

TEST REPORT # EMCC-140009B, 2014-06-30

EQUIPMENT UNDER TEST

Trade Name: Shield Knitted Fabric GUARD
Equipment Category: Shielding material

Manufacturer: Rivov Electronics Ltd.
Tzar Kaloian Str. 12-18
Haskovo 6300
BULGARIA

Applicant: same as manufacturer

Phone: +359 38 500 100
E-Mail: rivov@rivov.com

TEST PROCEDURE

IEEE-STD 299-2006

Tested:



Ludwig Kraft



Patrick Reusch

Checked:



Reinhard Sauerschell
(Head of Laboratory)

Shield Attenuation Test on Rivov Electronics Ltd. Shield Knitted Fabric GUARD

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Shield Attenuation Test on Rivov Electronics Ltd. Shield Knitted Fabric GUARD

1 IDENTIFICATION SUMMARY

1.1 Limits and Reservations

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1.2 Test Laboratory

Test Laboratory:	EMCCCons DR. RAŠEK GmbH & Co. KG
Accreditation No.:	D-PL-12067-01-00
Address of Labs I, II, III and Head Office:	EMCCCons DR. RAŠEK GmbH & Co. KG Moggast, Boelwiese 8 91320 Ebermannstadt GERMANY
Address of Labs IV and V:	EMCCCons DR. RAŠEK GmbH & Co. KG Stoernhofer Berg 15 91364 Unterleinleiter GERMANY
Name for contact purposes:	Mr Reinhard Sauerschell
Phone:	+49 9194 9016
Fax:	+49 9194 8125
E-mail:	r.sauerschell@emcc.de

1.3 Manufacturer

Company Name:	Rivov Electronics Ltd.
Street:	Tzar Kaloian Str. 12-18
City:	Haskovo 6300
Country:	BULGARIA
Name for contact purposes:	Mr Georgi Rivov
Phone:	+359 38 500 100
Fax:	+359 38 500 101
E-mail:	rivov@rivov.com

1.4 Applicant

Same as manufacturer.

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1.5 Ordering Information

Purchase Order:

E-Mail Order

Date:

2014-06-03

1.6 Dates and Test Location

The sample was tested at EMCCons DR. RAŠEK GmbH & Co. KG test laboratory IV in Unterleinleiter on 2014-06-25.

The sample was delivered to EMCCons DR. RAŠEK GmbH & Co. KG on 2014-06-11.

1.7 Climatic Conditions

Date	Temperature [°C]	Relative Humidity [%]	Air Pressure [hPa]	Lab	Customer attended tests
2014-06-25	24	46	969	IV	no

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2 EQUIPMENT UNDER TEST

2.1 General Description

The following description was delivered by the customer:

- *Property: protection and shield from electromagnetic waves; attenuation of electromagnetic energy*
- *Structure knitted fabric:*
 - *50% PES / 50% Cu&Sn*
 - *PES dtex 83 / Cu&Sn 0,050 mm*
 - *Width: 1500 mm – 1680 mm*
 - *Weight: 120 g/m²*
- *Application: warfare; security; medicine; data protection; anti espionage; protective clothing; labor protection; construction and more other.*

2.2 Modifications

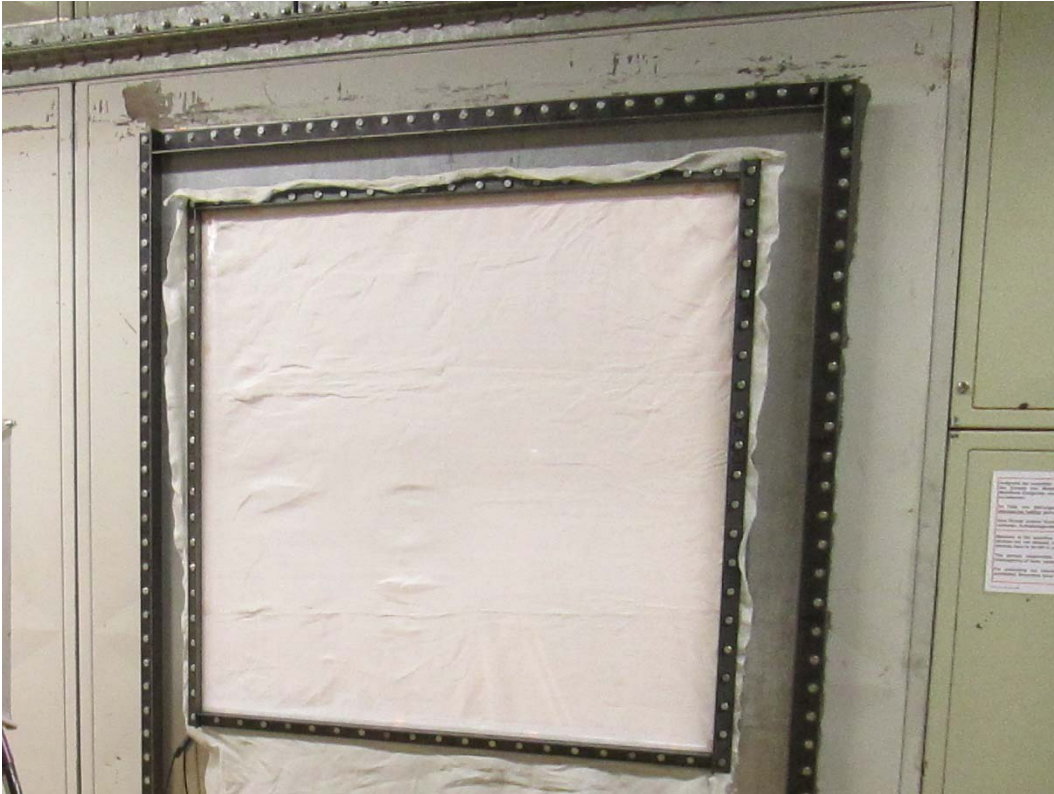
None.

2.3 Test Specifications and Standards

Nomenclature	IEEE-STD 299
Dated	2006
Issue/Revision	n.a.
Remarks	Incorporates the basics of MIL-STD 285

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2.4 Photos of the EUT



Photograph 2.4-1: Mounted EUT



Photograph 2.4-2: Mounted EUT – detailed view

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3 TEST DATA

3.1 Test Parameter

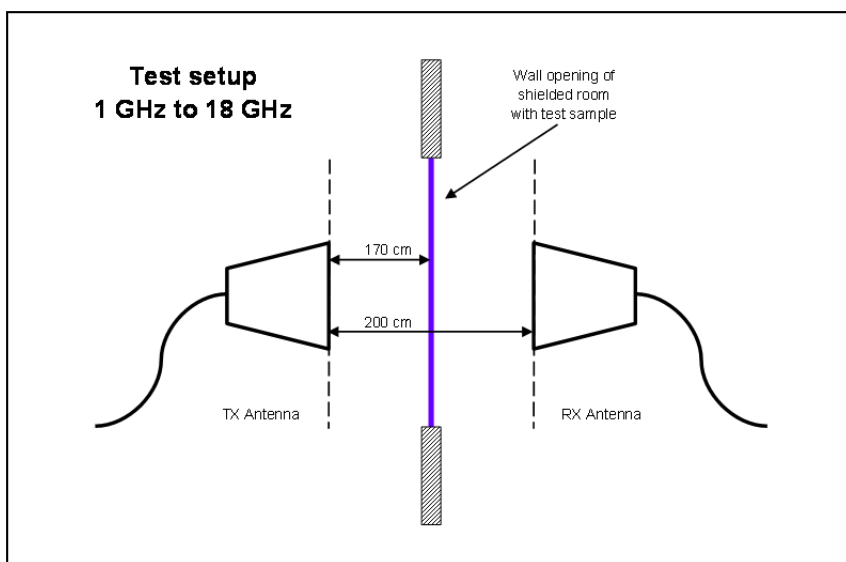
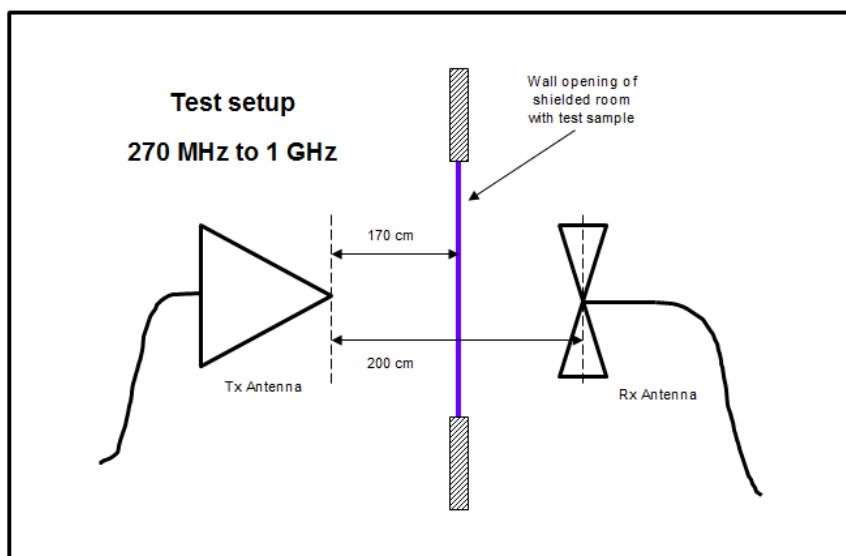
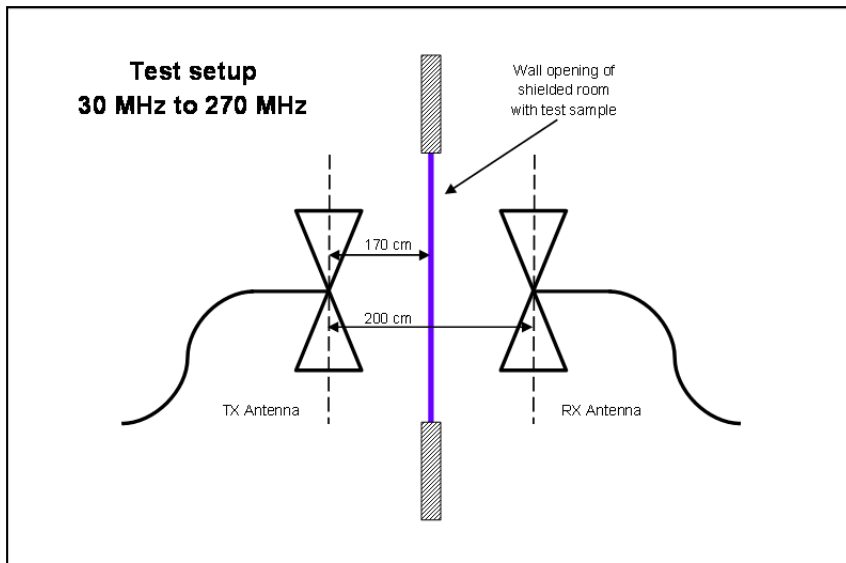
The shield attenuation test was performed in the frequency range of 30 MHz to 18 GHz.

The test was performed according to the specification IEEE-STD 299-2006: "IEEE Standard Method for Measuring the Effectiveness of Electromagnetic Shielding Enclosures", dated 2006.

TEST PARAMETER	
TYPE OF TESTS	Shield Attenuation Test with fix installed antennas
TEST SPECIFICATION	IEEE-STD 299
TEST PERSONNEL	Ludwig Kraft, Patrick Reusch
DATE OF TEST	2014-06-25
FREQUENCY RANGE	30 MHz to 18 GHz
POLARISATION	Vertical and horizontal
FREQUENCY STEP	$\leq 2\%$ log
DISTANCES	See § 3.2
TEST POINT	One, at the midpoint of test sample
REFERENCE MEASUREMENT	On the chamber wall opening without test sample
INSTALLATION OF SAMPLE	In wall opening (about 1m x 1m) of shielded room, the test sample was radiation proof screwed on the wall opening. The orientation of the textile sample was with metallic fibers in vertical direction.
CALCULATION OF SHIELD ATTENUATION	Attenuation (dB) = level of reference measurement (dB μ V) - level of measurement of the test sample (dB μ V)
DYNAMIC RANGE	80 dB min
REMARKS / RESPONSES	None

Shield Attenuation Test on Rivov Electronics Ltd. Shield Knitted Fabric GUARD

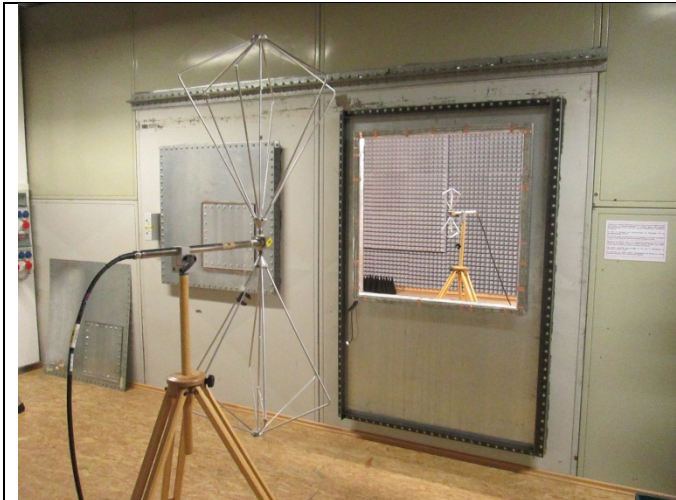
3.2 Test Setup



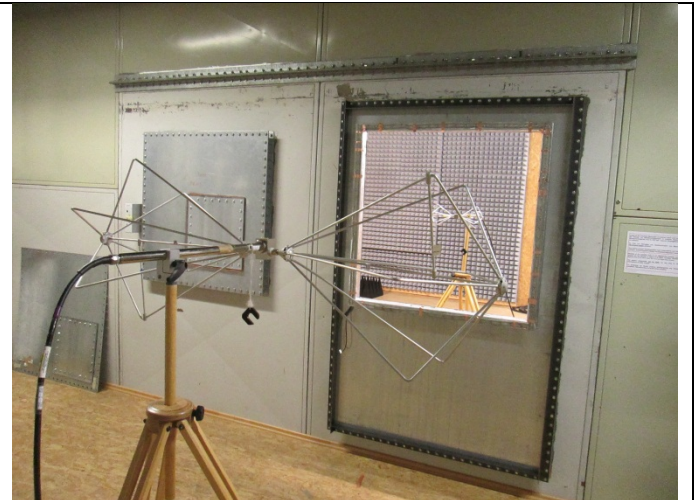
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4 MEASUREMENTS

4.1 Reference measurement



Reference meas.: 30 MHz – 270 MHz, vertical



Reference meas.: 30 MHz – 270 MHz, horizontal



Reference meas.: 270 MHz – 1000 MHz, vertical



Reference meas.: 270 MHz – 1000 MHz, horizontal



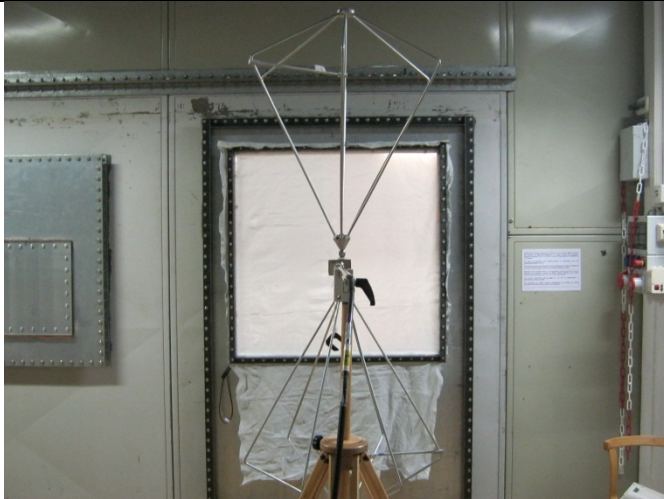
Reference meas.: 1 GHz – 18 GHz, vertical



Reference meas.: 1 GHz – 18 GHz, horizontal

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4.2 Measurement with EUT



Test setup: 30 MHz – 270 MHz, vertical, TX



Test setup: 30 MHz – 270 MHz, vertical, RX



Test setup: 270 MHz – 1000 MHz, vertical, TX



Test setup: 270 MHz – 1000 MHz, vertical, RX

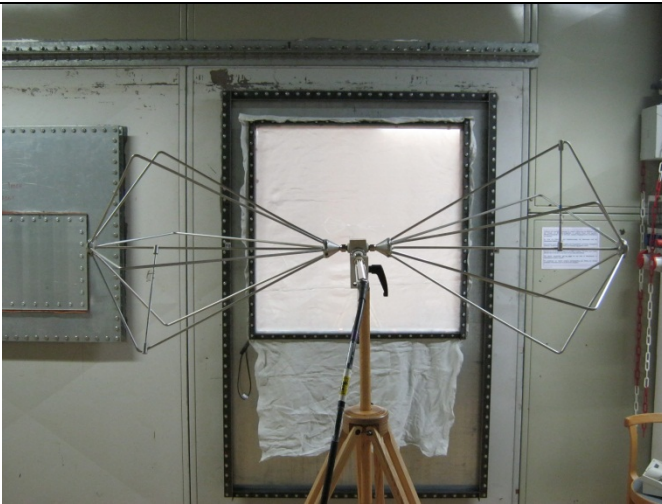


Test setup: 1 GHz – 18 GHz, vertical, TX

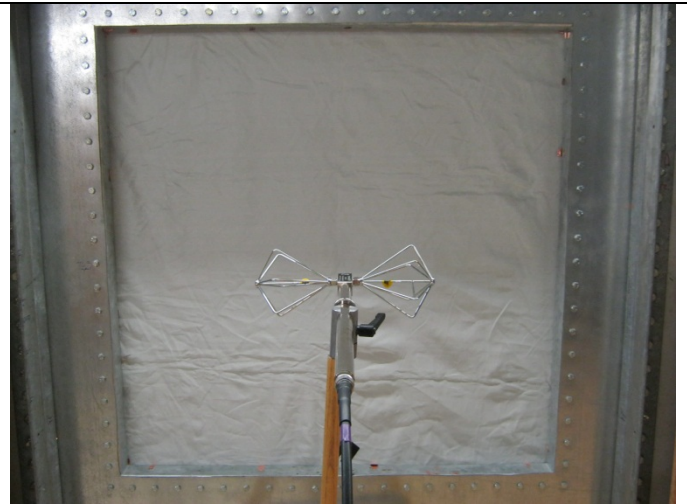


Test setup: 1 GHz – 18 GHz, vertical, RX

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Test setup: 30 MHz – 270 MHz, horizontal, TX



Test setup: 30 MHz – 270 MHz, horizontal, RX



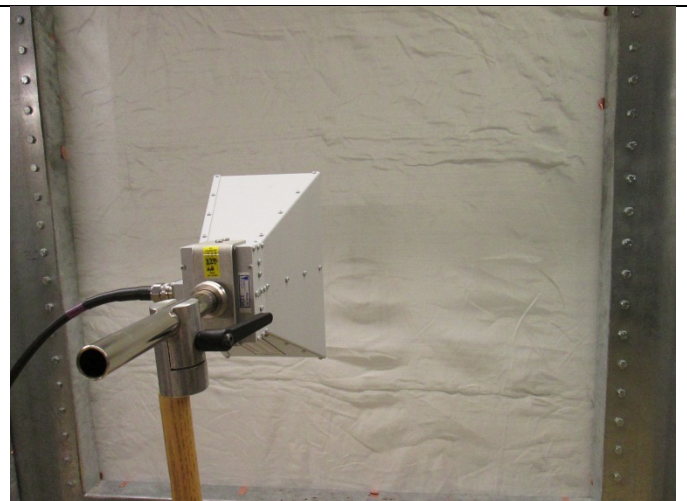
Test setup: 270 MHz – 1000 MHz, horizontal, TX



Test setup: 270 MHz – 1000 MHz, horizontal, RX



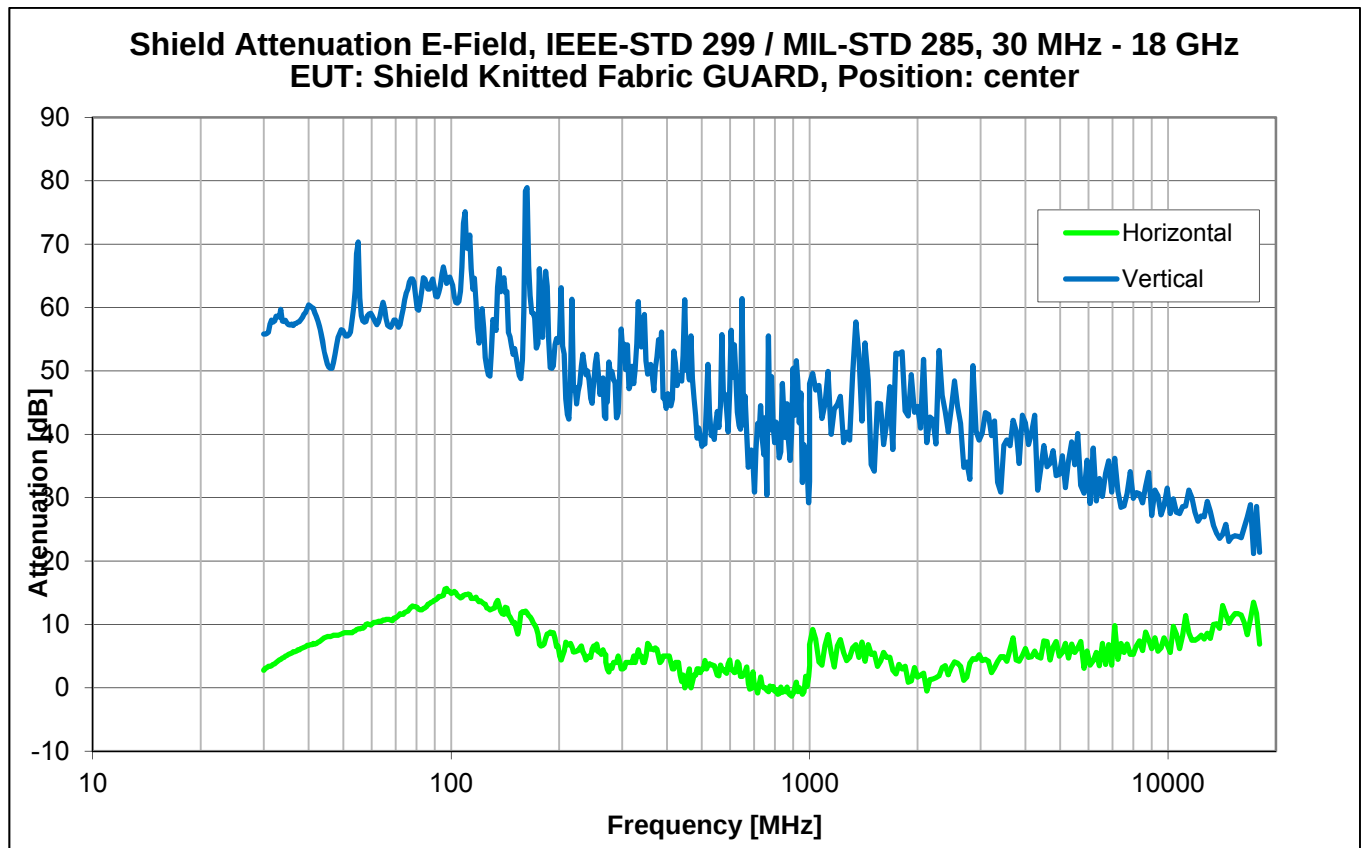
Test setup: 1 GHz – 18 GHz, horizontal, TX



Test setup: 1 GHz – 18 GHz, horizontal, RX

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Results:



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Table of measurements:

Attenuation Result [dB]			Attenuation Result [dB]			Attenuation Result [dB]		
Frequency [MHz]	Horizontal	Vertical	Frequency [MHz]	Horizontal	Vertical	Frequency [MHz]	Horizontal	Vertical
30	3	56	43.7858	8	55	63.9066	11	60
30.3	3	56	44.2237	8	53	64.5457	11	61
30.603	3	56	44.6659	8	52	65.1911	11	60
30.909	3	56	45.1126	8	51	65.843	11	58
31.2181	3	57	45.5637	8	51	66.5014	11	57
31.5303	4	58	46.0193	8	50	67.1665	11	57
31.8456	4	58	46.4795	8	50	67.8381	11	57
32.1641	4	58	46.9443	8	51	68.5165	11	57
32.4857	4	59	47.4138	8	53	69.2017	11	58
32.8106	4	59	47.8879	8	54	69.8937	11	58
33.1387	4	59	48.3668	8	55	70.5926	11	57
33.4701	5	60	48.8504	8	56	71.2986	11	57
33.8048	5	58	49.3389	9	57	72.0115	12	57
34.1428	5	58	49.8323	9	56	72.7316	12	59
34.4842	5	58	50.3307	9	56	73.459	12	60
34.8291	5	58	50.834	9	56	74.1936	12	61
35.1774	5	57	51.3423	9	56	74.9355	12	62
35.5291	5	57	51.8557	9	56	75.6848	12	63
35.8844	6	57	52.3743	9	56	76.4417	12	64
36.2433	6	57	52.898	9	58	77.2061	13	65
36.6057	6	57	53.427	9	60	77.9782	13	65
36.9718	6	58	53.9613	9	63	78.758	13	64
37.3415	6	58	54.5009	9	69	79.5455	13	62
37.7149	6	58	55.0459	9	70	80.341	13	60
38.092	6	58	55.5964	9	62	81.1444	12	60
38.473	6	58	56.1523	9	59	81.9559	12	61
38.8577	6	59	56.7139	9	58	82.7754	12	63
39.2463	7	59	57.281	10	58	83.6032	13	65
39.6387	7	60	57.8538	10	58	84.4392	13	65
40.0351	7	60	58.4323	10	59	85.2836	13	64
40.4355	7	60	59.0167	10	59	86.1364	13	63
40.8398	7	60	59.6068	10	59	86.9978	13	63
41.2482	7	60	60.2029	10	59	87.8678	14	64
41.6607	7	59	60.8049	10	58	88.7464	14	65
42.0773	7	59	61.413	10	58	89.6339	14	63
42.4981	7	58	62.0271	10	57	90.5303	14	62
42.9231	7	57	62.6474	11	58	91.4356	14	62
43.3523	7	56	63.2738	11	59	92.3499	14	62

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Attenuation Result [dB]			Attenuation Result [dB]			Attenuation Result [dB]		
Frequency [MHz]	Horizontal	Vertical	Frequency [MHz]	Horizontal	Vertical	Frequency [MHz]	Horizontal	Vertical
93.2734	14	63	136.1351	13	66	198.6928	7	55
94.2061	15	65	137.4964	12	63	200.6798	5	55
95.1482	15	66	138.8714	12	64	202.6866	4	63
96.0997	16	65	140.2601	12	65	204.7134	5	54
97.0607	16	64	141.6627	13	62	206.7606	6	53
98.0313	15	64	143.0793	13	63	208.8282	7	46
99.0116	15	65	144.5101	12	56	210.9165	7	43
100.0017	15	64	145.9552	11	55	213.0256	7	42
101.0017	15	64	147.4148	11	54	215.1559	7	47
102.0117	15	62	148.8889	10	53	217.3074	7	61
103.0319	15	61	150.3778	10	54	219.4805	6	47
104.0622	15	61	151.8816	9	52	221.6753	6	47
105.1028	14	61	153.4004	9	51	223.8921	6	45
106.1538	14	63	154.9344	10	49	226.131	6	47
107.2154	14	66	156.4837	12	49	228.3923	6	48
108.2875	15	73	158.0486	12	52	230.6762	7	51
109.3704	15	75	159.6291	12	59	232.983	6	53
110.4641	15	69	161.2254	12	78	235.3128	5	51
111.5687	15	69	162.8376	12	79	237.666	4	49
112.6844	15	71	164.466	11	67	240.0426	5	50
113.8113	14	66	166.1107	11	62	242.443	5	49
114.9494	14	63	167.7718	11	59	244.8675	5	46
116.0989	14	65	169.4495	10	59	247.3161	6	45
117.2599	14	61	171.144	10	58	249.7893	7	48
118.4325	14	57	172.8554	9	54	252.2872	6	51
119.6168	14	54	174.584	9	54	254.8101	7	53
120.813	14	56	176.3298	7	66	257.3582	6	50
122.0211	14	60	178.0931	7	58	259.9317	6	46
123.2413	13	57	179.874	7	55	262.531	5	48
124.4737	13	52	181.6728	7	62	265.1563	6	49
125.7185	13	51	183.4895	8	66	267.8079	5	43
126.9756	13	49	185.3244	9	63	270	4	45
128.2454	12	49	187.1776	9	55	272.7	3	45
129.5278	12	53	189.0494	9	51	275.427	3	51
130.8231	13	58	190.9399	9	50	278.1813	4	50
132.1313	13	57	192.8493	9	51	280.9631	3	50
133.4527	13	56	194.7778	8	54	283.7727	4	49
134.7872	14	63	196.7256	7	55	286.6104	4	48

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Attenuation Result [dB]			Attenuation Result [dB]			Attenuation Result [dB]		
Frequency [MHz]	Horizontal	Vertical	Frequency [MHz]	Horizontal	Vertical	Frequency [MHz]	Horizontal	Vertical
289.4766	4	43	422.4989	4	51	616.6485	2	54
292.3713	5	43	426.7238	4	48	622.815	3	50
295.295	4	50	430.9911	4	49	629.0432	4	44
298.248	3	57	435.301	2	49	635.3336	4	41
301.2305	3	53	439.654	1	48	641.6869	2	41
304.2428	3	54	444.0505	2	52	648.1038	2	61
307.2852	4	50	448.491	0	61	654.5848	2	42
310.358	4	54	452.976	1	50	661.1306	3	46
313.4616	4	47	457.5057	2	51	667.7419	3	40
316.5962	4	48	462.0807	3	49	674.4194	1	35
319.7622	4	51	466.7016	0	56	681.1636	0	36
322.9598	5	48	471.3686	1	49	687.9752	0	38
326.1894	4	50	476.0823	2	46	694.855	3	36
329.4513	5	54	480.8431	2	43	701.8035	0	31
332.7458	6	61	485.6516	3	39	708.8215	0	38
336.0733	5	55	490.5081	3	41	715.9097	-1	42
339.434	5	54	495.4131	2	40	723.0688	1	40
342.8283	4	57	500.3673	3	38	730.2996	2	45
346.2566	4	59	505.3709	3	39	737.6025	0	39
349.7192	5	52	510.4247	4	39	744.9786	0	37
353.2164	7	50	515.5289	3	45	752.4283	0	43
356.7485	7	51	520.6841	4	51	759.9526	0	30
360.316	6	51	525.891	4	43	767.5522	-1	56
363.9192	6	49	531.1499	4	40	775.2277	0	41
367.5583	6	47	536.4614	4	41	782.98	0	49
371.2339	6	50	541.826	4	39	790.8098	0	42
374.9463	6	52	547.2443	3	42	798.7178	-1	39
378.6957	5	55	552.7168	2	44	806.705	0	42
382.4827	4	53	558.244	2	41	814.7721	-1	40
386.3075	4	56	563.8264	4	45	822.9198	-1	36
390.1706	5	46	569.4647	3	56	831.149	0	37
394.0723	5	46	575.1593	3	46	839.4604	-1	48
398.013	5	44	580.9109	3	46	847.855	0	43
401.9932	5	46	586.72	2	44	856.3336	-1	40
406.0131	5	45	592.5872	4	40	864.897	0	45
410.0732	4	45	598.513	4	47	873.546	-1	39
414.174	3	46	604.4981	3	56	882.2814	-1	36
418.3157	3	53	610.5431	3	49	891.1042	-1	41

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Attenuation Result [dB]			Attenuation Result [dB]			Attenuation Result [dB]		
Frequency [MHz]	Horizontal	Vertical	Frequency [MHz]	Horizontal	Vertical	Frequency [MHz]	Horizontal	Vertical
900.0153	-1	50	1706.887	3	38	3622.523	6	38
909.0155	0	43	1741.024	2	53	3694.974	8	42
918.1057	1	52	1775.845	4	53	3768.873	4	41
927.2867	-1	49	1811.362	3	53	3844.25	4	35
936.5596	0	42	1847.589	3	44	3921.135	5	43
945.9252	-1	47	1884.541	1	43	3999.558	6	42
955.3844	-1	32	1922.231	1	49	4079.549	5	38
964.9382	-1	38	1960.676	3	44	4161.14	5	40
974.5876	2	33	1999.889	2	44	4244.363	6	43
984.3334	0	35	2039.887	2	41	4329.25	5	31
994.1768	2	29	2080.685	2	52	4415.835	5	35
1000	4	33	2122.299	-1	39	4504.152	7	38
1020	9	50	2164.745	1	43	4594.235	7	35
1040.4	8	47	2208.04	1	42	4686.12	4	35
1061.208	4	48	2252.201	2	39	4779.842	6	37
1082.432	4	43	2297.245	2	53	4875.438	7	34
1104.081	7	45	2343.189	3	46	4972.947	5	34
1126.162	8	50	2390.053	4	44	5072.406	6	37
1148.686	6	40	2437.854	2	40	5173.854	7	32
1171.659	3	44	2486.611	3	44	5277.332	5	36
1195.093	7	45	2536.344	4	48	5382.878	7	39
1218.995	8	46	2587.07	4	44	5490.536	6	35
1243.374	6	39	2638.812	3	42	5600.346	6	40
1268.242	4	40	2691.588	1	35	5712.353	7	32
1293.607	5	39	2745.42	2	36	5826.6	3	31
1319.479	6	49	2800.328	4	33	5943.132	6	36
1345.868	7	58	2856.335	5	51	6061.995	4	29
1372.786	5	53	2913.461	5	41	6183.235	4	38
1400.241	7	42	2971.731	5	39	6306.899	6	30
1428.246	4	54	3031.165	4	40	6433.038	4	33
1456.811	7	49	3091.789	5	43	6561.698	7	30
1485.948	5	35	3153.624	4	43	6692.932	4	34
1515.667	6	34	3216.697	2	40	6826.791	7	36
1545.98	3	45	3281.031	3	42	6963.327	4	31
1576.899	4	45	3346.651	4	32	7102.593	10	36
1608.437	6	38	3413.584	5	31	7244.645	5	31
1640.606	5	42	3481.856	5	38	7389.538	7	29
1673.418	5	48	3551.493	4	39	7537.329	6	29

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Frequency [MHz]	Attenuation Result [dB]		Frequency [MHz]		
	Horizontal	Vertical		Horizontal	Vertical
7688.075	7	31	16316.39	10	25
7841.837	5	34	16642.72	8	27
7998.674	5	30	16975.57	11	29
8158.647	7	31	17315.09	14	21
8321.82	7	31	17661.39	12	29
8488.257	6	29	18000	7	21
8658.021	9	32			
8831.182	8	34			
9007.806	6	27			
9187.962	8	31			
9371.721	6	30			
9559.155	6	27			
9750.338	8	29			
9945.345	7	32			
10144.25	6	28			
10347.14	10	30			
10554.08	9	28			
10765.16	6	28			
10980.46	8	29			
11200.07	11	29			
11424.08	9	31			
11652.56	8	30			
11885.61	8	28			
12123.32	8	26			
12365.79	8	27			
12613.1	8	27			
12865.36	9	29			
13122.67	8	28			
13385.13	10	26			
13652.83	10	24			
13925.88	9	24			
14204.4	13	24			
14488.49	12	26			
14778.26	10	23			
15073.82	11	24			
15375.3	12	24			
15682.81	12	24			
15996.46	12	24			

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5 LIST OF TEST INSTRUMENTS

Ident #	Instrument
267	VHF Double-Cone Ant.
410	Analyzer Display Unit, Analyzer RF-Unit, Tracking Generator
540	10V-Insertion Probe
553	GPIB-140A
554	GPIB-140A
810	150 W / 6 dB Attenuator/N
896	Double Ridged Guide Ant.
1091	Wideband Amplifier 1 W
1129	UHF Log.Per.Ant.,Transc.
1288	DC Block N
1378	RFS-Software
1404	2 W Precision Attn.3 dB/N
1405	5 W Attenuator 10dB/N
1454	Dual Direct. Coupler
1509	Power Amplifier 50 W
1514	RF-DC-Millivoltmeter
1554	Coupling Decoupling Network
1583	Analog Fiber Optic Link
1700	Thermometer/Hygrometer
1829	2 W Termination
1890	Shielded Cabinet, SR-ULL-05
2048	USB to GPIB adaptor
2066	Broadband Balun / Holder 4:1
2067	Biconical Elements
2397	N-Cable N/50
2723	5 W Attenuator 6dB
2749	5 W Attenuator 6dB
3050	Signal Generator
3236	Double Ridged Guide Ant.
3531	0.5W/50-ohms Termination
3962	RF and Microwave Signal Generator
4388	HF-Cable
4389	HF-Cable
4390	HF-Cable
4391	HF-Cable