



Nuvector Corporation
Bluetooth Pocket Programmer

EN 301 839 V2.1.1:2016

FCC Part 95l:2017

MICS Radio

Report # NUVE0019.4 Rev. 1



NVLAP LAB CODE: 200881-0



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CERTIFICATE OF TEST

Last Date of Test: November 8, 2018
Nuvector Corporation
Model: Bluetooth Pocket Programmer

Radio Equipment Testing

Standards

Specification	Method
EN 301 839 V2.1.1:2016	EN 301 839 V2.1.1:2016
FCC Part 95I:2017	

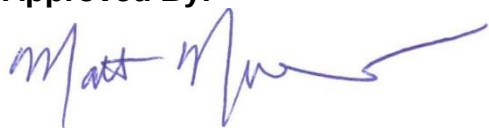
Results

Method Clause	Test Description	Applied	Results	Comments
5.3.7.1.3	LBT Threshold Power Level	Yes	Pass	
5.3.7.1.4	Monitoring System Bandwidth	Yes	Pass	
5.3.7.1.5.1.1	Monitoring System Scan Cycle Time	Yes	Pass	
5.3.7.1.5.1.2	Minimum Channel Monitoring Period	Yes	Pass	
5.3.7.1.6	Channel Access Based On Ambient Levels	Yes	Pass	
5.3.7.1.7	Discontinuation Of A MICS Session	Yes	Pass	
5.3.7.1.8	Use Of Pre-Scanned Alternative Channels	Yes	Pass	

Deviations From Test Standards

None

Approved By:



Matt Nuernberg, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.

REVISION HISTORY



Revision Number	Description	Date (yyyy-mm-dd)	Page Number
01	Updated Client Provided Information with the following information: The antenna gain is -9.7 dBi. The receiver emissions bandwidth shall be 247939 Hz. The channel that shall be used for testing is 403.35 MHz.	2019-08-05	8

ACCREDITATIONS AND AUTHORIZATIONS



United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Element to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with ISED.

European Union

European Commission – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

MSIT / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Israel

MOC – Recognized by MOC as a CAB for the acceptance of test data.

Hong Kong

OFCA – Recognized by OFCA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

SCOPE

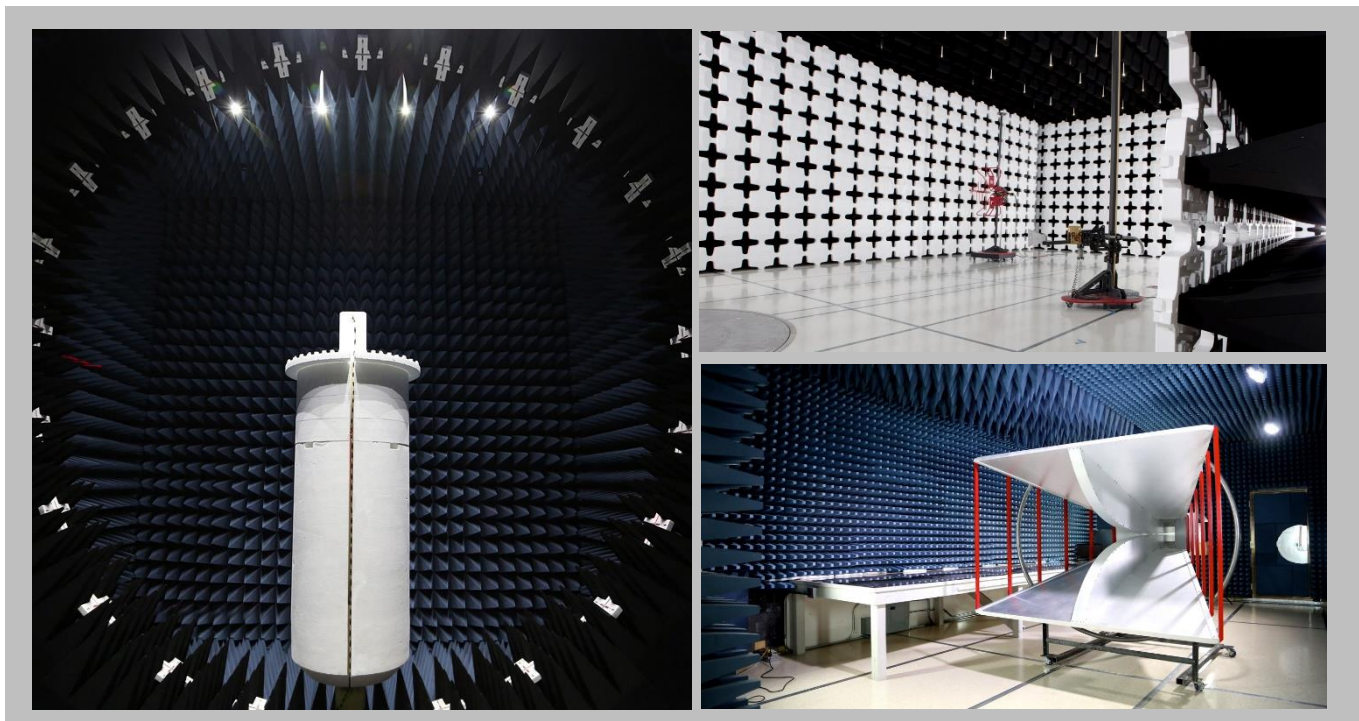
For details on the Scopes of our Accreditations, please visit:

<https://www.nwemc.com/emc-testing-accreditations>

FACILITIES



California Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612) 638-5136	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Oregon Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 98011 (425) 984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code: 201049-0	NVLAP Lab Code: 200629-0
Innovation, Science and Economic Development Canada					
2834B-1, 2834B-3	2834E-1, 2834E-3	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRR, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157



MEASUREMENT UNCERTAINTY

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

Test Setup Block Diagrams

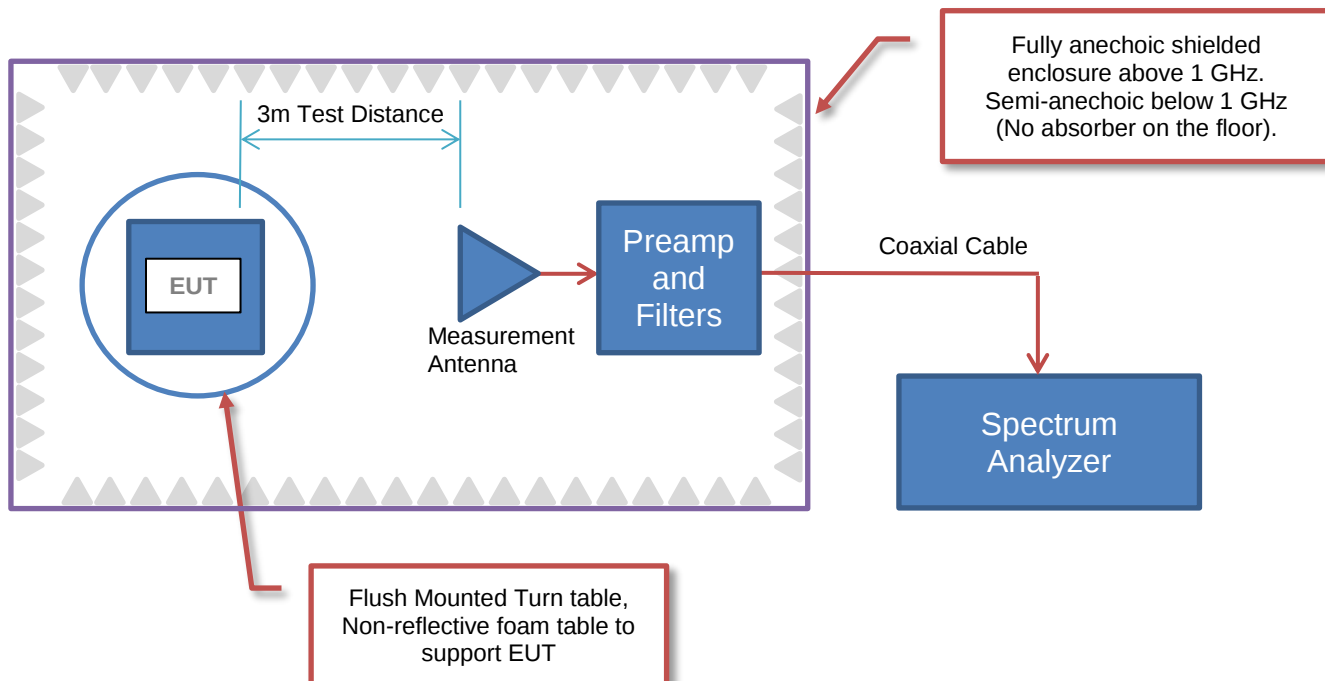
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Nuvector Corporation
Address:	10675 Naples St. NE
City, State, Zip:	Blaine, MN 55449
Test Requested By:	Peter Valentyik
Model:	Bluetooth Pocket Programmer
First Date of Test:	November 6, 2018
Last Date of Test:	November 8, 2018
Receipt Date of Samples:	November 5, 2018
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

Communicates with Clinician Programmer using Bluetooth and MICS with IPG.

Client Provided Information:

The Bluetooth Pocket Programmer Model 4110 test samples used in testing contain a new PCBA and have reused the mechanical enclosure, buttons, display, battery and labeling from the Pocket Programmer Model 4100. As a result, the label found on the test units contain the label with Model 4100.

The antenna gain is -9.7 dBi. The receiver emissions bandwidth shall be 247939 Hz. The channel that shall be used for testing is 403.35 MHz.

Testing Objective:

To demonstrate compliance of the MICS radio to Article 3.2 of the RED.

CONFIGURATIONS

Configuration NUVE0019- 6

Software/Firmware Running during test	
Description	Version
EMCTESTINGV2	2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Programmer	Nuvectora Corporation	4110	101016

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Power Supply	SL Power Electronics	ME10A0599B02	None
PG	Nuvectora Corporation	2408	036807

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Cable	No	1.45 m	No	Power Supply	Programmer

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2018-11-06	LBT Threshold Power Level	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2018-11-06	Monitoring System Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2018-11-06	Monitoring System Scan Cycle Time	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2018-11-06	Minimum Channel Monitoring Period	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2018-11-06	Channel Access Based On Ambient Levels	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	2018-11-08	Discontinuation Of A MICS Session	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	2018-11-08	Use Of Pre-Scanned Alternative Channels	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.



XMM 2017.12.13

LBT THRESHOLD POWER LEVEL

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAD	NCR	NCR
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAC	NCR	NCR
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR
Directional Coupler	Fairview Microwave	SMC4039-10	RGS	NCR	NCR
Generator - Signal	Keysight	N5182B	TFX	10-Apr-18	10-Apr-21
Generator - Signal	Agilent	E4422B	TGQ	15-Mar-18	15-Mar-21
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-18	13-Feb-19
Block - DC	Fairview Microwave	SD3379	AMI	7-Sep-18	7-Sep-19
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-17	19-Dec-18

TEST DESCRIPTION

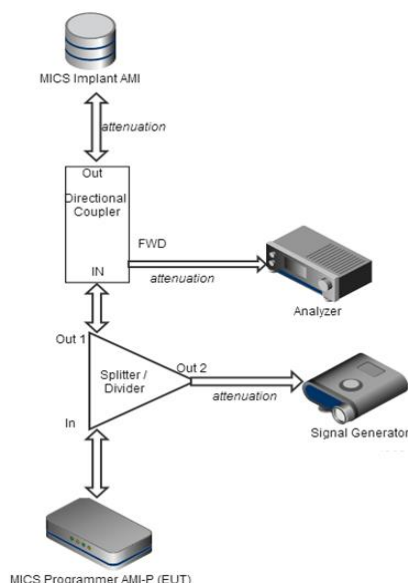
The EUT was configured according to the following block diagram:

The LBT Threshold was calculated as follows: $10 \cdot \log(\text{Bandwidth}) - 150 + \text{Antenna Gain}$

The signal generator was set to multitone operation to cause equal interference across the entire band except for at the intended channel center frequency, F_c . The amplitude of the multitone signals (out of operation region) were set to 3 dB above the LBT threshold. The EUT was verified to only transmit on F_c . The multitone was then set to 23 dB above the LBT threshold. The EUT was again verified to only transmit on F_c . The multitone was then lowered to 3 dB above the LBT threshold. The EUT was again verified to only transmit on F_c .

The spectrum analyzer was set to measure the transmit band of 402-405 MHz. A CW signal was then injected on F_c 6 dB below the LBT threshold, and raised by 1 dB increments until the EUT choose a different channel to start a session. Screen captures were provided to show the EUT behavior at the different LBT threshold levels.

The CW signal source amplitude at the EUT was then measured and recorded with the spectrum analyzer.



LBT THRESHOLD POWER LEVEL



XMI 2017.12.13

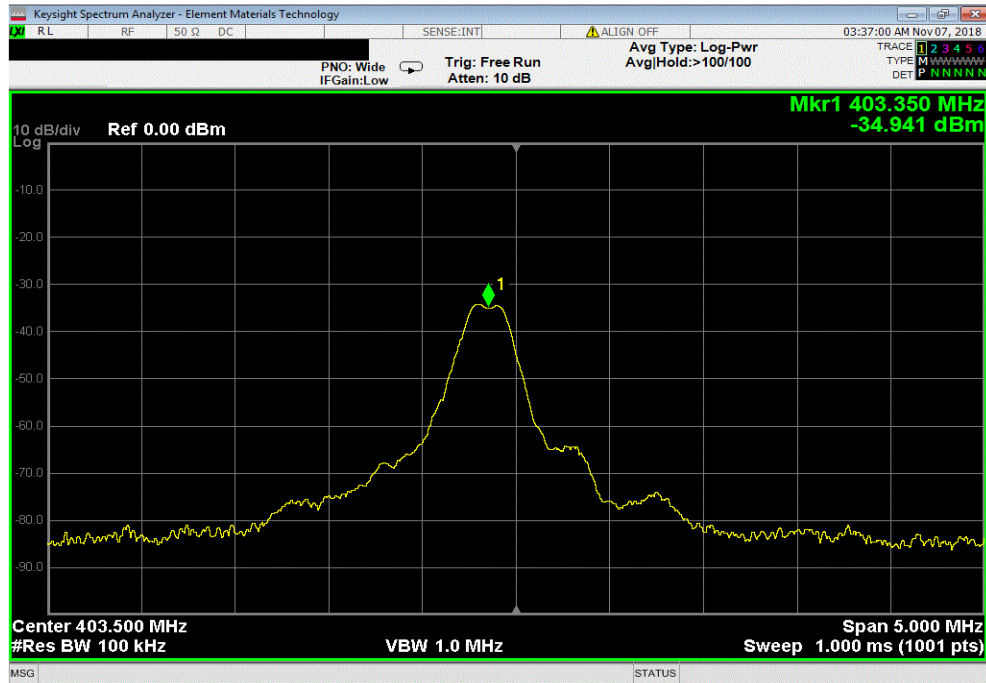
EUT: Bluetooth Pocket Programmer		Work Order: NUVE0019	
Serial Number: 101016		Date: 6-Nov-18	
Customer: Nuvectra Corporation		Temperature: 22.6 °C	
Attendees: Peter Valentyik		Humidity: 33.8% RH	
Project: None		Barometric Pres.: 1010 mbar	
Tested by: Kyle McMullan		Power: 230VAC/50Hz	
		Job Site: MN08	
TEST SPECIFICATIONS			
EN 301 839 V2.1.1:2016		Test Method	
EN 301 839 V2.1.1:2016		EN 301 839 V2.1.1:2016	
COMMENTS			
Fc is at 403.35 MHz.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	6	Signature <i>Kyle McMullan</i>	
		Value (dBm)	Limit < (dBm)
LBT Threshold -6 dB		N/A	N/A
LBT Threshold -5 dB		N/A	N/A
LBT Threshold -4 dB		N/A	N/A
LBT Threshold -3 dB		N/A	N/A
LBT Threshold -2 dB		N/A	N/A
LBT Threshold -1 dB		N/A	N/A
LBT Threshold 0		N/A	N/A
LBT Threshold +1 dB		N/A	N/A
LBT Threshold +2 dB		N/A	N/A
LBT Threshold +3 dB		-106.76	-105.76
			Pass

LBT THRESHOLD POWER LEVEL

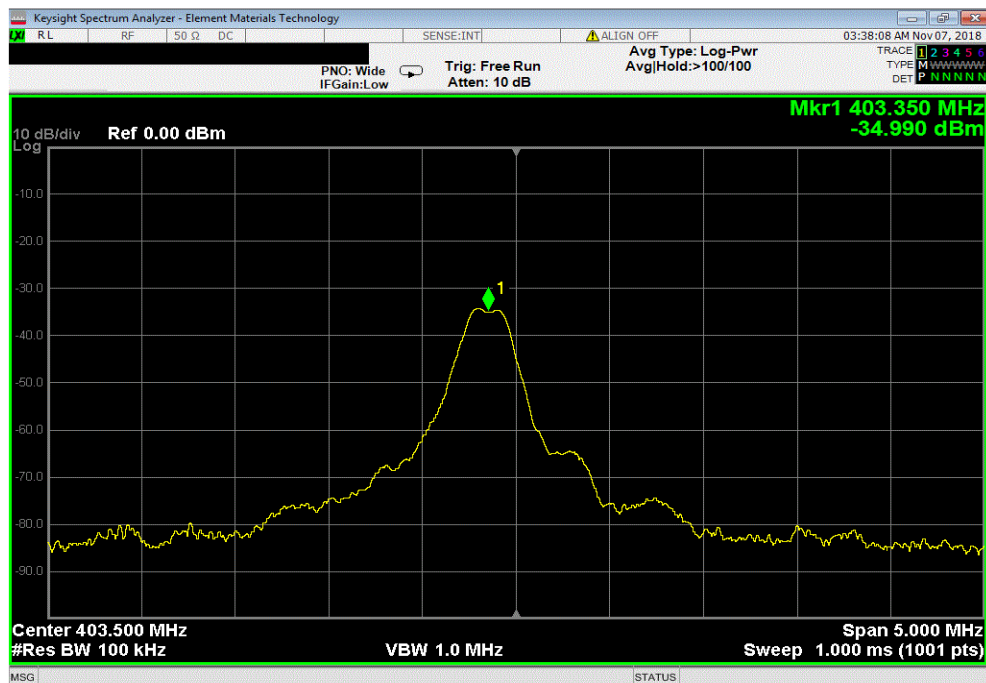


XMI 2017.12.13

LBT Threshold -6 dB						
				Value (dBm)	Limit < (dBm)	Result
				N/A	N/A	N/A



LBT Threshold -5 dB						
				Value (dBm)	Limit < (dBm)	Result
				N/A	N/A	N/A

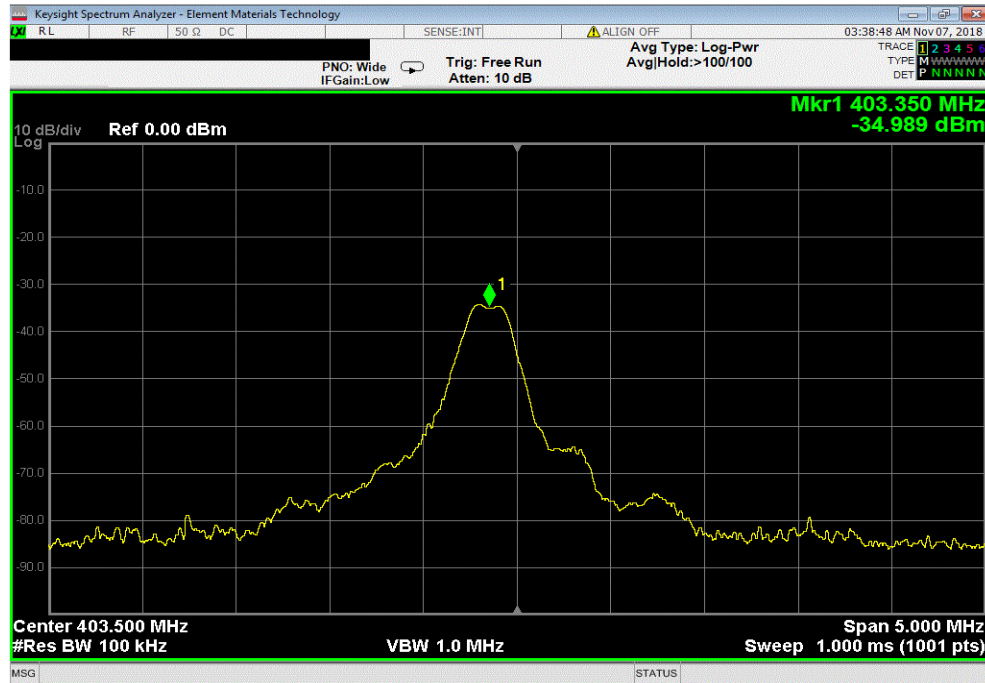


LBT THRESHOLD POWER LEVEL

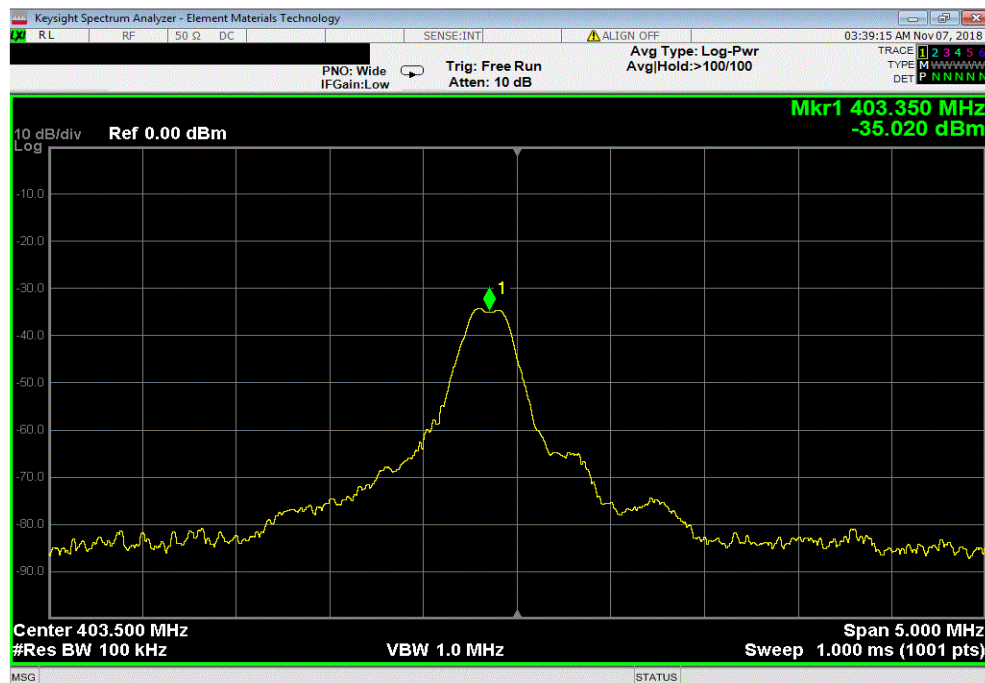


XMM 2017.12.13

LBT Threshold -4 dB						
				Value (dBm)	Limit < (dBm)	Result
				N/A	N/A	N/A



LBT Threshold -3 dB						
				Value (dBm)	Limit < (dBm)	Result
				N/A	N/A	N/A

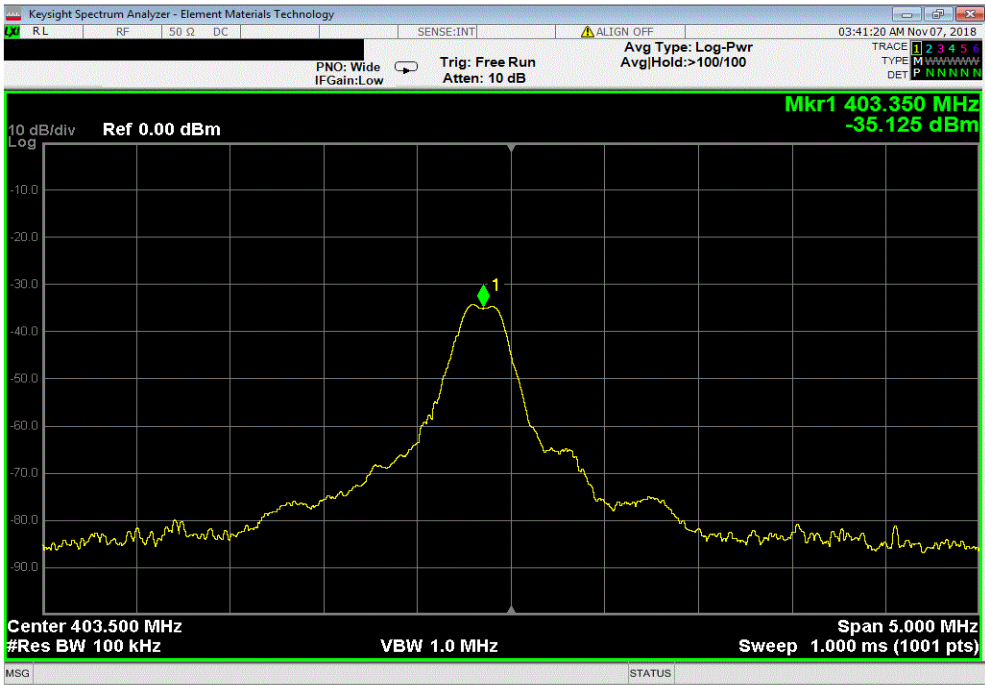


LBT THRESHOLD POWER LEVEL

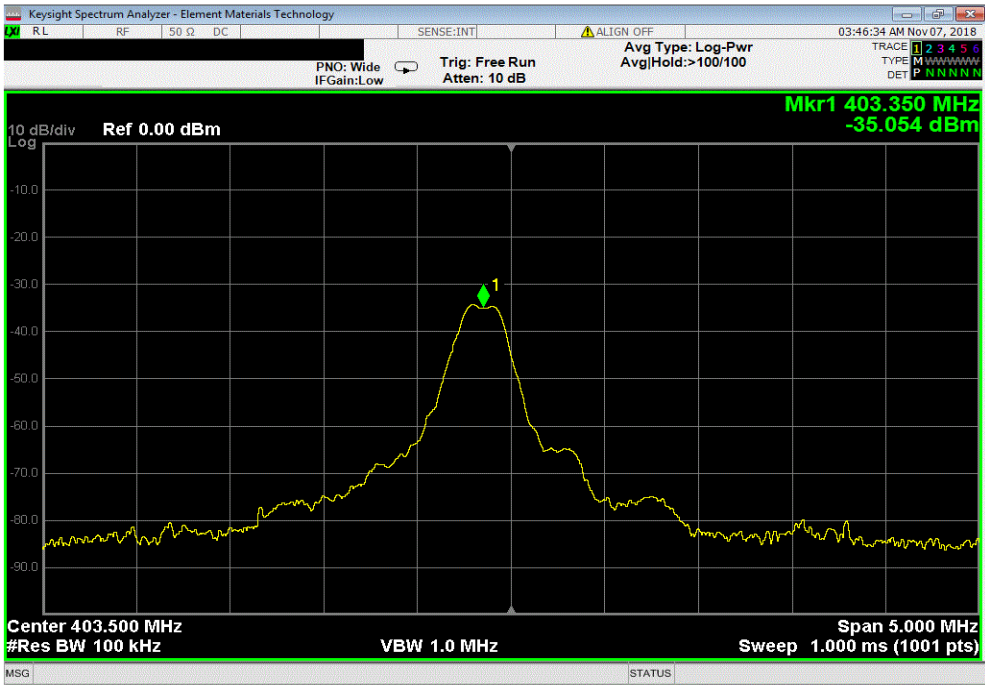


XMM 2017.12.13

LBT Threshold -2 dB						
				Value (dBm)	Limit < (dBm)	Result
				N/A	N/A	N/A



LBT Threshold -1 dB						
				Value (dBm)	Limit < (dBm)	Result
				N/A	N/A	N/A

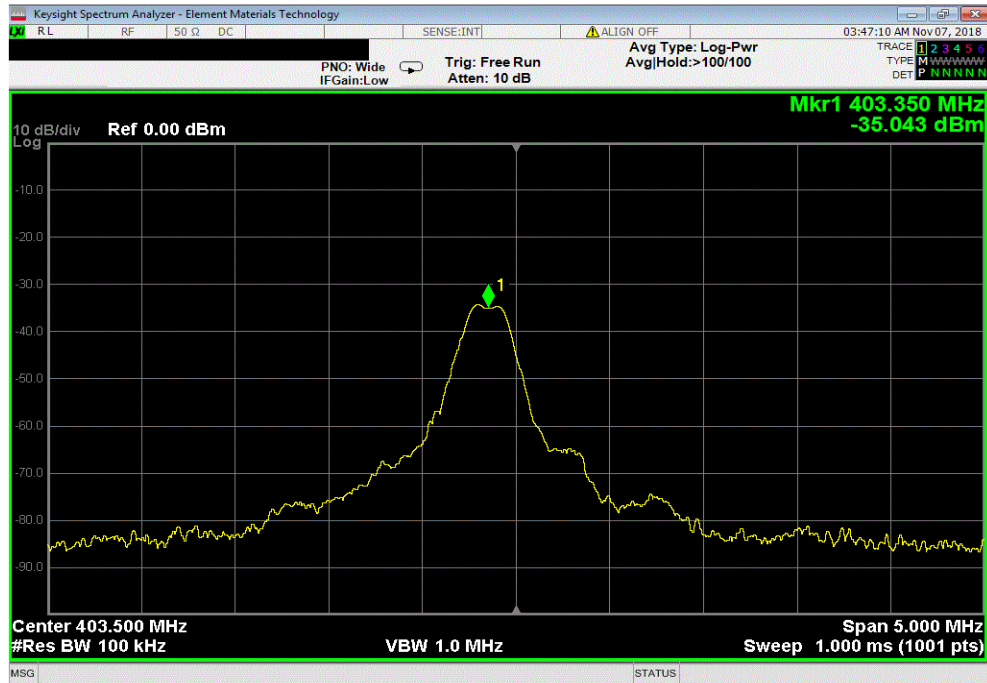


LBT THRESHOLD POWER LEVEL

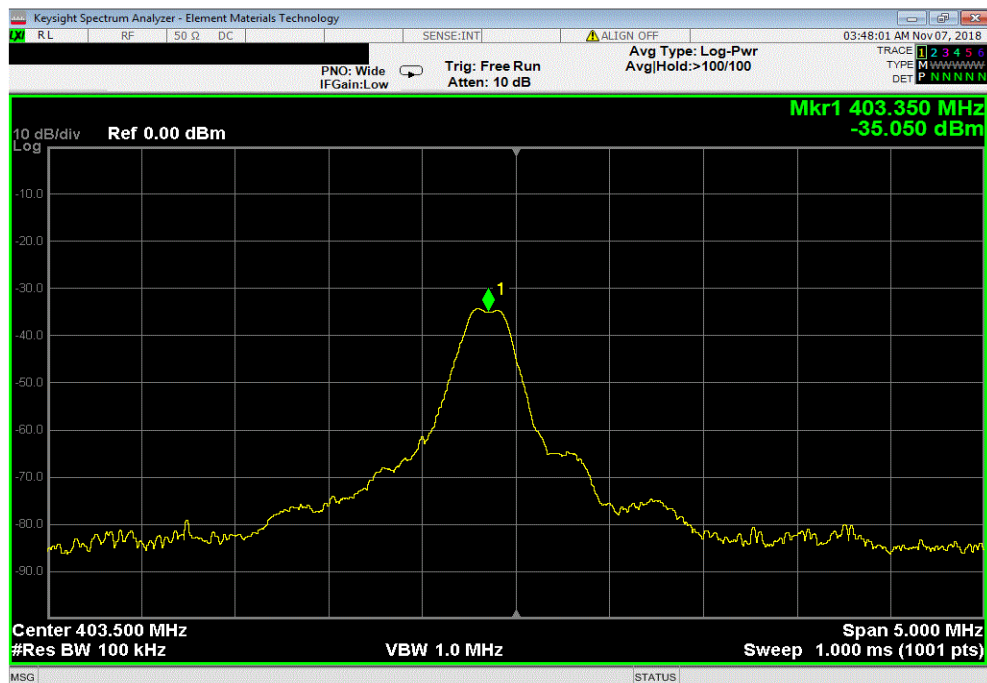


XMM 2017.12.13

LBT Threshold 0						
				Value (dBm)	Limit < (dBm)	Result
				N/A	N/A	N/A



LBT Threshold +1 dB						
				Value (dBm)	Limit < (dBm)	Result
				N/A	N/A	N/A

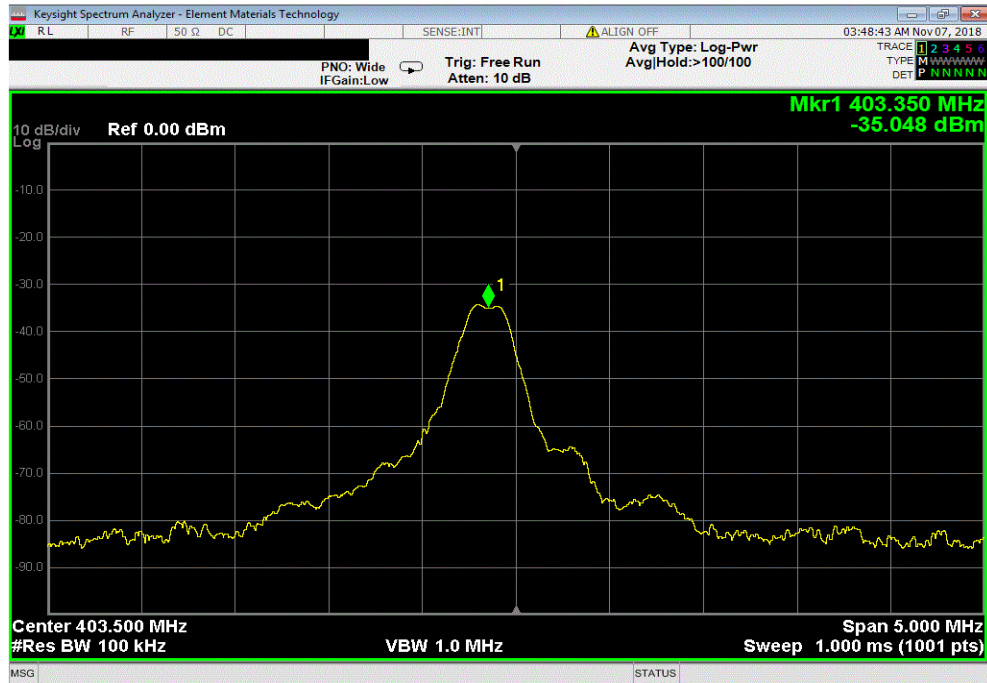


LBT THRESHOLD POWER LEVEL

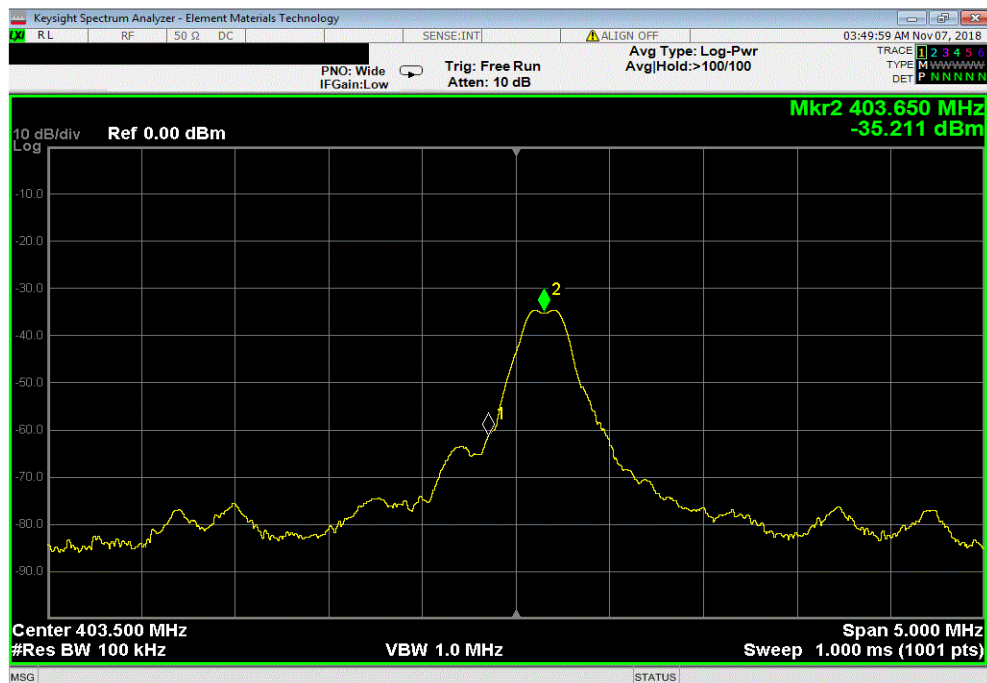


XMM 2017.12.13

LBT Threshold +2 dB						
				Value (dBm)	Limit < (dBm)	Result
				N/A	N/A	N/A



LBT Threshold +3 dB						
				Value (dBm)	Limit < (dBm)	Result
				-106.76	-105.76	Pass



MONITORING SYSTEM BANDWIDTH



XMR 2017.12.13

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAD	NCR	NCR
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAC	NCR	NCR
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR
Directional Coupler	Fairview Microwave	SMC4039-10	RGS	NCR	NCR
Generator - Signal	Agilent	E4422B	TGQ	15-Mar-18	15-Mar-21
Generator - Signal	Keysight	N5182B	TFX	10-Apr-18	10-Apr-21
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-18	13-Feb-19
Block - DC	Fairview Microwave	SD3379	AMI	7-Sep-18	7-Sep-19
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-17	19-Dec-18

TEST DESCRIPTION

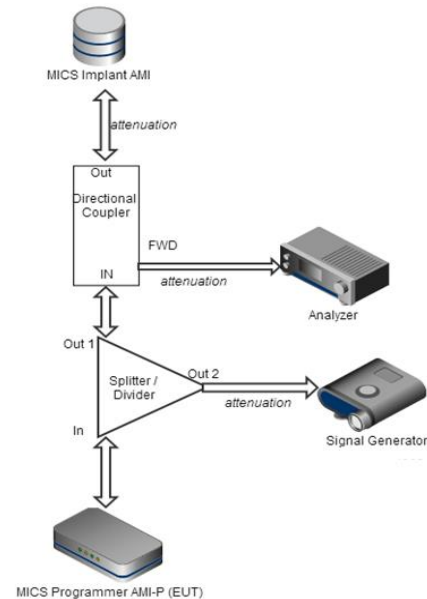
The EUT was configured according to the following block diagram:

The LBT threshold was calculated as follows: $10 \cdot \log(\text{Bandwidth}) - 150 + \text{Antenna Gain}$

The signal generator was set to multitone operation to cause equal interference across the entire band except for the intended frequency, F_c . The amplitude of the multitone signals (out of operation region) were set to 3 dB above the LBT threshold.

The spectrum analyzer was set to measure the transmit band of 402-405 MHz. The CW signal source was injected at F_c was set to a level far enough above the LBT threshold so that communication starts on a channel besides F_c , the CW signal source was then lowered by 1 dB increments until the EUT chooses the intended frequency (F_c) to start a session on. The CW signal source amplitude at the EUT was measured.

The CW signal source was changed from injecting on F_c to injecting on $F_c - \text{Bandwidth} / 2$. The amplitude was then raised until the EUT starts a session on a channel other than F_c . The CW signal source amplitude at the EUT was measured. This was repeated with the CW signal source injecting on $F_c + \text{Bandwidth} / 2$. The CW signal source amplitude at the EUT was measured.



MONITORING SYSTEM BANDWIDTH



XMM 2017.12.13

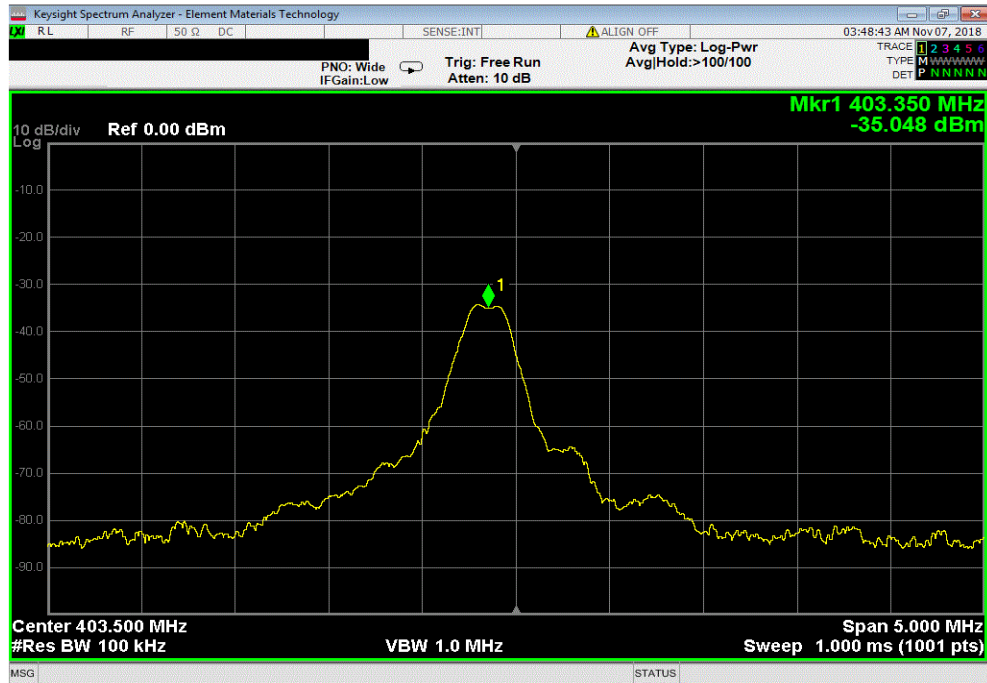
EUT: Bluetooth Pocket Programmer		Work Order: NUVE0019			
Serial Number: 101016		Date: 6-Nov-18			
Customer: Nuvectra Corporation		Temperature: 22.9 °C			
Attendees: Peter Valentyik		Humidity: 33.4% RH			
Project: None		Barometric Pres.: 1010 mbar			
Tested by: Kyle McMullan	Power: 230VAC/50Hz	Job Site: MN08			
TEST SPECIFICATIONS		Test Method			
EN 301 839 V2.1.1:2016		EN 301 839 V2.1.1:2016			
COMMENTS					
Fc is at 403.35 MHz.					
DEVIATIONS FROM TEST STANDARD					
None					
Configuration #	6	Signature <i>Kyle McMullan</i>			
		Reference Value (dBm)	Test Measured Value (dBm)		
		D1 or D2 Value (dB)	Limit (dB)		
		Result			
Pa = Fc	-102.76	N/A	N/A	Pass	
Pb = Fc - BW/2	N/A	-94.76	8	20	Pass
Pc = Fc + BW/2	N/A	-87.76	15	20	Pass

MONITORING SYSTEM BANDWIDTH

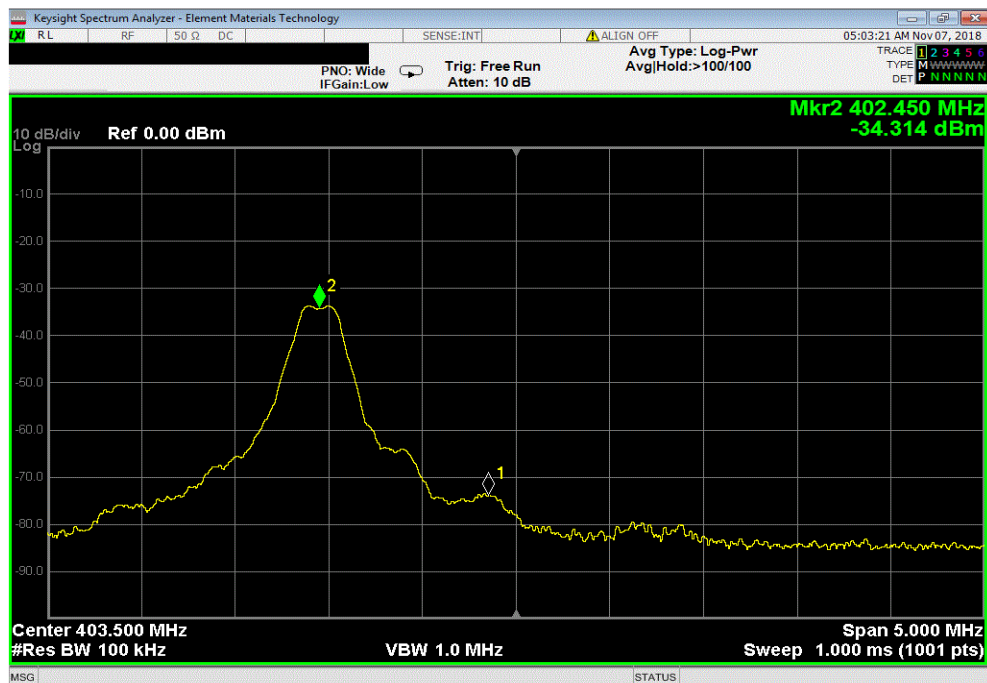


XMI 2017.12.13

Pa = Fc						
	Reference Value (dBm)	Test Measured Value (dBm)	D1 or D2 Value (dB)	Limit (dB)	Result	
	-102.76	N/A	N/A	N/A	Pass	



Pb = Fc - BW/2						
	Reference Value (dBm)	Test Measured Value (dBm)	D1 or D2 Value (dB)	Limit (dB)	Result	
	N/A	-94.76	8	20	Pass	

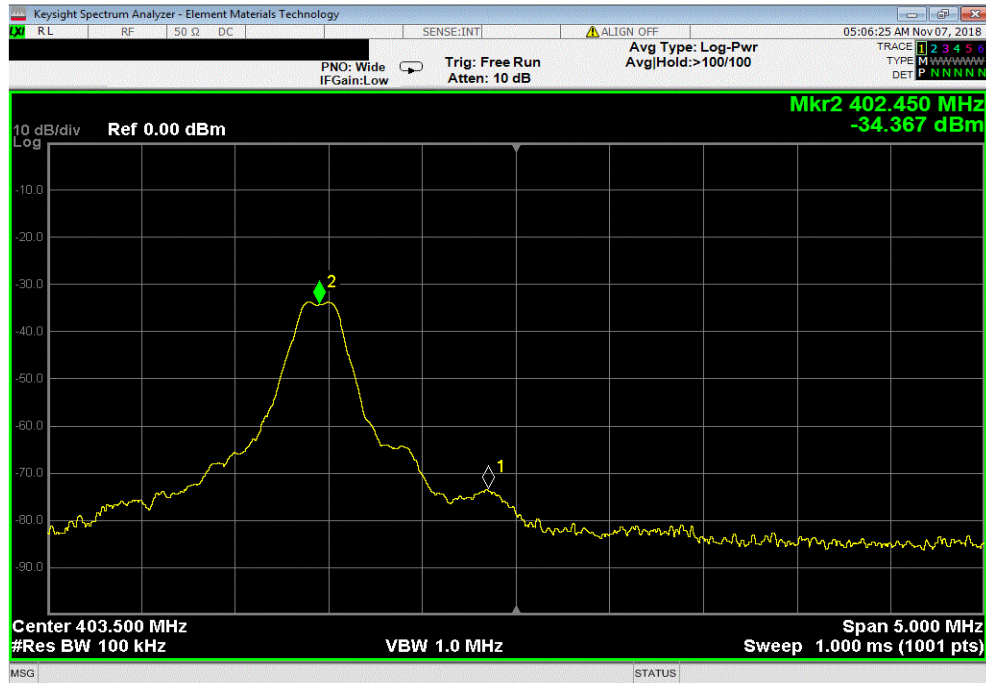


MONITORING SYSTEM BANDWIDTH



XMM 2017.12.13

Pc = Fc + BW/2						
	Reference Value (dBm)	Test Measured Value (dBm)	D1 or D2 Value (dB)	Limit (dB)	Result	
	N/A	-87.76	15	20	Pass	



MONITORING SYSTEM SCAN CYCLE TIME



XMI 2017.12.13

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

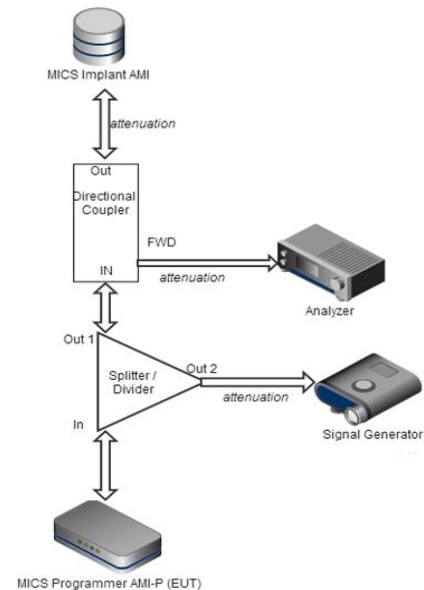
Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAD	NCR	NCR
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAC	NCR	NCR
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR
Terminator	Fairview Microwave	ST3B-C	RGW	18-Jun-18	18-Jun-19
Generator - Signal	Keysight	N5182B	TFX	10-Apr-18	10-Apr-21
Generator - Signal	Agilent	E4422B	TGQ	15-Mar-18	15-Mar-21
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-18	13-Feb-19
Block - DC	Fairview Microwave	SD3379	AMI	7-Sep-18	7-Sep-19
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-17	19-Dec-18

TEST DESCRIPTION

The EUT was configured according to the following block diagram:

The signal generator was set to multitone operation to cause equal interference across the entire band. The spectrum analyzer was set to zero span with a sweep time equal to 10 seconds.

The CW signal on the intended frequency (F_c) was removed. At the same time, the EUT was set to seek a session with the implantable device. The delay between F_c becoming available and the EUT establishing a session was measured. This measurement was repeated a sufficient number of times to establish a pattern for the cycle time.



MONITORING SYSTEM SCAN CYCLE TIME



XMI 2017.12.13

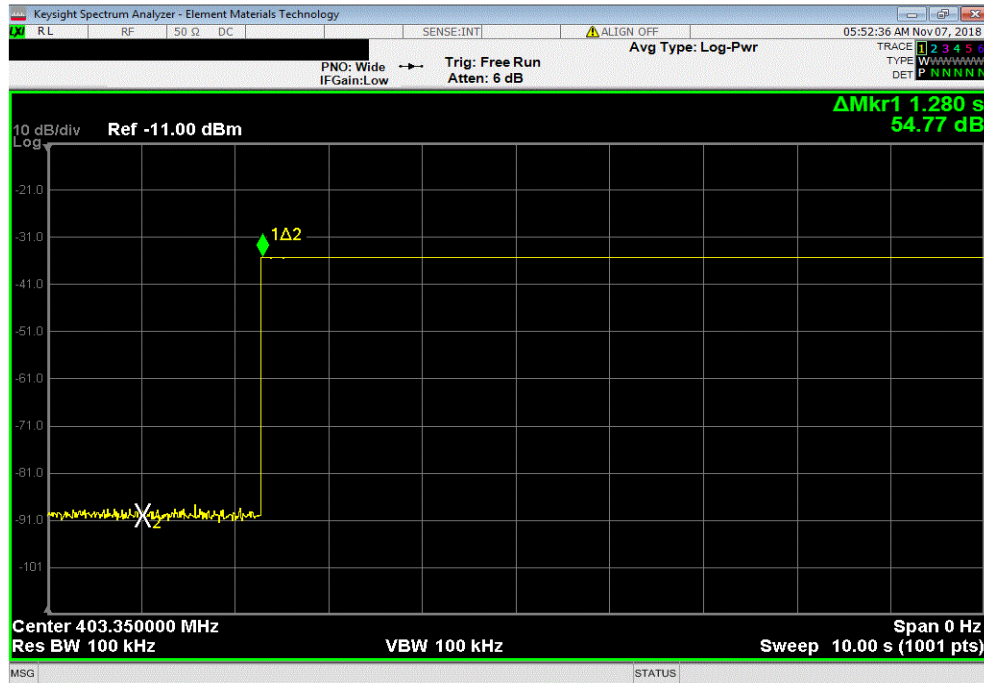
EUT: Bluetooth Pocket Programmer		Work Order: NUVE0019	
Serial Number: 101016		Date: 6-Nov-18	
Customer: Nuvectra Corporation		Temperature: 23 °C	
Attendees: Peter Valentyik		Humidity: 33% RH	
Project: None		Barometric Pres.: 1011 mbar	
Tested by: Kyle McMullan		Power: 230VAC/50Hz	
		Job Site: MN08	
TEST SPECIFICATIONS			
EN 301 839 V2.1.1:2016		Test Method	
EN 301 839 V2.1.1:2016		EN 301 839 V2.1.1:2016	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	6	Signature <i>Kyle McMullan</i>	
		Scan Cycle Time (s)	Limit (s)
Run 1		1.28	5
Run 2		1.14	5
Run 3		1.21	5
Run 4		1.28	5
Run 5		1.11	5
			Result
			Pass
			Pass
			Pass
			Pass
			Pass

MONITORING SYSTEM SCAN CYCLE TIME

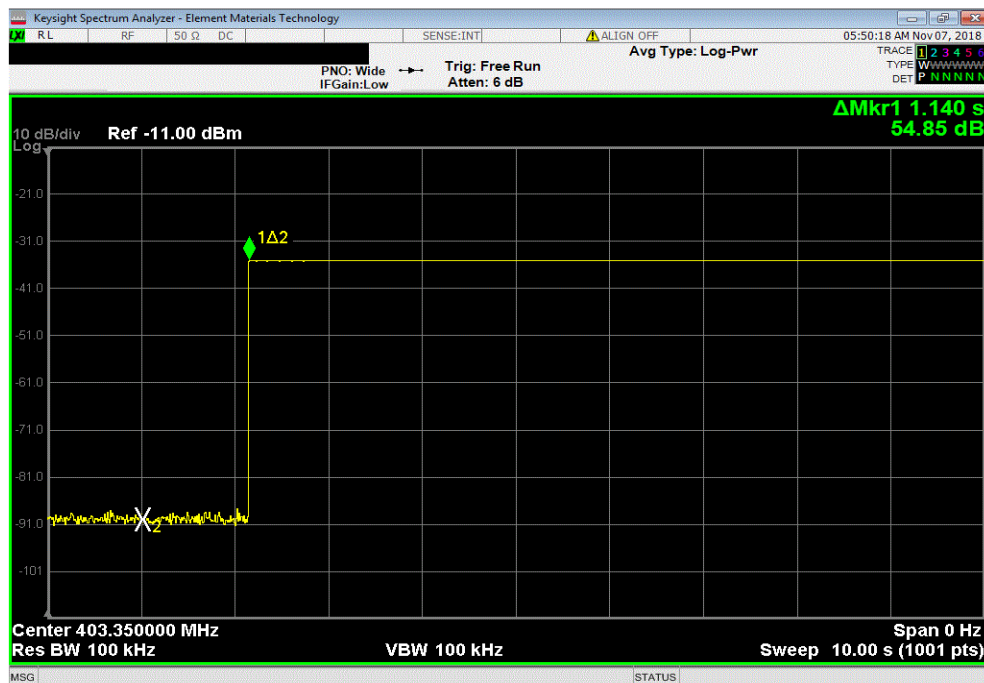


XMI 2017.12.13

Run 1						
				Scan Cycle Time (s)	Limit (s)	Result
				1.28	5	Pass



Run 2						
				Scan Cycle Time (s)	Limit (s)	Result
				1.14	5	Pass

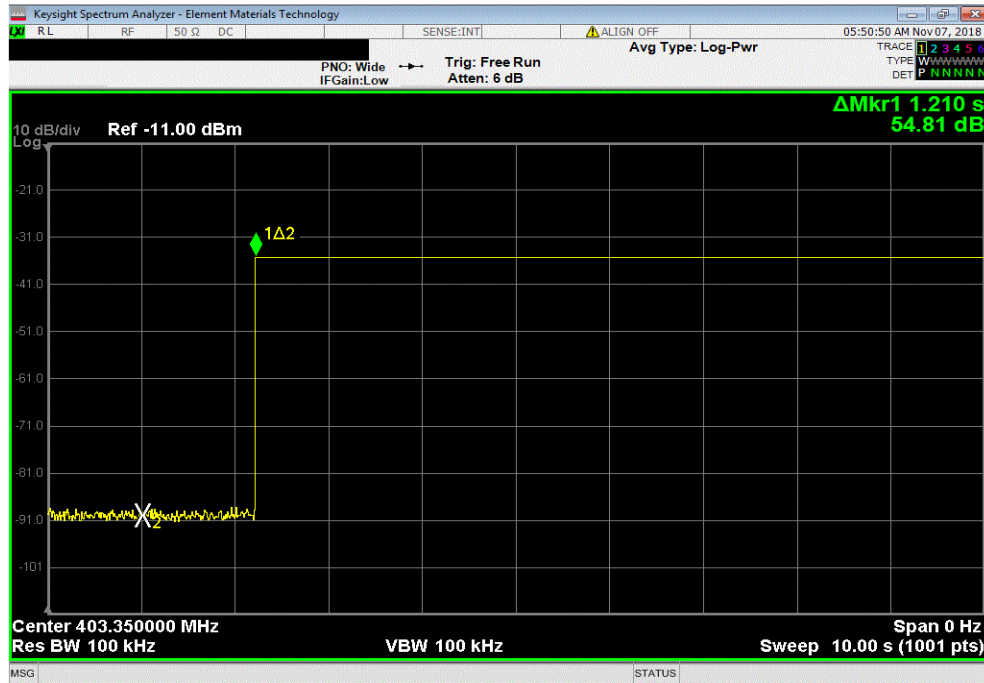


MONITORING SYSTEM SCAN CYCLE TIME

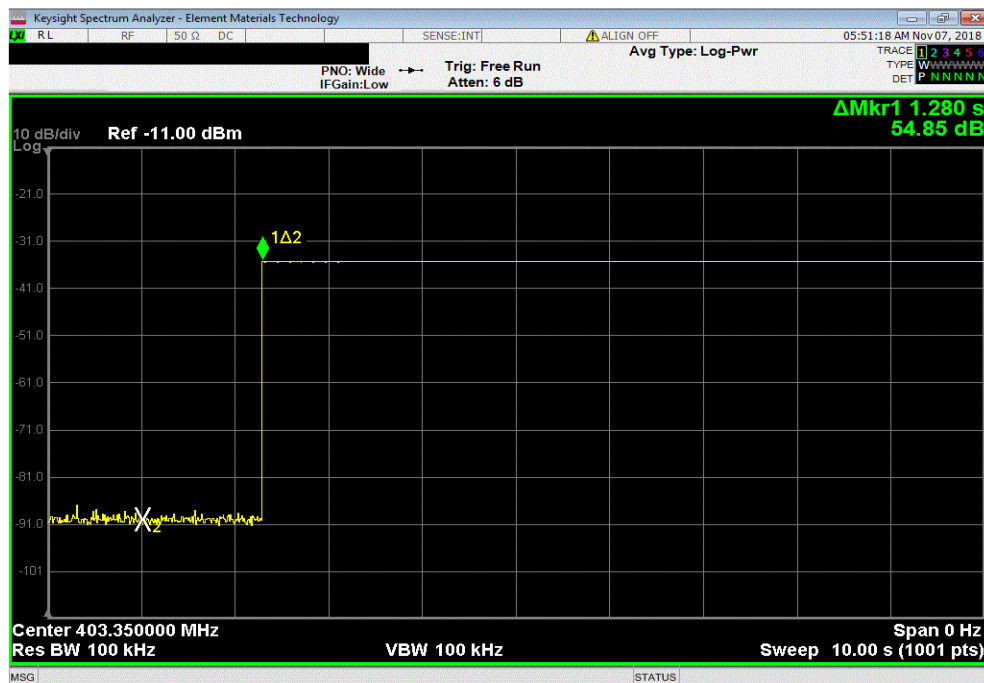


XMI 2017.12.13

Run 3						
				Scan Cycle Time (s)	Limit (s)	Result
				1.21	5	Pass



Run 4						
				Scan Cycle Time (s)	Limit (s)	Result
				1.28	5	Pass

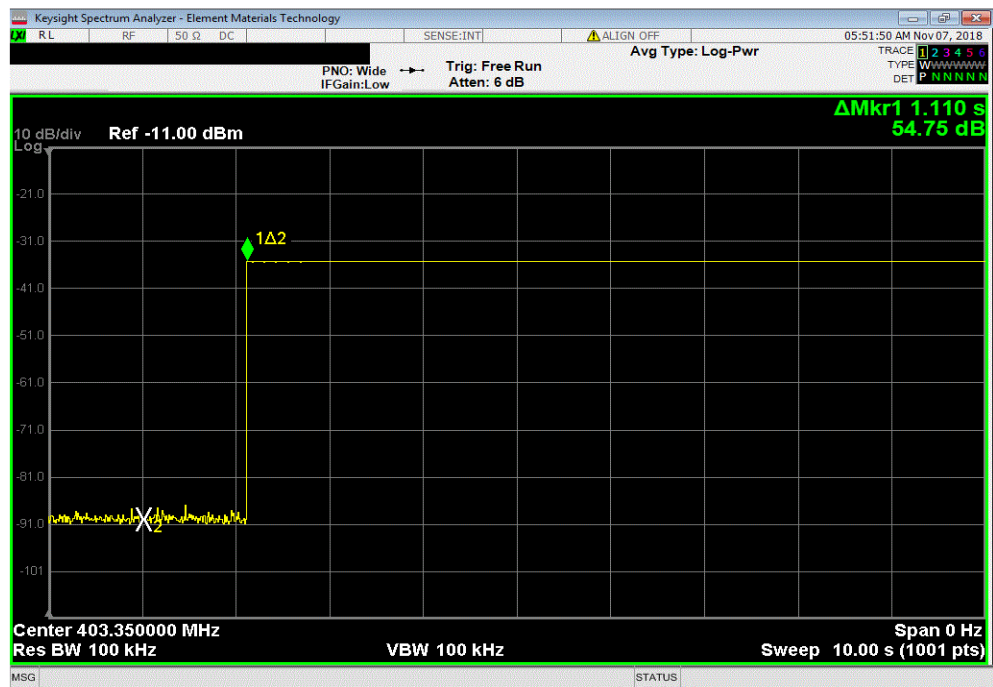


MONITORING SYSTEM SCAN CYCLE TIME



XMI 2017.12.13

Run 5						
				Scan Cycle Time (s)	Limit (s)	Result
				1.11	5	Pass



MINIMUM CHANNEL MONITORING PERIOD



XMH 2017.12.13

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

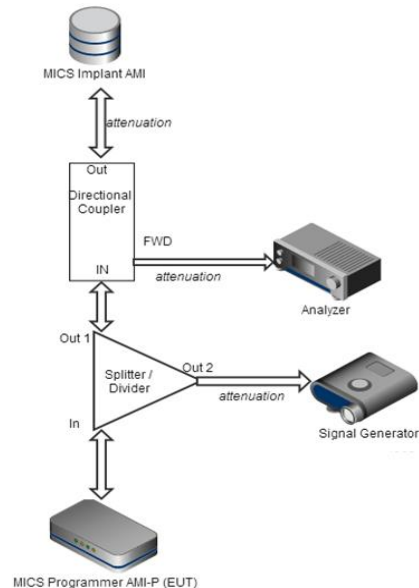
Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAD	NCR	NCR
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAC	NCR	NCR
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR
Directional Coupler	Fairview Microwave	SMC4039-10	RGS	NCR	NCR
Generator - Signal	Agilent	E4422B	TGQ	15-Mar-18	15-Mar-21
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-18	13-Feb-19
Block - DC	Fairview Microwave	SD3379	AMI	7-Sep-18	7-Sep-19
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-17	19-Dec-18

TEST DESCRIPTION

The EUT was configured according to the following block diagram:

The signal generator was set to multitone operation to cause equal interference across the entire band, except one channel (Fc) was left available. The multitone operation (out of operation region) was also set to Pulse modulation with a Period of 10 mS, and a Pulse Width of 0.1 mS. The spectrum analyzer was set to measure the transmit band of 402-405 MHz.

The EUT was set to seek a session with the implantable device. The EUT was verified to connect on Fc channel via a spectrum analyzer. This was repeated a minimum of 10 times.



MINIMUM CHANNEL MONITORING PERIOD



XMM 2017.12.13

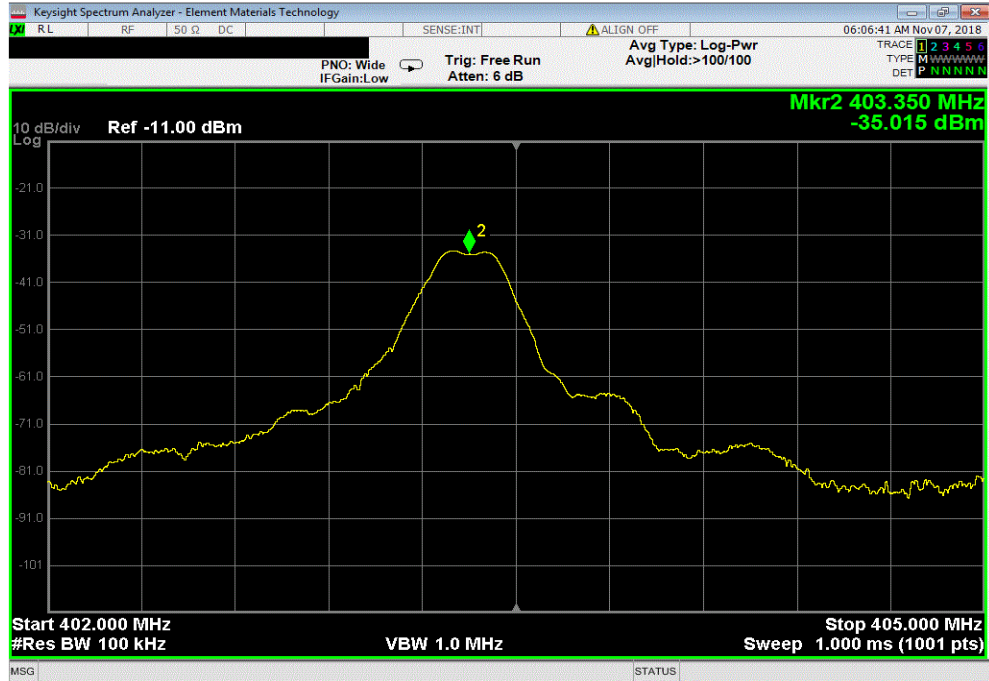
EUT: Bluetooth Pocket Programmer		Work Order: NUVE0019	
Serial Number: 101016		Date: 6-Nov-18	
Customer: Nuvectra Corporation		Temperature: 23.2 °C	
Attendees: Peter Valentyik		Humidity: 32.6% RH	
Project: None		Barometric Pres.: 1011 mbar	
Tested by: Kyle McMullan	Power: 230VAC/50Hz	Job Site: MN08	
TEST SPECIFICATIONS			
EN 301 839 V2.1.1:2016		Test Method	
EN 301 839 V2.1.1:2016		EN 301 839 V2.1.1:2016	
COMMENTS			
Fc is at 403.35 MHz			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	6	Signature <i>Kyle McMullan</i>	
		Transmit on Fc	Requirement
Run 1		Yes	Tx on Fc
Run 2		Yes	Tx on Fc
Run 3		Yes	Tx on Fc
Run 4		Yes	Tx on Fc
Run 5		Yes	Tx on Fc
Run 6		Yes	Tx on Fc
Run 7		Yes	Tx on Fc
Run 8		Yes	Tx on Fc
Run 9		Yes	Tx on Fc
Run 10		Yes	Tx on Fc
			Result
			Pass
			Pass
			Pass
			Pass
			Pass
			Pass
			Pass
			Pass
			Pass
			Pass

MINIMUM CHANNEL MONITORING PERIOD

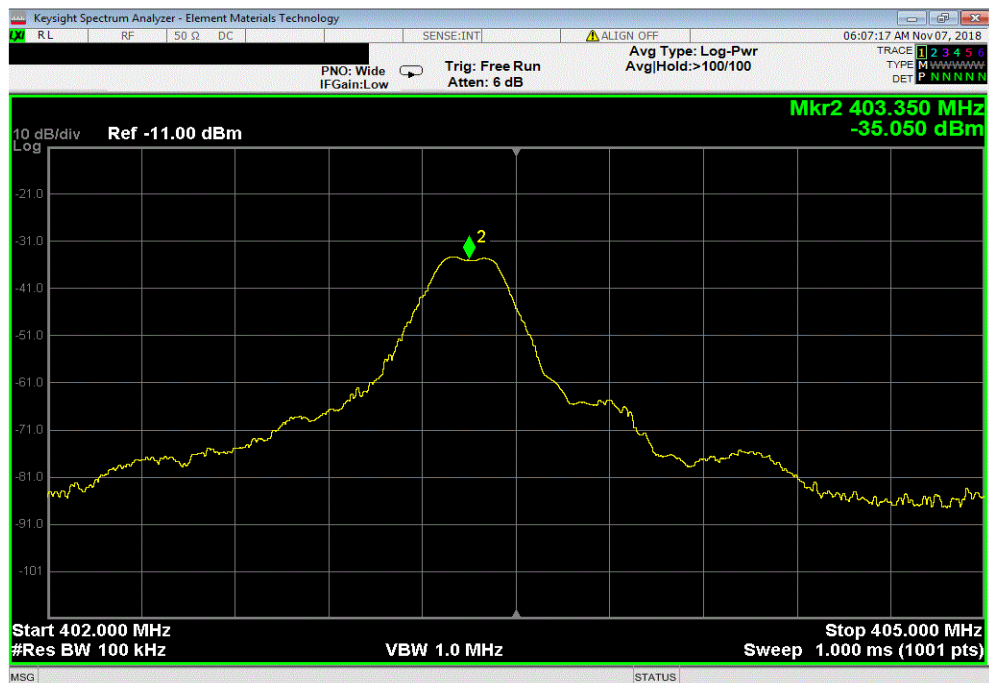


XMI 2017.12.13

Run 1						
				Transmit on Fc	Requirement	Result
				Yes	Tx on Fc	Pass



Run 2						
				Transmit on Fc	Requirement	Result
				Yes	Tx on Fc	Pass

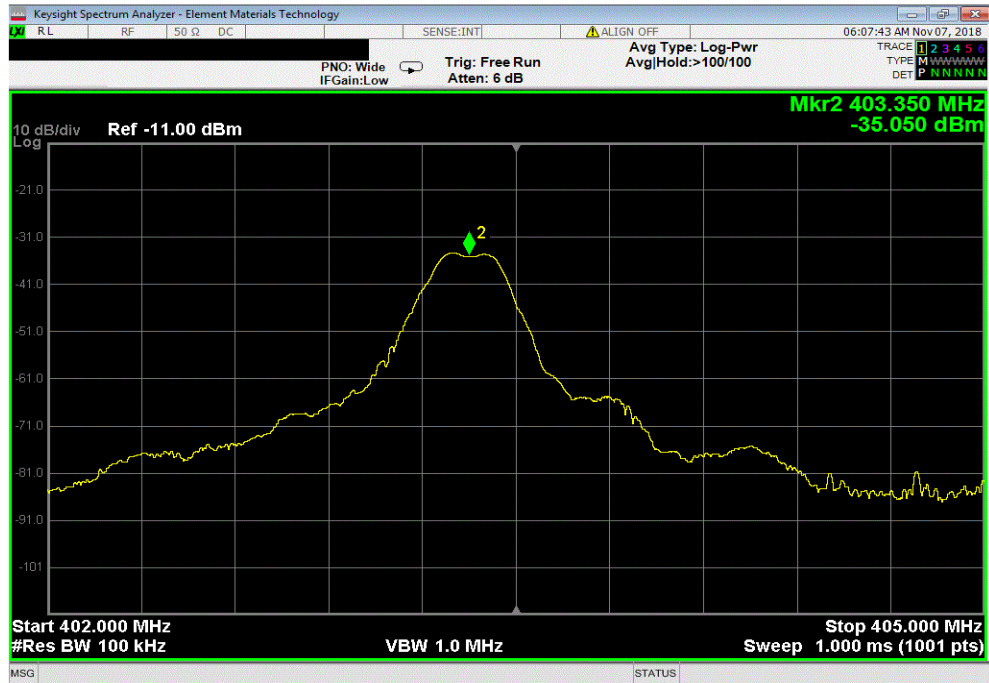


MINIMUM CHANNEL MONITORING PERIOD

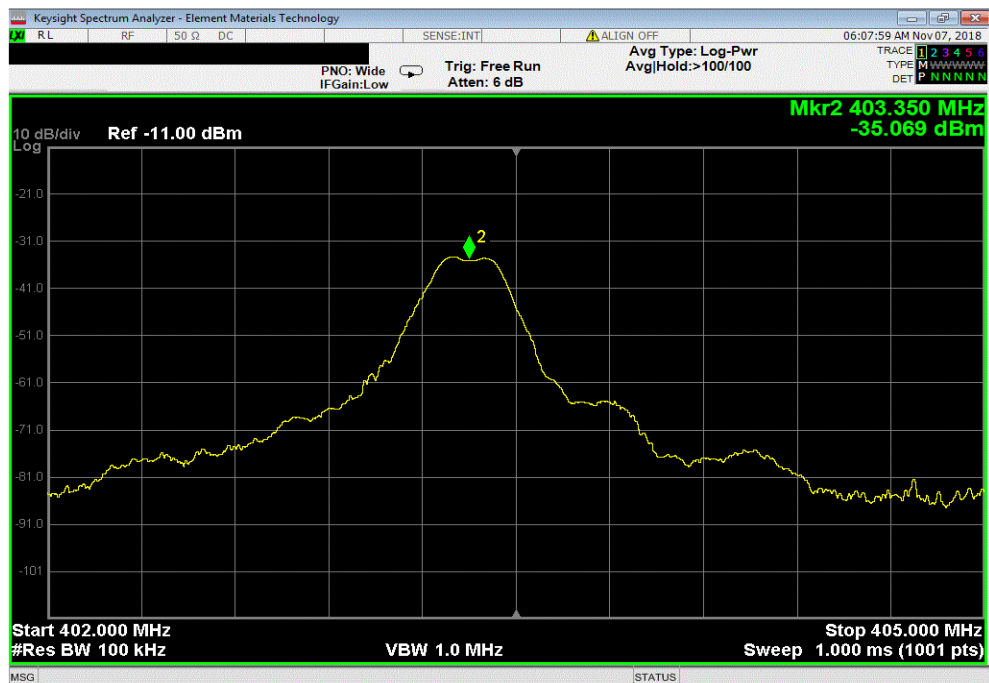


XMI 2017.12.13

Run 3						
				Transmit on Fc	Requirement	Result
				Yes	Tx on Fc	Pass



Run 4						
				Transmit on Fc	Requirement	Result
				Yes	Tx on Fc	Pass

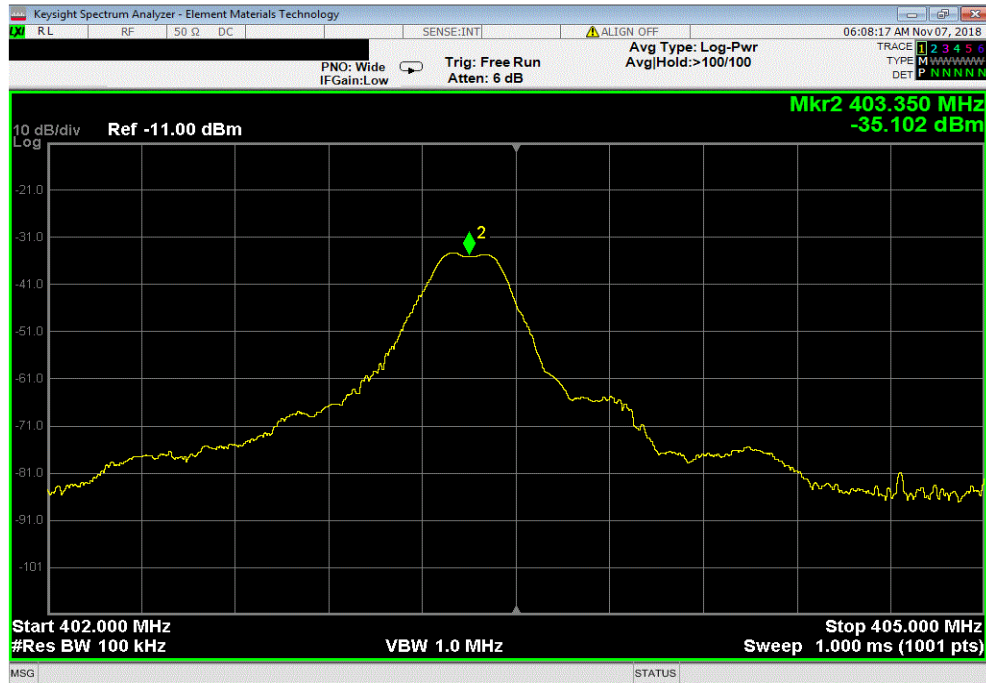


MINIMUM CHANNEL MONITORING PERIOD

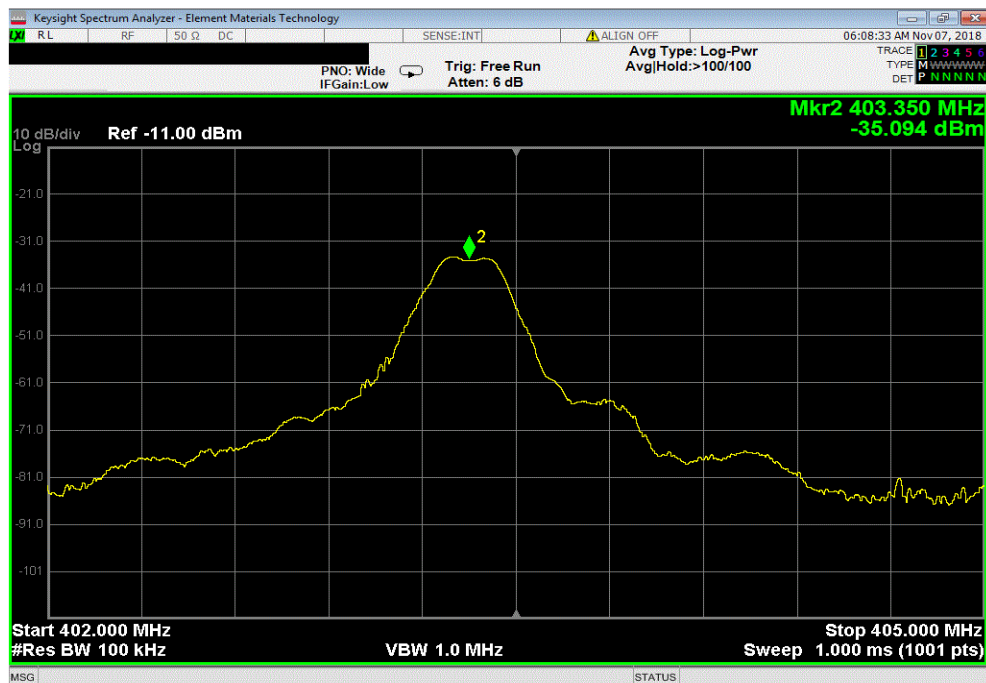


XMI 2017.12.13

Run 5						
				Transmit on Fc	Requirement	Result
				Yes	Tx on Fc	Pass



Run 6						
				Transmit on Fc	Requirement	Result
				Yes	Tx on Fc	Pass

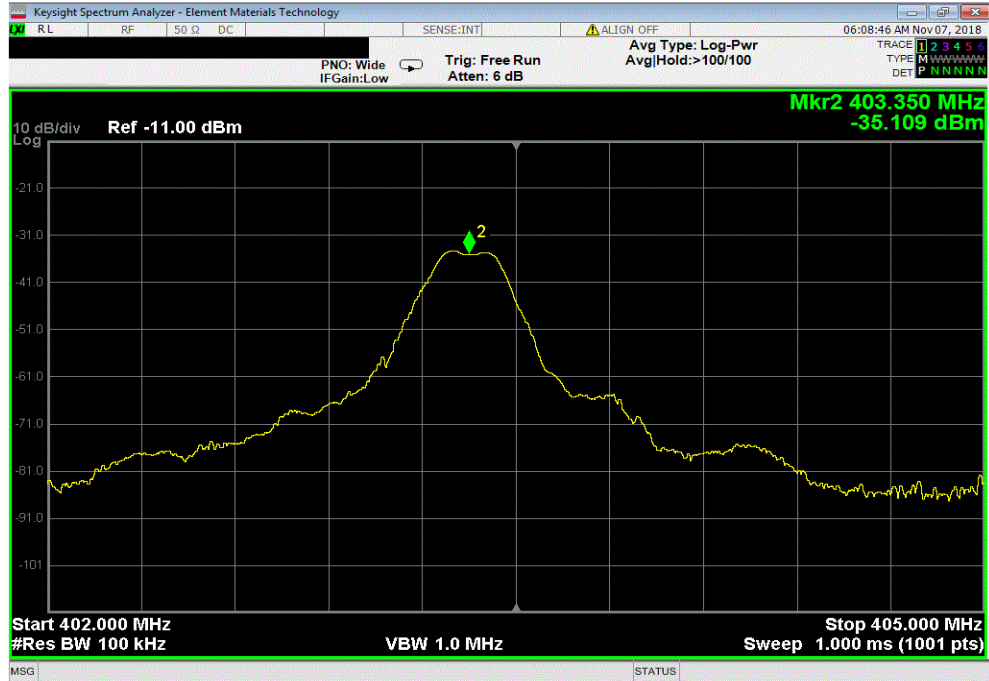


MINIMUM CHANNEL MONITORING PERIOD

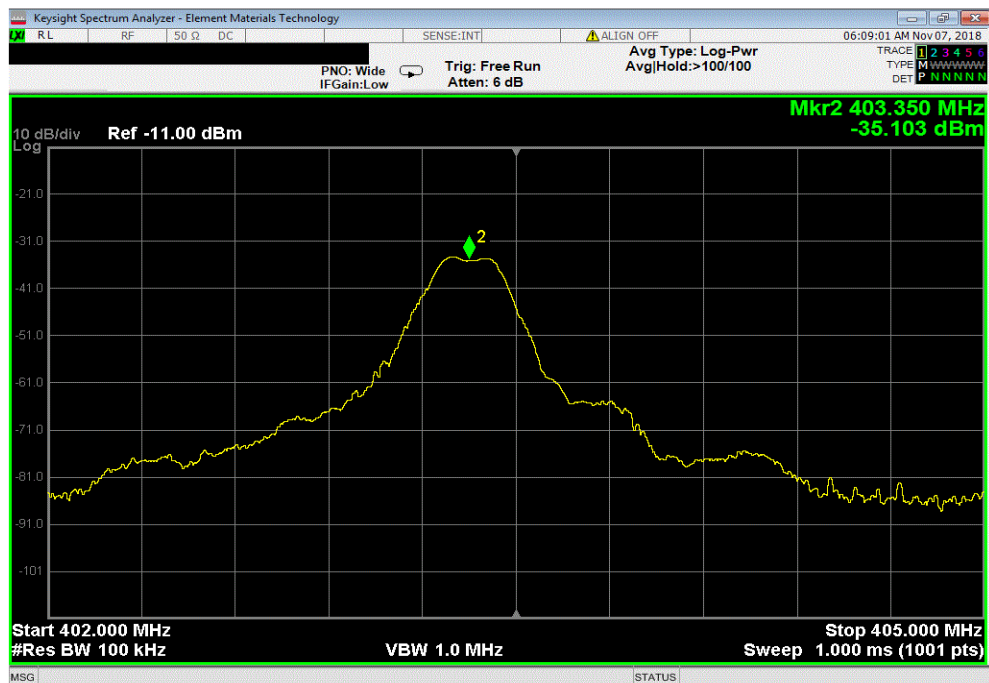


XMI 2017.12.13

Run 7						
				Transmit on Fc	Requirement	Result
				Yes	Tx on Fc	Pass



Run 8						
				Transmit on Fc	Requirement	Result
				Yes	Tx on Fc	Pass

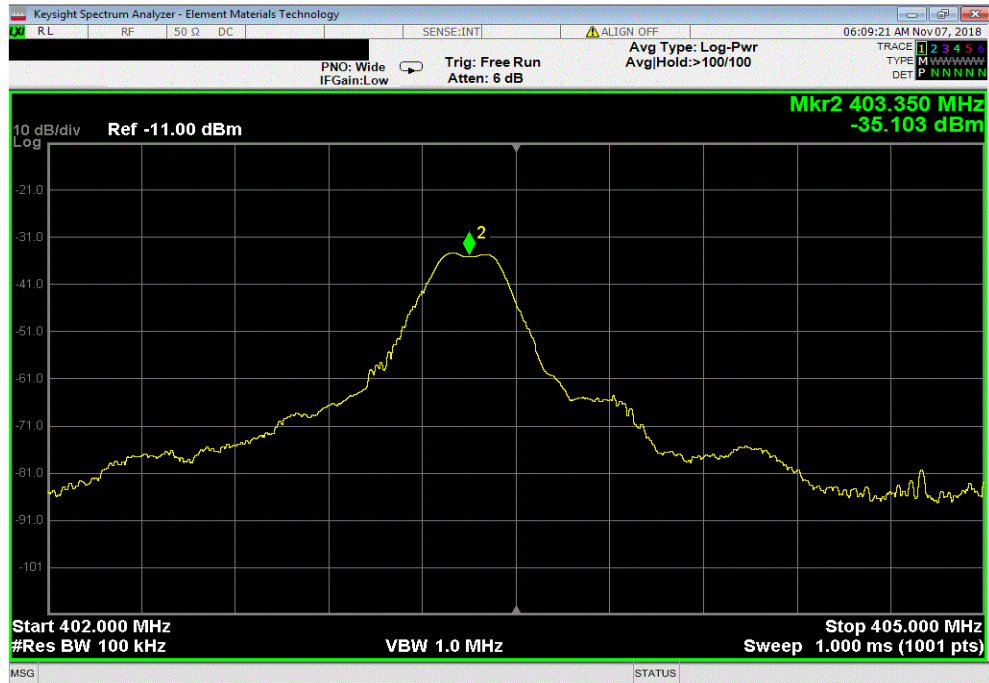


MINIMUM CHANNEL MONITORING PERIOD

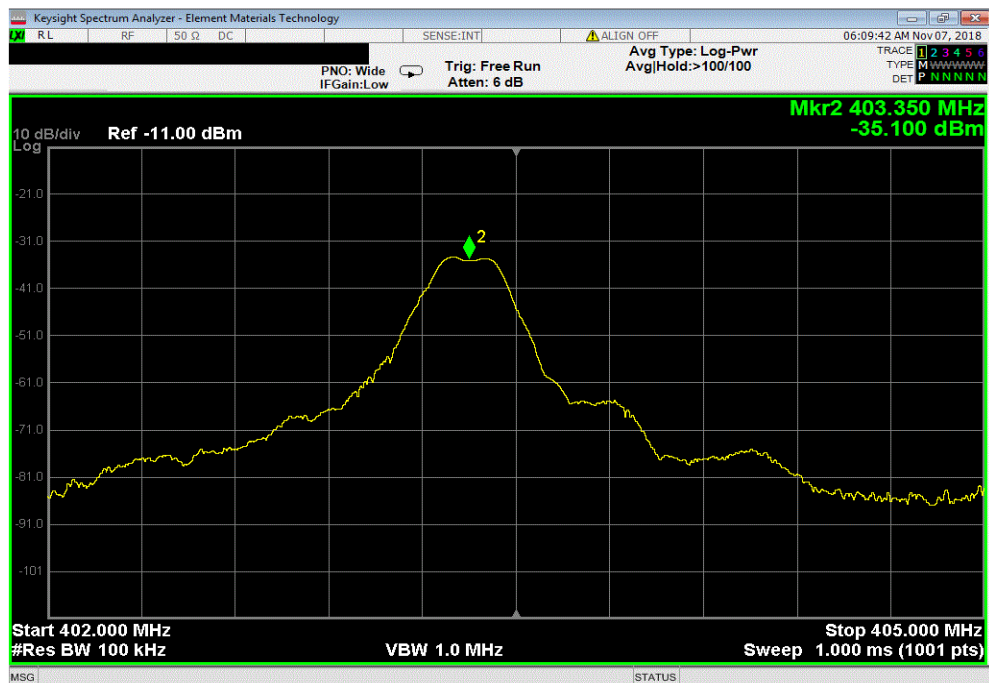


XMI 2017.12.13

Run 9						
				Transmit on Fc	Requirement	Result
				Yes	Tx on Fc	Pass



Run 10						
				Transmit on Fc	Requirement	Result
				Yes	Tx on Fc	Pass



CHANNEL ACCESS BASED ON AMBIENT LEVELS



XMIT 2017.12.13

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAD	NCR	NCR
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAC	NCR	NCR
Directional Coupler	Fairview Microwave	SMC4039-10	RGS	NCR	NCR
Generator - Signal	Keysight	N5182B	TFX	10-Apr-18	10-Apr-21
Generator - Signal	Agilent	E4422B	TGQ	15-Mar-18	15-Mar-21
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-18	13-Feb-19
Block - DC	Fairview Microwave	SD3379	AMI	7-Sep-18	7-Sep-19
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-17	19-Dec-18

TEST DESCRIPTION

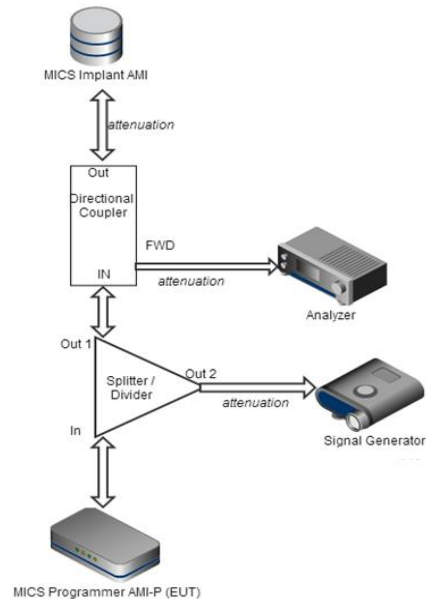
The EUT was configured according to the following block diagram:

The LBT threshold was calculated as follows: $10 \cdot \text{LOG}(\text{Bandwidth}) - 150 + \text{Antenna Gain}$

The signal generator was set to multitone operation to cause equal interference across the entire band except for on the intended frequency, F_c . The amplitude of the multitone signals (out of operation region) were set to 10 dB above the LBT threshold. A single channel on the multitone signal generator was then set to 7 dB above the LBT threshold, the channel is designated as the Least Interfered Channel (LIC).

The CW signal source was set to 3 dB below the LBT threshold and injected on F_c . The EUT was verified to transmit on F_c . The amplitude of the CW signal source at F_c was then raised to 6 dB above the LBT threshold. The EUT was verified to transmit on LIC.

The spectrum analyzer was set to measure the transmit band of 402-405 MHz. Screen captures were provided to show the EUT behavior at the different LBT threshold levels.



CHANNEL ACCESS BASED ON AMBIENT LEVELS



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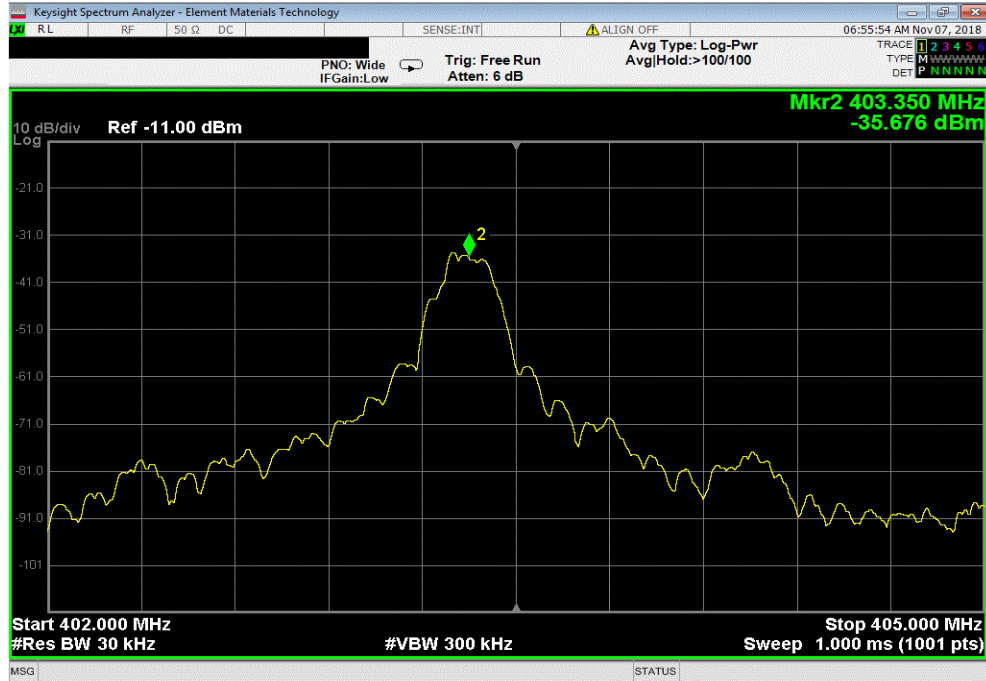
EUT: Bluetooth Pocket Programmer		Work Order: NUVE0019	
Serial Number: 101016		Date: 6-Nov-18	
Customer: Nuvectra Corporation		Temperature: 23.1 °C	
Attendees: Peter Valentyik		Humidity: 32% RH	
Project: None		Barometric Pres.: 1012 mbar	
Tested by: Kyle McMullan		Power: 230VAC/50Hz	
		Job Site: MN08	
TEST SPECIFICATIONS			
EN 301 839 V2.1.1:2016		Test Method	
EN 301 839 V2.1.1:2016		EN 301 839 V2.1.1:2016	
COMMENTS			
Fc is at 403.35 MHz, LIC is at 402.45 MHz.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	6	Signature <i>Kyle McMullan</i>	
		Transmit Channel	Specified Tx Channel
Fc 3 dB Below LBT Threshold		Fc	Pass
Fc 6 dB Above LBT Threshold		LIC	Pass

CHANNEL ACCESS BASED ON AMBIENT LEVELS

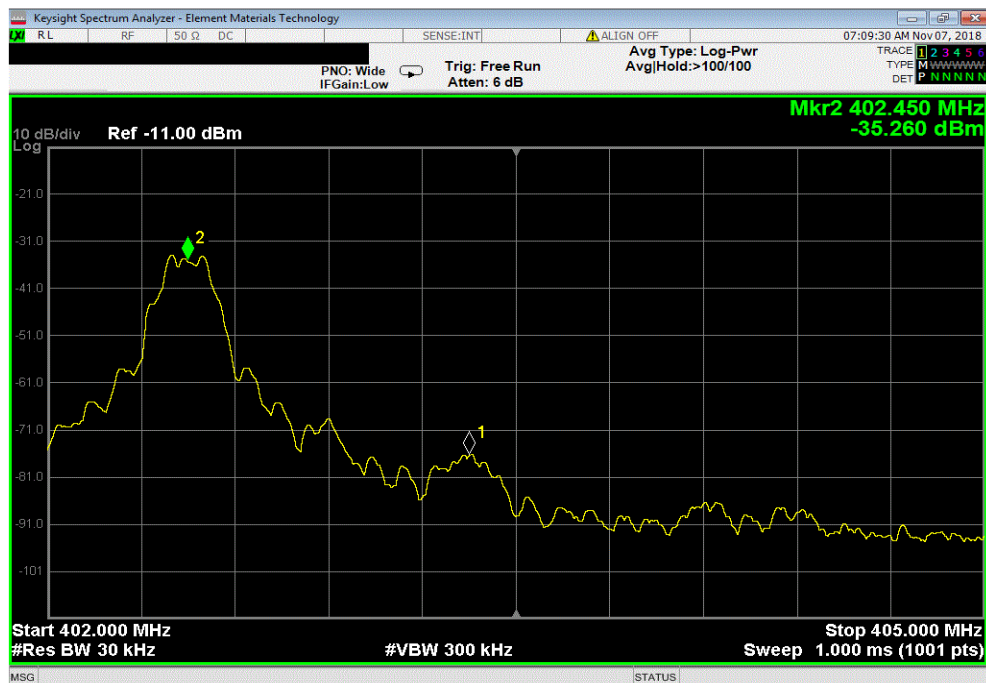


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Fc 3 dB Below LBT Threshold						
				Transmit Channel	Specified Tx Channel	Result
				Fc	Fc	Pass



Fc 6 dB Above LBT Threshold						
				Transmit Channel	Specified Tx Channel	Result
				LIC	LIC	Pass



DISCONTINUATION OF A MICS SESSION



XMII 2017.12.13

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAC	NCR	NCR
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAD	NCR	NCR
Directional Coupler	Fairview Microwave	SMC4039-10	RGS	NCR	NCR
Generator - Signal	Keysight	N5182B	TFX	10-Apr-18	10-Apr-21
Generator - Signal	Agilent	E4422B	TGQ	15-Mar-18	15-Mar-21
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-18	13-Feb-19
Block - DC	Fairview Microwave	SD3379	AMI	7-Sep-18	7-Sep-19
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-17	19-Dec-18

TEST DESCRIPTION

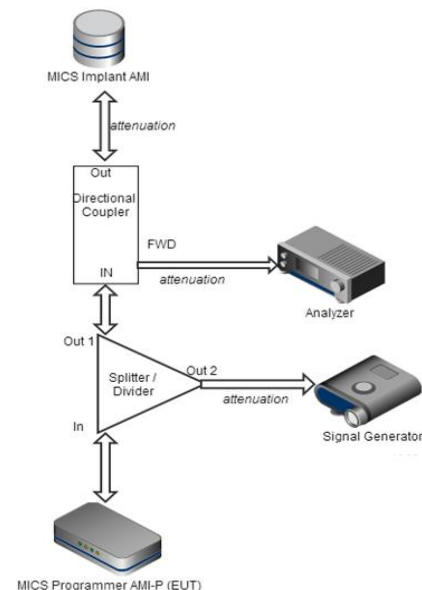
The EUT was configured according to the following block diagram:

The LBT threshold was calculated as follows: $10 \cdot \text{LOG}(\text{Bandwidth}) - 150 + \text{Antenna Gain}$

The signal generator was set to multitone operation to cause equal interference across the entire band. The amplitude of the multitone signals (out of operation region) were set to 10 dB above the LBT threshold.

A CW signal source was injected at the intended frequency (F_c) 6 dB above the LBT threshold. A least interfered channel (LIC) was set on the multitone signal source to 3 dB above the LBT threshold. The spectrum analyzer was set to measure the time between the removal of the MICS Implant AMI to when the EUT does not transmit on the LIC. As the MICS Implant AMI was removed, the CW signal source on F_c was set 3 dB below the LBT threshold. After the communication link was fully broken, the MICS implant was returned to the setup. Communication was re-established.

Screenshots were taken to verify the initial communication channel was the LIC, the time between the MICS Implant AMI being removed from the field and communication attempts on the LIC channel was less than 5 seconds, and that the communication channel after communication was re-established was not on the LIC.



DISCONTINUATION OF A MICS SESSION



XMM 2017.12.13

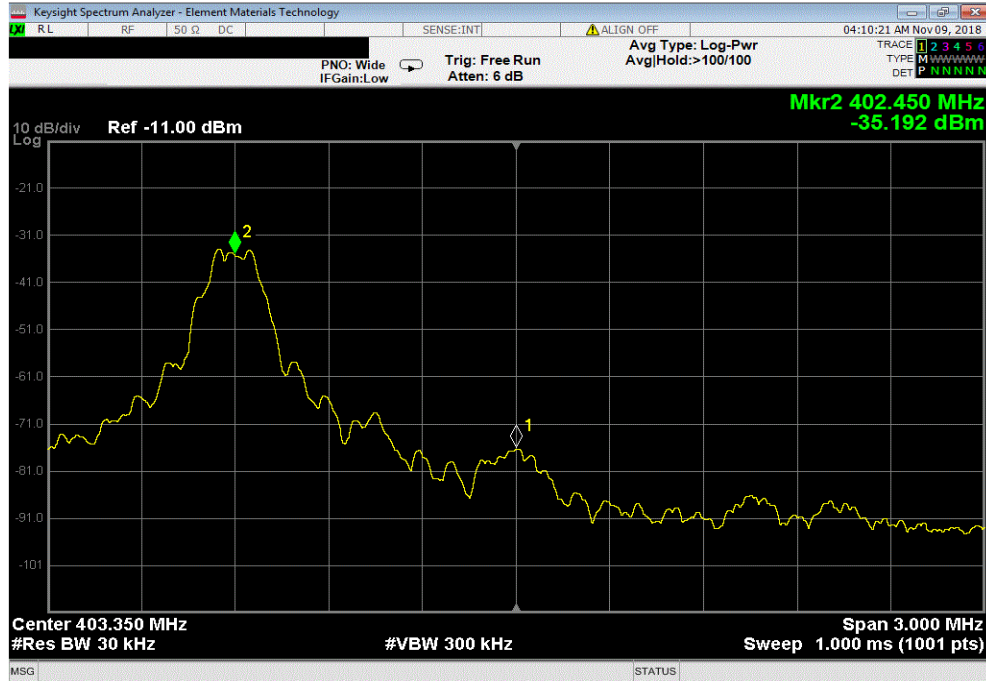
EUT: Bluetooth Pocket Programmer		Work Order: NUVE0019	
Serial Number: 101016		Date: 8-Nov-18	
Customer: Nuvectra Corporation		Temperature: 22.8 °C	
Attendees: Peter Valentyik		Humidity: 26% RH	
Project: None		Barometric Pres.: 1030 mbar	
Tested by: Kyle McMullan	Power: 230VAC/50Hz	Job Site: MN07	
TEST SPECIFICATIONS			
EN 301 839 V2.1.1:2016		Test Method	
EN 301 839 V2.1.1:2016		EN 301 839 V2.1.1:2016	
COMMENTS			
Fc is at 403.35 MHz. LIC is at 402.45 MHz.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	6	Signature <i>Kyle McMullan</i>	
		Comm Channel	Comm Time
Initial Comm Channel		LIC	N/A
5 Second Shut-Off		LIC	4.46 s
Re-established Comm Channel		Fc	N/A
		Requirement	Result
		LIC	Pass
		≤ 5 s	Pass
		Not LIC	Pass

DISCONTINUATION OF A MICS SESSION

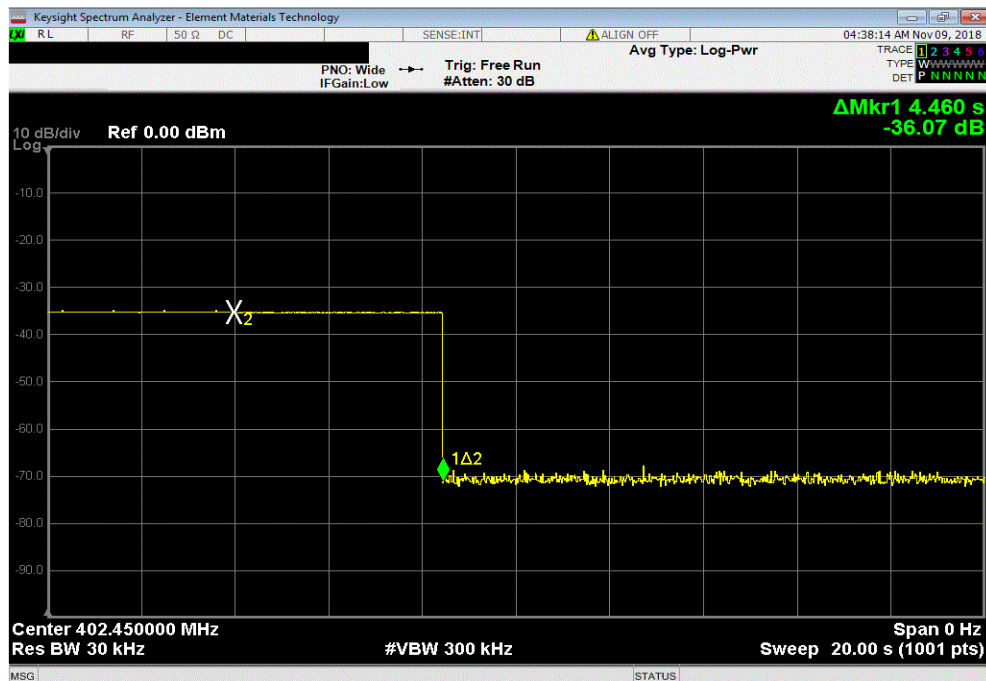


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Initial Comm Channel						
	Comm Channel	Comm Time	Requirement	Result		
	LIC	N/A	LIC	Pass		



5 Second Shut-Off						
	Comm Channel	Comm Time	Requirement	Result		
	LIC	4.46 s	≤ 5 s	Pass		

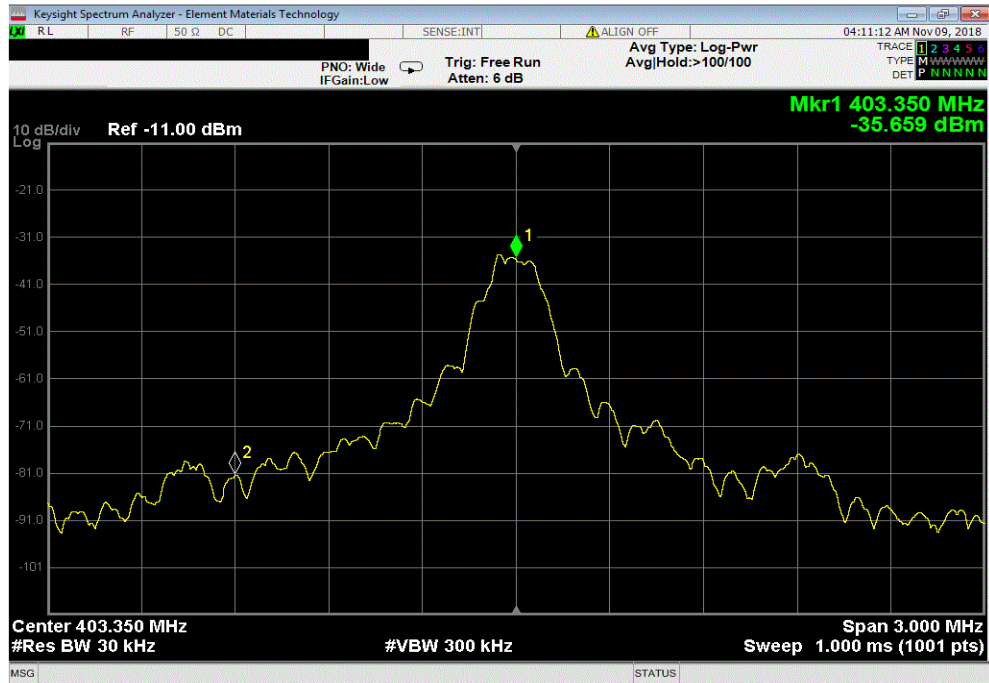


DISCONTINUATION OF A MICS SESSION



XMI 2017.12.13

Re-established Comm Channel						
	Comm Channel	Comm Time	Requirement	Result		
	Fc	N/A	Not LIC	Pass		



USE OF PRE-SCANNED ALTERNATIVE CHANNEL



XMIT 2017.12.13

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAC	NCR	NCR
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAD	NCR	NCR
Directional Coupler	Fairview Microwave	SMC4039-10	RGS	NCR	NCR
Generator - Signal	Keysight	N5182B	TFX	10-Apr-18	10-Apr-21
Generator - Signal	Agilent	E4422B	TGQ	15-Mar-18	15-Mar-21
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-18	13-Feb-19
Block - DC	Fairview Microwave	SD3379	AMI	7-Sep-18	7-Sep-19
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-17	19-Dec-18

TEST DESCRIPTION

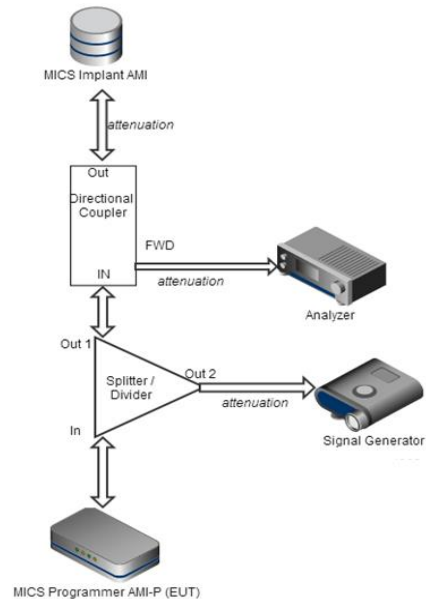
The EUT was configured according to the following block diagram:

The LBT threshold was calculated as follows: $10 \cdot \log(\text{Bandwidth}) - 150 + \text{Antenna Gain}$

The signal generator was set to multitone operation to cause equal interference across the entire band except for the intended frequency, Fc. The amplitude of the multitone signals (out of operation region) were set to 10 dB above the LBT threshold. A single channel on the multitone signal generator was then set to 7 dB above the LBT threshold, the channel is designated as the Least Interfered Channel (LIC).

A CW signal source was injected on Fc 3 dB below the LBT threshold. The EUT was verified to transmit on Fc. While the session was still active, on the multitone signal generator a second least interfered channel (LIC2) was set to the LBT threshold - 2 dB. The amplitude of Fc was then raised sufficiently high to cause the EUT to search for communication on another channel.

The spectrum analyzer was set to measure the transmit band of 402-405 MHz. Screen captures were provided to show the EUT behavior. The EUT was verified to transmit on LIC2 which shows that the EUT does not use pre-scanned alternate channels. Thus no further tests are necessary.



USE OF PRE-SCANNED ALTERNATIVE CHANNEL



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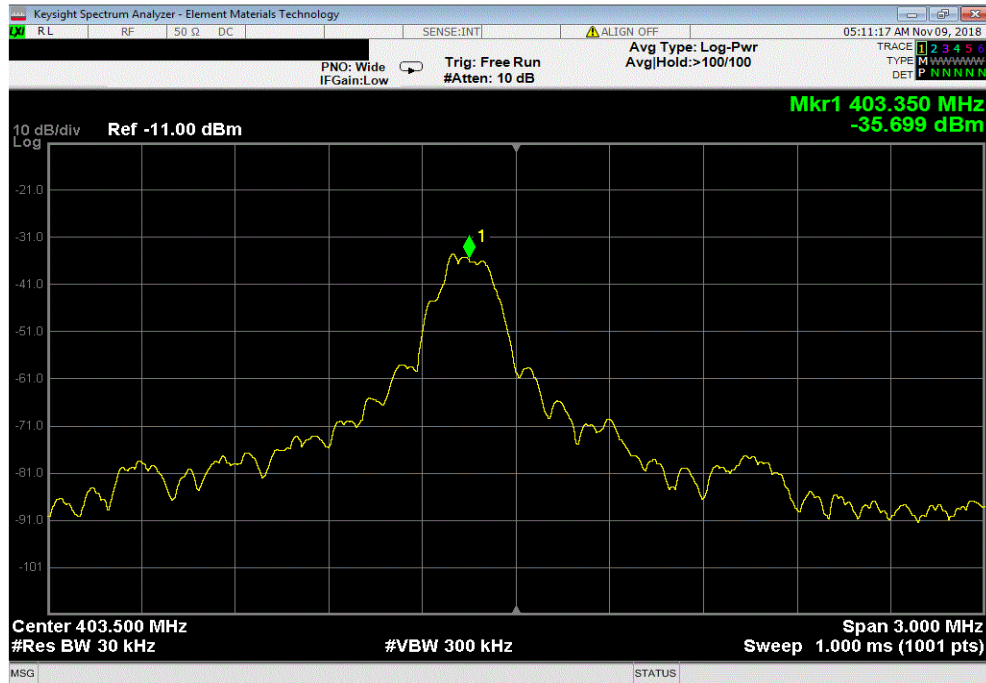
EUT: Bluetooth Pocket Programmer		Work Order: NUVE0019	
Serial Number: 101016		Date: 8-Nov-18	
Customer: Nuvectra Corporation		Temperature: 22.5 °C	
Attendees: Peter Valentyik		Humidity: 25% RH	
Project: None		Barometric Pres.: 1030 mbar	
Tested by: Kyle McMullan		Power: 230VAC/50Hz	
		Job Site: MN07	
TEST SPECIFICATIONS		Test Method	
EN 301 839 V2.1.1:2016		EN 301 839 V2.1.1:2016	
COMMENTS			
Fc is at 403.35 MHz. LIC is at 402.45 MHz. LIC2 is at 404.55 MHz.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	6	Signature <i>Kyle McMullan</i>	
		Transmit Channel	Requirement
No Blocking on Fc		Fc	N/A
Blocking on Fc		LIC2	Pass

USE OF PRE-SCANNED ALTERNATIVE CHANNEL



XMI 2017.12.13

No Blocking on Fc						
				Transmit Channel	Requirement	Result
				Fc	Fc	N/A



Blocking on Fc						
				Transmit Channel	Requirement	Result
				LIC2	LIC2	Pass

