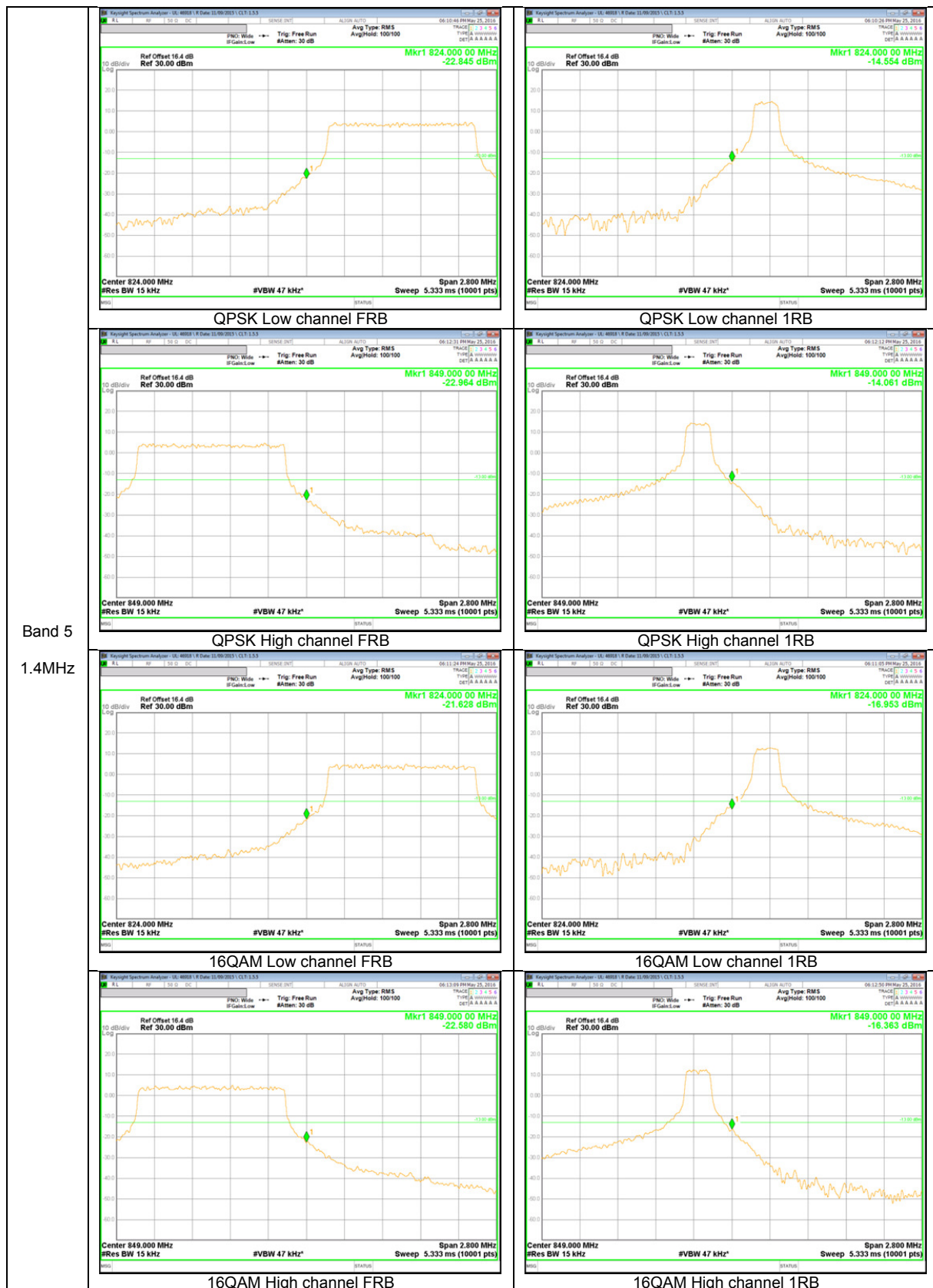




10.3. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.901, §22.917, §24.238

LIMITS

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v02r02

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

RESULTS

10.3.1. OUT OF BAND EMISSIONS RESULT

GSM

Band	Mode	f [MHz]	Spurious [dBm]	Limit [dBm]
GSM850	GPRS	824.2	-24.44	-13.00
		836.6	-24.31	
		848.8	-24.39	
	EGPRS	824.2	-24.81	
		836.6	-23.91	
		848.8	-24.63	
GSM1900	GPRS	1850.2	-24.28	
		1880.0	-24.13	
		1909.8	-23.42	
	EGPRS	1850.2	-23.57	
		1880.0	-24.04	
		1909.8	-23.74	

WCDMA

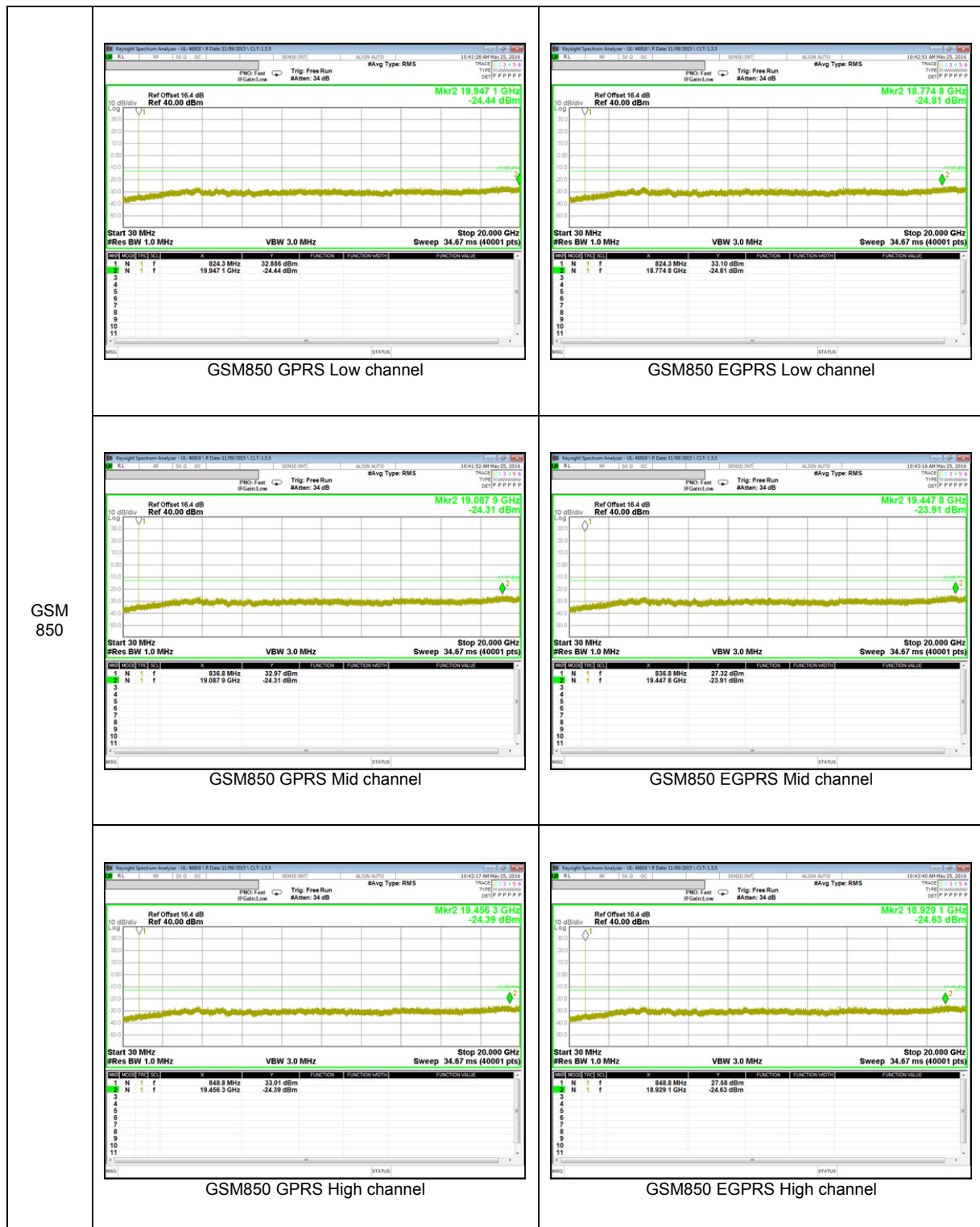
Band	Mode	f [MHz]	Spurious [dBm]	Limit [dBm]
Band 5	REL99	826.4	-34.79	-13.00
		836.6	-34.57	
		846.6	-35.35	
	HSDPA	826.4	-34.33	
		836.6	-34.23	
		846.6	-34.95	
Band 2	REL99	1852.4	-33.55	
		1880.0	-33.85	
		1907.6	-33.80	
	HSDPA	1852.4	-33.59	
		1880.0	-33.74	
		1907.6	-33.30	

LTE 5

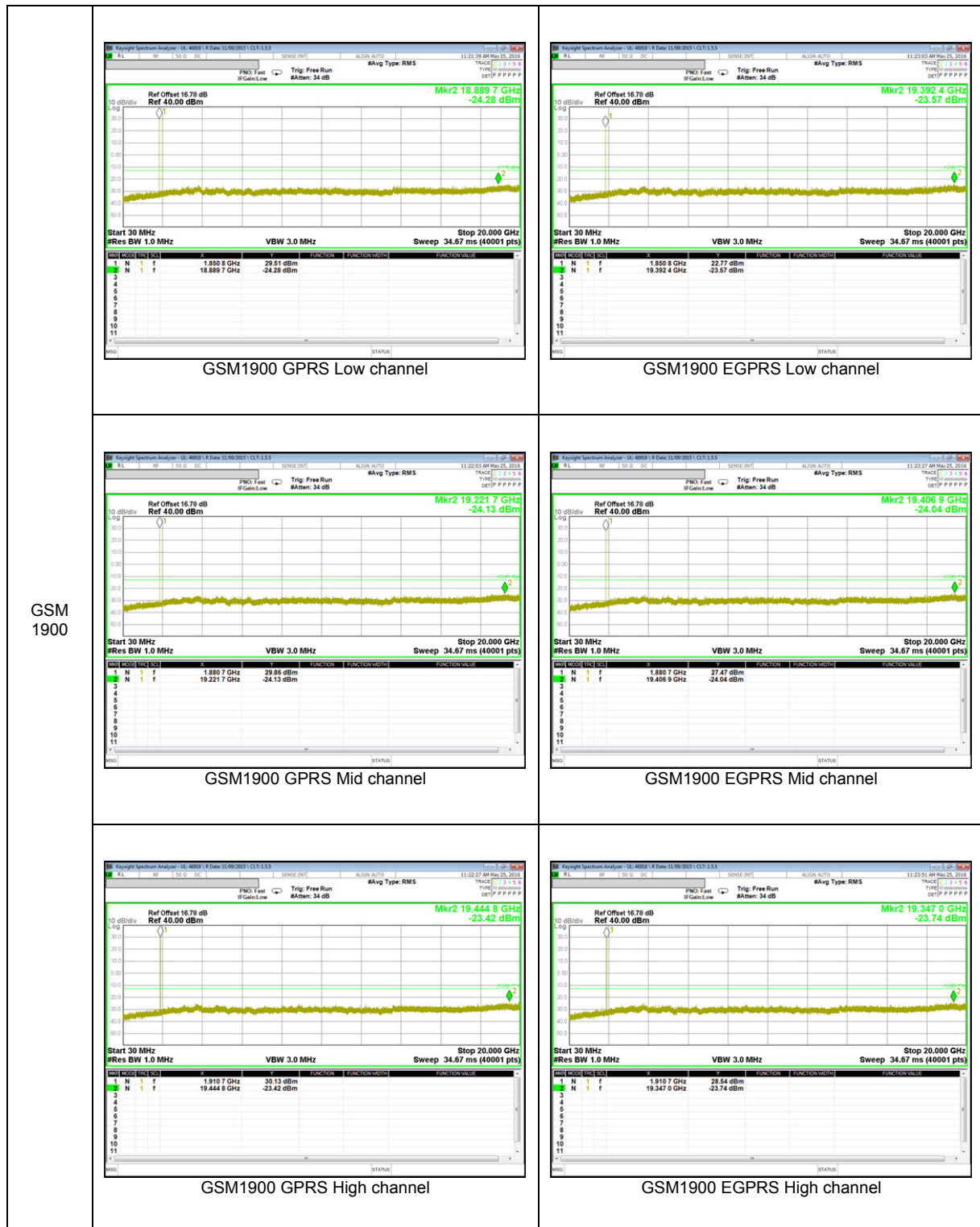
Bandwidth	Mode	f [MHz]	Spurious [dBm]	Limit [dBm]
10 MHz	QPSK	829.0	-29.03	-13.00
		836.5	-29.02	
		844.0	-29.97	
	16QAM	829.0	-29.48	
		836.5	-28.72	
		844.0	-28.84	
5 MHz	QPSK	826.5	-28.64	
		836.5	-29.89	
		846.5	-27.80	
	16QAM	826.5	-27.25	
		836.5	-28.68	
		846.5	-28.23	
3 MHz	QPSK	825.5	-29.26	
		836.5	-28.26	
		847.5	-28.42	
	16QAM	825.5	-28.66	
		836.5	-29.14	
		847.5	-28.75	
1.4 MHz	QPSK	824.7	-28.85	
		836.5	-29.22	
		848.3	-28.19	
	16QAM	824.7	-27.47	
		836.5	-28.95	
		848.3	-28.88	

10.3.2. OUT OF BAND EMISSIONS PLOTS

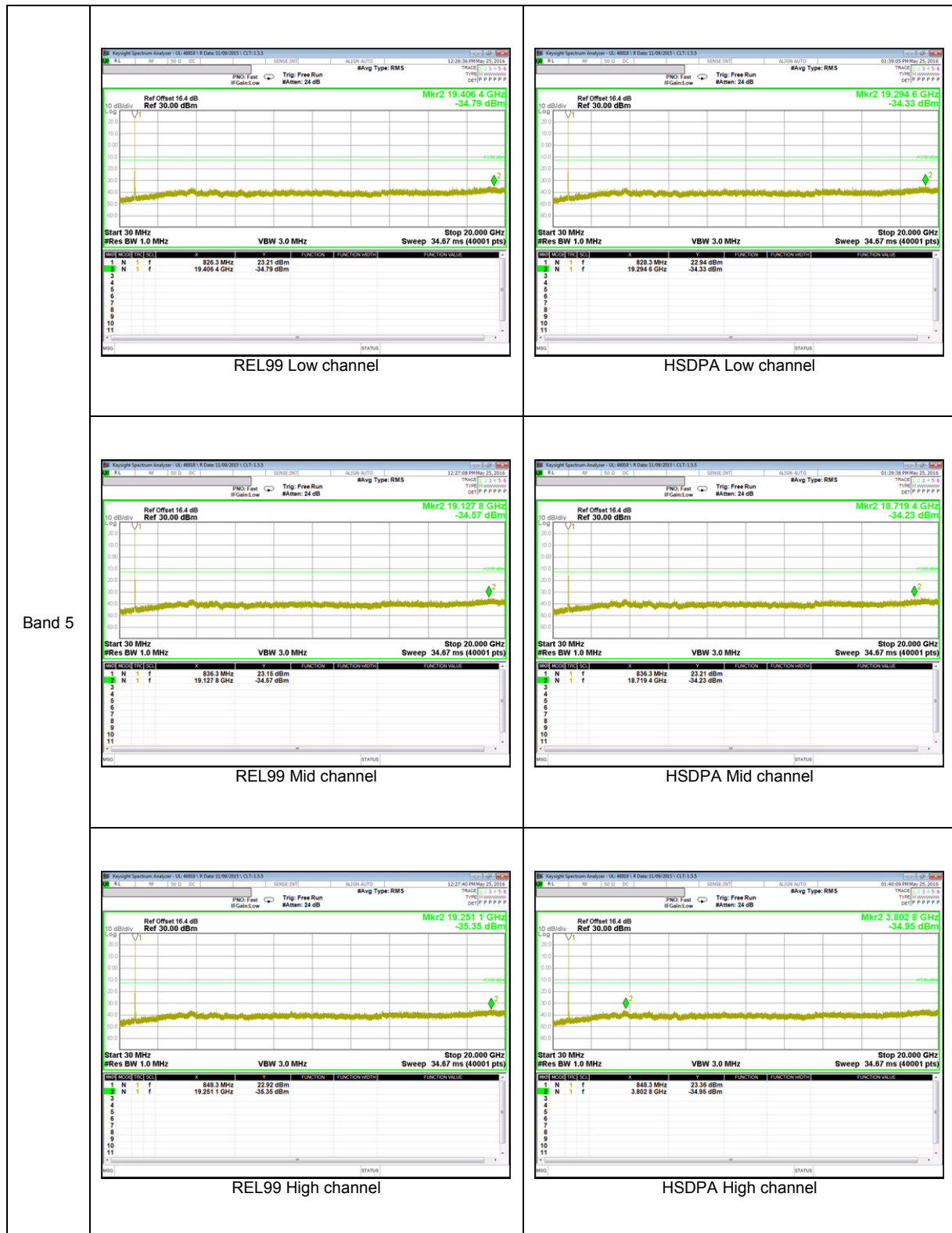
GSM 850



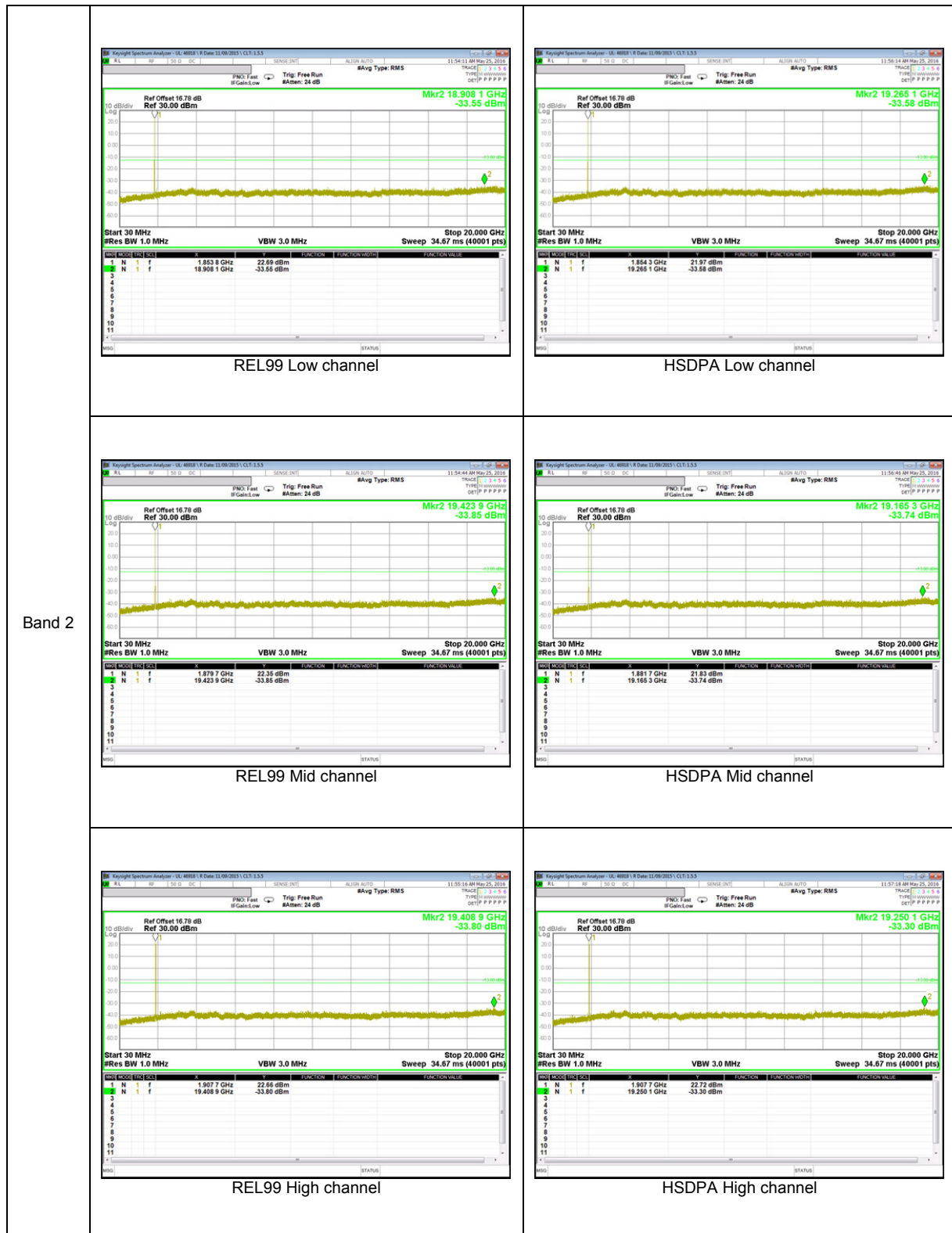
GSM 1900



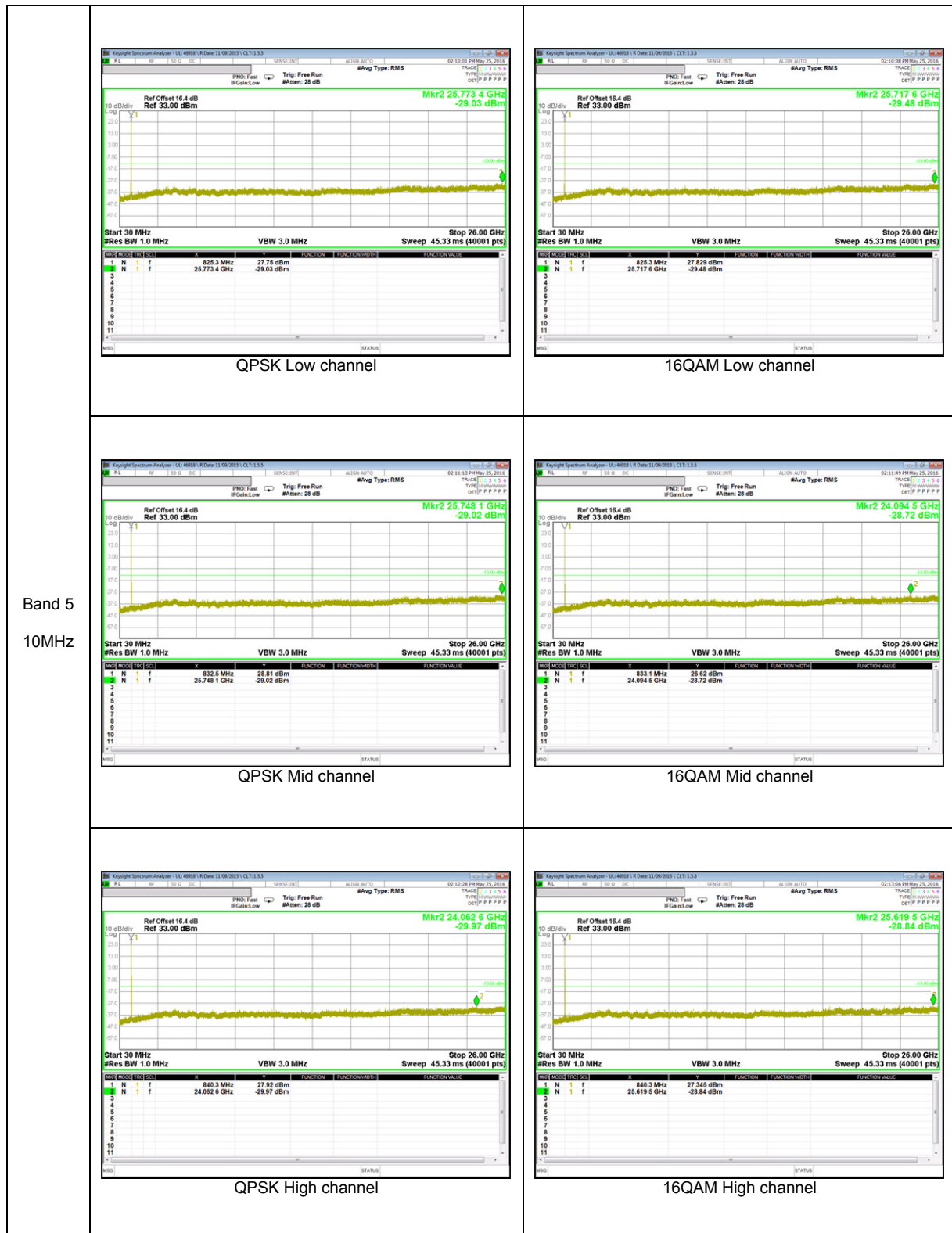
WCDMA Band 5

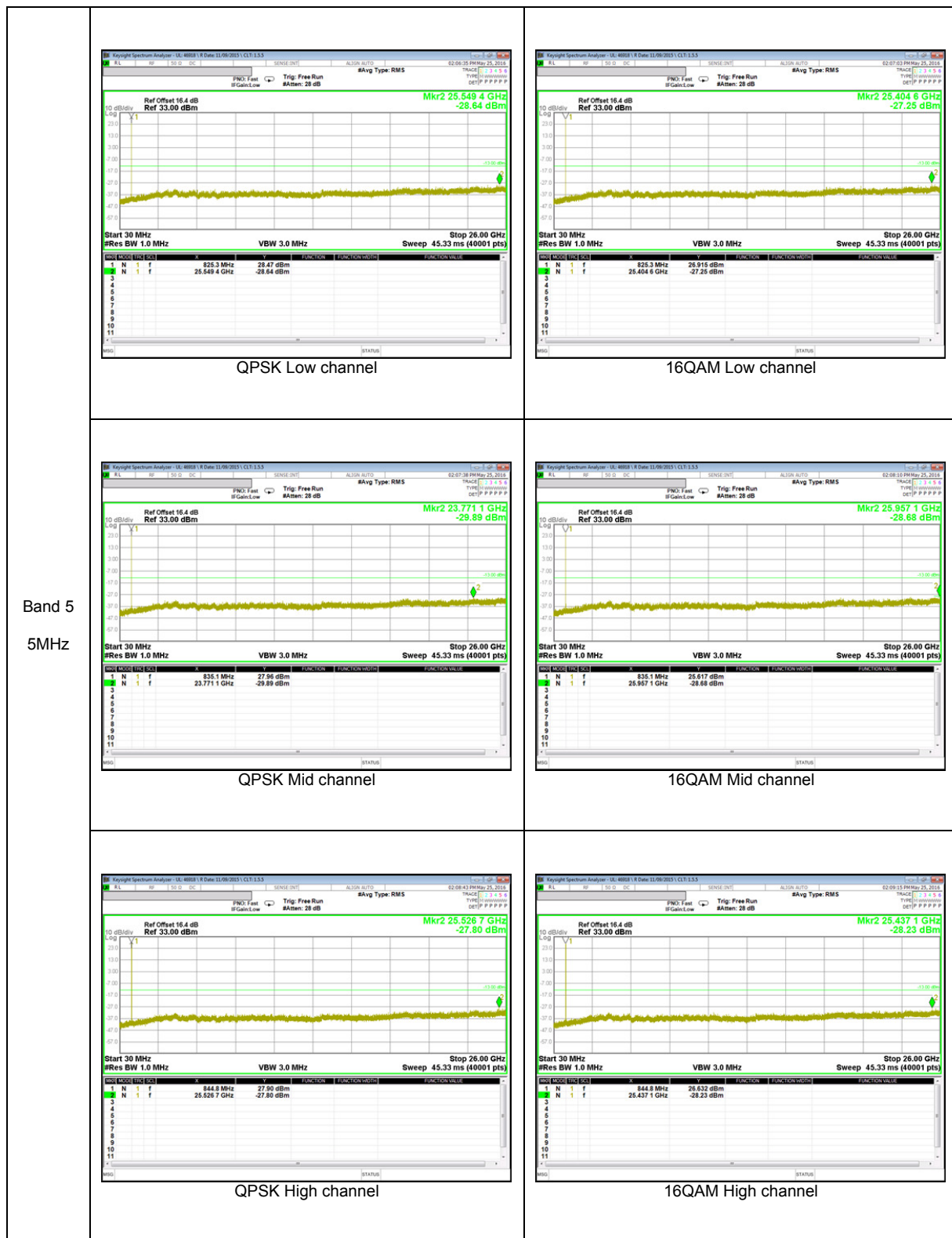


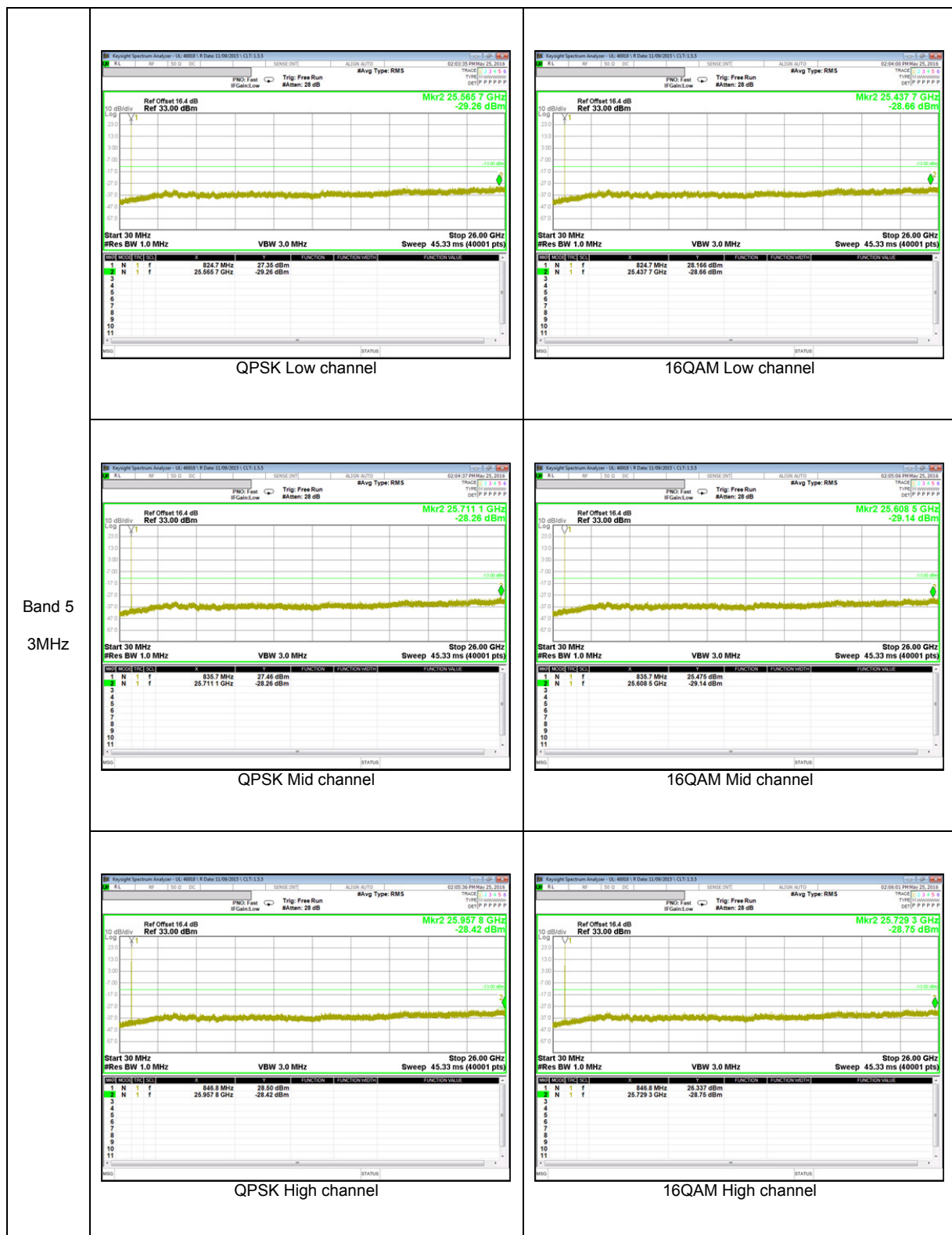
WCDMA Band 2

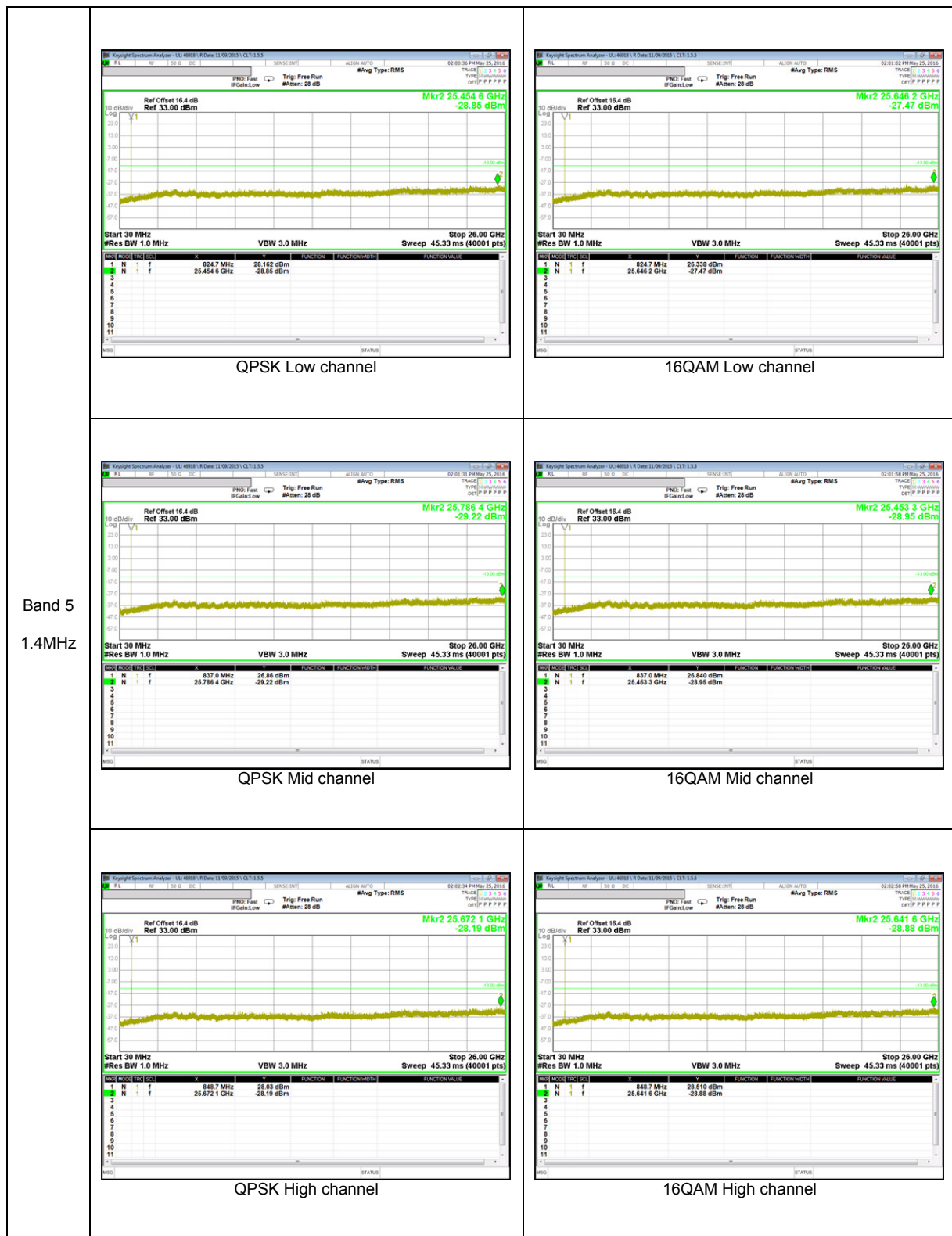


LTE Band 5









10.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235

LIMITS

§22.355 - The carrier frequency shall not depart from the reference frequency in excess of ± 2.5 ppm for mobile stations.

§24.235 - The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v02r02

RESULTS

See the following pages.

10.4.1. FREQUENCY STABILITY RESULTS

LTE Band 5, Channel 20524, Frequency 836.5 MHz

WCDMA Band 5, Channel 4183, Frequency 836.6 MHz

GSM 850, Channel 190, Frequency 836.6 MHz

Reference Frequency: Cellular Mid Channel 836.6 MHz @ 20°C				
Limit: ± 2.5 ppm = 2091.500 Hz				
Power Supply (Vdc)	Environment Temperature (*C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.80	50	836.59997921	-0.001	2.5
3.80	40	836.59997779	0.001	2.5
3.80	30	836.59997924	-0.001	2.5
3.80	20	836.59997850	0	2.5
3.80	10	836.59997861	0.000	2.5
3.80	0	836.59998202	-0.004	2.5
3.80	-10	836.59997914	-0.001	2.5
3.80	-20	836.59998144	-0.004	2.5
3.80	-30	836.59998153	-0.004	2.5

Reference Frequency: Cellular Mid Channel 836.6 MHz @ 20°C				
Limit: ± 2.5 ppm = 2091.500 Hz				
Power Supply (Vdc)	Environment Temperature (*C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.80	20	836.59997850	0	2.5
4.30	20	836.59997876	0.000	2.5
3.60	20	836.59998231	-0.005	2.5

WCDMA Band 2, Channel 9400, Frequency 1880.0 MHz

GSM 1900, Channel 661, Frequency 1880.0 MHz

Reference Frequency: PCS Mid Channel 1880 MHz @ 20°C				
Limit: ± 2.5 ppm = 4700.000 Hz				
Power Supply (Vdc)	Environment Temperature (*C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.80	50	1879.99997185	-0.001	2.5
3.80	40	1879.99997214	-0.001	2.5
3.80	30	1879.99996513	0.002	2.5
3.80	20	1879.99996949	0	2.5
3.80	10	1879.99996872	0.000	2.5
3.80	0	1879.99996836	0.001	2.5
3.80	-10	1879.99997608	-0.004	2.5
3.80	-20	1879.99997795	-0.004	2.5
3.80	-30	1879.99997504	-0.003	2.5

Reference Frequency: PCS Mid Channel 1880 MHz @ 20°C				
Limit: ± 2.5 ppm = 4700.000 Hz				
Power Supply (Vdc)	Environment Temperature (*C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.80	20	1879.99996949	0	2.5
4.30	20	1879.99996353	0.003	2.5
3.60	20	1879.99996539	0.002	2.5

11. RADIATED TEST RESULTS

11.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §22.913, §24.232

LIMITS

22.913(a) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(c) - Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13dB.

TEST PROCEDURE

ANSI / TIA / EIA 603D Clause 2.2.17; MXA setting reference to 971168 D01 v02r02

For peak power measurement with a MXA:

a) Set the RBW $\geq$ OBW; b) Set VBW $\geq 3 \times$ RBW; c) Set span $\geq 2 \times$ RBW; d) Sweep time = auto couple; e) Detector = peak; f) Ensure that the number of measurement points $\geq$ span/RBW; g) Trace mode = max hold;

For average power measurement with a MXA:

a) Set span to at least 1.5 times the OBW; b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz; c) Set VBW $\geq 3 \times$ RBW; d) Set number of points in sweep $\geq 2 \times$ span / RBW; e) Sweep time = auto-couple; f) Detector = RMS (power averaging); g) Use free run trigger If burst duty cycle ≥ 98 ; h) Use trigger to capture bursts If burst duty cycle < 98 ; i) Trace average at least 100 traces in power averaging (*i.e.*, RMS) mode. j) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function.

TEST RESULTS

11.1.1. ERP/EIRP Results

GSM

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
GSM850	GPRS	128	824.2	20.88	122.46
		190	836.6	20.04	100.93
		251	848.8	21.15	130.32
	EGPRS	128	824.2	16.20	41.69
		190	836.6	14.64	29.11
		251	848.8	15.34	34.20
GSM1900	GPRS	512	1850.2	27.49	561.05
		661	1880.0	29.07	807.24
		810	1909.8	30.75	1188.50
	EGPRS	512	1850.2	24.46	279.25
		661	1880.0	25.68	369.83
		810	1909.8	26.98	498.88

WCDMA

Band	Mode	Channel	f [MHz]	ERP / EIRP	
				[dBm]	[mW]
Band 5	REL99	4132	826.4	13.17	20.75
		4183	836.6	13.70	23.44
		4233	846.6	15.13	32.58
	HSDPA	4132	826.4	14.08	25.59
		4183	836.6	13.40	21.88
		4233	846.6	13.77	23.82
Band 2	REL99	9262	1852.4	24.22	264.24
		9400	1880.0	24.36	272.90
		9538	1907.6	25.25	334.97
	HSDPA	9262	1852.4	23.88	244.34
		9400	1880.0	24.01	251.77
		9538	1907.6	25.07	321.37

LTE Band 5

Band	BW [MHz]	Mode	RB/RB Size	f [MHz]	ERP / EIRP	
			Full RB		[dBm]	[mW]
Band 5	10	QPSK	50/0	829.0	11.71	14.83
			50/0	836.5	11.65	14.62
			50/0	844.0	12.84	19.23
		16QAM	50/0	829.0	11.85	15.31
			50/0	836.5	11.75	14.96
			50/0	844.0	12.91	19.54
	5	QPSK	25/0	826.5	11.44	13.93
			25/0	836.5	11.50	14.13
			25/0	846.5	12.53	17.91
		16QAM	25/0	826.5	11.46	14.00
			25/0	836.5	11.66	14.66
			25/0	846.5	13.24	21.09
	3	QPSK	15/0	825.5	11.74	14.93
			15/0	836.5	11.63	14.55
			15/0	847.5	12.94	19.68
		16QAM	15/0	825.5	11.90	15.49
			15/0	836.5	11.82	15.21
			15/0	847.5	13.24	21.09
	1.4	QPSK	6/0	824.7	9.76	9.46
			6/0	836.5	10.12	10.28
			6/0	848.3	10.84	12.13
		16QAM	6/0	824.7	9.81	9.57
			6/0	836.5	9.97	9.93
			6/0	848.3	11.22	13.24

GSM 1900

GSM

GSM1900

GPRS

High Frequency Substitution Measurement

UL Korea, Ltd. Suwon Laboratory Chamber 2

Company:

Samsung

Project #:

16K23304

Date:

04-26-16

Test Engineer:

YH Lim

Configuration:

EUT ONLY, X Position

Mode:

GPRS 1900MHz

Test Equipment:

Receiving: 3117[00168724] and Chamber 1 SMA Cables

Substitution: 3115[00161451] Substitution, 3m SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.20	16.5	V	1.60	8.80	23.71	33.0	-9.3	
1850.20	20.3	H	1.60	8.80	27.49	33.0	-5.5	
Mid Ch								
1880.00	21.6	V	1.62	8.62	28.57	33.0	-4.4	
1880.00	22.1	H	1.62	8.62	29.07	33.0	-3.9	
High Ch								
1909.80	22.8	V	1.63	8.44	29.58	33.0	-3.4	
1909.80	23.9	H	1.63	8.44	30.75	33.0	-2.2	

Rev. 3.17.11

GSM

GSM1900

EGPRS

High Frequency Substitution Measurement

UL Korea, Ltd. Suwon Laboratory Chamber 2

Company:

Samsung

Project #:

16K23304

Date:

04-26-16

Test Engineer:

YH Lim

Configuration:

EUT ONLY, X Position

Mode:

EGPRS 1900MHz

Test Equipment:

Receiving: 3117[00168724] and Chamber 1 SMA Cables

Substitution: 3115[00161451] Substitution, 3m SMA Cable Warehouse

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch								
1850.20	12.9	V	1.60	8.80	20.09	33.0	-12.9	
1850.20	17.3	H	1.60	8.80	24.46	33.0	-8.5	
Mid Ch								
1880.00	18.0	V	1.62	8.62	24.98	33.0	-8.0	
1880.00	18.7	H	1.62	8.62	25.68	33.0	-7.3	
High Ch								
1909.80	18.9	V	1.63	8.44	25.67	33.0	-7.3	
1909.80	20.2	H	1.63	8.44	26.98	33.0	-6.0	

Rev. 3.17.11

LTE Band 5

LTE Band 5 10MHz QPSK	High Frequency Substitution Measurement UL Korea, Ltd. Suwon Laboratory Chamber 2								
	Company: Samsung Project #: 16K23304 Date: 05-25-16 Test Engineer: Chan Park Configuration: EUT ONLY, X Position Mode: TX, LTE BAND 5, 10MHz BW,QPSK								
	Test Equipment: Receiving: VULB9163-749, and 3m Chamber N-type Cable (Setup this one for testing EUT) Substitution: Dipole S/N: 00164753, 3m SMA Cable Warehouse.								
	f	SG reading	Ant. Pol.	Cable Loss	Antenna Gain	ERP	Limit	Margin	Notes
	MHz	(dBm)	(H/V)	(dB)	(dBd)	(dBm)	(dBm)	(dB)	
	Low Ch								
	829.00	9.17	V	1.1	-1.5	6.59	38.5	-31.9	
	829.00	14.29	H	1.1	-1.5	11.71	38.5	-26.7	
	Mid Ch								
	836.50	8.42	V	1.1	-1.4	5.93	38.5	-32.5	
	836.50	14.14	H	1.1	-1.4	11.65	38.5	-26.8	
	High Ch								
	844.00	8.46	V	1.1	-1.3	6.07	38.5	-32.4	
	844.00	15.26	H	1.1	-1.3	12.84	38.5	-25.6	
	Rev. 3.17.11 Note: For Band 13/17 ERP limit is 34.77dBm; For Band 26 limit is 50dBm								
LTE Band 5 10MHz 16QAM	High Frequency Substitution Measurement UL Korea, Ltd. Suwon Laboratory Chamber 2								
	Company: Samsung Project #: 16K23304 Date: 05-25-16 Test Engineer: Chan Park Configuration: EUT ONLY, X Position Mode: LTE5 10MHz FUND 16QAM								
	Test Equipment: Receiving: VULB9163-749, and 3m Chamber N-type Cable (Setup this one for testing EUT) Substitution: Dipole S/N: 00164753, 3m SMA Cable Warehouse.								
	f	SG reading	Ant. Pol.	Cable Loss	Antenna Gain	ERP	Limit	Margin	Notes
	MHz	(dBm)	(H/V)	(dB)	(dBd)	(dBm)	(dBm)	(dB)	
	Low Ch								
	829.00	9.37	V	1.1	-1.5	6.79	38.5	-31.7	
	829.00	14.43	H	1.1	-1.5	11.85	38.5	-26.6	
	Mid Ch								
	836.50	8.56	V	1.1	-1.4	6.05	38.5	-32.4	
	836.50	14.26	H	1.1	-1.4	11.75	38.5	-26.7	
	High Ch								
	844.00	8.52	V	1.1	-1.3	6.10	38.5	-32.3	
	844.00	15.33	H	1.1	-1.3	12.91	38.5	-25.5	
	Rev. 3.17.11 Note: For Band 13/17 ERP limit is 34.77dBm; For Band 26 limit is 50dBm								