

CETECOM ICT Services GmbH

Radio Satellite Communication

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RSC14

issue test report consist of 41 Pages

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TTI-P-G-166/98-30

Accredited Bluetooth Test Facility (BQTF)

**Addendum to
Test report no.: 1_0138-A/01-1-3
FCC Part 24 / 15.247
NPL-1**

CETECOM – ICT Services GmbH
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1 General Information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

1.2 Test Laboratory

CETECOM ICT Services GmbH

Untertürkheimer Straße 6 - 10

66117 Saarbrücken

Germany

Telephone : + 49 681 598 - 0

Telefax : + 49 681 598 - 9075

E-mail : Harro.Ames@ict.cetecom.de

Internet : www.cetecom.de

Accredited testing laboratory

DAR-registration number : TTI-P-G-166/98-30

Accredited Bluetooth™ Test Facility (BQTF)

BLUETOOTH™ is a trademark owned by Bluetooth SIG, Inc. and licensed to CETECOM

1.3 Details of Applicant

Name : Nokia Mobile Phones
Street : Wilhelm-Runge-Str. 11
City : D-89081 Ulm
Country : Germany
Telephone : +49 (0) 731 505-08
Telefax : +49 (0) 731 505-68 06
Contact : Mr. Thomas Reitmayer
Telephone : +49 (0) 731 505-67 28

1.4 Application Details

Date of receipt of application : 20.11.01
Date of receipt of test item : 20.11.01
Date of test : 20.-22.11.01

1.5 Test Item

Type of equipment : **GSM Tri Band Mobile Phone with integrated BLUETOOTH module**
Type designation : NPL-1
Manufacturer : Applicant
Street :
City :
Country :
IMEI : 004400.00.161068.0
Additional information :
Frequency : GSM 1900 :1850 – 1910 MHz and Bluetooth 2402 – 2480 MHz
Type of modulation : GSM 1900 : 300KF2D Bluetooth : 1M00FXD / 79M0FXD
Number of channels : GSM 1900 : 300 Bluetooth : 79
Antenna : Integral antenna and socket
Power supply : 3.6 VDC accu Li-Polymer
Output power : GSM 1900 : 29.5 dBm Peak, Bluetooth : 1,88mW
Type of equipment : Temperature range : -30°C - +60°C
FCC – ID : PPINPL-1
Hardware : B3.0
Software : 2.08

1.6 Test Standards: FCC Part 24 / FCC Part 15.247

2 Technical Test

2.1 Summary of Test Results

This addendum was made to show compliance to radiated emissions in worst-case conditions during use with external charger (ACP-12), ear-phone (HDC-9P) and simultaneous transmit at 1900 and 2400 MHz.

The tests were performed radiated from 30 to 25000 MHz and conducted from 450 kHz to 30 MHz

No deviations from the technical specification(s) were ascertained in the course of the tests performed.

Technical Responsibility for Area of Testing :

11.12.01	RSC 8411	Berg M.
Date	Section	Name


Signature

Technical Responsibility for Area of Testing :

11.12.01	RSC8414	Ames H.
Date	Section	Name


Signature

2.2 Test Report

TEST REPORT

Addendum to Test Report no. : 1_0138-A/01-1-3

TEST REPORT REFERENCE

LIST OF MEASUREMENTS

PARAMETER TO BE MEASURED	Paragraph	PAGE
EMISSIONS LIMITS	§ 24.238	7
CONDUCTED EMISSIONS	§ 15.107/207	22
TEST SITE		28
PHOTOGRAPHS OF THE EQUIPMENT		32

EMISSIONS LIMITS

§24.238

Measurement Procedure:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4 – 1992 requirements and is recognised by the FCC to be in compliance for a 3 and a10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz / 2482 MHz. This was rounded up to 25 GHz. The resolution bandwidth is set as outlined in Part 24.238. The spectrum was scanned with the mobile station transmitting at carrier frequency 1880.2 MHz of the USPCS band and 2402 MHz for the BLUETOOTH device.

The BLUETOOTH device was transmitting continuously during test. The mobile was feed by a charger and connected to an earphone.

The final open field emission test procedure is as follows:

- The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- The antenna output was terminated in a 50 ohm load.
- A double ridged wave guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- Detected emissions were maximised at each frequency by rotating the test item and adjusting the receive antenna height and polarisation. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1 MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded. The equivalent power into a dipole antenna was calculated from the field intensity levels measured at 3 meters using the equation shown below:

$$P_g = E^2 4\pi d^2 / 120\pi = E^2 d^2 / 30$$

where :
P = power in watts
g = arithmetic gain of transmitting antenna over isotropic radiator.
E = maximum field strength in volts/meter
d = measurement distance in meter

Using a dipole gain of 1.67 or 2.2 dB and a test distance of 3 meters, this equation reduces to:

$$P(\text{dBm}) = E(\text{dB}\mu\text{V/m}) - 97.2\text{dB}$$

Measurement Limit:

Sec. 24.238 Emission Limits.

(a) On any frequency outside a licensee's frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least $43 + 10\log(P)$ dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least $43 + 10\log(P)$ dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Measurement Results:

Radiated emissions measurements were made only at the centre frequency of the USPCS band (1880.2 MHz). It was decided that measurements at this three carrier frequency would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the USPCS band into any of the other blocks during simultaneous work with transmitting BLUETOOTH device. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this

RESULTS OF OPEN FIELD RADIATED TEST FOR FCC-24:

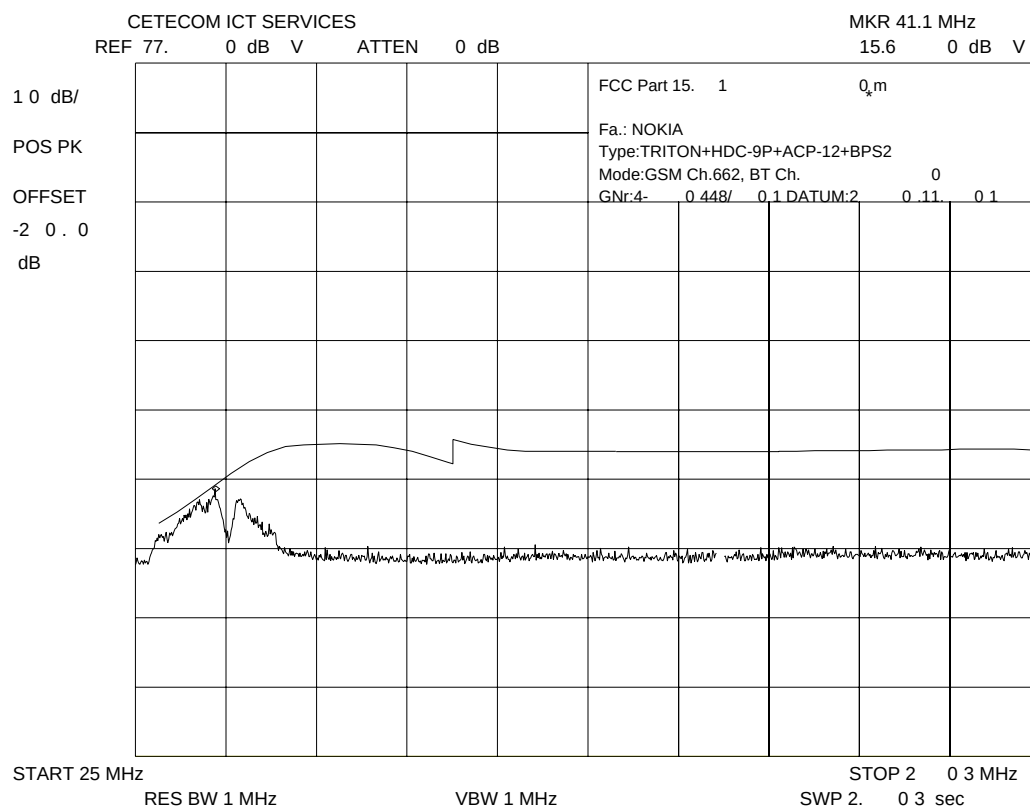
The final open field radiated levels are presented on the next pages.

As can be seen from this data, the emissions from the test item were within the specification limit.

EMISSION LIMITATIONS					
Mobile with accu set BPS-2					
f (MHz)	polarisation	amplitude of emission (dBµV/m) PEAK	amplitude of emission (dBµV/m) QUASI PEAK	limit max. allowed emmission power (dBµV/m)	results
CH 662					
37.778	vertical		21.7	29.5	pass
41.100	vertical		23.4	29.5	pass
46.098	vertical		22.0	29.5	pass
All	other	peaks	<<	limit	pass
Measurement uncertainty		± 6 dB			

Channel 662 (up to 1 GHz) Mobile with accu set BPS-2

30 – 200 MHz

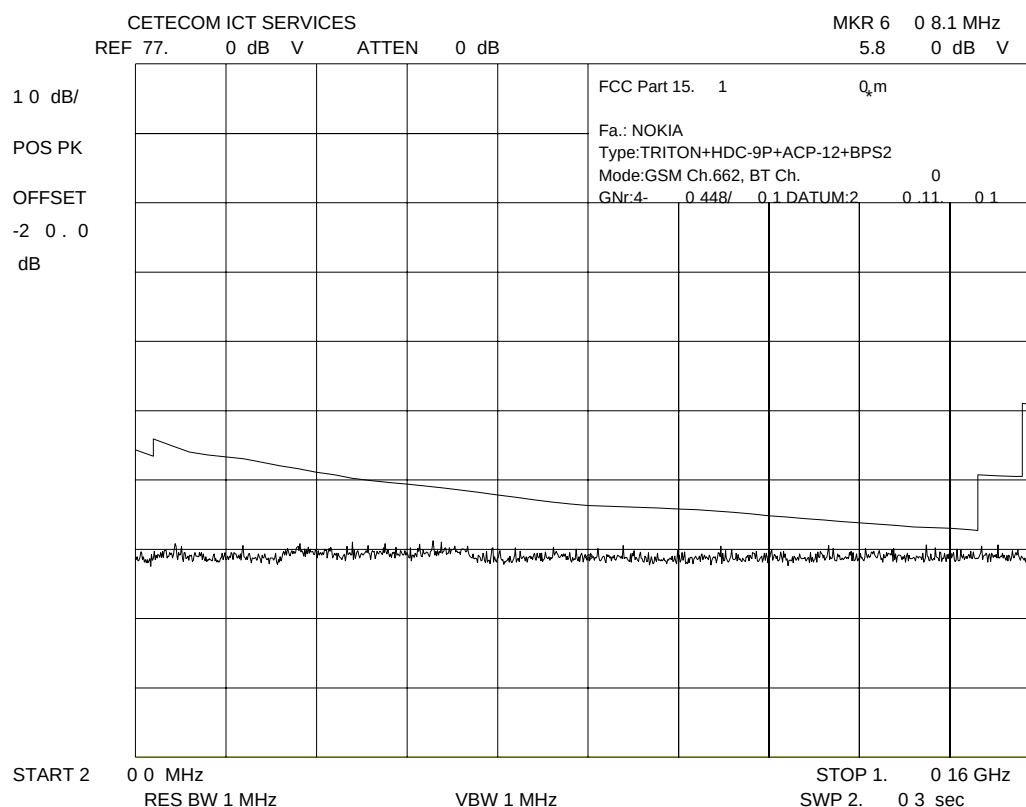


The plot shows the peak values, for QP values see table below.

No	EMISSION FREQUENCY MHz	SPEC LIMIT dBµV	MEASUREMENTS			POL	SITE		CORR FACTOR dB	COMMENTS
			ABS	dLIM	MODE		HGT	AZM		
				dB			cm	deg		
1	37.778	29.5	21.7	-7.8	QP	V	354	278	15.1	pass
2	41.100	29.5	23.4	-6.1	QP	V	105	68	13.4	pass
3	46.098	29.5	22.0	-7.5	QP	V	117	57	10.8	pass

Channel 662 (up to 1 GHz) Mobile with accu set BPS-2

200 – 1000 MHz

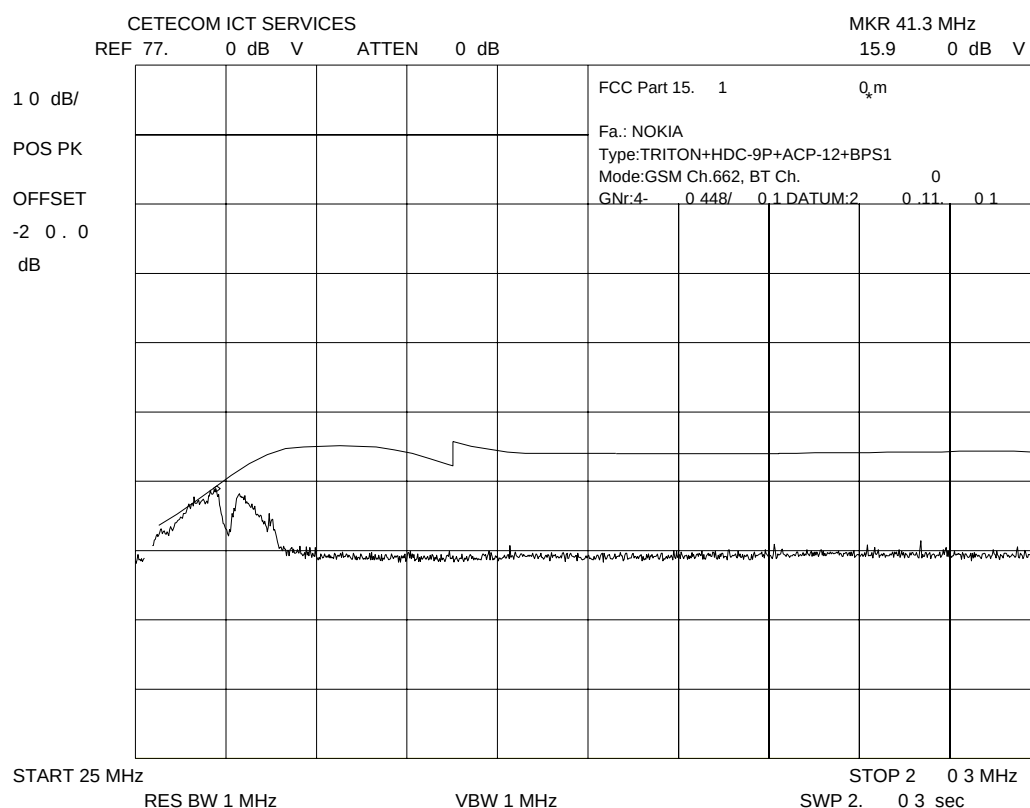


REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

EMISSION LIMITATIONS					
Mobile with accu set BPS-1					
f (MHz)	polarisation	amplitude of emission (dBµV/m) PEAK	amplitude of emission (dBµV/m) QUASI PEAK	limit max. allowed emmission power (dBµV/m)	results
CH 662					
37.892	vertical		25.1	29.5	pass
41.026	vertical		24.6	29.5	pass
45.954	vertical		20.6	29.5	pass
All	other	peaks	<<	limit	pass
Measurement uncertainty		± 6 dB			

Channel 662 (up to 1 GHz) Mobile with accu set BPS-1

30 – 200 MHz

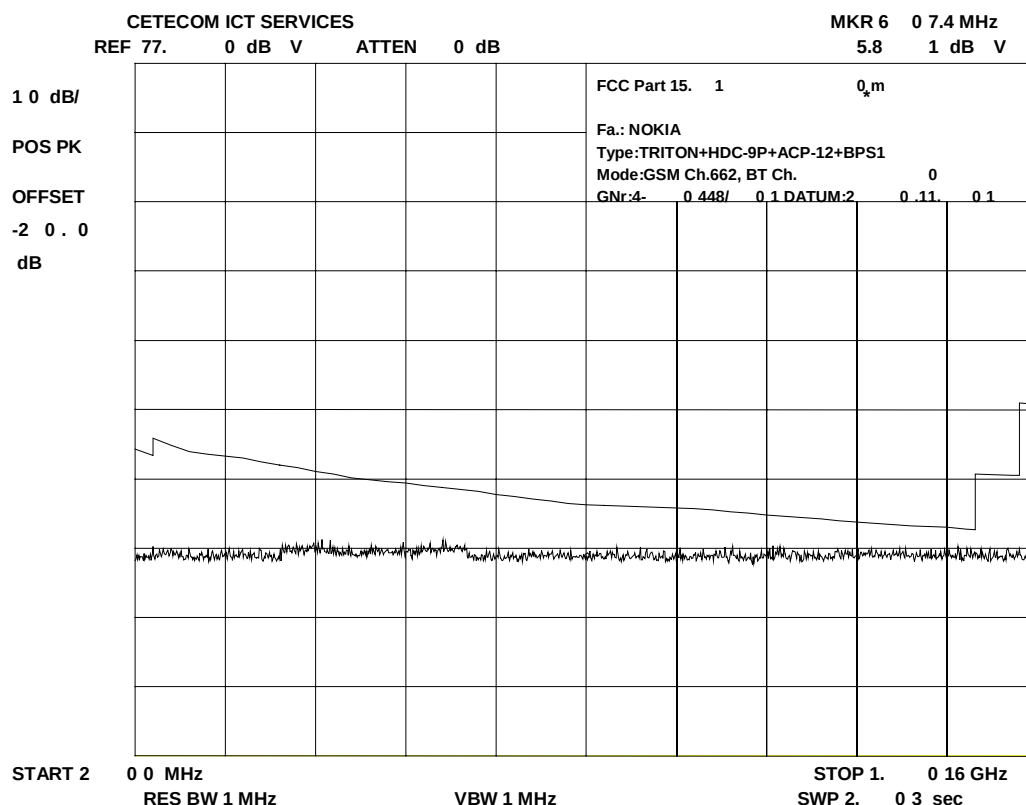


No	EMISSION	SPEC LIMIT dBμV	MEASUREMENTS			POL	SITE		CORR FACTOR dB	COMMENTS
	FREQUENCY MHz		ABS	dLIM	MODE		HGT	AZM		
				dB			cm	deg		
1	37.892	29.5	25.1	-4.4	QP	V	103	258	15.1	pass
2	41.026	29.5	24.6	-4.9	QP	V	108	58	13.4	pass
3	45.954	29.5	20.6	-8.9	QP	V	175	37	10.9	pass

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

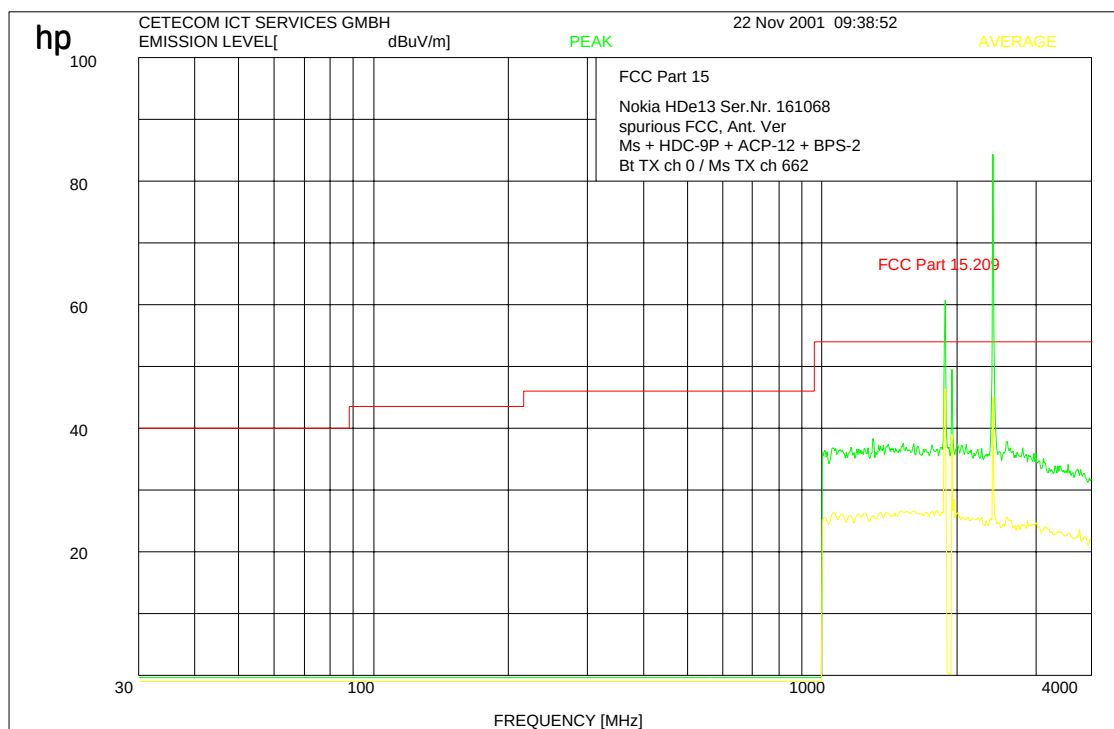
Channel 662 (up to 1 GHz) Mobile with accu set BPS-1

200 – 1000 MHz



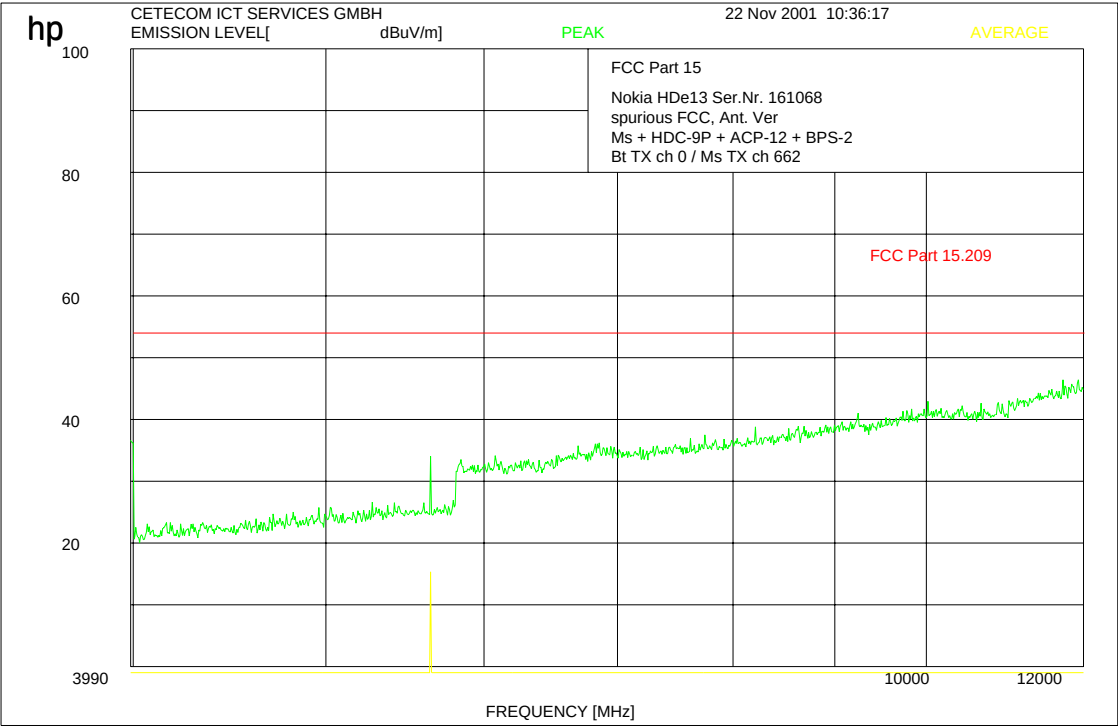
REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

Channel 662 : 1-4 GHz Mobile with accu set BPS-2



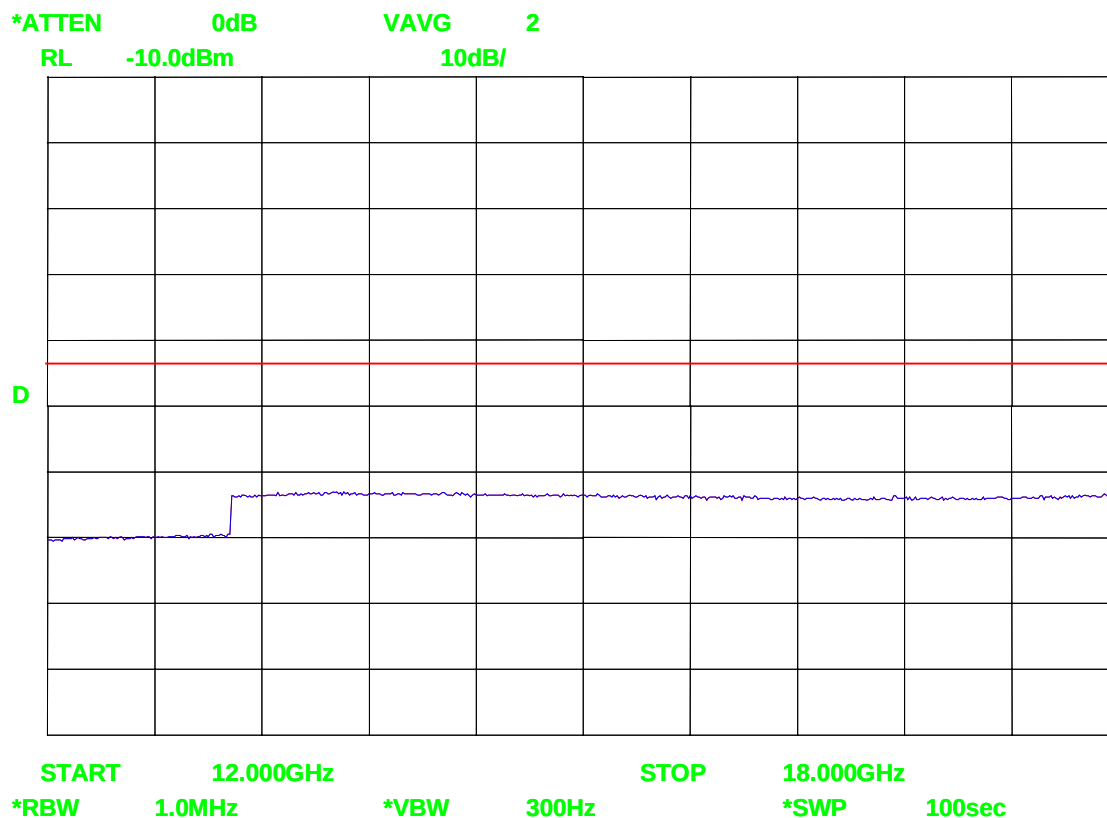
Carriers are suppressed by rejection filters to avoid overload of the low-noise preamp.

Channel 662 : 4 – 12 GHz Mobile with accu set BPS-2



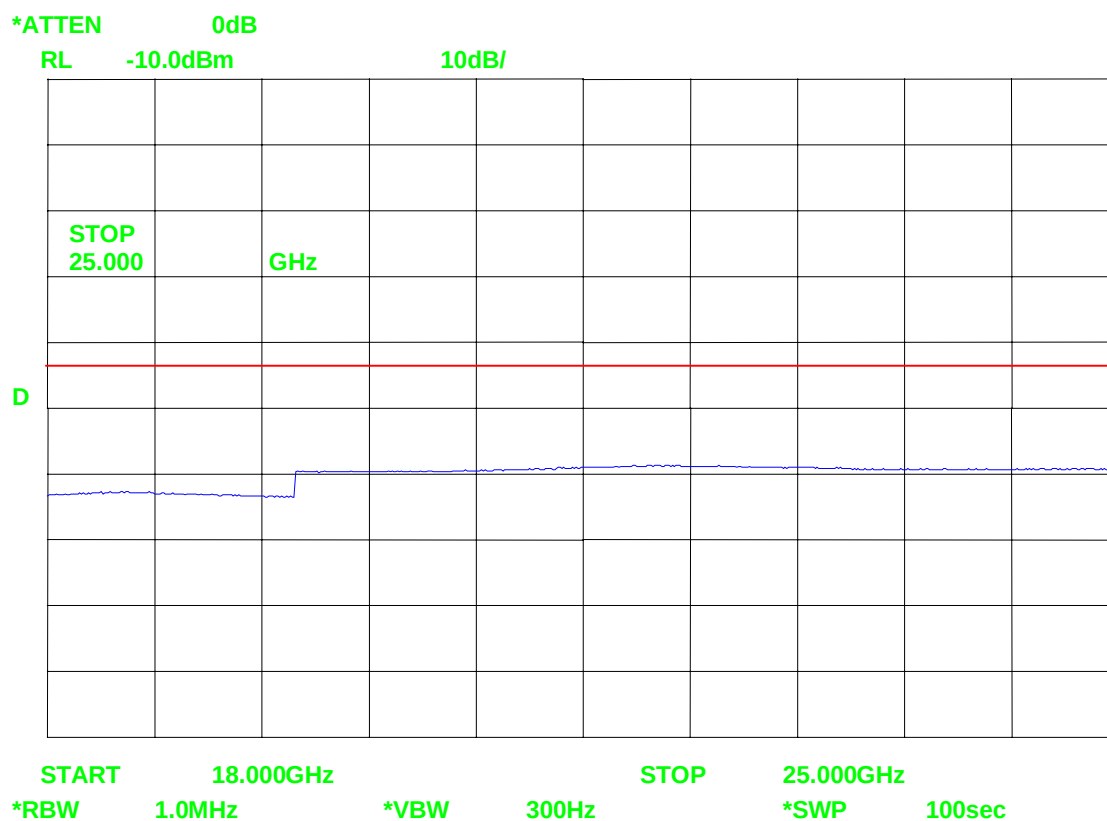
The peak at 5642 MHz is 16.4 dB μ V/m at 3m average.

Channel 662 : 12 - 18 GHz Mobile with accu set BPS-2



The reference level at -10 dBm is the same as 97.5 dB μ V/m at 3m.
The red line is 54 dB μ V/m at 3m.

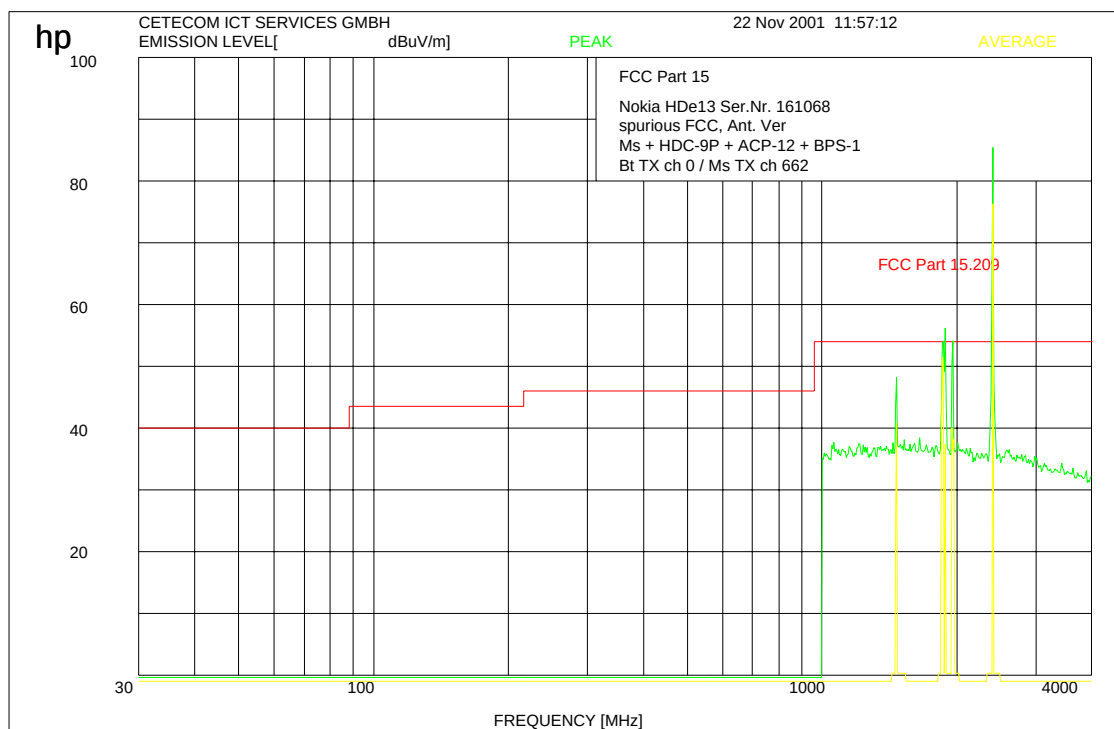
Channel 662 : 18 - 25 GHz Mobile with accu set BPS-2



The reverence level at –10 dBm is the same as 97.5 dBμV/m at 3m.

The red line is 54 dBμV/m at 3m.

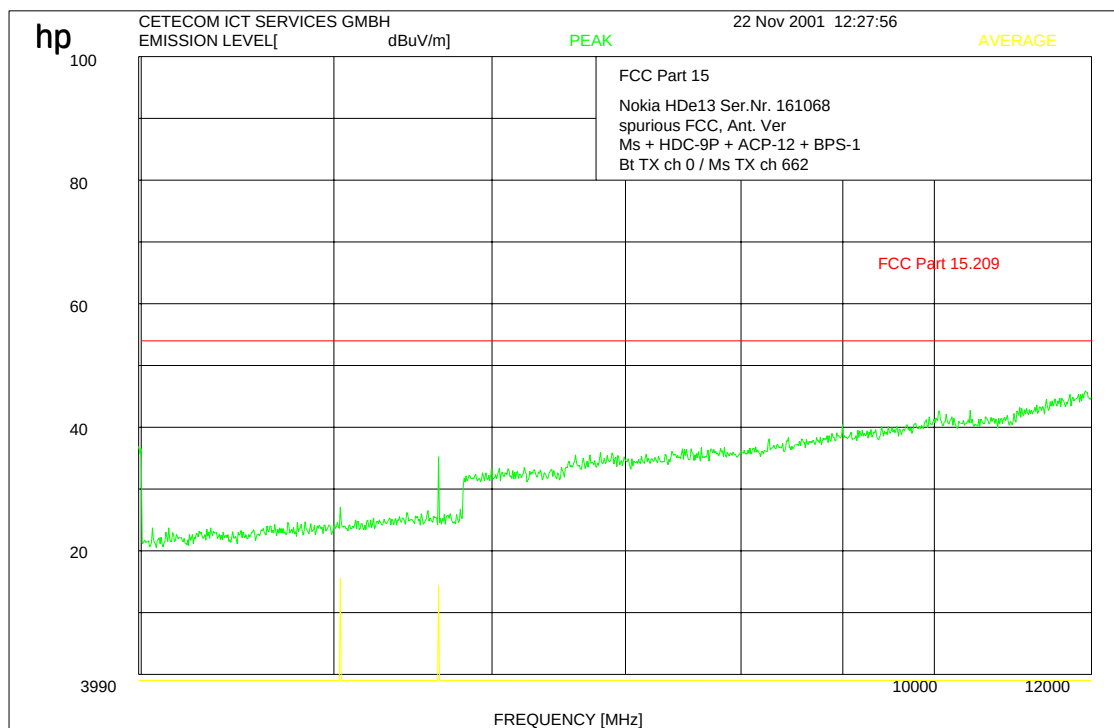
Channel 662 : 1-4 GHz Mobile with accu set BPS-1



Carriers are suppressed by rejection filters to avoid overload of the low-noise preamp.

The peak at 1358 MHz is 41.2 dBuV/m at 3 m average.

Channel 662 : 4 - 12 GHz Mobile with accu set BPS-1

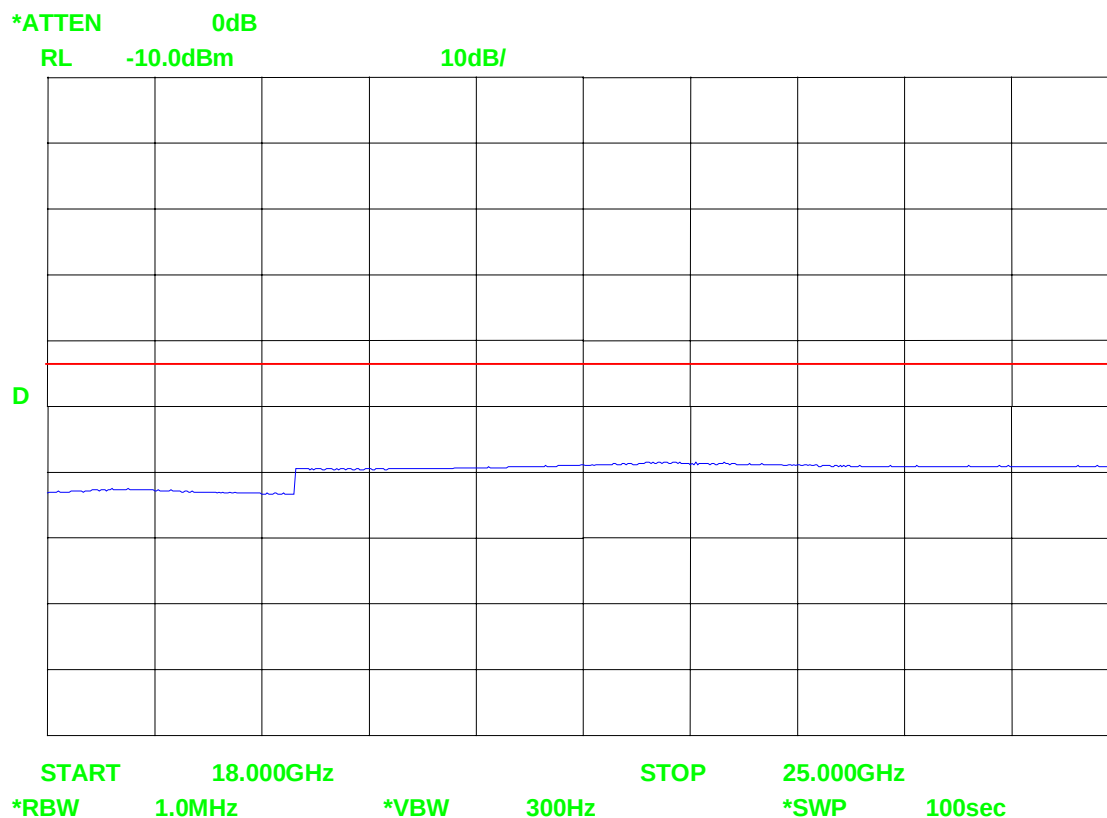


Carriers are suppressed by rejection filters to avoid overload of the low-noise preamp.

The peak at 5038 MHz is 15.5 dBuV/m at 3 m average.

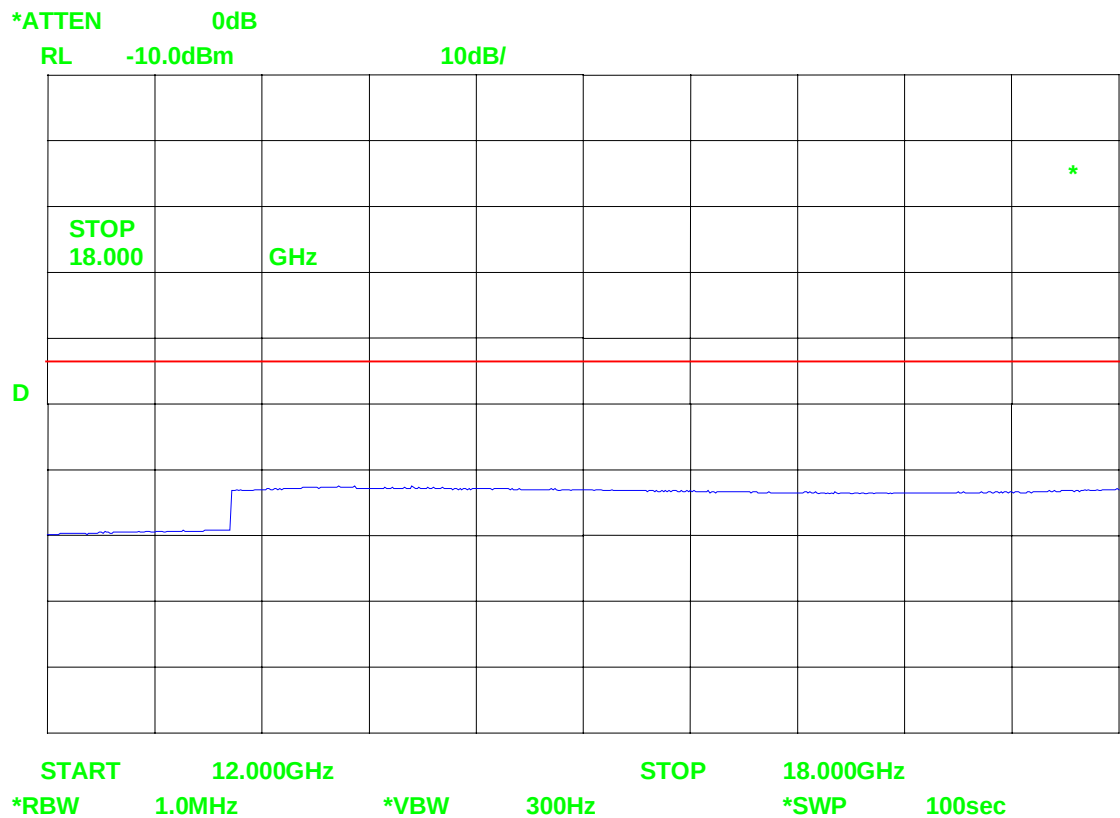
The peak at 5642 MHz is 14.4 dBuV/m at 3 m average.

Channel 662 : 12 – 18 GHz Mobile with accu set BPS-1



The reverence level at –10 dBm is the same as 97.5 dB μ V/m at 3m.
The red line is 54 dB μ V/m at 3m.

Channel 662 : 18 - 25 GHz Mobile with accu set BPS-1



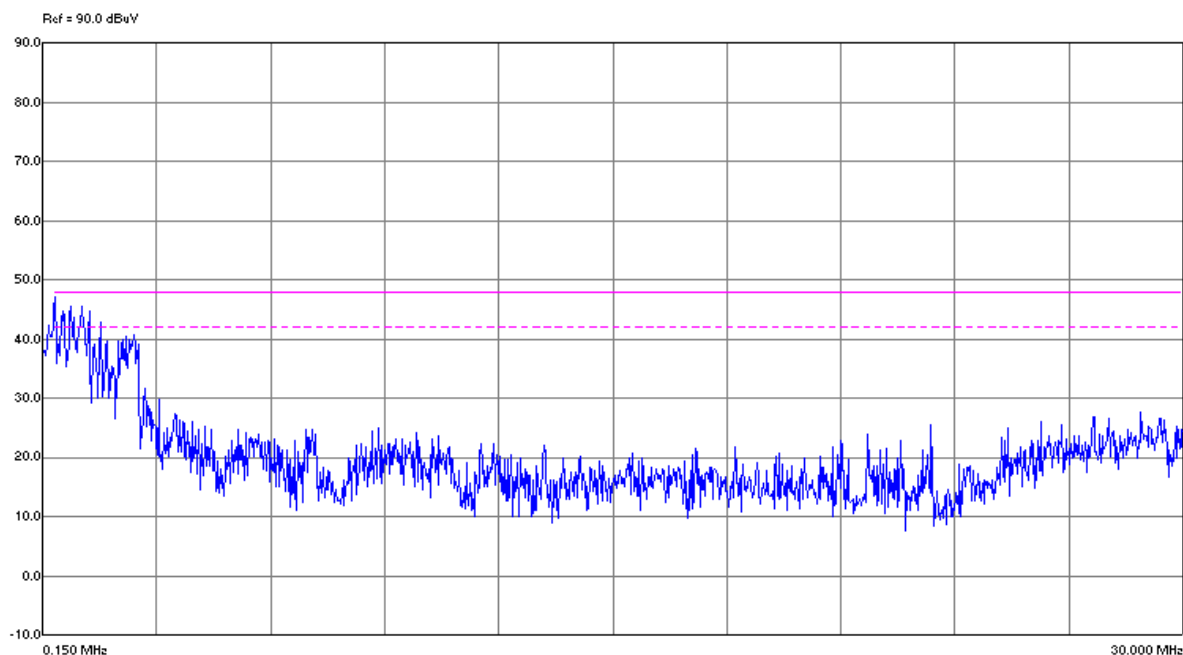
The reverence level at –10 dBm is the same as 97.5 dBμV/m at 3m.
The red line is 54 dBμV/m at 3m.

CONDUCTED EMISSIONS

§ 15.107/207

FCC Rule 47 Part 15

Conducted Emission Triton, +HDC-9, +ACP-12, +BPS-1, Mode: Traffic,
Loading Line: L1



Frequency MHz	Peak dBμV	QP dBμV	Lim dBμV	QP dBμV	DelLim-QP dB	Avg dBμV	Lim dBμV	Avg dBμV	DelLim-Avg dB
0.432500	47.06	--.--	38.17	--.--	--.--	31.29	--.--	--.--	--.--
0.588531	43.98	48.00	38.65	-9.35	48.00	27.16	-20.84		
0.673428	44.70	48.00	38.11	-9.89	48.00	27.97	-20.03		
0.841716	43.76	48.00	36.91	-11.09	48.00	24.99	-23.01		
0.893525	45.43	48.00	41.56	-6.44	48.00	30.46	-17.54		
0.936363	45.26	48.00	38.43	-9.57	48.00	31.27	-16.73		
1.124270	42.52	48.00	34.86	-13.14	48.00	27.96	-20.04		
1.154113	45.36	48.00	36.03	-11.97	48.00	31.72	-16.28		
1.354781	44.63	48.00	38.71	-9.29	48.00	26.66	-21.34		
1.665390	42.72	48.00	35.54	-12.46	48.00	30.46	-17.54		

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

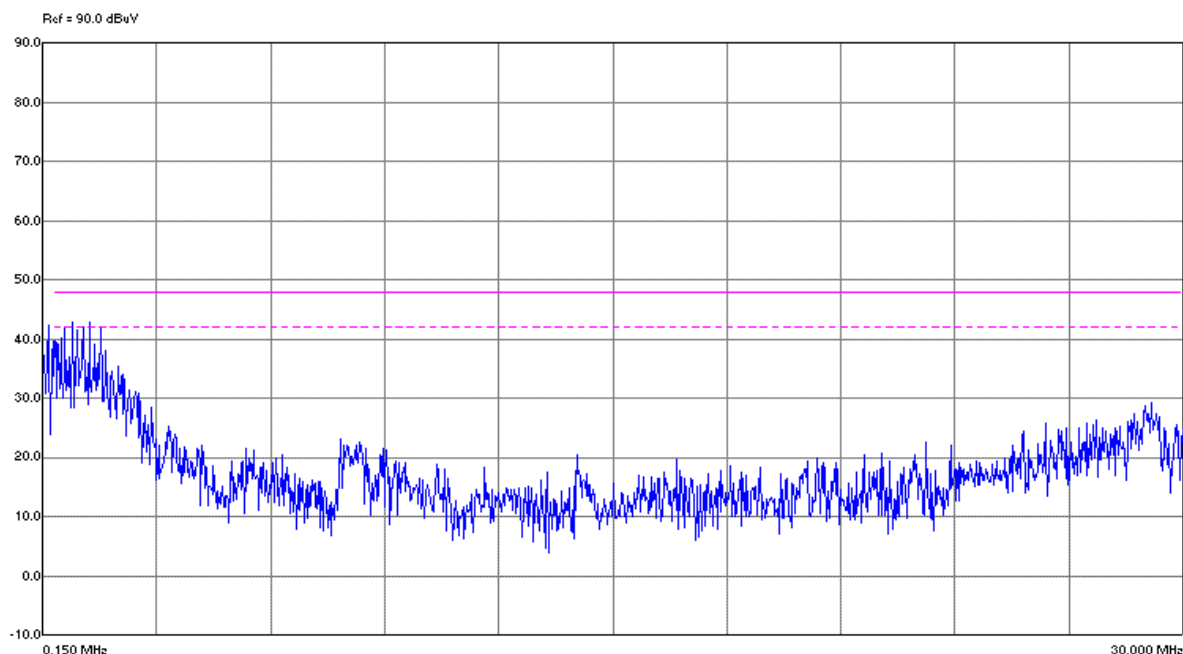
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CONDUCTED EMISSIONS

§ 15.107/207

FCC Rule 47 Part 15

Conducted Emission Triton, +HDC-9, +ACP-12, +**BPS-1**, Mode: Traffic,
Loading Line: N



Frequency MHz	Peak dBμV	QP dBμV	Lim dBμV	QP dBμV	DelLim-QP dB	Avg dBμV	Lim dBμV	Avg dBμV	DelLim-Avg dB
0.284307	42.33	--.--	36.46	--.--	--.--	17.12	--.--	--.--	--.--
0.295281	40.26	--.--	41.52	--.--	--.--	29.60	--.--	--.--	--.--
0.448887	42.97	--.--	35.81	--.--	--.--	17.47	--.--	--.--	--.--
0.600071	40.13	48.00	40.36	-7.64	48.00	31.04	-16.96		
0.726838	41.81	48.00	35.58	-12.42	48.00	25.40	-22.60		
0.899186	42.77	48.00	40.95	-7.05	48.00	30.79	-17.21		
1.030313	41.49	48.00	34.36	-13.64	48.00	19.16	-28.84		
1.207800	42.08	48.00	38.71	-9.29	48.00	28.97	-19.03		
1.340623	45.17	48.00	35.52	-12.48	48.00	23.53	-24.47		
1.650769	44.35	48.00	36.52	-11.48	48.00	26.30	-21.70		

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

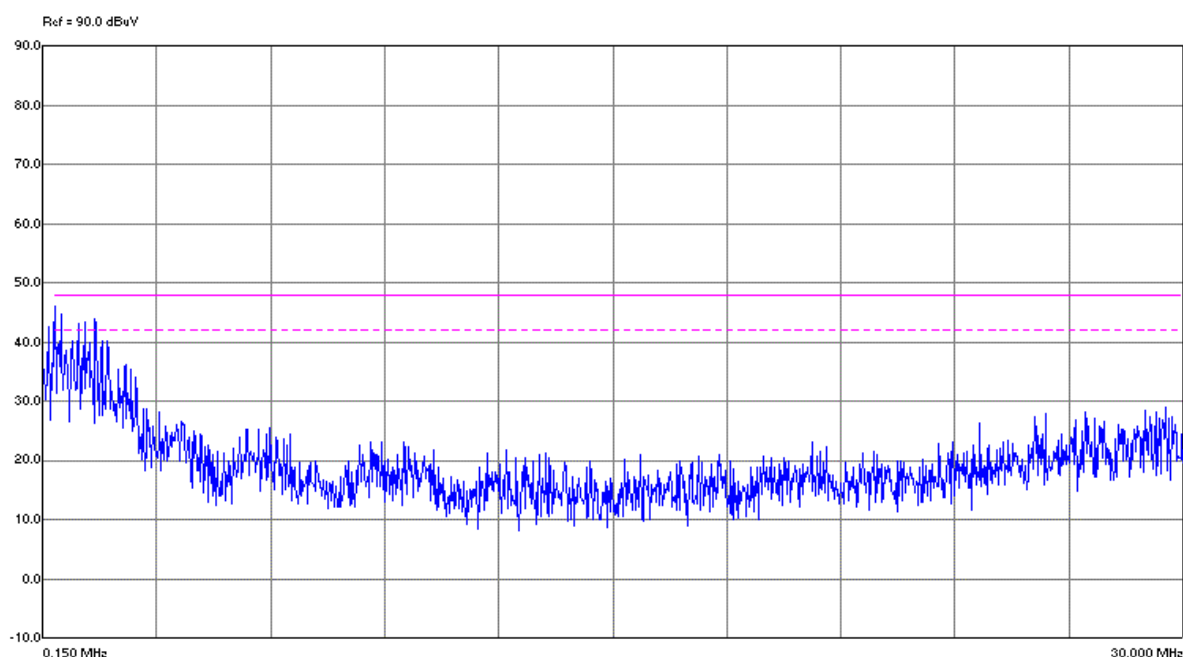
52-63

CONDUCTED EMISSIONS

§ 15.107/207

FCC Rule 47 Part 15

Conducted Emission Triton, +HDC-9, +ACP-12, +**BPS-2**, Mode: Traffic,
Loading Line: L1



Frequency MHz	Peak dBμV	QP	Lim dBμV	QP dBμV	DelLim-QP dB	Avg	Lim dBμV	Avg dBμV	DelLim-Avg dB
0.611496	44.69		48.00	38.28	-9.72		48.00	19.79	-28.21
1.076028	43.20		48.00	39.07	-8.93		48.00	18.21	-29.79
1.223097	43.44		48.00	39.33	-8.67		48.00	20.47	-27.53
1.505318	40.14		48.00	32.44	-15.56		48.00	17.56	-30.44
1.507332	43.87		48.00	33.03	-14.97		48.00	17.34	-30.66
1.843796	40.22		48.00	33.38	-14.62		48.00	14.54	-33.46

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

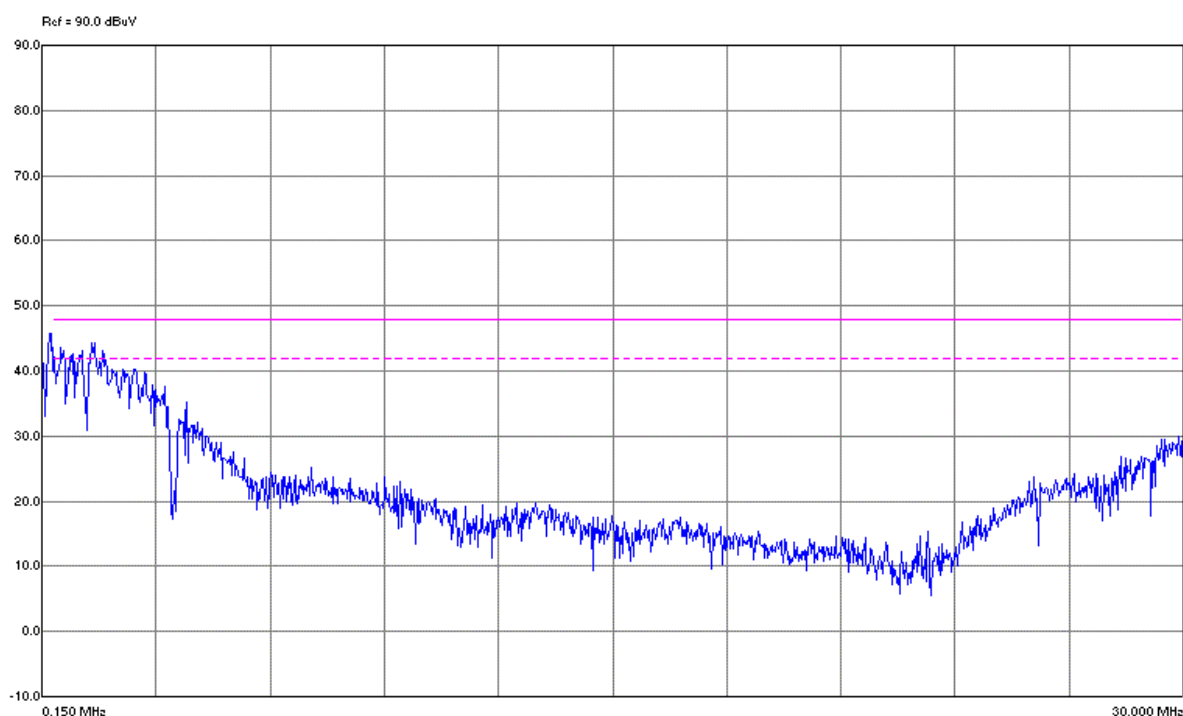
52-63

CONDUCTED EMISSIONS

§ 15.107/207

FCC Rule 47 Part 15

Conducted Emission Triton, +HDC-9, +ACP-12, +BPS-2, Mode: Traffic,
Loading Line: N



Frequency MHz	Peak dBμV	QP dBμV	Lim dBμV	QP dBμV	DelLim-QP dB	Avg dBμV	Lim dBμV	Avg dBmV	DelLim-Avg dB
0.370890	45.07	--.--	--.--	--.--	--.--	--.--	--.--	--.--	--.--
0.412680	44.35	--.--	--.--	--.--	--.--	--.--	--.--	--.--	--.--
0.594896	44.19	48.00	41.47	-6.53	48.00	29.60	-18.40		
0.637379	44.83	48.00	42.51	-5.49	48.00	31.24	-16.76		
0.883354	44.69	48.00	39.52	-8.48	48.00	27.71	-20.29		
0.937573	44.63	48.00	39.92	-8.08	48.00	29.54	-18.46		
1.403244	44.32	48.00	40.55	-7.45	48.00	29.43	-18.57		
1.417409	44.22	48.00	41.03	-6.97	48.00	30.34	-17.66		
1.445990	45.62	48.00	40.82	-7.18	48.00	30.26	-17.74		
1.697699	44.42	48.00	39.02	-8.98	48.00	29.43	-18.57		

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED

(for reference numbers see test equipment listing)

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TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
01	Spectrum Analyzer	8566 A	Hewlett-Packard	1925A00257
02	Analyzer Display	8566 A	Hewlett-Packard	1925A00860
03	Oscilloscope	7633	Tektronix	230054
04	Radio Communication Analyzer	CMTA 54	Rohde & Schwarz	894 043/010
05	System Power Supply	6038 A	Hewlett-Packard	2848A07027
06	Signal Generator	8111 A	Hewlett-Packard	2215G00867
07	Signal Generator	8662 A	Hewlett-Packard	2224A01012
08	Function Generator	AFGU	Rohde & Schwarz	862 480/032
09	Regulating Transformer	MPL	Erft	91350
10	LISN	NNLA 8120	Schwarzbeck	8120331
11	Relay-Matrix	PSU	Rohde & Schwarz	893 285/020
12	Power-Meter	436 A	Hewlett-Packard	2101A12378
13	Power-Sensor	8484 A	Hewlett-Packard	2237A10156
14	Power-Sensor	8482 A	Hewlett-Packard	2237A00616
15	Modulation Meter	9008	Racal-Dana	2647
16	Frequency Counter	5340 A	Hewlett-Packard	1532A03899
17	Anechoic Chamber	---	MWB	87400/002
18	Spectrum Analyzer	85660 B	Hewlett-Packard	2747A05306
19	Analyzer Display	85662 A	Hewlett-Packard	2816A16541
20	Quasi Peak Adapter	85650 A	Hewlett-Packard	2811A01131
21	RF-Preselector	85685 A	Hewlett-Packard	2833A00768
22	Biconical Antenna	3104	Emco	3758
23	Log. Per. Antenna	3146	Emco	2130
24	Double Ridged Horn	3115	Emco	3088
25	EMI-Testreceiver	ESAI	Rohde & Schwarz	863 180/013
26	EMI-Analyzer-Display	ESAI-D	Rohde & Schwarz	862 771/008
27	Biconical Antenna	HK 116	Rohde & Schwarz	888 945/013
28	Log. Per. Antenna	HL 223	Rohde & Schwarz	825 584/002
29	Relay-Switch-Unit	RSU	Rohde & Schwarz	375 339/002
30	Highpass	HM985955	FSY Microwave	001
31	Amplifier	P42-GA29	Tron-Tech	B 23602
32	Anechoic Chamber		Frankonia	
33	Control Computer	PSM 7	Rohde & Schwarz	834 621/004
34	EMI Test Receiver	ESMI	Rohde & Schwarz	827 063/010
35	EMI Test Receiver	Display	Rohde & Schwarz	829 808/010

CETECOM ICT Services GmbH

Addendum to test report nr.:1_0138-A/01-1-3 Issue date:27.11.2001 Page 27 (41)

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

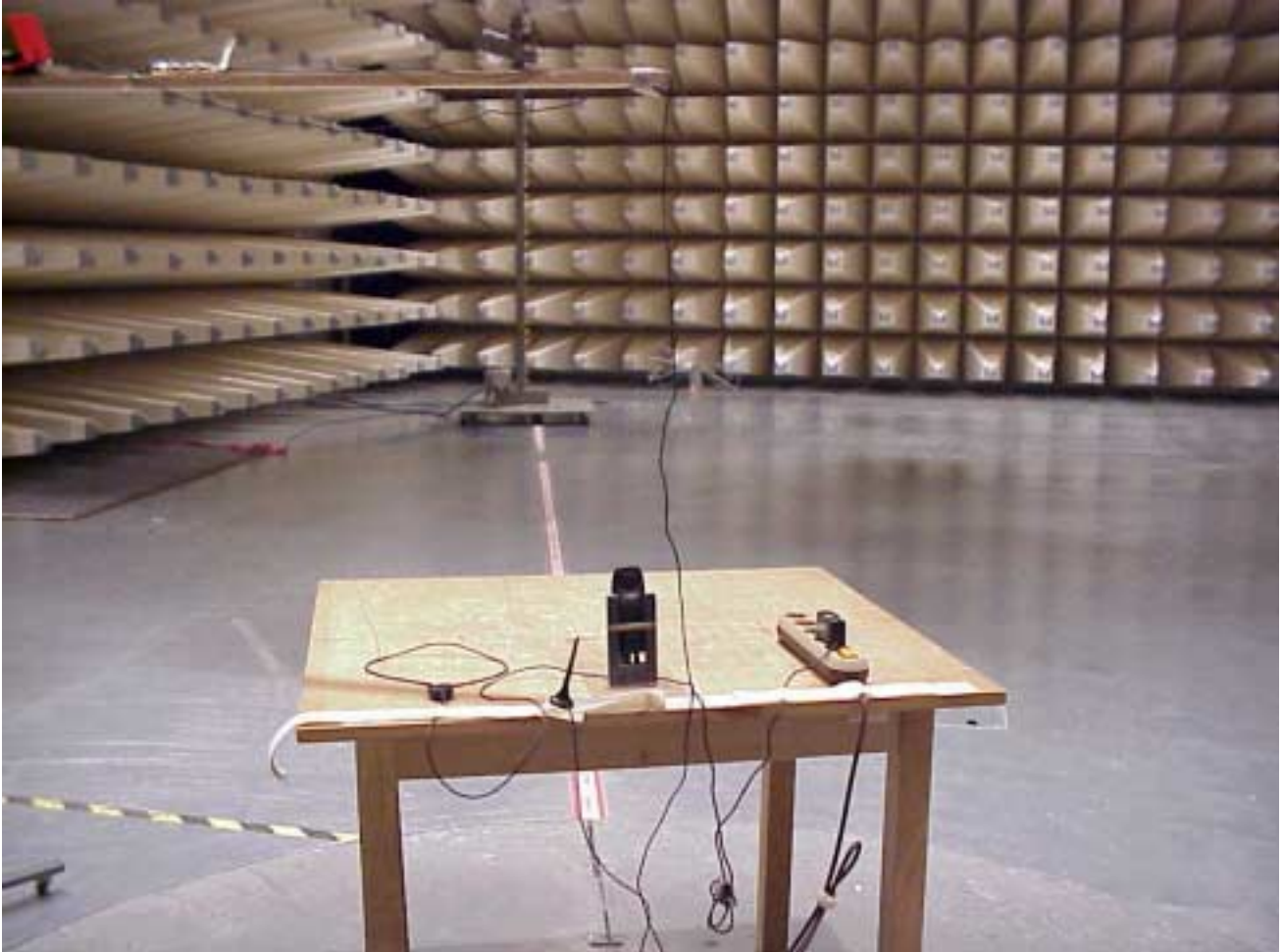
To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
36	Control Computer	HD 100	Deisel	100/322/93
37	Relay Matrix	PSN	Rohde & Schwarz	829 065/003
38	Control Unit	GB 016 A2	Rohde & Schwarz	344 122/008
39	Relay Switch Unit	RSU	Rohde & Schwarz	316 790/001
40	Power Supply	6032A	Hewlett Packard	2846A04063
41	Spectrum Monitor	EZM	Rohde & Schwarz	883 720/006
42	Measuring Receiver	ESH 3	Rohde & Schwarz	890 174/002
43	Measuring Receiver	ESVP	Rohde & Schwarz	891 752/005
44	Bicon Ant. 20-300MHz	HK 116	Rohde & Schwarz	833 162/011
45	Logper Ant. 0.3-1 GHz	HL 223	Rohde & Schwarz	832 914/010
46	Amplifier 0.1-4 GHz	AFS4	Miteq Inc.	206461
47	Logper Ant. 1-18 GHz	HL 024 A2	Rohde & Schwarz	342 662/002
48	Polarisation Network	HL 024 Z1	Rohde & Schwarz	341 570/002
49	Double Ridged Horn Antenna 1-26.5 GHz	3115	EMCO	9107-3696
50	Microw. Sys. Amplifier 0.5- 26.5 GHz	8317A	Hewlett Packard	3123A00105
51	Audio Analyzer	UPD	Rohde & Schwarz	1030.7500.04
52	Controler	PSM 7	Rohde & Schwarz	883 086/026
53	DC V-Network	ESH3-Z6	Rohde & Schwarz	861 406/005
54	DC V-Network	ESH3-Z6	Rohde & Schwarz	893 689/012
55	AC 2 Phase V-Network	ESH3-Z5	Rohde & Schwarz	861 189/014
56	AC 2 Phase V-Network	ESH3-Z5	Rohde & Schwarz	894 981/019
57	AC-3 Phase V-Network	ESH2-Z5	Rohde & Schwarz	882 394/007
58	Power Supply	6032A	Rohde & Schwarz	2933A05441
59	RF-Test Receiver	ESVP.52	Rohde & Schwarz	881 487/021
60	Spectrum Monitor	EZM	Rohde & Schwarz	883 086/026
61	RF-Test Receiver	ESH3	Rohde & Schwarz	881 515/002
62	Relay Matrix	PSU	Rohde & Schwarz	882 943/029
63	Relay Matrix	PSU	Rohde & Schwarz	828 628/007
64	Spectrum Analyzer	FSIQ 26	Rohde & Schwarz	119.6001.27
65	Spectrum Analyzer	HP 8565E	Hewlett Packard	3473A00773
66				
67				
68				

Test site**RADIATED EMISSIONS**

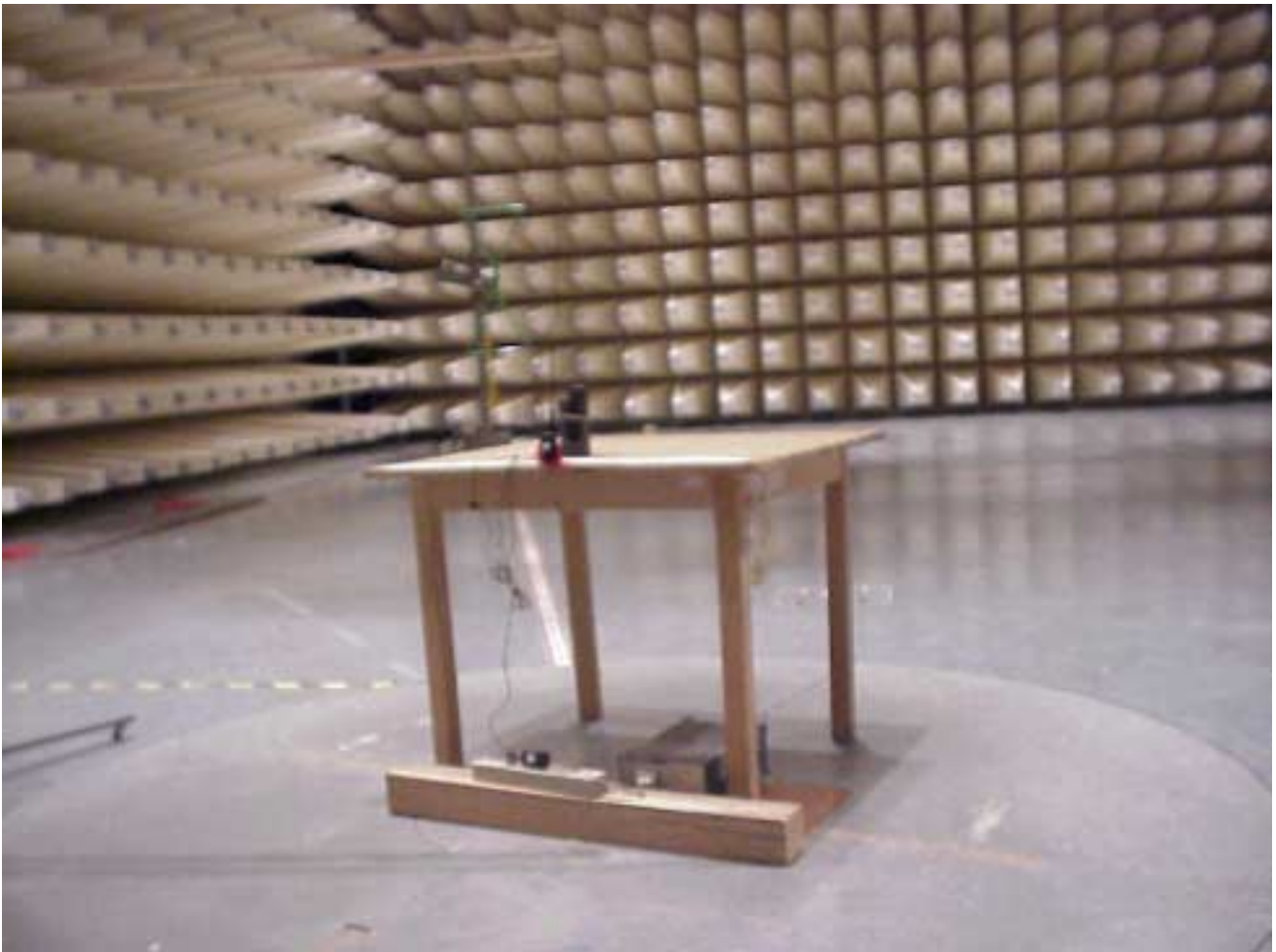
Test site

RADIATED EMISSIONS



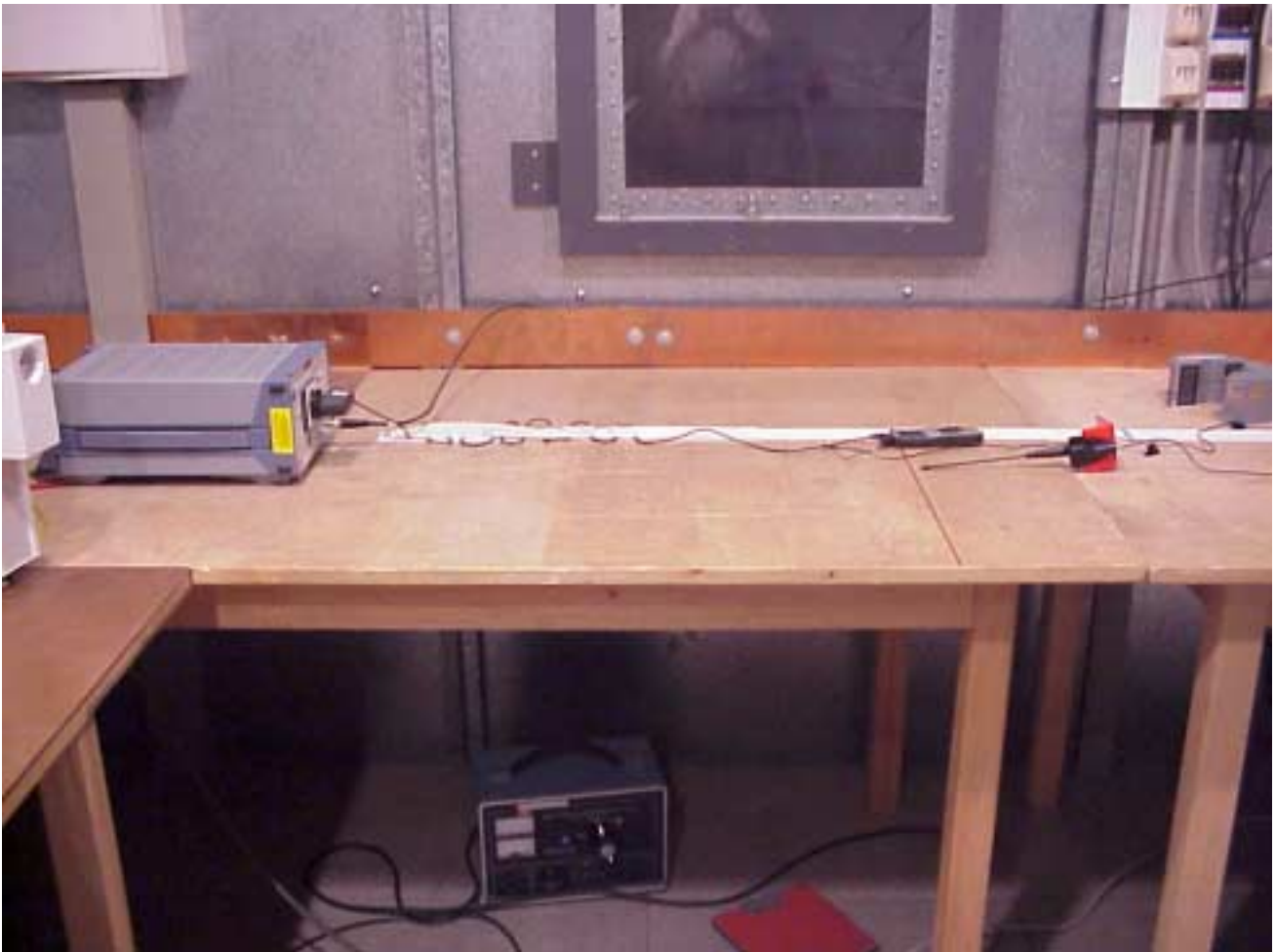
Test site

RADIATED EMISSIONS



Test site

CONDUCTED EMISSIONS



Photographs of the equipment**Photograph no.: 1**

Photographs of the equipment**Photograph no.: 2**

Photographs of the equipment**Photograph no.: 3**

Photographs of the equipment**Photograph no.: 4**

Photographs of the equipment**Photograph no.: 5**

Photographs of the equipment**Photograph no.: 6**

Photographs of the equipment**Photograph no.: 7**

Photographs of the equipment**Photograph no.: 8**

Photographs of the equipment**Photograph no.: 9**

Photographs of the equipment**Photograph no.: 10**