

TEST REPORT

Report Number: R16238088-E2d

Applicant: Samsung Electronics Co Ltd
129, Samsung-ro, Yeongtong-gu, Suwon-si,
Gyeonggi-do, 16677, Rep. of Korea

Model(s): SM-F976B

FCC ID: A3LSMF976B

EUT Description: GSM/WCDMA/LTE/NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax/be,
UWB, WPT and NFC

Test Standard(s): FCC 47 CFR PART 2, PART 22H, PART 24E, PART 27,
and PART 25
ISED RSS-GEN ISSUE 5 + A1 + A2, RSS132 ISSUE 4,
RSS-133 ISSUE 7, RSS-139 ISSUE 4

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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	2026-05-08	Initial Issue	Manish Baral

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Samsung Electronics Co Ltd
129, Samsung-ro, Yeongtong-gu, Suwon-si,
Gyeonggi-do, 16677, Rep. of Korea

EUT DESCRIPTION: GSM/WCDMA/LTE/NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax/be, UWB, WPT and
NFC

SERIAL NUMBERS: ZBK0266M, ZAQ0548M, ZAT0031M, ZBK0208M

SAMPLE RECEIVE DATE: 2026-03-09

DATE TESTED: 2026-03-09 – 2026-04-14

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC 47 CFR PART 2, PART 22H, PART 24E, PART 27, PART 25 ISED RSS-GEN ISSUE 5 + A1 + A2, RSS132 ISSUE 4, RSS-133 ISSUE 7, RSS- 139 ISSUE 4	Complies

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document.

Approved & Released
For UL LLC By:

Prepared By:



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2. SUMMARY OF TEST RESULTS

This report contains data provided by the customer which can impact the validity of results. UL LLC is only responsible for correctly integrating customer-provided data with measurements performed by UL LLC.

Requirement Description	Requirement Clause Number (FCC)	Requirement Clause Number (ISED)	Result	Remarks
Effective Radiated power	22.913 (a)(5)	RSS132§5.4	Complies	-
Equivalent Isotropic Radiated power	24.232 (c), 27.50 (d) (4)	RSS133§5.5 & SRSP-510, 5.1.2 RSS139§5.5	Complies	-
Occupied Bandwidth	2.1049	RSS132 RSS133§2.3 RSS139 RSS-GEN§6.7	Complies	-
Band Edge and Emission Mask	2.1051, 22.917 (a), 24.238 (a), 27.53 (h)	RSS132§5.5 RSS133§5.6 RSS139§5.6	Complies	-
Out of Band Emission	2.1051, 22.917 (a), 24.238 (a), 27.53 (h)	RSS132§5.5 RSS133§5.6 RSS139§5.6	Complies	-
Frequency Stability	2.1055, 22.355, 24.235, 27.54	RSS132§5.3 RSS133§5.4 RSS139§5.4	Complies	-
Peak-to-Average Ratio	22.913 (d), 24.232 (d), 27.50 (d) (5)	RSS132§5.4 RSS133§5.5 RSS139§5.5	Complies	-
Field Strength of Spurious Radiation	2.1053, 22.917 (a), 24.238 (a), 27.53 (h)	RSS132§5.5 RSS133§5.6 RSS139§5.6	Complies	-

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with the following.

FCC published lists of [measurement procedures](#) for compliance testing.

ISED published lists of [normative test standards and acceptable alternatives procedures](#).

- ANSI C63.26:2015
- ANSI/TIA-603-E (2016)
- FCC 47 CFR Part 2, Part 22H, Part 24E, Part 27, and Part 25.
- [FCC KDB 971168 D01](#): Power Meas License Digital Systems (ISED acceptable alternative procedure)
- [FCC KDB 971168 D02](#): Misc Rev Approv License Devices
- [FCC KDB 412172 D01](#): Determining ERP and EIRP
- [FCC KDB 273109 D02](#): Part 25 SCS and CMRS-Bands
- ISED RSS-Gen Issue 5 + A1 + A2, RSS-132 Issue 4, RSS-133 Issue 7, RSS-139 Issue 4

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, Certificate Number 0751.06, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
☒	Building 2800 Suite Perimeter Park Dr. Suite B Morrisville, NC 27560, USA	US0067	27265	825374

5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U _{Lab}
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.52 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.88 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.24 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.37 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.17 dB
Occupied Channel Bandwidth	±0.39 %
Temperature	±0.9 °C
Supply voltages	±0.45 %
Time	±0.02 %

Uncertainty figures are valid to a confidence level of 95%.

5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
 $36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$

6. EQUIPMENT UNDER TEST

6.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE/NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax/be, UWB, WPT and NFC.

The EUT supports the following 2G and 3G Bands and their antenna configurations:

GSM & WCDMA Bands	Config 0	Config 1
GSM850 & WCDMA5	ANT A+C	ANT E
GSM1900	ANT B	-
WCDMA2 & WCDMA4	ANT G	-

This report applies data referencing from FCC ID: A3LSMF976U. The test data to validate data referencing is included in Test Report R16238088-E29.

6.2. MAXIMUM OUTPUT POWER

EIRP/ERP TEST PROCEDURE

ANSI C63.26:2015
KDB 971168 D01 Section 5.2

$$\text{ERP/EIRP} = P_{\text{Meas}} + G_T - L_C$$

where: ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as P_{Meas} , typically dBW or dBm);

For devices utilizing multiple antennas, KDB 662911 provides guidance for determining the effective array transmit antenna gain term to be used in the above equation.

The EUT has different power levels for head use configuration and body use configuration. The tables below contain the highest of all configurations average conducted and peak EIRP/ERP output powers as follows:

GSM MODES

Part 22 / RSS 132						
Frequency range (MHz)	Modulation	FCC Limit (W)	ERP		99% BW (kHz)	Emission Designator
			(dBm)	(W)		
824.2-848.8	GPRS	7.0	27.77	0.598	242.84	243KGXW
	EGPRS	7.0	21.77	0.150	245.19	245KG7W
Part 24 / RSS 133						
Frequency range (MHz)	Modulation	Limit (W)	EIRP		99% BW (kHz)	Emission Designator
			(dBm)	(W)		
1850.2-1909.8	GPRS	2.0	27.19	0.524	243.82	244KGXW
	EGPRS		21.40	0.138	245.26	245KG7W

WCDMA MODE

Part 22 / RSS 132 Band 5							
Frequency range (MHz)	Modulation	FCC Limit (W)	ERP		99% BW (MHz)	99% BW (kHz)	Emission Designator
			(dBm)	(W)			
826.4-846.6	REL 99	7.0	20.81	0.121	4.142	4141.6	4M14F9W
Part 24 / RSS 133 Band 2							
Frequency range (MHz)	Modulation	Limit (W)	EIRP		99% BW (MHz)	99% BW (kHz)	Emission Designator
			(dBm)	(W)			
1852.4-1907.6	REL 99	2.0	21.65	0.146	4.161	4161.2	4M16F9W
Part 27 / RSS 139 Band 4							
Frequency range (MHz)	Modulation	Limit (W)	EIRP		99% BW (MHz)	99% BW (kHz)	Emission Designator
			(dBm)	(W)			
1712.4-1752.6	REL 99	1.0	20.94	0.124	4.143	4143.1	4M14F9W

6.3. WORST-CASE CONFIGURATION AND MODE

The worst-case scenario for all measurements is based upon an engineering evaluation made on conducted average power taken during pre-testing. The modulations with the highest output power were selected as worst-case. Conducted tests were performed on the worst-case antenna port per band. Full radiated Emissions Testing on each antenna was performed and reported.

The following is the worst-case antenna port, and modulation, as tested:

GSM & WCDMA Bands	Worst-Case Antenna Port	Worst-Case Modulation
GSM850 & WCDMA5	A+C	GPRS
GSM1900	B	GPRS
WCDMA2 & WCDMA4	G	Rel.99

The EUT was investigated in three orthogonal orientations X/Y/Z and with the EUT in an open / folded / closed state on both Low Band (Fundamental Below 1GHz) Mid Band (Fundamental between 1-3GHz) and High Band (Fundamental above 3GHz) over all antennas to find the worst-case orientation. For Simultaneous Tx scans in which there are two or more F_c ranges with different worst-case orientations, scans were performed in the orientation with the highest output power, and sufficient margin was added to cover other orientations. The following are the worst-case orientations:

GSM and WCDMA Bands	Config 0 Orientation	Config 1 Orientation
Low Band ($F_c < 1\text{GHz}$)	X, Open	X, Open
Mid Band ($1\text{GHz} < F_c < 3\text{GHz}$)	X, Open	-
High Band ($F_c > 3\text{GHz}$)	-	-

The EUT was tested while connected to AC Lines via charging cable and brick to represent worst case emissions.

Worst Case emissions from 9kHz-30Mhz, 30-1000MHz, 18-26.5GHz, and 26.5GHz-40GHz were done on the modes with the highest pre-tuned conducted average power per antenna. No emissions within 20dB were observed.

For Emission Limits in which the limit is expressed as $n \text{ dBm}/(1\% * B)$, B used was the Emission Bandwidth, instead of measured Occupied Bandwidth. Since EBW is greater than or equal to the OBW, more spectral energy was measured over the same measurement offset and is therefore worst-case.

6.4. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Power Adapter	Sony	XQZ-UC11-010-236-21	NA	NA

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB-C	1	USB-C	Shielded	<3m	Phone to power adapter

TEST SETUP

The EUT was connected to a base station simulator and set to transmit at max power for GSM/WCDMA testing

SETUP DIAGRAM

Please see R16238088-EP1d for Setup Diagrams and Setup Photos.

7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 4)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
8939	Passive Loop Antenna	EMCO	EM-6872	2024-11-18	2026-11-18
8940	Passive Loop Antenna	EMCO	EM-6871	2024-11-18	2026-11-18
	30-1000 MHz				
90628	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2026-02-09	2028-02-09
	1-18 GHz				
206211	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2024-04-09	2026-04-09
	18-40 GHz				
204704	Horn Antenna, 18-26.5GHz	Com Power	AH-826	2025-07-15	2027-07-15
204705	Horn Antenna, 26-40GHz	Com Power	AH-640	2025-11-19	2027-11-19
	Gain-Loss Chains				
207638	Gain-loss string: 0.009-30MHz	Various	Various	2025-06-13	2026-06-13
207639	Gain-loss string: 25-1000MHz	Various	Various	2025-06-13	2026-06-13
207640	Gain-loss string: 1-18GHz	Various	Various	2025-06-13	2026-06-13
225795	Gain-loss string: 18-40GHz	Various	Various	2025-06-13	2026-06-13
	Receiver & Software				
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2025-04-21	2026-04-21
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
241204	Environmental Meter	Fisher Scientific	15-077-963	2025-08-05	2027-08-05
213025	Wideband Radio Communications Tester	Rohde and Schwarz	CMW500	2025-01-14	2026-01-14
208720	Wideband Radio Communications Tester	Rohde and Schwarz	CMW500	N/A	N/A
21725	Radio Communications Tester	Rohde and Schwarz	CMX500	2025-11-25	2026-11-25
212167	Wideband Radio Communications Tester	Anritsu	MT8821C	N/A	N/A
198917*	1GHz high-pass filter, 2W, F _{high} = 18GHz	Micro-Tronics	HPM18129-02	2025-03-13	2026-03-31
169108 (BRF010)*	1.85-1.97GHz notch filter, 2W, F _{high} = 9GHz	Micro-Tronics	BRM50714-01	2025-03-13	2026-03-31
169106 (BRF008)*	1710-1785MHz notch filter, 2W, F _{high} = 9GHz	Micro-Tronics	BRM50713-01	2025-03-13	2026-03-31

NOTES:

1. * Testing is completed before equipment expiration date.
2. **Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 2)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	1-18 GHz				
86408	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2025-07-15	2027-07-15
	Gain-Loss Chains				
91977	Gain-loss string: 1-18GHz	Various	Various	2025-05-31	2026-05-31
	Receiver & Software				
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2025-07-29	2026-07-29
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
239540	Environmental Meter	Fisher Scientific	15-077-963	2025-08-05	2027-08-05
213025	Wideband Radio Communications Tester	Rohde and Schwarz	CMW500	N/A	N/A
198917	1GHz high-pass filter, 2W, Fhigh =18GHz	Micro-Tronics	HPM18129-02	2025-03-13	2026-03-13
169106 (BRF008)*	1710-1785MHz notch filter, 2W, Fhigh = 9GHz	Micro-Tronics	BRM50713-01	2025-03-13	2026-03-31
169108 (BRF010)*	1.85-1.97GHz notch filter, 2W, Fhigh = 9GHz	Micro-Tronics	BRM50714-01	2025-03-13	2026-03-31

NOTES:

1. * Testing is completed before equipment expiration date.
2. **Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 1)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	1-18 GHz				
88761	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2025-11-19	2027-11-19
	Gain-Loss Chains				
91979	Gain-loss string: 1-18GHz	Various	Various	2025-05-31	2026-05-31
	Receiver & Software				
206496	Spectrum Analyzer	Rohde & Schwarz	ESW44	2025-07-29	2026-07-29
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
241205	Environmental Meter	Fisher Scientific	15-077-963	2025-08-05	2027-08-05

NOTES:

1. * Testing is completed before equipment expiration date.
2. **Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

Wireless Conducted Measurement Equipment.

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Additional Equipment used				
90411	Spectrum Analyzer MY54490314	Keysight Technologies	N9030A	2026-03-03	2027-03-03
90416	Spectrum Analyzer MY54490254	Keysight Technologies	N9030A	2025-07-31	2026-07-31
212967	Wideband Radio Communications Tester 170733	Rohde and Schwarz	CMW500	2026-02-13	2027-02-13
212166	Wideband Radio Communications Tester	Anritsu	MT8000A	2026-02-23	2027-02-23
262469	Humidity and Temperature Probe	Control Company	15-077-963	2025-04-28	2026-04-28

Test Equipment Used - Wireless Conducted Attenuators, Cables, and Couplers

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
Attenuators					
226569	2.92mm Coaxial 10dB Attenuator 40GHz	Fairview Microwave	SA4014-10	2025-09-02	2026-09-02
226554*	20dB Attenuator	CentricRF	C18S2-20	2025-03-19	2026-03-31
226552*	20dB Attenuator	CentricRF	C18S2-20	2025-03-19	2026-03-31
Cables					
246257	SMA Cable	Huber + Suhner	104PEA	2025-09-05	2026-09-05
Couplers					
238018 (CPL003-SAR)	Ultra-Wideband Directional Coupler 0.5-18GHz	Mini-Circuits	ZUDC10-183+	2025-04-48	2026-04-28

NOTES:

1. * Testing is completed before equipment expiration date.
2. **Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

8. CONDUCTED TEST RESULTS

8.1. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049

IC: RSS132; RSS133§2.3; RSS139

LIMITS

For reporting purposes only.

TEST PROCEDURE

ANSI C63.26:2015: Section 5.4

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The 99% and -26dB bandwidths were measured with the spectrum analyzer at the middle channel in each band.

RESULTS

There is no limit required and power is the same for low, middle and high channel; therefore, only middle channel was tested.

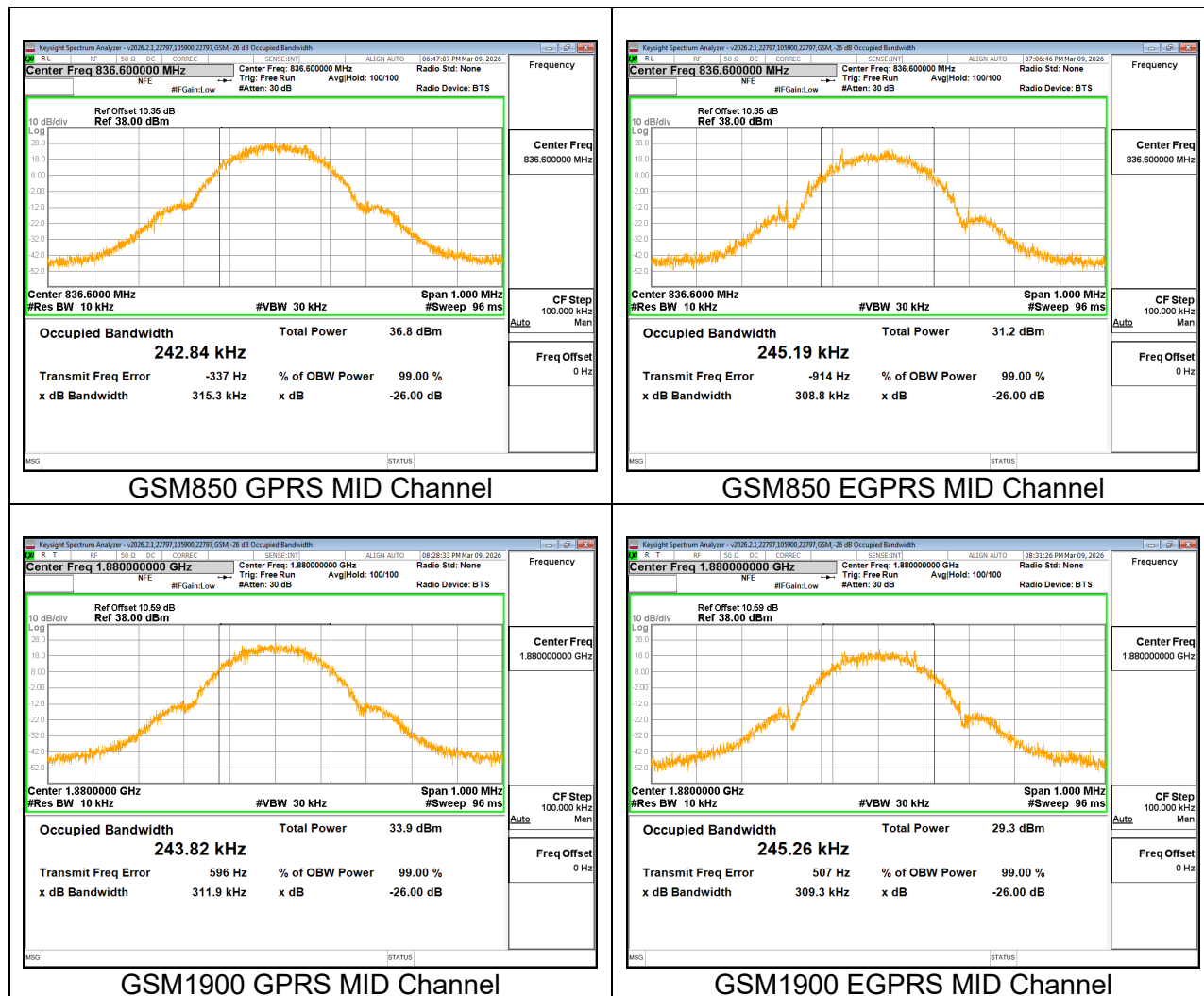
GSM

Band	Modulation	Channel	f(MHz)	99% BW (KHz)	-26dB BW (KHz)
GSM850	GPRS	190	836.6	242.84	315.3
	EGPRS			245.19	308.8
GSM1900	GPRS	661	1880.0	243.82	311.9
	EGPRS			245.26	309.3

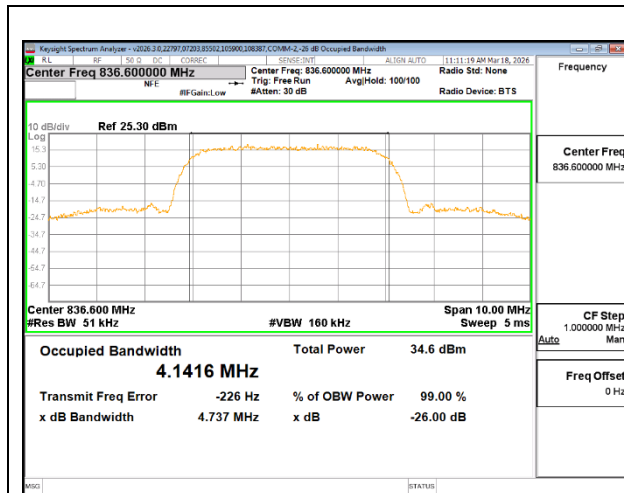
WCDMA

Band	Modulation	Channel	f(MHz)	99% BW (MHz)	-26dB BW (MHz)
BAND5	REL 99	4408	836.6	4.1416	4.737
	HSDPA			4.1358	4.712
BAND2	REL 99	9800	1880.0	4.1612	4.708
	HSDPA			4.1499	4.693
BAND4	REL 99	1638	1732.6	4.1431	4.690
	HSDPA			4.1490	4.677

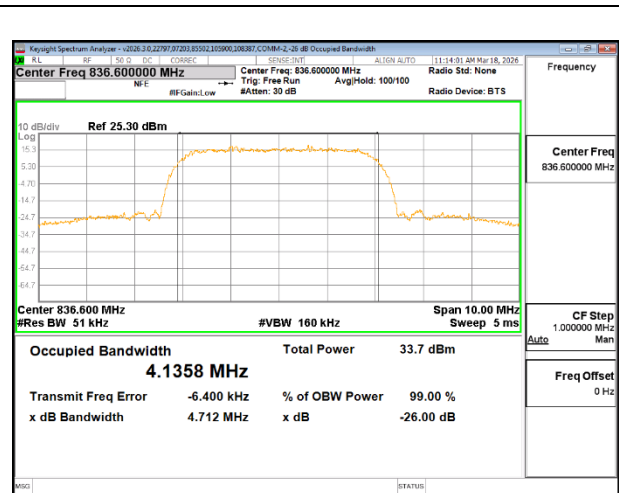
8.1.1. GSM



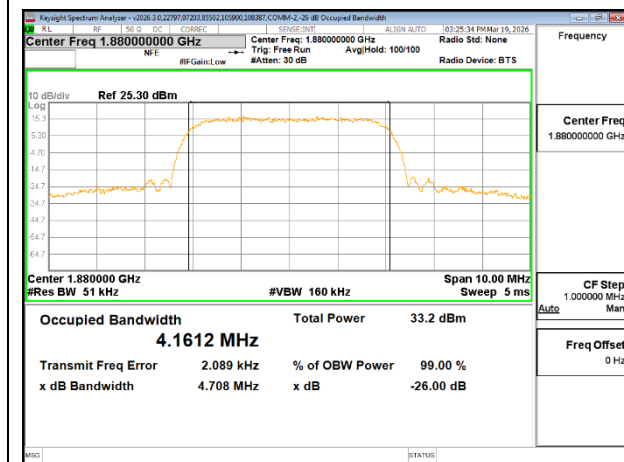
8.1.2. WCDMA



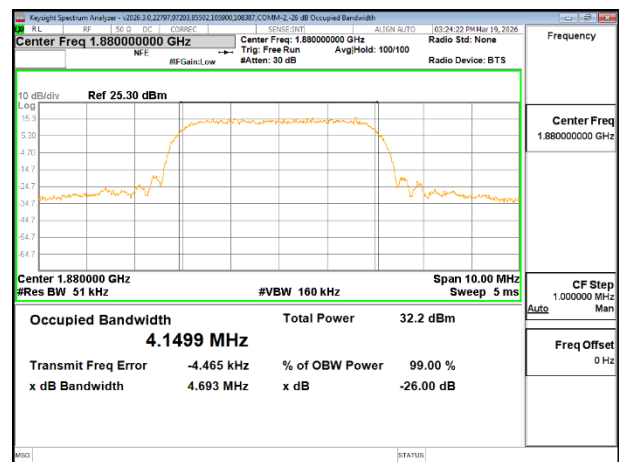
BAND 5 Rel 99 MID Channel



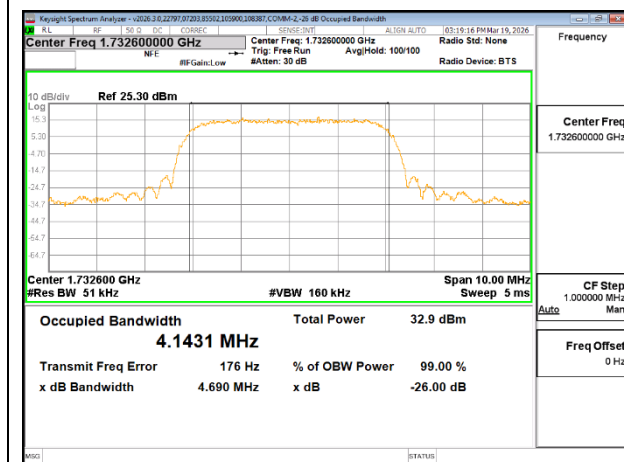
BAND 5 HSDPA MID Channel



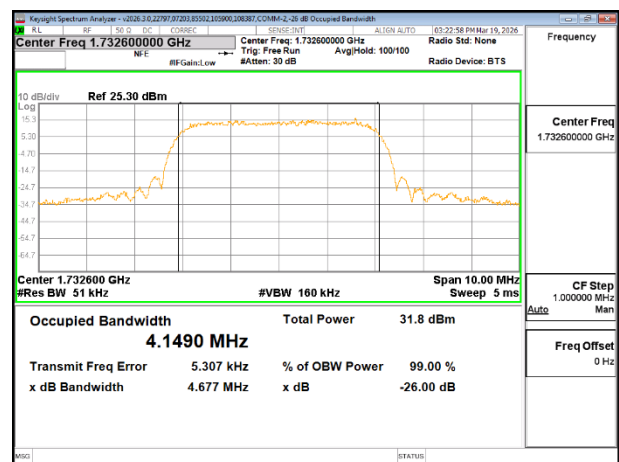
BAND 2 Rel 99 MID Channel



BAND 2 HSDPA MID Channel



BAND 4 Rel 99 MID Channel



BAND 4 HSDPA MID Channel

8.2. BAND EDGE AND EMISSION MASK

LIMITS

FCC: §22.917, §24.238, §27.53(h)

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.

RSS132§5.5

Mobile and base station equipment shall comply with the limits specified below.

- (i) In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated below the transmitter output power P (dBW) by at least $43 + 10 \log(p)$ dB.
- (ii) After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated below the transmitter output power P (dBW) by at least $43 + 10 \log(p)$ dB. If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

p is the output power specified in watts.

RSS133§5.6

For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors), where applicable, of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in the table 3.

Table 3: Unwanted emission limits for all equipment	
Offset frequency from the edge of the frequency block group (MHz)	Unwanted emission limit
≤ 1	-13 dBm/(1% of OBW*)
> 1	-13 dBm/MHz

Note: EBW used over OBW as worst-case.

RSS139§5.6

Unwanted emissions shall be measured in terms of average values

For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors) of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in table 4.

Table6: Unwanted emission limits	
Offset from the edge of the frequency block or frequency block group	Unwanted emission limits
≤ 1 MHz	-13 dBm/(1% of OB*)
> 1 MHz	-13 dBm/MHz

*OB in the frequency block or frequency block group. Note: EBW used over OB as worst-case.

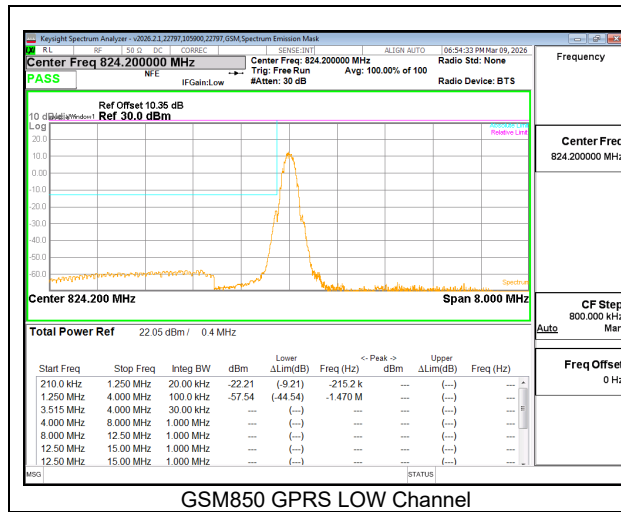
TEST PROCEDURE

The transmitter output was connected to a R&S CMW500 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

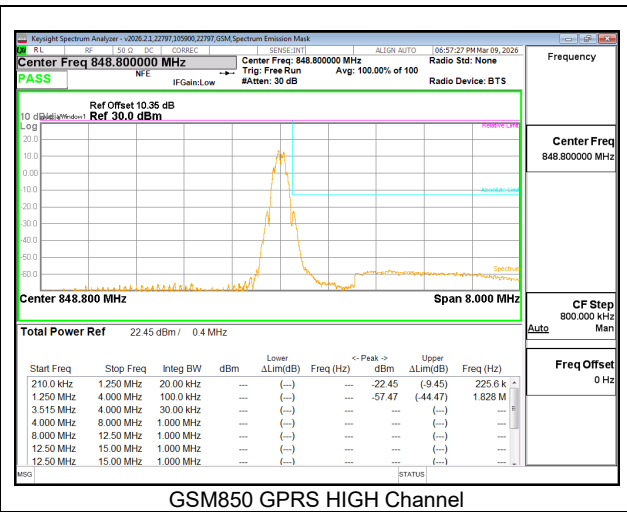
For each band edge measurement:

- Set the spectrum analyzer span to include the block edge frequency.
- Set a marker to point the corresponding band edge frequency in each test case.
- Set display line at -13 dBm
- Set resolution bandwidth to at least 1% of emission bandwidth.

8.2.1. GSM GSM850

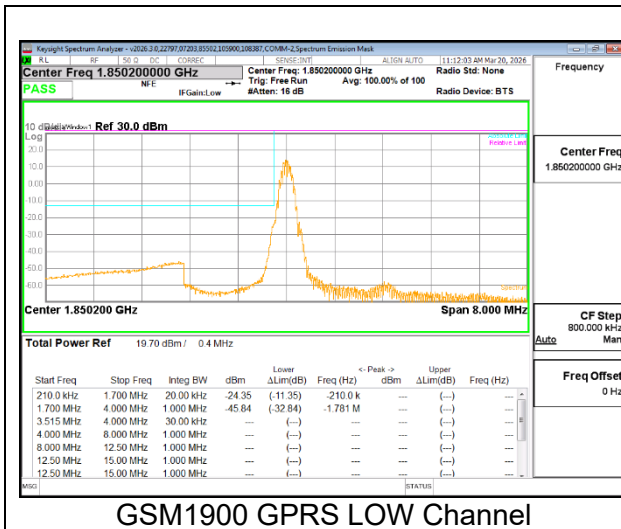


GSM850 GPRS LOW Channel

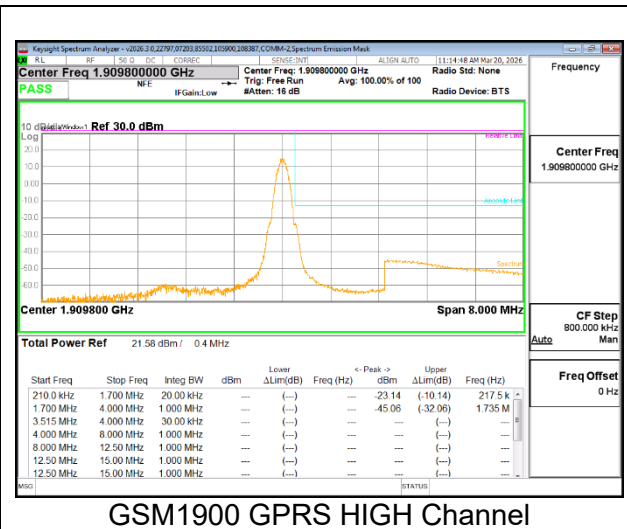


GSM850 GPRS HIGH Channel

8.2.2. GSM GSM1900

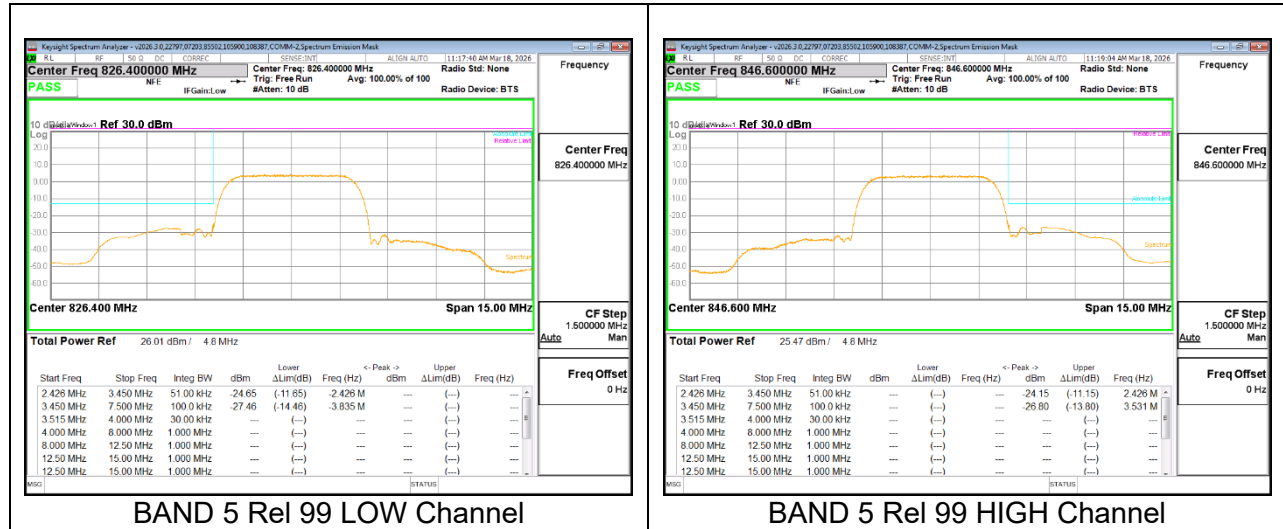


GSM1900 GPRS LOW Channel

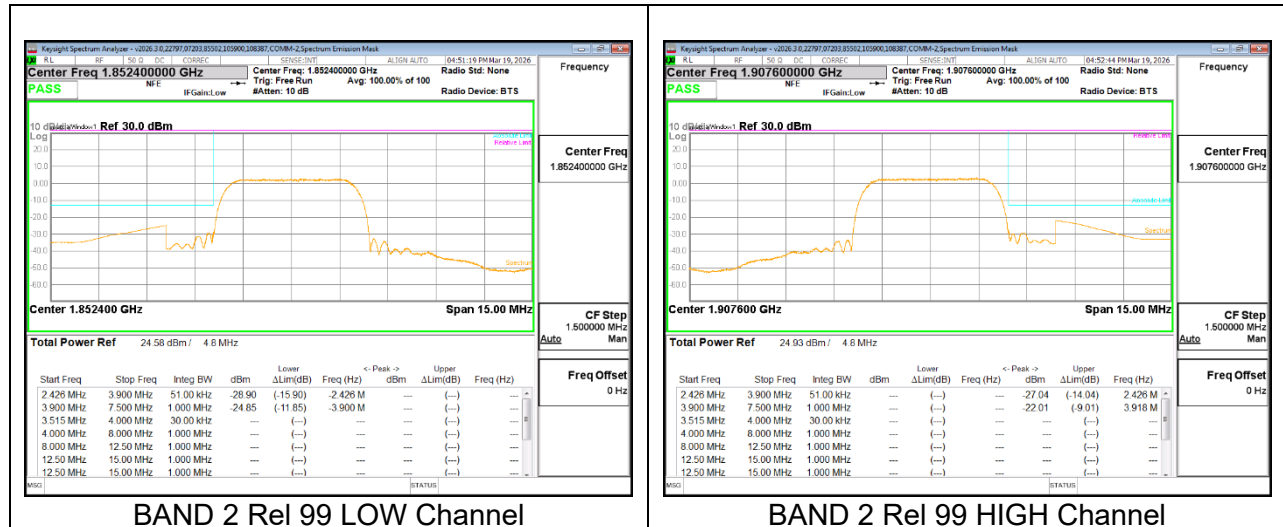


GSM1900 GPRS HIGH Channel

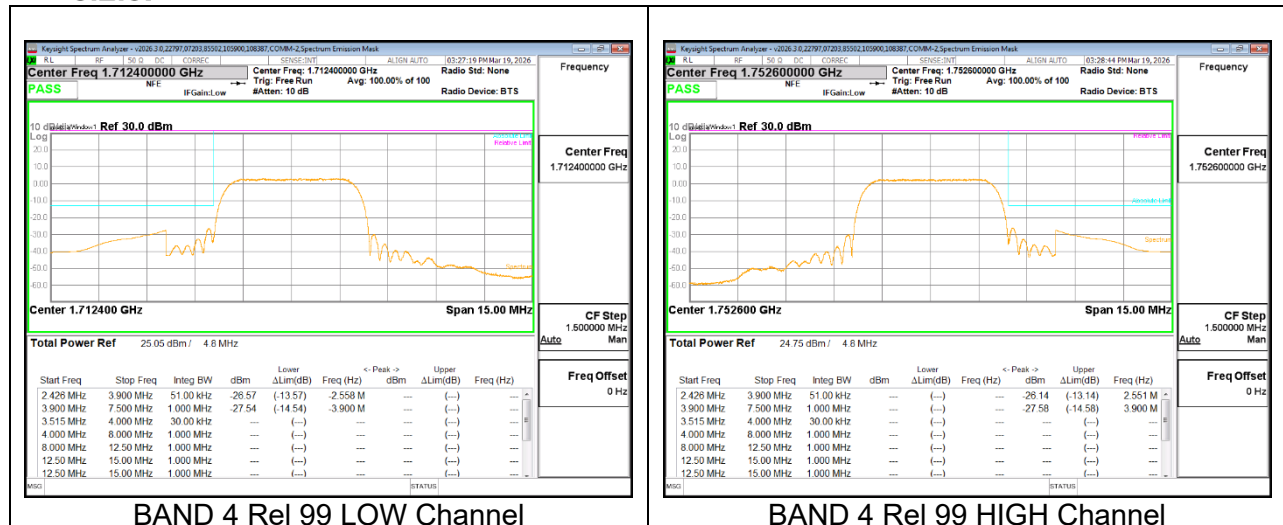
8.2.3. WCDMA BAND 5



8.2.4. WCDMA BAND 2



8.2.5. WCDMA BAND 4



8.3. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.917, §24.238, and §27.53

ISED: RSS132§5.5; RSS133§6.5 and RSS139§5.6

LIMITS

FCC: §22.917, §24.238, §27.53 (h).

The minimum permissible attenuation level of any spurious emissions is $43 + 10 \log (P)$ dB where transmitting power (P) in Watts.

RSS132§5.5, RSS133§6.5.1, RSS139§5.6

The minimum permissible attenuation level of any spurious emissions is $43 + 10 \log (P)$ dB where transmitting power (P) in Watts.

TEST PROCEDURE

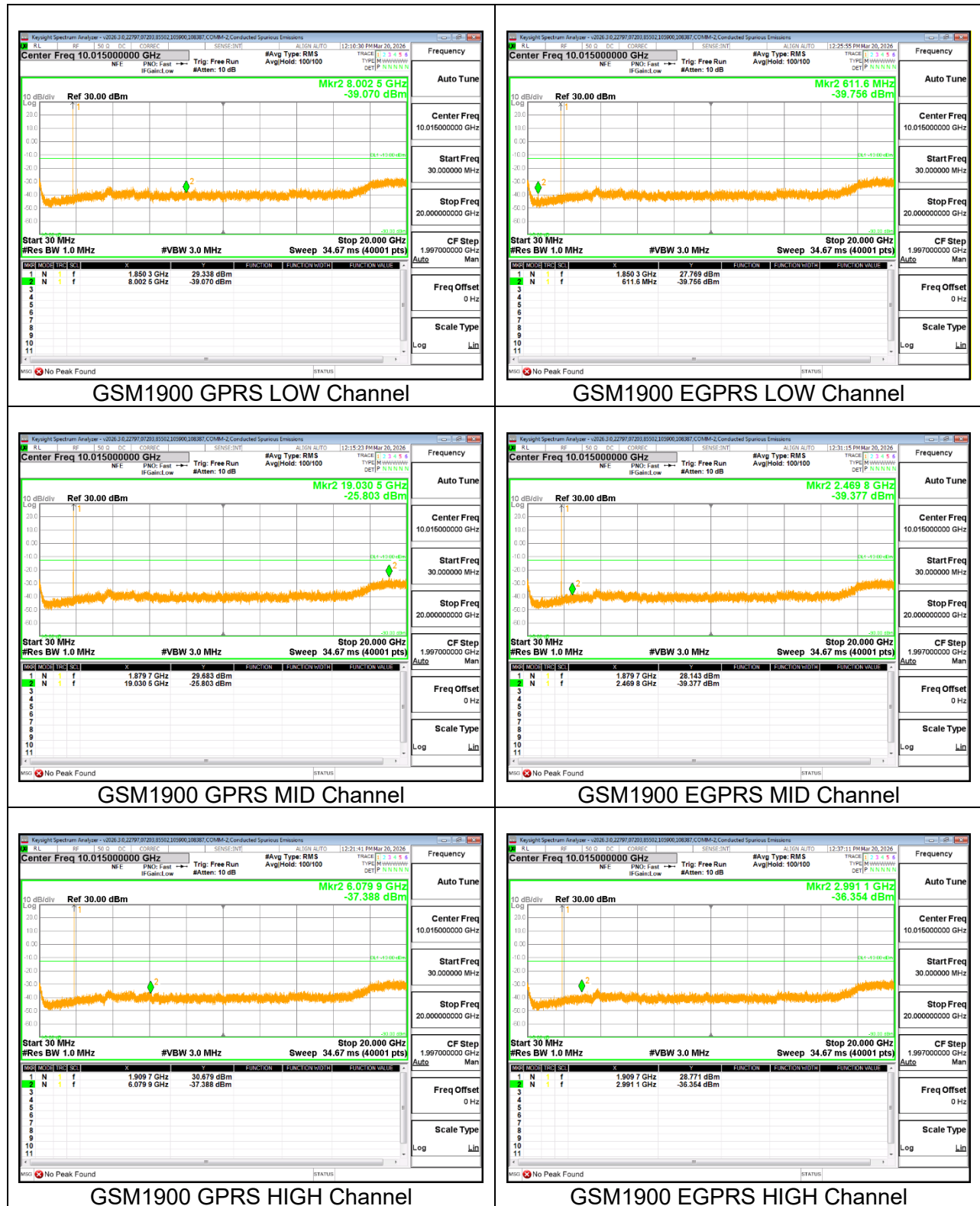
The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

For each out of band emissions measurement:

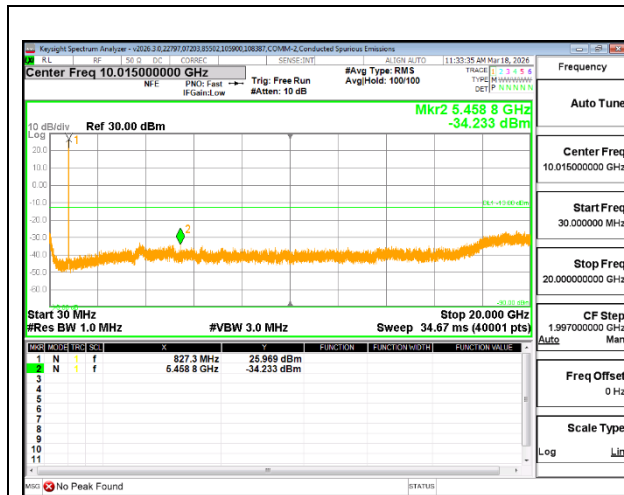
- Set display line at -13 dBm
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz. (NOTE: Worst case set RBW/VBW to 1MHz/3MHz)

RESULTS

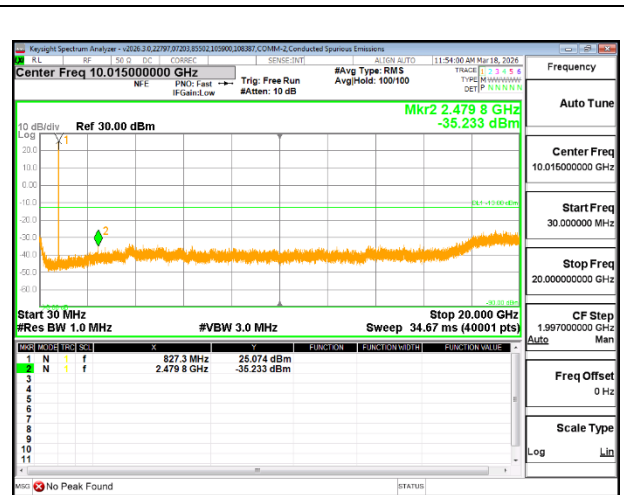
8.3.2. GSM GSM1900



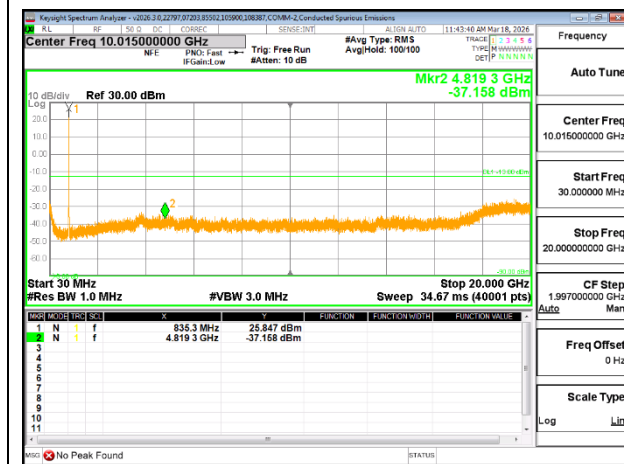
8.3.3. WCDMA BAND 5



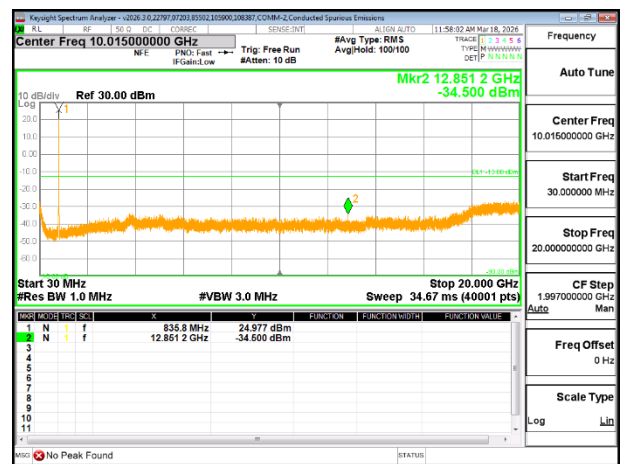
BAND 5 Rel 99 LOW Channel



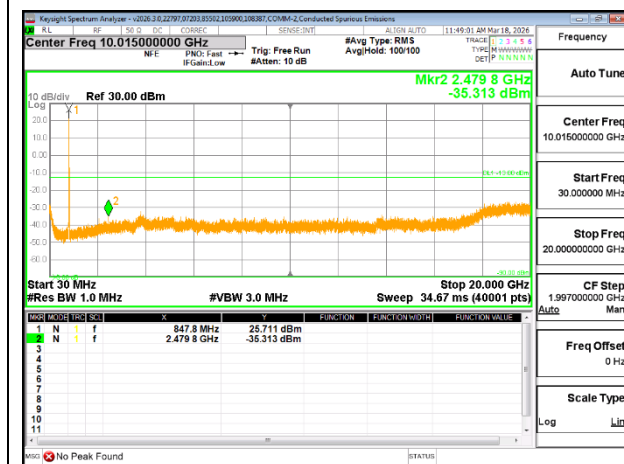
BAND 5 HSDPA LOW Channel



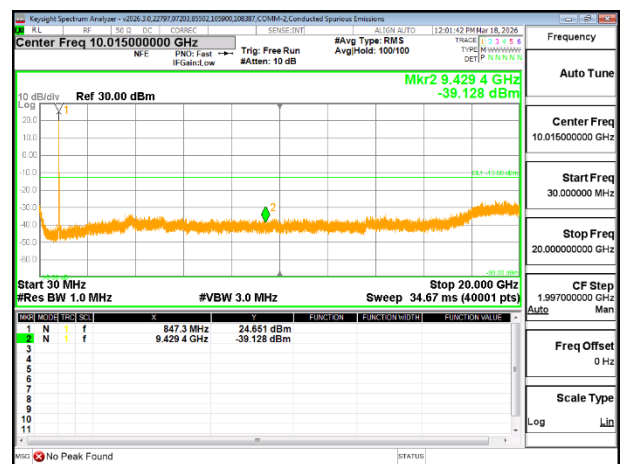
BAND 5 Rel 99 MID Channel



BAND 5 HSDPA MID Channel

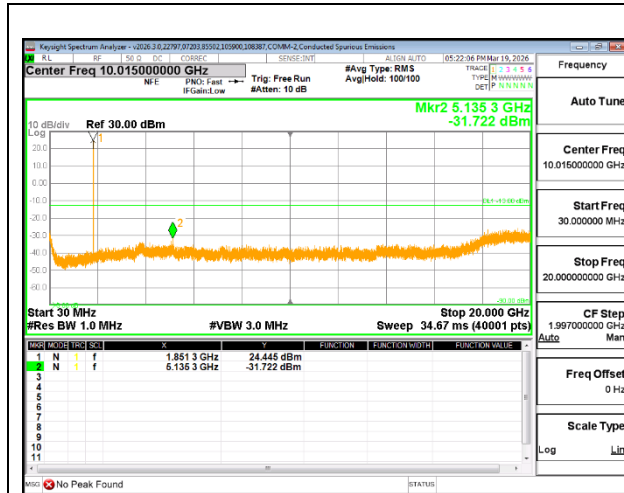


BAND 5 Rel 99 HIGH Channel

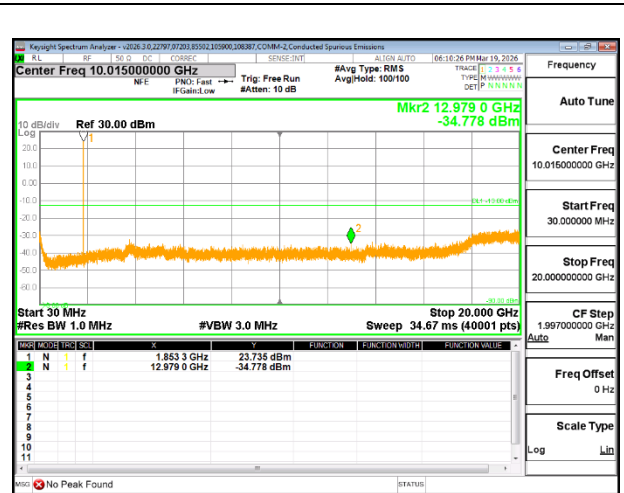


BAND 5 HSDPA HIGH Channel

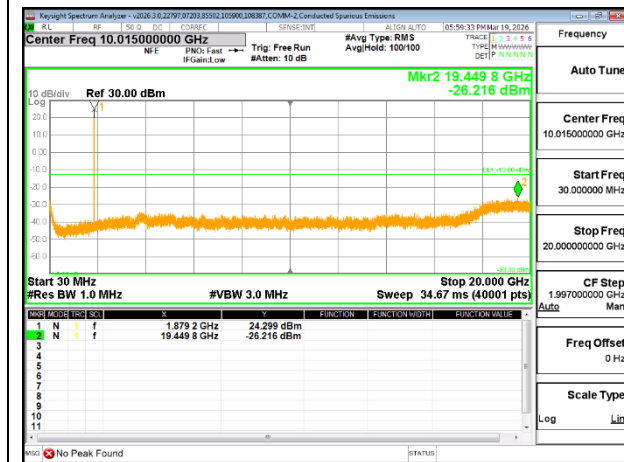
8.3.4. WCDMA BAND 2



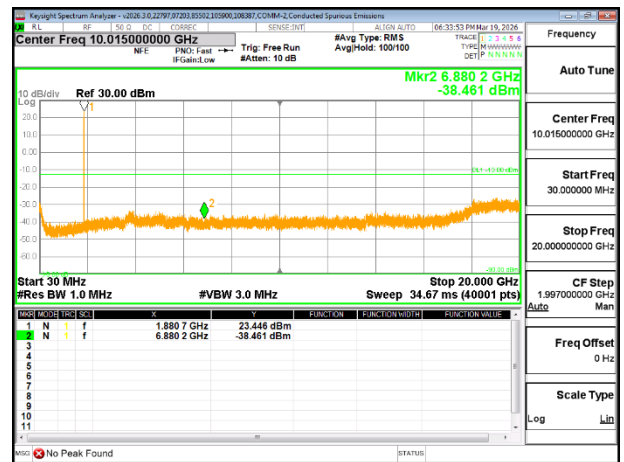
BAND 2 Rel 99 LOW Channel



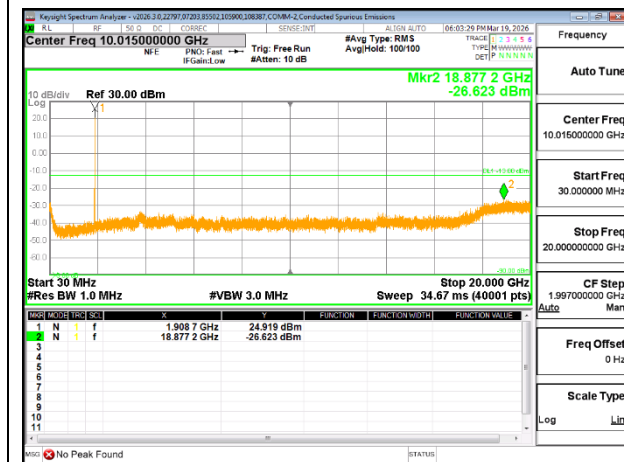
BAND 2 HSDPA LOW Channel



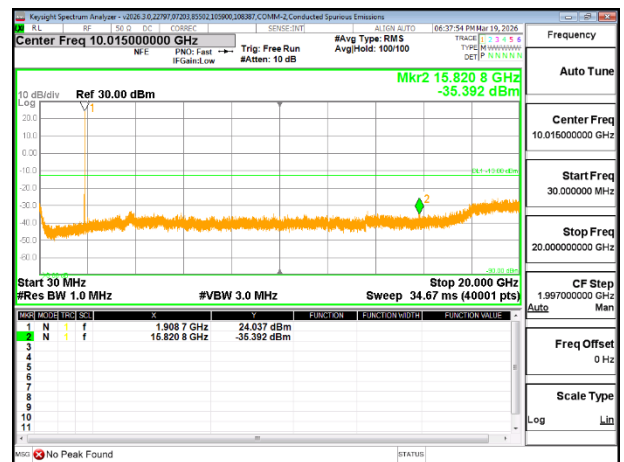
BAND 2 Rel 99 MID Channel



BAND 2 HSDPA MID Channel

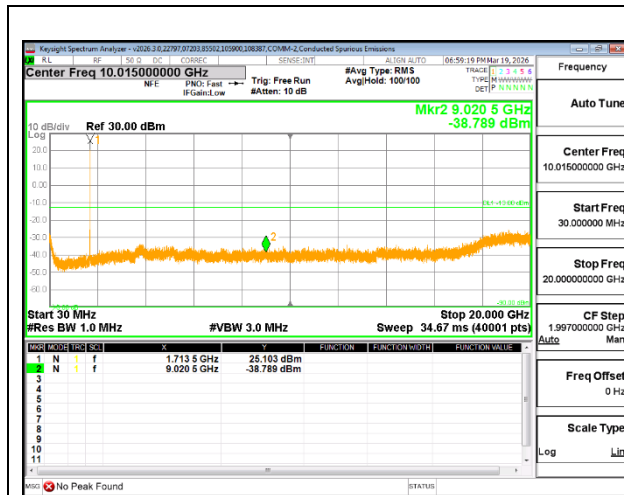


BAND 2 Rel 99 HIGH Channel

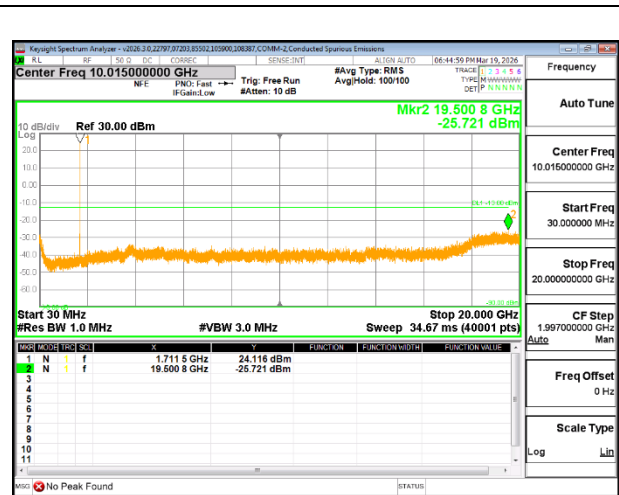


BAND 2 HSDPA HIGH Channel

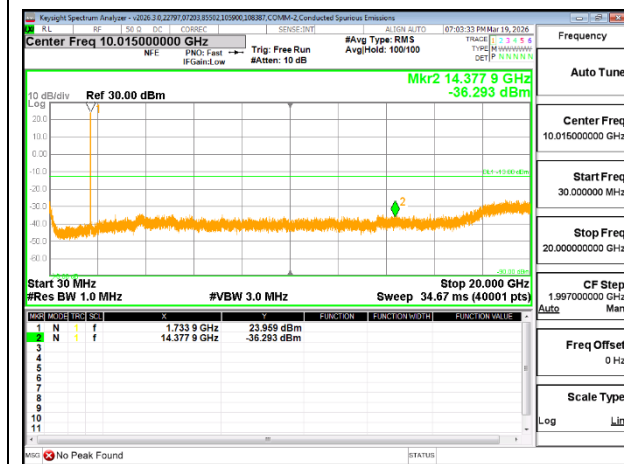
8.3.5. WCDMA BAND 4



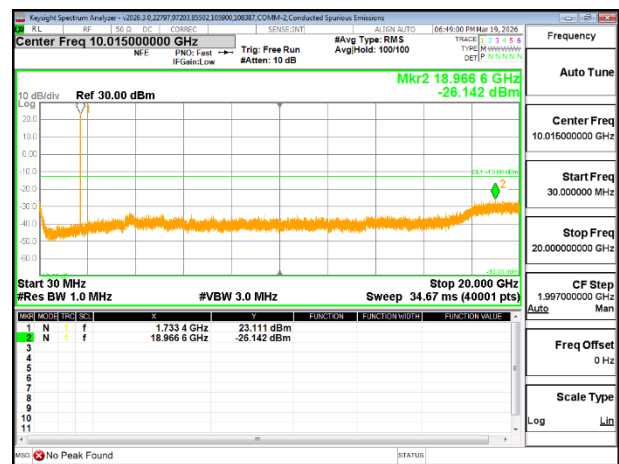
BAND 4 Rel 99 LOW Channel



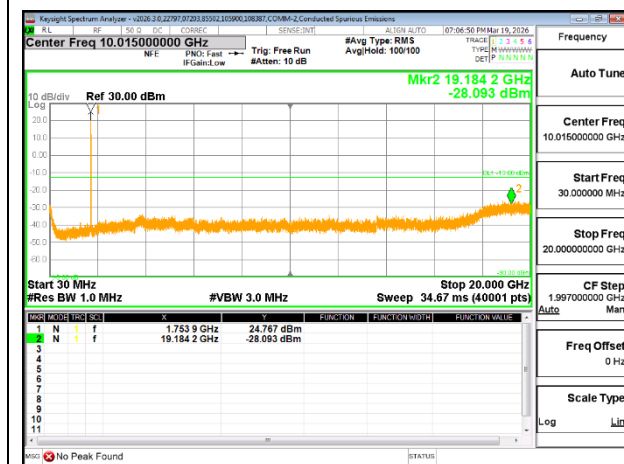
BAND 4 HSDPA LOW Channel



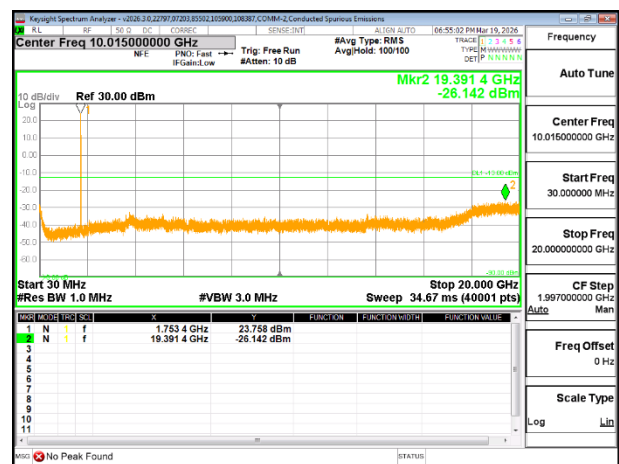
BAND 4 Rel 99 MID Channel



BAND 4 HSDPA MID Channel



BAND 4 Rel 99 HIGH Channel



BAND 4 HSDPA HIGH Channel

8.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235, and §27.54.
ISED: RSS132§5.3; RSS133§5.4 and RSS139§5.4

LIMITS

FCC §22.355

The carrier frequency shall not depart from the reference frequency in excess of ± 2.5 ppm for mobile stations.

FCC §24.235 & §27.54

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

RSS132§5.3

The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within each of the sub-bands when tested at the temperature and supply voltage variations specified in RSS-Gen.

RSS133§5.4

The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block or frequency block group when tested to the temperature and supply voltage variations specified in RSS-Gen.

RSS139§5.4

The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block or frequency block group when tested to the temperature and supply voltage variations specified in RSS-Gen.

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

- Temp. = -30°C to $+50^{\circ}\text{C}$
- Voltage = (85% - 100%)

Normal, 3.89VDC

End Voltage, 3.69VDC.

Frequency Stability vs Temperature:

The EUT is placed inside a temperature chamber. The temperature is set to 20°C and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until $+50^{\circ}\text{C}$ is reached.

Frequency Stability vs Voltage:

The peak frequency error is recorded (worst-case).

RESULTS

See the following pages.

8.4.1. GSM

Test Engineer ID:	105900/84740	Test Date:	2026-03-06 to 2026-04-09
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GPRS 850

Band	5	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		824	849		2.5	
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Normal (20°C)	Normal	823.8920	849.0966			
Extreme (50°C)		823.8920	849.0966	16.92	0.020	Yes
Extreme (40°C)		823.8920	849.0966	14.76	0.018	Yes
Extreme (30°C)		823.8920	849.0966	16.29	0.019	Yes
Extreme (10°C)		823.8920	849.0966	13.25	0.016	Yes
Extreme (0°C)		823.8920	849.0966	18.35	0.022	Yes
Extreme (-10°C)		823.8920	849.0966	15.41	0.018	Yes
Extreme (-20°C)		823.8920	849.0966	17.05	0.020	Yes
Extreme (-30°C)		823.8920	849.0966	12.94	0.015	Yes
20°C	End Point Voltage	823.8920	849.0966	24.08	0.029	Yes

GPRS 1900

Band	2	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		1850	1910		2.5	
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Normal (20°C)	Normal	1849.9758	1910.0428			
Extreme (50°C)		1849.9758	1910.0428	16.43	0.009	Yes
Extreme (40°C)		1849.9758	1910.0428	12.19	0.006	Yes
Extreme (30°C)		1849.9758	1910.0428	15.39	0.008	Yes
Extreme (10°C)		1849.9758	1910.0428	15.53	0.008	Yes
Extreme (0°C)		1849.9758	1910.0428	16.41	0.009	Yes
Extreme (-10°C)		1849.9758	1910.0428	14.32	0.008	Yes
Extreme (-20°C)		1849.9758	1910.0428	21.26	0.011	Yes
Extreme (-30°C)		1849.9758	1910.0428	10.56	0.006	Yes
20°C	End Point Voltage	1849.9757	1910.0427	-46.69	-0.025	Yes

8.4.2. WCDMA

Test Engineer ID:	105900/84740	Test Date:	2026-03-06 to 2026-04-09
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WCDMA REL 99 BAND 5

Band	5	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		824	849		2.5	
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Normal (20°C)	Normal	824.1350	848.8113			
Extreme (50°C)		824.1350	848.8113	1.86	0.002	Yes
Extreme (40°C)		824.1350	848.8113	2	0.002	Yes
Extreme (30°C)		824.1350	848.8113	1.82	0.002	Yes
Extreme (10°C)		824.1350	848.8113	2.64	0.003	Yes
Extreme (0°C)		824.1350	848.8113	2.55	0.003	Yes
Extreme (-10°C)		824.1350	848.8113	2.49	0.003	Yes
Extreme (-20°C)		824.1350	848.8113	2.25	0.003	Yes
Extreme (-30°C)		824.1350	848.8113	2.54	0.003	Yes
20°C	End Point Voltage	824.1350	848.8113	3.56	0.004	Yes

WCDMA REL 99 BAND 2

Band	2	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		1850	1910		2.5	
Temperature	Voltage	Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Normal (20°C)	Normal	1847.0550	1913.5025			
Extreme (50°C)		1847.0550	1913.5025	-4.44	-0.002	Yes
Extreme (40°C)		1847.0550	1913.5025	-4.48	-0.002	Yes
Extreme (30°C)		1847.0550	1913.5025	-4.21	-0.002	Yes
Extreme (10°C)		1847.0550	1913.5025	-3.81	-0.002	Yes
Extreme (0°C)		1847.0550	1913.5025	3.89	0.002	Yes
Extreme (-10°C)		1847.0550	1913.5025	4.8	0.003	Yes
Extreme (-20°C)		1847.0550	1913.5025	6.22	0.003	Yes
Extreme (-30°C)		1847.0550	1913.5025	4.29	0.002	Yes
20°C	End Point Voltage	1847.0550	1913.5025	-9.63	-0.005	Yes

WCDMA REL 99 BAND 4

Band	4	Frequency Range		Frequency Error Reading (Hz)	Limit	
Condition		1710	1755			
		Freq Reading @ Low End (MHz)	Freq Reading @ High End (MHz)		Frequency Stability (ppm)	Within Authorized Frequency Block (Hz)
Temperature	Voltage					
Normal (20°C)	Normal	1708.6125	1756.5925			
Extreme (50°C)		1708.6125	1756.5925	-4.77	-0.003	Yes
Extreme (40°C)		1708.6125	1756.5925	-4.62	-0.003	Yes
Extreme (30°C)		1708.6125	1756.5925	-6.27	-0.004	Yes
Extreme (10°C)		1708.6125	1756.5925	-3.99	-0.002	Yes
Extreme (0°C)		1708.6125	1756.5925	-3.95	-0.002	Yes
Extreme (-10°C)		1708.6125	1756.5925	-3.09	-0.002	Yes
Extreme (-20°C)		1708.6125	1756.5925	3.26	0.002	Yes
Extreme (-30°C)		1708.6125	1756.5925	-4.04	-0.002	Yes
20°C	End Point Voltage	1708.6125	1756.5925	-10.87	-0.006	Yes

8.5. PEAK TO AVERAGE RATIO

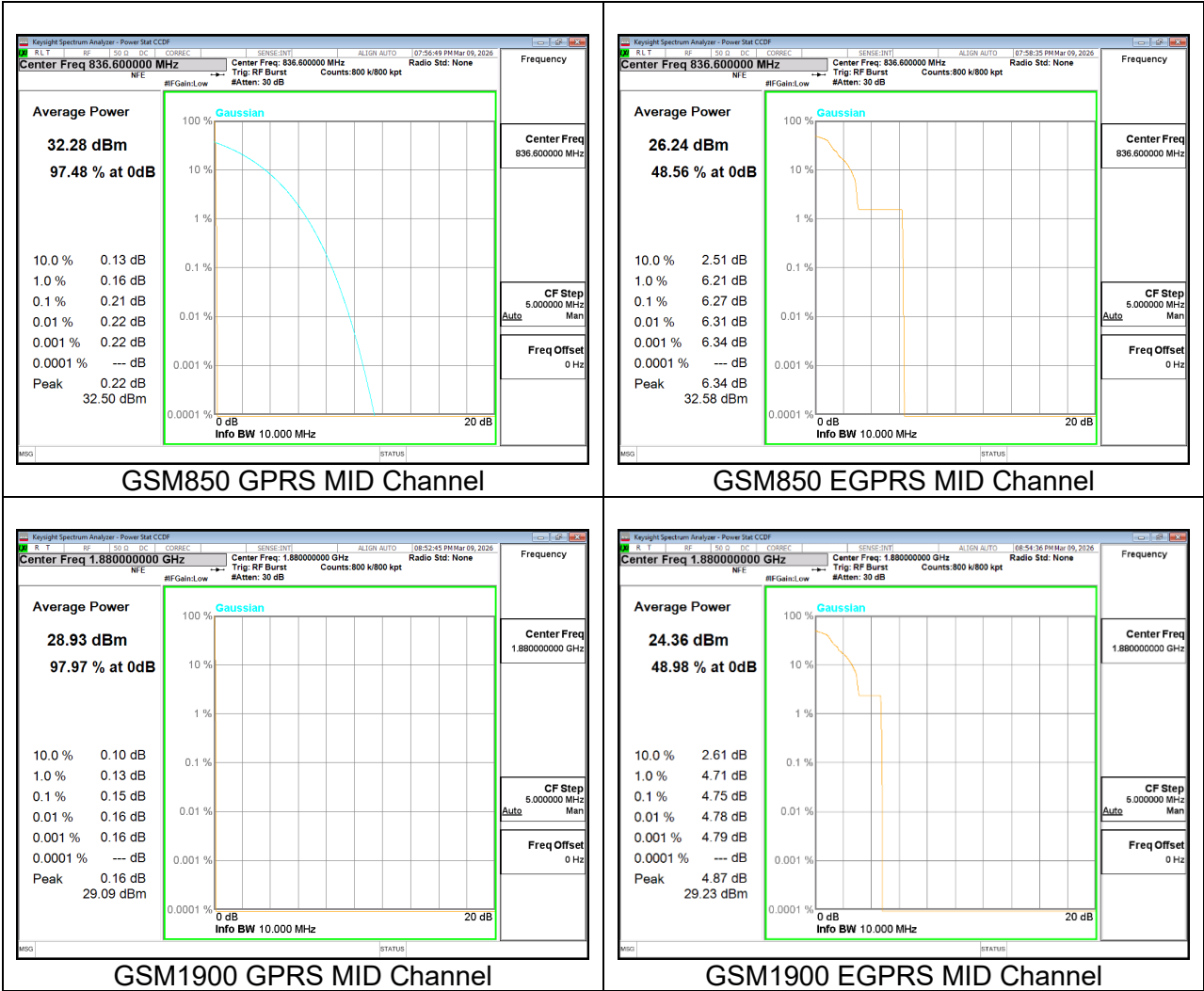
LIMITS

In addition, the peak to average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

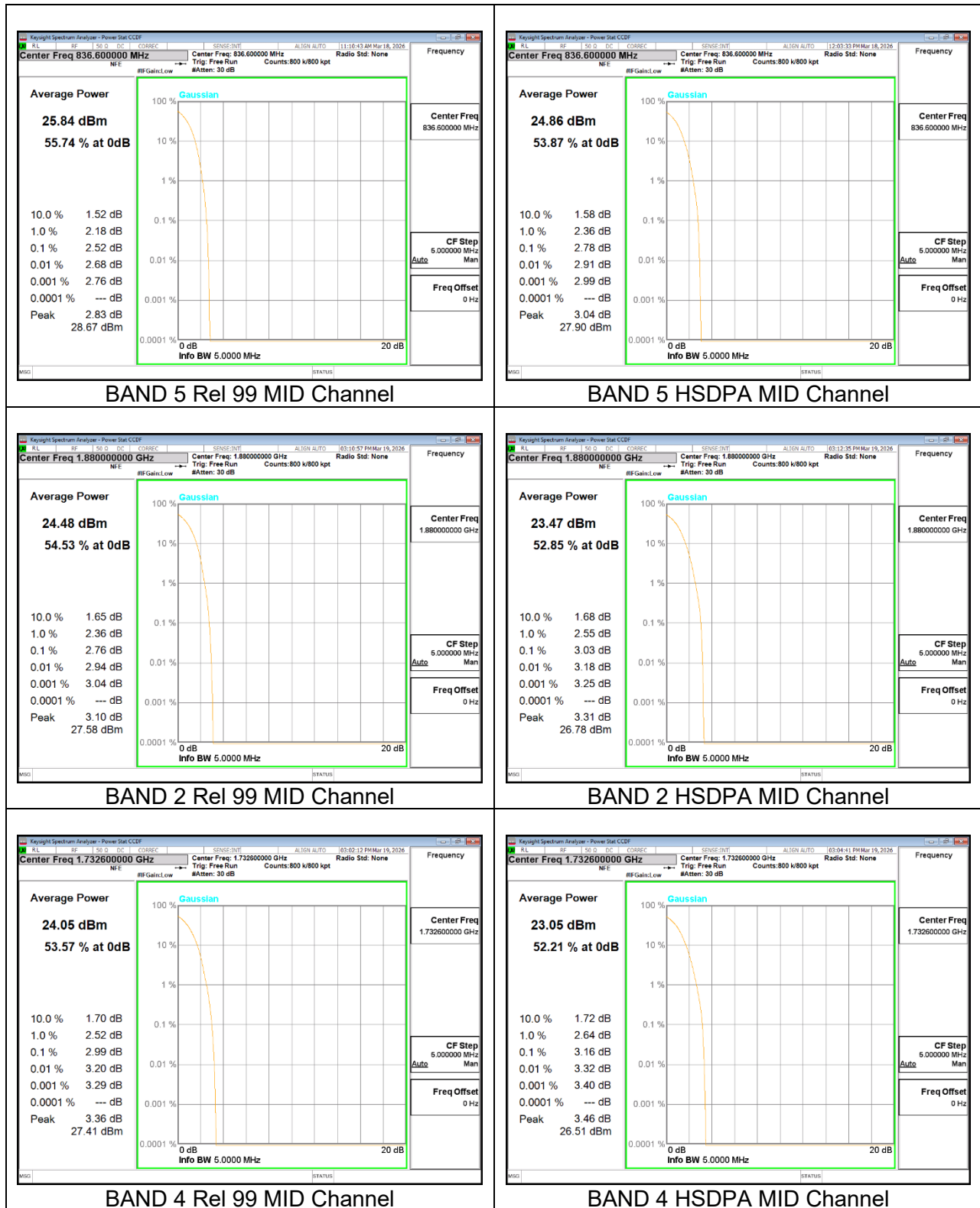
RESULT

Ant 1 antenna was used to measure as the worst case. The results from all CCDF plots are passed with 13dB peak-to-average power ratio criteria.

8.5.1. GSM



8.5.2. WCDMA



9. RADIATED TEST RESULTS

Radiated measurement using the Field Strength Method

Using the test configuration shown in Figure 6 below, we measure the radiated emissions directly from the EUT and convert the measured field strength or received power to ERP or EIRP, as required, for comparison to the applicable limits. As stated in 5.5.1 of ANSI C63.26-2015, the field strength measurement method using a test site validated to the requirements of ANSI C63.4 is an alternative to the substitution measurement method.

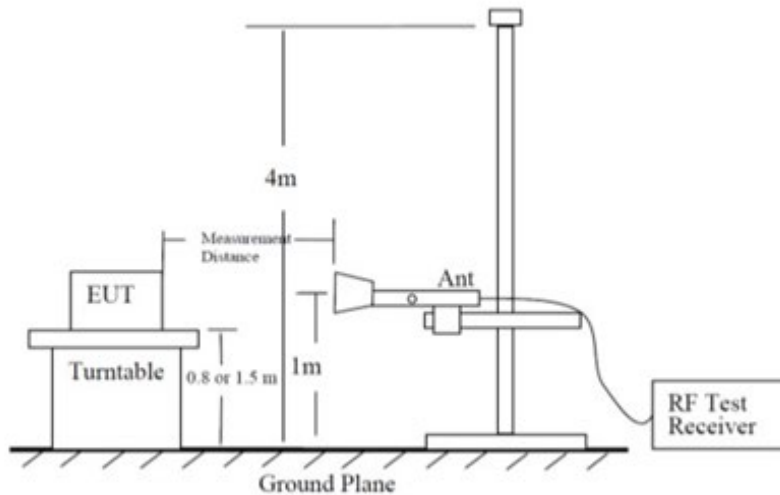


Figure 6—Test site-up for radiated ERP and/or EIRP measurements

Radiated Power Measurement Calculation According to ANSI C63.26-2015

- a) $E \text{ (dB}\mu\text{V/m)} = \text{Measured amplitude level (dB}\mu\text{V)} + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$.
- b) $E \text{ (dB}\mu\text{V/m)} = \text{Measured amplitude level (dBm)} + 107 + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$.
- c) $E \text{ (dB}\mu\text{V/m)} = \text{EIRP (dBm)} - 20\log(D) + 104.8$; where D is the measurement distance (in the far field region) in m.
- d) $\text{EIRP (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20\log(D) - 104.8$; where D is the measurement distance (in the far field region) in m.

So, from d)

The measuring distance is usually at 3m, then $20 \cdot \log(3) = 9.5424$

Then, $\text{EIRP (dBm)} = E \text{ (dB}\mu\text{V/m)} + 9.5424 - 104.8 = E \text{ (dB}\mu\text{V/m)} - 95.2576$

Note: Confidence check of each chamber is performed daily to see if any degradation from expected/normal reading reference data. Ambient check of each chamber is performed monthly.

9.1. EFFECTIVE RADIATED POWER ERP/EIRP

RULE PART(S)

FCC: §2.1046, §22.913, §24.232, §27.50

ISED: RSS132§5.4, RSS133§5.5 & SRSP-510, 5.1.2 RSS139§5.5

LIMITS

RSS132§5.4

22.913 (a)(5) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

RSS133§6.4 & SRSP-510 5.1.2

24.232(c) - Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

RSS139§5.5

27.50(c) - (10) Portable stations (hand-held devices) are limited to 3 watts ERP.

RSS139§5.5

27.50(d) - (4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13dB.

TEST PROCEDURE

ANSI C63.26:2015

KDB 971168 D01 Section 5.2

For average power measurements:

- a) Set span to at least 1.5 times the OBW;
- b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz;
- c) Set VBW $\geq 3 \times$ RBW;
- d) Set number of points in sweep $\geq 2 \times$ span / RBW;
- e) Sweep time = auto-couple;
- f) Detector = RMS (power averaging);
- g) Use free run trigger If burst duty cycle ≥ 98 ;
- h) Add a duty cycle correction factor (10Log(DC) if burst duty cycle < 98 ;
- i) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
- j) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function.

TEST RESULTS