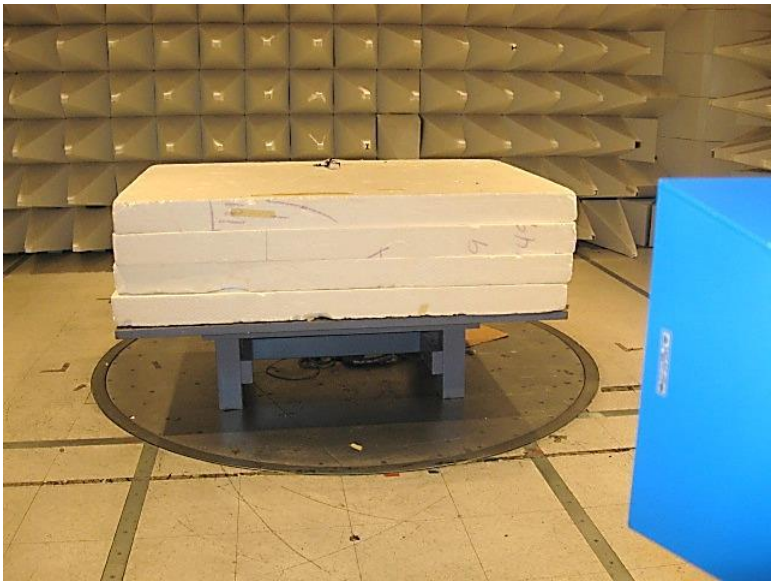
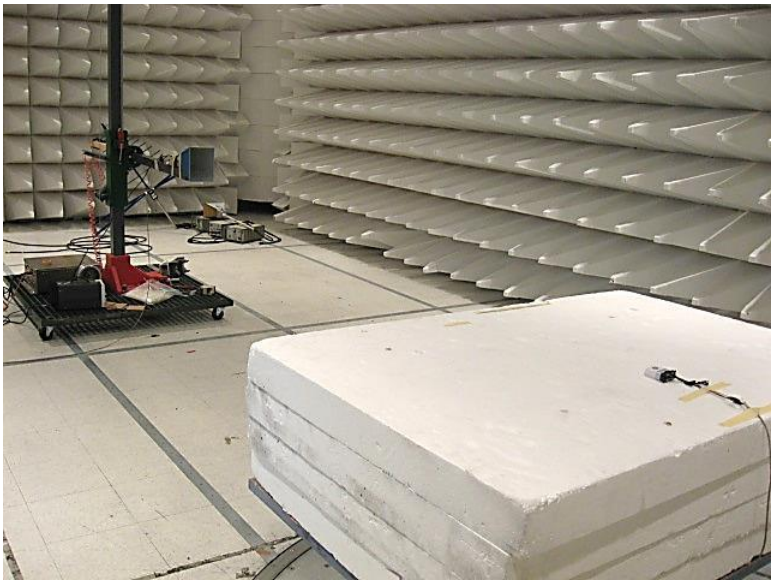
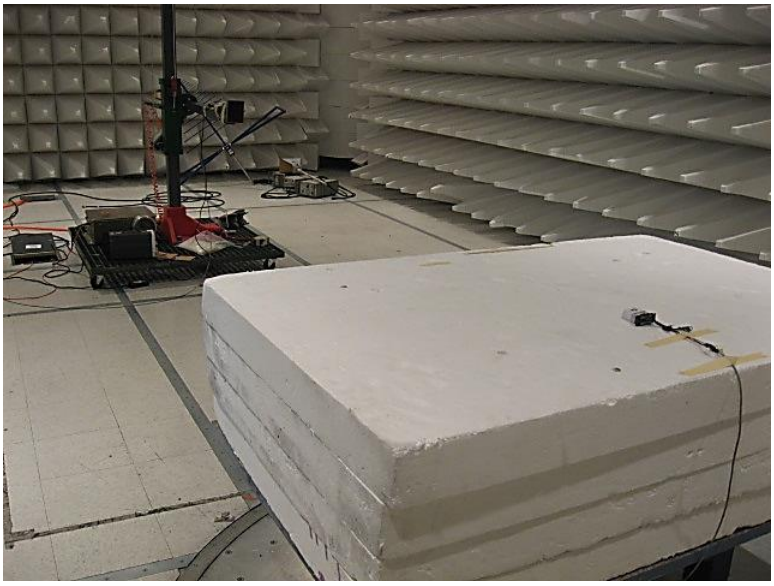


Front View, 4 DQPSK: 12-18GHz



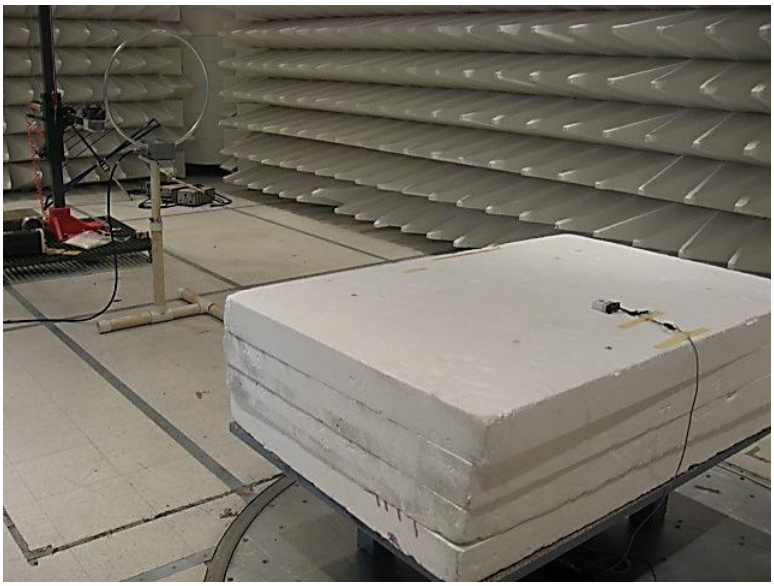
Back View, 4 DQPSK: 12-18GHz

Front View, 4 DQPSK: 18-25GHz

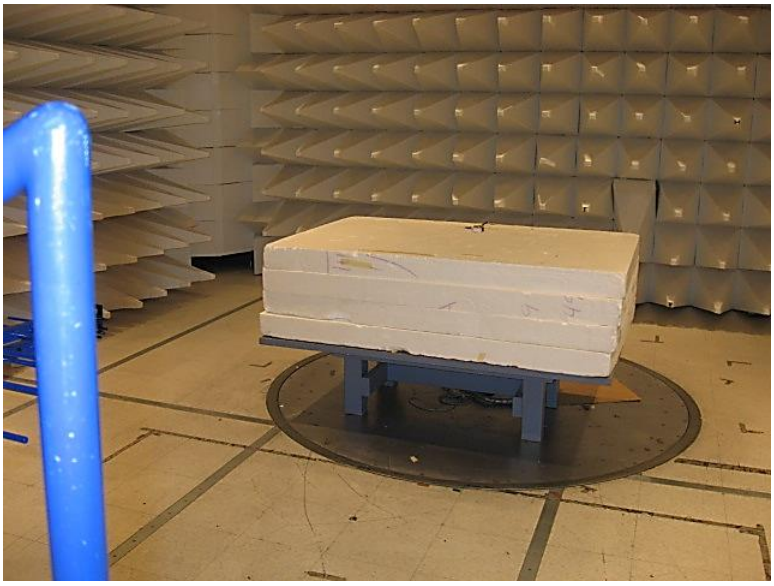


Back View, 4 DQPSK: 18-25GHz

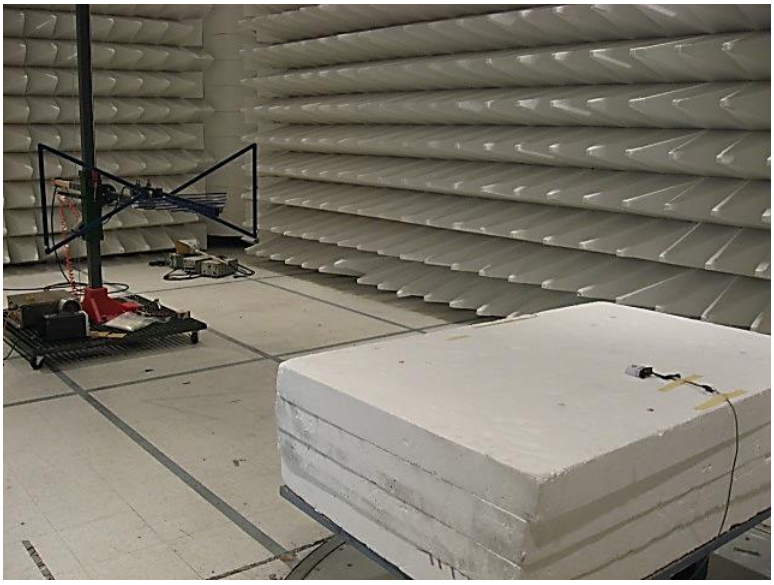
Front View, 8 DPSK: 9kHz - 30MHz



Back View, 8 DPSK: 9kHz - 30MHz

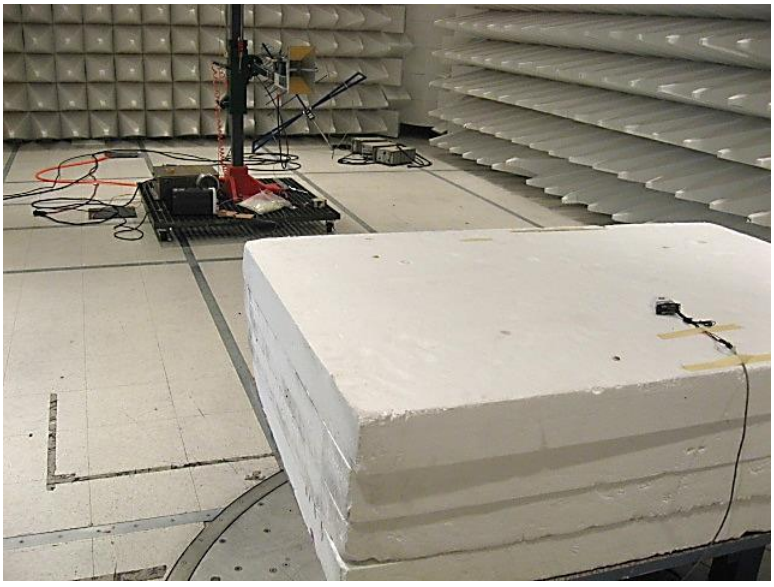


Front View, 8 DPSK: 30MHz – 1GHz

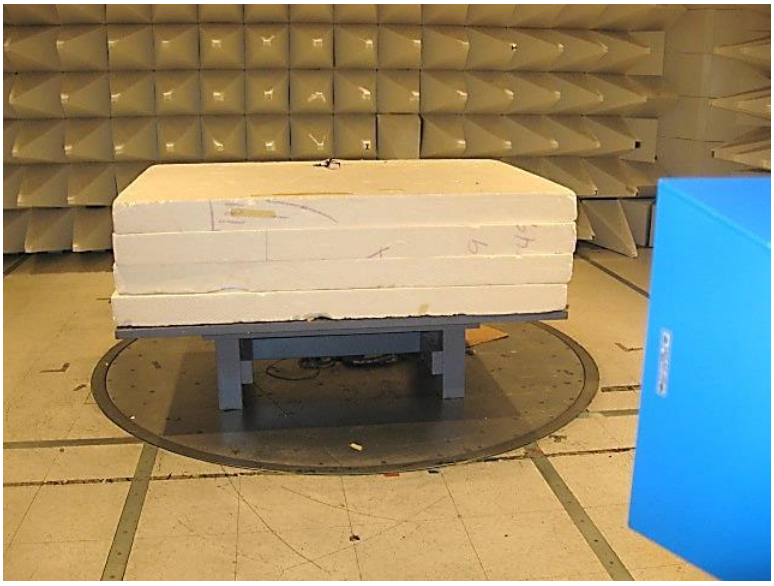


Back View, 8 DPSK: 30MHz – 1GHz

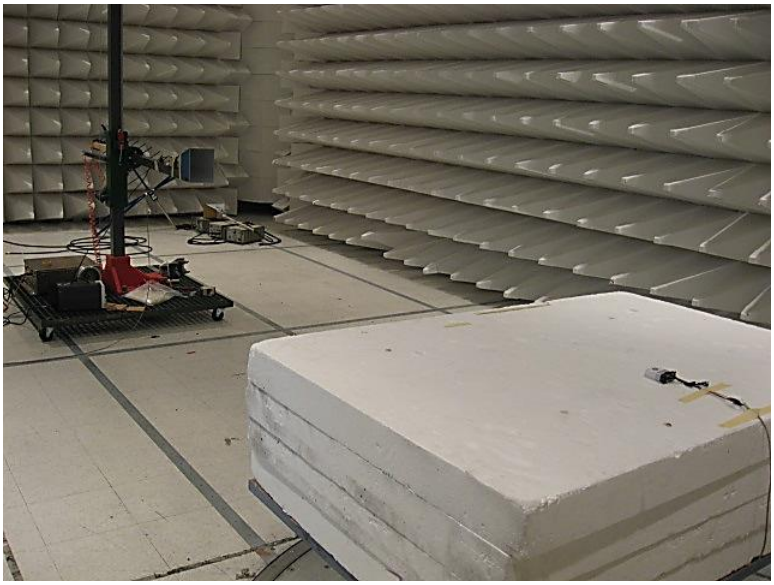
Front View, 8 DPSK: 1-12GHz



Back View, 8 DPSK: 1-12GHz

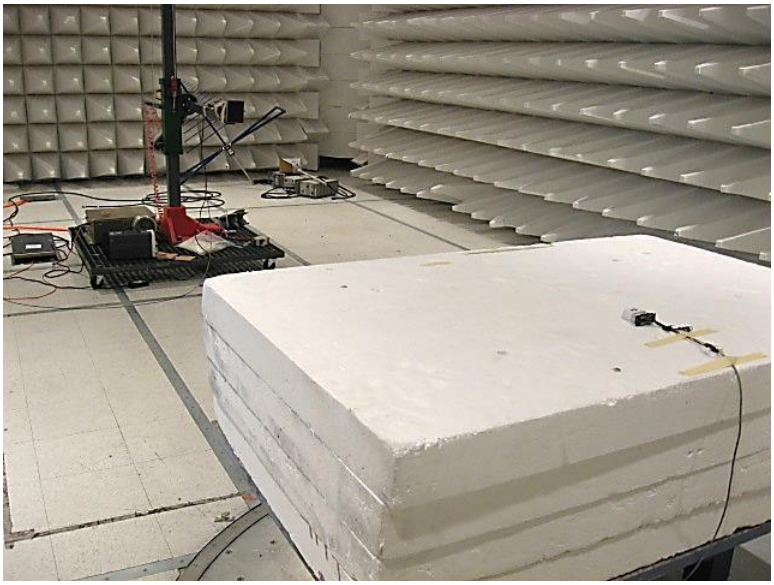


Front View, 8 DPSK: 12-18GHz



Back View, 8 DPSK: 12-18GHz

Front View, 8 DPSK: 18-25GHz



Back View, 8 DPSK: 18-25GHz

15.249(d) Band Edge

Test Conditions / Setup – 4 DQPSK-

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Automatic Labs**
Specification: **Band Edge**
Work Order #: **95286** Date: 1/9/2014
Test Type: **Radiated Scan** Time: 13:44:04
Equipment: **Link** Sequence#: 1
Manufacturer: Automatic Labs Tested By: Hieu Song Nguyenpham
Model: 1
S/N: FW1 1

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna-ANSI C63.5	3115	1/23/2013	1/23/2015
T2	AN03302	Cable	32026-29094K-29094K-72TC	3/21/2012	3/21/2014
T3	ANP01210	Cable	FSJ1P-50A-4A	2/19/2013	2/19/2015
	AN02668	Spectrum Analyzer	E4446A	2/22/2013	2/22/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Link*	Automatic Labs	1	FW1 1

Support Devices:

Function	Manufacturer	Model #	S/N
DC Power Supply	TekPower	HY1803D	259223

Test Conditions / Notes:

Band edge Set up
Temperature: 21.2°C, Humidity: 36%, Atmospheric Pressure: 102.0kPa

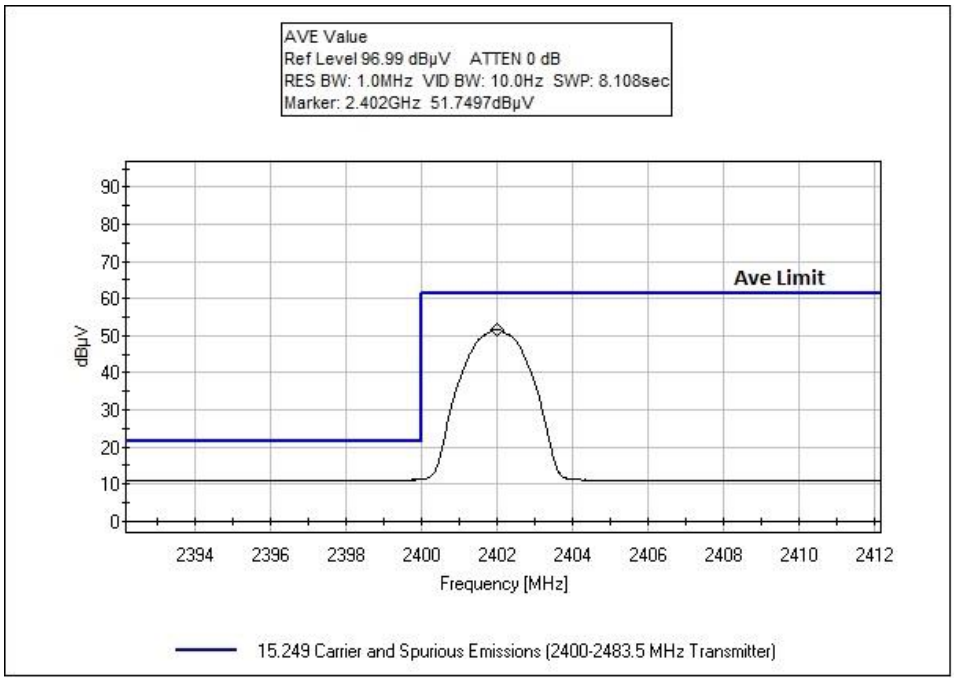
High Clock: 40MHz
Software Used: FCC test

Transmitter operating frequency: 2.4GHz
Number of Channel: 40
Low Frequency: 2.402GHz
Middle Frequency: 2.442GHz
High Frequency: 2.480GHz
RF output power: 2dBm

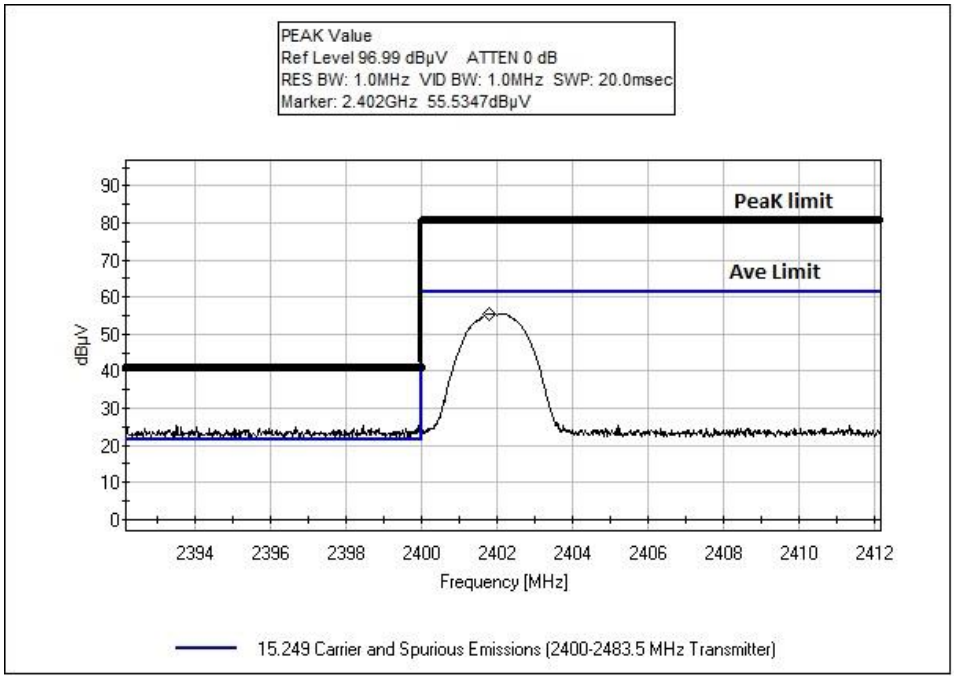
The EUT is a fixed device. It is placed on the 80 cm table, at the center of a turning table and 3 meters away from the measurement antenna. The EUT is connected to DC power supply which is outside of the chamber in order to control a transmitting operating frequency of the EUT. Test mode firmware installed for testing that modifies frequency based on input voltage.

Note: Modulation Type: 4 DQPSK (2Mbps)

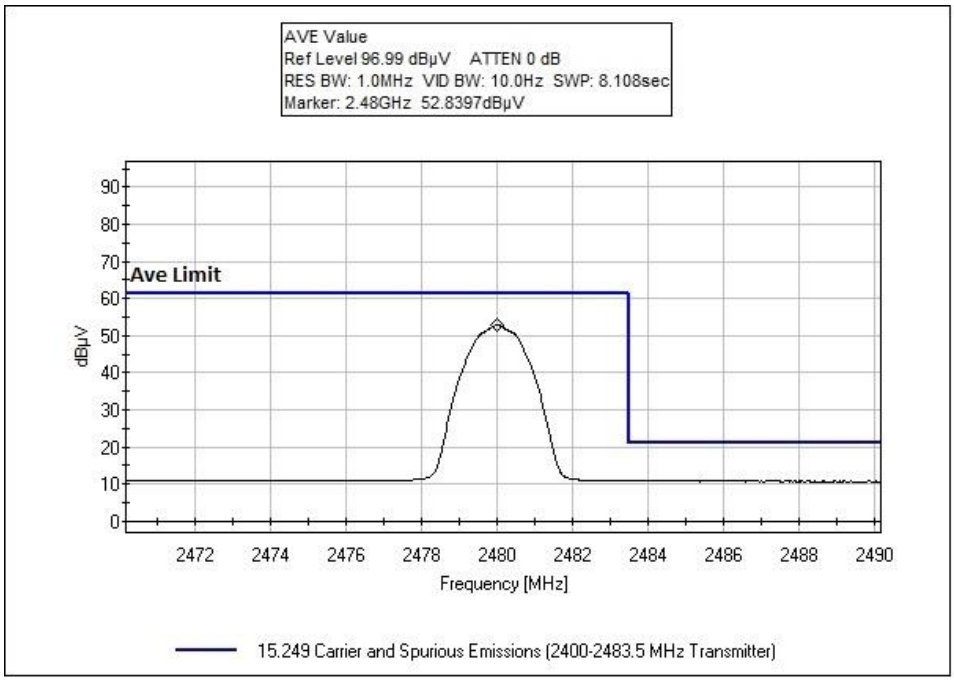
Test Data – 4 DQPSK-



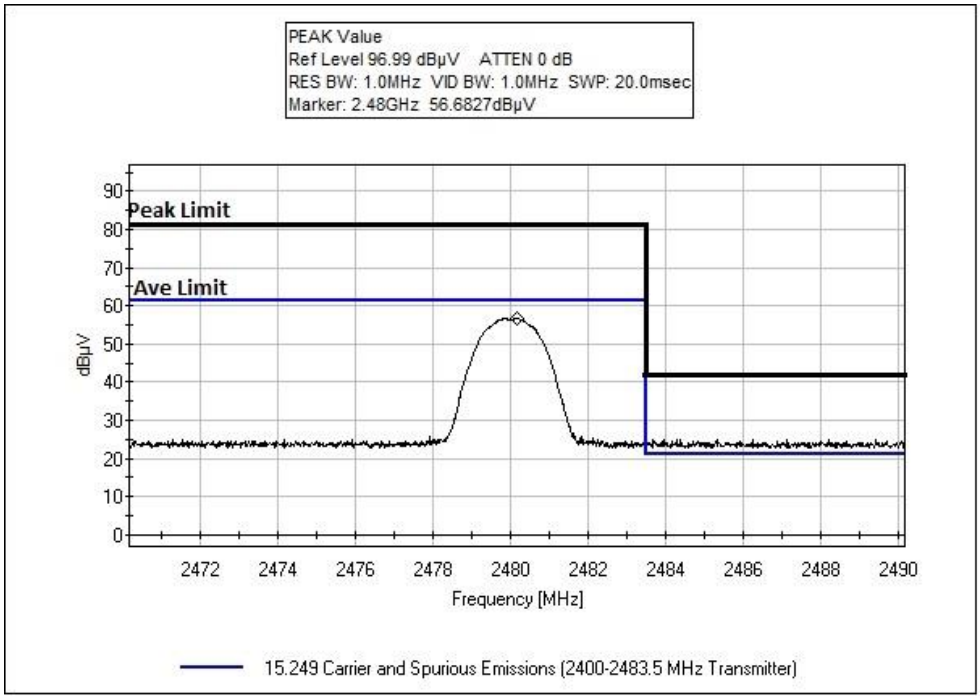
4 DQPSK-Low Channel-Ave Value



4 DQPSK-Low Channel-PEAK Value



4 DQPSK-High Channel-Ave Value



4 DQPSK-High Channel-PEAK Value

Test Conditions / Setup – 8 DPSK-

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170

Customer: **Automatic Labs**
Specification: **Band Edge**
Work Order #: **95286** Date: 1/9/2014
Test Type: **Radiated Scan** Time: 13:44:04
Equipment: **Link** Sequence#: 1
Manufacturer: Automatic Labs Tested By: Hieu Song Nguyenpham
Model: 1
S/N: FW1 1

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna-ANSI C63.5	3115	1/23/2013	1/23/2015
T2	AN03302	Cable	32026-29094K-29094K-72TC	3/21/2012	3/21/2014
T3	ANP01210	Cable	FSJ1P-50A-4A	2/19/2013	2/19/2015
	AN02668	Spectrum Analyzer	E4446A	2/22/2013	2/22/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Link*	Automatic Labs	1	FW1 1

Support Devices:

Function	Manufacturer	Model #	S/N
DC Power Supply	TekPower	HY1803D	259223

Test Conditions / Notes:

Band edge Set up

Temperature: 21.2°C, Humidity: 36%, Atmospheric Pressure: 102.0kPa

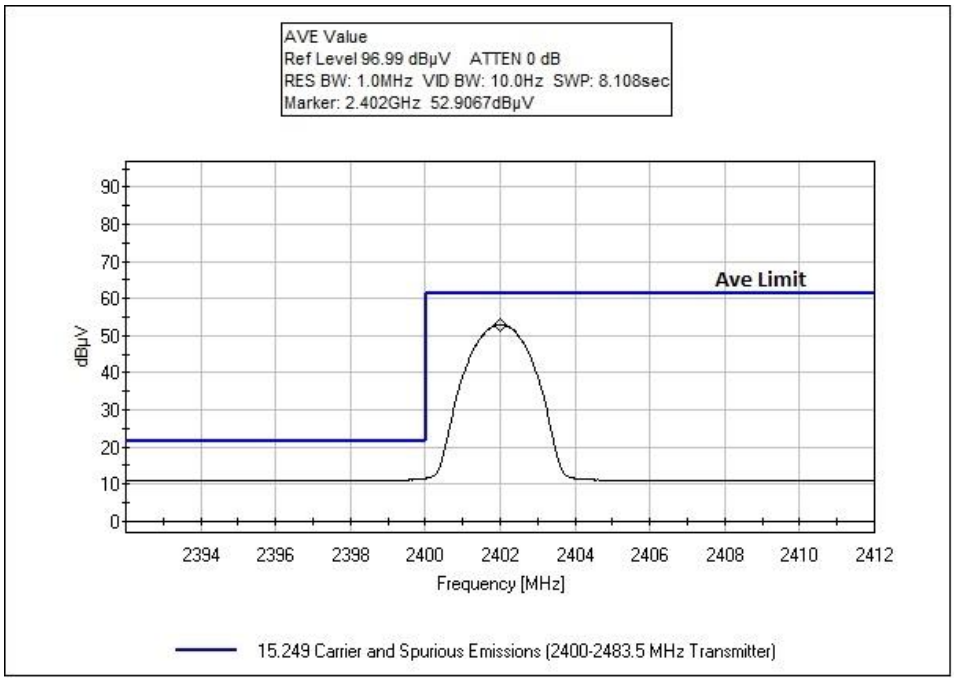
High Clock: 40MHz
Software Used: FCC test

Transmitter operating frequency: 2.4GHz
Number of Channel: 40
Low Frequency: 2.402GHz
Middle Frequency: 2.442GHz
High Frequency: 2.480GHz
RF output power: 2dBm

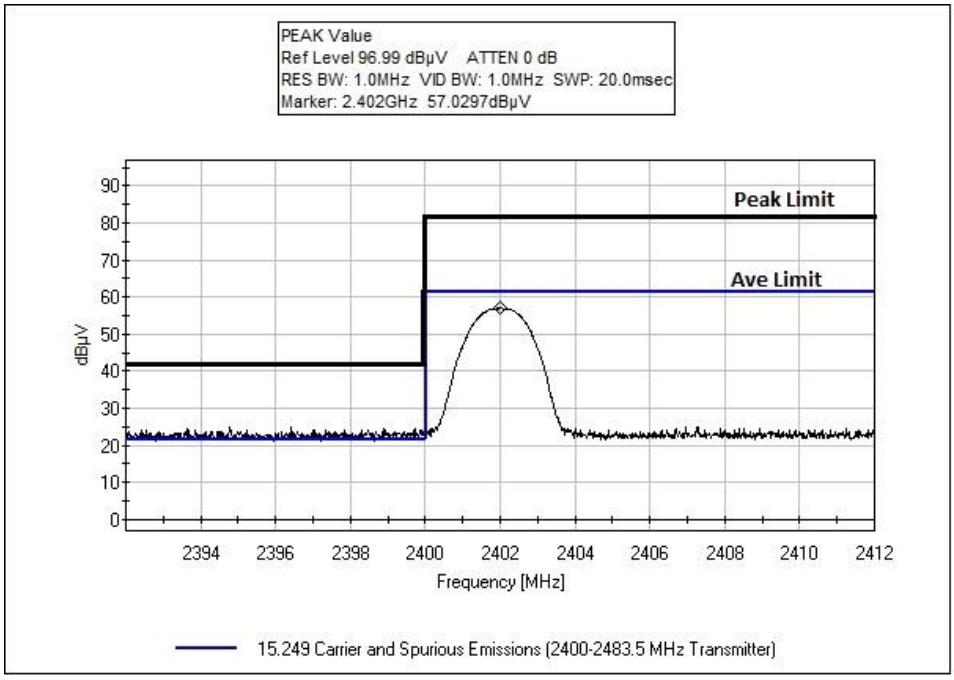
The EUT is a fixed device. It is placed on the 80 cm table, at the center of a turning table and 3 meters away from the measurement antenna. The EUT is connected to DC power supply which is outside of the chamber in order to control a transmitting operating frequency of the EUT.
Test mode firmware installed for testing that modifies frequency based on input voltage.

Note: Modulation Type: 8 DPSK (3Mbps)

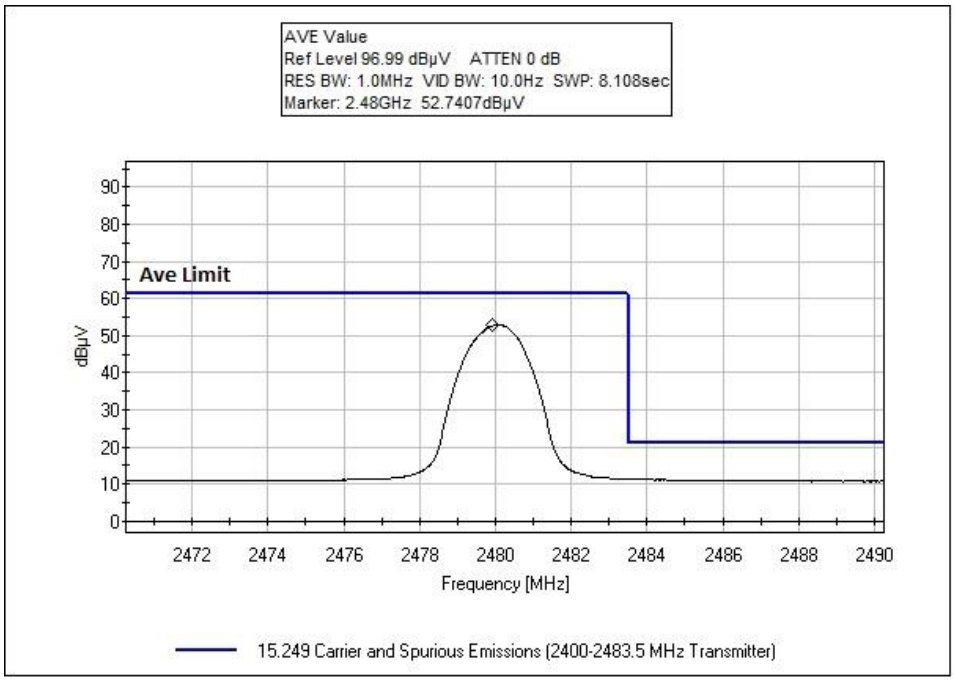
Test Data –8 DPSK



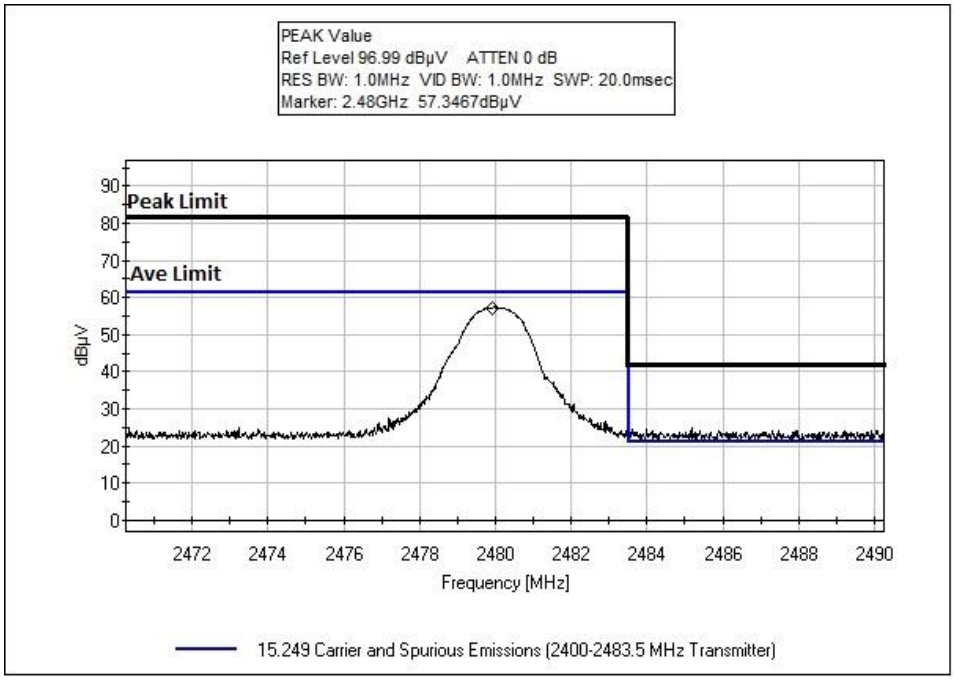
8 DPSK-Low Channel-AVE Value



8 DPSK-Low Channel-Peak Value

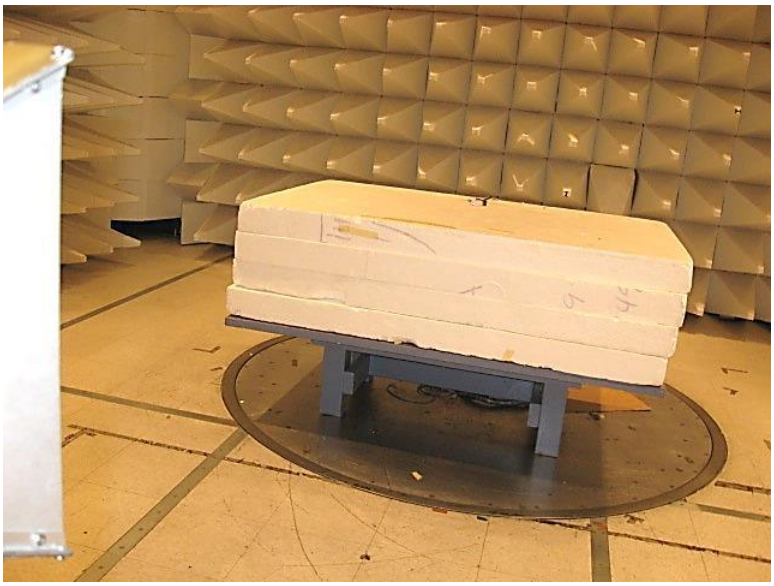


8 DPSK-High Channel-AVE Value

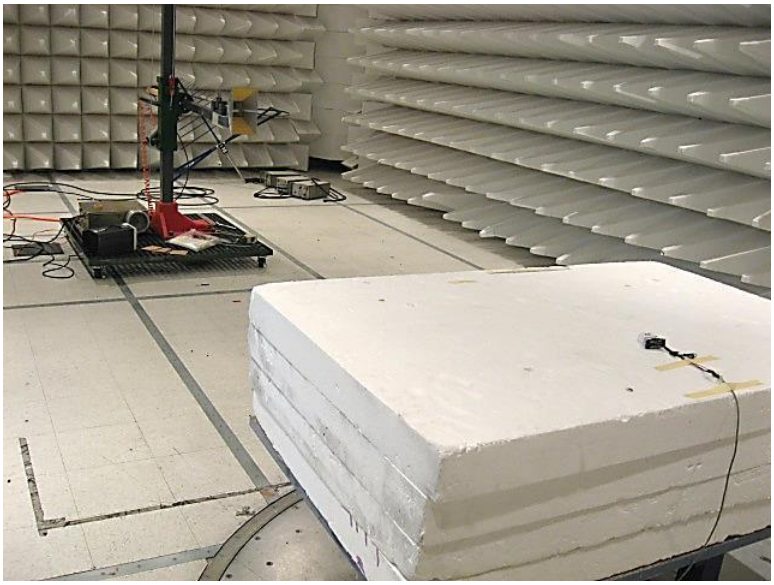


8 DPSK-High Channel-PEAK Value

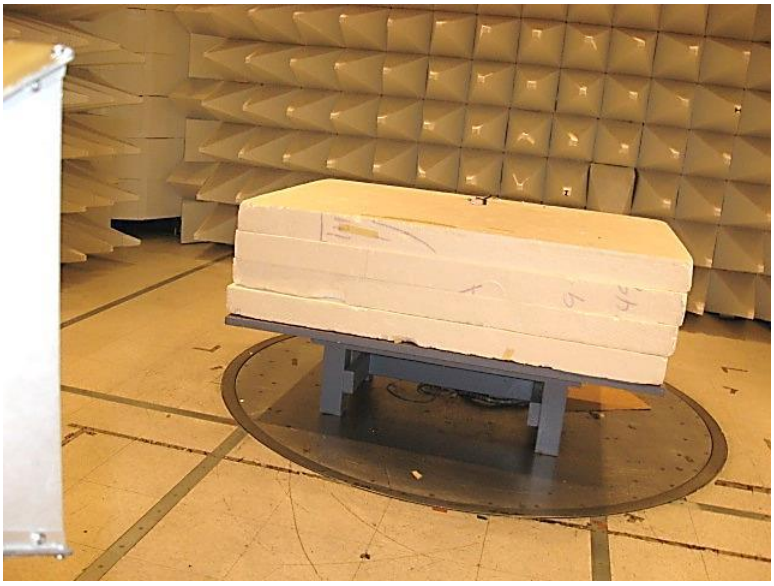
Test Setup Photo(s)



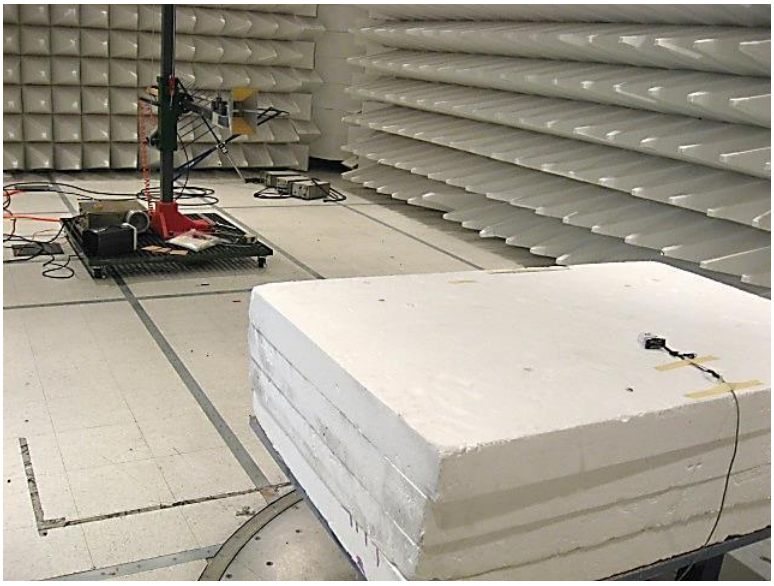
Front View, 4 DQPSK



Back View, 4 DQPSK



Front View, 8 DPSK



Back View, 8 DPSK

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

The reported measurement uncertainties are calculated based on the worst case of all laboratory environments from CKC Laboratories, Inc. test sites. Only those parameters which require estimation of measurement uncertainty are reported. The reported worst case measurement uncertainty is less than the maximum values derived in CISPR 16-4-2. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Inc. orporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or carrot ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.