



TEST REPORT

Product Name: High Precision GNSS Receiver
FCC ID: 2BMDI-SP30-PRO-SE
Trademark: SPHEREFIX
Model Number: SP30, SP30Se, SP30Pro
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Sample tested Date: Nov. 09, 2024 to Dec. 05, 2024
Issue Date: Dec. 05, 2024
Report No.: CTB24110900101RF04
Test Standards: FCC Part 22H & 24E
Test Results: PASS
Remark: This is GSM radio test report.

Compiled by:

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Note: If there is any objection to the inspection results in this report, please submit a written report to the company within 15 days from the date of receiving the report. The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen CTB Testing Technology Co., Ltd. this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client. "*" indicates the testing items were fulfilled by subcontracted lab. "#" indicates the items are not in CNAS accreditation scope.

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(Note: N/A means not applicable)



1. VERSION

Report No.	Issue Date	Description	Approved
CTB24110900101RF04	Dec. 05, 2024	Original	Valid

2. TEST SUMMARY

The Product has been tested according to the following specifications:

FCC Rules	Description of Test Item	Result
§1.1307, §2.1091	RF Exposure	Compliant
§22.913 (a), §24.232 (c)	RF Output Power	Compliant
§24.51	Peak-to-average Ratio(PAR) of Transmitter	Compliant
§22.917 (b), §24.238 (b)	Emission Bandwidth	Compliant
§22.917 (a), §24.238 (a)	Spurious Emissions at Antenna Terminal	Compliant
§22.917 (a), §24.238 (a)	Spurious Radiation Emissions	Compliant
§22.917 (a), §24.238 (a)	Out of Band Emissions	Compliant
§22.355, §24.235	Frequency Stability	Compliant

3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Item	Uncertainty
Occupancy bandwidth	54.3kHz
Conducted output power Above 1G	0.9dB
Conducted output power below 1G	0.9dB
Power Spectral Density , Conduction	0.9dB
Conduction spurious emissions	2.0dB
Out of band emission	2.0dB
3m camber Radiated spurious emission(30MHz-1GHz)	4.6dB
3m chamber Radiated spurious emission(1GHz-18GHz)	5.1dB
3m chamber Radiated spurious emission(18GHz-40GHz)	3.4dB
Receiver Reference Sensitivity level	1.9dB
humidity uncertainty	5.5%
Temperature uncertainty	0.63℃
frequency	1×10 ⁻⁷



4. PRODUCT INFORMATION AND TEST SETUP

4.1 Product Information

Model(s):	SP30, SP30Se, SP30Pro
Model Description:	All the model are the same circuit and RF module, only the name and appearance are different. Test sample model: SP30
Hardware Version:	T86X-PCBA.1.1
Software Version:	T86.2
Operation Frequency:	GPRS/EDGE 850: 824~849MHz GPRS/EDGE 1900: 1850~1910MHz WCDMA Band 5: 824~849MHz WCDMA Band 4: 1710-1755MHz WCDMA Band 2: 1850~1910MHz GSM850: 34.24dBm GSM1900: 30.26dBm
Max. RF output power:	WCDMA Band 5: 23.11dBm WCDMA Band 4: 23.65dBm WCDMA Band 2: 23.54 dBm
Type of Modulation:	GMSK, BPSK
Antenna installation:	Internal antenna GSM850: 0.6dBi, GSM1900: 1.3dBi
Antenna Gain:	WCDMA Band 5: 0.6dBi WCDMA Band 4: 1.1dBi WCDMA Band 2: 1.3dBi
Ratings:	INPUT: 100-240~50/60Hz 0.8A Max OUTPUT: 3.3-11.0V=2.72A 29.92W or 5.0V=3.0A 15.0W or 9.0V=3.0A 27.0W or 12.0V=2.5A 30.0W or 15.0V=2.0A 30.0W DC 7.4V by battery

4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

4.3 Support Equipment

No.	Device Type	Brand	Model	Series No.	Note

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Channel List

Testing Configure			
Support Band	Support Standard	Channel Frequency	Channel Number
GSM 850	GPRS/EDGE	824.2 MHz	128
		836.6 MHz	190
		848.8 MHz	251
PCS 1900	GPRS/EDGE	1850.2 MHz	512
		1880.0 MHz	661
		1909.8 MHz	810
WCDMA Band 5	WCDMA/HSDPA/HSUPA	826.4 MHz	4132
		836.6 MHz	4183
		846.6 MHz	4233
WCDMA Band 4	WCDMA/HSDPA/HSUPA	1712.4MHz	1312
		1732.4MHz	1412
		1752.6MHz	1513
WCDMA Band 2	WCDMA/HSDPA/HSUPA	1852.4 MHz	9262
		1880.0 MHz	9400
		1907.6 MHz	9538
Note: the transmitter has been tested on the communications mode of GSM, GPRS, EDGE, WCDMA, HSDPA, HSUPA compliance test and record the worst case.			

4.5 Test Mode

Test Mode List		
Test Mode	Description	Remark
TM1	GPRS 850	Low, Middle, High Channels
TM2	EDGE 850	Low, Middle, High Channels
TM3	GPRS 1900	Low, Middle, High Channels
TM4	EDGE 1900	Low, Middle, High Channels
TM5	WCDMA Band 5	Low, Middle, High Channels
TM6	HSDPA Band 5	Low, Middle, High Channels
TM7	HSUPA Band 5	Low, Middle, High Channels
TM8	WCDMA Band 4	Low, Middle, High Channels
TM9	HSDPA Band 4	Low, Middle, High Channels
TM10	HSUPA Band 4	Low, Middle, High Channels
TM8	WCDMA Band 2	Low, Middle, High Channels
TM9	HSDPA Band 2	Low, Middle, High Channels
TM10	HSUPA Band 2	Low, Middle, High Channels

4.6 Test Environment

Humidity(%):	54
Atmospheric Pressure(kPa):	101
Normal Voltage(DC):	7.4V
Normal Temperature(°C)	23
Low Temperature(°C)	0
High Temperature(°C)	40

5. TEST FACILITY AND TEST INSTRUMENT USED

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at 1&2F., Building A, No. 26, Xinh Road, Xinqiao, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

5.2 Test Instrument Used

Item	Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY52090073	2024.07.05
2	Power Sensor	Agilent	U2021XA	MY56120032	2024.07.05
3	Power Sensor	Agilent	U2021XA	MY56120034	2024.07.05
4	Communication test set	R&S	CMW500	108058	2024.07.05
5	Spectrum Analyzer	KEYSIGHT	N9020A	MY51289897	2024.07.05
6	Signal Generator	Agilent	N5181A	MY50140365	2024.07.05
7	Vector signal generator	Agilent	N5182A	MY47420195	2024.07.05
8	Communication test set	Agilent	E5515C	MY50102567	2024.07.06
9	2.4 GHz Filter	Shenxiang	MSF2400-2483.5MS-1154	20181015001	2024.07.05
10	5 GHz Filter	Shenxiang	MSF5150-5850 MS-1155	20181015001	2024.07.06
11	Filter	Xingbo	XBLBQ-DZA120	190821-1-1	2024.07.06
12	BT&WI-FI Automatic test software	Microwave	MTS8000	Ver. 2.0.0.0	/
13	Rohde & Schwarz SFU Broadcast Test System	R&S	SFU	101017	2024.10.30
14	Temperature humidity chamber	Hongjing	TH-80CH	DG-15174	2024.07.05
15	234G Automatic test software	Microwave	MTS8200	Ver. 2.0.0.0	/
16	966 chamber	C.R.T.	966	/	2024.08.11
17	Receiver	R&S	ESPI	100362	2024.07.05
18	Amplifier	HP	8447E	2945A02747	2024.07.05
19	Amplifier	Agilent	8449B	3008A01838	2024.07.05
20	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00869	2024.07.08



21	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA9120D	01911	2024.07.08
22	EMI test software	Fala	EZ-EMC	FA-03A2 RE	/
23	Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-224	2024.07.08
24	loop antenna	ZHINAN	ZN30900A	GTS534	/
25	40G Horn antenna	A/H/System	SAS-574	588	2024.10.30
26	Amplifier	AEROFLEX	Aeroflex	097	2024.07.05

6. RF OUTPUT POWER

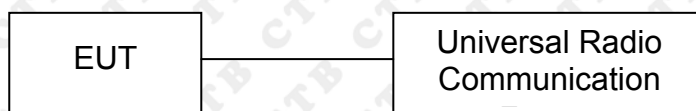
6.1 Standard Applicable

According to §22.913(a)(2), The ERP of mobile and portable stations transmitters and auxiliary test transmitters must not exceed 7 Watts.

According to §24.232 (c), Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

6.2 Test Procedure

Conducted output power test method:



Radiated power test method:

1. The setup of EUT is according with per ANSI/TIA Standard 603D and ANSI C63.4-2014 measurement procedure.
2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
4. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

6.3 Environmental Conditions

Temperature:	23 °C
Relative Humidity:	54%
ATM Pressure:	1010 mbar

6.4 Summary of Test Results/Plots

Max. Radiated Power

ERP For GPRS Mode GSM850

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 22H Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
824.2	33.89	1.5	0	H	1.5	0.6	32.99	38.45
824.2	34.02	1.5	0	V	1.5	0.6	33.12	38.45
Middle Channel								
836.6	33.28	1.5	0	H	1.5	0.6	32.38	38.45
836.6	33.68	1.5	0	V	1.5	0.6	32.78	38.45
High Channel								
848.8	33.63	1.5	0	H	1.5	0.6	32.73	38.45
848.8	33.58	1.5	0	V	1.5	0.6	32.68	38.45

EIRP For GPRS Mode PCS1900

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 24E Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
1850.2	30.13	1.5	0	H	1.9	1.3	29.53	33
1850.2	29.92	1.5	0	V	1.9	1.3	29.32	33
Middle Channel								
1880	29.71	1.5	0	H	1.9	1.3	29.11	33
1880	29.36	1.5	0	V	1.9	1.3	28.76	33
High Channel								
1909.8	29.57	1.5	0	H	1.9	1.3	28.97	33
1909.8	29.23	1.5	0	V	1.9	1.3	28.63	33



ERP For EDGE Mode GSM850

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 22H Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
824.2	34.19	1.5	0	H	1.5	0.6	33.29	38.45
824.2	33.78	1.5	0	V	1.5	0.6	32.88	38.45
Middle Channel								
836.6	33.77	1.5	0	H	1.5	0.6	32.87	38.45
836.6	33.83	1.5	0	V	1.5	0.6	32.93	38.45
High Channel								
848.8	33.39	1.5	0	H	1.5	0.6	32.49	38.45
848.8	34.07	1.5	0	V	1.5	0.6	33.17	38.45

EIRP For EDGE Mode PCS1900

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 24E Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
1850.2	29.86	1.5	0	H	1.9	1.3	29.26	33
1850.2	29.20	1.5	0	V	1.9	1.3	28.60	33
Middle Channel								
1880	29.54	1.5	0	H	1.9	1.3	28.94	33
1880	29.73	1.5	0	V	1.9	1.3	29.13	33
High Channel								
1909.8	29.98	1.5	0	H	1.9	1.3	29.38	33
1909.8	29.61	1.5	0	V	1.9	1.3	29.01	33

ERP For WCDMA Mode Band 5

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 22H Limit
MHz	dBm	Meter	Degree	H / V	dB	dBd	dBm	dBm
Low Channel								
826.4	22.47	1.5	0	H	1.5	0.6	21.57	38.45
826.4	22.35	1.5	0	V	1.5	0.6	21.45	38.45
Middle Channel								
836.6	22.70	1.5	0	H	1.5	0.6	21.80	38.45
836.6	22.88	1.5	0	V	1.5	0.6	21.98	38.45
High Channel								
846.6	22.32	1.5	0	H	1.5	0.6	21.42	38.45
846.6	22.32	1.5	0	V	1.5	0.6	21.42	38.45

ERP For HSDPA Mode Band 5

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 22H Limit
MHz	dBm	Meter	Degree	H / V	dB	dBd	dBm	dBm
Low Channel								
826.4	22.29	1.5	0	H	1.5	0.6	21.39	38.45
826.4	22.97	1.5	0	V	1.5	0.6	22.07	38.45
Middle Channel								
836.6	22.96	1.5	0	H	1.5	0.6	22.06	38.45
836.6	22.84	1.5	0	V	1.5	0.6	21.94	38.45
High Channel								
846.6	22.48	1.5	0	H	1.5	0.6	21.58	38.45
846.6	22.93	1.5	0	V	1.5	0.6	22.03	38.45

ERP For HSUPA Mode Band 5

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 22H Limit
MHz	dBm	Meter	Degree	H / V	dB	dBd	dBm	dBm
Low Channel								
826.4	22.66	1.5	0	H	1.5	0.6	21.76	38.45
826.4	22.92	1.5	0	V	1.5	0.6	22.02	38.45
Middle Channel								
836.6	22.46	1.5	0	H	1.5	0.6	21.56	38.45
836.6	22.20	1.5	0	V	1.5	0.6	21.30	38.45
High Channel								
846.6	22.29	1.5	0	H	1.5	0.6	21.39	38.45
846.6	22.74	1.5	0	V	1.5	0.6	21.84	38.45

ERP For WCDMA Mode Band 4

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 22H Limit
MHz	dBm	Meter	Degree	H / V	dB	dBd	dBm	dBm
Low Channel								
1712.4	21.93	1.5	0	H	1.5	1.1	21.53	38.45
1712.4	21.99	1.5	0	V	1.5	1.1	21.59	38.45
Middle Channel								
1740	22.69	1.5	0	H	1.5	1.1	22.29	38.45
1740	22.82	1.5	0	V	1.5	1.1	22.42	38.45
High Channel								
1752.6	23.02	1.5	0	H	1.5	1.1	22.62	38.45
1752.6	23.33	1.5	0	V	1.5	1.1	22.93	38.45

ERP For HSDPA Mode Band 4

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 22H Limit
MHz	dBm	Meter	Degree	H / V	dB	dBd	dBm	dBm
Low Channel								
1712.4	22.50	1.5	0	H	1.5	1.1	22.10	38.45
1712.4	22.79	1.5	0	V	1.5	1.1	22.39	38.45
Middle Channel								
1740	22.86	1.5	0	H	1.5	1.1	22.46	38.45
1740	23.03	1.5	0	V	1.5	1.1	22.63	38.45
High Channel								
1752.6	23.24	1.5	0	H	1.5	1.1	22.84	38.45
1752.6	22.75	1.5	0	V	1.5	1.1	22.35	38.45

ERP For HSUPA Mode Band 4

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 22H Limit
MHz	dBm	Meter	Degree	H / V	dB	dBd	dBm	dBm
Low Channel								
1712.4	22.63	1.5	0	H	1.5	1.1	22.23	38.45
1712.4	22.69	1.5	0	V	1.5	1.1	22.29	38.45
Middle Channel								
1740	22.35	1.5	0	H	1.5	1.1	21.95	38.45
1740	23.11	1.5	0	V	1.5	1.1	22.71	38.45
High Channel								
1752.6	22.81	1.5	0	H	1.5	1.1	22.41	38.45
1752.6	23.15	1.5	0	V	1.5	1.1	22.75	38.45

EIRP For WCDMA Mode Band 2

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 24E Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
1852.4	24.14	1.5	0	H	1.9	1.3	23.54	33
1852.4	23.05	1.5	0	V	1.9	1.3	22.45	33
Middle Channel								
1880	22.40	1.5	0	H	1.9	1.3	21.80	33
1880	24.33	1.5	0	V	1.9	1.3	23.73	33
High Channel								
1907.6	22.87	1.5	0	H	1.9	1.3	22.27	33
1907.6	23.92	1.5	0	V	1.9	1.3	23.32	33

EIRP For HSDPA Mode Band 2

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 24E Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
1852.4	22.48	1.5	0	H	1.9	1.3	21.88	33
1852.4	23.16	1.5	0	V	1.9	1.3	22.56	33
Middle Channel								
1880	23.66	1.5	0	H	1.9	1.3	23.06	33
1880	23.53	1.5	0	V	1.9	1.3	22.93	33
High Channel								
1907.6	22.98	1.5	0	H	1.9	1.3	22.38	33
1907.6	23.26	1.5	0	V	1.9	1.3	22.66	33

EIRP For HSUPA Mode Band 2

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 24E Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
1852.4	22.88	1.5	0	H	1.9	1.3	22.28	33
1852.4	24.30	1.5	0	V	1.9	1.3	23.70	33
Middle Channel								
1880	23.60	1.5	0	H	1.9	1.3	23.00	33
1880	23.66	1.5	0	V	1.9	1.3	23.06	33
High Channel								
1907.6	22.57	1.5	0	H	1.9	1.3	21.97	33
1907.6	22.76	1.5	0	V	1.9	1.3	22.16	33

Note: Result = Substitute - Cable loss + Antenna Gain

**Max. Conducted Output Power**

For Cellular Band (GSM850)

Test Mode	Channel	Frequency (MHz)	Average Power (dBm)	FCC Part 22.913 Limit (dBm)
GPRS(1 Slot)	Low Channel	824.2	34.22	38.45
	Middle Channel	836.6	33.92	38.45
	High Channel	848.8	34.09	38.45
EDGE(1 Slot)	Low Channel	824.2	34.24	38.45
	Middle Channel	836.6	33.92	38.45
	High Channel	848.8	34.09	38.45

For PCS Band (GSM1900)

Test Mode	Channel	Frequency (MHz)	Average Power (dBm)	FCC Part 24.232 Limit (dBm)
GPRS(1 Slot)	Low Channel	1850.2	30.26	33.0
	Middle Channel	1880.0	30.04	33.0
	High Channel	1909.8	30.12	33.0
EDGE(1 Slot)	Low Channel	1850.2	30.04	33.0
	Middle Channel	1880.0	29.95	33.0
	High Channel	1909.8	30.02	33.0



For WCDMA Band 5

Test Mode	Channel	Frequency (MHz)	Average Power (dBm)	FCC Part 22.913 Limit (dBm)
WCDMA	Low Channel	826.4	22.93	38.45
	Middle Channel	836.6	22.93	38.45
	High Channel	846.6	22.86	38.45
HSDPA	Low Channel	826.4	23.02	38.45
	Middle Channel	836.6	23.00	38.45
	High Channel	846.6	23.11	38.45
HSUPA	Low Channel	826.4	23.48	38.45
	Middle Channel	836.6	23.49	38.45
	High Channel	846.6	23.49	38.45

For WCDMA Band 4

Test Mode	Channel	Frequency (MHz)	Average Power (dBm)	FCC Part 22.913 Limit (dBm)
WCDMA	Low Channel	1712.4	22.65	38.45
	Middle Channel	1740	23.46	38.45
	High Channel	1752.6	23.33	38.45
HSDPA	Low Channel	1712.4	23.23	38.45
	Middle Channel	1740	23.32	38.45
	High Channel	1752.6	23.30	38.45
HSUPA	Low Channel	1712.4	23.27	38.45
	Middle Channel	1740	23.35	38.45
	High Channel	1752.6	23.33	38.45



For WCDMA Band 2

Test Mode	Channel	Frequency (MHz)	Average Power (dBm)	FCC Part 24.232 Limit (dBm)
WCDMA	Low Channel	1852.4	23.22	33.00
	Middle Channel	1880.0	23.37	33.00
	High Channel	1907.6	23.46	33.00
HSDPA	Low Channel	1852.4	23.42	33.00
	Middle Channel	1880.0	23.43	33.00
	High Channel	1907.6	23.54	33.00
HSUPA	Low Channel	1852.4	23.48	33.00
	Middle Channel	1880.0	23.49	33.00
	High Channel	1907.6	23.49	33.00

7. PEAK-TO-AVERAGE RATIO(PAR) OF TRANSMITTER

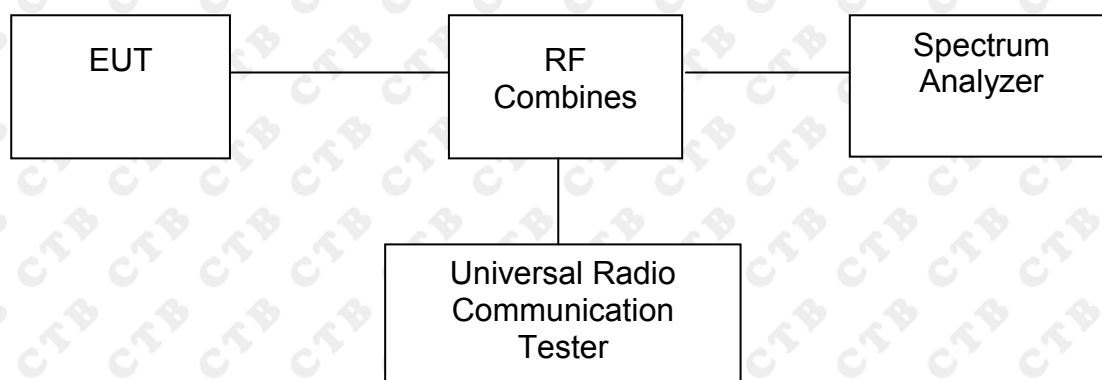
7.1 Standard Applicable

According to §24.232(d), Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

7.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 30kHz and the peak-to-average ratio (PAR) of the transmission was recorded. Record the maximum PAPR level associated with a probability of 0.1%.

Test Configuration for the emission bandwidth testing:



7.3 Environmental Conditions

Temperature:	23 °C
Relative Humidity:	54%
ATM Pressure:	1010 mbar

7.4 Summary of Test Results

Only the worst case was selected to record
For GSM850

Test Mode	Channel	Frequency (MHz)	PAR (dB)	Limit (dB)
GPRS(1 Slot)	190	836.6	2.75	13
EDGE(1 Slot)	128	824.2	2.75	13

For PCS 1900

Test Mode	Channel	Frequency (MHz)	PAR (dB)	Limit (dB)
GPRS(1 Slot)	661	1880	2.86	13
EDGE(1 Slot)	512	1850.2	2.87	13

For WCDMA Band 5

Test Mode	Channel	Frequency (MHz)	PAR (dB)	Limit (dB)
WCDMA	4132	826.4	3.22	13
HSDPA	4132	826.4	3.31	13
HSUPA	4132	826.4	3.32	13

For WCDMA Band 4

Test Mode	Channel	Frequency (MHz)	PAR (dB)	Limit (dB)
WCDMA	1312	1712.4	3.14	13
HSDPA	1312	1712.4	4.23	13
HSUPA	1450	1740	4.23	13

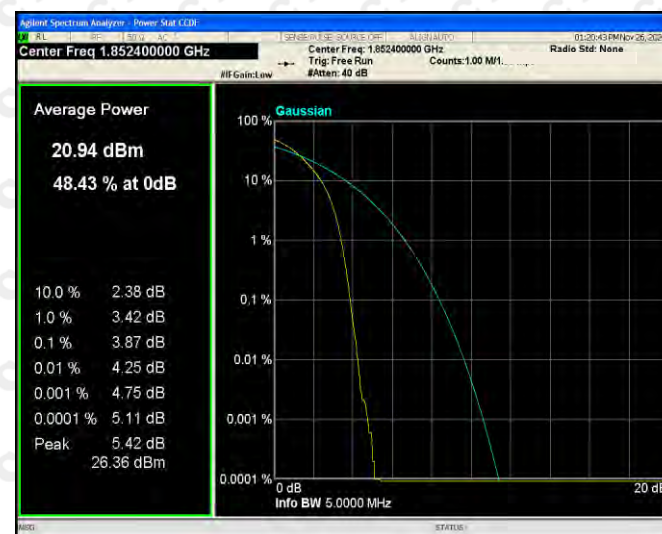
For WCDMA Band 2

Test Mode	Channel	Frequency (MHz)	PAR (dB)	Limit (dB)
WCDMA	9400	1880	3.16	13
HSDPA	9262	1852.4	4.25	13
HSUPA	9262	1852.4	4.05	13

GSM :



WCDMA:



8. EMISSION BANDWIDTH

8.1 Standard Applicable

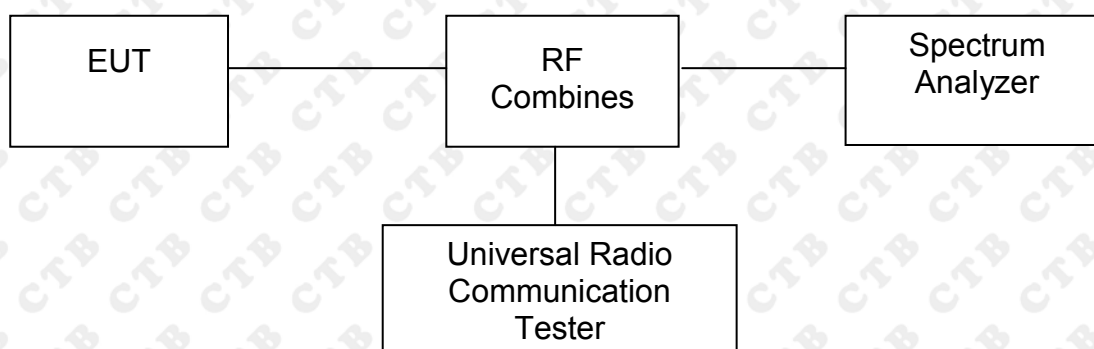
According to §22.917(b), The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

According to §24.238(b), The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

8.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 10kHz for GSM mode and 100kHz for WCDMA mode, VBW shall be at least 3 times the RBW, and the 26dB bandwidth was recorded.

Test Configuration for the emission bandwidth testing:



8.3 Environmental Conditions

Temperature:	23 °C
Relative Humidity:	54%
ATM Pressure:	1010 mbar

8.4 Summary of Test Results/Plots

For Cellular Band

Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GPRS	128	824.2	248.098	308.560
	190	836.6	240.542	307.557
	251	848.8	240.478	315.828
EDGE	128	824.2	238.434	318.652
	190	836.6	246.876	313.388
	251	848.8	246.715	320.453

For PCS Band

Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GPRS	512	1850.2	243.231	320.902
	661	1880.0	246.779	320.060
	810	1909.8	249.633	326.282
EDGE	512	1850.2	243.874	319.110
	661	1880.0	245.356	320.588
	810	1909.8	242.510	311.026

For Band 5

Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
WCDMA	4132	826.4	4137.033	4705.021
	4182	836.4	4118.768	4688.053
	4233	846.6	4124.305	4681.837
HSDPA	4132	826.4	4129.533	4709.236
	4183	836.6	4143.608	4715.332
	4233	846.6	4132.258	4724.746
HSUPA	4132	826.4	4129.815	4718.265
	4183	836.6	4132.794	4698.203
	4233	846.6	4143.811	4694.336

For Band 4

Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
WCDMA	1312	1712.4	4124.552	4695.887
	1450	1740	4144.515	4719.496
	1513	1752.6	4134.059	4694.650
HSDPA	1312	1712.4	4139.756	4669.106
	1450	1740	4126.186	4682.089
	1513	1752.6	4126.008	4700.764
HSUPA	1312	1712.4	4150.363	4695.331
	1450	1740	4125.444	4715.685
	1513	1752.6	4130.936	4674.835

For Band 2

Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
WCDMA	9262	1852.4	4110.343	4728.534
	9400	1880.0	4136.476	4681.114
	9538	1907.6	4119.096	4659.057
HSDPA	9262	1852.4	4140.821	4726.309
	9400	1880.0	4116.077	4693.486
	9538	1907.6	4117.450	4679.752
HSUPA	9262	1852.4	4125.185	4679.715
	9400	1880.0	4129.116	4683.595
	9538	1907.6	4127.400	4715.619

For Cellular Band

GPRS Low Channel



GPRS Middle Channel



GPRS High Channel



EDGE Low Channel



EDGE Middle Channel

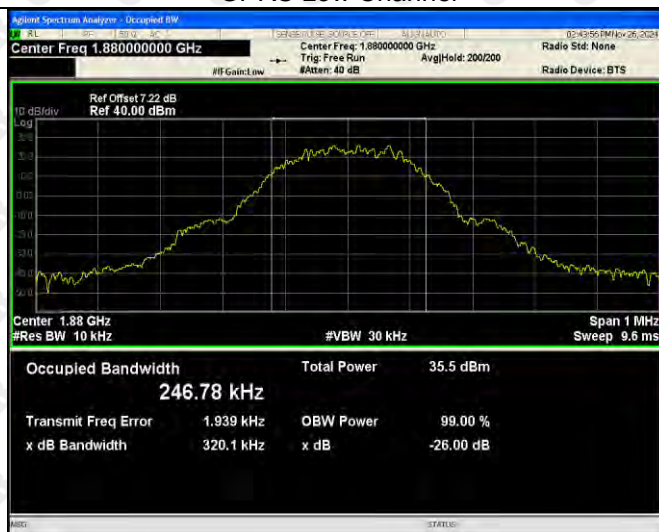


EDGE High Channel



For PCS Band

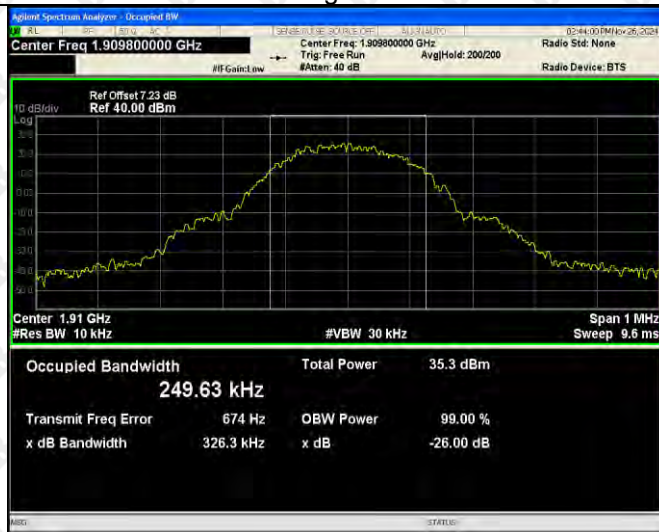
GPRS Low Channel



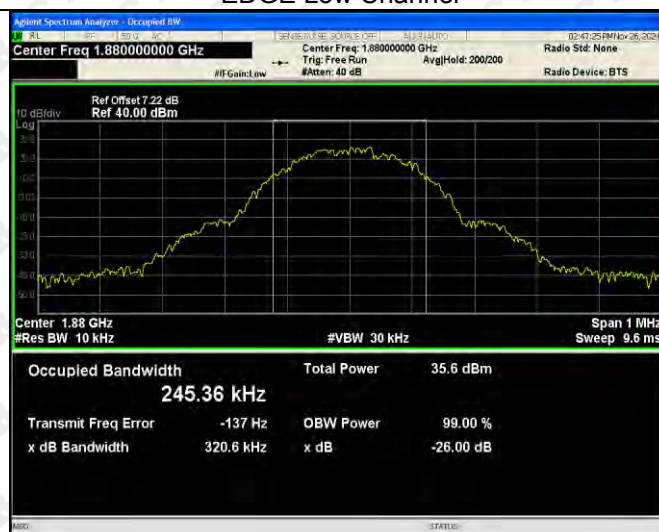
GPRS Middle Channel



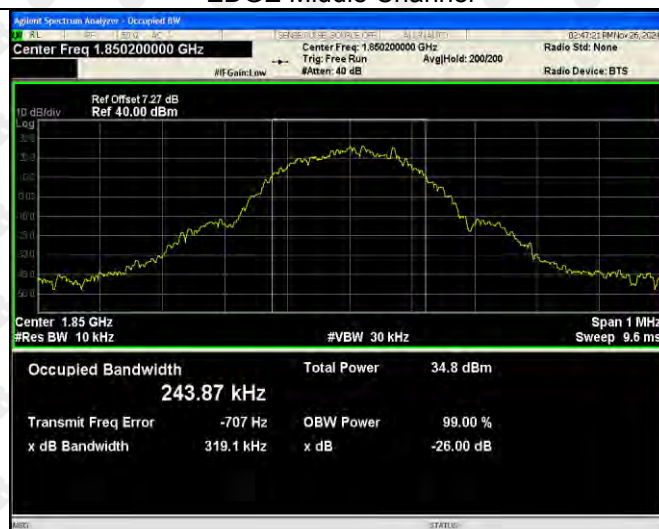
GPRS High Channel



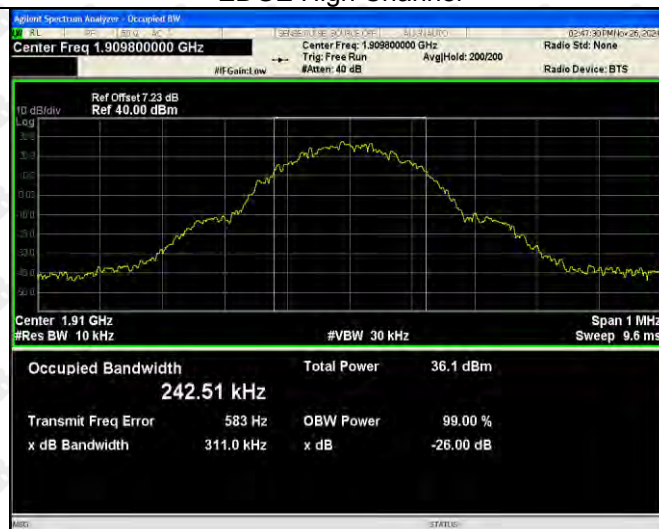
EDGE Low Channel



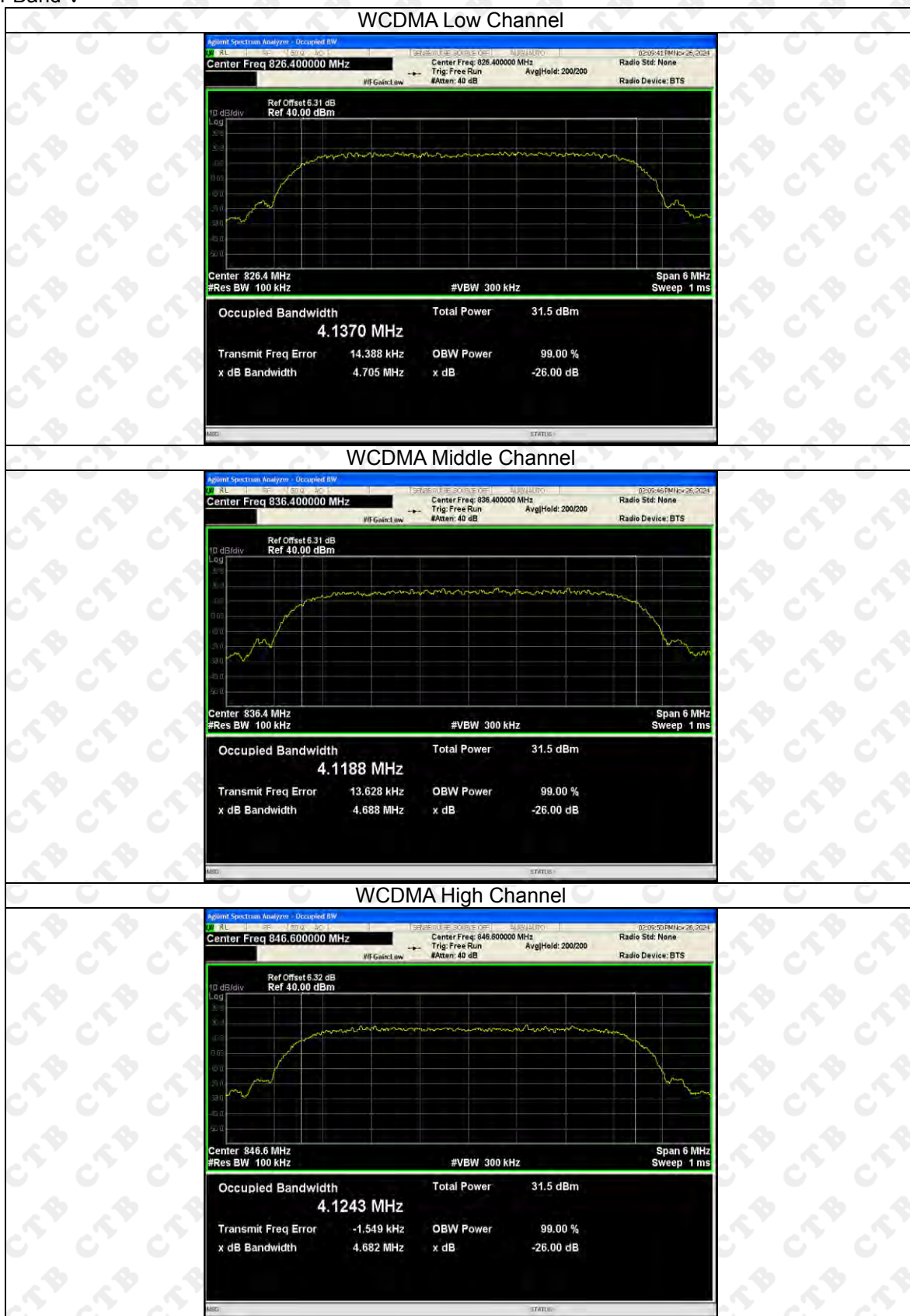
EDGE Middle Channel



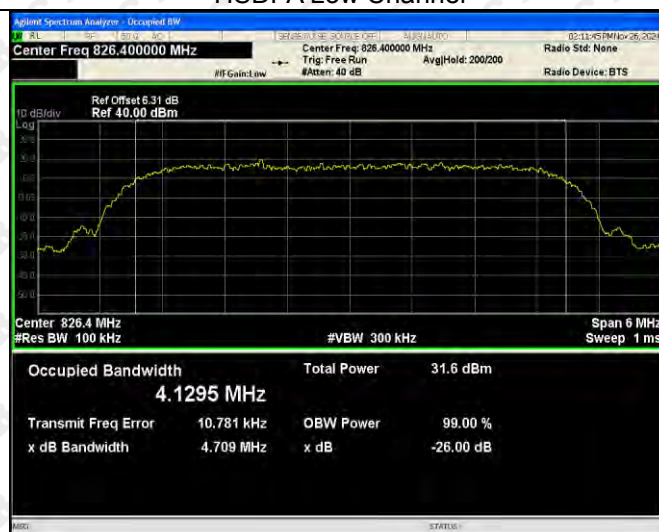
EDGE High Channel



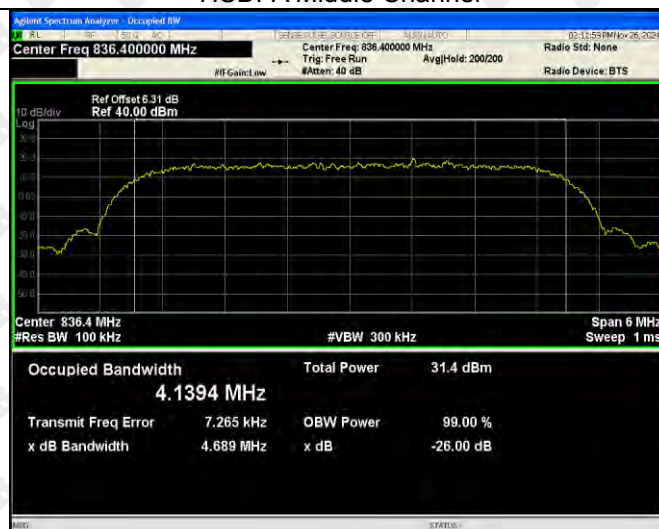
For Band V



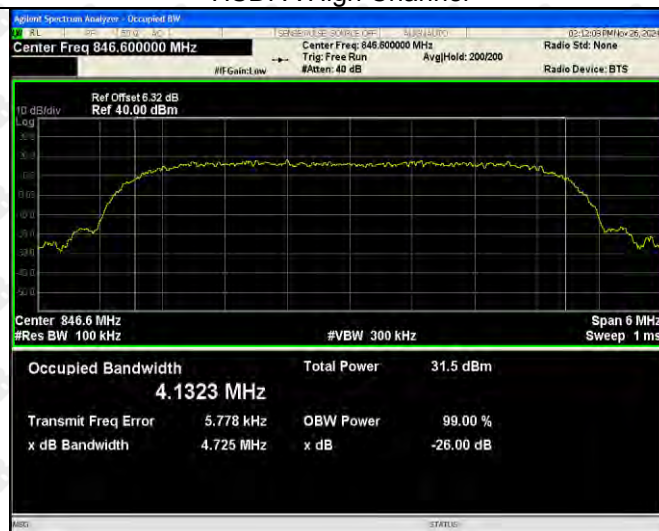
HSDPA Low Channel



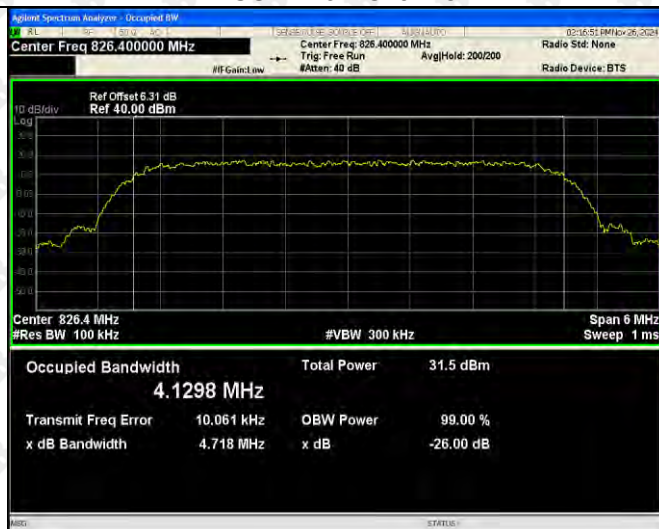
HSDPA Middle Channel



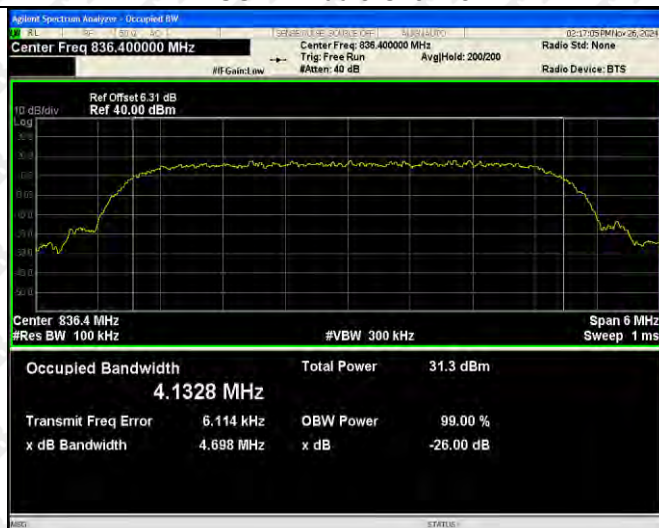
HSDPA High Channel



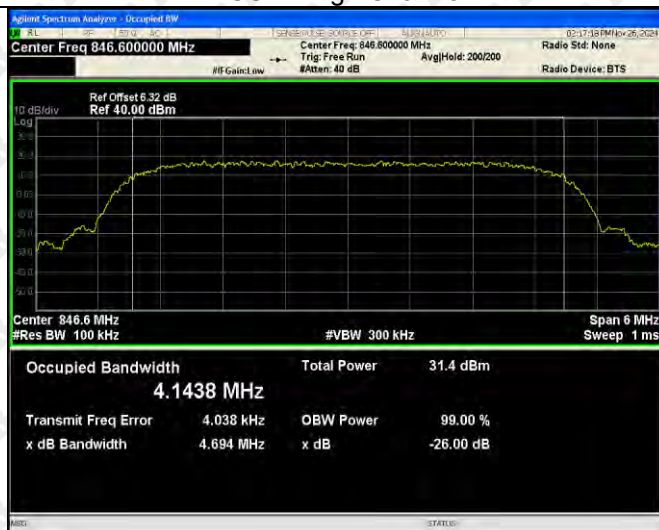
HSUPA Low Channel



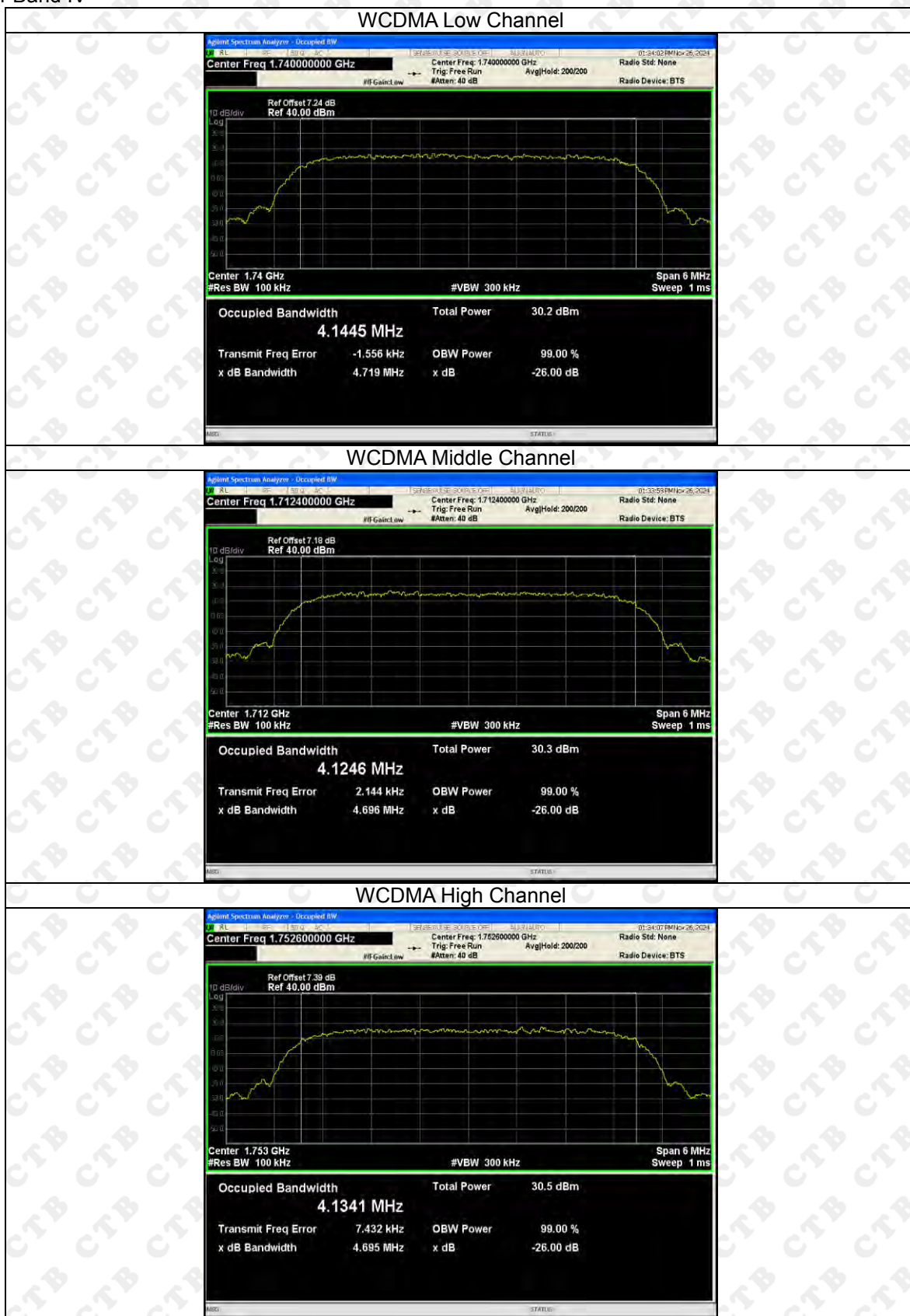
HSUPA Middle Channel



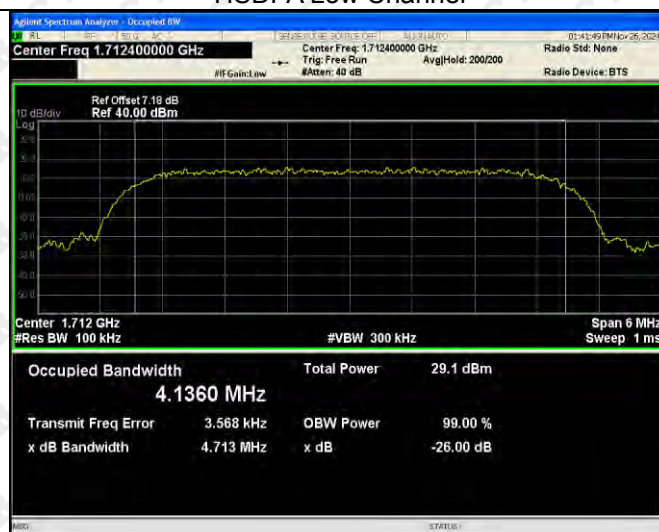
HSUPA High Channel



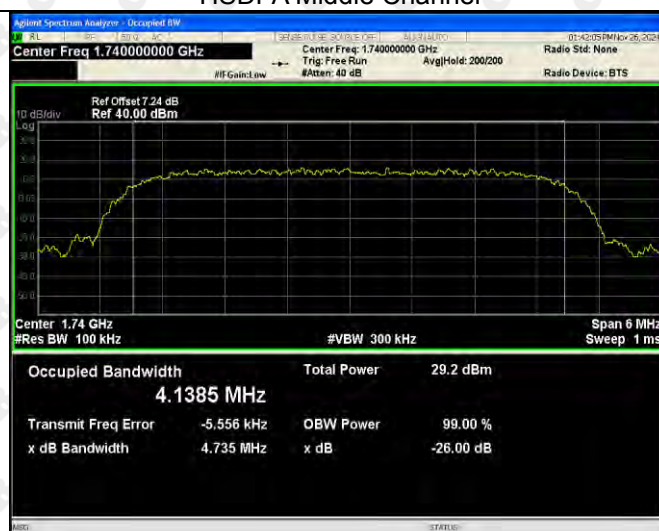
For Band IV



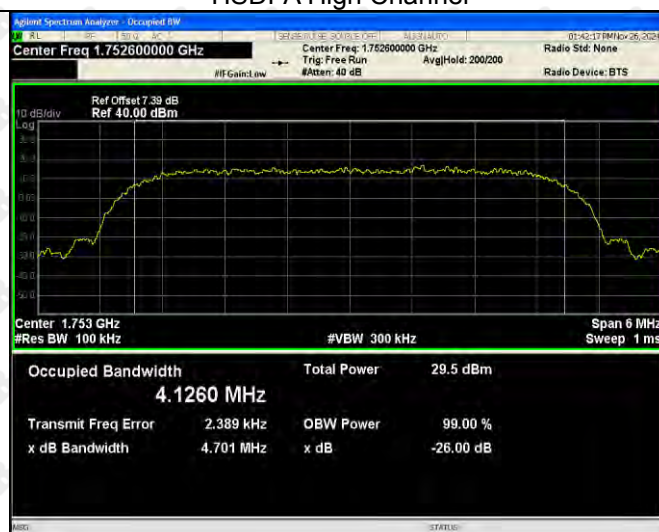
HSDPA Low Channel



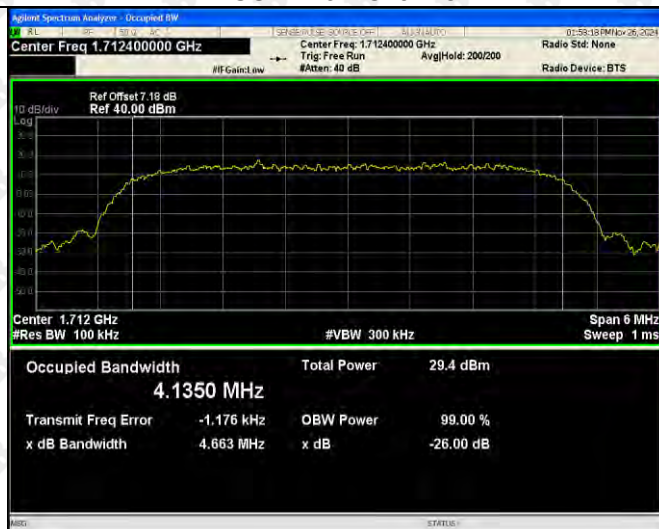
HSDPA Middle Channel



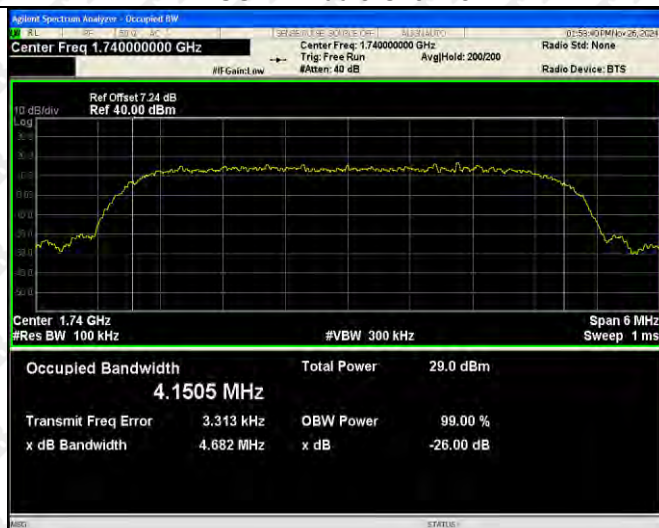
HSDPA High Channel



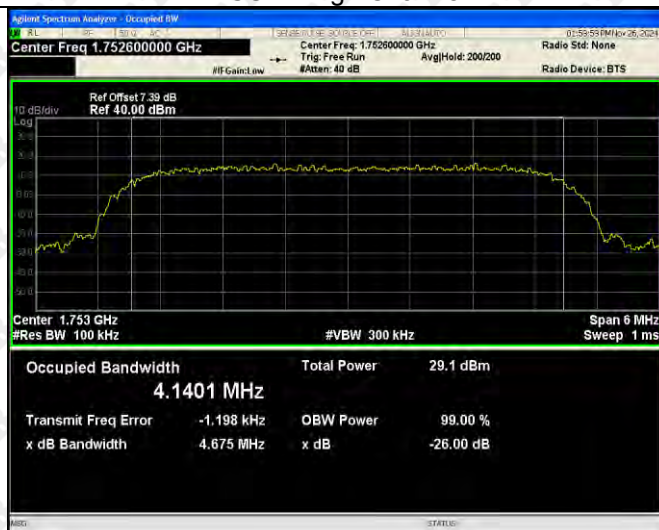
HSUPA Low Channel



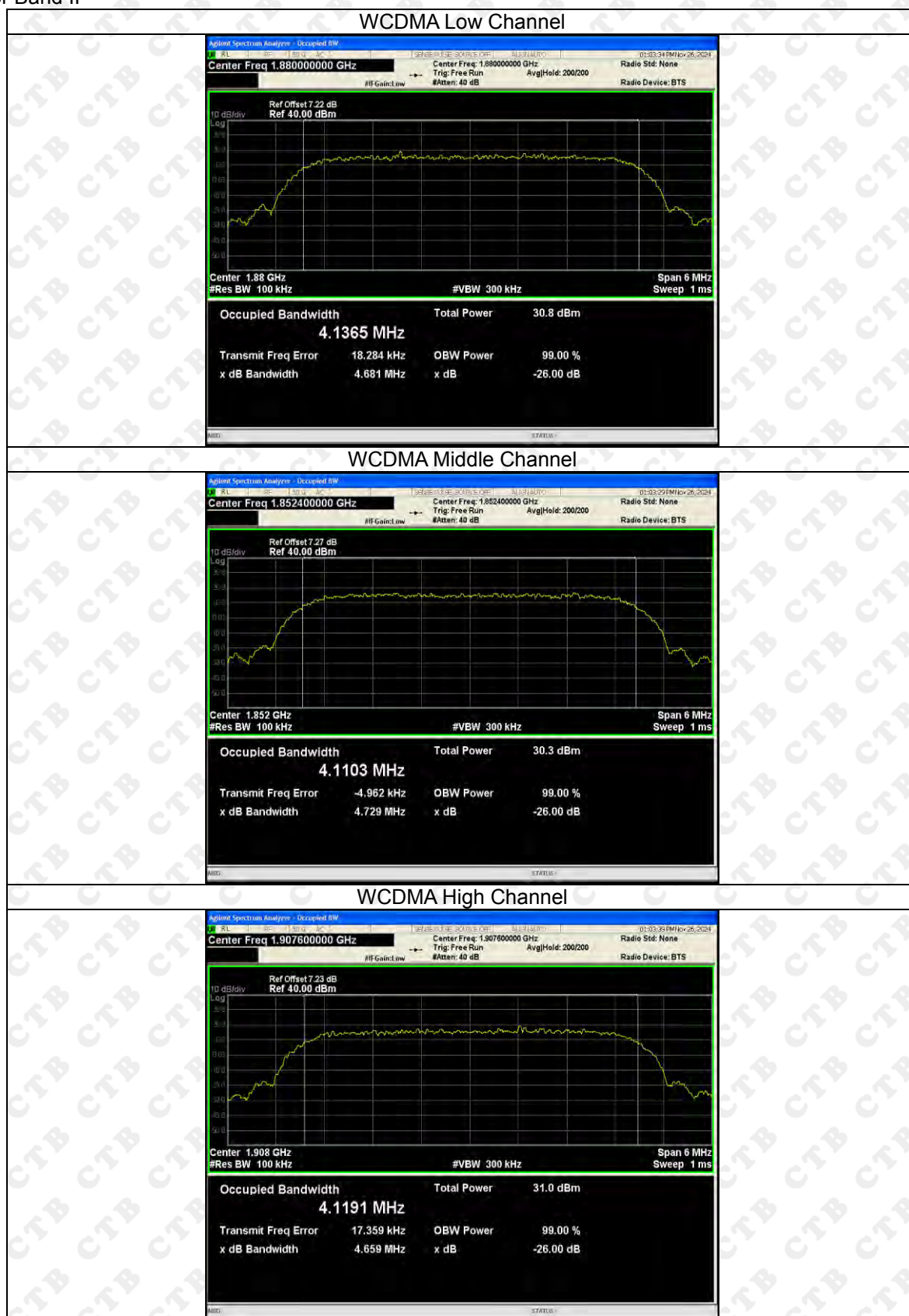
HSUPA Middle Channel



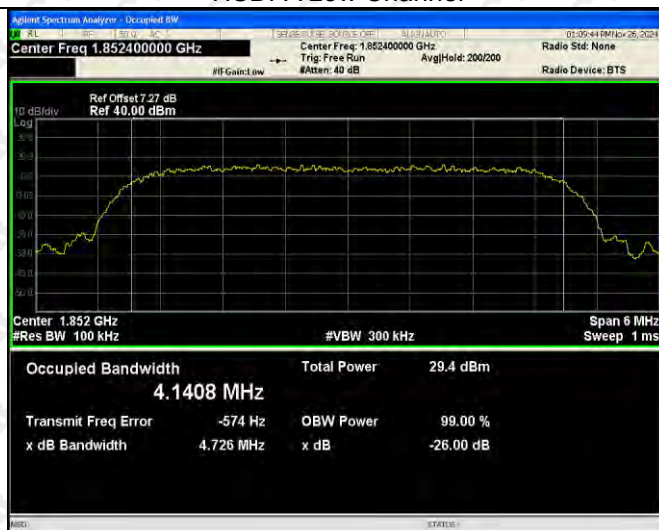
HSUPA High Channel



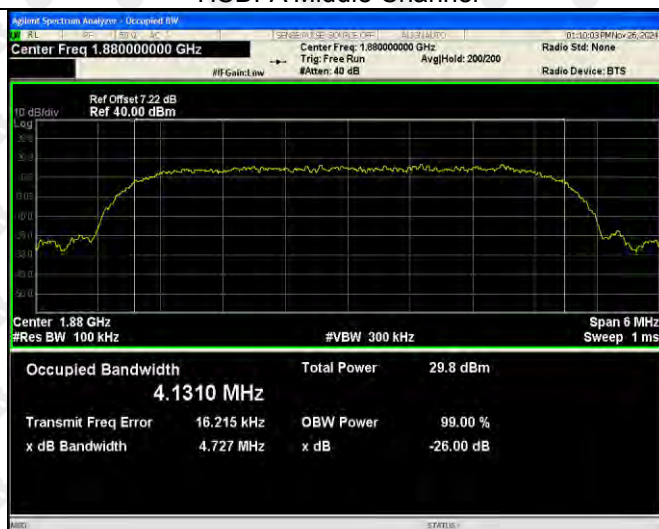
For Band II



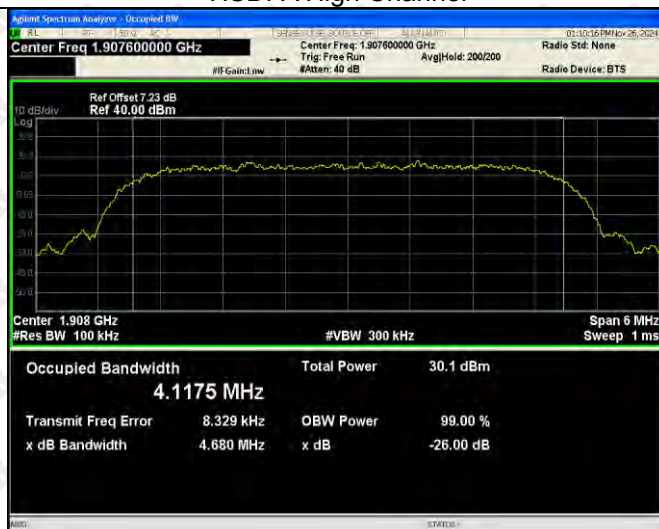
HSDPA Low Channel



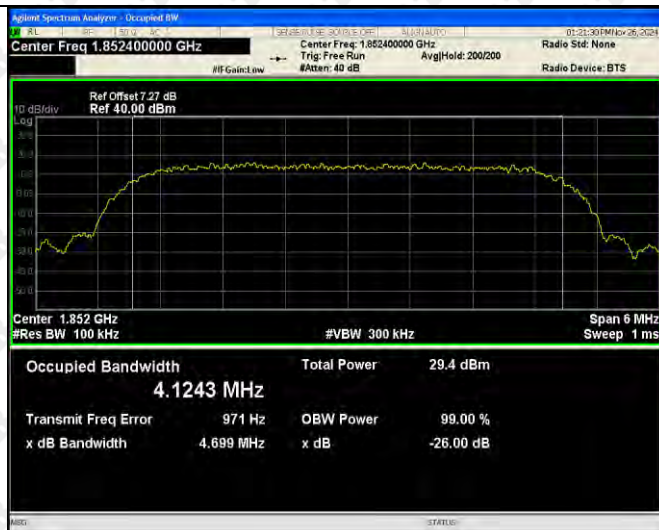
HSDPA Middle Channel



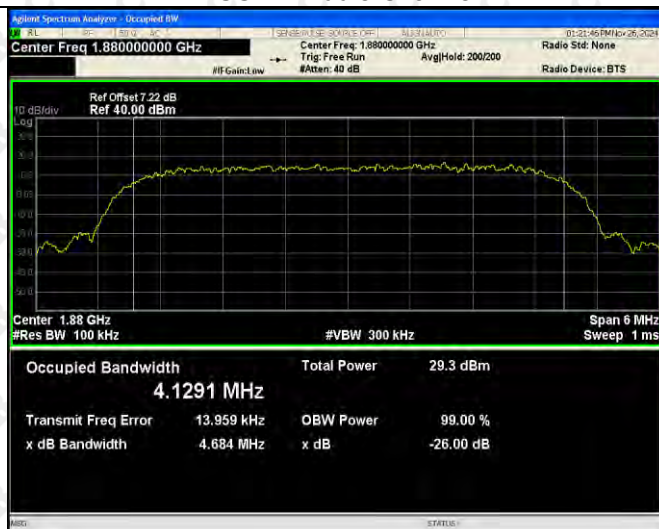
HSDPA High Channel



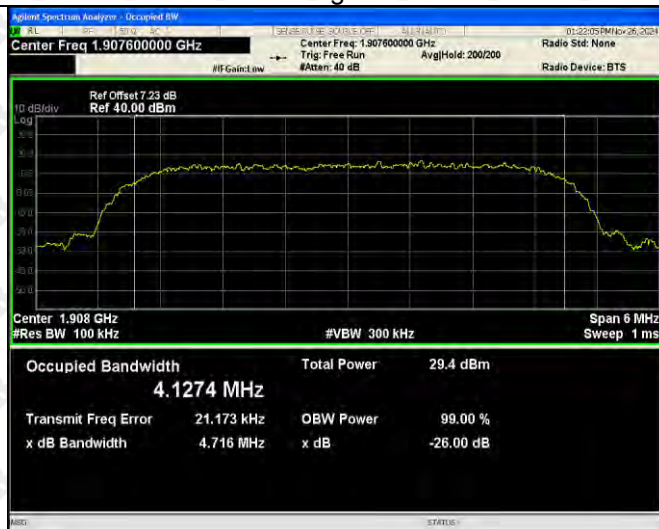
HSUPA Low Channel



HSUPA Middle Channel



HSUPA High Channel



9. OUT OF BAND EMISSIONS AT ANTENNA TERMINAL

9.1 Standard Applicable

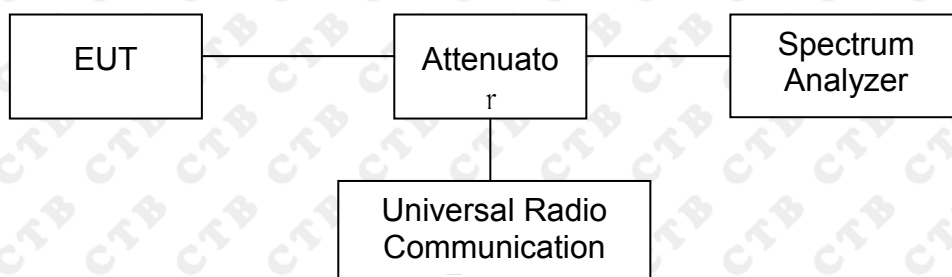
According to §22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

According to §24.238(a), the power of any emissions 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.

9.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 100kHz and 1MHz for the scan frequency from 30MHz to 1GHz and the scan frequency from 1GHz to up to 10^{th} harmonic.

Test Configuration for the out of band emissions testing:

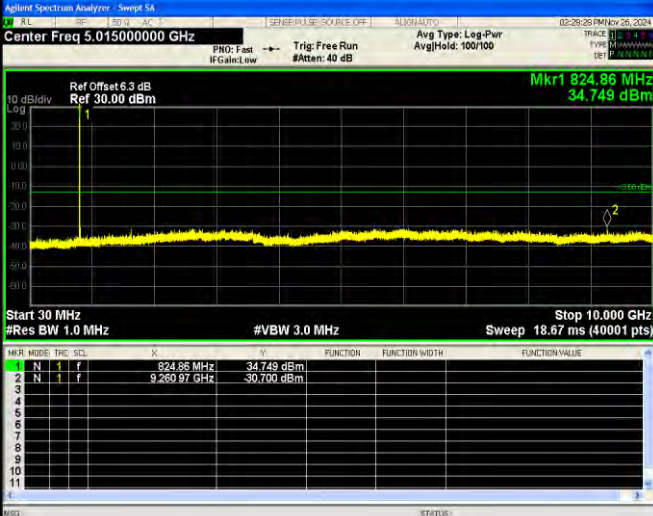
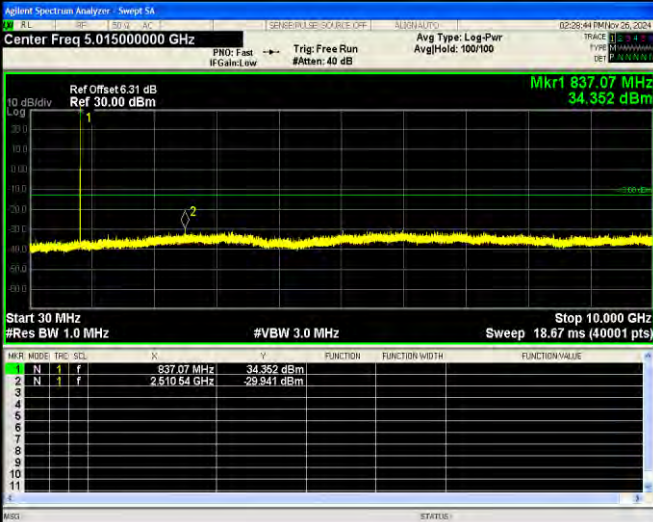
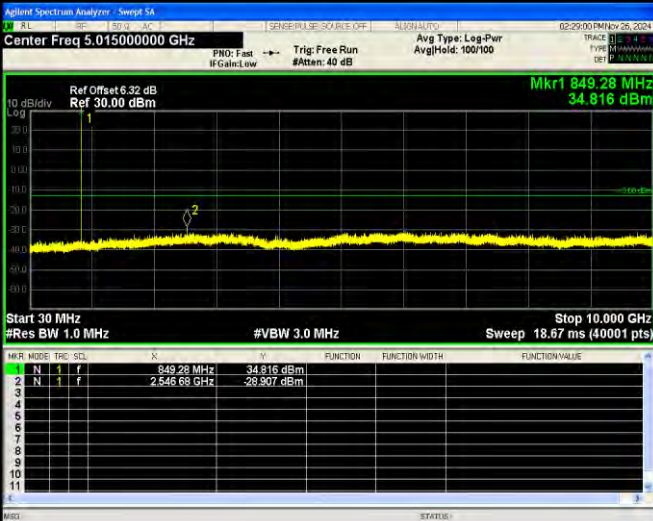


9.3 Environmental Conditions

Temperature:	23 °C
Relative Humidity:	54%
ATM Pressure:	1010 mbar

9.4 Summary of Test Results/Plots

Please refer to the following test plots
For Cellular Band

GPRS Low Channel		
GPRS Middle Channel		
GPRS High Channel		

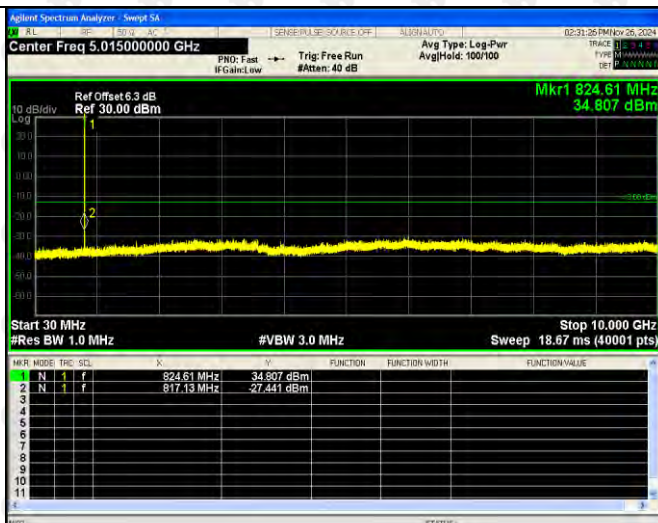
GPRS
Low
Band
Emission



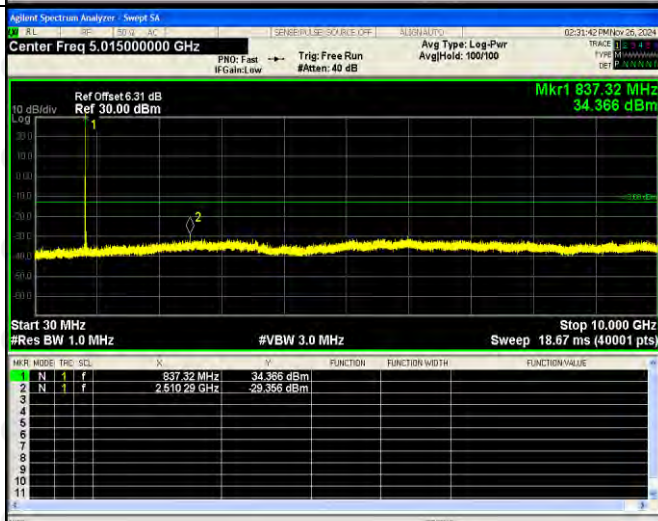
GPRS
High
Band
Emission



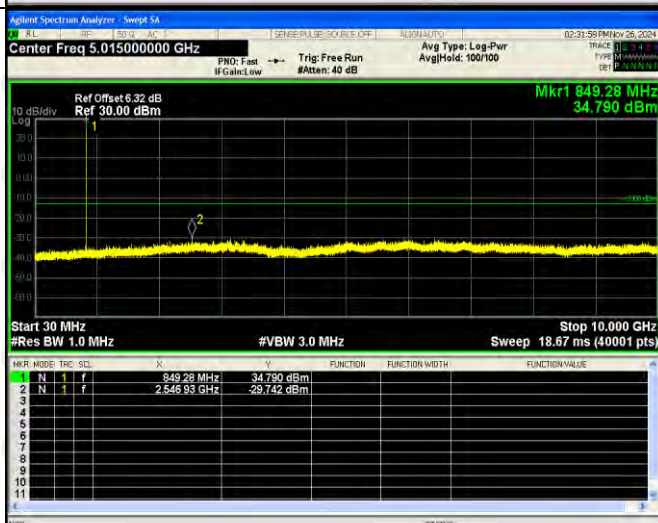
EDGE
Low
Channel



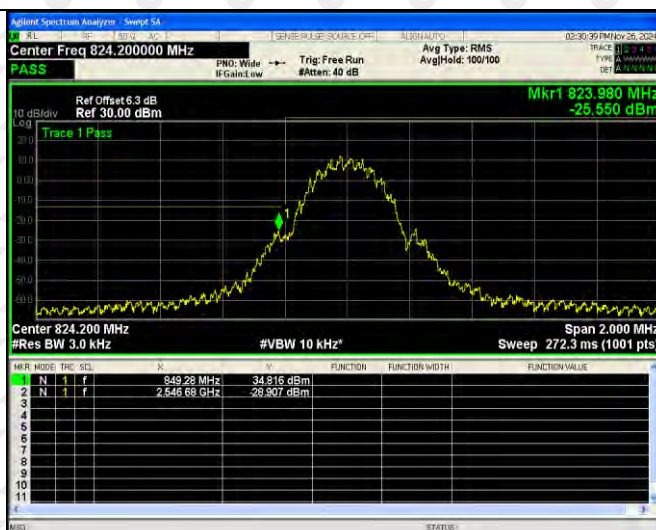
EDGE
Middle
Channel



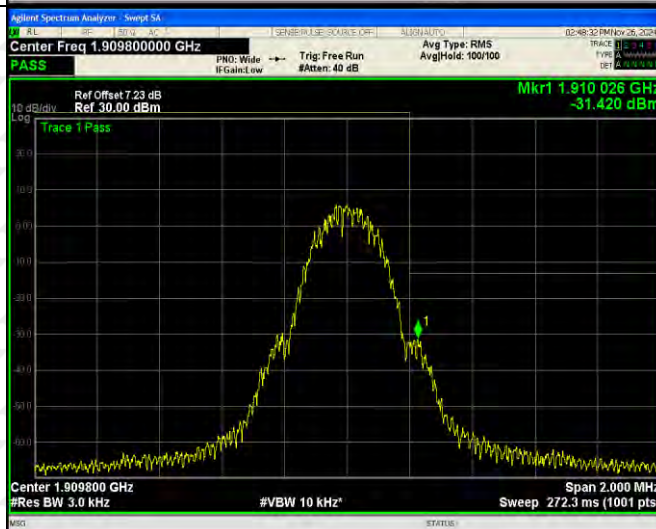
EDGE
High
Channel



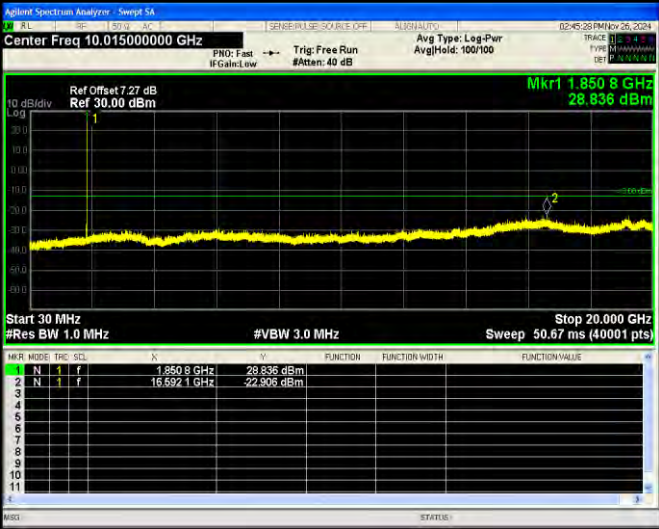
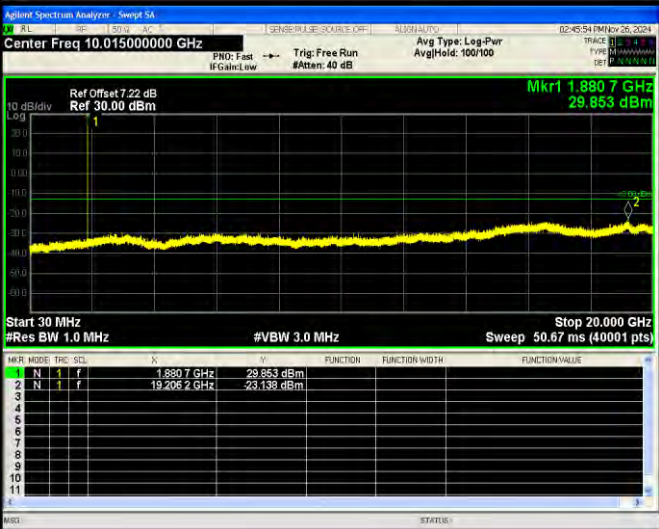
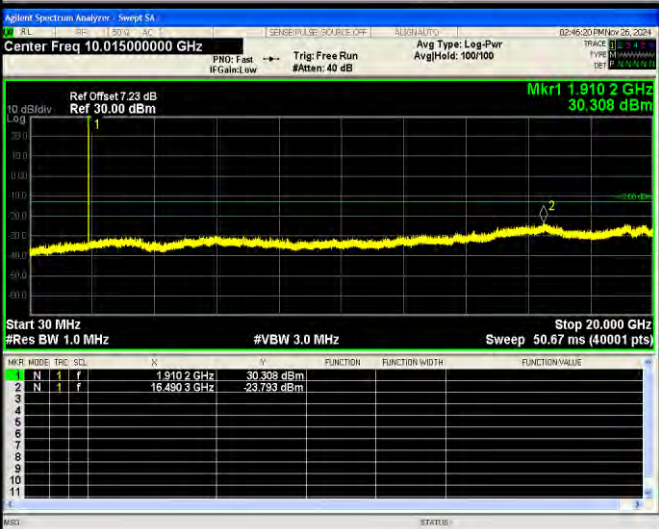
EDGE
Low
Band
Emission



EDGE
High
Band
Emission



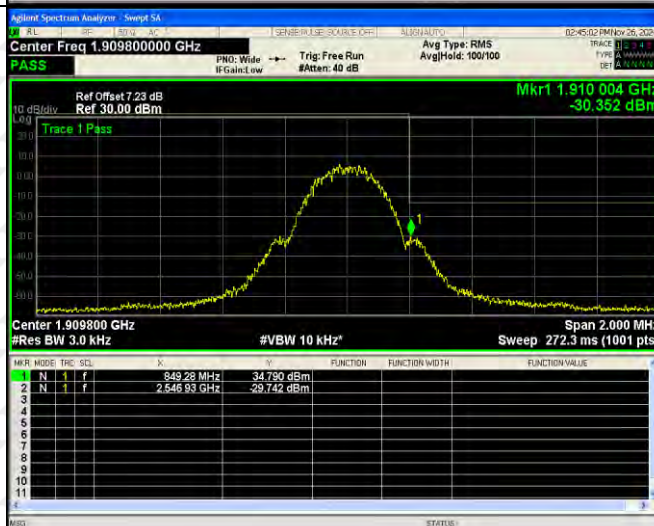
For PCS Band

GPRS Low Channel	
GPRS Middle Channel	
GPRS High Channel	

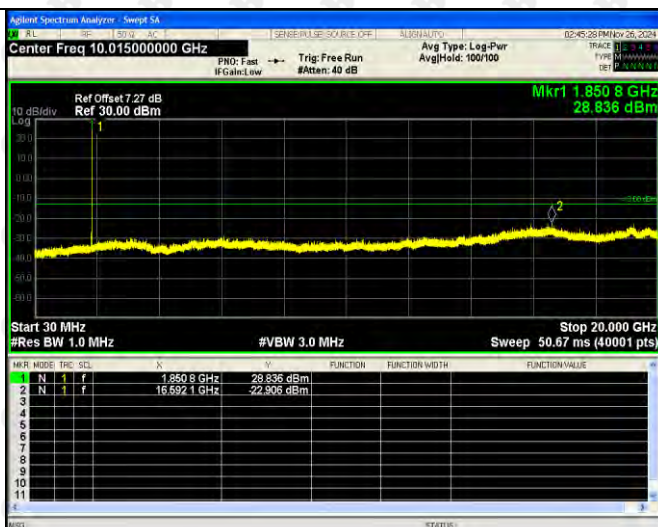
GPRS
Low
Band
Emission



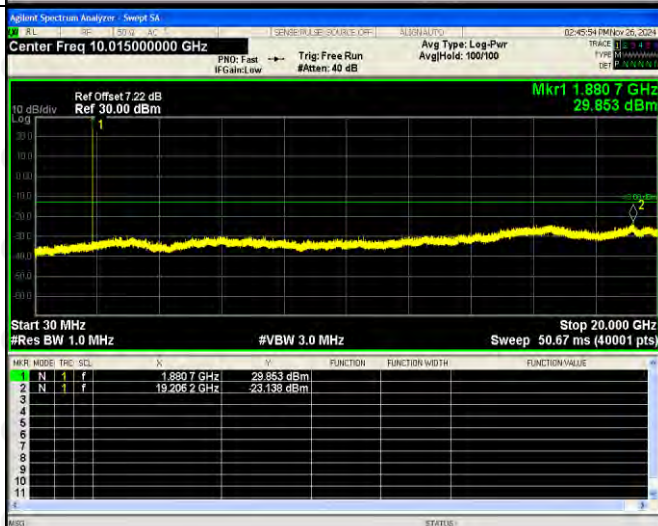
GPRS
High
Band
Emission



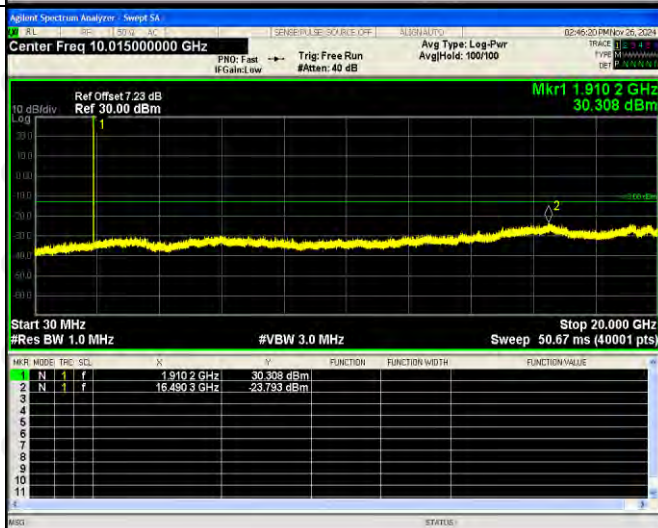
EDGE
Low
Channel



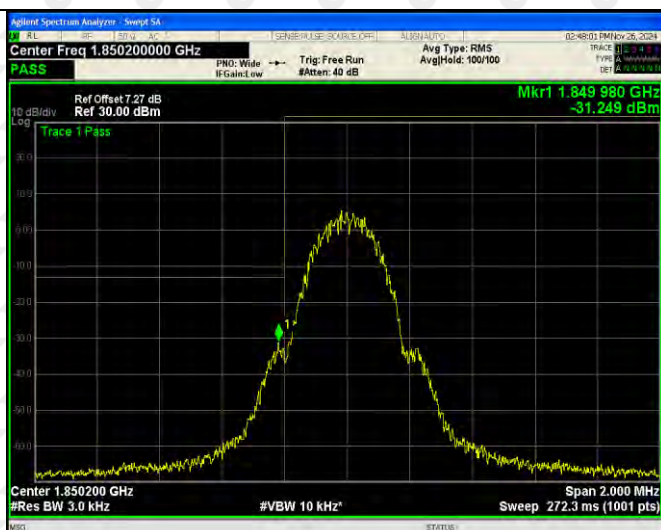
EDGE
Middle
Channel



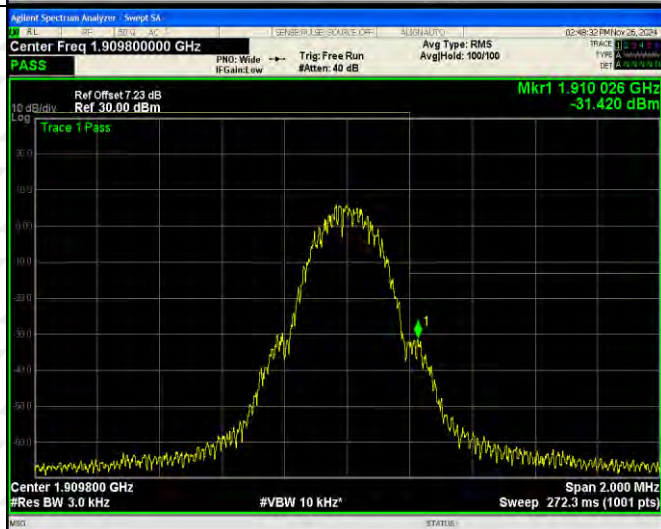
EDGE
High
Channel



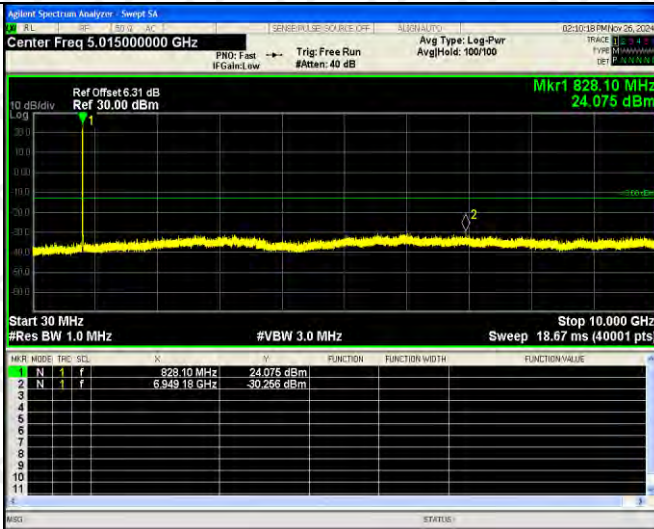
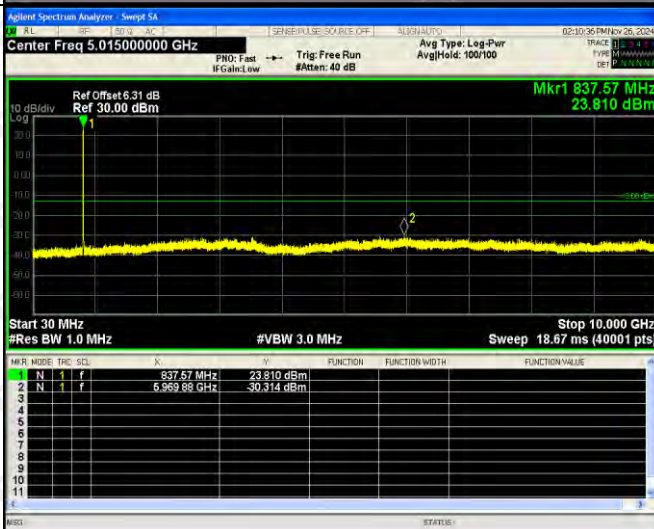
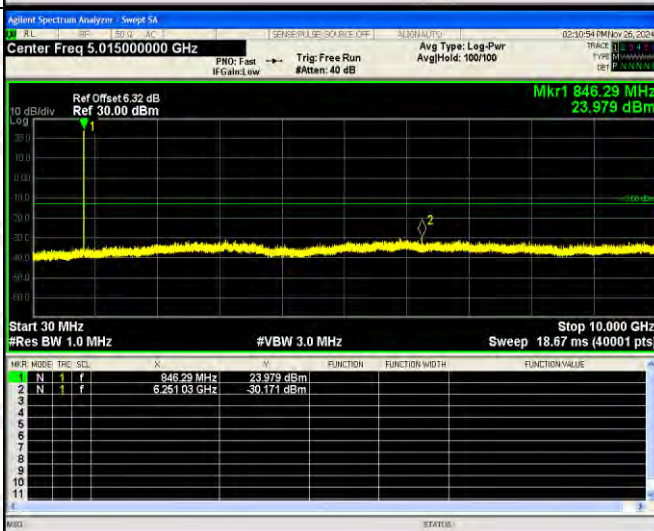
EDGE
Low
Band
Emission



EDGE
High
Band
Emission



For Band V

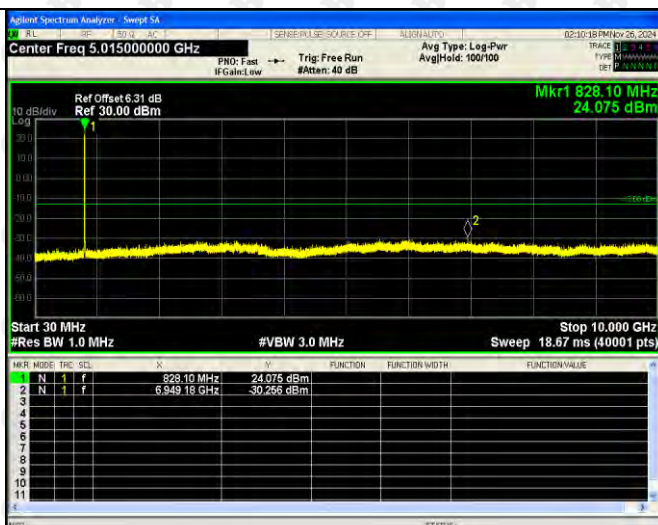
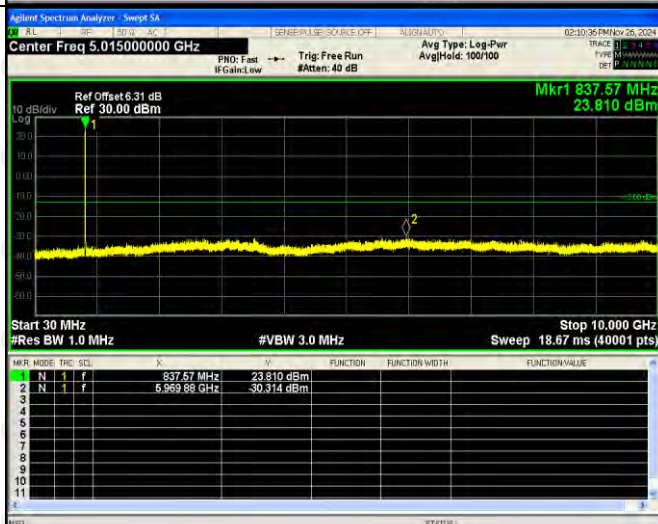
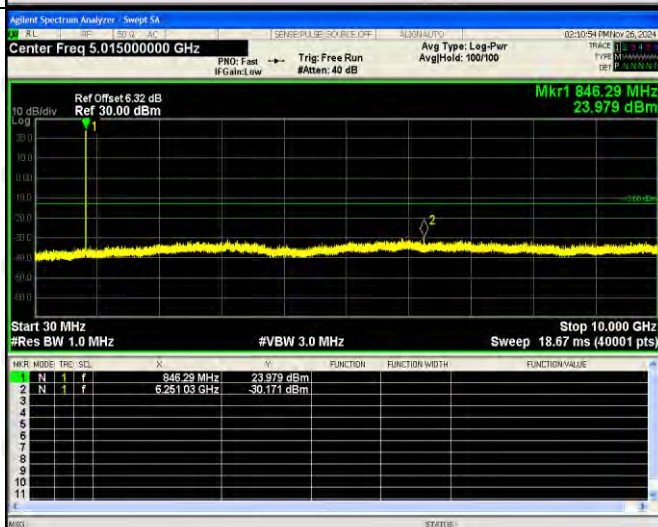
WCDMA Low Channel	 Agilent Spectrum Analyzer - Sweep SA Center Freq 5.015000000 GHz Ref Offset 6.31 dB Ref 30.00 dBm Mkr1 828.10 MHz 24.075 dBm Mkr2 6.94918 GHz -30.266 dBm Start 30 MHz #Res BW 1.0 MHz #VBW 3.0 MHz Stop 10.000 GHz Sweep 18.67 ms (40001 pts) <table><tr><th>MNR</th><th>MODE</th><th>FREQ</th><th>SC</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>828.10 MHz</td><td>f</td><td></td><td>24.075 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>6.94918 GHz</td><td>f</td><td></td><td>-30.266 dBm</td><td></td><td></td><td></td></tr></table>	MNR	MODE	FREQ	SC	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	828.10 MHz	f		24.075 dBm				2	N	6.94918 GHz	f		-30.266 dBm				
MNR	MODE	FREQ	SC	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																					
1	N	828.10 MHz	f		24.075 dBm																								
2	N	6.94918 GHz	f		-30.266 dBm																								
WCDMA Middle Channel	 Agilent Spectrum Analyzer - Sweep SA Center Freq 5.015000000 GHz Ref Offset 6.31 dB Ref 30.00 dBm Mkr1 837.57 MHz 23.810 dBm Mkr2 6.96988 GHz -30.314 dBm Start 30 MHz #Res BW 1.0 MHz #VBW 3.0 MHz Stop 10.000 GHz Sweep 18.67 ms (40001 pts) <table><tr><th>MNR</th><th>MODE</th><th>FREQ</th><th>SC</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>837.57 MHz</td><td>f</td><td></td><td>23.810 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>6.96988 GHz</td><td>f</td><td></td><td>-30.314 dBm</td><td></td><td></td><td></td></tr></table>	MNR	MODE	FREQ	SC	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	837.57 MHz	f		23.810 dBm				2	N	6.96988 GHz	f		-30.314 dBm				
MNR	MODE	FREQ	SC	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																					
1	N	837.57 MHz	f		23.810 dBm																								
2	N	6.96988 GHz	f		-30.314 dBm																								
WCDMA High Channel	 Agilent Spectrum Analyzer - Sweep SA Center Freq 5.015000000 GHz Ref Offset 6.32 dB Ref 30.00 dBm Mkr1 846.29 MHz 23.979 dBm Mkr2 6.28103 GHz -30.171 dBm Start 30 MHz #Res BW 1.0 MHz #VBW 3.0 MHz Stop 10.000 GHz Sweep 18.67 ms (40001 pts) <table><tr><th>MNR</th><th>MODE</th><th>FREQ</th><th>SC</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>846.29 MHz</td><td>f</td><td></td><td>23.979 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>6.28103 GHz</td><td>f</td><td></td><td>-30.171 dBm</td><td></td><td></td><td></td></tr></table>	MNR	MODE	FREQ	SC	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	846.29 MHz	f		23.979 dBm				2	N	6.28103 GHz	f		-30.171 dBm				
MNR	MODE	FREQ	SC	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																					
1	N	846.29 MHz	f		23.979 dBm																								
2	N	6.28103 GHz	f		-30.171 dBm																								

WCDMA
Low
Band
Spurious
Emission



WCDMA
High
Band
Spurious
Emission



HSDPA
Low
Channel

HSDPA
Middle
Channel

HSDPA
High
Channel


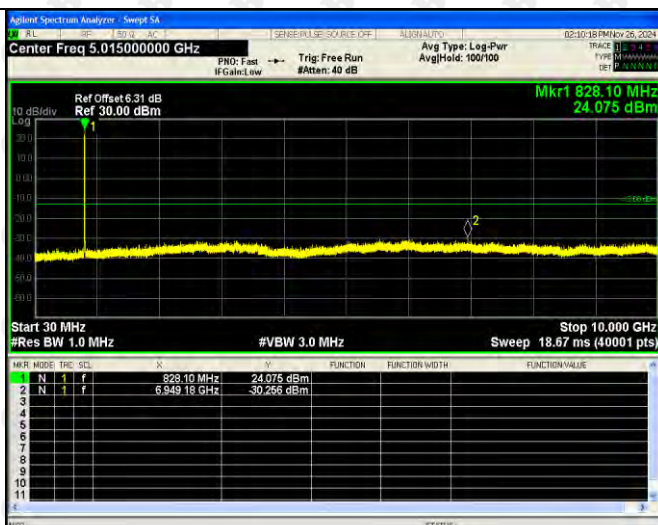
HSDPA
Low
Band
Spurious
Emission



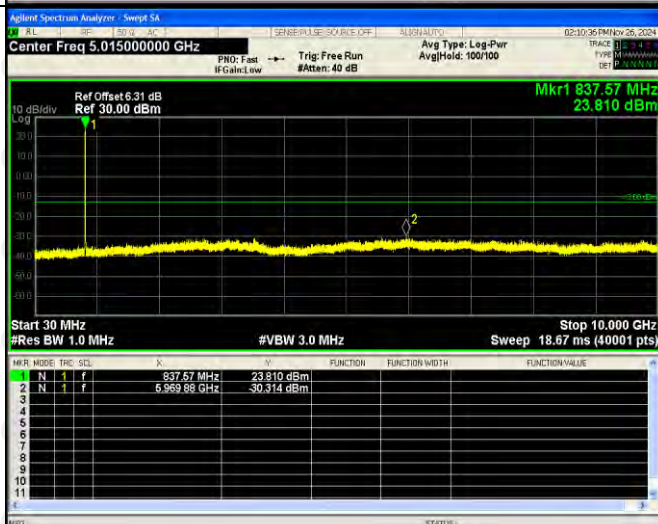
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High
Band
Spurious
Emission



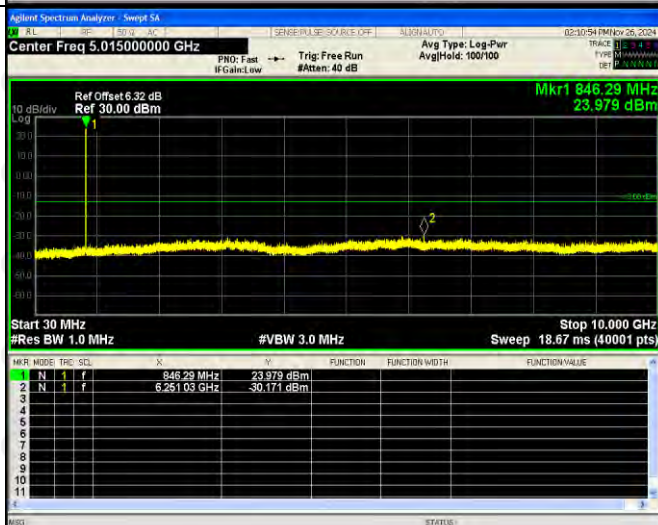
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Low
Channel



HSUPA
Middle
Channel

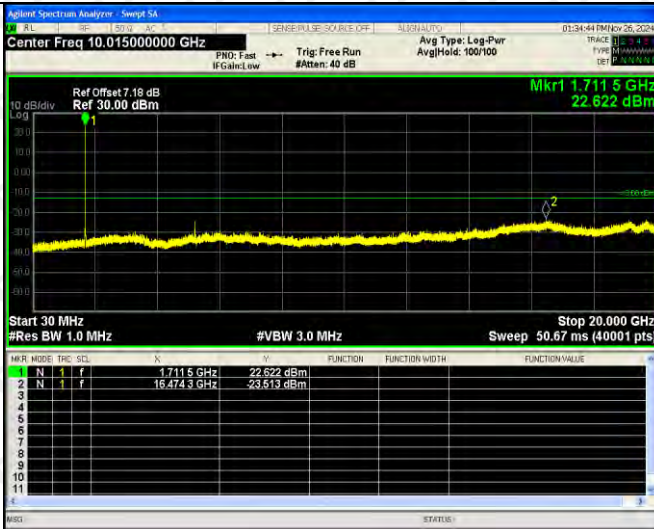
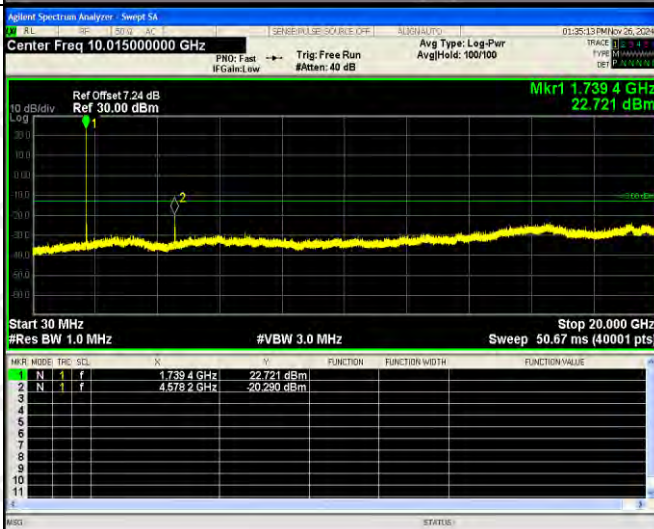
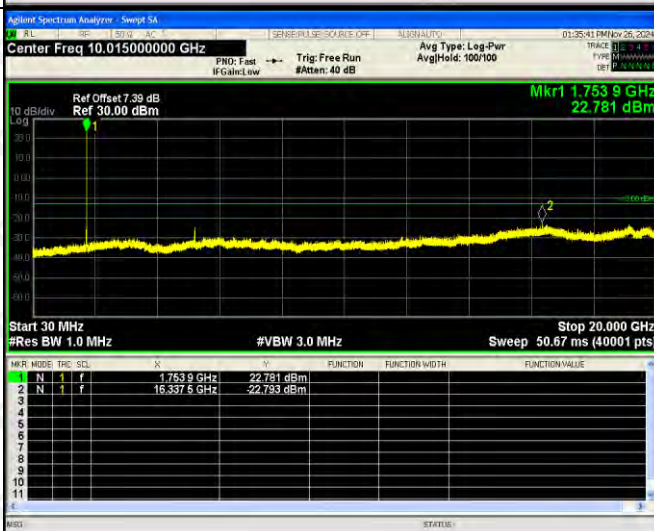


HSUPA
High
Channel



HSUPA Low Band Spurious Emission		
HSUPA High Band Spurious Emission		

For Band IV

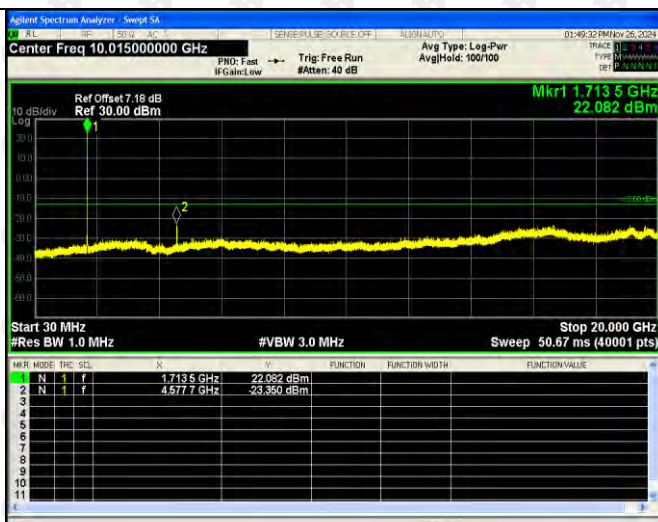
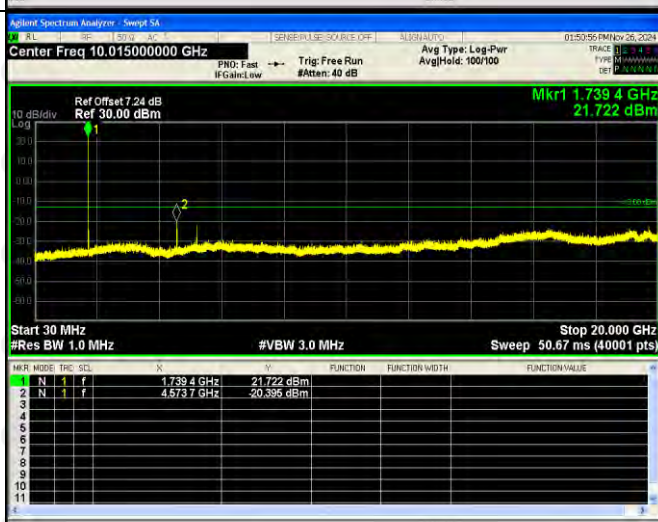
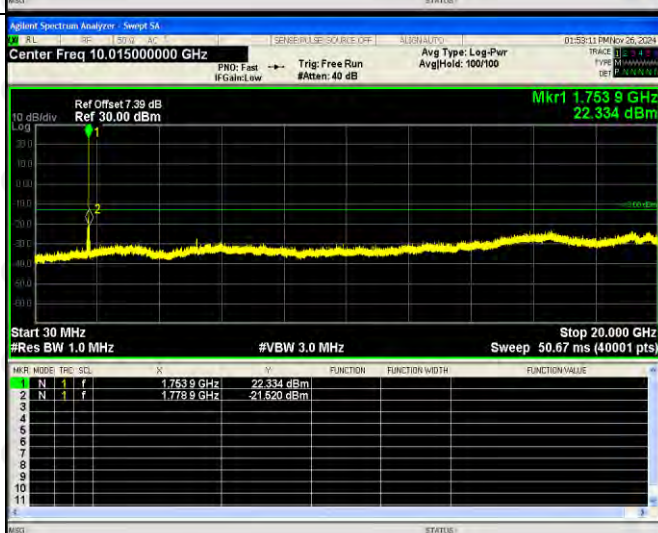
WCDMA Low Channel	 Agilent Spectrum Analyzer - Sweep SA Center Freq 10.015000000 GHz Ref Offset 7.18 dB Ref 30.00 dBm Mkr1 1.7115 GHz 22.622 dBm Start 30 MHz #Res BW 1.0 MHz #VBW 3.0 MHz Stop 20.000 GHz Sweep 50.67 ms (40001 pts) <table><tr><th>MNR</th><th>MODE</th><th>FREQ</th><th>SC</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>1.7115 GHz</td><td>22.622 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>16.4743 GHz</td><td>-23.613 dBm</td><td></td><td></td><td></td></tr></table>	MNR	MODE	FREQ	SC	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	1	f	1.7115 GHz	22.622 dBm				2	N	1	f	16.4743 GHz	-23.613 dBm			
MNR	MODE	FREQ	SC	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																				
1	N	1	f	1.7115 GHz	22.622 dBm																							
2	N	1	f	16.4743 GHz	-23.613 dBm																							
WCDMA Middle Channel	 Agilent Spectrum Analyzer - Sweep SA Center Freq 10.015000000 GHz Ref Offset 7.24 dB Ref 30.00 dBm Mkr1 1.7394 GHz 22.721 dBm Start 30 MHz #Res BW 1.0 MHz #VBW 3.0 MHz Stop 20.000 GHz Sweep 50.67 ms (40001 pts) <table><tr><th>MNR</th><th>MODE</th><th>FREQ</th><th>SC</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>1.7394 GHz</td><td>22.721 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>4.6782 GHz</td><td>-20.290 dBm</td><td></td><td></td><td></td></tr></table>	MNR	MODE	FREQ	SC	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	1	f	1.7394 GHz	22.721 dBm				2	N	1	f	4.6782 GHz	-20.290 dBm			
MNR	MODE	FREQ	SC	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																				
1	N	1	f	1.7394 GHz	22.721 dBm																							
2	N	1	f	4.6782 GHz	-20.290 dBm																							
WCDMA High Channel	 Agilent Spectrum Analyzer - Sweep SA Center Freq 10.015000000 GHz Ref Offset 7.39 dB Ref 30.00 dBm Mkr1 1.7639 GHz 22.781 dBm Start 30 MHz #Res BW 1.0 MHz #VBW 3.0 MHz Stop 20.000 GHz Sweep 50.67 ms (40001 pts) <table><tr><th>MNR</th><th>MODE</th><th>FREQ</th><th>SC</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>1.7639 GHz</td><td>22.781 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>16.3375 GHz</td><td>-22.793 dBm</td><td></td><td></td><td></td></tr></table>	MNR	MODE	FREQ	SC	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	1	f	1.7639 GHz	22.781 dBm				2	N	1	f	16.3375 GHz	-22.793 dBm			
MNR	MODE	FREQ	SC	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																				
1	N	1	f	1.7639 GHz	22.781 dBm																							
2	N	1	f	16.3375 GHz	-22.793 dBm																							

WCDMA
Low
Band
Spurious
Emission



WCDMA
High
Band
Spurious
Emission



HSDPA
Low
Channel

HSDPA
Middle
Channel

HSDPA
High
Channel


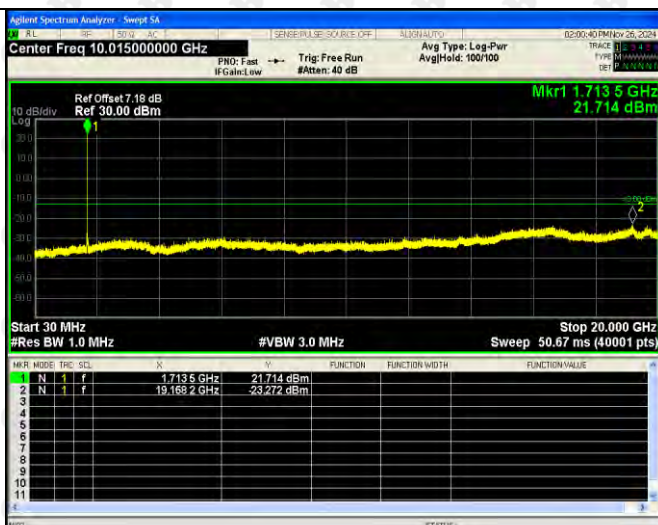
HSDPA
Low
Band
Spurious
Emission



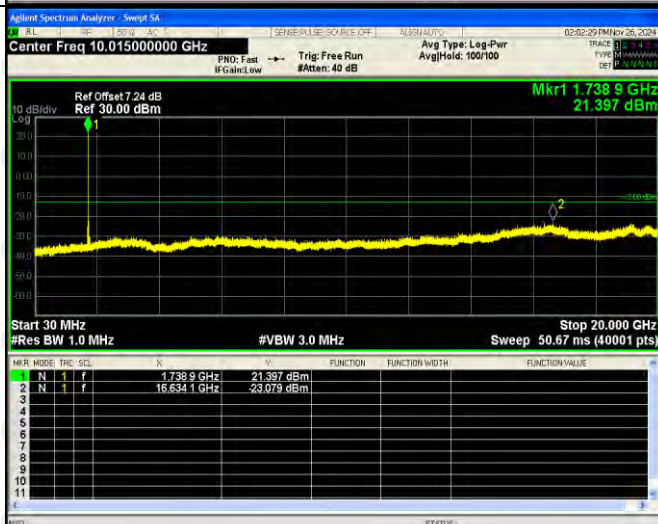
HSDPA
High
Band
Spurious
Emission



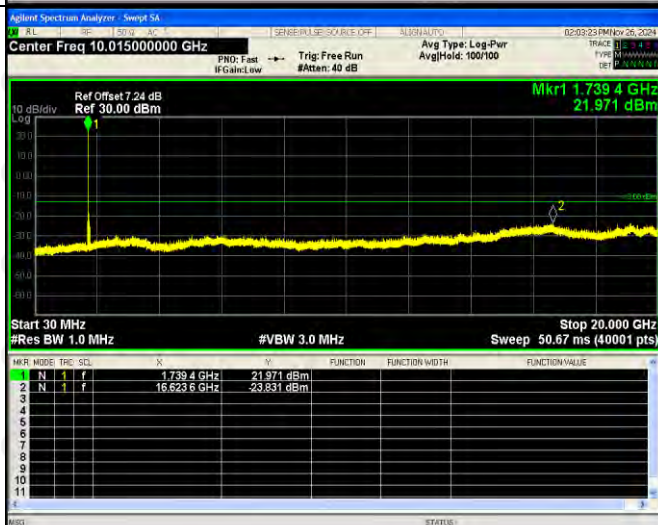
HSUPA
Low
Channel



HSUPA
Middle
Channel



HSUPA
High
Channel



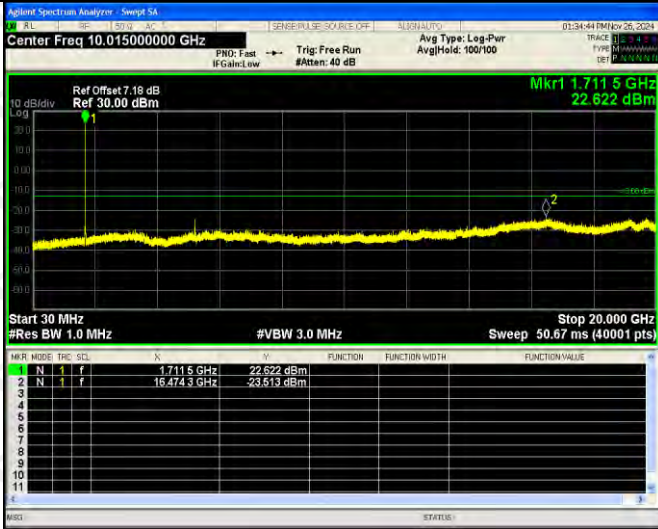
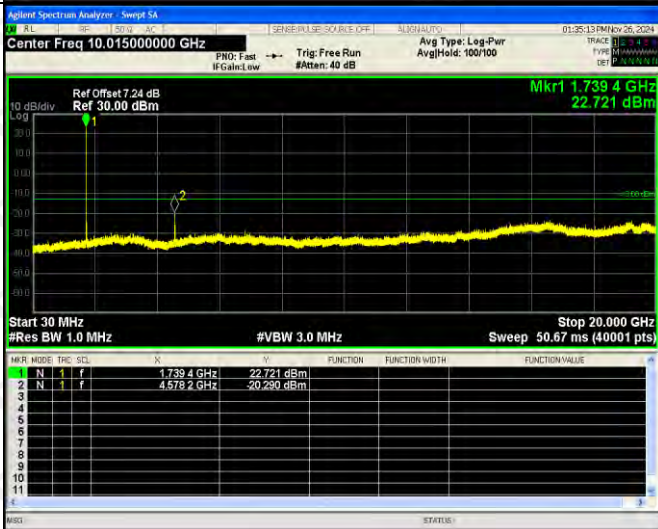
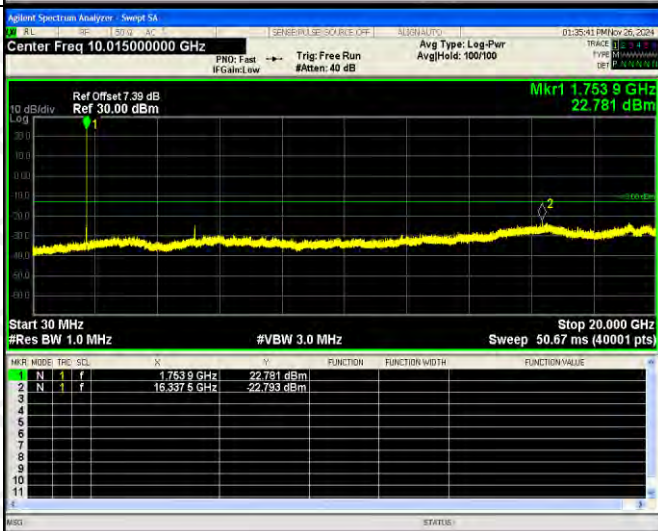
HSUPA
Low
Band
Spurious
Emission



HSUPA
High
Band
Spurious
Emission



For Band II

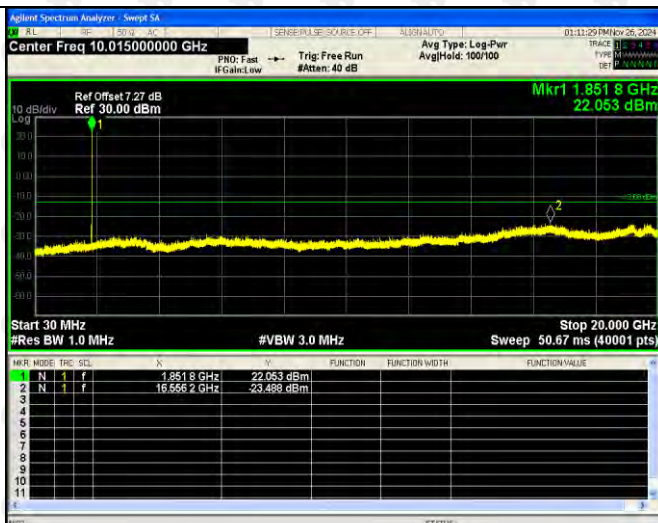
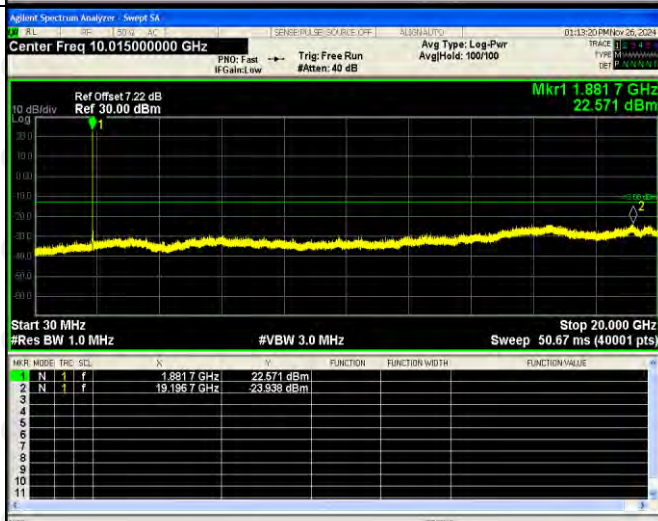
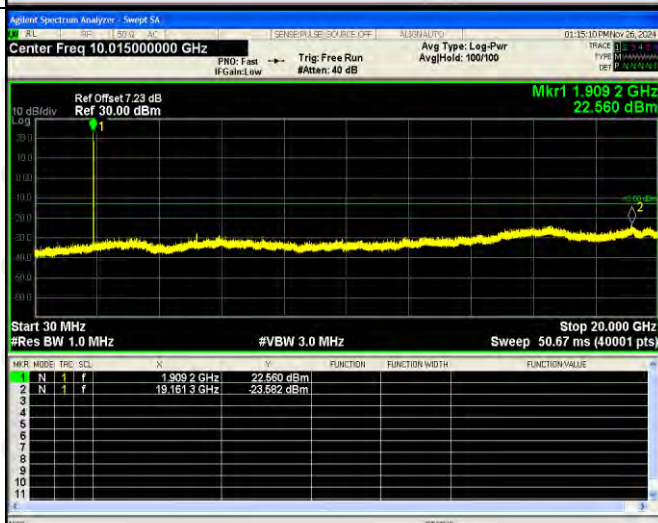
WCDMA Low Channel		
WCDMA Middle Channel		
WCDMA High Channel		

WCDMA
Low
Band
Spurious
Emission



WCDMA
High
Band
Spurious
Emission



HSDPA
Low
Channel

HSDPA
Middle
Channel

HSDPA
High
Channel


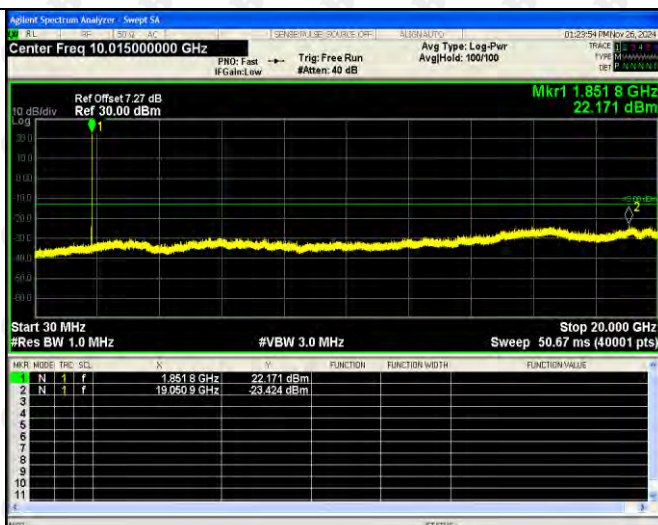
HSDPA
Low
Band
Spurious
Emission



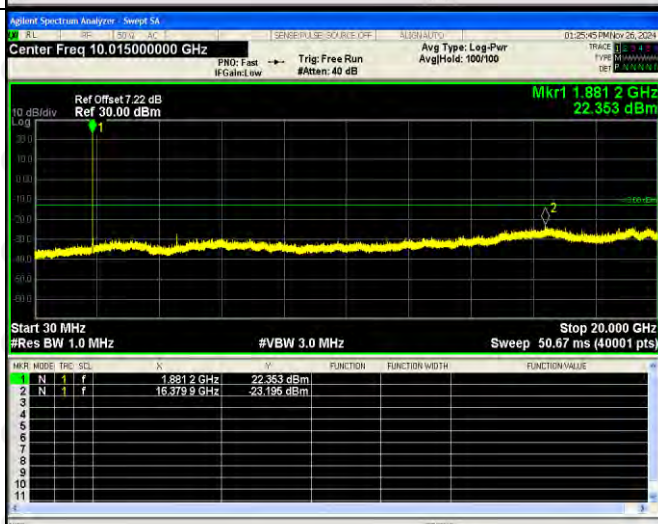
HSDPA
High
Band
Spurious
Emission



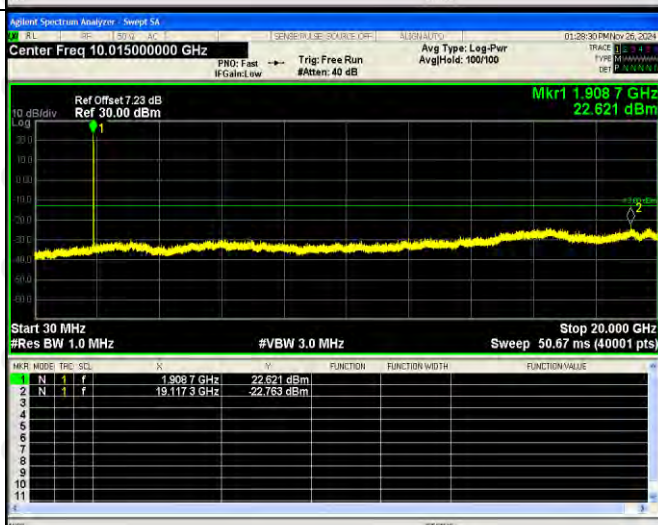
HSUPA
Low
Channel



HSUPA
Middle
Channel



HSUPA
High
Channel



HSUPA
Low
Band
Spurious
Emission



HSUPA
High
Band
Spurious
Emission



10. SPURIOUS RADIATED EMISSIONS

10.1 Standard Applicable

According to §22.917(a), the power of any emissions 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.

According to §24.238(a), the power of any emissions 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.

10.2 Test Procedure

- 1.The setup of EUT is according with per ANSI/TIA Standard 603D and ANSI C63.4-2014 measurement procedure.
- 2.The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
- 3.The frequency range up to tenth harmonic of the fundamental frequency was investigated.
- 4.Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious attenuation limit in dB $= 43 + 10 \log_{10}(\text{power out in Watts})$

10.3 Environmental Conditions

Temperature:	23 °C
Relative Humidity:	54%
ATM Pressure:	101 kPa
Test Voltage	DC6.4V

10.4 Summary of Test Results/Plots

According to the data below, the FCC Part22.917 and 24.238 standards, and had the worst margin of:

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

All test modes are performed, but only the worst case is recorded in this report.

For Cellular Band GSM850 Mode

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Low Channel (824.2MHz)						
43.18	-68.17	3.9	-64.27	-13	-51.27	H
1645.54	-57.05	4.83	-52.22	-13	-39.22	H
2465.53	-52.76	8.08	-44.68	-13	-31.68	H
40.22	-65.47	4.02	-61.45	-13	-48.45	V
1644.83	-47.45	4.48	-42.97	-13	-29.97	V
2464.57	-55.31	8.2	-47.11	-13	-34.11	V
Middle Channel (836.6MHz)						
36.48	-69.65	3.84	-65.81	-13	-52.81	H
1669.41	-51.82	4.62	-47.20	-13	-34.20	H
2506.02	-57.98	8.25	-49.73	-13	-36.73	H
39.41	-66.73	4.25	-62.48	-13	-49.48	V
1668.47	-49.38	4.54	-44.84	-13	-31.84	V
2506.12	-53.41	8.35	-45.06	-13	-29.75	V
High Channel (848.8MHz)						
45.63	-68.37	4.22	-72.59	-13	-59.59	H
1688.68	-55.26	4.87	-60.13	-13	-47.13	H
2539.02	-51.09	8.38	-59.47	-13	-46.47	H
38.34	-72.31	4.02	-76.33	-13	-63.33	V
1687.83	-49.33	4.56	-53.89	-13	-40.89	V
2538.76	-48.67	8.41	-57.08	-13	-44.08	V

For PCS Band GSM1900 Mode

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Low Channel (1850.2MHz)						
42.33	-73.66	4.34	-69.32	-13	-56.32	H
3698.51	-55.71	10.54	-45.17	-13	-32.17	H
5543.99	-54.04	13.37	-40.67	-13	-27.67	H
39.69	-73.95	4.34	-69.61	-13	-56.61	V
3699.40	-54.85	10.54	-44.31	-13	-31.31	V
5547.93	-59.34	13.37	-45.97	-13	-32.97	V
Middle Channel (1880MHz)						
39.10	-70.88	4.02	-66.86	-13	-53.86	H
3750.99	-55.44	10.71	-44.73	-13	-31.73	H
5635.54	-58.32	13.73	-44.59	-13	-31.59	H
45.95	-71.12	4.14	-66.98	-13	-53.98	V
3751.92	-50.21	10.22	-39.99	-13	-26.99	V
5632.59	-54.29	13.16	-41.13	-13	-28.13	V
High Channel (1909.8MHz)						
39.47	-69.45	4.02	-65.43	-13	-52.43	H
3811.09	-59.29	4.9	-54.39	-13	-41.39	H
5721.31	-50.40	8.09	-42.31	-13	-29.31	H
37.59	-61.10	4.25	-56.85	-13	-43.85	V
3814.23	-56.00	4.93	-51.07	-13	-38.07	V
5719.60	-64.28	8.43	-55.85	-13	-42.85	V

For Band 5 Mode

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Low Channel (826.4MHz)						
39.59	-74.97	3.91	-71.06	-13	-58.06	H
1647.20	-59.12	10.56	-48.56	-13	-35.56	H
2475.15	-56.65	13.5	-43.15	-13	-30.15	H
43.67	-72.53	3.93	-68.60	-13	-55.60	V
1647.88	-58.34	10.41	-47.93	-13	-34.93	V
2477.93	-55.23	13.16	-42.07	-13	-29.07	V
Middle Channel (836.6MHz)						
46.13	-75.24	4.02	-71.22	-13	-58.22	H
1663.64	-60.18	4.66	-55.52	-13	-42.52	H
2502.70	-45.63	8.34	-37.29	-13	-24.29	H
38.34	-58.11	4.17	-53.94	-13	-40.94	V
1664.90	-55.98	4.94	-51.04	-13	-38.04	V
2504.08	-64.14	8.19	-55.95	-13	-42.95	V
High Channel (846.6MHz)						
40.84	-73.91	3.87	-70.04	-13	-57.04	H
1689.67	-62.83	4.89	-57.94	-13	-44.94	H
2531.54	-49.44	8.42	-41.02	-13	-28.02	H
46.27	-53.96	3.95	-50.01	-13	-37.01	V
1686.77	-58.18	4.99	-53.19	-13	-40.19	V
2537.87	-64.60	8.12	-56.48	-13	-43.48	V

For Band 4Mode

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Low Channel (1712.4MHz)						
39.58	-67.53	3.91	-63.62	-13	-50.62	H
3415.12	-57.06	10.56	-46.50	-13	-33.50	H
5134.40	-56.03	13.5	-42.53	-13	-29.53	H
38.54	-71.76	3.93	-67.83	-13	-54.83	V
3420.52	-50.60	10.41	-40.19	-13	-27.19	V
5134.30	-57.33	13.16	-44.17	-13	-31.17	V
Middle Channel (1740 MHz)						
43.89	-74.50	4.02	-70.48	-13	-57.48	H
3474.28	-61.90	4.66	-57.24	-13	-44.24	H
5211.73	-44.72	8.34	-36.38	-13	-23.38	H
45.34	-54.56	4.17	-50.39	-13	-37.39	V
3471.25	-63.49	4.94	-58.55	-13	-45.55	V
5210.96	-60.02	8.19	-51.83	-13	-38.83	V
High Channel (1752.6MHz)						
38.57	-66.59	3.87	-62.72	-13	-49.72	H
3502.91	-62.36	4.89	-57.47	-13	-44.47	H
5248.55	-41.17	8.42	-32.75	-13	-19.75	H
36.49	-60.18	3.95	-56.23	-13	-43.23	V
3502.33	-64.35	4.99	-59.36	-13	-46.36	V
5250.45	-65.01	8.12	-56.89	-13	-43.89	V

For Band 2 Mode

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Low Channel (1852.4MHz)						
40.09	-73.55	3.91	-69.64	-13	-56.64	H
3700.58	-58.96	10.56	-48.40	-13	-35.40	H
5557.04	-57.37	13.5	-43.87	-13	-30.87	H
44.00	-66.01	3.93	-62.08	-13	-49.08	V
3695.23	-53.61	10.41	-43.20	-13	-30.20	V
5550.01	-55.49	13.16	-42.33	-13	-29.33	V
Middle Channel (1880MHz)						
36.35	-66.86	4.02	-62.84	-13	-49.84	H
3756.48	-62.11	4.66	-57.45	-13	-44.45	H
5638.50	-45.37	8.34	-37.03	-13	-24.03	H
40.38	-56.97	4.17	-52.80	-13	-39.80	V
3756.53	-59.95	4.94	-55.01	-13	-42.01	V
5636.56	-62.52	8.19	-54.33	-13	-41.33	V
High Channel (1907.6MHz)						
43.08	-67.47	3.87	-63.60	-13	-50.60	H
3814.55	-56.42	4.89	-51.53	-13	-38.53	H
5712.99	-43.57	8.42	-35.15	-13	-22.15	H
39.35	-56.14	3.95	-52.19	-13	-39.19	V
3807.03	-56.52	4.99	-51.53	-13	-38.53	V
5720.46	-59.83	8.12	-51.71	-13	-38.71	V

Note: Result=Reading+ Correct, Margin= Result- Limit

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

11. FREQUENCY STABILITY

11.1 Standard Applicable

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

Frequency Tolerance for Cellular Band

Frequency range (MHz)	Base, fixed (ppm)	Mobile >3 watts (ppm)	Mobile ≤3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	N/A	N/A
929 to 960	1.5	N/A	N/A
2110 to 2220	10.0	N/A	N/A

According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

According to §27.54 The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

11.2 Test Procedure

According to §2.1055, the following test procedure was performed.

The Frequency Stability is measured directly with a Frequency Domain Analyzer. Frequency Deviation in ppm is calculated from the measured peak to peak value.

The Carrier Frequency Stability over Power Supply Voltage and over Temperature is measured with a Frequency Domain Analyzer in histogram mode

11.3 Environmental Conditions

Temperature:	23°C
Relative Humidity:	54%
ATM Pressure:	101kPa

11.4 Summary of Test Results/Plots

For Cellular Band GPRS Mode

Reference Frequency(Middle Channel): 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	NV	8.44	0.01009
40	NV	8.79	0.01051
30	NV	9.74	0.01165
20	NV	9.16	0.01095
10	NV	9.85	0.01177
0	NV	10.66	0.01275
-10	NV	9.96	0.01191
-20	NV	10.23	0.01223
-30	NV	10.46	0.01250

For PCS Band GPRS Mode

Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	NV	12.33	0.00656
40	NV	12.76	0.00679
30	NV	12.26	0.00652
20	NV	12.82	0.00682
10	NV	13.51	0.00718
0	NV	14.06	0.00748
-10	NV	13.60	0.00724
-20	NV	14.49	0.00771
-30	NV	14.25	0.00758

For Cellular Band EDGE Mode

Reference Frequency(Middle Channel): 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	NV	11.11	0.01328
40	NV	11.51	0.01376
30	NV	11.79	0.01409
20	NV	12.02	0.01437
10	NV	11.77	0.01407
0	NV	11.69	0.01397
-10	NV	11.60	0.01387
-20	NV	12.55	0.01500
-30	NV	12.87	0.01538

For PCS Band EDGE Mode

Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	NV	-10.65	-0.00567
40	NV	-9.72	-0.00517
30	NV	-9.33	-0.00496
20	NV	-9.67	-0.00514
10	NV	-9.12	-0.00485
0	NV	-9.21	-0.00490
-10	NV	-8.12	-0.00432
-20	NV	-7.74	-0.00412
-30	NV	-7.86	-0.00418

For WCDMA Band 5 Mode

Reference Frequency(Middle Channel): 836.6 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	NV	0.36	0.00043
40	NV	0.54	0.00065
30	NV	0.65	0.00078
20	NV	0.84	0.00101
10	NV	1.00	0.00119
0	NV	0.76	0.00090
-10	NV	1.10	0.00132
-20	NV	1.41	0.00168
-30	NV	1.18	0.00141

For WCDMA Band 4Mode

Reference Frequency(Middle Channel): 1740 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	NV	-0.28	-0.00016
40	NV	0.24	0.00029
30	NV	0.72	0.00086
20	NV	1.13	0.00136
10	NV	0.98	0.00117
0	NV	0.83	0.00099
-10	NV	1.19	0.00143
-20	NV	1.36	0.00162
-30	NV	1.18	0.00141

For WCDMA Band 2 Mode

Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	NV	-0.27	-0.00014
40	NV	0.47	0.00025
30	NV	0.26	0.00014
20	NV	0.33	0.00017
10	NV	1.02	0.00054
0	NV	1.39	0.00074
-10	NV	0.71	0.00038
-20	NV	1.46	0.00078
-30	NV	1.08	0.00057

For HSDPA Band 5 Mode

Reference Frequency(Middle Channel): 836.6 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	NV	0.25	0.00030
40	NV	-0.16	-0.00019
30	NV	-0.10	-0.00012
20	NV	0.84	0.00101
10	NV	0.30	0.00036
0	NV	0.94	0.00113
-10	NV	0.54	0.00065
-20	NV	1.29	0.00154
-30	NV	1.32	0.00158

For HSDPA Band 4Mode

Reference Frequency(Middle Channel): 1740 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	NV	-0.07	-0.00004
40	NV	0.09	0.00011
30	NV	-0.01	-0.00001
20	NV	0.73	0.00087
10	NV	0.85	0.00102
0	NV	0.85	0.00101
-10	NV	0.64	0.00077
-20	NV	1.24	0.00148
-30	NV	1.31	0.00157

For HSDPA Band 2 Mode

Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	NV	4.69	0.00249
40	NV	4.49	0.00239
30	NV	4.25	0.00226
20	NV	5.61	0.00298
10	NV	5.55	0.00295
0	NV	6.21	0.00330
-10	NV	6.32	0.00336
-20	NV	6.02	0.00320
-30	NV	5.92	0.00315

For HSUPA Band 5 Mode

Reference Frequency(Middle Channel): 836.6 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	NV	0.30	0.00017
40	NV	0.24	0.00014
30	NV	0.00	0.00000
20	NV	0.71	0.00041
10	NV	0.49	0.00028
0	NV	1.16	0.00067
-10	NV	0.84	0.00049
-20	NV	1.40	0.00081
-30	NV	1.71	0.00099

For HSUPA Band 4Mode

Reference Frequency(Middle Channel): 1740 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	NV	0.33	0.00019
40	NV	1.12	0.00133
30	NV	0.56	0.00067
20	NV	1.34	0.00160
10	NV	0.87	0.00103
0	NV	2.08	0.00248
-10	NV	1.23	0.00147
-20	NV	2.28	0.00272
-30	NV	2.47	0.00296

For HSUPA Band 2 Mode

Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	NV	0.78	0.00045
40	NV	1.18	0.00068
30	NV	0.45	0.00026
20	NV	0.62	0.00036
10	NV	1.76	0.00101
0	NV	1.45	0.00084
-10	NV	1.98	0.00114
-20	NV	1.87	0.00108
-30	NV	2.45	0.00142

So, Frequency Stability Versus Input Voltage is:

Reference Frequency(Middle Channel): GPRS 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	LV	10.87	0.01299
	NV	11.68	0.01396
	HV	11.21	0.01340
Reference Frequency(Middle Channel): GPRS 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	LV	14.90	0.00793
	NV	14.55	0.00774
	HV	14.26	0.00759

Reference Frequency(Middle Channel): EDGE 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	LV	12.71	0.01521
	NV	13.36	0.01598
	HV	13.86	0.01658
Reference Frequency(Middle Channel): EDGE 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	LV	-7.54	-0.00401
	NV	-8.06	-0.00429
	HV	-7.78	-0.00414

Reference Frequency(Middle Channel): WCDMA 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	LV	1.36	0.00163
	NV	1.22	0.00145
	HV	1.90	0.00227
Reference Frequency(Middle Channel): WCDMA 1732.4MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	LV	1.61	0.00093
	NV	0.93	0.00054
	HV	1.32	0.00076
Reference Frequency(Middle Channel): WCDMA 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	LV	2.45	0.00130
	NV	2.29	0.00273
	HV	3.34	0.00399

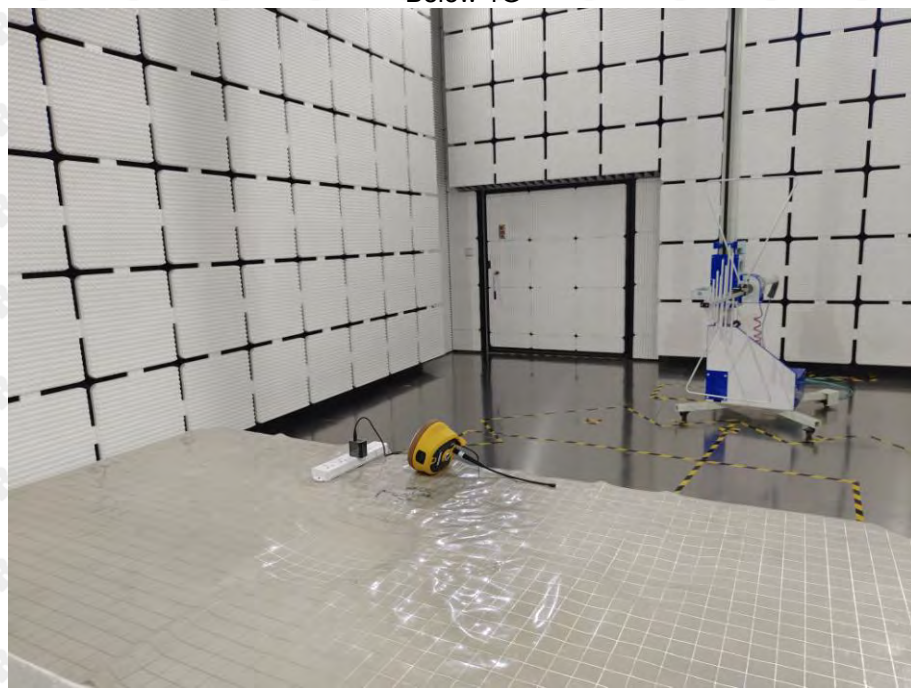
Reference Frequency(Middle Channel): HSDPA 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	LV	2.03	0.00242
	NV	1.90	0.00227
	HV	2.20	0.00263
Reference Frequency(Middle Channel): HSDPA 1732.4MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	LV	5.67	0.00327
	NV	6.64	0.00383
	HV	6.42	0.00370
Reference Frequency(Middle Channel): HSDPA 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	LV	7.22	0.00384
	NV	7.42	0.00394
	HV	7.63	0.00406

Reference Frequency(Middle Channel): HSUPA 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	LV	2.80	0.00335
	NV	2.55	0.00305
	HV	2.66	0.00318
Reference Frequency(Middle Channel): HSUPA 1732.4MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	LV	5.64	0.00325
	NV	5.42	0.00313
	HV	6.28	0.00363
Reference Frequency(Middle Channel): HSUPA 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	LV	8.66	0.00461
	NV	8.77	0.00467
	HV	9.28	0.00493

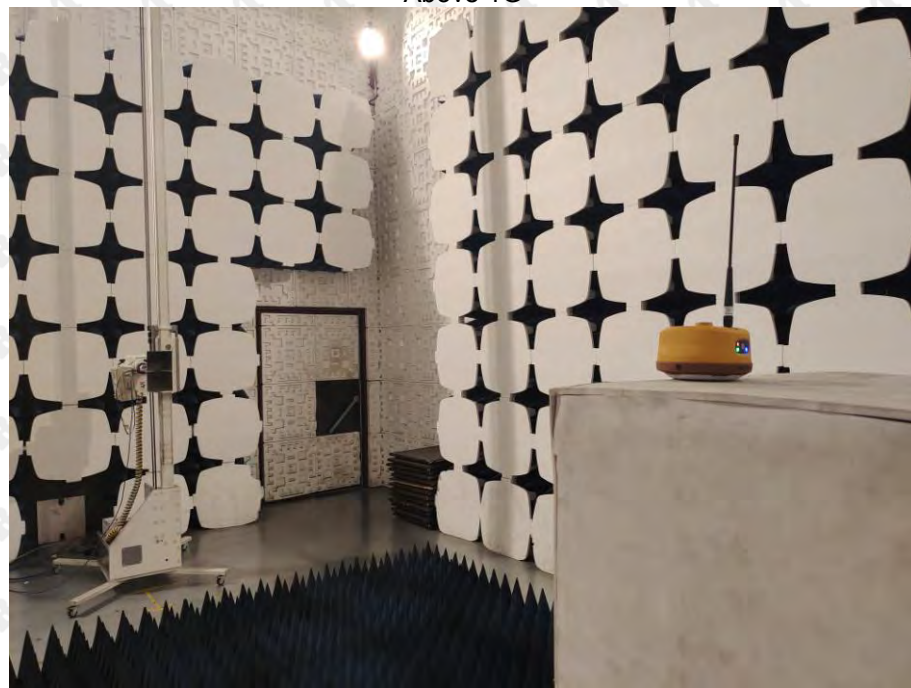
12. EUT TEST PHOTO

Radiated Emissions

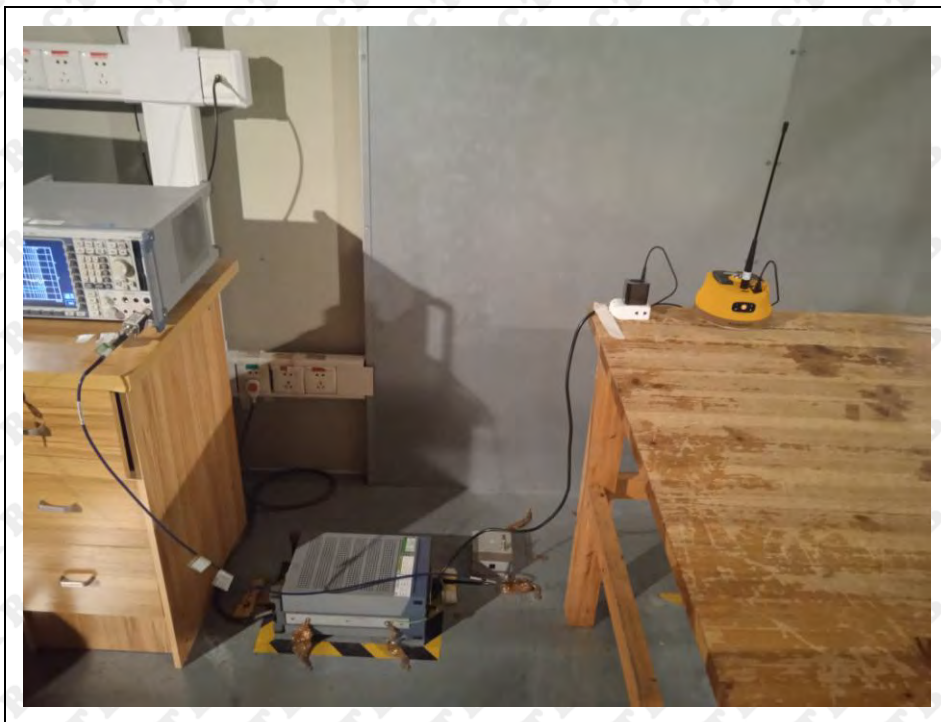
Below 1G



Above 1G



Conducted emission



***** END OF REPORT *****