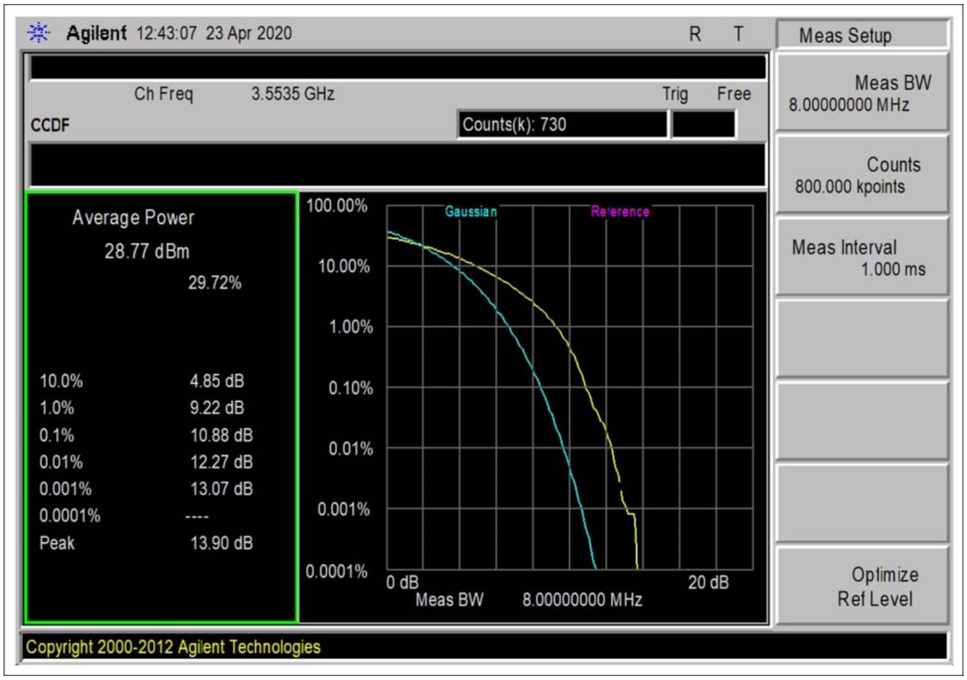
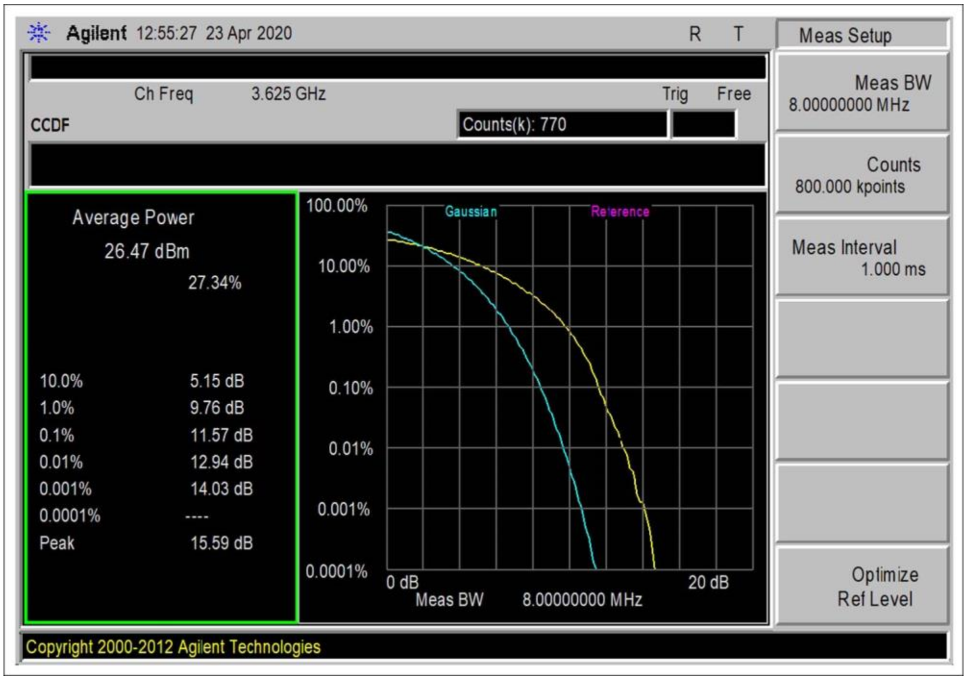
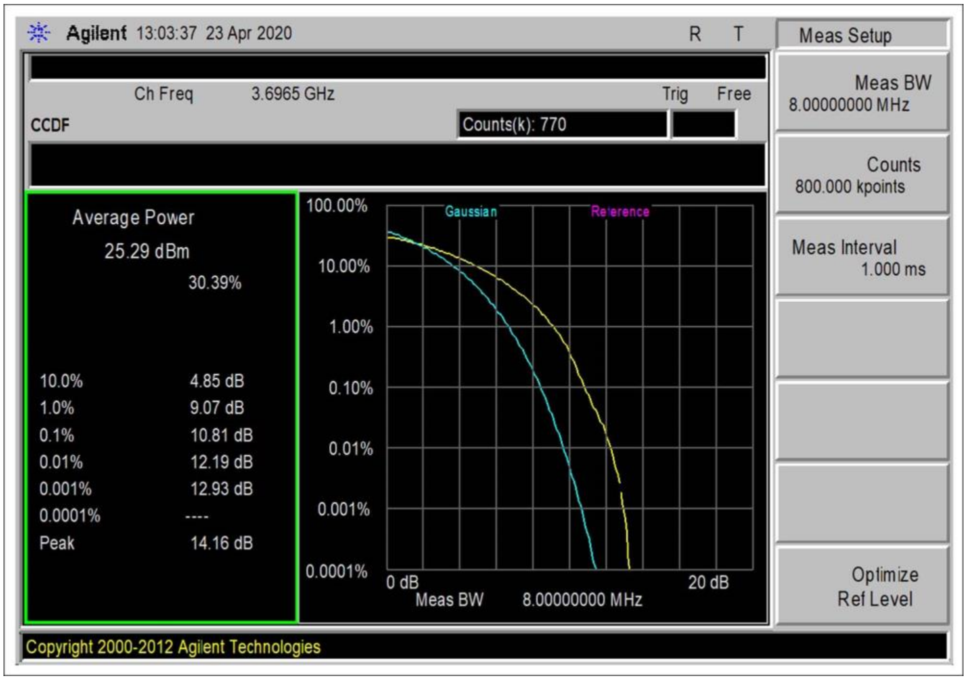
QAM64



Low Channel

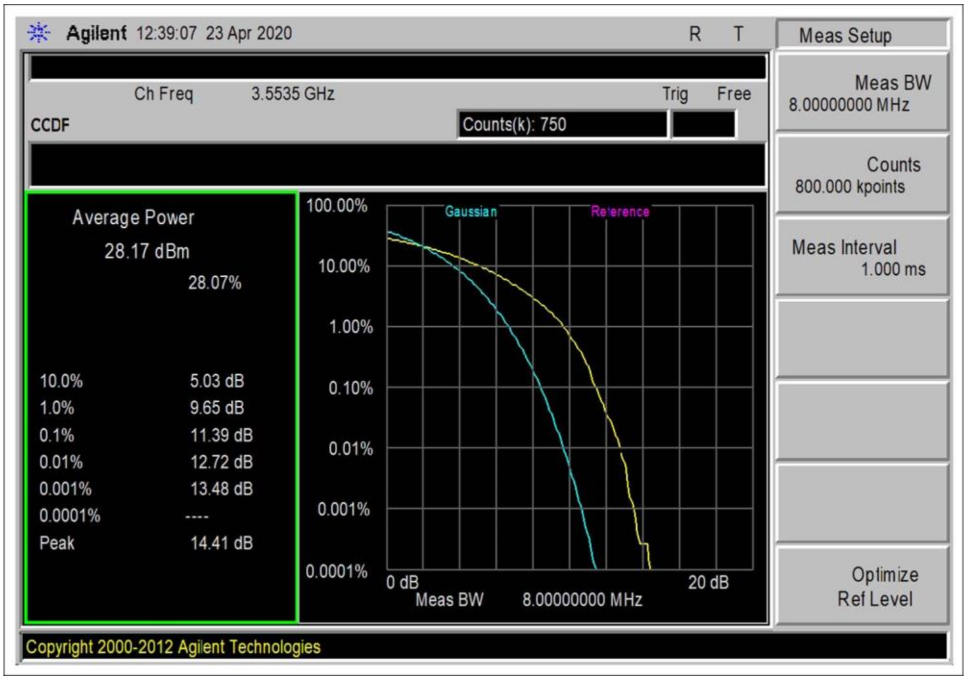


Middle Channel



High Channel

QPSK



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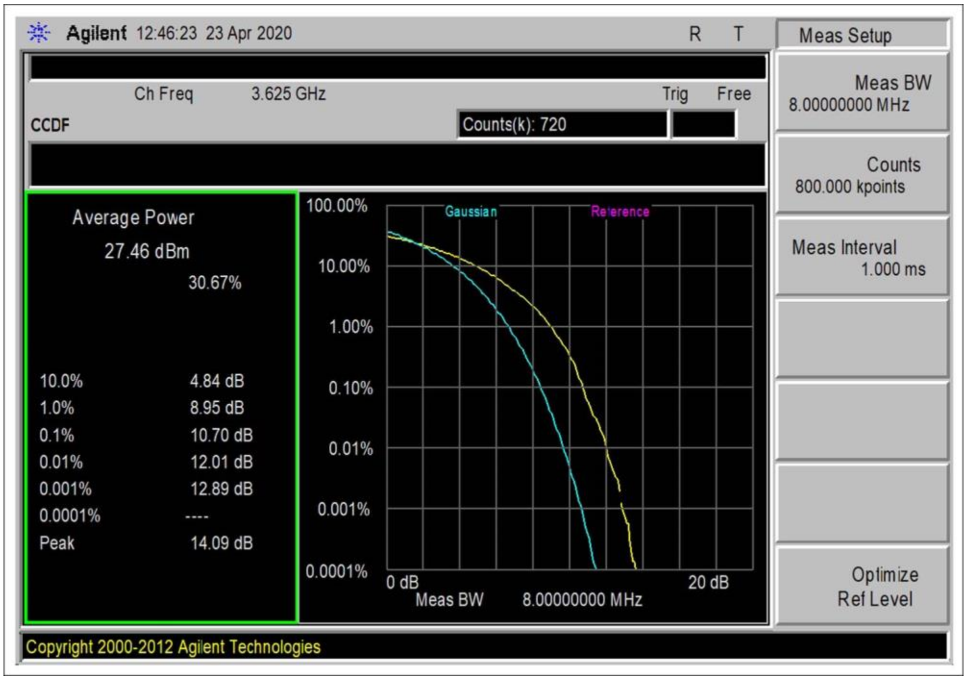

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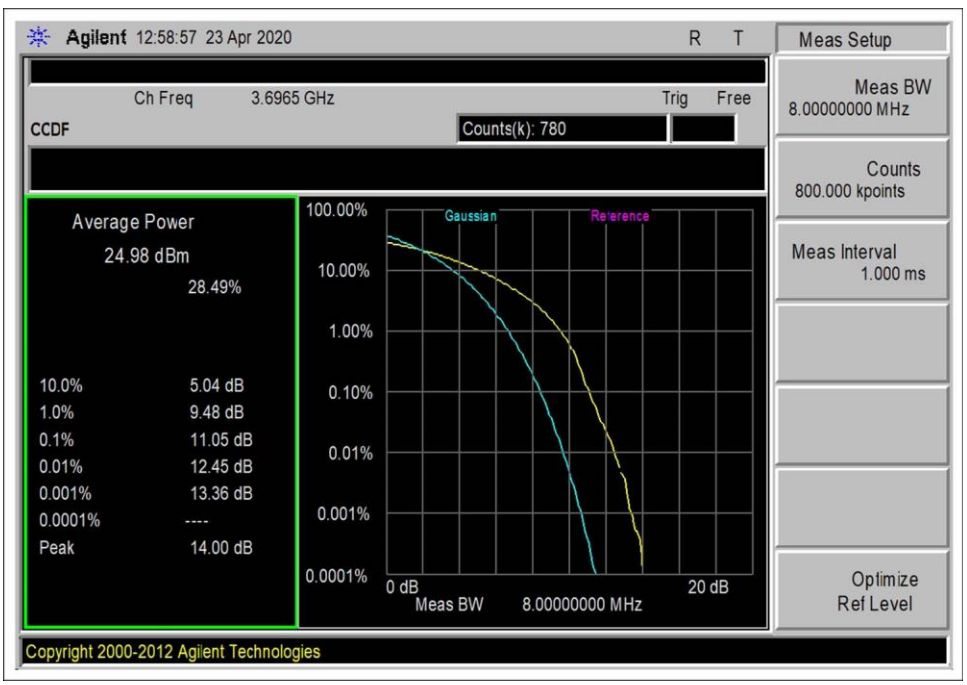
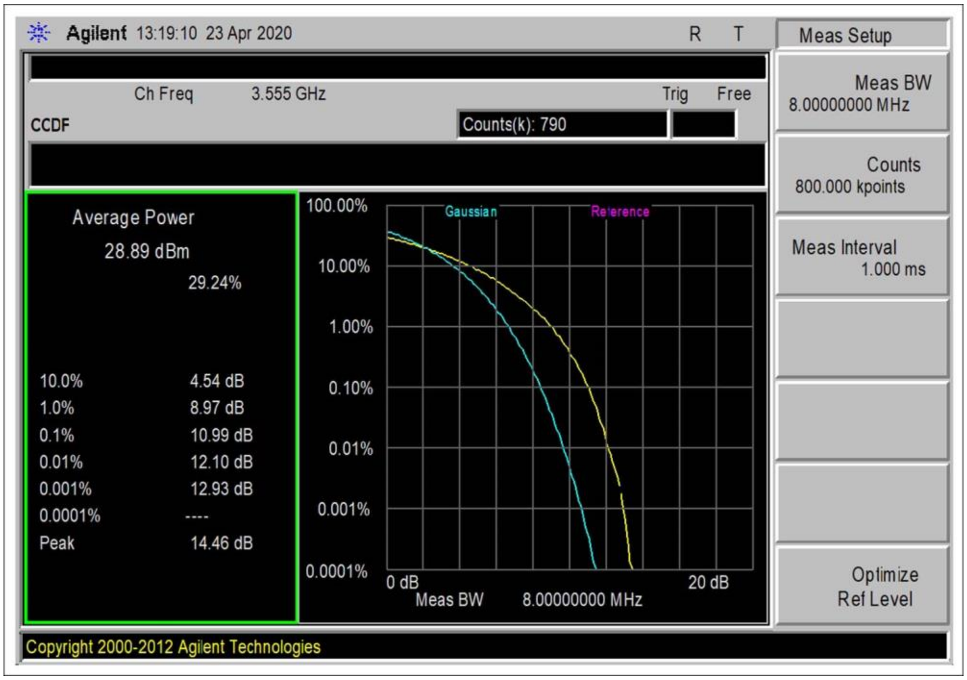


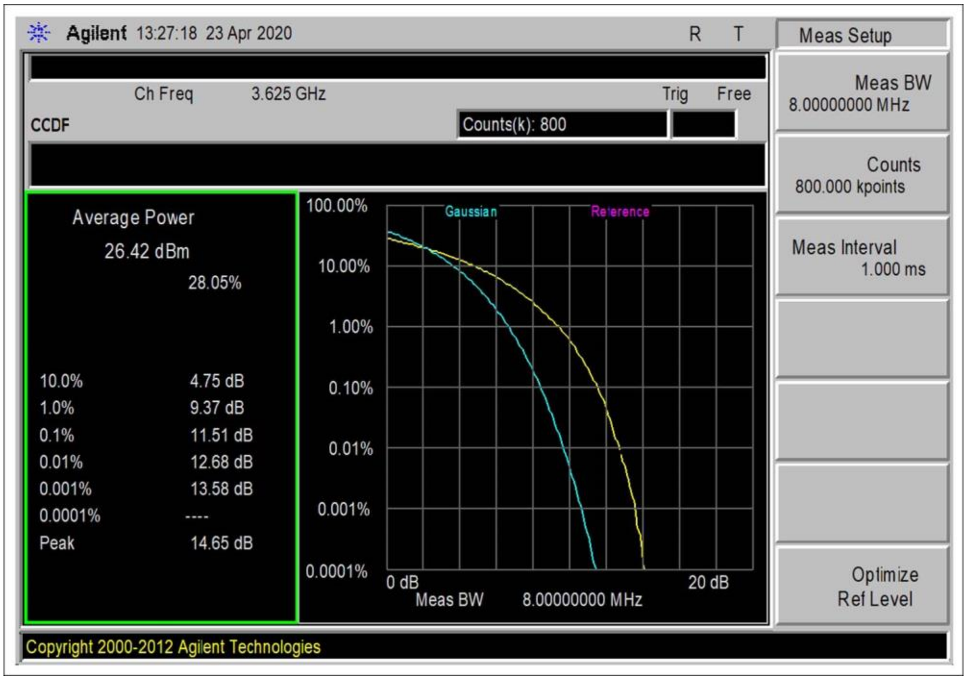
High Channel

Channel Bandwidth 10MHz

QAM16



Low Channel



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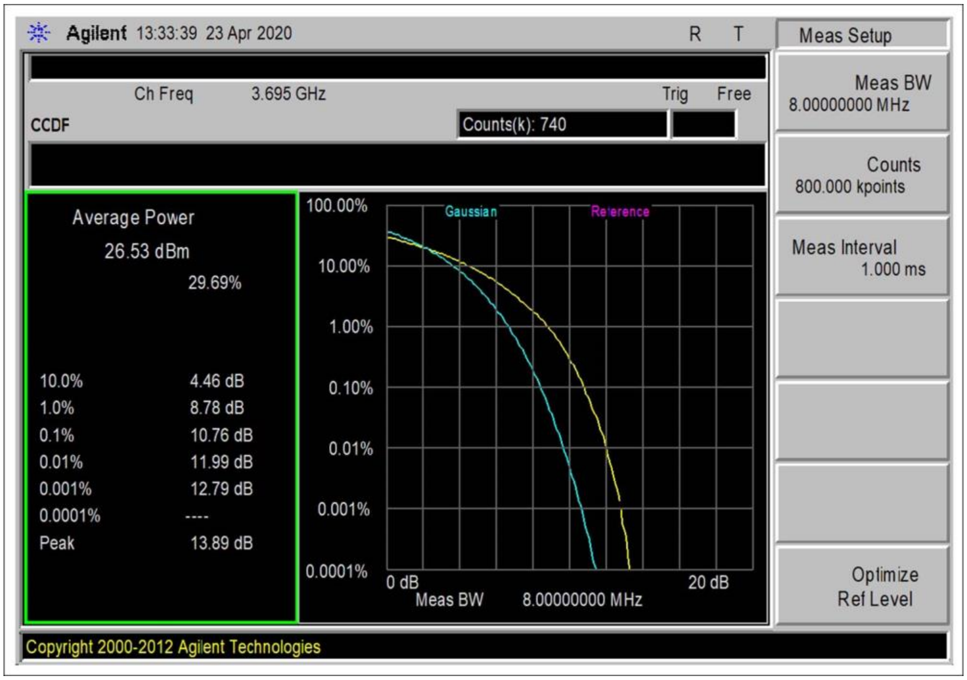
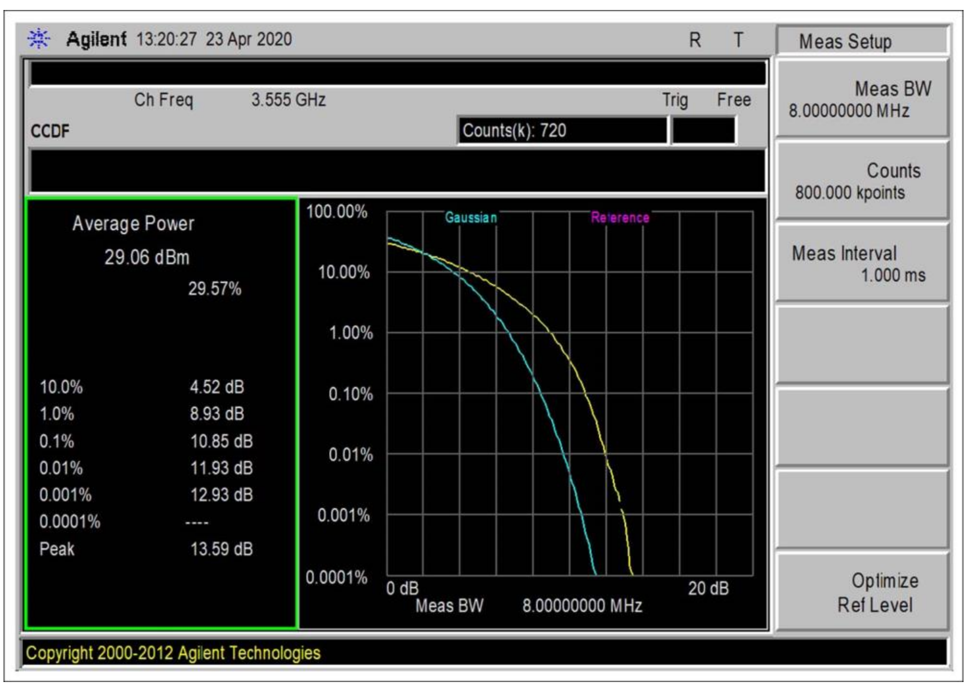
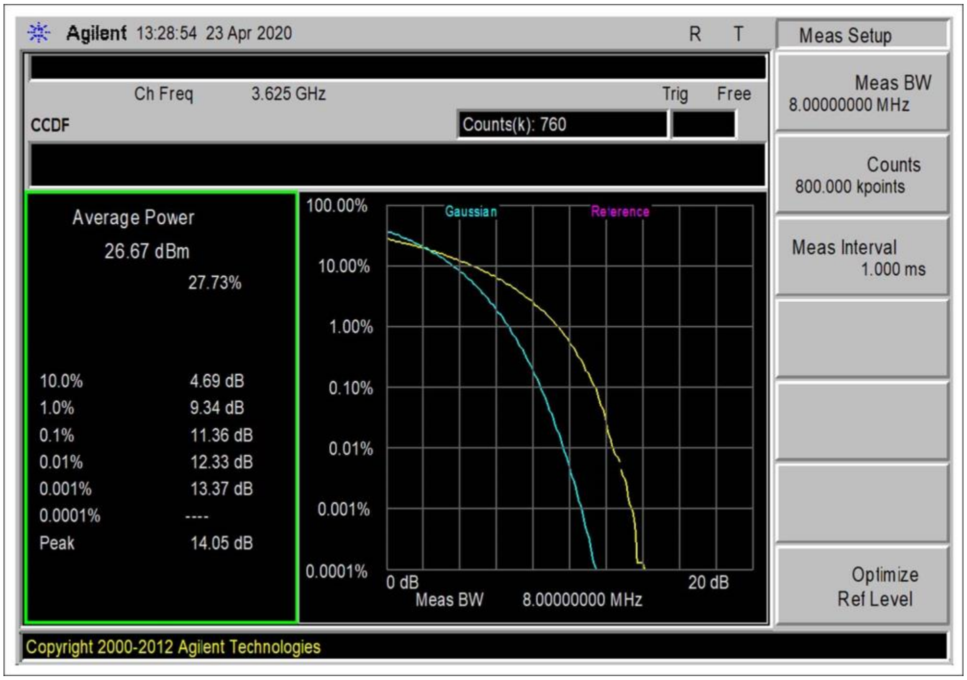


High Channel

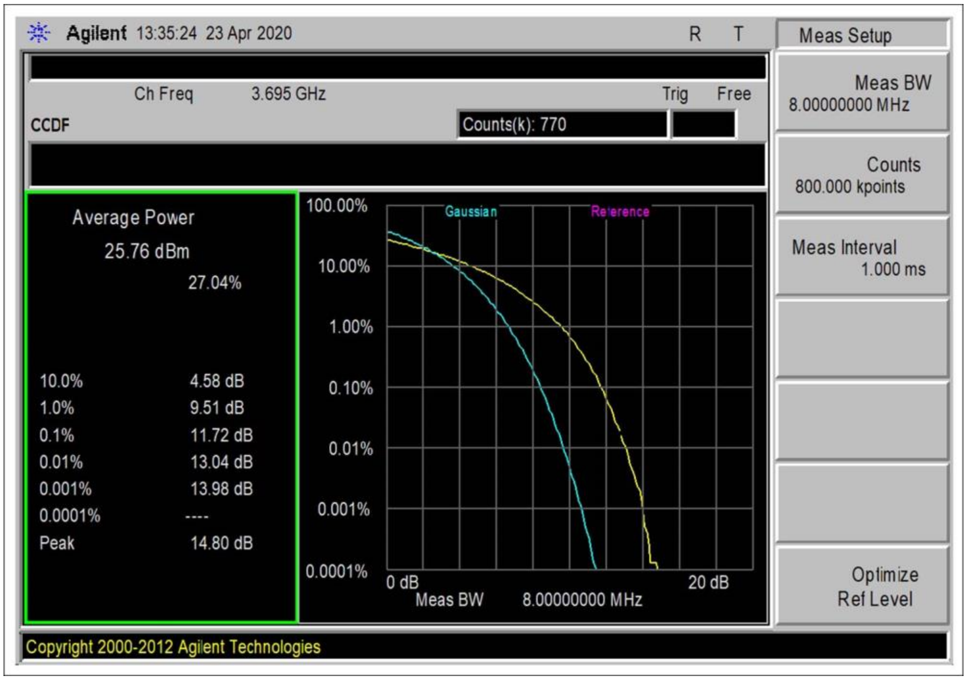
QAM64



Low Channel

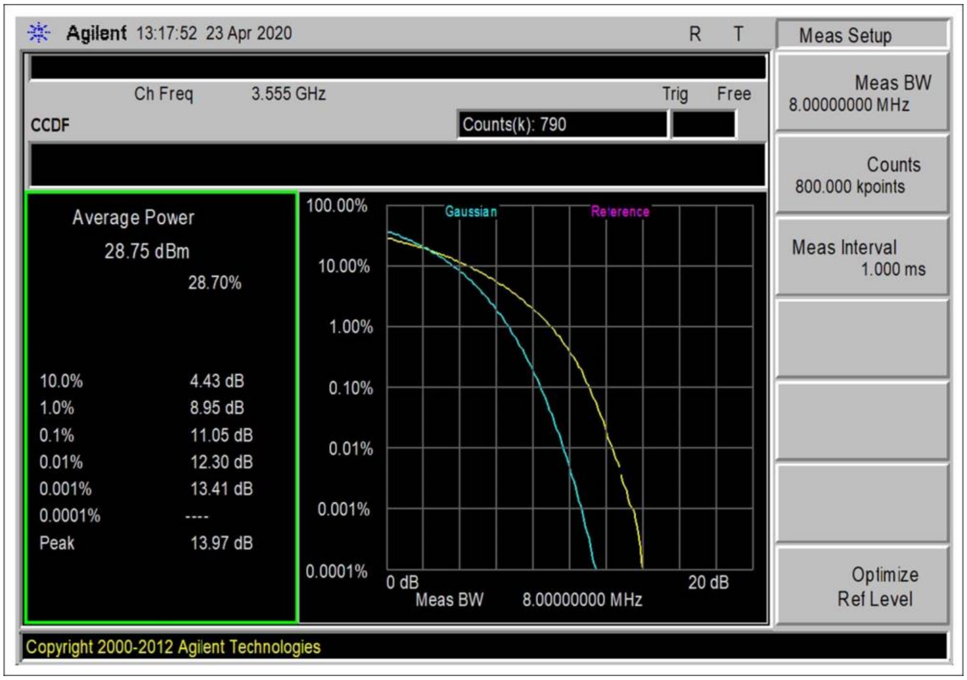


Middle Channel

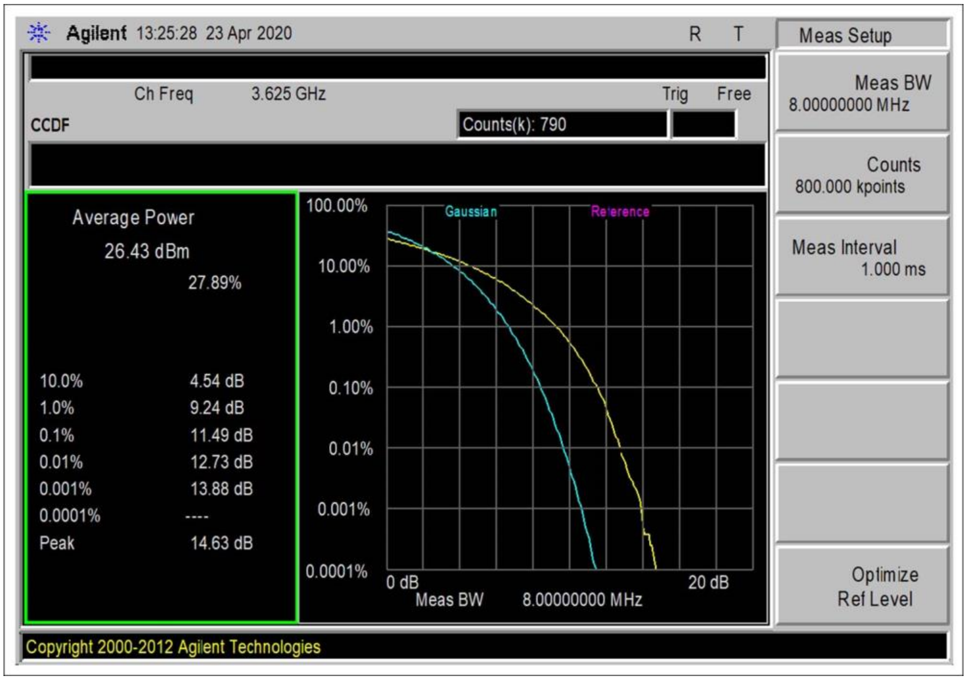


High Channel

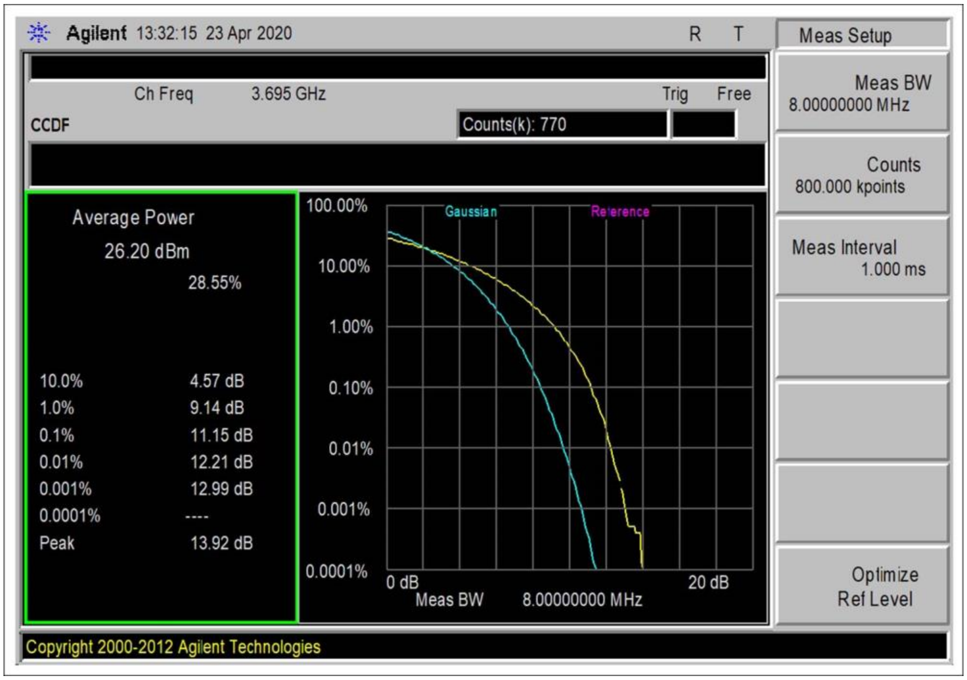
QPSK



Low Channel

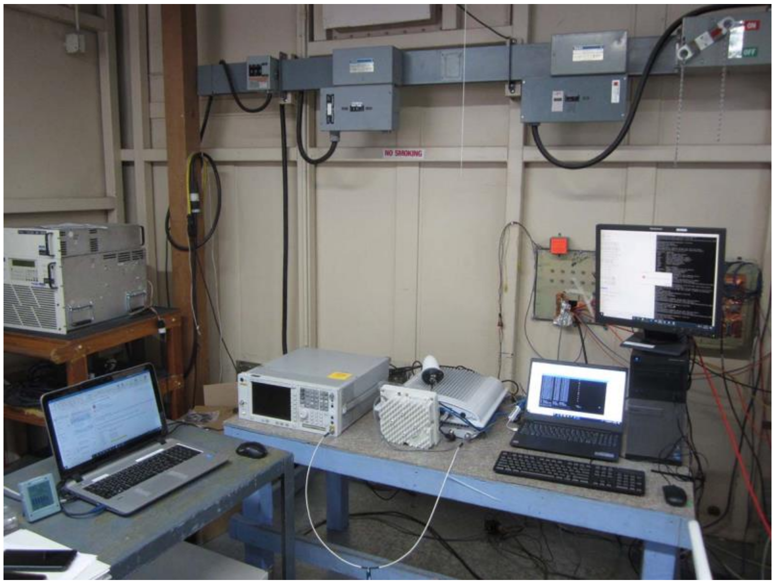


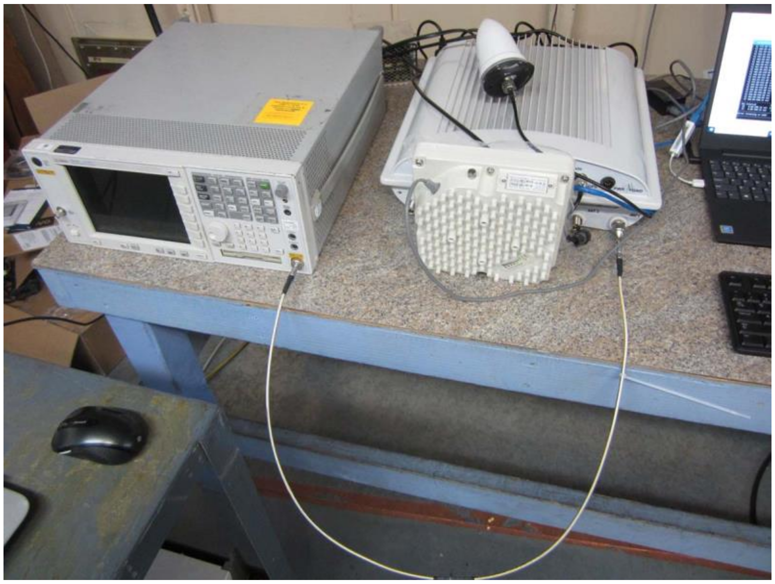
Middle Channel



High Channel

Test Setup Photo(s)





2.1055 Frequency Stability

Test Setup/Conditions			
Test Location:	Fremont Lab Bench	Test Engineer:	Benny Lovan
Test Method:	ANSI C63.26 (2015)	Test Date(s):	3/26/2020
Configuration:	1		
Test Setup:	The EUT is connected directly to the spectrum analyzer through 10.9dB of loss from the attenuator/cable chain used for measurement. The EUT is located inside a temperature chamber. A calibrated thermocouple is in the chamber measuring the temperature.		
Declarations:	Software output power setting was varied dependent upon channel bandwidth setting. See tables below for software setting.		

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02721	Temperature Humidity Chamber/Oven	Thermotron	SM-8C	NCR	NCR
02242	Thermometer	Omega	HH-26K	9/26/2018	9/26/2020
03471	RF Characteristics Analyzer	Agilent	E4440A	2/11/2020	2/11/2022
03356	Cable	AstroLab	32026-2-29094K-48TC	3/14/2019	3/14/2021
P06239	Attenuator	Weinschel	54A-10	12/18/2018	12/18/2020

NCR = No Calibration Required

Test Data Summary

Declared Temperature Range: -40 to 55 ºC

Low Frequency 3550 MHz

Temp (ºC)	Voltage	Deviation %	Results
-40	$V_{Nominal}$	0.00620	Pass
-30	$V_{Nominal}$	0.00338	
-20	$V_{Nominal}$	0.00225	
-10	$V_{Nominal}$	0.00282	
0	$V_{Nominal}$	0.00113	
10	$V_{Nominal}$	0.00169	
20	$V_{Minimum}$	0.00221	
20	$V_{Nominal}$	0.00056	
20	$V_{Maximum}$	0.00055	
30	$V_{Nominal}$	0.00000	
40	$V_{Nominal}$	0.00056	
50	$V_{Nominal}$	0.00056	
55	$V_{Nominal}$	0.00225	
Maximum Deviation		0.00620	

Mid Frequency 3625 MHz

Temp (ºC)	Voltage	Deviation %	Results
-40	$V_{Nominal}$	0.00110	Pass
-30	$V_{Nominal}$	0.00276	
-20	$V_{Nominal}$	0.00331	
-10	$V_{Nominal}$	0.00442	
0	$V_{Nominal}$	0.00497	
10	$V_{Nominal}$	0.00387	
20	$V_{Minimum}$	0.00221	
20	$V_{Nominal}$	0.00055	
20	$V_{Maximum}$	0.00055	
30	$V_{Nominal}$	0.00331	
40	$V_{Nominal}$	0.00055	
50	$V_{Nominal}$	0.00055	
55	$V_{Nominal}$	0.00055	
Maximum Deviation		0.00497	

High Frequency 3700 MHz

Temp (ºC)	Voltage	Deviation %	Results
-40	$V_{Nominal}$	0.00488	Pass
-30	$V_{Nominal}$	0.00434	
-20	$V_{Nominal}$	0.00379	
-10	$V_{Nominal}$	0.00054	
0	$V_{Nominal}$	0.00163	
10	$V_{Nominal}$	0.00217	
20	$V_{Minimum}$	0.00221	
20	$V_{Nominal}$	0.00108	
20	$V_{Maximum}$	0.00055	

Temp (ºC)	Voltage	Deviation %	Results
30	$V_{Nominal}$	0.00108	
40	$V_{Nominal}$	0.00434	
50	$V_{Nominal}$	0.00054	
55	$V_{Nominal}$	0.00054	
Maximum Deviation		0.00488	

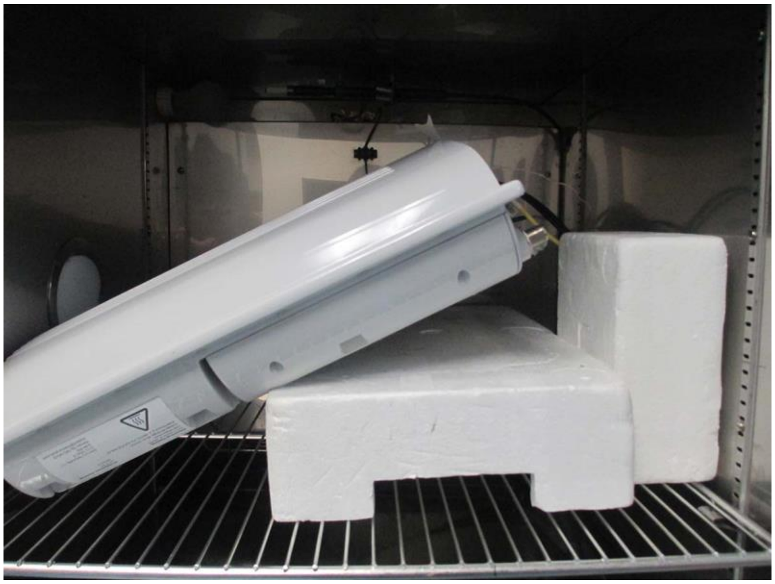
Parameter Definitions:

Measurements performed at input voltage according to manufacturer specification.

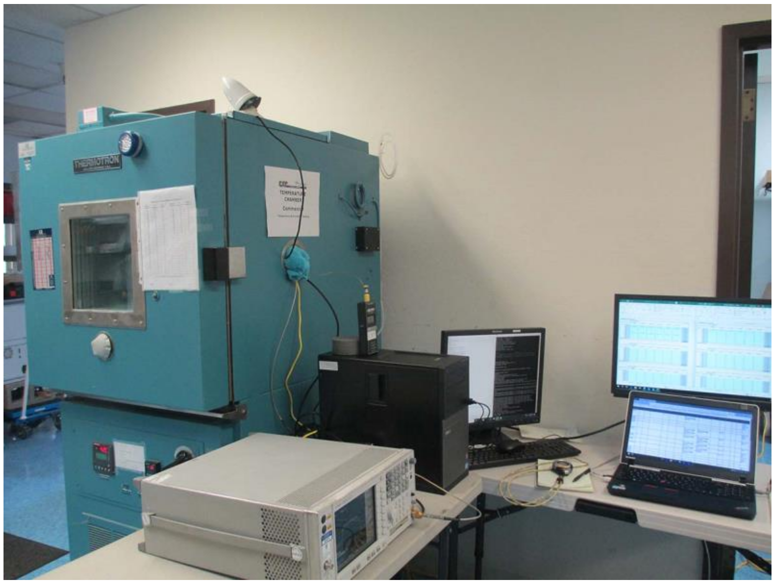
Parameter	Value
$V_{Nominal}$:	-48
$V_{Minimum}$:	-38 VDC
$V_{Maximum}$:	-60 VDC

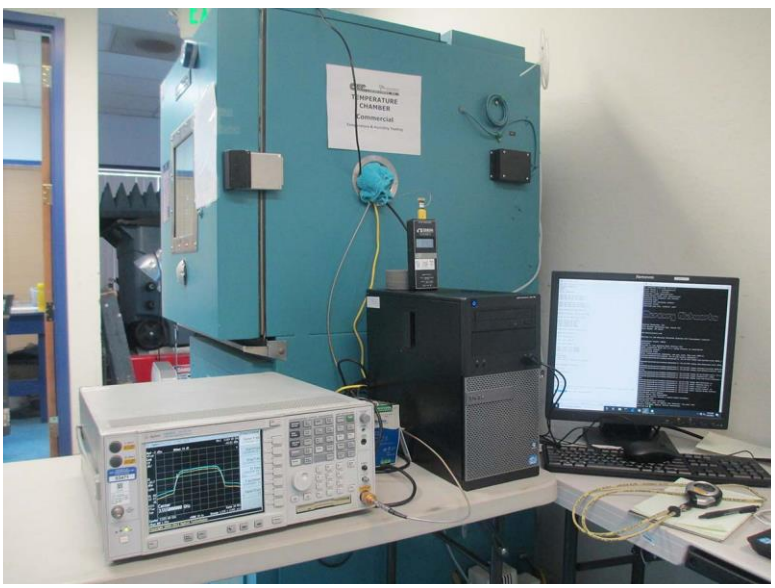
Note: The unit was declared to be non-operational 15% beyond the rated input. Manufacturer's specification was used.

Test Setup Photo(s)



Temperature Chamber Setup




TEMPERATURE
CHAMBER
Commercial

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

Uncertainties reported are worst case for all CKC Laboratories' sites and 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. Incorporating 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. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBμV)
+	Antenna Factor	(dB/m)
+	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 caret ("^") 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.