



RADIO TEST REPORT

ETSI EN 300 220-1/-2

For

Applicant : FUZHOU FANJU ELECTRONIC TECHNOLOGY CO., LTD.

Address : Dist C Building C2 Floor 26 Room 01, PuShang Avenue NO.216, WanD Plaza, FuZhou, FuJian, China

Product Name : RF433 Weather Station Clock

Model Name : FJ3365

Brand Name : N/A

Report No. : MTE/LUL/B17112326

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1. TEST RESULT CERTIFICATION

Product Name:	RF433 Weather Station Clock
Brand Name:	N/A
Model Name:	FJ3365
Series Model Name:	N/A
Series Model Difference description:	N/A
Applicant:	FUZHOU FANJU ELECTRONIC TECHNOLOGY CO., LTD.
Applicant Address:	Dist C Building C2 Floor 26 Room 01,PuShang Avenue NO.216,WanDa Plaza,FuZhou,FuJian,China
Manufacturer:	FUZHOU FANJU ELECTRONIC TECHNOLOGY CO., LTD.
Manufacturer Address:	Dist C Building C2 Floor 26 Room 01,PuShang Avenue NO.216,WanDa Plaza,FuZhou,FuJian,China
Test Standards:	ETSI EN 300 220-1 V3.1.1 (2017-02) ETSI EN 300 220-2 V3.1.1 (2017-02)
Test Result:	PASS

We, MOST, hereby certify that the submitted samples of the above item, as detailed in chapter 2.1 of this report, has been tested in our facility. The test record, data evaluation and test configuration represented herein are true and accurate accounts of measurements of the sample's EMC characteristics under the conditions herein specified.

Tested by (+ signature):

Lili Lu

Lili Lu (Engineer)

Nov.10-16, 2017

Review by (+ signature):

John Lin 

John Lin (Engineer)

Nov.17, 2017

Approved by (+ signature):

Yvette Zhou

Yvette Zhou(Manager)

Nov.17, 2017

2.EUT DESCRIPTION

Product Name:	RF433 Weather Station Clock
Brand Name:	N/A
Model Number:	FJ3365
Series Model Name:	N/A
Series Model Difference description:	N/A
Power Supply:	DC 4.5V by Adapter DC 3V by Batteries
Frequency Range:	433.92MHz
Modulation Technique:	FSK
Temperature Range:	0°C ~ +40°C

Remark:

1. For a more detailed description, refer to the user's manual of the EUT.

3. TEST METHODOLOGY

3.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT has been tested according to ETSI EN 300220-2 V3.1.1 (2017-02) together with ETSI EN300 220-1 V3.1.1 (2017-02).

ETSI EN 300220-1 V3.1.1 (2017-02)	Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz; Part 1: Technical characteristics and methods of measurement
ETSI EN 300220-2 V3.1.1 (2017-02)	Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz; Part 2: Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU for non specific radio equipment

3.2 DESCRIPTION OF TEST MODES

The EUT has been tested under normal operating and standby condition. Control the EUT for staying in continuous transmitting and receiving mode for testing.

The field strength of spurious radiation emission was measured in the following position: EUT lie-down position (Z axis), stand-up position (X, Y axis). The following data show only with the worst case setup.

The worst case of Z axis without cradle was reported.

3.3 ENVIRONMENTAL CONDITIONS

During the measurement the environmental conditions were within the listed ranges:

- Temperature: 15-35°C
- Humidity: 30-60 %
- Atmospheric pressure: 86-106 kPa

3.4 MEASUREMENT UNCERTAINTY

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in Measurement” (GUM) published by ISO.

- Uncertainty of Conducted Emission, $U_c = \pm 1.8\text{dB}$
- Uncertainty of Radiated Emission, $U_c = \pm 3.2\text{dB}$

4. TEST RESULTS

Test items and the results are as bellow:

Technical characteristics of the transmitter			
No	Section	Test Item	Result
1	EN 300 220 Sub-clause 4.2.1	Operating frequency	PASS
2	EN 300 220 Sub-clause 4.2.2	Unwanted emissions in the spurious domain	PASS
3	EN 300 220 Sub-clause 4.3.1	TX effective radiated power	PASS
4	EN 300 220 Sub-clause 4.3.2	TX Maximum e.r.p. spectral density	N/A
5	EN 300 220 Sub-clause 4.3.3	TX Duty cycle	N/A
6	EN 300 220 Sub-clause 4.3.4	TX Occupied bandwidth	PASS
7	EN 300 220 Sub-clause 4.3.5	TX out of band emissions	N/A
8	EN 300 220 Sub-clause 4.3.6	TX Transient	Pass
9	EN 300 220 Sub-clause 4.3.7	TX Adjacent channel power	Pass
10	EN 300 220 Sub-clause 4.3.8	TX behaviour under low voltage conditions	Pass
11	EN 300 220 Sub-clause 4.3.9	TX Adaptive power control	N/A
12	EN 300 220 Sub-clause 4.3.10	TX FHSS	N/A
12	EN 300 220 Sub-clause 4.3.11	TX Short term behaviour	N/A
Technical characteristics of the receiver			
No	Section	Test Item	Result
1	EN 300 220 Sub-clause 4.4.1	RX sensitivity	N/A
2	EN 300 220 Sub-clause 4.5.2	Clear channel assessment threshold	N/A
3	EN 300 220 Sub-clause 4.5.3	Polite spectrum access timing parameters	N/A
4	EN 300 220 Sub-clause 4.4.2	RX Blocking	PASS
5	EN 300 220 Sub-clause 4.5.4	Adaptive Frequency Agility	N/A

5.SETUP OF EQUIPMENT UNDER TEST

5.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

Remark:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

5.2 LIST OF EQUIPMENTS USED

No.	Equipment	Manufacturer	Model No.	S/N	Calibration Date	Calibration due date
1	Test Receiver	Rohde & Schwarz	ESCI	100492	2017/03/10	2018/03/09
2	L.I.S.N.	Rohde & Schwarz	ENV216	100093	2017/03/10	2018/03/09
3	Coaxial Switch	Anritsu Corp	MP59B	6200283933	2017/03/07	2018/03/06
4	Terminator	Hubersuhner	50Ω	No.1	2017/03/07	2018/03/06
5	RF Cable	SchwarzBeck	N/A	No.1	2017/03/07	2018/03/06
6	Test Receiver	Rohde & Schwarz	ESPI	101202	2017/03/10	2018/03/09
7	Bilog Antenna	Sunol	JB3	A121206	2017/03/14	2018/03/13
8	Cable	Resenberger	N/A	NO.1	2017/03/07	2018/03/06
9	Cable	SchwarzBeck	N/A	NO.2	2017/03/07	2018/03/06
10	Cable	SchwarzBeck	N/A	NO.3	2017/03/07	2018/03/06
11	DC Power Filter	DuoJi	DL2×30B	N/A	2017/03/07	2018/03/06
12	Single Phase Power Line Filter	DuoJi	FNF 202B30	N/A	2017/03/07	2018/03/06
13	3 Phase Power Line Filter	DuoJi	FNF 402B30	N/A	2017/03/07	2018/03/06
14	Test Receiver	Rohde & Schwarz	ESCI	100492	2017/03/10	2018/03/09
15	Absorbing Clamp	Luthi	MDS21	3635	2017/03/12	2018/03/11
16	Coaxial Switch	Anritsu Corp	MP59B	6200283933	206/03/07	2018/03/06
17	AC Power Source	Kikusui	AC40MA	LM003232	2017/03/10	2018/03/09
18	Test Analyzer	Kikusui	KHA1000	LM003720	2017/03/10	2018/03/09
19	Line Impedance Network	Kikusui	LIN40MA-PCR-L	LM002352	2017/03/10	2018/03/09
20	ESD Tester	Kikusui	KES4021	LM003537	2017/03/07	2018/03/06
21	EMC PRO System	EM Test	UCS-500-M4	V0648102026	2017/03/10	2018/03/09
22	Signal Generator	IFR	2032	203002/100	2017/03/10	2018/03/09
23	Amplifier	A&R	150W1000	301584	2017/03/14	2018/03/13
24	CDN	FCC	FCC-801-M2-25	47	2017/03/10	2018/03/09
25	CDN	FCC	FCC-801-M3-25	107	2017/03/10	2018/03/09
26	EM Injection Clamp	FCC	F-2031-23mm	403	2017/03/10	2018/03/09

27	RF Cable	MIYAZAKI	N/A	No.1/No.2	2017/03/07	2018/03/06
28	Universal Radio Communication Tester	ROHDE&SCHWARZ	CMU200	0304789	2017/03/10	2018/03/09
29	Telecommunication Antenna	European Antennas	PSA 75301R/170	0304213	2017/03/10	2018/03/09
30	Spectrum Analyzer	Agilent	E4408	MY41440460	2017/03/10	2018/03/09
31	Horn Antenna	SCHWARZBECK	BBHA9120D	D69250	2017/03/10	2018/03/09

NOTE:Equipments listed above have been calibrated and are in the period of validation.

6. ETSI EN 300 220-1/-2 REQUIREMENTS

6.1 OPERATING FREQUENCY

LIMIT

ETSI EN 300 220-1 (V.3.1.1) Sub-clause 4.2.1.2

The manufacturer may declare either one or more operating frequencies and operating channels.

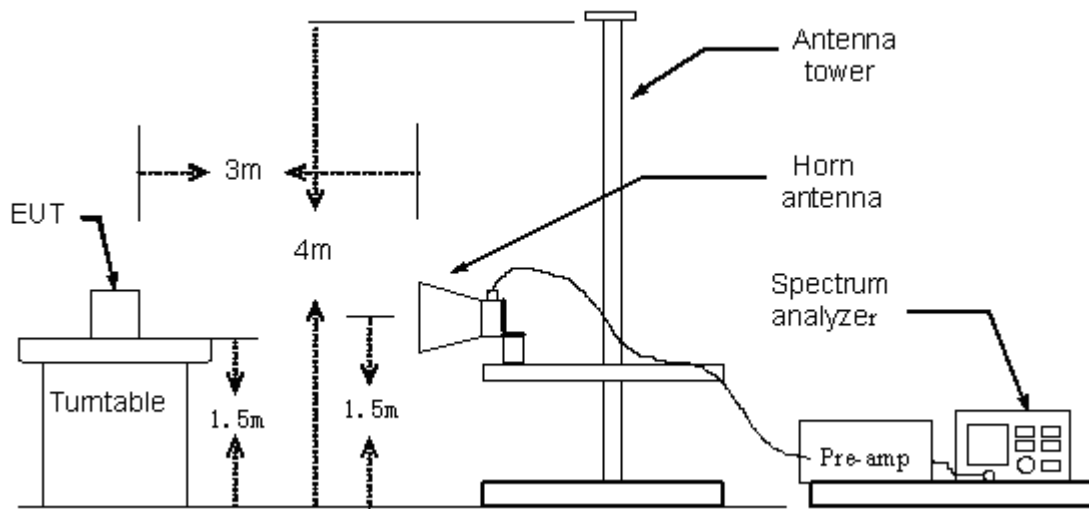
Operating channel(s) shall be entirely within operational frequency bands allowed by annexes B, C or any NRI.

TEST RESULTS

Customer defined limits

Note: see EUT description.

Above 1GHz



TEST PROCEDURE

1. Please refer to ETSI EN 300 220-1 (V.2.4.1) Sub-clause 5.1 for the test conditions.
2. Please refer to ETSI EN 300 220-1 (V.3.1.1) Sub-clause 5.9.3 for the measurement method.

TEST RESULTS

PASS

Remark : All test modes are performed, only the worst case is recorded in this report.

Please refer the following pages

TEST RESULTS

spurious emissions

Mode	Frequency MHz	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
TX Mode	223.71	H	-58.58	-54	-4.58
	447.45	H	-52.47	-36	-16.47
	1653.64	H	-47.38	-30	-17.38
	5889.52	H	-49.81	-30	-19.81
	176.79	V	-60.65	-54	-6.65
	278.68	V	-59.49	-36	-23.49
	1647.32	V	-49.61	-30	-19.61
	5573.57	V	-45.48	-30	-15.48
RX Mode	276.45	H	-60.36	-57	-3.36
	263.45	H	-59.59	-57	-2.59
	1478.63	H	-49.74	-47	-2.74
	5148.32	H	-53.56	-47	-6.56
	266.35	V	-60.41	-57	-3.41
	247.52	V	-59.64	-57	-2.64
	1471.58	V	-53.47	-47	-6.47
	5124.45	V	-49.76	-47	-2.76

Conducted measurement test Result:

Mode	Frequency	Measurement Bandwidth	Emissions Level	Limit	Margin
	MHz	KHz	dBm	dBm	dB
TX Mode	1995.43	100	-63.27	-54	-9.27
	446.32	100	-48.45	-36	-12.45
	1231.47	1000	-50.36	-30	-20.36
	other	\	\	\	\
RX Mode	225.34	100	-64.37	-57	-7.37
	546.28	100	-66.26	-57	-9.26
	1547.34	1000	-57.37	-47	-12.37
	other	\	\	\	\
Measurement uncertainty: ±3.2dB					

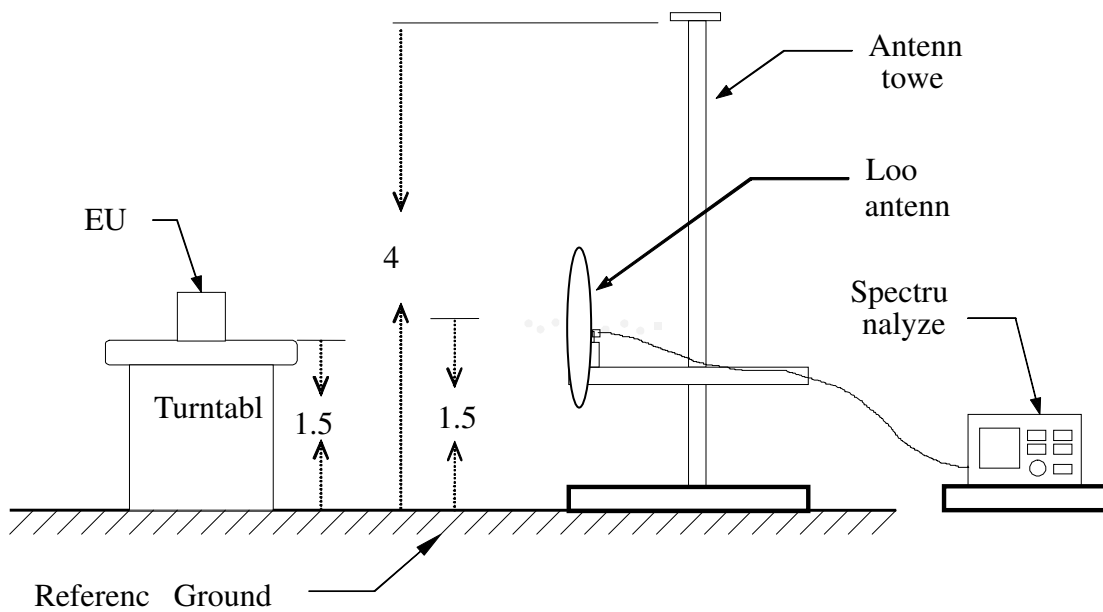
6.3 TX EFFECTIVE RADIATED POWER

LIMIT

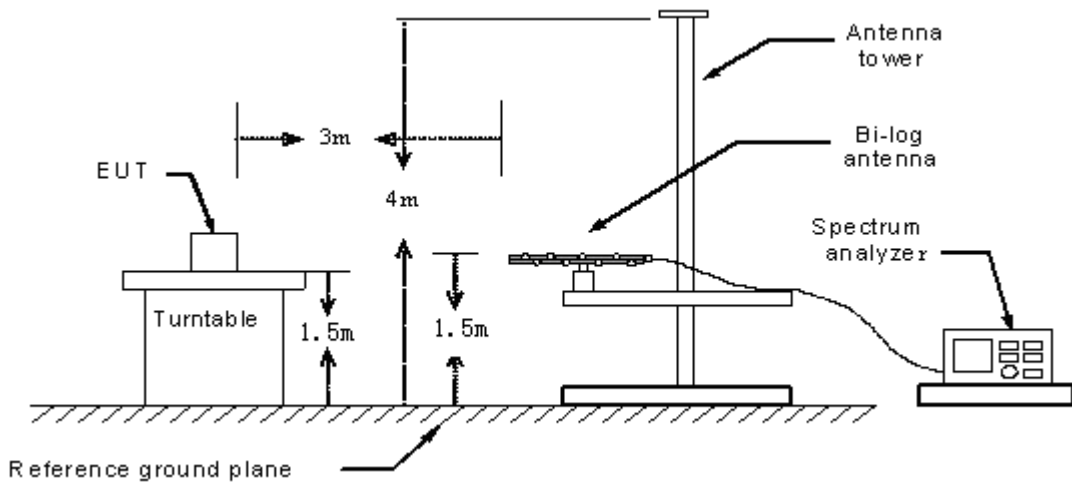
ETSI EN 300 220-2 (V.3.1.1) Sub-clause 4.3.1.2

The effective radiated power shall not be greater than the value allowed in annexes B or C for the chosen operational frequency band(s).

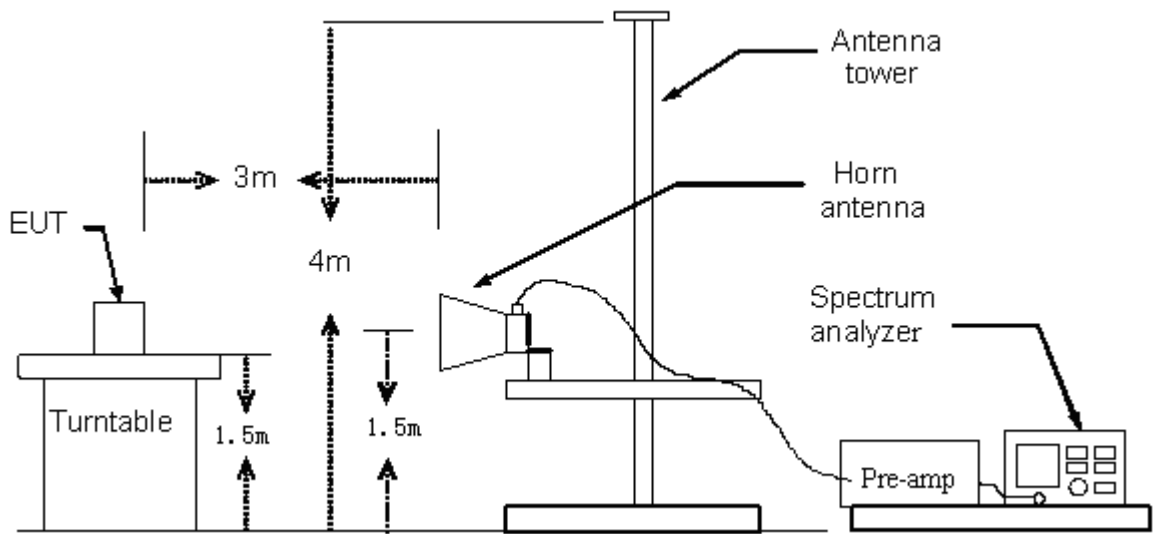
Below 30MHz



Below 1GHz



Above 1GHz



TEST PROCEDURE.

1. Please refer to ETSI EN 300 220-1 (V.3.1.1) Sub-clause 5.2.2 for the measurement method.

TEST RESULTS

Operation Mode: TX Mode

Test Date: Nov. 16, 2017

Temperature: 24°C

Tested by: Sunny

Humidity: 61 % RH

Polarity: Ver. / Hor.

:

433.920MHz

Freq. (MHz)	Antenna Polarity	Reading (dBm)	Correct Factor(dB)	Power (dBm)	Limit (dBm)
433.920	H	37.74	33.48	4.26	10
433.920	V	36.53	32.35	4.18	

6.4 TX OCCUPIED BANDWIDTH

LIMIT

ETSI EN 300 220-1 (V.3.1.1) Sub-clause 5.6.2

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 Flow and Fhigh.

Test Configuration

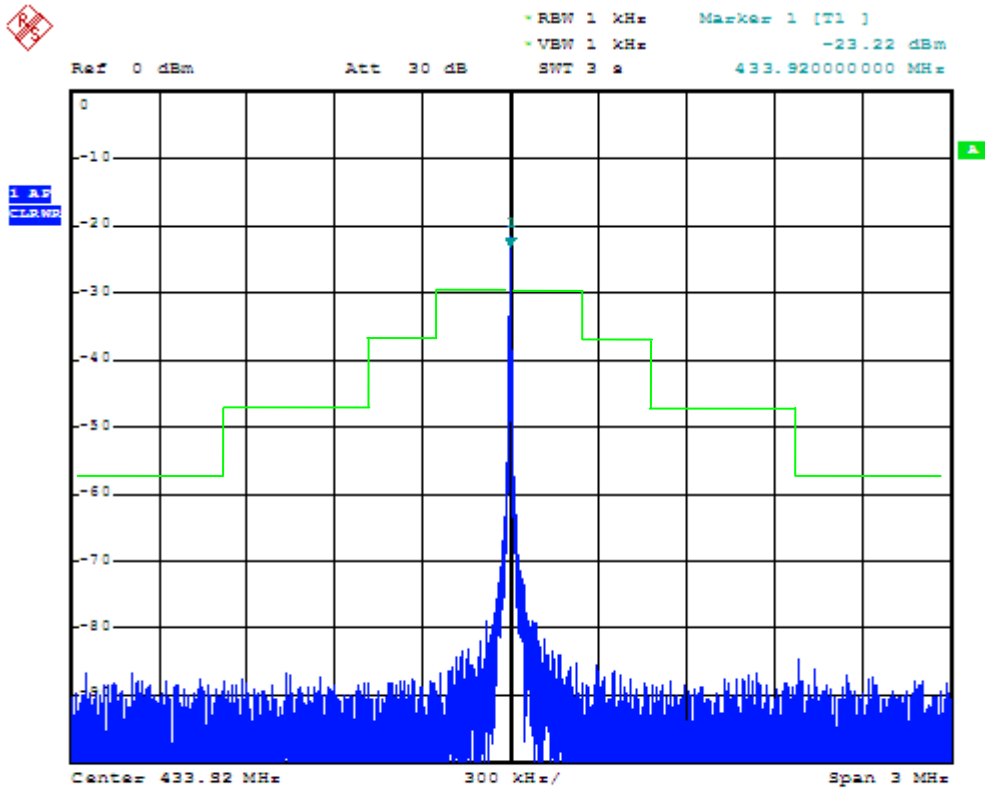
TEST PROCEDURE

1. Please refer to ETSI EN 300 220-1 (V.3.1.1) Sub-clause 5.1 for the test conditions.
2. Please refer to ETSI EN 300 220-1 (V3.1.1) Sub-clause 5.11.3 for the measurement method.

TEST RESULTS

Uncertainty: ± 3 dB

Test plot:



6.5 TX TRANSIENT

LIMIT

ETSI EN 300 220-2 (V.3.1.1) Sub-clause 5.10.2

The transient power shall not exceed the values given in Table 23..

Table 23: Transmitter Transient Power limits

Absolute offset from centre frequency	RBW _{REF}	Peak power limit applicable at measurement points
≤ 400 kHz	1 kHz	0 dBm
> 400 kHz	1 kHz	-27 dBm

TEST PROCEDURE

1. Please refer to ETSI EN 300 220-1 (V.3.1.1) Sub-clause 5.10.3 for the measurement method.

TEST RESULTS

Uncertainty: ± 3 dB

Channel	Maximum Transient power	Limit
400kHz above the edge of the modulation bandwidth	-31.2 dBm	-27dBm
400kHz below the edge of the modulation bandwidth	-18.9dBm	0dBm
Remark: The EUT to be used in a non-channelized continuous frequency band covering larger than 25 kHz, the EUT channel spacing defined as 100 kHz by test lab and manufactory. Pre-test every 120 kHz to 2 MHz from the primarily adjusted point to both sides of the wanted frequencies, find the worse case point at 120 KHz and report it. The Maximum transient power of the EUT was below the spurious domain limit in step 1, so the further evaluation of step 2 was not conducted.		

6.6TX ADJACENT CHANNEL POWER

LIMIT

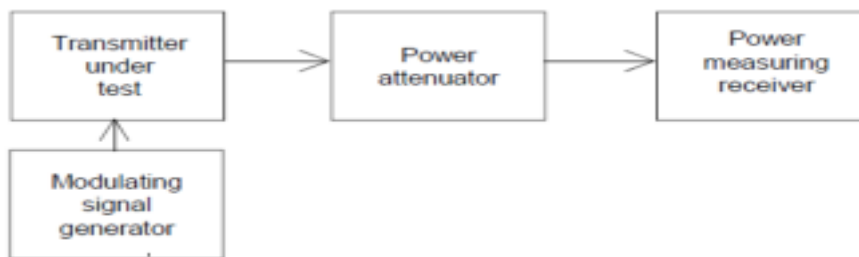
ETSI EN 300 220-1 (V.3.1.1)Sub-clause 5.11.2

Where the operating channel width is less than or equal to 25 kHz, the power in the adjacent channels shall not exceed the values given in Table 26

Table 26: Adjacent channel power limits for transmitters with OCW ≤ 25 kHz

		Adjacent Channel power integrated over 0,7 x OCW	Alternate Adjacent Channel power integrated over 0,7 x OCW
OCW < 20 kHz	Normal test conditions	-20 dBm	-20 dBm
	Extreme test conditions	-15 dBm	-20 dBm
OCW ≥ 20 kHz	Normal test conditions	-37 dBm	-40 dBm
	Extreme test conditions	-32 dBm	-37 dBm

Test Configuration



TEST PROCEDURE

3. Please refer to ETSI EN 300 220-1 (V.3.1.1) Sub-clause 5.1 for the test conditions.
4. Please refer to ETSI EN 300 220-1 (V3.1.1) Sub-clause 5.11.3 for the measurement method.

TEST RESULTS

:

433.92MHz
Adjacent channels

Measurement Conditions (in Normal & Extreme)		ACP Measured		Limit
		-1 Channel	+1 Channel	
°C	VDC	dBm	dBm	dBm
$T_{nom} = 25$	$V_{nom} = 4.50$	-31.63	-32.42	-20
$T_{max} = +40$ after Tx on for 30 minutes	$V_{max} = 4.50$	-32.78	-34.56	-15
	$V_{min} = 3.83$	-25.69	-26.52	-15
$T_{min} = -10$ after Tx on for 1 minute	$V_{max} = 4.50$	-34.57	-31.43	-15
	$V_{min} = 3.83$	-23.39	-26.46	-15

Remark:

1. The EUT belonged to category II- Portable Equipment.
2. The V_{min} was minimum voltage set at 85% of rated supply as standard required.
3. The V_{max} was maximum voltage set at rated supply as standard required.
4. The EUT to be used in a non-channelized continuous frequency band, the channel spacing of the EUT was defined as 10 kHz.

Alternate Adjacent channels

Measurement Conditions (in Normal & Extreme)		ACP Measured		Limit
		-1 Channel	+1 Channel	
°C	VDC	dBm	dBm	dBm
$T_{nom} = 25$	$V_{nom} = 4.50$	-32.57	-33.35	-20
$T_{max} = +50$ after Tx on for 30 minutes	$V_{max} = 4.50$	-31.78	-32.62	-20
	$V_{min} = 3.83$	-24.56	-25.34	-20
$T_{min} = -10$ after Tx on for 1 minute	$V_{max} = 4.50$	-30.61	-31.47	-20
	$V_{min} = 3.83$	-23.49	-25.35	-20

Remark:

5. The EUT belonged to category II- Portable Equipment.
6. The V_{min} was minimum voltage set at 85% of rated supply as standard required.
7. The V_{max} was maximum voltage set at rated supply as standard required.
8. The EUT to be used in a non-channelized continuous frequency band, the channel spacing of the EUT was defined as 10 kHz.

6.7TX BEHAVIOUR UNDER LOW VOLTAGE CONDITIONS

LIMIT

ETSI EN 300 220-1 (V.3.1.1)Sub-clause 5.12.1

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..

TEST PROCEDURE

1. Please refer to ETSI EN 300 220-1 (V.3.1.1) Sub-clause 5.1 for the test conditions.
2. Please refer to ETSI EN 300 220-1 (V.3.1.1)Sub-clause 5.12.3 for the measurement method.

TEST RESULTS

Power level at which measurement has been performed:

Nominal supply voltage:3.00 V DC

Extreme test voltage: 2.55V DC

Applied test voltage: reduced from 2.55V to1.30 V DC

Nominal Frequency was:433.92 MHz

Voltage (V)	Frequency spot with level $\leq 6\text{dBm}$		Limit (MHz)		Result
	FL	FH	lower	Higher	
3.00 V DC	433.518	433.845	FL \geq 433.050	FH \leq 434.790	Pass
2.55 V DC	433.413	433.876			
1.30 V DC	433.687	433.883			

6.8 BLOCKING

LIMIT

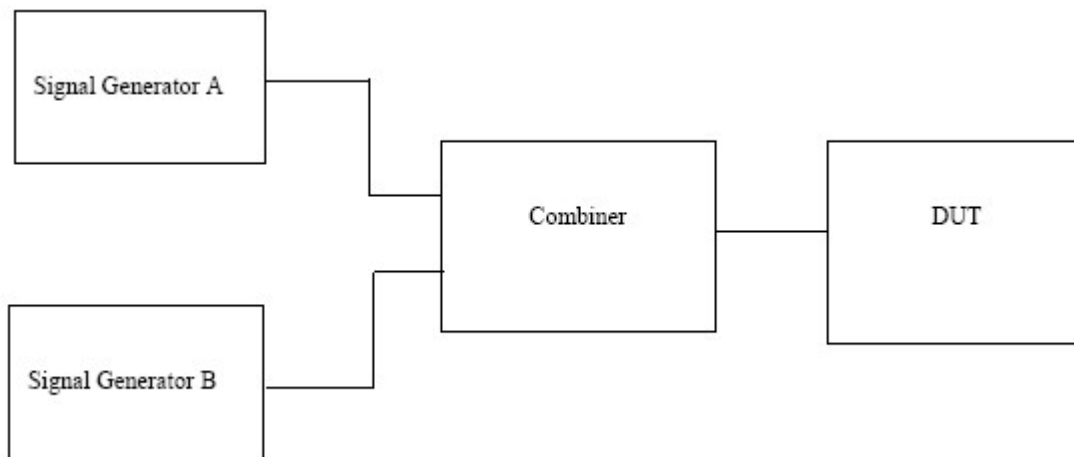
ETSI EN 300 220-1 (V.3.1.1) Sub-clause 8.4.3

The blocking levels at the specified frequency offsets shall be equal to or greater than the limits Table 41, except at frequencies where spurious responses are found.

Table 41: Blocking level parameters for RX category 2

Requirement	Limits
	Receiver category 2
Blocking at ± 2 MHz from OC edge f_{high} and f_{low}	≥ -69 dBm
Blocking at ± 10 MHz from OC edge f_{high} and f_{low}	≥ -44 dBm
Blocking at ± 5 % of Centre Frequency or 15 MHz, whichever is the greater	≥ -44 dBm

Test Configuration



TEST PROCEDURE

1. Please refer to ETSI EN 300 220-1 (V.3.1.1) Sub-clause 5.1 for the test conditions.
2. Please refer to ETSI EN 300 220-1 (V.3.1.1) Sub-clause 5.18.6.4 for the measurement method.

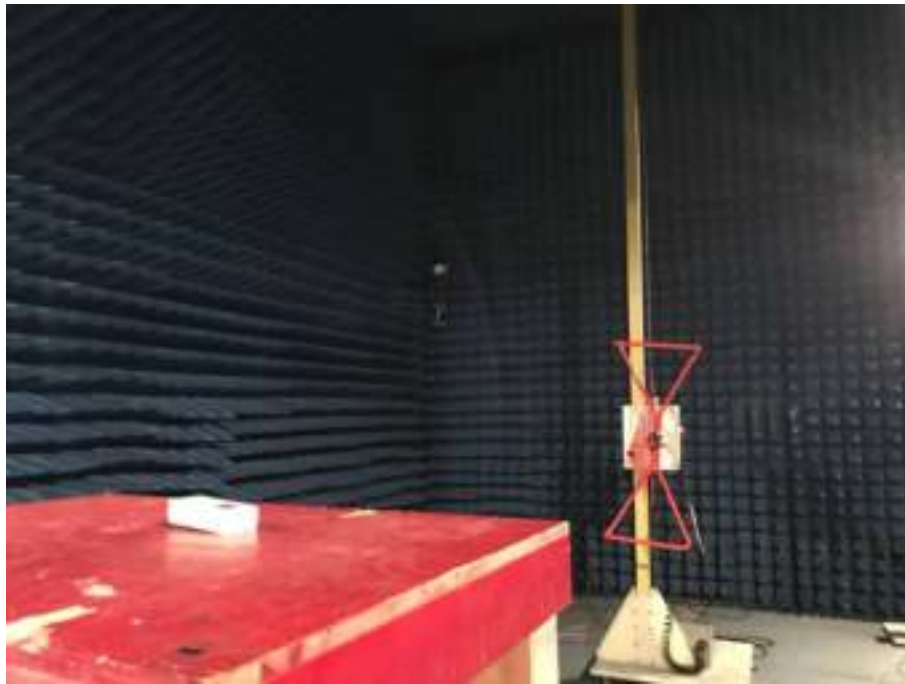
TEST RESULTS

Channel	Frequency offset (MHz)	Test result (dB)	Limit(dBm)	Result
433.92MHz	-2	32.74	-69	PASS
	+2	31.48	-69	PASS
	-10	57.36	-44	PASS
	+10	58.27	-44	PASS

RADIATED EMISSION TEST SETUP



RADIATED EMISSION TEST SETUP



---END OF REPORT---