

Normal Mode (Channel 8) Peak data



Normal Mode (Channel 8) Average data



Normal Mode (Channel 9) Peak data



Normal Mode (Channel 9) Average Data



Normal Mode (Channel 12) Peak data



Normal Mode (Channel 12) Average Data



Band Edge measurement for radiated emission in Restricted Band(Radiated) Turbo Mode (Channel 3) Peak data



Turbo Mode (Channel 3) Average data



Turbo Mode (Channel 3) Peak data



Turbo Mode (Channel 3) Average Data



Turbo Mode (Channel 4) Peak data



Turbo Mode (Channel 4) Average data





2.7 RF Exposure Measurement [Section 15.407(f)(4) & 1.1307(b)]

Refer to MPE Test Report

2.8 Frequency Stability [Section 15.407(g)]

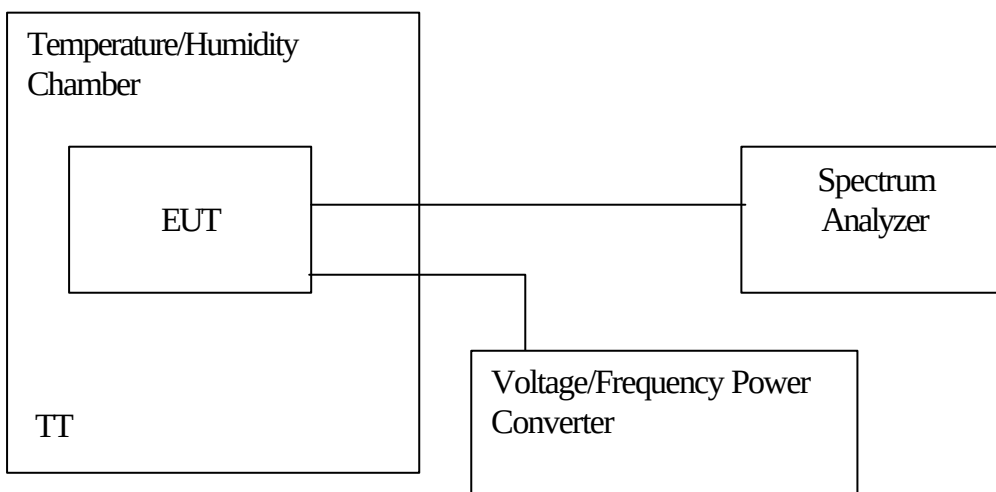
2.8.1 Limits of Frequency Stability Measurement

The frequency tolerance of the carrier sing shall be maintained within +/- 0.02% of the operating frequency over the operation temperature range of EUT (0⁰C~35⁰C), and variation in the primary supply voltage from 85% to 115% of the rated supply voltage (115V AC) at 20⁰C.

2.8.2 Test Procedure

1. The EUT was placed in the Temperature/Humidity Chamber and powered by a Voltage/Frequency Power converter.
2. Connect the RF output of EUT to Spectrum. Turn on the EUT.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the chamber temperature to stabilize. Turn the EUT on and measure the operating frequency after 2, 5, 10 minutes.
5. Set the Voltage/Frequency Power Converter to 85% and 115% of supply voltage, then repeat step 2, 3, 4 respectively.
6. Repeat step 2 , 3, 4, 5 with the temperature of chamber set to the lowest temperature.
7. Repeat step 2 , 3, 4, 5 with the temperature of chamber set to 20⁰C.

2.8.3 Test Setup



2.8.4 Test Data

Please refer to ISL report 04LR018FC part 1.

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3. TEST RESULTS (802.11b)

3.1 Powerline Conducted Emissions [Section 15.207]

3.1.1 EUT Configuration

The conducted emission test setups are in accordance with Figs 9, 10(a) and 10(b) of ANSI C63.4-2001, CFR 47 Part 15 Subpart B; or EN55022:1994/ A1:1995/A2:1997; CISPR 22:1993/A1:1995/A2:1996.

The EUT was set up on the non-conductive table that is 1.0 by 1.5 meter, 80cm above ground. The wall of the shielded room was located 40cm to the rear of the EUT.

Power to the EUT was provided through the LISN. The impedance vs. frequency characteristic of the LISN is complied with the limit shown on the figure 1 of ANSI C63.4-2001.

Both lines (neutral and hot) were connected to the LISN in series at testing. A coaxial-type connector which provides one 50 ohms terminating impedance was provided for connecting the test instrument. The excess length of the power cord was folded back and forth at the center of the lead so as to form a bundle not exceeding 40cm in length.

Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.

If the EUT is a Personal Computer or a peripheral of personal computer, and the personal computer has an auxiliary AC outlet which can be used for providing power to an external monitor, then all measurements will be made with the monitor power from first the computer-mounted AC outlet and then a floor-mounted AC outlet.

3.1.2 Test Procedure

The system was set up as described above, with the EMI diagnostic software running. The main power line conducted EMI tests were run on the hot and neutral conductors of the power cord and the results were recorded. The effect of varying the position of the interface cables has been investigated to find the configuration that produces maximum emission.

At the frequencies where the peak values of the emissions were higher than 6dB below the applicable limits, the emissions were also measured with the quasi-peak detectors. At the frequencies where the quasi-peak values of the emissions were higher than 6dB below the applicable average limits, the emissions were also measured with the average detectors.

The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information which could be useful in reducing their amplitude.

3.1.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

Frequency Range	150 KHz--30MHz
Detector Function	Quasi-Peak/Average
Bandwidth (RBW)	9KHz

3.1.4 Test Data:

Please refer to ISL report 04LR018FC part 1.

3.2 Bandwidth for DSSS [Section 15.247 (a)(2)]

3.2.1 Test Procedure

The Transmitter output of EUT was connected to the spectrum analyzer. The 6 dB bandwidth of the fundamental frequency was measured. The setting of spectrum analyzer is as follows

Equipment mode	Spectrum analyzer
Detector function	Peak mode
RBW	100KHz
VBW	100KHz

3.2.2 Test Setup



3.2.3 Test Data:

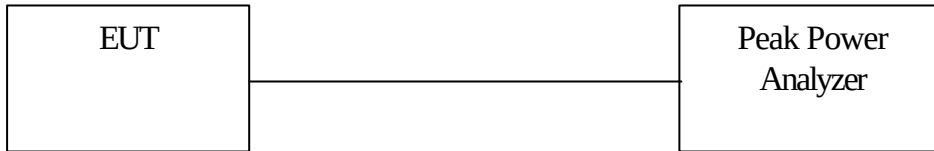
Please refer to ISL report 04LR018FC part 1.

3.3 DSSS Maximum Peak Output Power [Section 15.247 (b)(1)]

3.3.1 Test Procedure

The Transmitter output of EUT was connected to the peak power analyzer.

3.3.2 Test Setup



3.3.3 Test Data

Please refer to ISL report 04LR018FC part 1.

3.4 Radiated Emission Measurement [Section [15.247(c)(4)]

3.4.1 EUT Configuration

The equipment under test was set up on the 10 meter chamber with measurement distance of 3 meters. The EUT was placed on a non-conductive table 80cm above ground.

Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.

3.4.2 Test Procedure

The system was set up as described above, with the EMI diagnostic software running. We found the maximum readings by varying the height of antenna and then rotating the turntable. Both polarization of antenna, horizontal and vertical, are measured.

30M to 1GHz: The highest emissions between 30 MHz to 1000 MHz were also analyzed in details by operating the spectrum analyzer and/or EMI receiver in quasi-peak mode to determine the precise amplitude of the emissions. While doing so, the interconnecting cables and major parts of the system were moved around, the antenna height was varied between one and four meters, its polarization was varied between vertical and horizontal, and the turntable was slowly rotated, to maximize the emission.

1GHz – 25GHz: The highest emissions were also analyzed in details by operating the spectrum analyzer and/or EMI receiver in peak mode to determine the precise amplitude of the emission. While doing so, the interconnecting cables and major parts of the system were moved around, the antenna height was varied between one and four meters, its polarization was varied between vertical and horizontal, and the turntable was slowly rotated, to maximize the emission. During test the EMI receiver and spectrum was setup according to *EMI Receiver/Spectrum Analyzer Configuration*.

For the test of 2nd to 10th harmonics frequencies, the equipment setup was also refer to *EMI Receiver/Spectrum Analyzer Configuration*. The frequencies were tested using Peak mode first, if the test data is higher than the emissions limit, an additional measurement using Average mode will be performed and the average reading will be compared to the limit and record in test report.

3.4.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

Frequency Range Tested:	30MHz~1000MHz
Detector Function:	Quasi-Peak Mode
Resolution Bandwidth (RBW):	120KHz
Video Bandwidth (VBW)	1MHz

Frequency Range Tested:	1GHz – 25 GHz
Detector Function:	Peak Mode
Resolution Bandwidth (RBW):	1MHz
Video Bandwidth (VBW)	1MHz

Frequency Range Tested:	1GHz – 25 GHz
Detector Function:	Average Mode
Resolution Bandwidth (RBW):	1MHz
Video Bandwidth (VBW)	10 Hz

3.4.4 Test Data (30MHz – 1GHz):**30M – 1GHz Open Field Radiated Emissions (Horizontal) Channel 1, 6, 11**

Operator: Mailes Hsieh

Humidity (%): 46

Temperature (C): 25

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
198.78	24.97	8.86	4.18	0.00	38.01	43.50	-5.49	250.00	349.00
231.76	27.04	9.21	4.48	0.00	40.73	46.00	-5.27	250.00	22.00
298.69	22.39	13.57	4.69	0.00	40.66	46.00	-5.34	100.00	185.00
324.88	23.92	13.95	4.75	0.00	42.62	46.00	-3.38	250.00	5.00
350.1	22.68	14.30	4.97	0.00	41.95	46.00	-4.05	100.00	276.00
365.62	22.13	14.83	5.08	0.00	42.04	46.00	-3.96	100.00	185.00
399.57	21.27	15.99	5.32	0.00	42.57	46.00	-3.43	100.00	243.00
431.58	18.66	16.25	5.61	0.00	40.52	46.00	-5.48	150.00	169.00
464.56	15.53	16.78	5.87	0.00	38.18	46.00	-7.82	100.00	5.00
564.47	13.91	19.04	6.57	0.00	39.52	46.00	-6.48	200.00	169.00

30M – 1GHz Open Field Radiated Emissions (Vertical) Channel 1, 6, 11

Operator: Mailes Hsieh

Humidity (%): 46

Temperature (C): 25

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
99.84	17.84	10.27	3.02	0.00	31.13	43.50	-12.37	250.00	152.00
132.82	17.38	11.12	3.52	0.00	32.02	43.50	-11.48	100.00	267.00
231.76	19.92	9.21	4.48	0.00	33.62	46.00	-12.38	150.00	201.00
364.65	14.64	14.80	5.07	0.00	34.51	46.00	-11.49	100.00	267.00
431.58	13.27	16.25	5.61	0.00	35.13	46.00	-10.87	100.00	267.00
497.54	13.52	17.64	6.04	0.00	37.20	46.00	-8.80	100.00	316.00
564.47	8.02	19.04	6.57	0.00	33.63	46.00	-12.37	100.00	250.00
652.74	14.70	19.09	7.05	0.00	40.84	46.00	-5.16	100.00	283.00
660.5	9.65	19.08	7.07	0.00	35.79	46.00	-10.21	150.00	283.00
864.2	6.28	20.54	8.24	0.00	35.07	46.00	-10.93	100.00	50.00

NOTE:

During the Pre-test, the EUT has been tested for Channel 1, 6, 11 transmit from Main and Aux antenna respectively to get all the critical emission frequencies. In the final test all the critical emission frequencies has been tested and the test data are listed above.

Margin = Corrected Amplitude – Limit

Corrected Amplitude = Radiated Amplitude + Antenna Correction Factor + Cable Loss - Pre-Amplifier Gain

A margin of -8dB means that the emission is 8dB below the limit

All frequencies from 30MHz to 1GHz have been tested

3.4.5 Test Data (1GHz – 25 GHz) .**1GHz~ 25 GHz (Horizontal), Channel 1: 2412 MHz**

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
2341.16	60.93	30.93	2.59	46.21	48.25	54.00	-5.75	101	150
2351.15	62.82	30.93	2.61	46.21	50.15	54.00	-3.85	101	153
2501.00	60.56	30.90	2.82	46.21	48.07	54.00	-5.93	102	200
3748.25	47.09	31.85	2.12	46.38	34.68	54.00	-19.32	102	165
4821.68	49.25	34.92	1.28	46.88	38.56	54.00	-15.44	100	18
7227.77	38.33	39.46	3.15	46.21	34.73	54.00	-19.27	101	142

1GHz~ 25 GHz (Vertical), Channel 1: 2412 MHz

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
2351.15	55.73	30.93	2.61	46.21	43.06	54.00	-10.94	101	153
2361.14	60.72	30.93	2.62	46.21	48.06	54.00	-5.94	101	156
2373.63	63.52	30.93	2.64	46.21	50.87	54.00	-3.13	101	160
4821.68	53.88	34.92	1.28	46.88	43.19	54.00	-10.81	100	18
7233.77	44.36	39.47	3.15	46.21	40.78	54.00	-13.22	101	143
9643.36	34.90	40.58	3.17	42.07	36.58	54.00	-17.42	102	7

Note:

“ * ”: Fundamental Frequency

“**”: Not in the restricted band, Limit level=Fundamental Emission-20dB

“ pk”: peak reading

“av”: average reading

“---”: No meter reading data due to the emission level is smaller than spectrum noise level.

The Spectrum noise level+Correction Factor < Limit - 6 dB

Margin=Corrected Amplitude – Limit

Corrected Amplitude=Radiated Amplitude+Antenna Correction Factor+Cable Loss-Pre-Amplifier Gain

A margin of -8dB means that the emission is 8dB below the limit.

All frequencies from 1GHz to 25 GHz have been tested.

1GHz~ 25 GHz (Horizontal), Channel 6 : 2437 MHz

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
2343.66	60.63	30.93	2.60	46.21	47.95	54.00	-6.05	101	151
2366.13	62.95	30.93	2.63	46.21	50.30	54.00	-3.70	101	158
2515.98	62.95	30.91	2.82	46.22	50.45	54.00	-3.55	102	205
4870.63	52.42	35.11	1.25	46.93	41.86	54.00	-12.14	100	13
7305.69	39.46	39.59	3.20	46.18	36.07	54.00	-17.93	101	154
9559.44	33.81	40.77	3.20	42.29	35.49	54.00	-18.51	102	9

1GHz~ 25 GHz (Vertical), Channel 6 : 2437 MHz

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
2363.64	55.48	30.93	2.63	46.21	42.83	54.00	-11.17	101	157
2386.11	62.70	30.92	2.66	46.21	50.08	54.00	-3.92	101	164
4870.63	56.67	35.11	1.25	46.93	46.11	54.00	-7.89	100	13
7317.68	45.63	39.61	3.20	46.17	42.27	54.00	-11.73	101	155
9745.25	35.59	40.36	3.13	41.81	37.28	54.00	-16.72	102	5
12178.8	35.12	42.09	3.71	42.81	38.10	54.00	-15.90	100	132

Note:

“ * ”: Fundamental Frequency

“***”: Not in the restricted band, Limit level=Fundamental Emission-20dB

“ pk”: peak reading

“av”: average reading

“---“: No meter reading data due to the emission level is smaller than spectrum noise level.

The Spectrum noise level+Correction Factor < Limit - 6 dB

Margin=Corrected Amplitude – Limit

Corrected Amplitude=Radiated Amplitude+Antenna Correction Factor+Cable Loss-Pre-Amplifier Gain

A margin of -8dB means that the emission is 8dB below the limit.

All frequencies from 1GHz to 25 GHz have been tested.

1GHz~ 25 GHz (Horizontal), Channel 11: 2462 MHz

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
2358.64	60.30	30.93	2.62	46.21	47.64	54.00	-6.36	101	156
2368.63	63.48	30.93	2.63	46.21	50.84	54.00	-3.16	101	159
2376.12	63.47	30.92	2.64	46.21	50.83	54.00	-3.17	101	161
4923.08	57.41	35.31	1.23	46.97	46.97	54.00	-7.03	100	8
7383.62	41.30	39.71	3.25	46.14	38.11	54.00	-15.89	101	165
9841.16	34.75	40.15	3.10	41.56	36.44	54.00	-17.56	101	3

1GHz~ 25 GHz (Vertical), Channel 11 : 2462 MHz

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
2378.62	52.01	30.92	2.65	46.21	39.37	54.00	-14.63	101	162
2388.61	57.00	30.92	2.66	46.21	44.38	54.00	-9.62	101	165
2401.10	60.35	30.92	2.68	46.21	47.74	54.00	-6.26	101	169
4919.58	61.15	35.29	1.23	46.97	50.70	54.00	-3.30	100	8
7305.69	39.38	39.59	3.20	46.18	35.98	54.00	-18.02	101	154
9745.25	34.33	40.36	3.13	41.81	36.01	54.00	-17.99	102	5

Note:

“ * ”: Fundamental Frequency

“***”: Not in the restricted band, Limit level=Fundamental Emission-20dB

“ pk”: peak reading

“av”: average reading

“---”: No meter reading data due to the emission level is smaller than spectrum noise level.

The Spectrum noise level+Correction Factor < Limit - 6 dB

Margin=Corrected Amplitude – Limit

Corrected Amplitude=Radiated Amplitude+Antenna Correction Factor+Cable Loss-Pre-Amplifier Gain

A margin of -8dB means that the emission is 8dB below the limit.

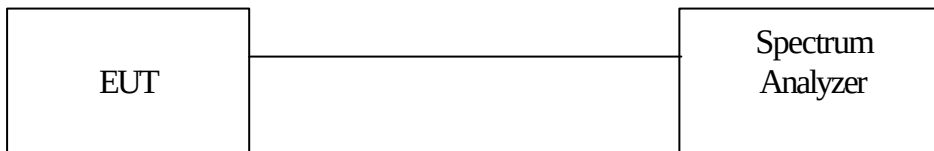
All frequencies from 1GHz to 25 GHz have been tested.

3.5 Band Edge Measurement

3.5.1 Test Procedure (Conducted)

1. The transmitter output of EUT was connected to the spectrum analyzer.
Equipment mode: Spectrum analyzer
Detector function: Peak mode
SPAN: 100MHz
RBW: 100KHz
VBW: 100KHz
Center frequency: 2.4GHz, 2.4835GHz.
2. Using Peak Search to read the peak power of Carrier frequencies after Maximum Hold function is completed
3. Find the next peak frequency outside the operation frequency band

3.5.2 Test Setup (Conducted)



3.5.3 Test Data:

Please refer to ISL report 04LR018FC part 1.

3.5.4 Test Procedure (Radiated)

1. Antenna and Turntable test procedure same as Radiated Emission Measurement.
Equipment mode: Spectrum analyzer
Detector function: Peak mode
SPAN: 100MHz
RBW: 1MHz
VBW: 1MHz
Center frequency: 2.395GHz, 2.48GHz.
2. Using Peak Search to read the peak power of Carrier frequencies after Maximum Hold function is completed.
3. Find the next peak frequency outside the operation frequency band
4. For peak frequency emission level measurement in Restricted Band ,
Change RBW: 1MHz
VBW: 10Hz
Span: 100MHz.
5. Get the spectrum reading after Maximum Hold function is completed.

3.5.5 Test Setup (Radiated)

Same as *Radiated Emission Measurement*

3.5.6 Test Data

Table Band Edge measurement (Radiated)

Temp. (deg. C): 25

Test Engr: Mailes
Hsieh

Humidity (%): 50

Channel	Frequency (MHz)	Spectrum Reading (dBuV)	Correction Factor (dB/m)	Emission Level (dBuV/m)	dBc (Limit: > 20dBc)	Limit (dBuV/m)	Equip. Setup VBW	Pass or Fail
1(peak mode)	2410.8	78.62	31.1	109.72	---	---	1MHz	---
Outside band	2397.1	47.39	31.1	78.49	31.23	---	1MHz	Pass
1(average mode)	2412.7	70.35	31.1	101.45	---	---	10Hz	---
Restricted band	2387.2	20.21	31.1	51.31	---	54	10Hz	Pass
11(peak mode)	2460.8	77.72	31.1	108.82	---	---	1MHz	---
Outside band	2488	45.51	31.1	76.61	32.21	---	1MHz	Pass
11(average mode)	2460.2	68.36	31.1	99.46	---	---	10Hz	---
Restricted band	2487.3	21.52	31.1	52.62	---	54	10Hz	Pass

Note:

The Spectrum plot of emission level measurement in Restricted band is attached.

Emission Level=Spectrum Reading+Correction Factor

Correction Factor=Antenna Factor+cable loss–amplifier gain

Both Horizontal and Vertical polarizaion have been tested and the worst data is listed above.

**Band Edge measurement for radiated emission in Restricted Band(Radiated)
Peak Mode (Channel 1)**



**Band Edge measurement for radiated emission in Restricted Band(Radiated)
Average Mode (Channel 1)**



**Band Edge measurement for radiated emission in Restricted Band(Radiated)
Peak Mode (Channel 11)**



**Band Edge measurement for radiated emission in Restricted Band(Radiated)
Average Mode (Channel 11)**



3.6 RF Exposure Measurement [Section 15.247(b)(4) & 1.1307(b)]

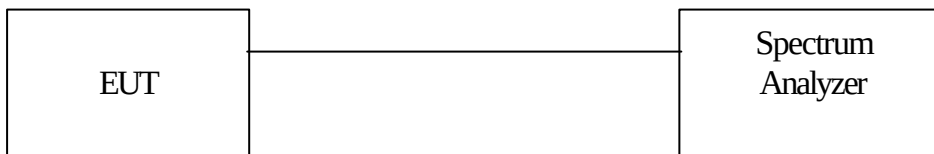
See MPE report

3.7 DSSS Peak Power Spectral Density [Section 15.247(d)]

3.7.1 Test Procedure

1. The Transmitter output of EUT was connected to the spectrum analyzer.
Equipment mode: Spectrum analyzer
Detector function: Peak mode
SPAN:1.5MHz
RBW: 3KHz
VBW: 30KHz
Center frequency: fundamental frequency tested.
Sweep time= 500 sec.
2. Using Peak Search to read the peak power after Maximum Hold function is completed.

3.7.2 Test Setup



3.7.3 Test Data

Please refer to ISL report 04LR018FC part 1.

4. TEST RESULTS (802.11g)

4.1 Powerline Conducted Emissions [Section 15.207]

4.1.1 EUT Configuration

The conducted emission test setups are in accordance with Figs 9, 10(a) and 10(b) of ANSI C63.4-2001, CFR 47 Part 15 Subpart B; or EN55022:1994/ A1:1995/A2:1997; CISPR 22:1993/A1:1995/A2:1996.

The EUT was set up on the non-conductive table that is 1.0 by 1.5 meter, 80cm above ground. The wall of the shielded room was located 40cm to the rear of the EUT.

Power to the EUT was provided through the LISN. The impedance vs. frequency characteristic of the LISN is complied with the limit shown on the figure 1 of ANSI C63.4-2001.

Both lines (neutral and hot) were connected to the LISN in series at testing. A coaxial-type connector which provides one 50 ohms terminating impedance was provided for connecting the test instrument. The excess length of the power cord was folded back and forth at the center of the lead so as to form a bundle not exceeding 40cm in length.

Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.

If the EUT is a Personal Computer or a peripheral of personal computer, and the personal computer has an auxiliary AC outlet which can be used for providing power to an external monitor, then all measurements will be made with the monitor power from first the computer-mounted AC outlet and then a floor-mounted AC outlet.

4.1.2 Test Procedure

The system was set up as described above, with the EMI diagnostic software running. The main power line conducted EMI tests were run on the hot and neutral conductors of the power cord and the results were recorded. The effect of varying the position of the interface cables has been investigated to find the configuration that produces maximum emission.

At the frequencies where the peak values of the emissions were higher than 6dB below the applicable limits, the emissions were also measured with the quasi-peak detectors. At the frequencies where the quasi-peak values of the emissions were higher than 6dB below the applicable average limits, the emissions were also measured with the average detectors.

The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information which could be useful in reducing their amplitude.

4.1.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

Frequency Range	150 KHz--30MHz
Detector Function	Quasi-Peak/Average
Bandwidth (RBW)	9KHz

4.1.4 Test Data:

Please refer to ISL report 04LR018FC part 1.

4.2 Bandwidth for DSSS [Section 15.247 (a)(2)]

4.2.1 Test Procedure

The Transmitter output of EUT was connected to the spectrum analyzer. The 6 dB bandwidth of the fundamental frequency was measured. The setting of spectrum analyzer is as follows

Equipment mode	Spectrum analyzer
Detector function	Peak mode
RBW	100KHz
VBW	100KHz

4.2.2 Test Setup



4.2.3 Test Data:

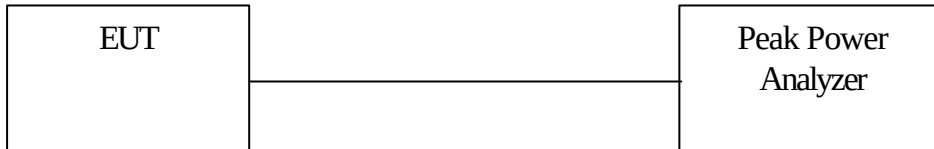
Please refer to ISL report 04LR018FC part 1.

4.3 DSSS Maximum Peak Output Power [Section 15.247 (b)(1)]

4.3.1 Test Procedure

The Transmitter output of EUT was connected to the peak power analyzer.

4.3.2 Test Setup



4.3.3 Test Data

Please refer to ISL report 04LR018FC part 1.

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4.4 Radiated Emission Measurement [Section [15.247(c)(4)]

4.4.1 EUT Configuration

The equipment under test was set up on the 10 meter chamber with measurement distance of 3 meters. The EUT was placed on a non-conductive table 80cm above ground.

Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.

4.4.2 Test Procedure

The system was set up as described above, with the EMI diagnostic software running. We found the maximum readings by varying the height of antenna and then rotating the turntable. Both polarization of antenna, horizontal and vertical, are measured.

30M to 1GHz: The highest emissions between 30 MHz to 1000 MHz were also analyzed in details by operating the spectrum analyzer and/or EMI receiver in quasi-peak mode to determine the precise amplitude of the emissions. While doing so, the interconnecting cables and major parts of the system were moved around, the antenna height was varied between one and four meters, its polarization was varied between vertical and horizontal, and the turntable was slowly rotated, to maximize the emission.

1GHz – 25GHz: The highest emissions were also analyzed in details by operating the spectrum analyzer and/or EMI receiver in peak mode to determine the precise amplitude of the emission. While doing so, the interconnecting cables and major parts of the system were moved around, the antenna height was varied between one and four meters, its polarization was varied between vertical and horizontal, and the turntable was slowly rotated, to maximize the emission. During test the EMI receiver and spectrum was setup according to *EMI Receiver/Spectrum Analyzer Configuration*.

For the test of 2nd to 10th harmonics frequencies, the equipment setup was also refer to *EMI Receiver/Spectrum Analyzer Configuration*. The frequencies were tested using Peak mode first, if the test data is higher than the emissions limit, an additional measurement using Average mode will be performed and the average reading will be compared to the limit and record in test report.

4.4.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

Frequency Range Tested:	30MHz~1000MHz
Detector Function:	Quasi-Peak Mode
Resolution Bandwidth (RBW):	120KHz
Video Bandwidth (VBW)	1MHz

Frequency Range Tested:	1GHz – 25 GHz
Detector Function:	Peak Mode
Resolution Bandwidth (RBW):	1MHz
Video Bandwidth (VBW)	1MHz

Frequency Range Tested:	1GHz – 25 GHz
Detector Function:	Average Mode
Resolution Bandwidth (RBW):	1MHz
Video Bandwidth (VBW)	10 Hz

4.4.4 Test Data (30MHz – 1GHz):**30M – 1GHz Open Field Radiated Emissions (Horizontal) Channel 1, 6, 11**

Operator: Mailes Hsieh

Humidity (%): 46

Temperature (C): 25

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
99.84	22.52	10.27	3.02	0.00	35.81	43.50	-7.69	150.00	186.00
198.78	24.87	8.86	4.18	0.00	37.91	43.50	-5.59	200.00	23.00
232.73	27.81	9.33	4.50	0.00	41.64	46.00	-4.36	100.00	72.00
298.69	21.92	13.57	4.69	0.00	40.19	46.00	-5.81	150.00	235.00
397.63	20.13	15.92	5.30	0.00	41.36	46.00	-4.64	250.00	304.00
431.58	19.22	16.25	5.61	0.00	41.08	46.00	-4.92	100.00	218.00
465.53	14.54	16.80	5.88	0.00	37.22	46.00	-8.78	100.00	56.00
497.54	19.08	17.64	6.04	0.00	42.75	46.00	-3.25	100.00	354.00
564.47	13.18	19.04	6.57	0.00	38.79	46.00	-7.21	100.00	354.00
863.23	9.40	20.55	8.23	0.00	38.18	46.00	-7.82	100.00	186.00

30M – 1GHz Open Field Radiated Emissions (Vertical) Channel 1, 6, 11

Operator: Mailes Hsieh

Humidity (%): 46

Temperature (C): 25

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
42.61	14.98	10.99	1.79	0.00	27.75	40.00	-12.25	250.00	107.00
133.79	18.55	11.02	3.52	0.00	33.09	43.50	-10.41	100.00	222.00
231.76	20.26	9.21	4.48	0.00	33.95	46.00	-12.05	200.00	156.00
365.62	15.30	14.83	5.08	0.00	35.20	46.00	-10.80	100.00	206.00
431.58	12.91	16.25	5.61	0.00	34.77	46.00	-11.23	100.00	222.00
497.54	13.07	17.64	6.04	0.00	36.74	46.00	-9.26	150.00	271.00
643.04	9.24	19.07	7.00	0.00	35.32	46.00	-10.68	100.00	238.00
651.77	15.37	19.10	7.04	0.00	41.51	46.00	-4.49	100.00	222.00
661.47	9.04	19.08	7.07	0.00	35.18	46.00	-10.82	100.00	238.00
864.2	6.00	20.54	8.24	0.00	34.78	46.00	-11.22	100.00	156.00

NOTE:

During the Pre-test, the EUT has been tested for Channel 1, 6, 11 transmit from Main and Aux antenna respectively to get all the critical emission frequencies. In the final test all the critical emission frequencies have been tested and the test data are listed above.

Margin = Corrected Amplitude – Limit

Corrected Amplitude = Radiated Amplitude + Antenna Correction Factor + Cable Loss - Pre-Amplifier Gain

A margin of -8dB means that the emission is 8dB below the limit

All frequencies from 30MHz to 1GHz have been tested

4.4.5 Test Data (1GHz – 25 GHz) .**1GHz~ 25 GHz (Horizontal), Channel 1: 2412 MHz**

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
2298.70	46.30	30.94	2.53	46.21	33.57	54.00	-20.43	101	137
2518.48	52.41	30.91	2.82	46.22	39.91	54.00	-14.09	102	206
2685.81	46.31	30.97	2.82	46.35	33.76	54.00	-20.24	102	258
3758.74	47.89	31.86	2.12	46.37	35.50	54.00	-18.50	102	162
4821.68	40.73	34.92	1.28	46.88	30.05	54.00	-23.95	100	18
9367.63	33.70	40.90	3.21	42.56	35.25	54.00	-18.75	102	13

1GHz~ 25 GHz (Vertical), Channel 1: 2412 MHz

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
2123.88	45.88	30.98	2.29	46.20	32.94	54.00	-21.06	100	82
2590.91	45.20	30.94	2.82	46.28	32.67	54.00	-21.33	102	229
2685.81	45.32	30.97	2.82	46.35	32.77	54.00	-21.23	102	258
3758.74	51.91	31.86	2.12	46.37	39.53	54.00	-14.47	102	162
4828.67	45.20	34.95	1.27	46.89	34.53	54.00	-19.47	100	17
9505.49	33.84	40.89	3.22	42.44	35.51	54.00	-18.49	102	10

Note:

“ * ”: Fundamental Frequency

“**”: Not in the restricted band, Limit level=Fundamental Emission-20dB

“ pk”: peak reading

“av”: average reading

“---”: No meter reading data due to the emission level is smaller than spectrum noise level.

The Spectrum noise level+Correction Factor < Limit - 6 dB

Margin=Corrected Amplitude – Limit

Corrected Amplitude=Radiated Amplitude+Antenna Correction Factor+Cable Loss-Pre-Amplifier Gain

A margin of -8dB means that the emission is 8dB below the limit.

All frequencies from 1GHz to 25 GHz have been tested.

1GHz~ 25 GHz (Horizontal), Channel 6 : 2437 MHz

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
2338.66	53.88	30.93	2.59	46.21	41.20	54.00	-12.80	101	149
2353.65	58.56	30.93	2.61	46.21	45.90	54.00	-8.10	101	154
2528.47	50.22	30.91	2.82	46.23	37.72	54.00	-16.28	102	209
3751.75	48.17	31.85	2.12	46.38	35.77	54.00	-18.23	102	164
4874.13	42.13	35.12	1.25	46.93	31.57	54.00	-22.43	100	13
9397.60	33.18	40.90	3.21	42.53	34.76	54.00	-19.24	102	12

1GHz~ 25 GHz (Vertical), Channel 6 : 2437 MHz

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
2366.13	50.34	30.93	2.63	46.21	37.69	54.00	-16.31	101	158
2595.90	44.88	30.94	2.82	46.28	32.35	54.00	-21.65	102	230
2773.23	47.32	31.01	2.82	46.41	34.74	54.00	-19.26	102	286
3758.74	52.02	31.86	2.12	46.37	39.64	54.00	-14.36	102	162
4870.63	46.39	35.11	1.25	46.93	35.82	54.00	-18.18	100	13
7311.69	38.52	39.60	3.20	46.17	35.14	54.00	-18.86	101	155

Note:

“ * ”: Fundamental Frequency

“ *** ”: Not in the restricted band, Limit level=Fundamental Emission-20dB

“ pk ”: peak reading

“ av ”: average reading

“ --- ”: No meter reading data due to the emission level is smaller than spectrum noise level.

The Spectrum noise level+ Correction Factor < Limit - 6 dB

Margin=Corrected Amplitude – Limit

Corrected Amplitude=Radiated Amplitude+Antenna Correction Factor+Cable Loss-Pre-Amplifier Gain

A margin of -8dB means that the emission is 8dB below the limit.

All frequencies from 1GHz to 25 GHz have been tested.

1GHz~ 25 GHz (Horizontal), Channel 11: 2462 MHz

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
2373.63	55.52	30.93	2.64	46.21	42.88	54.00	-11.12	101	160
2381.12	58.63	30.92	2.65	46.21	46.00	54.00	-8.00	101	163
2580.92	47.98	30.93	2.82	46.27	35.47	54.00	-18.53	102	225
3751.75	48.26	31.85	2.12	46.38	35.85	54.00	-18.15	102	164
4923.08	44.30	35.31	1.23	46.97	33.86	54.00	-20.14	100	8
10626.4	32.82	39.43	3.33	40.75	34.83	54.00	-19.17	102	146

1GHz~ 25 GHz (Vertical), Channel 11 : 2462 MHz

Operator: Mailes Hsieh

RBW: 1 MHz

Humidity (%): 46

Temperature (C): 25

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
2121.38	49.47	30.98	2.28	46.20	36.52	54.00	-17.48	100	81
2768.23	50.73	31.01	2.82	46.41	38.15	54.00	-15.85	102	284
3758.74	51.45	31.86	2.12	46.37	39.07	54.00	-14.93	102	162
4923.08	48.76	35.31	1.23	46.97	38.32	54.00	-15.68	100	8
7383.62	42.00	39.71	3.25	46.14	38.82	54.00	-15.18	101	165
12130.9	31.80	42.14	3.69	42.79	34.84	54.00	-19.16	100	119

Note:

“ * ”: Fundamental Frequency

“***”: Not in the restricted band, Limit level=Fundamental Emission-20dB

“pk”: peak reading

“av”: average reading

“---”: No meter reading data due to the emission level is smaller than spectrum noise level.

The Spectrum noise level+Correction Factor < Limit - 6 dB

Margin=Corrected Amplitude – Limit

Corrected Amplitude=Radiated Amplitude+Antenna Correction Factor+Cable Loss-Pre-Amplifier Gain

A margin of -8dB means that the emission is 8dB below the limit.

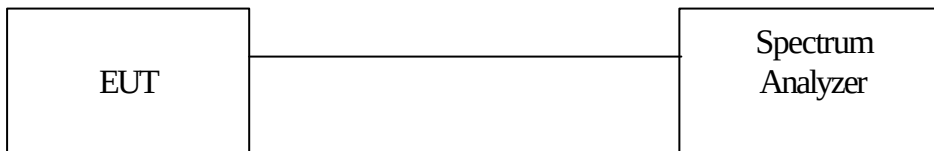
All frequencies from 1GHz to 25 GHz have been tested.

4.5 Band Edge Measurement

4.5.1 Test Procedure (Conducted)

1. The transmitter output of EUT was connected to the spectrum analyzer.
Equipment mode: Spectrum analyzer
Detector function: Peak mode
SPAN: 100MHz
RBW: 100KHz
VBW: 100KHz
Center frequency: 2.4GHz, 2.4835GHz.
2. Using Peak Search to read the peak power of Carrier frequencies after Maximum Hold function is completed
3. Find the next peak frequency outside the operation frequency band

4.5.2 Test Setup (Conducted)



4.5.3 Test Data:

Please refer to ISL report 04LR018FC part 1.

4.5.4 Test Procedure (Radiated)

1. Antenna and Turntable test procedure same as Radiated Emission Measurement.
Equipment mode: Spectrum analyzer
Detector function: Peak mode
SPAN: 100MHz
RBW: 1MHz
VBW: 1MHz
Center frequency: 2.395GHz, 2.48GHz.
2. Using Peak Search to read the peak power of Carrier frequencies after Maximum Hold function is completed.
3. Find the next peak frequency outside the operation frequency band
4. For peak frequency emission level measurement in Restricted Band ,
Change RBW: 1MHz
VBW: 10Hz
Span: 100MHz.
5. Get the spectrum reading after Maximum Hold function is completed.

4.5.5 Test Setup (Radiated)

Same as *Radiated Emission Measurement*

4.5.6 Test Data

Table Band Edge measurement (Radiated)

Temp. (deg. C): 25

Test Engr: Mailes
Hsieh

Humidity (%): 50

Channel	Frequency (MHz)	Spectrum Reading (dBuV)	Correction Factor (dB/m)	Emission Level (dBuV/m)	dBc (Limit: > 20dBc)	Limit (dBuV/m)	Equip. Setup VBW	Pass or Fail
1(peak mode)	2414.9	71.01	31.1	102.11	---	---	1MHz	---
Outside band	2399.9	49.7	31.1	80.8	21.31	---	1MHz	Pass
1(average mode)	2408.5	59.82	31.1	90.92	---	---	10Hz	---
Restricted band	2390	14.2	31.1	45.3	---	54	10Hz	Pass
11(peak mode)	2465	72.2	31.1	103.3	---	---	1MHz	---
Outside band	2477.4	40.38	31.1	71.48	31.82	---	1MHz	Pass
11(average mode)	2455.3	60.68	31.1	91.78	---	---	10Hz	---
Restricted band	2483.6	15.37	31.1	46.47	---	54	10Hz	Pass

Note:

The Spectrum plot of emission level measurement in Restricted band is attached.

Emission Level=Spectrum Reading+Correction Factor

Correction Factor=Antenna Factor+cable loss–amplifier gain

Both Horizontal and Vertical polarizaion have been tested and the worst data is listed above.

**Band Edge measurement for radiated emission in Restricted Band(Radiated)
Peak Mode (Channel 1)**



**Band Edge measurement for radiated emission in Restricted Band(Radiated)
Average Mode (Channel 1)**



**Band Edge measurement for radiated emission in Restricted Band(Radiated)
Peak Mode (Channel 11)**



**Band Edge measurement for radiated emission in Restricted Band(Radiated)
Average Mode (Channel 11)**



4.6 RF Exposure Measurement [Section 15.247(b)(4) & 1.1307(b)]

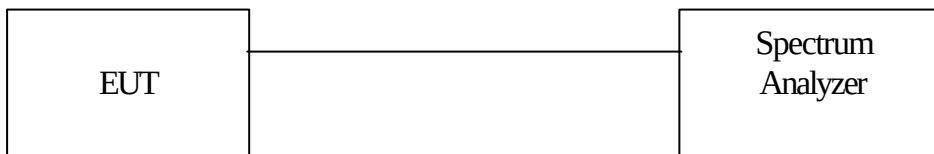
See MPE report

4.7 DSSS Peak Power Spectral Density [Section 15.247(d)]

4.7.1 Test Procedure

1. The Transmitter output of EUT was connected to the spectrum analyzer.
Equipment mode: Spectrum analyzer
Detector function: Peak mode
SPAN:1.5MHz
RBW: 3KHz
VBW: 30KHz
Center frequency: fundamental frequency tested.
Sweep time= 500 sec.
2. Using Peak Search to read the peak power after Maximum Hold function is completed.

4.7.2 Test Setup



4.7.3 Test Data

Please refer to ISL report 04LR018FC part 1.

4.8 Appendix : Antenna Spec.

Please refer to the attached file.