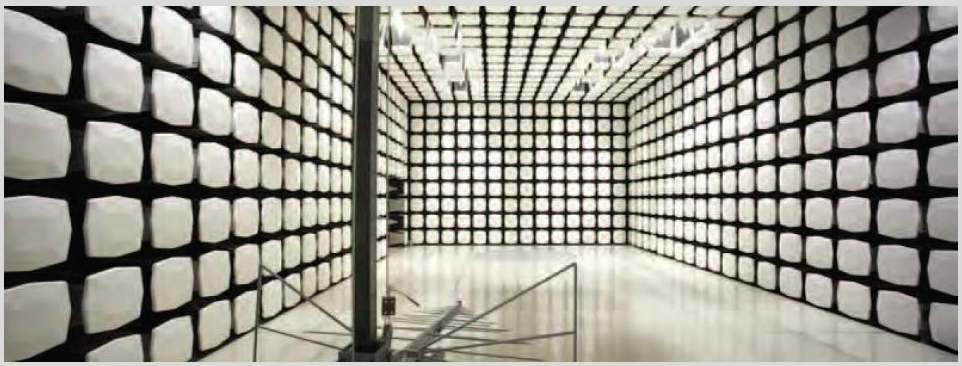
Starkey Laboratories, Inc.

The Dash Pro - Left

FCC 15.209:2017

10.6 MHz NFMI Radio

Report # STAK0082.5



NVLAP Lab Code: 200881-0

CERTIFICATE OF TEST

2017-1-25

Last Date of Test: March 17, 2017
Starkey Laboratories, Inc.
Model: The Dash Pro - Left

Radio Equipment Testing

Standards

Specification	Method
FCC 15.209:2017	ANSI C63.10:2013

Results

Method Clause	Test Description	Applied	Results	Comments
6.5	Field Strength of Fundamental	Yes	Pass	
6.5, 6.6	Field Strength of Harmonics and Spurious Radiated Emissions	Yes	Pass	

Deviations From Test Standards

None

Approved By:

Dean Ghizzone, General 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.

REVISION HISTORY

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

2017.1.25

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 – Validated by the European Commission as a Notified Body under the R&TTE Directive.

Australia/New Zealand

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

Korea

MSIP / 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.

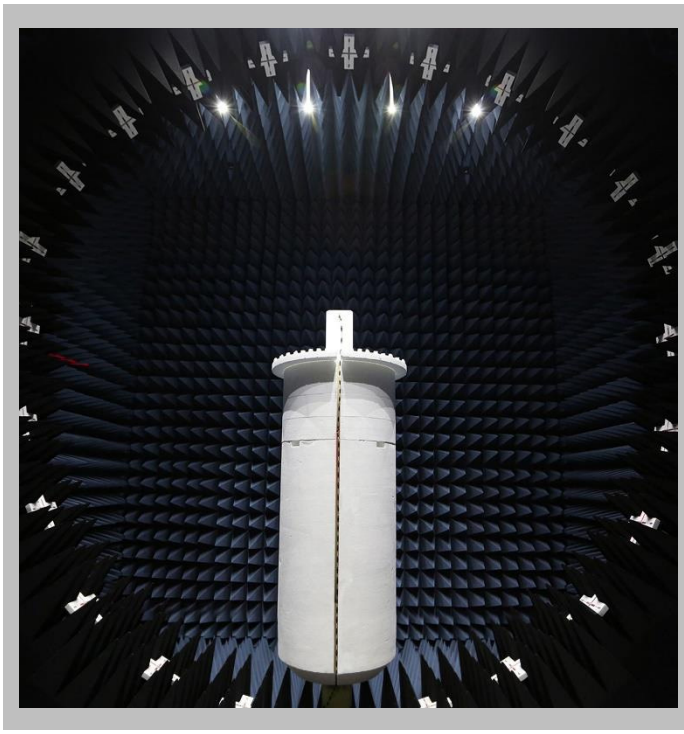
SCOPE

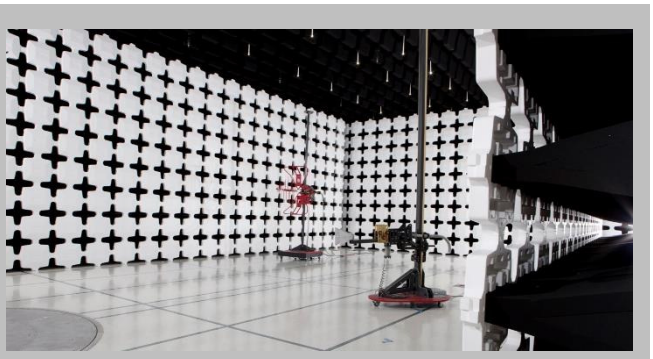
For details on the Scopes of our Accreditations, please visit:
http://portlandcustomer.element.com/ts/scope/scope.htm
http://gsi.nist.gov/global/docs/cabs/designations.html

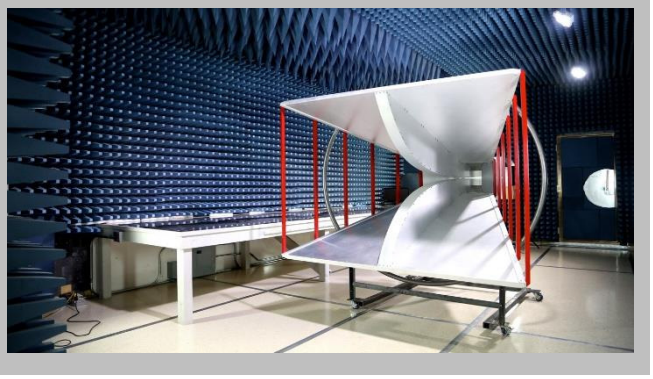
FACILITIES

2017.3.2

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-08, MN10 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 22975 NW Evergreen Pkwy 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	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

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.

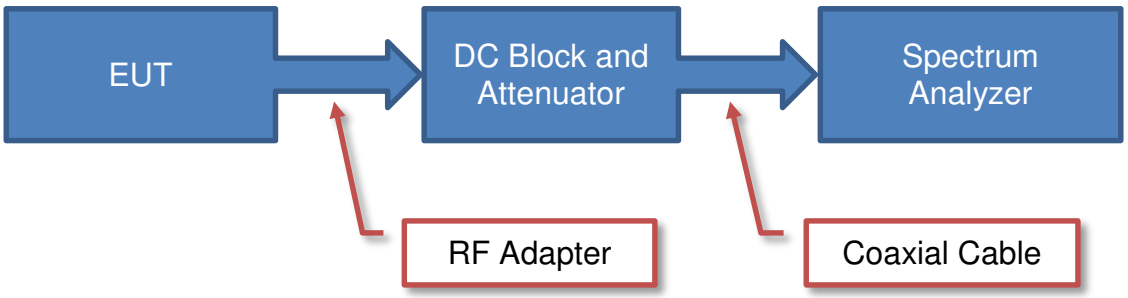
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable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

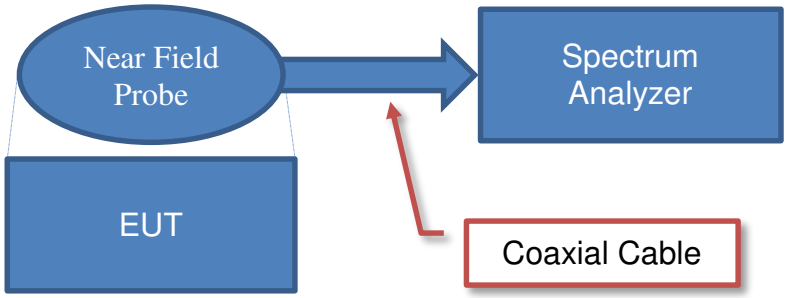
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

Test Setup Block Diagrams

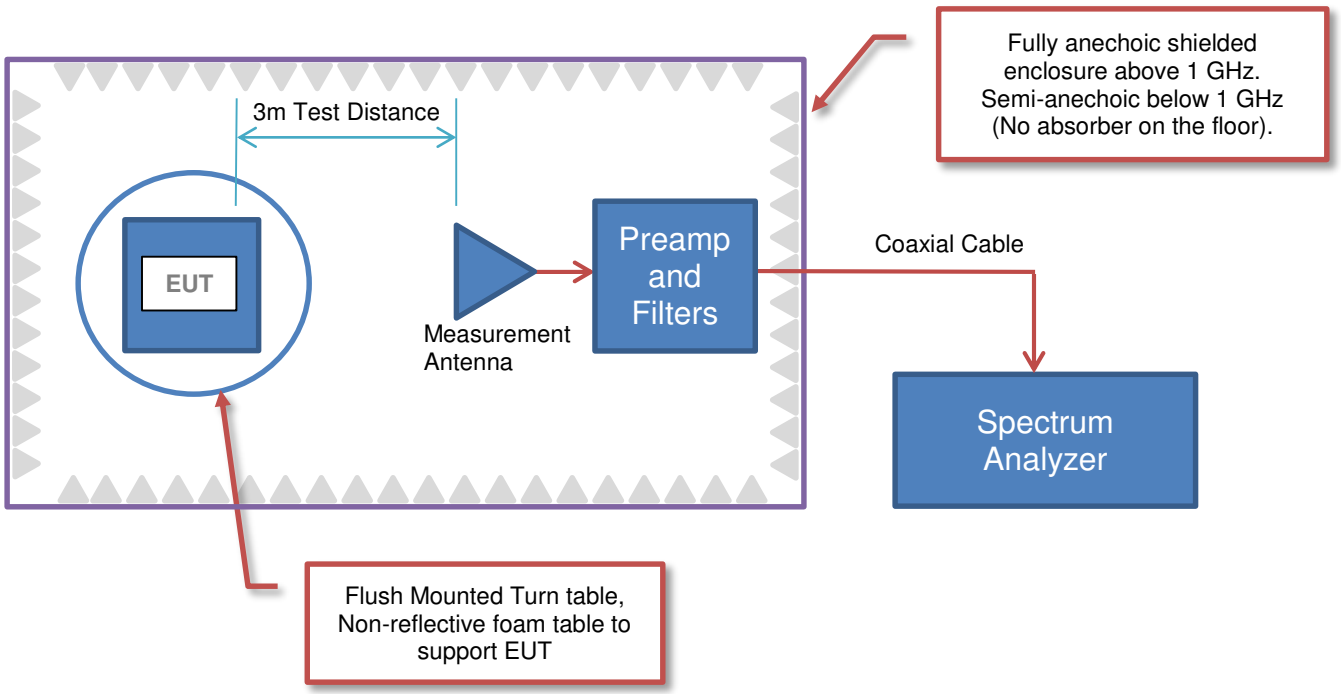
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Starkey Laboratories, Inc.
Address:	6600 Washington Ave. SO.
City, State, Zip:	Eden Prairie, MN 55344
Test Requested By:	Bill Mitchell
Model:	The Dash Pro - Left
First Date of Test:	March 16, 2017
Last Date of Test:	March 17, 2017
Receipt Date of Samples:	March 16, 2017
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
The Left Earbud of a pair containing 10.6 MHz inductive NFMI radios. The Left Earbud required the Right Earbud nearby for a handshake occurring every 100 ms in order to do a continuous transmit at 10.6 MHz.

Testing Objective:
Seeking to demonstrate compliance of the 10.6 MHz inductive radio to FCC 15.209 requirements.

CONFIGURATIONS

Configuration STAK0082- 2

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Wireless Earphones and Charging Dock	Starkey Laboratories, Inc.	The Dash Pro - Left	FCC-1

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
USB Cable	No	.17m	No	Wireless Earphones and Charging Dock	Unterminated

Configuration STAK0082- 8

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Wireless Earphone (Left)	Starkey Laboratories, Inc.	Rambo	FCC-NFMI

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Wireless Earphone (Right)	Starkey Laboratories, Inc.	Rambo	FCC-NFMI

MODIFICATIONS

2017-1-25

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	3/16/2017	Field Strength of Fundamental	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	3/17/2017	Field Strength of Harmonics and Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

FIELD STRENGTH OF FUNDAMENTAL

PSA-ESCI 2017.01.26

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. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Left/Right Ear Bud transmitting at 10.6MHz, CPFSK

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

STAK0082 - 8

FREQUENCY RANGE INVESTIGATED

Start Frequency	490 kHz	Stop Frequency	30 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/6/2017	12 mo
Cable	ESM Cable Corp.	Bilog Cables	MNH	12/1/2016	12 mo
Antenna	ETS Lindgren	6502	AOB	4/28/2015	24 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

The fundamental carrier of the EUT was maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The center of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.4, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

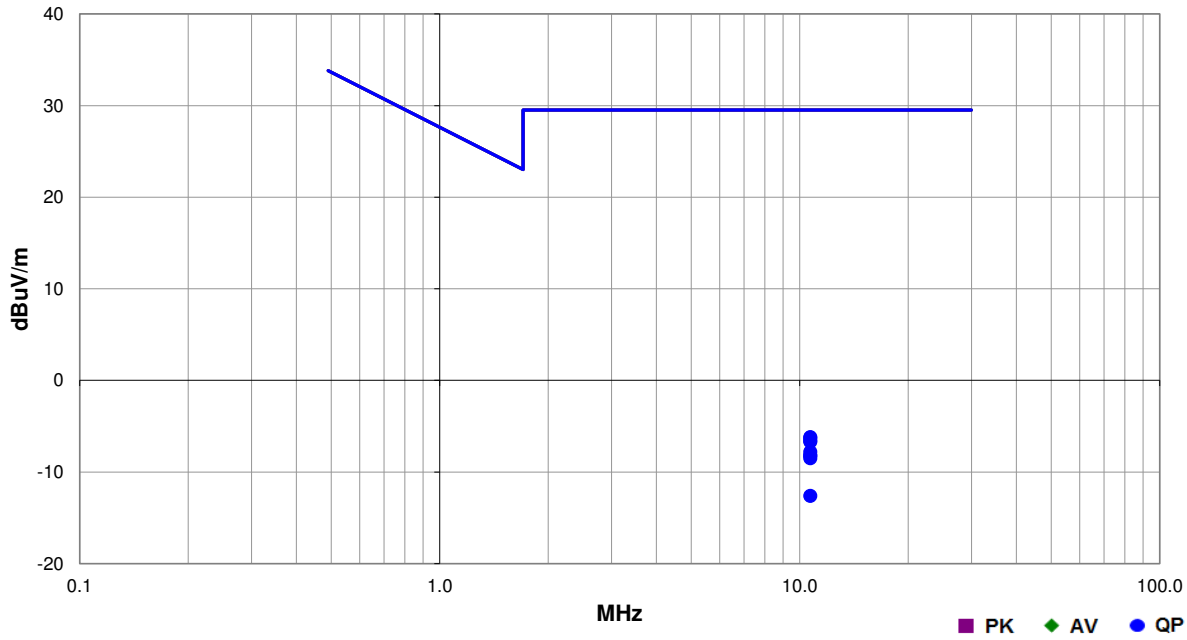
FIELD STRENGTH OF FUNDAMENTAL

EmiR5 2017.01.25 PSA-ESCI 2017.01.26

Work Order:	STAK0082	**Date:**	03/16/17		
Project:	None	**Temperature:**	21.5 °C		
Job Site:	MN05	**Humidity:**	16.6% RH		
Serial Number:	FCC-NFMI	**Barometric Pres.:**	1025 mbar	**Tested by:**	Trevor Buls, Chris Patterson
EUT:	The Dash Pro - Left				
Configuration:	8				
Customer:	Starkey Laboratories, Inc.				
Attendees:	Michael Thompson				
EUT Power:	Battery				
Operating Mode:	Left/Right Ear Bud transmitting at 10.6MHz, CPFSK				
Deviations:	None				
Comments:	Right ear bud in test boundary as support equipment - Left ear bud will only actively transmit in the presence of the right one, which transmits once every 100ms.				

Test Specifications	**Test Method**
FCC 15.209:2017	ANSI C63.10:2013

Run #	73	**Test Distance (m)**	1	**Antenna Height(s)**	1(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
10.700	41.6	11.3	1.0	95.1	1.0	0.0	Perp to Gnd	QP	-59.1	-6.2	29.5	-35.7	EUT on Side
10.699	41.5	11.3	1.0	182.0	1.0	0.0	Perp to Gnd	QP	-59.1	-6.3	29.5	-35.8	EUT Vert
10.700	41.2	11.3	1.0	303.0	1.0	0.0	Para to Gnd	QP	-59.1	-6.6	29.5	-36.1	EUT Horz
10.699	41.1	11.3	1.0	144.0	1.0	0.0	Para to EUT	QP	-59.1	-6.7	29.5	-36.2	EUT Vert
10.699	40.0	11.3	1.0	335.0	1.0	0.0	Para to Gnd	QP	-59.1	-7.8	29.5	-37.3	EUT Vert
10.699	39.6	11.3	1.0	75.1	1.0	0.0	Para to EUT	QP	-59.1	-8.2	29.5	-37.7	EUT Horz
10.698	39.6	11.3	1.0	37.1	1.0	0.0	Para to EUT	QP	-59.1	-8.2	29.5	-37.7	EUT on Side
10.698	39.3	11.3	1.0	257.9	1.0	0.0	Para to Gnd	QP	-59.1	-8.5	29.5	-38.0	EUT on Side
10.700	35.2	11.3	1.0	137.1	1.0	0.0	Perp to Gnd	QP	-59.1	-12.6	29.5	-42.1	EUT Horz

FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2017.01.26

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. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Left/Right Ear Bud transmitting at 10.6MHz, CPFSK

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

STAK0082 - 8

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	1000 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAS	2/22/2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	12/1/2016	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	24 mo
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	12/22/2016	12 mo
Cable	ESM Cable Corp.	Bilog Cables	MNH	12/1/2016	12 mo
Antenna	ETS Lindgren	6502	AOB	4/28/2015	24 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These “pre-scans” are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity. The center of the loop antenna was maintained at 1m above the ground plane during the testing.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

Measurements at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement instrumentation bandwidths. The amplitude delta measured on this screen capture is applied to the fundamental emission value to show the out-of-band emission level as applied to the limit.

As outlined in 15.209(e), 15.31(f)(2), and RSS-GEN, 6.4, measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

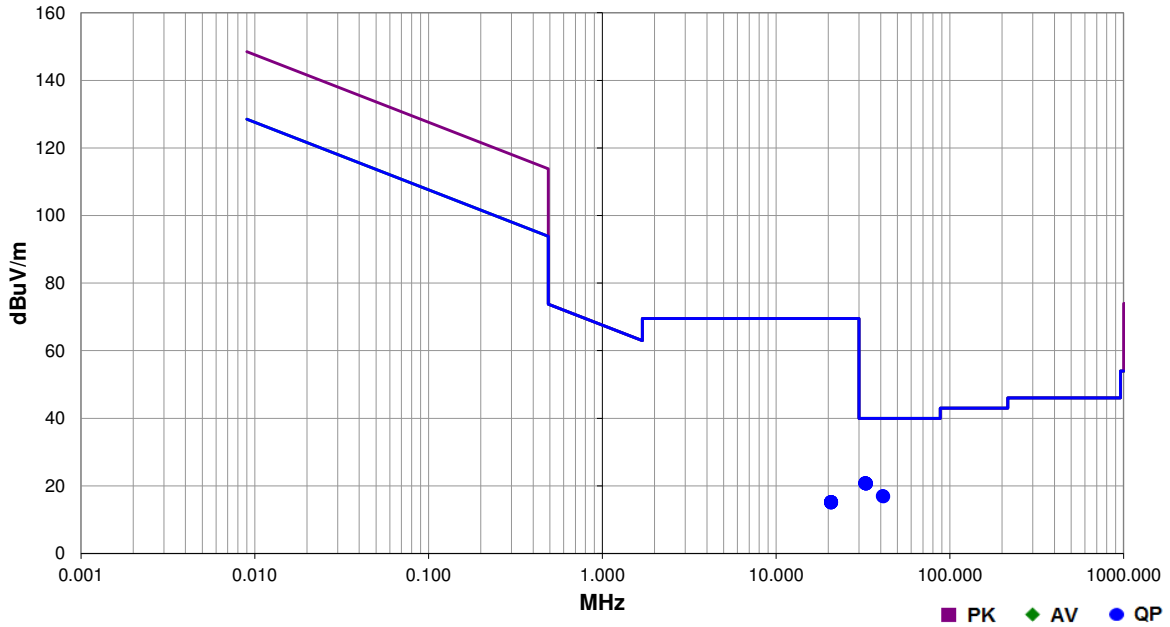
FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS

EmiR5 2017.01.25 PSA-ESCI 2017.01.26

Work Order:	STAK0082	**Date:**	03/17/17		
Project:	None	**Temperature:**	21.6 °C		
Job Site:	MN05	**Humidity:**	23.8% RH		
Serial Number:	FCC-NFMI	**Barometric Pres.:**	1017 mbar	**Tested by:**	Dustin Sparks
EUT:	The Dash Pro - Left				
Configuration:	8				
Customer:	Starkey Laboratories, Inc.				
Attendees:	Michael Thompson				
EUT Power:	Battery				
Operating Mode:	Left/Right Ear Bud transmitting at 10.6MHz, CPFSK				
Deviations:	None				
Comments:	Right ear bud in test boundary as support equipment - Left ear bud will only actively transmit in the presence of the right one, which transmits once every 100ms.				

Test Specifications	**Test Method**
FCC 15.209:2017	ANSI C63.10:2013

Run #	76	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
32.686	16.7	4.1	1.0	173.1	3.0	0.0	Vert	QP	0.0	20.8	40.0	-19.2
32.523	16.6	4.2	1.0	11.1	3.0	0.0	Horz	QP	0.0	20.8	40.0	-19.2
32.769	16.7	4.1	1.0	203.1	3.0	0.0	Vert	QP	0.0	20.8	40.0	-19.2
32.927	16.7	4.0	2.5	329.0	3.0	0.0	Horz	QP	0.0	20.7	40.0	-19.3
32.968	16.7	4.0	2.1	311.9	3.0	0.0	Horz	QP	0.0	20.7	40.0	-19.3
32.892	16.7	4.0	1.0	39.0	3.0	0.0	Vert	QP	0.0	20.7	40.0	-19.3
41.170	16.8	0.2	1.0	205.0	3.0	0.0	Vert	QP	0.0	17.0	40.0	-23.0
41.449	16.9	0.0	1.0	68.0	3.0	0.0	Horz	QP	0.0	16.9	40.0	-23.1
20.695	4.4	10.8	1.0	301.9	3.0	0.0	Par to EUT	QP	0.0	15.2	69.5	-54.3
20.706	4.4	10.8	1.0	252.0	3.0	0.0	Par to GND	QP	0.0	15.2	69.5	-54.3
20.714	4.4	10.8	1.0	253.0	3.0	0.0	Par to GND	QP	0.0	15.2	69.5	-54.3
20.730	4.4	10.8	1.0	0.0	3.0	0.0	Perp to GND	QP	0.0	15.2	69.5	-54.3
20.774	4.4	10.8	1.0	0.0	3.0	0.0	Par to EUT	QP	0.0	15.2	69.5	-54.3
20.700	4.4	10.8	1.0	279.0	3.0	0.0	Par to GND	QP	0.0	15.2	69.5	-54.3
20.747	4.3	10.8	1.0	264.0	3.0	0.0	Perp to GND	QP	0.0	15.1	69.5	-54.4
20.741	4.3	10.8	1.0	351.0	3.0	0.0	Par to EUT	QP	0.0	15.1	69.5	-54.4
20.727	4.3	10.8	1.0	77.1	3.0	0.0	Perp to GND	QP	0.0	15.1	69.5	-54.4