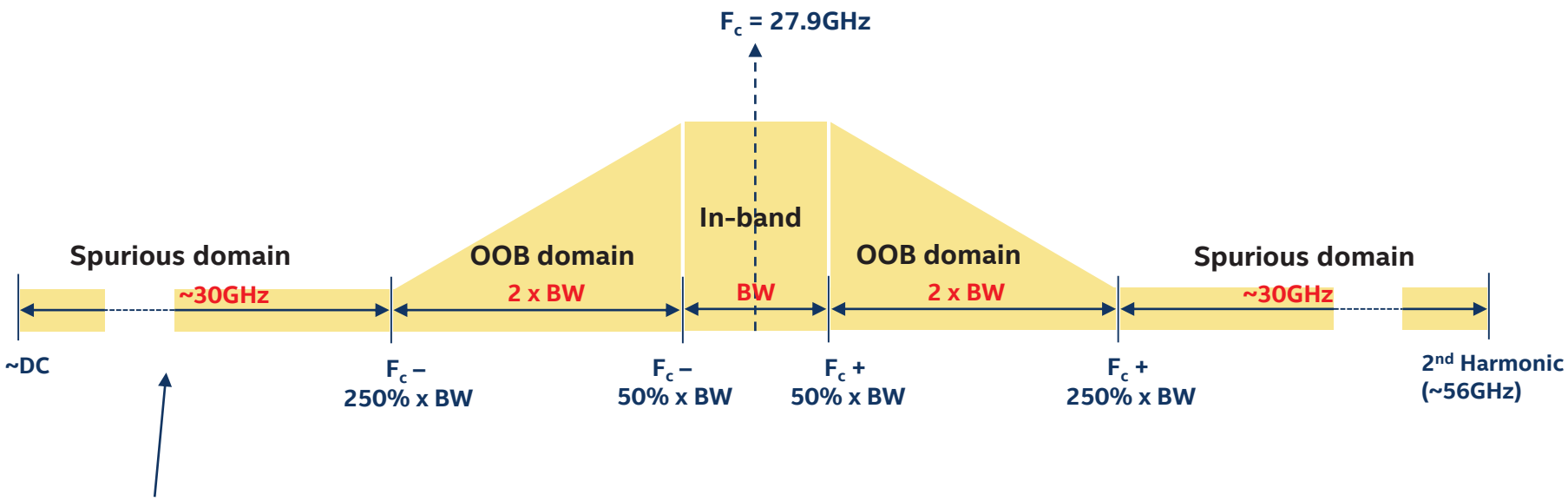
5G NOI Technical Rules Device Capabilities

5 August 2015

Definitions – ITU-R Terminology

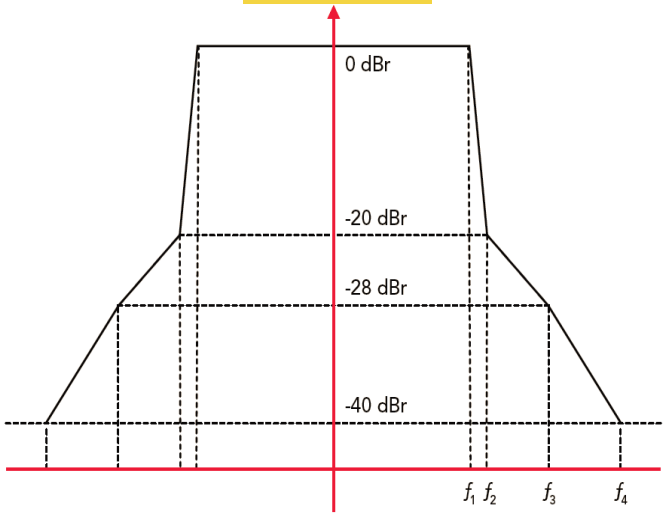


Knowledge of bands with restricted emissions (e.g. 31.5-31.8 GHz) is essential

Existing WiFi/WiGig Masks

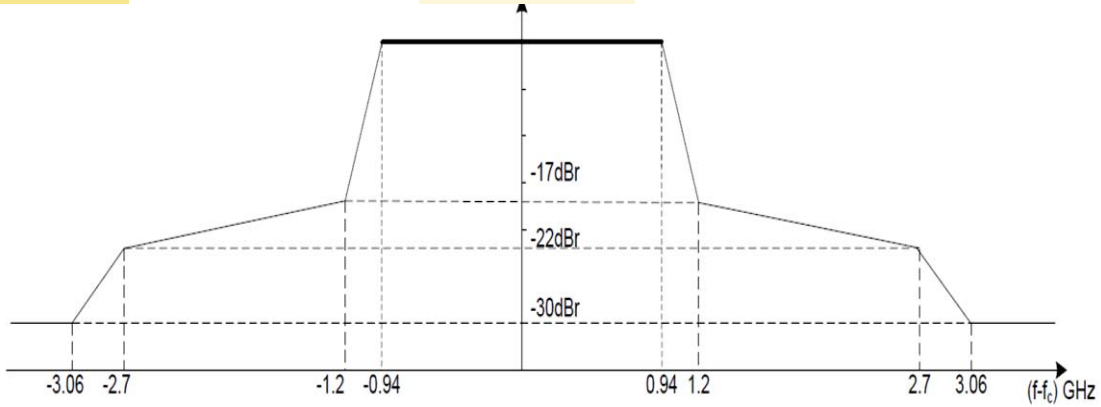
WiFi 802.11ac < 5G 28 GHz < WiGig 802.11ad

160 MHz



800 MHz

1800 MHz



Channel Size	f_1	f_2	f_3	f_4
20 MHz	9 MHz	11 MHz	20 MHz	30 MHz
40 MHz	19 MHz	21 MHz	40 MHz	60 MHz
80 MHz	39 MHz	41 MHz	80 MHz	120 MHz
160 MHz	79 MHz	81 MHz	160 MHz	240 MHz

Expected power emissions for an example 5G device

In Band			
Conductive power per element / total [dBm]	11 / 20		
Single antenna gain [dBi]	5		
BF gain [dB]	18		
EIRP [dBm]	34		
BW [MHz]	100	200	800
EIRP/MHz [dBm/MHz]	14	11	5

OOB Domain (50%-250%) x BW	
OOB integrated power relative to in-band [dBr]	24.5
OOB conductive power per element / total [dBm]	-13.5 / -4.5
OOB EIRP [dBm]*	9.5*
Scaled masks based WiFi (160MHz)/WiGig (1.8GHz)**	Passing

Spurious Domain			
Noise conductive per element / total [dBm/MHz]	-68.5 / -59.5		
BF non-coherent gain [dB]	9		
Single antenna gain [dBi]	5		
Noise EIRP [dBm/MHz]***	-55		
Images rejection [dBc]	45		
BW [MHz]	100	200	800
Images signals EIRP/MHz [dBm/MHz]	-31	-34	-40
Rx LO conductive per element / total [dBm] ****	-64 / -55		
Rx LO EIRP [dBm]***	-50		
Tx LO conductive per element / total [dBm]	-54 / -45		
Tx LO EIRP [dBm]	-40		

* OOBE is analyzed further per channel BW and per MHz slides 7,8

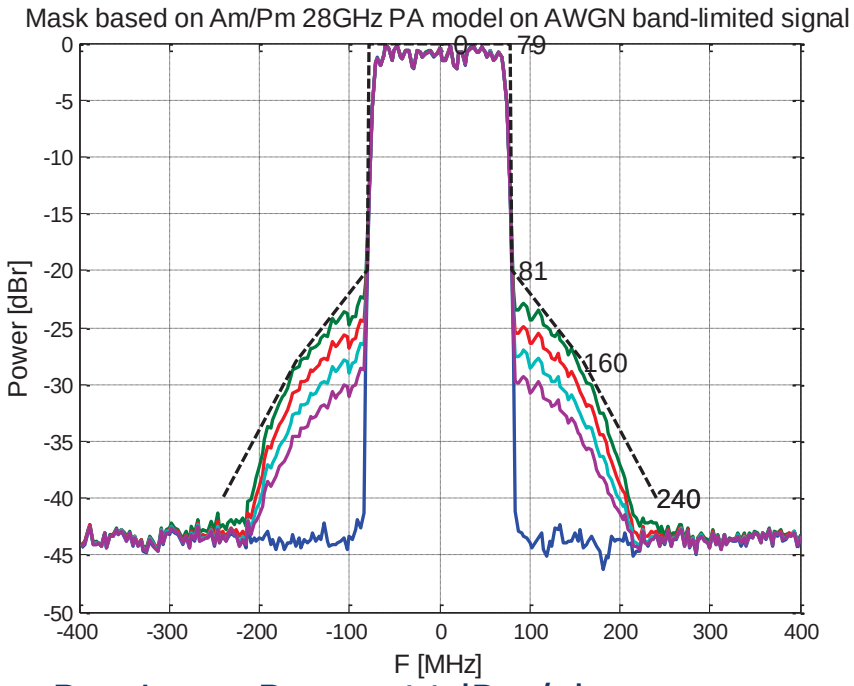
** Mask analysis slides 4,5

*** Incoherent BF

**** Regulatory targets slide 6

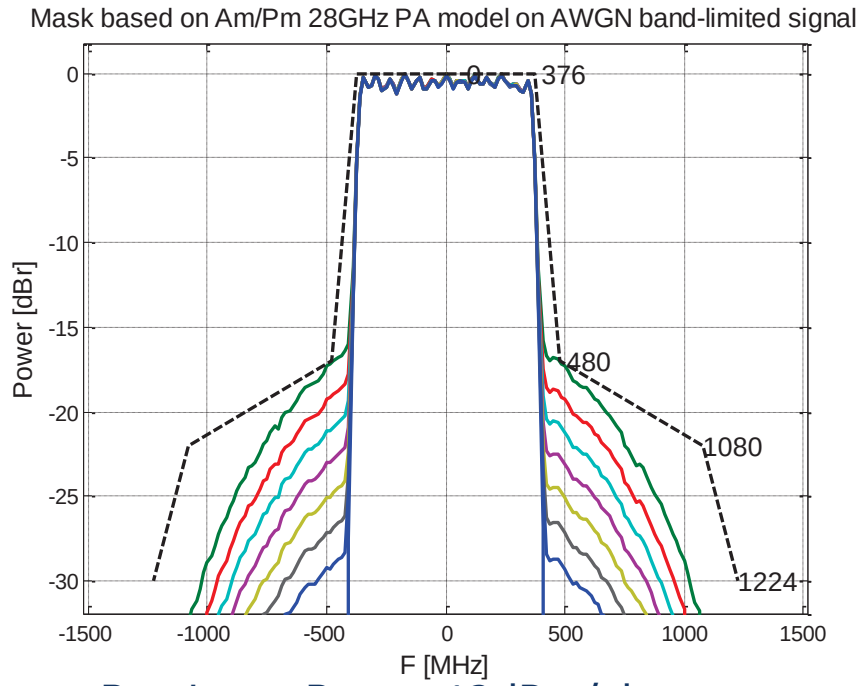
Scaled masks for an example 5G device - 800MHz PSD

Scaled WiFi mask



Passing at Pout = 11dBm/element

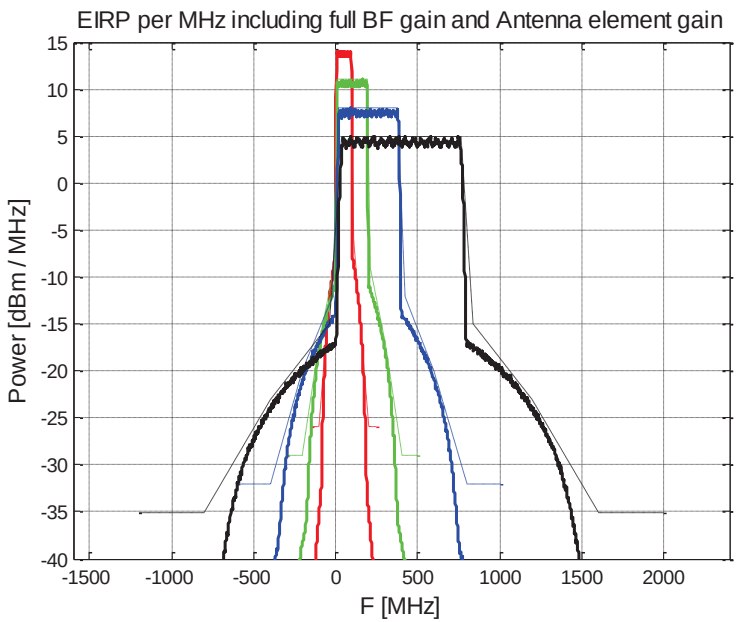
Scaled WiGig mask



Passing at Pout = 13dBm/element

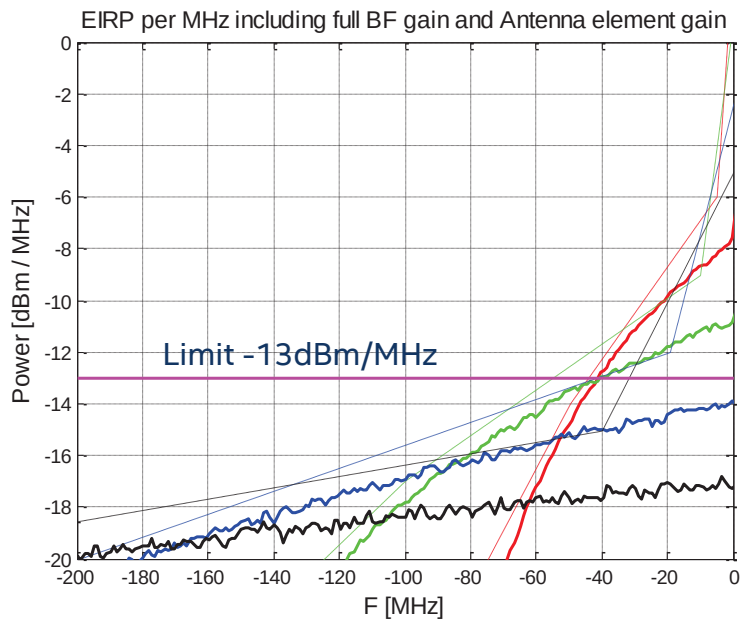
OOB emissions adherence

100/200/400/800MHz channels
Adjacent to edge of occupied BW



Note: Occupied BW starts at 0 MHz

Zoom-in

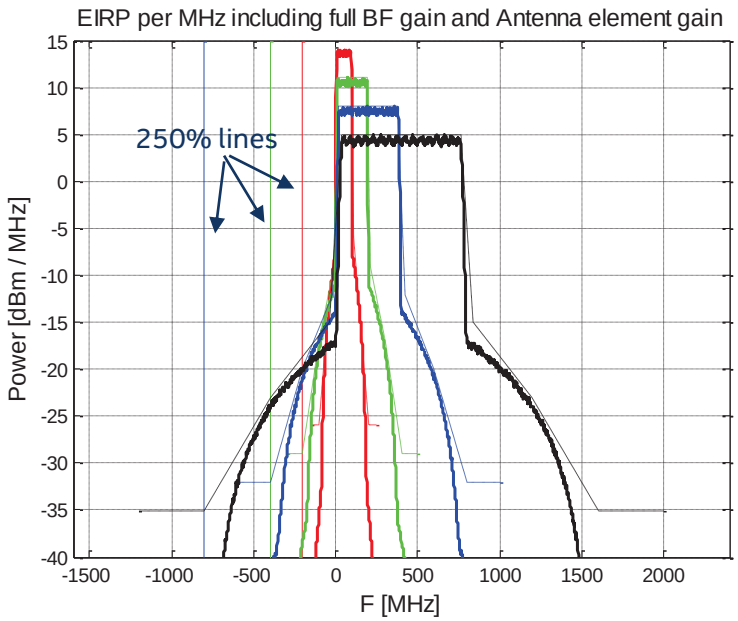


Note: Occupied BW starts at 0 MHz

Conclusion: step-like mask cannot meet requirements for 100/200MHz channels
Mask must be gradual up to offset of 50MHz

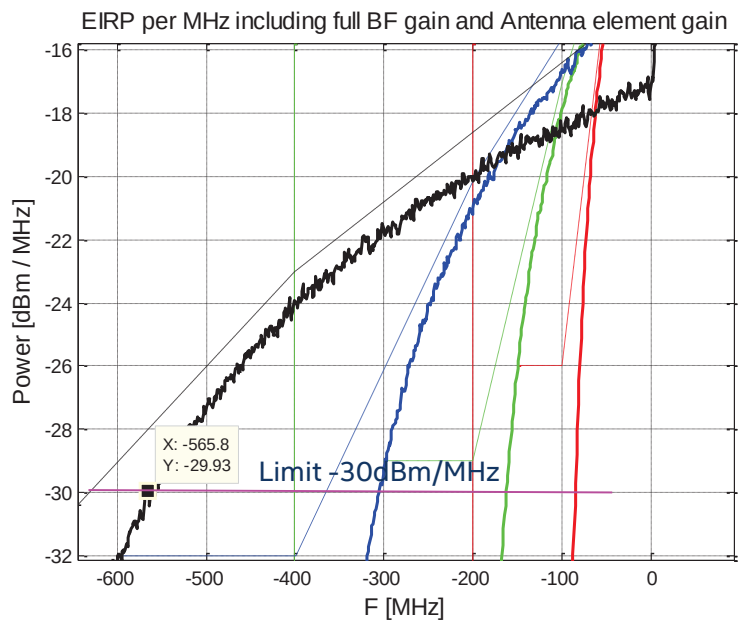
Spurious domain emissions adherence

100/200/400/800MHz channels
Adjacent to edge of occupied BW



Note: Occupied BW starts at 0 MHz

Zoom-in



Note: Occupied BW starts at 0 MHz

Conclusion: -30dBm/MHz is met separately for each channel width

Intel Communication and Devices Group