

Date of Calibration = Feb 28, 2019

Date Printed: Thursday, February 28, 2019 11:01 AM

Customer Name: Compliance Testing LLC

Antenna Manufacturer: EMCO

Antenna Model: 3116

Antenna Serial No.: 2076

Temperature (Deg C): 21.0

Humidity (%): 29.0

Measurement Distance in Meters = 1.0

Antenna Polarization = VERT

NOTES:

CAL CERT #: 190227-141643-b82d3e

Freq (MHz)	ACF (dB)	Gain (dBi)	Num GAIN
18000.0000	44.997	10.308	10.736
18100.0000	44.988	10.365	10.877
18200.0000	44.968	10.434	11.050
18300.0000	44.979	10.470	11.143
18400.0000	44.854	10.642	11.594
18500.0000	44.828	10.715	11.790
18600.0000	44.907	10.684	11.705
18700.0000	44.923	10.714	11.787
18800.0000	44.933	10.750	11.885
18900.0000	44.845	10.884	12.258
19000.0000	44.857	10.918	12.354
19100.0000	44.903	10.917	12.352
19200.0000	44.878	10.989	12.556
19300.0000	44.801	11.110	12.912
19400.0000	44.832	11.125	12.955
19500.0000	44.749	11.251	13.339
19600.0000	44.644	11.401	13.807
19700.0000	44.639	11.451	13.966
19800.0000	44.595	11.539	14.252
19900.0000	44.563	11.614	14.501
20000.0000	44.522	11.698	14.785
20100.0000	44.485	11.778	15.061
20200.0000	44.487	11.821	15.207
20300.0000	44.538	11.812	15.177
20400.0000	44.577	11.815	15.189
20500.0000	44.604	11.831	15.244
20600.0000	44.604	11.874	15.395
20700.0000	44.677	11.842	15.283
20800.0000	44.701	11.860	15.347
20900.0000	44.637	11.966	15.725
21000.0000	44.620	12.025	15.939
21100.0000	44.630	12.056	16.054

21200.0000	44.636	12.090	16.182
21300.0000	44.628	12.139	16.366
21400.0000	44.599	12.209	16.631
21500.0000	44.603	12.246	16.772
21600.0000	44.691	12.199	16.590
21700.0000	44.746	12.183	16.531
21800.0000	44.794	12.175	16.501
21900.0000	44.839	12.170	16.481
22000.0000	44.940	12.108	16.249
22100.0000	45.012	12.075	16.127
22200.0000	45.046	12.082	16.149
22300.0000	45.120	12.046	16.018
22400.0000	45.110	12.094	16.198
22500.0000	45.146	12.097	16.208
22600.0000	45.230	12.052	16.040
22700.0000	45.217	12.104	16.232
22800.0000	45.291	12.068	16.098
22900.0000	45.364	12.033	15.969
23000.0000	45.447	11.988	15.804
23100.0000	45.530	11.943	15.641
23200.0000	45.602	11.907	15.515
23300.0000	45.620	11.928	15.587
23400.0000	45.588	11.996	15.835
23500.0000	45.620	12.002	15.855
23600.0000	45.627	12.031	15.963
23700.0000	45.573	12.121	16.299
23800.0000	45.529	12.202	16.605
23900.0000	45.521	12.247	16.776
24000.0000	45.534	12.271	16.868
24100.0000	45.619	12.221	16.677
24200.0000	45.736	12.140	16.369
24300.0000	45.805	12.107	16.244
24400.0000	45.910	12.037	15.986
24500.0000	46.078	11.905	15.507
24600.0000	46.156	11.863	15.356
24700.0000	46.187	11.866	15.369
24800.0000	46.213	11.876	15.403
24900.0000	46.278	11.845	15.295
25000.0000	46.287	11.872	15.388
25100.0000	46.251	11.943	15.641
25200.0000	46.218	12.010	15.885
25300.0000	46.168	12.095	16.198
25400.0000	46.100	12.196	16.582
25500.0000	46.104	12.227	16.699
25600.0000	46.006	12.358	17.212
25700.0000	46.009	12.389	17.335
25800.0000	46.074	12.358	17.212
25900.0000	46.141	12.325	17.080
26000.0000	46.272	12.227	16.700
26100.0000	46.309	12.224	16.687

26200.0000	46.388	12.178	16.512
26300.0000	46.462	12.137	16.357
26400.0000	46.518	12.114	16.271
26500.0000	46.462	12.203	16.607
26600.0000	46.407	12.291	16.947
26700.0000	46.401	12.329	17.097
26800.0000	46.342	12.420	17.460
26900.0000	46.268	12.527	17.894
27000.0000	46.248	12.580	18.112
27100.0000	46.286	12.574	18.087
27200.0000	46.295	12.596	18.181
27300.0000	46.356	12.567	18.060
27400.0000	46.398	12.557	18.018
27500.0000	46.442	12.545	17.967
27600.0000	46.508	12.511	17.826
27700.0000	46.570	12.480	17.700
27800.0000	46.585	12.496	17.766
27900.0000	46.596	12.516	17.849
28000.0000	46.579	12.564	18.047
28100.0000	46.530	12.645	18.385
28200.0000	46.449	12.756	18.862
28300.0000	46.374	12.861	19.326
28400.0000	46.392	12.875	19.385
28500.0000	46.338	12.958	19.763
28600.0000	46.364	12.963	19.784
28700.0000	46.369	12.989	19.901
28800.0000	46.409	12.979	19.856
28900.0000	46.463	12.954	19.745
29000.0000	46.514	12.933	19.649
29100.0000	46.560	12.918	19.579
29200.0000	46.612	12.895	19.477
29300.0000	46.634	12.904	19.515
29400.0000	46.612	12.954	19.745
29500.0000	46.598	12.998	19.944
29600.0000	46.617	13.008	19.991
29700.0000	46.571	13.084	20.343
29800.0000	46.533	13.151	20.659
29900.0000	46.546	13.167	20.736
30000.0000	46.528	13.215	20.964
30100.0000	46.613	13.158	20.693
30200.0000	46.617	13.184	20.814
30300.0000	46.626	13.202	20.905
30400.0000	46.734	13.124	20.529
30500.0000	46.819	13.067	20.263
30600.0000	46.840	13.074	20.297
30700.0000	46.854	13.089	20.365
30800.0000	46.872	13.100	20.415
30900.0000	46.946	13.053	20.198
31000.0000	46.946	13.082	20.331
31100.0000	46.964	13.091	20.376

31200.0000	46.994	13.089	20.366
31300.0000	47.065	13.045	20.162
31400.0000	47.100	13.038	20.129
31500.0000	47.143	13.024	20.061
31600.0000	47.201	12.993	19.920
31700.0000	47.302	12.919	19.584
31800.0000	47.490	12.759	18.875
31900.0000	47.524	12.752	18.845
32000.0000	47.610	12.693	18.591
32100.0000	47.841	12.490	17.740
32200.0000	48.097	12.261	16.829
32300.0000	48.192	12.192	16.565
32400.0000	48.192	12.219	16.668
32500.0000	48.432	12.006	15.870
32600.0000	48.693	11.771	15.035
32700.0000	48.691	11.800	15.136
32800.0000	48.702	11.816	15.191
32900.0000	48.733	11.810	15.172
33000.0000	48.973	11.598	14.447
33100.0000	49.042	11.554	14.303
33200.0000	48.964	11.659	14.652
33300.0000	48.941	11.708	14.818
33400.0000	49.103	11.572	14.361
33500.0000	49.211	11.489	14.091
33600.0000	49.164	11.562	14.330
33700.0000	49.175	11.577	14.379
33800.0000	49.169	11.610	14.487
33900.0000	49.325	11.478	14.056
34000.0000	49.466	11.364	13.689
34100.0000	49.367	11.489	14.088
34200.0000	49.294	11.587	14.410
34300.0000	49.326	11.579	14.386
34400.0000	49.348	11.584	14.400
34500.0000	49.157	11.799	15.133
34600.0000	48.996	11.986	15.797
34700.0000	48.990	12.016	15.909
34800.0000	48.936	12.096	16.202
34900.0000	48.778	12.279	16.900
35000.0000	48.663	12.418	17.451
35100.0000	48.623	12.483	17.714
35200.0000	48.704	12.427	17.486
35300.0000	48.568	12.587	18.144
35400.0000	48.440	12.741	18.795
35500.0000	48.357	12.847	19.263
35600.0000	48.291	12.938	19.670
35700.0000	48.129	13.125	20.534
35800.0000	47.889	13.388	21.819
35900.0000	47.681	13.620	23.017
36000.0000	47.415	13.912	24.612
36100.0000	47.212	14.138	25.930

36200.0000	46.904	14.470	27.990
36300.0000	46.627	14.771	29.999
36400.0000	46.332	15.091	32.289
36500.0000	46.191	15.254	33.531
36600.0000	46.040	15.430	34.913
36700.0000	45.786	15.708	37.219
36800.0000	45.579	15.937	39.242
36900.0000	45.537	16.003	39.841
37000.0000	45.522	16.042	40.198
37100.0000	45.379	16.208	41.766
37200.0000	45.304	16.306	42.721
37300.0000	45.308	16.326	42.915
37400.0000	45.381	16.276	42.425
37500.0000	45.304	16.376	43.414
37600.0000	45.245	16.458	44.242
37700.0000	45.286	16.441	44.065
37800.0000	45.300	16.450	44.156
37900.0000	45.289	16.483	44.498
38000.0000	45.282	16.514	44.811
38100.0000	45.294	16.524	44.918
38200.0000	45.360	16.481	44.475
38300.0000	45.459	16.405	43.702
38400.0000	45.478	16.408	43.735
38500.0000	45.570	16.340	43.049
38600.0000	45.639	16.292	42.583
38700.0000	45.719	16.236	42.030
38800.0000	45.914	16.062	40.386
38900.0000	45.998	16.001	39.820
39000.0000	46.037	15.984	39.666
39100.0000	46.158	15.885	38.773
39200.0000	46.287	15.778	37.830
39300.0000	46.402	15.686	37.033
39400.0000	46.464	15.645	36.690
39500.0000	46.449	15.683	37.008
39600.0000	46.584	15.570	36.057
39700.0000	46.740	15.436	34.962
39800.0000	46.964	15.233	33.368
39900.0000	47.155	15.065	32.098
40000.0000	47.283	14.959	31.323

**CERTIFICATE #: 190227-141643-b82d3e**

190227-141643-b82d3e

**CLIENT:** Compliance Testing LLC, 1724 S Nevada Way, Mesa, AZ, 85204, USA  
**MANUFACTURER:** EMCO  
**EQUIPMENT TYPE:** Horn (Small)  
**MODEL NUMBER:** 3116  
**SERIAL NUMBER:** 2076  
**ASSET NUMBER:** i00085

**Instrumentation Environment:**                    **TEMP:** 21°C                    **RH:** 29%  
**Calibration Environment:**                    **TEMP:** 21°C                    **RH:** 29%

**DATE RECEIVED:** 02/26/2019  
**DATE OF CALIBRATION:** 02/28/2019  
**CALIBRATION DUE DATE:** 02/28/2021  
**CALIBRATION CYCLE NOTES:** 2 years from calibration date. The applied calibration cycle has been requested by the customer. The relevant documentation has been received and is on file.  
**CALIBRATION LOCATION:** 1346 Yellowwood Road, Kimballton, IA 51543  
**CALIBRATION BY:** Rodger Rasmussen

**EQUIPMENT STATUS**

Received in tolerance:	<input checked="" type="checkbox"/>	Returned in tolerance:	<input checked="" type="checkbox"/>
Received with limited cal.:	<input type="checkbox"/>	Returned with limited cal.:	<input type="checkbox"/>
Received out of tolerance:	<input type="checkbox"/>	Returned out of tolerance:	<input type="checkbox"/>

<b>CALIBRATION STANDARD(S)</b>	<b>CALIBRATION METHOD(S)</b>	<b>CALIBRATION PROCEDURE(S)</b>
SAE ARP 958D 2003	Combination of SAE Clause 4 and Appendix C	356847

**NOTES:**

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**Keysight-LC Service Center Manager**  
**Brandt Langer**

This report is not to be reproduced, except in full, without written approval of Keysight Technologies. All results of this calibration relate only to the item that was calibrated. The limits stated in the report correspond to the published specification of the equipment and/or standard, at the specified parameters. MEASURED VALUES ARE REPORTED ON THE ATTACHED PAGES.

**CALIBRATION EQUIPMENT USED:**

<u>Manufacturer</u>	<u>Equipment Type</u>	<u>Model Number</u>	<u>Serial Number</u>	<u>Trace #</u>	<u>Cal Due Date</u>
Comtest	Chamber	8M Chamber	20021	170321-095049-079e1b	05/22/2019
EMCO	Horn (4.5 - 40 GHz)	3116	9003-2135	170828-134217-bd6b9c	08/28/2019
ETS	Horn (Small) 4.5-40GHz	3116	00062501	170828-134508-1e57d2	08/28/2019
Keysight Technologies, Inc.	PNA Network Analyzer	N5225A	MY56051740	1-10144781110-1	06/25/2019

**CALIBRATION DATA FILE(S) THAT ARE PART OF THIS CERTIFICATE:**

2019-1MV.dat 2019-1MV.txt

\* All data/documentation is available online at: <http://certxpress.service.keysight.com/certxpress/login.aspx>

**CALIBRATION SOFTWARE:**

ACF-Insertion Loss Analysis 2.9  
DRWG Standard Site Method 2.12

**IN TOLERANCE/OUT OF TOLERANCE EXPLANATION:**

The standard criteria to determine the "In Tolerance/Out of Tolerance" status is based on one or more of the following conditions, as requested by the client:

1. If the manufacturer has a specified tolerance for the item being calibrated, then the calibration values are compared to this tolerance, and the values must fall within the manufacturer's tolerance. The tolerance may be obtained from the manufacturer's web site, data sheets, equipment manuals, etc.
2. Where tolerances are called out in a published standard, the calibration results are compared to this tolerance, and the measured values must fall within the standard's tolerance.
3. In cases where the manufacturer, standard, or client does not identify any relevant tolerances, applicable calibration results are compared to historical data with a +/- 3 dB tolerance.

**CALIBRATION TRACEABILITY:**

This laboratory is accredited to ISO/IEC 17025:2005 and NCSL/ANSI Z540-1-1994. All measurement instrumentation is traceable to a recognized National Metrology Institute, which is a signatory to the International Committee for Weights & Measures, Mutual Recognition Arrangement. Supporting documentation related to traceability is on file and is available for examination upon request.

**INTERPRETATION TO THE GUIDANCE AND USE OF CALIBRATION DATA:**

The calibration values supplied with this certificate apply to measurements made under the physical (geometric) arrangements with respect to the applicable calibration standard. This antenna has been individually calibrated in a freespace environment for stated distances from reference points on the antenna. Use of this antenna under other conditions will result in additional sources of error of which is the responsibility of the user.

**CALIBRATION UNCERTAINTY:**

- Actual uncertainty (Expanded) \_\_\_\_\_
- Uncertainties that apply to this calibration are shown below. CMC represents our typical uncertainty for the calibration documented in this certificate since, to the best of our knowledge, the conditions under which the CMC for this facility and calibration item was determined applied to this calibration as well. The repeatability contribution to CMC is based on a type A evaluation of at least 10 data sets or more.

<u>Parameter/Equipment:</u>	<u>Range:</u>	<u>CMC** (+/-):</u>
Horn Antennas/LPA's - 1 & 3 Meter Distance (CISPR 16-1-6), Far Field (ANSI C63.5)	700 MHz to 18 GHz (18 to 26.5) GHz (26.5 to 50) GHz	0.37 dB 0.42 dB 0.47 dB

**\*\* Calibration and Measurement Capability (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. Calibration and Measurement Capabilities represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of  $k = 2$ . The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration. In the statement of CMC, M is the uncertainty contribution of the mismatch error caused by the impedance mismatch between the calibration system of the laboratory and the device under calibration.**

For further detailed explanations, a complete copy of the scope of our A2LA accreditation is available upon request.



Date of Calibration = August 3, 2020

Date Printed: Monday, August 3, 2020 12:06 PM

Customer Name: Compliance Testing LLC

Antenna Manufacturer: ARA

Antenna Model: DRG-118/A

Antenna Serial No.: 1176

Temperature (Deg C): 23.0

Humidity (%): 50.0

Measurement Distance in Meters = 3.0

Antenna Polarization = VERT

NOTES: Observed Pin Depth: -0.0011" from typical.

CAL CERT #: 200803-095012-b16fe9

Freq (MHz)	ACF (dB)	Gain (dBi)	Num GAIN
1000.0000	24.239	5.961	3.945
1050.0000	24.575	6.048	4.026
1100.0000	24.796	6.232	4.199
1150.0000	24.559	6.854	4.847
1200.0000	24.883	6.901	4.899
1250.0000	25.009	7.130	5.164
1300.0000	24.937	7.542	5.678
1350.0000	24.868	7.938	6.221
1400.0000	25.020	8.103	6.461
1450.0000	25.049	8.378	6.884
1500.0000	25.024	8.697	7.409
1550.0000	24.975	9.032	8.002
1600.0000	25.089	9.193	8.305
1650.0000	25.458	9.092	8.113
1700.0000	25.448	9.361	8.632
1750.0000	25.405	9.656	9.238
1800.0000	25.885	9.421	8.751
1850.0000	26.233	9.310	8.531
1900.0000	26.679	9.097	8.122
1950.0000	27.422	8.578	7.208
2000.0000	28.014	8.207	6.617
2050.0000	28.342	8.093	6.446
2100.0000	28.267	8.377	6.882
2150.0000	28.276	8.572	7.198
2200.0000	27.991	9.058	8.050
2250.0000	27.634	9.610	9.141
2300.0000	27.702	9.732	9.402

2350.0000	27.942	9.679	9.288
2400.0000	27.971	9.834	9.624
2450.0000	28.178	9.805	9.561
2500.0000	28.573	9.585	9.090
2550.0000	28.937	9.394	8.697
2600.0000	29.158	9.342	8.594
2650.0000	29.540	9.125	8.175
2700.0000	29.553	9.275	8.462
2750.0000	29.492	9.494	8.901
2800.0000	29.608	9.535	8.985
2850.0000	29.628	9.669	9.266
2900.0000	29.542	9.906	9.786
2950.0000	29.683	9.914	9.803
3000.0000	30.039	9.704	9.341
3050.0000	30.061	9.825	9.605
3100.0000	29.996	10.032	10.073
3150.0000	30.256	9.911	9.796
3200.0000	30.419	9.883	9.735
3250.0000	30.193	10.245	10.580
3300.0000	30.255	10.315	10.753
3350.0000	30.737	9.963	9.916
3400.0000	30.718	10.112	10.261
3450.0000	30.595	10.361	10.867
3500.0000	31.114	9.967	9.925
3550.0000	31.538	9.666	9.260
3600.0000	31.325	10.001	10.002
3650.0000	30.972	10.473	11.152
3700.0000	30.774	10.790	11.995
3750.0000	30.632	11.048	12.730
3800.0000	30.624	11.172	13.097
3850.0000	30.498	11.412	13.841
3900.0000	30.435	11.587	14.410
3950.0000	30.737	11.395	13.788
4000.0000	30.994	11.248	13.328
4050.0000	30.963	11.386	13.760
4100.0000	31.043	11.412	13.843
4150.0000	31.211	11.349	13.644
4200.0000	31.512	11.152	13.039
4250.0000	31.586	11.181	13.126
4300.0000	31.540	11.329	13.581
4350.0000	31.570	11.399	13.802
4400.0000	31.654	11.415	13.852
4450.0000	31.614	11.554	14.301
4500.0000	31.508	11.756	14.983
4550.0000	31.655	11.706	14.810
4600.0000	31.911	11.544	14.269

4650.0000	31.969	11.580	14.388
4700.0000	32.213	11.429	13.896
4750.0000	32.725	11.009	12.615
4800.0000	32.991	10.834	12.117
4850.0000	33.023	10.891	12.278
4900.0000	32.970	11.034	12.688
4950.0000	33.095	10.998	12.582
5000.0000	33.393	10.787	11.986
5050.0000	33.412	10.854	12.173
5100.0000	33.425	10.927	12.379
5150.0000	33.523	10.913	12.340
5200.0000	33.480	11.041	12.707
5250.0000	33.567	11.037	12.696
5300.0000	33.530	11.156	13.049
5350.0000	33.502	11.265	13.381
5400.0000	33.476	11.371	13.713
5450.0000	33.501	11.426	13.888
5500.0000	33.666	11.341	13.618
5550.0000	33.612	11.474	14.041
5600.0000	33.491	11.673	14.699
5650.0000	33.470	11.770	15.033
5700.0000	33.428	11.889	15.450
5750.0000	33.572	11.822	15.211
5800.0000	33.707	11.762	15.003
5850.0000	33.949	11.594	14.435
5900.0000	34.286	11.331	13.586
5950.0000	34.561	11.130	12.971
6000.0000	34.752	11.011	12.621
6050.0000	34.933	10.902	12.309
6100.0000	34.866	11.040	12.707
6150.0000	34.712	11.265	13.382
6200.0000	34.616	11.432	13.906
6250.0000	34.683	11.434	13.913
6300.0000	34.775	11.411	13.840
6350.0000	34.706	11.549	14.286
6400.0000	34.771	11.552	14.297
6450.0000	34.996	11.396	13.790
6500.0000	35.219	11.240	13.303
6550.0000	35.377	11.147	13.024
6600.0000	35.587	11.003	12.599
6650.0000	35.794	10.863	12.198
6700.0000	35.995	10.727	11.822
6750.0000	36.084	10.702	11.754
6800.0000	36.225	10.626	11.549
6850.0000	36.425	10.488	11.190
6900.0000	36.569	10.408	10.985

6950.0000	36.791	10.248	10.589
7000.0000	37.027	10.075	10.174
7050.0000	37.342	9.822	9.598
7100.0000	37.552	9.673	9.275
7150.0000	37.654	9.632	9.188
7200.0000	37.524	9.822	9.599
7250.0000	37.573	9.833	9.624
7300.0000	37.582	9.885	9.738
7350.0000	37.507	10.018	10.042
7400.0000	37.387	10.198	10.466
7450.0000	37.442	10.201	10.474
7500.0000	37.467	10.234	10.554
7550.0000	37.490	10.269	10.639
7600.0000	37.408	10.408	10.985
7650.0000	37.445	10.428	11.036
7700.0000	37.407	10.522	11.278
7750.0000	37.441	10.546	11.338
7800.0000	37.444	10.597	11.475
7850.0000	37.430	10.668	11.662
7900.0000	37.395	10.758	11.906
7950.0000	37.329	10.879	12.242
8000.0000	37.251	11.010	12.619
8050.0000	37.226	11.090	12.853
8100.0000	37.248	11.122	12.947
8150.0000	37.262	11.162	13.066
8200.0000	37.254	11.223	13.251
8250.0000	37.330	11.199	13.180
8300.0000	37.370	11.211	13.217
8350.0000	37.424	11.210	13.213
8400.0000	37.305	11.380	13.741
8450.0000	37.279	11.458	13.990
8500.0000	37.365	11.424	13.879
8550.0000	37.373	11.466	14.016
8600.0000	37.460	11.430	13.899
8650.0000	37.528	11.413	13.844
8700.0000	37.600	11.391	13.774
8750.0000	37.699	11.342	13.619
8800.0000	37.759	11.331	13.586
8850.0000	37.803	11.335	13.600
8900.0000	37.886	11.301	13.494
8950.0000	37.925	11.311	13.525
9000.0000	37.901	11.384	13.753
9050.0000	37.959	11.374	13.721
9100.0000	37.954	11.427	13.890
9150.0000	38.073	11.356	13.664
9200.0000	38.170	11.305	13.506

9250.0000	38.173	11.350	13.646
9300.0000	38.406	11.163	13.072
9350.0000	38.559	11.057	12.756
9400.0000	38.549	11.113	12.922
9450.0000	38.649	11.060	12.764
9500.0000	38.686	11.069	12.790
9550.0000	38.792	11.009	12.614
9600.0000	38.721	11.124	12.955
9650.0000	38.694	11.196	13.171
9700.0000	38.758	11.177	13.114
9750.0000	38.802	11.178	13.116
9800.0000	38.801	11.224	13.255
9850.0000	38.844	11.224	13.257
9900.0000	38.852	11.260	13.367
9950.0000	38.866	11.290	13.459
10000.0000	38.913	11.287	13.451
10050.0000	38.943	11.300	13.490
10100.0000	38.984	11.302	13.497
10150.0000	39.014	11.316	13.538
10200.0000	39.060	11.313	13.529
10250.0000	39.065	11.350	13.645
10300.0000	39.055	11.402	13.810
10350.0000	39.083	11.415	13.853
10400.0000	39.073	11.467	14.020
10450.0000	39.121	11.461	14.000
10500.0000	39.167	11.456	13.984
10550.0000	39.210	11.455	13.980
10600.0000	39.235	11.472	14.033
10650.0000	39.272	11.474	14.043
10700.0000	39.290	11.498	14.118
10750.0000	39.256	11.572	14.362
10800.0000	39.238	11.631	14.557
10850.0000	39.137	11.771	15.036
10900.0000	39.074	11.874	15.397
10950.0000	39.007	11.981	15.780
11000.0000	38.966	12.062	16.077
11050.0000	38.999	12.068	16.099
11100.0000	39.101	12.005	15.868
11150.0000	39.201	11.944	15.647
11200.0000	39.303	11.881	15.421
11250.0000	39.515	11.709	14.820
11300.0000	39.681	11.580	14.389
11350.0000	39.768	11.531	14.228
11400.0000	39.811	11.527	14.214
11450.0000	39.830	11.547	14.278
11500.0000	39.861	11.553	14.299

11550.0000	39.915	11.537	14.246
11600.0000	39.943	11.547	14.278
11650.0000	39.937	11.590	14.420
11700.0000	39.957	11.607	14.477
11750.0000	40.073	11.528	14.216
11800.0000	40.051	11.587	14.411
11850.0000	40.100	11.575	14.370
11900.0000	40.176	11.535	14.240
11950.0000	40.417	11.330	13.584
12000.0000	40.544	11.239	13.302
12050.0000	40.566	11.254	13.347
12100.0000	40.553	11.302	13.497
12150.0000	40.483	11.408	13.830
12200.0000	40.268	11.659	14.652
12250.0000	40.011	11.951	15.672
12300.0000	39.857	12.142	16.374
12350.0000	39.736	12.297	16.971
12400.0000	39.686	12.382	17.307
12450.0000	39.619	12.485	17.720
12500.0000	39.626	12.512	17.832
12550.0000	39.558	12.615	18.260
12600.0000	39.474	12.734	18.766
12650.0000	39.268	12.973	19.831
12700.0000	39.106	13.170	20.749
12750.0000	39.018	13.293	21.343
12800.0000	38.950	13.395	21.850
12850.0000	38.958	13.421	21.981
12900.0000	39.053	13.359	21.672
12950.0000	39.219	13.226	21.019
13000.0000	39.271	13.207	20.929
13050.0000	39.497	13.015	20.022
13100.0000	39.635	12.911	19.547
13150.0000	39.839	12.740	18.792
13200.0000	39.881	12.731	18.753
13250.0000	40.021	12.624	18.296
13300.0000	40.243	12.434	17.515
13350.0000	40.348	12.361	17.224
13400.0000	40.413	12.329	17.096
13450.0000	40.590	12.184	16.536
13500.0000	40.599	12.208	16.626
13550.0000	40.572	12.266	16.852
13600.0000	40.442	12.429	17.494
13650.0000	40.459	12.443	17.552
13700.0000	40.440	12.494	17.759
13750.0000	40.459	12.507	17.812
13800.0000	40.570	12.427	17.488

13850.0000	40.730	12.299	16.979
13900.0000	40.872	12.189	16.553
13950.0000	41.010	12.081	16.148
14000.0000	41.098	12.024	15.938
14050.0000	41.286	11.867	15.372
14100.0000	41.378	11.807	15.159
14150.0000	41.635	11.581	14.390
14200.0000	41.682	11.563	14.333
14250.0000	41.796	11.481	14.063
14300.0000	41.988	11.318	13.547
14350.0000	42.277	11.061	12.766
14400.0000	42.458	10.909	12.329
14450.0000	42.825	10.572	11.408
14500.0000	43.225	10.202	10.477
14550.0000	43.899	9.559	9.034
14600.0000	44.356	9.132	8.188
14650.0000	44.871	8.646	7.321
14700.0000	45.013	8.534	7.135
14750.0000	44.752	8.824	7.628
14800.0000	44.159	9.447	8.804
14850.0000	43.350	10.285	10.678
14900.0000	42.523	11.140	13.003
14950.0000	41.803	11.890	15.452
15000.0000	41.043	12.679	18.531
15050.0000	40.413	13.338	21.567
15100.0000	39.901	13.879	24.427
15150.0000	39.474	14.334	27.128
15200.0000	39.083	14.754	29.881
15250.0000	38.744	15.122	32.521
15300.0000	38.498	15.395	34.637
15350.0000	38.298	15.625	36.514
15400.0000	38.136	15.815	38.148
15450.0000	38.038	15.941	39.272
15500.0000	37.948	16.058	40.349
15550.0000	37.868	16.167	41.370
15600.0000	37.817	16.246	42.128
15650.0000	37.811	16.279	42.454
15700.0000	37.774	16.343	43.087
15750.0000	37.743	16.402	43.675
15800.0000	37.730	16.444	44.092
15850.0000	37.729	16.471	44.374
15900.0000	37.721	16.506	44.735
15950.0000	37.808	16.448	44.133
16000.0000	37.872	16.411	43.759
16050.0000	37.980	16.329	42.946
16100.0000	38.070	16.266	42.328

16150.0000	38.189	16.175	41.445
16200.0000	38.302	16.088	40.627
16250.0000	38.335	16.082	40.570
16300.0000	38.442	16.001	39.823
16350.0000	38.542	15.929	39.162
16400.0000	38.673	15.824	38.229
16450.0000	38.797	15.726	37.378
16500.0000	38.963	15.586	36.194
16550.0000	39.141	15.435	34.954
16600.0000	39.352	15.251	33.501
16650.0000	39.579	15.050	31.986
16700.0000	39.832	14.823	30.358
16750.0000	40.076	14.604	28.868
16800.0000	40.420	14.287	26.832
16850.0000	40.810	13.921	24.669
16900.0000	41.124	13.633	23.085
16950.0000	41.352	13.432	22.038
17000.0000	41.517	13.291	21.338
17050.0000	41.606	13.229	21.032
17100.0000	41.658	13.201	20.900
17150.0000	41.800	13.086	20.350
17200.0000	42.000	12.910	19.545
17250.0000	42.280	12.656	18.433
17300.0000	42.516	12.445	17.559
17350.0000	42.732	12.253	16.802
17400.0000	42.950	12.060	16.071
17450.0000	43.121	11.914	15.540
17500.0000	43.225	11.836	15.261
17550.0000	43.301	11.785	15.083
17600.0000	43.274	11.836	15.262
17650.0000	43.206	11.929	15.592
17700.0000	42.967	12.192	16.566
17750.0000	42.764	12.420	17.458
17800.0000	42.632	12.576	18.098
17850.0000	42.468	12.764	18.899
17900.0000	42.548	12.710	18.662
17950.0000	42.739	12.542	17.956
18000.0000	43.134	12.172	16.488



Date of Calibration = August 3, 2020

Date Printed: Monday, August 3, 2020 12:06 PM

Customer Name: Compliance Testing LLC

Antenna Manufacturer: ARA

Antenna Model: DRG-118/A

Antenna Serial No.: 1176

Temperature (Deg C): 23.0

Humidity (%): 50.0

Measurement Distance in Meters = 3.0

Antenna Polarization = VERT

NOTES: Observed Pin Depth: -0.0011" from typical.

CAL CERT #: 200803-095012-b16fe9

Freq (MHz)	ACF (dB)	Gain (dBi)	Num GAIN
1000.0000	24.239	5.961	3.945
1010.0000	24.259	6.027	4.006
1020.0000	24.274	6.099	4.072
1030.0000	24.317	6.140	4.111
1040.0000	24.397	6.143	4.115
1050.0000	24.575	6.048	4.026
1060.0000	24.722	5.984	3.966
1070.0000	24.821	5.966	3.950
1080.0000	24.837	6.031	4.010
1090.0000	24.834	6.114	4.087
1100.0000	24.796	6.232	4.199
1110.0000	24.729	6.377	4.342
1120.0000	24.670	6.514	4.481
1130.0000	24.596	6.666	4.641
1140.0000	24.547	6.792	4.777
1150.0000	24.559	6.854	4.847
1160.0000	24.620	6.869	4.863
1170.0000	24.678	6.885	4.881
1180.0000	24.759	6.879	4.874
1190.0000	24.826	6.884	4.880
1200.0000	24.883	6.901	4.899
1210.0000	24.939	6.916	4.916
1220.0000	24.947	6.980	4.989
1230.0000	24.965	7.034	5.051
1240.0000	24.989	7.080	5.105
1250.0000	25.009	7.130	5.164
1260.0000	25.061	7.146	5.183

1270.0000	25.013	7.263	5.325
1280.0000	24.959	7.385	5.477
1290.0000	24.959	7.453	5.563
1300.0000	24.937	7.542	5.678
1310.0000	24.985	7.561	5.703
1320.0000	24.965	7.647	5.817
1330.0000	24.929	7.748	5.954
1340.0000	24.935	7.807	6.035
1350.0000	24.868	7.938	6.221
1360.0000	24.870	8.000	6.310
1370.0000	24.874	8.061	6.398
1380.0000	24.871	8.127	6.496
1390.0000	24.922	8.139	6.514
1400.0000	25.020	8.103	6.461
1410.0000	25.069	8.116	6.480
1420.0000	25.068	8.178	6.573
1430.0000	25.074	8.232	6.656
1440.0000	25.078	8.290	6.745
1450.0000	25.049	8.378	6.884
1460.0000	25.026	8.461	7.016
1470.0000	25.032	8.515	7.103
1480.0000	25.055	8.551	7.162
1490.0000	25.077	8.586	7.222
1500.0000	25.024	8.697	7.409
1510.0000	25.061	8.719	7.445
1520.0000	25.082	8.754	7.507
1530.0000	25.056	8.837	7.651
1540.0000	25.010	8.941	7.836
1550.0000	24.975	9.032	8.002
1560.0000	24.983	9.080	8.090
1570.0000	25.000	9.118	8.162
1580.0000	25.025	9.148	8.219
1590.0000	25.054	9.174	8.268
1600.0000	25.089	9.193	8.305
1610.0000	25.207	9.129	8.183
1620.0000	25.335	9.056	8.046
1630.0000	25.328	9.115	8.157
1640.0000	25.366	9.130	8.185
1650.0000	25.458	9.092	8.113
1660.0000	25.453	9.150	8.222
1670.0000	25.478	9.177	8.273
1680.0000	25.502	9.204	8.325
1690.0000	25.449	9.308	8.528
1700.0000	25.448	9.361	8.632
1710.0000	25.441	9.418	8.747
1720.0000	25.367	9.543	9.002

1730.0000	25.383	9.577	9.073
1740.0000	25.408	9.603	9.126
1750.0000	25.405	9.656	9.238
1760.0000	25.462	9.649	9.223
1770.0000	25.523	9.637	9.198
1780.0000	25.613	9.596	9.111
1790.0000	25.744	9.514	8.940
1800.0000	25.885	9.421	8.751
1810.0000	26.013	9.340	8.591
1820.0000	26.119	9.283	8.478
1830.0000	26.157	9.292	8.496
1840.0000	26.178	9.319	8.548
1850.0000	26.233	9.310	8.531
1860.0000	26.292	9.299	8.509
1870.0000	26.403	9.234	8.383
1880.0000	26.504	9.180	8.279
1890.0000	26.588	9.141	8.206
1900.0000	26.679	9.097	8.122
1910.0000	26.808	9.013	7.967
1920.0000	26.968	8.898	7.759
1930.0000	27.123	8.788	7.565
1940.0000	27.262	8.695	7.404
1950.0000	27.422	8.578	7.208
1960.0000	27.594	8.452	7.001
1970.0000	27.694	8.396	6.911
1980.0000	27.793	8.340	6.824
1990.0000	27.922	8.256	6.692
2000.0000	28.014	8.207	6.617
2010.0000	28.118	8.146	6.525
2020.0000	28.193	8.114	6.477
2030.0000	28.248	8.101	6.459
2040.0000	28.296	8.097	6.452
2050.0000	28.342	8.093	6.446
2060.0000	28.323	8.154	6.538
2070.0000	28.282	8.237	6.664
2080.0000	28.278	8.284	6.735
2090.0000	28.259	8.343	6.829
2100.0000	28.267	8.377	6.882
2110.0000	28.244	8.442	6.985
2120.0000	28.232	8.494	7.070
2130.0000	28.282	8.485	7.056
2140.0000	28.316	8.492	7.067
2150.0000	28.276	8.572	7.198
2160.0000	28.278	8.611	7.263
2170.0000	28.235	8.694	7.403
2180.0000	28.196	8.773	7.539

2190.0000	28.111	8.898	7.759
2200.0000	27.991	9.058	8.050
2210.0000	27.927	9.161	8.243
2220.0000	27.839	9.288	8.488
2230.0000	27.732	9.434	8.778
2240.0000	27.701	9.503	8.920
2250.0000	27.634	9.610	9.141
2260.0000	27.596	9.687	9.304
2270.0000	27.648	9.672	9.273
2280.0000	27.667	9.692	9.315
2290.0000	27.675	9.722	9.380
2300.0000	27.702	9.732	9.402
2310.0000	27.733	9.740	9.418
2320.0000	27.786	9.724	9.384
2330.0000	27.848	9.700	9.332
2340.0000	27.906	9.678	9.286
2350.0000	27.942	9.679	9.288
2360.0000	28.043	9.616	9.153
2370.0000	28.028	9.666	9.261
2380.0000	28.059	9.673	9.274
2390.0000	28.046	9.721	9.379
2400.0000	27.971	9.834	9.624
2410.0000	28.030	9.810	9.572
2420.0000	28.008	9.869	9.702
2430.0000	28.096	9.816	9.585
2440.0000	28.170	9.778	9.501
2450.0000	28.178	9.805	9.561
2460.0000	28.281	9.738	9.414
2470.0000	28.370	9.683	9.297
2480.0000	28.495	9.594	9.108
2490.0000	28.533	9.590	9.100
2500.0000	28.573	9.585	9.090
2510.0000	28.654	9.540	8.994
2520.0000	28.804	9.425	8.759
2530.0000	28.859	9.403	8.716
2540.0000	28.862	9.435	8.780
2550.0000	28.937	9.394	8.697
2560.0000	28.978	9.386	8.682
2570.0000	29.020	9.379	8.667
2580.0000	29.038	9.395	8.699
2590.0000	29.064	9.401	8.713
2600.0000	29.158	9.342	8.594
2610.0000	29.295	9.238	8.391
2620.0000	29.411	9.155	8.232
2630.0000	29.490	9.109	8.145
2640.0000	29.504	9.128	8.181

2650.0000	29.540	9.125	8.175
2660.0000	29.561	9.136	8.197
2670.0000	29.571	9.159	8.240
2680.0000	29.566	9.196	8.311
2690.0000	29.543	9.253	8.419
2700.0000	29.553	9.275	8.462
2710.0000	29.531	9.328	8.567
2720.0000	29.528	9.364	8.637
2730.0000	29.491	9.433	8.775
2740.0000	29.433	9.523	8.959
2750.0000	29.492	9.494	8.901
2760.0000	29.511	9.507	8.927
2770.0000	29.493	9.557	9.030
2780.0000	29.511	9.569	9.056
2790.0000	29.569	9.544	9.002
2800.0000	29.608	9.535	8.985
2810.0000	29.613	9.561	9.039
2820.0000	29.611	9.593	9.106
2830.0000	29.629	9.606	9.133
2840.0000	29.628	9.638	9.201
2850.0000	29.628	9.669	9.266
2860.0000	29.604	9.723	9.382
2870.0000	29.614	9.744	9.427
2880.0000	29.589	9.799	9.548
2890.0000	29.558	9.860	9.683
2900.0000	29.542	9.906	9.786
2910.0000	29.528	9.950	9.885
2920.0000	29.560	9.947	9.879
2930.0000	29.550	9.988	9.972
2940.0000	29.570	9.997	9.993
2950.0000	29.683	9.914	9.803
2960.0000	29.748	9.878	9.723
2970.0000	29.786	9.870	9.704
2980.0000	29.869	9.816	9.584
2990.0000	29.965	9.748	9.437
3000.0000	30.039	9.704	9.341
3050.0000	30.061	9.825	9.605
3100.0000	29.996	10.032	10.073
3150.0000	30.256	9.911	9.796
3200.0000	30.419	9.883	9.735
3250.0000	30.193	10.245	10.580
3300.0000	30.255	10.315	10.753
3350.0000	30.737	9.963	9.916
3400.0000	30.718	10.112	10.261
3450.0000	30.595	10.361	10.867
3500.0000	31.114	9.967	9.925

3550.0000	31.538	9.666	9.260
3600.0000	31.325	10.001	10.002
3650.0000	30.972	10.473	11.152
3700.0000	30.774	10.790	11.995
3750.0000	30.632	11.048	12.730
3800.0000	30.624	11.172	13.097
3850.0000	30.498	11.412	13.841
3900.0000	30.435	11.587	14.410
3950.0000	30.737	11.395	13.788
4000.0000	30.994	11.248	13.328
4050.0000	30.963	11.386	13.760
4100.0000	31.043	11.412	13.843
4150.0000	31.211	11.349	13.644
4200.0000	31.512	11.152	13.039
4250.0000	31.586	11.181	13.126
4300.0000	31.540	11.329	13.581
4350.0000	31.570	11.399	13.802
4400.0000	31.654	11.415	13.852
4450.0000	31.614	11.554	14.301
4500.0000	31.508	11.756	14.983
4550.0000	31.655	11.706	14.810
4600.0000	31.911	11.544	14.269
4650.0000	31.969	11.580	14.388
4700.0000	32.213	11.429	13.896
4750.0000	32.725	11.009	12.615
4800.0000	32.991	10.834	12.117
4850.0000	33.023	10.891	12.278
4900.0000	32.970	11.034	12.688
4950.0000	33.095	10.998	12.582
5000.0000	33.393	10.787	11.986
5050.0000	33.412	10.854	12.173
5100.0000	33.425	10.927	12.379
5150.0000	33.523	10.913	12.340
5200.0000	33.480	11.041	12.707
5250.0000	33.567	11.037	12.696
5300.0000	33.530	11.156	13.049
5350.0000	33.502	11.265	13.381
5400.0000	33.476	11.371	13.713
5450.0000	33.501	11.426	13.888
5500.0000	33.666	11.341	13.618
5550.0000	33.612	11.474	14.041
5600.0000	33.491	11.673	14.699
5650.0000	33.470	11.770	15.033
5700.0000	33.428	11.889	15.450
5750.0000	33.572	11.822	15.211
5800.0000	33.707	11.762	15.003

5850.0000	33.949	11.594	14.435
5900.0000	34.286	11.331	13.586
5950.0000	34.561	11.130	12.971
6000.0000	34.752	11.011	12.621
6050.0000	34.933	10.902	12.309
6100.0000	34.866	11.040	12.707
6150.0000	34.712	11.265	13.382
6200.0000	34.616	11.432	13.906
6250.0000	34.683	11.434	13.913
6300.0000	34.775	11.411	13.840
6350.0000	34.706	11.549	14.286
6400.0000	34.771	11.552	14.297
6450.0000	34.996	11.396	13.790
6500.0000	35.219	11.240	13.303
6550.0000	35.377	11.147	13.024
6600.0000	35.587	11.003	12.599
6650.0000	35.794	10.863	12.198
6700.0000	35.995	10.727	11.822
6750.0000	36.084	10.702	11.754
6800.0000	36.225	10.626	11.549
6850.0000	36.425	10.488	11.190
6900.0000	36.569	10.408	10.985
6950.0000	36.791	10.248	10.589
7000.0000	37.027	10.075	10.174
7050.0000	37.342	9.822	9.598
7100.0000	37.552	9.673	9.275
7150.0000	37.654	9.632	9.188
7200.0000	37.524	9.822	9.599
7250.0000	37.573	9.833	9.624
7300.0000	37.582	9.885	9.738
7350.0000	37.507	10.018	10.042
7400.0000	37.387	10.198	10.466
7450.0000	37.442	10.201	10.474
7500.0000	37.467	10.234	10.554
7550.0000	37.490	10.269	10.639
7600.0000	37.408	10.408	10.985
7650.0000	37.445	10.428	11.036
7700.0000	37.407	10.522	11.278
7750.0000	37.441	10.546	11.338
7800.0000	37.444	10.597	11.475
7850.0000	37.430	10.668	11.662
7900.0000	37.395	10.758	11.906
7950.0000	37.329	10.879	12.242
8000.0000	37.251	11.010	12.619
8050.0000	37.226	11.090	12.853
8100.0000	37.248	11.122	12.947

8150.0000	37.262	11.162	13.066
8200.0000	37.254	11.223	13.251
8250.0000	37.330	11.199	13.180
8300.0000	37.370	11.211	13.217
8350.0000	37.424	11.210	13.213
8400.0000	37.305	11.380	13.741
8450.0000	37.279	11.458	13.990
8500.0000	37.365	11.424	13.879
8550.0000	37.373	11.466	14.016
8600.0000	37.460	11.430	13.899
8650.0000	37.528	11.413	13.844
8700.0000	37.600	11.391	13.774
8750.0000	37.699	11.342	13.619
8800.0000	37.759	11.331	13.586
8850.0000	37.803	11.335	13.600
8900.0000	37.886	11.301	13.494
8950.0000	37.925	11.311	13.525
9000.0000	37.901	11.384	13.753
9050.0000	37.959	11.374	13.721
9100.0000	37.954	11.427	13.890
9150.0000	38.073	11.356	13.664
9200.0000	38.170	11.305	13.506
9250.0000	38.173	11.350	13.646
9300.0000	38.406	11.163	13.072
9350.0000	38.559	11.057	12.756
9400.0000	38.549	11.113	12.922
9450.0000	38.649	11.060	12.764
9500.0000	38.686	11.069	12.790
9550.0000	38.792	11.009	12.614
9600.0000	38.721	11.124	12.955
9650.0000	38.694	11.196	13.171
9700.0000	38.758	11.177	13.114
9750.0000	38.802	11.178	13.116
9800.0000	38.801	11.224	13.255
9850.0000	38.844	11.224	13.257
9900.0000	38.852	11.260	13.367
9950.0000	38.866	11.290	13.459
10000.0000	38.913	11.287	13.451
10050.0000	38.943	11.300	13.490
10100.0000	38.984	11.302	13.497
10150.0000	39.014	11.316	13.538
10200.0000	39.060	11.313	13.529
10250.0000	39.065	11.350	13.645
10300.0000	39.055	11.402	13.810
10350.0000	39.083	11.415	13.853
10400.0000	39.073	11.467	14.020



10450.0000	39.121	11.461	14.000
10500.0000	39.167	11.456	13.984
10550.0000	39.210	11.455	13.980
10600.0000	39.235	11.472	14.033
10650.0000	39.272	11.474	14.043
10700.0000	39.290	11.498	14.118
10750.0000	39.256	11.572	14.362
10800.0000	39.238	11.631	14.557
10850.0000	39.137	11.771	15.036
10900.0000	39.074	11.874	15.397
10950.0000	39.007	11.981	15.780
11000.0000	38.966	12.062	16.077
11050.0000	38.999	12.068	16.099
11100.0000	39.101	12.005	15.868
11150.0000	39.201	11.944	15.647
11200.0000	39.303	11.881	15.421
11250.0000	39.515	11.709	14.820
11300.0000	39.681	11.580	14.389
11350.0000	39.768	11.531	14.228
11400.0000	39.811	11.527	14.214
11450.0000	39.830	11.547	14.278
11500.0000	39.861	11.553	14.299
11550.0000	39.915	11.537	14.246
11600.0000	39.943	11.547	14.278
11650.0000	39.937	11.590	14.420
11700.0000	39.957	11.607	14.477
11750.0000	40.073	11.528	14.216
11800.0000	40.051	11.587	14.411
11850.0000	40.100	11.575	14.370
11900.0000	40.176	11.535	14.240
11950.0000	40.417	11.330	13.584
12000.0000	40.544	11.239	13.302
12050.0000	40.566	11.254	13.347
12100.0000	40.553	11.302	13.497
12150.0000	40.483	11.408	13.830
12200.0000	40.268	11.659	14.652
12250.0000	40.011	11.951	15.672
12300.0000	39.857	12.142	16.374
12350.0000	39.736	12.297	16.971
12400.0000	39.686	12.382	17.307
12450.0000	39.619	12.485	17.720
12500.0000	39.626	12.512	17.832
12550.0000	39.558	12.615	18.260
12600.0000	39.474	12.734	18.766
12650.0000	39.268	12.973	19.831
12700.0000	39.106	13.170	20.749

12750.0000	39.018	13.293	21.343
12800.0000	38.950	13.395	21.850
12850.0000	38.958	13.421	21.981
12900.0000	39.053	13.359	21.672
12950.0000	39.219	13.226	21.019
13000.0000	39.271	13.207	20.929
13050.0000	39.497	13.015	20.022
13100.0000	39.635	12.911	19.547
13150.0000	39.839	12.740	18.792
13200.0000	39.881	12.731	18.753
13250.0000	40.021	12.624	18.296
13300.0000	40.243	12.434	17.515
13350.0000	40.348	12.361	17.224
13400.0000	40.413	12.329	17.096
13450.0000	40.590	12.184	16.536
13500.0000	40.599	12.208	16.626
13550.0000	40.572	12.266	16.852
13600.0000	40.442	12.429	17.494
13650.0000	40.459	12.443	17.552
13700.0000	40.440	12.494	17.759
13750.0000	40.459	12.507	17.812
13800.0000	40.570	12.427	17.488
13850.0000	40.730	12.299	16.979
13900.0000	40.872	12.189	16.553
13950.0000	41.010	12.081	16.148
14000.0000	41.098	12.024	15.938
14050.0000	41.286	11.867	15.372
14100.0000	41.378	11.807	15.159
14150.0000	41.635	11.581	14.390
14200.0000	41.682	11.563	14.333
14250.0000	41.796	11.481	14.063
14300.0000	41.988	11.318	13.547
14350.0000	42.277	11.061	12.766
14400.0000	42.458	10.909	12.329
14450.0000	42.825	10.572	11.408
14500.0000	43.225	10.202	10.477
14550.0000	43.899	9.559	9.034
14600.0000	44.356	9.132	8.188
14650.0000	44.871	8.646	7.321
14700.0000	45.013	8.534	7.135
14750.0000	44.752	8.824	7.628
14800.0000	44.159	9.447	8.804
14850.0000	43.350	10.285	10.678
14900.0000	42.523	11.140	13.003
14950.0000	41.803	11.890	15.452
15000.0000	41.043	12.679	18.531

15050.0000	40.413	13.338	21.567
15100.0000	39.901	13.879	24.427
15150.0000	39.474	14.334	27.128
15200.0000	39.083	14.754	29.881
15250.0000	38.744	15.122	32.521
15300.0000	38.498	15.395	34.637
15350.0000	38.298	15.625	36.514
15400.0000	38.136	15.815	38.148
15450.0000	38.038	15.941	39.272
15500.0000	37.948	16.058	40.349
15550.0000	37.868	16.167	41.370
15600.0000	37.817	16.246	42.128
15650.0000	37.811	16.279	42.454
15700.0000	37.774	16.343	43.087
15750.0000	37.743	16.402	43.675
15800.0000	37.730	16.444	44.092
15850.0000	37.729	16.471	44.374
15900.0000	37.721	16.506	44.735
15950.0000	37.808	16.448	44.133
16000.0000	37.872	16.411	43.759
16050.0000	37.980	16.329	42.946
16100.0000	38.070	16.266	42.328
16150.0000	38.189	16.175	41.445
16200.0000	38.302	16.088	40.627
16250.0000	38.335	16.082	40.570
16300.0000	38.442	16.001	39.823
16350.0000	38.542	15.929	39.162
16400.0000	38.673	15.824	38.229
16450.0000	38.797	15.726	37.378
16500.0000	38.963	15.586	36.194
16550.0000	39.141	15.435	34.954
16600.0000	39.352	15.251	33.501
16650.0000	39.579	15.050	31.986
16700.0000	39.832	14.823	30.358
16750.0000	40.076	14.604	28.868
16800.0000	40.420	14.287	26.832
16850.0000	40.810	13.921	24.669
16900.0000	41.124	13.633	23.085
16950.0000	41.352	13.432	22.038
17000.0000	41.517	13.291	21.338
17050.0000	41.606	13.229	21.032
17100.0000	41.658	13.201	20.900
17150.0000	41.800	13.086	20.350
17200.0000	42.000	12.910	19.545
17250.0000	42.280	12.656	18.433
17300.0000	42.516	12.445	17.559

17350.0000	42.732	12.253	16.802
17400.0000	42.950	12.060	16.071
17450.0000	43.121	11.914	15.540
17500.0000	43.225	11.836	15.261
17550.0000	43.301	11.785	15.083
17600.0000	43.274	11.836	15.262
17650.0000	43.206	11.929	15.592
17700.0000	42.967	12.192	16.566
17750.0000	42.764	12.420	17.458
17800.0000	42.632	12.576	18.098
17850.0000	42.468	12.764	18.899
17900.0000	42.548	12.710	18.662
17950.0000	42.739	12.542	17.956
18000.0000	43.134	12.172	16.488



# Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NC SL Z540.1-1994  
Certificate Number 200803-095012-b16fe9



**Model Number** DRG-118/A  
**Manufacturer** ARA  
**Description** Horn (Small)  
**Serial Number** 1176  
**Customer Asset No.** i00271

**Customer**  
Compliance Testing LLC  
1724 S Nevada Way  
Mesa, AZ 85204  
USA

**Date of Calibration** 08/03/2020  
**Temperature** 23°C  
**Humidity** 50% RH

**Location of Calibration**  
Keysight Technologies Inc.  
1346 Yellowwood Road  
Kimballton, IA 51543  
United States

This certifies that the equipment has been calibrated using applicable Keysight Technologies procedures and in compliance with ISO/IEC 17025:2017 and ANSI/NC SL Z540.1-1994 (R2002). The quality management system is registered to ISO 9001:2015.

Calibration Standard(s)	Calibration Method(s)	Calibration Procedure(s)
ANSI C63.5 2017	ANSI Clause 5.1.3	356847

**Calibration Software**  
ACF-Insertion Loss Analysis 2.9.1  
DRWG Standard Site Method 2.0.14

**As Received Conditions**  
The measured values of the equipment were observed in specification at the points tested.

**Action Taken**  
No action was taken.

**As Completed Conditions**  
The measured values of the equipment were observed in specification at the points tested.

**Calibration Due**  
Based on the customer's request, the next calibration is due on 3 Aug 2022

**Remarks or Special Requirements**

This calibration report shall not be reproduced, except in full. The documented results relate to the equipment calibrated only.

The test limits stated in the report correspond to the published specifications of the equipment, at the points tested.

Keysight Technologies, Inc.  
1346 Yellowwood Road  
Kimballton, IA 51543  
United States

  
Brandt Langer Iowa Service Center Manager



# Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994  
Certificate Number 200803-095012-b16fe9



## Traceability Information

**Technician Name**      Rodger Rasmussen

Measurements are traceable to the International System of Units (SI) via national metrology institutes ([www.keysight.com/find/NMI](http://www.keysight.com/find/NMI)) that are signatories to the CIPM Mutual Recognition Arrangement.

## Calibration Equipment Used

Manufacturer	Model Number	Model Description	Equipment ID	Cal Due Date	Certificate Number
ETS - Lindgren	3115	Horn (Small)	10988	04/11/2021	190411-140758-44cbf8
ETS-Lindgren	3115	Horn (Small)	10989	04/24/2022	200424-113107-cf5a95
Agilent Technologies, Inc.	85054B	Type N Calibration Kit	10902	03/13/2021	1-12419885451-1
Comtest	8M Chamber	Chamber	20021	06/04/2021	190604-101014-fb528b
Keysight Technologies, Inc.	N5225A	PNA Network Analyzer	577122	08/19/2020	1-11379344683-1

## Compliance with Specification

Unless otherwise noted, the calibration results are reported without factoring in the effect of uncertainty on the assessment of compliance/specification.

## In Specification/Out of Specification Explanation

The standard criteria to determine the "In Specification/Out of Specification" status is based on one or more of the following conditions, as requested by the client:

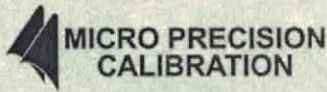
1. If the manufacturer has a specified specification for the item being calibrated, then the calibration values are compared to this specification, and the values must fall within the manufacturer's specification. The specification may be obtained from the manufacturer's web site, data sheets, equipment manuals, etc.
2. Where specifications are called out in a published standard, the calibration results are compared to this specification, and the measured values must fall within the standard's specification.
3. In cases where the manufacturer, standard, or client does not identify any relevant specifications, applicable calibration results are compared to historical data with a +/- 3 dB specification.

## Uncertainty of Measurement

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008(GUM). The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95%. This probability corresponds to a coverage factor of k=2 for a normal distribution.

Parameter	Range	MU (+/-)
Horn Antennas/LPA's - 1 & 3 Meter Distance (CISPR 16-1-6), Far Field (ANSI C63.5)	700 MHz to 18 GHz	0.37 dB
	(18 to 26.5) GHz	0.42 dB
	(26.5 to 50) GHz	0.47 dB





MICRO PRECISION CALIBRATION  
 22835 INDUSTRIAL PLACE  
 GRASS VALLEY CA 95949  
 530-268-1860



## Certificate of Calibration

Date: Jun 29, 2018

Cert No. 551220081442532

**Customer:**

COMPLIANCE TESTING LLC  
 1724 S NEVADA WAY  
 MESA AZ 85204

Work Order #: SAC-70095565

MPC Control #: DB8287  
 Asset ID: I00463  
 Gage Type: HARMONIC MIXER  
 Manufacturer: AGILENT  
 Model Number: 11970V  
 Size: N/A  
 Temp/RH: 72.0°F / 40.0%  
 Location: Calibration performed at MPC facility

Serial Number: 003950  
 Department: N/A  
 Performed By: TIM GALVIN  
 Received Condition: IN TOLERANCE  
 Returned Condition: IN TOLERANCE  
 Cal. Date: June 29, 2018  
 Cal. Interval: 12 MONTHS  
 Cal. Due Date: June 29, 2019

**Calibration Notes:**

See attached for data.

**Standards Used to Calibrate Equipment**

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AE4788	SPECTRUM ANALYZER	8565E	3846A01029	HEWLETT PACKARD	Oct 31, 2018	512200813079274
CE4280	WAVE SOURCE	83557A	2948A00105	AGILENT	Feb 28, 2019	512200813268159
Z3548	SWEPT CW GENERATOR	83650L	3844A00330	HEWLETT PACKARD	Dec 31, 2018	512200813171979

**Procedures Used in this Event**

Procedure Name	Description
KEYSIGHT 11970 SERIES	Harmonic Mixers Keysight 11970 Series Users Guide Jan-1-2015

Calibrating Technician:

TIM GALVIN

QC Approval:

Robert Means

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA's Publication and NIST Technical Note 1297, 1994 Edition. Services rendered comply with ISO/IEC 17025:2005, ANSI/NCCL Z540-1-1994, ANSI/NCCL Z540.3-2006, MPC Quality Manual, MPC CSD and with customer purchase order instructions.

Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. The information on this report, pertains only to the instrument identified.

All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. This report may not be reproduced in part or in a whole without the prior written approval of the issuing MPC lab.





MACRO PRECISION  
CALIBRATION INC.

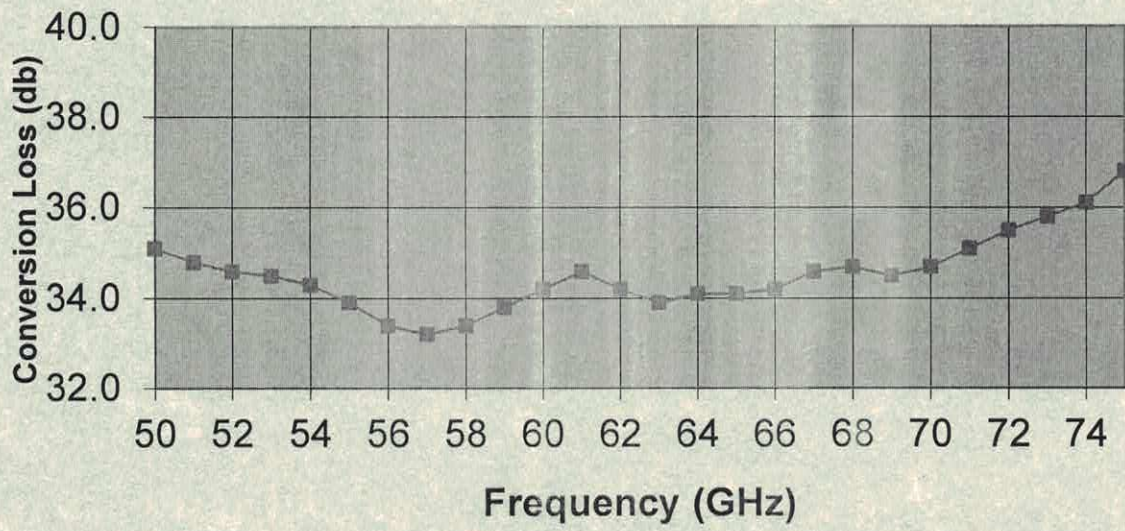
**Measurement Report: Harmonic Mixer 11970V**

Procedure: Manufacturer      Order Number: SAC-70095565

ID Number: DB8287      Calibration Date: June 29, 2018

Frequency (GHz)	Conversion Loss	Uncertainty +/- dB
50.0	35.1	0.6
51.0	34.8	0.6
52.0	34.6	0.6
53.0	34.5	0.6
54.0	34.3	0.6
55.0	33.9	0.6
56.0	33.4	0.6
57.0	33.2	0.6
58.0	33.4	0.6
59.0	33.8	0.6
60.0	34.2	0.6
61.0	34.6	0.6
62.0	34.2	0.6
63.0	33.9	0.6
64.0	34.1	0.6
65.0	34.1	0.6
66.0	34.2	0.6
67.0	34.6	0.6
68.0	34.7	0.6
69.0	34.5	0.6
70.0	34.7	0.6
71.0	35.1	0.6
72.0	35.5	0.6
73.0	35.8	0.6
74.0	36.1	0.6
75.0	36.8	0.6









MICRO PRECISION CALIBRATION  
 22835 INDUSTRIAL PLACE  
 GRASS VALLEY CA 95949  
 530-268-1860



# Certificate of Calibration

Date: Jun 29, 2018

Cert No. 551220081442570

**Customer:**

COMPLIANCE TESTING LLC  
 1724 S NEVADA WAY  
 MESA AZ 85204

Work Order #: SAC-70095565

MPC Control #: DN0031  
 Asset ID: I00464  
 Gage Type: HARMONIC MIXER  
 Manufacturer: HEWLETT PACKARD  
 Model Number: 11970W  
 Size: N/A  
 Temp/RH: 72.0°F / 40.0%  
 Location: Calibration performed at MPC facility

Serial Number: 190  
 Department: N/A  
 Performed By: TIM GALVIN  
 Received Condition: IN TOLERANCE  
 Returned Condition: IN TOLERANCE  
 Cal. Date: June 29, 2018  
 Cal. Interval: 12 MONTHS  
 Cal. Due Date: June 29, 2019

**Calibration Notes:**

See attached for data.

**Standards Used to Calibrate Equipment**

I.D.	Description.	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AE4788	SPECTRUM ANALYZER	8565E	3846A01029	HEWLETT PACKARD	Oct 31, 2018	512200813079274
DF9311	WAVE SOURCE MODULE	83554A	2612A00246	HEWLETT PACKARD	Feb 26, 2019	512200813273384
Z3548	SWEPT CW GENERATOR	83650L	3844A00330	HEWLETT PACKARD	Dec 31, 2018	512200813171979

**Procedures Used in this Event**

Procedure Name	Description
KEYSIGHT 11970 SERIES	Harmonic Mixers Keysight 11970 Series Users Guide Jan-1-2015

Calibrating Technician:

TIM GALVIN

QC Approval:

Robert Means

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA's Publication and NIST Technical Note 1297, 1994 Edition. Services rendered comply with ISO/IEC 17025:2005, ANSI/NCCL Z540-1-1994, ANSI/NCCL Z540.3-2006, MPC Quality Manual, MPC CSD and with customer purchase order instructions.

Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. The information on this report, pertains only to the instrument identified.

All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. This report may not be reproduced in part or in a whole without the prior written approval of the issuing MPC lab.





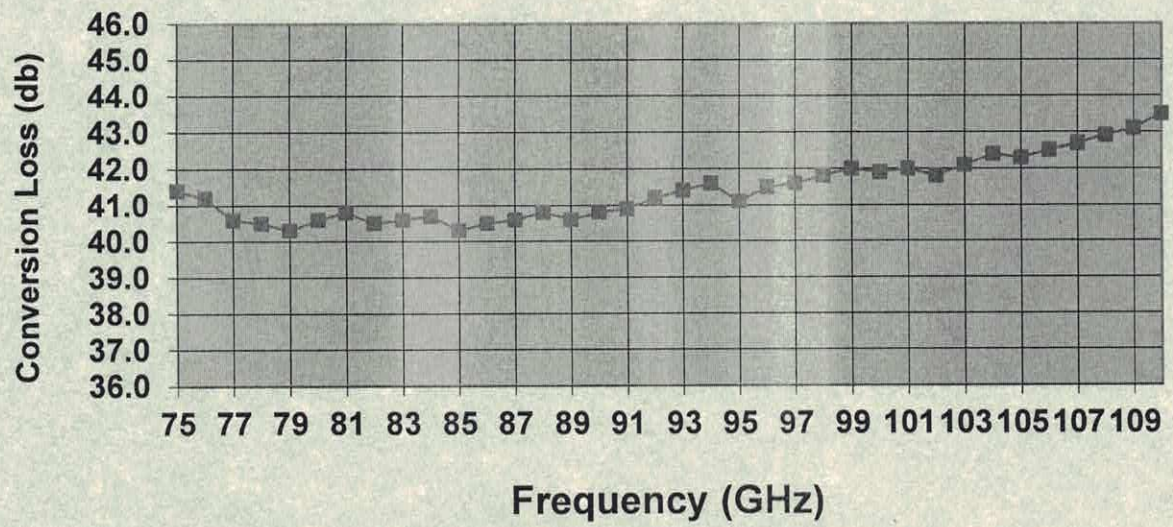
**Measurement Report: Harmonic Mixer 11970W**

Procedure: Manufacturer      Order Number: SAC-70095565

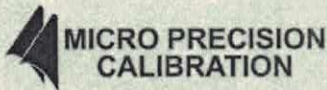
ID Number: DN0031      Calibration Date: June 29, 2018

Frequency (GHz)	Conversion Loss	Uncertainty +/- dB
75.0	41.4	0.6
76.0	41.2	0.6
77.0	40.6	0.6
78.0	40.5	0.6
79.0	40.3	0.6
80.0	40.6	0.6
81.0	40.8	0.6
82.0	40.5	0.6
83.0	40.6	0.6
84.0	40.7	0.6
85.0	40.3	0.6
86.0	40.5	0.6
87.0	40.6	0.6
88.0	40.8	0.6
89.0	40.6	0.6
90.0	40.8	0.6
91.0	40.9	0.6
92.0	41.2	0.6
93.0	41.4	0.6
94.0	41.6	0.6
95.0	41.1	0.6
96.0	41.5	0.6
97.0	41.6	0.6
98.0	41.8	0.6
99.0	42.0	0.6
100.0	41.9	0.6
101.0	42.0	0.6
102.0	41.8	0.6
103.0	42.1	0.6
104.0	42.4	0.6
105.0	42.3	0.6
106.0	42.5	0.6
107.0	42.7	0.6
108.0	42.9	0.6
109.0	43.1	0.6
110.0	43.5	0.6









MICRO PRECISION CALIBRATION  
 22835 INDUSTRIAL PLACE  
 GRASS VALLEY CA 95949  
 530-268-1860



## Certificate of Calibration

Date: Jun 29, 2018

Cert No. 551220081442541

**Customer:**

COMPLIANCE TESTING LLC  
 1724 S NEVADA WAY  
 MESA AZ 85204

Work Order #: SAC-70095565

MPC Control #: DB8289  
 Asset ID: I00465  
 Gage Type: HARMONIC MIXER  
 Manufacturer: HEWLETT PACKARD  
 Model Number: 11970Q  
 Size: 33-50 Ghz  
 Temp/RH: 72.0°F / 40.0%  
 Location: Calibration performed at MPC facility

Serial Number: 3003A03386  
 Department: N/A  
 Performed By: TIM GALVIN  
 Received Condition: IN TOLERANCE  
 Returned Condition: IN TOLERANCE  
 Cal. Date: June 29, 2018  
 Cal. Interval: 12 MONTHS  
 Cal. Due Date: June 29, 2019

**Calibration Notes:**

See attached for data.

**Standards Used to Calibrate Equipment**

I.D.	Description	Model	Serial	Manufacturer	Cal. Due Date	Traceability #
AE4788	SPECTRUM ANALYZER	8565E	3846A01029	HEWLETT PACKARD	Oct 31, 2018	512200813079274
AM1913	POWER SENSOR	8487A	3318A02585	AGILENT	Jan 31, 2019	512200813260111
V8087	POWER METER	438A	3513U04859	HEWLETT PACKARD	Dec 31, 2019	512200813160759
Z3548	SWEPT CW GENERATOR	83650L	3844A00330	HEWLETT PACKARD	Dec 31, 2018	512200813171979

**Procedures Used in this Event**

Procedure Name	Description
KEYSIGHT 11970 SERIES	Harmonic Mixers Keysight 11970 Series Users Guide Jan-1-2015

Calibrating Technician:

TIM GALVIN

QC Approval:

Robert Means

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA's Publication and NIST Technical Note 1297, 1994 Edition. Services rendered comply with ISO/IEC 17025:2005, ANSI/NCSL Z540-1-1994, ANSI/NCSL Z540.3-2006, MPC Quality Manual, MPC CSD and with customer purchase order instructions.

Calibration cycles and resulting due dates were submitted/approved by the customer. Any number of factors may cause an instrument to drift out of tolerance before the next scheduled calibration. Recalibration cycles should be based on frequency of use, environmental conditions and customer's established systematic accuracy. The information on this report, pertains only to the instrument identified.

All standards are traceable to SI through the National Institute of Standards and Technology (NIST) and/or recognized national or international standards laboratories. Services rendered include proper manufacturer's service instruction and are warranted for no less than thirty (30) days. This report may not be reproduced in part or in a whole without the prior written approval of the issuing MPC lab.





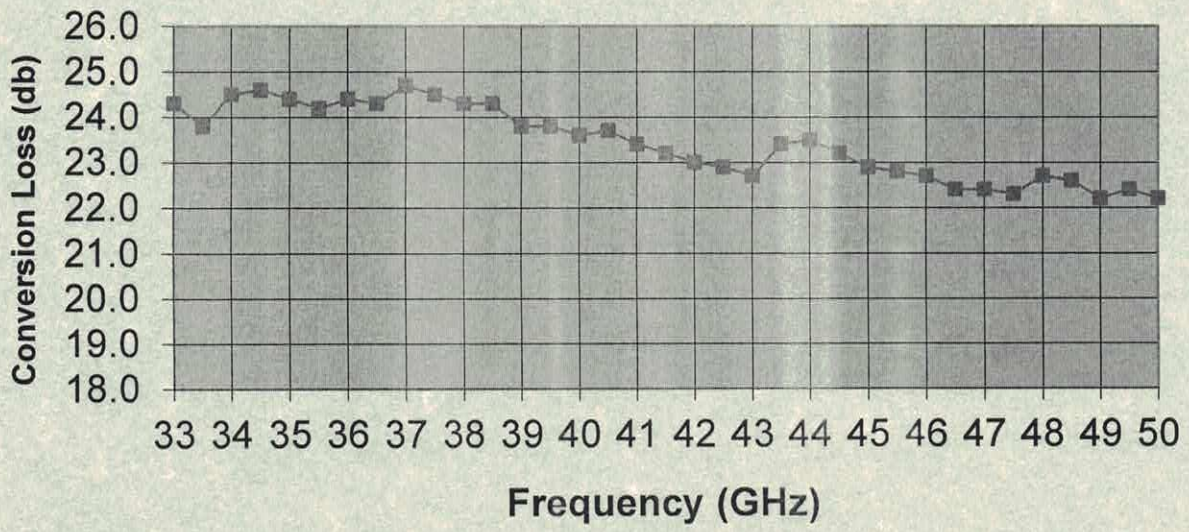
**Measurement Report: Harmonic Mixer 11970Q**

Procedure: Manufacturer Order Number: SAC-70095565

ID Number: DB8289 Calibration Date: June 29, 2018

Frequency (GHz)	Conversion Loss	Uncertainty +/- dB
33.0	24.3	0.6
33.5	23.8	0.6
34.0	24.5	0.6
34.5	24.6	0.6
35.0	24.4	0.6
35.5	24.2	0.6
36.0	24.4	0.6
36.5	24.3	0.6
37.0	24.7	0.6
37.5	24.5	0.6
38.0	24.3	0.6
38.5	24.3	0.6
39.0	23.8	0.6
39.5	23.8	0.6
40.0	23.6	0.6
40.5	23.7	0.6
41.0	23.4	0.6
41.5	23.2	0.6
42.0	23.0	0.6
42.5	22.9	0.6
43.0	22.7	0.6
43.5	23.4	0.6
44.0	23.5	0.6
44.5	23.2	0.6
45.0	22.9	0.6
45.5	22.8	0.6
46.0	22.7	0.6
46.5	22.4	0.6
47.0	22.4	0.6
47.5	22.3	0.6
48.0	22.7	0.6
48.5	22.6	0.6
49.0	22.2	0.6
49.5	22.4	0.6
50.0	22.2	0.6





Antenna Gain to Antenna correction factor conversion worksheet

Enter Freq in GHz and Antenna Gain in dBi and the wavelength, numeric antenna gain, and ACF are calculated

$$ACF = 19.8 - (20 * \text{LOG}(\lambda)) - (10 * \text{LOG}(G_{\text{num}}))$$

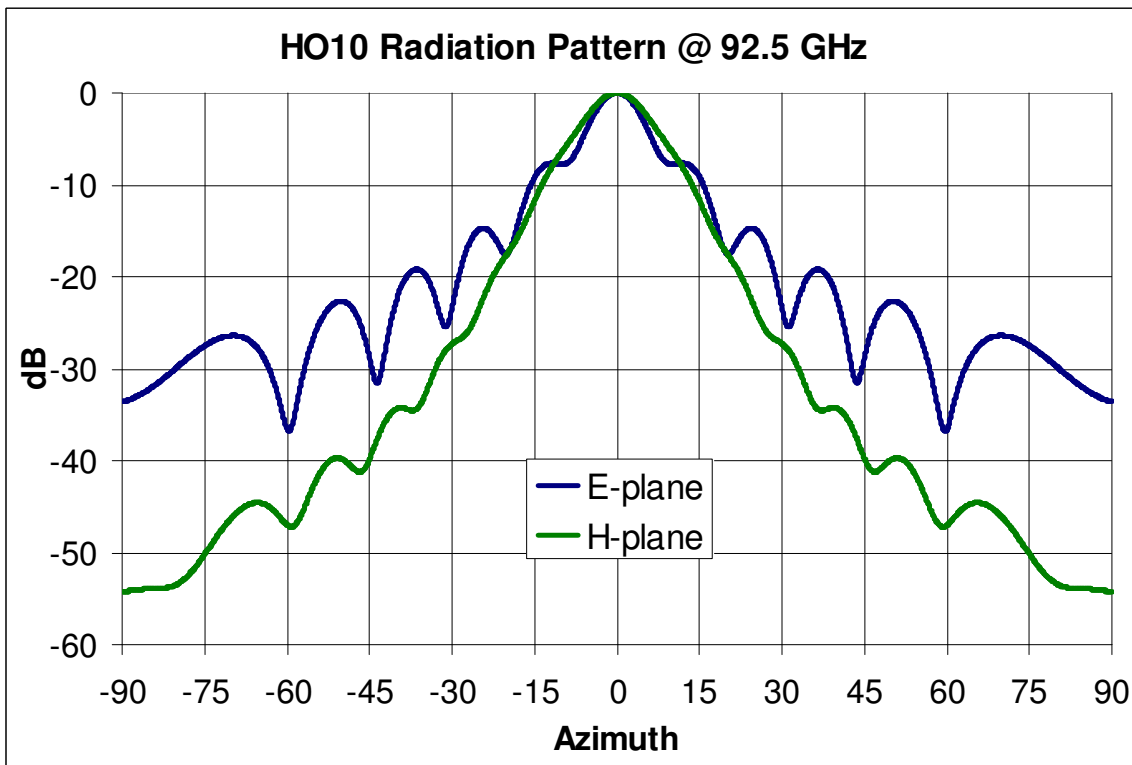
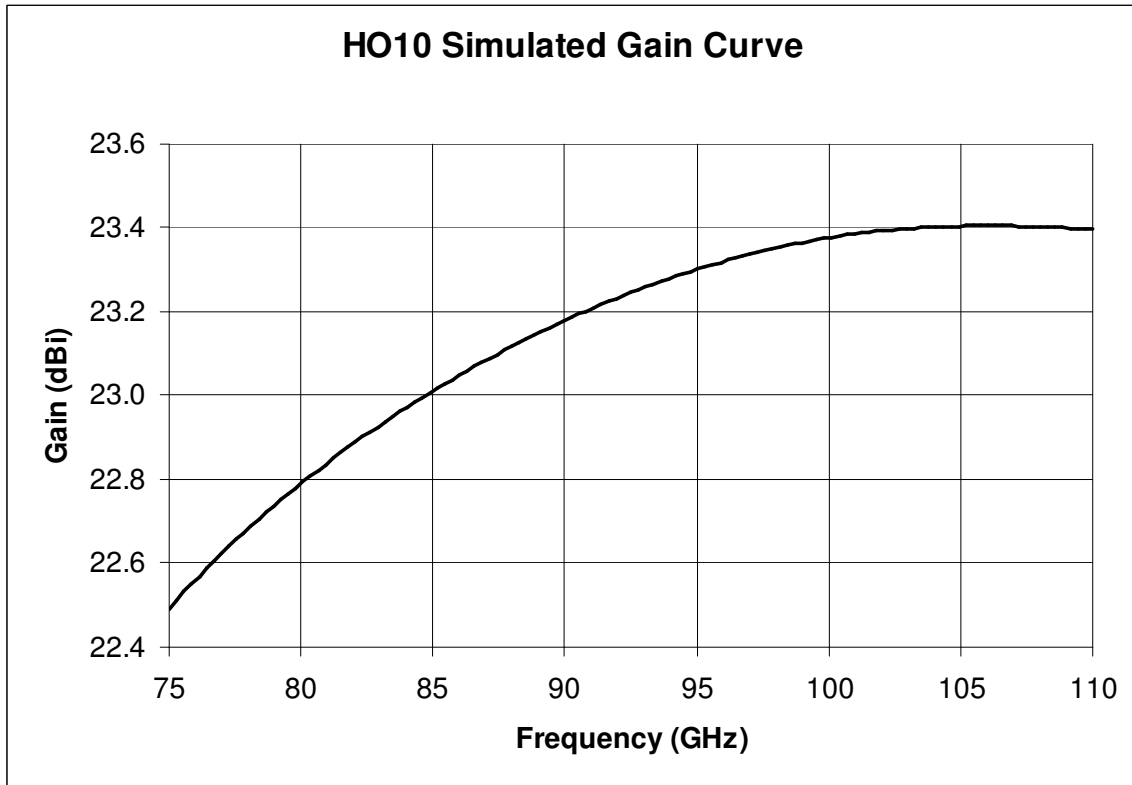
$\lambda$  = wavelength in meters = speed of light / frequency (Hz) => v/f

Speed of Light = 299792458 (m/sec)  $\approx 3 \times 10^8$

$G_{\text{num}} = \text{Numeric Antenna Gain} = 10^{(\text{Gain}_{\text{dBi}}/10)}$

Asset # i00476 (75 - 110 GHz Horn antenna)						
Frequency	Frequency	speed of light	wavelength	Ant Gain	Antenna Gain	ACF
GHz	Hz	m/sec	m	dBi	numeric	dB
75	75000000000	299792458	0.003997233	22.5	177.83	45.26
76	76000000000	299792458	0.003944638	22.56	180.30	45.32
77	77000000000	299792458	0.003893409	22.6	181.97	45.39
78	78000000000	299792458	0.003843493	22.65	184.08	45.46
79	79000000000	299792458	0.003794841	22.7	186.21	45.52
80	80000000000	299792458	0.003747406	22.75	188.36	45.58
81	81000000000	299792458	0.003701141	22.8	190.55	45.63
82	82000000000	299792458	0.003656006	22.85	192.75	45.69
83	83000000000	299792458	0.003611957	22.9	194.98	45.75
84	84000000000	299792458	0.003568958	22.95	197.24	45.80
85	85000000000	299792458	0.00352697	23	199.53	45.85
86	86000000000	299792458	0.003485959	23.05	201.84	45.90
87	87000000000	299792458	0.00344589	23.1	204.17	45.95
88	88000000000	299792458	0.003406732	23.13	205.59	46.02
89	89000000000	299792458	0.003368455	23.15	206.54	46.10
90	90000000000	299792458	0.003331027	23.18	207.97	46.17
91	91000000000	299792458	0.003294423	23.19	208.45	46.25
92	92000000000	299792458	0.003258614	23.2	208.93	46.34
93	93000000000	299792458	0.003223575	23.24	210.86	46.39
94	94000000000	299792458	0.003189281	23.27	212.32	46.46
95	95000000000	299792458	0.00315571	23.3	213.80	46.52
96	96000000000	299792458	0.003122838	23.31	214.29	46.60
97	97000000000	299792458	0.003090644	23.33	215.28	46.67
98	98000000000	299792458	0.003059107	23.35	216.27	46.74
99	99000000000	299792458	0.003028207	23.35	216.27	46.83
100	1E+11	299792458	0.002997925	23.37	217.27	46.89
101	1.01E+11	299792458	0.002968242	23.38	217.77	46.97
102	1.02E+11	299792458	0.002939142	23.39	218.27	47.05
103	1.03E+11	299792458	0.002910606	24	251.19	46.52
104	1.04E+11	299792458	0.00288262	24	251.19	46.60
105	1.05E+11	299792458	0.002855166	24	251.19	46.69
106	1.06E+11	299792458	0.002828231	24	251.19	46.77
107	1.07E+11	299792458	0.002801799	24	251.19	46.85
108	1.08E+11	299792458	0.002775856	24	251.19	46.93
109	1.09E+11	299792458	0.00275039	24	251.19	47.01
110	1.1E+11	299792458	0.002725386	24	251.19	47.09





Enter Freq in GHz and Antenna Gain in dBi and the wavelength, numeric antenna gain, and ACF are calculated

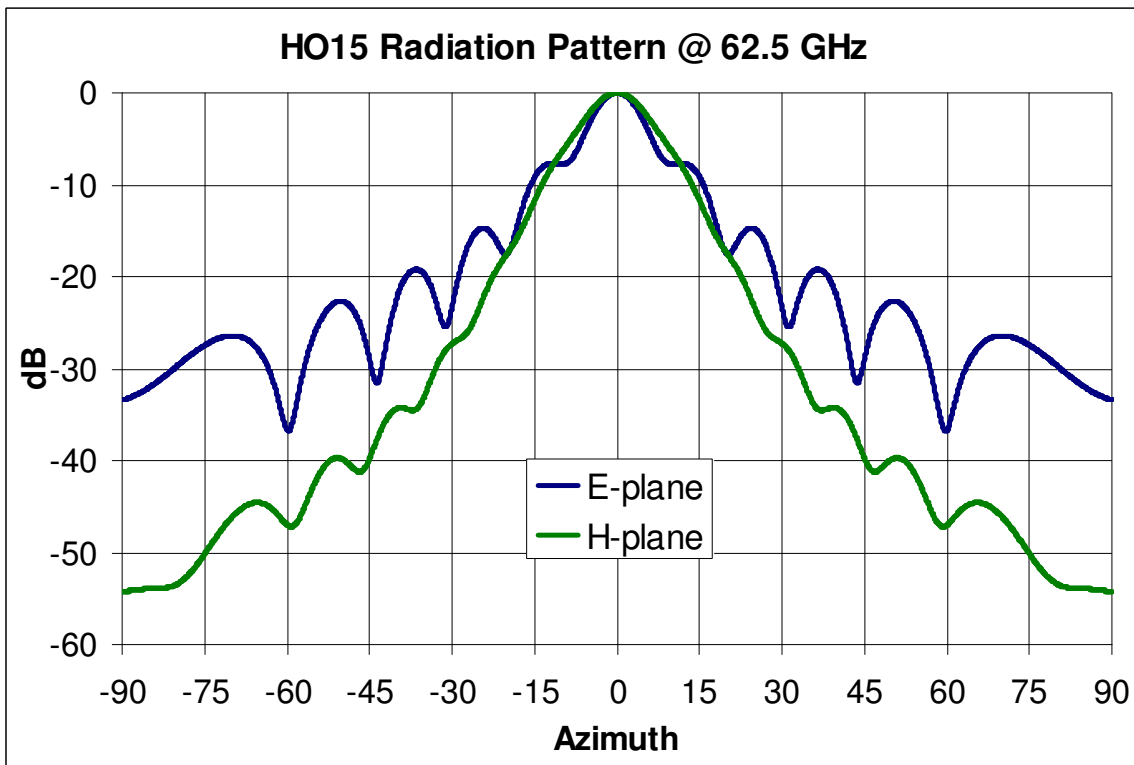
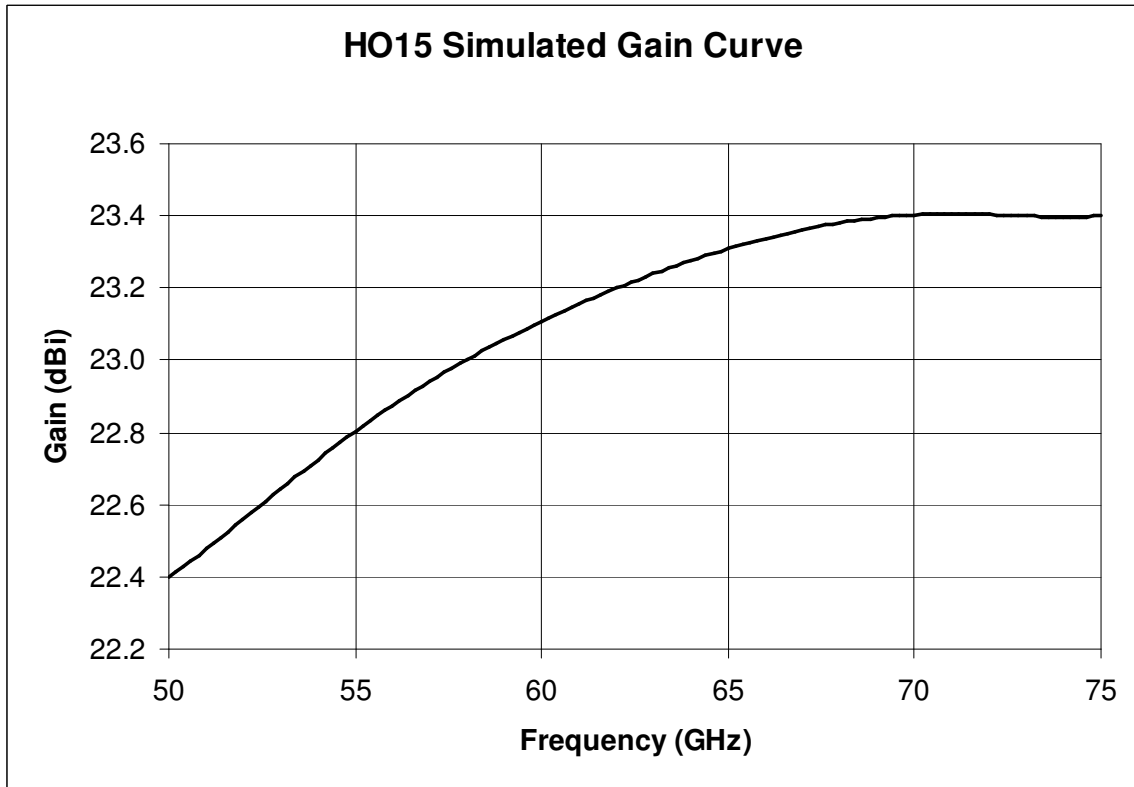
$$ACF = 19.8 - (20 * \text{LOG}(\lambda)) - (10 * \text{LOG}(G_{\text{num}}))$$

$\lambda$  = wavelength in meters = speed of light / frequency (Hz) => v/f

Speed of Light = 299792458 (m/sec)  $\approx 3 \times 10^8$

$G_{\text{num}}$  = Numeric Antenna Gain =  $10^{(\text{Gain}_{\text{dBi}}/10)}$

Asset # i00477 (50 - 75 GHz Horn antenna)						
Frequency	Frequency	speed of light	wavelength	Ant Gain	Antenna Gain	ACF
GHz	Hz	m/sec	m	dBi	numeric	dB
50	50000000000	299792458	0.005995849	22.4	173.78	41.84
51	51000000000	299792458	0.005878283	22.47	176.60	41.94
52	52000000000	299792458	0.00576524	22.5	177.83	42.08
53	53000000000	299792458	0.005656461	22.6	181.97	42.15
54	54000000000	299792458	0.005551712	22.7	186.21	42.21
55	55000000000	299792458	0.005450772	22.8	190.55	42.27
56	56000000000	299792458	0.005353437	22.85	192.75	42.38
57	57000000000	299792458	0.005259517	22.9	194.98	42.48
58	58000000000	299792458	0.005168835	22.97	198.15	42.56
59	59000000000	299792458	0.005081228	23.05	201.84	42.63
60	60000000000	299792458	0.004996541	23.1	204.17	42.73
61	61000000000	299792458	0.00491463	23.14	206.06	42.83
62	62000000000	299792458	0.004835362	23.18	207.97	42.93
63	63000000000	299792458	0.00475861	23.2	208.93	43.05
64	64000000000	299792458	0.004684257	23.25	211.35	43.14
65	65000000000	299792458	0.004612192	23.3	213.80	43.22
66	66000000000	299792458	0.00454231	23.32	214.78	43.33
67	67000000000	299792458	0.004474514	23.34	215.77	43.45
68	68000000000	299792458	0.004408713	23.36	216.77	43.55
69	69000000000	299792458	0.004344818	23.38	217.77	43.66
70	70000000000	299792458	0.004282749	23.4	218.78	43.77
71	71000000000	299792458	0.004222429	23.4	218.78	43.89
72	72000000000	299792458	0.004163784	23.4	218.78	44.01
73	73000000000	299792458	0.004106746	23.4	218.78	44.13
74	74000000000	299792458	0.004051249	23.4	218.78	44.25
75	75000000000	299792458	0.003997233	23.4	218.78	44.36



Enter Freq in GHz and Antenna Gain in dBi and the wavelength, numeric antenna gain, and ACF are calculated

$$ACF = 19.8 - (20 * \text{LOG}(\lambda)) - (10 * \text{LOG}(G_{\text{num}}))$$

$\lambda$  = wavelength in meters = speed of light / frequency (Hz) => v/f

Speed of Light = 299792458 (m/sec)  $\approx 3 \times 10^8$

$G_{\text{num}}$  = Numeric Antenna Gain =  $10^{(\text{Gain}_{\text{dBi}}/10)}$

Asset # i00484 (33 - 50 GHz Horn antenna)						
Frequency	Frequency	speed of light	wavelength	Ant Gain	Antenna Gain	ACF
GHz	Hz	m/sec	m	dBi	numeric	dB
33	33000000000	299792458	0.00908462	22.6	181.97	38.03
34	34000000000	299792458	0.008817425	22.6	181.97	38.29
35	35000000000	299792458	0.008565499	22.65	184.08	38.49
36	36000000000	299792458	0.008327568	22.8	190.55	38.59
37	37000000000	299792458	0.008102499	22.9	194.98	38.73
38	38000000000	299792458	0.007889275	23	199.53	38.86
39	39000000000	299792458	0.007686986	23.05	201.84	39.03
40	40000000000	299792458	0.007494811	23.1	204.17	39.20
41	41000000000	299792458	0.007312011	23.15	206.54	39.37
42	42000000000	299792458	0.007137916	23.2	208.93	39.53
43	43000000000	299792458	0.006971918	23.25	211.35	39.68
44	44000000000	299792458	0.006813465	23.3	213.80	39.83
45	45000000000	299792458	0.006662055	23.35	216.27	39.98
46	46000000000	299792458	0.006517227	23.38	217.77	40.14
47	47000000000	299792458	0.006378563	23.4	218.78	40.31
48	48000000000	299792458	0.006245676	23.41	219.28	40.48
49	49000000000	299792458	0.006118213	23.42	219.79	40.65
50	50000000000	299792458	0.005995849	23.45	221.31	40.79

Example using i00085 test data (18 - 40 GHz Horn Antenna)						
18	18000000000	299792458	0.016655137	10.789		45.0392241

