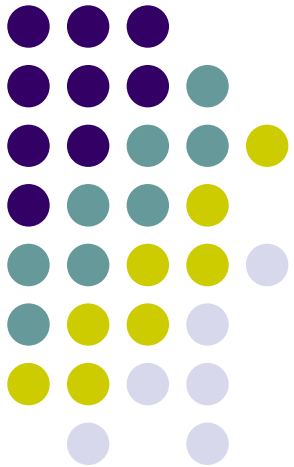
TOF High Voltage Systems



Details of the TOF High Voltage System.

- The STAR TOF High Voltage System will provide High Voltage bias to the TOF MRPC modules arranged in groups of 32 in TOF trays. Each tray will be supplied with two floating high voltage bias supplies of up to ± 7.5 kV @ maximum operational current of 1-2 μA/tray (scaled to RHIC II luminosities using current values from RUN 5) .

- The ground for the two floating HV inputs (one positive and one negative) is defined at the distribution boxes which are attached and grounded to STAR magnet.

- Due to the cost of the HV, **one pair of floating outputs from the HV supply will be fanned out into 12 outputs which would supply the ± HV to each tray**. This will be done using 10 HV distribution boxes located in two groups of 5 on the East and West ends of the STAR magnet, respectively. Ten pairs of HV outputs are needed to supply the HV to all 120 trays.

- The **high voltage power supply will be CAEN SY1527LC HV mainframe**. It will be equipped with **four A1534** high voltage modules to supply the HV to the trays. **Each A1534 floating output is capable of supplying 200 μA @ 8 kV (max.)**
  - **Two A1534P** will supply 12 floating, positive voltages (6 outputs per module)
  - **Two A1534N** will supply 12 floating, positive voltages.
  - 10 pairs will be used to supply HV to TOF trays using HV distribution boxes as fanouts and two pairs will be used as spare channels.
  - Each HV channel has a current and voltage limiting built into internal circuitry.
  - A potentiometer on each A1534 allows one to limit maximum output voltage from each module.
  - The power supply includes over temperature circuitry that disables the unit in case temperature exceeds a preset value.
  - All the parameters of the HV, including the value of the HV to be set and monitored (**1 volt resolution**) , HV current and trip current limits, (**20 nA resolution**), temperature, HV ramping rates are accessible remotely via an Ethernet port and TCP/IP (OPC server).

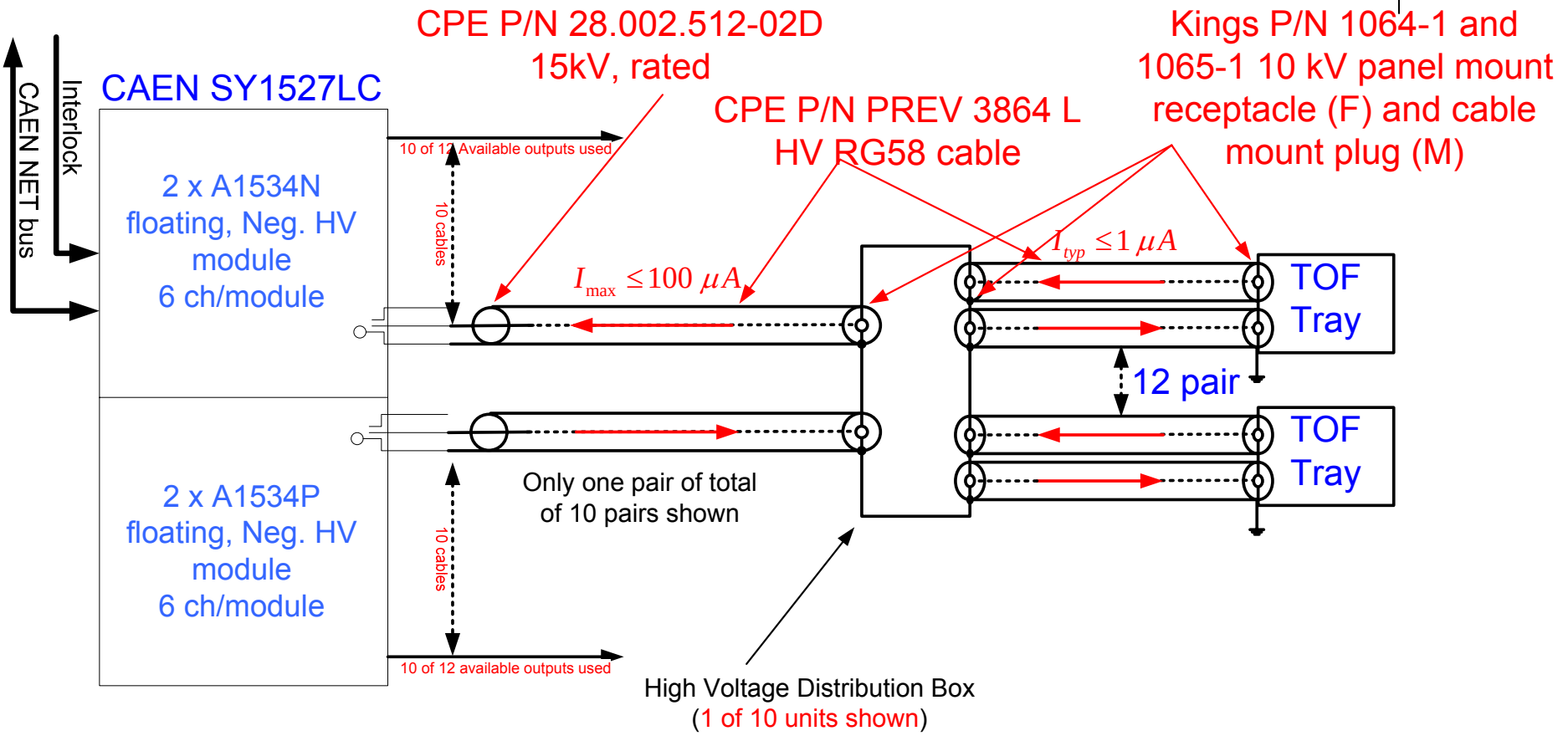
- A pair of HV outputs from an A1534P and A1534N floating supplies will be fanned out to 12 TOF trays using the HV distribution boxes located on the ends of the STAR magnet.
  - The distribution box distributes + and – HV to each tray using 20 MΩ high voltage [2 W, 15 kV rated] in series current limiting resistors along with HV filtering capacitors [15 kV @ 1000pF] to:
    1. Isolate one tray HV from the others
    2. To filter the HV to each tray individually.

- Each distribution box will consist of two 0.093" FR4 printed circuit boards [one PC board for each polarity]. The PC boards will be coated with HV conformal coating [Chemtronics Kon Form SR or AR] to prevent discharge and corona. **The common ground for the floating HV will be established by connecting the HV commons to STAR magnet ground**. The distribution box chassis will be metalic and will be attached mechanically and electrically to STAR magnet (will be grounded).

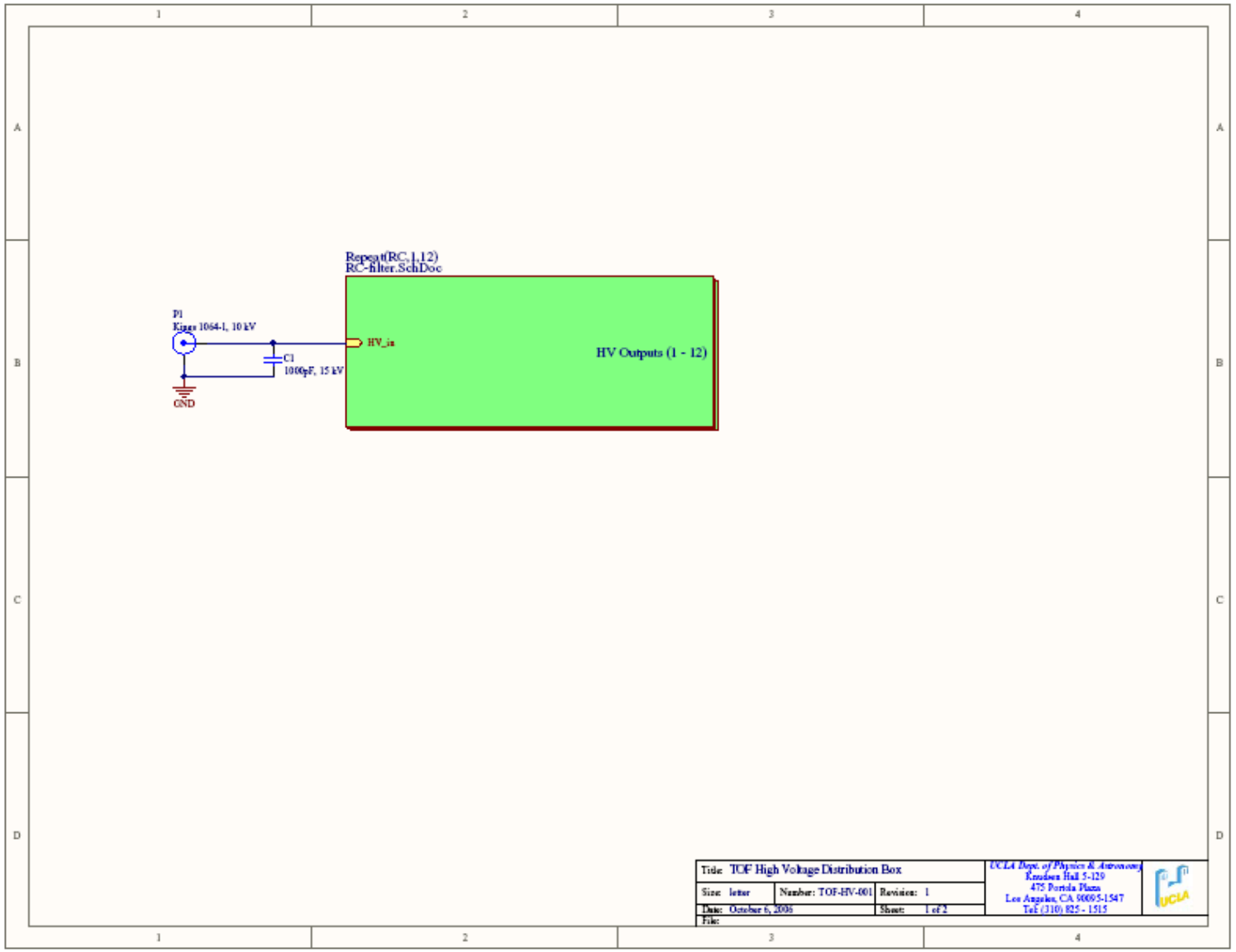
- There will be 12 pairs of special High Voltage RG58 cables [**CPE Italia P/N PREV 3846L**] (~ 80'-100') to transmit the HV current from the A1534P/N modules to the 10 HV distribution boxes. There will be 240 shorter cables to fanout the HV outputs from the ditribution boxes to the trays. The 24 ~100' cables connecting the to HV power supply outputs will use 15 kV rated CPE connectors [CPE P/N **28,000.512-019** male]. The PREV 3846L HV cable has been used in the TOF test beam setup during summer of 2006 at BNL. It is also used by Phenix collaboration. All other HV cables will use Kings 1065-1 (cable mount) and 1064-1 panel mount connectors.

- The High Voltage power supply interlock will be implemented using the rack AC power control box.

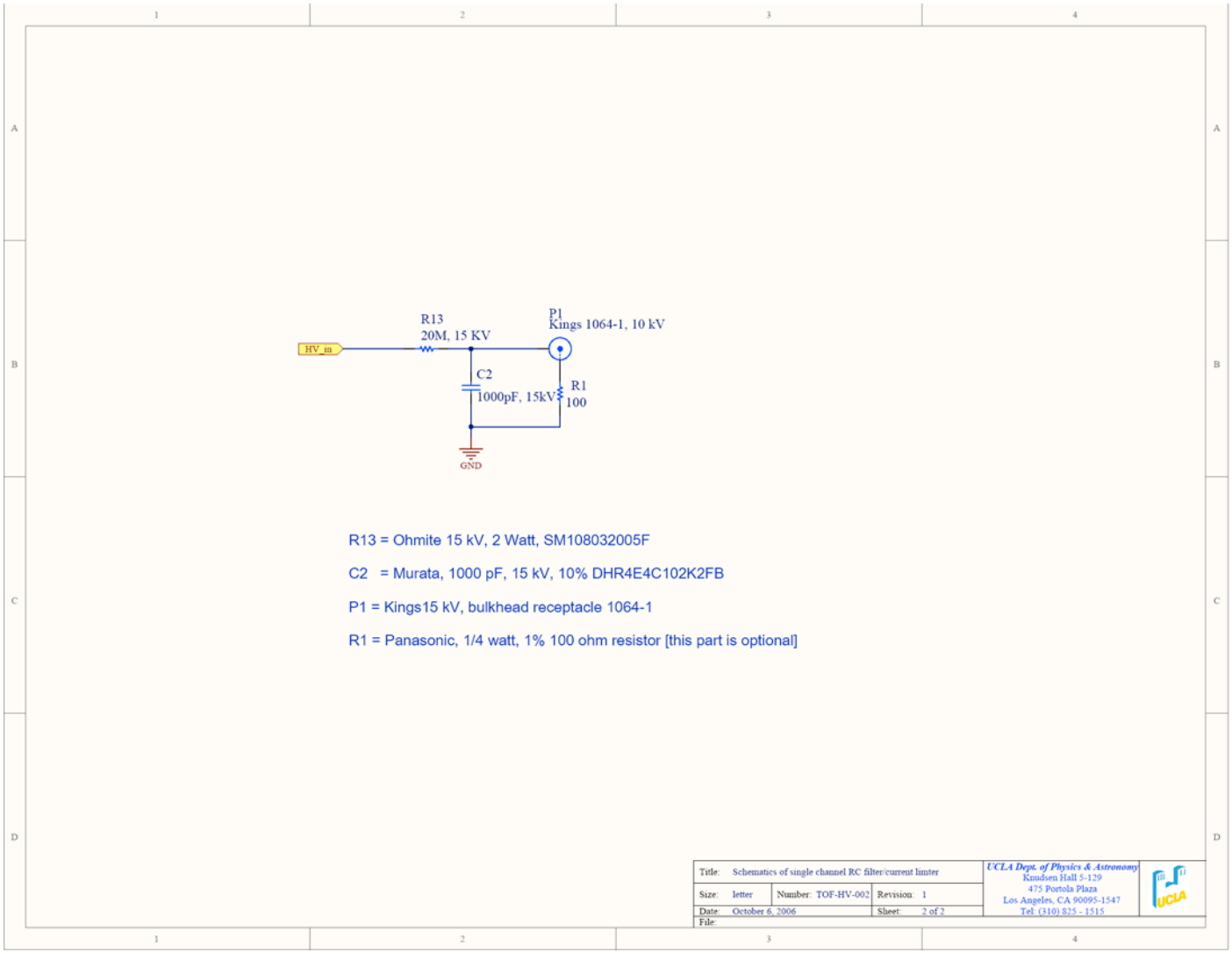
TOF High Voltage Distribution System



Schematics of the TOF High Voltage Distribution Box



Schematics of the TOF High Voltage Distribution Box (continued).

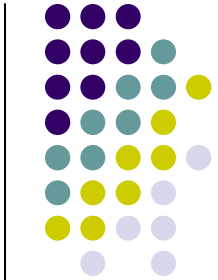


SY2527 and SY1527LC

SY1527LC (back view)

Back view of SY1527 with two A1534s.

Slow Control System for LV and HV systems.



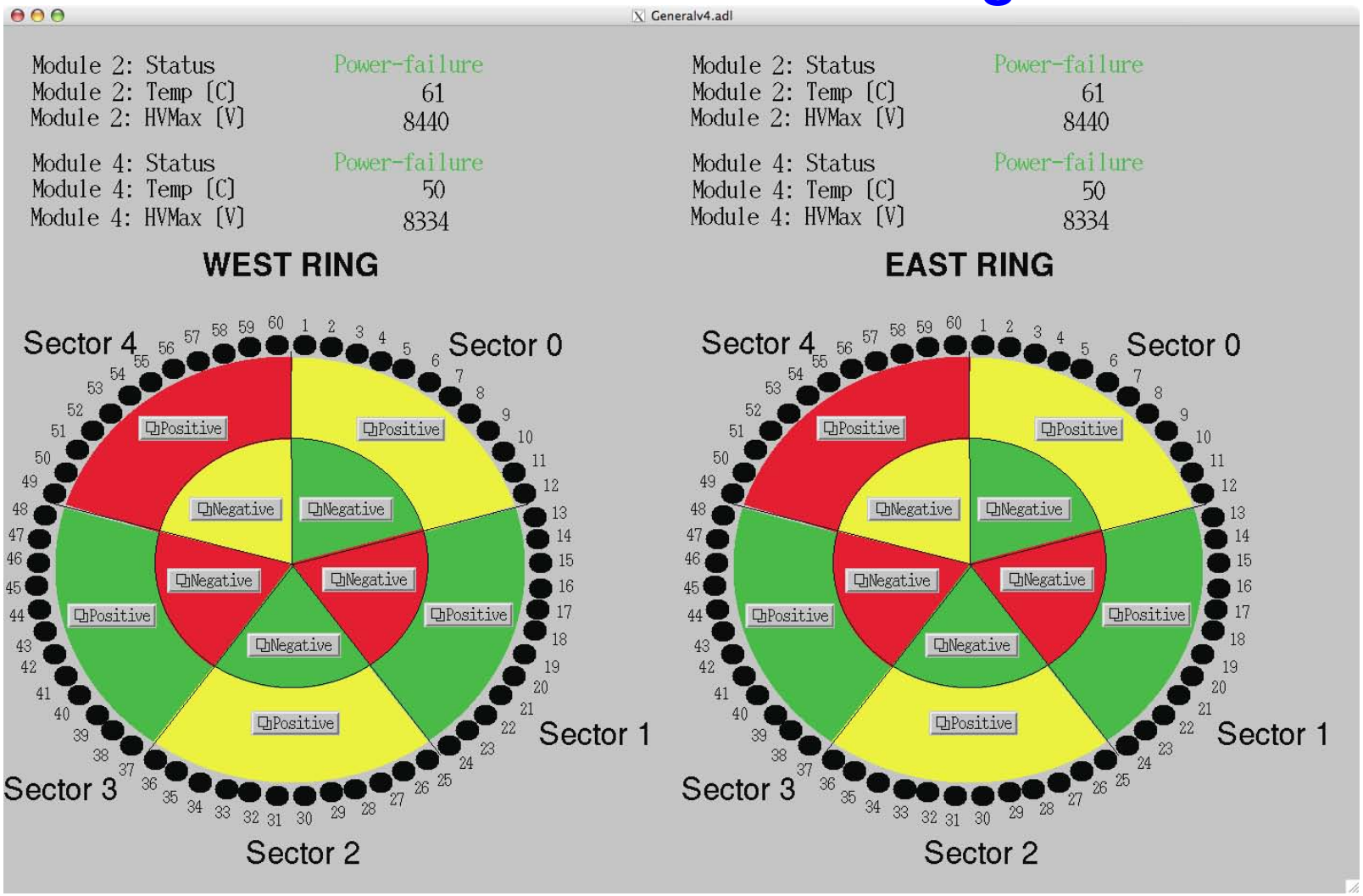
- An EPICS based slow control system is under development. EPICS/Scientific Linux is the STAR standard slow control environment. This allows archiving of process variables, and allows integration of the TOF LV and HV systems into the “experiment control”.

- The slow control system for the LV and HV are integrated (ie. both LV and HV systems are accessible through the same general MEDM screen), and is Ethernet based .

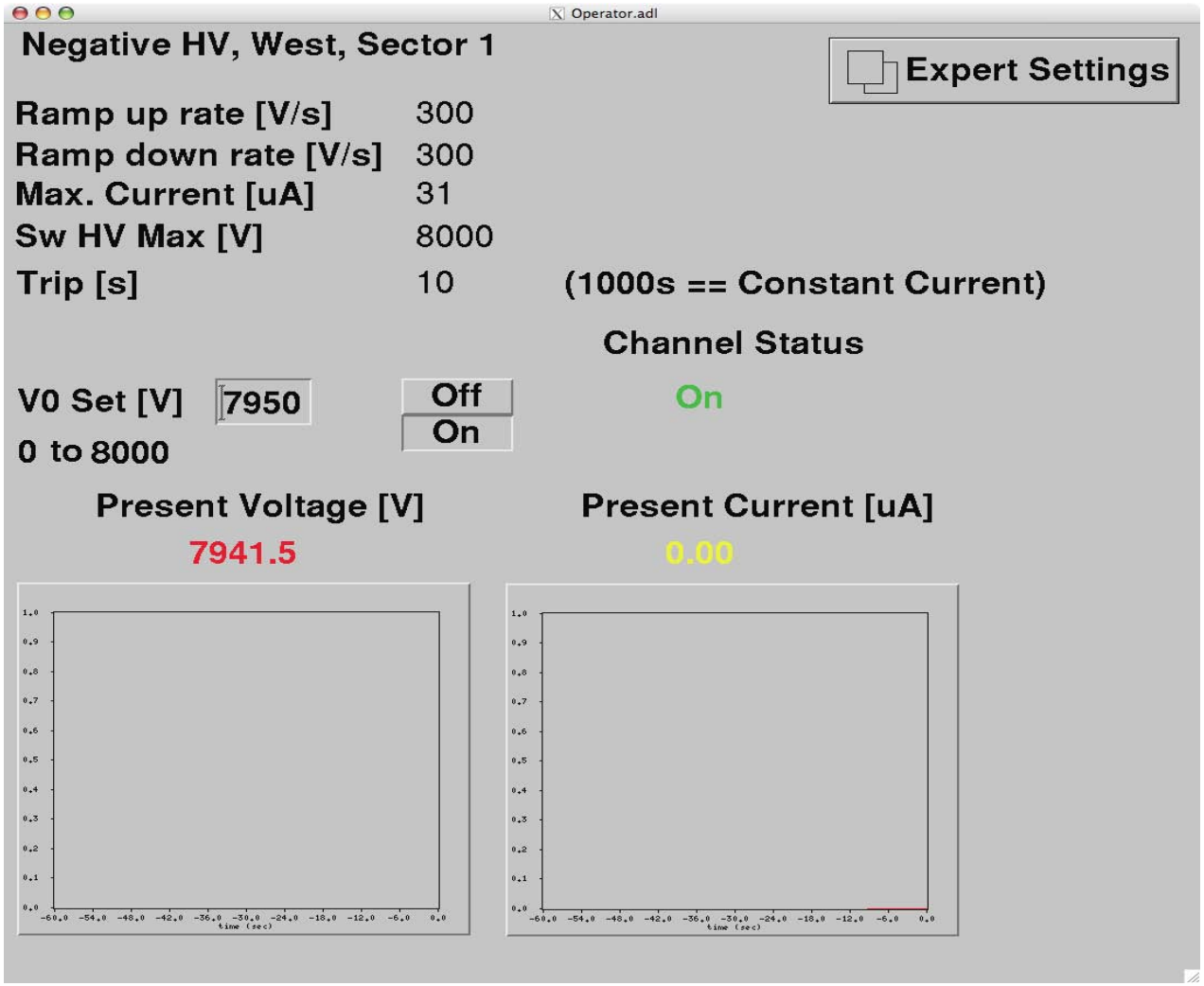
- The control system is multilayered (ie. Three different screens are used to give acces to the “General” user, “detector operator” and “expert” users).

- A UCLA graduate student (B. Biritz) has the responsibility for developing the slow control software. He has completed the development and testing of the HV control system using a loaner SY2527 from CAEN.

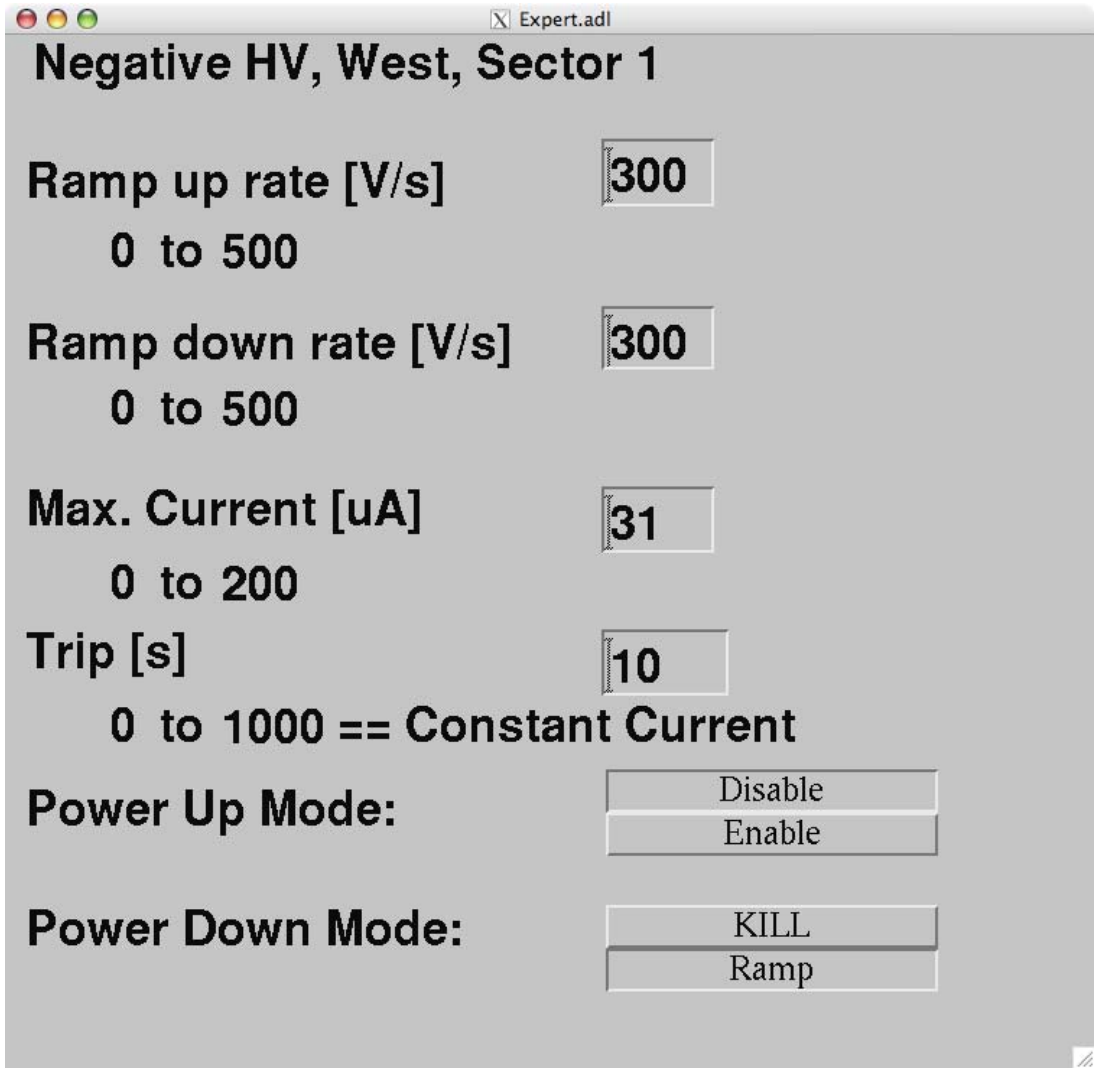
MEDM Screen for HV and LV Control and Monitoring



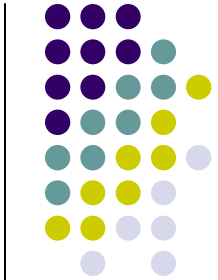
MEDM Screen for “Operator” User.



MEDM Panel for “Expert” User.

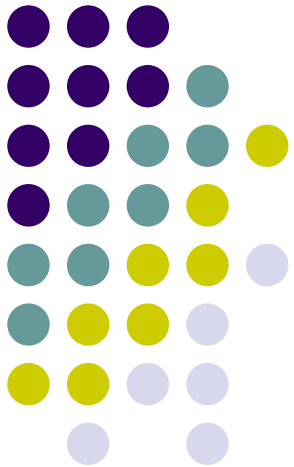


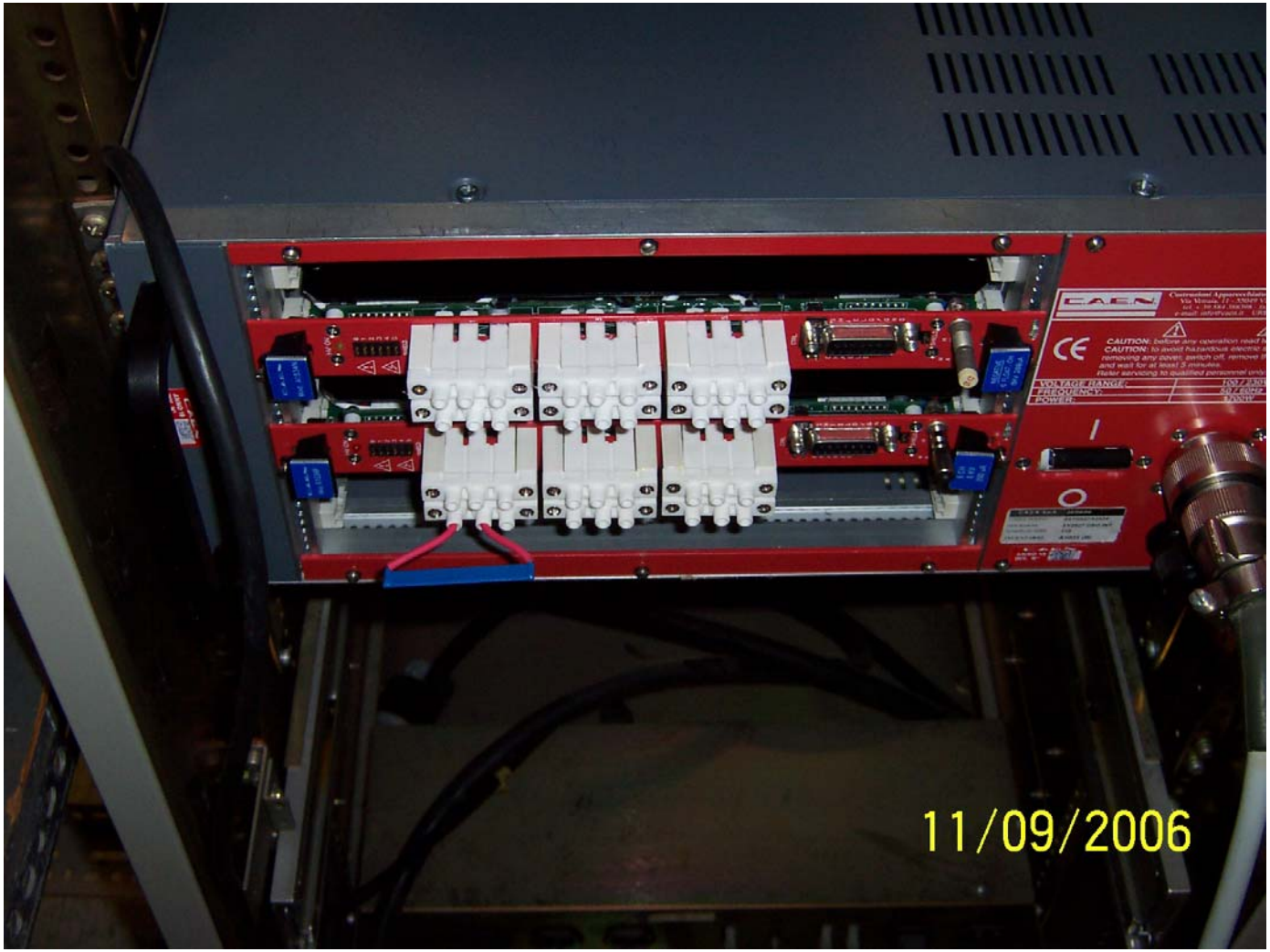
High Voltage Status and Plans



- Plans:
  - SY1527 will be ordered once the funding is approved. (delivery ~ 16-20 weeks).
  - SY1527 will be delivered to BNL where B. Biritz will install and test the control software in March-Spring 2007.
  - HV cables will be produced for a large portion of the HV system (depending on rearranged funding).
  - All HV distribution boxes will be fabricated and sent for installation in STAR for run 8.

THE END




CAEN
11/09/2006


MODEL 1034A
11/09/2006