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Report Reference ID:	209925-1TRFWL
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Test specification:	Title 47 – Telecommunication Chapter I – Federal Communications Commission Subchapter B – Common carrier services – Part 27 – Miscellaneous wireless communications services
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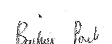
Applicant:	TEKO Telecom S.p.A. Via Meucci, 24/a I-40024 Castel S. Pietro Terme (BO) (Italy)
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Apparatus:	Digital Donor Front-End
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FCC ID:	XM2-DFE
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Model:	TDFE-7SL
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Testing laboratory:	Nemko Italy S.p.A. Via Carroccio, 4 I-20046 Biassono (Italy)
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	Name and title	Date
Tested by:	 G. Curioni, Wireless/EMC Specialist	2012/06/21
Reviewed by:	 P. Barbieri, Wireless/EMC Specialist	2012/06/21



Nemko Canada Inc., a testing laboratory, is accredited by the Standards Council of Canada.
The tests included in this report are within the scope of this accreditation.

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	Section 1: Report summary	Product: TDFE-7SL

Section 1: Report summary

1.1 Test specification

Specifications	Part 27 – Miscellaneous wireless communications services
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1.2 Statement of compliance

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

Exclusions	None
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1.4 Registration number

Registration number:	481407 (10 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

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. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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	Section 2: Summary of test results	Product: TDFE-7SL


Section 2: Summary of test results

2.1 FCC Part 27, test results

Part	Test description	Verdict
§27.50(c)	Peak output power at RF antenna connector	Pass
§27.52	RF safety	N/A a)
§27.53(g)	Spurious emissions at RF antenna connector	Pass
§27.53(g)	Radiated spurious emissions	Pass
§27.53(f)	Radiated spurious emissions within 1559–1610 MHz band	N/A b)
§27.54	Frequency stability	Pass
§2.1049	Occupied bandwidth	Pass
§2.1047	Modulation characteristics	Pass
§2-11-04/EAB/RF	Filter Frequency Response	Pass

Notes:

- a) NO Antenna provided
- b) 698-746MHz band

	Section 3: Equipment under test (EUT) details	Product: TDFE-7SL

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

3.1 Applicant details

Applicant complete business name	Name:	Teko Telecom S.p.A.
	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:	-DFE
Equipment class	TNB	
Description of product as it is marketed	Digital Donor Front-End	
	Model name/number:	TDFE-7SL
	Serial number:	120211001

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

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 checked="" type="checkbox"/> No <input 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 statues under the FCC ID(s) listed below: i FCC ID: ii FCC ID:

3.6 Sample information

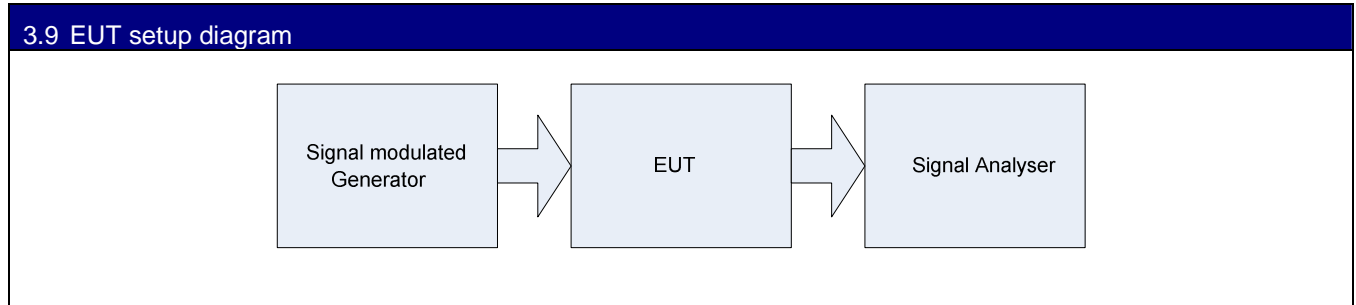
Receipt date:	2012-06-11
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	Section 3: Equipment under test (EUT) details	Product: TDFE-7SL

Nemko sample ID number:	-----
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3.7 EUT technical specifications	
Operating band:	Down Link: 728–746 MHz, Up Link: 698-716 MHz
Operating frequency:	Wideband
Modulation type:	LTE (QAM and QPSK)
Occupied bandwidth:	1,4 MHz – 3 MHz – 5 MHz – 10MHz
Channel spacing:	standard
Emission designator:	D7W
RF Output	Down Link: 10dBm (0,010W) Up Link: 26dBm (0,400W)
Gain	Down Link: 63dB Up Link: 64dB
Antenna type:	External Antenna is not provided, equipment that has an external 50 Ω RF connector
Power source:	28-30 Vdc stand alone 100-240 Vac in subrack with external Ac/Dc power supply

3.8 Operation of the EUT during testing	
Details:	Normal working at max gain with max RF power output



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 Power source and ambient temperatures

Normal temperature, humidity and air pressure test conditions

Temperature: 15–30 °C
 Relative humidity: 20–75 %
 Air pressure: 860–1060 hPa

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 6: 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 have been performed to provide a confidence level of 95 % and can be found in Nemko S.p.A. document WML1002.


Section 7: Test equipment

Identification number	Description	Manufacturer model	s/n	Cal. Due
1a	Vector Signal Generator	Agilent N5182A MXG	MY48180714	May 2013
1b	Vector Signal Generator	Agilent E4438C ESG	MY45094485	Ago 2013
2a	Spectrum Analyzer	Agilent E4440A	US40420470	Jul 2012
2b	Spectrum Analyzer	Agilent E9020A MXA	MY48011812	Jul 2012
3	Network Analyzer	Agilent E5071B	MY42301133	Jan 2013
4	Climatic chamber	Angelantoni Hygros 600	7237	Nov 2014

Client's property

Identification number	Equipment	Manufacturer	Model	Serial N°	Cal. due
1	Trilog Broadband Antenna	Schwarzbeck	VULB 9163	VULB 9163-286	04/2013
2	Bilog antenna	Schwarzbeck	STLP 9148-123	123	09/2012
3	Double ridge waveguide horn	Spin	DRH40	061106A40	09/2013
4	Broadband preamplifier	Schwarzbeck	BBV 9718	9718-137	05/2013
5	Broadband preamplifier	Miteq	JS44	1648665	05/2013
6	Spectrum Analyzer 9kHz-40GHz	R&S	FSEK	848255/005	09/2012
7	Controller	EMCO	2090	9511-1099	NSC
8	Antenna Tower	EMCO	2071-2	9601-1940	NSC
9	Turning table Controller	EMCO	1061-1.521	9012-1508	NSC
10	Semi-anechoic chamber	Nemko	3m semi-anechoic chamber	70	04/2013
11	Control room	Siemens	3m control room	3	NSC

Property of Nemko Italy


 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27.50(C) Peak output power at RF antenna connector		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

Section 8: Testing data

8.1 Clause 27.50(c) Peak output power at RF antenna connector

§ 27.50(c) Operation within the bands: 698-746 MHz.

- (1) Fixed and base stations transmitting a signal with an emission bandwidth of 1 MHz or less must not exceed an effective radiated power (ERP) of 1000 watts and an antenna height of 305 m height above average terrain (HAAT), except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section;
- (2) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal with an emission bandwidth of 1 MHz or less must not exceed an ERP of 2000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts ERP in accordance with Table 2 of this section;
- (3) Fixed and base stations transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section;
- (4) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal with an emission bandwidth greater than 1MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section;
- (5) Licensees seeking to operate a fixed or base station located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal at an ERP greater than 1000 watts must:
 - (i) coordinate in advance with all licensees authorized to operate in the 698–763 MHz, 775–793, and 805–806 MHz bands within 120 kilometers (75 miles) of the base or fixed station;
 - (ii) coordinate in advance with all regional planning committees, as identified in §§ 90.527 of this chapter, with jurisdiction within 120 kilometers (75 miles) of the base or fixed station.
- (6) Licensees of fixed or base stations transmitting a signal at an ERP greater than 1000 watts and greater than 1000 watts/MHz must comply with the provisions of paragraph (c)(8) of this section and § 27.55(b), except that licensees of fixed or base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, must comply with the provisions of paragraph (c)(8) of this section and § 27.55(b) only if transmitting a signal at an ERP greater than 2000 watts and greater than 2000 watts/MHz;
- (7) A licensee authorized to operate in the 710–716, 716–722, or 740–746 MHz bands, or in any unpaired spectrum blocks within the 698–746 MHz band, may operate a fixed or base station at an ERP up to a total of 50 kW within its authorized, 6 MHz spectrum block if the licensee complies with the provisions of § 27.55(b). The antenna height for such stations is limited only to the extent required to satisfy the requirements of § 27.55(b).

 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27.50(C) Peak output power at RF antenna connector		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

(8) Licensees intending to operate a base or fixed station at a power level permitted under the provisions of paragraph (c)(6) of this section must provide advanced notice of such operation. to the Commission and to licensees authorized in their area of operation. Licensees who must be notified are all licensees authorized under this part to operate on an adjacent spectrum block within 75 km of the base or fixed station. Notifications must provide the location and operating parameters of the base or fixed station, including the station's ERP, antenna coordinates, antenna height above ground, and vertical antenna pattern, and such notifications must be provided at least 90 days prior to the commencement of station operation.


(9) Control and mobile stations are limited to 30 watts ERP.

(10) Portable stations (hand-held devices) are limited to 3 watts ERP; and


(11) Licensees may employ equipment operating in compliance with either the measurement techniques described in paragraph (b)(11) of this section or a Commission-approved average power technique. In both instances, equipment employed must be authorized in accordance with the provisions of § 27.51..

Special notes

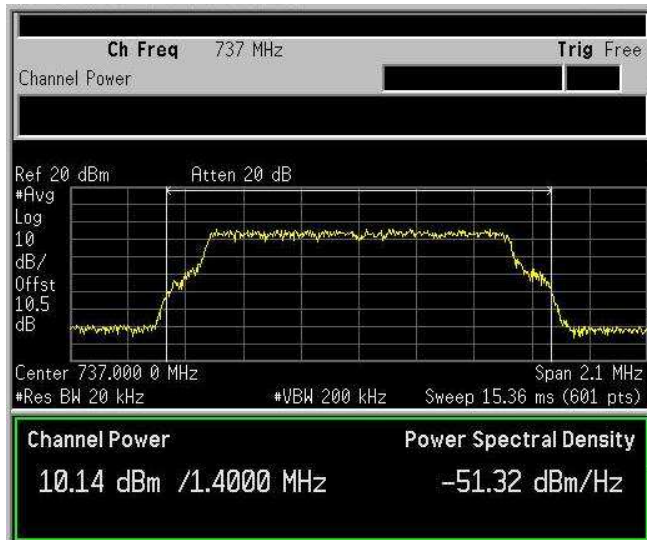
- The power was measured using spectrum analyzer with RMS detector / average power meter.

 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27.50(C) Peak output power at RF antenna connector		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

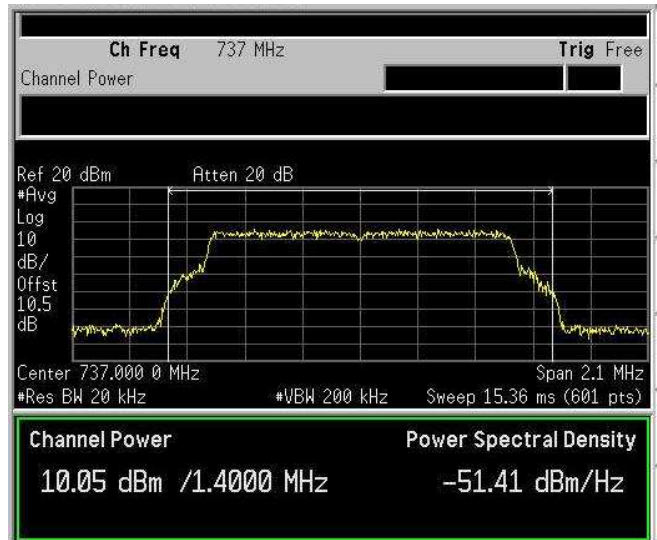
Test data					
Direction	Modulation	Frequency (MHz)	RF output Power (dBm)	RF output channel Power (W)	PAR (dB)
Down-link	LTE (QAM, 1,4MHz)	737	10.14	0.010	10.01
Down-link	LTE (QPSK, 1,4MHz)	737	10.05	0.010	9.40
Down-link	LTE (QAM, 3MHz)	737	10.17	0.010	10.46
Down-link	LTE (QPSK, 3MHz)	737	10.19	0.010	10.43
Down-link	LTE (QAM, 5MHz)	737	10.22	0.011	10.49
Down-link	LTE (QPSK, 5MHz)	737	10.21	0.011	10.37
Down-link	LTE (QAM, 10MHz)	737	10.09	0.010	10.72
Down-link	LTE (QPSK, 10MHz)	737	10.14	0.010	11.28
Up-link	LTE (QAM, 1,4MHz)	707	26.07	0.404	8.95
Up-link	LTE (QPSK, 1,4MHz)	707	26.13	0.411	8.69
Up-link	LTE (QAM, 3MHz)	707	26.15	0.412	9.41
Up-link	LTE (QPSK, 3MHz)	707	26.12	0.407	9.43
Up-link	LTE (QAM, 5MHz)	707	26.18	0.413	9.45
Up-link	LTE (QPSK, 5MHz)	707	26.16	0.403	9.40
Up-link	LTE (QAM, 10MHz)	707	26.17	0.413	10.27
Up-link	LTE (QPSK, 10MHz)	707	26.14	0.412	10.25

 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27.50(C) Peak output power at RF antenna connector		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

Mod. LTE 1,4MHz (Down-link)

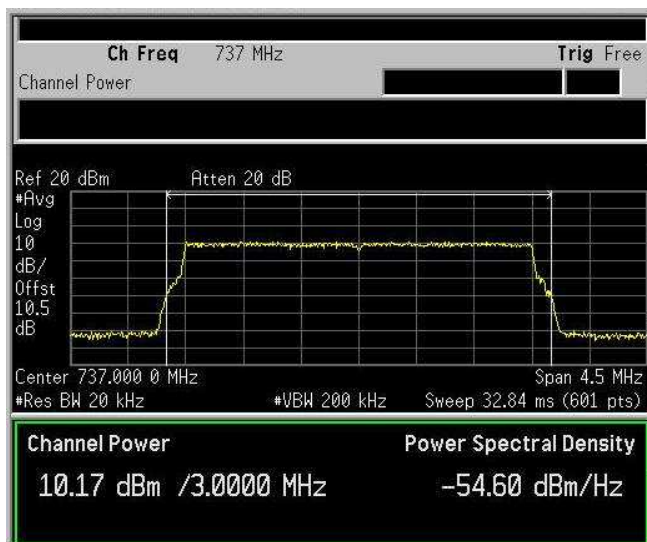


QAM

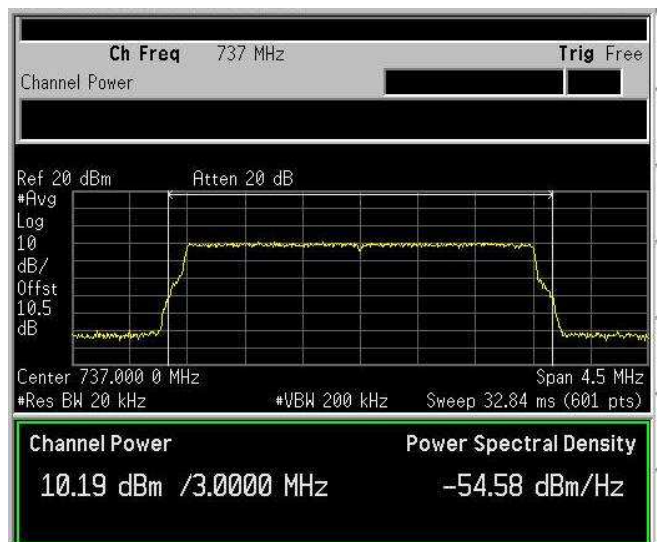


QPSK

Mod. LTE 3MHz (Down-link)



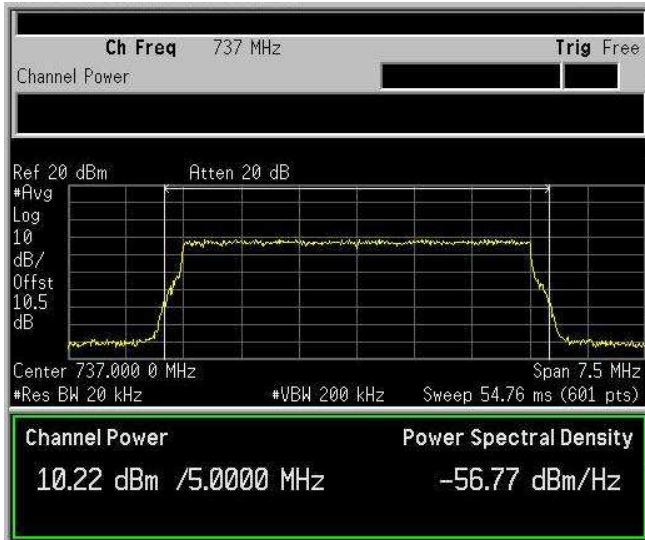
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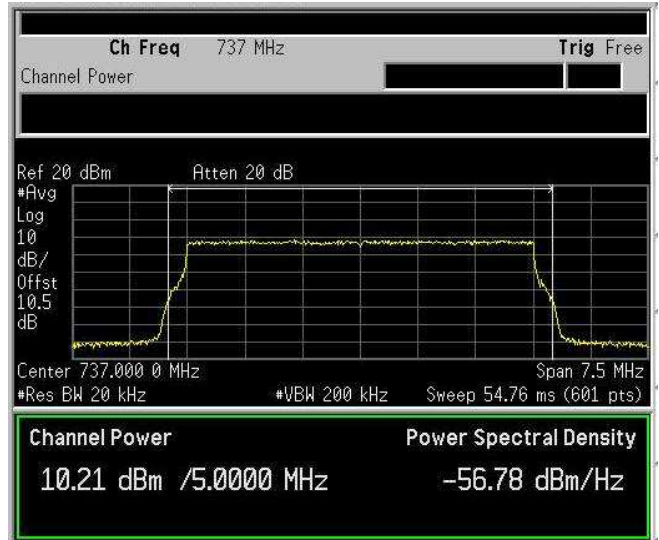
QPSK

Section 8: Testing data		Product: TDFE-7SL
Test name: Clause 27.50(C) Peak output power at RF antenna connector		
Test date: 11-20 June 2012		Test engineer: G. Curioni
Verdict: Pass		Supply input: 100-240 Vac
Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27		

Mod. LTE 3MHz (Down-link)

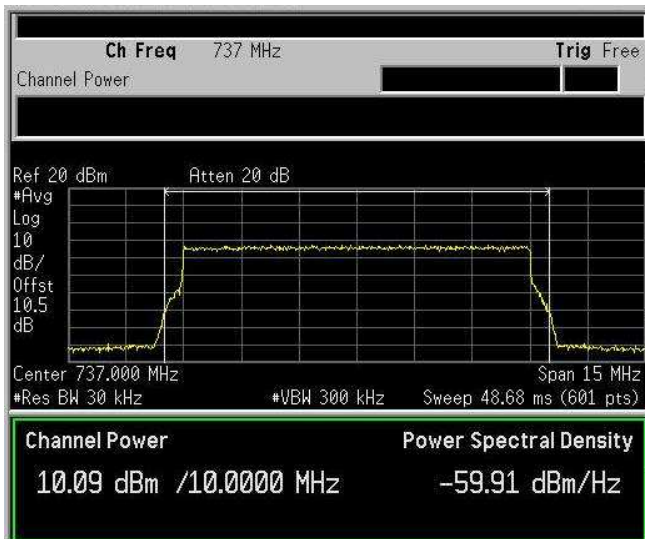


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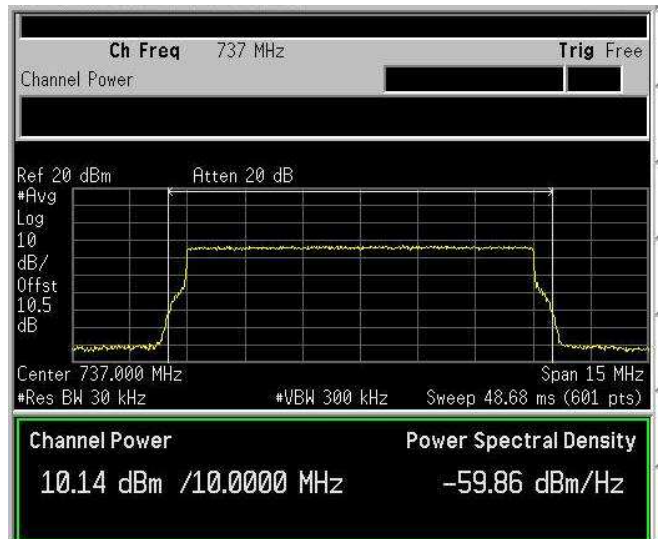


QPSK


Mod. LTE 10MHz (Down-link)



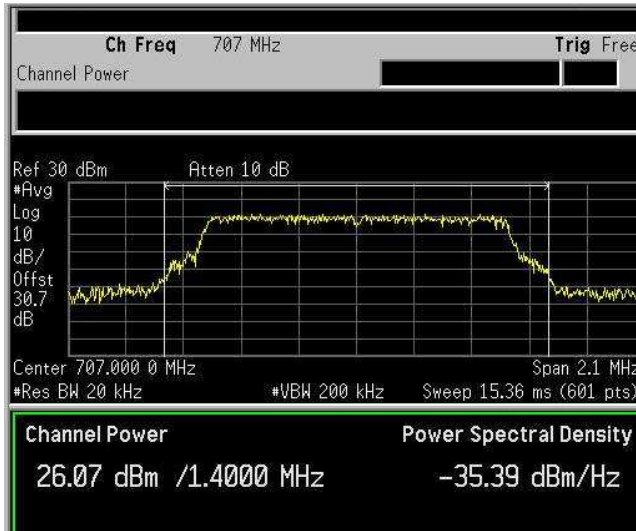
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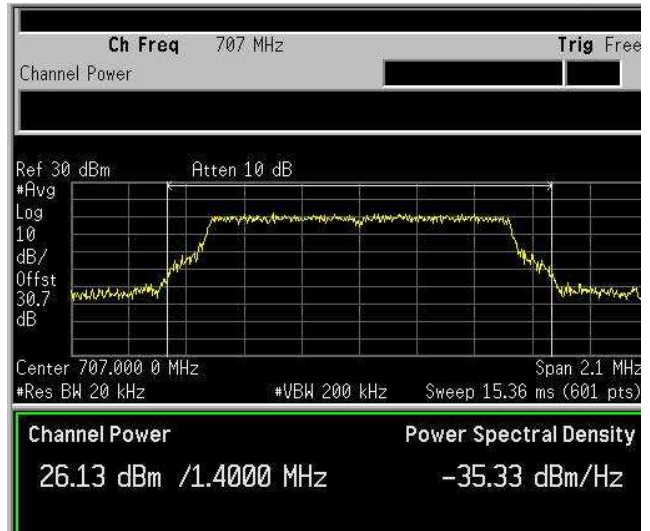
QPSK

 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27.50(C) Peak output power at RF antenna connector		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

Mod. LTE 1,4MHz (Up-link)

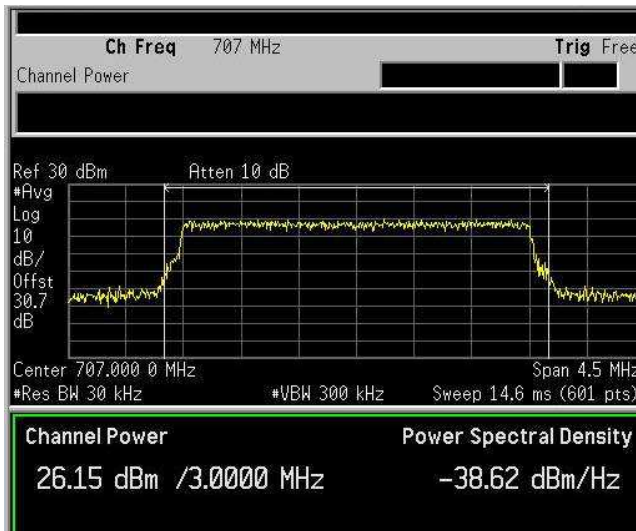


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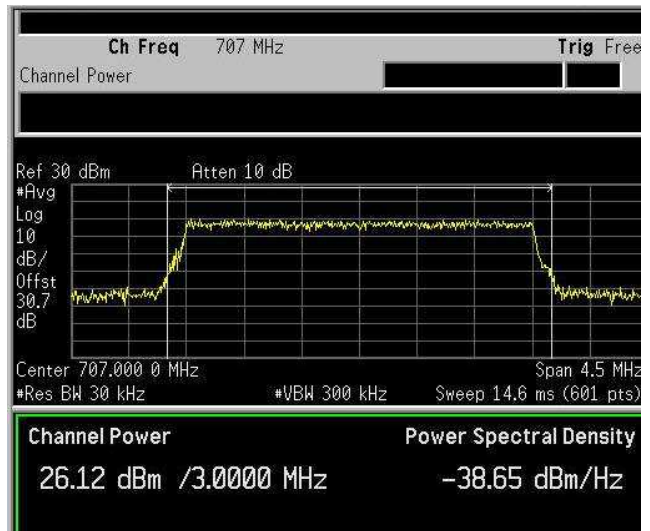


QPSK

Mod. LTE 3MHz (Up-link)



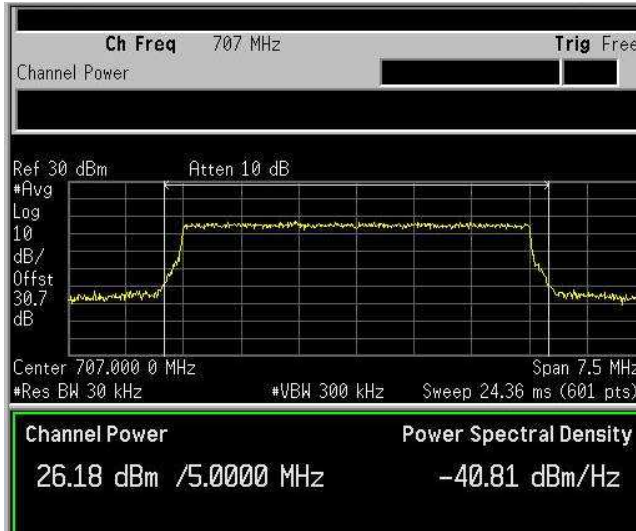
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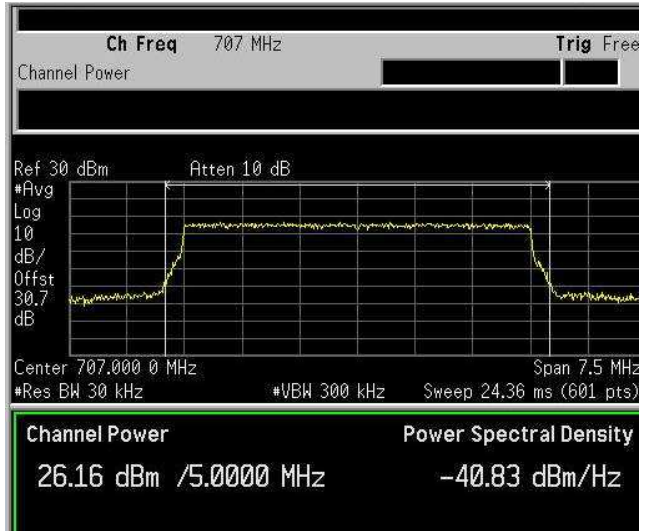
QPSK

Section 8: Testing data		Product: TDFE-7SL
Test name: Clause 27.50(C) Peak output power at RF antenna connector		
Test date: 11-20 June 2012		Test engineer: G. Curioni
Verdict: Pass		Supply input: 100-240 Vac
Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27		

Mod. LTE 5MHz (Up-link)

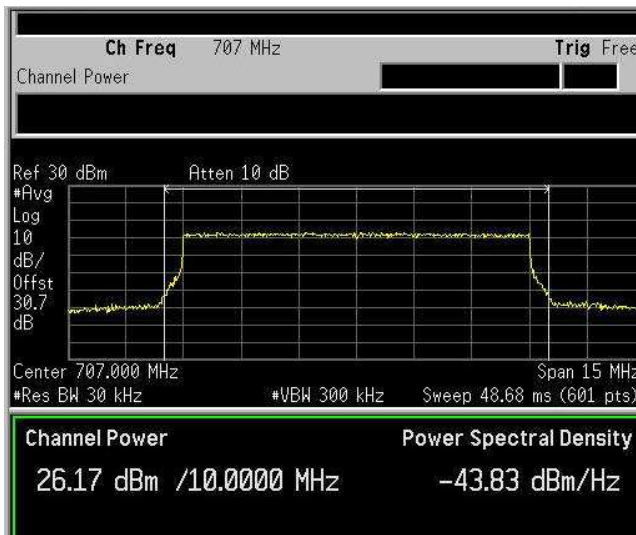


QAM

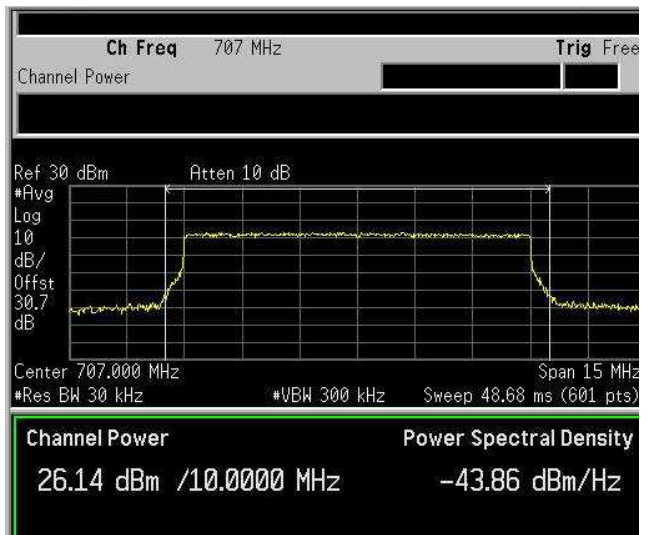


QPSK


Mod. LTE 10MHz (Up-link)



QAM



QPSK

 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27.52 RF safety		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

8.2 Clause 27.52 RF safety

Licensees and manufacturers are subject to the radio frequency radiation exposure requirements specified in sections 1.1307(b), 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

Special notes

The test was performed using E-field probe slowly moving towards the EUT until E-field equivalent to the maximum permitted power density was measured

Equivalent power density was calculated from electric field strength as follows:


$$S_{[mW/cm^2]} = \frac{0.1 \times E^2_{[V/m]}}{120 \times \pi} \quad S[W/m^2] = E^2[V/m]/377[\Omega]$$

where S is power density and E is electric field strength.

Test data

Test distance (cm)	Field strength (V/m)	Equivalent power density (mW/cm ²)	Limit (mW/cm ²)	Margin (mW/cm ²)
300				
250				
200				
150				
100				
50				
30				
20				
10				
5				

NOT APPLICABLE; External Antenna is not provided

 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27. 53 (g) Spurious emissions at RF antenna connector		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			


8.3 Clause 27.53 (g) Spurious emissions at RF antenna connector

(g) For operations in the 698–746 MHz band and the 776–788 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB.

Compliance with the provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed.


Special notes

- The spectrum was searched from 30 MHz to the 10th harmonic.
- All measurements were performed using a peak detector.
- RBW within 30–1000 MHz was 100 kHz and 30 kHz for bandedge; 1 MHz above 1 GHz. VBW was wider than RBW.

 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27. 53 (g) Spurious emissions at RF antenna connector		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

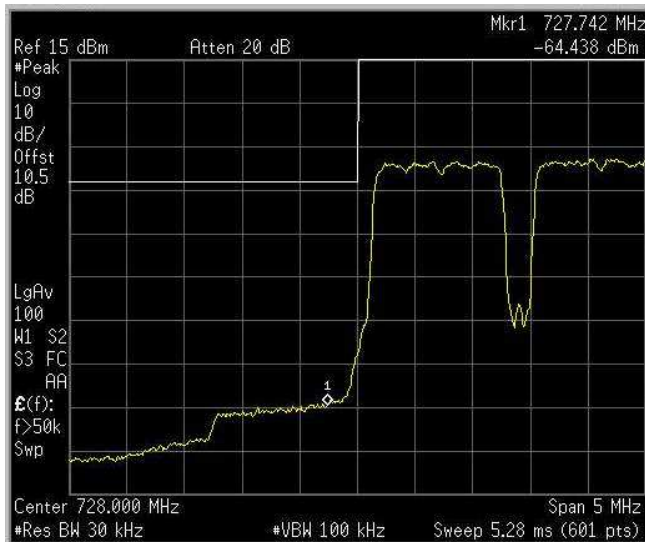
Test data			
Insert plots here			
Spurious emissions measurement results:			
Frequency (MHz)	Spurious emission (dBm)	Limit (dBm)	Margin (dB)
Low channel			
First channel Down-link	Negligible	-13	
First channel Up-link	Negligible	-13	
Mid channel			
737 MHz Down-link	Negligible	-13	
707 MHz Down-link	Negligible	-13	
High channel			
Last channel Down-link	Negligible	-13	
Last channel Up-link	Negligible	-13	

See Plots below

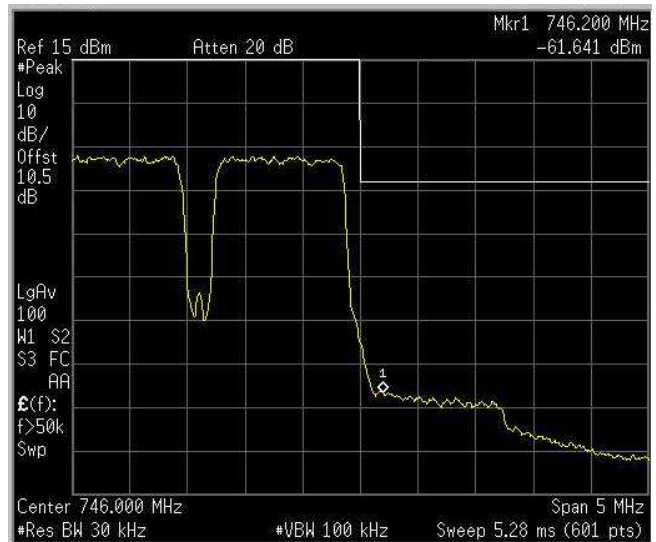
 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27. 53 (g) Spurious emissions at RF antenna connector		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

Test data, continued band edges Inter modulation:

Mod. LTE 1.4MHz (QAM) (Down-link)

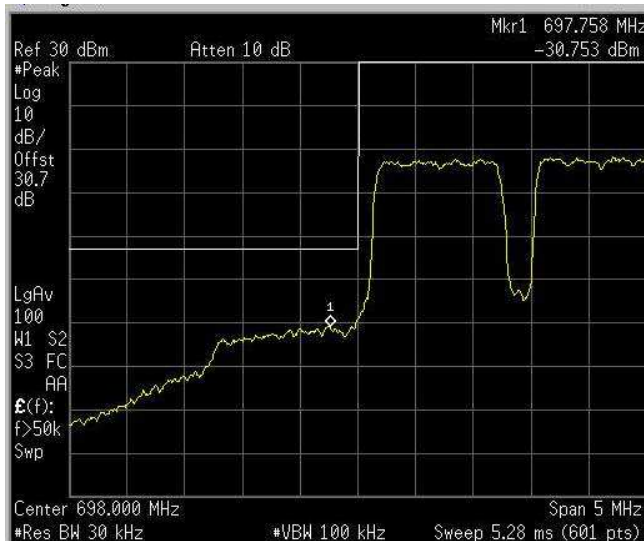


Low Band Edge

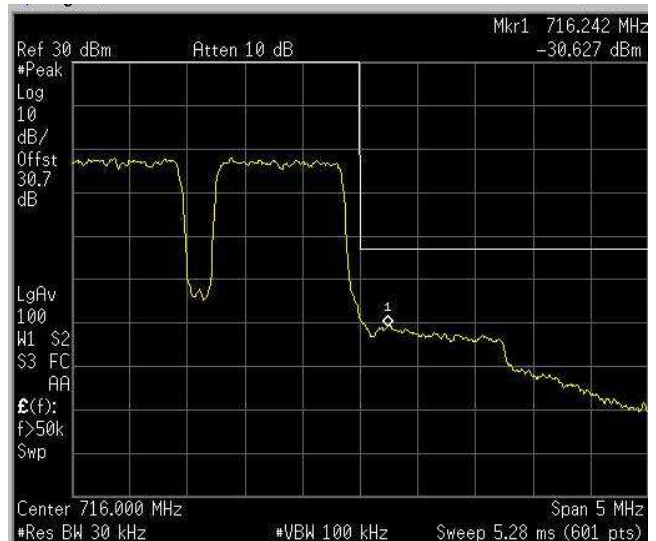


High Band Edge


Mod. LTE 1.4MHz (QAM) (Up-link)



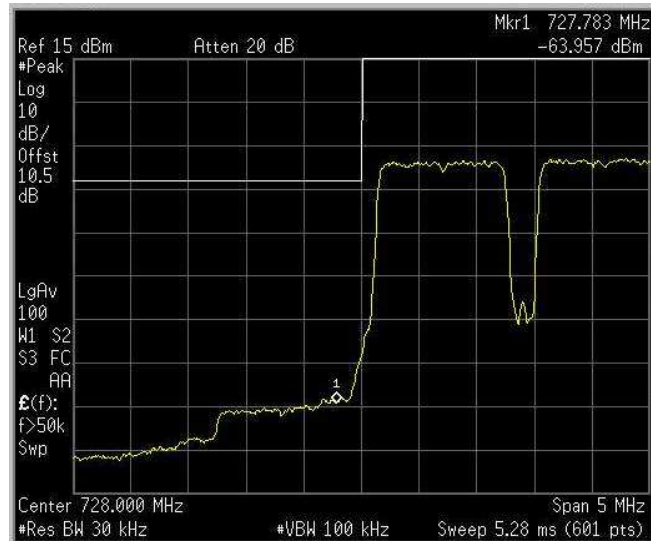
Low Band Edge



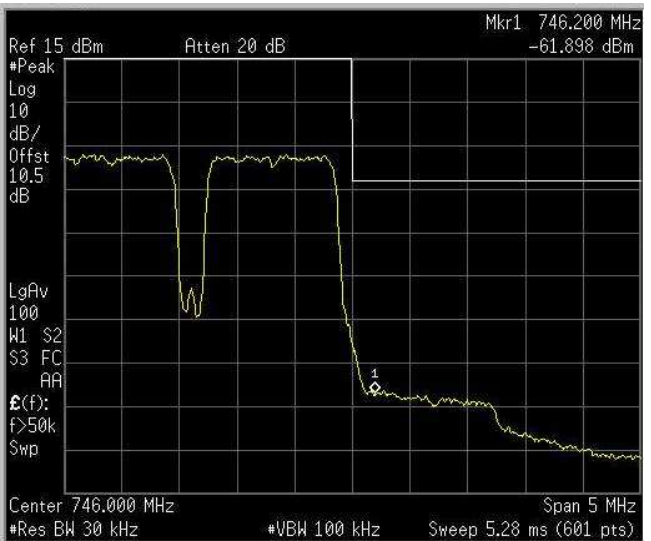
High Band Edge

 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27. 53 (g) Spurious emissions at RF antenna connector		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

Mod. LTE 1.4MHz (QPSK) (Down-link)

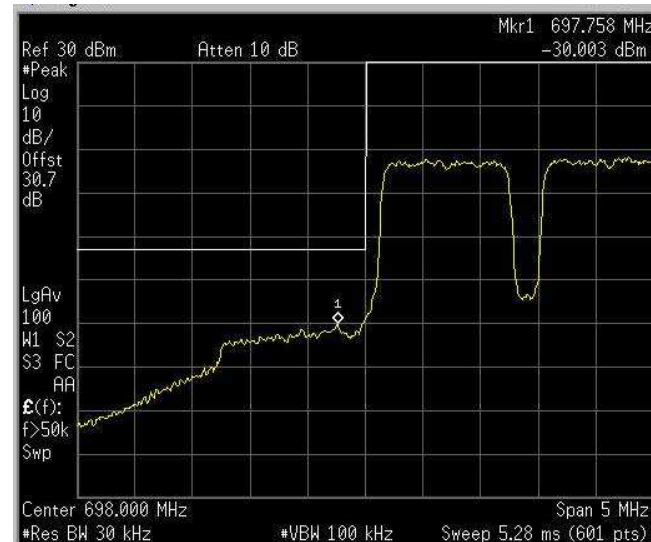


Low Band Edge

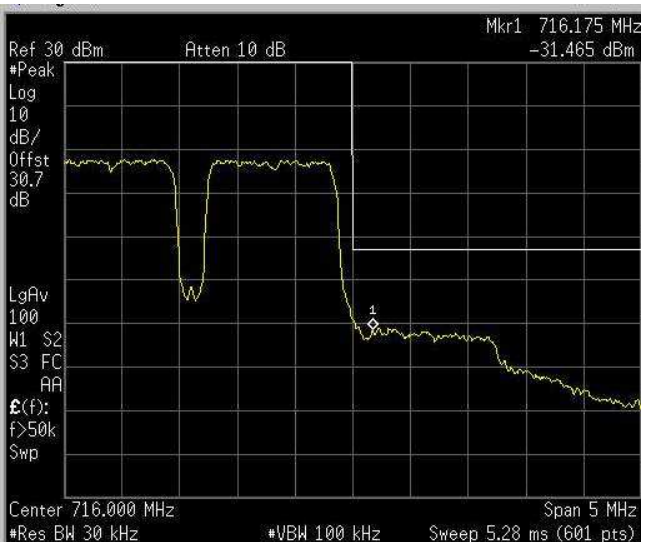


High Band Edge

Mod. LTE 1.4MHz (QPSK) (Up-link)



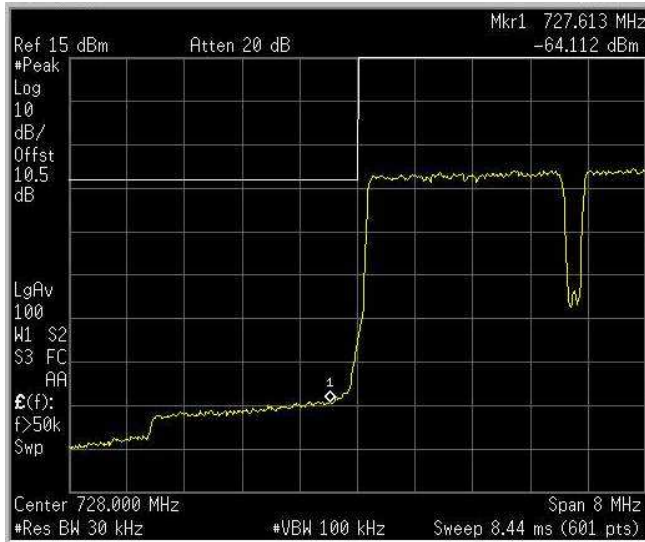
Low Band Edge



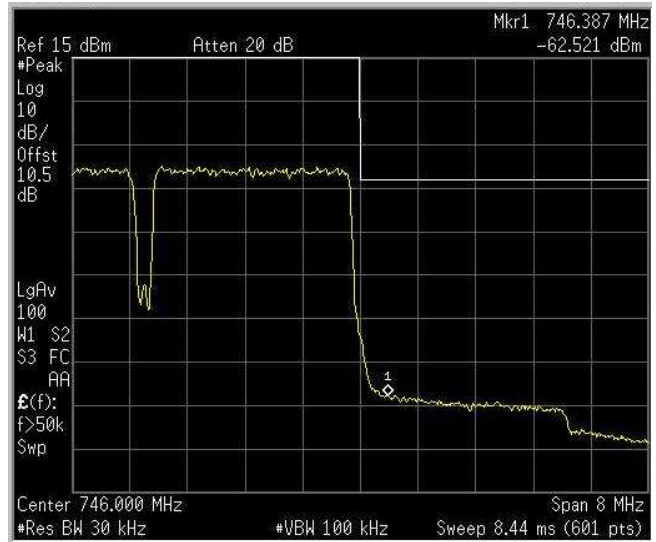
High Band Edge

Section 8: Testing data		Product: TDFE-7SL
Test name: Clause 27. 53 (g) Spurious emissions at RF antenna connector		
Test date: 11-20 June 2012		Test engineer: G. Curioni
Verdict: Pass		Supply input: 100-240 Vac
Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27		

Mod. LTE 3MHz (QAM) (Down-link)

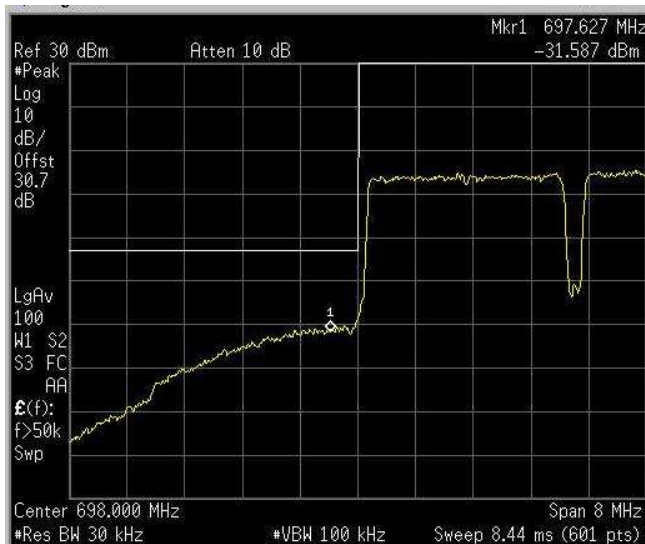


Low Band Edge

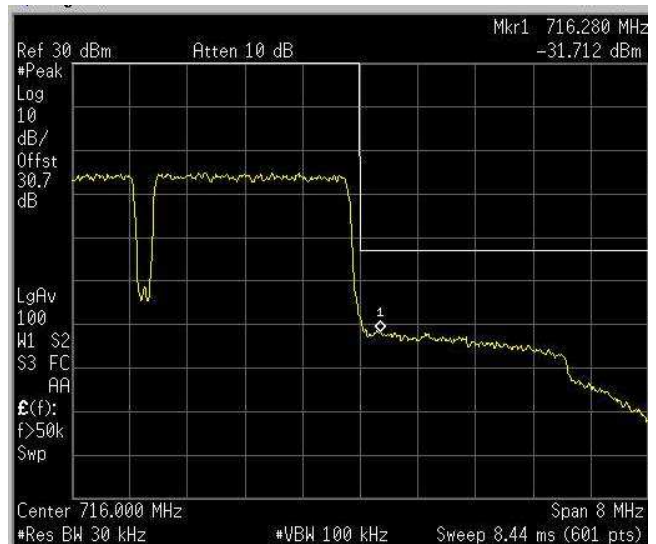


High Band Edge


Mod. LTE 3MHz (QAM) (Up-link)



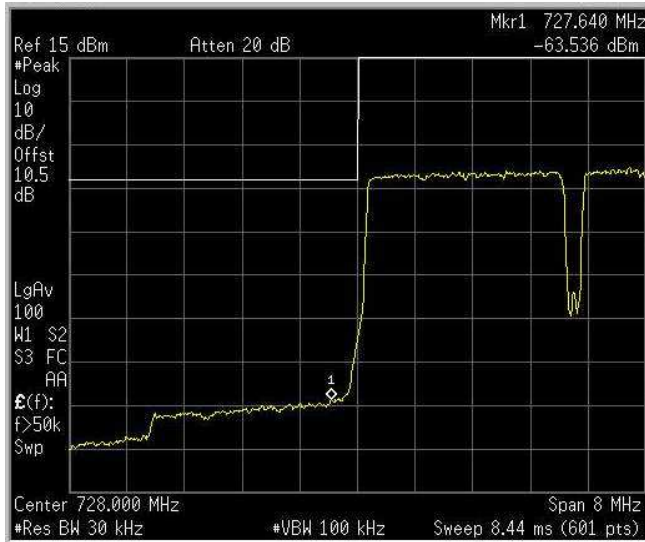
Low Band Edge



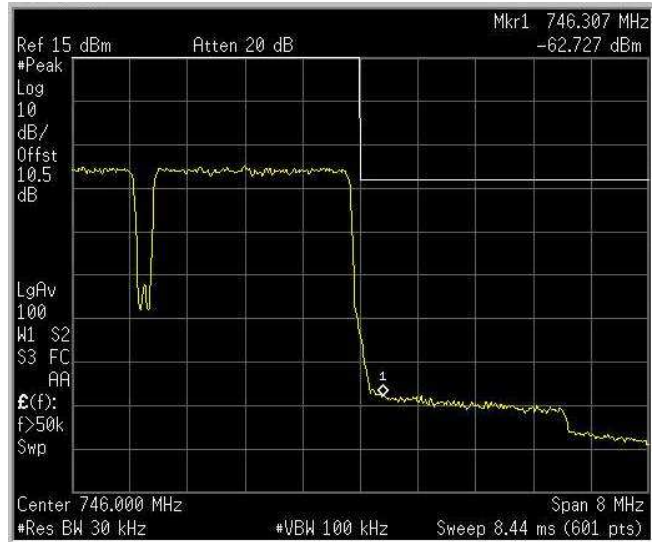
High Band Edge

 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27. 53 (g) Spurious emissions at RF antenna connector		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

Mod. LTE 3MHz (QPSK) (Down-link)

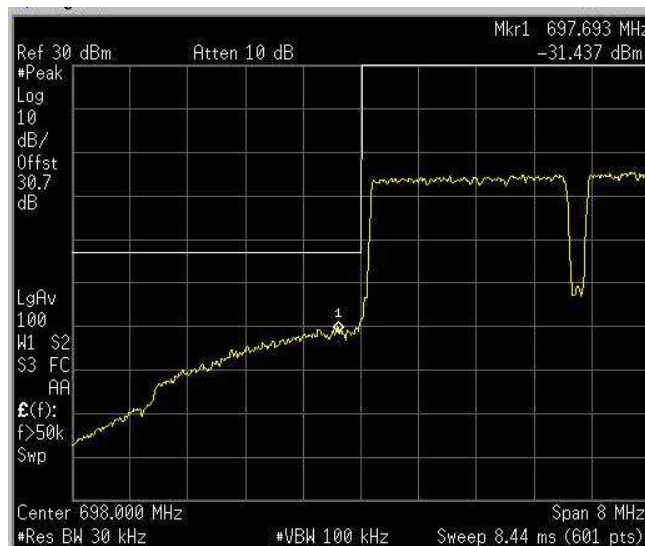


Low Band Edge

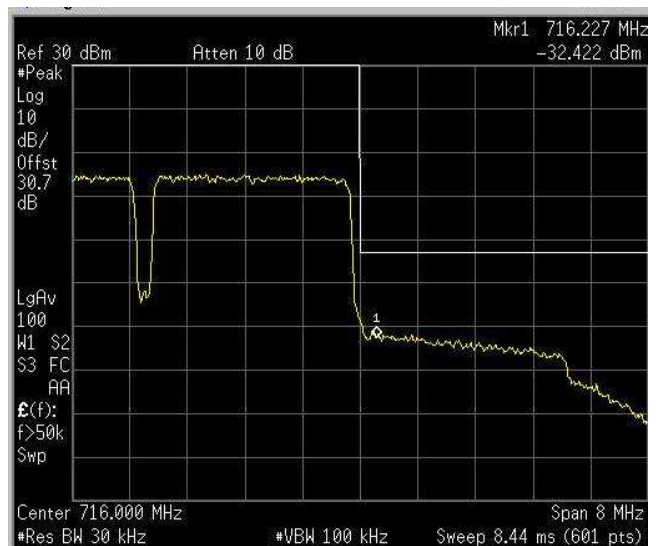


High Band Edge

Mod. LTE 3MHz (QPSK) (Up-link)



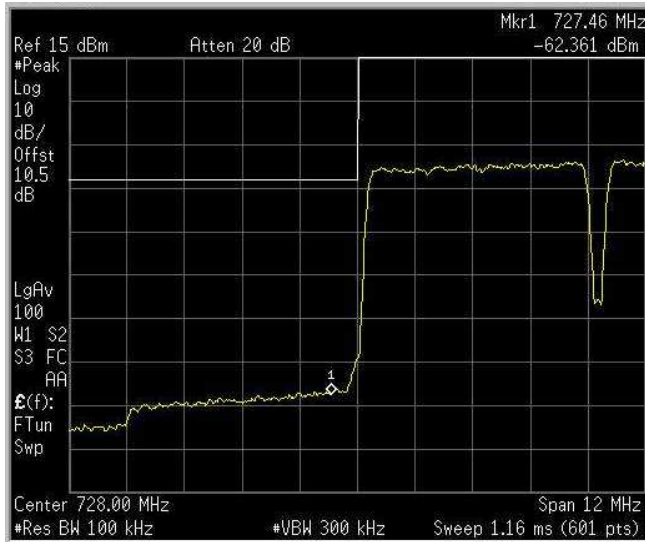
Low Band Edge



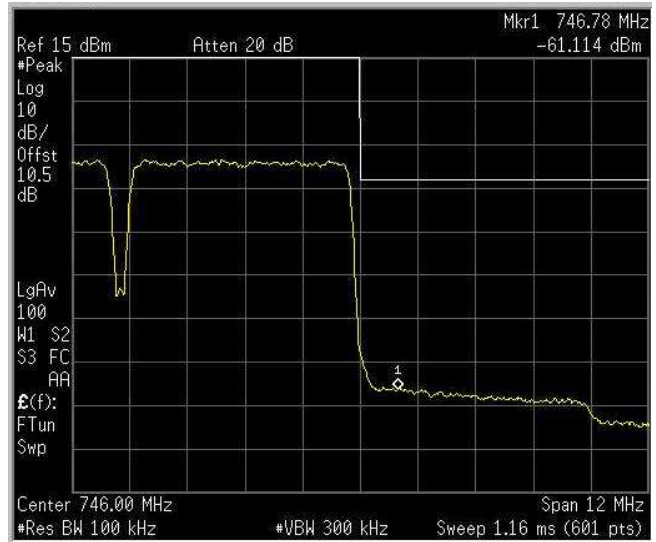
High Band Edge

Section 8: Testing data		Product: TDFE-7SL
Test name: Clause 27. 53 (g) Spurious emissions at RF antenna connector		
Test date: 11-20 June 2012		Test engineer: G. Curioni
Verdict: Pass		Supply input: 100-240 Vac
Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27		

Mod. LTE 5MHz (QAM) (Down-link)

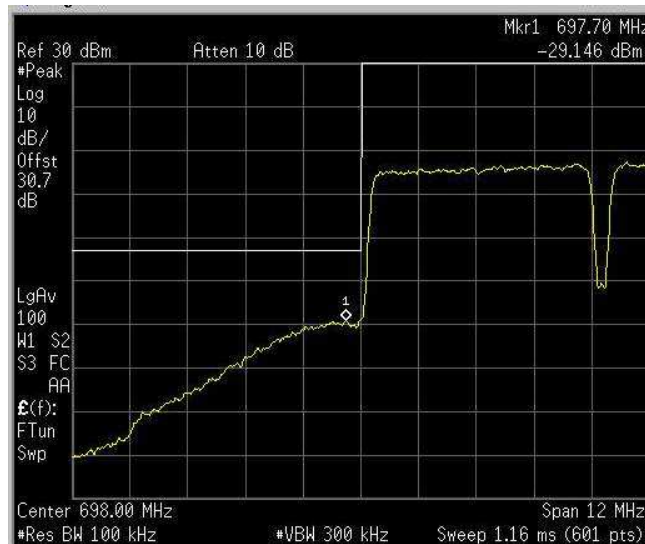


Low Band Edge

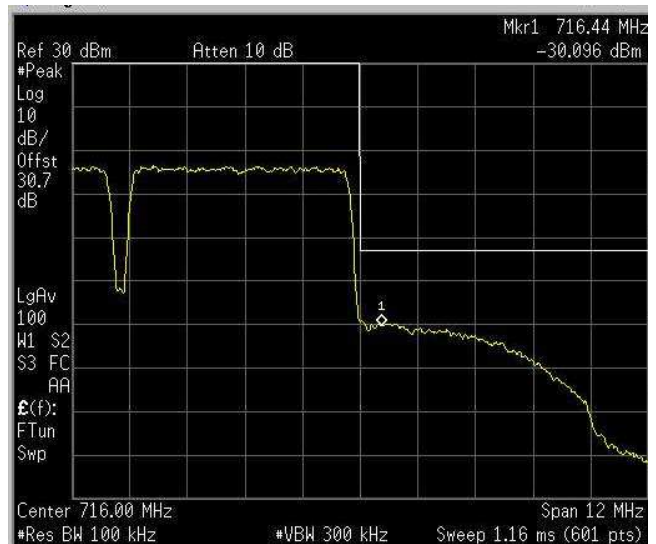


High Band Edge


Mod. LTE 5MHz (QAM) (Up-link)



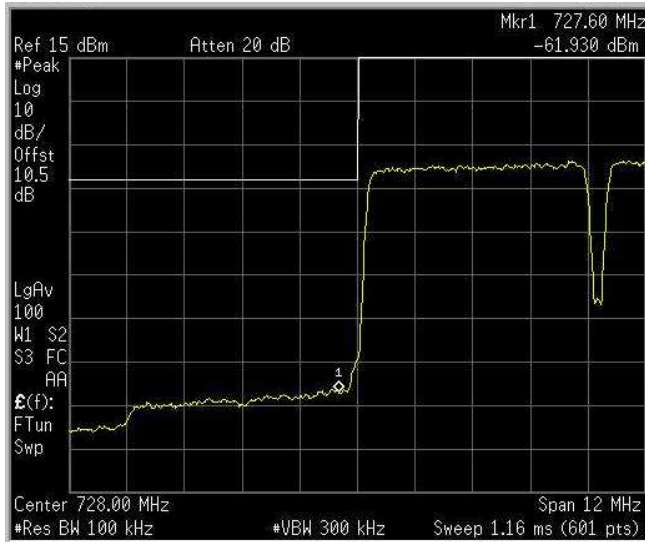
Low Band Edge



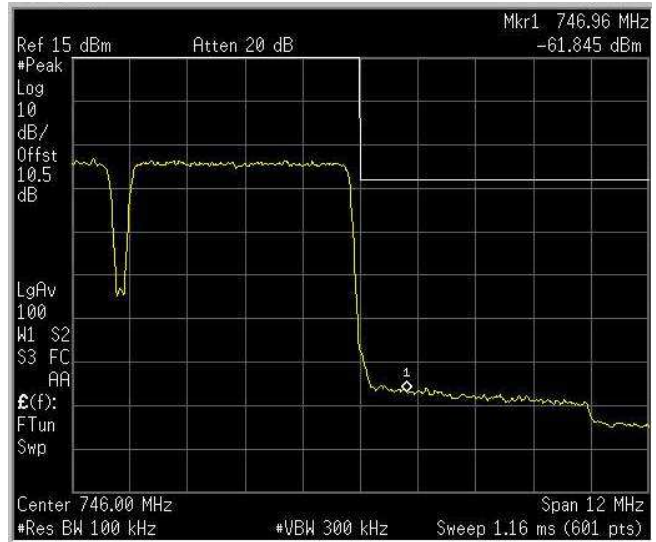
High Band Edge

 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27. 53 (g) Spurious emissions at RF antenna connector		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

Mod. LTE 5MHz (QPSK) (Down-link)

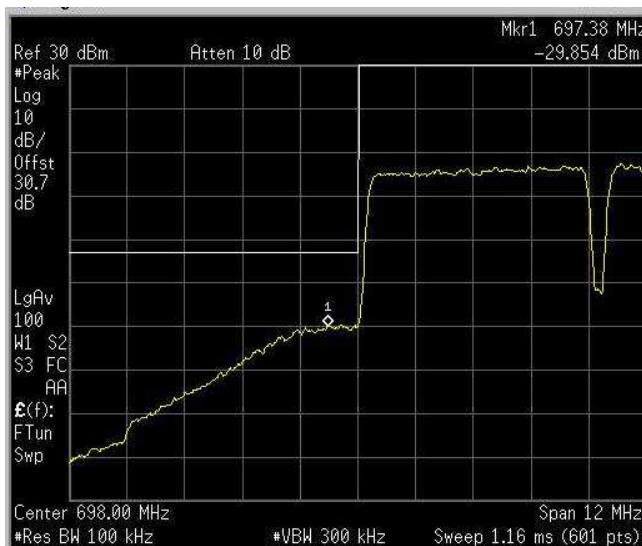


Low Band Edge

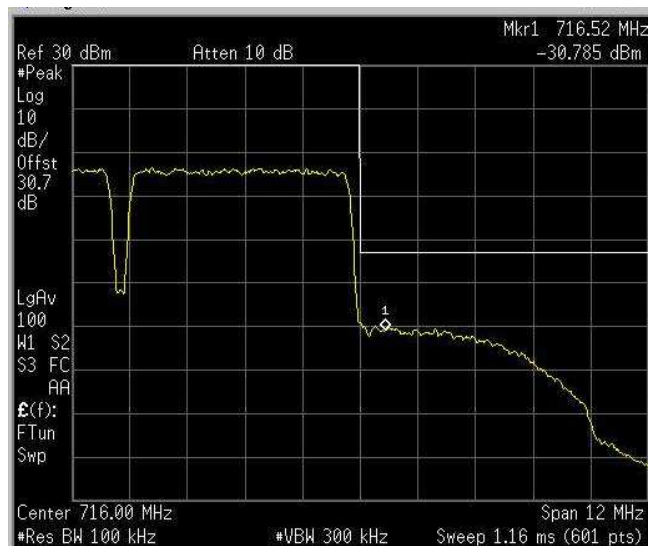


High Band Edge

Mod. LTE 5MHz (QPSK) (Up-link)



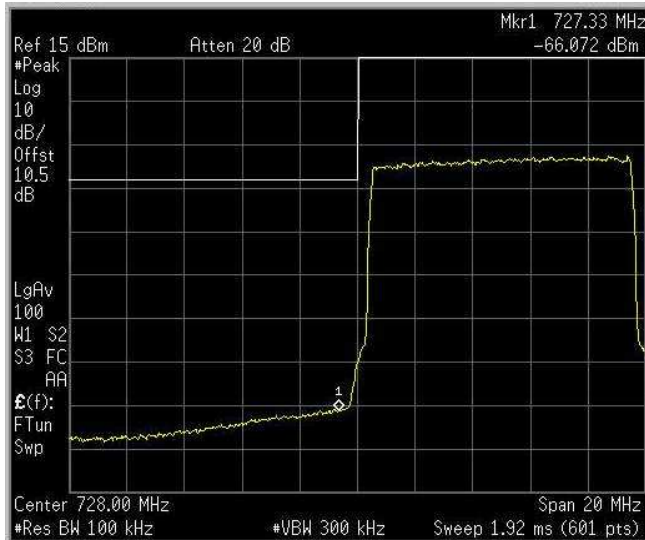
Low Band Edge



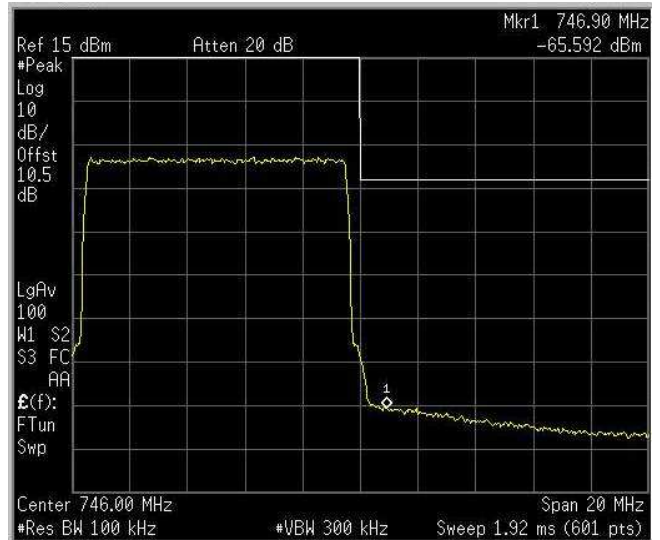
High Band Edge

Section 8: Testing data		Product: TDFE-7SL
Test name: Clause 27. 53 (g) Spurious emissions at RF antenna connector		
Test date: 11-20 June 2012		Test engineer: G. Curioni
Verdict: Pass		Supply input: 100-240 Vac
Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27		

Mod. LTE 10MHz (QAM) (Down-link)

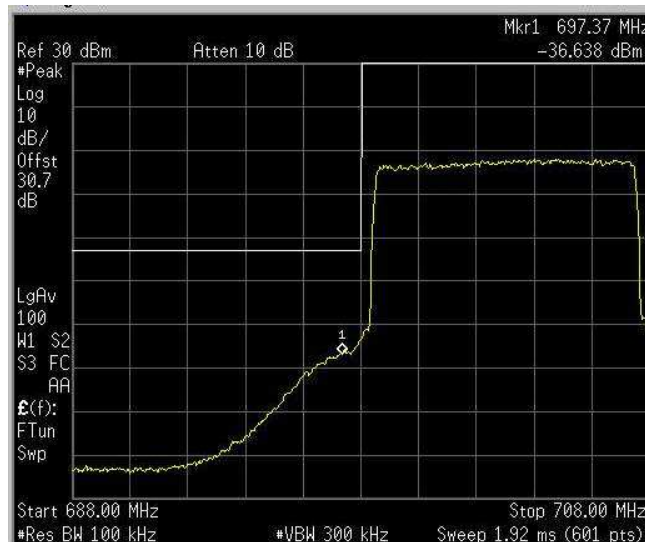


Low Band Edge

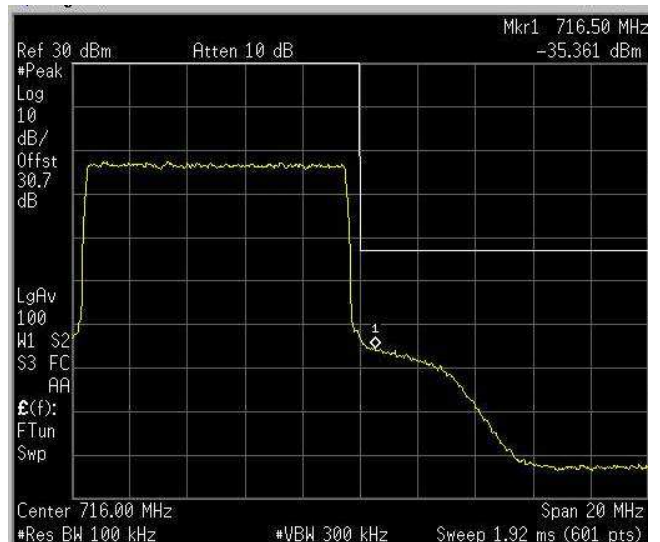


High Band Edge


Mod. LTE 10MHz (QAM) (Up-link)



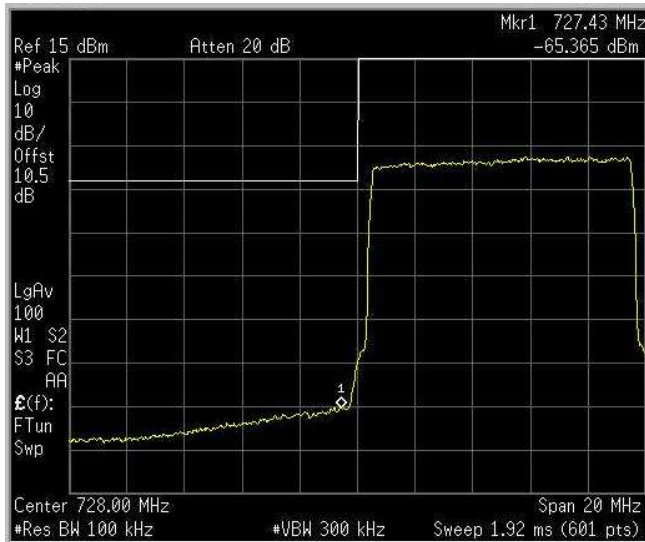
Low Band Edge



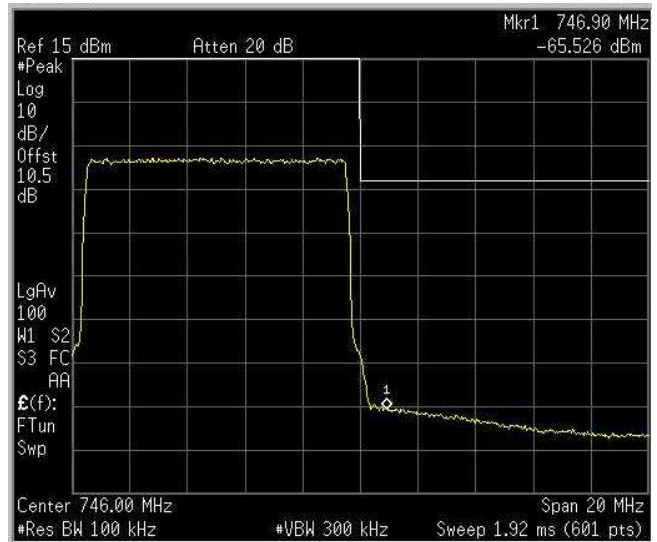
High Band Edge

 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27. 53 (g) Spurious emissions at RF antenna connector		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

Mod. LTE 10MHz (QPSK) (Down-link)

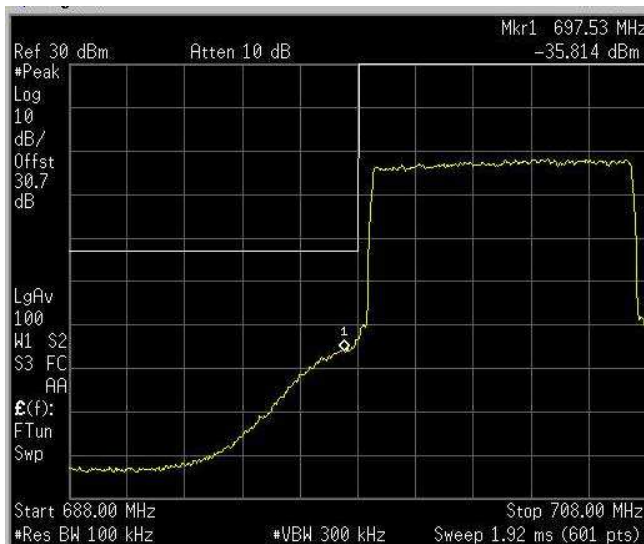


Low Band Edge

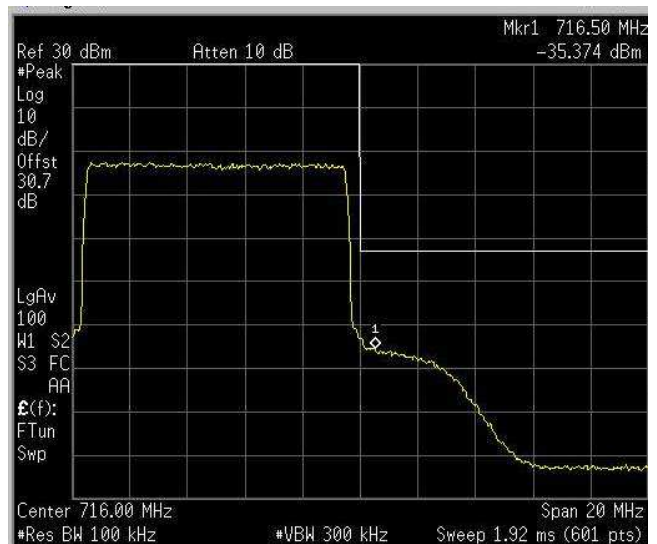


High Band Edge


Mod. LTE 10MHz (QPSK) (Up-link)



Low Band Edge

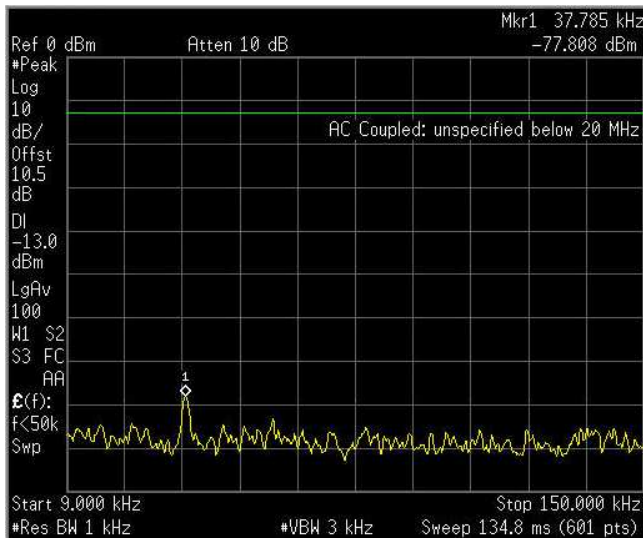


High Band Edge

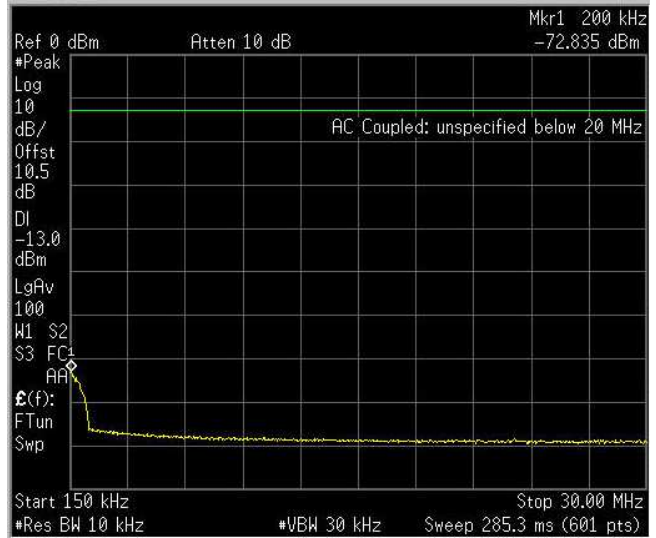
 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27. 53 (g) Spurious emissions at RF antenna connector		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

Clause 24.238 Spurious emissions at antenna terminal,

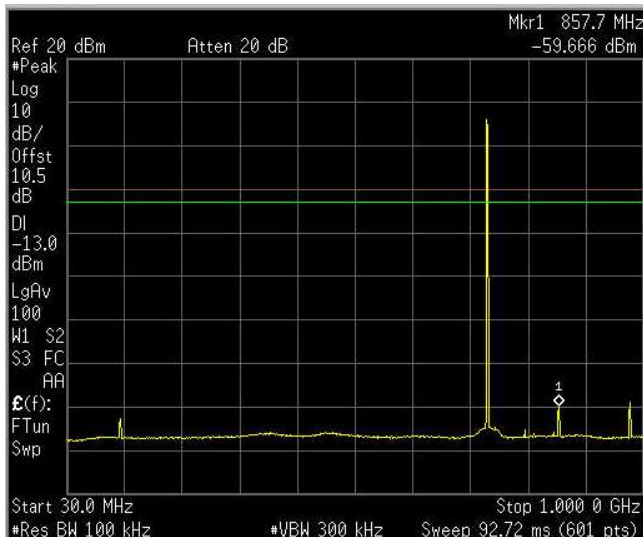
Mod. LTE 1.4MHz (QAM) (Down-link)



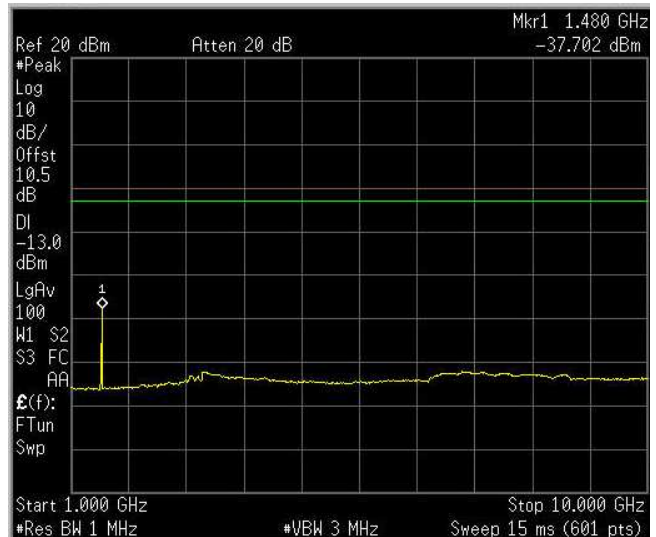
9kHz-150kHz



150kHz-30MHz




30MHz-1GHz

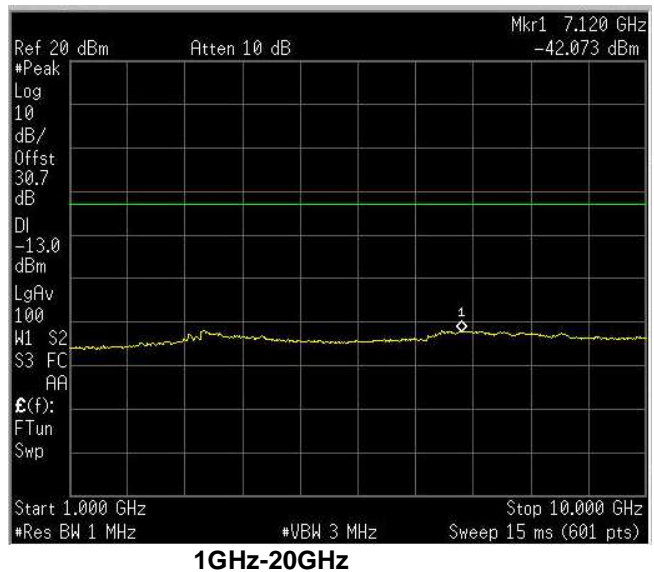
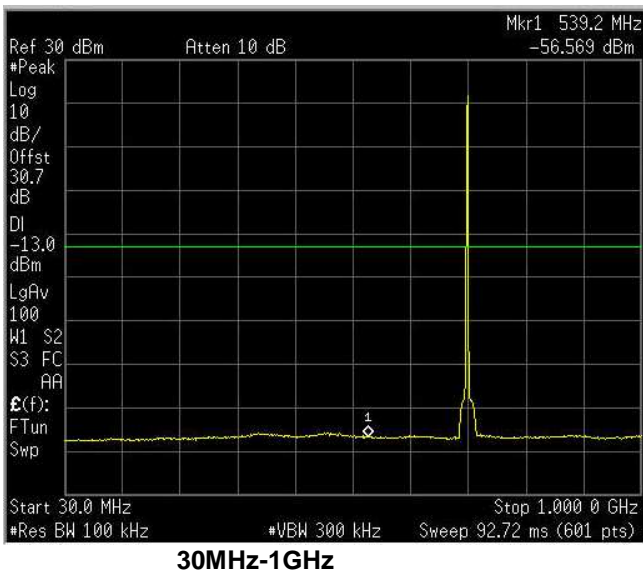
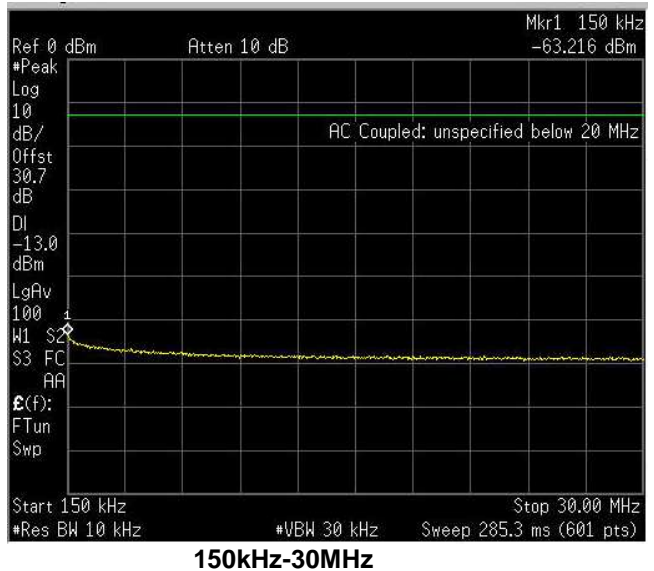
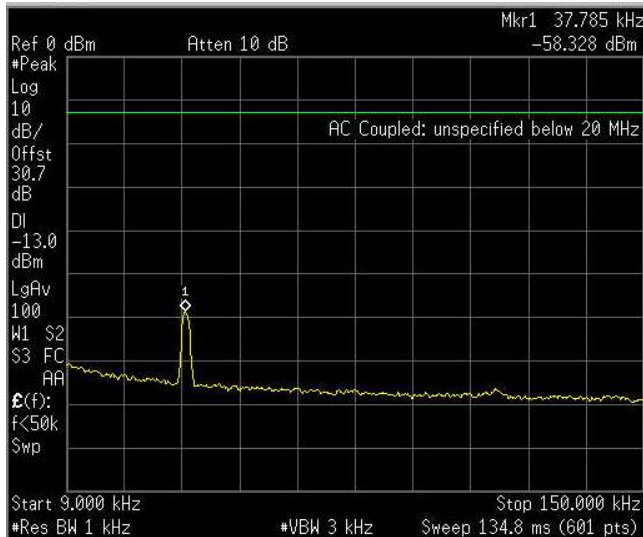


1GHz-10GHz


Only 1,4 QAM (Down-link) spurious emission plots are included here, other modulations spurious emission plots are negligible and the same.

 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27. 53 (g) Spurious emissions at RF antenna connector		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

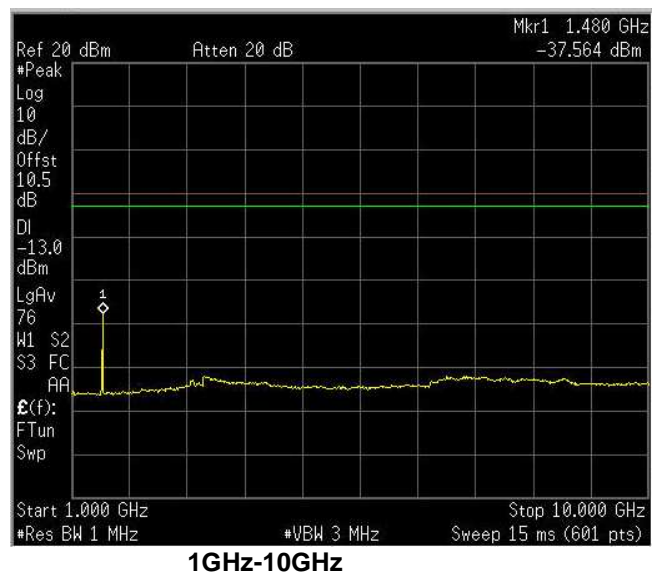
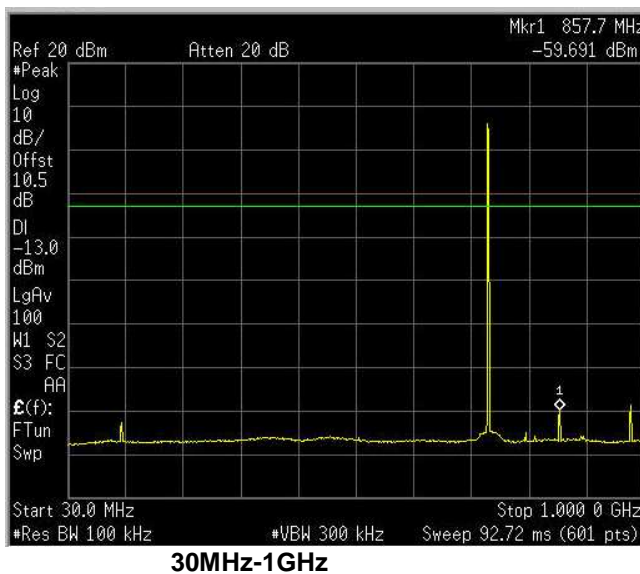
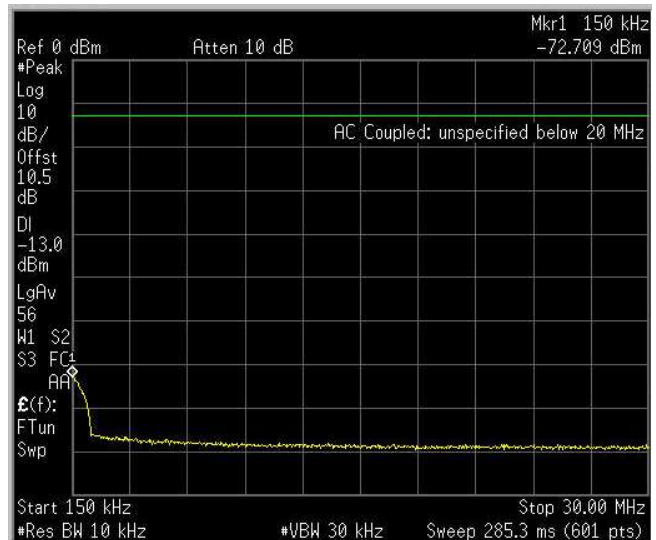
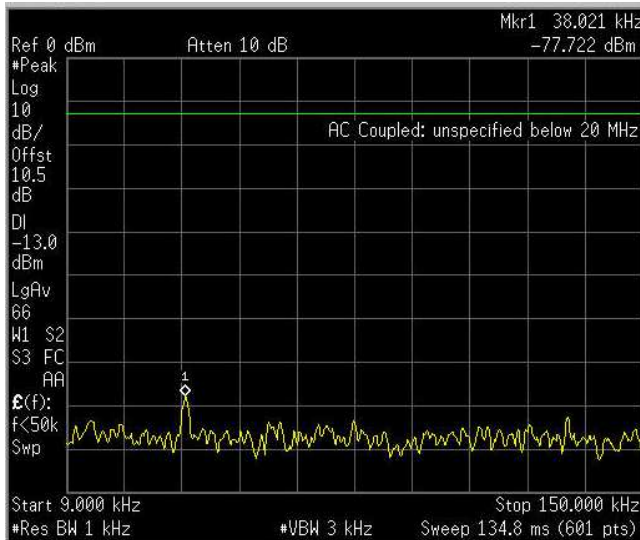
Mod. LTE 1.4MHz (QAM) (Up-link)



Only 1,4 QAM (Up-link) spurious emission plots are included here, other modulations spurious emission plots are negligible and the same.

 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27. 53 (g) Spurious emissions at RF antenna connector		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

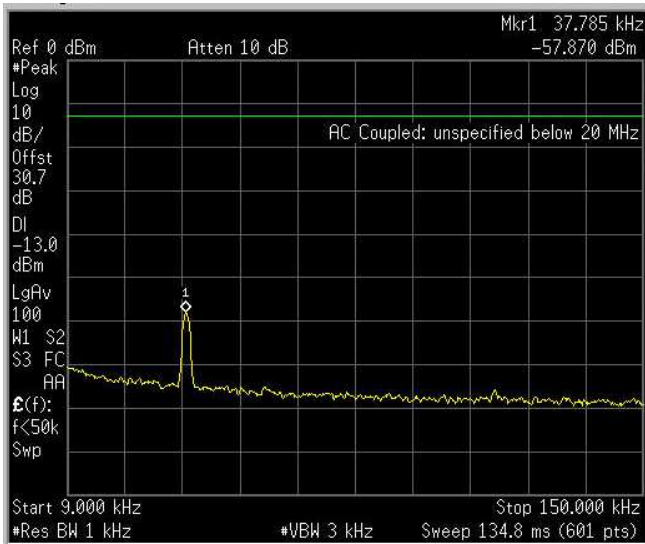
Mod. LTE 1.4MHz (QPSK) (Down-link)



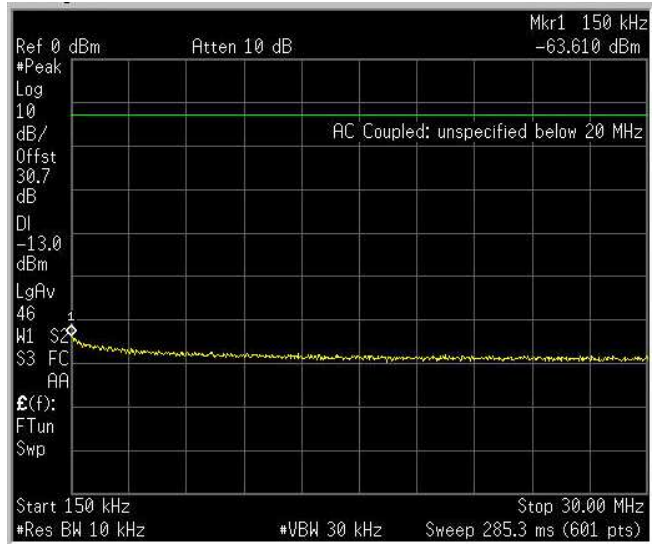
Only 1,4 QPSK (Down-link) spurious emission plots are included here, other modulations spurious emission plots are negligible and the same.

Section 8: Testing data		Product: TDFE-7SL
Test name: Clause 27. 53 (g) Spurious emissions at RF antenna connector		
Test date: 11-20 June 2012		Test engineer: G. Curioni
Verdict: Pass		Supply input: 100-240 Vac
Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27		

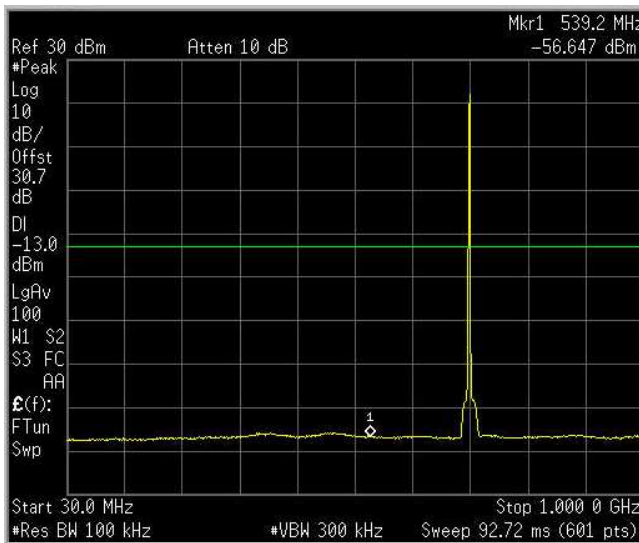
Mod. LTE 1.4MHz (QPSK) (Up-link)



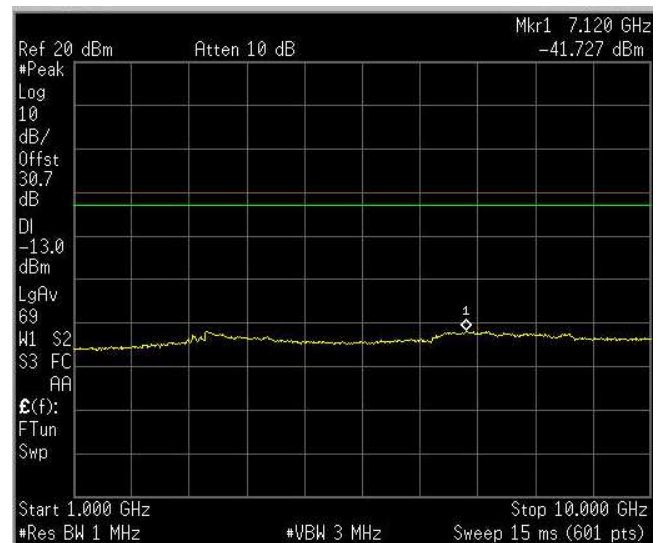
9kHz-150kHz



150kHz-30MHz




30MHz-1GHz

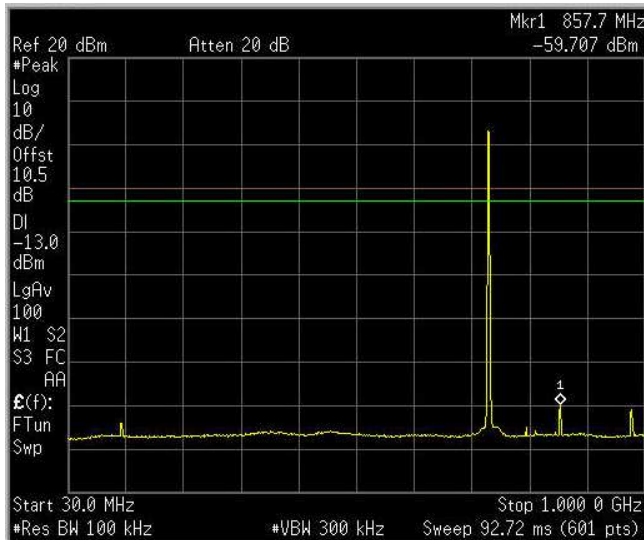


1GHz-10GHz

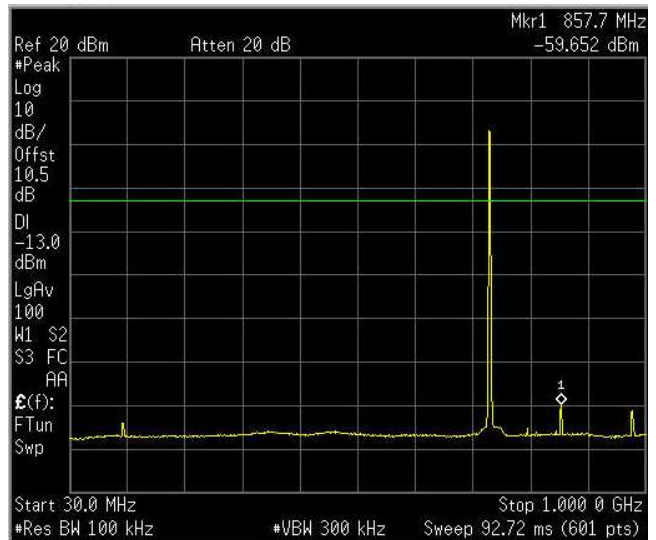
Only 1,4 QPSK (Up-link) spurious emission plots are included here, other modulations spurious emission plots are negligible and the same.

 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27. 53 (g) Spurious emissions at RF antenna connector		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

Mod. LTE 3MHz, only 30M-1G plot (Down-link)

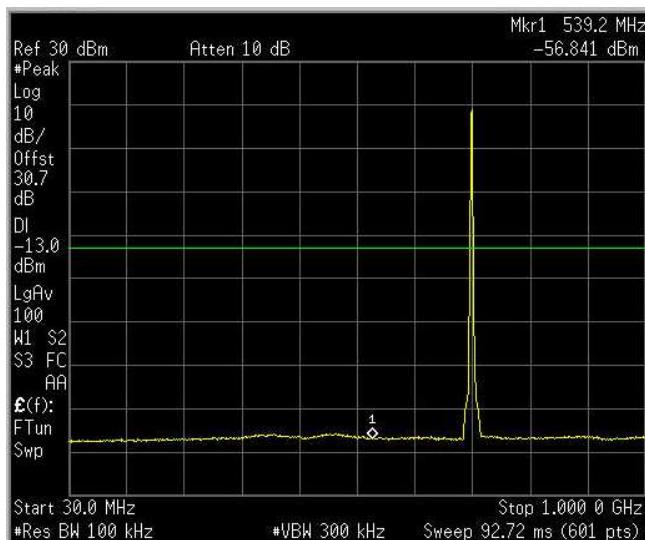


QAM

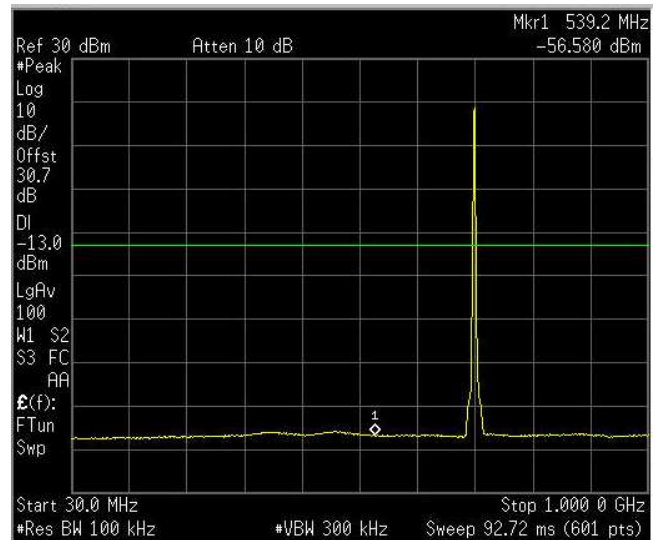


QPSK

Mod. LTE 3MHz, only 30M-1G plot (Up-link)



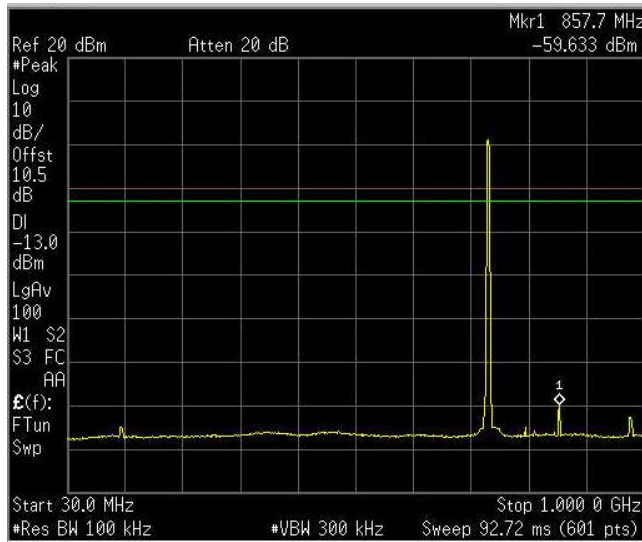
QAM



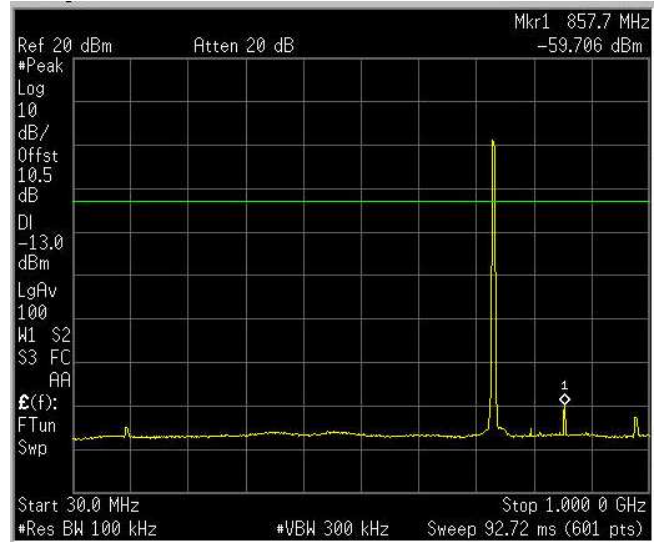
QPSK

Section 8: Testing data		Product: TDFE-7SL
Test name: Clause 27. 53 (g) Spurious emissions at RF antenna connector		
Test date: 11-20 June 2012		Test engineer: G. Curioni
Verdict: Pass		Supply input: 100-240 Vac
Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27		

Mod. LTE 5MHz, only 30M-1G plot (Down-link)

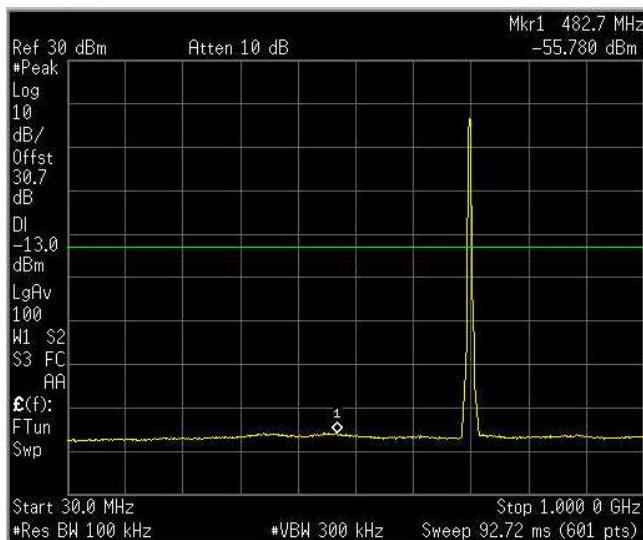


QAM

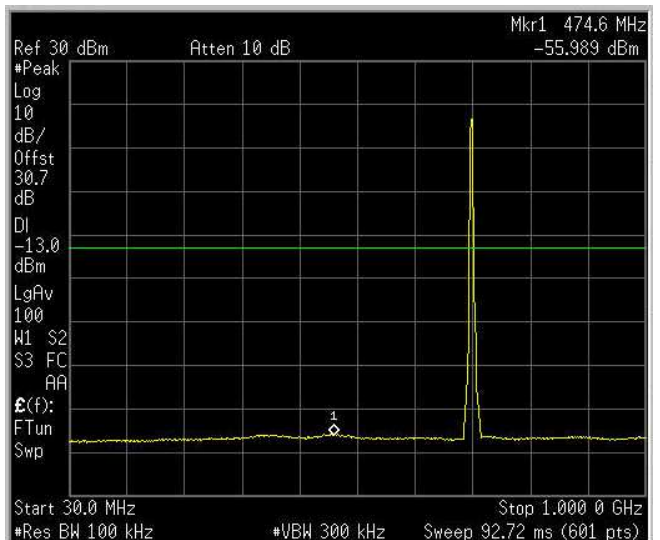


QPSK

Mod. LTE 5MHz, only 30M-1G plot (Up-link)



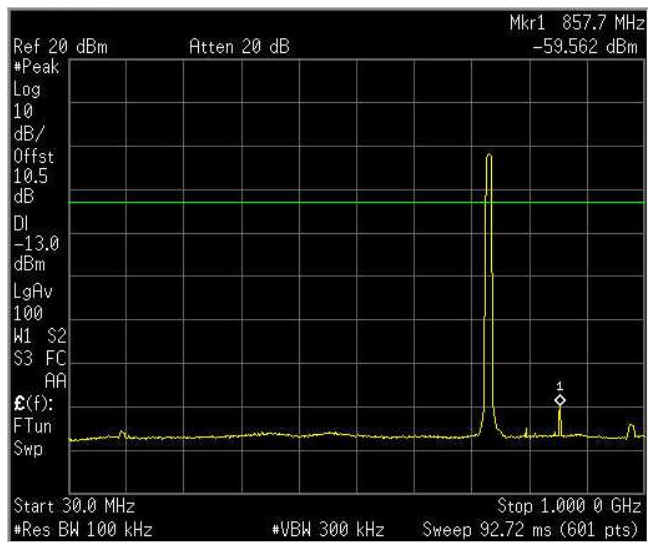
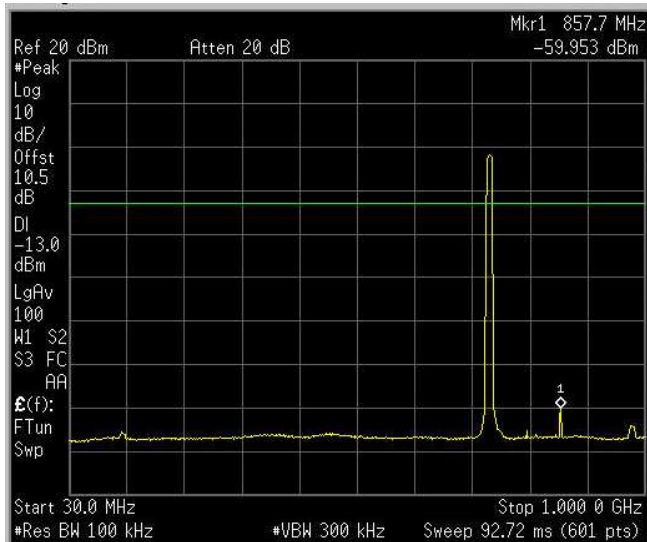
QAM



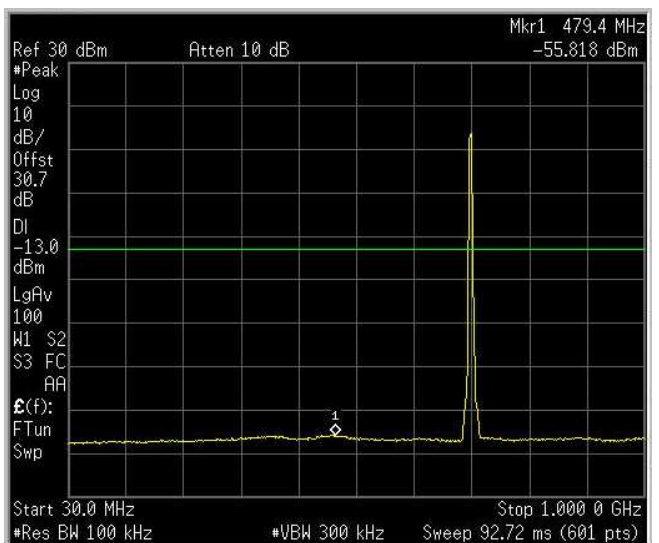
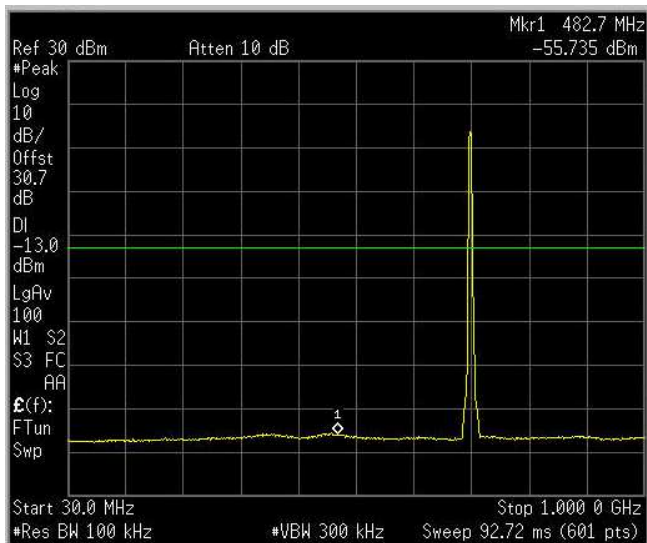
QPSK


Section 8: Testing data		Product: TDFE-7SL
Test name: Clause 27. 53 (g) Spurious emissions at RF antenna connector		
Test date: 11-20 June 2012		Test engineer: G. Curioni
Verdict: Pass		Supply input: 100-240 Vac
Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27		

Mod. LTE 10MHz, only 30M-1G plot (Down-link)



Mod. LTE 10MHz, only 30M-1G plot (Up-link)



 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27.53 (g) Radiated spurious emissions		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			


8.4 Clause 27.53 (g) Radiated spurious emissions

(g) For operations in the 698–746 MHz band and the 776–788 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB.

Compliance with the provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed.

Special notes

- The spectrum was searched from 30 MHz to the 10th harmonic.
- All measurements were performed using a peak detector.
- The measurements were performed at the distance of 3 m.
- RBW within 30–1000 MHz was 100 kHz and 1 MHz above 1 GHz. VBW was wider than RBW.

 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27.53 (g) Radiated spurious emissions		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
	Specification: FCC Part 27		

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.

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 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27.53 (f) Radiated spurious emissions within 1559-1610MHz band		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

8.5 Clause 27.53(f) Radiated spurious emissions within 1559–1610 MHz band

(f) For operations in the 746–763 MHz, 775–793 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to –70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and –80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

Special notes

- The spectrum was searched from 1559–1610 MHz.
- All measurements were performed using a peak detector.
- The measurements were performed at the distance of 3 m.
- RBW was set to 1 MHz and VBW was wider than RBW.

 Nemko Canada Inc., 303 River Rd, Ottawa, ON, Canada, K1V 1H2	Section 8: Testing data		Product: TDFE-7SL
	Test name: Clause 27.53 (f) Radiated spurious emissions within 1559-1610MHz band		
	Test date: 11-20 June 2012		Test engineer: G. Curioni
	Verdict: Pass		Supply input: 100-240 Vac
	Temperature: 25 °C	Air pressure: 860-1060 hPa	Relative humidity: 50 %
Specification: FCC Part 27			

Test data				
Insert plots here				
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.				

NOT APPLICABLE; External Antenna is not provided

8.6 Clause 27.54 Frequency stability

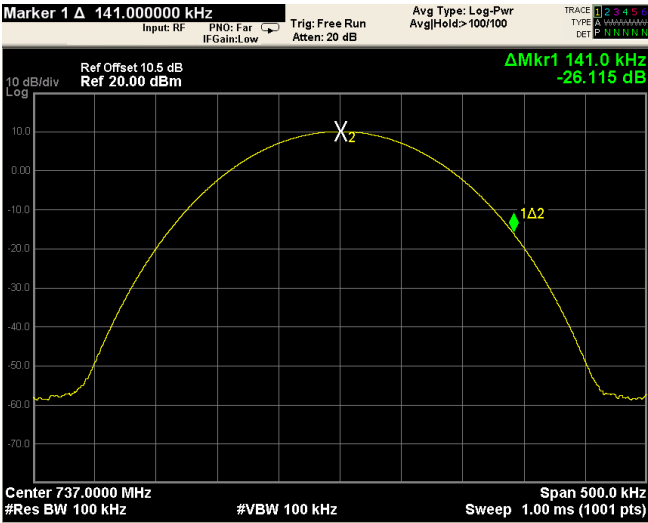
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

Special notes

- 26 dBc points including frequency tolerance were assessed to remain within assigned band.
- The resolution bandwidth was set to 100 kHz, video bandwidth was set to 100 kHz

Test data

26 dBc points measurement:



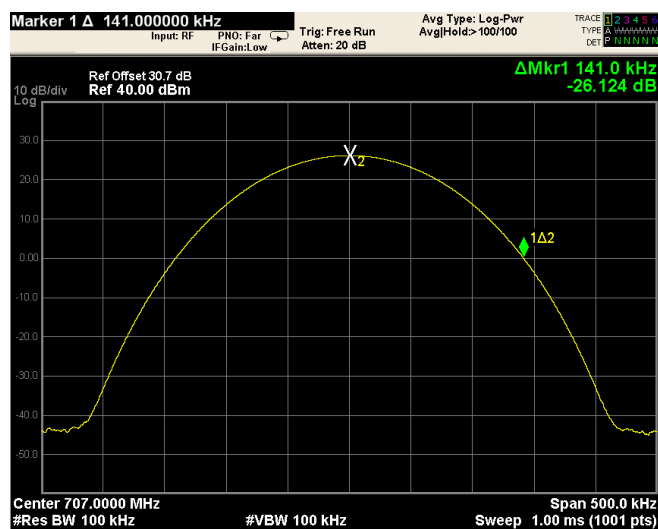
Frequency tolerance measurements:

Test conditions	Δ Frequency (Hz)	Offset (Hz)
+50 °C, Nominal	141000	0
+40 °C, Nominal	141000	0
+30 °C, Nominal	141000	0
+20 °C, +15 %	141000	0
+20 °C, Nominal	141000	Reference
+20 °C, -15 %	141000	0
+10 °C, Nominal	141000	0
0 °C, Nominal	141000	0
-10 °C, Nominal	141000	0
-20 °C, Nominal	EUT doesn't work	
-30 °C, Nominal	EUT doesn't work	

:

Test data

26 dBc points measurement:



Up-link

Frequency tolerance measurements:

Test conditions	Δ Frequency (Hz)	Offset (Hz)
+50 °C, Nominal	141000	0
+40 °C, Nominal	141000	0
+30 °C, Nominal	141000	0
+20 °C, +15 %	141000	0
+20 °C, Nominal	141000	Reference
+20 °C, -15 %	141000	0
+10 °C, Nominal	141000	0
0 °C, Nominal	141000	0
-10 °C, Nominal	141000	0
-20 °C, Nominal	EUT doesn't work	
-30 °C, Nominal	EUT doesn't work	
⋮		

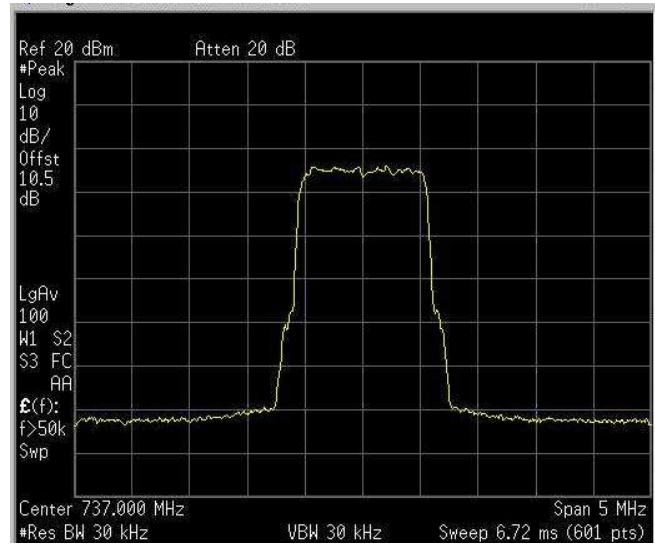
8.7 Clause 2.1049 Occupied bandwidth

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.

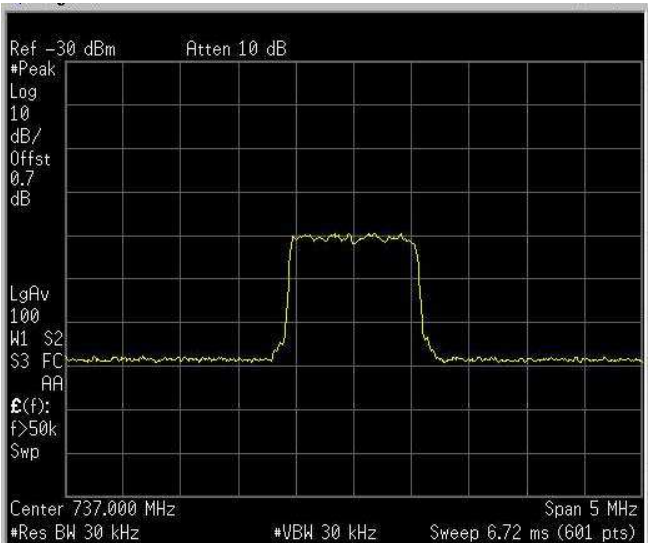
Special notes

- 26 dBc points provided in terms of attenuation below unmodulated carrier.
- RBW was set to 1 % of emissions bandwidth.

Mod. LTE 1.4MHz (QAM) (Down-link)

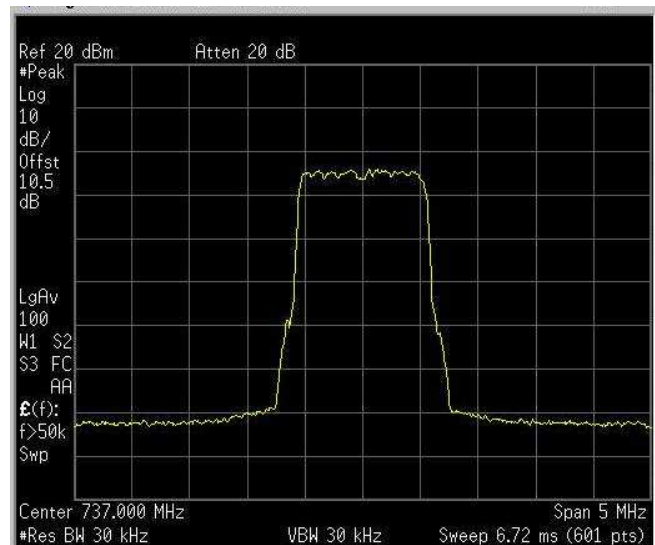


Output

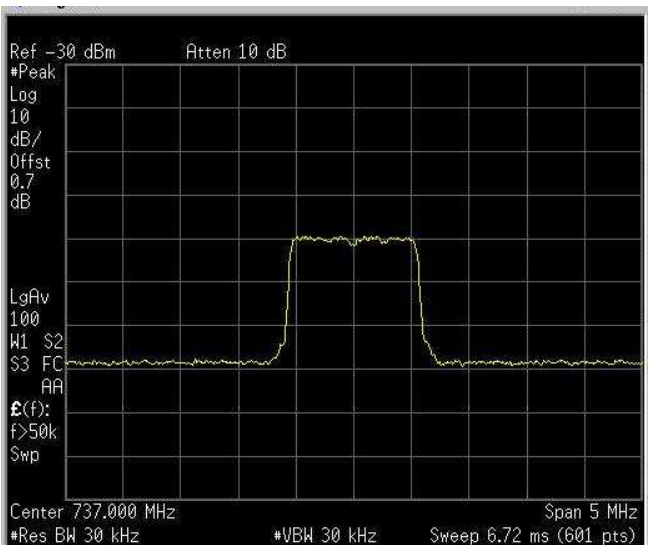


Input

Mod. LTE 1.4MHz (QPSK) (Down-link)

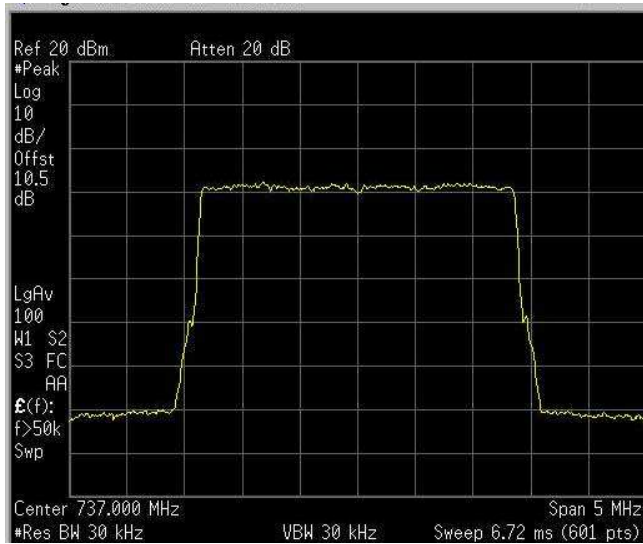


Output

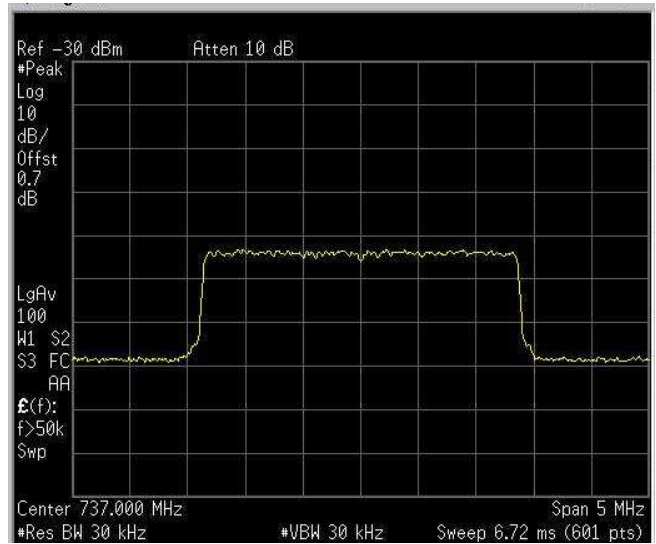


Input

Mod. LTE 3MHz (QAM) (Down-link)

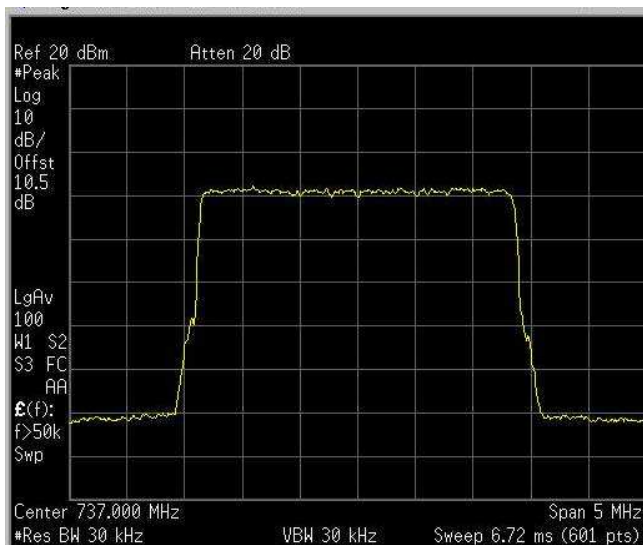


Output

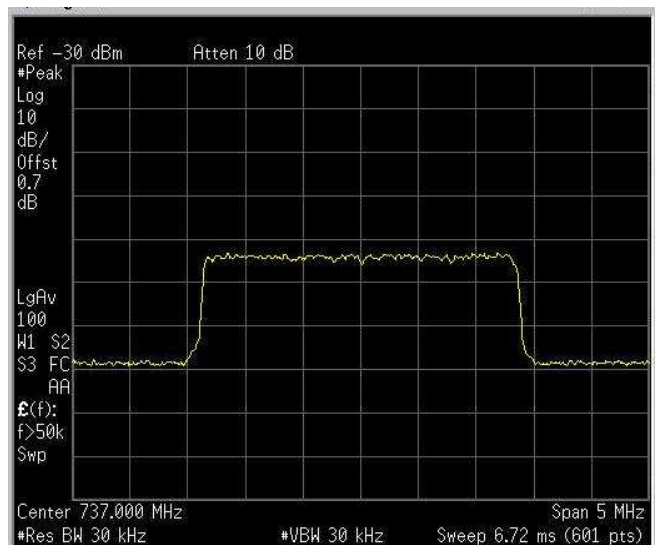


Input

Mod. LTE 3MHz (QPSK) (Down-link)

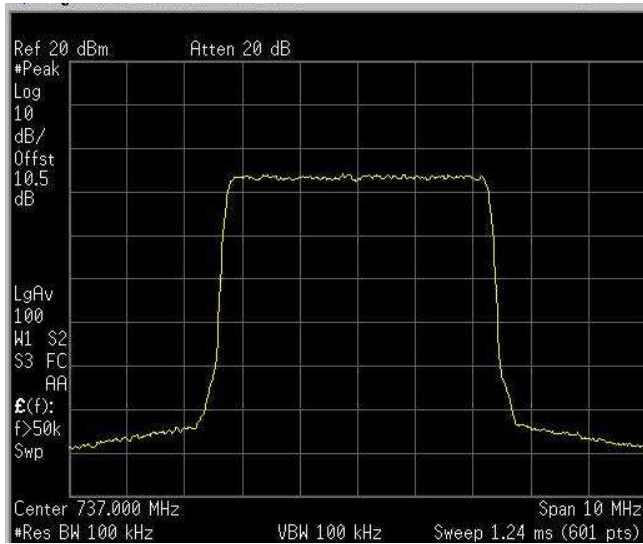


Output

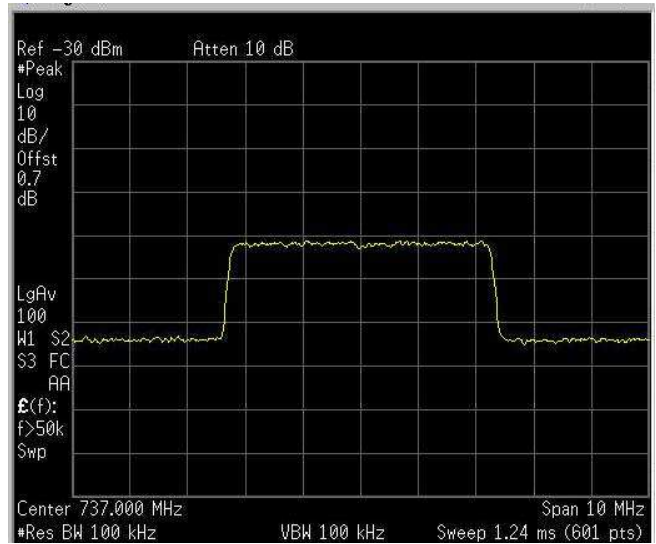


Input

Mod. LTE 5MHz (QAM) (Down-link)

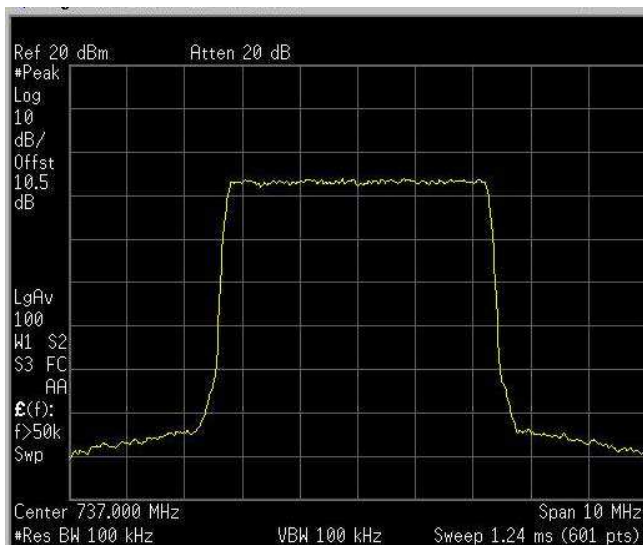


Output

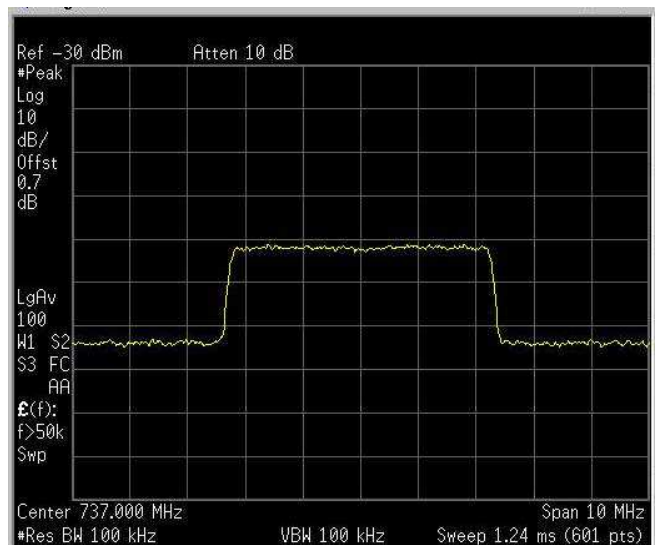


Input

Mod. LTE 5 MHz (QPSK) (Down-link)

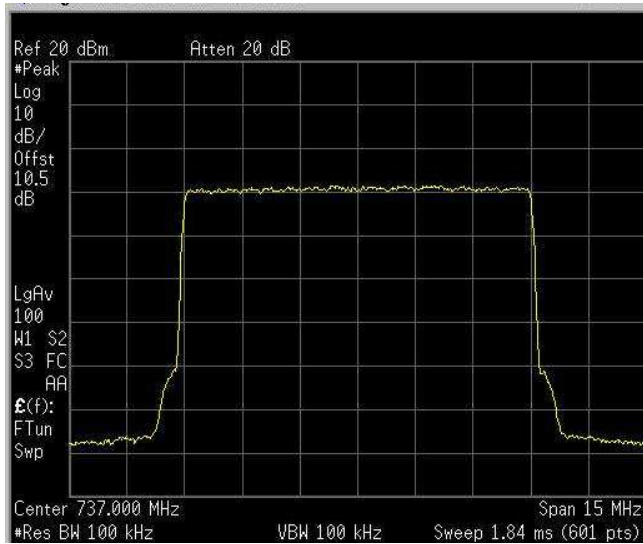


Output

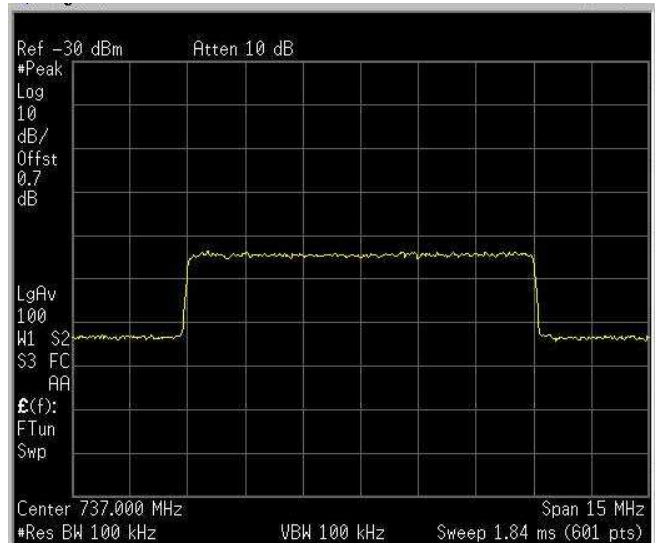


Input

Mod. LTE 10MHz (QAM) (Down-link)

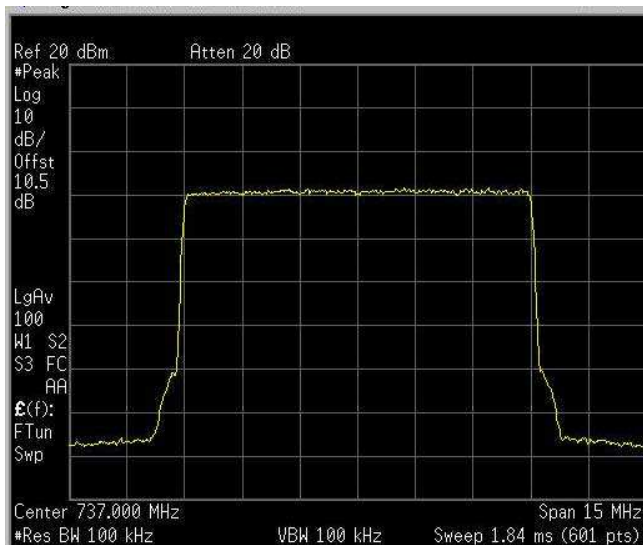


Output

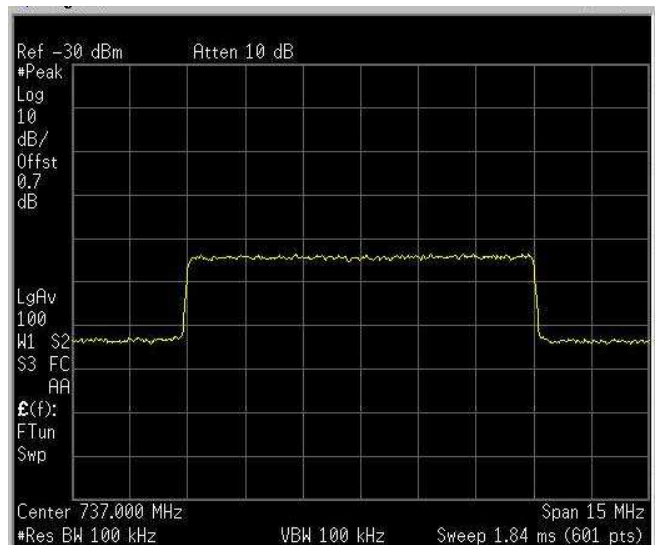


Input

Mod. LTE 10MHz (QPSK) (Down-link)

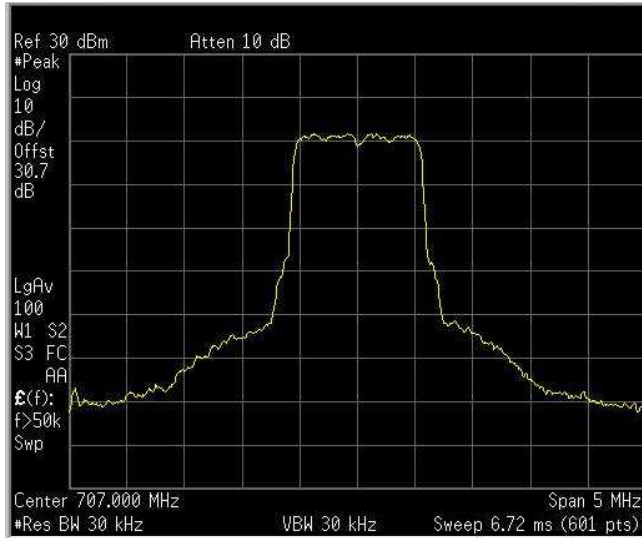


Output

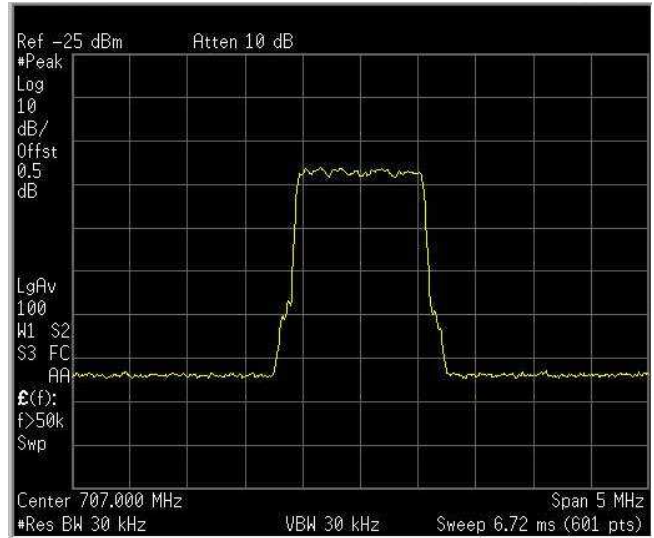


Input

Mod. LTE 1.4MHz (QAM) (Up-link)

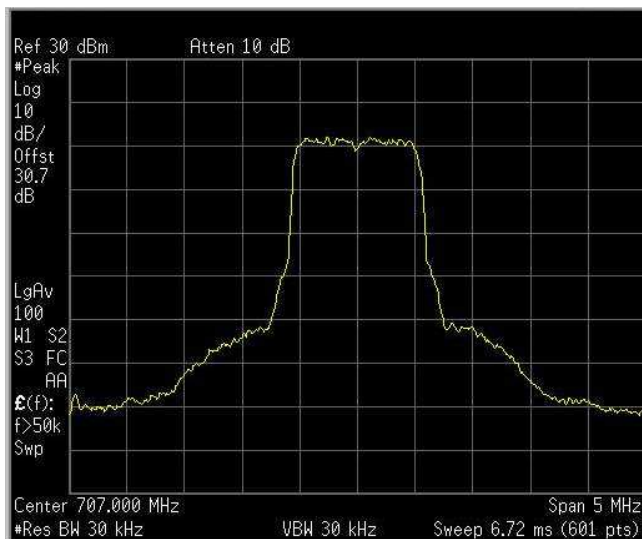


Output

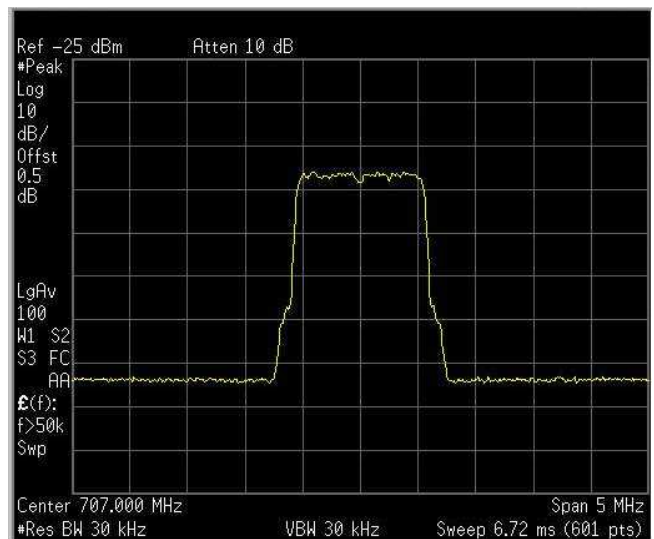


Input

Mod. LTE 1.4MHz (QPSK) (Up-link)

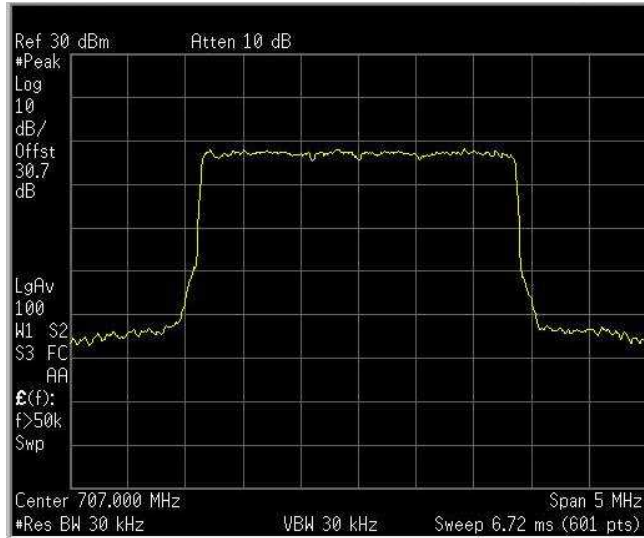


Output

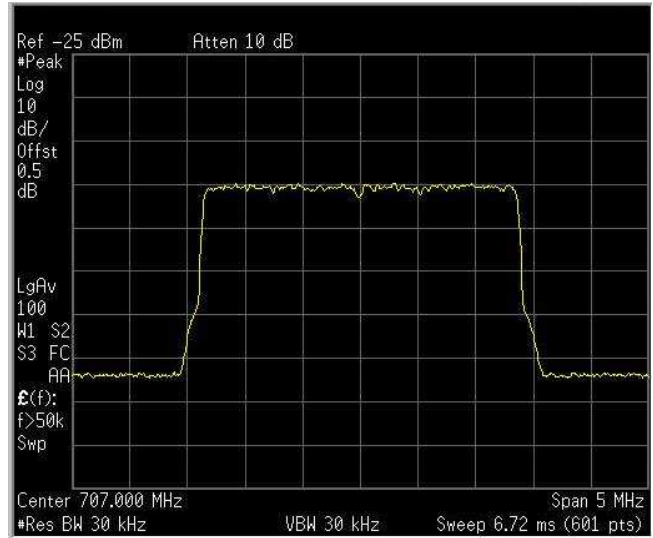


Input

Mod. LTE 3MHz (QAM) (Up-link)

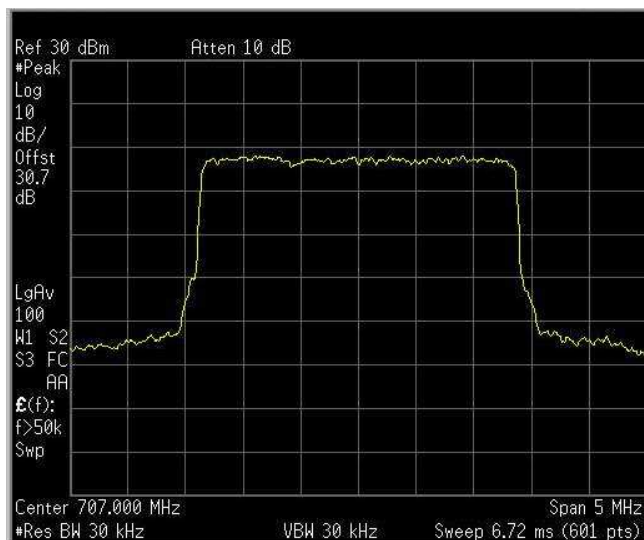


Output

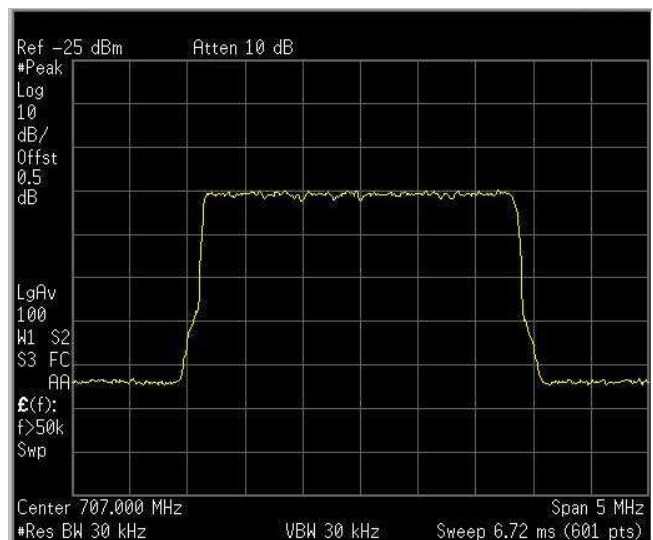


Input

Mod. LTE 3MHz (QPSK) (Up-link)

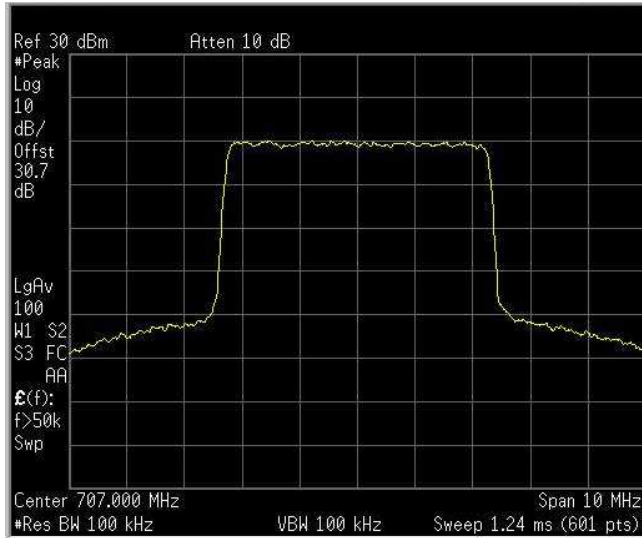


Output

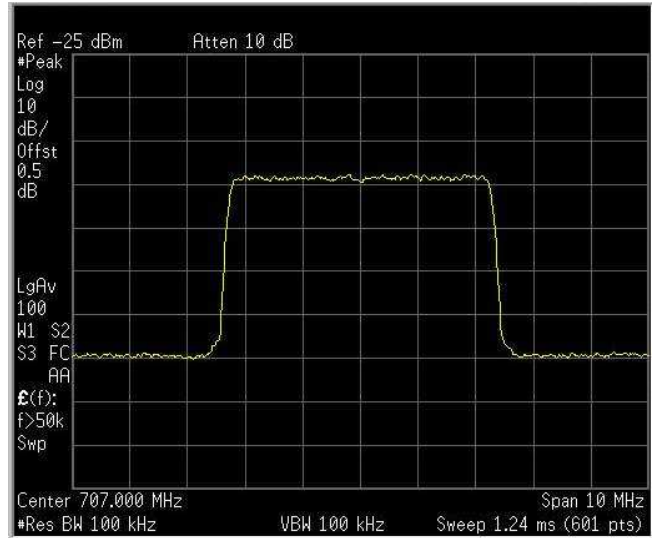


Input

Mod. LTE 5MHz (QAM) (Up-link)

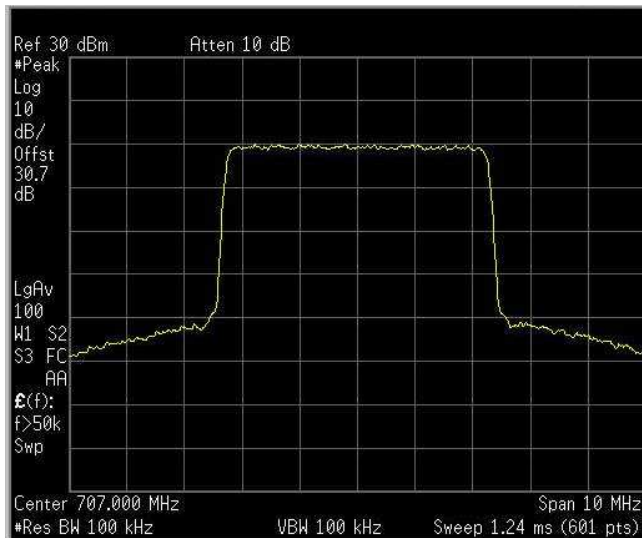


Output

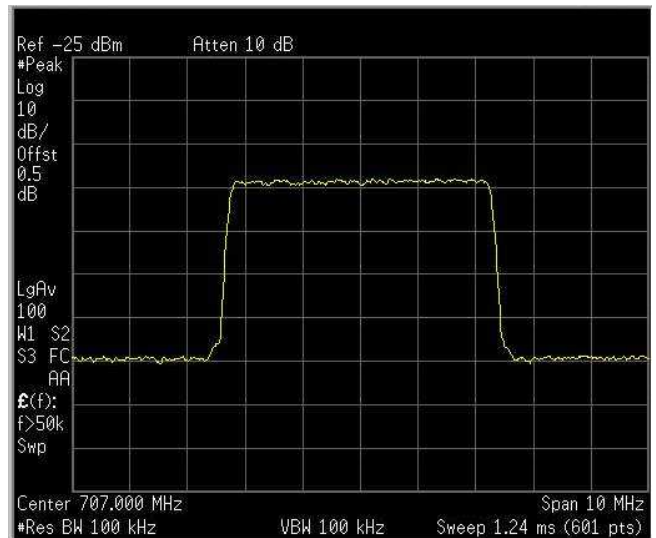


Input

Mod. LTE 5MHz (QPSK) (Up-link)

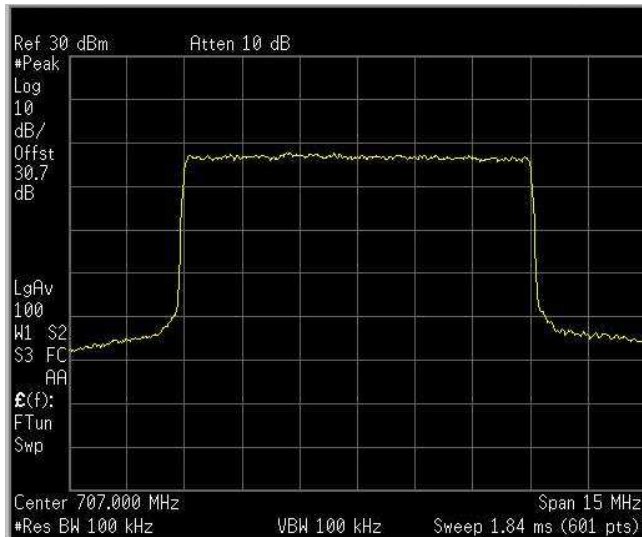


Output

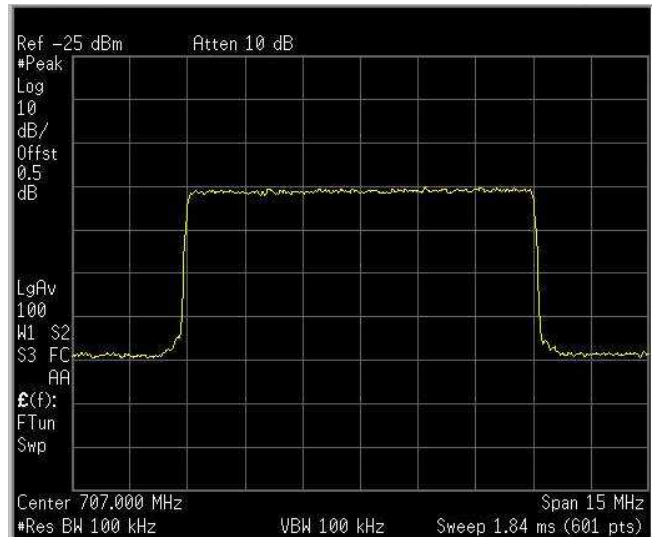


Input

Mod. LTE 10MHz (QAM) (Up-link)

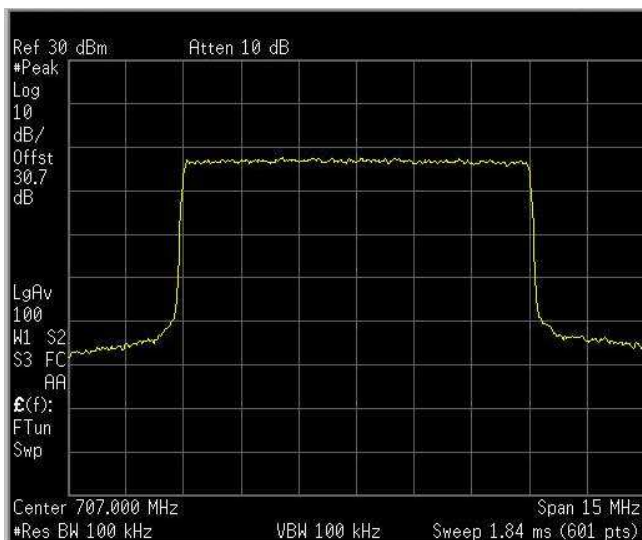


Output

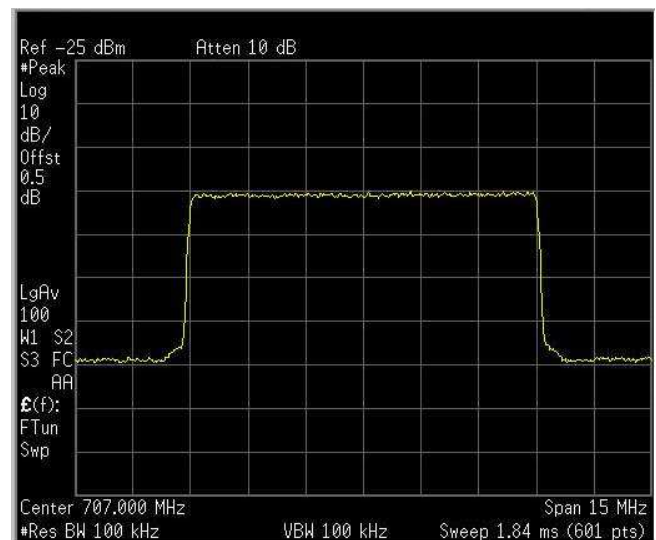


Input

Mod. LTE 10MHz (QPSK) (Up-link)



Output



Input

8.8 Clause 2.1047 Modulation characteristics

Unless specified elsewhere in this part, stations will be authorized emissions as provided for in paragraphs (b) through (n) of this section.

§ 2.1047 Measurements required: Modulation characteristics.

- (a) Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.
- (b) Equipment which employs modulation limiting. A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.
- (c) Single sideband and independent sideband radiotelephone transmitters which employ a device or circuit to limit peak envelope power. A curve showing the peak envelope power output versus the modulation input voltage shall be supplied. The modulating signals shall be the same in frequency as specified in paragraph (c) of §2.1049 for the occupied bandwidth tests.
- (d) Other types of equipment. A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

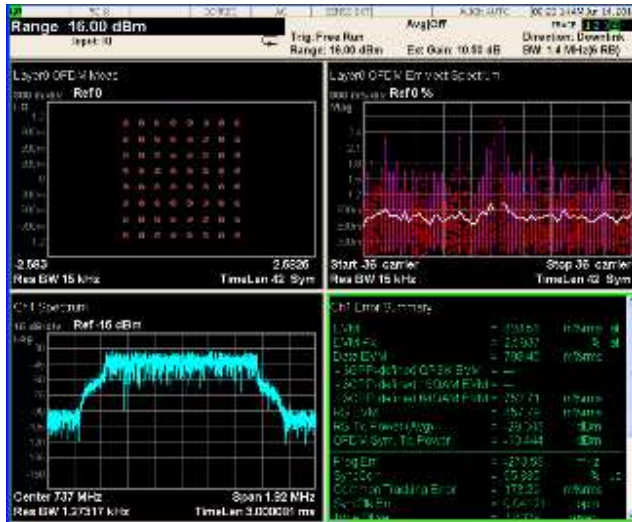
Test date: 2012-06-11

Test results: Pass

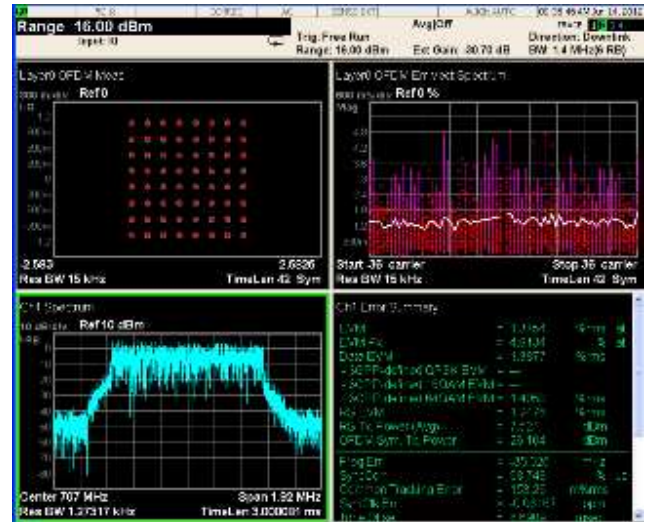
Test data

None

Mod. LTE 1.4MHz (QAM)

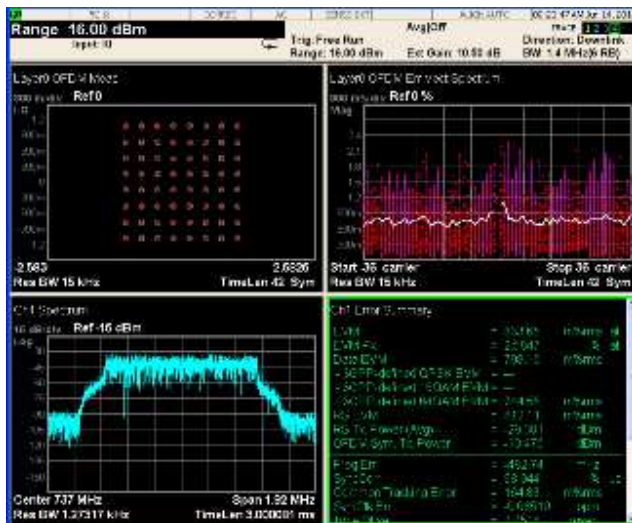


Down-link

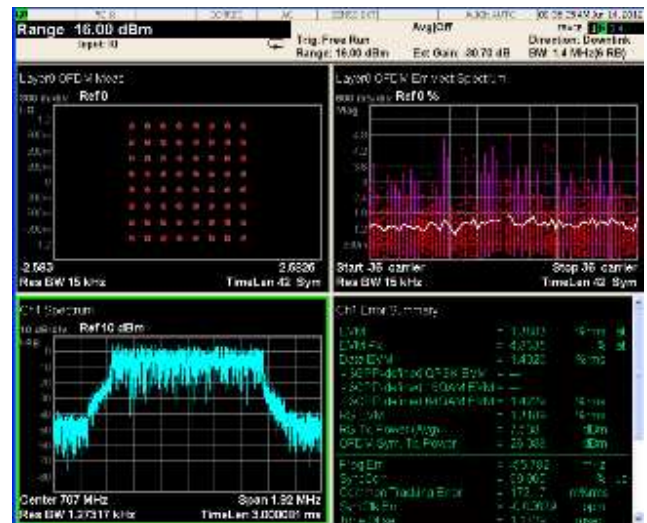


Up-link

Mod. LTE 1.4MHz (QPSK)

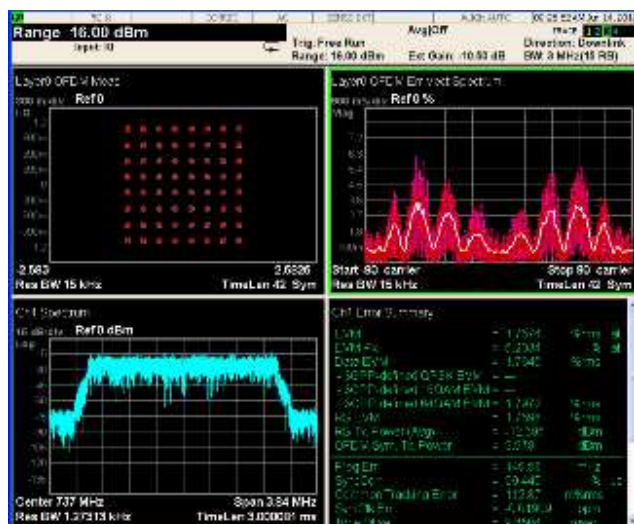


Down-link

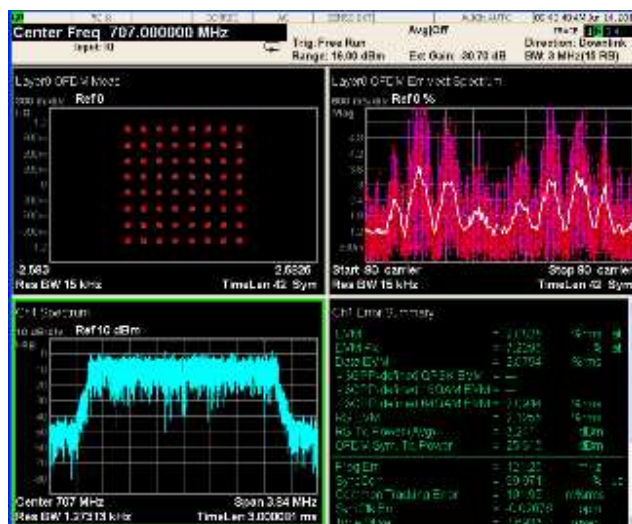


Up-link

Mod. LTE 3MHz (QAM)

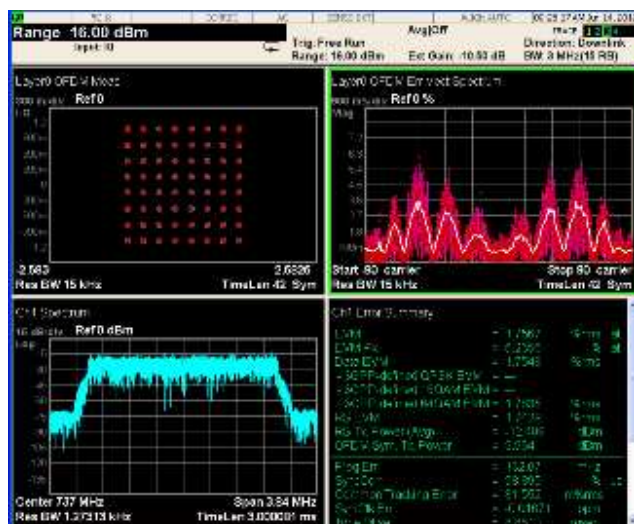


Down-link

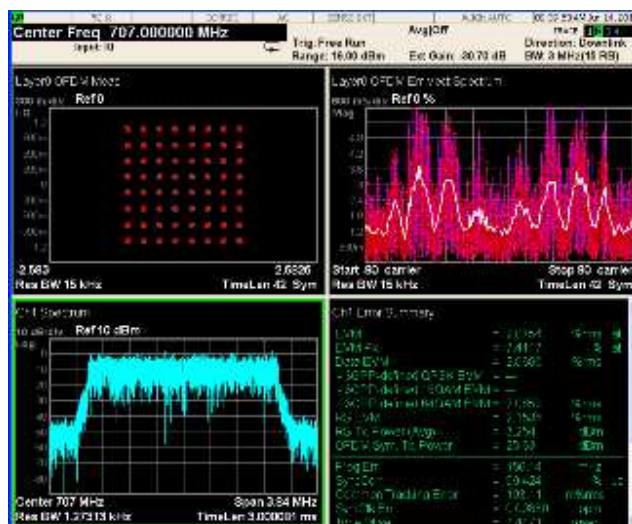


Up-link

Mod. LTE 3MHz (QPSK)

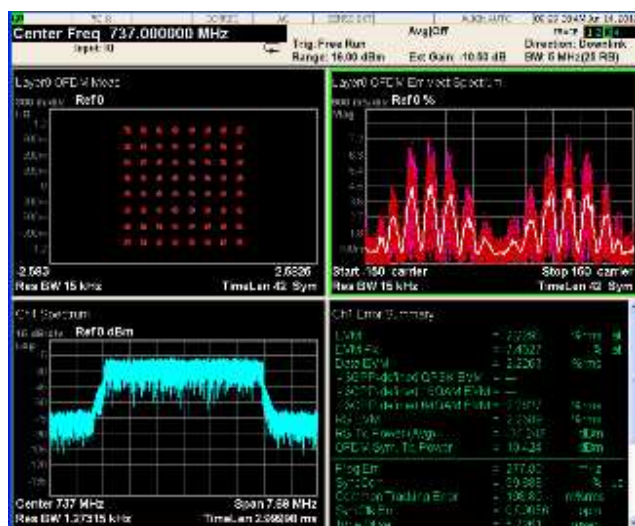


Down-link

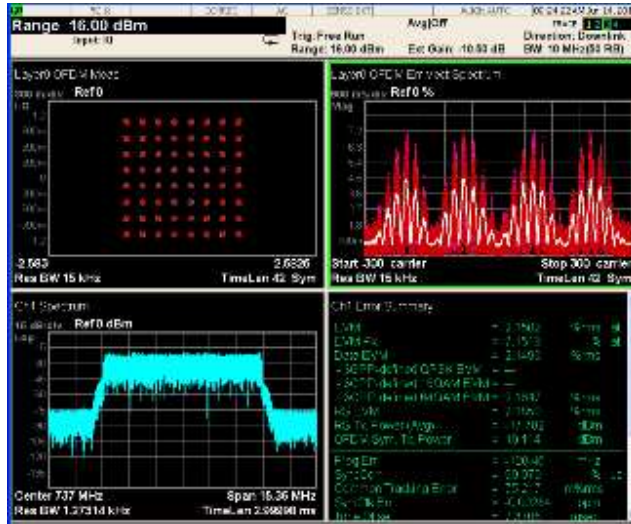


Up-link

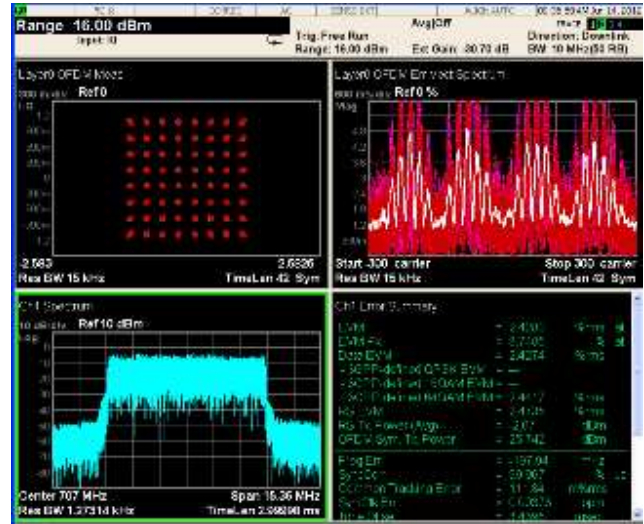
Mod. LTE 5MHz (QAM)



Mod. LTE 10MHz (QAM)

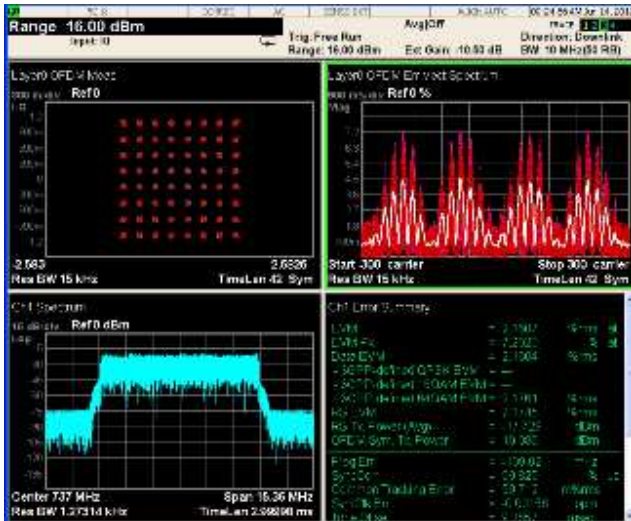


Down-link

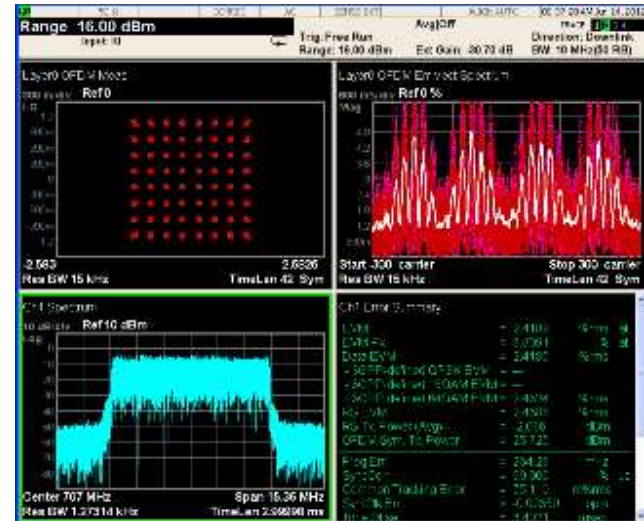


Up-link

Mod. LTE 10MHz (QPSK)

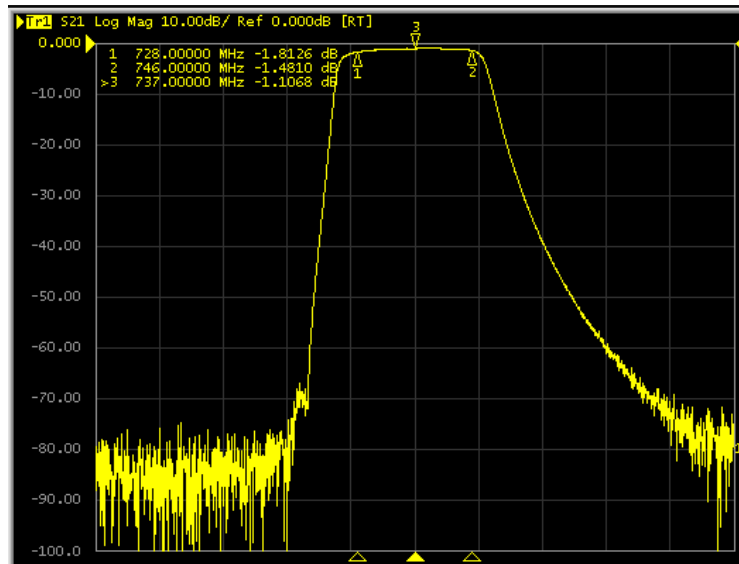


Down-link

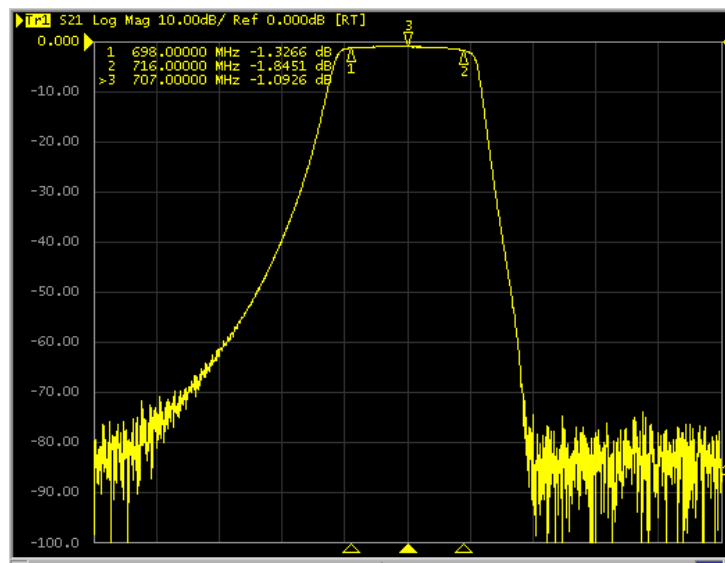


Up-link

Section 9: Filter Frequency Response



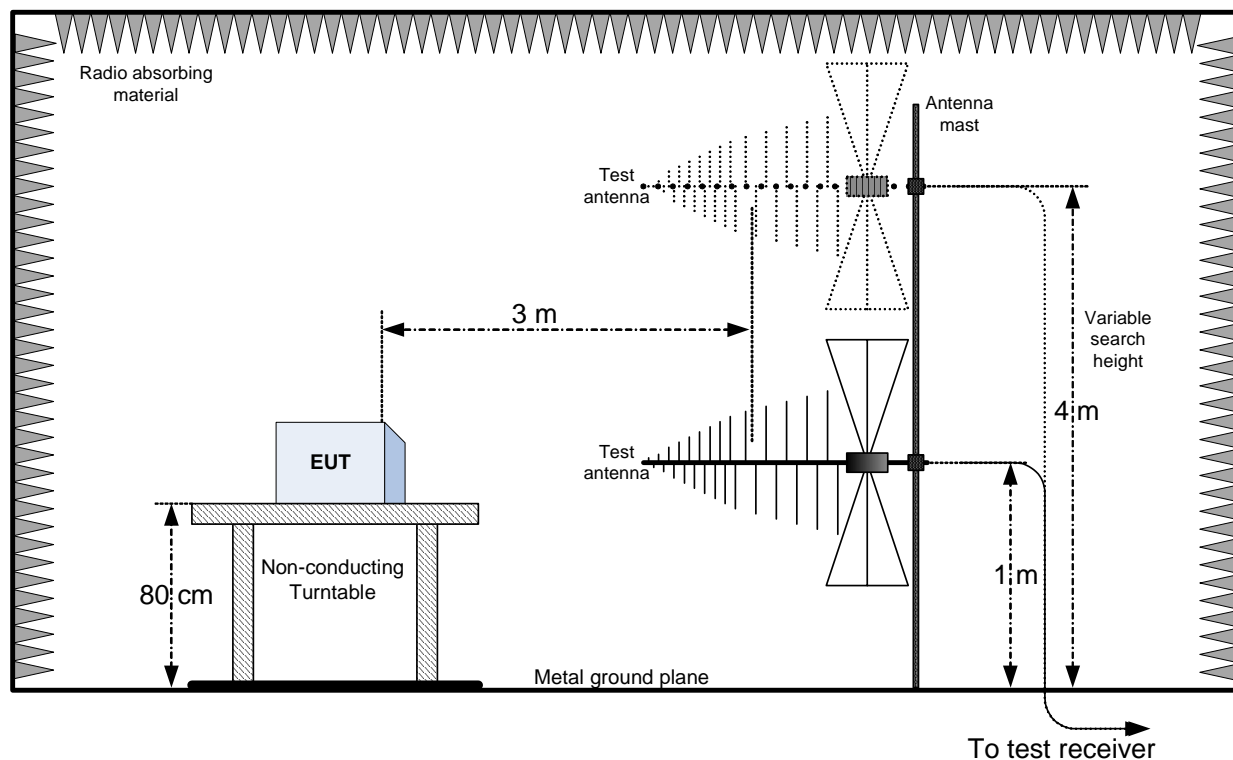
Down-link



Up-link

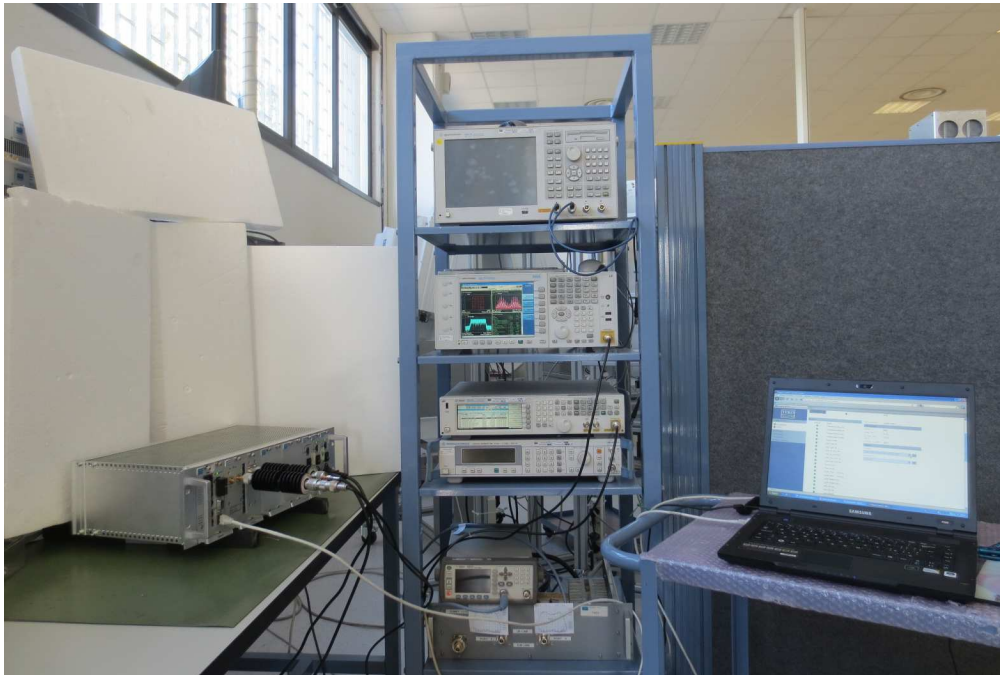
Section 10: Block diagrams of test set-ups

Radiated emissions set-up



Section 11: EUT photos

Photo Set up



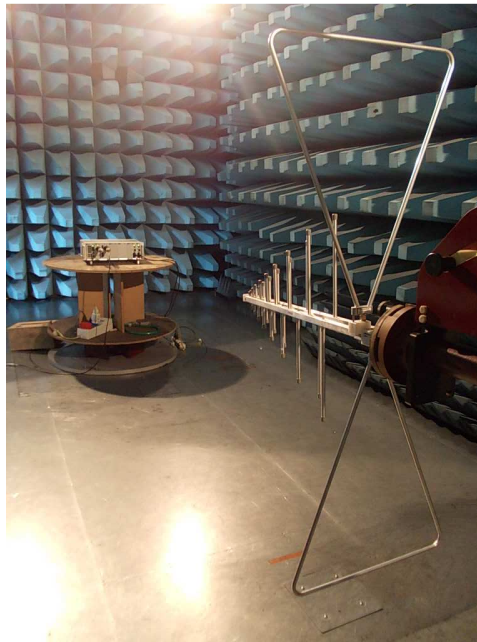


Photo EUT



