

TELE RADIO AB

C2PC RF TEST REPORT

Report Type:

FCC Part 15.249 RF report

Model:

ZART03, T13-03, ZART06, T13-06, ZART08, T13-08,
ZART10, ZART04, T13-04, T00013-04, T13-4, PN-T13-4

REPORT NUMBER

190201245SHA-001

ISSUE DATE

April 25, 2019

DOCUMENT CONTROL NUMBER:

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Manufacturer: TELE RADIO AB
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FCC ID: ONFC1202A

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:

47CFR Part 15 (2018): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2013): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

RSS-247 Issue 2 (February 2017): Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

RSS-Gen Issue 5 (March 2019): General Requirements for Compliance of Radio Apparatus

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TEST REPORT

Content

REVISION HISTORY	4
MEASUREMENT RESULT SUMMARY	5
1 GENERAL INFORMATION	6
1.1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	6
1.2 TECHNICAL SPECIFICATION	6
1.3 DESCRIPTION OF TEST FACILITY	7
2 TEST SPECIFICATIONS	8
2.1 STANDARDS OR SPECIFICATION	8
2.2 MODE OF OPERATION DURING THE TEST.....	8
2.3 TEST SOFTWARE LIST	9
2.4 TEST PERIPHERALS LIST	9
2.5 TEST ENVIRONMENT CONDITION:.....	9
2.6 INSTRUMENT LIST	10
2.7 MEASUREMENT UNCERTAINTY	11
3 RADIATED EMISSION	12
3.1 LIMIT	12
3.2 MEASUREMENT PROCEDURE	12
3.3 TEST CONFIGURATION	14
3.4 TEST RESULTS OF RADIATED EMISSIONS	16

Revision History

Report No.	Version	Description	Issued Date
190201245SHA-001	Rev. 01	Initial issue of report	April 25, 2019

Measurement result summary

TEST ITEM	FCC REFERANCE	RESULT
Radiated emission	15.249 & 15.209	Pass
Power line conducted emission	15.207	NA
Assigned bandwidth (20dB bandwidth)	15.215(c)	NP
Antenna requirement	15.203	NP

Notes: 1. NA = Not Applicable

2. NP = Not Performed, among this C2PC report, these test items are not influenced and no repeated test is necessary.

3. Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	TRANSMITTER
Type/Model:	ZART03, T13-03, ZART06, T13-06, ZART08, T13-08, ZART10, ZART04, T13-04, T00013-04, T13-4, PN-T13-4
EUT description:	Twelve models were added and according to the difference between the new models and the original models, only the model of T00013-04 was chosen to perform the radiated emission test as representative.
Rating:	DC 3.0V
EUT type:	<input checked="" type="checkbox"/> Table top <input type="checkbox"/> Floor standing
Software Version:	/
Hardware Version:	/
Sample received date:	March 10, 2019
Date of test:	March 10, 2019

The difference between new models and the original models:

New models	Original models	Difference
ZART03, T13-03	T00013-03	The new models are the same as the original model except the model name for market purpose.
ZART06, T13-06	T00013-06	The new models are the same as the original model except the model name for market purpose.
ZART08, T13-08	T00013-08	The new models are the same as the original model except the model name for market purpose.
ZART10	T00013-10	The new model is the same as the original model except the model name for market purpose.
ZART04, T13-04, T00013-04, T13-4, PN-T13-4	T00013-03	The new models are the same as the original model except the keypad number was changed from three to four.

1.2 Technical Specification

Frequency Range:	2405MHz to 2480MHz
Type of Modulation:	O-QPSK
Channel Number:	16
Channel Separation:	5 MHz
Antenna Information:	Chip antenna, 4dBi

1.3 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN1175
	IC Registration Lab CAB identifier.: CN0051
	VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252
	A2LA Accreditation Lab Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2018)

ANSI C63.10 (2013)

2.2 Mode of operation during the test

The EUT is a handheld device, so three axes (X, Y, Z) were observed while the test receiver worked as “max hold” continuously and the highest reading among the whole test procedure was recorded.

The lowest, middle and highest channel were tested as representatives.

Frequency (MHz)			
Channel	Frequency (MHz)	Channel	Frequency (MHz)
11	2405	19	2445
12	2410	20	2450
13	2415	21	2455
14	2420	22	2460
15	2425	23	2465
16	2430	24	2470
17	2435	25	2475
18	2440	26	2480

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

2.4 Test peripherals list

Item No.	Name	Band and Model	Description
1	Laptop computer	DELL 5480	-

2.5 Test environment condition:

Test items	Temperature	Humidity
Radiated emission	22°C	56% RH
Assigned bandwidth (20dB bandwidth)	-	-
Power line conducted emission	-	-

2.6 Instrument list

Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESIB 26	EC 3045	2019-10-18
<input checked="" type="checkbox"/>	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2019-05-30
<input checked="" type="checkbox"/>	Horn antenna	R&S	HF 906	EC 3049	2019-09-22
<input type="checkbox"/>	Horn antenna	ETS	3117	EC 4792-1	2019-08-23
<input checked="" type="checkbox"/>	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2020-07-09
<input checked="" type="checkbox"/>	Pre-amplifier	R&S	Pre-amp 18	EC5881	2019-06-19
<input checked="" type="checkbox"/>	Semi-anechoic chamber	Albatross project	-	EC 3048	2019-09-08
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Therom-Hydrograph	ZJ1-2A	S.M.I.F.	EC 3323	2019-06-14
<input checked="" type="checkbox"/>	Pressure meter	YM3	Shanghai Mengde	EC 3320	2019-06-28

2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum peak output power	± 0.74dB
Radiated Emissions in restricted frequency bands below 1GHz	± 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 5.02dB
Emission outside the frequency band	± 2.89dB
Power line conducted emission	± 3.19dB

TEST REPORT

3 Radiated emission

Test result: Pass

3.1 Limit

Fundamental Frequency (MHz)	Fundamental limit (dBuV/m)	Harmonic limit (dBuV/m)
<input type="checkbox"/> 902 - 928	94	54
<input checked="" type="checkbox"/> 2400 - 2483.5	94	54
<input type="checkbox"/> 5725 - 5875	94	54
<input type="checkbox"/> 24000 - 24250	108	68

The radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits:

Frequencies (MHz)	Field Strength (microvolts/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
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

3.2 Measurement Procedure

For Radiated emission below 30MHz:

- a) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) Both X and Y axes of the antenna are set to make the measurement.
- d) For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

TEST REPORT**For Radiated emission above 30MHz:**

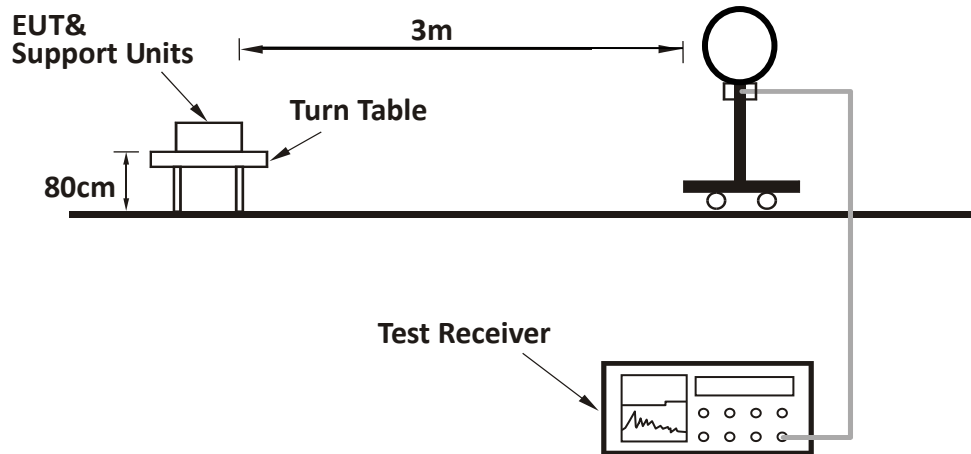
- a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meters chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) The height of antenna 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.
- d) 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 rotatable table was turned from 0 degree to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to peak or quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

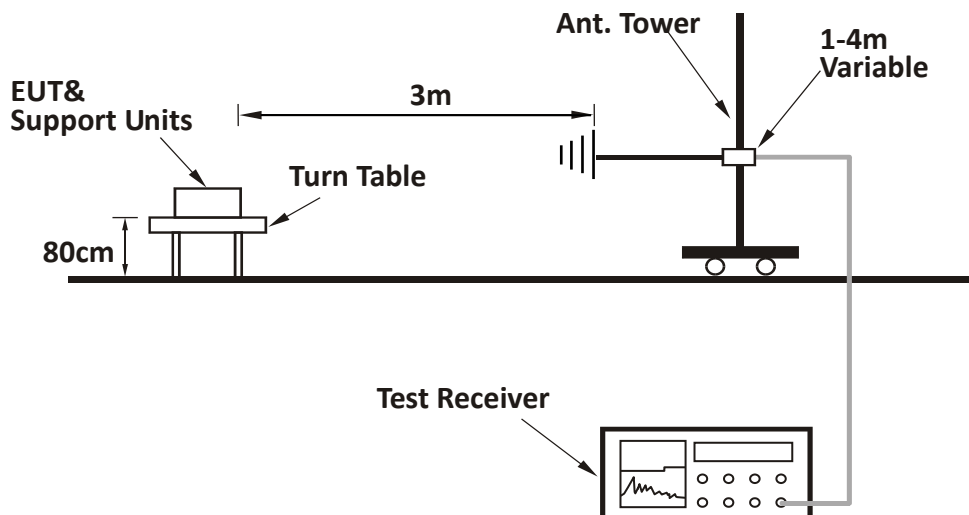
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 3 x RBW (Duty cycle \geq 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported

3.3 Test Configuration

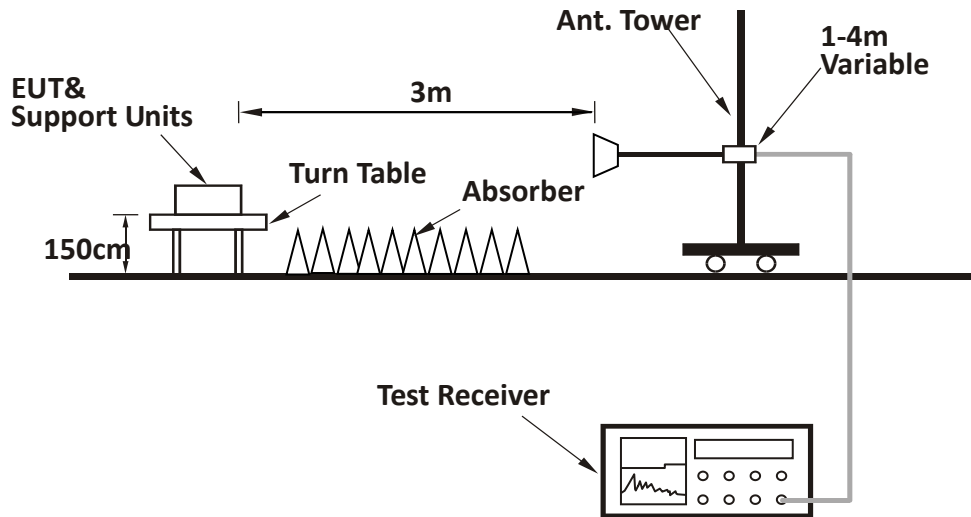
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



For Radiated emission above 1GHz:



TEST REPORT

3.4 Test Results of Radiated Emissions

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

The worst waveform from 30MHz to 1000MHz is listed as below:

Test data below 1GHz

Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	30.00	21.60	19.20	40.00	18.40	PK
H	43.80	13.50	11.60	40.00	26.50	PK
H	74.50	14.50	7.50	40.00	25.50	PK
H	125.50	16.60	13.10	43.50	26.90	PK
H	635.62	26.20	20.70	46.00	19.80	PK
H	935.20	29.50	23.30	46.00	16.50	PK
V	30.00	22.20	19.20	40.00	17.80	PK
V	43.60	13.20	11.60	40.00	26.80	PK
V	74.65	14.30	7.50	40.00	25.70	PK
V	495.30	22.60	19.20	46.00	23.40	PK
V	596.20	26.60	20.50	46.00	19.40	PK
V	928.30	29.80	23.30	46.00	16.20	PK

Test result above 1GHz:

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H/V	2405	85.80	34.34	114.00	28.20	PK
	H/V	2400	42.10	34.29	74.00	31.90	PK
	H/V	4810	52.10	6.50	74.00	21.90	PK
	H/V	7215	54.50	9.30	74.00	19.50	PK
	H/V	7215	42.60	9.30	54.00	11.40	AV
	H/V	9620	57.50	11.50	74.00	16.50	PK
	H/V	9620	44.50	11.50	54.00	9.50	AV

TEST REPORT

M	H/V	2445	85.60	34.36	114.00	28.40	PK
	H/V	4890	52.80	6.50	74.00	21.20	PK
	H/V	7335	61.50	9.30	74.00	12.50	PK
	H/V	7335	45.60	9.30	54.00	8.40	AV
	H/V	9780	57.20	11.50	74.00	16.80	PK
	H/V	9780	46.80	11.50	54.00	7.20	AV
H	H/V	2480	86.20	34.38	114.00	27.80	PK
	H/V	2483.5	42.50	34.40	74.00	31.50	PK
	H/V	4960	55.60	6.70	74.00	18.40	PK
	H/V	4960	37.50	6.70	54.00	16.50	AV
	H/V	7440	52.40	9.30	74.00	21.60	PK
	H/V	9920	57.80	11.50	74.00	16.20	PK
	H/V	9920	44.20	11.50	54.00	9.80	AV

- Remark: 1. Correct Factor = Antenna Factor + Cable Loss (- Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
 2. Corrected Reading = Original Receiver Reading + Correct Factor
 3. Margin = Limit - Corrected Reading
 4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
 Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
 Limit = 40.00dBuV/m.
 Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
 Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
 Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

***** END *****