RF Power Handling
IS640-300 0.030”
IS640-338 0.030”

Testing Performed by: D.L.S. Electronic Systems, Wheeling Illinois

Application

The need to know how well a Dielectric handles RF power is specific to the application. The most common applications are Feed and Matching Networks for the Radiating Elements, RF Power Amplifiers, Radar Network Boards, and Microwave lenses to name a few.

There are properties of the Dielectric that can help to predict how well a material will perform under high RF Wattage.
1.) Loss Tangent (Tan δ & Df): The lower the Tan δ less energy is dissipated as heat in the Dielectric therefore the more power the Dielectric can handle.
2.) TCDf (Thermal Coefficient of Tan δ): The lower the TCDf the less change in the Tan δ as the temperature increases in the Dielectric therefore the more power the Dielectric can handle.
3.) Thermal Conductivity: The higher the Thermal Conductivity more heat is transferred away from the conductor therefore the more power the Dielectric can handle.

The following typical values for Isola IS640 dielectric materials were the reason for the successful results presented herein. IS640 dielectric material Power Handling typical values observed - Tan δ 0.004, TCDf 8 ppm/ºC, Thermal Conductivity 0.320 W/mK.

Test Apparatus

DUT: 12 inch 50 ohms Microstrip Transmission Line

Fixture: Stainless steel plate 0.375 inch thick, DUT mounted on fixture matching grounds, connectors mounted directly to fixture for immediate ground at points of launch.

Capture load: 50 ohm “N” style connection ST3N-500, Maximum capability 500 watts, at 3.0 GHz, VSWR at 3.0 GHz = 1.2

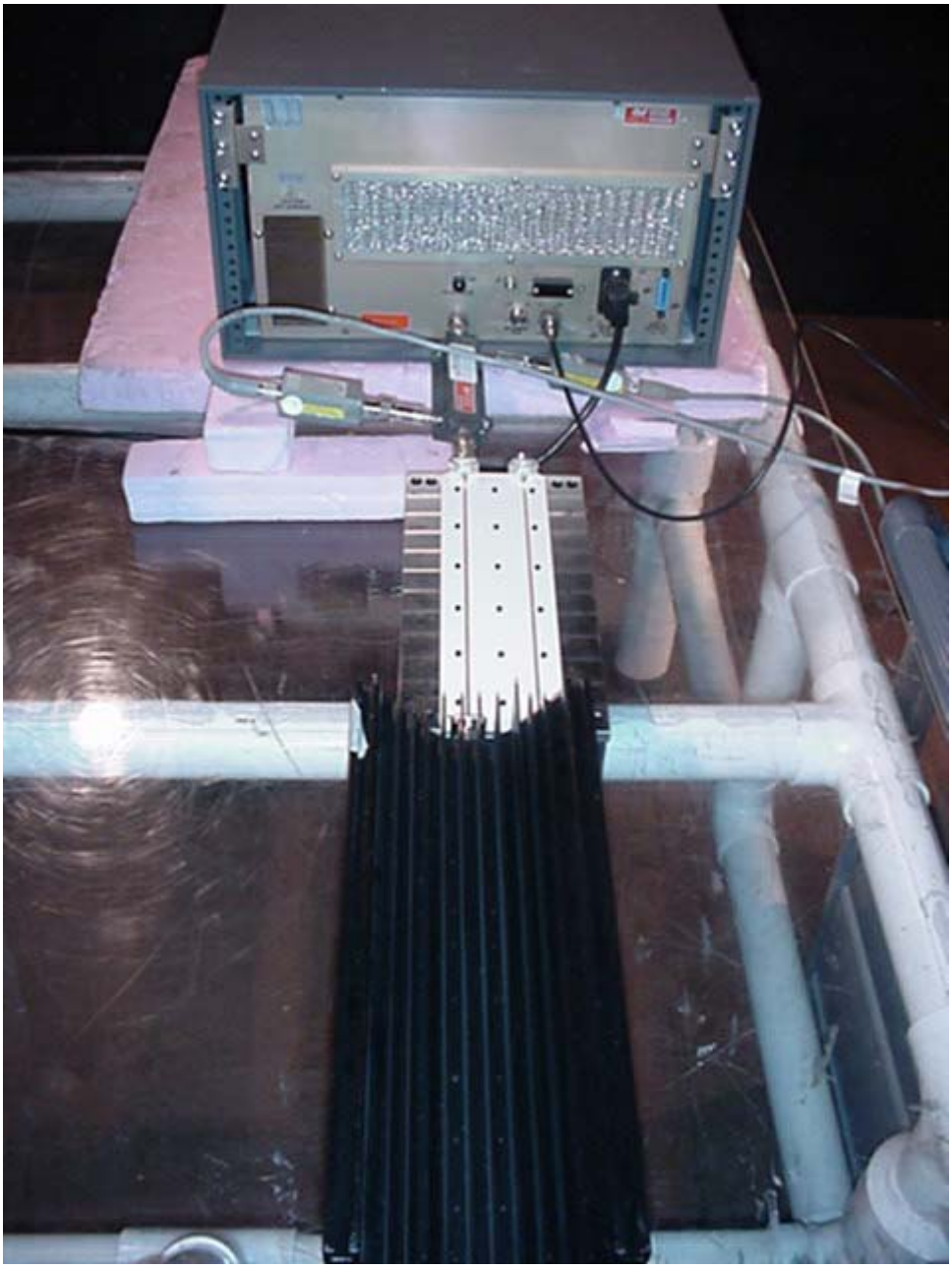
Connectors: Delta Electronics flange style “N” connectors part # 1113 000 N331 009 05 07

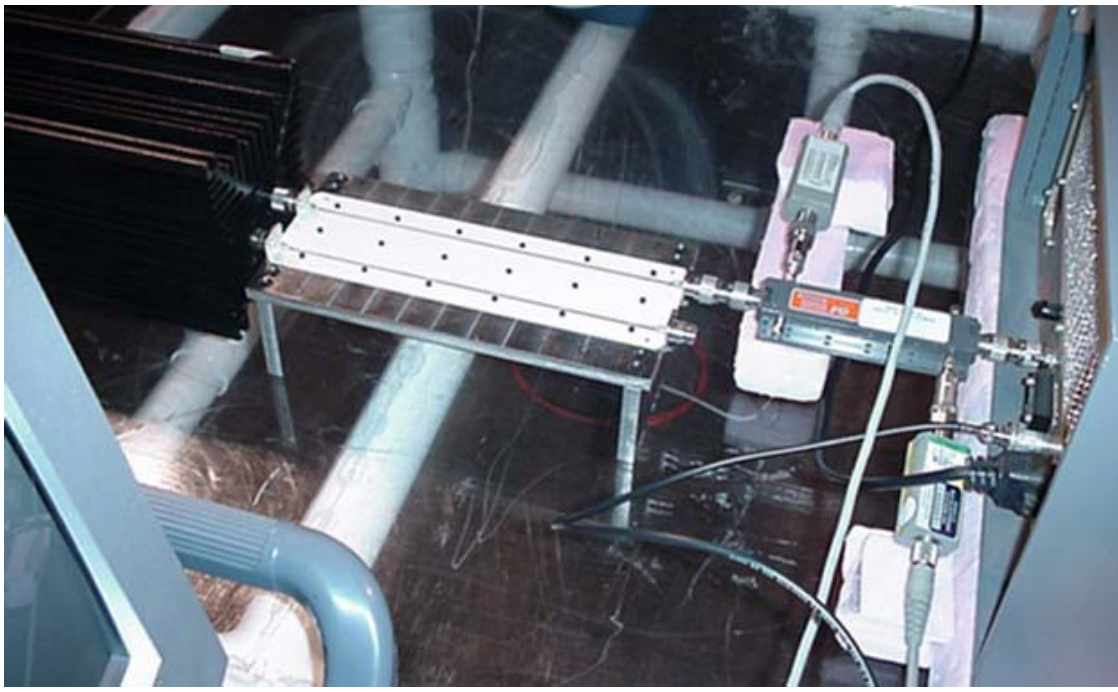
Amplifier: Amplifier Research maximum output 250 Watts with read out couplers attached at point of launch.

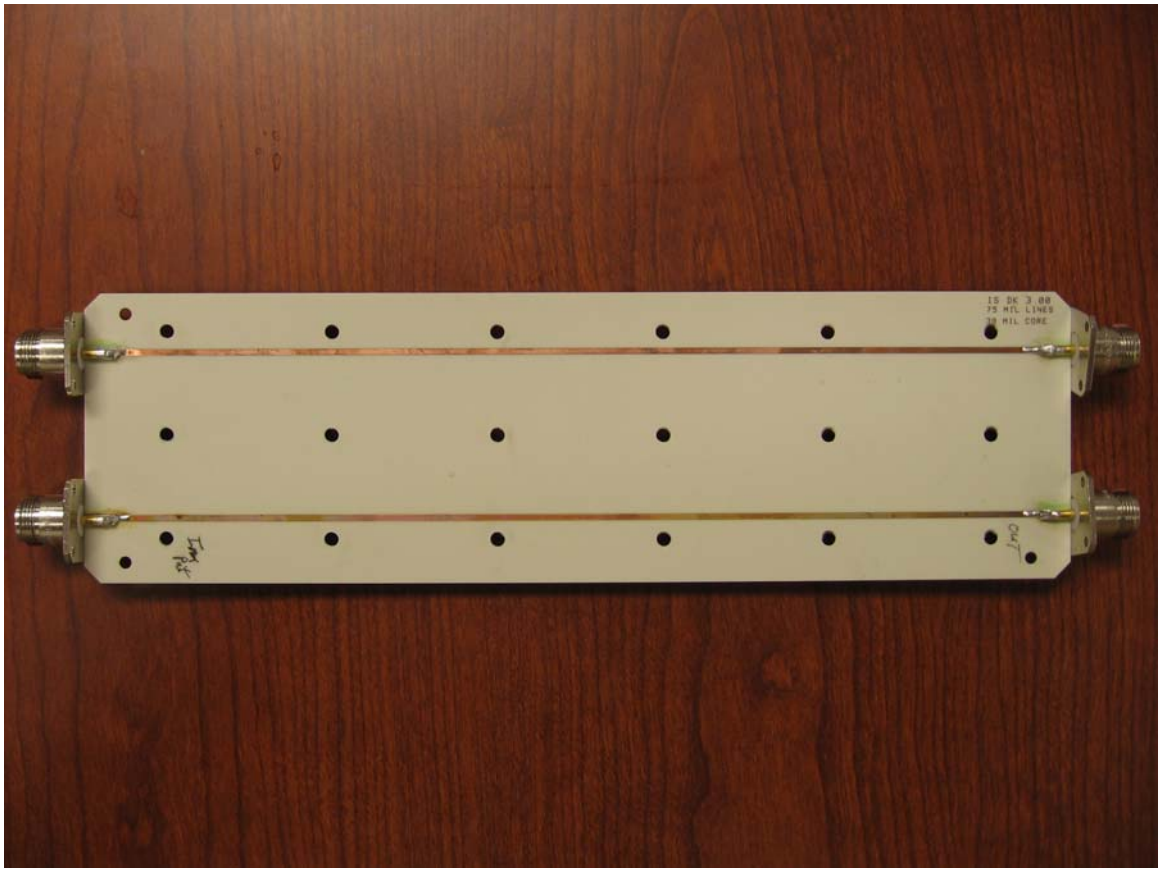
Testing Frequency: 2.0 GHz

Testing Power Output: 200 Watts continuous for two hours then increased to 250 Watts Continuous for two hours, for a total of four hours of continuous power loading.

Pictures of Test Apparatus






IS DK 3.88
75 MIL LINES
10 MIL CORE

Test Method

Started at 200 Watts continuous power at 2.0 GHz for two hours then immediately increased the power to 240 Watts continuous at 2.0 GHz for an additional two hours. Failure threshold defined as in increase in Reflected Power by more than 10%.

Test Results

At Time 0 Minute: DUT temperature = 73ºF; Frequency = 2.0 GHz; Power = 200 Watts; Reflected Power = 10 Watts
At Time 20 Minutes: DUT temperature = 212ºF; Frequency = 2.0 GHz; Power = 200 Watts; Reflected Power = 8.5 Watts and Stabilized
At Time 2 Hours: DUT temperature = 216ºF; Frequency = 2.0 GHz; Power = Increased to 240 Watts; Reflected Power = Increased to 9.6 Watts
At Time 2 hours 10 Minutes: DUT temperature = 218ºF; Frequency = 2.0 GHz; Power = 240 Watts; Reflected Power = 9.21 Watts and Stabilized
At Time 4 Hours: DUT temperature = 220ºF; Frequency = 2.0 GHz; Power = 240 Watts; Reflected Power = 9.21 Watts; Power shut off test ended.

Table of Results

Time Interval Hours	Power Loading Watts	Reflected Power Watts	Temperature Launch Point Degrees F	Temperature Mid Point Degrees F	Temperature Exit Point Degrees F
0:00	200	10	73	73	73
0:20	200	8.5	132	212	230
2:00	240	9.6	135	216	235
2:10	240	9.21	143	218	241
4:00	240	9.21	145	220	245

Conclusions

- After 4 hours of continuous power no failures were observed by Reflected Power and no failure after Cross Sections of Transmission Line.
- After 3 hours and 40 minutes at elevated operating temperatures no failures were observed by Reflected Power and no failure after Cross Sections of Transmission Line.

Pictures of Cross Sections after Testing Complete