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LP-009

Test report

Number:	**T251-0908/16**	Project file:	C20160897
		Date:	2017-01-23
		Pages:	44

Product: **System for automatic switch-off of directional indicators**

Type reference: **STS-M2.4**

Ratings: 12 Vdc
Protection class: III

Trademark: Smart Turn System - STS

Applicant: **ABCS SISTEM d.o.o.**
Vojkova c. 63, SI-1000 Ljubljana, Slovenia

Manufacturer: ABCS SISTEM d.o.o.
Vojkova c. 63, SI-1000 Ljubljana, Slovenia

Place of manufacture: OMF d.o.o.
Brnčičeva u. 7, SI-1000 Ljubljana, Slovenia

Summary of testing

Testing method: FCC Part 15, Subpart B, Class B

Testing location: SIQ Ljubljana, Trpinčeva ulica 37 A, SI-1000 Ljubljana, Slovenia

Remarks: Date of receipt of test items: 2016-03-30
Number of items tested: 1
Date of performance of tests: 2016-09-12
The test results presented in this report relate only to the items tested.
The product complies with the requirements of the testing methods.
/

Tested by: Gregor Šterk **Approved by:** Marjan Mak

The report shall not be reproduced except in full.

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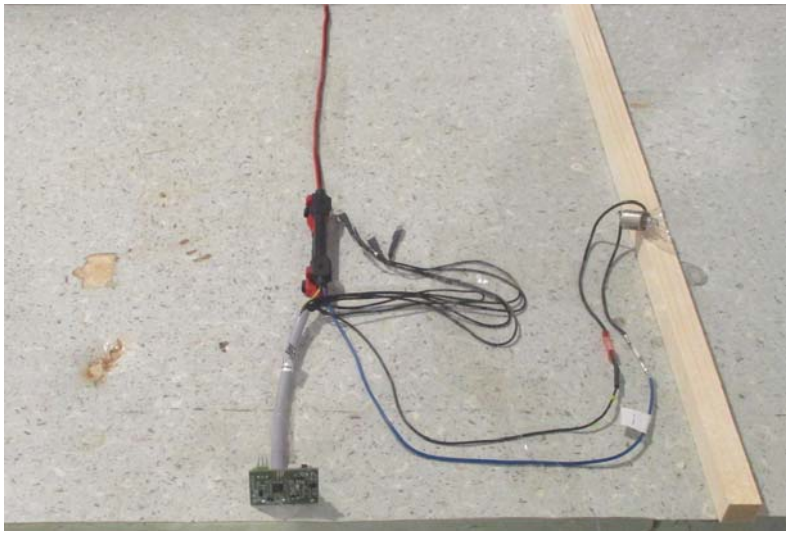
1 GENERAL

History sheet			
Date	Report No.	Change	Revision
2017-01-23	T251-0908/16	Initial Test Report issued.	--

Environmental conditions:
Ambient temperature: 15 °C to 35 °C
Relative humidity: 30 % to 60 %
Atmospheric pressure: 860 mbar to 1060 mbar

1.1 Equipment under test

System for automatic switch-off of directional indicators
Type: **STS-M2.4**



Picture of EUT and its peripheral

1.1.1 General product information

Tested sample number: S20160817

1.2 ANSI C63.4 Subpart selection

Subpart B: Unintentional Radiators

Subpart C: Intentional Radiators

1.3 Class statement requirements

- The Class A statement cautions that operation of the device in a residential area is likely to cause harmful interference.
- The Class B statement offers several suggestions for minimizing interference to radio or TV receivers, including reorienting the receiving antenna and moving the Class B device farther away from the receiver.

1.4 Occupied bandwidth measurement

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

1.5 Quasi-peak detector

Frequency range	Bandwidth (-6dB)
10 Hz to 20 kHz	Full range (wideband)
10 kHz to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz
30 MHz to 1 GHz	120 kHz

1.6 Peak, rms, and average detectors

Frequency range	Bandwidth (-6dB)
10 Hz to 20 kHz	10, 100, 1000 Hz
10 kHz to 150 kHz	1 and 10 kHz
150 kHz to 30 MHz	1 and 10 kHz
30 MHz to 1 GHz	10 and 100 kHz
1 GHz to 40 GHz	0.1, 1.0 and 10 MHz

2 LIMITS FOR ALL SUBPARTS

2.1 Subpart B: Unintentional Radiators

2.1.1 Conducted emission limits (according to FCC15):

CLASS B limits:

Frequency Range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.5	66 – 56*	56 – 46*
0.5 to 5.0	56	46
5.0 to 30.0	60	50

* Decreases with the logarithm of the frequency.

CLASS A limits:

Frequency Range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.5	79	66
0.5 to 30.0	73	60

2.1.2 Radiated emission limits (according to FCC15):

CLASS B limits:

Frequency Range (MHz)	Limits (dBµV/m)		Test distance (m)
	VERTICAL	HORIZONTAL	
30 to 88	40	40	3
88 to 216	43.5	43.5	3
216 to 960	46	46	3
Above 960	54	54	3

CLASS A limits:

Frequency Range (MHz)	Limits (dBµV/m)		Test distance (m)
	VERTICAL	HORIZONTAL	
30 to 88	39	39	10
88 to 216	43.5	43.5	10
216 to 960	46.4	46.4	10
Above 960	49.5	49.5	10

2.2 Subpart C: Intentional Radiators

2.2.1 Conducted emission limits:

CLASS B limits:

Frequency Range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.5	66 – 56*	56 – 46*
0.5 to 5.0	56	46
5.0 to 30.0	60	50

* Decreases with the logarithm of the frequency.

The shown limits in table shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

- For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

- For all other carrier current systems: 1000 µV within the frequency band 535-1705 kHz, as measured using a 50 µH/50 ohms LISN.

- Carrier current systems operating below 30 MHz are also subject to the radiated emission limits as appropriate.

2.2.2 Radiated emission limits:

CLASS B limits:

Frequency Range (MHz)	Limits (dBµV/m)		Test distance (m)
	VERTICAL	HORIZONTAL	
0,009 to 0,490	20*log(2400/F(kHz))	20*log(2400/F(kHz))	300
0,490 to 1,705	20*log(24000/F(kHz))	20*log(24000/F(kHz))	30
1,705 to 30,0	29.5	29.5	30
30 to 88	40**	40**	3
88 to 216	43.5**	43.5**	3
216 to 960	46**	46**	3
Above 960	54	54	3

** Except as provided in paragraph below, fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz.

Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.

NOTE: For special limits refer to standard

3 ALL TEST EQUIPMENT AND THEIR DESCRIPTION

3.1 General information

Description	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
Rohde-Schwarz, RFI receiver	ESU8	105187	2015-11	2017-11	24 months	X
Rohde-Schwarz, RFI receiver	ESU26	100428	2016-02	2018-02	24 months	
Rohde & Schwarz, Artificial main network	ESH2-Z5	106899	2015-05	2017-05	24 months	X
ETS, Anechoic chamber	3m	103949	2014-11	2016-11	24 months	X
EMCO, Antenna	3142B	104351	2015-09	2017-09	24 months	X
EMCO, Antenna	3115	103002	2015-09	2017-09	24 months	X
Heinrich Deisel, Turn table	DS 420.00	103337	NA	NA	NA	X
Antenna tower	/	/	NA	NA	NA	X
Controller for turn table and antenna tower	/	/	NA	NA	NA	X

3.2 Other instrument information and auxiliary equipment

Description	Model No.	Bandwidth	Detector functions	Antenna factors	Cable loss	Range
Rohde-Schwarz, AMN	ENV216	/	/	/	/	9 kHz do 30 MHz
Rohde-Schwarz, RFI receiver	ESU8	200Hz, 9kHz, 120kHz, 1MHz	Peak, Q-peak, Average	/	/	20 Hz – 8 GHz
Rohde-Schwarz, RFI receiver	ESU26	200Hz, 9kHz, 120kHz, 1MHz	Peak, Q-peak, Average	/	/	20 Hz – 26.5 GHz
Hewlett Packard, RF Spectrum Analyzer	8593E	200Hz, 9kHz, 120kHz, 1MHz	Peak, Q-peak, Average	/	/	9 kHz – 26.5 GHz
Rohde & Schwarz, Artificial main network	ESH 2-Z5	/	/	/	/	9 kHz – 30 MHz
ETS, Anechoic chamber	3m	/	/	/	/	30 MHz – 18 GHz
EMCO, Antenna	model 3142	/	/	See tables below	/	26 MHz – 2 GHz
EMCO, Antenna	model 3115	/	/	See tables below	/	1 GHz – 18 GHz
Schwarzbeck Mess-Elektronik, Horn antenna	BBHA9120E	/	/	See tables below	/	450 MHz – 6 GHz
SIQ, Conducted emission cable	SIQ	/	/	/	See tables below	/
SIQ, Radiated emission cable	SIQ	/	/	/	See tables below	/

3.2.1 Cable loss and attenuation of radiated emission

3.2.1.1 Conducted emission cable (SIQ-K024)

Point	Frequency (9kHz-30MHz)	Cable length (meters)	Loss (dB)
1	190 kHz	1	0,4
2	530 kHz	1	0,26
3	2,53 MHz	1	0,16
4	5,19 MHz	1	0,07
5	11,05 MHz	1	0,03
6	22,01 MHz	1	0,06
7	24,03 MHz	1	0,04

3.2.1.2 Radiated emission attenuation

Point	Frequency (30 MHz – 26,5 GHz)	Attenuation (dB)
1	30 MHz	0,501
2	150 MHz	1,174
3	400 MHz	2,034
4	800 MHz	2,995
5	1 GHz	3,416
6	1,363	1,666667
7	2,686	3,58333
8	5,332	5,25
9	7,978	6,25
10	10,624	7,5
11	13,27	8,333333
12	15,916	9,166666
13	18,562	9,833333
14	21,208	10,66667
15	23,854	11,5
16	26,5	12,16667

4 CONVERSION FACTORS AND ALL OTHER FORMULAS

Unit	Conversion unit	Formula of conversion
dBμV	dBμV/m	dBμV/m = dBμV + AF
μV/m	dBμV/m	dBμV/m = 20log(X(μV/m)/1μV)

	Test distance stated in standard	Test distance of measurement	Conversion factor
Class B	3 m	3 m	/
Class A	10 m	3 m	20dB/decade

5 GENERAL AND SPECIAL CONDITIONS DESCRIPTION

5.1 General condition description

Interconnect and power cabling (or wiring)

5.1.1 Test arrangement for conducted emissions

Interconnecting cables that hang closer than 40 cm to the ground-plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω. LISN can be placed on top of, or immediately beneath, reference ground-plane.
All other equipment powered from additional LISN(s).
Multiple outlet strip can be used for multiple power cords of non-EUT equipment.
LISN at least 80 cm from nearest part of EUT chassis.

Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.

Non-EUT components of EUT system being tested.

Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.

Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground-plane.

5.1.2 Test arrangement for conducted emissions- floor-standing equipment

Excess I/O cables shall be bundled in the center. If bundling is not possible, the cables shall be arranged in serpentine fashion. Bundling shall not exceed 40 cm in length.

Excess power cords shall be bundled in the center or shortened to appropriate length.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. If bundling is not possible, the cable shall be arranged in serpentine fashion.

EUT and all cables shall be insulated, if required, from the ground-plane by up to 12 mm of insulating material.

EUT connected to one LISN. LISN can be placed on top of, or immediately beneath, the ground-plane.
All other equipment powered from a second LISN or additional LISN(s).
Multiple outlet strip can be used for multiple power cords of non-EUT equipment.

5.1.3 Test arrangement for radiated emissions tabletop equipment

Interconnecting cables that hang closer than 40 cm to the ground-plane shall be folded back and forth in the center, forming a bundle 30 to 40 cm long.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated if required using the correct terminating impedance. The total length shall not exceed 1 m.

If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the ground-plane with the receptacle flush with the ground-plane.

Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.

Non-EUT components of EUT system being tested.

Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.

No vertical conducting plane used.

Power cords drape to the floor and are routed over to receptacle.

5.1.4 Test arrangement for radiated emissions floor-standing equipment

Excess I/O cables shall be bundled in center. If bundling is not possible, the cables shall be arranged in serpentine fashion. Bundling not to exceed 40 cm in length.

Excess power cords shall be bundled in the center or shortened to appropriate length.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. If bundling is not possible, the cable shall be arranged in a serpentine fashion.

EUT and all cables shall be insulated, if required, from the ground-plane by up to 12 mm of insulating material.

If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the ground-plane with the receptacle flush with the ground plane.

Overhead cable trays and suspended ceilings

5.1.5 Test arrangement for floor-standing equipment

Only one vertical riser may be used where typical of system under test.

Excess power cord shall be bundled in the center or shortened to appropriate length.

EUT and cables shall be insulated from ground-plane by up to 12 mm. Where the manual has specified or there exists a code of practice for installation of the EUT, the test arrangement shall allow the use of this practice for the tests.

Power cords being measured connected to one LISN. All other system power cords powered through other LISN(s). A multiple receptacle strip may be used for other power cords.

For *conducted* tests, the LISNs may be placed on top of or immediately beneath and bonded directly to the ground-plane. For *radiated* tests, the LISN(s), if used, should be installed under, with the receptacle flush with the ground-plane.

5.1.6 Placement and manipulation of interconnect cabling (or wiring) of tabletop equipment

LISN(s) may have to be positioned to the side of the table to meet the criterion that the LISN receptacle shall be 80 cm away from the EUT. LISN(s) may be above ground-plane only for conducted emission measurements.

Accessories, such as ac power adapter, if typically table-mounted, shall occupy peripheral positions as is applicable.

Accessories, which are typically floor-mounted, shall occupy a floor position directly below the portion of the EUT to which they are typically connected. T

Table length may be extended beyond 1.5 m with peripherals aligned with the back edge. The table depth may be extended beyond 1 m. The 40 cm distance to the vertical conducting plane shall be maintained for conducted emission testing.

Placement of wall-mounted equipment

5.1.7 Test configuration/arrangement for combination floor-standing and tabletop equipment

Interconnecting cables that hang closer than 40 cm to the ground-plane shall be folded back and forth in the center, forming a bundle 30 to 40 cm long.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated if required using the correct terminating impedance.

If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the ground-plane with the receptacle flush with the ground-plane.

Cables of hand-operated devices, such as keyboards, mice, etc., have to be placed as for normal use.

Non-EUT components of EUT system being tested.

I/O cable to floor-standing unit drapes to the ground-plane and shortened or excess bundled. Cables not reaching the metal ground-plane are draped to the height of the connector or 40 cm, whichever is lower.

Power cords and signal cables shall drape to the floor. No extension cords shall be used to the power receptacles.

The floor-standing unit can be placed under the table if its height permits.

5.2 Special condition description

If for some reason the above measurement conditions can’t be met, the description below should be used as an appropriate measurement condition and placement.

(Description is written additionally as the measurements differ – all is within test procedure)

6 TEST SUMMARY

STANDARDS (details on first page)	Tested yes	Tested no	Sample pass	Sample not pass
ANSI C63.4-2014; FCC Part 15, Subpart B, Class B	☑	☐	☑	☐

Test	Section within the report	Class	Conclusion
Conducted emission measurement (unintentional radiator)	7.1	/	N/A
Radiated emission measurement (unintentional radiator)	7.2	A	PASS

6.1 Operating voltages/frequencies used for testing

Section	Test	Operating conditions
7.1	Conducted emission measurement (unintentional radiator)	N/A
7.2	Radiated emission measurement (unintentional radiator)	12 Vdc

7 EMISSION TESTS

7.1 Conducted emission measurement (unintentional radiator)

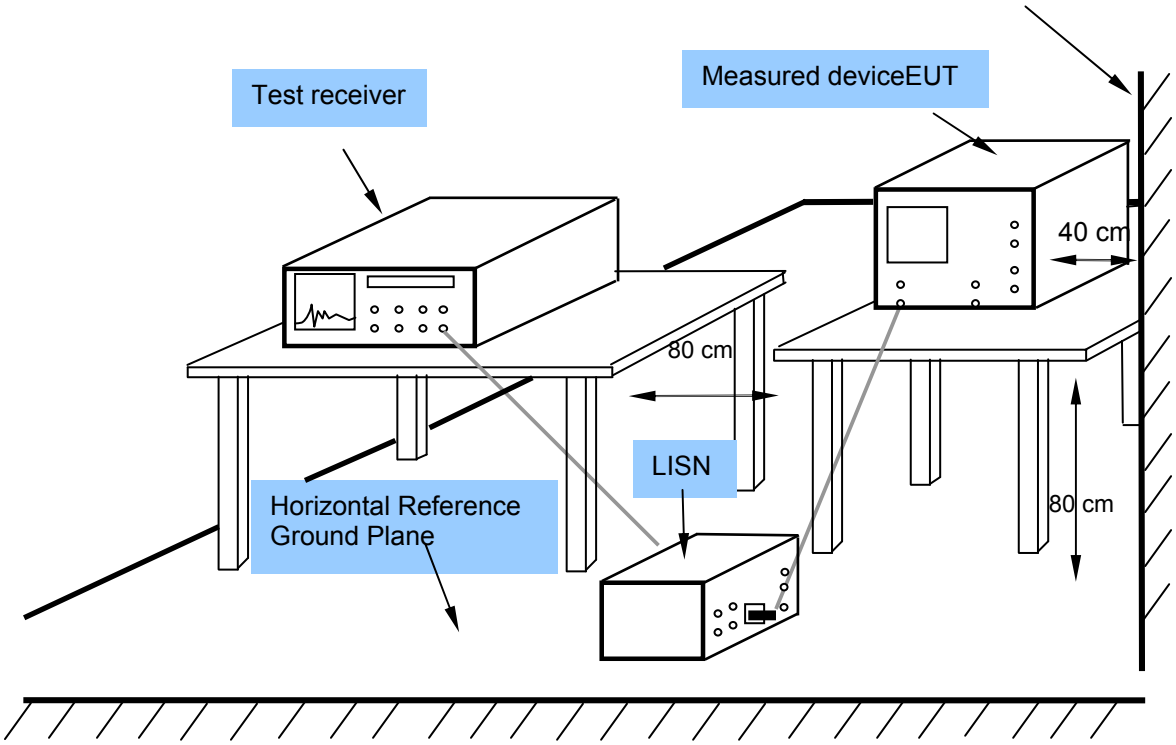
7.1.1 Test instruments

Description	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
Rohde-Schwarz, RFI receiver	ESU8	105187	2015-11	2017-11	24 months	X
Rohde & Schwarz, Artificial main network	ESH2-Z5	100406	2015-05	2017-05	24 months	X

7.1.2 Test procedure

- The EUT is placed on a non-conductive 0.8 meters high table, 0.4 meters from the vertical conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). LISN provide 50 Ohm / 50 μH + 5 Ohm of coupling impedance for the measuring instrument.
- Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.
- AC power lines of EUT are checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz is searched using PEAK, QUASI-PEAK and AVERAGE function of the receiver. Bandwidth is set to 9 kHz.
- If applicable functions are changed (data transfer speed, clock speed,…) it should be noted in the test report.

7.1.3 Test setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.1.4 Test result

Test is not applicable due to EUT is intended to be used in vehicle.

7.2 Radiated emission measurement (unintentional radiator)

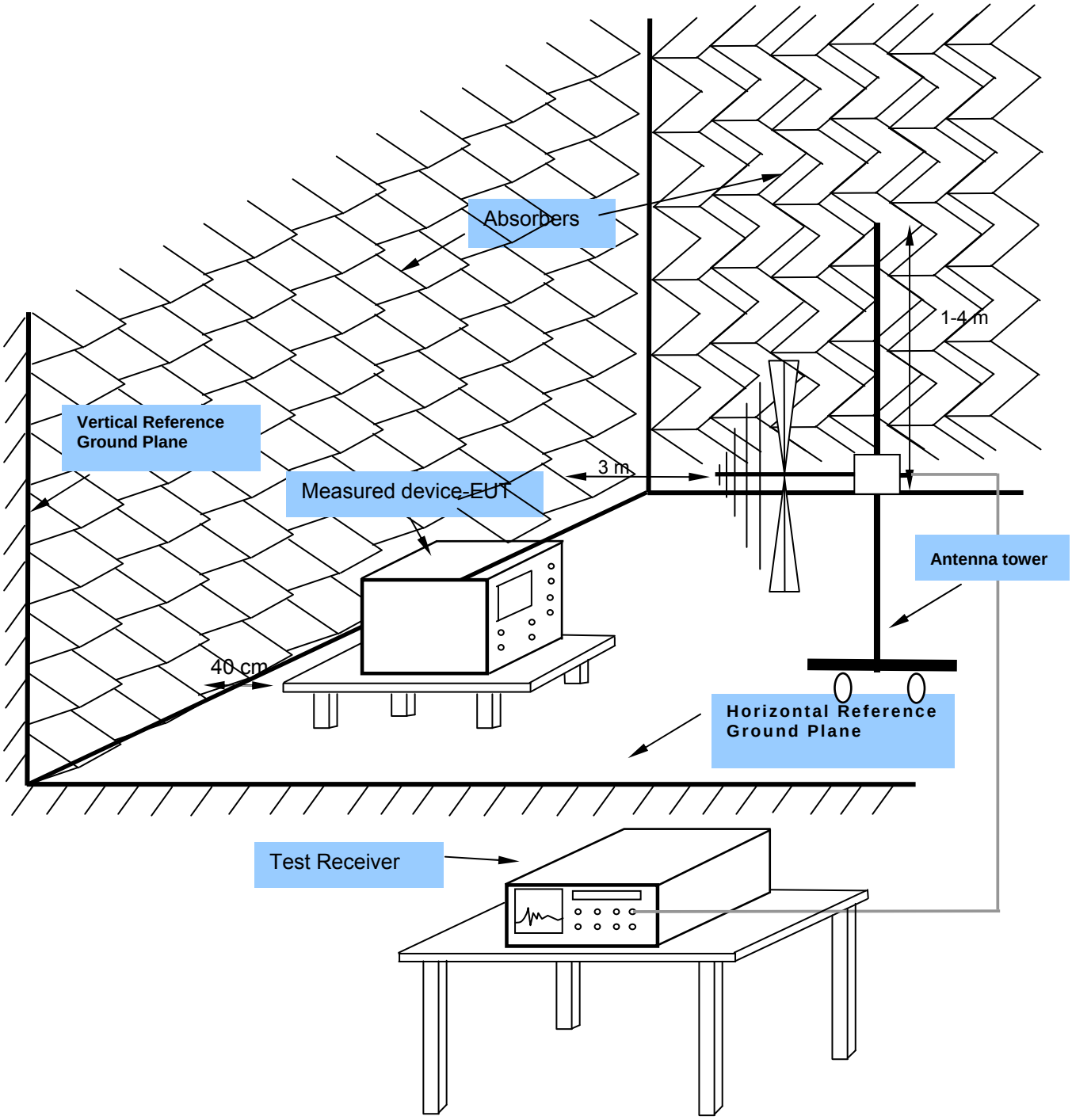
7.2.1 Test instruments

Description & Manufacturer	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
ETS, Anechoic chamber	3m	103949	2014-11	2016-11	24 months	X
Rohde-Schwarz, RFI receiver	ESU8	105187	2015-11	2017-11	24 months	X
Rohde-Schwarz, RFI receiver	ESU26	100428	2016-02	2018-02	24 months	
EMCO, Antenna	3142B	104351	2015-09	2017-09	24 months	X
EMCO, Antenna	3115	103002	2015-09	2017-09	24 months	
Heinrich Deisel, Turn table	DS 420.00	103337	NA	NA	NA	X
Antenna tower	/	/	NA	NA	NA	X
Controller for turn table and antenna tower	/	/	NA	NA	NA	X

7.2.2 Test procedure

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of variable-height antenna tower.
3. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to PEAK and QUASI-PEAK Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The highest points would be re-tested one by one using the quasi-peak method.

7.2.3 Test setup



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.2.4 Test result

C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

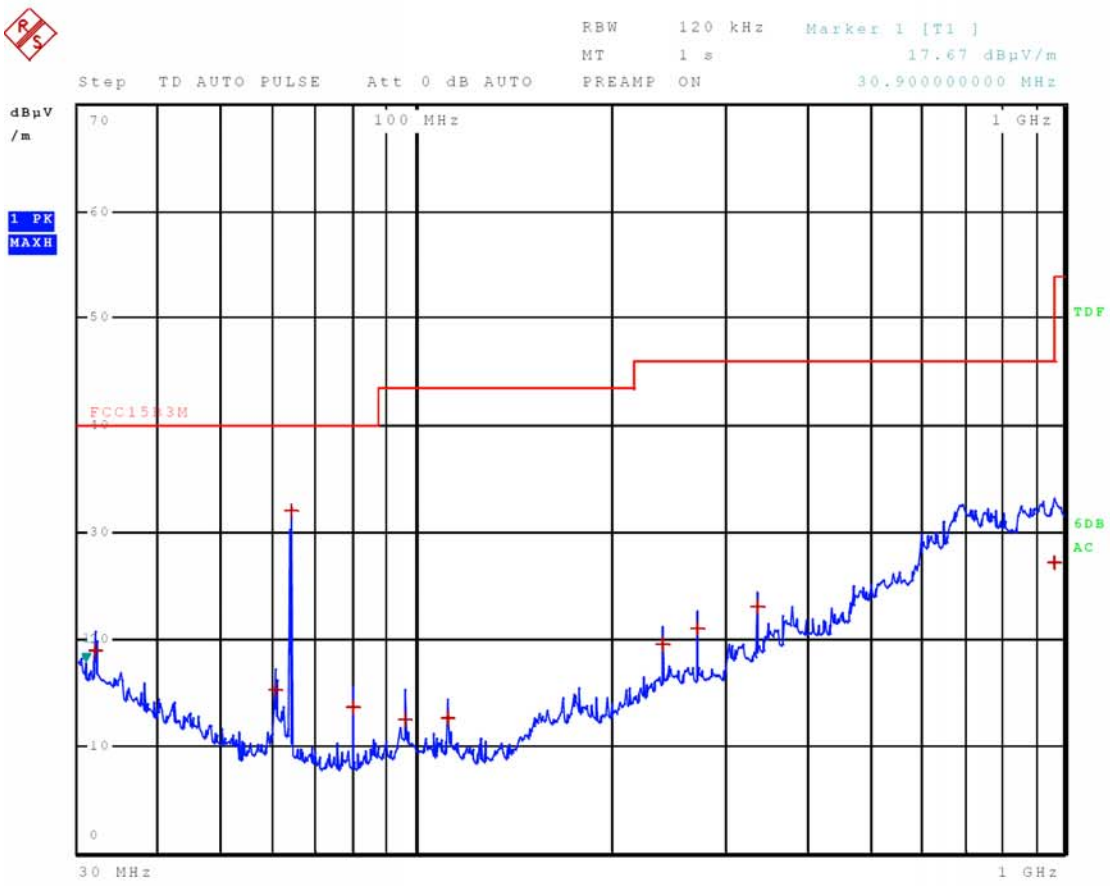
Test Spec

ANTENNA AT 1m/0deg - VERTICAL

Time Domain Scan (1 Range)

Scan Start:	30 MHz
Scan Stop:	1 GHz
Detector:	Trace 1: MAX PEAK
Transducer:	3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	2 ms	Auto	20 dB	INPUT2



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Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

Test Spec

ANTENNA AT 1m/0deg - VERTICAL

Final Measurement

Meas Time:	1 s
Margin:	30 dB
Peaks:	10

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	31.950000000 MHz	18.87	Quasi Peak	-21.13
1	60.690000000 MHz	15.20	Quasi Peak	-24.80
1	63.870000000 MHz	31.99	Quasi Peak	-8.01
1	79.830000000 MHz	13.66	Quasi Peak	-26.34
1	95.820000000 MHz	12.38	Quasi Peak	-31.12
1	111.780000000 MHz	12.62	Quasi Peak	-30.88
1	239.550000000 MHz	19.45	Quasi Peak	-26.55
1	271.470000000 MHz	20.90	Quasi Peak	-25.10
1	335.370000000 MHz	23.04	Quasi Peak	-22.96
1	964.110000000 MHz	27.10	Quasi Peak	-26.90

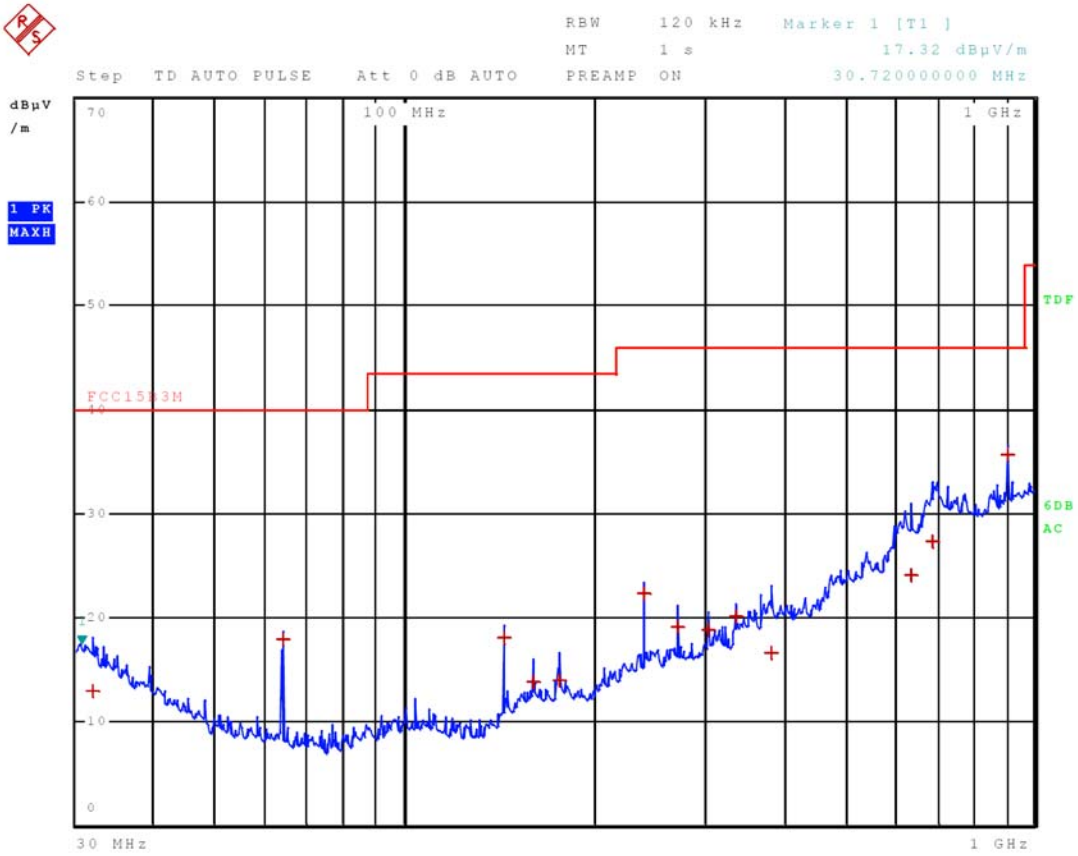
Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
OP Condition	12 VDC
Test Spec	

ANTENNA AT 1m/0deg - HORIZONTAL

Time Domain Scan (1 Range)

Scan Start:	30 MHz
Scan Stop:	1 GHz
Detector:	Trace 1: MAX PEAK
Transducer:	3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	2 ms	Auto	20 dB	INPUT2



Meas Type RADIATED EMISSION
Equipment under Test SMART TURN SYSTEM
OP Condition 12 VDC
Test Spec
ANTENNA AT 1m/0deg - HORIZONTAL

Final Measurement

Meas Time: 1 s
Margin: 30 dB
Peaks: 13

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	31.830000000 MHz	12.85	Quasi Peak	-27.15
1	63.870000000 MHz	17.80	Quasi Peak	-22.20
1	143.730000000 MHz	18.07	Quasi Peak	-25.43
1	159.690000000 MHz	13.71	Quasi Peak	-29.79
1	175.680000000 MHz	13.91	Quasi Peak	-29.59
1	239.550000000 MHz	22.31	Quasi Peak	-23.69
1	271.470000000 MHz	18.99	Quasi Peak	-27.01
1	303.420000000 MHz	18.77	Quasi Peak	-27.23
1	335.370000000 MHz	20.13	Quasi Peak	-25.87
1	382.920000000 MHz	16.51	Quasi Peak	-29.49
1	636.420000000 MHz	24.00	Quasi Peak	-22.00
1	690.150000000 MHz	27.33	Quasi Peak	-18.67
1	910.200000000 MHz	35.70	Quasi Peak	-10.30

C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

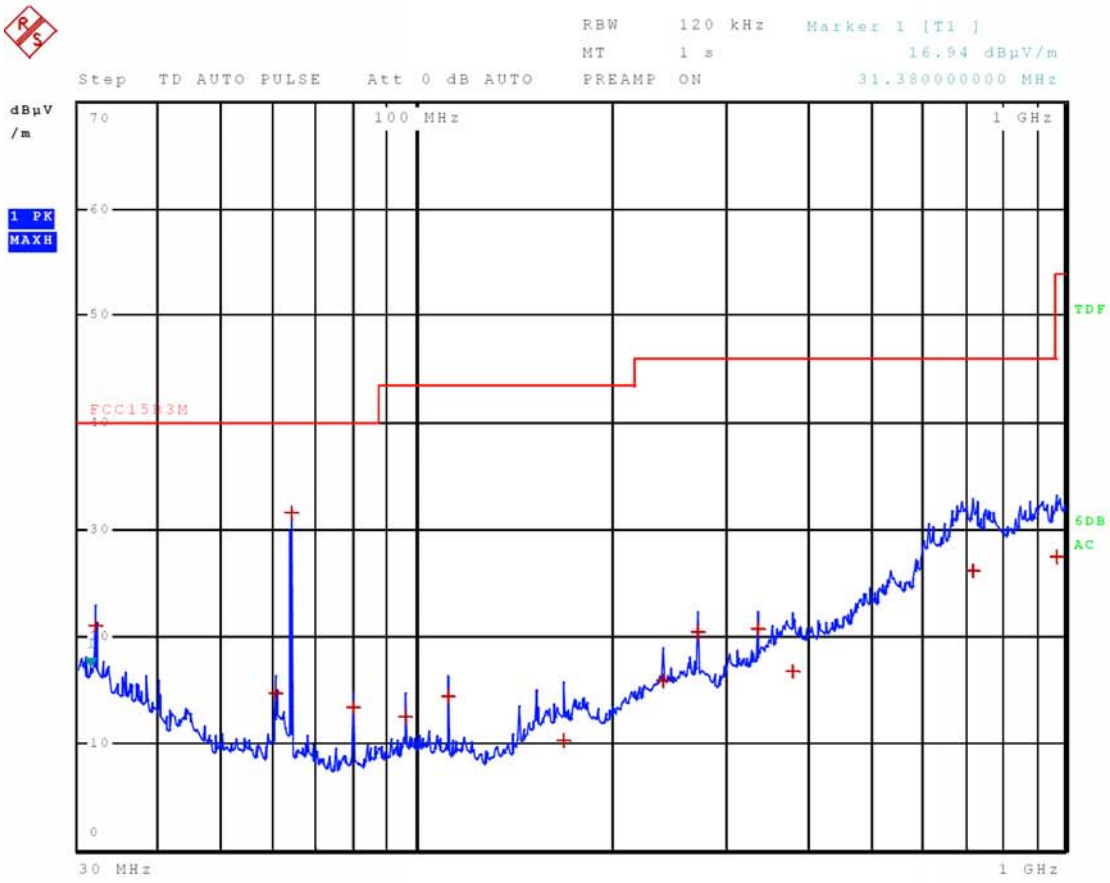
Test Spec

ANTENNA AT 1m/90deg - VERTICAL

Time Domain Scan (1 Range)

Scan Start: 30 MHz
Scan Stop: 1 GHz
Detector: Trace 1: MAX PEAK
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	2 ms	Auto	20 dB	INPUT2



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Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

Test Spec

ANTENNA AT 1m/90deg - VERTICAL

Final Measurement

Meas Time:	1 s
Margin:	30 dB
Peaks:	13

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	31.950000000 MHz	21.01	Quasi Peak	-18.99
1	60.690000000 MHz	14.66	Quasi Peak	-25.34
1	63.870000000 MHz	31.56	Quasi Peak	-8.44
1	79.860000000 MHz	13.28	Quasi Peak	-26.72
1	95.820000000 MHz	12.45	Quasi Peak	-31.05
1	111.780000000 MHz	14.40	Quasi Peak	-29.10
1	168.060000000 MHz	10.26	Quasi Peak	-33.24
1	239.550000000 MHz	15.76	Quasi Peak	-30.24
1	271.470000000 MHz	20.34	Quasi Peak	-25.66
1	335.340000000 MHz	20.59	Quasi Peak	-25.41
1	380.550000000 MHz	16.69	Quasi Peak	-29.31
1	720.420000000 MHz	26.13	Quasi Peak	-19.87
1	969.690000000 MHz	27.40	Quasi Peak	-26.60

C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

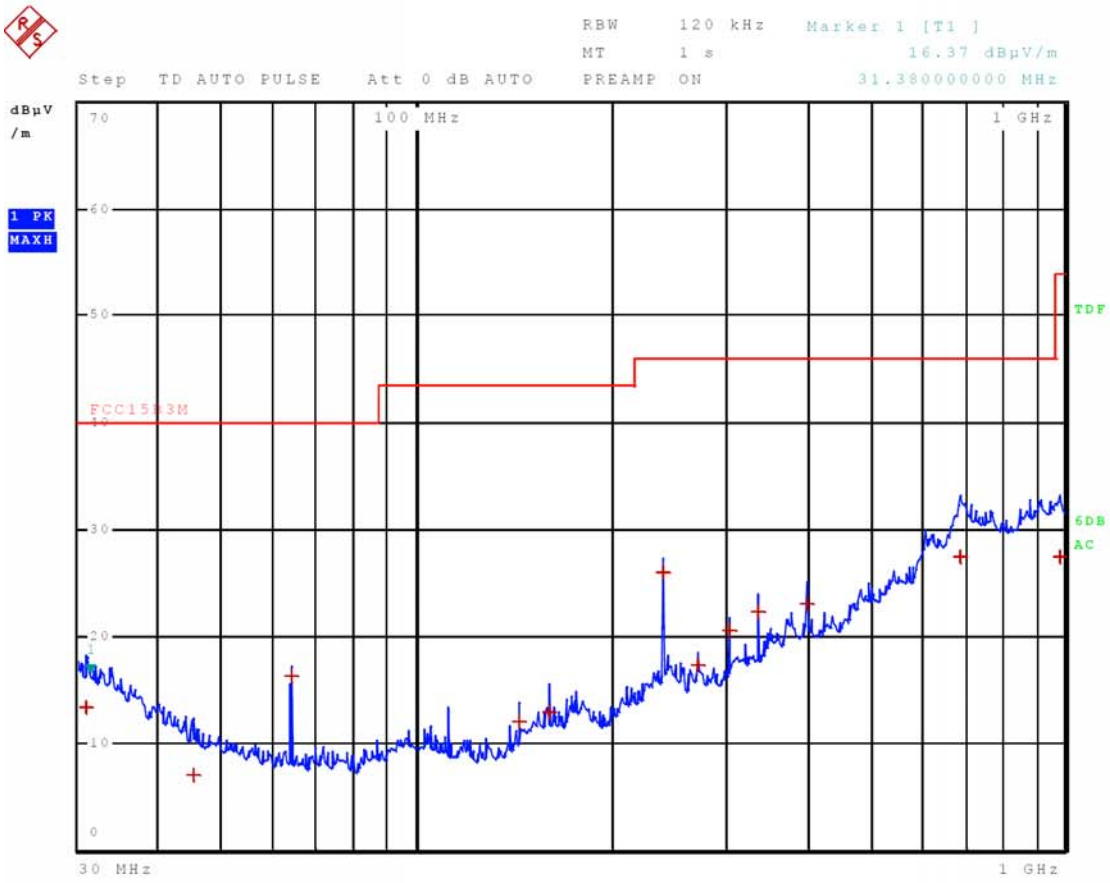
Test Spec

ANTENNA AT 1m/90deg - HORIZONTAL

Time Domain Scan (1 Range)

Scan Start: 30 MHz
Scan Stop: 1 GHz
Detector: Trace 1: MAX PEAK
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	2 ms	Auto	20 dB	INPUT2



C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

Test Spec

ANTENNA AT 1m/90deg - HORIZONTAL

Final Measurement

Meas Time:	1 s
Margin:	30 dB
Peaks:	12

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	30.810000000 MHz	13.32	Quasi Peak	-26.68
1	45.060000000 MHz	7.05	Quasi Peak	-32.95
1	63.870000000 MHz	16.18	Quasi Peak	-23.82
1	143.730000000 MHz	12.05	Quasi Peak	-31.45
1	159.690000000 MHz	12.85	Quasi Peak	-30.65
1	239.550000000 MHz	26.02	Quasi Peak	-19.98
1	271.470000000 MHz	17.28	Quasi Peak	-28.72
1	303.420000000 MHz	20.53	Quasi Peak	-25.47
1	335.340000000 MHz	22.31	Quasi Peak	-23.69
1	399.240000000 MHz	22.99	Quasi Peak	-23.01
1	691.560000000 MHz	27.37	Quasi Peak	-18.63
1	983.850000000 MHz	27.48	Quasi Peak	-26.52

C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

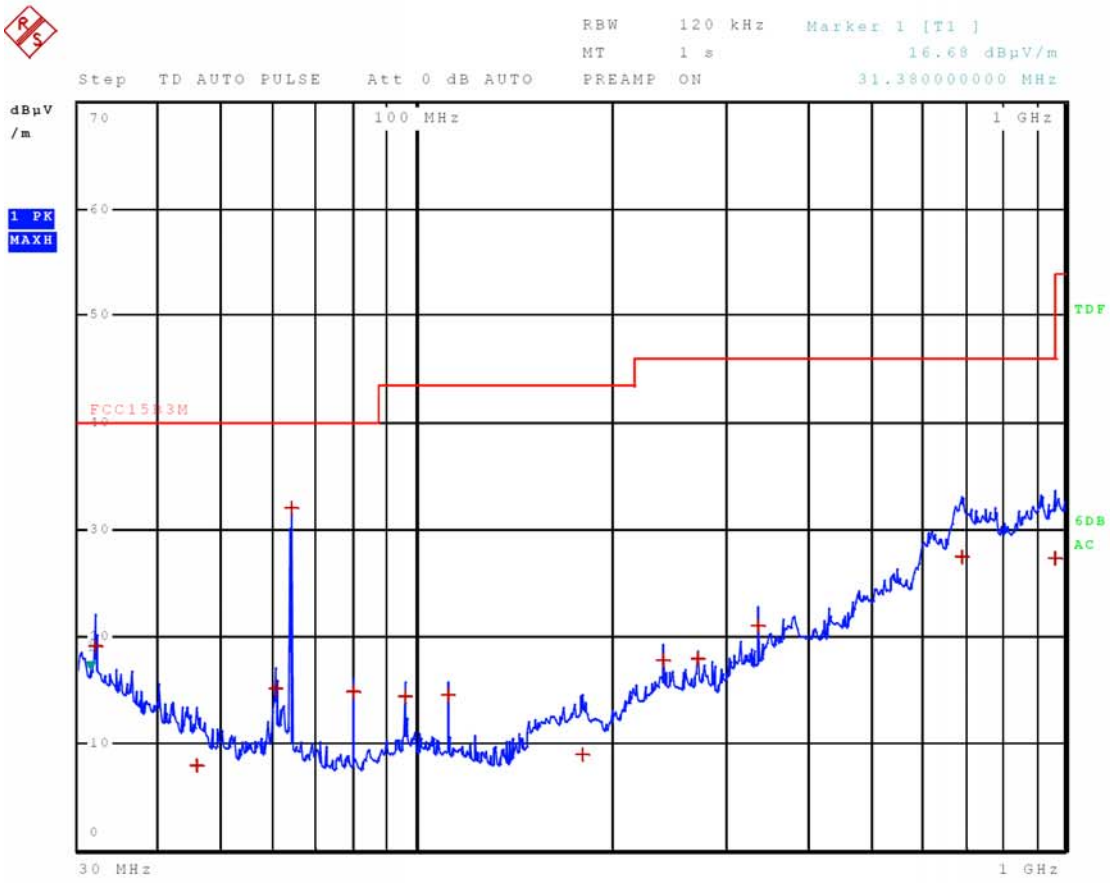
Test Spec

ANTENNA AT 1m/180deg - VERTICAL

Time Domain Scan (1 Range)

Scan Start: 30 MHz
Scan Stop: 1 GHz
Detector: Trace 1: MAX PEAK
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	2 ms	Auto	20 dB	INPUT2



C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

Test Spec

ANTENNA AT 1m/180deg - VERTICAL

Final Measurement

Meas Time:	1 s
Margin:	30 dB
Peaks:	13

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	31.950000000 MHz	19.03	Quasi Peak	-20.97
1	45.630000000 MHz	7.91	Quasi Peak	-32.09
1	60.690000000 MHz	15.11	Quasi Peak	-24.89
1	63.870000000 MHz	31.93	Quasi Peak	-8.07
1	79.830000000 MHz	14.76	Quasi Peak	-25.24
1	95.820000000 MHz	14.31	Quasi Peak	-29.19
1	111.780000000 MHz	14.53	Quasi Peak	-28.97
1	179.640000000 MHz	8.93	Quasi Peak	-34.57
1	239.550000000 MHz	17.65	Quasi Peak	-28.35
1	271.470000000 MHz	17.80	Quasi Peak	-28.20
1	335.370000000 MHz	20.94	Quasi Peak	-25.06
1	695.580000000 MHz	27.42	Quasi Peak	-18.58
1	968.430000000 MHz	27.35	Quasi Peak	-26.65

C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

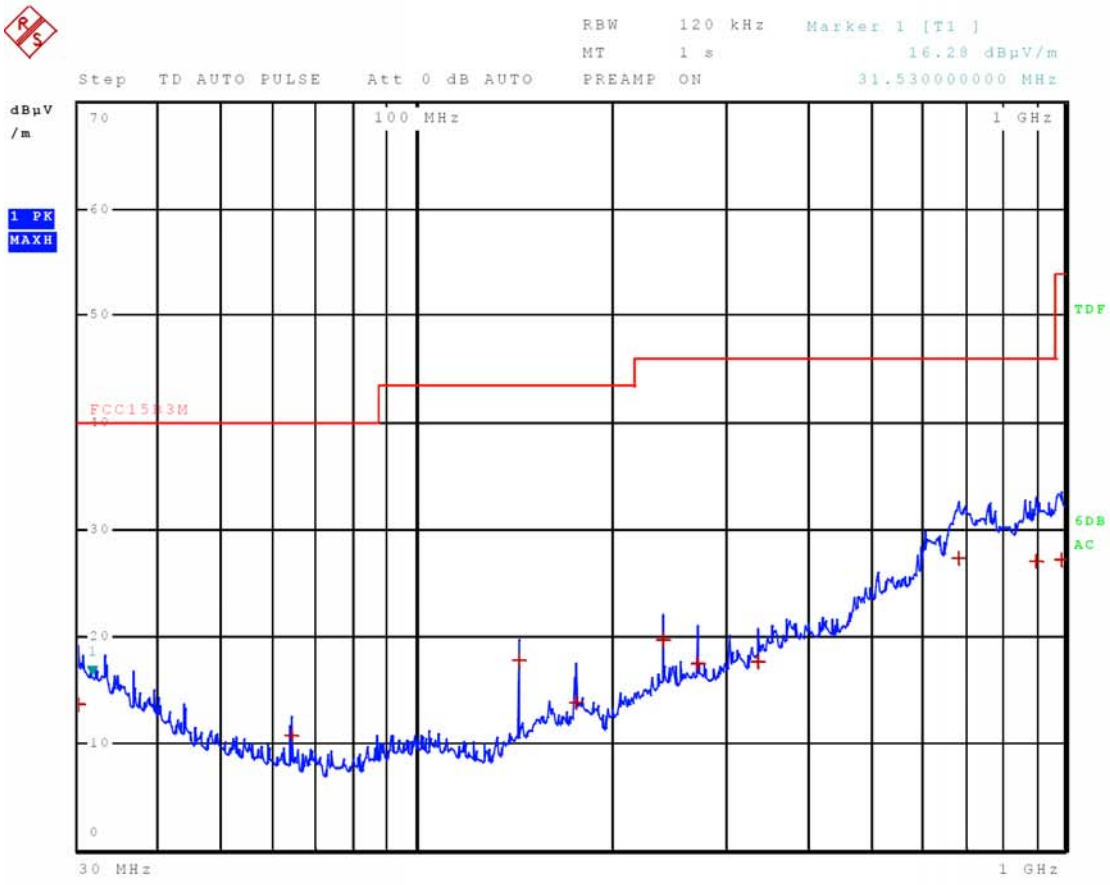
Test Spec

ANTENNA AT 1m/180deg - HORIZONTAL

Time Domain Scan (1 Range)

Scan Start: 30 MHz
Scan Stop: 1 GHz
Detector: Trace 1: MAX PEAK
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	2 ms	Auto	20 dB	INPUT2



C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

Test Spec

ANTENNA AT 1m/180deg - HORIZONTAL

Final Measurement

Meas Time:	1 s
Margin:	30 dB
Peaks:	10

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	30.000000000 MHz	13.61	Quasi Peak	-26.39
1	63.900000000 MHz	10.70	Quasi Peak	-29.30
1	143.730000000 MHz	17.77	Quasi Peak	-25.73
1	175.650000000 MHz	13.81	Quasi Peak	-29.69
1	239.550000000 MHz	19.63	Quasi Peak	-26.37
1	271.470000000 MHz	17.37	Quasi Peak	-28.63
1	335.340000000 MHz	17.52	Quasi Peak	-28.48
1	686.700000000 MHz	27.32	Quasi Peak	-18.68
1	901.800000000 MHz	26.95	Quasi Peak	-19.05
1	989.790000000 MHz	27.14	Quasi Peak	-26.86

C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

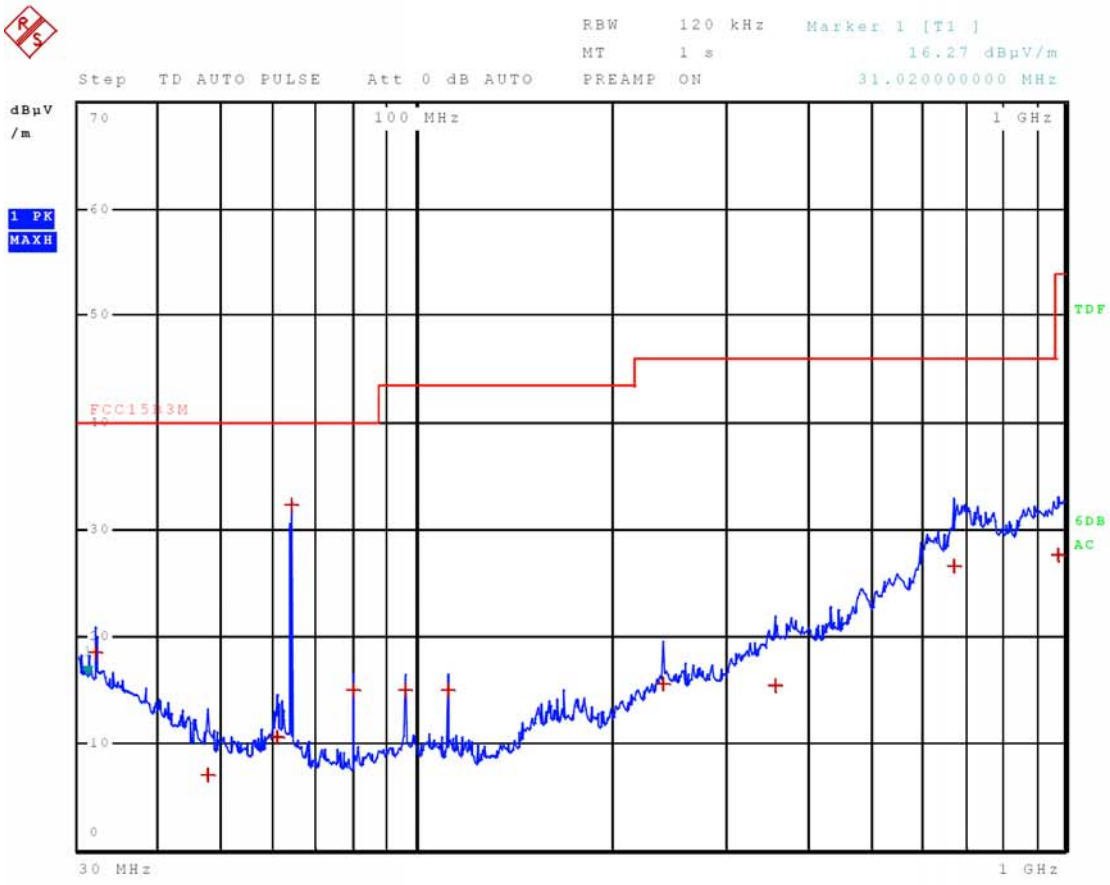
Test Spec

ANTENNA AT 1m/270deg - VERTICAL

Time Domain Scan (1 Range)

Scan Start: 30 MHz
Scan Stop: 1 GHz
Detector: Trace 1: MAX PEAK
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	2 ms	Auto	20 dB	INPUT2



C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

Test Spec

ANTENNA AT 1m/270deg - VERTICAL

Final Measurement

Meas Time:	1 s
Margin:	30 dB
Peaks:	11

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	31.920000000 MHz	18.52	Quasi Peak	-21.48
1	47.460000000 MHz	6.98	Quasi Peak	-33.02
1	60.840000000 MHz	10.55	Quasi Peak	-29.45
1	63.870000000 MHz	32.27	Quasi Peak	-7.73
1	79.830000000 MHz	14.88	Quasi Peak	-25.12
1	95.820000000 MHz	14.99	Quasi Peak	-28.51
1	111.780000000 MHz	14.98	Quasi Peak	-28.52
1	239.550000000 MHz	15.58	Quasi Peak	-30.42
1	357.420000000 MHz	15.43	Quasi Peak	-30.57
1	674.820000000 MHz	26.56	Quasi Peak	-19.44
1	980.130000000 MHz	27.63	Quasi Peak	-26.37

C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

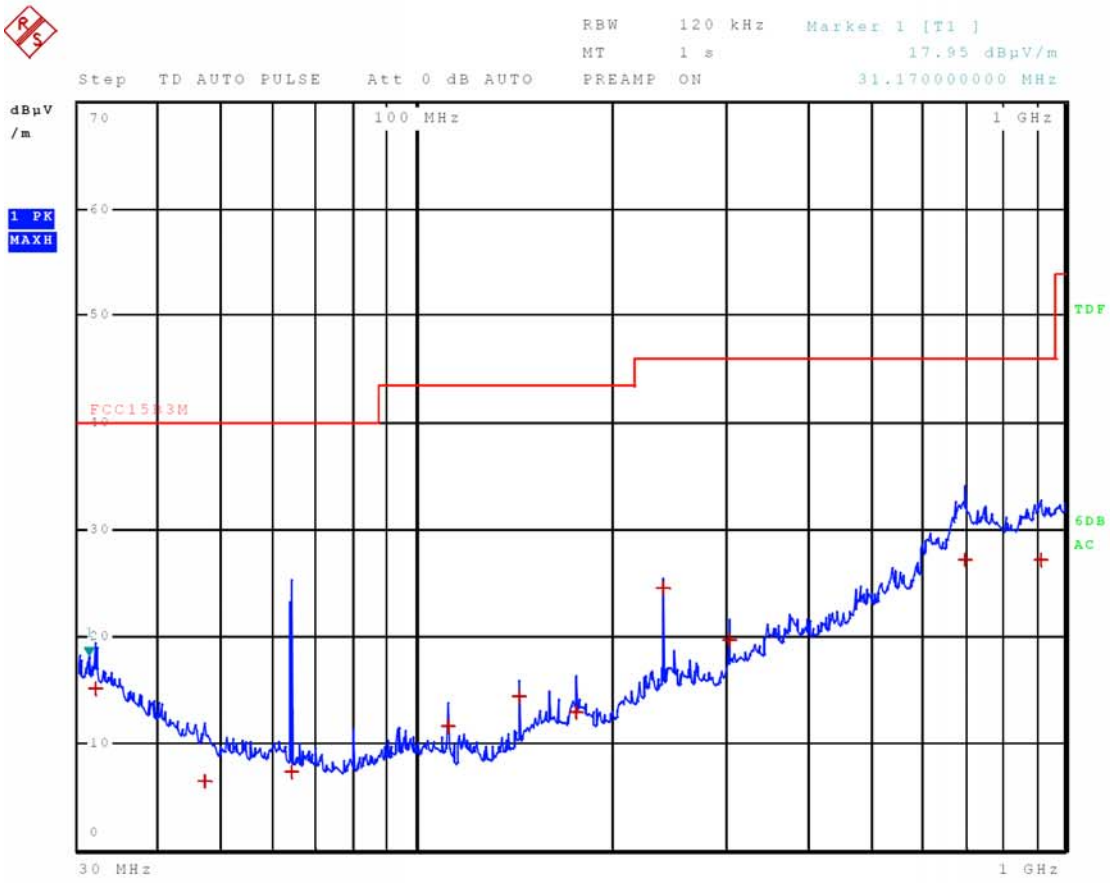
Test Spec

ANTENNA AT 1m/270deg - HORIZONTAL

Time Domain Scan (1 Range)

Scan Start: 30 MHz
Scan Stop: 1 GHz
Detector: Trace 1: MAX PEAK
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	2 ms	Auto	20 dB	INPUT2



C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

Test Spec

ANTENNA AT 1m/270deg - HORIZONTAL

Final Measurement

Meas Time:	1 s
Margin:	30 dB
Peaks:	10

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	31.950000000 MHz	15.06	Quasi Peak	-24.94
1	47.070000000 MHz	6.38	Quasi Peak	-33.62
1	63.870000000 MHz	7.31	Quasi Peak	-32.69
1	111.780000000 MHz	11.62	Quasi Peak	-31.88
1	143.730000000 MHz	14.32	Quasi Peak	-29.18
1	175.680000000 MHz	12.80	Quasi Peak	-30.70
1	239.550000000 MHz	24.48	Quasi Peak	-21.52
1	303.420000000 MHz	19.61	Quasi Peak	-26.39
1	703.620000000 MHz	27.20	Quasi Peak	-18.80
1	919.980000000 MHz	27.20	Quasi Peak	-18.80

C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

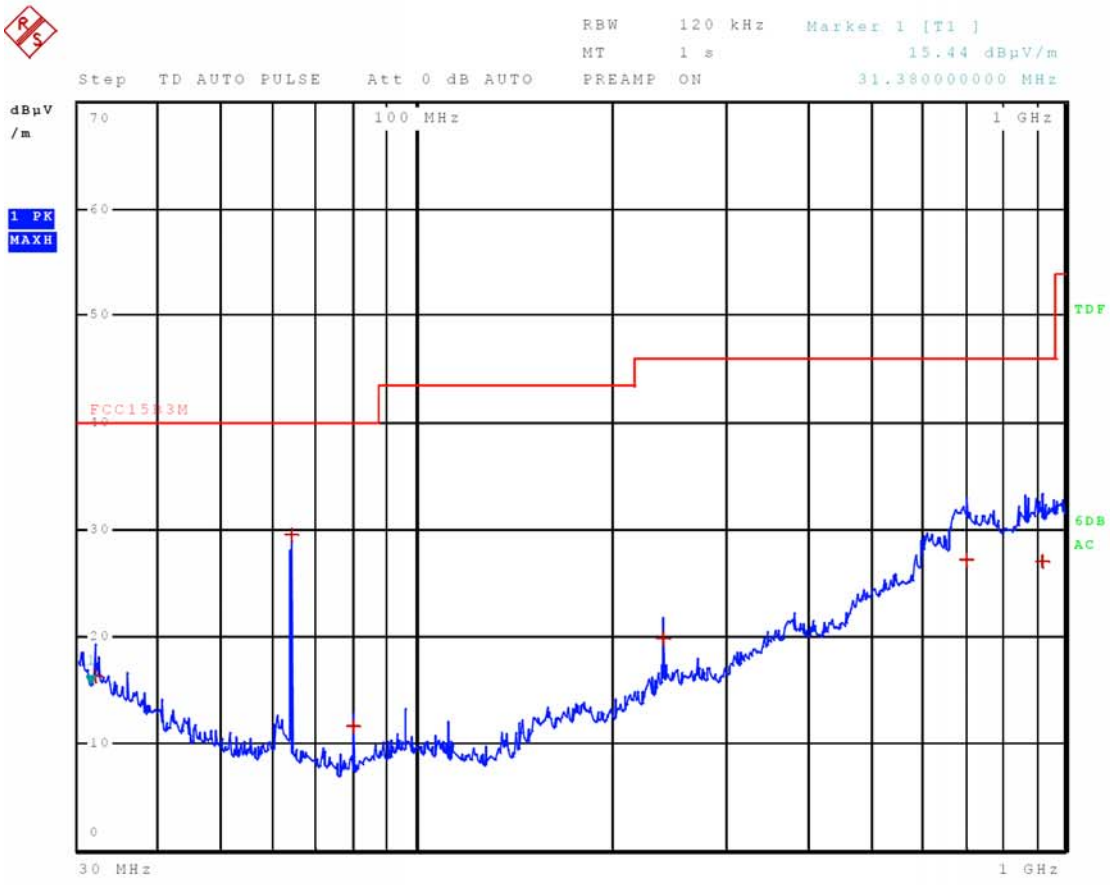
Test Spec

ANTENNA AT 2.5m/180deg - VERTICAL

Time Domain Scan (1 Range)

Scan Start: 30 MHz
Scan Stop: 1 GHz
Detector: Trace 1: MAX PEAK
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	2 ms	Auto	20 dB	INPUT2



C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

Test Spec

ANTENNA AT 2.5m/180deg - VERTICAL

Final Measurement

Meas Time:	1 s
Margin:	30 dB
Peaks:	6

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	31.950000000 MHz	16.30	Quasi Peak	-23.70
1	63.870000000 MHz	29.48	Quasi Peak	-10.52
1	79.860000000 MHz	11.58	Quasi Peak	-28.42
1	239.550000000 MHz	19.80	Quasi Peak	-26.20
1	704.160000000 MHz	27.16	Quasi Peak	-18.84
1	924.120000000 MHz	27.00	Quasi Peak	-19.00

C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

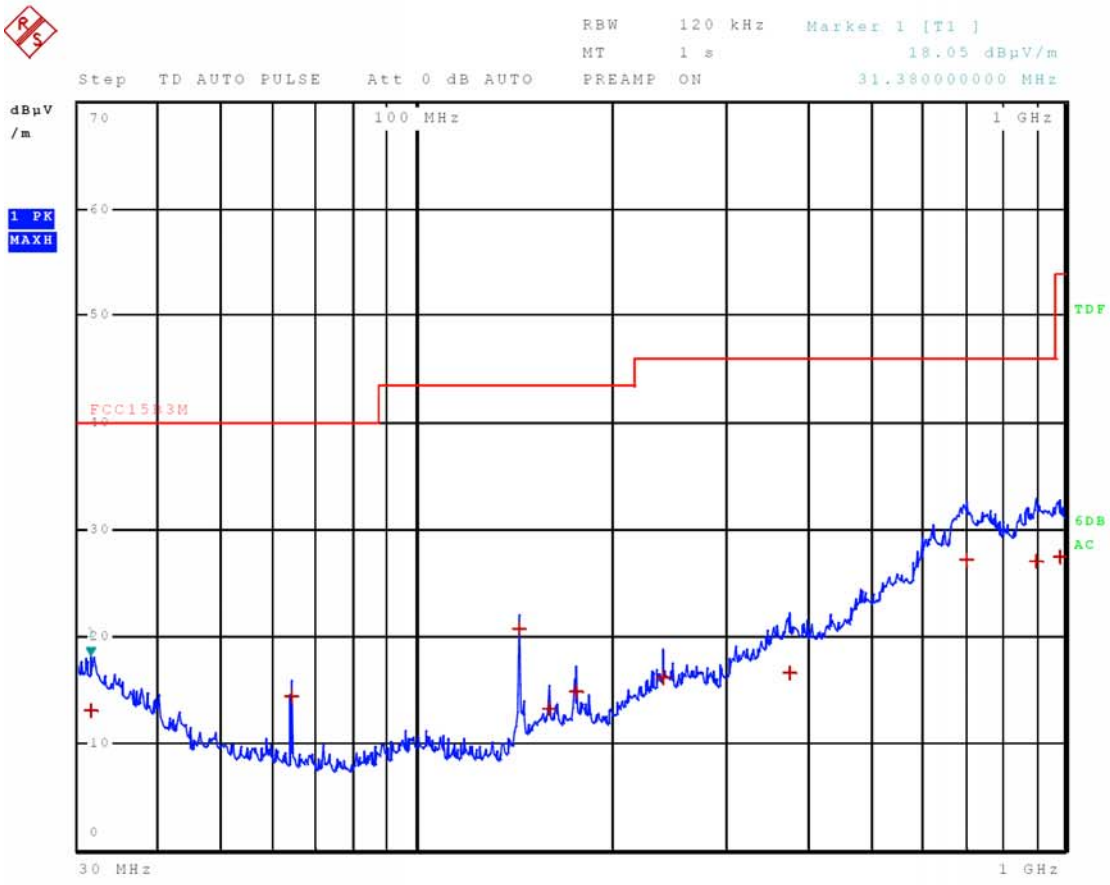
Test Spec

ANTENNA AT 2.5m/180deg - HORIZONTAL

Time Domain Scan (1 Range)

Scan Start: 30 MHz
Scan Stop: 1 GHz
Detector: Trace 1: MAX PEAK
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	2 ms	Auto	20 dB	INPUT2



C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

Test Spec

ANTENNA AT 2.5m/180deg - HORIZONTAL

Final Measurement

Meas Time:	1 s
Margin:	30 dB
Peaks:	10

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	31.380000000 MHz	13.03	Quasi Peak	-26.97
1	63.870000000 MHz	14.28	Quasi Peak	-25.72
1	143.730000000 MHz	20.66	Quasi Peak	-22.84
1	159.720000000 MHz	13.18	Quasi Peak	-30.32
1	175.680000000 MHz	14.80	Quasi Peak	-28.70
1	239.550000000 MHz	16.17	Quasi Peak	-29.83
1	375.060000000 MHz	16.57	Quasi Peak	-29.43
1	704.760000000 MHz	27.14	Quasi Peak	-18.86
1	902.670000000 MHz	26.95	Quasi Peak	-19.05
1	985.140000000 MHz	27.36	Quasi Peak	-26.64

C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

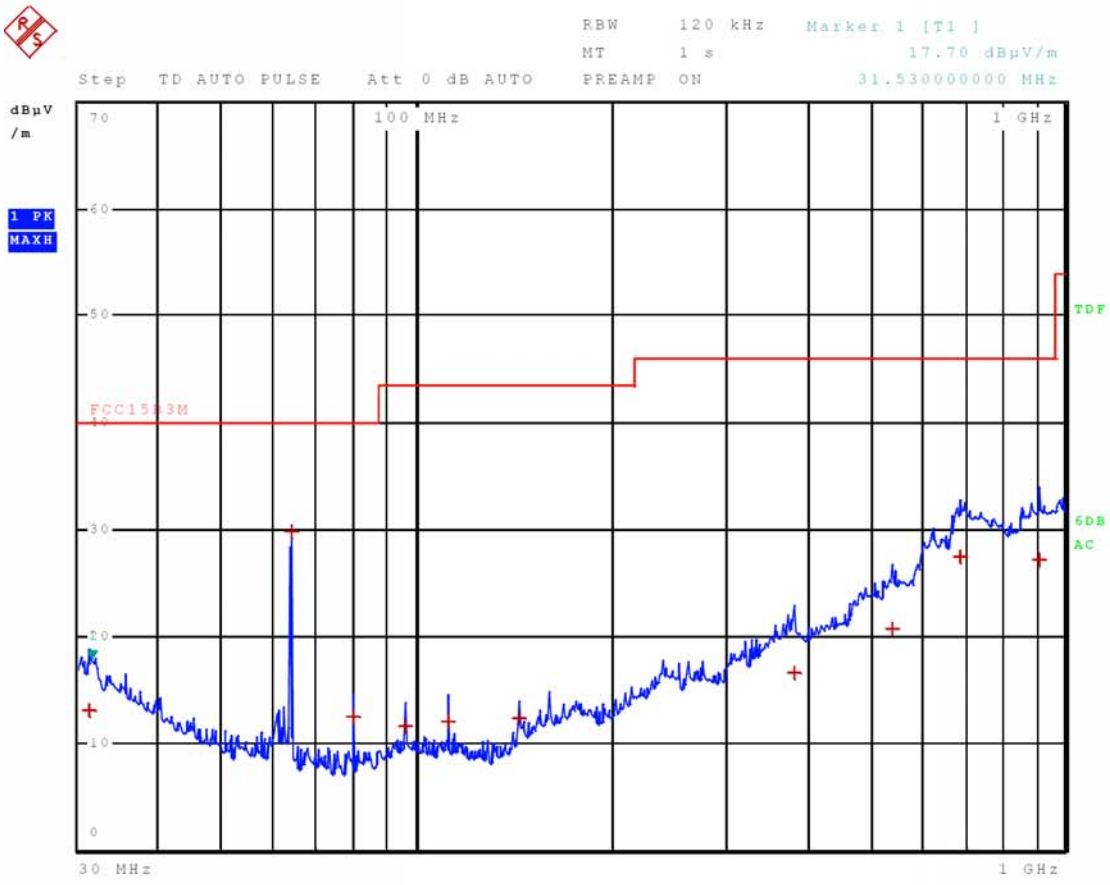
Test Spec

ANTENNA AT 2.5m/270deg - VERTICAL

Time Domain Scan (1 Range)

Scan Start: 30 MHz
Scan Stop: 1 GHz
Detector: Trace 1: MAX PEAK
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	2 ms	Auto	20 dB	INPUT2



C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

Test Spec

ANTENNA AT 2.5m/270deg - VERTICAL

Final Measurement

Meas Time:	1 s
Margin:	30 dB
Peaks:	10

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	31.230000000 MHz	13.05	Quasi Peak	-26.95
1	63.870000000 MHz	29.85	Quasi Peak	-10.15
1	79.860000000 MHz	12.42	Quasi Peak	-27.58
1	95.820000000 MHz	11.61	Quasi Peak	-31.89
1	111.780000000 MHz	12.03	Quasi Peak	-31.47
1	143.730000000 MHz	12.21	Quasi Peak	-31.29
1	382.470000000 MHz	16.49	Quasi Peak	-29.51
1	541.680000000 MHz	20.67	Quasi Peak	-25.33
1	690.090000000 MHz	27.40	Quasi Peak	-18.60
1	914.910000000 MHz	27.20	Quasi Peak	-18.80

C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

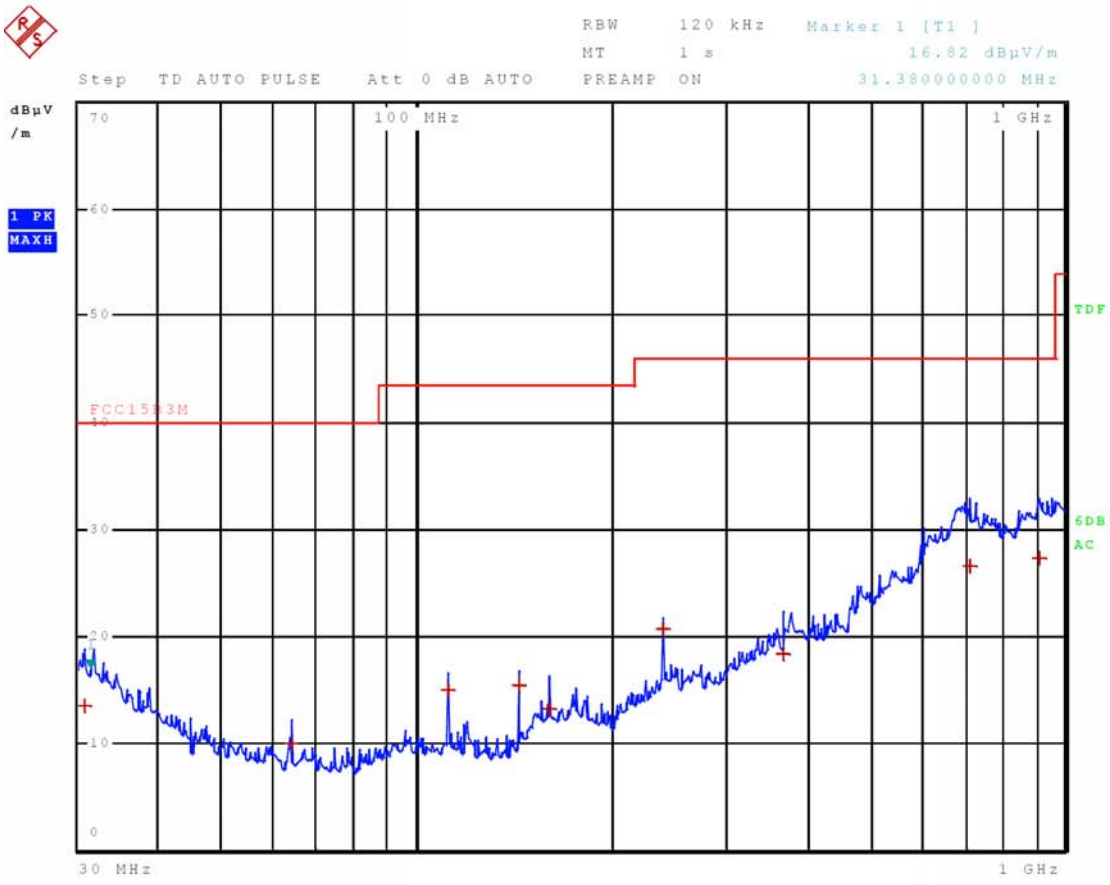
Test Spec

ANTENNA AT 2.5m/270deg - HORIZONTAL

Time Domain Scan (1 Range)

Scan Start: 30 MHz
Scan Stop: 1 GHz
Detector: Trace 1: MAX PEAK
Transducer: 3142B3m

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
30.000000 MHz	1.000000 GHz	30.00 kHz	120.00 kHz	2 ms	Auto	20 dB	INPUT2



C20160897

Meas Type	RADIATED EMISSION
Equipment under Test	SMART TURN SYSTEM
Manufacturer	ABCS SISTEM d.o.o.
OP Condition	12 VDC
Operator	Gregor Šterk

Test Spec

ANTENNA AT 2.5m/270deg - HORIZONTAL

Final Measurement

Meas Time:	1 s
Margin:	30 dB
Peaks:	9

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	30.570000000 MHz	13.40	Quasi Peak	-26.60
1	63.900000000 MHz	9.99	Quasi Peak	-30.01
1	111.780000000 MHz	14.92	Quasi Peak	-28.58
1	143.730000000 MHz	15.31	Quasi Peak	-28.19
1	159.690000000 MHz	13.13	Quasi Peak	-30.37
1	239.550000000 MHz	20.65	Quasi Peak	-25.35
1	367.320000000 MHz	18.34	Quasi Peak	-27.66
1	713.430000000 MHz	26.54	Quasi Peak	-19.46
1	913.080000000 MHz	27.26	Quasi Peak	-18.74

Figure 1: Radiated emission test

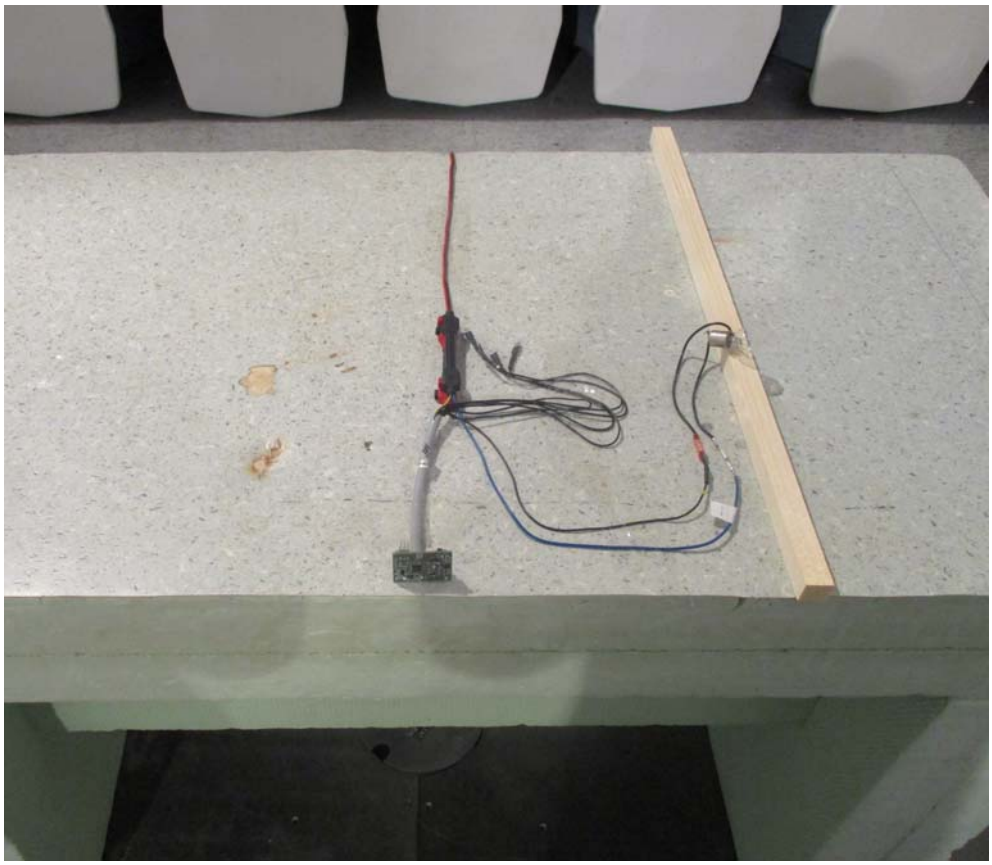


Figure 2: Radiated emission test