

Kalibrierstelle für Antennen und Feldsonden
Calibration Body for Antennas and Field Probes

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AKKREDITIERUNG AUSTRIA



Kalibrierschein nach ISO/IEC 17025
Calibration Certificate according to ISO/IEC 17025

Kalibrierzeichen
Calibration mark

EH-A565/21
0612
16.04.2021

<p>Gegenstand <i>Object</i></p> <p>Hersteller & Typ <i>Manufacturer & Type</i></p> <p>Herstellernummer <i>Serial number</i></p> <p>Auftraggeber <i>Customer</i></p> <p>Auftragsnummer <i>Order Nr.</i></p> <p>Anzahl der Seiten des Kalibrierscheines <i>Number of pages of the certificate</i></p> <p>Datum der Kalibrierung <i>Date of calibration</i></p>	<p>Log.-Periodical Antenna</p> <p>Tekbox TBMA3</p> <p>TBMA320002</p> <p>TekBox Digital Solutions Vietnam Co. Ltd. Saigon Hi-Tech Park, Factory 4, 5F, Lot I-3B-1, N6 Str., Tan Phu Ward, D 9 70000 Ho Chi Minh Vietnam</p> <p>L.L7.00059.0.0-A-8537_1 Ext. Ord. No.: PO-20210329001</p> <p>1 - 11</p> <p>16.04.2021</p>	<p>Akkreditierung Austria ist Vollmitglied bei der International Laboratory Accreditation Cooperation ILAC und Unterzeichner der MRAs für die Bereiche „Testing, Calibration and Inspection“.</p> <p>Die Kalibrierung erfolgt auf der gesetzlichen Grundlage des Akkreditierungsgesetzes in gültiger Fassung entsprechend den Anforderungen der ÖVE/ÖNORM EN ISO/IEC 17025.</p> <p>Dieser Kalibrierschein dokumentiert die Rückführbarkeit auf nationale Normale zur Darstellung der physikalischen Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).</p> <p>Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.</p> <p><i>Akkreditierung Austria is a full member of the International Laboratory Accreditation Cooperation ILAC and a signatory of the MRA for "Testing, Calibration and Inspection".</i></p> <p><i>The calibration is performed in accordance with the Akkreditierungsgesetz in the amended version and the requirements of ÖVE/ÖNORM EN ISO/IEC 17025.</i></p> <p><i>This calibration certificate documents the traceability to national standards, which realize the physical units or measurements according to the International System of Units (SI).</i></p> <p><i>The user is obliged to have the object recalibrated at appropriate intervals.</i></p>
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Dieser Kalibrierschein darf nur vollständig und unverändert weiterverarbeitet werden. Auszüge oder Änderungen sind unzulässig. Kalibrierscheine ohne Unterschrift haben keine Gültigkeit.

This calibration certificate may not be reproduced other than in full. Calibration certificates without signature are not valid.

Datum <i>Date</i>	Zeichnungsberechtigter <i>Authorized person</i>	Bearbeiter <i>Person responsible</i>
19.04.2021	Patrick Preiner	Markus Vaclav

Calibration Procedure

Standard Site Method

Calibration of the antenna factor is carried out on the Reference Open-Area Test Site using the standard-site method based on CISPR 16-1-6 and ANSI C63.5 where the antenna factor is derived from the site attenuation measurement of three antennas. At the terminal of each antenna an attenuator is inserted in order to minimise the mismatch.

The gain is calculated from the antenna factor using the equation 8 from SAE ARP 958.

The voltage reflection coefficient (VRC) is measured using a network analyser. Results are shown as voltage standing wave ration (VSWR) calculated from the voltage reflection coefficient as following:

$$VSWR = \frac{1 + VRC}{1 - VRC}$$

Calibrations are carried out as described in internal working procedures of the ISO 9001 certified quality management system. All relevant additional ports of the device under test are terminated.

Test Equipment

Type	Identification
Network Analyzer R&S ZVA8	E0156
Antenna Mast Maturo MCU	E1063
TriLog Antenna Schwarzbeck VULB 9163	E1611
TriLog Antenna Schwarzbeck VULB 9163	E1612
Attenuator 10 dB	E1273
Attenuator 10 dB	E1274
CalStan 10.0	E0920

Environmental Conditions

Test Site Temperature	8°C	± 3 °C
Test Site Humidity	57 %	± 10 %
Control Room Temperature	19°C	± 3 °C
Control Room Humidity	44 %	± 10 %

Results

Type	Distance	Polarisation	Height	Fig./Table
AF	3 m	Horizontal	2 m	1
Gain	3 m	Horizontal	2 m	2
VSWR			2 m	3

Accuracy of Calibration

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EAL Publication EA 4/02.

References

- [1] A.Smith, R.German, J.Pate: Calculation of Site Attenuation From Antenna Factors, IEEE Transactions on Electromagnetic Compatibility, Vol. EMC-24, No 3, August 1982
- [2] SAE ARP 958D:2003 Electromagnetic Interference Measurement Antennas; Standard Calibration Method
- [3] EA-4/02 M:2013 Evaluation of the Uncertainty of Measurement in Calibration

Figure 1: AF; distance = 3 m; polarization = Horizontal; height = 2 m

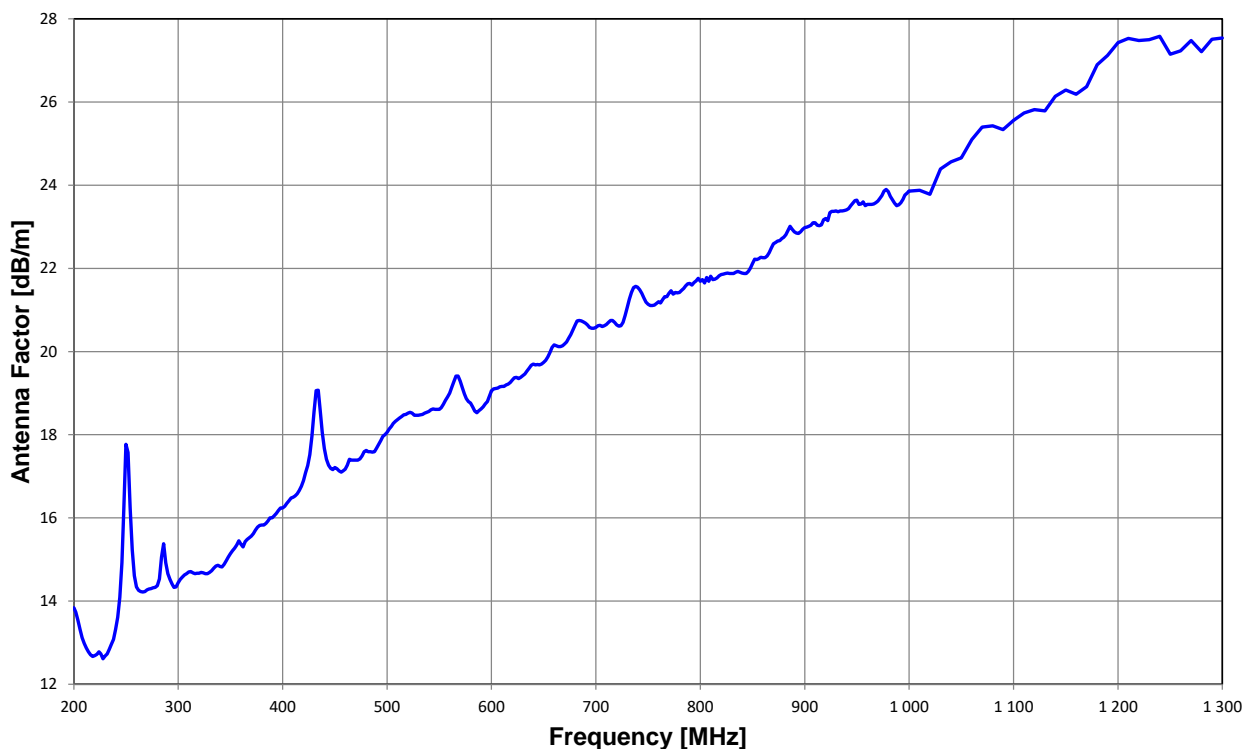


Table 1: AF; distance = 3 m; polarization = Horizontal; height = 2 m

f [MHz]	AF [dB/m]	U [dB]	f [MHz]	AF [dB/m]	U [dB]	f [MHz]	AF [dB/m]	U [dB]
200	13.84	1.00	340	14.83	1.00	480	17.62	1.00
202	13.73	1.00	342	14.82	1.00	482	17.59	1.00
204	13.54	1.00	344	14.88	1.00	484	17.59	1.00
206	13.32	1.00	346	14.97	1.00	486	17.58	1.00
208	13.12	1.00	348	15.06	1.00	488	17.59	1.00
210	12.98	1.00	350	15.14	1.00	490	17.68	1.00
212	12.87	1.00	352	15.21	1.00	492	17.77	1.00
214	12.78	1.00	354	15.27	1.00	494	17.86	1.00
216	12.71	1.00	356	15.35	1.00	496	17.96	1.00
218	12.67	1.00	358	15.45	1.00	498	18.00	1.00
220	12.69	1.00	360	15.37	1.00	500	18.06	1.00
222	12.72	1.00	362	15.30	1.00	502	18.14	1.00
224	12.78	1.00	364	15.43	1.00	504	18.20	1.00
226	12.73	1.00	366	15.48	1.00	506	18.27	1.00
228	12.61	1.00	368	15.52	1.00	508	18.32	1.00
230	12.68	1.00	370	15.56	1.00	510	18.36	1.00
232	12.73	1.00	372	15.62	1.00	512	18.40	1.00
234	12.84	1.00	374	15.71	1.00	514	18.44	1.00
236	12.96	1.00	376	15.78	1.00	516	18.48	1.00
238	13.08	1.00	378	15.82	1.00	518	18.49	1.00
240	13.32	1.00	380	15.83	1.00	520	18.52	1.00
242	13.61	1.00	382	15.83	1.00	522	18.54	1.00
244	14.09	1.00	384	15.87	1.00	524	18.52	1.00
246	14.92	1.00	386	15.93	1.00	526	18.47	1.00
248	16.22	1.00	388	16.00	1.00	528	18.47	1.00
250	17.77	1.00	390	16.00	1.00	530	18.47	1.00
252	17.57	1.00	392	16.05	1.00	532	18.48	1.00
254	16.24	1.00	394	16.11	1.00	534	18.49	1.00
256	15.23	1.00	396	16.18	1.00	536	18.52	1.00
258	14.61	1.00	398	16.24	1.00	538	18.54	1.00
260	14.34	1.00	400	16.24	1.00	540	18.56	1.00
262	14.26	1.00	402	16.28	1.00	542	18.60	1.00
264	14.23	1.00	404	16.35	1.00	544	18.62	1.00
266	14.22	1.00	406	16.41	1.00	546	18.61	1.00
268	14.23	1.00	408	16.48	1.00	548	18.61	1.00
270	14.27	1.00	410	16.50	1.00	550	18.61	1.00
272	14.29	1.00	412	16.53	1.00	552	18.65	1.00
274	14.30	1.00	414	16.58	1.00	554	18.73	1.00
276	14.32	1.00	416	16.66	1.00	556	18.83	1.00
278	14.33	1.00	418	16.76	1.00	558	18.91	1.00
280	14.37	1.00	420	16.90	1.00	560	19.00	1.00
282	14.53	1.00	422	17.09	1.00	562	19.14	1.00
284	15.06	1.00	424	17.26	1.00	564	19.28	1.00
286	15.38	1.00	426	17.52	1.00	566	19.41	1.00
288	14.92	1.00	428	17.96	1.00	568	19.41	1.00
290	14.66	1.00	430	18.55	1.00	570	19.29	1.00
292	14.52	1.00	432	19.06	1.00	572	19.13	1.00
294	14.41	1.00	434	19.07	1.00	574	18.98	1.00
296	14.33	1.00	436	18.60	1.00	576	18.87	1.00
298	14.34	1.00	438	18.06	1.00	578	18.80	1.00
300	14.44	1.00	440	17.67	1.00	580	18.76	1.00
302	14.52	1.00	442	17.41	1.00	582	18.67	1.00
304	14.58	1.00	444	17.27	1.00	584	18.57	1.00
306	14.63	1.00	446	17.19	1.00	586	18.53	1.00
308	14.66	1.00	448	17.16	1.00	588	18.58	1.00
310	14.70	1.00	450	17.21	1.00	590	18.62	1.00
312	14.71	1.00	452	17.18	1.00	592	18.67	1.00
314	14.68	1.00	454	17.13	1.00	594	18.74	1.00
316	14.66	1.00	456	17.10	1.00	596	18.80	1.00
318	14.67	1.00	458	17.13	1.00	598	18.92	1.00
320	14.67	1.00	460	17.17	1.00	600	19.05	1.00
322	14.69	1.00	462	17.27	1.00	602	19.10	1.00
324	14.68	1.00	464	17.41	1.00	604	19.11	1.00
326	14.66	1.00	466	17.39	1.00	606	19.12	1.00
328	14.66	1.00	468	17.39	1.00	608	19.15	1.00
330	14.69	1.00	470	17.39	1.00	610	19.16	1.00
332	14.73	1.00	472	17.39	1.00	612	19.16	1.00
334	14.79	1.00	474	17.42	1.00	614	19.20	1.00
336	14.84	1.00	476	17.49	1.00	616	19.22	1.00
338	14.86	1.00	478	17.59	1.00	618	19.26	1.00

f [MHz]	AF [dB/m]	U [dB]	f [MHz]	AF [dB/m]	U [dB]	f [MHz]	AF [dB/m]	U [dB]
620	19.32	1.00	768	21.32	1.00	916	23.05	1.00
622	19.37	1.00	770	21.40	1.00	918	23.17	1.00
624	19.38	1.00	772	21.46	1.00	920	23.20	1.00
626	19.35	1.00	774	21.38	1.00	922	23.15	1.00
628	19.38	1.00	776	21.42	1.00	924	23.34	1.00
630	19.42	1.00	778	21.41	1.00	926	23.37	1.00
632	19.46	1.00	780	21.42	1.00	928	23.37	1.00
634	19.53	1.00	782	21.47	1.00	930	23.38	1.00
636	19.60	1.00	784	21.52	1.00	932	23.36	1.00
638	19.67	1.00	786	21.58	1.00	934	23.38	1.00
640	19.70	1.00	788	21.63	1.00	936	23.38	1.00
642	19.68	1.00	790	21.64	1.00	938	23.39	1.00
644	19.69	1.00	792	21.60	1.00	940	23.41	1.00
646	19.68	1.00	794	21.66	1.00	942	23.44	1.00
648	19.70	1.00	796	21.70	1.00	944	23.51	1.00
650	19.74	1.00	798	21.76	1.00	946	23.57	1.00
652	19.79	1.00	800	21.69	1.00	948	23.63	1.00
654	19.87	1.00	802	21.73	1.00	950	23.64	1.00
656	19.98	1.00	804	21.65	1.00	952	23.54	1.00
658	20.10	1.00	806	21.78	1.00	954	23.55	1.00
660	20.16	1.00	808	21.69	1.00	956	23.60	1.00
662	20.14	1.00	810	21.81	1.00	958	23.51	1.00
664	20.12	1.00	812	21.73	1.00	960	23.54	1.00
666	20.12	1.00	814	21.74	1.00	962	23.54	1.00
668	20.14	1.00	816	21.77	1.00	964	23.54	1.00
670	20.18	1.00	818	21.82	1.00	966	23.55	1.00
672	20.23	1.00	820	21.85	1.00	968	23.58	1.00
674	20.32	1.00	822	21.86	1.00	970	23.62	1.00
676	20.41	1.00	824	21.88	1.00	972	23.68	1.00
678	20.52	1.00	826	21.89	1.00	974	23.75	1.00
680	20.63	1.00	828	21.88	1.00	976	23.86	1.00
682	20.74	1.00	830	21.88	1.00	978	23.90	1.00
684	20.75	1.00	832	21.88	1.00	980	23.85	1.00
686	20.74	1.00	834	21.91	1.00	982	23.73	1.00
688	20.71	1.00	836	21.93	1.00	984	23.65	1.00
690	20.68	1.00	838	21.91	1.00	986	23.57	1.00
692	20.64	1.00	840	21.89	1.00	988	23.51	1.00
694	20.58	1.00	842	21.88	1.00	990	23.53	1.00
696	20.56	1.00	844	21.88	1.00	992	23.58	1.00
698	20.56	1.00	846	21.93	1.00	994	23.66	1.00
700	20.58	1.00	848	22.01	1.00	996	23.76	1.00
702	20.62	1.00	850	22.12	1.00	998	23.81	1.00
704	20.63	1.00	852	22.22	1.00	1000	23.86	1.00
706	20.60	1.00	854	22.21	1.00	1010	23.88	1.00
708	20.62	1.00	856	22.23	1.00	1020	23.78	1.00
710	20.65	1.00	858	22.27	1.00	1030	24.39	1.00
712	20.70	1.00	860	22.26	1.00	1040	24.56	1.00
714	20.75	1.00	862	22.26	1.00	1050	24.66	1.00
716	20.75	1.00	864	22.30	1.00	1060	25.10	1.00
718	20.70	1.00	866	22.38	1.00	1070	25.40	1.00
720	20.64	1.00	868	22.49	1.00	1080	25.43	1.00
722	20.61	1.00	870	22.59	1.00	1090	25.34	1.00
724	20.62	1.00	872	22.62	1.00	1100	25.56	1.00
726	20.70	1.00	874	22.66	1.00	1110	25.74	1.00
728	20.87	1.00	876	22.67	1.00	1120	25.82	1.00
730	21.06	1.00	878	22.72	1.00	1130	25.79	1.00
732	21.26	1.00	880	22.75	1.00	1140	26.14	1.00
734	21.42	1.00	882	22.81	1.00	1150	26.29	1.00
736	21.54	1.00	884	22.91	1.00	1160	26.19	1.00
738	21.57	1.00	886	23.01	1.00	1170	26.37	1.00
740	21.55	1.00	888	22.94	1.00	1180	26.90	1.00
742	21.49	1.00	890	22.88	1.00	1190	27.12	1.00
744	21.40	1.00	892	22.85	1.00	1200	27.43	1.00
746	21.29	1.00	894	22.84	1.00	1210	27.53	1.00
748	21.19	1.00	896	22.88	1.00	1220	27.48	1.00
750	21.14	1.00	898	22.94	1.00	1230	27.50	1.00
752	21.11	1.00	900	22.98	1.00	1240	27.58	1.00
754	21.11	1.00	902	22.99	1.00	1250	27.15	1.00
756	21.12	1.00	904	23.01	1.00	1260	27.23	1.00
758	21.16	1.00	906	23.04	1.00	1270	27.48	1.00
760	21.20	1.00	908	23.10	1.00	1280	27.21	1.00
762	21.17	1.00	910	23.10	1.00	1290	27.51	1.00
764	21.25	1.00	912	23.04	1.00	1300	27.54	1.00
766	21.32	1.00	914	23.03	1.00			

Figure 2: Gain; distance = 3 m; polarization = Horizontal; height = 2 m

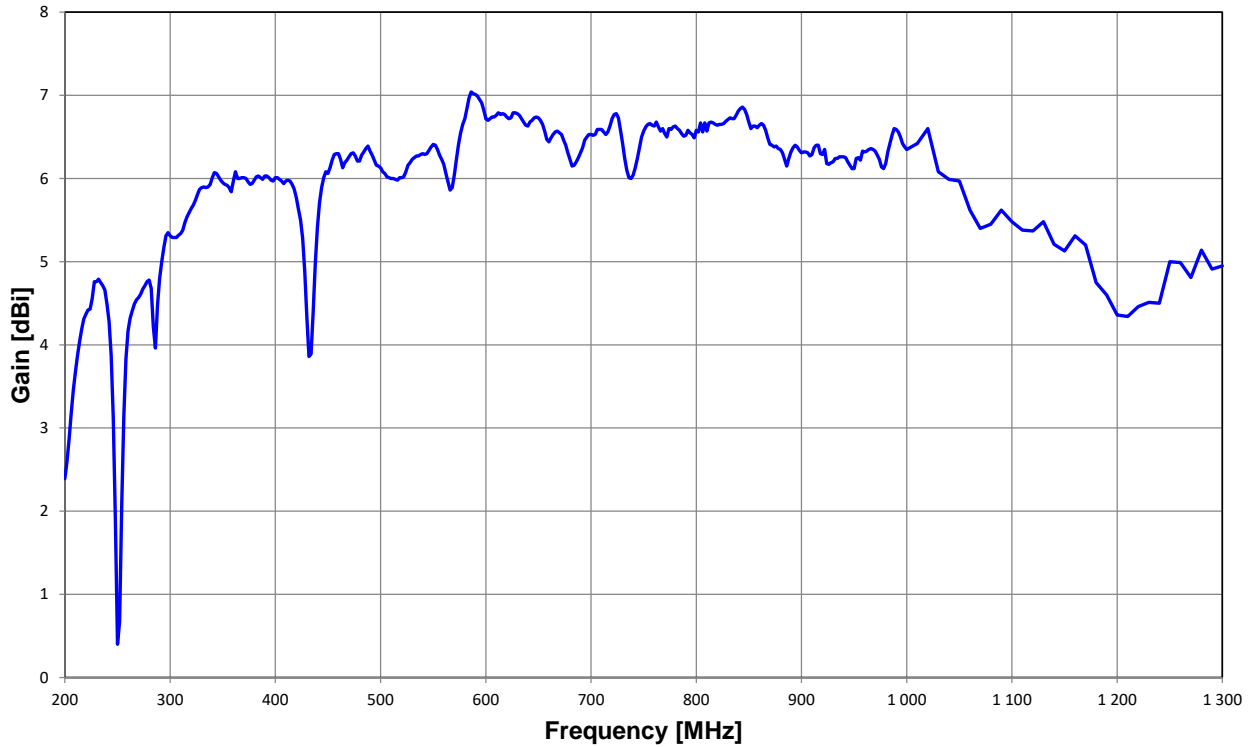


Table 2: Gain; distance = 3 m; polarization = Horizontal; height = 2 m

f [MHz]	Gain [dBi]	U [dB]	f [MHz]	Gain [dBi]	U [dB]	f [MHz]	Gain [dBi]	U [dB]
200	2.39	1.00	264	4.41	1.00	328	5.87	1.00
202	2.59	1.00	266	4.49	1.00	330	5.89	1.00
204	2.86	1.00	268	4.54	1.00	332	5.90	1.00
206	3.17	1.00	270	4.57	1.00	334	5.89	1.00
208	3.45	1.00	272	4.61	1.00	336	5.90	1.00
210	3.67	1.00	274	4.67	1.00	338	5.93	1.00
212	3.87	1.00	276	4.71	1.00	340	6.01	1.00
214	4.04	1.00	278	4.76	1.00	342	6.07	1.00
216	4.19	1.00	280	4.78	1.00	344	6.06	1.00
218	4.31	1.00	282	4.68	1.00	346	6.02	1.00
220	4.37	1.00	284	4.22	1.00	348	5.98	1.00
222	4.42	1.00	286	3.96	1.00	350	5.95	1.00
224	4.43	1.00	288	4.48	1.00	352	5.93	1.00
226	4.56	1.00	290	4.80	1.00	354	5.92	1.00
228	4.76	1.00	292	5.00	1.00	356	5.89	1.00
230	4.76	1.00	294	5.17	1.00	358	5.84	1.00
232	4.79	1.00	296	5.31	1.00	360	5.97	1.00
234	4.75	1.00	298	5.35	1.00	362	6.08	1.00
236	4.71	1.00	300	5.31	1.00	364	6.00	1.00
238	4.66	1.00	302	5.29	1.00	366	6.00	1.00
240	4.49	1.00	304	5.29	1.00	368	6.01	1.00
242	4.28	1.00	306	5.29	1.00	370	6.01	1.00
244	3.87	1.00	308	5.32	1.00	372	6.00	1.00
246	3.11	1.00	310	5.34	1.00	374	5.96	1.00
248	1.88	1.00	312	5.38	1.00	376	5.93	1.00
250	0.40	1.00	314	5.47	1.00	378	5.94	1.00
252	0.67	1.00	316	5.54	1.00	380	5.98	1.00
254	2.07	1.00	318	5.59	1.00	382	6.02	1.00
256	3.14	1.00	320	5.64	1.00	384	6.03	1.00
258	3.83	1.00	322	5.68	1.00	386	6.01	1.00
260	4.17	1.00	324	5.74	1.00	388	5.99	1.00
262	4.32	1.00	326	5.81	1.00	390	6.03	1.00



f [MHz]	Gain [dBi]	U [dB]	f [MHz]	Gain [dBi]	U [dB]	f [MHz]	Gain [dBi]	U [dB]
392	6.03	1.00	540	6.30	1.00	688	6.25	1.00
394	6.01	1.00	542	6.29	1.00	690	6.31	1.00
396	5.98	1.00	544	6.30	1.00	692	6.37	1.00
398	5.97	1.00	546	6.34	1.00	694	6.46	1.00
400	6.01	1.00	548	6.38	1.00	696	6.50	1.00
402	6.01	1.00	550	6.41	1.00	698	6.53	1.00
404	5.99	1.00	552	6.40	1.00	700	6.53	1.00
406	5.97	1.00	554	6.35	1.00	702	6.52	1.00
408	5.94	1.00	556	6.28	1.00	704	6.53	1.00
410	5.97	1.00	558	6.23	1.00	706	6.59	1.00
412	5.98	1.00	560	6.17	1.00	708	6.59	1.00
414	5.97	1.00	562	6.06	1.00	710	6.59	1.00
416	5.93	1.00	564	5.96	1.00	712	6.56	1.00
418	5.87	1.00	566	5.86	1.00	714	6.53	1.00
420	5.77	1.00	568	5.89	1.00	716	6.56	1.00
422	5.63	1.00	570	6.04	1.00	718	6.63	1.00
424	5.50	1.00	572	6.23	1.00	720	6.72	1.00
426	5.28	1.00	574	6.41	1.00	722	6.77	1.00
428	4.88	1.00	576	6.55	1.00	724	6.78	1.00
430	4.33	1.00	578	6.65	1.00	726	6.73	1.00
432	3.86	1.00	580	6.72	1.00	728	6.58	1.00
434	3.89	1.00	582	6.84	1.00	730	6.42	1.00
436	4.40	1.00	584	6.97	1.00	732	6.24	1.00
438	4.98	1.00	586	7.04	1.00	734	6.10	1.00
440	5.41	1.00	588	7.02	1.00	736	6.01	1.00
442	5.71	1.00	590	7.01	1.00	738	6.00	1.00
444	5.89	1.00	592	6.99	1.00	740	6.04	1.00
446	6.01	1.00	594	6.95	1.00	742	6.13	1.00
448	6.08	1.00	596	6.91	1.00	744	6.24	1.00
450	6.06	1.00	598	6.82	1.00	746	6.37	1.00
452	6.13	1.00	600	6.72	1.00	748	6.50	1.00
454	6.22	1.00	602	6.70	1.00	750	6.57	1.00
456	6.29	1.00	604	6.72	1.00	752	6.62	1.00
458	6.30	1.00	606	6.74	1.00	754	6.65	1.00
460	6.30	1.00	608	6.74	1.00	756	6.66	1.00
462	6.23	1.00	610	6.76	1.00	758	6.64	1.00
464	6.13	1.00	612	6.79	1.00	760	6.63	1.00
466	6.19	1.00	614	6.77	1.00	762	6.68	1.00
468	6.22	1.00	616	6.78	1.00	764	6.62	1.00
470	6.26	1.00	618	6.77	1.00	766	6.57	1.00
472	6.30	1.00	620	6.74	1.00	768	6.60	1.00
474	6.31	1.00	622	6.72	1.00	770	6.54	1.00
476	6.27	1.00	624	6.73	1.00	772	6.50	1.00
478	6.21	1.00	626	6.79	1.00	774	6.60	1.00
480	6.21	1.00	628	6.79	1.00	776	6.59	1.00
482	6.28	1.00	630	6.78	1.00	778	6.62	1.00
484	6.32	1.00	632	6.76	1.00	780	6.63	1.00
486	6.36	1.00	634	6.72	1.00	782	6.60	1.00
488	6.39	1.00	636	6.68	1.00	784	6.58	1.00
490	6.33	1.00	638	6.64	1.00	786	6.54	1.00
492	6.28	1.00	640	6.63	1.00	788	6.51	1.00
494	6.22	1.00	642	6.68	1.00	790	6.52	1.00
496	6.16	1.00	644	6.70	1.00	792	6.58	1.00
498	6.15	1.00	646	6.73	1.00	794	6.55	1.00
500	6.13	1.00	648	6.74	1.00	796	6.53	1.00
502	6.08	1.00	650	6.73	1.00	798	6.49	1.00
504	6.06	1.00	652	6.70	1.00	800	6.58	1.00
506	6.02	1.00	654	6.65	1.00	802	6.56	1.00
508	6.01	1.00	656	6.57	1.00	804	6.67	1.00
510	6.00	1.00	658	6.47	1.00	806	6.56	1.00
512	6.00	1.00	660	6.44	1.00	808	6.67	1.00
514	5.99	1.00	662	6.49	1.00	810	6.57	1.00
516	5.98	1.00	664	6.53	1.00	812	6.67	1.00
518	6.01	1.00	666	6.56	1.00	814	6.68	1.00
520	6.01	1.00	668	6.57	1.00	816	6.67	1.00
522	6.02	1.00	670	6.55	1.00	818	6.65	1.00
524	6.08	1.00	672	6.53	1.00	820	6.64	1.00
526	6.16	1.00	674	6.46	1.00	822	6.65	1.00
528	6.19	1.00	676	6.40	1.00	824	6.65	1.00
530	6.23	1.00	678	6.31	1.00	826	6.66	1.00
532	6.25	1.00	680	6.23	1.00	828	6.69	1.00
534	6.27	1.00	682	6.15	1.00	830	6.71	1.00
536	6.27	1.00	684	6.16	1.00	832	6.73	1.00
538	6.29	1.00	686	6.20	1.00	834	6.72	1.00

f [MHz]	Gain [dBi]	U [dB]	f [MHz]	Gain [dBi]	U [dB]	f [MHz]	Gain [dBi]	U [dB]
836	6.72	1.00	914	6.40	1.00	992	6.56	1.00
838	6.76	1.00	916	6.40	1.00	994	6.50	1.00
840	6.81	1.00	918	6.30	1.00	996	6.42	1.00
842	6.84	1.00	920	6.29	1.00	998	6.38	1.00
844	6.86	1.00	922	6.35	1.00	1000	6.35	1.00
846	6.83	1.00	924	6.18	1.00	1010	6.42	1.00
848	6.77	1.00	926	6.17	1.00	1020	6.60	1.00
850	6.68	1.00	928	6.19	1.00	1030	6.08	1.00
852	6.60	1.00	930	6.20	1.00	1040	5.99	1.00
854	6.63	1.00	932	6.24	1.00	1050	5.97	1.00
856	6.63	1.00	934	6.24	1.00	1060	5.62	1.00
858	6.61	1.00	936	6.26	1.00	1070	5.40	1.00
860	6.64	1.00	938	6.26	1.00	1080	5.45	1.00
862	6.66	1.00	940	6.26	1.00	1090	5.62	1.00
864	6.64	1.00	942	6.25	1.00	1100	5.48	1.00
866	6.58	1.00	944	6.20	1.00	1110	5.38	1.00
868	6.49	1.00	946	6.16	1.00	1120	5.37	1.00
870	6.41	1.00	948	6.12	1.00	1130	5.48	1.00
872	6.40	1.00	950	6.12	1.00	1140	5.21	1.00
874	6.38	1.00	952	6.24	1.00	1150	5.13	1.00
876	6.39	1.00	954	6.25	1.00	1160	5.31	1.00
878	6.36	1.00	956	6.22	1.00	1170	5.20	1.00
880	6.35	1.00	958	6.33	1.00	1180	4.75	1.00
882	6.31	1.00	960	6.32	1.00	1190	4.60	1.00
884	6.23	1.00	962	6.33	1.00	1200	4.36	1.00
886	6.15	1.00	964	6.35	1.00	1210	4.34	1.00
888	6.24	1.00	966	6.36	1.00	1220	4.46	1.00
890	6.32	1.00	968	6.35	1.00	1230	4.51	1.00
892	6.37	1.00	970	6.33	1.00	1240	4.50	1.00
894	6.40	1.00	972	6.28	1.00	1250	5.00	1.00
896	6.38	1.00	974	6.23	1.00	1260	4.99	1.00
898	6.34	1.00	976	6.14	1.00	1270	4.81	1.00
900	6.31	1.00	978	6.12	1.00	1280	5.14	1.00
902	6.32	1.00	980	6.18	1.00	1290	4.91	1.00
904	6.32	1.00	982	6.32	1.00	1300	4.95	1.00
906	6.31	1.00	984	6.42	1.00			
908	6.27	1.00	986	6.52	1.00			
910	6.29	1.00	988	6.60	1.00			
912	6.37	1.00	990	6.59	1.00			

Figure 3: VSWR; height = 2 m

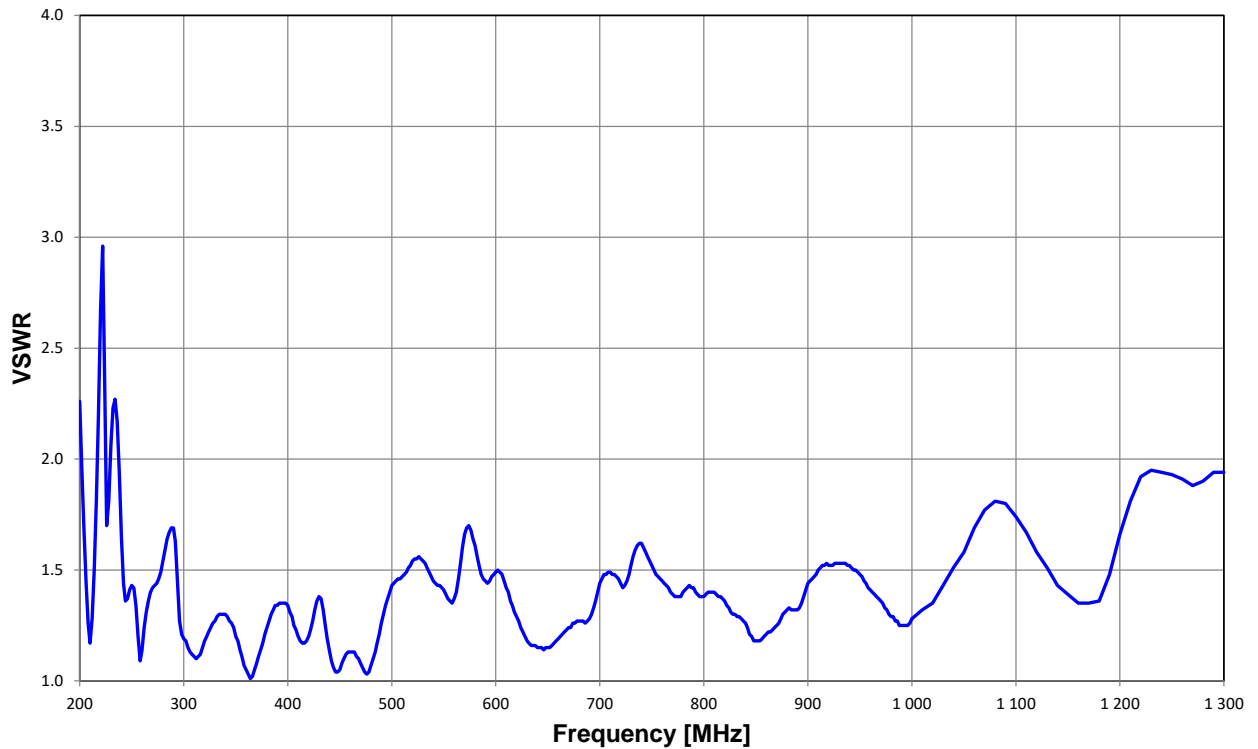


Table 3: VSWR; height = 2 m

f [MHz]	VSWR [1]	U [1]	f [MHz]	VSWR [1]	U [1]	f [MHz]	VSWR [1]	U [1]
200	2.26	-0.25/0.29	266	1.36	-0.13/0.15	332	1.29	-0.12/0.14
202	1.96	-0.20/0.24	268	1.40	-0.14/0.15	334	1.30	-0.13/0.14
204	1.69	-0.17/0.19	270	1.42	-0.14/0.16	336	1.30	-0.13/0.14
206	1.45	-0.14/0.16	272	1.43	-0.14/0.16	338	1.30	-0.13/0.14
208	1.26	-0.12/0.13	274	1.44	-0.14/0.16	340	1.30	-0.12/0.14
210	1.17	-0.11/0.12	276	1.46	-0.14/0.16	342	1.29	-0.12/0.14
212	1.28	-0.12/0.14	278	1.49	-0.15/0.17	344	1.27	-0.12/0.14
214	1.50	-0.15/0.17	280	1.54	-0.15/0.17	346	1.26	-0.12/0.13
216	1.81	-0.18/0.21	282	1.59	-0.16/0.18	348	1.24	-0.12/0.13
218	2.20	-0.24/0.28	284	1.64	-0.16/0.19	350	1.20	-0.12/0.13
220	2.67	-0.31/0.37	286	1.67	-0.17/0.19	352	1.18	-0.11/0.13
222	2.96	-0.36/0.44	288	1.69	-0.17/0.19	354	1.14	-0.11/0.12
224	2.32	-0.25/0.30	290	1.69	-0.17/0.19	356	1.11	-0.11/0.12
226	1.70	-0.17/0.20	292	1.63	-0.16/0.19	358	1.07	-0.07/0.11
228	1.81	-0.18/0.21	294	1.45	-0.14/0.16	360	1.05	-0.05/0.11
230	2.06	-0.22/0.25	296	1.27	-0.12/0.14	362	1.03	-0.03/0.11
232	2.23	-0.24/0.28	298	1.21	-0.12/0.13	364	1.01	-0.01/0.11
234	2.27	-0.25/0.29	300	1.19	-0.11/0.13	366	1.02	-0.02/0.11
236	2.17	-0.23/0.27	302	1.18	-0.11/0.13	368	1.05	-0.05/0.11
238	1.94	-0.20/0.23	304	1.15	-0.11/0.12	370	1.08	-0.08/0.11
240	1.65	-0.17/0.19	306	1.13	-0.11/0.12	372	1.11	-0.11/0.12
242	1.44	-0.14/0.16	308	1.12	-0.11/0.12	374	1.14	-0.11/0.12
244	1.36	-0.13/0.15	310	1.11	-0.11/0.12	376	1.17	-0.11/0.12
246	1.37	-0.13/0.15	312	1.10	-0.10/0.12	378	1.21	-0.12/0.13
248	1.41	-0.14/0.15	314	1.11	-0.11/0.12	380	1.24	-0.12/0.13
250	1.43	-0.14/0.16	316	1.12	-0.11/0.12	382	1.27	-0.12/0.14
252	1.42	-0.14/0.16	318	1.15	-0.11/0.12	384	1.30	-0.13/0.14
254	1.34	-0.13/0.15	320	1.18	-0.11/0.13	386	1.32	-0.13/0.14
256	1.20	-0.12/0.13	322	1.20	-0.11/0.13	388	1.34	-0.13/0.14
258	1.09	-0.09/0.11	324	1.22	-0.12/0.13	390	1.34	-0.13/0.15
260	1.14	-0.11/0.12	326	1.24	-0.12/0.13	392	1.35	-0.13/0.15
262	1.24	-0.12/0.13	328	1.26	-0.12/0.14	394	1.35	-0.13/0.15
264	1.31	-0.13/0.14	330	1.27	-0.12/0.14	396	1.35	-0.13/0.15

f [MHz]	VSWR [1]	U [1]	f [MHz]	VSWR [1]	U [1]	f [MHz]	VSWR [1]	U [1]
398	1.35	-0.13/0.15	546	1.43	-0.14/0.16	694	1.33	-0.13/0.14
400	1.34	-0.13/0.14	548	1.42	-0.14/0.16	696	1.36	-0.13/0.15
402	1.31	-0.13/0.14	550	1.41	-0.14/0.15	698	1.40	-0.14/0.15
404	1.29	-0.12/0.14	552	1.39	-0.14/0.15	700	1.44	-0.14/0.16
406	1.25	-0.12/0.13	554	1.37	-0.13/0.15	702	1.46	-0.14/0.16
408	1.23	-0.12/0.13	556	1.36	-0.13/0.15	704	1.48	-0.14/0.16
410	1.20	-0.11/0.13	558	1.35	-0.13/0.15	706	1.48	-0.15/0.16
412	1.18	-0.11/0.13	560	1.37	-0.13/0.15	708	1.49	-0.15/0.17
414	1.17	-0.11/0.12	562	1.40	-0.14/0.15	710	1.49	-0.15/0.17
416	1.17	-0.11/0.12	564	1.46	-0.14/0.16	712	1.48	-0.15/0.16
418	1.18	-0.11/0.13	566	1.53	-0.15/0.17	714	1.48	-0.14/0.16
420	1.20	-0.11/0.13	568	1.60	-0.16/0.18	716	1.47	-0.14/0.16
422	1.23	-0.12/0.13	570	1.66	-0.17/0.19	718	1.46	-0.14/0.16
424	1.27	-0.12/0.14	572	1.69	-0.17/0.19	720	1.44	-0.14/0.16
426	1.32	-0.13/0.14	574	1.70	-0.17/0.19	722	1.42	-0.14/0.16
428	1.36	-0.13/0.15	576	1.68	-0.17/0.19	724	1.43	-0.14/0.16
430	1.38	-0.13/0.15	578	1.64	-0.16/0.19	726	1.45	-0.14/0.16
432	1.37	-0.13/0.15	580	1.61	-0.16/0.18	728	1.48	-0.15/0.16
434	1.32	-0.13/0.14	582	1.56	-0.15/0.18	730	1.52	-0.15/0.17
436	1.25	-0.12/0.13	584	1.52	-0.15/0.17	732	1.56	-0.15/0.17
438	1.19	-0.11/0.13	586	1.48	-0.15/0.16	734	1.59	-0.16/0.18
440	1.14	-0.11/0.12	588	1.46	-0.14/0.16	736	1.61	-0.16/0.18
442	1.09	-0.09/0.12	590	1.45	-0.14/0.16	738	1.62	-0.16/0.18
444	1.06	-0.06/0.11	592	1.44	-0.14/0.16	740	1.62	-0.16/0.18
446	1.04	-0.04/0.11	594	1.45	-0.14/0.16	742	1.60	-0.16/0.18
448	1.04	-0.04/0.11	596	1.47	-0.14/0.16	744	1.58	-0.16/0.18
450	1.05	-0.05/0.11	598	1.48	-0.14/0.16	746	1.56	-0.15/0.17
452	1.08	-0.08/0.11	600	1.49	-0.15/0.17	748	1.54	-0.15/0.17
454	1.10	-0.10/0.12	602	1.50	-0.15/0.17	750	1.52	-0.15/0.17
456	1.12	-0.11/0.12	604	1.49	-0.15/0.17	752	1.50	-0.15/0.17
458	1.13	-0.11/0.12	606	1.48	-0.14/0.16	754	1.48	-0.15/0.16
460	1.13	-0.11/0.12	608	1.45	-0.14/0.16	756	1.47	-0.14/0.16
462	1.13	-0.11/0.12	610	1.42	-0.14/0.16	758	1.46	-0.14/0.16
464	1.13	-0.11/0.12	612	1.40	-0.14/0.15	760	1.45	-0.14/0.16
466	1.11	-0.11/0.12	614	1.36	-0.13/0.15	762	1.44	-0.14/0.16
468	1.10	-0.10/0.12	616	1.34	-0.13/0.15	764	1.43	-0.14/0.16
470	1.08	-0.08/0.11	618	1.31	-0.13/0.14	766	1.42	-0.14/0.16
472	1.06	-0.06/0.11	620	1.29	-0.12/0.14	768	1.40	-0.14/0.15
474	1.04	-0.04/0.11	622	1.27	-0.12/0.14	770	1.39	-0.13/0.15
476	1.03	-0.03/0.11	624	1.24	-0.12/0.13	772	1.38	-0.13/0.15
478	1.04	-0.04/0.11	626	1.22	-0.12/0.13	774	1.38	-0.13/0.15
480	1.07	-0.07/0.11	628	1.20	-0.11/0.13	776	1.38	-0.13/0.15
482	1.10	-0.10/0.12	630	1.18	-0.11/0.13	778	1.38	-0.13/0.15
484	1.13	-0.11/0.12	632	1.17	-0.11/0.12	780	1.40	-0.14/0.15
486	1.17	-0.11/0.12	634	1.16	-0.11/0.12	782	1.41	-0.14/0.15
488	1.21	-0.12/0.13	636	1.16	-0.11/0.12	784	1.42	-0.14/0.16
490	1.26	-0.12/0.13	638	1.16	-0.11/0.12	786	1.43	-0.14/0.16
492	1.30	-0.12/0.14	640	1.15	-0.11/0.12	788	1.42	-0.14/0.16
494	1.34	-0.13/0.15	642	1.15	-0.11/0.12	790	1.42	-0.14/0.16
496	1.37	-0.13/0.15	644	1.15	-0.11/0.12	792	1.40	-0.14/0.15
498	1.40	-0.14/0.15	646	1.14	-0.11/0.12	794	1.39	-0.13/0.15
500	1.43	-0.14/0.16	648	1.15	-0.11/0.12	796	1.38	-0.13/0.15
502	1.44	-0.14/0.16	650	1.15	-0.11/0.12	798	1.38	-0.13/0.15
504	1.45	-0.14/0.16	652	1.15	-0.11/0.12	800	1.38	-0.13/0.15
506	1.46	-0.14/0.16	654	1.16	-0.11/0.12	802	1.39	-0.13/0.15
508	1.46	-0.14/0.16	656	1.17	-0.11/0.12	804	1.40	-0.14/0.15
510	1.47	-0.14/0.16	658	1.18	-0.11/0.13	806	1.40	-0.14/0.15
512	1.48	-0.14/0.16	660	1.19	-0.11/0.13	808	1.40	-0.14/0.15
514	1.49	-0.15/0.17	662	1.20	-0.11/0.13	810	1.40	-0.14/0.15
516	1.51	-0.15/0.17	664	1.21	-0.12/0.13	812	1.39	-0.13/0.15
518	1.52	-0.15/0.17	666	1.22	-0.12/0.13	814	1.38	-0.13/0.15
520	1.54	-0.15/0.17	668	1.23	-0.12/0.13	816	1.38	-0.13/0.15
522	1.55	-0.15/0.17	670	1.24	-0.12/0.13	818	1.37	-0.13/0.15
524	1.55	-0.15/0.17	672	1.24	-0.12/0.13	820	1.36	-0.13/0.15
526	1.56	-0.15/0.17	674	1.26	-0.12/0.13	822	1.34	-0.13/0.15
528	1.55	-0.15/0.17	676	1.26	-0.12/0.14	824	1.33	-0.13/0.14
530	1.54	-0.15/0.17	678	1.27	-0.12/0.14	826	1.31	-0.13/0.14
532	1.53	-0.15/0.17	680	1.27	-0.12/0.14	828	1.30	-0.12/0.14
534	1.51	-0.15/0.17	682	1.27	-0.12/0.14	830	1.30	-0.12/0.14
536	1.49	-0.15/0.17	684	1.27	-0.12/0.14	832	1.29	-0.12/0.14
538	1.47	-0.14/0.16	686	1.26	-0.12/0.14	834	1.29	-0.12/0.14
540	1.45	-0.14/0.16	688	1.27	-0.12/0.14	836	1.28	-0.12/0.14
542	1.44	-0.14/0.16	690	1.28	-0.12/0.14	838	1.27	-0.12/0.14
544	1.43	-0.14/0.16	692	1.30	-0.12/0.14	840	1.26	-0.12/0.13

f [MHz]	VSWR [1]	U [1]
842	1.24	-0.12/0.13
844	1.21	-0.12/0.13
846	1.20	-0.11/0.13
848	1.18	-0.11/0.13
850	1.18	-0.11/0.13
852	1.18	-0.11/0.13
854	1.18	-0.11/0.13
856	1.19	-0.11/0.13
858	1.20	-0.11/0.13
860	1.21	-0.12/0.13
862	1.22	-0.12/0.13
864	1.22	-0.12/0.13
866	1.23	-0.12/0.13
868	1.24	-0.12/0.13
870	1.25	-0.12/0.13
872	1.26	-0.12/0.14
874	1.28	-0.12/0.14
876	1.30	-0.12/0.14
878	1.31	-0.13/0.14
880	1.32	-0.13/0.14
882	1.33	-0.13/0.14
884	1.32	-0.13/0.14
886	1.32	-0.13/0.14
888	1.32	-0.13/0.14
890	1.32	-0.13/0.14
892	1.33	-0.13/0.14
894	1.35	-0.13/0.15
896	1.38	-0.13/0.15
898	1.41	-0.14/0.15
900	1.44	-0.14/0.16
902	1.45	-0.14/0.16
904	1.46	-0.14/0.16
906	1.47	-0.14/0.16
908	1.48	-0.14/0.16
910	1.50	-0.15/0.17
912	1.51	-0.15/0.17
914	1.52	-0.15/0.17

f [MHz]	VSWR [1]	U [1]
916	1.52	-0.15/0.17
918	1.53	-0.15/0.17
920	1.52	-0.15/0.17
922	1.52	-0.15/0.17
924	1.52	-0.15/0.17
926	1.53	-0.15/0.17
928	1.53	-0.15/0.17
930	1.53	-0.15/0.17
932	1.53	-0.15/0.17
934	1.53	-0.15/0.17
936	1.53	-0.15/0.17
938	1.52	-0.15/0.17
940	1.52	-0.15/0.17
942	1.51	-0.15/0.17
944	1.50	-0.15/0.17
946	1.50	-0.15/0.17
948	1.49	-0.15/0.17
950	1.48	-0.14/0.16
952	1.47	-0.14/0.16
954	1.45	-0.14/0.16
956	1.44	-0.14/0.16
958	1.42	-0.14/0.16
960	1.41	-0.14/0.15
962	1.40	-0.14/0.15
964	1.39	-0.13/0.15
966	1.38	-0.13/0.15
968	1.37	-0.13/0.15
970	1.36	-0.13/0.15
972	1.35	-0.13/0.15
974	1.33	-0.13/0.14
976	1.32	-0.13/0.14
978	1.30	-0.13/0.14
980	1.29	-0.12/0.14
982	1.29	-0.12/0.14
984	1.27	-0.12/0.14
986	1.27	-0.12/0.14
988	1.25	-0.12/0.13

f [MHz]	VSWR [1]	U [1]
990	1.25	-0.12/0.13
992	1.25	-0.12/0.13
994	1.25	-0.12/0.13
996	1.25	-0.12/0.13
998	1.26	-0.12/0.14
1000	1.28	-0.12/0.14
1010	1.32	-0.13/0.14
1020	1.35	-0.13/0.15
1030	1.43	-0.14/0.16
1040	1.51	-0.15/0.17
1050	1.58	-0.16/0.18
1060	1.69	-0.17/0.19
1070	1.77	-0.18/0.21
1080	1.81	-0.18/0.21
1090	1.80	-0.18/0.21
1100	1.74	-0.18/0.20
1110	1.67	-0.17/0.19
1120	1.58	-0.16/0.18
1130	1.51	-0.15/0.17
1140	1.43	-0.14/0.16
1150	1.39	-0.13/0.15
1160	1.35	-0.13/0.15
1170	1.35	-0.13/0.15
1180	1.36	-0.13/0.15
1190	1.48	-0.15/0.16
1200	1.66	-0.17/0.19
1210	1.81	-0.18/0.21
1220	1.92	-0.20/0.23
1230	1.95	-0.20/0.24
1240	1.94	-0.20/0.23
1250	1.93	-0.20/0.23
1260	1.91	-0.20/0.23
1270	1.88	-0.19/0.22
1280	1.90	-0.20/0.23
1290	1.94	-0.20/0.23
1300	1.94	-0.20/0.23