NTS Test Report No. PR034819 Rev. 1



Radio Test Report

Application for Grant of Equipment Authorization

FCC Part 27 Subpart C IC RSS-195 Issue 2 2350MHz - 2360MHz

FCC ID:	VBNFRNC-01
IC:	661W-FRNC

56

Model: Product Name:	FRNC Flexi Multiradio BTS
APPLICANT:	Nokia Solutions and Networks 6000 Connection Drive Irving, TX 75039
TEST SITE(S):	National Technical Systems - Plano 1701 E Plano Pkwy #150 Plano, TX 75074
REPORT DATE:	May 26, 2015

FINAL TEST DATES: **TOTAL NUMBER OF PAGES:** Mar 9 – Mar 19, 2015

Prepared By:

y E phul

Yunus E. Faziloglu **Wireless Manager**

Approved By:

Kimberly Zavala Quality Assurance Manager

Reviewed By:

John Ngo **General Manager**

This report and the information contained herein represent the results of testing test articles identified and selected by the client performed to specifications and/or procedures selected by the client. National Technical Systems (NTS) makes no representations, expressed or implied, that such testing is adequate (or inadequate) to demonstrate efficiency, performance, reliability, or any other characteristic of the articles being tested, or similar products. This report should not be relied upon as an endorsement or certification by NTS of the equipment tested, nor does it represent any statement whatsoever as to its merchantability or fitness of the test article, or similar products, for a particular purpose. This report shall not be reproduced except in full.

REVISION HISTORY

Rev#	Date	Comments	Modified By
0	Apr 13, 2015	1 st release	Yunus Faziloglu
1	May 26, 2015	To address TCB comments	Yunus Faziloglu

TABLE OF CONTENTS

REVISION HISTORY	2
TABLE OF CONTENTS	3
SCOPE	4
OBJECTIVE	5
STATEMENT OF COMPLIANCE	5
DEVIATIONS FROM THE STANDARDS	5
TEST RESULTS	6
FCC PART 27 SUBPART C AND RSS-195 ISSUE 2 (BASE STATIONS OPERATING IN 2350MHz-2360MHz BAND) EXTREME CONDITIONS	6 7
MEASUREMENT UNCERTAINTIES	7
EOUIPMENT UNDER TEST (EUT) DETAILS	8
GENERAL	8
ENCLOSURE	9
AUXILLARY EQUIPMENT	9
SUPPORT EQUIPMENT	9
EUT INTERFACE PORTS	9
	.10
EUT FIRMWARE/SOFTWARE	.10
MODIFICATIONS	.10
TESTING	.11
GENERAL INFORMATION	. 1 1
MEASUREMENT PROCEDURES	.12
TEST EQUIPMENT	.14
APPENDIX A TEST DATA	.15
RF OUTPUT POWER	.16
EMISSION BANDWIDTHS (26DB AND 99%)	.27
ANTENNA PORT CONDUCTED BANDEDGE	.31
TRANSMITTER ANTENNA PORT CONDUCTED SPURIOUS EMISSIONS	.44
TRANSMITTER RADIATED SPURIOUS EMISSIONS	.51
Frequency Stability	.55
END OF REPORT	.56

SCOPE

Tests have been performed on Nokia Solutions and Networks product Flexi Multiradio BTS RRH Model FRNC, pursuant to the relevant requirements of the following standard(s) in order to obtain device certification against the regulatory requirements of the Federal Communications Commission.

- Code of Federal Regulations (CFR) Title 47 Part 2
- CFR Title 47 Part 27 Subpart C
- RSS-Gen Issue 4 November 2014
- RSS-195 Issue 2 April 2014

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards:

ANSI C63.4-2009 ANSI TIA-603-C FCC KDB 971168 D01 v02r02

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant FCC requirements.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of Nokia Solutions and Networks product Flexi Multiradio BTS RRH Model FRNC and therefore apply only to the tested sample. The sample was selected and prepared by Hobert Smith of Nokia Solutions and Networks.

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, the device requires certification.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

Testing was performed only on Model FRNC. No additional models were described or supplied for testing.

STATEMENT OF COMPLIANCE

The tested sample of Nokia Solutions and Networks product Flexi Multiradio BTS RRH Model FRNC complied with the requirements of the standards and frequency bands declared in the scope of this test report.

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

TEST RESULTS

FCC	IC	Description	Measured	Limit	Result		
Transmitter M	Transmitter Modulation, output power and other characteristics						
§27.5(a)	RSS-195 Section 5.2	Frequency range(s)	2352.5MHz - 2357.5MHz (5M LTE) 2355.0MHz - 2355.0MHz (10M LTE)	2350MHz - 2360MHz	Pass		
§2.1033(c)(4)	RSS-195 Section 5.3	Modulation Type	QPSK, 16QAM, 64QAM (5M and 10M for each)	Digital	Pass		
§27.50(a)	RSS-195 Section 5.5	Output Power	Conducted Output Power (Highest on Port 1) RMS: 44.41Bm EIRP will depend on antenna gain (unknown)	2000W EIRP	Pass		
§27.50(a)	RSS-195 Section 5.5	Peak to Average Ratio	10.88dB highest	13dB	Pass		
§2.1049	RSS-Gen Section 6.6	Emission Bandwidth (99%)	4.506MHz (5M LTE) 8.997MHz (10M LTE)	Remain in Block	Pass		
N/A Informational	N/A Informational	Emission Bandwidth (26dB)	4.882MHz (5M LTE) 9.767MHz (10M LTE)	Remain in Block	Pass		
Transmitter s	Transmitter spurious emissions ¹						
\$27.52(a)	RSS-195	At the antenna terminals	<-19.03dBm	-19.03 dBm (per TX chain)	Pass		
927.33(a)	Section 5.6	Field strength	40.0dBuV/m at 3m Eq. to -55.2dBm EIRP	-13 dBm EIRP	Pass		
Other details	Other details						
§27.54	RSS-195 Section 5.4	Frequency stability	0.0001ppm	Remain in Block	Pass		
§1.1310	RSS-102 Issue 5	RF Exposure	N/A		Pass ²		
Notes							

Note 1 – Based on 1MHz RBW. In 1MHz bands immediately outside and adjacent to the frequency block an RBW of at least 1% of the emission bandwidth has been used.

Note 2 - Applicant's declaration on a separate exhibit based on hypothetical antenna gains.

	Emission Designators					
	LTE-0	QPSK	LTE-1	6QAM	LTE-64QAM	
	FCC	IC	FCC IC		FCC	IC
5M	4M88F9W	4M49F9W	4M86F9W	4M49F9W	4M88F9W	4M51F9W
10M	9M72F9W	8M98F9W	9M71F9W	9M00F9W	9M77F9W	8M98F9W

Note: FCC based on 26dB emission bandwidth, IC based on 99% emissions bandwidth.

EXTREME CONDITIONS

Frequency stability is determined over extremes of temperature and voltage. The extremes of voltage were 85 to 115 percent of the nominal value.

The extremes of temperature were -30° C to $+50^{\circ}$ C as specified in FCC §2.1055(a)(1).

MEASUREMENT UNCERTAINTIES

Measurement uncertainties of the test facility based on a 95% confidence level are as follows,

Test	Uncertainty
Radio frequency	± 0.2ppm
RF power conducted	±1.2 dB
RF power radiated	±3.3 dB
RF power density conducted	±1.2 dB
Spurious emissions conducted	±1.2 dB
Adjacent channel power	±0.4 dB
Spurious emissions radiated	±4 dB
Temperature	±1°C
Humidity	±1.6 %
Voltage (DC)	±0.2 %
Voltage (AC)	±0.3 %

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The equipment under test (EUT) is a Nokia Solutions and Networks Flexi Multiradio Base Transceiver Station (BTS) Remote Radio Head (RRH) module, model FRNC which operates over 3GPP frequency band 30 (BTS Rx: 2305 to 2315 MHz/BTS Tx: 2350 to 2360 MHz). The FRNC has four co-located transmitters with each transmit port supporting 30 watts maximum rated RF output power. The FRNC can be operated as MIMO or as non-MIMO. Multi-carrier operation is supported.

The FRNC is multi-standard capable (GSM/EDGE/WCDMA/LTE), but for this effort only the LTE mode is tested. The FRNC supports three downlink modulation types for LTE (QPSK, 16QAM and 64QAM). The FRNC supports two LTE channel bandwidths (5 MHz and 10 MHz).

The FRNC has external interfaces including DC power, ground, TX/RX (Ant), RX monitor (RXO), external alarm (EAC), optical OBSAI (OPT) and remote electrical tilt (RET). The RRH with applicable installation kit may be pole or wall mounted.

	Downlink EARFCN	Downlink Frequency	LTE Channe	l Bandwidth
		(MHz)	5 MHz	10 MHz
	9770	2350.0	Bandedge	Bandedge
3, 4)	9795	2352.5	Bottom Ch	
5,3				
) (Ant 1,	9820	2355.0	Middle Ch	Bottom Ch Middle Ch Top Channel
d 3(
Ban	9845	2357.5	Top Channel	
, ,				
	9870	2360.0	Bandedge	Bandedge

The FRNC LTE channel numbers and frequencies are as follows:

FRNC Downlink LTE Frequency Channels

The sample was received on Mar 9, 2015 and tested on Mar 9 - Mar 19, 2015. The EUT consisted of the following component(s):

Company	Model	Description	Part/Serial Number	FCC ID/IC Number
Nokia Solutions	FRNC	Flexi Multiradio BTS	Part#: 473189A.x21	FCC ID: VBNFRNC-01
and Networks		RRH	Serial#: YK150400367	IC: 661W-FRNC

ENCLOSURE

The EUT enclosure is made of heavy duty aluminum and measures approximately $12(W) \times 7(D) \times 24(H)$ inches.

AUXILLARY EQUIPMENT

Company	Model	Description	Part/Serial Number	FCC ID/IC Number
Nokia Solutions	FOSH	6GHz SFP Module	Part#: 472579A.101	N/A
and Networks		(Plugs into FRNC Opt	(2 units per RRH)	
		Ports 1&2)	Serial#: CE30LC5Z2	
			and CE30LCCBA	

SUPPORT EQUIPMENT

Company	Model	Description	Part/Serial Number	FCC ID/IC Number
Nokia Solutions and Networks	FSMF	Flexi System Module	Part#: 472181A.103	N/A
Nokia Solutions and Networks	FBBA	Baseband Extension Module	Part#: 472182A.101 (2 units per FSMF)	N/A
HP	Elite Book 6930p	Laptop PC	N/A	N/A

EUT INTERFACE PORTS

The I/O cabling configuration during testing was as follows:

Cable	Туре	Shield	Length	Used in Test	Quantity	Termination
Power Input	Power	No	~ 3 m	Yes	1	Power Supply
Earth	Earth	No	~ 1 m	Yes	1	Lab earth ground
Antenna	RF	Yes	$\sim 3 \text{ m}$	Yes	4	50Ω Load
RX monitor	RF	Yes	$\sim 2 \ m$	Yes	2	50Ω Load
External Alarm	Signal	Yes	~ 3 m	Yes	1	Un-terminated
Remote Electrical Tilt	Signal	Yes	~ 3 m	Yes	1	Un-terminated
Multimode Optical	Optical	No	>6 m	Yes	2	System Module

The connector layout for FRNC is provided below:



FRNC External Interfaces:

Name	Qty	Connector Type	Purpose (and Description)
DC In	1	Screw Terminal	3-port Power Input -48 VDC, up to AWG 4 cable
GND	1	Screw lug (2xM5/1xM8)	Ground
ANT	4	4.3-10	RF signal for Transmitter/Receiver (50 Ohm)
RXO	4	QMA	RX output for monitoring/location services
Unit	1	LED	Unit Status LED
LMP	1	Card edge	Local Management/Test Port (Ethernet 10Base- T/100Base-Tx and others, not field accessible)
EAC	1	MDR14	External Alarm Interface (4 alarms)
OPT	3	SFP+ cage	Optical OBSAI Interface up to 6 Gps.
RET	1	8-pin circular connector conforming to IEC 60130-9 – Ed.3.0	AISG 2.0 to external devices

EUT OPERATION

During testing, the EUT was transmitting continuously with 100% duty-cycle at full power on all chains.

EUT FIRMWARE/SOFTWARE

The laptop PC connects to the FSMF System Module over the LMP (Ethernet) port. The system module controls the FRNC RRH via the optical (OBSAI) interface. The laptop is used for changing configuration settings, monitoring tests and controlling the BTS. The following software versions are used for the FRNC testing:

- (1) RRH Unit Software: FRM35.02.R01
- (2) System Module Software: FB_PS_REL_2013_09_016

MODIFICATIONS

No modifications were made to the EUT during testing.

TESTING

GENERAL INFORMATION

Antenna port measurements were taken at NTS Plano branch located at 1701 E Plano Pkwy #150 Plano, TX 75074.

Radiated spurious emissions measurements were taken at the NTS Plano Anechoic Chamber listed below. The sites conform to the requirements of ANSI C63.4-2009 *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz and CISPR 16-1-4:2007 - Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus Ancillary equipment Radiated disturbances. They are on file with the FCC and Industry Canada.*

Site	Registratio	n Numbers	Location	
Sile	FCC	Canada	Location	
Chamber 1	A2LA Accredited Designation Number US1077	IC 4319A	1701 E Plano Pkwy #150 Plano, TX 75074.	

Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements.

MEASUREMENT PROCEDURES

Output power, emission bandwidth, conducted spurious, conducted bandedge and carrier frequency stability measurements were all performed via a spectrum analyzer connected to the individual RF chains via a 40dB attenuator and an RF cable. The EUT was operating in 4x4 MIMO configuration at full power for all tests. While measuring one transmit chain, others were terminated with termination blocks. All measurements were corrected for the insertion loss of the attenuator and cable inserted between the RF port of the EUT and the spectrum analyzer. Simple test diagram is shown below.



Test Configuration for Antenna Port Measurements

26dB emission bandwidth was measured in accordance with Section 4.1 of FCC KDB 971168 D01 v02r02. 99% occupied bandwidth was measured in accordance with Section 6.6 of RSS-Gen Issue 4. For both measurements an NTS custom software tool was used. Spectrum analyzer settings are shown on their corresponding plots in test results section.

Emissions at the band-edges were also captured with an NTS custom software tool with settings described in the corresponding sections of the FCC and IC rules. Spectrum analyzer settings are shown on their corresponding plots in test results section. A notch filter supplied by the customer was characterized for insertion loss and used to measure emissions in the 2195MHz-2345MHz and 2365MHz-2400MHz ranges to reduce measurement instrumentation noise floor. Worst case insertion loss of the filter has been factored in via reference level offset to the spectrum analyzer.

Peak and average output power measurements were performed in accordance with FCC KDB 971168 D01 v02r02. An NTS custom software tool was used for power integration to compensate for resolution bandwidth limitations of the spectrum analyzer and settings are shown on their corresponding plots in test results section.

Peak to average power ratio was calculated in accordance with Section 5.7.2 of FCC KDB 971168 D01 v02r02.

Conducted spurious emissions were captured with TILE6 software which corrected the readings for cable loss and attenuator loss across the 9kHz-24GHz frequency span. Settings of the spectrum analyzer are described in the corresponding test result section.

For frequency stability, the EUT was placed inside a temperature chamber with all support and test equipment located outside of the chamber. Temperature was varied across the specified range in 10 degree increments and EUT was allowed enough time to stabilize at each temperature step. A signal analyzer as detailed in the test equipment section has been used for précised frequency error measurements.

Transmitter radiated spurious emissions measurements were made in accordance with ANSI C63.4-2009 by measuring the field strength of the emissions from the device at 3m test distance. The eirp limit as specified in the relevant rule part(s) is converted to a field strength at the test distance and the emissions from the EUT are then compared to that limit. Only emissions within 20dB of this limit are subjected to a substitution measurement in accordance with TIA-603-C-2004. Both preliminary and final measurements were performed at the same FCC listed test chamber. Preliminary scans were performed with TILE6 software. This software corrected the measurements for antenna factors, cable losses and pre-amplifier gains. Both polarizations of the receiving antenna were scanned from 30MHz to 24GHz with a peak detector (RBW=1MHz, VBW=3MHz, with trace max hold over multiple sweeps). Based on the preliminary scan results, frequencies of interest have been maximized via rotating the EUT 360 degrees and varying the height of the test antenna (1m to 4m). Final measurements were also taken with the peak detector as described above. A biconilog antenna was used for 30MHz-1GHz range. A double ridged waveguide horn antenna was used for 1-18GHz range and a smaller horn antenna was used for 18-24GHz range. Measurements in the 18-24GHz range were performed at 1m distance. The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height. EUT was placed on a non-conductive RF transparent structure to provide 80cm height from the ground floor. A motorized turntable allowed it to be rotated during testing to determine the angle with the highest level of emissions.

NTS	Description	Manufacturer	Model	Calibration	Calibration
Equipment #	_			Duration	Due Date
E1529P	PSA	Agilent	E4446A	12 Months	3/3/2016
E1563P	PSA	Agilent	E4440A	12 Months	9/2/2015
E1554P	PreAmp	MITEQ	JS32-00104000-	12 Months	5/14/2015
	(1GHz-40GHz)		62-5P		
E1366P	PreAmp (30MHz-	MITEQ	AM-1431-N-	12 Months	12/12/2015
	1GHz)		1197SC		
E1289P	Biconilog	ETS Lindgren	3142C	12 Months	3/19/2016
	Antenna				
	(30MHz-1GHz)				
E1149P	Horn Antenna	EMCO	3115	12 Months	12/10/2015
	(1GHz-18GHz)				
E1447P	RMS Multimeter	Fluke	87V	12 Months	5/20/2015
D1131P	Data Acquisition	Agilent	34970A	12 Months	7/2/2015
	Switch Unit	_			
ENV1195P	Climatic Chamber	Thermotron	SE-300-2-2	N/A	NCR
* NM04508	MXA Signal	Agilent	N9020A	24 Months	1/27/2017
	Analyzer				

Test Equipment

* Test equipment supplied by the customer for LTE frequency error measurements

Appendix A Test Data

RF Output Power

RF output power has been measured in both Peak and RMS Average terms for each transmit chain at the center channel for all modulations and bandwidth modes. Peak to average ratio (PAR) has been calculated as described in Section 5.7.2 of KDB971168 D01 v02r02 and all results are presented in tabular form below.

			LTE - QPSK		L	TE - 16QAN	Л	L	TE - 64QAN	Λ
		Peak	Average	PAR	Peak	Average	PAR	Peak	Average	PAR
		(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Port 1	5M	54.29	44.34	9.95	54.96	44.41	10.55	54.08	44.38	9.7
Center Ch	10M	54.13	44.03	10.1	54.54	43.81	10.73	53.94	43.96	9.98
Port 2	5M	54.13	44.21	9.92	54.77	44.37	10.4	54.09	44.23	9.86
Center Ch	10M	54.27	44.08	10.19	54.86	44.03	10.83	54.11	44.04	10.07
Port 3	5M	53.22	43.28	9.94	53.88	43.34	10.54	53.03	43.23	9.8
Center Ch	10M	53.73	43.32	10.41	54.04	43.2	10.84	53.47	43.19	10.28
Port 4	5M	54.17	44.15	10.02	54.85	44.23	10.62	53.98	44.15	9.83
Center Ch	10M	54.28	44.09	10.19	54.88	44	10.88	54.07	44.06	10.01
Combined	5M	59.99	50.04	9.95	60.66	50.13	10.53	59.84	50.04	9.8
Center Ch	10M	60.13	49.91	10.22	60.61	49.79	10.82	59.93	49.85	10.08

Based on the results above, Port 1 had the highest RMS average power and therefore it was selected for all the remaining antenna port tests on the product.

Subsequently output power levels on lowest and highest channels in 5MHz channel bandwidth mode were tested only at Port 1 and results presented below. 10MHz channel bandwidth mode had only 1 channel of operation at the center.

			LTE - QPSK		L	TE - 16QAN	Л	L	TE - 64QAN	Λ
		Peak	Average	PAR	Peak	Average	PAR	Peak	Average	PAR
		(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Port 1 Low										
Channel	5M	54.06	44.05	10.01	54.9	44.22	10.68	54.18	44.24	9.94
Port 1 High										
Channel	5M	54.02	43.95	10.07	54.72	43.87	10.85	53.9	43.98	9.92

All corresponding plots included on the following pages. Total path loss of 40.8dB (Attenuator Loss: 40dB, RF cable loss: 0.8dB) accounted in via reference level offset to the spectrum analyzer.

Port 1 – LTE – QPSK – 5M – Center Channel – Peak	Port 1 – LTE – QPSK – 5M – Center Channel – Average
Spectrum Analyzer Settings 50.0 -	Spectrum Analyzer Settings 30.0
SPAN: 7.500 MHz 45.0 -	SPAN: 7.500 MHz 25.0-
VB: 3.000 MHz 40.0-	RB: 120 kHz 20.0 -
Detector: PK (CISPR) 35.0 - 99% Points 99% Points	Detector: RMS 15.0 -
RL Offset: 40.8 DB 30.0 -	Attn: 20 DB 10.0 -
Sweep Time: 1.0s Ref. vi: 50.8 DBM 25.0 -	Sweep Time: 4.4ms 5.0-
Max hold: 60 sweeps E 20.0	Ref Lvl: 50.8 DBM 0.0 -
Amp corr: 0.0dB g 20.0 Bin size: 916 Hz	Amp corr: 0.0dB 🚡 -5.0-
15.0-	Bin size: 916 Hz -10.0 -
10.0-	-15.0-
5.0-11	-20.0-
99% Bandwidth 0.0 -	-25.0-
5.06 MHz -5.0-	99% Bandwidth -30.0 - /
Power Over Span -10.0 -	4.48 MHz -35.0
i8469.756 mW 2351.2 2352.5 2355.0 2357.5 2358.8	Power Over Span -40.0 -
54.29 dBm Frequency (MHz)	27186.975 mW 2351.2 2352.5 2355.0 2357.5 2358.8
99% Bandwidth, Power Over Span and PSD	44.34 dBm Frequency (MHz)
	99% Bandwidth, Power Over Span and PSD
Port 1 – LTE – 16QAM – 5M – Center Channel – Peak	Port 1 – LTE – 16QAM – 5M – Center Channel – Average
Spectrum Analyzer Settings	Spectrum Analyzer Settings
CF: 2355.000 MHz	CF: 2355.000 MHz 25.0-
RB: 1.000 MHz 40.0-	SPAN: 7.500 MHz 23.0
VB: 3.000 MHz TO.0	VB: 360 kHz
Attn: 20 DB 20.0	Detector: RMS 15.0
RL Offset: 40.8 DB 50.0	RL Offset: 40.8 DB
Ref Lvl: 50.8 DBM 25.0	Sweep Time: 4.4ms 5.0 -
Amp corr: 0.0dB	Pwr avg: 100 sweeps
Bin size: 916 Hz 0 15.0-	Amp corr: 0.0dB & -5.0 -
10.0	-10.0-
5.0-	-15.0-
0.0-	-20.0-
99% Bandwidth -5.0 - 1	-25.0
5.07 MHz -10.0-	9996 Bandwidth -30.0 -
Power Over Span -15.0 -	4.48 MHz -35.0 - Mervary PM/
13286.854 mW 2351.2 2352.5 2355.0 2357.5 2358.8	Power Over Span -40.0 -
54.96 dBm Prequeicy (MIL2)	27596.839 mW 2351.2 2352.5 2355.0 2357.5 2358.8
99% Bandwidth, Power Over Span and PSD	44.41 dBm Frequency (MHz)
	99% Bandwidth, Power Over Span and PSD
Port 1 – LTE – 64QAM – 5M – Center Channel – Peak	Port I – LTE – 64QAM – 5M – Center Channel – Average
CE: 22EE 000 MU	30.0
SPAN: 7.500 MHz 45.0 -	SPAN: 7.500 MHz 25.0 -
RB: 1.000 MHz 40.0 -	RB: 120 kHz 20.0 -
Detector: PK (CISPR) 35.0 - 200 Automatical Automatica	VB: 360 KH2 Detector: RMS 15.0 -
Attn: 20 DB 39 Points 99% Points 99% Points	Attn: 20 DB 10.0 -
Sweep Time: 1.0s	RL Offset: 40.8 DB Sweep Time: 4.4ms 5.0 -
Max hold: 60 sweeps	Ref Lvl: 50.8 DBM 0.0 -
Amp corr: 0.0dB 20.0 - /	Pwr avg: 100 sweeps Amp.corr: 0.0dB & 5.0-
15.0-	Bin size: 916 Hz -10.0 -
10.0-	-15.0-
5.0-	-20.0-
asse Brodwidth 0.0 - P	-25.0-
5.08 MHz -5.0	-25.0
	4.48 MHz
10,0-1 5883,110 mW 2351,2 2352,5 2355,0 2357,5 2355,0	-35.0 - Provide Address
54.08 dBm E302.12 2002.13 2003.10 2007.13 2008.0	27412.214
99% Bandwidth Power Over Spap and PSD	44.38 dem 2351.2 2352.5 2353.6 2357.5 2350.6
22 Ao bandmach, romor Offer Span and PSD	000/ Deschuldh Derror Com Com ad PCD
	99% bandwidth, Power Over Span and PSD

Port 2 – LTE – QPSK – 5M – Center Channel – Peak	Port 2 – LTE – QPSK – 5M – Center Channel – Average
Spectrum Analyzer Settings 50.0 -	Spectrum Analyzer Settings 30.0
CF: 2355.000 MHz 45.0 -	CF: 2355.000 MHz SPAN: 7.500 MHz 25.0 -
RB: 1.000 MHz 40.0 -	RB: 120 kHz 20.0-
Detector: PK (CISPR) 35.0 - age/ Points age/	VB: 360 kHz
Attn: 20 DB 30.0-	Attin 20 DB 10.0-
Sweep Time: 1.0s	RL Offset: 40.8 DB
Ref Lvl: 50.8 DBM	Sweep Time: 4,4ms 5,0 T
Max hold: 60 sweeps 20.0 -	Pwr avg: 100 sweeps
Bin size: 916 Hz 0 15.0-	Amp corr: 0.0dB 흙 -5.0-
10.0-	Bin Size: 916 Hz -10.0 -
5.0-	-15.0-
0.0	-20.0-
99% Bandwidth -5.0 -	-25.0 -
5.06 MHz = 10.0 -	9996 Bandwidth -30.0-
Power Over Spap	4.48 MHz 25.0
i8759.131 www. 2351.2 2352.5 2355.0 2357.5 2358.8	Policy Over Span
54.13 dem	Power Oter Span -40,0-1
	44.21 In Frequency (MHz)
99% Bandwidth, Power Over Span and PSD	90% Produidth Dower Over Soon and DSD
Dort 2 ITE 160AM SM Contor Channel De-1-	Dort 2 LTE 160AM 5M Contar Channel Average
FOIL 2 - LTE - TOQAIVI - SIVI - CENTER Channel - Peak Spectrum Analyzer Settings	POIL 2 – LTE – TOQAIVI – SIVI – Center Channel – Average
CE- 2355 000 MHz 50.0-	
SPAN: 7.500 MHz 45.0 -	SPAN: 7,500 MHz 25.0-
RB: 1.000 MHz 40.0 -	RB: 120 kHz 20.0-
Detector: PK (CISPR) 35.0 - 99% Points 99% Prints	VB: 360 kHz
Attn: 20 DB 30.0	Attn: 20 DB 10.0-
Sweep Time: 1.0s 25.0-	RL Offset: 40.8 DB
Ref Lvi: 50.8 DBM	Ref Lvis 50.8 DBM 0.0
Amp corr: 0.0dB	Pwr avg: 100 sweeps
Bin size: 916 Hz O 15.0	Amp corr: 0.0dB & -5.0
10.0	-10.0 -
5.0-	-15.0-
0.0- 1	-20.0 -
99% Bandwidth -5.0-	-25.0-
5.07 MHz -10.0-	99% Bandwidth
Power Over Spap	4.48 MHz 25.0
19921.639 mw 2351.2 2352.5 2355.0 2357.5 2358.8	-33.0 million fragment
54,77 dBm Frequency (MHz)	Power Over Spart -40,0-1
00% Deschrückler Demos Gross and DCD	44.27 In Frequency (MHz)
99% balluwuul, Power Over Span aliu PSD	99% Bandwidth, Power Over Span and PSD
Port $2 - LTE - 640AM - 5M - Center Channel - Peak$	Port 2 – LTF – 640AM – 5M – Center Channel – Average
Spectrum Analyzer Settings 50.0-	Spectrum Analyzer Settings
CF: 2355.000 MHz 45.0-	CF: 2355.000 MHz 25.0
RB: 1.000 MHz 40.0	SPAN: 7.500 MHz 20.0
VB: 3.000 MHz 40.0	VB: 360 kHz
Attn: 20 DB 35.0 - 39% Points 39% Points	Detector: RMS 15.0 -
RL Offset: 40.8 DB 30.0	Attn: 20 DB 10.0-
Sweep Time: 1.0s 25.0-	Sweep Time: 4.4ms 5.0 -
Max hold: 60 sweeps _ 20.0 -	Ref Lvi: 50.8 DBM 0.0-
Amp corr: 0.0dB	Amp corr: 0.0dB & -5.0
10.0-	Bin size: 916 Hz -10.0 -
50-1	-15.0-
0.0	20.0-
0.0	-20.0
99% Bandwidth -5.0 -	-25.0-
5.08 MHz -10.0 -	9996 Bandwidth -30.0 -
Power Over Span -15.0 -	4.48 MHz -35.0 - Manufacture
i6190.682 mW 2351.2 2352.5 2355.0 2357.5 2358.8	Power Over Span -40.0 -
54.09 dBm Frequency (MHz)	26437.445 mW 2351.2 2352.5 2355.0 2357.5 2358.8
99% Bandwidth, Power Over Span and PSD	44.23 dBm Frequency (MHz)
<u></u>	99% Bandwidth, Power Over Span and PSD

Port 3 – LTE – QPSK – 5M – Center Channel – Peak	Port 3 – LTE – QPSK – 5M – Center Channel – Average
Spectrum Analyzer Settings	Spectrum Analyzer Settings
50.0-	30.0
SPAN: 7.500 MHz 45.0	CF: 2355.000 MHz 25.0 -
RB: 1.000 MHz 40.0-	RB: 120 kHz 20.0-
VB: 3,000 MHz Detectory DK (CTSDR) 35.0 - 99% Points 39% Points	VB: 360 kHz 15.0
Atto: 20 DB 20 0	Detector: RMS 15.0-
RL Offset: 40.8 DB	Attn: 20 DB 10.0 -
Sweep Time: 1.0s 25.0 -	Sweet Time: 44ms 5.0-
Max hold: 60 sweeps	Ref Lvi: 50.8 DBM 0.0-
Amp corr: 0.0dB 📓 15.0-	Pwr avg: 100 sweeps
Bin size: 916 Hz 10.0-	Amp corr: 0.0dB ar -5.0-
5.0-1-4	-10.0 -
0.0-	-15.0-
5.0	-20.0 -
-5,0 -	-25.0-
-10.0 - 1	9996 Panduidh
-15.0-	-30.0 -
Power Over Span -20.0 -	-35.0
19689.475 mW 2351.2 2352.5 2355.0 2357.5 2358.8	Power Over Span -40.0 -
53.22 dBm Frequency (MHz)	21267.809 mW 2351.2 2352.5 2355.0 2357.5 2358.8
99% Bandwidth, Power Over Span and PSD	43.28 dBm Frequency (MHz)
	99% Bandwidth, Power Over Span and PSD
Port 3 – I TF – 160AM – 5M – Center Channel – Peak	Port 3 – I TF – 160 AM – 5M – Center Channel – Average
Spectrum Analyzer Settings	Soetrum Analyzer Settings
CE: 2355.000 MHz	30.0
SPAN: 7.500 MHz 45.0 -	SPAN: 7,500 MHz
RB: 1.000 MHz 40.0-	RB: 120 kHz 20,0-
VB: 3.000 MHz Detector: PK (CTSPR) 35.0 - 39% Points 39% Points	VB: 360 kHz
Attn: 20 DB 30.0 -	Detector: RMS
RL Offset: 40.8 DB	RUG Both 40.8 DB
Sweep rime: 1.05 20.0	Sweep Time: 4.4ms
Max hold: 60 sweeps	Ref Lvl: 50.8 DBM 0.0-
Amp corr: 0.04B g 15.0-	Pwr avg: 100 sweeps
Bin 3221 916 H2 10.0-	Bin size: 916 Hz 10.0-
5.0-	-10.0-
0.0-	
-5.0-	-20.0-
99% Bandwidth 10.0 -	
5.07 MHz 15.0	99% Bandwidth
-15.0-	4.49 MHz
Power Over Span -20,0 -	and the second sec
4621.890 mW 2351.2 2352.5 2355.0 2357.5 2358.8	Power Over Span -40,0 - 1
53.88 dBm	21553.222 mW 2351.2 2352.5 2355.0 2357.5 2358.8
99% Bandwidth, Power Over Span and PSD	43.34 dBm Frequency (MHz)
	99% Bandwidth, Power Over Span and PSD
Port 3 – LTE – 64QAM – 5M – Center Channel – Peak	Port 3 – LTE – 64QAM – 5M – Center Channel – Average
Spectrum Analyzer Settings 50.0 -	Spectrum Analyzer Settings 30.0-
CF: 2355.000 MHz 45.0 -	CF: 2355.000 MHz 2444.000 MHz 2444.0000 MHz 2444.000 MHz 2444.0000 MHz 2440000 MHz 2440000 MHz 244000 MHz 2440000 MHz 244000000
RB: 1.000 MHz 40.0 -	SPAN: / 500 MHz 88: 120 kHz 20.0
VB: 3,000 MHz 35.0 - 1092 Paints	VB: 360 kHz
Atte: 20 DB 20 0	Detector: RMS
RL Offset: 40.8 DB	Attn: 20 DB 10.0-
Sweep Time: 1.0s 25.0 -	Sween Time: 4 dos
Max hold: 60 sweeps 20.0 -	RefLvi: 50.8 DBM 0.0-
Amp corr: 0.0dB 15.0 -	Pwr avg: 100 sweeps
Bin size: 916 Hz 10.0-	Amp corrisold B g
5.0-	-10.0-
0.0-	
5.0-	-20.0-
9994 Bandwidth	
-10.0-	and Deschalder
-15.0-	-30,0-
Power Over Span -20.0 -	4.48 171-12
11137.694 mW 2351.2 2352.5 2355.0 2357.5 2358.8	Power Over Span -40.0 -
53.03 dBm Frequency (MHz)	21019.390 mW 2351.2 2352.5 2355.0 2357.5 2358.8
99% Bandwidth, Power Over Span and PSD	43.23 dBm Frequency (MHz)
	99% Bandwidth, Power Over Span and PSD

Port 4 – LTE – QPSK – 5M – Center Channel – Peak	Port 4 – LTE – QPSK – 5M – Center Channel – Average
Spectrum Analyzer Settings	Spectrum Analyzer Settings
CE: 2355.000 MHz	
SPAN: 7.500 MHz 45.0 -	SPAN: 7,500 MHz 25.0 -
RB: 1.000 MHz 40.0 -	RB: 120 kHz 20.0-
VBI 3.000 MH2 Deletory BK (CISPR) 35.0 - Doversite	VB: 360 kHz
Attn: 20 DB 39% Points 39% Points	Detector: RMS 13.0
RL Offset: 40.8 DB 30.0	RU Offset: 40.8 DB 10.0-
Sweep Time: 1.0s 25.0-	Sweep Time: 4.4ms 5.0-
Max holds 60 sweeps _ 20.0 -	Ref Lvi: 50.8 DBM 0.0-
Amp corr: 0.0dB	Pwr avg: 100 sweeps E = 0
Bin size: 916 Hz 0 1010	Ring rise 10.008 The state of t
10.0-	-10.0 -
5.0-	-15.0-
0.0-1	-20.0 -
1996 Pandwidth 50-	-25.0-
Social Soci	9996 Bandwidth co.o.
5.06 1012 -10.0-1	-30.0
Power Over Span -15.0 -	4.49 WHZ -35.0 - WWW
31015.334 mW 2351.2 2352.5 2355.0 2357.5 2358.8	Power Over Span -40.0-
54.17 dBm Frequency (MHz)	26012.418 mW 2351.2 2352.5 2355.0 2357.5 2358.
99% Bandwidth, Power Over Span and PSD	44.15 dBm Frequency (MHz)
55 to bandmach, i omor orec span and i 50	99% Bandwidth, Power Over Span and PSD
Port 4 – LTE – 16OAM – 5M – Center Channel – Peak	Port 4 – LTE – 16OAM – 5M – Center Channel – Average
pectrum Analyzer Settings 50.0 -	Spectrum Analyzer Settings 30.0
CF: 2355.000 MHz	CF: 2355.000 MHz
SPAN: 7.500 MHz 45.0 -	SPAN: 7.500 MHz 25.0 -
K8: 1.000 MHz 40.0 -	RB: 120 kHz 20.0 -
Petector: PK (CISPR) 35.0 - 39% Points 39% Points	VB: 350 KHz Detacher: BMS 15.0 -
Attn: 20 DB 30.0-	Attn: 20 DB 10 D-
RL Offset: 40.8 DB 50.0	RLOffset: 40.8 DB
sweep filler tos 25.0-	Sweep Time: 4.4ms 5.0-
Max hold: 60 sweeps _ 20.0 -	RefLvi: 50.8 DBM 0.0-
Amp corr: 0.0dB	Pwr avg: 100 sweeps
BIU 21561 319 HZ	Bin size: 1916 Hz
10.0-	-10.0-
5.0-	-15.0 -
0.0-	-20.0-
man hardwith F.O. D	
9% Bandwidth -5.0	-25.0
5.07 MHz -10.0 - 1	99% Bandwidth -30.0 -
ower Over Span -15.0 -	4.47 MHz -35.0 - Manual Part
05269.711 mW 2351.2 2352.5 2355.0 2357.5 2358.8	Power Over Span _40.0 -
54.85 dBm Frequency (MHz)	26503.694 mW 2351.2 2352.5 2355.0 2357.5 2358
00% Descheidt Deuter Gree and DCD	44.23 In Frequency (MH2)
99% Bandwidth, Power Over Span and PSU	99% Bandwidth, Power Over Snan and PSD
Port 4 – LTE – 640AM – 5M – Center Channel – Peak	Port 4 – LTE – 640AM – 5M – Center Channel – Average
	Spectrum Analyzer Settings 20.0-
F: 2355.000 MHz	CF: 2355.000 MHz
5PAN: 7.500 MHz 45.U	SPAN: 7.500 MHz 25.0 -
(B): 3,000 MHz 40.0 -	RB: 120 kHz 20.0-
Detector: PK (CISPR) 35.0 - 39% Points 30% Paints	VB: 350 KHz Detector: PMC 15.0 -
Attn: 20 DB 30.0-	Attn: 20 DB 10 0-
RL Offset: 40.8 DB 50.0	RL Offset: 40.8 DB
tef Lvl: 50.8 DBM 25.0 -	Sweep Time: 4.4ms 5.0-
fax hold: 60 sweeps _ 20.0- /	Ref Lvl: 50.8 DBM 0.0-
Amp corr: 0.0dB & 15.0-	Pwr avg: 100 sweeps
10.0-	Bin size: 916 Hz 10.0-
10.0	-10.0
5.0-	-15.0-
0.0-	-20.0-
	-25.0-
196 Pandwidth 50	1996 Producidh 20.0
196 Bandwidth -5.0 -	
196 Bandwidth -5.0	-30.0
196 Bandwidth - 5,0	4.48 MHz -35.0
1% Bandwidth -5.0- 5.08 MHz -10.0- оwer Over Span -1:5.0- оwer 302 мH w 2351.2 2352.5 2355.0 2357.5 2358.8	
9% Bandwidth -5.0 - 5.08 MH₂ -10.0 - ≫wer Over Span -15.0 - 8002.491 mW 2351.2 2352.5 2355.0 2357.5 2358.8 53.89 dBm Frequency (MH₂)	
196 Bandwidth -5.0 - 5.08 MHz -10.0 - owar Over Span -15.0 - 3002.491 mW 2351.2 2352.5 2355.0 2357.5 2358.8 53.38 dBm 999.8 Bandwidth Frequency (MHz) - - -	
3% Bandwidth -5.0 - 5.08 MHz -10.0 - -10.0 - -10.0 - 38/2 A41 mW -255.0 2357.5 2358.8 53.38 dBm 99% Bandwidth, Power Over Span and PSD	









Port 1 – LTE – QPSK – 5M – Low Channel – Peak	Port 1 – LTE – QPSK – 5M – Low Channel – Average
Port 1 – LTE – QPSK – 5M – Low Channel – Peak Spectrum Analyzer Setting: 50.0 CF: 252:500 MHz 45.0 SPACtor MAL 45.0 Wath Note Note: 10.0 Wath Note: 00.0 Ref UNISS DBM 25.0 Max hold: 95.0 Sovept Time: 0.0	Port 1 - LTE - QPSK - 5M - Low Channel - Average Spectrum Analyzer Settings 30.0 CF: 2352.500 MHz 25.0- SPARti: 7500 MHz 20.0- VB: 500 kHz 20.0- Detector: RMS 15.0- Atn: 20 BB 10.0- Re: 120 kHz 5.0- Bin tite: 916 Hz 5.0- 1996 Bandwidth -30.0-
Power Over Span -15.0	Power Over Span -40.0-
54.06 dBm Frequency (MHz)	25398.977 mW 2348.8 2350.0 2352.5 2355.0 2356.2 44.05 dBm
55 % ballomius, rowel ovel spall and rsb	99% Bandwidth, Power Over Span and PSD
Port 1 – LTE – 160AM – 5M – Low Channel – Peak	Port 1 – LTE – 16OAM – 5M – Low Channel – Average
	Spectrum Analyzer Settings
CF: 322.500 MHz 50.0 SPAH: 750 MHz 40.0 V8: 300 MHz 40.0 V8: 300 MHz 50.0 V8: 300 MHz 50.0 V8: 300 MHz 35.0 Atm: 20 B 30.0 Ref. U, IS 30 DEM 30.0 Ref. U, IS 30 DEM 30.0 Ref. U, IS 30 DEM 30.0 Max hold: 05 Newps 25.0 Ref. U, IS 30 DEM 25.0 Ana hold: 05 Newps 6 10.0 10.0 5.0 10.0	CF: 2322.500 MHz 50.0 SPAN: 7.500 MHz 25.0
0.0- 5.0- 5.0- 99% Bandwidth 5.07 MHz Power Over Span 15.0- 1995/376 mW 2348.8 2350.0 2352.5 2355.0 2356.2 Frequency (MHz) 99% Bandwidth, Prwer Over Span and PD	-20.0 - -25.0
	99% Bandwidth, Power Over Span and PSD
Port 1 – LTE – 64QAM – 5M – Low Channel – Peak	Port 1 – LTE – 64QAM – 5M – Low Channel – Average
Spectrum Analyzer Setting: 50.0 CF: 322.500 MHz 50.0 SPAH: 7500 MHz 45.0 RB: 1.000 MHz 45.0 VB: 300 MHz 40.0 VB: 300 MHz 35.0 Atm. 20 EB 30.0 Ref. UI, S02 DEM 30.0 Ref. UI, S02 DEM 30.0 Ref. UI, S02 DEM 30.0 Max hold: S0 XMMZ 30.0 IS 00 MHz 30.0 Joint S02 DEM 30.0 Ref. UI, S02 DEM 30.0 Ref. UI, S02 DEM 30.0 Joint S02 DEM 10.0 Joint S02 DEM 10.0	Spectrum Analyzer Settings 30.0 CF 232,200 MHz 25.0 SPAN 17 500 MHz 25.0 R8: 828 KHz 20.0 Detactors RMS 15.0 R1: 0.0 FB 5.0 Ref 10 B 10.0 River Time 4 Ams 5.0 Ref Lvit 50.8 DBM 0.0 Pur avgl: 100 sweeps -0.0 Bin size 1916 Hz -10.0 -15.0 -20.0
99% Bandwidth -5.0 - 5.08 MHz -10.0 - Power Over Span -15.0 - 11511.14 mW 2348.8 2350.0 2352.5 2355.0 2366.2	-25.0 - 99% Bandwidth -30.0 - 4.49 MHz -35.0
54.18 dBm Frequency (MHz)	26562.595 mW 2348.8 2350.0 2352.5 2355.0 2356.2
99% Bandwidth, Power Over Span and PSD	94424 dBm rrequericy (mrz)
	99% balluwilun, Power Over Span and PSD

Port 1 – LTE – QPSK – 5M – High Channel – Peak	Port 1 – LTE – QPSK – 5M – High Channel – Average
Spectrum Analyzer Settings	Spectrum Analyzer Settings
CF: 2357.500 MHz 45.0	CF: 2357.500 MHz
SPAN: 7.500 MHz 45.0	SPAN: 7.500 MHz 20.0
VB: 1000 MHz 40.0-	RB: 120 kHz 20.0
Detector: PK (CISPR) 35.0 - 99% Points 99% Points	VB: 360 KHZ Detector: RMS
Attn: 20 DB 30.0	Attn: 20 DB 10.0
Sweep Time: 1.0s 25.0 -	RL Offset: 40.8 DB
Ref Lvl: 50.8 DBM 20.0 -	Sweep Ime: 4.4ms 0.0-
Amp corr: 0.0dB & 15.0 -	Pwr avg: 100 sweeps
Bin size: 916 Hz 10.0-	Amp corr: 0.0dB10.0 -
50-44	Bin size: 916 Hz
0.0-	-20.0 -
5.0	
99% Panduidh	-30.0
E DE MHZ	996 Bandwidth White
-15.0 -	-40.0 -
Power Over Span -20.0 -	4,40 10 12
x2210.610 mW 2353.8 2355.0 2357.5 2360.0 2361.2	Power Over Span -50,0 - : :
54.02 dBm Prequeilcy (MIn2)	24845.725 mW 2353.8 2355.0 2357.5 2360.0 2361.2
99% Bandwidth, Power Over Span and PSD	43.95 dBm Frequency (MHz)
	99% Bandwidth, Power Over Span and PSD
Port 1 – LTE – 16OAM – 5M – High Channel – Peak	Port 1 – LTE – 16OAM – 5M – High Channel – Average
Spectrum Analyzer Settings	Spectrum Analyzer Settings
CF: 2357.500 MHz 45.0	CF: 2357.500 MHz
SPAN: 7,500 MHz 45.U-	SPAN: 7.500 MHz
RB: 1.000 MHz 40.0 -	R8: 120 kHz 20.0
Detector: PK (CISPR) 35.0 - 99% Points 99% Points	VB: 350 KH2
Attn: 20 DB 30.0	Attn: 20 DB 10.0-
Sweep Time: 1.0s 25.0 -	RL Offset: 40.8 DB
Ref Lvi: 50.8 DBM 20.0-	Sweep Time: 4.4ms 0.0 -
Amp corru 0.0dB	Pwr avg: 100 sweeps
Bin size: 916 Hz 10.0-	Amp corr: 0.0dB 🖉 -10.0 -
50	Bin size: 916 Hz
5.0-	-20.0 -
0.0-	
-5.U-	-30.0-
99% Bandwidth -10.0-	and he with an and the second
-15.0-	-40.0
Power Over Span -20.0 -	4,46 / 1/11/2
36263.859 mW 2353.8 2355.0 2357.5 2360.0 2361.2	Power Over Span -50.0 -
54.72 dBm Prequency (MHz)	24376.048 mW 2353.8 2355.0 2357.5 2360.0 2361.2
99% Bandwidth, Power Over Span and PSD	43.87 dBm Frequency (MHz)
	99% Bandwidth, Power Over Span and PSD
Port 1 – LTE – 64QAM – 5M – High Channel – Peak	Port 1 – LTE – 64QAM – 5M – High Channel – Average
Spectrum Analyzer Settings 50.0 -	Spectrum Analyzer Settings 30.0
CF: 235/ 500 MHz 45.0 -	
RB: 1.000 MHz 40.0 -	RB: 120 kHz 20.0 -
VB: 3.000 MHz Detector: PK (CTSPR) 35.0 - 39% Points 39% Phints	VB: 360 kHz
Attn: 20 DB 30.0 -	Attes 20 DR 10.0 -
RL Offset: 40.8 DB 25.0 -	RL Offset: 40.8 DB
Ref Lvl: 50.8 DBM 20.0-	Sweep Time: 4.4ms 0.0 -
Max hold: 60 sweeps E 15 0	Ref Livi: 50.8 DBM
Amp corr: 0.008 Bin size: 916 Hz	Amp corr: 0.0dB & -10.0 -
10.0	Bin size: 916 Hz
5.0-10	-20.0 -
0.0-	
-5.0-1	-30.0-
99% Bandwidth -10.0 -	annual Martin Carlos and Car
5.08 MHz -15.0 -	9996 Bandwidth -40.0 -
Power Over Span -20.0 -	4.48 MHz
15599.612 mW 2353.8 2355.0 2357.5 2360.0 2361.2	Power Over Span
53.90 dBm Frequency (MHz)	25018.835 millir 2353.8 2355.0 2357.5 2360.0 2361.2
99% Bandwidth, Power Over Span and PSD	43.98 dBm Frequency (MHz)
	99% Bandwidth, Power Over Span and PSD

Emission Bandwidths (26dB and 99%)

Emissions bandwidths were measured at Port 1 on low and high channels in 5MHz channel bandwidth mode and on center channel in 10MHz channel bandwidth mode for all modulations and results presented below.

	LTE - QPSK					LTE - 16QAM				LTE - 64QAM			
	Low High		Low		High		Low		High				
	26dB (MHz)	99% (MHz)	26dB (MHz)	99% (MHz)	26dB (MHz)	99% (MHz)	26dB (MHz)	99% (MHz)	26dB (MHz)	99% (MHz)	26dB (MHz)	99% (MHz)	
5M	4.875	4.491	4.875	4.49	4.859	4.485	4.849	4.482	4.882	4.506	4.882	4.5	

LTE - QPSK			LTE -	16QAM	LTE - 64QAM		
	Center		Ce	nter	Center		
	26dB (MHz) 99% (MHz)		26dB (MHz) 99% (MHz)		26dB (MHz)	99% (MHz)	
10M	9.72	8.984	9.708	8.997	9.767	8.979	

Corresponding plots included on the following pages.







Antenna Port Conducted Bandedge

Limits below reflect reduction by 10*log(4) per FCC KDB 662911D01 v02r01 due to 4x4 MIMO operation.

Frequen	Limit (dBm)				
<22	<2200				
2200	2285	-51.0206			
2285	2287.5	-48.0206			
2287.5	2300	-46.0206			
2300	2305	-19.0206			
2305	2320	-19.0206			
2320	2345	-51.0206			
2345	2360	-19.0206			
2360	2362.5	-19.0206			
2362.5	2365	-31.0206			
2365	2367.5	-46.0206			
2367.5	2370	-48.0206			
2370	2395	-51.0206			
>23	-19.0206				

In 5MHz channel bandwidth mode, low and high channels as well as dual carrier mode (low channel + high channel) configurations were tested. In 10MHz channel bandwidth mode, unit can only operate in single carrier mode at the center channel.

Results summary:

	LTE - QPSK				LTE - 16QAM				LTE - 64QAM			
	Low		Hi	High Low		High		Low		High		
5M	-23.24	-22.18	-23.05	-23.94	-23.23	-22.79	-24.1	-24.11	-23.78	-22.11	-24.84	-22.61
10M	-24.46 -24.33		.33	-25.8		-26.37		-25.68		-25.56		
5M Dual	-25.7		-25	.63	-26.57		-25.99		-26.42		-25.25	

Measurements were performed at Port 1 in RMS average mode over 100 traces. In 1MHz bands immediately outside and adjacent to the frequency blocks, RBW was reduced to 1% of the emission bandwidth. In 2345-2354MHz and 2361-2365MHz bands, RBW was again reduced to 1% of the emission bandwidth and power was integrated. A notch filter supplied by the customer was characterized for insertion loss and used to measure emissions in the 2195MHz-2345MHz and 2365MHz-2400MHz ranges to reduce measurement instrumentation noise floor. For all measurements insertion losses were factored in via reference level offset to the spectrum analyzer and settings are shown on corresponding plots on the following pages.

























Transmitter Antenna Port Conducted Spurious Emissions

Tests performed at Port 1 on center channel for all modulations and bandwidth modes. Due to 4x4 MIMO operation, limit is -19.03 dBm (-13 dBm $- 10*\log(4)$) per FCC KDB 662911D01 v02r01.

			0	<u> </u>	0	<u> </u>	
Frequency Range	RBW	VBW	Number of	Divided into	Detector	Sweep	Max hold
			data points			Time	over
9kHz-150kHz	1kHz	3kHz	8000	1 segment	Peak	Auto	50 sweeps
150kHz-1.5MHz	100kHz	300kHz	8000	1 segments	Peak	Auto	50 sweeps
1.5MHz-2.5GHz	1MHz	3MHz	8000	3 segments	Peak	Auto	50 sweeps
2.5GHz-24GHz	1MHz	3MHz	8000	10 segments	Peak	Auto	50 sweeps

TILE6 measurement software was used during testing with the following settings:

Above 2.5GHz, in order to reduce the measurement instrumentation noise floor a high pass filter has been used to block the fundamental.

Corresponding plots are included on the following pages.

5M – LTE – QPSK



5M - LTE - 16QAM



5M - LTE - 64QAM



10M - LTE - QPSK



10M - LTE - 16QAM



Company: Nokia Solutions and Net

10M - LTE - 64QAM



Page 50

Transmitter Radiated Spurious Emissions

Antenna port conducted spurious emissions tests produced similar results for all modulations and channel bandwidth modes. Preliminary scans for radiated spurious emissions were performed in 30MHz – 24GHz frequency range in the following configuration:

Transmitting in 5MHz-QPSK-LTE mode at center channel (2355MHz) on all 4 ports.

Final maximized peak radiated emissions were measured in this mode. Measurement distance was 3m for frequencies below 18GHz and 1m for frequencies above 18GHz. During testing all 4 antenna ports of the base station were terminated with 50ohm termination blocks and unit was transmitting on all of its ports at full power as described above.

		Pow				Corrected		
		Reading	Amplifier	Antenna	Cable	Field Strength	l imit at	
Frequency	Polarity	at 3m	Gain	Factor		at 3m	3m	Margin
(MHz)		(dBuV)	(dB)	(dB/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
614.4	V	19.6	-39.3	21	1.6	32.9	82.2	-49.3
614.4	ч	49.5	-39.3	21	1.6	32.5	82.2	-49.5
921.6	v	49.9	-40.2	24 3	2.8	35.7	82.2	-46 5
921.6	н	48.3	-40.2	24.3	2.8	35.2	82.2	-47
1000	v	46.7	-39.8	24.3	3.2	34.4	82.2	-47.8
1000	Н	47.1	-39.8	24.3	3.2	34.8	82.2	-47.4
2457.6	v	56.7	-48.2	28.4	3.1	40	82.2	-42.2
2457.6	н	55	-48.2	28.4	3.1	38.3	82.2	-43.9
17960 - NF	V	48.8	-45.5	45.9	10.7	59.9	82.2	-22.3
17960 - NF	Н	48.5	-45.5	45.9	10.7	59.6	82.2	-22.6
		Raw				Corrected		
		Reading	Amplifier	Antenna	Cable	Field Strength	Limit at	
Frequency	Polarity	at 1m	Gain	Factor	Loss	at 1m	1m	Margin
(MHz)	(H/V)	(dBuV)	(dB)	(dB/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
22233 - NF	V	46.5	-45.6	45.4	13.4	59.7	91.7	-32
21939 - NF	Н	46.2	-45.2	45.2	13.3	59.5	91.7	-32.2
Corrected Fiel	Corrected Field Strength = Raw Reading + Amplifier Gain + Antenna Factor + Cable Loss							
Negative marg	gin indicates	s a passing re	sult.					
Detector: Peal	k, RBW=1MI	Hz, VBW=3MI	Hz, Max-hold					
NF: Noise Floo	or							

Highest noise floor of the measurement instrumentation was more than 20dB below the 82.2dBuV/m at 3m limit and 91.7dBuV/m at 1m limit (both equivalent to -13dBm EIRP). Since all maximized readings were more than 20dB below these levels as well, substitution measurements were not performed. TILE software was used for all preliminary scans and plots included on the following pages. The limits shown on the plots correspond to levels 20dB below the said limits above.

30MHz – 1GHz Peak Prescan at 3m - H



30MHz – 1GHz Peak Prescan at 3m - V



1GHz – 18GHz Peak Prescan at 3m – H



1GHz – 18GHz Peak Prescan at 3m – V



18GHz – 24GHz Peak Prescan at 1m – H



18GHz – 24GHz Peak Prescan at 1m – V



Frequency Stability

In order to demonstrate carrier frequency stability at extreme temperatures and voltages, frequency error was measured in the following configuration:

Transmitting in 10MHz-64QAM-LTE mode at center channel (2355MHz) on port 1.

Nominal operating voltage of the product is declared as 48VDC.

Frequency error results are listed below for extreme voltages and temperatures.

Extreme Voltages

20C	Freq. Error (mHz)
40.8VDC	259
55.2VDC	230

Extreme Temperatures

48VDC	Freq. Error (mHz)
-30	48
-20	9
-10	80
0	39
10	112
20	180
30	178
40	116
50	112

Based on the results above, highest recorded frequency error is equivalent to 0.0001ppm, which ensures that the transmitted signal remains in its authorized frequency block at extreme voltages and temperatures.

Results above are deemed sufficient to demonstrate carrier frequency stability for all other channel bandwidth modes and modulations since all carriers are controlled by the same frequency stabilization circuitry that was subjected to the extreme conditions under this test.

End of Report

This page is intentionally blank and marks the last page of this test report.