

Status of MIPP RICH

Rajendran Raja
Fermilab

- On Sunday March 14, 2004 MIPP had a smoke alarm. Three smoke detectors had tripped. The one the RICH, Relay Rack 18 and Relay Rack 20.
- Upon further investigation, it was found that the cause of the smoke was in the RICH PMT box.
- We have established that inadequate cooling did not cause the accident per se.
- RICH interlock with HV functional. Temperature klixons recovered did function.
- Highest temperatures in box exceeded 266 degrees C.
- There was a source of ignition in the PMT box
- RICH readout system is OK.

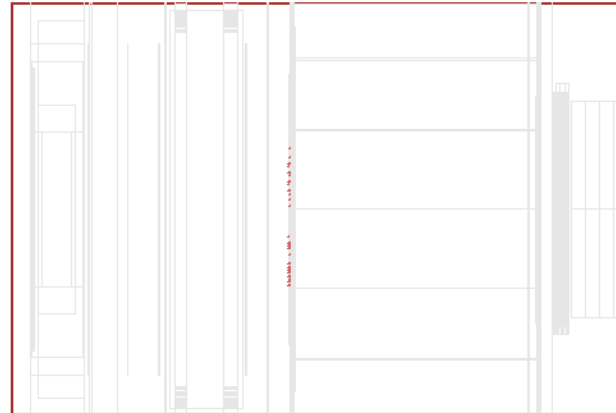
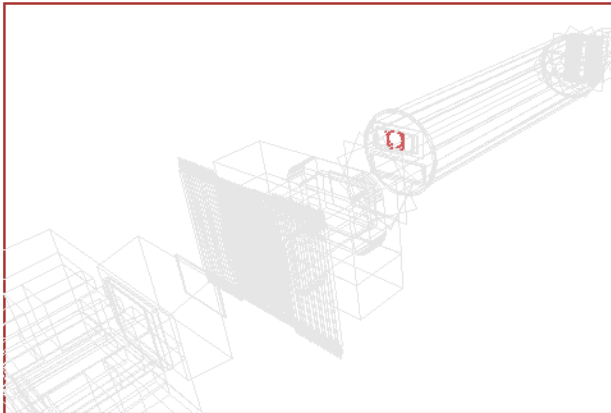
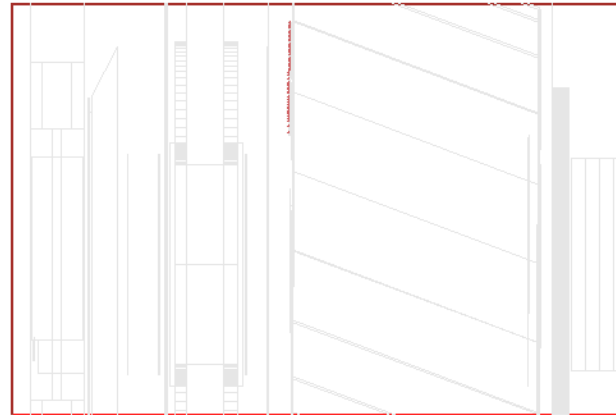
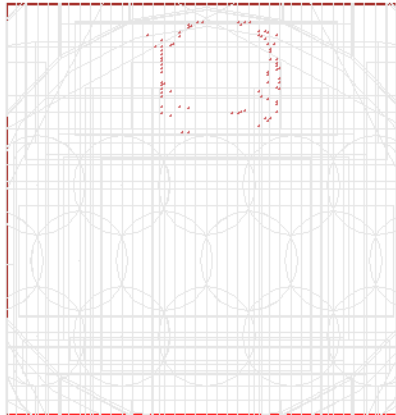
RICH was being read out successfully. We see rings.

MIPP (FNAL E907)

Run: 4337
SubRun: 0
Event: 33

Fri Mar 12 2004
07:07:47.991455

Version: 0
Trigger: d



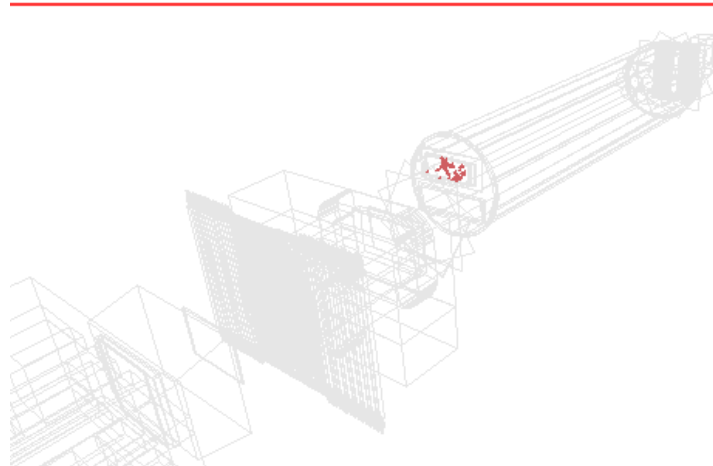
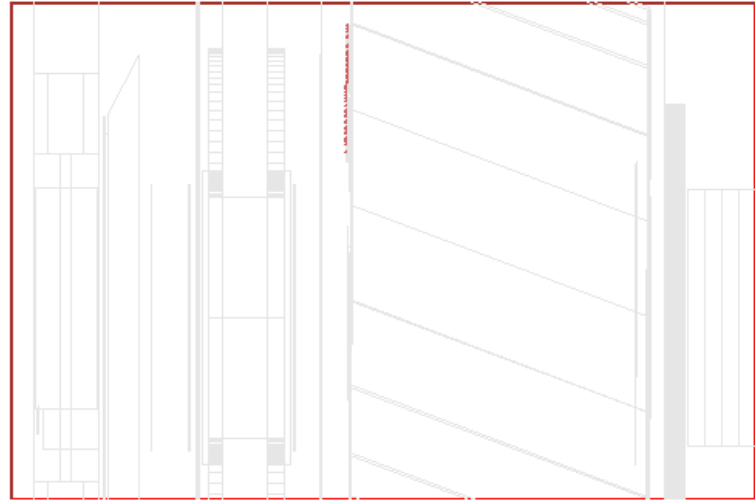
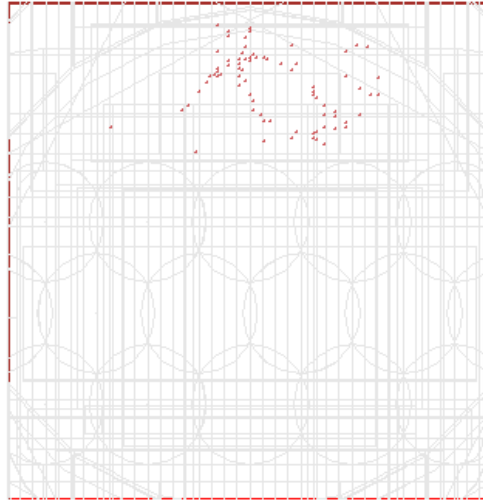
RICh rinas

IPP (FNAL E907)

Job: 4337
JobRun: 0
Event: 45

Time: Mar 12 2004
Time: 07:48.095883

Version: 0
Trigger: d



MIPP RICH



RICH HV supplies

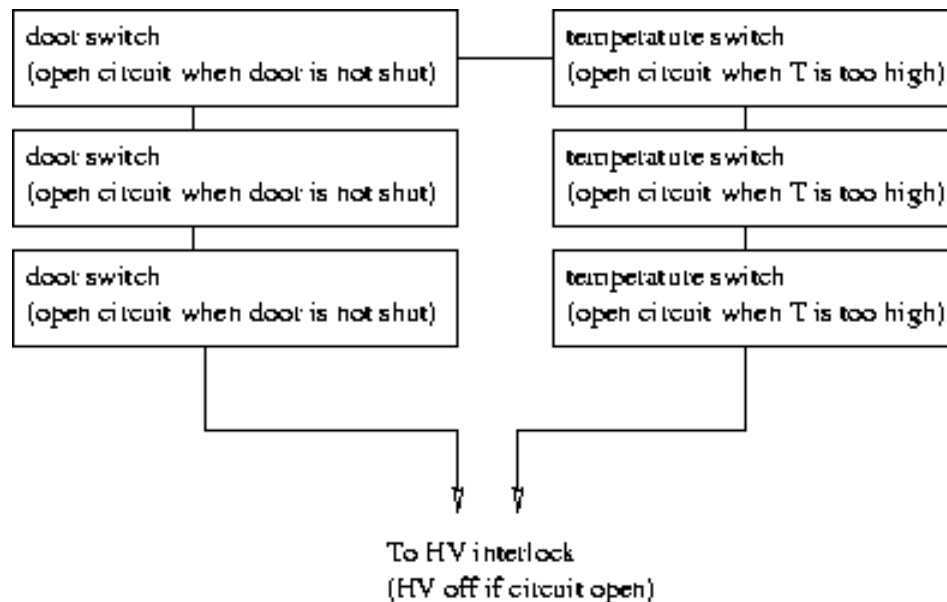
- Current trip limits
3x100mA, 2x140 mA. Trips work.
- Interlocked with RICH
- Interlocks work
- Put out
900Watts for
~3000
phototubes



RICH Interlocks

- As far as temperature interlock is concerned, quoting Sasha Kozhevnikov:

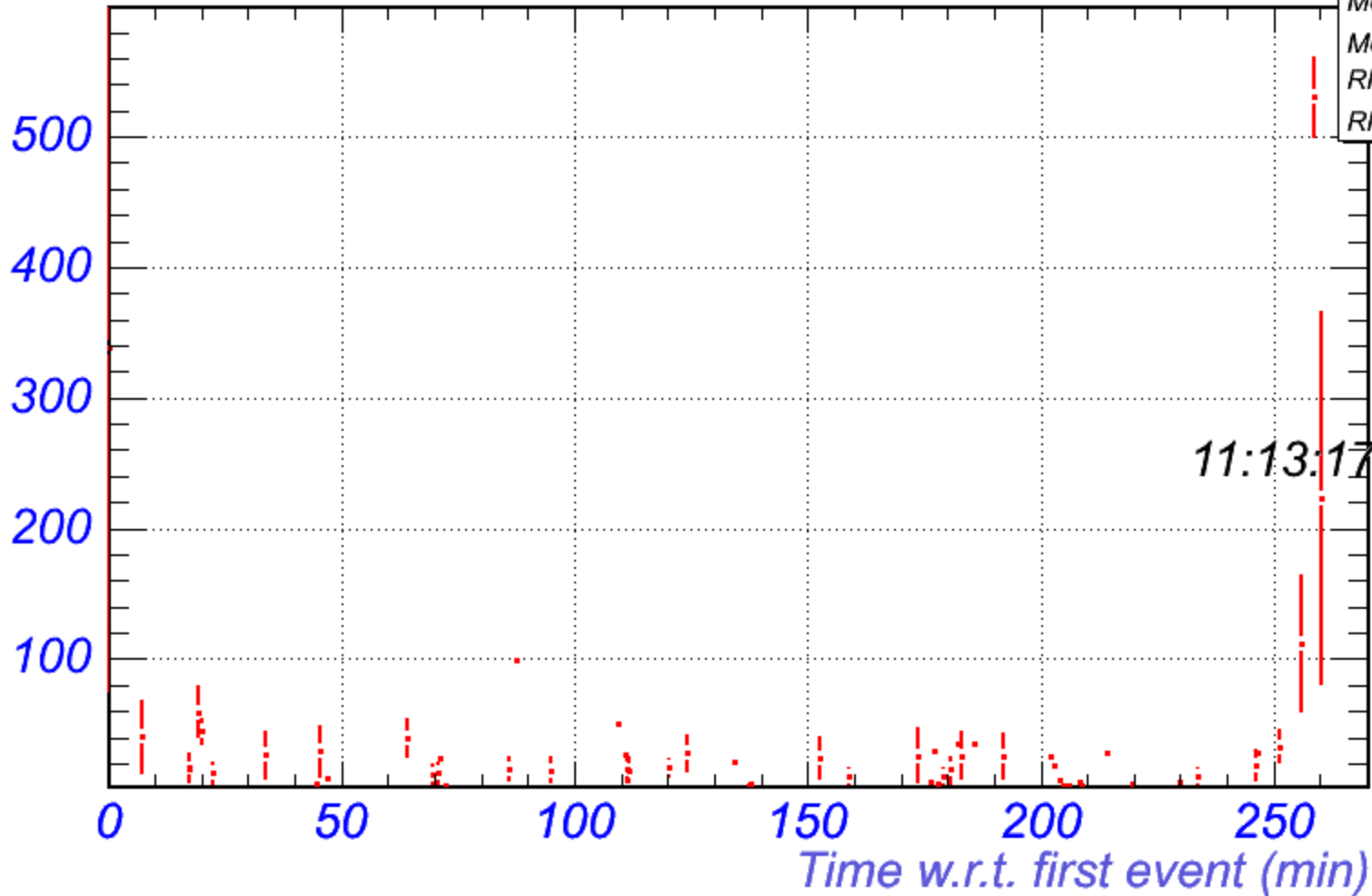
Normally HVPS are powered through HV interlock box, which has two interlock inputs from interlock chain inside PMT box. Chain consists of 3 door switches and 3 thermo-switches hidden somewhere between PMT bases. Chain need to be closed for interlock to operate (You could use 50 Ohm BNC terminators for that). When this chain become open, main circuit breaker on the front of the box will trip.

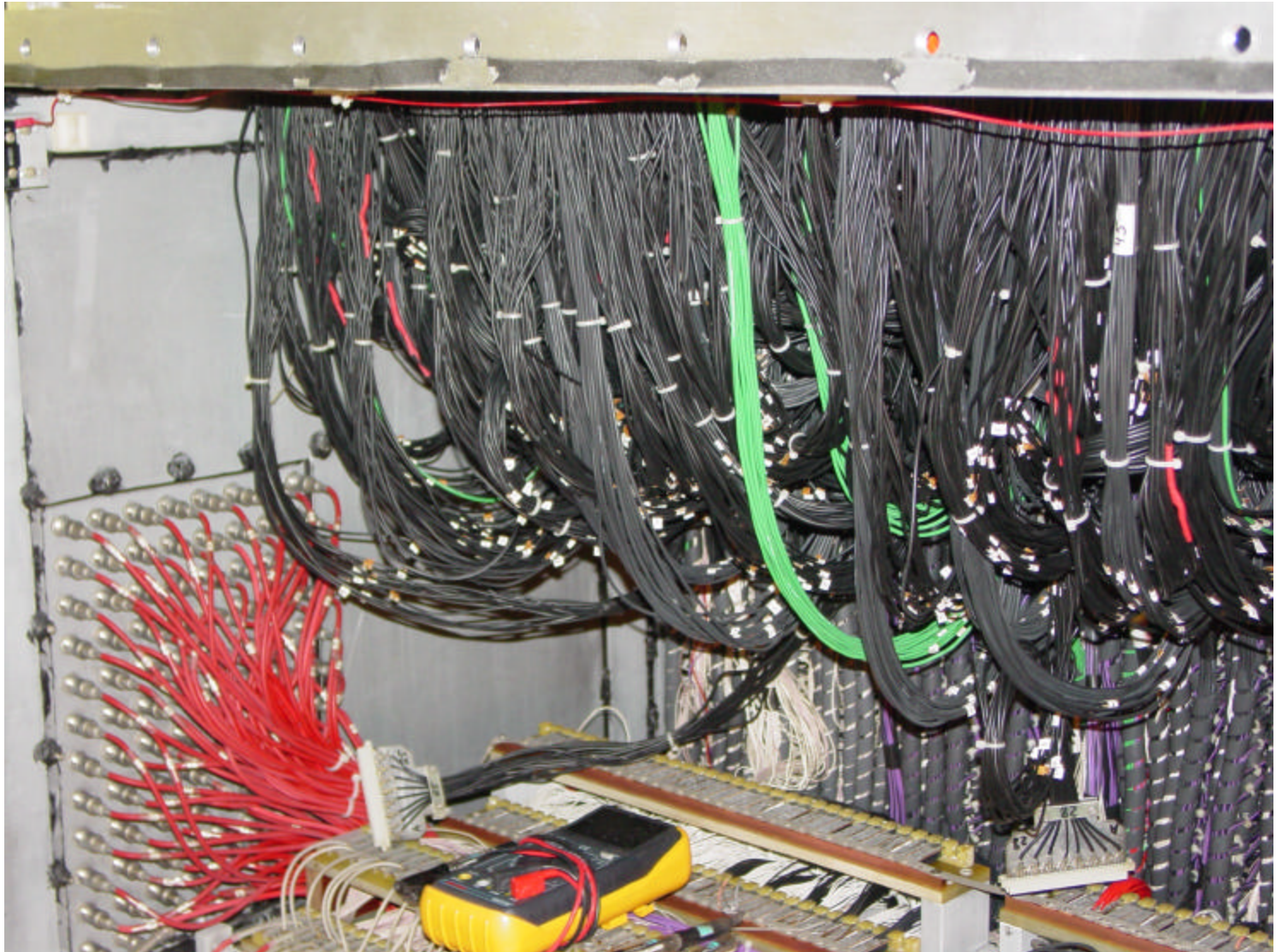


RICH history

- The HV was turned on March 2, 2004. All HV was set at 1400 V to begin with. This was 50-500 V below nominal.
- There was some sort of power glitch a week later. May be unconnected.
- Last event taken on March 14, 2003 at 11:13:11 AM.

Number of RICH digits vs. time





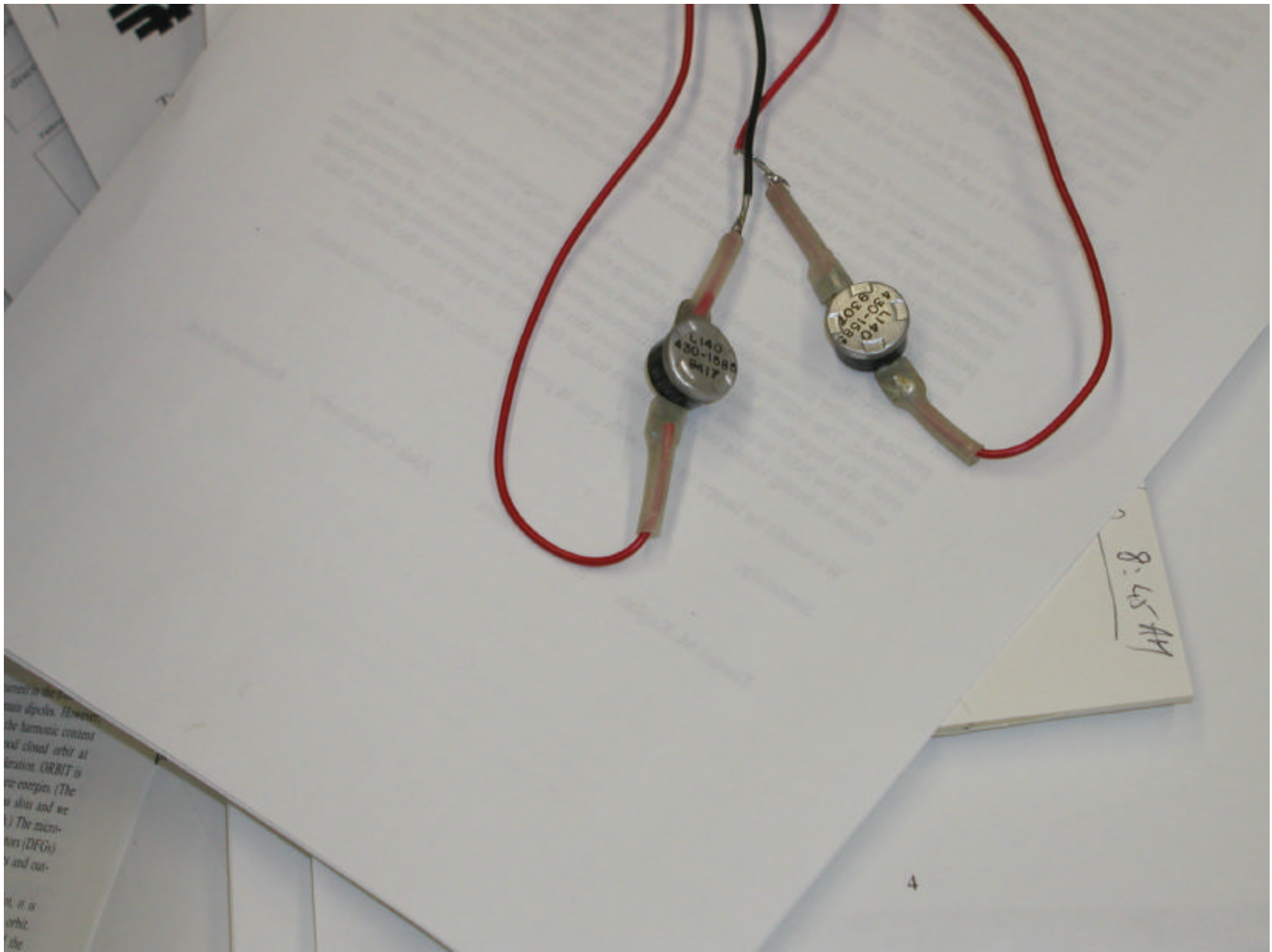
RICH Pictures



Questions & Answers

- All our readout electronics OK.
- Why did the Klixons not fire and kill the HV? Klixons were irrelevant
- How much damage has been suffered by the bases? (we have lost ~ 30% of detector)
- How much damage has been suffered by the phototubes? (working on this)
- The blowers were working. Did the cooler lose power before the incident? NO

Klixon testing



Bad Klixon in center of hot spot



u
8:45 AM

Testing Klixons

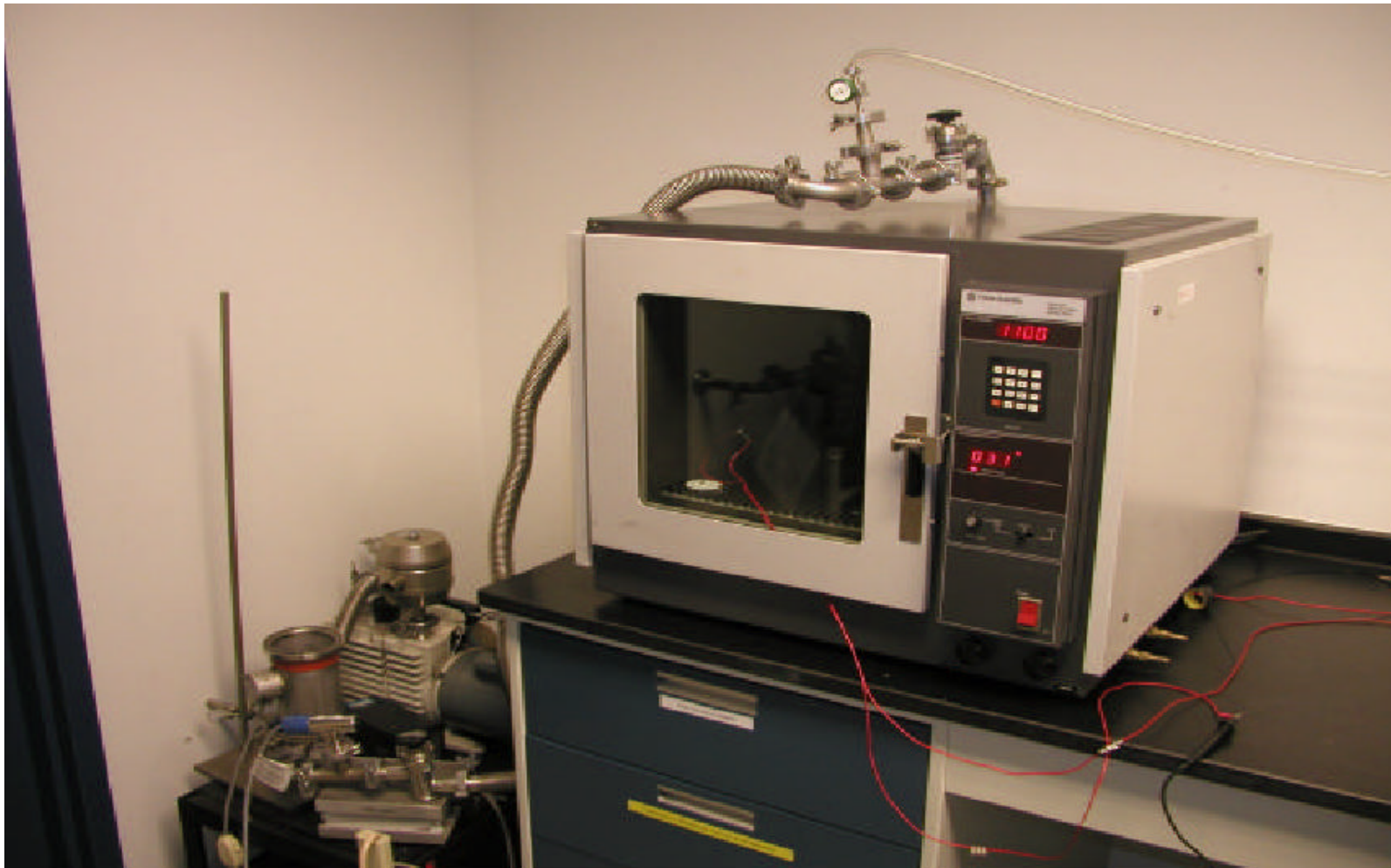
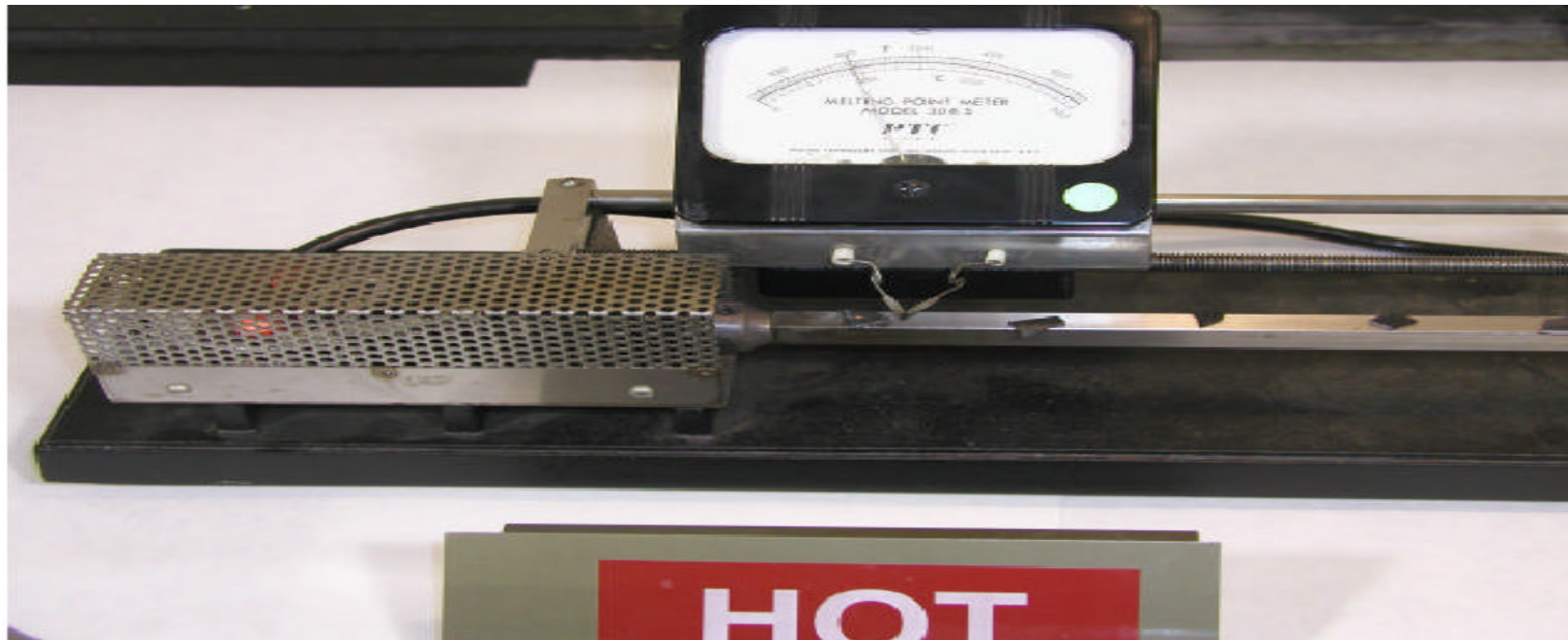


Figure 1 Oven with klixon in. The white object in the oven is a simple “coiled-spring” thermometer that measures the local temperature. The dial on the oven in the middle RHS measures the temperature according to a device in the back of the oven.

Klixon result

- Both good klixons opened up, the first one at 51degrees C, the second one (40-60 degrees C).
- Temperature of hot spot
- Measurement made in Lab 5



Samples are placed on a rod that is heated gradually from one end. The temperature rises gradually at the left hand end. There is a temperature gradient across the bar. The temperature at any point in the bar can be measured by the sliding meter. There was also a thermocouple which could measure temperature.

Results:

| Temperature Degrees C | Effect |
|--------------------------|----------------------|
| 153 | Becomes plastic |
| 160 | Becomes more plastic |
| 197 | Almost molten |
| 266 | Black fumes emitted |

Conclusion—The heat in the affected area was so intense as to melt the plastic. So it must have exceeded 266 degrees C. For the heat NOT to trigger the good klixons implies a very sharp heat gradient consistent with a fire and NOT a heating problem due to inadequate cooling.

Fire Department Conclusion+ Jim Priest Conclusion

- Lt. Russ Wood and Brian Schopp-
- “Our examination of the wiring and subject area was as complete as could be. There were portions of the effected wiring and material already removed to aid access to the area and assess the damage. Our examination started at row 81 and went from there. A significant amount of damage to the insulation and wiring was noted. It is our opinion that the damage is consistent with a fire condition”
- Jim Priest concurs. Likely due to an HV Short that did not trip the HV supply but caused ignition.

Panel Formed

Charge:- Investigate what happened and recommend and approve course of action.

Gary Feldman (RICH/Harvard)

Andre Lebedev

Sharon Seun

Mark Messier (RICH/Indiana)

Nick Graf

Jim Kilmer (Engineer)

Jim Priest (safety)

Keith Schuh

Stan Orr

Win Baker

Erik Ramberg (Selex)

Peter Cooper

Peter Barnes (MIPP)

Rajendran Raja

Panel 1st meeting Friday 26-mar-04

- Subjects discussed- testing phototubes- Able to resuscitate CKM test stand in Lab 6-Some more work to make 16 phototube measurements simultaneously
- Inerting the PMT box with N₂, smoke detector + halon system
- Glyptoling bases to prevent sparks
- Need to determine cause of fire to decide on exact course of action- This should yield a 1st pass RI CH with fewer tubes. Best way to deploy tubes being worked out.
- Slightly longer term- New bases + new tubes.