



# Test report

**Number:** T251-0752/17  
**Project file:** C20163039  
**Date:** 2018-02-12  
**Pages:** 74

**Product:** RFID Reader

**Type reference:** Metra Wristband Collector

**Ratings:** EUT: 24 Vdc (powered via AC/DC adapter)  
AC/DC adapter: 100-240 V~; 50/60 Hz  
Operating clock frequency: 13,56 MHz  
Protection class: - EUT: III  
- AC/DC adapter: I

**Trademark:** Metra MEW System

**Applicant:** Metra inženiring d.o.o.  
Špruha 19, IOC Trzin, SI-1236 Trzin, Slovenia

**Manufacturer:** Metra inženiring d.o.o.  
Špruha 19, IOC Trzin, SI-1236 Trzin, Slovenia

**Place of manufacture:** Metra inženiring d.o.o.  
Špruha 19, IOC Trzin, SI-1236 Trzin, Slovenia

## Summary of testing

**Testing method:** 47 CFR Part 15, Subpart C

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

**Remarks:** Date of receipt of test items: 2017-02-03  
Number of items tested: 1  
Date of performance of tests: 2017-02-03 - 2017-08-31  
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:** Andrej Škof

**Approved by:** Marjan Mak

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## 1 GENERAL

History sheet			
Date	Report No.	Change	Revision
2017-10-09	T251-0xxx/17	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

#### RFID Reader

Type: Metra Wristband Collector

Tested SIQ sample number: S20170738

#### Pictures of EUT:



Pictures of Metra Wristband Collector



Internal photo Metra Wristband Collector

### 1.1.1 General product information

<b>Product</b>	MEW MODULE
<b>Type / Model</b>	Metra Wristband Collector
<b>Supply voltage of transmitter</b>	24 Vdc (powered via AC/DC adapter)
<b>Operating frequency</b>	13,56 MHz
<b>Number of channels</b>	1
<b>Antenna type</b>	Two passive antennas tuned to 13,56 MHz
<b>Product class:</b>	1
<b>Receiver category:</b>	3
<b>Hardware version:</b>	1201 - MEWSMR v 1
<b>Software version:</b>	Test software covers worst case scenario, all hardware resources active and all communication ports active.

“Metra Wristband Collector” is a standalone module which can be integrated into different Metra access control systems. It is used whenever RFID Wristband has to be retained when a guest leaves the facility. It grants the exit signal only when the Wristband (ticket) is successfully erased and retained.

“Metra Wristband Collector” can be integrated into different Metra access control products such as Tripod Turnstile, Metra Access Terminal or similar.

For that purpose it contains specific electronic parts that enables construction of the RFID electromechanical devices. Such parts are:

- Two RFID readers each connected to different shape of RFID Antenna. Both read ISO 15693, ISO 1443A, ISO 14443B compatible RFID media
- Two Stepper Motor drivers
- Metra MEW serial communication interface
- LED signalisation and audio signalisation (Buzzer)
- Hall proximity sensors

#### Processor Used:

NXP1769 Cortex-M3

Quartz oscillator 12MHz internally multiplied by PLL VCO to 288 MHz then divided to operating frequency 96 MHz

#### LIN communication:

19200 Baud. Maximum length 60m

3wire cable 0.25 mm<sup>2</sup> – 0,75 mm<sup>2</sup>

#### Two RFID Readers:

NXP CLRC663 RFID Reader Chip.

Quartz oscillator 27.12 MHz divided by 2 to obtain RFID operating frequency 13.56 MHz.

RFID readers never operate simultaneously. Procedures reading RFID media is always focused on one physical reader/antenna then if needed new procedure starts on the other.

### 1.1.2 Auxiliary equipment used during testing

AC/DC Adapter: Mean Well, Model: GS90A24; Input: 100-240 V~; 50/60 Hz; Output: 24 VDC; 3,75 A

Metra MEW Controller

Temperature chamber, Kambič, I-190CK, SN 12064024



## 1.2 ANSI C63.4 Subpart selection

### *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 C: Intentional Radiators

#### 2.1.1 Section 15.207, Conducted emission 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.

#### 2.1.2 Section 15.209, Radiated emission limits:

**Limits:**

Frequency Range (MHz)	Limits (dBµV/m)		Test distance (m)
	VERTICAL	HORIZONTAL	
0,009 to 0,490	$20 \cdot \log(2400/F(\text{kHz}))$	$20 \cdot \log(2400/F(\text{kHz}))$	300
0,490 to 1,705	$20 \cdot \log(24000/F(\text{kHz}))$	$20 \cdot \log(24000/F(\text{kHz}))$	30
1,705 to 30,0	30	30	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.

**Additional provisions to the general radiated emission limitations – Section 15.215:** In no case shall the level of the unwanted emissions from an intentional radiator operating under these additional provisions exceed the field strength of the fundamental emission as per clause 15.209.

Intentional radiators operating under the alternative provisions to the general emission limits must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

### 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	
Rohde-Schwarz, RFI receiver	ESU26	100428	2016-02	2018-02	24 months	X
Rohde & Schwarz, Artificial main network	ESH2-Z5	106899	2017-06	2019-06	24 months	X
ETS, Anechoic chamber	3m	103949	2014-11	2016-11	24 months	X
R&S, Antenna	HFH2-Z2	/	2015-09	2017-09	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	3,583333
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

## 3.2.2 Antenna factors

### 3.2.2.1 Antenna HL562E

Frequency (MHz)	Antenna factor HL562E (SN 100842)	Antenna factor HL562E (SN 100843)
30	18.12	18.17
32	17.08	17.07
34	16.01	16
36	14.91	14.94
38	13.76	13.75
40	12.64	12.61
42	11.43	11.4
44	10.17	10.15
46	8.86	8.81
48	7.42	7.44
50	6.01	5.96
52	4.59	4.56
54	3.38	3.37
56	2.84	2.85
58	3.06	3.14
60	3.78	3.76
62	4.44	4.4
64	5.36	5.32
66	6.19	6.18
68	6.96	6.92
70	7.56	7.52
72	8.04	8.01
74	8.38	8.35
76	8.67	8.64
78	8.88	8.85
80	9.04	9.03
82	9.14	9.09
84	9.2	9.14
86	9.22	9.16
88	9.22	9.17
90	9.21	9.17
92	9.22	9.15
94	9.22	9.16
96	9.21	9.16
98	9.22	9.17
100	9.33	9.05
105	9.38	9.39
110	9.67	9.74
115	9.55	10.33
120	10.51	9.88
125	10.15	9.87
130	9.23	9.13
135	8.79	8.71
140	8.4	8.4
145	7.93	7.82
150	7.74	7.75
155	7.68	7.76
160	7.86	7.78
165	8.47	8.33



170	9.83	9.66
175	10.29	10.3
180	7.86	7.93
185	7.19	7.27
190	7.54	7.21
195	7.32	7.2
200	7.56	7.49
205	7.56	7.68
210	7.71	7.95
215	8.68	8.29
220	8.43	8.49
225	8.51	8.62
230	8.85	8.82
235	9.1	9.05
240	9.31	9.29
245	9.33	9.33
250	9.5	9.45
255	9.71	9.64
260	9.86	9.81
265	9.95	9.9
270	10	10.02
275	10.15	10.15
280	10.37	10.36
285	10.58	10.61
290	10.76	10.8
295	10.84	10.9
300	10.83	11.12
305	11.38	11.37
310	11.36	11.32
315	11.53	11.48
320	11.7	11.67
325	11.84	11.81
330	11.98	11.94
335	12.32	12.13
340	12.19	12.22
345	12.29	12.35
350	12.43	12.47
355	12.59	12.61
360	12.72	12.73
365	12.83	12.81
370	12.99	12.99
375	13.08	13.1
380	13.12	13.11
385	13.21	13.2
390	13.38	13.33
395	13.54	13.5
400	13.65	13.63
405	13.74	13.73
410	13.84	13.83
415	14.14	13.96
420	14.1	14
425	14.13	14.08
430	14.24	14.2
435	14.4	14.4
440	14.55	14.49
445	14.7	14.65
450	14.82	14.79

455	14.89	14.91
460	14.9	15.09
465	15.16	15.19
470	15.24	15.22
475	15.31	15.25
480	15.38	15.32
485	15.48	15.43
490	15.58	15.52
495	15.66	15.6
500	15.72	15.7
505	15.74	15.75
510	15.83	15.82
515	16.05	15.92
520	15.95	15.93
525	15.97	15.97
530	16.05	16.01
535	16.09	16.07
540	16.16	16.15
545	16.21	16.21
550	16.29	16.3
555	16.38	16.41
560	16.51	16.53
565	16.67	16.68
570	16.78	16.85
575	16.87	17.02
580	17.03	17.11
585	17.06	17.08
590	17.1	17.09
595	17.15	17.13
600	17.22	17.18
605	17.28	17.25
610	17.35	17.33
615	17.42	17.37
620	17.41	17.42
625	17.48	17.48
630	17.56	17.55
635	17.67	17.65
640	17.8	17.79
645	17.94	17.95
650	18.08	18.13
655	18.16	18.12
660	18.18	18.03
665	18.12	17.99
670	18.13	18.01
675	18.19	18.09
680	18.26	18.24
685	18.42	18.41
690	18.56	18.56
695	18.62	18.61
700	18.67	18.67
705	18.7	18.74
710	18.74	18.79
715	18.81	18.86
720	18.89	18.95
725	19.09	19.09
730	19.22	19.26
735	19.17	19.23



740	19.19	19.14
745	19.14	19.1
750	19.13	19.09
755	19.17	19.1
760	19.19	19.15
765	19.24	19.21
770	19.34	19.29
775	19.37	19.36
780	19.36	19.36
785	19.43	19.41
790	19.51	19.48
795	19.59	19.56
800	19.7	19.66
805	19.83	19.79
810	19.98	19.95
815	20.07	20.04
820	20.1	19.96
825	20.11	19.92
830	20.09	19.94
835	20.09	19.96
840	20.14	20.05
845	20.19	20.11
850	20.27	20.2
855	20.36	20.29
860	20.42	20.37
865	20.46	20.44
870	20.5	20.51
875	20.52	20.55
880	20.59	20.61
885	20.7	20.69
890	20.82	20.77
895	20.89	20.83
900	20.88	20.92
905	20.83	21.08
910	20.93	21.21
915	21.19	21.17
920	21.22	21.1
925	21.09	21.03
930	20.98	21
935	20.95	21
940	20.96	21.01
945	21	21.04
950	21.05	21.06
955	21.09	21.07
960	21.15	21.13
965	21.23	21.2
970	21.27	21.26
975	21.31	21.3
980	21.36	21.37
985	21.43	21.44
990	21.52	21.53
995	21.63	21.64
1000	21.73	21.73

### 3.2.2.2 Antenna HF907

Frequency (GHz)	Antenna factor HF907 (SN 102508)	Antenna factor HF907 (SN 102494)
1	24.36	24.36
1.01	24.34	24.38
1.02	24.53	24.55
1.03	24.6	24.63
1.04	24.46	24.51
1.05	24.35	24.41
1.06	24.48	24.49
1.07	24.51	24.56
1.08	24.32	24.37
1.09	24.26	24.29
1.1	24.33	24.35
1.11	24.38	24.44
1.12	24.23	24.25
1.13	24.18	24.19
1.14	24.23	24.24
1.15	24.35	24.38
1.16	24.3	24.3
1.17	24.23	24.26
1.18	24.37	24.4
1.19	24.56	24.57
1.2	24.52	24.55
1.21	24.39	24.42
1.22	24.51	24.52
1.23	24.66	24.7
1.24	24.64	24.68
1.25	24.51	24.54
1.26	24.53	24.55
1.27	24.69	24.72
1.28	24.65	24.65
1.29	24.46	24.47
1.3	24.48	24.52
1.31	24.66	24.68
1.32	24.64	24.65
1.33	24.49	24.5
1.34	24.53	24.53
1.35	24.75	24.75
1.36	24.73	24.76
1.37	24.62	24.65
1.38	24.74	24.76
1.39	24.96	24.99
1.4	25.02	25.05
1.41	24.94	24.95
1.42	25.02	25.03
1.43	25.31	25.37
1.44	25.39	25.43
1.45	25.27	25.29
1.46	25.37	25.42
1.47	25.7	25.7
1.48	25.77	25.76
1.49	25.66	25.67
1.5	25.76	25.77

1.51	26.04	26.03
1.52	26.12	26.12
1.53	26.01	26.03
1.54	26.06	26.03
1.55	26.29	26.29
1.56	26.35	26.36
1.57	26.25	26.25
1.58	26.27	26.27
1.59	26.41	26.45
1.6	26.51	26.5
1.61	26.37	26.36
1.62	26.33	26.33
1.63	26.48	26.52
1.64	26.58	26.57
1.65	26.42	26.44
1.66	26.35	26.37
1.67	26.51	26.53
1.68	26.64	26.59
1.69	26.46	26.47
1.7	26.36	26.34
1.71	26.52	26.5
1.72	26.7	26.7
1.73	26.54	26.53
1.74	26.4	26.38
1.75	26.62	26.64
1.76	26.85	26.83
1.77	26.72	26.73
1.78	26.59	26.57
1.79	26.75	26.8
1.8	27.08	27.07
1.81	26.92	26.92
1.82	26.77	26.76
1.83	27	27
1.84	27.26	27.23
1.85	27.09	27.06
1.86	26.92	26.88
1.87	27.17	27.14
1.88	27.4	27.35
1.89	27.27	27.22
1.9	27.14	27.12
1.91	27.43	27.38
1.92	27.72	27.71
1.93	27.59	27.56
1.94	27.55	27.52
1.95	27.9	27.9
1.96	28.25	28.24
1.97	28.13	28.1
1.98	28.06	28.04
1.99	28.43	28.44
2	28.67	28.63
2.01	28.5	28.45
2.02	28.37	28.39
2.03	28.67	28.63
2.04	28.76	28.76
2.05	28.48	28.46
2.06	28.37	28.36
2.07	28.49	28.48



2.08	28.52	28.51
2.09	28.31	28.29
2.1	28.16	28.14
2.11	28.24	28.23
2.12	28.28	28.27
2.13	28.15	28.13
2.14	28.01	28
2.15	28.1	28.09
2.16	28.22	28.21
2.17	28.14	28.1
2.18	28.02	28
2.19	28.11	28.08
2.2	28.29	28.28
2.21	28.24	28.21
2.22	28.11	28.08
2.23	28.21	28.18
2.24	28.37	28.36
2.25	28.31	28.28
2.26	28.16	28.13
2.27	28.21	28.19
2.28	28.4	28.38
2.29	28.37	28.35
2.3	28.21	28.19
2.31	28.28	28.25
2.32	28.46	28.43
2.33	28.47	28.44
2.34	28.35	28.33
2.35	28.41	28.38
2.36	28.56	28.54
2.37	28.62	28.59
2.38	28.54	28.49
2.39	28.56	28.55
2.4	28.73	28.71
2.41	28.77	28.74
2.42	28.72	28.69
2.43	28.74	28.72
2.44	28.86	28.85
2.45	28.9	28.89
2.46	28.86	28.84
2.47	28.89	28.88
2.48	29.02	29.01
2.49	29.08	29.07
2.5	29.05	29.03
2.51	29.1	29.09
2.52	29.3	29.29
2.53	29.39	29.39
2.54	29.38	29.35
2.55	29.39	29.38
2.56	29.58	29.57
2.57	29.74	29.73
2.58	29.65	29.62
2.59	29.54	29.52
2.6	29.71	29.68
2.61	29.9	29.87
2.62	29.71	29.68
2.63	29.53	29.5
2.64	29.67	29.65

2.65	29.87	29.84
2.66	29.72	29.66
2.67	29.5	29.48
2.68	29.6	29.58
2.69	29.82	29.79
2.7	29.71	29.69
2.71	29.51	29.48
2.72	29.59	29.55
2.73	29.77	29.76
2.74	29.72	29.68
2.75	29.56	29.51
2.76	29.59	29.56
2.77	29.74	29.71
2.78	29.69	29.63
2.79	29.53	29.48
2.8	29.54	29.51
2.81	29.65	29.61
2.82	29.6	29.55
2.83	29.44	29.42
2.84	29.49	29.47
2.85	29.63	29.6
2.86	29.6	29.56
2.87	29.49	29.47
2.88	29.59	29.57
2.89	29.79	29.78
2.9	29.79	29.77
2.91	29.73	29.71
2.92	29.88	29.86
2.93	30.1	30.09
2.94	30.16	30.14
2.95	30.08	30.06
2.96	30.23	30.21
2.97	30.54	30.52
2.98	30.57	30.55
2.99	30.46	30.43
3	30.58	30.56
3.05	31.17	31.18
3.1	31.68	31.64
3.15	31.58	31.55
3.2	31.75	31.72
3.25	31.89	31.85
3.3	31.71	31.68
3.35	31.64	31.6
3.4	31.7	31.67
3.45	31.84	31.83
3.5	31.95	31.91
3.55	32.01	31.96
3.6	32.09	32.07
3.65	32.32	32.29
3.7	32.52	32.48
3.75	32.62	32.57
3.8	32.85	32.8
3.85	32.93	32.89
3.9	32.94	32.91
3.95	33.02	32.98
4	32.97	32.91
4.05	33.07	33.01

4.1	33.21	33.17
4.15	33.33	33.31
4.2	33.48	33.43
4.25	33.71	33.66
4.3	33.87	33.83
4.35	34.02	33.99
4.4	33.83	33.82
4.45	33.57	33.53
4.5	33.61	33.58
4.55	33.61	33.59
4.6	33.51	33.49
4.65	33.44	33.39
4.7	33.6	33.58
4.75	33.93	33.92
4.8	34.06	34.05
4.85	34.13	34.13
4.9	34.27	34.25
4.95	34.38	34.36
5	34.38	34.34
5.05	34.19	34.17
5.1	33.99	33.97
5.15	33.93	33.93
5.2	33.97	33.96
5.25	33.92	33.91
5.3	33.93	33.93
5.35	34.17	34.18
5.4	34.37	34.38
5.45	34.43	34.44
5.5	34.38	34.38
5.55	34.42	34.42
5.6	34.45	34.45
5.65	34.28	34.28
5.7	34.05	34.04
5.75	34.04	34.05
5.8	34.2	34.2
5.85	34.31	34.31
5.9	34.35	34.35
5.95	34.47	34.49
6	34.69	34.7
6.05	34.87	34.86
6.1	34.82	34.82
6.15	34.75	34.75
6.2	34.78	34.79
6.25	34.77	34.79
6.3	34.68	34.69
6.35	34.66	34.68
6.4	34.84	34.87
6.45	35.03	35.07
6.5	35.13	35.14
6.55	35.13	35.13
6.6	35.26	35.26
6.65	35.36	35.36
6.7	35.29	35.29
6.75	35.17	35.16
6.8	35.16	35.15
6.85	35.26	35.28
6.9	35.37	35.38



6.95	35.35	35.36
7	35.44	35.45
7.05	35.59	35.61
7.1	35.74	35.76
7.15	35.73	35.74
7.2	35.61	35.63
7.25	35.65	35.66
7.3	35.65	35.67
7.35	35.64	35.64
7.4	35.63	35.64
7.45	35.71	35.74
7.5	35.89	35.9
7.55	35.99	36.01
7.6	36.09	36.1
7.65	36.18	36.21
7.7	36.23	36.25
7.75	36.26	36.29
7.8	36.21	36.22
7.85	36.2	36.2
7.9	36.14	36.16
7.95	36.16	36.17
8	36.14	36.15
8.05	36.19	36.19
8.1	36.3	36.32
8.15	36.46	36.47
8.2	36.5	36.5
8.25	36.51	36.53
8.3	36.51	36.5
8.35	36.48	36.48
8.4	36.46	36.45
8.45	36.4	36.39
8.5	36.41	36.4
8.55	36.45	36.45
8.6	36.56	36.58
8.65	36.7	36.71
8.7	36.71	36.7
8.75	36.79	36.83
8.8	36.85	36.88
8.85	36.88	36.85
8.9	36.79	36.75
8.95	36.79	36.81
9	36.87	36.84
9.05	36.82	36.75
9.1	36.85	36.81
9.15	36.9	36.88
9.2	36.89	36.9
9.25	36.92	36.91
9.3	36.97	36.97
9.35	37.07	37.07
9.4	37.11	37.11
9.45	37.14	37.16
9.5	37.2	37.19
9.55	37.1	37.08
9.6	37.06	37.03
9.65	37.04	37.05
9.7	36.96	36.97
9.75	36.93	36.93

9.8	37	37
9.85	37.15	37.16
9.9	37.23	37.24
9.95	37.25	37.22
10	37.31	37.3
10.05	37.31	37.3
10.1	37.23	37.2
10.15	37.15	37.13
10.2	37.11	37.13
10.25	37.11	37.15
10.3	37.11	37.13
10.35	37.15	37.19
10.4	37.21	37.24
10.45	37.25	37.27
10.5	37.27	37.28
10.55	37.24	37.24
10.6	37.18	37.18
10.65	37.17	37.19
10.7	37.19	37.19
10.75	37.16	37.17
10.8	37.16	37.18
10.85	37.26	37.26
10.9	37.32	37.32
10.95	37.33	37.32
11	37.36	37.35
11.05	37.34	37.33
11.1	37.34	37.36
11.15	37.35	37.34
11.2	37.34	37.33
11.25	37.29	37.29
11.3	37.28	37.29
11.35	37.34	37.31
11.4	37.31	37.3
11.45	37.32	37.33
11.5	37.38	37.39
11.55	37.41	37.42
11.6	37.44	37.43
11.65	37.44	37.42
11.7	37.43	37.42
11.75	37.48	37.48
11.8	37.39	37.38
11.85	37.4	37.38
11.9	37.45	37.39
11.95	37.45	37.43
12	37.48	37.47
12.05	37.51	37.5
12.1	37.54	37.51
12.15	37.58	37.58
12.2	37.59	37.6
12.25	37.62	37.6
12.3	37.62	37.6
12.35	37.61	37.62
12.4	37.61	37.65
12.45	37.65	37.63
12.5	37.67	37.66
12.55	37.71	37.71
12.6	37.8	37.76



12.65	37.86	37.82
12.7	37.89	37.86
12.75	37.92	37.9
12.8	38	37.98
12.85	38.05	38.02
12.9	38.06	38.02
12.95	38.09	38.05
13	38.14	38.1
13.05	38.21	38.19
13.1	38.29	38.24
13.15	38.36	38.35
13.2	38.44	38.47
13.25	38.57	38.55
13.3	38.63	38.59
13.35	38.68	38.67
13.4	38.77	38.73
13.45	38.84	38.77
13.5	38.9	38.8
13.55	38.92	38.88
13.6	39.03	39
13.65	39.15	39.11
13.7	39.3	39.23
13.75	39.42	39.33
13.8	39.53	39.49
13.85	39.66	39.59
13.9	39.74	39.65
13.95	39.81	39.7
14	39.89	39.83
14.05	39.96	39.92
14.1	40.02	39.96
14.15	40.08	40.04
14.2	40.16	40.11
14.25	40.25	40.18
14.3	40.33	40.27
14.35	40.37	40.28
14.4	40.44	40.32
14.45	40.5	40.4
14.5	40.62	40.56
14.55	40.7	40.61
14.6	40.77	40.64
14.65	40.83	40.71
14.7	40.86	40.77
14.75	40.83	40.72
14.8	40.79	40.65
14.85	40.76	40.65
14.9	40.84	40.76
14.95	40.87	40.77
15	40.89	40.79
15.05	40.95	40.85
15.1	41.03	40.94
15.15	41.08	40.96
15.2	41.02	40.93
15.25	40.99	40.88
15.3	41.01	40.91
15.35	41.04	40.88
15.4	41.08	40.92
15.45	41.12	40.96

15.5	41.15	40.97
15.55	41.18	41
15.6	41.14	41.01
15.65	41.05	40.99
15.7	40.99	40.95
15.75	40.99	40.92
15.8	41.03	41
15.85	41.14	41.11
15.9	41.18	41.15
15.95	41.27	41.22
16	41.34	41.33
16.05	41.4	41.36
16.1	41.39	41.34
16.15	41.33	41.32
16.2	41.31	41.31
16.25	41.4	41.37
16.3	41.47	41.43
16.35	41.53	41.52
16.4	41.66	41.66
16.45	41.77	41.75
16.5	41.82	41.77
16.55	41.84	41.87
16.6	41.83	41.95
16.65	41.85	41.94
16.7	41.91	42
16.75	42.09	42.2
16.8	42.23	42.35
16.85	42.36	42.39
16.9	42.5	42.49
16.95	42.61	42.59
17	42.63	42.6
17.05	42.63	42.57
17.1	42.64	42.54
17.15	42.76	42.58
17.2	42.82	42.63
17.25	42.86	42.75
17.3	43.02	42.9
17.35	43.15	42.98
17.4	43.28	43.1
17.45	43.3	43.17
17.5	43.32	43.16
17.55	43.37	43.19
17.6	43.39	43.23
17.65	43.5	43.35
17.7	43.52	43.41
17.75	43.62	43.49
17.8	43.74	43.6
17.85	43.89	43.69
17.9	43.92	43.81
17.95	44.02	43.89
18	44.18	43.98

#### 4 CONVERSION FACTORS AND ALL OTHER FORMULAS

Unit	Conversion unit	Formula of conversion
$\text{dB}\mu\text{V}$	$\text{dB}\mu\text{V}/\text{m}$	$\text{dB}\mu\text{V}/\text{m} = \text{dB}\mu\text{V} + \text{AF}$
$\mu\text{V}/\text{m}$	$\text{dB}\mu\text{V}/\text{m}$	$\text{dB}\mu\text{V}/\text{m} = 20\log(X(\mu\text{V}/\text{m})/1\mu\text{V})$

	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  $\Omega$ . 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		Sample	
	yes	no	pass	not pass
47 CFR Part 15, Subpart C ANSI C63.10-2013;	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Test	47 CFR Part 15 section	Section within the report	Conclusion
Conducted emission	15.207	7.1	PASS
Radiated emission	15.209	7.2	PASS
Bandwidth of the emission	15.215	7.3	PASS
Spectrum mask	15.225	7.4	PASS
Frequency tolerance of the carrier signal	15.225	7.5	PASS

### 6.1 Operating voltages/frequencies used for testing

Section	Test	Operating conditions
7.1	Conducted emission	120 V; 60 Hz
7.2	Radiated emission	120 V; 60 Hz
7.3.	Bandwidth of the emission	120 V; 60 Hz
7.4	Spectrum mask	120 V; 60 Hz
7.5	Frequency tolerance of the carrier signal	120 V; 60 Hz

## 7 EMISSION TESTS

### 7.1 Conducted emission measurement (15.207)

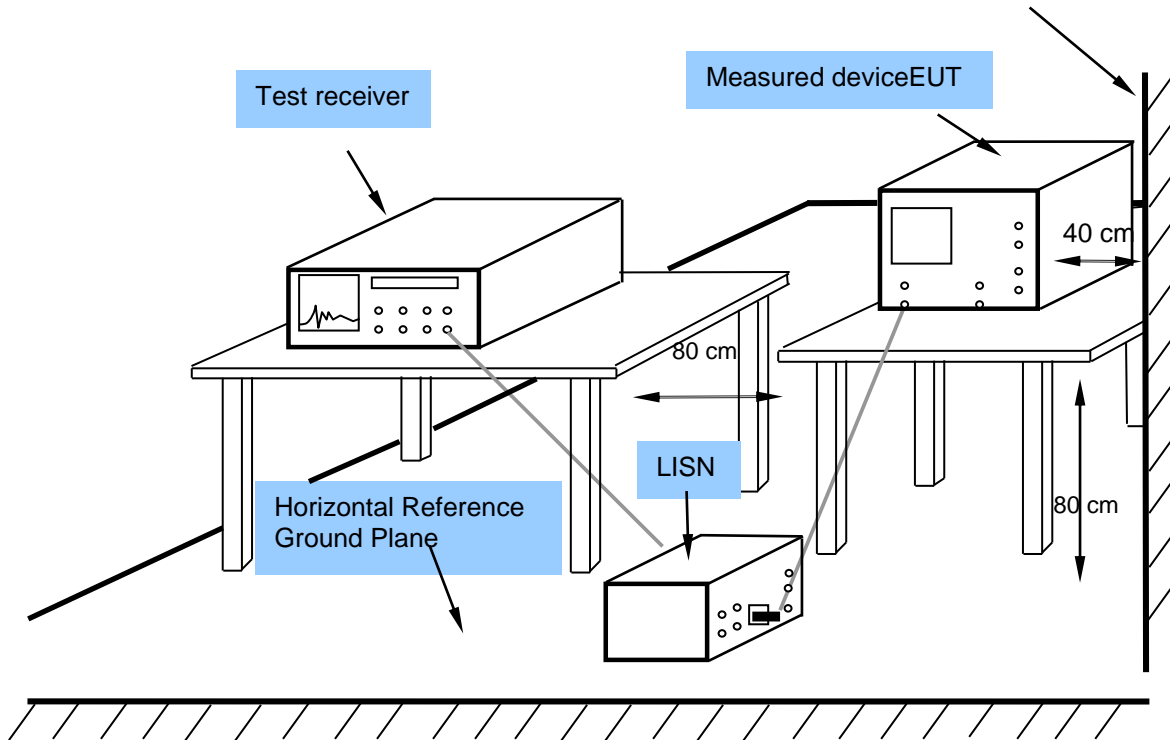
#### 7.1.1 Test instruments

Description	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
Rohde-Schwarz, RFI receiver	ESU26	100428	2016-02	2018-02	24 months	X
Rohde & Schwarz, Artificial main network	ESH2-Z5	100406	2017-06	2019-06	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  $\mu$ H + 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 results

Device passed the requirements stated in FCC part 15, Subpart C, Section 15.207

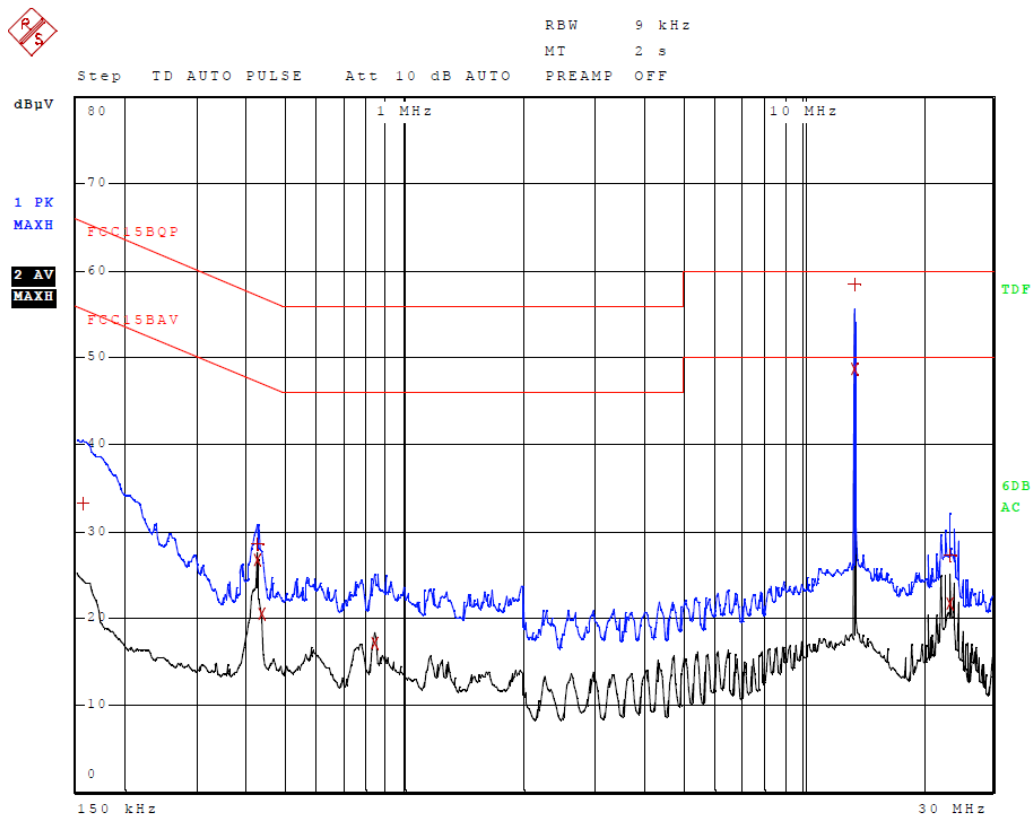
**C20163039**

Meas Type CONDUCTED EMISSION  
 Equipment under Test WBC  
 Manufacturer METRA INZENIRING d.o.o.  
 OP Condition Uin: 120V, 60Hz, WAITING  
 Operator ANDREJ SKOF  
 Test Spec  
 PHASE

#### Time Domain Scan (1 Range)

Scan Start: 150 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK Trace 2: Average  
 Transducer: ESH2-Z5

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	5 ms	Auto	0 dB	INPUT2





**C20163039**

Meas Type CONDUCTED EMISSION  
Equipment under Test WBC  
Manufacturer METRA INZENIRING d.o.o.  
OP Condition Uin: 120V, 60Hz, WAITING  
Operator ANDREJ SKOF  
Test Spec  
PHASE

**Final Measurement**

Meas Time: 2 s  
Margin: 28 dB  
Subranges: 9

Trace	Frequency	Level (dB $\mu$ V)	Detector	Delta Limit/dB
2	13.560000000 MHz	48.73	CISPR Averag	-1.27
1	13.560000000 MHz	58.43	Quasi Peak	-1.57
2	424.500000000 kHz	26.65	CISPR Averag	-20.71
2	433.500000000 kHz	20.38	CISPR Averag	-26.81
2	23.496000000 MHz	21.68	CISPR Averag	-28.32
2	840.750000000 kHz	17.13	CISPR Averag	-28.87
1	424.500000000 kHz	28.47	Quasi Peak	-28.89
1	154.500000000 kHz	33.27	Quasi Peak	-32.49
1	23.498250000 MHz	27.11	Quasi Peak	-32.89



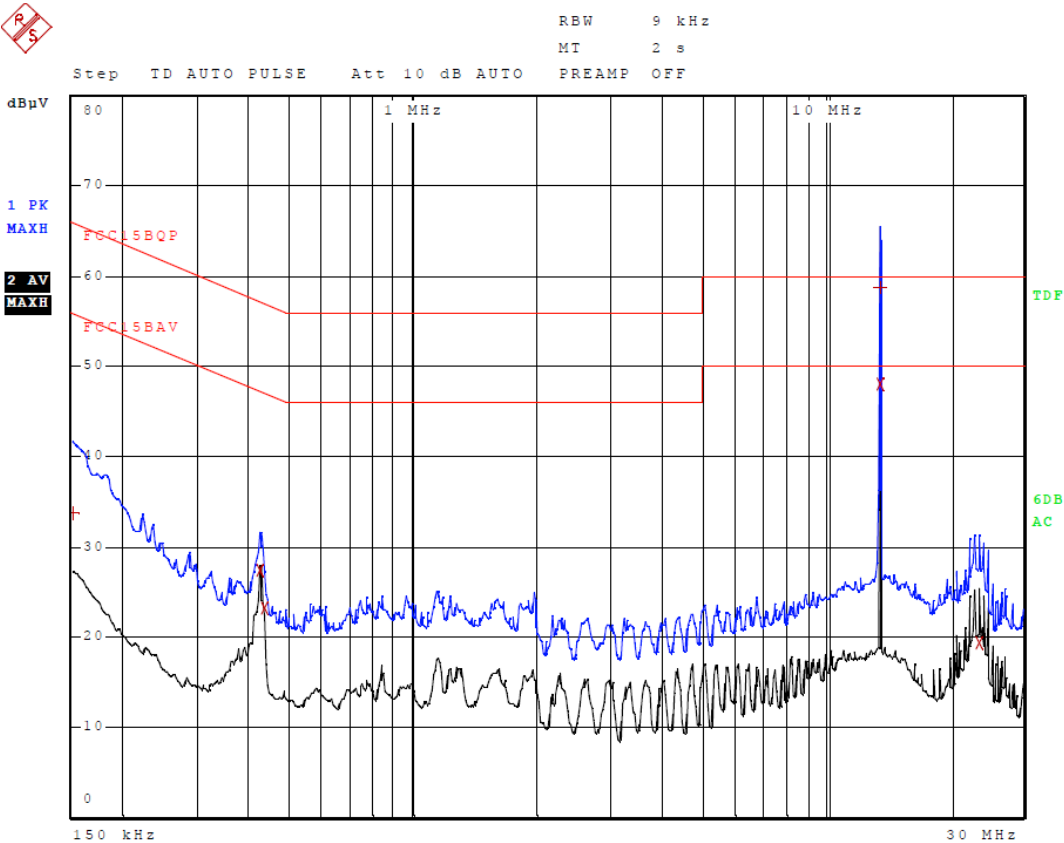
**C20163039**

Meas Type                    CONDUCTED EMISSION  
Equipment under Test      WBC  
Manufacturer               METRA INZENIRING d.o.o.  
OP Condition               Uin: 120V, 60Hz, WAITING  
Operator                    ANDREJ SKOF  
Test Spec  
NEUTRAL

**Time Domain Scan (1 Range)**

Scan Start:            150 kHz  
Scan Stop:            30 MHz  
Detector:              Trace 1: MAX PEAK    Trace 2: Average  
Transducer:            ESH2-Z5

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	5 ms	Auto	0 dB	INPUT2



**C20163039**

Meas Type CONDUCTED EMISSION  
Equipment under Test WBC  
Manufacturer METRA INZENIRING d.o.o.  
OP Condition Uin: 120V, 60Hz, WAITING  
Operator ANDREJ SKOF  
Test Spec  
NEUTRAL

**Final Measurement**

Meas Time: 2 s  
Margin: 25 dB  
Subranges: 6

Trace	Frequency	Level (dB $\mu$ V)	Detector	Delta Limit/dB
1	13.560000000 MHz	58.67	Quasi Peak	-1.33
2	13.560000000 MHz	47.97	CISPR Averag	-2.03
2	424.500000000 kHz	27.24	CISPR Averag	-20.12
2	435.750000000 kHz	23.09	CISPR Averag	-24.05
2	23.487000000 MHz	19.18	CISPR Averag	-30.82
1	150.000000000 kHz	33.62	Quasi Peak	-32.38

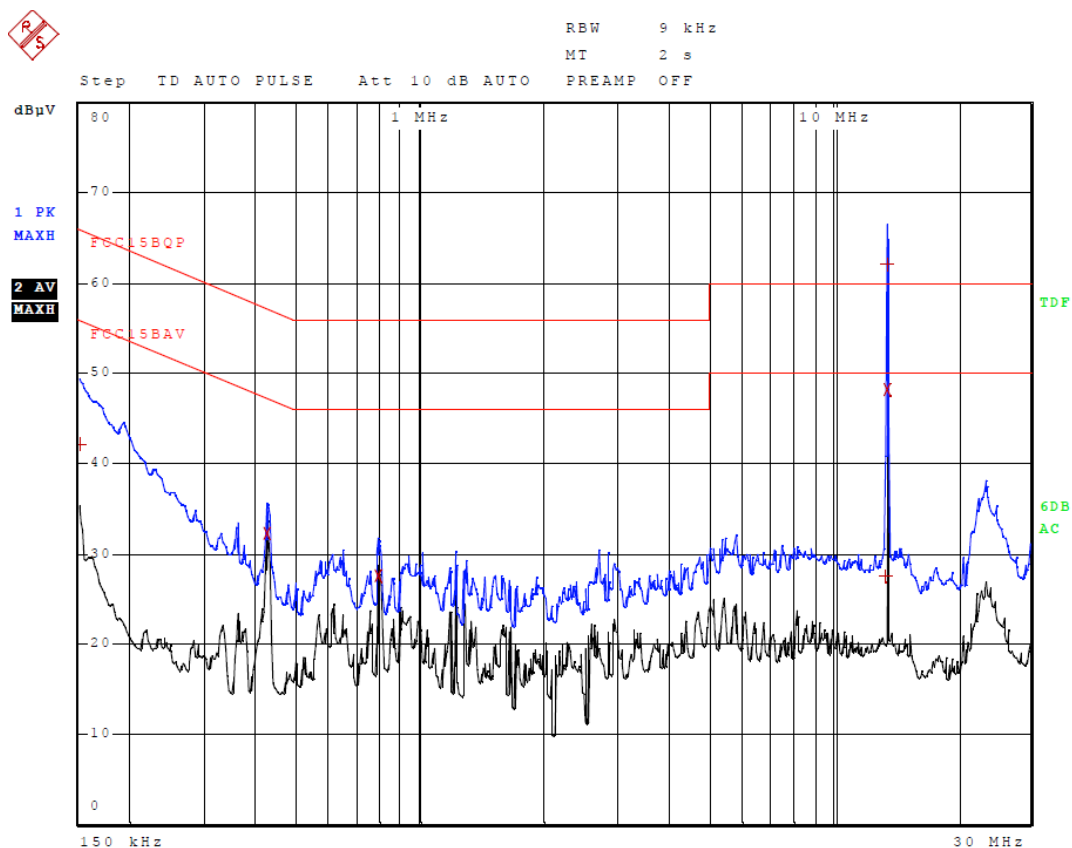
**C20163039**

**Meas Type** CONDUCTED EMISSION  
**Equipment under Test** WBC  
**Manufacturer** METRA INZENIRING d.o.o.  
**OP Condition** Uin: 120V, 60Hz, READING  
**Operator** ANDREJ SKOF  
**Test Spec**  
 NEUTRAL

**Time Domain Scan (1 Range)**

Scan Start: 150 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK Trace 2: Average  
 Transducer: ESH2-Z5

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	5 ms	Auto	0 dB	INPUT2



**C20163039**

Meas Type CONDUCTED EMISSION  
Equipment under Test WBC  
Manufacturer METRA INZENIRING d.o.o.  
OP Condition Uin: 120V, 60Hz, READING  
Operator ANDREJ SKOF  
Test Spec  
NEUTRAL

**Final Measurement**

Meas Time: 2 s  
Margin: 18 dB  
Subranges: 6

Trace	Frequency	Level (dB $\mu$ V)	Detector	Delta Limit/dB
1	13.560000000 MHz	62.05	Quasi Peak	2.05
2	13.560000000 MHz	48.22	CISPR Averag	-1.78
2	424.500000000 kHz	32.15	CISPR Averag	-15.21
2	791.250000000 kHz	27.41	CISPR Averag	-18.59
1	150.000000000 kHz	42.15	Quasi Peak	-23.85
1	13.481250000 MHz	27.53	Quasi Peak	-32.47

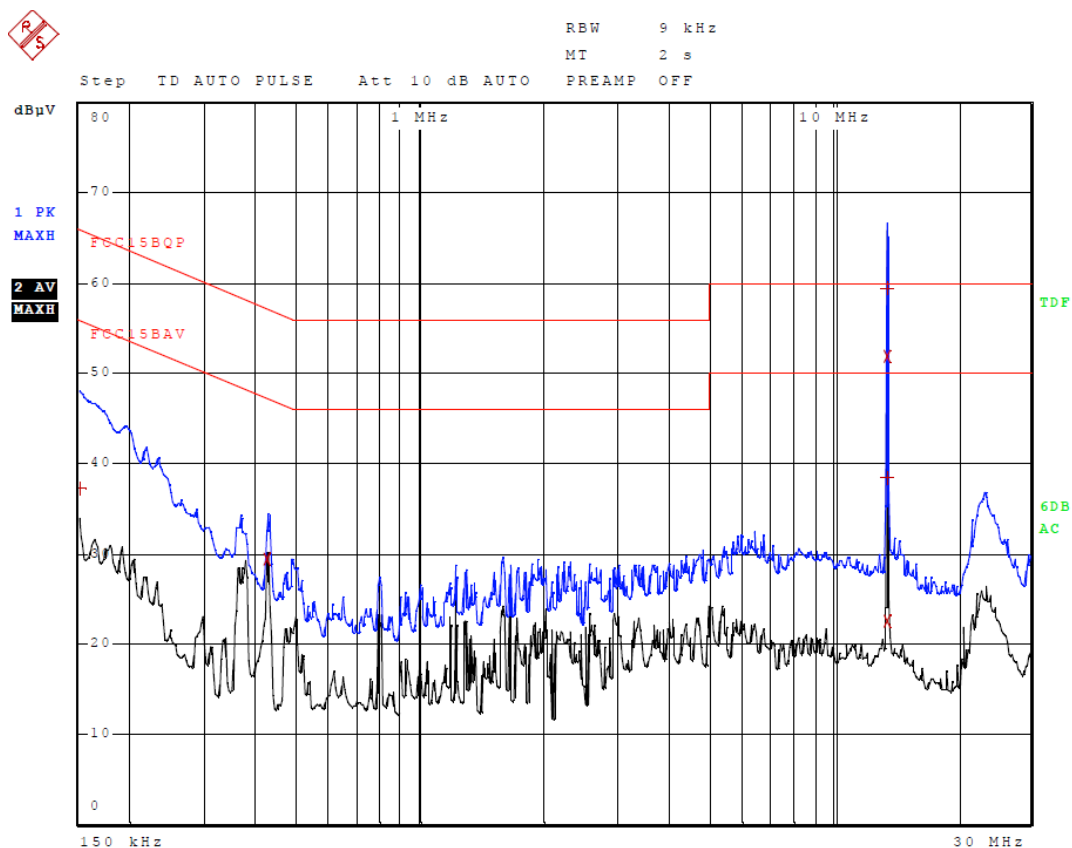
**C20163039**

Meas Type CONDUCTED EMISSION  
Equipment under Test WBC  
Manufacturer METRA INZENIRING d.o.o.  
OP Condition Uin: 120V, 60Hz, READING  
Operator ANDREJ SKOF  
Test Spec  
NEUTRAL

**Time Domain Scan (1 Range)**

Scan Start: 150 kHz  
Scan Stop: 30 MHz  
Detector: Trace 1: MAX PEAK Trace 2: Average  
Transducer: ESH2-Z5

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	5 ms	Auto	0 dB	INPUT2



**C20163039**

Meas Type CONDUCTED EMISSION  
Equipment under Test WBC  
Manufacturer METRA INZENIRING d.o.o.  
OP Condition Uin: 120V, 60Hz, READING  
Operator ANDREJ SKOF  
Test Spec  
NEUTRAL

**Final Measurement**

Meas Time: 2 s  
Margin: 20 dB  
Subranges: 6

Trace	Frequency	Level (dB $\mu$ V)	Detector	Delta Limit/dB
2	13.560000000 MHz	51.89	CISPR Averag	1.89
1	13.560000000 MHz	59.40	Quasi Peak	-0.60
2	424.500000000 kHz	29.30	CISPR Averag	-18.06
1	13.548750000 MHz	38.35	Quasi Peak	-21.65
2	13.548750000 MHz	22.45	CISPR Averag	-27.55
1	150.000000000 kHz	37.19	Quasi Peak	-28.81

**C20163039**

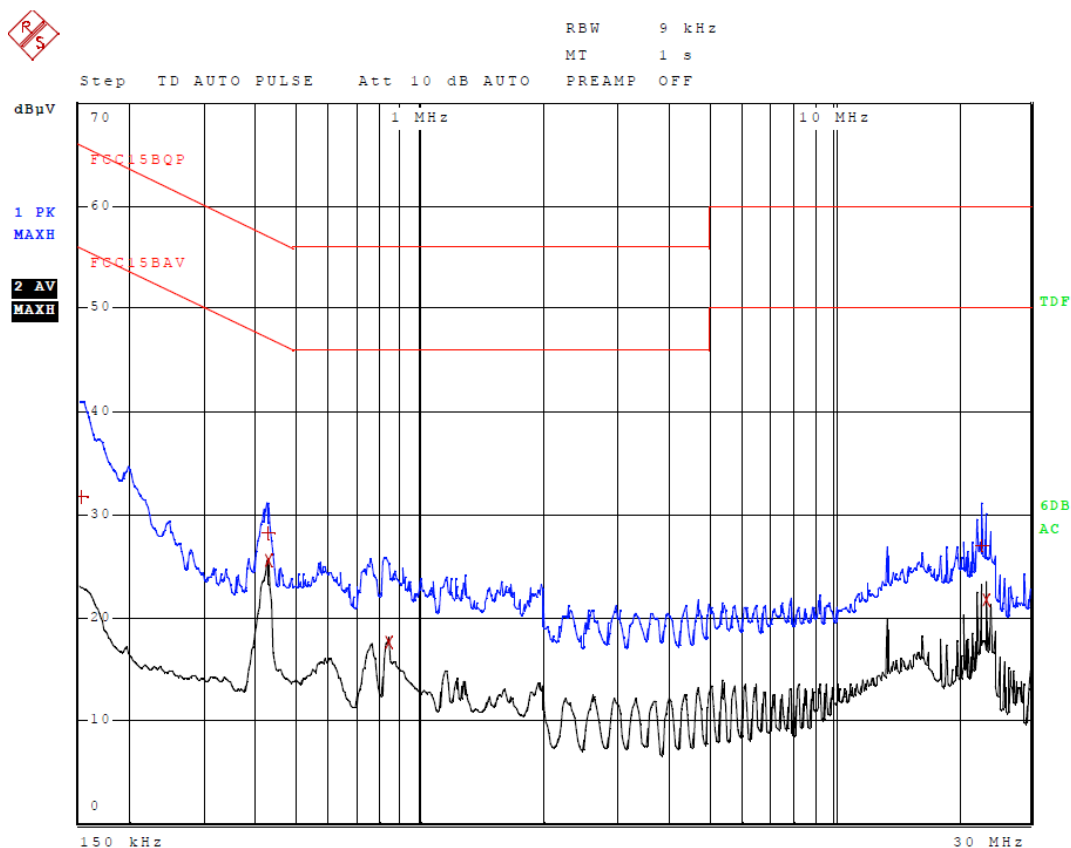
02.Mar 17 13:42

**Meas Type** CONDUCTED EMISSION  
**Equipment under Test** WBC  
**Manufacturer** METRA INZENIRING D.O.O  
**OP Condition** Uin: 120 V, 60 Hz; WITH DUMMY LOAD  
**Operator** ANDREJ SKOF  
**Test Spec**  
 PHASE

**Time Domain Scan (1 Range)**

Scan Start: 150 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK Trace 2: Average  
 Transducer: ESH2-Z5

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	0 dB	INPUT2





**C20163039**

02.Mar 17 13:42

Meas Type CONDUCTED EMISSION  
Equipment under Test WBC  
Manufacturer METRA INZENIRING D.O.O  
OP Condition Uin: 120 V, 60 Hz; WITH DUMMY LOAD  
Operator ANDREJ SKOF  
Test Spec  
PHASE

**Final Measurement**

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

Trace	Frequency	Level (dBμV)	Detector	Delta Limit/dB
2	426.750000000 kHz	25.58	CISPR Averag	-21.73
2	23.525250000 MHz	21.73	CISPR Averag	-28.27
2	838.500000000 kHz	17.57	CISPR Averag	-28.43
1	426.750000000 kHz	28.20	Quasi Peak	-29.11
1	22.915500000 MHz	27.05	Quasi Peak	-32.95
1	152.250000000 kHz	31.73	Quasi Peak	-34.15

**C20163039**

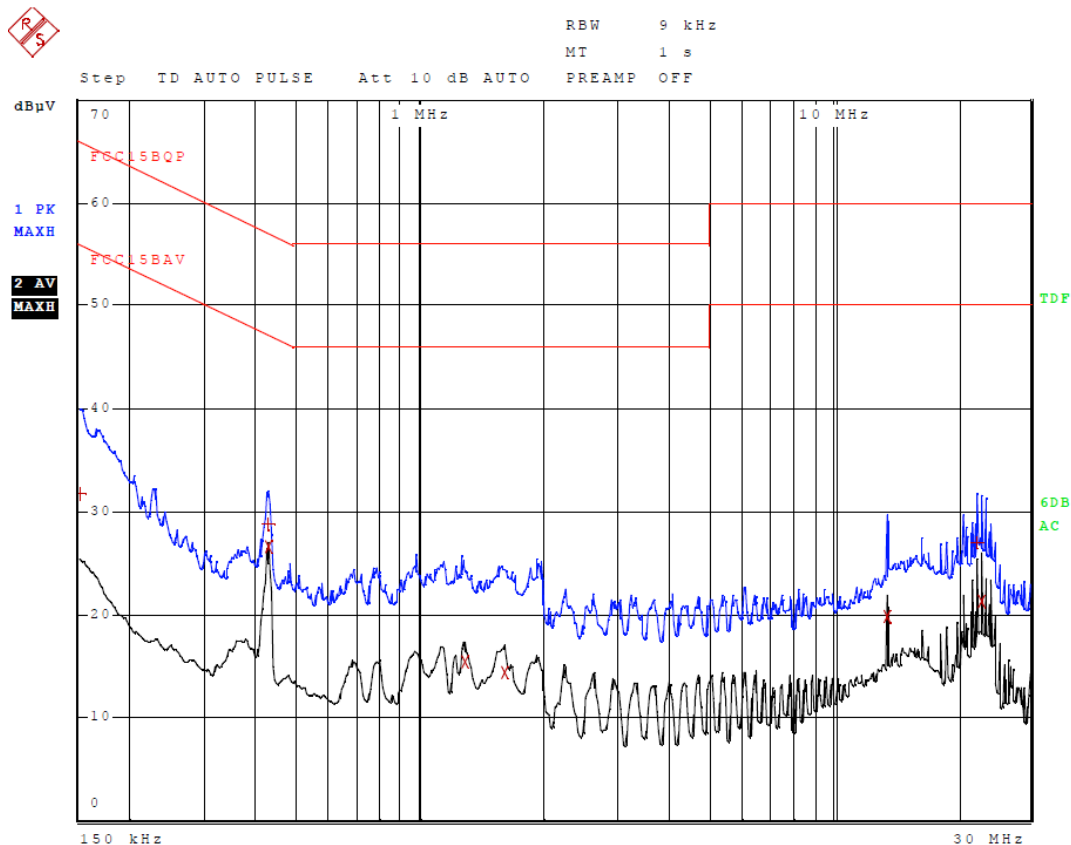
02.Mar 17 13:39

**Meas Type** CONDUCTED EMISSION  
**Equipment under Test** WBC  
**Manufacturer** METRA INZENIRING D.O.O  
**OP Condition** Uin: 120 V, 60 Hz; WITH DUMMY LOAD  
**Operator** ANDREJ SKOF  
**Test Spec**  
 NEUTRAL

**Time Domain Scan (1 Range)**

Scan Start: 150 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK Trace 2: Average  
 Transducer: ESH2-Z5

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	0 dB	INPUT2



**C20163039**

02.Mar 17 13:39

Meas Type CONDUCTED EMISSION  
Equipment under Test WBC  
Manufacturer METRA INZENIRING D.O.O  
OP Condition Uin: 120 V, 60 Hz; WITH DUMMY LOAD  
Operator ANDREJ SKOF  
Test Spec  
NEUTRAL

**Final Measurement**

Meas Time: 1 s  
Margin: 30 dB  
Subranges: 8

Trace	Frequency	Level (dBμV)	Detector	Delta Limit/dB
2	426.750000000 kHz	26.58	CISPR Averag	-20.74
1	426.750000000 kHz	28.75	Quasi Peak	-28.56
2	22.908750000 MHz	21.27	CISPR Averag	-28.73
2	13.560000000 MHz	19.81	CISPR Averag	-30.19
2	1.279500000 MHz	15.34	CISPR Averag	-30.66
2	1.601250000 MHz	14.38	CISPR Averag	-31.62
1	22.328250000 MHz	26.98	Quasi Peak	-33.02
1	150.000000000 kHz	31.64	Quasi Peak	-34.36

## 7.2 Radiated emission measurement (15.209)

### 7.2.1 Test instruments

Description & Manufacturer	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
ETS, Anechoic chamber	3m	103949	2016-11	2017-11	12 months	X
Rohde-Schwarz, RFI receiver	ESU8	105187	2015-11	2017-11	24 months	
Rohde-Schwarz, RFI receiver	ESU26	100428	2018-02	2018-02	24 months	X
R&S, Antenna	HFH2-Z2	/	2015-09	2017-09	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

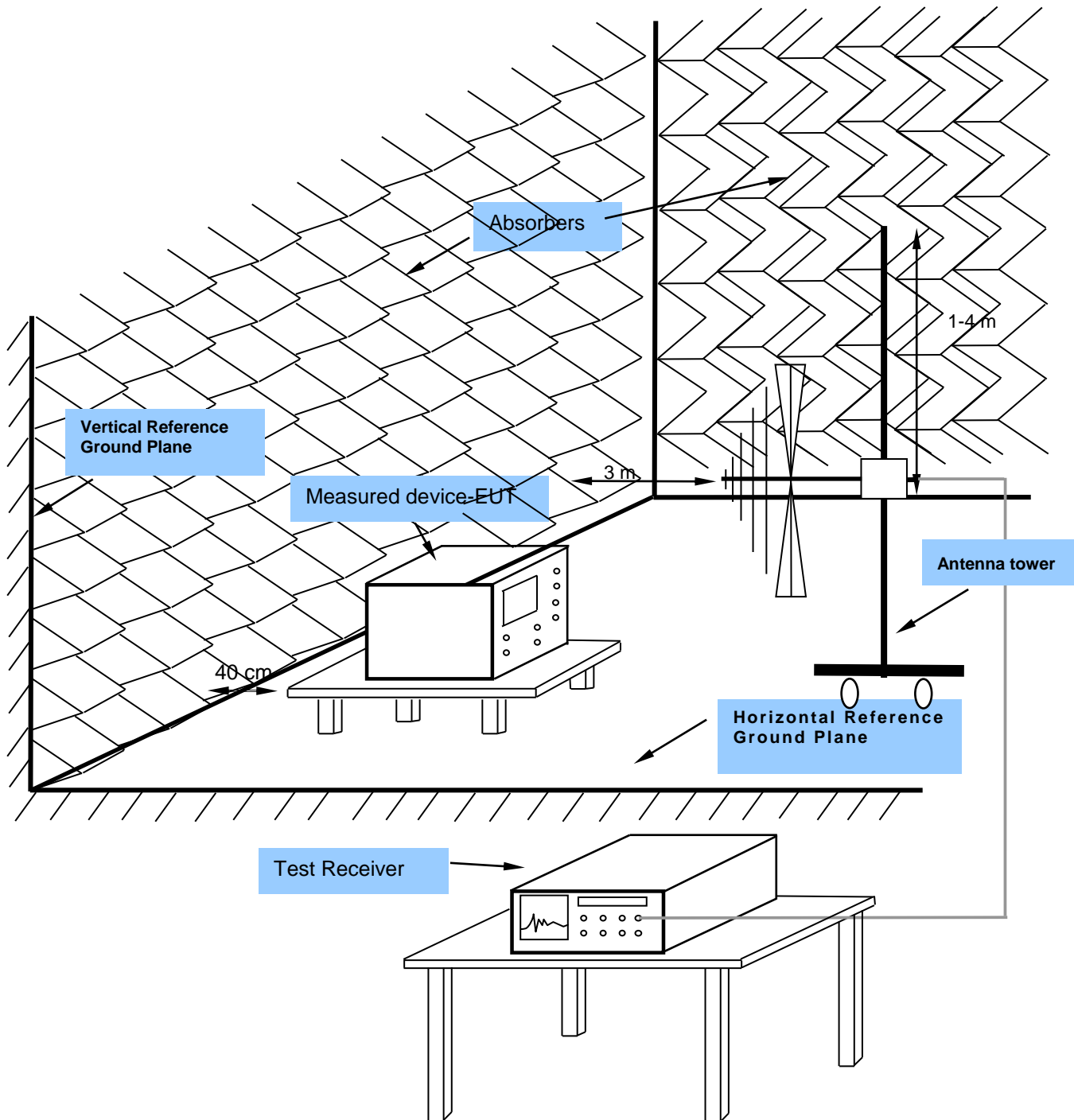
### 7.2.2 Test procedure for measurements from 9 kHz to 30 MHz

1. Radiated emission in the frequency range 9 kHz to 30 MHz are measured Active loop Antenna.
2. First preliminary measurements were performed in Semi-anechoic chamber at a distance of 3 m using active loop antenna.
3. The EUT was placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table and antenna was rotated 360 degrees to determine the position of the highest radiation.
4. Final measurements were done at a distance of 10 m at Open Area Test Site due to low emissions measured during preliminary measurements acc. to the clauses from Part 15, Sections 15.31(d) and 15.31(f)(2). Test results were extrapolated by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

### 7.2.3 Test procedure for measurements from 30 MHz to 1 GHz

5. 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.
6. The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of variable-height antenna tower.
7. 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.
8. 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.
9. The test-receiver system was set to PEAK and QUAS-PEAK Detect Function and Specified Bandwidth with Maximum Hold Mode.
10. The highest points would be re-tested one by one using the quasi-peak method.

## 7.2.4 Test setup



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

## 7.2.5 Test result

Device passed the requirements stated in FCC Part 15, Subpart C, Section 15.209



**ROHDE & SCHWARZ**

**C20163039**

16.Mar 17 10:12

Meas Type RADIATED EMISSION  
 Equipment under Test WBC; reader A4  
 Manufacturer METRA INZENIRING d.o.o.  
 OP Condition WAITING  
 Operator ANDREJ SKOF

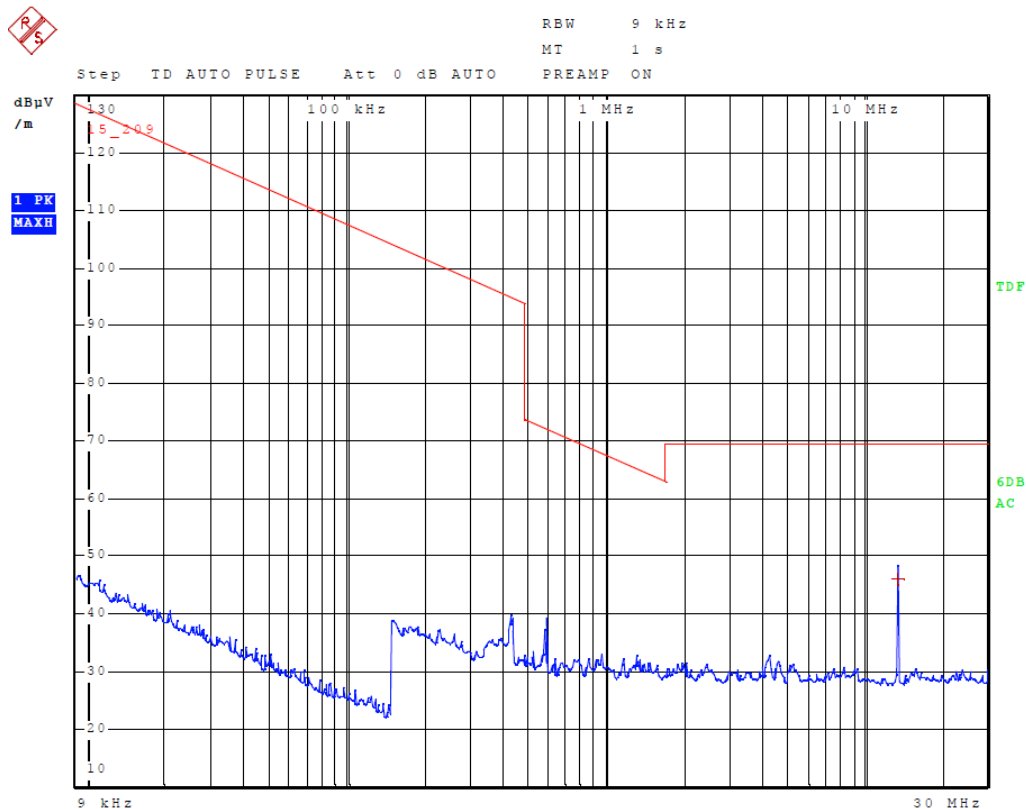
### Test Spec

Antenna: 305 deg, Sample: 65 deg

### Time Domain Scan (2 Ranges)

Scan Start: 9 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK  
 Transducer: HFH2-Z2V

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
9.000000 kHz	149.950000 kHz	50.00 Hz	200.00 Hz	300 ms	Auto	20 dB	INPUT2
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	20 dB	INPUT2



**ROHDE & SCHWARZ****C20163039**

16.Mar 17 10:12

Meas Type RADIATED EMISSION  
Equipment under Test WBC; reader A4  
Manufacturer METRA INZENIRING d.o.o.  
OP Condition WAITING  
Operator ANDREJ SKOF

**Test Spec**

Antenna: 305 deg, Sample: 65 deg

**Final Measurement**

Meas Time: 1 s  
Margin: 40 dB  
Peaks: 1

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	13.560000000 MHz	46.00	Quasi Peak	-23.50

**C20163039**

16.Mar 17 10:09

**Meas Type** RADIATED EMISSION  
**Equipment under Test** WBC; reader A4  
**Manufacturer** METRA INZENIRING d.o.o.  
**OP Condition** READING  
**Operator** ANDREJ SKOF

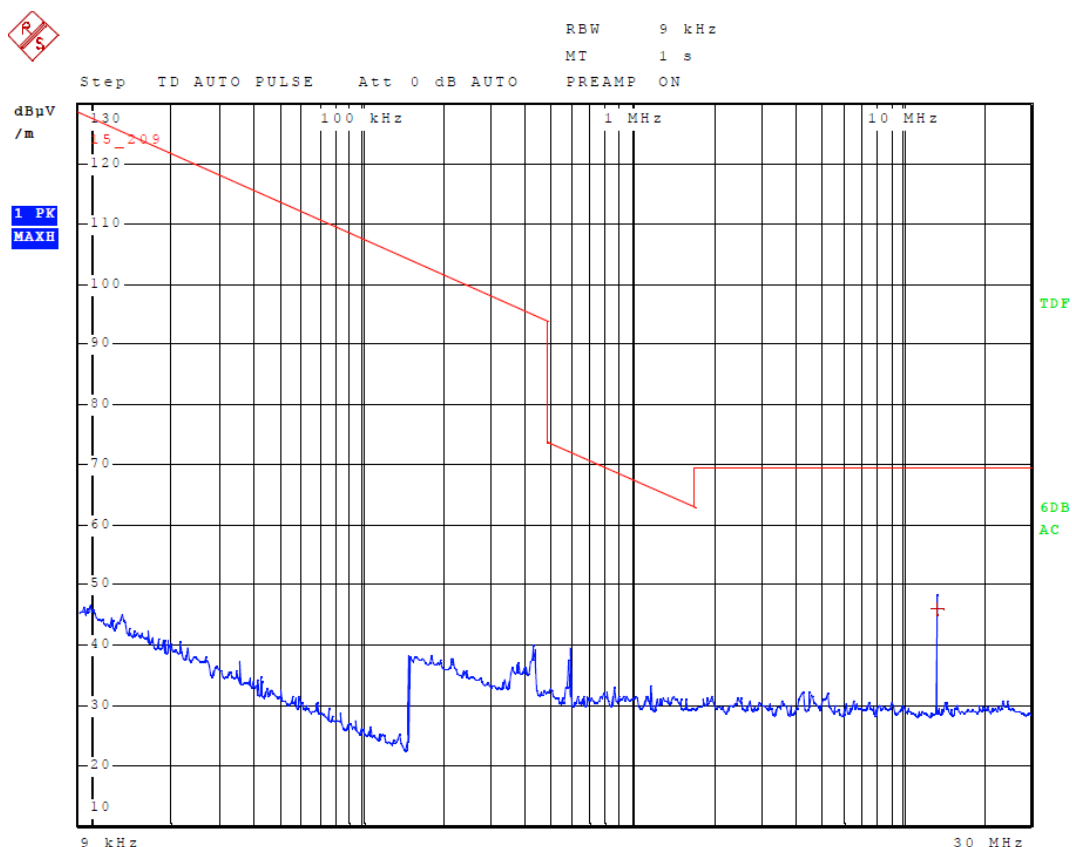
**Test Spec**

Antenna: 305 deg, Sample: 65 deg

**Time Domain Scan (2 Ranges)**

Scan Start: 9 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK  
 Transducer: HFH2-Z2V

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
9.000000 kHz	149.950000 kHz	50.00 Hz	200.00 Hz	300 ms	Auto	20 dB	INPUT2
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	20 dB	INPUT2





**ROHDE & SCHWARZ****C20163039**

16.Mar 17 10:09

Meas Type RADIATED EMISSION  
Equipment under Test WBC; reader A4  
Manufacturer METRA INZENIRING d.o.o.  
OP Condition READING  
Operator ANDREJ SKOF

**Test Spec**

Antenna: 305 deg, Sample: 65 deg

**Final Measurement**

Meas Time: 1 s  
Margin: 40 dB  
Peaks: 1

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	13.560000000 MHz	45.89	Quasi Peak	-23.61

**C20163039**

16.Mar 17 10:22

**Meas Type** RADIATED EMISSION  
**Equipment under Test** WBC; reader B3  
**Manufacturer** METRA INZENIRING d.o.o.  
**OP Condition** WAITING  
**Operator** ANDREJ SKOF

**Test Spec**

Antenna: 305 deg, Sample: 190 deg

**Time Domain Scan (2 Ranges)**

Scan Start: 9 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK  
 Transducer: HFH2-Z2V

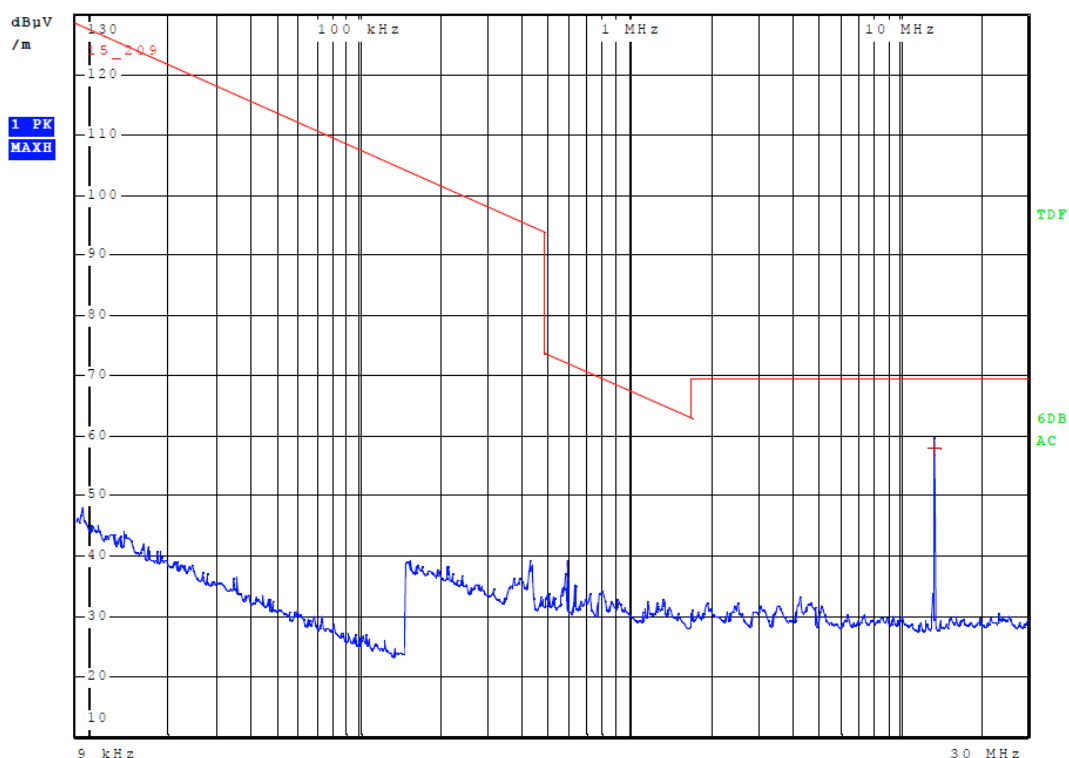
Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
9.000000 kHz	149.950000 kHz	50.00 Hz	200.00 Hz	300 ms	Auto	20 dB	INPUT2
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	20 dB	INPUT2



RBW 9 kHz

MT 1 s

Step TD AUTO PULSE Att 0 dB AUTO PREAMP ON



**ROHDE & SCHWARZ****C20163039**

16.Mar 17 10:22

Meas Type RADIATED EMISSION  
Equipment under Test WBC; reader B3  
Manufacturer METRA INZENIRING d.o.o.  
OP Condition WAITING  
Operator ANDREJ SKOF

**Test Spec**

Antenna: 305 deg, Sample: 190 deg

**Final Measurement**

Meas Time: 1 s  
Margin: 40 dB  
Peaks: 1

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	13.560000000 MHz	57.76	Quasi Peak	-11.74

**C20163039**

16.Mar 17 10:21

**Meas Type** RADIATED EMISSION  
**Equipment under Test** WBC; reader B3  
**Manufacturer** METRA INZENIRING d.o.o.  
**OP Condition** READING  
**Operator** ANDREJ SKOF

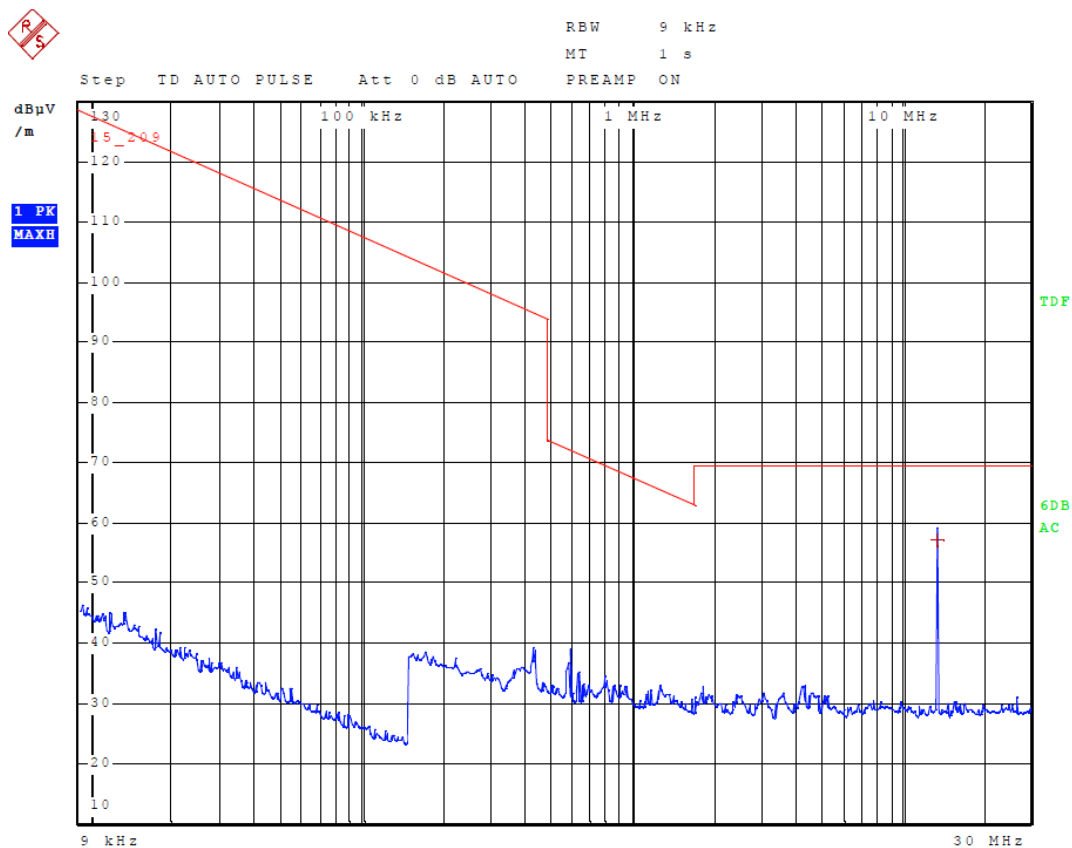
**Test Spec**

Antenna: 305 deg, Sample: 190 deg

**Time Domain Scan (2 Ranges)**

Scan Start: 9 kHz  
 Scan Stop: 30 MHz  
 Detector: Trace 1: MAX PEAK  
 Transducer: HFH2-Z2V

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
9.000000 kHz	149.950000 kHz	50.00 Hz	200.00 Hz	300 ms	Auto	20 dB	INPUT2
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	30 ms	Auto	20 dB	INPUT2



**C20163039**

16.Mar 17 10:21

Meas Type RADIATED EMISSION  
Equipment under Test WBC; reader B3  
Manufacturer METRA INZENIRING d.o.o.  
OP Condition READING  
Operator ANDREJ SKOF

**Test Spec**

Antenna: 305 deg, Sample: 190 deg

**Final Measurement**

Meas Time: 1 s  
Margin: 40 dB  
Peaks: 1

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	13.560000000 MHz	57.01	Quasi Peak	-12.49

## Final measurement at 10 m in OATS

Results with measuring distance of 10 m				
Mode	Frequency (MHz)	Measured value (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
Reader A4 reading	13,56	34,64	104,00	69,36
Reader A4 waiting	13,56	28,63	104,00	75,37
Reader B3 reading	13,56	30,47	104,00	73,53
Reader B3 waiting	13,56	36,54	104,00	67,64

Calculated value from 10 m to 30 m						
Mode	Frequency (MHz)	Measured value at 10 m (dB $\mu$ V/m)	Correction factor from 10 m to 30 m (dB)	Calculated value at 30 m (dB $\mu$ V/m)	Limit at 30 m (dB $\mu$ V/m)	Margin (dB)
Reader A4 reading	13,56	34,64	20	14,64	84,00	69,36
Reader A4 waiting	13,56	28,63	20	8,63	84,00	75,37
Reader B3 reading	13,56	30,47	20	10,47	84,00	73,53
Reader B3 waiting	13,56	36,54	20	16,54	84,00	67,64

**NOTE:** Antenna factor and cable loss are already included in measurement correction.

**C20163039**

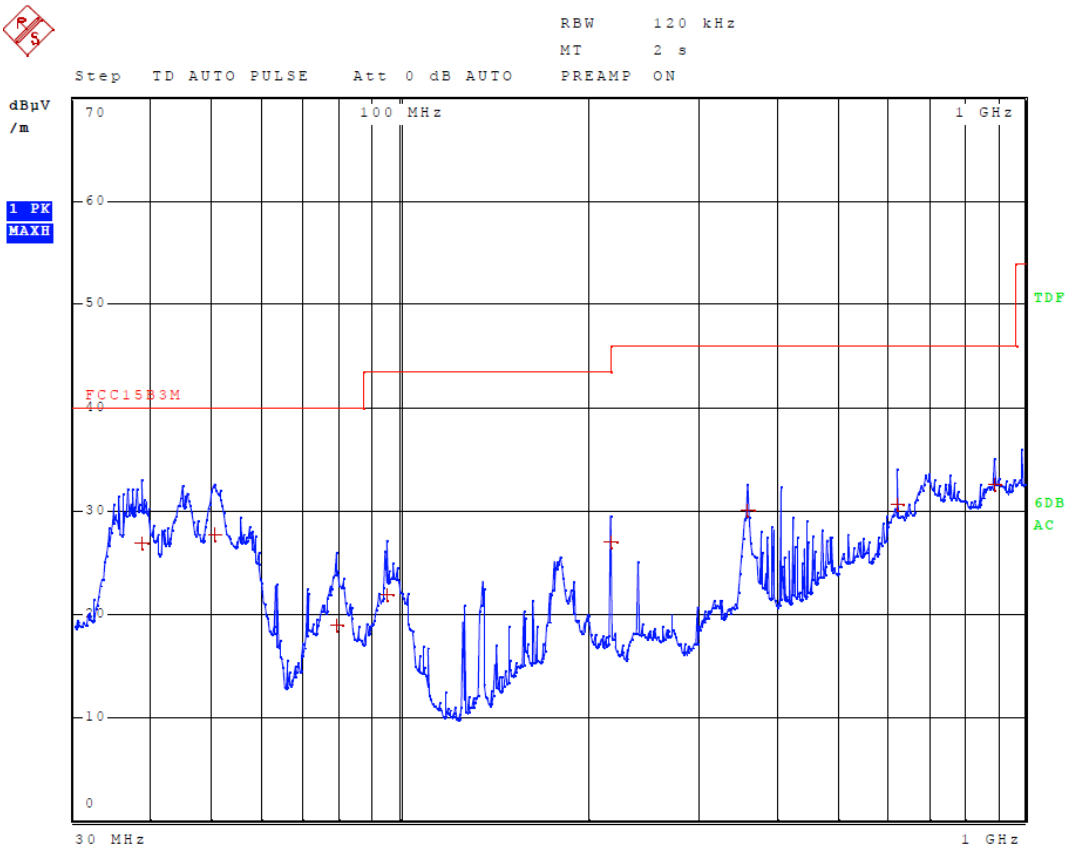
03.Feb 17 08:20

Meas Type RADIATED EMISSION  
 Equipment under Test WBC  
 Manufacturer METRA INZENIRING d.o.o.  
 OP Condition READING  
 Operator ANDREJ SKOF  
 Test Spec  
 VERTICAL 100 cm, 0 deg

**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	1 ms	Auto	20 dB	INPUT2



**C20163039**

03.Feb 17 08:20

**Meas Type** RADIATED EMISSION  
**Equipment under Test** WBC  
**Manufacturer** METRA INZENIRING d.o.o.  
**OP Condition** READING  
**Operator** ANDREJ SKOF  
**Test Spec**  
VERTICAL 100 cm, 0 deg

**Final Measurement**

**Meas Time:** 2 s  
**Margin:** 20 dB  
**Subranges:** 8

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	50.310000000 MHz	27.77	Quasi Peak	-12.23
1	38.340000000 MHz	26.85	Quasi Peak	-13.15
1	894.960000000 MHz	32.51	Quasi Peak	-13.49
1	623.760000000 MHz	30.65	Quasi Peak	-15.35
1	360.000000000 MHz	30.12	Quasi Peak	-15.88
1	216.960000000 MHz	27.03	Quasi Peak	-18.97
1	78.960000000 MHz	18.91	Quasi Peak	-21.09
1	94.710000000 MHz	21.85	Quasi Peak	-21.65



**C20163039**

03.Feb 17 08:24

**Meas Type** RADIATED EMISSION  
**Equipment under Test** WBC  
**Manufacturer** METRA INZENIRING d.o.o.  
**OP Condition** READING  
**Operator** ANDREJ SKOF  
**Test Spec**  
 HORIZONTAL 100 cm, 0 deg

**Time Domain Scan (1 Range)**

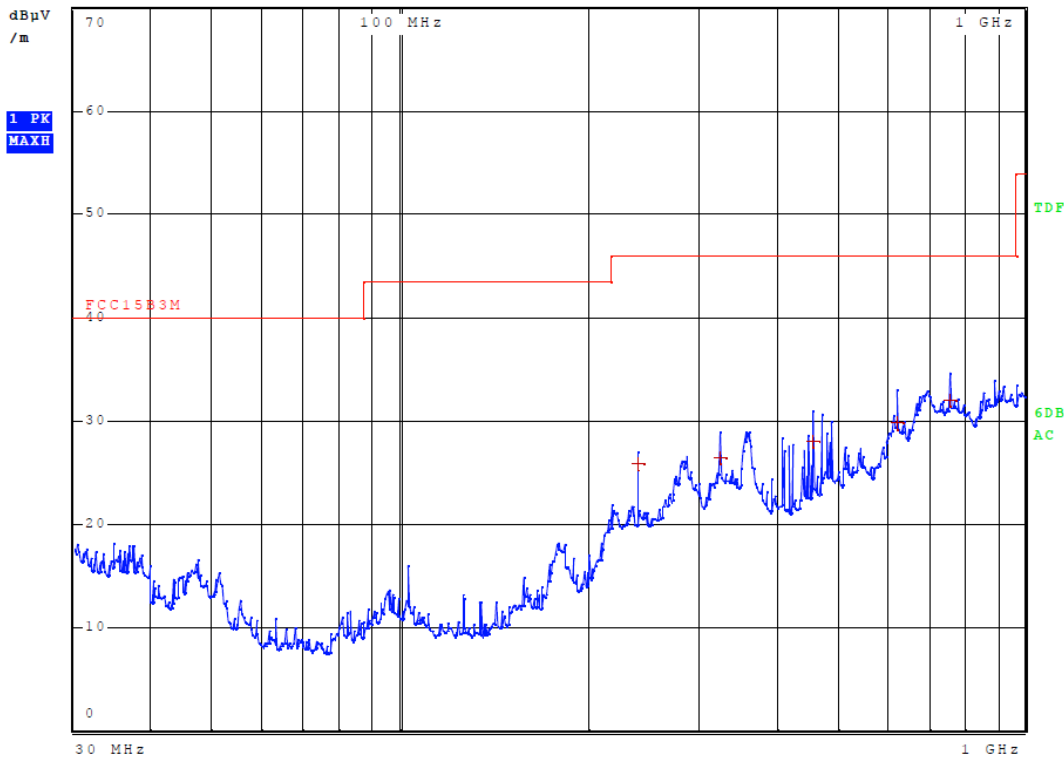
Scan Start: 30 MHz  
 Scan Stop: 1 GHz  
 Detector: Trace 1: MAX PEAK  
 Transducer: 3142B3m

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	1 ms	Auto	20 dB	INPUT2



RBW 120 kHz  
 MT 2 s

Step TD AUTO PULSE Att 0 dB AUTO PREAMP ON



**C20163039**

03.Feb 17 08:24

**Meas Type** RADIATED EMISSION  
**Equipment under Test** WBC  
**Manufacturer** METRA INZENIRING d.o.o.  
**OP Condition** READING  
**Operator** ANDREJ SKOF  
**Test Spec**  
HORIZONTAL 100 cm, 0 deg

**Final Measurement**

**Meas Time:** 2 s  
**Margin:** 20 dB  
**Subranges:** 5

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	759.360000000 MHz	32.02	Quasi Peak	-13.98
1	623.760000000 MHz	29.83	Quasi Peak	-16.17
1	457.500000000 MHz	27.98	Quasi Peak	-18.02
1	325.440000000 MHz	26.44	Quasi Peak	-19.56
1	240.000000000 MHz	25.77	Quasi Peak	-20.23

# Worst case measurements:

**C20163039**

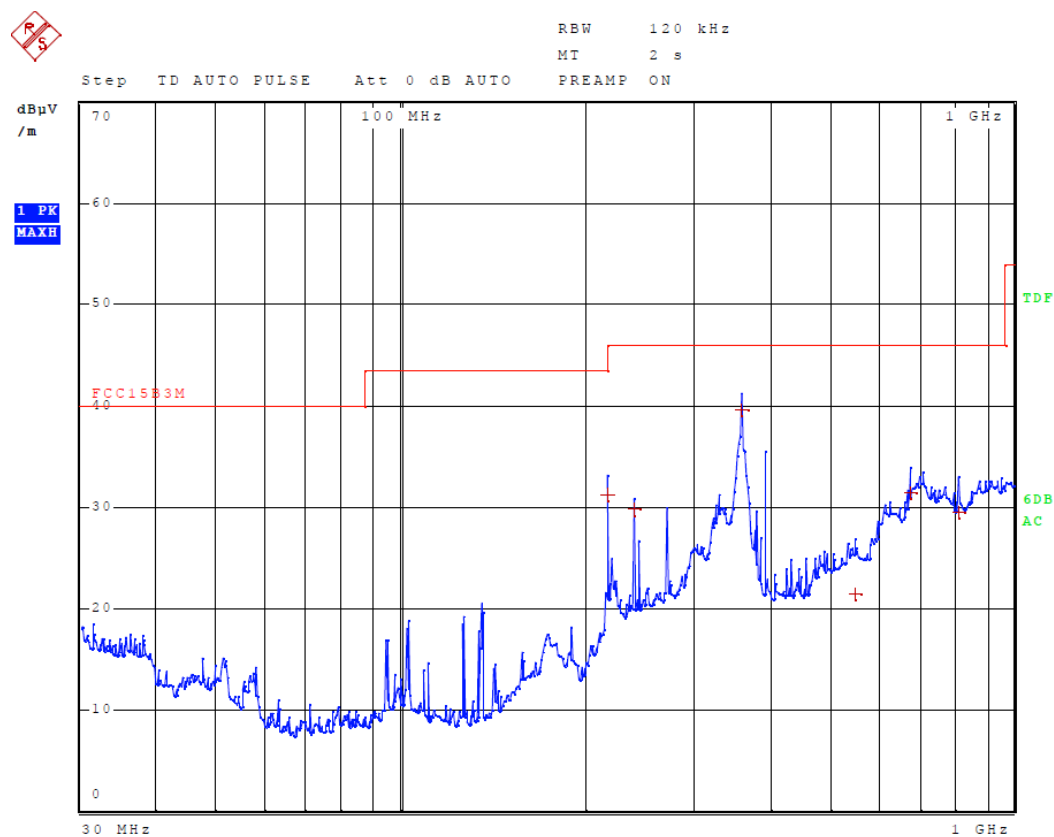
03.Feb 17 08:26

Meas Type RADIATED EMISSION  
Equipment under Test WBC  
Manufacturer METRA INZENIRING d.o.o.  
OP Condition READING  
Operator ANDREJ SKOF  
Test Spec  
HORIZONTAL 100 cm, 90 deg

## 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	1 ms	Auto	20 dB	INPUT2



**C20163039**

03.Feb 17 08:26

**Meas Type** RADIATED EMISSION  
**Equipment under Test** WBC  
**Manufacturer** METRA INZENIRING d.o.o.  
**OP Condition** READING  
**Operator** ANDREJ SKOF  
**Test Spec**  
HORIZONTAL 100 cm, 90 deg

**Final Measurement**

**Meas Time:** 2 s  
**Margin:** 20 dB  
**Subranges:** 6

Trace	Frequency	Level (dB $\mu$ V/m)	Detector	Delta Limit/dB
1	360.000000000 MHz	39.59	Quasi Peak	-6.41
1	678.000000000 MHz	31.41	Quasi Peak	-14.59
1	216.960000000 MHz	31.20	Quasi Peak	-14.80
1	240.000000000 MHz	29.71	Quasi Peak	-16.29
1	813.600000000 MHz	29.55	Quasi Peak	-16.45
1	551.970000000 MHz	21.37	Quasi Peak	-24.63

## 7.3 Bandwidth of the emission (15.215)

### Section 15.215 Additional provisions to the general radiated emission limitations

#### 7.3.1 Test instruments

Description & Manufacturer	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
ETS, Anechoic chamber	3m	103949	2016-11	2017-11	12 months	X
Rohde-Schwarz, RFI receiver	ESU8	105187	2015-11	2017-11	24 months	X
EMCO, Antenna	3142B	06/068	2015-09	2017-09	24 months	
Rohde & Schwarz, Active loop antenna	HFH2-Z2	/	2015-09	2017-09	24 months	X
Heinrich Deisel, Turn table	DS 420.00	103337	NA	NA	NA	X
ETS, Antenna tower	/	/	NA	NA	NA	X
ETS, Controller for turn table and antenna tower	/	/	NA	NA	NA	X

#### 7.3.2 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.
3. Resolution bandwidth is set to a value greater than 5% of the allowed bandwidth. If no bandwidth specifications are given, the guidelines in Section 1.4 are used

### 7.3.3 Test results

Device passed the requirements stated in FCC Part 15, Subpart C, Section 15.215



**C20163039**

16.Mar 17 10:58

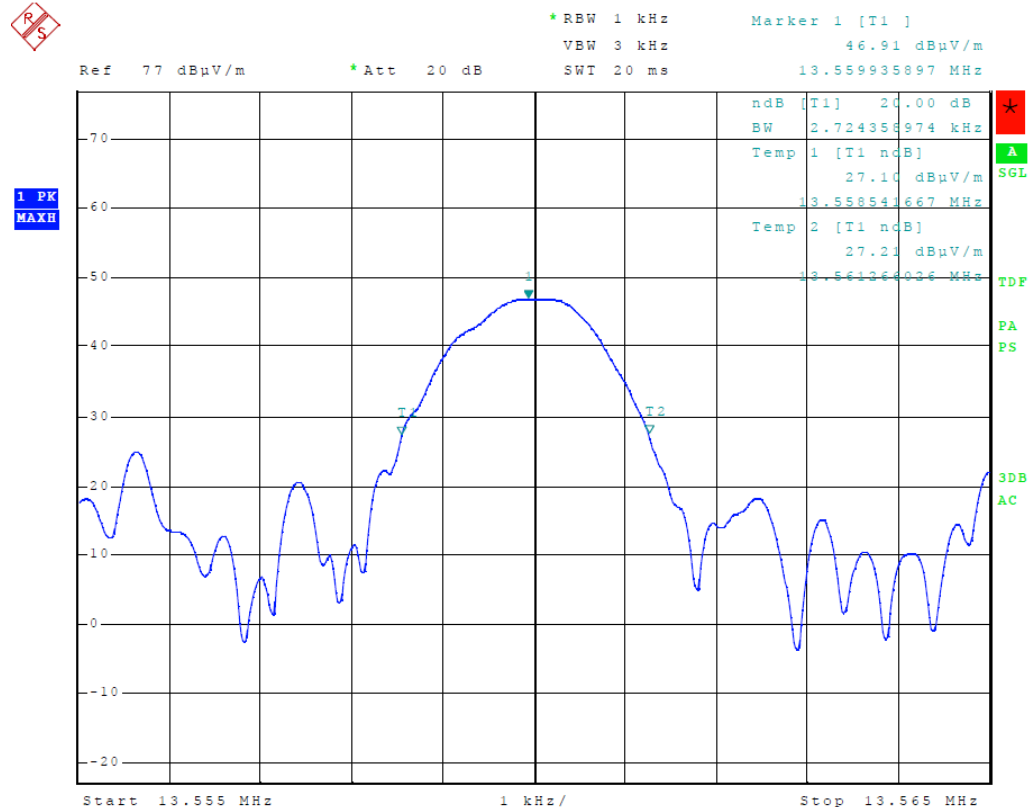
Meas Type OCCUPIED BANDWIDTH  
 Equipment under Test WBC; reader A4  
 Manufacturer METRA INZENIRING d.o.o.  
 OP Condition WAITING  
 Operator ANDREJ SKOF

#### Test Spec

Antenna: 305 deg, Sample: 65 deg

#### Sweep Settings Screen A

Center Frequency	13.560000 MHz	Ref Level	77.000 dBμV/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	10.000000 kHz	Ref Position	100.000 %
Start Frequency	13.555000 MHz	Level Range	100.000 dB
Stop Frequency	13.565000 MHz	RF Att	20.000 dB
RBW	1.000000 kHz		
VBW	3.000000 kHz	X-Axis	LIN
Sweep Time	20.00 ms	Y-Axis	LOG



**Meas Type** OCCUPIED BANDWIDTH  
**Equipment under Test** WBC; reader A4  
**Manufacturer** METRA INZENIRING d.o.o.  
**OP Condition** READING  
**Operator** ANDREJ SKOF

**Test Spec**  
 Antenna: 305 deg, Sample: 65 deg

## Sweep Settings Screen A

Center Frequency	13.560000 MHz	Ref Level	77.000 dBμV/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	10.000000 kHz	Ref Position	100.000 %
Start Frequency	13.555000 MHz	Level Range	100.000 dB
Stop Frequency	13.565000 MHz	RF Att	20.000 dB
RBW	1.000000 kHz		
VBW	3.000000 kHz	X-Axis	LIN
Sweep Time	20.00 ms	Y-Axis	LOG

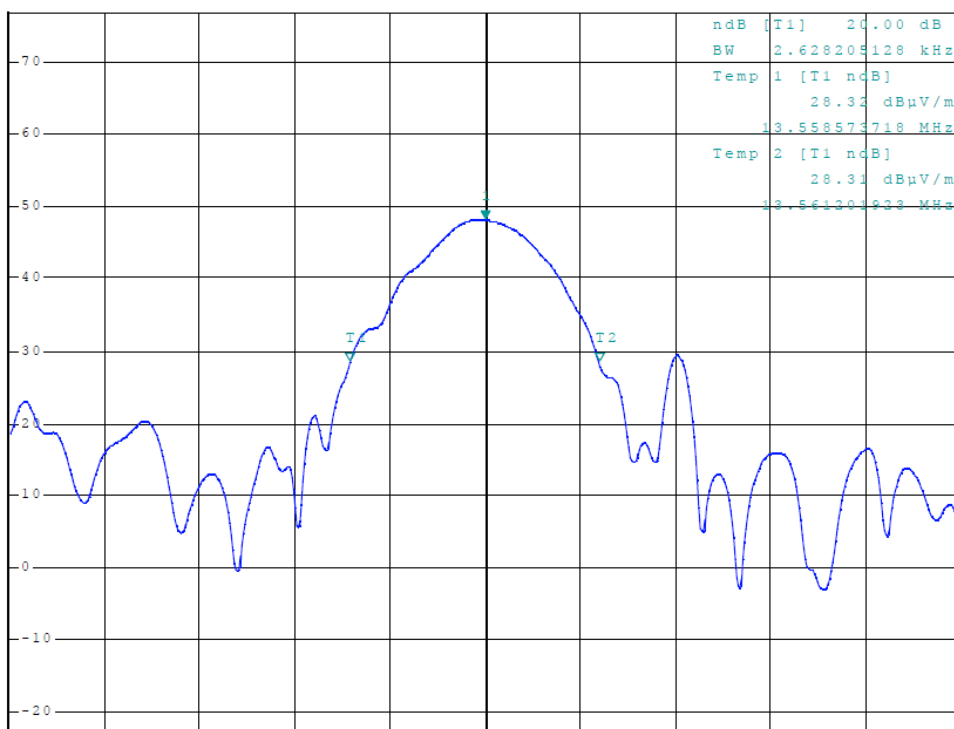


\* RBW 1 kHz      Marker 1 [T1]  
 VBW 3 kHz      48.10 dBμV/m  
 \* SWT 20 ms      13.55995000 MHz

Ref 77 dBμV/m

\* Att 20 dB

\* SWT 20 ms

1 PK  
MAXH


Center 13.56 MHz

1 kHz/

Span 10 kHz

**C20163039**

16.Mar 17 11:16

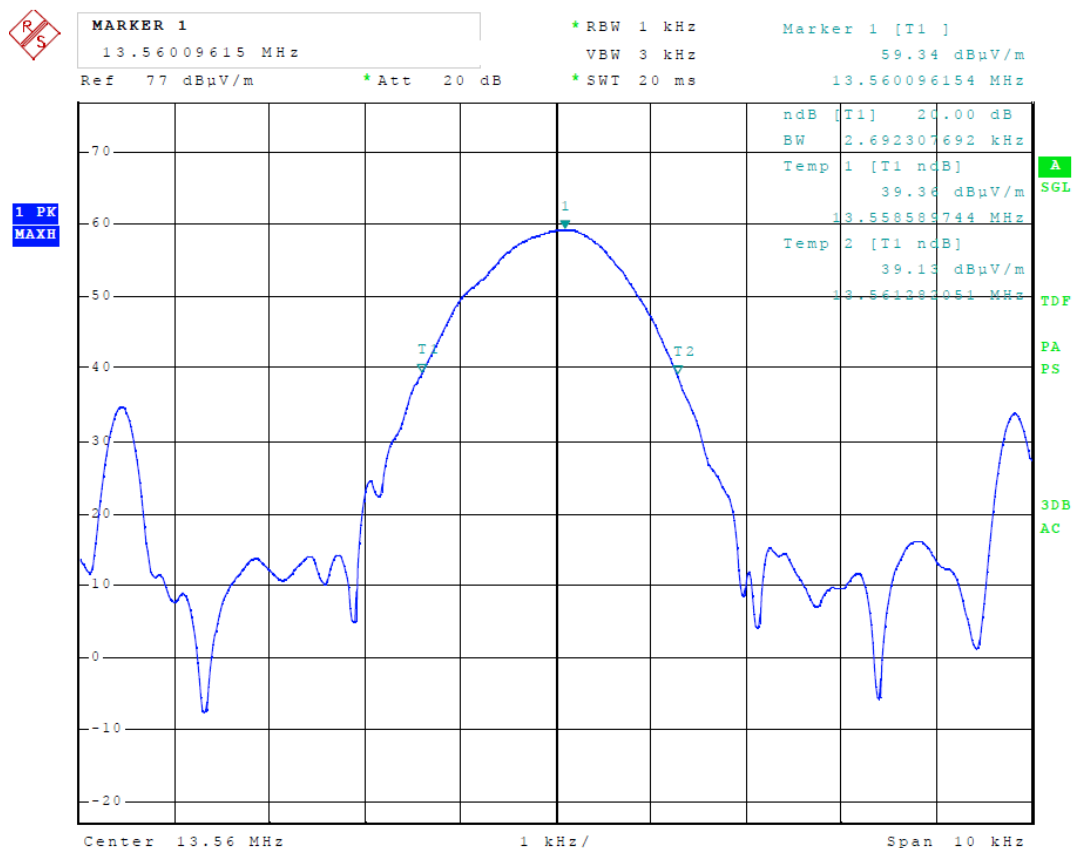
**Meas Type** OCCUPIED BANDWIDTH  
**Equipment under Test** WBC; reader B3  
**Manufacturer** METRA INZENIRING d.o.o.  
**OP Condition** WAITING  
**Operator** ANDREJ SKOF

**Test Spec**

Antenna: 305 deg, Sample: 190 deg

**Sweep Settings Screen A**

Center Frequency	13.560000 MHz	Ref Level	77.000 dBμV/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	10.000000 kHz	Ref Position	100.000 %
Start Frequency	13.555000 MHz	Level Range	100.000 dB
Stop Frequency	13.565000 MHz	RF Att	20.000 dB
RBW	1.000000 kHz		
VBW	3.000000 kHz	X-Axis	LIN
Sweep Time	20.00 ms	Y-Axis	LOG





**Meas Type** OCCUPIED BANDWIDTH  
**Equipment under Test** WBC; reader B3  
**Manufacturer** METRA INZENIRING d.o.o.  
**OP Condition** READING  
**Operator** ANDREJ SKOF

**Test Spec**  
 Antenna: 305 deg, Sample: 190 deg

## Sweep Settings Screen A

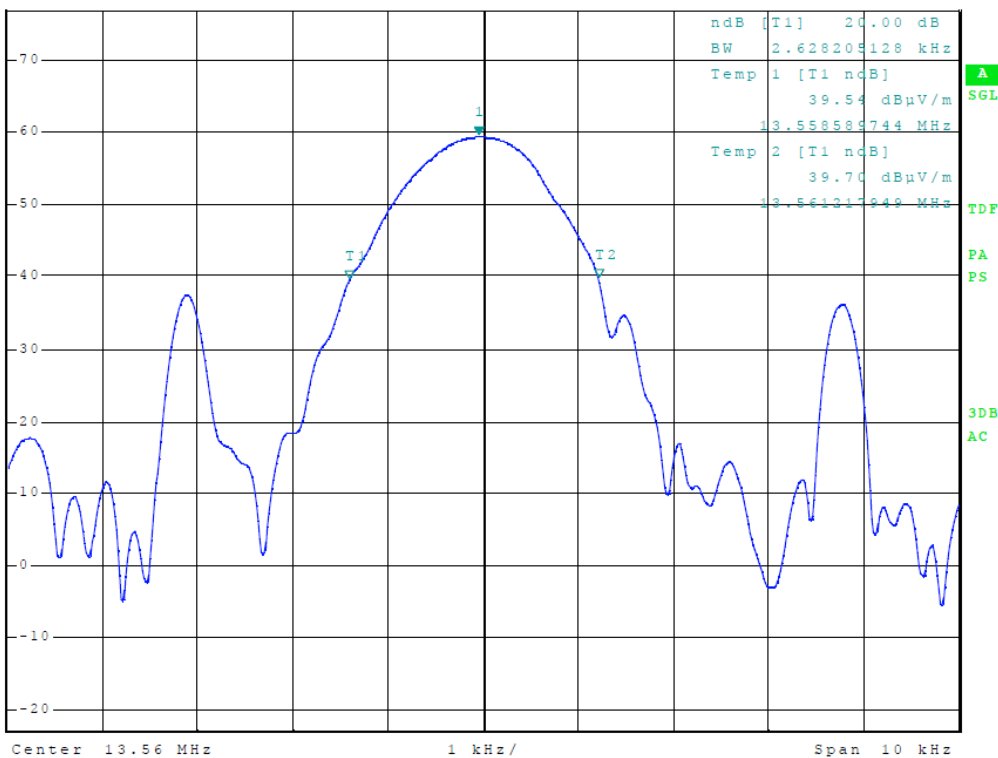
Center Frequency	13.560000 MHz	Ref Level	77.000 dBμV/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	10.000000 kHz	Ref Position	100.000 %
Start Frequency	13.555000 MHz	Level Range	100.000 dB
Stop Frequency	13.565000 MHz	RF Att	20.000 dB
RBW	1.000000 kHz		
VBW	3.000000 kHz	X-Axis	LIN
Sweep Time	20.00 ms	Y-Axis	LOG



**MARKER 1**  
 13.55995192 MHz  
 Ref 77 dBμV/m \* Att 20 dB

\* RBW 1 kHz Marker 1 [T1]  
 VBW 3 kHz 59.39 dBμV/m  
 \* SWT 20 ms 13.559951923 MHz

1 PK  
MAXH





Frequency (MHz)	Permitted frequency band (MHz)	20 dB bandwidth (kHz)	PASS/FAIL
13.56	13.110 – 14.010	2.72	PASS

## 7.4 Spectrum mask (15.225)

### Section 15.225 Operation within the band 13.110 – 14.010 MHz – clause a – clause d

#### 7.4.1 Test instruments

Description & Manufacturer	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
ETS, Anechoic chamber	3m	103949	2016-11	2017-11	12 months	X
Rohde-Schwarz, RFI receiver	ESU26	106897	2015-12	2017-12	24 months	X
EMCO, Antenna	3142B	06/068	2015-09	2017-09	24 months	
Rohde & Schwarz, Active loop antenna	HFH2-Z2	/	2015-09	2017-09	24 months	X
Heinrich Deisel, Turn table	DS 420.00	103337	NA	NA	NA	X
ETS, Antenna tower	/	/	NA	NA	NA	X
ETS, Controller for turn table and antenna tower	/	/	NA	NA	NA	X

#### 7.4.2 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.
3. Frequencies with maximum emission were retested on OATS.
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.

### 7.4.3 Test results

Device passed the requirements stated in FCC Part 15, Subpart C, Section 15.225



**ROHDE & SCHWARZ**

**C20163039**

16.Mar 17 10:48

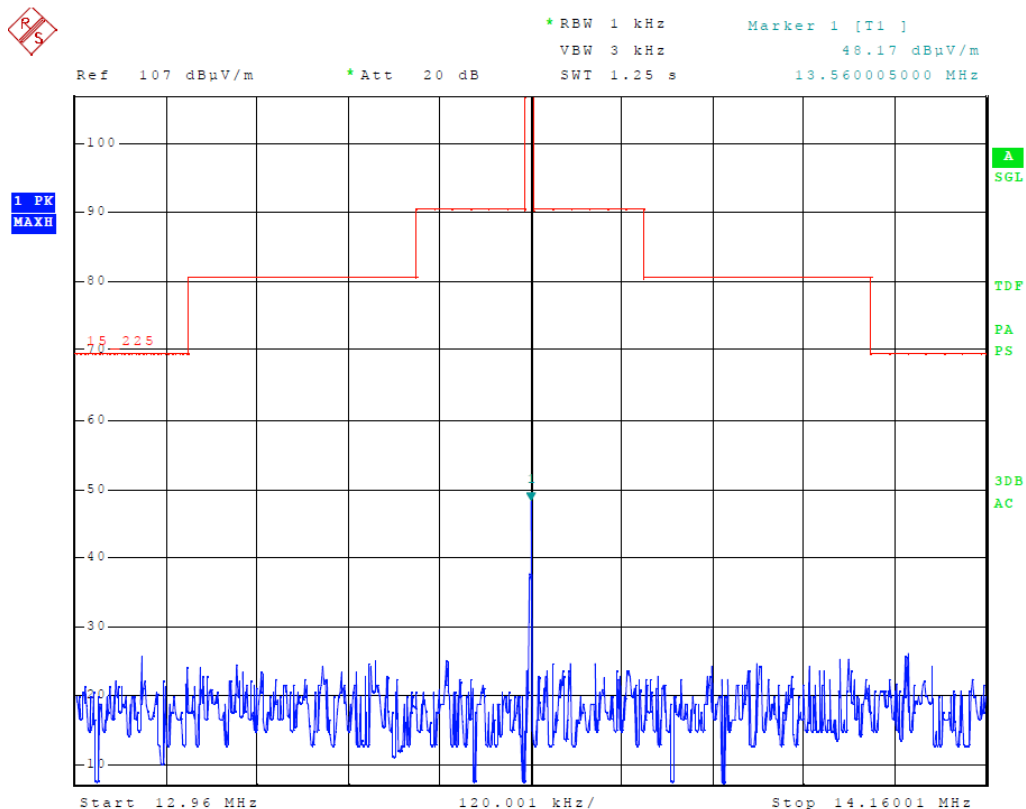
Meas Type SPECTRUM MASK  
 Equipment under Test WBC; reader A4  
 Manufacturer METRA INZENIRING d.o.o.  
 OP Condition WAITING  
 Operator ANDREJ SKOF

#### Test Spec

Antenna: 305 deg, Sample: 65 deg

#### Sweep Settings Screen A

Center Frequency	13.560005 MHz	Ref Level	107.000 dBμV/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	1.200010 MHz	Ref Position	100.000 %
Start Frequency	12.960000 MHz	Level Range	100.000 dB
Stop Frequency	14.160010 MHz	RF Att	20.000 dB
RBW	1.000000 kHz		
VBW	3.000000 kHz	X-Axis	LIN
Sweep Time	1.25 s	Y-Axis	LOG



**Meas Type** SPECTRUM MASK  
**Equipment under Test** WBC; reader A4  
**Manufacturer** METRA INZENIRING d.o.o.  
**OP Condition** READING  
**Operator** ANDREJ SKOF

**Test Spec**

Antenna: 305 deg, Sample: 65 deg

**Sweep Settings      Screen A**

Center Frequency	13.560005 MHz	Ref Level	107.000 dBμV/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	1.200010 MHz	Ref Position	100.000 %
Start Frequency	12.960000 MHz	Level Range	100.000 dB
Stop Frequency	14.160010 MHz	RF Att	20.000 dB
RBW	1.000000 kHz		
VBW	3.000000 kHz	X-Axis	LIN
Sweep Time	1.25 s	Y-Axis	LOG



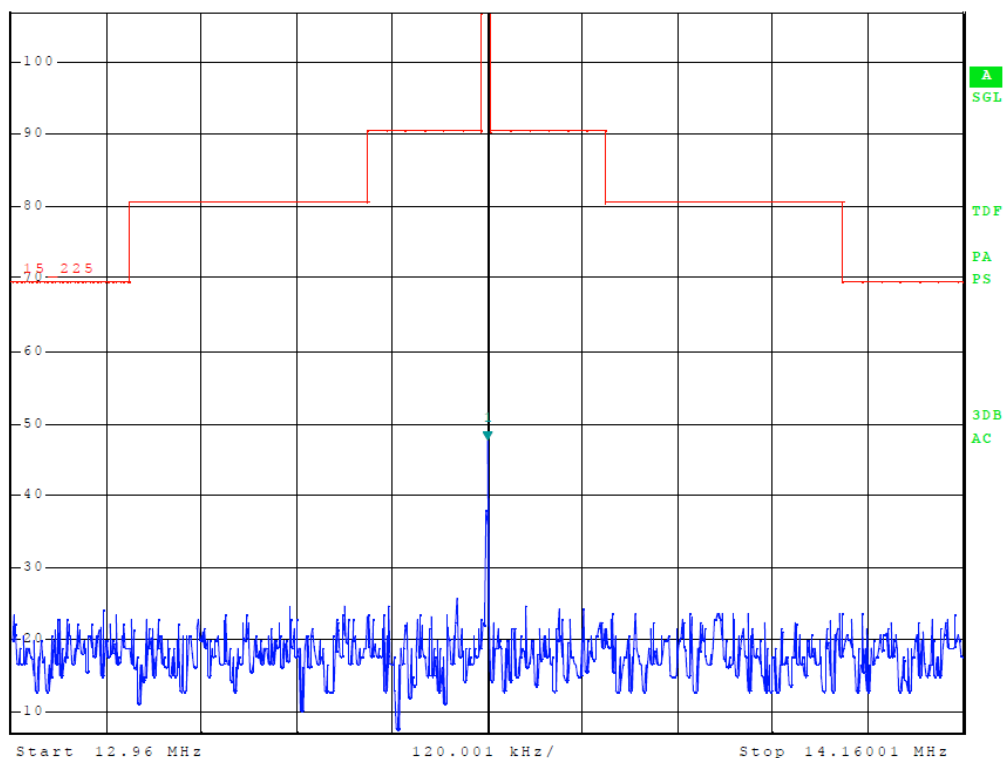
\* RBW 1 kHz      Marker 1 [T1]  
 VBW 3 kHz      47.53 dBμV/m  
 SWT 1.25 s      13.560005000 MHz

Ref 107 dBμV/m

\* Att 20 dB

SWT 1.25 s

13.560005000 MHz

1 PK  
MAXH


**C20163039**

16.Mar 17 10:39

**Meas Type** SPECTRUM MASK  
**Equipment under Test** WBC; reader B3  
**Manufacturer** METRA INZENIRING d.o.o.  
**OP Condition** WAITING  
**Operator** ANDREJ SKOF

**Test Spec**

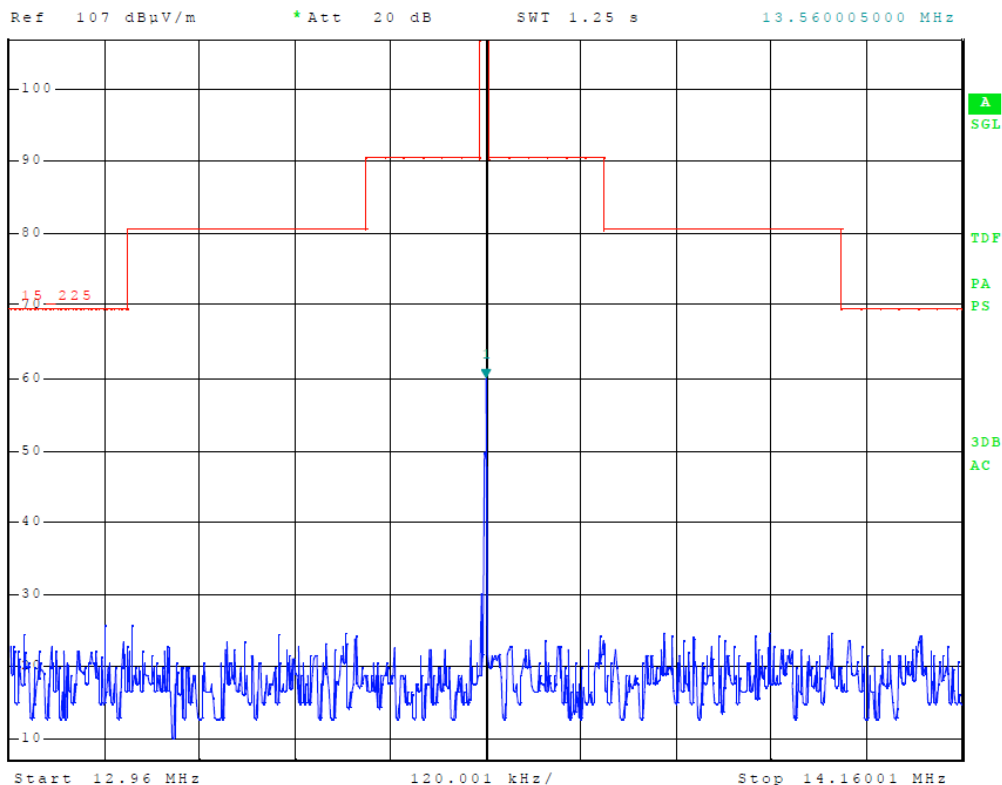
Antenna: 305 deg, Sample: 190 deg

**Sweep Settings Screen A**

Center Frequency	13.560005 MHz	Ref Level	107.000 dBuV/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	1.200010 MHz	Ref Position	100.000 %
Start Frequency	12.960000 MHz	Level Range	100.000 dB
Stop Frequency	14.160010 MHz	RF Att	20.000 dB
RBW	1.000000 kHz		
VBW	3.000000 kHz	X-Axis	LIN
Sweep Time	1.25 s	Y-Axis	LOG



\*RBW 1 kHz      Marker 1 [T1]  
 VBW 3 kHz      59.89 dBuV/m  
 SWT 1.25 s      13.560005000 MHz



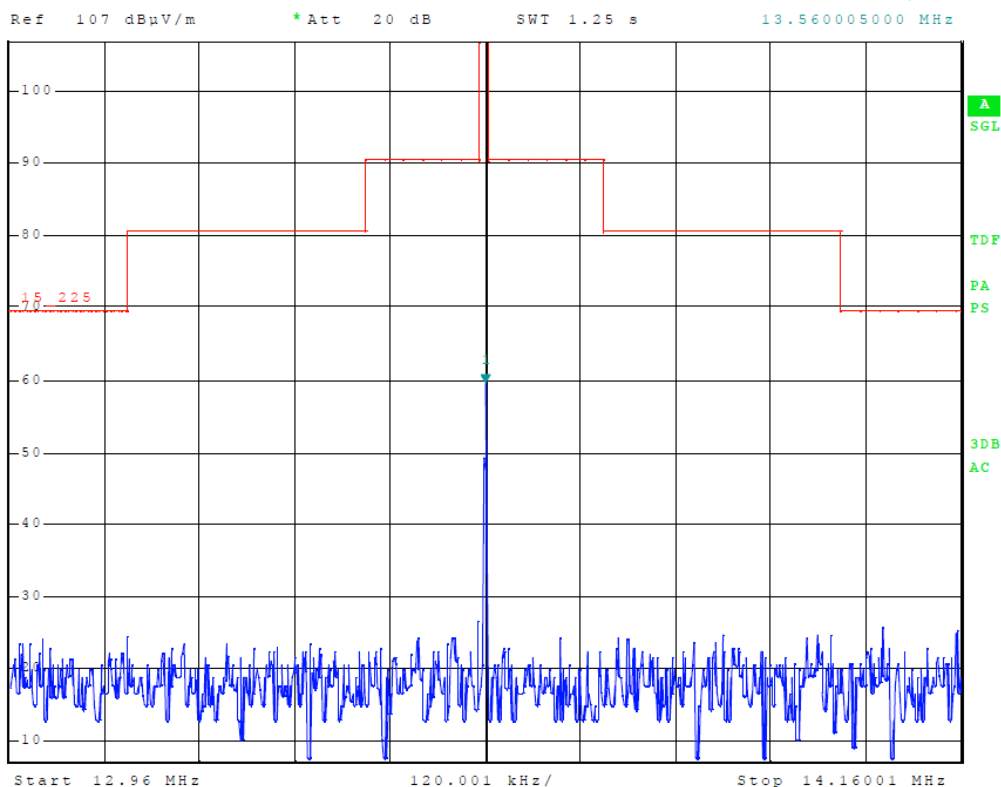
**Meas Type** SPECTRUM MASK  
**Equipment under Test** WBC; reader B3  
**Manufacturer** METRA INZENIRING d.o.o.  
**OP Condition** READING  
**Operator** ANDREJ SKOF  
**Test Spec**  
 Antenna: 305 deg, Sample: 190 deg

**Sweep Settings Screen A**

Center Frequency	13.560005 MHz	Ref Level	107.000 dBμV/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	1.200010 MHz	Ref Position	100.000 %
Start Frequency	12.960000 MHz	Level Range	100.000 dB
Stop Frequency	14.160010 MHz	RF Att	20.000 dB
RBW	1.000000 kHz		
VBW	3.000000 kHz	X-Axis	LIN
Sweep Time	1.25 s	Y-Axis	LOG



\* RBW 1 kHz      Marker 1 [T1]  
 VBW 3 kHz      59.45 dBμV/m  
 SWT 1.25 s      13.560005000 MHz



## 7.5 Frequency tolerance of the carrier signal (15.225)

### Section 15.225 Operation within the band 13.110 – 14.010 MHz

#### 7.5.1 Test instruments:

Description & Manufacturer	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, Active loop antenna	HFH2-Z2	/	2015-09	2017-09	24 months	X
Fluke, Digital Multimeter	179	106728	2016-07	2018-07	12 months	X
Kambič, Temperature chamber	I-190 CK	107298	Na	Na	/	X

#### 7.5.2 Test requirements:

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.



### 7.5.3 Test results

Device passed the requirements stated in FCC Part 15, Subpart C, Section 15.225

Metra WBC Antenna A4		FREQUENCY STABILITY				
Temperature	Supply voltage (V)	Minutes after switch on	Measured Frequency (MHz)	Allowed tolerance	Measured tolerance	RESULT
50	24,00	0	13,559866987	Fref±1.356 kHz	-0,119	PASS
	24,00	2	13,559847756	Fref±1.356 kHz	-0,138	PASS
	24,00	5	13,559847756	Fref±1.356 kHz	-0,138	PASS
	24,00	10	13,559847756	Fref±1.356 kHz	-0,138	PASS
40	24,00	0	13,559932692	Fref±1.356 kHz	-0,053	PASS
	24,00	2	13,559907051	Fref±1.356 kHz	-0,079	PASS
	24,00	5	13,559902244	Fref±1.356 kHz	-0,083	PASS
	24,00	10	13,559891026	Fref±1.356 kHz	-0,095	PASS
30	24,00	0	13,559972756	Fref±1.356 kHz	-0,013	PASS
	24,00	2	13,559955128	Fref±1.356 kHz	-0,030	PASS
	24,00	5	13,559935897	Fref±1.356 kHz	-0,050	PASS
	24,00	10	13,559932692	Fref±1.356 kHz	-0,053	PASS
20	20,40	0	13,560020833	Fref±1.356 kHz	0,035	PASS
	20,40	2	13,560003205	Fref±1.356 kHz	0,018	PASS
	20,40	5	13,559996795	Fref±1.356 kHz	0,011	PASS
	20,40	10	13,559991987	Fref±1.356 kHz	0,006	PASS
20	24,00	0	13,560000000	Fref±1.356 kHz	0,014	PASS
	24,00	2	13,560004808	Fref±1.356 kHz	0,019	PASS
	24,00	5	13,559988782	Fref±1.356 kHz	0,003	PASS
	24,00	10	13,559985577	Fref		PASS
20	27,60	0	13,560022436	Fref±1.356 kHz	0,037	PASS
	27,60	2	13,560004808	Fref±1.356 kHz	0,019	PASS
	27,60	5	13,559990385	Fref±1.356 kHz	0,005	PASS
	27,60	10	13,559983974	Fref±1.356 kHz	-0,002	PASS
10	24,00	0	13,560051282	Fref±1.356 kHz	0,066	PASS
	24,00	2	13,560035256	Fref±1.356 kHz	0,050	PASS
	24,00	5	13,560032051	Fref±1.356 kHz	0,046	PASS
	24,00	10	13,560030449	Fref±1.356 kHz	0,045	PASS
0	24,00	0	13,560081731	Fref±1.356 kHz	0,096	PASS
	24,00	2	13,560076923	Fref±1.356 kHz	0,091	PASS
	24,00	5	13,560073718	Fref±1.356 kHz	0,088	PASS
	24,00	10	13,560072115	Fref±1.356 kHz	0,087	PASS
-10	24,00	0	13,560096154	Fref±1.356 kHz	0,111	PASS
	24,00	2	13,560096154	Fref±1.356 kHz	0,111	PASS
	24,00	5	13,560096154	Fref±1.356 kHz	0,111	PASS
	24,00	10	13,560092949	Fref±1.356 kHz	0,107	PASS
-20	24,00	0	13,560072115	Fref±1.356 kHz	0,087	PASS
	24,00	2	13,560086538	Fref±1.356 kHz	0,101	PASS
	24,00	5	13,560096154	Fref±1.356 kHz	0,111	PASS
	24,00	10	13,560091346	Fref±1.356 kHz	0,106	PASS



Metra WBC Antenna B3		FREQUENCY STABILITY				
Temperature	Supply voltage (V)	Minutes after switch on	Measured Frequency (MHz)	Allowed tolerance	Measured tolerance	RESULT
50	24,00	0	13,559889423	Fref±1.356 kHz	-0,125	PASS
	24,00	2	13,559883013	Fref±1.356 kHz	-0,131	PASS
	24,00	5	13,559881410	Fref±1.356 kHz	-0,133	PASS
	24,00	10	13,559881410	Fref±1.356 kHz	-0,133	PASS
40	24,00	0	13,559926282	Fref±1.356 kHz	-0,088	PASS
	24,00	2	13,559921474	Fref±1.356 kHz	-0,093	PASS
	24,00	5	13,559911859	Fref±1.356 kHz	-0,103	PASS
	24,00	10	13,559907051	Fref±1.356 kHz	-0,107	PASS
30	24,00	0	13,559983974	Fref±1.356 kHz	-0,019	PASS
	24,00	2	13,559975962	Fref±1.356 kHz	-0,027	PASS
	24,00	5	13,559961538	Fref±1.356 kHz	-0,042	PASS
	24,00	10	13,559956731	Fref±1.356 kHz	-0,046	PASS
20	20,40	0	13,560014423	Fref±1.356 kHz	0,011	PASS
	20,40	2	13,560006410	Fref±1.356 kHz	0,003	PASS
	20,40	5	13,560000000	Fref±1.356 kHz	-0,003	PASS
	20,40	10	13,559996795	Fref±1.356 kHz	-0,006	PASS
20	24,00	0	13,560020833	Fref±1.356 kHz	0,018	PASS
	24,00	2	13,560009615	Fref±1.356 kHz	0,006	PASS
	24,00	5	13,560006410	Fref±1.356 kHz	0,003	PASS
	24,00	10	13,560003205	Fref	0,000	PASS
20	27,60	0	13,560014423	Fref±1.356 kHz	0,011	PASS
	27,60	2	13,560004808	Fref±1.356 kHz	0,002	PASS
	27,60	5	13,560001603	Fref±1.356 kHz	-0,002	PASS
	27,60	10	13,559995192	Fref±1.356 kHz	-0,008	PASS
10	24,00	0	13,560054487	Fref±1.356 kHz	0,051	PASS
	24,00	2	13,560046474	Fref±1.356 kHz	0,003	PASS
	24,00	5	13,560036859	Fref±1.356 kHz	0,034	PASS
	24,00	10	13,560041667	Fref±1.356 kHz	0,038	PASS
0	24,00	0	13,560078526	Fref±1.356 kHz	0,075	PASS
	24,00	2	13,560065705	Fref±1.356 kHz	0,063	PASS
	24,00	5	13,560070513	Fref±1.356 kHz	0,067	PASS
	24,00	10	13,560068910	Fref±1.356 kHz	0,066	PASS
-10	24,00	0	13,560080128	Fref±1.356 kHz	0,077	PASS
	24,00	2	13,560080128	Fref±1.356 kHz	0,077	PASS
	24,00	5	13,560083333	Fref±1.356 kHz	0,080	PASS
	24,00	10	13,560080128	Fref±1.356 kHz	0,077	PASS
-20	24,00	0	13,560052885	Fref±1.356 kHz	0,058	PASS
	24,00	2	13,560059295	Fref±1.356 kHz	0,064	PASS
	24,00	5	13,560062500	Fref±1.356 kHz	0,067	PASS
	24,00	10	13,560064103	Fref±1.356 kHz	0,069	PASS