Nuvectra Corporation

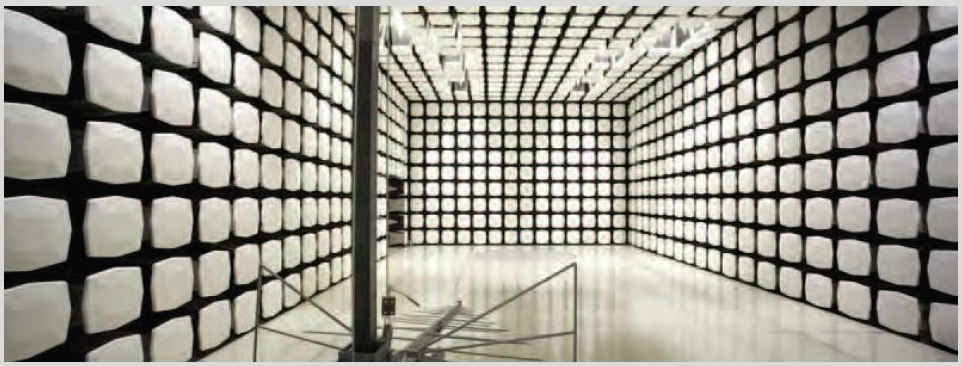
Bluetooth Pocket Programmer

EN 301 839 V2.1.1:2016

FCC Part 95I: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
Nuvectra 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

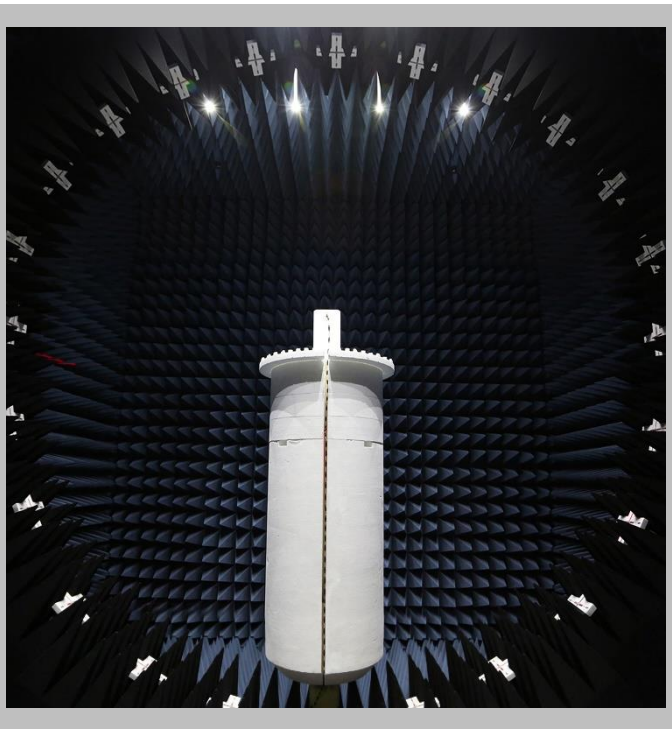
MIC – Recognized by MIC as a CAB for the acceptance of test data.

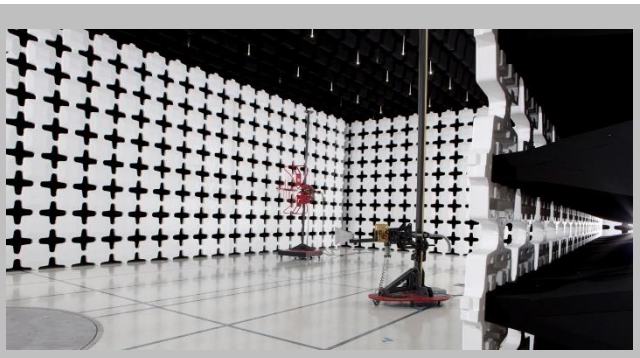
SCOPE

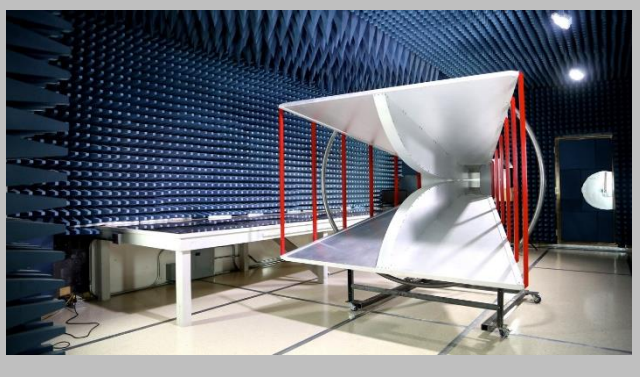
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

FACILITIES

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th 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/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157







MEASUREMENT UNCERTAINTY

element
TMU.2015.07.10

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.

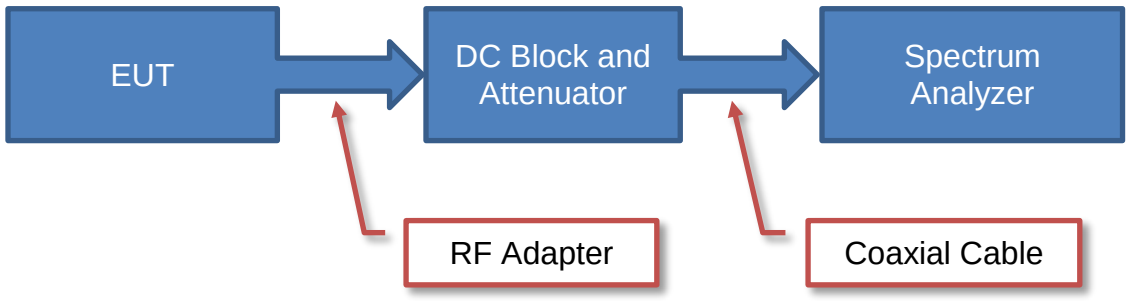
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable 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.

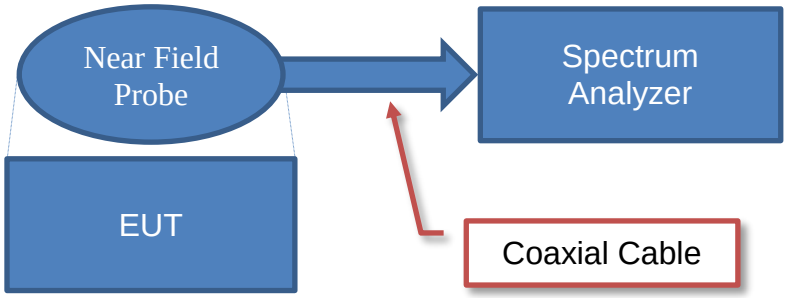
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

Test Setup Block Diagrams

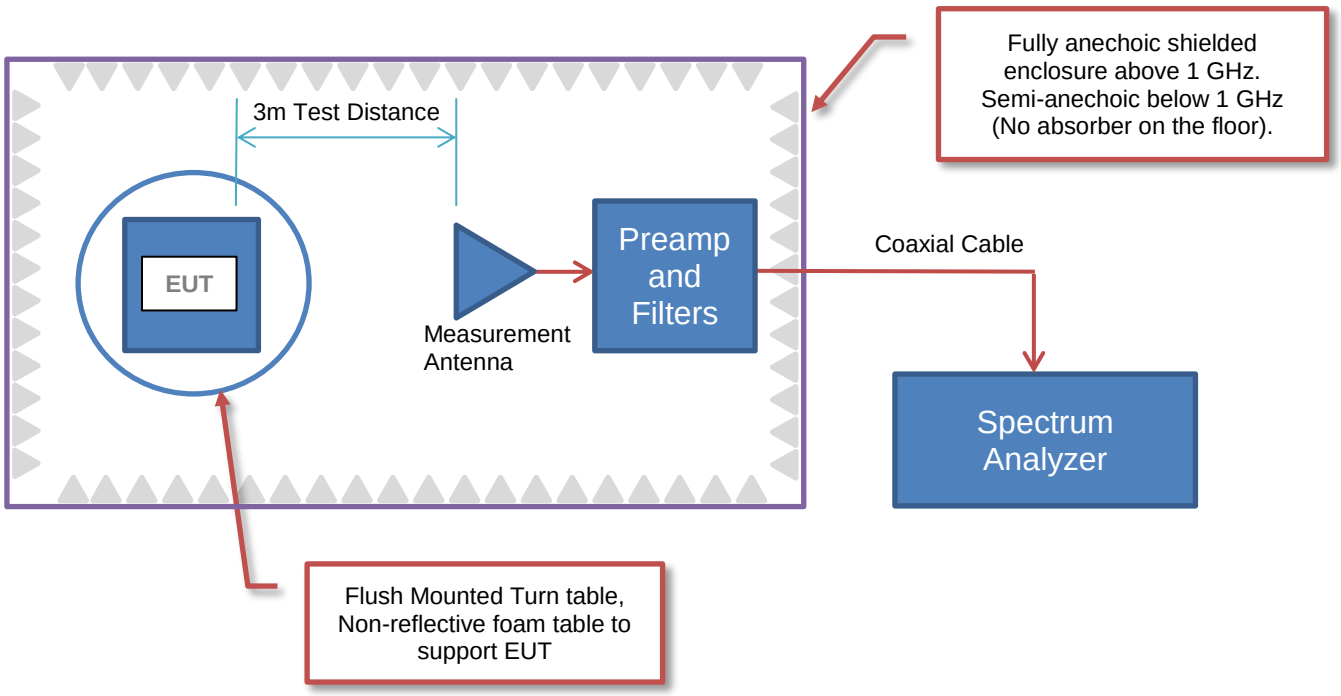
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Nuvectra 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	Nuvectra Corporation	4110	101016

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Power Supply	SL Power Electronics	ME10A0599B02	None
PG	Nuvectra 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.

LBT THRESHOLD POWER LEVEL

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
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

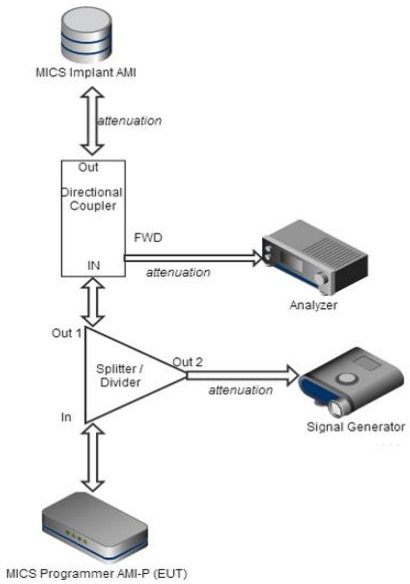
The EUT was configured according to the following block diagram:

The LBT Threshold was calculated as follows: 10*LOG(Bandwidth) - 150 + Antenna Gain

The signal generator was set to multitone operation to cause equal interferance across the entire band except for at the intended channel center frequency, Fc. 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 Fc. The multitone was then set to 23 dB above the LBT threshold. The EUT was again verified to only transmit on Fc. The multitone was then lowered to 3 dB above the LBT threshold. The EUT was again verified to only transmit on Fc.

The spectrum analyzer was set to measure the transmit band of 402-405 MHz. A CW signal was then injected on Fc 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

element

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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	**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*

	Value (dBm)	**Limit < (dBm)**	**Result**
LBT Threshold -6 dB	N/A	N/A	N/A
LBT Threshold -5 dB	N/A	N/A	N/A
LBT Threshold -4 dB	N/A	N/A	N/A
LBT Threshold -3 dB	N/A	N/A	N/A
LBT Threshold -2 dB	N/A	N/A	N/A
LBT Threshold -1 dB	N/A	N/A	N/A
LBT Threshold 0	N/A	N/A	N/A
LBT Threshold +1 dB	N/A	N/A	N/A
LBT Threshold +2 dB	N/A	N/A	N/A
LBT Threshold +3 dB	-106.76	-105.76	Pass

LBT THRESHOLD POWER LEVEL

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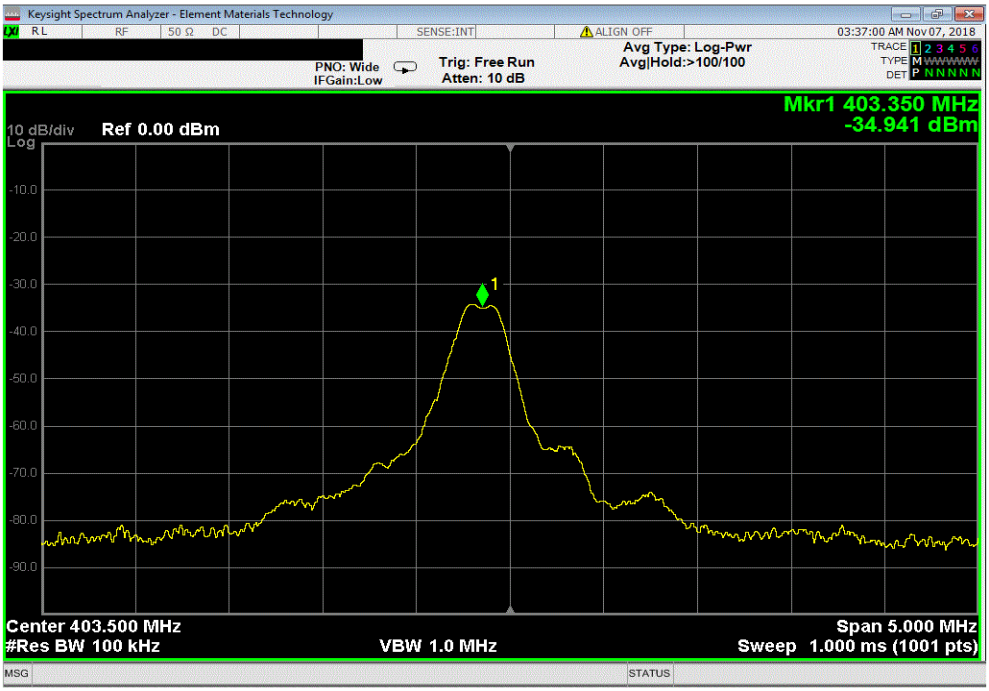
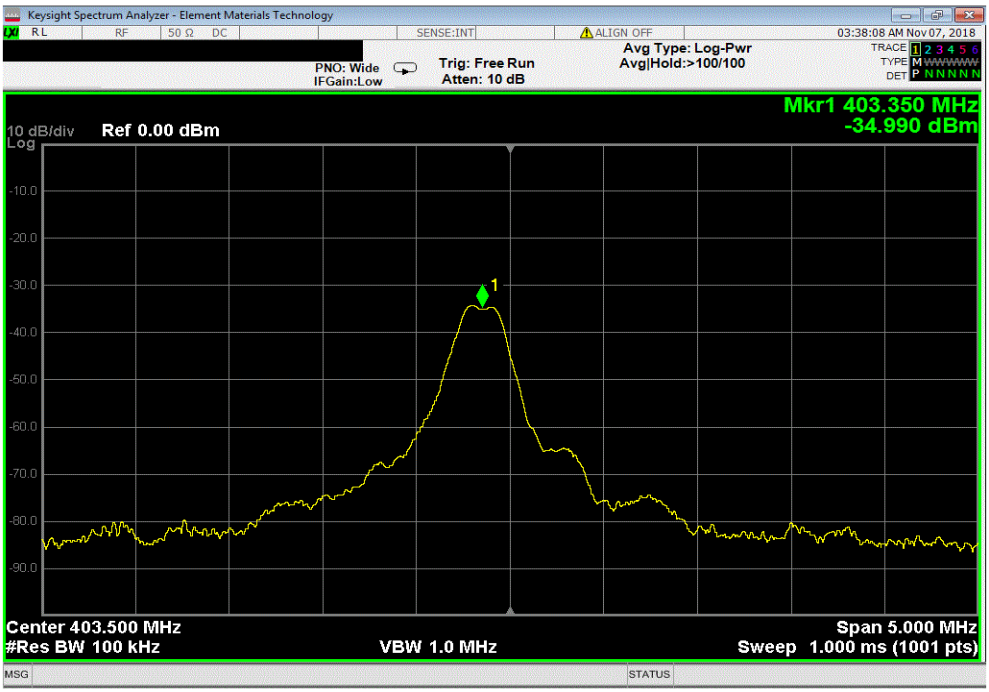
LBT Threshold -6 dB							
					Value (dBm)	Limit < (dBm)	Result
					N/A	N/A	N/A



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



LBT THRESHOLD POWER LEVEL

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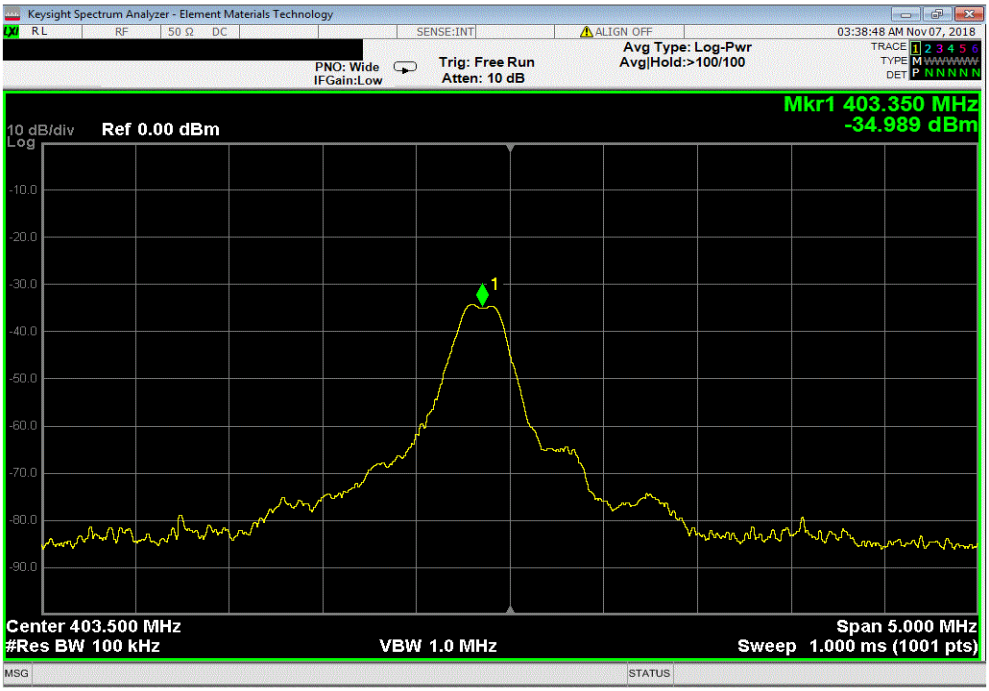
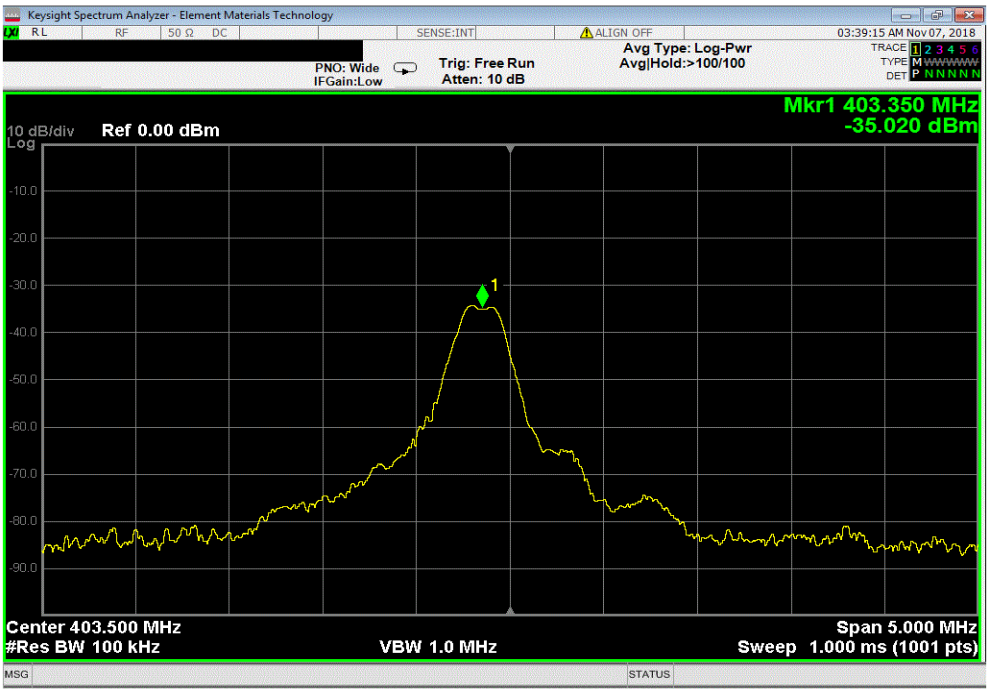
LBT Threshold -4 dB							
					Value (dBm)	Limit < (dBm)	Result
					N/A	N/A	N/A



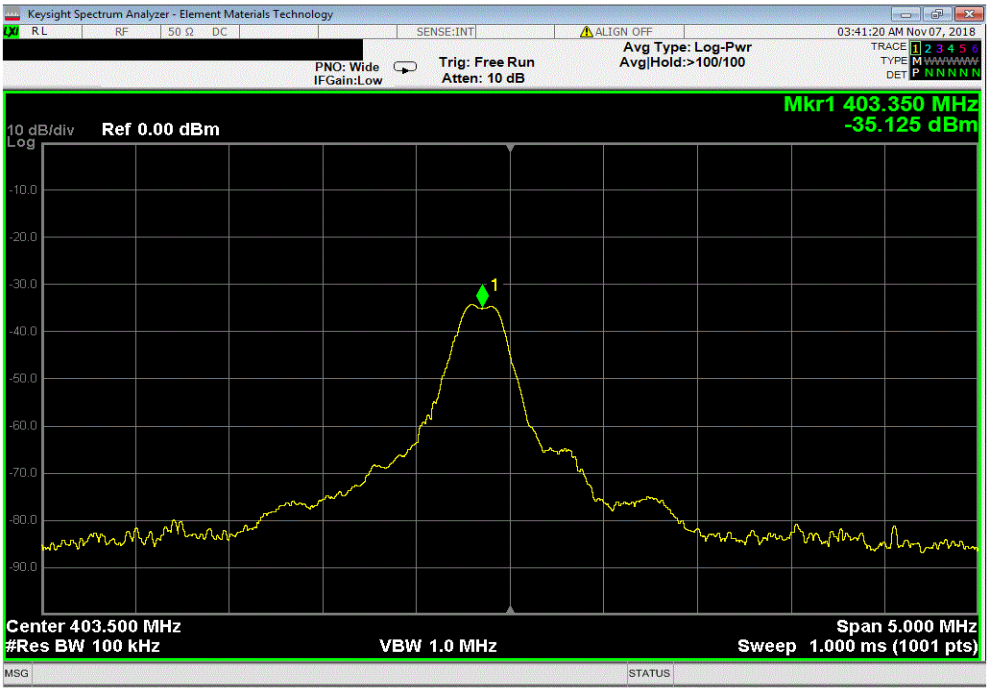
LBT Threshold -3 dB							
					Value (dBm)	Limit < (dBm)	Result
					N/A	N/A	N/A



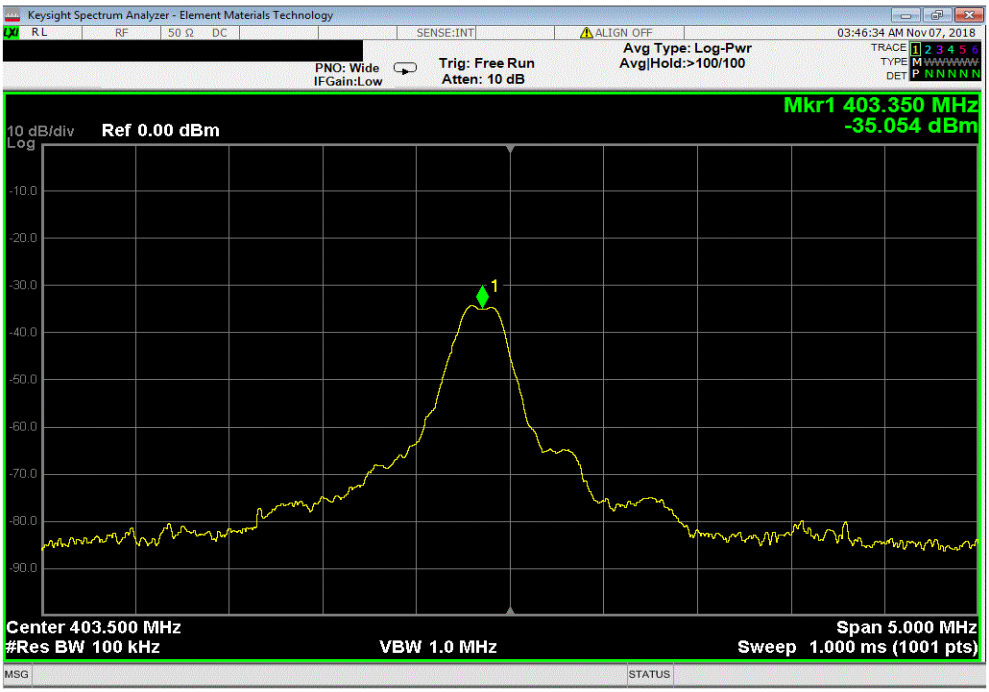
LBT THRESHOLD POWER LEVEL

XMit 2017.12.13

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



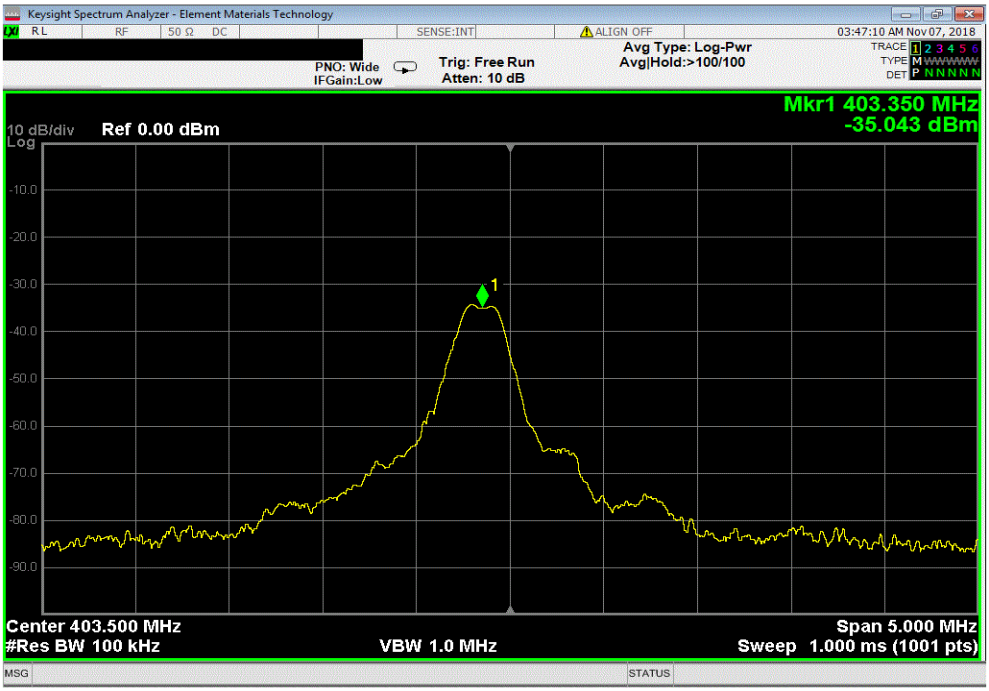
LBT Threshold -1 dB							
					Value (dBm)	Limit < (dBm)	Result
					N/A	N/A	N/A



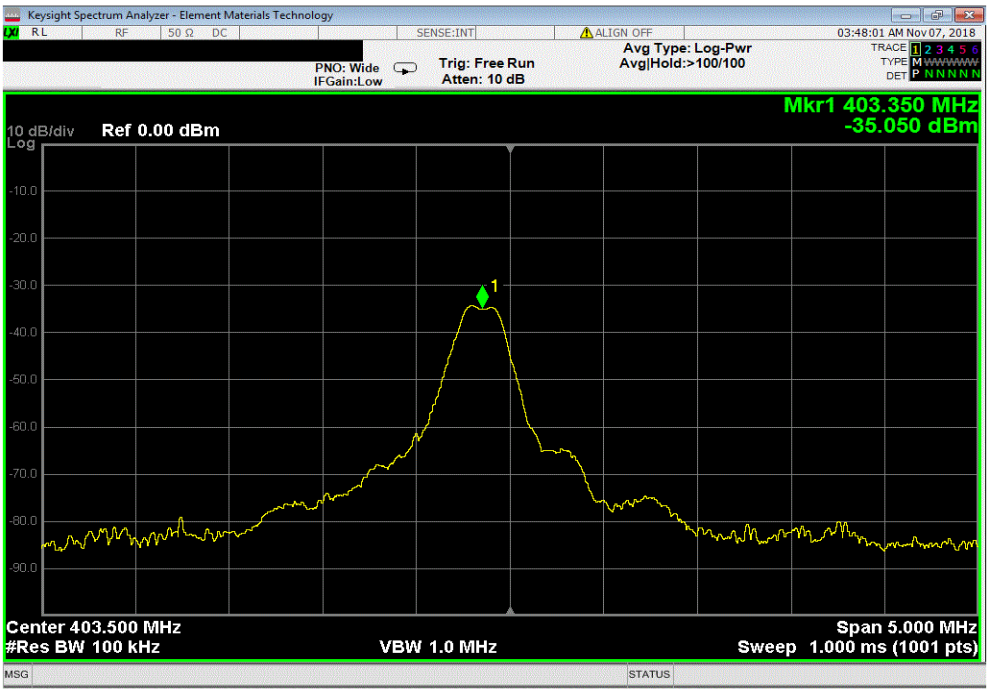
LBT THRESHOLD POWER LEVEL

XMit 2017.12.13

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



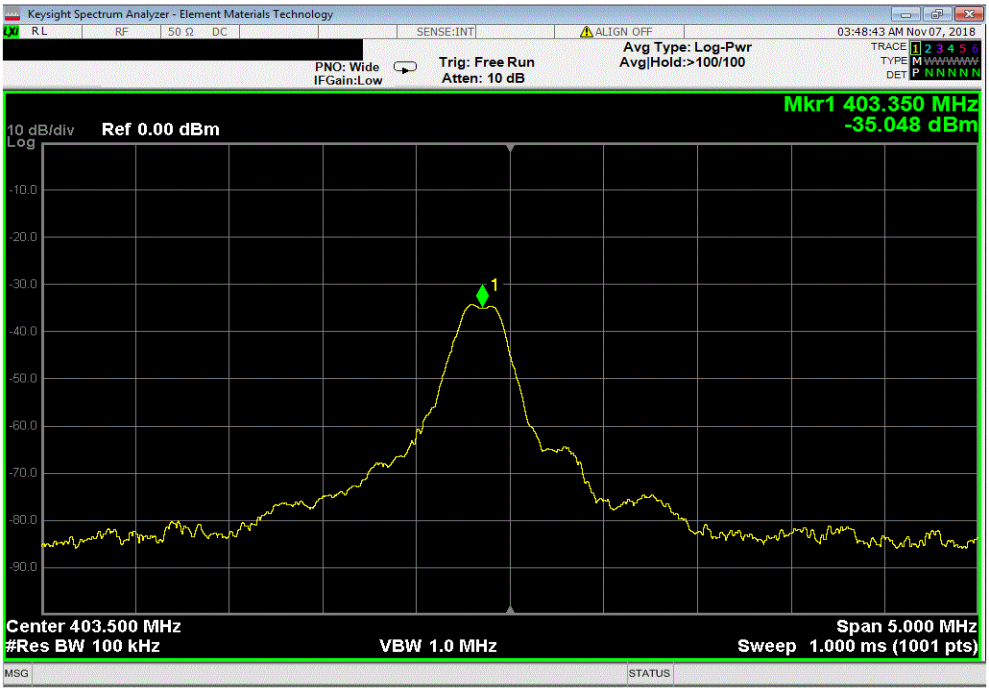
LBT Threshold +1 dB						
				Value (dBm)	Limit < (dBm)	Result
				N/A	N/A	N/A



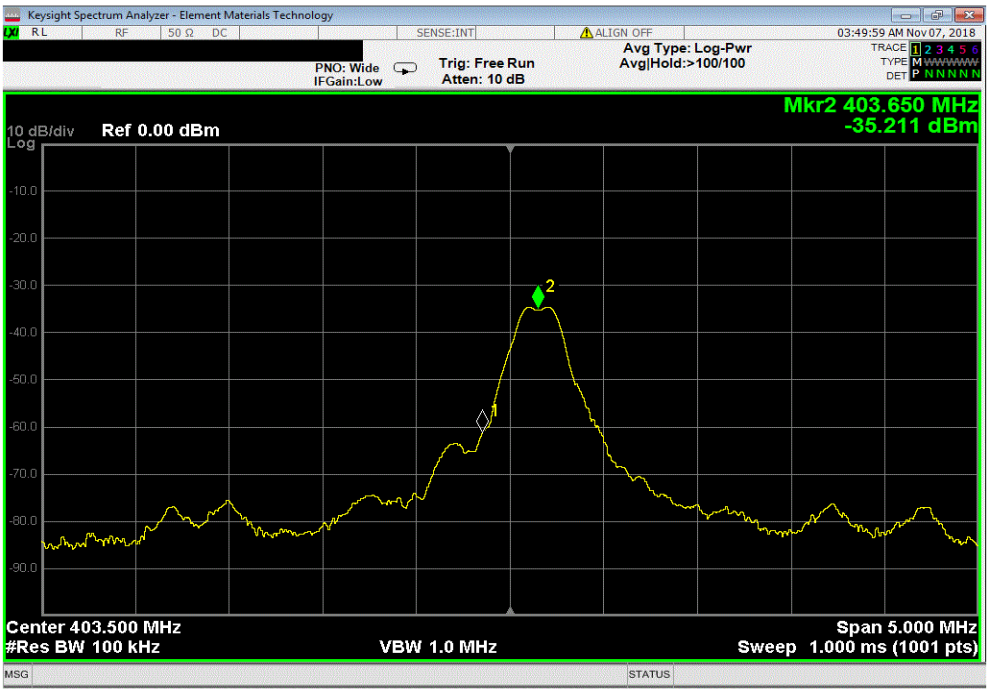
LBT THRESHOLD POWER LEVEL

XMit 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

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
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

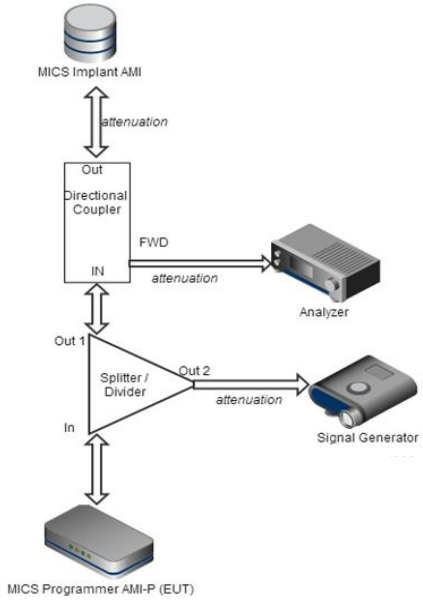
The EUT was configured according to the following block diagram:

The LBT threshold was calculated as follows: 10*LOG(Bandwidth) - 150 + 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 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 Fc was set to a level far enough above the LBT threshold so that communication starts on a channel besides Fc, the CW signal source was then lowered by 1 dB increments until the EUT chooses the intended frequency (Fc) to start a session on. The CW signal source amplitude at the EUT was measured.

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



MONITORING SYSTEM BANDWIDTH

XMit 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*

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

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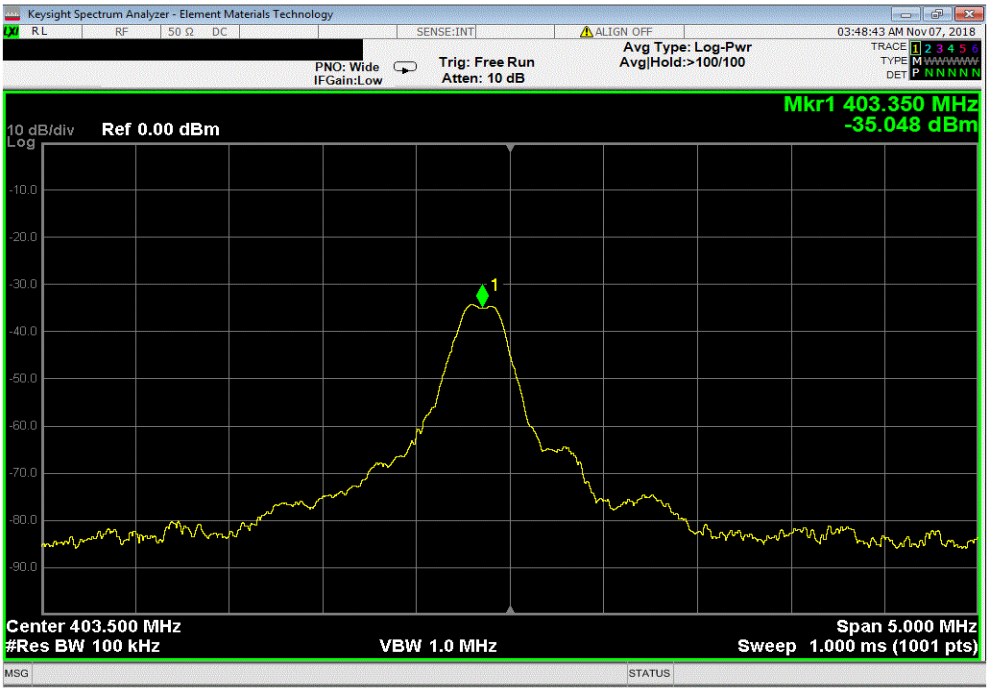
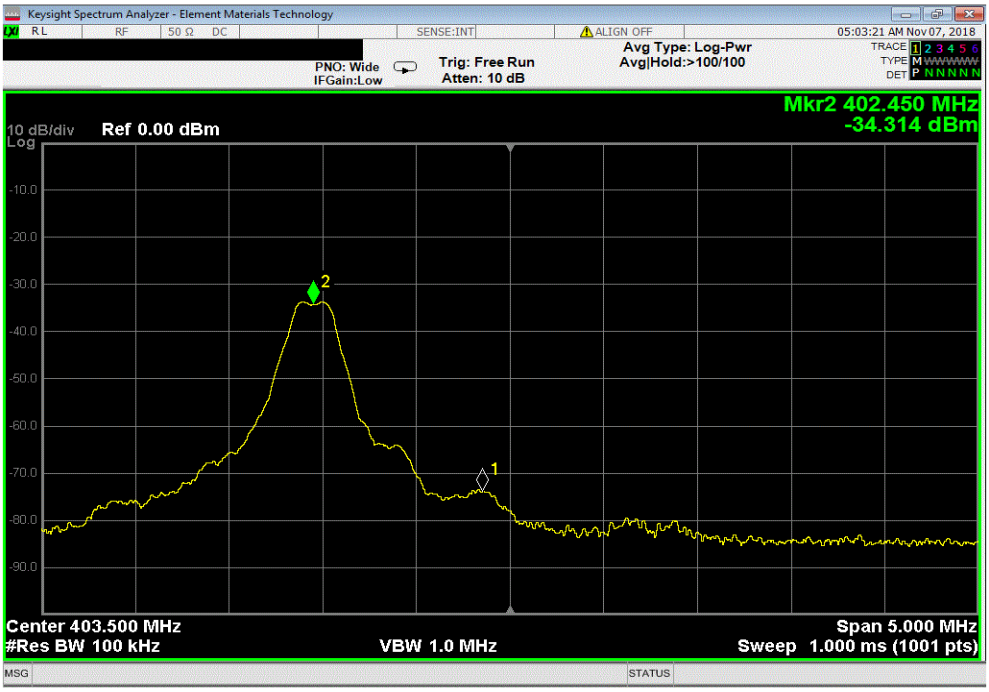
Pa = Fc						
		Reference Value (dBm)	Test Measured Value (dBm)	D1 or D2 Value (dB)	Limit (dB)	Result
		-102.76	N/A	N/A	N/A	Pass



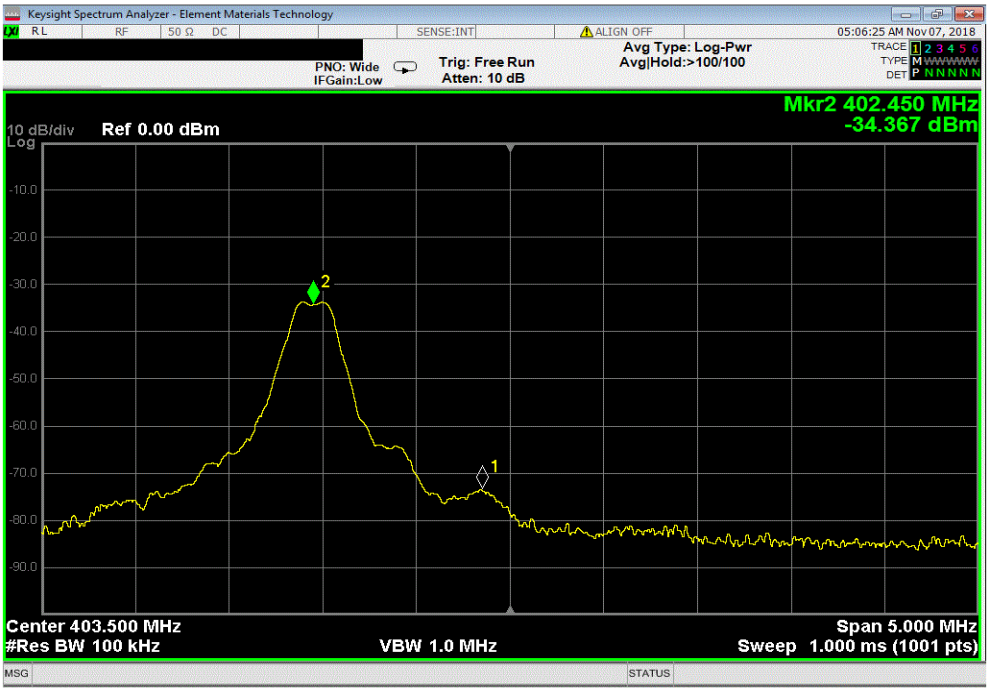
Pb = Fc - BW/2						
		Reference Value (dBm)	Test Measured Value (dBm)	D1 or D2 Value (dB)	Limit (dB)	Result
		N/A	-94.76	8	20	Pass



MONITORING SYSTEM BANDWIDTH

XMit 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

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

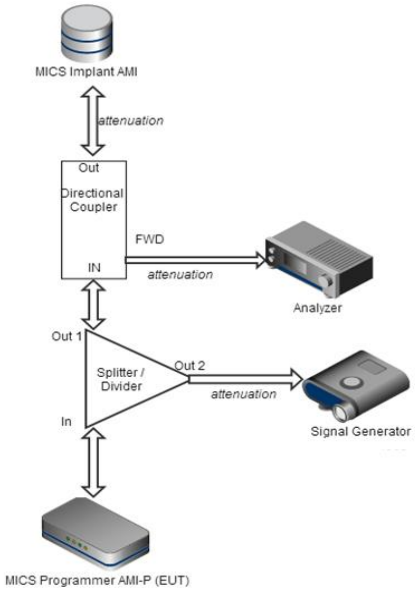
Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAD	NCR	NCR
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAC	NCR	NCR
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR
Terminator	Fairview Microwave	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 interferance 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 (Fc) was removed. At the same time, the EUT was set to seek a session with the implantable device. The delay between Fc 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

XMit 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	**Test Method**
EN 301 839 V2.1.1:2016	EN 301 839 V2.1.1:2016

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

None

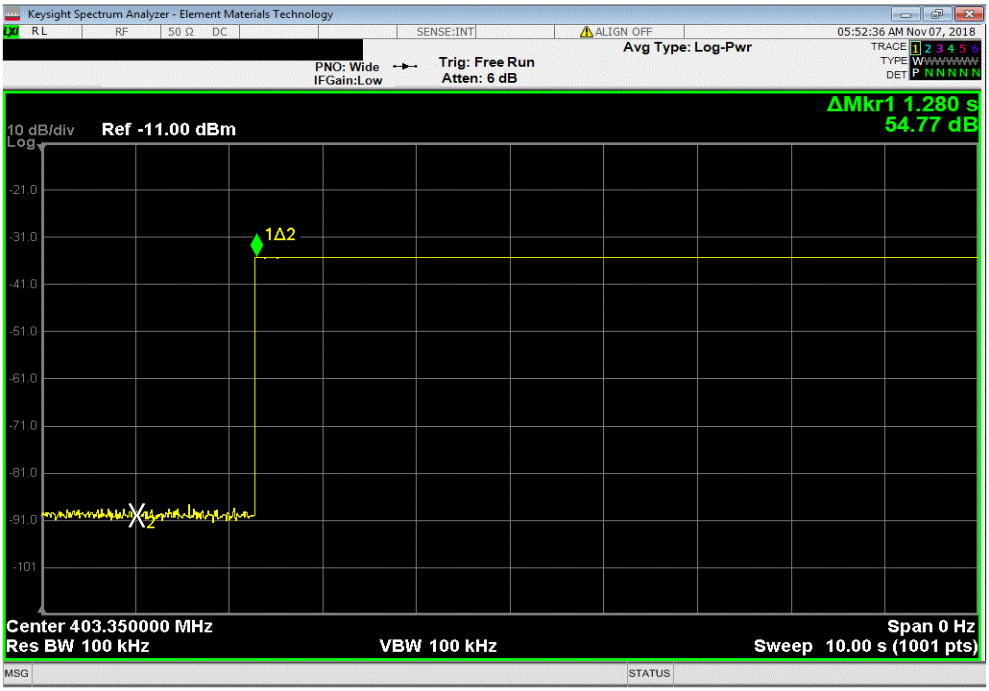
Configuration #	**6**	*Signature*

	Scan Cycle Time (s)	**Limit (s)**	**Result**
Run 1	1.28	5	Pass
Run 2	1.14	5	Pass
Run 3	1.21	5	Pass
Run 4	1.28	5	Pass
Run 5	1.11	5	Pass

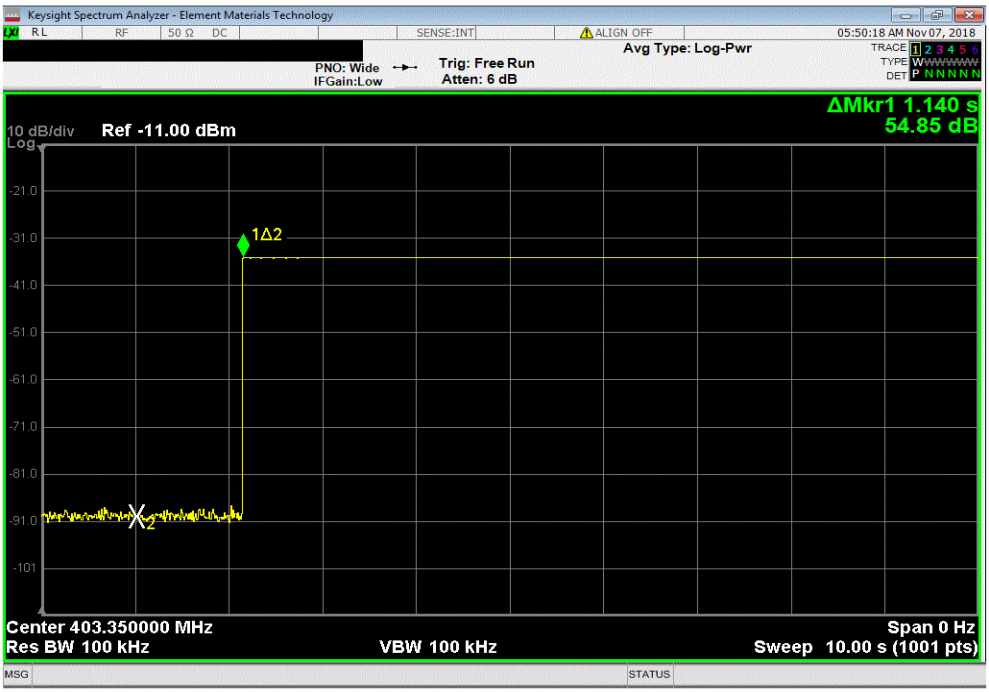
MONITORING SYSTEM SCAN CYCLE TIME

XMit 2017.12.13

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



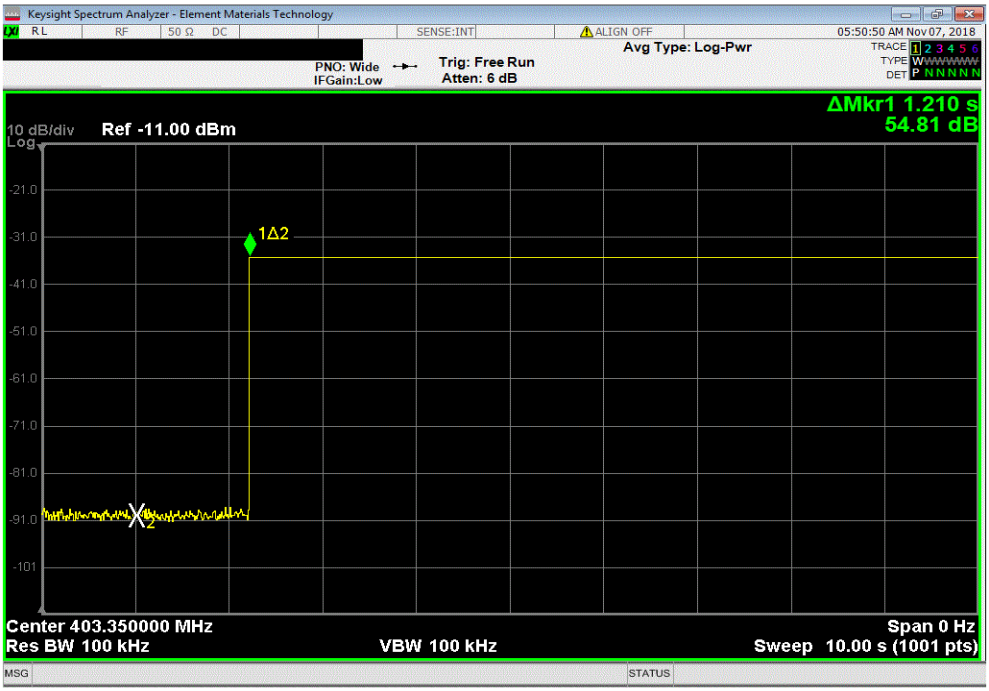
Run 2							
					Scan Cycle Time (s)	Limit (s)	Result
					1.14	5	Pass



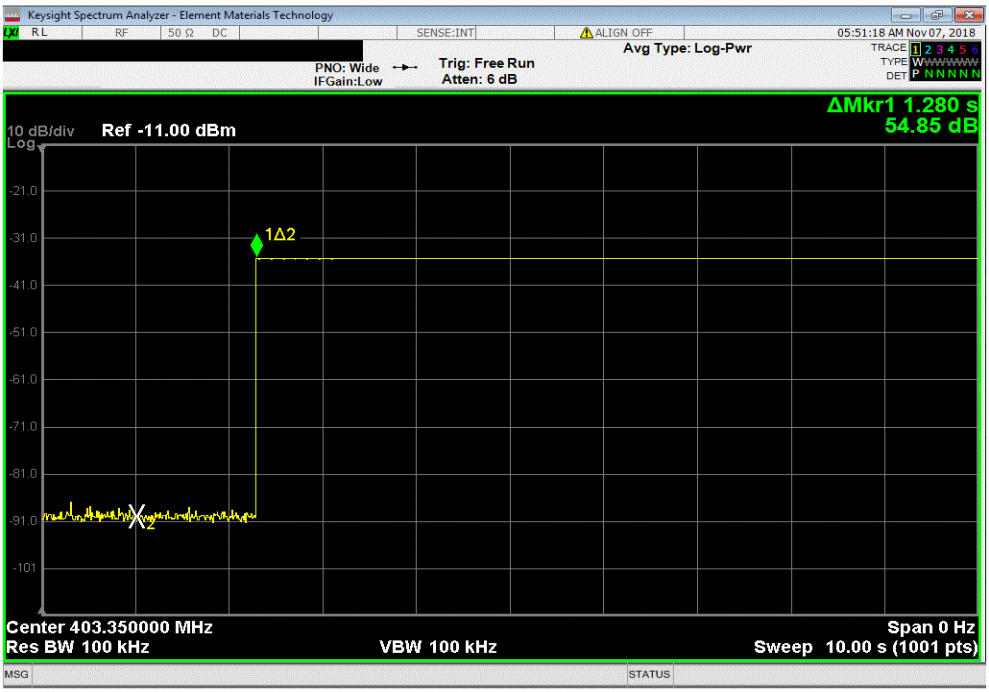
MONITORING SYSTEM SCAN CYCLE TIME

XMit 2017.12.13

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



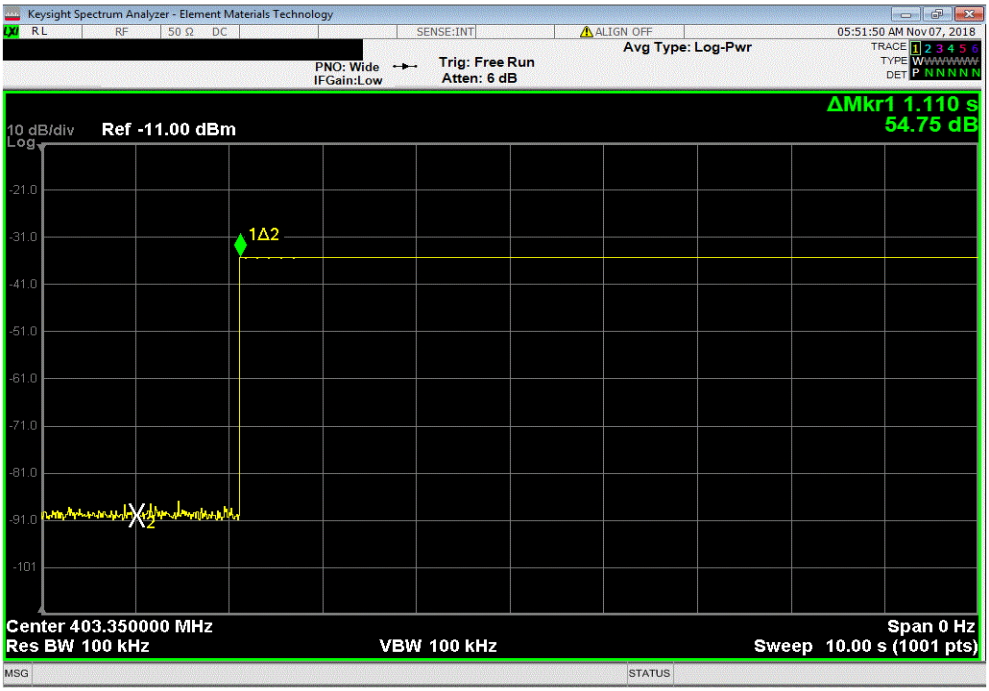
Run 4							
					Scan Cycle Time (s)	Limit (s)	Result
					1.28	5	Pass



MONITORING SYSTEM SCAN CYCLE TIME

XMit 2017.12.13

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



MINIMUM CHANNEL MONITORING PERIOD

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

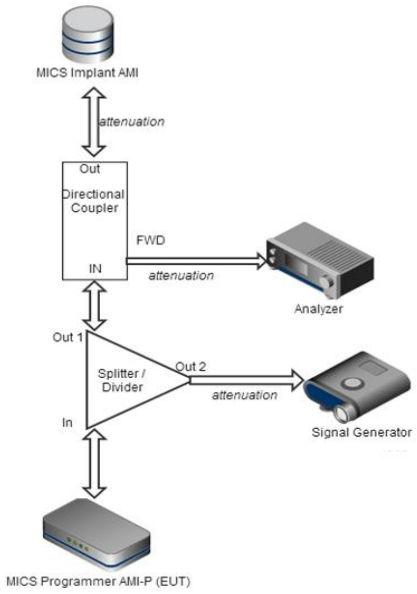
Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAD	NCR	NCR
Power Divider/Combiner	Fairview Microwave Inc (SM electronics)	MP8451-2	IAC	NCR	NCR
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR
Directional Coupler	Fairview 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 interferance 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

element

XMit 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	**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

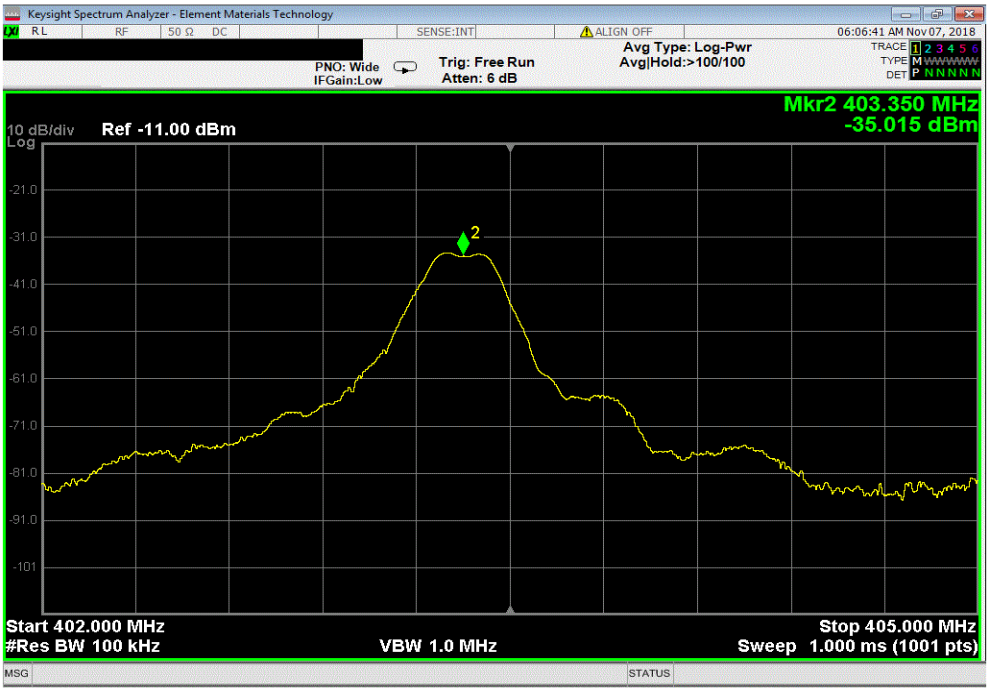
Configuration #	**6**	*Signature*

	Transmit on Fc	**Requirement**	**Result**
Run 1	Yes	Tx on Fc	Pass
Run 2	Yes	Tx on Fc	Pass
Run 3	Yes	Tx on Fc	Pass
Run 4	Yes	Tx on Fc	Pass
Run 5	Yes	Tx on Fc	Pass
Run 6	Yes	Tx on Fc	Pass
Run 7	Yes	Tx on Fc	Pass
Run 8	Yes	Tx on Fc	Pass
Run 9	Yes	Tx on Fc	Pass
Run 10	Yes	Tx on Fc	Pass

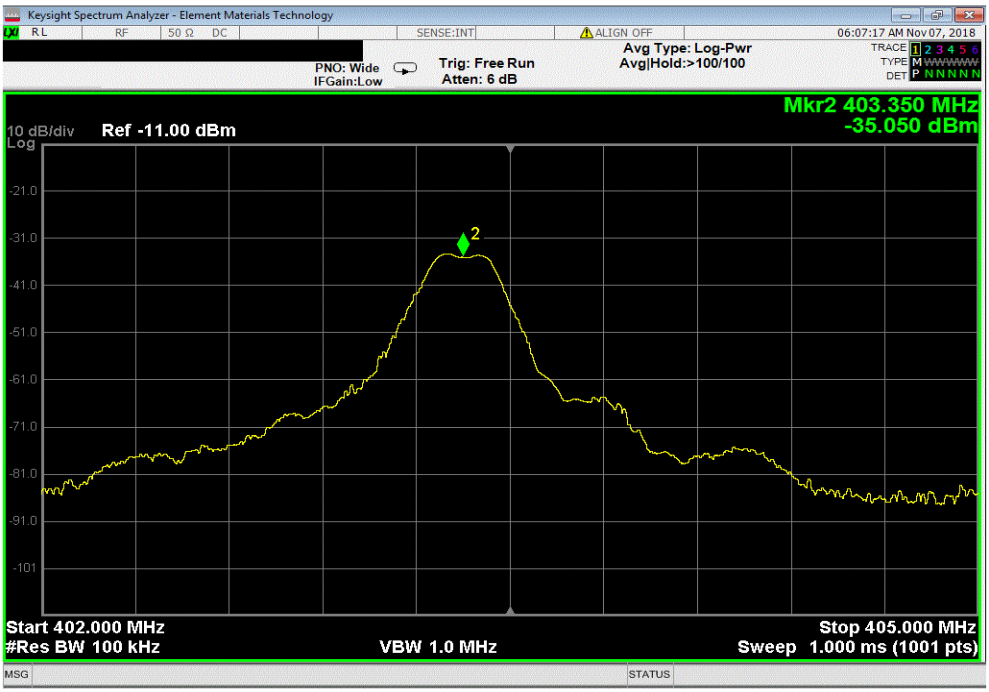
MINIMUM CHANNEL MONITORING PERIOD

XMit 2017.12.13

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



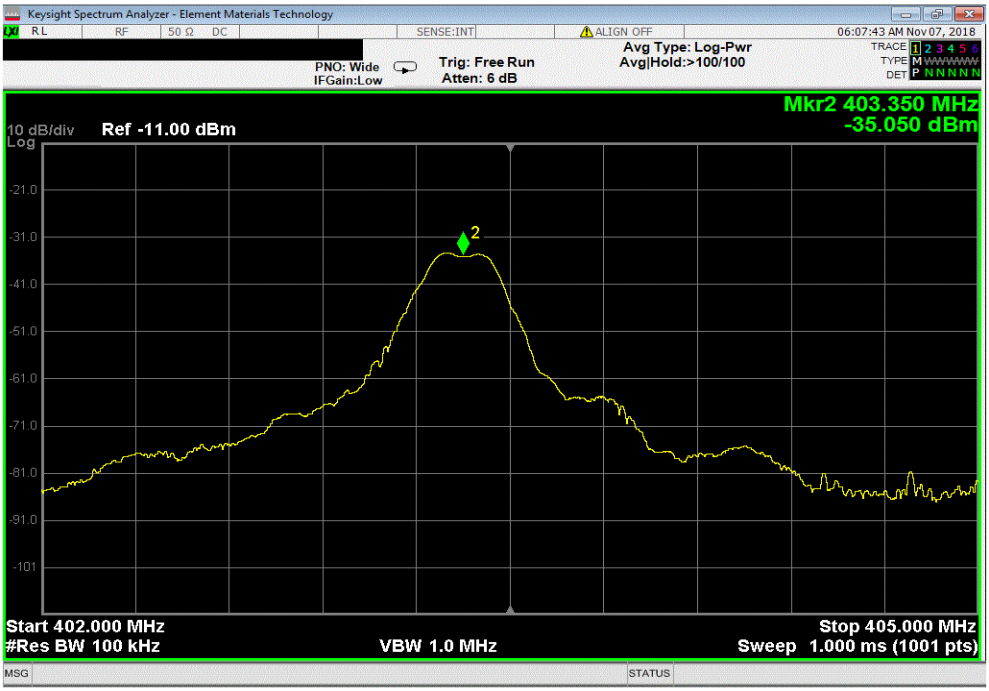
Run 2							
					Transmit on Fc	Requirement	Result
					Yes	Tx on Fc	Pass



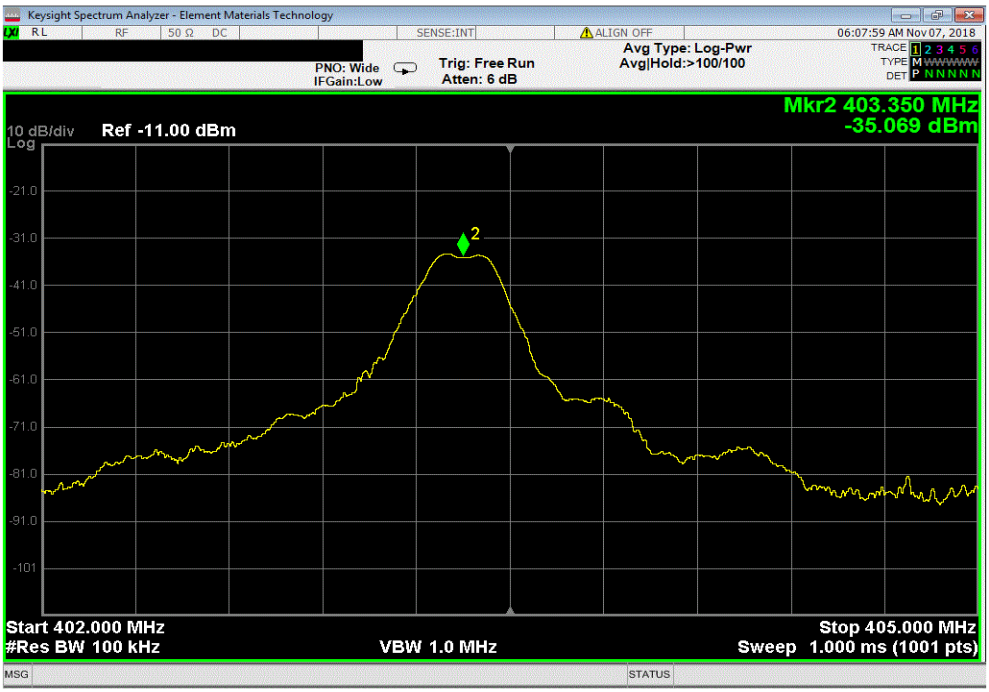
MINIMUM CHANNEL MONITORING PERIOD

XMit 2017.12.13

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



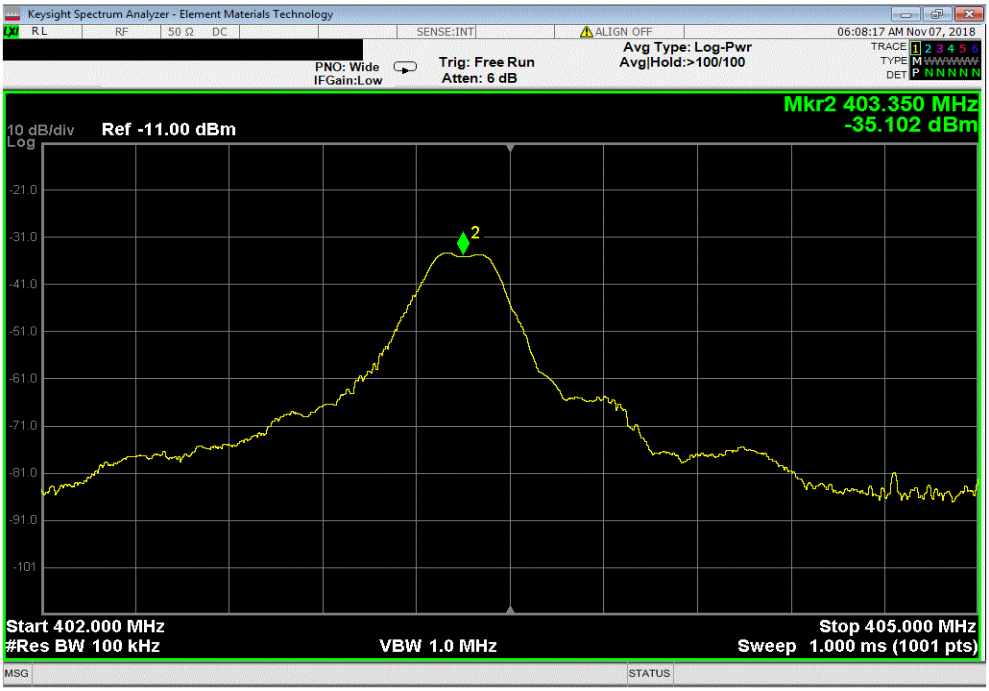
Run 4							
					Transmit on Fc	Requirement	Result
					Yes	Tx on Fc	Pass



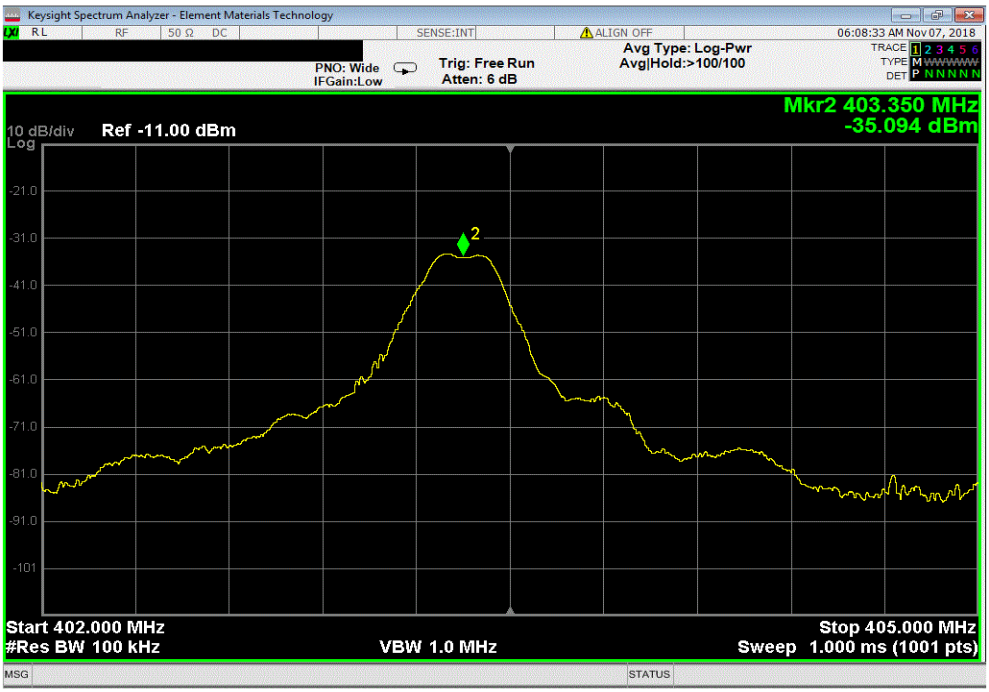
MINIMUM CHANNEL MONITORING PERIOD

XMit 2017.12.13

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



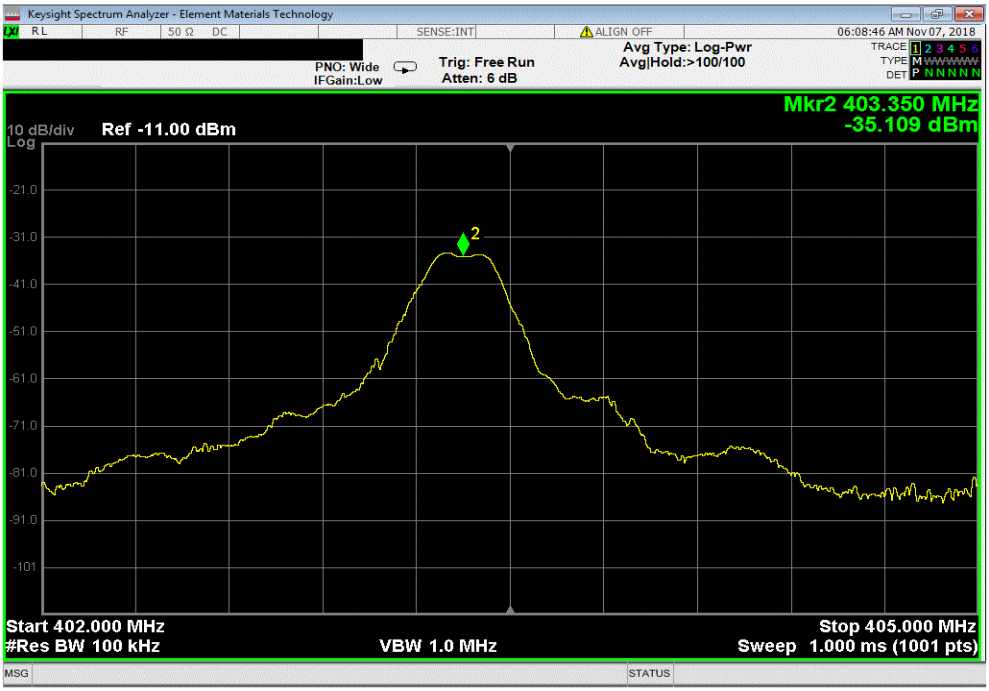
Run 6							
					Transmit on Fc	Requirement	Result
					Yes	Tx on Fc	Pass



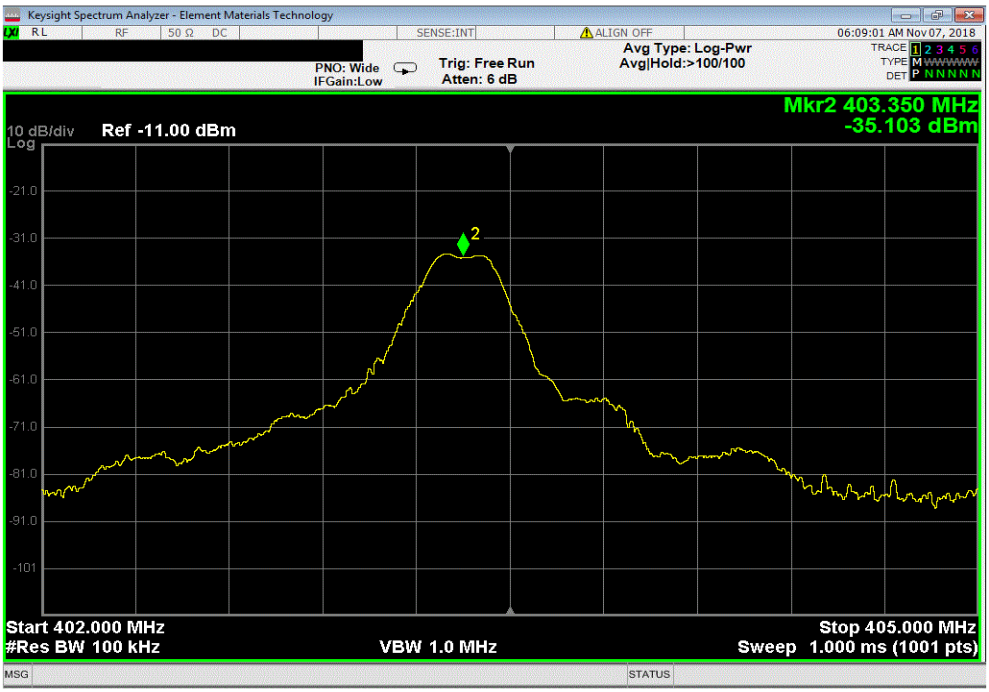
MINIMUM CHANNEL MONITORING PERIOD

XMit 2017.12.13

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



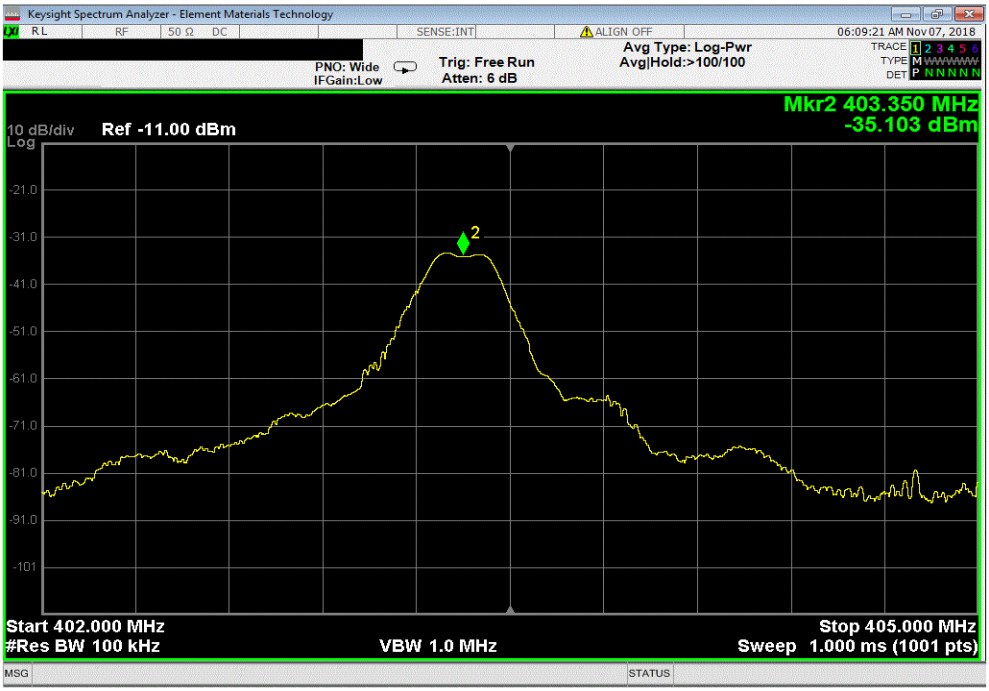
Run 8							
					Transmit on Fc	Requirement	Result
					Yes	Tx on Fc	Pass



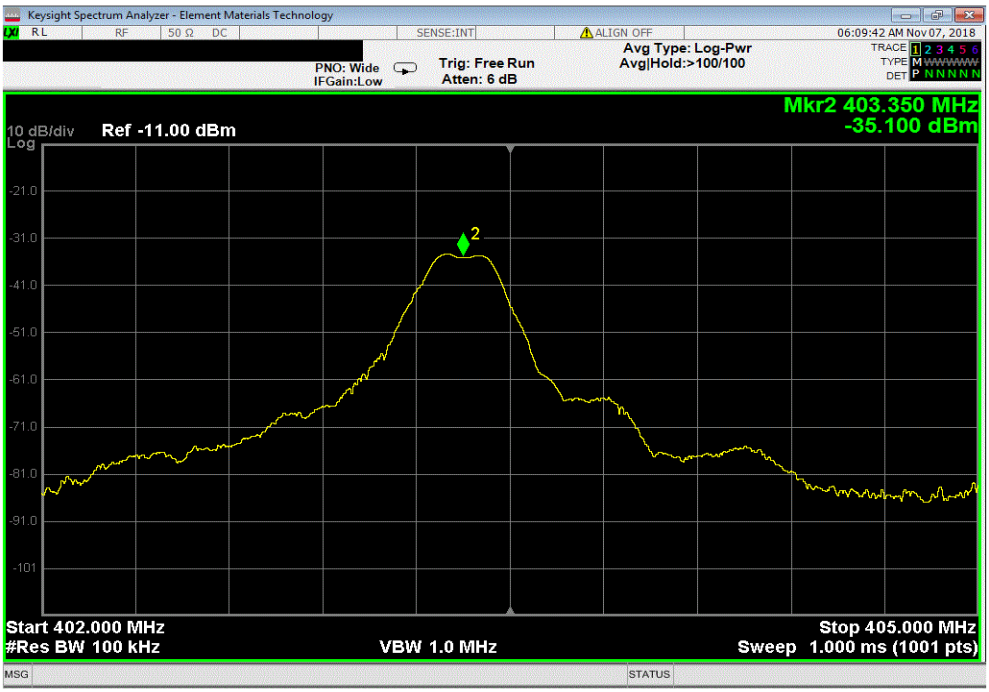
MINIMUM CHANNEL MONITORING PERIOD

XMit 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

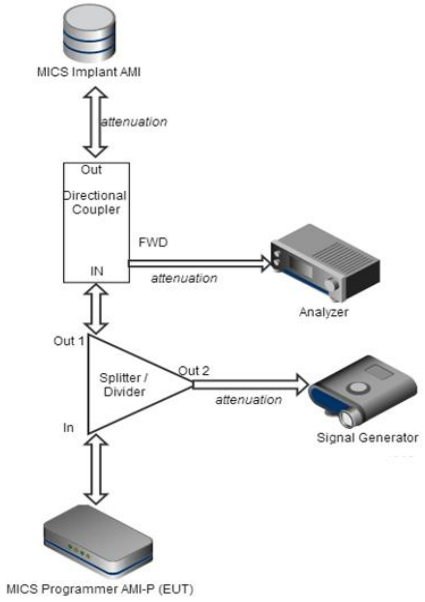
The EUT was configured according to the following block diagram:

The LBT threshold was calculated as follows: 10*LOG(Bandwidth) - 150 + Antenna Gain

The signal generator was set to multitone operation to cause equal interferance across the entire band except for on 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 mutlitone 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 Fc. The EUT was verified to transmit on Fc. The amplitude of the CW signal source at Fc 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

XMit 2017.12.13

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	**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.

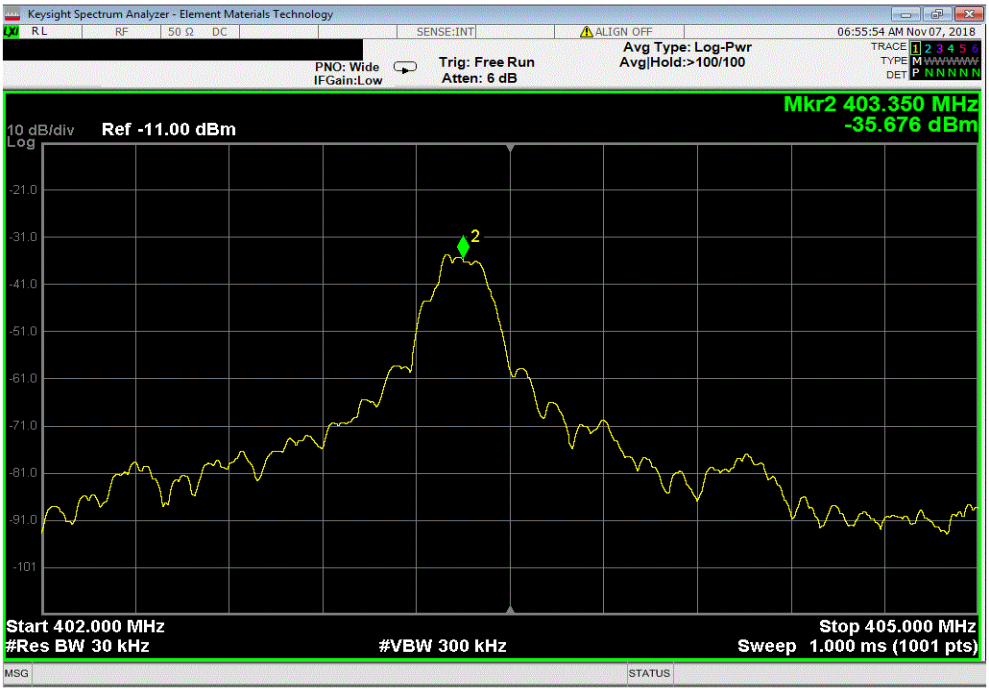
DEVIATIONS FROM TEST STANDARD

None

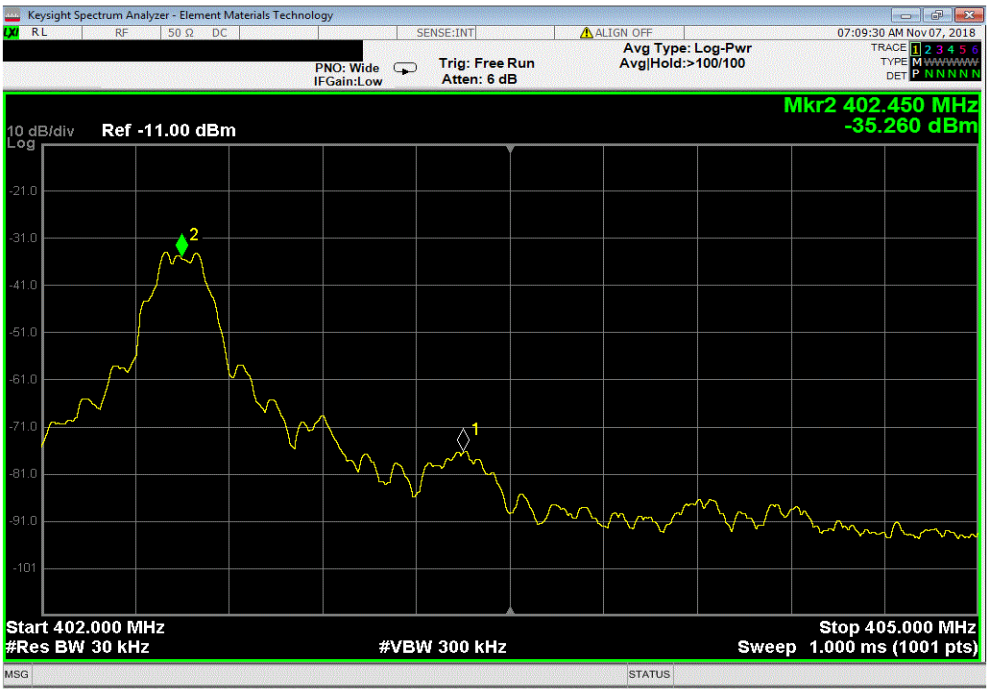
Configuration #	**6**	*Signature* Kyle McMullan

	Transmit Channel	**Specificed Tx Channel**	**Result**
Fc 3 dB Below LBT Threshold	Fc	Fc	Pass
Fc 6 dB Above LBT Threshold	LIC	LIC	Pass

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



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



DISCONTINUATION OF A MICS SESSION

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

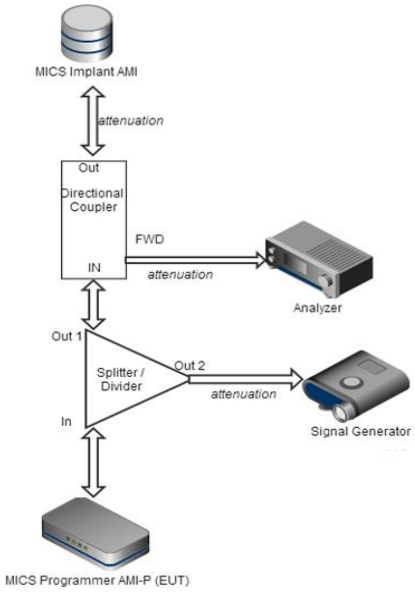
The EUT was configured according to the following block diagram:

The LBT threshold was calculated as follows: 10*LOG(Bandwidth) - 150 + Antenna Gain

The signal generator was set to multitone operation to cause equal interferance 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 (Fc) 6 dB above the LBT threshold. A least interferred 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 Fc 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

element

XMit 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	**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*

	Comm Channel	**Comm Time**	**Requirement**	**Result**
Initial Comm Channel	LIC	N/A	LIC	Pass
5 Second Shut-Off	LIC	4.46 s	≤ 5 s	Pass
Re-established Comm Channel	Fc	N/A	Not LIC	Pass

DISCONTINUATION OF A MICS SESSION

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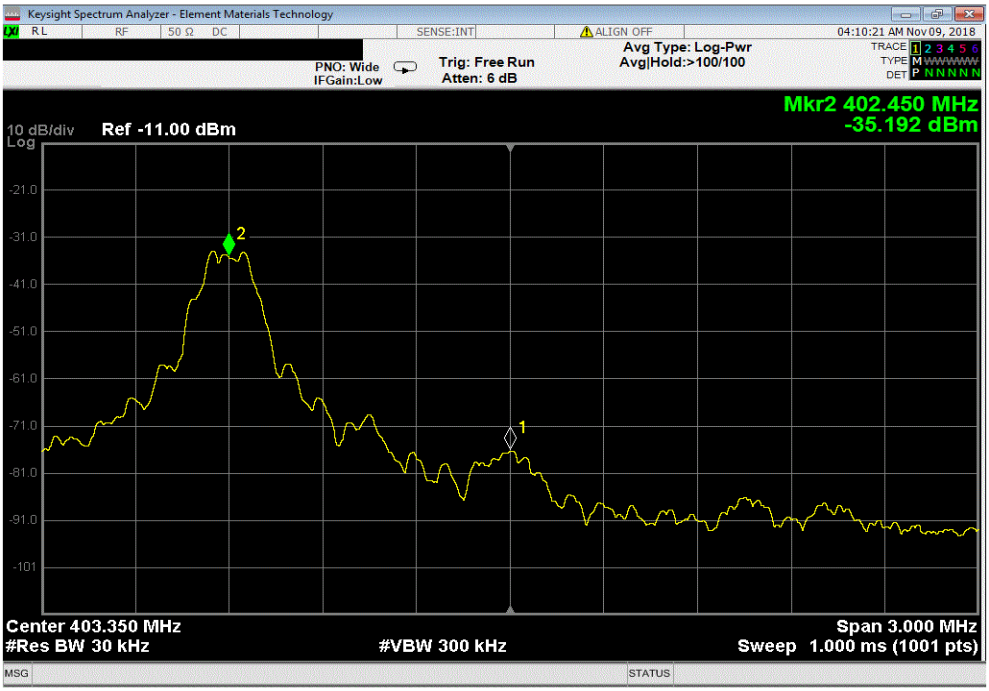
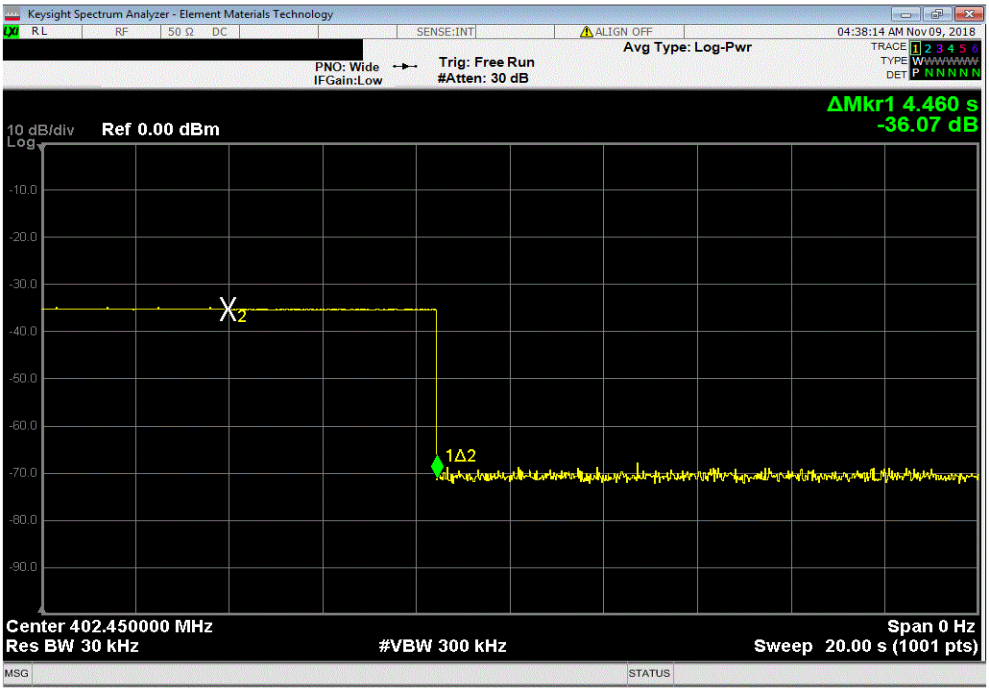
Initial Comm Channel						
			Comm Channel	Comm Time	Requirement	Result
			LIC	N/A	LIC	Pass



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



DISCONTINUATION OF A MICS SESSION

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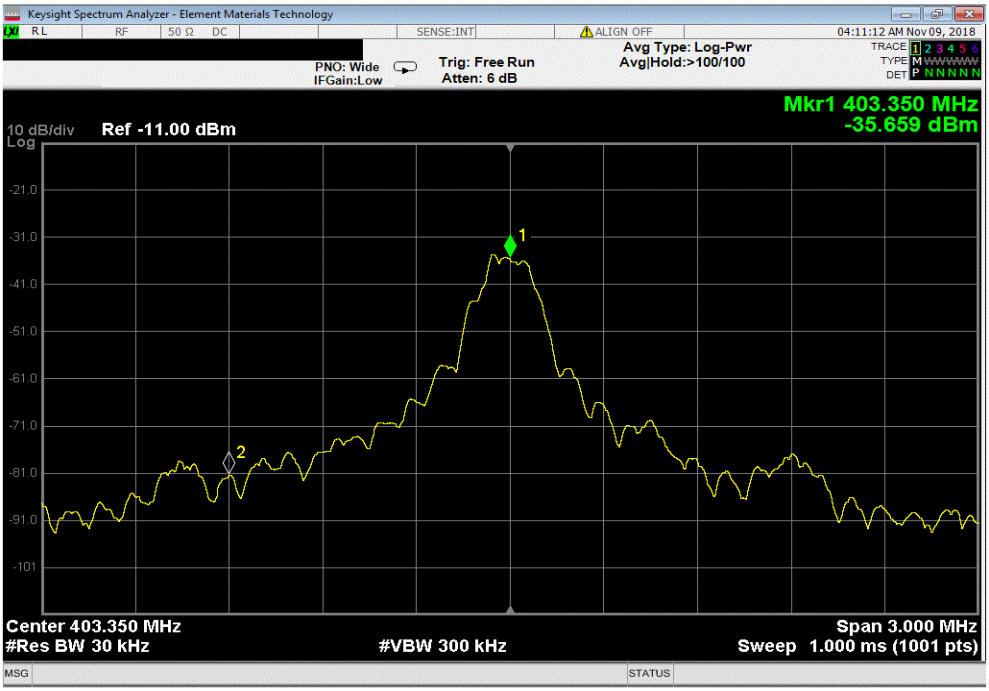
Re-established Comm Channel						
			Comm Channel	Comm Time	Requirement	Result
			Fc	N/A	Not LIC	Pass



USE OF PRE-SCANNED ALTERNATIVE CHANNEL

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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

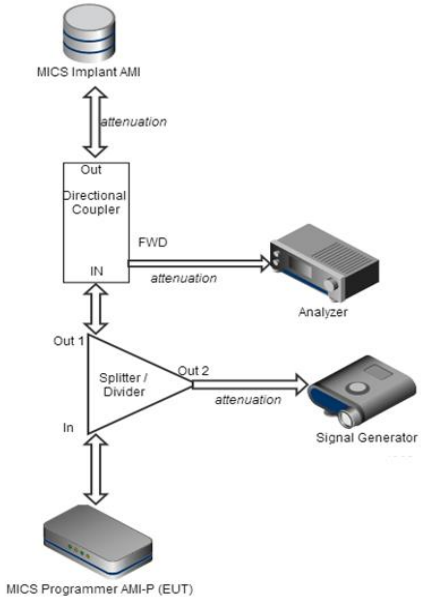
The EUT was configured according to the following block diagram:

The LBT threshold was calculated as follows: 10*LOG(Bandwidth) - 150 + Antenna Gain

The signal generator was set to multitone operation to cause equal interferance 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 mutlitone 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 interferred 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

XMit 2017.12.13

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

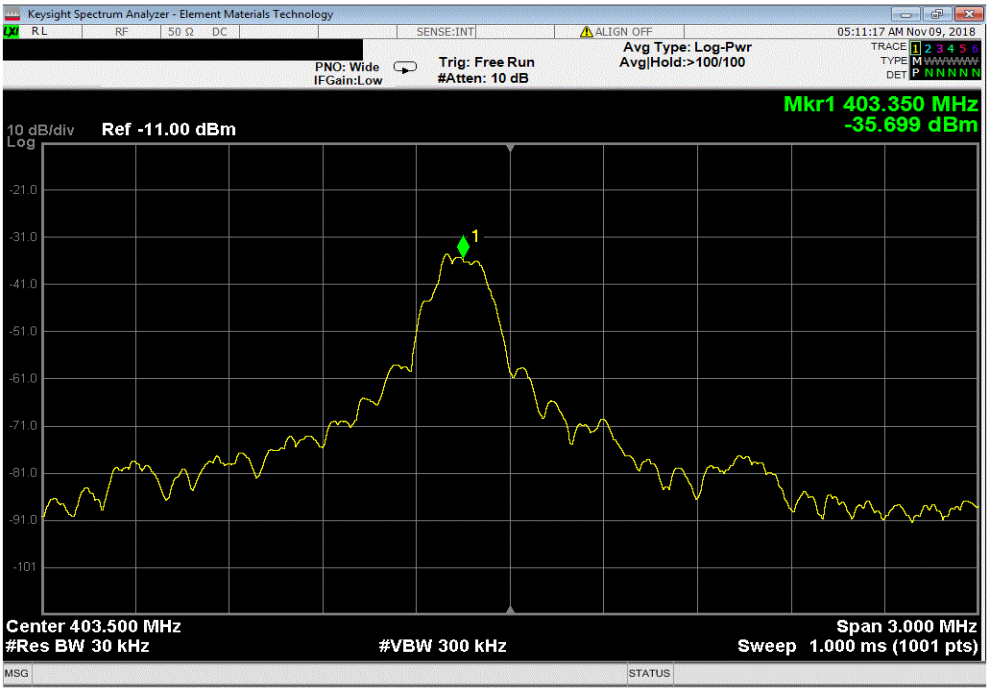
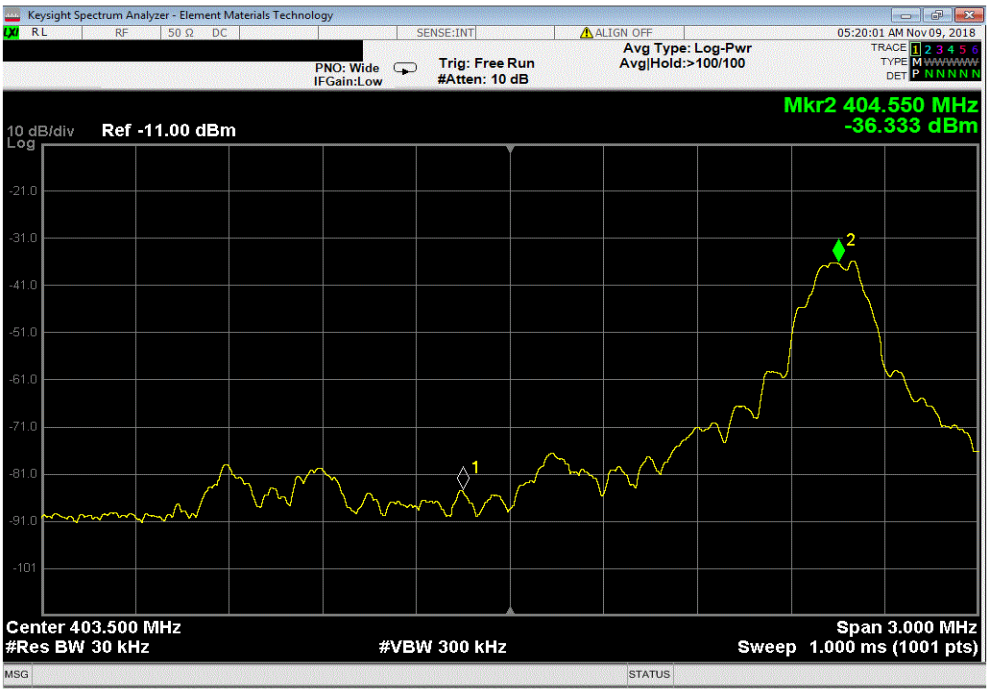
Configuration #	**6**	*Signature*

	Transmit Channel	**Requirement**	**Result**
No Blocking on Fc	Fc	Fc	N/A
Blocking on Fc	LIC2	LIC2	Pass

USE OF PRE-SCANNED ALTERNATIVE CHANNEL

XMit 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