

# Test Facilities and Component Developments

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# High Gradient Research Facilities at SLAC

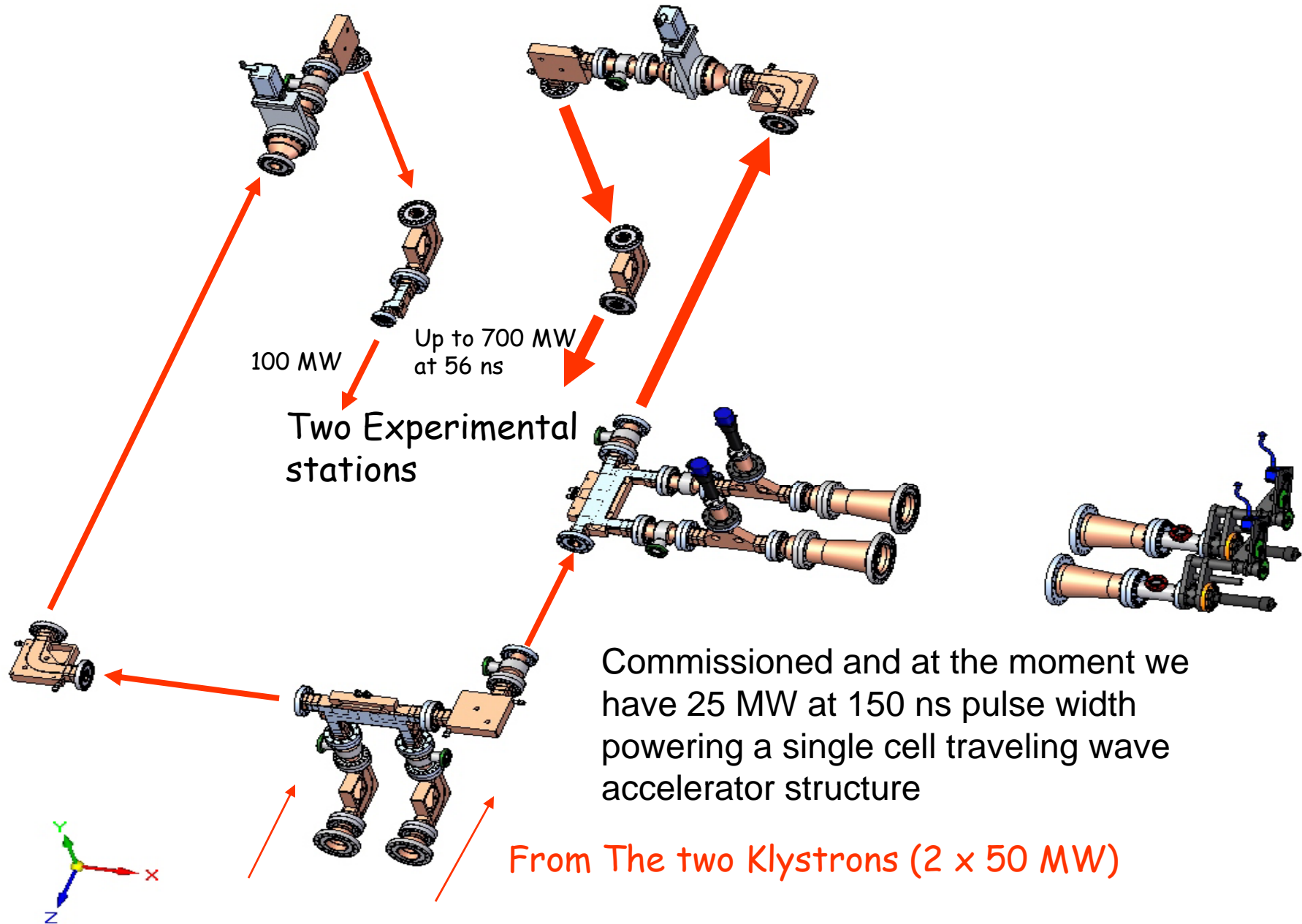
We concentrated on being accessible to the rest of the collaboration through Improving our test facilities

- 2-pack
  - new modulator have been installed and the system will be under vacuum and run for the first time in 5 years in the spring of 2008
- ASTA
  - powered by two 50 MW Klystrons whose 1.5 us pulses are combined and compressed using SLED-II expected to produce up to ~ 500 MW
  - Cost effective testing through reusable couplers and supply compatible flanges. Hence, other groups need only to worry about the design of the accelerator structure “proper”
  - We are introducing new types of gate valve to minimize, time, effort and cost for installation of different experiments
  - a very versatile pulse length and output power
  - **ASTA was put back together and started its initial commissioning in Jan 2008.**
- individual stations:
  - Two Individual Stations, each have 1 50 MW klystron with 1.5 us pulse width.
  - **very productive, more than 12 experiments have been conducted in these stations in 2007**
- NLCTA
  - Station 1 and 2 each are powered by two 50 MW Klystrons whose 1.5 us pulses are combined and compressed using SLED-II and Have two, 2.5 m slots for structures. It Can run 24/7 using automatic controls
  - Six week run of CERN HDX11-Mo quadrant structure - gradient at a  $10^{-6}$  breakdown rate with 70 ns pulses only 60 MV/m.
  - Run slotted,  $a/\lambda = 0.18$ , 75 cm NLC structure (H75vg4S18) with 150 ns pulses - at 102 MV/m, breakdown rate =  $6 \cdot 10^{-6}$ .
  - Run early NLC, non-slotted, 53 cm, smaller aperture ( $a/\lambda = 0.13$ ) structure (T53vg3MC) at short pulses - gradient at a  $10^{-6}$  breakdown rate with 100 ns pulses is 105 MV/m. **Have ran about 2200 hours since structure installed in 4/07**

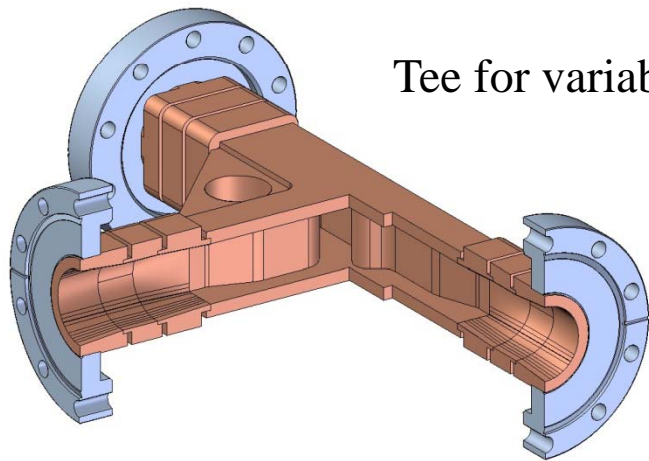
# Pulse compressors at ASTA and Two-Pack

- All New overmoded components for high reliability (So that we are testing structure rather than RF system)
- Flexible pulse length and gain
- High efficiency
- Each is powered by two klystrons

# ASTA Pulse Compressor

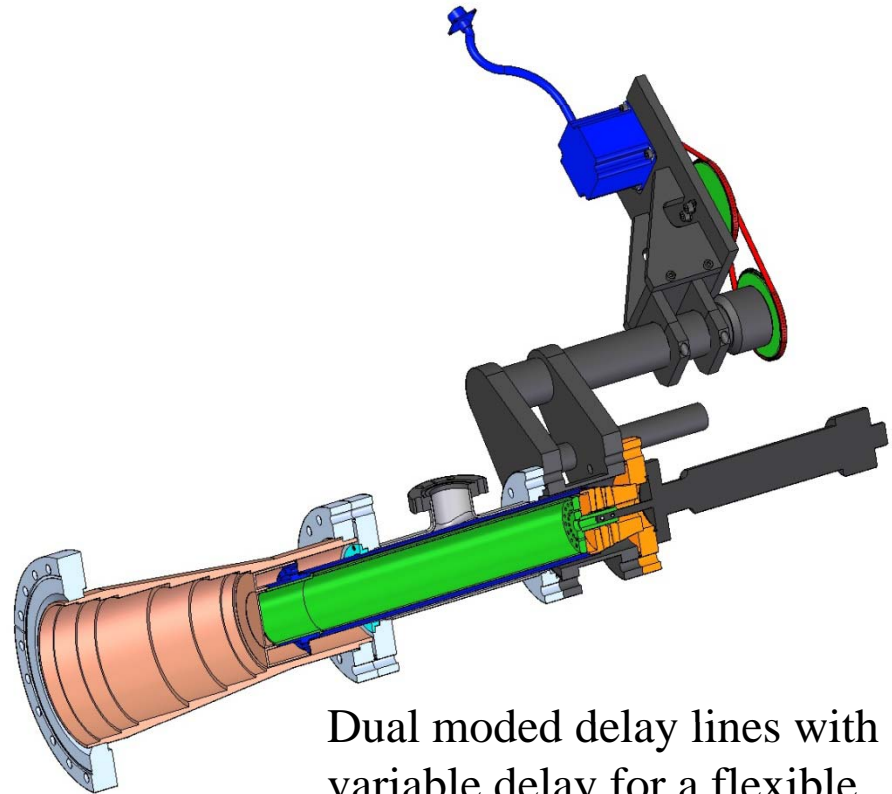
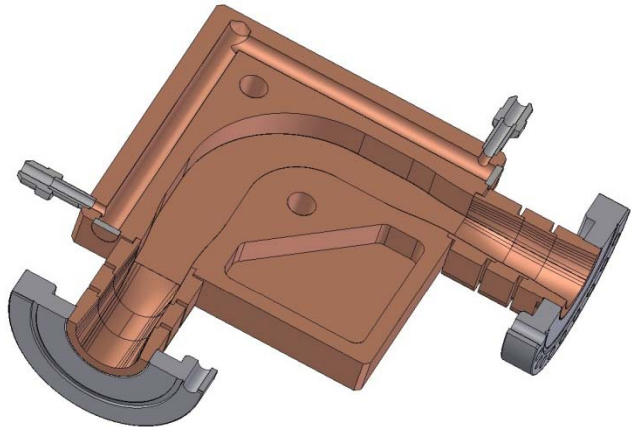


# Components To Support The Experimental Facilities



Tee for variable iris

Bends for low loss transmission and reliable RF systems



Dual moded delay lines with variable delay for a flexible pulse width

All these components have designed and in different stages of manufacturing

# ASTA (Continued)



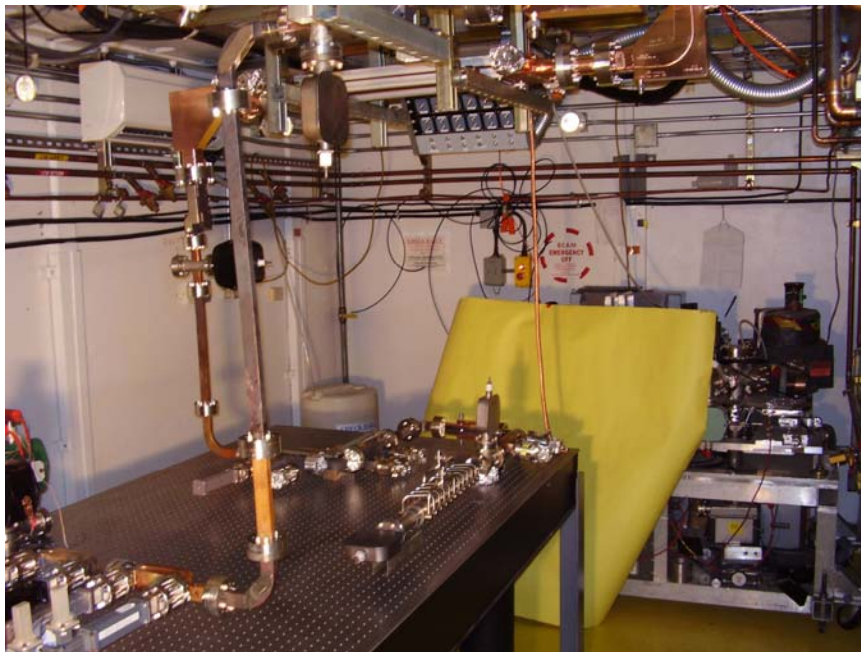
The uncompressed arm has a variable phase shifter and a gate valve



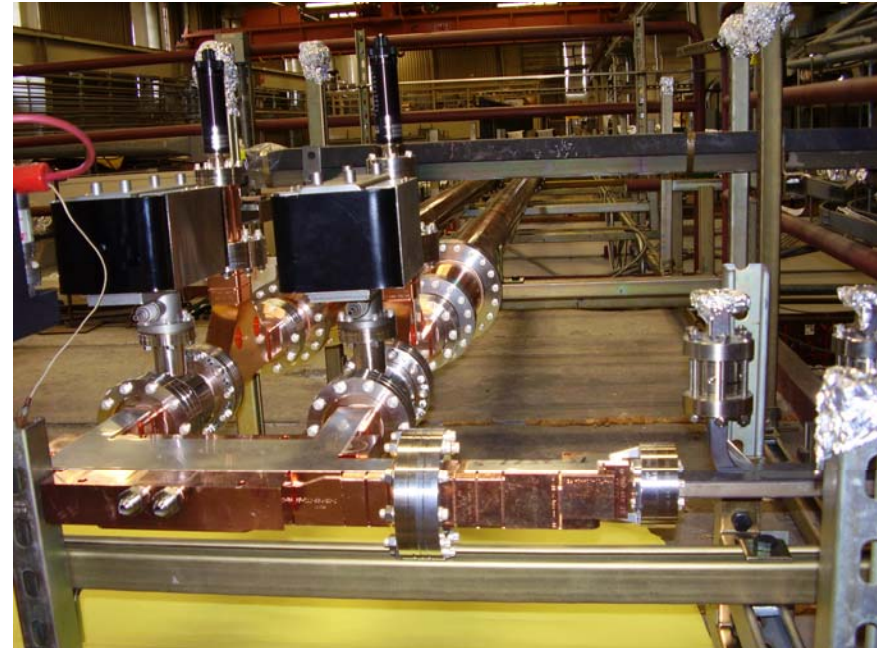
The ASTA pulse compressor with variable delay delay-lines( Miller cup)

# ASTA

- ASTA has been rebuilt and is being commissioned with two test stations, one with a pulse compressor and another without.

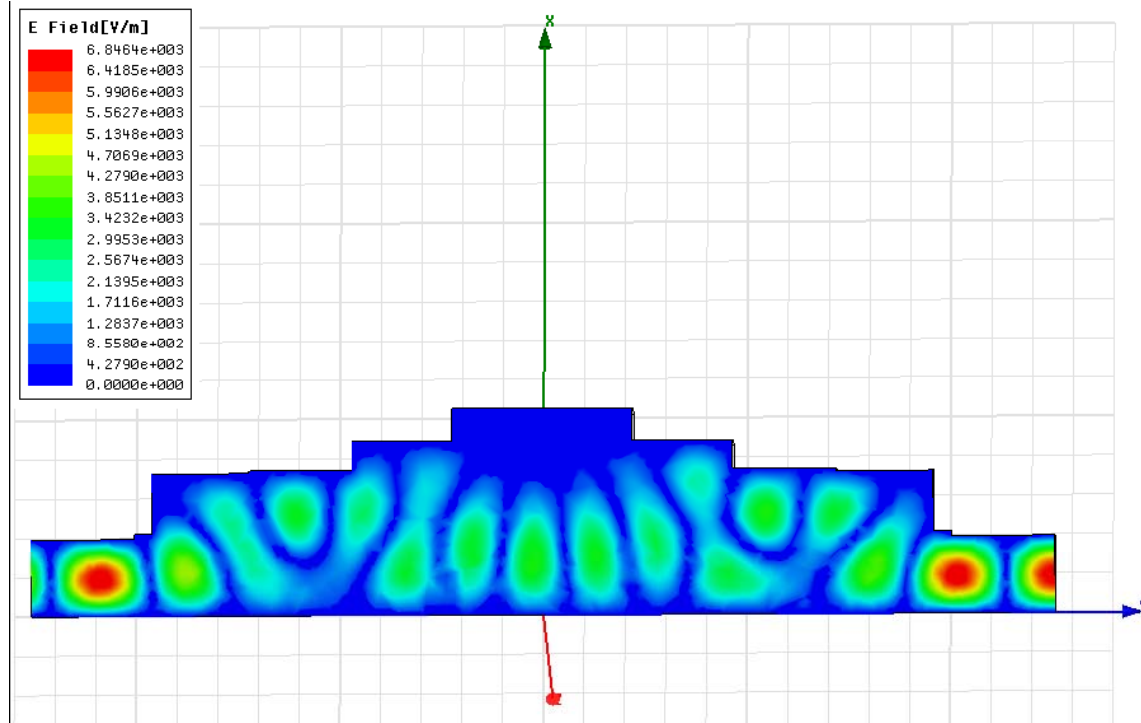
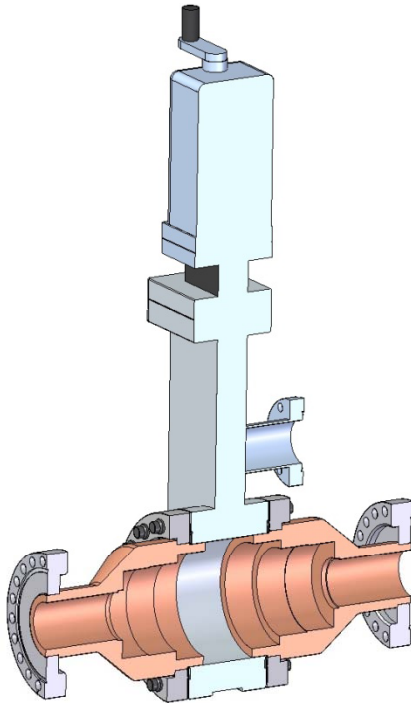


Two feeds for the two experimental stations inside the ASTA bunker



The ASTA pulse compressor with variable iris

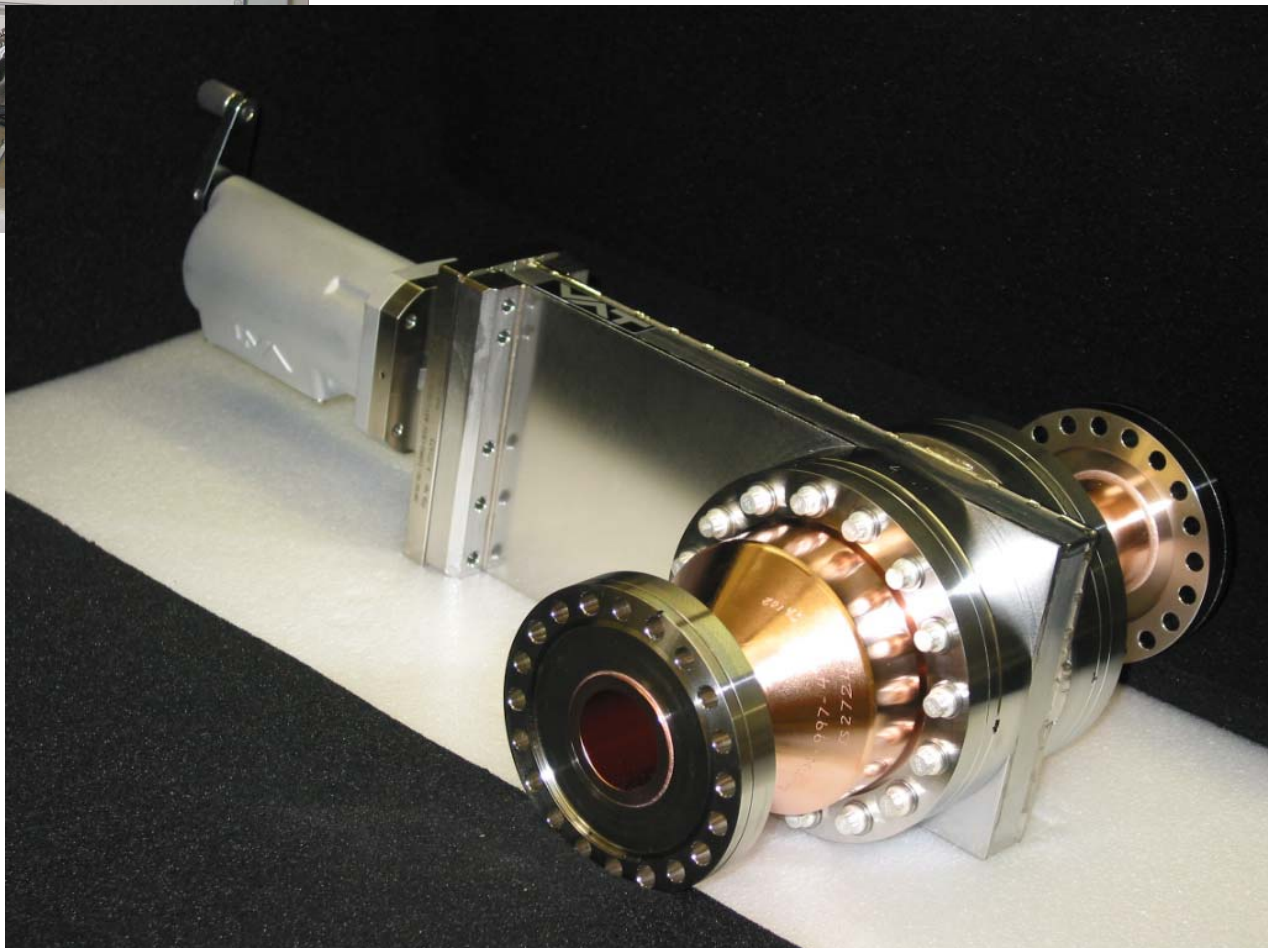
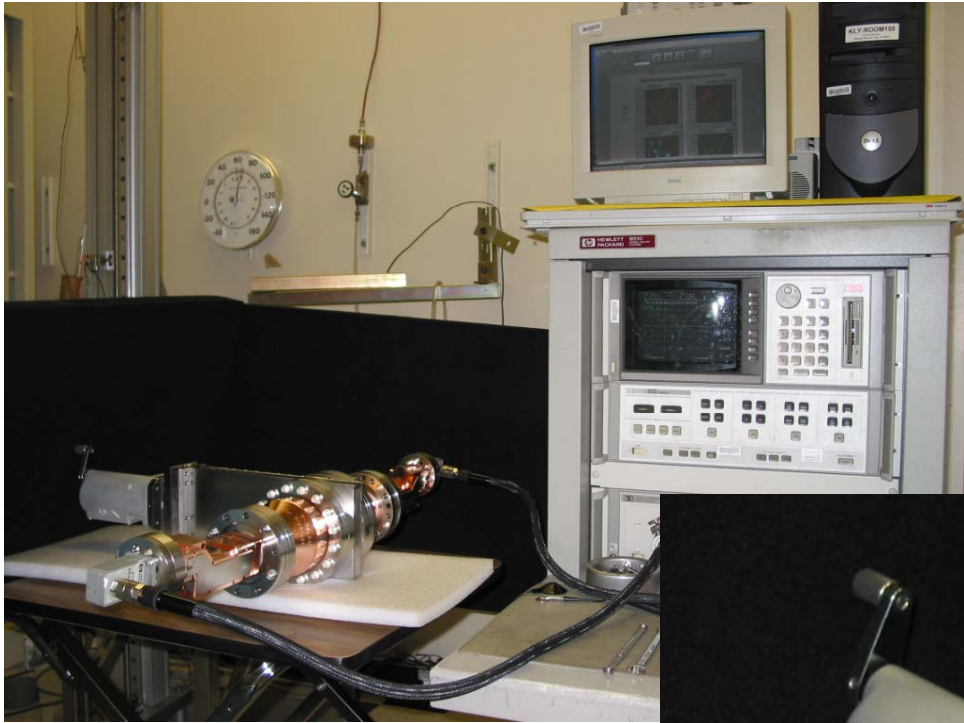
# Gate Valve

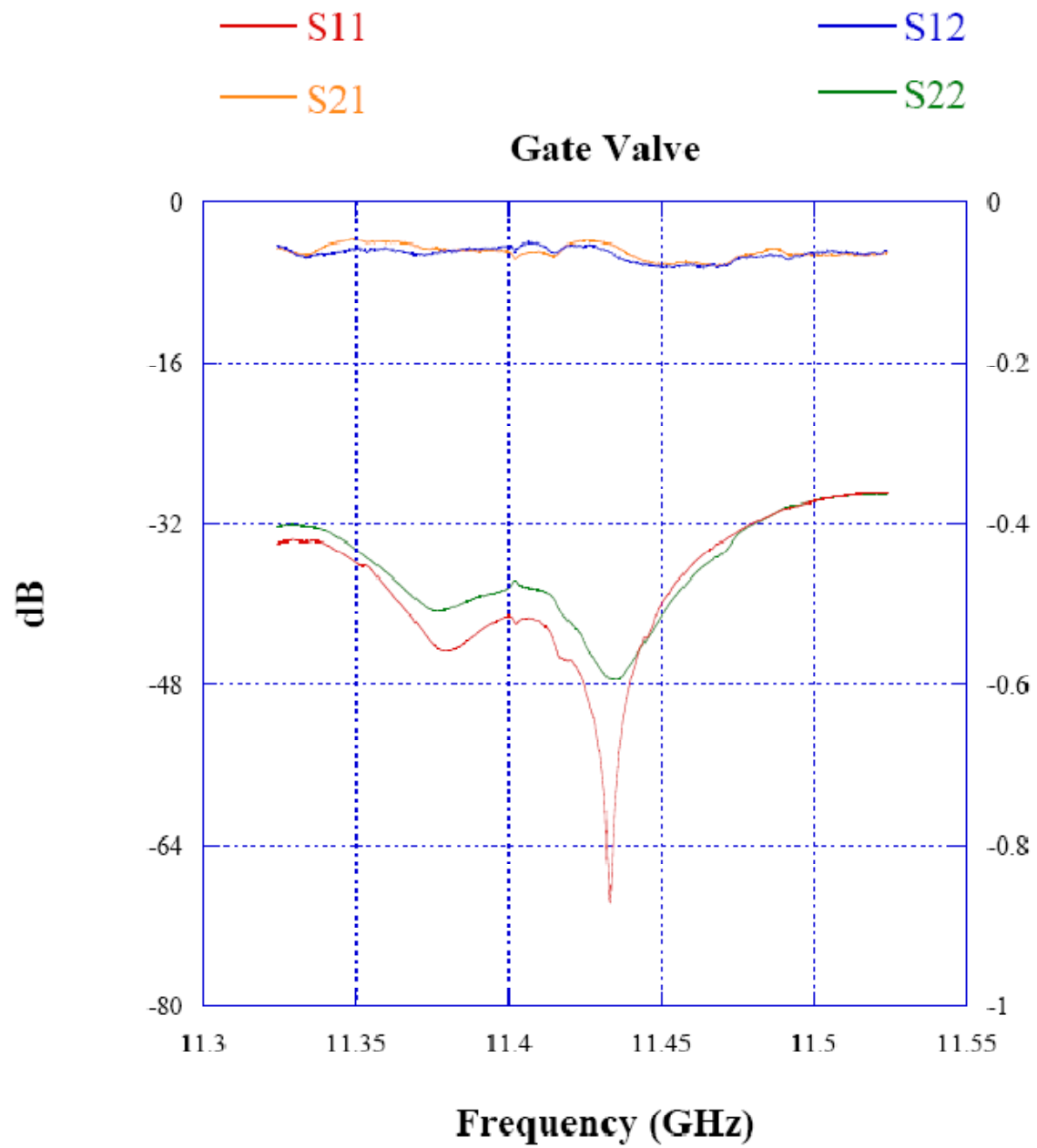


We have designed a new type of gate valves to allow fast exchange of experimental structure. This will cut the change time from a week to one day (so far it has been tested to 300 ns at 100 MW)

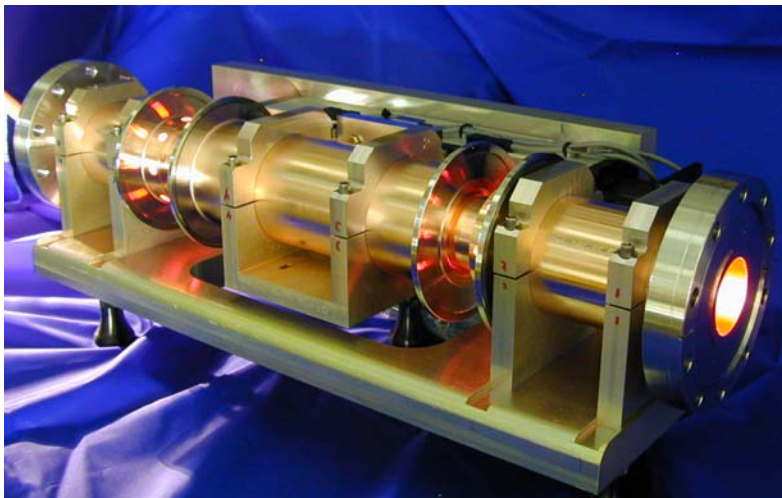
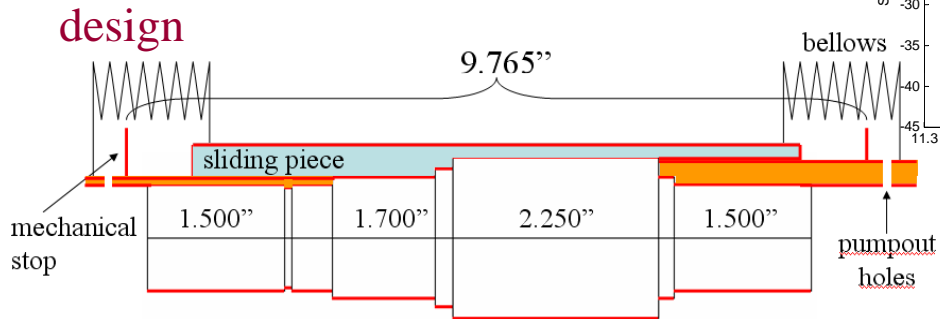
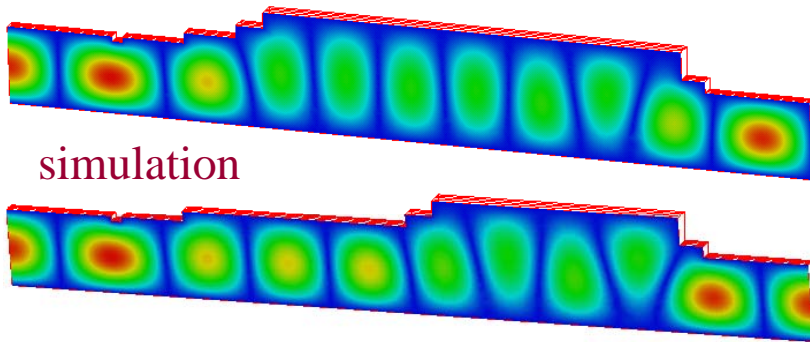
A. Grudiev, "Development Of A Novel Rf Waveguide Vacuum Valve," Proceedings of EPAC 2006, Edinburgh, Scotland



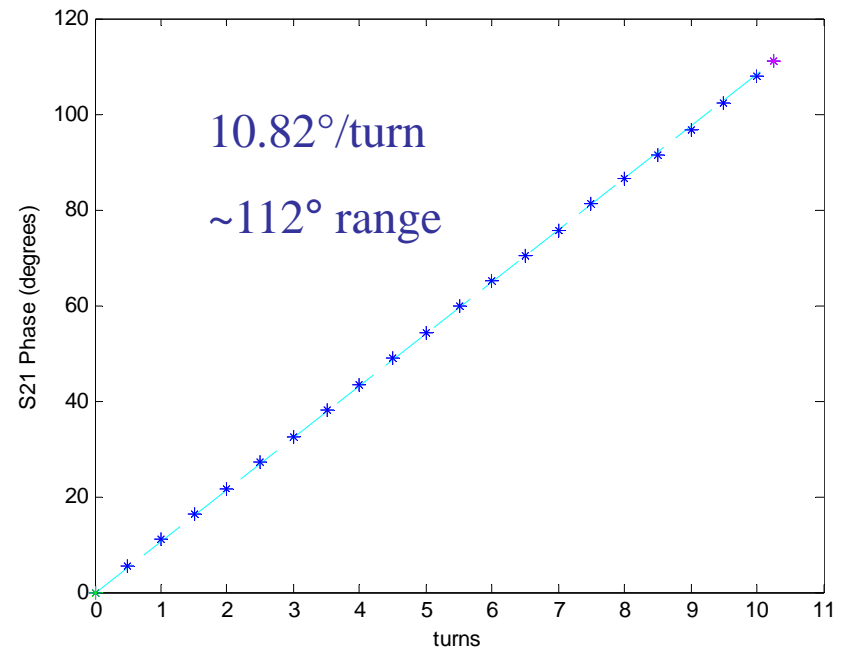
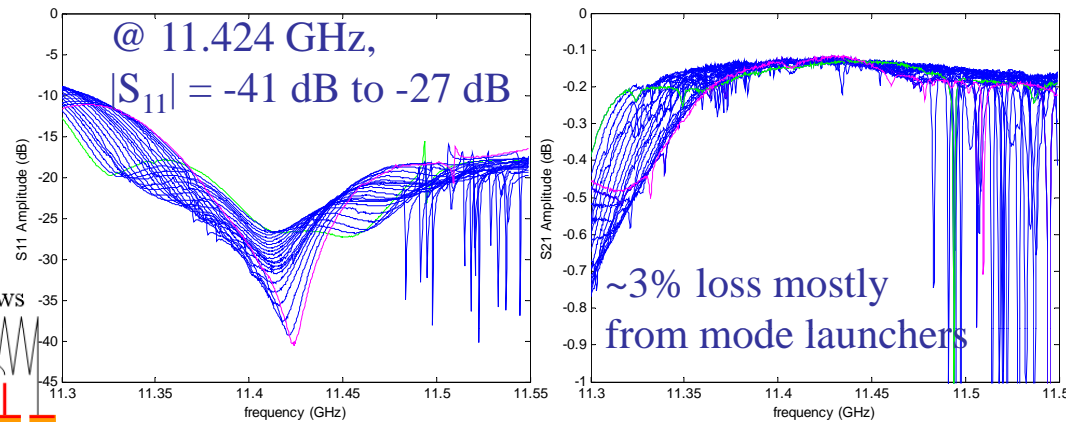




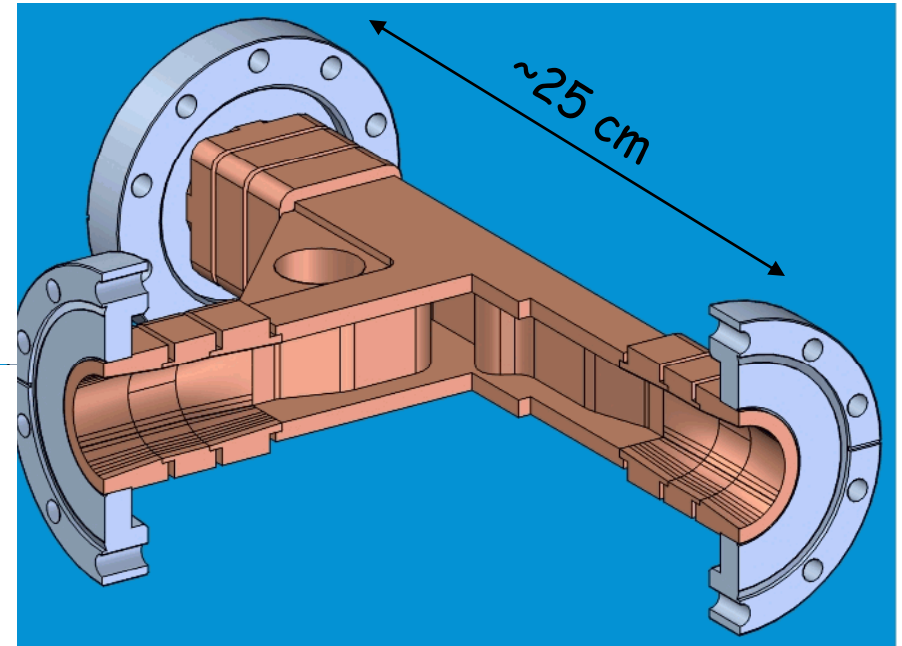
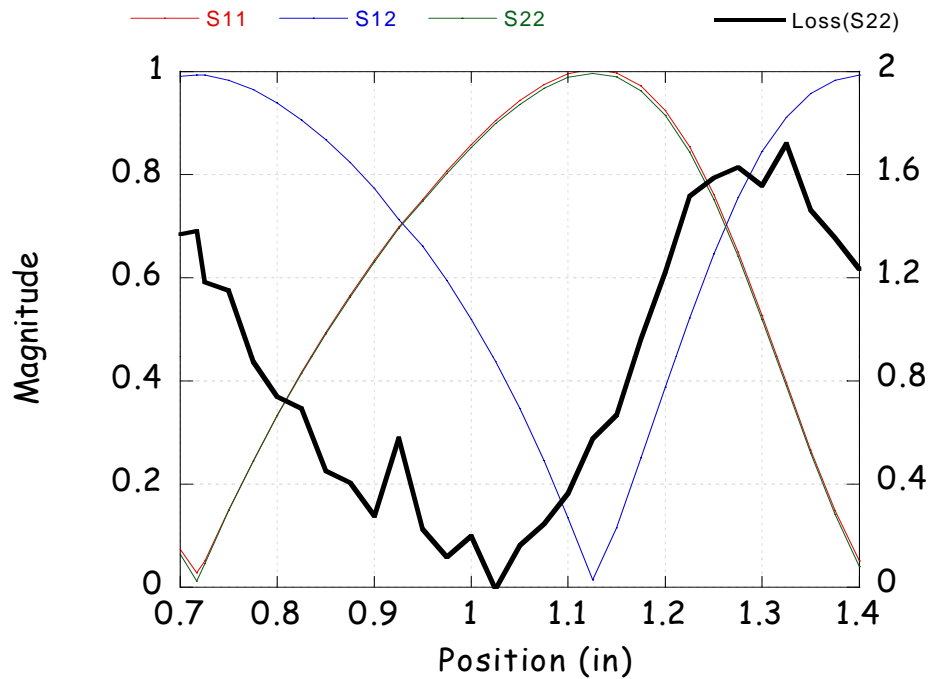
# Circular TE<sub>01</sub> Mode Slide Phase Shifter



cold test results

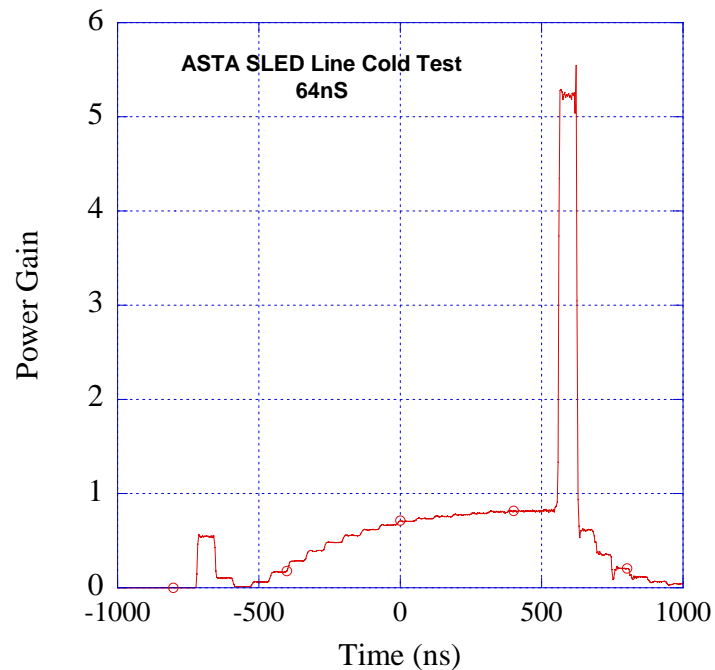


# TE<sub>01</sub> Mode Tee (Variable Iris)

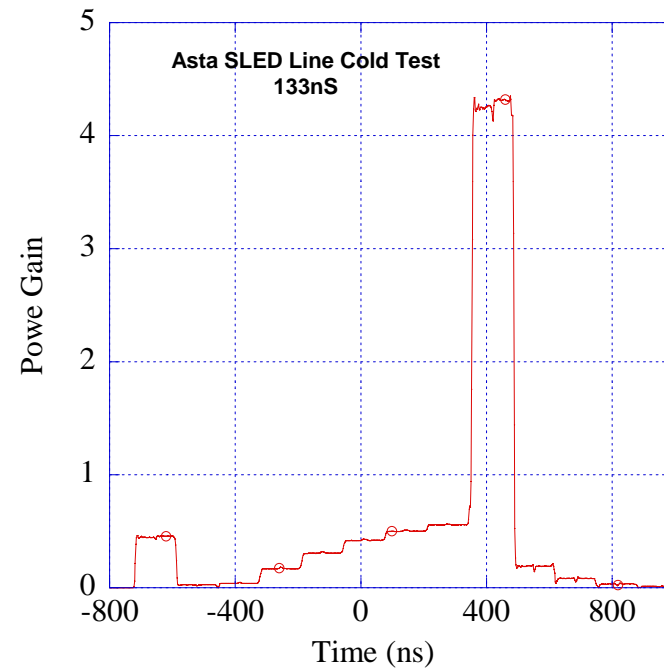


- The Tee body is planar rectangular guide operating in the TE<sub>20</sub>
- We Taper from Circular to Rectangular with a special taper which generate the TE<sub>01</sub> mode

# ASTA Pulse Compressor Cold Tests



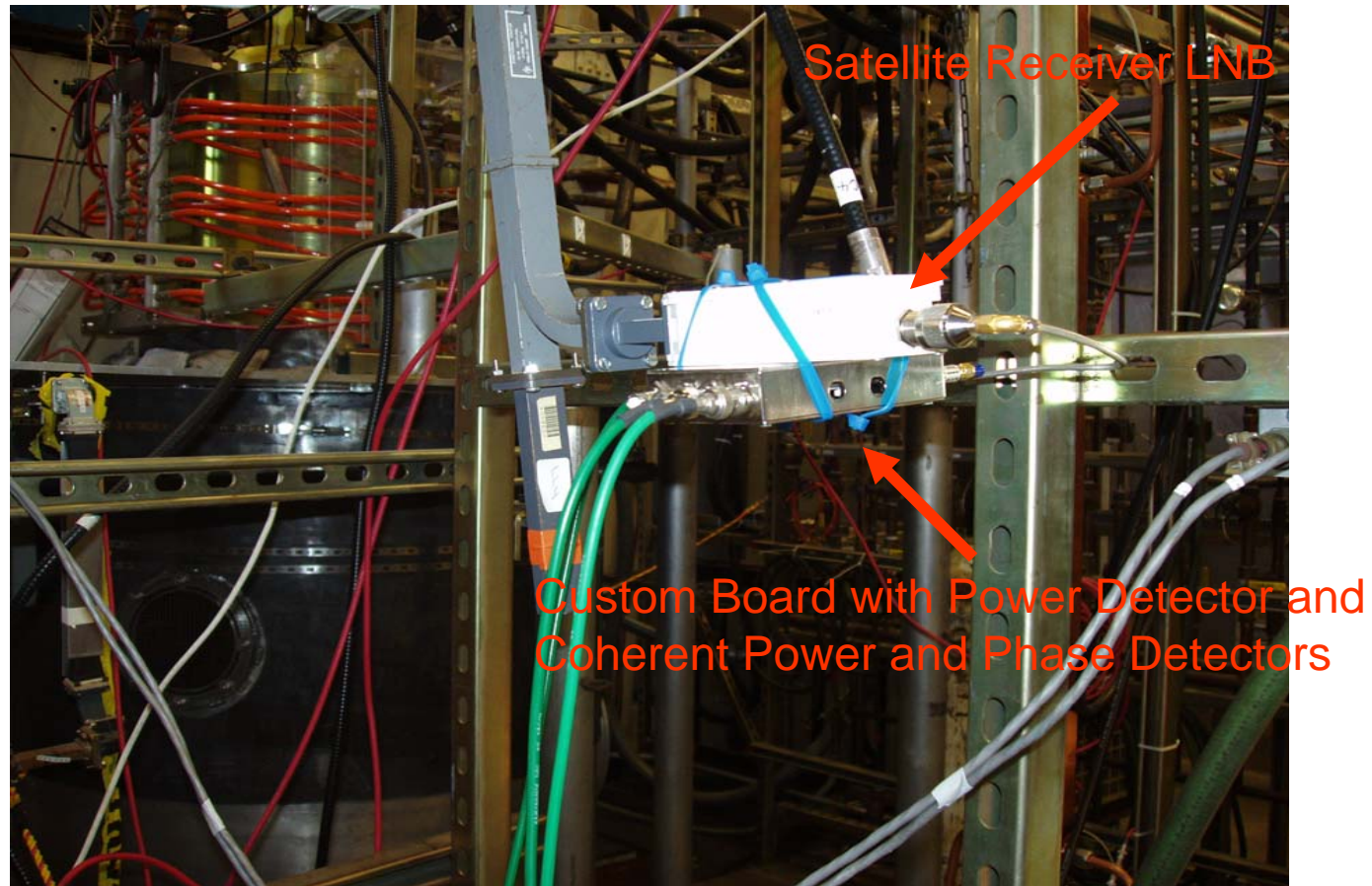
Test with a single mode in the delay line



Test with a dual-mode in the delay line ( the Miller cup is tuned for two modes)

With input pulse modulation one gets a gain of about 3 at 266 ns and a gain of about 2 at 399 ns

# Low-Level RF and Data Acquisition



# High-Power RF Load Research

## CeSiC Material

- High Thermal Conductivity ~equivalent to Al
- Electrical conductivity is about  $65 \text{ (Ohm cm)}^{-1}$
- Research on mechanical properties and manufacturing techniques is under way
- High power tests are planned.

