

FCC RADIO TEST REPORT

FCC ID: AJYSLX-1

Product: GNSS Receiver

Trade Name: The logo for SATLAB GEOSOLUTIONS features the word "SATLAB" in a large, bold, sans-serif font. A red swoosh underline is positioned beneath the letters "ATLAB". Below "SATLAB", the word "GEOSOLUTIONS" is written in a smaller, all-caps, sans-serif font.

Model Name: SLX-1

Serial Model: N/A

Report No.: STUEMO016060204111RF1

Prepared for

GEOSOLUTION I GOTEORG AB

Datavagen 21B 43632 ASKIM SWEDEN

Prepared by

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TEST RESULT CERTIFICATION

Applicant's name: GEOSOLUTION I GOTEBORG AB
Address: Datavagen 21B 43632 ASKIM SWEDEN
Manufacture's Name: GEOSOLUTION I GOTEBORG AB
Address: Datavagen 21B 43632 ASKIM SWEDEN

Product description

Product name: GNSS Receiver
Model and/or type reference: SLX-1
Serial Model: N/A

Standards: FCC Part 22H and 24E

Test procedure: FCC Part 22(H), FCC Part 24(E), FCC Part 27: 2014; ANSI/TIAC603 D:
2010

This device described above has been tested by BZT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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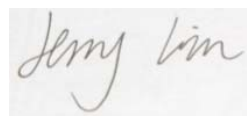
Date of Test

Date (s) of performance of tests: 7 Jun. 2016 ~17 Jun. 2016

Date of Issue: 17 Jun. 2016

Test Result.....: **Pass**

Testing Engineer :



(Jerry Lin)

Technical Manager :



(Jimmy Yao)

Authorized Signatory :



(Terry Yang)

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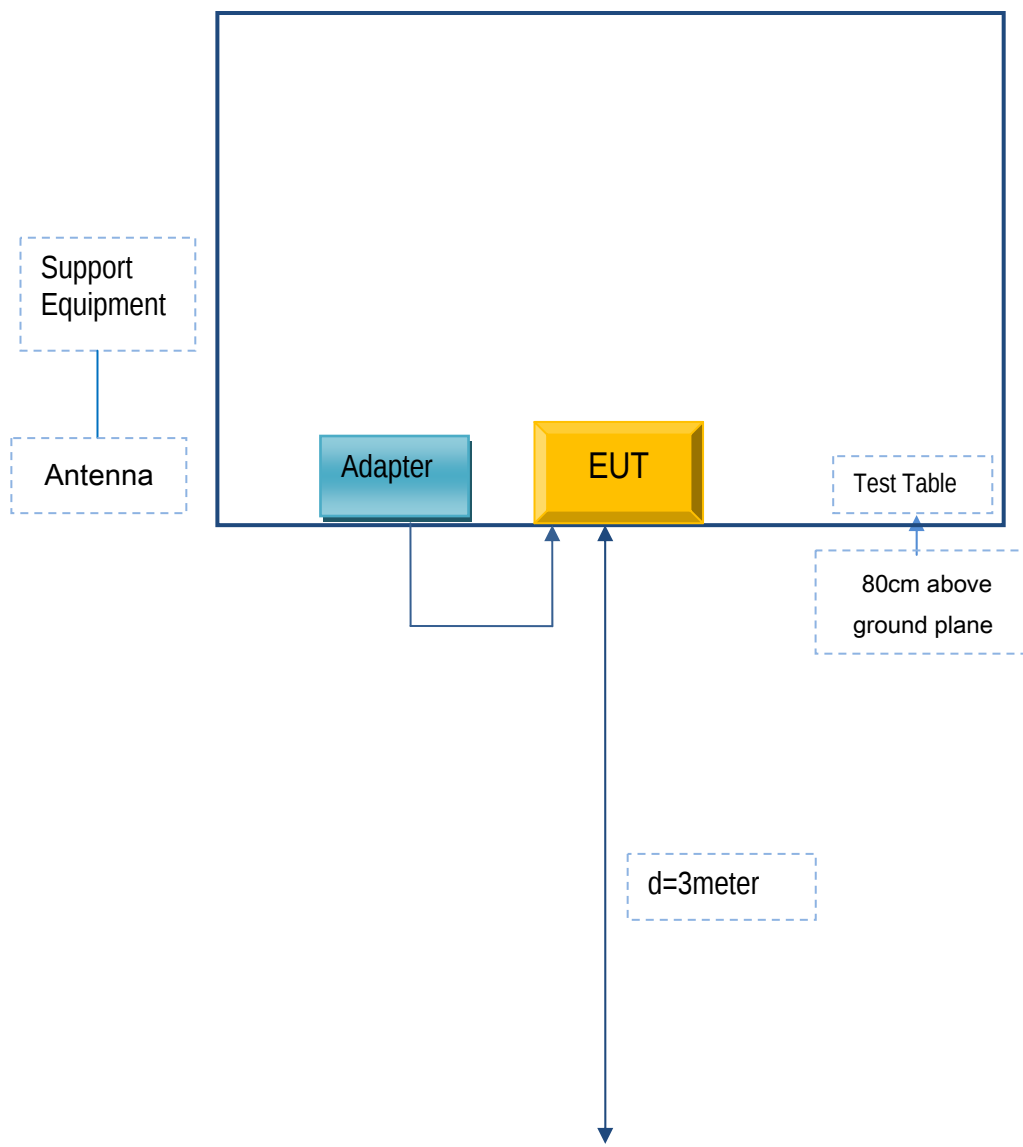
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1. Report Revision History

Report No.	Report Version	Description	Issue Date
STUEMO016060204111RF1	NONE	Original	17 Jun.2016

2. TEST SETUP AND SUPPORTING EQUIPMENT

Block Configuration Diagram for Radiated Emissions



SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

Manufacturer	Equipment Description	Model	Calibration Date	Calibration Due Date
N/A	N/A	N/A	N/A	N/A

3. Test site information

Lab performing tests	BZT Testing Technology Co., Ltd.
Lab Address	Buliding 17, Xinghua Road Xingwei industrial Park Fuyong, Baoan District, Shenzhen, Guangdong, China
FCC Test Site No.	701733

4. TEST INSTRUMENT

RF Conducted Test

Instrument	Model	Serial #	Cal Date	Cal Due
Agilent ESA-E SERIES SPECTRUM ANALYZER	E4407B	MY45108319	09/17/2015	09/16/2016
Power Splitter	1#	1#	09/02/2015	09/01/2016
Universal Radio Communication Tester	CMU200	121393	09/26/2015	09/25/2016
Temperature/Humidity Chamber	UHL-270	001	10/10/2015	10/09/2016
DC Power Supply	E3640A	MY40004013	09/18/2015	09/17/2016

Radiated Emissions

Instrument	Model	Serial #	Cal Date	Cal Due
EMI test receiver	ESL6	100262	09/18/2015	09/17/2016
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	09/02/2015	09/01/2016
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/25/2016	03/24/2017
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/22/2015	09/21/2016
Bilog Antenna (30MHz~2GHz)	JB1	A112017	09/22/2015	09/21/2016
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71259	09/25/2015	09/24/2016

Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2015	09/24/2016
SYNTHESIZED SIGNAL GENERATOR	8665B	3744A01293	09/18/2015	09/17/2016
Tunable Notch Filter	3NF-800/1000- S	AA4	09/02/2015	09/01/2016
Tunable Notch Filter	3NF- 1000/2000-S	AM 4	09/02/2015	09/01/2016

5. Equipment under Test (EUT) Information

Equipment Category :	PCE
Antenna Gain:	GSM850: 0.51dBi PCS1900: 0.34dBi UMTS-FDD Band V: 0.39dBi UMTS-FDD Band II: 0.37 dBi WIFI: 2.0dBi
Type of Modulation:	GSM / GPRS: GMSK EGPRS: GMSK, 8PSK UMTS-FDD: QPSK, 16QAM 802.11b/g/n: DSSS, OFDM
RF Operating Frequency (ies):	GSM850 TX: 824.2 ~ 848.8 MHz; RX: 869.2 ~ 893.8 MHz PCS1900 TX: 1850.2 ~ 1909.8 MHz; RX: 1930.2 ~ 1989.8 MHz UMTS-FDD Band V TX: 826.4 ~ 846.6 MHz; RX: 871.4 ~ 891.6 MHz UMTS-FDD Band II TX: 1852.4 ~ 1907.6 MHz; RX: 1932.4 ~ 1987.6 MHz WIFI: 802.11b/g/n(20M): 2412-2462 MHz
Maximum Conducted AV Power to Antenna:	GSM850: 33.57dBm PCS1900: 29.76dBm UMTS-FDD Band V: 23.73 dBm UMTS-FDD Band II: 23.28 dBm

ERP/EIRP:

GSM850: 28.22 dBm / ERP
PCS1900: 25.58 dBm / EIRP
UMTS-FDD Band V: 20.11 dBm / ERP
UMTS-FDD Band II: 19.84 dBm / EIRP

Number of Channels:

GSM 850: 124CH
PCS1900: 299CH
UMTS-FDD Band V: 102CH
UMTS-FDD Band II: 277CH
WIFI :802.11b/g/n(20M): 11CH

Input Power:

Battery:
DC 7.4V, 12500mAH
Adapter:
Model:GS40A12
Input: 100-240V~, 50/60Hz, 1A
Output: 12V---, 3.34A

Trade Name :



GPRS/EGPRS Multi-slot class 8/10/12

6. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

FCC Rules	Description of Test	Result
§ 1.1307; § 2.1093	RF Exposure	Compliance
§2.1046; § 22.913(a); § 24.232(c);	RF Output Power	Compliance
§ 24.232 (d) ; § 27.50(d)	Peak-Average Ratio	Compliance
§ 2.1047	Modulation Characteristics	Compliance
§ 2.1049; § 22.905; § 22.917; § 24.238;	99% & -26 dB Occupied Bandwidth	Compliance
§ 2.1051; § 22.917(a); § 24.238(a)	Spurious Emissions at Antenna Terminal	Compliance
§ 2.1053; § 22.917(a); § 24.238(a)	Field Strength of Spurious Radiation	Compliance
§ 22.917(a); § 24.238(a);	Out of band emission, Band Edge	Compliance
§ 2.1055; § 22.355; § 24.235; § 27.5(h)	Frequency stability vs. temperature Frequency stability vs. voltage	Compliance

Note: Testing was performed by configuring EUT to maximum output power status, the declared output power class for different

Measurement Uncertainty

Emissions		
Test Item	Description	Uncertainty
Band Edge and Radiated Spurious Emissions	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
-	-	-

7. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

7.1 RF Exposure

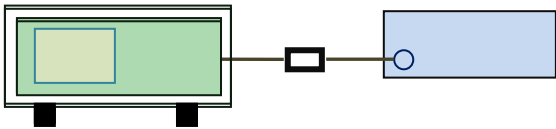
Test Result: Pass

The EUT is a Mobile device, Please refer to MPE Evaluation Report: STUEMO016060204111RF3

7.2 RF Output Power

Temperature	23°C
Relative Humidity	53%
Atmospheric Pressure	1004mbar
Test date :	Jun 8, 2016
Tested By :	Wiky.Jam

Requirement(s):

Spec	Item	Requirement	Applicable
§22.913 (a)	a)	ERP:38.45dBm	☒
§24.232 (c)	b)	EIRP:33dBm	☒
§27.50 (c)	c)	EIRP: 30dBm	☒
Test Setup			
Test Procedure	For Conducted Power: The transmitter output port was connected to base station. Set EUT at maximum power through base station. Select lowest, middle, and highest channels for each band and different test mode. For ERP/EIRP: The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable. 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. The frequency range up to tenth harmonic of the fundamental frequency was investigated. 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 emissions in dB = $10 \log (\text{TX power in Watts}/0.001)$ – the absolute level Spurious attenuation limit in dB = $43 + 10 \log_{10} (\text{power out in Watts})$.		
Remark			
Result	☒ Pass ☐ Fail		



Test Data ☒ Yes

☐ N/A

Test Plot ☐ Yes (See below)

☒ N/A

Conducted Power

GSM Mode:

Burst Average Power (dBm);								
Band	GSM850				PCS1900			
Channel	128	190	251	Tune up Power tolerant	512	661	810	Tune up Power tolerant
Frequency (MHz)	824.2	836.6	848.8	/	1850.2	1880	1909.8	/
GSM (1 uplink),GMSK	33.17	33.35	33.57	33±1	29.76	29.63	29.63	29±1
GPRS Multi-Slot Class 8 (1 uplink),GMSK	33.15	33.32	33.54	33±1	29.74	29.62	29.57	29±1
GPRS Multi-Slot Class 10 (2 uplink) GMSK	32.53	32.71	32.92	32±1	29.01	29.05	29.03	29±1
GPRS Multi-Slot Class 12 (4 uplink) GMSK	30.01	30.12	30.32	30±1	25.87	26.34	26.35	26±1
EGPRS Multi-Slot Class 8 (1 uplink) GMSK MCS1	33.16	33.33	33.55	33±1	29.71	29.56	29.49	29±1
EGPRS Multi-Slot Class 10 (2 uplink) GMSK MCS1	32.54	32.71	32.92	32±1	28.96	28.99	28.96	28±1
EGPRS Multi-Slot Class 12 (4 uplink) GMSK MCS1	29.88	30.03	30.21	30±1	25.84	26.33	26.34	26±1

Remark :

GPRS, CS1 coding scheme.

EGPRS, MCS1 coding scheme.

EGPRS, MCS5 coding scheme.

Multi-Slot Class 8 , Support Max 4 downlink, 1 uplink , 5 working link

Multi-Slot Class 10 , Support Max 4 downlink, 2 uplink , 5 working link

Multi-Slot Class 12 , Support Max 4 downlink, 4 uplink , 5 working link

Note: Since GSM mode has higher power, so the test items below were not performed to GPRS and EGPRS mode.

UMTS Mode:

UMTS-FDD Band V

Band/ Time Slot configuration	Channel	Frequency	Average power (dBm)
RMC 12.2kbps	4132	826.4	23.73
	4175	835	23.45
	4233	846.6	23.47
HSDPA Subtest1	4132	826.4	23.69
	4175	835	23.44
	4233	846.6	23.41
HSDPA Subtest2	4132	826.4	23.72
	4175	835	23.49
	4233	846.6	23.46
HSDPA Subtest3	4132	826.4	23.71
	4175	835	23.47
	4233	846.6	23.49
HSDPA Subtest4	4132	826.4	23.70
	4175	835	23.44
	4233	846.6	23.43
HSUPA Subtest1	4132	826.4	23.70
	4175	835	23.46
	4233	846.6	23.49
HSUPA Subtest2	4132	826.4	23.71
	4175	835	23.45
	4233	846.6	23.47
HSUPA Subtest3	4132	826.4	23.72
	4175	835	23.35
	4233	846.6	23.37
HSUPA Subtest4	4132	826.4	23.69
	4175	835	23.39
	4233	846.6	23.41
HSUPA Subtest5	4132	826.4	23.72
	4175	835	23.36
	4233	846.6	23.41

UMTS-FDD Band II

Band/ Time Slot configuration	Channel	Frequency	Average power (dBm)
RMC 12.2kbps	9262	1852.4	23.28
	9400	1880	22.83
	9538	1907.6	22.68
HSDPA Subtest1	9262	1852.4	23.24
	9400	1880	22.91
	9538	1907.6	22.87
HSDPA Subtest2	9262	1852.4	23.19
	9400	1880	22.86
	9538	1907.6	22.79
HSDPA Subtest3	9262	1852.4	23.14
	9400	1880	22.87
	9538	1907.6	22.64
HSDPA Subtest4	9262	1852.4	23.11
	9400	1880	22.84
	9538	1907.6	22.67
HSUPA Subtest1	9262	1852.4	23.16
	9400	1880	22.89
	9538	1907.6	22.67
HSUPA Subtest2	9262	1852.4	23.14
	9400	1880	22.84
	9538	1907.6	22.65
HSUPA Subtest3	9262	1852.4	23.09
	9400	1880	22.86
	9538	1907.6	22.64
HSUPA Subtest4	9262	1852.4	23.12
	9400	1880	22.84
	9538	1907.6	22.56
HSUPA Subtest5	9262	1852.4	23.17
	9400	1880	22.83
	9538	1907.6	22.59

ERP & EIRP

ERP for Cellular Band (Part 22H)

Frequency (MHz)	Substituted level (dBm)	Antenna Polarization	Antenna Gain correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)
824.2	21.33	V	6.8	0.53	27.60	38.45
824.2	19.5	H	6.8	0.53	25.77	38.45
836.6	21.26	V	6.8	0.53	27.53	38.45
836.6	20.41	H	6.8	0.53	26.68	38.45
848.8	21.85	V	6.9	0.53	28.22	38.45
848.8	19.77	H	6.9	0.53	26.14	38.45

EIRP for PCS Band (Part 24E)

Frequency (MHz)	Substituted level (dBm)	Antenna Polarization	Antenna Gain correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)
1850.2	18.41	V	7.88	0.85	25.44	33
1850.2	16.63	H	7.88	0.85	23.66	33
1880	18.29	V	7.88	0.85	25.32	33
1880	16.35	H	7.88	0.85	23.38	33
1909.8	18.57	V	7.86	0.85	25.58	33
1909.8	16.52	H	7.86	0.85	23.53	33

ERP for UMTS-FDD Band V (Part 22H)

Frequency (MHz)	Substituted level (dBm)	Antenna Polarization	Antenna Gain correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)
826.4	13.58	V	6.8	0.53	19.85	38.45
826.4	12.27	H	6.8	0.53	18.54	38.45
835	13.41	V	6.8	0.53	19.68	38.45
835	12.83	H	6.8	0.53	19.10	38.45
846.6	13.74	V	6.9	0.53	20.11	38.45
846.6	12.43	H	6.9	0.53	18.80	38.45

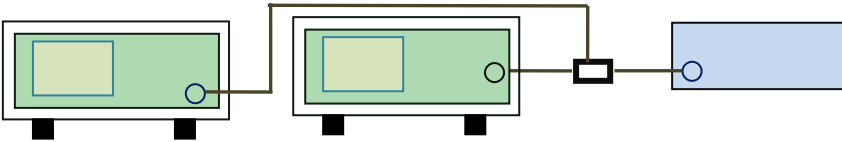
EIRP for UMTS-FDD Band II (Part 24E)

Frequency (MHz)	Substituted level (dBm)	Antenna Polarization	Antenna Gain correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)
1852.4	12.39	V	7.88	0.85	19.42	33
1852.4	11.47	H	7.88	0.85	18.50	33
1880	12.81	V	7.88	0.85	19.84	33
1880	11.42	H	7.88	0.85	18.45	33
1907.6	12.75	V	7.86	0.85	19.76	33
1907.6	11.83	H	7.86	0.85	18.84	33

7.3 Peak-Average Ratio

Temperature	23°C
Relative Humidity	53%
Atmospheric Pressure	1004mbar
Test date :	Jun 9, 2016
Tested By :	Wiky.Jam

Requirement(s):

Spec	Item	Requirement	Applicable
§24.232(d) § 27.50(d)	a)	The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.	☒
Test Setup			
Test Procedure	According with KDB 971168 1. The signal analyzer' s CCDF measurement profile is enabled 2. Frequency = carrier center frequency 3. Measurement BW > Emission bandwidth of signal 4. The signal analyzer was set to collect one million samples to generate the CCDF curve 5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal “ RF Burst” trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the “ on time” of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power		
Remark			
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A
 Test Plot ☐ Yes (See below) ☒ N/A

GSM 1900 PK-AV POWER(PART 22H)

Frequency (MHz)	Conducted power(dBm)		Peak-Average Ratio(PAR)
	Peak	Average	
1850.2	30.12	29.76	0.36
1880	30.42	29.63	0.79
1909.8	30.39	29.63	0.76

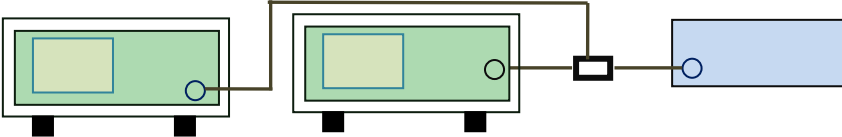
UMTS-FDD BandII PK-AV POWER(PART 24E)

Frequency (MHz)	Conducted power(dBm)		Peak-Average Ratio(PAR)
	Peak	Average	
1852.4	24.22	22.35	1.87
1880	23.37	21.68	1.69
1907.6	23.75	22.12	1.63

7.4 Occupied Bandwidth

Temperature	20°C
Relative Humidity	51%
Atmospheric Pressure	1009mbar
Test date :	Jun 10, 2016
Tested By :	Wiky.Jam

Requirement(s):

Spec	Item	Requirement	Applicable
§2.1049, §22.917, §22.905 §24.238 §27.53(a)	a)	99% Occupied Bandwidth(kHz)	☒
	b)	26 dB Bandwidth(kHz)	☒
Test Setup			
Test Procedure	- The EUT was connected to Spectrum Analyzer and Base Station via power divider. - The 99% and 26 dB occupied bandwidth (BW) of the middle channel for the highest RF powers.		
Remark			
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Cellular Band (Part 22H) result

Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)
128	824.2	248.4367	319.992
190	836.6	245.0682	324.642
251	848.8	244.2806	320.901

PCS Band (Part 24E) result

Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)
512	1850.2	247.3035	318.367
661	1880.0	246.3853	319.517
810	1909.8	243.8729	319.637

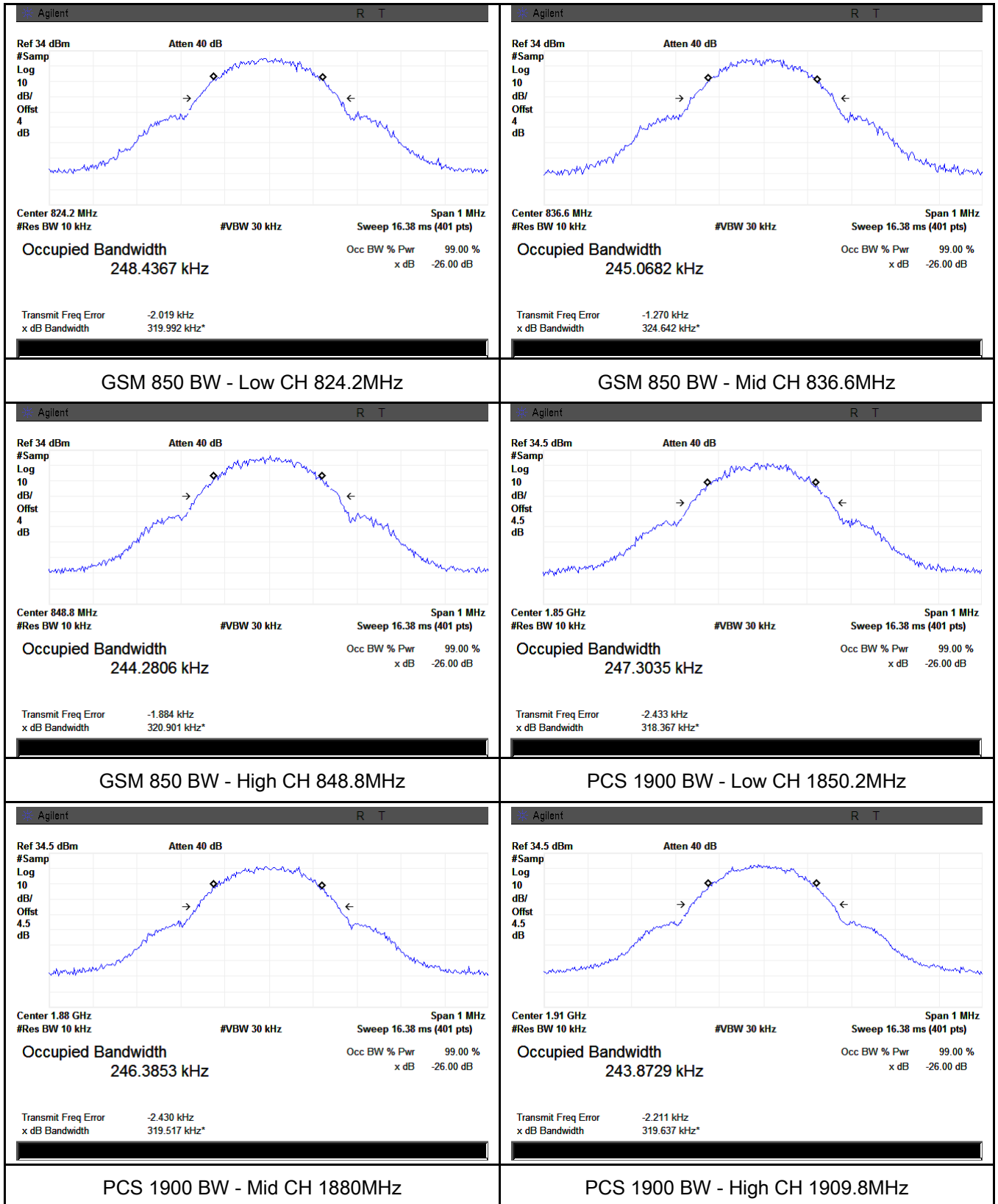
UMTS-FDD Band V (Part 22H)

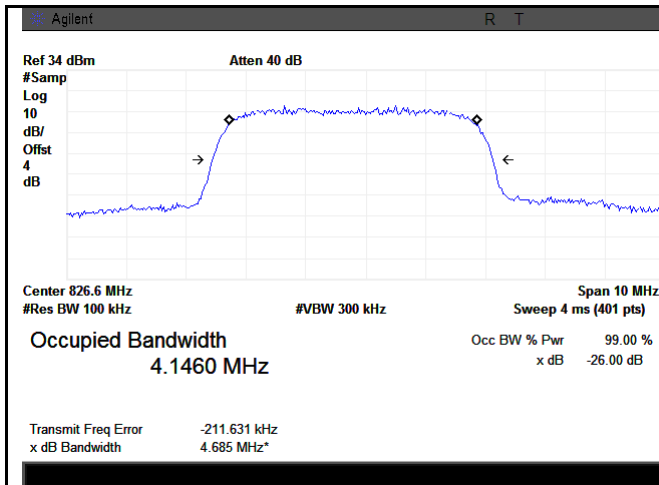
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
4132	826.4	4.1460	4.685
4175	835.0	4.1549	4.703
4233	846.6	4.1475	4.705

UMTS-FDD Band II (Part 24E)

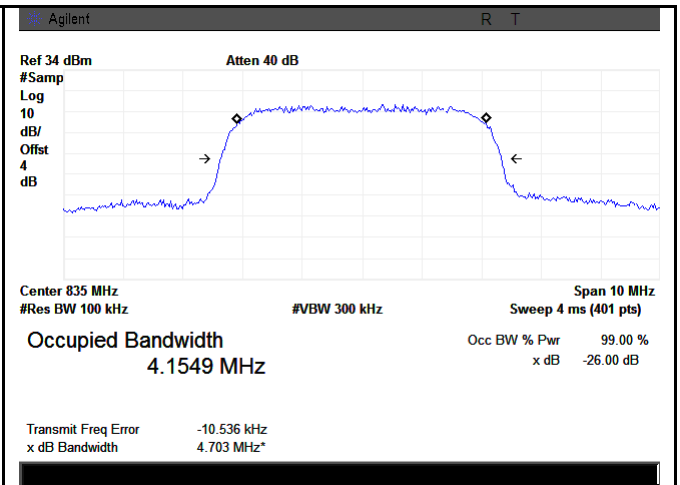
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
9262	1852.4	4.1646	4.709
9400	1880.0	4.1484	4.688
9538	1907.6	4.1531	4.701

Test Plots

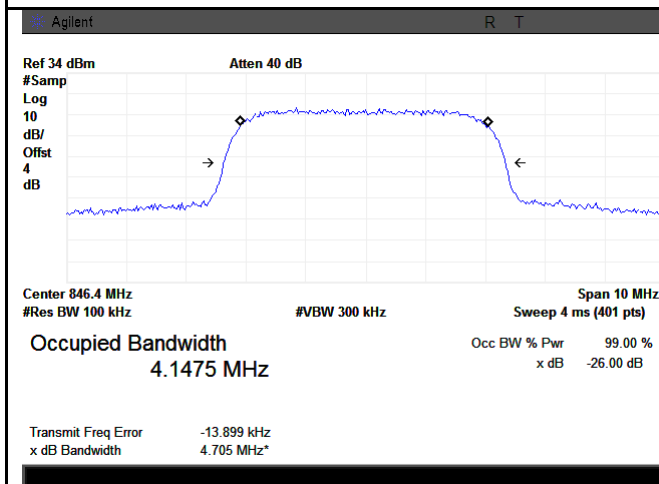




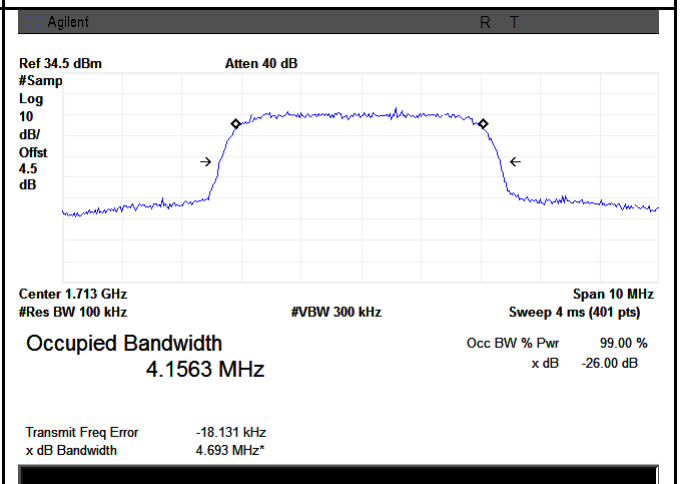
Band V BW - Low CH 826.6 MHz



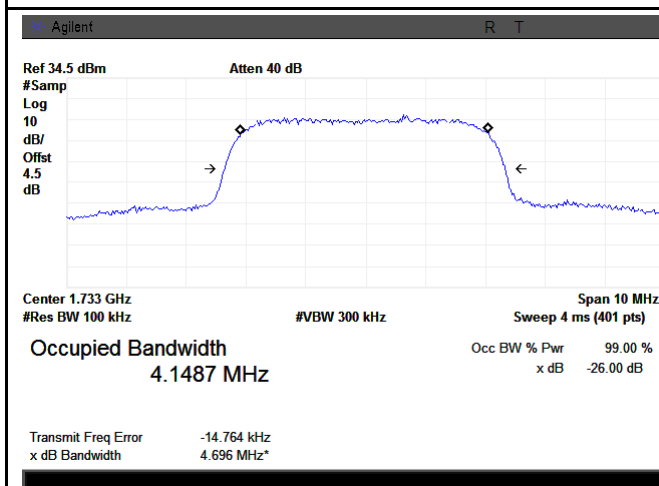
Band V BW - Mid CH 835.0 MHz



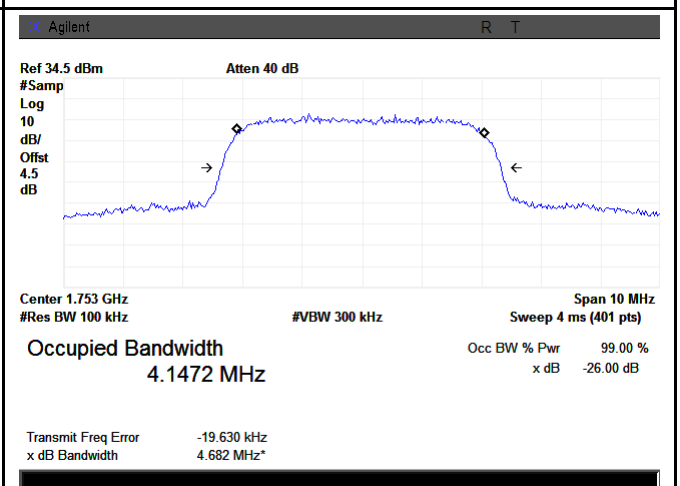
Band V BW - High CH 846.4 MHz



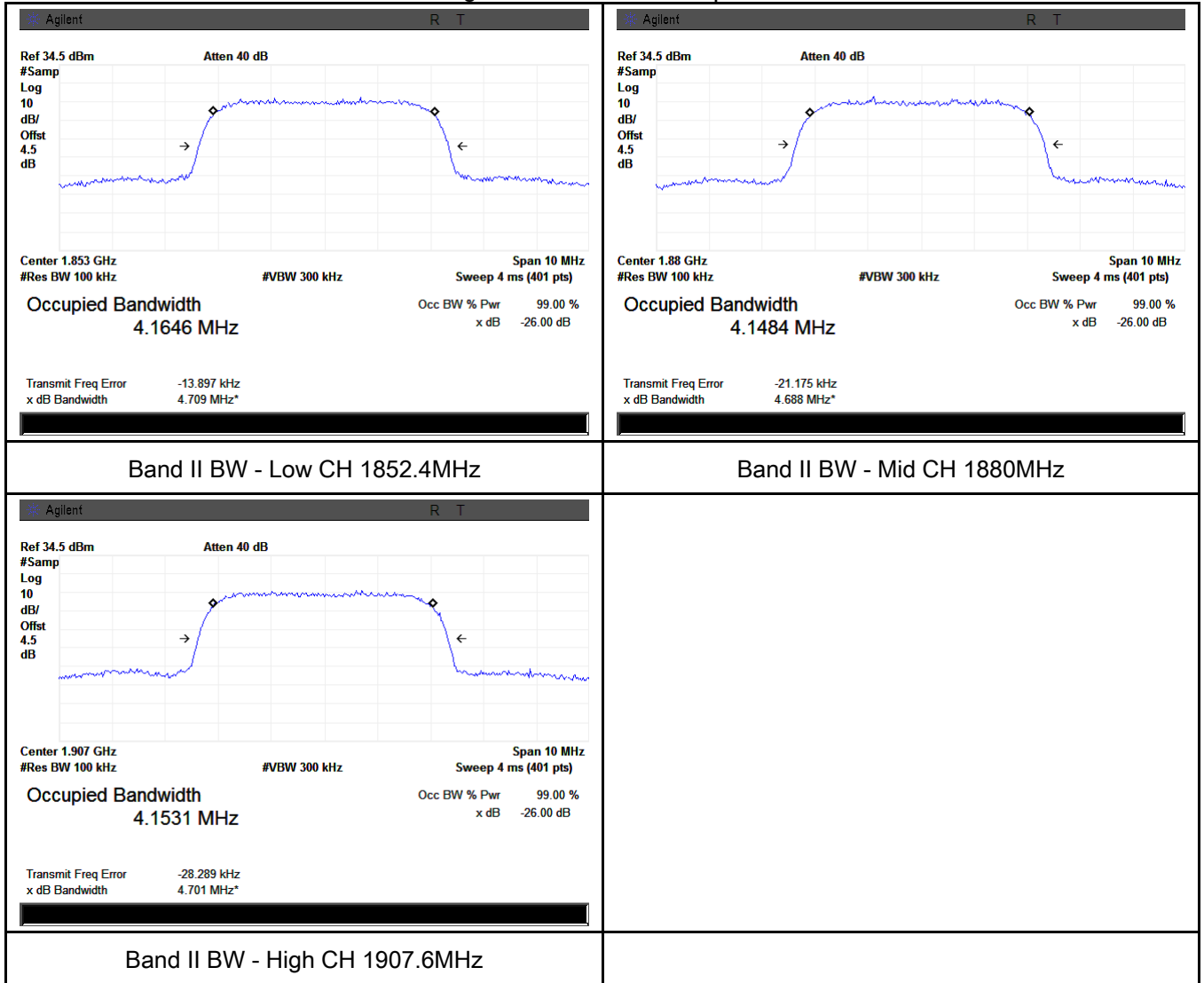
Band IV BW - Low CH 1852.4 MHz



Band IV BW - Mid CH 1880 MHz



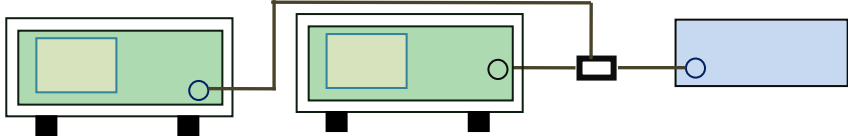
Band IV BW - High CH 1907.6 MHz



7.5 Spurious Emissions at Antenna Terminals

Temperature	23°C
Relative Humidity	53%
Atmospheric Pressure	1004mbar
Test date :	Jun 10, 2016
Tested By :	Wiky.Jam

Requirement(s):

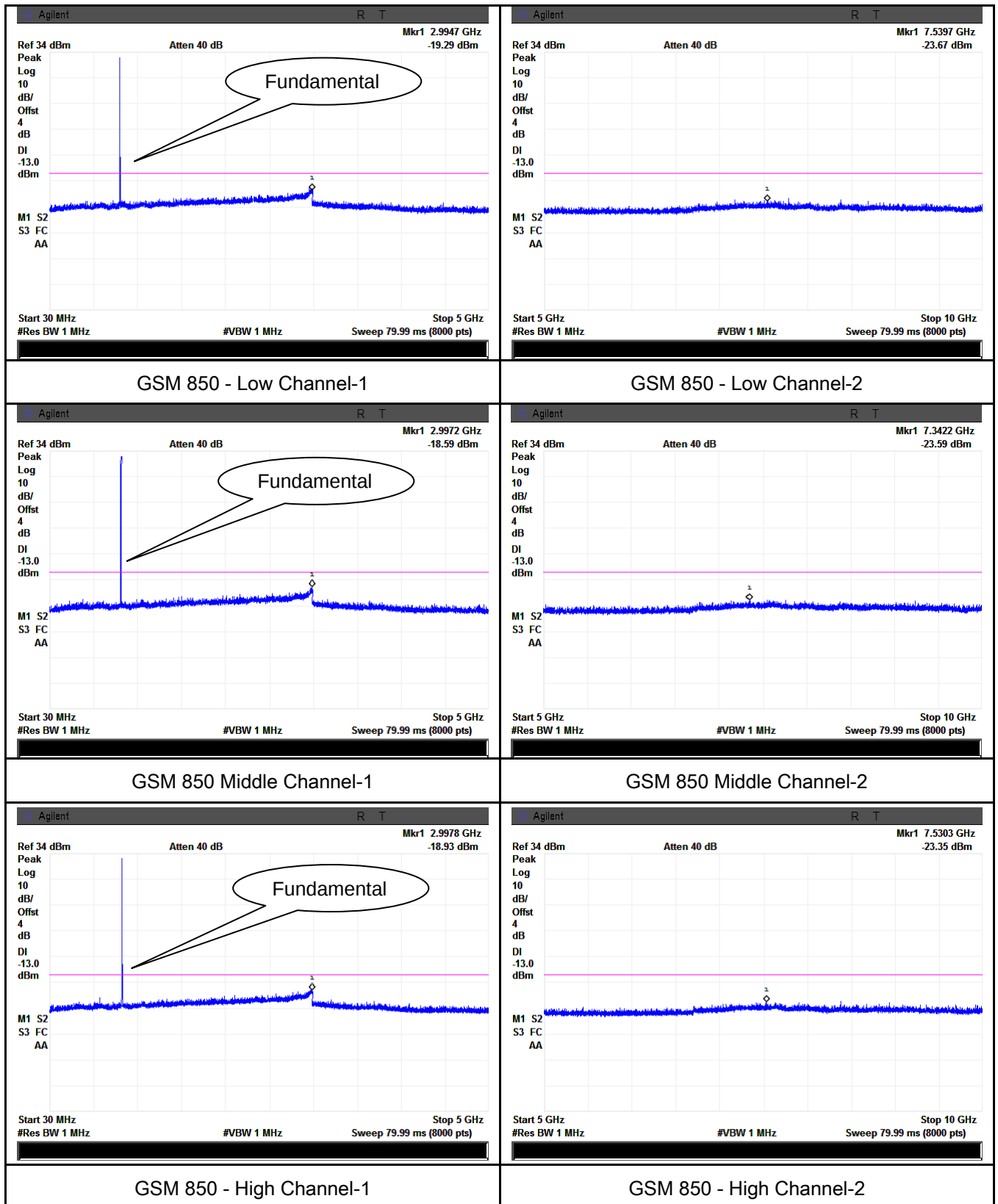
Spec	Item	Requirement	Applicable
§2.1051, §22.917(a)& §24.238(a) § 27.53(h)	a)	The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB	☒
Test Setup			
Test Procedure	The EUT was connected to Spectrum Analyzer and Base Station via power divider. The Band Edges of low and high channels for the highest RF powers were measured. Setting RBW as roughly BW/100.		
Remark			
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

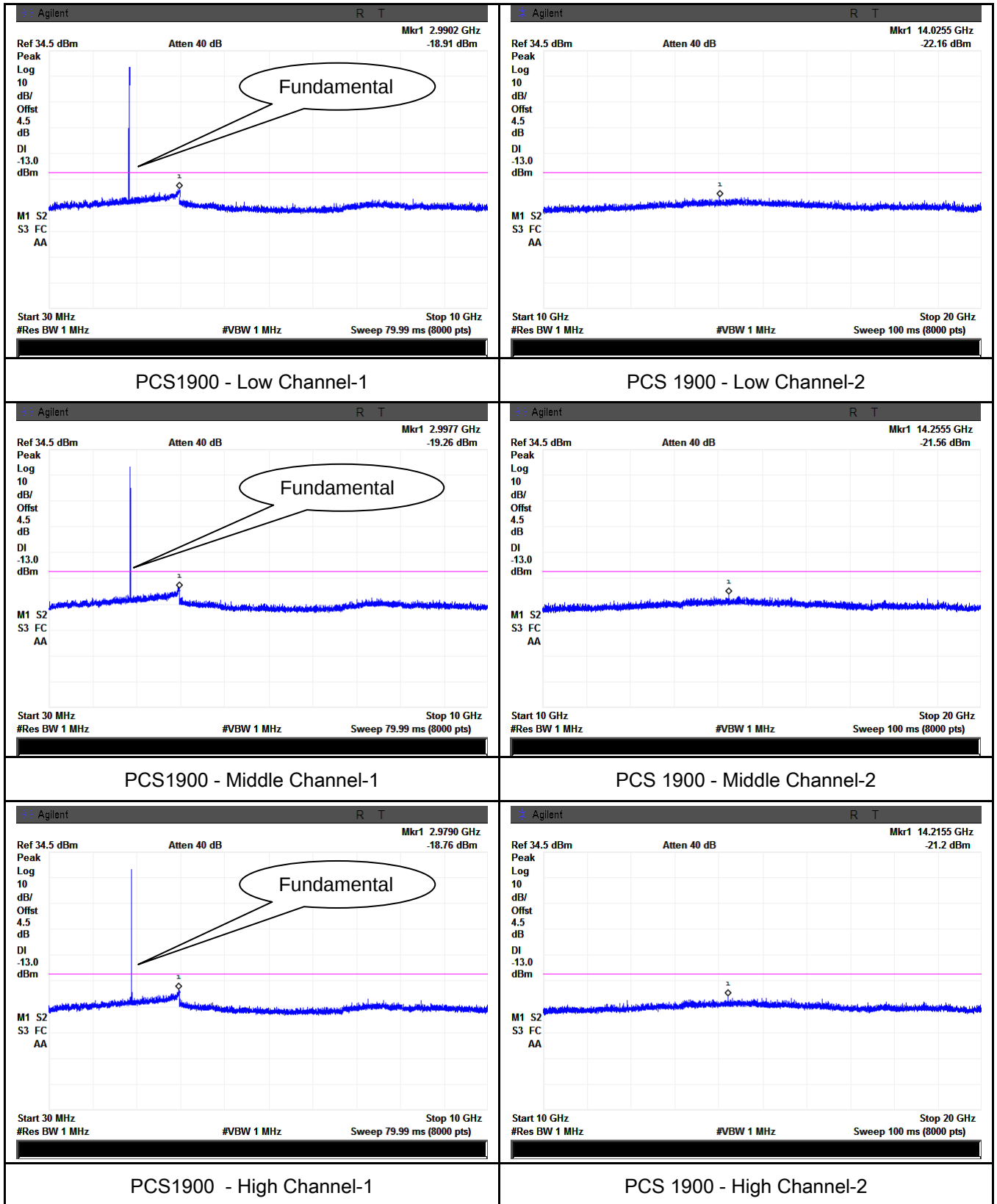
Test Plot ☒ Yes (See below) ☐ N/A

Test Plots

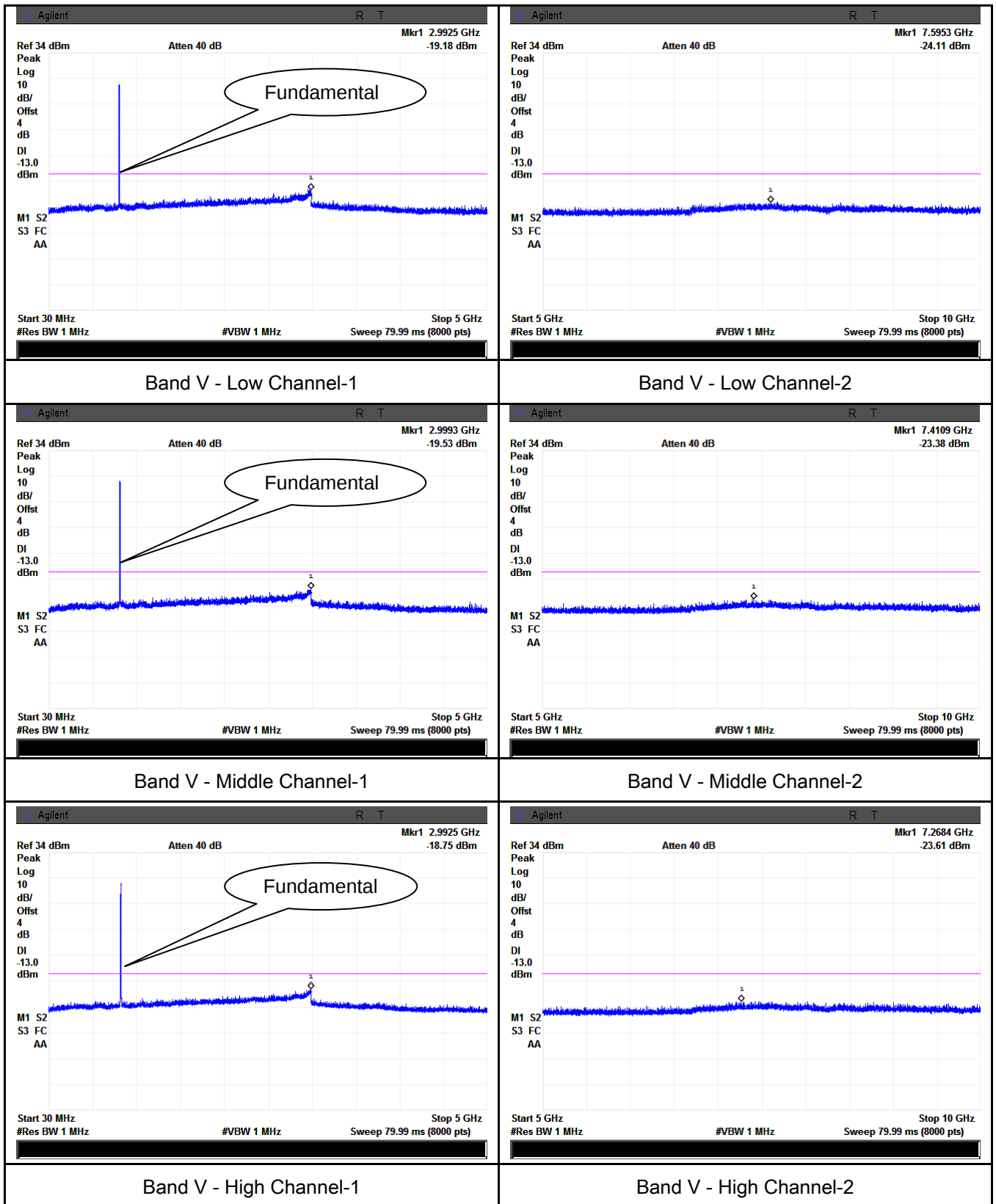
Cellular Band (Part 22H) result



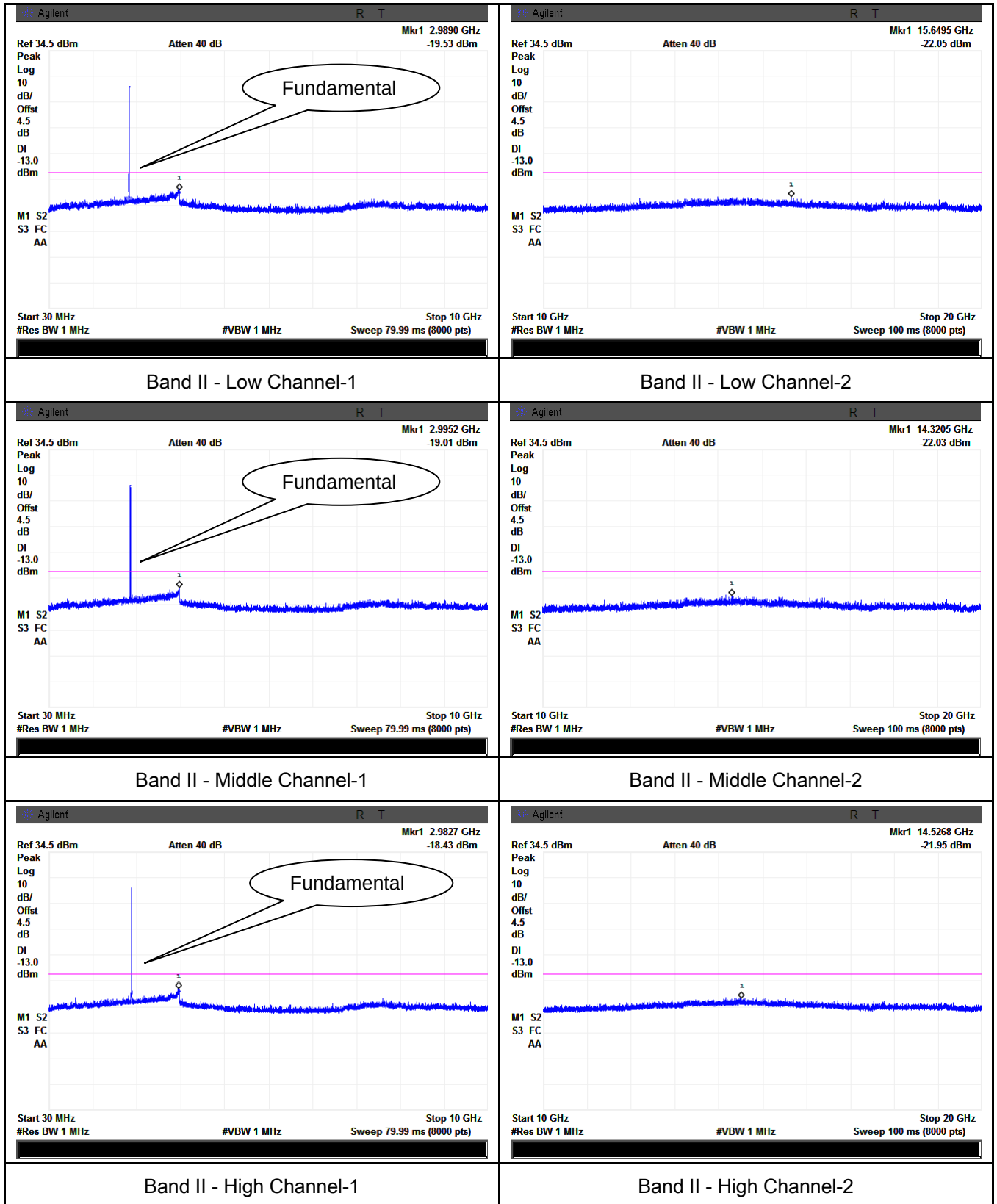
PCS Band (Part24E) result



UMTS-FDD Band V (Part 22H)



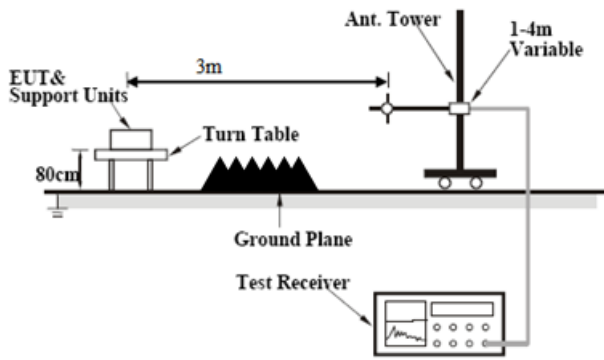
UMTS-FDD Band II (Part 24E)



7.6 Spurious Radiated Emissions

Temperature	33°C
Relative Humidity	57%
Atmospheric Pressure	1004mbar
Test date :	Jun 10, 2016
Tested By :	Wiky.Jam

Requirement(s):

Spec	Item	Requirement	Applicable
§2.1053, §22.917 & §24.238 § 27.53(h)	a)	The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.	☒
Test setup			
Test Procedure	- The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable. - 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. - 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. Sample Calculation: EUT Field Strength = Raw Amplitude (dBμV/m) – Amplifier Gain (dB) + Antenna Factor (dB) + Cable Loss (dB) + Filter Attenuation (dB, if used)		
Remark			

Result	☒ Pass	☐ Fail
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Test Data ☒ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Cellular Band (Part 22H) result

Low channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1648.4	-42.75	V	7.95	0.78	-35.58	-13	-22.58
1648.4	-43.81	H	7.95	0.78	-36.64	-13	-23.64
360.3	-54.83	V	6.7	0.28	-48.41	-13	-35.41
820.8	-50.25	H	6.9	0.44	-43.79	-13	-30.79

Middle channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1673.2	-42.15	V	7.95	0.78	-34.98	-13	-21.98
1673.2	-43.72	H	7.95	0.78	-36.55	-13	-23.55
358.3	-55.24	V	6.7	0.28	-48.82	-13	-35.82
819.7	-51.46	H	6.9	0.44	-45	-13	-32

High channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1697.6	-43.67	V	7.95	0.78	-36.5	-13	-23.5
1697.6	-44.29	H	7.95	0.78	-37.12	-13	-24.12
359.1	-55.37	V	6.7	0.28	-48.95	-13	-35.95
818.6	-50.96	H	6.9	0.44	-44.5	-13	-31.5

PCS Band (Part24E) result

Low channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3700.4	-45.84	V	10.25	2.73	-38.32	-13	-25.32
3700.4	-46.33	H	10.25	2.73	-38.81	-13	-25.81
361.9	-55.47	V	6.7	0.28	-49.05	-13	-36.05
821.7	-51.35	H	6.9	0.44	-44.89	-13	-31.89

Middle channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3760	-45.61	V	10.25	2.73	-38.09	-13	-25.09
3760	-46.22	H	10.25	2.73	-38.7	-13	-25.7
358.9	-56.33	V	6.7	0.28	-49.91	-13	-36.91
818.5	-52.85	H	6.9	0.44	-46.39	-13	-33.39

High channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3819.6	-44.83	V	10.36	2.73	-37.2	-13	-24.2
3819.6	-45.75	H	10.36	2.73	-38.12	-13	-25.12
359.6	-55.26	V	6.7	0.28	-48.84	-13	-35.84
821.6	-50.38	H	6.9	0.44	-43.92	-13	-30.92

UMTS-FDD Band V (Part 22H)

Low channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1652.8	-46.16	V	7.95	0.78	-38.99	-13	-25.99
1652.8	-47.42	H	7.95	0.78	-40.25	-13	-27.25
356.2	-56.81	V	6.7	0.28	-50.39	-13	-37.39
817.9	-51.95	H	6.9	0.44	-45.49	-13	-32.49

Middle channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1670	-46.85	V	7.95	0.78	-39.68	-13	-26.68
1670	-46.37	H	7.95	0.78	-39.2	-13	-26.2
362.4	-55.44	V	6.7	0.28	-49.02	-13	-36.02
821.4	-51.72	H	6.9	0.44	-45.26	-13	-32.26

High channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1693.2	-47.48	V	7.95	0.78	-40.31	-13	-27.31
1693.2	-46.28	H	7.95	0.78	-39.11	-13	-26.11
363.5	-55.68	V	6.7	0.28	-49.26	-13	-36.26
822.7	-50.38	H	6.9	0.44	-43.92	-13	-30.92

UMTS-FDD Band II (Part 24E)

Low channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3704.8	-46.76	V	10.25	2.73	-39.24	-13	-26.24
3704.8	-47.62	H	10.25	2.73	-40.1	-13	-27.1
356.3	-54.86	V	6.7	0.28	-48.44	-13	-35.44
823.9	-51.39	H	6.9	0.44	-44.93	-13	-31.93

Middle channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3760	-46.77	V	10.25	2.73	-39.25	-13	-26.25
3760	-46.05	H	10.25	2.73	-38.53	-13	-25.53
364.8	-55.42	V	6.7	0.28	-49	-13	-36
825.2	-51.77	H	6.9	0.44	-45.31	-13	-32.31

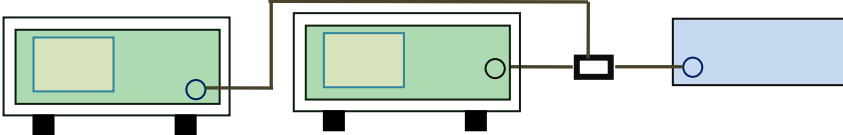
High channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3815.2	-46.29	V	10.36	2.73	-38.66	-13	-25.66
3815.2	-46.14	H	10.36	2.73	-38.51	-13	-25.51
362.8	-55.37	V	6.7	0.28	-48.95	-13	-35.95
819.3	-51.29	H	6.9	0.44	-44.83	-13	-31.83

7.7 Band Edge

Temperature	23°C
Relative Humidity	53%
Atmospheric Pressure	1004mbar
Test date :	Jun 10, 2016
Tested By :	Wiky.Jam

Requirement(s):

Spec	Item	Requirement	Applicable
§22.917(a) §24.238(a) § 27.53(h)	a)	The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB.	☒
Test setup			
Procedure	The EUT was connected to Spectrum Analyzer and Base Station via power divider. The Band Edges of low and high channels for the highest RF powers were measured. Setting RBW as roughly BW/100.		
Remark			
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A
 Test Plot ☒ Yes (See below) ☐ N/A

Cellular Band (Part 22H) result

Frequency (MHz)	Emission (dBm)	Limit (dBm)
823.9650	-13.35	-13
849.0200	-13.19	-13

PCS Band (Part24E) result

Frequency (MHz)	Emission (dBm)	Limit (dBm)
1849.9950	-15.74	-13
1910.0175	-15.57	-13

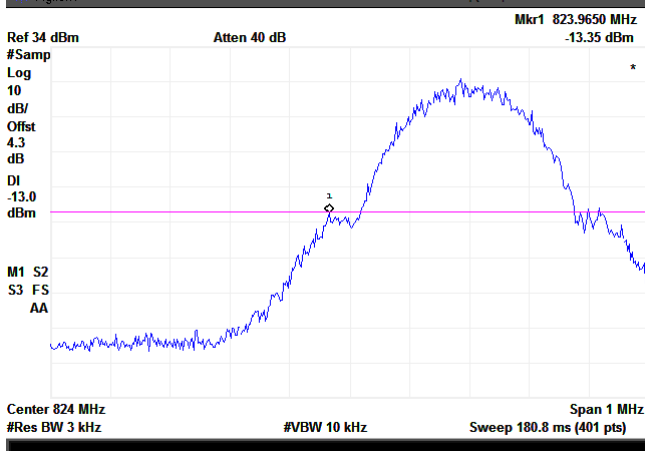
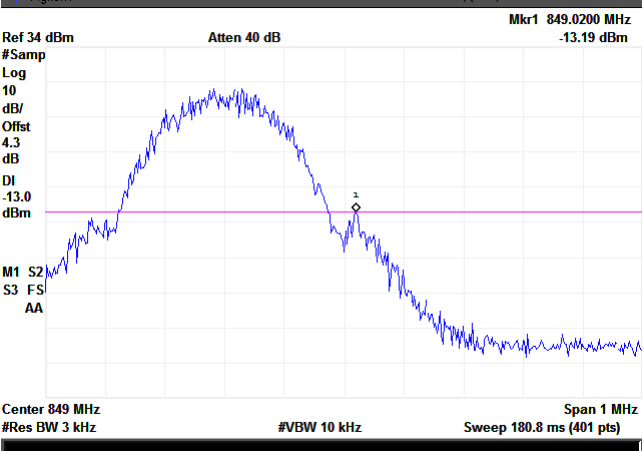
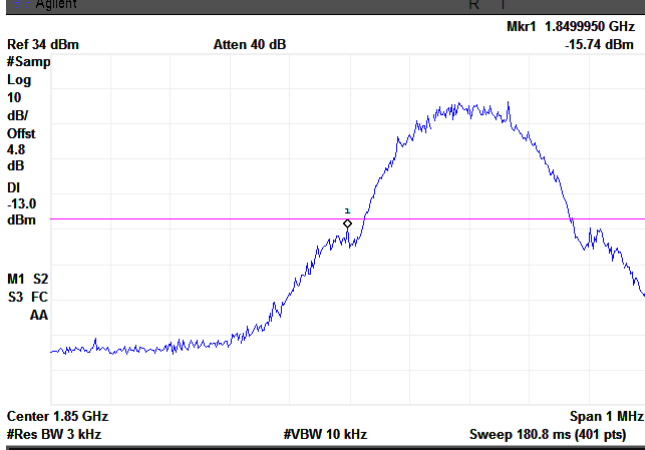
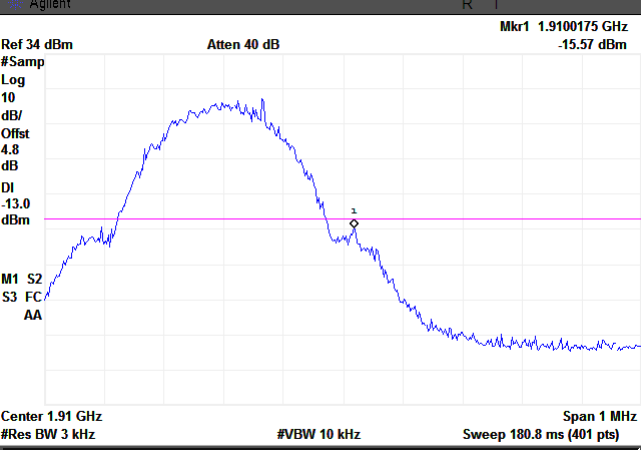
UMTS-FDD Band V (Part 22H)

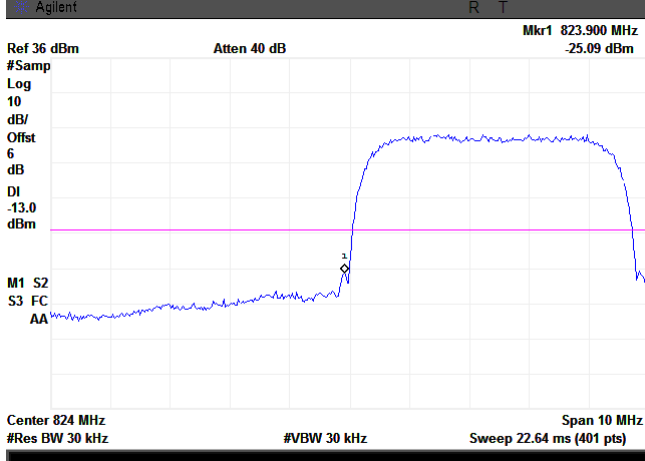
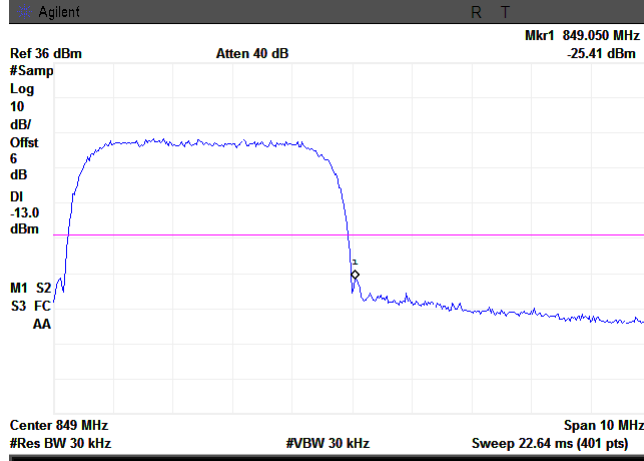
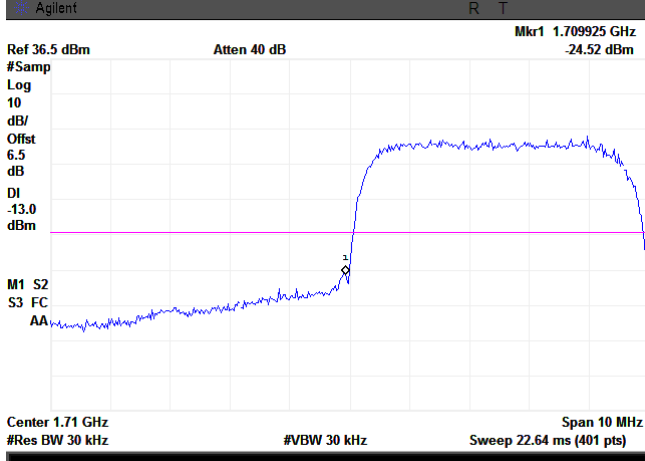
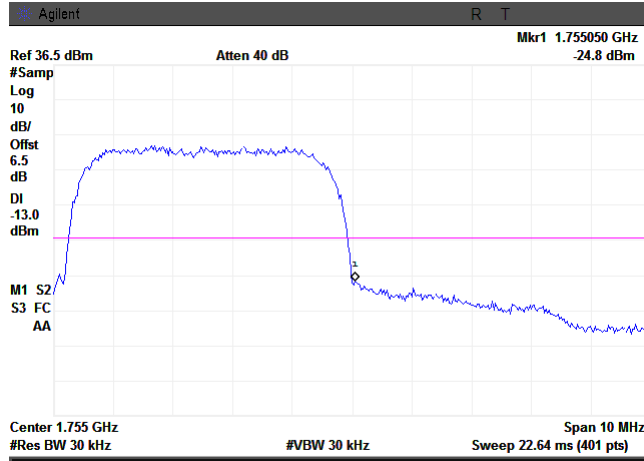
Frequency (MHz)	Emission (dBm)	Limit (dBm)
823.9000	-25.09	-13
849.0500	-24.41	-13

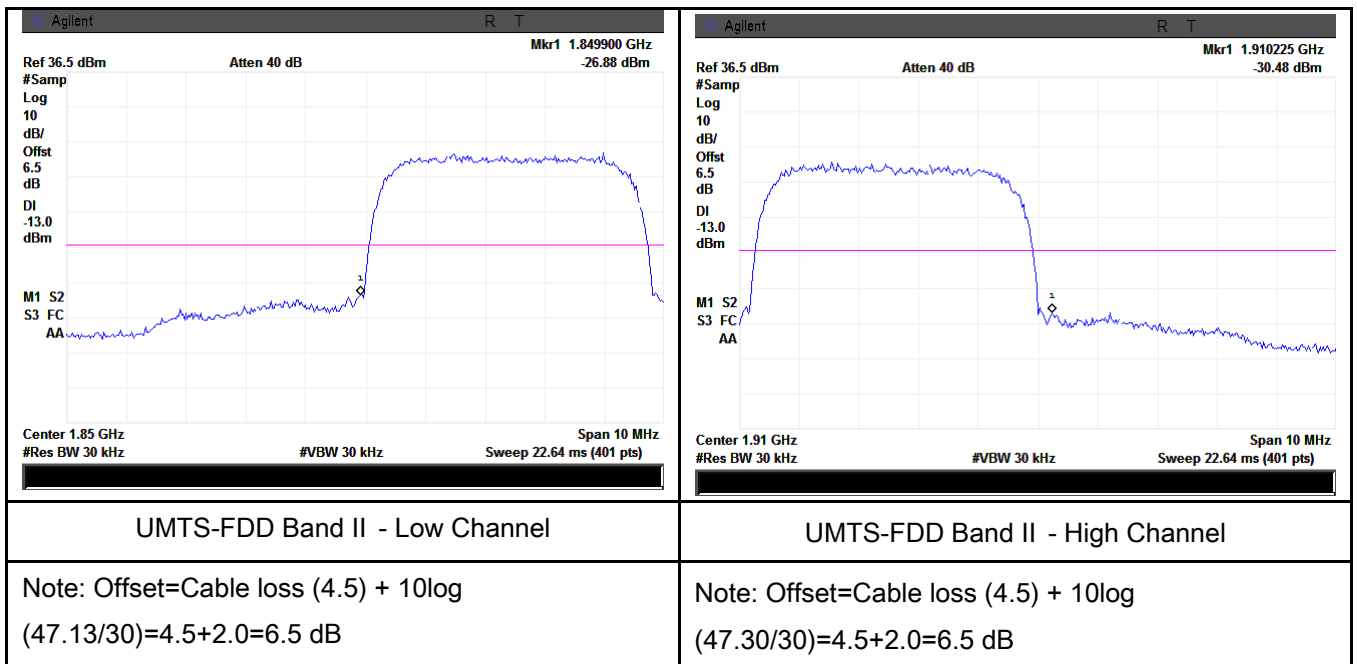
UMTS-FDD Band II (Part 24E)

Frequency (MHz)	Emission (dBm)	Limit (dBm)
1849.9000	-26.88	-13
1910.2250	-30.48	-13

Test Plots

 Ref 34 dBm #Samp Log 10 dB/Offst 4.3 dB DI -13.0 dBm M1 S2 S3 FS AA Center 824 MHz #Res BW 3 kHz #VBW 10 kHz Sweep 180.8 ms (401 pts)	 Ref 34 dBm #Samp Log 10 dB/Offst 4.3 dB DI -13.0 dBm M1 S2 S3 FS AA Center 849 MHz #Res BW 3 kHz #VBW 10 kHz Sweep 180.8 ms (401 pts)
Cellular Band - Low Channel	Cellular Band - High Channel
Note: Offset=Cable loss (4.0) + 10log (3.20/3)=4.0+0.3=4.3 dB	Note: Offset=Cable loss (4.0) + 10log (3.21/3)=4.0+0.3=4.3 dB
 Ref 34 dBm #Samp Log 10 dB/Offst 4.8 dB DI -13.0 dBm M1 S2 S3 FC AA Center 1.85 GHz #Res BW 3 kHz #VBW 10 kHz Sweep 180.8 ms (401 pts)	 Ref 34 dBm #Samp Log 10 dB/Offst 4.8 dB DI -13.0 dBm M1 S2 S3 FC AA Center 1.91 GHz #Res BW 3 kHz #VBW 10 kHz Sweep 180.8 ms (401 pts)
PCS Band - Low Channel	PCS Band - High Channel
Note: Offset=Cable loss (4.5) + 10log (3.18/3)=4.5+0.3=4.8dB	Note: Offset=Cable loss (4.5) + 10log (3.18/3)=4.5+0.3=4.8 dB

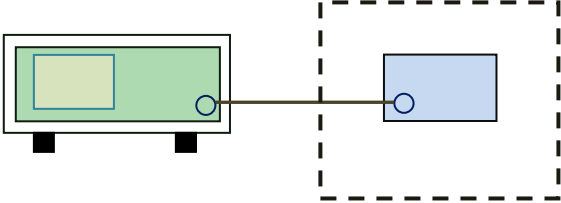
 Agilent R T Ref 36 dBm Atten 40 dB Mkr1 823.900 MHz -25.09 dBm #Samp Log 10 dB/ Offst 6 dB DI -13.0 dBm M1 S2 S3 FC AA Center 824 MHz Span 10 MHz #Res BW 30 kHz #VBW 30 kHz Sweep 22.64 ms (401 pts)	 Agilent R T Ref 36 dBm Atten 40 dB Mkr1 849.050 MHz -25.41 dBm #Samp Log 10 dB/ Offst 6 dB DI -13.0 dBm M1 S2 S3 FC AA Center 849 MHz Span 10 MHz #Res BW 30 kHz #VBW 30 kHz Sweep 22.64 ms (401 pts)
UMTS-FDD Band V - Low Channel	UMTS-FDD Band V - High Channel
Note: Offset=Cable loss (4.0) + 10log (47.22/30)=4.0+2.0=6.0 dB	Note: Offset=Cable loss (4.0) + 10log (47.05/30)=4.0+2.0=6.0 dB
 Agilent R T Ref 36.5 dBm Atten 40 dB Mkr1 1.709925 GHz -24.52 dBm #Samp Log 10 dB/ Offst 6.5 dB DI -13.0 dBm M1 S2 S3 FC AA Center 1.71 GHz Span 10 MHz #Res BW 30 kHz #VBW 30 kHz Sweep 22.64 ms (401 pts)	 Agilent R T Ref 36.5 dBm Atten 40 dB Mkr1 1.755050 GHz -24.8 dBm #Samp Log 10 dB/ Offst 6.5 dB DI -13.0 dBm M1 S2 S3 FC AA Center 1.755 GHz Span 10 MHz #Res BW 30 kHz #VBW 30 kHz Sweep 22.64 ms (401 pts)
UMTS-FDD Band IV- Low Channel	UMTS-FDD Band IV-- High Channel
Note: Offset=Cable loss (4.5) + 10log (47.13/30)=4.5+2.0=6.5 dB	Note: Offset=Cable loss (4.5) + 10log (47.30/30)=4.5+2.0=6.5 dB



7.8 Frequency Stability

Temperature	23°C
Relative Humidity	53%
Atmospheric Pressure	1004mbar
Test date :	Jun 11, 2016
Tested By :	Wiky.Jam

Requirement(s):

Spec	Item	Requirement	Applicable																																
§2.1055, §22.355 & §24.235 § 27.5(h); § 27.54	a)	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 Transmitters in the Public Mobile Services <table border="1"> <thead> <tr> <th>Frequency Range (MHz)</th><th>Base, fixed (ppm)</th><th>Mobile ≤ 3 watts (ppm)</th><th>Mobile ≤ 3 watts (ppm)</th></tr> </thead> <tbody> <tr> <td>25 to 50</td><td>20.0</td><td>20.0</td><td>50.0</td></tr> <tr> <td>50 to 450</td><td>5.0</td><td>5.0</td><td>50.0</td></tr> <tr> <td>450 to 512</td><td>2.5</td><td>5.0</td><td>5.0</td></tr> <tr> <td>821 to 896</td><td>1.5</td><td>2.5</td><td>2.5</td></tr> <tr> <td>928 to 29.</td><td>5.0</td><td>N/A</td><td>N/A</td></tr> <tr> <td>929 to 960.</td><td>1.5</td><td>N/A</td><td>N/A</td></tr> <tr> <td>2110 to 2220</td><td>10.0</td><td>N/A</td><td>N/A</td></tr> </tbody> </table> According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized frequency block.	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 29.	5.0	N/A	N/A	929 to 960.	1.5	N/A	N/A	2110 to 2220	10.0	N/A	N/A	
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 29.	5.0	N/A	N/A																																
929 to 960.	1.5	N/A	N/A																																
2110 to 2220	10.0	N/A	N/A																																
Test setup																																			

Procedure	A communication link was established between EUT and base station. The frequency error was monitored and measured by base station under variation of ambient temperature and variation of primary supply voltage. Limit: The frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ ($\pm 2.5\text{ppm}$) of the center frequency.
Remark	
Result	☒ Pass ☐ Fail

Test Data ☒ Yes ☐ N/A
 Test Plot ☐ Yes (See below) ☒ N/A

Cellular Band (Part 22H) result

Middle Channel, $f_0 = 836.6$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	7	0.0084	2.5
0		9	0.0108	2.5
10		8	0.0096	2.5
20		11	0.0131	2.5
30		6	0.0072	2.5
40		11	0.0131	2.5
50		12	0.0143	2.5
55		9	0.0108	2.5
25	4.2	8	0.0096	2.5
	3.5	7	0.0084	2.5

PCS Band (Part 24E) result

Middle Channel, $f_0 = 1880$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	37	0.0197	2.5
0		35	0.0186	2.5
10		43	0.0229	2.5
20		33	0.0176	2.5
30		41	0.0218	2.5
40		38	0.0202	2.5
50		36	0.0191	2.5
55		39	0.0207	2.5
25	4.2	35	0.0186	2.5
	3.5	36	0.0191	2.5

UMTS-FDD Band V (Part 22H)

Middle Channel, $f_0 = 835$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	2	0.0024	2.5
0		3	0.0036	2.5
10		7	0.0084	2.5
20		5	0.0060	2.5
30		4	0.0048	2.5
40		5	0.0060	2.5
50		5	0.0060	2.5
55		4	0.0048	2.5
25	4.2	3	0.0036	2.5
	3.5	6	0.0072	2.5

UMTS-FDD Band II (Part 24E)

Middle Channel, $f_0 = 1880$ MHz				
Temperature (°C)	Power Supplied (V _{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-10	3.7	-3	-0.0016	2.5
0		-4	-0.0021	2.5
10		-6	-0.0032	2.5
20		-2	-0.0011	2.5
30		-4	-0.0021	2.5
40		-6	-0.0032	2.5
50		-1	-0.0005	2.5
55		-5	-0.0027	2.5
25	4.2	-4	-0.0021	2.5
	3.5	-2	-0.0011	2.5

Annex A. Photograph: Test Setup Photo

RADIATED SPURIOUS EMISSION

