

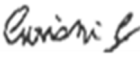
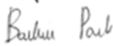


Report Reference ID:	333994-4TRFWL
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Test specification:	Title 47 – Telecommunication Chapter I – Federal Communications Commission Subchapter B – Common carrier services Part 101 – Fixed Microwave Services
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Applicant:	TEKO Telecom Srl. Via Meucci, 24/a I-40024 Castel S. Pietro Terme (BO) (Italy)
Apparatus:	Enhanced Power Remote Unit
Model:	TRU7FL8P9PPWE/AC-WT
FCC ID:	XM2-EP7FL8P9PP

Testing laboratory:	Nemko Italy Spa Via del Carroccio, 4 20853 Biassono (MB) – Italy Telephone: +39 039 2201201 Facsimile: +39 039 2201221
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	Name and title	Date
Tested by:	 G. Curioni, Wireless/EMC Specialist	06/29/2017
Reviewed by:	 P. Barbieri, Wireless/EMC Specialist	06/29/2017

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Section 1: Report summary

1.1 Test specification

Specifications	Part 101 – Fixed Microwave Services
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1.2 Statement of compliance

Compliance	<p>In the configuration tested the EUT was found compliant Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> <p>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.</p>
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1.3 Exclusions

Exclusions	None
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1.4 Registration number

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

2.1 FCC Part 27, test results			
Part	Methods	Test description	Verdict
	§ 935210 D05v01r01 (3.2)	AGC threshold	Pass
	§ 935210 D05v01r01 (3.3)	Out of band rejection	Pass
	§ 935210 D05v01r01 (3.4)	Occupied bandwidth	Pass
§101.113	§ 935210 D05v01r01 (3.5)	Peak output power at RF antenna connector	Pass
§101.111	§ 935210 D05v01r01 (3.6)	Spurious emissions at RF antenna connector	Pass
§101.111	§ 935210 D05v01r01 (3.8)	Radiated spurious emissions	Pass
§101.107	§ 935210 D05v01r01 (3.7)	Frequency stability	N/A a)
<p>Notes:</p> <p style="padding-left: 40px;">a) NOT APPLICABLE: Modulation/frequency conversion circuitry not in use. No frequency change in EUT (input and output have same frequency)</p>			

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

3.1 Applicant details

Applicant complete business name	Name:	Teko Telecom Srl
	Federal Registration Number (FRN):	0018963462
	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 approval	Single modular approval Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
b) Limited single modular approval	Limited single modular approval Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>

3.3 Product details

FCC ID	Grantee code:	XM2
	Product code:	-EP7FL8P9PP
Equipment class	BOS	
Description of product as it is marketed	Booster	
	Model name/number:	TRU7FL8P9PPWE/AC-WT
	Serial number:	1007068001

3.4 Application purpose

Type of application	<input checked="" type="checkbox"/> Original certification <input type="checkbox"/> Change in identification of presently authorized equipment Original FCC ID: _____ Grant date: _____ <input type="checkbox"/> Class II permissive change or modification of presently authorized equipment
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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 Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
b) Related equipment	The EUT is part of a system that operates with, or is marketed with, another device that requires an equipment authorization Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
c) Related FCC ID	If either of the above is "yes": <input type="checkbox"/> has been granted under the FCC ID(s) listed below: <input type="checkbox"/> is in the process of being filled under the FCC ID(s) listed below: <input type="checkbox"/> is pending with the FCC ID(s) listed below: <input type="checkbox"/> has a mix of pending and granted statuses 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: 928-929 MHz
Operating frequency:	Narrowband
Modulation type:	P25, FM
Occupied bandwidth:	Standard
Channel spacing:	standard
Emission designator:	F1E, F1D, F3E
RF Output	Down Link: 31dBm (1,25W) Up Link: N.A. (The EUT does not transmit over the air in the up-link direction)
Gain	Down Link: 36dB 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:	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 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 diagram
<p>In this system, Remote Unit is the EUT. Master Unit includes only management module and optical module (to convert RF signal in optical signal in down link direction and viceversa optical signal in RF signal in up link direction). As described in “Operational description”, master unit is connected directly to base station, so the system doesn’t use another equipment (under another FCC ID) to exercise the EUT. Signal generator is linked directly to the RF connector of optical module in the Master Unit.</p> <p>Test setup for output power, occupied bandwidth, spurious emissions:</p> <div style="text-align: center;">  <pre> graph LR A[Signal modulated Generator] --> B[EUT] B --> C[Spectrum Analyzer] </pre> </div> <p>Procedure Connect the signal modulated generator to the input of the EUT, so that the EUT works at the max gain. Raise the input level to the EUT until reach the maximum output power. Connect the spectrum analyzer to the RF output connector of the EUT.</p>

Section 4: Engineering considerations

4.1 Modifications incorporated in the EUT

Modifications	Modifications performed to the EUT during this assessment None <input checked="" type="checkbox"/> Yes <input type="checkbox"/> , performed by Client <input type="checkbox"/> or Nemko <input type="checkbox"/> Details:
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4.2 Deviations from laboratory tests procedures

Deviations	Deviations from laboratory test procedures None <input checked="" type="checkbox"/> Yes <input type="checkbox"/> - details are listed below:
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4.3 Technical judgment

Judgment	None
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Section 5: Test conditions

5.1 Deviations from laboratory tests procedures

No deviations were made from laboratory test procedures.

5.2 Test conditions, power source and ambient temperatures

<p>Normal temperature, humidity and air pressure test conditions</p>	<p>Temperature: 15–30 °C Relative humidity: 20–75 % Air pressure: 86–106 kPa</p> <p>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.</p>
<p>Power supply range:</p>	<p>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.</p>

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.

5.4 Test equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next cal.
Vector Signal Generator	Agilent	N5172B EXG	MY53051238	Jan 2018
Vector Signal Generator	Agilent	E4438C ESG	MY45094485	Ago 2019
Spectrum Analyzer	Agilent	N9030A PXA	MY53120882	Nov 2017
Network Analyzer	Agilent	E5071C ENA	MY46106183	Ago 2017
V-network	R & S	ESH2-Z5	872 460/041	10/2017
Trilog Broad Band Antenna 25-2000 MHz	Schwarzbeck	VULB 9168	VULB 9168-242	06/2018
Trilog 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
Antenna horn	A.H.System Inc.	SAS-574	061106A40	10/2017
Preamplifier 18-40 GHz	Miteq	JS44	1648665	12/2017
Broadband preamplifier 1-18 GHz	Schwarzbeck	BBV 9718	9718-137	12/2017
EMI receiver 20 Hz ÷ 8 GHz	R&S	ESU8	100202	04/2018
EMI receiver 20 Hz ÷ 3 GHz	R&S	ESCI	100888	08/2017
Hydraulic revolving platform	Nemko	RTPL 01	4.233	NCR
Turning-table	R&S	HCT	835 803/03	NCR
Antenna mast	R&S	HCM	836 529/05	NCR
Controller	R&S	HCC	836 620/7	NCR
Spectrum Analyzer 9kHz ÷ 40GHz	R&S	FSEK	848255/005	01/2018
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530	10/2018
Shielded room	Siemens	10m control room	1947	NCR
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	70	NCR
Shielded Room	Siemens	3m semi-anechoic chamber	3	NCR
Motor controller	Emco	1051-25	9012-1559	NCR
Motor 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

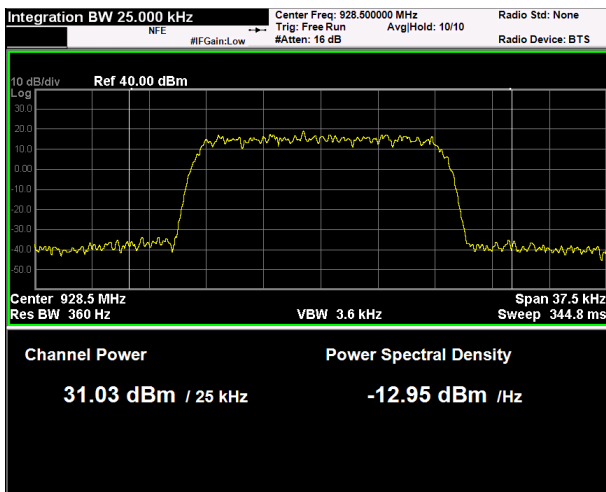
Clause 935210 D05v01r01 (3.2) AGC threshold

Measure of EUT AGC Threshold

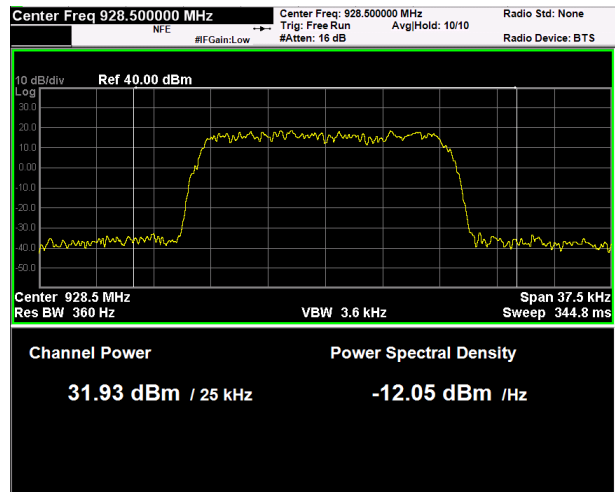
Test date: 06/28/2017
 Test results: Pass

—

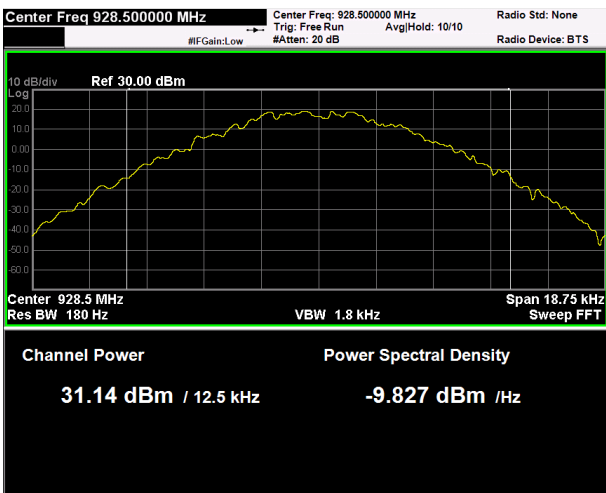
Test data



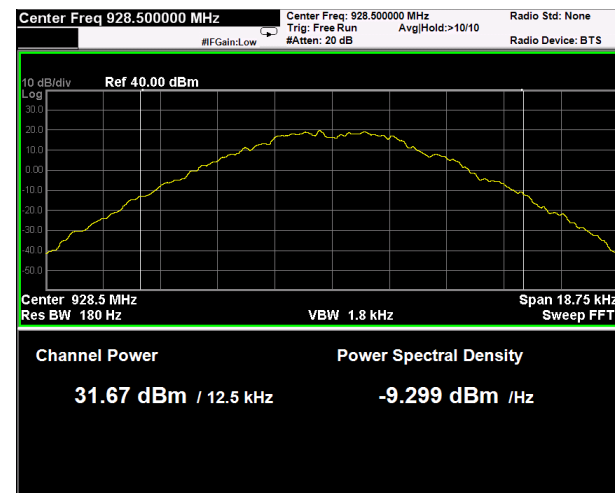
16k signal, nominal input signal



16k signal, nominal input signal +1 dB



P25 signal, nominal input signal



P25 signal, nominal input signal +1 dB

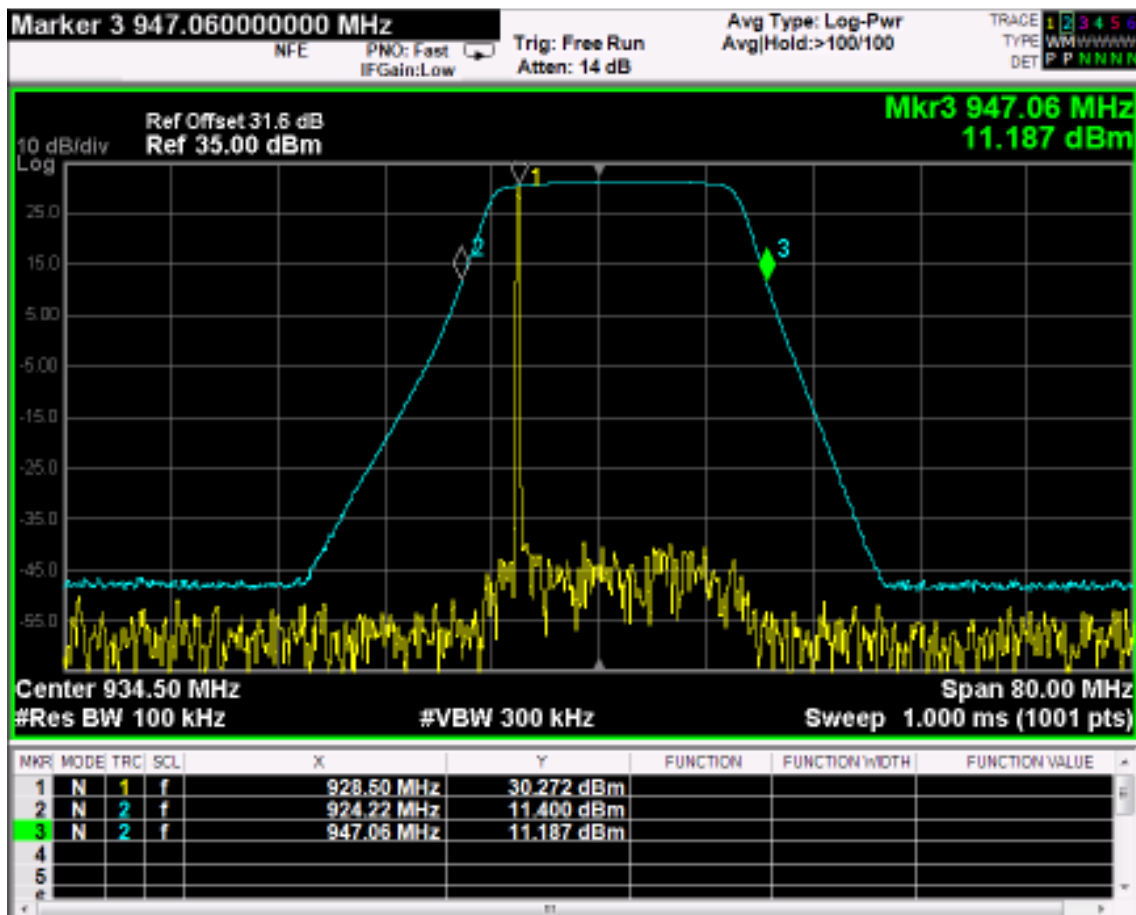
Clause 935210 D05v01r01 (3.3) Out of band rejection

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

Test date: [06/28/2017](#)
 Test results: [Pass](#)

Special notes
 –

Test data



Clause 935210 D05v01r01 (3.4) Occupied bandwidth

A 26 dB bandwidth measurement shall be performed on the input signal and the output signal; alternatively, the 99% OBW can be measured and used.

Test date: [06/28/2017](#)

Test results: [Pass](#)

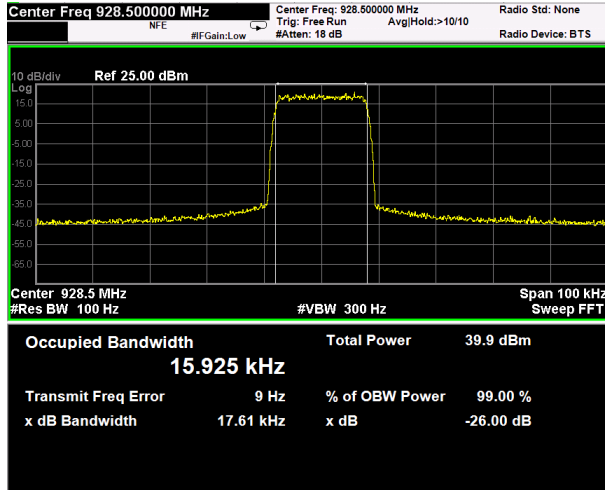
Special notes

-

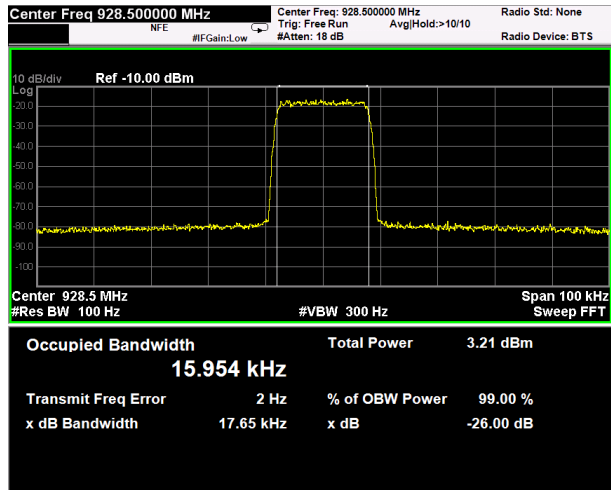
Clause 935210 D05v01r01 (3.4) Occupied bandwidth, continued

Test data

16k signal, nominal input signal

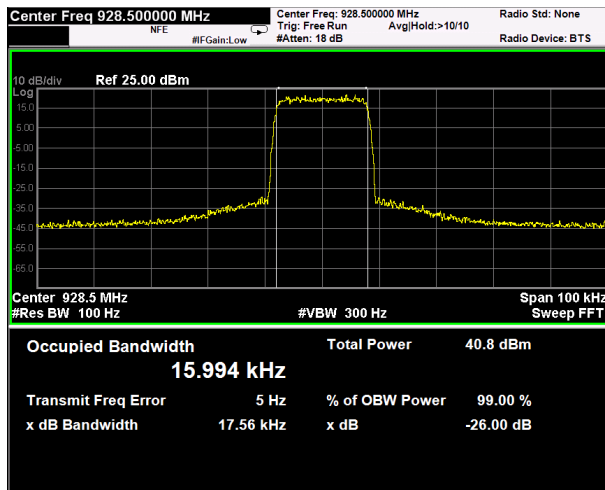


Output

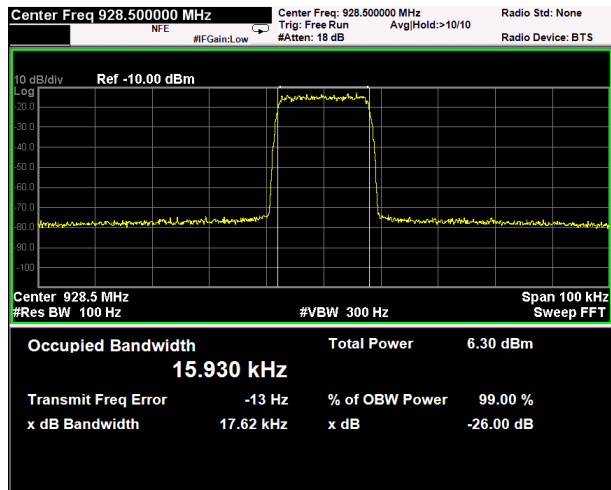


Input

16k signal, nominal input signal + 3dB

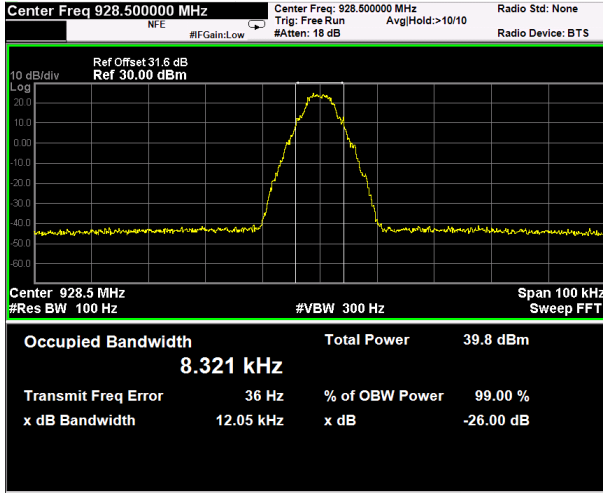


Output

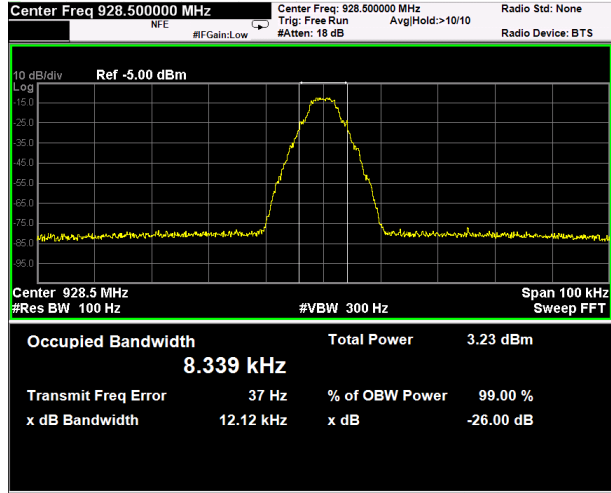


Input

P25 signal, nominal input signal

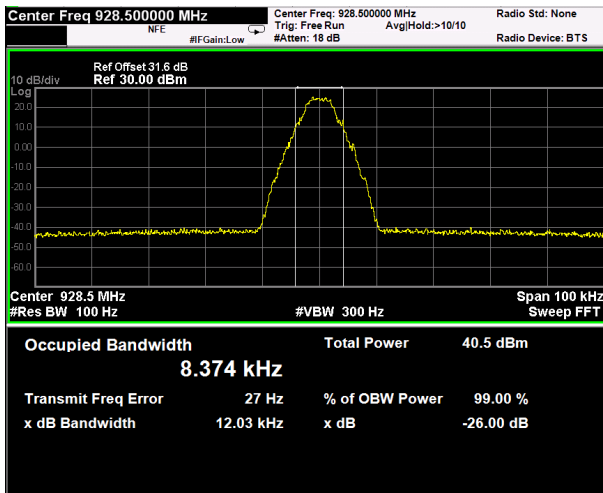


Output

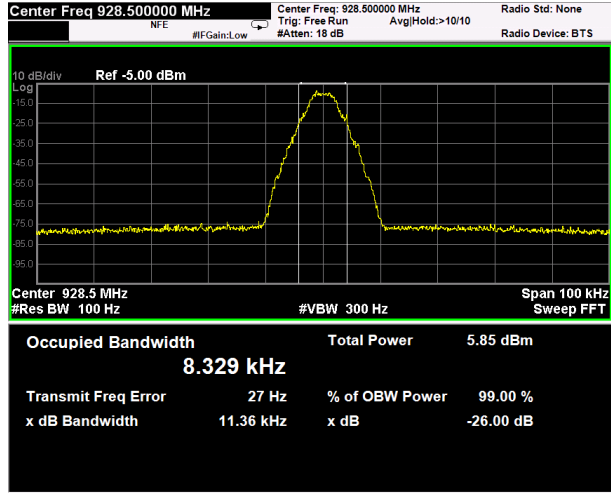


Input

P25 signal, nominal input signal + 3dB



Output



Input

Clause 101.113 Peak output power at RF antenna connector

§ 101.113 Transmitter power limitations.

(a) On any authorized frequency, the average power delivered to an antenna in this service must be the minimum amount of power necessary to carry out the communications desired. Application of this principle includes, but is not to be limited to, requiring a licensee who replaces one or more of its antennas with larger antennas to reduce its antenna input power by an amount appropriate to compensate for the increased primary lobe gain of the replacement antenna(s). In no event shall the average equivalent isotropically radiated power (EIRP), as referenced to an isotropic radiator, exceed the values specified below. In cases of harmful interference, the Commission may, after notice and opportunity for hearing, order a change in the effective radiated power of this station. Further, the output power of a transmitter on any authorized frequency in this service may not exceed the following table.

Test date: [06/26/2017](#)

Test results: [Pass](#)

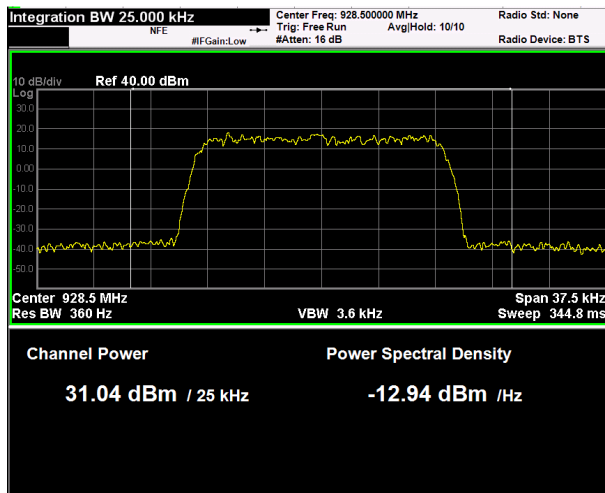
Special notes

Clause 101.113 Peak output power at RF antenna connector

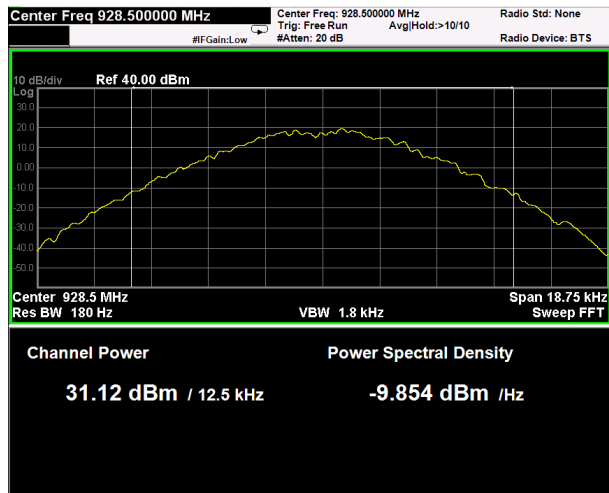
Test data

Nominal input signal

Test data				
Direction	Modulation	Frequency (MHz)	RF output Power (dBm)	RF output channel Power (W)
Down-link	16k	928.5	31.04	1.27
Down-link	P25	928.5	31.12	1.29



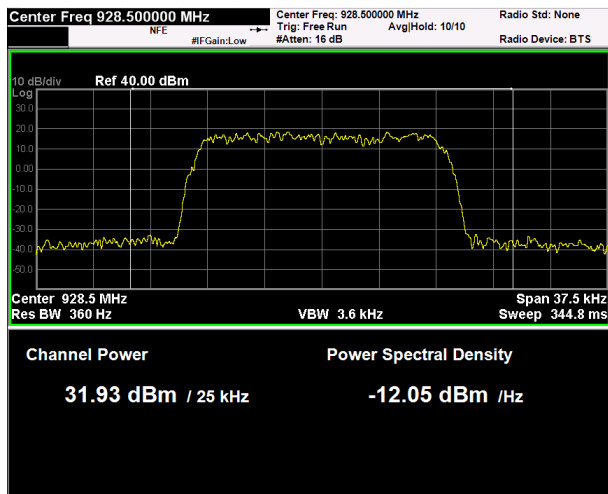
16k



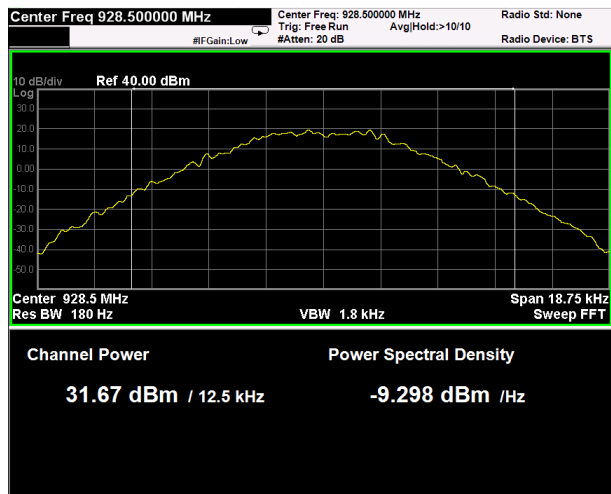
P25

Nominal input signal + 3dB

Test data				
Direction	Modulation	Frequency (MHz)	RF output Power (dBm)	RF output channel Power (W)
Down-link	16k	928.5	31.93	1.56
Down-link	P25	928.5	31.67	1.47



16k



P25

Clause 101.111 Spurious emissions at RF antenna connector

(a) The mean power of emissions must be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(5) When using transmissions employing digital modulation techniques on the 900 MHz multiple address frequencies with a 12.5 KHz bandwidth, the power of any emission must be attenuated below the unmodulated carrier power of the transmitter (P) in accordance with the following schedule:

- (i) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in KHz) of more than 2.5 KHz up to and including 6.25 KHz: At least $53 \log_{10}(f_d/2.5)$ decibels;
- (ii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in KHz) of more than 6.25 KHz up to and including 9.5 KHz: At least $103 \log_{10}(f_d/3.9)$ decibels;
- (iii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in KHz) of more than 9.5 KHz up to and including 15 KHz: At least $157 \log_{10}(f_d/5.3)$ decibels; and
- (iv) On any frequency removed from the center of the authorized bandwidth by a displacement frequency greater than 15 KHz: At least 50 plus $10 \log_{10}(P)$ or 70 decibels, whichever is the lesser attenuation.

(6) When using transmissions employing digital modulation techniques on the 900 MHz multiple address frequencies with a bandwidth greater than 12.5 KHz, the power of any emission must be attenuated below the unmodulated carrier power of the transmitter (P) in accordance with the following schedule:

- (i) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in KHz) of more than 5 KHz up to and including 10 KHz: At least $83 \log_{10}(f_d/5)$ decibels;
- (ii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in KHz) of more than 10 KHz up to and including 250 percent of the authorized bandwidth: At least $116 \log_{10}(f_d/6.1)$ decibels or 50 plus $10 \log_{10}(P)$ or 70 decibels, whichever is the lesser attenuation; and
- (iii) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 plus $10 \log_{10}(\text{output power in watts})$ decibels or 80 decibels, whichever is the lesser attenuation.

Test date: 06/28/2017

Test results: Pass

Special notes

Clause 101.111 Spurious emissions at RF antenna connector, continued

Test data

See Plots below

Spurious emissions measurement results:

Frequency (MHz)	Spurious emission (dBm)	Limit (dBm)	Margin (dB)
Low channel			
First channel	Negligible	-13	
Mid channel			
928,5 MHz	Negligible	-13	
High channel			
Last channel	Negligible	-13	

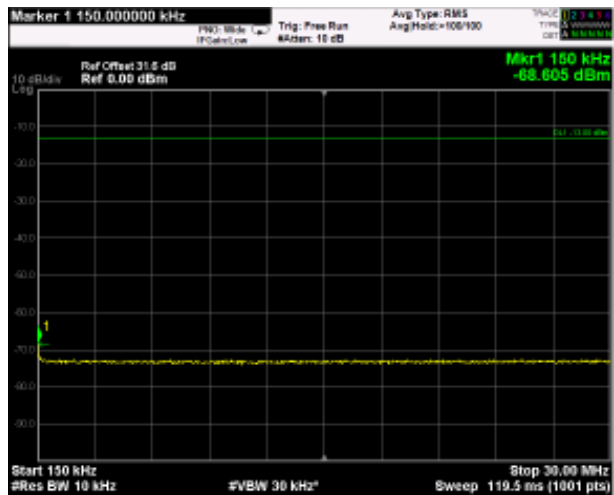
Test data, continued: spurious emissions at antenna terminal

16k signal

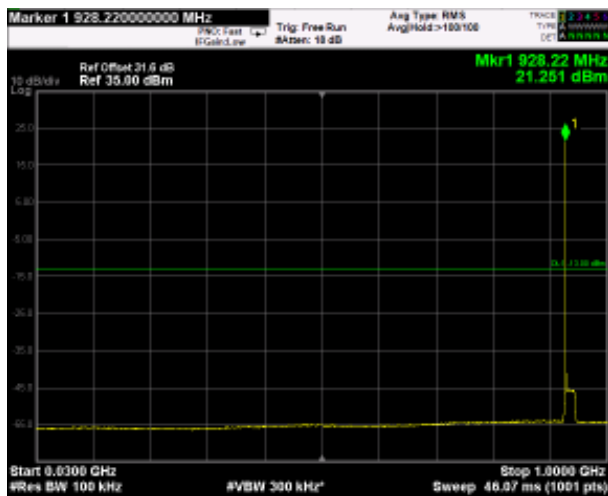
(Plots are referred to modulated carrier at the Middle Channel)



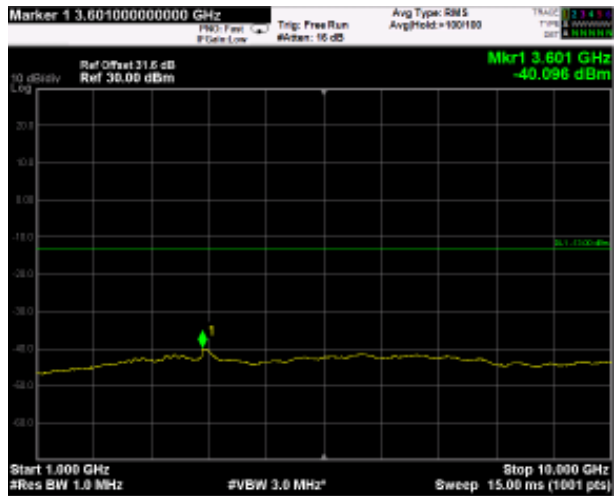
9kHz-150kHz



150kHz-30MHz



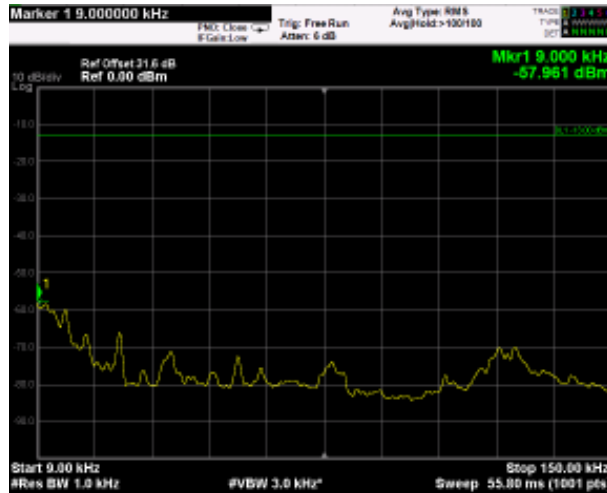
30MHz-1GHz



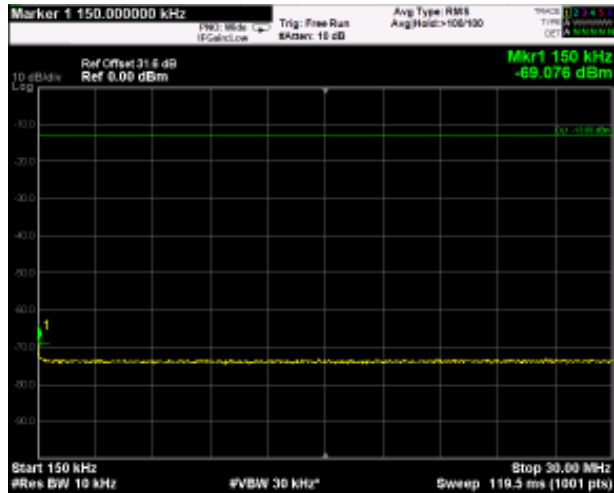
1GHz-10GHz

P25 signal

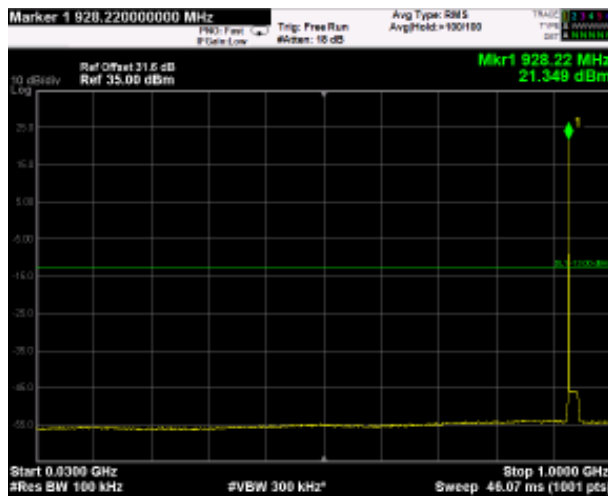
(Plots are referred to modulated carrier at the Middle Channel)



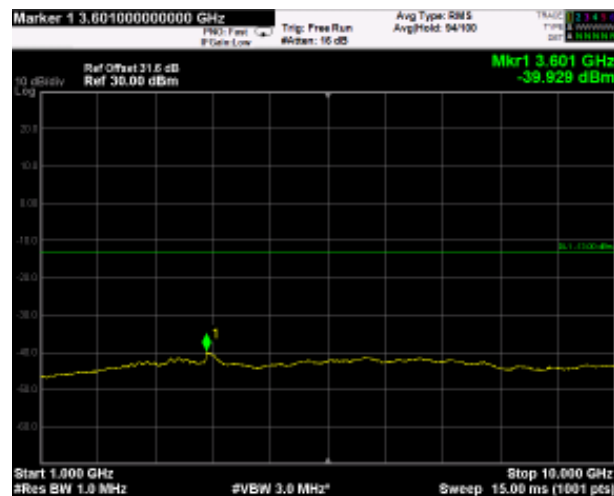
9kHz-150kHz



150kHz-30MHz



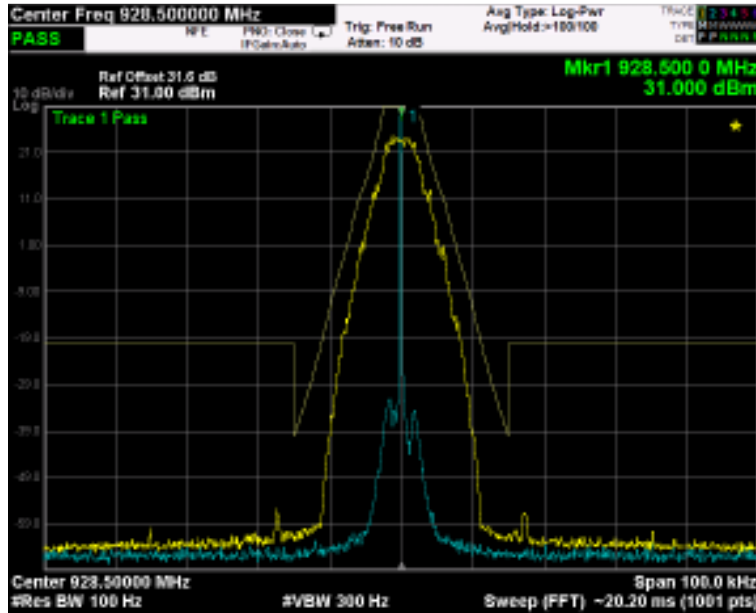
30MHz-1GHz



1GHz-10GHz

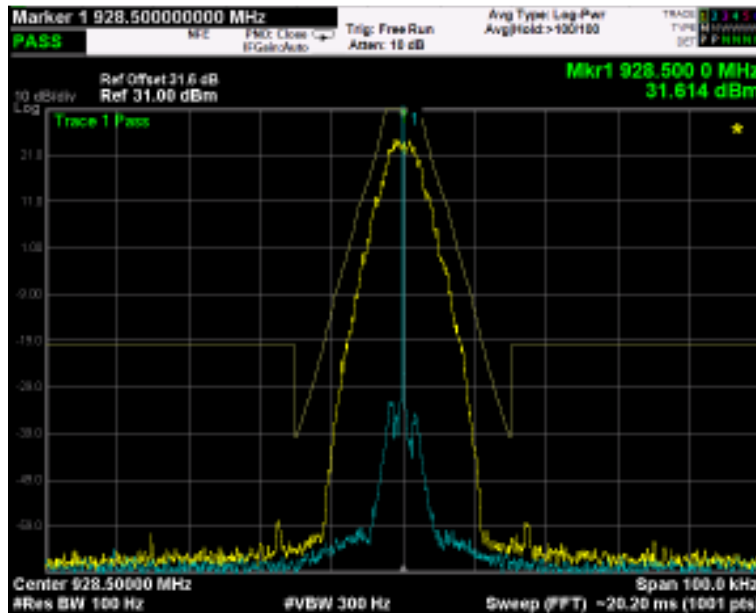
Test data, continued: Mask

P25 signal, nominal input signal (928,5MHz)



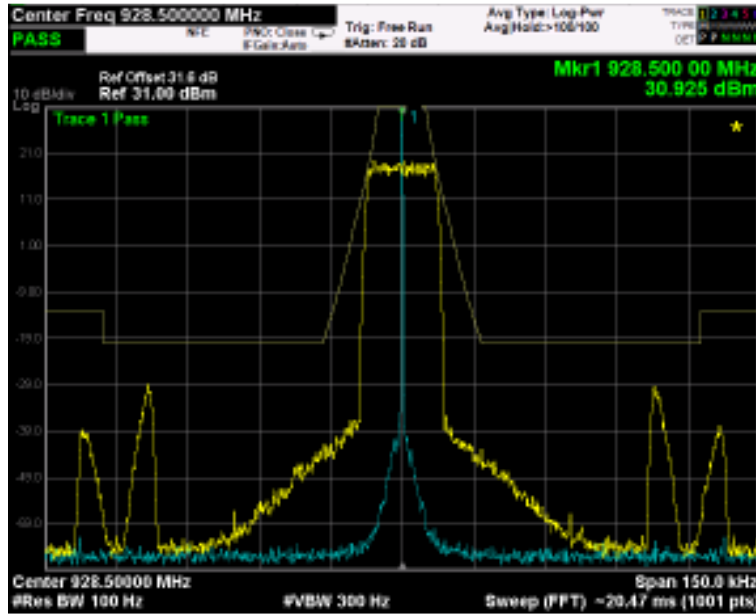
Mask with BW <12,5kHz signal

P25 signal, nominal input signal + 3dB (928,5MHz)



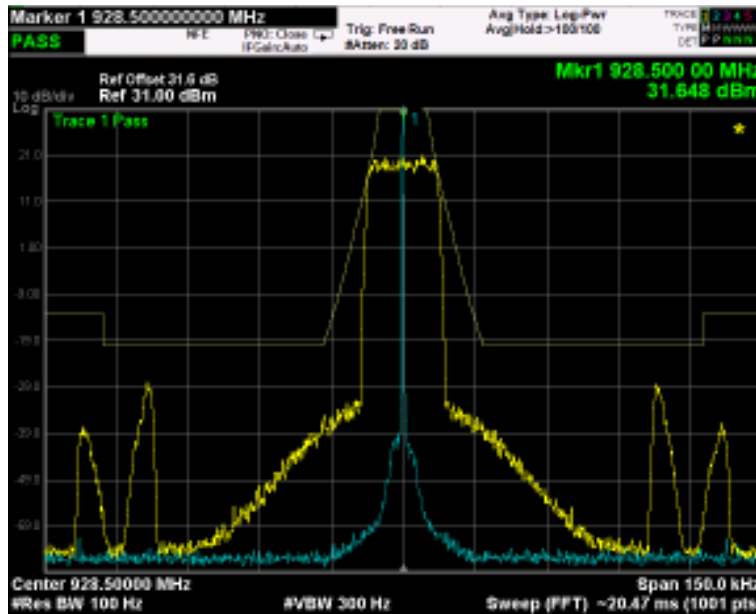
Mask with BW <12,5kHz signal

16k signal, nominal input signal (928,5MHz)



Mask with BW >12,5kHz signal

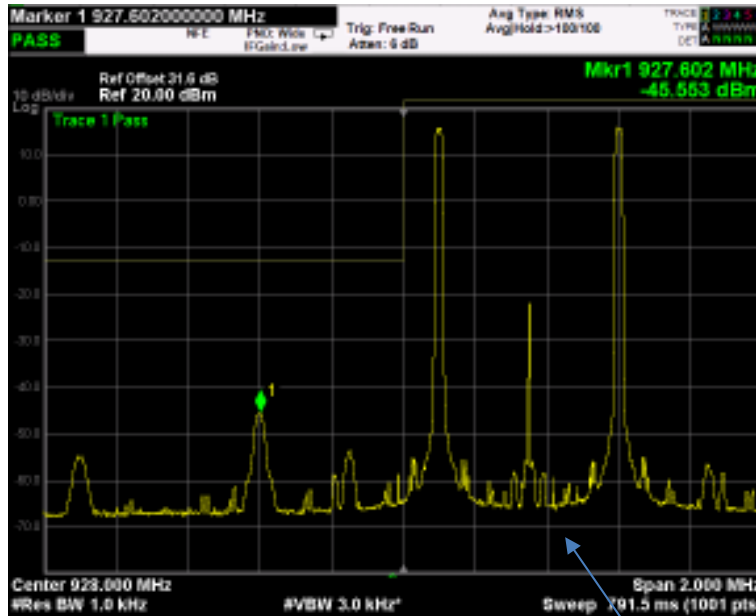
16k signal, nominal input signal + 3dB (928,5MHz)



Mask with BW >12,5kHz signal

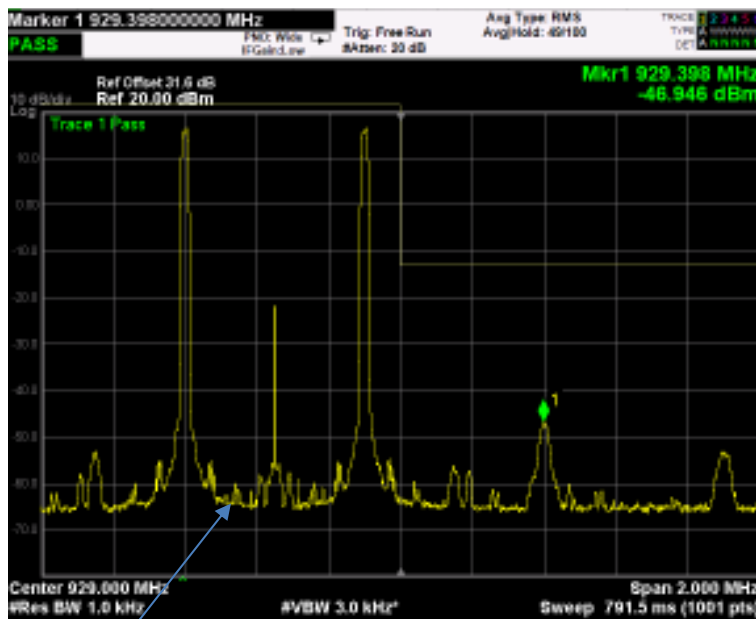
Test data, continued: band edges Inter modulation

16k signal, nominal input signal



Low Band Edge

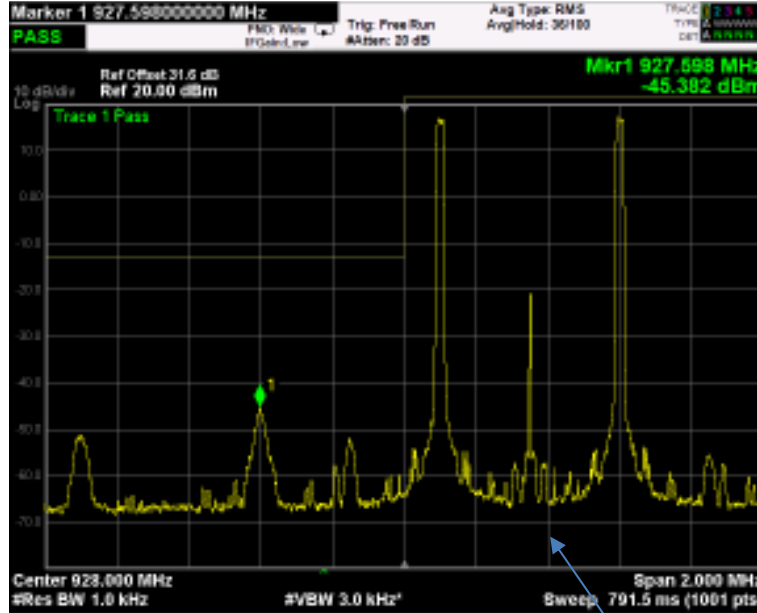
The in-band signal between the two tones is internally generated by the "multicarrier" feature of the signal generator



High Band Edge

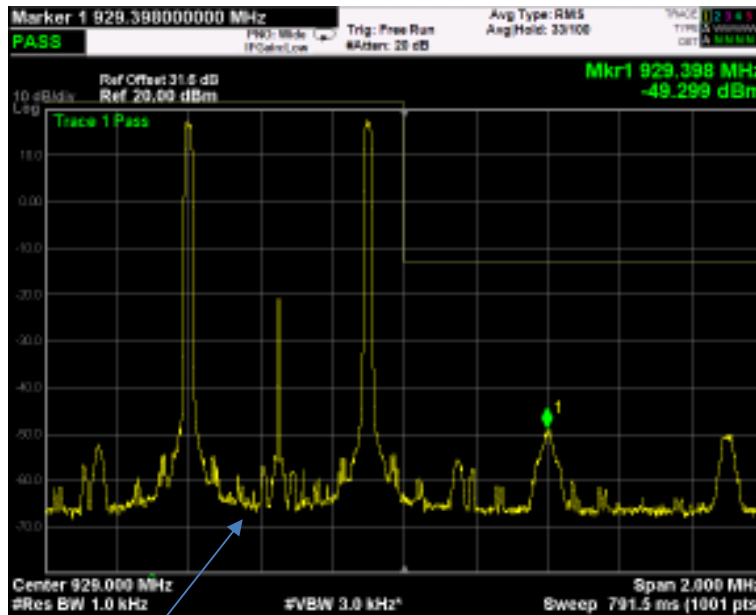
The in-band signal between the two tones is internally generated by the "multicarrier" feature of the signal generator

16k signal, nominal input signal + 3dB



Low Band Edge

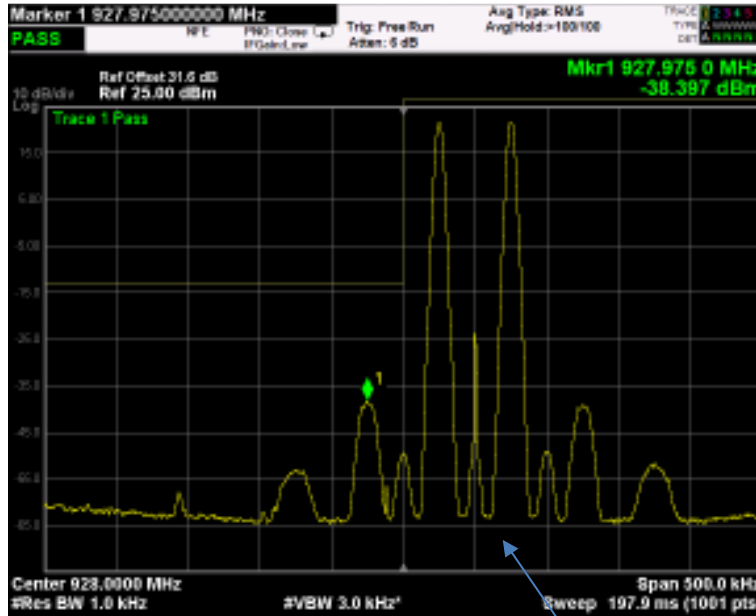
The in-band signal between the two tones is internally generated by the "multicarrier" feature of the signal generator



High Band Edge

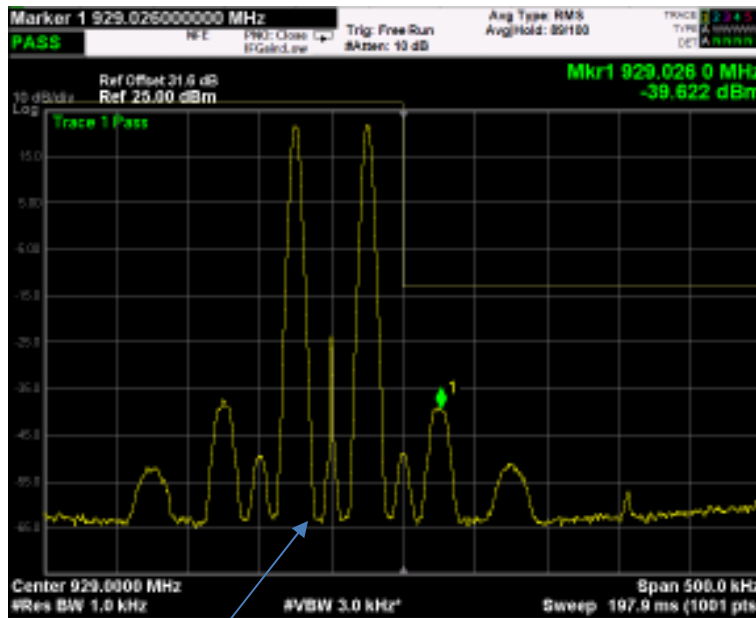
The in-band signal between the two tones is internally generated by the "multicarrier" feature of the signal generator

P25 signal, nominal input signal



Low Band Edge

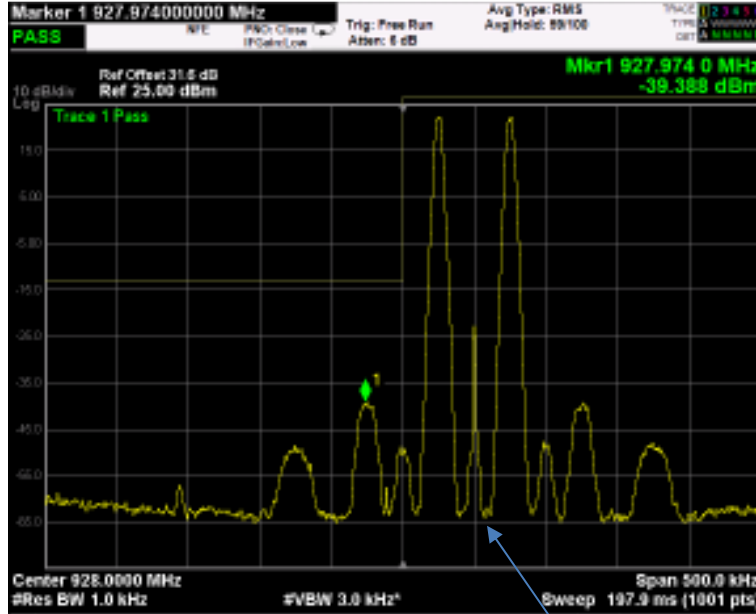
The in-band signal between the two tones is internally generated by the “multicarrier” feature of the signal generator



High Band Edge

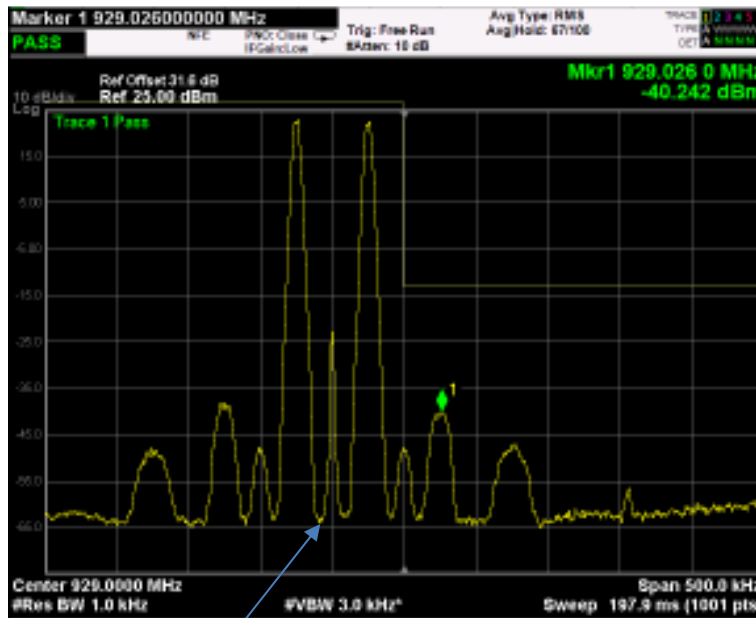
The in-band signal between the two tones is internally generated by the “multicarrier” feature of the signal generator

P25 signal, nominal input signal + 3dB



Low Band Edge

The in-band signal between the two tones is internally generated by the "multicarrier" feature of the signal generator



High Band Edge

The in-band signal between the two tones is internally generated by the "multicarrier" feature of the signal generator

Clause 101.111 Radiated Spurious emissions

(a) The mean power of emissions must be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(5) When using transmissions employing digital modulation techniques on the 900 MHz multiple address frequencies with a 12.5 KHz bandwidth, the power of any emission must be attenuated below the unmodulated carrier power of the transmitter (P) in accordance with the following schedule:

(i) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in KHz) of more than 2.5 KHz up to and including 6.25 KHz: At least $53 \log_{10}(f_d/2.5)$ decibels;

(ii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in KHz) of more than 6.25 KHz up to and including 9.5 KHz: At least $103 \log_{10}(f_d/3.9)$ decibels;

(iii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in KHz) of more than 9.5 KHz up to and including 15 KHz: At least $157 \log_{10}(f_d/5.3)$ decibels; and

(iv) On any frequency removed from the center of the authorized bandwidth by a displacement frequency greater than 15 KHz: At least 50 plus $10 \log_{10}(P)$ or 70 decibels, whichever is the lesser attenuation.

(6) When using transmissions employing digital modulation techniques on the 900 MHz multiple address frequencies with a bandwidth greater than 12.5 KHz, the power of any emission must be attenuated below the unmodulated carrier power of the transmitter (P) in accordance with the following schedule:

(i) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in KHz) of more than 5 KHz up to and including 10 KHz: At least $83 \log_{10}(f_d/5)$ decibels;

(ii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in KHz) of more than 10 KHz up to and including 250 percent of the authorized bandwidth: At least $116 \log_{10}(f_d/6.1)$ decibels or 50 plus $10 \log_{10}(P)$ or 70 decibels, whichever is the lesser attenuation; and

(iii) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 plus $10 \log_{10}(\text{output power in watts})$ decibels or 80 decibels, whichever is the lesser attenuation.

Test date: [06/28/2017](#)

Test results: [Pass](#)

Special notes

Clause 101.111 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.

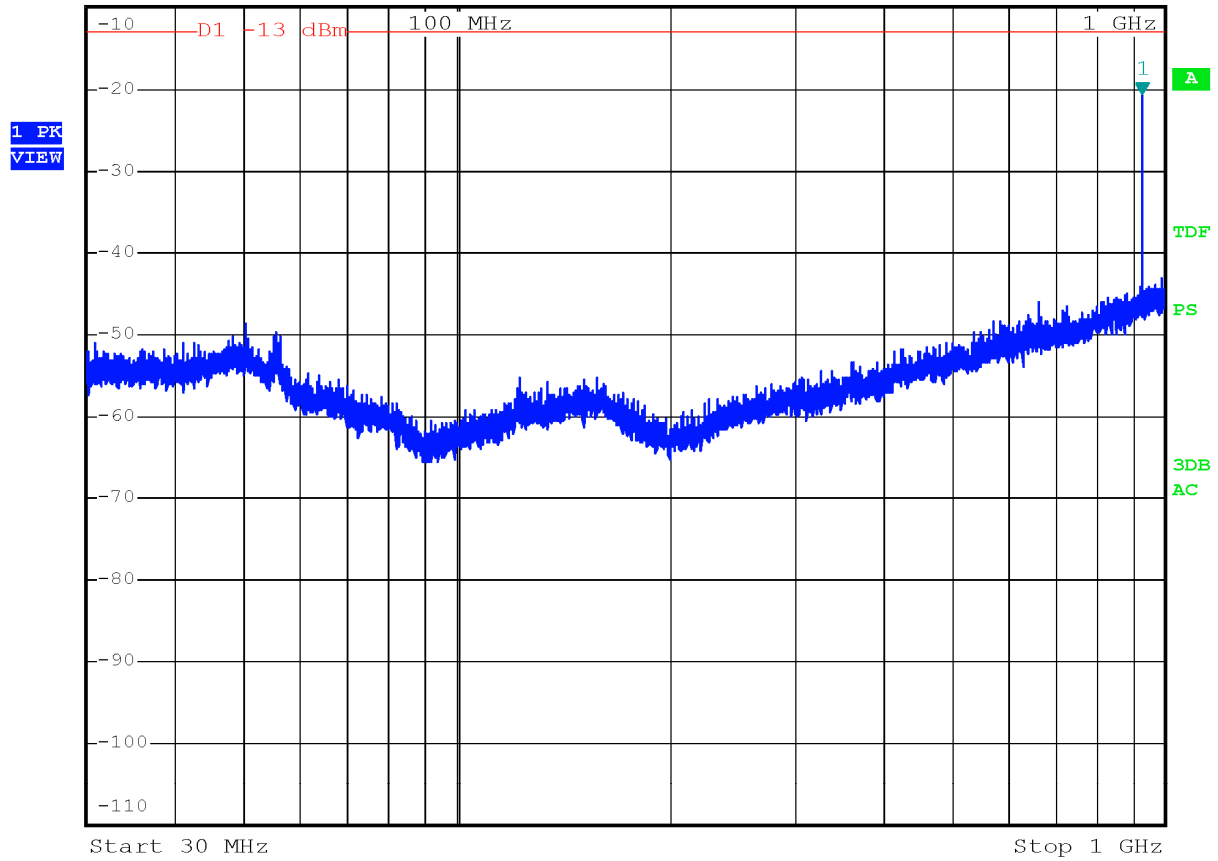
Spurious emissions measurement results:

Frequency (MHz)	Polarization. V/H	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Low channel				
Mid channel				
High channel				

Note: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.



Ref -10 dBm * Att 10 dB * RBW 100 kHz Marker 1 [T1]
 * VBW 300 kHz -20.61 dBm
 SWT 100 ms 929.008197834 MHz

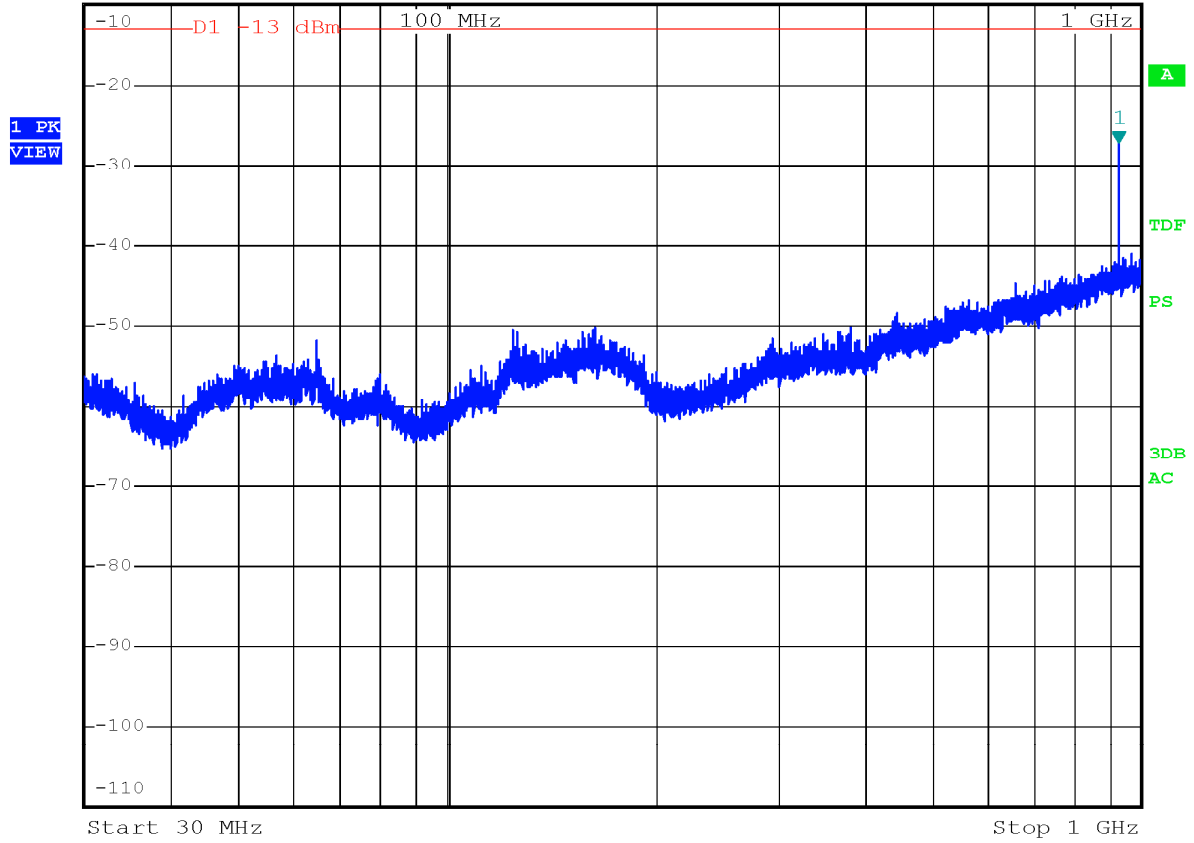


Date: 28.JUN.2017 11:41:59

30MHz-1GHz – H Pol



Ref -10 dBm * Att 10 dB * RBW 100 kHz Marker 1 [T1] * VBW 300 kHz -27.11 dBm SWT 100 ms 929.008197834 MHz

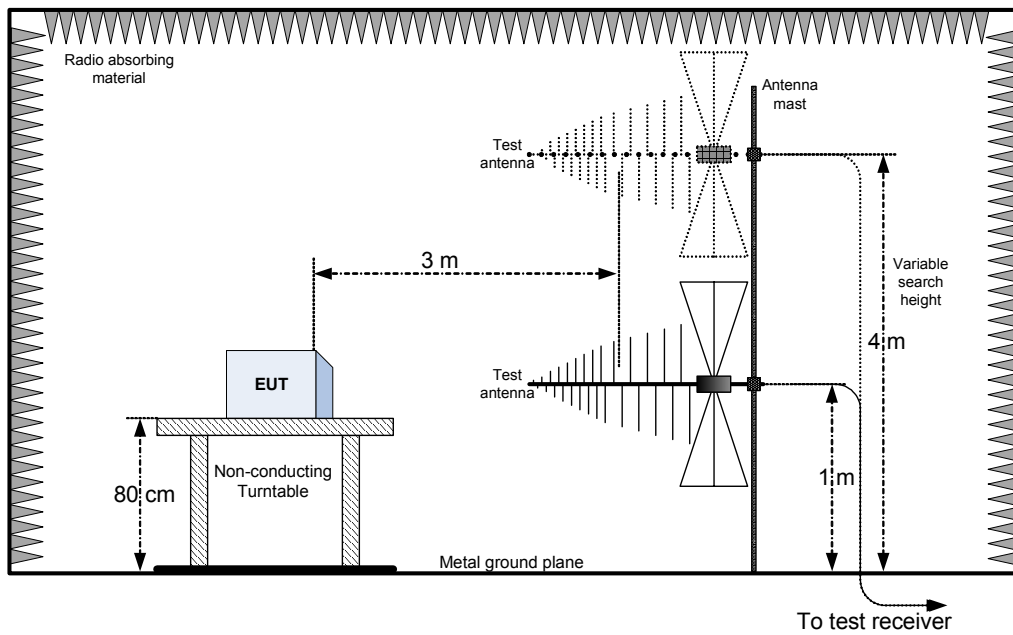


Date: 28.JUN.2017 11:40:06

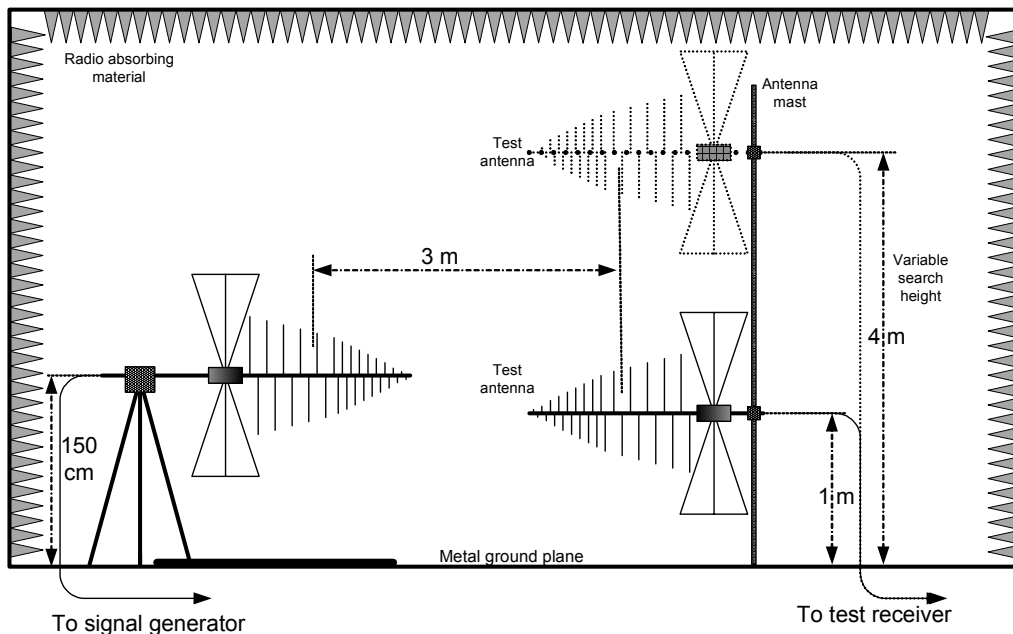
30MHz-1GHz – V Pol

Appendix B: Block diagrams of test set-ups

Radiated emissions set-up



Substitution method set-up



Appendix C: EUT Photos

Photo Set up





Photo EUT



