

RADIO TEST REPORT

Issued for

Acrel Co., Ltd.

No.253, Yulv Road, Jiading District, Shanghai, China

Product Name:	Wireless Temperature Sensor
Brand Name:	Acrel
Model Name:	ATC600-C
Series Model:	ATE100,ATE100M,ATE100P,ATE200,ATE200P, ATE400, ATC450-C
Test Standard:	ETSI EN 300 220-1 V3.1.1 ETSI EN 300 220-2 V3.2.1

TEST RESULT CERTIFICATION

Applicant's Name: Acrel Co., Ltd.
Address.....: No.253, Yulv Road, Jiading District, Shanghai, China
Manufacture's Name: Jiangsu Acrel Electrical Manufacturing. Co., Ltd.
Address.....: No.5, Dongmeng Road, Nanzha Street, Jiangyin City, Jiangsu Province, China

Product Description

Product Name: Wireless Temperature Sensor
Brand Name: Acrel
Model Name.....: ATC600-C
Series Model.....: ATE100,ATE100M,ATE100P,ATE200,ATE200P,ATE400, ATC450-C
Test Standards.....: ETSI EN 300 220-1 V3.1.1
ETSI EN 300 220-2 V3.2.1

This device described above has been tested by FCS, and the test results show that the equipment under test (EUT) is in compliance with the 2014/53/EU RED Directive requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test..... :

Date (s) of performance of tests : May. 15. 2021 ~ May. 26. 2021

Date of Issue..... : May. 26. 2021

Test Result : Pass

Tested by

:

Scott Shen

(Scott Shen)

Reviewed by

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Duke Qian

(Duke Qian)

Approved by

:

Kait Chen

(Kait Chen)



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Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	May 26, 2021	FCS202105023W01	ALL	Initial Issue

1. TEST RESULT CERTIFICATION

Product Name:	Wireless Temperature Sensor
Brand Name:	Acrel
Model Name:	ATC600-C
Series Model:	ATE100,ATE100M,ATE100P,ATE200,ATE200P,ATE400, ATC450-C
Frequency Range:	433.92 MHz
Power Rating:	AC 230V 50HZ
Modulation Technique:	FSK
Antenna type:	External antenna
Antenna gain:	1 dBi
Hardware version number:	V1.0
Software version number:	V1.0
Temperature Range:	-10°C ~ +55°C

Note: 1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2. TEST FACTORY

Company Name:	Flux Compliance Service Laboratory.
Address:	Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan,

2.1 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately **95 %**.

No.	Item	Uncertainty
1	RF power,conducted	$\pm 0.71\text{dB}$
2	Spurious emissions,conducted	$\pm 0.63\text{dB}$
3	Spurious emissions,radiated(>1G)	$\pm 2.25\text{dB}$
4	Spurious emissions,radiated(<1G)	$\pm 2.21\text{dB}$
5	Spurious emissions,radiated(<30M)	$\pm 3.02\text{dB}$

2.2EQUIPMENTS LIST FOR ALL TEST ITEMS

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Bilog Antenna	TESEQ	CBL6111D	34678	2020.11.02	2021.11.01
Horn Antenna	Schwarzbeck	BBHA 9120D(1201)	9120D-1343	2020.11.02	2021.10.26
USB RF power sensor	DARE	RPR3006W	15I00041SNO 03	2020.11.02	2021.11.01
Pre-mpifier (0.1M-3GHz)	EM	EM330	60538	2020.11.02	2021.11.01
PreAmplifier (1G-26.5GHz)	Agilent	8449B	60538	2020.11.02	2021.11.01
Temperature& Humidity test chamber	GZGONGWEN	GDS-250	080821	2020.11.02	2021.11.01
Signal Generator	Agilent	N5182A	MY50140530	2020.11.02	2021.11.01
Signal Analyzer	Agilent	N9020A	MY49100060	2020.11.02	2021.11.01
Universal Radio communication tester	R&S	CMU200	112012	2020.11.02	2021.11.01
Attenuator	HP	8494B	DC-18G	2020.11.02	2021.11.01
programmable power supply	Agilent	3642A	STS-S095	N.C.R	N.C.R
AC Power Source	APC	KDF-11010G	F214050035	N.C.R	N.C.R
turn table	EM	SC100_1	60531	N/A	N/A
Antenna mast	EM	SC100	N/A	N/A	N/A

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

3. TEST METHODOLOGY

3.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT has been tested according to ETSI EN 300 220-2 V3.2.1 (2018-06) together with ETSI EN 300 220-1 V3.1.1 (2017-02).

ETSI EN 300 220-1 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 300 220-2 V3.2.1 (2018-06)	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 the Directive 2014/53/EU for non specific radio equipment

3.2 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 stand-up position (Z axis), lie-down position (X, Y axis). The following data show only with the worst case setup.

The worst case of Y axis without was reported.

3.3 ENTAL CONDITIONS

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

- Temperature: 15-35°C
- Humidity: 20-75 %
- Atmospheric pressure: 86-106 kPa

3.4 TEST SUMMARY

Test Description	Reference	U/C	Condition	Judgment
Operating frequency	4.2.1	U		PASS
Unwanted emissions in the spurious domain	4.2.2	U		PASS
TX effective radiated power	4.3.1	U		PASS
TX Maximum e.r.p spectral density	4.3.2	C	Applies to EUT using Annex B bands I, L. Applies to EUT using DSSS or other wideband techniques other than FHSS modulation in Annex C band X.	N/A
TX Duty cycle	4.3.3	C	Not applicable to EUT with polite spectrum access using bands L,M,N,O,P,R,X.	PASS
TX Occupied bandwidth	4.3.4	U		PASS
TX out of band emissions	4.3.5	C	Applies to EUT with OCW > 25 kHz.	N/A(OCW is 22KHz)
TX Transient	4.3.6	U		PASS
TX Adjacent channel power	4.3.7	C	Applies to EUT with OCW ≤25 kHz.	PASS (OCW=20KHz)
TX behaviour under low voltage conditions	4.3.8	C	Applies to battery powered EUT.	PASS
TX Adaptive power control	4.3.9	C	Applies to EUT with adaptive power control using annex C band AA.	N/A
TX FHSS	4.3.10	C	Applies to FHSS EUT.	N/A
TX Short term behaviour	4.3.11	C	Applies to EUT using Annex C bands Y, Z, AA, AB, AC, AD.	N/A
RX sensitivity	4.4.1	C	Applies to EUT with polite spectrum access.	N/A
Clear channel assessment threshold	4.4.3	C	Applies to EUT with polite spectrum access.	N/A
Polite spectrum access	4.4.4	C	Applies to EUT with polite spectrum access.	N/A
RX Blocking	4.4.2	U		N/A
Adaptive Frequency Agility	4.5.1	C	Applies to EUT with AFA.	N/A

Note: (1)" N/A" denotes test is not applicable in this Test Report

4. OPERATING FREQUENCY

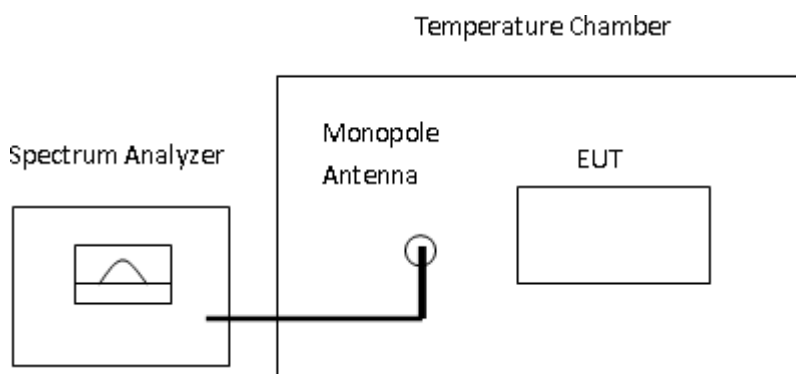
4.1 LIMIT

Value	Notes
Operational Frequency band or bands	Declared by the provider
Nominal Operating Frequency or Frequencies	Declared by the provider
Operating Channel width(s) - OCW -	Declared by the provider

4.2 DESCRIPTION

The nominal Operating Frequency is the centre of a channel of width OCW.

4.3 TEST CONFIGURATION



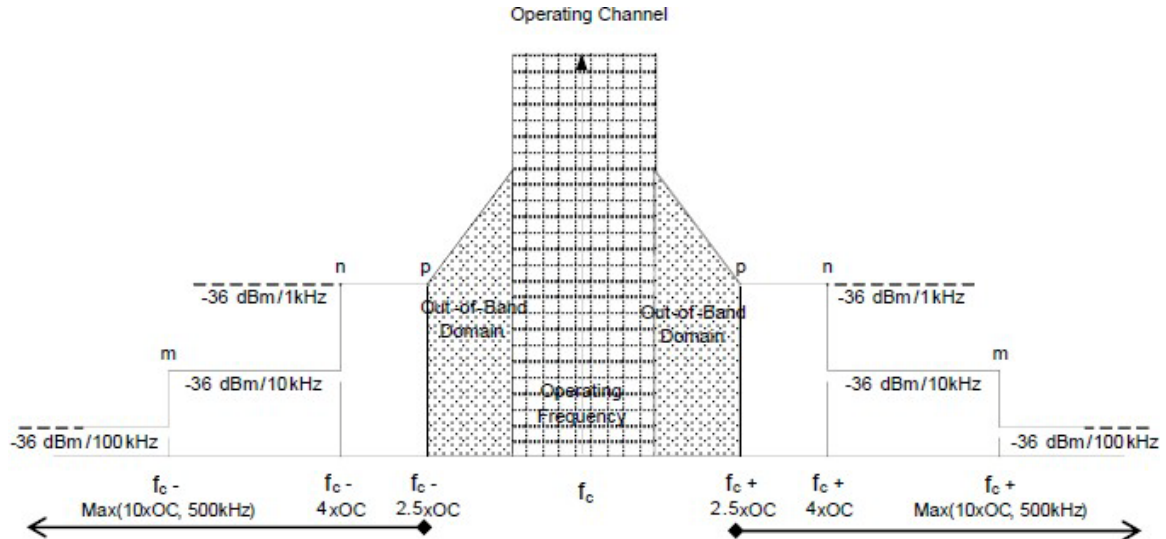
4.4 TEST RESULTS

Operation Frequency	Test conditions		Measured Frequency(MHz)
433.92MHz	Normal		433.9296
	Extreme	LTLV	433.9301
		LTHV	433.9305
		HTLV	433.9302
		HTHV	433.9307
Limit			433.00~434.70

5. UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

5.1 LIMIT

Unwanted emissions for a TX mode

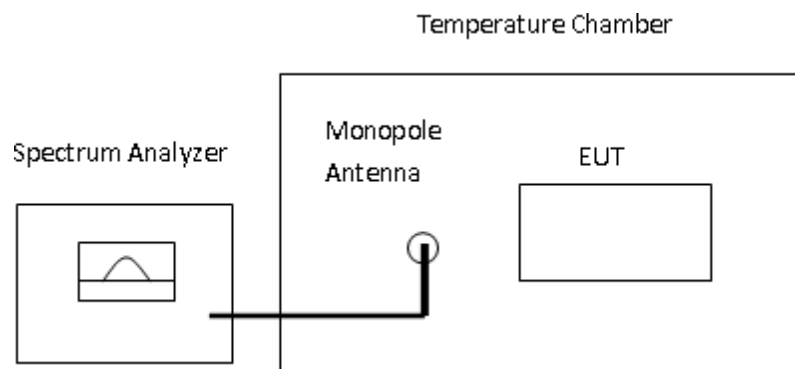


Unwanted emissions for all other modes

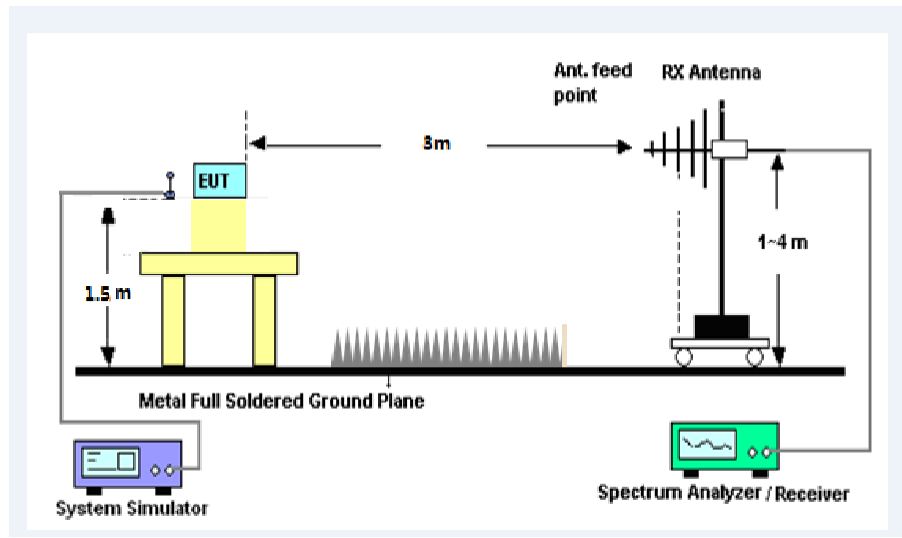
State	Frequency	47 MHz to 74 MHz 87.5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 790 MHz	Other frequencies below 1000 MHz	Frequencies above 1000 MHz
TX mode		-54 dBm	-36 dBm	-30 dBm
RX and all other modes		-57 dBm	-57 dBm	-47 dBm

5.2 TEST CONFIGURATION

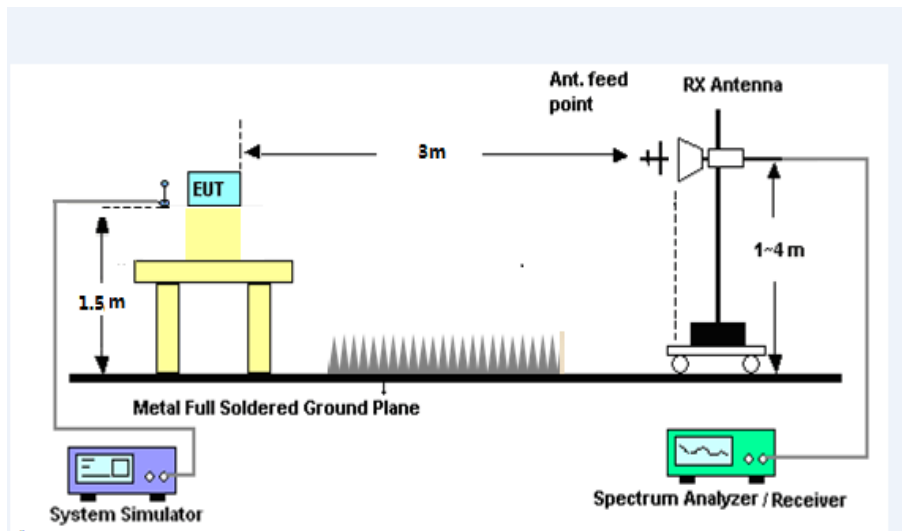
CONDUCTED MEASUREMENT



Below 1GHz



Above 1GHz



5.3 TEST PROCEDURE

1. Please refer to ETSI EN 300 220-1 Sub-clause 5.9.3.1/ Sub-clause 5.9.3.2 for the test conditions.
2. Please refer to ETSI EN 300 220-1 Sub-clause 5.9.3.3.1/5.9.3.3.2 for the measurement method.

5.4 TEST RESULTS

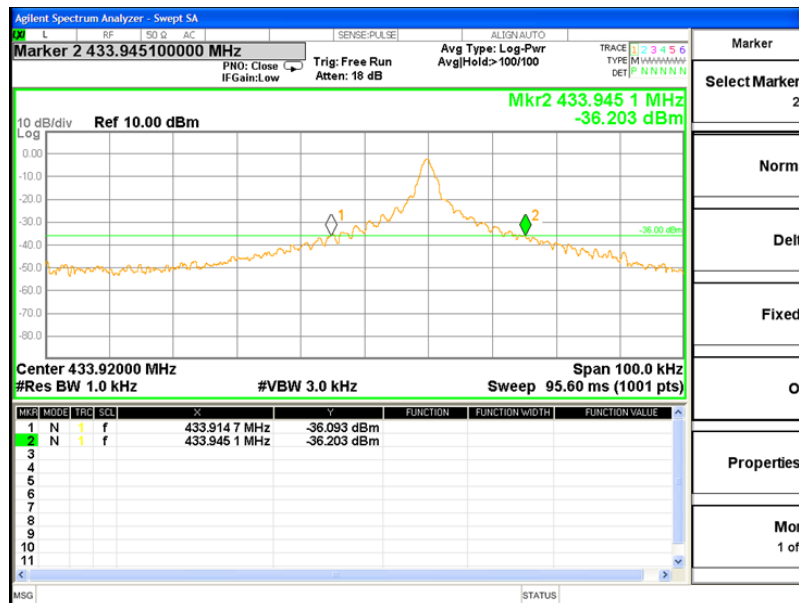
For conducted measurement

Not application, EUT without an external conventional 50 Ω coaxial antenna connector.

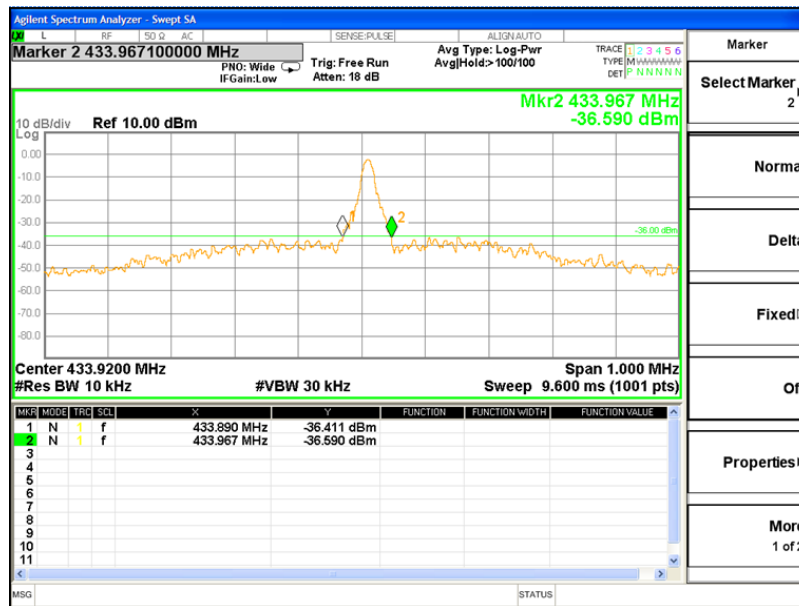
For Radiated measurement

Test sequence	RBW, (kHz)	Limit, dBm	Cross point frequency (MHz)	Reading (dBm)	Limit of Modul ated Signal (MHz)	Limit Note	Verdict
1	1	-36	433.9147	-36.0930	433.8700	Fc-2.5*OCW	Pass
			433.9451	-36.2030	433.9700	Fc+2.5*OCW	Pass
2	10	-36	433.8900	-36.4110	433.8700	Fc-4*OCW	Pass
			433.9670	-36.5900	433.9700	Fc+4*OCW	Pass
3	100	-36	433.5150	-36.9010	433.4200	Fc-Max(10xOCW, 500kHz)	Pass
			434.3220	-36.3390	434.4200	Fc+Max(10xOCW , 500kHz)	Pass

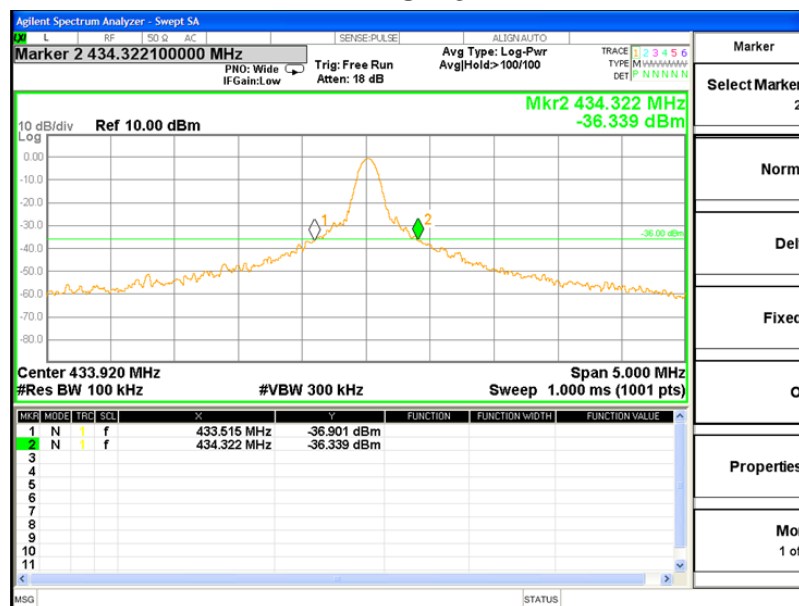
MASK-1



MASK-2



MASK-3

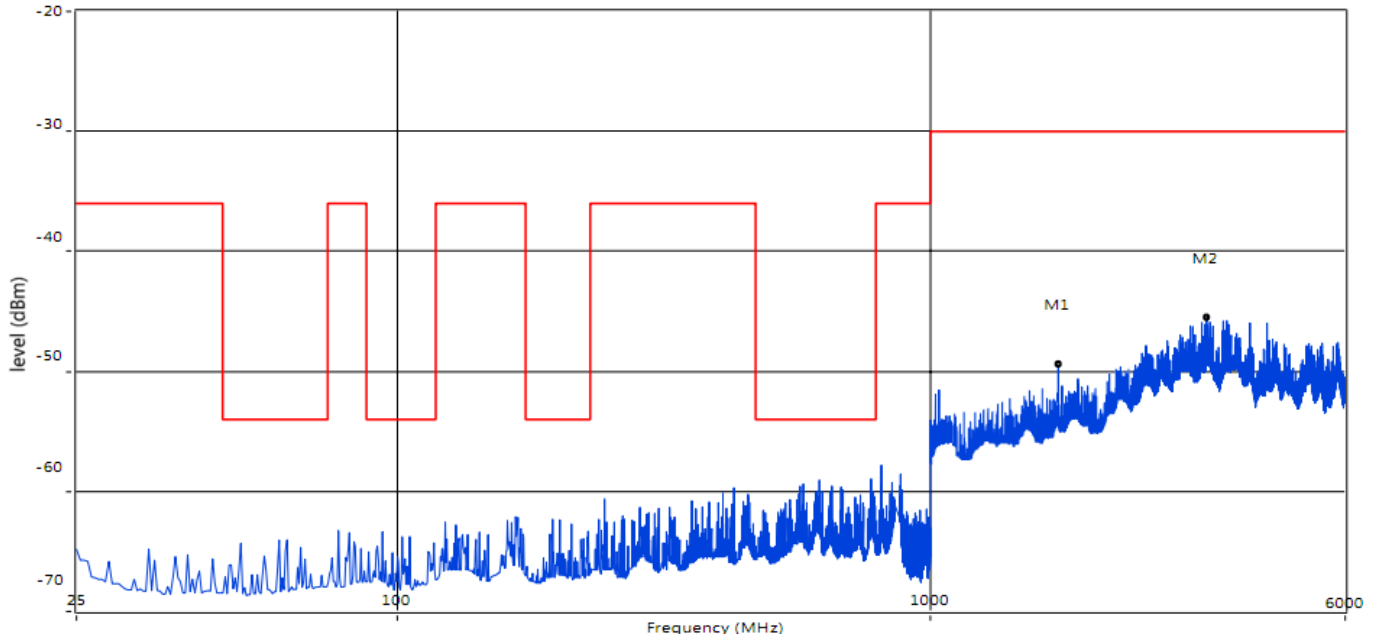


25MHz ~ 6000MHz

TX

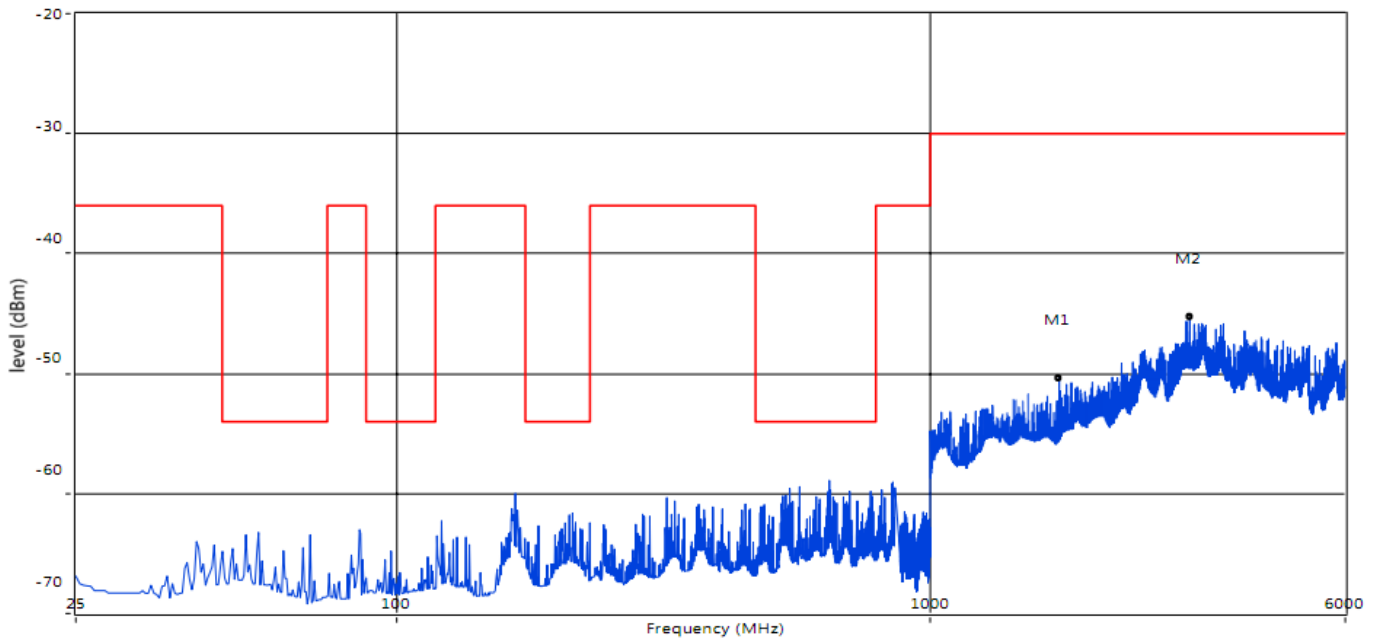
Hor.

EN_RSE_300 220_TX_25-6GH



Ver.

EN_RSE_300 220_TX_25-6GH

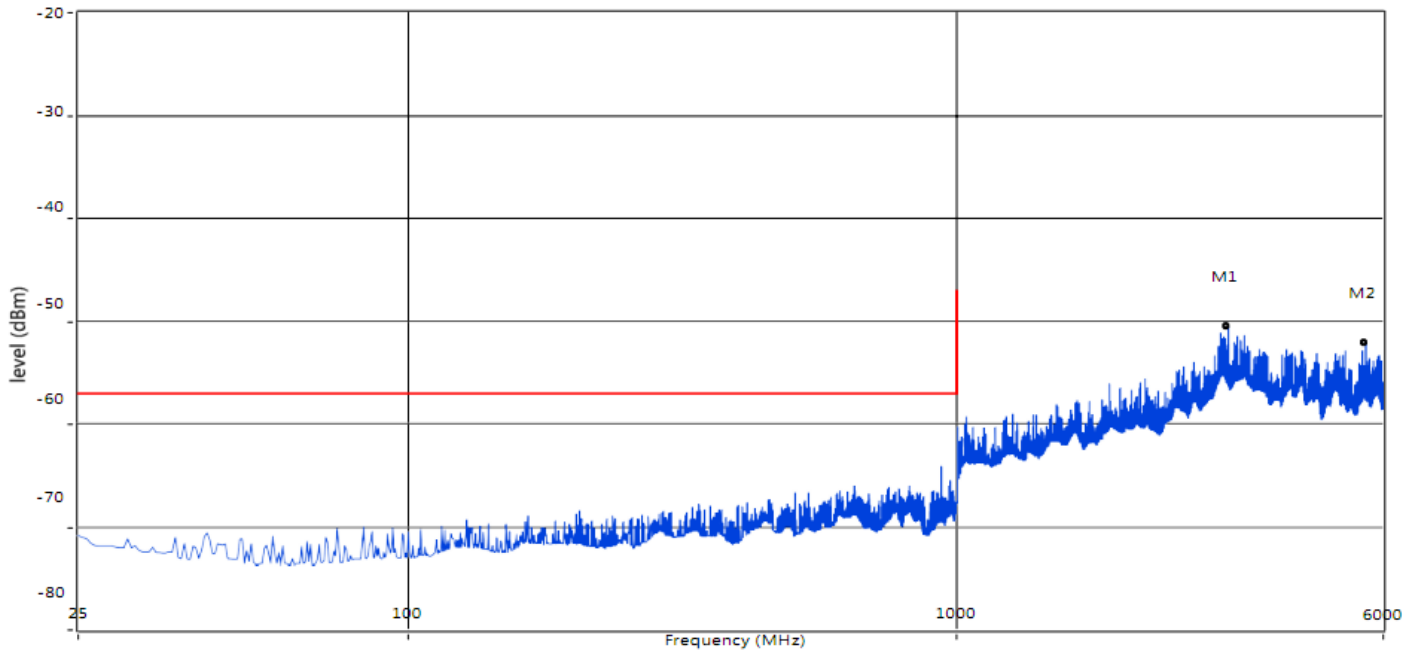


25MHz ~ 6000MHz

RX

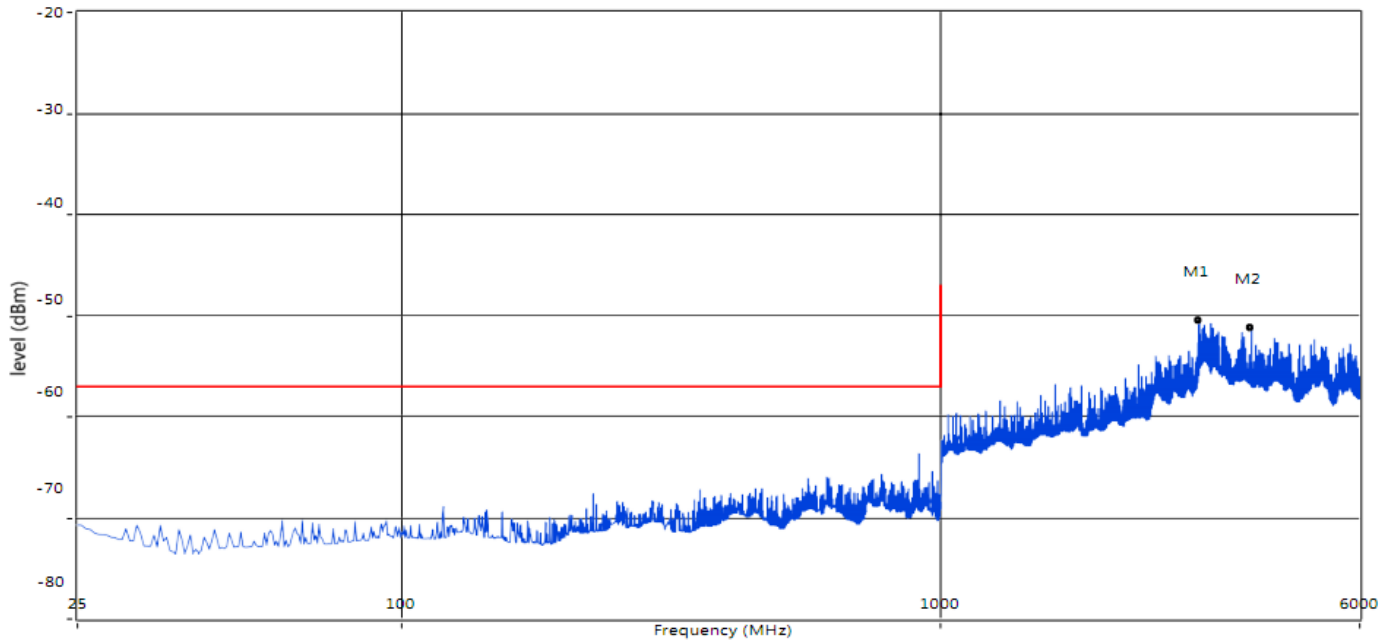
Hor.

EN_RSE_300 220_RX-25-6GHz



Ver.

EN_RSE_300 220_RX-25-6GHz



Remark:

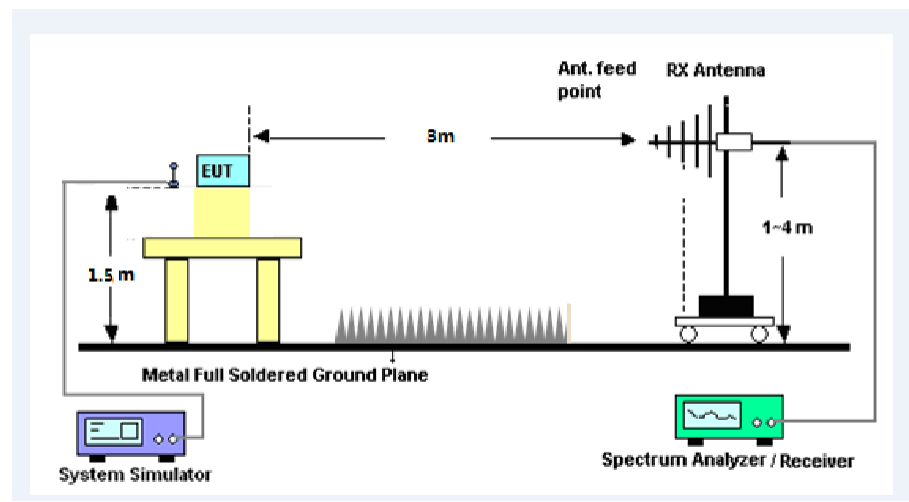
1. The emission behavior belongs to narrowband spurious emission.

6. EFFECTIVE RADIATED POWER

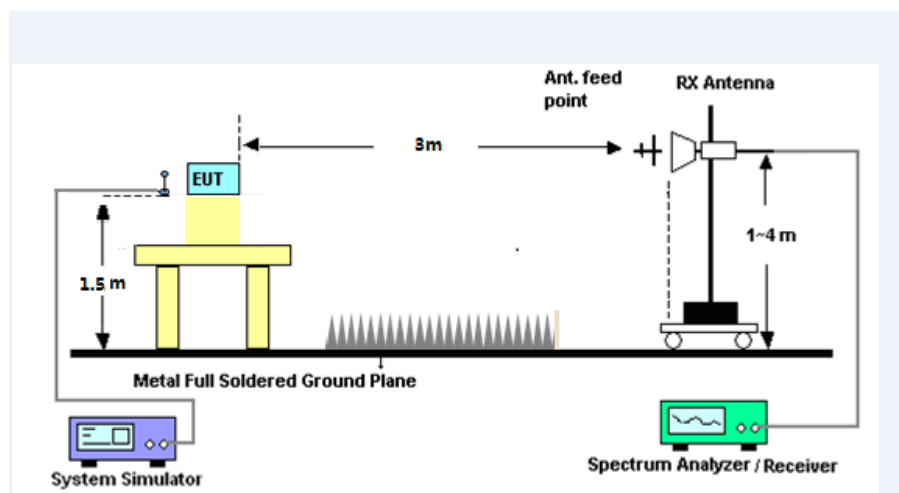
6.1 LIMIT

According to Article 8 (2) of Directive 2014/53/EU [i.2], the European Commission has adopted implementing acts establishing the equivalence between notified national radio interfaces and assigning a radio equipment class. So called Class 1 equipment is equipment that can be placed on the market and be put into service without restrictions. The Commission, in consultation with Member States, publishes an indicative and non-exhaustive list of equipment falling within the scope of Class 1. Table B.1 summarizes the relevant parameters in the band 25 MHz to 1000 MHz from the latest list of class 1 equipment (December 2014). Table B.1 is in line with the harmonised frequency bands and technical parameters for short-range devices from EC Decision 2013/752/EU [i.3].

Below 1GHz



Above 1GHz



6.2 TEST PROCEDURE

1. Please refer to ETSI EN 300 220-1 Sub-clause 5.2.2.1.1 for the test conditions.
2. Please refer to ETSI EN 300 220-1 Sub-clause 5.2.2.1.2 for the measurement method.

6.3 TEST RESULTS

Note: scan with normal condition and extreme condition, only show the worst case of normal condition in the report

Effective Radiated Power

Note: $ERP (dBm) = EIRP - 2.15$

Ambient temperature: 22 °C			Relative humidity: 55%								
Freque ncy	Detec t or	Ant .	Antenn a Height	Turn table Angle	result	Gain	EIRP	Corre ction	ERP	Limit	Result
(MHz)		Pol	(m)	(°)	(dBm)	(dBi)	(dBm)	(dB)	(dBm)	(dBm)	
433.92	Peak	H	1.5	157	3.07	1	4.07	2.15	1.92	10.00	Pass
433.92	Peak	V	1.5	196	3.86	1	4.86	2.15	2.71	10.00	Pass

7. DUTY CYCLE

7.1 LIMIT

An assessment of the overall Duty Cycle shall be made for a representative period of Tobs over the observation bandwidth Fobs. Unless otherwise specified, Tobs is 1 hour and the observation bandwidth Fobs is the operational frequency band.

The representative period shall be the most active one in normal use of the device. As a guide "Normal use" is considered as representing the behaviour of the device during transmission of 99 % of traffic generated during its operational lifetime.

Procedures such as test and development of equipment and setup and configuration during installation and maintenance are not considered part of normal operation.

Where an acknowledgement is used, the additional transmitter on-time from a message responder shall be declared only once whether included in the message initiator Duty Cycle or in the message responder Duty Cycle.

7.2 TEST PROCEDURE

Please refer to ETSI EN 300 220-1 Sub-clause 5.4.1 for the test conditions.

7.3 TEST RESULTS

Duty Cycle	
Ambient temperature: 22 °C	Relative humidity: 55%
Duty Cycle	Limit
9.00%	No restriction
The EUT is manual operation for remote controller , it is declared by the manufacturer as a duty cycle ratio of No restriction	
The EUT _{ms} Max work time : Ton =0.13745 The EUT _{ms} Max work period :T=TON+TOFF=1.5279 The EUT _{ms} Max duty cycle : D = Ton /Tp= 9.0%	
For the purposes of the present document the duty cycle is defined as the ratio, expressed as a percentage, of the maximum transmitter "on" time monitored over one hour, relative to a one hour period. The device may be triggered either automatically or manually and depending on how the device is triggered will also depend on whether the duty cycle is fixed or random	

8. OCCUPIED BANDWIDTH

8.1 LIMIT

Limits apply under normal and extreme conditions.

The Operating Channel shall be declared and shall reside entirely within the Operational Frequency Band.

The Occupied Bandwidth at 99 % shall reside entirely within the Operating Channel.

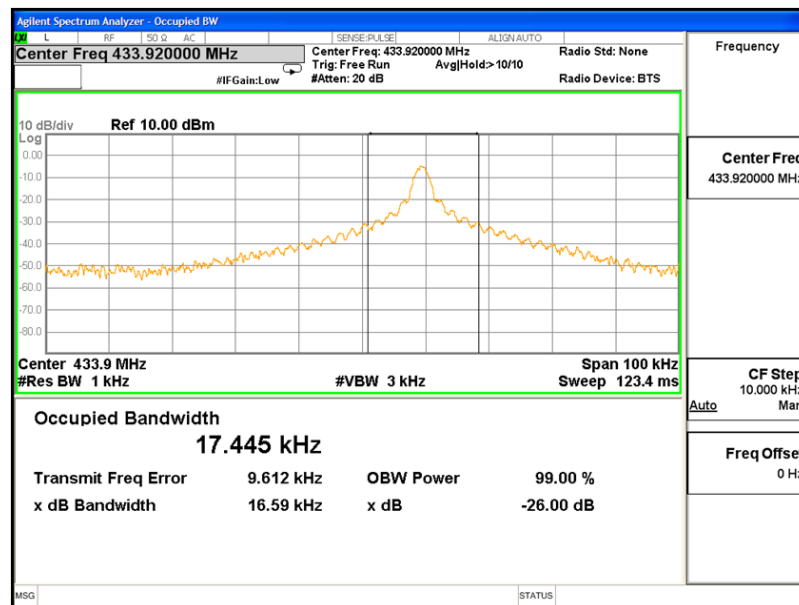
For systems where 99 % OBW cannot be measured, the bandwidth at -23 dBc shall reside entirely within the Operating Channel bandwidth.

8.2 TEST PROCEDURE

1. Please refer to ETSI EN 300 220-1 Sub-clause 5.6.3.1 for the test conditions.
2. Please refer to ETSI EN 300 220-1 Sub-clause 5.6.3.3 for the measurement method.

8.3 TEST RESULTS

Modulation Bandwidth		
Ambient temperature: 22 °C		Relative humidity: 55%
Fa(MHz)	Fb(MHz)	Modulation bandwidth(KHz)
433.9216	433.9390	17.445



9. TRANSIENT POWER

9.1 LIMIT

Transmitter transient power is power falling into frequencies other than the operating channel as a result of the transmitter being switched on and off.

The transient power shall not exceed the values given in below table

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

9.2 TEST PROCEDURE

1. Please refer to ETSI EN 300 220-1 Sub-clause 5.10.3.1 for the test conditions.
2. Please refer to ETSI EN 300 220-1 Sub-clause 5.10.3.2 for the measurement method.

9.3 TEST RESULTS

Transient power							
Ambient temperature: 22 °C					Relative humidity: 55%		
Measurement points: offset from centre frequency	Absolute offset from centre frequency	Analyser RBW(KHz)	RBW ref	Measured value at the Analyser RBW	Corresponding value at RBW ref	Limit	Results
(KHz)	(MHz)	(KHz)	(KHz)	(dBm)	(dBm)	(dBm)	(P/F)
(-0,5 x OCW - 3 kHz)	433.9070	1	1	-36.6830	-36.6830	0	PASS
(+0,5 x OCW + 3 kHz)	433.9330	1	1	-36.5610	-36.5610	0	PASS
min (-12,5 kHz, -OCW)	433.9000	3	1	-37.8420	-42.6132	0	PASS
max (+12,5 kHz, OCW)	433.9400	3	1	-37.6930	-42.4642	0	PASS
(-0,5 x OCW - 400 kHz)	433.5100	100	1	-37.3750	-57.3750	-27	PASS
(+0,5 x OCW + 400 kHz)	434.3300	100	1	-37.2580	-57.2580	-27	PASS
(-0,5 x OCW -1 200 kHz)	432.7100	300	1	-38.5170	-63.2882	-27	PASS
(+0,5 x OCW + 1 200 kHz)	435.1300	300	1	-37.3860	-62.1572	-27	PASS

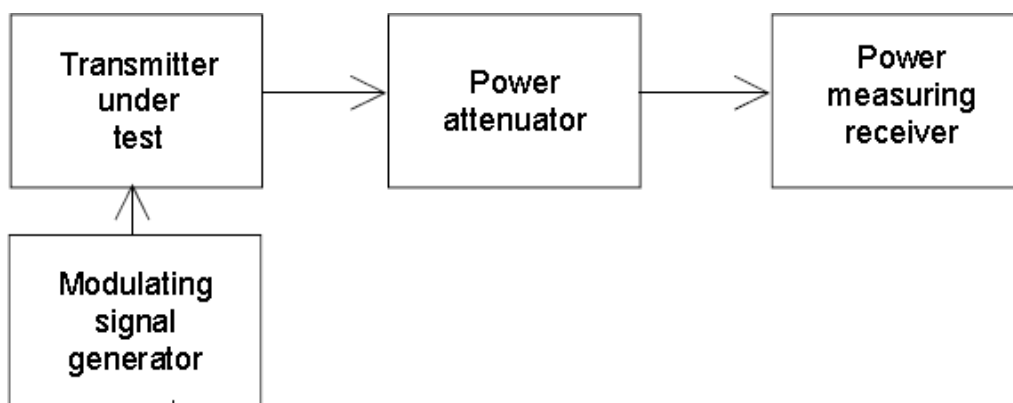
10. ADJACENT CHANNEL POWER

10.1 LIMIT

The adjacent channel power shall not exceed the maximum values given below:

	TEST CONDITIONS	Adjacent Channel power integrated over 0.7 x OCW	Alternate Adjacent Channel power integrated over 0.7 x OCW
OCW <20 kHz	Normal	-20 dBm	-20 dBm
	Extreme	-15 dBm	-20 dBm
OCW ≥ 20 kHz	Normal	-37 dBm	-40 dBm
	Extreme	-32 dBm	-37 dBm

Test Configuration

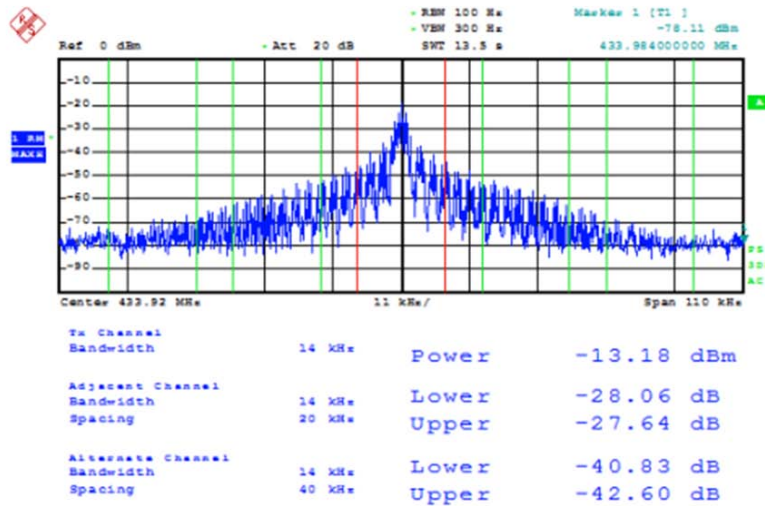


10.2 TEST PROCEDURE

1. Please refer to ETSI EN 300 220-1 Sub-clause 5.11.3.1 for the test conditions.
2. Please refer to ETSI EN 300 220-1 Sub-clause 5.11.3.3/5.11.3.4 for the measurement method.

10.3 TEST RESULTS

MEASUREMENT	TEST CONDITIONS	TEST RESULT(dBm)
ADJACENT CHANNEL	Normal	-27.64
	Extreme	-25.31
ALTERNATE CHANNEL	Normal	-40.83
	Extreme	-39.28



11. TX BEHAVIOUR UNDER LOW VOLTAGE CONDITIONS

11.1 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, (e.g. no emission above EMC levels)
- as the voltage falls below the providers declared operating voltage

11.2 TEST PROCEDURE

1. Please refer to ETSI EN 300 220-1 Sub-clause 5.12.3.1 for the test conditions.
2. Please refer to ETSI EN 300 220-1 Sub-clause 5.12.3.2 for the measurement method.

11.3 TEST RESULTS

VOLTAGE	OPERATING FREQUENCY(MHz)	ABNORMAL	Duty Cycle
12V	433.92	NO	9.00%

12. BLOCKING

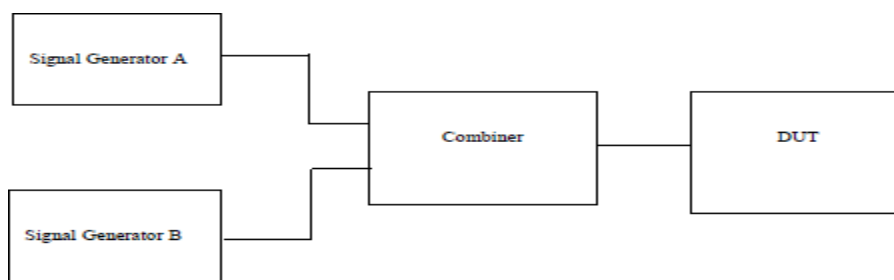
12.1 LIMIT

Blocking is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted input signal at any frequencies other than those of the spurious responses or the adjacent channels or bands.

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

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

12.2 TEST CONFIGURATION



12.3 TEST PROCEDURE

1. Please refer to ETSI EN 300 220-1 Sub- clause 5.19.6.1,for the test conditions.
2. Please refer to ETSI EN 300 220-1 Sub-clause 5.19.6.4 for the measurement method

12.4 TEST RESULT

Not applicable

*****END OF THE REPORT*****