



# Test report

REP023073-2R2TRFWL

Date of issue: September 13, 2024

Applicant:

SOLiD

Product description:

Edge Remote Optic Unit (eROU)

Model:

eROU\_17192325L1\_N,  
eROU\_17192325L2\_N

Product marketing name(s):

N/A


FCC ID:

W6UER17192325N

Specifications:

- ◆ FCC 47 CFR Part 24 – Personal Communication Services
- ◆ FCC 47 CFR Part 27 – Miscellaneous Wireless Communication Services

Lab and test locations

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Country	USA
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Website	www.nemko.com
FCC Site Number	Test Firm Registration Number: 392943; Designation Number: US3165
ISED Test Site	2040B
Tested by	Lan Sayasane, EMC Test Engineer
Reviewed by	James Cunningham, EMC/WL Manager
Review date	September 13, 2024
Reviewer signature	

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 USA's ISO/IEC 17025 accreditation.

This report must not be used by the client to claim product certification, approval, or endorsement by ANAB, NIST, or any agency of the U.S. Government.

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## Section 1 Report summary

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### 1.1 Test specifications

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FCC 47 CFR Part 24	Personal Communication Services
FCC 47 CFR Part 27	Miscellaneous Wireless Communication Services

### 1.2 Test methods

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ANSI C63.26 – 2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Services; Section 7 – RF Repeaters, amplifiers, and boosters testing
FCC KDB 935210 D05 v01r04	Measurements Guidance for Industrial, and Non-Consumer Signal Booster, Repeater, and Amplifier Devices

### 1.3 Exclusions

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None.

### 1.4 Statement of compliance

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Testing was performed against all relevant requirements of the test standard(s).

Results obtained indicate that the product under test complies in full with the tested requirements.

The test results relate only to the item(s) tested.

See “Section 2 Summary of test results” for full details.

### 1.5 Test report revision history

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**Table 1.5-1: Test report revision history**

Revision #	Issue Date	Details of changes made to test report
REPO23073-2TRFEMC	March 26, 2024	Original report issued
REPO23073-2R1TRFEMC	April 24, 2024	Minor corrections
REPO23073-2R2TRFEMC	September 13, 2024	Corrections following TCB feedback

## Section 2 Summary of test results

### 2.1 Sample information

Receipt date	22-Jan-24
Nemko sample ID number	REP023073

### 2.2 Testing period

Test start date	22-Jan-24
Test end date	09-Feb-24

### 2.3 Test results

**Table 2.3-1: Summary of results**

FCC Part	Test method	Test description	Verdict
	KDB 935210 D05V01r04 (3.2) ANSI C63.26 7.2.2.1	AGC threshold	Pass
	KDB 935210 D05v01r04 (3.3) ANSI C63.26 7.2.2.2	Out of band rejection	Pass
FCC Part 2.1049	KDB 935210 D05v01r05 (3.4) ANSI C63.26 7.2.2.3	Occupied bandwidth / Input-versus-output spectrum	Pass
FCC Part 24.232 (band 25 operation) FCC Part 27.50(a) (band 30 operation) FCC Part 27.50(d) (band 66, 70 operation) FCC Part 27.50(h) (band 41 operation)	KDB 935210 D05v01r05 (3.5) ANSI C63.26 7.2.2.4	Input/output power and amplifier/booster gain	Pass
FCC Part 24.238 (band 25 operation) FCC Part 27.53(a) (band 30 operation) FCC Part 27.23(h) (band 66, 70 operation) FCC Part 27.53(m) (band 41 operation)	KDB 935210 D05v01r05 (3.6) ANSI C63.26 7.2.2.5	Spurious emissions at RF antenna connector	Pass
FCC Part 24.235 (band 25 operation) FCC Part 27.54 (band 30, 66, 70, 41 operation)	KDB 935210 D05v01r05 (3.7) ANSI C63.26 7.2.2.6	Frequency stability	Not applicable <sup>1</sup>
FCC Part 24.238 (band 25 operation) FCC Part 27.53(a) (band 30 operation) FCC Part 27.23(h) (band 66, 70 operation) FCC Part 27.53(m) (band 41 operation)	KDB 935210 D05v01r05 (3.8) ANSI C63.26 7.2.2.7	Radiated spurious emissions	Pass

Notes: <sup>1</sup> Per ANSI C63.26-2015 clause 7.2.2.6 and KDB 935210 Clause 3.7, frequency stability testing is not required if the EUT does not process the input signal in a manner that can influence the output signal frequency/frequencies.

## Section 3 Equipment under test (EUT) details

### 3.1 Disclaimer

This section contains information provided by the applicant and has been utilized to support the test plan. Inaccurate information provided by the applicant can affect the validity of the results within this test report. Nemko accepts no responsibility for the information contained within this section and the impact it may have on the test plan and resulting measurements.

### 3.2 Applicant

Company name	SOLiD
Address	800 Klein Road, Suite 200
City	Plano
State	TX
Postal/Zip code	75074
Country	USA

### 3.3 Manufacturer

Company name	SOLiD
Address	800 Klein Road, Suite 200
City	Plano
State	TX
Postal/Zip code	75074
Country	USA

### 3.4 EUT information

Product name	Edge Remote Optic Unit (eROU)
Model	eROU_17192325L1_N, eROU_17192325L2_N
Variant(s)	N/A
Serial number	N/A
Part number	N/A
Power requirements	Input: 100-240Vac, 50/60Hz, 1.5A / Output: +48V, 1.35A
Description/theory of operation	eROU receives Tx optical signals from eHUB and converts them into RF signals. The converted RF signal is radiated to the antenna port via the AMP and Multiplexer. When receiving Rx signals through the antenna port, this unit filters out-of-band signals in a corresponding Multiplexer and sends the results to OPTIC to make electronic-optical conversion of them. After converted, the signals are sent to an upper device of eHUB. The eROU supports up to 4 bands.
Operational frequencies	Band 25: 1930 – 1995 MHz DL / 1850 – 1915 MHz UL Band 70: 1995 – 2020 MHz DL / 1695 – 1710 UL Band 66: 2110 – 2200 MHz DL / 1695 – 1780 MHz UL Band 30: 2350 – 2360 MHz DL / 2305 – 2315 MHz UL Band 41: 2496 – 2690 MHz UL/DL
Software details	N/A

### 3.5 Transmitter Information

Frequency band(s)	Band 25: 1930 – 1995 MHz DL / 1850 – 1915 MHz UL Band 70: 1995 – 2020 MHz DL / 1695 – 1710 UL Band 66: 2110 – 2200 MHz DL / 1695 – 1780 MHz UL Band 30: 2350 – 2360 MHz DL / 2305 – 2315 MHz UL Band 41: 2496 – 2690 MHz UL/DL																																																												
Antenna information	2 antenna ports – one for bands 25, 70 and 41 and one for bands 66 and 30 Integrated antenna, type eROU_Ant2.  Peak gain: <table border="1"> <thead> <tr> <th>Frequency (MHz)</th> <th>Peak Gain (dBi)</th> <th>Efficiency (dB)</th> <th>Efficiency (%)</th> </tr> </thead> <tbody> <tr><td>1695</td><td>1.86</td><td>-1.43</td><td>71.9</td></tr> <tr><td>1780</td><td>1.99</td><td>-1.22</td><td>75.6</td></tr> <tr><td>1850</td><td>2.90</td><td>-1.53</td><td>70.4</td></tr> <tr><td>1925</td><td>2.28</td><td>-1.54</td><td>70.1</td></tr> <tr><td>1995</td><td>3.30</td><td>-0.62</td><td>86.6</td></tr> <tr><td>2110</td><td>2.65</td><td>-1.48</td><td>71.1</td></tr> <tr><td>2200</td><td>4.86</td><td>-0.32</td><td>92.9</td></tr> <tr><td>2305</td><td>4.15</td><td>-1.30</td><td>74.2</td></tr> <tr><td>2320</td><td>4.70</td><td>-0.84</td><td>82.4</td></tr> <tr><td>2345</td><td>4.85</td><td>-0.81</td><td>82.9</td></tr> <tr><td>2360</td><td>4.97</td><td>-0.73</td><td>84.5</td></tr> <tr><td>2496</td><td>4.52</td><td>-1.39</td><td>72.6</td></tr> <tr><td>2600</td><td>4.80</td><td>-1.81</td><td>65.9</td></tr> <tr><td>2690</td><td>4.40</td><td>-2.22</td><td>60.0</td></tr> </tbody> </table>	Frequency (MHz)	Peak Gain (dBi)	Efficiency (dB)	Efficiency (%)	1695	1.86	-1.43	71.9	1780	1.99	-1.22	75.6	1850	2.90	-1.53	70.4	1925	2.28	-1.54	70.1	1995	3.30	-0.62	86.6	2110	2.65	-1.48	71.1	2200	4.86	-0.32	92.9	2305	4.15	-1.30	74.2	2320	4.70	-0.84	82.4	2345	4.85	-0.81	82.9	2360	4.97	-0.73	84.5	2496	4.52	-1.39	72.6	2600	4.80	-1.81	65.9	2690	4.40	-2.22	60.0
Frequency (MHz)	Peak Gain (dBi)	Efficiency (dB)	Efficiency (%)																																																										
1695	1.86	-1.43	71.9																																																										
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### 3.6 EUT setup details

**Table 3.6-1: EUT sub assemblies**

Description	Brand name	Model/Part number	Serial number	Rev.
Edge Remote Optic Unit (eROU)	SOLID	eROU_17192325L1_N	N/A	--

**Table 3.6-2: EUT interface ports**

Description	Qty.
+48Vdc port	1
Fiber (LC-APC) port	1
Ethernet port (Add ON eROU – Not populated)	1
USB-C port (Service Only – Not populated)	1
QMA (Add ON eROU – Not populated) Tx port	1
QMA (Add ON eROU – Not populated) Rx port	1
Antenna 1 port (Terminated with 50 ohms when Antenna 2 is operating)	1
Antenna 2 port (Terminated with 50 ohms when Antenna 1 is operating)	1

**Table 3.6-3: Support equipment**

Description	Brand name	Model/Part number	Serial number	Rev.
Laptop	DELL	Latitude 5480	6KP16H2	--
iBIU System Interface	SOLID	iBIU_AC	65100122800159	--
eHub	SOLID	eHUB_SR_AC_R	35872M66G8421B00059	--

**Table 3.6-4: Inter-connection cables**

Cable description	From	To	Length (m)
Serial to USB	Laptop	iBIU System Interface	2
Fiber Optic	iBIU System Interface	eHub	1.5
Power cable	eHub	eROU	3
Fiber Optic	eHUB	eROU	10

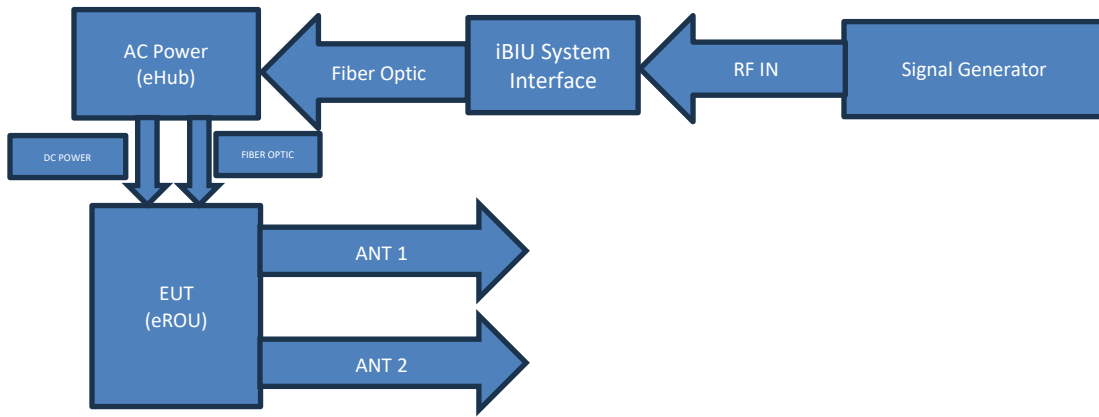


Figure 3.6-1: Test setup diagram



## Section 4 Engineering considerations

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### 4.1 Modifications incorporated in the EUT

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None.

### 4.2 Technical judgement

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None.

### 4.3 Deviations from laboratory test procedures

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None.

## Section 5 Test conditions

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### 5.1 Atmospheric conditions

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Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	86–106 kPa

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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.

### 5.2 Power supply range

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The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages  $\pm 5\%$ , for which the equipment was designed.

## Section 6 Measurement uncertainty

### 6.1 Uncertainty of measurement

Nemko USA Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 “Uncertainty in EMC measurements.” Measurement uncertainty was calculated using the methods described in CISPR 16-4-2 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics, and limit modelling – Measurement instrumentation uncertainty. The expression of Uncertainty in EMC testing. Measurement uncertainty calculations assume a coverage factor of K=2 with 95% certainty.

**Table 6.1-1: Measurement uncertainty calculations**

Measurement		$U_{cispr}$ dB	$U_{lab}$ dB
Conducted disturbance at AC mains and other port power using a V-AMN	9 kHz to 150 kHz	3.8	2.9
	150 kHz to 30 MHz	3.4	2.3
Conducted disturbance at telecommunication port using AAN	150 kHz to 30 MHz	5.0	4.3
Conducted disturbance at telecommunication port using CVP	150 kHz to 30 MHz	3.9	2.9
Conducted disturbance at telecommunication port using CP	150 kHz to 30 MHz	2.9	1.4
Conducted disturbance at telecommunication port using CP and CVP	150 kHz to 30 MHz	4.0	3.1
Radiated disturbance (electric field strength in a SAC)	30 MHz to 1 GHz	6.3	5.5
Radiated disturbance (electric field strength in a FAR)	1 GHz to 6 GHz	5.2	4.7
Radiated disturbance (electric field strength in a FAR)	6 GHz to 18 GHz	5.5	5.0

- Notes: Compliance assessment:
- If  $U_{lab}$  is less than or equal to  $U_{cispr}$  then:
- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit.
  - non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit
- If  $U_{lab}$  is greater than  $U_{cispr}$  then:
- compliance is deemed to occur if no measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit.
  - non-compliance is deemed to occur if any measured disturbance level, increased by  $(U_{lab} - U_{cispr})$ , exceeds the disturbance limit

V-AMN: V type artificial mains network  
 AAN: Asymmetric artificial network  
 CP: Current probe  
 CVP: Capacitive voltage probe  
 SAC: Semi-anechoic chamber  
 FAR: Fully anechoic room

## Section 7 Test equipment

### 7.1 Test equipment list

**Table 7.1-1: Test Equipment List**

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	E1120	2 years	14-Dec-2025
Vector Signal Generator	Rohde & Schwarz	SMW200A	E1156	3 years	10-May-2024
Power Sensor	ETS-Lindgren	7002-006	EW110	1 year	14-Apr-2024
EMI Test Receiver	Rohde & Schwarz	ESU 40	E1121	1 year	23-Aug-2024
System Controller	Sunol Sciences	SC104V	E1191	NCR	NCR
Antenna, Bilog	Schaffner-Chase	CBL6111C	1480	1 year	21-Feb-2024
Antenna, DRG Horn	ETS-Lindgren	3117-PA	E1160	1 year	13-Feb-2024
Antenna, Horn (18-26.5 GHz)	Eravant	SAZ-2410-42-S1	EW107	1 year	05-Dec-2024
Antenna, Horn (26.5-40 GHz)	Eravant	SAZ-2410-2-S1	EW108	1 year	05-Dec-2024
Termination, 50 ohms	Diamond Antenna	DC-500MHz	N/A	NCR	NCR
Attenuator, 30dB	Pasternack	PE7388-30	E1325	VBU	VBU

Notes: NCR: no calibration required  
VBU: verify before use

### 7.2 Test software list

**Table 7.2-1: Test Software**

Manufacturer	Details
Rohde & Schwarz	EMC 32 V10.60.10 (AC conducted emissions)
Rohde & Schwarz	EMC 32 V10.60.15 (radiated emissions)

## Section 8 Testing data

### 8.1 AGC Threshold

#### 8.1.1 References and limits

- ANSI C63.26 Section 7.2.2.1
- KDB 935210 D05v01r04 Clause 3.2

#### 8.1.2 Test summary

Verdict	Pass		
Test date	January 23, 2024 January 24, 2024	Temperature	20 °C
Test engineer	Lan Sayasane, EMC Test Engineer	Air pressure	1008 mbar
Test location	<input type="checkbox"/> 10m semi anechoic chamber <input type="checkbox"/> 3m semi anechoic chamber <input checked="" type="checkbox"/> Wireless bench <input type="checkbox"/> Other:	Relative humidity	54 %

#### 8.1.3 Notes

Per KDB 935210 D05 v01r04, Clause 3.1 and ANSI C63.26 Clause 7.2.2.1, testing was performed with a narrowband test signal (MSK modulated, gaussian filter of 0.3 and data rate 270 kbps) and a broadband signal (AWGN, 4.1 MHz 99% occupied bandwidth).

#### 8.1.4 Setup details

EUT power input during test	120 VAC / 60 Hz
EUT setup configuration	<input checked="" type="checkbox"/> Table-top <input type="checkbox"/> Floor standing <input type="checkbox"/> Other:
Measurement details	<p>The automatic gain control (AGC) threshold is determined as follows:</p> <ol style="list-style-type: none"> <li>a) Connect a signal generator to the input of the EUT.</li> <li>b) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation.</li> <li>c) The signal generator must be set to either of the required modulation signals.</li> <li>d) Set the frequency to the middle frequency of the EUT operating band.</li> <li>e) While monitoring the output of the EUT using the method of ANSI C63.26 7.2.2.4.2 or 7.2.2.4.3, increase the input level until a 1 dB increase in the input signal no longer causes a 1 dB increase in the output signal.</li> <li>f) This is the AGC threshold level of the EUT.</li> <li>g) Repeat for the other modulation signal.</li> </ol>

#### 8.1.5 Test data

**Table 8.1-1:** AGC Threshold results

Operating frequency band	Input signal type	AGC Threshold Level (dBm)
Band 25: 1930 – 1995 MHz	Narrowband	-13.0
	Broadband	-14.0
Band 70: 1995 – 2020 MHz	Narrowband	-19.0
	Broadband	-18.0
Band 66: 2110 – 2200 MHz	Narrowband	-18.0
	Broadband	-19.0
Band 30: 2350 – 2360 MHz	Narrowband	-9.0
	Broadband	-10.0
Band 41: 2496 – 2690 MHz	Narrowband	-8.0
	Broadband	-9.0

## 8.2 Out of band rejection

### 8.2.1 References and limits

- ANSI C63.26 Section 7.2.2.2
- KDB 935210 D05v01r04 Clause 3.3

### 8.2.2 Test summary

Verdict	Pass		
Test date	January 23, 2024 January 24, 2024	Temperature	20 °C
Test engineer	Lan Sayasane, EMC Test Engineer	Air pressure	1008 mbar
Test location	<input type="checkbox"/> 10m semi anechoic chamber <input type="checkbox"/> 3m semi anechoic chamber <input checked="" type="checkbox"/> Wireless bench <input type="checkbox"/> Other:	Relative humidity	54 %

### 8.2.3 Notes

None

### 8.2.4 Setup details

EUT power input during test	120 VAC / 60 Hz
EUT setup configuration	<input checked="" type="checkbox"/> Table-top <input type="checkbox"/> Floor standing <input type="checkbox"/> Other:
Measurement details	<p>The out-of-band rejection is measured as follows:</p> <ol style="list-style-type: none"> <li>a. Connect a signal generator to the input of the EUT.</li> <li>b. Configure a swept CW signal with the following parameters:             <ol style="list-style-type: none"> <li>1) Frequency range = <math>\pm 250\%</math> of the passband from the center of the passband, for each applicable operating frequency band.</li> <li>2) Level = a sufficient level to affirm that the out-of-band rejection is <math>&gt; 20</math> dB above the noise floor and will not engage the AGC during the entire sweep.</li> <li>3) Dwell time = approximately 10 ms.</li> <li>4) Number of points = <math>SPAN/(RBW/2)</math>.</li> </ol> </li> <li>c. Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.</li> <li>d. Set the span of the spectrum analyzer to the same frequency range of the signal generator.</li> <li>e. Set the RBW of the spectrum analyzer to be 1% to 5% of the EUT passband and the VBW shall be set to <math>\geq 3 \times RBW</math>.</li> <li>f. Set the detector to Peak Max-Hold and wait for the spectrum analyzer's display to fill.</li> <li>g. Capture the frequency response of the EUT.</li> <li>h. Place a marker to the peak of the frequency response and record this frequency as <math>f_0</math>.</li> <li>i. Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the -20 dB down amplitude to determine the 20 dB bandwidth.</li> <li>j. Repeat for all frequency bands applicable for use by the EUT.</li> </ol>

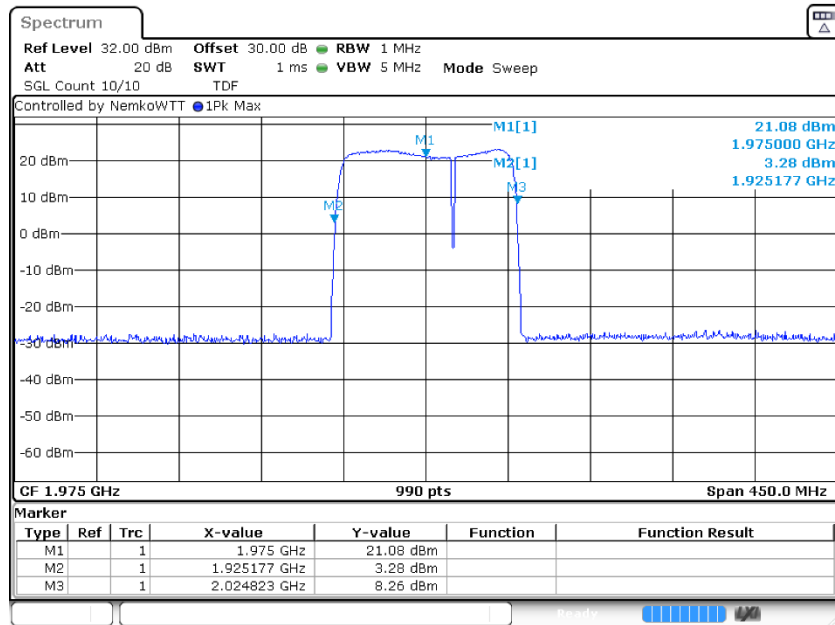
8.2.5 Test data

8.2.5.1 Operating frequency band: Band 25 and Band 70: 1930 – 2020 MHz

Note: Since Band 25 and Band 70 are adjacent to each other, a single measurement was performed across both bands.

**Table 8.2-1:** Out of band rejection results, Band 25\_Band 70

Parameter	Value
$f_0$	1975.000
$f_i$	1925.177
$f_h$	2024.823
20 dB bandwidth	99.646



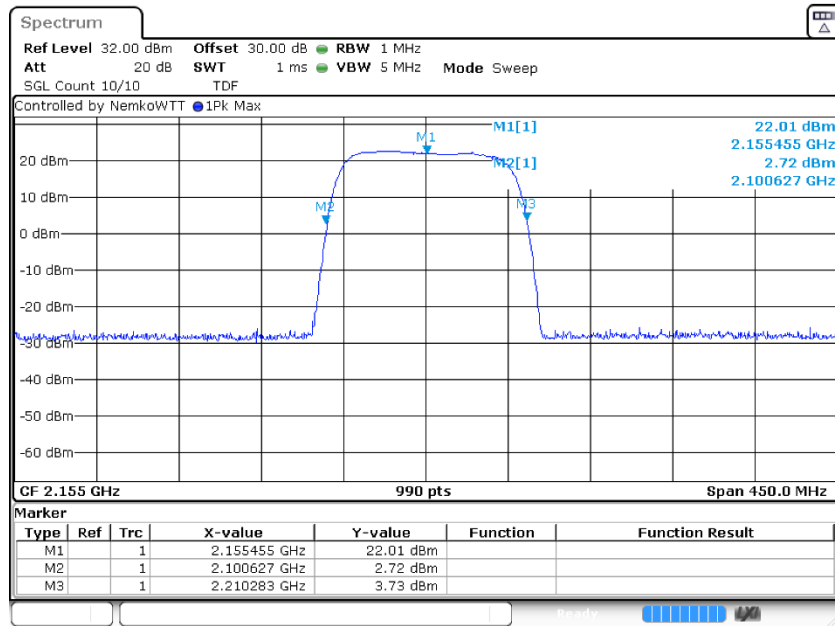
Out-of-band rejection, 1930-2020 MHz

**Figure 8.2-1:** Out of band rejection results, Band 25\_Band 70

8.2.5.2 Operating frequency band: Band 66: 2110 – 2200 MHz

**Table 8.2-2: Out of band rejection results, Band 66**

Parameter	Value
$f_0$	2155.455
$f_i$	2100.627
$f_h$	2210.283
20 dB bandwidth	109.656



Out-of-band rejection, 2110-2200 MHz

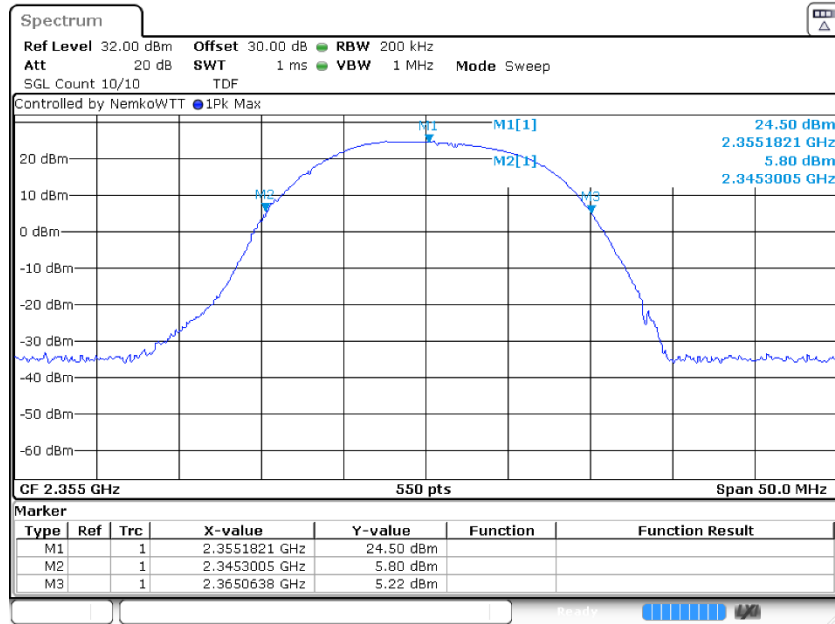
**Figure 8.2-2: Out of band rejection results, Band 66**



8.2.5.3 Operating frequency band: Band 30: 2350 – 2360 MHz

**Table 8.2-3: Out of band rejection results, Band 30**

Parameter	Value
$f_0$	2355.182
$f_l$	2345.301
$f_h$	2365.064
20 dB bandwidth	19.763



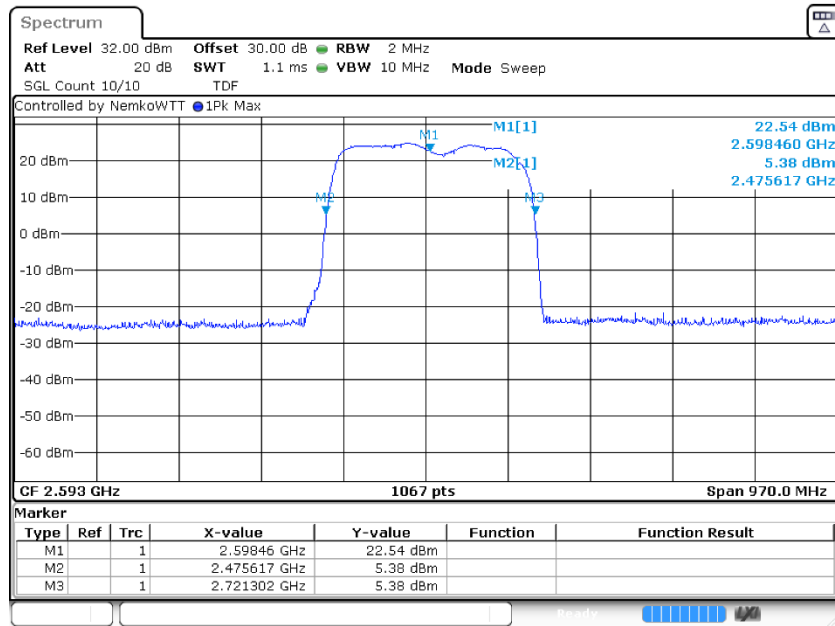
Out-of-band rejection, 2350-2360 MHz

**Figure 8.2-3: Out of band rejection results, Band 30**

8.2.5.4 Operating frequency band: Band 41: 2496 – 2690 MHz

**Table 8.2-4: Out of band rejection results, Band 41**

Parameter	Value
$f_0$	2598.460
$f_l$	2475.617
$f_h$	2721.302
20 dB bandwidth	245.685



Out-of-band rejection, 2496-2690 MHz

**Figure 8.2-4: Out of band rejection results, Band 41**

## 8.3 Occupied bandwidth / Input Versus Output Comparison

### 8.3.1 References and limits

- FCC 47 CFR Part 2.1049
- ANSI C63.26 Clause 7.2.2.4
- KDB 935210 D05v01r04 Clause 3.4

### 8.3.2 Test summary

Verdict	Pass		
Test date	January 23, 2024 January 24, 2024	Temperature	20 °C
Test engineer	Lan Sayasane, EMC Test Engineer	Air pressure	1008 mbar
Test location	<input type="checkbox"/> 10m semi anechoic chamber <input type="checkbox"/> 3m semi anechoic chamber <input checked="" type="checkbox"/> Wireless bench <input type="checkbox"/> Other:	Relative humidity	54 %

### 8.3.3 Notes

Per KDB 935210 D05 v01r04, Clause 3.3 and ANSI C63.26 Clause 7.2.2.3, testing was performed with a narrowband test signal (MSK modulated, gaussian filter of 0.3 and data rate 270 kbps) and a broadband signal (AWGN, 4.1 MHz 99% occupied bandwidth).

### 8.3.4 Setup details

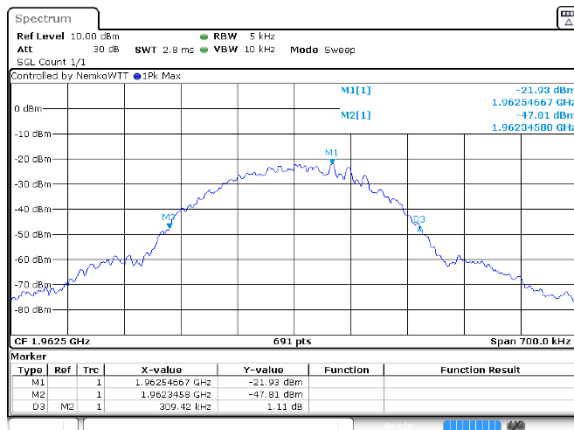
EUT power input during test	120 VAC / 60 Hz
EUT setup configuration	<input checked="" type="checkbox"/> Table-top <input type="checkbox"/> Floor standing <input type="checkbox"/> Other:
Measurement details	<p>A 26 dB bandwidth measurement shall be performed on the input and the output signal.</p> <ol style="list-style-type: none"> <li>a. Connect a signal generator to the EUT.</li> <li>b. Configure the signal generator to transmit the AWGN signal.</li> <li>c. Configure the signal level to be just below the AGC threshold, but not more than 015 dB below.</li> <li>d. Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.</li> <li>e. Set the spectrum analyzer center frequency to the nominal EUT channel center frequency. The span range of the spectrum analyzer shall be between 2 x OBW and 5 x OBW.</li> <li>f. The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW and the VBW shall be <math>\geq 3 \times</math> RBW.</li> <li>g. Set the reference level of the instrument as required, to prevent the signal from exceeding the maximum spectrum analyzer input mixer level for linear operation. In general, the peak of the spectral envelope must be more than <math>[10 \log (OBW / RBW)]</math> below the reference level. Step f) and step g) can require iteration to enable adjustments within the specified tolerances.</li> <li>h. The noise floor of the spectrum analyzer at the selected RBW shall be at least 36 dB below the reference level.</li> <li>i. Set spectrum analyzer detection mode to peak, and the trace mode to max hold.</li> <li>j. Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference level).</li> <li>k. Determine the -26 dB down amplitude by placing two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the -26 dB down amplitude. If a marker is below the -26 dB down value, it should be as close as possible to this value. The OBW is the positive frequency difference between the two markers.</li> <li>l. Repeat step 3) to step k) to measure the input signal to the EUT (i.e., signal generator output). Compare the 26 dB bandwidths to affirm they are similar.</li> <li>m. Repeat step e) to step l) with the input signal to the EUT set to 3 dB above the AGC threshold.</li> <li>n. Repeat step e) to step m) with the signal generator set to the narrowband signal.</li> <li>o. Repeat step e) to step n) for all bands used by the EUT.</li> </ol>

8.3.5 Test data

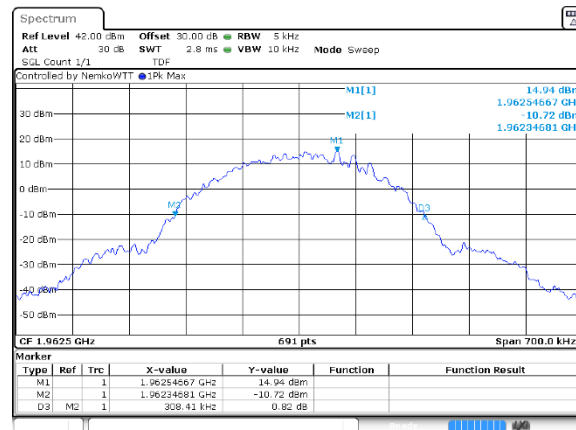
8.3.5.1 Operating frequency band: Band 25: 1930 – 1995 MHz

Table 8.3-1: Occupied bandwidth / Input Versus Output Comparison results

Condition	Test Frequency (MHz)	26 dB Bandwidth (Input Signal) (MHz)	26 dB Bandwidth (Output Signal) (MHz)
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband	1962.5	0.30942	0.30841
Input Level = AGC Threshold + 3 dB Input signal = narrowband	1962.5	0.30942	0.30841
Input Level = AGC Threshold - 0.5 dB Input signal = broadband	1962.5	4.6667	4.6667
Input Level = AGC Threshold + 3 dB Input signal = broadband	1962.5	4.6667	4.6667

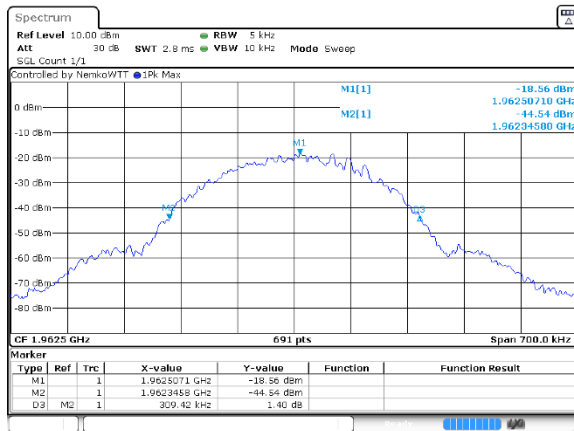


Occupied bandwidth (26 dB), TX: 1962.5 MHz, BW: 0.2 MHz, MOD: GSM

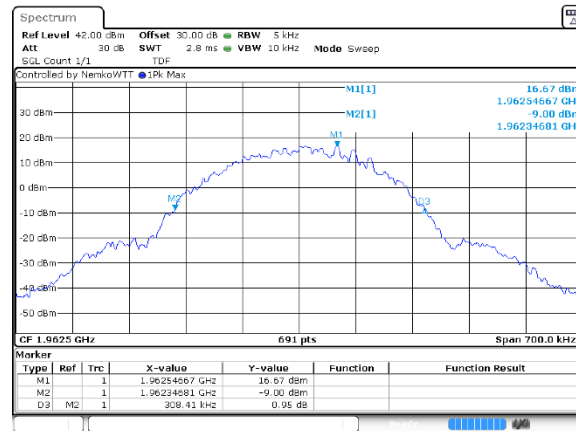


Occupied bandwidth (26 dB), TX: 1962.5 MHz, BW: 0.2 MHz, MOD: GSM

Figure 8.3-1: Occupied bandwidth / Input Versus Output Comparison results, narrowband signal, 0.5 dB below AGC threshold, input and output signal respectively

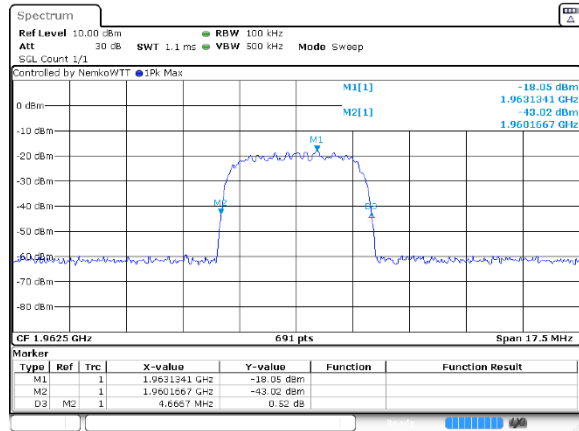


Occupied bandwidth (26 dB), TX: 1962.5 MHz, BW: 0.2 MHz, MOD: GSM

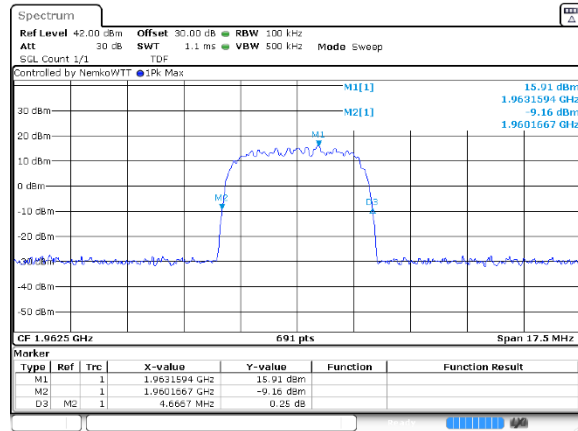


Occupied bandwidth (26 dB), TX: 1962.5 MHz, BW: 0.2 MHz, MOD: GSM

Figure 8.3-2: Occupied bandwidth / Input Versus Output Comparison results, narrowband signal, 3.0 dB above AGC threshold, input and output signal respectively

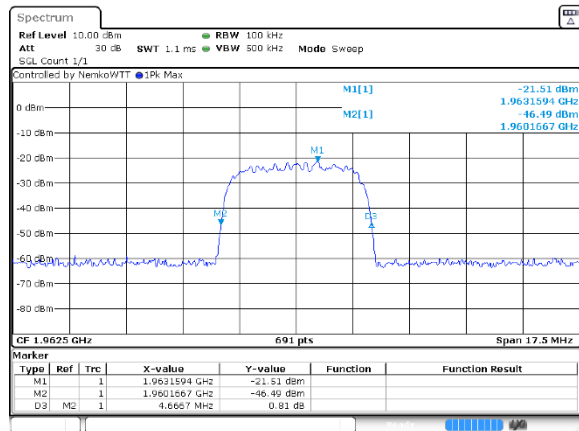


Occupied bandwidth (26 dB), TX: 1962.5 MHz, BW: 5MHz, MOD: W  
CDMA

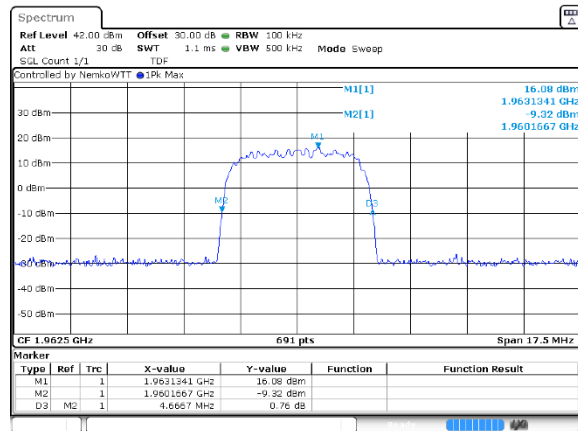


Occupied bandwidth (26 dB), TX: 1962.5 MHz, BW: 5MHz, MOD: W  
CDMA

Figure 8.3-3: Occupied bandwidth / Input Versus Output Comparison results, broadband signal, 0.5 dB below AGC threshold, input and output signal respectively



Occupied bandwidth (26 dB), TX: 1962.5 MHz, BW: 5MHz, MOD: W  
CDMA



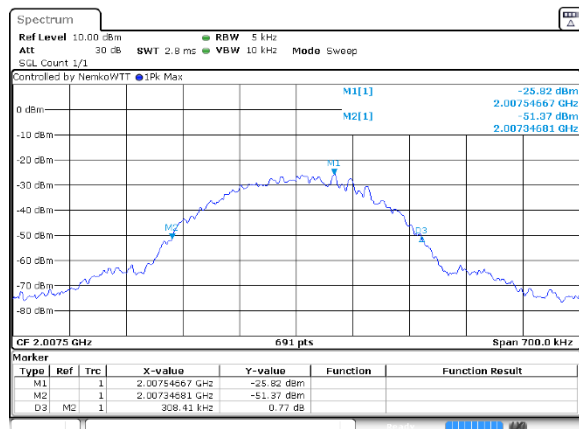
Occupied bandwidth (26 dB), TX: 1962.5 MHz, BW: 5MHz, MOD: W  
CDMA

Figure 8.3-4: Occupied bandwidth / Input Versus Output Comparison results, broadband signal, 3.0 dB above AGC threshold, input and output signal respectively

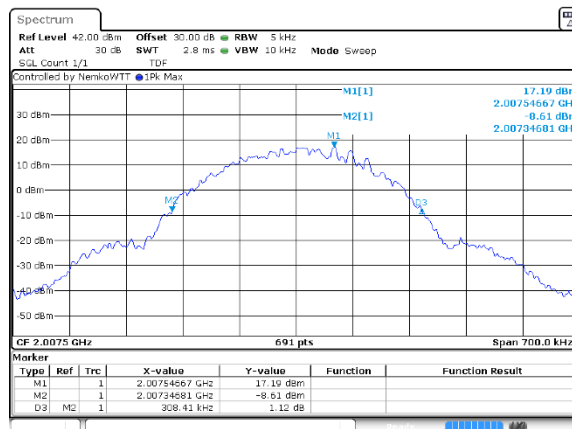
8.3.5.2 Operating frequency band: Band 70: 1995 – 2020 MHz

Table 8.3-2: Occupied bandwidth / Input Versus Output Comparison results

Condition	Test Frequency (MHz)	26 dB Bandwidth (Input Signal) (MHz)	26 dB Bandwidth (Output Signal) (MHz)
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband	2007.5	0.30841	0.30841
Input Level = AGC Threshold + 3 dB Input signal = narrowband	2007.5	0.30841	0.30942
Input Level = AGC Threshold - 0.5 dB Input signal = broadband	2007.5	4.6920	4.6667
Input Level = AGC Threshold + 3 dB Input signal = broadband	2007.5	4.6667	4.6667

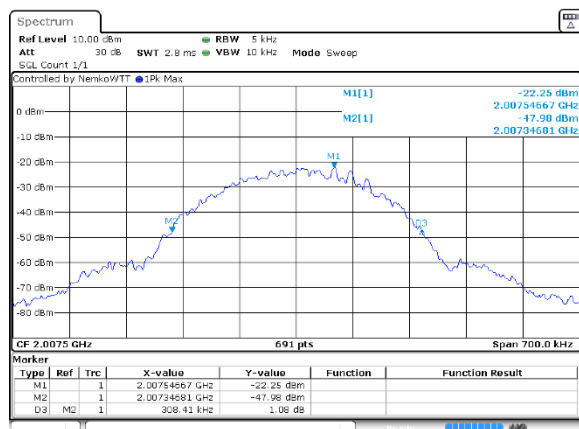


Occupied bandwidth (26 dB), TX: 2007.5 MHz, BW: 0.2 MHz, MOD: GSM

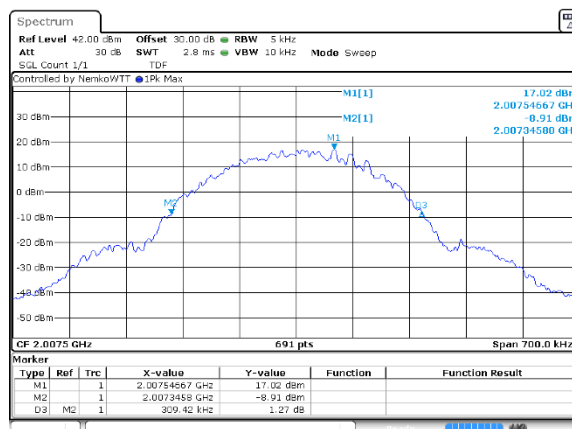


Occupied bandwidth (26 dB), TX: 2007.5 MHz, BW: 0.2 MHz, MOD: GSM

Figure 8.3-5: Occupied bandwidth / Input Versus Output Comparison results, narrowband signal, 0.5 dB below AGC threshold, input and output signal respectively

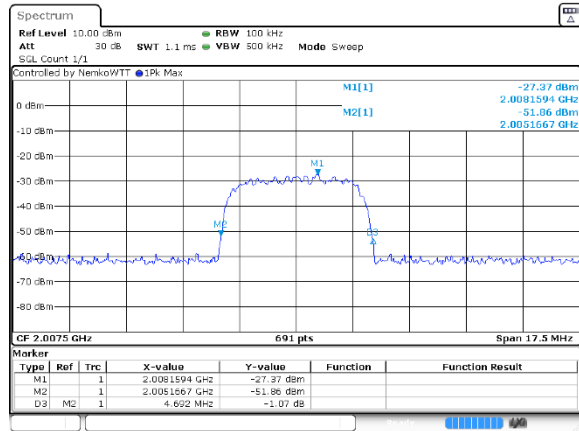


Occupied bandwidth (26 dB), TX: 2007.5 MHz, BW: 0.2 MHz, MOD: GSM

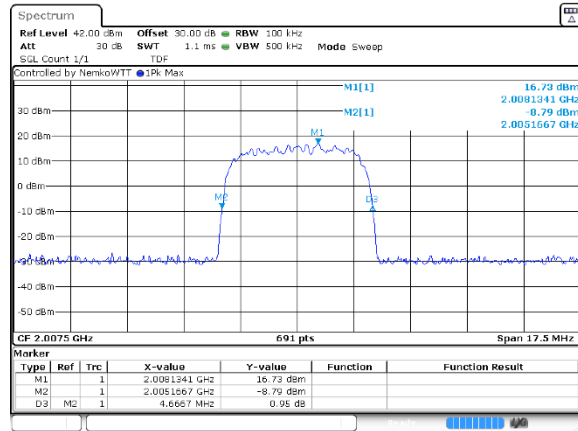


Occupied bandwidth (26 dB), TX: 2007.5 MHz, BW: 0.2 MHz, MOD: GSM

Figure 8.3-6: Occupied bandwidth / Input Versus Output Comparison results, narrowband signal, 3.0 dB above AGC threshold, input and output signal respectively

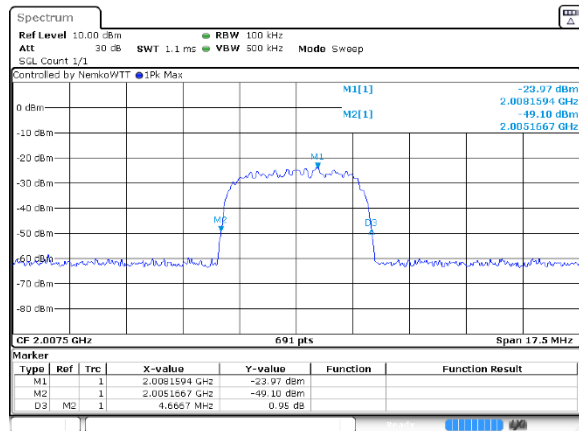


Occupied bandwidth (26 dB), TX: 2007.5 MHz, BW: 5MHz, MOD: W  
CDMA

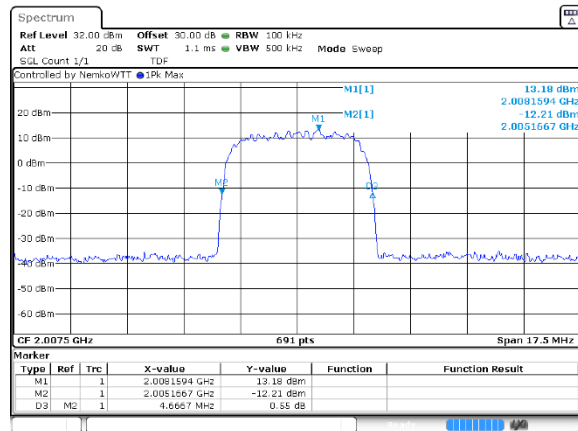


Occupied bandwidth (26 dB), TX: 2007.5 MHz, BW: 5MHz, MOD: W  
CDMA

Figure 8.3-7: Occupied bandwidth / Input Versus Output Comparison results, broadband signal, 0.5 dB below AGC threshold, input and output signal respectively



Occupied bandwidth (26 dB), TX: 2007.5 MHz, BW: 5MHz, MOD: W  
CDMA



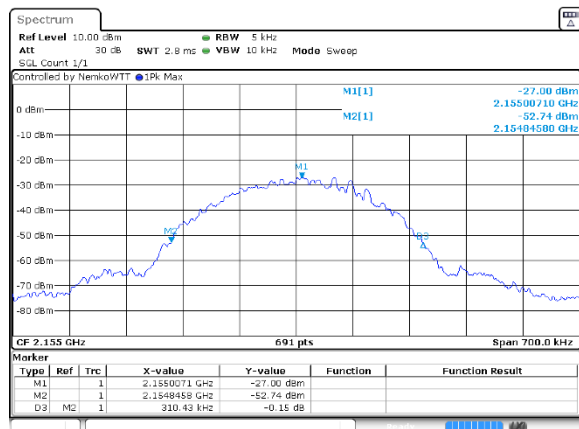
Occupied bandwidth (26 dB), TX: 2007.5 MHz, BW: 5MHz, MOD: W  
CDMA

Figure 8.3-8: Occupied bandwidth / Input Versus Output Comparison results, broadband signal, 3.0 dB above AGC threshold, input and output signal respectively

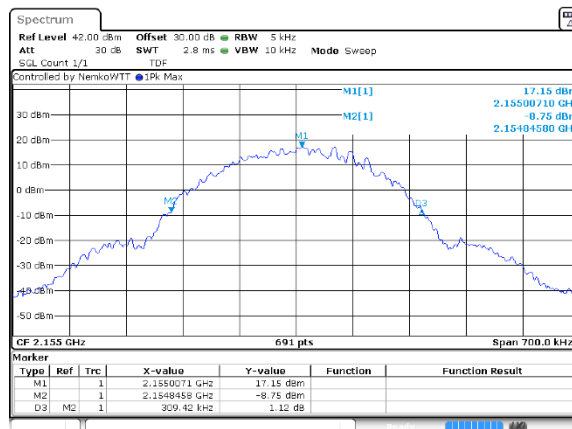
8.3.5.3 Operating frequency band: Band 66: 2110 – 2200 MHz

Table 8.3-3: Occupied bandwidth / Input Versus Output Comparison results

Condition	Test Frequency (MHz)	26 dB Bandwidth (Input Signal) (MHz)	26 dB Bandwidth (Output Signal) (MHz)
Input Level = AGC Threshold -0.5 dB Input signal = narrowband	2155	0.31043	0.30942
Input Level = AGC Threshold + 3 dB Input signal = narrowband	2155	0.30841	0.30841
Input Level = AGC Threshold -0.5 dB Input signal = broadband	2155	4.6667	4.6667
Input Level = AGC Threshold + 3 dB Input signal = broadband	2155	4.6667	4.6667

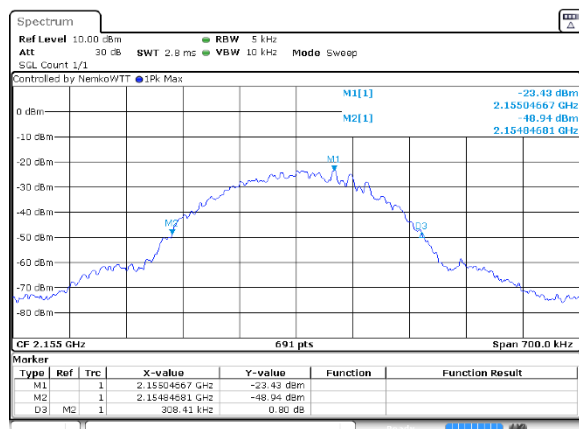


Occupied bandwidth (26 dB), TX: 2155 MHz, BW: 0.2 MHz, MOD: G SM

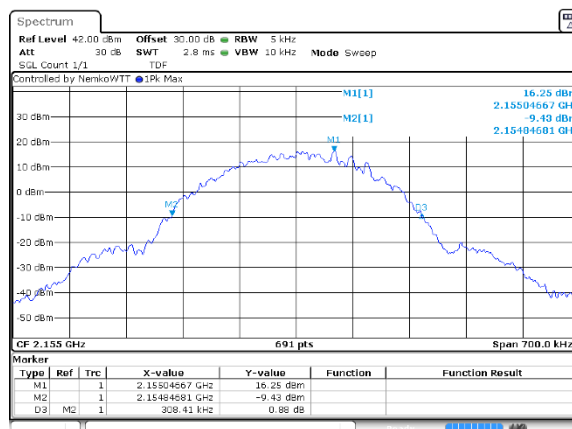


Occupied bandwidth (26 dB), TX: 2155 MHz, BW: 0.2 MHz, MOD: G SM

Figure 8.3-9: Occupied bandwidth / Input Versus Output Comparison results, narrowband signal, 0.5 dB below AGC threshold, input and output signal respectively



Occupied bandwidth (26 dB), TX: 2155 MHz, BW: 0.2 MHz, MOD: G SM



Occupied bandwidth (26 dB), TX: 2155 MHz, BW: 0.2 MHz, MOD: G SM

Figure 8.3-10: Occupied bandwidth / Input Versus Output Comparison results, narrowband signal, 3.0 dB above AGC threshold, input and output signal respectively



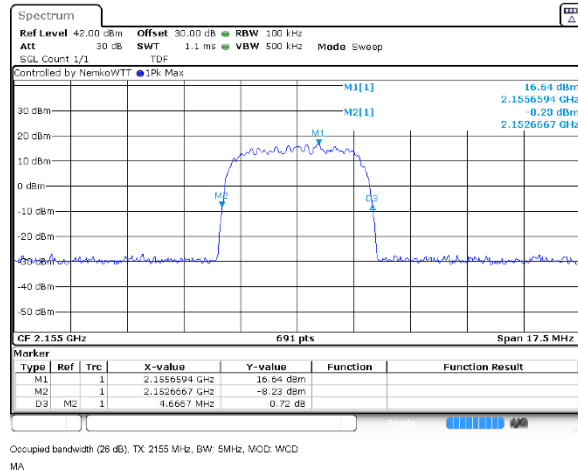
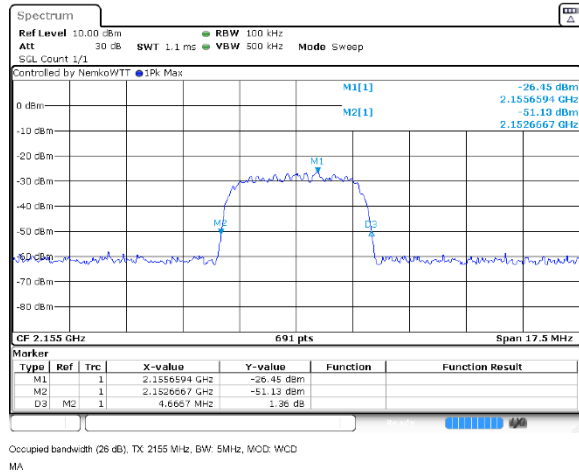


Figure 8.3-11: Occupied bandwidth / Input Versus Output Comparison results, broadband signal, 0.5 dB below AGC threshold, input and output signal respectively

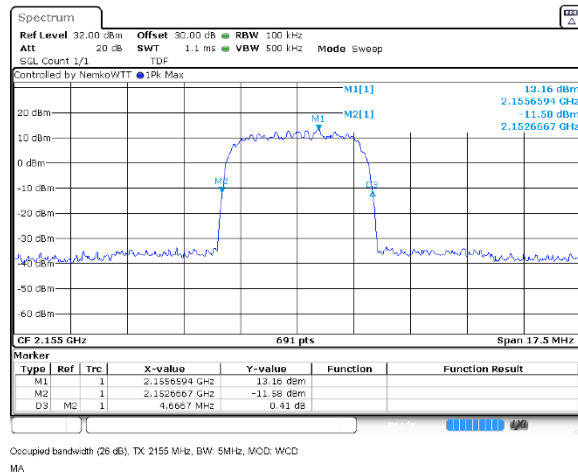
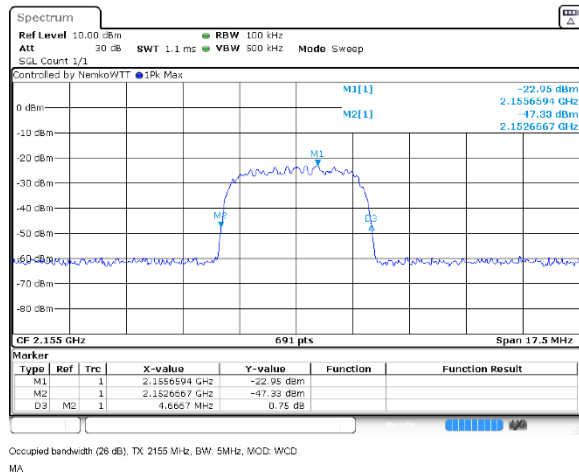
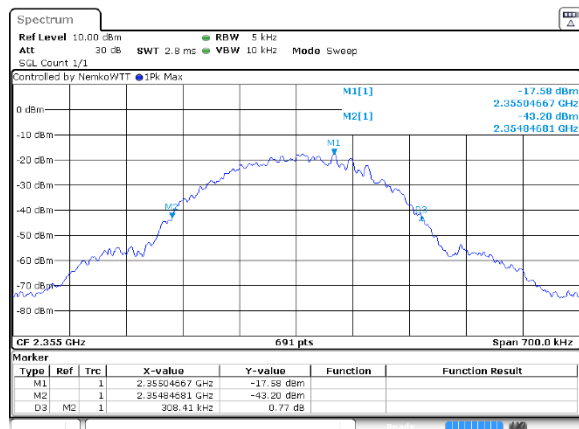


Figure 8.3-12: Occupied bandwidth / Input Versus Output Comparison results, broadband signal, 3.0 dB above AGC threshold, input and output signal respectively

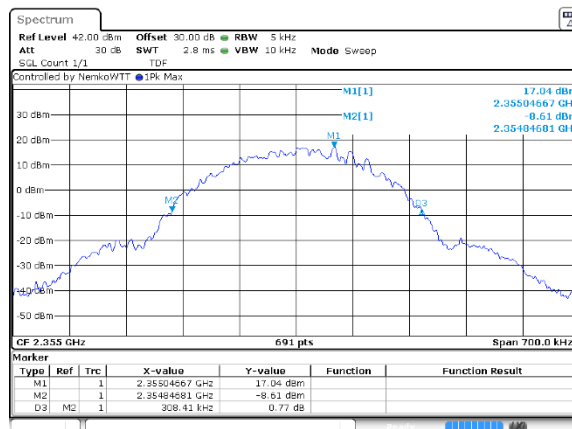
8.3.5.4 Operating frequency band: Band 30: 2350 – 2360 MHz

Table 8.3-4: Occupied bandwidth / Input Versus Output Comparison results

Condition	Test Frequency (MHz)	26 dB Bandwidth (Input Signal) (MHz)	26 dB Bandwidth (Output Signal) (MHz)
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband	2355	0.30841	0.30841
Input Level = AGC Threshold + 3 dB Input signal = narrowband	2355	0.30841	0.30841
Input Level = AGC Threshold - 0.5 dB Input signal = broadband	2355	4.6667	4.6667
Input Level = AGC Threshold + 3 dB Input signal = broadband	2355	4.6667	4.6667

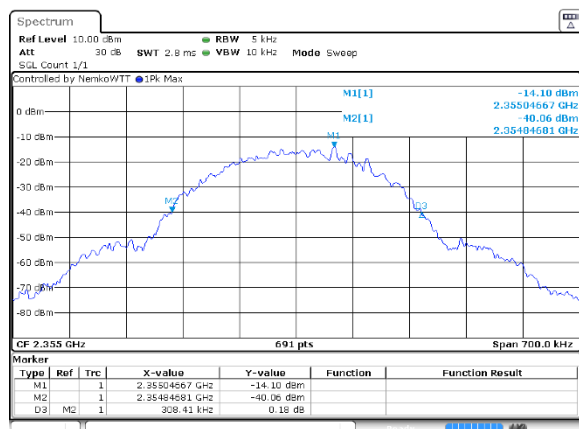


Occupied bandwidth (26 dB), TX: 2355 MHz, BW: 0.2 MHz, MOD: G SM

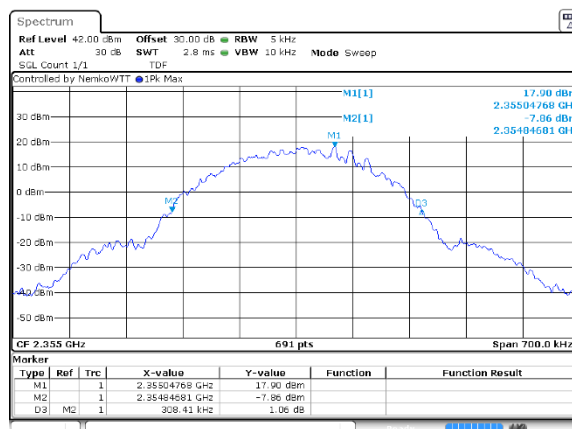


Occupied bandwidth (26 dB), TX: 2355 MHz, BW: 0.2 MHz, MOD: G SM

Figure 8.3-13: Occupied bandwidth / Input Versus Output Comparison results, narrowband signal, 0.5 dB below AGC threshold, input and output signal respectively

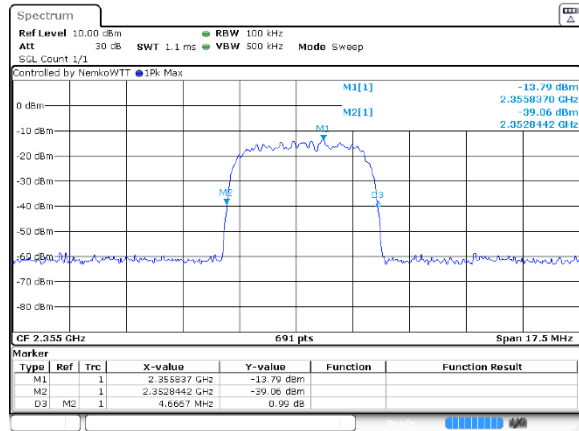


Occupied bandwidth (26 dB), TX: 2355 MHz, BW: 0.2 MHz, MOD: G SM

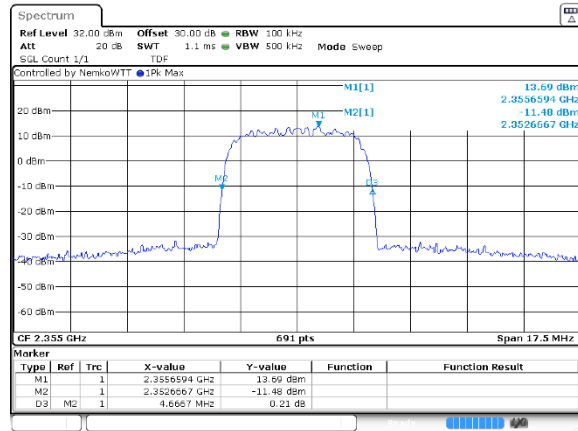


Occupied bandwidth (26 dB), TX: 2355 MHz, BW: 0.2 MHz, MOD: G SM

Figure 8.3-14: Occupied bandwidth / Input Versus Output Comparison results, narrowband signal, 3.0 dB above AGC threshold, input and output signal respectively

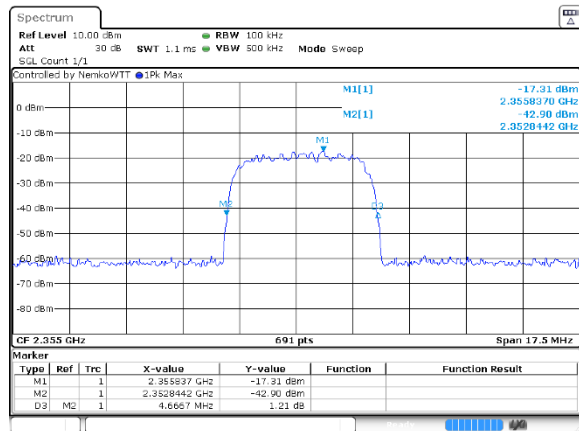


Occupied bandwidth (26 dB), TX: 2355 MHz, BW: 5MHz, MOD: WCD  
MA

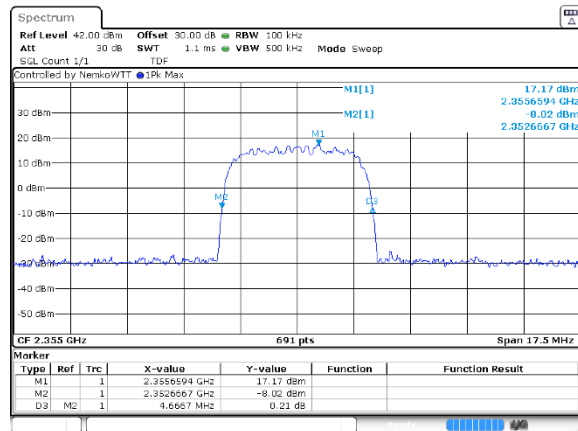


Occupied bandwidth (26 dB), TX: 2355 MHz, BW: 5MHz, MOD: WCD  
MA

Figure 8.3-15: Occupied bandwidth / Input Versus Output Comparison results, broadband signal, 0.5 dB below AGC threshold, input and output signal respectively



Occupied bandwidth (26 dB), TX: 2355 MHz, BW: 5MHz, MOD: WCD  
MA



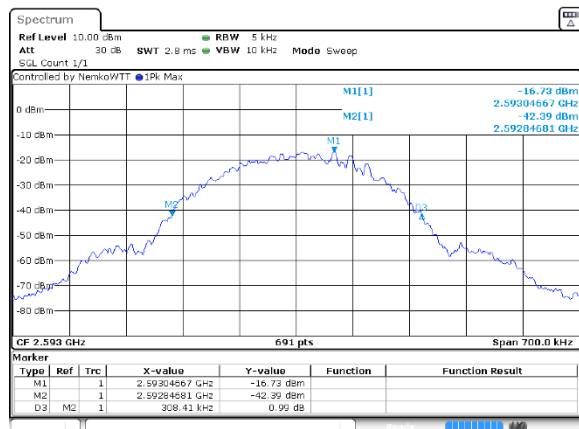
Occupied bandwidth (26 dB), TX: 2355 MHz, BW: 5MHz, MOD: WCD  
MA

Figure 8.3-16: Occupied bandwidth / Input Versus Output Comparison results, broadband signal, 3.0 dB above AGC threshold, input and output signal respectively

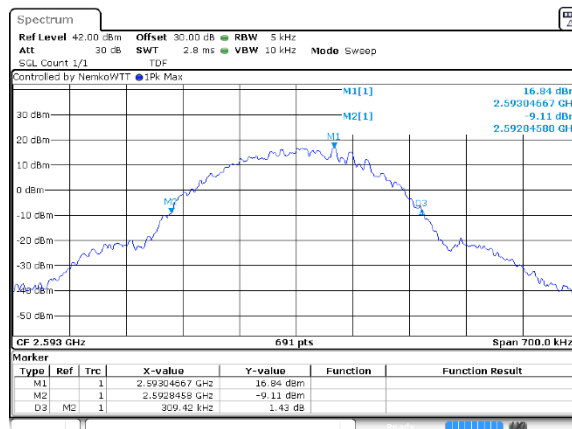
8.3.5.5 Operating frequency band: Band 41: 2496 – 2690 MHz

Table 8.3-5: Occupied bandwidth / Input Versus Output Comparison results

Condition	Test Frequency (MHz)	26 dB Bandwidth (Input Signal) (MHz)	26 dB Bandwidth (Output Signal) (MHz)
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband	2593	0.30841	0.30942
Input Level = AGC Threshold + 3 dB Input signal = narrowband	2593	0.30841	0.30841
Input Level = AGC Threshold - 0.5 dB Input signal = broadband	2593	4.6667	4.6667
Input Level = AGC Threshold + 3 dB Input signal = broadband	2593	4.6667	4.6667

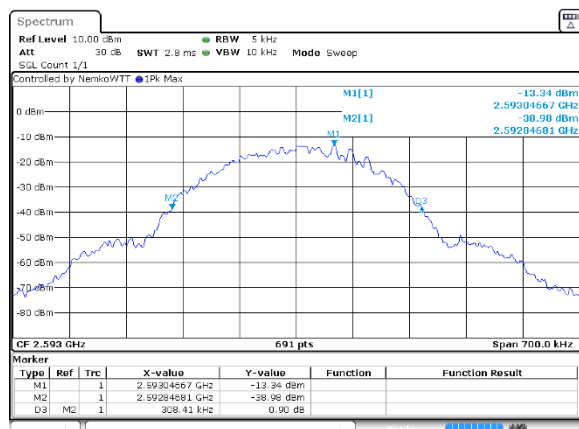


Occupied bandwidth (26 dB), TX: 2593 MHz, BW: 0.2 MHz, MOD: G SM

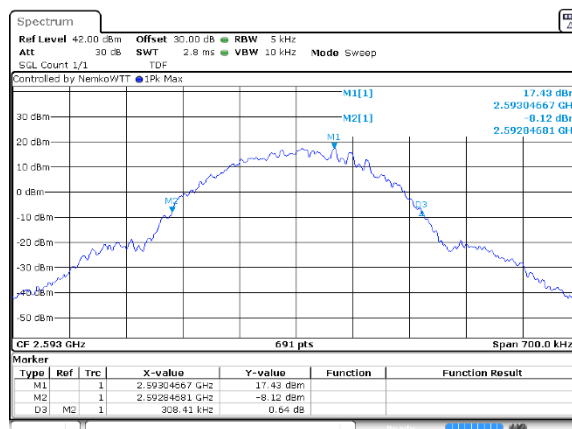


Occupied bandwidth (26 dB), TX: 2593 MHz, BW: 0.2 MHz, MOD: G SM

Figure 8.3-17: Occupied bandwidth / Input Versus Output Comparison results, narrowband signal, 0.5 dB below AGC threshold, input and output signal respectively

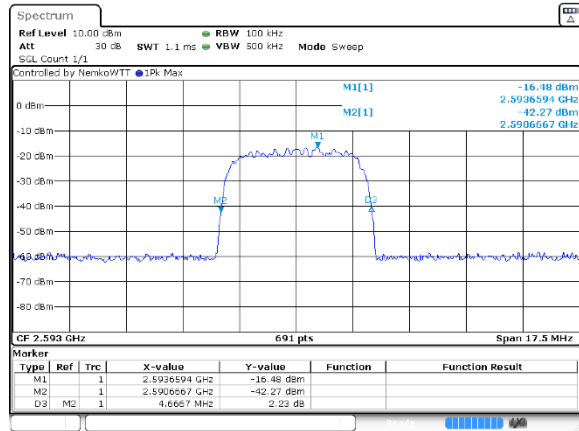


Occupied bandwidth (26 dB), TX: 2593 MHz, BW: 0.2 MHz, MOD: G SM

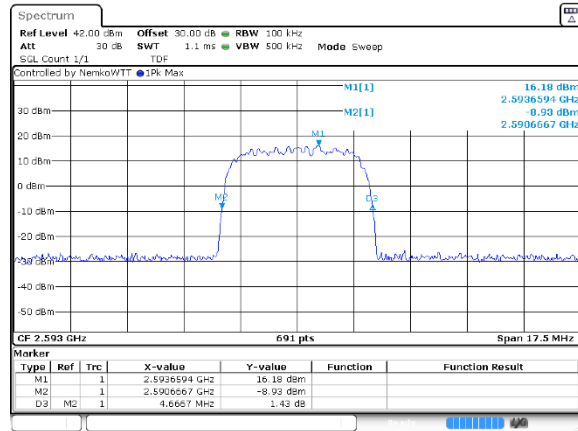


Occupied bandwidth (26 dB), TX: 2593 MHz, BW: 0.2 MHz, MOD: G SM

Figure 8.3-18: Occupied bandwidth / Input Versus Output Comparison results, narrowband signal, 3.0 dB above AGC threshold, input and output signal respectively

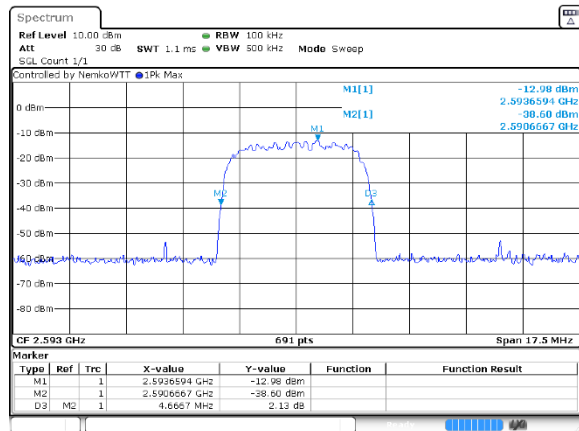


Occupied bandwidth (26 dB), TX: 2593 MHz, BW: 5MHz, MOD: WCD  
MA

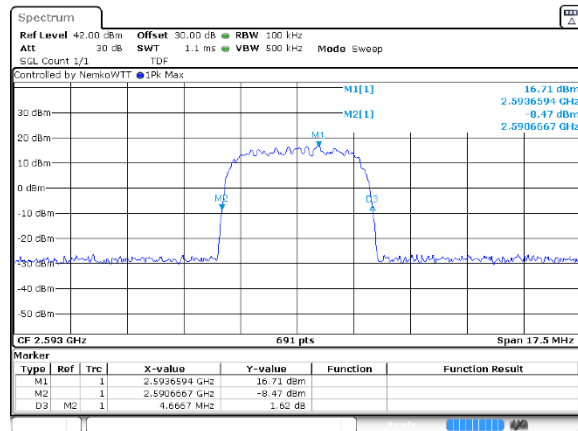


Occupied bandwidth (26 dB), TX: 2593 MHz, BW: 5MHz, MOD: WCD  
MA

Figure 8.3-19: Occupied bandwidth / Input Versus Output Comparison results, broadband signal, 0.5 dB below AGC threshold, input and output signal respectively



Occupied bandwidth (26 dB), TX: 2593 MHz, BW: 5MHz, MOD: WCD  
MA



Occupied bandwidth (26 dB), TX: 2593 MHz, BW: 5MHz, MOD: WCD  
MA

Figure 8.3-20: Occupied bandwidth / Input Versus Output Comparison results, broadband signal, 3.0 dB above AGC threshold, input and output signal respectively

## 8.4 Output power / Mean output power and amplifier gain

### 8.4.1 References and limits

- FCC Part 24.232 (band 25 operation)
- FCC Part 27.50(a) (band 30 operation)
- FCC Part 27.50(d) (band 66, and 70 operation)
- FCC Part 27.50(h) (band 41 operation)
- ANSI C63.26 Clause 7.2.2.4
- KDB 935210 D05v01r05 Clause 3.5

### 8.4.2 Test summary

Verdict	Pass		
Test date	January 23, 2024 January 24, 2024	Temperature	20 °C
Test engineer	Lan Sayasane, EMC Test Engineer	Air pressure	1008 mbar
Test location	<input type="checkbox"/> 10m semi anechoic chamber <input type="checkbox"/> 3m semi anechoic chamber <input checked="" type="checkbox"/> Wireless bench <input type="checkbox"/> Other:	Relative humidity	54 %

### 8.4.3 Notes

Per KDB 935210 D05 v01r04, Clause 3.4 and ANSI C63.26 Clause 7.2.2.4, testing was performed with a narrowband test signal (MSK modulated, gaussian filter of 0.3 and data rate 270 kbps) and a broadband signal (AWGN, 4.1 MHz 99% occupied bandwidth).

### 8.4.4 Setup details

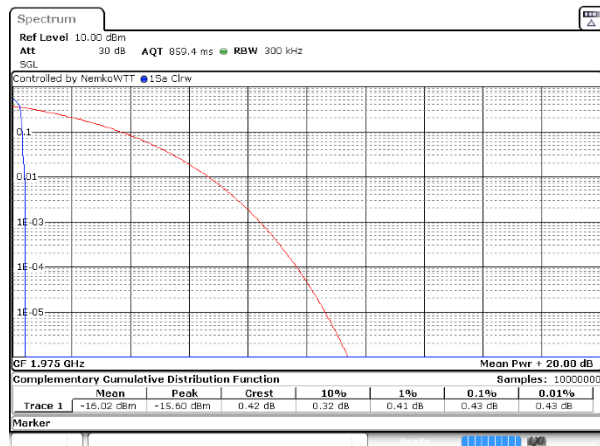
EUT power input during test	120 VAC / 60 Hz
EUT setup configuration	<input checked="" type="checkbox"/> Table-top <input type="checkbox"/> Floor standing <input type="checkbox"/> Other:
Measurement details	<p>Adjust the internal gain control of the EUT to the maximum gain for which the equipment certification is sought. Any EUT attenuation settings shall be set to their minimum value.</p> <ol style="list-style-type: none"> <li>a. Connect a signal generator to the input of the EUT.</li> <li>b. The modulation shall be set to the AWGN signal.</li> <li>c. The frequency of the signal generator shall be set to the frequency <math>f_0</math> as determined during the out-of-band rejection measurement.</li> <li>d. Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation,</li> <li>e. Set the level of the signal generator to a level that produces an output just below the AGC threshold, but not more than 015 dB below.</li> <li>f. Measure the output power of the EUT.</li> <li>g. Remove the EUT from the measurement set-up. Using the same signal generator settings, repeat the power measurement on the input signal to the EUT (i.e., the signal generator output). Calculate the amplifier gain as follows:             <math display="block">\text{Gain (dB)} = \text{output (dBm)} - \text{input (dBm)}.</math> </li> <li>h. Repeat step f) and g) with the input level set to a level that is 3 dB above the AGC threshold.</li> <li>i. Repeat step e) to step h) with the input signal set to narrowband modulation.</li> <li>j. Repeat step e) to step i) for all bands used by the EUT.</li> </ol>

8.4.5 Test data

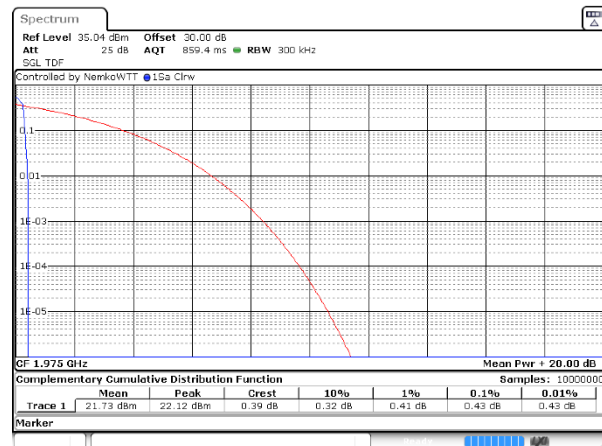
8.4.5.1 Operating frequency band: Band 25: 1930 – 1995 MHz

Table 8.4-1: Output power / Mean output power and amplifier gain test data

Condition	Test frequency (MHz)	Input power (dBm / MHz)	Output power (dBm/MHz)	Amplifier gain (dB)	0.1 % PAPR (dB)
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband	1975	-16.02	21.73	37.75	0.43
Input Level = AGC Threshold + 3 dB Input signal = narrowband	1975	-12.47	21.47	33.94	0.41
Input Level = AGC Threshold - 0.5 dB Input signal = broadband	1975	-14.74	18.32	33.06	4.43
Input Level = AGC Threshold + 3 dB Input signal = broadband	1975	-11.25	21.79	33.04	4.46

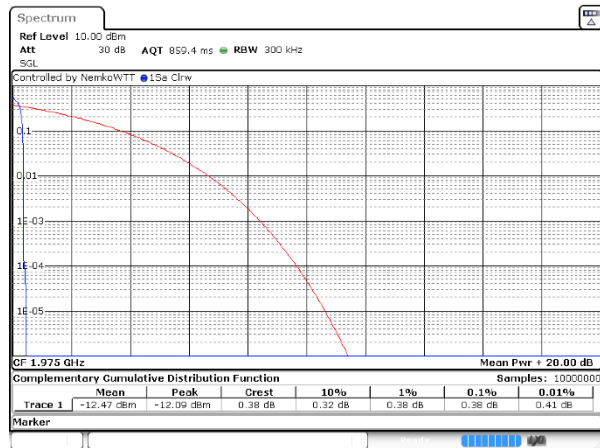


Peak power, TX 1975 MHz, BW: 0.2MHz, MOD: GSM

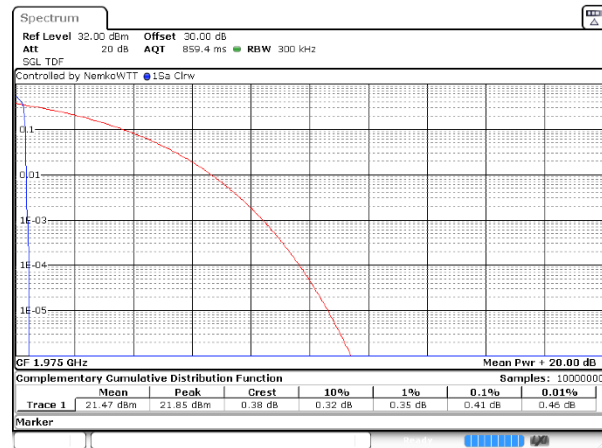


Peak power, TX 1975 MHz, BW: 0.2MHz, MOD: GSM

Figure 8.4-1: Output power / Mean output power and amplifier gain results, narrowband signal, 0.5 dB below AGC threshold, input and output signal respectively

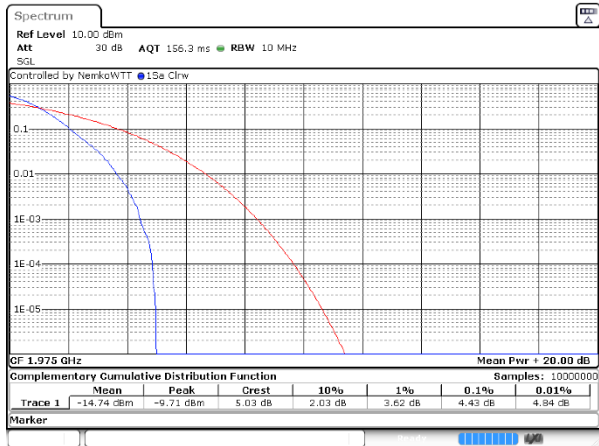


Peak power, TX 1975 MHz, BW: 0.2MHz, MOD: GSM

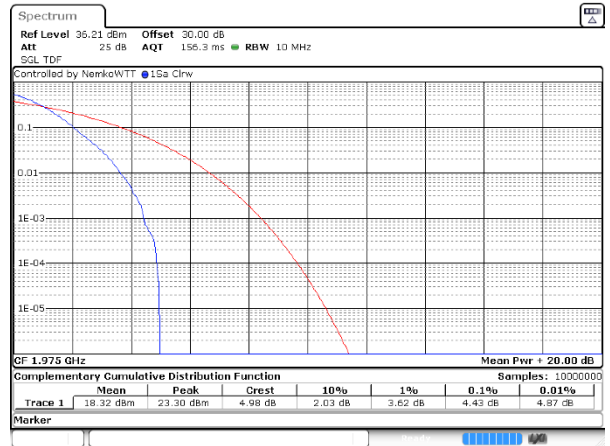


Peak power, TX 1975 MHz, BW: 0.2MHz, MOD: GSM

Figure 8.4-2: Output power / Mean output power and amplifier gain results, narrowband signal, 3 dB above AGC threshold, input and output signal respectively

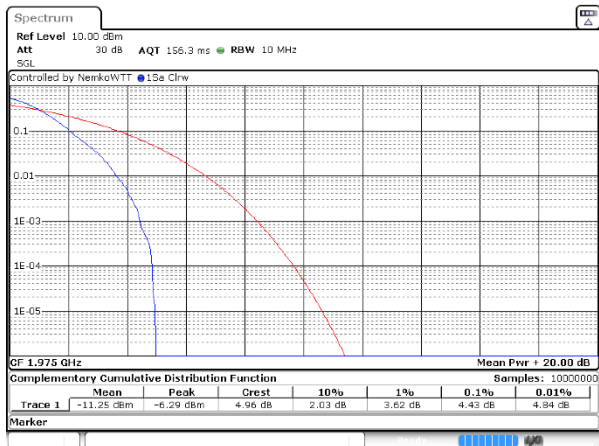


Peak power, TX 1975 MHz, BW: 5MHz, MOD: WCDMA

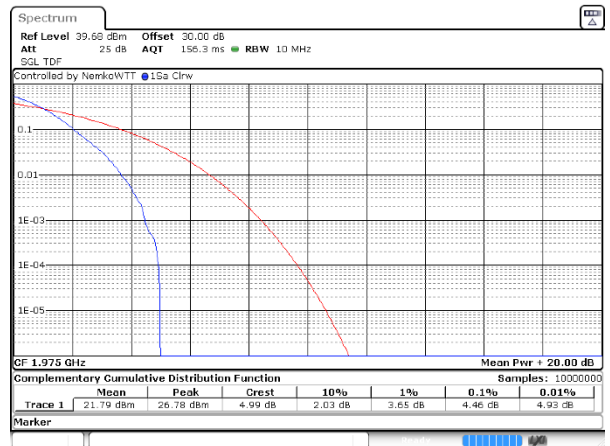


Peak power, TX 1975 MHz, BW: 5MHz, MOD: WCDMA

Figure 8.4-3: Output power / Mean output power and amplifier gain results, broadband signal, 0.5 dB below AGC threshold, input and output signal respectively



Peak power, TX 1975 MHz, BW: 5MHz, MOD: WCDMA



Peak power, TX 1975 MHz, BW: 5MHz, MOD: WCDMA

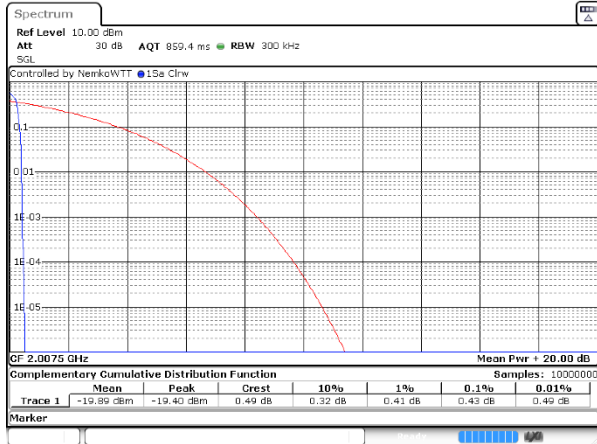
Figure 8.4-4: Output power / Mean output power and amplifier gain results, broadband signal, 3 dB above AGC threshold, input and output signal respectively



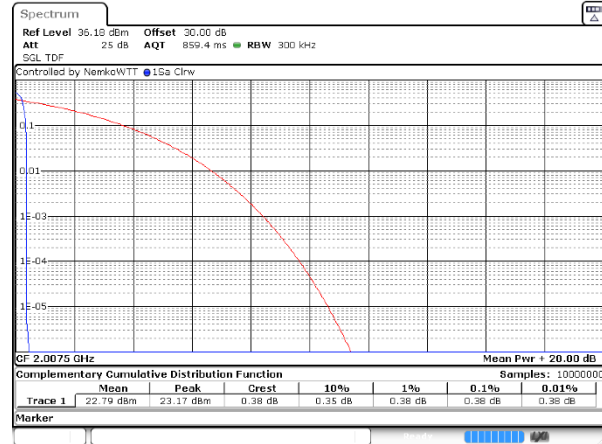
8.4.5.2 Operating frequency band: Band 70: 1995 – 2020 MHz

Table 8.4-2: Output power / Mean output power and amplifier gain test data

Condition	Test frequency (MHz)	Input power (dBm / MHz)	Output power (dBm/MHz)	Amplifier gain (dB)	0.1 % PAPR (dB)
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband	2007.5	-19.89	22.79	42.68	0.38
Input Level = AGC Threshold + 3 dB Input signal = narrowband	2007.5	-16.38	23.32	39.70	0.43
Input Level = AGC Threshold - 0.5 dB Input signal = broadband	2007.5	-20.66	23.62	44.28	4.41
Input Level = AGC Threshold + 3 dB Input signal = broadband	2007.5	-17.12	23.57	40.69	4.41

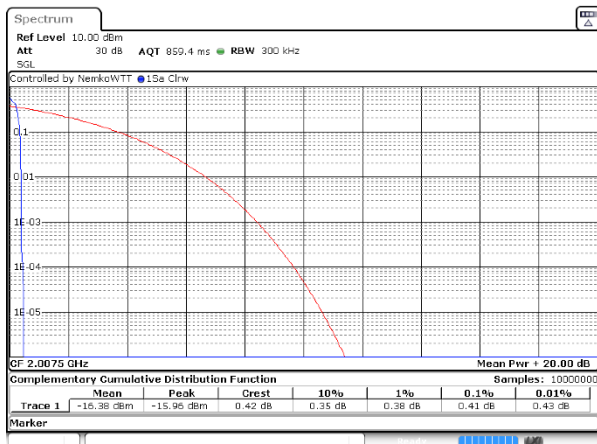


Peak power, TX 2007.5 MHz, BW: 0.2MHz, MOD: GSM

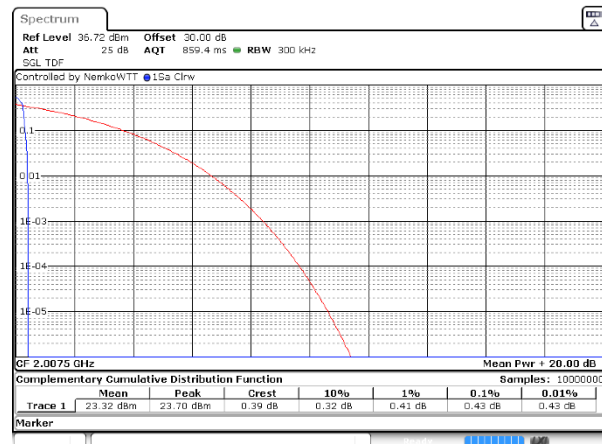


Peak power, TX 2007.5 MHz, BW: 0.2MHz, MOD: GSM

Figure 8.4-5: Output power / Mean output power and amplifier gain results, narrowband signal, 0.5 dB below AGC threshold, input and output signal respectively

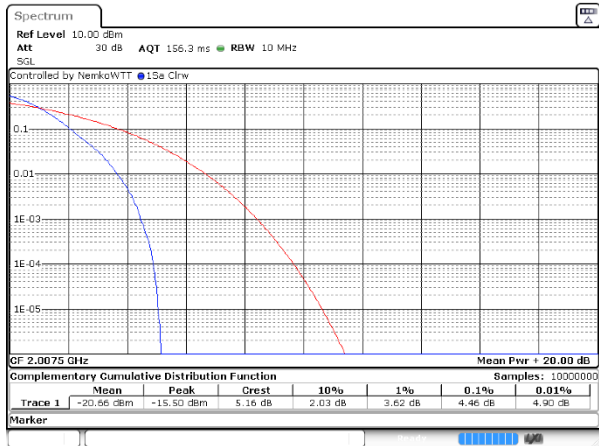


Peak power, TX 2007.5 MHz, BW: 0.2MHz, MOD: GSM

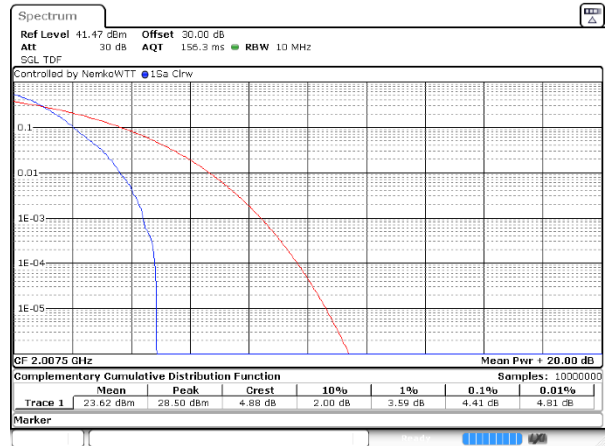


Peak power, TX 2007.5 MHz, BW: 0.2MHz, MOD: GSM

Figure 8.4-6: Output power / Mean output power and amplifier gain results, narrowband signal, 3 dB above AGC threshold, input and output signal respectively

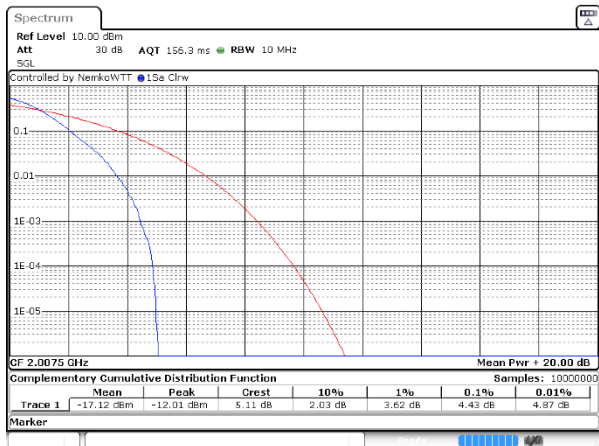


Peak power, TX 2007.5 MHz, BW: 5MHz, MOD: WCDMA

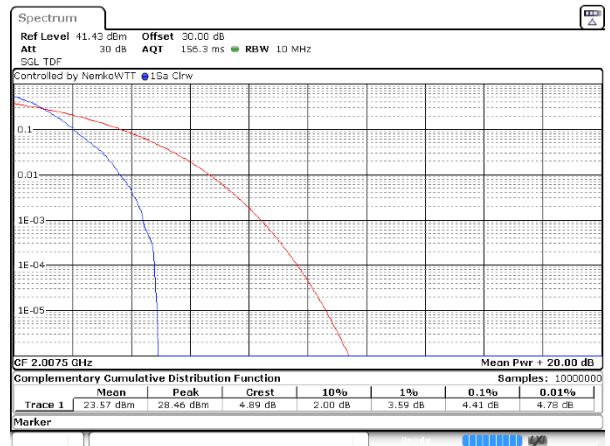


Peak power, TX 2007.5 MHz, BW: 5MHz, MOD: WCDMA

Figure 8.4-7: Output power / Mean output power and amplifier gain results, broadband signal, 0.5 dB below AGC threshold, input and output signal respectively



Peak power, TX 2007.5 MHz, BW: 5MHz, MOD: WCDMA



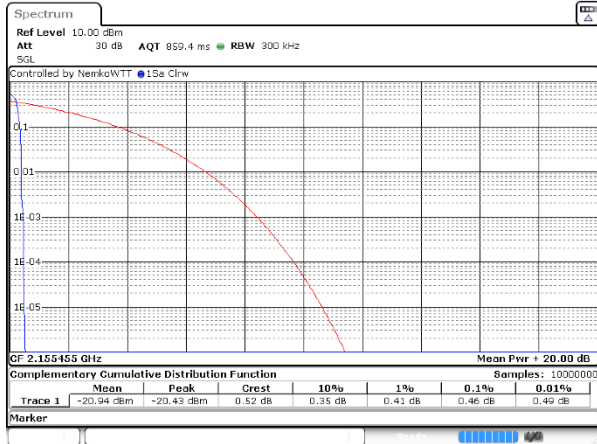
Peak power, TX 2007.5 MHz, BW: 5MHz, MOD: WCDMA

Figure 8.4-8: Output power / Mean output power and amplifier gain results, broadband signal, 3 dB above AGC threshold, input and output signal respectively

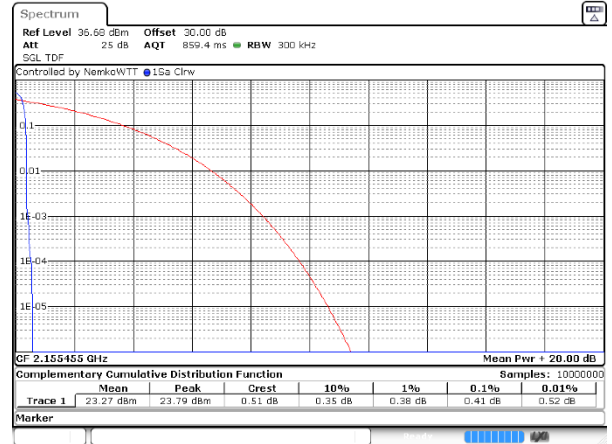
8.4.5.3 Operating frequency band: Band 66: 2110 – 2200 MHz

Table 8.4-3: Output power / Mean output power and amplifier gain test data

Condition	Test frequency (MHz)	Input power (dBm / MHz)	Output power (dBm/MHz)	Amplifier gain (dB)	0.1 % PAPR (dB)
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband	2155.455	-20.94	23.27	44.21	0.41
Input Level = AGC Threshold + 3 dB Input signal = narrowband	2155.455	-17.43	23.19	40.62	0.38
Input Level = AGC Threshold - 0.5 dB Input signal = broadband	2155.455	-19.70	23.49	43.19	4.41
Input Level = AGC Threshold + 3 dB Input signal = broadband	2155.455	-16.16	23.90	40.06	4.41

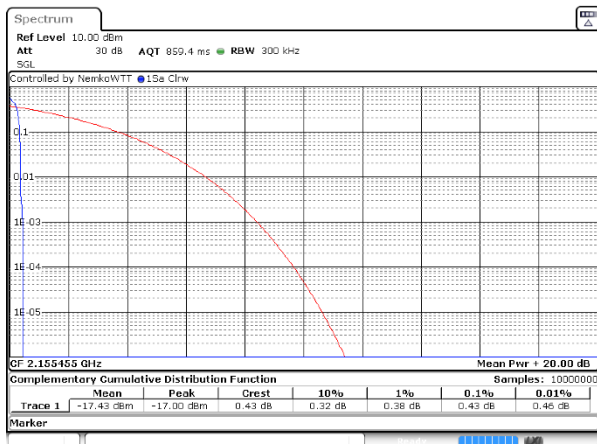


Peak power, TX 2155.455 MHz, BW: 0.2MHz, MOD: GSM

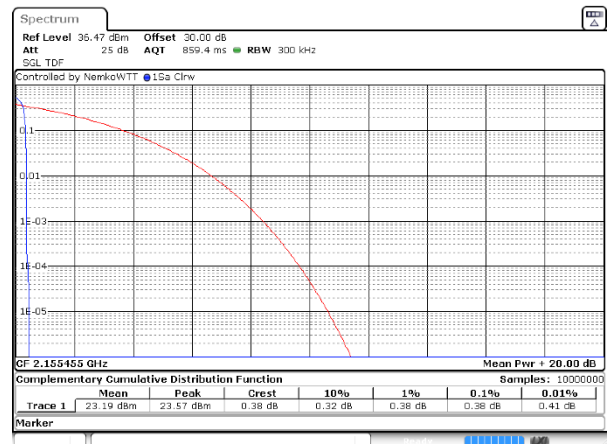


Peak power, TX 2155.455 MHz, BW: 0.2MHz, MOD: GSM

Figure 8.4-9: Output power / Mean output power and amplifier gain results, narrowband signal, 0.5 dB below AGC threshold, input and output signal respectively

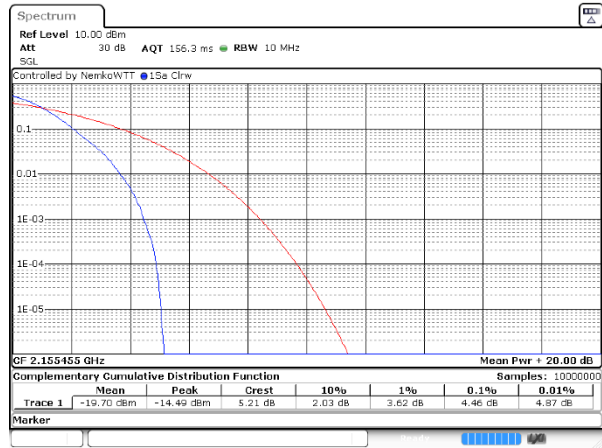


Peak power, TX 2155.455 MHz, BW: 0.2MHz, MOD: GSM

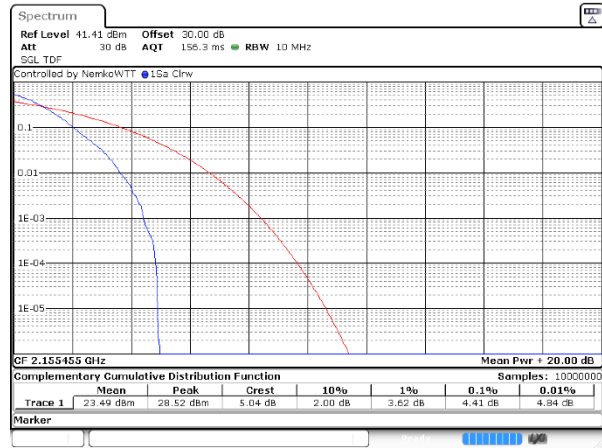


Peak power, TX 2155.455 MHz, BW: 0.2MHz, MOD: GSM

Figure 8.4-10: Output power / Mean output power and amplifier gain results, narrowband signal, 3 dB above AGC threshold, input and output signal respectively

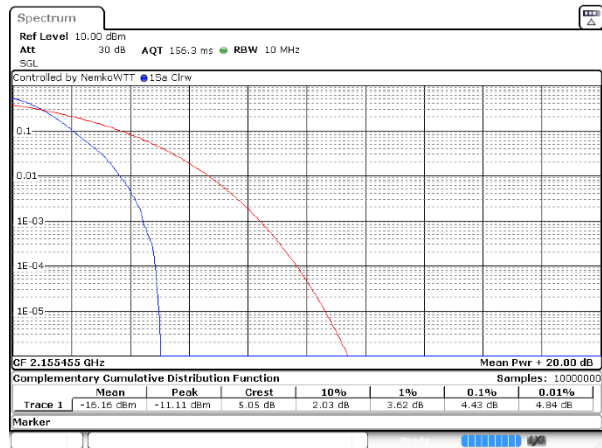


Peak power, TX 2155.455 MHz, BW: 5MHz, MOD: WCDMA

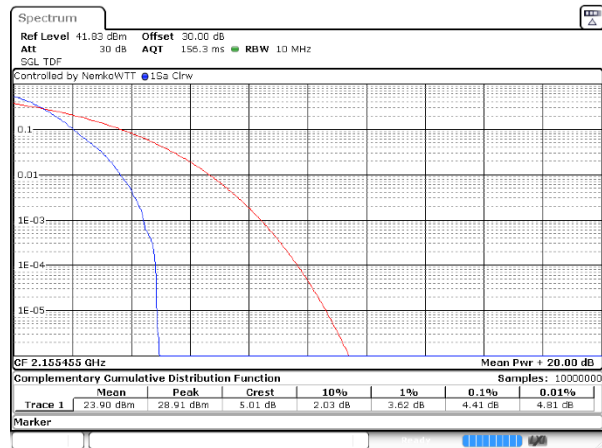


Peak power, TX 2155.455 MHz, BW: 5MHz, MOD: WCDMA

Figure 8.4-11: Output power / Mean output power and amplifier gain results, broadband signal, 0.5 dB below AGC threshold, input and output signal respectively



Peak power, TX 2155.455 MHz, BW: 5MHz, MOD: WCDMA



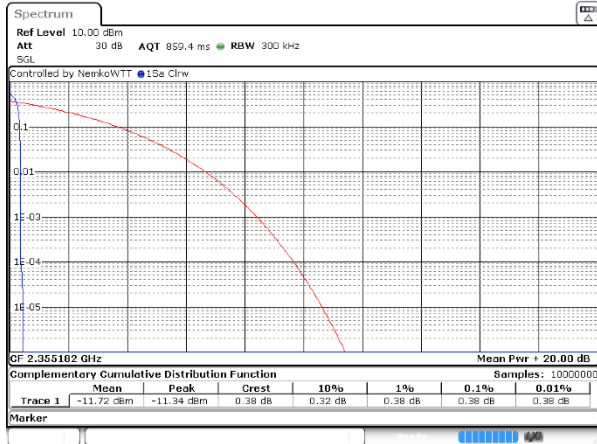
Peak power, TX 2155.455 MHz, BW: 5MHz, MOD: WCDMA

Figure 8.4-12: Output power / Mean output power and amplifier gain results, broadband signal, 3 dB above AGC threshold, input and output signal respectively

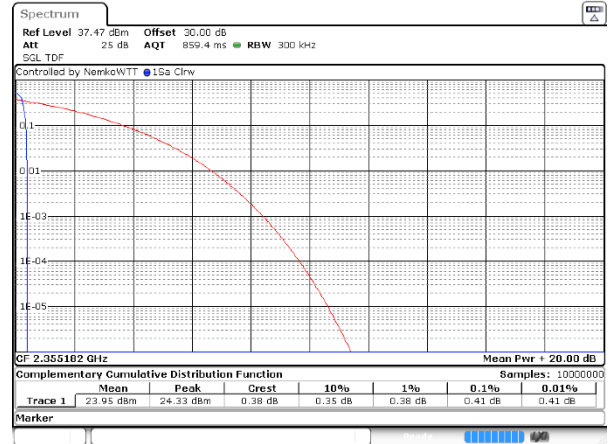
8.4.5.4 Operating frequency band: Band 30: 2350 – 2360 MHz

Table 8.4-4: Output power / Mean output power and amplifier gain test data

Condition	Test frequency (MHz)	Input power (dBm / MHz)	Output power (dBm/MHz)	Amplifier gain (dB)	0.1 % PAPR (dB)
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband	2355.182	-11.72	23.95	35.67	0.41
Input Level = AGC Threshold + 3 dB Input signal = narrowband	2355.182	-8.25	23.33	31.58	0.43
Input Level = AGC Threshold - 0.5 dB Input signal = broadband	2355.182	-10.56	23.17	33.73	4.41
Input Level = AGC Threshold + 3 dB Input signal = broadband	2355.182	-7.04	24.11	31.15	4.41

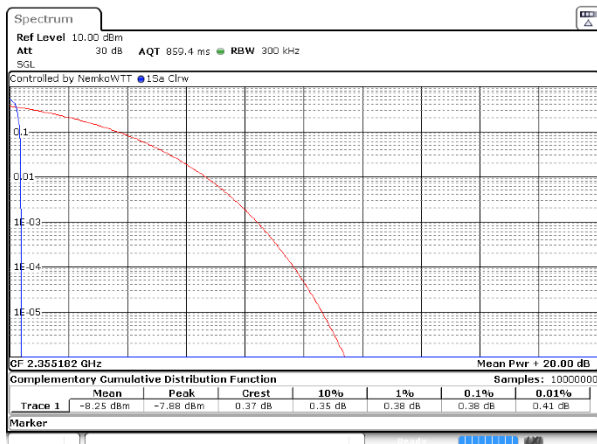


Peak power, TX 2355.182 MHz, BW: 0.2MHz, MOD: GSM

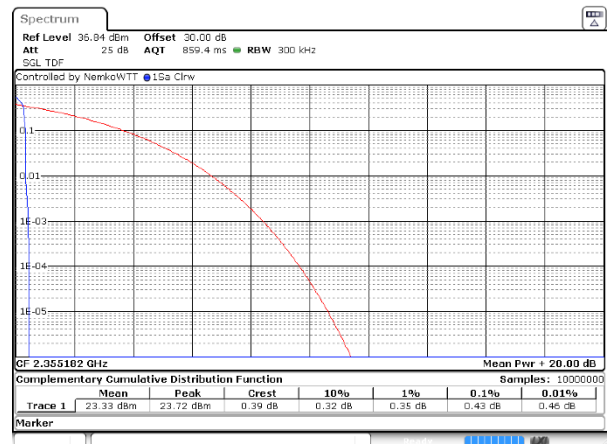


Peak power, TX 2355.182 MHz, BW: 0.2MHz, MOD: GSM

Figure 8.4-13: Output power / Mean output power and amplifier gain results, narrowband signal, 0.5 dB below AGC threshold, input and output signal respectively

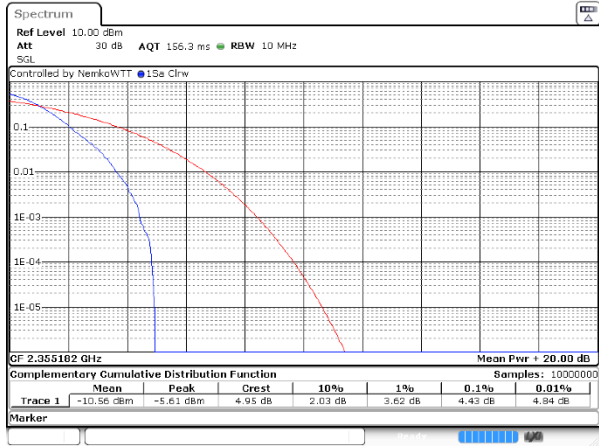


Peak power, TX 2355.182 MHz, BW: 0.2MHz, MOD: GSM

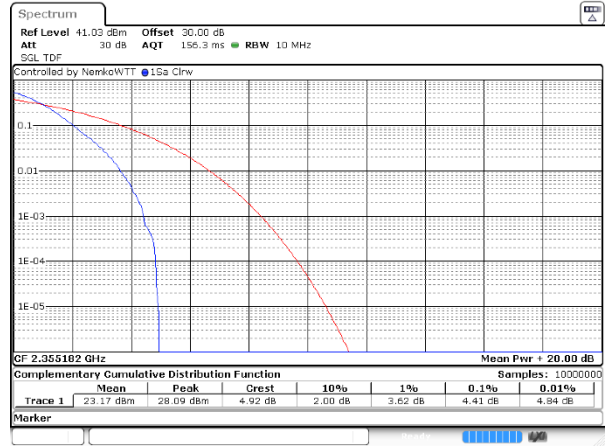


Peak power, TX 2355.182 MHz, BW: 0.2MHz, MOD: GSM

Figure 8.4-14: Output power / Mean output power and amplifier gain results, narrowband signal, 3 dB above AGC threshold, input and output signal respectively

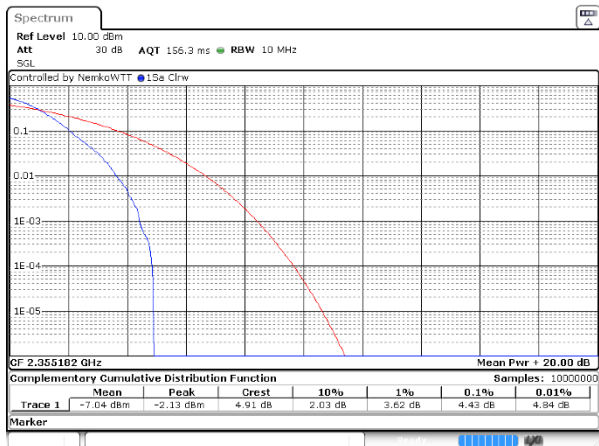


Peak power, TX 2355.182 MHz, BW: 5MHz, MOD: WCDMA

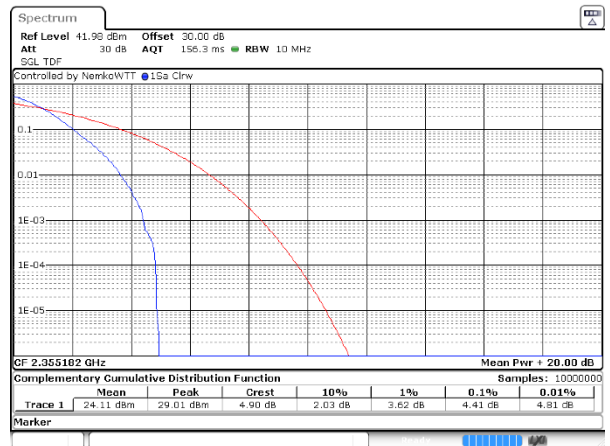


Peak power, TX 2355.182 MHz, BW: 5MHz, MOD: WCDMA

Figure 8.4-15: Output power / Mean output power and amplifier gain results, broadband signal, 0.5 dB below AGC threshold, input and output signal respectively



Peak power, TX 2355.182 MHz, BW: 5MHz, MOD: WCDMA



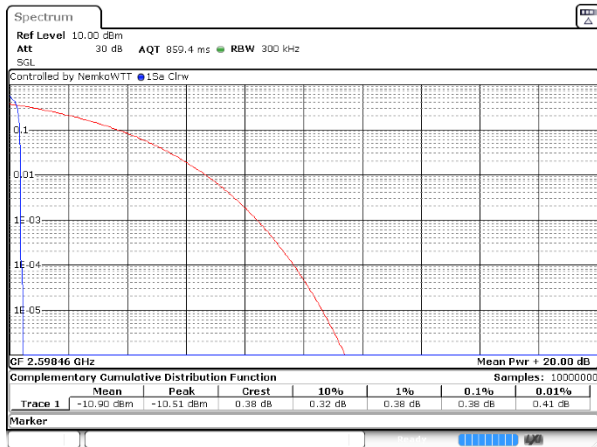
Peak power, TX 2355.182 MHz, BW: 5MHz, MOD: WCDMA

Figure 8.4-16: Output power / Mean output power and amplifier gain results, broadband signal, 3 dB above AGC threshold, input and output signal respectively

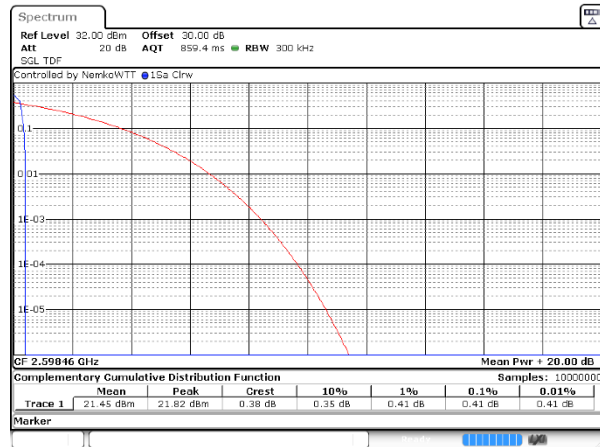
8.4.5.5 Operating frequency band: Band 41: 2496 – 2690 MHz

Table 8.4-5: Output power / Mean output power and amplifier gain test data

Condition	Test frequency (MHz)	Input power (dBm / MHz)	Output power (dBm/MHz)	Amplifier gain (dB)	0.1 % PAPR (dB)
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband	2598.46	-10.90	21.45	32.35	0.41
Input Level = AGC Threshold + 3 dB Input signal = narrowband	2598.46	-7.46	22.95	30.41	0.43
Input Level = AGC Threshold - 0.5 dB Input signal = broadband	2598.46	-9.75	22.50	32.25	4.46
Input Level = AGC Threshold + 3 dB Input signal = broadband	2598.46	-6.23	23.09	29.32	4.46

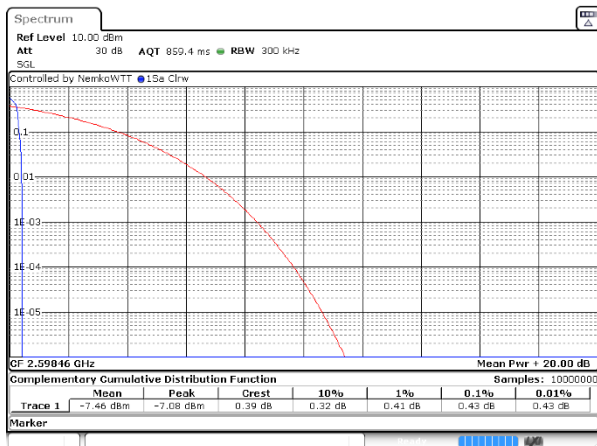


Peak power, TX 2596.46 MHz, BW: 0.2MHz, MOD: GSM

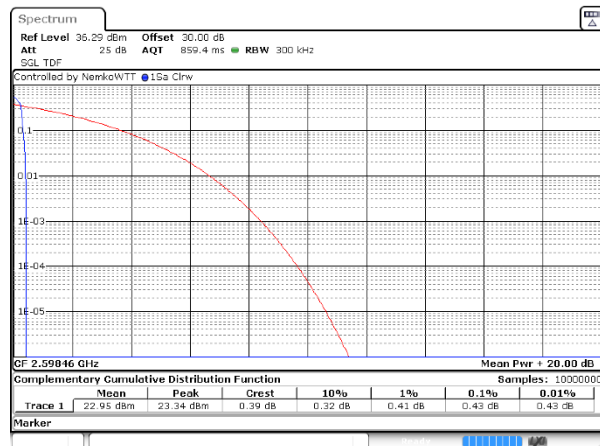


Peak power, TX 2596.46 MHz, BW: 0.2MHz, MOD: GSM

Figure 8.4-17: Output power / Mean output power and amplifier gain results, narrowband signal, 0.5 dB below AGC threshold, input and output signal respectively

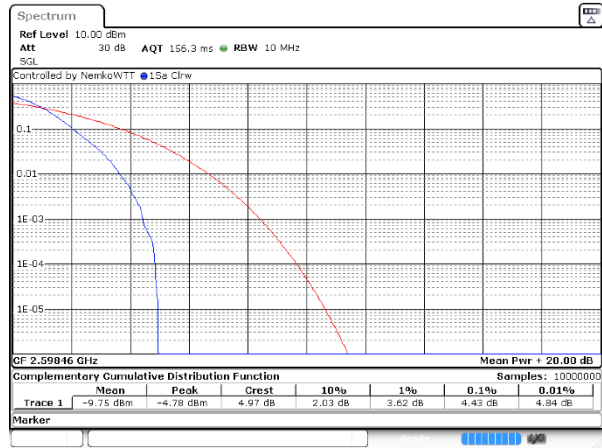


Peak power, TX 2596.46 MHz, BW: 0.2MHz, MOD: GSM

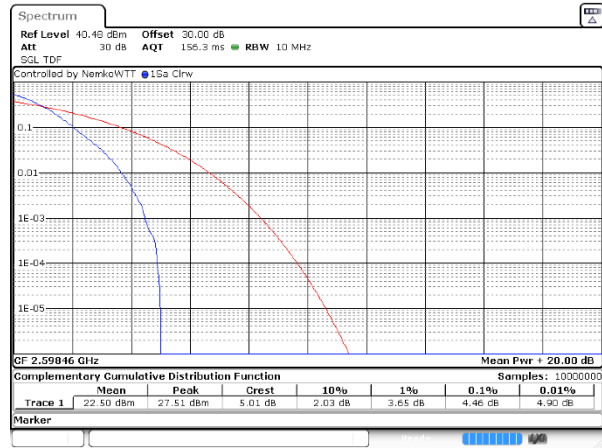


Peak power, TX 2596.46 MHz, BW: 0.2MHz, MOD: GSM

Figure 8.4-18: Output power / Mean output power and amplifier gain results, narrowband signal, 3 dB above AGC threshold, input and output signal respectively

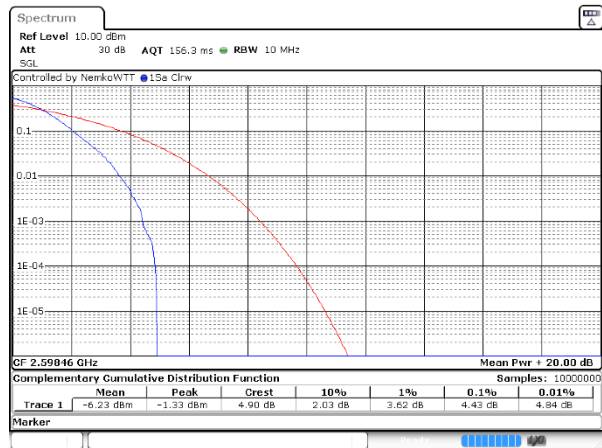


Peak power, TX 2596.46 MHz, BW: 5MHz, MOD: WCDMA

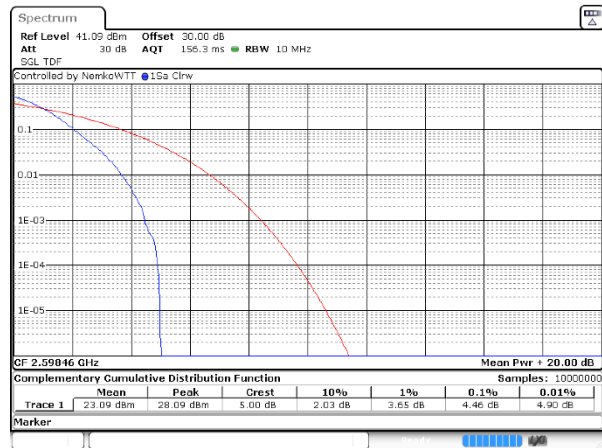


Peak power, TX 2596.46 MHz, BW: 5MHz, MOD: WCDMA

Figure 8.4-19: Output power / Mean output power and amplifier gain results, broadband signal, 0.5 dB below AGC threshold, input and output signal respectively



Peak power, TX 2596.46 MHz, BW: 5MHz, MOD: WCDMA



Peak power, TX 2596.46 MHz, BW: 5MHz, MOD: WCDMA

Figure 8.4-20: Output power / Mean output power and amplifier gain results, broadband signal, 3 dB above AGC threshold, input and output signal respectively



## 8.5 Spurious emissions at RF connector

### 8.5.1 References and limits

- FCC Part 24.232 (band 25 operation)
- FCC Part 27.53(a) (band 30 operation)
- FCC Part 27.53(h) (band 66, and 70 operation)
- FCC Part 27.53(m) (band 41 operation)
- ANSI C63.26 Clause 7.2.2.5
- KDB 935210 D05v01r05 Clause 3.6

### 8.5.2 Test summary

Verdict	Pass		
Test date	January 23, 2024 January 24, 2024	Temperature	20 °C
Test engineer	Lan Sayasane, EMC Test Engineer	Air pressure	1008 mbar
Test location	<input type="checkbox"/> 10m semi anechoic chamber <input type="checkbox"/> 3m semi anechoic chamber <input checked="" type="checkbox"/> Wireless bench <input type="checkbox"/> Other:	Relative humidity	54 %

### 8.5.3 Notes

Per KDB 935210 D05 v01r04, Clause 3.4 and ANSI C63.26 Clause 7.2.2.4, testing was performed with a narrowband test signal (MSK modulated, gaussian filter of 0.3 and data rate 270 kbps) and a broadband signal (AWGN, 4.1 MHz 99% occupied bandwidth).

For intermodulation products and out-of-channel block tests, testing is performed under the following two conditions (per ANSI C63.26 7.2.2.5.1 and KDB 935210 D05v01r04 Section 3.6):

- a) Two modulated signals set to the lower or upper block edge.
- b) A single modulated signal set to the low or high channel

### 8.5.4 Setup details

EUT power input during test	120 VAC / 60 Hz
EUT setup configuration	<input checked="" type="checkbox"/> Table-top <input type="checkbox"/> Floor standing <input type="checkbox"/> Other:
Measurement details	<p>Out-of-channel-block and out-of-band emissions:</p> <ol style="list-style-type: none"> <li>a. Connect a signal generator to the input of the EUT. If the signal generator is not capable of generating two modulated carriers at one time, then it may be replaced by two signal generators connected with an appropriate combining network</li> <li>b. Set the signal generator to produce 2 AWGN signals.</li> <li>c. The frequencies shall be set so that the AWGN signals occupy adjacent channels, as defined by industry standards such as 3GPP or 3GPP2, at the upper block edge of the frequency band under test.</li> <li>d. The composite power levels shall be set so that the signal is just below the AGC threshold, but not more than 0.5 dB below. The composite power can be measured using the methods described in the output power methods, however, it will be necessary to measure the composite power by increasing the band power integration bandwidth to include both transmit channels, or alternatively, this measurement can be performed using an average power meter.</li> <li>e. Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.</li> <li>f. Set the RBW= reference bandwidth in the applicable rule section for the supported frequency band (typically 1% of the EBW or 100 kHz or 1 MHz).</li> <li>g. Set the VBW = 3 x RBW.</li> <li>h. Set the detector to power averaging (rms) detector.</li> <li>i. Set the sweep time = auto couple.</li> <li>j. Set the spectrum analyzer start frequency to the upper block edge frequency and the stop frequency to the upper block edge frequency plus 300 kHz or 3 MHz for frequencies below and above 1 GHz, respectively.</li> <li>k. Trace average at least one hundred traces in power averaging (i.e., rms) mode.</li> </ol>

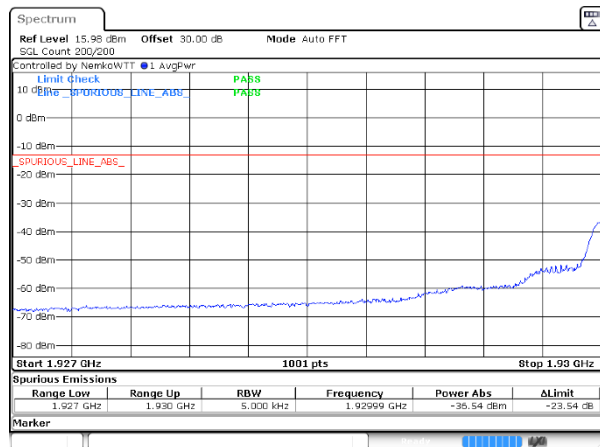
- l. Use the marker function to find the maximum power level.
  - m. Capture the spectrum analyzer trace of the power level for inclusion in the test report.
  - n. Repeat step k) and step m) with the input level set to 3 dB above the AGC threshold.
  - o. Set the frequencies of the input signals to the lower block edge of the frequency band under test.
  - p. Reset the analyzer start frequency to the lower block edge frequency minus 300 kHz or 3 MHz for frequencies below and above 1 GHz, respectively, and the stop frequency to the lower block edge frequency.
  - q. Repeat step k) to step n).
  - r. Repeat step a) to step q) with the signal generator set to only a single signal closest to the block edges.
  - s. Repeat step a) to step r) with the narrowband signal.
  - t. Repeat step a) to step s) for all bands used by the EUT.
- Conducted spurious:
- a. Connect a signal generator to the input of the EUT.
  - b. Set the signal generator to produce the AWGN signal.
  - c. Set the frequency of the signal to the lowest channel within the frequency block.
  - d. The power levels shall be set so that the signal is just below the AGC threshold, but not more than 0.5 dB below.
  - e. Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
  - f. Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band (typically 100 kHz or 1 MHz).
  - g. Set the VBW = 3 x RBW.
  - h. Set the sweep time = auto-couple.
  - i. Set the spectrum analyzer start frequency to the lowest RF signal generated in the equipment, without going below 9 kHz, and the stop frequency to the lower band/block edge frequency minus 100 kHz to 1 MHz, as specified in the applicable rule part. The number of measurement points in each sweep must be  $\geq (2 \times \text{span}/\text{RBW})$ , which may require that the measurement range defined by the start and stop frequencies be subdivided depending on the available number of measurement points provided by the spectrum analyzer.
  - j. Trace average at least ten traces in power averaging (i.e., rms) mode.
  - k. Use the peak marker function to identify the highest amplitude level over each of measured frequency range. Record the frequency and amplitude and capture a plot for inclusion in the test report.
  - l. Reset the spectrum analyzer start frequency to the upper band/block edge frequency plus 100 kHz or 1 MHz, as specified in the applicable rule part, and the spectrum analyzer stop frequency to ten times the highest frequency of the fundamental emission. The number of measurement points in each sweep must be  $\geq (2 \times \text{span}/\text{RBW})$ , which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.
  - m. Trace average at least ten traces in power averaging (i.e., rms) mode.
  - n. Use the peak marker function to identify the highest amplitude level over each of the measured frequency ranges. Record the frequency and amplitude and capture a plot for inclusion in the test report; also provide tabular data, if required.
  - o. Repeat step i) to step n) with the input signal firstly set to a middle channel frequency and then tuned to a high channel frequency.
  - p. Repeat step c) to step o) with the narrowband signal.
  - q. Repeat step b) to step p) for all bands used by the EUT

8.5.5 Test data – out-of-channel block and out-of-band emissions

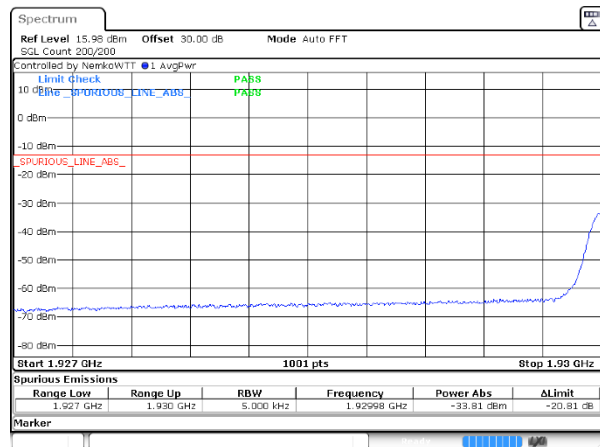
8.5.5.1 Operating frequency band: Band 25: 1930-1995 MHz

Table 8.5-1: Spurious emissions at RF connector test data, narrowband

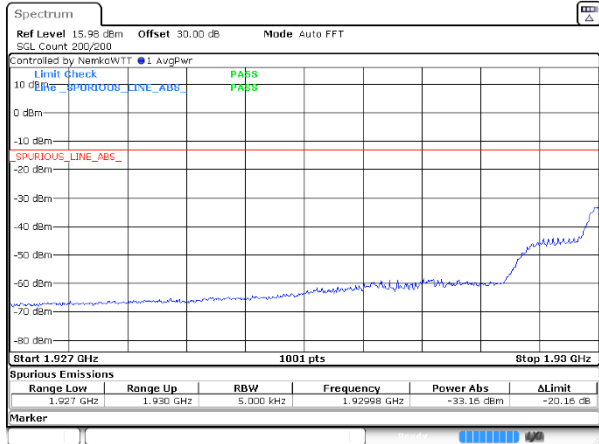
Condition	Frequency of highest emission (MHz)	Level (dBm)	Limit (dBm)
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband Number of signals: 2 Low band edge	1929.993	-36.54	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband Number of signals: 1 Low band edge	1929.984	-33.81	-13.00
Input Level = AGC Threshold +3 dB Input signal = narrowband Number of signals: 2 Low band edge	1929.984	-33.16	-13.00
Input Level = AGC Threshold + 3 dB Input signal = narrowband Number of signals: 1 Low band edge	1929.990	-29.93	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband Number of signals: 2 High band edge	1995.010	-35.06	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband Number of signals: 1 High band edge	1995.010	-32.25	-13.00
Input Level = AGC Threshold +3 dB Input signal = narrowband Number of signals: 2 High band edge	1995.010	-31.67	-13.00
Input Level = AGC Threshold + 3 dB Input signal = narrowband Number of signals: 1 High band edge	1995.016	-28.70	-13.00



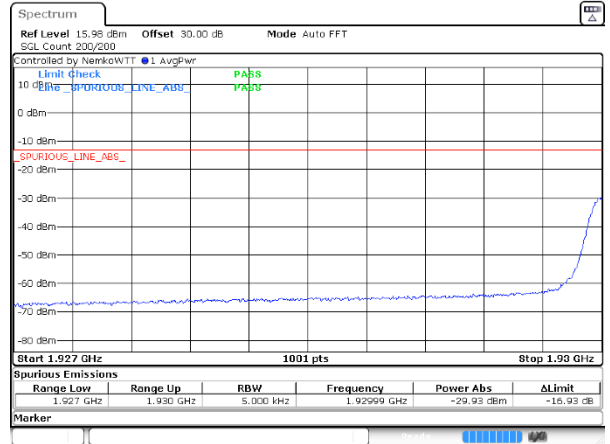
Low band edge, 2 signals, level = AGC Threshold - 0.5



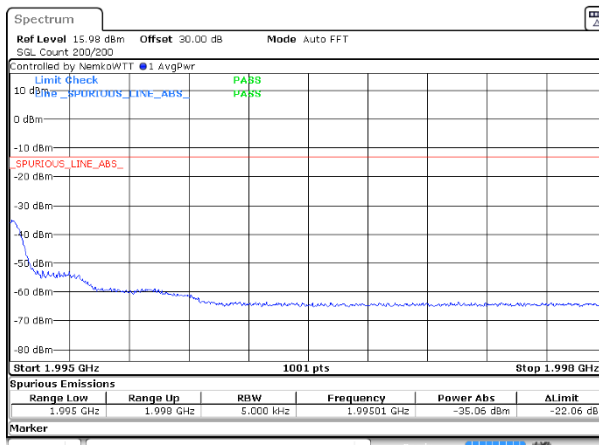
Low band edge, 1 signal, level = AGC Threshold - 0.5



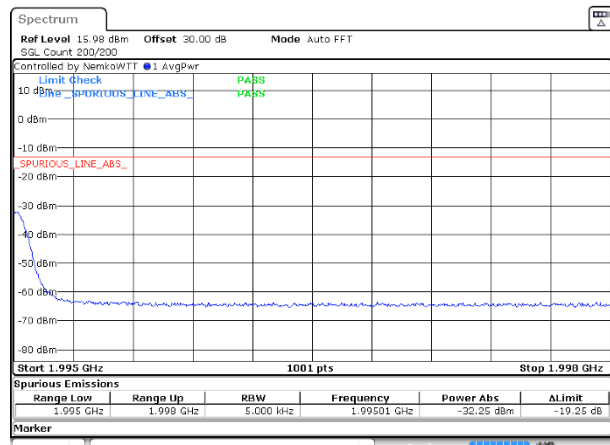
Low band edge, 2 signals, level = AGC Threshold + 3



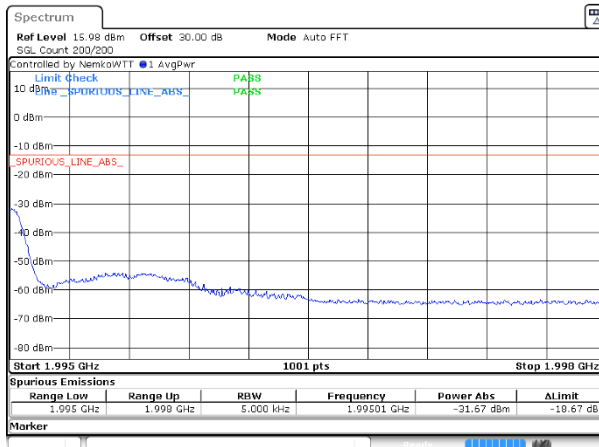
Low band edge, 1 signal, level = AGC Threshold + 3



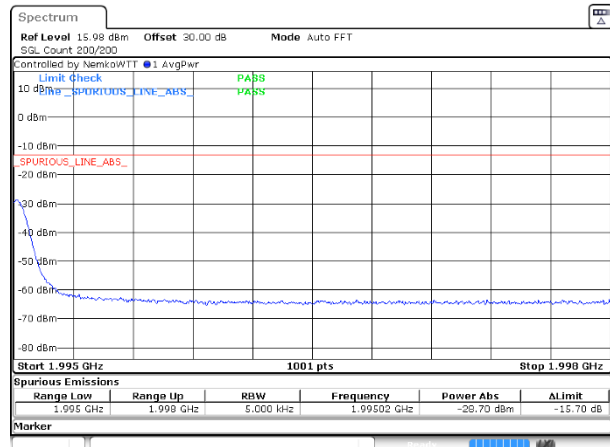
High band edge, 2 signals, level = AGC Threshold - 0.5



High band edge, 1 signal, level = AGC Threshold - 0.5



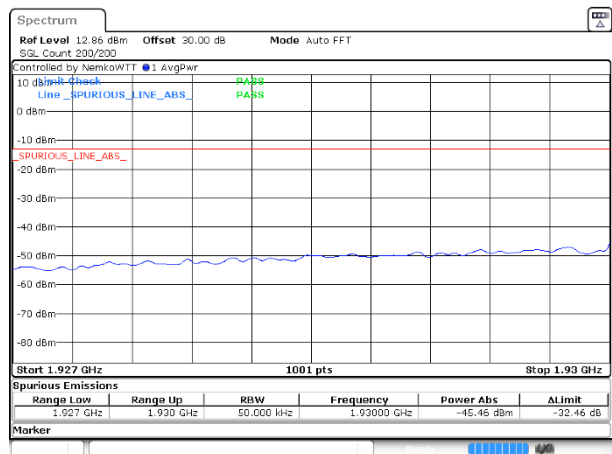
High band edge, 2 signals, level = AGC Threshold + 3



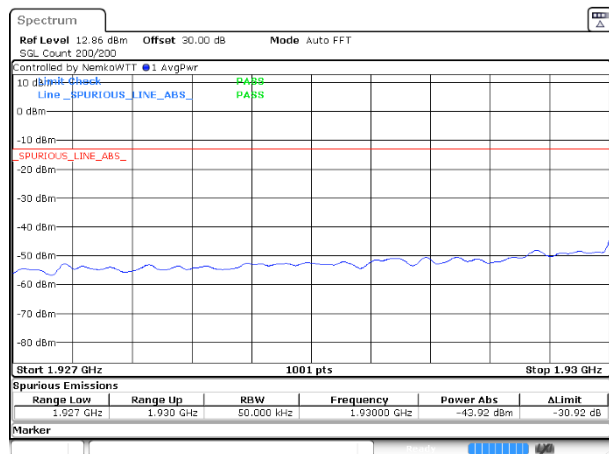
Low band edge, 1 signal, level = AGC Threshold + 3

Table 8.5-2: Spurious emissions at RF connector test data, broadband

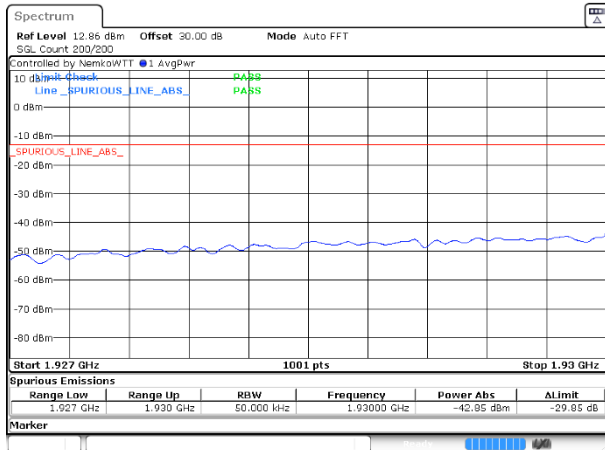
Condition	Frequency of highest emission (MHz)	Level (dBm)	Limit (dBm)
Input Level = AGC Threshold - 0.5 dB Input signal = broadband Number of signals: 2 Low band edge	1929.998	-45.46	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = broadband Number of signals: 1 Low band edge	1929.998	-43.92	-13.00
Input Level = AGC Threshold +3 dB Input signal = broadband Number of signals: 2 Low band edge	1929.998	-42.85	-13.00
Input Level = AGC Threshold + 3 dB Input signal = broadband Number of signals: 1 Low band edge	1929.998	-42.43	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = broadband Number of signals: 2 High band edge	1995.001	-45.26	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = broadband Number of signals: 1 High band edge	1995.001	-42.00	-13.00
Input Level = AGC Threshold +3 dB Input signal = broadband Number of signals: 2 High band edge	1995.001	-42.44	-13.00
Input Level = AGC Threshold + 3 dB Input signal = broadband Number of signals: 1 High band edge	1995.001	-39.62	-13.00



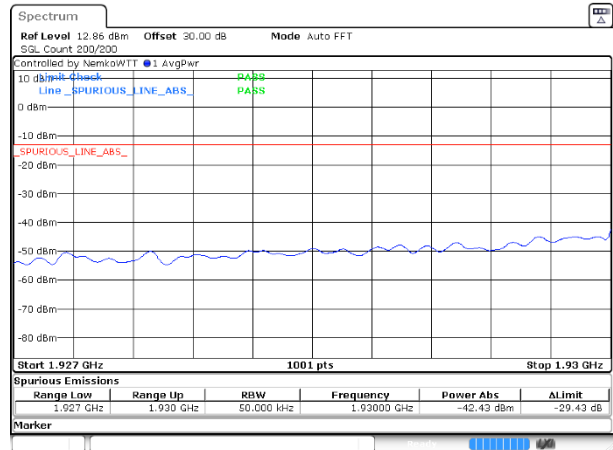
Low band edge, 2 signals, level = AGC Threshold - 0.5



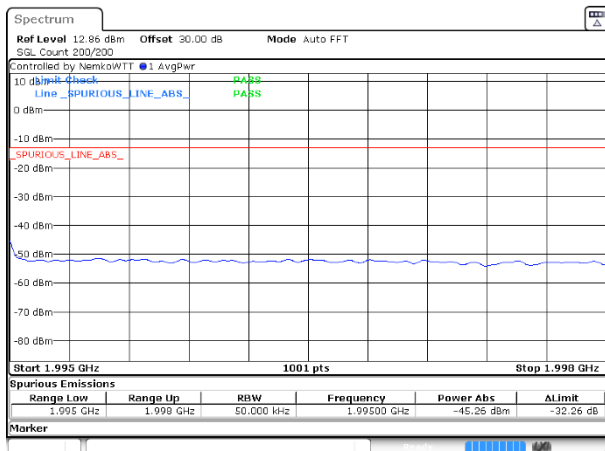
Low band edge, 1 signal, level = AGC Threshold - 0.5



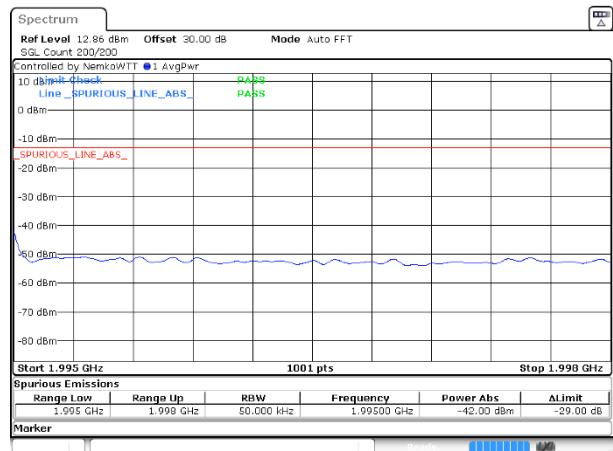
Low band edge, 2 signals, level = AGC Threshold + 3



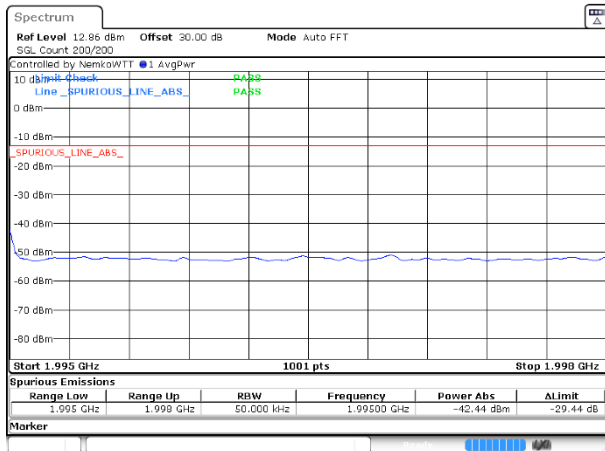
Low band edge, 1 signal, level = AGC Threshold + 3



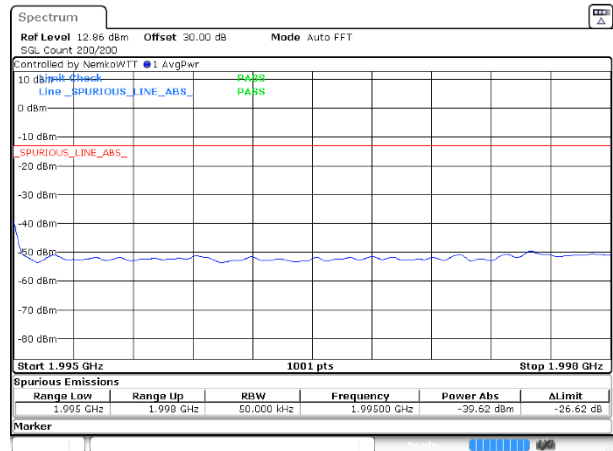
High band edge, 2 signals, level = AGC Threshold - 0.5



High band edge, 1 signal, level = AGC Threshold - 0.5



High band edge, 2 signals, level = AGC Threshold + 3

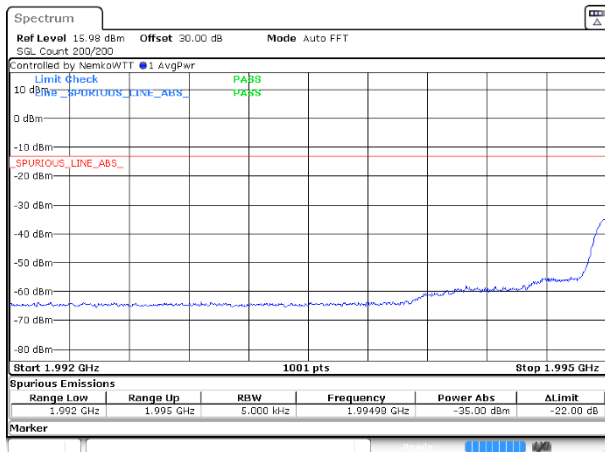


Low band edge, 1 signal, level = AGC Threshold + 3

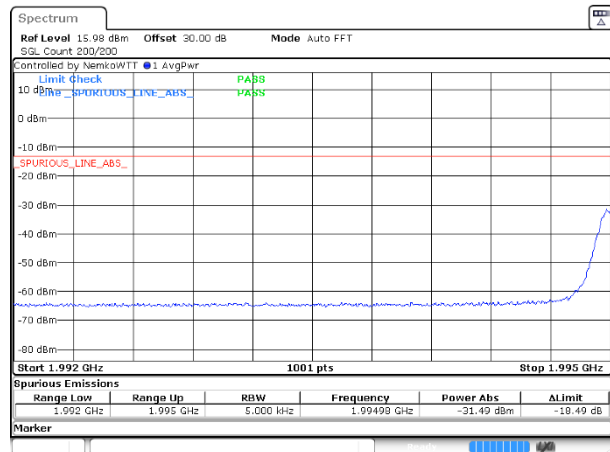
8.5.5.2 Operating frequency band: Band 70: 1995-2020 MHz

Table 8.5-3: Spurious emissions at RF connector test data, narrowband

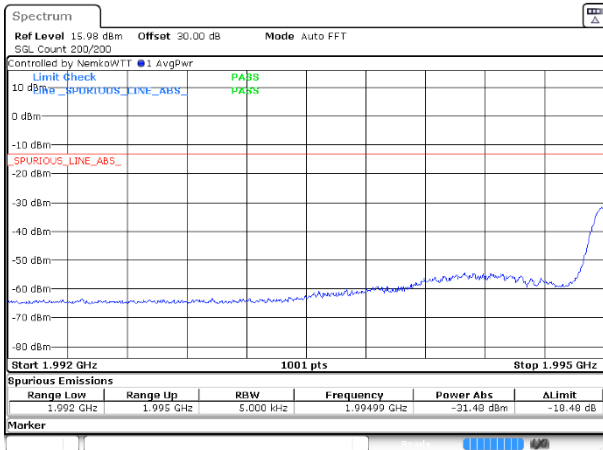
Condition	Frequency of highest emission (MHz)	Level (dBm)	Limit (dBm)
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband Number of signals: 2 Low band edge	1994.984	-35.00	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband Number of signals: 1 Low band edge	1994.981	-31.49	-13.00
Input Level = AGC Threshold +3 dB Input signal = narrowband Number of signals: 2 Low band edge	1994.993	-31.48	-13.00
Input Level = AGC Threshold + 3 dB Input signal = narrowband Number of signals: 1 Low band edge	1994.987	-28.67	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband Number of signals: 2 High band edge	2020.016	-34.63	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = narrowband Number of signals: 1 High band edge	2020.004	-31.88	-13.00
Input Level = AGC Threshold +3 dB Input signal = narrowband Number of signals: 2 High band edge	2020.022	-31.33	-13.00
Input Level = AGC Threshold + 3 dB Input signal = narrowband Number of signals: 1 High band edge	2020.013	-28.33	-13.00



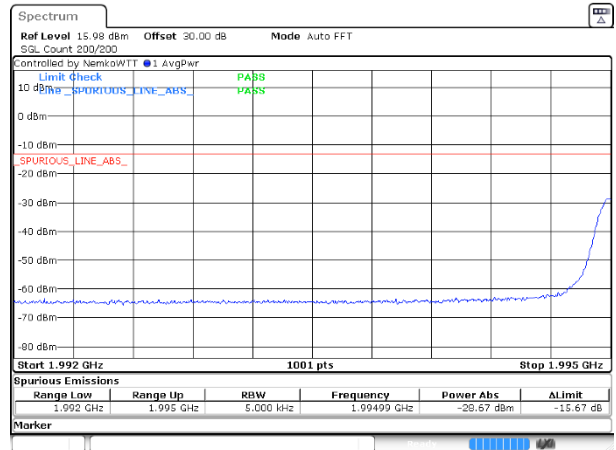
Low band edge, 2 signals, level = AGC Threshold - 0.5



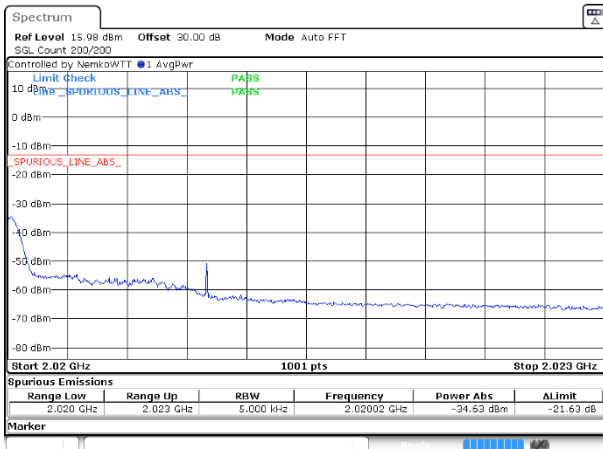
Low band edge, 1 signal, level = AGC Threshold - 0.5



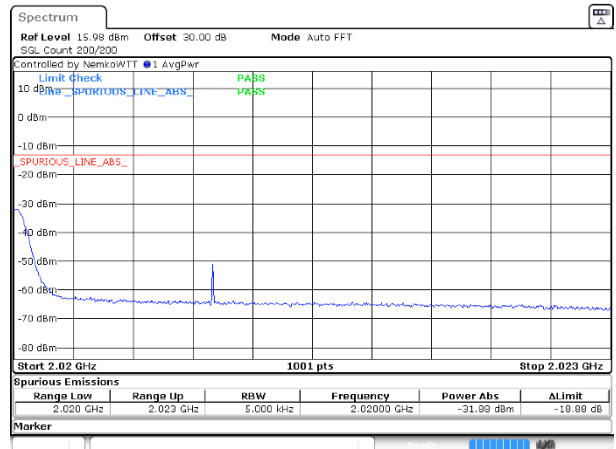
Low band edge, 2 signals, level = AGC Threshold + 3



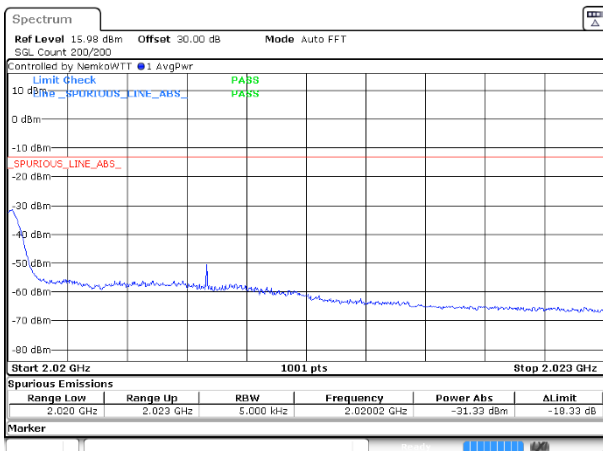
Low band edge, 1 signal, level = AGC Threshold + 3



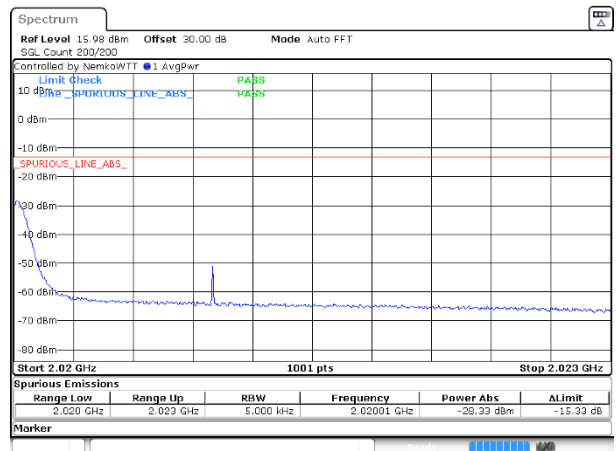
High band edge, 2 signals, level = AGC Threshold - 0.5



High band edge, 1 signal, level = AGC Threshold - 0.5



High band edge, 2 signals, level = AGC Threshold + 3

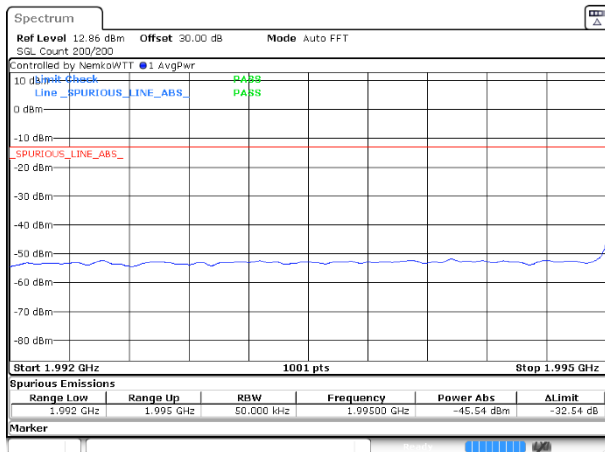


Low band edge, 1 signal, level = AGC Threshold + 3

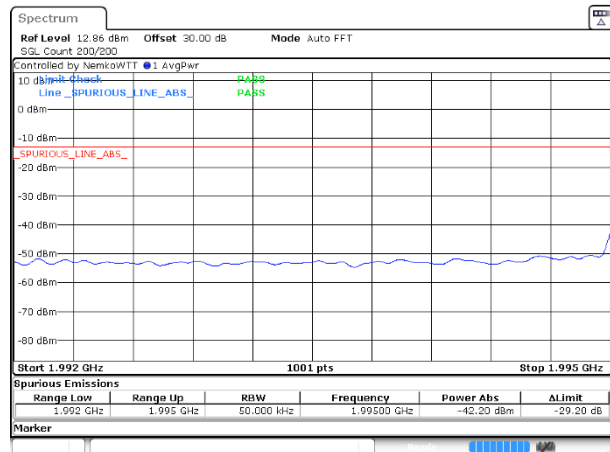


Table 8.5-4: Spurious emissions at RF connector test data, broadband

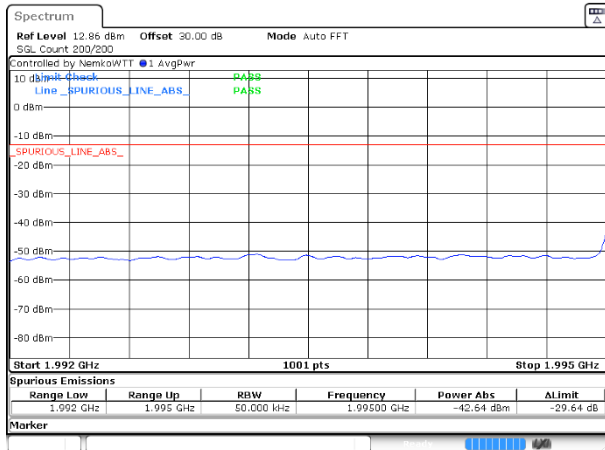
Condition	Frequency of highest emission (MHz)	Level (dBm)	Limit (dBm)
Input Level = AGC Threshold - 0.5 dB Input signal = broadband Number of signals: 2 Low band edge	1994.998	-45.54	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = broadband Number of signals: 1 Low band edge	1994.998	-42.20	-13.00
Input Level = AGC Threshold +3 dB Input signal = broadband Number of signals: 2 Low band edge	1994.998	-42.64	-13.00
Input Level = AGC Threshold + 3 dB Input signal = broadband Number of signals: 1 Low band edge	1994.998	-39.15	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = broadband Number of signals: 2 High band edge	2020.001	-45.90	-13.00
Input Level = AGC Threshold - 0.5 dB Input signal = broadband Number of signals: 1 High band edge	2020.001	-42.87	-13.00
Input Level = AGC Threshold +3 dB Input signal = broadband Number of signals: 2 High band edge	2020.001	-42.72	-13.00
Input Level = AGC Threshold + 3 dB Input signal = broadband Number of signals: 1 High band edge	2020.001	-40.12	-13.00



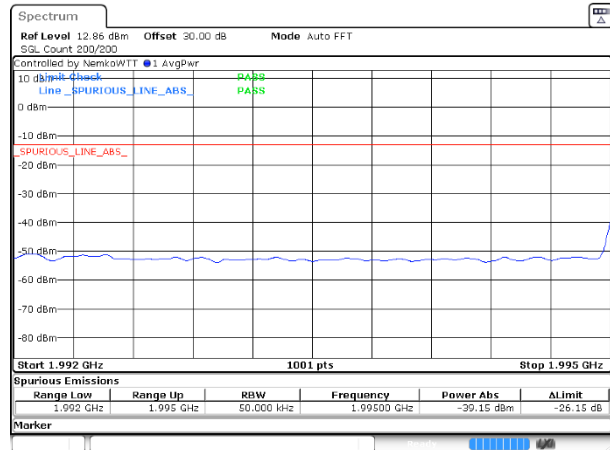
Low band edge, 2 signals, level = AGC Threshold - 0.5



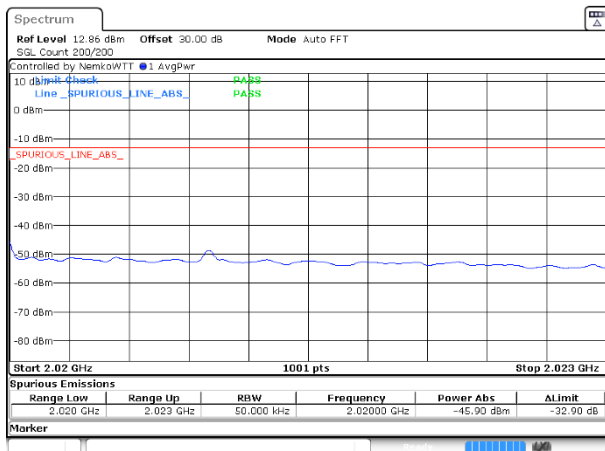
Low band edge, 1 signal, level = AGC Threshold - 0.5



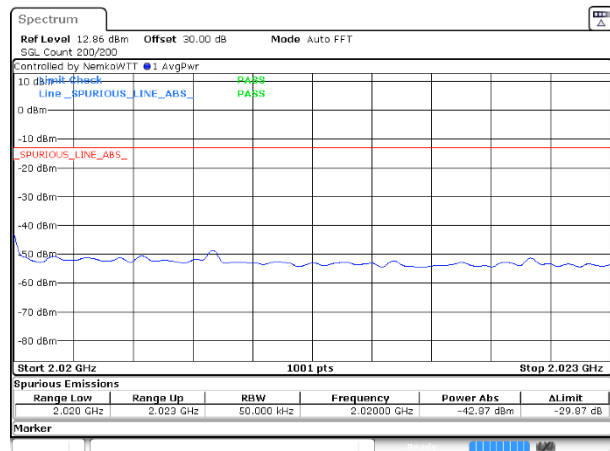
Low band edge, 2 signals, level = AGC Threshold + 3



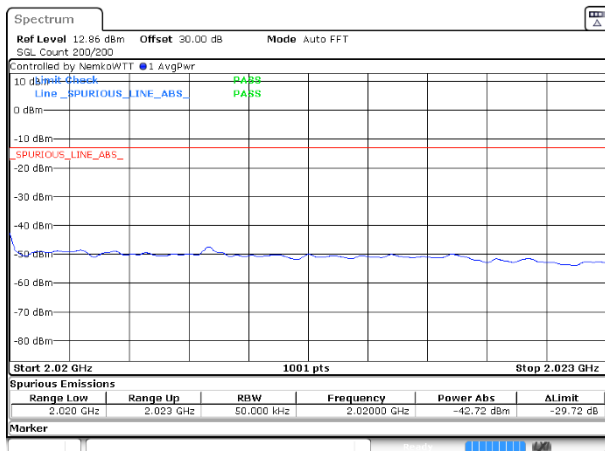
Low band edge, 1 signal, level = AGC Threshold + 3



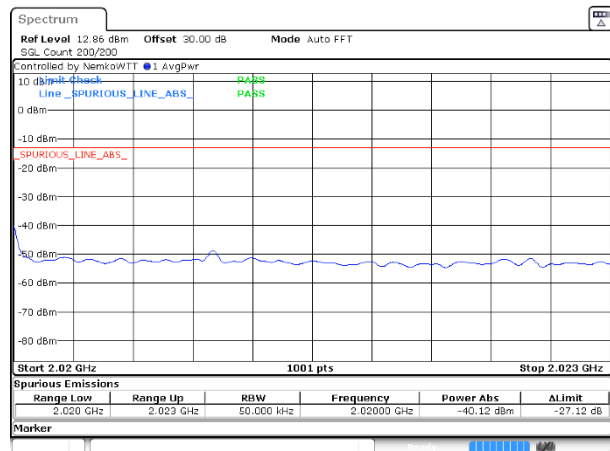
High band edge, 2 signals, level = AGC Threshold - 0.5



High band edge, 1 signal, level = AGC Threshold - 0.5



High band edge, 2 signals, level = AGC Threshold + 3



Low band edge, 1 signal, level = AGC Threshold + 3