Front End Setup in Meson
for High Intensity Neutrino Source

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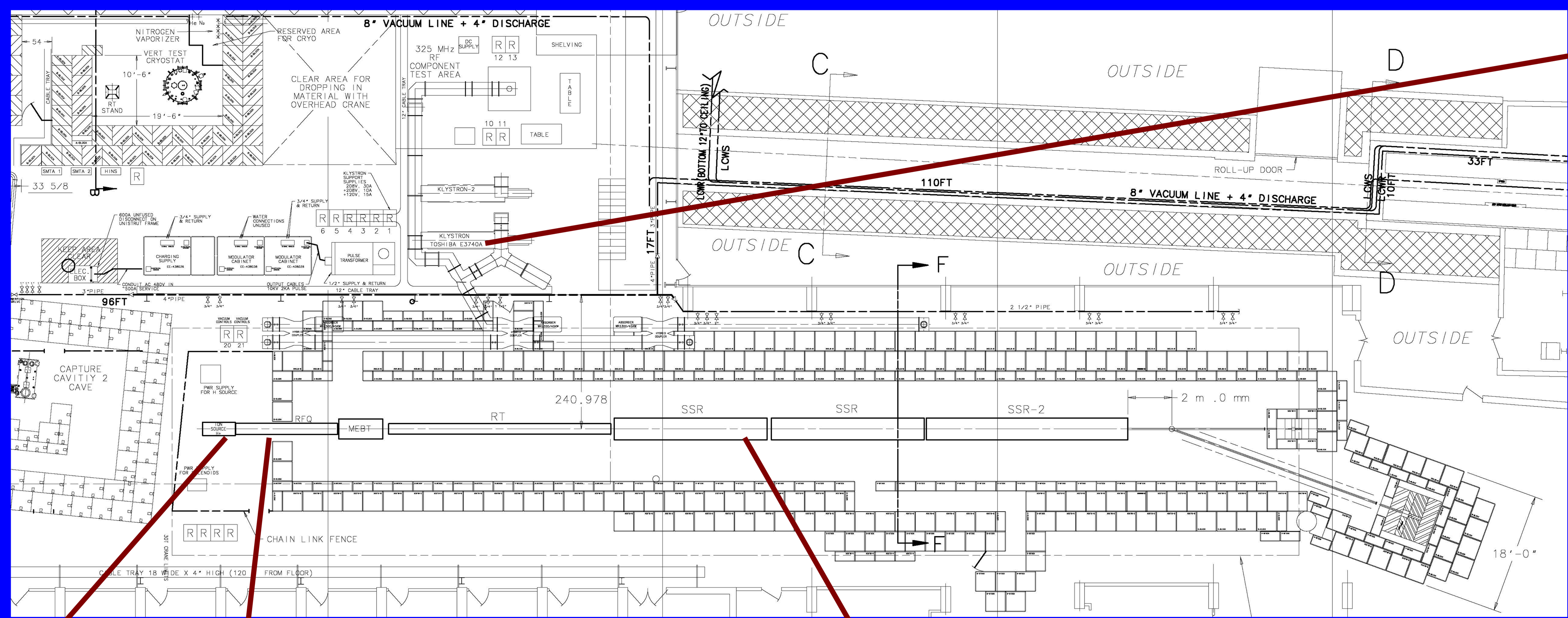
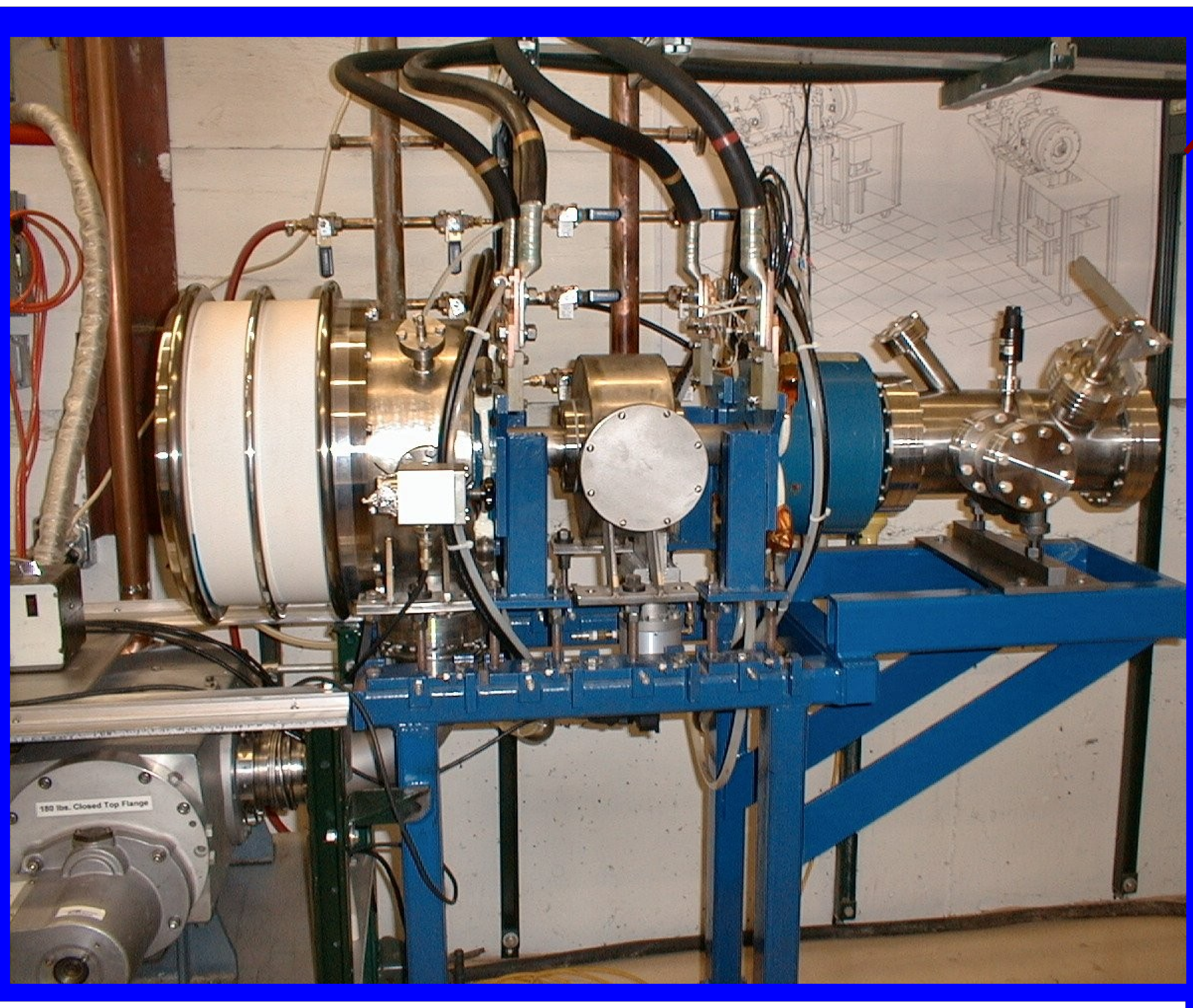
The **High Intensity Neutrino Source (HINS)** initiative has embarked on a plan to study new and innovative designs in linear accelerator technology for producing the next generation, high flux neutrino source. The first task of the initiative is to construct a 60 MeV, H^- linear accelerator that could be used as the front end of a larger 8 GeV linear accelerator. The purpose of the accelerator is to act as a test system for new technology and paradigms for a high flux neutrino source. One of the new paradigms being tested by the accelerator is using **a single, high power klystron to power multiple RF cavities**. One klystron will be used to power the entire 60 MeV linac, and individual cavity and amplitude control will be performed by new, high power RF, **ferrite vector modulators**. Other new paradigms include the use of short, high field, **superconducting solenoids** as the primary lattice focusing elements, and a low energy transition from room temperature to superconducting RF acceleration (10 MeV). Some of the components being tested on the new accelerator are: a **45mA ion source, room temperature and superconducting spoke resonators,** a fast beam chopper**, and ferrite vector modulators**. This accelerator is being assembled in the Meson building of the fixed target line.

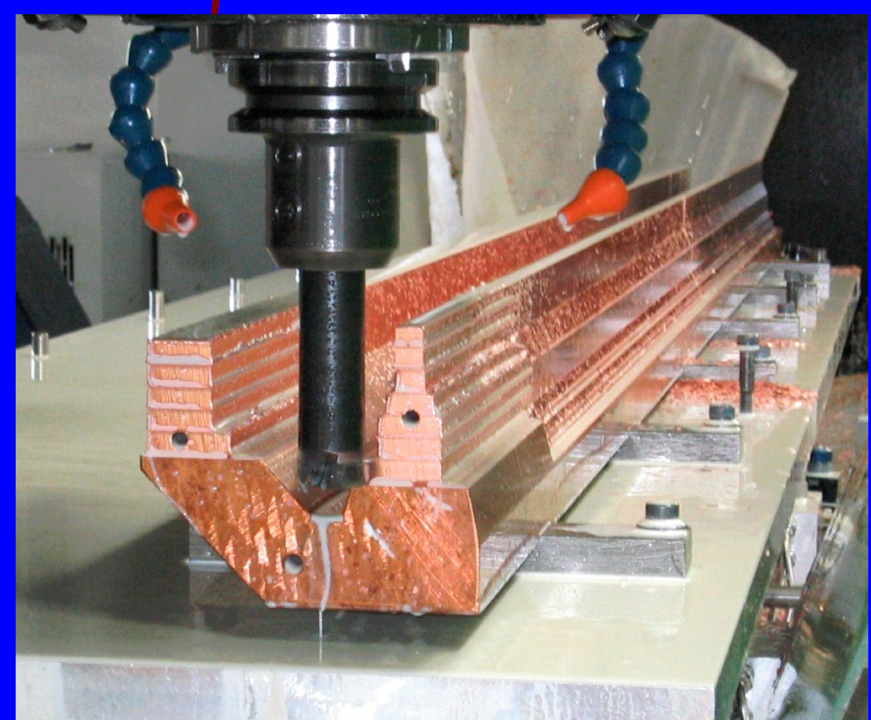
Plan for 60 MeV Linac in Meson:
This drawing shows the current plan for the construction of a 60 MeV linac in the Meson facility. The four main sections of the design are: the beam line, the power sources, the component test area, and the cryostat test cave. Construction is complete except for the beam line. The low energy beam line enclosure is complete.



2.5 MW Klystron:
This 2.5 MW, 325 MHz klystron from Toshiba will power all of the RF cavities and RFQ in the 60 MeV linac. The klystron is commissioned and has already been utilized for RF component testing.

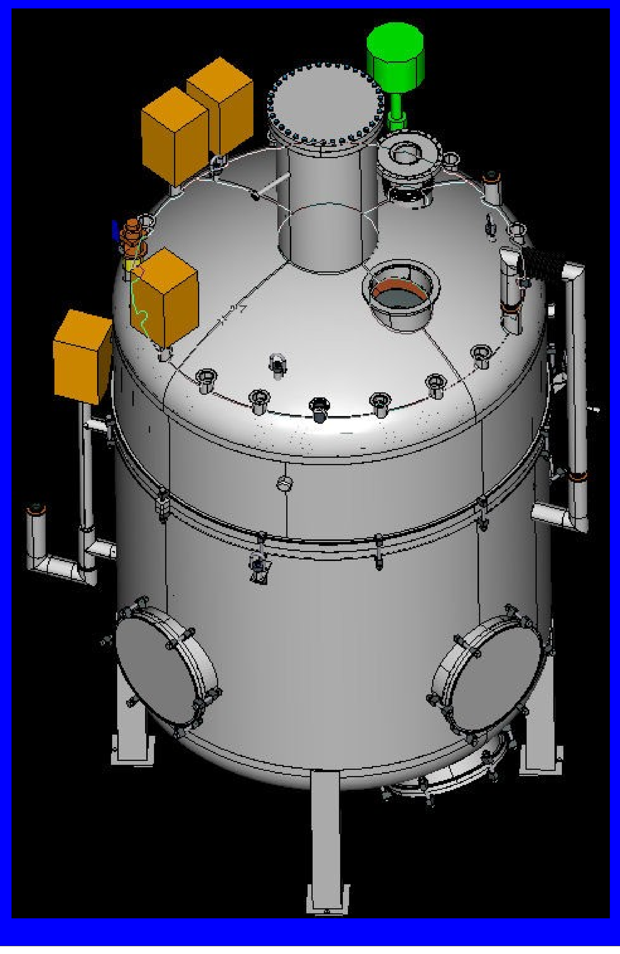


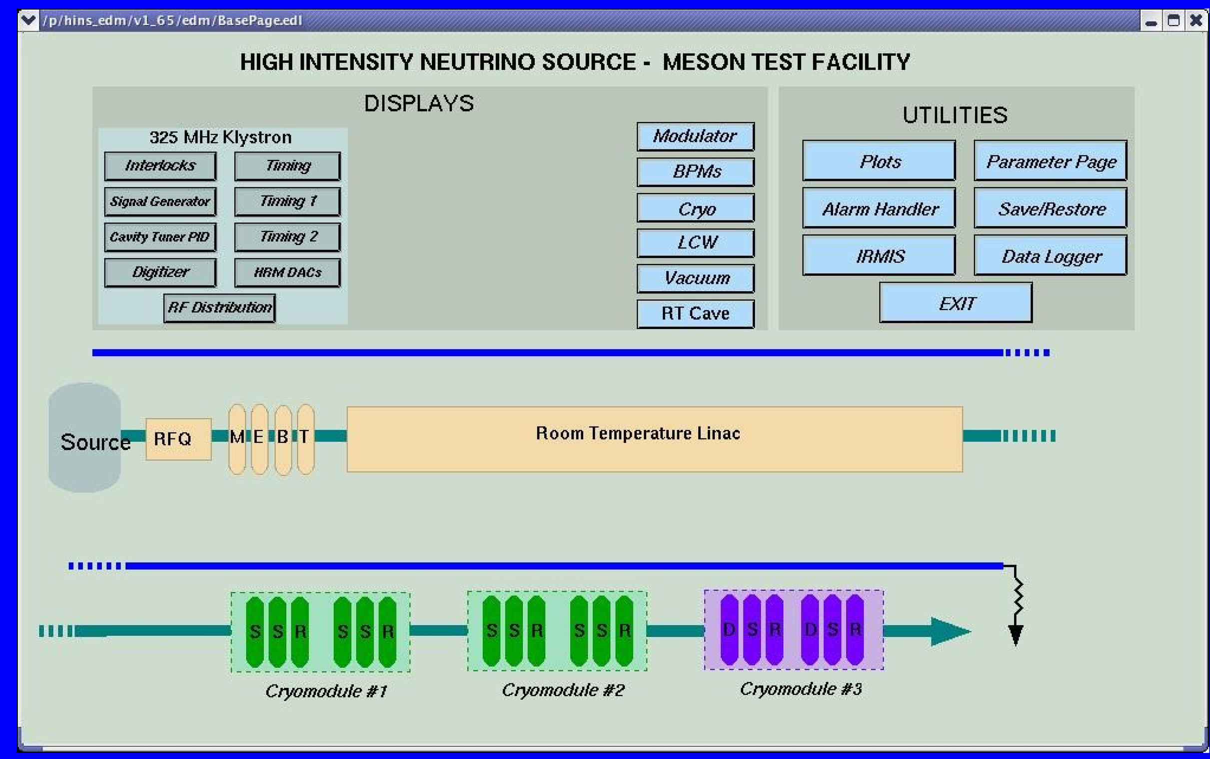
Ion Source & LEBT:
The ion source & LEBT are currently being constructed in MS6. The first H^+ source, capable of 12mA, has been tested. The system will move to Meson in October of 2007.



RFQ:
This RFQ vane is part of a design to accelerate beam from 50kV to 2.5MeV and has a 450kW power handling capability. Construction of RFQ is complete. Tuning and testing should be completed by November. Delivery by December.

SSR Superconducting Cavities:
The final 50 MeV of acceleration is provided by a series of single spoke superconducting resonators. Two styles of cavities will be created: β=0.22, β=0.4 (the first style illustrated to the left). Testing of the β=0.22 superconducting resonators has begun.





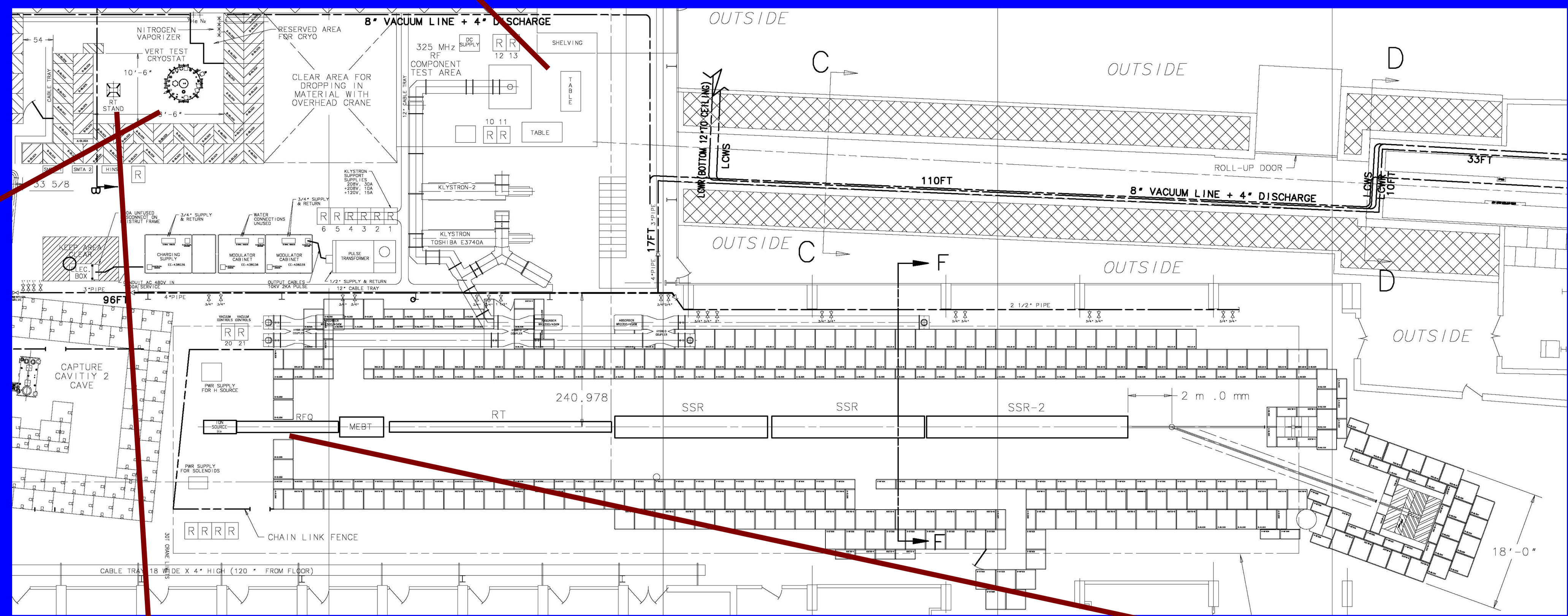
EPICS Control System:
Control of the linac is based on the EPICS system. This system is standard at other laboratories and has provided collaboration compatibility with the Spallation Neutron Source and ILC R&D. The system is currently in operation and has worked during commissioning and testing of high power RF components.

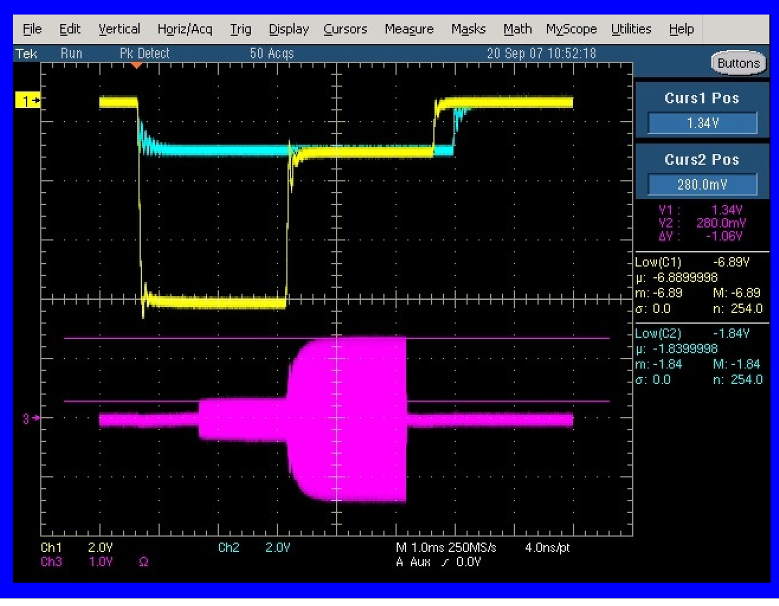
325 MHz RF Component Test Area:
This area of the facility will be used to verify specifications of individual, high power RF components. Examples of components to test include phase shifters, circulators, hybrids, couplers, and completed ferrite vector modulators.

Status of Other Components

- Fast chopper pulser prototyping is underway.
- Buncher cavity design is complete.
- RT cavities #2-4 are being fabricated.
- RT SC solenoid+trim magnet design and prototyping is complete and production order is placed.
- Full voltage CW test of first SC spoke cavity will happen in ILC Vertical Test Stand.
- Long-term scope and resources of HINS R&D program will be re-assessed in the context of Project X.

325 MHz Test Cryostat:
This section of the facility will be used for superconducting cavity testing. A rendering of the test cryostat design is shown above. RF power will be coupled from the component test area to verify cavity and coupler operating parameters. Design of the cryostat is nearly complete, and the order will be placed in early 2008.



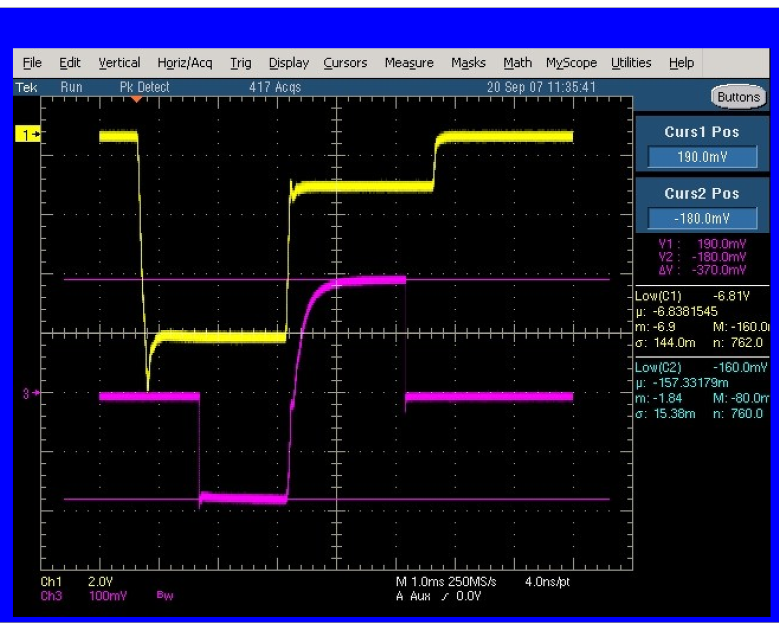


Amplitude Tuning Range of FVM:
Pink trace shows cavity gap voltage as FVM bias is changed. Tuning range is 13dB.

FVM **RT Cavity**

Room Temperature Cavities and Ferrite Vector Modulator (FVM):
The beam is accelerated from 2.5MeV after the MEBT to 10MeV by the RT cavity section. The RT cavities are 3 & 4-spoke resonators. This will be the first application of spoke resonators in a real beam situation. The picture to the left shows a RT cavity set up for a high power test with a FVM. This prototype cavity was conditioned and tested successfully up to 12 kW. The FVM was conditioned and tested individually up to 45 kW and with the cavity up to 6 kW. The plots to the left of the picture illustrate the effect of the FVM on the cavity gap monitor.

Low Energy Beam Line Enclosure



Phase Tuning Range of FVM:
Pink trace shows phase detector voltage as FVM bias is changed. Tuning range is 155°.