



TTI-P-G166/98

Accredited Bluetooth Test Facility (BQTF)

**Test report no.: 2-2509-R/01
Antenna Diagrams
Toshiba**

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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 Testing laboratory

CETECOM ICT Services GmbH

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Telefone : + 49 681 598 - 0

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Accredited testing laboratory

DAR-registration number : TTI-P-G 166/98-00

1.3 Details of applicant

Name : Technology & Quality Management Division,
Toshiba Corporation, Digital Media Network Company
Street : 1-1-1 Shibaura
City : Minarto-ku, Tokyo 198-8001
Country : Japan
Telephone : +81 (3) 3457 2565
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Contact : Mr. Hideo Abe
Telephone : +81 (3) 3457 2565

1.4 Application details

Date of receipt of application : 05.02.02
Date of receipt of test item : 05.02.02
Date of test : 05.02.02

1.5 Test item

Type of equipment : **Antennas with fixed coax cables for 2400 MHz**
Type designation :
Manufacturer : - applicant -
Street :
City :
Country :
Serial number :

Additional informations: :

Frequency : 2450 MHz
Type of modulation :
Number of channels :
Antennas :
Antenna type 1: DUAL FILM antenna 'HTL-008'
(2,4 and 5,4 GHz patch type with grey coax)

Antenna type 2: FILM antenna 'HTL-004'
(2,4 GHz patch type with white coax)

Antenna type 3: STICK antenna 'HTL-007'
(2,4 GHz with short white coax)

Antenna type 4: STICK antenna 'HTL-007'
(2,4 GHz with long grey coax)

2 Technical test

2.1 Summary of test results

This report shows the horizontal and vertical diagrams of four different type of antennas.

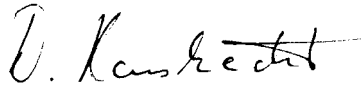
The measuring system set 0 dB at the outside of the diagram.

We feed this power level in the coax adapter of the antennas.

Points inside the outer circle indicate a negative gain, outside the circle a positive gain.

That means you have in the diagrams the loss of the coax cable and the gain of the antenna.

Technical responsibility for area of testing :

14.02.02	RSC 8412	Hausknecht	
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Date	Section	Name	Signature
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Technical responsibility for area of testing :

14.02.02	RSC8414	Ames	
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Date	Section	Name	Signature
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2.2 Testreport

TEST REPORT

report no. : 2-2509-R/01

TEST REPORT REFERENCE

LIST OF MEASUREMENTS

PARAMETER TO BE MEASURED	PAGE
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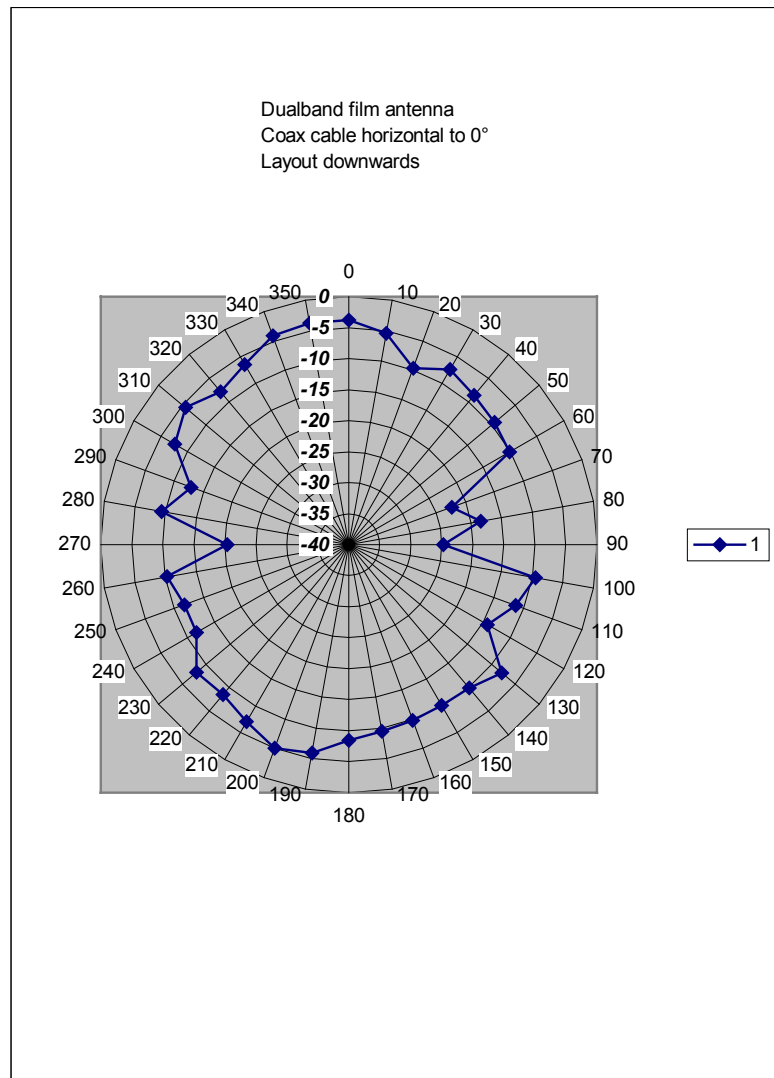
Antenna measurement**TYPE 1: DUAL FILM antenna 'HTL-008'**

The antenna was fixed printed side down on a wooden carrier.

The coax cable shows to 0 degree.

Receiving antenna horizontal.

dBm	degree	Elevation	
-3,74	0	0	0
-5,39	10	0	0
-9,71	20	0	0
-7,4	30	0	0
-8,52	40	0	0
-9,3	50	0	0
-10,09	60	0	0
-22,33	70	0	0
-18,45	80	0	0
-24,74	90	0	0
-9,46	100	0	0
-11,34	110	0	0
-14,21	120	0	0
-7,83	130	0	0
-9,79	140	0	0
-10,12	150	0	0
-9,81	160	0	0
-9,38	170	0	0
-8,44	180	0	0
-5,93	190	0	0
-5,06	200	0	0
-7,1	210	0	0
-8,44	220	0	0
-7,96	230	0	0
-11,62	240	0	0
-11,72	250	0	0
-10,19	260	0	0
-20,43	270	0	0
-9,3	280	0	0
-12,91	290	0	0
-7,53	300	0	0
-5,6	310	0	0
-7,86	320	0	0
-6,46	330	0	0
-4,2	340	0	0
-3,69	350	0	0
-3,34	360	0	0



Antenna measurement

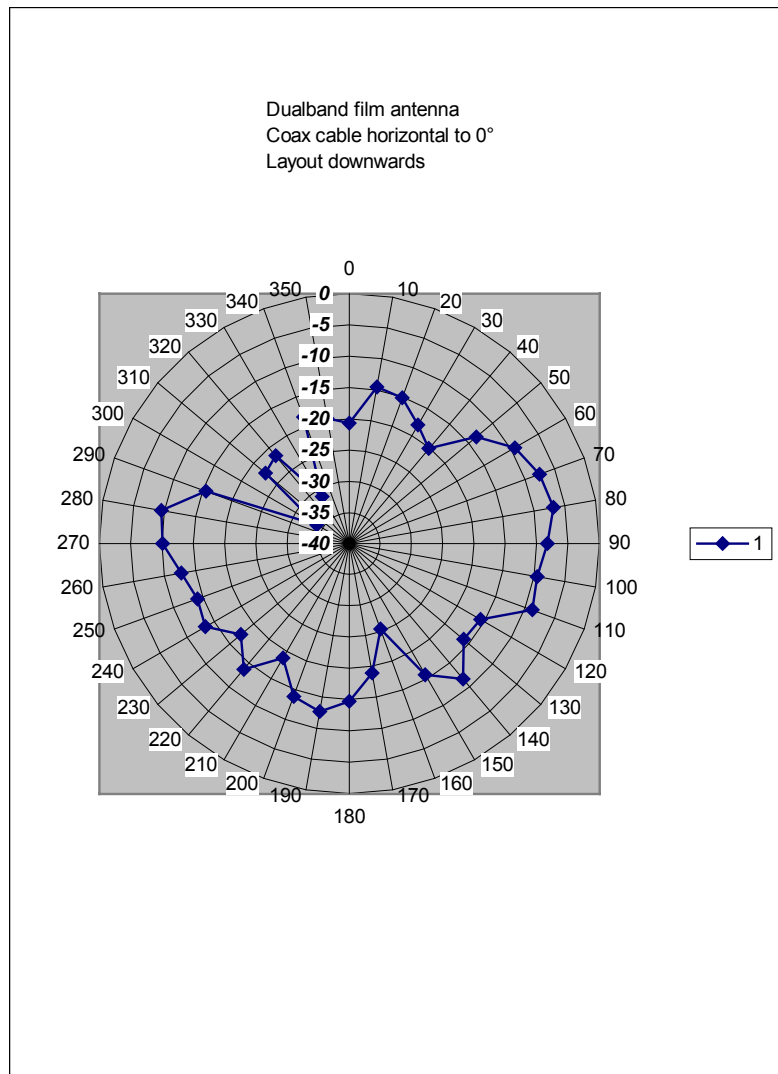
TYPE 1: DUAL FILM antenna 'HTL-008'

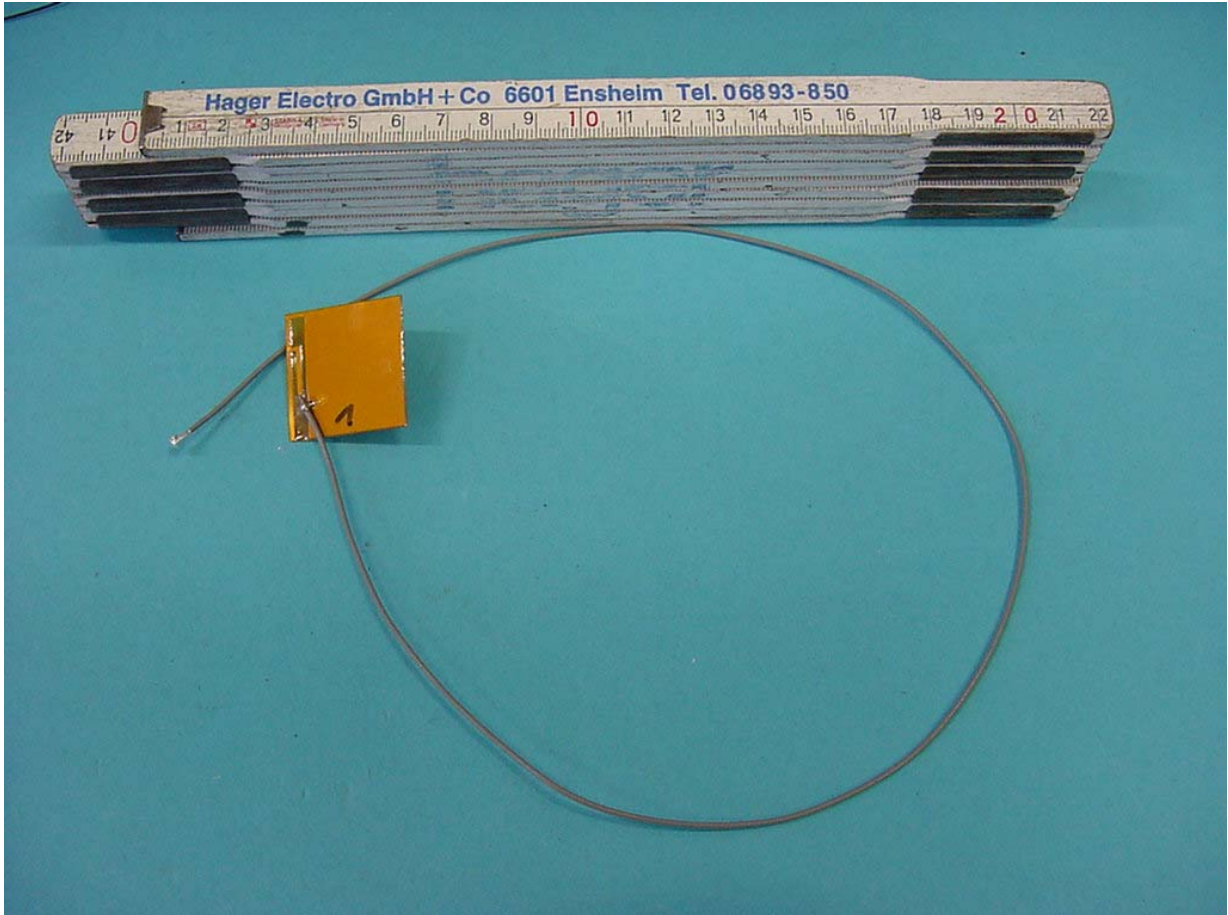
The antenna was fixed printed side down on a wooden carrier.

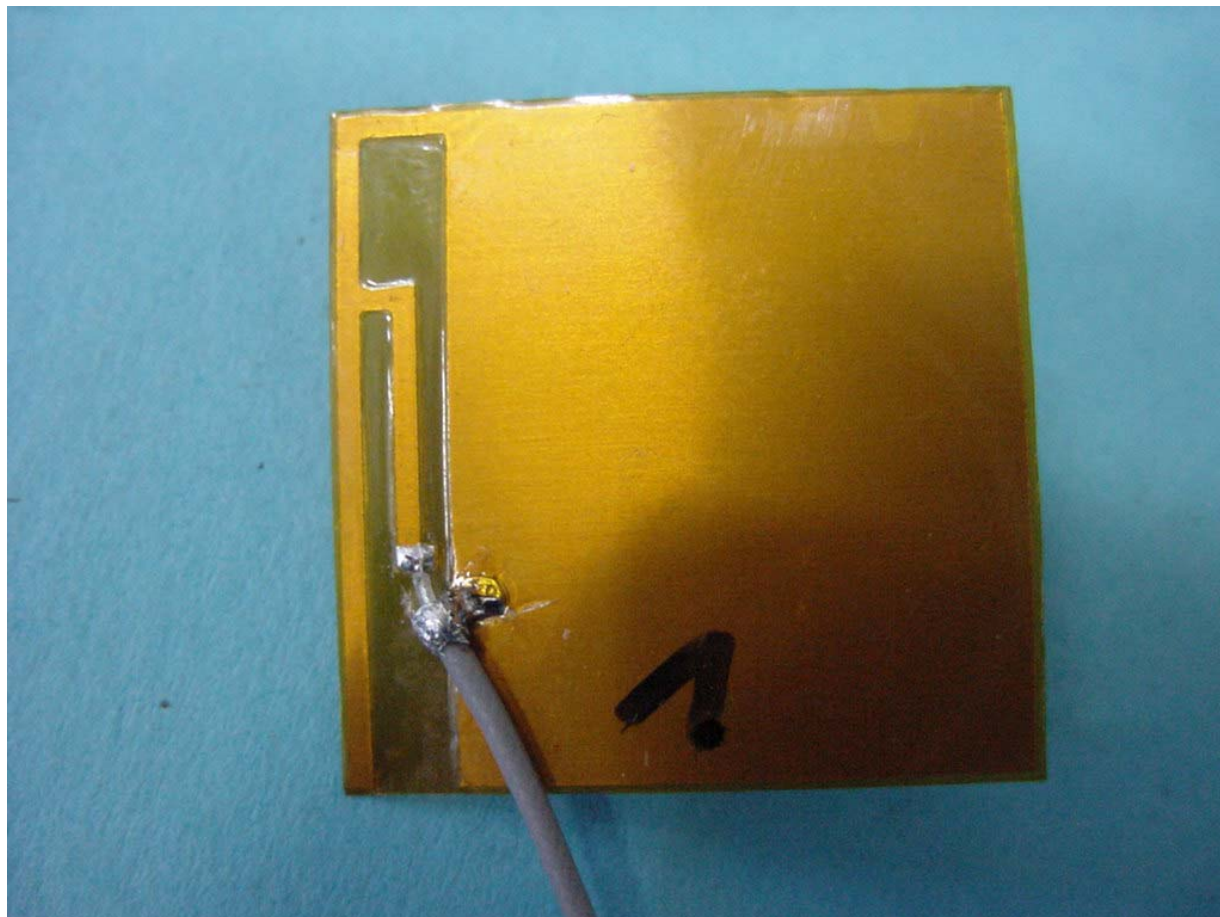
The coax cable shows to 0 degree.

Receiving antenna vertical.

dBm	degree	Elevation
-20,68	0	0
-14,54	10	0
-15,17	20	0
-18,01	30	0
-20,1	40	0
-13,37	50	0
-9,43	60	0
-7,63	70	0
-6,87	80	0
-8,29	90	0
-9,46	100	0
-8,82	110	0
-15,73	120	0
-16,11	130	0
-11,64	140	0
-15,7	150	0
-25,45	160	0
-18,95	170	0
-14,74	180	0
-12,76	190	0
-13,98	200	0
-18,9	210	0
-13,67	220	0
-17,33	230	0
-13,37	240	0
-14,21	250	0
-12,68	260	0
-10,14	270	0
-9,46	280	0
-15,58	290	0
-34,06	300	0
-22,48	310	0
-21,67	320	0
-31,37	330	0
-18,52	340	0
-19,66	350	0
-16,57	360	0







Antenna measurement

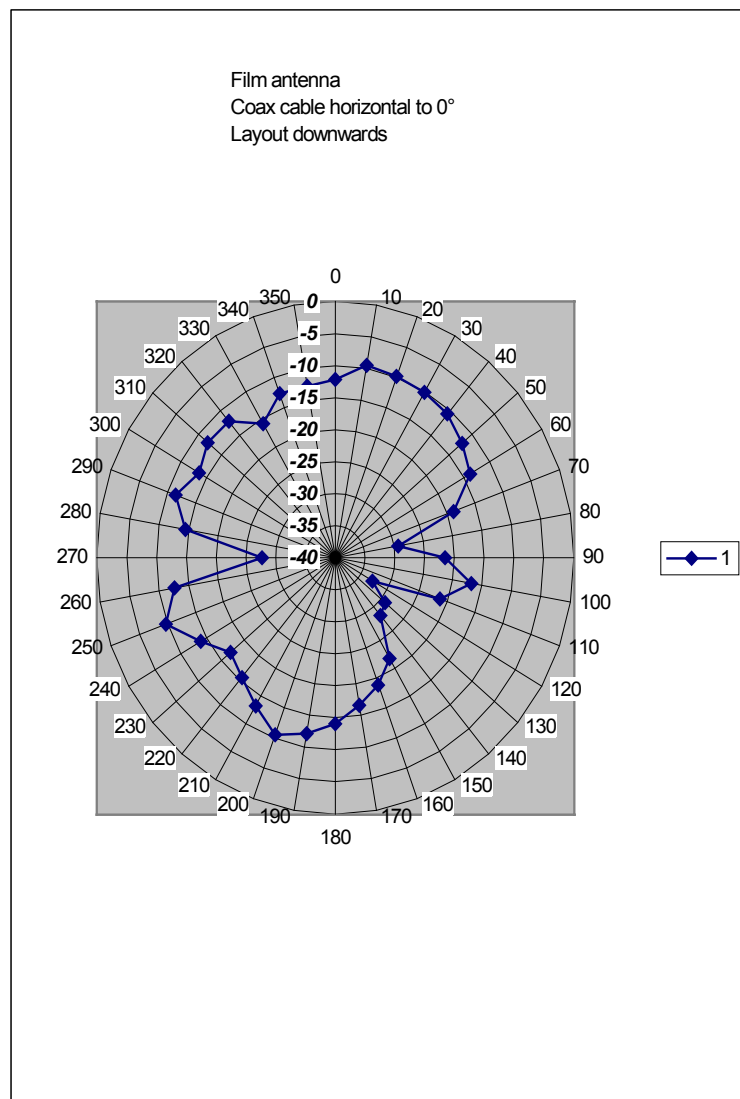
TYPE 2: FILM antenna 'HTL-004'

The antenna was fixed printed side down on a wooden carrier.

The coax cable shows to 0 degree.

Receiving antenna horizontal.

dBm	degree	Elevation	
-12,15	0	0	
-9,48	10	0	
-9,91	20	0	
-10,12	30	0	
-10,73	40	0	
-12,15	50	0	
-13,88	60	0	
-18,93	70	0	
-29,21	80	0	
-21,54	90	0	
-16,74	100	0	
-21,26	110	0	
-32,84	120	0	
-29,06	130	0	
-28,2	140	0	
-21,9	150	0	
-18,85	160	0	
-16,62	170	0	
-14,1	180	0	
-12,17	190	0	
-10,52	200	0	
-13,37	210	0	
-15,68	220	0	
-17,07	230	0	
-14	240	0	
-9,81	250	0	
-12,63	260	0	
-27,71	270	0	
-14,48	280	0	
-11,49	290	0	
-13,6	300	0	
-12,05	310	0	
-12,22	320	0	
-15,86	330	0	
-12,78	340	0	
-12,86	350	0	
-13,16	360	0	



Antenna measurement

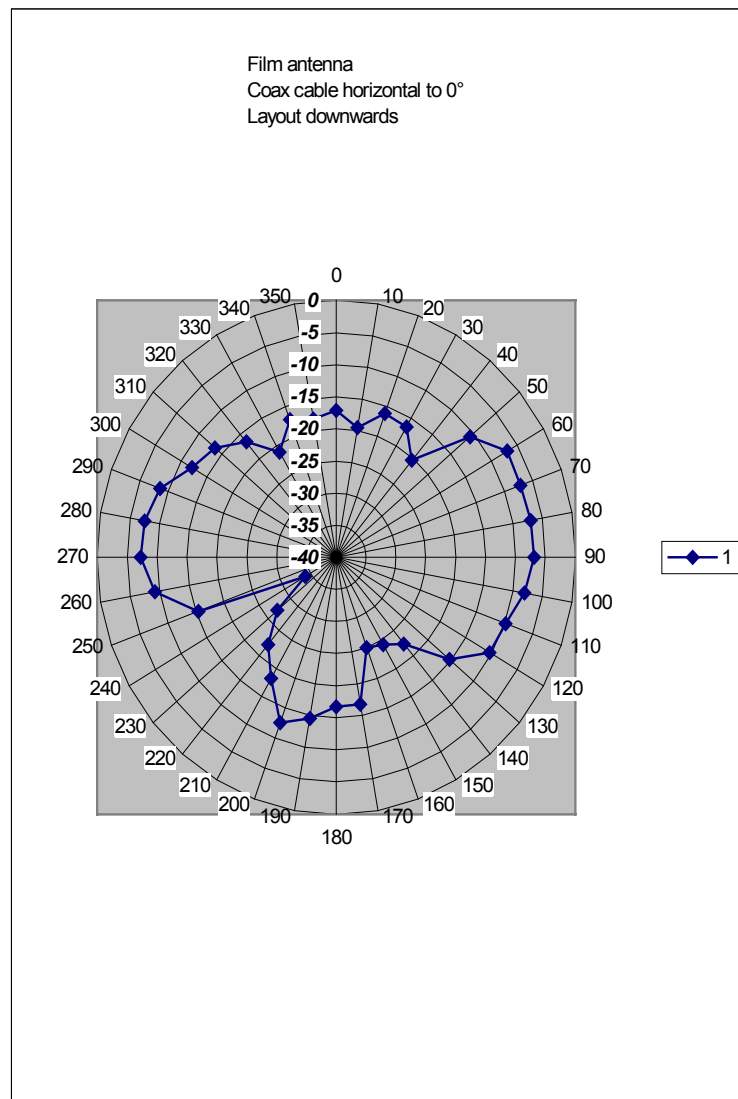
TYPE 2: FILM antenna 'HTL-004'

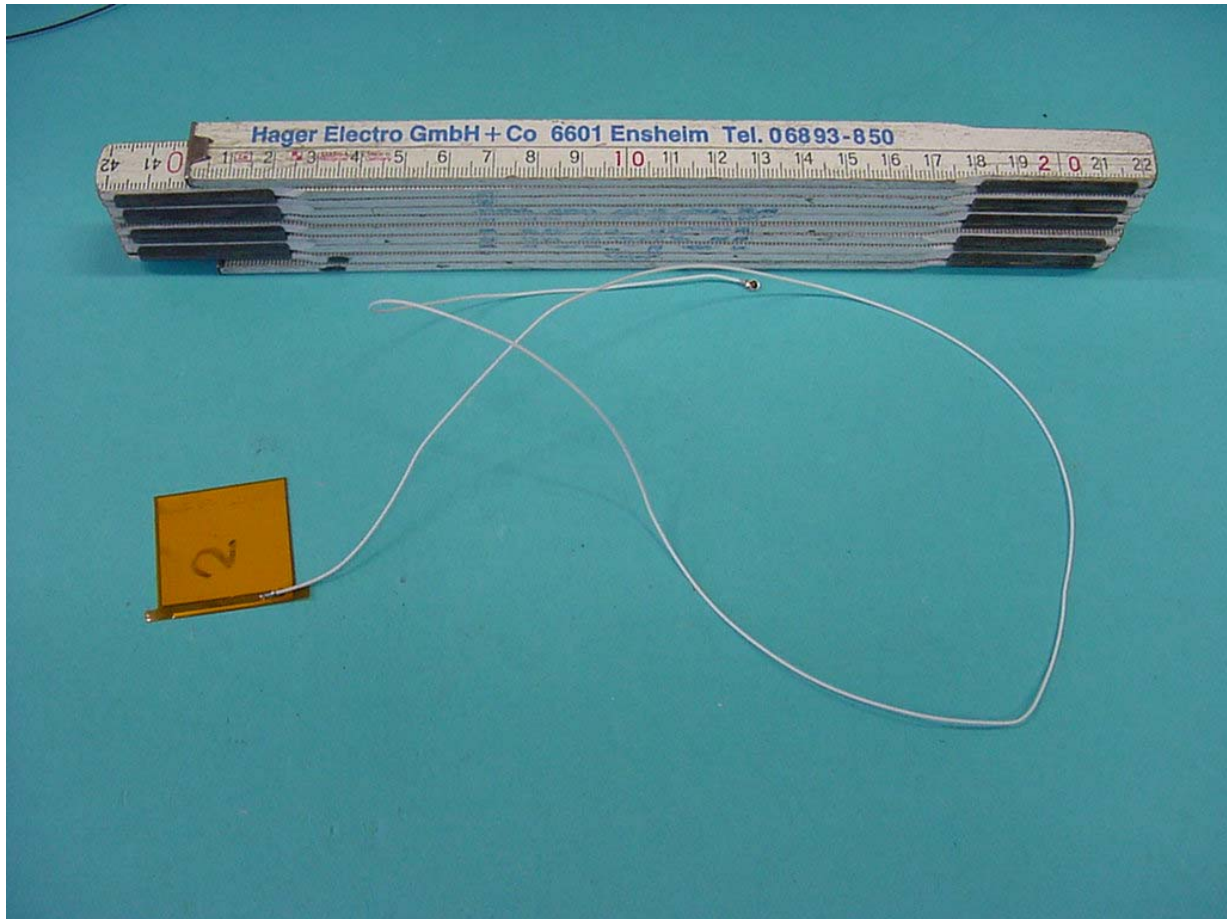
The antenna was fixed printed side down on a wooden carrier.

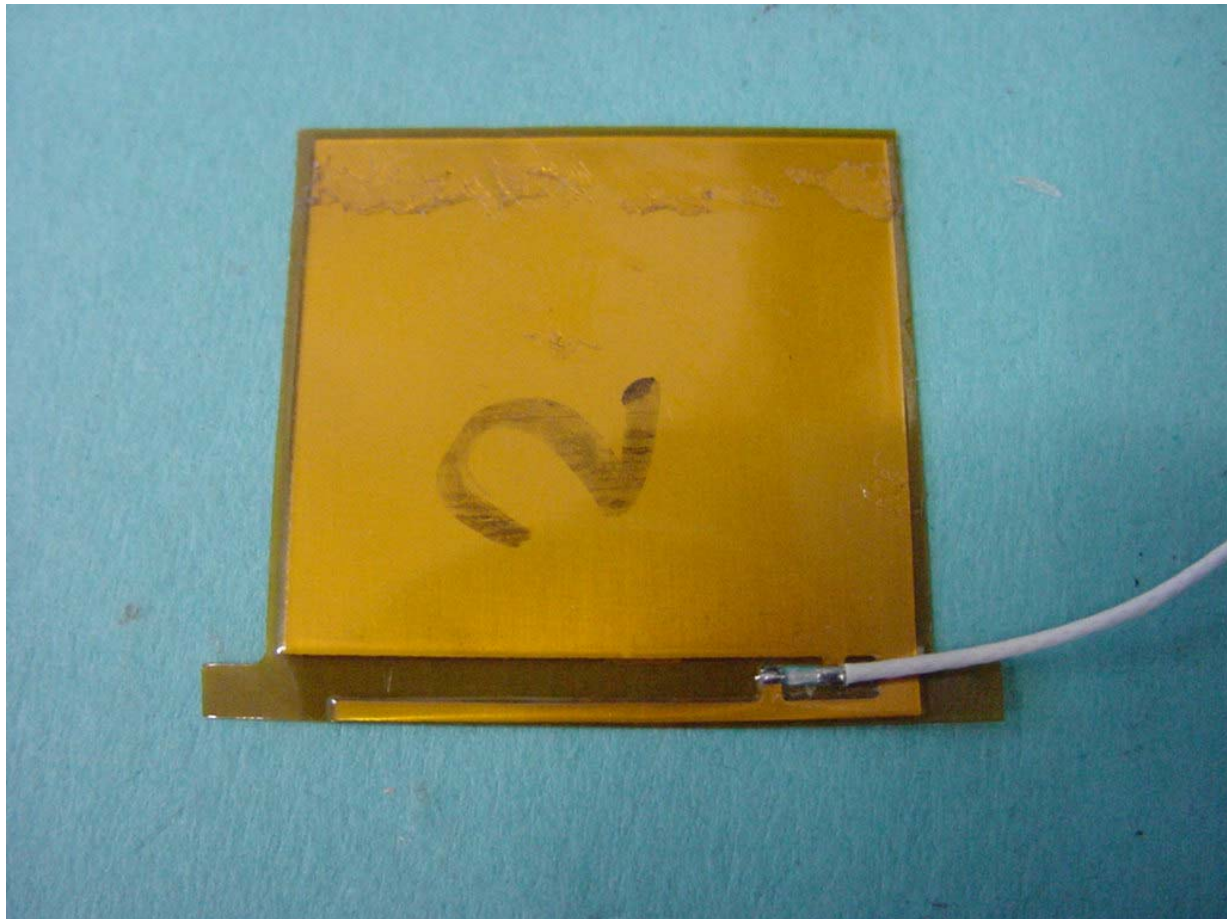
The coax cable shows to 0 degree.

Receiving antenna vertical.

dBm	degree	Elevation	
-17,13	0	0	0
-19,56	10	0	0
-16,19	20	0	0
-16,57	30	0	0
-20,27	40	0	0
-10,83	50	0	0
-6,94	60	0	0
-7,17	70	0	0
-6,99	80	0	0
-6,92	90	0	0
-8,06	100	0	0
-9,84	110	0	0
-10,29	120	0	0
-15,32	130	0	0
-22,36	140	0	0
-24,34	150	0	0
-25,05	160	0	0
-16,72	170	0	0
-16,74	180	0	0
-14,59	190	0	0
-12,63	200	0	0
-18,14	210	0	0
-22,26	220	0	0
-27,18	230	0	0
-34,11	240	0	0
-15,55	250	0	0
-9,2	260	0	0
-7,25	270	0	0
-7,45	280	0	0
-8,57	290	0	0
-12,17	300	0	0
-13,47	310	0	0
-16,57	320	0	0
-21,11	330	0	0
-17,25	340	0	0
-18,19	350	0	0
-18,34	360	0	0







Antenna measurement

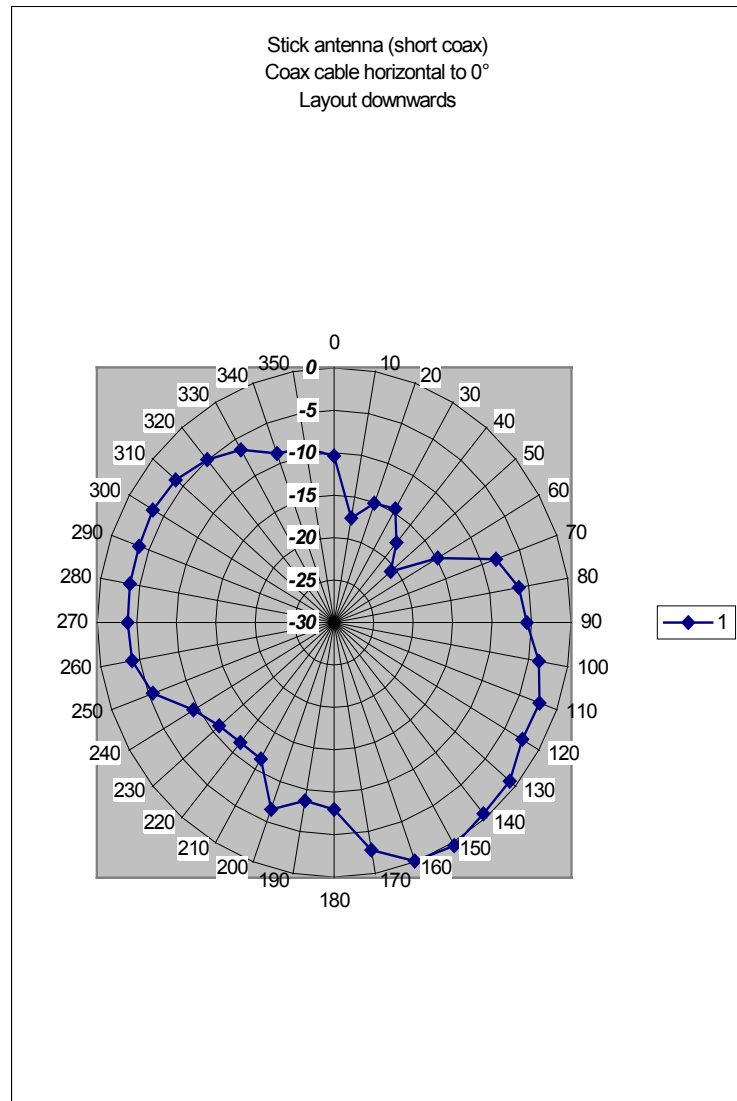
TYPE 3: STICK antenna 'HTL-007' (short coax)

The antenna was fixed printed side down on a wooden carrier.

The coax cable shows to 0 degree.

Receiving antenna horizontal.

dBm	degree	Elevation	
-10,4	0	0	0
-17,46	10	0	0
-15,14	20	0	0
-14,51	30	0	0
-17,68	40	0	0
-20,71	50	0	0
-14,87	60	0	0
-8,24	70	0	0
-6,26	80	0	0
-5,65	90	0	0
-3,67	100	0	0
-2,35	110	0	0
-2,5	120	0	0
-0,98	130	0	0
-0,65	140	0	0
0,32	150	0	0
-0,11	160	0	0
-2,83	170	0	0
-8,06	180	0	0
-8,72	190	0	0
-6,64	200	0	0
-11,46	210	0	0
-11,56	220	0	0
-11,08	230	0	0
-9,48	240	0	0
-5,65	250	0	0
-4,15	260	0	0
-3,92	270	0	0
-3,79	280	0	0
-3,79	290	0	0
-3,57	300	0	0
-3,87	310	0	0
-4,99	320	0	0
-6,54	330	0	0
-8,82	340	0	0
-9,2	350	0	0
-13,19	360	0	0



Antenna measurement

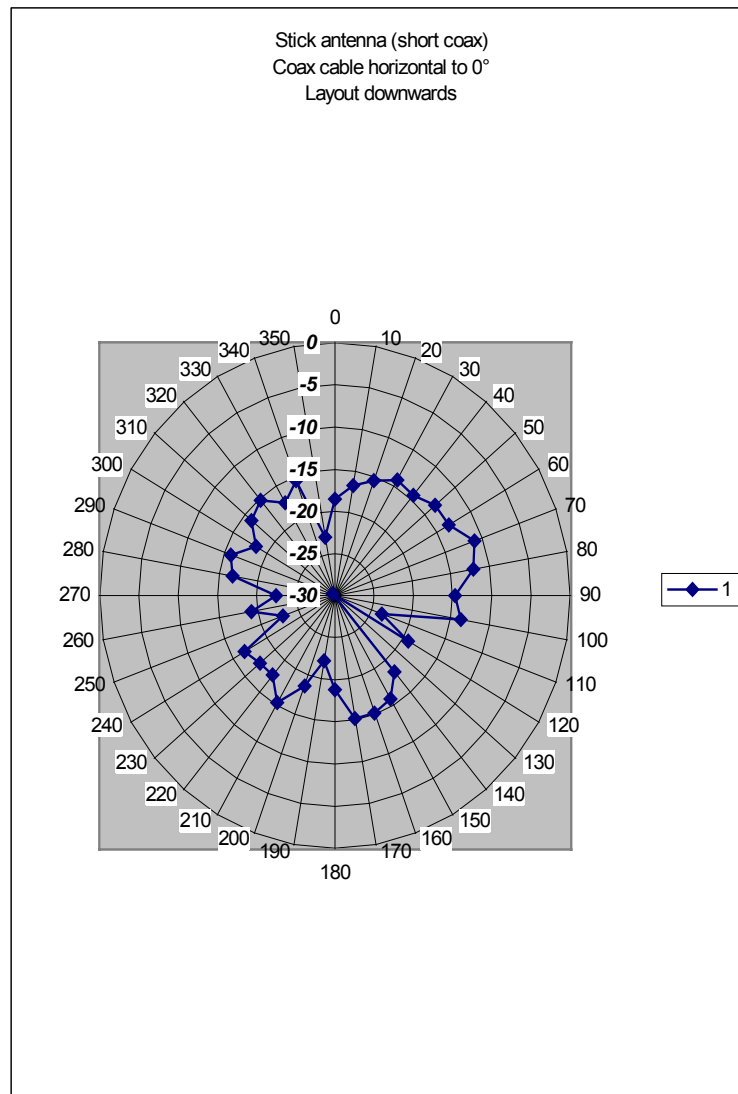
TYPE 3: STICK antenna 'HTL-007' (short coax)

The antenna was fixed printed side down on a wooden carrier.

The coax cable shows to 0 degree.

Receiving antenna vertical.

dBm	degree	Elevation
-18,55	0	0
-16,77	10	0
-15,53	20	0
-14,23	30	0
-14,51	40	0
-13,29	50	0
-13,27	60	0
-11,08	70	0
-12,07	80	0
-14,71	90	0
-13,75	100	0
-23,63	110	0
-19,21	120	0
-30,33	130	0
-18,22	140	0
-15,88	150	0
-15,25	160	0
-15,25	170	0
-18,88	180	0
-22,1	190	0
-18,65	200	0
-15,4	210	0
-17,68	220	0
-17,58	230	0
-16,72	240	0
-22,92	250	0
-19,23	260	0
-22,53	270	0
-16,74	280	0
-15,86	290	0
-18,45	300	0
-16,19	310	0
-15,27	320	0
-17,35	330	0
-15,5	340	0
-23,02	350	0
-18,85	360	0







Antenna measurement

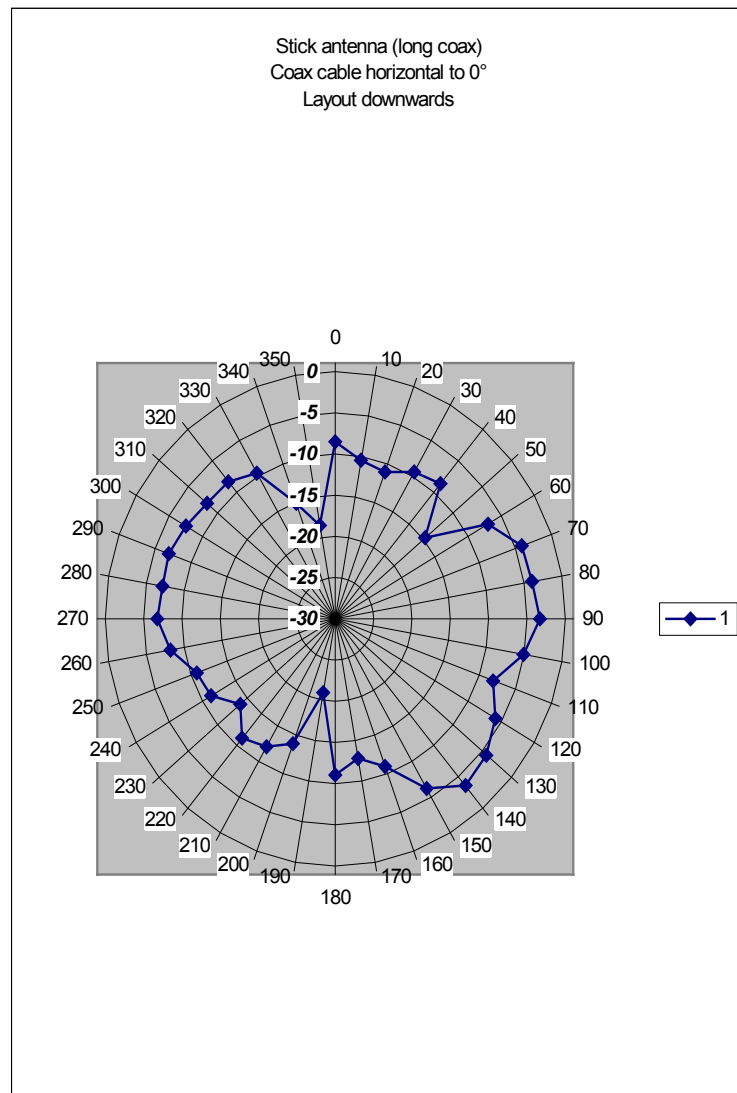
TYPE 4: STICK antenna 'HTL-007' (long coax)

The antenna was fixed printed side down on a wooden carrier.

The coax cable shows to 0 degree.

Receiving antenna horizontal.

dBm	degree	Elevation
-8,52	0	0
-10,45	10	0
-11,08	20	0
-9,41	30	0
-8,62	40	0
-14,69	50	0
-7,07	60	0
-4,17	70	0
-4	80	0
-3,31	90	0
-5,11	100	0
-8,09	110	0
-5,93	120	0
-4,28	130	0
-3,59	140	0
-6,26	150	0
-10,98	160	0
-12,78	170	0
-11,08	180	0
-20,91	190	0
-13,9	200	0
-12,15	210	0
-11,11	220	0
-13,8	230	0
-11,34	240	0
-10,78	250	0
-8,21	260	0
-6,84	270	0
-7,1	280	0
-6,89	290	0
-7,6	300	0
-8,24	310	0
-8,31	320	0
-9,56	330	0
-15,09	340	0
-18,55	350	0
-13,62	360	0



Antenna measurement

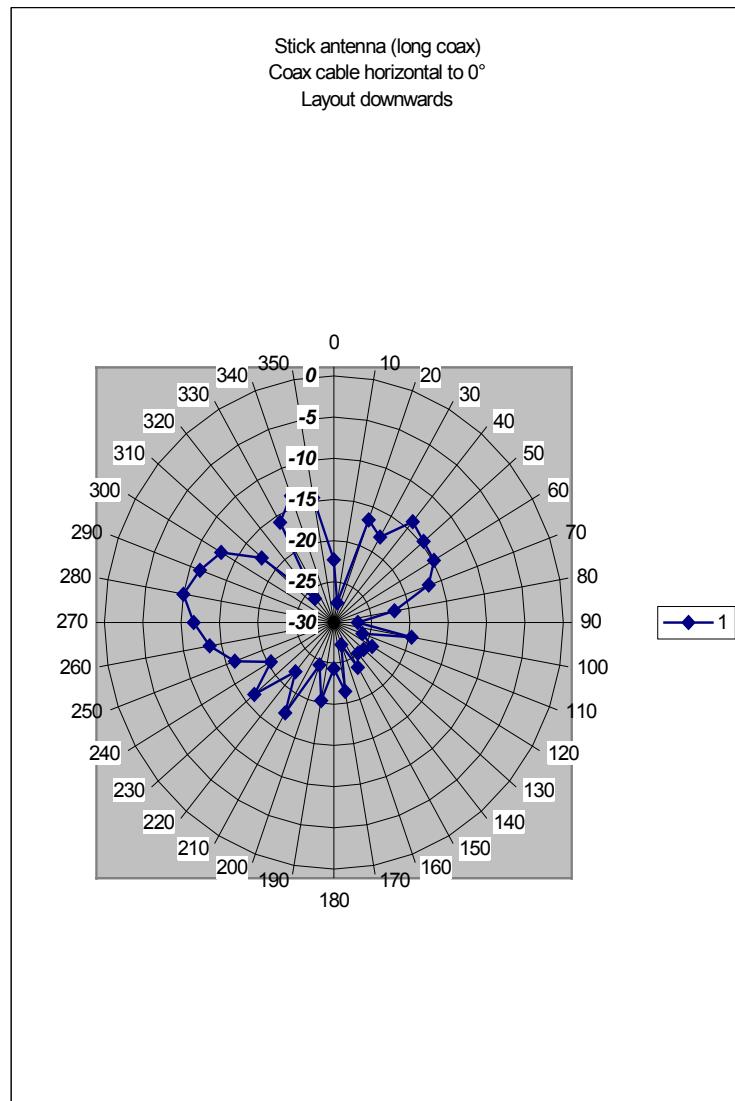
TYPE 4: STICK antenna 'HTL-007' (long coax)

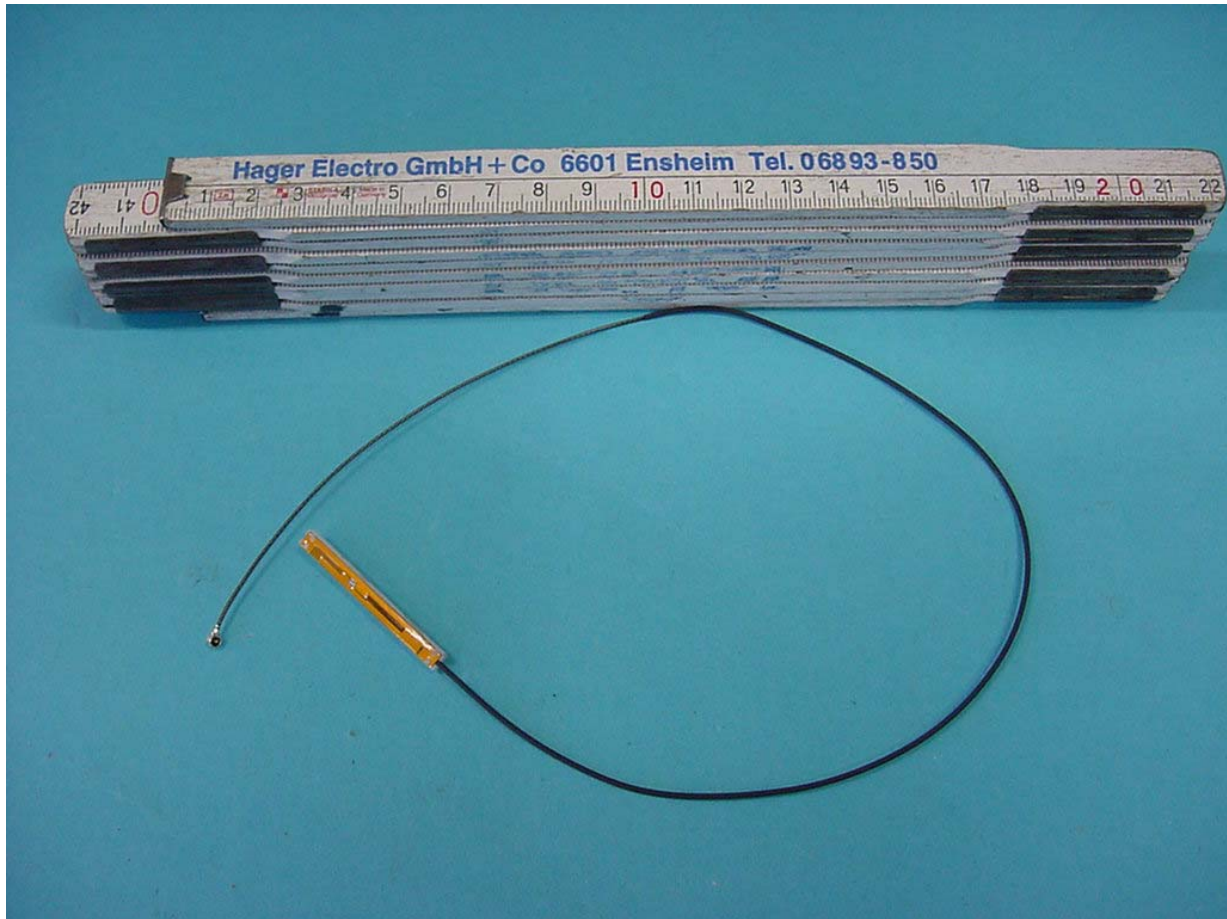
The antenna was fixed printed side down on a wooden carrier.

The coax cable shows to 0 degree.

Receiving antenna vertical.

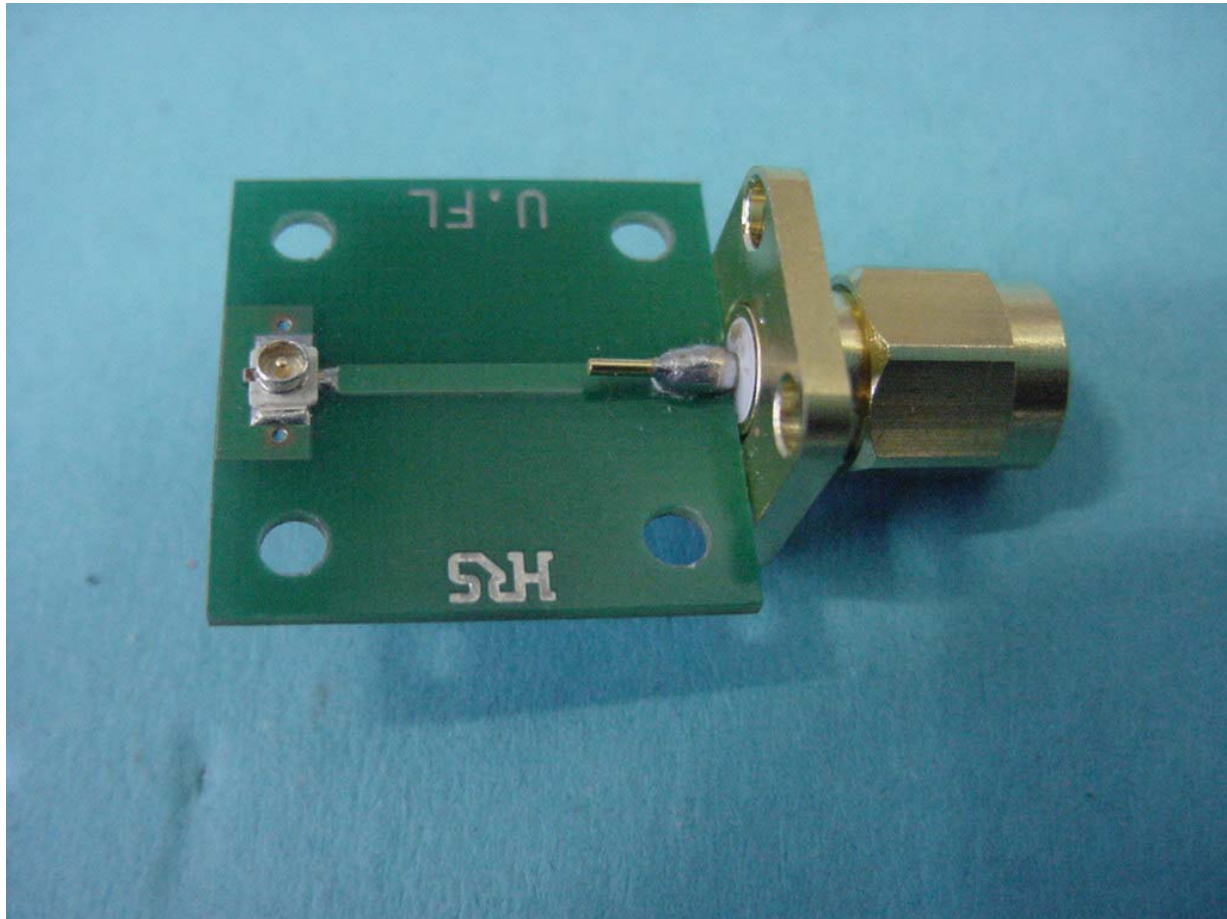
dBm	degree	Elevation
-22,41	0	0
-27,59	10	0
-16,72	20	0
-18,01	30	0
-14,05	40	0
-14,69	50	0
-14,89	60	0
-16,77	70	0
-21,9	80	0
-26,88	90	0
-19,66	100	0
-26,01	110	0
-24,26	120	0
-24,92	130	0
-25,15	140	0
-23,73	150	0
-27,18	160	0
-21,49	170	0
-24,39	180	0
-20,4	190	0
-24,54	200	0
-17,3	210	0
-22,23	220	0
-16,41	230	0
-20,53	240	0
-16,24	250	0
-13,55	260	0
-11,67	270	0
-10,02	280	0
-11,39	290	0
-12,99	300	0
-17,76	310	0
-26,17	320	0
-15,93	330	0
-13,62	340	0
-14,64	350	0
-18,27	360	0







This adapter was used for all type of antennas to connect to our measuring system.



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 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	Funktionsgenerator	AFGU	Rohde & Schwarz	862 480/032
09	Regeltrenntrafo	MPL	Erfi	91350
10	Netznachbildung	NNLA 8120	Schwarzbeck	8120331
11	Relais-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	Modulationsmeter	9008	Racal-Dana	2647
16	Frequenzzähler	5340 A	Hewlett-Packard	1532A03899
17	Absorber Schirmkabine	---	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 Antenne	3104	Emco	3758
23	Log. Per. Antenne	3146	Emco	2130
24	Double Ridge 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 Antenne	HK 116	Rohde & Schwarz	888 945/013
28	Log. Per. Antenne	HL 223	Rohde & Schwarz	825 584/002
29	Relais-Switch-Unit	RSU	Rohde & Schwarz	375 339/002
30	Highpass	HM985955	FSY Microwave	001
31	Amplifier	P42-GA29	Tron-Tech	B 23602
32	Absorber Schirmkabine		Frankonia	
33	Steuerrechner	PSM 7	Rohde & Schwarz	834 621/004
34	EMI Test Reciever	ESMI	Rohde & Schwarz	827 063/010
35	EMI Test Receiver	Display	Rohde & Schwarz	829 808/010

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	Controler	HD 100	Deisel	100/322/93
37	Relais Matrix	PSN	Rohde & Schwarz	829 065/003
38	Control Unit	GB 016 A2	Rohde & Schwarz	344 122/008
39	Relais Switch Unit	RSU	Rohde & Schwarz	316 790/001
40	Power Supply	6032A	Hewlett Packard	2846A04063
41	Spektrum Monitor	EZM	Rohde & Schwarz	883 720/006
42	Meßempfänger	ESH 3	Rohde & Schwarz	890 174/002
43	Meßempfänger	ESVP	Rohde & Schwarz	891 752/005
44	Biconi 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	Polarisationsnetzwerk	HL 024 Z1	Rohde & Schwarz	341 570/002
49	Double Ridge G Horn Antenne 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	Steuerrechner	PSM 7	Rohde & Schwarz	883 086/026
53	DC V-Netzwerk	ESH3-Z6	Rohde & Schwarz	861 406/005
54	DC V-Netzwerk	ESH3-Z6	Rohde & Schwarz	893 689/012
55	AC 2 Phasen V-Netzwerk	ESH3-Z5	Rohde & Schwarz	861 189/014
56	AC 2 Phasen V-Netzwerk	ESH3-Z5	Rohde & Schwarz	894 981/019
57	AC-3 Phasen V-Netzwerk	ESH2-Z5	Rohde & Schwarz	882 394/007
58	Stromversorgung	6032A	Rohde & Schwarz	2933A05441
59	HF-Test Empfänger	ESVP.52	Rohde & Schwarz	881 487/021
60	Spectrum Monitor	EZM	Rohde & Schwarz	883 086/026
61	HF-Test Empfänger	ESH3	Rohde & Schwarz	881 515/002
62	Relais Matrix	PSU	Rohde & Schwarz	882 943/029
63	Relais Matrix	PSU	Rohde & Schwarz	828 628/007
64	Spectrum Analyzer	FSIQ 26	Rohde & Schwarz	119.6001.27
67				

Test site

RADIATED EMISSIONS



Test site

RADIATED EMISSIONS

