

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-A688/26
0612
09.04.2026

Gegenstand <i>Object</i>	Hybrid Antenna
Hersteller & Typ <i>Manufacturer & Type</i>	TEKBOX TBMA12
Herstellernummer <i>Serial number</i>	TBMA12260001
Auftraggeber <i>Customer</i>	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
Auftragsnummer <i>Order Nr.</i>	L.L7.00059.0.0-A-13675_5 Ext. Order No.: P03699
Anzahl der Seiten des Kalibrierscheines <i>Number of pages of the certificate</i>	1 - 5
Datum und Ort der Kalibrierung <i>Date and place of calibration</i>	09.04.2026 Seibersdorf

Akkreditierung Austria ist Vollmitglied bei der International Laboratory Accreditation Cooperation ILAC und Unterzeichner der MRAs für die Bereiche „Testing, Calibration and Inspection“.

Die Kalibrierung erfolgt auf der gesetzlichen Grundlage des Akkreditierungsgesetzes in gültiger Fassung entsprechend den Anforderungen der ÖVE/ÖNORM EN ISO/IEC 17025.

Dieser Kalibrierschein dokumentiert die Rückführbarkeit auf nationale Normale zur Darstellung der physikalischen Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).

Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

Akkreditierung Austria is a full member of the International Laboratory Accreditation Cooperation ILAC and a signatory of the MRA for "Testing, Calibration and Inspection".

The calibration is performed in accordance with the Akkreditierungsgesetz in the amended version and the requirements of ÖVE/ÖNORM EN ISO/IEC 17025.

This calibration certificate documents the traceability to national standards, which realize the physical units or measurements according to the International System of Units (SI).

The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein gilt ausschließlich für den kalibrierten Gegenstand und darf nur vollständig und unverändert weiterverarbeitet werden. Auszüge oder Änderungen sind unzulässig. Kalibrierscheine ohne Unterschrift haben keine Gültigkeit.

This calibration certificate is valid only for the calibrated object and may not be reproduced other than in full. Calibration certificates without signature are not valid.

Datum
Date

Zeichnungsberechtigter
Authorized person

Bearbeiter
Person responsible

09.04.2026

Patrick Preiner

Markus Vaclav

Calibration Procedure

Calibration of the **antenna factor** is carried out according to the 3-Antenna Method described in internal process guideline LE-EH-VA-A01 (2023-12). The calibration fulfils the requirements given in SAE ARP 958. The distance between the antennas is measured from the feedpoint (dipole like antenna), tip (log periodic or hybrid antenna) or aperture plane (horn antenna). The near field correction between 20 MHz and 45 MHz is not applied.

Test Equipment

Type	Identification
Network Analyzer Keysight E5080B	LE0406
Hybrid Antenna Schwarzbeck VULB 9162	LE0431
Hybrid Antenna Schwarzbeck VULB 9162	LE0432
Fully Anechoic Chamber	LE0455
CalStan 11	E0921

Environmental Conditions

Site Temperature	20°C - 27°C
Site Humidity	30% - 80%
Control Temperature	20°C - 27°C
Control Humidity	30% - 80%

Results

Type	Description	Fig./Table
Antenna Factor	30MHz-6000MHz, d=1m (tip)	1

Uncertainty

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] SAE ARP 958D:2003 Electromagnetic Interference Measurement Antennas; Standard Calibration Method
- [2] SAE ARP 958E:2021 Electromagnetic Interference Measurement Antennas; Standard Calibration Method
- [3] The Handbook of Antenna Design, Volume 1, A.W.Rudge, K.Milne, A.D.Olver, P.Knight, IEE Electromagnetic Waves Series 15, 1982 Peter Peregrinus Ltd., London, UK
- [4] EA-4/02 M: 2022 Evaluation of the Uncertainty of Measurement in calibration

Figure 1: Antenna Factor; 30MHz-6000MHz, d=1m (tip)

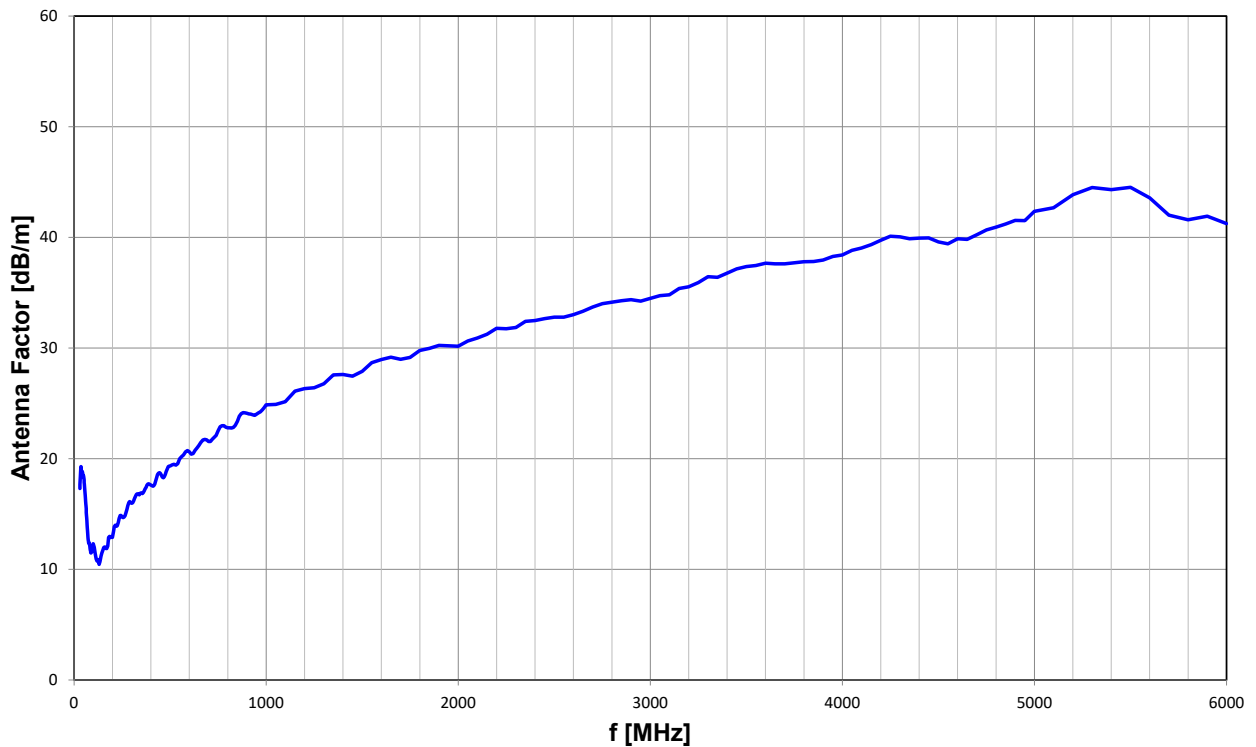


Table 1: Antenna Factor; 30MHz-6000MHz, d=1m (tip)

f [MHz]	AF1 Ver [dB/m]	U [dB]	f [MHz]	AF1 Ver [dB/m]	U [dB]	f [MHz]	AF1 Ver [dB/m]	U [dB]
30	17.29	±1.00	41	18.80	±1.00	52	18.05	±1.00
31	17.66	±1.00	42	18.84	±1.00	53	17.84	±1.00
32	18.02	±1.00	43	18.85	±1.00	54	17.67	±1.00
33	18.35	±1.00	44	18.79	±1.00	55	17.43	±1.00
34	18.74	±1.00	45	18.68	±1.00	56	17.19	±1.00
35	19.09	±1.00	46	18.55	±1.00	57	16.93	±1.00
36	19.28	±1.00	47	18.34	±1.00	58	16.71	±1.00
37	19.14	±1.00	48	18.43	±1.00	59	16.43	±1.00
38	18.75	±1.00	49	18.46	±1.00	60	16.13	±1.00
39	18.66	±1.00	50	18.34	±1.00	61	15.89	±1.00
40	18.74	±1.00	51	18.21	±1.00	62	15.69	±1.00

f [MHz]	AF1 Ver [dB/m]	U [dB]	f [MHz]	AF1 Ver [dB/m]	U [dB]	f [MHz]	AF1 Ver [dB/m]	U [dB]
63	15.46	±1.00	235	14.59	±1.00	610	20.40	±1.00
64	15.12	±1.00	240	14.85	±1.00	620	20.46	±1.00
65	14.88	±1.00	245	14.86	±1.00	630	20.74	±1.00
66	14.67	±1.00	250	14.73	±1.00	640	20.95	±1.00
67	14.39	±1.00	255	14.68	±1.00	650	21.18	±1.00
68	14.02	±1.00	260	14.71	±1.00	660	21.45	±1.00
69	13.71	±1.00	265	14.84	±1.00	670	21.68	±1.00
70	13.48	±1.00	270	15.09	±1.00	680	21.73	±1.00
71	13.20	±1.00	275	15.41	±1.00	690	21.71	±1.00
72	12.90	±1.00	280	15.74	±1.00	700	21.54	±1.00
73	12.69	±1.00	285	16.03	±1.00	710	21.55	±1.00
74	12.58	±1.00	290	16.12	±1.00	720	21.76	±1.00
75	12.46	±1.00	295	16.02	±1.00	730	21.92	±1.00
76	12.39	±1.00	300	15.96	±1.00	740	22.10	±1.00
77	12.39	±1.00	305	16.01	±1.00	750	22.50	±1.00
78	12.39	±1.00	310	16.19	±1.00	760	22.87	±1.00
79	12.31	±1.00	315	16.40	±1.00	770	22.98	±1.00
80	12.24	±1.00	320	16.61	±1.00	780	22.98	±1.00
81	12.18	±1.00	325	16.77	±1.00	790	22.85	±1.00
82	12.07	±1.00	330	16.81	±1.00	800	22.78	±1.00
83	11.88	±1.00	335	16.79	±1.00	810	22.79	±1.00
84	11.76	±1.00	340	16.72	±1.00	820	22.76	±1.00
85	11.67	±1.00	345	16.87	±1.00	830	22.82	±1.00
86	11.60	±1.00	350	16.90	±1.00	840	23.02	±1.00
87	11.51	±1.00	355	16.83	±1.00	850	23.38	±1.00
88	11.47	±1.00	360	16.91	±1.00	860	23.83	±1.00
89	11.49	±1.00	365	17.09	±1.00	870	24.05	±1.00
90	11.51	±1.00	370	17.25	±1.00	880	24.15	±1.00
91	11.54	±1.00	375	17.42	±1.00	890	24.13	±1.00
92	11.59	±1.00	380	17.60	±1.00	900	24.10	±1.00
93	11.70	±1.00	385	17.71	±1.00	910	24.05	±1.00
94	11.81	±1.00	390	17.71	±1.00	920	24.02	±1.00
95	11.92	±1.00	395	17.65	±1.00	930	23.96	±1.00
96	12.02	±1.00	400	17.60	±1.00	940	23.91	±1.00
97	12.12	±1.00	405	17.55	±1.00	950	24.01	±1.00
98	12.23	±1.00	410	17.50	±1.00	960	24.13	±1.00
99	12.28	±1.00	415	17.54	±1.00	970	24.23	±1.00
100	12.30	±1.00	420	17.70	±1.00	980	24.39	±1.00
105	11.98	±1.00	425	17.96	±1.00	990	24.62	±1.00
110	11.46	±1.00	430	18.28	±1.00	1 000	24.85	±1.00
115	10.93	±1.00	435	18.55	±1.00	1 050	24.89	±1.00
120	10.75	±1.00	440	18.70	±1.00	1 100	25.14	±1.00
125	10.87	±1.00	445	18.73	±1.00	1 150	26.10	±1.00
130	10.44	±1.00	450	18.66	±1.00	1 200	26.32	±1.00
135	10.68	±1.00	455	18.48	±1.00	1 250	26.40	±1.00
140	11.18	±1.00	460	18.32	±1.00	1 300	26.77	±1.00
145	11.47	±1.00	465	18.26	±1.00	1 350	27.57	±1.00
150	11.73	±1.00	470	18.36	±1.00	1 400	27.60	±1.00
155	11.97	±1.00	475	18.58	±1.00	1 450	27.44	±1.00
160	12.02	±1.00	480	18.82	±1.00	1 500	27.88	±1.00
165	11.89	±1.00	485	19.06	±1.00	1 550	28.67	±1.00
170	11.87	±1.00	490	19.28	±1.00	1 600	28.96	±1.00
175	12.10	±1.00	495	19.32	±1.00	1 650	29.16	±1.00
180	12.88	±1.00	500	19.33	±1.00	1 700	28.97	±1.00
185	12.96	±1.00	510	19.43	±1.00	1 750	29.15	±1.00
190	12.87	±1.00	520	19.48	±1.00	1 800	29.77	±1.00
195	12.91	±1.00	530	19.42	±1.00	1 850	29.96	±1.00
200	12.88	±1.00	540	19.54	±1.00	1 900	30.23	±1.00
205	13.38	±1.00	550	19.99	±1.00	1 950	30.20	±1.00
210	13.86	±1.00	560	20.17	±1.00	2 000	30.15	±1.00
215	13.99	±1.00	570	20.32	±1.00	2 050	30.64	±1.00
220	13.88	±1.00	580	20.61	±1.00	2 100	30.89	±1.00
225	13.93	±1.00	590	20.72	±1.00	2 150	31.24	±1.00
230	14.22	±1.00	600	20.60	±1.00	2 200	31.78	±1.00

f	AF1 Ver	U	f	AF1 Ver	U	f	AF1 Ver	U
[MHz]	[dB/m]	[dB]	[MHz]	[dB/m]	[dB]	[MHz]	[dB/m]	[dB]
2 250	31.74	±1.00	3 350	36.38	±1.20	4 450	39.95	±1.20
2 300	31.86	±1.00	3 400	36.76	±1.20	4 500	39.59	±1.20
2 350	32.40	±1.00	3 450	37.15	±1.20	4 550	39.42	±1.20
2 400	32.47	±1.00	3 500	37.35	±1.20	4 600	39.87	±1.20
2 450	32.65	±1.00	3 550	37.44	±1.20	4 650	39.81	±1.20
2 500	32.78	±1.00	3 600	37.66	±1.20	4 700	40.23	±1.20
2 550	32.78	±1.00	3 650	37.61	±1.20	4 750	40.67	±1.20
2 600	33.02	±1.00	3 700	37.60	±1.20	4 800	40.92	±1.20
2 650	33.31	±1.00	3 750	37.70	±1.20	4 850	41.21	±1.20
2 700	33.70	±1.00	3 800	37.80	±1.20	4 900	41.52	±1.20
2 750	33.99	±1.00	3 850	37.82	±1.20	4 950	41.51	±1.20
2 800	34.14	±1.00	3 900	37.94	±1.20	5 000	42.35	±1.20
2 850	34.27	±1.00	3 950	38.26	±1.20	5 100	42.68	±1.20
2 900	34.36	±1.00	4 000	38.40	±1.20	5 200	43.86	±1.20
2 950	34.24	±1.00	4 050	38.83	±1.20	5 300	44.50	±1.20
3 000	34.48	±1.00	4 100	39.02	±1.20	5 400	44.30	±1.20
3 050	34.73	±1.20	4 150	39.34	±1.20	5 500	44.51	±1.20
3 100	34.79	±1.20	4 200	39.73	±1.20	5 600	43.56	±1.20
3 150	35.37	±1.20	4 250	40.10	±1.20	5 700	42.01	±1.20
3 200	35.53	±1.20	4 300	40.03	±1.20	5 800	41.59	±1.20
3 250	35.91	±1.20	4 350	39.87	±1.20	5 900	41.91	±1.20
3 300	36.45	±1.20	4 400	39.93	±1.20	6 000	41.25	±1.20