RECEIVER PERFORMANCE PORTION OF EN 300 220-2 v3.1.1

TEST REPORT

FOR

868-870 MHZ TRANSCEIVER

MODEL NUMBER: A1101R08A & A1101R08C

REPORT NUMBER: 11773265-E1V1

ISSUE DATE: OCTOBER 3, 2017

Prepared for
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ANAREN, INC.
6635 KIRKVILLE ROAD
EAST SYRACUSE, NY 13057. U.S.A

EUT DESCRIPTION: 868-870 MHZ TRANSCEIVER

MODEL: A1101R08C

SERIAL NUMBER: 000000000000

DATE TESTED: JULY 28 – AUG 02, 2017

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
RECEIVER PERFORMANCE PORTION OF EN 300 220-2 v3.1.1	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

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2. TEST METHODOLOGY

All tests were performed in accordance with EN 300 220-1 v3.1.1 as referenced by the Receiver Performance portion of EN 300 220-2 v3.1.1.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL Verification Services, Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

EN 303 220-1 v3.1.1 and EN 303 220-2 v3.1.1 are outside the scope of the laboratory's accreditation.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
RF level uncertainty for a given BER	±1.13 dB

Uncertainty figures are valid to a confidence level of 95%.

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 868-870 MHz Transceiver.

5.2. FREQUENCY BAND, OPERATING FREQUENCY, AND CHANNEL WIDTH

The EUT supports the frequencies Bands of M, N, P, Q, R and X.

The EUT supports operating frequencies in the 868 to 870 MHz range.

The Channel Widths at each Operating Frequency are 60 kHz, 70 kHz, 84 kHz, 121 kHz, 140 kHz, 211 kHz, 337 kHz, 675 kHz and 844 kHz.

The supported Modulations are MSK, 2FSK, 4FSK and GFSK.

The supported data rates(kbps) are 0.6, 1.2, 4.8, 10, 19.2, 38, 100, 125, 250, 300, 500 and 600.

5.3. DESCRIPTION OF MODELS DIFFERENCES

A110LR08C is a conducted sample that has an antenna port, to which an external monopole antenna can be connected.
A110LR08A is a radiated sample with PCB antenna built on the board; all other hardware design is identical.

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PCB type antenna with a gain of 2 dBi or an external monopole antenna with a gain of 3 dBi.

5.5. RECEIVER CATEGORY

The EUT is a Category 2 receiver.

5.6. SPECTRUM ACCESS MECHANISM

The Spectrum Access Mechanism is Duty Cycle.

5.7. SOFTWARE AND FIRMWARE

The software used in the EUT during testing was version 01.01.

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6. DESCRIPTION OF TEST SETUP

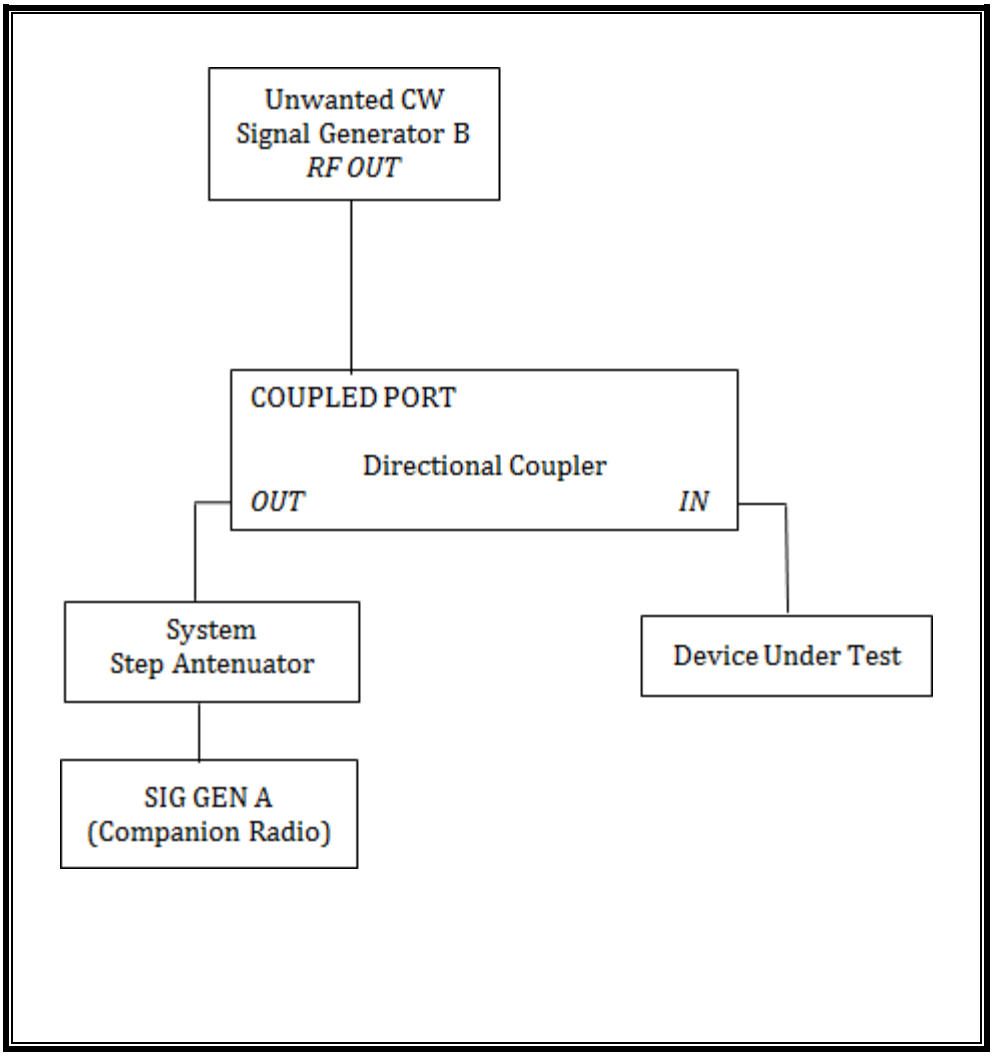
6.1. SYSTEM OVERVIEW

These tests were performed using a Conducted instrument configuration.

6.2. TEST AND MEASUREMENT SYSTEM

CONDUCTED TEST CONFIGURATION

NOTE: Coupler port designations “IN” and “OUT” refer to labeling on the coupler, not RF Signal Flow.



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6.3. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**Cal Due**
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent Technologies	N9030A	MY51350187	06/22/18
Signal Generator, MXG X-Series RF Vector	Agilent	N5182B	MY53050404	05/02/18

TEST SETUP

The wanted and unwanted interference signal generators are connected via a directional coupler to the EUT to perform the tests. Sig Gen A (Companion Radio) and the EUT are both powered via usb by a controller laptop that measures the PER values.

6.4. TEST ROOM ENVIRONMENT

The test room temperature and humidity shall be maintained within normal temperature of 15~35 °C and normal humidity 20~75% (relative humidity).

ENVIRONMENT CONDITION

Parameter	Value
Temperature	24.3 °C
Humidity	42 %

6.5. TEST AND MEASUREMENT SOFTWARE

The test and measurement software utilized for the tests documented in this report is AIR FCC Test Version 4.3.0.0

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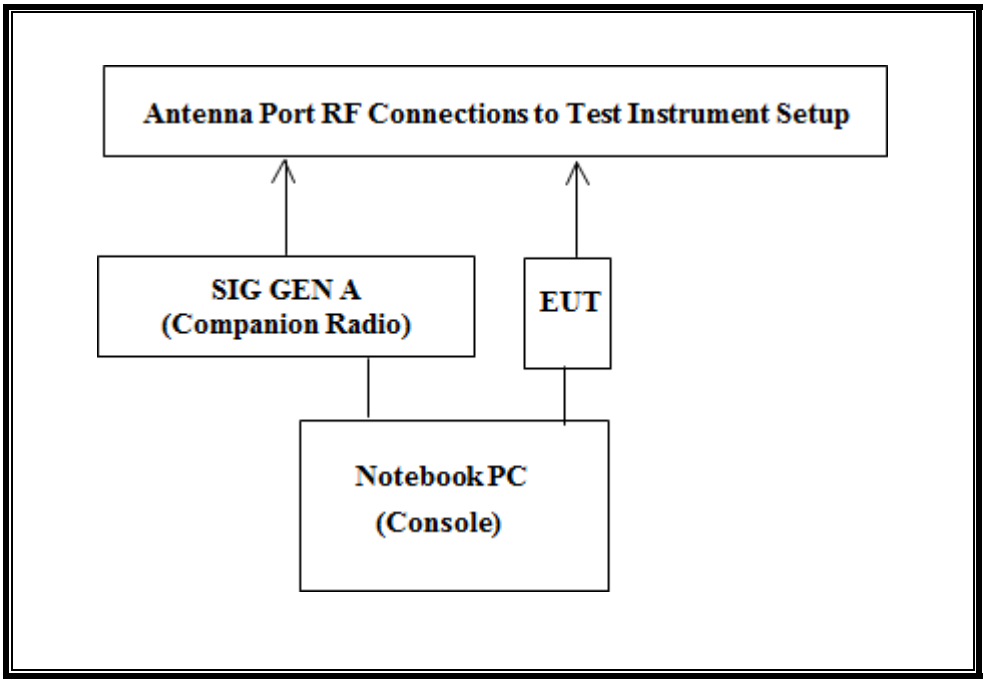
7. SETUP OF EUT

7.1. CONDUCTED METHOD EUT TEST SETUP



7.2. SUPPORT EQUIPMENT AND PERIPHERALS

The following support equipment was utilized for the tests documented in this report:

PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	**Manufacturer**	**Model**	**Serial Number**
Sig Gen A (Companion Radio)	Anaren	A1101R08C	000000000000
Laptop PC (Controller)	DELL	P22S	3482536200113
AC Adapter	Delta Electronics Inc.	DA130PE1-00	CN-0JU012-48661-93K-7I5D-A02

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8. RECEIVER CONFORMANCE

8.1. SENSITIVITY

The EUT utilizes duty cycle limitations to meet polite spectrum access requirements.

8.2. BLOCKING

PERFORMANCE CRITERIA

ETSI EN 300 220-1 V3.1.1, Clause 4.1

The performance criterion is a PER of 42.9%.

TEST CHANNELS

ETSI EN 300 220-2 V3.1.1, Annex B

Operational Frequency Band		Maximum effective radiated power, e.r.p.	Channel access and occupation rules (e.g. Duty cycle or LBT + AFA)	Maximum occupied bandwidth	Other usage restrictions	Band number from EC Decision 2013/752/EU [i.3]	Class 1 sub-class number according Commission Decision 2000/299/EU [i.7]
M	868,000 MHz to 868,600 MHz	25 mW e.r.p.	≤ 1 % duty cycle or polite spectrum access	The whole band except for audio & video applications limited to 300 kHz		48	28
N	868,700 MHz to 869,200 MHz	25 mW e.r.p.	≤ 0,1% duty cycle or polite spectrum access	The whole sub-band except for audio & video applications limited to 300 kHz		50	29
O	869,400 MHz to 869,650 MHz	25 mW e.r.p.	≤ 0.1% duty cycle or polite spectrum access	The whole band	.	54a	130
P	869,400 MHz to 869,650 MHz	500 mW e.r.p.	≤ 10 % duty cycle or polite spectrum access	The whole band		54b	30
Q	869,700 MHz to 870,000 MHz	5 mW e.r.p.	No requirement	The whole band	Audio and video applications are excluded.	56a	31
R	869,700 MHz to 870,000 MHz	25 mW e.r.p.	≤ 1% duty cycle or polite spectrum access	The whole band	Analogue audio applications are excluded. Analogue video applications are excluded.	56b	69

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Operational Frequency Band		Maximum Effective Radiated Power	Channel access and occupation rules	Additional/other spectrum access parameters	Maximum occupied bandwidth	Other usage restriction	Notes	CEPT/ERC/REC 70-03 [i.1] implementation status
X	863 MHz to 870 MHz	25 mW e.r.p.	≤ 0,1 % duty cycle or polite spectrum access	≤ 1 % Duty Cycle if the band is limited to 865 MHz to 868 MHz	100 kHz for 47 or more channels	FHSS	Sub-bands for alarms [868,6 MHz to 868,7 MHz], [869,250 - 869,4 MHz], [869,650 MHz to 869,700 MHz] are excluded.	90 %
		25 mW e.r.p. Power density: -4,5 dBm/100 kHz. The power density can be increased to +6,2 dBm/100 kHz if the band of operation is limited to 865 MHz to 868 MHz. The power density can be increased to -0,8 dBm/100 kHz, if the band of operation is limited 865 MHz to 870 MHz.	≤ 0,1 % duty cycle or polite spectrum access	Duty cycle may be increased to 1 % if the band is limited to 865 MHz to 868 MHz and power limited to 10 mW e.r.p	The whole band except for audio & video limited to 300 kHz and voice limited to 25 kHz		DSSS and any techniques other than FHSS Sub-bands [868,6 MHz to 868,7 MHz], [869,250 MHz to 869,4 MHz], [869,650 MHz to 869,700 MHz] for alarms are excluded.	90 %
		25 mW e.r.p.	≤ 0,1 % duty cycle or polite spectrum access		300 kHz except for voice limited to 25 kHz		Sub-bands [868,6 MHz to 868,7 MHz], [869,250 - 869,4 MHz], [869,650 MHz to 869,700 MHz] for alarms are excluded.	90 %

REFERENCE LIMITS

ETSI EN 300 220-1 V3.1.1, Clause 5.18.2

The blocking levels at the specified frequency offsets shall be equal to or greater than the limits Tables below, except at frequencies where spurious responses are found.

Table 41: Blocking level parameters for RX category 2

Requirement	Limits
	Receiver category 2
Blocking at ±2 MHz from OC edge f_{high} and f_{low}	≥ -69 dBm
Blocking at ±10 MHz from OC edge f_{high} and f_{low}	≥ -44 dBm
Blocking at ±5 % of Centre Frequency or 15 MHz, whichever is the greater	≥ -44 dBm

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TEST PROCEDURE

ETSI EN 300 220-1 V3.1.1, Clause 5.18.6

The FEC/ARQ mechanism of the EUT is disabled during tests.

The Spectrum Analyzer is used to measure the wanted signal level set by signal generator A and the blocking level set by signal generator B.

Sig Gen A (Companion Radio) is set to the Limit for Receiver sensitivity from Table 32 of EN 300 220-1 v3.1.1. If the EUT does not meet the performance criterion, the level of wanted signal A is adjusted until the performance criterion is met.

The wanted signal A level is then raised by 3 dB.

The unwanted signal B is then introduced at the applicable level.

A temporary connection to the antenna port is used for test purposes.

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RESULTS

CODE M1 RESULTS

Bandwidth, Modulation, & Data rate at Code M1 are 844 kHz, MSK & 500 kbps.
The Receiver sensitivity Reference limit from Table 32 is -87.737dBm.

Code	Band	Band	Frequency Setting	Frequency (MHz)	Sig Gen A Sp (dBm)	Attenuator	PER(Sp) (%)	Sp + 3 (dBm)	SP +3 Attenuator	PER (Sp+3) (%)	Blocker Freq Offset	Blocker Freq	Maximum Value for Sig Gen B for Passing PER (dBm)	Category 2 Limits ≥ dBm	Pass/Fail	Margin
M1	X	M	3	868.299706	-87.737	38	0	-84.737	35	0	2	870.299706	-44.89	-69	PASS	24.11
											-2	866.299706	-44.88	-69	PASS	24.12
											10	878.299706	-28.89	-44	PASS	15.11
											-10	858.299706	-28.78	-44	PASS	15.22
											43.4149853	911.714691	-24.74	-44	PASS	19.26
											-43.4149853	824.884721	-24.75	-44	PASS	19.25
		N	10	868.999054		38	0		35	0	2	870.999054	-42.89	-69	PASS	26.11
											-2	866.999054	-43.90	-69	PASS	25.10
											10	878.999054	-29.88	-44	PASS	14.12
											-10	858.999054	-29.78	-44	PASS	14.22
											43.4499527	912.449007	-24.79	-44	PASS	19.21
											-43.4499527	825.549101	-24.76	-44	PASS	19.24
		P	15	869.498589		38	0		35	0	2	871.498589	-44.90	-69	PASS	24.10
											-2	867.498589	-44.89	-69	PASS	24.11
											10	879.498589	-29.90	-44	PASS	14.10
											-10	859.498589	-29.77	-44	PASS	14.23
											43.4749295	912.973518	-24.77	-44	PASS	19.23
											-43.47492945	826.023660	-25.73	-44	PASS	18.27
		Q & R	19	869.898216		38	0		35	0	2	871.898216	-43.91	-69	PASS	25.09
											-2	867.898216	-43.87	-69	PASS	25.13
											10	879.898216	-28.92	-44	PASS	15.08
											-10	859.898216	-29.77	-44	PASS	14.23
											43.4949108	913.393127	-24.74	-44	PASS	19.26
											-43.4949108	826.403305	-24.75	-44	PASS	19.25

CODE M2 RESULTS

Bandwidth, Modulation, & Data rate at Code M2 are 140 kHz, MSK & 100 kbps.
The Receiver sensitivity Reference limit from Table 32 is -95.539 dBm.

Code	Band	Band	Frequency Setting	Frequency (MHz)	Sig Gen A Sp (dBm)	Attenuator	PER(Sp) (%)	Sp + 3 (dBm)	SP +3 Attenuator	PER (Sp+3) (%)	Blocker Freq Offset	Blocker Freq	Maximum Value for Sig Gen B for Passing PER (dBm)	Category 2 Limits ≥ dBm	Pass/Fail	Margin
M2	X	M	3	868.299706	-95.539	49	0	-92.539	46	0	2	870.299706	-39.90	-69	PASS	29.10
											-2	866.299706	-38.87	-69	PASS	30.13
											10	878.299706	-29.90	-44	PASS	14.10
											-10	858.299706	-29.77	-44	PASS	14.23
											43.4149853	911.714691	-23.77	-44	PASS	20.23
											-43.4149853	824.884721	-23.73	-44	PASS	20.27
		N	10	868.999054		49	0		46	0	2	870.999054	-39.91	-69	PASS	29.09
											-2	866.999054	-38.87	-69	PASS	30.13
											10	878.999054	-28.92	-44	PASS	15.08
											-10	858.999054	-28.78	-44	PASS	15.22
											43.4499527	912.449007	-23.79	-44	PASS	20.21
											-43.4499527	825.549101	-24.76	-44	PASS	19.24
		P	15	869.498589		49	0		46	0	2	871.498589	-38.90	-69	PASS	30.10
											-2	867.498589	-38.89	-69	PASS	30.11
											10	879.498589	-29.90	-44	PASS	14.10
											-10	859.498589	-29.76	-44	PASS	14.24
											43.4749295	912.973518	-23.77	-44	PASS	20.23
											-43.47492945	826.023660	-23.78	-44	PASS	20.22
		Q & R	19	869.898216		49	0		46	0	2	871.898216	-39.90	-69	PASS	29.10
											-2	867.898216	-38.85	-69	PASS	30.15
											10	879.898216	-28.92	-44	PASS	15.08
											-10	859.898216	-29.79	-44	PASS	14.21
											43.4949108	913.393127	-23.82	-44	PASS	20.18
											-43.4949108	826.403305	-23.77	-44	PASS	20.23

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CODE M3 RESULTS

Bandwidth, Modulation, & Data rate at Code M3 are 60 kHz, MSK & 38 kbps.
The Receiver sensitivity Reference limit from Table 32 is -99.218 dBm.

Code	Band	Band	Frequency Setting	Frequency (MHz)	Sig Gen A Sp (dBm)	Attenuator	PER(Sp) (%)	Sp + 3 (dBm)	SP +3 Attenuator	PER (Sp+3) (%)	Blocker Freq Offset	Blocker Freq	Maximum Value for Sig Gen B for Passing PER (dBm)	Category 2 Limits ≥ dBm	Pass/Fail	Margin
M3	X	M	6	868.299706	-99.218	54	0	-96.218	51	0	2	870.299706	-38.87	-69	PASS	30.13
											-2	866.299706	-38.86	-69	PASS	30.14
											10	878.299706	-29.86	-44	PASS	14.14
											-10	858.299706	-30.73	-44	PASS	13.27
											43.4149853	911.714691	-24.73	-44	PASS	19.27
											-43.4149853	824.884721	-24.72	-44	PASS	19.28
		N	20	868.999054		54	0		51	0	2	870.999054	-38.87	-69	PASS	30.13
											-2	866.999054	-37.86	-69	PASS	31.14
											10	878.999054	-30.87	-44	PASS	13.13
											-10	858.999054	-30.72	-44	PASS	13.28
											43.4499527	912.449007	-24.73	-44	PASS	19.27
											-43.4499527	825.549101	-24.72	-44	PASS	19.28
		P	30	869.498589		54	0		51	0	2	871.498589	-38.89	-69	PASS	30.11
											-2	867.498589	-38.80	-69	PASS	30.20
											10	879.498589	-30.88	-44	PASS	13.12
											-10	859.498589	-30.78	-44	PASS	13.22
											43.4749295	912.973518	-24.79	-44	PASS	19.21
											-43.47492945	826.023660	-25.76	-44	PASS	18.24
		Q & R	38	869.898216		54	0		51	0	2	871.898216	-37.90	-69	PASS	31.10
											-2	867.898216	-37.89	-69	PASS	31.11
											10	879.898216	-29.90	-44	PASS	14.10
											-10	859.898216	-29.77	-44	PASS	14.23
											43.4949108	913.393127	-24.77	-44	PASS	19.23
											-43.4949108	826.403305	-24.73	-44	PASS	19.27

CODE M4 RESULTS

Bandwidth, Modulation, & Data rate at Code M4 are 84 kHz, 2FSK & 1.2 kbps.
The Receiver sensitivity Reference limit from Table 32 is -97.757 dBm.

Code	Band	Band	Frequency Setting	Frequency (MHz)	Sig Gen A Sp (dBm)	Attenuator	PER(Sp) (%)	Sp + 3 (dBm)	SP +3 Attenuator	PER (Sp+3) (%)	Blocker Freq Offset	Blocker Freq	Maximum Value for Sig Gen B for Passing PER (dBm)	Category 2 Limits ≥ dBm	Pass/Fail	Margin
M4	X	M	6	868.299706	-97.757	52	0	-94.757	49	0	2	870.299706	-34.91	-69	PASS	34.09
											-2	866.299706	-34.88	-69	PASS	34.12
											10	878.299706	-26.92	-44	PASS	17.08
											-10	858.299706	-25.77	-44	PASS	18.23
											43.4149853	911.714691	-15.74	-44	PASS	28.26
											-43.4149853	824.884721	-16.75	-44	PASS	27.25
		N	20	868.999054		52	0		49	0	2	870.999054	-34.90	-69	PASS	34.10
											-2	866.999054	-34.89	-69	PASS	34.11
											10	878.999054	-26.90	-44	PASS	17.10
											-10	858.999054	-26.76	-44	PASS	17.24
											43.4499527	912.449007	-15.77	-44	PASS	28.23
											-43.4499527	825.549101	-15.78	-44	PASS	28.22
		P	30	869.498589		52	0		49	0	2	871.498589	-34.90	-69	PASS	34.10
											-2	867.498589	-35.89	-69	PASS	33.11
											10	879.498589	-26.90	-44	PASS	17.10
											-10	859.498589	-26.77	-44	PASS	17.23
											43.4749295	912.973518	-16.77	-44	PASS	27.23
											-43.47492945	826.023660	-15.74	-44	PASS	28.26
		Q & R	38	869.898216		52	0		49	0	2	871.898216	-34.90	-69	PASS	34.10
											-2	867.898216	-34.87	-69	PASS	34.13
											10	879.898216	-25.90	-44	PASS	18.10
											-10	859.898216	-26.77	-44	PASS	17.23
											43.4949108	913.393127	-16.77	-44	PASS	27.23
											-43.4949108	826.403305	-16.73	-44	PASS	27.27

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CODE M5 RESULTS

Bandwidth, Modulation, & Data rate at Code M5 are 121 kHz, 2FSK & 10 kbps.
The Receiver sensitivity Reference limit from Table 32 is -96.172 dBm.

Code	Band	Band	Frequency Setting	Frequency (MHz)	Sig Gen A Sp (dBm)	Attenuator	PER(Sp) (%)	Sp + 3 (dBm)	SP +3 Attenuator	PER (Sp+3) (%)	Blocker Freq Offset	Blocker Freq	Maximum Value for Sig Gen B for Passing PER (dBm)	Category 2 Limits ≥ dBm	Pass/Fail	Margin
M5	X	M	6	868.299706	-96.172	51	0	-93.172	48	0	2	870.299706	-36.87	-69	PASS	32.13
											-2	866.299706	-36.87	-69	PASS	32.13
											10	878.299706	-29.88	-44	PASS	14.12
											-10	858.299706	-30.72	-44	PASS	13.28
											43.4149853	911.714691	-25.73	-44	PASS	18.27
											-43.4149853	824.884721	-26.71	-44	PASS	17.29
		N	20	868.999054		51	0		48	0	2	870.999054	-37.87	-69	PASS	31.13
											-2	866.999054	-37.86	-69	PASS	31.14
											10	878.999054	-29.87	-44	PASS	14.13
											-10	858.999054	-29.73	-44	PASS	14.27
											43.4499527	912.449007	-25.71	-44	PASS	18.29
											-43.4499527	825.549101	-26.71	-44	PASS	17.29
		P	30	869.498589		51	0		48	0	2	871.498589	-37.87	-69	PASS	31.13
											-2	867.498589	-38.86	-69	PASS	30.14
											10	879.498589	-29.86	-44	PASS	14.14
											-10	859.498589	-30.73	-44	PASS	13.27
											43.4749295	912.973518	-26.73	-44	PASS	17.27
											-43.47492945	826.023660	-26.72	-44	PASS	17.28
		Q & R	38	869.898216		51	0		48	0	2	871.898216	-37.87	-69	PASS	31.13
											-2	867.898216	-40.86	-69	PASS	28.14
											10	879.898216	-30.87	-44	PASS	13.13
											-10	859.898216	-30.72	-44	PASS	13.28
											43.4949108	913.393127	-25.73	-44	PASS	18.27
											-43.4949108	826.403305	-25.72	-44	PASS	18.28

CODE M7 RESULTS

Bandwidth, Modulation, & Data rate at Code M7 are 70 kHz, GFSK & 38 kbps.
The Receiver sensitivity Reference limit from Table 32 is -98.549 dBm.

Code	Band	Band	Frequency Setting	Frequency (MHz)	Sig Gen A Sp (dBm)	Attenuator	PER(Sp) (%)	Sp + 3 (dBm)	SP +3 Attenuator	PER (Sp+3) (%)	Blocker Freq Offset	Blocker Freq	Maximum Value for Sig Gen B for Passing PER (dBm)	Category 2 Limits ≥ dBm	Pass/Fail	Margin
M7	X	M	6	868.299706	-98.549	53	0	-95.549	50	0	2	870.299706	-38.86	-69	PASS	30.14
											-2	866.299706	-38.83	-69	PASS	30.17
											10	878.299706	-31.90	-44	PASS	12.10
											-10	858.299706	-31.77	-44	PASS	12.23
											43.4149853	911.714691	-26.78	-44	PASS	17.22
											-43.4149853	824.884721	-26.72	-44	PASS	17.28
		N	20	868.999054		53	0		50	0	2	870.999054	-37.87	-69	PASS	31.13
											-2	866.999054	-37.85	-69	PASS	31.15
											10	878.999054	-31.91	-44	PASS	12.09
											-10	858.999054	-31.77	-44	PASS	12.23
											43.4499527	912.449007	-25.76	-44	PASS	18.24
											-43.4499527	825.549101	-26.73	-44	PASS	17.27
		P	30	869.498589		53	0		50	0	2	871.498589	-39.87	-69	PASS	29.13
											-2	867.498589	-37.84	-69	PASS	31.16
											10	879.498589	-30.90	-44	PASS	13.10
											-10	859.498589	-30.77	-44	PASS	13.23
											43.4749295	912.973518	-25.76	-44	PASS	18.24
											-43.47492945	826.023660	-25.73	-44	PASS	18.27
		Q & R	38	869.898216		53	0		50	0	2	871.898216	-38.88	-69	PASS	30.12
											-2	867.898216	-38.87	-69	PASS	30.13
											10	879.898216	-30.91	-44	PASS	13.09
											-10	859.898216	-31.75	-44	PASS	12.25
											43.4949108	913.393127	-25.75	-44	PASS	18.25
											-43.4949108	826.403305	-26.74	-44	PASS	17.26

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CODE M8 RESULTS

Bandwidth, Modulation, & Data rate at Code M8 are 211 kHz, GFSK & 100 kbps.
The Receiver sensitivity Reference limit from Table 32 is -93.757 dBm.

Code	Band	Band	Frequency Setting	Frequency (MHz)	Sig Gen A Sp (dBm)	Attenuator	PER(Sp) (%)	Sp + 3 (dBm)	SP +3 Attenuator	PER (Sp+3) (%)	Blocker Freq Offset	Blocker Freq	Maximum Value for Sig Gen B for Passing PER (dBm)	Category 2 Limits ≥ dBm	Pass/Fail	Margin
M8	X	M	6	868.299706	-93.757	47	0	-90.757	44	0	2	870.299706	-38.91	-69	PASS	30.09
											-2	866.299706	-39.87	-69	PASS	29.13
											10	878.299706	-30.92	-44	PASS	13.08
											-10	858.299706	-30.77	-44	PASS	13.23
											43.4149853	911.714691	-24.74	-44	PASS	19.26
											-43.4149853	824.884721	-25.75	-44	PASS	18.25
		N	20	868.999054		47	0		44	0	2	870.999054	-38.90	-69	PASS	30.10
											-2	866.999054	-39.87	-69	PASS	29.13
											10	878.999054	-31.90	-44	PASS	12.10
											-10	858.999054	-30.77	-44	PASS	13.23
											43.4499527	912.449007	-24.77	-44	PASS	19.23
											-43.4499527	825.549101	-25.73	-44	PASS	18.27
		P	30	869.498589		47	0		44	0	2	871.498589	-39.90	-69	PASS	29.10
											-2	867.498589	-39.87	-69	PASS	29.13
											10	879.498589	-31.90	-44	PASS	12.10
											-10	859.498589	-31.77	-44	PASS	12.23
											43.4749295	912.973518	-24.77	-44	PASS	19.23
											-43.47492945	826.023660	-24.73	-44	PASS	19.27
		Q & R	38	869.898216		47	0		44	0	2	871.898216	-39.87	-69	PASS	29.13
											-2	867.898216	-38.87	-69	PASS	30.13
											10	879.898216	-30.88	-44	PASS	13.12
											-10	859.898216	-31.72	-44	PASS	12.28
											43.4949108	913.393127	-24.73	-44	PASS	19.27
											-43.4949108	826.403305	-24.71	-44	PASS	19.29

CODE M9 RESULTS

Bandwidth, Modulation, & Data rate at Code M9 are 337 kHz, 4FSK & 125 kbps.
The Receiver sensitivity Reference limit from Table 32 is –91.724 dBm.

Code	Band	Band	Frequency Setting	Frequency (MHz)	Sig Gen A Sp (dBm)	Attenuator	PER(Sp) (%)	Sp + 3 (dBm)	SP +3 Attenuator	PER (Sp+3) (%)	Blocker Freq Offset	Blocker Freq	Maximum Value for Sig Gen B for Passing PER (dBm)	Category 2 Limits ≥ dBm	Pass/Fail	Margin
M9	X	M	3	868.299706	-91.724	45	0	-88.724	42	0	2	870.299706	-44.87	-69	PASS	24.13
											-2	866.299706	-44.86	-69	PASS	24.14
											10	878.299706	-32.87	-44	PASS	11.13
											-10	858.299706	-32.72	-44	PASS	11.28
											43.4149853	911.714691	-26.73	-44	PASS	17.27
											-43.4149853	824.884721	-26.72	-44	PASS	17.28
		N	10	868.999054		45	0		42	0	2	870.999054	-44.89	-69	PASS	24.11
											-2	866.999054	-43.90	-69	PASS	25.10
											10	878.999054	-32.88	-44	PASS	11.12
											-10	858.999054	-32.78	-44	PASS	11.22
											43.4499527	912.449007	-26.79	-44	PASS	17.21
											-43.4499527	825.549101	-27.76	-44	PASS	16.24
		P	15	869.498589		45	0		42	0	2	871.498589	-44.89	-69	PASS	24.11
											-2	867.498589	-44.88	-69	PASS	24.12
											10	879.498589	-32.89	-44	PASS	11.11
											-10	859.498589	-33.78	-44	PASS	10.22
											43.4749295	912.973518	-26.74	-44	PASS	17.26
											-43.47492945	826.023660	-27.75	-44	PASS	16.25
		Q & R	19	869.898216		45	0		42	0	2	871.898216	-44.89	-69	PASS	24.11
											-2	867.898216	-44.90	-69	PASS	24.10
											10	879.898216	-32.88	-44	PASS	11.12
											-10	859.898216	-32.78	-44	PASS	11.22
											43.4949108	913.393127	-26.79	-44	PASS	17.21
											-43.4949108	826.403305	-26.76	-44	PASS	17.24

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CODE M10 RESULTS

Bandwidth, Modulation, & Data rate at Code M10 are 675 kHz, 4FSK & 250 kbps.
The Receiver sensitivity Reference limit from Table 32 is –88.707 dBm.

Code	Band	Band	Frequency Setting	Frequency (MHz)	Sig Gen A Sp (dBm)	Attenuator	PER(Sp) (%)	Sp + 3 (dBm)	SP +3 Attenuator	PER (Sp+3) (%)	Blocker Freq Offset	Blocker Freq	Maximum Value for Sig Gen B for Passing PER (dBm)	Category 2 Limits ≥ dBm	Pass/Fail	Margin
M10	X	M	3	868.299706	-88.707	42	0	-85.707	39	0	2	870.299706	-46.87	-69	PASS	22.13
											-2	866.299706	-45.86	-69	PASS	23.14
											10	878.299706	-34.86	-44	PASS	9.14
											-10	858.299706	-33.73	-44	PASS	10.27
											43.4149853	911.714691	-28.72	-44	PASS	15.28
											-43.4149853	824.884721	-27.71	-44	PASS	16.29
		N	10	868.999054		42	0		39	0	2	870.999054	-46.90	-69	PASS	22.10
											-2	866.999054	-46.89	-69	PASS	22.11
											10	878.999054	-34.90	-44	PASS	9.10
											-10	858.999054	-34.77	-44	PASS	9.23
											43.4499527	912.449007	-28.77	-44	PASS	15.23
											-43.4499527	825.549101	-28.73	-44	PASS	15.27
		P	15	869.498589		42	0		39	0	2	871.498589	-45.91	-69	PASS	23.09
											-2	867.498589	-45.88	-69	PASS	23.12
											10	879.498589	-34.92	-44	PASS	9.08
											-10	859.498589	-33.77	-44	PASS	10.23
											43.4749295	912.973518	-29.74	-44	PASS	14.26
											-43.47492945	826.023660	-27.75	-44	PASS	16.25
		Q & R	19	869.898216		42	0		39	0	2	871.898216	-46.89	-69	PASS	22.11
											-2	867.898216	-46.90	-69	PASS	22.10
											10	879.898216	-34.88	-44	PASS	9.12
											-10	859.898216	-34.78	-44	PASS	9.22
											43.4949108	913.393127	-28.79	-44	PASS	15.21
											-43.4949108	826.403305	-29.76	-44	PASS	14.24

CODE M6 RESULTS

Bandwidth, Modulation, & Data rate at Code M6 are 60 kHz, GFSK & 10 kbps.
The Receiver sensitivity Reference limit from Table 32 is –99.218 dBm.

Code	Band	Band	Frequency Setting	Frequency (MHz)	Sig Gen A Sp (dBm)	Attenuator	PER(Sp) (%)	Sp + 3 (dBm)	SP +3 Attenuator	PER (Sp+3) (%)	Blocker Freq Offset	Blocker Freq	Maximum Value for Sig Gen B for Passing PER (dBm)	Category 2 Limits ≥ dBm	Pass/Fail	Margin
M6	X	M	6	868.299706	-99.218	54	0	-96.218	51	0	2	870.299706	-38.90	-69	PASS	30.10
											-2	866.299706	-38.89	-69	PASS	30.11
											10	878.299706	-31.90	-44	PASS	12.10
											-10	858.299706	-31.77	-44	PASS	12.23
											43.4149853	911.714691	-24.77	-44	PASS	19.23
											-43.4149853	824.884721	-25.73	-44	PASS	18.27
		N	20	868.999054		54	0		51	0	2	870.999054	-38.87	-69	PASS	30.13
											-2	866.999054	-37.87	-69	PASS	31.13
											10	878.999054	-30.88	-44	PASS	13.12
											-10	858.999054	-31.72	-44	PASS	12.28
											43.4499527	912.449007	-25.73	-44	PASS	18.27
											-43.4499527	825.549101	-25.71	-44	PASS	18.29
		P	30	869.498589		54	0		51	0	2	871.498589	-37.87	-69	PASS	31.13
											-2	867.498589	-38.86	-69	PASS	30.14
											10	879.498589	-30.87	-44	PASS	13.13
											-10	859.498589	-31.73	-44	PASS	12.27
											43.4749295	912.973518	-25.71	-44	PASS	18.29
											-43.47492945	826.023660	-25.71	-44	PASS	18.29
		Q & R	38	869.898216		54	0		51	0	2	871.898216	-38.91	-69	PASS	30.09
											-2	867.898216	-38.87	-69	PASS	30.13
											10	879.898216	-31.92	-44	PASS	12.08
											-10	859.898216	-31.77	-44	PASS	12.23
											43.4949108	913.393127	-25.74	-44	PASS	18.26
											-43.4949108	826.403305	-25.75	-44	PASS	18.25

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CODE M11 RESULTS

Bandwidth, Modulation, & Data rate at Code M11 are 60 kHz, 2FSK & 0.6 kbps.
The Receiver sensitivity Reference limit from Table 32 is –99.218 dBm.

Code	Band	Band	Frequency Setting	Frequency (MHz)	Sig Gen A Sp (dBm)	Attenuator	PER(Sp) (%)	Sp + 3 (dBm)	SP +3 Attenuator	PER (Sp+3) (%)	Blocker Freq Offset	Blocker Freq	Maximum Value for Sig Gen B for Passing PER (dBm)	Category 2 Limits ≥ dBm	Pass/Fail	Margin
M11	X	M	6	868.299706	-99.218	54	0	-96.218	51	0	2	870.299706	-34.86	-69	PASS	34.14
											-2	866.299706	-34.83	-69	PASS	34.17
											10	878.299706	-26.90	-44	PASS	17.10
											-10	858.299706	-26.90	-44	PASS	17.10
											43.4149853	911.714691	-17.87	-44	PASS	26.13
											-43.4149853	824.884721	-18.81	-44	PASS	25.19
		N	20	868.999054		54	0		51	0	2	870.999054	-34.93	-69	PASS	34.07
											-2	866.999054	-34.90	-69	PASS	34.10
											10	878.999054	-26.93	-44	PASS	17.07
											-10	858.999054	-26.77	-44	PASS	17.23
											43.4499527	912.449007	-17.78	-44	PASS	26.22
											-43.4499527	825.549101	-17.72	-44	PASS	26.28
		P	30	869.498589		54	0		51	0	2	871.498589	-34.90	-69	PASS	34.10
											-2	867.498589	-35.90	-69	PASS	33.10
											10	879.498589	-26.90	-44	PASS	17.10
											-10	859.498589	-26.77	-44	PASS	17.23
											43.4749295	912.973518	-17.76	-44	PASS	26.24
											-43.47492945	826.023660	-18.72	-44	PASS	25.28
		Q & R	38	869.898216		54	0		51	0	2	871.898216	-34.91	-69	PASS	34.09
											-2	867.898216	-34.88	-69	PASS	34.12
											10	879.898216	-27.92	-44	PASS	16.08
											-10	859.898216	-27.77	-44	PASS	16.23
											43.4949108	913.393127	-18.74	-44	PASS	25.26
											-43.4949108	826.403305	-18.73	-44	PASS	25.27

CODE M12 RESULTS

Bandwidth, Modulation, & Data rate at Code M12 are 60 kHz, GFSK & 4.8 kbps.
The Receiver sensitivity Reference limit from Table 32 is –99.218 dBm.

Code	Band	Band	Frequency Setting	Frequency (MHz)	Sig Gen A Sp (dBm)	Attenuator	PER(Sp) (%)	Sp + 3 (dBm)	SP +3 Attenuator	PER (Sp+3) (%)	Blocker Freq Offset	Blocker Freq	Maximum Value for Sig Gen B for Passing PER (dBm)	Category 2 Limits ≥ dBm	Pass/Fail	Margin
M12	X	M	6	868.299706	-99.218	54	0	-96.218	51	0	2	870.299706	-36.89	-69	PASS	32.11
											-2	866.299706	-36.88	-69	PASS	32.12
											10	878.299706	-29.89	-44	PASS	14.11
											-10	858.299706	-29.78	-44	PASS	14.22
											43.4149853	911.714691	-23.74	-44	PASS	20.26
											-43.4149853	824.884721	-23.75	-44	PASS	20.25
		N	20	868.999054		54	0		51	0	2	870.999054	-36.89	-69	PASS	32.11
											-2	866.999054	-35.90	-69	PASS	33.10
											10	878.999054	-28.88	-44	PASS	15.12
											-10	858.999054	-29.81	-44	PASS	14.19
											43.4499527	912.449007	-22.81	-44	PASS	21.19
											-43.4499527	825.549101	-23.80	-44	PASS	20.20
		P	30	869.498589		54	0		51	0	2	871.498589	-36.89	-69	PASS	32.11
											-2	867.498589	-36.91	-69	PASS	32.09
											10	879.498589	-29.93	-44	PASS	14.07
											-10	859.498589	-29.90	-44	PASS	14.10
											43.4749295	912.973518	-22.88	-44	PASS	21.12
											-43.47492945	826.023660	-23.92	-44	PASS	20.08
		Q & R	38	869.898216		54	0		51	0	2	871.898216	-36.87	-69	PASS	32.13
											-2	867.898216	-36.85	-69	PASS	32.15
											10	879.898216	-29.91	-44	PASS	14.09
											-10	859.898216	-28.77	-44	PASS	15.23
											43.4949108	913.393127	-22.76	-44	PASS	21.24
											-43.4949108	826.403305	-23.73	-44	PASS	20.27

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CODE M13 RESULTS

Bandwidth, Modulation, & Data rate at Code M13 are 60 kHz, GFSK & 19.2 kbps.
The Receiver sensitivity Reference limit from Table 32 is –99.218 dBm.

Code	Band	Band	Frequency Setting	Frequency (MHz)	Sig Gen A Sp (dBm)	Attenuator	PER(Sp) (%)	Sp + 3 (dBm)	SP +3 Attenuator	PER (Sp+3) (%)	Blocker Freq Offset	Blocker Freq	Maximum Value for Sig Gen B for Passing PER (dBm)	Category 2 Limits ≥ dBm	Pass/Fail	Margin
M13	X	M	6	868.299706	-99.218	54	0	-96.218	51	0	2	870.299706	-37.91	-69	PASS	31.09
											-2	866.299706	-38.87	-69	PASS	30.13
											10	878.299706	-30.92	-44	PASS	13.08
											-10	858.299706	-30.77	-44	PASS	13.23
											43.4149853	911.714691	-24.74	-44	PASS	19.26
											-43.4149853	824.884721	-25.75	-44	PASS	18.25
		N	20	868.999054		54	0		51	0	2	870.999054	-37.82	-69	PASS	31.18
											-2	866.999054	-37.87	-69	PASS	31.13
											10	878.999054	-30.79	-44	PASS	13.21
											-10	858.999054	-30.80	-44	PASS	13.20
											43.4499527	912.449007	-24.79	-44	PASS	19.21
											-43.4499527	825.549101	-24.79	-44	PASS	19.21
		P	30	869.498589		54	0		51	0	2	871.498589	-37.90	-69	PASS	31.10
											-2	867.498589	-37.91	-69	PASS	31.09
											10	879.498589	-30.92	-44	PASS	13.08
											-10	859.498589	-30.77	-44	PASS	13.23
											43.4749295	912.973518	-25.77	-44	PASS	18.23
											-43.47492945	826.023660	-24.73	-44	PASS	19.27
		Q & R	38	869.898216		54	0		51	0	2	871.898216	-38.90	-69	PASS	30.10
											-2	867.898216	-38.87	-69	PASS	30.13
											10	879.898216	-31.90	-44	PASS	12.10
											-10	859.898216	-31.78	-44	PASS	12.22
											43.4949108	913.393127	-24.77	-44	PASS	19.23
											-43.4949108	826.403305	-25.73	-44	PASS	18.27

CODE M14 RESULTS

Bandwidth, Modulation, & Data rate at Code M14 are 844 kHz, 4FSK & 300 kbps.
The Receiver sensitivity Reference limit from Table 32 is –87.737 dBm.

Code	Band	Band	Frequency Setting	Frequency (MHz)	Sig Gen A Sp (dBm)	Attenuator	PER(Sp) (%)	Sp + 3 (dBm)	SP +3 Attenuator	PER (Sp+3) (%)	Blocker Freq Offset	Blocker Freq	Maximum Value for Sig Gen B for Passing PER (dBm)	Category 2 Limits ≥ dBm	Pass/Fail	Margin
M14	X	M	3	868.299706	-87.737	42	0	-84.737	39	0.4	2	870.299706	-48.91	-69	PASS	20.09
											-2	866.299706	-48.88	-69	PASS	20.12
											10	878.299706	-34.92	-44	PASS	9.08
											-10	858.299706	-34.77	-44	PASS	9.23
											43.4149853	911.714691	-31.74	-44	PASS	12.26
											-43.4149853	824.884721	-31.75	-44	PASS	12.25
		N	10	868.999054		42	0		39	0	2	870.999054	-48.90	-69	PASS	20.10
											-2	866.999054	-49.89	-69	PASS	19.11
											10	878.999054	-35.90	-44	PASS	8.10
											-10	858.999054	-34.76	-44	PASS	9.24
											43.4499527	912.449007	-30.77	-44	PASS	13.23
											-43.4499527	825.549101	-31.78	-44	PASS	12.22
		P	15	869.498589		42	0		39	0.3	2	871.498589	-48.90	-69	PASS	20.10
											-2	867.498589	-49.89	-69	PASS	19.11
											10	879.498589	-34.89	-44	PASS	9.11
											-10	859.498589	-34.78	-44	PASS	9.22
											43.4749295	912.973518	-31.76	-44	PASS	12.24
											-43.47492945	826.023660	-32.74	-44	PASS	11.26
		Q & R	19	869.898216		42	0		39	1	2	871.898216	-47.90	-69	PASS	21.10
											-2	867.898216	-49.89	-69	PASS	19.11
											10	879.898216	-35.90	-44	PASS	8.10
											-10	859.898216	-34.78	-44	PASS	9.22
											43.4949108	913.393127	-29.79	-44	PASS	14.21
											-43.4949108	826.403305	-30.79	-44	PASS	13.21

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CODE M15 RESULTS

Bandwidth, Modulation, & Data rate at Code M15 are 844 kHz, MSK & 600 kbps.
The Receiver sensitivity Reference limit from Table 32 is –87.737 dBm.

Code	Band	Band	Frequency Setting	Frequency (MHz)	Sig Gen A Sp (dBm)	Attenuator	PER(Sp) (%)	Sp + 3 (dBm)	SP +3 Attenuator	PER (Sp+3) (%)	Blocker Freq Offset	Blocker Freq	Maximum Value for Sig Gen B for Passing PER (dBm)	Category 2 Limits ≥ dBm	Pass/Fail	Margin
M15	X	M	3	868.299706	-87.737	42	0	-84.737	39	0	2	870.299706	-45.90	-69	PASS	23.10
											-2	866.299706	-46.88	-69	PASS	22.12
											10	878.299706	-33.92	-44	PASS	10.08
											-10	858.299706	-34.80	-44	PASS	9.20
											43.4149853	911.714691	-27.83	-44	PASS	16.17
											-43.4149853	824.884721	-27.79	-44	PASS	16.21
		N	10	868.999054		42	0		39	0	2	870.999054	-44.90	-69	PASS	24.10
											-2	866.999054	-47.91	-69	PASS	21.09
											10	878.999054	-33.92	-44	PASS	10.08
											-10	858.999054	-33.81	-44	PASS	10.19
											43.4499527	912.449007	-26.82	-44	PASS	17.18
											-43.4499527	825.549101	-27.80	-44	PASS	16.20
		P	15	869.498589		42	0		39	0	2	871.498589	-46.89	-69	PASS	22.11
											-2	867.498589	-47.91	-69	PASS	21.09
											10	879.498589	-34.93	-44	PASS	9.07
											-10	859.498589	-33.80	-44	PASS	10.20
											43.4749295	912.973518	-27.87	-44	PASS	16.13
											-43.47492945	826.023660	-27.81	-44	PASS	16.19
		Q & R	19	869.898216		42	0		39	0	2	871.898216	-45.93	-69	PASS	23.07
											-2	867.898216	-46.90	-69	PASS	22.10
											10	879.898216	-33.96	-44	PASS	10.04
											-10	859.898216	-33.82	-44	PASS	10.18
											43.4949108	913.393127	-28.87	-44	PASS	15.13
											-43.4949108	826.403305	-27.79	-44	PASS	16.21

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9. POLITE SPECTRUM ACCESS

The EUT utilizes duty cycle limitations to meet polite spectrum access requirements.

9.1. DUTY CYCLE

Duty cycle is measured by setting the appropriate duty cycle via the provided test software.

Code	ON Time B (sec)	Period (sec)	Duty Cycle x (linear)	Duty Cycle (%)
M1	0.001	1.124	0.0009	0.09%
M2	0.006	5.631	0.0010	0.10%
M3	0.014	14.770	0.0010	0.10%
M4	0.450	461.400	0.0010	0.10%
M5	0.054	56.220	0.0010	0.10%
M6	0.056	56.210	0.0010	0.10%
M7	0.014	14.770	0.0010	0.10%
M8	0.006	5.619	0.0010	0.10%
M9	0.003	4.505	0.0006	0.06%
M10	0.001	2.248	0.0005	0.05%
M11	0.001	1.875	0.0006	0.06%
M12	0.116	117.100	0.0010	0.10%
M13	0.029	29.230	0.0010	0.10%
M14	0.001	1.875	0.0006	0.06%
M15	0.001	0.9404	0.0010	0.10%

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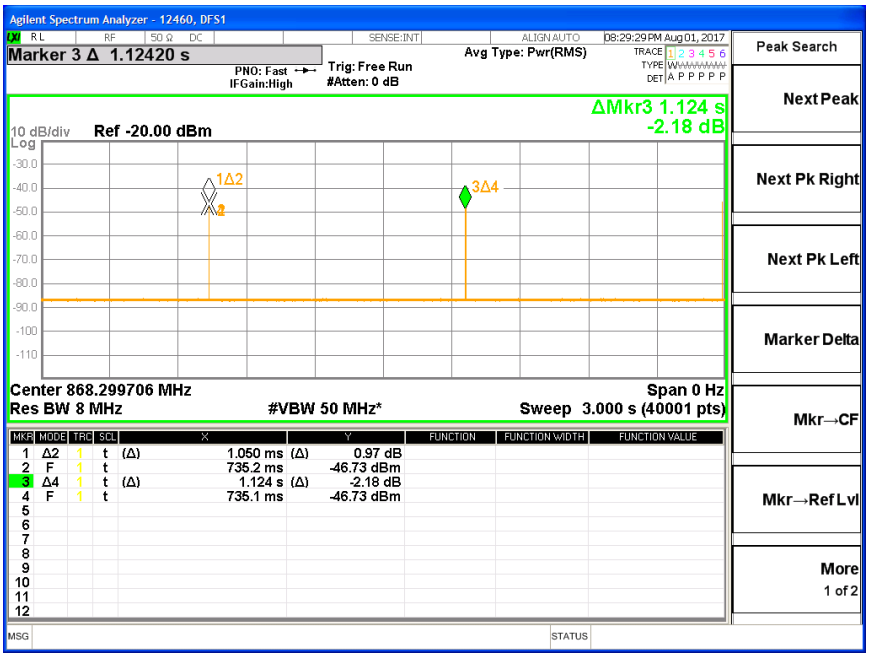
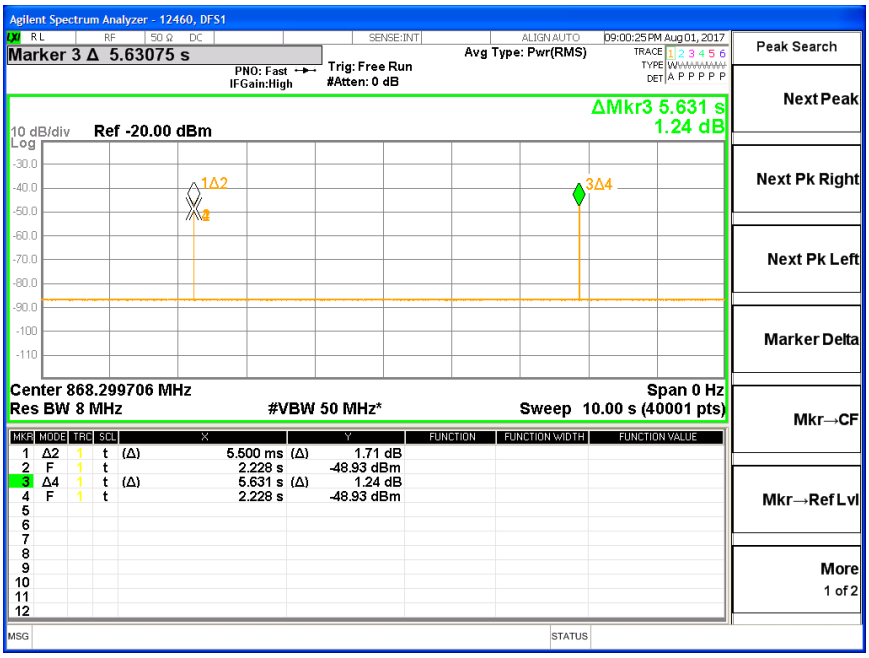
M1



M2



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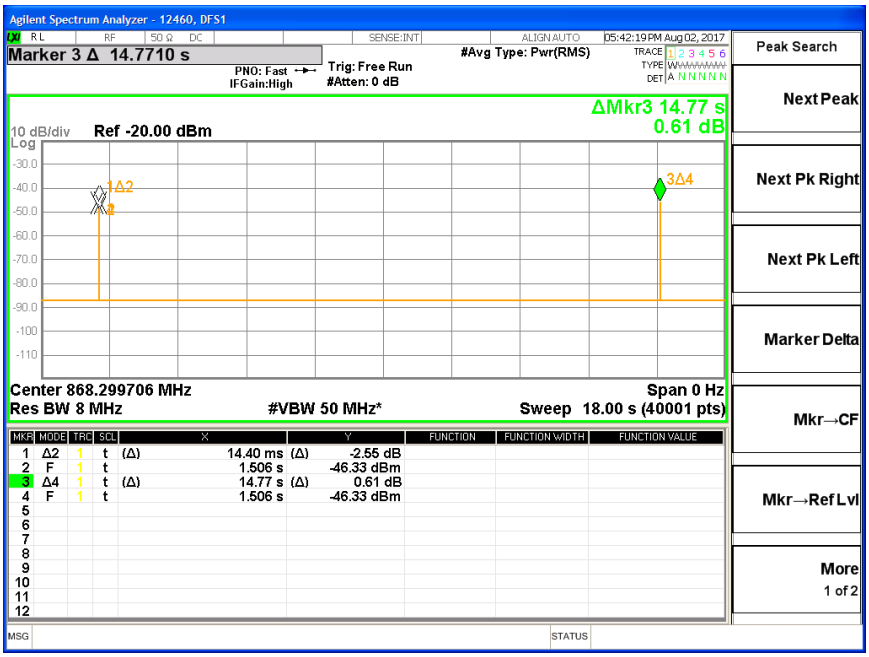
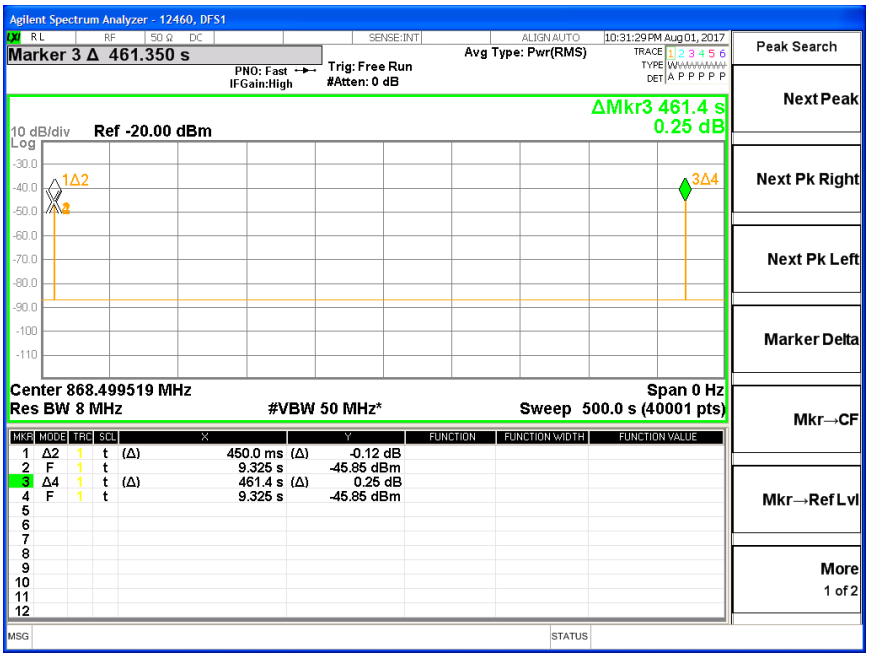
M3



M4



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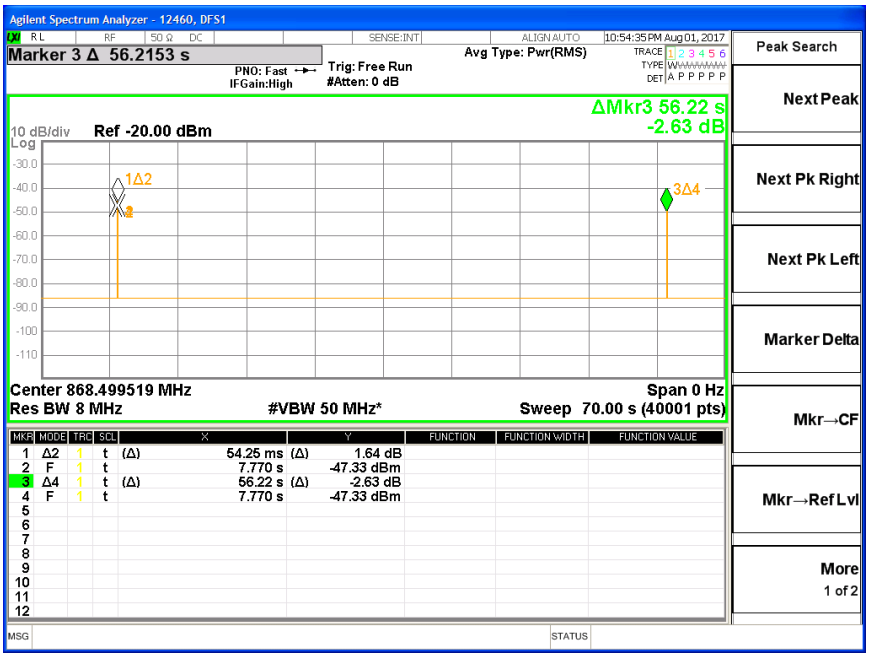
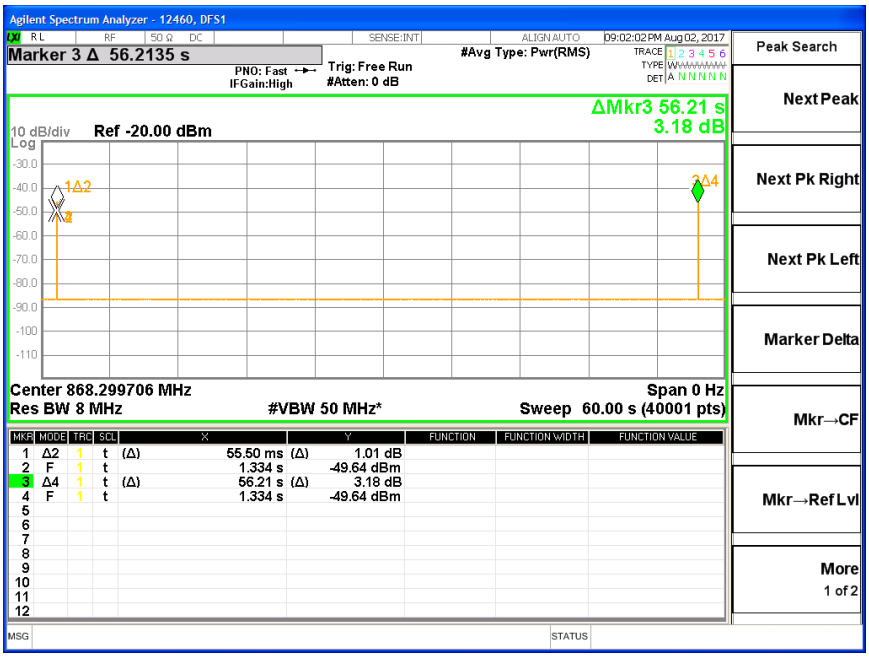
M5



M6



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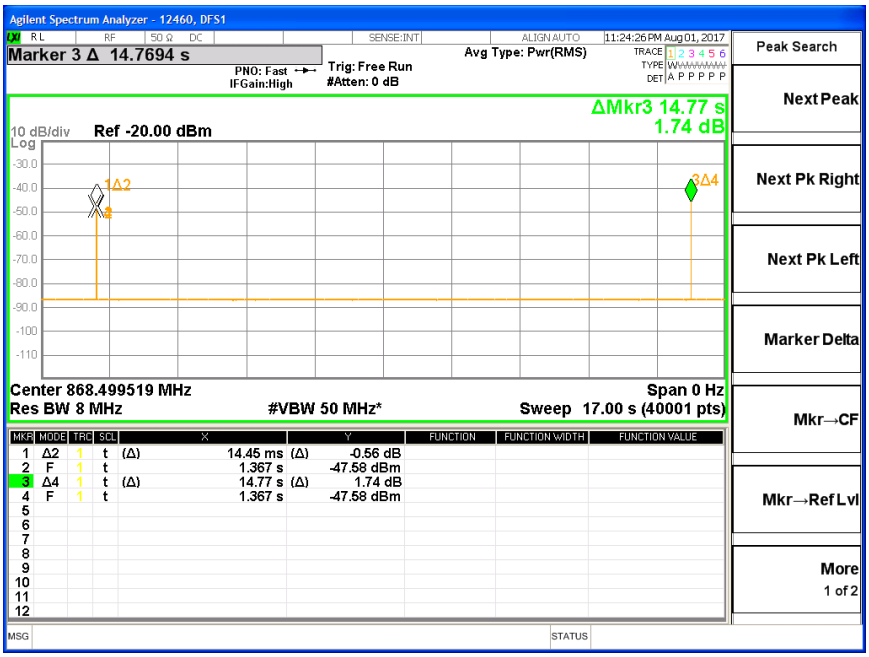
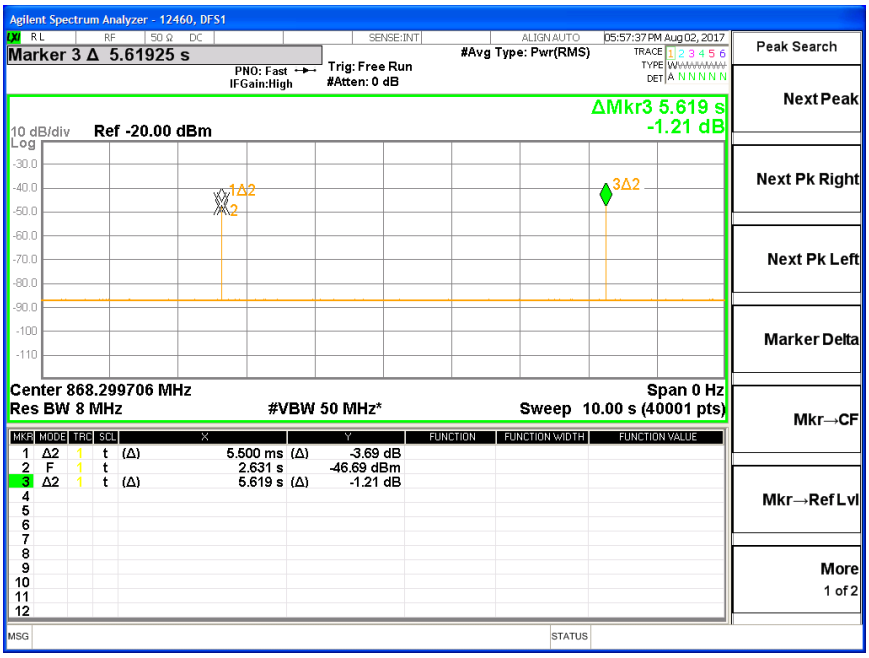
M7



M8



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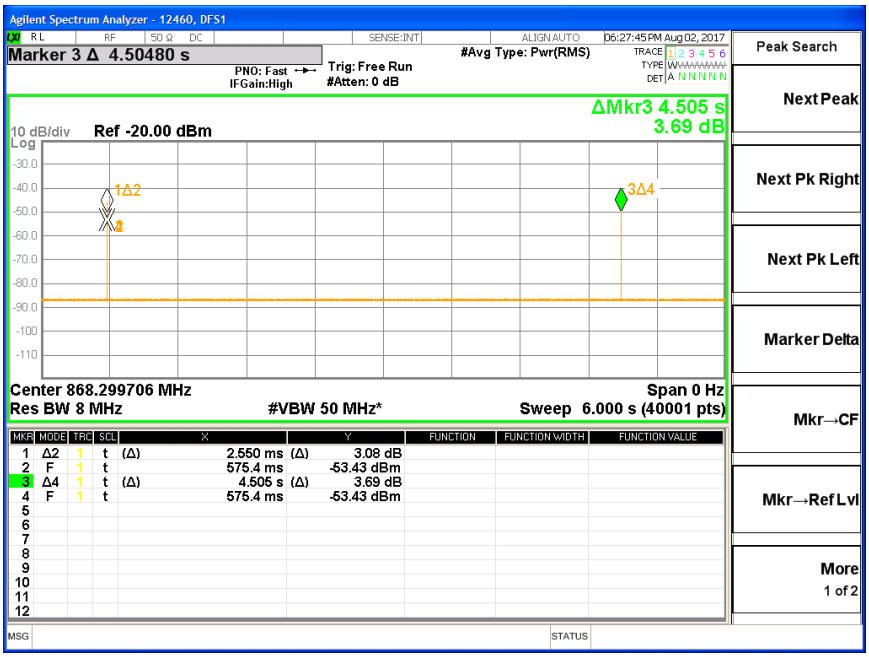
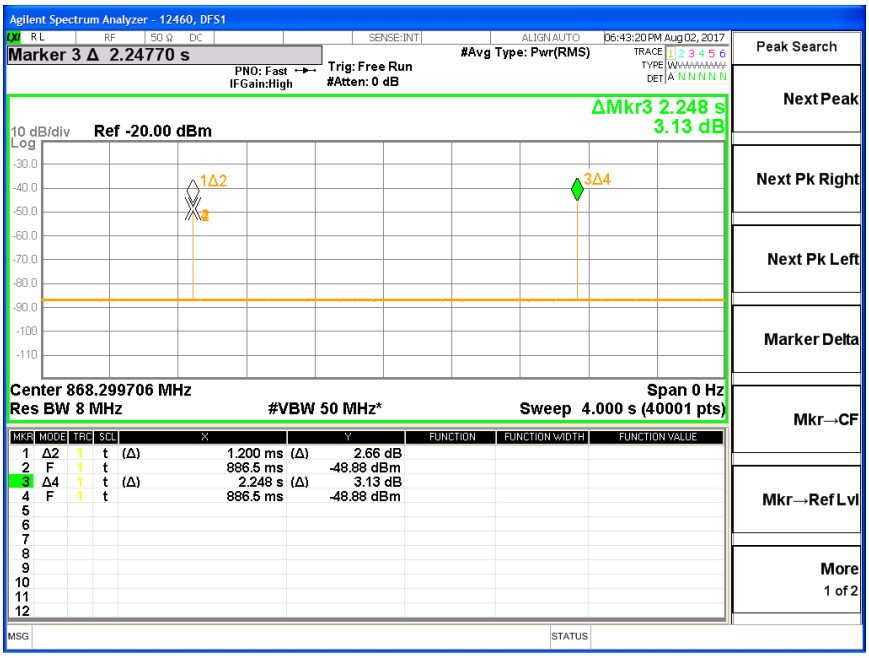
M9



M10



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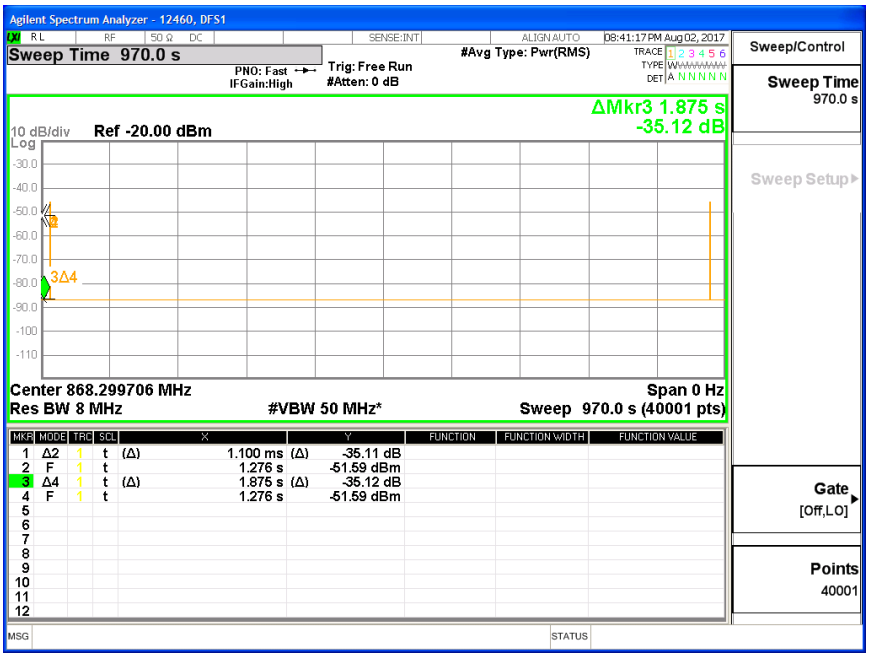
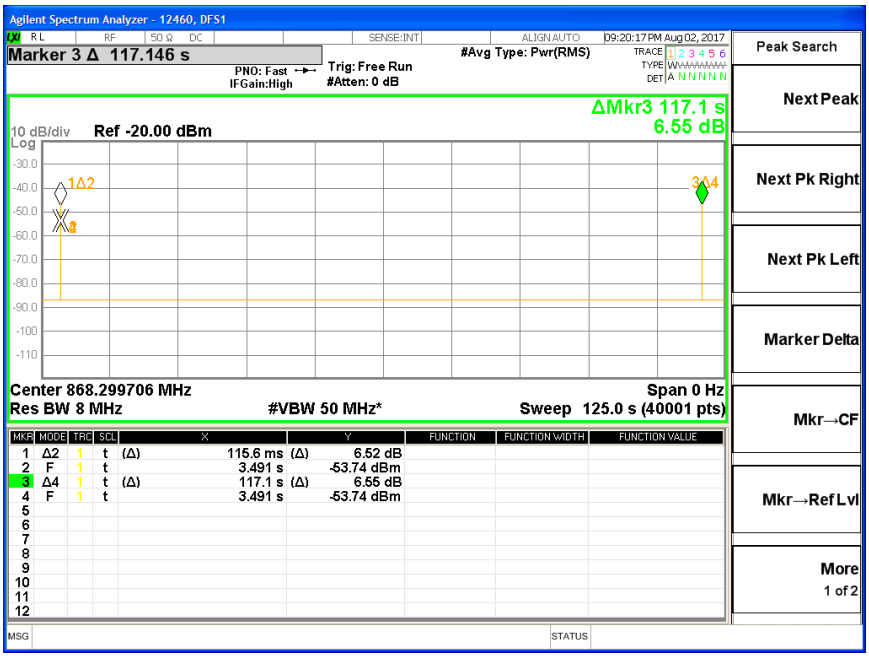
M11



M12



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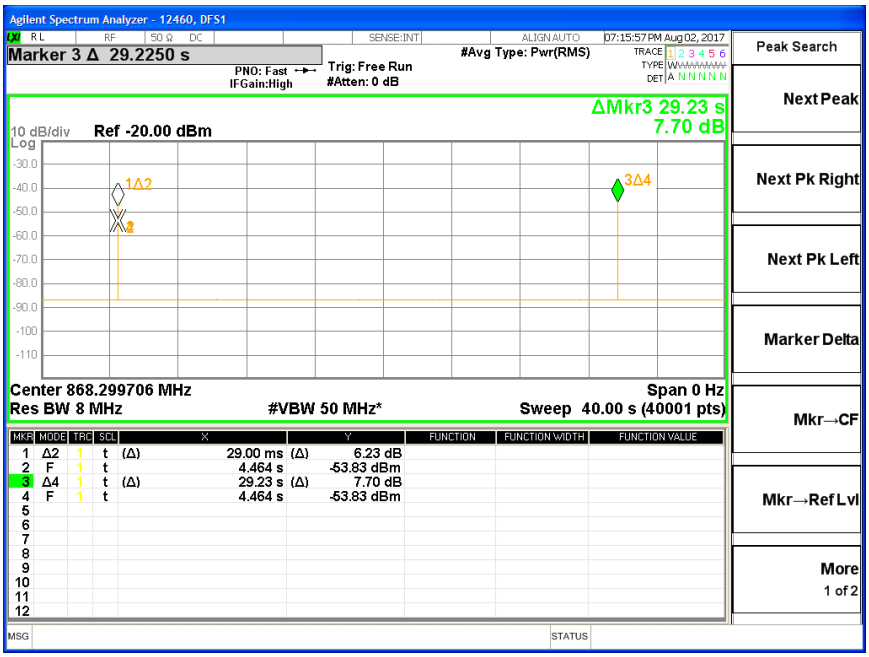
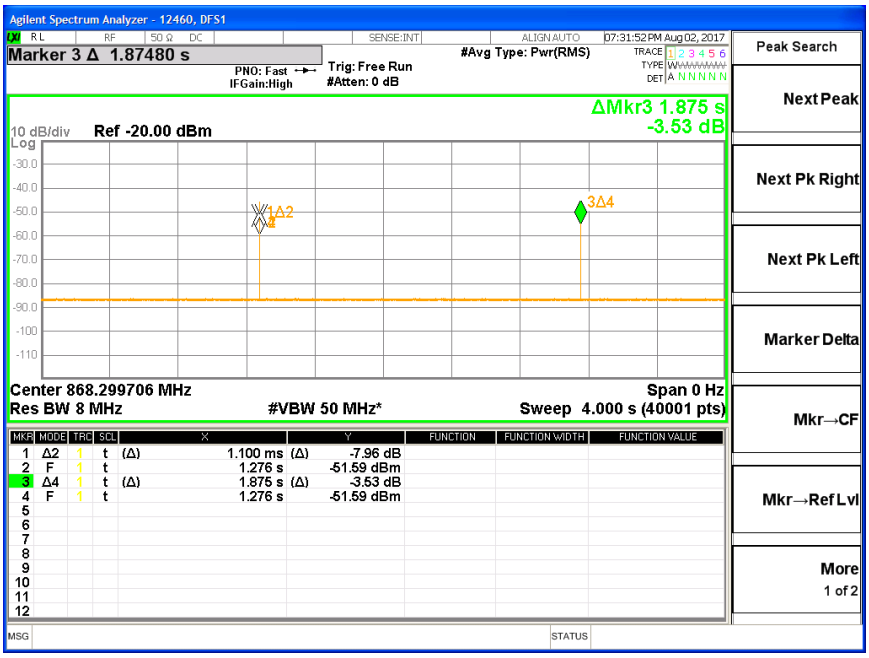
M13



M14



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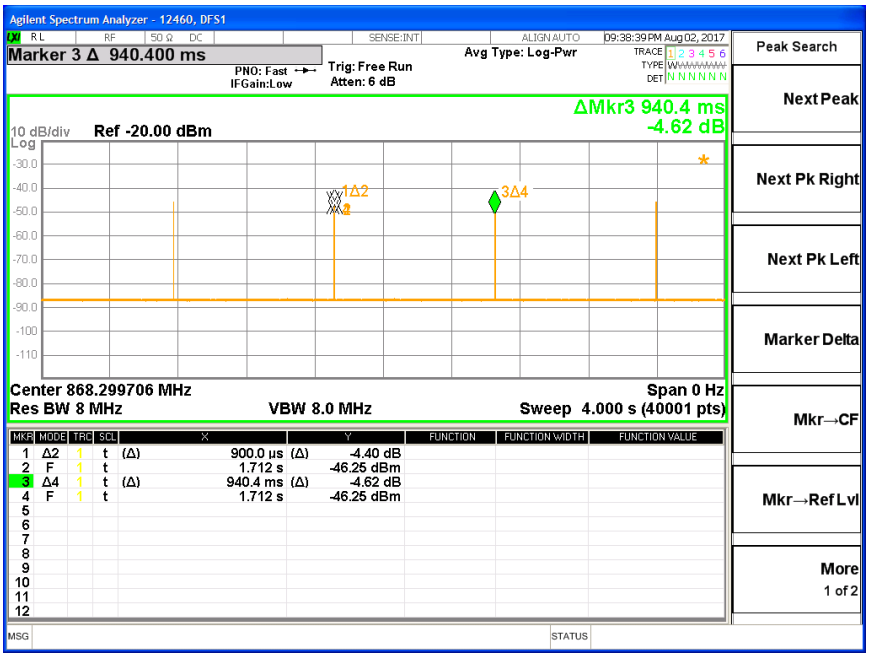
M15



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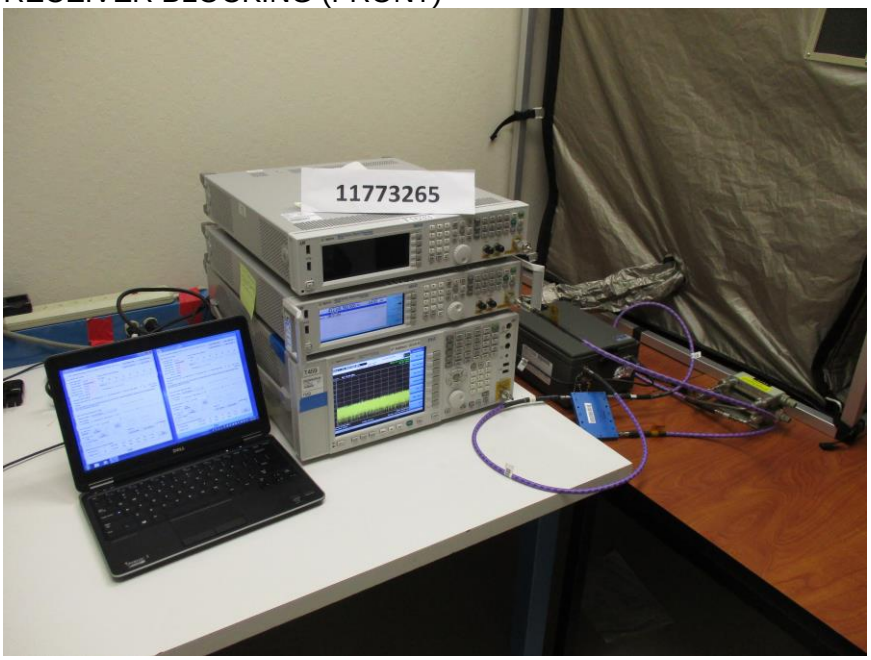
10. SETUP PHOTOS

RECEIVER BLOCKING (FRONT)



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