

## **Radio test report**

### **20114119301-Ver 2.00**

based on:

- FCC part 15; subpart C; section 15.249 & 15.209  
(10-1-13 edition)
- FCC part 15, subpart B: section 15.109  
(10-1-13 edition)

Battery operated wireless humidity unit  
Dyzle  
RH-TAG 2.0 / 040 1003 001

## Revision history

REVISION	DATE	REMARKS	REVISED BY
Ver 2.00	2015 07 07	Correction of release dates	ing. J.C. le Clercq
Ver 1.00	2015 02 12	Initial release	ing. J.C. le Clercq
Ver 0.50	2014 11 26	Version for peer review	ing. J.C. le Clercq

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This report comprises of three modules. The total number of pages is: 25

## Main module

### 1 Introduction

This report contains the result of tests performed by:

Telefication B.V.  
Edisonstraat 12a  
6902 PK Zevenaar  
The Netherlands

*Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2005. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).*

*Telefication is designated by the FCC as an Accredited Test Firm for compliance testing of equipment subject to Certification under Parts 15 & 18. The Registration Number is: 282250.*

*The Industry Canada number for the Open Area Test Site of Telefication is: 4173A-1.*

*The contents of this test report, if reproduced, shall be copied in full, unless special consent in writing for reproduction in part is granted by Telefication. Copyright of this test report is reserved to Telefication.*

#### Ordering party:

Company name : Dyzle Services B.V.  
Address : Transistorstraat 2D  
Zipcode : 1322 CE  
City/town : Almere  
Country : The Netherlands  
Date of order : 22 August 2014

## 2 Product

A sample of the following product was submitted for testing:

Product description	:	Battery operated wireless humidity unit
Manufacturer	:	Dyzle Services B.V.
Trade mark	:	Dyzle
Type designation	:	RH-TAG 2.0 / 040 1003 001
FCC ID	:	2ADBY040103
Hardware version	:	2.0
Software release	:	0.28
Serial number	:	--

## 3 Test schedule

Tests are carried out in accordance with the specification detailed in chapter 7 “Summary” of this report.

Tests are carried out at the following location:

- Telefication, Zevenaar

The samples of the product were received on:

- 22 September 2014

Tests are carried out between:

- 2 October and 30 October 2014

## 4 Product documentation

For production of this report the following product documentation was used:

Description	Identification	Date
Bill of materials	BOM_RH_3.0_produc(9-4-2014).xls	2014 04 22
Circuit diagram	RH Tag.pdf	2014 09 19

The above-mentioned documentation will be filed at Telefication for a period of 10 years following the issue of this test report.

## 5 Observations and comments

None.

## 6 Modifications to the sample

None.

## 7 Summary

The product is intended for use in the following application area:

INTENTIONAL RADIATOR OPERATING IN THE FREQUENCY BAND 2400 - 2483.5 MHz

The sample is tested according to the following specifications:

FCC part 15; subpart C; section 15.249 & 15.209 (10-1-13 edition)

FCC part 15, subpart B, section 15.109 (10-1-13 edition)

## 8 Conclusions

The samples of the product showed **NO NON-COMPLIANCES** to the specifications stated in chapter 7 of this report.

The results of the tests as stated in this report are exclusively applicable to the product item as identified in this report. Telefication accepts no responsibility for any stated properties of product items in this test report, which are not supported by the tests as specified in chapter 7 “Summary”.

All tests are performed by:

Name : ing. J.C. le Clercq

Review of test report by:

Name : ing. P.A. Suringa

The above conclusions have been verified by the following signatory:

Date : 7 July 2015

Name : A. Amininejad

Function : Operational Manager Radio laboratory

Signature :



## Test results module

### 1 General information

#### 1.1 Equipment information

Rated RF output power	1 mW
Rated radiated RF power	1 mW
Operating frequency range	2404 MHz to 2480 MHz (32 channels)
Type of antenna	chip antenna
Modulation	off
Duty cycle (during testing)	100 %
FCC ID	2ADBY040103

channel 1 - 2404	MHz	channel 19 - 2448	MHz
channel 2 - 2406	MHz	channel 20 - 2450	MHz
channel 3 - 2408	MHz	channel 21 - 2452	MHz
channel 4 - 2410	MHz	channel 22 - 2454	MHz
channel 5 - 2412	MHz	channel 23 - 2456	MHz
channel 6 - 2416	MHz	channel 24 - 2460	MHz
channel 7 - 2418	MHz	channel 25 - 2462	MHz
channel 8 - 2420	MHz	channel 26 - 2464	MHz
channel 9 - 2422	MHz	channel 27 - 2466	MHz
channel 10 - 2426	MHz	channel 28 - 2470	MHz
channel 11 - 2428	MHz	channel 29 - 2472	MHz
channel 12 - 2430	MHz	channel 30 - 2474	MHz
channel 13 - 2432	MHz	channel 31 - 2476	MHz
channel 14 - 2434	MHz		
channel 15 - 2438	MHz	channel 32 - 2480	MHz
channel 16 - 2440	MHz		
channel 17 - 2442	MHz		
channel 18 - 2444	MHz		



## 2 Emission tests

### 2.1 Field strength of intentional signal

Compliance standard	:	FCC part 15, subpart C, section 15.249 (a) & (e)
Method of test	:	FCC part 15, subpart A, section 15.31(m), 15.33, 15.35, ANSI C63.10-2009, section 6.6
EUT condition	:	transmit mode
Atmospheric pressure	:	Between 86 kPa and 106 kPa
Temperature	:	24 °C
Relative humidity	:	46 %
Test results	:	

Note: only peak field strength was measured.

#### Peak field strength:

Frequency (MHz)	Test result @ 3 m distance (dB $\mu$ V/m)	Polarisation	Limit (dB $\mu$ V/m)
2404	83.7	H	114
2442	86.3	H	114
2480	86.8	H	114

The average field strength has been calculated by the following formula:

$$FS_{\text{average}} \text{ (dB}\mu\text{V/m)} = FS_{\text{peak}} \text{ (dB}\mu\text{V/m)} + \text{ACF (Average Correction Factor)}$$

$$\text{ACF} = 20 \log (1/x), \text{ where } x \text{ is the duty cycle in a 100 ms period.}$$

$$x = \tau / T = 1.056 \text{ ms} / 100 \text{ ms} = 1.056 \%$$

$$\text{ACF} = 20 \log (1.056/100) = -40.0 \text{ dB}$$

#### Average field strength\*:

Frequency (MHz)	Calculated field strength @ 3 m distance (dB $\mu$ V/m)	Polarisation	Limit (dB $\mu$ V/m)
2404	43.7	H	94
2442	46.3	H	94
2480	46.8	H	94

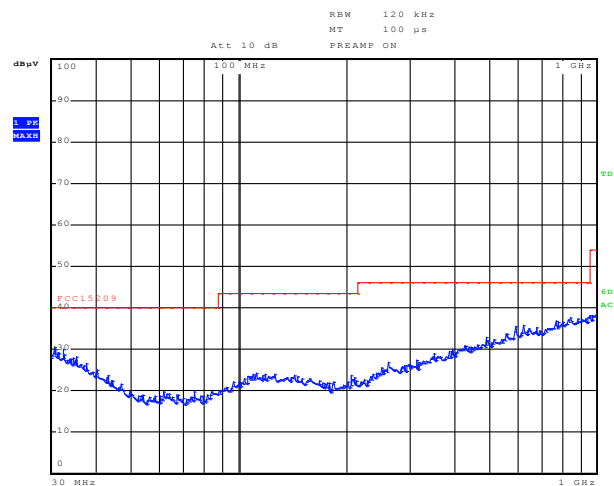
Measurement uncertainty	+4.5 dB / -6.1 dB.
Measurement equipment used (item numbers refer to section “used test equipment”)	24, 34, 42, 46, 51.

## 2.2 Field strength of unwanted emissions 30 - 1000 MHz in transmit mode

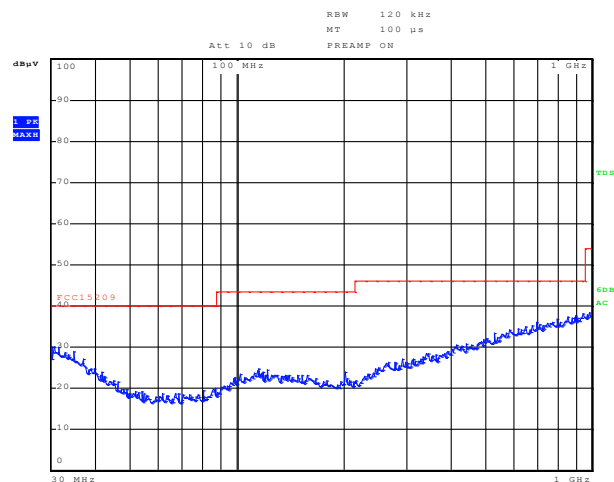
Compliance standard : FCC part 15, subpart C, section 15.209 (a) & 15.249 (d)  
 Method of test : ANSI C63.10-2009, section 6.5  
 FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.  
 EUT condition : transmit mode  
 Atmospheric pressure : Between 86 kPa and 106 kPa  
 Temperature : 24 °C  
 Relative humidity : 46 %  
 Test results :

Polarization horizontal (max. hold)

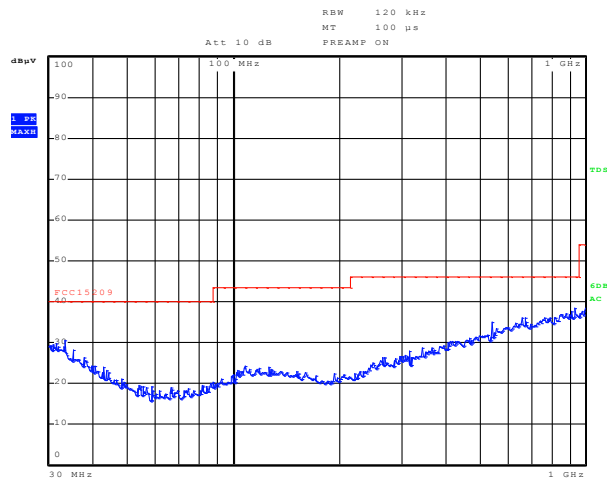
Channel 1



Channel 17

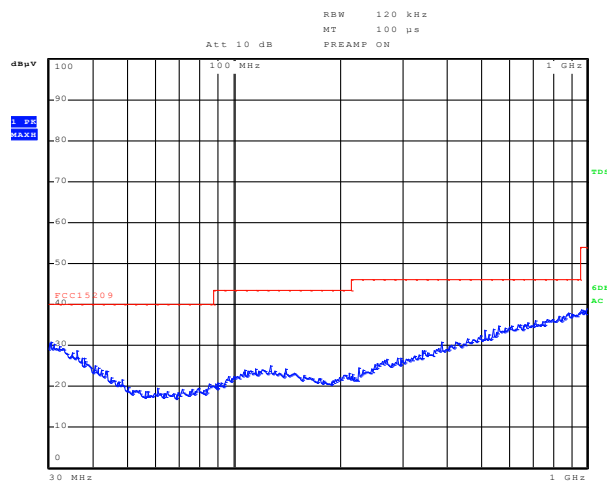


## Channel 32

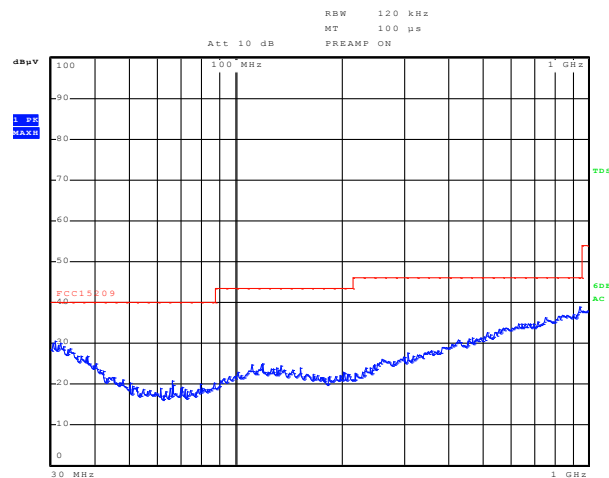


Polarization vertical (max. hold)

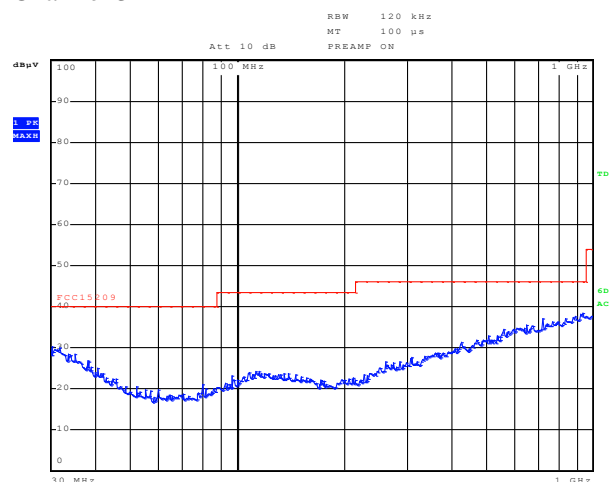
## Channel 1



## Channel 17



## Channel 32



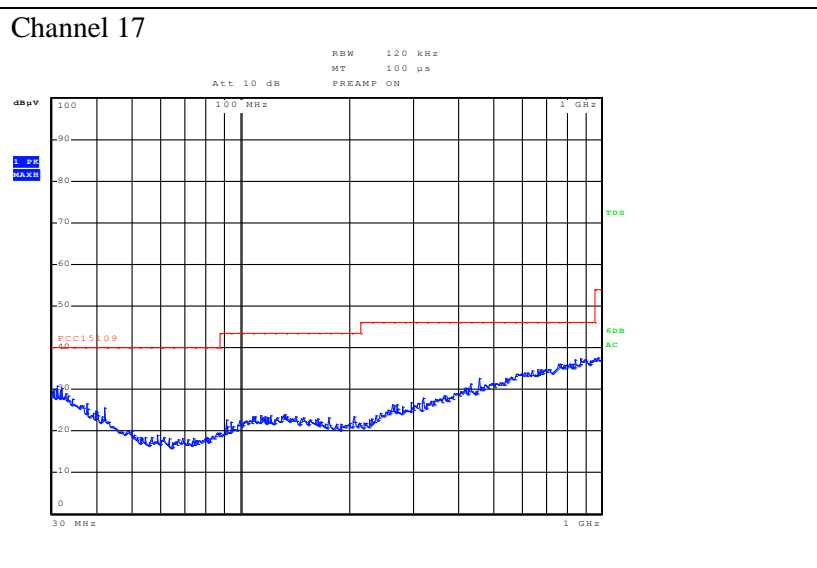
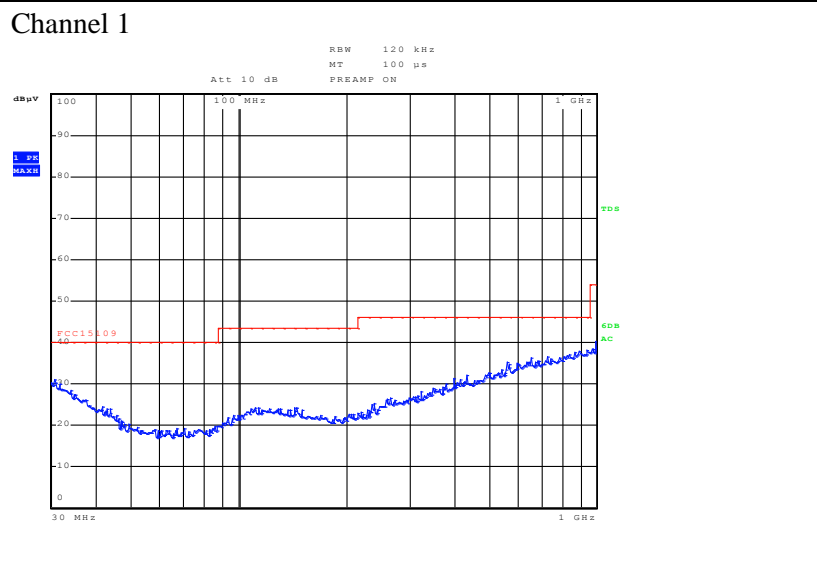
Measurement uncertainty	Vertical polarisation:	
	30 – 200 MHz	5.4 dB
	200 -1000 MHz	4.6 dB
	Horizontal polarisation:	
	30 – 200 MHz	4.5 dB
	200 -1000 MHz	3.6 dB

Measurement equipment used (item numbers refer to section “used test equipment”	34, 36, 39, 43, 50, 51.
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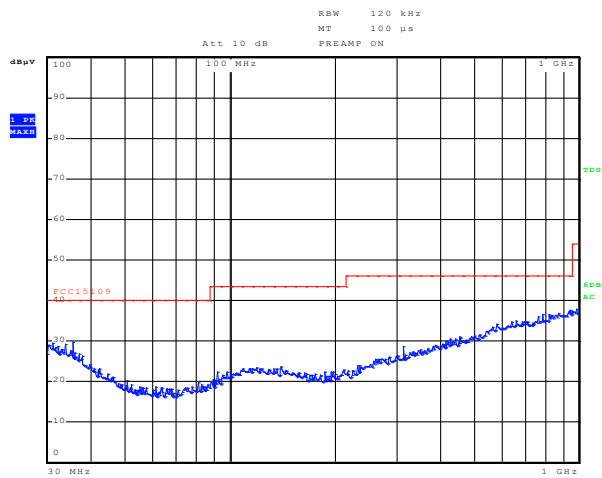
## 2.3 Field strength of unwanted emissions 30 - 1000 MHz in receive mode

Compliance standard	:	FCC part 15, subpart B, section 15.109
Method of test	:	ANSI C63.10-2009, section 6.5
		FCC part 15, subpart A, section 15.31(m), 15.33, 15.35.
EUT condition	:	receive mode
Atmospheric pressure	:	Between 86 kPa and 106 kPa
Temperature	:	24 °C
Relative humidity	:	46 %
Test results	:	

Polarization horizontal (max. hold)

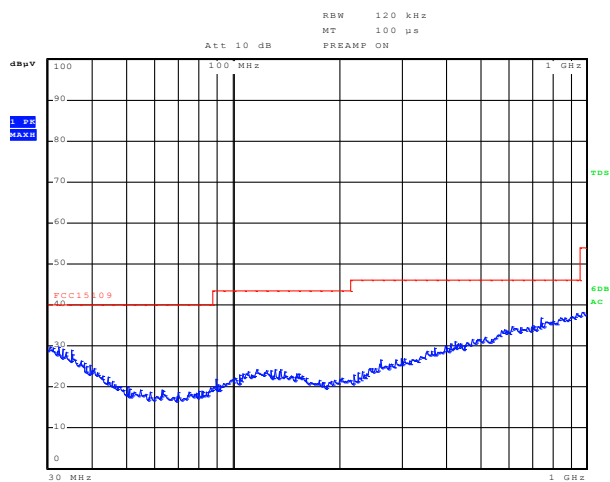


## Channel 32

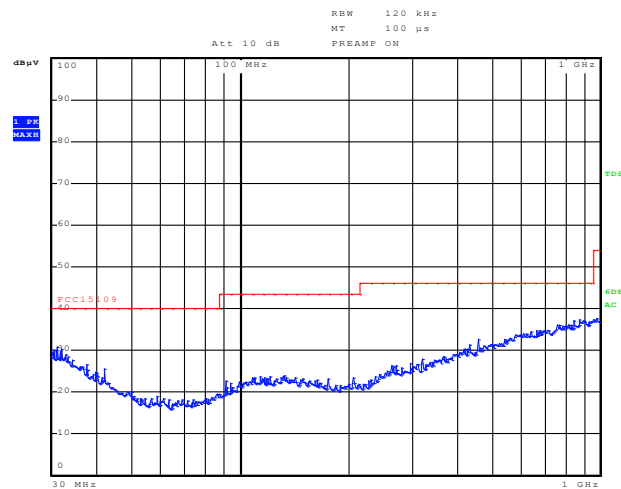


Polarization vertical (max. hold)

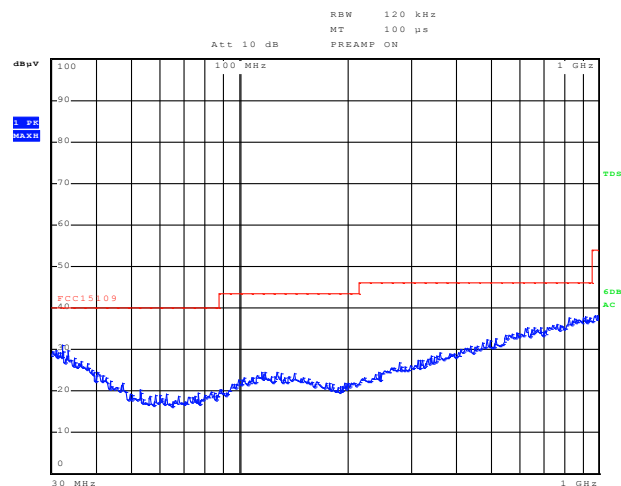
## Channel 1



## Channel 17



## Channel 32



Measurement uncertainty	Vertical polarisation:	
	30 – 200 MHz	5.4 dB
	200 -1000 MHz	4.6 dB
	Horizontal polarisation:	
	30 – 200 MHz	4.5 dB
	200 -1000 MHz	3.6 dB

Measurement equipment used (item numbers refer to section “used test equipment”)	34, 36, 39, 43, 50, 51.
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## 2.4 Average factor

Compliance standard	:	--
Method of test	:	FCC part 15, subpart C, section 15.35 (b) and (c)
EUT condition	:	transmit mode
Atmospheric pressure	:	Between 86 kPa and 106 kPa
Temperature	:	24 °C
Relative humidity	:	46 %
Test results	:	n.a.

The average field strength has been calculated by the following formula:

$$FS_{\text{average}} \text{ (dB}\mu\text{V/m)} = FS_{\text{peak}} \text{ (dB}\mu\text{V/m)} + \text{ACF (Average Correction Factor)}$$

$$\text{ACF} = 20 \log (1/x), \text{ where } x \text{ is the duty cycle in a 100 ms period.}$$

$$x = \tau / T = 1.056 \text{ ms} / 100 \text{ ms} = 1.056 \%$$

$$\text{ACF} = 20 \log (1.056/100) = -40.0 \text{ dB}$$

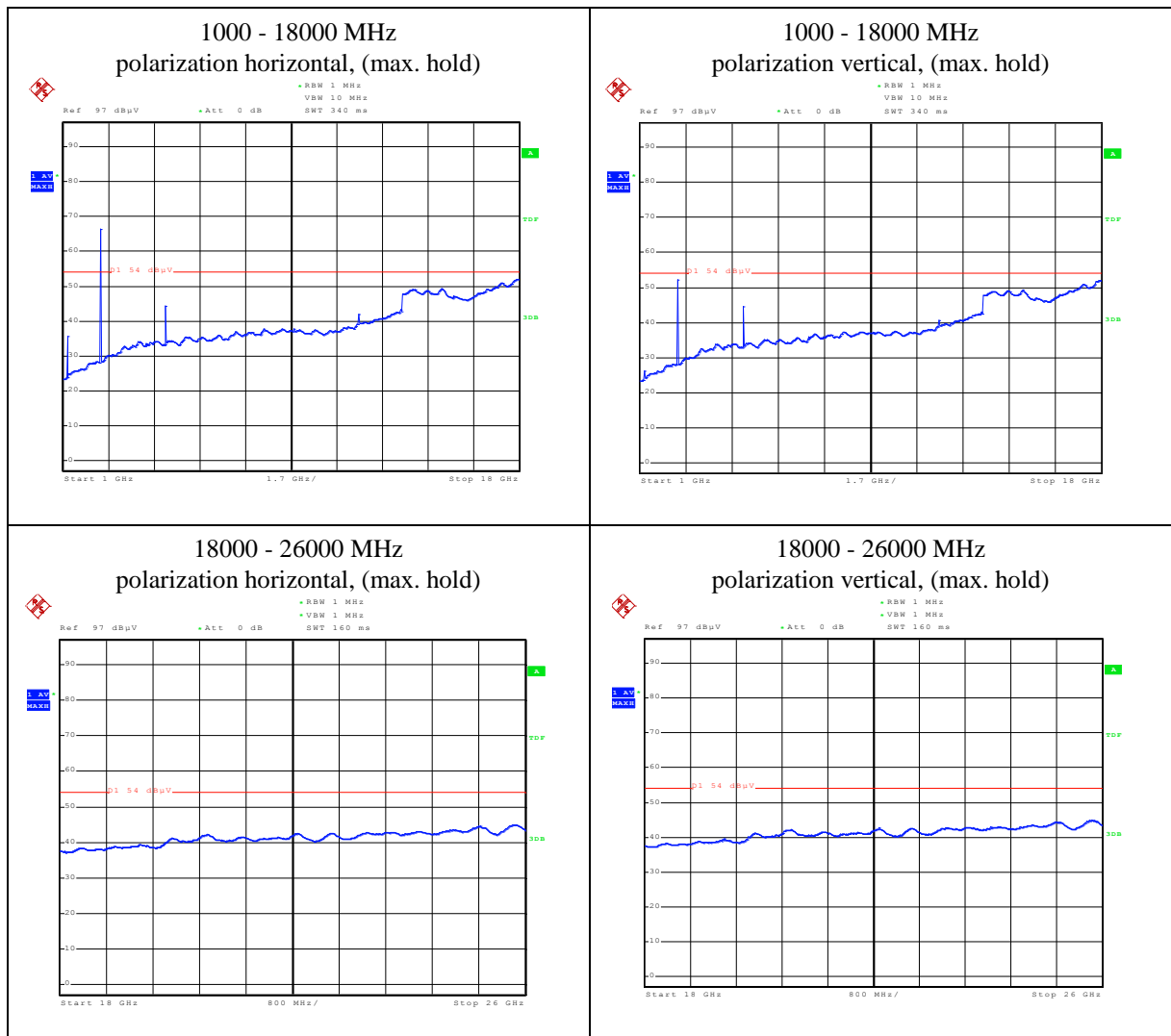


## 2.5 Field strength of unwanted emissions > 1000 MHz in transmit mode

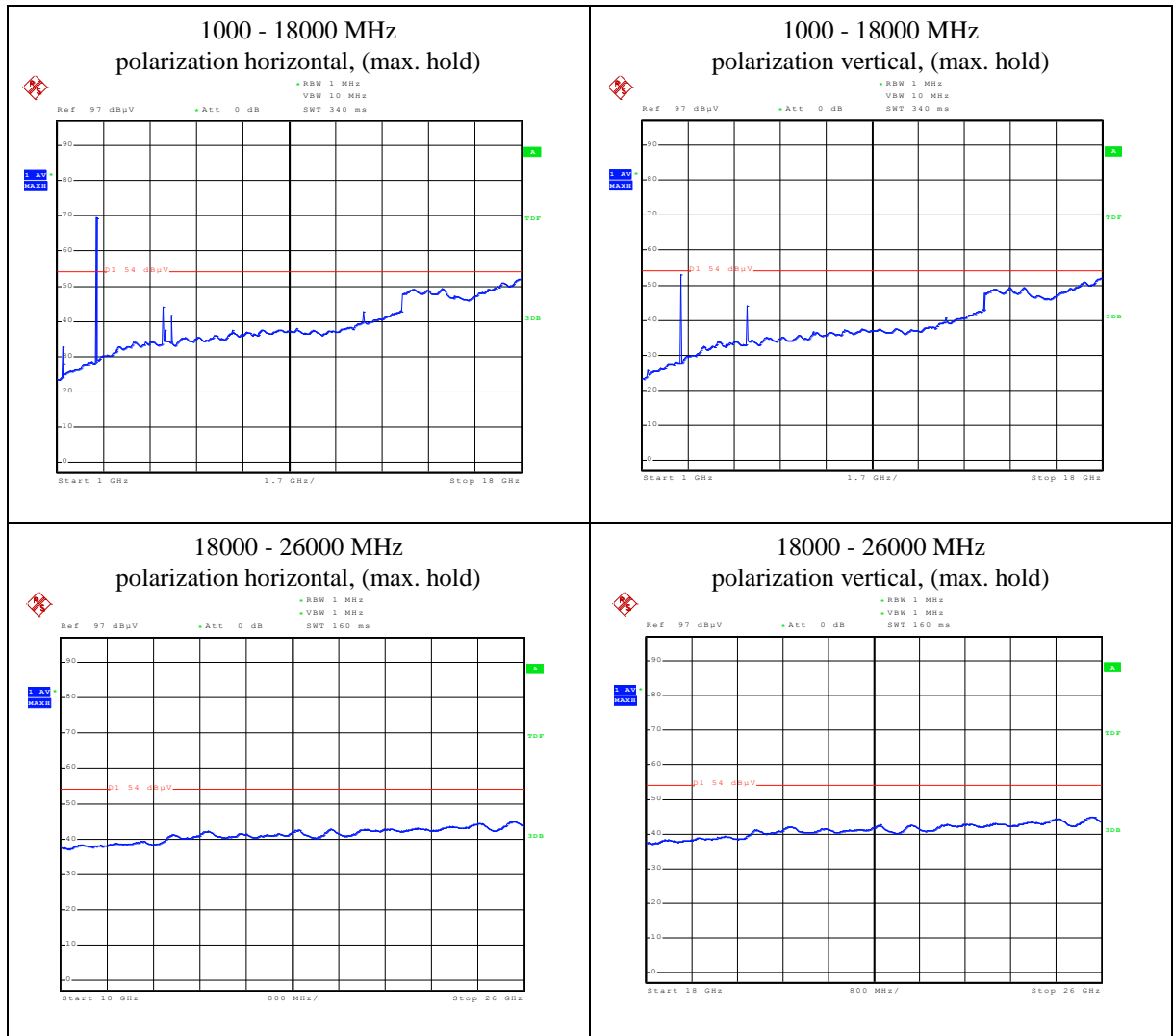
Compliance standard : FCC part 15, subpart C, section 15.209 (a)& 15.249 (a) & (e)  
 Method of test : ANSI C63.10-2009, section 6.6  
 FCC part 15, subpart A, section 15.31(m), 15.33, 15.35;  
 EUT condition : transmit mode  
 Measuring distance : 3 m  
 Atmospheric pressure : Between 86 kPa and 106 kPa  
 Temperature : 24 °C  
 Relative humidity : 46 %  
 Test results :

### Unwanted emissions transmitter (average values):

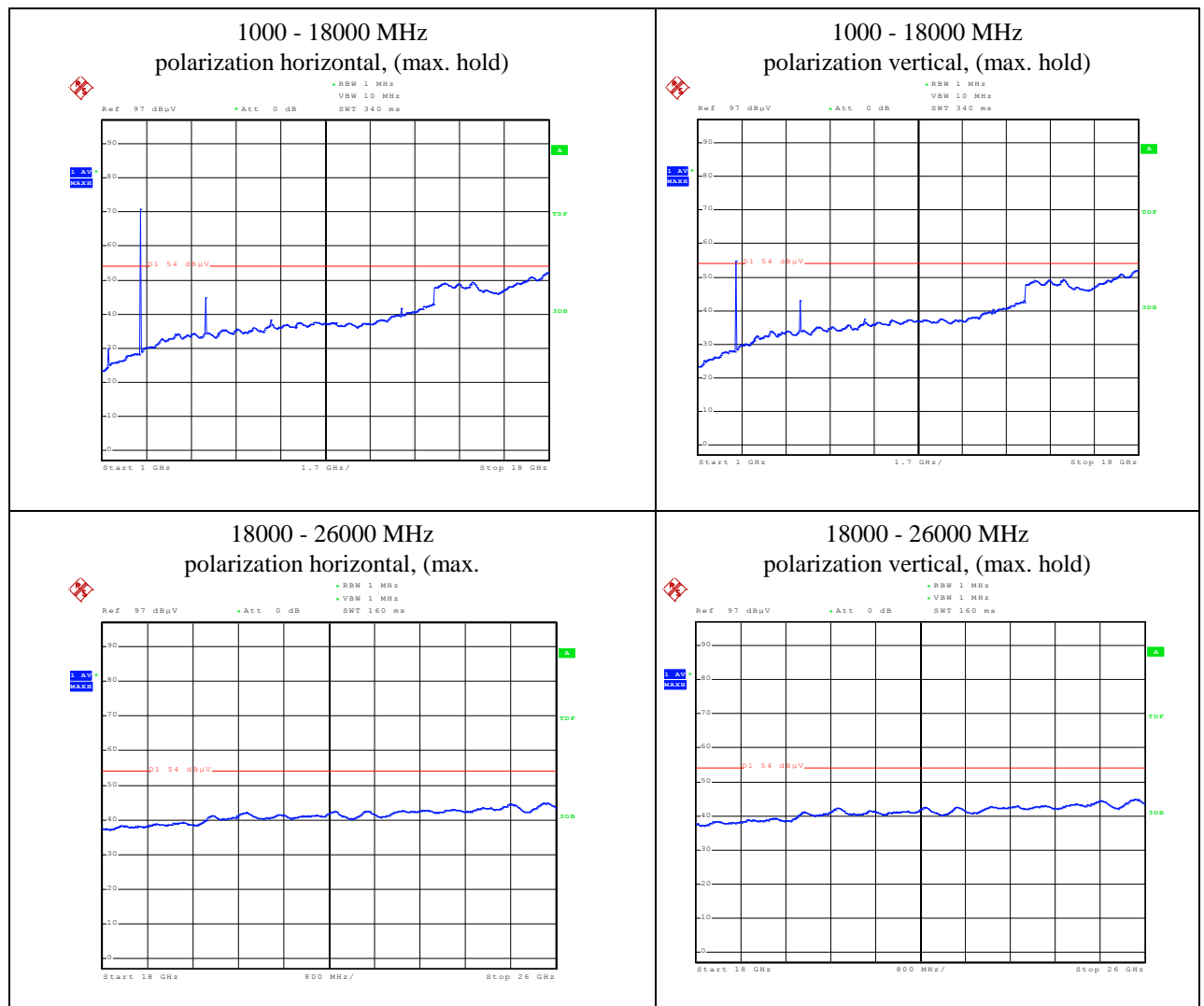
#### Channel 1



## Channel 17



## Channel 32



Measurement uncertainty

+4.5 dB / -6.1 dB.

Measurement equipment used  
(item numbers refer to section “used test equipment”)

31, 34, 42, 45, 51.

## 2.6 TX unwanted emission of harmonics, horizontal polarization

Compliance standard : FCC part 15, subpart C, section 15.249(a)  
 Method of test : ANSI C63.10-2009, section 6.6  
 FCC part 15, subpart A, section 15.31(m), 15.33, 15.35;  
 EUT condition : transmit mode  
 Atmospheric pressure : Between 86 kPa and 106 kPa  
 Temperature : 24 °C  
 Relative humidity : 46 %  
 Polarisation : horizontal

Test results :

Frequency (MHz)	Test results peak (dB $\mu$ V/m)	Average factor (dB)	Test results average (dB $\mu$ V/m)	Resolution bandwidth (MHz)	Peak limit (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)
4808	61.7	-40	21.7	1	74	54
4884	63.8	-40	23.8	1	74	54
4960	64.6	-40	24.6	1	74	54
7212	48.6	-40	8.6	1	74	54
7326	48.8	-40	8.8	1	74	54
7425	52.5	-40	12.5	1	74	54
9616	51.3	-40	11.3	1	74	54
9768	52.6	-40	12.6	1	74	54
9920	51.9	-40	11.9	1	74	54
12020	49.3	-40	9.3	1	74	54
12210	53.6	-40	13.6	1	74	54
12400	54.4	-40	14.4	1	74	54
14424	58.7	-40	18.7	1	74	54
14652	57.9	-40	17.9	1	74	54
14880	58.2	-40	18.2	1	74	54
16828	59.5	-40	19.5	1	74	54
17094	60.5	-40	20.5	1	74	54
17360	60.6	-40	20.6	1	74	54

Measurement uncertainty	+4.5 dB / -6.1 dB.
Measurement equipment used (item numbers refer to section “used test equipment”)	24, 34, 42, 46, 51.

## 2.7 TX unwanted emission of harmonics, vertical polarization

Compliance standard : FCC part 15, subpart C, section 15.249(a)  
 Method of test : ANSI C63.10-2009, section 6.6  
 FCC part 15, subpart A, section 15.31(m), 15.33, 15.35;  
 EUT condition : transmit mode  
 Atmospheric pressure : Between 86 kPa and 106 kPa  
 Temperature : 24 °C  
 Relative humidity : 46 %  
 Polarisation : vertical

Test results :

Frequency (MHz)	Test results peak (dB $\mu$ V/m)	Average factor (dB)	Test results average (dB $\mu$ V/m)	Resolution bandwidth (MHz)	Peak limit (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)
4808	64.0	-40	24.0	1	74	54
4884	60.7	-40	20.7	1	74	54
4960	59.9	-40	19.9	1	74	54
7212	49.7	-40	9.7	1	74	54
7326	47.0	-40	7.0	1	74	54
7425	50.7	-40	10.7	1	74	54
9616	49.7	-40	9.7	1	74	54
9768	51.5	-40	11.5	1	74	54
9920	50.3	-40	10.3	1	74	54
12020	57.0	-40	17.0	1	74	54
12210	55.2	-40	15.2	1	74	54
12400	52.6	-40	12.6	1	74	54
14424	58.5	-40	18.5	1	74	54
14652	57.6	-40	17.6	1	74	54
14880	58.0	-40	18.0	1	74	54
16828	59.2	-40	19.2	1	74	54
17094	59.3	-40	19.3	1	74	54
17360	60.9	-40	20.9	1	74	54

Measurement uncertainty	+4.5 dB / -6.1 dB.
-------------------------	--------------------

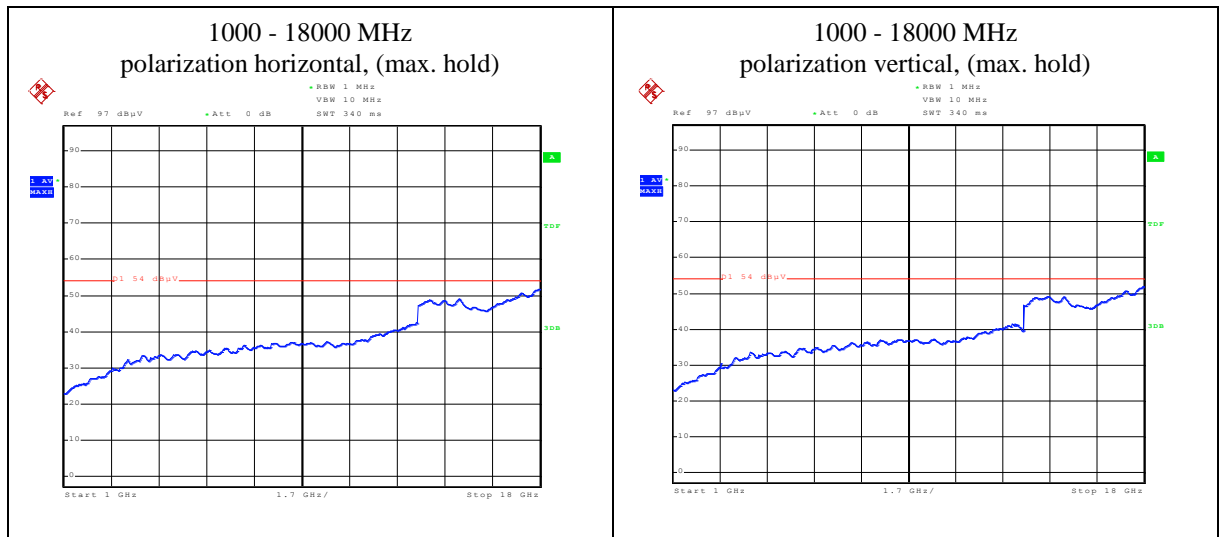
Measurement equipment used (item numbers refer to section “used test equipment”)	24, 34, 42, 46, 51.
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## 2.8 Field strength of unwanted emissions > 1000 MHz in receive mode

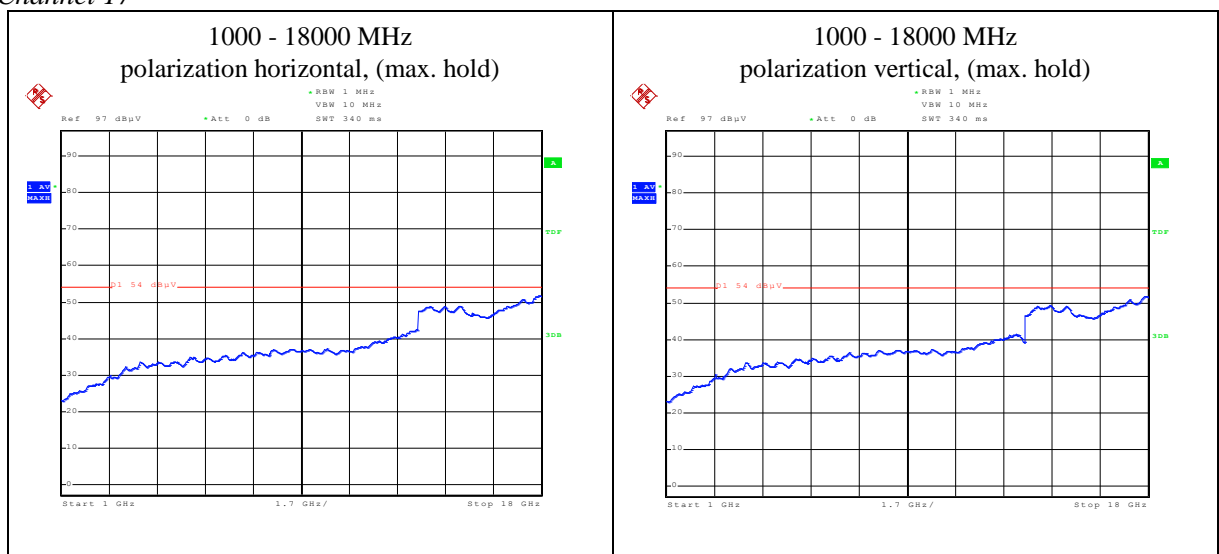
Compliance standard : FCC part 15, subpart B, section 15.109 (a)  
 Method of test : ANSI C63.10-2009, sections 6.6;  
 FCC part 15, subpart A, section 15.31(m), 15.33, 15.35;  
 EUT condition : receive mode  
 Measuring distance : 3 m  
 Atmospheric pressure : Between 86 kPa and 106 kPa  
 Temperature : 24 °C  
 Relative humidity : 46 %  
 Test results :

### Unwanted emissions receiver (average values):

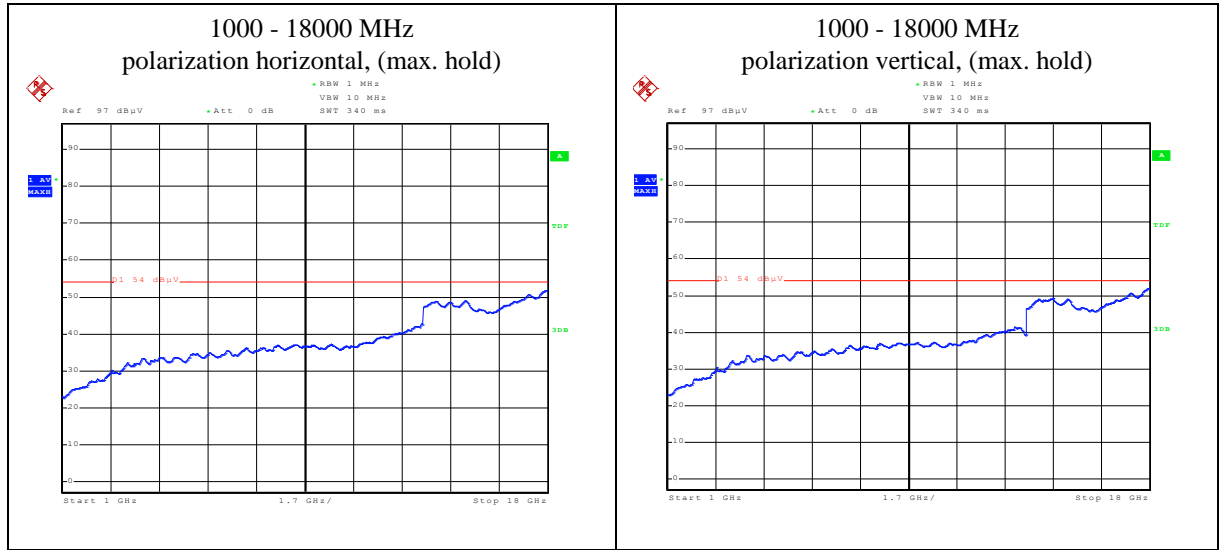
#### Channel 1



#### Channel 17



### Channel 32



Measurement uncertainty

+4.5 dB / -6.1 dB.

Measurement equipment used  
(item numbers refer to section “used test equipment”)

31, 34, 42, 45, 51.

## Used test equipment module

Item	Description	Manufacturer	Type	ID
1	Signal generator	Marconi	2042	TE 00030
2	Preamplifier 1 – 26.5 GHz	HP	8449B	TE 00092
3	Preamplifier 1 – 26.5 GHz	HP	8449B	TE 00093
4	Pre-amplifier 10 dB	R & S	ESV-Z3	TE 00097
5	Pre-amplifier 10 dB	R & S	ESV-Z3	TE 00098
6	--	--	--	--
7	Microwave amplifier	HP	HP8349A	TE 00124
8	Digital multimeter	HP	34401A	TE 00143
9	Digital multimeter	HP	3438A	TE 00215
10	Step attenuator	HP	8494A	TE 00233
11	Step attenuator	HP	8496A	TE 00234
12	Power sensor	HP	8484A	TE 00245
13	Power meter	HP	435B	TE 00249
14	Power meter	HP	437B	TE 00354
15	Power sensor	HP	8481A	TE 00355
16	--	--	--	TE 00359
17	Audio analyzer	HP	8903A	TE 00373
18	Signal generator	Marconi	2042	TE 00379
19	Digital thermometer	Fluke	51	TE 00388
20	Step attenuator	HP	8491A	TE 00403
21	Signal generator	HP	8642B	TE 00424
22	Signal generator	Marconi	2042	TE 00427
23	--	--	--	--
24	Horn antenna	EMCO	3115	TE 00531
25	Horn antenna	EMCO	3116	TE 00533
26	Biconilog antenna	EMCO	3143	TE 00700
27	Climate chamber	CTS	C-40/350	TE 00741
28	Active loop antenna	R & S	HFH2-Z2	TE 00746
29	Horn antenna	Quinstar	QWH-1900-AA	TE 00747



Item	Description	Manufacturer	Type	ID
30	Step attenuator	HP	8491A	TE 00787
31	Standard gain horn	Flann	20240-25	TE 00818
32	Power supply for amplifier	R & S	HZ-9	TE 00830
33	Power supply	Delta Elektronika	E030-1	TE 00851
34	Semi Anechoic Room	Comtest	--	TE 00861
35	Power supply	Delta Elektronika	MST030-10	TE 00886
36	Biconilog antenna	Chase	CBL6112A	TE 00967
37	Anechoic chamber	Euroshield	RFB-F-100	TE 01064
38	Triple loop antenna	Telefication	--	TE 01066
39	Temp / RH logger	ATAL	EPD-TRH-INT	TE 01224
40	Broadband resistive power divider	Weinschel	1506A	TE 01120
41	Broadband resistive power divider	Weinschel	1506A	TE 01122
42	Spectrum analyser	R & S	FSP 40	TE 11125
43	EMI test receiver	R & S	ESCI	TE 11128
44	---	--	--	--
45	Pre-amplifier	Miteq	JS4-18004000	TE 11131
46	Low noise amplifier	Miteq	AFS42-041001800	TE 11132
47	Antenna tower	Heinrich Deisel	AS 620P	ANEC
48	Turntable	Heinrich Deisel	DS-412	ANEC
49	Turntable controller	Heinrich Deisel	HD-050	ANEC
50	Antenna mast	EMCO	1070	SAR
51	Turn table	EMCO	1060-2M	SAR
52	Near field probe	--	--	--
53	Digital multimeter	Fluke	87	TE 00257
54	Variable transformer	KSL	RU8	TE 00904
55	Two line V-network	R & S	ESH3-Z5	TE 00208
56	Pulse limiter	R & S	ESH3-Z2	TE 00756