

TEST REPORT

No. AR18-0021495-03

performed in accordance with

FCC Rules: Code of Federal Regulations (CFR) no. 47
Part 15 Subpart C Section 15.231

PRODUCT	LPD transmitter
MODEL(s) TESTED	TCW1
FCC ID	PMLTCW1
TRADE MARK(s)	NICE

APPLICANT	NICE S.p.A. ~ Via Pezza alta, 13 ~ I-31046 Rustignè di Oderzo (TV)
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Tested by	Robertino Torri <i>[Laboratory technician]</i>	
Approved by	Gianluca Mastrodomenico <i>[Operations Area manager]</i>	

Revision Sheet

Release No.	Date	Revision Description
Rev. 0	2018-02-02	First edition Digital signed - AR18-0021495-03_TR_FCC Part C 15.231 - NICE - TWC1
Rev. 1	2018-03-08	Adjustment operating frequency at pag.4, erased derivated model and inserted the plots at § 7.4 Digital signed - AR18-0021495-03 rev.1_TR_FCC Part C 15.231 - NICE - TWC1
Rev. 2	2018-06-26	Duty cycle revised and measurement corrected Digital signed - AR18-0021495-03 rev.2_TR_FCC Part C 15.231 - NICE - TWC1
Rev. 3	2018-07-09	Typo correction on ISEDC ID (pages 1 and 4), duty cycle revised pag.17 and measurement corrected pag.12 Digital signed - AR18-0021495-03 rev 3_TR_FCC Part C 15 231 - NICE - TWC1

The results of tests and checks reported in this Test Report refer exclusively to the samples tested and described in the Report itself.
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1. GENERAL DATA

SAMPLE		
Samples received on	2017-12-14	(Item(s) sampled and sent by applicant)
IMQ reference samples	BEM	89041
Samples tested No.	1	
Object under analysis recognition	Not carried out Except where stated, characteristics of products were taken from client description and were not verified by the laboratory	
Date of acceptance of test item	2017-12-19	
TEST LOCATION		
Testing dates	2017-12-19 ÷ 2017-12-20	
Testing laboratory.	IMQ S.p.A. - Via Quintiliano, 43 – I-20138 Milano	
Testing site	Via Quintiliano, 43 – I-20138 Milano	
Date of acceptance of test item	8839A-2	
ENVIRONMENTAL CONDITIONING		
Parameter	Measured 2017-12-19	Measured 2017-12-20
Ambient Temperature	20.3 °C	20.4 °C
Relative Humidity	40 %	40 %
Atmospheric Pressure	1014 mbar	1016 mbar
The laboratory is monitored by a continuous environmental conditions measurements system. Temperature, humidity and pressure data are recorded on a weekly basis and stored in local archive.		
REMARKS		
Throughout this report a point is used as the decimal separator. The ability or reliability of this product to perform its intended function in a particular application has not been investigated. IMQ declines any responsibility derived from missing or wrong information provided aside by the applicant.		

2. REFERENCE DOCUMENT

	DOCUMENT	DATE	TITLE
☒	47 CFR Part 15	2015	Radio Frequency Device
☒	ANSI C63.4	2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
☒	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices

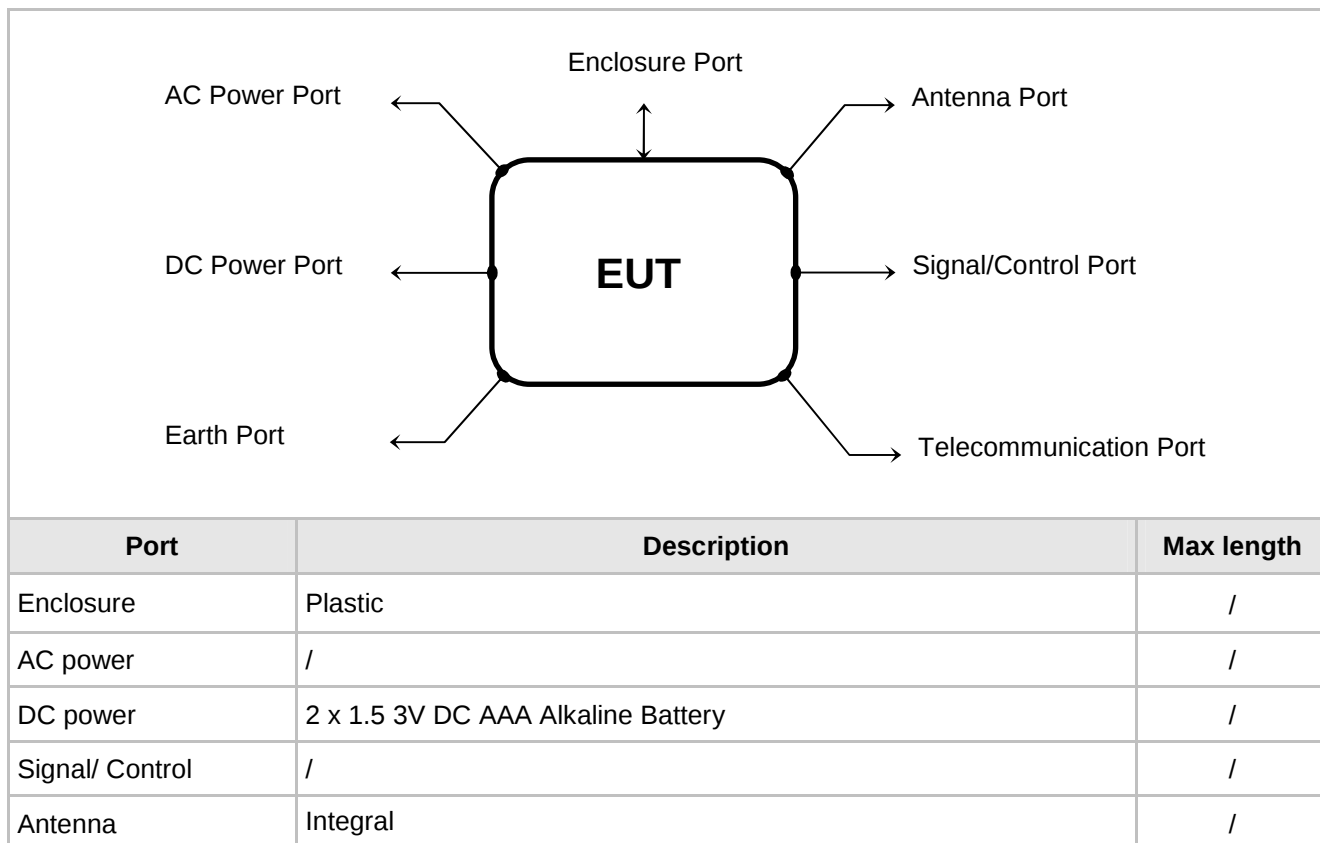
3. UNIT UNDER TEST (EUT) DETAILS

GENERAL DATA

MODEL (basic)	Description
TCW1	LPD transmitter sensor for sensitive edge non-rechargeable alkaline batteries
MODEL (derivated)	Description
/	/
FCC ID	PMLTCW1
Manufacturer	NICE S.p.A. ~ Via Pezza alta, 13 ~ I-31046 Rustignè di Oderzo (TV)
Type of equipment	LPD transmitter
Operating frequency	CH0 863.50 MHz and CH3 866.50 MHz
Max radiated power	92.79 dBμV/m (at 3m distance)
Modulation	(G)FSK
Channel Spacing	/
Channel bandwidth	/
Antenna	Integral
Number of channels	/

4. TEST CONFIGURATION OF UNIT UNDER TEST

EUT PORTS



STATE OF THE EUT DURING TESTS

Ref.	Mode	Description
#1	Operating	Transmission mode modulated with 100% duty cycle
#2	Operating	Normal transmission (button push)
#3	Operating	Receiving mode

SUPPORT EQUIPMENT

Defined as equipment needed for correct operation or loading of the EUT, but not considered as tested:

Equipment	Manufacturer	Model
/	/	/

ELECTROMAGNETICALLY RELEVANT COMPONENTS

Component	No.	Manufacturer	Model
PCB board	1	NICE	286-A

RFI SUPPRESSION DEVICES

Component	No.	Manufacturer	Model
/	/	/	/

EMI PROTECTION DEVICES

Component	No.	Manufacturer	Model
/	/	/	/

EUT TECHNICAL DOCUMENTATION

Document	Reference
/	/

5. METHODS OF MEASUREMENT

All compliance measurements have been carried out using the procedures described in the standard ANSI C63.4:2014, ANSI C63.10:2013 and Section 15.31 of CFR47 Part 15 – Subpart A (General).

Additional test requirements have been adopted according to the reference Section indicated in the § 6 of this test report.

FREQUENCY RANGE INVESTIGATED

Radiated emission tests: from 30 kHz to tenth harmonic of fundamental (or 1GHz)

6. SUMMARY OF TEST RESULTS

POSSIBLE TEST CASE VERDICTS:	
Test object meets the requirement	PASS
Test object does not meet the requirement	FAIL
Test case does not apply to the test object	N.A.
Test not performed	N.P.

CFR47 Part 15	TITLE	RESULT
§ 15.203	Antenna Requirements	PASS
§ 15.207 (a)	Conducted Emission	N.A.
§ 15.205 - 15.209	Radiated Emission	PASS
§ 15.231 (b)	Field Strengths	PASS
§ 15.231 (a) (1)	Duration of manually activated transmission	N.A.
§ 15.231 (a) (2)	Duration of automatically activated transmission	PASS
§ 15.231 (a) (3)	Transmission at predetermined / regular intervals	PASS
§ 15.231 (a) (4)	Pendency of transmission used during emergencies	N.A.
§ 15.231 (a) (5)	Transmission of set-up information for security systems	N.A.
§ 15.231 (c)	Bandwidth of the emission	PASS
§ 15.231 (d)	Frequency stability in band 40.66÷40.70 MHz	N.A.

PERIODIC OPERATION – PERIODIC RATE EXCEEDING THAT SPECIFIED IN PARAGRAPH 15.231 (A)		
CFR47 Part 15	TITLE	RESULT
§ 15.209 (a) (f) § 15.231 (e)	Radiated Emission	N.A.
§ 15.231 (e)	Duration of transmission & periods between transmissions	N.A.

7. TEST RESULTS

7.1 ANTENNA REQUIREMENTS

TEST 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 shall be considered sufficient to comply with the provisions of this Section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

Testing dates	2017-12-19
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Antenna specifications

N° of authorized antenna types	1
Antenna type	Integral
Antenna size	---
Maximum total gain	---
External power amplifiers	Not present

TEST RESULT

The EUT meets the requirements of section 15.203 and 15.204

7.2 RADIATED DISTURBANCES

TEST REQUIREMENT	
Test setup	ANSI C63.4
Test facility	Semi-anechoic chamber
Test distance	3 meters
Frequency range	20 kHz to tenth harmonic of fundamental (or 1 GHz)
IF bandwidth (below 30 MHz)	9 kHz
IF bandwidth (below 1,000 MHz)	120 kHz
IF bandwidth (above 1,000 MHz)	1 MHz
Deviation to test procedure	None
Limits	sections 15.209 (a) & 15.231 (b)
EUT operating condition	#1 & #3
Remark	(*) In accordance with part 15.31 (f) (2), where the measurement distance was specified to be 30 or 300 meters, a correction factor was applied in order to permit measurement to be performed at a separation distance. The applied formula for limits at 3 meter is: Extrapolation (dB) = $40\log(300\text{meter} / 3\text{meter}) = +80\text{db}$ Extrapolation (dB) = $40\log(30\text{meter} / 3\text{meter}) = +40\text{db}$
Testing dates	2017-12-20

TEST RESULT

The EUT meets the requirements of sections 15.209 (a) & 15.231 (b)

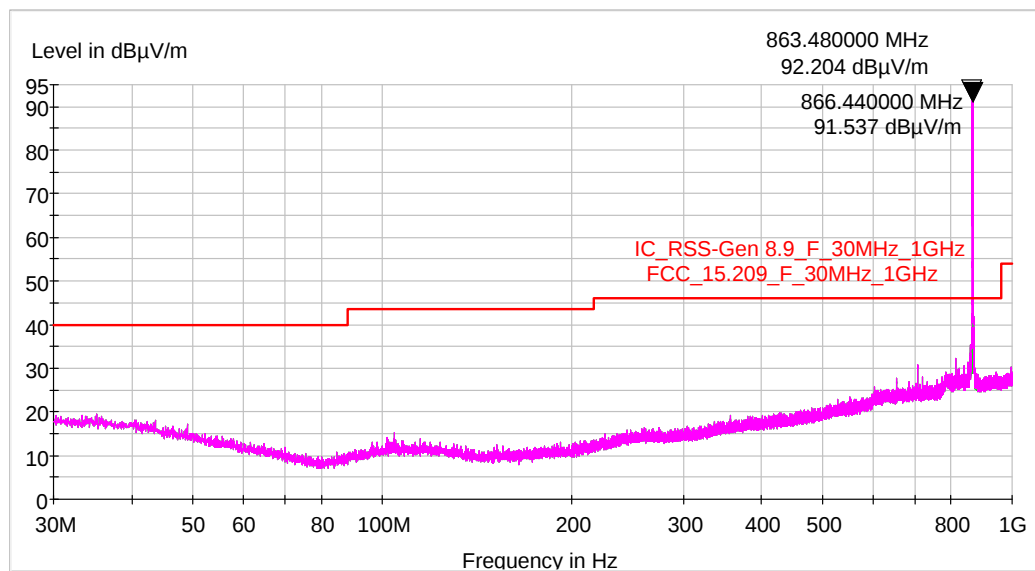
LIMITS FOR SPURIOUS		
Band of operations	Peak (dB μ V/m)	Average Limit (dB μ V/m)
Restricted bands (par. 15.205)	74	54
Other bands	According to 15.209 or fundamental –20dB (which is greater)	According to 15.209 or fundamental –20dB (which is greater)

TEST PROCEDURE

- 1) The EUT was placed on turntable which is 0.8 m above the ground plane
- 2) The turntable shall rotate from 0° to 360° degrees to determine the position of maximum emission level.
- 3) The EUT is positioned 3 m away from the receiving antenna which varied from 1 to 4 m to find the highest emission.
- 4) The measurements were made with the detector set to PEAK and AVERAGE amplitude within a bandwidth of 100 kHz below 1000 MHz and 1 MHz above 1000 MHz.
- 5) The receiving antenna was positioned in both horizontal and vertical polarization.
- 6) The measurements with Quasi-Peak detector, below 1000 MHz are performed only for frequencies for which the Peak values are $\geq$ (Q.P. limit – 6 dB).

MEASUREMENTS RESULTS

Range: 30 + 1000 MHz



Range: f>1000 MHz

PEAK RESULT					
Frequency	Reading Value	Correction factor	Correcting reading	PK Limit	Margin
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
1720	54.85	-6.12	48.73	74.00	25.27
2600	65.01	-4.45	60.56	74.00	13.44
3448	73.04	-7.80	65.24	74.00	8.76
4312	60.87	0.35	61.22	74.00	12.78
5208	59.74	2.66	62.40	74.00	11.60
6072	54.52	4.7	59.22	74.00	14.78
6936	48.72	7.38	56.10	74.00	17.90
8648	48.72	9.85	58.57	74.00	15.43
AVERAGE RESULT					
Frequency	PK Amplitude	Duty Cycle Correction factor	AV Amplitude	AV Limit	Margin
(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
1720	48.73	-19.948	28.78	54.00	39.25
2600	60.56	-19.948	40.61	54.00	27.42
3448	65.24	-19.948	45.29	54.00	22.74
4312	61.22	-19.948	41.27	54.00	26.76
5208	62.4	-19.948	42.45	54.00	25.58
6072	59.22	-19.948	39.27	54.00	28.76
6936	56.1	-19.948	36.15	54.00	31.88
8648	58.57	-19.948	38.62	54.00	29.41

NOTE: The measures above are the worst case on 3 axes X, Y and Z and both polarization.

Correct reading value = Reading value + correction factor = 54.85 + (-6.12) = 48.73
 AV amplitude value = PK amplitude + Duty Cycle correction factor = 48.73 + (-19.948) = 28.78

7.3 FIELD STRENGTHS

TEST REQUIREMENT	
Spectrum analyzer settings	
Span	Wide enough to capture the peak level of the emission
Resolution bandwidth (RBW)	100 kHz
Video bandwidth (VBW)	300 kHz
Sweep time (SWT)	2.5 ms
Detector function	Peak
Trace	Max hold
Attenuator	/
Deviation to test procedure	None
EUT operating condition	#1
Remark	None
Testing dates	2017-12-20

TEST PROCEDURE
Radiated measurements:
As the EUT is supplied with a dedicated antenna, the effective radiated power is measured in a 3 m anechoic chamber with the substitution antenna method

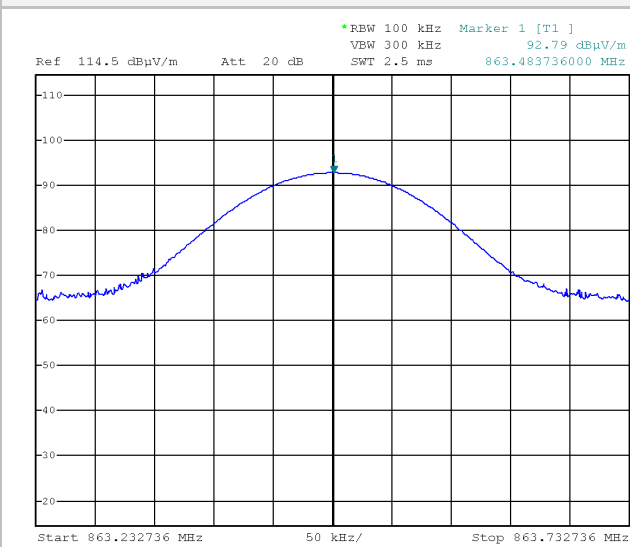
LIMITS
Above 470 MHz: Frequency Strength ($\mu\text{V/m}$) = 12,500 $\mu\text{V/m}$ = 81.94 dB $\mu\text{V/m}$ (AV); 101.94 dB $\mu\text{V/m}$ (PK) Average correction factor : -20 dB (see page 17 for correction factor determination). AV _(calculated) Radiated Output Power = PK Radiated Output Power - Average correction factor (-20)

TEST RESULT
The EUT meets the requirements of § 15.231 (b)

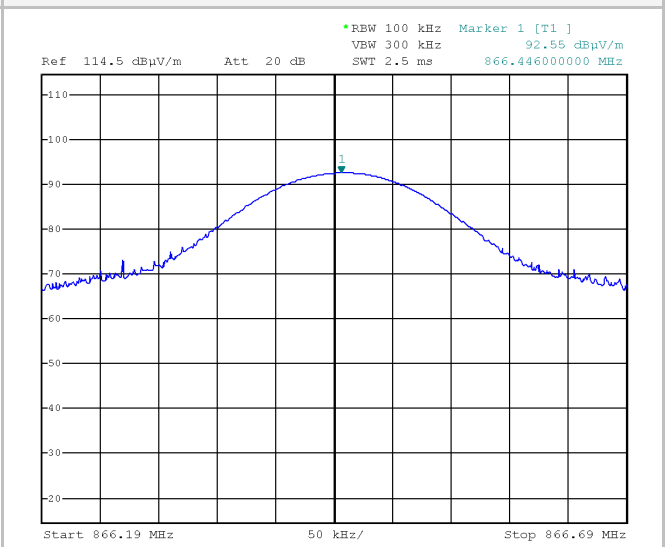
FIELDS STRE RESULTS (RADIATED)

Channel (No.)	Frequency (MHz)	Detector	Radiated Output Power (at 3m. distance) (dBμV/m)	Limit (dBμV/m)
1	863.484	PK	92.79	101.94
1	863.484	AV (calculated)	72.79	81.94
2	866.446	PK	92.55	101.94
2	866.446	AV (calculated)	72.55	81.94

Plot 1 – CH 1



Plot 2 – CH 2



7.4 CHARACTERISTICS OF TRANSMISSION

TEST REQUIREMENT § 15.231 (A)

The provisions of this Section are restricted to periodic operation within the band 40.66 -MHz and above 70 MHz. Except as shown in paragraph (e) of this Section, the intentional radiator restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

- (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
- (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
- (3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.
- (4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.
- (5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmission are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

Testing dates

2017-12-20

TEST RESULT

The EUT meets the requirements of sections 15.231 (a)

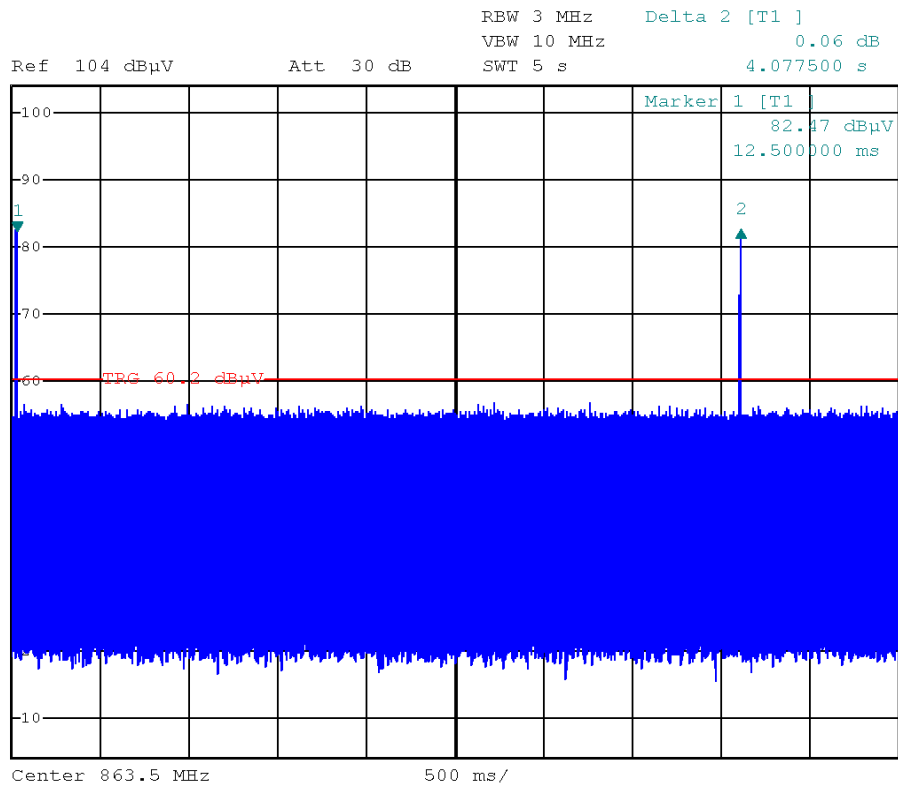
MEASUREMENTS RESULTS

Working Phases:

- 1) Stby: the sensor transmit every 4 s a 2 ms long RF packet, the master listen (**Plot 1**)
- 2) Occurring obstacle: the sensor transmit 1 times the alarm packet 3x2 ms long each
- 3) If a sensor have a missing master try 4 times to 3 frequencies = 12 attempts 2 ms long each (**Plot 2**).

Stby working phase

PLOT 1

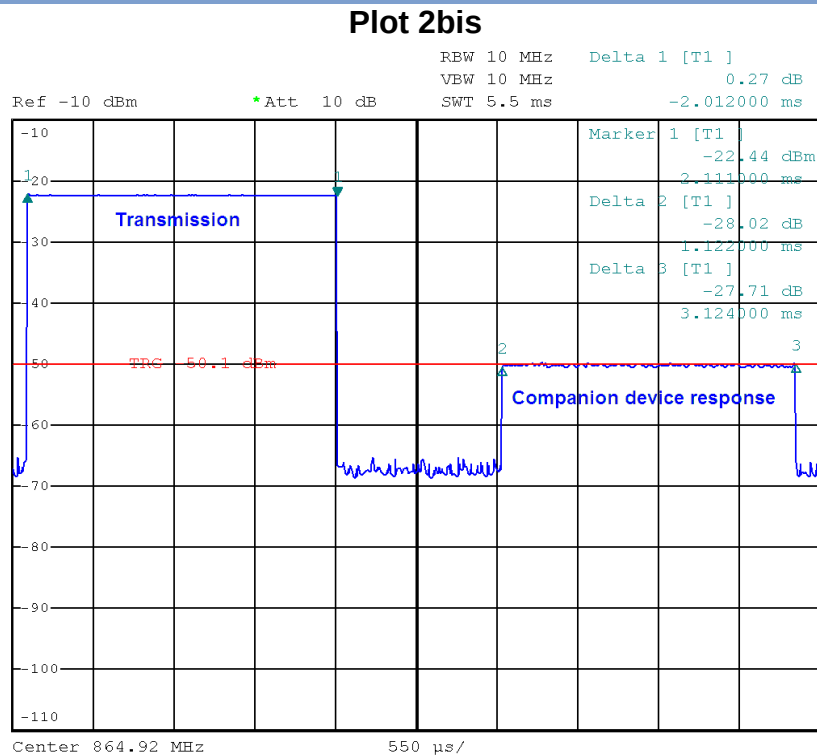
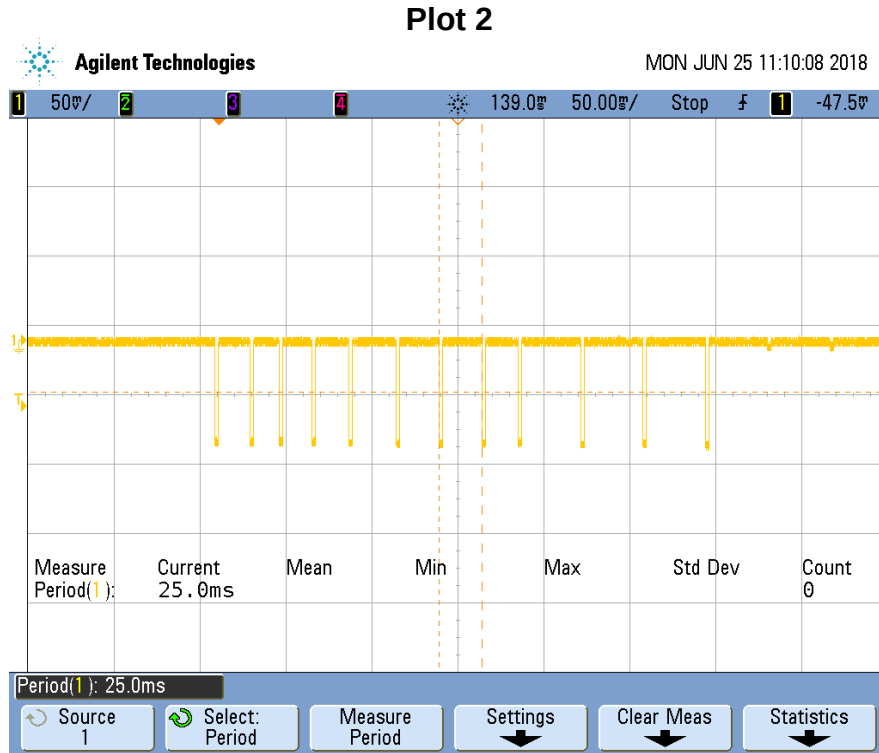


T_{ON}: .2 ms
T_{OFF}: 4000 ms

Duty-cycle in 100ms = 2 / 100 = 0.02
Correction for average = 20 x log (0.02) = -33.98 dB

Missing master phase

PLOT 2 & 2bis

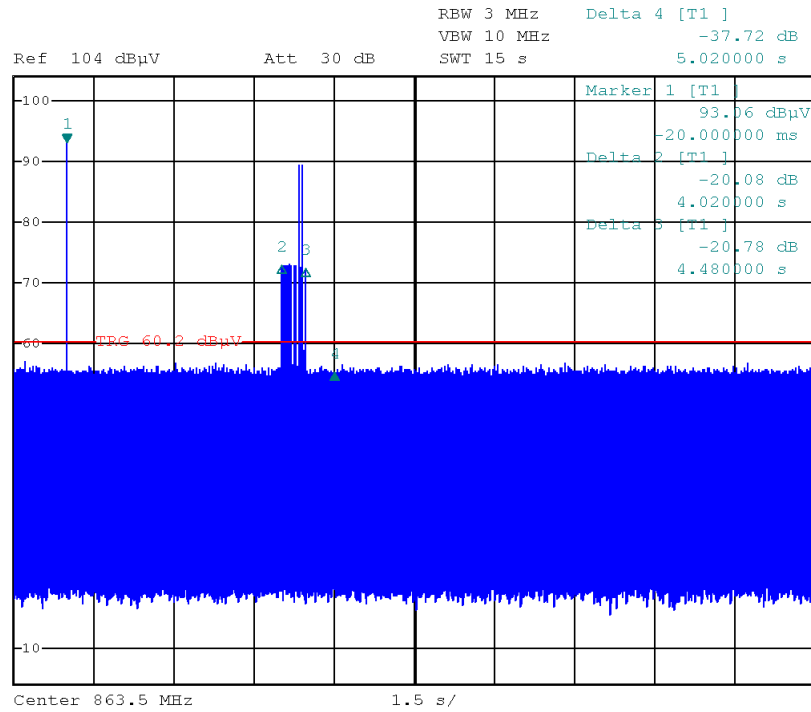


T_{ON} : 12 x 2.012 ms

Duty-cycle in 100ms = $(5 \times 2.012) / 100 = 0.1006$

Correction for average = $20 \times \log(0.1006) = -19.948$ dB

Cease transmission within 5 seconds after activation



7.5 BANDWIDTH OF EMISSION IN PERIODIC TRANSMISSION

TEST REQUIREMENT	
Test setup	ANSI C63.4
Test facility	Semi-Anechoic chamber
Frequency range	Over 70MHz
Resolution BW	See next table
Deviation to test procedure	None
Limits	0.25% of the center frequency (in Range 70÷900MHz) 0.5 % of the center frequency (for frequencies above 900MHz)
EUT operating condition	#1
Remark	None
Testing dates	2017-12-20

TEST RESULT
The EUT meets the requirements of sections 15.231 (c)

ANSI C63-4 SPECIFICATION

13.1.7 Occupied bandwidth measurements

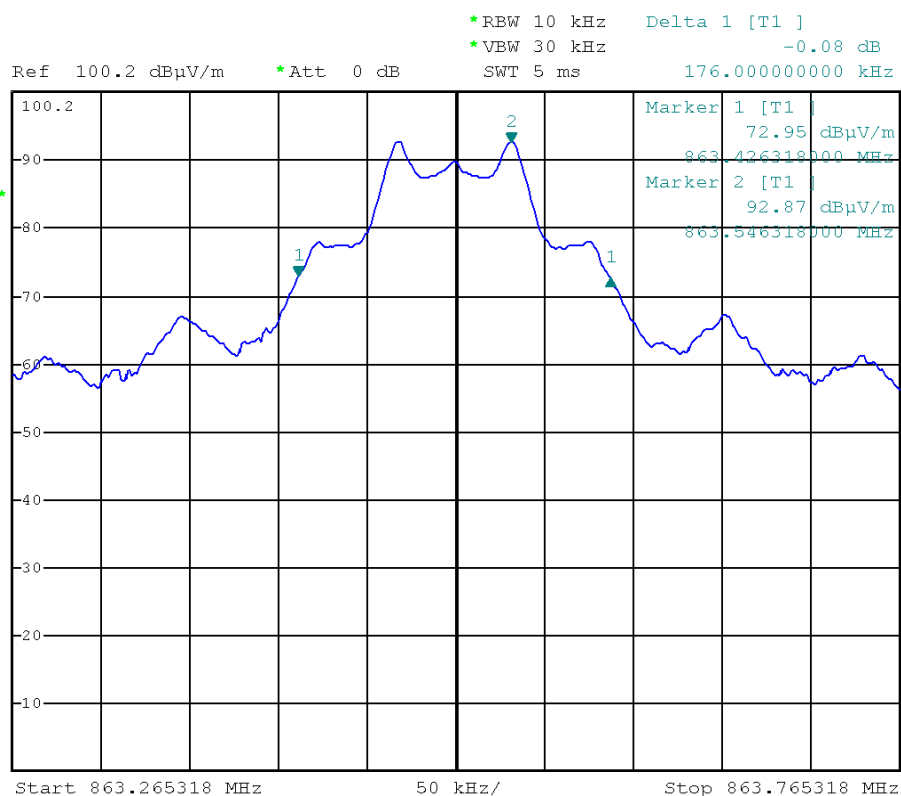
In order to measure the modulated signal properly, a resolution bandwidth that is small compared with the bandwidth required by the procuring or regulatory agency shall be used on the measuring instrument. However, the resolution bandwidth of the measuring instrument shall be set to a value greater than 5% of the bandwidth requirements. When no bandwidth requirements are specified, the minimum resolution bandwidth of the measuring instrument is given in the following table:

Fundamental frequency	Minimum resolution bandwidth
9 kHz to 30 MHz	1 kHz
30 to 1000 MHz	10 kHz
1000 MHz to 40 GHz	100 kHz

MEASUREMENTS RESULTS

BANDWIDTH OF EMISSION (AT -20DB POINTS)

Plot 1



BANDWIDTH OF EMISSION

Frequency	Bandwidth at -20dB points	Limit (0,25% of center Frequency MHz)	Margin
MHz	MHz	MHz	kHz
863.546	0.176	215.887	215.711

8. MEASUREMENTS AND TESTS UNCERTAINTY

Unless otherwise stated the uncertainties for the tests and measurements are evaluated in according to IMQ Operational Instruction IO-LAB-001 and IO-LAB-004. and requirement of NIST Technical Note 1297 and NIS 81: 1994 "The Treatment of Uncertainty in EMC Measurements"

The expanded uncertainty was calculated for all measurements and tests listed in this test report according to CISPR 16-4-2 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainty in EMC Measurements", with UKAS document LAB 34 and is documented in the quality system accordance to ISO/IEC 17025.

Internal Procedure PG-037 ensures that the requirements for traceability of calibrations, of all test equipment requiring calibration, and calibration intervals are met.

Methods/Standard	Parameter	Expanded Uncertainty	Unit	Confidence level	Coverage Factor	Degree of freedom
Continuous disturbance	QP detector 9 – 150 kHz	2,47	dB	95%	2,00	25
	QP detector 150 k – 30 MHz	2,61	dB	95%	2,00	26
	QP detector using Voltage Probe	2,45	dB	95%	2,00	26
	QP detector using ISN	3,15	dB	95%	2,00	> 60
	QP detector using Current Probe	2,15	dB	95%	2,00	35
Radiated disturbance	QP detector (30 MHz - 100 MHz) H polarization	4,33	dB	95%	2,00	> 60
	QP detector (30 MHz - 100 MHz) V polarization	4,22	dB	95%	2,00	> 60
	QP detector (100 MHz - 200 MHz) H polarization	3,40	dB	95%	2,00	> 60
	QP detector (100 MHz - 200 MHz) V polarization	4,76	dB	95%	2,00	> 60
	QP detector (200 MHz - 1000 MHz) H polarization	3,91	dB	95%	2,00	> 60
	QP detector (200 MHz - 1000 MHz) V polarization	3,82	dB	95%	2,00	> 60
	P detector 1-6 GHz	4,77	dB	95%	2,00	> 60
	P detector 6 – 18 GHz	5,14	dB	95%	2,00	> 60

9. LIST OF MEASURING EQUIPMENT AND CALIBRATION INFORMATION

IMQ Serial Number	Instrument	Manufacturer	Type	Last Cal.	Cal. Period.	Calibration Company
P01709	Shielded semi-anechoic chamber	SIDT	/	03-17	24	IMQ
P02486	Turntable controller unit	FRANKONIA	FCTAM01	/	/	/
P02488	Mast antenna	FRANKONIA	FAM4	/	/	/
S05562	EMI Receiver	ROHDE & SCHWARZ	ESU 8	01-17	12	Rohde & Schwarz
S02385	Log antenna	ARA	LPB-2513	06-17	36	NPL
S03463	Horn Antenna	SCHWARZBECK	BBHA 9120D	07-17	36	NPL
S03629	Spectrum Analyzer	Rohde & Schwarz	FSP40	08-17	12	Rohde & Schwarz
S03542	Preamplifier	Hewlett Packard	HP 8449B	05-16	24	IMQ
S04193	Preamplifier	Bonn Elektronik	BLNA 0110-15C35	05-16	24	IMQ
S06762	Preamplifier	SCHWARZBECK	BBV 9745	01-16	24	Rohde & Schwarz
W00199/E	Software	ROHDE & SCHWARZ	EMC32 Ver. 6.30	/	/	/
H00165	PC	/	/	/	/	/

END OF TEST REPORT