🛕 TÜVRheinland®

Produkte Products

Prüfbericht-Nr.: Test Report No.:	CN2218VL 001	Auftrags-Nr.: Order No.:	158256203	Seite 1 von 15 Page 1 of 15
Kunden-Referenz-Nr.: Client Reference No.:	N/A	Auftragsdatum: Order date:	26.05.2021	
Auftraggeber: Client:	Arwin Technology Limited Unit 541B, 5/F, Building 1W, 1 Science Park West Avenue, N.T.			
Prüfgegenstand: Test item:	Indoor Air Quality Senso	or Device		
Bezeichnung / Typ-Nr.: Identification / Type No.:	LRS10701			
Auftrags-Inhalt: Order content:	FCC Certification			
Prüfgrundlage: Test specification:	FCC Part 15 Subpart C,	ANSI C63.10-2013		
Wareneingangsdatum: Date of receipt:	14.07.2022			1
Prüfmuster-Nr.: Test sample No.:	A003300268 001~004			
Prüfzeitraum: Testing period:	04.08.2021 - 11.09.2022			
Ort der Prüfung: Place of testing:	Hong Kong			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland Hong Kong Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von / tested by:		kontrolliert von /	reviewed by:	
	Ø.	<		-
10/12/2022 Eddy Tsa	ng / Engineer	10/12/2022 Share	on Li / Senior Mana	ger
Datum Name / Stel	lung Unterschrift	Datum Na	me / Stellung me / Position	Unterschrift Signature
Sonstiges / Other: FC	C ID: 2AMWTLRS10701	2010 110		c.griataro
"Decision Rule" docume	nt announced in our websit	e (https://www.tuv.coi	n/landingpage/en/c	qm-gcn/)
describes the statement	of conformity and its rule of	f enforcement for test	results are applica	ble throughout
Zustand des Prüfgeger	etandes hei Anlieferung:	Prüfmuster vollstär		diat
Condition of the test item	n at delivery:	Test item complete	and undamaged	aigt
* Legende: 1 = sehr gut	2 = gut 3 = befriedige	nd	4 = ausreichend	5 = mangelhaft
P(ass) = entspricht o Legend: 1 = very good	.g. Prüfgrundlage(n) F(ail) = entspr 2 = good 3 = satisfactor test specification(s) F(ail) = failed	icht nicht o.g. Prüfgrundlage(n y a.m. test specification(s)) N/A = nicht anwendbar 4 = sufficient	N/T = nicht getestet 5 = poor N/T = not tested
r (ass) - passed a.m				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.				

Table of Content

Page

Cover Page	1
Table of Content	2
Product information	4
Manufacturers declarations	.4
Product function and intended use	.4
Submitted documents	.4
Independent Operation Modes	.4
Related Submittal(s) Grants	.4
Remark	.4
Test Set-up and Operation Mode	5
Principle of Configuration Selection	. 5
Test Operation and Test Software	. 5
Special Accessories and Auxiliary Equipment	. 5
Countermeasures to achieve EMC Compliance	.5
Test Methodology	6
Radiated Emission	.6
Field Strength Calculation	.6
Test Setup Diagram	7
Test Facility	8
Test Laboratory Information	.8
List of Test and Measurement Instruments	9
Measurement Uncertainty1	0
Results FCC Part 15 – Subpart C1	1
FCC 15.203 – Antenna Requirement 1 Pass	11
FCC 15.204 – Antenna Requirement 2	11
FCC 15.207 / RSS-Gen 8.8 – Conducted Emission on AC Mains	1
FCC 15.247 (a) – Receiver Input Bandwidth	1
FCC 15.247 (a)(2) – 6dB Bandwidth Measurement	12
FCC 15.247(b)(3) – Maximum conducted (average) output powerPassPass	12
FCC 15.247(e) – Power Spectral Density	13
FCC 15.247(d) – Spurious Conducted Emissions	14
FCC 15.205 – Radiated Emissions in Restricted Frequency Bands Pass	15
Appendix 1 – Test protocols 23 page) S



Appendix 2 – Test setup	3 pages
Appendix 3 – EUT External Photos	5 pages
Appendix 4 – EUT Internal Photos	
Appendix 5 – RF exposure information	2 pages



Product information

Manufacturers declarations

	Transceiver
Operating frequency range	903.0 - 914.2 MHz
Type of modulation	DSSS modulation
Number of channels	8
Channel separation	1.6 MHz
Type of antenna	Internal Antenna
Antenna gain (dBi)	-2.32 dBi
Power level	fix
Type of equipment	Stand-alone Radio Device
Connection to public utility power line	No
Nominal voltage	7.2 VDC
Independent Operation Modes	Transceiver

Product function and intended use

The equipment under test (EUT) is a LoRa Radio Module.

Models	Product description	Authorized Antenna
LRS10701	Indoor Air Quality Sensor Device	YP-A200-JK-015

Submitted documents

Circuit Diagram Block Diagram Technical Description User manual Label

Independent Operation Modes

The basic operation modes are:

- Transceiver mode.

For further information refer to User Manual

Related Submittal(s) Grants

- This is a single application for certification of the Transceiver Module.

Remark

The test results in this test report are only relevant to the tested sample and does not involve any assessment in the production.

FCC_15.247_DTS_v2.0



Test Set-up and Operation Mode

Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

Test Operation and Test Software

Test operation should refer to test methodology.

- During test, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power is fixed.

Special Accessories and Auxiliary Equipment

- Nil

Countermeasures to achieve EMC Compliance

- Nil



Test Methodology

Radiated Emission

The radiated emission measurements of the transmitter part were performed according to the procedures in ANSI C63.10-2013.

For measurement below 1GHz - the equipment under test (EUT) was placed at the middle of the 80 cm height turntable. For measurement above 1GHz - the EUT was placed at the middle of the 1.5 m height turntable and RF absorbing material was placed on ground plane between turntable and measuring antenna. During the testing, the EUT was operated standalone and arranged for maximum emissions. The EUT was tested in three orthogonal planes.

The investigation is performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained.

All radiated tests were performed at an antenna to EUT with 3 meters distance, unless stated otherwise in particular parts of this test report.

Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

FS = R + AF + CF + FA - PA

Where FS = Field Strength in dBuV/m at 3 meters.

- R = Reading of Spectrum Analyzer in dBuV.
- AF = Antenna Factor in dB.
- CF = Cable Attenuation Factor in dB.
- FA = Filter Attenuation Factor in dB.
- PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.



Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1 GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Mains Conduction Measurement (if applicable)





Test Facility

Test Laboratory Information

TÜV Rheinland Hong Kong Ltd. Address: 3-4/F, Fou Wah Industrial Building, 10-16 Pun Shan Street, Tsuen Wan, N.T., Hong Kong· Tel.: +852 2192 1000 Fax: +852 2192 1001 Email <u>service-gc@tuv.com</u>

The test facility is recognized or accredited by the following organizations:

FCC

Test Firm Registration Number : 371735



List of Test and Measurement Instruments

Hong Kong Productivity Council

Radiated Emission

Equipment	Manufacturer	Туре	Cal. Date	Due Date
Multi-functional Anechoic Chamber (SVSWR)	Albatross	N/A	04 Jan 21	04 Jan 23
Standard Gain Horn	ETS-Lindgren	3160-07	24 Nov 20	24 Nov 22
Standard Gain Horn	ETS-Lindgren	3160-08	24 Nov 20	24 Nov 22
Standard Gain Horn	ETS-Lindgren	3160-10	30 Nov 20	30 Nov 22
Double-Ridged Waveguide Horn	EMCO	3116	30 Nov 20	30 Nov 22
Double-Ridged Waveguide Horn	EMCO	3117	11 Nov 20	11 Nov 22
Test Receiver	R&S	ESU26	07 Oct 21	07 Oct 22
Coaxial cable	Huber+Suhner	SF118/11N/11N /12000MM	07 Jan 21	07 Jan 23
Microwave Preamplifier	COM-POWER Corporation	PAM-118A	06 Mar 21	06 Mar 23
Preamplifier 18GHz to 40GHz with cable	A.H. Systems, Inc.	PAM-1840VH	29 Jan 21	29 Jan 23
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	30 Oct 19	30 Oct 22
High Frequency Cable	Pasternack	PE3VNA4001-3M	29 Jan 21	29 Jan 23
Multi-functional Anechoic Chamber (NSA)	Albatross	Nil	6-Jan-21	6-Jan-23
Bi-conical Antenna	R&S	HK116	15-Sep-20	15-Sep-22
Log Periodic Antenna	R&S	HL223	15-Sep-20	15-Sep-22
Coaxial cable	Huber+Suhner	SF118/11N/11N /12000MM	7-Jan-21	7-Jan-23
Active Loop Antenna	EMCO	6502	3-Nov-20	3-Nov-22

TÜV Rheinland Hong Kong Ltd.

Radio Test

Equipment	Manufacturer	Туре	Cal. Date	Due Date
Spectrum Analyzer	R&S	FSV40	10 Jun 22	10 Jun 23



Measurement Uncertainty

The estimated combined standard uncertainty for power-line conducted emissions measurements is ±2.42dB.

The estimated combined standard uncertainty for radiated emissions measurements is ± 4.81 dB (9kHz to 30MHz) and ± 4.62 dB (30MHz to 200MHz) and ± 5.67 dB (200MHz to 1000MHz) and is ± 5.07 dB (1GHz to 8.2GHz) and ± 4.58 dB (8.2GHz to 12.4GHz) and ± 4.78 dB (12.4GHz to 18GHz)

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor of k=2, which for the level of confidence is approximately 95%.



Results FCC Part 15 – Subpart C

FCC 15.203 – Antenna Requirement 1		Pass	
FCC Requirement:	No antenna other than that furnished by the responsible party shall be used with the device		
Results :			
Antenna 1	a) Antenna type:	Internal PCB Antenna	
	b) Manufacturer and model no:	JIAKANG TECHNOLOGY	
		YP-A200-JK-015	
	c) Peak Gain:	-2.32 dBi	
Verdict:	Pass		

FCC 15.204 – Antenna Requirement 2

FCC Requirement:An intentional radiator may be operated only with the antenna with which it is authorized.
If an antenna is marketed with the intentional radiator, it shall be of a type which is
authorized with the intentional radiator.Results:Only one authorized antennas can be used.

Verdict: Pass

FCC 15.207 / RSS-Gen 8.8 – Conducted Emission on AC Mains

N/A

Pass

Pass

There is no AC power input or output ports on the EUT.

FCC 15.247 (a) – Receiver Input Bandwidth

FCC Requirement: The associated receiver(s) complies with the requirement that its input bandwidth matches the bandwidth of the transmitted signal.

Refer to LoRa Specification



FCC 15.247 (a)(2) -	FCC 15.247 (a)(2) – 6dB Bandwidth Measurement Pass			
FCC Requirement:	Systems using digital modulation techniques may operate in the 902 – 928 MHz, 2400 – 2483.5 MHz, and 5725 – 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500kHz.			
Test Specification:Test date:Mode of operation:Supply voltage:Temperature:Humidity:	Specification : ANSI C63.10 – 2013 date : 04.09.2021 of operation : Tx mode ly voltage : 7.2 VDC berature : 23°C dity : 51%			
Results:	or test protocols ple	ase refer to Appendix 1		
Channel frequ	uency (MHz)	6dB bandwidth (kHz)	Limit (kHz)	
903	5.0	631.0	500	
909	0.4	631.0	500	
914	2	630.9	500	
FCC 15.247(b)(3) – Maximum conducted (average) output power Pass				

FCC 15.247(b)(3) – Maximum conducted (average) output power Pass				
FCC Requirement: For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725- 5850MHz bands: 1 Watt (30dBm)				
Test Specification : ANSI C63.10 - 2013Test date : 08.09.2021Mode of operation : Tx modeSupply voltage : 7.2 VDCTemperature : 23°CHumidity : 51%				
Results: For test protocols please refer to Appendix 1				
Frequency (MHz)	Measured Band Power (dBm)	Average Output Power (dBm) (mW)	Limit (dBm W)	Verdict
903.0	-3.69	18.77 75.34	30.0 1	Pass
909.4	-3.96	18.51 65.01	30.0 1	Pass
914.2	-4.33	18.13 25.64	30.0 1	Pass
Duty cycle < 98% and the transmissions exhibit a constant duty cycle during the measurement duration, therefore method AVGPSD-2 applied.				
Average output power is calculated by adding [10 log (1 / D)] dB to Measured Band Power, where D is duty cycle, 1 / D = period / pulse duration				

where D is duty cycle, 1 / D = period / pulse duration

Frequency (MHz)	Pulse duration (ms)	Period (ms)	1 / Duty Cycle	10 log (1 / D) (dB)
903.0	28.36	5001	176.340	22.46
909.4	28.34	5002	176.450	22.47
914.2	28.35	5000	176.367	22.46

FCC Requirement: For systems using digital modulation, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. Test Specification : ANSI C63.10 – 2013 Test date : 15.07.2021									
Test Specification : ANSI C63.10 – 2013									
Test Specification:ANSI C63.10 - 2013Test date:15.07.2021Mode of operation:Tx modeSupply voltage:7.2 VDCTemperature:23°CHumidity:51%									
Results: For test protocols please refer to Appendix 1.									
Frequency (MHz)Measured PSD (dBm)10 log (1 / D) (dB)Average Power Spectral Density (dBm)Limit (dBm)Verdict									
903.0 -3.69 22.46 -1.19 8.0 Pass									
909.4 -3.96 22.47 -1.59 8.0 Pass									
914.2 -4.33 22.46 -1.71 8.0 Pass									
Duty cycle < 98% and the transmissions exhibit a constant duty cycle during the measurement duration, therefore method AVGPSD-2 applied.									

where D is duty cycle, 1 / D = period / pulse duration

FCC 15.247(d) -	FCC 15.247(d) – Spurious Conducted Emissions Pass												
Test Specification : ANSI C63.10 – 2013 Test date : 15.07.2021 (DTS) Mode of operation : Tx mode Supply voltage : 7.2 VDC Temperature : 25°C Humidity : 56%													
FCC Requirement: In any 100 kHz bandwidth outside the frequency band in which the spread spectrur digitally modulated intentional radiator is operating, the radio frequency power that produced by the intentional radiator shall be at least 20 dB below that in the 100 kH bandwidth within the band that contains the highest level of the desired power, bas either an RF conducted or a radiated measurement.													
Results:	Pre-scan has combinations Only the wors	Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. Only the worst cases is shown below. For test protocols refer to Appendix 1											
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Limit (dBm)	Margin (dB)	Verdict							
903.0	459.96	-48.52	18.86	-1.14	47.38	Pass							
903.0	3,822.25	-46.38	18.86	-1.14	45.24	Pass							
903.0	6,971.85	-42.77	18.86	-1.14	41.63	Pass							
903.0	6,981.15	-42.81	18.86	-1.14	41.67	Pass							
909.4	468.60	-47.74	18.56	-1.44	46.30	Pass							
909.4	2,903.35	-45.32	18.56	-1.44	43.88	Pass							
909.4	6,884.95	-42.77	18.56	-1.44	41.33	Pass							
909.4	6,998.45	-42.48	18.56	-1.44	41.04	Pass							
914.2	733.73	-47.22	18.20	-1.80	45.42	Pass							
914.2	3,729.16	-46.06	18.20	-1.80	44.26	Pass							
914.2	6,639.96	-42.77	18.20	-1.80	40.97	Pass							
914.2	6,990.05	-42.38	18.20	-1.80	40.58	Pass							

FCC 15.205 – Radiated Emissions	in Restricted Frequency Bands	Pass									
Test Specification: ANSI C63.10 - 2Test date: 04.08.2021Mode of operation: Tx modeFrequency range: 9kHz - 10GHzSupply voltage: 7.2 VDCTemperature: 25.2°CHumidity: 50%	2013										
FCC Requirement: In any 100kHz level of the des bands must als	FCC Requirement: In any 100kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission general limits.										
Results:Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. All three transmit frequency modes comply with the field strength within the restricted bands. There is no spurious found below 30MHz.											
Mode: 903.0 MHz TX	Vertical Polarization										
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m									
855.680	24.2	46.0 / QP									
1806.000	35.0	74.0 / PK									
1806.000	20.8	54.0 / AV									
Mode: 903.0 MHz TX Horizontal Polarization											
Frequency		Limit/ Detector									
1806.000	23.0	54.0 / AV									
Mode: 909.4 MHz TX	Vertical Polarization	07.07/11									
Frequency	Level	Limit/ Detector									
ЙНz	dBuV/m	dBuV/m									
887.480	27.8	46.0 / QP									
1818.800	41.8	74.0 / PK									
1818.800	24.1	54.0 / AV									
Mode: 909.4 MHz TX	Horizontal Polarization										
Frequency	Level	Limit/ Detector									
MHz	dBuV/m	dBuV/m									
882.230	25.4	46.0 / QP									
1818.800	46.6	74.0 / PK									
Mode: 914.2 MHz TX	Vertical Polarization	54.07 AV									
Frequency	Level	Limit/ Detector									
MHz	dBuV/m	dBuV/m									
898.970	24.0	46.0 / QP									
1828.400	43.9	74.0 / PK									
1828.400	26.1	54.0 / AV									
Mode: 914.2 MHz TX	Horizontal Polarization										
Frequency	Level	Limit/ Detector									
MHz	dBuV/m	dBuV/m									
1828.400	49.3	74.0 / PK									
1828.400	29.9	54.0 / AV									



Appendix 1 Test Results



Transmission Period

TX Frequency 903.0MHz



Date: 11.SEP.2022 16:44:29

TX Frequency : 909.4MHz



Date: 11.SEP.2022 16:46:27



TX Frequency 914.2MHz



Date: 11.SEP.2022 16:49:34



Transmission Pulse Duration

TX Frequency 903.0MHz

Md dam							
a della martin				M1[1] 18.0 10			
				and and all and	1000	28	.36000 r
10 dBm TI	RG 10.000	dBm				and and a star	
0 dBm						- Barris	
-10 dBm					-	167 (a) 176 184	D2
-20 dBm							4
-30 dBm			_		-		
-40 dBm	_				-		1
50 dBm			_	_	-	-	
50 dBm	_		-		-		
CF 903.0 MH	łz		3001 pt	s			3.0 ms
Type Ref	Trc	X-value	Y-value	Function	Fur	nction Result	-

Date: 11.SEP.2022 11:38:49

TX Frequency : 909.4MHz

Spect	rum								
Ref Lo Att SGL TR	evel RG: VIC	30.00 dBm 40 dB	e SWT 3	🖷 R 0 ms 🖷 V	BW 1 MHz BW 3 MHz				
O1AP M	lax								
M1 dBm						M1[1]			18.42 dBm 30.00 µs -27.73 dB
									28.34000 ms
10 dBm	τ	RG 10.000	dBm						
0 dBm—	_								
-10 dBm	n	-		-					02
-20 dBm	1-			_		-			
-30 dBm					-	_	_		
-40 dBm	1-	_			-	-			in the second
50 dBm		_							
50 dBm	-	_	_					_	
CF 909	.4 Mł	łz			3001 p	ts			3.0 ms/
Marker									
Type	Ref	Trc	X-value	e	Y-value	Function	1	Function	n Result
M1 D2	M1	1	28	30.0 µs 1.34 ms	18.42 dBm -27.73 dB				

Date: 11.SEP.2022 11:41:56



TX Frequency 914.2MHz

Spectr	rum						
Ref Le	evel	30.00 dBm	-	RBW 1 MHz			
Att		40 dB	🖷 SWT 30 ms 🖷 '	VBW 3 MHz			
SGL TR	IG: VIE)					
O LAP M	ax						10.17.40.
M1					willi		20.00 µs
20 dBm-							-40.28 dB
10.10	_	-	A.1.		1	1 1	28.35000 ms
10 apm	1	RG 10.000	dBm			-	
0 dBm—	-			_			
-10 dBm		_					
-20 dBm	-			-	-		
-30 dBm							
-40 dBm							a la companya da companya d
50 dBm	-						
50 dBm	-	_			-		
CF 914	.2 M	lz		3001 pt	5		3.0 ms/
Marker							
Туре	Ref	Trc	X-value	Y-value	Function	Functi	on Result
D2	M1	1	20.0 µs 28.35 ms	-40.28 dB			

Date: 11.SEP.2022 11:44:01



6 dB Bandwidth Measurement

TX Frequency 903.0MHz

Spect	rum							
Ref Le Att	vel 3	0.00 dBn 50 dB	3 SWT 18.9	ps = V	BW 100 kHz BW 300 kHz N	lode Auto FFT		
01Pk Ma	ах							
20 dBm				02		M1[1] M1 D2[1]	3	18.79 dBm 903.22290 MHz -5.79 dB -538.40 kHz
10 dBm				1				
0 dBm—	_			/				
-10 dBm	-			-	-			
-20 dBm	-	/		_			_	
-30 dBr	-	~						
-40 dBm							-	
-50 dBm		_		-				
-60 dBm		-		_				
CF 903	.0 MH	Iz			691 pt	s		Span 2.0 MHz
Marker						1		
Туре	Ref	Trc	X-value	O MUL	Y-value	Function	Fun	ction Result
M1 D2	M1	1	903.222	4 kHz	-5.70 dBm			
D3	M1	1	92	6 kHz	-5.84 dB			

Date: 4.SEP.2022 09:44:01

TX Frequency : 909.4MHz

Spect	rum							
Ref Le Att	vel 3	0.00 dBm 50 dB	SWT 18.9	e Re μs e Vi	3W 100 kHz 3W 300 kHz M	ode Auto FFT		
01Pk M	ах							
20 dBm	_			DZ	M1	M1[1]	D 3	18.50 dBm 909,18290 MHz -5.81 dB -98,40 kHz
10 dBm	-	-		P			4	
0 dBm—				/		-		
-10 dBm	n	-	/					6
-20 dBm	n							
-30 dBm	2	~						
-40 dBm	n	-					_	
-50 dBm	n	-						
-60 dBm	n							
CF 909	0.4 MH	Iz			691 pt	5		Span 2.0 MHz
Marker		·						
Туре	Ref	Trc	X-value		Y-value	Function	Fun	iction Result
M1 D2	M1	1	909.182		18,50 dBm -5,81 dB			
D3	M1	1	532	.6 kHz	-5.91 dB		1	

Date: 4.SEP.2022 11:14:23



TX Frequency 914.2MHz

Spect	rum						
Ref Le Att	vel 3	0.00 dBm 50 dB	SWT 18.9 μs 🖷	RBW 100 kHz VBW 300 kHz M	lode Auto FFT		
01Pk M	ах						
20 dBm	-		DZ	M1	M1[1]		18.12 dBm 914.01770 MHz -5.90 dB -133.10 kHz
10 dBm							
0 dBm-	-						
-10 dBn	n	-					
-20 dBn	n.——	~					
_30 dBn						-	
-40 dBn	n	_			-		
-50 dBn	n						
-60 dBn	n	_					
CF 914	1.2 MH	Iz		691 pt	s		Span 2.0 MHz
Marker				1			
Туре	Ref	Trc	X-value	Y-value	Function	Funct	tion Result
D2	M1	1	-133.1 kHz	-5.90 dB			
D3	M1	1	497.8 kHz	-5.93 dB		1	

Date: 4.SEP.2022 11:23:29



Conducted (Average) Output power



TX Frequency 903.0MHz

Date: 8.SEP.2022 11:54:57

TX Frequency : 909.4MHz



Date: 8.SEP.2022 13:25:26



TX Frequency 914.2MHz



Date: 8.SEP.2022 13:30:58



Power Spectral Density

TX Frequency 903.0MHz



Date: 8.SEP.2022 12:03:41

TX Frequency : 909.4MHz



Date: 8.SEP.2022 12:14:02



TX Frequency 914.2MHz

Spectrum						
Ref Level Att SGL Count 2	30.00 dBm 40 dB 00000/20(n - F 8 SWT 632 µs - V 0000	RBW 3 kHz /BW 10 kHz M	lode Auto FFT		
1Rm AvgPwi						
				M1[1]	-24.17 dBm 913.977200 MHz	
20 dBm						
10 dBm	_					
0 dBm						
-10 dBm						
-20 dBm		Mi				
-30 dBm		/ / / /			m	
-40 dBm			-			
-50 dBm	,					
-60 dBm	NNNNN					wwww
CF 914.2 MH	Iz	I	1001 p	ots		Span 1.0 MHz
Marker						
Type Ref M1	Trc 1	X-value 913.9772 MHz	Y-value -24.17 dBm	Function	Functio	n Result

Date: 8.SEP.2022 13:37:27



Spurious Conducted Emissions





Date: 8.SEP.2022 14:35:12

TX Frequency 903.0MHz _ 1M~1GHz

Spectr	um									₽
Ref Le Att	evel 30	.00 dBm 40 dB	n B SWT 10,	= F 1 ms = V	BW 100 kHz BW 300 kHz	Mode A	uto Swe	ер		
1AP Ma	эх									
20 dBm-	-			_		N	11[1]		dBm MHz dBm MHz	
10 dBm-	-				-		1			
0 dBm—	-	_				_	-			_
-10 dBm		-	-	-		-	-	-		
-20 dBm				-				-		_
-30 dBm		-		-						
-40 dBm	-	-		-	M2	-		-		
-50id9m	ant or lite	the set	likele por solo-mon & d		- In the second		-	un let a la company	A 11, 11 and any Holman de la haite and	
-60 dBm-	-	-		-						_
CF 501.	.0 MHz	_		_	10001	pts			Span 1.0 (GHz
Marker	netla	Two I	Vuslus	- 1	M unlug	1 Free	tion 1		unation Desult	-
M1	Ref	1	x-value 903.) MHz	18.85 dB	m Fun	LIUII	F	unction Result	
M2		1	459,9	5 MHz	-48.52 dB	m				

Date: 8.SEP.2022 15:22:14



Spectr	rum							
Ref Le	evel 3	0.00 dBm 40 dB	swr 36,4 ms =	RBW 1 MHz VBW 3 MHz Mi	ode Auto Swee	D		
O1AP Ma	ax							
1 20 dBm-	-	-			D2[1] -52 5.94480 M1[1] 18.6 903.00			
10 dBm-				1		-		
0 dBm—	+							
-10 dBm					-	-		
-20 dBm		-						
-30 dBm	-	-			D2			
Min dam	and seek	. Alexandread Barriel					an chuir an air ann an Anna Aile In Anna Aine an an an Aile	
and and an and a state of the		Menton pullin	I for the spin of	the second s	and the party of the second		The state part of the plant of the second	
-60 dBm	1							
Start 9	00.0 M	1Hz		9101 pt	s	;	Stop 10.0 GHz	
Marker			the factor of the second					
Type	Ref	Trc	X-value	Y-value	Function	Fun	ction Result	
M1 D2	M1	1	903.0 MHz 5.9448 GHz	18.68 dBm -52.03 dB				

TX Frequency : 903.0MHz _ Pre-Scan

Date: 11.SEP.2022 10:11:03

Spect	rum						
Ref Le	evel :	30.00 dBr	n 👄 1	RBW 100 kHz			
ALL 1 AD M	lav	40 0	8 SWT 30,1 ms 📟	VBW 300 KHZ N	Node Auto Swee	p	
1 20 dBm-		_			M2[1]		-46.38 dBm 3.8222526 GHz 18.47 dBm
10 dBm	_						903.0000 MHz
0 dBm—	+	_			_		
-10 dBm	n				_	-	
-20 dBm	n	-					
-30 dBm	n					+	
-40 dBm	n	-				-	M2
				annetitel settentions and set	No. Sparshered on a sparse shirt of all	and the second second	and the state of t
-60 dBm	n	-					
Start 9	00.0	MHz		30001 pt	ts	_	Stop 3.9 GHz
Type	Ref	Trel	X-value	Y-value	Function	Fun	ction Result
M1	ING1	1	903.0 MHz	18.47 dBm	runction	1 dill	octorr no suit
M2		1	3.822253 GHz	-46.38 dBm			

TX Frequency 903.0MHz _ 900M~3.9GHz

Date: 11.SEP.2022 09:47:13



Spectrum						
Ref Level Att	30.00 dBm 40 dB	SWT 30,1 ms 💻	RBW 100 kHz VBW 300 kHz	Mode Auto Swe	ер	
1AP Max						
				M1[1]	100.00	-42.77 dBm 6.8718500 GHz
20 dBm						
10 dBm					-	
0 dBm					-	
-10 dBm						
-20 dBm		-	-			
-30 dBm	-					
-40 dBm	_					M1
-SO ORW-	dulanteraine.		A CARE A LEAST OF LEAST AND			
-60 dBm		_				
Start 3.9 G	Hz		30001 p	its	_	Stop 6.9 GHz
Marker						
Type Ref	Trc 1	X-value 6.87185 GHz	Y-value -42.77 dBm	Function	Funct	ion Result

TX Frequency 903.0MHz _ 3.9~6.9GHz

Date: 11.SEP.2022 09:56:27

TX Frequency 903.0MHz _ 6.9~9.9GHz

Spectrum					
Ref Level Att	30.00 dBm 40 dB		RBW 100 kHz VBW 300 kHz	Mode Auto Swee	эр
1AP Max					
	-			M1[1]	-42.81 dBm 6.9811500 GHz
20 dBm					
10 dBm					
0 dBm	-				
-10 dBm	-				
-20 dBm			-		
-30 dBm	-				
-40 dBm					
-50 dBm		Alter distriction in the second		And the second second second	
-60 dBm					
Start 6.9 GH	z		30001 p	its	Stop 9.9 GHz
Marker					
M1 M1	1 1	6.98115 GHz	Y-value -42.81 dBm	Function	Function Result

Date: 11.SEP.2022 10:06:12



Spect	rum		_	Ū			
Ref Le	evel	30.00 dBm 40 dB	е SWT 18,9 µs 🖷	RBW 100 kHz VBW 300 kHz	Mode Auto FFT		
●1AP M	ax						
20 dBm·	_				M2[1]	MI	-31.69 dBm 902,00000 MHz 18.75 dBm 903.00000 MHz
10 dBm	-						1
0 dBm—	+	-				192.0	
-10 dBm	n	-					
-20 dBm		_			/		
-30 dBm				M2	\sim		~
-40 dBm	1-						
-50 dBm	1-	_					
-60 dBm	1						
Start 9	00.0	MHz	· · · ·	1001 pt	s		Stop 904.0 MHz
Marker							
Туре	Ref	Trc	X-value	Y-value	Function	Functio	on Result
M1 M2		1	903.0 MHz 902.0 MHz	-31.69 dBm			

TX Frequency : 903.0MHz _ Band Edge 902MHz

Date: 11.SEP.2022 11:32:36



TX Frequency 903.0MHz _ Band Edge 928MHz

Date: 11.SEP.2022 11:28:39



Spectrun		_				
Ref Leve Att	1 30.00 dBr 40 d	n – R B SWT 19 µs – V	BW 100 kHz BW 300 kHz M	ode Auto FFT		
●1AP Max						
45 ₀				M1[1]		18.56 dBr 909.56900 MH
20 dBm-		(
10 dBm						
0 dBm			_			
-10 dBm—						
-20 dBm						
-30 dBm—	-					
-40 dBm						
-50 dBm						
-60 dBm						
CF 909.4 M	MHz		201 p	ts		Span 2.0 MHz
Marker Type Re	f Trc	X-value	Y-value	Function	Funct	ion Result
M1	1	ANA'222 ANAS	18.56 dBm			

TX Frequency 909.4MHz _ Reference

Date: 8.SEP.2022 14:22:17

TX Frequency 909.4MHz _ 1M~1GHz



Date: 8.SEP.2022 15:10:20



Spectru	m		1 A A			
Ref Leve	el 30.00 dBr	m 🗕 I	RBW 1 MHz	11 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
Att	40 d	B SWT 36,4 ms 🖷 1	VBW 3 MHz MC	de Auto Sweep		
1AP Max						
				M2[1]		-33.14 dBm
20 dBm-				MILII		18 68 dBm
				witt r1		909,400 MHz
10 dBm-					-	
100 C						
n dBm			_			
-						
-10 dBm-			_			
10 00111						
-20 d8m-						1 1 1 1 1
20 0011	1					
-20 dBm-				M2		
-30 000				Turner and the		
Man damath	. I de anno anno	and the state of t	New States of the second states of the		No. and a fair of the state of the	And a standard and a stand of
1. Contraction						
				And Annual states and the states of the		
Internet Service	and the state of the	an and a state of the state of	and the state of the		the shall be a state of the sta	And provide a state of the second
COL IN.						+
-60 08m-						
	la se sere					
Start 900	.0 MHz		9101 pt	s		top 10.0 GHz
Marker						
Type R	ef Trc	X-value	Y-value	Function	Function Re	sult
M1	1	909.4 MHz	18.68 dBm			
M2	1	6.8758 GHz	-33.14 dBm			

TX Frequency : 909.4MHz _ Pre-Scan

Date: 8.SEP.2022 18:01:02



TX Frequency 909.4MHz _ 900M~3.9GHz

Date: 8.SEP.2022 18:09:52



Spectrum Ref Level 30.00 dBm 🖷 RBW 100 kHz Att 40 dB SWT 30.1 ms 🖷 VBW 300 kHz Mode Auto Sweep ●1AP Max M1[1] -42.77 dBm 6.8849500 GHz 20 dBm 10 dBm-0 dBm -10 dBm -20 dBm--30 dBm 40 dBm U GBD -60 dBm-Start 3.9 GHz 30001 pts Stop 6.9 GHz Marker Type | Ref | Trc | X-value Y-value Function **Function Result** M1 6.88495 GHz -42.77 dBm 1

TX Frequency 909.4MHz _ 3.9~6.9GHz

Date: 8.SEP.2022 18:18:25

TX Frequency 909.4MHz _ 6.9~9.9GHz



Date: 8.SEP.2022 18:29:51



Spect	rum					
Ref Lo Att	evel	30.00 dBm 40 dB	e RB SWT 19 μs e VB	W 100 kHz W 300 kHz Mo	de Auto FFT	
1AP M	lax					
20 dBm	-				M2[1]	-49.34 dBm 902.00000 MH 1 <u>8.42 d</u> Bm 909.40000 MH
10 dBm						
0 dBm—	-	_		-		
-10 dBm	n					
-20 dBm	n					
-30 dBm	n					mann
-40 dBm	n	M	2	m	mon	
-50 984	Kun	man and	hannen			
-60 dBm	n		* :**			
Start 9	00.0	MHz	+ 422 +	1001 pt	s	Stop 910.0 MHz
Marker						
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1 M2	-	1	909.4 MHz 902.0 MHz	18.42 dBm -49.34 dBm		

TX Frequency : 909.4MHz Band Edge 902MHz

Date: 11.SEP.2022 11:03:21



TX Frequency 909.4MHz _ Band Edge 928MHz

Date: 11.SEP.2022 11:17:14



Spectrum						
Ref Level Att	30.00 dB 40 d	m 🖷 RB IB SWT 19 µs 🖷 VB	W 100 kHz W 300 kHz Mo	de Auto FFT		
●1AP Max						
194 ₁₀		M		M1[1]		18.20 dBm 913.96100 MHz
20 dBm-						
10 dBm	_					
0 dBm	-					
-10 dBm						
-20 dBm	/					
-30 dBm						
-40 dBm						
-50 dBm						
-60 dBm						
CF 914.2 M	Ηz		201 pt	5		Span 2.0 MHz
Marker						
Type Ref M1	Trc 1	X-value 913.961 MHz	Y-value 18.20 dBm	Function	Functi	on Result

TX Frequency 914.2MHz _ Reference

Date: 8.SEP.2022 14:19:35

TX Frequency 914.2MHz _ 1M~1GHz



Date: 8.SEP.2022 15:36:35



Spect	rum			1.1.1			
Ref Le	evel	30.00 dBr 40 dl	n 🗧 B SWT 36,4 ms 🖷	RBW 1 MHz VBW 3 MHz M	ode Auto Swee	p	
O1AP M	lax						
20 dBm·	-				M1[1] M2[1]		18.44 dBm 914.200 MHz -33.05 dBm 7.008829 GHz
10 dBm-	-			-			
0 dBm—	-	_		-		-	
-10 dBm	n	_			_	-	
-20 dBm	n					_	
-30 dBm	n					M2	
and a well to		and a solution	and the second	فما خروفي وينارك	and dilling and the second	No. of controls all	in a second data and the second
land as a stream	م الأراد مع		a particular and a second s		and an an and the second second	a summer and	Internet and the particular second
-60 dBm	n						1000 U
CF 5.4	5 GHz			9101 pt	s		Span 9.1 GHz
Marker							
Туре	Ref	Trc	X-value	Y-value	Function	Fund	ction Result
M1 M2	_	1	914.2 MHz	18.44 dBm			
1412		÷	1.000023 GHZ	55705 UBIII			

TX Frequency : 914.2MHz _ Pre-Scan

Date: 8.SEP.2022 15:49:11



TX Frequency 914.2MHz _ 900M~3.9GHz

Date: 8.SEP.2022 16:13:22



Spectrum Ref Level 30.00 dBm 🖷 RBW 100 kHz Att 40 dB SWT 30.1 ms 🖷 VBW 300 kHz Mode Auto Sweep ●1AP Max M1[1] 42.77 dBm 6.6399600 GHz 20 dBm 10 dBm-0 dBm -10 dBm--20 dBm--30 dBm 40 dBm 7 U OBM -60 dBm-Start 3.9 GHz 30001 pts Stop 6.9 GHz Marker Type | Ref | Trc | X-value Y-value Function **Function Result** M1 6.63996 GHz -42.77 dBm 1

TX Frequency 914.2MHz _ 3.9~6.9GHz

Date: 8.SEP.2022 16:24:54

TX Frequency 914.2MHz _ 6.9~9.9GHz



Date: 8.SEP.2022 16:49:02



	<u> </u>	_	_	Ũ			(m
Spect	rum						
Ref L	evel	30.00 dBm	🖷 RB	₩ 100 kHz	1.		
Att		40 dB	SWT 19 µs 🖷 VB	W 300 kHz Mo	de Auto FFT		
DIAP M	lax						
-					M2[1]		-49.37 dBm
00 d0m							905'0080 WHS
20 ubm					M1[1]		18.25 dBm
					4	1 1	914.2000 MHz
10 dBm	-						
0 dBm-	-			-			
-10 dBm	n						
-20 dBm	n						
-20 dBm							
30 001						monaring	man
40 d0m					N		5.5
-40 080	0				Arrow .		
Anna	1	M2		A	- nerona		
-50 dBm	n		when a second a for the second				
-60 dBm	n						
Start 9	00.0	MHz		1001 pt	5		Stop 915.0 MHz
Marker							
Type	Ref	Trc	X-value	Y-value	Function	Functi	on Result
M1		1	914.2 MHz	18.25 dBm			
M2		1	902.0 MHz	-49.37 dBm			

TX Frequency : 914.2MHz Band Edge 902MHz

Date: 11.SEP.2022 16:28:26



TX Frequency 914.2MHz _ Band Edge 928MHz

Date: 11.SEP.2022 11:22:55



Appendix 2

Test Setup Photos

Test Report No.: CN2218VL 001





Set up for Radiated Emission Above 1G



Set up for Radiated Emission Below 200M~1G



Set up for Radiated Emission 30M~200MHz



Set up for Radiated Emission Below 30MHz



Appendix 3 EUT External Photos

FCC ID: 2AMWTLRS10701



























Appendix 4

EUT Internal Photos

FCC ID: 2AMWTLRS10701



































Appendix 5

RF Exposure Information

FCC ID: 2AMWTLRS10701

Maximum Effective Radiated Power

According to KDB 447498 D04, MPE based exemption is determine in § 1.1307(b)(3)(i)(C) :

A single RF source is exempt if using Table 1 of § 1.1307(b)(3)(i)(C) and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency.

RF Source frequency (MHz)	Threshold ERP (watts)
300 ~ 1,500	0.0128 R ² f
1,500 ~ 100,000	19.2 R ²

Table 1 of § 1.1307(b)(3)(i)(C)

Where R = 20cm, the minimum distance mentioned in module datasheet.

For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters

For Frequency between 300MM~1,500M, Max. ERP is no more than the Threshold ERP = $0.0128 \times (0.2m)^2 \times f$ (in MHz)

 $\lambda/2\pi$ and Threshold ERP is calculated in below table

Frequency (MHz)	Wavelength λ (m)	λ/2π (cm)	R (cm)	Threshold ERP (W)
903.0	0.332	5.29	20	0.4623
909.4	0.330	5.25	20	0.4656
914.2	0.328	5.22	20	0.4681

Result :

Max. ERP (dBm) = P + T + G Where

P = Maximum pear output power

T = Maximum tune up tolerance declare by customer

G = Antenna Gain relative to half-wave dipole (dBd)

Frequency (MHz)	Maximum Output power (dBm)	Maximum Tune Up Tolerance (dB)	Antenna Gain relative to half-wave dipole (dBd)	Max. ERP (dBm)	Max. ERP (W)	Threshold ERP (W)
903.0	18.77	+2	-4.47	16.30	0.0427	0.4623
909.4	18.51	+2	-4.47	16.04	0.0402	0.4656
914.2	18.13	+2	-4.47	15.66	0.0368	0.4681

Note :

- highest antenna gain within the operating range of the antenna is taken
- dBd = dBi 2.15dB as per KDB 447498 D04 note 10

Conclusion:

Max. ERP of all frequencies lower than Threshold ERP No SAR is required.