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Report On

FCC and ISED Testing of the
Ericsson KRC 161 689/3 Radio 4478 B5 (850 MHz) GSM and NR Base
Station in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 22,
Industry Canada RSS-GEN and Industry Canada RSS-132

COMMERCIAL-IN-CONFIDENCE

FCC: TA8AKRC161689

ISED: 287AB-AS161689

PREPARED BY

Daria Fiedorowicz
Senior Administrator
(Technical)

APPROVED BY

Steve Scarfe
Authorised Signatory

DATED

24 July 2020

Document 75949116 Report 09 Issue 2

July 2020



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SECTION 1

REPORT INFORMATION



1.1 REPORT DETAILS

Manufacturer	Ericsson
Address	Torshamnsgatan 23 Kista SE-16480 Stockholm Sweden
Product Name & Product Number	Radio 4478 B5 & KRC 161 689/3
IC Model Name	AS161689
Serial Number(s)	B440820312
Software Version	CXP9013268/15 Rev R82CV CXP9013268/15 Rev R82KA14
Hardware Version	R2A
Non tested Variant	KRC 161 689/1
Test Specification/Issue/Date	FCC CFR 47 Part 2: 2019 FCC CFR 47 Part 22: 2019 Industry Canada RSS-GEN: Issue 5: March 2019 Amendment 1 Industry Canada RSS-132: Issue 3: 2013
Test Plan	Test Plan FCC&IC NR legacy 20Q2
Start of Test	09 June 2020
Finish of Test	20 July 2020
Name of Engineer(s)	Neil Rousell & Graeme Lawler
Related Document(s)	KDB 971168 D01 v02r02 KDB 662911 D01 v02r01

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate compliance with FCC CFR 47 Part 22. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

Neil Rousell

This report has been up issued to Issue 2 and should be read in place of Issue 1. This report has been up issued to Issue 2 to include additional testing and information on Maximum Peak Output Power and Peak to Average Ratio - Conducted.



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results for each configuration, in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 22, Industry Canada RSS-GEN and Industry Canada RSS-132 is shown below.

Section	Specification Clause				Test Description	Result
	FCC CFR 47 Part 2	FCC CFR 47 Part 22	RSS-GEN	RSS-132		
2.1	2.1046	22.913 (a)	-	5.4	Maximum Peak Output Power and Peak to Average Ratio - Conducted	Pass
2.2	2.1049	22.917 (b)	6.7	5.5	Occupied Bandwidth	Pass
2.3	2.1051	22.917(b)	-	5.5	Band Edge	Pass
2.4	2.1051	22.917(b)	6.13	5.5	Transmitter Spurious Emissions	Pass
2.5	-	22.917(a)	6.13	5.5	Radiated Emissions	Pass



1.3 CONFIGURATION DESCRIPTION

Configuration	RAT	No. Of carriers	Carrier Bandwidth	Carrier Frequency Configuration (MHz)		
				Bottom	Middle	Top
1	NR	1	15 MHz – SCS 15kHz	876.5	881.5	886.5
	NR	1	20 MHz – SCS 15kHz	879.0	881.5	884.0
	NR	1	20 MHz – SCS 60kHz	879.0	881.5	884.0
2	NR	1	25 MHz – SCS 15kHz using carrier aggregation	-	874.0 + 886.5	-
3	GSM	1	0.2 MHz	869.4	881.6	893.6

1.4 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	Radio Unit
MANUFACTURER	Ericsson AB
PRODUCT NAME	Radio 4478 B5
PART NUMBER	KRC 161 689/3, KRC 161 689/1 ¹
IC Model Name	AS161689
SERIAL NUMBER	B440820312
HARDWARE VERSION	R2A
SOFTWARE VERSION	CXP9013268/15 – R82CV CXP9013268/15 – R82KA14
TRANSMITTER OPERATING RANGE	869-894 MHz
MODULATIONS	GSM: GMSK, AQPSK, 8PSK WCDMA: QPSK, 16QAM, 64QAM LTE & NR: QPSK, 16QAM, 64QAM, 256QAM
ITU DESIGNATION OF EMISSION	GSM: GMSK&AQPSK 245KGXW, 8PSK 245KG7W
	WCDMA 5 MHz BW channel: 5M00F9W
	LTE 1.4 MHz BW channel: 1M40W7D
	LTE 3 MHz BW channel: 3M00W7D
	LTE 5 MHz BW channel: 5M00W7D
	LTE 10 MHz BW channel: 10M0W7D
	LTE 10+10 MHz CA channel: 20M0W7D
	NB IoT SA channel: 224KW7D
	NR 5 MHz BW channel: 5M00W7D
	NR 10 MHz BW channel: 10M0W7D
	NR 15 MHz BW channel: 15M0W7D
	NR 20 MHz BW channel: 20M0W7D
	NR 10+15 MHz CA channel: 25M0W7D
OUTPUT POWER (RMS) (W or dBm)	4 ports, 40W per port ²
FCC ID	TA8AKRC161689
IC ID	287AB-AS161689
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Base station radio

¹ KRC 161 689/3 is the test object. KRC 161 689/1 is equivalent in Radio performance terms but without monitor port

² 20W per port for GSM<E1.4/3&NB_IoT SA

Signature


Zheng Zhao

Date

2020-06-30

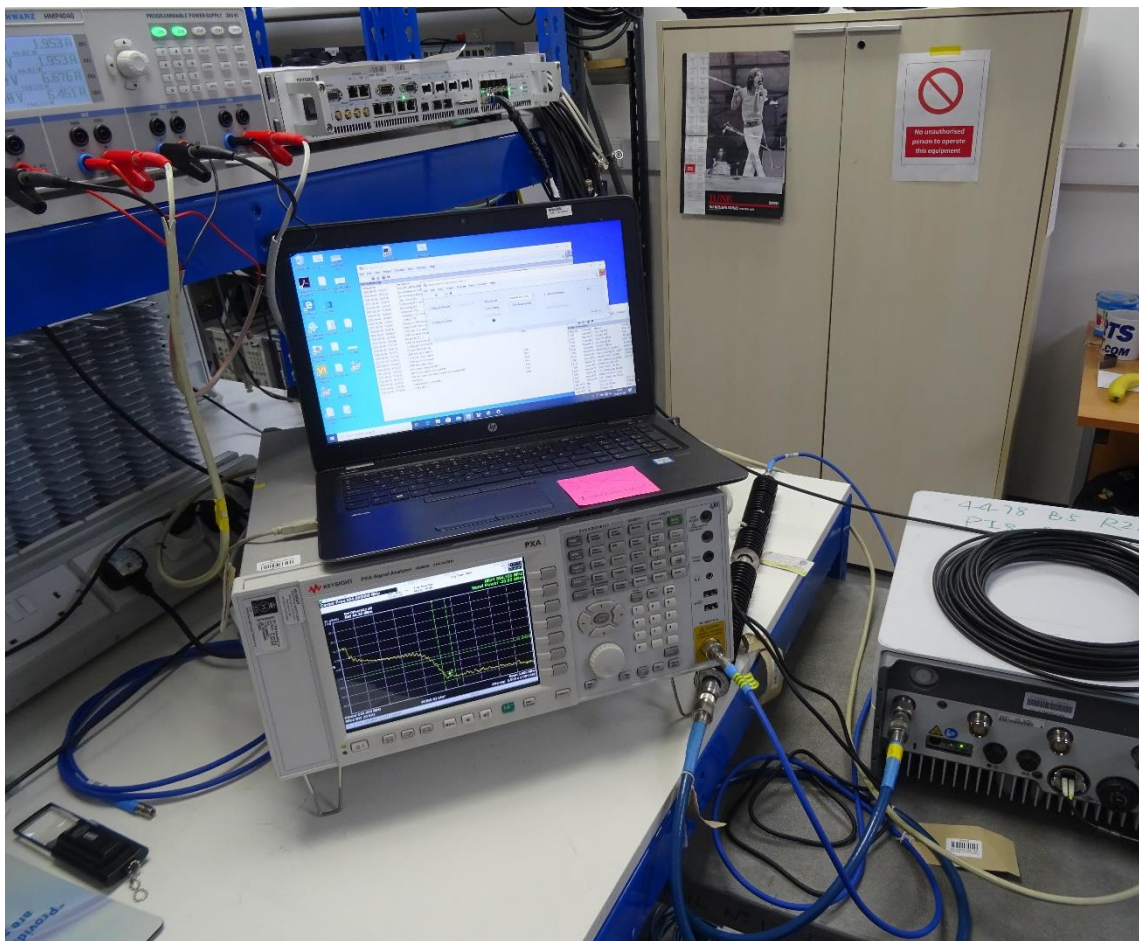
No responsibility will be accepted by TÜV SÜD Product Service UK Limited as to the accuracy of the information declared in this document by the manufacturer.

1.5 PRODUCT INFORMATION

1.5.1 Technical Description

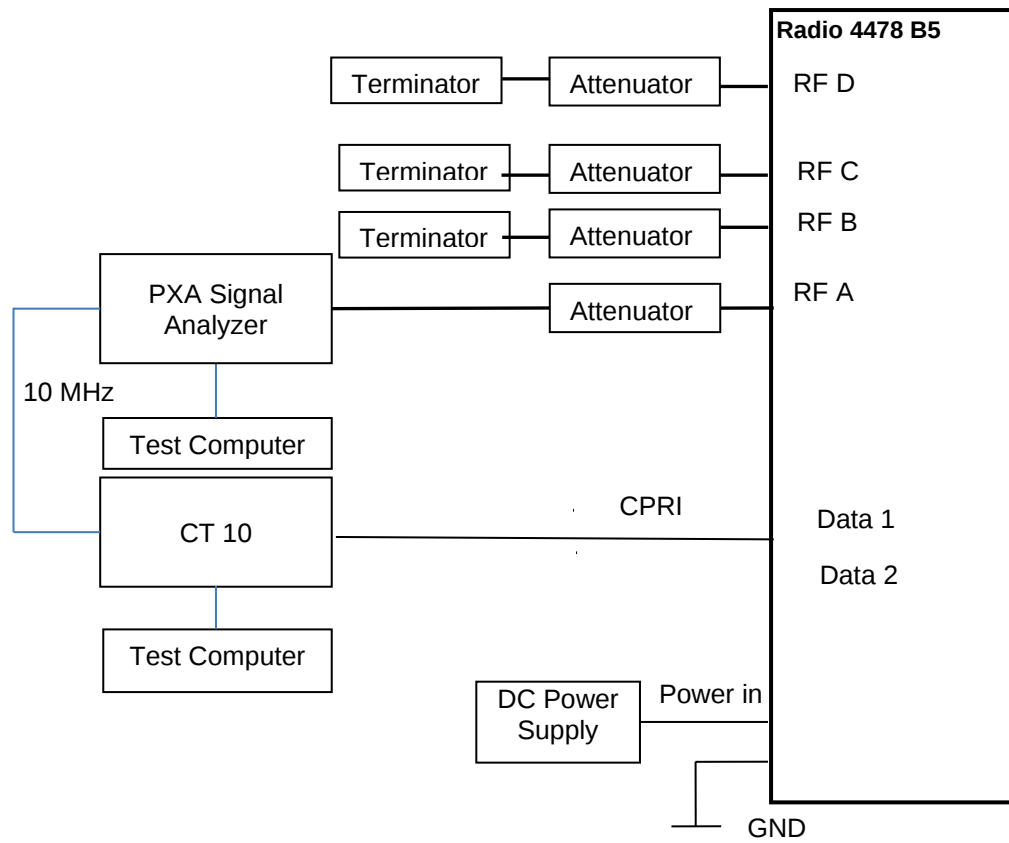
The Equipment Under Test (EUT) Radio 4478 B5 is an Ericsson AB Radio Unit working in the public mobile service 850 MHz band which provides communication connections to 850 MHz network. The Radio 4478 B5 operates from a -48V DC supply.

The Equipment Under Test (EUT) is shown in the photograph below. A full technical description can be found in the Manufacturer's documentation.



Equipment Under Test

1.6 TEST SETUP





1.7 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated as described in the Test Method for each Test.

The EUT was powered from a -48V DC supply.

FCC Measurement Facility Registration Number
90987 Octagon House, Fareham Test Laboratory

ISED Accreditation
ISED#12669A Octagon House, Fareham Test Laboratory

Test Name	Name of Engineer(s)
Maximum Peak Output Power and Peak to Average Ratio - Conducted	Neil Rousell
Occupied Bandwidth	Neil Rousell
Band Edge	Neil Rousell
Transmitter Spurious Emissions	Neil Rousell
Radiated Emissions	Graeme Lawler

1.8 DEVIATION FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.9 MODIFICATION RECORD

No modifications were made to the EUT during testing.

1.10 ADDITIONAL INFORMATION

Ericsson declare that the Radio 4478 B5 KRC 161 689/3 without monitor port and Radio 4478 B5 KRC 161 689/1 with monitor port are equivalent in Radio performance terms, and as such no extra testing is required to prove conformity.



SECTION 2

TEST DETAILS



2.1 MAXIMUM PEAK OUTPUT POWER AND PEAK TO AVERAGE RATIO - CONDUCTED

2.1.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR 47 Part 22, Clause 22.913 (a)
Industry Canada RSS-132, Clause 5.4

2.1.2 Date of Test and Modification State

09, 15 June and 20 July 2020 - Modification State 0

2.1.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.4 Environmental Conditions

Ambient Temperature 21.7-22.9°C
Relative Humidity 46.1 - 54.4%

2.1.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01, clause 5.2.1 and summed in accordance with FCC KDB 662911 D01.

2.1.6 Test Results

Configuration 1

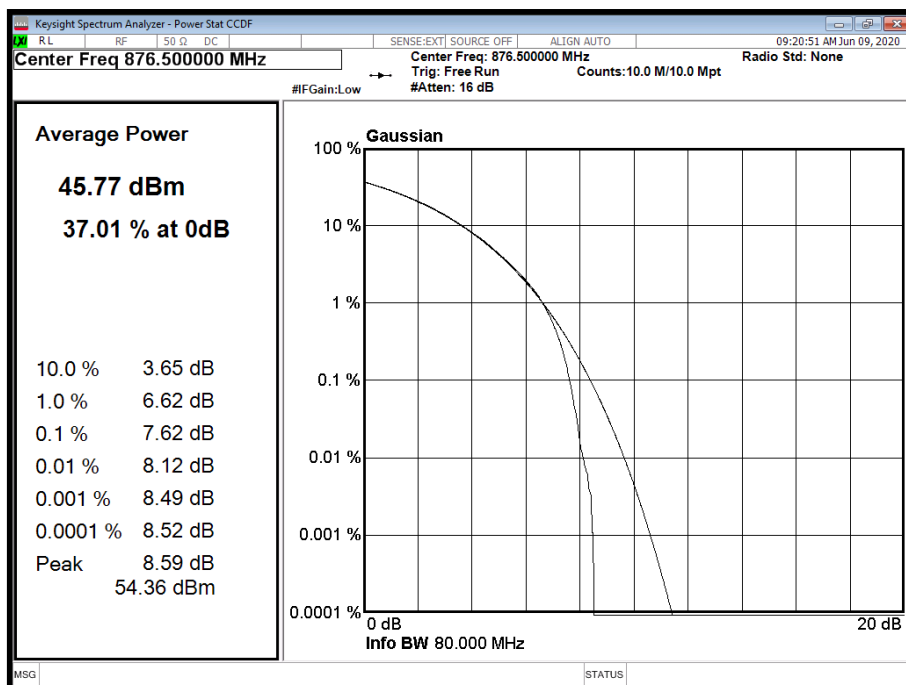
Maximum Output Power 46.0 dBm

Antenna	NR Modulation	NR Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power			
			Channel Position B			
			PAR (dB)	Average Power		Total Power A + B + C + D
				dBm	dBm/MHz	
A	QPSK	15.0 MHz 15 kHz SCS	7.62	45.78	35.26	51.80
A	QPSK	20.0 MHz 15 kHz SCS	7.60	45.68	33.86	51.70
A	QPSK	20.0 MHz 60 kHz SCS	7.43	46.07	34.57	52.09

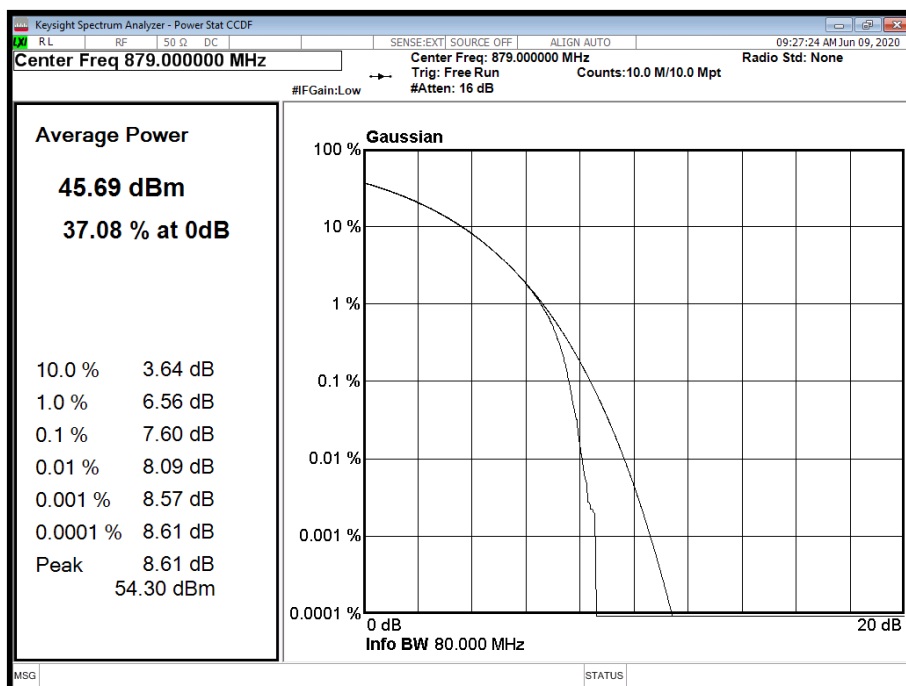
Remarks

Calculations: Total power = measured output power (port A, worst case) + 10log (4)

Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 15.0 MHz 15 kHz SCS - Channel Position B

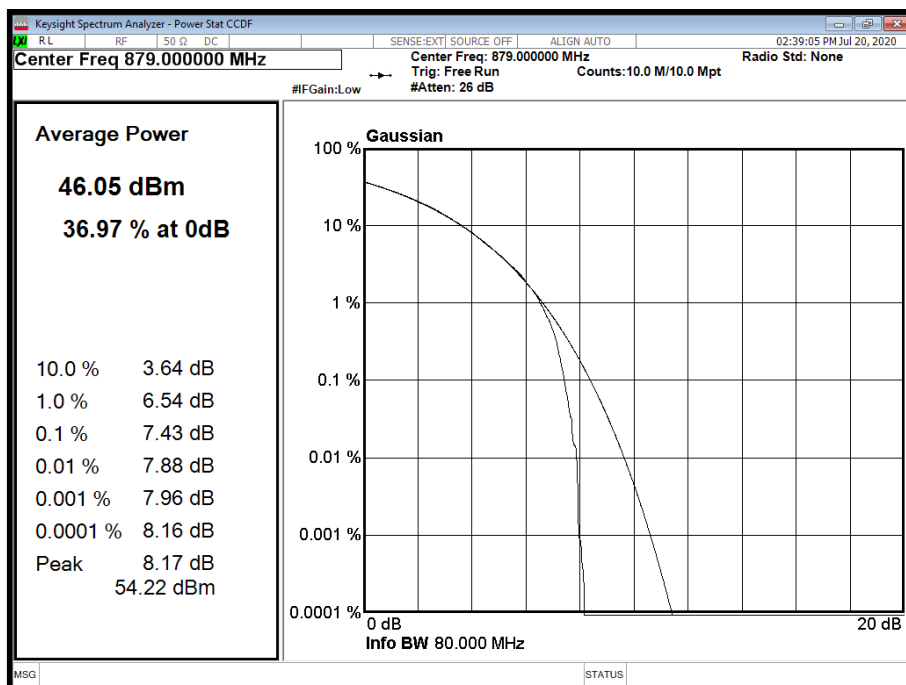


Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 15 kHz SCS - Channel Position B





Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 60 kHz SCS - Channel Position B



Configuration 1

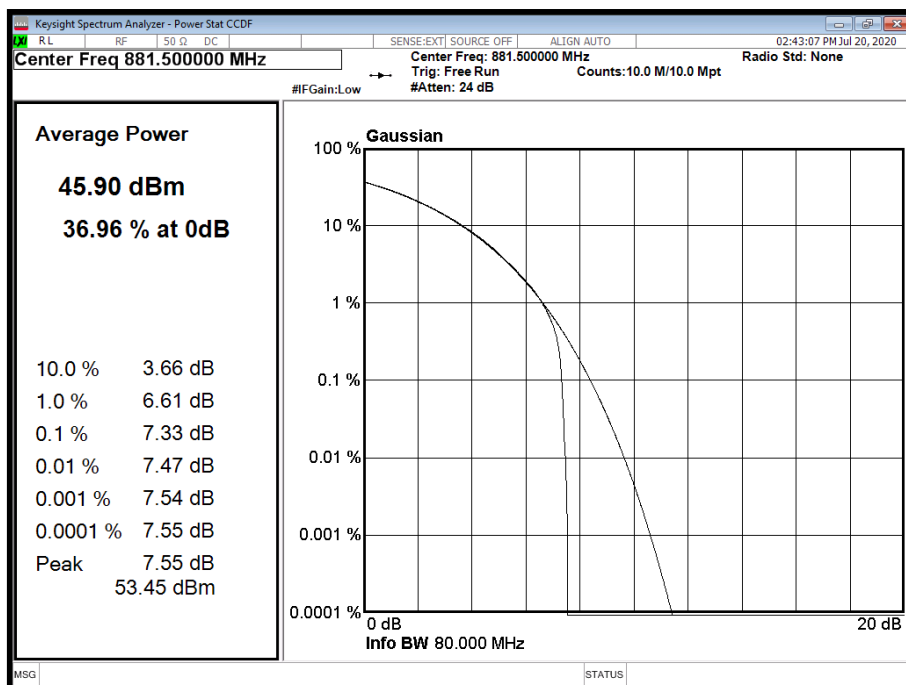
Maximum Output Power 46.0 dBm

Antenna	NR Modulation	NR Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power			
			Channel Position M			
			PAR (dB)	Average Power		Total Power A + B + C + D
				dBm	dBm/MHz	
A	QPSK	15.0 MHz 15 kHz SCS	7.33	45.88	35.29	51.90
A	QPSK	20.0 MHz 15 kHz SCS	7.38	45.92	34.05	51.94
A	QPSK	20.0 MHz 60 kHz SCS	7.37	45.94	34.59	51.96

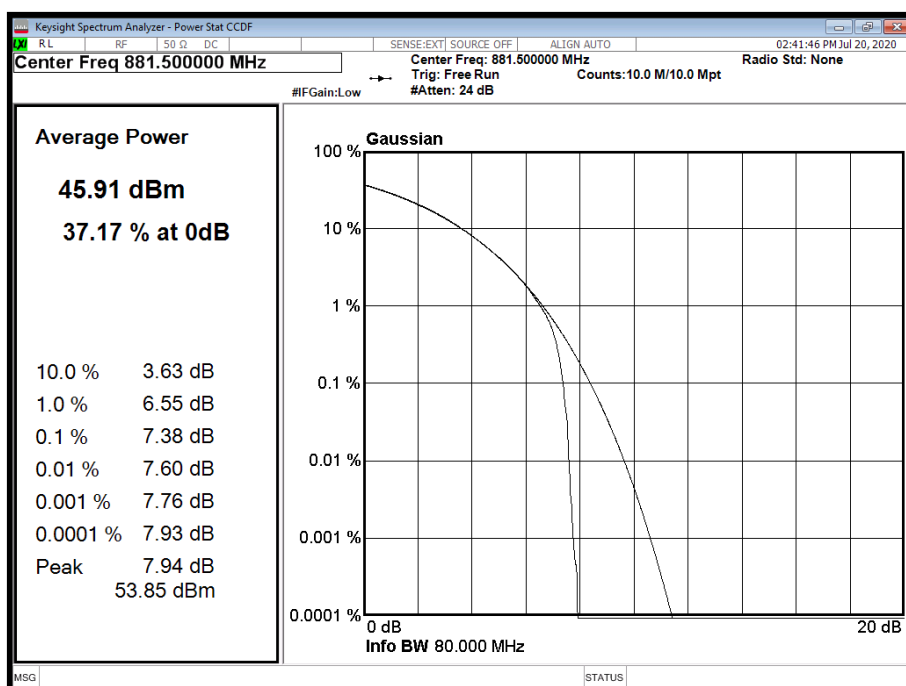
Remarks

Calculations: Total power = measured output power (port A, worst case) + 10log (4)

Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 15.0 MHz 15 kHz SCS - Channel Position M

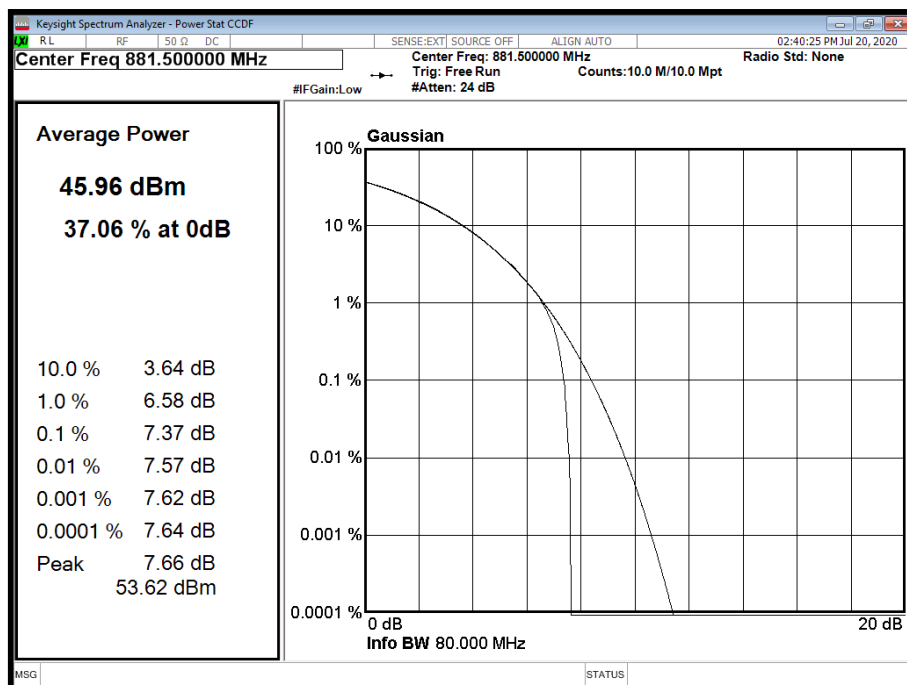


Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 15 kHz SCS - Channel Position M





Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 60 kHz SCS - Channel Position M



Configuration 1

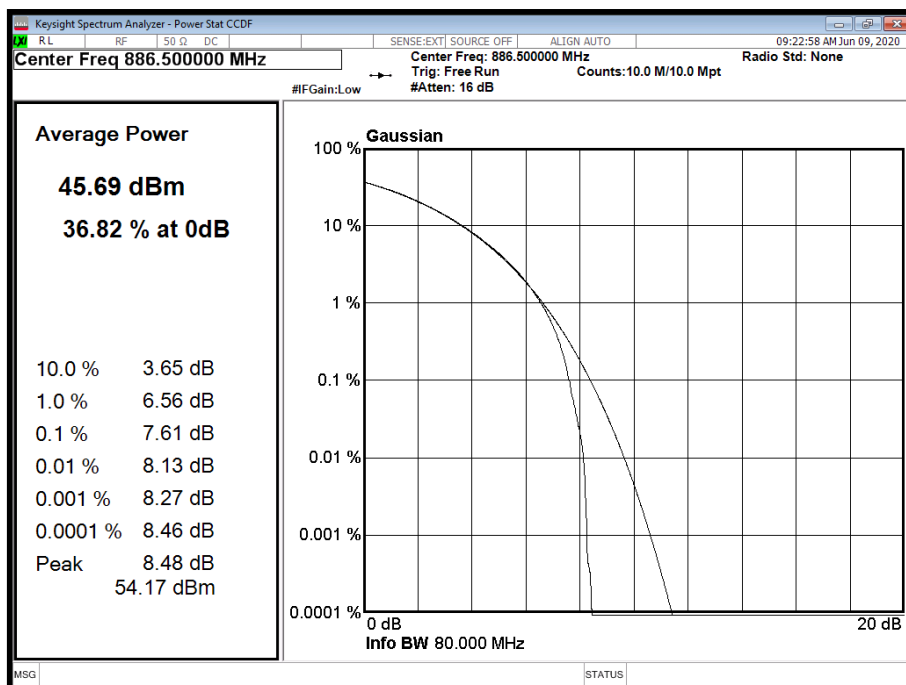
Maximum Output Power 46.0 dBm

Antenna	NR Modulation	NR Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power			
			Channel Position T			
			PAR (dB)	Average Power		Total Power A + B + C +D
				dBm	dBm/MHz	
A	QPSK	15.0 MHz 15 kHz SCS	7.61	45.74	35.29	51.76
A	QPSK	20.0 MHz 15 kHz SCS	7.64	45.61	33.94	51.63
A	QPSK	20.0 MHz 60 kHz SCS	7.43	46.01	34.57	52.03

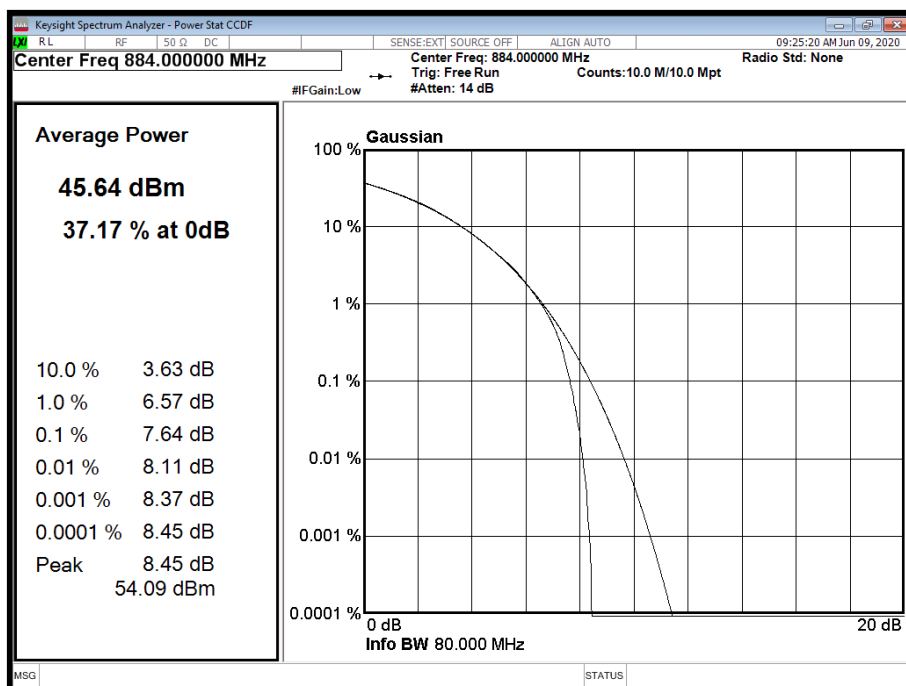
Remarks

Calculations: Total power = measured output power (port A, worst case) + 10log (4)

Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 15.0 MHz 15 kHz SCS - Channel Position T

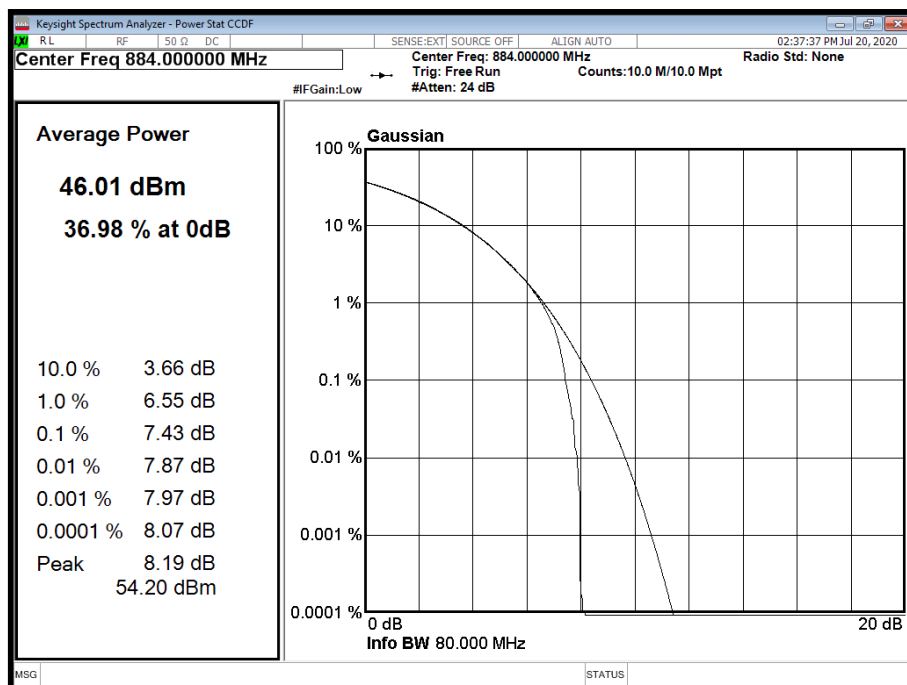


Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 15 kHz SCS - Channel Position T





Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 60 kHz SCS - Channel Position T



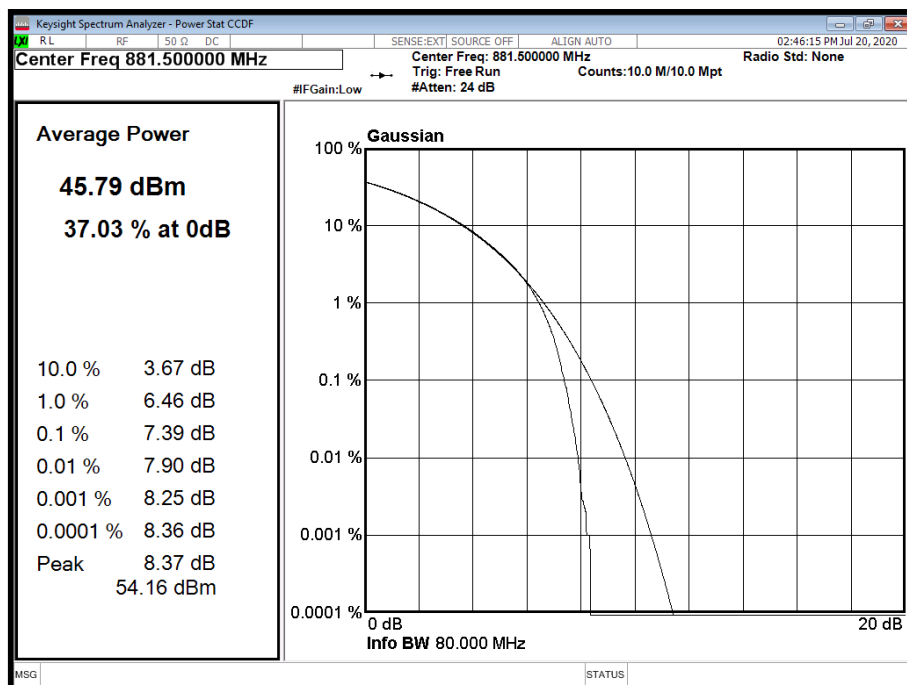
Configuration 2

Maximum Output Power 46.0 dBm

Antenna	NR Modulation	NR Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power			
			Channel Position M			
			PAR (dB)	Average Power		Total Power A + B + C + D
				dBm	dBm/MHz	dBm
A	QPSK	10.0 + 15.0 MHz CA 15 kHz SCS	7.39	45.85	33.96	51.87



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 10.0 + 15.0 MHz CA 15 kHz SCS - Channel Position M

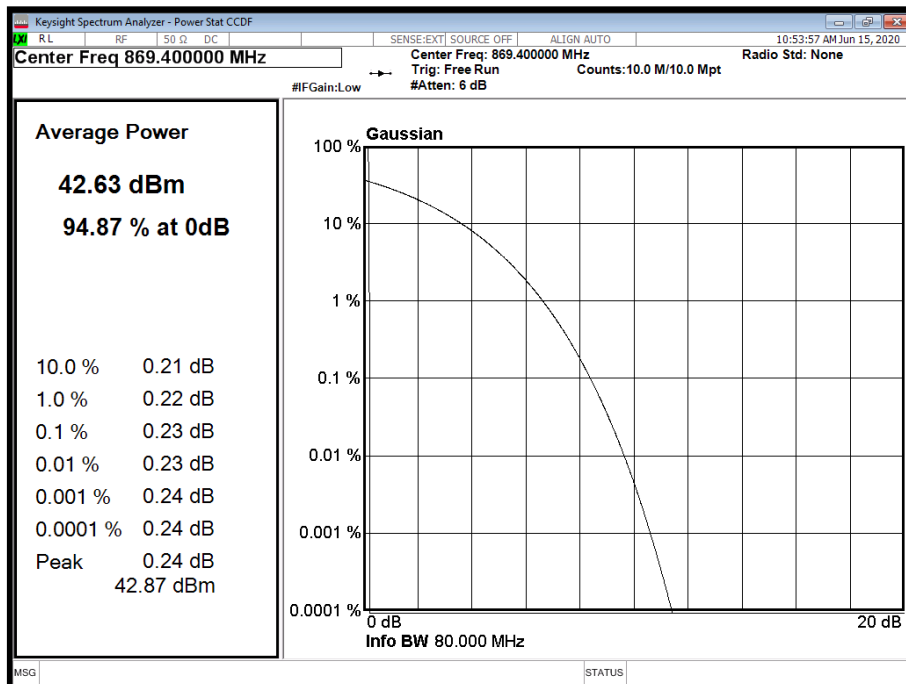


Configuration 3

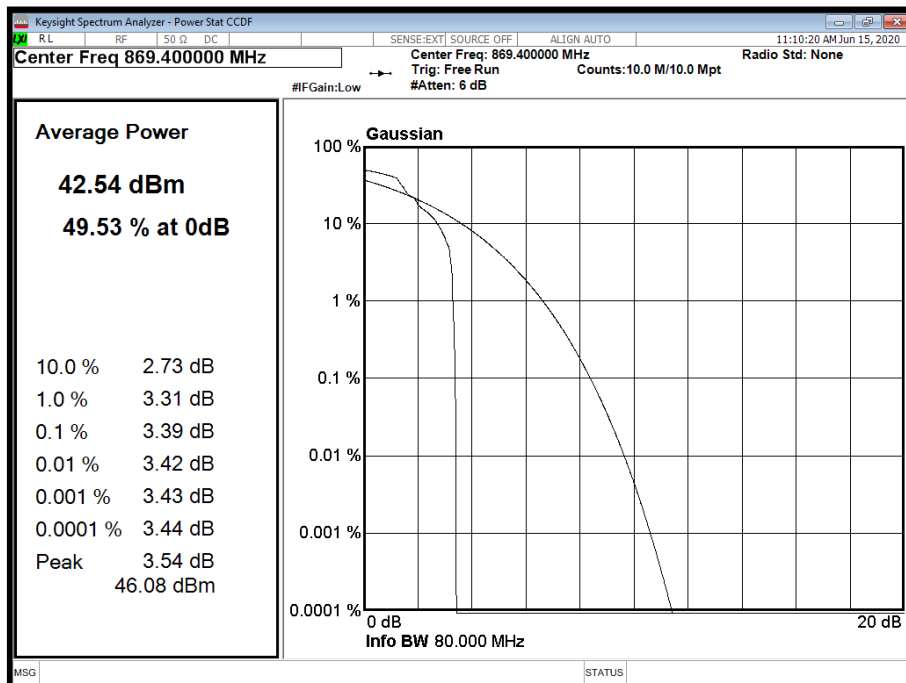
Maximum Output Power 43.00 dBm

Antenna	GSM Modulation	GSM Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position B		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	GMSK	0.2 MHz	0.23	42.72	42.77
A	8-PSK	0.2 MHz	3.39	42.49	42.95
A	AQPSK	0.2 MHz	3.54	42.46	43.15

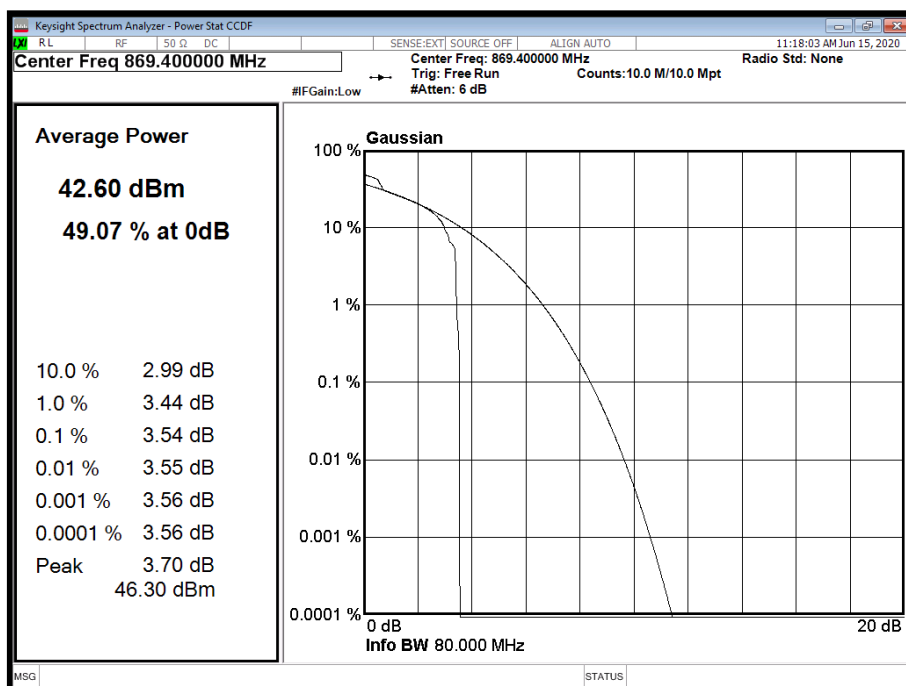
Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position B



Antenna A - GSM Modulation 8-PSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position B



Antenna A - GSM Modulation AQPSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position B

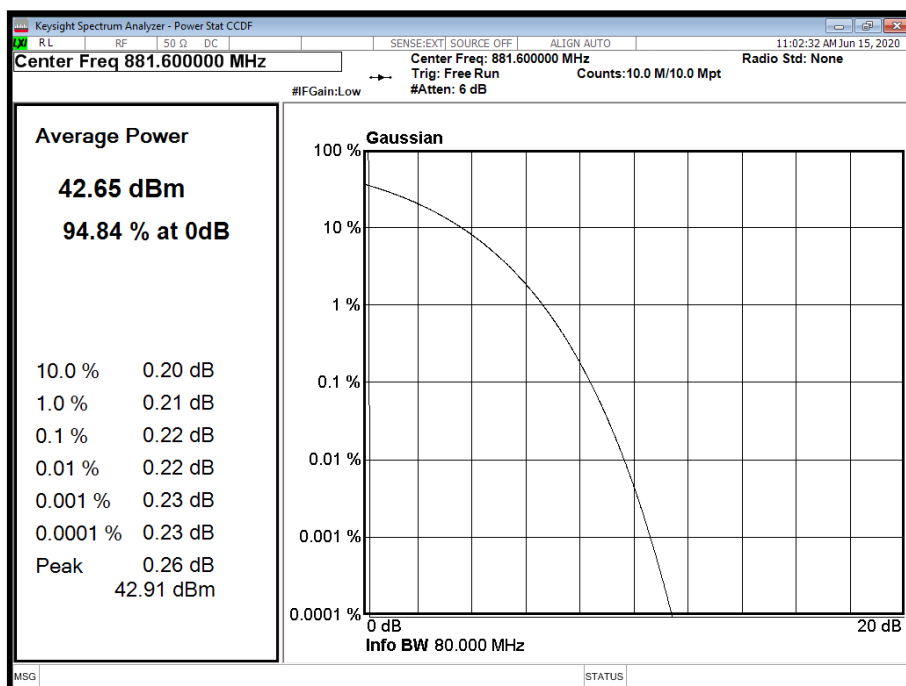


Configuration 3

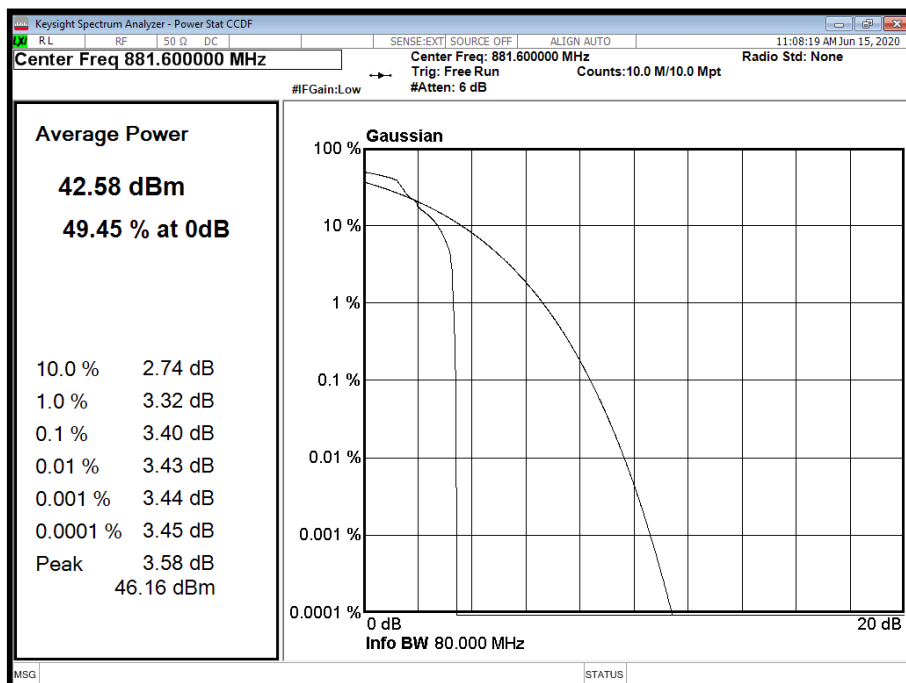
Maximum Output Power 43.00 dBm

Antenna	GSM Modulation	GSM Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			Channel Position M		
			PAR (dB)	Average Power	
				dBm	dBm/MHz
A	GMSK	0.2 MHz	0.22	42.54	42.76
A	8-PSK	0.2 MHz	3.40	42.50	43.00
A	AQPSK	0.2 MHz	3.54	42.67	43.05

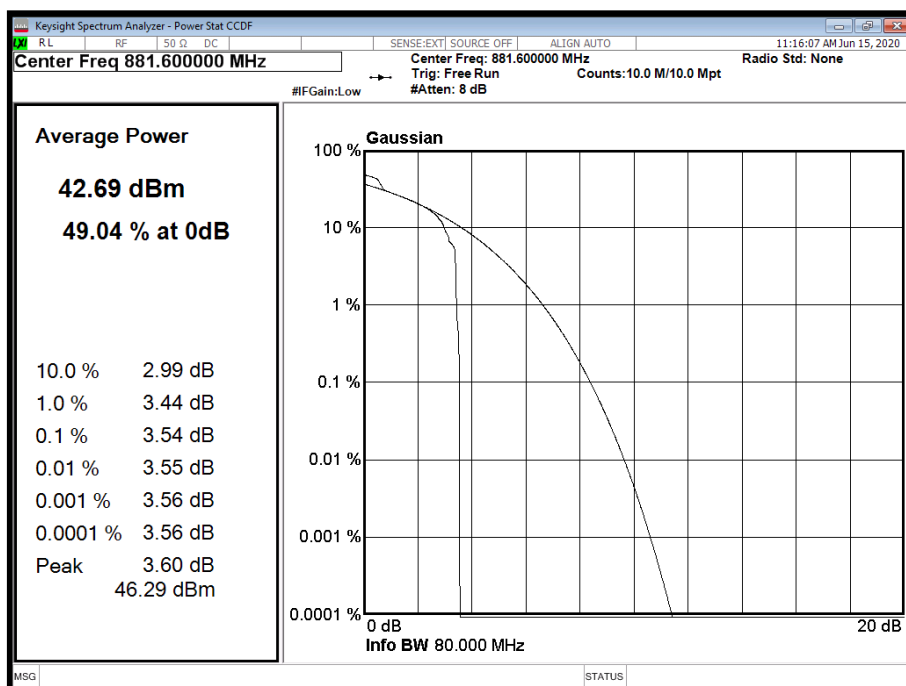
Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position M



Antenna A - GSM Modulation 8-PSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position M



Antenna A - GSM Modulation AQPSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position M

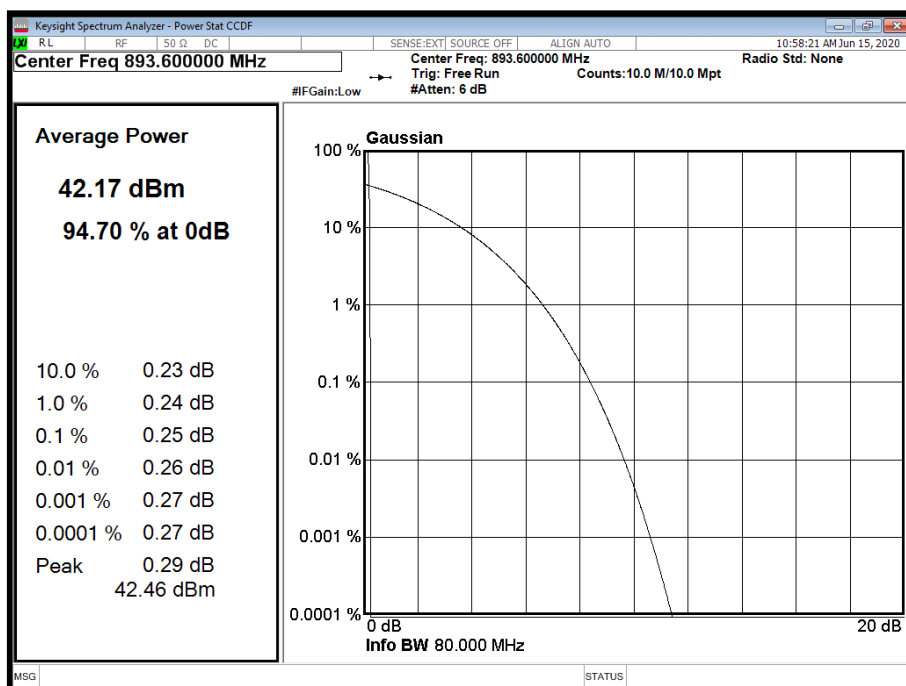


Configuration 3

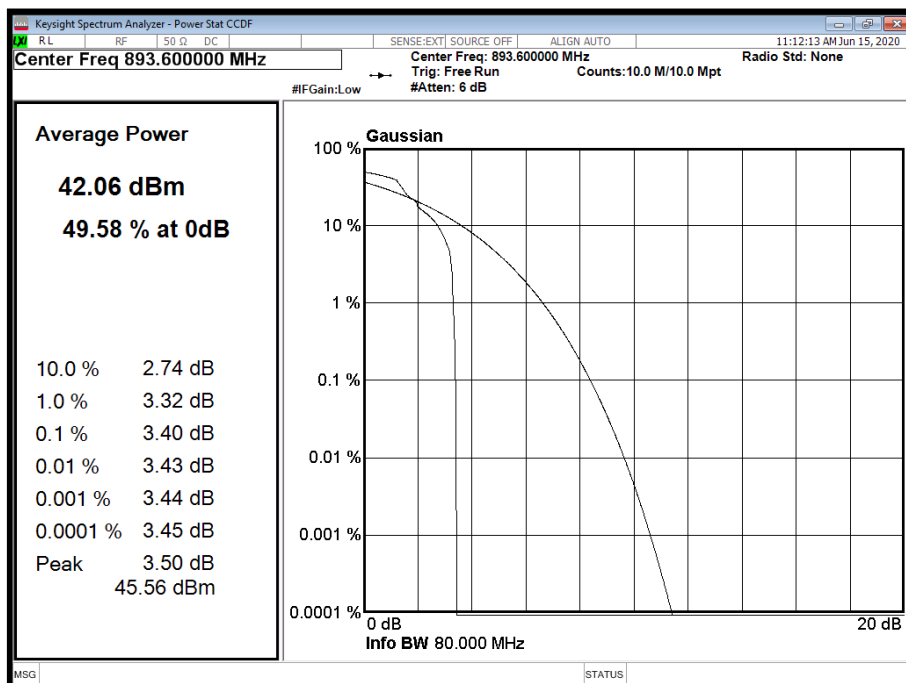
Maximum Output Power 43.00 dBm

Antenna	GSM Modulation	GSM Carrier Bandwidth	Peak to Average Ratio (PAR) / Output Power		
			PAR (dB)	Channel Position T	
				Average Power	
				dBm	dBm/MHz
A	GMSK	0.2 MHz	0.25	42.09	42.24
A	8-PSK	0.2 MHz	3.40	42.03	42.36
A	AQPSK	0.2 MHz	3.55	42.14	42.59

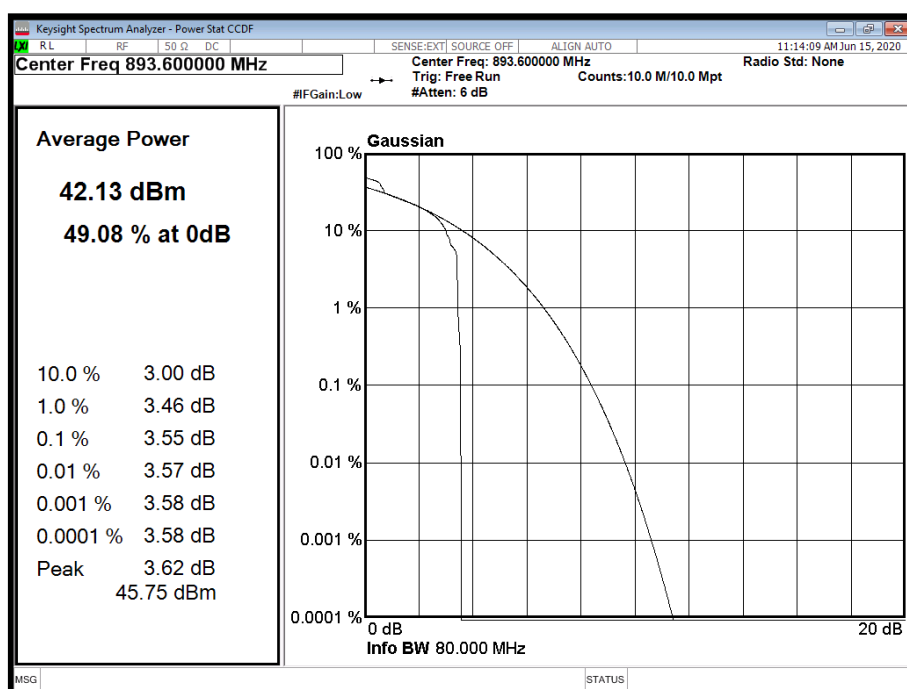
Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position T



Antenna A - GSM Modulation 8-PSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position T



Antenna A - GSM Modulation AQPSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position T



Limit	
Peak Power	≤ 1640 W or ≤ +62.15 dBm
Peak to Average Ratio	13 dB

The radio unit was tested with maximum output power and without an antenna. ERP/EIRP compliance is addressed at the time of licensing, as required by the responsible FCC/ISED Bureau(s). Licensees are required to take into account maximum allowed antenna gain used in combination with the above power settings to prevent the radiated output power exceeding the limits.



2.2 OCCUPIED BANDWIDTH

2.2.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1049
FCC CFR 47 Part 22, Clause 22.917 (b)
Industry Canada RSS-GEN, Clause 6.7
Industry Canada RSS-132, Clause 5.5

2.2.2 Date of Test and Modification State

09 June and 15 June 2020 - Modification State 0

2.2.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.4 Environmental Conditions

Ambient Temperature 21.7-22.1°C
Relative Humidity 46.1 - 54.4%

2.2.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01.

2.2.6 Test Results

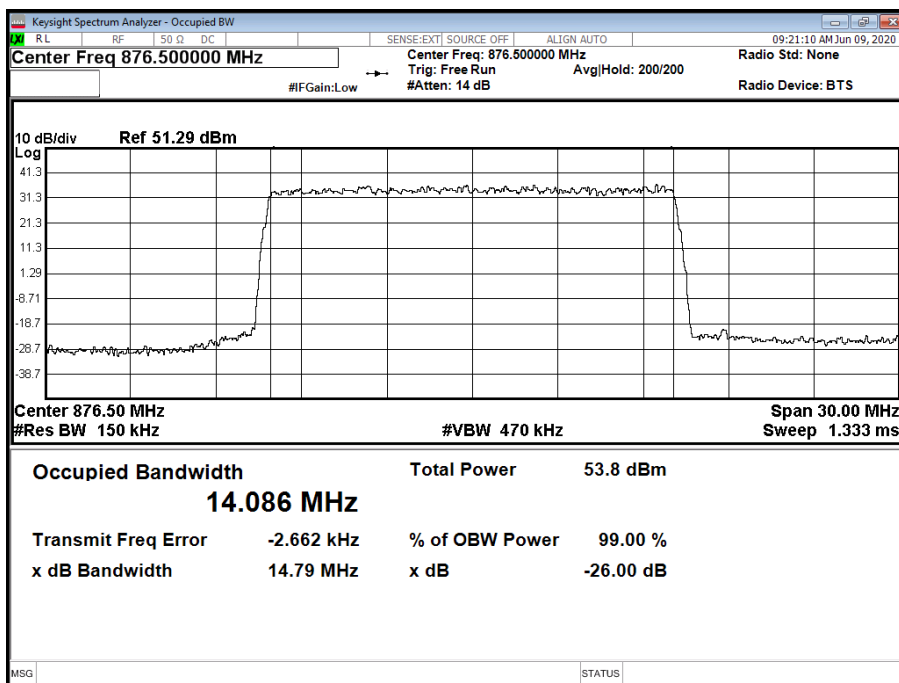
Configuration 1

Maximum Output Power 46 dBm

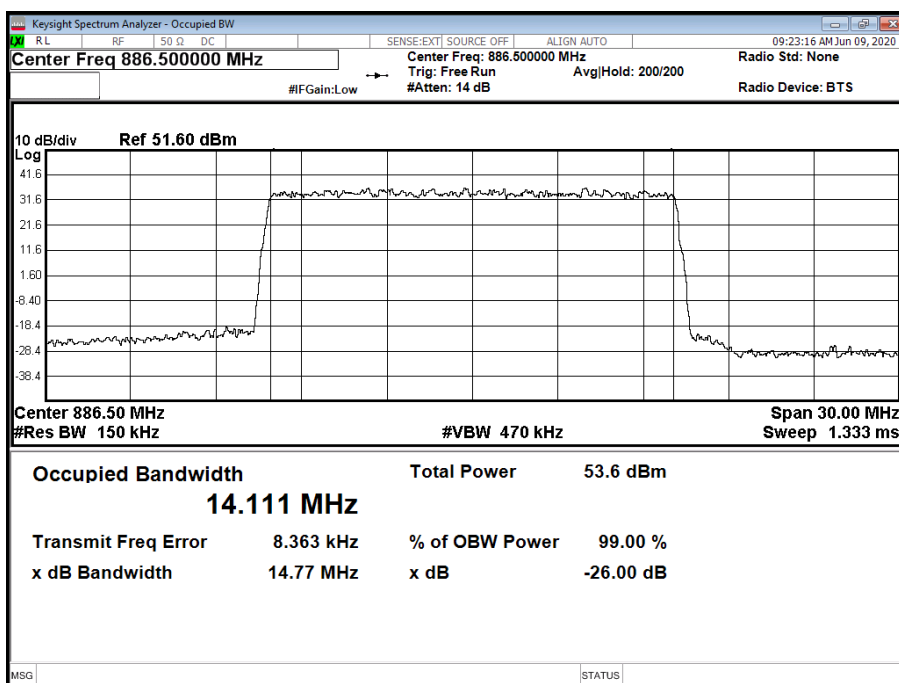
Antenna	NR Modulation	NR Carrier Bandwidth	Result (KHz)			
			Channel Position B		Channel Position T	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
A	QPSK	15.0 MHz 15 kHz SCS	14,086.42	14,785.24	14,111.42	14,772.90
A	QPSK	20.0 MHz 15 kHz SCS	18,869.49	19,736.74	18,933.79	19,765.65
A	QPSK	20.0 MHz 60 kHz SCS	17,215.38	19,570.34	17,192.92	19,635.48



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 15.0 MHz 15 kHz SCS - Channel Position B

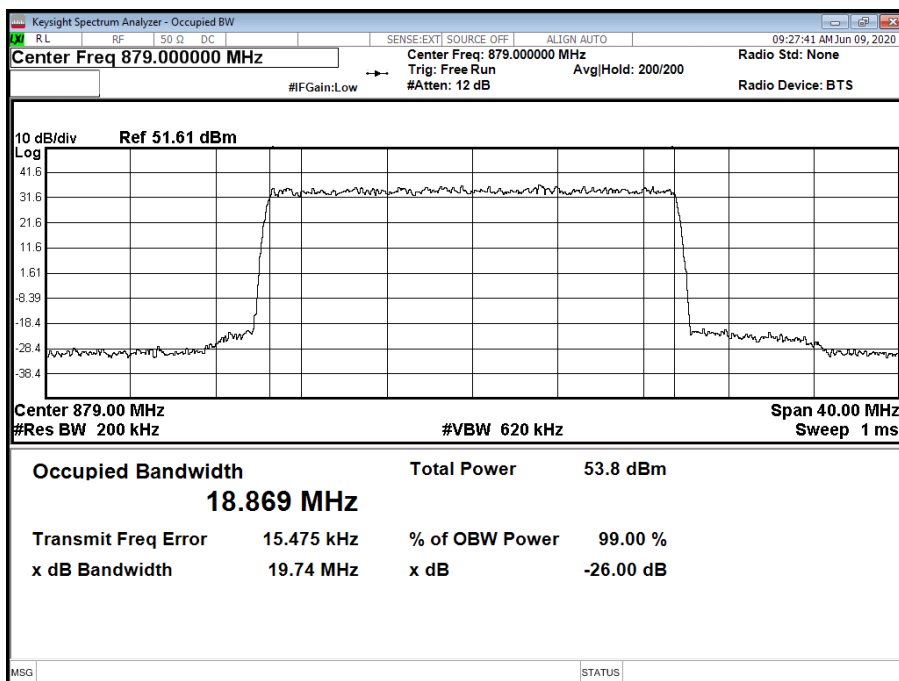


Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 15.0 MHz 15 kHz SCS - Channel Position T

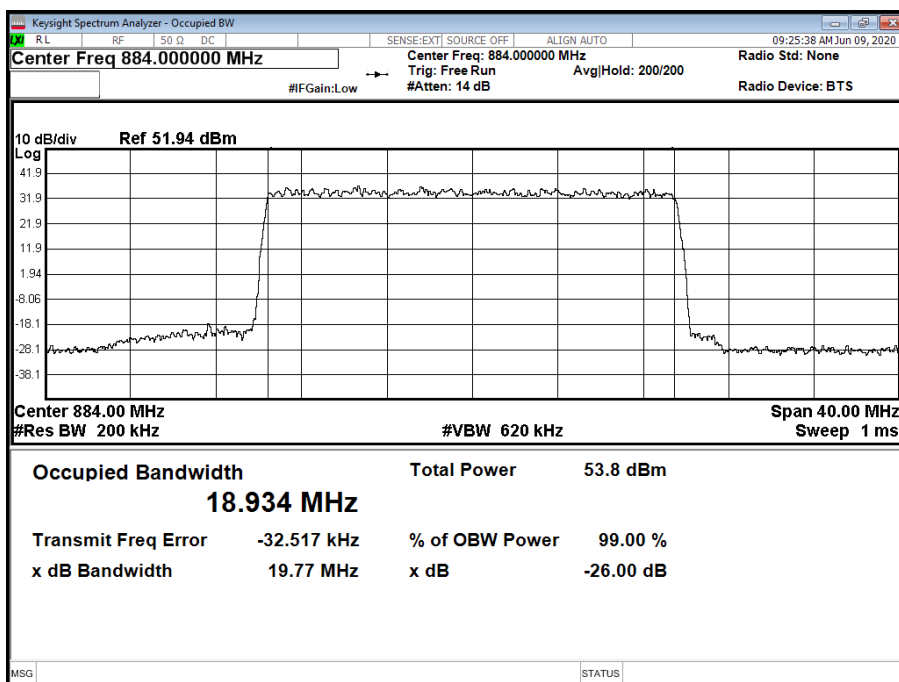




Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 15 kHz SCS - Channel Position B

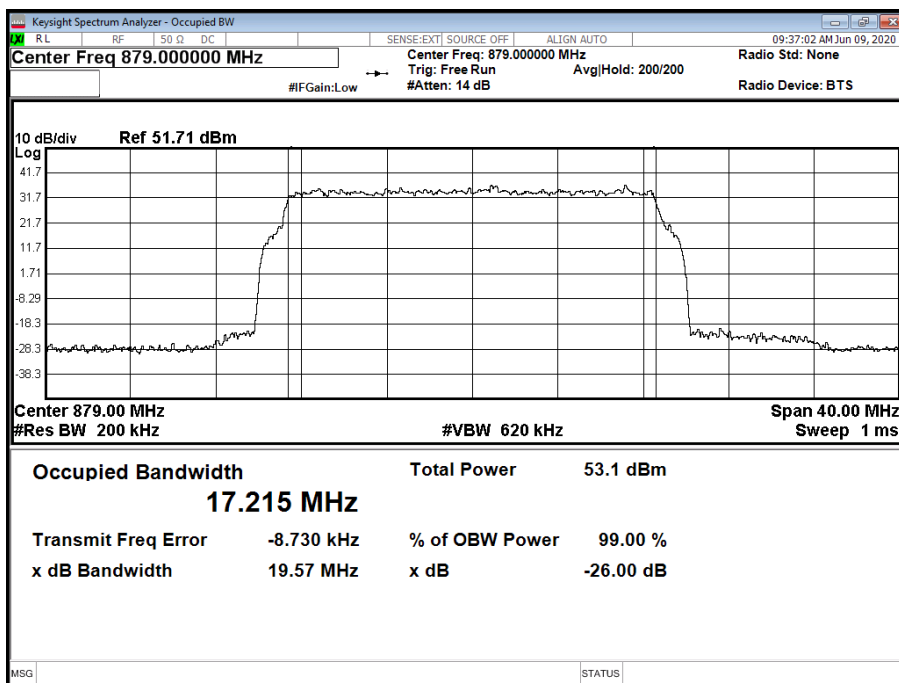


Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 15 kHz SCS - Channel Position T

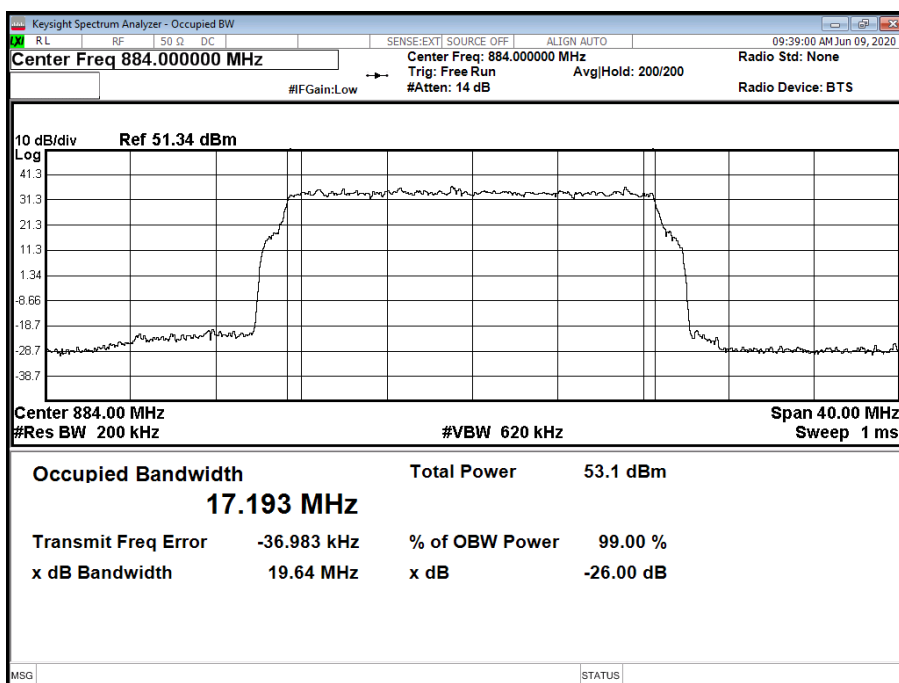




Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 60 kHz SCS - Channel Position B



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 60 kHz SCS - Channel Position T



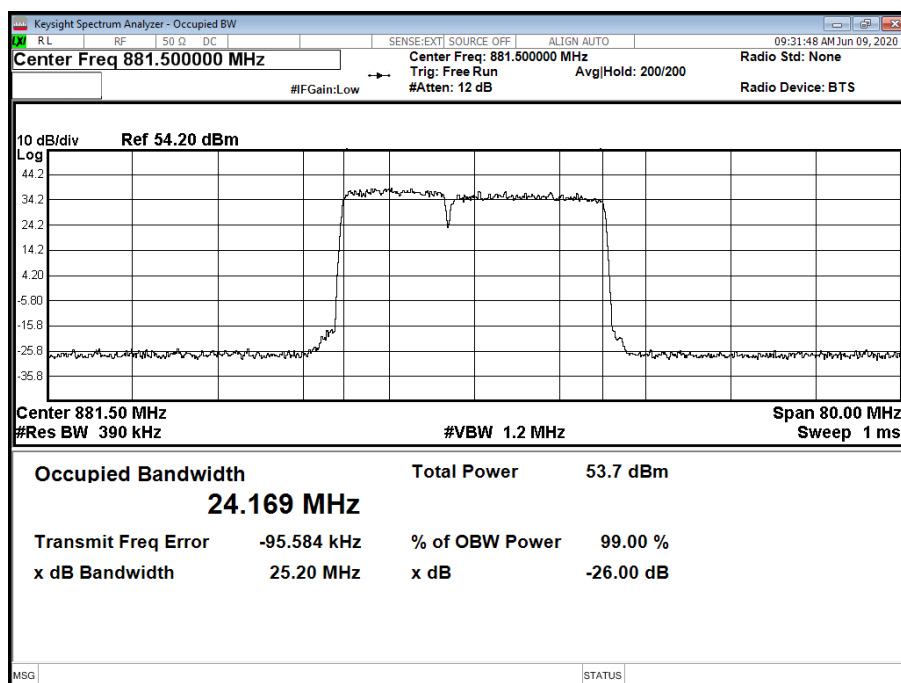


Configuration 2

Maximum Output Power 46 dBm

Antenna	NR Modulation	NR Carrier Bandwidth	Result (KHz)	
			Channel Position M	
			Occupied Bandwidth	-26 dB Bandwidth
A	QPSK	10.0 + 15.0 MHz CA 15 kHz SCS	24,168.54	25,203.54

Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 10.0 + 15.0 MHz CA 15 kHz SCS - Channel Position M



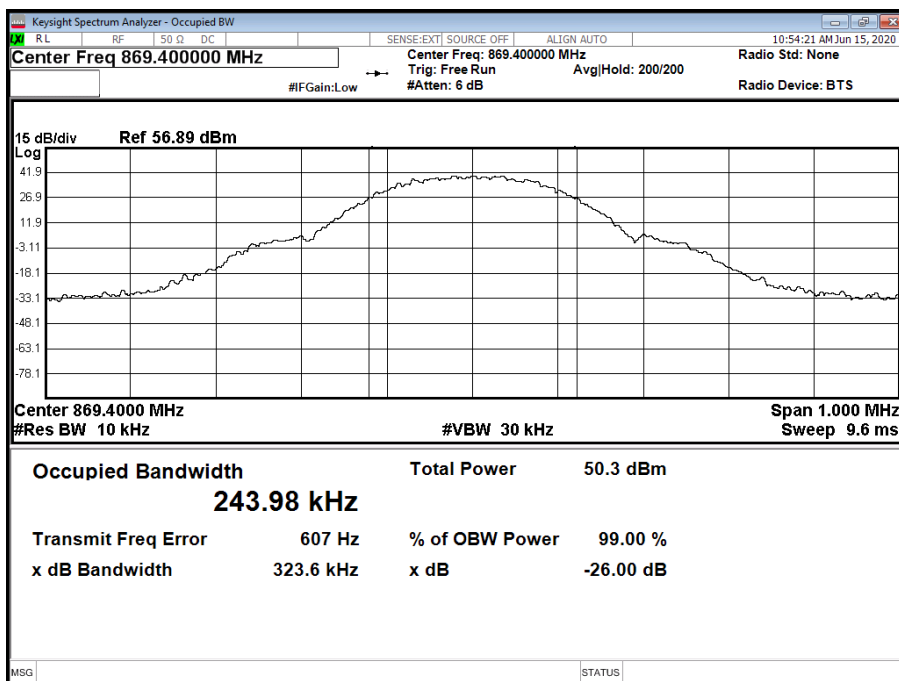
Configuration 3

Maximum Output Power 43 dBm

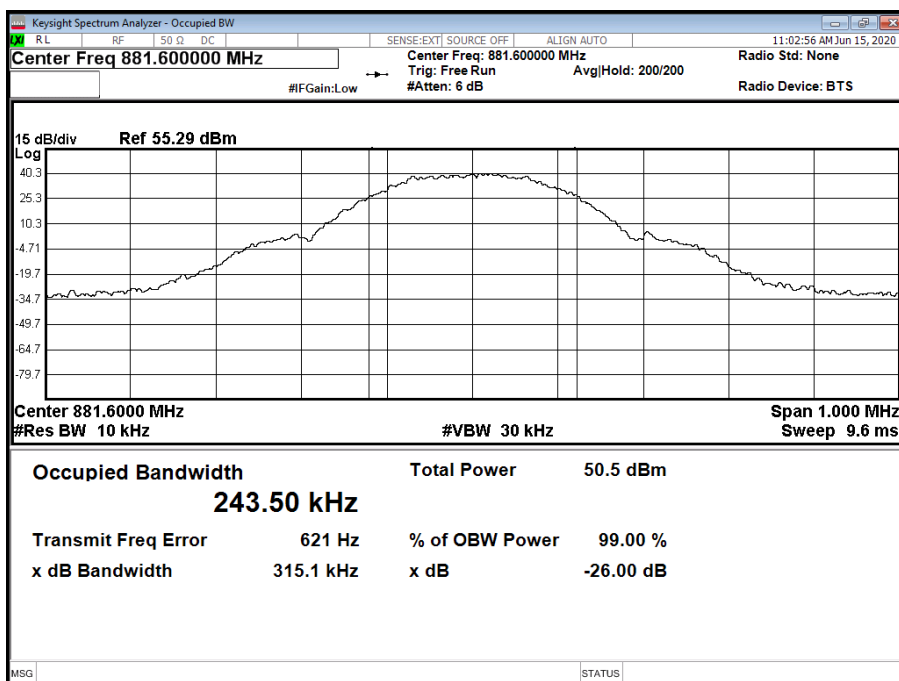
Antenna	GSM Modulation	GSM Carrier Bandwidth	Result (KHz)					
			Channel Position B		Channel Position M		Channel Position T	
			Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth	Occupied Bandwidth	-26 dB Bandwidth
A	GMSK	0.2 MHz	243.98	323.58	243.50	315.14	244.84	322.47
A	8-PSK	0.2 MHz	247.65	318.57	248.94	315.58	245.09	313.62
A	AQPSK	0.2 MHz	243.72	313.66	245.05	312.30	245.25	314.68



Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position B

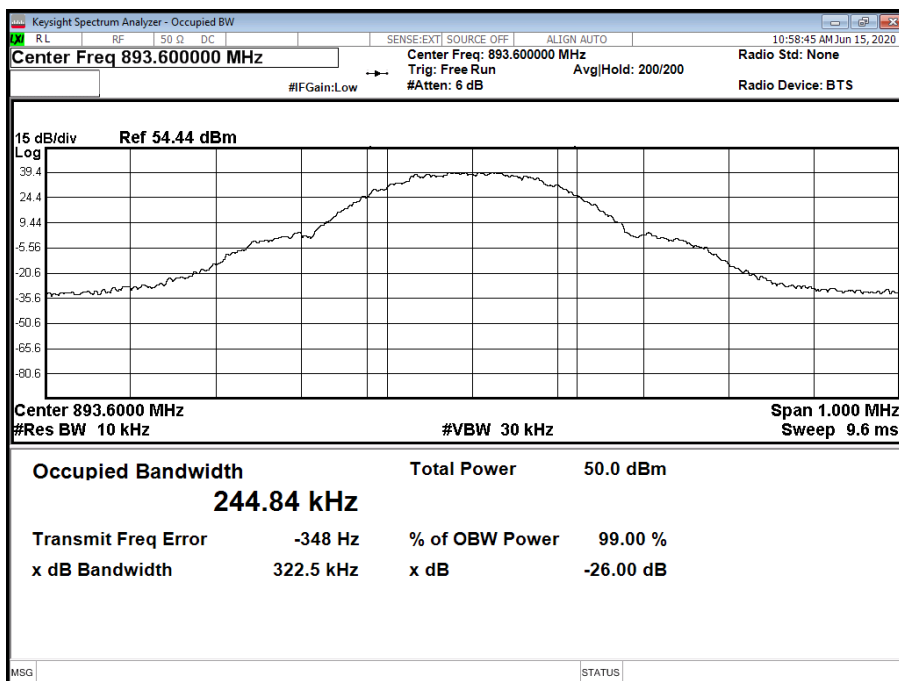


Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position M



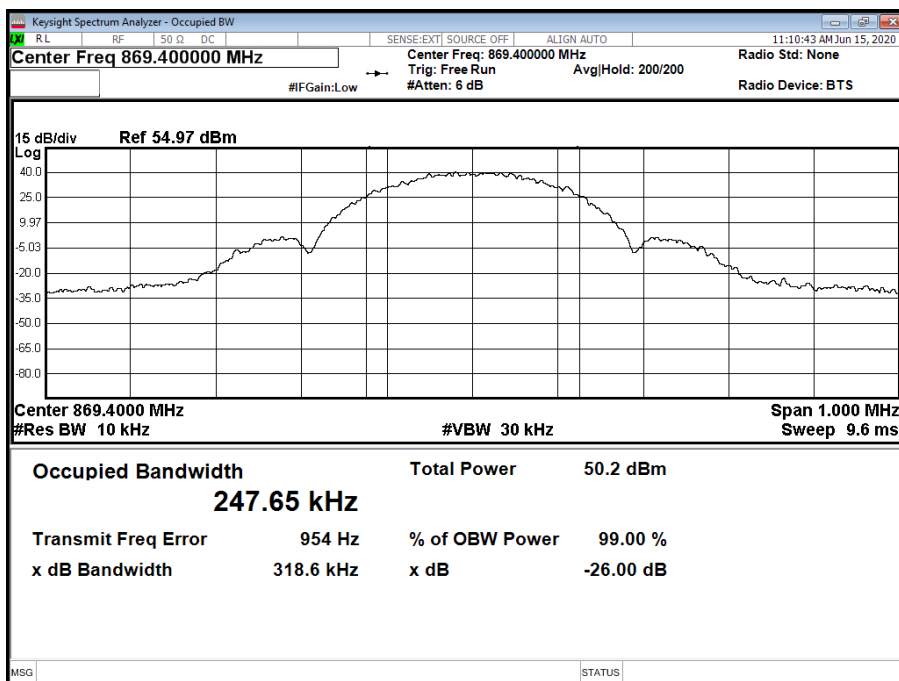


Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position T

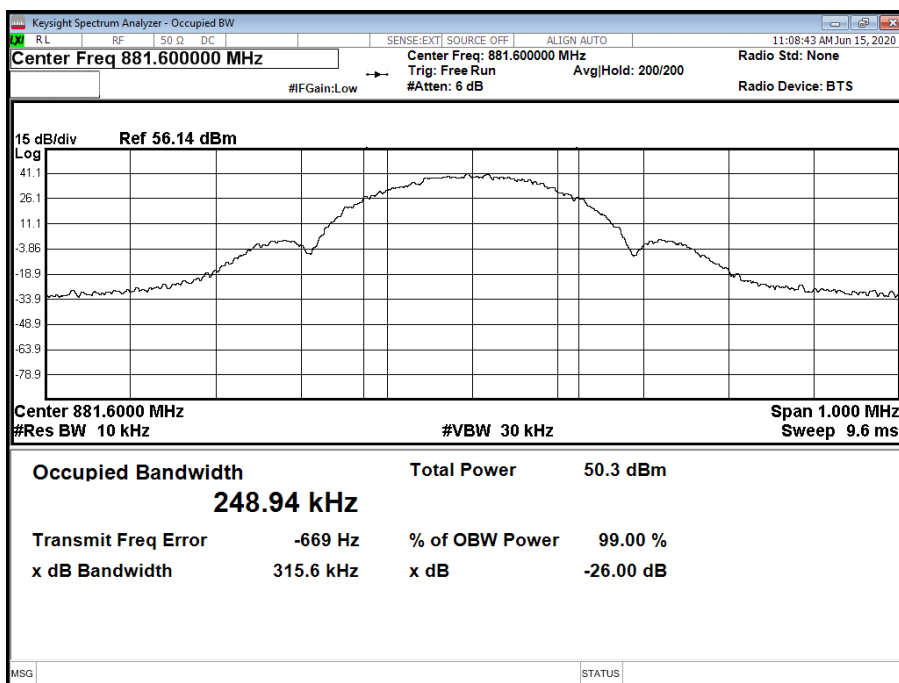




Antenna A - GSM Modulation 8-PSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position B

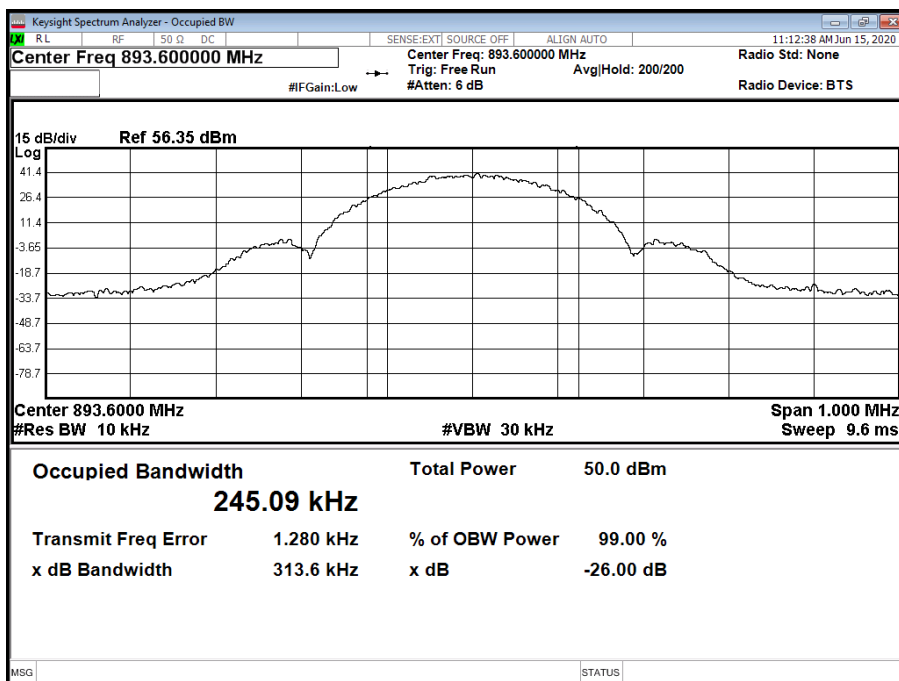


Antenna A - GSM Modulation 8-PSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position M

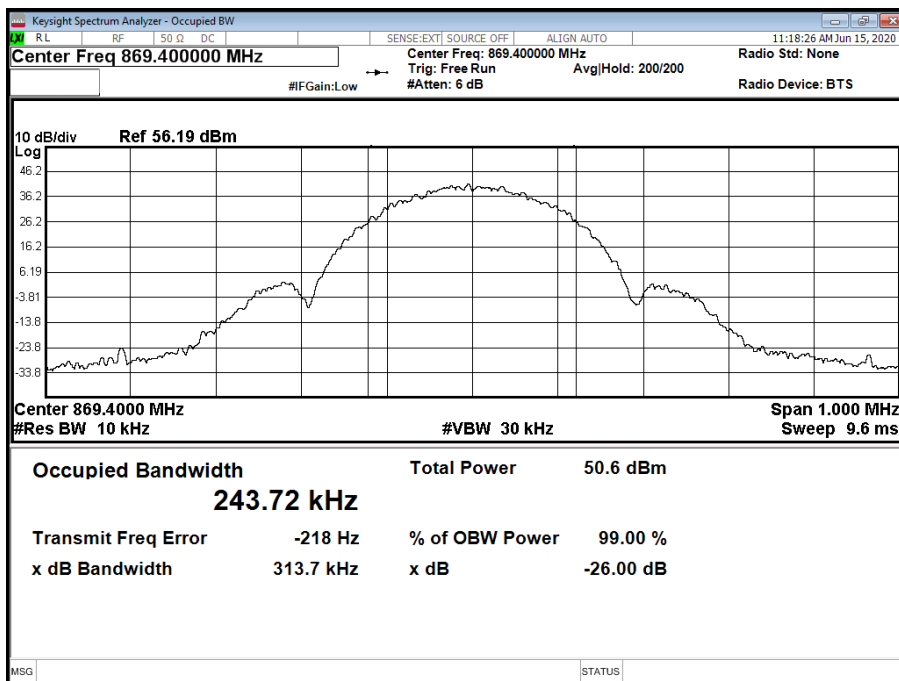




Antenna A - GSM Modulation 8-PSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position T

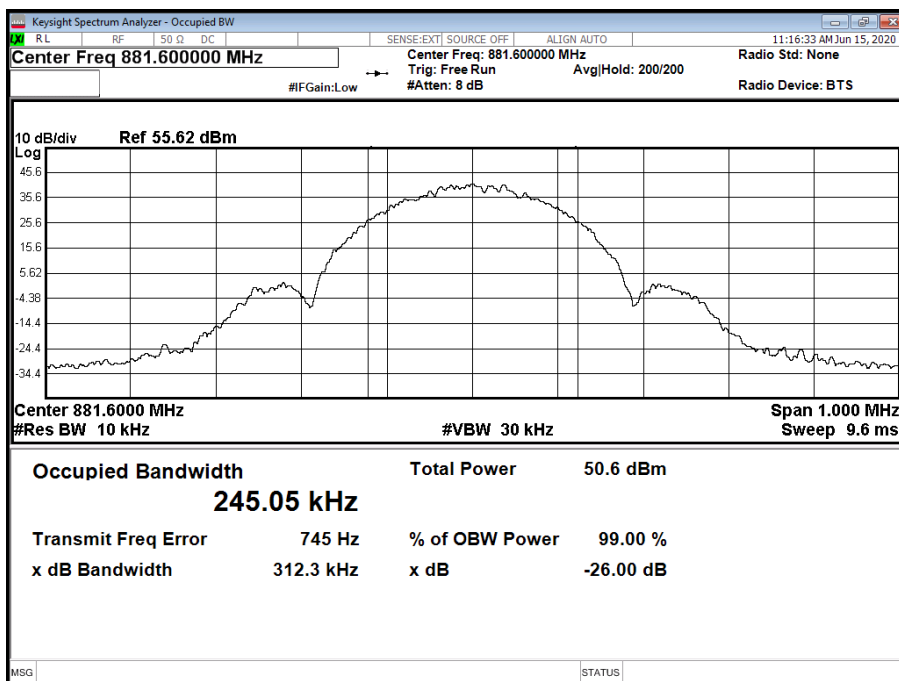


Antenna A - GSM Modulation AQPSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position B

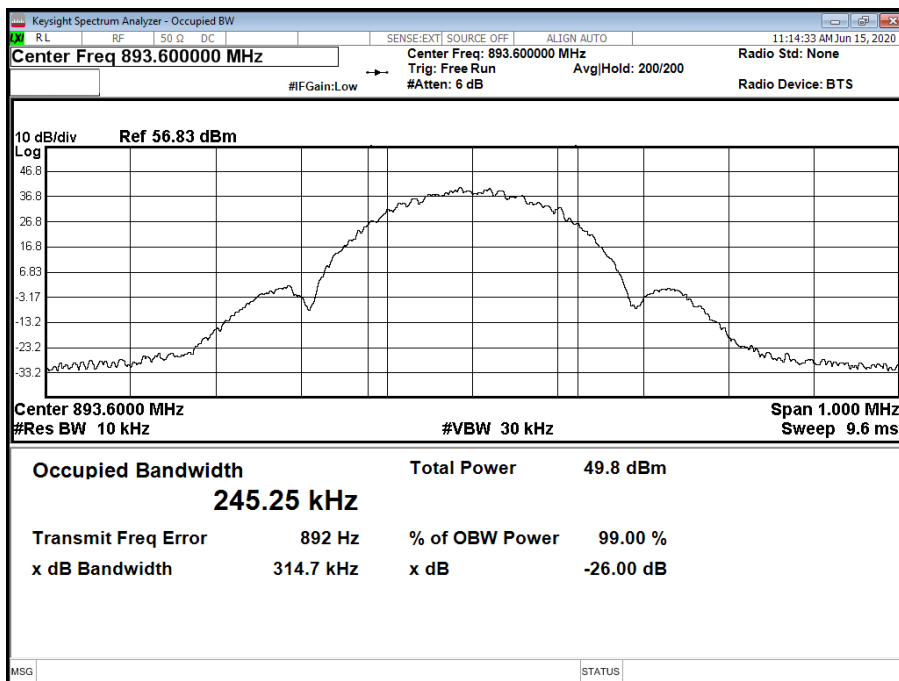




Antenna A - GSM Modulation AQPSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position M



Antenna A - GSM Modulation AQPSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position T





2.3 BAND EDGE

2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 22, Clause 22.917(b)
Industry Canada RSS-132, Clause 5.5

2.3.2 Date of Test and Modification State

09 June and 15 June 2020 - Modification State 0

2.3.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.4 Environmental Conditions

Ambient Temperature 21.7-22.1°C
Relative Humidity 46.1 - 54.4%

2.3.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01.

Each antenna port has been declared as being equivalent, therefore measurements were made on one antenna port only. To account for this, the limit was tightened by $10 * \log(N)$, where N is equal to the number of MIMO antenna ports.

For four ports, the limit was calculated as being $-13 \text{ dBm} - 10 * \log(4) = -19 \text{ dBm}$.

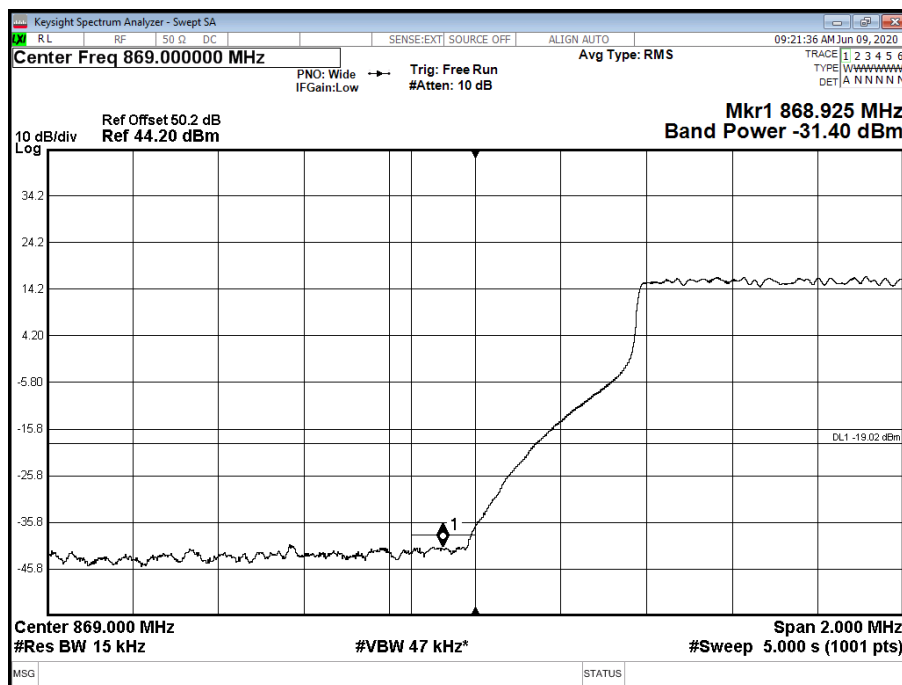
2.3.6 Test Results

Configuration 1

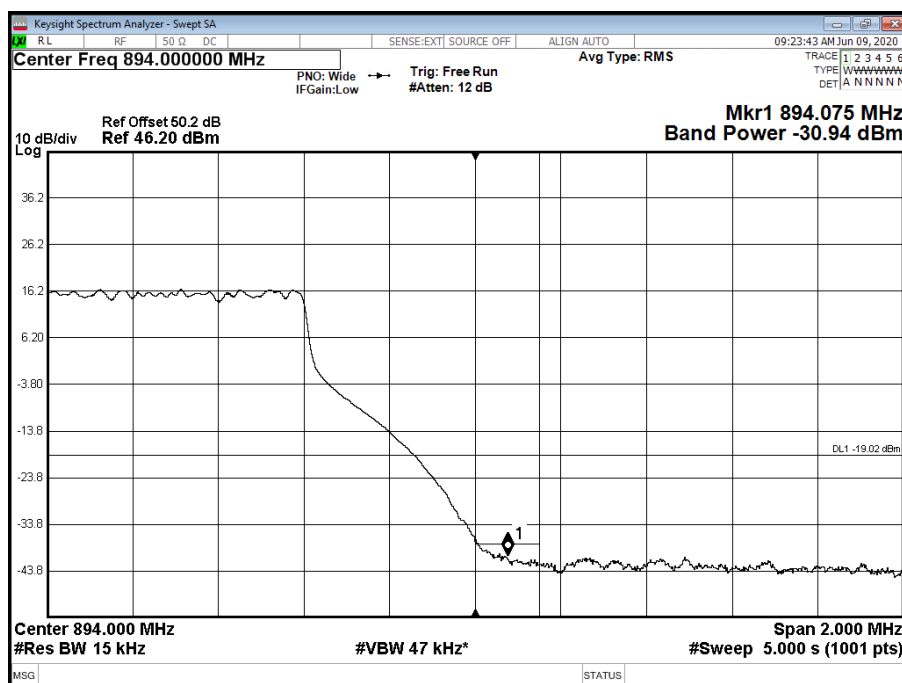
Maximum Output Power 46 dBm

Antenna	NR Modulation	NR Carrier Bandwidth	Band Edge (MHz)	
			Channel Position B	Channel Position T
A	QPSK	15.0 MHz 15 kHz SCS	876.5	886.5
A	QPSK	20.0 MHz 15 kHz SCS	879.0	884.0
A	QPSK	20.0 MHz 60 kHz SCS	879.0	884.0

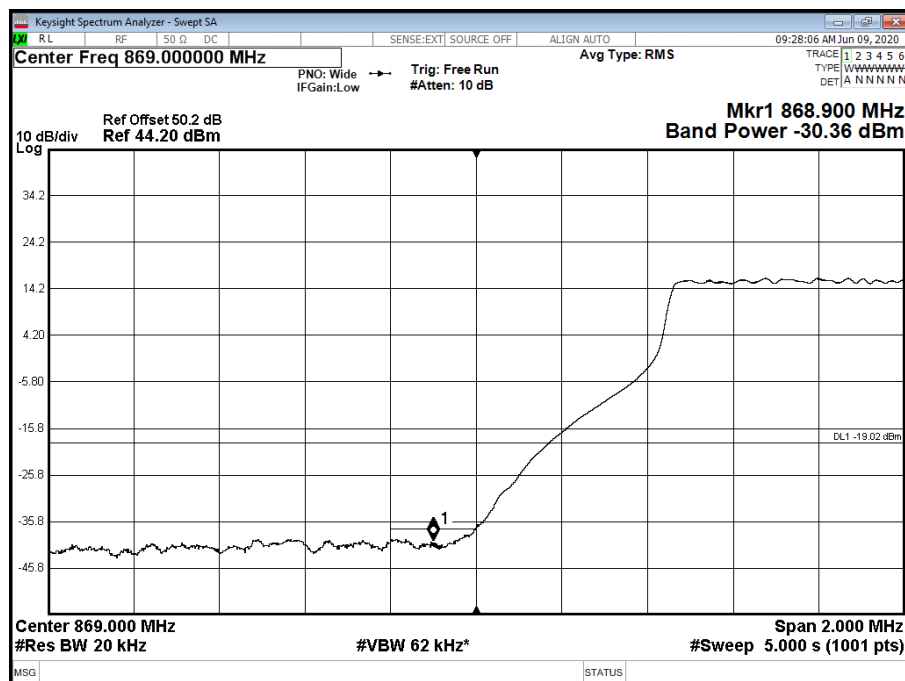
Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 15.0 MHz 15 kHz SCS - Channel Position B



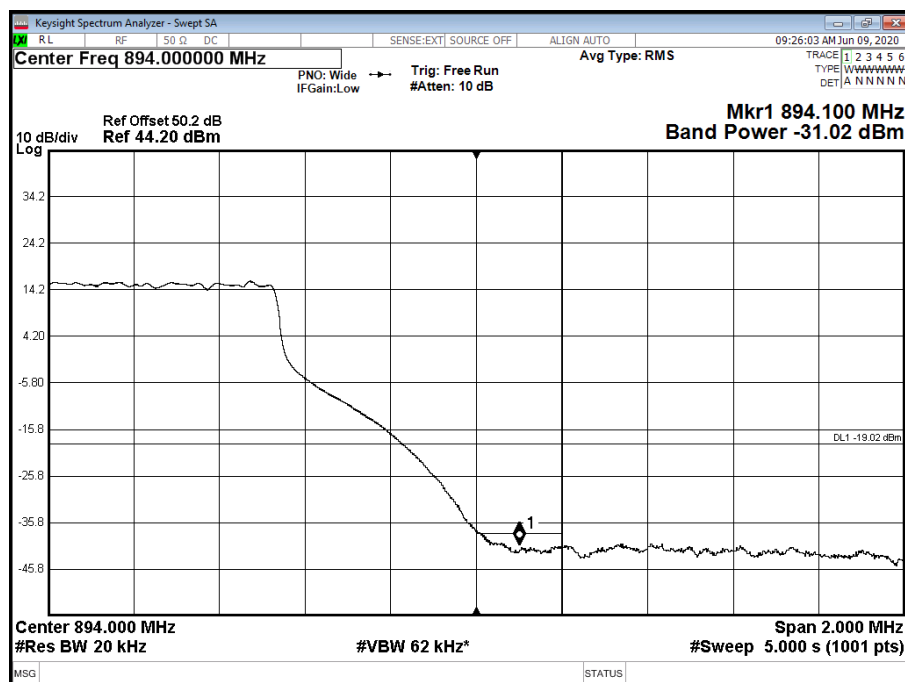
Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 15.0 MHz 15 kHz SCS - Channel Position T



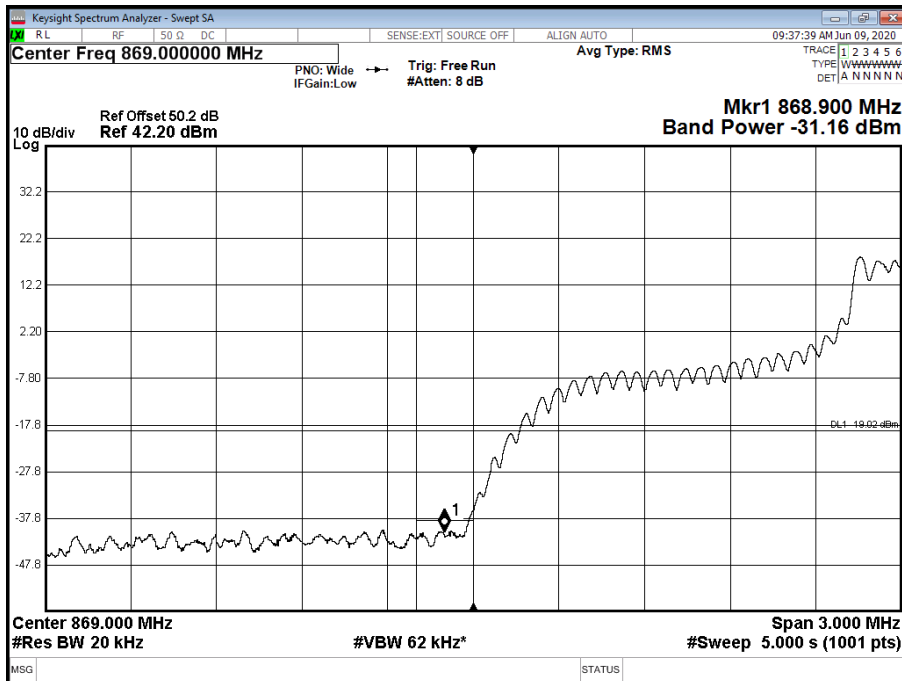
Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 15 kHz SCS - Channel Position B



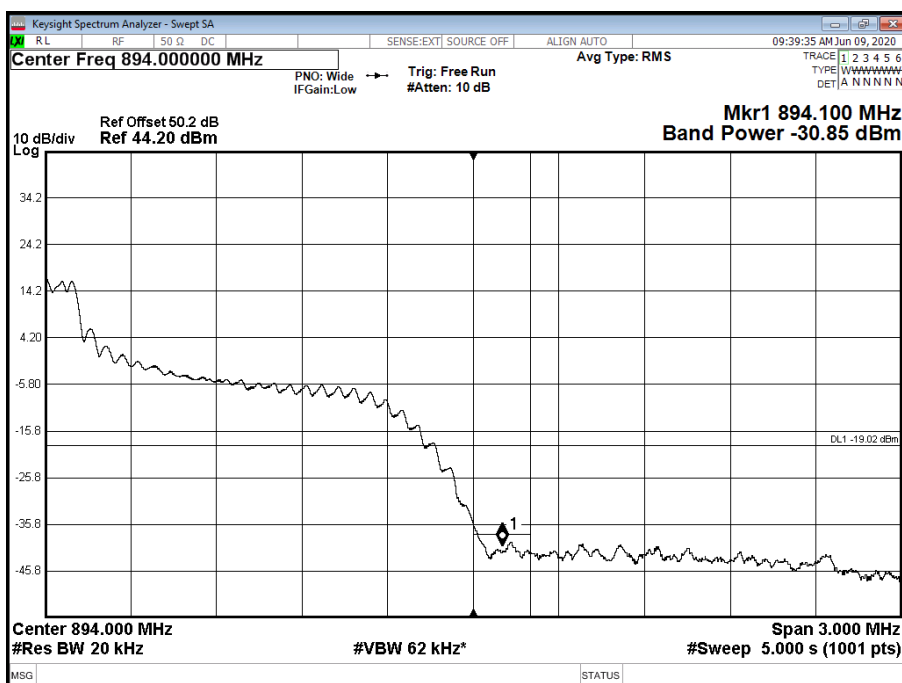
Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 15 kHz SCS - Channel Position T



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 60 kHz SCS - Channel Position B



Antenna A - NR Modulation QPSK - NR Carrier Bandwidth 20.0 MHz 60 kHz SCS - Channel Position T

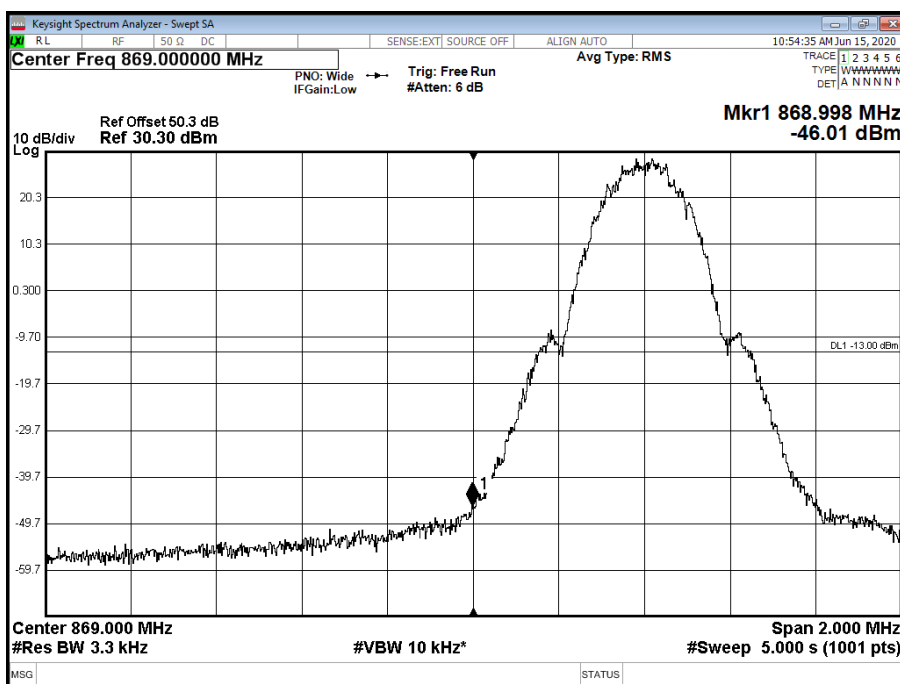


Configuration 3

Maximum Output Power 43 dBm

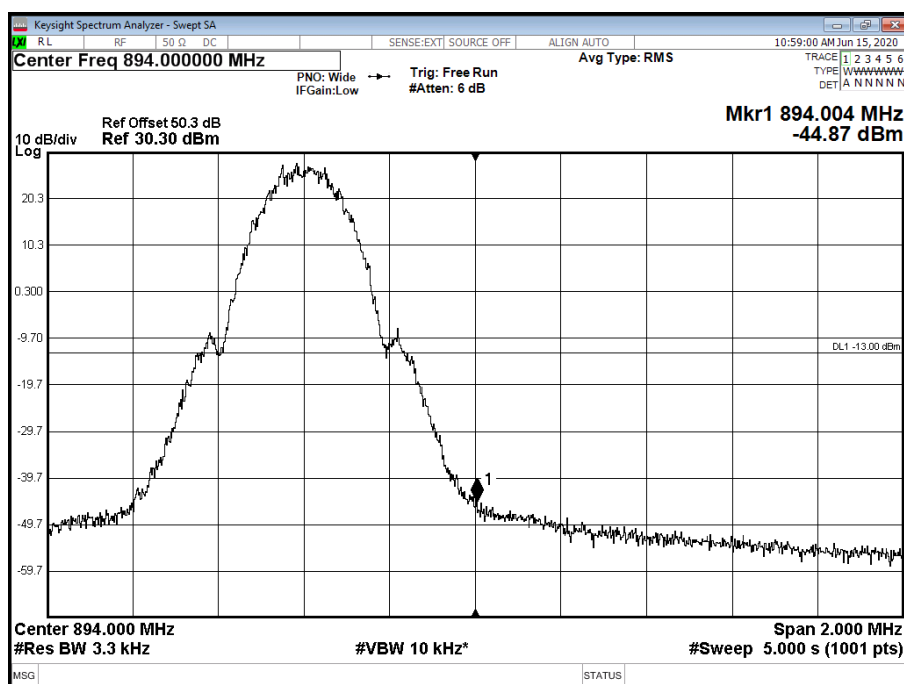
Antenna	GSM Modulation	GSM Carrier Bandwidth	Band Edge (MHz)	
			Channel Position B	Channel Position T
A	GMSK	0.2 MHz	869.4	893.6

Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position B





Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position T



Limit	-13 dBm
	-19 dBm (MIMO)



2.4 TRANSMITTER SPURIOUS EMISSIONS

2.4.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 22, Clause 22.917(b)
Industry Canada RSS-GEN, Clause 6.13
Industry Canada RSS-132, Clause 5.5

2.4.2 Date of Test and Modification State

15 June 2020 - Modification State 0

2.4.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.4 Environmental Conditions

Ambient Temperature	22.1°C
Relative Humidity	54.4%

2.4.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01.

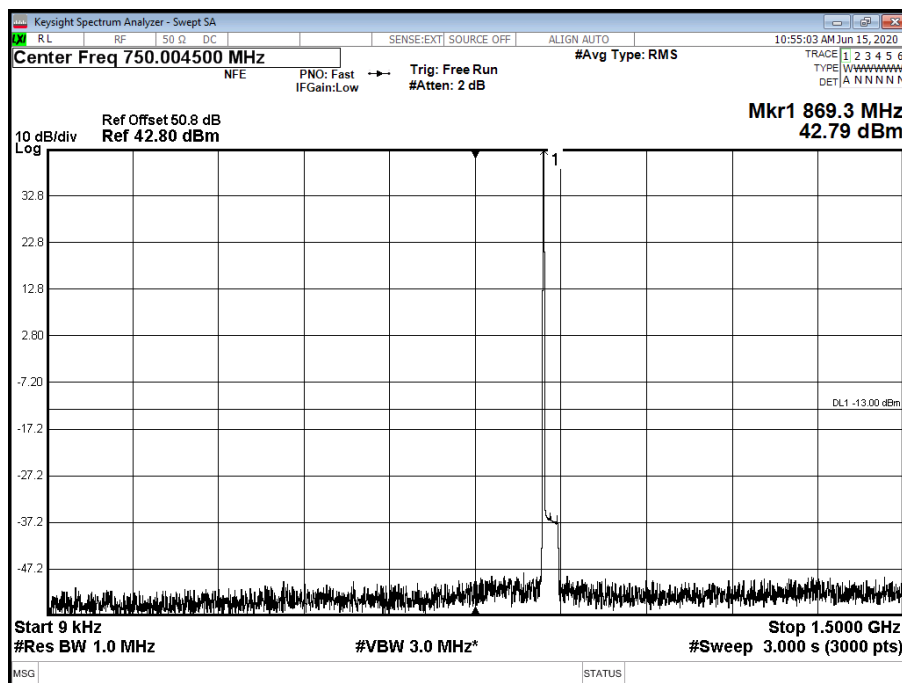
Each antenna port has been declared as being equivalent, therefore measurements were made on one antenna port only.

2.4.6 Test Results

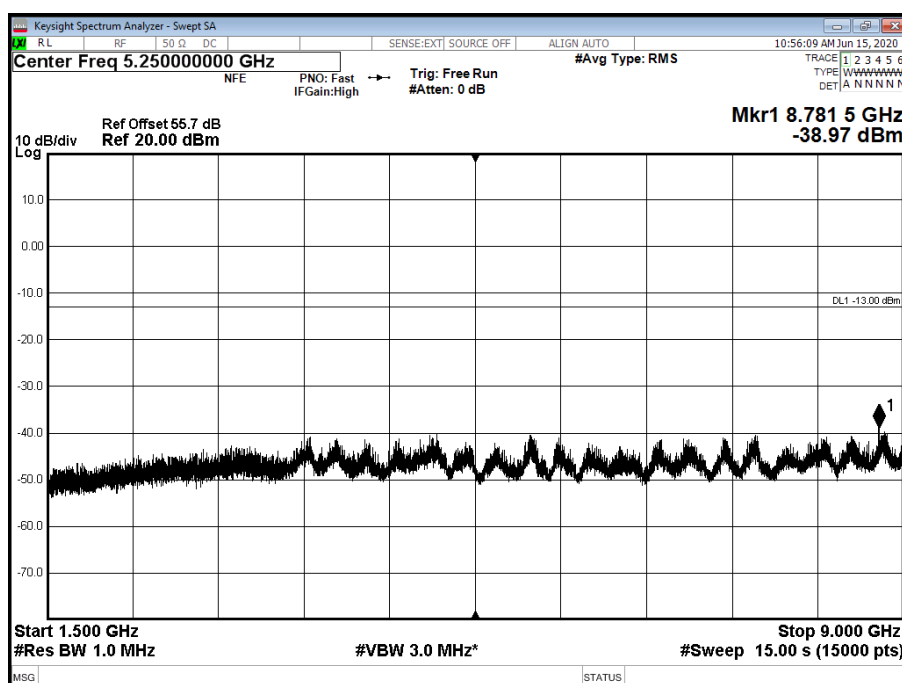
Configuration 3

Maximum Output Power 43 dBm

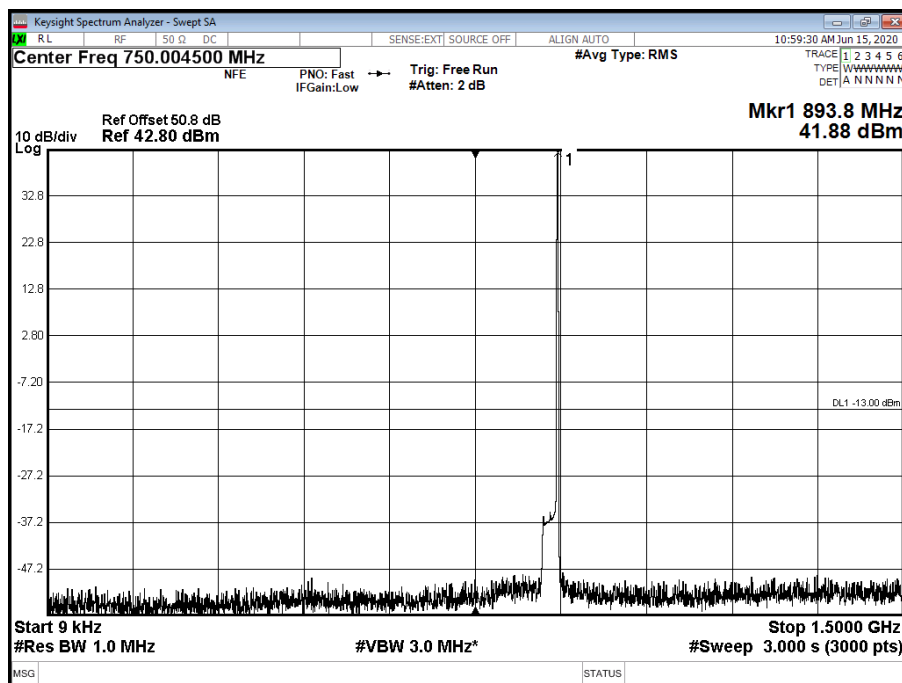
Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position B - Band 1 - Range 0.009 to 1500 MHz



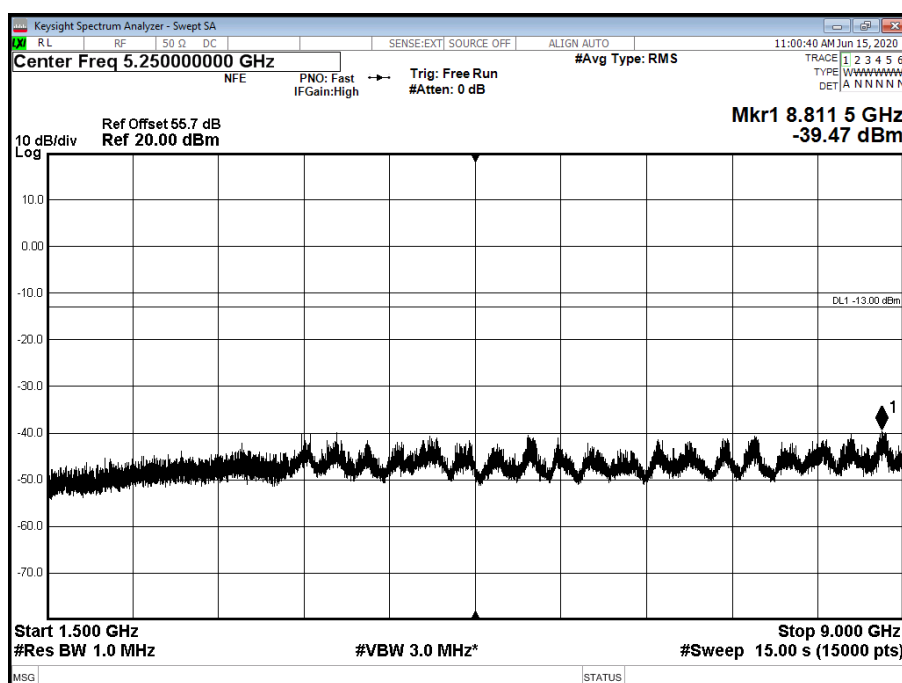
Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position B - Band 2 - Range 1500 to 9000 MHz



Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position T - Band 1 - Range 0.009 to 1500 MHz



Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position T - Band 2 - Range 1500 to 9000 MHz



Limit	-13dBm
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2.5 RADIATED EMISSIONS

2.5.1 Specification Reference

FCC CFR 47 Part 22, Clause 22.917(a)
Industry Canada RSS-GEN, Clause 6.13
Industry Canada RSS-132, Clause 5.5

2.5.2 Date of Test and Modification State

23 June 2020 - Modification State 0

2.5.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.4 Environmental Conditions

Ambient Temperature	20.9°C
Relative Humidity	55.9%

2.5.5 Test Method

The test was performed in accordance with ANSI C63.26 Clause 5.5. The EUT was configured as defined in ANSI C63.26, clause 5.5.2.3.1.

The EUT was setup at a height of 0.8 m above the reference ground plane for measurements below 1 GHz. Above 1 GHz, the EUT was placed at a height of 1.5 m.
A preliminary profile of the Spurious Radiated Emissions was obtained up to the 10th harmonic by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber.

Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Prescans and final measurements were performed using the direct field strength method. The final measurement detector used is Peak with a Max Hold trace.

The Regulatory limit of -13dBm / MHz has been converted to a field strength limit in accordance with ANSI C63.26 clause 5.2.7 equation c). This is the limit line shown on the plots. Testing was performed at a measurement distance of 3 m.

Example calculation

$E \text{ (dBuV/m)} = \text{EIRP (dBm)} - 20\log(d) + 104.8$ where (d) is the measurement distance.

$E \text{ (dBuV/m)} = -13 - 20\log(3) + 104.8$

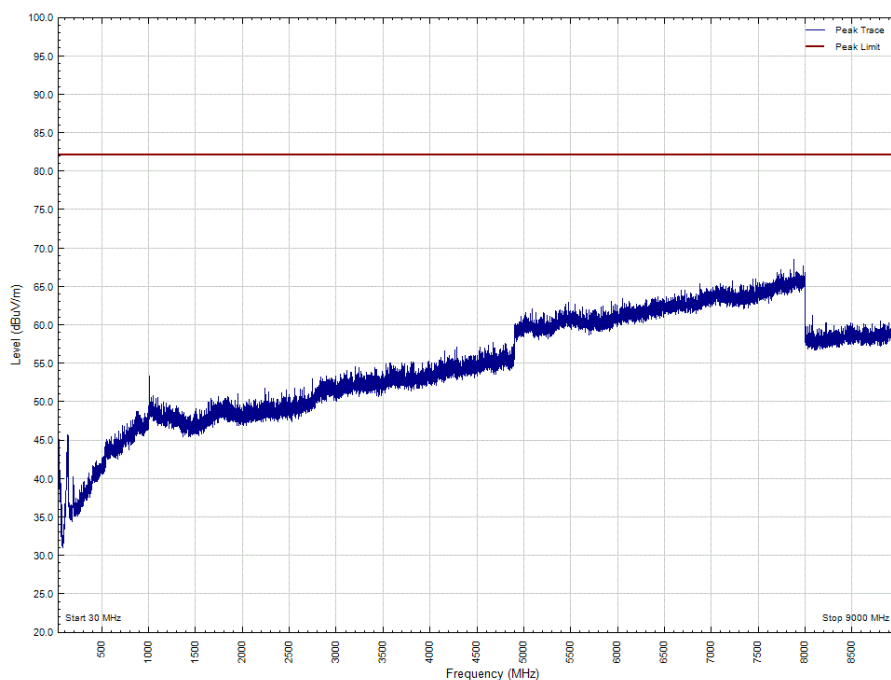
$E \text{ (dBuV/m)} = 82.26$

2.5.6 Test Results

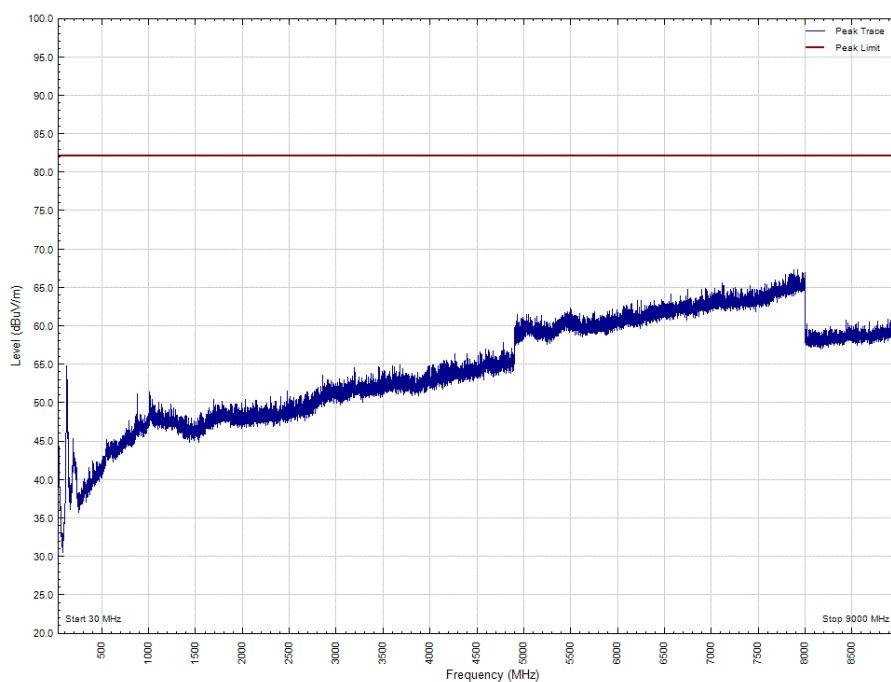
Configuration 3

Maximum Output Power 43 dBm

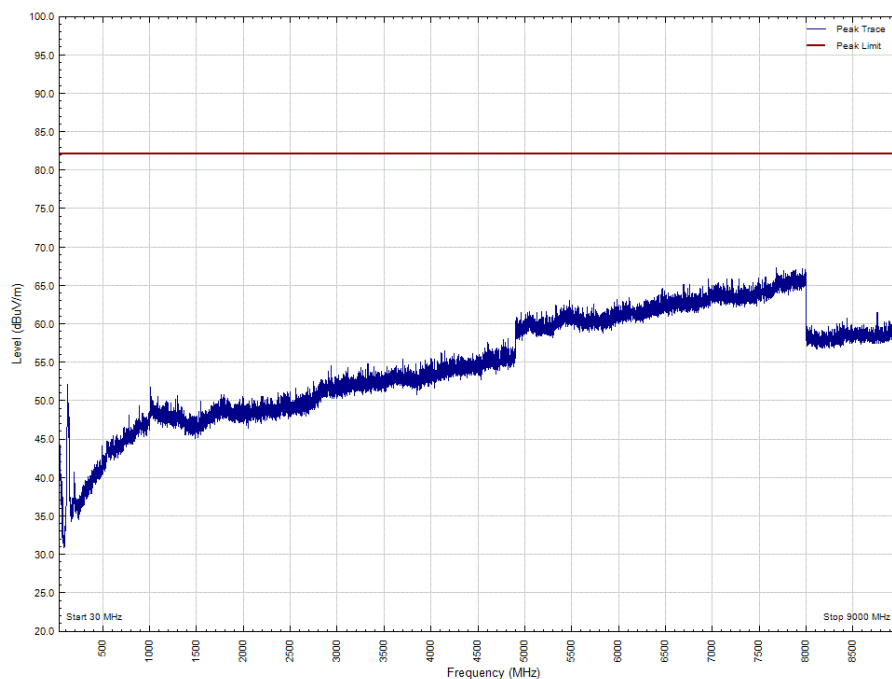
Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position B - Band 5 - Range 0.03 to 9000 MHz – Vertical polarisation



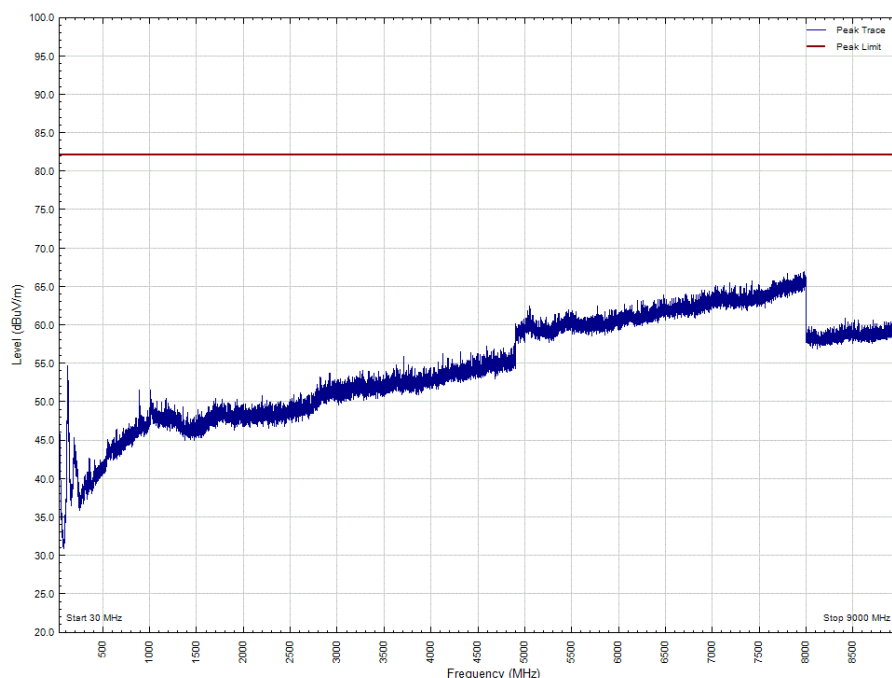
Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position B - Band 5 - Range 0.03 to 9000 MHz – Horizontal polarisation



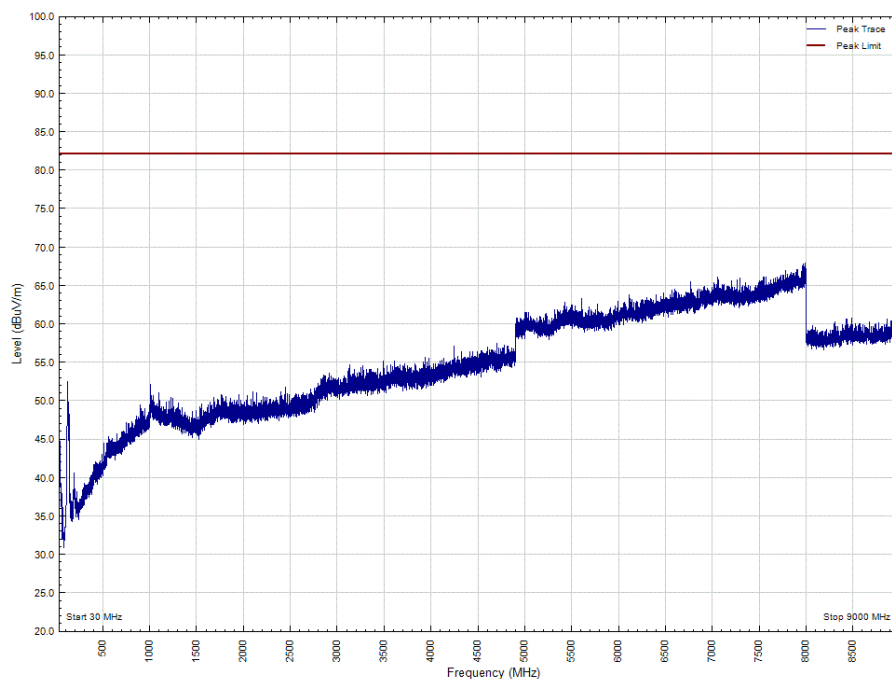
Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position M - Band 5 - Range 0.03 to 9000 MHz – Vertical polarisation



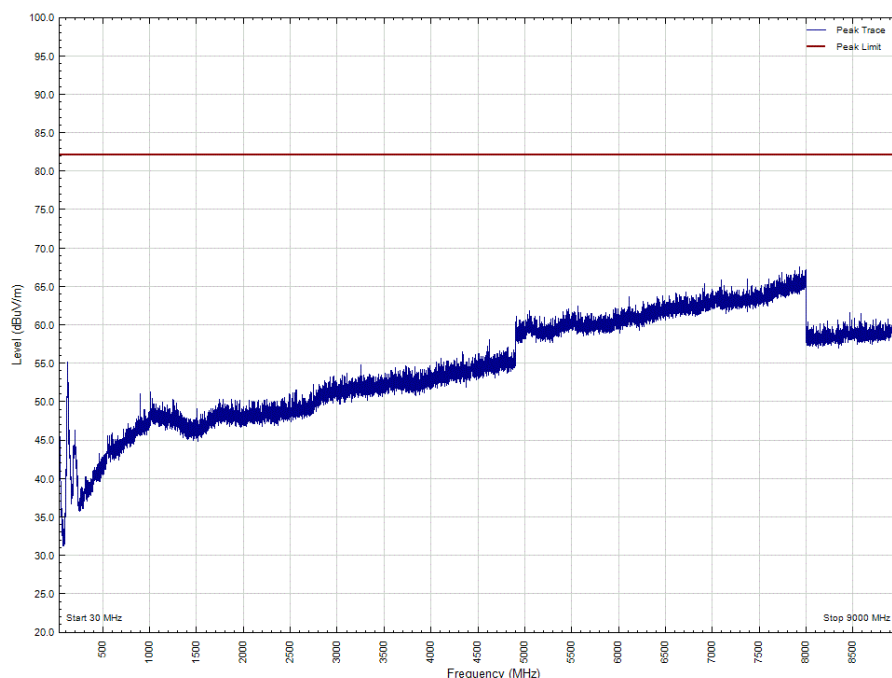
Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position M - Band 5 - Range 0.03 to 9000 MHz - Horizontal polarisation



Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position T - Band 5 - Range 0.03 to 9000 MHz – Vertical polarisation ui8



Antenna A - GSM Modulation GMSK - GSM Carrier Bandwidth 0.2 MHz - Channel Position T - Band 5 - Range 0.03 to 9000 MHz - Horizontal polarisation



Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ db.



SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Maximum Peak Output Power and Peak to Average Ratio - Conducted					
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5480	12	18-Mar-2021
Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P MON
Multimeter	Fluke	177	3813	12	09-Oct-2020
Attenuator 20dB 100W	Weinschel	48-20-43-LIM	5133	12	29-Nov-2020
Attenuator 30dB 100W	Weinschel	48-30-43-LIM	5135	-	O/P MON
PXA Signal Analyser	Keysight	N9030A	4654	12	21-Oct-2020
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	08-Nov-2020
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	08-Nov-2020
Analyser	Rohde & Schwarz	ZVA 40	3548	12	11-Dec-2020
Calibration Kit	Rohde & Schwarz	ZV-Z54	4368	12	28-Nov-2020
Occupied Bandwidth					
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5480	12	18-Mar-2021
Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P MON
Multimeter	Fluke	177	3813	12	09-Oct-2020
Attenuator 20dB 100W	Weinschel	48-20-43-LIM	5133	12	29-Nov-2020
Attenuator 30dB 100W	Weinschel	48-30-43-LIM	5135	-	O/P MON
PXA Signal Analyser	Keysight	N9030A	4654	12	21-Oct-2020
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	08-Nov-2020
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	08-Nov-2020
Analyser	Rohde & Schwarz	ZVA 40	3548	12	11-Dec-2020
Calibration Kit	Rohde & Schwarz	ZV-Z54	4368	12	28-Nov-2020
Band Edge					
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5480	12	18-Mar-2021
Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P MON
Multimeter	Fluke	177	3813	12	09-Oct-2020
Attenuator 20dB 100W	Weinschel	48-20-43-LIM	5133	12	29-Nov-2020
Attenuator 30dB 100W	Weinschel	48-30-43-LIM	5135	-	O/P MON
PXA Signal Analyser	Keysight	N9030A	4654	12	21-Oct-2020
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	08-Nov-2020
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	08-Nov-2020
Analyser	Rohde & Schwarz	ZVA 40	3548	12	11-Dec-2020
Calibration Kit	Rohde & Schwarz	ZV-Z54	4368	12	28-Nov-2020
Transmitter Spurious Emissions					
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5480	12	18-Mar-2021
Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P MON
Multimeter	Fluke	177	3813	12	09-Oct-2020
Attenuator 20dB 100W	Weinschel	48-20-43-LIM	5133	12	29-Nov-2020
Attenuator 30dB 100W	Weinschel	48-30-43-LIM	5135	-	O/P MON
PXA Signal Analyser	Keysight	N9030A	4654	12	21-Oct-2020



Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	08-Nov-2020
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	08-Nov-2020
Analyser	Rohde & Schwarz	ZVA 40	3548	12	11-Dec-2020
Calibration Kit	Rohde & Schwarz	ZV-Z54	4368	12	28-Nov-2020
HPF	Wainwright	WHKX12-1290-1500-18000-80SS	4961	12	23-Mar-2021
Radiated Emissions					
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM 101	2118	12	07-Feb-2021
Antenna with permanent attenuator (Bilog)	Chase	CBL6143	2904	24	30-Sep-2021
Mast Controller	Maturo GmbH	NCD	4810	-	TU
Tilt Antenna Mast	Maturo GmbH	TAM 4.0-P	4811	-	TU
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	10-Mar-2021
4dB Attenuator	Pasternack	PE7047-4	4935	24	30-Sep-2021
EmX Emissions Software	TUV SUD	EmX V.V1.5.10	5125	-	Software
Antenna (DRG Horn 7.5-18GHz)	Schwarzbeck	HWRD750	5348	12	04-Sep-2020
Thermo-Hygro-Barometer	PCE Instruments	OCE-THB-40	5470	12	16-Mar-2021
2m SMA Cable	Junkosha	MWX221-02000AMSAMS/A	5517	12	01-Apr-2021
8m N-Type Cable	Junkosha	MWX221-08000NMSNMS/B	5520	12	24-Mar-2021
EMI Test Receiver	Rohde & Schwarz	ESW44	5527	12	06-Feb-2021

N/A – Not Applicable

O/P Mon – Output Monitored with Calibrated Equipment



3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	Frequency / Parameter		MU
Conducted Maximum Peak Output Power	30 MHz to 20 GHz Amplitude		± 0.95 dB
Conducted Emissions	30 MHz to 20 GHz Amplitude		± 1.6 dB
Occupied Bandwidth	Up to 20 MHz Bandwidth	0.2 MHz Bandwidth	± 3.74 kHz
		15 MHz Bandwidth	± 353.784 kHz
		20 MHz Bandwidth	± 145.903 kHz
Band Edge	30 MHz to 20 GHz Amplitude		± 0.95 dB
Radiated Spurious Emissions	30 MHz to 1 GHz		± 5.2 dB
	1 GHz to 40GHz		± 6.3 dB

Measurement Uncertainty Decision Rule

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2007, clause 4.4.3 and 4.5.1.



SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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ANNEX A

MODULE LIST



Configuration 1, 2 & 3			
Product	Product No	R-State	Serial No
Radio 4478 B5	KRC 161 689/3	R2A	B440820312
Software Version:	CXP9013268/15	Revision:	R82CV
Software Version (GSM):	CXP9013268/15	Revision:	R82KA14