

RADIO TEST REPORT

FCC ID: 2AAU7-AHP

Product : Alloy Hub+

Trade Mark : Alloy SmartHome

Model Name : ah+.zw8us.4G

Family Model : N/A

Report No. : S23041904205005

Prepared for

Tri plus grupa d.o.o.

Banjavciceva 11, 10000 Zagreb, Croatia

Prepared by

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TEST RESULT CERTIFICATION**Applicant's name**: Tri plus grupa d.o.o.

Address: Banjavciceva 11, 10000 Zagreb, Croatia

Manufacturer's Name.....: Tri plus grupa d.o.o.

Address: Banjavciceva 11, 10000 Zagreb, Croatia

Product description

Product name: Alloy Hub+

Trademark: Alloy SmartHome

Model and/or type reference ..: ah+.zw8us.4G

Family Model: N/A

Standards: FCC Part15.249

Test procedure ANSI C63.10-2013

This device described above has been tested by NTEK, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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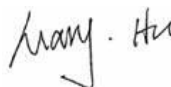
Test Sample Number.....: S230419042002**Date of Test**

Date (s) of performance of tests: Apr 19, 2023 ~ Jun 14, 2023

Date of Issue: Jun 14, 2023

Test Result.....: **Pass**

Testing Engineer :



(Mary Hu)

Authorized Signatory :



(Alex Li)

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1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15, Subpart C (15.249)			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	Pass	
15.203	Antenna Requirement	Pass	
15.249 15.209	Radiated Spurious Emission	Pass	
15.249(2)	Frequency Tolerance	N/A	
15.249(a)	Fundamental Measurement	Pass	
15.205	Band Edge Emission	Pass	
15.215	Occupied Bandwidth	Pass	

1.1 TEST FACILITY

Shenzhen NTEK Testing Technology Co., Ltd

Add. : 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen 518126 P.R. China.

FCC FRN Registration No.:463705; IC Registration No.:9270A-1

CNAS Registration No.:L5516

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
2	RF power,conducted	$\pm 0.16\text{dB}$
3	Spurious emissions,conducted	$\pm 0.21\text{dB}$
4	All emissions,radiated(<1G)	$\pm 4.68\text{dB}$
5	All emissions,radiated(>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^{\circ}\text{C}$
7	Humidity	$\pm 2\%$

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Alloy Hub+		
Trade Mark	Alloy SmartHome		
Model Name	ah+.zw8us.4G		
Family Model	ah+.zw8us.4G/BG95, ah+.zw8us.4G/SIMC, zts+.zw8us.4G		
Model Difference	All models are the same circuit and RF module, except model names.		
Product Description	The EUT is a Alloy Hub+		
	Operation Frequency:	908.4-916MHz	
	Modulation Type:	GFSK	
	Antenna Designation:	stamped metal antenna	
	Antenna Gain(Peak)	-0.9 dBi	
	Based on the application, features, or specification exhibited in User's Manual. More details of EUT technical specification, please refer to the User's Manual.		
Channel List	Please refer to the Note 2.		
Adapter	N/A		
Battery	N/A		
Power Rating	Input: AC 24V		
Hardware Version	V0.7.2		
Firmware version	V1.16.0		
Software version	V1.16.0		

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.

Channel	Frequency(MHz)
01	908.4
02	908.42
03	912
04	916

3.

Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	N/A	N/A	stamped metal antenna	N/A	-0.9	Antenna

4. The EUT contains a LTE Module that has applied FCC certification,
FCC ID: XMR201807EG91NA

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	CH01/02/03/04
Mode 2	Normal link

For Radiated Spurious Emission

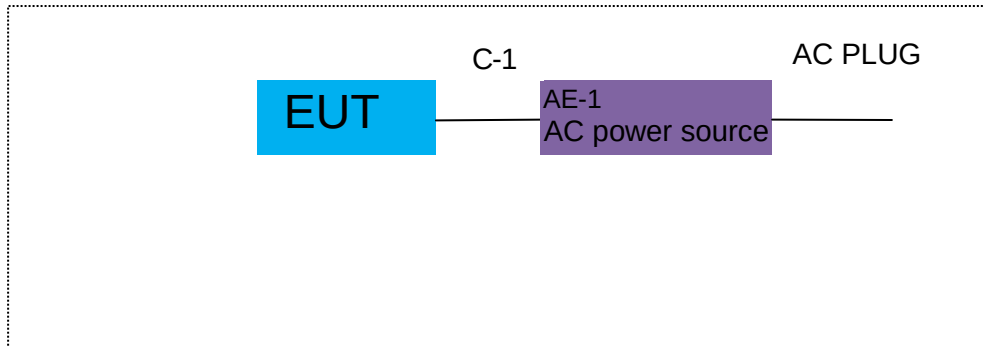
Pretest Mode	Description
Mode 1	CH01/02/03/04

For Conducted Emission

Final Test Mode	Description
Mode 1	CH01/02/03/04
Mode 2	Normal link

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Conducted Emission Mode



Radiated Spurious Emission Test



2.4 DESCRIPTION OF SUPPORT UNITS (CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Model/Type No.	Series No.	Note
AE-1	AC power source	N/A	N/A	

Item	Cable Type	Shielded Type	Ferrite Core	Length	Note
C-1	Power Cable	YES	NO	1.0m	

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2023.03.27	2024.03.26	1 year
2	Spectrum Analyzer	Agilent	N9020A	MY49100060	2022.06.16	2023.06.15	1 year
3	Spectrum Analyzer	R&S	FSV40	101417	2022.06.16	2023.06.15	1 year
4	Test Receiver	R&S	ESPI7	101318	2023.03.27	2024.04.26	1 year
5	Bilog Antenna	TESEQ	CBL6111D	31216	2023.03.16	2024.03.16	1 year
6	50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2020.05.11 2023.05.06	2023.05.10 2026.05.05	3 year
7	Horn Antenna	EM	EM-AH-10180	2011071402	2023.01.12	2024.01.11	1 year
8	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	803	2022.11.07	2023.11.06	1 year
9	Amplifier	EMC	EMC051835SE	980246	2022.06.17	2023.06.16	1 year
10	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	055	2022.11.04	2023.11.03	1 year
11	Power Meter	DARE	RPR3006W	15I00041SN084	2022.06.16	2023.06.15	1 year
12	Test Cable (9KHz-30MHz)	N/A	R-01	N/A	2022.06.17	2025.06.16	3 year
13	Test Cable (30MHz-1GHz)	N/A	R-02	N/A	2022.06.17	2025.06.16	3 year
14	High Test Cable(1G-40G Hz)	N/A	R-03	N/A	2022.06.17	2025.06.16	3 year
15	High Test Cable(1G-40G Hz)	N/A	R-04	N/A	2023.03.26	2026.03.25	3 year
16	Filter	TRILTHIC	2400MHz	29	2023.03.26	2026.03.25	3 year
17	temporary antenna connector (Note)	NTS	R001	N/A	N/A	N/A	N/A

Note:

We will use the temporary antenna connector (soldered on the PCB board) When conducted test
And this temporary antenna connector is listed within the instrument list

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	101160	2023.03.27	2024.03.26	1 year
2	LISN	R&S	ENV216	101313	2023.03.27	2024.03.26	1 year
3	LISN	SCHWARZBECK	NNLK 8129	8129245	2023.03.27	2024.03.26	1 year
4	50Ω Coaxial Switch	ANRITSU CORP	MP59B	6200983704	2020.05.11 2023.05.06	2023.05.10 2026.05.05	3 year
5	Test Cable (9KHz-30MHz)	N/A	C01	N/A	2020.05.11 2023.05.06	2023.05.10 2026.05.05	3 year
6	Test Cable (9KHz-30MHz)	N/A	C02	N/A	2020.05.11 2023.05.06	2023.05.10 2026.05.05	3 year
7	Test Cable (9KHz-30MHz)	N/A	C03	N/A	2020.05.11 2023.05.06	2023.05.10 2026.05.05	3 year

Note: Each piece of equipment is scheduled for calibration once a year except the Test Cable which is scheduled for calibration every 3 years.

3. ANTENNA REQUIREMENT

3.1 STANDARD REQUIREMENT

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

3.2 EUT ANTENNA

The EUT antenna is stamped metal Antenna (Gain: 0.5dBi). It comply with the standard requirement.

3.3 CONDUCTED EMISSION MEASUREMENT

3.3.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5			66 - 56 *	56 - 46 *	CISPR
0.50 -5.0			56.00	46.00	CISPR
5.0 -30.0			60.00	50.00	CISPR

0.15 -0.5			66 - 56 *	56 - 46 *	LP002.
0.50 -5.0			56.00	46.00	LP002.
5.0 -30.0			60.00	50.00	LP002.

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

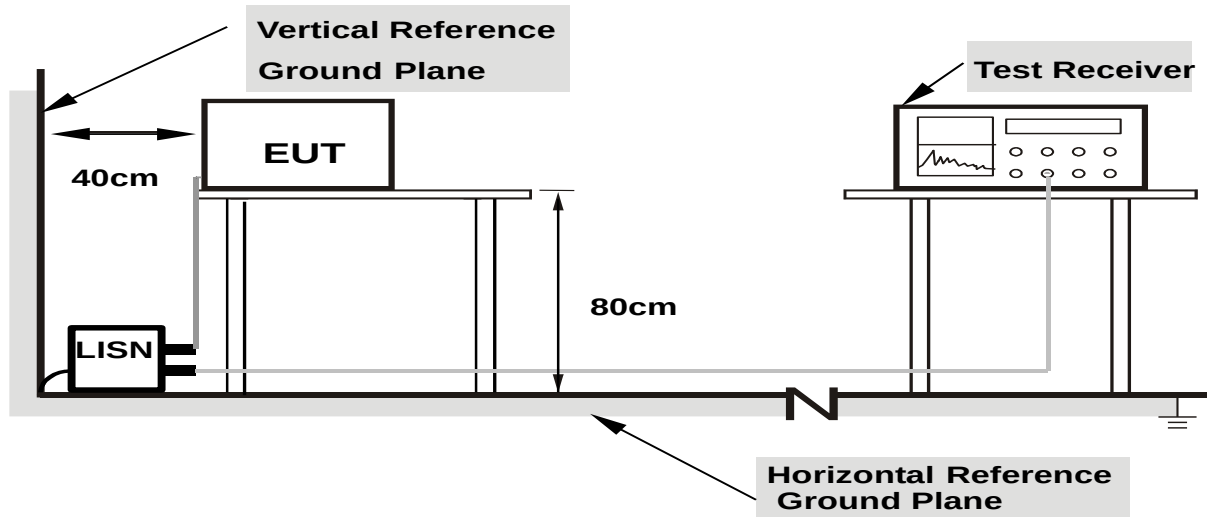
3.3.2 TEST PROCEDURE

- The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.3.3 DEVIATION FROM TEST STANDARD

No deviation

3.3.4 TEST SETUP



Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

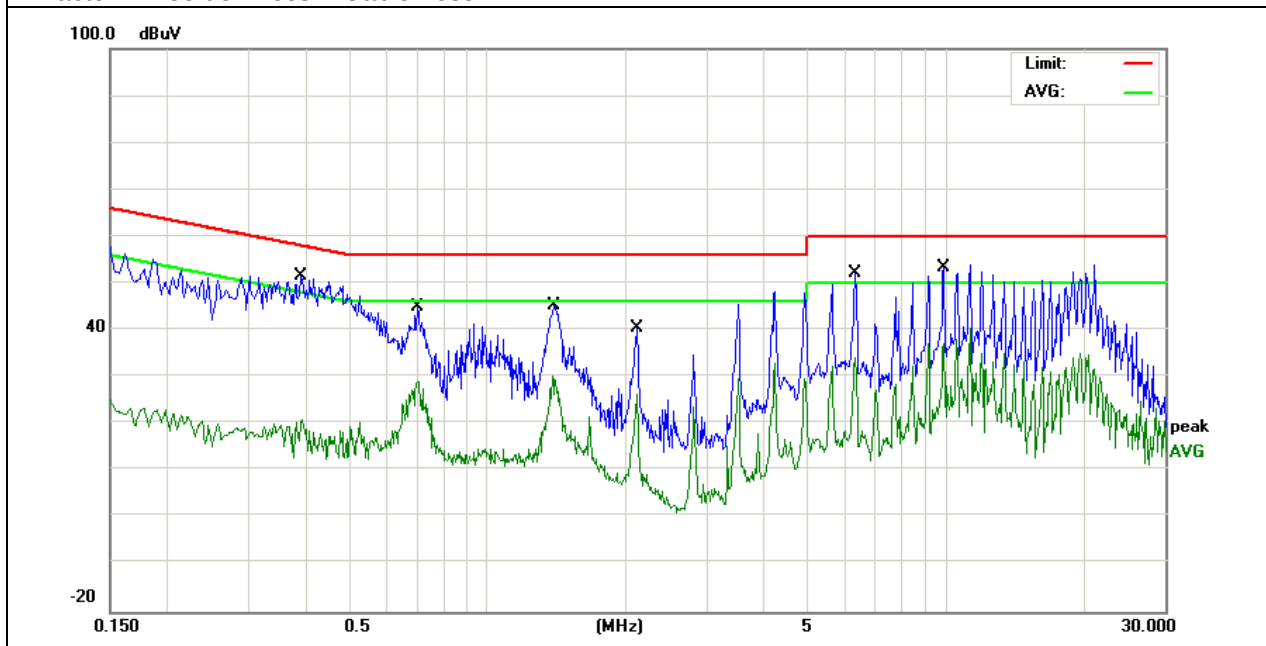
3.2.5 TEST RESULT

EUT :	Alloy Hub+	Model Name. :	ah+.zw8us.4G
Temperature :	25 °C	Relative Humidity :	55%
Pressure :	1010hPa	Phase :	L
Test Voltage :	AC 24V from AC Source AC 120V/60Hz	Test Mode :	Mode 1

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.3899	41.66	10.03	51.69	58.06	-6.37	QP
0.3899	10.78	10.03	20.81	48.06	-27.25	AVG
0.7019	34.56	10.35	44.91	56.00	-11.09	QP
0.7019	18.82	10.35	29.17	46.00	-16.83	AVG
1.3820	34.36	11.04	45.40	56.00	-10.60	QP
1.3820	19.23	11.04	30.27	46.00	-15.73	AVG
2.1140	30.71	9.66	40.37	56.00	-15.63	QP
2.1140	16.79	9.66	26.45	46.00	-19.55	AVG
6.3300	42.41	9.68	52.09	60.00	-7.91	QP
6.3300	24.44	9.68	34.12	50.00	-15.88	AVG
9.8698	43.65	9.69	53.34	60.00	-6.66	QP
9.8698	27.34	9.69	37.03	50.00	-12.97	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

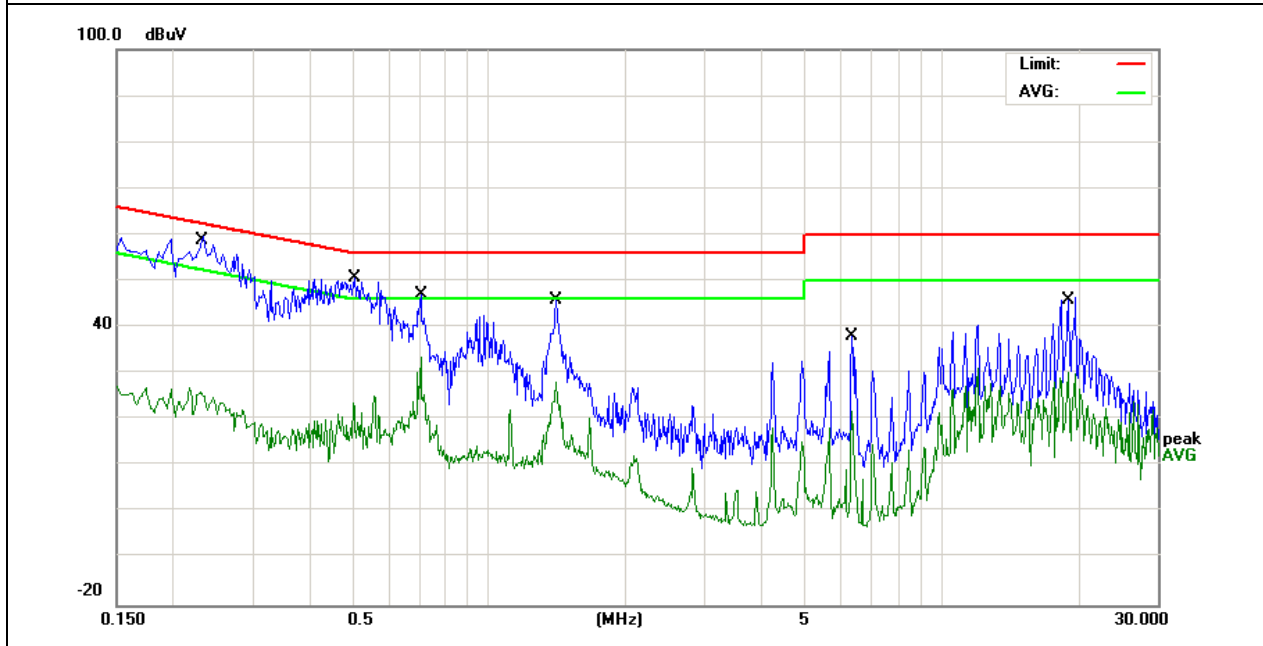


EUT :	Alloy Hub+	Model Name. :	ah+.zw8us.4G
Temperature :	25 °C	Relative Humidity :	55%
Pressure :	1010hPa	Phase :	N
Test Voltage :	AC 24V from AC Source AC 120V/60Hz	Test Mode :	Mode 1

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.2300	38.63	9.87	48.50	62.45	-13.95	QP
0.2300	16.07	9.87	25.94	52.45	-26.51	AVG
0.5060	40.58	10.16	50.74	56.00	-5.26	QP
0.5060	13.46	10.16	23.62	46.00	-22.38	AVG
0.7060	36.77	10.36	47.13	56.00	-8.87	QP
0.7060	23.17	10.36	33.53	46.00	-12.47	AVG
1.4100	34.90	11.07	45.97	56.00	-10.03	QP
1.4100	16.95	11.07	28.02	46.00	-17.98	AVG
6.3340	28.45	9.68	38.13	60.00	-21.87	QP
6.3340	12.28	9.68	21.96	50.00	-28.04	AVG
19.0260	36.59	9.72	46.31	60.00	-13.69	QP
19.0260	20.45	9.72	30.17	50.00	-19.83	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



3.3.5 RADIATED EMISSION MEASUREMENT

3.3.6 Radiated Emission Limits (FCC 15.209)

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
Frequency (MHz)	Limit (dBuV)	
30~88	40	3
88~216	43.5	3
216~960	46	3
960 -10000	54.00	3
*902 - 928	94.00	3

Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission level (dBuV/m)=20log Emission level (uV/m).
- (3) *Note: This is the limit for the fundamental frequency.

LIMITS OF RADIATED EMISSION MEASUREMENT (FCC 15.249)

Frequency of Emission (MHz)	Field Strength of fundamental ((millivolts /meter)	Field Strength of Harmonics (microvolts/meter)
902-928	50	500

Notes:

- (1) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1MHz / 1MHz for Peak

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.3.7 TEST PROCEDURE

- The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- The EUT was placed on the top of a rotating table 0.8 m for below 1GHz and 1.5m for above 1GHz the ground at a 3 meter. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment or of the substitution antenna shall be 0.8 m for below 1GHz and 1.5m for above 1GHz; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

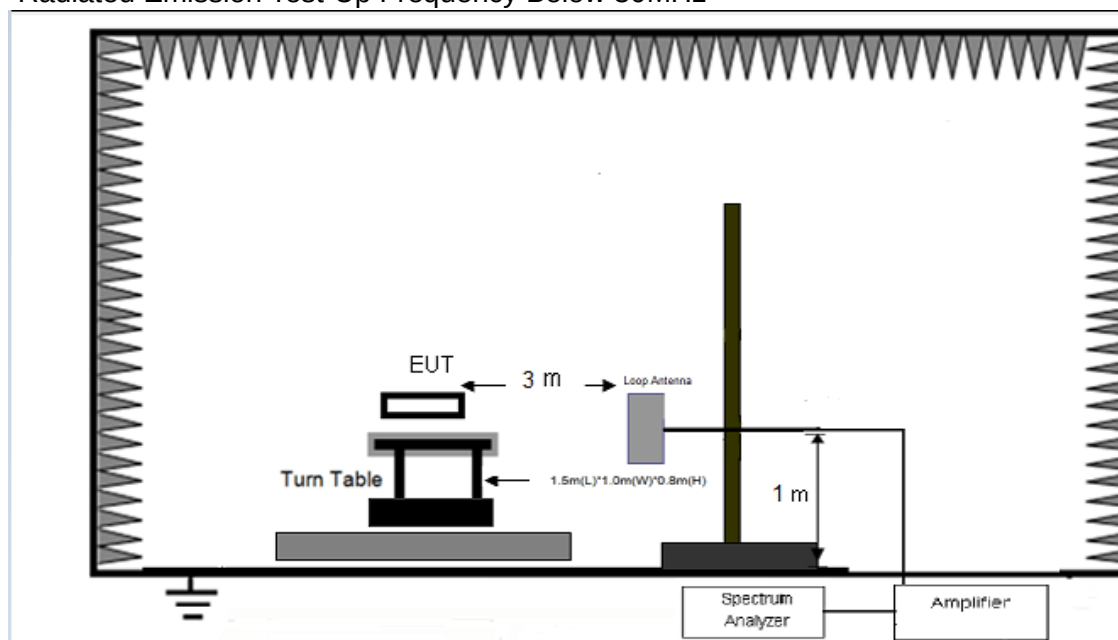
Note:

Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

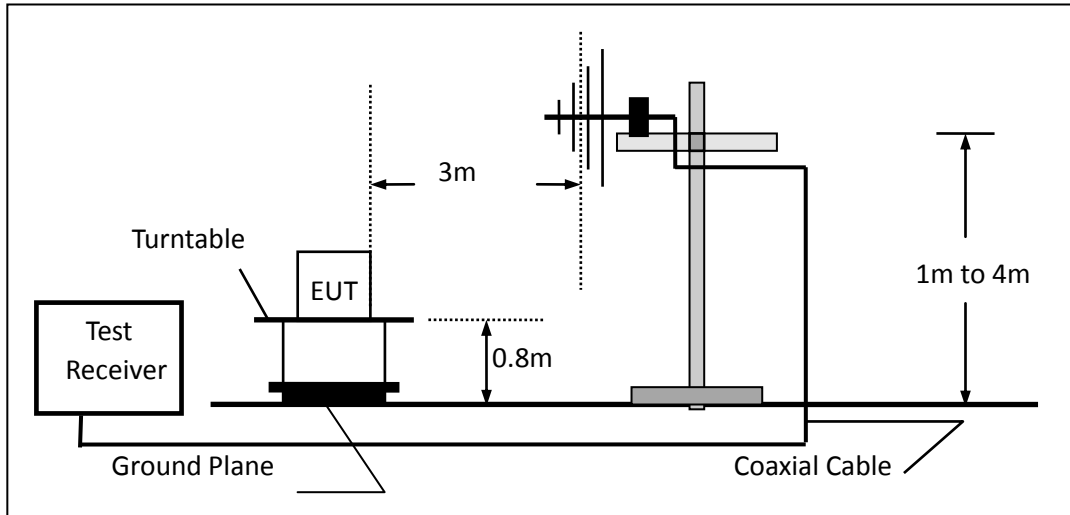
3.3.8 DEVIATION FROM TEST STANDARD

No deviation

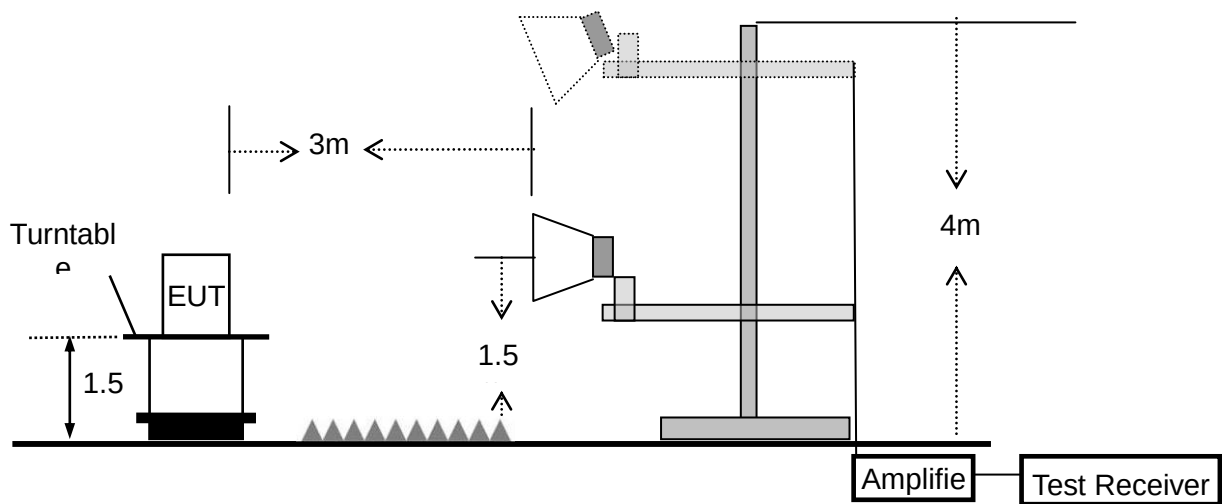
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



3.3.9 TEST RESULTS (BELOW 30MHz)

EUT :	Alloy Hub+	Model Name. :	ah+.zw8us.4G
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	AC 24V
Test Mode :	TX	Polarization :	--

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Remark :1. Emission level in dBuV/m=20 log (uV/m)

2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

3. For Frequency 9kHz~30MHz:

Distance extrapolation factor = $40\log(\text{Specific distance/ test distance})(\text{dB})$;

Limit line=Specific limits(dBuV) + distance extrapolation factor.

For Frequency above 30MHz:

Distance extrapolation factor = $20\log(\text{Specific distance/ test distance})(\text{dB})$;

Limit line=Specific limits(dBuV) + distance extrapolation factor.

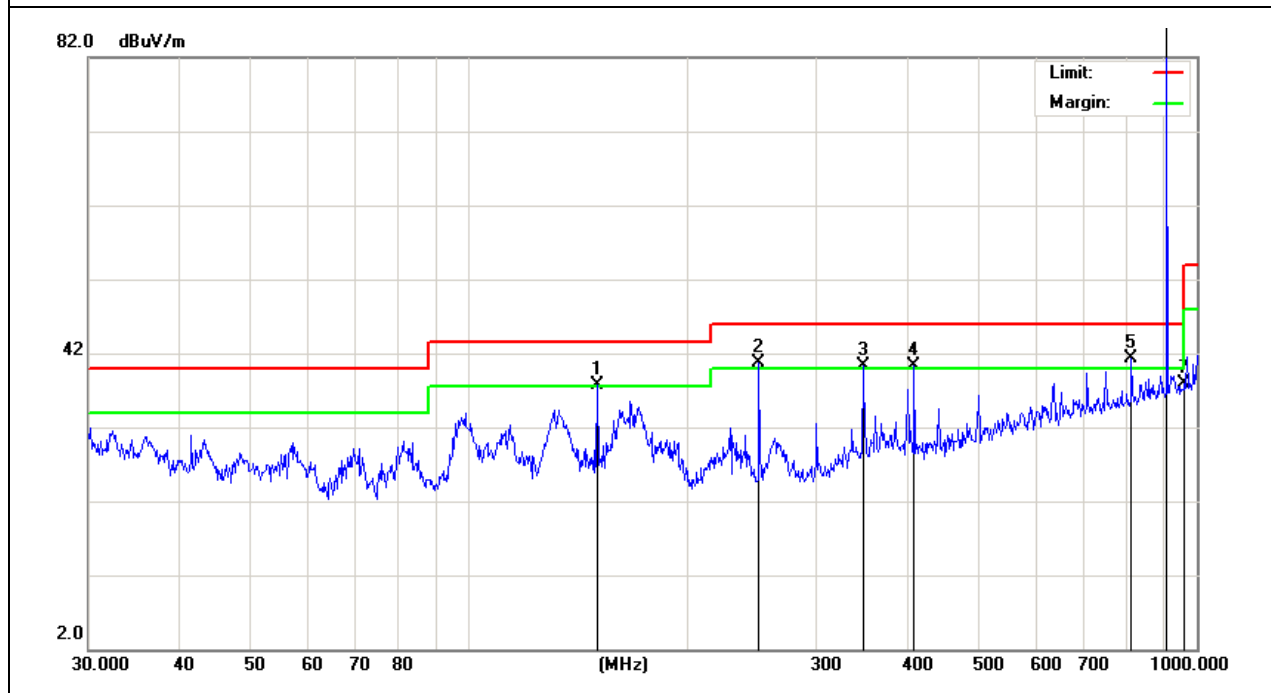
3.3.10 TEST RESULTS (BELOW 1000 MHz)

EUT :	Alloy Hub+	Model Name :	ah+.zw8us.4G
Temperature :	25 °C	Relative Humidity :	51%
Pressure :	1010 hPa	Test Voltage :	AC 24V
Test Mode :	908.42MHz	Polarization :	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
150.0107	19.24	18.53	37.77	43.50	-5.73	QP
250.3009	21.74	18.96	40.70	46.00	-5.30	QP
348.0274	18.62	21.68	40.30	46.00	-5.70	QP
408.9460	17.00	23.40	40.40	46.00	-5.60	QP
813.1114	11.58	29.69	41.27	46.00	-4.73	QP
908.4200	57.60	30.88	89.48	N/A	N/A	N/A
960.0000	6.48	31.39	37.87	46.00	-8.13	QP

Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

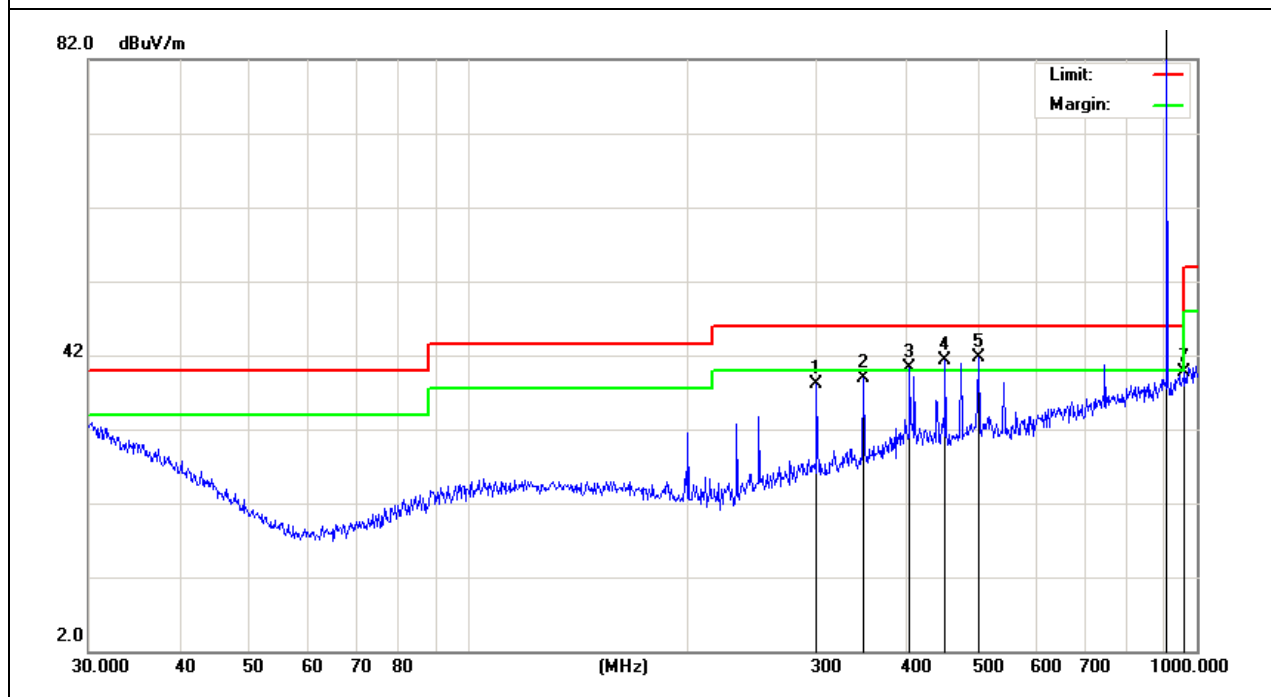


EUT :	Alloy Hub+	Model Name :	ah+.zw8us.4G
Temperature :	25 °C	Relative Humidity :	51%
Pressure :	1010 hPa	Test Voltage :	AC 24V
Test Mode :	908.42MHz	Polarization :	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
300.3672	17.99	20.21	38.20	46.00	-7.80	QP
348.0274	17.32	21.68	39.00	46.00	-7.00	QP
403.2500	17.03	23.27	40.30	46.00	-5.70	QP
451.1349	17.10	24.20	41.30	46.00	-4.70	QP
501.1788	16.82	24.88	41.70	46.00	-4.30	QP
908.4200	60.90	30.88	91.78	N/A	N/A	N/A
960.0000	8.31	31.39	39.70	46.00	-6.30	QP

Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.



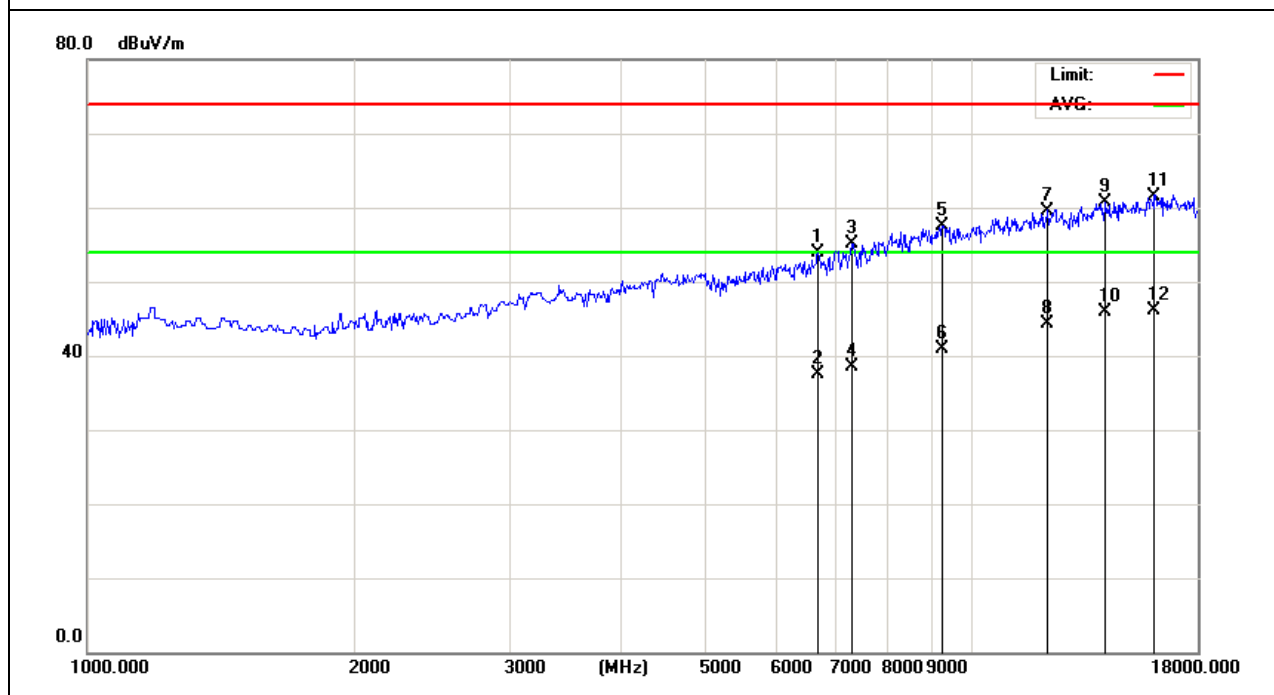
3.3.11 TEST RESULTS (ABOVE 1000 MHZ)

EUT :	Alloy Hub+	Model Name :	ah+.zw8us.4G
Temperature :	25 °C	Relative Humidity :	51%
Pressure :	1010 hPa	Test Voltage :	AC 24V
Test Mode :	908.42MHz	Polarization :	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
6695.000	32.99	20.91	53.90	74.00	-20.10	peak
6695.000	16.65	20.91	37.56	54.00	-16.44	AVG
7290.000	32.96	22.14	55.10	74.00	-18.90	peak
7290.000	16.32	22.14	38.46	54.00	-15.54	AVG
9245.000	32.76	24.71	57.47	74.00	-16.53	peak
9245.000	16.28	24.71	40.99	54.00	-13.01	AVG
12169.000	32.21	27.39	59.60	74.00	-14.40	peak
12169.000	16.98	27.39	44.37	54.00	-9.63	AVG
14124.000	32.19	28.51	60.70	74.00	-13.30	peak
14124.000	17.32	28.51	45.83	54.00	-8.17	AVG
16045.000	34.95	26.65	61.60	74.00	-12.40	peak
16045.000	19.52	26.65	46.17	54.00	-7.83	AVG

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

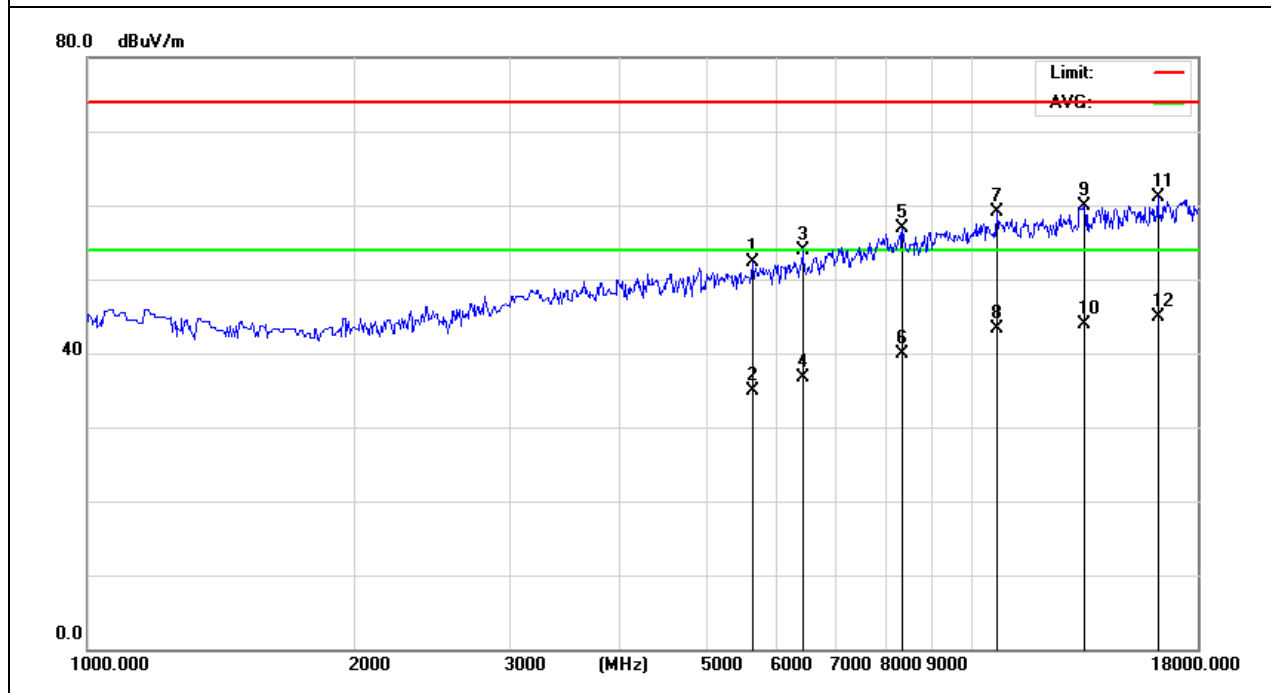


EUT :	Alloy Hub+	Model Name :	ah+.zw8us.4G
Temperature :	25 °C	Relative Humidity :	51%
Pressure :	1010 hPa	Test Voltage :	AC 24V
Test Mode :	908.42MHz	Polarization :	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5641.000	34.58	17.64	52.22	74.00	-21.78	peak
5641.000	17.29	17.64	34.93	54.00	-19.07	AVG
6423.000	34.06	19.77	53.83	74.00	-20.17	peak
6423.000	16.98	19.77	36.75	54.00	-17.25	AVG
8327.000	33.80	23.20	57.00	74.00	-17.00	peak
8327.000	16.69	23.20	39.89	54.00	-14.11	AVG
10656.000	33.00	26.02	59.02	74.00	-14.98	peak
10656.000	17.35	26.02	43.37	54.00	-10.63	AVG
13376.000	31.30	28.68	59.98	74.00	-14.02	peak
13376.000	15.32	28.68	44.00	54.00	-10.00	AVG
16198.000	34.60	26.53	61.13	74.00	-12.87	peak
16198.000	18.32	26.53	44.85	54.00	-9.15	AVG

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.



Note:

- 1) EUT Pre-scan X/Y/Z orientation, only worst case is presented in the report(X orientation).
- 2) Since the PEAK test results are below the AV limit, according to 15.31, the amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

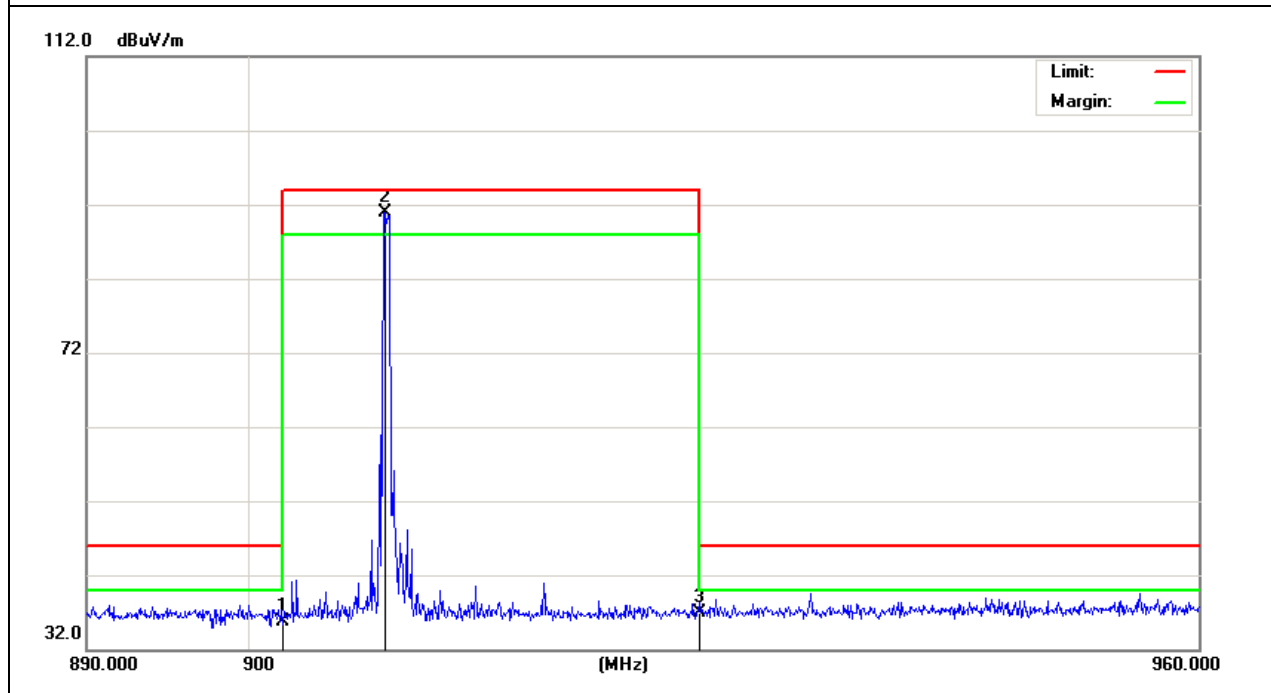
3.3.12 TEST RESULTS (RESTRICTED BANDS REQUIREMENTS)

EUT :	Alloy Hub+	Model Name :	ah+.zw8us.4G
Temperature :	25 °C	Relative Humidity :	51%
Pressure :	1010 hPa	Test Voltage :	AC 24V
Test Mode :	TX-908MHz	Polarization :	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
902.0000	4.89	30.81	35.70	46.00	-10.30	QP
908.4000	60.12	30.88	91.00	94.00	-3.00	QP
928.0000	5.84	31.12	36.96	46.00	-9.04	QP

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

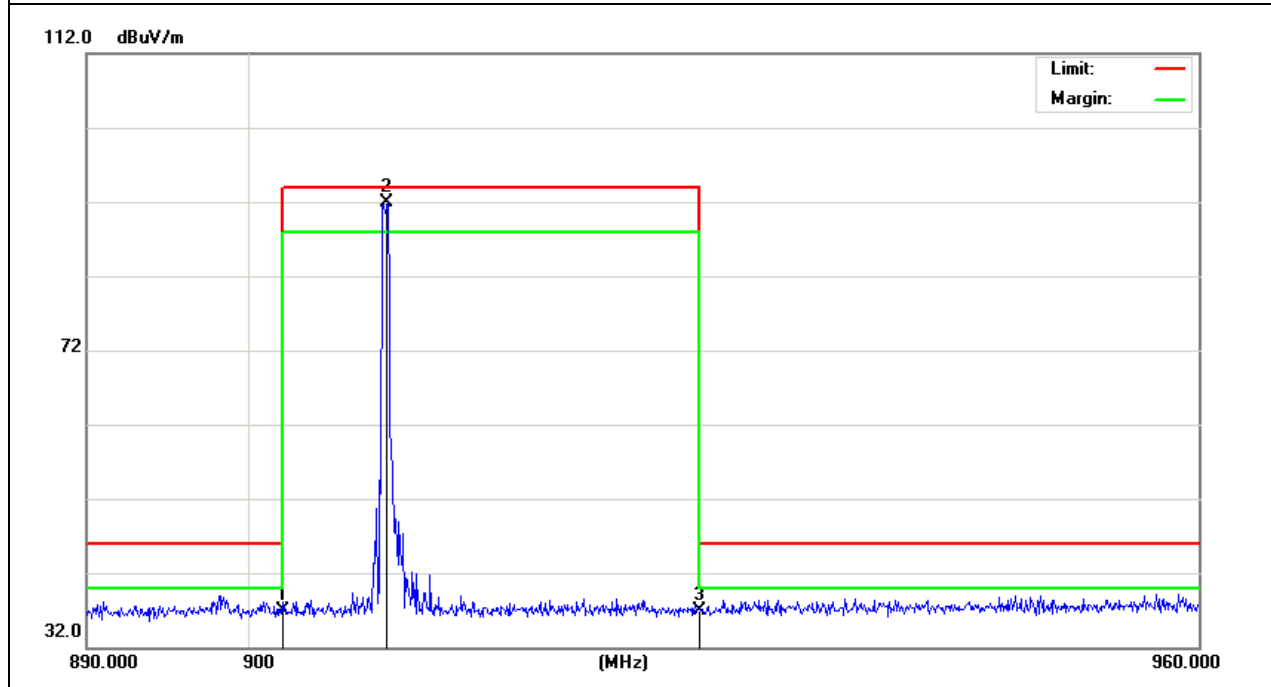


EUT :	Alloy Hub+	Model Name :	ah+.zw8us.4G
Temperature :	25 °C	Relative Humidity :	51%
Pressure :	1010 hPa	Test Voltage :	AC 24V
Test Mode :	TX-908MHz	Polarization :	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
902.0000	6.07	30.81	36.88	46.00	-9.12	QP
908.4000	61.02	30.88	91.90	94.00	-2.10	QP
928.0000	5.72	31.12	36.84	46.00	-9.16	QP

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

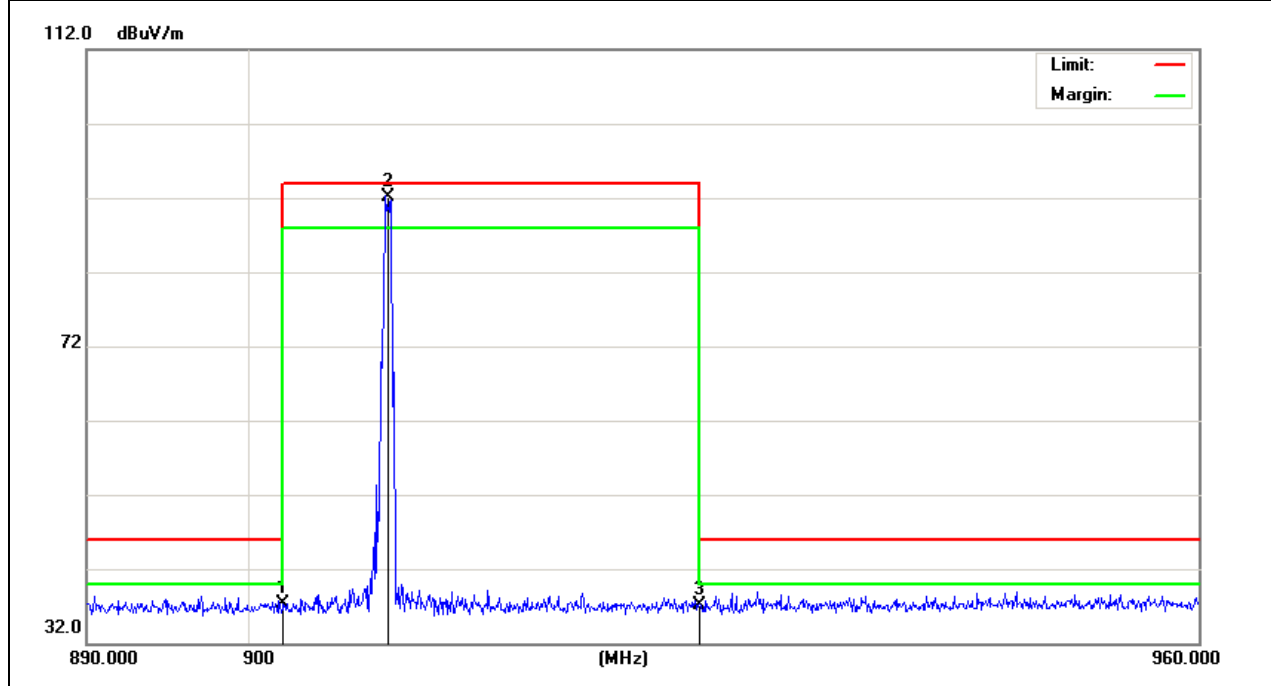


EUT :	Alloy Hub+	Model Name :	ah+.zw8us.4G
Temperature :	25 °C	Relative Humidity :	51%
Pressure :	1010 hPa	Test Voltage :	AC 24V
Test Mode :	TX-908.42MHz	Polarization :	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
902.0000	6.55	30.81	37.36	46.00	-8.64	QP
908.4200	61.32	30.88	92.20	94.00	-1.80	QP
928.0000	5.97	31.12	37.09	46.00	-8.91	QP

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

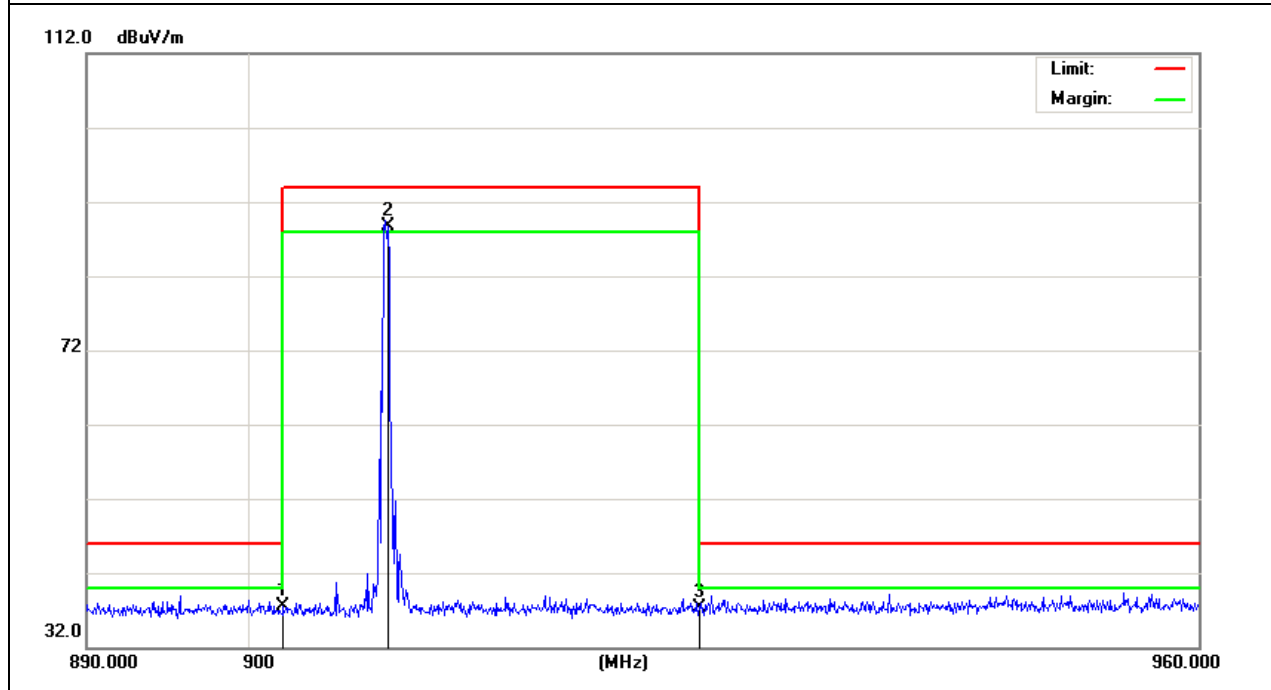


EUT :	Alloy Hub+	Model Name :	ah+.zw8us.4G
Temperature :	25 °C	Relative Humidity :	51%
Pressure :	1010 hPa	Test Voltage :	AC 24V
Test Mode :	TX-908.42MHz	Polarization :	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
902.0000	6.62	30.81	37.43	46.00	-8.57	peak
908.4200	57.92	30.88	88.80	94.00	-5.20	peak
928.0000	6.27	31.12	37.39	46.00	-8.61	peak

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

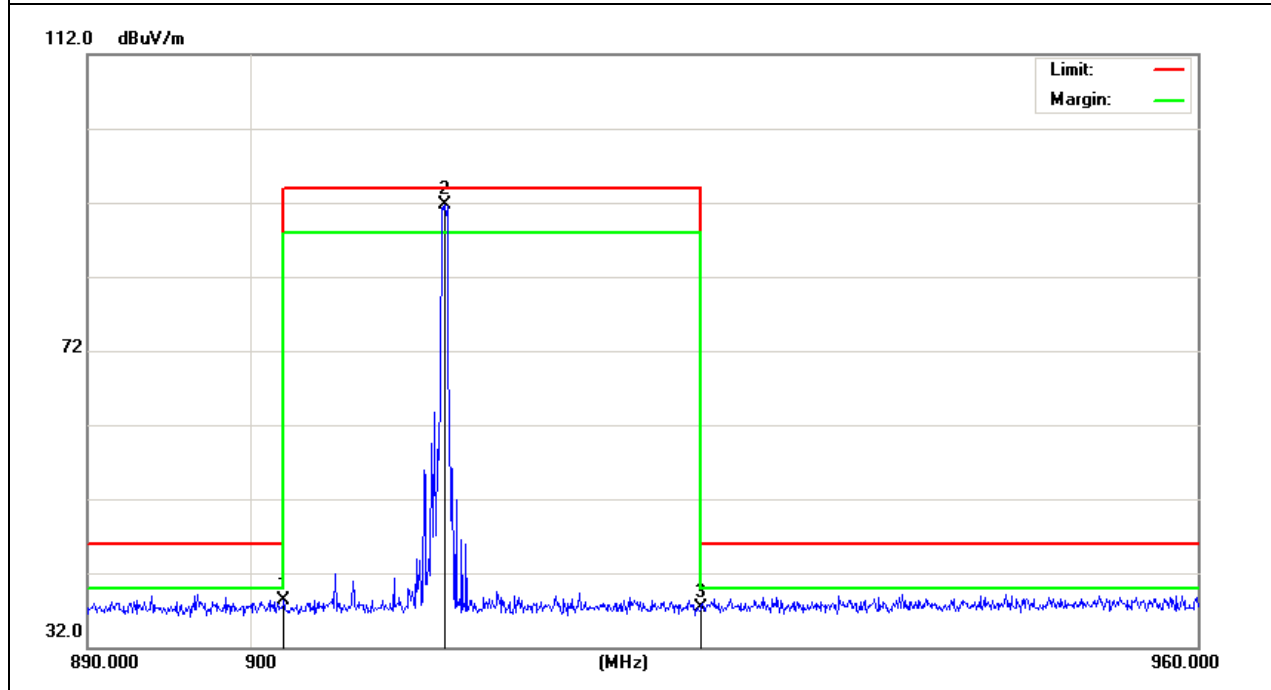


EUT :	Alloy Hub+	Model Name :	ah+.zw8us.4G
Temperature :	25 °C	Relative Humidity :	51%
Pressure :	1010 hPa	Test Voltage :	AC 24V
Test Mode :	TX-912MHz	Polarization :	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
902.0000	7.49	30.81	38.30	46.00	-7.70	peak
911.9800	60.87	30.93	91.80	94.00	-2.20	peak
928.0000	6.08	31.12	37.20	46.00	-8.80	peak

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

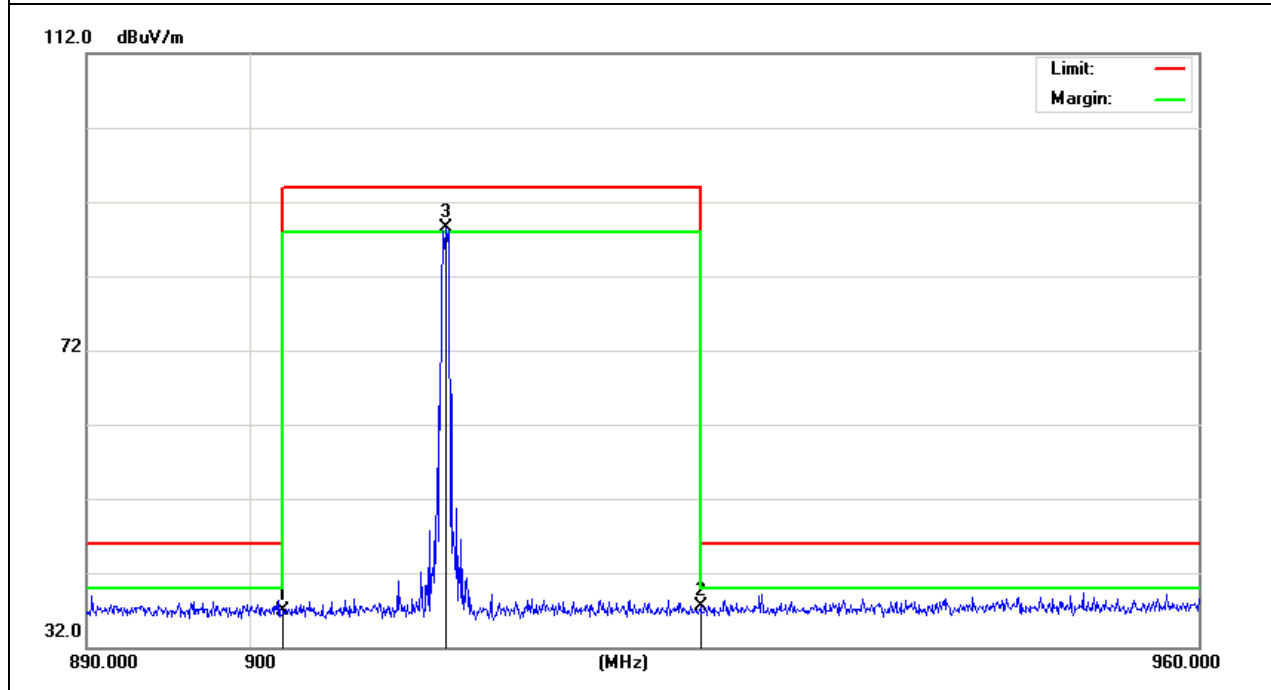


EUT :	Alloy Hub+	Model Name :	ah+.zw8us.4G
Temperature :	25 °C	Relative Humidity :	51%
Pressure :	1010 hPa	Test Voltage :	AC 24V
Test Mode :	TX-912MHz	Polarization :	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
902.0000	6.06	30.81	36.87	46.00	-9.13	peak
928.0000	6.36	31.12	37.48	46.00	-8.52	peak
912.0000	57.67	30.93	88.60	94.00	-5.40	peak

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

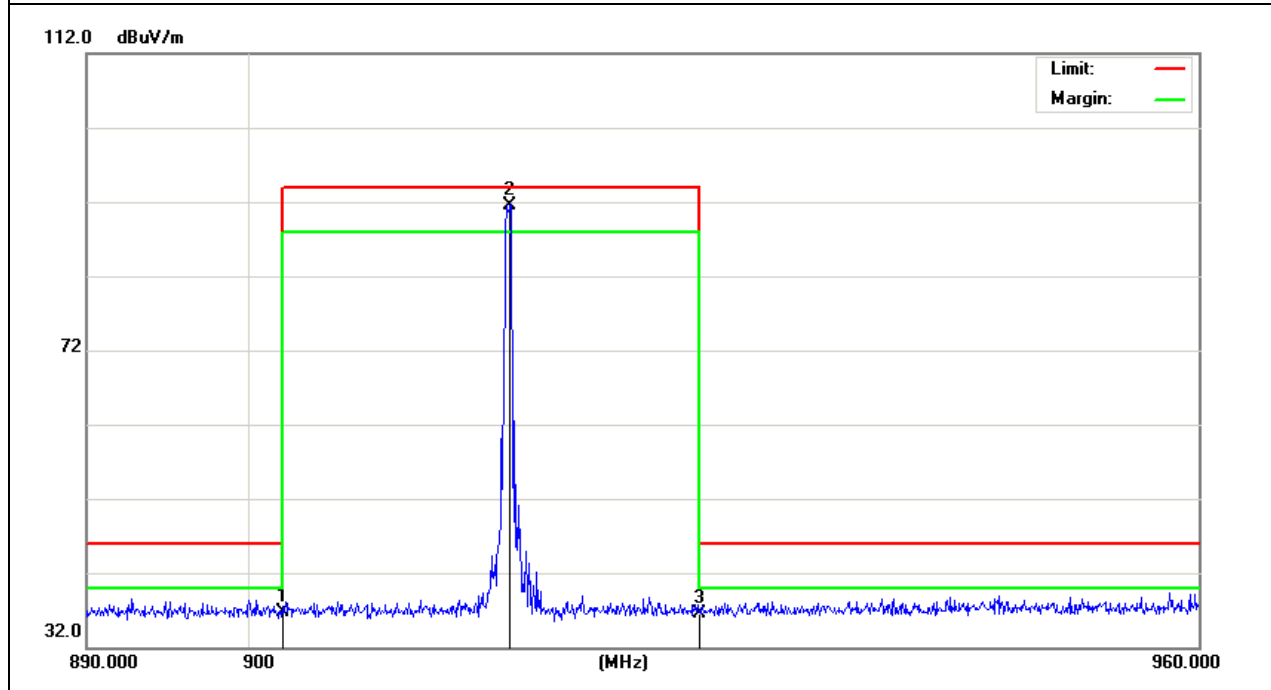


EUT :	Alloy Hub+	Model Name :	ah+.zw8us.4G
Temperature :	25 °C	Relative Humidity :	51%
Pressure :	1010 hPa	Test Voltage :	AC 24V
Test Mode :	TX-916MHz	Polarization :	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
902.0000	5.97	30.81	36.78	46.00	-9.22	peak
916.0000	60.63	30.97	91.60	94.00	-2.40	peak
928.0000	5.47	31.12	36.59	46.00	-9.41	peak

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

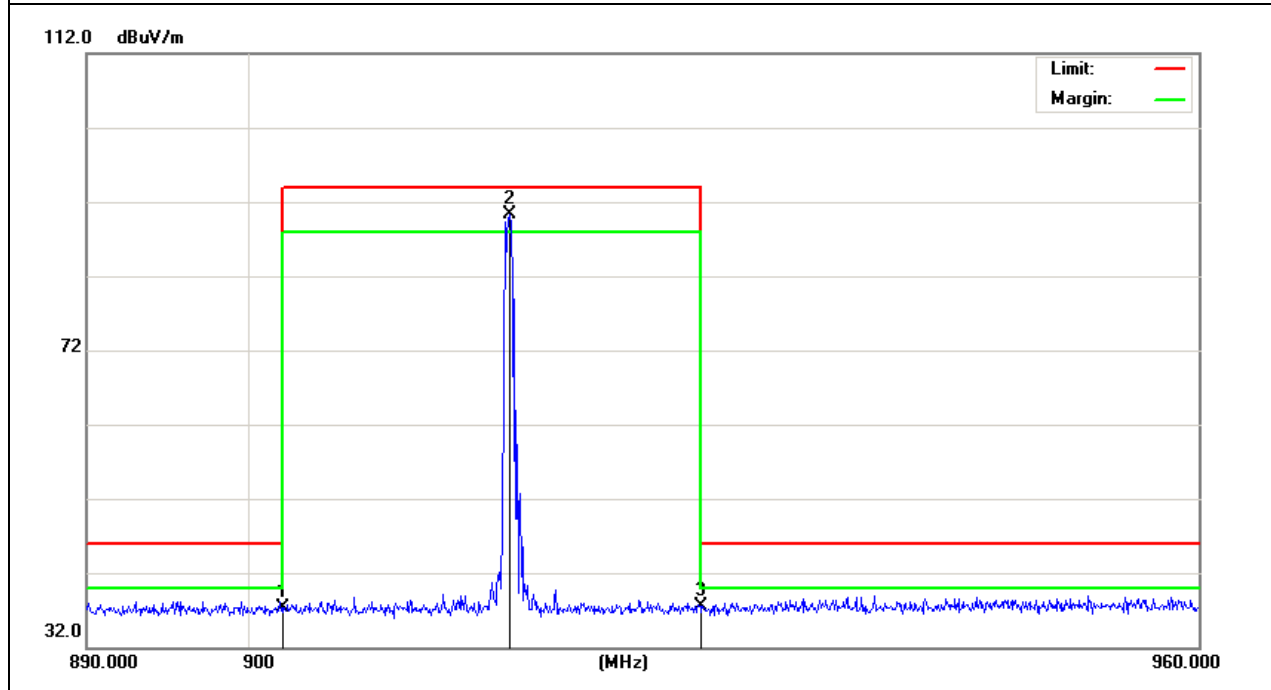


EUT :	Alloy Hub+	Model Name :	ah+.zw8us.4G
Temperature :	25 °C	Relative Humidity :	51%
Pressure :	1010 hPa	Test Voltage :	AC 24V
Test Mode :	TX-916MHz	Polarization :	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
902.0000	6.56	30.81	37.37	46.00	-8.63	peak
916.0000	59.33	30.97	90.30	94.00	-3.70	peak
928.0000	6.41	31.12	37.53	46.00	-8.47	peak

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.



4. BANDWIDTH TEST

4.1 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- b. Spectrum Setting : The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value., Sweep time = Auto.

4.2 DEVIATION FROM STANDARD

No deviation.

4.3 TEST SETUP

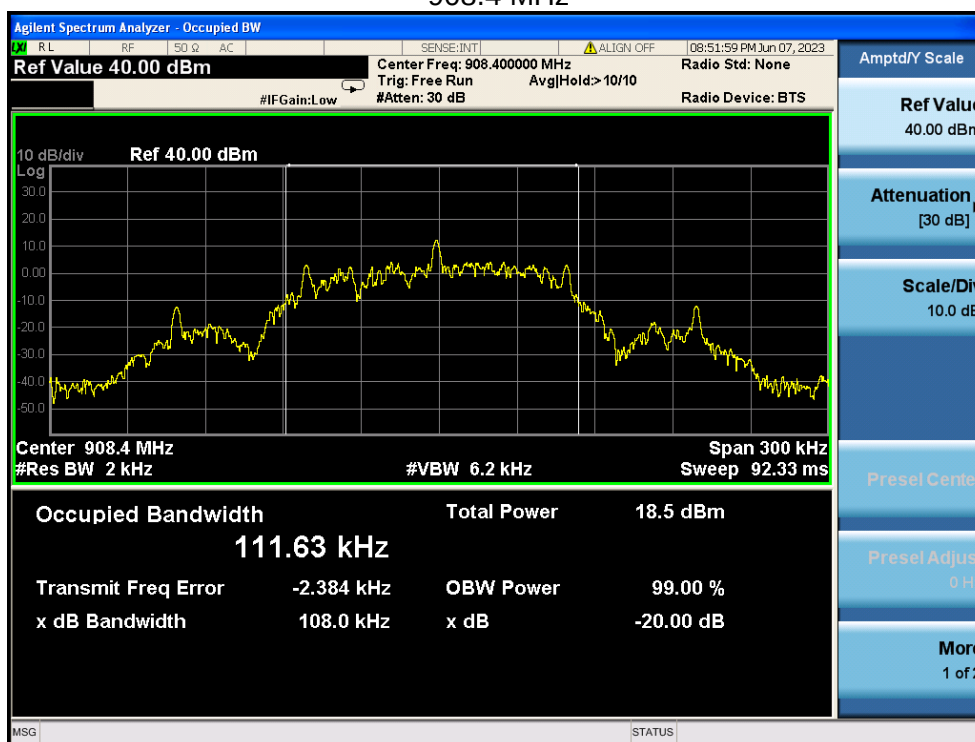


6. TEST RESULTS

EUT :	Alloy Hub+	Model Name :	ah+.zw8us.4G
Temperature :	26 °C	Relative Humidity :	53%
Pressure :	1020 hPa	Test Power :	AC 24V
Test Mode :	Mode 1		

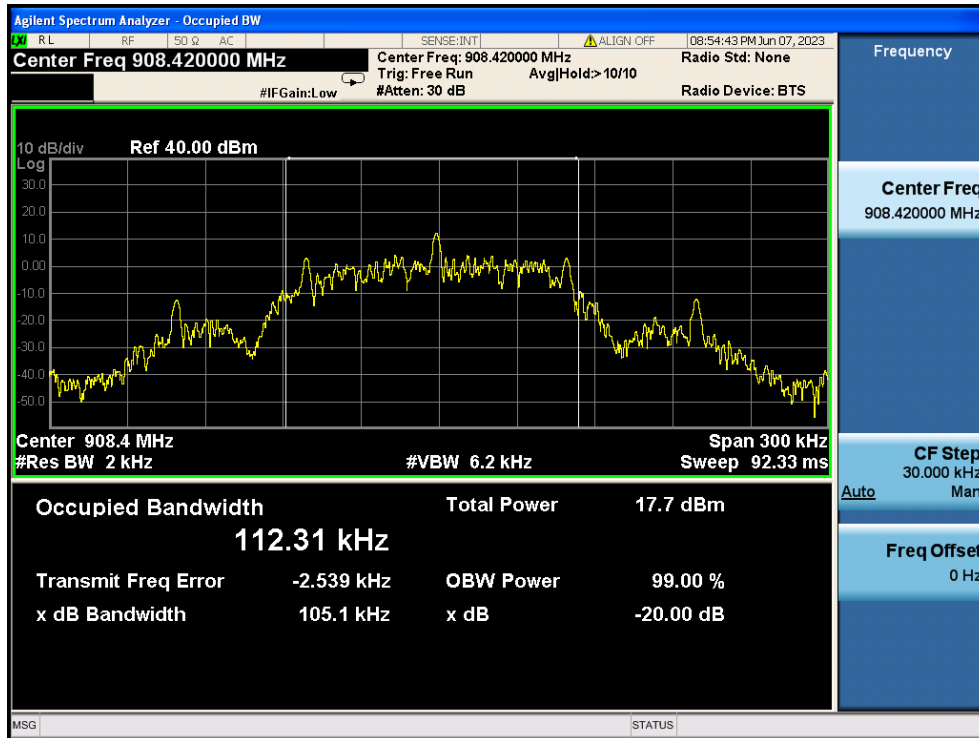
Test Channel	Frequency (MHz)	20 dBc Bandwidth (kHz)
CH01	908.4	108

908.4 MHz



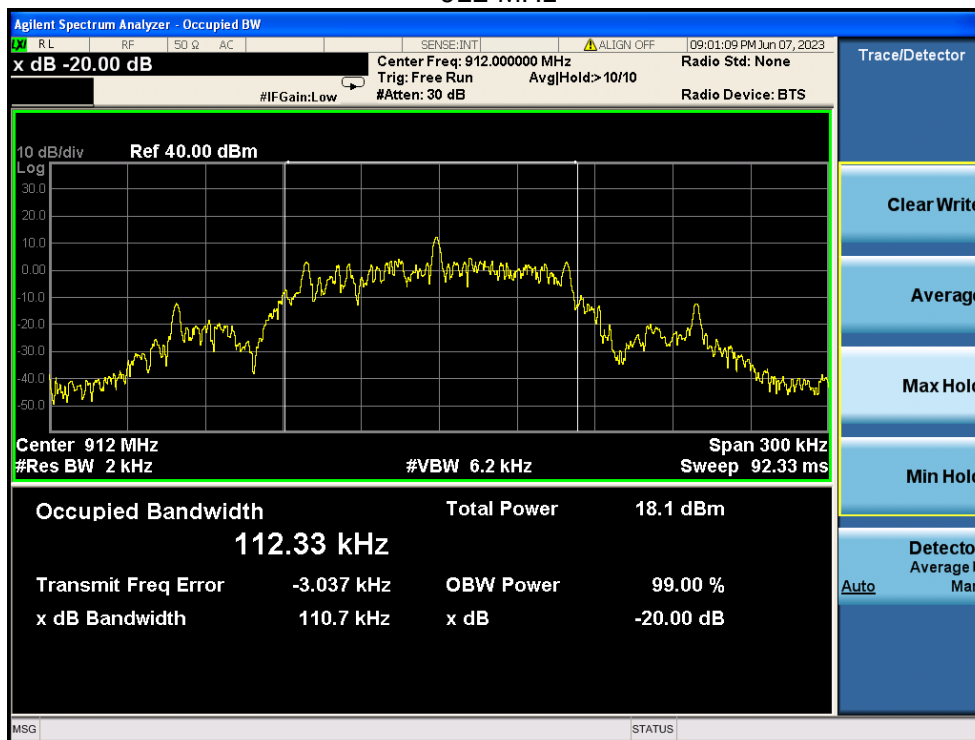
Test Channel	Frequency (MHz)	20 dBc Bandwidth (kHz)
CH02	908.42	105.1

908.42 MHz



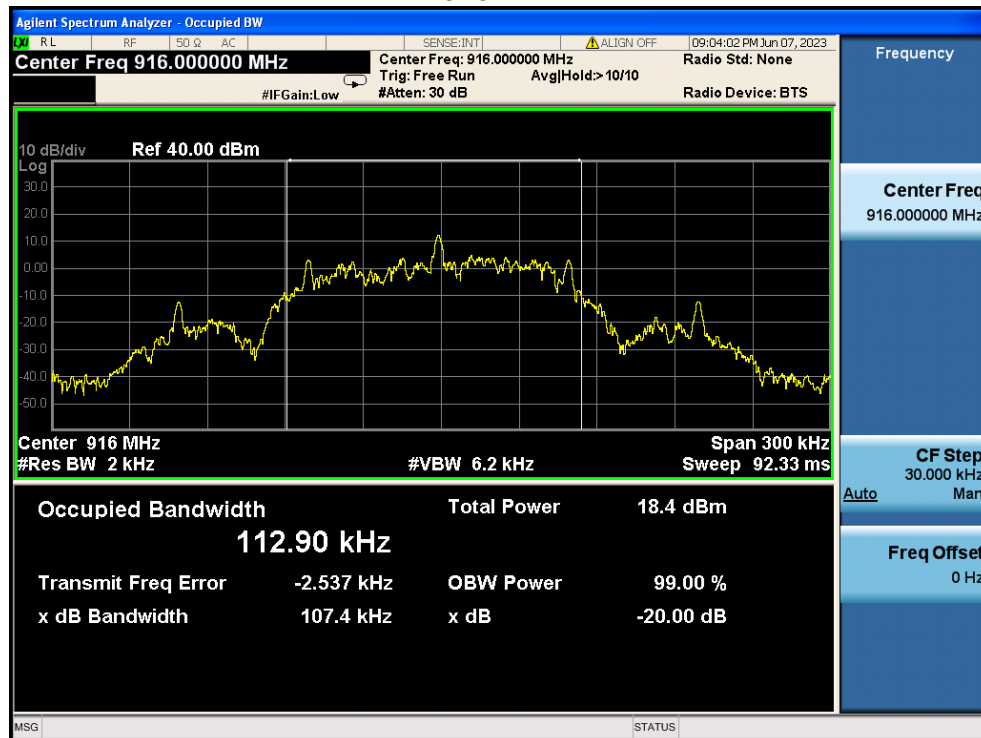
Test Channel	Frequency (MHz)	20 dBc Bandwidth (MHz)
CH03	912	110.7

912 MHz



Test Channel	Frequency (MHz)	20 dBc Bandwidth (MHz)
CH04	916	107.4

916 MHz



END OF REPORT