

Test Report # 3584 C (DFS)

Equipment Under Test:	A700x Series Devices (A710x, A720x, A730x)
Requirement(s):	FCC 15.407, RSS-247, DFS
Test Date(s):	May 16 th , 2022
Prepared for:	Honeywell International Inc. Attn: Gretchen Bullen 9680 Old Bailes Road Fort Mill, SC 29707

Report Issued by: Adam Alger, Laboratory Manager	Signature: <i>Adam Alger</i>	Date: 9/15/2022
Report Reviewed by: Adam Alger, Laboratory Manager	Signature: <i>Adam Alger</i>	Date: 7/6/2022
Report Constructed by: Zach Wilson, EMC Engineer	Signature: <i>Zach Wilson</i>	Date: 7/5/2022

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Laird Connectivity Test Services in Review

The Laird Connectivity LLC laboratory located at W66 N220 Commerce Court Cedarburg, Wisconsin, 53012 USA is recognized through the following organizations:



A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025:2017 with Electrical (EMC) Scope

A2LA Certificate Number: 1255.01

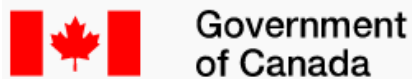
Scope of accreditation includes all test methods listed herein unless otherwise noted



Federal Communications Commission (FCC) – USA

Accredited Test Firm Registration Number: 953492

Recognition of two 3 meter Semi-Anechoic Chambers



Innovation, Science and Economic Development Canada

Accredited U.S. Identification Number: US0218

Recognition of two 3 meter Semi-Anechoic Chambers

Company: Honeywell International Inc.	Page 3 of 14	Name: A700x Series Devices (A710x, A720x, A730x)
Report: TR3584 C		Model: TAP1010-02, TAP1020-02, TAP1030-02
Quote: NBO-01-2022-004630		Serial: Engineering Sample

1 TEST REPORT SUMMARY

On **May 16th, 2022** the Equipment Under Test (EUT), **A700x Series Devices (A710x, 720x, 730x)**, as provided by **Honeywell International Inc.** was tested to the following requirements of **Federal Communications Commission and Innovation, Science and Economic Development Canada**:

FCC	ISED Canada	Test Description	Method	Result
15.407 (h)(2)	RSS-247 Section 6.3	Dynamic Frequency Selection	FCC KDB 905462 D02	Pass ^{Note}
15.407 (h)(2)(ii)	RSS-247 Section 6.3	Channel Availability Check Time	FCC KDB 905462 D02	N/A ^{Note}
15.407 (h)(2)(iii)	RSS-247 Section 6.3	Channel Move Time	FCC KDB 905462 D02	Pass
15.407 (h)(2)(iv)	RSS-247 Section 6.3	Non-Occupancy period	FCC KDB 905462 D02	Pass

Note 1: The EUT is a client only device.

Notice:

The results relate only to the item tested and described in this report. Any modifications made to the equipment under test after the specified test date(s) may invalidate the data herein.

If the resulting measurement margin is seen to be within the uncertainty value, as listed in this report, the possibility exists that this unit may not meet the required limit specification if subsequently tested.

2 CLIENT INFORMATION

Company Name	Honeywell International Inc.
Contact Person	Gretchen Bullen
Address	9680 Old Bailes Road Fort Mill, SC 29707

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	A700x Series Devices (A710x, 720x, 730x)
Model Number	TAP1010-02, TAP1020-02, TAP1030-02
Serial Number	Engineering Sample
FCC ID	HD5-TAP1000-02
IC ID	1693B-TAP100002

2.2 Product Description

The EUT is a handheld communication device consisting of the Laird SU60-SIPT WLAN 2.4/5 GHz and BLE/BT module. The EUT also contains the NXP PN7150BOHN/C110xx NFC radio. The EUT was powered by a 3.7 VDC battery. The WLAN operates in SISO mode only.

The EUT has three different models:

- A710x - Contains the basic wireless functionality
- A720x - Contains an end cap with two external proprietary connectors that add on the ability to connect a wired headset and a peripheral device such as a printer or scanner.
- A730x - Contains an imager end cap that adds scanning functionality.

All models use identical radios and circuit boards in the “base unit” and the different A700x versions add additional (non-radio) capabilities through different, factory configurable “end caps”.

All conducted testing was completed on the A710x model.

2.3 Modifications Incorporated for Compliance

None noted at time of test

2.4 Deviations and Exclusions from Test Specifications

None noted at time of test

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2.5 Channels and Data Rates

IEEE Standard	Data Rate
802.11ac(80)	MCS0, MCS9

Channel	Frequency (MHz)	Channel Bandwidth (MHz)
58	5290	80
106	5530	80

2.6 Radio Programming

The WLAN radios were programmed using the Laird Regulatory Tool v 9.32.0.6. BLE and BT radios were programmed using default HCI commands via the windows command prompt. The NFC radio was programmed using Honeywell's CBOB program V1.0.

2.7 Antennas

The device contains three antennas:

- Custom dual band PCB inverted F type antenna with a peak gain of
 - +4.7 dBi in 2400-2484 MHz
 - +6.4 dBi in 5150-5350 MHz
 - +6.9 dBi in 5470-5725 MHz
 - +7.3 dBi in 5725-5850 MHz
- Custom PCB inverted F type antenna with a peak gain of +0.2 dBi for the BT/BLE radios.
- Flex circuit magnetic loop antenna, P/N 1002403 for the NFC radio.

3 REFERENCES

Publication	Edition	Date	AMD 1	AMD 2
FCC eCFR	-	2022	-	-
RSS 247	2	2017	-	-
RSS GEN	5	2018	2019	2021
ANSI C63.10	-	2013	-	-
FCC KDB 905462 D03 v02	-	2016	-	-

4 UNCERTAINTY SUMMARY

Using the guidance of the following publications the calculated measurement uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of $k = 2$.

References	Version / Date
CISPR 16-4-1	Ed. 2 (2009-02)
CISPR 16-4-2	Ed. 2 (2011-06)
CISPR 32	Ed. 1 (2012-01)
ANSI C63.23	2012
A2LA P103	February 4, 2016
A2LA P103c	August 10, 2015
ETSI TR 100-028	V1.3.1 (2001-03)

Measurement Type	Configuration	Uncertainty \pm
Radiated Emissions	Biconical Antenna	5.0 dB
Radiated Emissions	Log Periodic Antenna	5.3 dB
Radiated Emissions	Horn Antenna	4.7 dB
AC Line Conducted Emissions	Artificial Mains Network	3.4 dB
Telecom Conducted Emissions	Asymmetric Artificial Network	4.9 dB
Disturbance Power Emissions	Absorbing Clamp	4.1 dB
Radiated Immunity	3 Volts/meter	2.2 dB
Conducted Immunity	CDN/EM/BCI	2.4/3.5/3.4 dB
EFT Burst/Surge	Peak pulse voltage	164 volts
ESD Immunity	15 kV level	1377 Volts

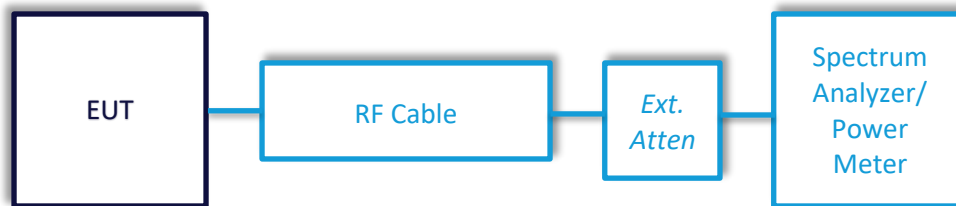
Parameter	ETSI U.C. \pm	U.C. \pm
Radio Frequency, from F0	1×10^{-7}	0.55×10^{-7}
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of Measurement	<p>The direct measurement of emissions at the antenna port of the EUT is achieved by use of a RF connection to a spectrum analyzer or power meter.</p> <p>The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.</p>
Example Calculations	<p>Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm)</p> <p>Margin (dB) = Limit (dBm) – Corrected Reading (dBm)</p>

Block Diagram



Instrumentation

Asset #	Description	Manufacturer	Model #	Serial #	Date	Due Date	Status
CC 000259C	Generator - Function / Arbitrary Waveform	Agilent	33250A	US40000583	4/13/2022	4/13/2024	Active Calibration
CC 000314C	Vector Signal Generator	Agilent	E4438C	US 41469143	7/31/2020	7/31/2022	Active Calibration
EE 960087	Analyzer - Spectrum	Agilent	N9010A	MY53400296	4/12/2022	4/12/2023	Active Calibration
AA 960180	Attenuator - Step Variable 1 dB	RF Lambda	RKT2G6A10	16100801	4/20/2022	4/20/2023	Active Verification
AA 960181	Attenuator - Step Variable 10 dB	RF Lambda	RKT2G6A60	16102401	4/20/2022	4/20/2023	Active Verification
CC 000267C	Oscilloscope	Agilent	54624A	US40020305	4/14/2022	4/14/2023	Active Calibration
AA 960182	RF Splitter/Combiner	Mini-Circuits	ZFSC-2-10G+	F707701704	4/20/2022	4/20/2023	Active Verification
AA 960183	RF Splitter/Combiner	Mini-Circuits	ZFSC-2-10G+	F707701704	4/20/2022	4/20/2023	Active Verification

5.1.1 Antenna Port Conducted Emissions – DFS

Operator	Braden Smith
QA	Zach Wilson
Test Date	5/16/2022
Location	Conducted Radio Bench
Temp. / R.H.	22.6°C/41.6%
Rule	FCC Part 15.407 (h) / RSS-247 6.3
Method	FCC KDB 905462 D02

Requirements

Client without Radar Detection Requirements Prior to Use of a Channel

1. Non-Occupancy Period

minimum 30 minutes

Client without Radar Detection Requirements During Normal Operation

1. Channel Closing Time

200 ms + an aggregate of 60 ms over remaining 10 second period using Radar Type 0 starting at beginning of Channel move time plus any additional control signals not counting quiet periods during the remaining 10 second period.

2. Channel Move Time

10 seconds using Radar Type 0

Radar Type 0

Pulse width = 1 μ sec

PRI = 1428 μ sec

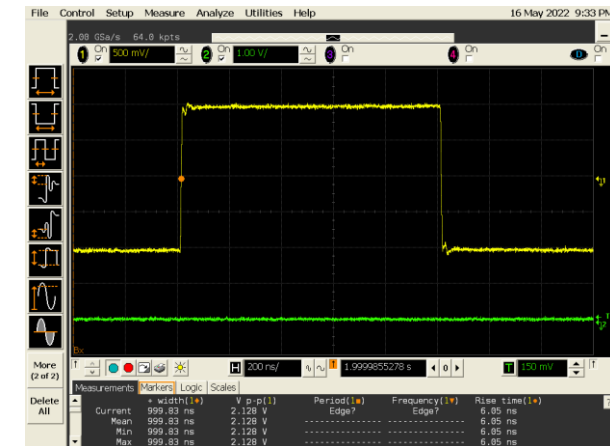
Number of Pulses = 18

Master Info	FCC ID: LDK102061, LDK102062 IC: 2461B-102061, 2461B-102062
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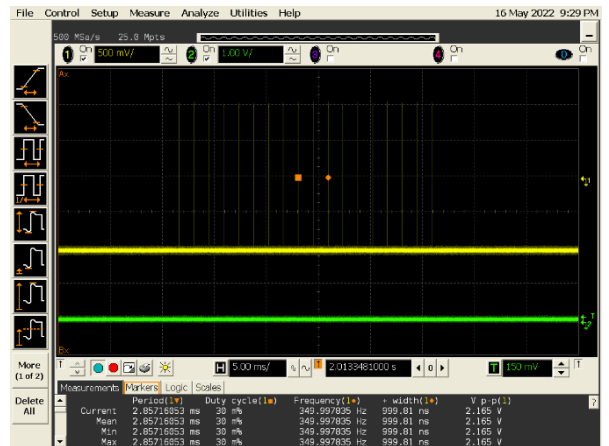
Test Parameters

Frequency	5290, 5530 MHz
Bandwidth	RBW 3 MHz, VBW 3 MHz
Detectors	Peak
EUT Setup	Client with no monitoring; Conducted Setup for Client with injection at the Master
EUT Power	3.7VDC
Notes	EUT Setup to connect to Master and perform data streaming using 'I-Perf'. Channel loading (23.4%) shown to be greater than 17%.

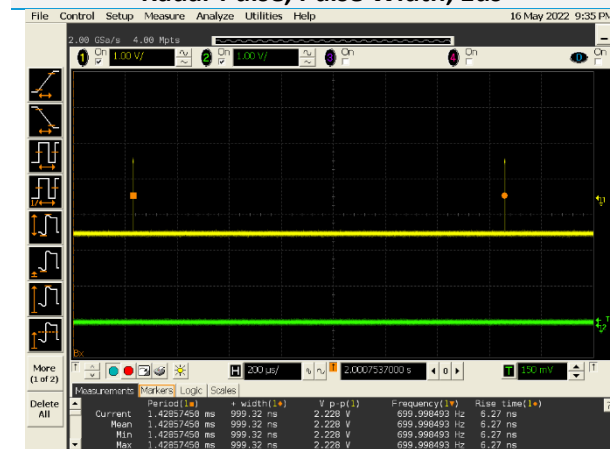
Plots



Radar Pulse, Pulse Width, 1us



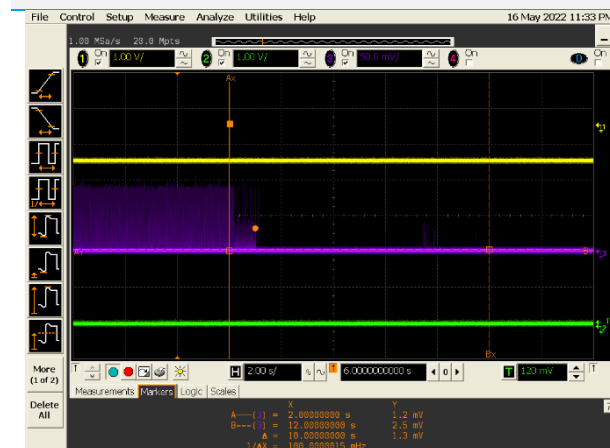
18 Pulses



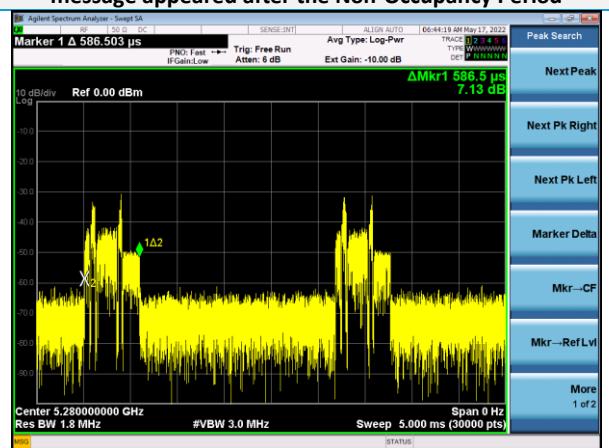
Pulse Repetition Rate, 1.4286ms



30 Minute Non-Occupancy Period – “Waiting for trigger” message appeared after the Non-Occupancy Period

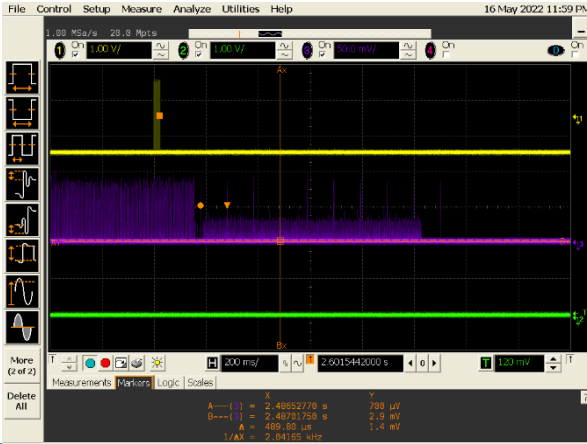


Channel Move Time, Radar Signal Injected @ 10s (orange line)

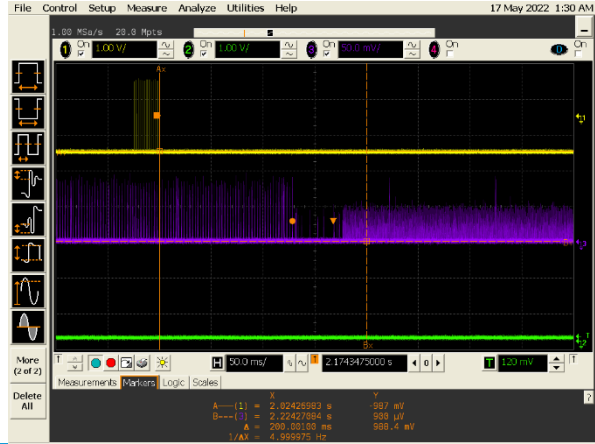


Channel Loading, On Time = 1.17ms, Observation Period = 5.00ms Loading = 23.4%

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**SCS: 9 pulses, each 490us
Total = 4.41ms SCS**



Channel Closing Time, 200ms

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6 REVISION HISTORY

Version	Date	Notes	Person
0	7/5/2022	Initial Draft	Zach Wilson
1	7/6/2022	Final	Zach Wilson
2	8/11/2022	Correction for TCB comments	Adam Alger
3	9/15/2022	Update antenna gain	Adam Alger

END OF REPORT