

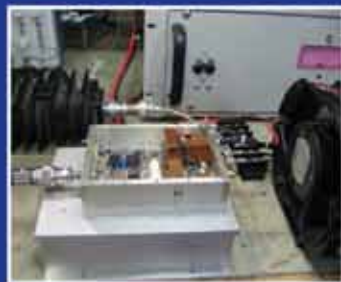
2012 RF & Microwave Toolbox



Application Notes & Data Sheets

Amplifiers
For Every Application!

INSTRUMENTS FOR INDUSTRY INC.



- **Engineering**
- **Development**
- **Machine Shop**
- **Test & Assembly**
- **Burn-in Test**
- **Environmental Test**
- **R&D**
- **Conformal Coating**
- **Volume Production**

Customer Service and Repair



Temperature Testing





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COMPANY DESCRIPTION

IFI is the leader in amplifier technology, originally founded in 1953, and now the only manufacturer building products in house from DC-40GHz. IFI manufactures low, medium and high power amplifiers; CW amplifiers with power levels to 5000 watts and Pulse amplifiers to 50,000 watts. IFI manufactures a full range of TWT, Solid State and Tetrode Tube amplifiers, as well as Antennas, Tem cells and other RF & Microwave accessories. Customers can purchase a complete solution for all their testing requirements from a single source. IFI also provides "Single Amplifier Solutions" from 10KHz to 1GHz, 0.8GHz to 18GHz and 18GHz to 40GHz. These single amplifier solutions are ideal for simplifying customer test setups and providing time savings for other necessary lab tasks.

IFI Technology: IFI is actively involved in the design & manufacture of Solid State, Traveling Wave Tube (TWT) and Tetrode Tube amplifiers (Pulsed & CW). IFI continues with development of low, medium & high power state-of-the-art products. Our designs are the simplest for customers to use, while providing the maximum amount of user information for their test applications. The equipment is designed for any remote control a customer could require, which is why IFI equipment is used successfully in applications all around the world.

Experienced Personnel: The staff of IFI has several decades of individual experience in amplifier configurations beginning with devices such as: Tetrode Tubes, Traveling Wave Tubes, Klystrons, and Solid State devices. Our staff has been involved with design, development and manufacturing of everything from the most basic test equipment to the most sophisticated military systems. This wealth of education & experience is what we put to work for our customers working in concert to find cost effective solutions to their requirements. IFI's experience extends to ruggedized environmentally protected equipment for outdoor communications and EW/ECM applications.

Product Options: IFI offers customers the ability of tailoring our products for the required application. We can add, delete or configure our amplifier products to best fit any customer's need. See our Amplifier option list @ www.ifi.com

Markets Served: IFI products are used for ECM/EW simulators and EMC/RF testing applications, by the automotive, aircraft, military, medical, electronics, wireless, communications and educational markets.

Facilities: IFI is located in Ronkonkoma, New York on Long Island and just minutes from Islip MacArthur airport, 40 miles from JFK and LaGuardia airports. Our 12,000 square foot facility is where we design and manufacture the best amplifier products available today.

Quality Control: IFI is an ISO9001-2008 registered company. We build in accordance to MIL-I-45208A and can implement special quality control procedures as required by the end user.

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Application Note 114

The Real Facts for Class A vs. AB Amplifiers for EMC Applications

Class A Amplifiers:

Class A amplifiers operate over a relatively small portion of a transistor's drain-current range and have continuous drain-current flow throughout each RF cycle. Their efficiency in converting DC-source-power to RF-output-power is poor. DC source power that is not converted to radio frequency output power is dissipated as heat. However, in comparison, Class A amplifiers have greater input-to-output waveform linearity (*lower harmonics known as output-signal distortion*) than any other amplifier class. **They are most commonly used in small-signal applications where linearity is more important than power efficiency, but are sometimes used in large-signal applications where the need for extraordinarily high linearity outweighs cost and heat disadvantages associated with poor power efficiency.**

Note: Reflections occur whether an amplifier is Class A or AB due to High VSWR common in EMC Applications. Class A operation reduces the longevity and reliability of a high power amplifier system due to the high heat dissipation and constant stress. Class A amplifiers see additional stress and dissipation in High VSWR applications as the additional reflected power is additive to the higher dissipation already present in a Class A configuration.

Class AB Amplifiers:

As the designation suggests, Class AB amplifiers are compromises between Class A and Class B operation. They are biased so drain-current flows less than 360 degrees, but more than 180 degrees, of each RF cycle. Any bias-point between those limits can be used which provides a continuous selection-range extending from low-distortion, low-efficiency on one end to higher-distortion, higher-efficiency on the other. Class AB amplifiers are widely used in linear amplifier applications where low-distortion and high power-efficiency tend to both be very important such as in EMC Applications. Push-Pull Class AB amplifiers are especially attractive in linear amplifier applications, because the greater linearity resulting from having one amplifier or the other always con-

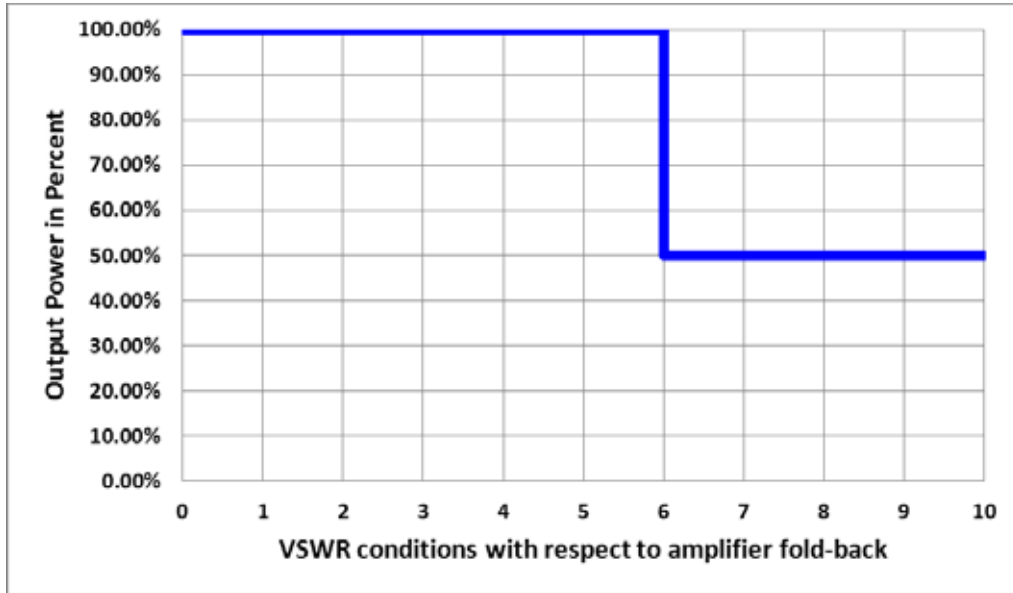
ducting makes it possible to bias push-pull Class AB amplifiers close enough to the Class A end of the AB scale where the linearity is very good as well as the power-efficiency being higher. **These push-pull Class AB amplifiers can be biased far enough toward the linear Class A end of the scale to make broadband operation possible where reduced harmonics (low output signal distortion) is as important as power-efficiency.**

Note: IFI does produce some Class A amplifiers as they are appropriate for some lower power levels and applications. Our Amplifiers that are Class AB, they are biased "Bias plus Class AB", meaning that for RF amplitudes up to approximately -3/dB below the P1dB point, the Transistors operate predominantly Class-A. From approximately -3dB up to Saturation, the Transistors are operating Class-AB. This "Bias plus Class-AB" mode has been successfully and is predominantly used for EMC amplifier systems, communications, component and Industrial applications as these also require very good linearity and harmonic reduction coupled with the advantages of improved efficiency over Pure Class-A operation. This reduces operating costs in high power test facilities and increases the long term life / availability of the amplifier due to the increased efficiency over pure Class-A operation.

Amplifier VSWR ruggedness is addressed in terms of IFI's typical "3dB-over-silicon", meaning that the transistors are operated at 50% of their specified rating. In addition to keeping the drain current lower, the amplifier is designed to fold-back under very high reflective loads. For open/short circuit VSWR conditions, field loads would not be exposed to the DUT and the test would be ineffective with the reflected power coming back into the amplifier. Class AB amplifiers are ideal in these situations as they will protect themselves which greatly improves the long-term reliability, performance and continual operational use of the amplifier. In essence, the IFI solution is a 50/50 Class A-AB taking the best overall advantages of both classes of operation. Figure 1 illustrates the "Bias-Plus Class AB" power curve.



Figure 1: Power Fold-Back Curve for our Class AB amplifier design



Class A Amplifiers:		Class AB Amplifiers:	
Pros	Cons	Pros	Cons
Best Linearity	Very Poor Efficiency	Good Linearity	Limited Dynamic range~30dB
Lowest Distortion (low harmonics)	Maximum Heat Dissipated	Low Distortion (low harmonics)	Higher Band-Pass Ripple at low power levels
Broad Bandwidth	Larger Size	Broad Bandwidth	
Low Band-Pass Ripple at all power levels	More transistor devices needed	Low Band-Pass Ripple	
Low to Medium Power		Up to Multi-Kilowatt Power	
		Good Efficiency	
		Compact Size	
		Relatively Cool Operation	
		Less transistor devices needed	

Summary Analysis:

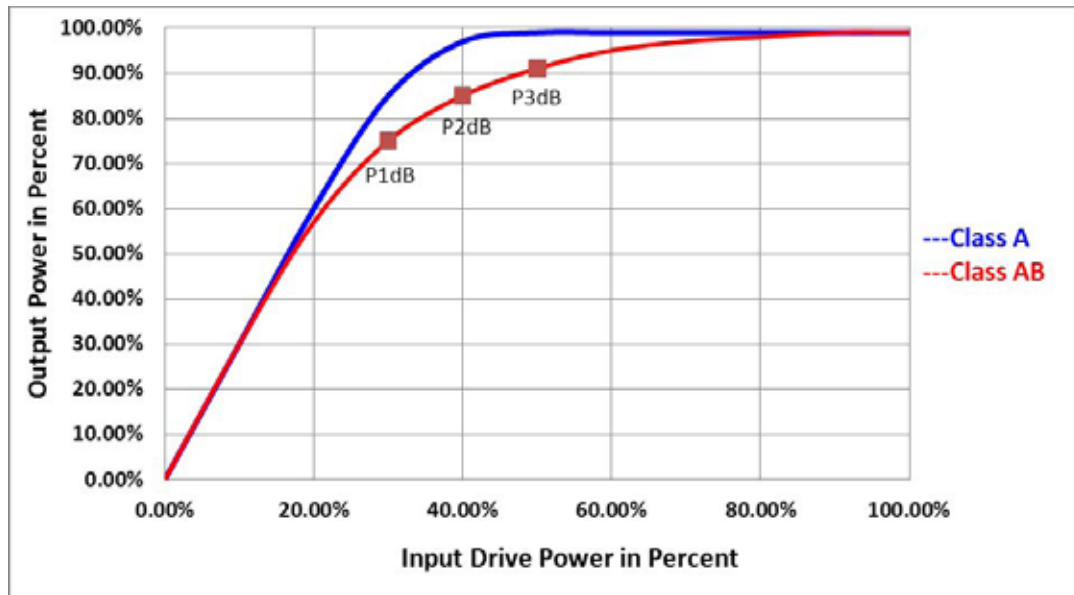
Class A amplifiers provide good linear amplification but have very poor DC to RF power conversion efficiency; they are a larger amplifier size producing maximum heat dissipation.

Class AB amplifiers provide good linear amplification have good DC to RF power conversion efficiency; they are a more compact amplifier design and have proven to be an excellent solution and compromise with lower heat dissipation thereby providing excellent reliability.



Figure 2: Linearity Chart for Class A vs. AB amplifier design

Illustrating Harmonic Distortion & Compression



Harmonic Content (output signal distortion):

Class A amplifiers provide good linear amplification for the operating area on the Class-A straight line up to Rated Power. The 2nd harmonic is typically -25 to -35dBc (the industry standard is normally -20dBc for most test applications). The in-band 3rd harmonic is typically -22 to -30dBc. Harmonic content beyond the P1dB point increases in a non-linear manner.

Class AB amplifiers provide good linear amplification for the operating area on the Class-A straight line up to the P1dB point. The 2nd harmonic is typically -25 to -35dBc (the industry standard is normally -20dBc for most test applications). In a Class-AB push-pull configuration, the 3rd harmonic is typically -22 to -24dBc before driving the amplifier beyond the P1dB point. Harmonic content beyond the P1dB point increases in a non-linear manner due to the start of the deviation off the straight line linearity curve. Out of band Harmonics are attenuated due to the natural roll-off of the linear amplifier.

EMC testing is routinely accomplished using Class AB amplifiers in their linear region. There is no difference with respect to the results using either amplifier class being that the difference in Harmonic content (non-linearities) are virtually equal for EMC applications. **Class AB amplifiers are ideal for these EMC Application as they will protect themselves which greatly improves the long-term reliability, performance and continual operational use of the amplifier.** In essence, the IFI solution is a 50/50 Class A-AB taking the best overall advantages of both classes of operation.

IMPORTANT NOTE: Output distortion products (Harmonics/output signal distortions) increase non-linearly for any amplifier Class once you exceed the P1dB point.

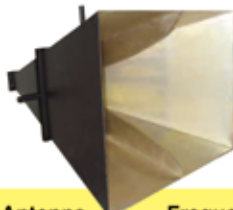


One Tuff Animal..

With Or Without Our Horns!



+



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The Power of Choice



Antenna Model	Frequency Range (GHz)	Power Level CW & Pulse	Connector Type	Minimum Gain (dBi)				
				10	12	15	20	-XX

Standard Gain Horn

ANT-SH975	.75-1.12	300KW	WR 975	N/A	N/A	N/A	N/A	-14
ANT-SH650	1.12-1.70	240KW	WR 650	-10	N/A	-15	-20	N/A
ANT-SH430	1.70-2.60	95KW	WR 430	-10	N/A	-15	-20	N/A
ANT-SH340	2.20-3.30	58KW	WR 340	-10	N/A	-15	-20	N/A
ANT-SH284	2.60-3.95	36KW	WR 284	-10	N/A	-15	-20	N/A
ANT-SH229	3.30-4.90	24KW	WR 229	-10	N/A	-15	-20	N/A
ANT-SH187	3.95-5.85	14KW	WR 187	-10	N/A	-15	-20	N/A
ANT-SH159	4.09-7.05	12KW	WR 159	-10	N/A	-15	-20	N/A
ANT-SH137	5.85-8.20	8KW	WR 137	-10	N/A	-15	-20	N/A
ANT-SH112	7.05-10.0	4.8KW	WR 112	-10	N/A	-15	-20	N/A
ANT-SH102	7.00-11.0	4KW	WR 102	-10	N/A	-15	-20	N/A
ANT-SH90	8.20-12.4	2.4KW	WR 90	-10	N/A	-15	-20	N/A
ANT-SH75	10.0-15.0	2.2KW	WR 75	-10	N/A	-15	-20	N/A
ANT-SH62	12.4-18.0	1.4KW	WR 62	-10	N/A	-15	-20	N/A
ANT-SH51	15.0-22.0	1.2KW	WR 51	-10	N/A	-15	-20	N/A
ANT-SH42	18.0-26.5	.6KW	WR 42	-10	N/A	-15	-20	N/A
ANT-SH28	26.5-40.0	.4KW	WR 28	-10	N/A	-15	-20	N/A

500 Watt-Broadband Gain Horn

ANT-AH102-500	.2-1.0	500 Watts	N Female	4-10	N/A	N/A	N/A	N/A
ANT-AH251-500	1.0-2.5	500 Watts	N Female	-10	-12	-15	-20	-XX
ANT-AH42-500	2.0-4.0	500 Watts	N Female	-10	-12	-15	-20	-XX
ANT-AH84-500	4.0-8.0	500 Watts	N Female	-10	-12	-15	-20	-XX
ANT-AH82-500	2.0-8.0	500 Watts	N Female	-10	-12	-15	-20	-XX
ANT-AH7525-500	2.5-7.5	500 Watts	N Female	-10	-12	-15	-20	-XX
ANT-AH188-500	7.5-18.0	500 Watts	WRD750	-10	-12	-15	-20	-XX
ANT-AH4018-200	18.0-40.0	200 Watts	WRD180	-10	-12	-15	-20	-XX

Kilowatt-Broadband Gain Horn

ANT-AH102-1KW	.2-1.0	1000 Watts	7/16 Female	4-10	N/A	N/A	N/A	N/A
ANT-AH251-1KW	1.0-2.5	1000 Watts	7/16 Female	-10	-12	-15	-20	-XX
ANT-AH42-1KW	2.0-4.0	1000 Watts	7/16 Female	-10	-12	-15	-20	-XX
ANT-AH84-1KW	4.0-8.0	1000 Watts	7/16 Female	-10	-12	-15	-20	-XX
ANT-AH82-1KW	2.0-8.0	1000 Watts	7/16 Female	-10	-12	-15	-20	-XX
ANT-AH7525-1KW	2.5-7.5	1000 Watts	7/16 Female	-10	-12	-15	-20	-XX
ANT-AH188-1KW	7.5-18.0	1000 Watts	WRD750	-10	-12	-15	-20	-XX

E- Field Generators

EFG-3	10KHz-220MHz	1000 Watts	N Female	N/A	N/A	N/A	N/A	N/A
EFG-3B	10KHz-220MHz	2000 Watts	SC Female	N/A	N/A	N/A	N/A	N/A
EFG-3C	10KHz-100MHz	3500 Watts	7/16 Female	N/A	N/A	N/A	N/A	N/A

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Application Note 109

VSWR vs. Return Loss Chart

VOLTAGE STANDING WAVE RATIO vs. Return Loss									
Return Loss (dB)	VSWR	Return Loss (dB)	VSWR	Return Loss (dB)	VSWR	Return Loss (dB)	VSWR	Return Loss (dB)	VSWR
46.064	1.01	13.842	1.51	9.485	2.01	7.327	2.51	5.999	3.01
40.086	1.02	13.708	1.52	9.428	2.02	7.294	2.52	5.970	3.02
36.607	1.03	13.577	1.53	9.372	2.03	7.262	2.53	5.956	3.03
34.151	1.04	13.449	1.54	9.317	2.04	7.230	2.54	5.935	3.04
32.256	1.05	13.324	1.55	9.262	2.05	7.198	2.55	5.914	3.05
30.714	1.06	13.201	1.56	9.208	2.06	7.167	2.56	5.893	3.06
29.417	1.07	13.061	1.57	9.155	2.07	7.135	2.57	5.872	3.07
28.299	1.08	12.964	1.58	9.103	2.08	7.105	2.58	5.852	3.08
27.318	1.09	12.849	1.59	9.051	2.09	7.074	2.59	5.832	3.09
26.444	1.10	12.736	1.60	8.999	2.10	7.044	2.60	5.811	3.10
25.658	1.11	12.625	1.61	8.949	2.11	7.014	2.61	5.791	3.11
24.943	1.12	12.518	1.62	8.899	2.12	6.984	2.62	5.771	3.12
24.289	1.13	12.412	1.63	8.849	2.13	6.954	2.63	5.751	3.13
23.686	1.14	12.308	1.64	8.800	2.14	6.925	2.64	5.732	3.14
23.127	1.15	12.207	1.65	8.752	2.15	6.896	2.65	5.712	3.15
22.607	1.16	12.107	1.66	8.705	2.16	6.867	2.66	5.693	3.16
22.120	1.17	12.009	1.67	8.657	2.17	6.839	2.67	5.674	3.17
21.664	1.18	11.913	1.68	8.611	2.18	6.811	2.68	5.654	3.18
21.234	1.19	11.818	1.69	8.565	2.19	6.783	2.69	5.635	3.19
20.828	1.20	11.725	1.70	8.519	2.20	6.755	2.70	5.617	3.20
20.443	1.21	11.634	1.71	8.474	2.21	6.728	2.71	5.598	3.21
20.079	1.22	11.545	1.72	8.430	2.22	6.700	2.72	5.579	3.22
19.732	1.23	11.457	1.73	8.386	2.23	6.673	2.73	5.561	3.23
19.401	1.24	11.370	1.74	8.342	2.24	6.646	2.74	5.542	3.24
19.085	1.25	11.285	1.75	8.299	2.25	6.620	2.75	5.524	3.25
18.783	1.26	11.202	1.76	8.257	2.26	6.594	2.76	5.506	3.26
18.493	1.27	11.120	1.77	8.215	2.27	6.567	2.77	5.488	3.27
18.216	1.28	11.039	1.78	8.173	2.28	6.541	2.78	5.470	3.28
17.949	1.29	10.960	1.79	8.138	2.29	6.516	2.79	5.452	3.29
17.690	1.30	10.881	1.80	8.091	2.30	6.490	2.80	5.435	3.30
17.445	1.31	10.804	1.81	8.051	2.31	6.465	2.81	5.417	3.31
17.207	1.32	10.729	1.82	8.011	2.32	6.440	2.82	5.400	3.32
16.977	1.33	10.654	1.83	7.972	2.33	6.415	2.83	5.383	3.33
16.755	1.34	10.581	1.84	7.933	2.34	6.390	2.84	5.365	3.34
16.540	1.35	10.509	1.85	7.894	2.35	6.366	2.85	5.348	3.35
16.332	1.36	10.437	1.86	7.856	2.36	6.341	2.86	5.331	3.36
16.131	1.37	10.367	1.87	7.818	2.37	6.317	2.87	5.315	3.37
15.936	1.38	10.298	1.88	7.781	2.38	6.293	2.88	5.298	3.38
15.747	1.39	10.230	1.89	7.744	2.39	6.270	2.89	5.281	3.39
15.563	1.40	10.163	1.90	7.707	2.40	6.246	2.90	5.265	3.40
15.385	1.41	10.097	1.91	7.671	2.41	6.223	2.91	5.248	3.41
15.211	1.42	10.032	1.92	7.635	2.42	6.200	2.92	5.232	3.42
15.043	1.43	9.968	1.93	7.599	2.43	6.177	2.93	5.216	3.43
14.879	1.44	9.904	1.94	7.564	2.44	6.154	2.94	5.200	3.44
14.719	1.45	9.842	1.95	7.529	2.45	6.131	2.95	5.184	3.45
14.564	1.46	9.780	1.96	7.494	2.46	6.109	2.96	5.168	3.46
14.412	1.47	9.720	1.97	7.460	2.47	6.086	2.97	5.152	3.47
14.264	1.48	9.660	1.98	7.426	2.48	6.064	2.98	5.137	3.48
14.120	1.49	9.601	1.99	7.393	2.49	6.042	2.99	5.121	3.49
13.979	1.50	9.542	2.00	7.360	2.50	6.021	3.00	5.105	3.50



Application Note 106

dBm to Watts Power Conversion Table



dBm	Watts	dBm	Watts	dBm	Watts	dBm	Watts
30.0	1.00	38.6	7.24	47.2	52.50	52.9	195.00
30.2	1.05	38.8	7.59	47.4	55.00	53.0	200.00
30.4	1.10	39.0	7.94	47.6	57.50	53.1	204.00
30.6	1.15	39.2	8.32	47.8	60.30	53.2	209.00
30.8	1.20	39.4	8.71	48.0	63.10	53.3	214.00
31.0	1.26	39.6	9.12	48.2	66.10	53.4	219.00
31.2	1.32	39.8	9.55	48.4	69.20	53.5	224.00
31.4	1.38	40.0	10.00	48.6	72.40	53.6	229.00
31.6	1.45	40.2	10.50	48.8	75.90	53.7	234.00
31.8	1.51	40.4	11.00	49.0	79.40	53.8	240.00
32.0	1.58	40.6	11.50	49.2	83.20	53.9	245.00
32.2	1.66	40.8	12.00	49.4	87.10	54.0	251.00
32.4	1.74	41.0	12.60	49.6	91.20	54.1	257.00
32.6	1.82	41.2	13.20	49.8	95.50	54.2	263.00
32.8	1.91	41.4	13.80	50.0	100.00	54.3	269.00
33.0	2.00	41.6	14.50	50.1	102.00	54.4	275.00
33.2	2.09	41.8	15.10	50.2	105.00	54.5	282.00
33.4	2.19	42.0	15.80	50.3	107.00	54.6	288.00
33.6	2.29	42.2	16.60	50.4	110.00	54.7	295.00
33.8	2.40	42.4	17.40	50.5	112.00	54.8	302.00
34.0	2.51	42.6	18.20	50.6	115.00	54.9	309.00
34.2	2.63	42.8	19.10	50.7	117.00	55.0	316.00
34.4	2.75	43.0	20.00	50.8	120.00	55.1	324.00
34.6	2.88	43.2	20.90	50.9	123.00	55.2	331.00
34.8	3.02	43.4	21.90	51.0	126.00	55.3	339.00
35.0	3.16	43.6	22.90	51.1	129.00	55.4	347.00
35.2	3.31	43.8	24.00	51.2	132.00	55.5	355.00
35.4	3.47	44.0	25.10	51.3	135.00	55.6	363.00
35.6	3.63	44.2	26.30	51.4	138.00	55.7	372.00
35.8	3.80	44.4	27.50	51.5	141.00	55.8	380.00
36.0	3.98	44.6	28.80	51.6	145.00	55.9	389.00
36.2	4.17	44.8	30.20	51.7	148.00	56.0	398.00
36.4	4.37	45.0	31.60	51.8	151.00	56.1	407.00
36.6	4.57	45.2	33.10	51.9	155.00	56.2	417.00
36.8	4.79	45.4	34.70	52.0	158.00	56.3	427.00
37.0	5.01	45.6	36.30	52.1	162.00	56.4	437.00
37.2	5.25	45.8	38.00	52.2	166.00	56.5	447.00
37.4	5.50	46.0	39.80	52.3	170.00	56.6	457.00
37.6	5.75	46.2	41.70	52.4	174.00	56.7	468.00
37.8	6.03	46.4	43.70	52.5	178.00	56.8	479.00
38.0	6.31	46.6	45.70	52.6	182.00	56.9	490.00
38.2	6.61	46.8	47.90	52.7	186.00	57.0	501.00
38.4	6.92	47.0	51.10	52.8	191.00	57.1	513.00



Application Note 106

dBm to Watts Power Conversion Table

dBm	Watts	dBm	Watts	dBm	Watts
57.2	525.00	61.5	1410.00	65.8	3800.00
57.3	537.00	61.6	1450.00	65.9	3890.00
57.4	550.00	61.7	1480.00	66.0	3980.00
57.5	562.00	61.8	1510.00	66.1	4070.00
57.6	575.00	61.9	1550.00	66.2	4170.00
57.7	589.00	62.0	1580.00	66.3	4270.00
57.8	603.00	62.1	1620.00	66.4	4370.00
57.9	617.00	62.2	1660.00	66.5	4470.00
58.0	631.00	62.3	1700.00	66.6	4570.00
58.1	646.00	62.4	1740.00	66.7	4680.00
58.2	661.00	62.5	1780.00	66.8	4790.00
58.3	676.00	62.6	1820.00	66.9	4900.00
58.4	692.00	62.7	1860.00	67.0	5010.00
58.5	708.00	62.8	1910.00	67.1	5130.00
58.6	724.00	62.9	1950.00	67.2	5250.00
58.7	741.00	63.0	2000.00	67.3	5370.00
58.8	759.00	63.1	2040.00	67.4	5500.00
58.9	776.00	63.2	2090.00	67.5	5620.00
59.0	794.00	63.3	2140.00	67.6	5750.00
59.1	813.00	63.4	2190.00	67.7	5890.00
59.2	832.00	63.5	2240.00	67.8	6030.00
59.3	851.00	63.6	2290.00	67.9	6170.00
59.4	871.00	63.7	2340.00	68.0	6310.00
59.5	891.00	63.8	2400.00	68.1	6460.00
59.6	912.00	63.9	2450.00	68.2	6610.00
59.7	933.00	64.0	2510.00	68.3	6760.00
59.8	955.00	64.1	2570.00	68.4	6920.00
59.9	977.00	64.2	2630.00	68.5	7080.00
60.0	1000.00	64.3	2690.00	68.6	7240.00
60.1	1020.00	64.4	2750.00	68.7	7410.00
60.2	1050.00	64.5	2820.00	68.8	7590.00
60.3	1070.00	64.6	2880.00	68.9	7760.00
60.4	1100.00	64.7	2960.00	69.0	7940.00
60.5	1120.00	64.8	3020.00	69.1	8130.00
60.6	1150.00	64.9	3090.00	69.2	8320.00
60.7	1170.00	65.0	3160.00	69.3	8510.00
60.8	1200.00	65.1	3240.00	69.4	8710.00
60.9	1230.00	65.2	3310.00	69.5	8910.00
61.0	1260.00	65.3	3390.00	69.6	9120.00
61.1	1290.00	65.4	3470.00	69.7	9330.00
61.2	1320.00	65.5	3550.00	69.8	9650.00
61.3	1350.00	65.6	3630.00	69.9	9770.00
61.4	1380.00	65.7	3720.00	70.0	10000.00





PT1-2KW Series Pulse TWT Microwave Power Amplifiers

1.0 – 18 GHz • 1,000 – 2,000 watts, Minimum Rated Power

The PT series of KW Pulse amplifiers built by IFI; are high power, "State-of-the-art" Pulse TWT amplifiers specifically designed for microwave testing applications. Our elegant approach provides 1,000-2,000 Watts of pulse power for various frequency ranges from 1.0 to 18.0 Gigahertz in various packages that offers all the controls and communications needed for today's automated test systems. These amplifiers have field proven reliability and unsurpassed performance as the best in the industry.

From the ground up the PT series amps are built to withstand rugged handling, whether it's being shipped to you or hauled around from site to site. Our amplifiers feature modular construction and this concept of modular design minimizes internally produced EMI signal leakage and provides easy access for field service and rapid turnaround at

depot level repair facilities. Redundant thermal and airflow sensors prevent the TWT from overheating. In addition, high VSWR protection is built in.

The PT series "State-of-the-art" interface is sophisticated yet simple to use. The backlit LCD screen shows forward/reverse power indication, status and self-diagnostic information. All the amplifiers operating parameters are simultaneously available in the amplifier front panel display as well as over the remote bus. Selection switches allow you to switch the amplifier to the desired mode of operation for local control if the unit is not being operated remotely. For computer automation, both an RS-232 and IEEE-488 interface are included. To meet individual requirements, the PT series amplifiers can be easily customized with our available options that may be required for your application.

IFI Pulse TWT Amplifier Features:

- Solid State Power Supply Designs
- Instantaneous Broadband Frequency ranges
- Modular Design Construction
- Rugged construction & High Reliability
- Backlit LCD Display
- Integrated Force Air Cooling
- Self-diagnostic circuitry
- IEEE-488 interface, RS232



For full data sheets, go to www.ifi.com

Models & General Specifications:

Model Number	Frequency Range (GHz)	Rated Power (kW minimum)	Gain (dB min)	Mains (kVA)	Weight (pounds)	Size (Inches)
PT21-1KW	1.0-2.0	1.0	60	1.5	85	10.5"Hx19"Wx25.25D
PT21-2KW	1.0-2.0	2.0	63	1.5	85	10.5"Hx19"Wx25.25D
PT251-1KW	1.0-2.5	1.0	60	1.5	75	10.5"Hx19"Wx25.25D
PT251-2KW	1.0-2.5	2.0	63	1.5	75	10.5"Hx19"Wx25.25D
PT42-1KW	2.0-4.0	1.0	60	1.5	75	10.5"Hx19"Wx25.25D
PT42-2KW	2.0-4.0	2.0	63	1.5	75	10.5"Hx19"Wx25.25D
PT82-1KW	2.0-8.0	1.0	60	1.5	75	10.5"Hx19"Wx25.25D
PT82-2KW	2.0-8.0	2.0	63	1.5	75	10.5"Hx19"Wx25.25D
PT825-1KW	2.5-8.0	1.0	60	1.5	75	10.5"Hx19"Wx25.25D
PT825-2KW	2.5-8.0	2.0	63	1.5	75	10.5"Hx19"Wx25.25D
PT84-1KW	4.0-8.0	1.0	60	1.5	75	10.5"Hx19"Wx25.25D
PT84-2KW	4.0-8.0	2.0	63	1.5	75	10.5"Hx19"Wx25.25D
PT128-1KW	8.0-12.0	1.0	60	1.5	75	10.5"Hx19"Wx25.25D
PT128-2KW*	8.0-12.0	2.0	63	1.5	75	10.5"Hx19"Wx25.25D
PT1812-1KW	12.0-18.0	1.0	60	1.5	75	10.5"Hx19"Wx25.25D
PT1812-2KW*	12.0-18.0	2.0	63	1.5	75	10.5"Hx19"Wx25.25D
PT188-1KW	8.0-18.0	1.0	60	1.5	75	10.5"Hx19"Wx25.25D
PT188-2KW*	8.0-18.0	2.0	63	1.5	75	10.5"Hx19"Wx25.25D
PT186-1KW	6.5-18.0	1.0	60	1.5	75	10.5"Hx19"Wx25.25D
PT186-2KW*	6.5-18.0	2.0	63	1.5	75	10.5"Hx19"Wx25.25D

* Over the majority of the band



PT-KW Series Pulse TWT Microwave Power Amplifiers

1.0 – 18 GHz • 2,000 – 4,000 watts, Minimum Rated Power

The PT series of KW Pulse amplifiers built by IFI; are high power, "State-of-the-art" Pulse TWT amplifiers specifically designed for microwave testing applications. Our elegant approach provides 2000-4000 Watts of pulse power for various frequency ranges from 1.0 to 18.0 Gigahertz in various packages that offers all the controls and communications needed for today's automated test systems. These amplifiers have field proven reliability and unsurpassed performance as the best in the industry.

From the ground up the PT series amps are built to withstand rugged handling, whether it's being shipped to you or hauled around from site to site. Our amplifiers feature modular construction and this concept of modular design minimizes internally produced EMI signal leakage and provides easy access for field service and rapid turnaround at

depot level repair facilities. Redundant thermal and airflow sensors prevent the TWT from overheating. In addition, high VSWR protection is built in.

The PT series "State-of-the-art" interface is sophisticated yet simple to use. The backlit LCD screen shows forward/reverse power indication, status and self-diagnostic information. All the amplifiers operating parameters are simultaneously available in the amplifier front panel display as well as over the remote bus. Selection switches allow you to switch the amplifier to the desired mode of operation for local control if the unit is not being operated remotely. For computer automation, both an RS-232 and IEEE-488 interface are included. To meet individual requirements, the PT series amplifiers can be easily customized with our available options that may be required for your application.

IFI Pulse TWT Amplifier Features:

- Solid State Power Supply Designs
- Instantaneous Broadband Frequency ranges
- Modular Design Construction
- Rugged construction & High Reliability
- Backlit LCD Display
- Integrated Force Air Cooling
- Self-diagnostic circuitry
- IEEE-488 interface, RS232

For full data sheets, go to www.ifi.com



Models & General Specifications:

Model Number	Frequency Range (GHz)	Rated Power (kW minimum)	Gain (dB min)	Mains (kVA)	Weight (pounds)	Size (Inches)
PT21-3KW	1-2	3.0	65	1.5	120	14.0"Hx19"Wx25.25D
PT251-3KW	1-2.5	3.0	65	1.5	120	14.0"Hx19"Wx25.25D
PT42-3KW	2-4	3.0	65	1.5	85	14.0"Hx19"Wx25.25D
PT64-3KW	4-6	3.0	65	1.5	85	14.0"Hx19"Wx25.25D
PT84-3KW	4-8	3.0	65	1.5	85	14.0"Hx19"Wx25.25D
PT128-3KW	8-12	3.0	65	1.5	85	14.0"Hx19"Wx25.25D
PT1812-3KW	12-18	3.0	65	1.5	85	14.0"Hx19"Wx25.25D
PT188-2KW	8-18	2.0	65	1.5	75	10.5"Hx19"Wx25.25D
PT188-3KW	8-18	3.0	65	1.5	85	14.0"Hx19"Wx25.25D
PT186-2KW	6.5-18	2.0	65	1.5	75	10.5"Hx19"Wx25.25D
PT186-3KW	6.5-18	3.0	65	1.5	85	14.0"Hx19"Wx25.25D
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PT21-4KW	1-2	4.0	66	1.5	85	14.0"Hx19"Wx25.25D
PT42-4KW	2-4	4.0	66	1.5	85	14.0"Hx19"Wx25.25D
PT64-4KW	4-6	4.0	66	1.5	85	14.0"Hx19"Wx25.25D
PT84-4KW	4-8	4.0	66	1.5	85	14.0"Hx19"Wx25.25D
PT128-4KW	8-12	4.0	66	1.5	85	14.0"Hx19"Wx25.25D
PT1812-3.5KW	12-18	3.5	66	1.5	85	14.0"Hx19"Wx25.25D



T-200 Series High Power TWT Microwave Power Amplifiers

1.0 – 18 GHz • 200-250 watts, Minimum Rated Power

Instruments for Industry, T-200 Series Amplifiers provide outstanding RF performance. Our "T-200 Series" products are a mature design but incorporate the latest features with respect to control and monitoring. These amplifiers are "State of the Art"; have field proven reliability and unsurpassed performance as the best in the industry. These products are available in power levels from 200 watts to 250 watts in the 1GHz-18GHz frequency range.

Operation safety and ease of use are paramount in IFI product designs. The IFI T-200 Series include a full complement of RF and hardware protection systems including high VSWR, over-current and voltage protection as well as redundant thermal and airflow sensors to prevent the TWT from overheating. In addition, the T-200 series includes a state-of-the-art interface that is sophisticated, comprehensive, but yet simple to use. Our amplifiers feature modular

construction and this concept of modular design minimizes internally produced EMI signal leakage and provides easy access for field service and rapid turnaround at depot level repair facilities.

The backlit LCD screen shows forward/reverse power indication, system status and self-diagnostic information. All the amplifier operating parameters are simultaneously available in the amplifier front panel display as well as over the remote bus. Selection switches allow you to switch the amplifier to the desired mode of operation for local control if the unit is not being operated remotely.

For computer automation both an RS-232 and IEEE-488 interface are included. To meet individual application needs, the T-200 Series amplifiers can be easily customized with harmonic filters or other options.

IFI RF Power Amplifier Features:

- Instantaneous Broadband Frequency range
- Modular Design Construction
- Rugged Construction & High Reliability
- Backlit LCD Display
- Integrated Force Air Cooling
- Self-diagnostic circuitry
- IEEE-488 interface, RS232
- Solid State Power Supply



For full data sheets, go to www.ifi.com

Models & General Specifications:

Model Number	Frequency Range (GHz)	Rated Power (watts minimum)	PI dB Power (nominal)	Gain (dB min)	Mains (kVA)	Weight (Pounds)	Size (Inches)
T21-200	1.0-2.0	200	100	53	2.5	85	10.5"H x 19"W x 27.00"D
T21-250	1.0-2.0	250	125	54	2.5	85	10.5"H x 19"W x 27.00"D
T251-200	1.0-2.5	200	100	53	2.5	85	10.5"H x 19"W x 27.00"D
T251-250	1.0-2.5	250	125	54	2.5	85	10.5"H x 19"W x 27.00"D
T281-200	1.0-2.8	200	100	53	2.5	80	10.5"H x 19"W x 27.00"D
T281-250	1.0-2.8	250	125	54	2.5	80	10.5"H x 19"W x 27.00"D
T31-250	1.0-3.0	250	125	54	2.5	85	10.5"H x 19"W x 27.00"D
T42-200	2.0-4.0	200	100	53	2.0	75	10.5"H x 19"W x 25.25"D
T42-250	2.0-4.0	250	125	54	2.5	75	10.5"H x 19"W x 25.25"D
T82-200	2.0-8.0	200	100	53	2.5	75	10.5"H x 19"W x 25.25"D
T82-250	2.0-8.0	250	125	54	2.5	75	10.5"H x 19"W x 25.25"D
T128-200	8.0-12.4	200	100	53	2.0	70	10.5"H x 19"W x 25.25"D
T128-250	8.0-12.4	250	125	54	2.5	70	10.5"H x 19"W x 25.25"D
T1812-200	12.0-18.0	200	100	53	2.0	70	10.5"H x 19"W x 25.25"D
T1812-250	12.0-18.0	250	125	54	2.5	70	10.5"H x 19"W x 25.25"D
T188-200	7.5-18.0	200	100	53	2.0	70	10.5"H x 19"W x 25.25"D
T188-250	7.5-18.0	250	125	54	2.5	70	10.5"H x 19"W x 25.25"D
T186-200	6.0-18.0	200	100	53	2.0	70	10.5"H x 19"W x 25.25"D
T186-250	6.0-18.0	250	125	54	2.5	70	10.5"H x 19"W x 25.25"D



T-500 Series High Power TWT Microwave Power Amplifiers

1.0 – 18 GHz • 500 watts, Minimum Rated Power

Instruments for Industry, T-500 Series Amplifiers provide outstanding RF performance. Our "T-500 Series" products are a mature design but incorporate the latest features with respect to control and monitoring.

These amplifiers are "State of the Art"; have field proven reliability and unsurpassed performance as the best in the industry. These products are available in a wide range of frequency bands from 1GHz-18GHz at 500 watts. Operation safety and ease of use are paramount in IFI product designs. The IFI T-500 Series include a full complement of RF and hardware protection systems including high VSWR, over-current and voltage protection as well as redundant thermal and airflow sensors to prevent the TWT from overheating.

In addition, the T-500 series includes a state-of-the-art interface that is sophisticated, comprehensive, but yet simple to use. Our amplifiers feature modular construction and this concept of modular design minimizes internally produced EMI signal leakage and provides easy access for field service and rapid turnaround at depot level repair facilities. The backlit LCD screen shows forward/reverse power indication, system status and self-diagnostic information. All the amplifier operating parameters are simultaneously available in the amplifier front panel display as well as over the remote bus. Selection switches allow you to switch the amplifier to the desired mode of operation for local control if the unit is not being operated remotely.

IFI RF Power Amplifier Features:

- Instantaneous Broadband Frequency range
- Modular Design Construction
- Rugged Construction & High Reliability
- Backlit LCD Display
- Integrated Force Air Cooling
- Self-diagnostic circuitry
- IEEE-488 interface, RS232
- Solid State Power Supply

For full data sheets, go to www.ifi.com



Models & General Specifications:

Model Number	Frequency Range (GHz)	Rated Power (watts minimum)	Pl dB Power (nominal)	Gain (dB min)	Mains (kVA)	Weight (Pounds)	Size (Inches)
T21-500	1.0-2.0	500	250	57	3.0	85	10.5"H x 19"W x 27.00"D
T251-500	1.0-2.5	500	250	57	3.0	85	10.5"H x 19"W x 27.00"D
T42-500	2.0-4.0	500	250	57	3.0	85	10.5"H x 19"W x 25.25"D
T62-500	2.0-6.0	500	250	57	3.0	85	10.5"H x 19"W x 25.25"D
T7525-500	2.5-7.5	500	250	57	3.0	85	10.5"H x 19"W x 25.25"D
T82-500	2.0-8.0	500	250	57	3.0	85	10.5"H x 19"W x 25.25"D
T825-500	2.5-8.0	500	250	57	3.0	85	10.5"H x 19"W x 25.25"D
T84-500	4.0-8.0	500	250	57	3.0	85	10.5"H x 19"W x 25.25"D
T186-500	6.0-18.0	500	250	57	4.0	120	14.0"H x 19"W x 27.00"D
T188-500	8.0-18.0	500	250	57	4.0	120	14.0"H x 19"W x 27.00"D
T128-500	8.0-12.0	500	250	57	4.0	120	14.0"H x 19"W x 27.00"D
T1812-500	12.0-18.0	500	250	57	4.0	120	14.0"H x 19"W x 27.00"D



T4026 Series Medium to High Power Millimeter TWT Amplifiers

26.5 – 40.0 GHz • 10-200 watts, Minimum Rated Power

Instruments for Industry, T4026 Series Amplifiers provide outstanding RF performance. Our “T4026 Series” products are a mature design but incorporate the latest features with respect to control and monitoring. These amplifiers are “State of the Art”; have field proven reliability and unsurpassed performance as the best in the industry. These products are available in a wide range of power levels from 10 watts to 200 watts in the 26.5GHz-40.0GHz frequency range.

Operation safety and ease of use are paramount in IFI product designs. The IFI T4026 Series include a full complement of RF and hardware protection systems including high VSWR, over-current and voltage protection as well as redundant thermal and airflow sensors to prevent the TWT from overheating. In addition, the T4026 series includes a state-of-the-art interface that is sophisticated, comprehensive, but yet simple to use. Our amplifiers feature modular construction and this concept of modular design minimizes

internally produced EMI signal leakage and provides easy access for field service and rapid turnaround at depot level repair facilities.

The backlit LCD screen shows forward/reverse power indication, system status and self-diagnostic information. All the amplifier operating parameters are simultaneously available in the amplifier front panel display as well as over the remote bus. Selection switches allow you to switch the amplifier to the desired mode of operation for local control if the unit is not being operated remotely.

For computer automation both an RS-232 and IEEE-488 interface are included. To meet individual application needs, the T4026 Series amplifiers can be easily customized with harmonic filters or other options. With this capability and its reliable elegant design, the T4026 series amplifiers are the perfect amplifier for your microwave needs. IFI offers different size packages and configurations to best suit your application. A product and design built to last!

IFI RF Power Amplifier Features:

- Instantaneous Broadband Frequency range
- Modular Design Construction
- Rugged Construction & High Reliability
- Backlit LCD Display
- Integrated Force Air Cooling
- Self-diagnostic circuitry
- IEEE-488 interface, RS232 & Ethernet Remote available
- Solid State Power Supply

For full data sheets, go to www.ifi.com



Models & General Specifications:

Model Number	Frequency Range (GHz)	Rated Power (watts minimum)	P1dB Power (nominal)	Gain (dB min)	Mains (kVA)	Weight (Pounds)	Size (Inches)
T4026-10	26.5-40.0	10	8	40	0.7	45	5.25”H x 19”W x 24.00”D
T4026-25	26.5-40.0	25	10	44	0.8	45	5.25”H x 19”W x 24.00”D
T4026-40	26.5-40.0	40	20	46	0.9	45	5.25”H x 19”W x 24.00”D
T4026-50	26.5-40.0	50	25	47	1.0	45	5.25”H x 19”W x 24.00”D
T4026-80	26.5-40.0	80	35	49	1.8	80	14.0”H x 19”W x 25.25”D
T4026-100	26.5-40.0	100	45	50	1.9	90	14.0”H x 19”W x 25.25”D
T4026-125	26.5-40.0	125	50	52	2.0	100	14.0”H x 19”W x 25.25”D
T4026-200	26.5-40.0	200	100	53	3.5	200	2x 14.0”H x 19”W x 27.00”D



T2618 Series Medium to High Power Millimeter TWT Amplifiers

18.0 – 26.5 GHz • 10-200 watts, Minimum Rated Power

Instruments for Industry, T2618 Series Amplifiers provide outstanding RF performance. Our "T2618 Series" products are a mature design but incorporate the latest features with respect to control and monitoring. These amplifiers are "State of the Art"; have field proven reliability and unsurpassed performance as the best in the industry. These products are available in a wide range of power levels from 10 watts to 200 watts in the 18.0GHz-26.5GHz frequency range.

Operation safety and ease of use are paramount in IFI product designs. The IFI T2618 Series include a full complement of RF and hardware protection systems including high VSWR, over-current and voltage protection as well as redundant thermal and airflow sensors to prevent the TWT from overheating. In addition, the T2618 series includes a state-of-the-art interface that is sophisticated, comprehensive, but yet simple to use. Our amplifiers feature modular construction and this concept of modular design minimizes

internally produced EMI signal leakage and provides easy access for field service and rapid turnaround at depot level repair facilities.

The backlit LCD screen shows forward/reverse power indication, system status and self-diagnostic information. All the amplifier operating parameters are simultaneously available in the amplifier front panel display as well as over the remote bus. Selection switches allow you to switch the amplifier to the desired mode of operation for local control if the unit is not being operated remotely.

For computer automation both an RS-232 and IEEE-488 interface are included. To meet individual application needs, the T2618 Series amplifiers can be easily customized with harmonic filters or other options. With this capability and its reliable elegant design, the T2618 series amplifiers are the perfect amplifier for your microwave needs. IFI offers different size packages and configurations to best suit your application. A product and design built to last!

IFI RF Power Amplifier Features:

- Instantaneous Broadband Frequency range
- Modular Design Construction
- Rugged Construction & High Reliability
- Backlit LCD Display
- Integrated Force Air Cooling
- Self-diagnostic circuitry
- IEEE-488 interface, RS232 & Ethernet Remote available
- Solid State Power Supply
- IEEE-488 interface, RS232 & Ethernet Remote

For full data sheets, go to www.ifi.com



Models & General Specifications:

Model Number	Frequency Range (GHz)	Rated Power (watts minimum)	P1dB Power (nominal)	Gain (dB min)	Mains (kVA)	Weight (Pounds)	Size (Inches)
T2618-10	18.0-26.5	10	8	40	0.7	45	5.25"H x 19"W x 24.00"D
T2618-25	18.0-26.5	25	10	44	0.8	45	5.25"H x 19"W x 24.00"D
T2618-40	18.0-26.5	40	20	46	0.9	45	5.25"H x 19"W x 24.00"D
T2618-50	18.0-26.5	50	25	47	1.0	45	5.25"H x 19"W x 24.00"D
T2618-80	18.0-26.5	80	35	49	1.8	80	14.0"H x 19"W x 25.25"D
T2618-100	18.0-26.5	100	45	50	1.9	90	14.0"H x 19"W x 25.25"D
T2618-125	18.0-26.5	125	50	52	2.0	100	14.0"H x 19"W x 25.25"D
T2618-200	18.0-26.5	200	100	53	3.5	200	2x 14.0"H x 19"W x 27.00"D

DEPENDABILITY

Starts With Equipment
That Works The Way You
Expect It To!



IFI Offers Innovative Amplifier Solutions for
every EMC & EMI testing application,
DC to 40 GHz, 1 watt to 50 Kilowatts.

That's what makes us...

The POWER OF CHOICE!

Solid State RF Power Amplifiers

Model Number	Frequency Range	Rated Power (Watts) Min.	P1dB Power (Watts) Min.	Gain (dB) Min.
SCDX10	10KHz-400MHz	10	10	40
SCDX25	10KHz-400MHz	25	25	44
SCDX50	10KHz-400MHz	50	50	47
SCDX100	10KHz-400MHz	100	80	50
SCDX150	10KHz-400MHz	150	100	52
SCDX200	10KHz-400MHz	200	160	53
SCDX250	10KHz-400MHz	250	200	54
SCDX350	10KHz-400MHz	350	280	56
SCDX500	10KHz-400MHz	500	300	57



Download a free data sheet
for Solid State Amplifiers at
www.ifi.com/SolidState



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“SCCX-Series” Solid State RF Power Amplifiers

10 kHz – 220 MHz • 10 to 1200 watts, Minimum Rated Power

Instruments for Industry, SCCX-series Amplifiers provide outstanding RF performance. Our “SCCX-Series” products are state-of-the-art solid-state power amplifiers specifically designed for laboratory and all testing applications. These products are available in a wide range of power levels from 10 watts to 1200 watts in the 10 kHz - 220 MHz frequency range.

IFI RF amplifiers are very conservatively designed to operate below maximum ratings for ruggedness and long term reliability. Sixth generation LDMOS Transistors provide reliable brute-power performance at frequencies up to 220 MHz.

Our RF power amplifiers feature individually shielded assemblies for the module level. This concept of shielded modular design minimizes internally produced EMI signal leakage and provides easy access for field service and rapid turnaround at depot level repair facilities.

From the ground up, the “SCCX-SERIES” products are structurally engineered to withstand operation in mechanically hostile environments. Ruggedized versions are available for applications that will be exposed to very harsh environments.

IFI Amplifier Features:

- Solid State LDMOS Designs
- Instantaneous Broadband Frequency range
- Modular Design Construction
- Rugged construction & High Reliability
- Integrated Force Air Cooling
- Self-diagnostic circuitry
- IEEE-488 interface & RS232 Remote

For full data sheets, go to www.ifi.com



Models & General Specifications

Model Number	Frequency Range (MHz)	Rated Power (Watts) Minimum	P1dB Power Watts Minimum	Gain (dB) Minimum	KVA	Weight In Pounds	Size In Inches
SCCX10	10KHz – 220MHz	10	10	40	.1KVA	33 Lbs	5.25” H x 19” W x 24” D
SCCX25	10KHz – 220MHz	25	25	44	.2KVA	35 Lbs	5.25” H x 19” W x 24” D
SCCX50	10KHz – 220MHz	50	50	47	.4KVA	36 Lbs	5.25” H x 19” W x 24” D
SCCX100	10KHz – 220MHz	100	80	50	.5KVA	38 Lbs	5.25” H x 19” W x 24” D
SCCX150	10KHz – 220MHz	150	100	52	.8KVA	40 Lbs	5.25” H x 19” W x 24” D
SCCX200	10KHz – 220MHz	200	160	53	1.5KVA	80 Lbs	14.0” H x 19” W x 27” D
SCCX250	10KHz – 220MHz	250	200	54	2.0KVA	90 Lbs	14.0” H x 19” W x 27” D
SCCX350	10KHz – 220MHz	350	280	56	2.5KVA	95 Lbs	14.0” H x 19” W x 27” D
SCCX500	10KHz – 220MHz	500	300	57	3.0KVA	100 Lbs	14.0” H x 19” W x 27” D
SCCX800	10KHz – 220MHz	800	500	60	5.0KVA	400 Lbs	Rack Integrated
SCCX1200	10KHz – 220MHz	1200	800	62	10.0KVA	650 Lbs	Rack Integrated



S61 Series Solid State Microwave Power Amplifiers

1.0 – 6.0 GHz • 5 Watts to 250 Watts

Instruments for Industry, S61 Series Solid State amplifiers are state-of-the-art amplifiers and provide outstanding RF performance. The S61 Series amplifiers operate over the frequency range from 1.0-6.0 GHz and can be supplied at power levels from 5 watts to 250 watts offering all the control and communication features needed for today's automated test systems. From the ground up, the S61 Series amplifiers are built to withstand rugged handling, whether it's being shipped to you or hauled around from site to site. They feature heavy-duty aluminum chassis construction with a modular approach for easy access and service.

Operation safety and ease of use are paramount in IFI product designs. The IFI S61 Series include a full complement of RF and hardware protection circuits including high VSWR, over-current, voltage protection, redundant thermal and airflow sensors for the module and the system level.

In addition, the S61 series includes a state-of-the-art interface that is sophisticated, comprehensive, and yet simple to use.

The backlit LCD screen shows forward/reverse power indication, system status and self-diagnostic information. All the amplifiers operating parameters are simultaneously available in the amplifier front panel display as well as over the remote bus. Selection switches allow you to switch the amplifier to the desired mode of operation for local control if the unit is not being operated remotely.

For computer automation both an RS-232 and IEEE interface are provided as standard. To meet individual application needs, the S61 Series amplifiers can be easily customized with other options. With this capability and its reliable elegant design, the S61 series amplifiers are the perfect system for your applications.

IFI Amplifier Features:

- Solid State Design
- Rugged Construction & High Reliability
- Instantaneous Broadband Frequency range
- Backlit screen
- Modular Design Construction
- Integrated Force Air Cooling
- Self-diagnostic circuitry
- IEEE-488 interface & RS232 Remote

For full data sheets, go to www.ifi.com



Models & General Specifications:

Model Number	Frequency Range (GHz)	Rated Power (watts minimum)	P1dB Power (watts minimum)	Gain (dB min)	Mains (kVA)	Weight (Pounds)	Size (Inches)
S61-5	1.0-6.0	5	5	37	.10	40 Lbs	5.25" H x 19" W x 24" D
S61-10	1.0-6.0	10	8	40	.10	45 Lbs	5.25" H x 19" W x 24" D
S61-20	1.0-6.0	20	15	43	.20	50 Lbs	7.00" H x 19" W x 24" D
S61-25	1.0-6.0	25	20	44	.25	60 Lbs	7.00" H x 19" W x 24" D
S61-40	1.0-6.0	40	30	46	.30	75 Lbs	8.75" H x 19" W x 24" D
S61-50	1.0-6.0	50	40	47	.40	90 Lbs	10.5" H x 19" W x 25" D
S61-75	1.0-6.0	75	60	49	.60	100 Lbs	10.5" H x 19" W x 25" D
S61-100	1.0-6.0	100	80	50	0.8	180 Lbs	2x 10.5" H x 19" W x 25" D
S61-150	1.0-6.0	150	130	52	1.2	200 Lbs	2x 10.5" H x 19" W x 25" D
S61-200	1.0-6.0	200	150	53	1.5	400 Lbs	Rack Integrated
S61-250	1.0-6.0	250	200	54	2.0	450 Lbs	Rack Integrated



SMC Series Solid State Amplifiers

80 – 1000 MHz • 10 Watts to 3000 Watts, Minimum Rated Power

Instruments for Industry, SMC-Series Amplifiers provide outstanding RF performance. These products are available in a wide range of power levels from 10 watts to 3000 watts in the 80 – 1000MHz frequency range. These state-of-the-art solid-state power amplifiers are specifically designed for laboratory and all testing applications.

IFI RF amplifiers are very conservatively designed to operate below maximum ratings for ruggedness and long term reliability. Sixth generation LDMOS Transistors provide reliable brute-power performance at frequencies up

to 1000MHz.

Our RF power amplifiers feature heavy-duty individually shielded aluminum housings at the module level. This concept of a shielded modular design minimizes internally produced EMI signal leakage and provides easy access for field service and rapid turnaround at depot level repair facilities.

From the ground up, the “SMC-SERIES” products are structurally engineered to withstand operation in mechanically hostile environments. Ruggedized versions are available for applications that will be exposed to very harsh environments.

IFI Amplifier Features:

- Solid State Design
- Rugged Construction & High Reliability
- Instantaneous Broadband Frequency range
- Backlit screen
- Modular Design Construction
- Integrated Force Air Cooling
- Self-diagnostic circuitry
- IEEE-488 interface & RS232 Remote

For full data sheets, go to www.ifi.com



Models & General Specifications

Model Number	Frequency Range (MHz)	Rated Power (Watts) Minimum	P1dB Power Watts Minimum	Gain (dB) Minimum	KVA	Weight In Pounds	Size In Inches
SMC10	80-1000	10	10	40	.1KVA	25 Lbs	6.25" H x 19" W x 24" D
SMC25	80-1000	25	25	44	.2KVA	30 Lbs	6.25" H x 19" W x 24" D
SMC50	80-1000	50	50	47	.4KVA	45 Lbs	7.0" H x 19" W x 25" D
SMC100	80-1000	100	80	50	.5KVA	60 Lbs	7.0" H x 19" W x 25" D
SMC150	80-1000	150	120	52	.8KVA	75 Lbs	8.75" H x 19" W x 24" D
SMC200	80-1000	200	160	53	1.4KVA	120 Lbs	8.75" H x 19" W x 24" D
SMC250	80-1000	250	200	54	1.6KVA	140 Lbs	10.5" H x 19" W x 25.25" D
SMC350	80-1000	350	250	56	3.0KVA	160 Lbs	10.5" H x 19" W x 25.25" D
SMC500	80-1000	500	350	57	4.0KVA	200 Lbs	2x 10.5" H x 19" W x 25.25" D
SMC750	80-1000	750	600	59	6.0KVA	250 Lbs	2x 10.5" H x 19" W x 25.25" D
SMC1000	80-1000	1000	800	60	8.0KVA	500 Lbs	Rack Integrated
SMC2000	80-1000	2000	1500	63	15.0KVA	1000 Lbs	Rack Integrated
SMC2500	80-1000	2500	1800	64	20.0KVA	1500 Lbs	Rack Integrated
SMC3000	80-1000	3000	2500	65	25.0KVA	2000 Lbs	Rack Integrated



Application Note 116

Calibration and use of an RF Amplifier Forward Internal RF Sample Port

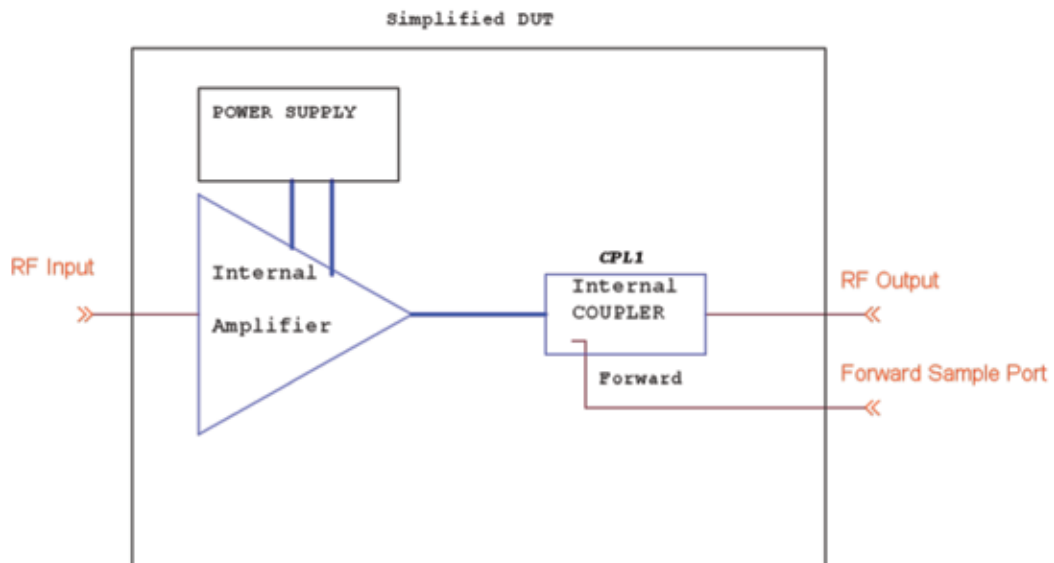
Overview

The forward sample port on IFI amplifiers has several uses while performing testing. This feature of a forward RF sample port can be used to measure Forward power, in band harmonic content and output fidelity as well as many other signal characteristics. Utilizing the sample port is a way to accurately quantify the operating parameters of the RF signal. The sample port allows for testing at safe power levels that are typically 40 to 60 dBc depending on customer specification.

Forward Sample Port Calibration

In order to use the sample port as an accurate means of measuring forward power, it must be calibrated first. If your amplifier does not have forward sample port data for the frequency point that needs to be measured, there are a few simple steps to calibrate the sample port. Figure 1 below is a visual representation of how the sample coupler would be integrated in the amplifier RF output line for forward RF power sampling.

Figure 1





Forward Sample Port Calibration (continued)

Network Analyzer Method of Calibrating the Test Coupler

- 1) Obtain and calibrate a test coupler that covers both the frequency band and power level of the UUT.
 - a. Terminate the test coupler Direct RF Output.
 - b. Calibrate the network analyzer for a S21 "Response / Thru" calibration.
 - c. Connect port 1 of the network analyzer to the RF input port of the test coupler.
 - d. Connect port 2 of the network analyzer to the Coupled port of the test coupler.
 - e. Scale the network analyzer to view the trace.
 - f. Place markers on test required test frequencies and record the coupling value for its corresponding frequency.
- 2) Connect the calibrated coupler to the UUT RF Output port and connect a power meter to the coupled port of the external calibrated coupler. Set the power meter offset to the value (from step #1) for the frequency that is being tested.
- 3) Connect a second power meter to the Forward Sample Port and set that power meter's offset to zero.
- 4) Connect a signal generator to the RF Input port of the UUT and increase the power out to rated power. Measure the power in dBm and record the value. Record the value from power meter #2 (in dBm) which is connected to the Forward Sample Port.
- 5) Subtract the value from the Forward Sample Port from the value measured at the calibrated external coupler.

Example 1: 60 dBm (Power out) - -0.8 dBm (Forward Sample Power) = 60.8 dB (coupling)
Example 2: 60 dBm (Power out) - +0.5 dBm (Forward Sample Power) = 59.5 dB (coupling)
- 6) Repeat this process for each frequency point needed. Record the coupling value for each point.
- 7) Using these calibrated points, forward power can be measured accurately.

Using the Forward Sample Port to Measure Signal Characteristics

- 1) The Forward Sample Port can be used to measure In band frequencies only. This includes harmonic measurements. Any amplitude measurement of signals outside the useable bandwidth of the amplifier will not be accurate. Therefore, harmonic measurements will be accurate within the flatness of the sample port where the 2nd and 3rd harmonic products are in band.
- 2) All other in band signal characteristics can be measured using the Forward Sample Port. One important thing to note is that the spectrum analyzer should be padded so that the RF power supplied to it is at -10 dBm. This protects the analyzer as well as makes the measurement as accurate as possible.



Application Note #116: Forward Sample Port Calibration (continued)

Manual Method of Calibrating the Test Coupler

- 1) Obtain and calibrate a test coupler that covers both the frequency band and power level of the UUT.
 - a. Terminate the test coupler Direct RF Output.
 - b. Apply 0dBm that was verified with a calibrated power meter at the frequency to be measured to the RF coupler input port.
 - c. Connect a calibrated power meter to the coupled port and measure the power on the coupled port. Record this value.
 - d. Repeat step b & c for all frequency points that would be measured.

Example: Test coupler has 40 dBc coupled ports. With a true 0dBm applied the coupled port measures with the calibrated power meter -0.5dBm. Then the coupled port correction is -40.5dBc. If the measured power was +0.5dBm then the coupled port correction would be -39.5dBm. After recording all the required points you can then proceed to quantifying the internal sample port for the frequencies required.

- 2) Connect the calibrated coupler to the UUT RF Output port and connect a power meter to the coupled port of the external calibrated coupler. Set the power meter offset to the value (from step #1) for the frequency that is being tested.
- 3) Connect a second power meter to the Forward Sample Port and set that power meter's offset to zero.
- 4) Connect a signal generator to the RF Input port of the UUT and increase the power out to rated power. Measure the power in dBm and record the value. Record the value from power meter #2 (in dBm) which is connected to the Forward Sample Port.
- 5) Subtract the value from the Forward Sample Port from the value measured at the calibrated external coupler.

Example 1: 60 dBm (Power out) - -0.8 dBm (Forward Sample Power) = 60.8 dB (coupling)

Example 2: 60 dBm (Power out) - +0.5 dBm (Forward Sample Power) = 59.5 dB (coupling)

- 6) Repeat this process for each frequency point needed. Record the coupling value for each point.
- 7) Using these calibrated points, forward power can be measured accurately.



Amplifier Type	IFI Model Amplifier	Description- Frequency & Power	
Tetrode Tube Amplifiers	M406	10 KHz - 220 MHz, 1000 Watt Amplifier	
	TCCX2500	10 KHz - 220 MHz, 2500 Watt Amplifier	
Combination Tetrode, Solid State Amplifiers	CMX5001	10KHz - 1000 MHz, 500/100 Watt Amplifier	
Solid State Amplifiers	SCCX100	10 KHz - 220 MHz, 100 Watt Amplifier	
	SMX200	10 kHz - 220 MHz/200 MHz - 1 GHz, 200 Watt Amplifier	
	SCCX500	10 KHz - 200 MHz, 500 Watt Amplifier	
	SVC500	100 MHz - 500 MHz, 500 Watt Amplifier	
	SMCC100	200 MHz - 1000 MHz, 100 Watt Amplifier	
	SMCC250	200 MHz - 1000 MHz, 250 Watt Amplifier	
	SMCC500	200 MHz - 1000 MHz, 500 Watt Amplifier	
	SMCC1000	200 MHz - 1000 MHz, 1000 Watt Amplifier	
	SMX100	10 KHz - 220 MHz/200 MHz - 1.0 GHz, 100 Watt Amplifier	
	CMC150	80 MHz - 1000 MHz, 150 Watt Amplifier	
	High Power CW TWT Amplifiers	T31-200	1 GHz - 2.8 GHz / 2.8 GHz - 3 GHz, 200/100 Watts
		T281-250	1.0 GHz - 2.8 GHz, 250 Watt TWT Amplifier
T251-500		1.0 GHz - 2.5 GHz, 500 Watt TWT Amplifier	
T42-200		2 GHz - 4 GHz, 200 Watt TWT Amplifier	
GT825-500		2.5 GHz - 8 GHz, 500 Watt TWT Amplifier	
T82-50		2 GHz - 8 GHz, 50 Watt TWT Amplifier	
T82-250		2 GHz - 8 GHz, 250 Watt TWT Amplifier	
T82-300		2 GHz - 8 GHz, 300 Watt TWT Amplifier	
T825-500		2.5 GHz - 8.0 GHz, 450 Watts High Power TWT Amplifier	
T7525-500		2.5 GHz - 7.5 GHz, 500 Watts High Power TWT Amplifier	
T84-50		4 GHz - 8 GHz, 50 Watt TWT Amplifier	
T84-250		4 GHz - 8 GHz, 250 Watt TWT Amplifier	
T186-50		6 GHz - 18 GHz, 50 Watt TWT Amplifier	
T186-60		6 GHz - 18 GHz, 60 Watt TWT Amplifier	
T186-300		6 GHz - 18 GHz 300 Watt TWT Amplifier	
T128-250		8 GHz - 12 GHz, 250 Watt TWT Amplifier	
T188-300		7.5 GHz - 18.0 GHz, 300 Watt TWT Amplifier	
T188-500		7.5 GHz - 18.0 GHz, 500 Watt TWT Amplifier	
Millimeter TWT Amplifiers	T2618-10	18.0 GHz - 26.5 GHz, 10 Watt TWT Amplifier	
	T2618-40	18.0 GHz - 26.5 GHz, 40 Watt TWT Amplifier	
	T4026-10	26.5 GHz - 40.0 GHz, 10 Watt TWT Amplifier	
	T4026-40	26.5 GHz - 40.0 GHz, 40 Watt TWT Amplifier	
	T4026-50	26.5 GHz - 40.0 GHz, 50 Watt TWT Amplifier	
Pulse/CW High Power TWT Amplifiers	GT251-500A	1 GHz - 2.5 GHz, 500 Watt TWT Amplifier	
	GT186-200	6 GHz - 18 GHz, 200 Watt TWT Amplifier	

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Solid State Microwave Power Amplifiers

Model Number	Frequency Range (GHz)	Rated Power (Watts) Min.	P1dB Power (Watts) Min.	Gain (dB) Min.
S31-5	0.8-3.0	5	5	37
S31-10	0.8-3.0	10	8	40
S31-20	0.8-3.0	20	15	43
S31-25	0.8-3.0	25	20	44
S31-40	0.8-3.0	40	30	46
S31-50	0.8-3.0	50	40	47
S31-75	0.8-3.0	75	60	49
S31-100	0.8-3.0	100	80	50
S31-150	0.8-3.0	150	130	52
S31-200	0.8-3.0	200	150	53
S31-250	0.8-3.0	250	200	54
S31-300	0.8-3.0	300	250	55
S31-400	0.8-3.0	400	350	56
S31-500	0.8-3.0	500	450	57

IFI Offers Innovative Amplifier Solutions for every EW & ECM testing application, DC to 40 GHz, 1 watt to 50 Kilowatts. That's what makes us...

The POWER OF CHOICE!



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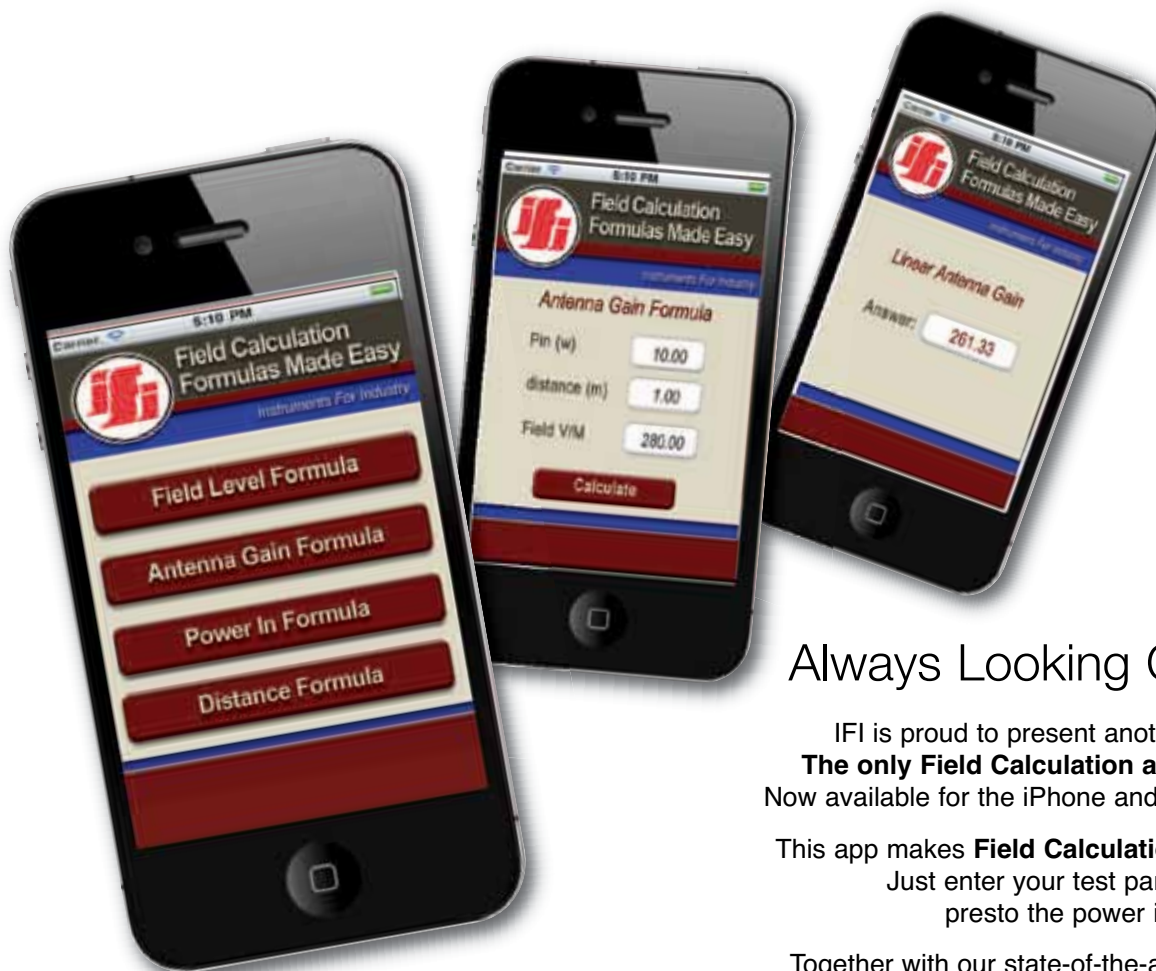
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IFI... Your Innovative Amplifier Solution Provider!

IFI is actively involved in the design and manufacture of Solid State and Traveling Wave Tube Amplifiers (both pulsed and CW). The company continues with development of its Low and High Power Amplifiers to offer the broadest range of Amplifiers manufactured by any company in the world. Instrument For Industry's equipment is used successfully in applications all over the world and is the leading supplier of high power transmitters.

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- #104: Pulse Amplifiers and detectors for EMC Testing Applications
- #103: Selection and Operation of RF Power Amplifiers for EMC Testing Applications
- #102: RF Power Costs Money, How Much Do You Really Need?
- #101: Selection and Operation of RF Power Amplifiers for EMC Testing

- Small Unmanned Sea Planes Could Clandestinely Recharge on Power Lines Using Electromagnetic Induction
- Lighting Technology Company Testing Balast Technology against ANSI, Energy Star and FCC Standards
- Company Claims its Ultrasound Location and Tracking Devices for Hospitals Does Not Have EMI Risks
- RFID Manufacturer says Study about RFID Interference in Medical Equipment Ignores Real-World Use Cases
- Electromagnetic Interference From RFID Inducing Potentially Hazardous Incidents in Critical Care Medical Equipment
- Scientist to Congress: U.S. Risks 'Catastrophe' in Nuclear EMP Attack

IFI Amplifiers

- Tetrode Tube Amplifiers
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Product Highlights

IFI Product Highlight
T251-2500 High Power Amplifier for High Field Level Testing Applications

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