



In Collaboration with
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CALIBRATION LABORATORY



中国认可
国际互认
校准
CALIBRATION
CNAS L0570

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Client

B.V.ADT

Certificate No:

Z21-60339

CALIBRATION CERTIFICATE

Object

D2600V2 - SN: 1110

Calibration Procedure(s)

FF-Z11-003-01

Calibration Procedures for dipole validation kits

Calibration date:

September 16, 2021

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	23-Sep-20 (CTTL, No.J20X08336)	Sep-21
Power sensor NRP8S	104291	23-Sep-20 (CTTL, No.J20X08336)	Sep-21
Reference Probe EX3DV4	SN 7517	03-Feb-21(CTTL-SPEAG,No.Z21-60001)	Feb-22
DAE4	SN 1556	15-Jan-21(SPEAG,No.DAE4-1556_Jan21)	Jan-22
Secondary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No.J21X00593)	Jan-22
Network Analyzer E5071C	MY46110673	14-Jan-21 (CTTL, No.J21X00232)	Jan-22

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: September 21, 2021

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM _{x,y,z}
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor $k=2$, which for a normal distribution Corresponds to a coverage probability of approximately 95%.



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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.0 ± 6 %	1.95 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.9 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	55.8 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.6 W/kg ± 18.7 % (k=2)



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Appendix(Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.1Ω- 5.12jΩ
Return Loss	- 25.7dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.058 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 09.16.2021

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1110

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2600$ MHz; $\sigma = 1.949$ S/m; $\epsilon_r = 39.04$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(7.1, 7.1, 7.1) @ 2600 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.3 V/m; Power Drift = 0.01 dB

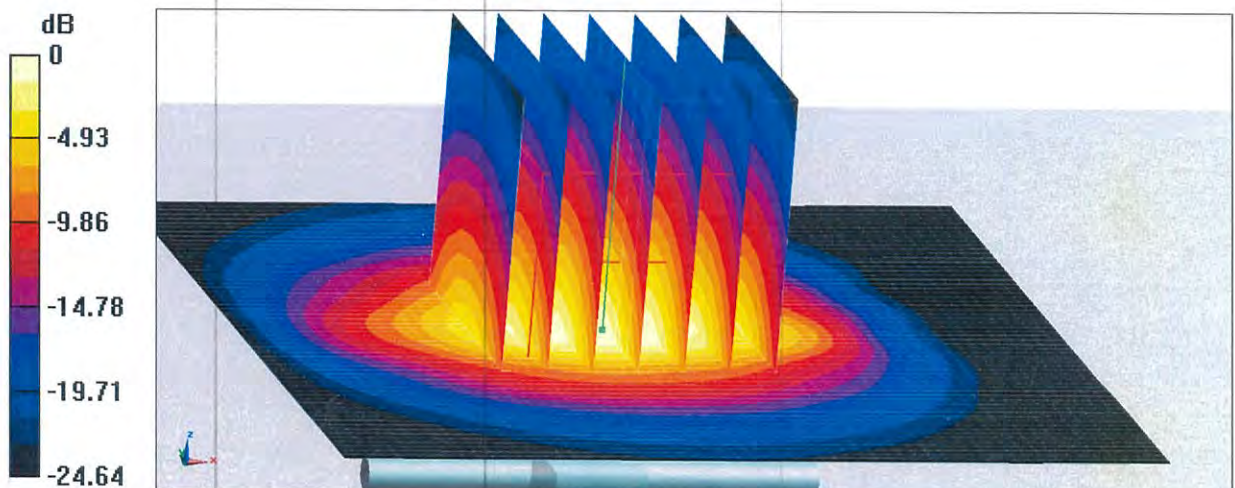
Peak SAR (extrapolated) = 30.6 W/kg

SAR(1 g) = 13.9 W/kg; SAR(10 g) = 6.13 W/kg

Smallest distance from peaks to all points 3 dB below = 9 mm

Ratio of SAR at M2 to SAR at M1 = 45.2%

Maximum value of SAR (measured) = 24.1 W/kg



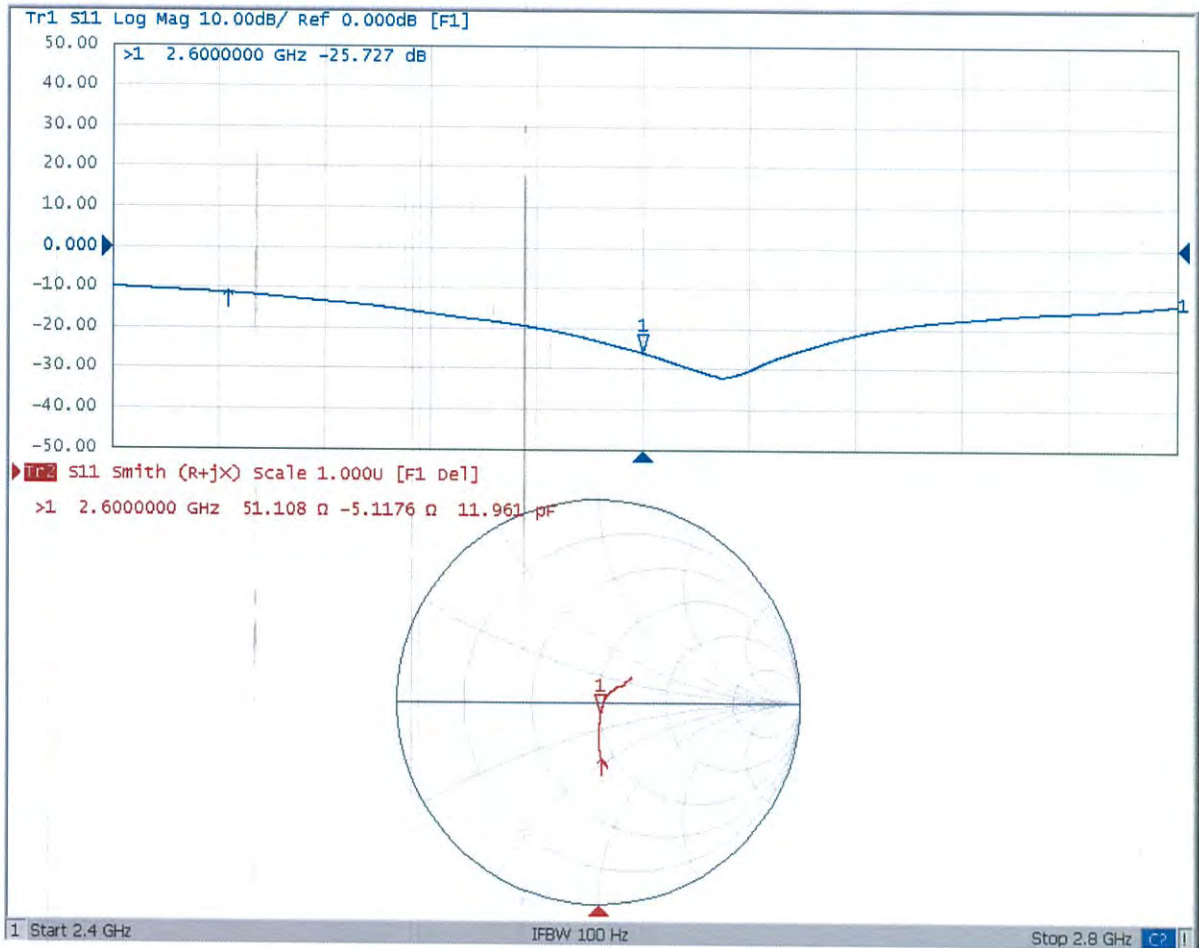
0 dB = 24.1 W/kg = 13.82 dBW/kg



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Impedance Measurement Plot for Head TSL



D2600V2 - SN: 1110 Extended Dipole Calibrations

Referring to KDB 865664 D01, if dipoles are verified in return loss ($< -20\text{dB}$, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

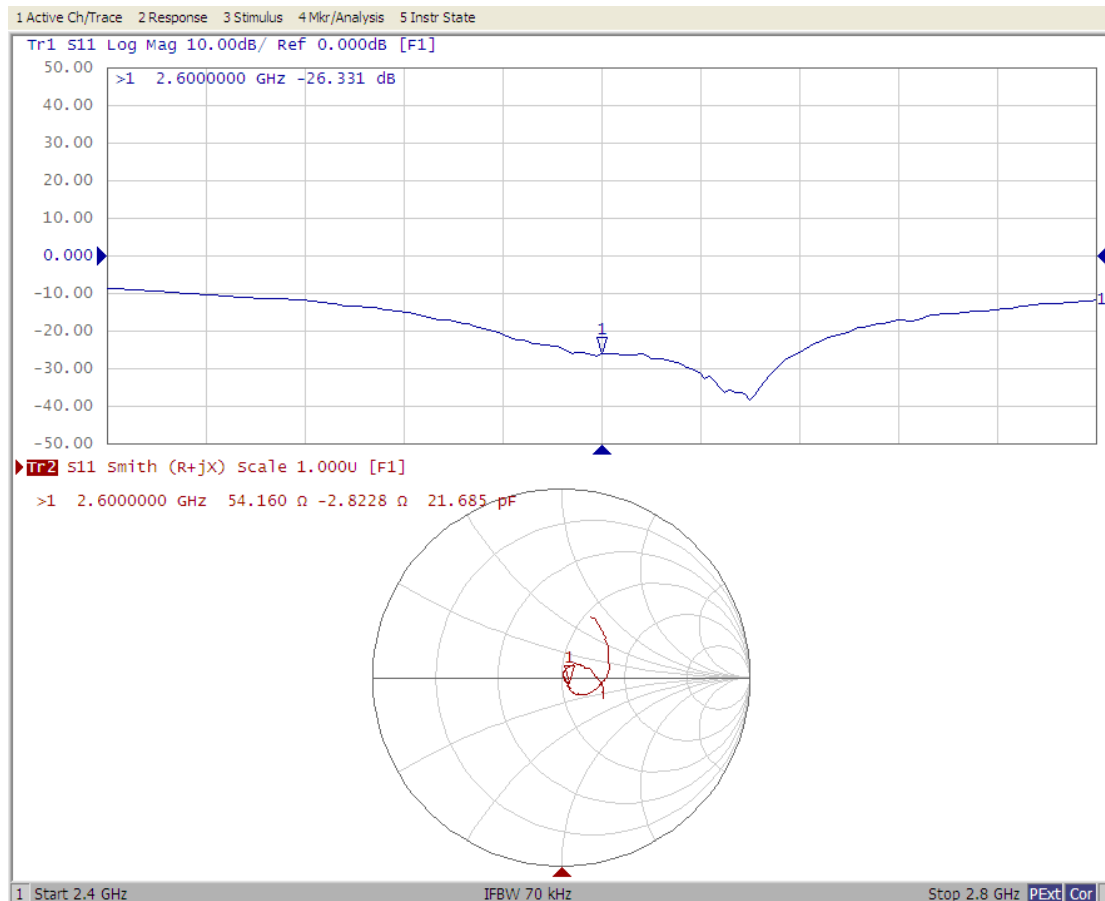
D2600V2 - SN: 1110						
2600 Head						
Date of Measurement	Return-loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2021.09.16	-25.7		51.1		-5.1	
2022.09.16	-26.3	2.7	54.2	3.1	-2.8	2.3

<Justification of the extended calibration>

The return loss is $< -20\text{dB}$, within 20% of prior calibration, and the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

<Dipole Verification Data>

Head 2600MHz _2022.09.16





Appendix D. Conducted Power Result

Band	GSM850				GSM1900				
	Channel	128	189	251	Max. Tune-up Power	512	661	810	Max. Tune-up Power
Frequency	824.2	836.4	848.8		1850.2	1880	1909.8		
GSM	32.39	32.37	32.38	33.50	29.68	29.93	29.90	31.00	
GPRS 1Tx Slot	32.46	32.41	32.37	33.50	29.75	29.95	29.97	31.00	
GPRS 2Tx Slot	30.75	30.62	30.58	31.50	27.89	27.76	27.83	28.50	
GPRS 3Tx Slot	29.05	28.91	28.84	30.00	26.37	26.24	26.28	27.00	
GPRS 4Tx Slot	27.49	27.38	27.28	28.50	24.35	24.30	24.29	25.00	
EDGE 1Tx Slot	26.42	26.36	26.20	27.50	26.23	26.67	26.66	27.50	
EDGE 2Tx Slot	25.15	24.68	24.83	26.00	24.79	25.48	25.28	26.50	
EDGE 3Tx Slot	22.40	21.98	22.18	23.00	22.52	23.37	23.06	24.00	
EDGE 4Tx Slot	19.48	19.21	19.32	20.50	19.30	20.25	20.12	21.00	

Source-Based Time-Averaged Power									
Band	GSM850				Max. Tune-up Power	GSM1900			Max. Tune-up Power
	Channel	128	189	251		512	661	810	
GSM		23.39	23.37	23.38	24.50	20.68	20.93	20.90	22.00
GPRS 1Tx Slot		23.46	23.41	23.37	24.50	20.75	20.95	20.97	22.00
GPRS 2Tx Slot		24.75	24.62	24.58	25.50	21.89	21.76	21.83	22.50
GPRS 3Tx Slot		24.79	24.65	24.58	25.74	22.11	21.98	22.02	22.74
GPRS 4Tx Slot		24.49	24.38	24.28	25.50	21.35	21.30	21.29	22.00
EDGE 1Tx Slot		17.42	17.36	17.20	18.50	17.23	17.67	17.66	18.50
EDGE 2Tx Slot		19.15	18.68	18.83	20.00	18.79	19.48	19.28	20.50
EDGE 3Tx Slot		18.14	17.72	17.92	18.74	18.26	19.11	18.80	19.74
EDGE 4Tx Slot		16.48	16.21	16.32	17.50	16.30	17.25	17.12	18.00

Band	WCDMA II			WCDMA II	WCDMA V			WCDMA V	WCDMA IV			WCDMA V	
	TX Channel	9262	9400		9538	4132	4182		4233	1312	1413		1513
Rx Channel	9662	9800	9938	Max. Tune-up Power	4357	4407	4458	Max. Tune-up Power	4357	4407	4458	Max. Tune-up Power	
Frequency	1852.4	1880	1907.6		826.4	836.4	846.6		1712.4	1732.6	1752.6		
RMC 12.2K	23.21	23.26	23.31	24.00	24.27	24.29	24.31	25.00	21.45	21.46	21.42	22.50	Proposal
HSDPA Subtest-1	22.63	22.68	22.73	23.50	23.49	23.51	23.53	24.50	20.87	20.88	20.84	21.50	0
HSDPA Subtest-2	22.62	22.67	22.72	23.50	23.48	23.50	23.52	24.50	20.86	20.87	20.83	21.50	0
HSDPA Subtest-3	22.11	22.16	22.21	23.00	22.97	22.99	23.01	24.00	20.35	20.36	20.32	21.00	0.5
HSDPA Subtest-4	22.10	22.15	22.20	23.00	22.96	22.98	23.00	24.00	20.34	20.35	20.31	21.00	0.5
DC-HSDPA Subtest-1	22.55	22.62	22.65	23.50	23.41	23.45	23.45	24.50	20.79	20.82	20.76	21.50	0
DC-HSDPA Subtest-2	22.54	22.61	22.64	23.50	23.40	23.44	23.44	24.50	20.78	20.81	20.75	21.50	0
DC-HSDPA Subtest-3	22.12	22.10	22.15	23.00	22.98	22.93	22.95	24.00	20.36	20.30	20.26	21.00	0.5
DC-HSDPA Subtest-4	22.11	22.09	22.14	23.00	22.97	22.92	22.94	24.00	20.35	20.29	20.25	21.00	0.5
HSUPA Subtest-1	22.59	22.64	22.69	23.50	23.45	23.47	23.49	24.50	20.83	20.84	20.80	21.50	0
HSUPA Subtest-2	21.58	21.63	21.68	22.50	22.44	22.46	22.48	23.50	19.82	19.83	19.79	20.50	2
HSUPA Subtest-3	22.06	22.12	22.17	23.00	22.92	22.95	22.97	24.00	20.30	20.32	20.28	21.00	1
HSUPA Subtest-4	21.55	21.61	21.66	22.50	22.41	22.44	22.46	23.50	19.79	19.81	19.77	20.50	2
HSUPA Subtest-5	22.54	22.60	22.65	23.50	23.40	23.43	23.45	24.50	20.78	20.80	20.76	21.50	0
HSPA+ Subtest-1	21.30	21.37	21.42	22.00	22.16	22.20	22.22	23.00	19.54	19.57	19.53	20.50	2.5

		LTE Band 2						
BW	MCS Index	RB Size	RB Offset	Channel			Max. Tune-up (MHz)	
				1870	1890	1910		
20M	QPSK	1	0	23.66	23.71	23.72	24.50	
		1	50	23.71	23.76	23.75	24.50	
		1	99	23.73	23.81	23.79	24.50	
		50	0	22.64	22.72	22.73	23.50	
		50	25	22.73	22.65	22.71	23.50	
		50	50	22.68	22.81	22.68	23.50	
	16QAM	1	0	22.72	22.73	22.73	23.50	
		1	0	22.34	22.36	22.41	23.50	
		1	50	22.52	22.39	22.65	23.50	
		1	99	22.48	22.44	22.71	23.50	
		50	0	21.87	21.81	21.91	22.50	
		50	25	21.81	21.83	21.93	22.50	
64QAM	1	0	21.80	20.96	20.88	21.50		
	1	50	21.89	21.99	22.01	22.50		
	1	99	21.94	22.11	22.04	22.50		
	50	0	20.95	20.95	21.01	21.50		
	50	25	21.01	20.98	20.99	21.50		
	100	0	20.89	20.93	21.02	21.50		
15M	QPSK	1	0	23.65	23.67	23.64	24.50	
		1	37	23.67	23.73	23.69	24.50	
		1	74	23.74	23.80	23.74	24.50	
		36	0	22.58	22.70	22.72	23.50	
		36	19	22.72	22.63	22.66	23.50	
		36	39	22.60	22.54	22.66	23.50	
	16QAM	1	0	22.31	22.35	22.35	23.50	
		1	37	22.48	22.34	22.34	23.50	
		1	74	22.42	22.42	22.68	23.50	
		36	0	21.85	21.73	21.90	22.50	
		36	19	21.73	21.79	21.88	22.50	
		36	39	21.77	21.80	21.85	22.50	
64QAM	1	0	21.70	21.74	21.81	22.50		
	1	0	21.01	22.01	21.92	22.50		
	1	37	21.87	21.92	21.96	22.50		
	1	74	21.98	22.03	22.02	22.50		
	36	0	20.94	20.93	20.93	21.50		
	36	19	20.93	20.88	20.92	21.50		
10M	QPSK	1	0	23.58	23.67	23.67	24.50	
		1	24	23.69	23.68	23.74	24.50	
		1	49	23.65	23.77	23.74	24.50	
		25	0	22.61	22.69	22.71	23.50	
		25	12	22.58	22.56	22.56	23.50	
		25	25	22.62	22.53	22.56	23.50	
	16QAM	1	0	22.27	22.28	22.35	23.50	
		1	24	22.49	22.33	22.63	23.50	
		1	49	22.46	22.37	22.66	23.50	
		25	0	21.81	21.78	21.89	22.50	
		25	12	21.79	21.75	21.92	22.50	
		25	25	21.72	21.82	21.82	22.50	
64QAM	1	0	21.89	21.71	21.88	22.50		
	1	0	21.89	22.00	21.91	22.50		
	1	24	21.86	21.93	21.99	22.50		
	1	49	21.92	22.04	21.99	22.50		
	25	0	20.99	20.97	20.99	21.50		
	25	12	20.99	20.94	20.90	21.50		
5M	QPSK	1	0	23.60	23.68	23.68	24.50	
		1	12	23.68	23.73	23.78	24.50	
		12	0	22.60	22.70	22.68	23.50	
		12	13	22.64	22.56	22.67	23.50	
		25	0	22.61	22.70	22.64	23.50	
		1	0	22.27	22.31	22.39	23.50	
	16QAM	1	0	22.44	22.37	22.60	23.50	
		1	24	22.46	22.36	22.69	23.50	
		12	0	21.79	21.75	21.83	22.50	
		12	6	21.75	21.81	21.87	22.50	
		12	13	21.73	21.81	21.85	22.50	
		25	0	21.65	21.72	21.84	22.50	
64QAM	1	0	21.90	21.99	21.94	22.50		
	1	12	21.81	21.97	21.95	22.50		
	1	24	21.86	22.10	22.02	22.50		
	12	0	20.91	20.90	20.93	21.50		
	12	6	20.92	20.96	20.96	21.50		
	12	13	20.97	20.93	20.91	21.50		
3M	QPSK	1	0	23.58	23.67	23.67	24.50	
		1	7	23.64	23.71	23.73	24.50	
		1	14	23.67	23.74	23.74	24.50	
		8	0	22.65	22.63	22.65	23.50	
		8	7	22.60	22.60	22.66	23.50	
		15	0	22.63	22.67	22.61	23.50	
	16QAM	1	0	22.28	22.35	22.39	23.50	
		1	7	22.47	22.34	22.61	23.50	
		1	14	22.46	22.36	22.70	23.50	
		8	0	21.79	21.77	21.86	22.50	
		8	3	21.78	21.77	21.91	22.50	
		8	7	21.78	21.79	21.82	22.50	
64QAM	1	0	21.85	21.71	21.87	22.50		
	1	0	21.86	22.02	21.88	22.50		
	1	7	21.84	21.91	21.96	22.50		
	1	14	21.93	22.05	22.02	22.50		
	8	0	20.90	20.93	20.94	21.50		
	8	3	20.98	20.88	20.97	21.50		
1.4M	QPSK	1	0	23.60	23.68	23.68	24.50	
		1	2	23.68	23.70	23.73	24.50	
		1	5	23.71	23.74	23.74	24.50	
		3	0	22.62	22.67	22.67	23.50	
		3	1	22.58	22.63	22.63	23.50	
		3	3	22.63	22.53	22.62	23.50	
	16QAM	1	0	22.29	22.29	22.36	23.50	
		1	2	22.50	22.31	22.63	23.50	
		1	5	22.43	22.36	22.70	23.50	
		3	0	22.83	22.76	22.86	23.50	
		3	1	22.73	22.82	22.88	23.50	
		3	3	22.76	22.81	22.85	23.50	
64QAM	1	0	21.85	21.77	21.84	22.50		
	1	0	21.90	21.99	21.94	22.50		
	1	2	21.81	21.97	21.96	22.50		
	1	5	21.92	22.03	22.02	22.50		
	3	0	21.87	21.89	21.93	22.50		
	3	1	21.94	21.94	21.99	22.50		

		LTE Band 4						
BW	MCS Index	RB Size	RB Offset	Channel			Max. Tune-up (MHz)	
				2050	2075	2090		
20M	QPSK	1	0	21.45	21.49	21.53	22.50	
		1	50	21.49	21.55	21.58	22.50	
		1	99	21.67	21.60	21.66	22.50	
		50	0	20.74	20.84	20.66	21.50	
		50	25	20.81	20.83	20.70	21.50	
		50	50	20.67	20.90	20.68	21.50	
	16QAM	1	0	21.04	21.11	21.13	22.00	
		1	0	21.04	21.15	21.16	22.00	
		1	99	20.32	21.17	21.14	22.00	
		50	0	19.82	19.71	19.78	20.50	
		50	25	19.80	19.75	19.85	20.50	
		50	50	19.77	19.72	19.80	20.50	
64QAM	1	0	19.87	19.88	19.73	20.50		
	1	50	19.97	20.04	19.96	20.50		
	1	99	19.63	20.06	19.94	20.50		
	50	0	18.54	19.32	18.99	20.50		
	50	25	19.18	19.33	19.17	20.50		
	50	50	19.56	19.65	19.63	20.50		
15M	QPSK	1	0	21.45	21.45	21.45	22.50	
		1	37	21.45	21.52	21.52	22.50	
		1	74	21.65	21.65	21.62	22.50	
		36	0	20.68	20.49	20.65	21.50	
		36	19	20.60	20.61	20.65	21.50	
		36	39	20.59	20.53	20.78	21.50	
	16QAM	1	0	21.01	21.10	21.07	22.00	
		1	37	21.04	21.12	21.14	22.00	
		1	74	20.26	21.15	21.11	22.00	
		36	0	19.80	19.63	19.77	20.50	
		36	19	19.72	19.71	19.80	20.50	
		36	39	19.74	19.66	19.78	20.50	
64QAM	1	0	19.84	19.74	19.75	20.50		
	1	0	19.81	19.85	19.89	20.50		
	1	37	19.85	19.97	19.91	20.50		
	1	74	19.57	19.98	19.92	20.50		
	36	0	18.93	19.30	18.91	20.50		
	36	19	19.11	19.25	19.11	20.50		
10M	QPSK	1	0	21.37	21.45	21.48	22.50	
		1	24	21.47	21.47	21.57	22.50	
		1	49	21.59	21.56	21.61	22.50	
		25	0	20.71	20.48	20.64	21.50	
		25	12	20.69	20.56	20.65	21.50	
		25	25	20.61	20.52	20.78	21.50	
	16QAM	1	0	20.97	21.03	21.03	22.00	
		1	24	21.05	21.09	21.14	22.00	
		1	49	20.30	21.01	21.09	22.00	
		25	0	19.76	19.63	19.76	20.50	
		25	12	19.68	19.67	19.84	20.50	
		25	25	19.69	19.68	19.75	20.50	
64QAM	1	0	19.83	19.71	19.82	20.50		
	1	0	19.79	19.84	19.68	20.50		
	1	24	19.94	19.98	19.94	20.50		
	1	49	19.61	19.99	19.89	20.50		
	25	0	18.98	19.34	19.30	20.50		
	25	12	19.17	19.31	19.29	20.50		
5M	QPSK	1	0	21.37	21.45	21.48	22.50	
		1	24	21.47	21.47	21.57	22.50	
		1	49	21.59	21.56	21.61	22.50	
		25	0	20.71	20.48	20.64	21.50	
		25	12	20.69	20.56	20.65	21.50	
		25	25	20.61	20.52	20.78	21.50	
	16QAM	1	0	20.97	21.03	21.03	22.00	
		1	24	21.05	21.09	21.14	22.00	
		1	49	20.30	21.01	21.09	22.00	
		25	0	19.76	19.63	19.76	20.50	
		25	12	19.68	19.67	19.84	20.50	
		25	25	19.69	19.68	19.75	20.50	
64QAM	1	0	19.83	19.71				

LTE Band 7												
BW	MCS Index	RB Size	RB Offset	Channel			Max. Tune-up (dBm)					
				2095	2100	2105						
				Low	Mid	High						
				2095	2100	2105						
20M	QPSK	16QAM	1	0	22.01	21.98	21.89	22.50				
			1	50	21.98	21.96	21.77	22.50				
			1	99	22.07	21.77	21.81	22.50				
			50	0	21.27	21.19	21.01	22.00				
			50	25	21.10	21.14	21.00	22.00				
			50	50	21.26	20.95	20.89	22.00				
			100	0	21.09	21.04	20.97	22.00				
			1	0	20.72	20.73	20.69	21.50				
			1	50	20.69	20.65	20.49	21.50				
			1	99	20.77	20.76	20.01	21.50				
	50	0	20.40	20.45	20.17	21.50						
	50	25	20.38	20.38	20.13	21.50						
	50	50	19.89	19.27	19.21	20.50						
	100	0	20.13	20.25	20.11	21.50						
	1	0	20.29	20.23	20.09	21.00						
	1	50	20.18	20.08	19.99	21.00						
	1	99	20.12	20.02	20.02	21.00						
	50	0	19.43	19.38	19.27	20.50						
	50	25	19.44	19.36	19.38	20.50						
	50	50	19.44	19.36	19.38	20.50						
	100	0	19.37	19.29	19.27	20.50						
	15M	QPSK	16QAM	1	0	22.00	21.94	21.81	22.50			
				1	37	21.84	21.93	21.71	22.50			
				1	74	22.05	21.78	21.57	22.50			
				36	0	21.21	21.14	21.00	22.00			
				36	19	21.09	21.12	20.95	22.00			
				36	39	21.18	20.88	20.87	22.00			
				75	0	21.08	21.00	20.94	22.00			
				1	0	20.69	20.72	20.63	21.50			
				1	37	20.65	20.60	20.47	21.50			
1				74	20.71	20.74	19.98	21.50				
36		0	20.38	20.37	20.16	21.50						
36		19	20.30	20.34	20.08	21.50						
36		39	20.38	20.06	20.04	21.50						
75		0	20.12	20.20	20.03	21.50						
1		0	20.23	20.20	20.05	21.00						
1		37	20.16	20.01	19.94	21.00						
1		74	20.06	19.94	20.00	21.00						
36		0	19.42	19.34	19.19	20.50						
36		19	19.52	19.19	19.15	20.50						
36		39	19.42	19.35	19.34	20.50						
75		0	19.35	19.24	19.28	20.50						
10M		QPSK	16QAM	1	0	21.93	21.94	21.84	22.50			
				1	24	21.96	21.88	21.76	22.50			
				1	49	21.99	21.73	21.56	22.50			
				25	0	21.24	21.13	20.99	22.00			
				25	12	21.08	21.07	20.95	22.00			
				25	25	21.20	20.87	20.87	22.00			
				50	0	21.08	21.02	20.89	22.00			
				1	0	20.65	20.65	20.63	21.50			
				1	24	20.68	20.69	20.47	21.50			
	1			49	20.75	20.69	19.96	21.50				
	25	0	20.34	20.37	20.15	21.50						
	25	12	20.36	20.30	20.12	21.50						
	25	25	20.33	20.08	20.01	21.50						
	50	0	20.11	20.17	20.10	21.50						
	1	0	20.21	20.19	20.04	21.00						
	1	24	20.15	20.02	19.97	21.00						
	1	49	20.10	19.95	19.97	21.00						
	25	0	19.27	19.28	19.25	20.50						
	25	12	19.58	19.25	19.13	20.50						
	25	25	19.39	19.28	19.32	20.50						
	50	0	19.38	19.23	19.25	20.50						
	5M	QPSK	16QAM	1	0	21.98	21.91	21.84	22.50			
				1	12	21.96	21.88	21.75	22.50			
				1	24	22.02	21.89	21.60	22.50			
				12	0	21.23	21.14	20.96	22.00			
				12	6	21.02	21.13	20.95	22.00			
				12	13	21.22	20.90	20.88	22.00			
				25	0	21.03	21.02	20.92	22.00			
				1	0	20.65	20.68	20.67	21.50			
				1	12	20.61	20.63	20.44	21.50			
1				24	20.75	20.68	19.99	21.50				
12		0	20.32	20.39	20.09	21.50						
12		6	20.32	20.36	20.07	21.50						
12		13	20.34	20.07	20.04	21.50						
25		0	20.07	20.18	20.06	21.50						
1		0	20.22	20.18	20.07	21.00						
1		12	20.10	20.06	19.93	21.00						
1		24	20.04	20.01	20.00	21.00						
12		0	19.39	19.31	19.19	20.50						
12		6	19.51	19.28	19.19	20.50						
12		13	19.40	19.31	19.30	20.50						
25		0	19.31	19.27	19.24	20.50						

LTE Band 12												
BW	MCS Index	RB Size	RB Offset	Channel			Max. Tune-up (dBm)					
				2306	2305	2310						
				Low	Mid	High						
				2306	2305	2310						
10M	QPSK	16QAM	1	0	23.52	23.50	23.49	24.50				
			1	24	23.49	23.56	23.51	24.50				
			1	49	23.43	23.57	23.52	24.50				
			25	0	22.44	22.55	22.50	23.50				
			25	12	22.56	22.65	22.63	23.50				
			25	25	22.61	22.50	22.64	23.50				
			50	0	22.51	22.64	22.52	23.50				
			1	0	22.77	22.64	22.97	23.50				
			1	24	22.74	22.68	21.61	23.50				
			1	49	22.78	22.72	22.75	23.50				
	25	0	21.62	21.66	21.76	22.50						
	25	12	21.65	21.71	21.79	22.50						
	25	25	21.69	21.63	21.88	22.50						
	50	0	21.67	21.72	21.74	22.50						
	1	0	21.72	21.75	21.71	22.50						
	1	24	21.96	21.83	21.73	22.50						
	1	49	21.77	21.79	21.75	22.50						
	25	0	20.67	20.69	20.54	21.50						
	25	12	20.53	20.61	20.64	21.50						
	25	25	20.68	20.63	20.94	21.50						
	50	0	20.57	20.71	20.67	21.50						
	5M	QPSK	16QAM	1	0	23.47	23.43	23.44	24.50			
				1	12	23.47	23.48	23.49	24.50			
				1	24	23.38	23.49	23.51	24.50			
				12	0	22.40	22.50	22.45	23.50			
				12	6	22.48	22.64	22.58	23.50			
				12	13	22.57	22.45	22.63	23.50			
				25	0	22.45	22.52	22.47	23.50			
				1	0	22.70	22.59	22.95	23.50			
				1	12	22.68	22.66	22.88	23.50			
1				24	22.76	22.64	22.73	23.50				
12		0	21.54	21.60	21.68	22.50						
12		6	21.59	21.69	21.73	22.50						
12		13	21.62	21.58	21.86	22.50						
25		0	21.61	21.65	21.69	22.50						
1		0	21.65	21.70	21.69	22.50						
1		12	21.88	21.81	21.67	22.50						
1		24	21.69	21.78	21.73	22.50						
12		0	20.63	20.64	20.46	21.50						
12		6	20.45	20.60	20.62	21.50						
12		13	20.62	20.58	20.86	21.50						
25		0	20.51	20.69	20.64	21.50						
1.4M		QPSK	16QAM	1	0	23.44	23.46	23.44	24.50			
				1	2	23.46	23.50	23.49	24.50			
				1	5	23.41	23.50	23.47	24.50			
				3	0	23.38	23.47	23.48	24.50			
				3	1	23.56	23.63	23.55	24.50			
				3	3	23.56	23.42	23.58	24.50			
				6	0	22.50	22.48	22.50	23.50			
				1	0	22.72	22.57	22.92	23.50			
				1	2	22.72	22.60	22.89	23.50			
	1			5	22.73	22.64	22.74	23.50				
	3	0	22.58	22.61	22.71	23.50						
	3	1	22.57	22.70	22.74	23.50						
	3	3	22.65	22.58	22.87	23.50						
	6	0	21.61	21.70	21.69	22.50						
	1	0	21.65	21.70	21.69	22.50						
	1	2	21.88	21.81	21.68	22.50						
	1	5	21.75	21.71	21.73	22.50						
	3	0	21.59	21.63	21.46	22.50						
	3	1	21.47	21.59	21.58	22.50						
	3	3	21.61	21.51	21.93	22.50						
	6	0	20.53	20.66	20.62	21.50						

LTE Band 13											
BW	MCS Index	RB Size	RB Offset	Channel			Max. Tune-up (dBm)				
				2326	2330	2335					
				Low	Mid	High					
				2326	2330	2335					
10M	QPSK	16QAM	1	0	23.26	23.26	23.26	24.50			
			1	24	23.45	23.45	23.45	24.50			
			1	49	23.78	23.78	23.78	24.50			
			25	0	22.63	22.63	22.63	23.50			
			25	12	22.77	22.77	22.7				

LTE Band 17									
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	Max. Time-up (dBm)		
		Channel		2378.0	2379.0	2380.0			
		Frequency (MHz)		799	799	799			
10M	QPSK	1	0	23.46	23.50	23.51	24.50		
		1	24	23.37	23.42	23.37	24.50		
		1	49	23.42	23.48	23.42	24.50		
		25	0	22.51	22.53	22.72	23.50		
		25	12	22.50	22.70	22.57	23.50		
		25	25	22.59	22.59	22.59	23.50		
		50	0	22.49	22.58	22.61	23.50		
		1	0	22.86	22.75	22.90	23.50		
		1	24	22.82	22.74	22.77	23.50		
		1	49	22.55	22.65	22.57	23.50		
	16QAM	25	0	21.67	22.65	21.58	22.50		
		25	12	21.66	21.63	21.61	22.50		
		25	25	21.63	21.58	21.82	22.50		
		50	0	21.59	21.68	21.60	22.50		
		1	0	21.70	21.79	21.84	22.50		
		1	24	21.81	21.55	21.75	22.50		
		1	49	21.77	21.64	21.61	22.50		
		25	0	20.74	20.81	20.50	21.50		
		25	12	20.55	20.82	20.52	21.50		
		25	25	20.99	21.07	21.06	21.50		
	64QAM	50	0	20.61	20.78	20.71	21.50		
		BW MCS Index Channel 2378.0 2379.0 2380.0 Max. Time-up							
				Frequency (MHz)		798.5	799	799.5	
		5M	QPSK	1	0	23.41	23.43	23.46	24.50
				1	12	23.35	23.34	23.35	24.50
1				24	23.37	23.40	23.41	24.50	
12				0	22.47	22.48	22.67	23.50	
12				6	22.42	22.69	22.52	23.50	
12				13	22.55	22.54	22.58	23.50	
25				0	22.43	22.58	22.56	23.50	
1	0			22.73	22.70	22.58	23.50		
1	12			22.54	22.72	22.72	23.50		
1	24			22.53	22.57	22.55	23.50		
16QAM	12	0	21.59	22.59	21.50	22.50			
	12	6	21.60	21.61	21.55	22.50			
	12	13	21.56	21.53	21.60	22.50			
	25	0	21.53	21.61	21.55	22.50			
	1	0	21.83	21.74	21.82	22.50			
	1	12	21.73	21.53	21.69	22.50			
	1	24	21.69	21.63	21.59	22.50			
	12	0	20.70	20.76	20.42	21.50			
	12	6	20.47	20.81	20.50	21.50			
	12	13	20.95	21.02	20.98	21.50			
25	0	20.55	20.78	20.68	21.50				

LTE Band 66										
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	Max. Time-up (dBm)			
		Channel		13267.2	13272	13272				
		Frequency (MHz)		1729	1745	1776				
20M	QPSK	1	0	21.59	21.61	21.65	22.50			
		1	50	21.67	21.63	21.78	22.50			
		1	99	21.72	21.69	21.85	22.50			
		50	0	20.80	20.75	20.75	21.50			
		50	25	20.80	20.77	20.85	21.50			
		50	50	20.86	20.83	20.88	21.50			
		100	0	20.76	20.85	20.87	21.50			
		1	0	20.78	21.18	20.79	22.00			
		1	50	20.87	21.21	20.98	22.00			
		1	99	20.95	21.26	21.01	22.00			
		50	0	19.91	19.94	19.86	21.00			
		50	25	19.92	19.96	19.90	21.00			
		50	50	19.89	20.01	19.98	21.00			
		100	0	19.85	19.88	19.84	21.00			
		1	0	19.79	20.17	19.95	21.00			
	1	50	19.81	20.04	19.87	21.00				
	1	99	20.20	20.36	20.07	21.00				
	50	0	19.02	19.06	19.76	20.50				
	50	25	19.19	19.35	19.67	20.50				
	50	50	19.63	19.81	19.95	20.50				
	100	0	19.15	19.49	19.82	20.50				
	15M	QPSK	BW MCS Index Channel 13267.2 13272 13272 Max. Time-up							
					Frequency (MHz)		1729	1745	1776	
			1	0	21.58	21.57	21.57	22.50		
			1	37	21.63	21.60	21.72	22.50		
			1	74	21.70	21.68	21.81	22.50		
			36	0	20.74	20.70	20.74	21.50		
			36	19	20.79	20.75	20.80	21.50		
			36	39	20.78	20.76	20.86	21.50		
			75	0	20.76	20.81	20.84	21.50		
			1	0	20.75	21.17	20.73	22.00		
			1	37	20.83	21.16	20.96	22.00		
			1	74	20.89	21.24	20.98	22.00		
			36	0	19.89	19.86	19.85	21.00		
			36	19	19.84	19.84	19.85	21.00		
			36	39	19.86	19.95	19.96	21.00		
		75	0	19.84	19.83	19.76	21.00			
		1	0	19.73	20.14	19.81	21.00			
		1	37	19.89	19.97	19.92	21.00			
		1	74	20.14	20.28	20.05	21.00			
		36	0	19.01	19.04	19.68	20.50			
		36	19	19.12	19.27	19.61	20.50			
		36	39	19.61	19.80	19.91	20.50			
		75	0	19.13	19.41	19.81	20.50			
		10M	QPSK	BW MCS Index Channel 13267.2 13272 13272 Max. Time-up						
				Frequency (MHz)		1716	1745	1776		
1				0	21.51	21.57	21.60	22.50		
1				24	21.65	21.55	21.77	22.50		
1				49	21.64	21.65	21.80	22.50		
25				0	20.77	20.69	20.73	21.50		
25				12	20.78	20.70	20.80	21.50		
25				25	20.80	20.81	20.86	21.50		
50				0	20.75	20.83	20.79	21.50		
1				0	20.71	21.10	20.73	22.00		
1				24	20.84	21.15	20.96	22.00		
1				49	20.93	21.19	20.96	22.00		
25				0	19.85	19.86	19.84	21.00		
25				12	19.90	19.90	19.89	21.00		
25				25	19.81	19.87	19.81	21.00		
50			0	19.83	19.80	19.83	21.00			
1			0	19.71	20.13	19.90	21.00			
1			24	19.88	19.88	19.95	21.00			
1			49	20.18	20.29	20.02	21.00			
25			0	18.96	18.98	19.74	20.50			
25			12	19.18	19.33	19.59	20.50			
25			25	19.58	19.73	19.88	20.50			
50	0		19.14	19.43	19.80	20.50				
5M	QPSK		BW MCS Index Channel 13199.7 13232 13267.2 Max. Time-up							
					Frequency (MHz)		1712.5	1745	1777.5	
			1	0	21.54	21.54	21.60	22.50		
			1	12	21.65	21.55	21.76	22.50		
			1	24	21.67	21.61	21.84	22.50		
			12	0	20.76	20.70	20.70	21.50		
			12	6	20.72	20.76	20.80	21.50		
			12	13	20.82	20.78	20.87	21.50		
			25	0	20.70	20.83	20.82	21.50		
			1	0	20.71	21.13	20.77	22.00		
			1	12	20.79	21.19	20.93	22.00		
			1	24	20.93	21.18	20.99	22.00		
			12	0	19.83	19.88	19.78	21.00		
			12	6	19.86	19.86	19.84	21.00		
			12	13	19.82	19.96	19.96	21.00		
	25		0	19.79	19.81	19.79	21.00			
	1		0	19.72	20.12	19.93	21.00			
	1		12	19.83	20.02	19.91	21.00			
	1		24	20.12	20.35	20.05	21.00			
	12		0	18.98	19.01	19.88	20.50			
	12		6	19.11	19.34	19.65	20.50			
	12		13	19.59	19.76	19.87	20.50			
	25	0	19.09	19.47	19.79	20.50				
	3M	QPSK	BW MCS Index Channel 13199.7 13232 13267.2 Max. Time-up							
					Frequency (MHz)		1711.5	1745	1778.5	
			1	0	21.53	21.59	21.59	22.50		
			1	7	21.60	21.58	21.76	22.50		
			1	14	21.66	21.62	21.80	22.50		
			8	0	20.73	20.70	20.73	21.50		
			8	3	20.72	20.75	20.79	21.50		
			8	7	20.78	20.82	20.86	21.50		
			15	0	20.72	20.80	20.79	21.50		
			1	0	20.70	21.17	20.77	22.00		
			1	7	20.82	21.16	20.94	22.00		
			1	14	20.93	21.18	21.00	22.00		
			8	0	19.83	19.80	19.81	21.00		
			8	3	19.89	19.92	19.88	21.00		
			8	7	19.87	19.94	19.93	21.00		
		15	0	19.79	19.80	19.82	21.00			
		1	0	19.78	20.15	19.87	21.00			
		1	7	19.86	19.96	19.91	21.00			
		1	14	20.19	20.30	20.05	21.00			
		8	0	18.97	19.04	19.89	20.50			
		8	3	19.17	19.27	19.66	20.50			
		8	7	19.55	19.77	19.90	20.50			
15		0	19.13	19.41	19.81	20.50				
1.4M		QPSK	BW MCS Index Channel 13197.9 13232 13266.5 Max. Time-up							
					Frequency (MHz)		1710.7	1745	1778.3	
			1	0	21.51	21.57	21.60	22.50		
			1	2	21.64	21.57	21.76	22.50		
			1	5	21.70	21.62	21.80	22.50		
			3	0	21.74	21.67	21.73	22.50		
			3	1	21.79	21.75	21.77	22.50		
			3	3	21.81	21.75	21.82	22.50		
			6	0	20.75	20.79	20.85	21.50		
			1	0	20.73	21.11	20.74	22.00		
			1	2	20.85	21.13	20.96	22.00		
			1	5	20.90	21.18	21.00	22.00		
			3	0	20.87	20.89	20.81	22.00		
			3	1	20.84	20.97	20.85	22.00		
			3	3	20.85	20.96	20.97	22.00		
		6	0	19.79	19.86	19.79	21.00			
		1	0	19.72	20.12	19.93	21.00			
		1	2	19.83	20.02	19.92	21.00			
		1	5	20.18	20.28	20.05	21.00			
		3	0	19.94	19.73	19.88	21.00			
		3	1	19.83	20.03	19.81	21.00			
		3	3	19.78	19.93	20.14	21.00			
	6	0	19.11	19.44	19.77	20.50				

2.4GHz WLAN	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit
	802.11b 1Mbps	1	2412	15.21	16.00
		6	2437	17.56	18.50
		11	2462	14.82	15.50
	802.11g 6Mbps	1	2412	14.13	15.00
		6	2437	16.14	17.00
		11	2462	13.77	14.50
	802.11n-HT20 MCS0	1	2412	14.91	15.50
		6	2437	16.52	17.50
		11	2462	14.19	15.00

BR / EDR	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	
	GFSK	CH 0	2402	7.51	8.00	
		CH 39	2441	7.19	8.00	
		CH 78	2480	5.56	7.00	
	DQPSK	CH 0	2402	6.67	8.00	
		CH 39	2441	5.42	7.00	
		CH 78	2480	4.07	5.00	
	8DPSK	CH 0	2402	6.66	8.00	
		CH 39	2441	5.42	7.00	
		CH 78	2480	4.11	5.00	
	BLE	1M	CH 0	2402	-0.76	1.00
			CH 19	2440	-1.16	0.00
CH 39			2480	-2.73	-1.00	