

# - High Channel:

Spectrum											
Ref Level Att	35.00 dB 30 d		7.14 dB   RBW 5 kHz 30 ms   VBW 20 kHz								
1Pk View	50 0	U UNI		Mode Sweet	, ,						
30 dBm							D3[1 Occ I M1[1	3w			0.17 dB 311.4380 kHz 198.960000000 kHz 14.02 dBm 1.9147933270 GHz
20 dBm						<u> </u>				1	1.9147933270 GHz
10 dBm			- m	Sum	M1	~~~	m	www.	my		
0 dBm			me						T2		
-10 dBm		M2 1 - 1.980 dBm	m						2	mon	44
-20 dBm-											Murant
-30 dBm	_										
-40 dBm											
-50 dBm											
-60 dBm					_						
CF 1.9148	GHz				3000	0 pts					Span 400.0 kHz
Marker		1			WALLST CONTRACTOR						
Type M1	Ref	Trc 1	X-value	793327 GHz	Y-value 14.02	dDm	Functio	n		Function Result	
T1		1		793327 GHz 702207 GHz	-1.89			Occ Bw			198.96 kHz
T2		1		901167 GHz	-0.66						
M2		1		551739 GHz	-12.22						
D3	Ma	2 1	3	11.438 kHz	0.1	7 dB					
	M									Measuring	4,40



# Spurious Emissions at Antenna Terminals

### Limits

FCC §2.1051 and §24.238. RSS-133, Clause 6.5.

The power of emissions shall be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P) dB$ . P in watts.

Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater.

At Po transmitting power, the specified minimum attenuation becomes 43+10 log (Po), and the level in dBm relative to Po becomes:

Po (dBm) – [43 + 10 log (Po in mW) - 30] = -13 dBm

### Method

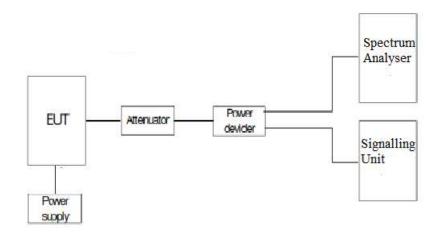
The EUT RF output connector was connected to a spectrum analyser and to the Universal Radio Communication tester R&S CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using a 50-Ohm attenuator and a power divider.

The spectrum was investigated from 9 kHz to 20 GHz.

The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

The configuration of tones and modulation which is the worst case for conducted power was used.

### Test setup





## Results

## NBIoT Band 25:

Preliminary measurements determined  $\pi/4$  - QPSK modulation, 3 tones 15 kHz, Offset Tone = 6, as the worst case. The next results are for this worst-case configuration.

Low Channel: No spurious signals found at less than 20dB below the limit.
Middle Channel: No spurious signals found at less than 20dB below the limit.
High Channel: No spurious signals found at less than 20dB below the limit.

# Verdict

Pass



### Attachments

The peak above the limit on all plots below is the carrier frequency.

## NBIOT Band 25.

 $\pi/4$  - QPSK modulation. 3 tones 15 kHz, Offset Tone = 6.

### - Low Channel:

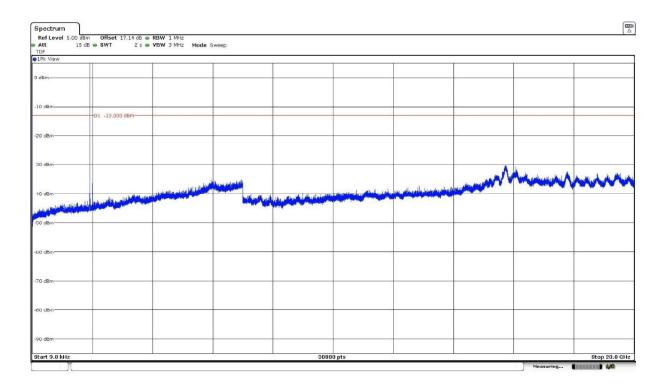
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Pk View									
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art 9.0 kHz				3000	- 100 <b>-</b> 100				Stop 20.0 C



### - Middle Channel:

Spectrum									
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1Pk View									
0 dBm							-		
10 dBm									
	D1 -13.000 dBm								-
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-00 dBm									
70 dBm-									
-80 dBm									
90 dBm									
Start 9.0 kHz				3000	0 mtr				Stop 20.0 GH
start 9.0 KHZ									

# - High Channel:





# Spurious Emissions at Antenna Terminals at Block Edges

#### Limits

FCC §2.1051 and §24.238. RSS-133, Clause 6.5.

The power of emissions shall be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P) dB$ . P in watts.

Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater.

At Po transmitting power, the specified minimum attenuation becomes 43+10 log (Po), and the level in dBm relative to Po becomes:

Po (dBm) – [43 + 10 log (Po in mW) - 30] = -13 dBm

### Method

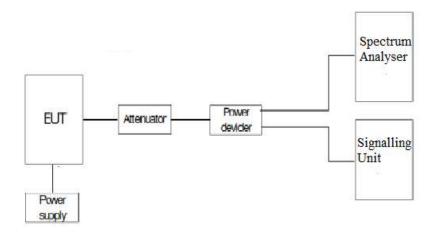
The EUT RF output connector was connected to a spectrum analyser and to the Universal Radio Communication tester R&S CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using a 50-Ohm attenuator and a power splitter.

The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

The configuration of modulation which is the worst case for conducted power was used. Lowest and highest channels were tested to show compliance with low and high block edges respectively.

As stated in FCC part 24.238 / RSS-133 Clause 6.5, in the 1 MHz bands immediately outside and adjacent to the frequency block or band a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

### Test setup





### Results

## NBIoT Band 25:

A preliminary measurement determined  $\pi/4$  - QPSK modulation as the worst case for 1 tone of 3.75 kHz. A preliminary measurement determined  $\pi/4$  - QPSK modulation as the worst case for 1 tone of 15 kHz. The next results are for these worst-case modulations.

NBIoT configuration	Maximum measured level at lowest Block Edge at antenna port (dBm)
1 Tone 3.75 kHz, Offset Tone = 0 $\pi/4$ - QPSK	-28.19
1 Tone 15 kHz, Offset Tone = 0 π/4 - QPSK	-29.09
12 Tones 15kHz, Offset Tone = 0 π/4 - QPSK	-27.21

NBIoT configuration	Maximum measured level at highest Block Edge at antenna port (dBm)
1 Tone 3.75 kHz, Offset Tone = 47 π/4 - QPSK	-28.88
1 Tone 15 kHz, Offset Tone = 11 π/4 - QPSK	-28.40
12 Tones 15kHz, Offset Tone = 0 π/4 - QPSK	-24.17

# Verdict

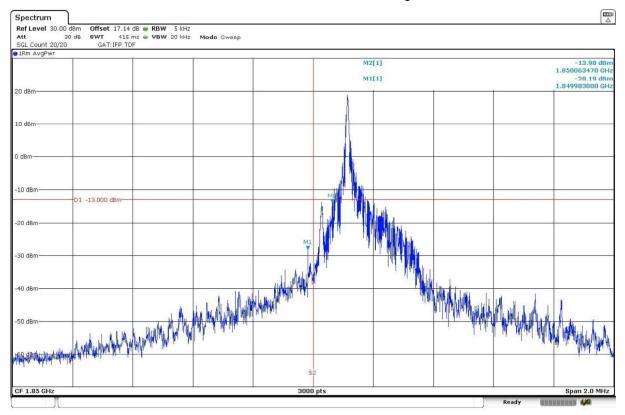
Pass



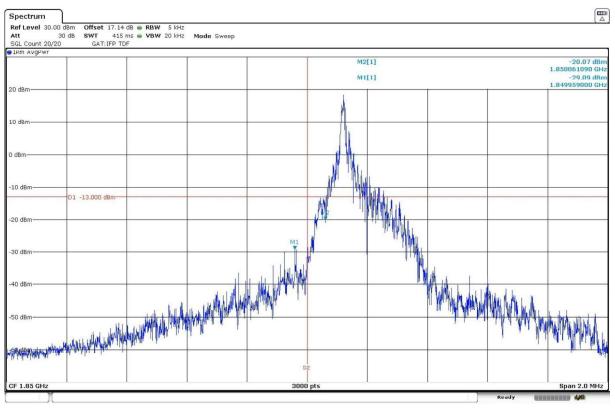
## Attachments

## NBIoT Band 25.

1 Tone 3.75 kHz, Offset Tone = 0.  $\pi/4$  - QPSK modulation. Low Block Edge:

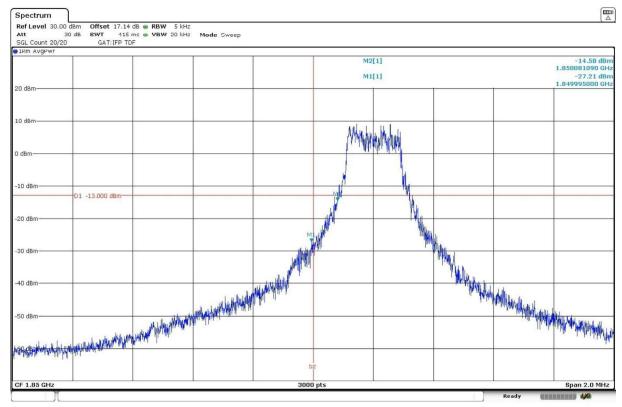


1 Tone 15 kHz, Offset Tone = 0.  $\pi/4$  – QPSK modulation. Low Block Edge:

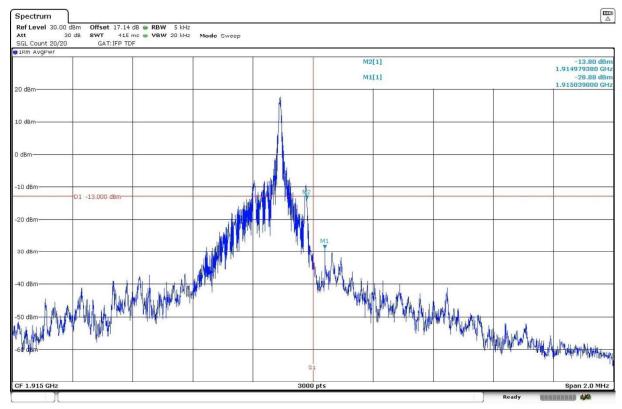




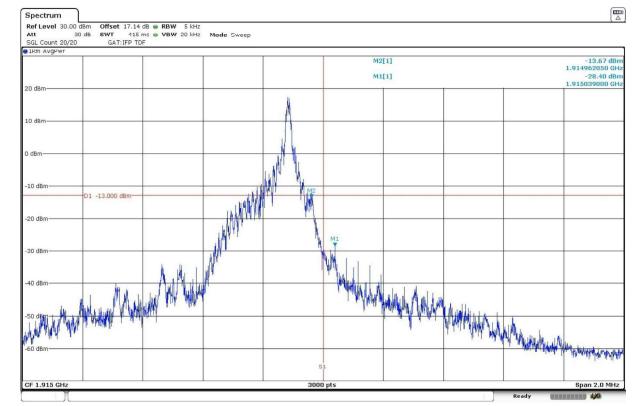
## 12 Tones 15 kHz, Offset Tone = 0. $\pi/4$ - QPSK modulation. Low Block Edge:



1 Tone 3.75 kHz, Offset Tone = 47.  $\pi/4$  - QPSK modulation. High Block Edge:







## 1 Tone 15 kHz, Offset Tone = 11. $\pi/4$ - QPSK modulation. High Block Edge:

12 Tones 15 kHz, Offset Tone = 0.  $\pi/4$  - QPSK modulation. High Block Edge:

