

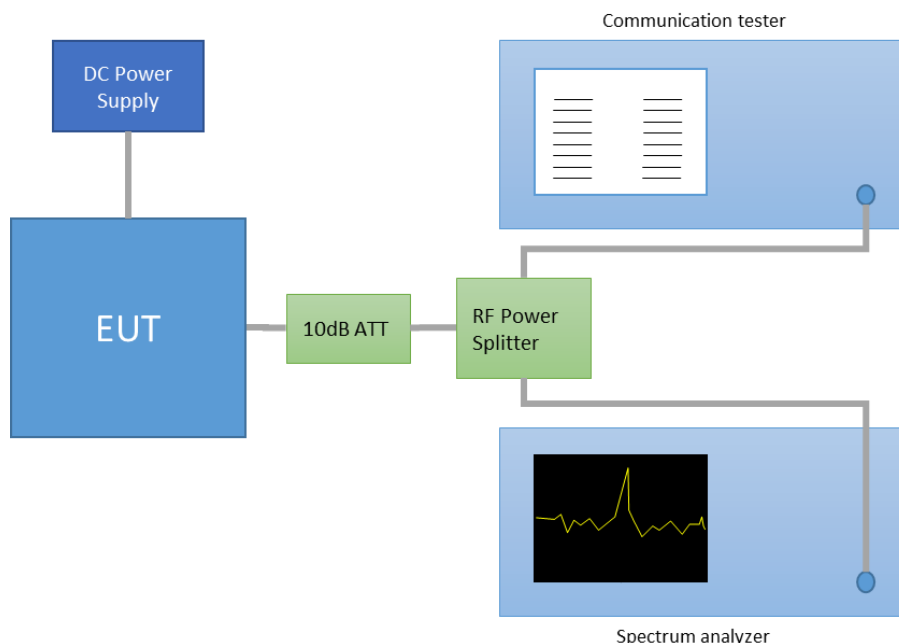
## B.2.4 Conducted band-edge and spurious emission

### Standard references

BAND	FCC part	Limits
PCS 1900 WCDMA II	2.1051, 24.238	§2.1051 The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.
GSM 850 WCDMA V	2.1051, 22.917	§22. 917 & 24.238 The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB

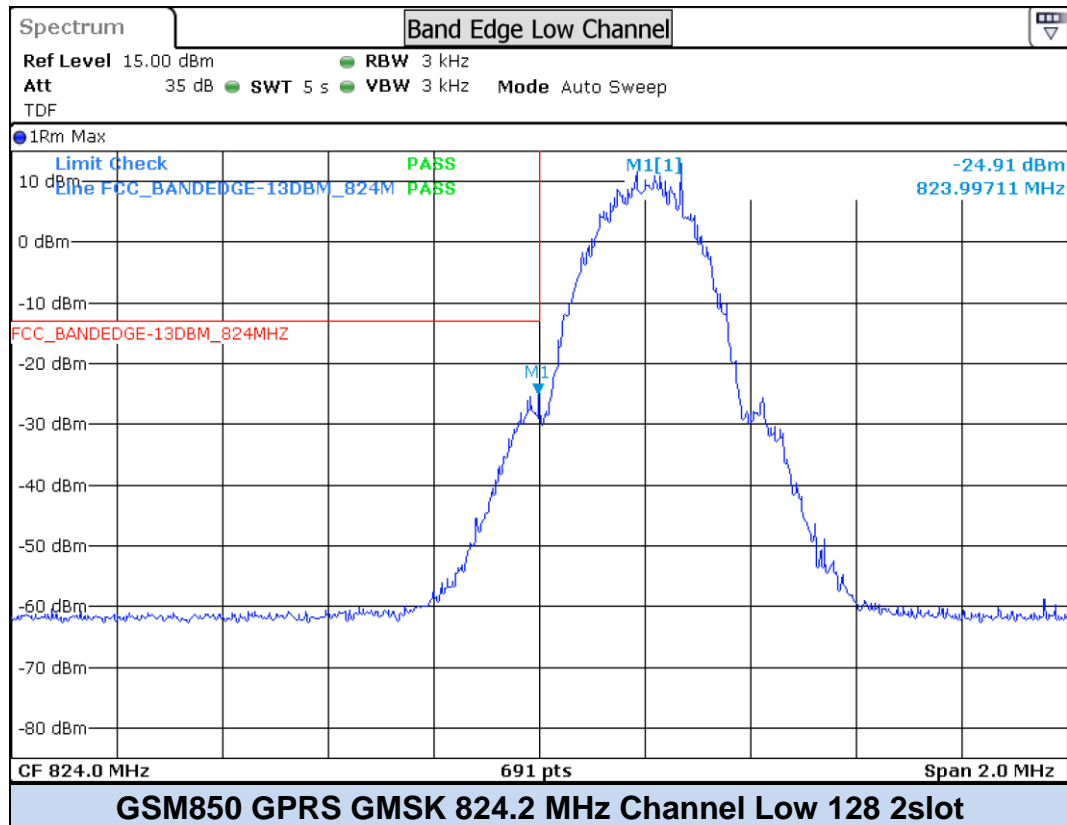
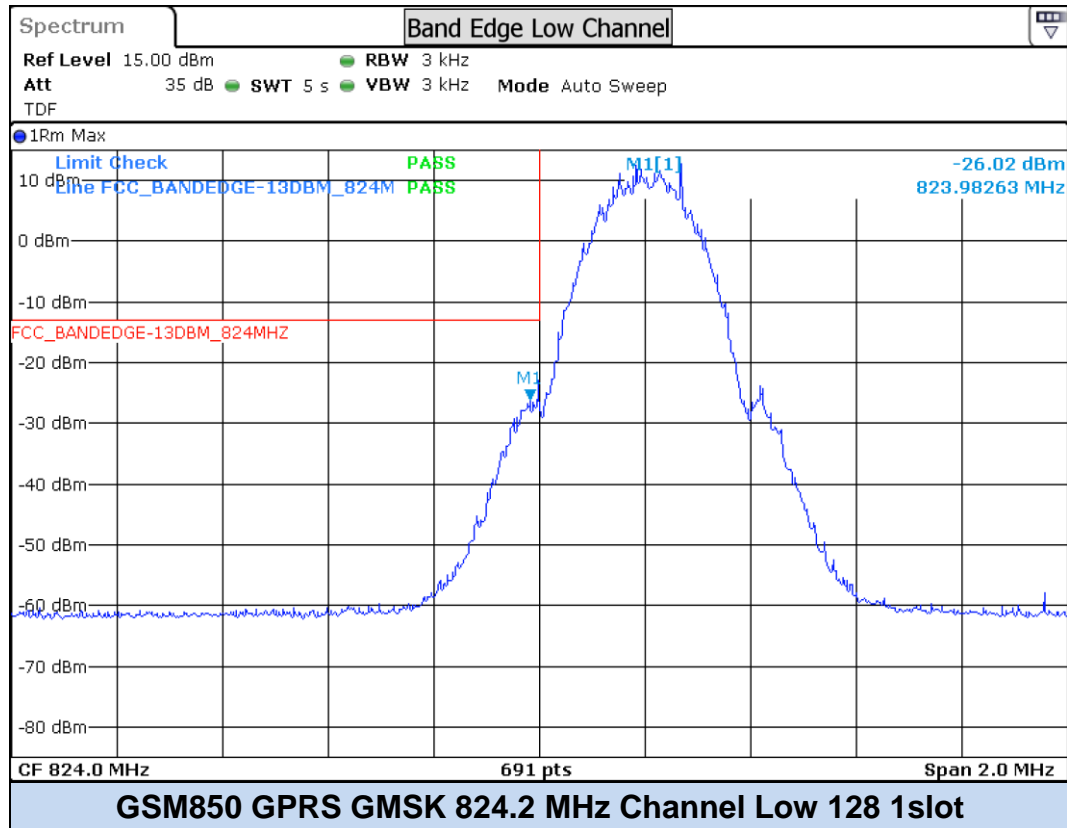
### Test procedure

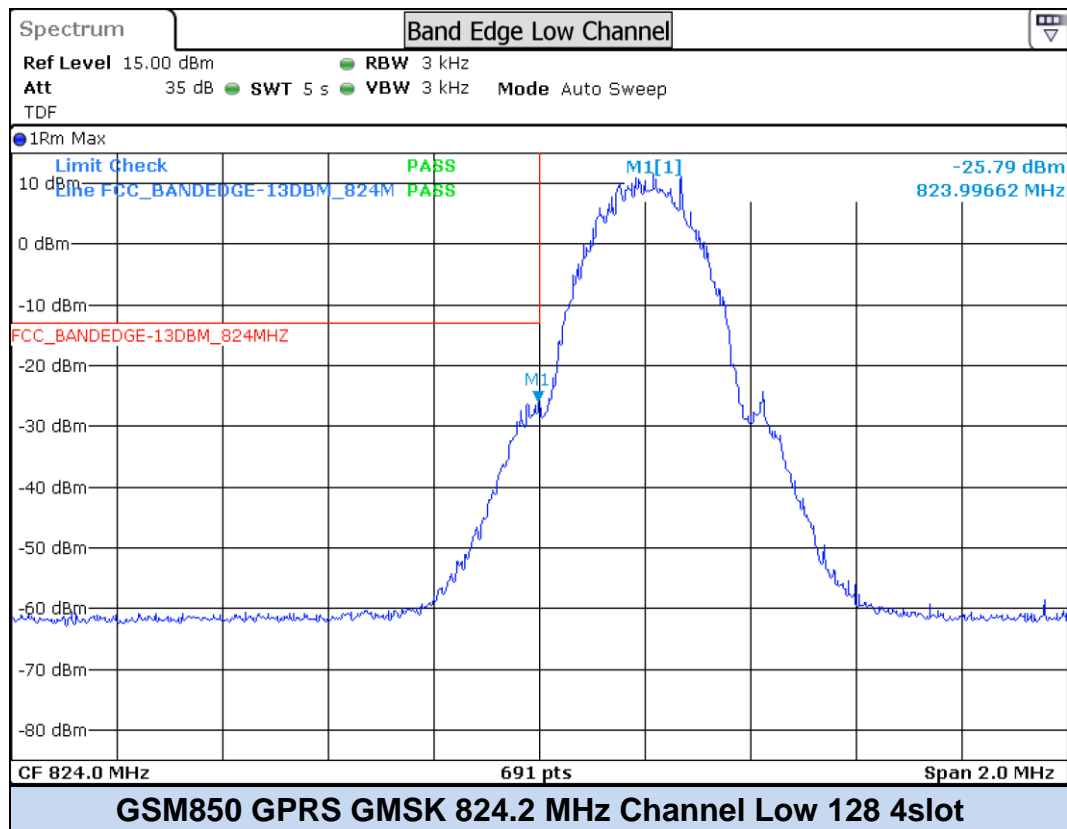
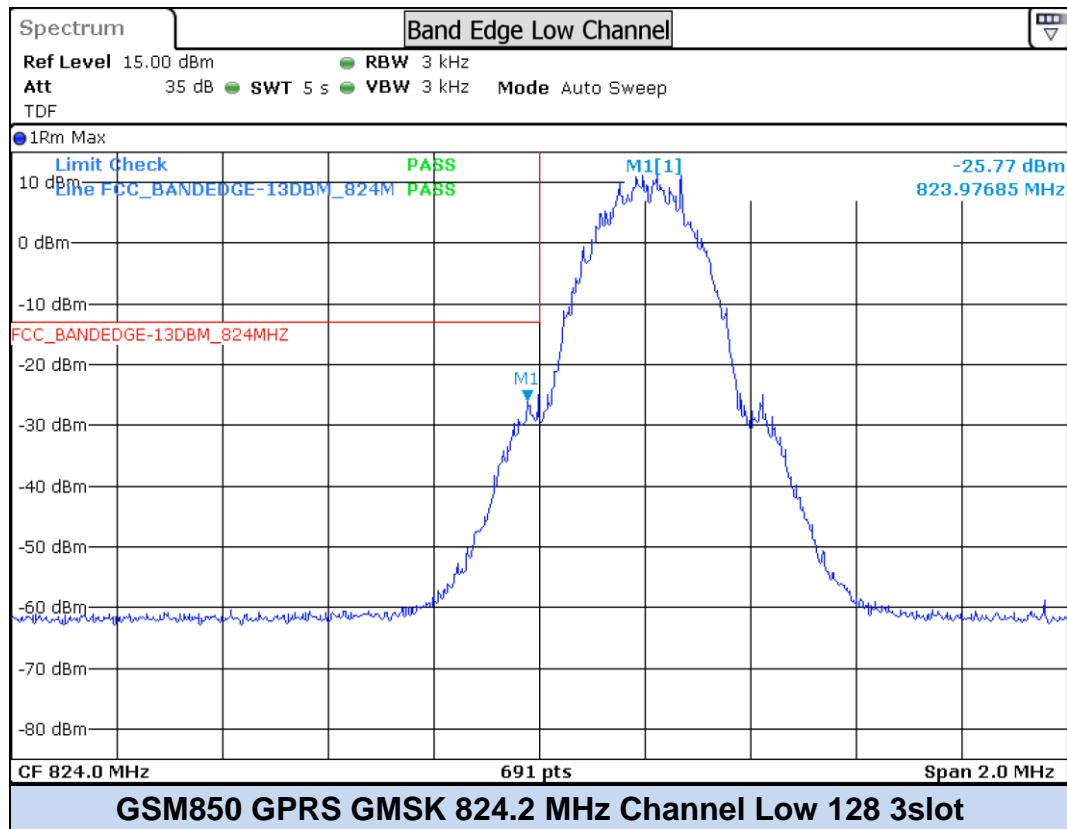
The setup below was used to measure the band-edge and the conducted spurious. The antenna terminal of the EUT is connected to the spectrum analyzer and the communication tester through an attenuator and a power splitter. According to the standard reference, at 1 MHz immediately outside and adjacent to the authorized operating frequency range, a resolution bandwidth of at least 1% has been applied. For all measurements results shown in this section, the video bandwidth is always set to at least 3 times the resolution bandwidth. The spectrum analyzer's resolution bandwidth was set to 1 MHz and the video bandwidth set to 3MHz for all conducted spurious measurements.

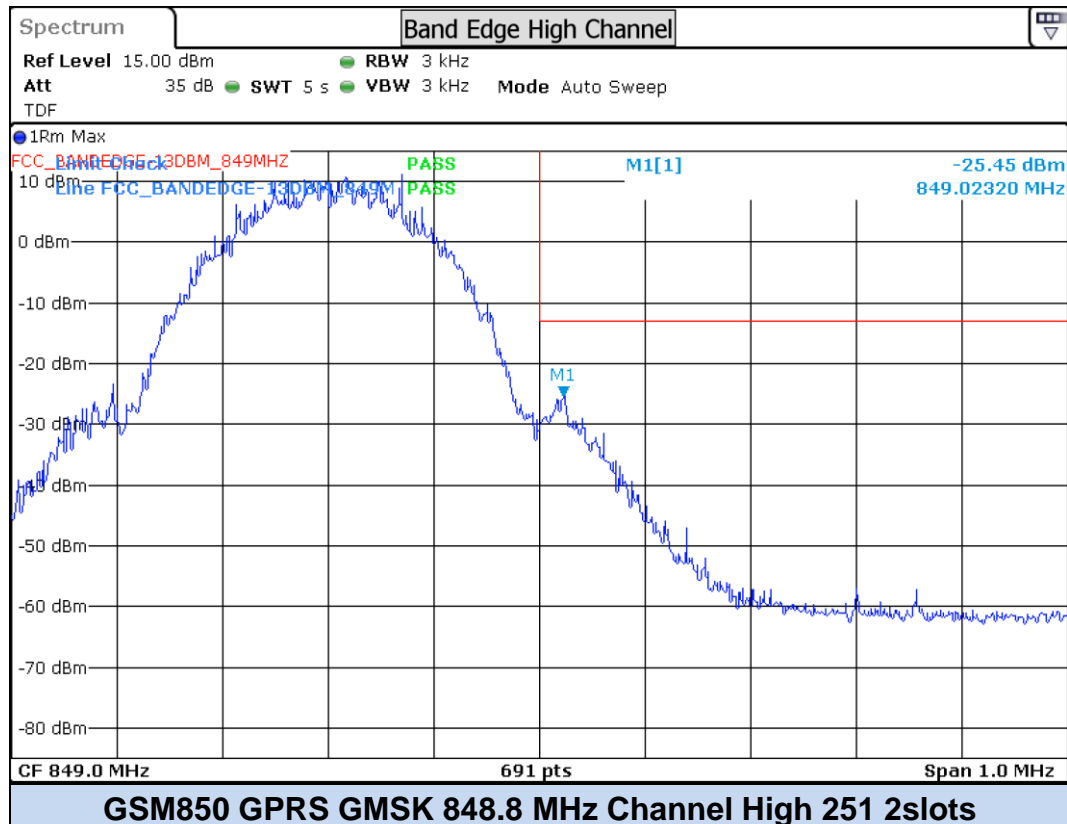
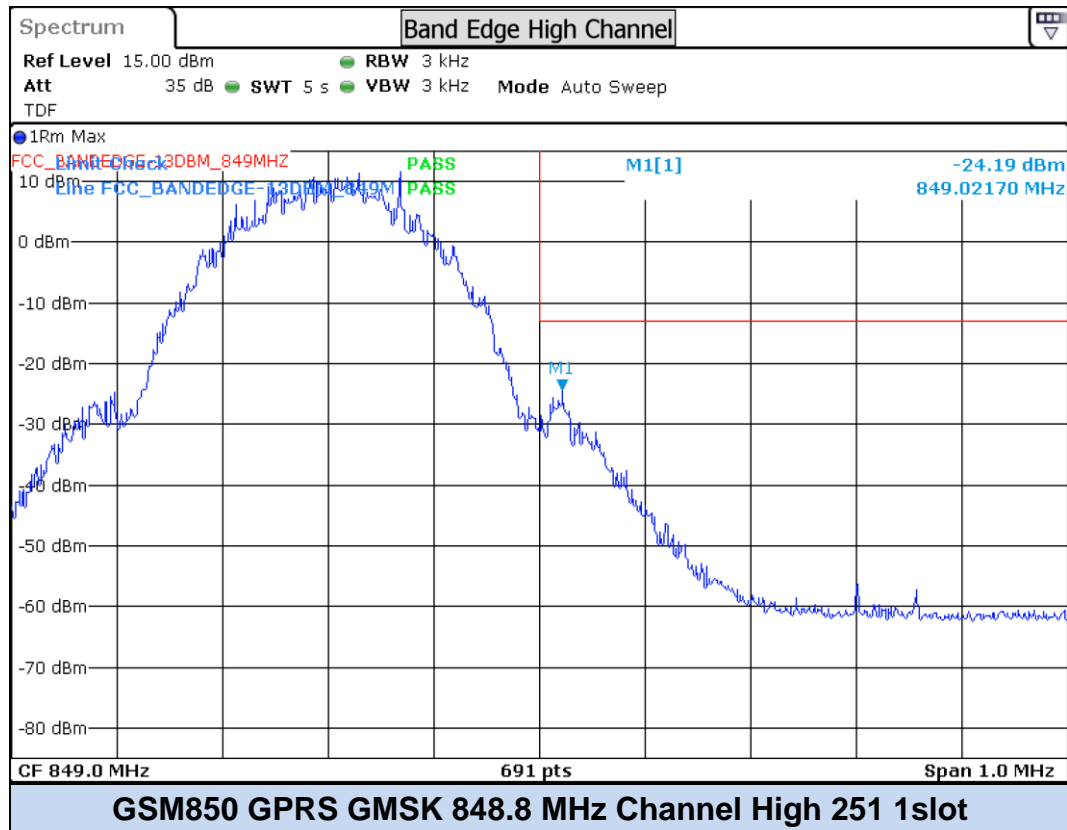


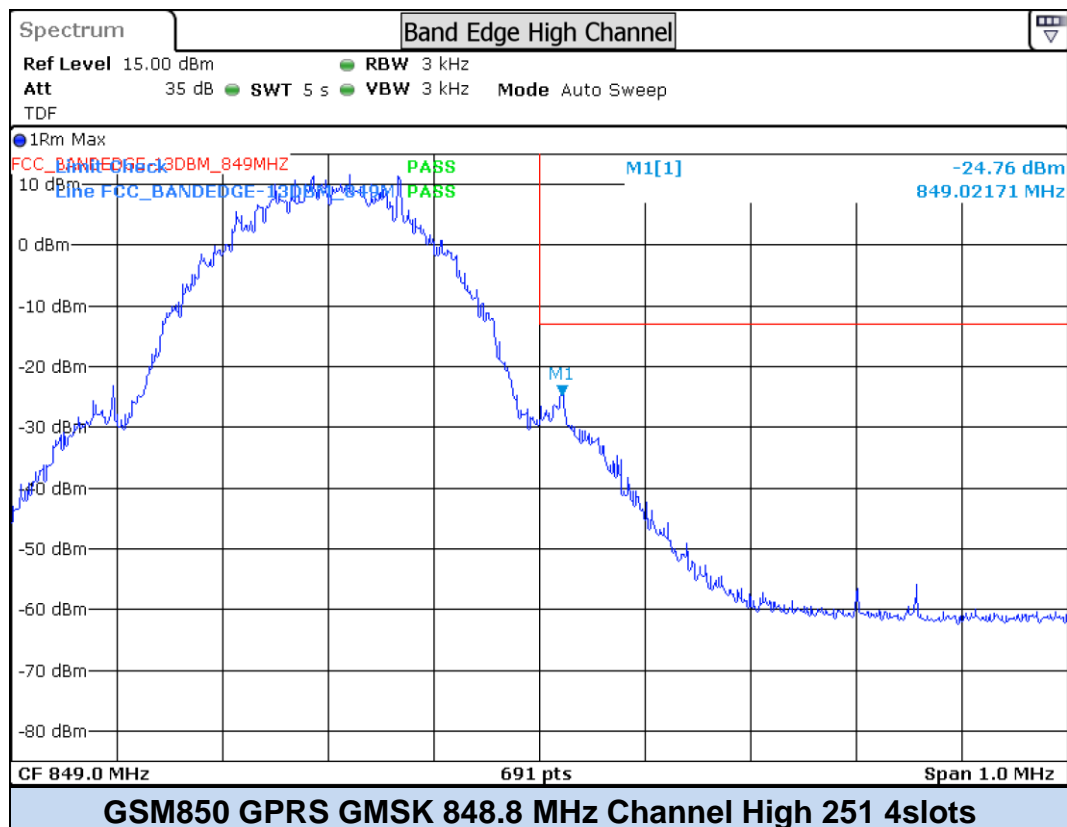
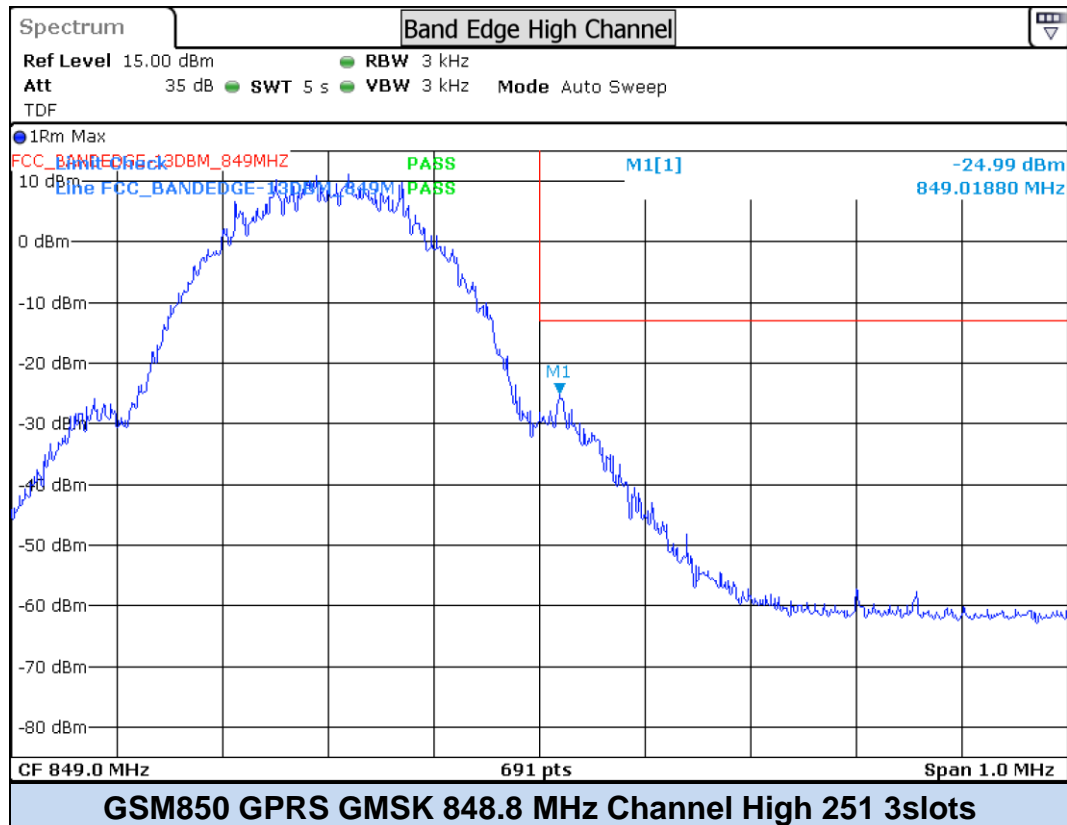
# Band-edge emission screenshot results

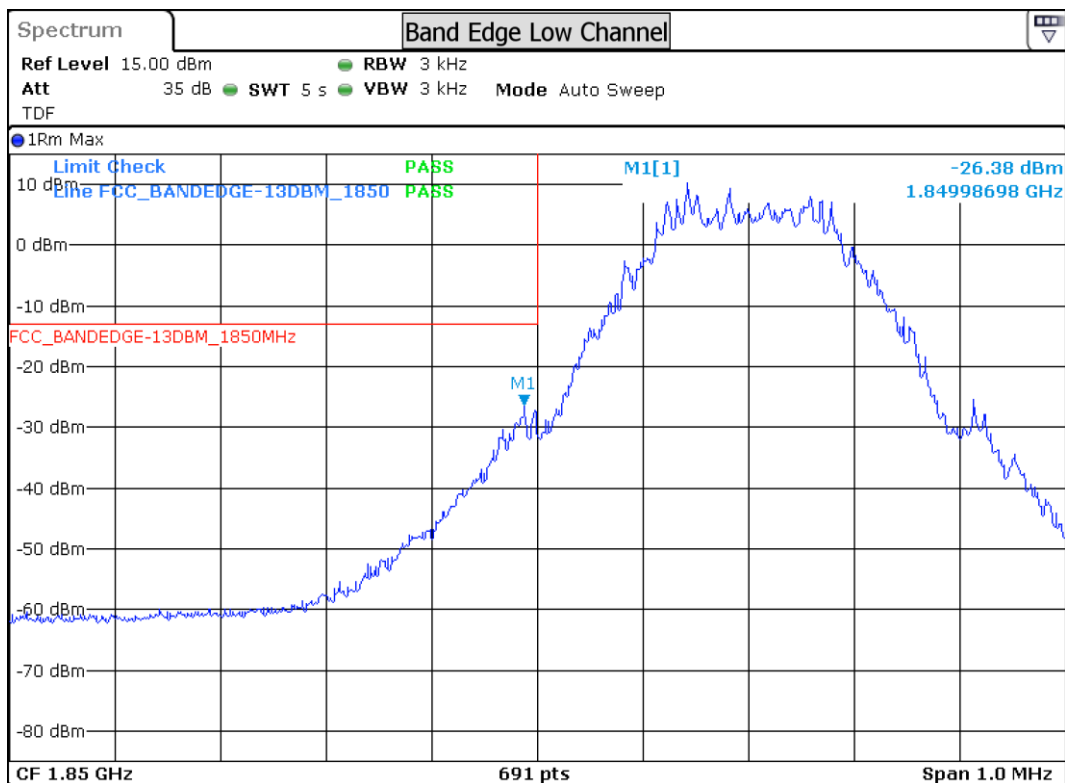
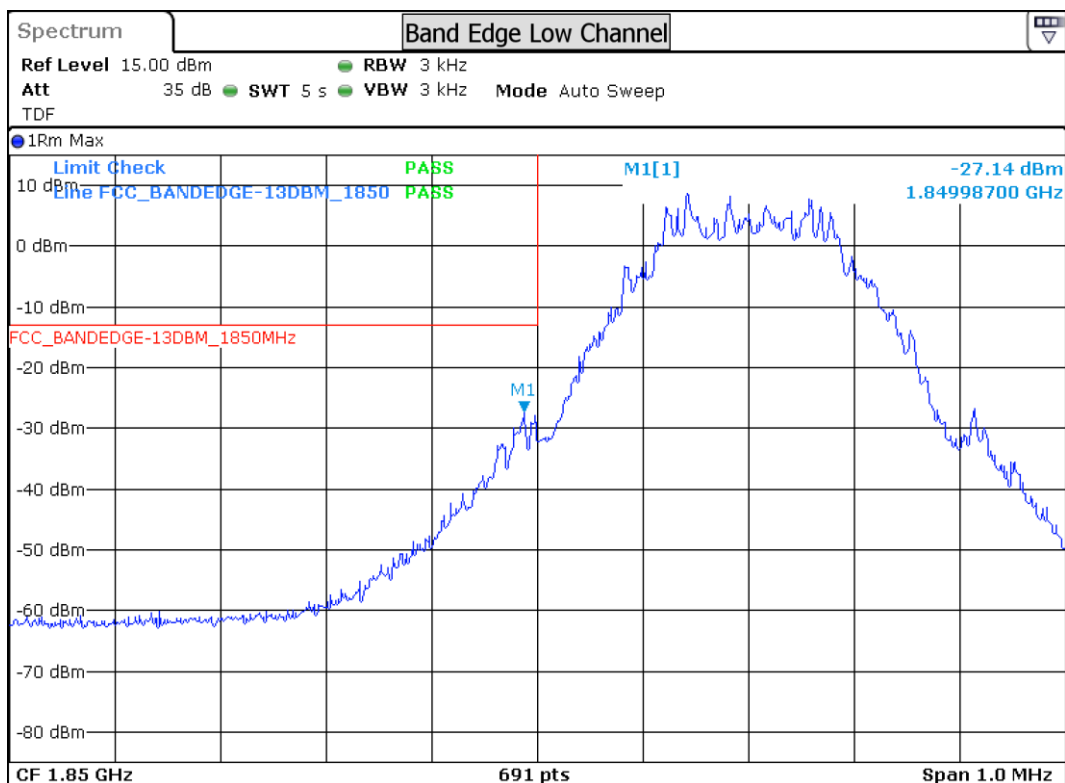
## GSM 850

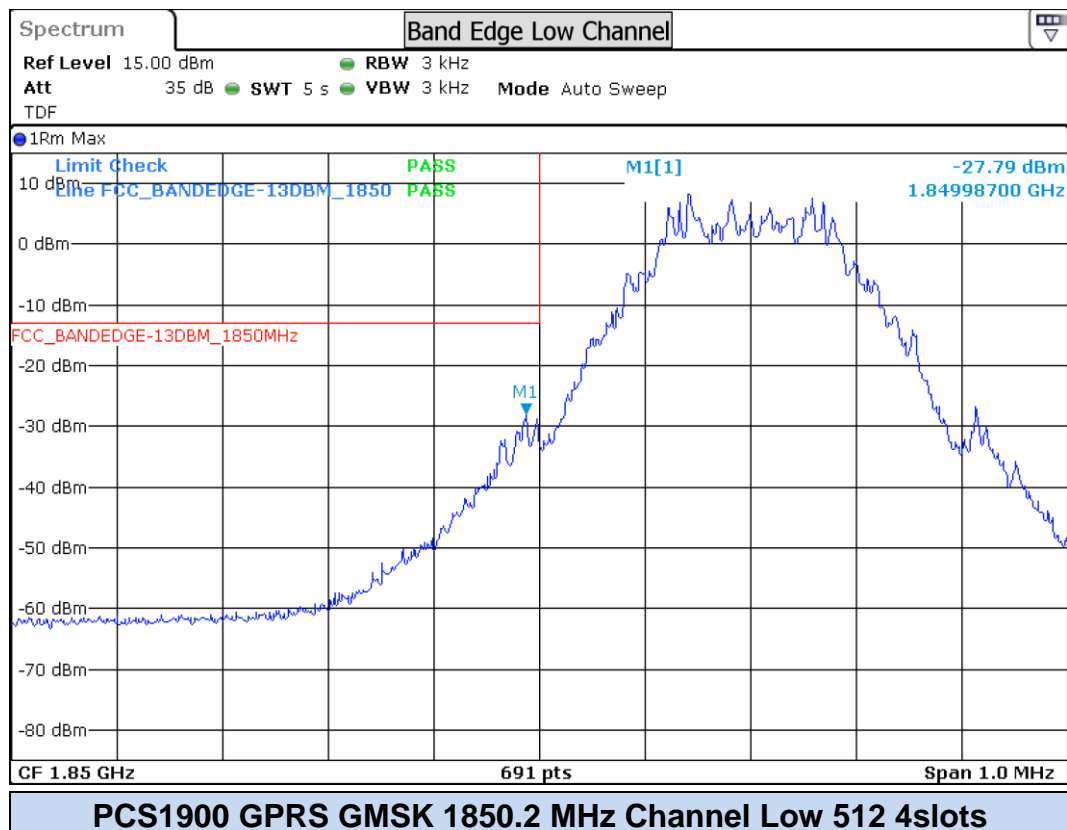
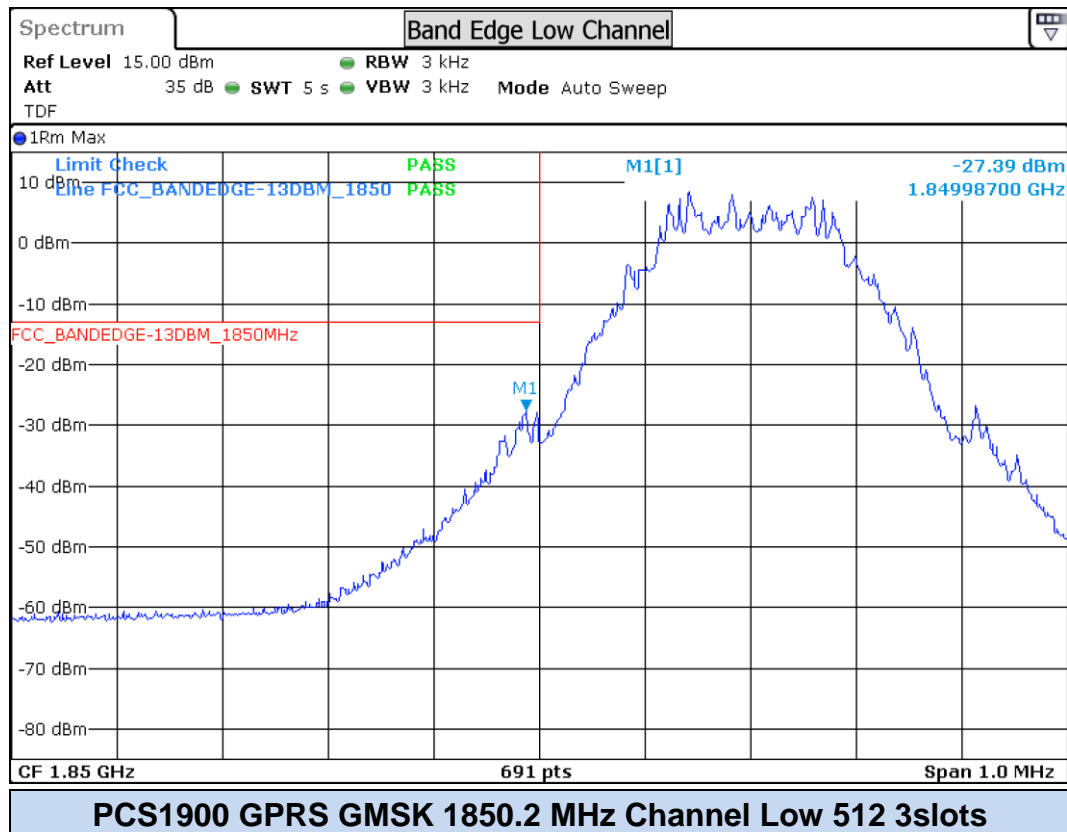


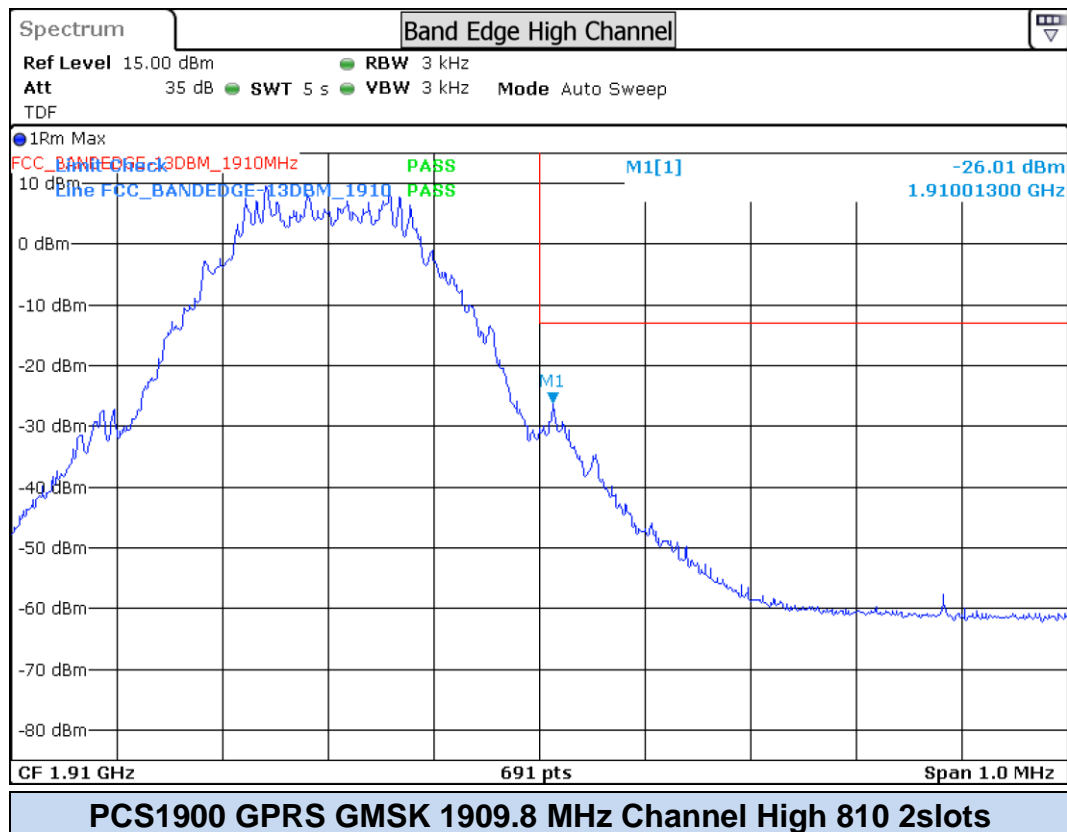
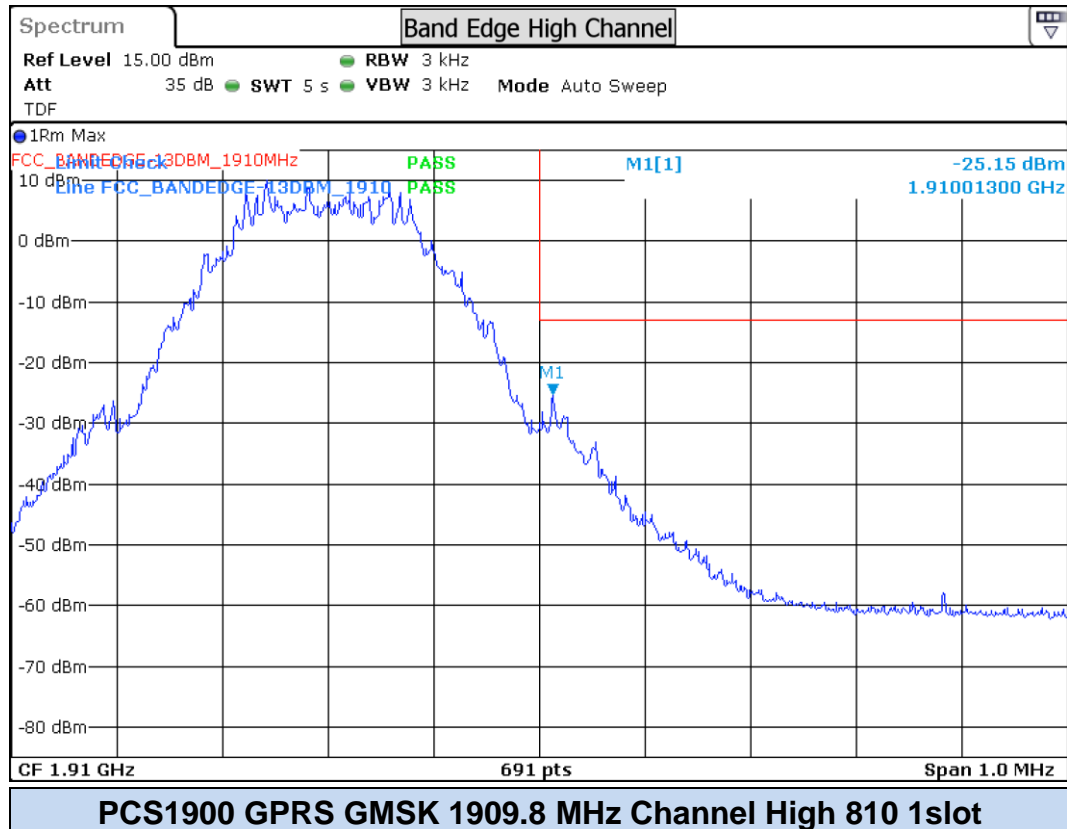




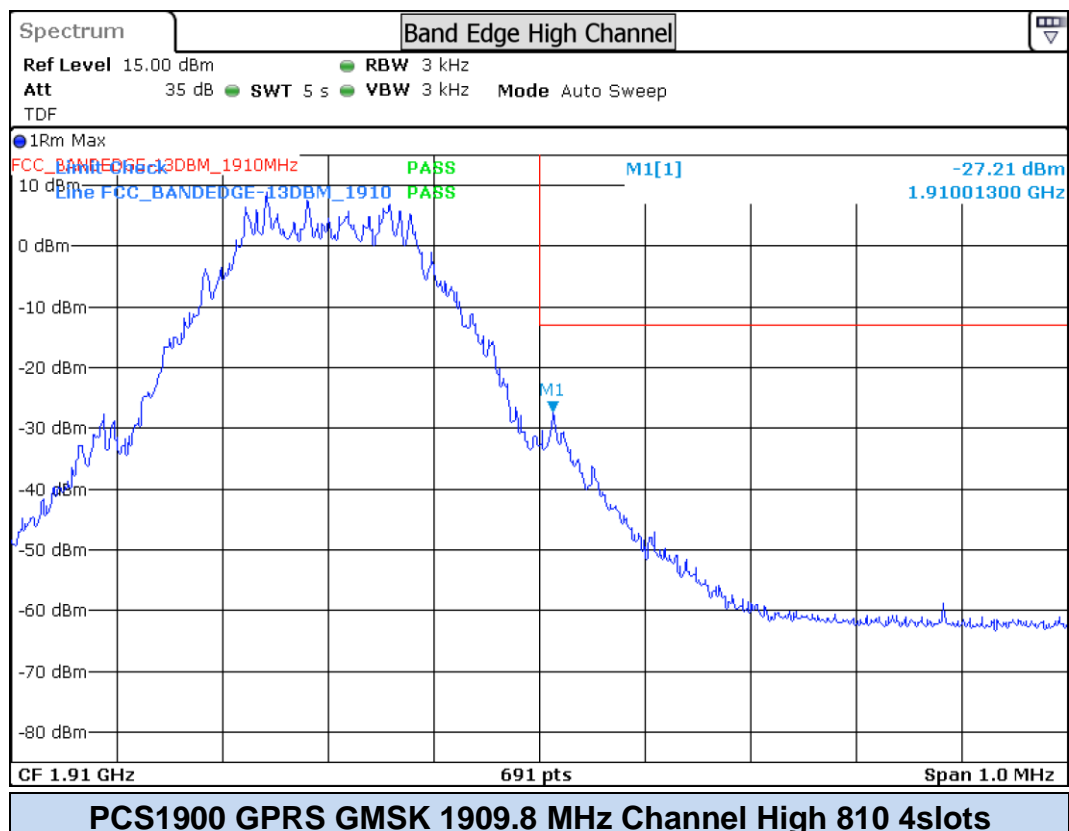
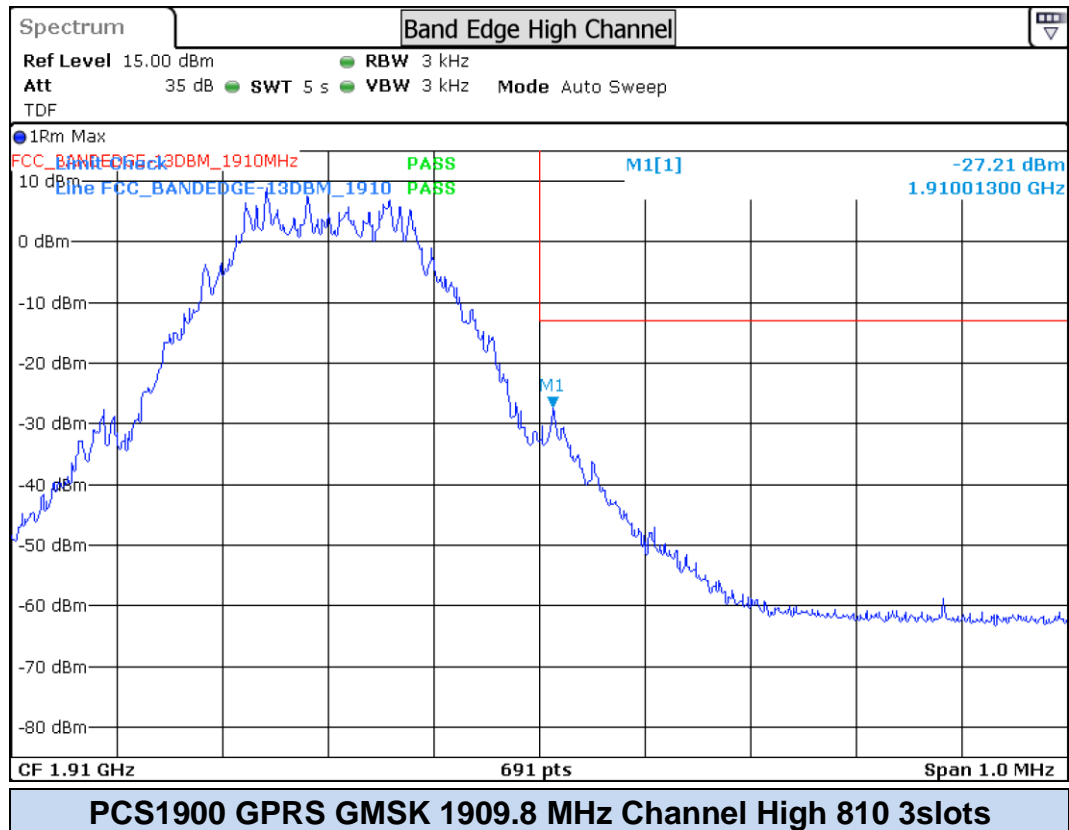


**PCS 1900****PCS1900 GPRS GMSK 1850.2 MHz Channel Low 512 1slot****PCS1900 GPRS GMSK 1850.2 MHz Channel Low 512 2slots**

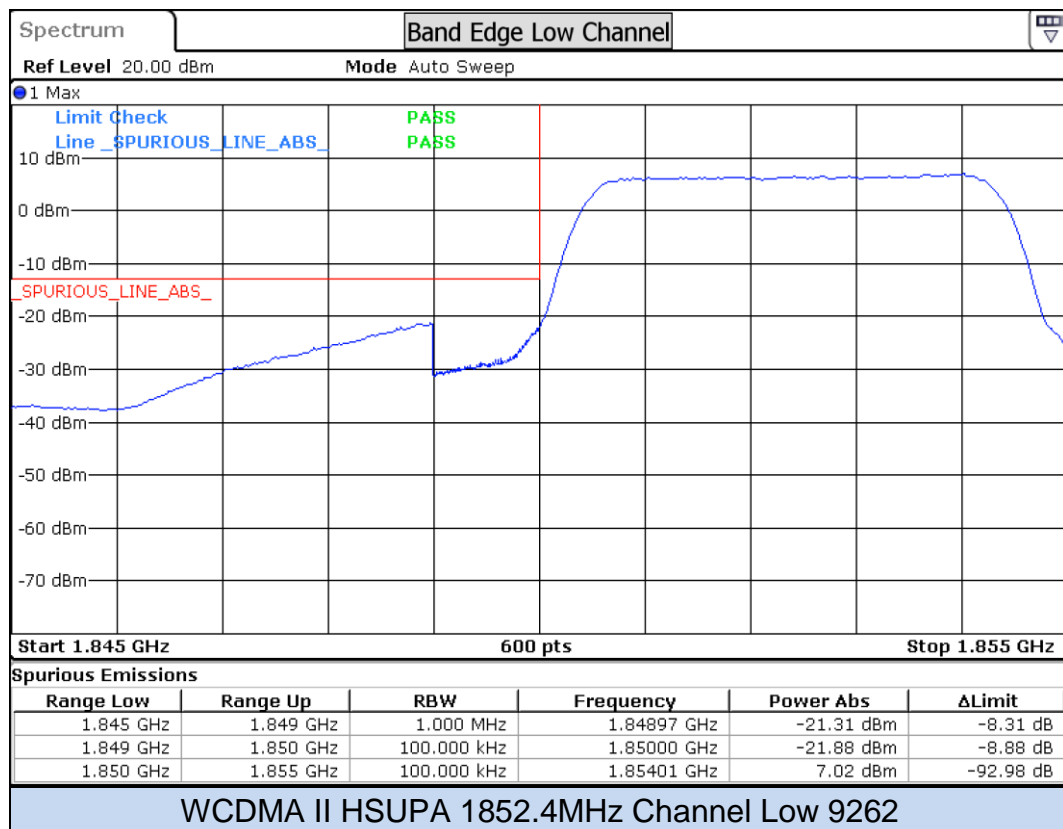
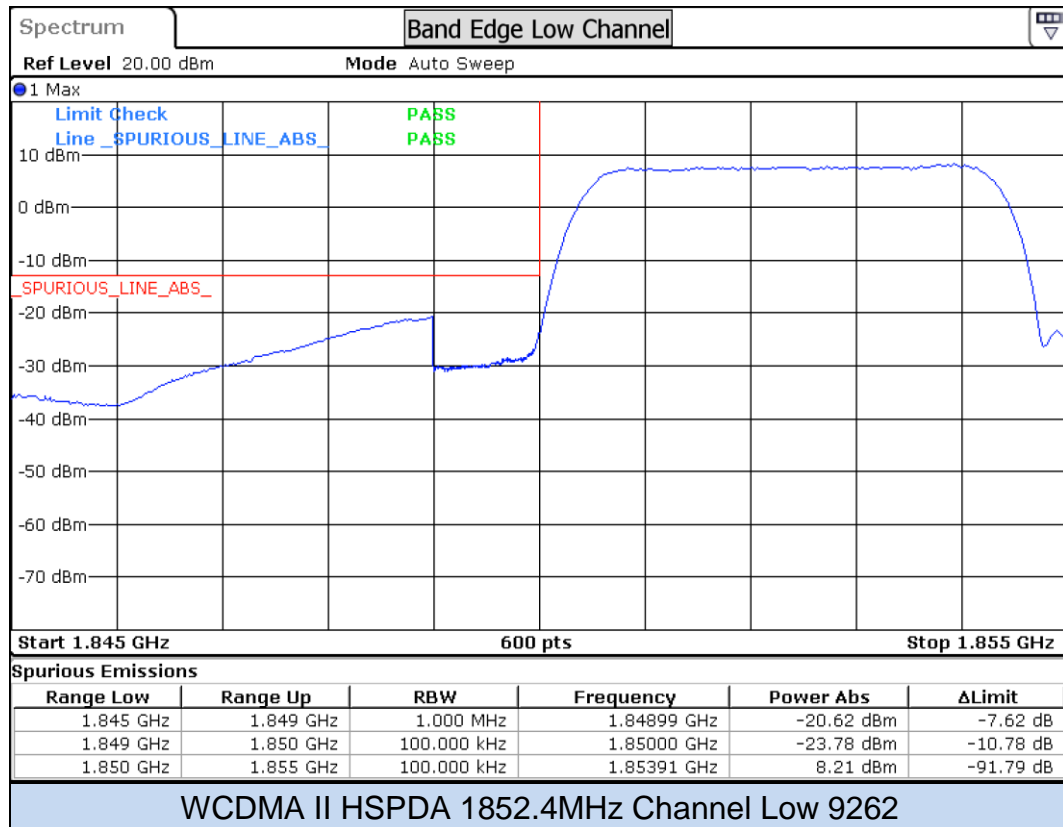


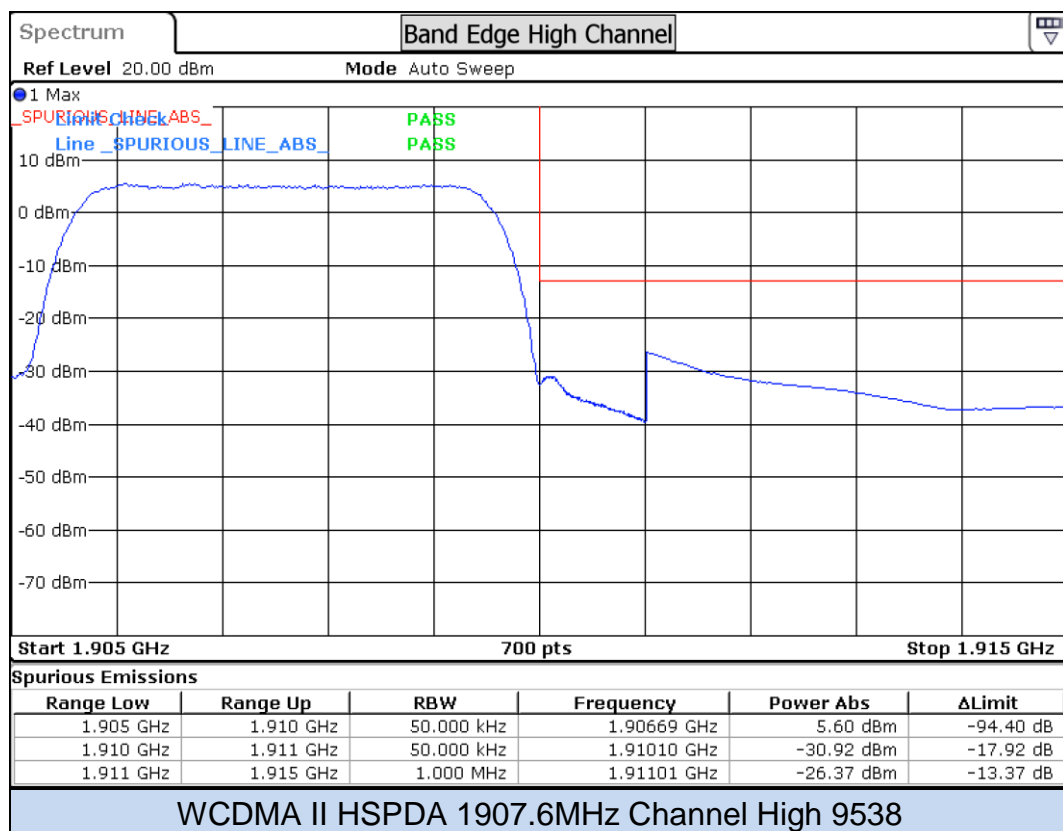
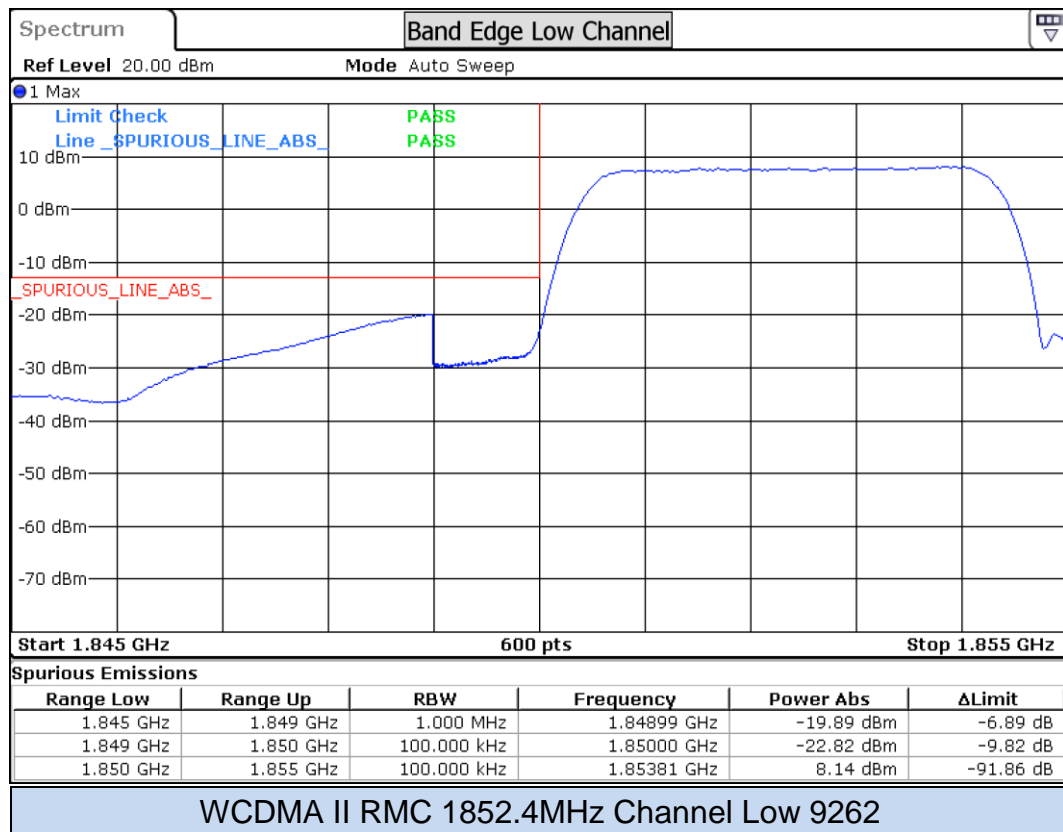


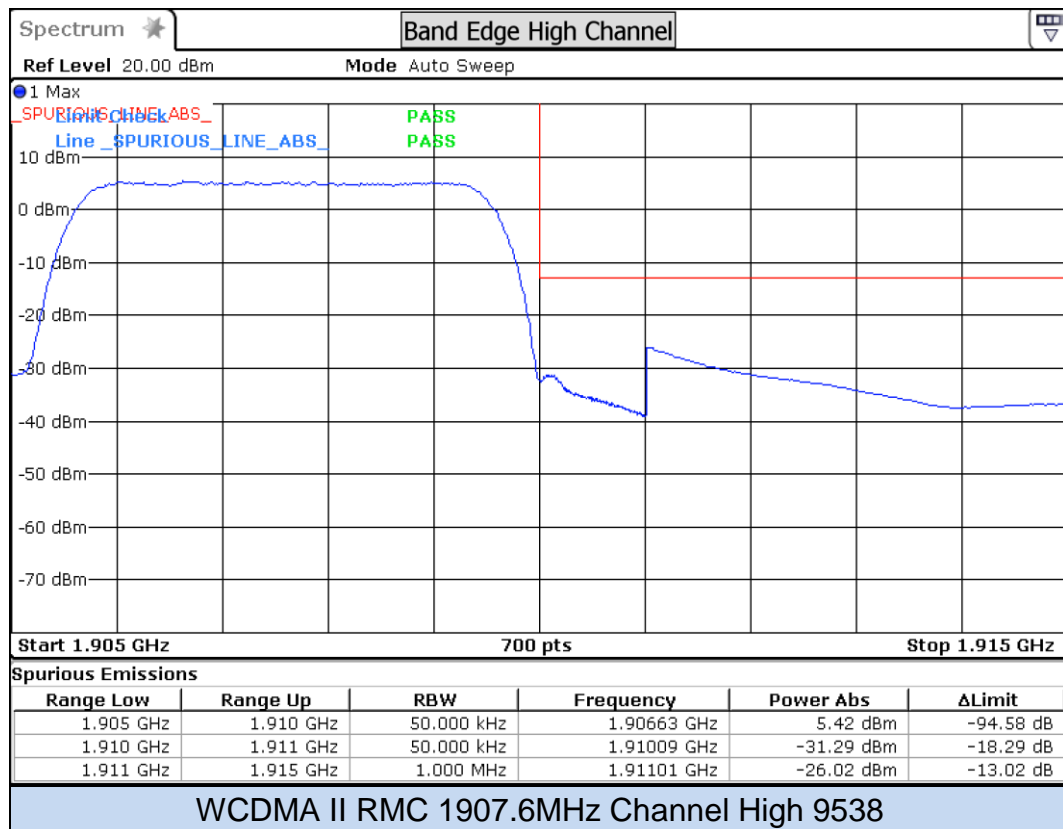
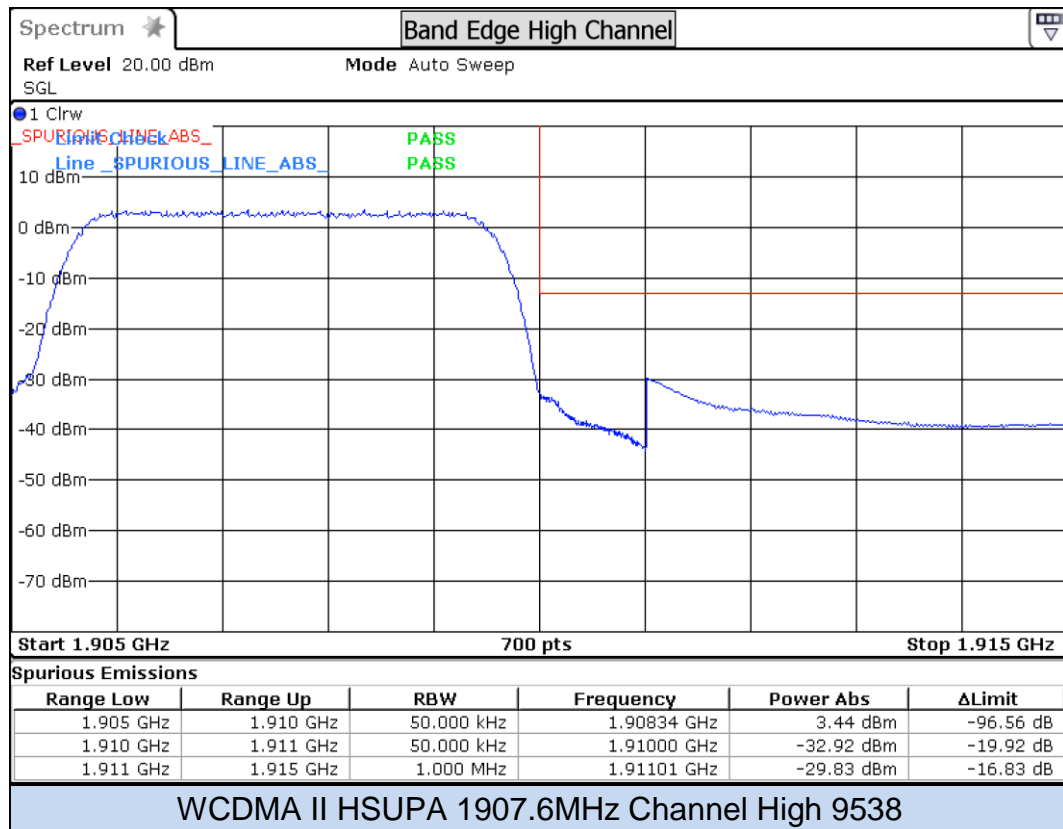




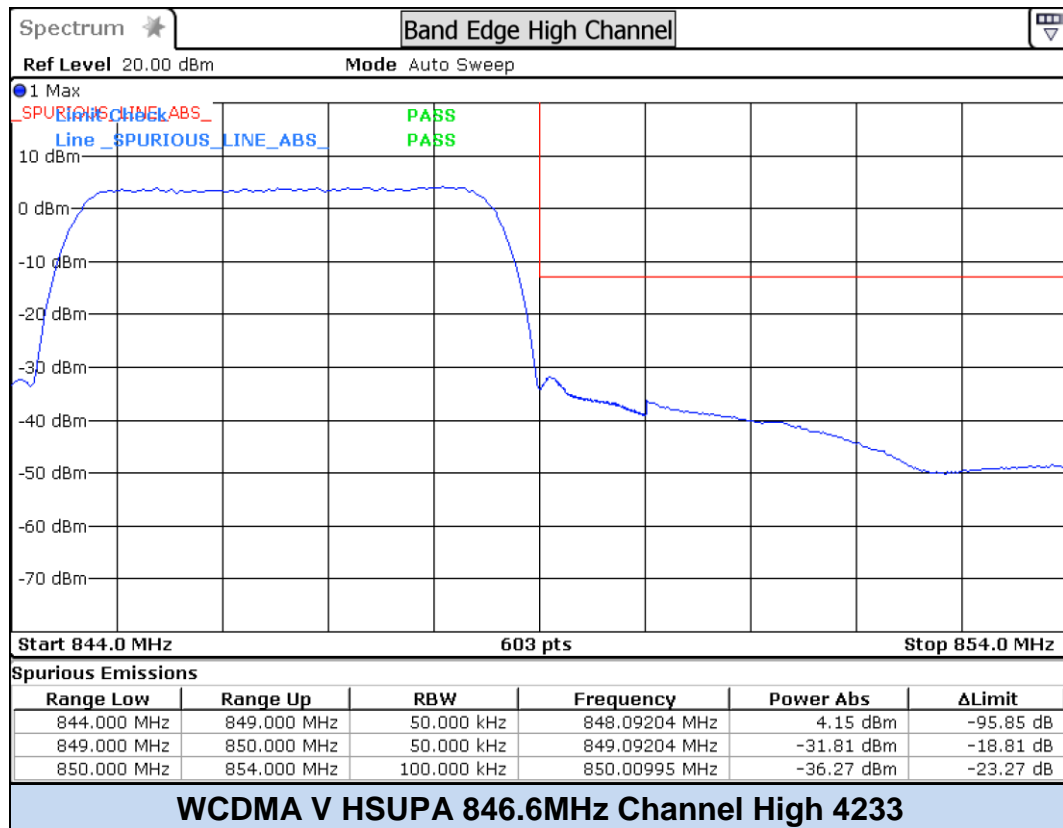
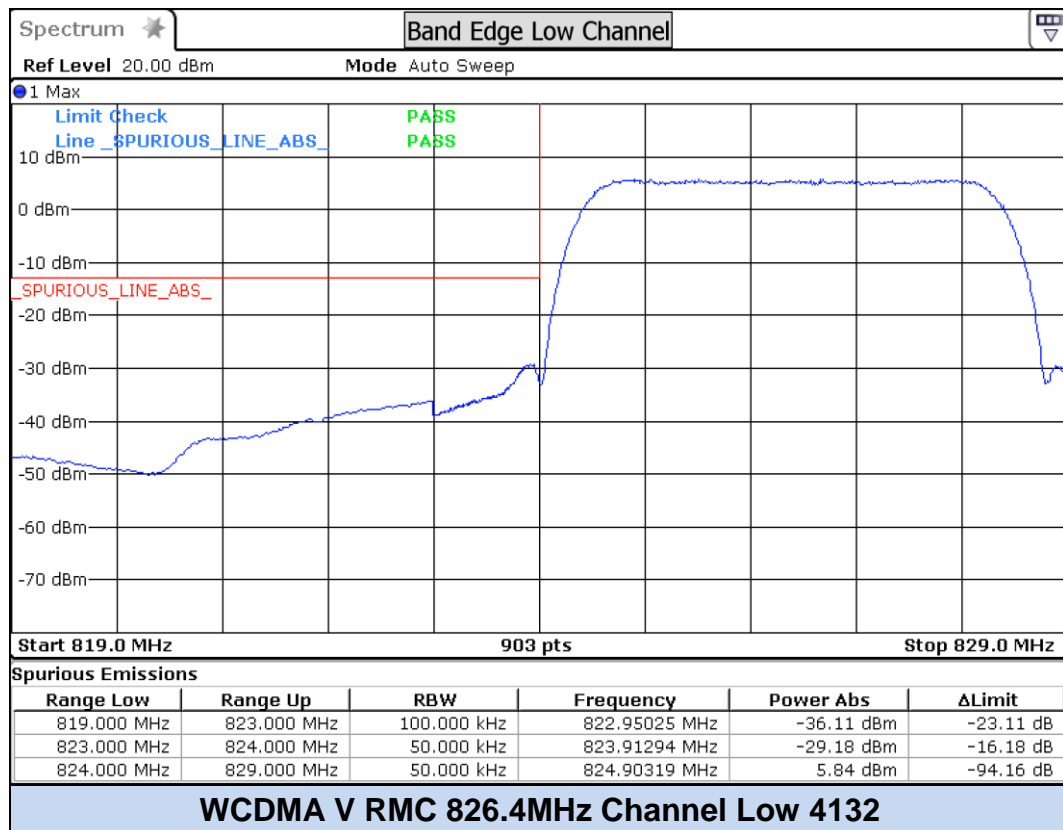
## WCDMA Band II

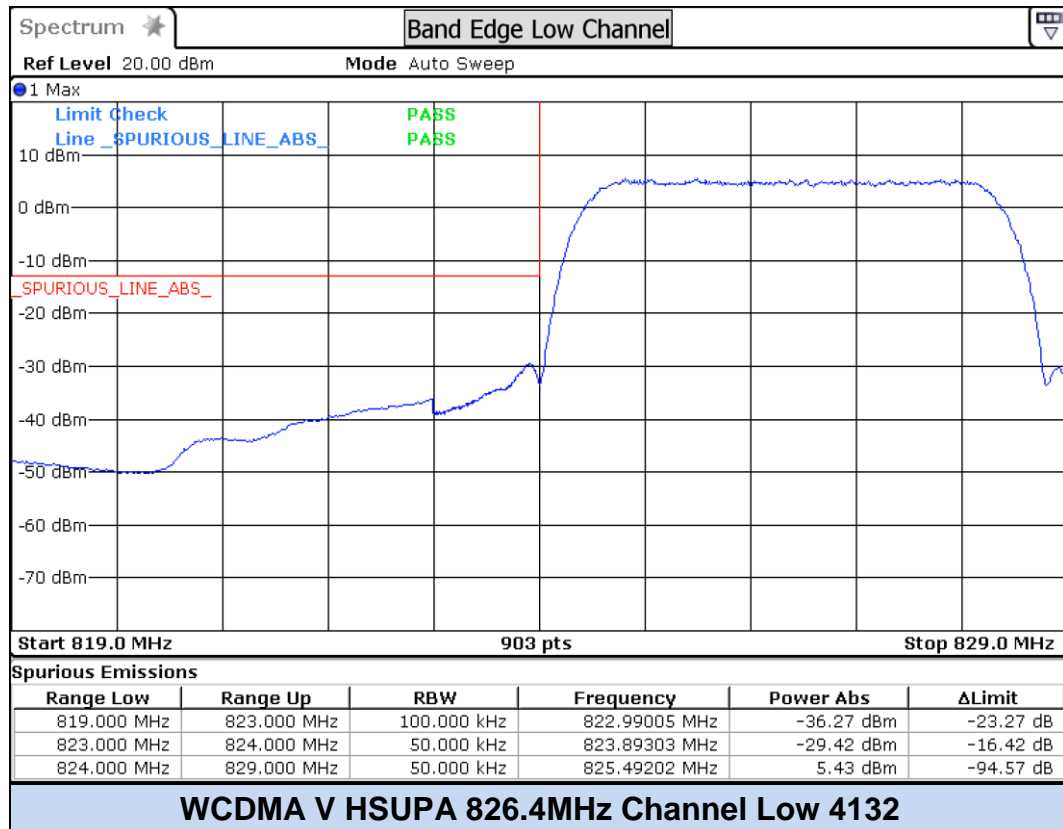
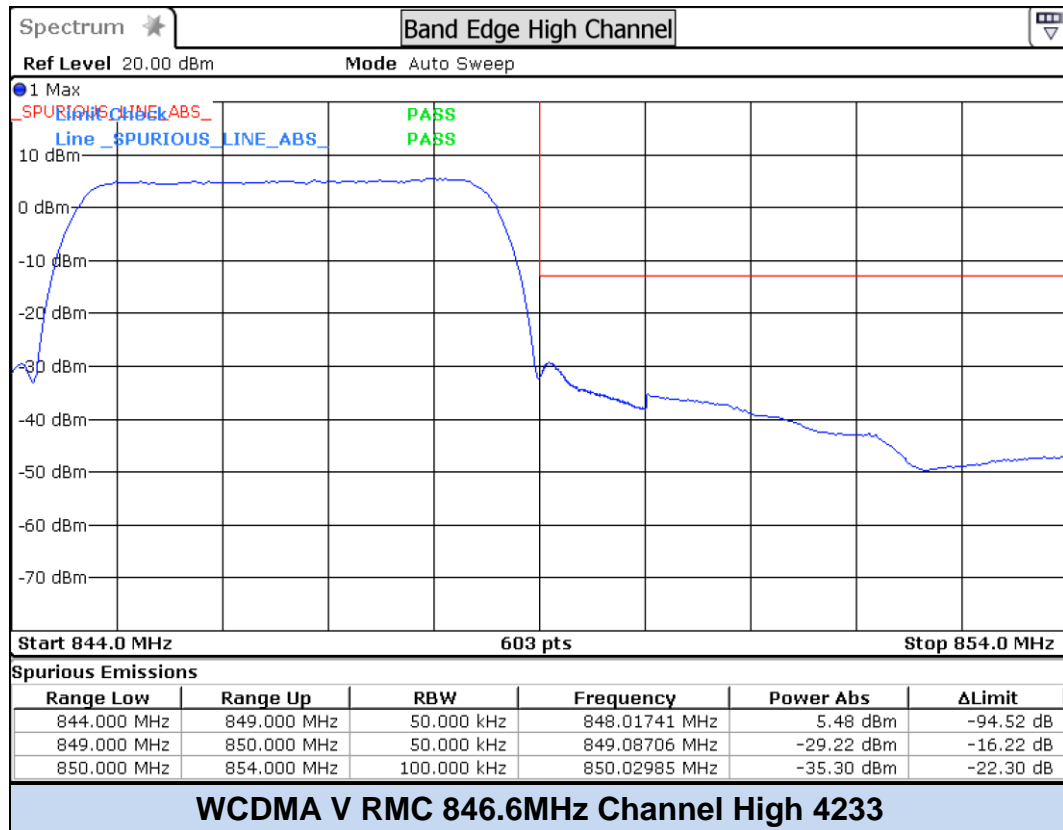




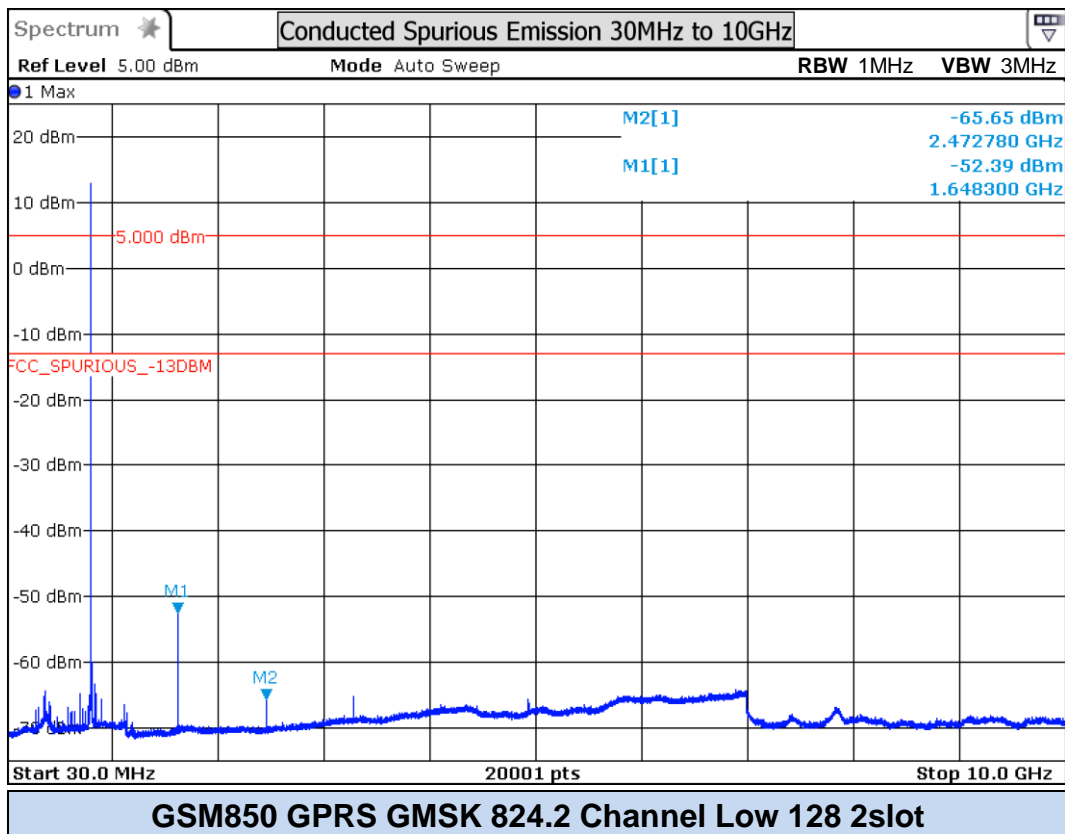
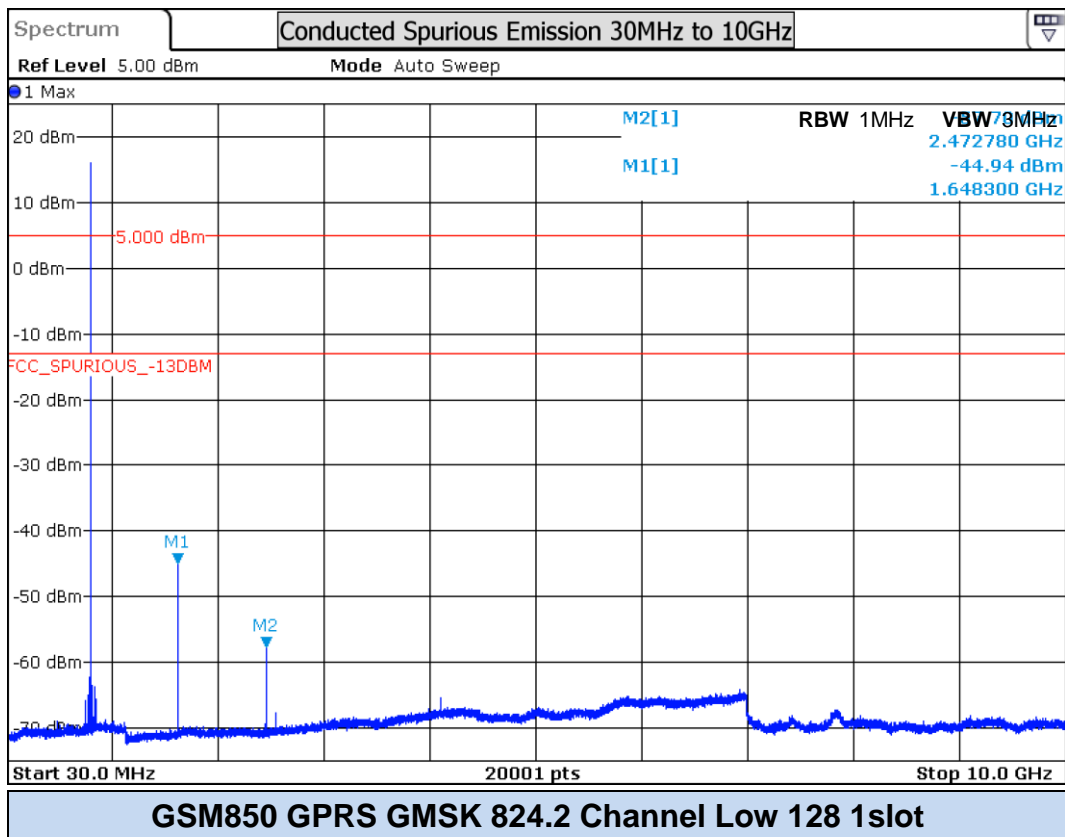


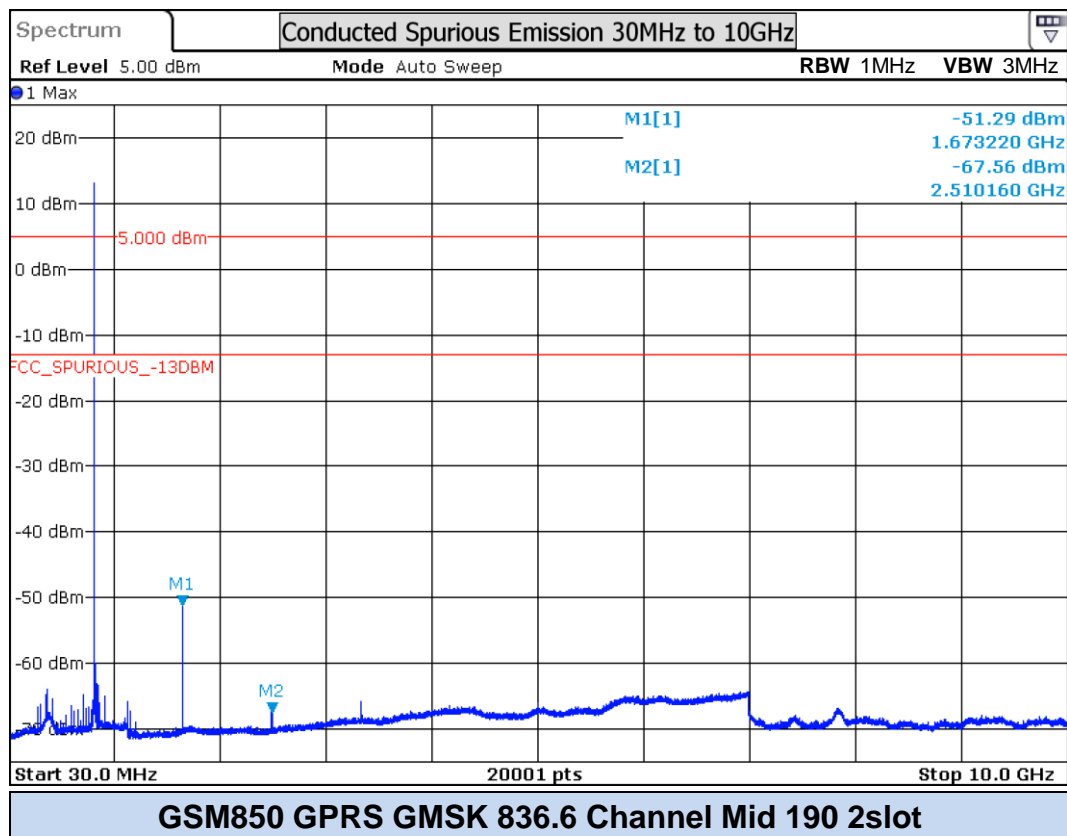
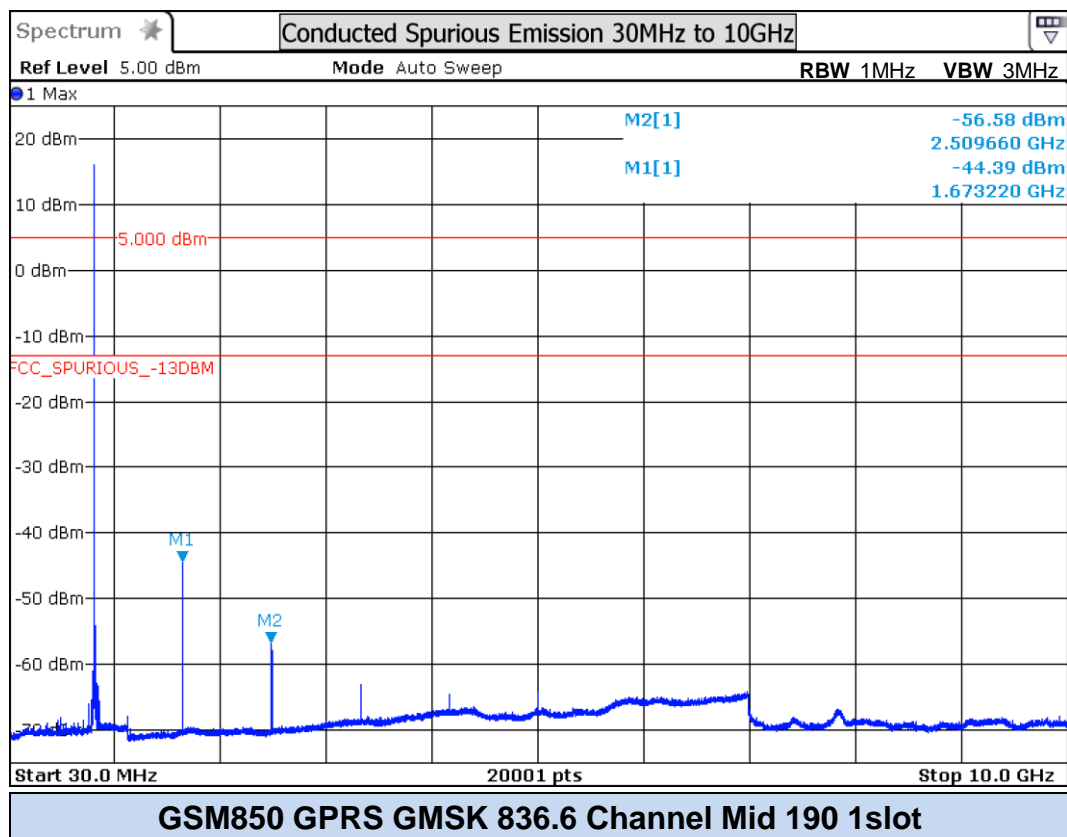
## WCDMA Band V



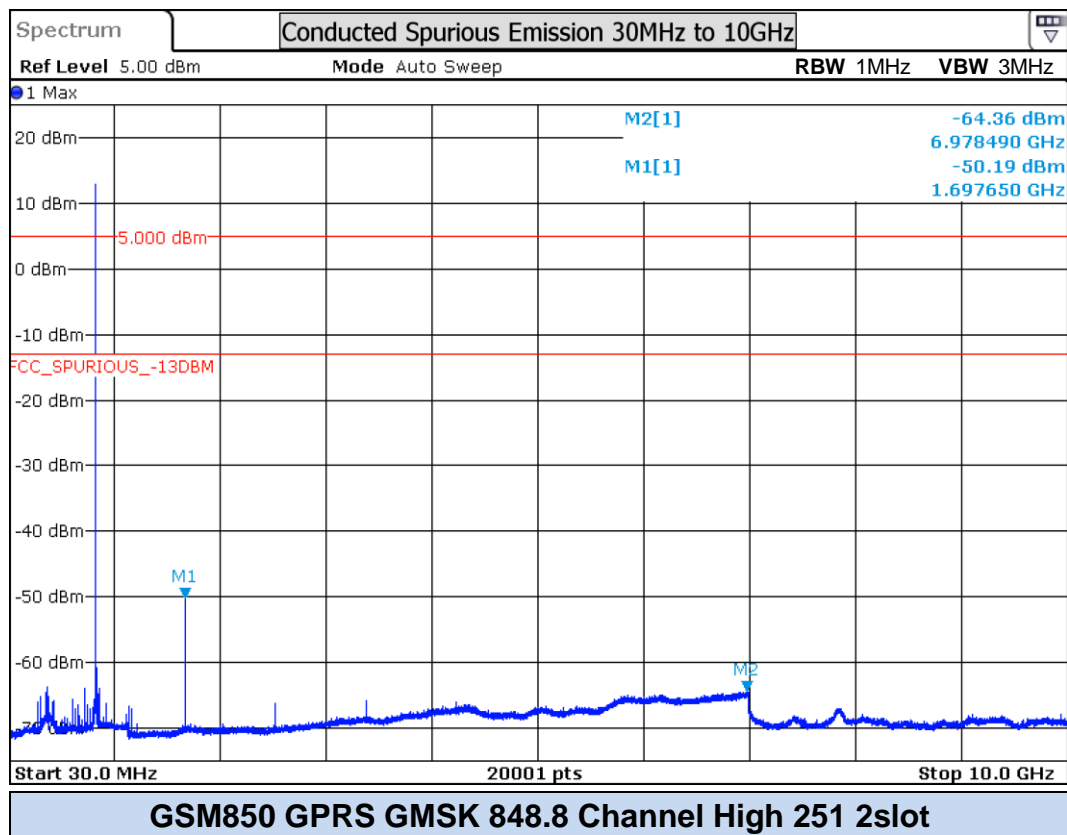
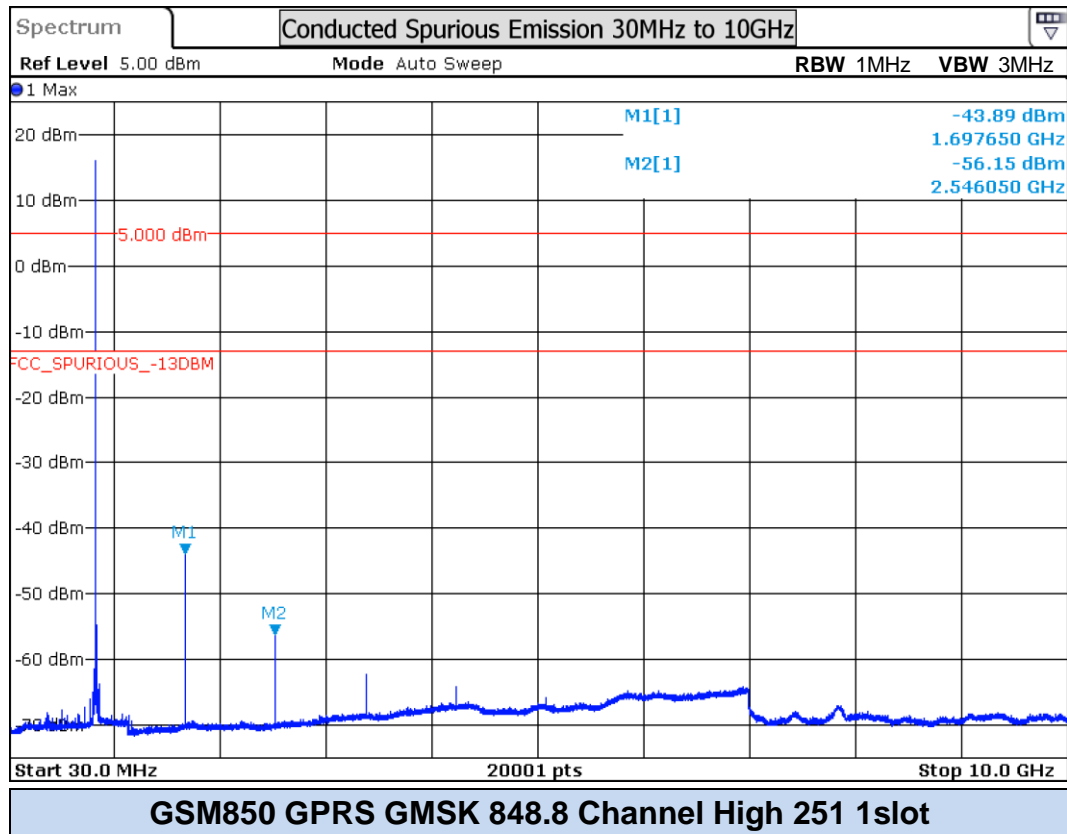


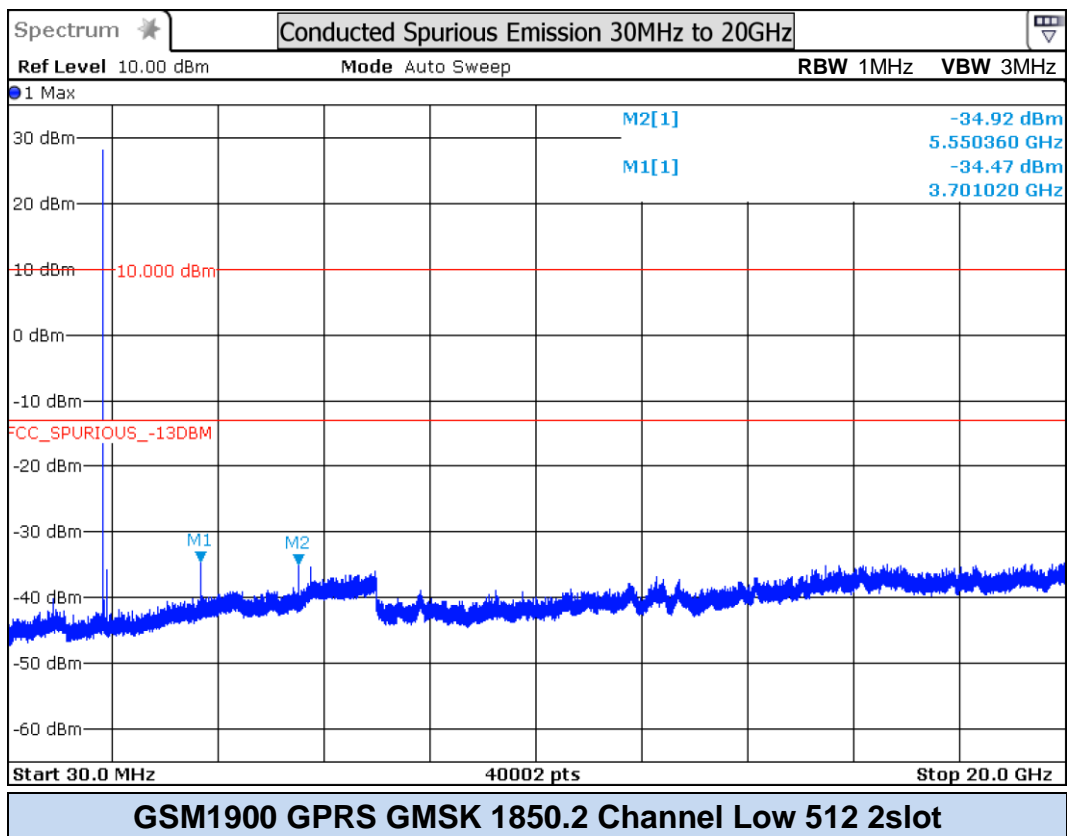
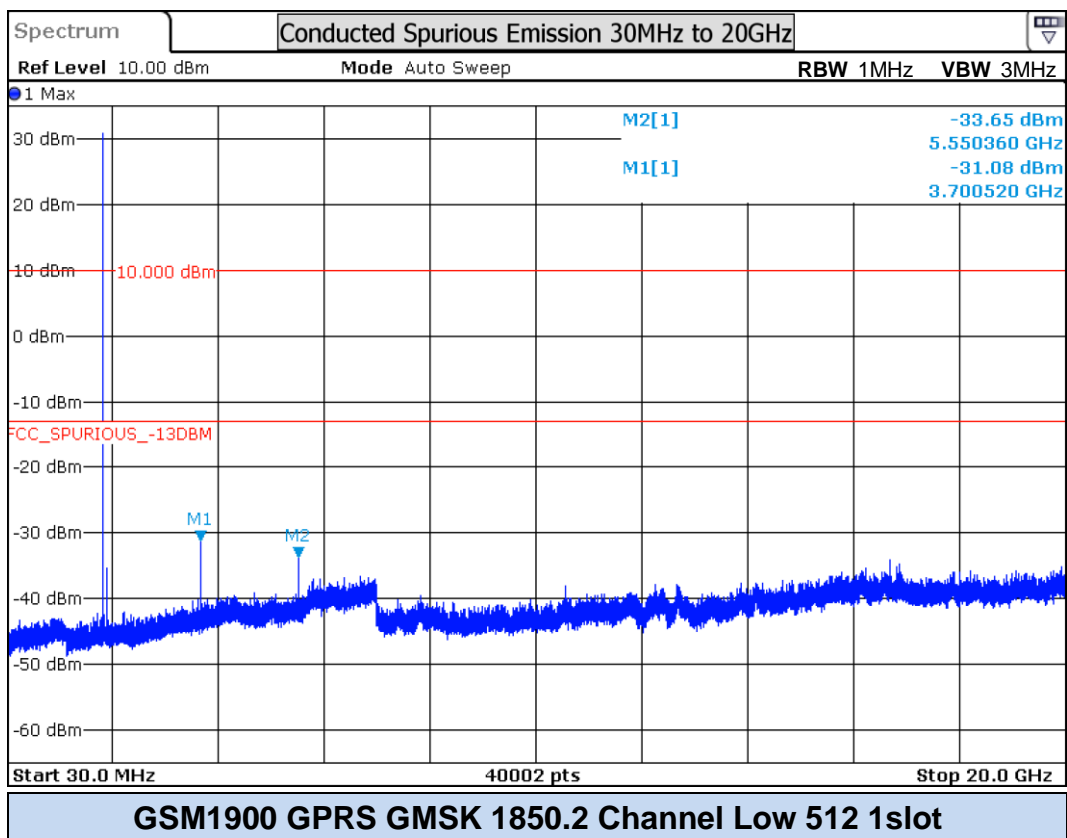
### Spurious emission screenshot results

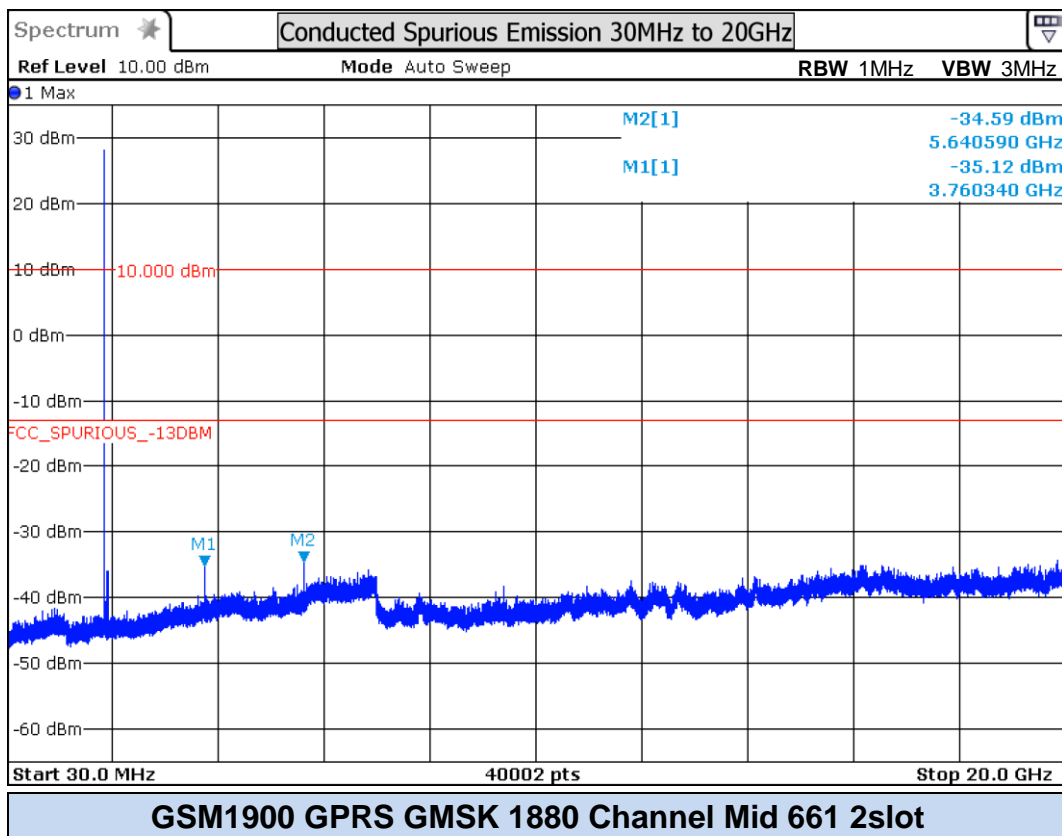
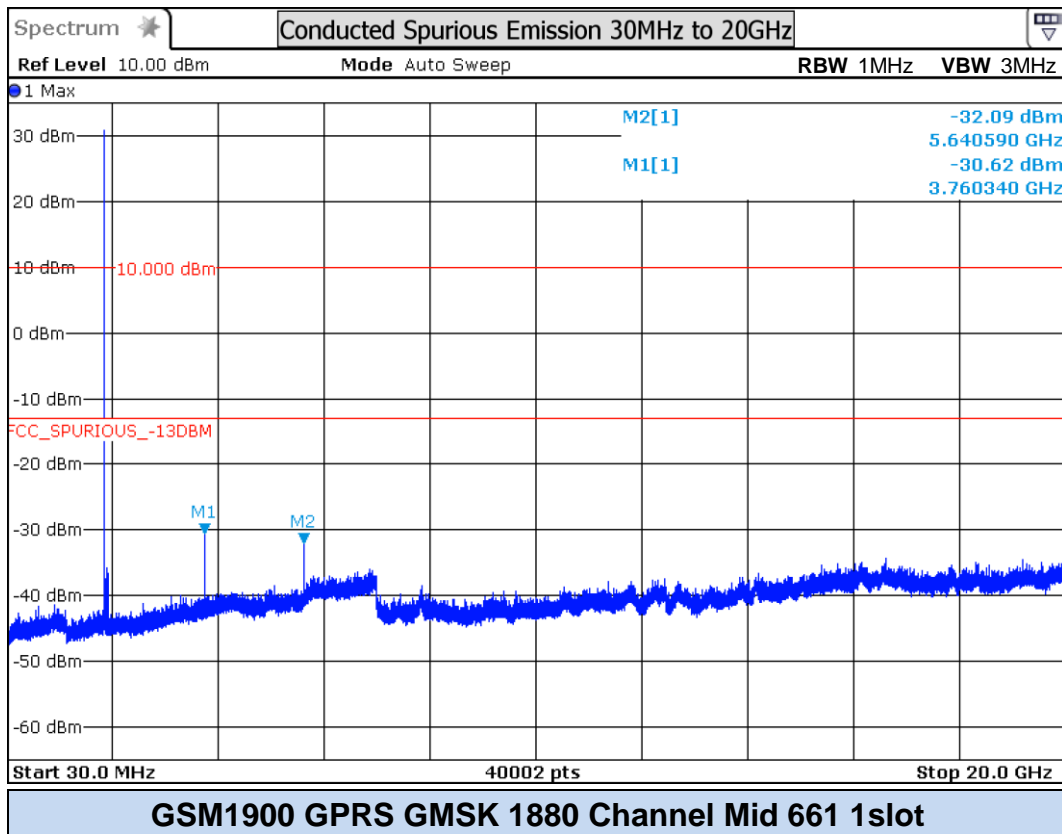
**GSM 850**

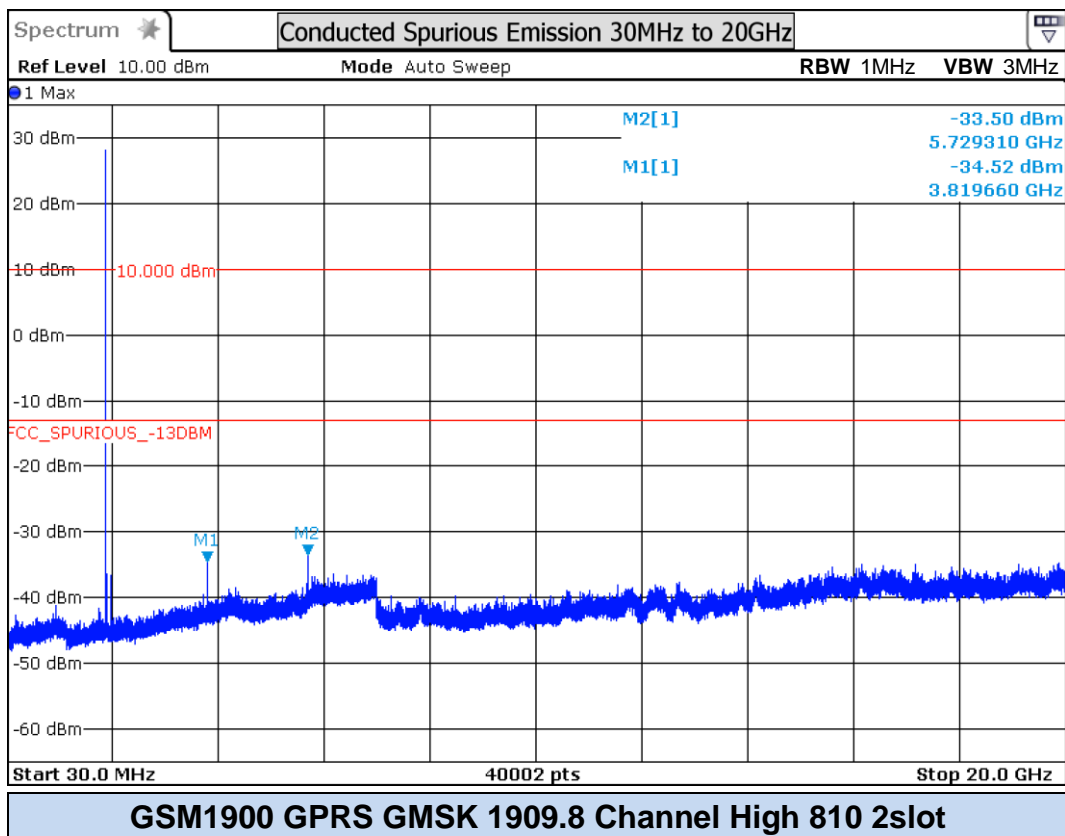
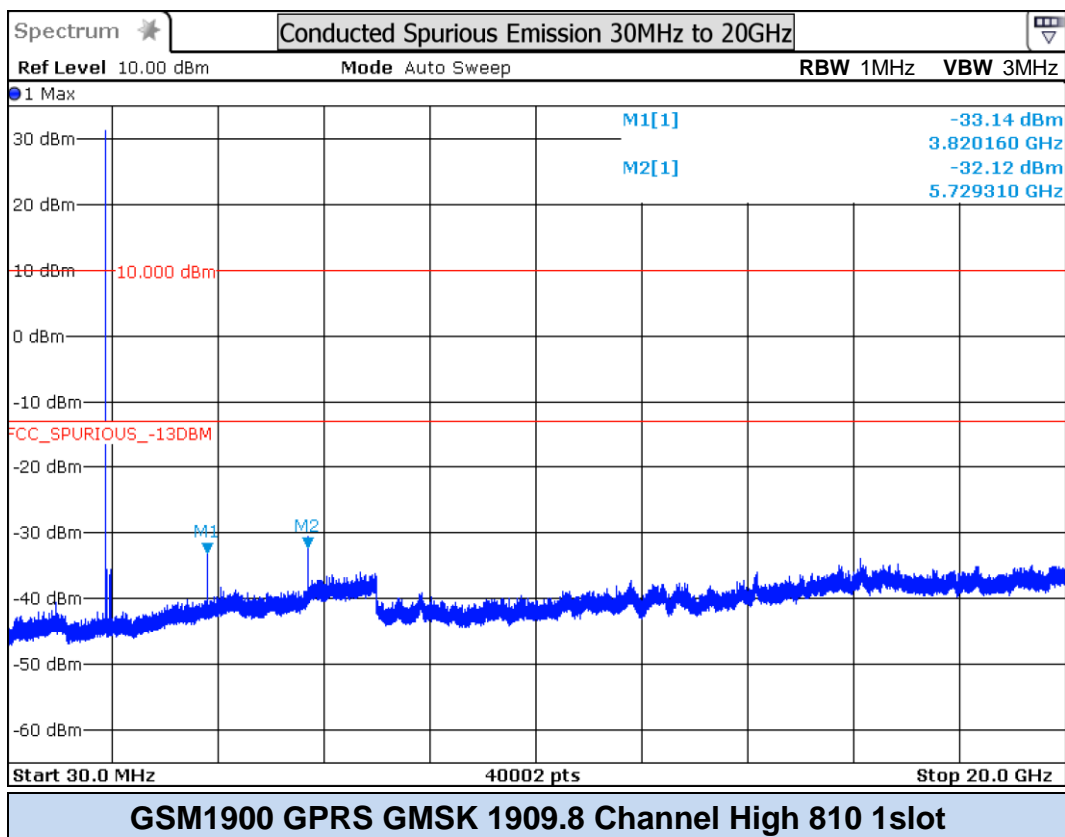




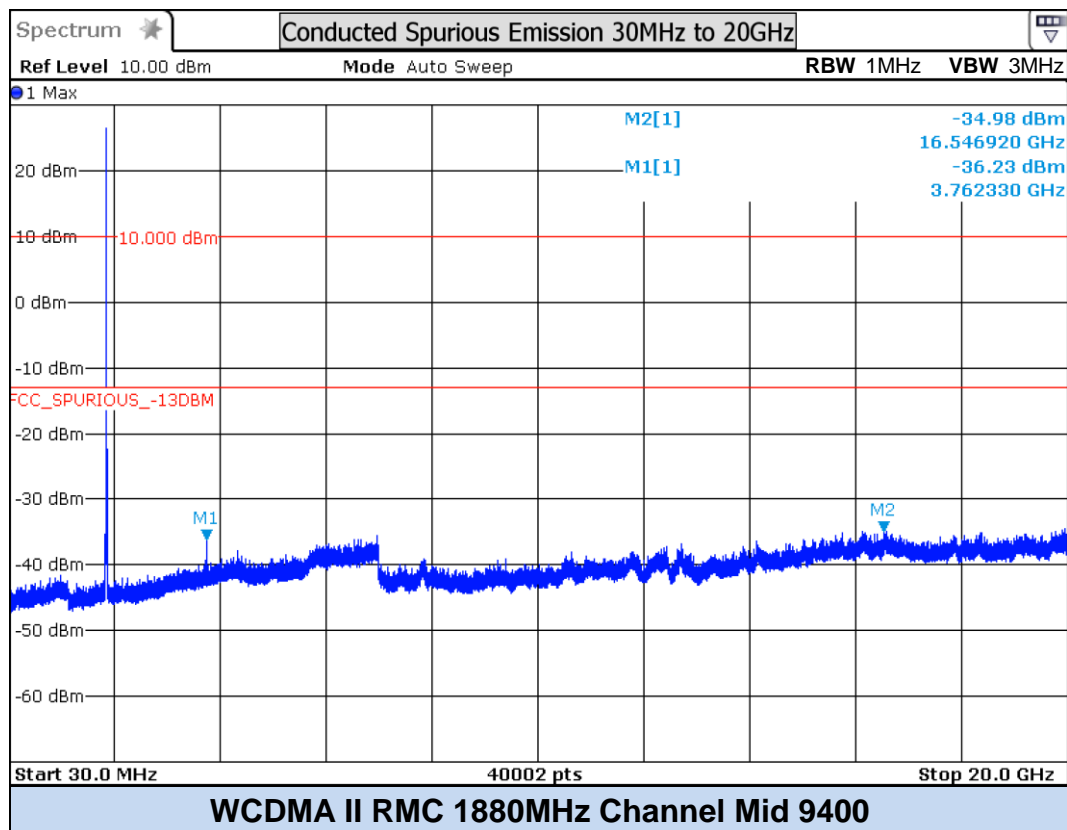
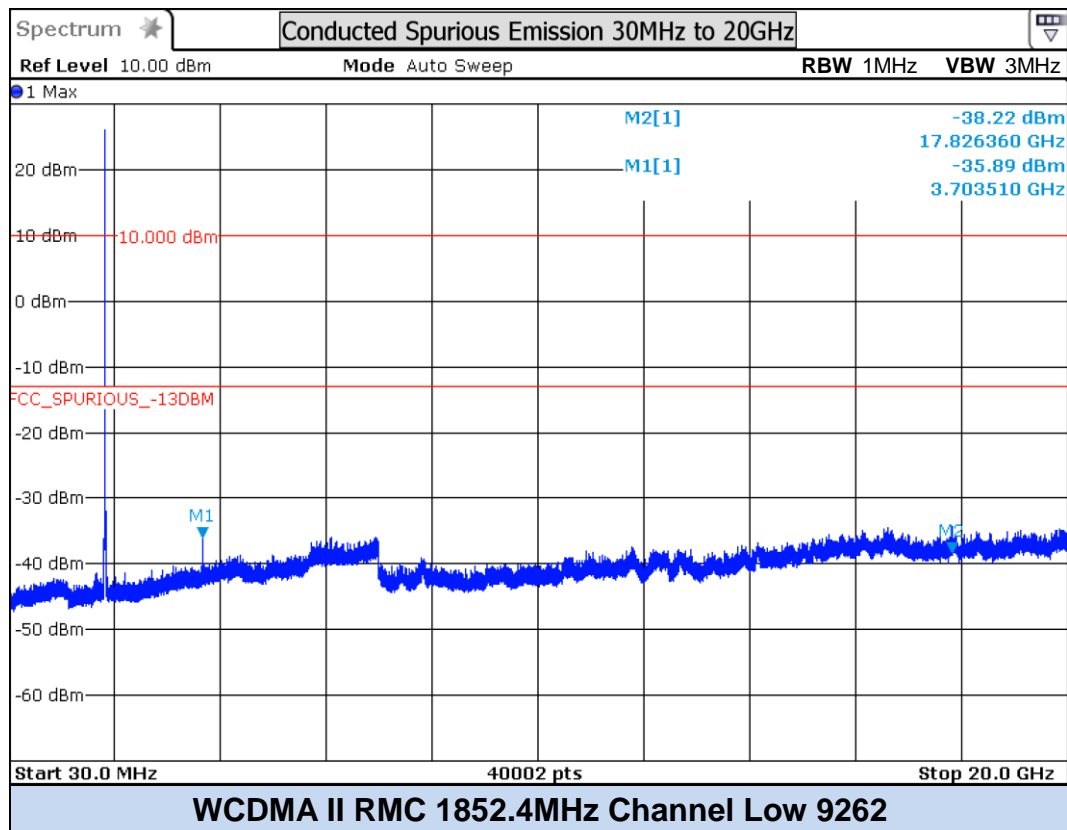


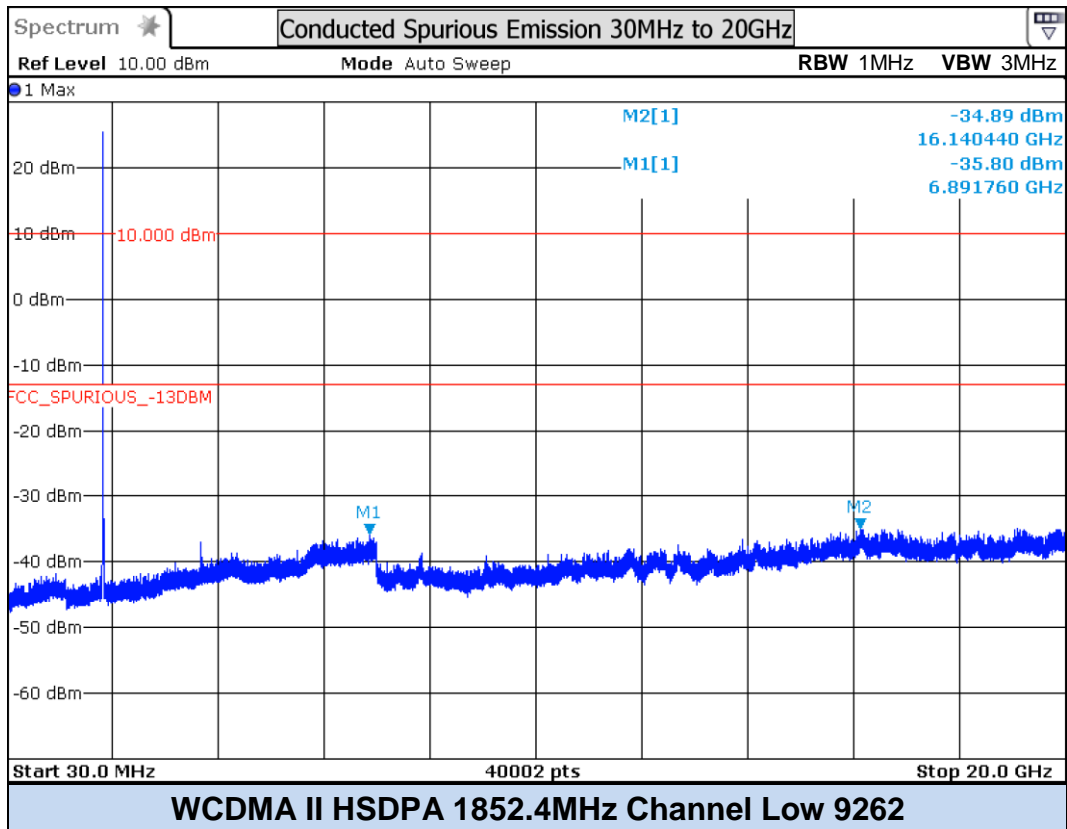
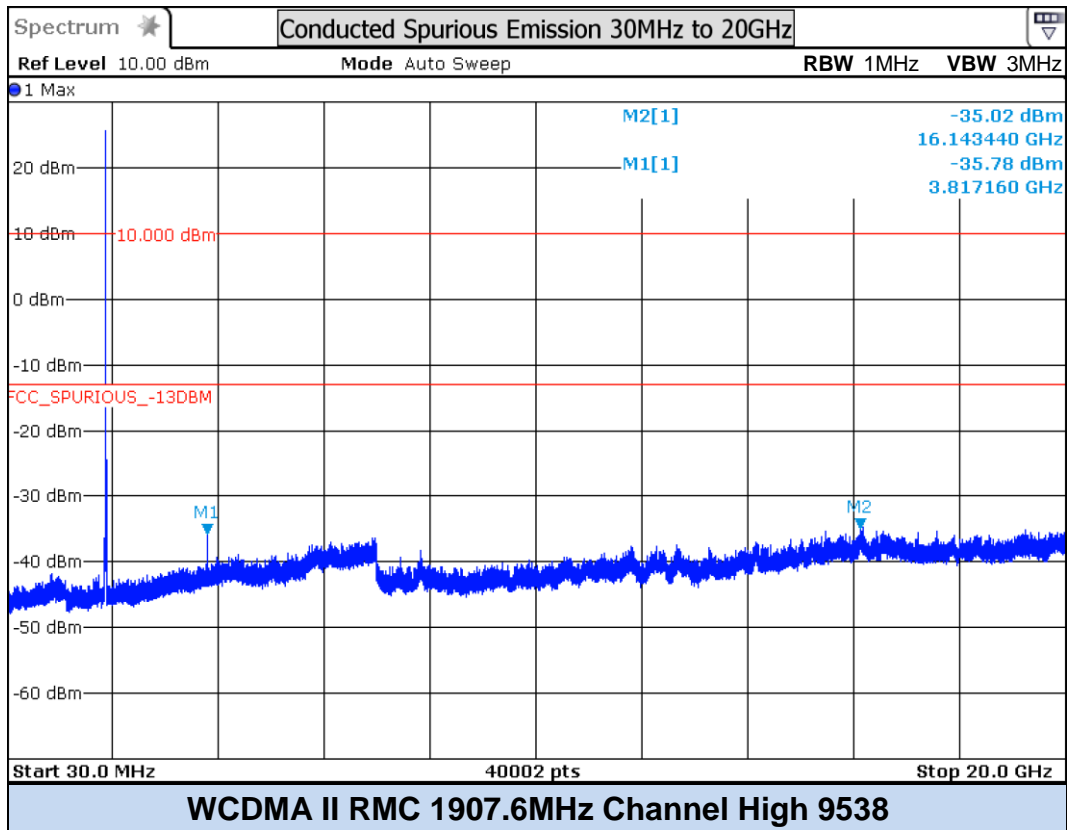
**PCS 1900**

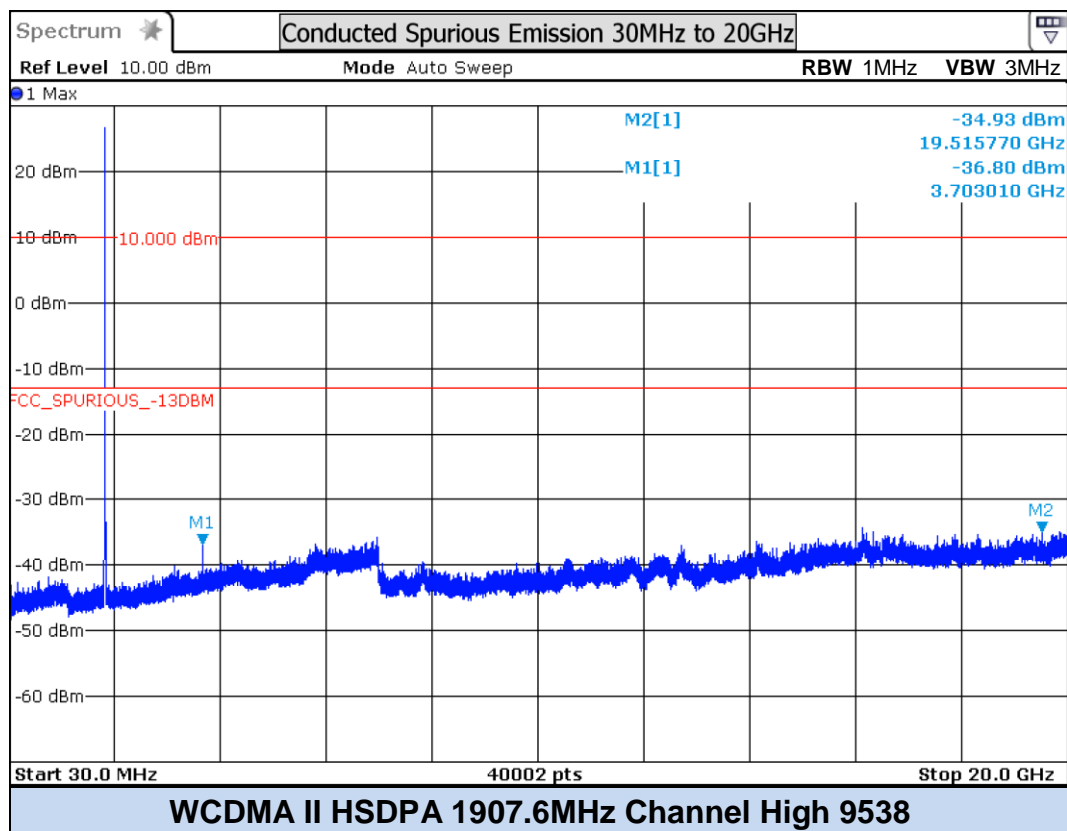
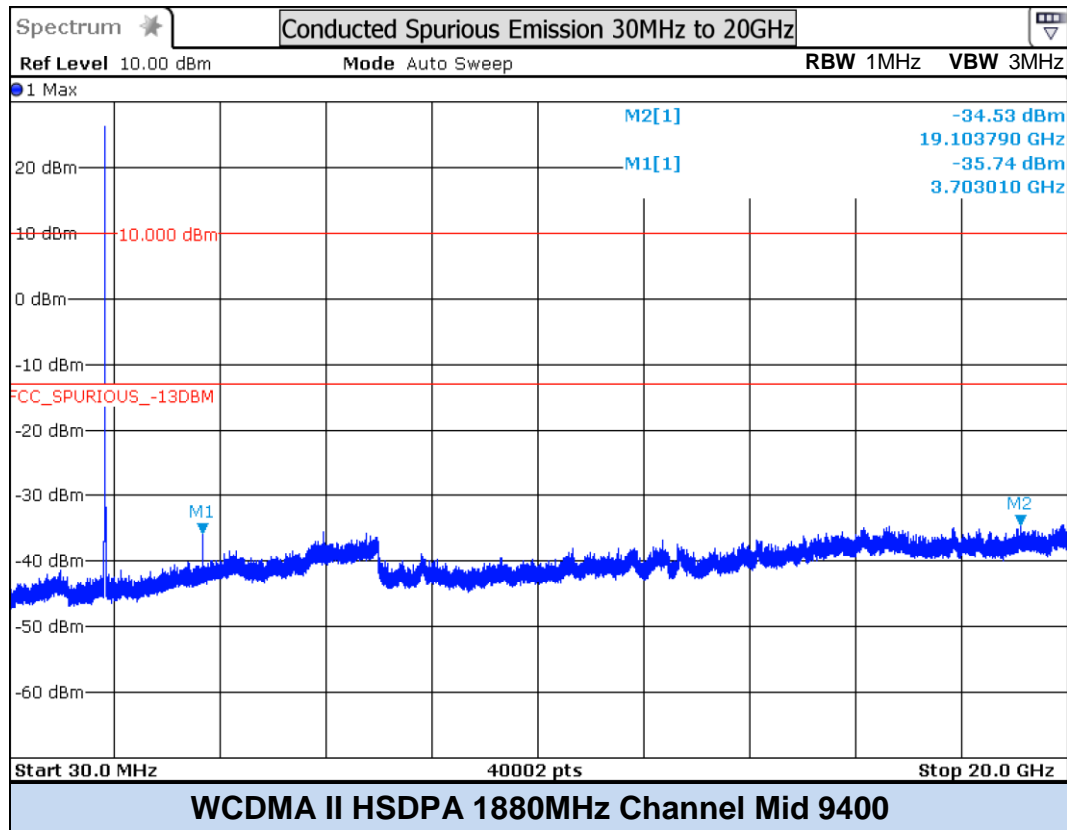


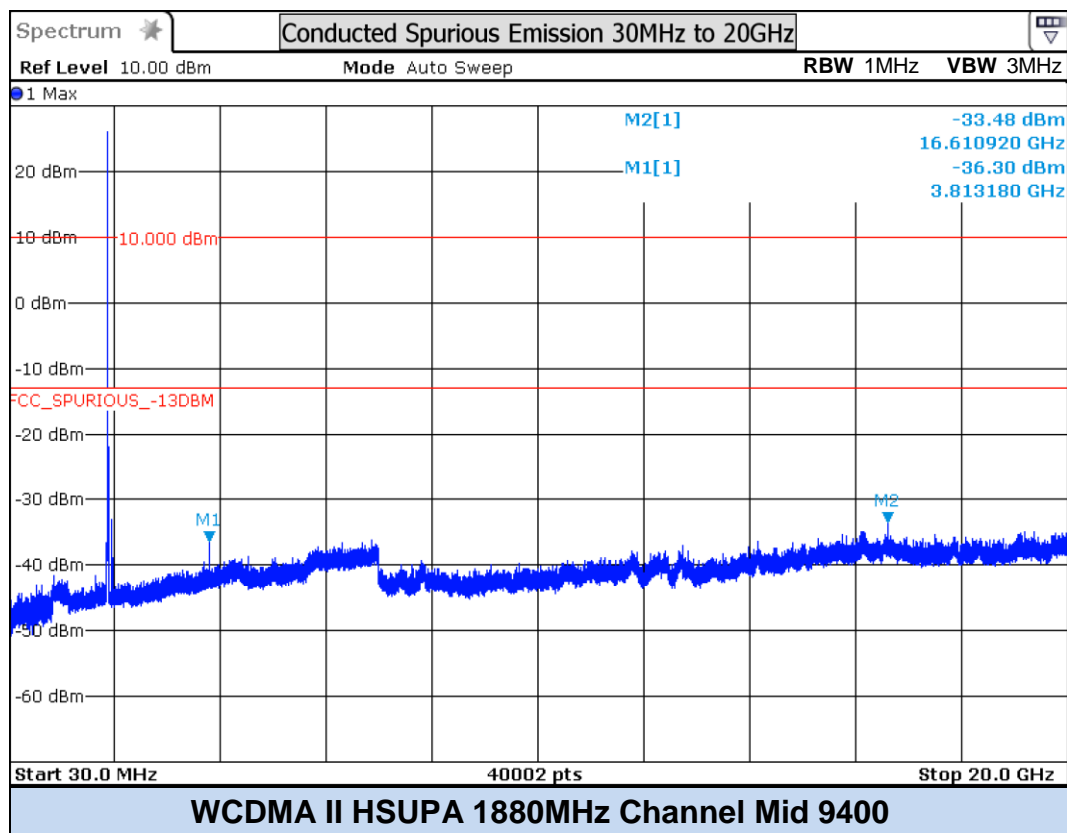
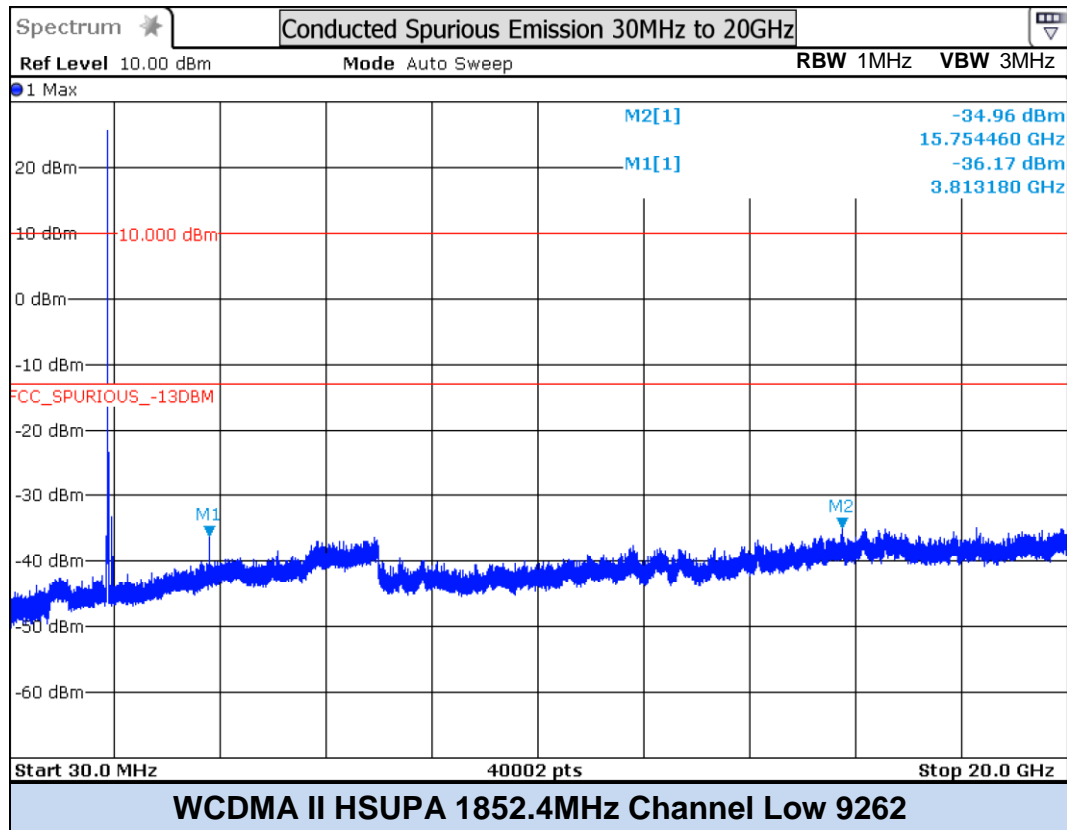


## WCDMA Band II

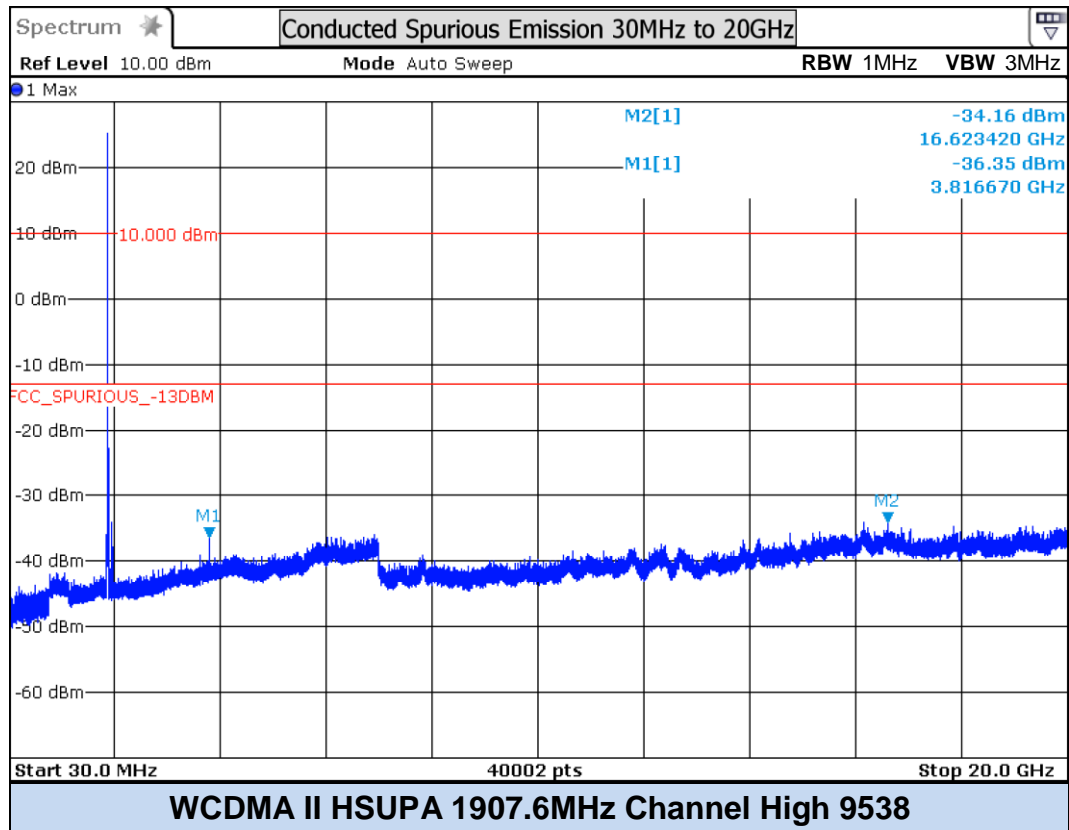




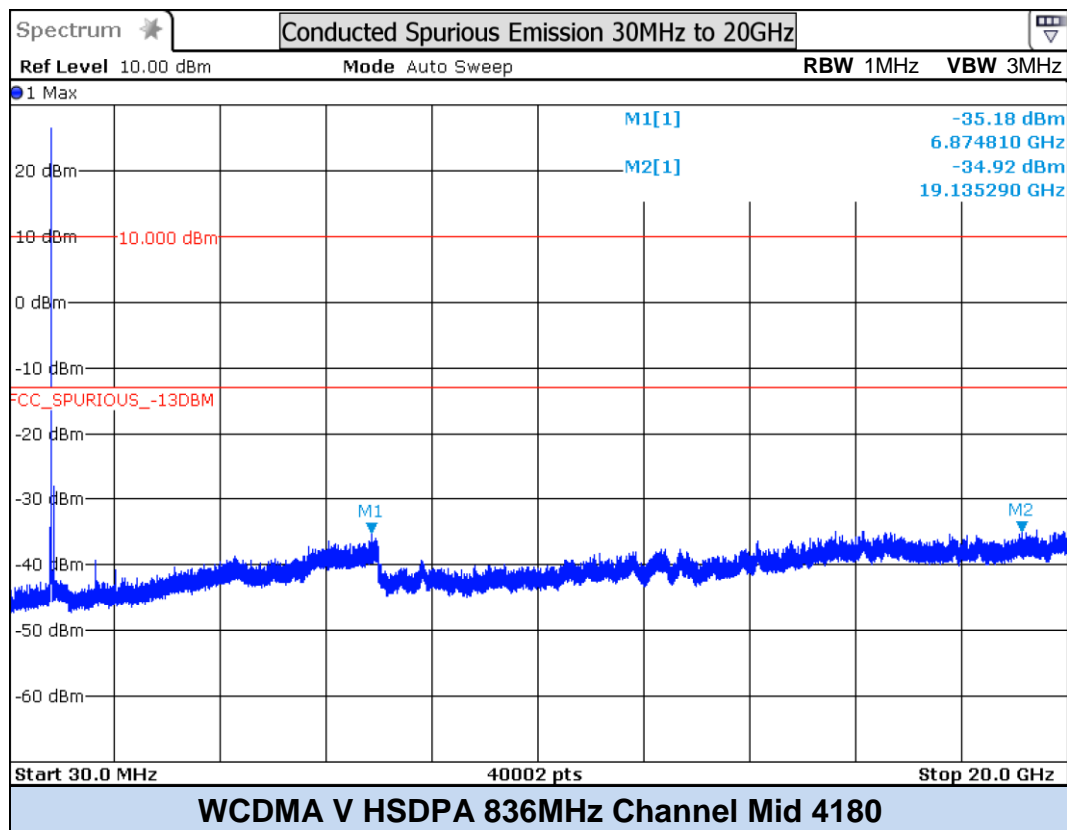
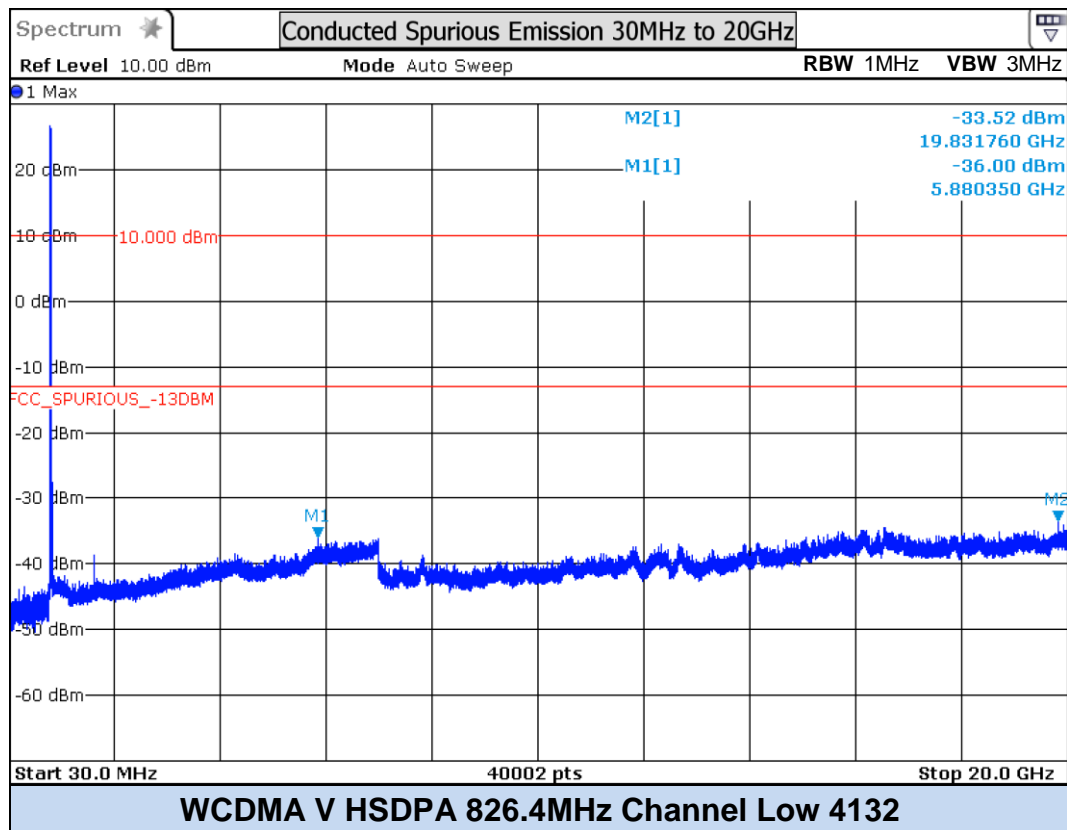


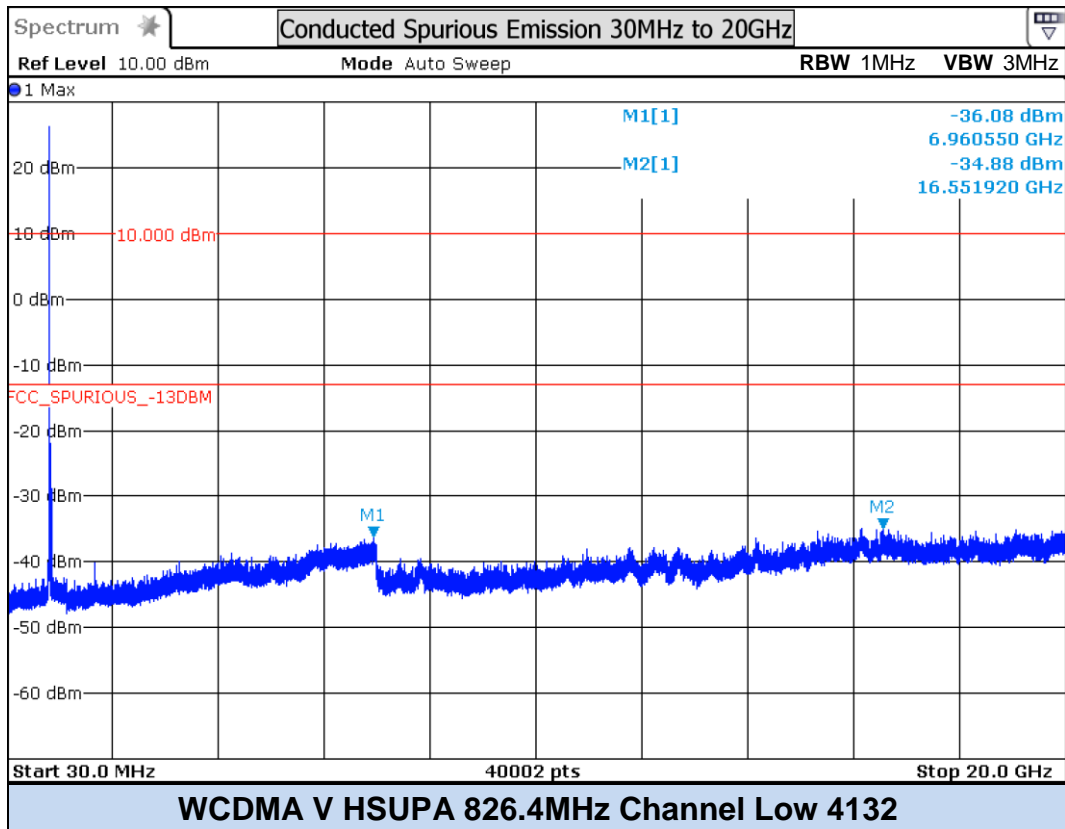
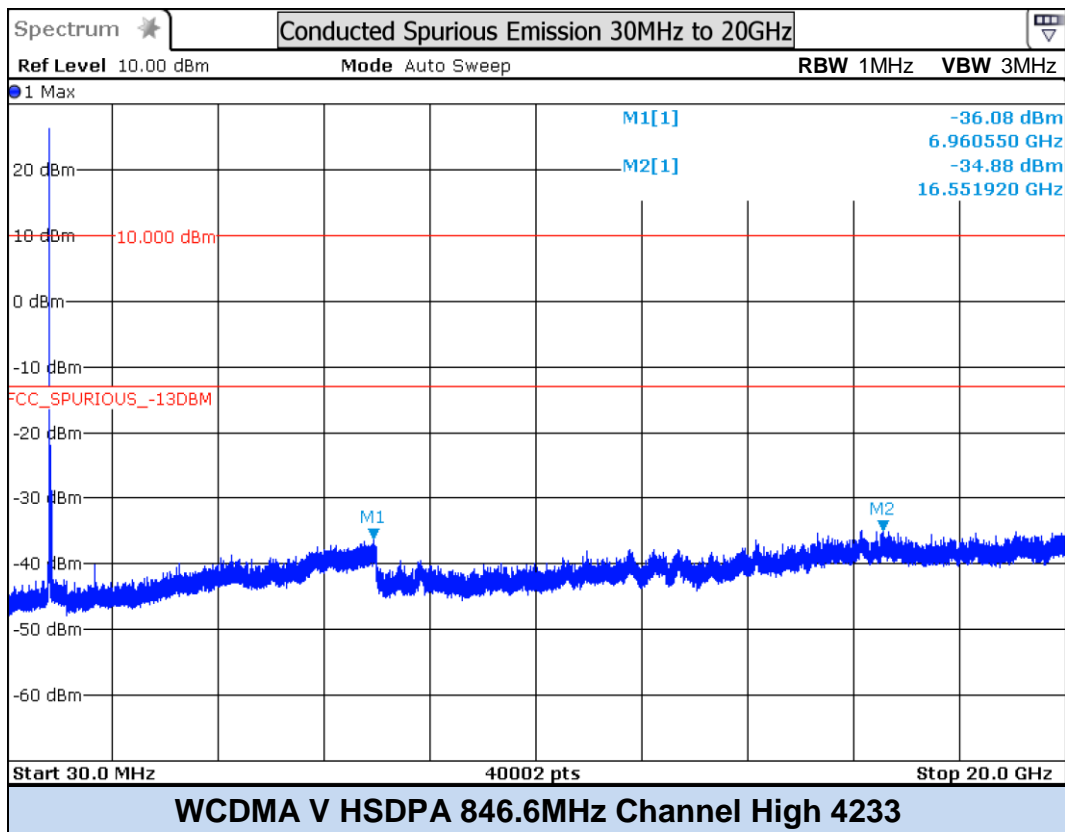


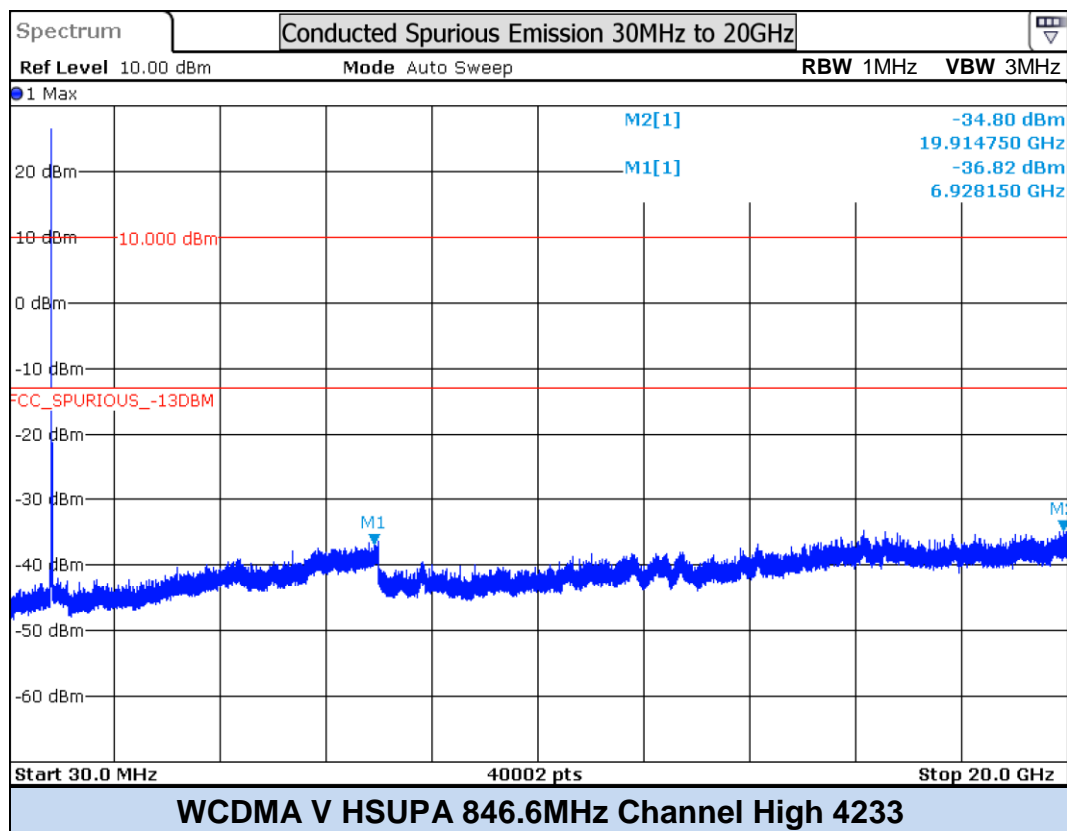
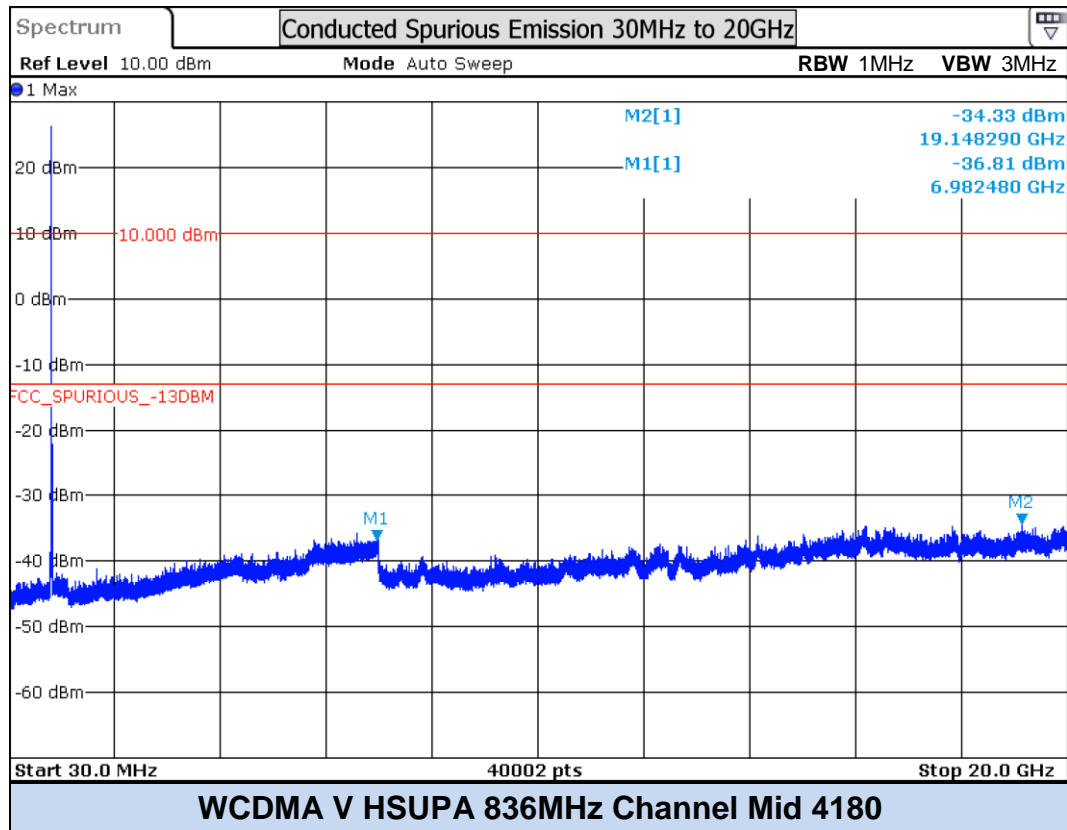




## WCDMA Band V







## B.2.5 Frequency stability

### Standard references

BAND	FCC parts	Limits
GSM850	2.1055	§2.1055 The frequency stability shall be measured with variation of ambient temperature from $-30^{\circ}$ to $+50^{\circ}$ centigrade, at intervals of not more than $10^{\circ}$ centigrade through the range.  (d)(2)For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point <sup>1</sup> which shall be specified by the manufacturer.
PCS1900		
WCDMAII	22.355	§22.355 – (for transmitters from 821 to 896 MHz) The carrier frequency shall not depart from the reference frequency in excess of $\pm 2.5$ ppm for mobile stations.
WCDMAV	24.235	§24.235 - The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

### Test procedure

The setup showed below is used to measure the frequency stability. The antenna terminal of the EUT is connected to the communication tester and its Frequency Error measurement capability is used. The peak frequency error is recorded (worst-case).

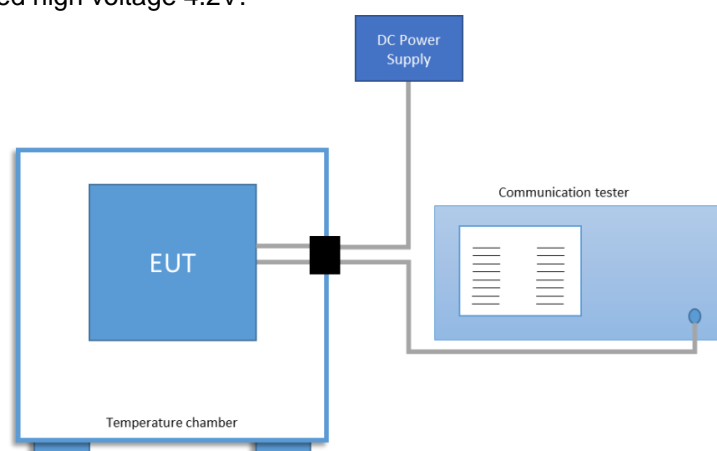
- Temperature =  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$
- Voltage = Low 3.6V, Normal 4 V, High 4.2V

#### **Frequency Stability vs. Temperature:**

The EUT is placed inside a temperature chamber. The temperature is varied from  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  in  $10^{\circ}\text{C}$  increment. For each temperature increment the frequency error is measured after sufficient soak time.

#### **Frequency Stability vs. Voltage:**

The frequency error was measured at ambient temperature for both the operating end point<sup>1</sup> specified 3.6V and the specified high voltage 4.2V.



<sup>1</sup> Battery operating end-point - Cell voltage below which the connected equipment will not operate or below which operation is not recommended.

### Results tables - Frequency stability vs. Temperature.

#### **GSM850, channel 190 frequency 836.6MHz**

GPRS, MODULATION GMSK

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	34.09	0.041
+40	20.70	0.025
+30	30.15	0.036
+20	27.09	0.032
+10	23.57	0.028
0	28.70	0.034
-10	28.35	0.034
-20	23.21	0.028
-30	22.70	0.027

#### **PCS1900, channel 661 frequency 1880MHz**

GPRS, MODULATION GMSK

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	33.01	0.018
+40	26.80	0.014
+30	30.87	0.016
+20	37.58	0.020
+10	33.03	0.018
0	26.99	0.014
-10	31.80	0.017
-20	32.32	0.017
-30	30.80	0.016

#### **WCDMA V, channel 4183 frequency 836.6MHz**

RMC MODULATION QPSK

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	24.98	0.030
+40	24.42	0.029
+30	25.23	0.030
+20	26.39	0.032
+10	25.42	0.030
0	26.09	0.031
-10	24.97	0.030
-20	25.76	0.031
-30	24.96	0.030

HSUPA MODULATION QPSK

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	25.65	0.031
+40	24.57	0.029
+30	25.07	0.030
+20	24.28	0.029
+10	25.35	0.030
0	26.42	0.032
-10	24.24	0.029
-20	25.23	0.030
-30	25.71	0.031

**WCDMA II, channel 9400 frequency 1880MHz**
**RMC MODULATION QPSK**

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	61.39	0.033
+40	51.14	0.027
+30	53.37	0.028
+20	51.71	0.028
+10	55.20	0.029
0	51.79	0.028
-10	54.52	0.029
-20	53.88	0.029
-30	61.84	0.033

**HSUPA MODULATION QPSK**

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	58.65	0.031
+40	52.31	0.028
+30	51.40	0.027
+20	54.25	0.029
+10	53.24	0.028
0	55.87	0.030
-10	55.56	0.030
-20	54.26	0.029
-30	48.51	0.026

### **Results tables - Frequency stability vs. Voltage**

The nominal voltage is 4.0 V

#### **GSM850, channel 190 frequency 836.6MHz**

GPRS, MODULATION GMSK

Supply voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	20.70	0.025
3.6	34.09	0.041

#### **PCS1900, channel 661 frequency 1880MHz**

GPRS, MODULATION GMSK

Supply voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	38.94	0.020
3.6	31.58	0.017

#### **WCDMA V, channel 4183 frequency 836.6MHz**

RMC MODULATION QPSK

Supply voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	26.61	0.032
3.6	29.99	0.036

HSUPA MODULATION QPSK

Supply voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	27.65	0.033
3.6	29.88	0.036

#### **WCDMA II, channel 9400 frequency 1880MHz**

RMC MODULATION QPSK

Supply voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	50.97	0.027
3.6	38.38	0.020

HSUPA MODULATION QPSK

Supply voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
4.2	50.85	0.027
3.6	50.75	0.027



## B.2.6 Radiated spurious emission

### Standard references

BAND	FCC part	Limits
PCS 1900, WCDMA 2	2.1051, 24.238	The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB
GSM 850, WCDMA 5	2.1051, 22.917	The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB

### Test procedure

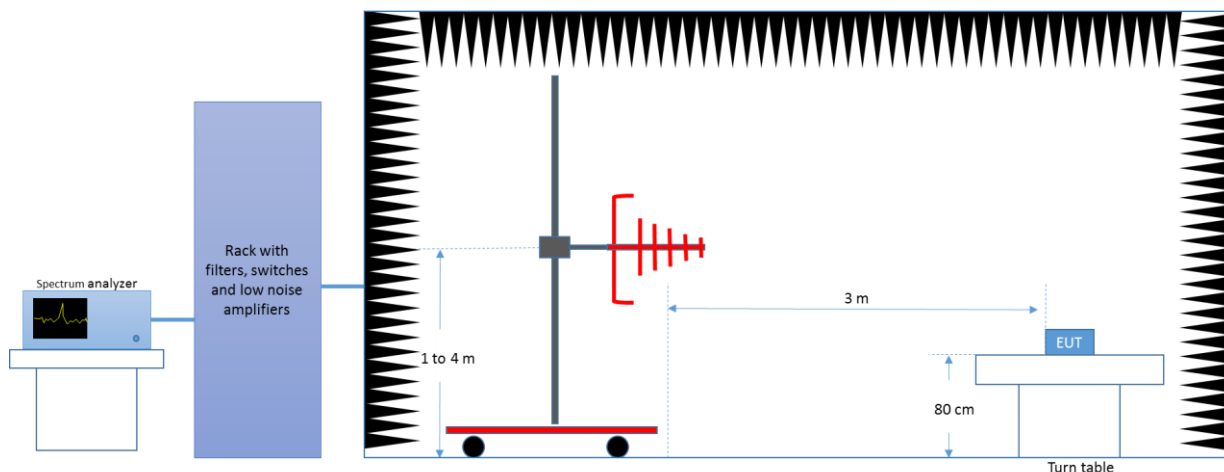
The setup below was used to measure the radiated spurious emissions. The test was done following the FCC OET KDB 971168 D01 v02r02 § 7. The receiver's resolution bandwidth was set to 1 MHz and the video bandwidth set to 3MHz for all radiated measurements.

Depending of the frequency range and bands being tested, different antennas and filters were used.

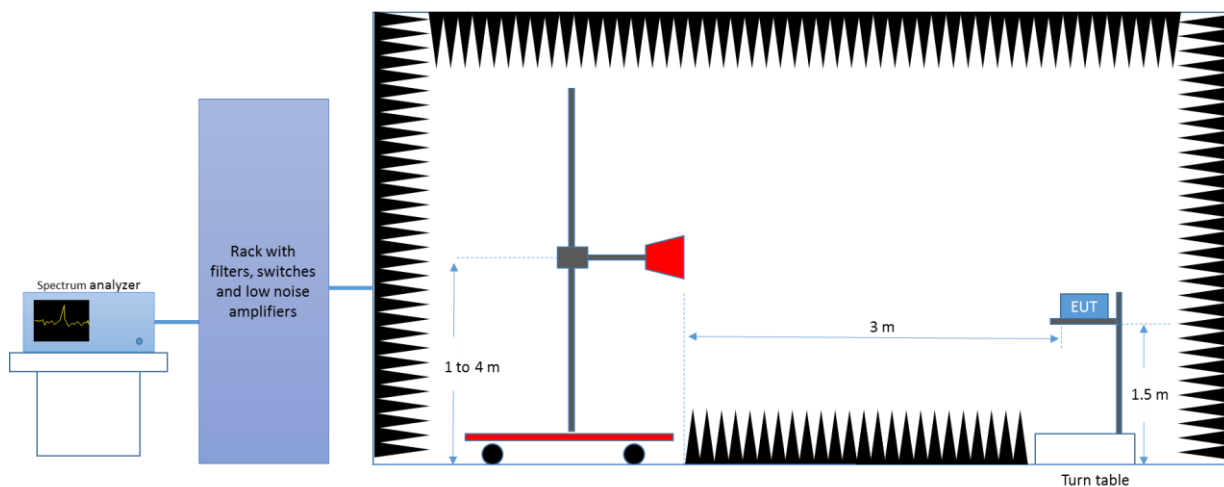
The final measurement is done by varying the antenna height from 1 to 4 meters, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations. The substitution method according to the ANSI/TIA-603-D was used to determine the spurious level identified during the exploratory radiated emissions measurements.

The radiated spurious emission was measured on the worst case configuration selected from the chapter B.2.1 and on the low, middle and high channel.

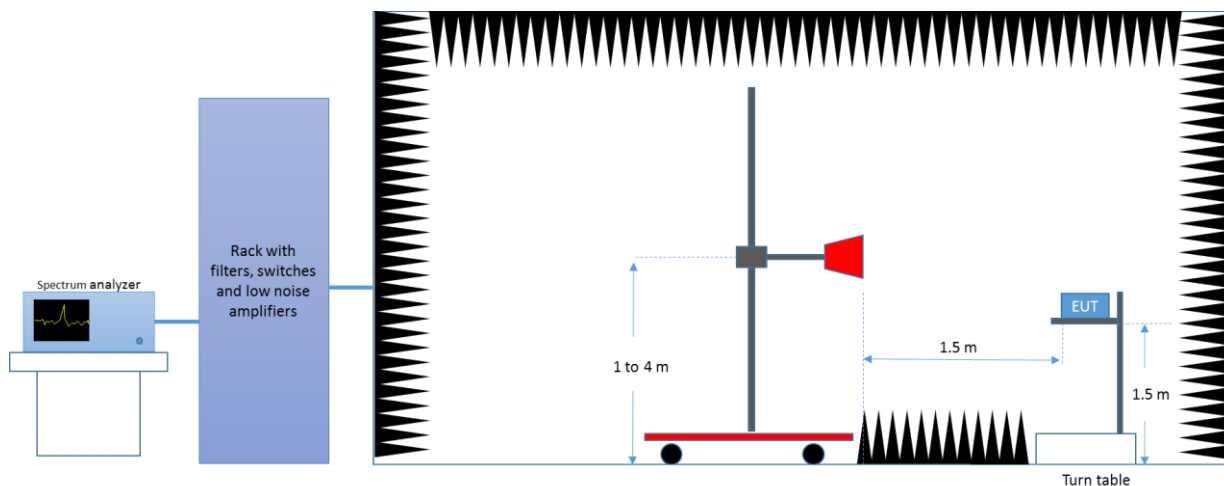
### *Radiated Setup < 1GHz*



*Radiated Setup Frequency range 1GHz - 18GHz*



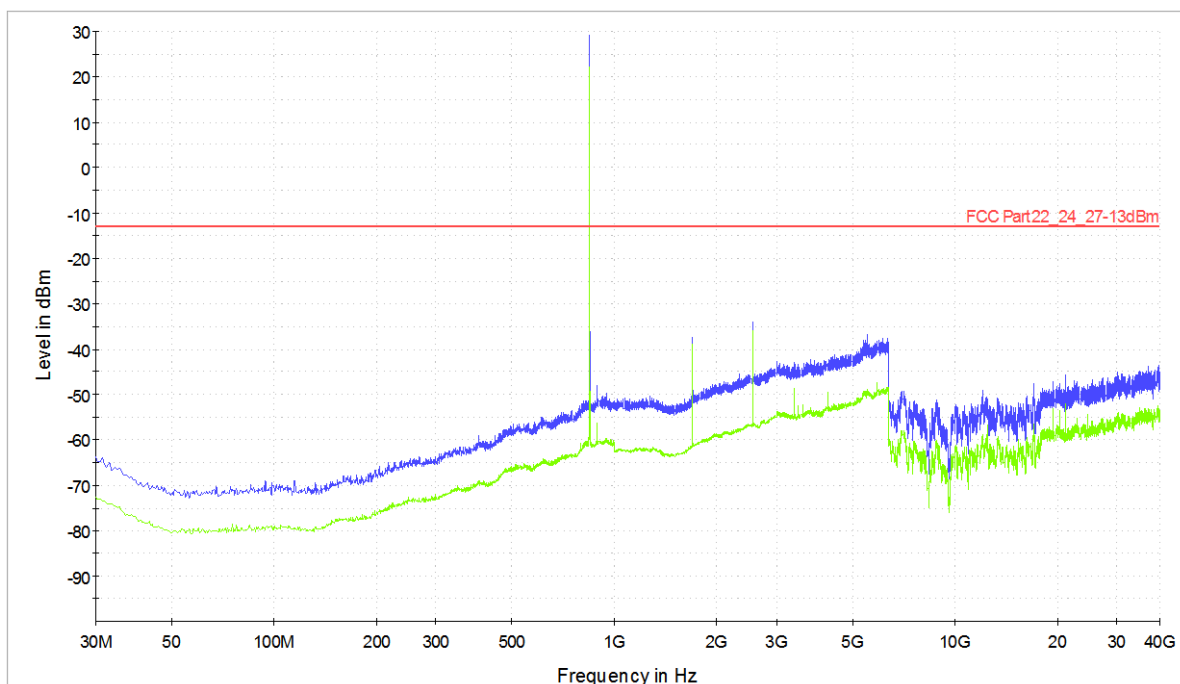
*Radiated Setup > 18GHz*



# Test Results – GSM850

## GSM850 GPRS/GMSK - Low Channel CH128

### Radiated Spurious – 30MHz to 40GHz

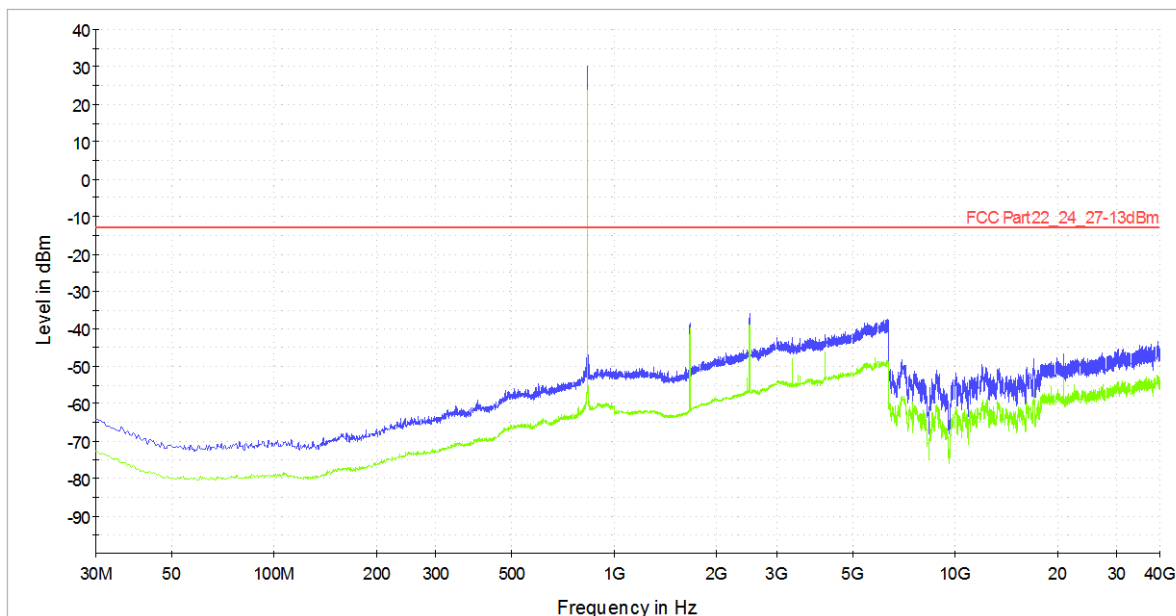


— Peak measurements
 — RMS measurements
 — Limit FCC

Frequency	Max Peak	RMS	Limit	Margin
MHz	dBm	dBm	dBm	dB
1648.0	-38.6		-13	25.6
1648.0		-40.9	-13	27.9
2472.8	-30.7		-13	17.7
2472.8		-32.2	-13	19.2

## GSM850 GPRS/GMSK - Mid channel CH190

### Radiated Spurious – 30MHz to 40GHz

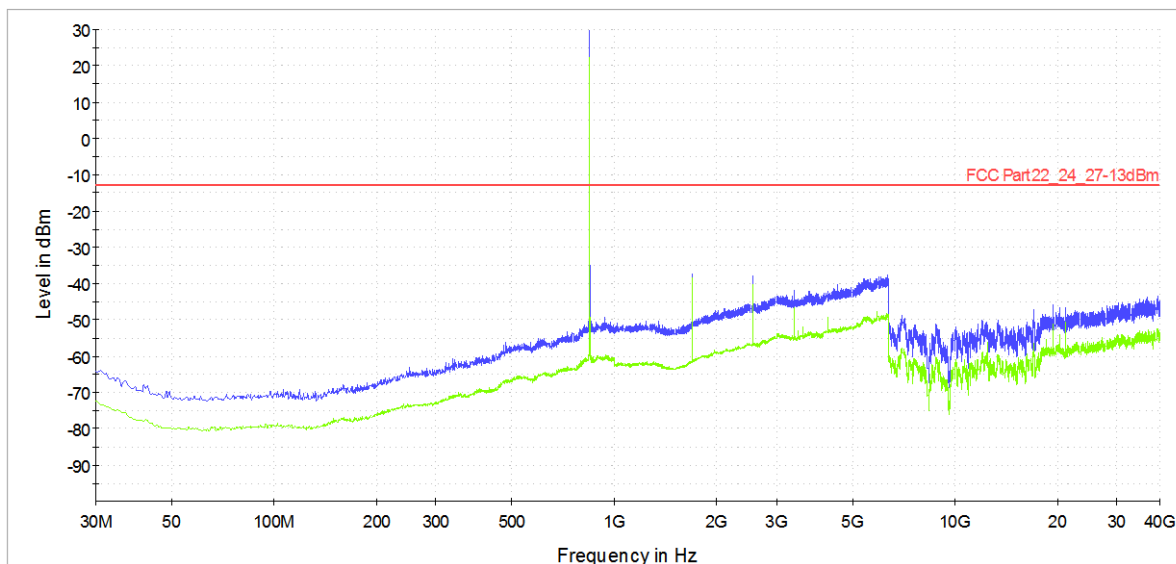


— Peak measurements
 — RMS measurements
 — Limit FCC

Frequency	Max Peak	RMS	Limit	Margin
MHz	dBm	dBm	dBm	dB
1671.9	-38.3		-13	25.3
1671.9		-39.6	-13	26.6
2508.0	-35.9		-13	22.9
2508.0		-38.9	-13	25.9

## GSM850 GPRS/GMSK - High channel CH251

### Radiated Spurious – 30MHz to 40GHz



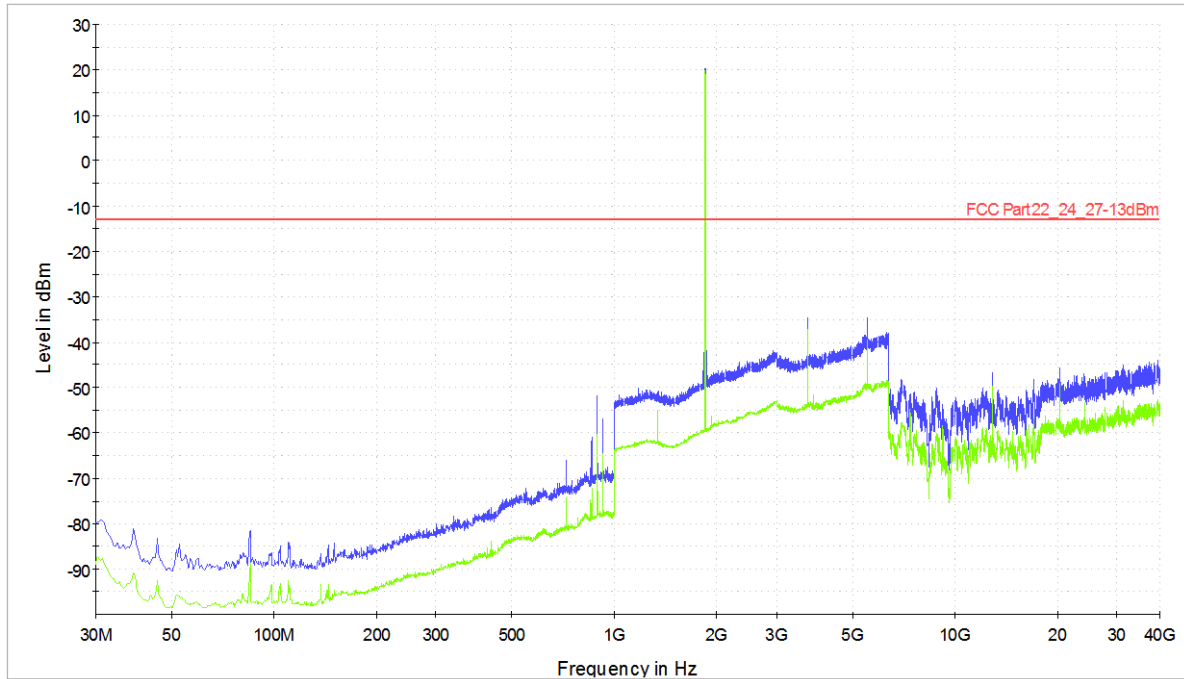
— Peak measurements     
 — RMS measurements     
 — Limit FCC

Frequency	Max Peak	RMS	Limit	Margin
MHz	dBm	dBm	dBm	dB
1697.6	-37.2		-13	24.2
1697.6		-38.4	-13	25.4
2546.6	-37.8		-13	24.8
2546.6		-40.1	-13	27.1

# Test Results – PCS1900

## GSM1900 GPRS/GMSK - Low channel CH512

### Radiated Spurious – 30MHz to 40GHz

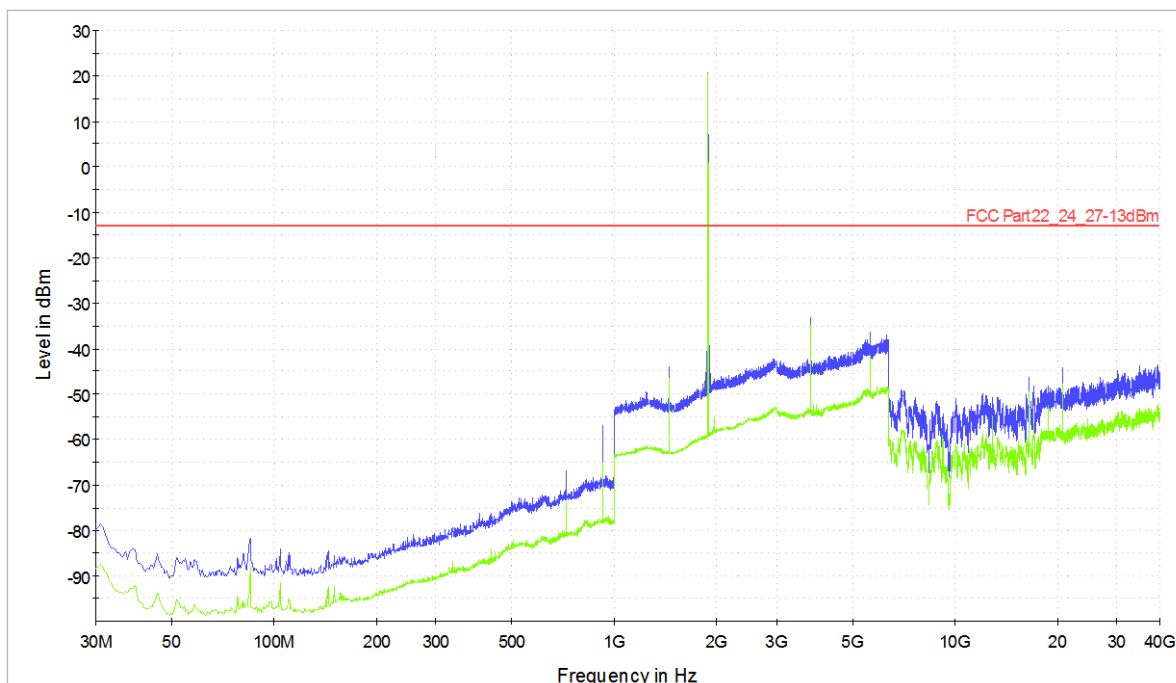


— Peak measurements
 — RMS measurements
 — Limit FCC

Frequency	Max Peak	RMS	Limit	Margin
MHz	dBm	dBm	dBm	dB
3700.0	-34.6		-13	21.6
3700.0		-37.3	-13	24.3
5550.5	-34.5		-13	21.5
5550.5		-39.3	-13	26.3

## GSM1900 GPRS/GMSK - Mid channel CH661

### Radiated Spurious – 30MHz to 40GHz

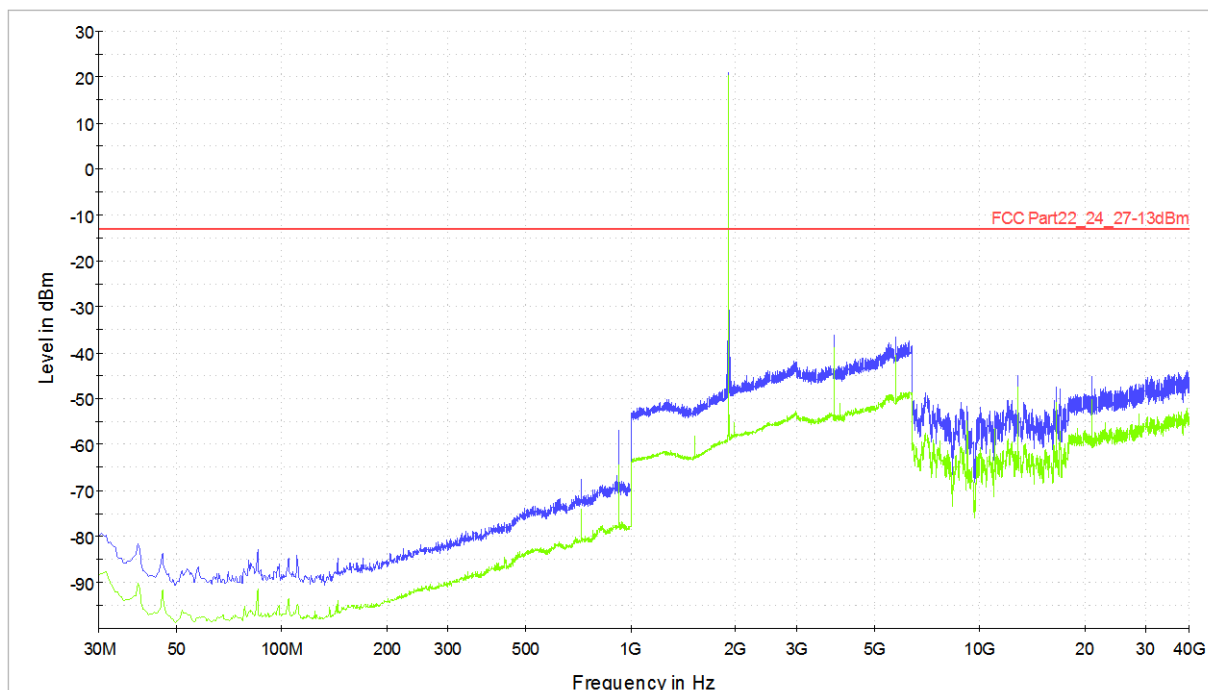


— Peak measurements     
 — RMS measurements     
 — Limit FCC

Frequency	Max Peak	RMS	Limit	Margin
MHz	dBm	dBm	dBm	dB
3774.0	-33.3		-13	20.3
3774.0		-34.8	-13	21.8
5661.0	-36.2		-13	23.2
5661.0		-41.4	-13	28.4

## GSM1900 GPRS/GMSK - High channel CH810

### Radiated Spurious – 30MHz to 40GHz



— Peak measurements     
 — RMS measurements     
 — Limit FCC

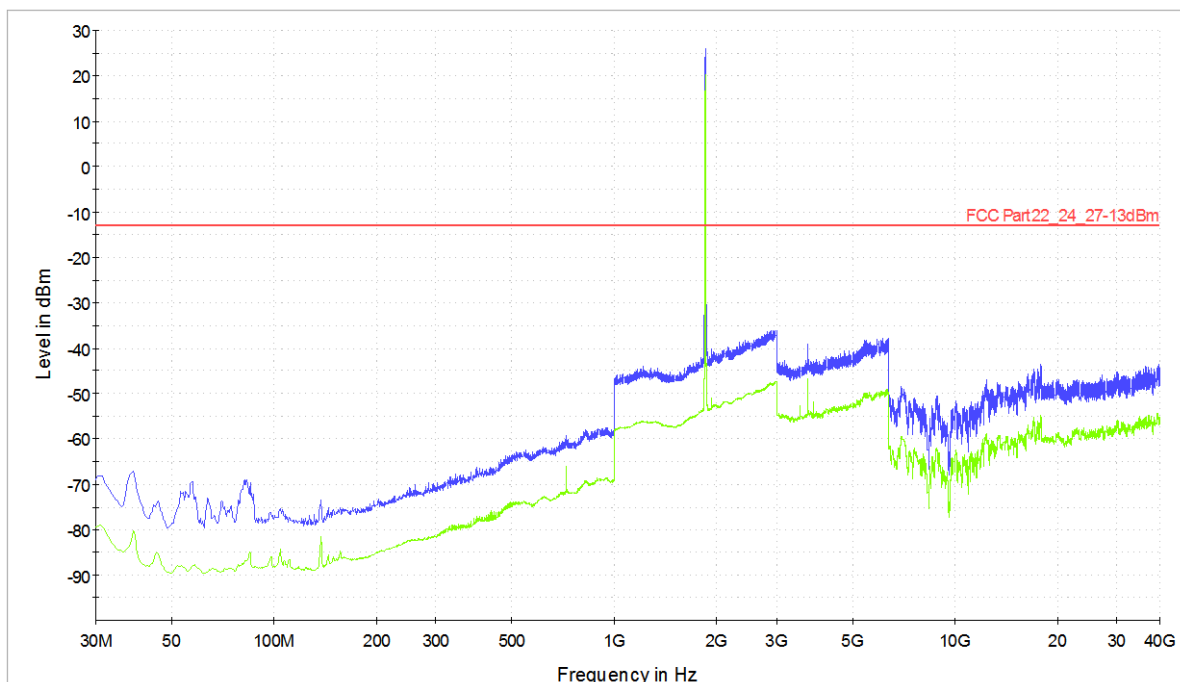
Frequency	Max Peak	RMS	Limit	Margin
MHz	dBm	dBm	dBm	dB
3820.0	-36.1		-13	23.1
3820.0		-38.6	-13	25.6
5729.5	-36.5		-13	23.5
5729.5		-40.4	-13	27.4



# Test Results – WCDMA 2

## WCDMA 2 / RMC - Low channel CH9262

### Radiated Spurious – 30MHz to 40GHz

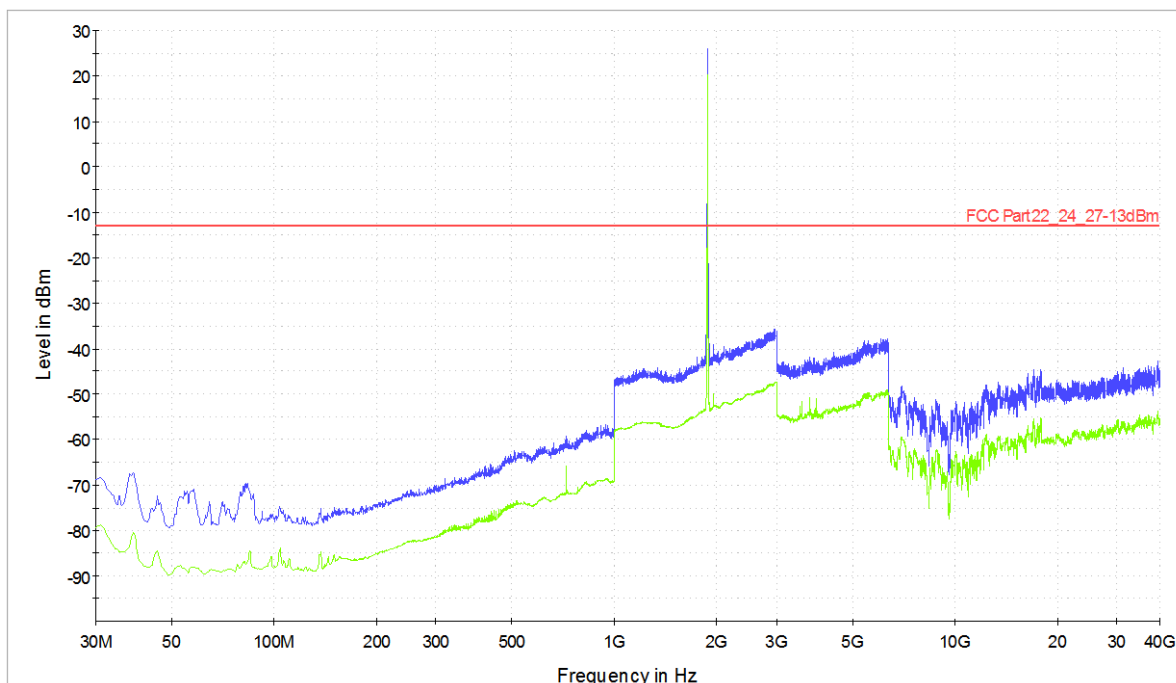


— Peak measurements
 — RMS measurements
 — Limit FCC

Frequency	Max Peak	RMS	Limit	Margin
MHz	dBm	dBm	dBm	dB
2945.0	-36.1		-13	23.1
2945.0		-47.9	-13	34.9

## WCDMA 2 / RMC - Mid channel CH9400

### Radiated Spurious – 30MHz to 40GHz

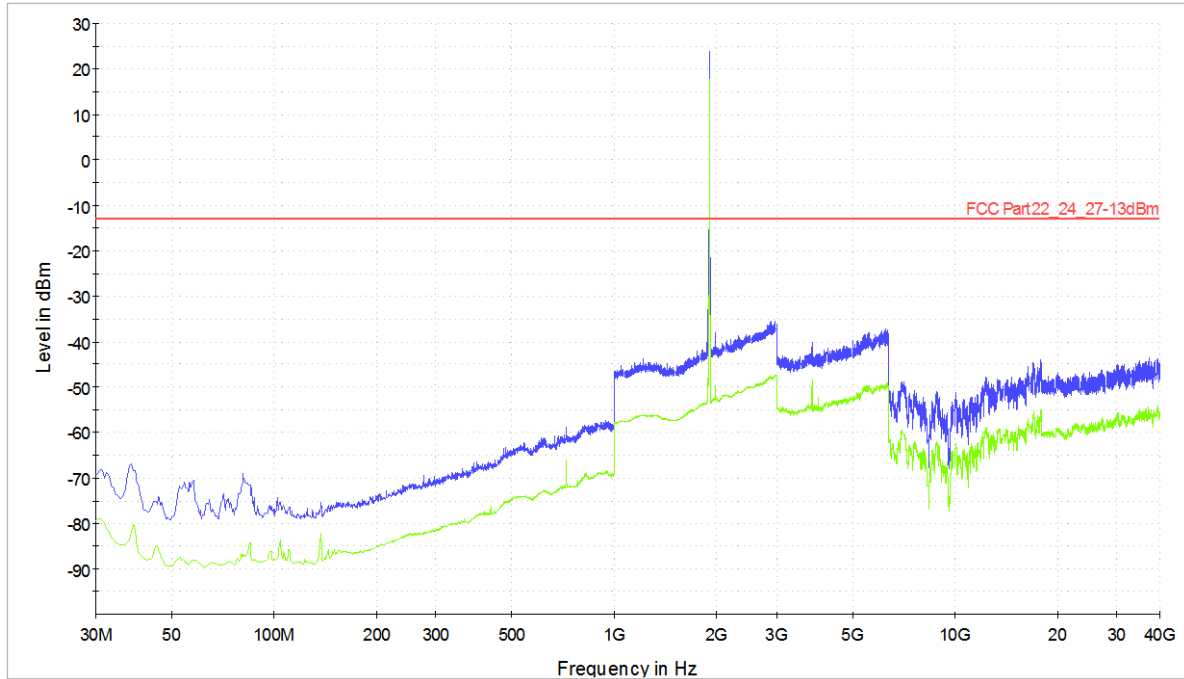


— Peak measurements     
 — RMS measurements     
 — Limit FCC

Frequency	Max Peak	RMS	Limit	Margin
MHz	dBm	dBm	dBm	dB
2961.0	-35.7		-13	22.7
2961.0		-47.9	-13	34.9

## WCDMA 2 / RMC - High channel CH9538

### Radiated Spurious – 30MHz to 40GHz



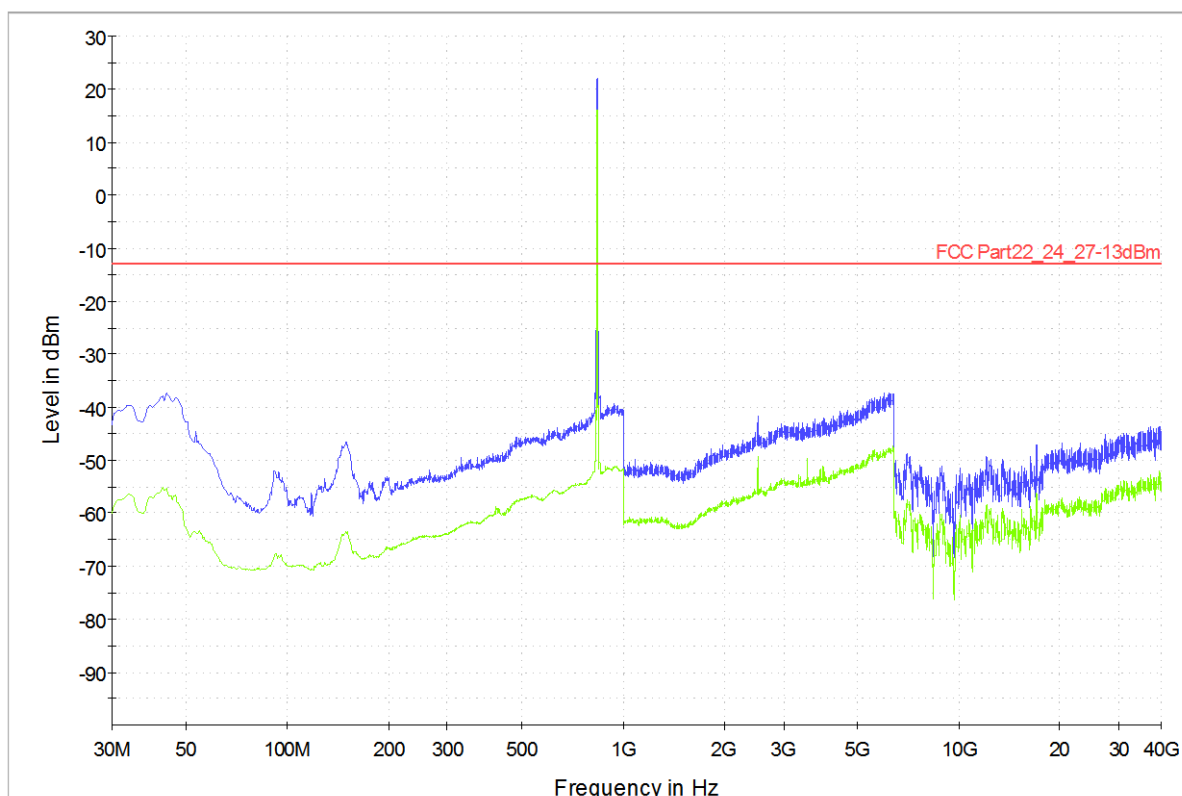
— Peak measurements     
 — RMS measurements     
 — Limit FCC

Frequency	Max Peak	RMS	Limit	Margin
MHz	dBm	dBm	dBm	dB
2897.0	-35.5		-13	22.5
2897.0		-48.0	-13	35.0

# Test Results – WCDMA 5

## WCDMA 5 / RMC - Low channel CH4132

### Radiated Spurious – 30MHz to 40GHz

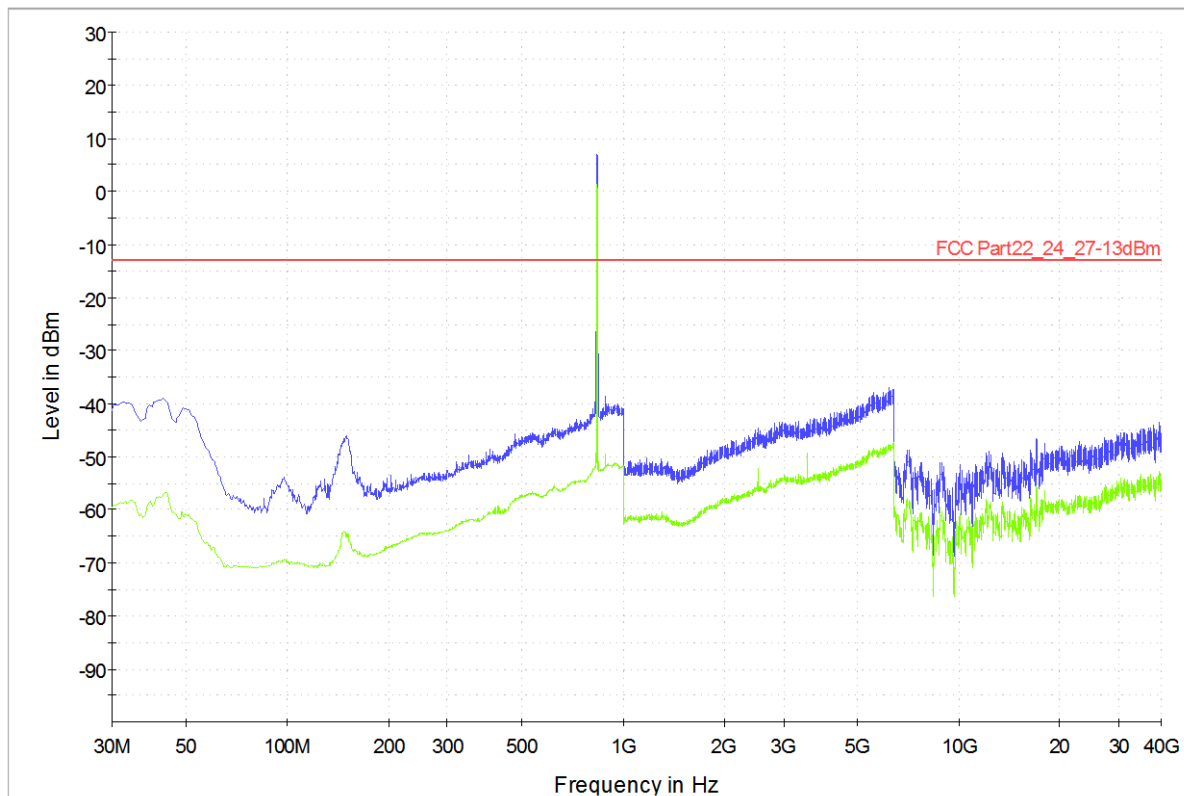


— Peak measurements
 — RMS measurements
 — Limit FCC

Frequency	Max Peak	RMS	Limit	Margin
MHz	dBm	dBm	dBm	dB
942.2	-39.0		-13	26.0
942.2		-51.2	-13	38.2
2475.5	-43.9		-13	30.9
2475.5		-51.1	-13	38.1

## WCDMA 5 / RMC - Mid channel CH4180

### Radiated Spurious – 30MHz to 40GHz

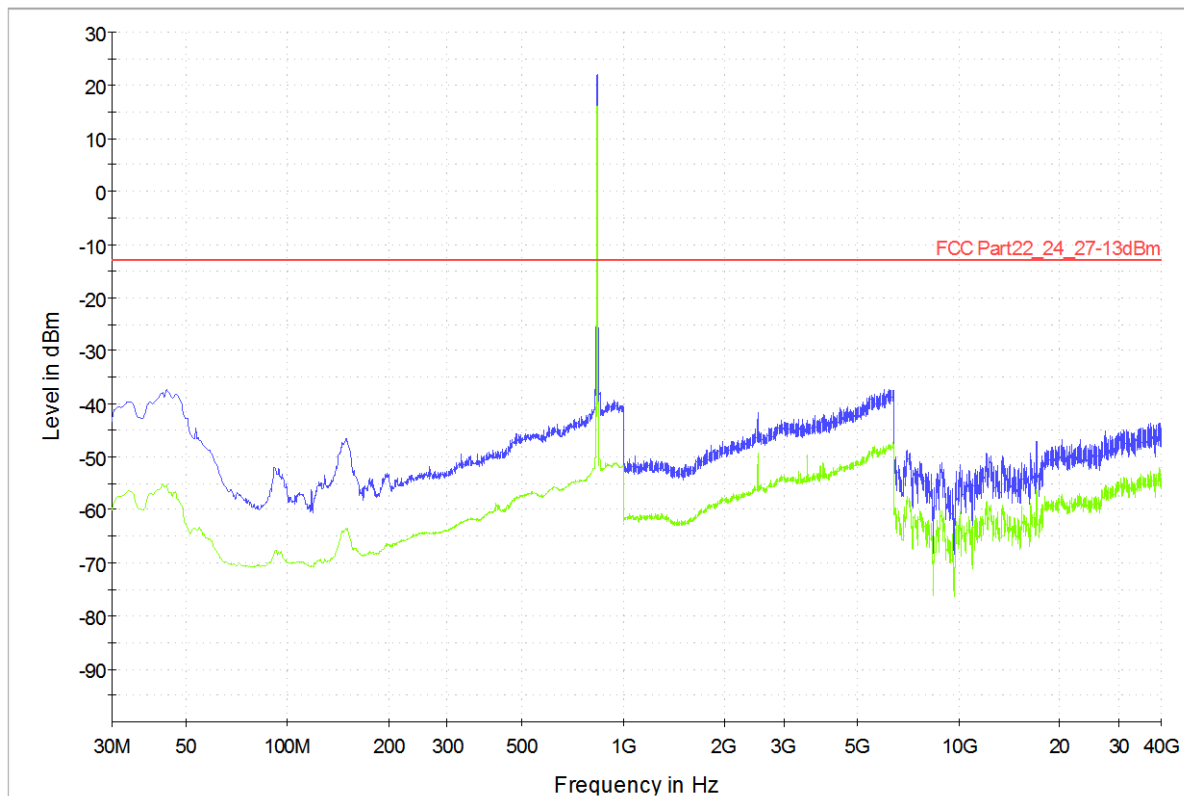


— Peak measurements     
 — RMS measurements     
 — Limit FCC

Frequency	Max Peak	RMS	Limit	Margin
MHz	dBm	dBm	dBm	dB
963.6	-40.2		-13	27.2
963.6		-51.6	-13	38.6
3526.3	-43.8		-13	30.8
3526.3		-50.2	-13	37.2

## WCDMA 5 / RMC - High channel CH4230

### Radiated Spurious – 30MHz to 40GHz



— Peak measurements     
 — RMS measurements     
 — Limit FCC

Frequency	Max Peak	RMS	Limit	Margin
MHz	dBm	dBm	dBm	dB
936.4	-40.8		-13	27.8
936.4		-51.4	-13	38.4
2543.9	-40.3		-13	27.3
2542.6		-47.6	-13	34.6