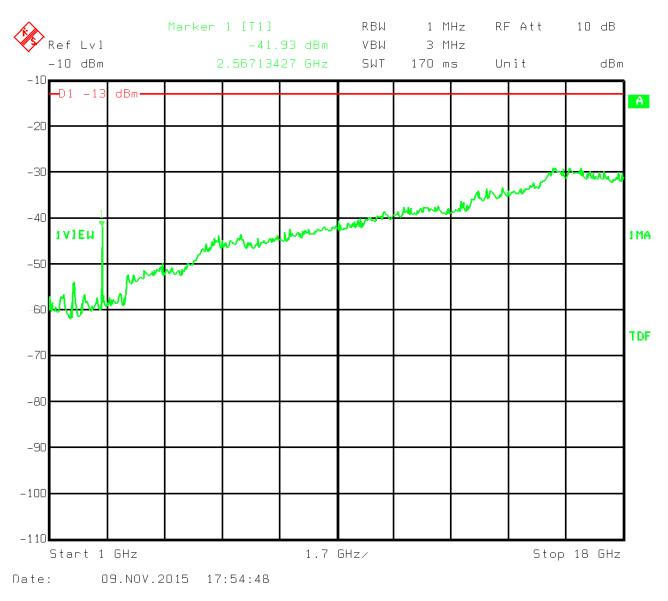
30MHz-1GHz – H Pol





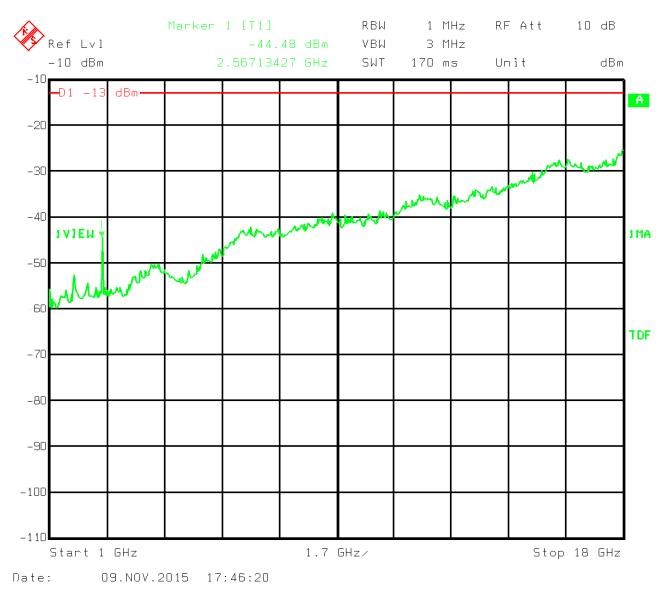
30MHz-1GHz – V Pol





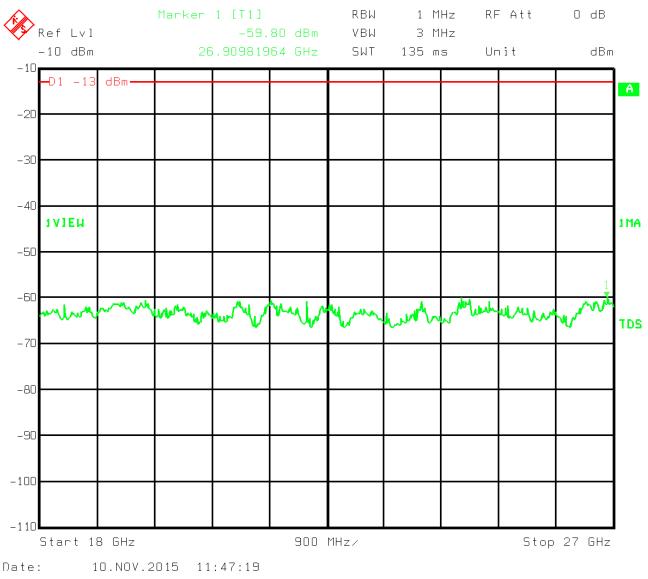
1GHz-18GHz – H Pol





1GHz-18GHz – V Pol

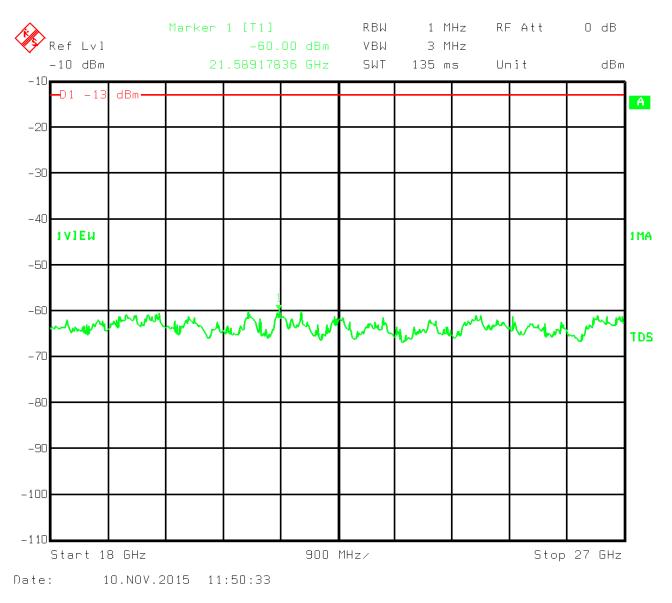




18GHz-27GHz – H Pol



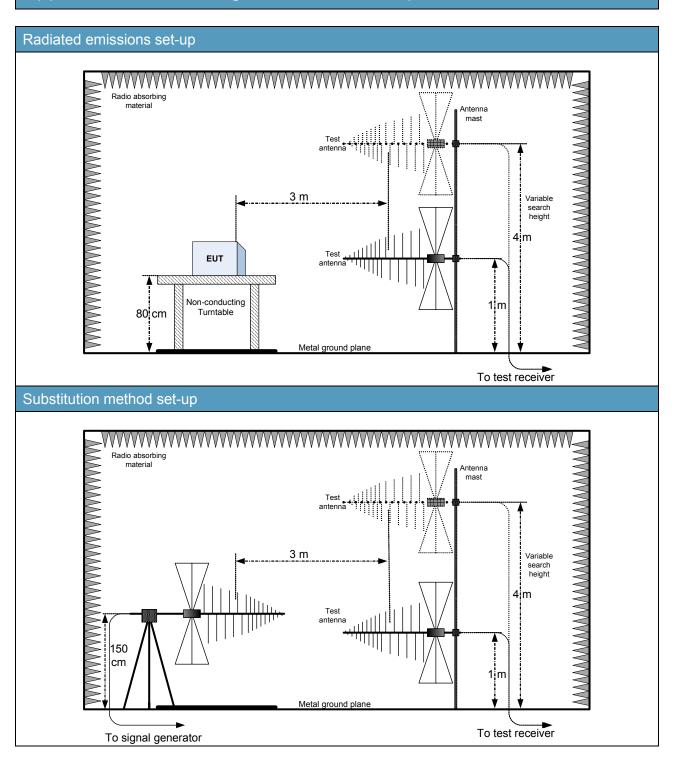




18GHz-27GHz – V Pol



Appendix B: Block diagrams of test set-ups





Appendix C: EUT Photos

Photo Set up





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Photo EUT







