

Figure 6: Emission mask arrangement for Uplink

6.3.3 Test procedures

- (1) Connect the device as illustrated Figure 5 and Figure 6, when the output power is over the maximum value of the Spectrum Analyzer, add the attenuator to avoid destroying.
- (2) Configure the signal generator to transmit the appropriate test signal associated with the public safety emission designation.
- (3) Configure the signal frequency to centre frequency and the signal level to be just below the ALC threshold and maximum gain.
- (4) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary;
- (5) Set the spectrum analyzer center frequency to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between 2 times to 5 times the OBW;
- (6) The nominal RBW shall be 100 Hz for 12.5kHz channel and 300 Hz for 25kHz channel and 100kHz for LTE;
- (7) Set the reference level of the spectrum analyzer to accommodate the maximum input amplitude level;
- (8) Set spectrum analyzer detection mode to Peak, and trace mode to Avg;
- (9) Confirm that the signal is contained within the appropriate emissions mask;
- (10) Measure the emission Mask according to Table 3, Table 4, Table 5, Table 6, Table 7 at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the specified value;
- (11) Repeat RF channels to be tested for single-carrier: Low and High frequency;

6.3.4 Test Results

6.3.4.1 700MHz Band

6.3.4.1.1 Modulation signal: LTE

Resolution Bandwidth: 100 kHz
 Configuration: Single Band
 Operating frequency range: Downlink: 758MHz~768MHz
 Uplink:788MHz~798MHz

Carrier frequency(MHz)	Limit	Result
Downlink transmit mode		
Mid frequency: 763.0	Mask B	pass
Uplink transmit mode		
Mid frequency: 793.0	Mask B	pass

6.3.4.1.2 Modulation signal: C4FM

Resolution Bandwidth: 100 Hz
 Video Bandwidth: 300 Hz
 Detector mode: Peak
 Trace mode: Average
 Symbol Rate: 4.8ksps
 Configuration: Single Band
 Operating frequency range: Downlink: 769MHz~775MHz
 Uplink:799MHz~805MHz

Carrier frequency(MHz)	Limit	Result
Downlink transmit mode		
Low frequency: 769.00625	Mask B & C	pass
Mid frequency: 772.00625	Mask B & C	pass
High frequency: 774.99375	Mask B & C	pass
Uplink transmit mode		
Low frequency: 799.00625	Mask B & C	pass
Mid frequency: 802.00625	Mask B & C	pass
High frequency: 804.99375	Mask B & C	pass

6.3.4.1.3 Modulation signal: Tetra

Resolution Bandwidth: 300 Hz
 Video Bandwidth: 1 kHz
 Detector mode: Peak

Trace mode: Average
 Symbol Rate: 18ksps
 Configuration: Single Band
 Operating frequency range: Downlink: 769MHz~775MHz
 Uplink:799MHz~805MHz

Carrier frequency(MHz)	Limit	Result
Downlink transmit mode		
Low frequency: 769.0125	Mask B	pass
Mid frequency: 772.0125	Mask B	pass
High frequency: 774.9875	Mask B	pass
Uplink transmit mode		
Low frequency: 799.0125	Mask B	pass
Mid frequency: 802.0125	Mask B	pass
High frequency: 804.9875	Mask B	pass

6.3.4.1.4 Modulation signal: Analog FM(10kHz/1kHz)

Resolution Bandwidth: 300 Hz
 Video Bandwidth: 1 kHz
 Detector mode: Peak
 Trace mode: Average
 Symbol Rate: 1ksps
 Frequency Dev: 10kHz
 Configuration: Single Band
 Operating frequency range: Downlink: 769MHz~775MHz
 Uplink:799MHz~805MHz

Carrier frequency(MHz)	Limit	Result
Downlink transmit mode		
Low frequency: 769.0125	Mask B	pass
Mid frequency: 772.0125	Mask B	pass
High frequency: 774.9875	Mask B	pass
Uplink transmit mode		
Low frequency: 799.0125	Mask B	pass
Mid frequency: 802.0125	Mask B	pass
High frequency: 804.9875	Mask B	pass

6.3.4.2 800MHz Band

6.3.4.2.1 Modulation signal: C4FM

Resolution Bandwidth: 100 Hz
 Video Bandwidth: 300 Hz
 Detector mode: Peak
 Trace mode: Average
 Symbol Rate: 4.8ksps
 Configuration: Single Band
 Operating frequency range: Downlink: 851MHz~862MHz
 Uplink:806MHz~817MHz

Carrier frequency(MHz)		Limit	Result
Downlink transmit mode			
851~854	Low frequency: 851.00625	Mask B & H	pass
	Mid frequency: 852.50625	Mask B & H	pass
	High frequency: 853.99375	Mask B & H	pass
Uplink transmit mode			
806~809	Low frequency: 806.00625	Mask B & H	pass
	Mid frequency: 807.50625	Mask B & H	pass
	High frequency: 808.99375	Mask B & H	pass

6.3.4.2.2 Modulation signal: Tetra

Resolution Bandwidth: 300 Hz
 Video Bandwidth: 1 kHz
 Detector mode: Peak
 Trace mode: Average
 Symbol Rate: 18ksps
 Configuration: Single Band
 Operating frequency range: Downlink: 851MHz~862MHz
 Uplink:806MHz~817MHz

Carrier frequency(MHz)		Limit	Result
Downlink transmit mode			
854~869	Low frequency: 854.0125	Mask B & G	pass
	Mid frequency: 861.5125	Mask B & G	pass
	High frequency: 868.9875	Mask B & G	pass
Uplink transmit mode			
809~824	Low frequency: 809.0125	Mask B & G	pass

	Mid frequency: 816.5125	Mask B & G	pass
	High frequency: 823.9875	Mask B & G	pass

6.3.4.2.3 Modulation signal: Analog FM(10kHz/1kHz)

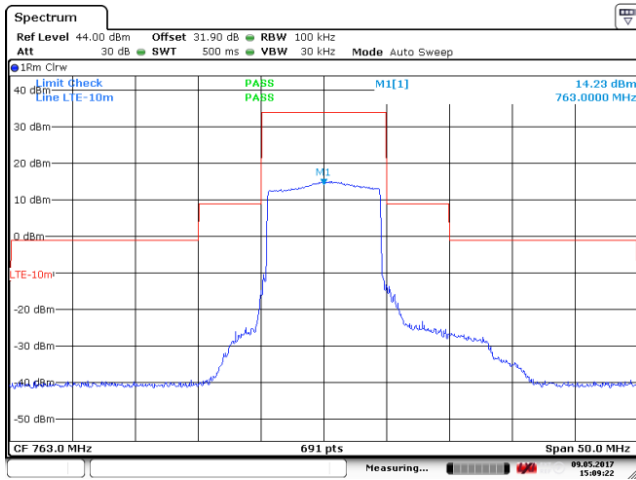
Resolution Bandwidth:	300 Hz
Video Bandwidth:	1 kHz
Detector mode:	Peak
Trace mode:	Average
Symbol Rate:	1ksps
Frequency Dev:	10kHz
Configuration:	Single Band
Operating frequency range:	Downlink: 851MHz~862MHz Uplink:806MHz~817MHz

Carrier frequency(MHz)		Limit	Result
Downlink transmit mode			
854~869	Low frequency: 854.0125	Mask B & G	pass
	Mid frequency: 861.5125	Mask B & G	pass
	High frequency: 868.9875	Mask B & G	pass
Uplink transmit mode			
809~824	Low frequency: 809.0125	Mask B & G	pass
	Mid frequency: 816.5125	Mask B & G	pass
	High frequency: 823.9875	Mask B & G	pass

6.3.5 Test screenshot

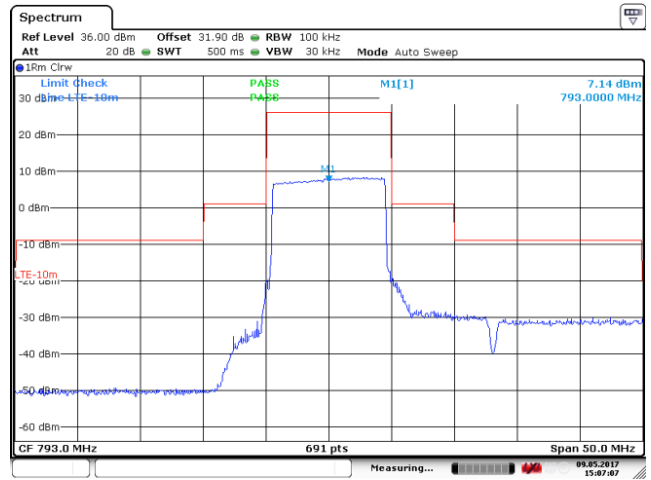
6.3.5.1 700MHz Band

6.3.5.1.1 Modulation signal: LTE



Date: 9.MAY.2017 15:09:22

Downlink: 763.0MHz

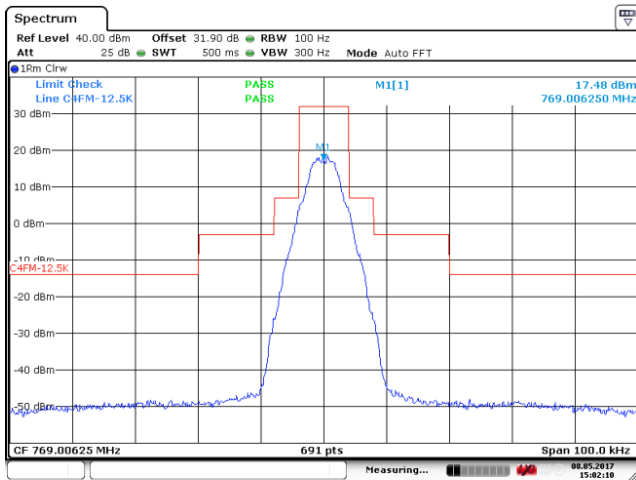


Date: 9.MAY.2017 15:07:07

Uplink: 793.0MHz

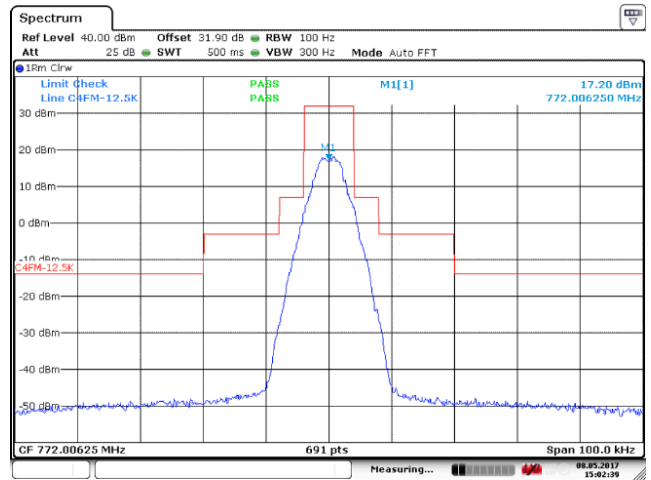
6.3.5.1.2 Modulation signal: C4FM

(1) Downlink



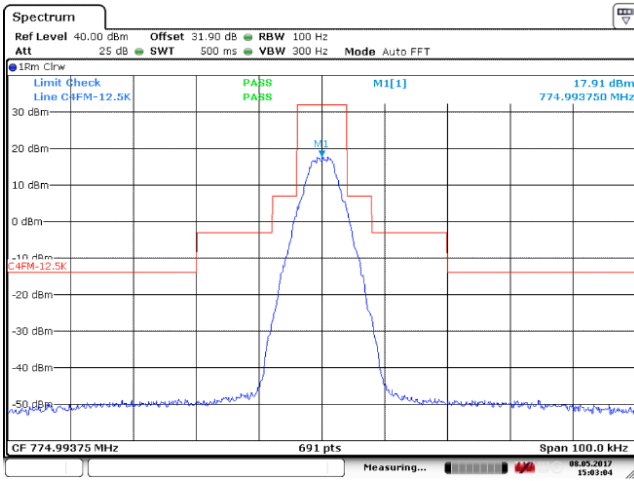
Date: 8.MAY.2017 15:02:10

Low Frequency: 769.00625MHz (Mask B)

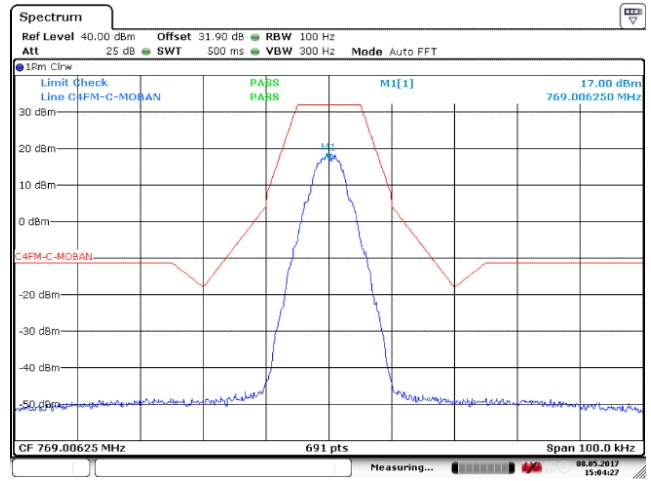


Date: 8.MAY.2017 15:02:39

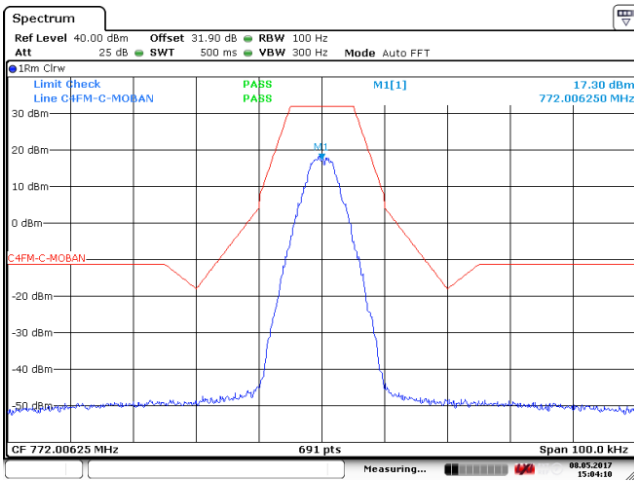
Mid Frequency: 772.00625MHz (Mask B)



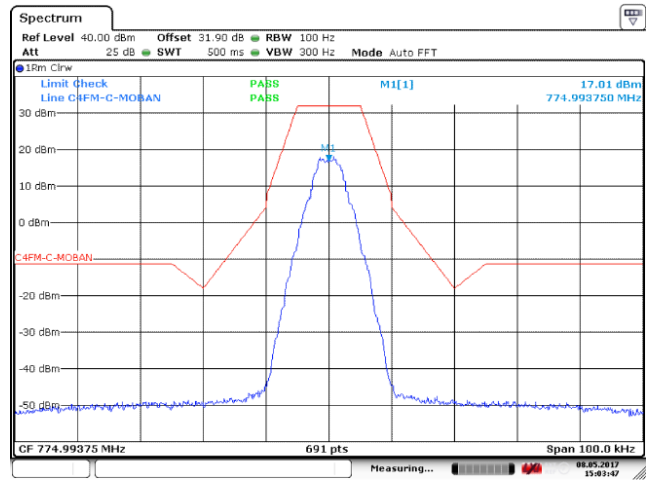
High Frequency: 774.99375MHz (Mask B)



Low Frequency: 769.00625MHz (Mask C)

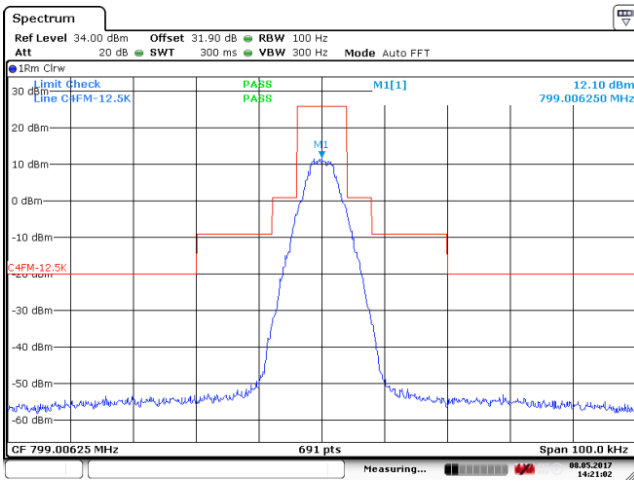


Mid Frequency: 772.00625MHz (Mask C)

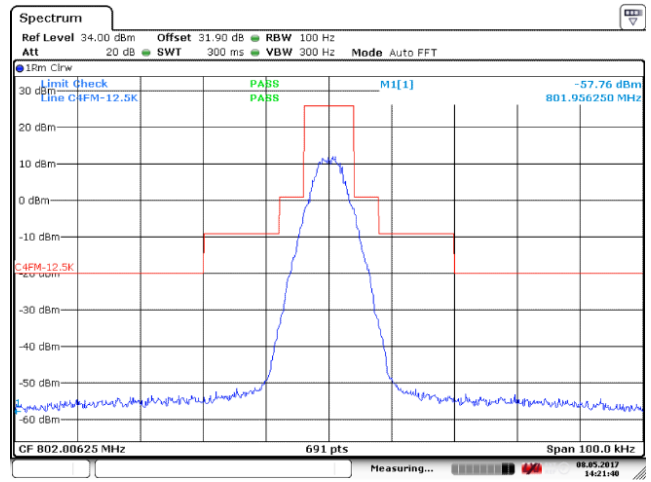


High Frequency: 774.99375MHz (Mask C)

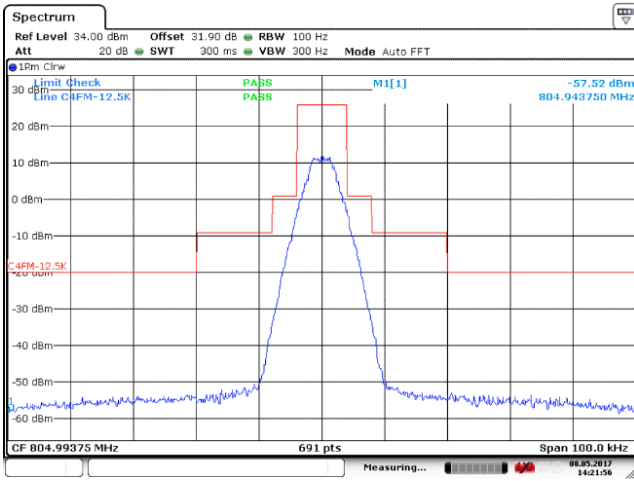
(2) Uplink



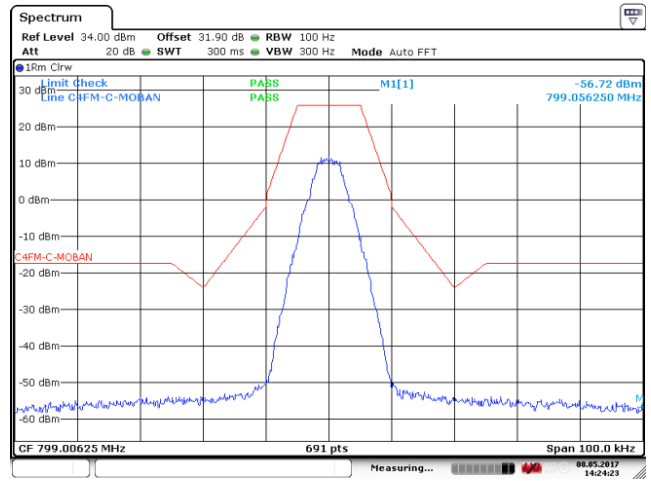
Low Frequency: 799.00625MHz (Mask B)



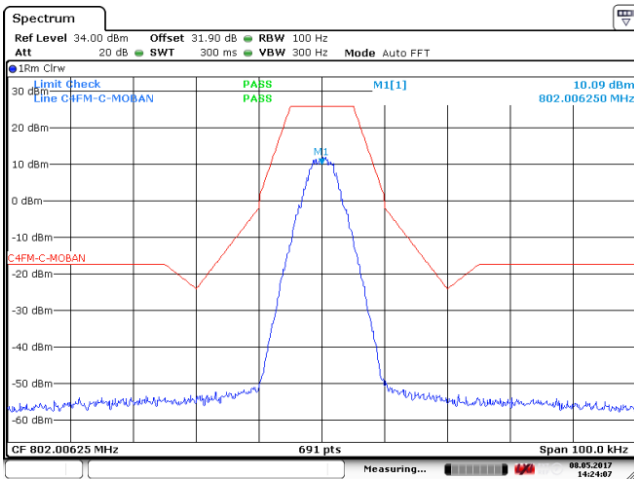
Mid Frequency: 802.00625MHz (Mask B)



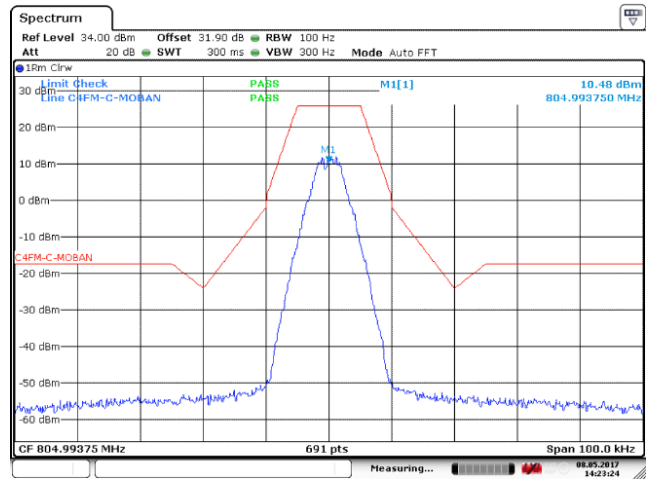
High Frequency: 804.99375MHz (Mask B)



Low Frequency: 799.00625MHz (Mask C)



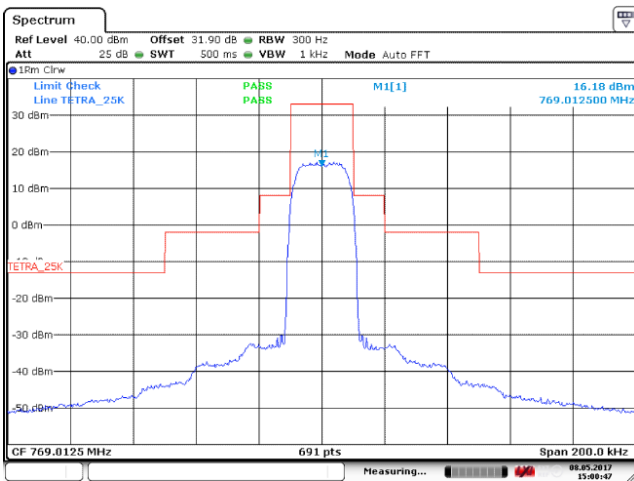
Mid Frequency: 802.00625MHz (Mask C)



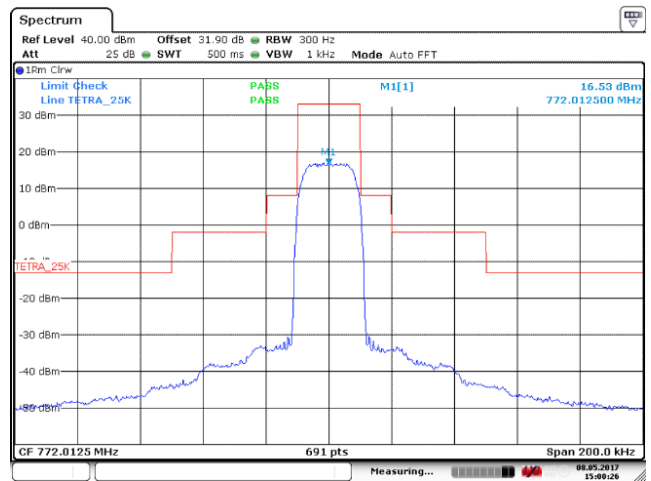
High Frequency: 804.99375MHz (Mask C)

6.3.5.1.3 Modulation signal: Tetra

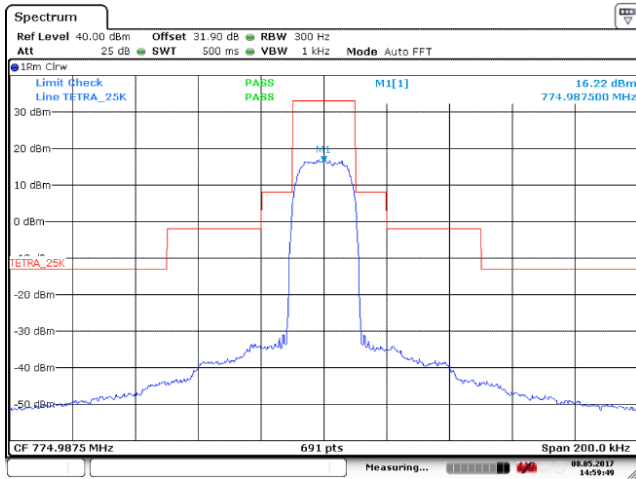
(1) Downlink



Low Frequency: 769.0125MHz (Mask B)

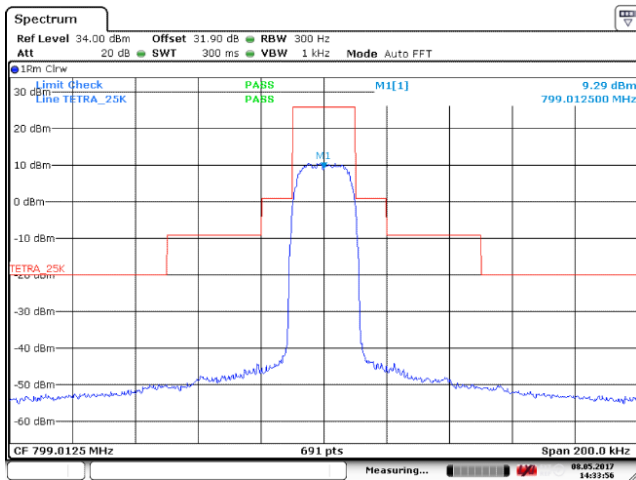


Mid Frequency: 772.0125MHz (Mask B)

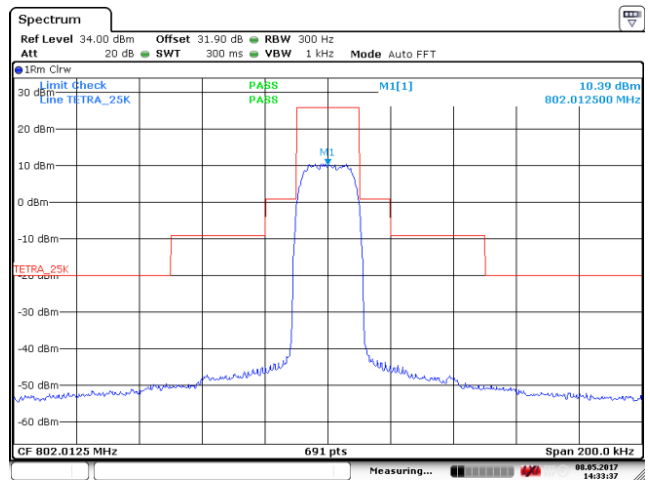


High Frequency: 774.9875MHz(Mask B)

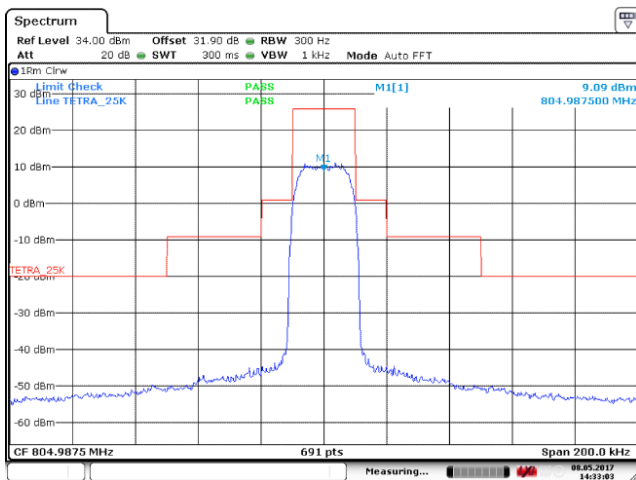
(2) Uplink



Low Frequency: 799.0125MHz(Mask B)



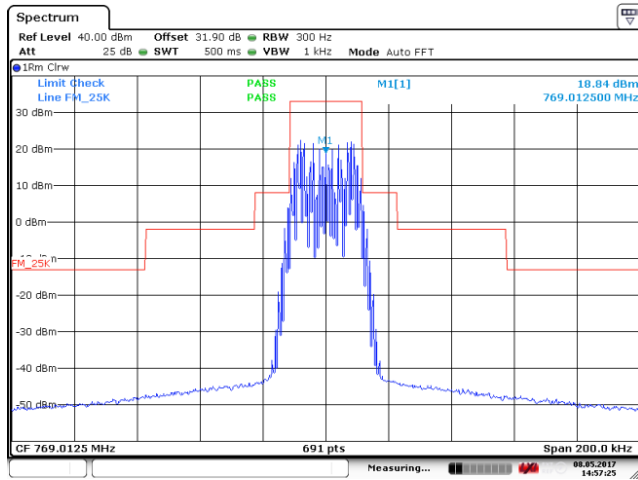
Mid Frequency: 802.0125MHz(Mask B)



High Frequency: 804.9875MHz(Mask B)

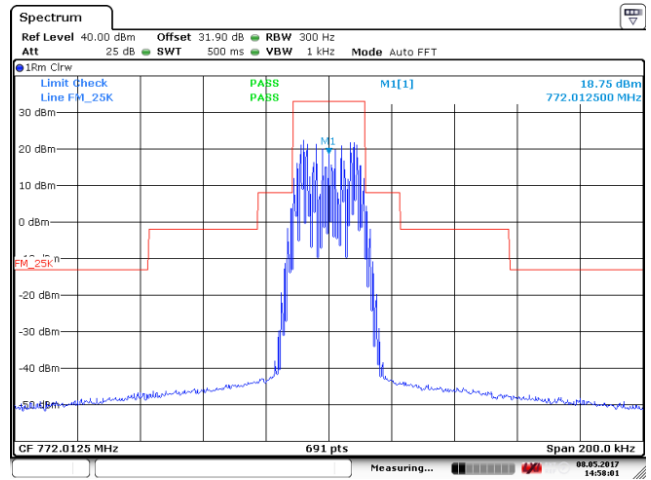
6.3.5.1.4 Modulation signal: Analog FM(10kHz/1kHz)

(1) Downlink



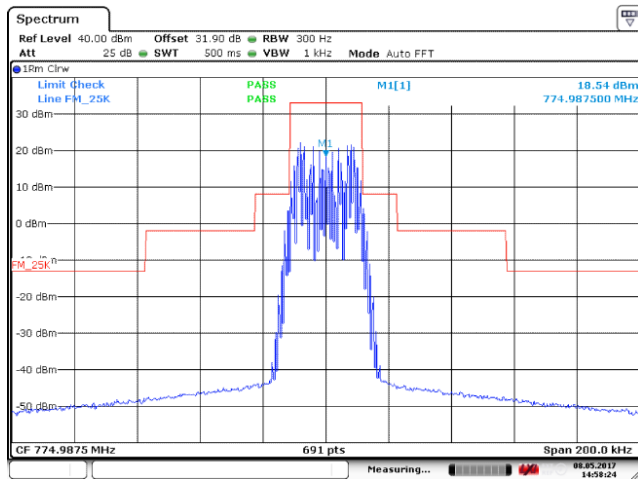
Date: 8.MAY.2017 14:57:25

Low Frequency: 769.0125MHz(Mask B)



Date: 8.MAY.2017 14:58:01

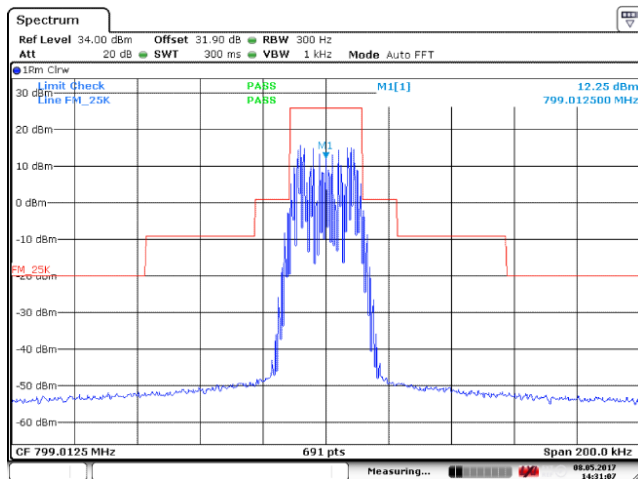
Mid Frequency: 772.0125MHz(Mask B)



Date: 8.MAY.2017 14:58:23

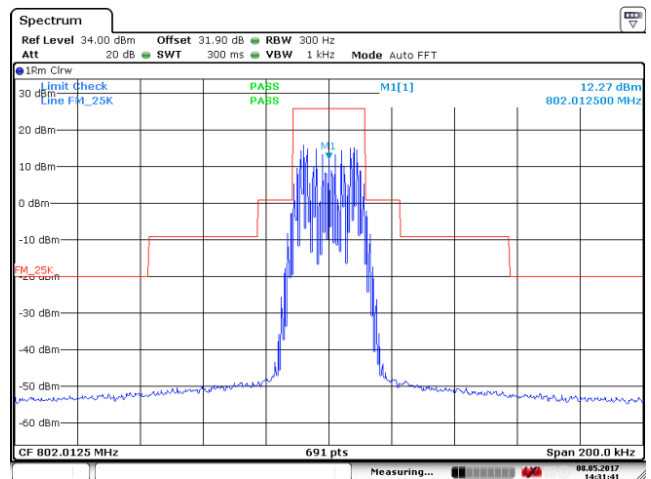
High Frequency: 774.9875MHz(Mask B)

(2) Uplink



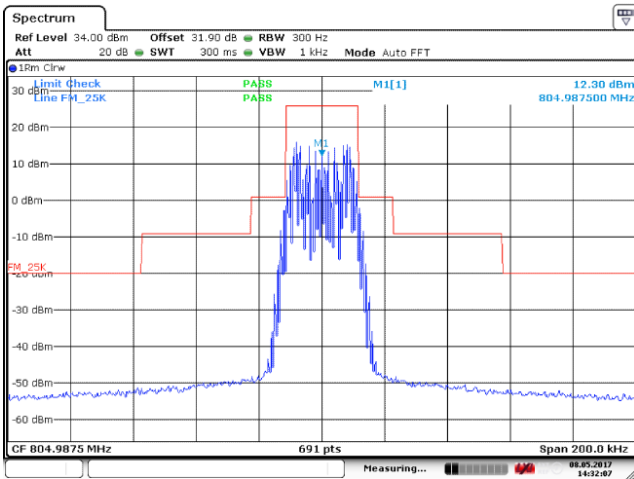
Date: 8.MAY.2017 14:31:07

Low Frequency: 799.0125MHz(Mask B)



Date: 8.MAY.2017 14:31:40

Mid Frequency: 802.0125MHz(Mask B)



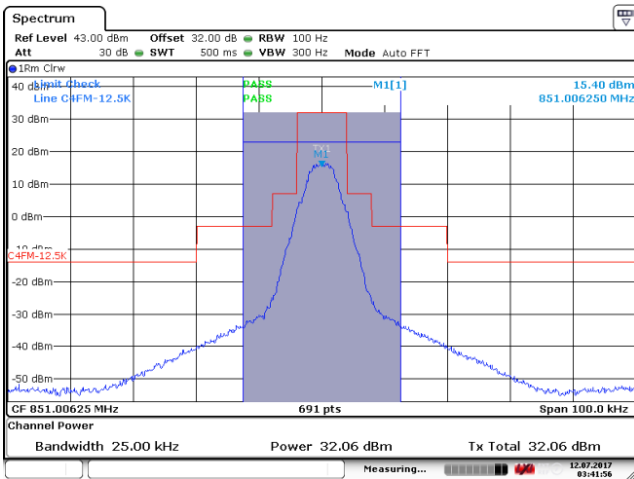
Date: 8.MAY.2017 14:32:07

High Frequency: 804.9875MHz(Mask B)

6.3.5.2 800MHz Band

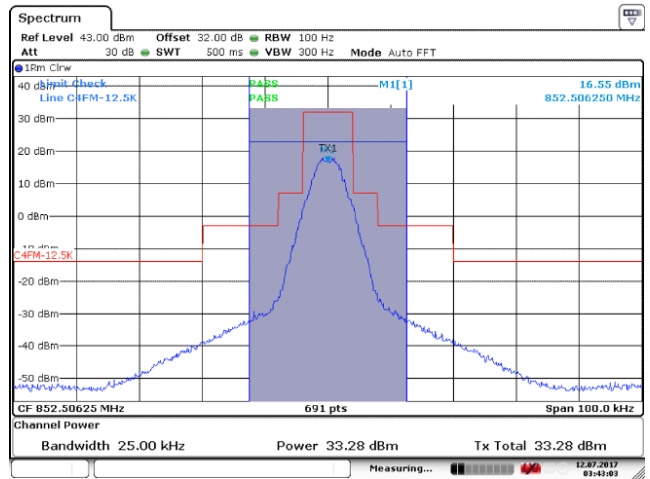
6.3.5.2.1 Modulation signal: C4FM

(1) Downlink



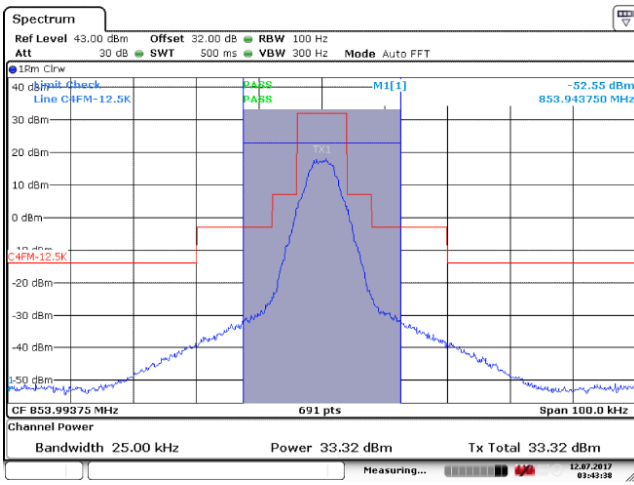
Date: 12.JUL.2017 03:41:56

Low Frequency: 851.00625MHz (Mask B)



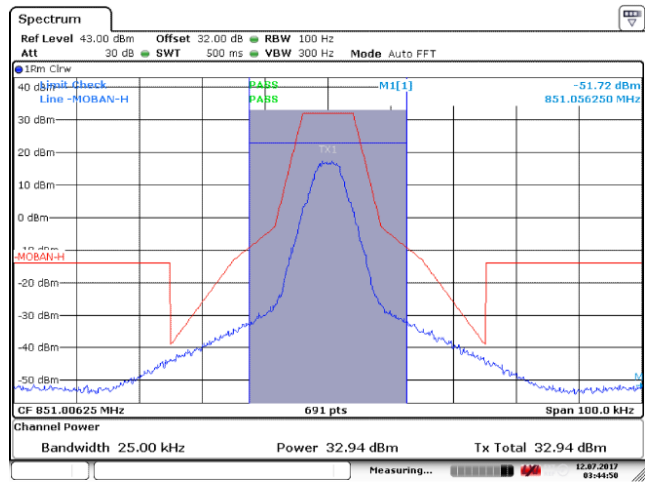
Date: 12.JUL.2017 03:43:03

Mid Frequency: 852.50625MHz(Mask B)



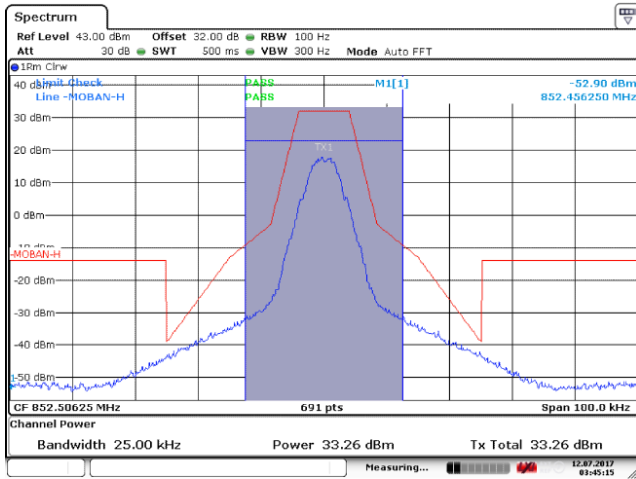
Date: 12.JUL.2017 03:43:38

High Frequency: 853.99375MHz(Mask B)

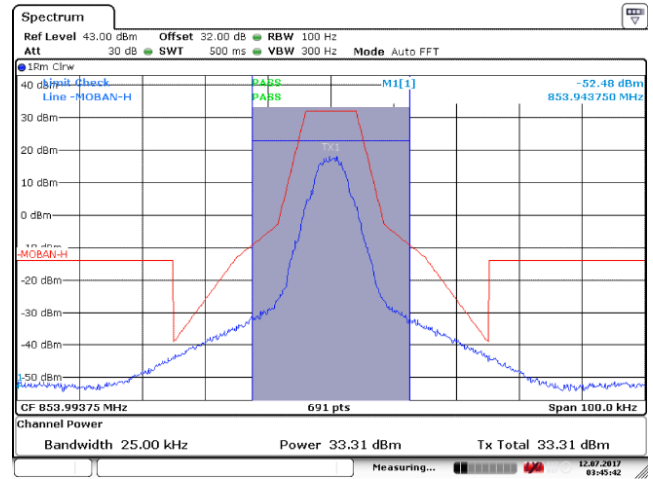


Date: 12.JUL.2017 03:44:50

Low Frequency: 851.00625MHz (Mask H)

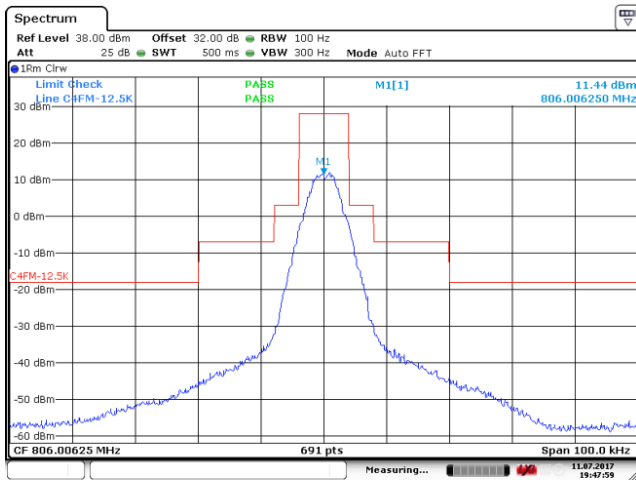


Mid Frequency: 852.50625MHz (Mask H)

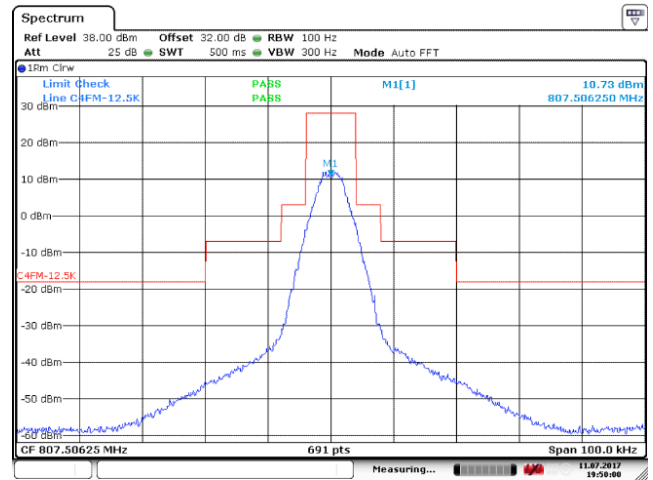


High Frequency: 853.99375MHz (Mask H)

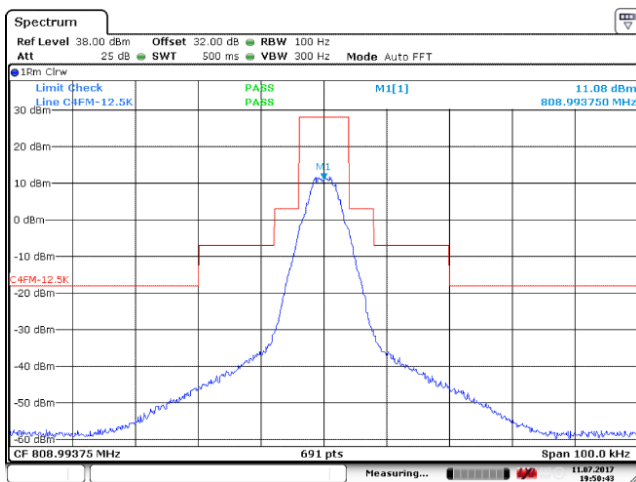
(2) Uplink



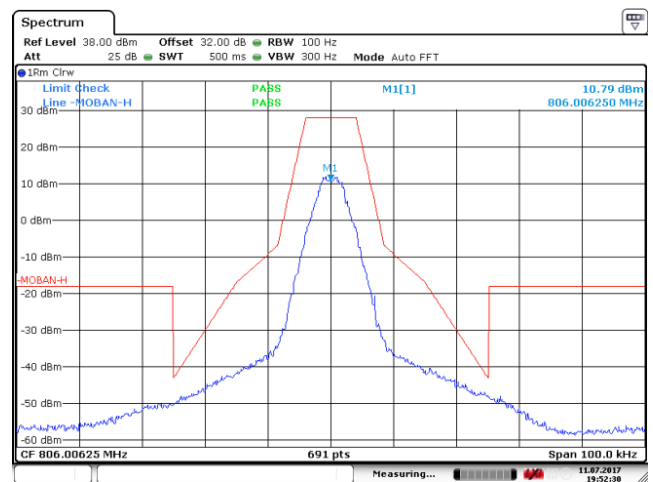
Low Frequency: 806.00625MHz(Mask B)



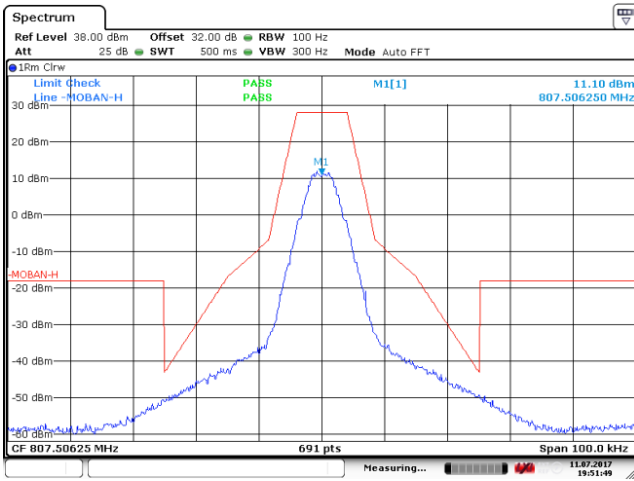
Mid Frequency: 807.50625MHz(Mask B)



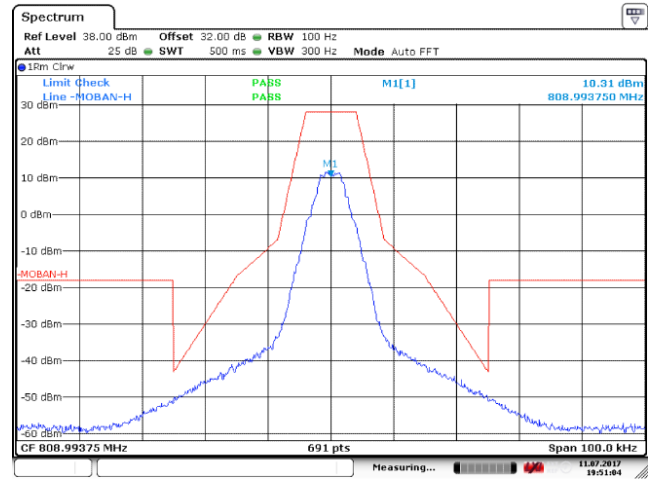
High Frequency: 808.99375MHz(Mask B)



Low Frequency: 806.00625MHz (Mask H)



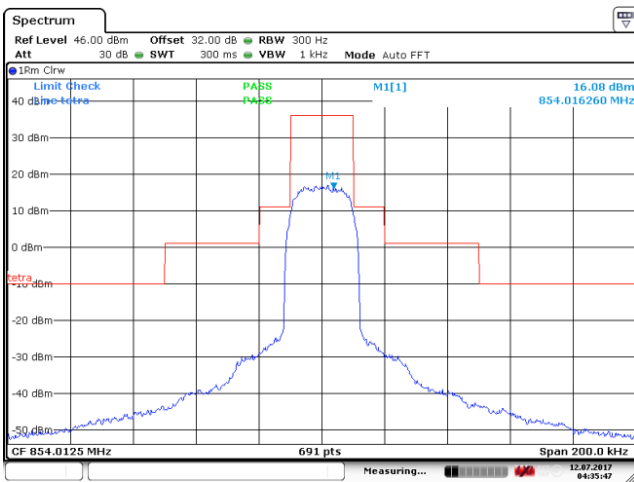
Mid Frequency: 807.50625MHz (Mask H)



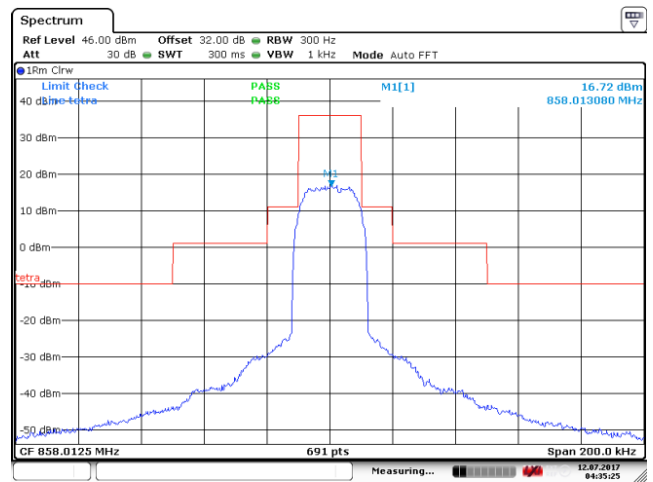
High Frequency: 808.99375MHz (Mask H)

6.3.5.2.2 Modulation signal: Tetra

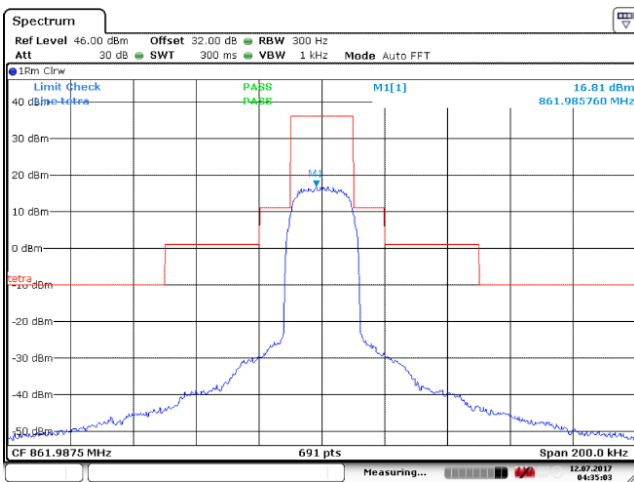
(1) Downlink



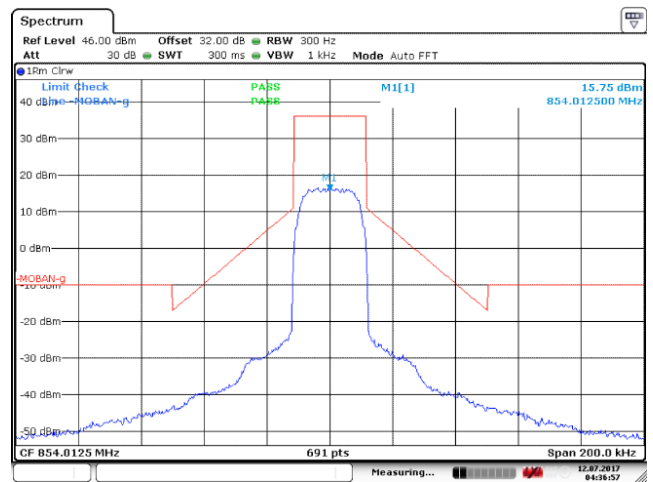
Low Frequency: 854.0125MHz (Mask B)



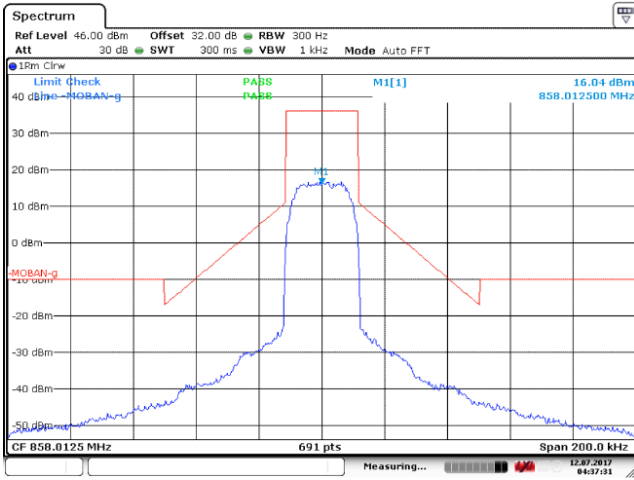
Mid Frequency: 858.0125MHz (Mask B)



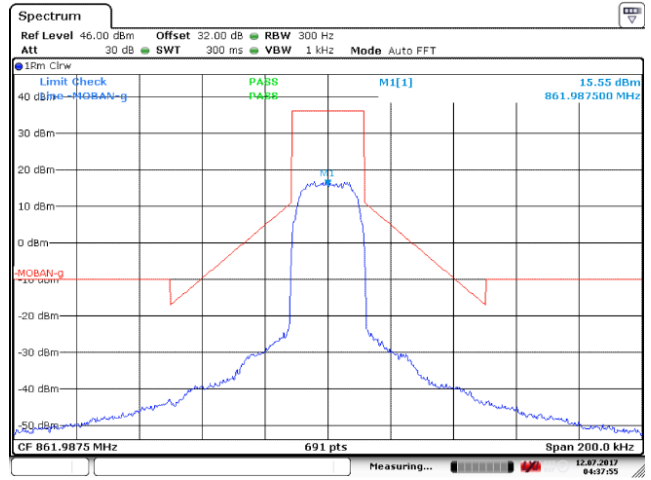
High Frequency: 861.9875MHz (Mask B)



Low Frequency: 854.0125MHz (Mask G)

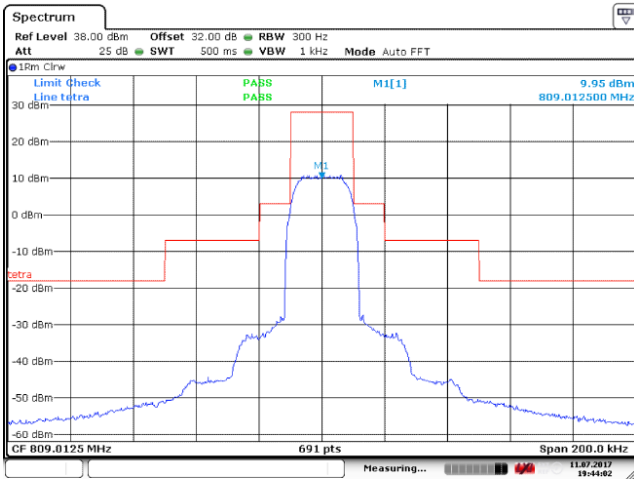


Mid Frequency: 858.0125MHz (Mask G)

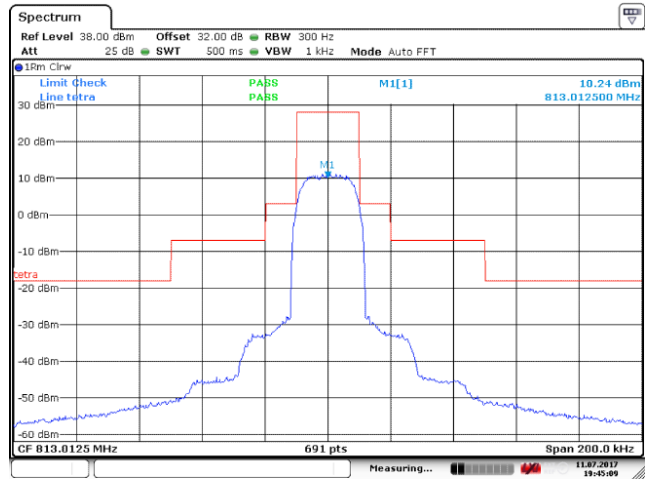


High Frequency: 861.9875MHz (Mask G)

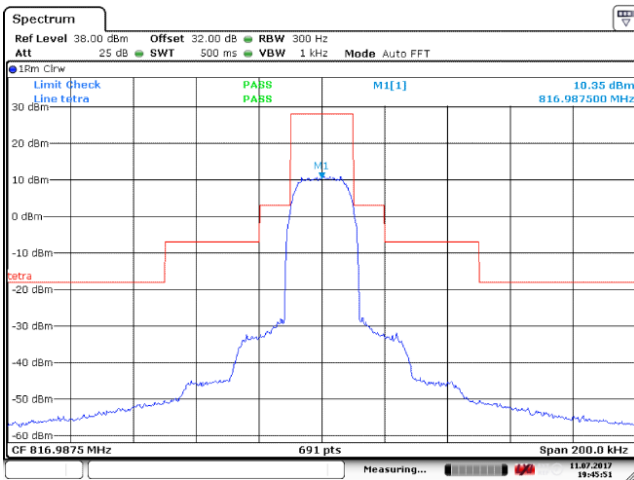
(2) Uplink



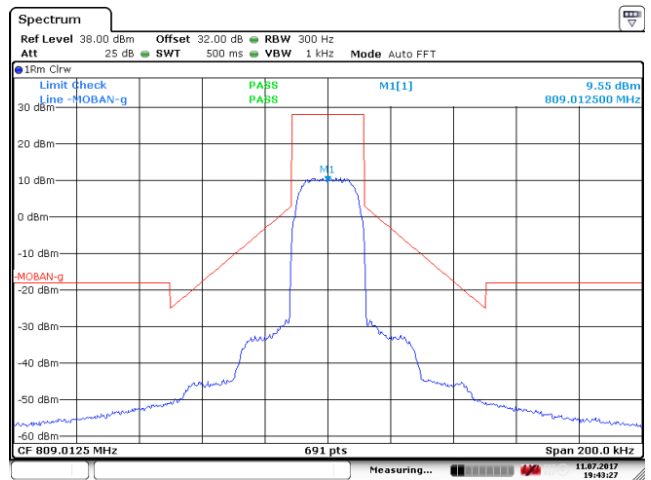
Low Frequency: 809.0125MHz (Mask B)



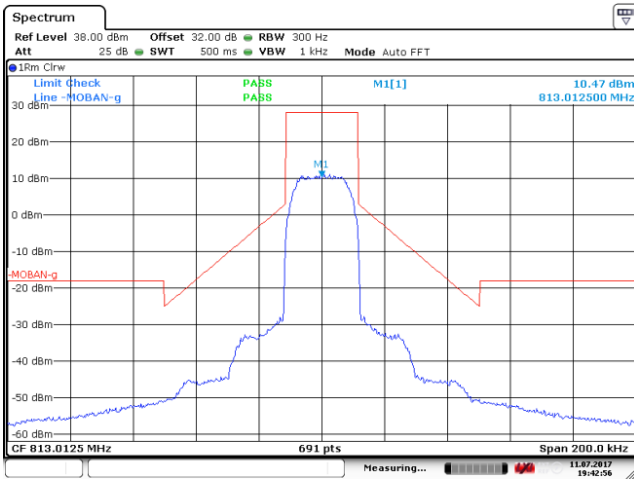
Mid Frequency: 813.0125MHz (Mask B)



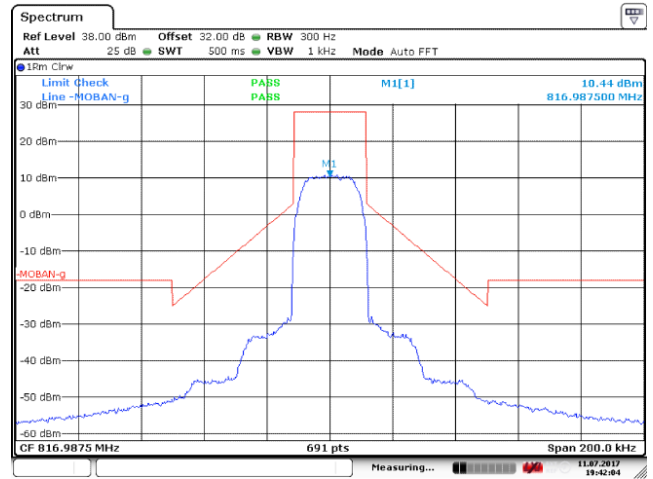
High Frequency: 817.9875MHz (Mask B)



Low Frequency: 809.0125MHz (Mask G)



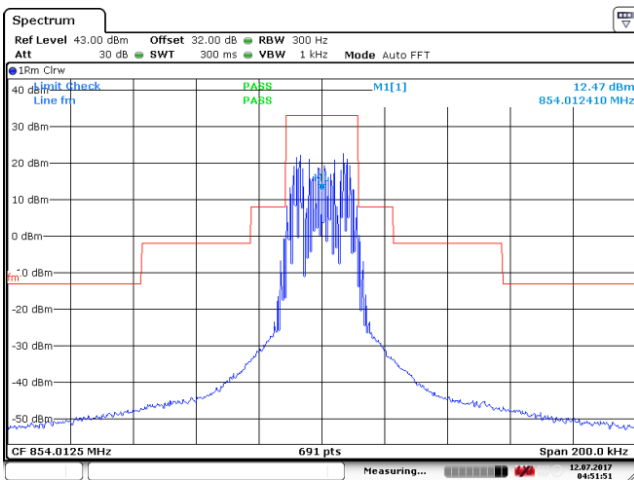
Mid Frequency: 813.0125MHz (Mask G)



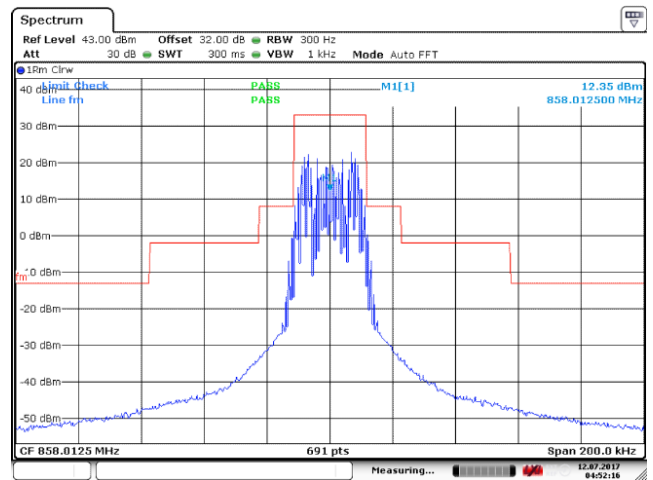
High Frequency: 817.9875MHz (Mask G)

6.3.5.2.3 Modulation signal: Analog FM(10kHz/1kHz)

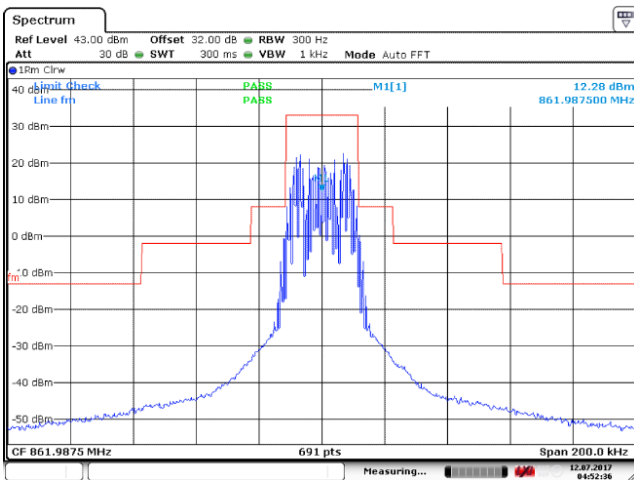
(1) Downlink



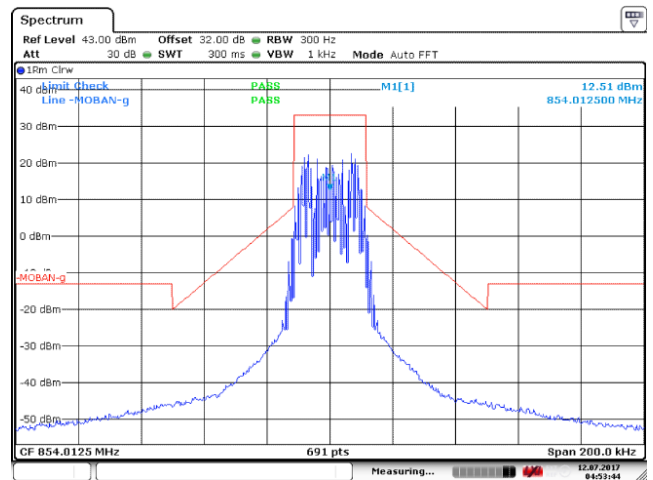
Low Frequency: 854.0125MHz (Mask B)



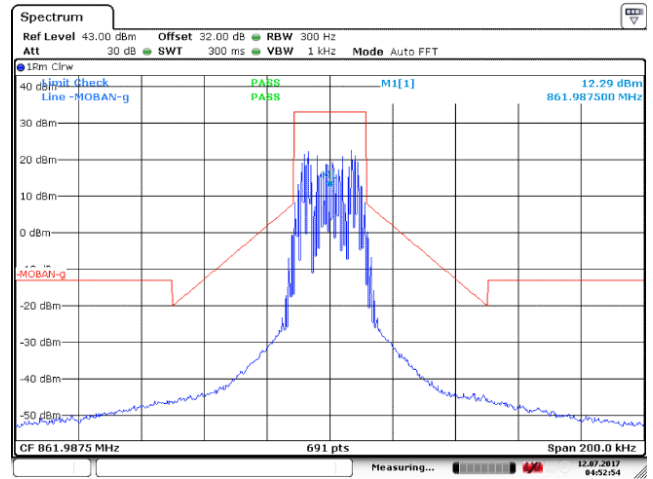
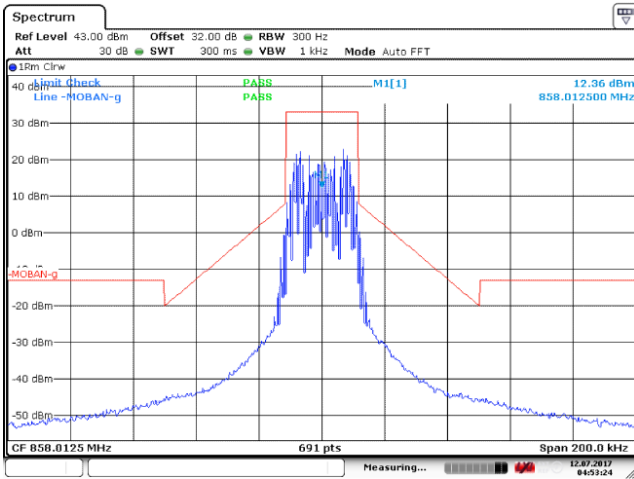
Mid Frequency: 858.0125MHz (Mask B)



High Frequency: 861.9875MHz (Mask B)



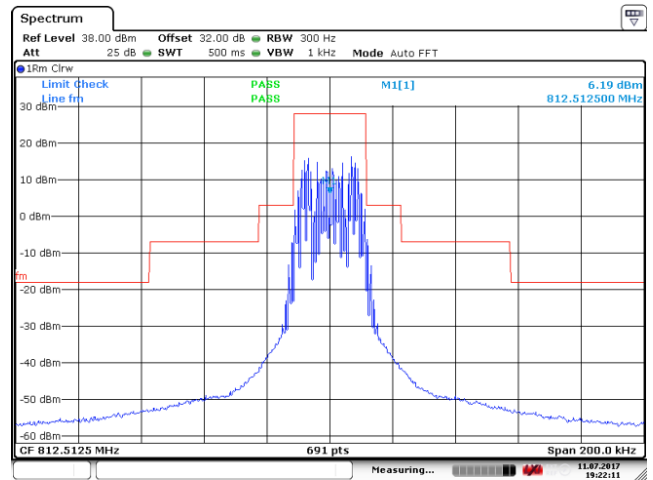
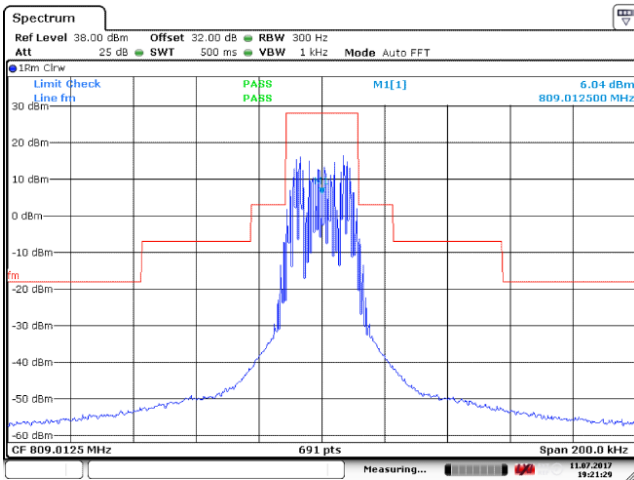
Low Frequency: 854.0125MHz (Mask G)



Mid Frequency: 858.0125MHz (Mask G)

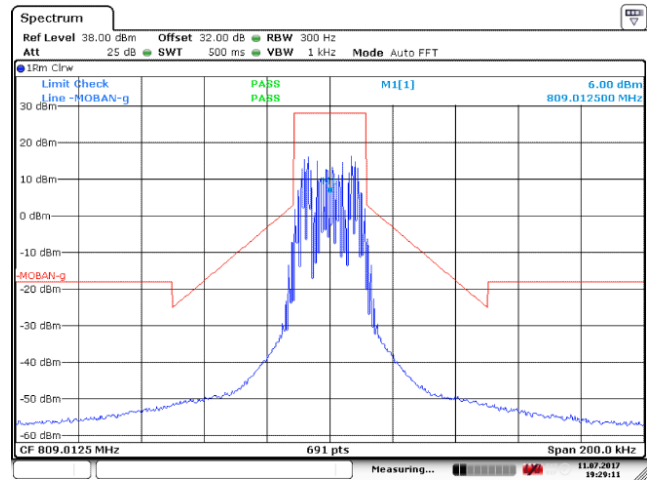
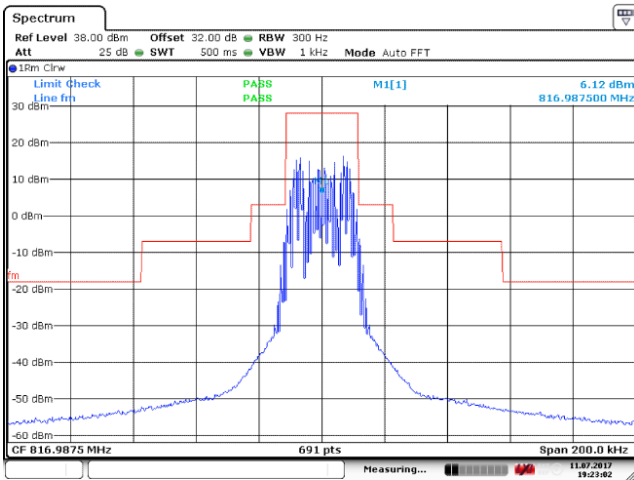
High Frequency: 861.9875MHz (Mask G)

(2) Uplink



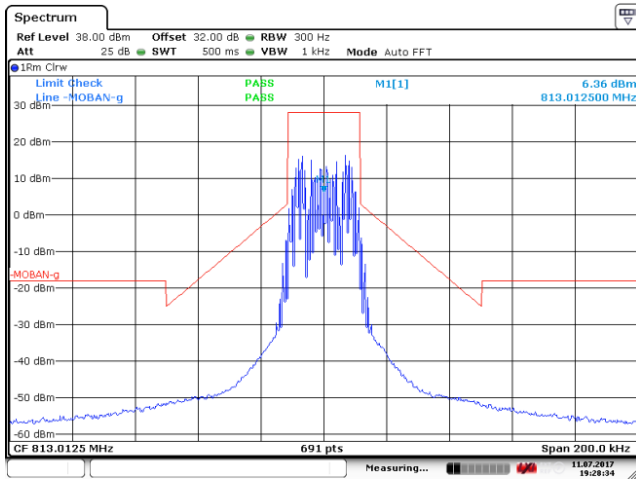
Low Frequency: 809.0125MHz (Mask B)

Mid Frequency: 813.0125MHz (Mask B)

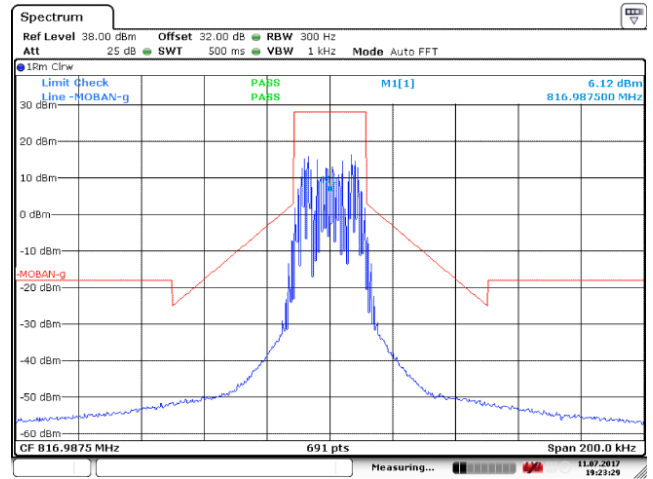


High Frequency: 816.9875MHz (Mask B)

Low Frequency: 809.0125MHz (Mask G)



Mid Frequency: 813.0125MHz (Mask G)



High Frequency: 816.9875MHz (Mask G)

6.4 Conducted spurious emissions

Test Date (yy-mm-dd): 2017-05-16 to 2017-07-11

Test environment: Normal

Ambient Temp 24.1°C~26.1°C, Humid 46%~51%, Atmospheric Pressure 101kpa

Power supply: AC 120V 50/60Hz
DC -48V

Test Method: KDB 935210 D05 Indus Booster Basic Meas v01r01

Test Requirement: FCC part 90.219(e)(3)

6.4.1 Limit

Specification test limits of spurious emissions from a signal booster are given in table 8

Table 8 Spurious emissions limits

frequency range	Maximum level	Measurement bandwidth
9kHz~1GHz	-13dBm	100kHz
1GHz~8.6GHz	-13dBm	100kHz

NOTE:

1. RF channels to be tested for single-carrier: Low frequency, Mid frequency and High frequency;
2. Modulation types are C4FM, Tetra, Analog FM and LTE;

6.4.2 Test configuration

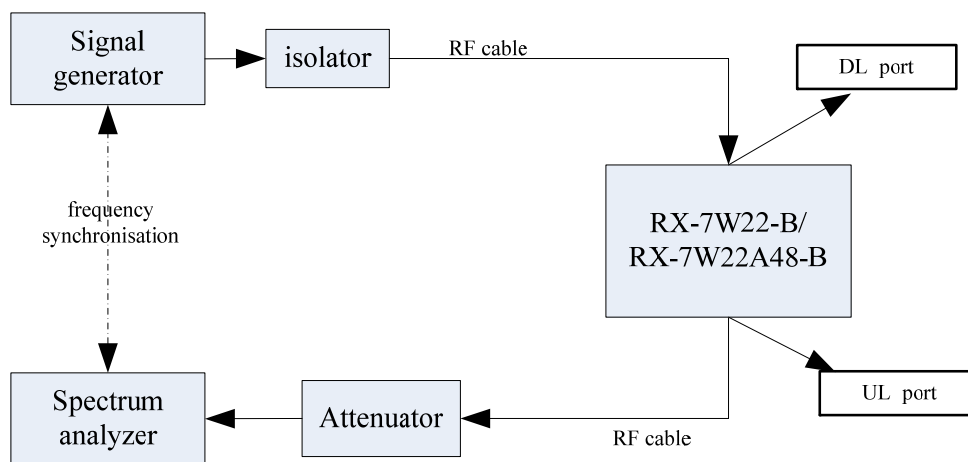


Figure 7: Conducted spurious emissions arrangement for Downlink

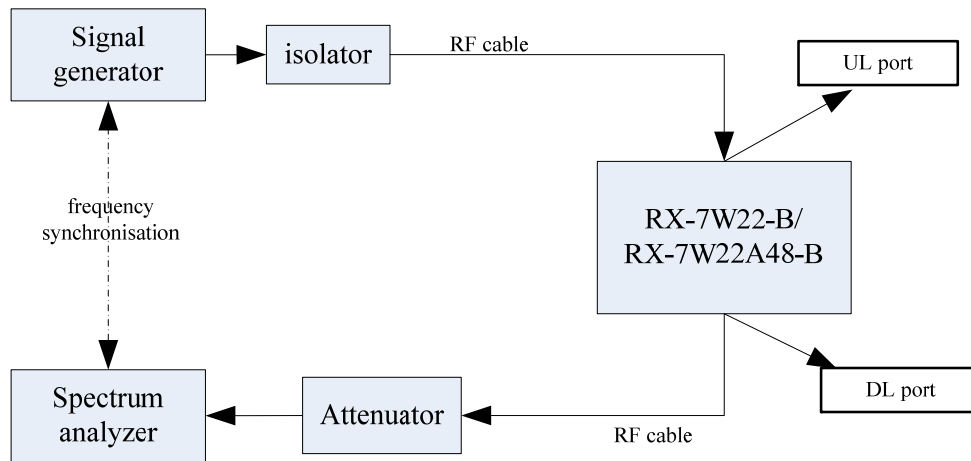


Figure 8: Conducted spurious emissions arrangement for Uplink

6.4.3 Test procedures

- (1) Connect the device as illustrated Figure 7 and Figure 8, when the output power is over the maximum value of the Spectrum Analyzer, add the attenuator to avoid destroying;
- (2) The signal generator should initially be configured to produce C4FM(Tetra , Analog FM or LTE) test signals;
- (3) Set the signal generator frequency to the center frequency of the EUT operating band;
- (4) Set the output power level so that the resultant signal is just below the AGC threshold and maximum gain;
- (5) Connect a spectrum analyzer to the output of the EUT, using appropriate attenuation as necessary;
- (6) Set the RBW = 100 kHz. (i.e., for 30 MHz to 1 GHz PLMRS and/or PSRS booster devices);
- (7) Set the VBW = $3 \times$ RBW;
- (8) Set the Sweep time = auto-couple;
- (9) Set the detector to PEAK;
- (10) Set the spectrum analyzer start frequency to 30 MHz (or the lowest radio frequency signal generated in the EUT, without going below 9 kHz if the EUT has additional internal clock frequencies), and the stop frequency to 10 times the highest allowable frequency of the EUT passband;
- (11) Select MAX HOLD, and use the marker peak function to find the highest emission(s) outside the passband. (This could be either at a frequency lesser or greater than the passband frequencies.);
- (12) Capture a plot for inclusion in the test report;
- (13) Repeat steps (3) to (12) for each authorized frequency band/block of operation

6.4.4 Test Results

6.4.4.1 700MHz Band

6.4.4.1.1 Modulation signal: LTE.

Frequency range		Max. Spurious Limit(dBm)	RBW (kHz)	Max. Spurious mark Level (dBm)	Margin ^{1*} (dB)	Result
1). AC 120V, 50/60Hz						
1.1) Downlink transmit mode (Frequency range: 758MHz~768MHz)						
frequency 763.0MHz	9kHz~1GHz	-13	100	-50.96	-37.96	pass
	1GHz~8.6GHz	-13	100	-50.52	-37.52	pass
1.2). Uplink transmit mode(Frequency range: 788MHz~798MHz)						
Low frequency 793.0MHz	9kHz~1GHz	-13	100	-50.74	-37.74	pass
	1GHz~8.6GHz	-13	100	-51.82	-38.82	pass
2. DC -48V						
2.1) Downlink transmit mode (Frequency range: 758MHz~768MHz)						
frequency 763.0MHz	9kHz~1GHz	-13	100	-53.36	-40.36	pass
	1GHz~8.6GHz	-13	100	-50.80	-37.80	pass
2.2). Uplink transmit mode(Frequency range: 788MHz~798MHz)						
Low frequency 793.0MHz	9kHz~1GHz	-13	100	-49.47	-36.47	pass
	1GHz~8.6GHz	-13	100	-53.18	-40.18	pass
Note: 1*--Margin= Maximum mark level- specification limit.						

6.4.4.1.2 Modulation signal: C4FM, Tetra and Analog FM

Frequency range		Max. Spurious Limit(dBm)	RBW (kHz)	Max. Spurious mark Level (dBm)	Margin ^{1*} (dB)	Result
1). AC 120V, 50/60Hz						
1.1) Downlink transmit mode (Frequency range: 769MHz~775MHz)						
Low frequency 769.0125MHz	9kHz~1GHz	-13	100	-46.18	-33.18	pass
	1GHz~8.6GHz	-13	100	-46.05	-33.05	pass
Mid frequency 772.0125MHz	9kHz~1GHz	-13	100	-46.14	-33.14	pass
	1GHz~8.6GHz	-13	100	-44.03	-31.03	pass

High frequency 774.9875MHz	9kHz~1GHz	-13	100	-46.17	-33.17	pass
	1GHz~8.6GHz	-13	100	-45.79	-32.79	pass
1.2) Uplink transmit mode(Frequency range: 799MHz~805MHz)						
Low frequency 799.0125MHz	9kHz~1GHz	-13	100	-50.08	-37.08	pass
	1GHz~8.6GHz	-13	100	-50.99	-37.99	pass
Mid frequency 802.0125MHz	9kHz~1GHz	-13	100	-49.18	-36.18	pass
	1GHz~8.6GHz	-13	100	-52.07	-39.07	pass
High frequency 804.9875MHz	9kHz~1GHz	-13	100	-50.46	-37.46	pass
	1GHz~8.6GHz	-13	100	-53.25	-40.25	pass
2. DC -48V						
2.1) Downlink transmit mode (Frequency range: 769MHz~775MHz)						
Low frequency 769.0125MHz	9kHz~1GHz	-13	100	-55.68	-42.68	pass
	1GHz~8.6GHz	-13	100	-49.49	-36.49	pass
Mid frequency 772.0125MHz	9kHz~1GHz	-13	100	-55.72	-42.72	pass
	1GHz~8.6GHz	-13	100	-46.62	-33.62	pass
High frequency 774.9875MHz	9kHz~1GHz	-13	100	-54.56	-41.56	pass
	1GHz~8.6GHz	-13	100	-48.02	-35.02	pass
2.2) Uplink transmit mode(Frequency range: 799MHz~805MHz)						
Low frequency 799.0125MHz	9kHz~1GHz	-13	100	-54.72	-41.72	pass
	1GHz~8.6GHz	-13	100	-50.61	-37.61	pass
Mid frequency 802.0125MHz	9kHz~1GHz	-13	100	-55.10	-42.10	pass
	1GHz~8.6GHz	-13	100	-51.14	-38.14	pass
High frequency 804.9875MHz	9kHz~1GHz	-13	100	-55.15	-42.15	pass
	1GHz~8.6GHz	-13	100	-51.12	-38.12	pass
Note: 1*--Margin= Maximum mark level- specification limit.						

6.4.4.2 800MHz Band

6.4.4.2.1 Modulation signal: C4FM, Tetra and Analog FM

Frequency range		Max. Spurious Limit(dBm)	RBW (kHz)	Max. Spurious mark Level (dBm)	Margin ^{1*} (dB)	Result
1). AC 120V, 50/60Hz						
1.1) Downlink transmit mode (Frequency range: 851MHz~862MHz)						
Low frequency 851.0125MHz	9kHz~1GHz	-13	100	-56.01	-43.01	pass
	1GHz~8.6GHz	-13	100	-49.19	-36.19	pass
Mid frequency 856.5125MHz	9kHz~1GHz	-13	100	-55.48	-42.48	pass
	1GHz~8.6GHz	-13	100	-49.21	-36.21	pass
High frequency 861.9875MHz	9kHz~1GHz	-13	100	-54.29	-41.29	pass
	1GHz~8.6GHz	-13	100	-50.58	-37.58	pass
1.2) Uplink transmit mode(Frequency range: 806MHz~817MHz)						
Low frequency 806.0125MHz	9kHz~1GHz	-13	100	-48.84	-3.84	pass
	1GHz~8.6GHz	-13	100	-51.94	-38.94	pass
Mid frequency 811.5125MHz	9kHz~1GHz	-13	100	-48.59	-35.59	pass
	1GHz~8.6GHz	-13	100	-51.19	-38.19	pass
High frequency 817.9875MHz	9kHz~1GHz	-13	100	-48.30	-35.30	pass
	1GHz~8.6GHz	-13	100	-54.18	-38.18	pass
2. DC -48V						
2.1) Downlink transmit mode (Frequency range: 851MHz~862MHz)						
Low frequency 851.0125MHz	9kHz~1GHz	-13	100	-56.01	-43.01	pass
	1GHz~8.6GHz	-13	100	-49.19	-36.19	pass
Mid frequency 856.5125MHz	9kHz~1GHz	-13	100	-55.48	-42.48	pass
	1GHz~8.6GHz	-13	100	-49.21	-36.21	pass
High frequency 861.9875MHz	9kHz~1GHz	-13	100	-54.29	-41.29	pass
	1GHz~8.6GHz	-13	100	-50.58	-37.58	pass
2.2) Uplink transmit mode(Frequency range: 806MHz~817MHz)						
Low frequency 806.0125MHz	9kHz~1GHz	-13	100	-51.04	-38.04	pass

	1GHz~8.6GHz	-13	100	-59.71	-46.71	pass
Mid frequency 811.5125MHz	9kHz~1GHz	-13	100	-50.12	-37.12	pass
	1GHz~8.6GHz	-13	100	-59.89	-46.89	pass
High frequency 817.9875MHz	9kHz~1GHz	-13	100	-49.26	-36.26	pass
	1GHz~8.6GHz	-13	100	-59.35	-46.35	pass
Note: 1*--Margin= Maximum mark level- specification limit.						

6.5 Frequency stability

Test Date (yy-mm-dd): 2017-05-16 to 2017-07-11

Test environment: Normal

Ambient Temp 24.1°C~26.1°C, Humid 46%~51%, Atmospheric Pressure 101kpa

Power supply: AC 120V 50/60Hz

Test Method: KDB 935210 D05 Indus Booster Basic Meas v01r01

Test Requirement: FCC part 90.213 & part 90.539

6.5.1 Limit

Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table 9.

Table 9 Frequency stability limits

frequency range(MHz)	Minimum Frequency Stability(ppm)
758-768/788~798	± 2.5
769-775/799-805	± 1.5(Channel Bandwidth 12.5kHz) ± 2.5(Channel Bandwidth 25kHz)
806-809/851-854	± 1.0
809-817/854-862	± 1.5

6.5.2 Test configuration

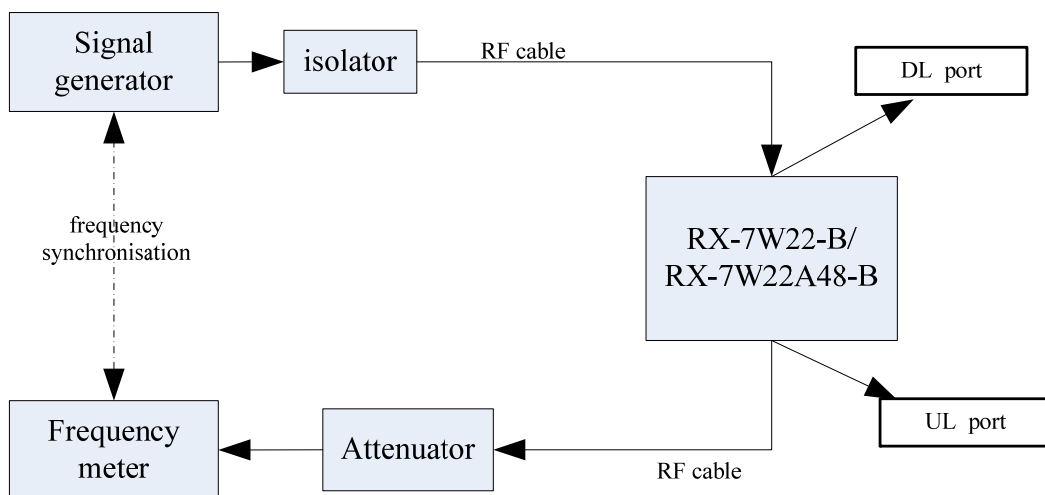


Figure 9: Frequency stability arrangement for Downlink

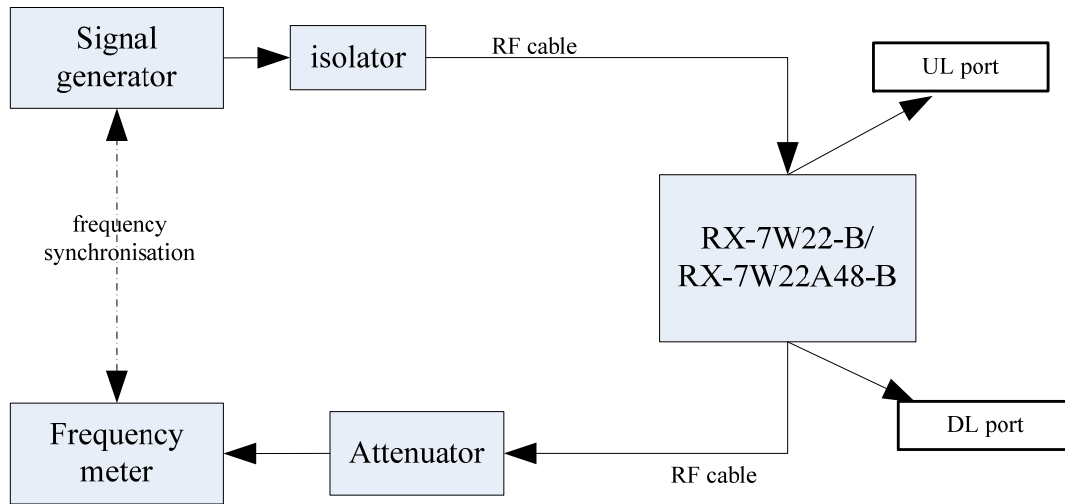


Figure 10: Frequency stability arrangement for Uplink

6.5.3 Test procedures

- (1) Connect the device as illustrated Figure 9 and Figure 10, when the output power is over the maximum value of the Spectrum Analyzer, add the attenuator to avoid destroying;
- (2) The signal generator should initially be configured to produce CW signals;
- (3) Set the signal generator frequency to the center frequency of the EUT operating band;
- (4) Keep signal source and frequency meter synchronization;
- (5) Record Output frequency value when level as the ALC threshold level;
- (6) Read the frequency at the relative temperature;
- (7) Vary the voltage from -15% nominal voltage to +15% voltage;