



InterLab®

GSM/UMTS Module MO0401

Report Reference: MDE_OPTI_0810_FCC15b

Date: Juli 11, 2008

Test Laboratory:

7 layers AG
Borsigstr. 11
40880 Ratingen
Germany

Note:

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

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DAT-P-192/99-01

Registergericht • registered in:
Düsseldorf, HRB 44096
USt-IdNr • VAT No:
DE 203159652
TAX No. 147/5869/0385

1 Administrative Data

1.1 Project Data

Project Responsible: Yao Jing
Date Of Test Report: 2008/07/11
Date of first test: 2008/07/08
Date of last test: 2008/07/08

1.2 Applicant Data

Company Name: Option NV
Street: Gaston Geenslaan 14
City: 3001 Leuven
Country: Belgium
Contact Person: Mr. Thomas Gulinck
Phone: +32 16 317 411
E-Mail: T.Gulinck@option.com

1.3 Test Laboratory Data

The following list shows all places and laboratories involved for test result generation:

7 layers DE

Company Name : 7 layers AG
Street : Borsigstrasse 11
City : 40880 Ratingen
Country : Germany
Contact Person : Mr. Michael Albert
Phone : +49 2102 749 201
Fax : +49 2102 749 444
E Mail : michael.albert@7Layers.de

Laboratory Details

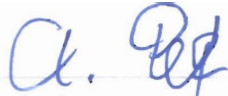
<i>Lab ID</i>	<i>Identification</i>	<i>Responsible</i>	<i>Accreditation Info</i>
Lab 1	Conducted Emissions	Mr. Robert Machulec Mr. Andreas Petz	DAR-Registration no. DAT-P-192/99-01
Lab 2	Radiated Emissions	Mr. Robert Machulec Mr. Andreas Petz	DAR-Registration no. DAT-P-192/99-01

1.4 Signature of the Testing Responsible



Michael Küppers
responsible for tests performed in: Lab 1, Lab 2

1.5 Signature of the Accreditation Responsible



Accreditation scope responsible person
responsible for Lab 1, Lab 2



7 layers AG, Borsigstr. 11
40880 Ratingen, Germany
Phone +49 (0)2102 749 0

2 Test Object Data

2.1 General OUT Description

The following section lists all OUTs (Object's Under Test) involved during testing.

OUT: M00401

Type / Model / Family:	GSM/UMTS Module M00401
Product Category:	Module
Manufacturer:	
Company Name:	Option NV
Street:	Gaston Geenslaan 14
City:	3001 Leuven
Country:	Belgium
Contact Person:	Mr. Stefan Lodeweyckx
Fax:	0032 16 207 164

2.2 Detailed Description of OUT Samples

Sample : d02

OUT Identifier	M00401		
Sample Description			
Serial No.	PM2485W00H		
HW Status	2.1		
SW Status	1.3.2.0Hd		
Low Voltage	3.0 V	Low Temp.	-10 °C
High Voltage	3.6 V	High Temp.	+55 °C
Nominal Voltage	3.6 V	Normal Temp.	+23 °C

2.3 OUT Features

Features for OUT: MO0401

<i>Designation</i>	<i>Description</i>	<i>Allowed Values</i>	<i>Supported Value(s)</i>
Features for scope: FCC_v2			
AC	EUT is powered by AC		
Dant	removable antenna supplied and type tested with the radio equipment, designed as an example part of the equipment		
DC	EUT is powered by DC		
EDGE850	EUT supports EDGE in the band 824 MHz - 849 MHz		
EDGE1900	EUT supports EDGE in the band 1850 MHz - 1910 MHz		
GSM850	EUT supports GSM850 band 824MHz - 849MHz		
PantC	permanent fixed antenna connector, which may be built-in, designed as an indispensable part of the equipment		
PCS1900	EUT supports PCS1900 band 1850MHz - 1910MHz		

2.4 Auxiliary Equipment

<i>AE No.</i>	<i>Type Designation</i>	<i>Serial No.</i>	<i>HW Status</i>	<i>SW Status</i>	<i>Description</i>
AE Ant01					Telsa antenna
AE ACadap	ADP-80NB	CP293661-01			AC Adapter
AE key	CHERRY RS 6000	G 0000273 2P28			keyboard
AE Printer	EPSON Stylus C84 (B251A)	FBPT048906			Printer
AE Laptop	Fujitsu Siemens Lifebook C1410	YK5T053232			Laptop 7L-OPTI-LAP-05
AE TFT	LG Flatron L1740BQ	509WANF1W607			TFT display
AE 024	Pepijn V1.0		V1.0		Test Cradle

2.5 Operating Mode(s)

<i>Ref.-No.</i>	<i>Description</i>
TCH190	Device is transmitting on traffic channel 190, GSM850.
TCH661	Device is transmitting on traffic channel 661, GSM1900.

2.6 Setups used for Testing

For each setup a relation is given to determine if and which samples and auxiliary equipment is used. The left side list all OUT samples and the right side lists all auxiliary equipment for the given setup.

<i>Setup No.</i>	<i>List of OUT samples</i>		<i>List of auxiliary equipment</i>	
<i>Sample No.</i>	<i>Sample Description</i>		<i>AE No.</i>	<i>AE Description</i>
D02_FCC15b (set-up for FCC 15b tests with peripheral equipment)				
<i>Sample: d02</i>			AE Ant01	Telsa antenna
			AE ACadap	AC Adapter
			AE key	keyboard
			AE Printer	Printer
			AE Laptop	Laptop 7L-OPTI-LAP-05
			AE TFT	TFT display
			AE 024	Test Cradle

3 Results

3.1 General

Documentation of tested devices:

Available at the test laboratory.

Interpretation of the test results:

The results of the inspection are described on the following pages, where 'Conformity' or 'Passed' means that the certification criteria were verified and that the tested device is conform to the applied standard.

In cases where 'Declaration' is printed, the required documents are available in the manufacturers product documentation.

In cases where 'not applicable' is printed, the test case requirements are not relevant to the specific equipment implementation.

3.2 List of the Applicable Body

(Body for Scope: FCC_v1)

<i>Designation</i>	<i>Description</i>
FCC47CFRChIPART15bRADIO FREQUENCY DEVICES	Subpart B - Unintentional Radiators

3.3 List of Test Specification

<i>Test Specification:</i>	FCC part 2 and 15
<i>Date / Version</i>	2007/10/01 Version: 10-1-07 Edition
<i>Title:</i>	PART 2 - GENERAL RULES AND REGULATIONS PART 15 - RADIO FREQUENCY DEVICES

3.4 Summary

<i>Test Case Identifier / Name Test (condition)</i>	<i>Result</i>	<i>Date of Test</i>	<i>Lab Ref.</i>	<i>Setup</i>
15b.1 Conducted Emissions (AC Power Line) §15.107				
15b.1 Conducted Emissions (AC Power Line)	Passed	2008/07/08	Lab 1	D02_FCC15b
	operating mode: TCH190			
15b.2 Spurious Radiated Emissions §15.109				
15b.2 Spurious Radiated Emissions	Passed	2008/07/08	Lab 2	D02_FCC15b
	operating mode: TCH661			

3.5 Detailed Results

3.5.1 15b.1 Conducted Emissions (AC Power Line) §15.107

Test: 15b.1 Conducted Emissions (AC Power Line)

Result: Passed
Setup No.: D02_FCC15b
Date of Test: 2008/07/08 9:55
Body: FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
Test Specification: FCC part 2 and 15
Test Equipment Environmental Conditions
 Temperature: 26°C
 Air Pressure: 1005hPa
 Rel. Humidity: 41%

Detailed Results:

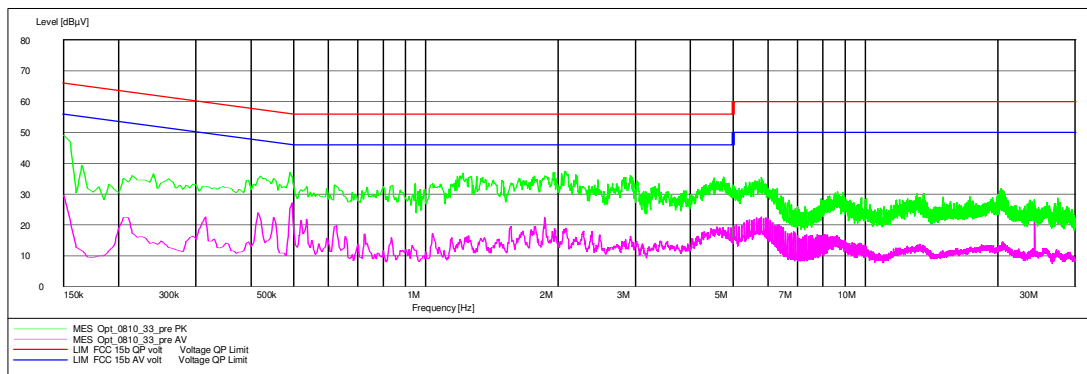
AC MAINS CONDUCTED

Diagram No. : 1.01

EUT: MO0401 (37430d02)
 Manufacturer: Option NV
 Operating Condition: GSM 850 TCH 190
 Test Site: 7 layers Ratingen
 Operator: Groe
 Test Specification: ANSI C63.4; FCC 15.107 / 15.207
 Comment:
 Start of Test: 08.07.2008 / 06:18:09

SCAN TABLE: "FCC Voltage"

Short Description:	FCC Voltage
Start	Detector
Stop	Meas. IF
Step	Transducer
Frequency	Time Bandw.
150.0 kHz	30.0 MHz
5.0 kHz	MaxPeak 20.0 ms
	Average 9 kHz
	ESH3-25



3.5.2 15b.2 Spurious Radiated Emissions §15.109

Test: 15b.2 Spurious Radiated Emissions

<i>Result:</i>	Passed
<i>Setup No.:</i>	D02_FCC15b
<i>Date of Test:</i>	2008/07/08 9:58
<i>Body:</i>	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
<i>Test Specification:</i>	FCC part 2 and 15
<i>Test Equipment Environmental Conditions</i>	
<i>Temperature:</i>	25°C
<i>Air Pressure:</i>	1007hPa
<i>Rel. Humidity:</i>	44%

Detailed Results:

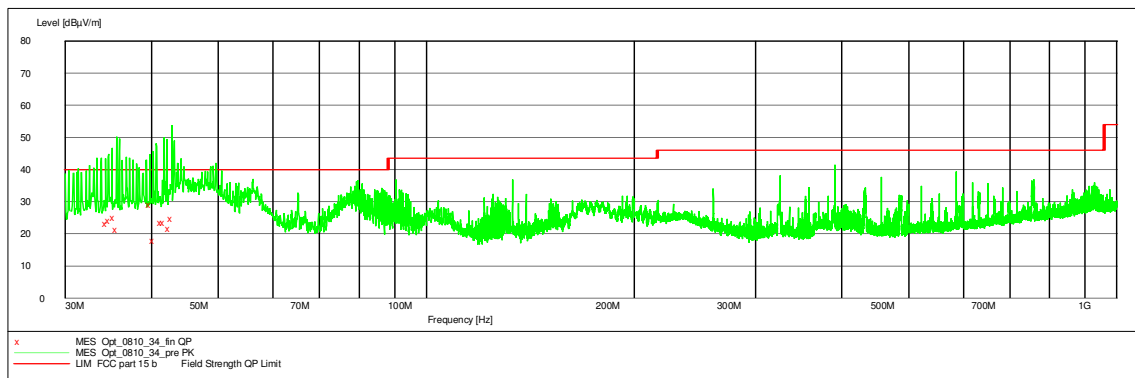
EMI RADIATED TEST

Diagram No. : 2.01

EUT: MO0401 (37430d02)
 Manufacturer: Option NV
 Operating Condition: GSM 1900 TCH 661, normal voltage = 3.6V
 Test Site: 7 layers, Ratingen
 Operator: Dsch
 Test Specification: FCC part 15 b
 Comment: Horizontal EUT position
 Start of Test: 08.07.2008 / 07:43:21

SCAN TABLE: "FCC part 15 b"

Short Description: FCC part 15 b
 Start Stop Step Detector Meas. IF Transducer
 Frequency Frequency Width Time Bandw.
 30.0 MHz 1.0 GHz 60.0 kHz MaxPeak 1.0 ms 120 kHz HL562



MEASUREMENT RESULT: "Opt_0810_34_fin_QP"

08.07.2008 08:49

Frequency MHz	Level dBuV/m	Transd dB	Limit dBuV/m	Margin dB	Height cm	Azimuth deg	Polarisation
34.680000	23.10	17.8	40.0	16.9	164.0	292.00	VERTICAL
35.040000	24.20	17.5	40.0	15.8	125.0	297.00	VERTICAL
35.580000	25.10	17.2	40.0	14.9	125.0	319.00	VERTICAL
35.940000	21.20	16.9	40.0	18.8	142.0	311.00	VERTICAL
40.200000	29.00	14.5	40.0	11.0	193.0	125.00	VERTICAL
40.620000	17.90	14.3	40.0	22.1	150.0	324.00	VERTICAL
41.700000	23.50	13.7	40.0	16.5	223.0	136.00	VERTICAL
42.120000	23.60	13.4	40.0	16.4	223.0	123.00	VERTICAL
42.840000	21.80	13.0	40.0	18.2	127.0	326.00	VERTICAL
43.140000	24.60	12.8	40.0	15.4	397.0	309.00	VERTICAL

4.2 Additional Information for Report



set-up for conducted tests



set-up for radiated tests

Test Description

Conducted emissions (AC power line)

Standard FCC Part 15, 10-1-07
Subpart B

The test was performed according to: ANSI C 63.4, 2003

Test Description

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2003. The Equipment Under Test (EUT) was setup in a shielded room to perform the conducted emissions measurements in a typical installation configuration. The EUT was powered from 50 μ H || 50 Ohm Line Impedance Stabilization Network (LISN). The LISN's unused connections were terminated with 50 Ohm loads.

The measurement procedure consists of two steps. It is implemented into the EMI test software ES-K1 from R&S.

Step 1: Preliminary scan

Intention of this step is, to determine the conducted EMI-profile of the EUT.

EMI receiver settings:

- Detector: Peak - Maxhold
- Frequency range: 150 kHz – 30 MHz
- Frequency steps: 5 kHz
- IF-Bandwidth: 9 kHz
- Measuring time / Frequency step: 20 ms
- Measurement on phase + neutral lines of the power cords

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2: Final measurement

Intention of this step is, to determine the highest emissions with the settings defined in the test specification for the frequencies identified in step 1.

EMI receiver settings:

- Detector: Quasi-Peak
- IF - Bandwidth: 9 kHz
- Measuring time: 1 s / frequency

At each frequency determined in step 1, four measurements are performed in the following combinations:

- 1) Neutral lead - reference ground (PE grounded)
- 2) Phase lead - reference ground (PE grounded)
- 3) Neutral lead - reference ground (PE floating)
- 4) Phase lead - reference ground (PE floating)

The highest value is reported.

Test Requirements / Limits

FCC Part 15, Subpart B, §15.107

Frequency Range (MHz)	QP Limit (dB μ V)	AV Limit (dB μ V)
0.15 – 0.5	66 to 56	56 to 46
0.5 – 5	56	46
5 – 30	60	50

Used conversion factor: Limit (dB μ V) = 20 log (Limit (μ V)/1 μ V).

NOTE: a missing result table in the corresponding test report section means, that no final measurement was performed because no relevant frequencies (peaks) were found in the preliminary scan.

Spurious radiated emissions

Standard FCC Part 15, 10-1-07
Subpart B

The test was performed according to: ANSI C 63.4, 2003

Test Description

Measurement below 1 GHz:

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2003.

The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna.

The radiated emissions measurements were made in a typical installation configuration.

The measurement procedure is implemented into the EMI test software ES-K1 from R&S.

Step 1: Preliminary scan (test to identify the highest amplitudes relative to the limit)

Intention of this step is, to determine the radiated EMI-profile of the EUT.

Settings for step 1:

- Detector: Peak-Maxhold
- Frequency range: 30 – 1000 MHz
- Frequency steps: 60 kHz
- IF-Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 μ s
- Turntable angle range: -180° to 180°
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2:

A further measurement will be performed on the frequencies determined in step 1. Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.

Settings for step 2:

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: -180° to 180°
- Turntable step size: 45°
- Height variation range: 1 – 4 m
- Height variation step size: 0.5 m
- Polarisation: horizontal + vertical

After this step the EMI test system has determined the following values for each frequency (of step 1):

- Frequency
- Azimuth value (of turntable)
- Antenna height

The last two values have now the following accuracy:

- Azimuth value (of turntable): 45°
- Antenna height: 0.5 m

Step 3: final measurement

In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum value of every frequency.

For each frequency, which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will be slowly varied by $\pm 22.5^\circ$ around this value. During this action the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position the antenna height is also slowly varied by ± 25 cm around the antenna height determined. During this action the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100ms
- Turntable angle range: -22.5° to $+ 22.5^\circ$ around the determined value
- Height variation range: -0.25m to + 0.25m around the determined value

Step 4: Final measurement (with QP detector)

With the settings determined in step 3, the final measurement will be performed:

EMI receiver settings for step 4:

- Detector: Quasi-Peak(< 1GHz)
- Measured frequencies: in step 3 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

Measurement above 1 GHz:

The following modifications apply to the measurement procedure for the frequency range above 1 GHz: The measurement distance was reduced to 1 m. The results were extrapolated by the extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements, inverse-linear-distance-squared for the power density measurements). Due to the fact that in this frequency range a double ridged wave guided horn antenna (up to 18 GHz) and a horn antenna (18–25 GHz) are used, the steps 2-4 as described before, are omitted. Step 1 was performed at one height of the receiving antenna only.

Detector: Peak, Average (simultaneously)

RBW = VBW = 1 MHz; above 7 GHz 100 kHz

Test Requirements / Limits

FCC Part 15, Subpart B, §15.109, Radiated Emission Limits

Frequency Range (MHz): Class B Limit (dBµV/m)

Frequency Range (MHz)	Class B Limit (dBµV/m)
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
above 960	54.0

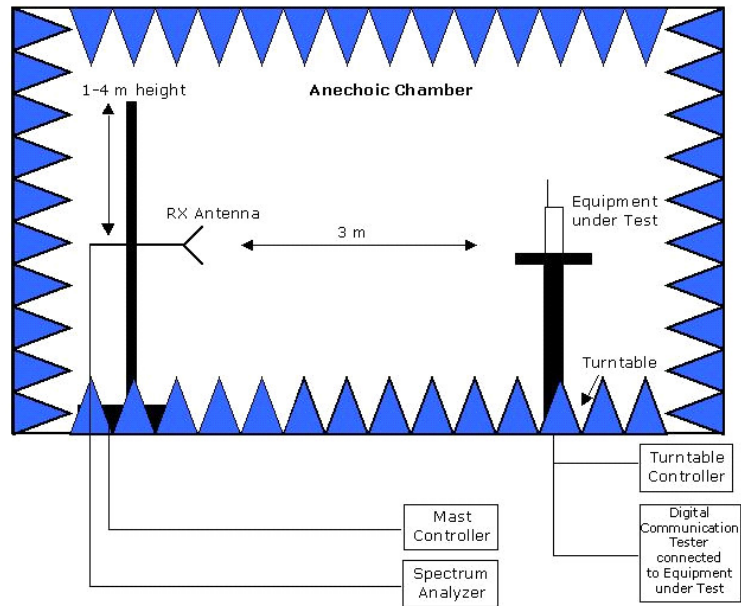
§15.35(b)

..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....

Used conversion factor: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

NOTE: a missing result table in the corresponding test report section means, that no final measurement was performed because no relevant frequencies (peaks) were found in the preliminary scan.

Setup Drawings



Remark: Depending on the frequency range suitable antenna types, attenuators or preamplifiers are used.

Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting ground plane.

Test Equipment

EUT Digital Signalling System

Equipment	Type	Serial No.	Manufacturer	Last Cal	Next cal
Digital Radio Communication Tester	CMD 55	831050/020	Rohde & Schwarz	01.12.05	01.12.08
Signalling Unit for Bluetooth	PTW60	100004	Rohde & Schwarz	-	-
Universal Radio Communication Tester	CMU200	102366	Rohde & Schwarz	22.09.07	22.09.09

EMI Test System

Equipment	Type	Serial No.	Manufacturer	Last Cal	Next cal
Comparison Noise Emitter	CNE III	99/016	York	-	-
EMI Analyzer	ESI 26	830482/004	Rohde & Schwarz	06.12.07	06.12.09
Signal Generator	SMR 20	846834/008	Rohde & Schwarz	05.12.07	05.12.09
AC Power Source	6404	64040000B04	Croma ATE INC.	01.06.08	N/A the parameters will be checked before testing

EMI Radiated Auxiliary Equipment

Equipment	Type	Serial No.	Manufacturer	Last Cal	Next cal
Antenna mast 4m	MA 240	240/492	HD GmbH H. Deisel	-	-
Biconical dipole	VUBA 9117	9117108	Schwarzbeck	02.07.03	02.07.08
Broadband Amplifier 18MHz-26GHz	JS4- 18002600 -32	849785	Miteq	06.02.08	06.08.08
Broadband Amplifier 30MHz-18GHz	JS4- 00101800 -35	896037	Miteq	06.02.08	06.08.08
Broadband Amplifier 45MHz-27GHz	JS4- 00102600 -42	619368	Miteq	06.02.08	06.08.08
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2 W38.01-2	Kabel Kusch	06.02.08	06.08.08
Cable "ESI to Horn Antenna"	UFB311A UFB293C	W18.02-2 W38.02-2	Rosenberger- Microcoax	06.02.08	06.08.08
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz	12.05.06	12.05.08
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz	20.01.04	N/A - spare antenna
High Pass Filter	5HC3500/ 12750- 1.2-KK	200035008	Trilithic	06.02.08	06.08.08
High Pass Filter	5HC2700/ 12750- 1.5-KK	9942012	Trilithic	06.02.08	06.08.08
High Pass Filter	4HC1600/ 12750- 1.5-KK	9942011	Trilithic	06.02.08	06.08.08
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz	17.05.06	17.05.09
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz	19.08.02	N/A - only used for pre-testing
Pyramidal Horn Antenna 26.5 GHz	Model 3160-09	9910-1184	EMCO	06.02.08	06.08.08

EMI Conducted Auxiliary Equipment

Equipment	Type	Serial No.	Manufacturer	Last Cal	Next cal
Cable "LISN to ESI"	RG214	W18.03+W48.03	Huber+Suhner	06.02.08	06.08.08
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz	01.11.05	01.11.08
Two-Line V-Network	ESH 3-Z5	829996/002	Rohde & Schwarz	-	-

Auxiliary Test Equipment – calibration not applicable; spare equipment

Equipment	Type	Serial No.	Manufacturer	Last Cal	Next cal
Broadband Resist. Power Divider N	1506A / 93459	LM390	Weinschel	-	-
Broadband Resist. Power Divider SMA	1515 / 93459	LN673	Weinschel	-	-
Digital Multimeter 01	Voltcraft M-3860M	IJ096055	Conrad	-	-
Digital Multimeter 02	Voltcraft M-3860M	IJ095955	Conrad	-	-
Digital Oscilloscope	TDS 784C	B021311	Tektronix	-	-
Fibre optic link Satellite	FO RS232 Link	181-018	Pontis	-	-
Fibre optic link Transceiver	FO RS232 Link	182-018	Pontis	-	-
I/Q Modulation Generator	AMIQ-B1	832085/018	Rohde & Schwarz	-	-
Notch Filter ultra stable	WRCA800 /960-6E	24	Wainwright	-	-
Spectrum Analyzer 9 kHz to 3 GHz	FSP3	838164/004	Rohde & Schwarz	-	-
Temperature Chamber	VT 4002	58566002150010	Vötsch	-	-
Temperature Chamber	KWP 120/70	59226012190010	Weiss	-	-
ThermoHygro Datalogger 03	Opus10 THI (8152.00)	7482	Lufft Mess- und Regeltechnik GmbH	-	-

Anechoic Chamber – calibration not applicable

Equipment	Type	Serial No.	Manufacturer	Last Cal	Next cal
Air Compressor (pneumatic) Controller	CO 2000	CO2000/328/12470406/L	Atlas Copco Innco innovative constructions GmbH	-	-
EMC Camera	CE-CAM/1		CE-SYS	-	-
EMC Camera for observation of EUT	CCD-400E	0005033	Mitsubishi	-	-
Filter ISDN	B84312-C110-E1		Siemens & Matsushita	-	-
Filter telephone systems / modem	B84312-C40-B1		Siemens & Matsushita	-	-
Filter Universal 1A	B84312-C30-H3		Siemens & Matsushita	-	-
Fully/Semi AE Chamber	10.58x6.3 8x6		Frankonia	-	-
Turntable	DS 420S	420/573/99	HD GmbH, H.Deisel	-	-
Valve Control Unit (pneum.)	VE 615P	615/348/99	HD GmbH, H.Deisel	-	-

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