

FCC REPORT

(LoRa WAN)

Applicant: SPE SMARTICO, LLC

Address of Applicant: 82G, Oleksandra Polya Avenue, Dnipro, Ukraine, 49000

Equipment Under Test (EUT)

Product Name: Smartico Industrial Sensor LoRaWAN

Model No.: IS-LR

Trade mark: Smartico

FCC ID: 2AURW-SISLR02

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Date of sample receipt: 07 Jan., 2021

Date of Test: 05 Mar., to 21 May, 2021

Date of report issued: 10 Jun., 2021

Test Result: PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Bruce Zhang
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the JYT product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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2 Version

Version No.	Date	Description
00	24 May, 2021	Original
01	10 Jun., 2021	Update page 4, 7, 8, 10, 20, and update FCC ID.

Tested by:



Test Engineer

Date:

10 Jun., 2021

Reviewed by:



Project Engineer

Date:

10 Jun., 2021

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4 Test Summary

Test Items	Section in CFR 47	Result
Antenna requirement	15.203/15.247 (b)(4)	Pass
AC Power Line Conducted Emission	15.207	Pass*
Conducted Peak Output Power	15.247 (b)(3)	Pass*
6dB Emission Bandwidth	15.247 (a)(2)	Pass*
Power Spectral Density	15.247 (e)	Pass*
Restricted bands	15.205/15.247(d)	Pass
Conducted and radiated Spurious Emission	15.205/15.209	Pass
Remark: 1. Pass: Meet the requirement. 2. N/A: Not Applicable. 3. Pass*: refer to the FCC ID: 2AURW-LORARF, Report No.: RDG190927003-00A.		
Test Method:	ANSI C63.10-2013 KDB 558074 D01 15.247 Meas Guidance v05r02	

5 General Information

5.1 Client Information

Applicant:	SPE SMARTICO, LLC
Address:	82G, Oleksandra Polya Avenue, Dnipro, Ukraine, 49000
Manufacturer/Factory:	SPE SMARTICO, LLC
Address:	82G, Oleksandra Polya Avenue, Dnipro, Ukraine, 49000

5.2 General Description of E.U.T.

Product Name:	Smartico Industrial Sensor LoRaWAN
Model No.:	IS-LR
Operation Frequency:	903.0 MHz - 914.2 MHz
Channel numbers:	8
Channel separation:	1.6 MHz
Modulation type:	Lora
Antenna Type:	Internal antenna External antenna
Antenna gain:	Internal antenna: 1.6dBi External antenna: 5.0dBi
Power supply:	Rechargeable Li-ion Battery DC3.6V, 9000mAh
Test Sample Condition:	The test samples were provided in good working order with no visible defects.

Operation Frequency each of channel			
Channel	Frequency	Channel	Frequency
1	903.0MHz	5	909.4MHz
2	904.6MHz	6	911.0MHz
3	906.2MHz	7	912.6MHz
4	907.8MHz	8	914.2MHz
Remark: Channel 1, 4 & 8 were selected to test.			

5.3 Test environment and mode

Operating Environment:	
Temperature:	24.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010 mbar
Test mode:	
Transmitting mode	Keep the EUT in continuous transmitting with modulation
The sample was placed 0.8m (below 1GHz)/1.5m (above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. Duty cycle setting during the transmission is 100% with maximum power setting for all modulations.	

5.4 Description of Support Units

Manufacturer	Description	Model	S/N	FCC ID/DoC
LENOVO	Laptop	SL510	2847A65	DoC

5.5 Measurement Uncertainty

Parameters	Expanded Uncertainty
Conducted Emission (9kHz ~ 30MHz)	±1.60 dB (k=2)
Radiated Emission (9kHz ~ 30MHz)	±3.12 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	±4.32 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.16 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±3.20 dB (k=2)

5.6 Additions to, deviations, or exclusions from the method

No

5.7 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations: ● FCC - Designation No.: CN1211 JianYan Testing Group Shenzhen Co., Ltd. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Registration No. is 727551. ● CNAS - Registration No.: CNAS L6048 JianYan Testing Group Shenzhen Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048. ● A2LA - Registration No.: 4346.01 This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: https://portal.a2la.org/scopepdf/4346-01.pdf
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5.8 Laboratory Location

JianYan Testing Group Shenzhen Co., Ltd. Address: No.101, Building 8, Innovation Wisdom Port, No.155 Hongtian Road, Huangpu Community, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, People's Republic of China. Tel: +86-755-23118282, Fax: +86-755-23116366 Email: info@ccis-cb.com, Website: http://www.ccis-cb.com
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5.9 Test Instruments list

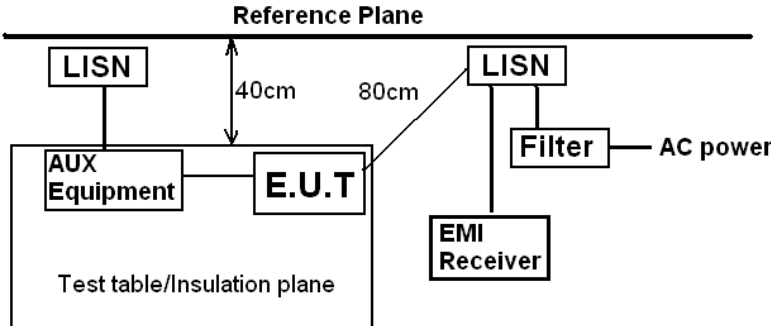
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	ETS	9m*6m*6m	966	01-19-2021	01-18-2024
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-03-2021	03-02-2022
Biconical Antenna	SCHWARZBECK	VUBA9117	359	06-18-2020	06-17-2021
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-03-2021	03-02-2022
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-18-2020	06-17-2021
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170582	11-18-2020	11-17-2021
Loop Antenna	SCHWARZBECK	FMZB 1519 B	00044	06-20-2020	06-19-2023
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-03-2021	03-02-2022
Pre-amplifier	CD	PAP-1G18	11804	03-03-2021	03-02-2022
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-03-2021	03-02-2022
Spectrum analyzer	Rohde & Schwarz	FSP40	100363	11-18-2020	11-17-2021
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-03-2021	03-02-2022
Spectrum Analyzer	Agilent	N9020A	MY50510123	11-18-2020	11-17-2021
Signal Generator	Rohde & Schwarz	SMX	835454/016	03-03-2021	03-02-2022
Signal Generator	R&S	SMR20	1008100050	03-03-2021	03-02-2022
EMI Test Software	Tonscend	TS+	Version: 3.0.0.1		
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-03-2021	03-02-2022
Cable	MICRO-COAX	MFR64639	K10742-5	03-03-2021	03-02-2022
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-03-2021	03-02-2022
DC Power Supply	XinNuoEr	WYK-10020K	1409050110020	09-25-2020	09-24-2021
Temperature Humidity Chamber	HengPu	HPGDS-500	20140828008	11-01-2020	10-31-2021

6 Test results and Measurement Data

6.1 Antenna requirement:

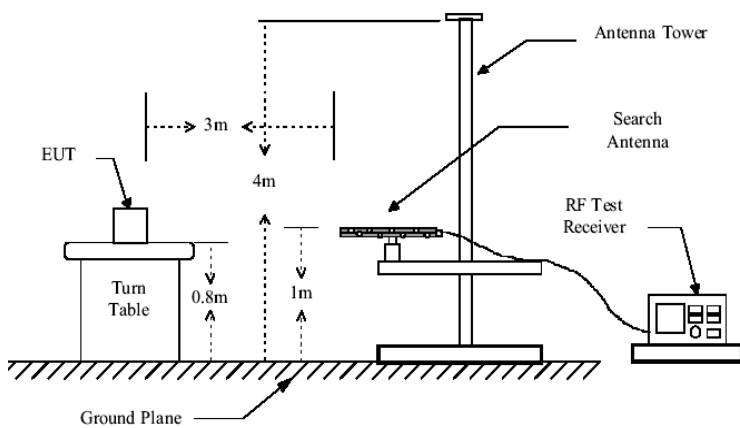
Standard requirement:	FCC Part 15 C Section 15.203 /247(b)(4)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
E.U.T Antenna:	
The antenna is an internal antenna which permanently attached, and the best case gain of the antenna is 1.6 dBi. The antenna is an external antenna which uses a unique connector, and the best case gain of the antenna is 5.0 dBi.	

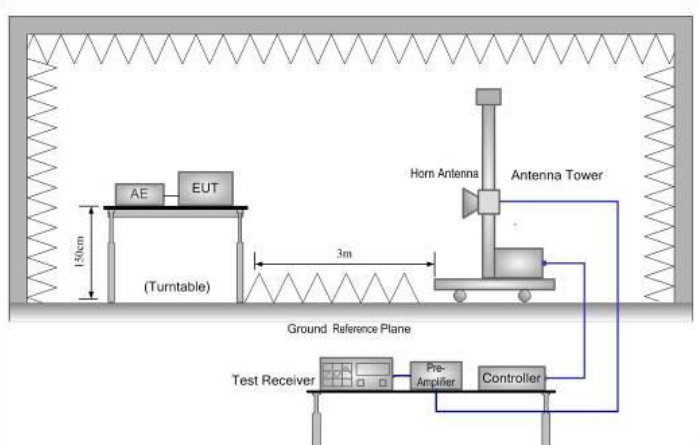
6.2 Conducted Emission

Test Requirement:	FCC Part 15 C Section 15.207		
Test Frequency Range:	150 kHz to 30 MHz		
Class / Severity:	Class B		
Receiver setup:	RBW=9kHz, VBW=30kHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
* Decreases with the logarithm of the frequency.			
Test procedure	- The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.), which provides a 50ohm/50uH coupling impedance for the measuring equipment. - The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). - Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4(latest version) on conducted measurement.		
Test setup:	 <i>Remark</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m		
Test Instruments:	Refer to section 5.9 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	N/A(EUT is powered by DC 3.6V)		

6.3 Restricted bands

6.3.1 Radiated Emission Method

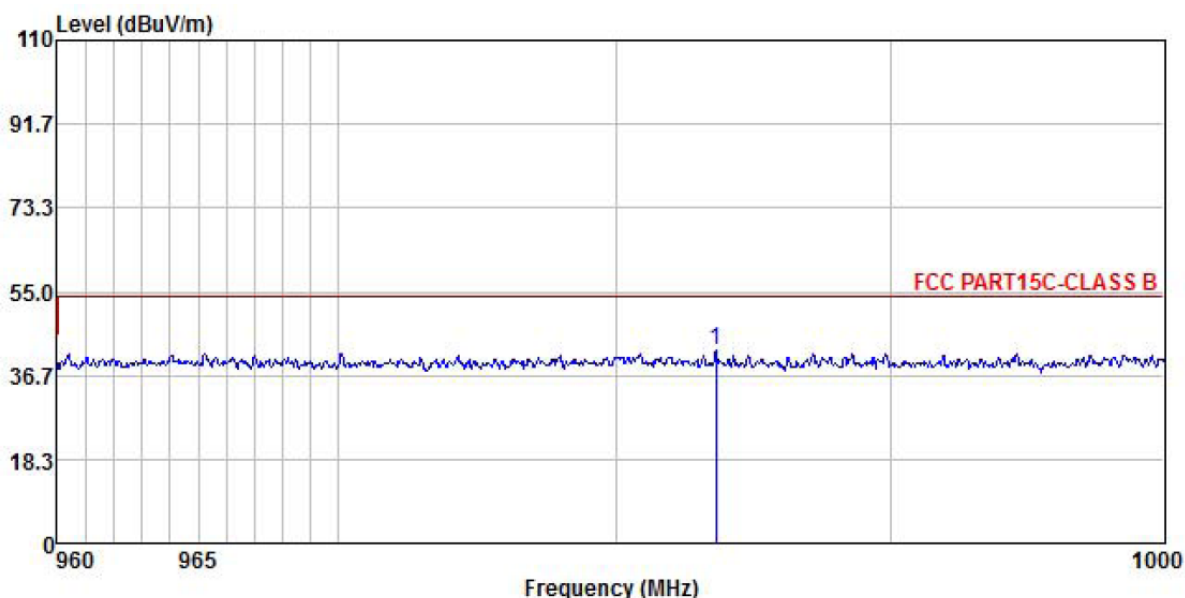
Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Frequency Range:	960MHz to 1.240GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	960MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
RMS		1MHz	3MHz	Average Value	
Limit:	Frequency	Limit (dBuV/m @3m)			Remark
	960MHz-1GHz	54.00			Quasi-peak Value
	Above 1GHz	54.00			Average Value
74.00			Peak Value		
Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8m(below 1GHz) /1.5m(above 1GHz) above the groundat a 3 meter chamber.The table was rotated 360 degrees todetermine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, whichwas mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatablewas turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and SpecifiedBandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limitspecified, then testing could be stopped and the peak values of the EUT wouldbe reported. Otherwise the emissions that did not have 10dB margin would bere-tested one by one using peak, quasi-peak or average method as specified andthen reported in a data sheet.				
Test setup:	Below 1GHz  Above 1GHz				

	
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed

Below 1GHz:

Internal antenna

Product Name:	Smartico Industrial Sensor LoRaWAN	Product Model:	IS-LR
Test By:	Mike	Test mode:	Tx mode
Test Channel:	Highest channel	Polarization:	Vertical
Test Voltage:	DC3.6V	Environment:	Temp: 24℃ Huni: 57%

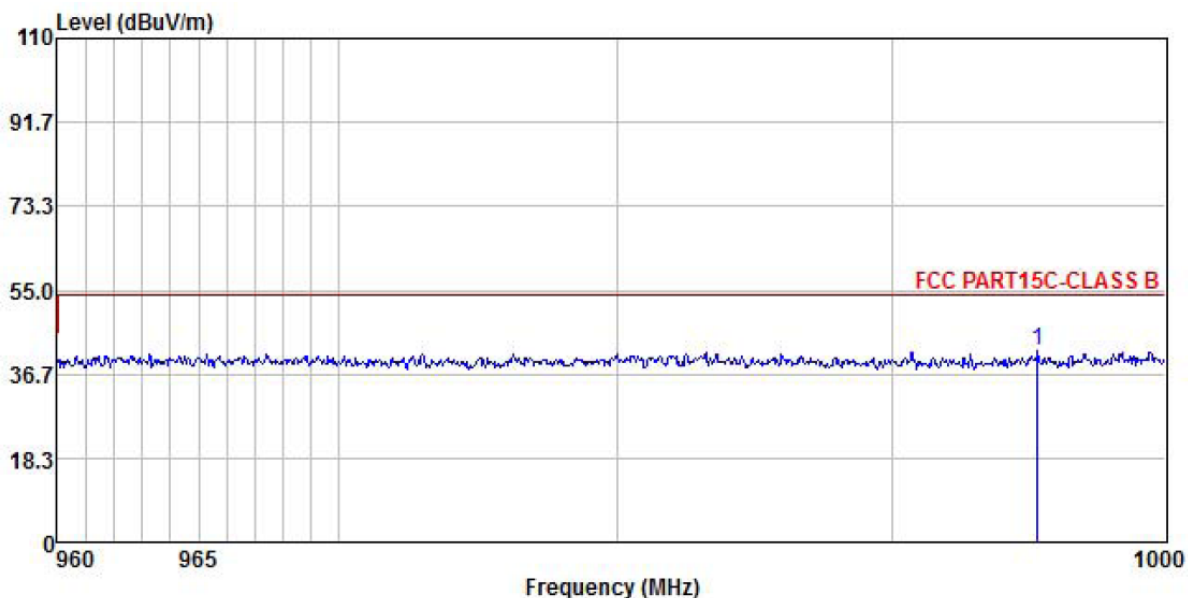


	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	983.603	15.58	23.00	3.61	0.00	42.19	54.00	-11.81	QP

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	Smartico Industrial Sensor LoRaWAN	Product Model:	IS-LR
Test By:	Mike	Test mode:	Tx mode
Test Channel:	Highest channel	Polarization:	Horizontal
Test Voltage:	DC3.6V	Environment:	Temp: 24℃ Humi: 57%



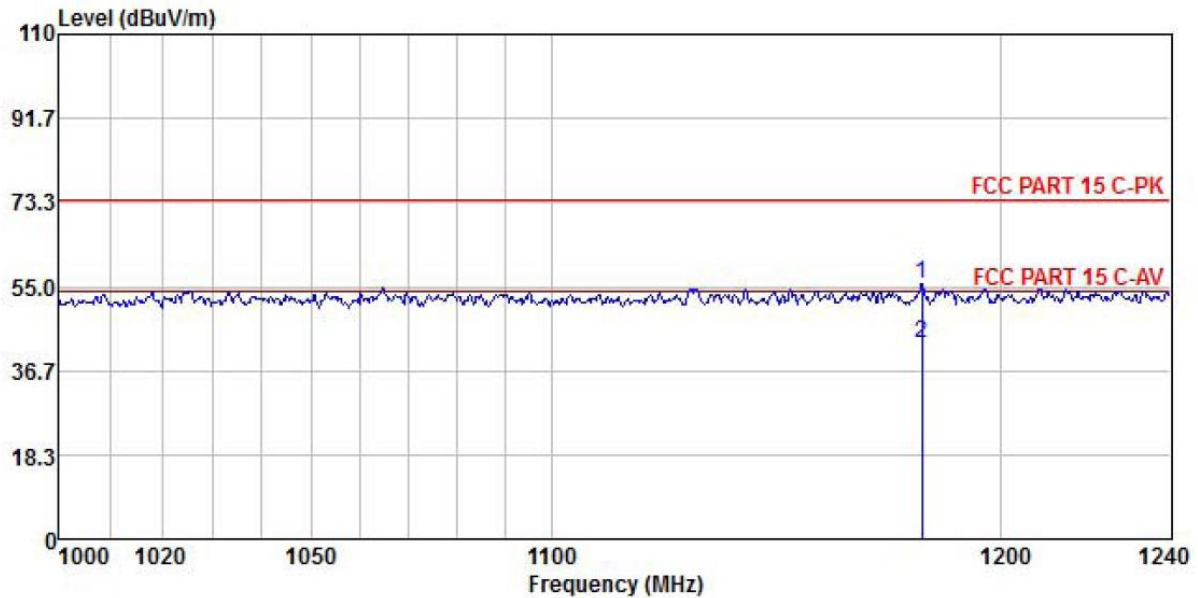
	Freq	ReadAntenna	Cable Preamp		Limit	Over	
		Level	Factor	Loss	Factor	Level	Line
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m
							dB
1	995.276	14.90	23.08	3.67	0.00	41.65	54.00
							-12.35
							QP

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Above 1GHz:

Product Name:	Smartico Industrial Sensor LoRaWAN	Product Model:	IS-LR
Test By:	Mike	Test mode:	Tx mode
Test Channel:	Highest channel	Polarization:	Vertical
Test Voltage:	DC3.6V	Environment:	Temp: 24℃ Humi: 57%

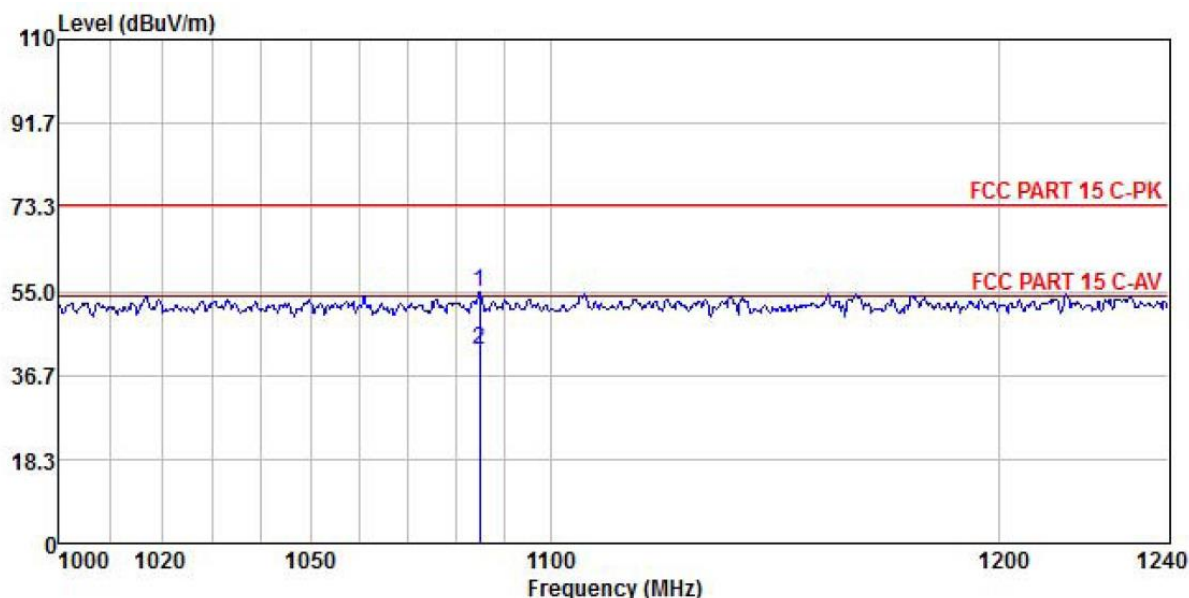


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1181.667	25.14	24.29	6.05	0.00	55.48	74.00	-18.52	Peak
2	1181.667	12.34	24.29	6.05	0.00	42.68	54.00	-11.32	Average

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	Smartico Industrial Sensor LoRaWAN	Product Model:	IS-LR
Test By:	Mike	Test mode:	Tx mode
Test Channel:	Highest channel	Polarization:	Horizontal
Test Voltage:	DC3.6V	Environment:	Temp: 24℃ Humi: 57%



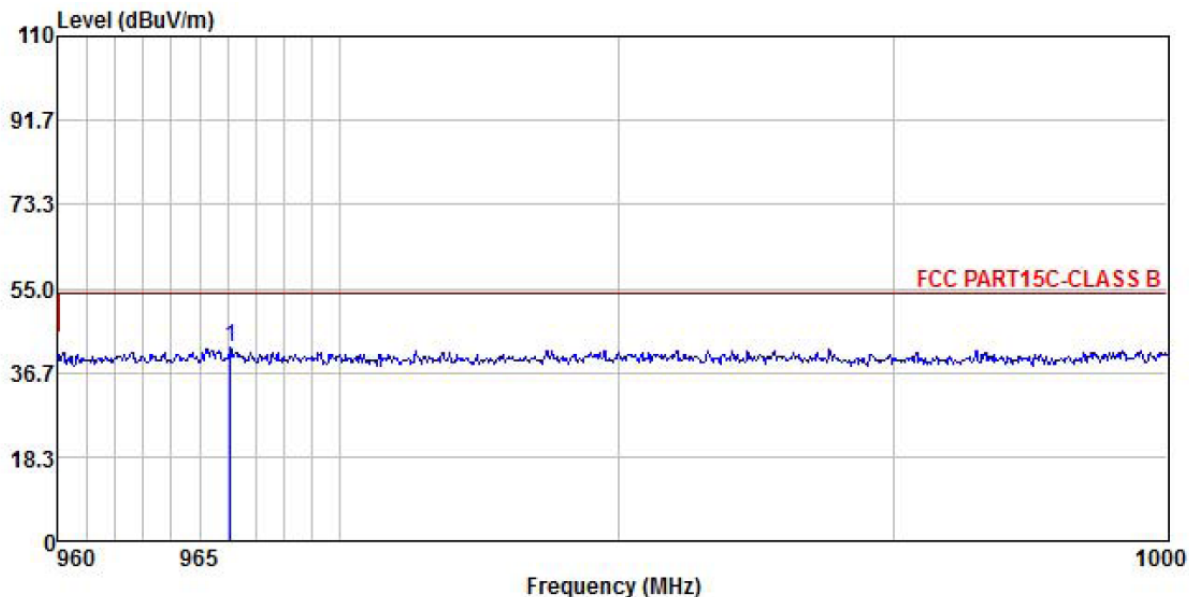
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1084.943	24.75	24.24	5.78	0.00	54.77	74.00	-19.23	Peak
2	1084.943	12.17	24.24	5.78	0.00	42.19	54.00	-11.81	Average

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

External antenna

Product Name:	Smartico Industrial Sensor LoRaWAN	Product Model:	IS-LR
Test By:	Mike	Test mode:	Tx mode
Test Channel:	Highest channel	Polarization:	Vertical
Test Voltage:	DC3.6V	Environment:	Temp: 24℃ Humi: 57%

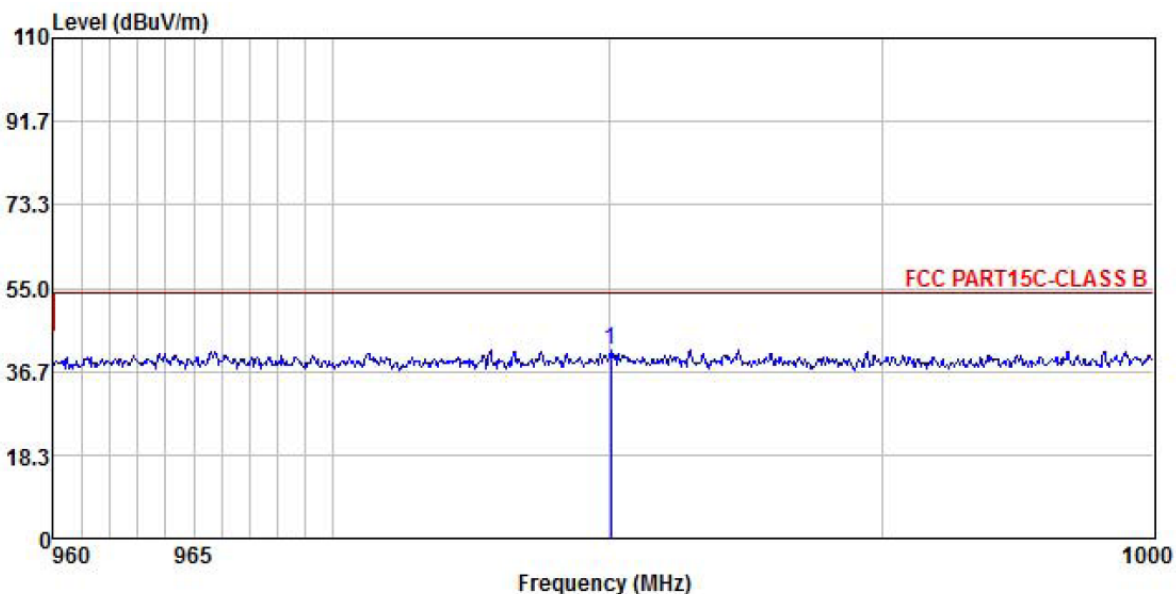


	Freq	ReadAntenna	Cable	Preamp	Limit	Over	
		Level	Factor	Loss	Factor	Level	Line
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m
1	966.094	15.93	22.90	3.54	0.00	42.37	54.00
							-11.63
							QP

Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	Smartico Industrial Sensor LoRaWAN	Product Model:	IS-LR
Test By:	Mike	Test mode:	Tx mode
Test Channel:	Highest channel	Polarization:	Horizontal
Test Voltage:	DC3.6V	Environment:	Temp: 24℃ Humi: 57%



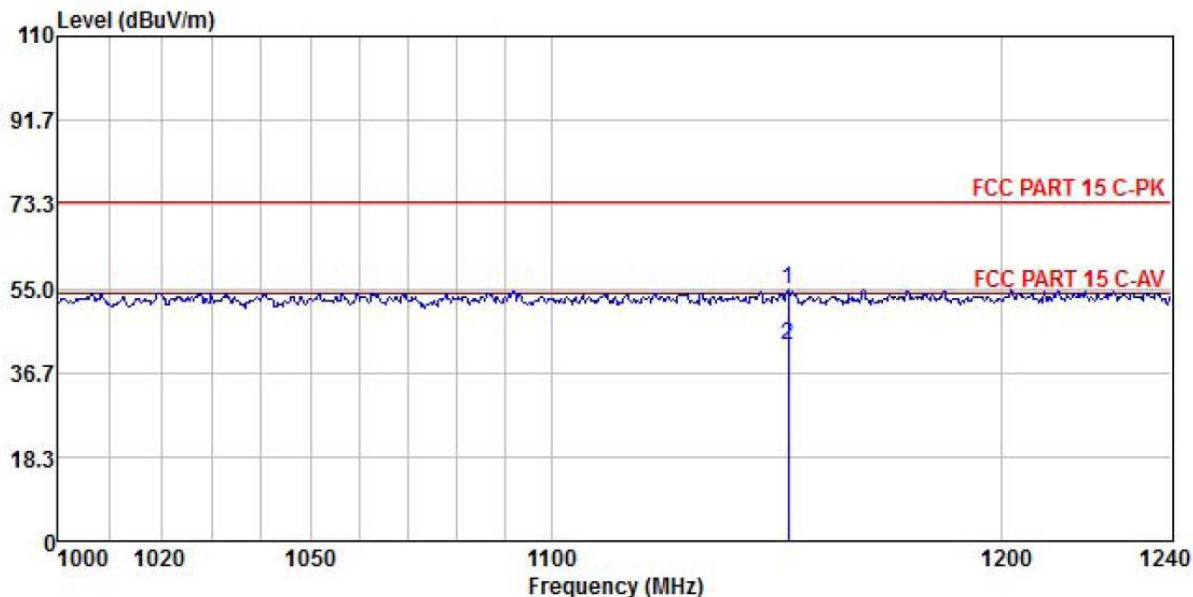
	Freq	ReadAntenna	Cable	Preamp		Limit	Over	
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit
		dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	980.036	14.86	22.98	3.60	0.00	41.44	54.00	-12.56 QP

Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are very lower than the limit and not show in test report.

Above 1GHz:

Product Name:	Smartico Industrial Sensor LoRaWAN	Product Model:	IS-LR
Test By:	Mike	Test mode:	Tx mode
Test Channel:	Highest channel	Polarization:	Vertical
Test Voltage:	DC3.6V	Environment:	Temp: 24℃ Humi: 57%

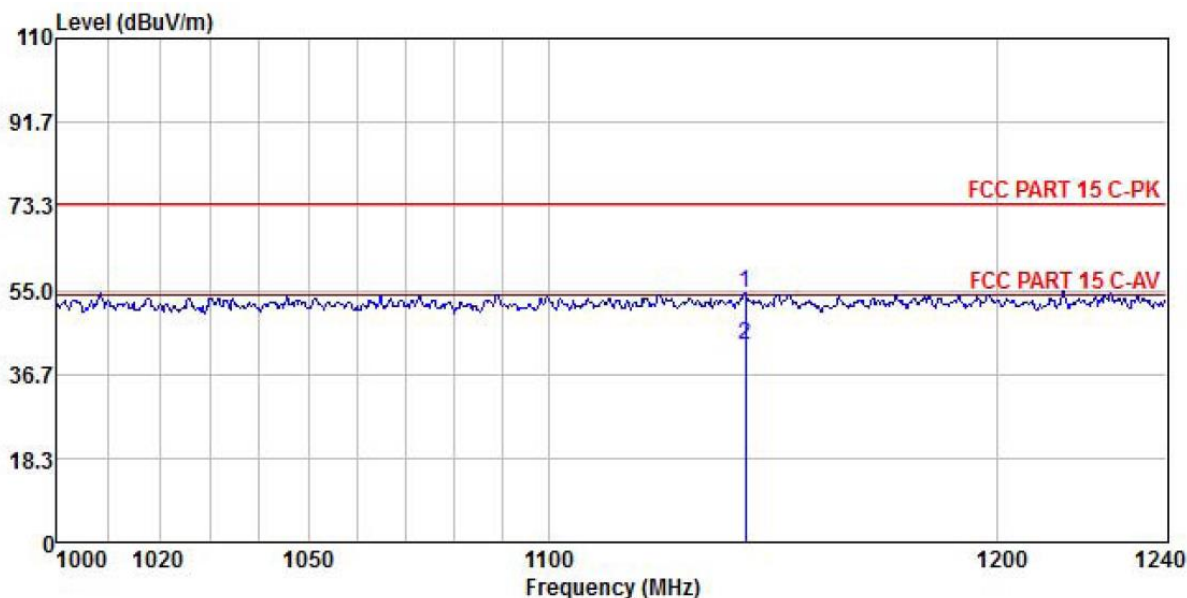


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1151.307	24.62	24.28	5.96	0.00	54.86	74.00	-19.14	Peak
2	1151.307	12.54	24.28	5.96	0.00	42.78	54.00	-11.22	Average

Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	Smartico Industrial Sensor LoRaWAN	Product Model:	IS-LR
Test By:	Mike	Test mode:	Tx mode
Test Channel:	Highest channel	Polarization:	Horizontal
Test Voltage:	DC3.6V	Environment:	Temp: 24℃ Humi: 57%



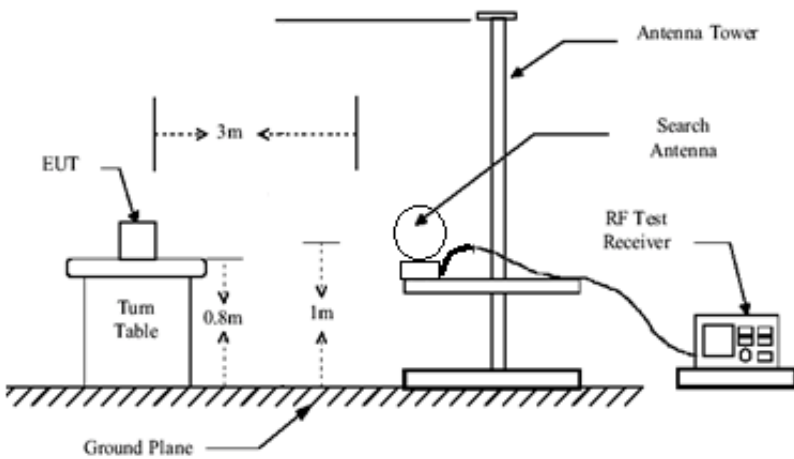
	Freq	ReadAntenna	Cable Preamp	Level	Limit	Over	
	MHz	Level	Factor	Loss	Factor	Line	Limit
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m
1	1142.672	24.37	24.27	5.91	0.00	54.55	74.00
2	1142.672	12.70	24.27	5.91	0.00	42.88	54.00

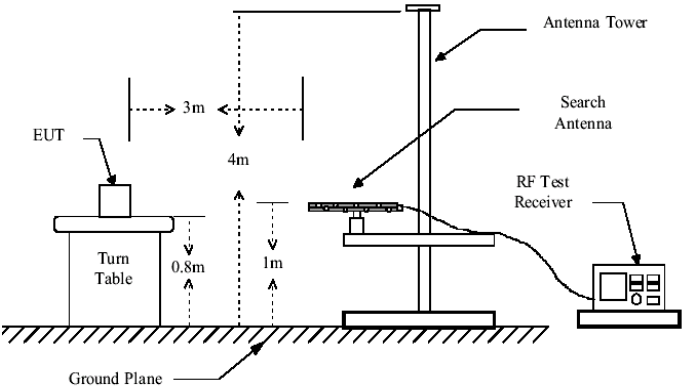
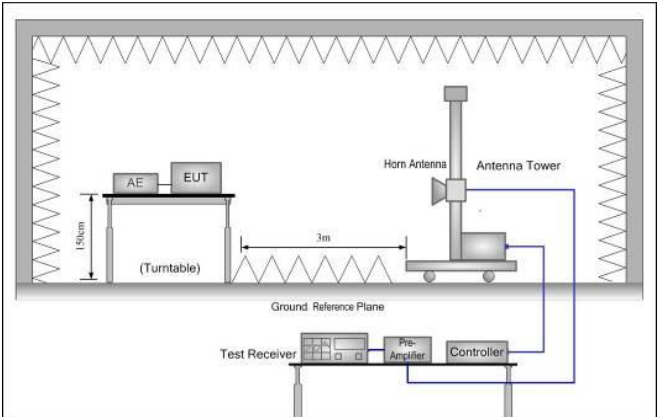
Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are very lower than the limit and not show in test report.

6.4 Spurious Emission

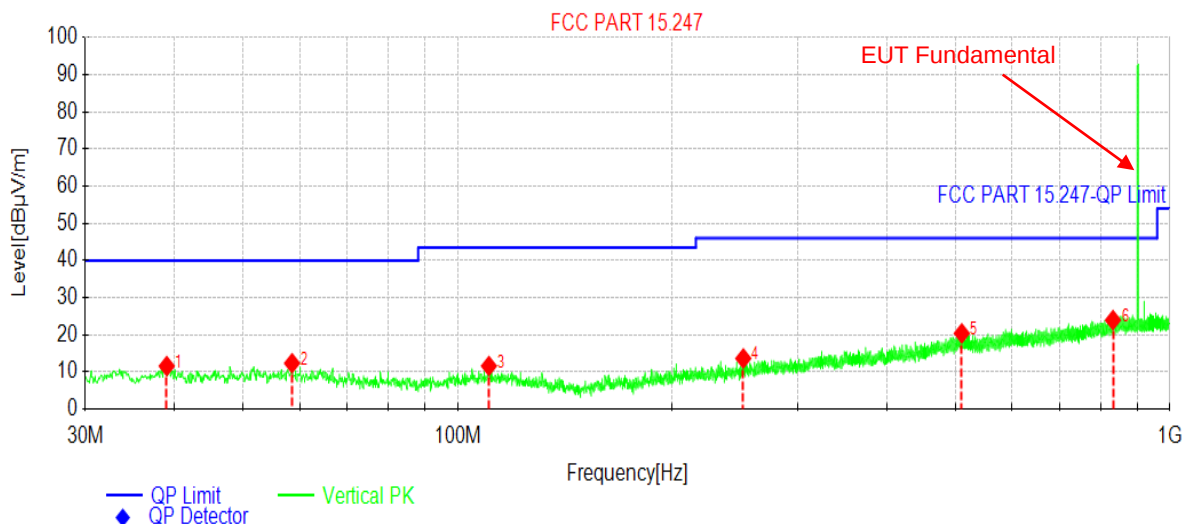
6.4.1 Radiated Emission Method

Test Requirement:	FCC Part 15 C Section 15.209 and 15.205				
Test Frequency Range:	9kHz to 25GHz				
Test Distance:	3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
RMS		1MHz	3MHz	Average Value	
Limit:	Frequency		Limit (dBuV/m @3m)		Remark
	30MHz-88MHz		40.0		Quasi-peak Value
	88MHz-216MHz		43.5		Quasi-peak Value
	216MHz-960MHz		46.0		Quasi-peak Value
	960MHz-1GHz		54.0		Quasi-peak Value
	Above 1GHz		54.0		Average Value
Test Procedure:			74.0		Peak Value
	1. The EUT was placed on the top of a rotating table 0.8m(below 1GHz)/1.5m(above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.				
	2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.				
	3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.				
	4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.				
	5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.				
Test setup:	6. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.				
	9kHz-30MHz				
					

	30MHz - 1GHz  Above 1GHz 
Test Instruments:	Refer to section 5.9 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed
Remark:	1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case. 2. 9 kHz to 30MHz is too low, so only shows the data of above 30MHz in this report.

Measurement Data (worst case):
Below 1GHz:
Internal antenna

Product Name:	Smartico Industrial Sensor LoRaWAN	Product Model:	IS-LR
Test By:	Mike	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical
Test Voltage:	DC3.6V	Environment:	Temp: 24℃ Humi: 57%

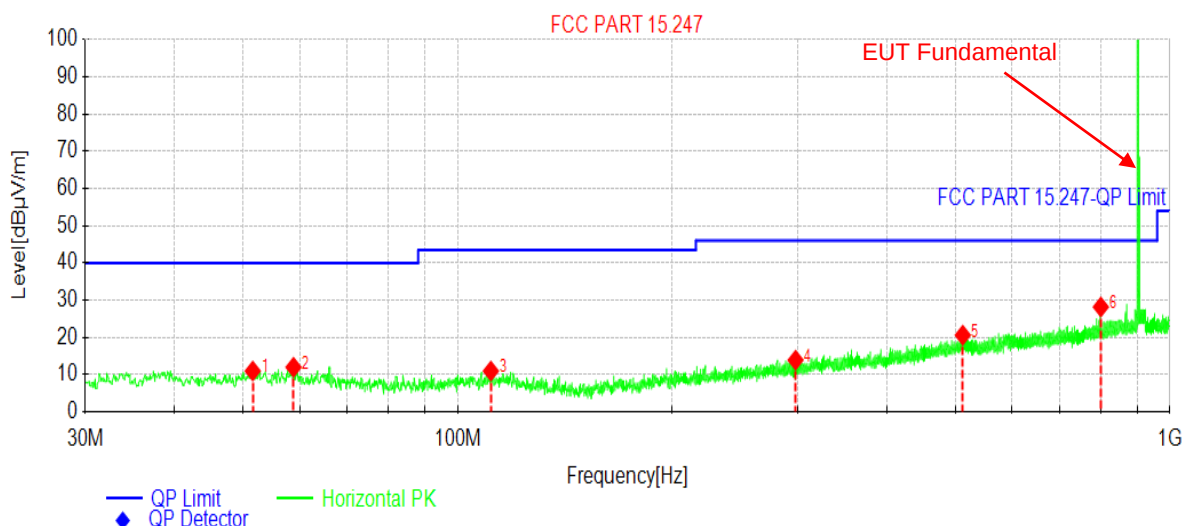


NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	39.0219	28.46	11.56	-16.90	40.00	28.44	QP	Vertical
2	58.5209	29.46	12.33	-17.13	40.00	27.67	QP	Vertical
3	110.615	29.51	11.58	-17.93	43.50	31.92	QP	Vertical
4	251.764	28.82	13.61	-15.21	46.00	32.39	QP	Vertical
5	510.295	29.88	20.38	-9.50	46.00	25.62	QP	Vertical
6	831.979	28.64	23.94	-4.70	46.00	22.06	QP	Vertical

Remark:

- Final Level = Receiver Read level + Factor.
Factor = Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	Smartico Industrial Sensor LoRaWAN	Product Model:	IS-LR
Test By:	Mike	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Horizontal
Test Voltage:	DC3.6V	Environment:	Temp: 24℃ Humi: 57%



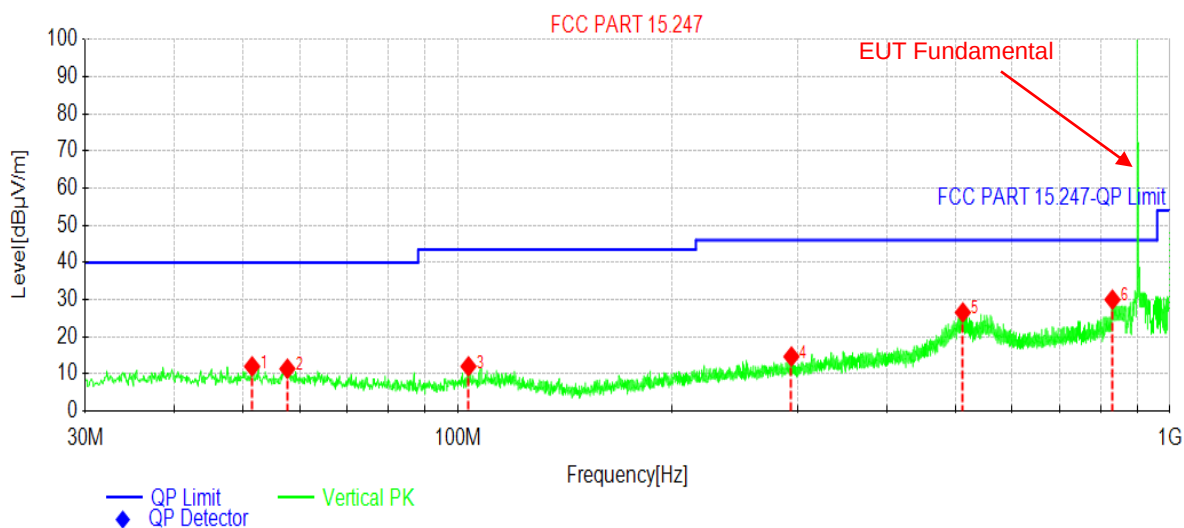
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	51.5362	28.04	10.97	-17.07	40.00	29.03	QP	Horizontal
2	58.8119	29.12	11.97	-17.15	40.00	28.03	QP	Horizontal
3	111.294	28.83	10.95	-17.88	43.50	32.55	QP	Horizontal
4	298.134	28.04	13.89	-14.15	46.00	32.11	QP	Horizontal
5	511.944	30.07	20.59	-9.48	46.00	25.41	QP	Horizontal
6	800.160	33.75	28.16	-5.59	46.00	17.84	QP	Horizontal

Remark:

- Final Level = Receiver Read level + Factor.
Factor = Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are very lower than the limit and not show in test report.

external antenna

Product Name:	Smartico Industrial Sensor LoRaWAN	Product Model:	IS-LR
Test By:	Mike	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical
Test Voltage:	DC3.6V	Environment:	Temp: 24℃ Humi: 57%

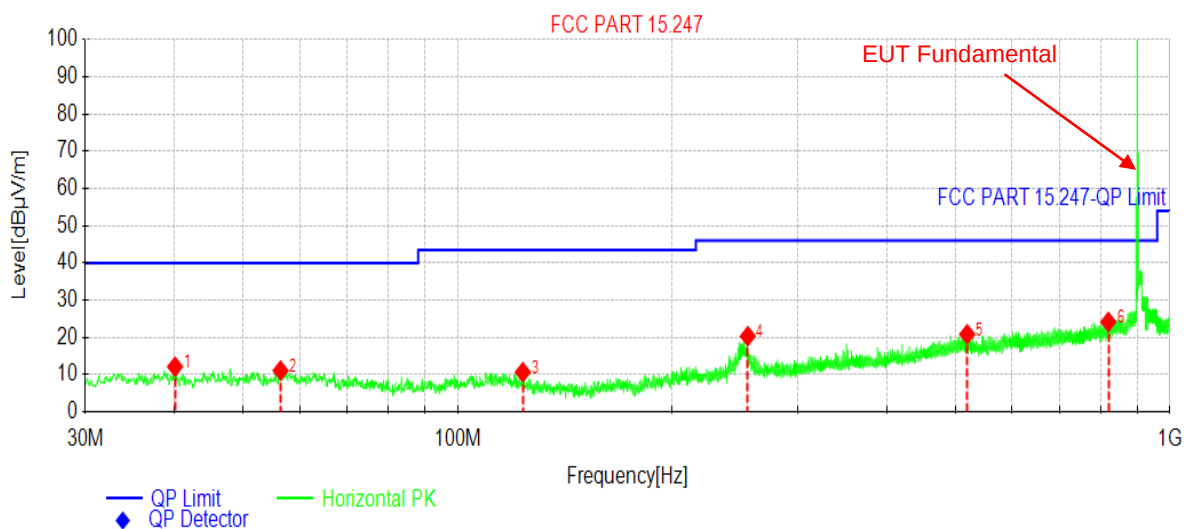


NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Factor [dB]	Limit [dBuV/m]	Margin [dB]	Trace	Polarity
1	51.4391	29.07	12.00	-17.07	40.00	28.00	QP	Vertical
2	57.6478	28.45	11.37	-17.08	40.00	28.63	QP	Vertical
3	103.533	30.23	12.03	-18.20	43.50	31.47	QP	Vertical
4	294.157	28.86	14.67	-14.19	46.00	31.33	QP	Vertical
5	512.041	36.01	26.53	-9.48	46.00	19.47	QP	Vertical
6	830.621	34.72	29.97	-4.75	46.00	16.03	QP	Vertical

Remark:

- Final Level = Receiver Read level + Factor.
Factor = Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	Smartico Industrial Sensor LoRaWAN	Product Model:	IS-LR
Test By:	Mike	Test mode:	Tx mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Horizontal
Test Voltage:	DC3.6V	Environment:	Temp: 24℃ Humi: 57%



NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Trace	Polarity
1	40.0890	28.93	12.12	-16.81	40.00	27.88	QP	Horizontal
2	56.3866	28.07	11.06	-17.01	40.00	28.94	QP	Horizontal
3	123.420	29.21	10.64	-18.57	43.50	32.86	QP	Horizontal
4	255.450	35.34	20.31	-15.03	46.00	25.69	QP	Horizontal
5	519.316	30.22	20.83	-9.39	46.00	25.17	QP	Horizontal
6	819.756	29.06	24.14	-4.92	46.00	21.86	QP	Horizontal

Remark:

- Final Level = Receiver Read level + Factor.
Factor = Antenna Factor + Cable Loss – Preamplifier Factor.
- The emission levels of other frequencies are very lower than the limit and not show in test report.

Above 1GHz:

Internal antenna

Test channel: Lowest channel									
Detector: Peak Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	AUX Factor(dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1806.00	54.33	30.78	6.80	2.44	41.81	52.54	74.00	-21.46	Vertical
1806.00	54.07	30.78	6.80	2.44	41.81	52.28	74.00	-21.72	Horizontal
2709.00	56.86	30.78	6.80	2.44	41.81	55.07	74.00	-18.93	Vertical
2709.00	55.90	30.78	6.80	2.44	41.81	54.11	74.00	-19.89	Horizontal
3612.00	55.65	30.78	6.80	2.44	41.81	53.86	74.00	-20.14	Vertical
3612.00	55.82	30.78	6.80	2.44	41.81	54.03	74.00	-19.97	Horizontal
Detector: Average Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	AUX Factor(dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1806.00	46.52	30.78	6.80	2.44	41.81	44.73	54.00	-9.27	Vertical
1806.00	46.43	30.78	6.80	2.44	41.81	44.64	54.00	-9.36	Horizontal
2709.00	47.52	30.78	6.80	2.44	41.81	45.73	54.00	-8.27	Vertical
2709.00	47.23	30.78	6.80	2.44	41.81	45.44	54.00	-8.56	Horizontal
3612.00	47.86	30.78	6.80	2.44	41.81	46.07	54.00	-7.93	Vertical
3612.00	47.22	30.78	6.80	2.44	41.81	45.43	54.00	-8.57	Horizontal
Remark: 1. Final Level = Receiver Read level + Antenna Factor + Cable Loss + AUX Factor – Preamplifier Factor. 2. The emission levels of other frequencies are very lower than the limit and not show in test report.									

Test channel: Middle channel									
Detector: Peak Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	AUX Factor(dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1815.60	54.06	30.96	6.86	2.47	41.84	52.51	74.00	-21.49	Vertical
1815.60	54.56	30.96	6.86	2.47	41.84	53.01	74.00	-20.99	Horizontal
2723.40	57.32	30.96	6.86	2.47	41.84	55.77	74.00	-18.23	Vertical
2723.40	56.27	30.96	6.86	2.47	41.84	54.72	74.00	-19.28	Horizontal
3631.20	56.04	30.96	6.86	2.47	41.84	54.49	74.00	-19.51	Vertical
3631.20	55.95	30.96	6.86	2.47	41.84	54.40	74.00	-19.60	Horizontal
Detector: Average Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	AUX Factor(dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1815.60	46.78	30.96	6.86	2.47	41.84	45.23	54.00	-8.77	Vertical
1815.60	46.61	30.96	6.86	2.47	41.84	45.06	54.00	-8.94	Horizontal
2723.40	47.40	30.96	6.86	2.47	41.84	45.85	54.00	-8.15	Vertical
2723.40	47.39	30.96	6.86	2.47	41.84	45.84	54.00	-8.16	Horizontal
3631.20	48.19	30.96	6.86	2.47	41.84	46.64	54.00	-7.36	Vertical
3631.20	47.33	30.96	6.86	2.47	41.84	45.78	54.00	-8.22	Horizontal
Remark: 1. Final Level = Receiver Read level + Antenna Factor + Cable Loss + AUX Factor – Preamplifier Factor. 2. The emission levels of other frequencies are very lower than the limit and not show in test report.									

Test channel: Highest channel									
Detector: Peak Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	AUX Factor(dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1829.80	54.09	31.11	6.91	2.49	41.87	52.73	74.00	-21.27	Vertical
1829.80	54.39	31.11	6.91	2.49	41.87	53.03	74.00	-20.97	Horizontal
2744.70	57.60	31.11	6.91	2.49	41.87	56.24	74.00	-17.76	Vertical
2744.70	55.92	31.11	6.91	2.49	41.87	54.56	74.00	-19.44	Horizontal
3659.60	56.48	31.11	6.91	2.49	41.87	55.12	74.00	-18.88	Vertical
3659.60	56.31	31.11	6.91	2.49	41.87	54.95	74.00	-19.05	Horizontal
Detector: Average Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	AUX Factor(dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1828.40	46.38	31.11	6.91	2.49	41.87	45.02	54.00	-8.98	Vertical
1828.40	46.65	31.11	6.91	2.49	41.87	45.29	54.00	-8.71	Horizontal
2742.60	47.09	31.11	6.91	2.49	41.87	45.73	54.00	-8.27	Vertical
2742.60	47.23	31.11	6.91	2.49	41.87	45.87	54.00	-8.13	Horizontal
3656.80	48.44	31.11	6.91	2.49	41.87	47.08	54.00	-6.92	Vertical
3656.80	47.53	31.11	6.91	2.49	41.87	46.17	54.00	-7.83	Horizontal
Remark: 1. Final Level = Receiver Read level + Antenna Factor + Cable Loss + AUX Factor – Preamplifier Factor. 2. The emission levels of other frequencies are very lower than the limit and not show in test report.									

External antenna

Test channel: Lowest channel									
Detector: Peak Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	AUX Factor(dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1806.00	56.91	30.78	6.80	2.44	41.81	55.12	74.00	-18.88	Vertical
1806.00	58.08	30.78	6.80	2.44	41.81	56.29	74.00	-17.71	Horizontal
2709.00	58.06	30.78	6.80	2.44	41.81	56.27	74.00	-17.73	Vertical
2709.00	57.97	30.78	6.80	2.44	41.81	56.18	74.00	-17.82	Horizontal
3612.00	56.22	30.78	6.80	2.44	41.81	54.43	74.00	-19.57	Vertical
3612.00	60.08	30.78	6.80	2.44	41.81	58.29	74.00	-15.71	Horizontal
Detector: Average Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	AUX Factor(dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1806.00	51.05	30.78	6.80	2.44	41.81	49.26	54.00	-4.74	Vertical
1806.00	49.56	30.78	6.80	2.44	41.81	47.77	54.00	-6.23	Horizontal
2709.00	50.59	30.78	6.80	2.44	41.81	48.80	54.00	-5.20	Vertical
2709.00	50.51	30.78	6.80	2.44	41.81	48.72	54.00	-5.28	Horizontal
3612.00	50.64	30.78	6.80	2.44	41.81	48.85	54.00	-5.15	Vertical
3612.00	48.69	30.78	6.80	2.44	41.81	46.90	54.00	-7.10	Horizontal
Remark: 1. Final Level = Receiver Read level + Antenna Factor + Cable Loss + AUX Factor – Preamplifier Factor. 2. The emission levels of other frequencies are very lower than the limit and not show in test report.									

Test channel: Middle channel									
Detector: Peak Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	AUX Factor(dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1815.60	56.73	30.96	6.86	2.47	41.84	55.18	74.00	-18.82	Vertical
1815.60	58.46	30.96	6.86	2.47	41.84	56.91	74.00	-17.09	Horizontal
2723.40	58.44	30.96	6.86	2.47	41.84	56.89	74.00	-17.11	Vertical
2723.40	58.25	30.96	6.86	2.47	41.84	56.70	74.00	-17.30	Horizontal
3631.20	56.52	30.96	6.86	2.47	41.84	54.97	74.00	-19.03	Vertical
3631.20	60.30	30.96	6.86	2.47	41.84	58.75	74.00	-15.25	Horizontal
Detector: Average Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	AUX Factor(dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1815.60	50.95	30.96	6.86	2.47	41.84	49.40	54.00	-4.60	Vertical
1815.60	49.19	30.96	6.86	2.47	41.84	47.64	54.00	-6.36	Horizontal
2723.40	50.73	30.96	6.86	2.47	41.84	49.18	54.00	-4.82	Vertical
2723.40	50.78	30.96	6.86	2.47	41.84	49.23	54.00	-4.77	Horizontal
3631.20	50.70	30.96	6.86	2.47	41.84	49.15	54.00	-4.85	Vertical
3631.20	48.92	30.96	6.86	2.47	41.84	47.37	54.00	-6.63	Horizontal
Remark: 1. Final Level = Receiver Read level + Antenna Factor + Cable Loss + AUX Factor – Preamplifier Factor. 2. The emission levels of other frequencies are very lower than the limit and not show in test report.									

Test channel: Highest channel									
Detector: Peak Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	AUX Factor(dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1829.80	56.47	31.11	6.91	2.49	41.87	55.11	74.00	-18.89	Vertical
1829.80	58.04	31.11	6.91	2.49	41.87	56.68	74.00	-17.32	Horizontal
2744.70	58.89	31.11	6.91	2.49	41.87	57.53	74.00	-16.47	Vertical
2744.70	58.55	31.11	6.91	2.49	41.87	57.19	74.00	-16.81	Horizontal
3659.60	56.72	31.11	6.91	2.49	41.87	55.36	74.00	-18.64	Vertical
3659.60	60.07	31.11	6.91	2.49	41.87	58.71	74.00	-15.29	Horizontal
Detector: Average Value									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	AUX Factor(dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
1828.40	51.36	31.11	6.91	2.49	41.87	50.00	54.00	-4.00	Vertical
1828.40	49.58	31.11	6.91	2.49	41.87	48.22	54.00	-5.78	Horizontal
2742.60	50.55	31.11	6.91	2.49	41.87	49.19	54.00	-4.81	Vertical
2742.60	50.89	31.11	6.91	2.49	41.87	49.53	54.00	-4.47	Horizontal
3656.80	50.98	31.11	6.91	2.49	41.87	49.62	54.00	-4.38	Vertical
3656.80	49.19	31.11	6.91	2.49	41.87	47.83	54.00	-6.17	Horizontal
Remark:									
1. Final Level = Receiver Read level + Antenna Factor + Cable Loss + AUX Factor – Preamplifier Factor.									
2. The emission levels of other frequencies are very lower than the limit and not show in test report.									

8 EUT Constructional Details

Reference to the test report No.: JYTSZB-R01-2100058.

-----End of report-----