


TEST REPORT

No. AR19-0045639-02

performed in accordance with

FCC Rules: Code of Federal Regulations (CFR) no. 47
Part 15 Subpart B Section 15.107 and 15.109

PRODUCT	Electronic position indicator system
MODEL TESTED	DD51-E
TRADE MARK	
APPLICANT	ELESA S.p.A. - Via Pompei, 29 – 20900 Monza (MB)

FCC ID	2AVRQ-DD51-E
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Tested by	Bonomo Matteo <i>[Laboratory technician]</i>	
Approved by	Mastrodomenico Gianluca <i>[Operations Area manager]</i>	

Revision Sheet

Release No.	Date	Revision Description
Rev. 0	2020-05-07	First edition Digital signed AR19-0045639-02_ FCC Rules Part 15 Subpart B Section 15.107 and 15.109_ELESA_DD51-E_Electronic position indicator
Rev. 1	2020-12-04	Second edition Removed FCC ID at page 4 and added it at page 1 Digital signed AR19-0045639-02_Rev.1_ FCC Rules Part 15 Subpart B Section 15.107 and 15.109_ELESA_DD51-E_Electronic position indicator
Rev. 2	2021-05-27	Third edition Edit test result at page 9 and removed C.63.10 at page 3 and 7. Digital signed AR19-0045639-02_Rev.2_ FCC Rules Part 15 Subpart B Section 15.107 and 15.109_ELESA_DD51-E_Electronic position indicator

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	2020-01-22	(Item(s) sampled and sent by applicant)
IMQ reference samples	BEM	98546
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	2020-01-22	
TEST LOCATION		
Testing dates	2020-02-03	
Testing laboratory.	IMQ S.p.A. - Via Quintiliano, 43 – I-20138 Milano	
Testing site	Via Quintiliano, 43 – I-20138 Milano	
ENVIRONMENTAL CONDITIONING		
<i>Parameter</i>	<i>Measured</i>	
Ambient Temperature	25.1 ÷ 25.6 °C	
Relative Humidity	52 ÷ 54 %	
Atmospheric Pressure	1003 ÷ 1005 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. Unless otherwise specified, warnings, installation instruction and/or user manual provided with the sample have been checked in Italian or English version only. IMQ declines any responsibility derived from missing or wrong information provided aside by the applicant.		

2. REFERENCE DOCUMENT

	DOCUMENT	DATE	TITLE
<input checked="" type="checkbox"/>	47 CFR Part 15	2015	Radio Frequency Device
<input checked="" type="checkbox"/>	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
<input type="checkbox"/>	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices

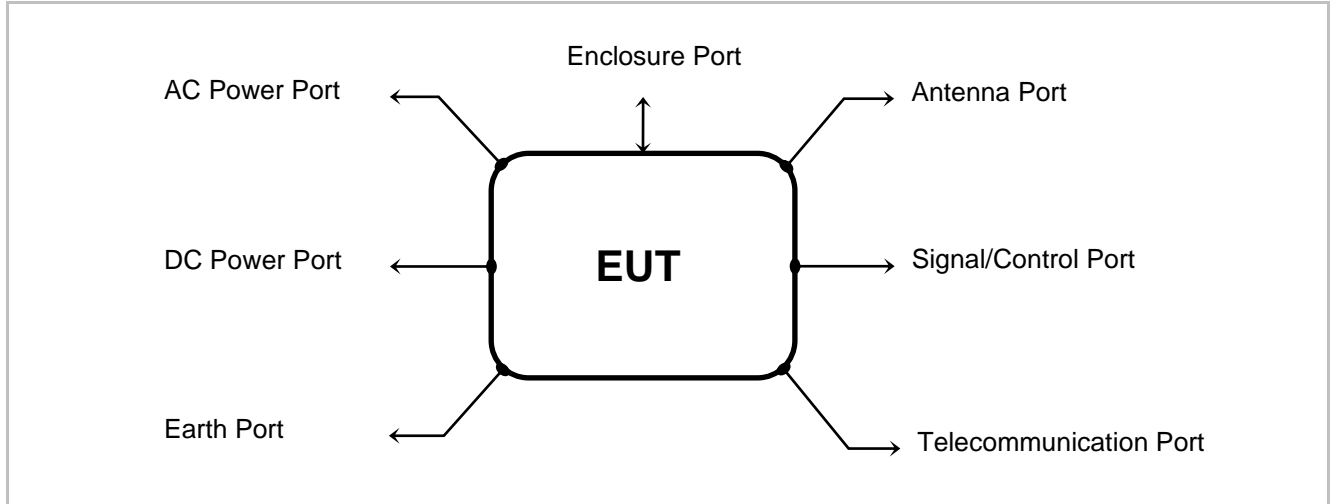
3. UNIT UNDER TEST (EUT) DETAILS

GENERAL DATA

MODEL (basic)	Description
DD51-E	Electronic position indicator
VARIANTS (derived)	Description
/	/
Manufacturer	ELESA S.p.A. - Via Pompei, 29 – 20900 Monza (MB)
Type of equipment	Electronic position indicator
Frequency	As declared by the manufacture the higher internal frequency is 14 MHz

4. TEST CONFIGURATION OF UNIT UNDER TEST

EUT PORTS



Port	Description	Max length
Enclosure	Metallic/plastic	/
AC power	/	/
DC power	Lithium battery CR2450 3.0 V	/
Earth	/	/
Telecommunication	/	/
Signal	/	/
Control	/	/
Antenna	/	/

STATE OF THE EUT DURING TESTS

Ref.	Mode	Description
#1	Normal operating	Measuring 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
MCU	1	Silabs	EFM32TG840F32
Control board	1	ELESA	T690 V1.0
Battery board	1	ELESA	T867 V1.0
Main board	1	ELESA	T689 V1.0

RFI SUPPRESSION DEVICES

Component	No.	Manufacturer	Model
/	/	/	/

EMI PROTECTION DEVICES

Component	No.	Manufacturer	Model
/	/	/	/
/	/	/	/

OSCILLATOR FREQUENCY

Component	description
CPU	The internal frequency is 14 MHz

EUT TECHNICAL DOCUMENTATION

Document	Reference
/	/

5. METHODS OF MEASUREMENT

All compliance measurements have been carried out using the procedures described in 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

Conducted emission tests : from 150 kHz to 30 MHz.

Radiated emission tests: from 30 MHz to 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
§ 15.107	Conducted emission	N.A. ¹
§ 15.109	Radiated disturbances	PASS

Note 1	Port not present, battery operating device
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7. TEST RESULTS

7.1 RADIATED DISTURBANCES

TEST REQUIREMENT	
Test setup	ANSI C63.4
Test facility	Semi-anechoic chamber
Test distance	3 meters
Frequency range	30 MHz to 1 GHz
IF bandwidth (below 1,000 MHz)	120 kHz
IF bandwidth (above 1,000 MHz)	1 MHz
Deviation to test procedure	None
Limits	sections 15.109
EUT operating condition	#1
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	2020-02-03
Testing site	Via Quintiliano, 43 – I-20138 Milano

TEST RESULT

The EUT meets the requirements of sections 15.109
The device met with Class B levels even if it is classified as Class A

LIMITS FOR SPURIOUS		
Band of operations	Limit $\mu\text{V}/\text{m}$	Limit $\text{dB}\mu\text{V}/\text{m}$
30÷88 MHz	100	50
88÷216 MHz	150	53,5
216÷960 MHz	210	56
Above 960MHz	300	64

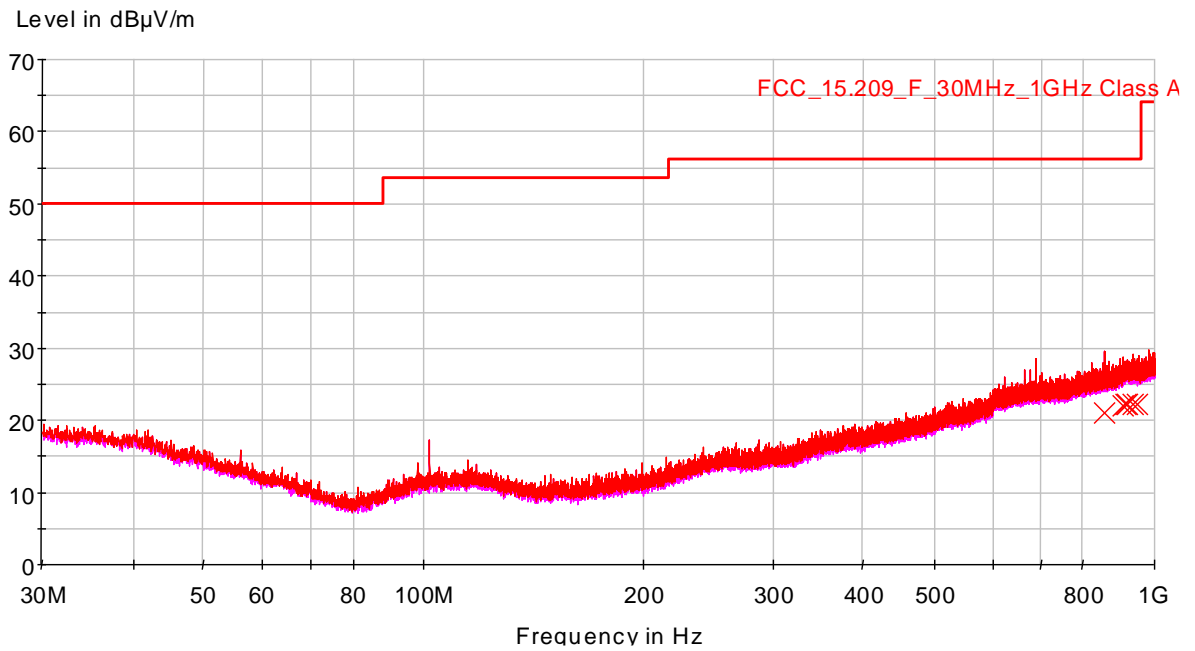
TEST PROCEDURE

- 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

Vertical & Horizontal polarization



Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB)	Comment
855.200000	21.1	1000.0	120.000	100.0	V	22.1	
903.840000	22.1	1000.0	120.000	100.0	H	22.9	
912.040000	22.1	1000.0	120.000	100.0	V	23.0	
917.000000	22.2	1000.0	120.000	100.0	H	23.1	
934.040000	22.2	1000.0	120.000	100.0	V	23.1	
948.840000	22.2	1000.0	120.000	100.0	V	23.1	

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
Radiated disturbance	QP detector (30 MHz - 100 MHz) H polarization	4.0	dB	95%
	QP detector (30 MHz - 100 MHz) V polarization	3.9	dB	95%
	QP detector (100 MHz - 200 MHz) H polarization	2.9	dB	95%
	QP detector (100 MHz - 200 MHz) V polarization	4.0	dB	95%
	QP detector (200 MHz - 1000 MHz) H polarization	3.5	dB	95%
	QP detector (200 MHz - 1000 MHz) V polarization	3.4	dB	95%

9. LIST OF MEASURING EQUIPMENT AND CALIBRATION INFORMATION

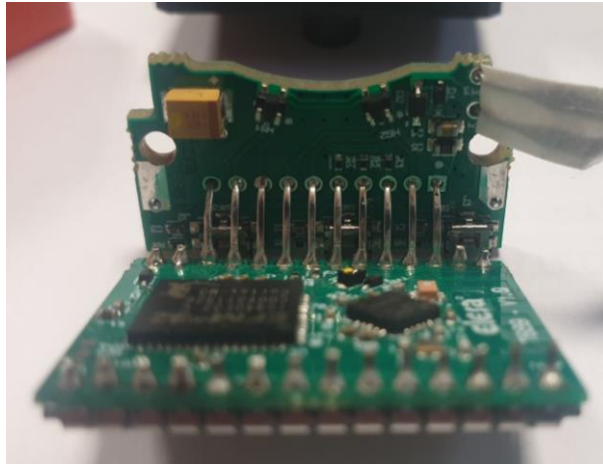
Measurement of radiated electromagnetic disturbance (§ 7.1)					
Instrument	Manufacturer	Model	IMQ Ref.	Cal. Date	Cal. Due
Shielded anechoic chamber	SIDT	/	P-01709	2019-10-21	2020-10-31
Turntable controller unit	FRANKONIA	FCTAM01	P-02486	/	/
EMI Receiver	ROHDE & SCHWARZ	ESU 8	S-05562	2019-07-09	2020-07-31
Horn antenna	SCHWARZBECK	BBHA 9120D	S-03463	2017-07-21	2020-07-31
Log antenna	ARA	LPB-2513 (30MHz - 1GHz)	S-02385	2017-06-08	2020-06-30
EMI cable	/	EMI1 RG 214/U	S-05040	2019-05-27	2020-05-31
Control / DAQ Software	ROHDE & SCHWARZ	EMC 32 Vers. 8.52	W-00199/E	/	/
PC	/	/	H-00165	/	/

10. PHOTOGRAPHIC DOCUMENTATION

EUT IDENTIFICATION: DD51-E EXTERNAL VIEW



EUT IDENTIFICATION: DD51-E INTERNAL VIEW



END OF REPORT