

RED-Radio Test Report

For

Low Power Radio Solutions Ltd

easyRadio Transceiver

Model No.: ER400TRS-02

Prepared For : Low Power Radio Solutions Ltd
Address : Two Rivers Industrial Estate, Station Lane, Witney, OXON, OX28 4BH,
United Kingdom

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TEST REPORT

Applicant : Low Power Radio Solutions Ltd
Manufacturer : Low Power Radio Solutions Ltd
Product Name : easyRadio Transceiver
Model No. : ER400TRS-02
Trade Mark : N.A.
Rating(s) : Input: DC 3-6V

**Test Standard(s) : ETSI EN 300 220-1 V3.1.1 (2017-02)
ETSI EN 300 220-2 V3.1.1 (2017-02)**

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN 300220-1&EN 300220-2 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test

Feb. 07~Mar. 08, 2018

Prepared by



Winkey Wang

(Tested Engineer / Winkey Wang)

Reviewer

May Lu

(Project Manager / May Lu)

Approved & Authorized Signer

Tom Chen

(Manager / Tom Chen)

1. General Information

1.1. Client Information

Applicant	:	Low Power Radio Solutions Ltd
Address	:	Two Rivers Industrial Estate, Station Lane, Witney, OXON, OX28 4BH, United Kingdom
Manufacturer	:	Low Power Radio Solutions Ltd
Address	:	Two Rivers Industrial Estate, Station Lane, Witney, OXON, OX28 4BH, United Kingdom

1.2. Description of Device (EUT)

Product Name	:	easyRadio Transceiver	
Model No.	:	ER400TRS-02	
Trade Mark	:	N.A.	
Test Power Supply	:	DC 5V	
Product Description	:	Operation Frequency:	433.270-434.340MHz
		Number of Channel:	10 Channels
		Modulation Type:	FSK
		Antenna Type:	N/A
		Antenna Gain(Peak):	N/A
<p>Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2) Client didn't provide any antenna.</p>			

1.3. Auxiliary Equipment Used During Test

N/A	
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1.4. Description of Test Modes

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Test Items	EUT configure mode	Available Channel	Tested Channel
Unwanted emissions in the spurious domain	TX Mode	00~09	00, 04, 09
Effective radiated power	TX Mode	00~09	00, 04, 09
Occupied bandwidth	TX Mode	00~09	00, 04, 09
TX out of band emissions	TX Mode	00~09	00, 04, 09
Transient Power	TX Mode	00~09	00, 04, 09
TX behaviour under low voltage conditions	TX Mode	00~09	00, 04, 09
Unwanted emissions in the spurious domain	RX Mode	00~09	00, 04, 09
Receiver Blocking	RX Mode	00~09	00, 04, 09

1.5. List of Channels

Channel	Freq.(MHz)	Channel	Freq.(MHz)
00	433.270	05	433.805
01	433.350	06	433.920
02	433.435	07	434.050
03	433.535	08	434.210
04	433.655	09	434.340

1.6. Test Conditions

	Normal Test Conditions	Extreme Test Conditions
Temperature	15°C ~ 35°C	-10°C ~ 45°C Note: (1)
Relative Humidity	20% ~ 75%	N/A
Supply Voltage	DC 5V	DC 4.5V~ DC 5.5V
Note: (1) The HT 45°C and LT -10°C was declared by manufacturer, The EUT couldn't be operate normally with higher or lower temperature.		

1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Nov. 17, 2017	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Nov. 17, 2017	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Nov. 17, 2017	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	Nov. 17, 2017	1 Year
5.	Spectrum Analysis	Agilent	N9038A	MY53227295	Nov. 17, 2017	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G3 0D	KD17503	Nov. 17, 2017	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Nov. 17, 2017	1 Year
8.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 20, 2017	1 Year
9.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 20, 2017	1 Year
10.	Loop Antenna	Schwarzbeck	HFH2-Z2	100047	Nov. 17, 2017	1 Year
11.	Horn Antenna	Schwarzbeck	BBHA9170	9170-375	Nov. 17, 2017	1 Year
12.	Pre-amplifier	SONOMA	310N	186860	Nov. 17, 2017	1 Year
13.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
14.	RF Test Control System	YIHENG	YH3000	2017430	Nov. 18, 2017	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN045	Nov. 17, 2017	1 Year
16.	Power Sensor	DAER	RPR3006W	15I00041SN046	Nov. 17, 2017	1 Year
17.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 18, 2017	1 Year
18.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Nov. 18, 2017	1 Year
19.	Signal Generator	Agilent	E4421B	MY41000743	Nov. 18, 2017	1 Year
20.	DC Power Supply	LW	TPR-6410D	349315	Nov. 01, 2017	1 Year
21.	Constant Temperature Humidity Chamber	Sertep	ZJ-HWHS8 0B	ZJ-17042804	Nov. 01, 2017	1 Year

1.8. Measurement Uncertainty

For the test methods, according to ETSI EN 300 220-1&-2 standard, the measurement uncertainty figures shall be calculated in accordance with ETR 100 028-1 [4] and shall correspond to an expansion factor (coverage factor) $k = 1,96$ or $k = 2$ (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Maximum measurement uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	$\pm 5 \%$
RF output power, conducted	$\pm 1,5 \text{ dB}$
All emissions, conducted	$\pm 6 \text{ dB}$
All emissions, radiated	$\pm 6 \text{ dB}$
Temperature	$\pm 1 \text{ }^\circ\text{C}$
Humidity	$\pm 5 \%$
DC and low frequency voltages	$\pm 3 \%$
Time	$\pm 5 \%$
Duty Cycle	$\pm 5 \%$

1.9. Description of Test Facility

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

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111, July 31, 2017.

ISED-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A-1, June 13, 2016.

Test Location

All Emissions tests were performed at

Shenzhen Anbotek Compliance Laboratory Limited.

1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

2. Summary of Test Results

Harmonised Standard ETSI EN 300 220-2			
No.	Test Items	Clause No.	Results
1	Operating frequency	4.2.1	PASS
2	Unwanted emissions in the spurious domain	4.2.2	PASS
3	Effective radiated power	4.3.1	PASS
4	Maximum e.r.p. spectral density	4.3.2	N/A
5	Duty cycle	4.3.3	N/A
6	Occupied bandwidth	4.3.4	PASS
7	TX out of band emissions	4.3.5	PASS
8	Transient Power	4.3.6	PASS
9	Adjacent channel power	4.3.7	N/A
10	TX behaviour under low voltage conditions	4.3.8	PASS
11	Adaptive power control	4.3.9	N/A
12	FHSS	4.3.10	N/A
13	Short term behaviour	4.3.11	N/A
14	RX sensitivity	4.4.1	N/A
15	Receiver Blocking	4.4.2	PASS
16	Clear channel assessment threshold	4.5.2	N/A
17	Polite spectrum access timing parameters	4.5.3	N/A
18	Adaptive Frequency Agility	4.5.4	N/A
Note: "N/A" is an abbreviation for Not Applicable and means this test item is not applicable for this device according to the technology characteristic of device.			

3. Unwanted Emissions In The Spurious Domain

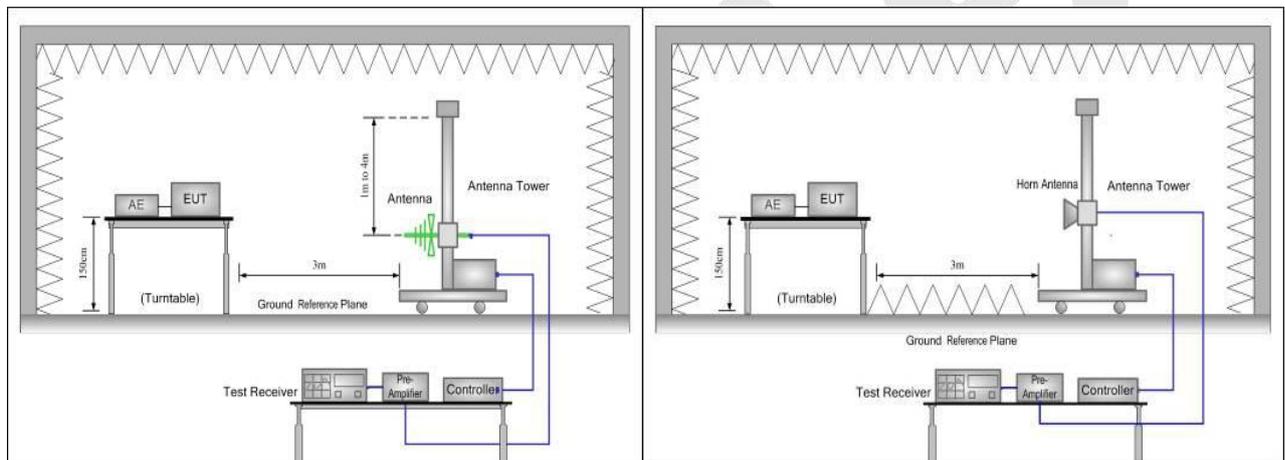
3.1. Test Standard and Limit

Test Standard	ETSI EN300220-2 V3.1.1 Clause 4.2.2			
Test Limit	State \ Frequency	47 MHz to 74 MHz 87,5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 790 MHz	Other frequencies below 1 000 MHz	Frequencies above 1 000 MHz
	TX mode	-54 dBm	-36 dBm	-30 dBm
	RX and all other modes	-57 dBm	-57 dBm	-47 dBm

3.2. Test Setup

(A) Radiated Emission Test Set-Up Frequency Bellow 1 GHz.

(B) Radiated Emission Test Set-Up Frequency Above 1 GHz



3.3. Test Procedure

The conducted measurement procedure in clause 5.9.3.3.1 of ETSI EN 300 220-1 V3.1.1.

The radiated measurement procedure in clause 5.9.3.3.2 of ETSI EN 300 220-1 V3.1.1, with the antenna port terminated in a dummy load.

The measurements shall be performed during continuously transmitting.

3.4. Test Data

PASS

433.270MHz

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 5V

Test Mode: TX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
49.49	-74.66	-54.00	-20.66	H	PASS
167.61	-58.19	-36.00	-22.19	H	
180.32	-74.27	-54.00	-20.27	H	
433.27	-46.65	-36.00	-10.65	H	
645.99	-69.76	-54.00	-15.76	H	
866.54	-61.84	-54.00	-7.84	H	
71.43	-70.88	-54.00	-16.88	V	
172.72	-53.72	-36.00	-17.72	V	
218.96	-66.67	-54.00	-12.67	V	
433.92	-40.31	-36.00	-4.31	V	
682.08	-68.32	-54.00	-14.32	V	
867.84	-65.49	-54.00	-11.49	V	

Test Result: above 1000MHz

Test Mode: TX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1299.81	-44.53	-30.00	-14.53	H	PASS
1390.80	-46.74	-30.00	-16.74	H	
1733.08	-45.51	-30.00	-15.51	H	
1390.80	-48.28	-30.00	-18.28	V	
1299.81	-47.59	-30.00	-17.59	V	
1733.08	-47.32	-30.00	-17.32	V	

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 5V

Test Mode: Standby Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
57.19	-64.70	-54.00	-10.70	H	PASS
106.81	-65.28	-54.00	-11.28	H	
167.15	-60.64	-36.00	-24.64	H	
197.83	-69.20	-54.00	-15.20	H	
311.24	-57.27	-36.00	-21.27	H	
835.83	-68.36	-54.00	-14.36	H	
72.13	-70.28	-54.00	-16.28	V	
90.08	-69.45	-54.00	-15.45	V	
117.05	-58.18	-36.00	-22.18	V	
229.11	-69.75	-54.00	-15.75	V	
403.55	-56.83	-36.00	-20.83	V	
680.23	-65.92	-54.00	-11.92	V	

Test Result: above 1000MHz

Test Mode: Standby Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1295.48	-47.97	-30.00	-17.97	H	PASS
1304.14	-48.09	-30.00	-18.09	H	
1737.41	-44.93	-30.00	-14.93	H	
1390.80	-44.46	-30.00	-14.46	V	
1304.14	-50.27	-30.00	-20.27	V	
1737.41	-45.02	-30.00	-15.02	V	

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 5V

Test Mode: RX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
68.60	-64.19	-57.00	-7.19	H	PASS
102.27	-65.77	-57.00	-8.77	H	
153.21	-67.82	-57.00	-10.82	H	
175.68	-68.09	-57.00	-11.09	H	
456.70	-68.84	-57.00	-11.84	H	
718.79	-70.04	-57.00	-13.04	H	
63.26	-65.53	-57.00	-8.53	V	
95.72	-67.56	-57.00	-10.56	V	
172.77	-68.91	-57.00	-11.91	V	
197.95	-68.30	-57.00	-11.30	V	
310.66	-76.26	-57.00	-19.26	V	
820.74	-68.63	-57.00	-11.63	V	

Test Result: above 1000MHz

Test Mode: RX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1291.14	-46.19	-30.00	-16.19	H	PASS
1308.48	-45.49	-30.00	-15.49	H	
1741.75	-43.56	-30.00	-13.56	H	
1390.80	-48.51	-30.00	-18.51	V	
1304.14	-51.46	-30.00	-21.46	V	
1737.41	-43.49	-30.00	-13.49	V	

433.655MHz

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 5V

Test Mode: TX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
56.20	-73.09	-54.00	-19.09	H	PASS
142.81	-54.40	-36.00	-18.40	H	
218.59	-69.34	-54.00	-15.34	H	
433.66	-43.81	-36.00	-7.81	H	
536.33	-69.22	-54.00	-15.22	H	
867.31	-63.29	-54.00	-9.29	H	
68.48	-64.43	-54.00	-10.43	V	
169.32	-51.60	-36.00	-15.60	V	
204.33	-66.35	-54.00	-12.35	V	
433.92	-46.70	-36.00	-10.70	V	
612.46	-64.25	-54.00	-10.25	V	
867.84	-64.78	-54.00	-10.78	V	

Test Result: above 1000MHz

Test Mode: TX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1300.97	-47.79	-30.00	-17.79	H	PASS
1392.03	-47.12	-30.00	-17.12	H	
1734.62	-47.32	-30.00	-17.32	H	
1392.03	-48.45	-30.00	-18.45	V	
1300.97	-51.97	-30.00	-21.97	V	
1734.62	-47.76	-30.00	-17.76	V	

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 5V

Test Mode: Standby Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
50.94	-74.23	-54.00	-20.23	H	PASS
90.75	-67.28	-54.00	-13.28	H	
112.38	-55.90	-36.00	-19.90	H	
202.91	-69.23	-54.00	-15.23	H	
366.05	-54.08	-36.00	-18.08	H	
745.13	-67.29	-54.00	-13.29	H	
58.63	-74.41	-54.00	-20.41	V	
99.41	-68.36	-54.00	-14.36	V	
127.44	-57.53	-36.00	-21.53	V	
188.95	-67.67	-54.00	-13.67	V	
272.03	-45.97	-36.00	-9.97	V	
782.41	-62.37	-54.00	-8.37	V	

Test Result: above 1000MHz

Test Mode: Standby Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1296.63	-44.36	-30.00	-14.36	H	PASS
1305.30	-48.71	-30.00	-18.71	H	
1738.96	-48.18	-30.00	-18.18	H	
1392.03	-44.17	-30.00	-14.17	V	
1305.30	-50.46	-30.00	-20.46	V	
1738.96	-40.87	-30.00	-10.87	V	

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 5V

Test Mode: RX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
52.00	-70.38	-57.00	-13.38	H	PASS
101.08	-68.21	-57.00	-11.21	H	
129.86	-62.64	-57.00	-5.64	H	
190.23	-74.78	-57.00	-17.78	H	
432.15	-61.02	-57.00	-4.02	H	
565.98	-64.90	-57.00	-7.90	H	
63.74	-69.59	-57.00	-12.59	V	
94.87	-68.97	-57.00	-11.97	V	
121.16	-67.87	-57.00	-10.87	V	
178.68	-74.15	-57.00	-17.15	V	
409.47	-66.69	-57.00	-9.69	V	
624.11	-67.70	-57.00	-10.70	V	

Test Result: above 1000MHz

Test Mode: RX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1292.29	-44.49	-30.00	-14.49	H	PASS
1309.64	-48.34	-30.00	-18.34	H	
1743.29	-44.50	-30.00	-14.50	H	
1392.03	-45.72	-30.00	-15.72	V	
1305.30	-45.99	-30.00	-15.99	V	
1738.96	-40.83	-30.00	-10.83	V	

434.340MHz

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 5V

Test Mode: TX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
54.69	-70.17	-54.00	-16.17	H	PASS
168.47	-57.68	-36.00	-21.68	H	
212.45	-72.20	-54.00	-18.20	H	
434.34	-40.95	-36.00	-4.95	H	
516.18	-62.69	-54.00	-8.69	H	
868.68	-65.59	-54.00	-11.59	H	
47.76	-72.82	-54.00	-18.82	V	
154.48	-60.22	-36.00	-24.22	V	
218.04	-73.25	-54.00	-19.25	V	
433.92	-40.61	-36.00	-4.61	V	
570.95	-65.77	-54.00	-11.77	V	
867.84	-63.07	-54.00	-9.07	V	

Test Result: above 1000MHz

Test Mode: TX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1303.02	-47.26	-30.00	-17.26	H	PASS
1394.23	-45.68	-30.00	-15.68	H	
1737.36	-46.98	-30.00	-16.98	H	
1394.23	-45.04	-30.00	-15.04	V	
1303.02	-47.37	-30.00	-17.37	V	
1737.36	-46.98	-30.00	-16.98	V	

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 5V

Test Mode: Standby Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
51.39	-73.51	-54.00	-19.51	H	PASS
96.44	-66.94	-54.00	-12.94	H	
157.90	-56.29	-36.00	-20.29	H	
225.56	-72.20	-54.00	-18.20	H	
237.48	-45.52	-36.00	-9.52	H	
709.48	-68.55	-54.00	-14.55	H	
62.15	-70.13	-54.00	-16.13	V	
96.34	-67.87	-54.00	-13.87	V	
147.59	-60.20	-36.00	-24.20	V	
220.52	-74.66	-54.00	-20.66	V	
331.20	-49.98	-36.00	-13.98	V	
775.13	-63.22	-54.00	-9.22	V	

Test Result: above 1000MHz

Test Mode: Standby Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1298.68	-48.09	-30.00	-18.09	H	PASS
1307.36	-48.89	-30.00	-18.89	H	
1741.70	-45.83	-30.00	-15.83	H	
1394.23	-44.12	-30.00	-14.12	V	
1307.36	-51.59	-30.00	-21.59	V	
1741.70	-42.76	-30.00	-12.76	V	

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 5V

Test Mode: RX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
68.98	-68.30	-57.00	-11.30	H	PASS
99.14	-68.69	-57.00	-11.69	H	
150.89	-65.17	-57.00	-8.17	H	
228.28	-66.90	-57.00	-9.90	H	
268.17	-66.68	-57.00	-9.68	H	
849.31	-68.48	-57.00	-11.48	H	
55.85	-68.60	-57.00	-11.60	V	
102.45	-67.29	-57.00	-10.29	V	
113.16	-61.76	-57.00	-4.76	V	
197.86	-68.00	-57.00	-11.00	V	
283.85	-72.82	-57.00	-15.82	V	
827.95	-63.84	-57.00	-6.84	V	

Test Result: above 1000MHz

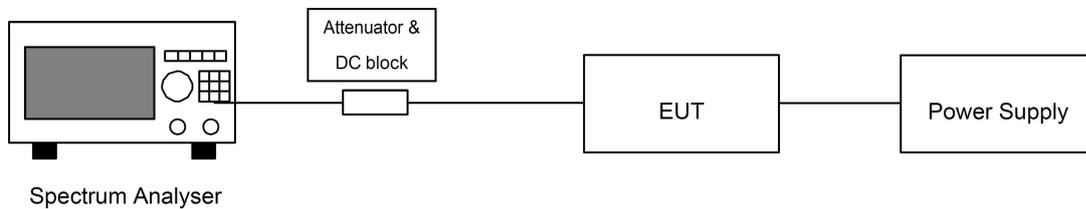
Test Mode: RX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1294.33	-45.24	-30.00	-15.24	H	PASS
1311.71	-47.62	-30.00	-17.62	H	
1746.05	-47.41	-30.00	-17.41	H	
1394.23	-47.18	-30.00	-17.18	V	
1307.36	-52.24	-30.00	-22.24	V	
1741.70	-41.94	-30.00	-11.94	V	

4. Effective Radiated Power

4.1. Test Standard and Limit

Test Standard	ETSI EN300220-2 V3.1.1 Clause 4.3.1	
Test Limit	The effective radiated power shall not be greater than the value allowed in annexes B or C (EN 300 220-2) for the chosen operational frequency band(s).	
	Frequency Band	Maximum effective radiated power
	433.04MHz to 434.79MHz	10mW
	865MHz to 868MHz	25mW

4.2. Test Setup



4.3. Test Procedure

The conducted measurement procedure in clause 5.2.2.1 of ETSI EN 300 220-1 V3.1.1.
The measurements shall be performed during continuously transmitting.

4.4. Test Data

Temperature:	See below	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 5V

433.270MHz

Test Mode:		TX CH00		
Test Conditions				Total e.r.p (dBm)
T nom (°C)	25.00	V nom (V)	DC 5V	8.46
T min (°C)	-10.00	V nom (V)	DC 5V	8.21
T max (°C)	45.00	V nom (V)	DC 5V	8.03
Max RF Power				8.46
Limits				10
Result				PASS

433.655MHz

Test Mode:		TX CH04		
Test Conditions				Total e.r.p (dBm)
T nom (°C)	25.00	V nom (V)	DC 5V	8.45
T min (°C)	-10.00	V nom (V)	DC 5V	8.30
T max (°C)	45.00	V nom (V)	DC 5V	8.06
Max RF Power				8.45
Limits				10
Result				PASS

434.340MHz

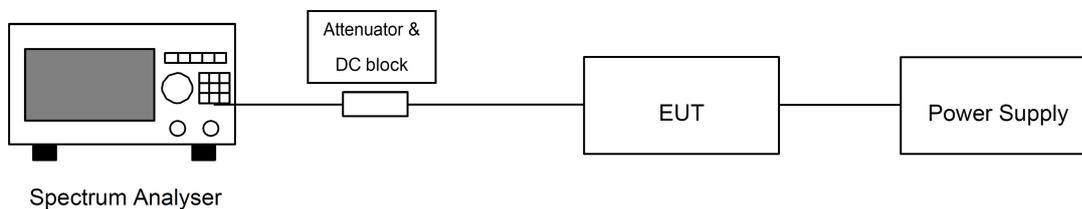
Test Mode:		TX CH09		
Test Conditions				Total e.r.p (dBm)
T nom (°C)	25.00	V nom (V)	DC 5V	8.43
T min (°C)	-10.00	V nom (V)	DC 5V	8.28
T max (°C)	45.00	V nom (V)	DC 5V	8.01
Max RF Power				8.43
Limits				10
Result				PASS

5. Occupied Bandwidth

5.1. Test Standard and Limit

Test Standard	ETSI EN300220-2 V3.1.1 Clause 4.3.4
Test Limit	The Operating Channel shall be declared and shall reside entirely within the Operational Frequency Band. The Maximum Occupied Bandwidth at 99 % shall reside entirely within the Operating Channel defined by F_{low} and F_{high} .

5.2. Test Setup



5.3. Test Procedure

The conducted measurement procedure in clause 5.6.3.4 of ETSI EN 300 220-1 V3.1.1.
The measurements shall be performed during continuously transmitting.

5.4. Test Data

Temperature:	See below	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 5V

Test Mode:	TX CH00	
Test Channel	Test Freq. (MHz)	99% Bandwidth (KHz)
CH00	433.350MHz	187.48
CH04	433.655MHz	184.92
CH09	434.345MHz	190.45

6. Out Of Band Emissions

6.1. Test Standard and Limit

Test Standard	ETSI EN300220-2 V3.1.1 Clause 4.3.5			
Test Limit	Domain	Frequency Range	RBW _{REF}	Max power limit
	OOB limits applicable to Operational Frequency Band (See Figure 6)	$f \leq f_{low_OFB} - 400 \text{ kHz}$	10 kHz	-36 dBm
		$f_{low_OFB} - 400 \text{ kHz} \leq f \leq f_{low_OFB} - 200 \text{ kHz}$	1 kHz	-36 dBm
		$f_{low} - 200 \text{ kHz} \leq f < f_{low_OFB}$	1 kHz	See Figure 6
		$f = f_{low_OFB}$	1 kHz	-36 dBm
		$f = f_{high_OFB}$	1 kHz	-36 dBm
		$f_{high_OFB} < f \leq f_{high_OFB} + 200 \text{ kHz}$	1 kHz	0 dBm
		$f_{high_OFB} + 200 \text{ kHz} \leq f \leq f_{high_OFB} + 400 \text{ kHz}$	1 kHz	-36 dBm
		$f_{high_OFB} + 400 \text{ kHz} \leq f$	10 kHz	-36 dBm
	OOB limits applicable to Operating Channel (See Figure 5)	$f = f_c - 2.5 \times \text{OCW}$	1 kHz	-36 dBm
		$f_c - 2.5 \times \text{OCW} \leq f \leq f_c - 0.5 \times \text{OCW}$	1 kHz	See Figure 5
		$f = f_c - 0.5 \times \text{OCW}$	1 kHz	0 dBm
		$f = f_c + 0.5 \times \text{OCW}$	1 kHz	0 dBm
		$f_c + 0.5 \times \text{OCW} \leq f \leq f_c + 2.5 \times \text{OCW}$	1 kHz	See Figure 5
		$f = f_c + 2.5 \times \text{OCW}$	1 kHz	-36 dBm
NOTE: f is the measurement frequency. f _c is the Operating Frequency. f _{low_OFB} is the lower edge of the Operational Frequency Band. f _{high_OFB} is the upper edge of the Operational Frequency Band. OCW is the operating channel bandwidth.				

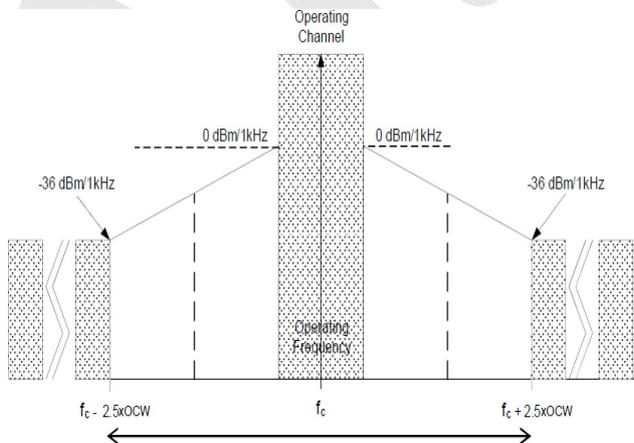


Figure 5: Out Of Band Domain for Operating Channel with reference BW

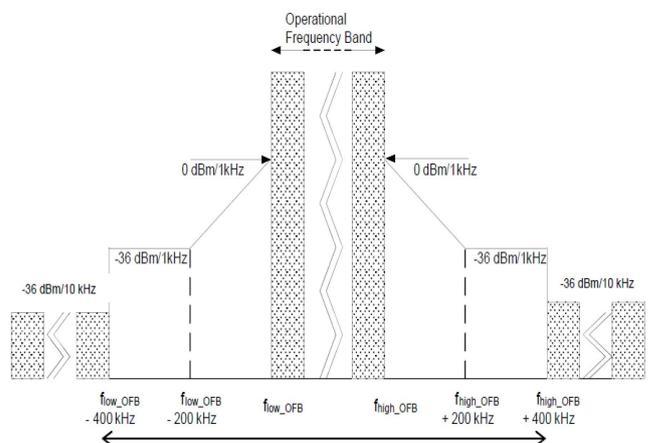
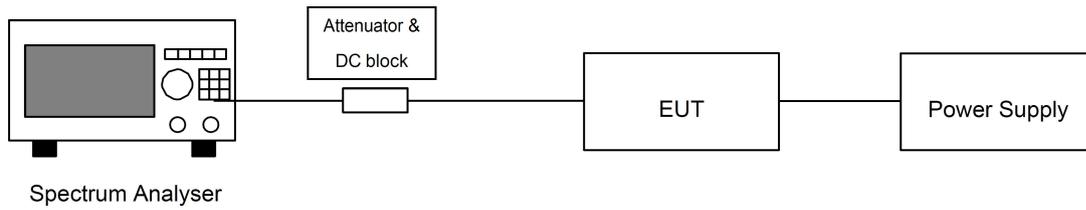


Figure 6: Out Of Band Domain for Operational Frequency Band with reference BW

6.2. Test Setup



6.3. Test Procedure

The conducted measurement procedure in clause 5.8.3.3 of ETSI EN 300 220-1 V3.1.1.

The measurements shall be performed during continuously transmitting.

6.4. Test Data

Temperature:	See below	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 5V

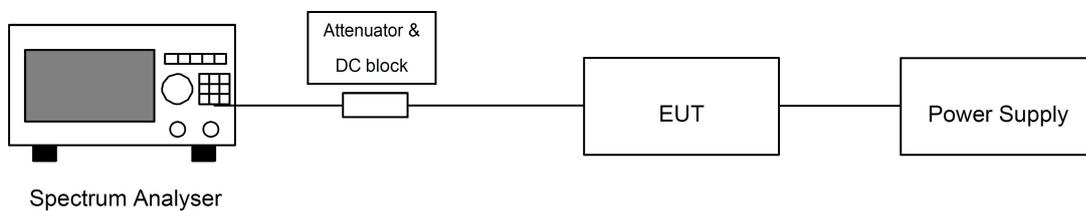
PASS

7. Transient Power

7.1. Test Standard and Limit

Test Standard	ETSI EN300220-2 V3.1.1 Clause 4.3.6		
Test Limit	Absolute offset from centre frequency	RBW _{REF}	Peak power limit applicable at measurement
	≤ 400 kHz	1 kHz	0 dBm
	> 400 kHz	1 kHz	-27 dBm

7.2. Test Setup



7.3. Test Procedure

The conducted measurement procedure in clause 5.10.3.2 of ETSI EN 300 220-1 V3.1.1.

The measurements shall be performed during continuously transmitting.

7.4. Test Data

Temperature:	See below	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 5V

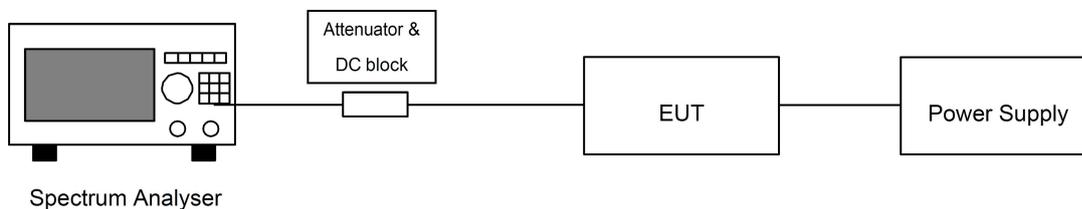
Measurement points: offset from centre frequency	Peak power limit applicable at measurement points (dBm)	Test Result (dBm)
-OCW	0	-10.53
+OCW	0	-11.48
-0,5 x OCW - 400 kHz	-27	-35.26
0,5 x OCW + 400 kHz	-27	-33.54
-0,5 x OCW -1 200 kHz	-27	-36.57
0,5 x OCW + 1 200 kHz	-27	-32.52

8. TX Behaviour Under Low Voltage Conditions

8.1. Test Standard and Limit

Test Standard	ETSI EN300220-2 V3.1.1 Clause 4.3.8
Test Limit	The equipment shall either: a) remain in the Operating Channel OC without exceeding any applicable limits (e.g. Duty Cycle); or b) reduce its effective radiated power below the Spurious Emission limits without exceeding any applicable limits (e.g. Duty Cycle); or c) shut down, (ceasing function); as the voltage falls below the manufacturers declared operating voltage.

8.2. Test Setup



8.3. Test Procedure

The conducted measurement procedure in clause 5.12.3.2 of ETSI EN 300 220-1 V3.1.1.

The measurements shall be performed during continuously transmitting.

8.4. Test Data

Temperature:	See below	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 5V

Please refer to the following pages.

433.270MHz

Test Mode:		TX CH00		
Test Conditions				Use Condition Under Low Voltage
T nom (°C)	25.00	V nom (V)	DC 5.0V	Normal Function
T nom (°C)	25.00	Voltage (V)	DC 4.5V	Normal Function
T nom (°C)	25.00	Voltage (V)	DC 4.0V	Normal Function
T nom (°C)	25.00	Voltage (V)	DC 3.5V	Normal Function
T nom (°C)	25.00	Voltage (V)	DC 3.0V	Normal Function
T nom (°C)	25.00	Voltage (V)	DC 2.5V	Normal Function
T nom (°C)	25.00	Voltage (V)	DC 2.3V	Function Stop
Limits				Manufacturer declared operating voltage 2.4Vdc
Result				Complies

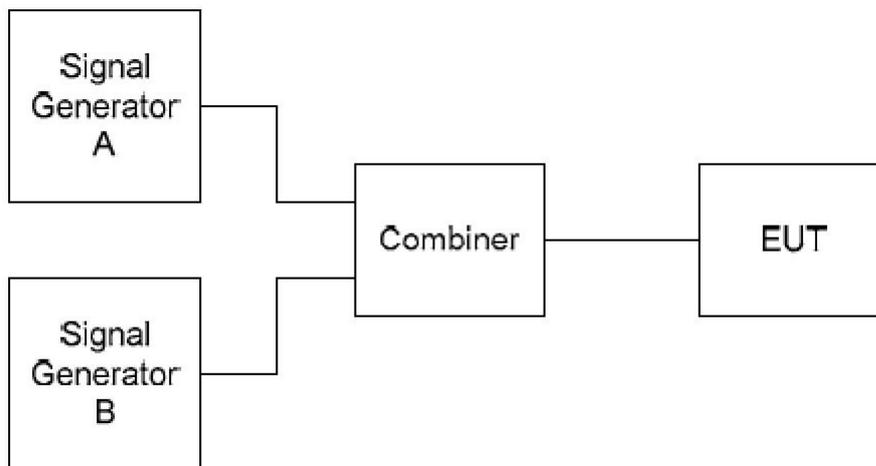
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9. Receiver Blocking

9.1. Test Standard and Limit

Test Standard	ETSI EN300220-2 V3.1.1 Clause 4.4.2				
Test Limit	Requirement	Limits			
		Receiver category 3	Receiver category 2	Receiver category 1.5	Receiver category 1
	Blocking at ± 2 MHz from OC edge f_{high} and f_{low}	≥ -80 dBm	≥ -69 dBm	≥ -43 dBm	≥ -20 dBm
	Blocking at ± 10 MHz from OC edge f_{high} and f_{low}	≥ -60 dBm	≥ -44 dBm	≥ -33 dBm	≥ -20 dBm
	Blocking at ± 5 % of Centre Frequency or 15 MHz, whichever is the greater	≥ -60 dBm	≥ -44 dBm	≥ -33 dBm	≥ -20 dBm

9.2. Test Setup



9.3. Test Procedure

The conducted measurement procedure in clause 5.18.6.3 of ETSI EN 300 220-1 V3.1.1.
The measurements shall be performed during continuously receiving.

9.4. Test Data

Temperature:	See below	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 5V

EUT category:category 3		Operating Channel:RX Mode	
Requirement	Limit	Results	
Blocking at -2 MHz from Operating Channel	≥ -80 dBm	PASS	
Blocking at +2 MHz from Centre Frequency	≥ -80 dBm	PASS	
Blocking at -10 MHz from Centre Frequency	≥ -60 dBm	PASS	
Blocking at +10 MHz from Centre Frequency	≥ -60 dBm	PASS	
Blocking at -5 % of Centre Frequency or 15 MHz, whichever is the greater	≥ -60 dBm	PASS	
Blocking at +5 % of Centre Frequency or 15 MHz, whichever is the greater	≥ -60 dBm	PASS	

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APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Radiation Emission Test



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