

# KCTL Inc.

65, Sinwon-ro, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, 16677, Korea  
TEL: 82-31-285-0894 FAX: 82-505-299-8311  
[www.kctl.co.kr](http://www.kctl.co.kr)

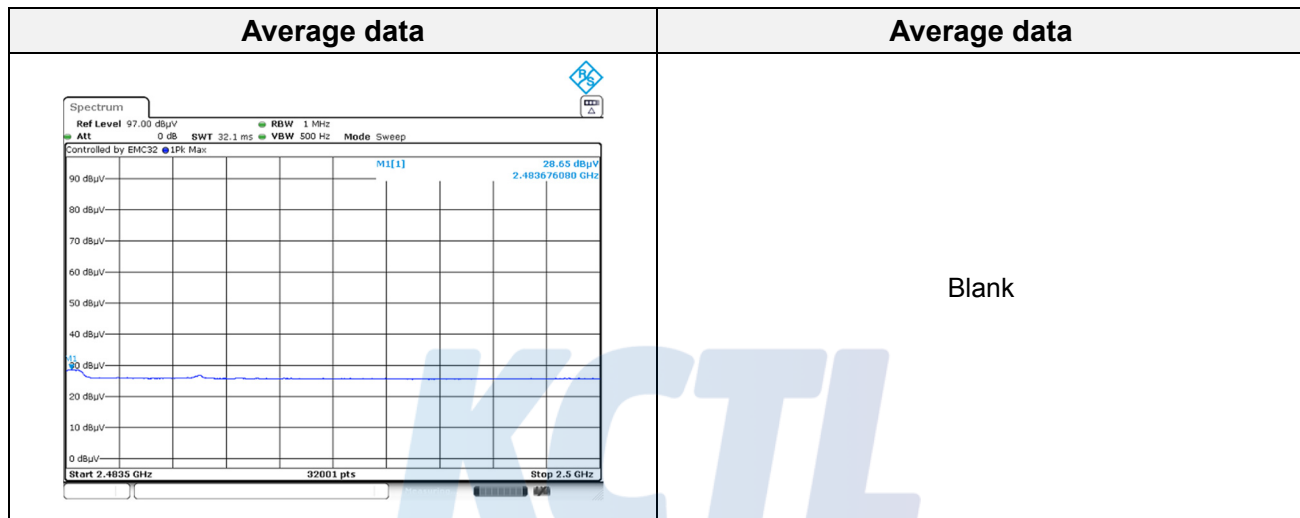
Report No.:  
KR20-SRF0043

Page (50) of (60)

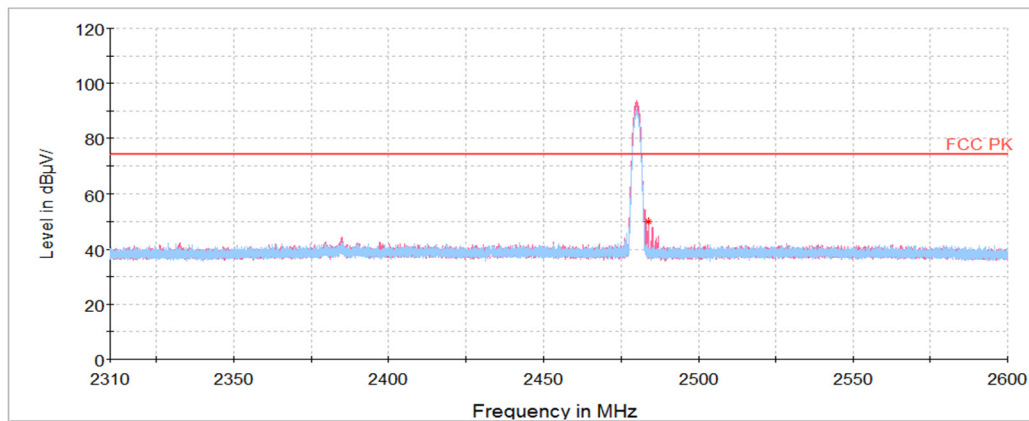


## High Channel

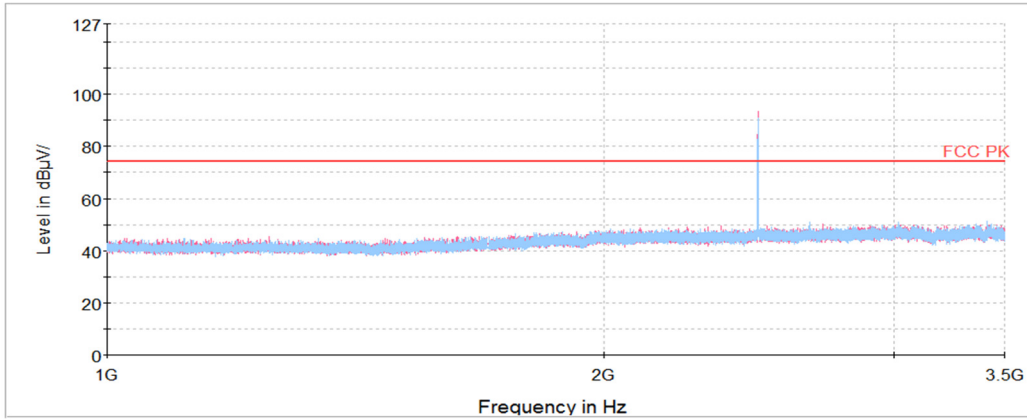
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 483.68 <sup>1)</sup>	V	47.23	32.09	-29.21	-	50.11	74.00	23.89
4 959.52 <sup>1)</sup>	H	60.01	33.88	-54.59	-	39.30	74.00	34.70
<b>Average Data</b>								
2 483.68 <sup>1)</sup>	V	28.65	32.09	-29.21	-	31.53	54.00	22.47



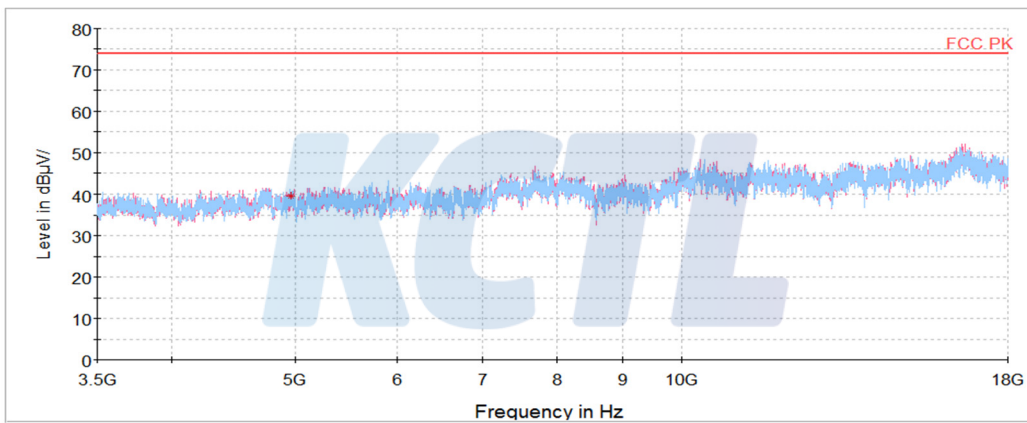
## Horizontal/Vertical for Band-edge



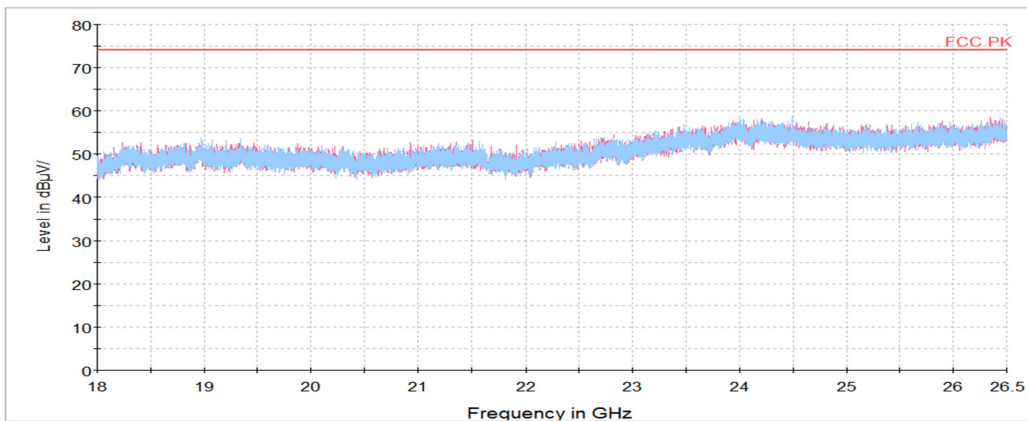
**Horizontal/Vertical for 1 GHz ~ 3.5 GHz**



**Horizontal/Vertical for 3.5 GHz ~ 18 GHz**



**Horizontal/Vertical for 18 GHz ~ 26.5 GHz**



# KCTL Inc.

65, Sinwon-ro, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, 16677, Korea  
TEL: 82-31-285-0894 FAX: 82-505-299-8311  
[www.kctl.co.kr](http://www.kctl.co.kr)

Report No.:  
KR20-SRF0043

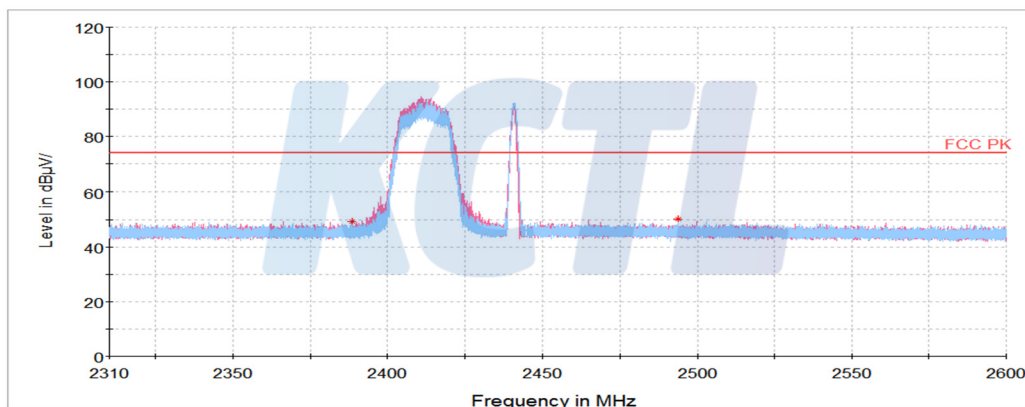
Page (52) of (60)



## Simultaneously\_802.11g (2 412 MHz) + BT,GFSK(2 441 MHz)

Frequency (MHz)	Pol. (V/H)	Reading (dB( $\mu$ V))	Ant. Factor (dB)	Amp. + Cable (dB)	DCCF (dB)	Result (dB( $\mu$ V/m))	Limit (dB( $\mu$ V/m))	Margin (dB)
<b>Peak data</b>								
2 388.46 <sup>1)</sup>	H	46.50	31.88	-29.05	-	49.33	74.00	24.67
2 493.82 <sup>1)</sup>	H	47.21	32.09	-29.24	-	50.06	74.00	23.94
4 824.03 <sup>1)</sup>	V	60.38	33.93	-52.83	-	41.48	74.00	32.52
4 880.22 <sup>1)</sup>	V	60.52	33.95	-54.38	-	40.09	74.00	33.91
7 236.47	V	60.61	35.40	-51.87	-	44.14	68.20	24.06
7 319.84 <sup>1)</sup>	V	59.75	35.40	-51.46	-	43.69	74.00	30.31
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

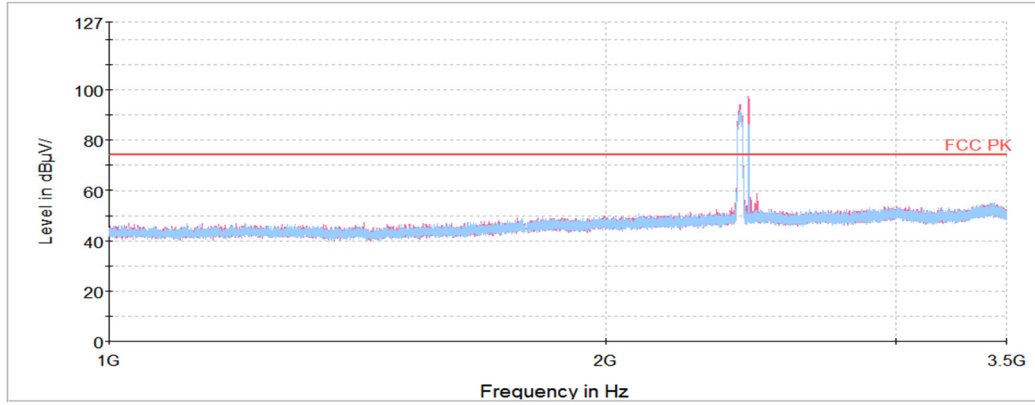
## Horizontal/Vertical for Band-edge



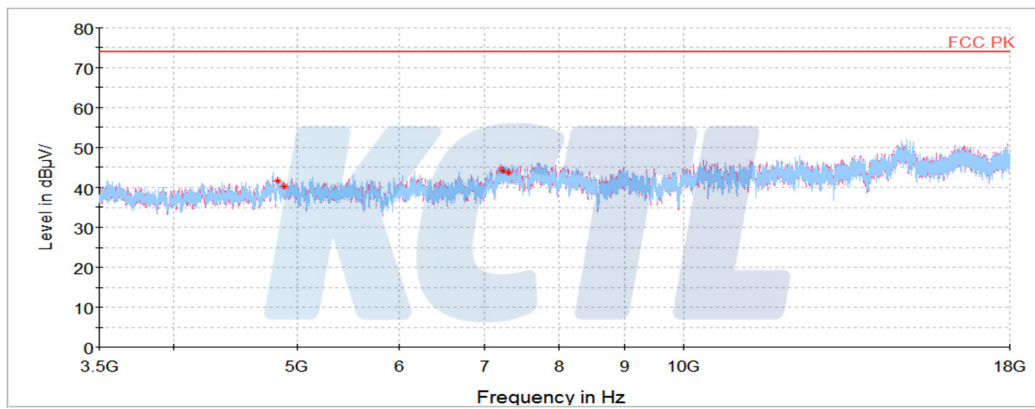
This test report shall not be reproduced, except in full, without the written approval

KCTL-TIR001-003/2

**Horizontal/Vertical for 1 GHz ~ 3.5 GHz**



**Horizontal/Vertical for 3.5 GHz ~ 18 GHz**



# KCTL Inc.

65, Sinwon-ro, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, 16677, Korea  
TEL: 82-31-285-0894 FAX: 82-505-299-8311  
[www.kctl.co.kr](http://www.kctl.co.kr)

Report No.:  
KR20-SRF0043

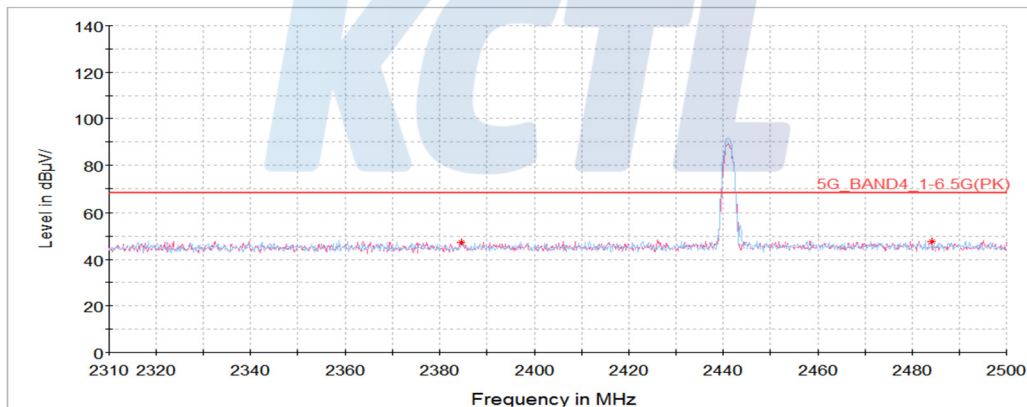
Page (54) of (60)



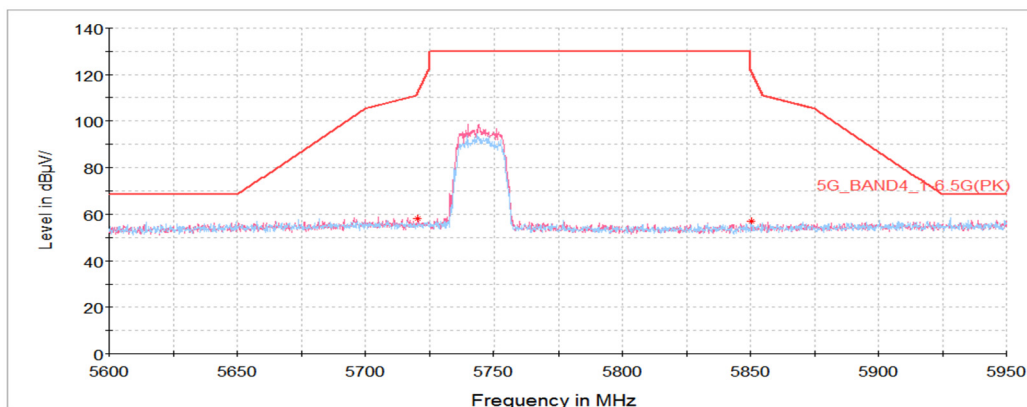
## Simultaneously\_802.11ac VHT20 / UNII-3 Lowest(5 745 MHz)+BT,GFSK(2 441 MHz)

Frequency (MHz)	Pol. (V/H)	Reading (dB( $\mu$ V))	Ant. Factor (dB)	Amp.+Cable (dB)	DCCF (dB)	Result (dB( $\mu$ V/m))	Limit (dB( $\mu$ V/m))	Margin (dB)
<b>Peak data</b>								
2 384.63 <sup>1)</sup>	H	44.60	31.87	-29.07	-	47.40	74.00	26.60
2 484.31 <sup>1)</sup>	H	44.69	32.07	-29.22	-	47.54	74.00	26.46
3 302.95	V	78.38	32.56	-47.71	-	63.23	68.20	4.97
4 880.59 <sup>1)</sup>	H	62.36	33.95	-54.39	-	41.92	74.00	32.08
5 720.55	V	48.87	35.06	-25.85	-	58.08	112.05	53.96
5 850.48	H	48.40	35.22	-26.68	-	56.94	121.10	64.16
7 319.73 <sup>1)</sup>	H	58.48	35.40	-51.19	-	42.69	74.00	31.31
11 489.56 <sup>1)</sup>	V	57.78	37.99	-50.07	-	45.70	74.00	28.30
17 236.33	H	54.05	41.21	-47.72	-	47.54	68.20	20.66
<b>Average Data</b>								
No spurious emissions were detected within 20 dB of the limit.								

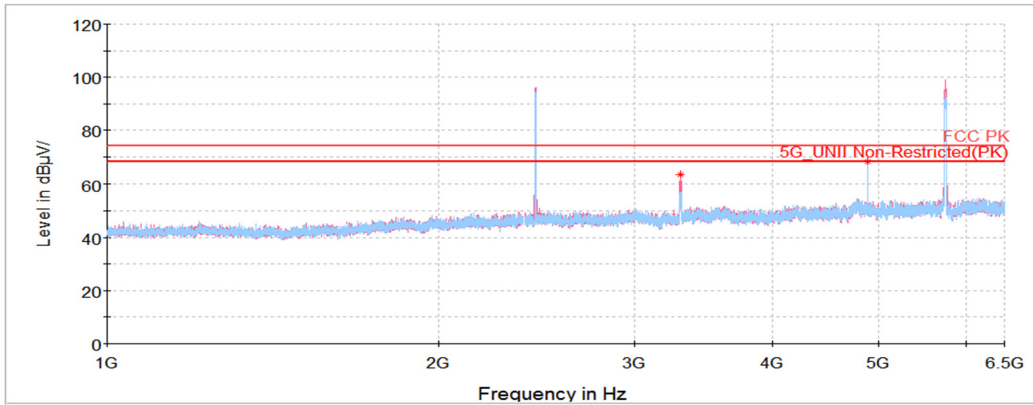
### Horizontal/Vertical for BT Band-edge



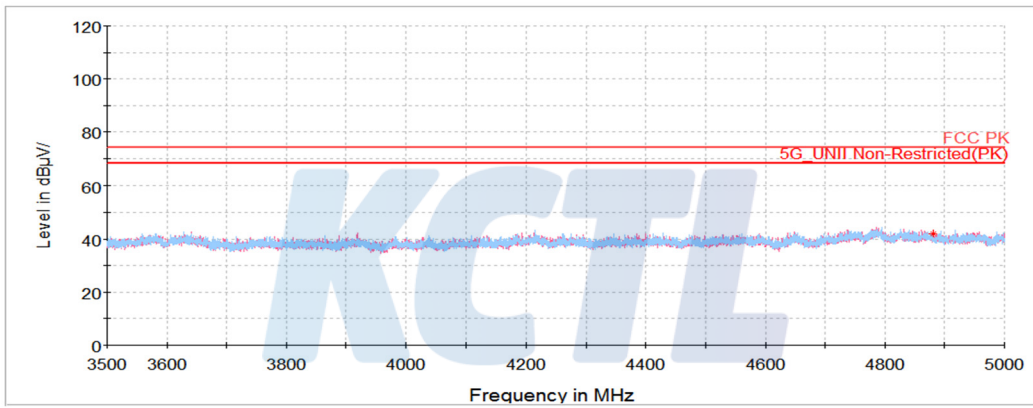
### Horizontal/Vertical for 5G WIFI Band-edge



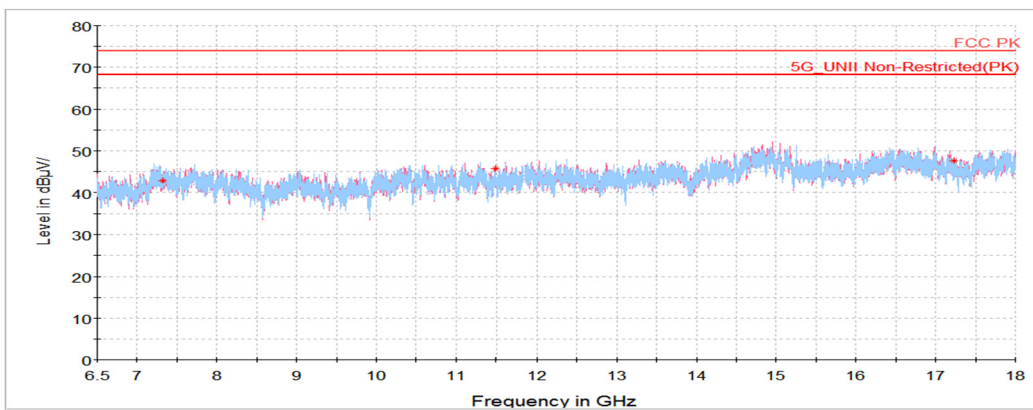
### Horizontal/Vertical for 1 GHz ~ 6.5 GHz



**Horizontal/Vertical for 3.5 GHz ~ 5 GHz (BT Harmonic)**

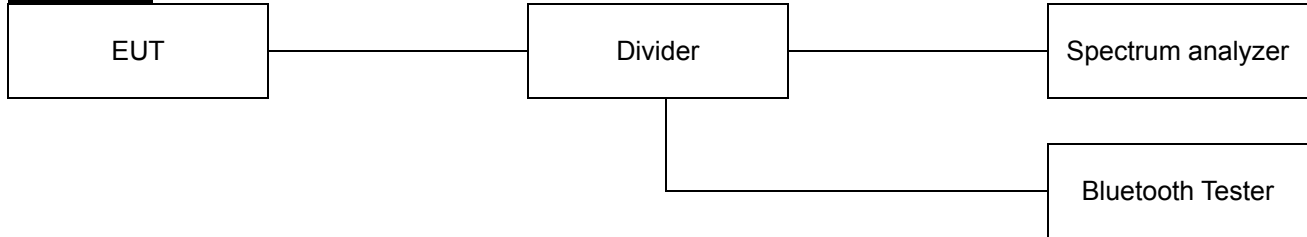


**Horizontal/Vertical for 6.5 GHz ~ 18 GHz (BT, 5G WIFI Harmonic)**



## 7.7. Conducted Spurious Emission

### Test setup



### Limit

According to §15.247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operation, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation specified in §15.209(a) is not required. In addition, radiated emission limits specified in §15.209(a) (see §15.205(c)).

Limit : 20 dBc

### Test procedure

ANSI C63.10-2013 - Section 6.10.4, 7.8.8

### Test settings

#### ▪ Band-edge

- 1) Span : Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation
- 2) Reference level : As required to keep the signal from exceeding the maximum instrument input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log(OBW/RBW)] below the reference level.
- 3) Attenuation: Auto (at least 10 dB preferred)
- 4) Sweep time = Coupled
- 5) RBW : 100 kHz
- 6) VBW : 300 kHz
- 7) Detector : Peak
- 8) Trace : Max hold

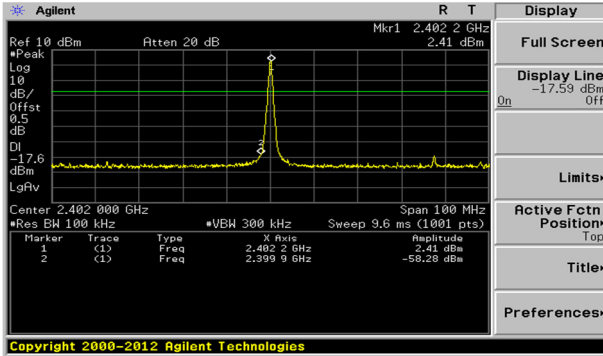
#### ▪ Spurious emissions

- 1) Span : 30 MHz to 10 times the operating frequency in GHz
- 2) RBW : 100 kHz
- 3) VBW : 300 kHz
- 4) Sweep time : Coupled
- 5) Detector : Peak

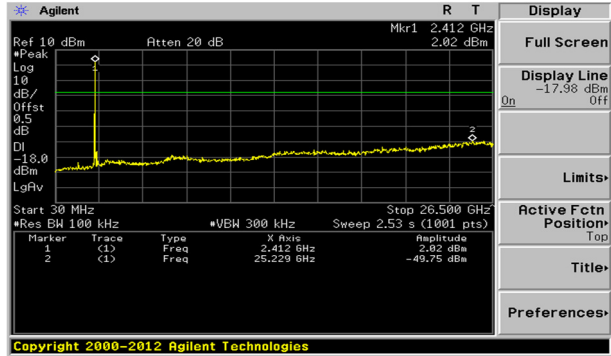
**Test results**

**GFSK**

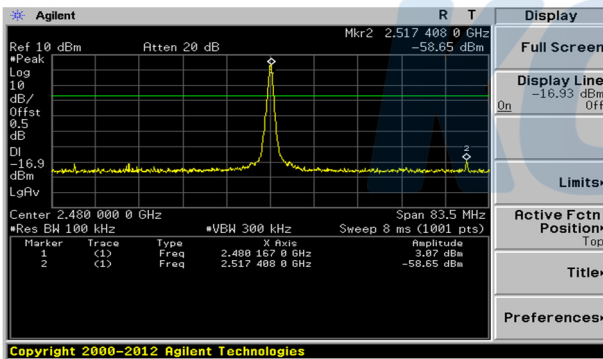
**Conducted band-edge / Low ch.**



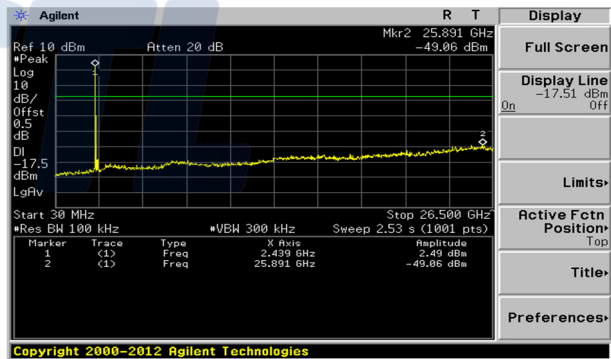
**Conducted spurious / Low ch.**



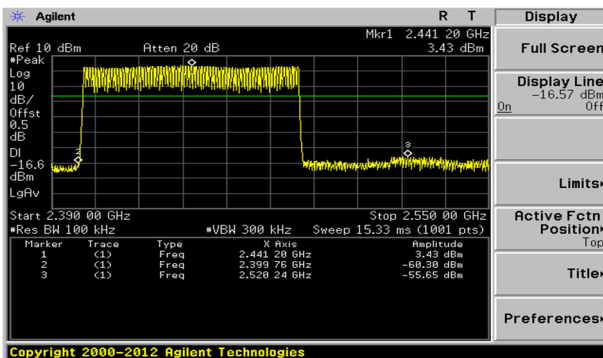
**Conducted band-edge / High ch.**



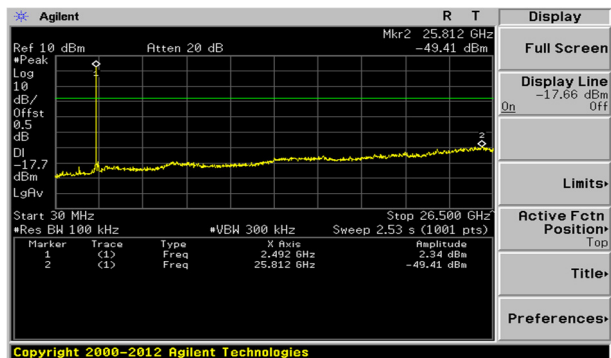
**Conducted spurious / Mid ch.**



**Conducted band-edge / Hopping ch.**



**Conducted spurious / High ch.**





# KCTL Inc.

65, Sinwon-ro, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, 16677, Korea  
TEL: 82-31-285-0894 FAX: 82-505-299-8311  
[www.kctl.co.kr](http://www.kctl.co.kr)

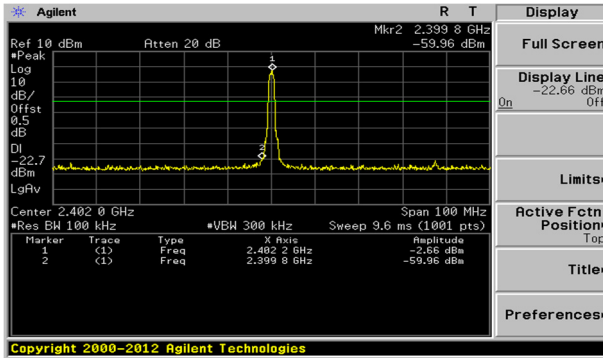
Report No.:  
KR20-SRF0043

Page (58) of (60)

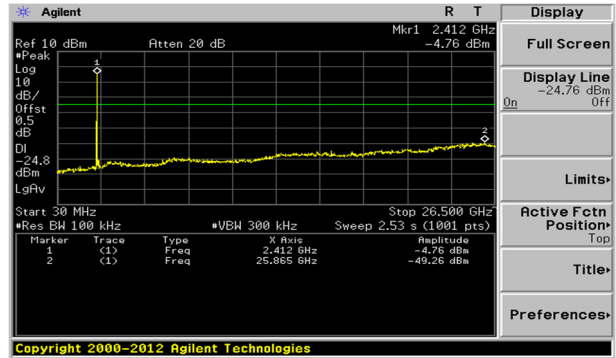


## $\pi/4$ DQPSK

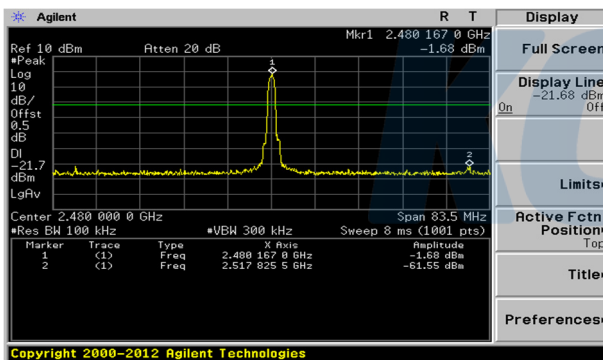
### Conducted band-edge / Low ch.



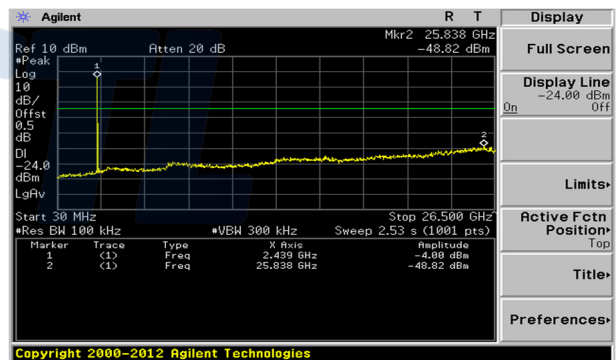
### Conducted spurious / Low ch.



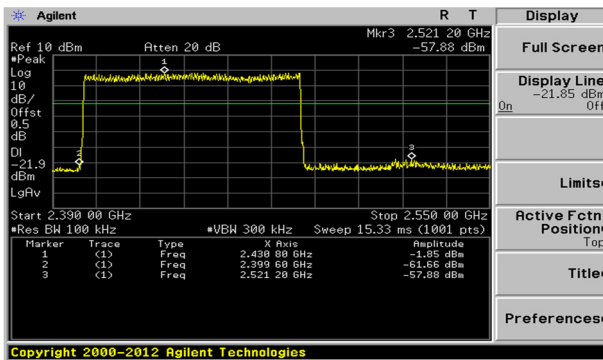
### Conducted band-edge / High ch.



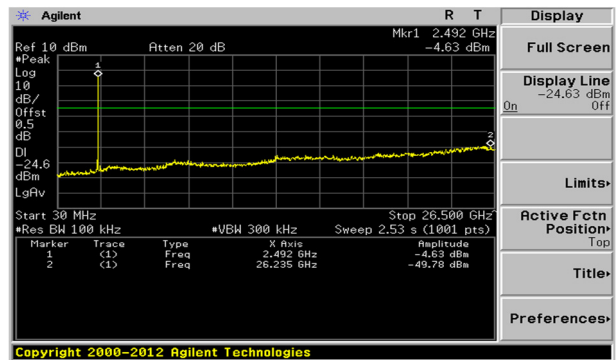
### Conducted spurious / Mid ch.



### Conducted band-edge / Hopping ch.

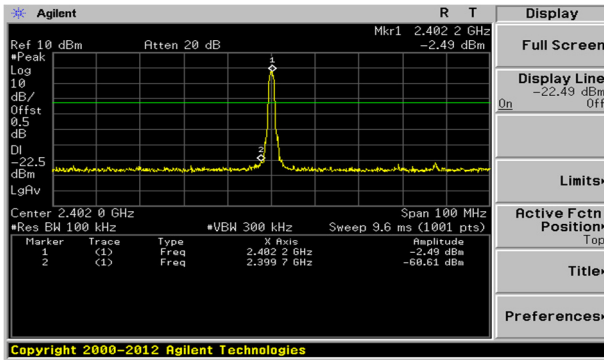


### Conducted spurious / High ch.

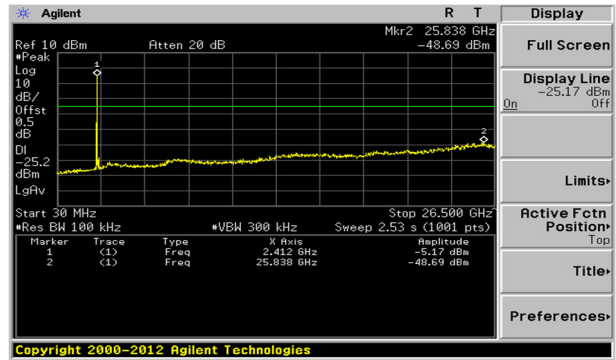


**8DPSK**

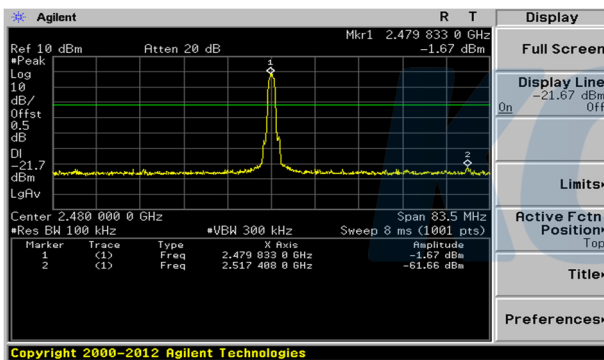
**Conducted band-edge / Low ch.**



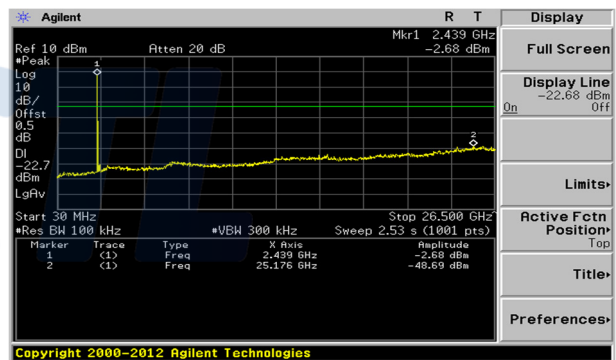
**Conducted spurious / Low ch.**



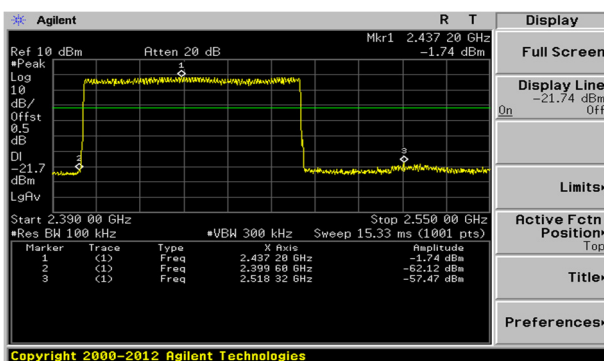
**Conducted band-edge / High ch.**



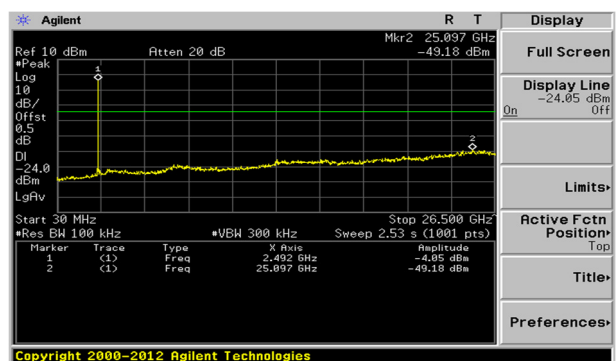
**Conducted spurious / Mid ch.**



**Conducted band-edge / Hopping ch.**



**Conducted spurious / High ch.**



**KCTL Inc.**

65, Sinwon-ro, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, 16677, Korea  
TEL: 82-31-285-0894 FAX: 82-505-299-8311  
[www.kctl.co.kr](http://www.kctl.co.kr)

Report No.:  
KR20-SRF0043

Page (60) of (60)

**KCTL****8. Measurement equipment**

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	AGILENT	E4440A	MY46186407	20.07.30
Spectrum Analyzer	R&S	FSV40	100988	20.01.04
Attenuator	API Inmet	40AH2W-10	17	20.05.15
Power divider	Aeroflex/ Weinschel, Inc	1580-1	SC571	20.08.01
Vector Signal Generator	R&S	SMBV100A	257566	20.01.04
Bluetooth Tester	TESCOM	TC-3000B	3000B640056	20.01.25
Wideband Power Sensor	R&S	NRP-Z81	102398	20.01.25
Signal Generator	R&S	SMR40	100007	20.05.13
Attenuator	Weinschel ENGINEERING	21-10	0005	20.01.25
EMI TEST RECEIVER	R&S	ESC17	100732	20.08.22
Bi-Log Antenna	SCHWARZBECK	VULB 9168	583	20.05.04
Amplifier	SONOMA INSTRUMENT	310N	284608	20.08.22
COAXIAL FIXED ATTENUATOR	Agilent	8491B-003	2708A18758	20.05.04
Horn antenna	ETS.lindgren	3116	00086632	20.02.15
Horn antenna	ETS.lindgren	3117	155787	20.10.24
Attenuator	API Inmet	40AH2W-10	12	20.05.15
Broadband PreAmplifier	SCHWARZBECK	BBV9718	216	20.07.30
AMPLIFIER	L-3 Narda-MITEQ	AMF-7D-01001800 -22-10P	2031196	20.02.21
AMPLIFIER	L-3 Narda-MITEQ	JS44-18004000-33-8P	2000996	20.01.28
LOOP Antenna	R&S	HFH2-Z2	100355	20.08.24
Antenna Mast	Innco Systems	MA4640-XP-ET	-	-
Turn Table	Innco Systems	DT2000	79	-
Antenna Mast	Innco Systems	MA4000-EP	303	-
Turn Table	Innco Systems	DT2000	79	-
Highpass Filter	WT	WT-A1698-HS	WT160411001	20.05.14

**End of test report**

This test report shall not be reproduced, except in full, without the written approval

KCTL-TIR001-003/2