

# REVIEW OF FILTERSCOPE UPGRADE AND CALIBRATION ISSUES

by  
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Upgrade is a joint effort of R. Colchin and D. Fehling  
of ORNL and N. Brooks, S. Flanagan, W. Brown of GA

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## MOTIVATION: “TO GET BACK A LIFE”

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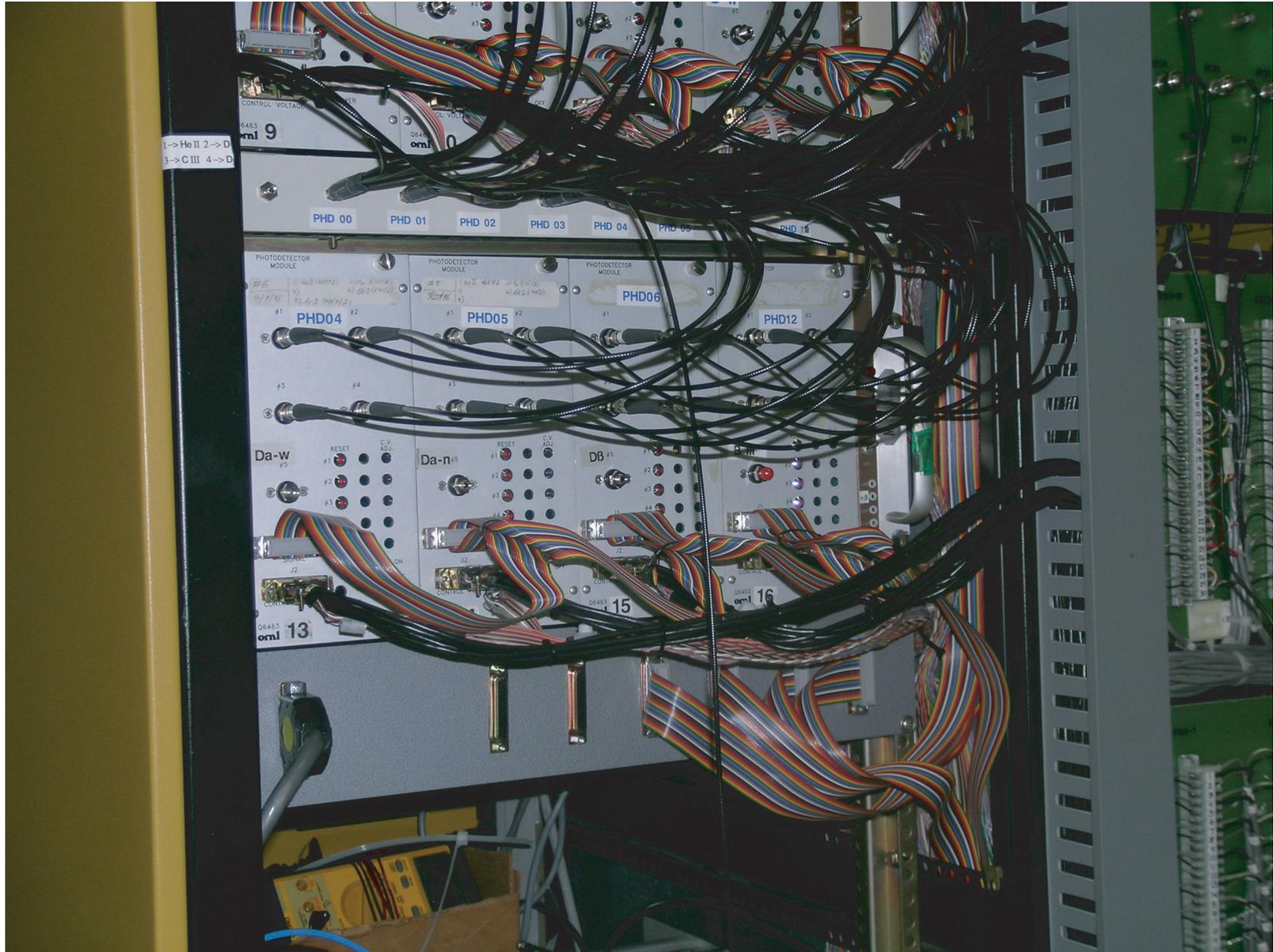
- Filterscope system contains 96 PMTs with individual gain and HV control
- Maintaining proper gains is a tedious, time-consuming business
- Automation of diagnostic possible with remote control of gain and HV
- Improved frequency response is another benefit of upgrade

# UPGRADE ENCOMPASSES CHANGES TO BOTH HARDWARE AND SOFTWARE

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- **HARDWARE: 16 modules upgraded, out of a total of 24**
  - ASDEX PC (C.R.) communicates through National Instrument card and 30kV optoisolators with printed circuit board in each filterscope module (C.R. Annex)
  - new circuit board contains digital control of gain and HV
  - CAMAC amplifiers for  $D_\alpha$  signals bypassed
  
- **SOFTWARE**
  - MDSplus event dispatcher initiates optimization program on HYDRA between shots
  - IDL program tweaks gain or HV, based on signal levels in last shot





# DETAILS OF HARDWARE MODIFICATION TO ALL POLOIDAL CHANNELS

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- two gain stages added (decade & binary)
- preamp feedback changed to give high frequency response
- on-board DAQ chip added for digital control
- channels per module reduced from five to four

#6  
4/9/96  
1) HeII (4687.1) 2) HeI (6681.2)  
3) 4) HeI (6401.2)  
5) ArI (7067.12)

PHD04

#1

#2

#3

#4

Da-w  
#5

RESET

C.V.  
ADJ.

#1

#2

#3

#4

J1

SIGNAL

J2

CONTROL VOLTAGE

POWER

ON

OFF

Q6463

oml

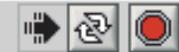
13



# DETAILS OF SOFTWARE CONTROL AND TESTING TO DATE

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1. Restore gain and HV from reference shot
  - optional action by filterscope operator; rest is automatic
  - optimization program initiated after every shot by MDSplus event dispatcher
2. Set latch node in MDSplus when relational database indicates achievement of ref. parameters
3. Tweak gain or HV according to signal level on preceding shot
  - gain choices administratively restricted to 1, 2, 4, 10, 20, 40, 100, 200
  - change HV in 50 volt steps if gain range exhausted
4. Send email alert if HV requested by PC disagrees with that read by CAMAC
5. Copy xls file with recommended gain and HV from HYDRA to PC at pretrigger 73
  - 1, 2 and 4 checked during DAQ shots
  - 3 evaluated over past six months
  - PMT sensitivity measured before and after change of PC board
    - generally 1.6X more sensitive now



**Mode**

- Pause
- Read Configuration File
- Write Configuration File
- Write to Module
- Diagnostic Operation

**Next Shot**  
121238

**Reset**  
Press to Reset



es.xls **Shot Number Mode**  
Shot

**RCP Data**  
Transfer Data

code: no error 0

source:

**Data Directory**  
C:\Data

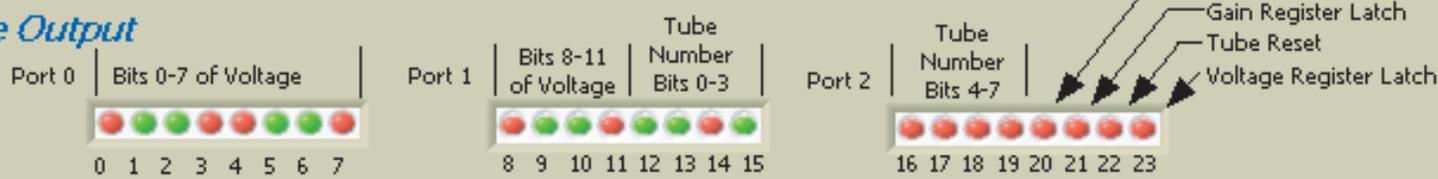
**System Message**  
11:04:00 - Configuration Written to Module

**Tube Configuration Parameters**

Tube Number	Active	Voltage	Gain	Signal Name (10 Chrs)	Description (24 Chrs)
59	<input checked="" type="checkbox"/>	0.40 0.0 - 1.0 Volts	1	fs_clb15-3	fs06c3

**Data Written To Filter Scope During Module Write**

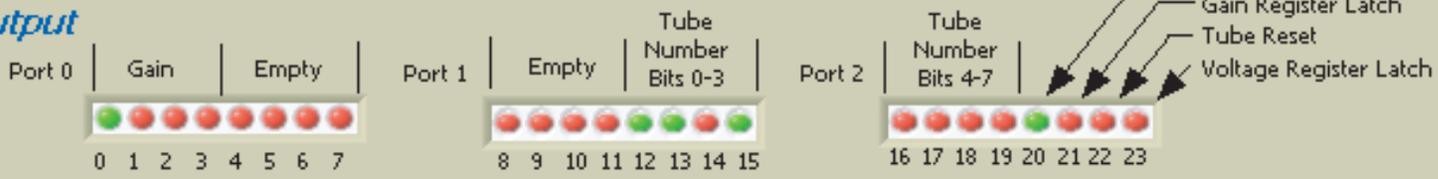
**Voltage Output**



**Change Tube # in Tube Config Parameters**

Tube Number: 59  
Output Written? **YES**

**Gain Output**



64 # Tubes Active

# STEPS REMAINING BEFORE FIRST PLASMA

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- Incorporate sensitivity change in Spectroscopy tree nodes - Brooks
  - cause of gain change unknown
  - back calibration will provide true calibration
- Incorporate item 5 in PC program – Fehling
- Check operation of automatic program – Brooks & Flanagan
- Provide phd02 and phd04 signals to PCS system – Brooks & Brown

# LONG TERM IMPROVEMENTS UNDER CONSIDERATION

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- **Replace CAMAC-based DAQ system with compact PCI: ? 2006?**
  - gain high frequency response on all channels
  - eliminate reconfiguration of hardware and software to record fast C III signal
  - possibly move PC control into Annex at same time (ORNL)
- **Adopt fixed set of filters for 2006 – current “flexibility” is a nightmare**
  - permanently substitute C II, CD and DI (n-2) lines for some He II channels
  - put pellet duochromator channels in midplane system
- **Modify 135R+2 fiber clamp**
  - shift lower plane views toroidally to see tile cracks on faceted 45° ring
  - add continuous linear array of small diameter fibers for coupling to linear CCD
  - add views through 150 beamline at current axis for CER

# CALIBRATION ISSUES

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- Inconsistencies with reference shots observed by numerous session leaders during 2004
- Communication failure in DAQ2 highway (3/04–8/04) uncovered by R. Fisher
- CAMAC amplifiers operated with default values of 1/2 during this period
- MDSplus shot trees corrected so  $G = 1/2$  in RCG node, rather than  $G$  requested
- Mistake made in original correction due to misunderstanding of MDSplus tree
- Photomultiplier gain versus HV needs to be remeasured after end of 2005 campaign