

Report Reference ID:	332502-6TRFWL	
Test specification:	Title 47 – Telecommunication Chapter I – Federal Communications Commission Subchapter A – General Part 24 – Personal Communication Services Subpart E – Broadband PCS	
Applicant:	TEKO Telecom Srl. Via Meucci, 24/a I-40024 Castel S. Pietro Terme (BO) (Italy)	
Apparatus:	Medium Power Remote Unit	
Model:	TRM7E8AE19HAWX23AT	
FCC ID:	XM2-MP6B	

Testing laboratory:	Nemko Italy Spa Via del Carroccio, 4 20853 Biassono (MB) – Italy Telephone: +39 039 2201201 Facsimile: +39 039 2201221
---------------------	--

	Name and title	Date	
Tested by:	Christie &	06/29/2017	
	G. Curioni, Wireless/EMC Specialist	00,20,2011	
Reviewed by:	Buchun Part	06/29/2017	
	P. Barbieri, Wireless/EMC Specialist	00,20,20,11	

#### Nemko Spa, 20853 Biassono (MB) - Italy. All rights reserved.

This publication may be reproduced in whole for non-commercial purposes as long as Nemko Spa is acknowledged as copyright owner and source of the material. Nemko Spa takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context. Nemko Spa accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This test report may not be partially reproduced, except with the prior written permission of Nemko Spa. The test report merely corresponds to the test sample. The phase of sampling / collection of equipment under test is carried out by the customer.

This Test Report, when bearing the Nemko name and logo is only valid when issued by a Nemko laboratory, or by a laboratory having special agreement with Nemko.



# Table of contents

Section 1: 1.1	: Report summary	
	•	
1.2	Statement of compliance	
1.3	Exclusions	
1.4	Registration number	
1.5	Test report revision history	
1.6	Limits of responsibility	4
<b>Section 2</b> : 2.1	<b>Summary of test results</b>	
<b>Section 3</b> : 3.1	Equipment under test (EUT) and application details6 Applicant details	
3.2	Modular equipment	6
3.3	Product details	6
3.4	Application purpose	6
3.5	Composite/related equipment	7
3.6	Sample information	7
3.7	EUT technical specifications	7
3.8	Accessories and support equipment	8
3.9	Operation of the EUT during testing	g
3.10	EUT setup diagram	9
Section 4: 4.1	Engineering considerations	
4.2	Deviations from laboratory tests procedures	10
4.3	Technical judgment	10
<b>Section 5</b> : 5.1	Test conditions	11
5.2	Test conditions, power source and ambient temperatures	11
5.3	Measurement uncertainty	12
5.4	Test equipment	12
Appendix Clause 93	A: Test results	13
Clause 93	5210 D05v01 (3.3) Out of band rejection	14
Clause 24	.238(b) Occupied bandwidth	15
	.232(a) Peak output power at RF antenna connector	
Clause 24	.238(a) Spurious emissions at RF antenna connector	23
1		



Clause 24.238(a) Radiated Spurious emissions	31
Appendix B: Block diagrams of test set-ups	
Appendix C: EUT Photos	



# Section 1: Report summary

1.1 Test sp	ecification
Specifications	Part 24 Subpart E, Broadband PCS

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 24. 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.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. Nemko Spa authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

Nemko Spa accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.



# Section 2: Summary of test results

Part	Methods	Test description	Verdict	
	§ 935210 D05v01r01 (3.2)	AGC threshold	Pass	
	§ 935210 D05v01r01 (3.3)	Out of band rejection	Pass	
§24.238(b)	§ 935210 D05v01r01 (3.4)	Occupied bandwidth	Pass	
§24.232(a)	§ 935210 D05v01r01 (3.5)	Peak output power at RF antenna connector	Pass	
§24.238(a)	§ 935210 D05v01r01 (3.6)	Spurious emissions at RF antenna connector	Pass	
§24.238(a)	§ 935210 D05v01r01 (3.8)	Radiated spurious emissions	Pass	
§24.235	§ 935210 D05v01r01 (3.7)	Frequency stability	N/A a)	
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 equipment		
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:	-MP6B
Equipment class	B2I	
Description of	Booster	
product as it is marketed	Model name/number:	TRM7E8AE19HAWX23AT
	Serial number:	1007061001

3.4 Application	purpo	se
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	The EUT is a composite device subject to an additional equipment	
equipment	authorization	
	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:	06/26/2017	
Nemko sample ID number:		

3.7 EUT technical specifications		
Operating band:	Down Link 1930-1995 MHz; Up Link 1850-1915 MHz	
Operating frequency:	Wideband	
Modulation type:	GSM, EDGE, CDMA, WCDMA, LTE (QAM and QPSK)	
Occupied	GSM and EDGE: 200 kHz;	
bandwidth:	CDMA: 1,25 MHz,	
	WCDMA: 5 MHz	
	LTE: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz	
Channel spacing:	standard	
Emission	GSM and EDGE: GXW;	
designator:	CDMA, WCDMA: F9W,	
	LTE: D7W	
RF Output	Down Link: 33dBm (2W)	
	Up Link: N.A. (The EUT does not transmit over the air in the up-link	
	direction)	
Gain	Down Link: 38dB	
	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 $\Omega$ RF connector	
Power source:	100-240 Vac	



### 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:	Master Unit - Subrack
Brand name:	Teko Telecom srl
Model name or number:	SUB-TRX-PSU
Serial number:	101083001
Nemko sample number:	
Connection port:	
Cable length and type:	
Item # 2	
Type of equipment:	Master Unit – Management Module
Brand name:	Teko Telecom srl
Model name or number:	TSPV-R
Serial number:	110942253
Nemko sample number:	
Connection port:	LAN port
Cable length and type:	
Item # 3	
Type of equipment:	Master Unit – Optical Module
Brand name:	Teko Telecom srl
Model name or number:	TTRU4W-S-M
Serial number:	110679007
Nemko sample number:	
Connection port:	DL/UL RF connector (to connect to the base station)
	Optical port (to connect to remote unit)
Cable length and type:	
Item # 4	
Type of equipment:	Master Unit – Power Supply
Brand name:	Teko Telecom srl
Model name or number:	TPSU/AC
Serial number:	081063004
Nemko sample number:	
Connection port:	
Cable length and type:	





3.9 Operatior	of the EUT during testing
Details:	In down-link direction, normal working at max gain with max RF power output.
optical module (to o signal in RF signal connected directly t FCC ID) to exercise module in the Maste	note Unit is the EUT. Master Unit includes only management module and convert RF signal in optical signal in down link direction and viceversa optical in up link direction). As described in "Operational description", master unit is o base station, so the system doesn't use another equipment (under another e the EUT. Signal generator is linked directly to the RF connector of optical
	al modulated enerator EUT Spectrum Analyzer
max gain. Raise the	modulated generator to the input of the EUT, so that the EUT works at the einput level to the EUT until reach the maximum output power. Connect the to the RF output connector of the EUT.



# Section 4: Engineering considerations

4.1 Modifications incorporated in the EUT		
Modifications	Modifications performed to the EUT during this assessment None 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 $\pm 5$ %, 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.
ector Signal enerator	Agilent	N5172B EXG	MY53051238	Jan 2018
ector Signal enerator	Agilent	E4438C ESG	MY45094485	Ago 2019
Spectrum Analyzer	Agilent	N9030A PXA	MY53120882	Nov 2017
letwork Analyzer	Agilent	E5071C ENA	MY46106183	Ago 2017
-network	R&S	ESH2-Z5	872 460/041	10/2017
ilog Broad Band ntenna 25-2000 MHz	Schwarzbeck	VULB 9168	VULB 9168-242	06/2018
rilog Broad Band ntenna 25-8000 MHz	Schwarzbeck	VULB 9162	VULB 9162-25	07/2018
Antenna 1-18 GHz	Schwarzbeck	STLP 9148	STPL 9148-123	06/2018
Antenna horn	A.H.System Inc.	SAS-574	061106A40	10/2017
reamplifier 18-40 GHz	Miteq	JS44	1648665	12/2017
roadband preamplifier 18 GHz	Schwarzbeck	BBV 9718	9718-137	12/2017
MI receiver 20 Hz ÷ 8 Hz	R&S	ESU8	100202	04/2018
MI receiver 20 Hz ÷ 3 Hz	R&S	ESCI	100888	08/2017
lydraulic revolving latform	Nemko	RTPL 01	4.233	NCR
urning-table	R&S	HCT	835 803/03	NCR
ntenna mast	R&S	НСМ	836 529/05	NCR
ontroller	R&S	HCC	836 620/7	NCR
pectrum Analyzer <hz 40ghz<="" td="" ÷=""><td>R&amp;S</td><td>FSEK</td><td>848255/005</td><td>01/2018</td></hz>	R&S	FSEK	848255/005	01/2018
emi-anechoic hamber	Nemko	10m semi-anechoic chamber	530	10/2018
Shielded room	Siemens	10m control room	1947	NCR
emi-anechoic namber	Nemko	10m semi-anechoic chamber	70	NCR
hielded Room	Siemens	3m semi-anechoic chamber	3	NCR
Notor controller	Emco	1051-25	9012-1559	NCR
lotor controller	Emco	1061-1.521	9012-1508	NCR
ntenna 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

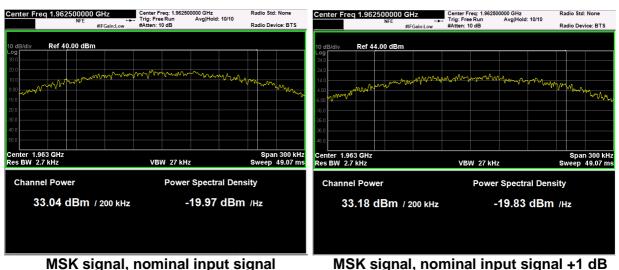
### Test date: 06/27/2017

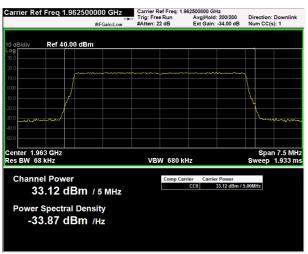
Test results: Pass

#### **Special notes**

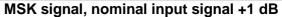
- Narrowband amplifiers: MSK test signal used (GSM-TDMA signal)
- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel) \_

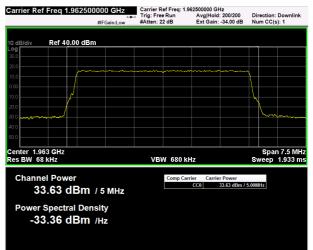
#### Test data





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: 06/27/2017 Test results: Pass Special notes

#### Test data

\_

Marker 3 2.0350000	00000 GHz NFE PNO: Fast G IFGain:Low	☐ Trig: Free Run Atten: 16 dB	Avg Type: Log-Pwr Avg Hold:>100/100	TRACE <b>1 2 3 4 5</b> 6 TYPE WMWWWW DET <mark>P P N N N N</mark>
Ref Offset 34 10 dB/div Ref 40.00			Mkr3	2.035 0 GHz 13.199 dBm
<b>Log</b> 30.0				
20.0	2		3	
0.00	↓ ¥			
-10.0				
-20.0		Nudlling abhit, us din		
-40.0		MANUTAN TURA MANUNA MANUTAN		
				Snon 200 0 Mills
Center 1.9750 GHz #Res BW 1.0 MHz	#VBV	V 3.0 MHz		Span 300.0 MHz )0 ms (1001 pts)
MKR MODE TRC SCL 1 N 1 f 2 N 2 f 3 N 2 f 4	× 1.962 7 GHz 1.924 3 GHz 2.035 0 GHz	Y FL 32.904 dBm 12.263 dBm 13.199 dBm	UNCTION FUNCTION WIDTH	FUNCTION VALUE
5				-



## Clause 24.238(b) 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: 06/27/2017

Test results: Pass

Special notes

- Narrowband amplifiers: MSK test signal used (GSM-TDMA signal)
- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)

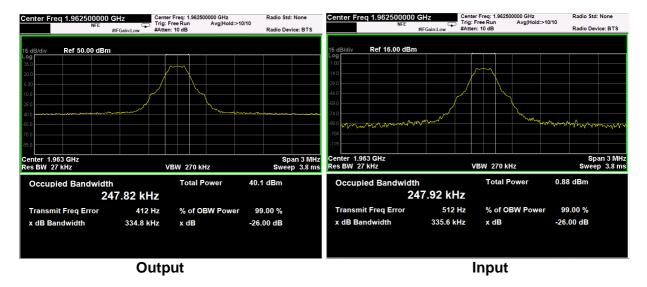


#### Clause 24.238(b) Occupied bandwidth, continued

#### Test data

Nèmko

#### MSK signal, nominal input signal



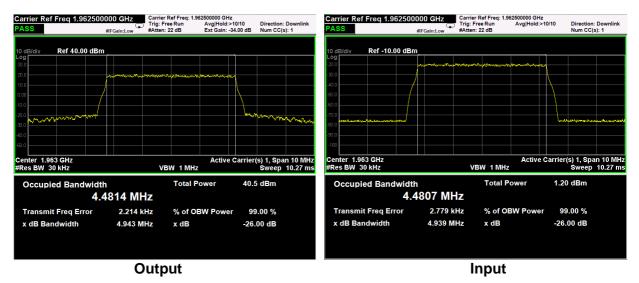
#### MSK signal, nominal input signal + 3dB



Output

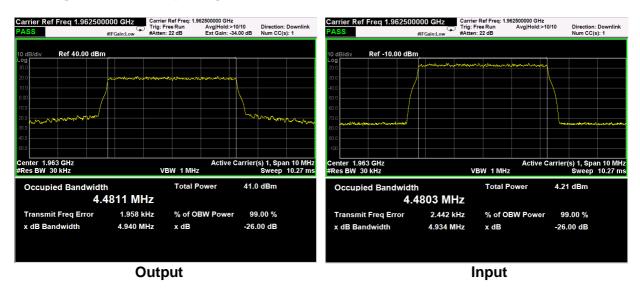


### AWGN signal, nominal input signal



Appendix B: Block diagrams

#### AWGN signal, nominal input signal + 3dB





### Clause 24.232(a) Peak output power at RF antenna connector

(a) (1) Base stations with an emission bandwidth of 1 MHz or less are limited to 1640 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

(a) (2) Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

(d) Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

Test date: 06/27/2017 Test results: Pass

#### Special notes

- Narrowband amplifiers: MSK test signal used (GSM-TDMA signal)
- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)

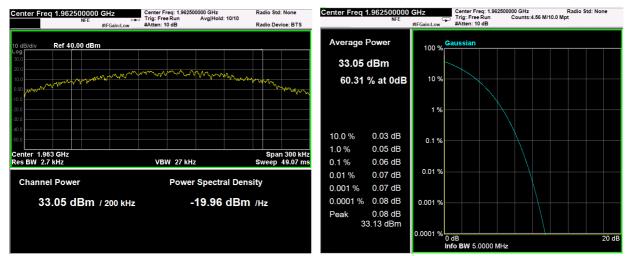


#### Clause 24.232(a) Peak output power at RF antenna connector

#### Test data

#### MSK signal, nominal input signal

Test data					
Direction	Modulation	Frequency (MHz)	RF output Power (dBm)	RF output channel Power (W)	PAR (dB)
Down-link	MSK (GSM, 200kHz)	1962.5	33.05	2,02	0,08

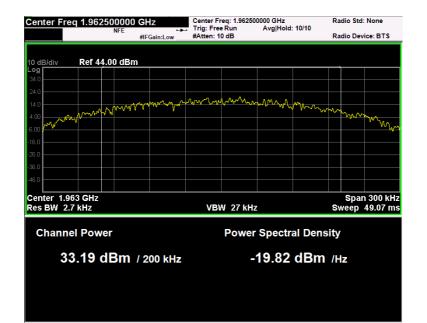


PAR measure is performed by the "CCDF" function installed on Spectrum analyzer that provides average power (the same measured with "Channel power" function), peak power and PAR.



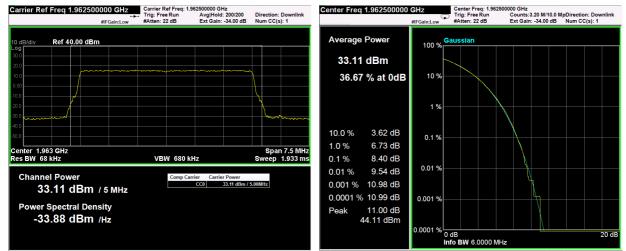
#### MSK signal, nominal input signal + 3dB

Test data				
Direction	Modulation	Frequency (MHz)	RF output Power (dBm)	RF output channel Power (W)
Down-link	MSK (GSM, 200kHz)	1962.5	33.19	2.08



#### 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)	1962.5	33.11	2.05	0.41	11.00



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)	1962.5	33.62	2.30	0.46

arrier Re	ef Freq 1.	.96250		🕂 Trig: Free	Run	62500000 G Avg Hold	: 200/200			Downlink
			#IFGain:Low	#Atten: 22	dB	Ext Gain:	-34.00 dB	Nu	ım CC(s	): 1
) dB/div	Ref 40	.00 dB	m							
og 0.0										
0.0										
0.0		·			~~~~~			7		
.00										
10		/						X		
0.0								\ \	<u> </u>	
0.0	man								ham	
0.0										
enter 1.9								-		17.5 MF
es BW 6	8 KHZ			VBW	/ 680 ki	IZ		S	weep	1.933 n
Chann	el Pow				Comp Car		er Power			
					Comp Car		33.62 dBm /	5.00N	IHz	
3	3.62 c	IВm	/ 5 MHz							
Deurer	Create		oitr							
	Spectr		-							
-3	3.37 c	IBm	/Hz							
_										



## Clause 24.238(a) Spurious emissions at RF antenna connector

a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 Log (P) dB.

Test date: 06/27/2017

Test results: Pass

Special notes

- Narrowband amplifiers: MSK test signal used (GSM-TDMA signal)
- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)



### Clause 24.238(a) Spurious emissions at RF antenna connector, continued

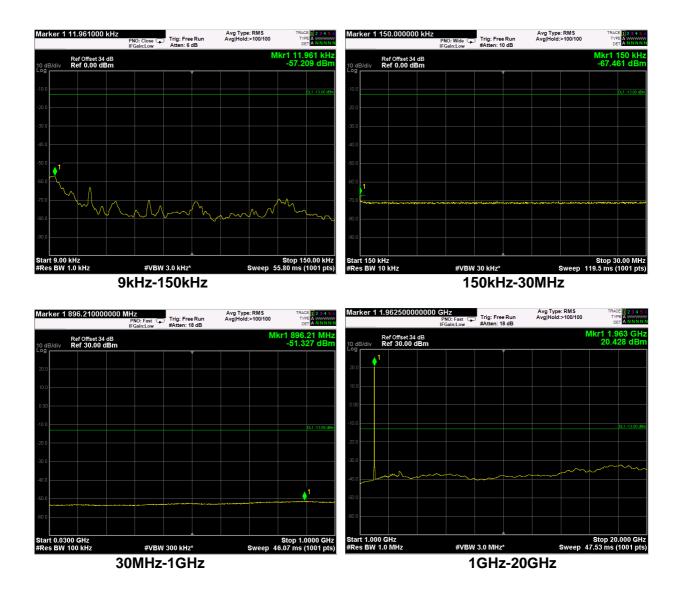
Test data			
See Plots below			
Spurious emissions me	easurement results:		
Frequency (MHz)	Spurious emission (dBm)	Limit (dBm)	Margin (dB)
Low channel			
First channel	Negligible	-13	
Mid channel			
1962,5 MHz	Negligible	-13	
High channel			
Last channel	Negligible	-13	



Test data: spurious emissions at antenna terminal

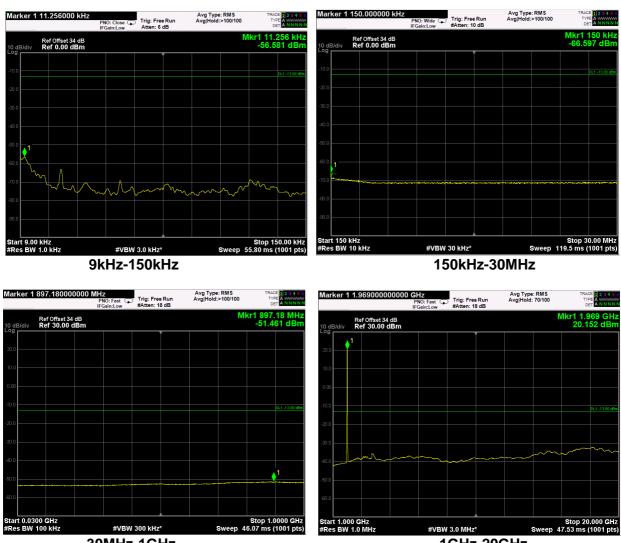
#### **MSK** signal

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



#### **AWGN** signal

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



30MHz-1GHz

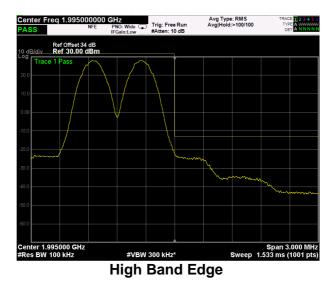
1GHz-20GHz

Test data, continued: band edges Inter modulation

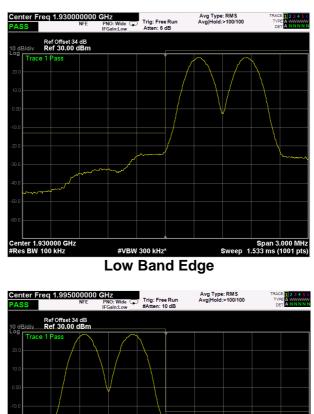
#### MSK signal, nominal input signal



Low Band Edge







### MSK signal, nominal input signal + 3dB

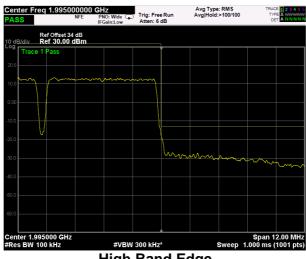


**High Band Edge** 



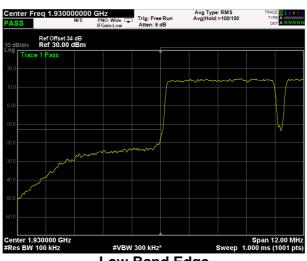
### AWGN signal, nominal input signal





High Band Edge





### AWGN signal, nominal input signal + 3dB



Center Freq 1.995	NFE P	NO: Wide 🕞 Gain:Low	Trig: Fre Atten: 6		Avg Type Avg Hold	e: RMS :>100/100	TRAC TYF DE	E 1 2 3 4 5 E A WWW
Ref Offset 10 dB/div Ref 30.0	34 dB 0 dBm							
og Trace 1 Pass				Ť				
20.0			m					
10.0								
0.00								
10.0				1				
20.0				hormon	nm	mm	-Ann	
30.0								~~~~
40.0								
50.0								
60.0								
Center 1.995000 GI #Res BW 100 kHz	Hz	#VBW	300 kH:	z*		Sweep 1	Span 1 .000 ms (	2.00 Mi 1001 pt
		liah	Bar	nd Eo	due			

High Band Edge



## Clause 24.238(a) Radiated Spurious emissions

a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 Log (P) dB.

Test date: 06/26/2017 Test results: Pass

Special notes

Report reference 332502-6TRFWL



#### Clause 24.238(a) 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  $\Omega$  shielded dummy load.

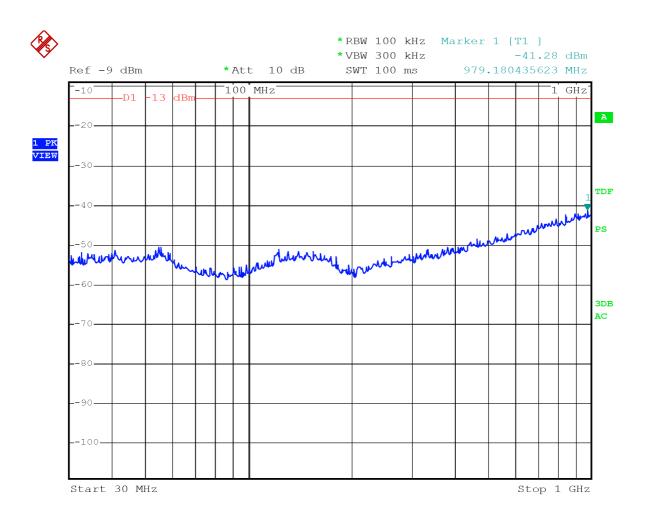
The spectrum was searched from 30 MHz to 1 GHz (RBW 100 kHz) & 1 GHz (RBW 1 MHz) to the tenth harmonic of the carrier.

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

Spurious emissions measurement results:

Frequency (MHz)	Polarization. V/H	Field strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Low channel				
Mid channel				
Lligh sharped				
High channel				
Note: Field streng where applicable.	th includes correction	n factor of antenna,	cable loss, amplifier	, and attenuators

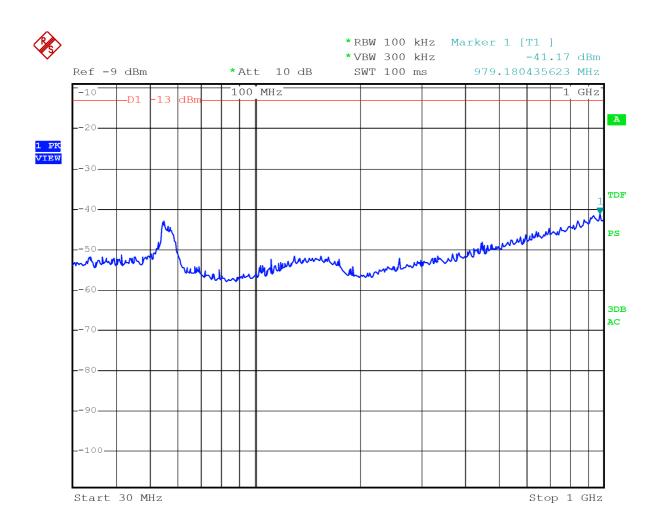




Date: 26.JUN.2017 15:56:52

#### 30MHz-1GHz – H Pol





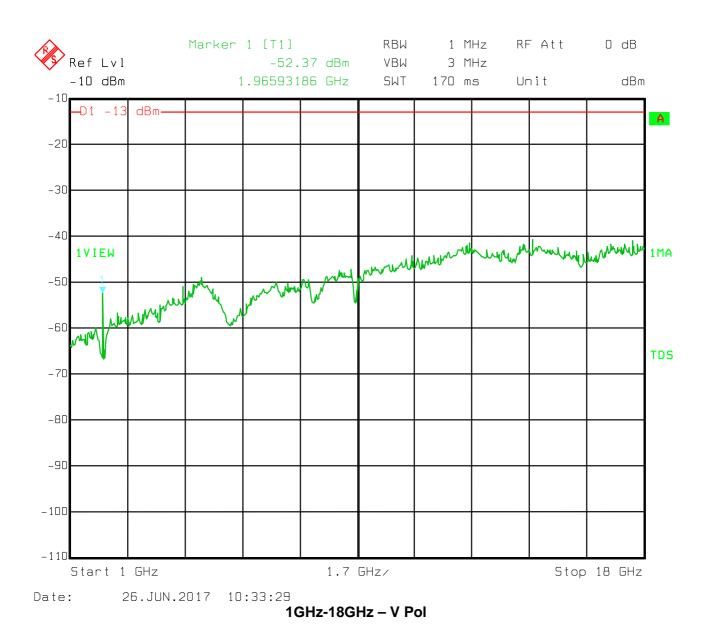
Date: 26.JUN.2017 15:55:32

#### 30MHz-1GHz - V Pol

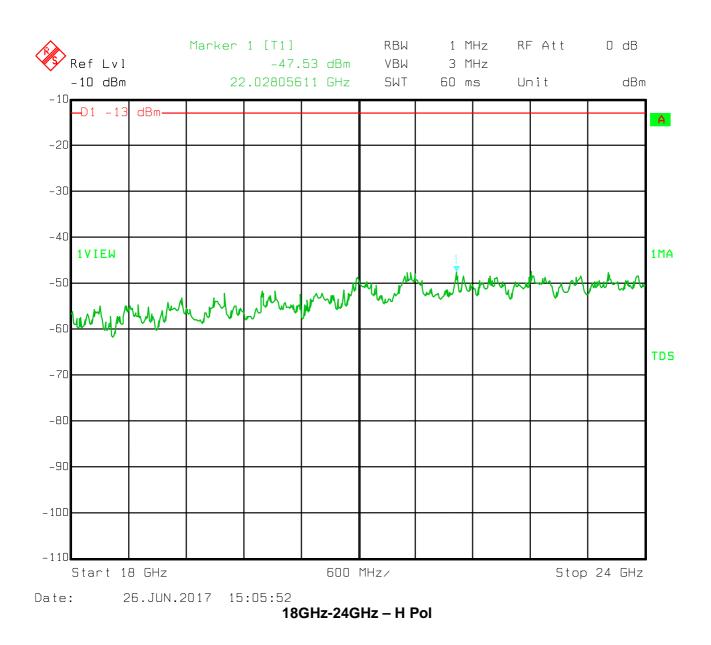




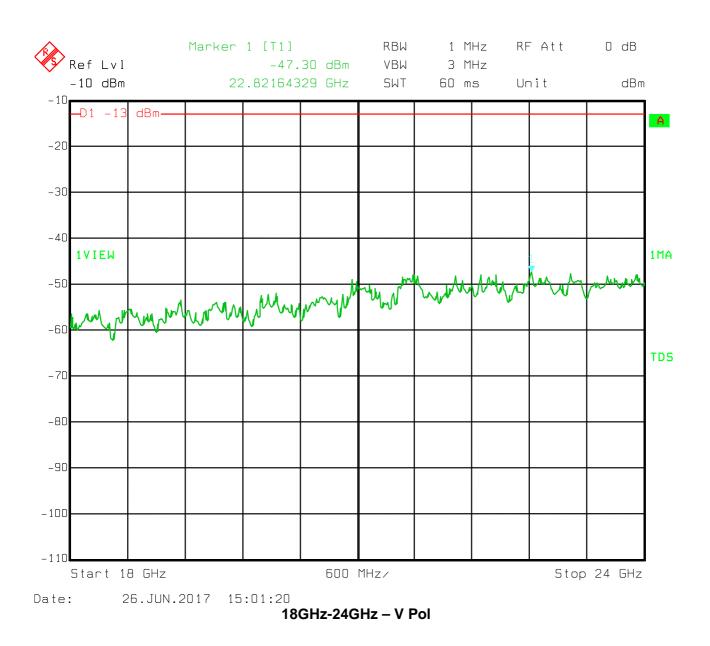






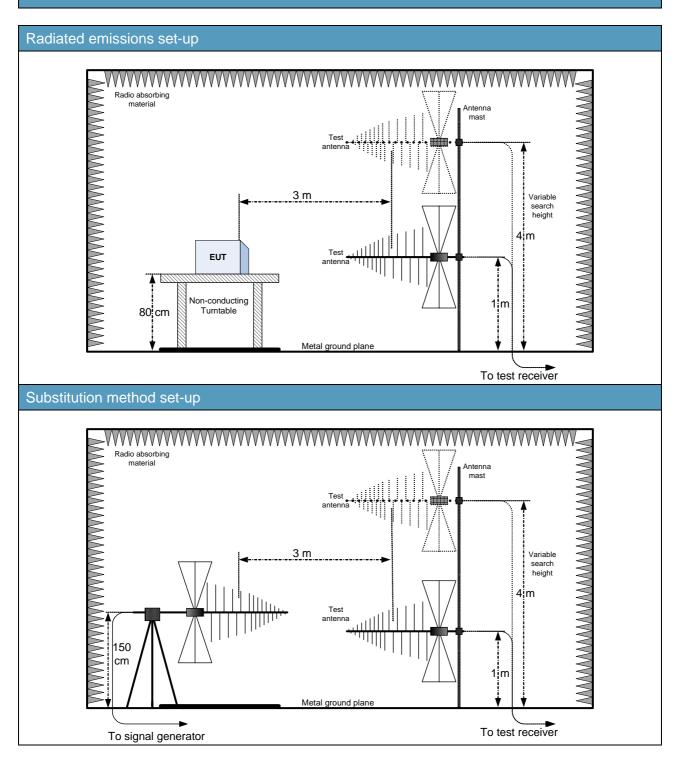








# Appendix B: Block diagrams of test set-ups





# Appendix C: EUT Photos

#### Photo Set up











Photo EUT









