



# Low Cost 200 kW CW 352MHz MOSFET Amplifier Design



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6<sup>th</sup> ESLS RF Meeting

Villigen, November 28 - 29, 2002

# Low Cost 200 kW CW 352 MHz MOSFET Amplifier Design

Robert LOPES Ti RUAN

## 1) 330 W Module

Unconditional Stability

Circulator 1078A with Wide Band

Input Filter Omitted

Resistors for Improving 100 MHz Stability

$K > 12$  dB (Input Including a 1.2 m RG13 Cable)

Power Gain 10.5 - 11.5 dB with D1029UK.05

## 2) 2.5 kW Power Combiner

Heat Sinks Attached

## 3) 20 kW Power Combiner

Heat Sinks Attached

Inner Connection Improved

Silver-Plating on Aluminium

## 4) 40 kW Power Combiner

3 1/8" Connectors Plug in Inner Conductor of  
6 1/8" Directly

Silver-Plating on Aluminium

2D Simulation Software Design Not Easy

3D Simulation (Mr. Vladimir Zviagintsev, INFN)

### **5) 40 kW Amplifier for Booster**

Modules or Building Blocks (Toy Bricks) Design :

146 Amplifier Modules  $[(1 + 8 + 8 \times 8) \times 2]$

146 DC/DC 600 W Converter Modules

Micro-controller : Supervision, Interlocks, Alarm, Measurements

Clamp System Connecting Tubes Instead of Traditional Cabinets

Water Cooling, PADA Extruded Heat Sink 8391

Very Simple Spare Parts and Convenient Maintenance

Estimated Cost 170 kEUR

### **6) 200 kW Amplifier Design for Storage Ring**

Prefer Combining 5 Sets of 40 kW amplifier

IEC 50 - 233 -1 (9 - 3/16") Coaxial Line Possible

The Lowest Cut-off Frequency  $f_c$  Occurs with the TE<sub>11</sub> Mode :

Straight Connector  $f_c \times 0.95 = 550$  MHz

Right Angle Connector  $f_c \times 0.665 = 380$  MHz

200 kW Inner Conductor Temperature of 102°C  
(Ambient 40°C)

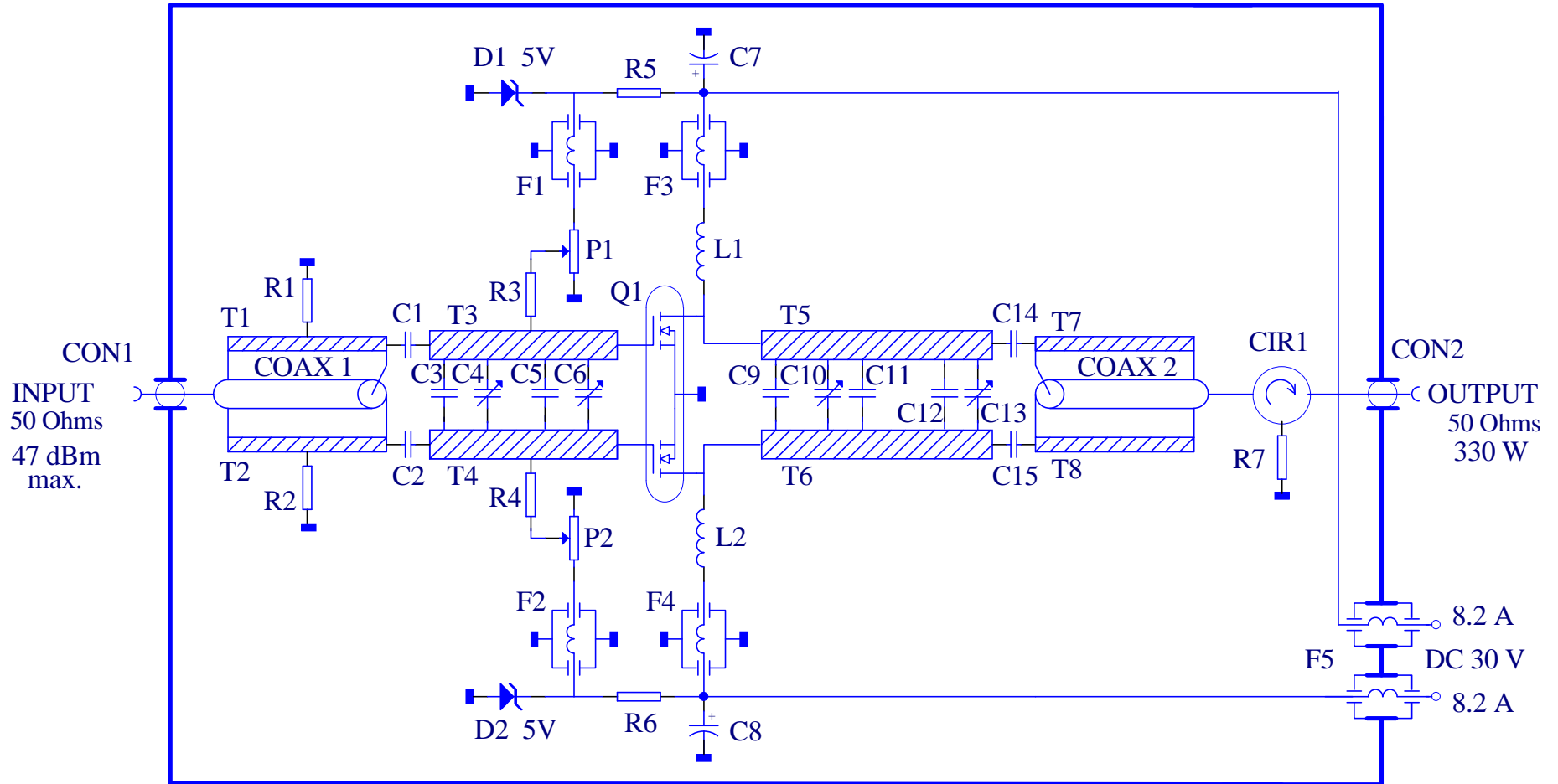
Waveguide WR1800

### **7) 200 kW Power Combiner (the Only Key Part)**

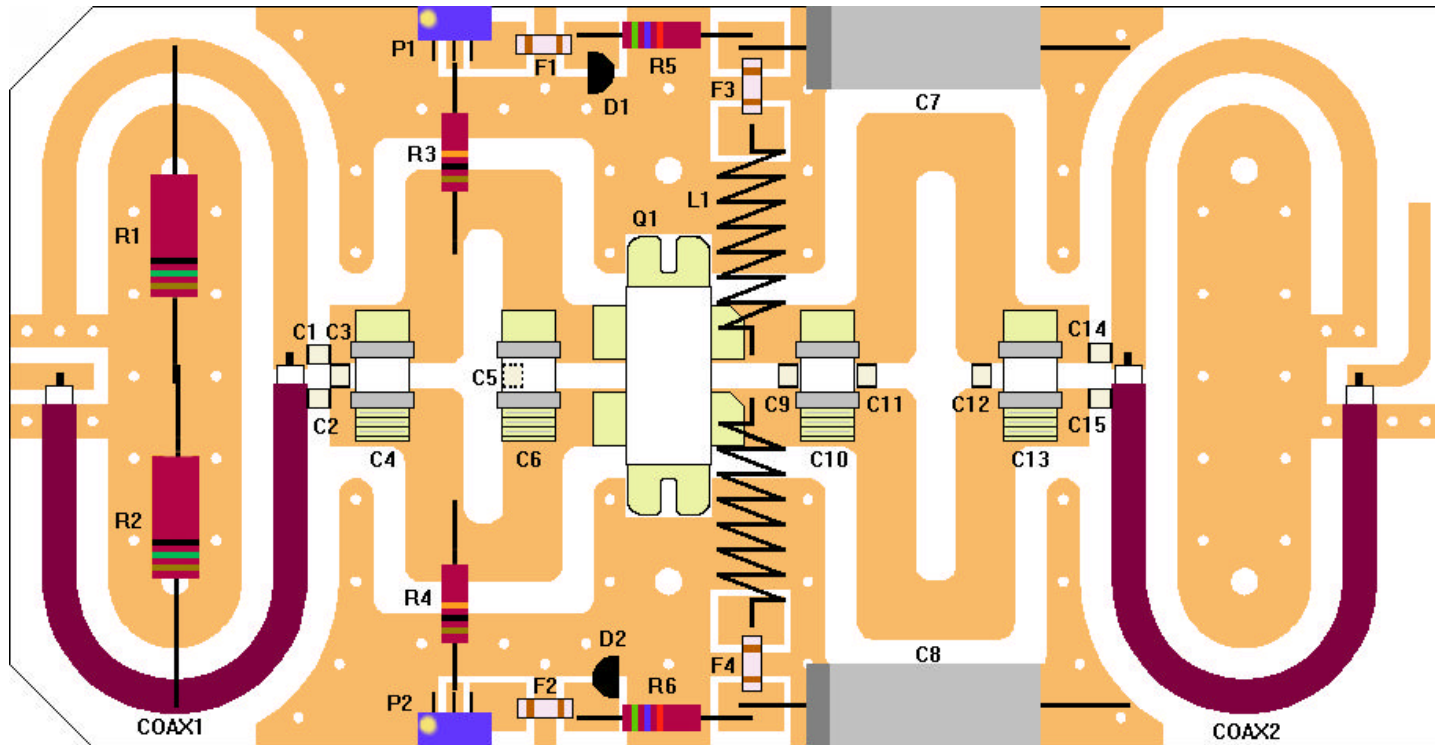
9 - 3/16" Outer Conductor

3D Simulation Software Needed

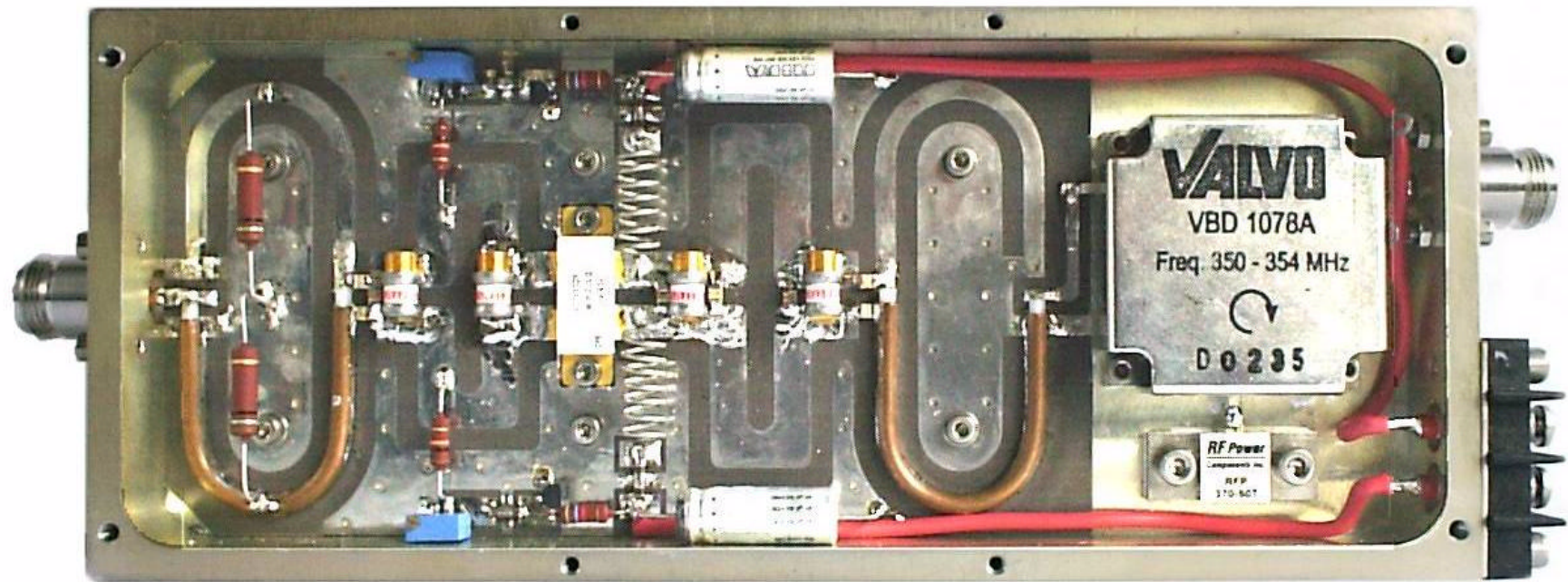
Pay attention to TE<sub>11</sub> and HOM



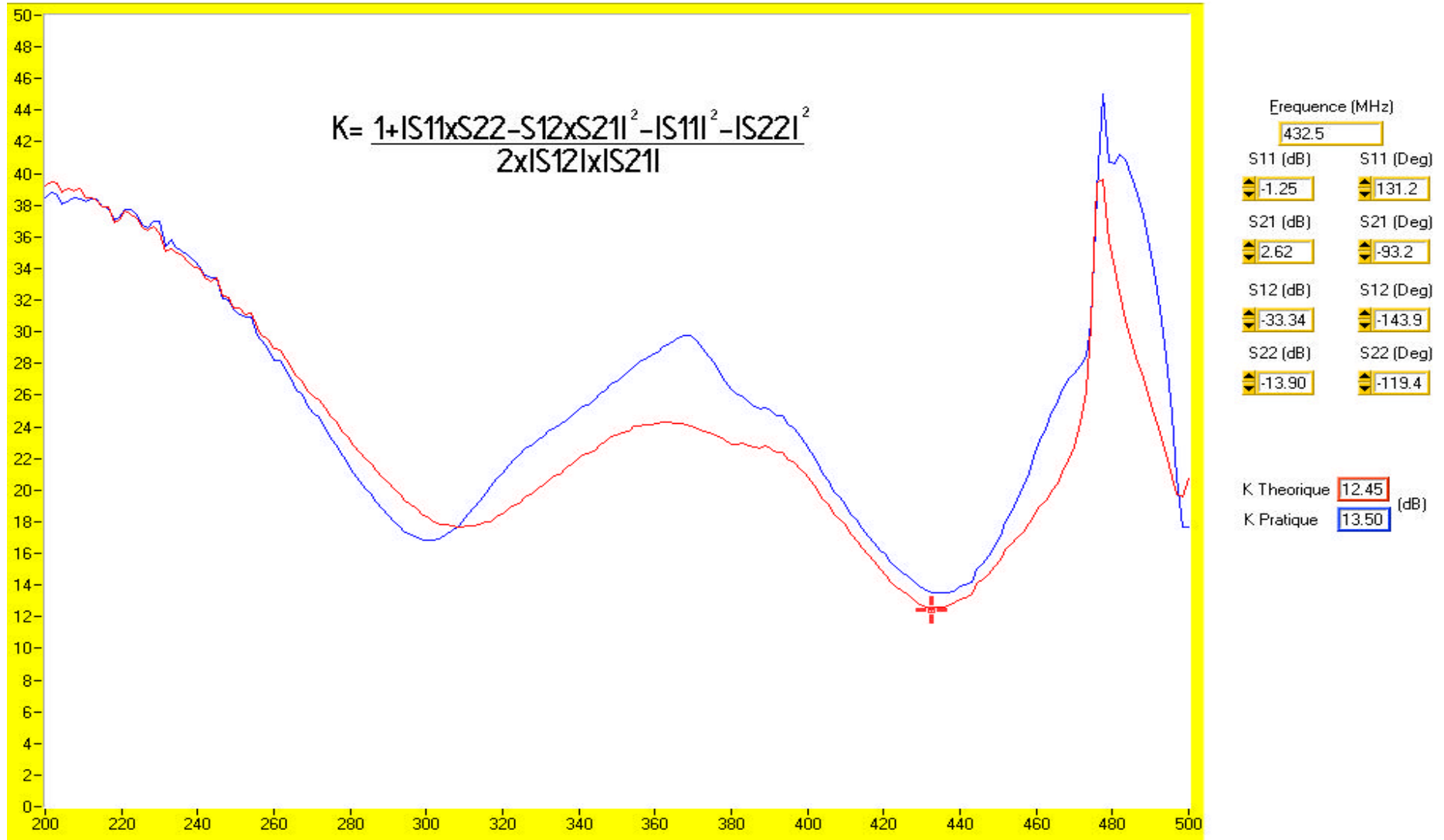
# 330 W 352 MHz Amplifier Module



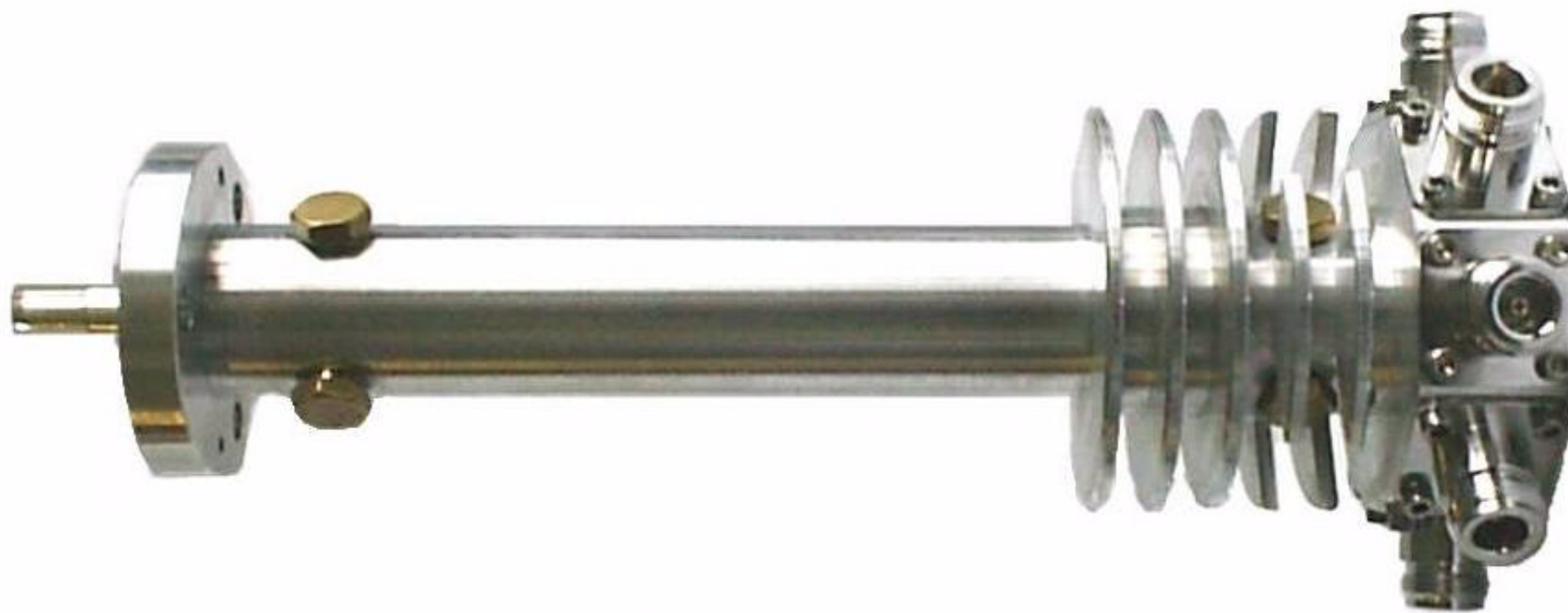
330W Amplifier Module PCB



330 W 352 MHz Amplifier Module



# Stability Of Amplifier

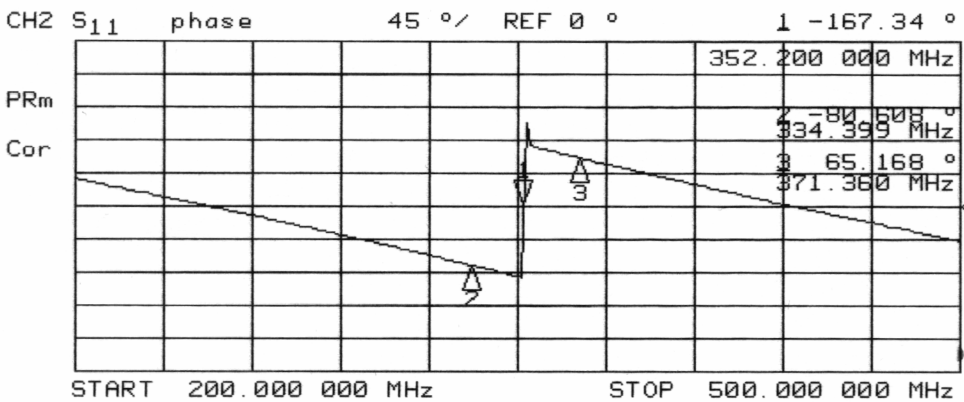
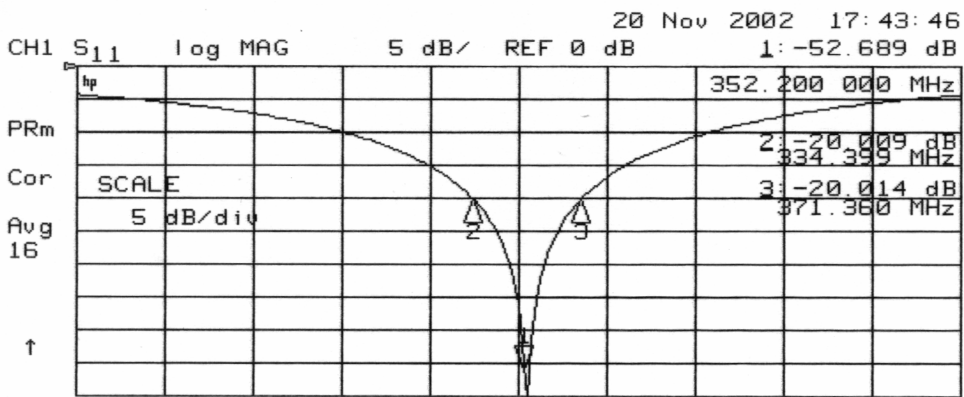
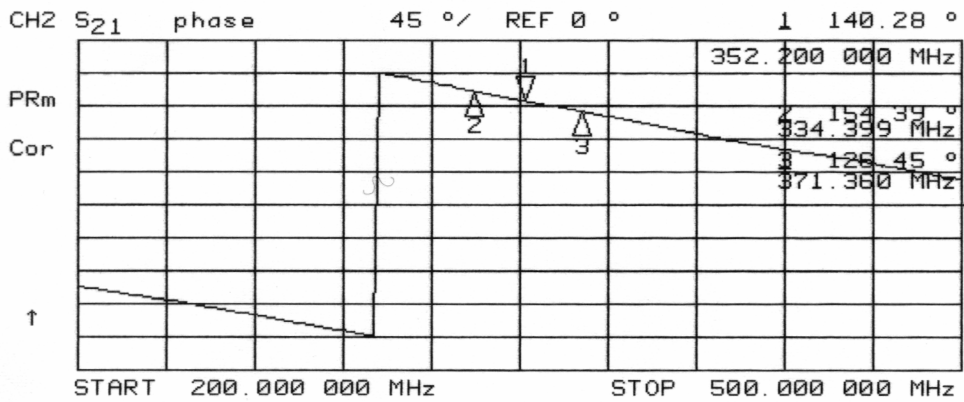
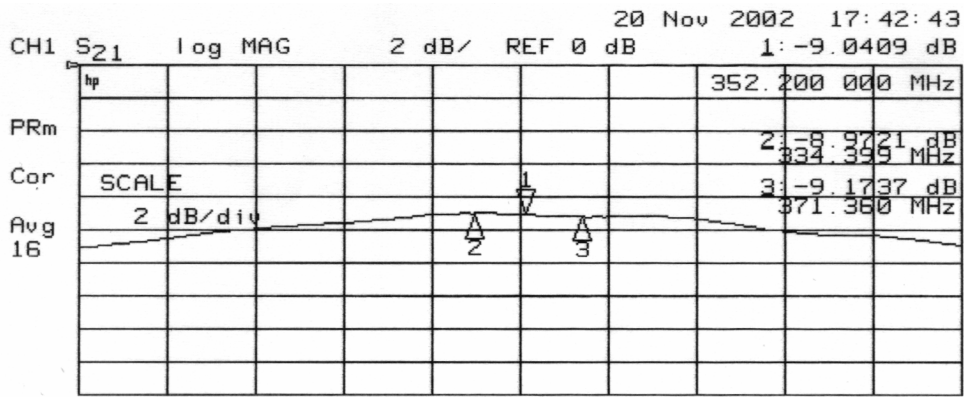


8-way 2.5 kW Combiner

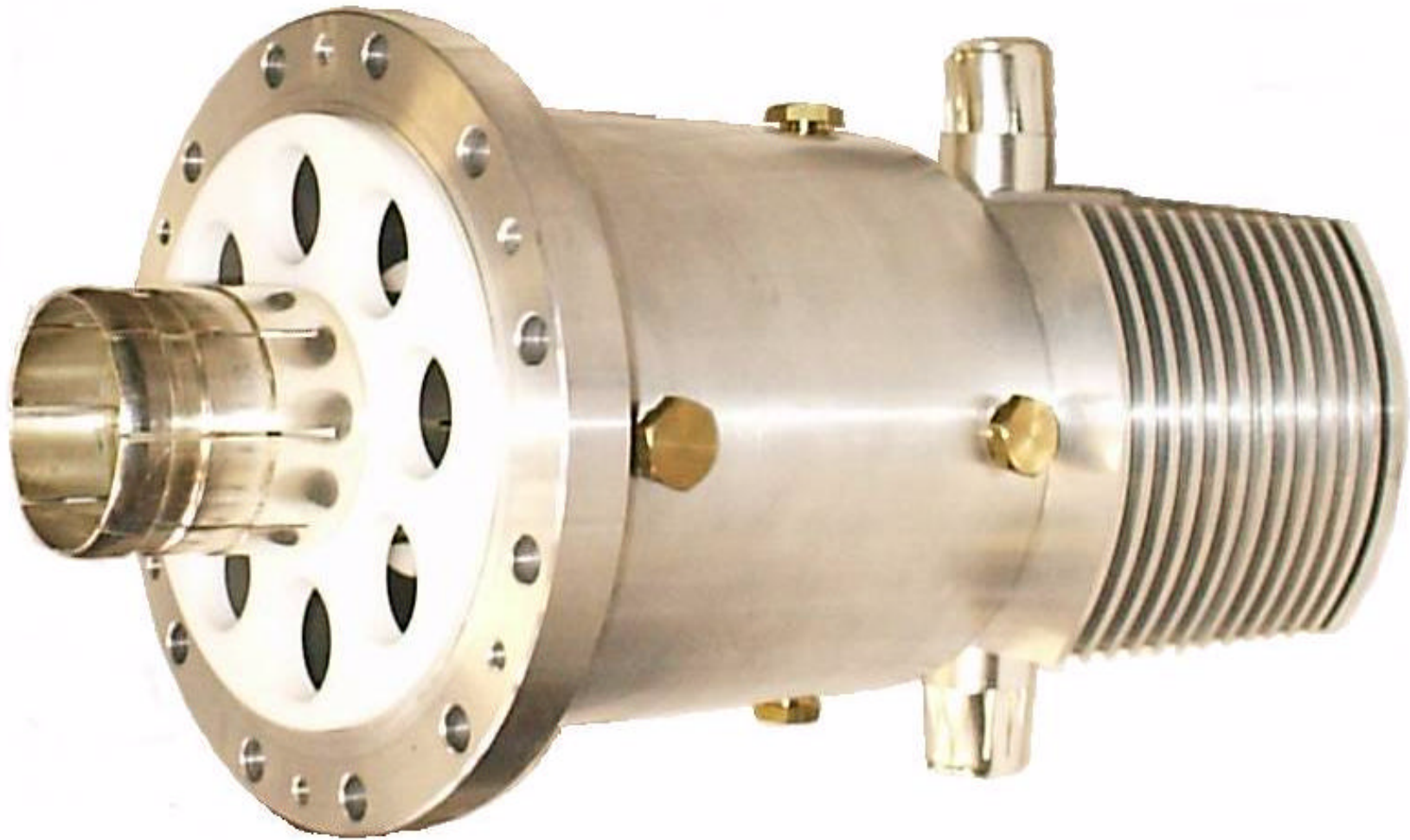




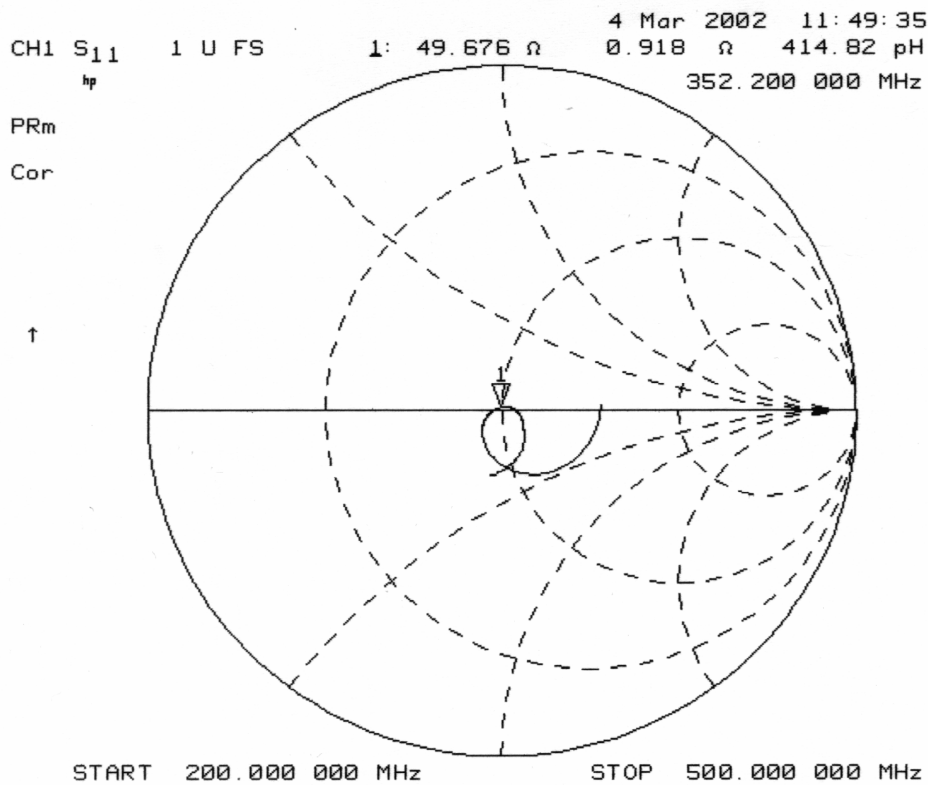
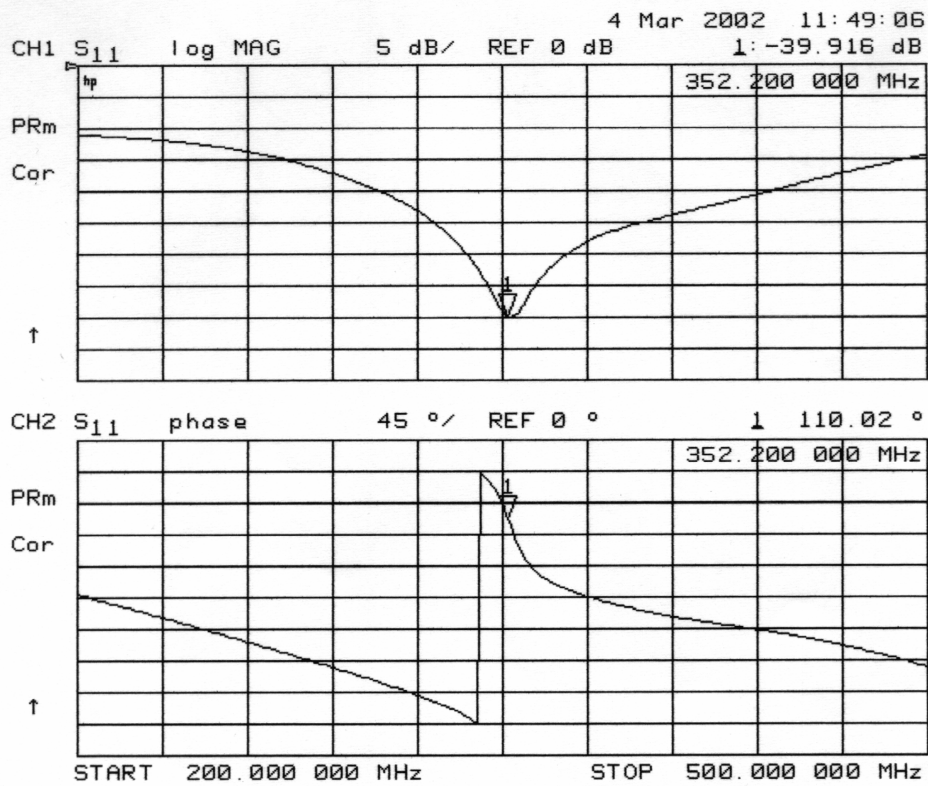
8-way 20 kW Combiner



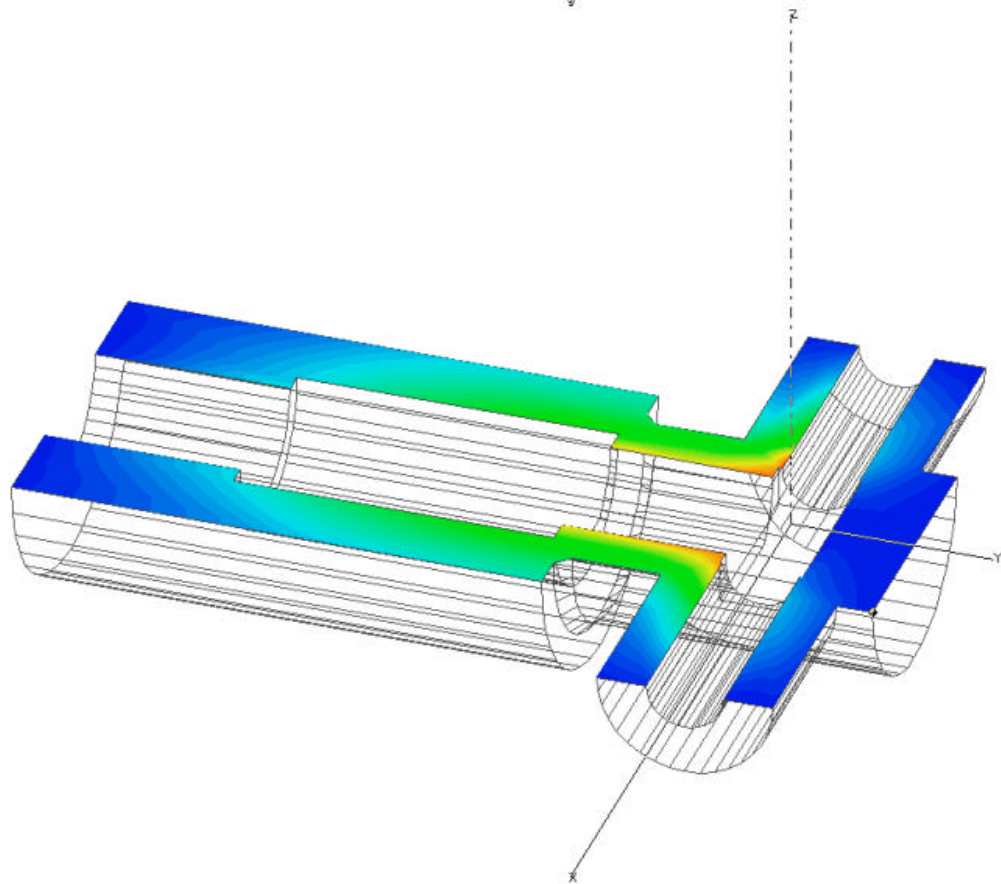
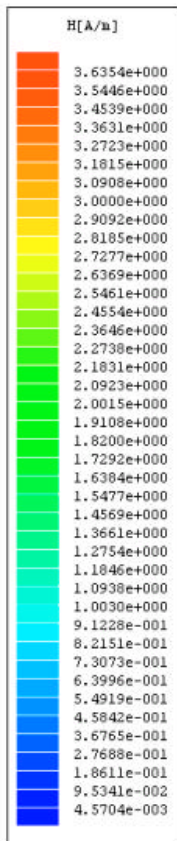
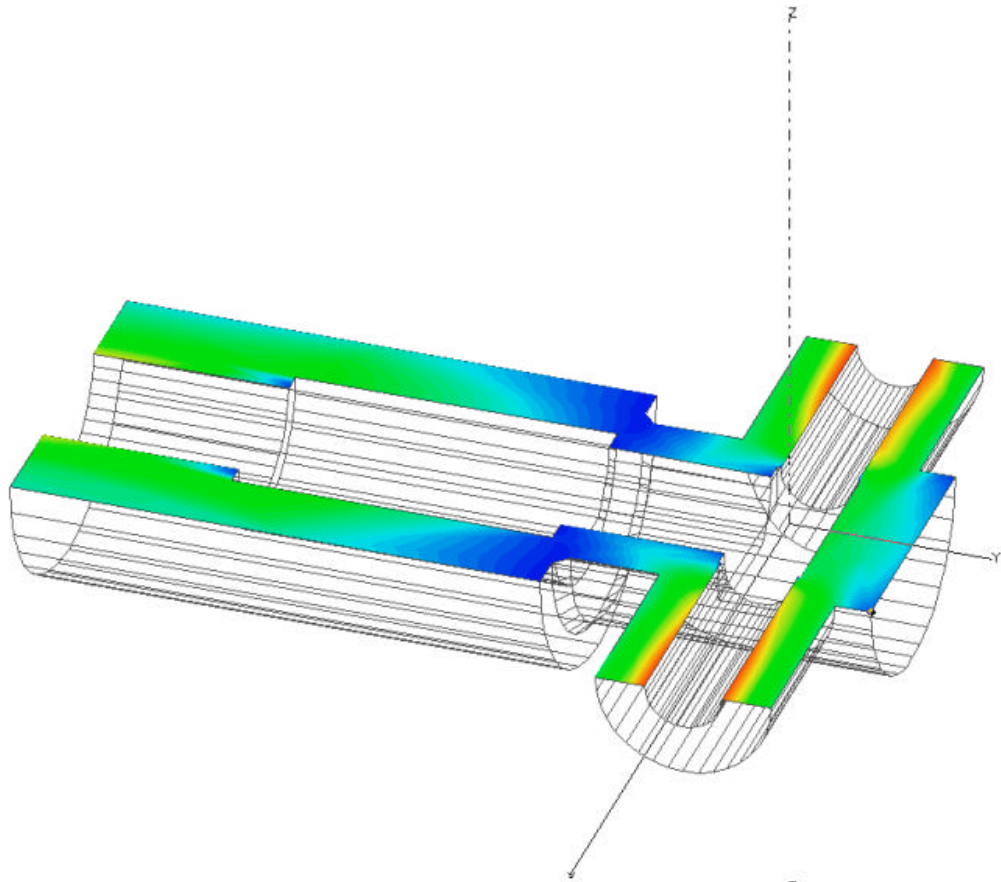
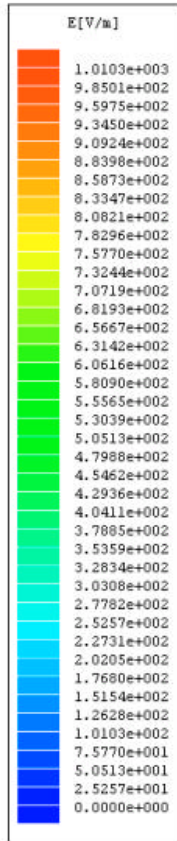
# 8-way 20 kW Combiner



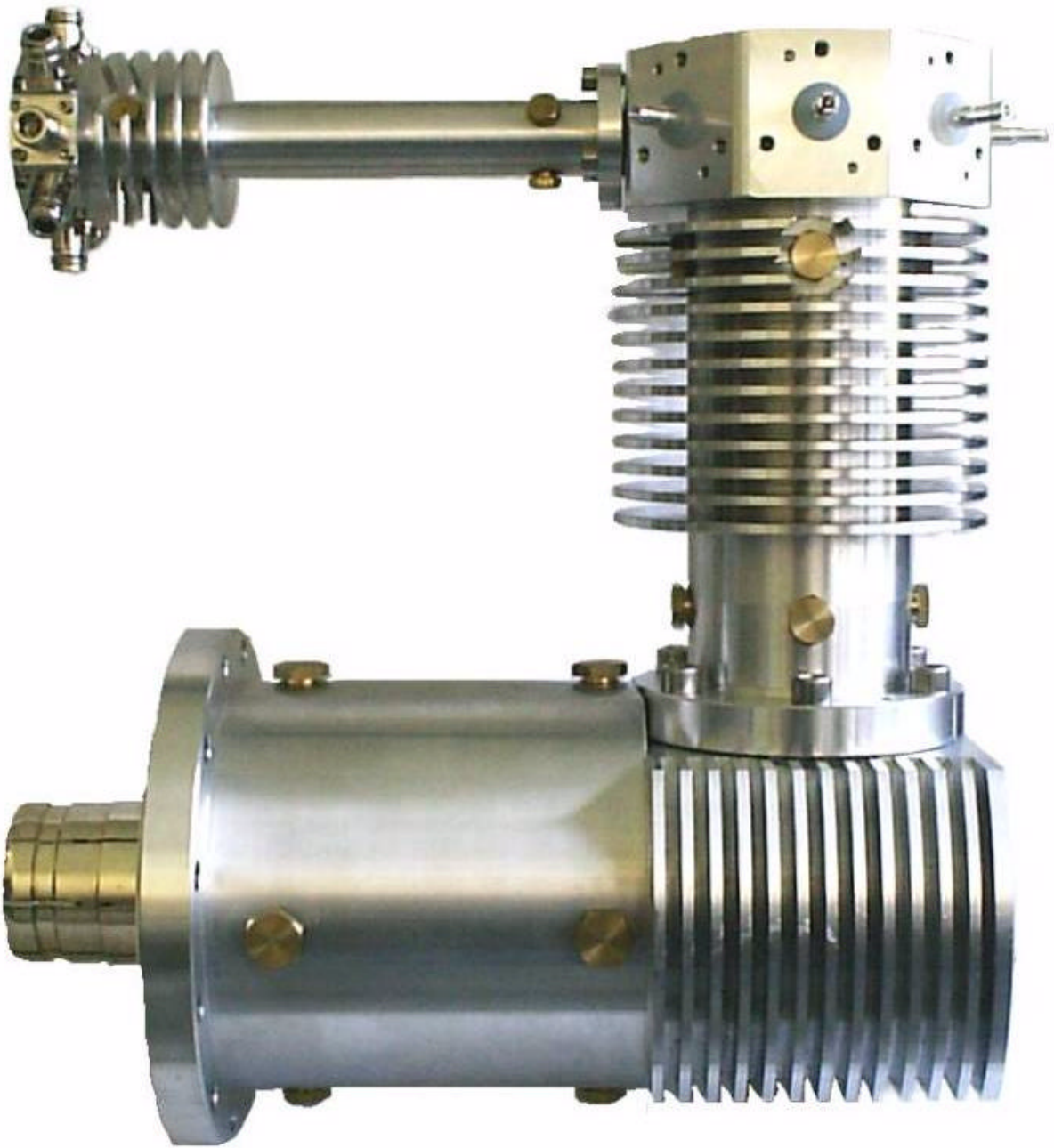
2-way 40 kW Combiner



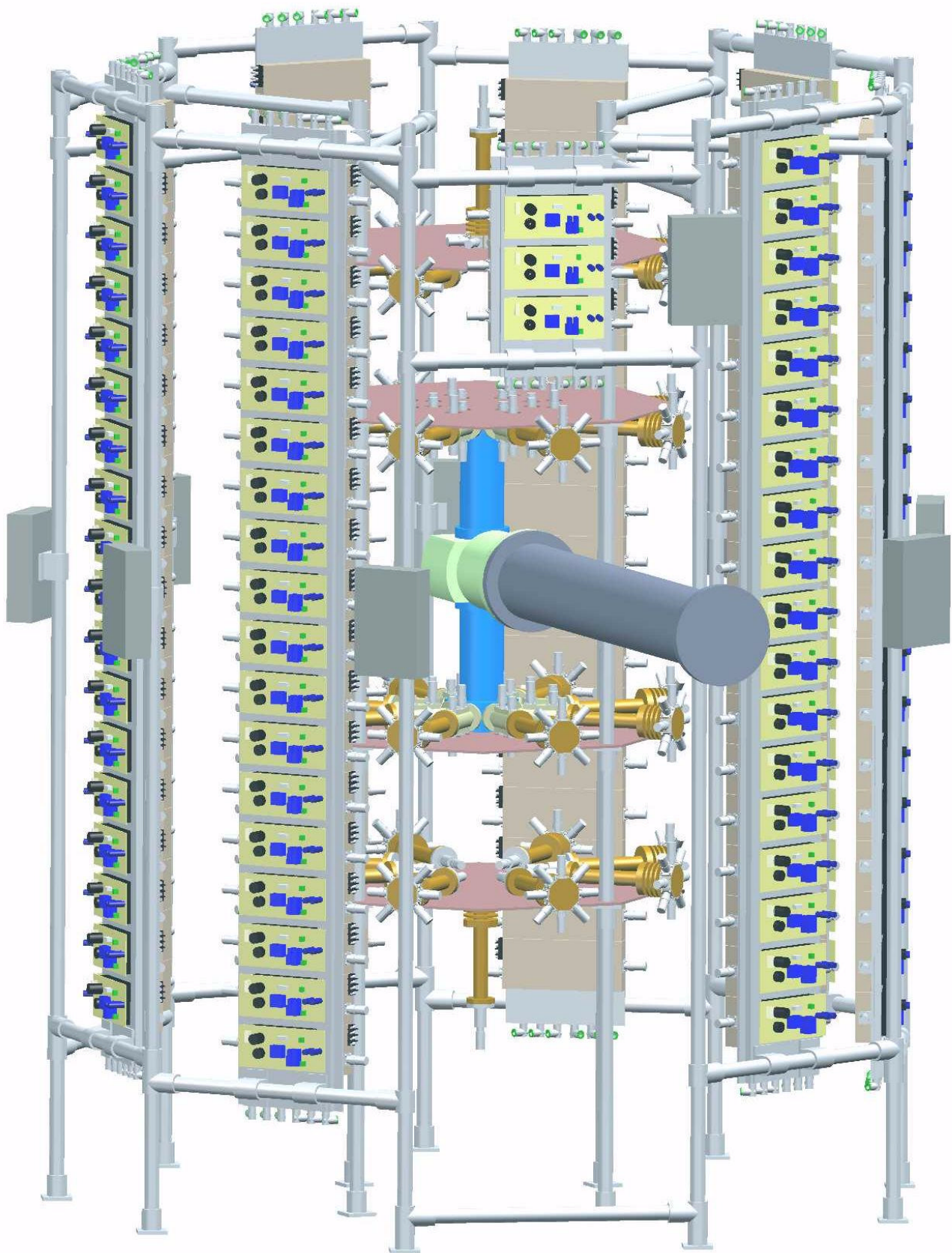
# 2-way 40 kW Combiner



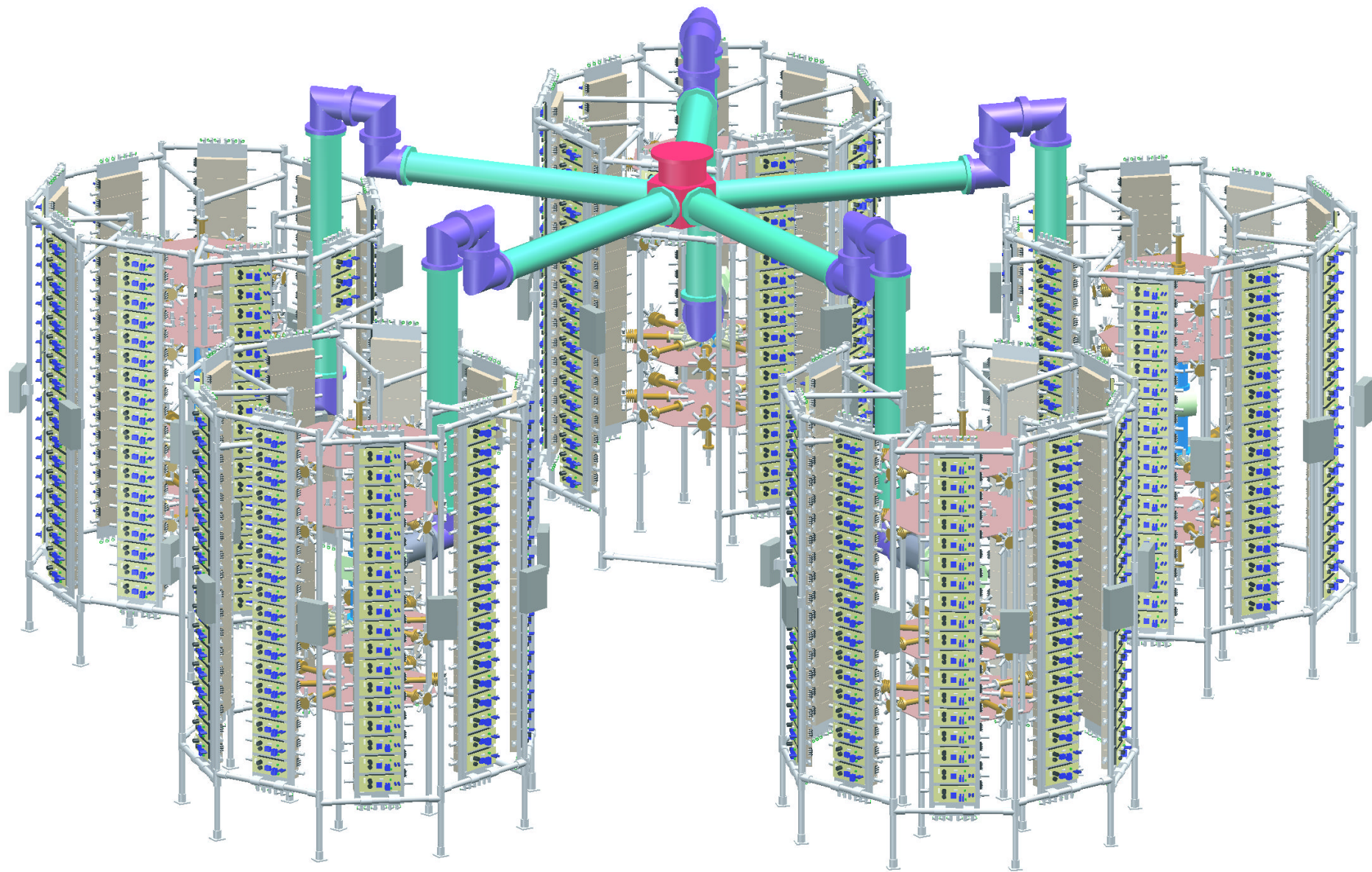
# 2-way 40 kW Combiner



**Assemblage Of Combiners**



40 kW RF Amplifier



**200kW RF MOSFET Amplifier**