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ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

Rombit NV Applicant::

Meir 30, 2000 Antwerpen, Belgium

Integrated personal safety and site security device **Product Name:**

Brand Name: Romware

Model No.: Romware One

Model Difference: N/A

Report Number: E2/2020/30004

FCC ID: 2AVTBRW01U1

§15.519, Cat: UWB **FCC Rule Part:**

Issue Date: Sep. 09, 2020

Date of Test: Mar. 25, 2020 ~ May 15, 2020 & Sep. 08, 2020

Date of EUT Received: Mar. 03, 2020

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Approved By: __CHUN-, CHIEH, CHEW Chun Chieh Chen / Supervisor





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Revision History								
Report Number Revision Description Issue Date Remark								
E2/2020/30004	Rev.00	Original.	Sep. 09, 2020	Revised By: Karen Huang				

Note:

1 · Disclaimer

Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

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GENERAL INFORMATION

1.1 Product description

Product Name:	Integrated personal safety and site security device			
Brand Name:	Romware			
Model No.:	Romware One			
Model difference:	N/A			
Hardware Version:	N/A			
Software Version:	N/A			
USB Cable:	Model No.: 2P-2.54PH-2, Supplier: Feng King Co. Ltd.			
Power Supply:	3.7Vdc from Rechargeable Li-polymer Battery or 5Vdc from USB Port			
rowei Suppiy.	Battery: Model No.: A-037-000550SAD, Supplier: Axiss Technology Corp.			

Radio Technology:	Ultra WideBand
Operating Band:	3993.6MHz, 6489.6MHz
Channel number:	2 channels
Modulation type:	π/2 shifted BPSK + DSSS
Transmit Power:	-47.98dBm
Antenna Designation:	Dielectric Chip Antenna, Gain : 4.16dBi

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart F §15.519

ANSI C63.10:2013

KDB 393764 D01 UWB FAQ v02

Note: All test items have been performed and record as per the above standards.

1.3 Test Facility

SGS Taiwan Ltd. Central RF Lab (TAF code 3702)

No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333

FCC Designation number: TW0028

1.4 Special Accessories

There is no special accessory used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50uH/50 ohm of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

2.3.3 Radiated Emissions

The EUT is a placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

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2.4 Measurement Results Explanation Example

2.4.1 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m*9m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

2.4.2 For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission



Fig. 2-2 Conducted (AC Power Line)

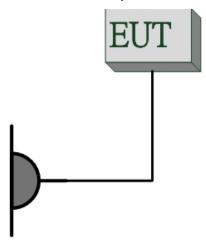


Table 2-1 Equipment Used in Tested System

Iten	n Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1	UWB Test Software	N/A	N/A	N/A	N/A	N/A
2	Adapter	HONG SHAING	MUC-5K	AC-USB012	N/A	N/A

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SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Test Report Section	Result
§15.207(a)	AC Power Line Conducted Emission	6.6	Compliant
§15.519(b)	UWB bandwidth	7.5	Compliant
§15.209 §15.519(c)(d) §15.521(c)(d)(h)	Radiated Emission below 960MHz and above 960MHz. Radiated Emissions in GPS bands. Average Emissions of UWB transmissions in a 1MHz Bandwidth	8.6 8.7 8.8	Compliant
§15.519(e) §15.521(e)(g)	Peak level of the Emission	8.5	Compliant
§15.519(a) (1)	Transmitter Timeout	9.5	Compliant

DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

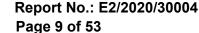
Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Test frequency 3993.6MHz, 6489.6MHz are chosen for full testing.

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) the worst case H position was reported.

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MEASUREMENT UNCERTAINTY

Test Items	Uncertainty		
AC Power Line Conducted Emission	+/- 2.586 dB		
UWB Bandwidth	+/- 51.33 Hz		
Temperature	+/- 0.65 °C		
Humidity	+/- 4.6 %		
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%		

Radiated Spurious Emission Measurement Uncertainty					
	9kHz~30MHz: +-2.3dB				
	30MHz - 180MHz: +/- 3.37dB				
Polarization: Vertical	180MHz -417MHz: +/- 3.19dB				
Polarization. Vertical	0.417GHz-1GHz: +/- 3.19dB				
	1GHz - 18GHz: +/- 4.04dB				
	18GHz - 40GHz: +/- 4.04dB				
	9kHz~30MHz: +-2.3dB				
	30MHz - 167MHz: +/- 4.22dB				
Polarization: Horizontal	167MHz -500MHz: +/- 3.44dB				
Polarization. Horizontal	0.5GHz-1GHz: +/- 3.39dB				
	1GHz - 18GHz: +/- 4.08dB				
	18GHz - 40GHz: +/- 4.08dB				

Note:

- 1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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6 CONDUCTED EMISSION TEST

6.1 Standard Applicable

Frequency within 150 kHz to 30MHz shall not exceed the limit table as below.

Frequency range	Limits dB(uV)			
MHz	Quasi-peak	Average		
0.15 to 0.50	66 to 56	56 to 46		
0.50 to 5	56	46		
5 to 30	60	50		

Note

- 1. The lower limit shall apply at the transition frequencies
- 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz

6.2 Measurement Equipment Used

Conducted Emission Test Site								
EQUIPMENT MFR MODEL SERIAL LAST CAL DI NUMBER NUMBER CAL.								
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	974	03/25/2020	03/24/2021			
EMI Test Receiver	R&S	ESCI	101342	04/28/2020	04/27/2021			

6.3 EUT Setup

- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

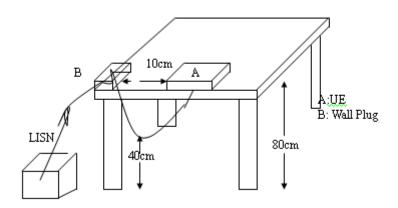
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6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure

- 1. The EUT was placed on a table which is 0.8m above ground plan.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all frequency measured were complete.

6.6 Measurement Result

Note: Refer to next page for measurement data and plots.

Note2: The * reveals the worst-case results that closet to the limit.

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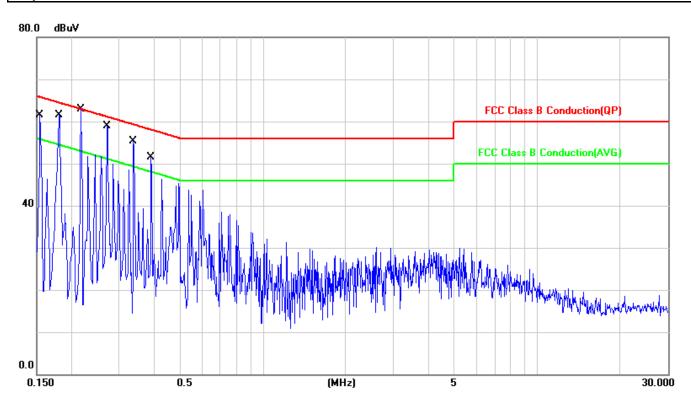
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Description: Operation 2020/05/15 Line: L1 Temp.(°C)/Hum.(%): 25.6(°C)/62%

Test Voltage: AC 120V/60Hz Test By: Kailin

Report Number: E2/2020/30004



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Comment
NO.	IVIK.	(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)	Detector	Comment
1	*	0.1545	50.55	10.22	60.77	65.75	-4.98	QP	
2		0.1545	19.74	10.22	29.96	55.75	-25.79	AVG	
3		0.1815	48.49	10.22	58.71	64.42	-5.71	QP	
4		0.1815	18.18	10.22	28.40	54.42	-26.02	AVG	
5		0.2175	44.78	10.22	55.00	62.91	-7.91	QP	
6		0.2175	14.03	10.22	24.25	52.91	-28.66	AVG	
7		0.2714	40.64	10.22	50.86	61.07	-10.21	QP	
8		0.2714	13.45	10.22	23.67	51.07	-27.40	AVG	
9		0.3390	36.19	10.22	46.41	59.23	-12.82	QP	
10		0.3390	6.48	10.22	16.70	49.23	-32.53	AVG	
11		0.3930	33.21	10.22	43.43	58.00	-14.57	QP	
12		0.3930	6.47	10.22	16.69	48.00	-31.31	AVG	

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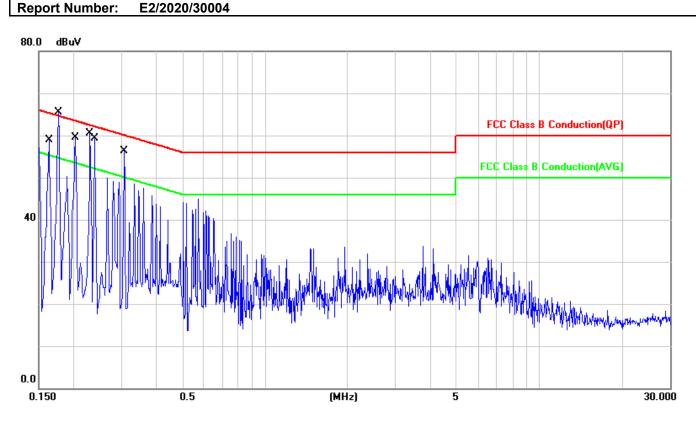


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2020/05/15 **Description:** Operation Date:

Line: Temp.(°C)/Hum.(%): 25.6(°C)/62%

Test Voltage: AC 120V/60Hz Test By: Kailin E2/2020/30004



Na	NAIs	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Commont
No.	Mk.	(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)	Detector	Comment
1		0.1635	48.21	10.21	58.42	65.28	-6.86	QP	
2		0.1635	17.71	10.21	27.92	55.28	-27.36	AVG	
3	*	0.1770	48.20	10.21	58.41	64.63	-6.22	QP	
4		0.1770	18.11	10.21	28.32	54.63	-26.31	AVG	
5		0.2040	45.09	10.21	55.30	63.45	-8.15	QP	
6		0.2040	14.89	10.21	25.10	53.45	-28.35	AVG	
7		0.2310	42.40	10.21	52.61	62.41	-9.80	QP	
8		0.2310	12.68	10.21	22.89	52.41	-29.52	AVG	
9		0.2400	43.08	10.21	53.29	62.10	-8.81	QP	
10		0.2400	12.30	10.21	22.51	52.10	-29.59	AVG	
11		0.3075	38.15	10.22	48.37	60.04	-11.67	QP	
12		0.3075	8.84	10.22	19.06	50.04	-30.98	AVG	

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7 UWB BANDWIDTH

7.1 Standard Applicable

According to §15.519 (b) The UWB bandwidth of a device operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz

According to §15.503 (d) Ultra-wideband (UWB) transmitter. An intentional radiator that, at any point in time, has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.

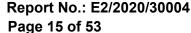
7.2 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	SCHWAZBECK	VULB 9168	9168-617	11/04/2019	11/03/2020
Broadband Antenna	TESEQ	CBL 6112D	35240	09/09/2019	09/08/2020
	*				
Horn Antenna	Schwarzbeck	BBHA9120D	1187	01/10/2020	01/09/2021
Horn Antenna	Schwarzbeck	BBHA9170	185	08/07/2019	08/06/2020
Horn Antenna	Schwarzbeck	BBHA9120D	1341	06/12/2019	06/11/2020
3m Site NSA	SGS	966 chamber D	N/A	07/12/2019	07/11/2020
EMI Test Receiver	R&S	ESU 40	100363	04/15/2019	04/14/2020
Pre-Amplifier	EMC Instru- ments	EMC330	980096	11/20/2019	11/19/2020
Pre-Amplifier	EMC Instru- ments	EMC0011830	980199	11/20/2019	11/19/2020
Pre-Amplifier	EMC Instru- ments	EMC184045B	980135	11/20/2019	11/19/2020
Pre-Amplifier	EMC Instru- ments	EMC9135	980234	11/20/2019	11/19/2020
Pre-Amplifier	EMC Instru- ments	EMC12630SE	980271	11/20/2019	11/19/2020
Highpass Filter	Micro Tronics	BRM50701-01	G008	11/20/2019	11/19/2020
High Pass Filter	Micro-Tronics	G003	RF99	11/20/2019	11/19/2020
Notch Filter	Woken	EWT-54-0037	RF54	11/20/2019	11/19/2020
Notch Filter	Woken	EWT-54-0038	RF55	11/20/2019	11/19/2020
Lowpass Filter	Woken	EWT-56-0019	RF46	11/20/2019	11/19/2020
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	11/20/2019	11/19/2020
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	11/20/2019	11/19/2020
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17413/4	11/20/2019	11/19/2020

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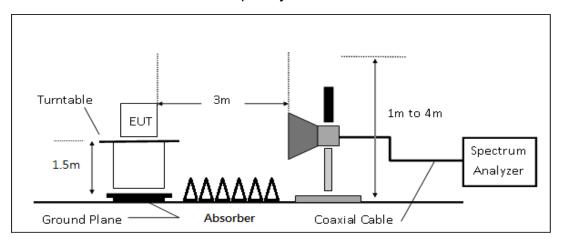
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7.3 Test Set-up:

(A) Radiated Emission Test Set-UP Frequency for 3 meter



7.4 Measurement Procedure:

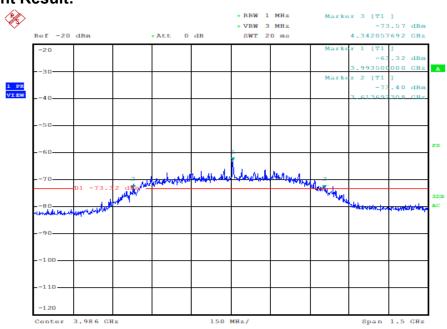
- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum. RBW = 1MHz, VBW = 3MHz, Span: 1GHz, Detector =peak, Sweep = Auto.
- 3. Record the max. Reading as observed from Spectrum.
- 4. Repeat above procedures until all test default channel measured was complete.

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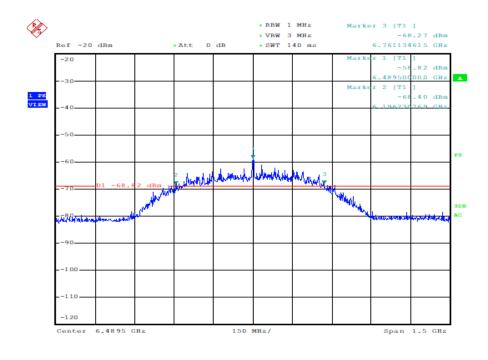
解析子角成男・加報音鏡来贈到阅成之條面買真「阿伊瓜條面贈取贈別人。本報音不經本公司普圖計画、不可能財後製。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at http://www.sgs.com.tw/Terms-and-Conditions and for electronic format documents, subject to Terms and Conditions for Electronic Documents at http://www.sgs.com.tw/Terms-and-Conditions. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document is the solution of the limitation of liability is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. ment cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law



7.5 Measurement Result:



Date: 25.MAR.2020 10:19:04



Date: 25.MAR.2020 10:36:18

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Test Channel	FM (MHz)	FC (MHz)	FL (MHz)	FH (MHz)	-10dB BW (MHz)	Fractional BW	-10dB BW limit (MHz)	Fractional BW Limit
Low	3993.6	3977.87	3613.69	4342.05	728.36	0.18310	>500	>0.2
High	6489.6	6478.68	6196.23	6761.13	564.9	0.08719	>500	>0.2

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RADIATED EMISSION AND PEAK LEVEL OF THE EMISSION

8.1 Standard Applicable

According to §15.519(c), The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in § 15.209. The radiated emissions above

960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960–1610	-75.3 -63.3 -61.3 -41.3 -61.3

§15.519 (d), In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164–1240	- 85.3
1559–1610	- 85.3

§15.519 (e), There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, fM. That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in § 15.521.

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8.2 Measurement Equipment Used

EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
TYPE		NUMBER	NUMBER	CAL.	
Broadband Antenna	SCHWAZBECK	VULB 9168	9168-617	11/04/2019	11/03/2020
Broadband Antenna	TESEQ	CBL 6112D	35240	09/09/2019	09/08/2020
Horn Antenna	Schwarzbeck	BBHA9120D	1187	01/10/2020	01/09/2021
Horn Antenna	Schwarzbeck	BBHA9170	185	08/07/2019	08/06/2020
Horn Antenna	Schwarzbeck	BBHA9120D	1341	06/12/2019	06/11/2020
3m Site NSA	SGS	966 chamber D	N/A	07/12/2019	07/11/2020
EMI Test Receiver	R&S	ESU 40	100363	04/15/2019	04/14/2020
Pre-Amplifier	EMC Instruments	EMC330	980096	11/20/2019	11/19/2020
Pre-Amplifier	EMC Instruments	EMC0011830	980199	11/20/2019	11/19/2020
Pre-Amplifier	EMC Instruments	EMC184045B	980135	11/20/2019	11/19/2020
Pre-Amplifier	EMC Instruments	EMC9135	980234	11/20/2019	11/19/2020
Pre-Amplifier	EMC Instruments	EMC12630SE	980271	11/20/2019	11/19/2020
Highpass Filter	Micro Tronics	BRM50701-01	G008	11/20/2019	11/19/2020
High Pass Filter	Micro-Tronics	G003	RF99	11/20/2019	11/19/2020
Notch Filter	Woken	EWT-54-0037	RF54	11/20/2019	11/19/2020
Notch Filter	Woken	EWT-54-0038	RF55	11/20/2019	11/19/2020
Lowpass Filter	Woken	EWT-56-0019	RF46	11/20/2019	11/19/2020
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	11/20/2019	11/19/2020
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	11/20/2019	11/19/2020
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17413/4	11/20/2019	11/19/2020

For TX (30-960M)

EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
TYPE		NUMBER	NUMBER	CAL.	
Broadband Antenna	SCHWAZBECK	VULB 9168	9168-617	11/04/2019	11/03/2020
Loop Antenna	ETS.LINDGREN	6502	143303	04/28/2020	04/27/2021
3m Site NSA	SGS	966 chamber D	N/A	07/12/2019	07/11/2020
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	07/15/2019	07/14/2020
Pre-Amplifier	EMC Instruments	EMC184045B	980135	11/20/2019	11/19/2020
Attenuator	Woken	WATT-218FS-10	RF25	11/20/2019	11/19/2020
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	11/20/2019	11/19/2020
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17413/4	11/20/2019	11/19/2020

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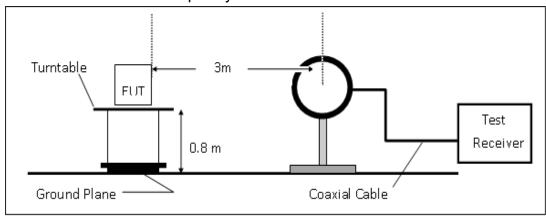


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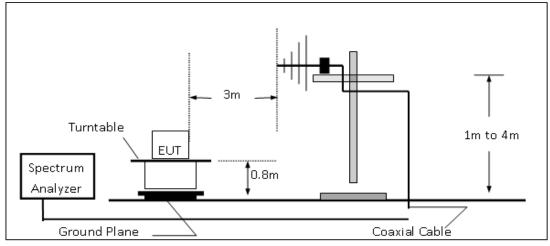


8.3 Test Set-up

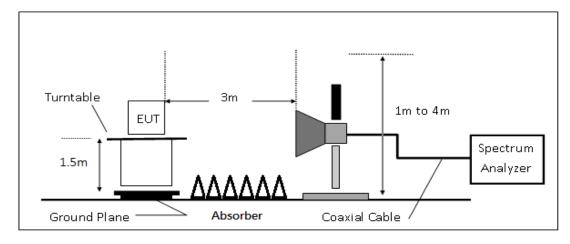
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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8.4 Measurement Procedure

- The testing follows the Measurement Procedure of ANSI C63.10:2013.
- The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plan.
- The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- 5. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz at frequency below 1 GHz.
- Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz at frequency above 1 GHz.
- When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
- 8. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 9. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
- 10. Repeat above procedures until all default test channel measured were complete.

Note:

EIRP(dBm) = SG Level(dBm) + Antenna Gain(dBi) + Cable Loss(dB)

Note:

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

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8.5 Measurement Result

Peak level of the Emission Measurement Result

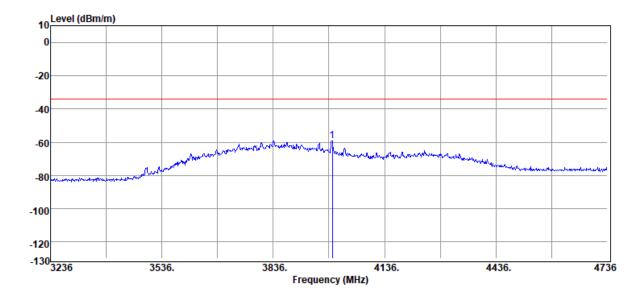
Report Number **Test Date** :2020-03-25 :E2/2020/30004

:21.1/71 **Operation Mode** :UWB CH2 Temp./Humi.

Test Mode :Main Power LOW Antenna Pol. :VERTICAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :3993.6 MHz



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
3995.00	-59.20	-66.42	11.90	-4.68	-33.97	-25.23

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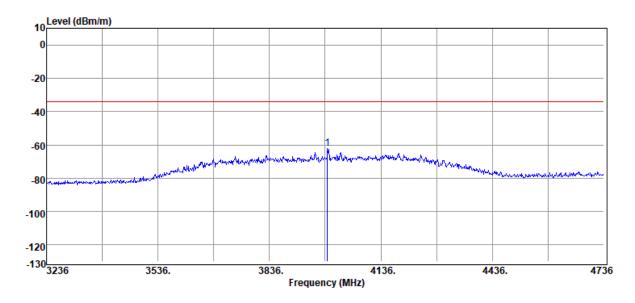
Test Date Report Number :2020-03-25 :E2/2020/30004

Operation Mode :UWB CH2 Temp./Humi. :21.1/71

Test Mode :Main Power LOW Antenna Pol. :HORIZONTAL

:H Plan **EUT Pol** Engineer :Ashton

Test Frequency :3993.6 MHz



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
3992.00	-62.29	-69.52	11.90	-4.67	-33.97	-28.32

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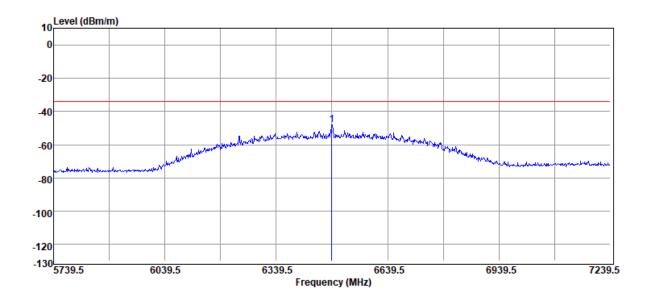
Report Number **Test Date** :E2/2020/30004 :2020-03-25

:UWB CH5 **Operation Mode** Temp./Humi. :21.3/69

Test Mode :Main Power HIGH Antenna Pol. :VERTICAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :6489.6 MHz



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
6489.50	-47.98	-53.02	10.63	-5.59	-33.97	-14.01

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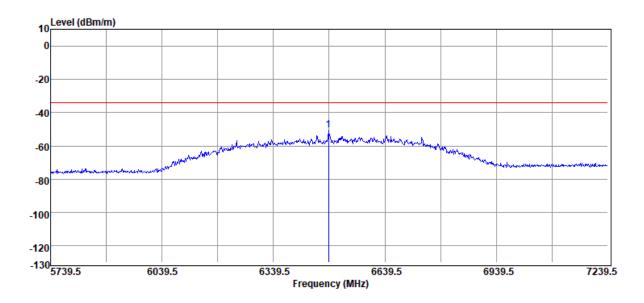
Report Number **Test Date** :2020-03-25 :E2/2020/30004

:UWB CH5 **Operation Mode** Temp./Humi. :21.3/69

Test Mode :Main Power HIGH Antenna Pol. :HORIZONTAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :6489.6 MHz



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
6488.00	-50.45	-55.51	10.64	-5.58	-33.97	-16.48

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Test Channel	Frequency Center (MHz)	Test Frequency (MHz)	EIRP Peak Power Density dBm/MHz	EIRP Peak Power dBm/50MHz	EIRP Peak Power Density dBm/MHz Limit	EIRP Peak Power dBm/50MHz Limit	Antenna Pol
Low	3977.87	3995	-59.20	-25.20	<-34	<0	V
Low	3977.87	3992	-62.29	-28.29	<-34	<0	Н
High	6478.68	6489	-47.98	-13.98	<-34	<0	V
High	6478.68	6488	-50.45	-16.45	<-34	<0	Н

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Radiated Emission in GPS bands Measurement Result GPS receive band (1160-1240MHz)

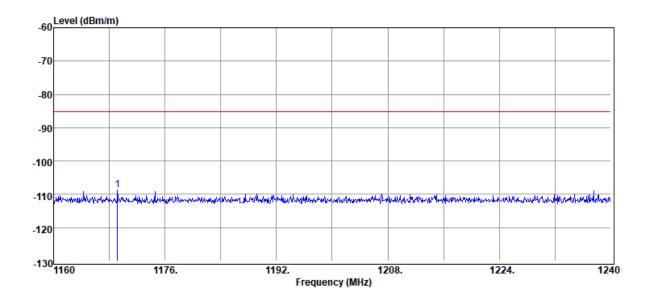
Test Date Report Number :E2/2020/30004 :2020-03-25

:UWB CH2 GPS BAND Temp./Humi. **Operation Mode** :21.3/71

Test Mode :TX CH LOW Antenna Pol. :VERTICAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :3993.6 MHz



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
1169.20	-108.59	-114.16	6.81	-1.24	-85.30	-23.29

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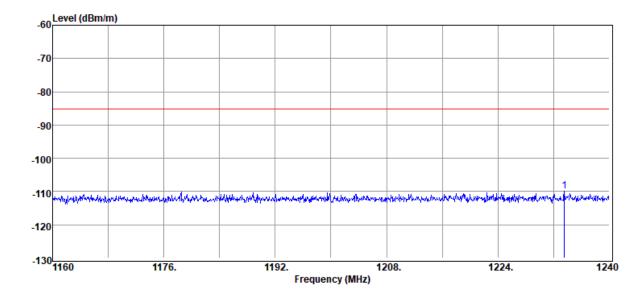
Report Number :E2/2020/30004 Test Date :2020-03-25

Operation Mode :UWB CH2 GPS BAND Temp./Humi. :21.3/71

Test Mode :TX CH LOW Antenna Pol. :HORIZONTAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :3993.6 MHz



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
 MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
1233.52	-109.84	-115.63	7.08	-1.29	-85.30	-24.54

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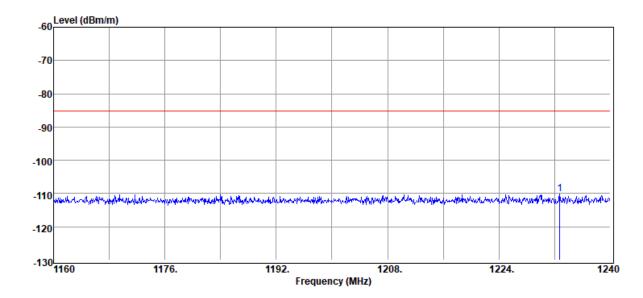
Report Number **Test Date** :E2/2020/30004 :2020-03-25

:UWB CH5 GPS BAND **Operation Mode** Temp./Humi. :21.3/70

Test Mode :TX CH HIGH Antenna Pol. :VERTICAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :6489.6 MHz



	Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
_	MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
	1232.72	-110.24	-116.03	7.08	-1.29	-85.30	-24.94

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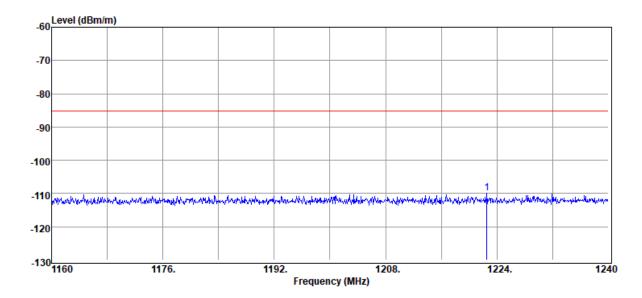
Report Number :E2/2020/30004 Test Date :2020-03-25

Operation Mode :UWB CH5 GPS BAND Temp./Humi. :21.3/70

Test Mode :TX CH HIGH Antenna Pol. :HORIZONTAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :6489.6 MHz



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
 MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
1222.56	-109.89	-115.64	7.03	-1.28	-85.30	-24.59

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GPS receive band (1559-1620MHz)

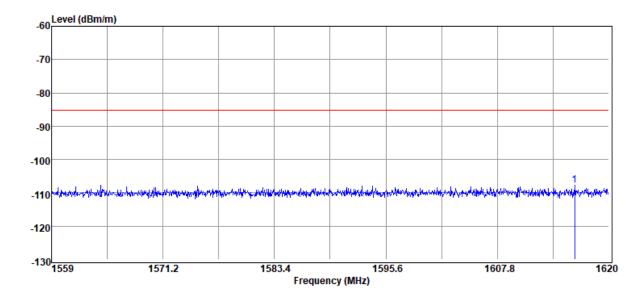
Test Date Report Number :E2/2020/30004 :2020-03-25

Operation Mode :UWB CH2 GPS BAND Temp./Humi. :21.3/71

Test Mode :TX CH LOW Antenna Pol. :VERTICAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :3993.6 MHz



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
1616.28	-107.61	-114.67	8.64	-1.58	-85.30	-22.31

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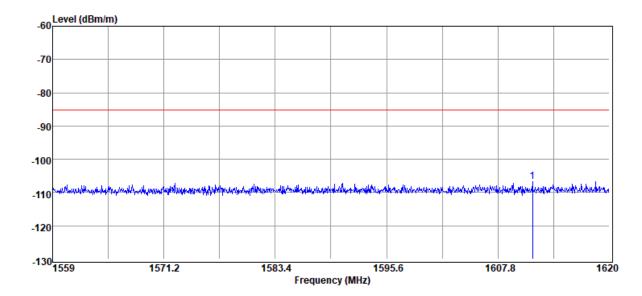
Report Number **Test Date** :E2/2020/30004 :2020-03-25

:UWB CH2 GPS BAND **Operation Mode** Temp./Humi. :21.3/71

Test Mode :TX CH LOW Antenna Pol. :HORIZONTAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :3993.6 MHz



	Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
_	MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
	1611.58	-106.70	-113.74	8.62	-1.58	-85.30	-21.40

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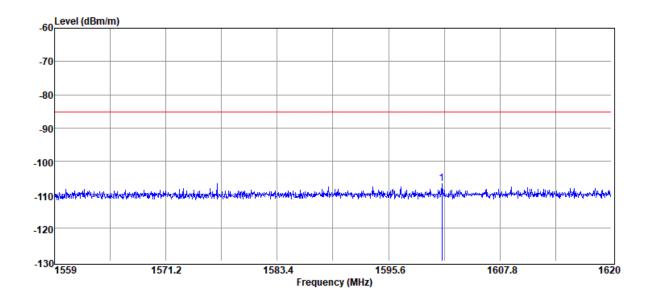
Report Number **Test Date** :E2/2020/30004 :2020-03-25

:UWB CH5 GPS BAND **Operation Mode** Temp./Humi. :21.3/70

Test Mode :TX CH HIGH Antenna Pol. :VERTICAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :6489.6 MHz



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
1601.46	-106.78	-113.80	8.59	-1.57	-85.30	-21.48

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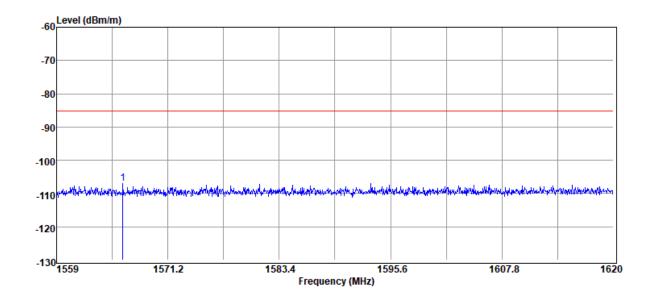
Report Number **Test Date** :E2/2020/30004 :2020-03-25

:UWB CH5 GPS BAND **Operation Mode** Temp./Humi. :21.3/70

Test Mode :TX CH HIGH Antenna Pol. :HORIZONTAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :6489.6 MHz



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
 MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
1566.26	-107.02	-113.92	8.45	-1.55	-85.30	-21.72

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Radiated Spurious Emission Measurement Result (§15.209 & §15.519)

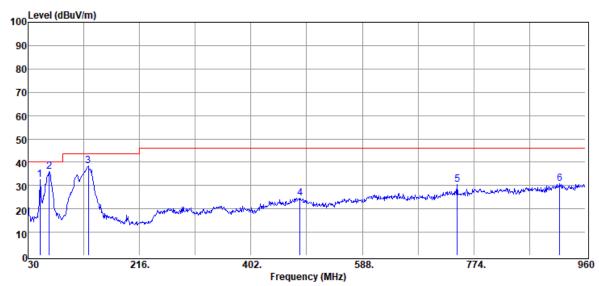
Report Number :E2/2020/30004 **Test Date** :2020-05-15

Operation Mode :UWB CH2 Temp./Humi. :20.3/72

Test Frequency :3993.6 MHz Antenna Pol. :VERTICAL

Test Mode :TX CH LOW Engineer :Kailin

EUT Pol :H Plan



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
49.53	Peak	49.44	-16.83	32.61	40.00	-7.39
65.34	Peak	54.33	-18.35	35.98	40.00	-4.02
130.44	Peak	56.12	-17.85	38.27	43.50	-5.23
483.84	Peak	35.68	-11.18	24.50	46.00	-21.50
746.10	Peak	37.46	-6.86	30.60	46.00	-15.40
917.22	Peak	35.55	-4.89	30.66	46.00	-15.34

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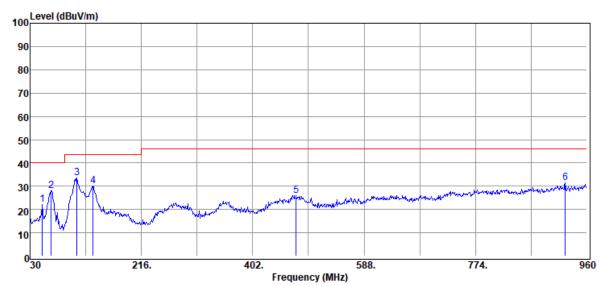
Report Number **Test Date** :E2/2020/30004 :2020-05-15

Operation Mode :UWB CH2 Temp./Humi. :20.3/72

Test Frequency :3993.6 MHz Antenna Pol. :HORIZONTAL

Test Mode :TX CH LOW Engineer :Kailin

EUT Pol :H Plan



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
50.46	Peak	39.09	-16.87	22.22	40.00	-17.78
65.34	Peak	46.38	-18.35	28.03	40.00	-11.97
108.12	Peak	53.48	-19.86	33.62	43.50	-9.88
135.09	Peak	47.43	-17.30	30.13	43.50	-13.37
474.54	Peak	37.31	-11.27	26.04	46.00	-19.96
923.73	Peak	36.36	-4.78	31.58	46.00	-14.42

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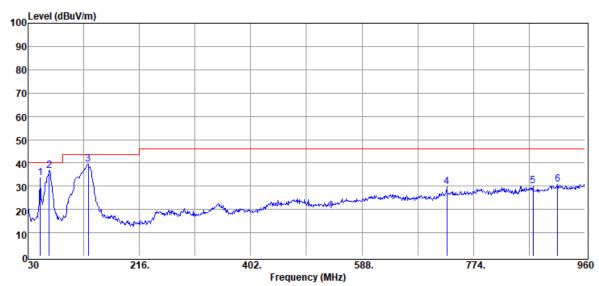
Report Number **Test Date** :E2/2020/30004 :2020-05-15

Operation Mode :UWB CH5 Temp./Humi. :20.3/72

:VERTICAL Test Frequency :6489.6 MHz Antenna Pol.

Test Mode :TX CH HIGH Engineer :Kailin

EUT Pol :H Plan



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
50.46	Peak	50.44	-16.87	33.57	40.00	-6.43
65.34	Peak	55.13	-18.35	36.78	40.00	-3.22
130.44	Peak	57.28	-17.85	39.43	43.50	-4.07
729.36	Peak	36.86	-7.15	29.71	46.00	-16.29
873.51	Peak	35.88	-5.78	30.10	46.00	-15.90
914.43	Peak	35.70	-5.02	30.68	46.00	-15.32

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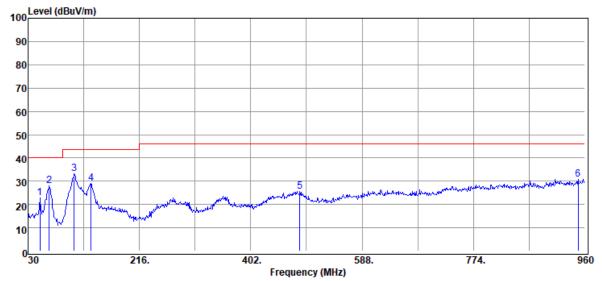
Report Number **Test Date** :E2/2020/30004 :2020-05-15

Operation Mode :UWB CH5 Temp./Humi. :20.3/72

Test Frequency :6489.6 MHz Antenna Pol. :HORIZONTAL

Test Mode :TX CH HIGH Engineer :Kailin

EUT Pol :H Plan



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dΒμV/m	dB
49.53	Peak	39.57	-16.83	22.74	40.00	-17.26
65.34	Peak	46.31	-18.35	27.96	40.00	-12.04
107.19	Peak	53.11	-19.97	33.14	43.50	-10.36
135.09	Peak	46.25	-17.30	28.95	43.50	-14.55
483.84	Peak	36.90	-11.18	25.72	46.00	-20.28
948.84	Peak	35.26	-4.57	30.69	46.00	-15.31

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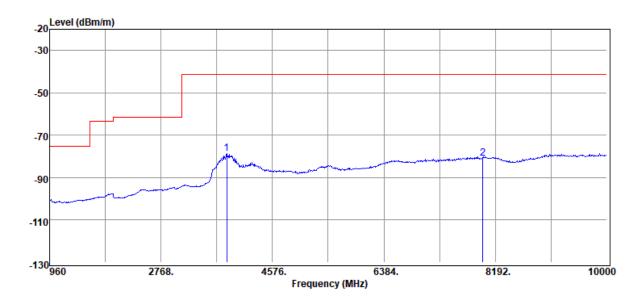
Report Number **Test Date** :E2/2020/30004 :2020-03-25

:UWB CH2 **Operation Mode** Temp./Humi. :21.1/71

Test Mode :TX CH LOW Antenna Pol. :VERTICAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :3993.6 MHz



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
3834.72	-78.75	-86.60	11.87	-4.02	-41.30	-37.45
7987.20	-80.76	-85.35	10.20	-5.61	-41.30	-39.46

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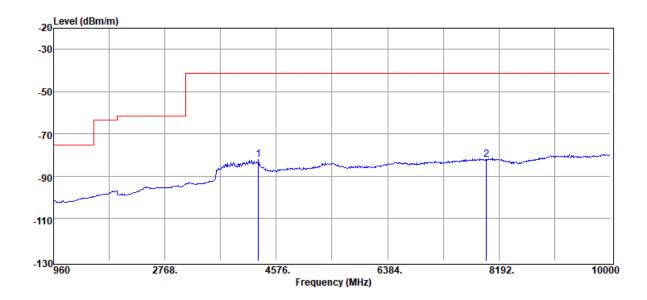
Report Number **Test Date** :E2/2020/30004 :2020-03-25

:UWB CH2 **Operation Mode** Temp./Humi. :21.1/71

Test Mode :TX CH LOW Antenna Pol. :HORIZONTAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :3993.6 MHz



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
4286.72	-81.89	-89.04	11.84	-4.69	-41.30	-40.59
7987.20	-81.93	-86.52	10.20	-5.61	-41.30	-40.63

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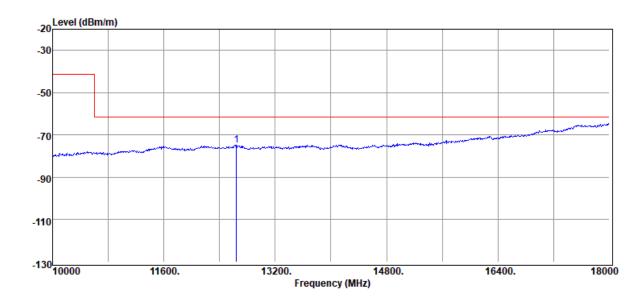
Report Number **Test Date** :E2/2020/30004 :2020-03-25

:UWB CH2 **Operation Mode** Temp./Humi. :21.1/71

Test Mode :TX CH LOW Antenna Pol. :VERTICAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :3993.6 MHz



Fre	eq. EIRP	P/ERP SG Output I	Antenna ₋evel Gain	a Cable Loss	Limit	Margin
MI	Hz c	dBm dBn	n dBi/dBd	l dB	dBm	dB
1264	0.00 -7	74.70 -80.79	9 12.33	-6.24	-61.30	-13.40

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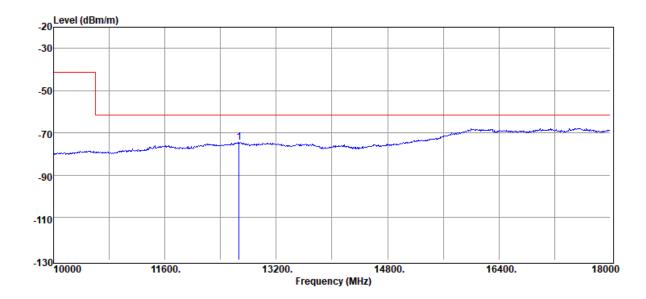
Report Number **Test Date** :E2/2020/30004 :2020-03-25

:UWB CH2 **Operation Mode** Temp./Humi. :21.1/71

Test Mode :TX CH LOW Antenna Pol. :HORIZONTAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :3993.6 MHz



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
12664.00	-74.33	-80.41	12.33	-6.25	-61.30	-13.03

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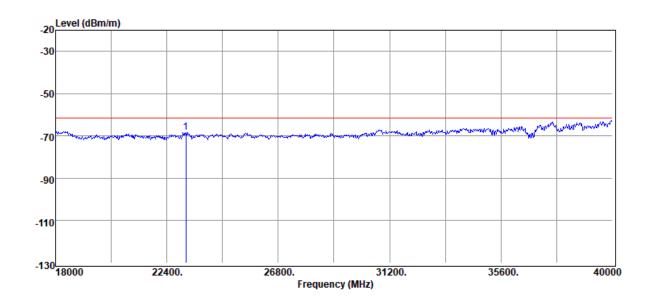
Report Number **Test Date** :2020-03-25 :E2/2020/30004

:UWB CH2 **Operation Mode** Temp./Humi. :21.1/71

Test Mode :TX CH LOW Antenna Pol. :VERTICAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :3993.6 MHz



Fred	. EIRP/ERP	SG Output Le	Antenna evel Gain	Cable Loss	Limit	Margin
MH:	dBm	dBm	dBi/dBd	dB	dBm	dB
23148	00 -68.15	-78.48	19.06	-8.73	-61.30	-6.85

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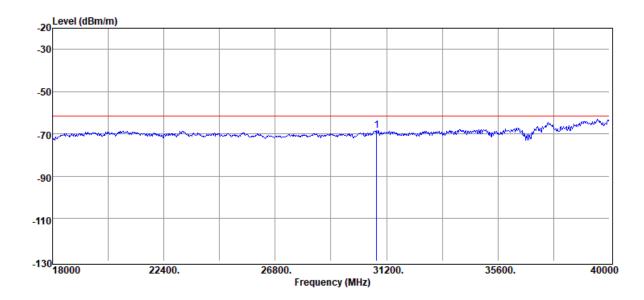
Report Number **Test Date** :2020-03-25 :E2/2020/30004

:UWB CH2 **Operation Mode** Temp./Humi. :21.1/71

Test Mode :TX CH LOW Antenna Pol. :HORIZONTAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :3993.6 MHz



	Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
_	MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
	30804.00	-68.29	-78.37	19.72	-9.64	-61.30	-6.99

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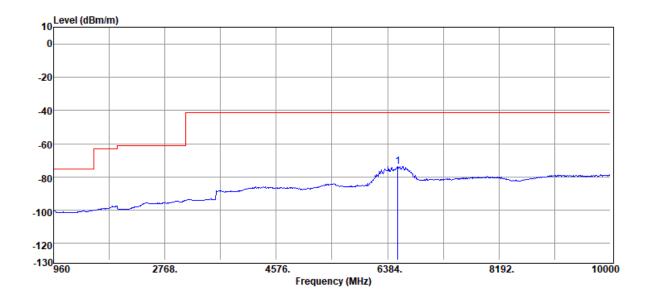
Report Number **Test Date** :E2/2020/30004 :2020-03-25

:UWB CH5 **Operation Mode** Temp./Humi. :21.2/70

Test Mode :TX CH HIGH Antenna Pol. :VERTICAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :6489.6 MHz



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
6546.72	-73.58	-78.52	10.53	-5.59	-41.30	-32.28

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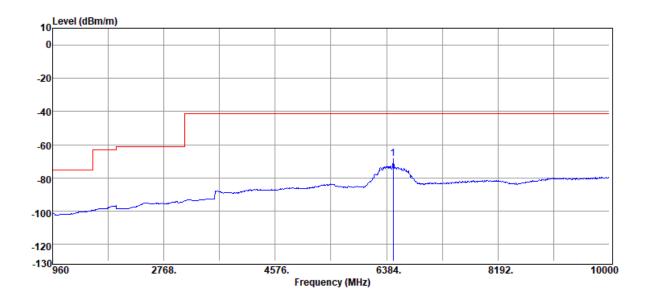
Report Number **Test Date** :E2/2020/30004 :2020-03-25

:UWB CH5 **Operation Mode** Temp./Humi. :21.2/70

Test Mode :TX CH HIGH Antenna Pol. :HORIZONTAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :6489.6 MHz



Fr	eq. EIRP/EI	RP SG Output Le	Antenna vel Gain	Cable Loss	Limit	Margin
M	Hz dBr	n dBm	dBi/dBd	dB	dBm	dB
649	2.48 -68.3	34 -73.37	10.62	-5.59	-41.30	-27.04

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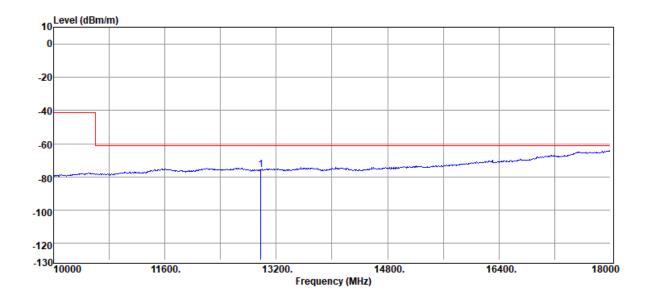
Report Number **Test Date** :2020-03-25 :E2/2020/30004

:UWB CH5 **Operation Mode** Temp./Humi. :21.2/70

Test Mode :TX CH HIGH Antenna Pol. :VERTICAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :6489.6 MHz



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
12979.20	-75.96	-81.90	12.40	-6.46	-61.30	-14.66

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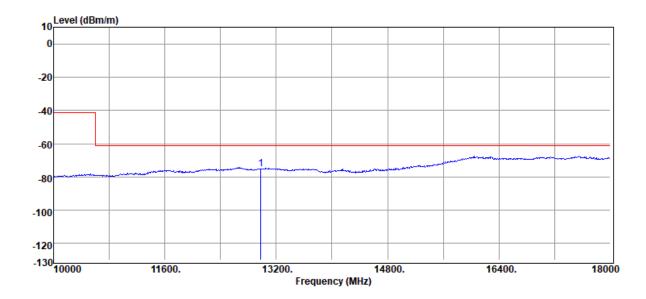
Report Number **Test Date** :2020-03-25 :E2/2020/30004

:UWB CH5 **Operation Mode** Temp./Humi. :21.2/70

Test Mode :TX CH HIGH Antenna Pol. :HORIZONTAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :6489.6 MHz



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin
 MHz	dBm	dBm	dBi/dBd	dB	dBm	dB
12979.20	-75.39	-81.33	12.40	-6.46	-61.30	-14.09

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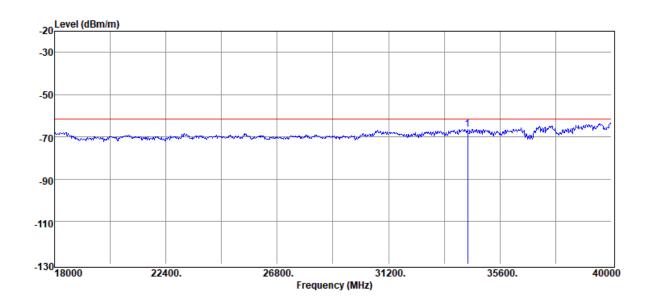
Report Number **Test Date** :2020-03-25 :E2/2020/30004

:UWB CH5 **Operation Mode** Temp./Humi. :21.1/69

Test Mode :TX CH HIGH Antenna Pol. :VERTICAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :6489.6 MHz



	Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin	
_	MHz	dBm	dBm	dBi/dBd	dB	dBm	dB	
	34324.00	-66.40	-75.26	19.11	-10.25	-61.30	-5.10	

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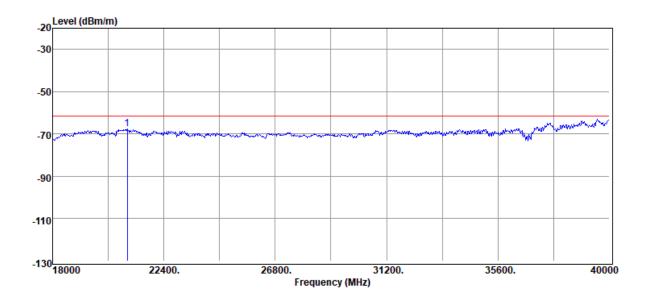
Report Number **Test Date** :2020-03-25 :E2/2020/30004

:UWB CH5 **Operation Mode** Temp./Humi. :21.1/69

Test Mode :TX CH HIGH Antenna Pol. :HORIZONTAL

EUT Pol :H Plan Engineer :Ashton

Test Frequency :6489.6 MHz



Freq.	EIRP/ERP	SG Output Level	Antenna Gain	Cable Loss	Limit	Margin	
MHz	dBm	dBm	dBi/dBd	dB	dBm	dB	
20948.00	-67.40	-76.65	18.69	-9.44	-61.30	-6.10	

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TRANSMITTER TIMEOUT

9.1 Standard Applicable

According to §15.519(a) (1), A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

9.2 Measurement Equipment Used

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120200	03/17/2020	03/16/2021
DC Power Supply	Agilent	E3640A	MY53170008	09/03/2020	09/02/2021
Temperature Chamber	TERCHY	MHK-120LK	1020582	07/08/2020	07/07/2021

9.3 Test SET-UP

Refer to section 7.3 for details.

9.4 Measurement Procedure

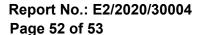
The Transmitter Timeout was measured with a spectrum analyzer connected to the antenna port

9.5 Measurement Result

Note: Refer to next page spectrum analyzer data chart.

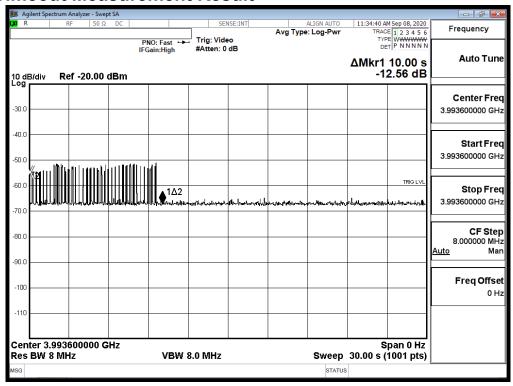
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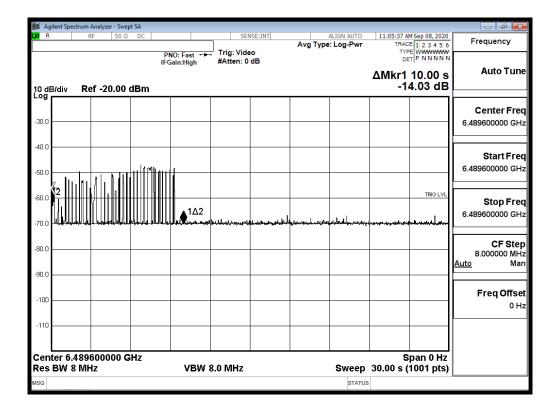
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Transmitter Timeout Measurement Result





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10 ANTENNA REQUIREMENT

10.1 Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

10.2 Antenna Connected Construction

The antenna utilized by the device under test is a soldered surface mount type.

~ End of Report ~

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