

Report number:

#### 253922-4TRFWL

XM2-EP6B

**Equipment Under Test:** TRE7S8SC8A9S19AWAS

Applicant:

**TEKO Telecom Srl** Via Meucci, 24/a I-40024 Castel S. Pietro Terme (BO)

FCC ID:

Test specification:

**Title 47-Telecommunication** Chapter I - Federal Communications Commission Subchapter D – Safety and special radio services Part 90 - Private land mobile services

#### Subpart I – General technical standards \_

Curioni &

Buthis Part Reviewed by: Signature

P. Barbieri, Wireless/EMC Specialist

Reviewed by:

Signature G. Curioni, Wireless/EMC Specialist

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2014/03/27

2014/03/27 Date

Date

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## Section 1: Report summary

This report contains an assessment of apparatus against specifications based upon tests carried out on samples submitted at Nemko Italy SpA.

Test specification:	
FCC Part 90 Private land mobile services	
Subpart I – General technical standards	

Compliance status:	Complies
Exclusions:	None
Non-compliances:	None
Report release history:	Original release
Test location:	Nemko Italy S.p.A. Via Carroccio, 4 I-20853 Biassono (Italy)
Registration number:	481407 (10 m Semi anechoic chamber)

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 Italy's ISO/IEC 17025 accreditation.

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# Section 2: Equipment under test

## 2.1 Identification of equipment under test (EUT)

The following information identifies the EUT under test:	
Type of equipment:	Remote Unit
Product marketing name:	Teko Telecom Srl
Model number:	TRE7S8SC8A9S19AWAS
Serial number:	132059001
Nemko sample number:	
FCC ID:	XM2-EP6B
Date of receipt:	2014-03-03

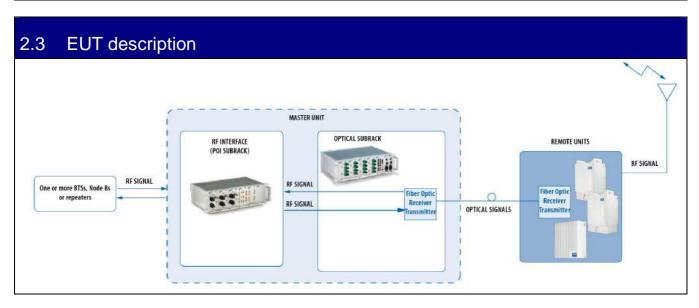
## 2.2 Accessories and support equipment

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

Item # 1	
Type of equipment:	
Brand name:	
Model name or number:	
Serial number:	
Nemko sample number:	
Connection port:	
Cable length and type:	
Item # 2	
Type of equipment:	
Brand name:	
Model name or number:	
Serial number:	
Nemko sample number:	
Connection port:	
Cable length and type:	

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### Section 2: Equipment under test, continued

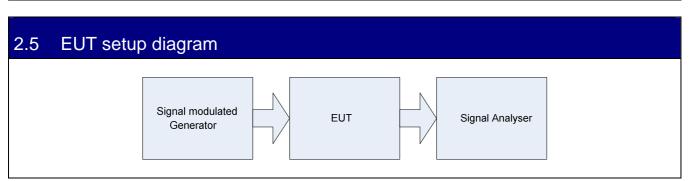


## 2.4 Technical specifications of the EUT

Operating band:	Down Link: 862–869 MHz, Up Link: 817-824 MHz	
Operating frequency:	Wideband	
Modulation type:	iDEN, GSM, EDGE, CDMA, WCDMA, LTE (QAM and QPSK)	
Occupied bandwidth:	Standard	
Emission designator:	iDEN: D7W	
	GSM and EDGE: GXW;	
	CDMA, WCDMA: F9W,	
	LTE: D7W	
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 data:	No antenna provided	
Antenna type:	No antenna provided	
	External Antenna	
	(Equipment that has an external 50 $\Omega$ RF connector)	
Power source	100-240 Vac	

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#### Section 2: Equipment under test, continued



## 2.6 Operation of the EUT during testing

In down-link direction, normal working at max gain with max RF power output

## 2.7 Modifications incorporated in the EUT

None

There were no modifications performed to the EUT during this assessment

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## Section 3: Test conditions

## 3.1 Deviations from laboratory tests procedures

No deviations were made from laboratory test procedures.

## 3.2 Test conditions, power source and ambient temperatures

Normal temperature, humidity and air pressure test conditions	Temperature: 15–30 °C Relative humidity: 30–60 % 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 3: Test conditions, continued			

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

## 3.4 Test equipment

### Client's property:

Identification number	Description	Manufacturer model	s/n	Cal. Due
1a	Vector Signal Generator	Agilent N5182A MXG	MY48180714	May 2015
1b	Vector Signal Generator	Agilent E4438C ESG	MY45094485	Ago 2016
2a	Spectrum Analyzer	Agilent E4440A	US40420470	May 2015
2b	Spectrum Analyzer	Agilent E9020A MXA	MY48011812	Ago 2015
3	Network Analyzer	Agilent E5071B	MY42301133	Ago 2016
4	Climatic chamber	Angelantoni Hygros 600	7237	Nov 2014

#### Property of Nemko Italy:

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle months	Next cal.
Trilog Broad Band Antenna 25-2000 MHz	Schwarzbeck	VULB 9168	VULB 9168- 242	36	02/2015
Trilog Broad Band Antenna 25-8000 MHz	Schwarzbeck	VULB 9162	VULB 9162- 25	36	05/2015
Antenna 1-18 GHz	Schwarzbeck	STLP 9148	STPL 9148- 123	36	02/2015
Double ridge waveguide horn	RFspin	DRH40	061106A40		08/2016
Preamplifier 18-40 GHz	Miteq	JS44	1648665		09/2014
Broadband preamplifier 1-18 GHz	Schwarzbeck	BBV 9718	9718-137	36	09/2014
EMI receiver 20 Hz ÷ 8 GHz	R&S	ESU8	100202	12	02/2015
EMI receiver 20 Hz ÷ 3 GHz	R&S	ESCI	100888	12	08/2014
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		08/2014
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530		08/2014
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
V-Network	Rohde & Schwarz	ESH2-Z5	872 460/041	12	09/2014

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## Section 4: Result summary

## 4.1 FCC Part 90: Test results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

Ν	No : not applicable / not relevant.
Y	Yes : Mandatory i.e. the apparatus shall conform to these tests.
N/T	Not Tested, mandatory but not assessed. (See report summary)

§90.205§2.1046Output powerYF§90.209§2.1049Occupied bandwidthYF§90.210§2.1051Spurious Emissions at the antenna terminalYF§90.210§2.1053Field strength of spurious radiationYF§90.213§2.1055Frequency stabilityNN§90.214-Transient BehaviorNS§2-11-Filter Frequency ResponseSSS					
§90.209§2.1049Occupied bandwidthYF§90.210§2.1051Spurious Emissions at the antenna terminalYF§90.210§2.1053Field strength of spurious radiationYF§90.213§2.1055Frequency stabilityNN§90.214-Transient BehaviorN§2-11-Filter Frequency ResponseI	Part	Test method	Test description	Required	Result
§90.210§2.1051Spurious Emissions at the antenna terminalYF§90.210§2.1053Field strength of spurious radiationYF§90.213§2.1055Frequency stabilityNN§90.214-Transient BehaviorN§2-11-Filter Frequency ResponseI	§90.205	§2.1046	Output power	Y	Pass
§90.210§2.1053Field strength of spurious radiationYF§90.213§2.1055Frequency stabilityNN§90.214-Transient BehaviorN§2-11-Filter Frequency ResponseI	§90.209	§2.1049	Occupied bandwidth	Y	Pass
§90.213§2.1055Frequency stabilityNN§90.214-Transient BehaviorN§2-11-Filter Frequency ResponseI	§90.210	§2.1051	Spurious Emissions at the antenna terminal	Y	Pass
§90.214 – Transient Behavior N   §2-11- Filter Frequency Response Image: Comparison of the second	§90.210	§2.1053	Field strength of spurious radiation	Y	Pass
§2-11- Filter Frequency Response	§90.213	§2.1055	Frequency stability	N	N/A a)
	§90.214	-	Transient Behavior	N	
	§2-11-		Filter Frequency Response		
04/EAD/ I I	04/EAB/			Y	Pass
RF	RF				
Notes:	Notes:				

 NOT APPLICABLE: Modulation/frequency conversion circuitry not in use. No frequency change in EUT (input and output have same frequency)

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## Appendix A: Test results

### Clause 90.205 Output power

Applicants for licenses must request and use no more power than the actual power necessary for satisfactory operation. Except where otherwise specifically provided for, the maximum power that will be authorized to applicants whose license applications for new stations are filed after August 18, 1995 is as follows in FCC Part 90.205 (a) through (r).

For measurements conducted pursuant to paragraphs (a) and (b) of § 2.1046, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

### Test date: 2014-03-07

Test results: Pass

#### Special notes

Conducted measurement were performed:

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

In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13dB

Only conducted measurement at antenna connector was possible, no antenna provided by manufacturer

(N) Nemko	Appendix A: Test Result
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#### Test data

Conducted measurement

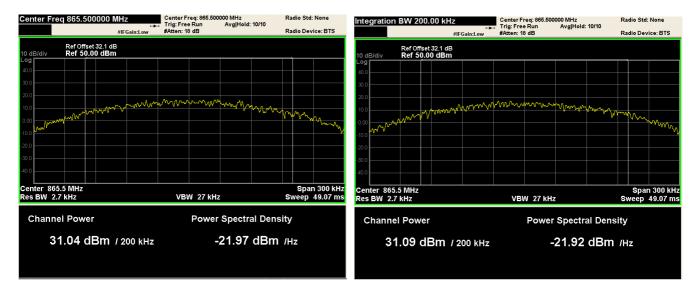
Test data					
Direction	Modulation	Frequency (MHz)	RF output channel Power (dBm)	RF output channel Power (W)	PAR (dB)
Down-link	iDEN (25 kHz)	865.5	31.09	1.29	3.15
Down-link	GSM (200 kHz)	865.5	31.04	1.27	0,07
Down-link	EDGE (200 kHz)	865.5	31.09	1.29	3.27
Down-link	CDMA (1,25MHz)	865.5	31.15	1.30	9.38
Down-link	WCDMA (5MHz)	865.5	31.10	1.29	11.29
Down-link	LTE (QAM, 1,4MHz)	865.5	31.00	1.25	10,46
Down-link	LTE (QPSK, 1,4MHz)	865.5	31.09	1.29	9.87

#### Mod. iDEN



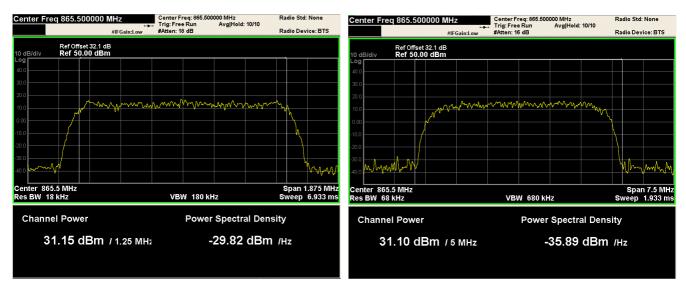
#### Mod. GSM

#### Mod. EDGE



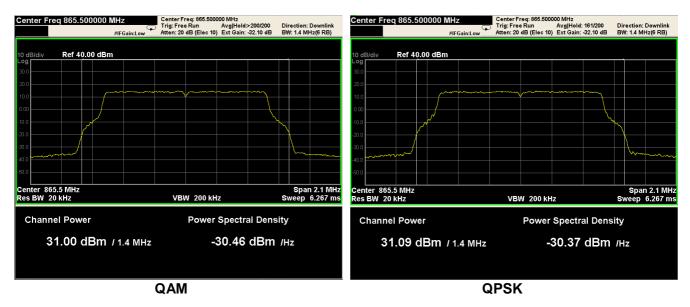
N Nemko	Appendix A: Test Result
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#### Mod. CDMA



#### Mod. WCDMA

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



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## Clause 90.209 Occupied bandwidth

Unless specified elsewhere, channel spacings and bandwidths that will be authorized in the following frequency bands are given in the following table:

Standard Channel Spacing/Bandwidth

Frequency Band	Channel Spacing	Authorized Bandwidth
(MHz)	(kHz)	(kHz)
Below 25	_	_
25–50	20	20
72–76	20	20
150–174	7.5	20/11.25/6
216–220	6.25	20/11.25/6
220–222	5	4
406–512	6.25	20/11.25/6
806-809/851-854	12.5	20
809-824/854-869	25	20
896-901/935-940	12.5	13.6
902–928	_	-
929–930	25	20
1427–1432	12.5	12.5
2450–2483.5	_	_
Above 2500	_	_

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Test date: 2014-03-07

Test results: Pass

#### Test data

Resolution bandwidth was set wider or equal than occupied bandwidth.

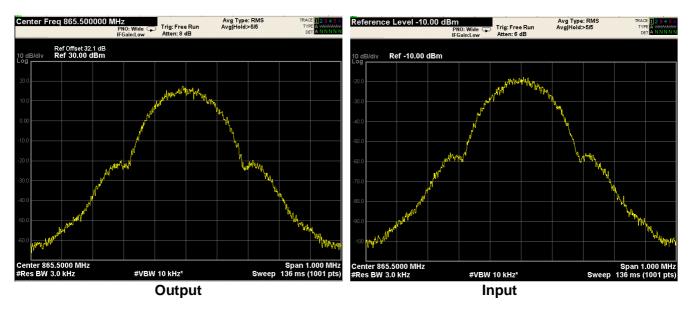
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Appendix A: Test Result Report Number: **253922-4** Specification: FCC 90

#### Mod. iDEN (QAM)

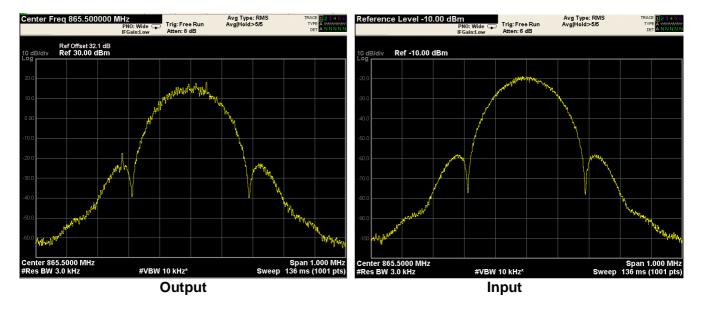


#### Mod. GSM (Down-link)

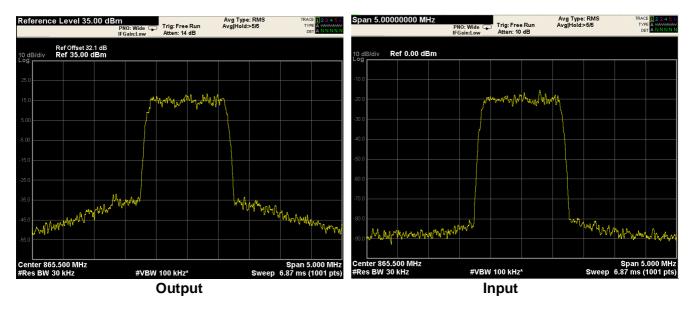


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#### Mod. EDGE (Down-link)

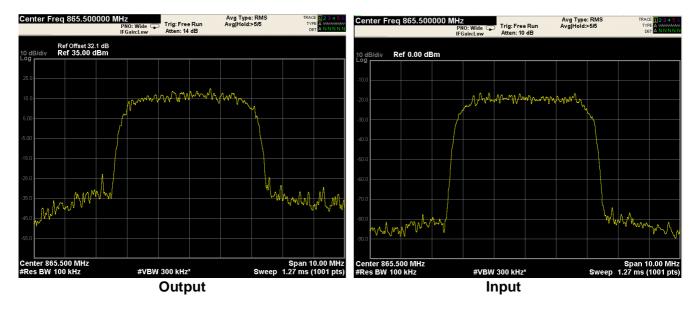


### Mod. CDMA (Down-link)

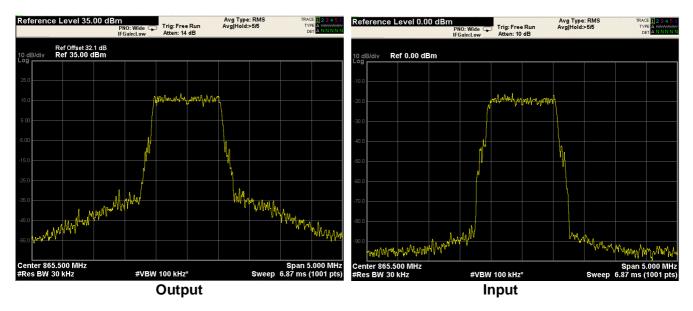


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#### Mod. WCDMA (Down-link)

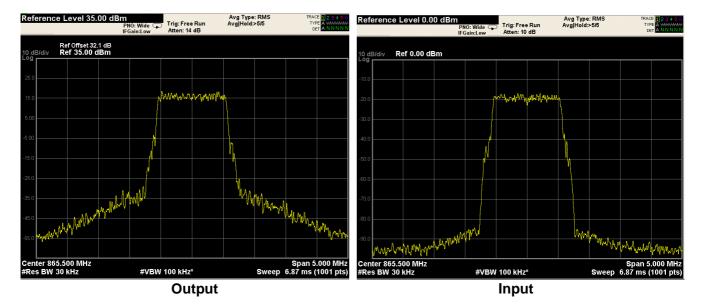


#### Mod. LTE 1.4MHz (QAM) (Down-link)



Nemko	Appendix A: Test Result
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### Mod. LTE 1.4MHz (QPSK) (Down-link)



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### Clause 90.210 Spurious emissions at the antenna terminal

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.

Frequency band (MHz)	Mask for equipment with Audio low pass filter	Mask for equipment without audio low pass filter
Below 25	A or B	A or C
25–50	В	С
72–76	В	С
150–174	B, D, or E	C, D, or E
150 Paging-only	В	С
220–222	F	F
421–512	B, D, or E	C, D, or E
450 Paging-only	В	G
806-809/851-854	В	Н
809-824/854-869	В	G
896-901/935-940		J
902–928	К	К
929–930	В	G
4940–4990	L or M	L or M.
5850–5925	-	-
All other bands	В	С

#### Applicable Emission Masks:

#### § 2.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

Test date: 2014-03-07

Test results: Pass

Special notes

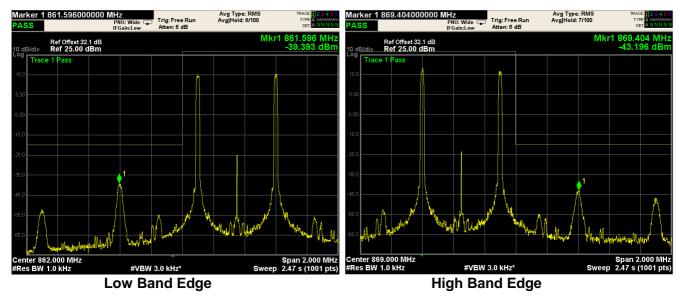
Mask G is applied.

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#### Band edges Inter modulation:

### Mod. iDEN (QAM) (Down-link)

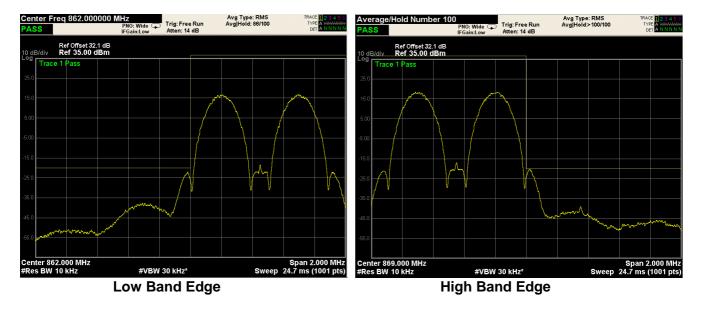


#### Mod. GSM (Down-link)



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#### Mod. EDGE (Down-link)

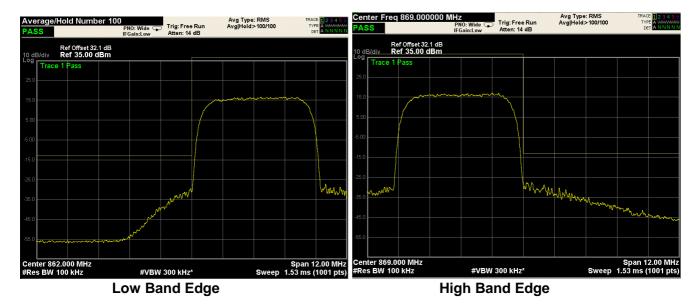


### Mod. CDMA (Down-link)



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#### Mod. WCDMA (Down-link)

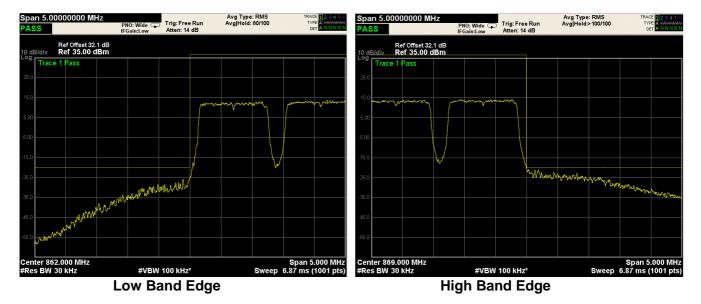


#### Mod. LTE 1.4MHz (QAM) (Down-link)



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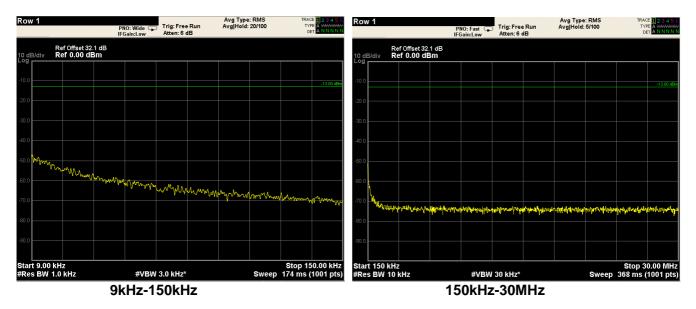
### Mod. LTE 1.4MHz (QPSK) (Down-link)



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#### Spurious emissions at antenna terminal:

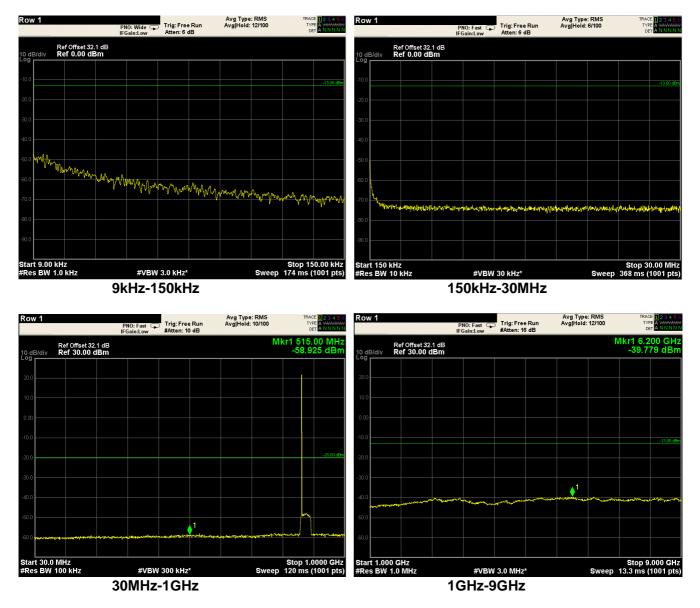
#### Mod. iDEN (QAM) (Down-link)





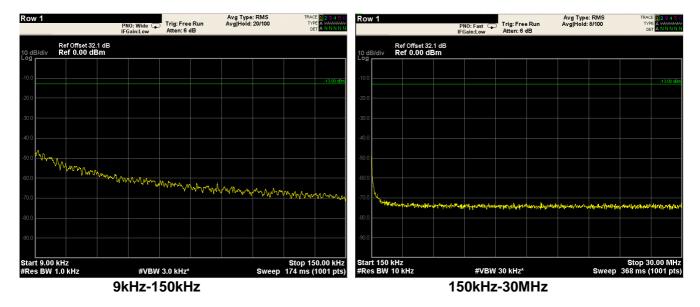
Nemko	Appendix A: Test Result
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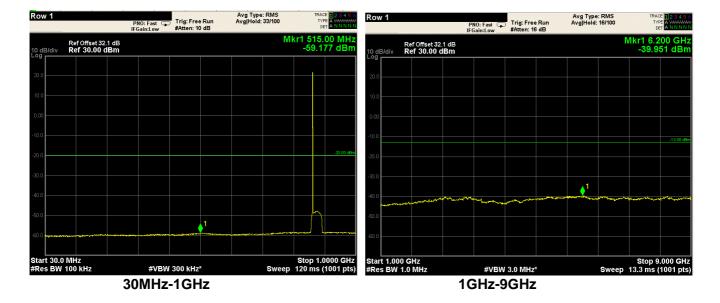
#### Mod. GSM (Down-link)



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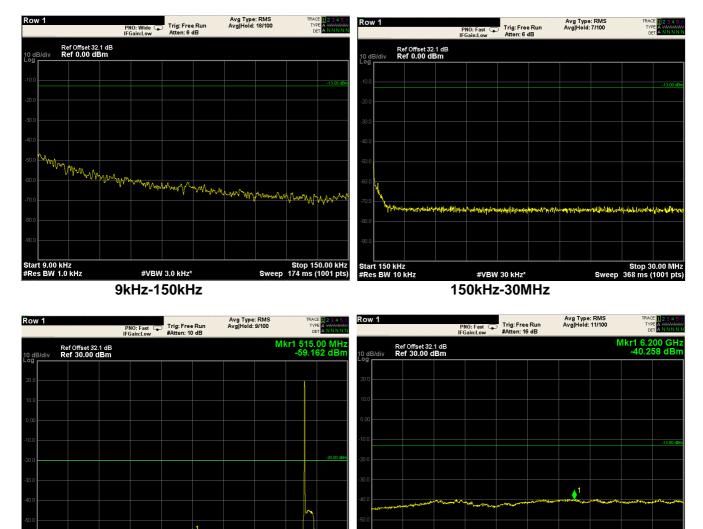
#### Mod. EDGE (Down-link)





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#### Mod. CDMA (Down-link)



Start 1.000 GHz #Res BW 1.0 MHz

Stop 1.0000 GHz 120 ms (1001 pts)

Start 30.0 MHz #Res BW 100 kHz #VBW 300 kHz\* Sweep 30MHz-1GHz

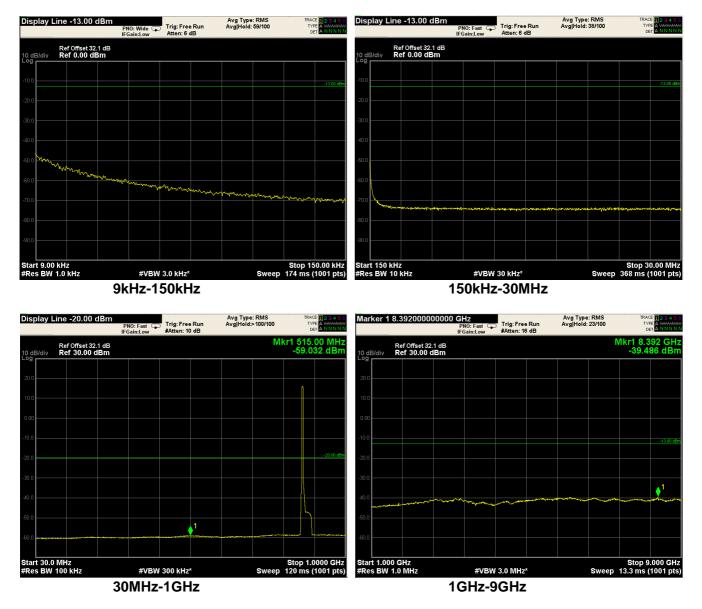
1GHz-9GHz

#VBW 3.0 MHz\*

Stop 9.000 GHz Sweep 13.3 ms (1001 pts

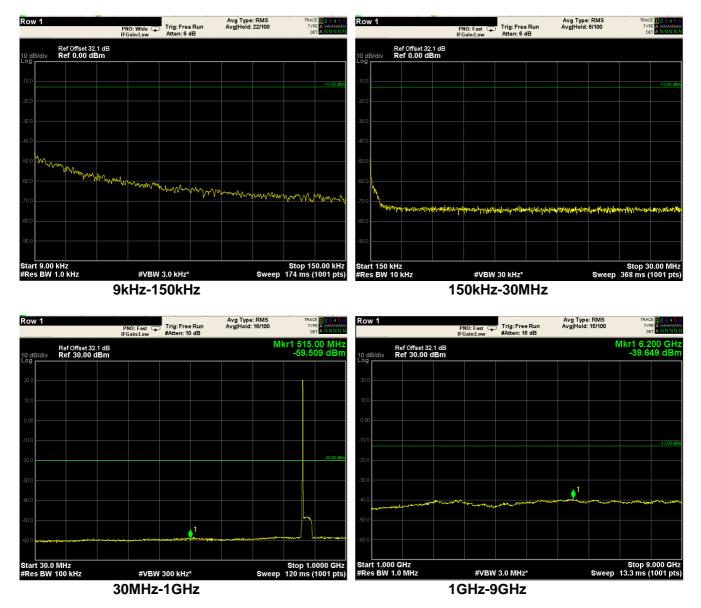
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#### Mod. WCDMA (Down-link)



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



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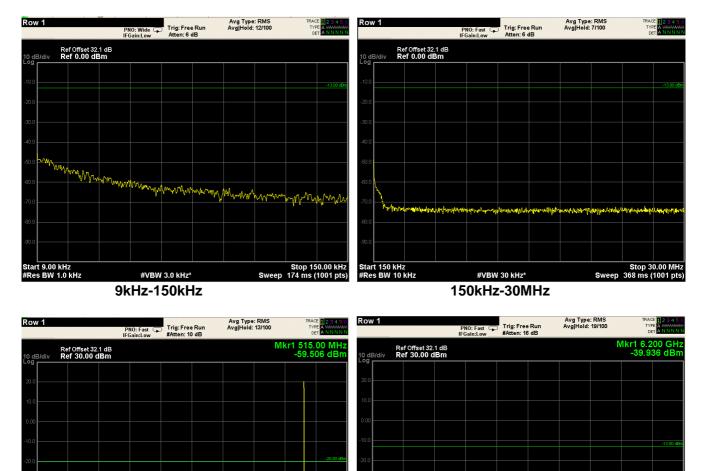
#### Mod. LTE 1.4MHz (QPSK) (Down-link)

1

#VBW 300 kHz\*

30MHz-1GHz

Start 30.0 MHz #Res BW 100 kHz



Stop 1.0000 GHz 120 ms (1001 pts)

Sweep

Start 1.000 GHz #Res BW 1.0 MHz Stop 9.000 GHz Sweep 13.3 ms (1001 pts

**∮**<sup>1</sup>

#VBW 3.0 MHz\*

1GHz-9GHz

N Nemko	Appendix A: Test Result
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### Clause 90.210 Field strength of spurious radiation

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.

#### § 2.1053 Measurements required: Field strength of spurious radiation.

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

(b) The measurements specified in paragraph (a) of this section shall be made for the following equipment:

(1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.

(2) All equipment operating on frequencies higher than 25 MHz.

- (3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
- (4) Other types of equipment as required, when deemed necessary by the Commission.

Test date: 2014-03-07	
Test results: Pass	

Sp	pecial notes
-	The spectrum was searched from 30 MHz to the 10 <sup>th</sup> harmonic.
_	The EUT was measured on three orthogonal axis.

- All measurements were performed at a distance of 3 m.
- Only the worst data presented in the test report.

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#### Clause 90.210 Field Strength of spurious radiation, continued

#### Test Data

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

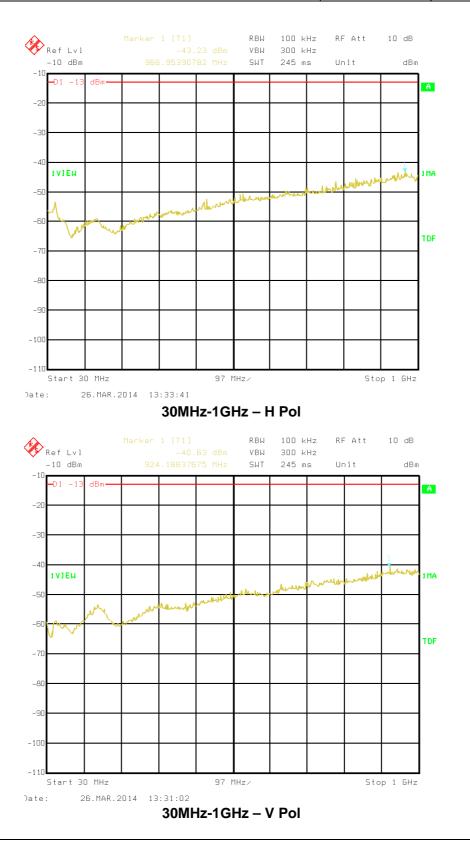
The D.U.T. antenna connector was terminated by a 50  $\Omega$  shielded dummy load.

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

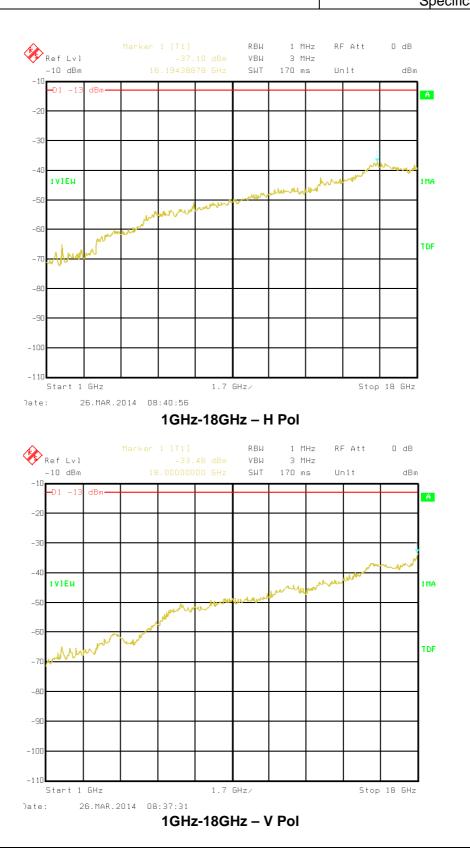
There were no emissions detected above the noise floor which was at least 20 dB below the specification limit.

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## Clause 90.213 Frequency stability

Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

Frequency range	Fixed and base	Mobile	stations
(MHz)	stations	Over 2 W output power	2 W or less output power
Below 25	100	100	200
25–50	20	20	50
72–76	5	_	50
150–174	50	5	50
216–220	1.0	_	1.0
220–222	0.1	1.5	1.5
421–512	2.5	5	5
806-809	1.0	1.5	1.5
809-824	1.5	2.5	2.5
851-854	1.0	1.5	1.5
854-869	1.5	2.5	2.5
896-901	0.1	1.5	1.5
902-928	2.5	2.5	2.5
929–930	1.5	_	-
935–940	0.1	1.5	1.5
1427–1435	300	300	300
Above 2450	_	_	-
The unite are in pon	2		

The units are in ppm

#### Test date:

Test results:

NOT APPLICABLE: Modulation/frequency conversion circuitry not in use. No frequency change in EUT (input and output have same frequency)

#### Special notes

Nemko	Appendix A: Test Result
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## Clause 90.213 Frequency stability, continued

Test data, continued

#### Down-link

Conditions	Frequency (Hz)	Offset (ppm)	
+50 °C, Nominal power			
+40 °C, Nominal power			
+30 °C, Nominal power			
+20 °C, +15 % power			
+20 °C, Nominal power			
+20 °C, -15 % power			
+10 °C, Nominal power			
0 °C, Nominal power			
–10 °C, Nominal power			
–20 °C, Nominal power			
-30 °C, Nominal power			

Offset calculation:  $\frac{F_{Measured} - F_{reference}}{F_{reference}} \times 1.10^{6}$ 

Maximum frequency drift is kHz

N Nemko	Appendix A: Test Result
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## Clause 90.214 Transient frequency behaviour

Transmitters designed to operate in the 150–174 MHz and 421–512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time Intervals	Maximum frequency	All equipment	
nine intervais	difference	150 to 174 MHz	421 to 512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels			
t1	±25.0 kHz	5.0 ms	10.0 ms
t2	±12.5 kHz	20.0 ms	25.0 ms
t3	±25.0 kHz	5.0 ms	10.0 ms
Transient Frequ	ency Behavior for Equip	ment Designed to Operate on 1	2.5 kHz Channels
t1	±12.5 kHz	5.0 ms	10.0 ms
t2	±6.25 kHz	20.0 ms	25.0 ms
t3	±12.5 kHz	5.0 ms	10.0 ms
Transient Frequ	ency Behavior for Equip	ment Designed to Operate on 6	5.25 kHz Channels
t1	±6.25 kHz	5.0 ms	10.0 ms
t2	±3.125 kHz	20.0 ms	25.0 ms
t3	±6.25 kHz	5.0 ms	10.0 ms

#### Test date: NA

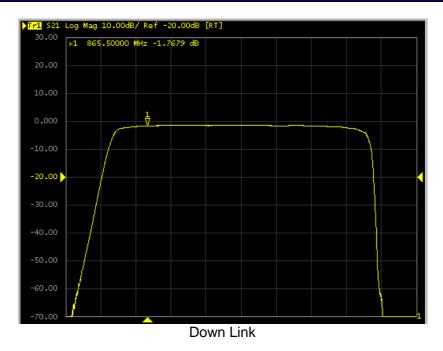
Test results: ------

#### Special notes

NOT APPLICABLE: different operating band

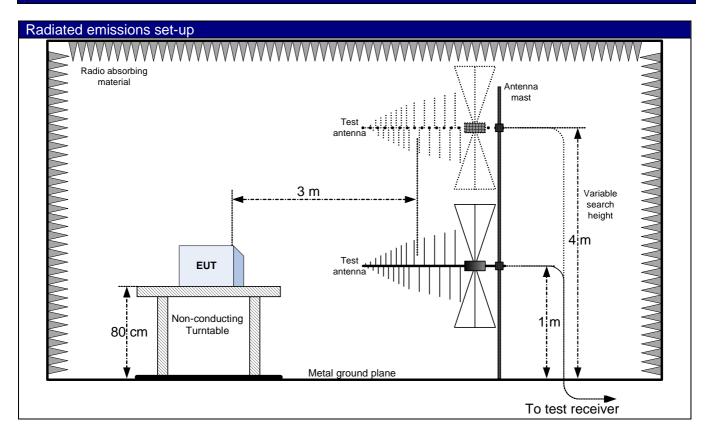
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## Frequency Filter Response



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## Appendix B: Block diagrams of test set-ups



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# Appendix C: EUT photos

Photo Set up





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## Photo EUT





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# Nemko

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