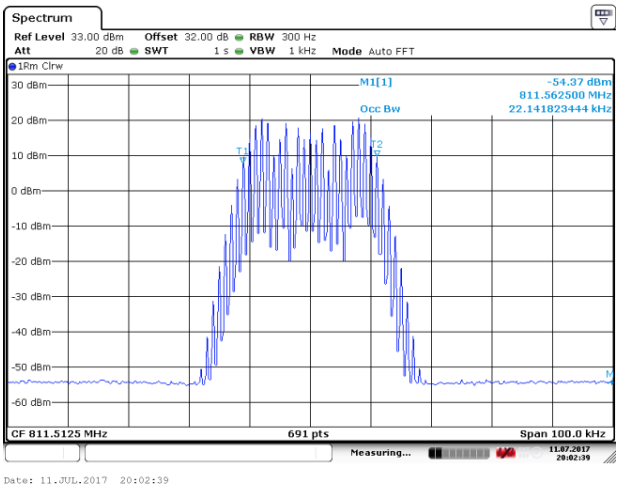
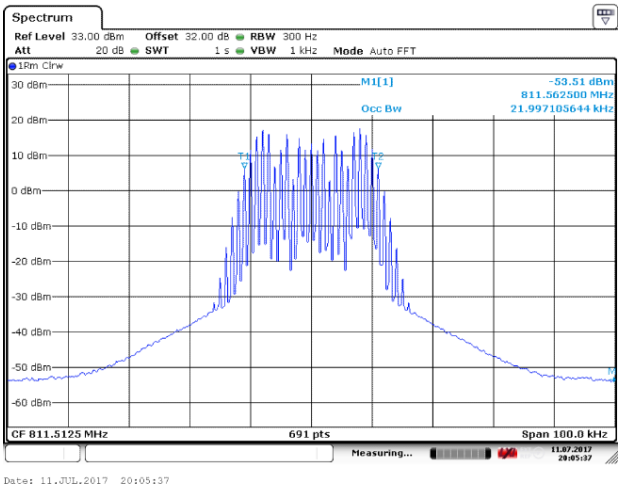
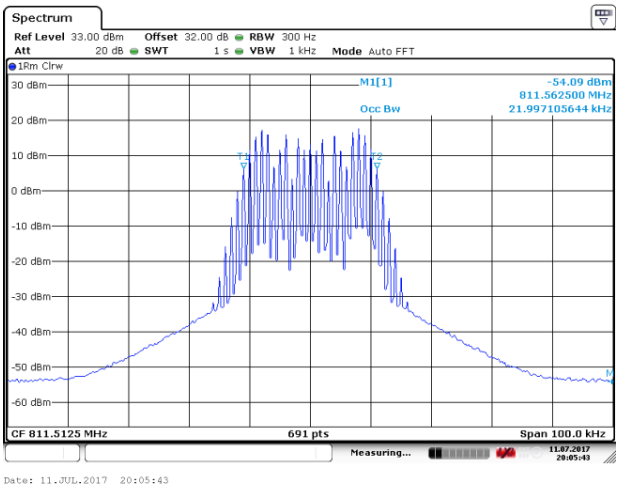
(2) Uplink



Mid Frequency: 811.5125MHz, Input occupied BW



Mid Frequency: 811.5125MHz, Output occupied BW(ALC)



Mid Frequency: 811.5125MHz, Output occupied BW(with the input signal amplitude set 3 dB above the ALC threshold)

6.3 Emission mask

Test Date (yy-mm-dd):	2017-05-16 to 2017-07-11
Test environment:	Normal
	Ambient Temp 24.1℃~26.1℃, Humid 46%~51%, Atmospheric Pressure 101kpa
Power supply:	AC 120V 50/60Hz
Test Method:	FCC part 2. 1047& FCC part 2. 1051 & KDB 935210 D05 Indus Booster Basic Meas v01r01
Test Requirement:	FCC part 90.210(b)

6.3.1 Limit

Except as indicated else where in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for device operating under this part.

This test was performed to measure Emission mask in table 3. Specification test limits are given in table 4, table 5, table 6 and table 7.

Table 3 Applicable Emission Masks

Frequency band (MHz)	Mask for device with audio low pass filter	Mask for device without audio low pass filter
806-809/851-854	B	H
809-817/854-862	B	G
All other bands	B	C

Table 4 Emission Masks limit(Emission mask B)

Frequency displacement from carrier(kHz)	Attenuation below carrier
C4FM Modulation: Channel bandwidth 12.5kHz, authorized bandwidth 8kHz with audio low pass filter	
0 ~4.0	0 dB
4.0 ~ 8.0	25.0 dB
8.0 ~ 20.0	35.0 dB
More than 20.0	43+10logP(W) dB

Tetra modulation: Channel bandwidth 25kHz, authorized bandwidth 20kHz with audio low pass filter	
0 ~10.0	0 dB
10.0 ~ 20.0	25.0 dB
20.0 ~ 50.0	35.0 dB
More than 50.0	43+10logP(W) dB
Analog FM(10kHz/1kHz) modulation: Channel bandwidth 25kHz, authorized bandwidth 23kHz with audio low pass filter	
0 ~11.5	0 dB
11.5 ~ 23.0	25.0 dB
23.0 ~ 57.5	35.0 dB
More than 57.5	43+10logP(W) dB
LTE modulation: Channel bandwidth 10MHz, authorized bandwidth 10MHz with audio low pass filter	
0 MHz ~5MHz	0
5MHz ~ 10MHz	25.0 dB
10MHz ~ 25MHz	35.0 dB
More than 25MHz	43+10logP(W) dB

Table 5 Emission Masks limit (Emission mask C, Only 700MHz Band)

Frequency displacement from carrier(kHz)	Attenuation below carrier
C4FM Modulation: Channel bandwidth 12.5kHz, authorized bandwidth 8kHz without audio low pass filter	
0 ~5.0	0
5.0 ~ 10.0	83*log (fd/5) dB
10.0 ~ 20.0	29*log (fd^2/11) dB
More than 20.0	43+10logP(W) dB
Note: fd mean to Frequency displacement from carrier.	

Table 6 Emission Masks limit (Emission mask H, Only 806~809MHz/851~854MHz)

Frequency displacement from carrier(kHz)	Attenuation below carrier(dB)
C4FM Modulation: Channel bandwidth 12.5kHz, authorized bandwidth 8kHz without audio low pass filter	
0 ~4.0	0 dB
4.0 ~ 8.5	107*og (f_d/4) dB
8.5 ~15.0	40.5*log (fd/1.16) dB
15.0 ~25.0	116*log (fd/6.1) dB
More than 25.0	43+10logP(W) dB
Note: fd mean to Frequency displacement from carrier.	

Table 7 Emission Masks limit (Emission mask G, Only 809~824MHz/854~869MHz)

Frequency displacement from carrier(kHz)	Attenuation below carrier(dB)
Analog FM(10kHz/1kHz) modulation: Channel bandwidth 25kHz, authorized bandwidth 23kHz without audio low pass filter	
0 ~10.0	0
10.0 ~ 50.0	50+10*log P(W) dB
More than 50.0	43+10logP(W) dB
Note: fd mean to Frequency displacement from carrier.	

Note : This device is a device with audio low pass filter.

(1) RF channels to be tested for single-carrier: B, M and T.

(2) Modulation types are C4FM, Tetra, Analog FM and LTE.

(3) Modulation envelope reference points are provided in terms of attenuation below the unmodulated carrier.

(4) Emission mask includes carrier modulation envelope within ±250% of the authorized bandwidth. The frequency range removed beyond ±250% of the authorized bandwidth from carrier was investigated as spurious emission.

6.3.2 Test configuration

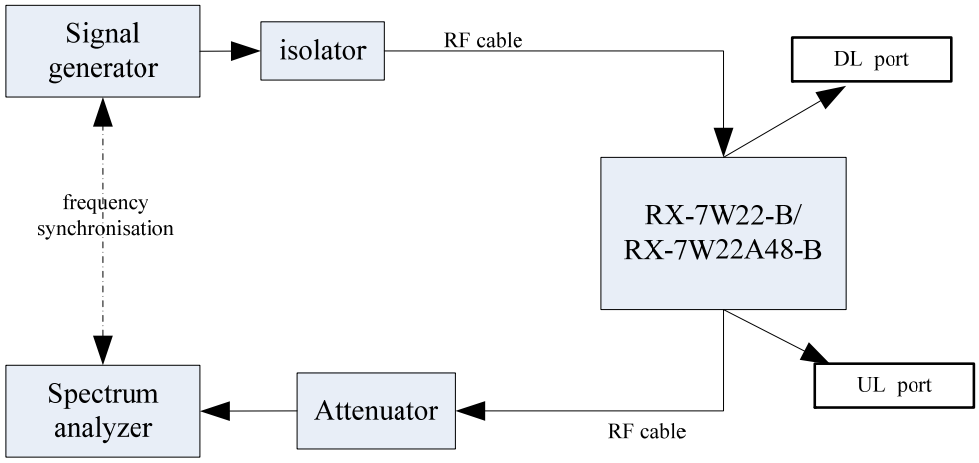


Figure 5: Emission mask arrangement for Downlink

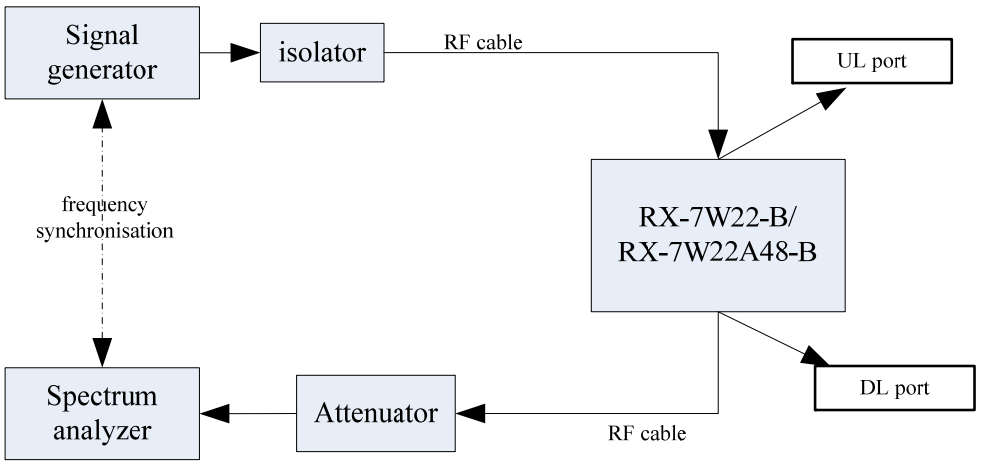


Figure 6: Emission mask arrangement for Uplink

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)

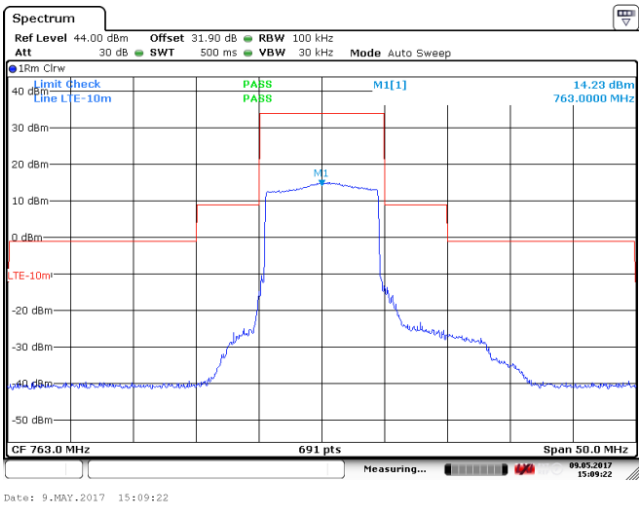
Resolution Bandwidth:	300 Hz
Video Bandwidth:	1 kHz
Detector mode:	Peak
Trace mode:	Average
Symbol Rate:	1ksps
Frequency Dev:	10kHz
Configuration:	Single Band
Operating frequency range:	Downlink: 851MHz~862MHz Uplink:806MHz~817MHz

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

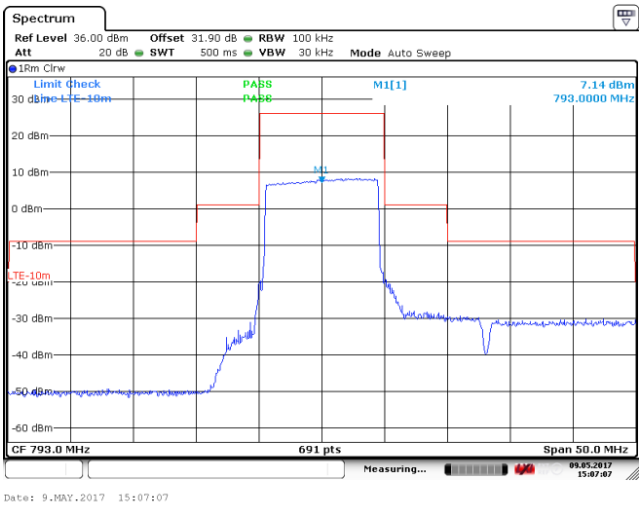
6.3.5 Test screenshot

6.3.5.1 700MHz Band

6.3.5.1.1 Modulation signal: LTE



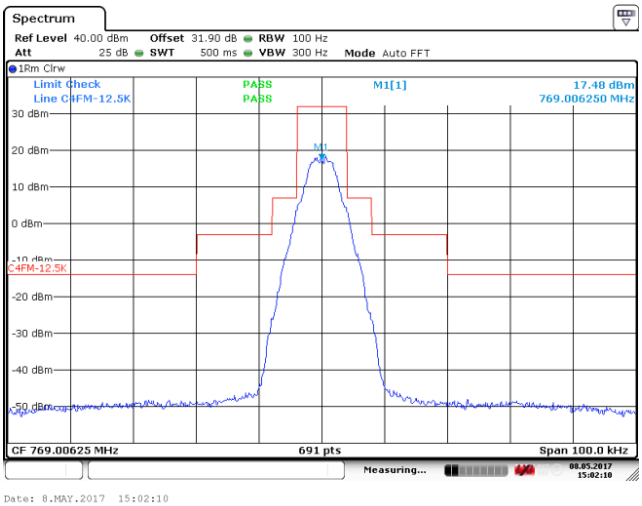
Downlink: 763.0MHz



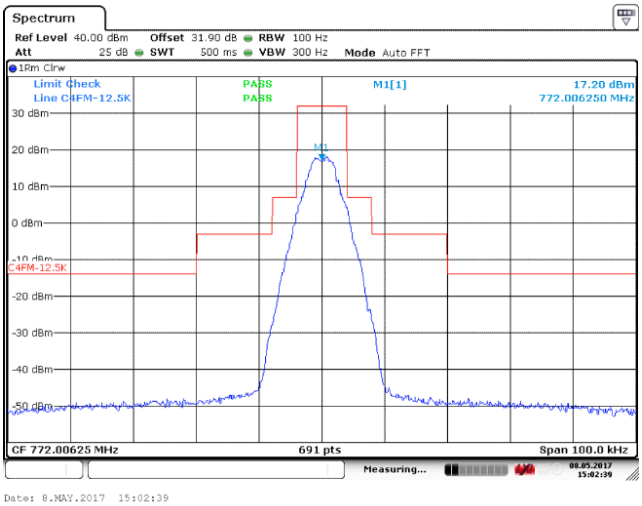
Uplink: 793.0MHz

6.3.5.1.2 Modulation signal: C4FM

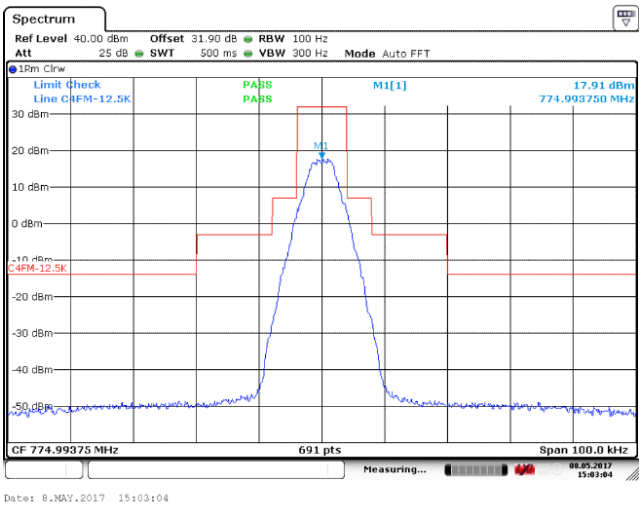
(1) Downlink



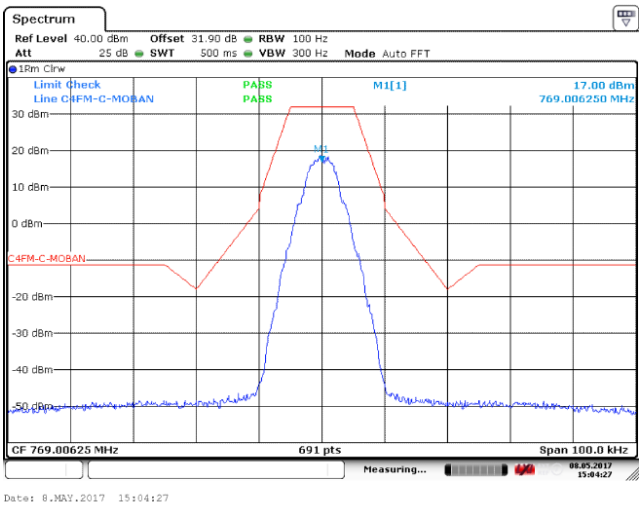
Low Frequency: 769.00625MHz (Mask B)



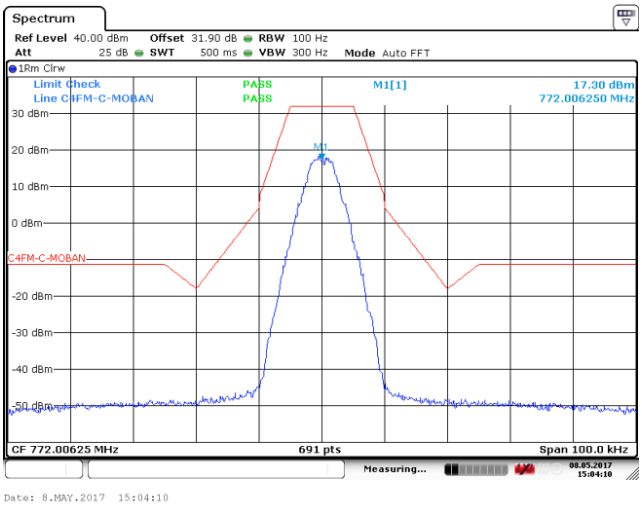
Mid Frequency: 772.00625MHz (Mask B)



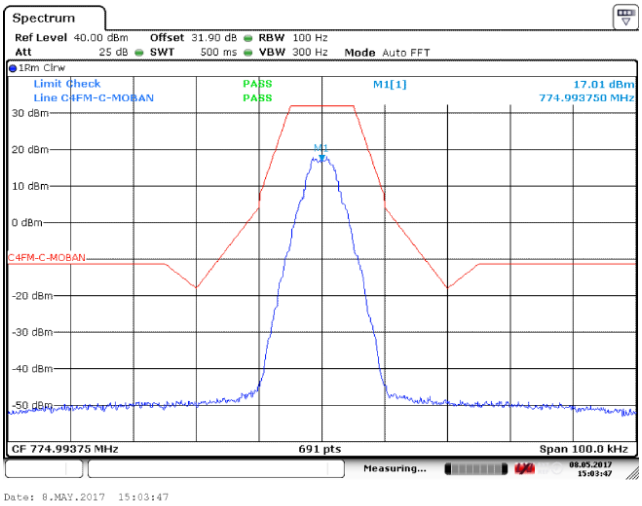
High Frequency: 774.99375MHz (Mask B)



Low Frequency: 769.00625MHz (Mask C)

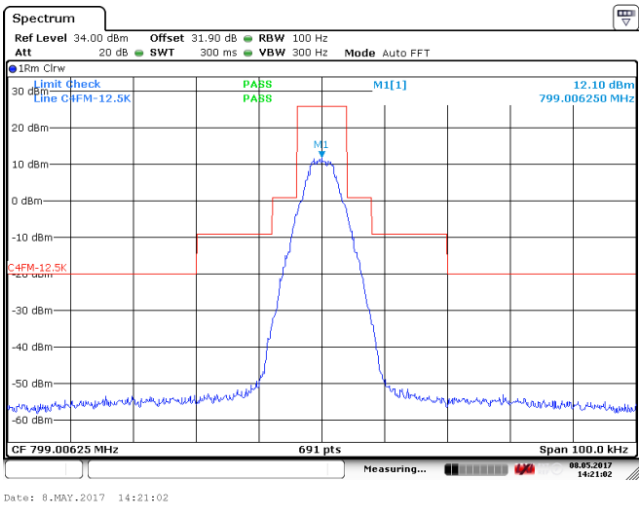


Mid Frequency: 772.00625MHz (Mask C)

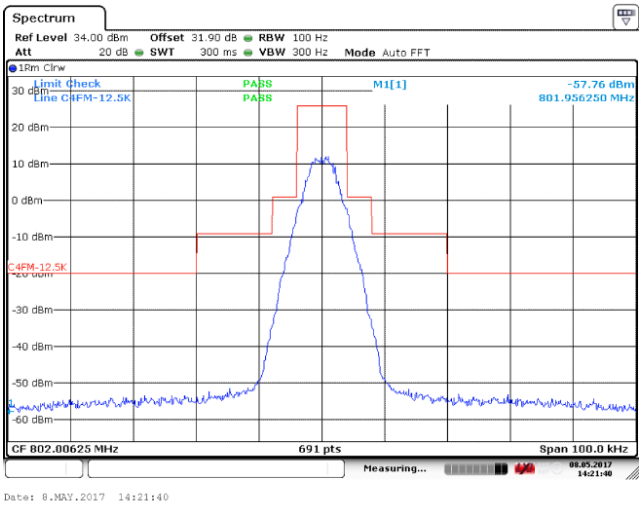


High Frequency: 774.99375MHz (Mask C)

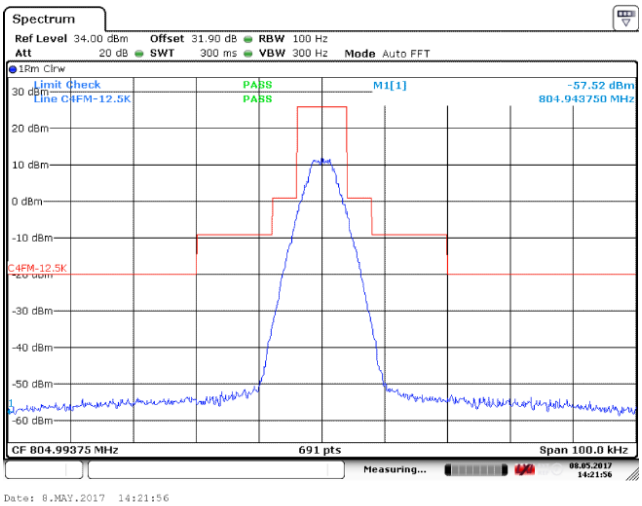
(2) Uplink



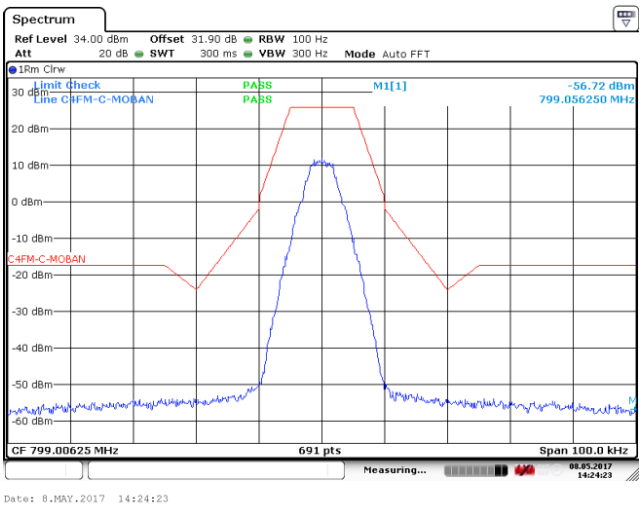
Low Frequency: 799.00625MHz (Mask B)



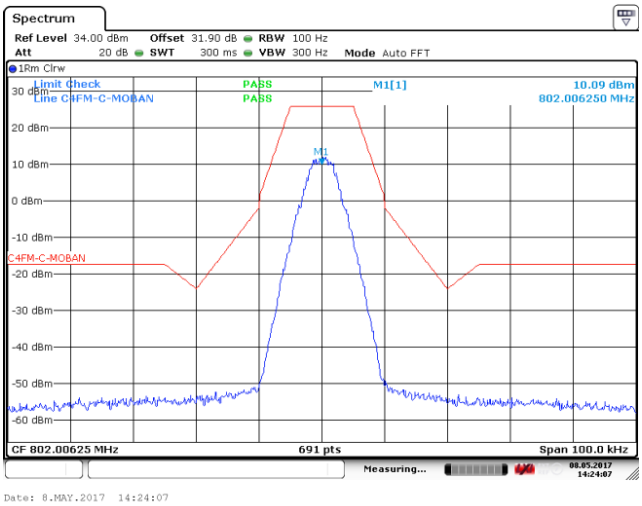
Mid Frequency: 802.00625MHz (Mask B)



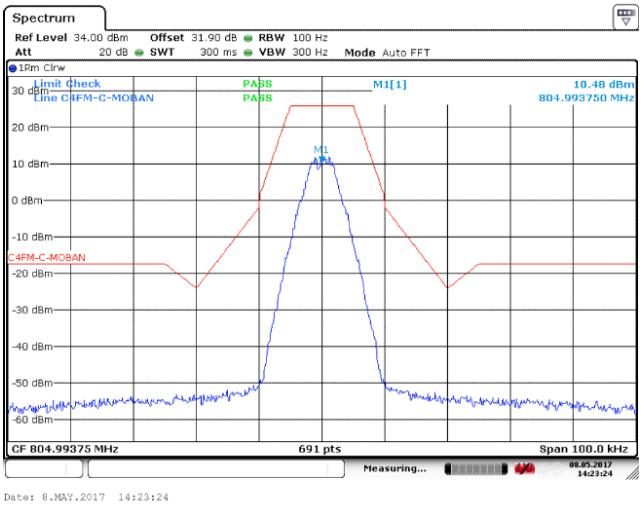
High Frequency: 804.99375MHz (Mask B)



Low Frequency: 799.00625MHz (Mask C)



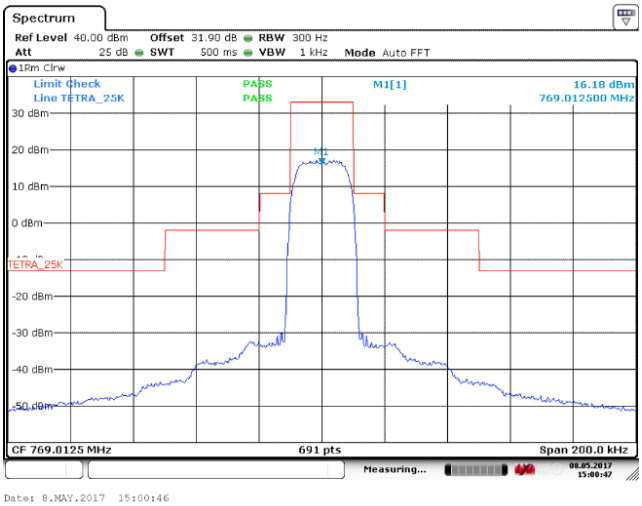
Mid Frequency: 802.00625MHz (Mask C)



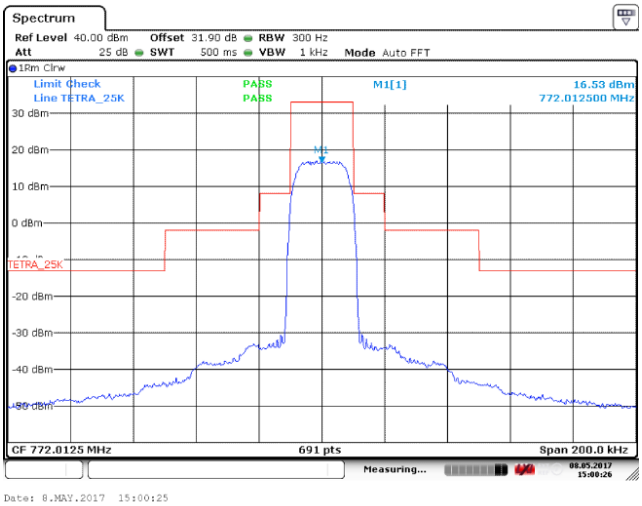
High Frequency: 804.99375MHz (Mask C)

6.3.5.1.3 Modulation signal: Tetra

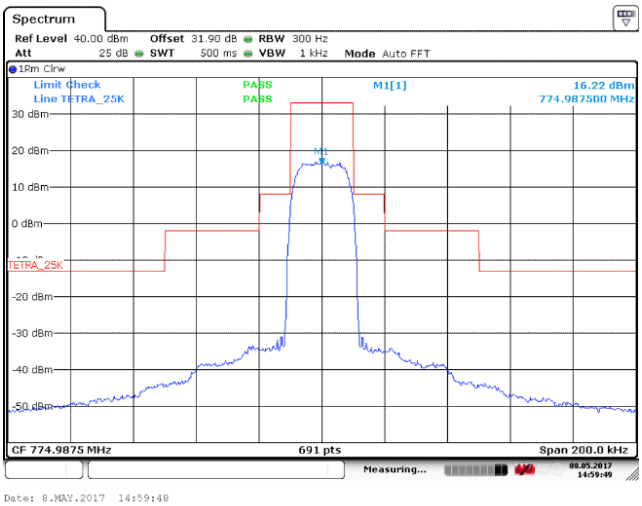
(1) Downlink



Low Frequency: 769.0125MHz (Mask B)

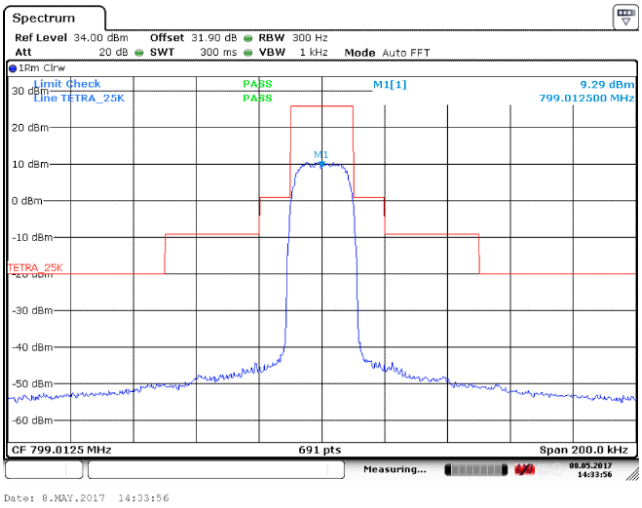


Mid Frequency: 772.0125MHz(Mask B)

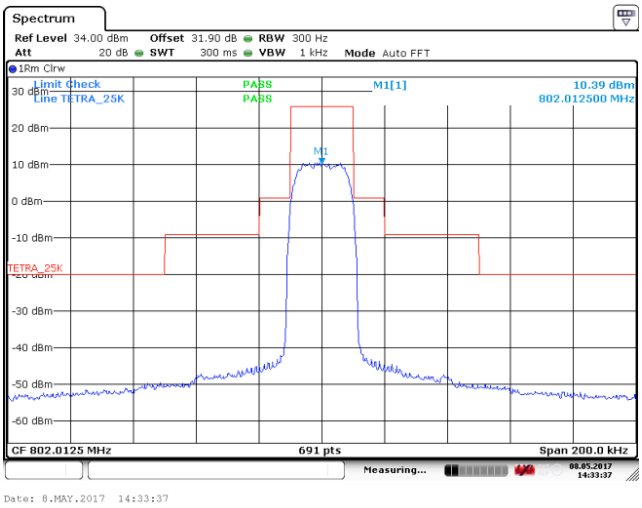


High Frequency: 774.9875MHz(Mask B)

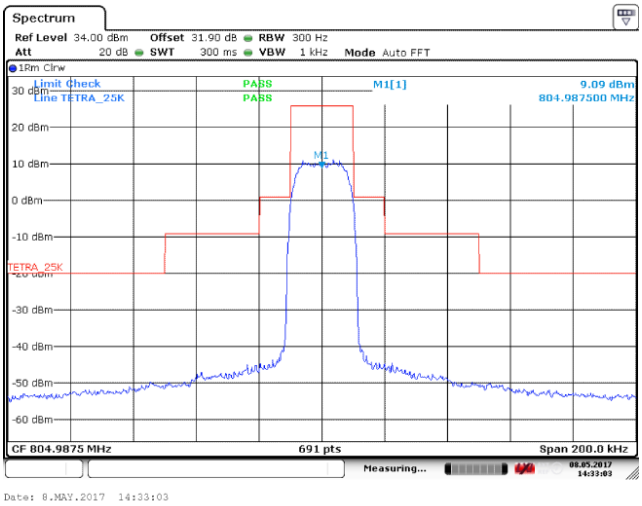
(2) Uplink



Low Frequency: 799.0125MHz(Mask B)



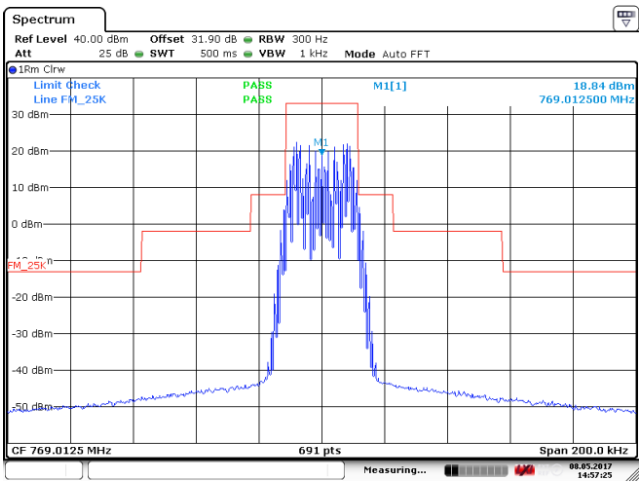
Mid Frequency: 802.0125MHz(Mask B)



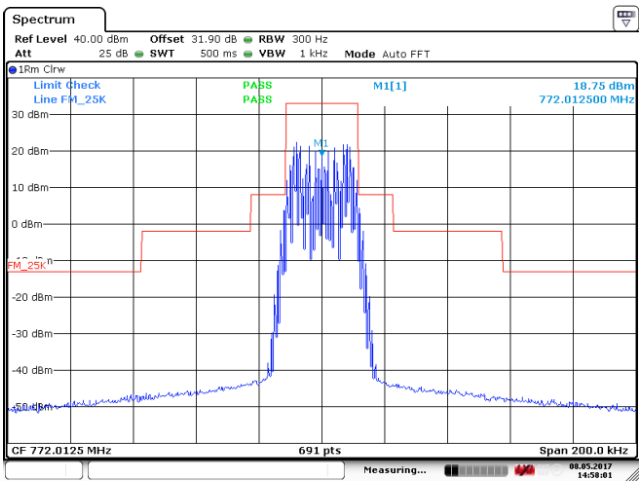
High Frequency: 804.9875MHz(Mask B)

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

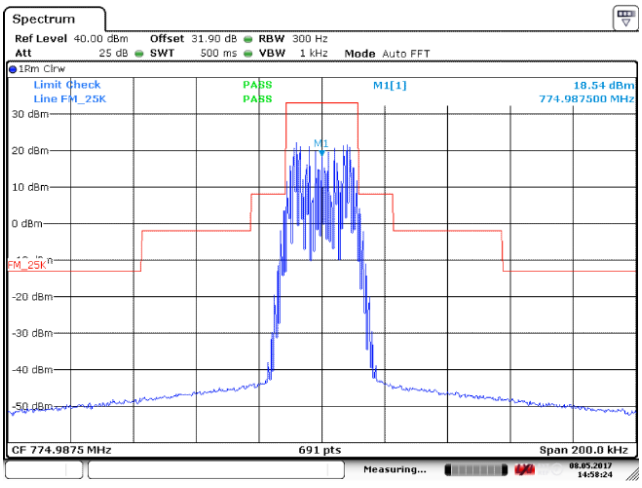
(1) Downlink



Low Frequency: 769.0125MHz(Mask B)

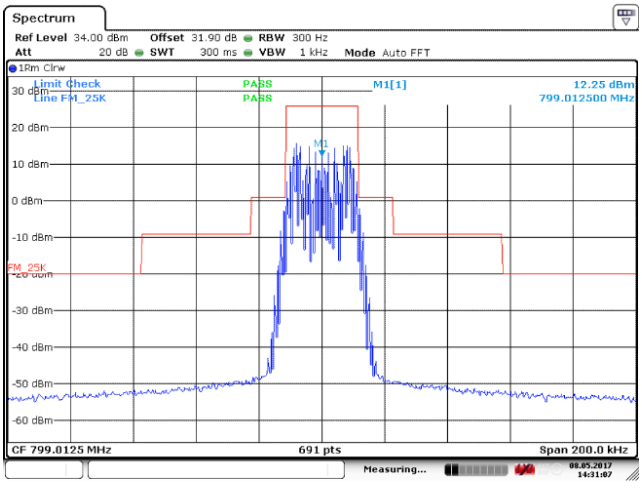


Mid Frequency: 772.0125MHz(Mask B)

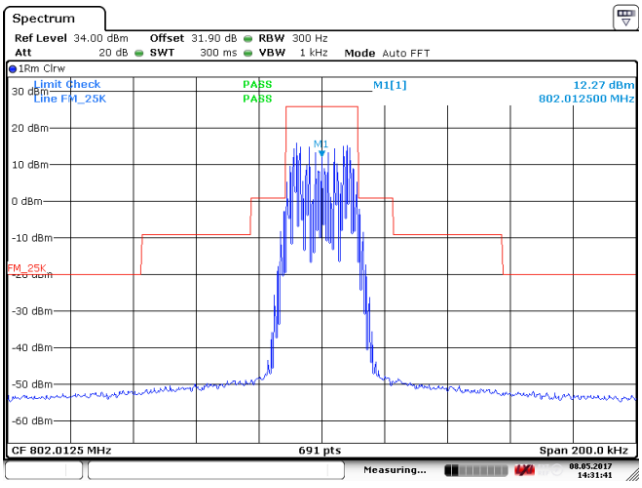


High Frequency: 774.9875MHz(Mask B)

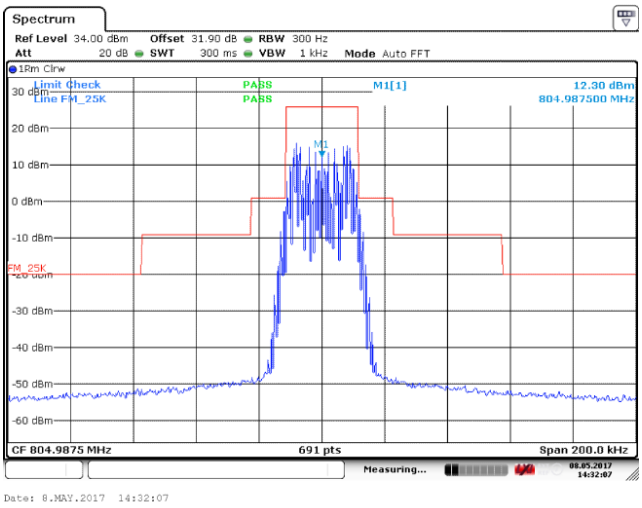
(2) Uplink



Low Frequency: 799.0125MHz(Mask B)



Mid Frequency: 802.0125MHz(Mask B)

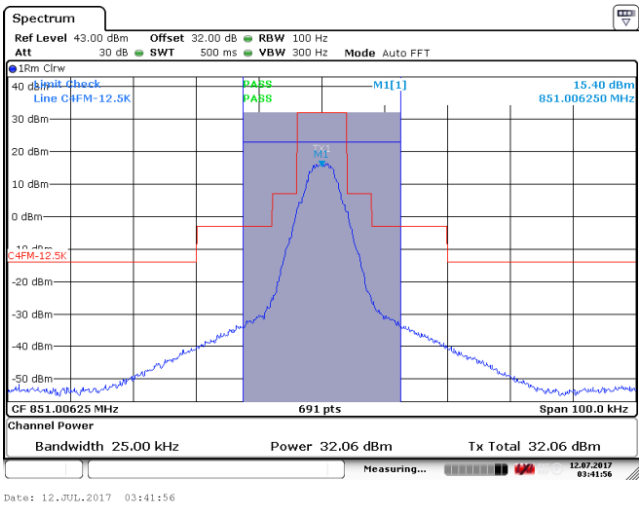


High Frequency: 804.9875MHz(Mask B)

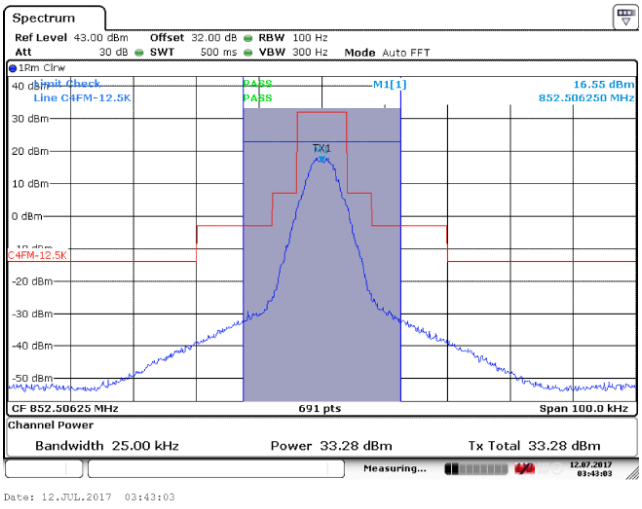
6.3.5.2 800MHz Band

6.3.5.2.1 Modulation signal: C4FM

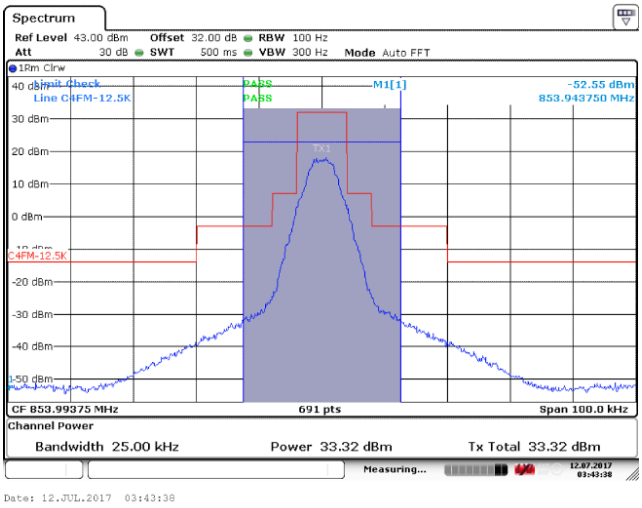
(1) Downlink



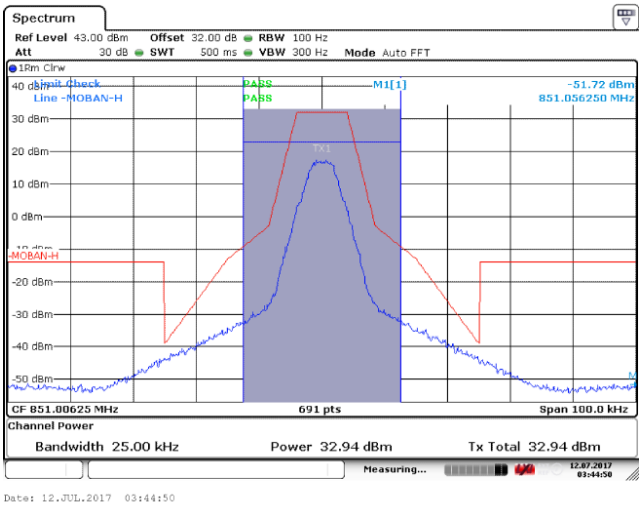
Low Frequency: 851.00625MHz (Mask B)



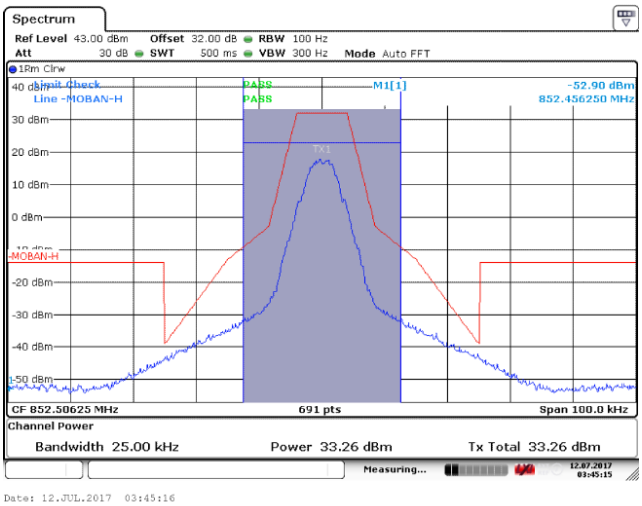
Mid Frequency: 852.50625MHz(Mask B)



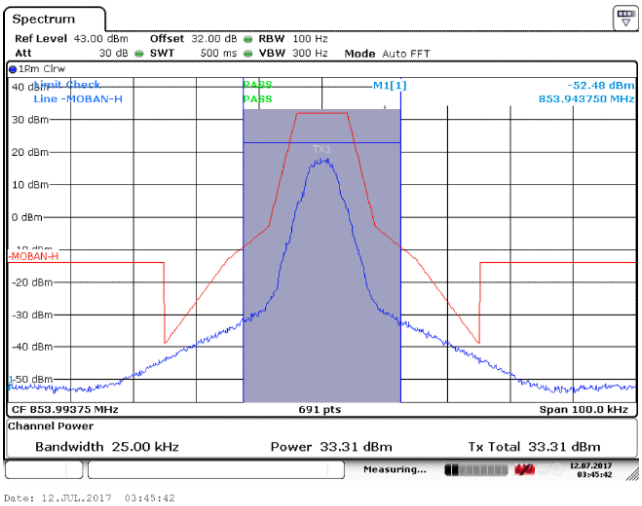
High Frequency: 853.99375MHz(Mask B)



Low Frequency: 851.00625MHz (Mask H)

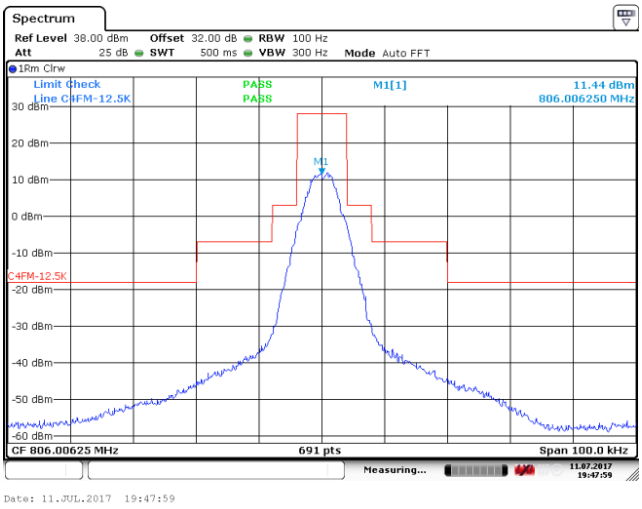


Mid Frequency: 852.50625MHz (Mask H)

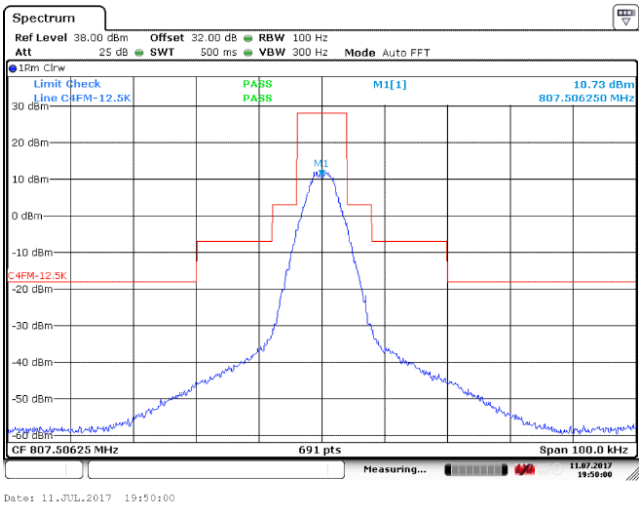


High Frequency: 853.99375MHz (Mask H)

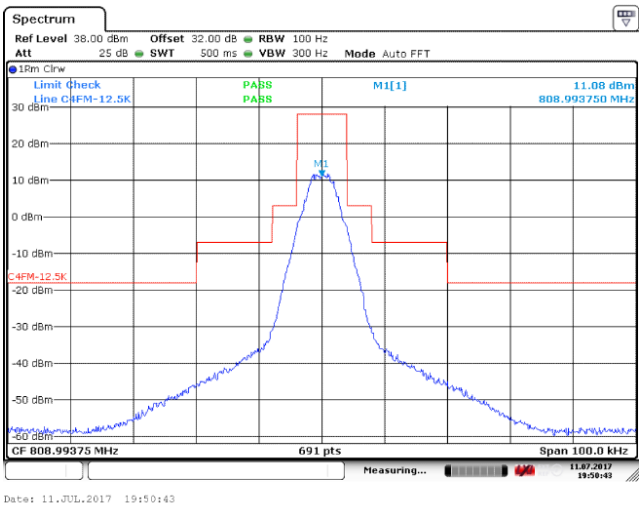
(2) Uplink



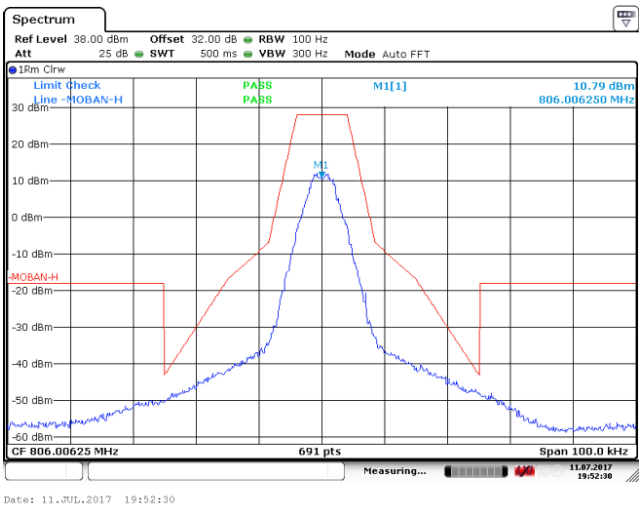
Low Frequency: 806.00625MHz(Mask B)



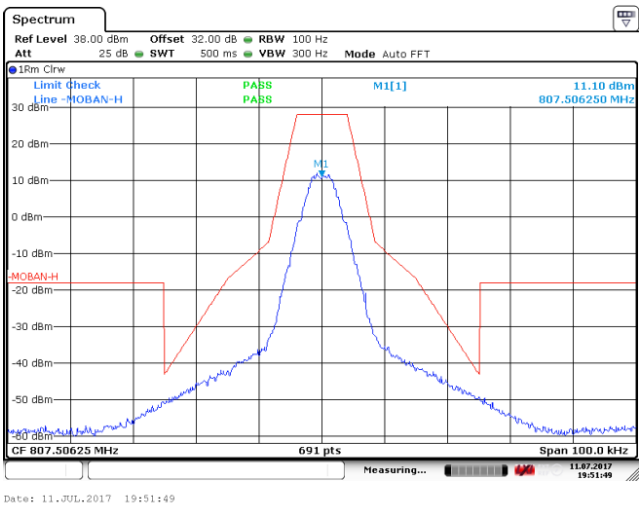
Mid Frequency: 807.50625MHz(Mask B)



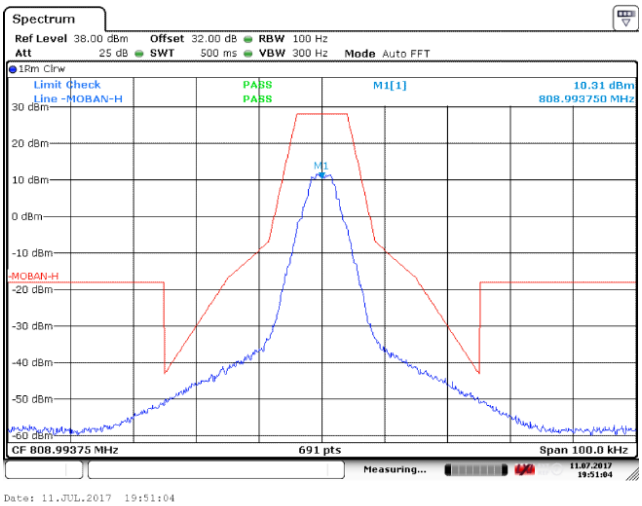
High Frequency: 808.99375MHz(Mask B)



Low Frequency: 806.00625MHz (Mask H)



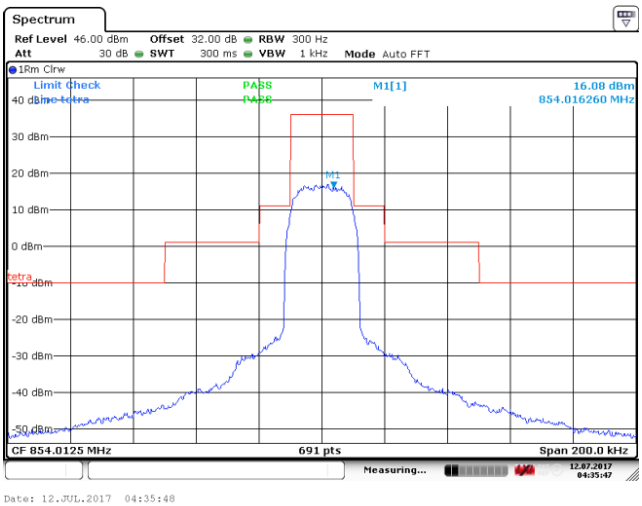
Mid Frequency: 807.50625MHz (Mask H)



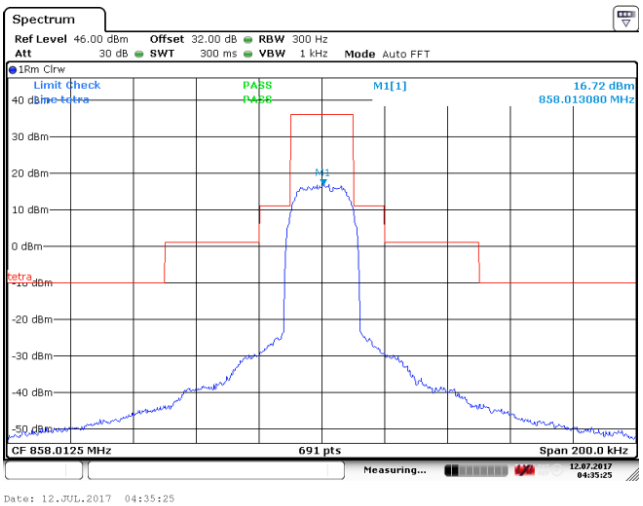
High Frequency: 808.99375MHz (Mask H)

6.3.5.2.2 Modulation signal: Tetra

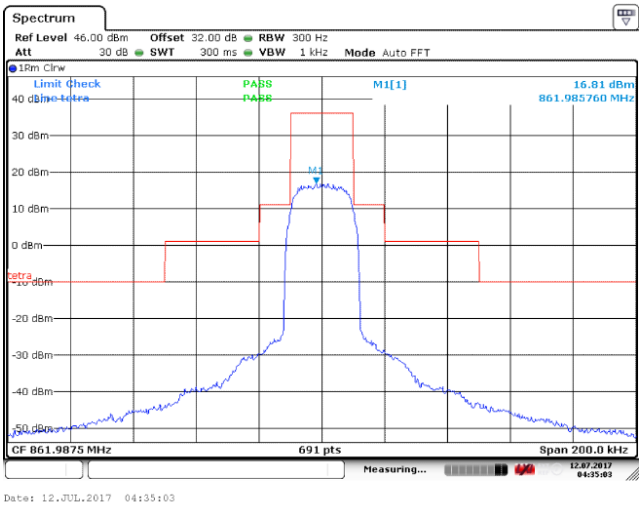
(1) Downlink



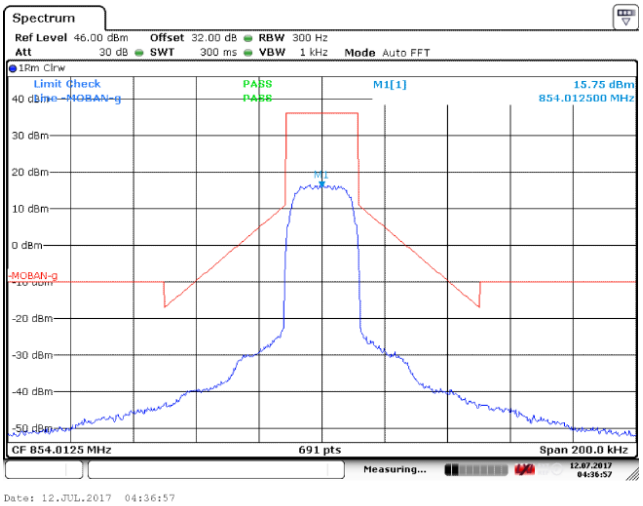
Low Frequency: 854.0125MHz (Mask B)



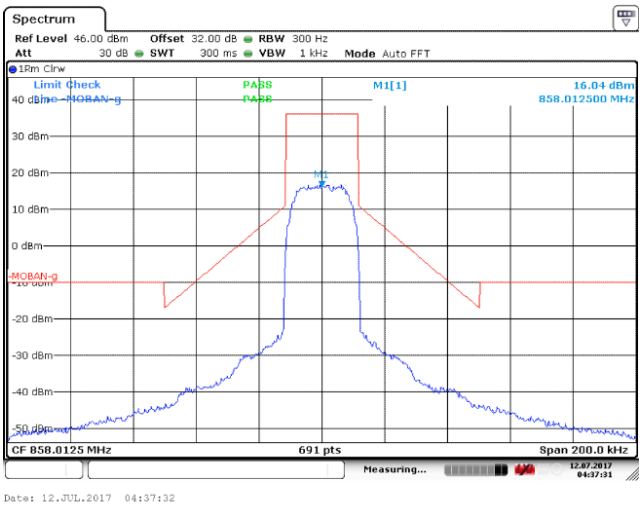
Mid Frequency: 858.0125MHz (Mask B)



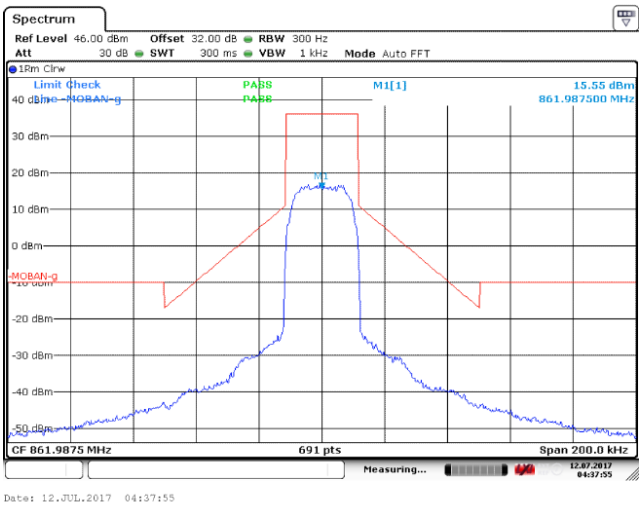
High Frequency: 861.9875MHz (Mask B)



Low Frequency: 854.0125MHz (Mask G)

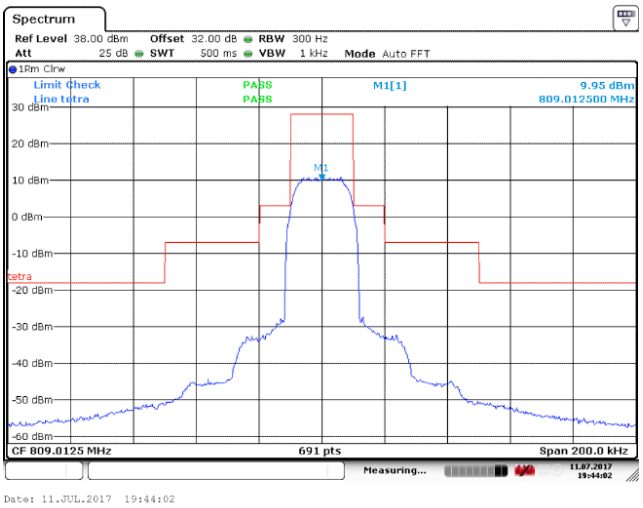


Mid Frequency: 858.0125MHz (Mask G)

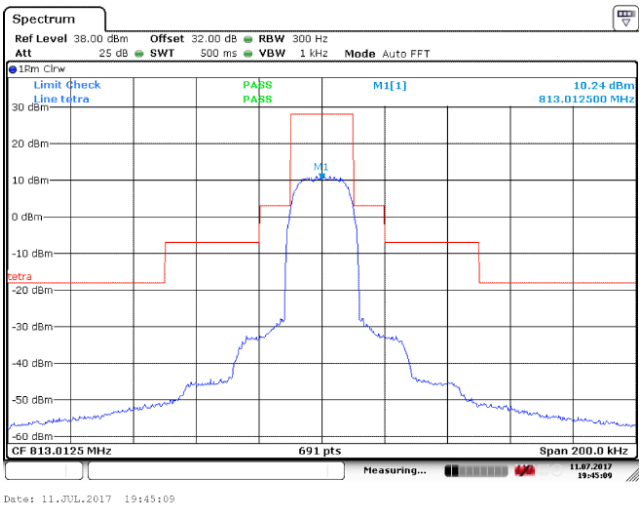


High Frequency: 861.9875MHz (Mask G)

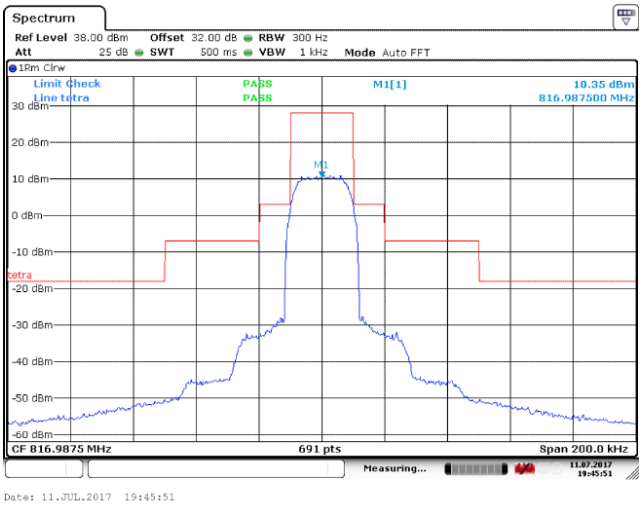
(2) Uplink



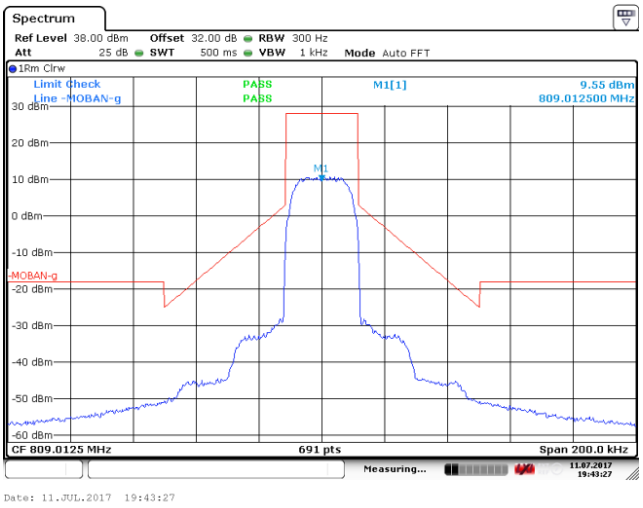
Low Frequency: 809.0125MHz (Mask B)



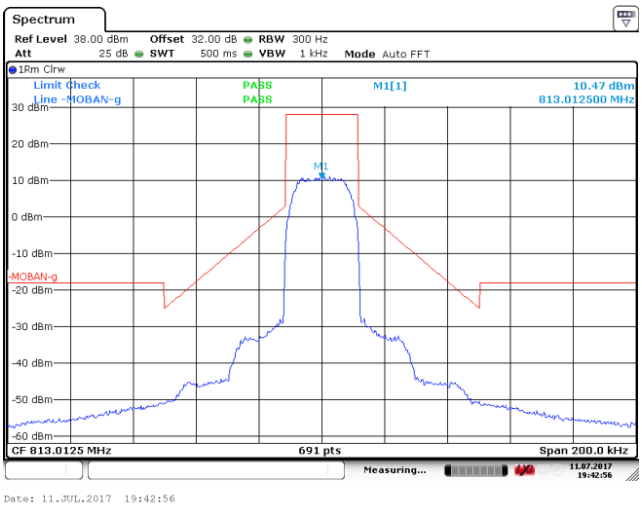
Mid Frequency: 813.0125MHz (Mask B)



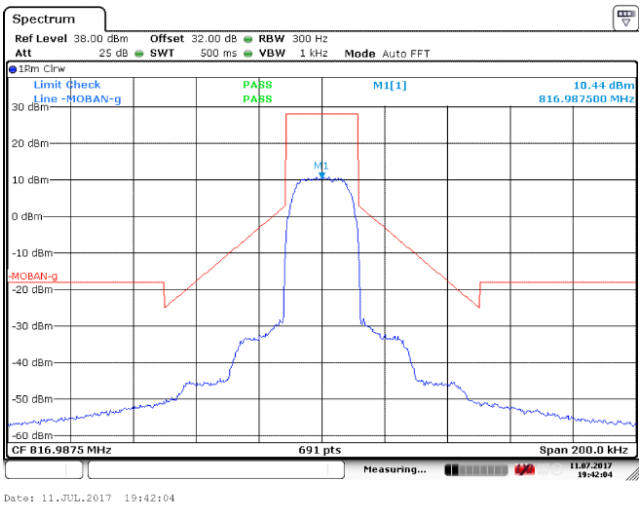
High Frequency: 817.9875MHz (Mask B)



Low Frequency: 809.0125MHz (Mask G)



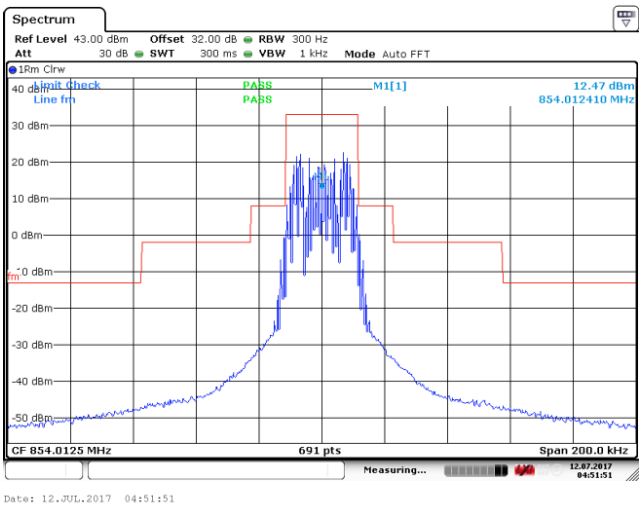
Mid Frequency: 813.0125MHz (Mask G)



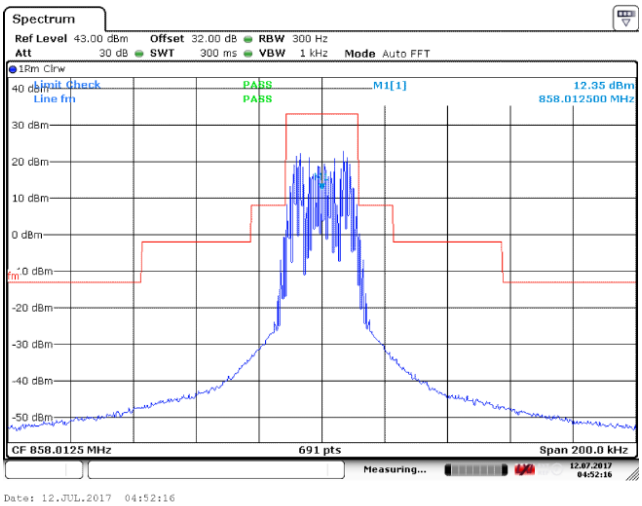
High Frequency: 817.9875MHz (Mask G)

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

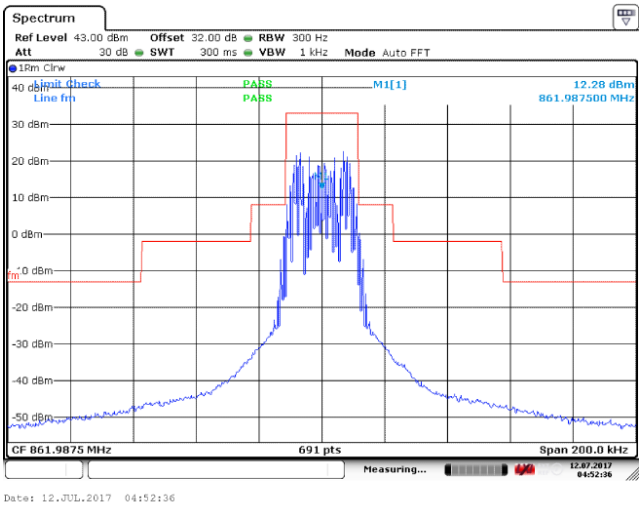
(1) Downlink



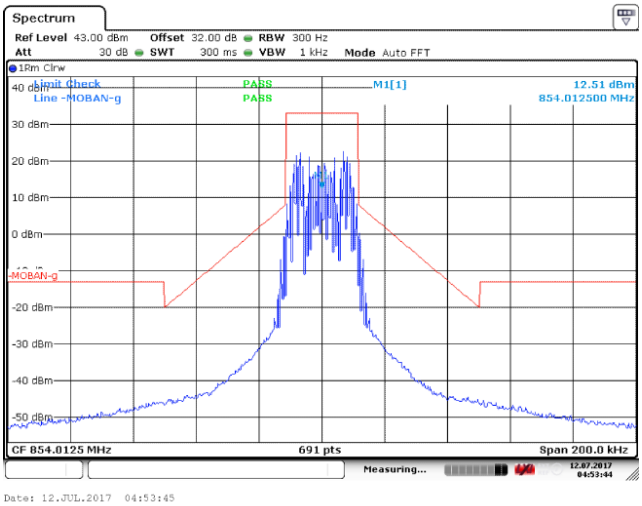
Low Frequency: 854.0125MHz (Mask B)



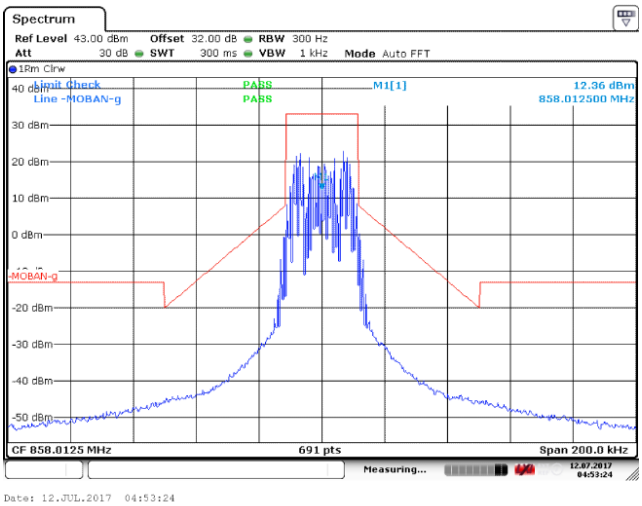
Mid Frequency: 858.0125MHz (Mask B)



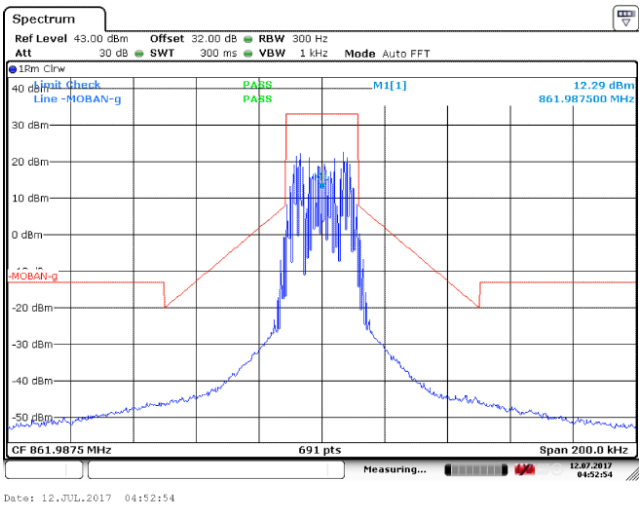
High Frequency: 861.9875MHz (Mask B)



Low Frequency: 854.0125MHz (Mask G)

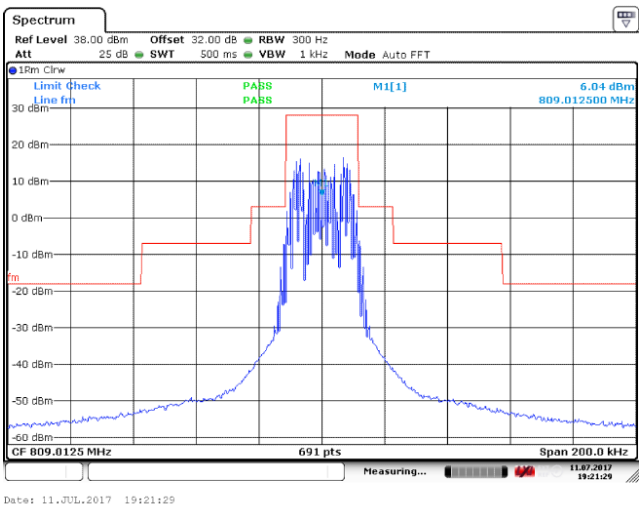


Mid Frequency: 858.0125MHz (Mask G)

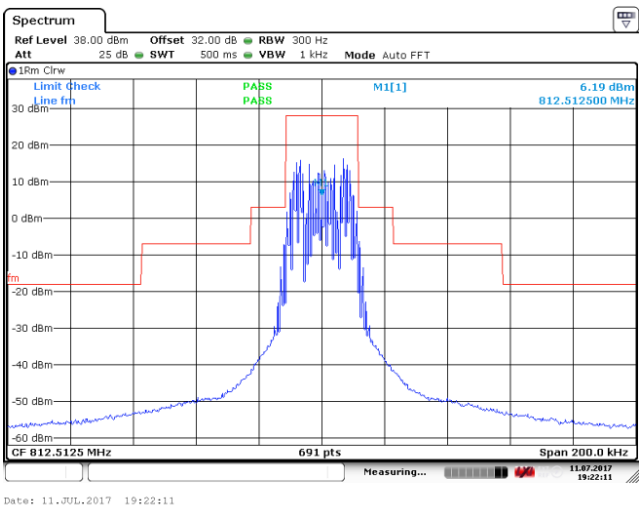


High Frequency: 861.9875MHz (Mask G)

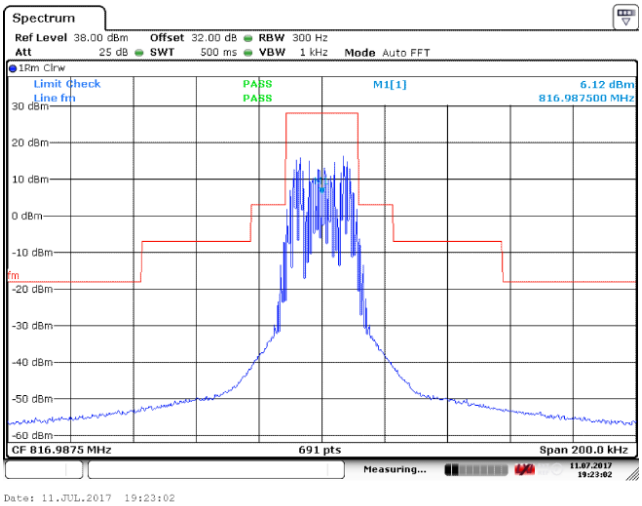
(2) Uplink



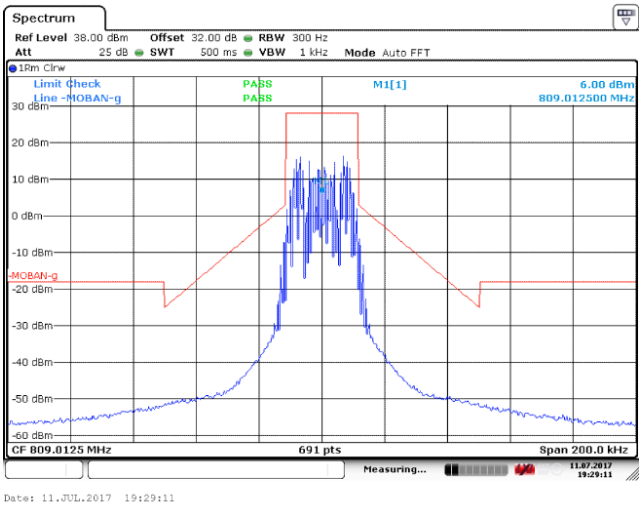
Low Frequency: 809.0125MHz (Mask B)



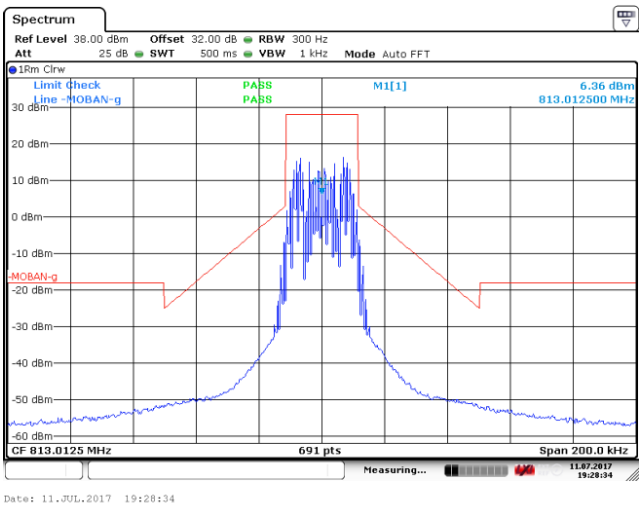
Mid Frequency: 813.0125MHz (Mask B)



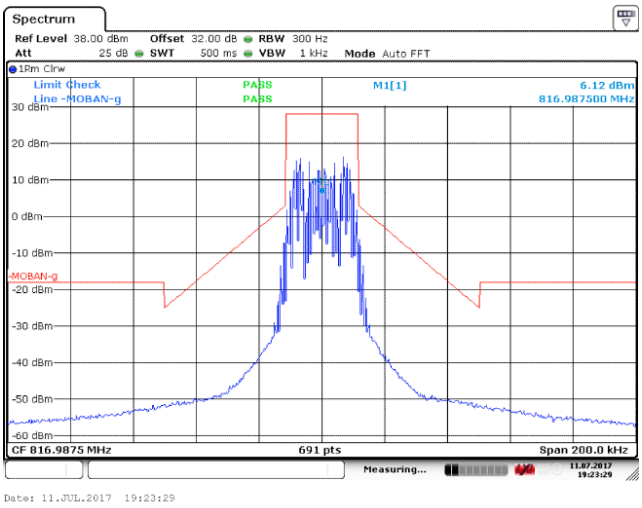
High Frequency: 816.9875MHz (Mask B)



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℃~26.1℃, 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

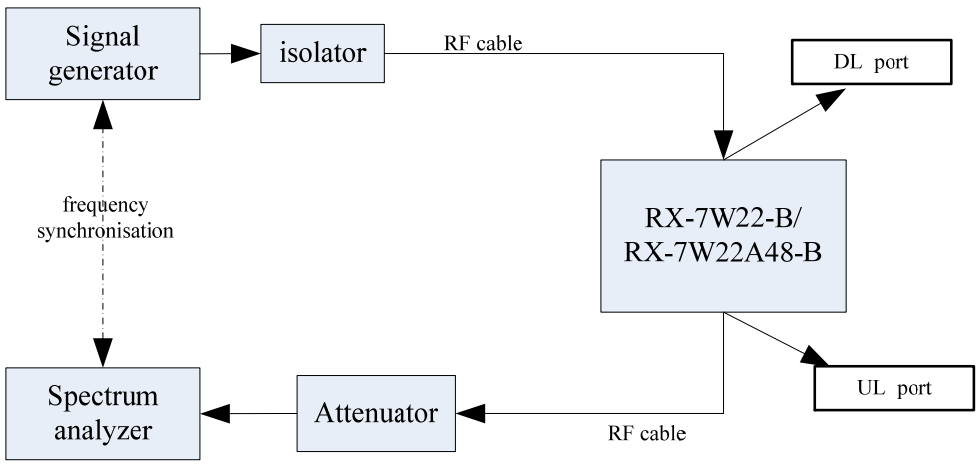


Figure 7: Conducted spurious emissions arrangement for Downlink

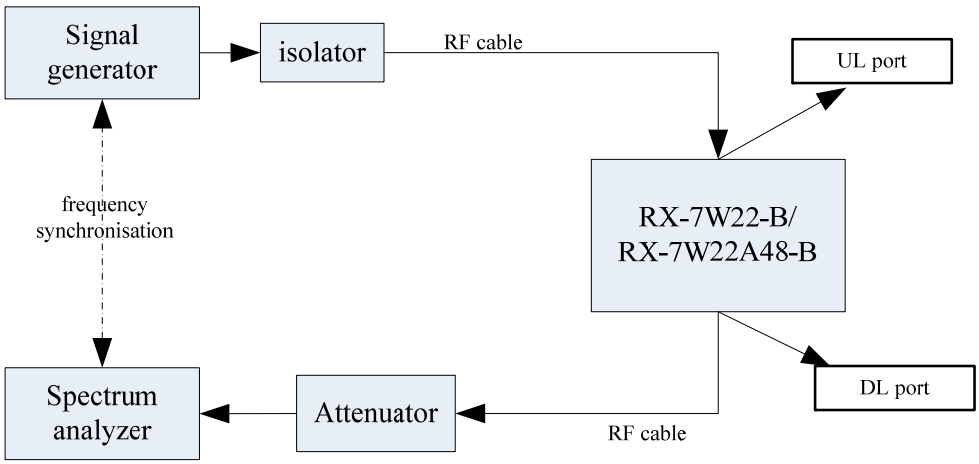


Figure 8: Conducted spurious emissions arrangement for Uplink

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 × 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.						