

# HPS Hybrid and Module Qualification, Testing and Calibration

**Tim Nelson - Feb. 3, 2012**
























# Major Steps

- ❖ Hybrid Qualification Testing
- ❖ Routine Hybrid QA
- ❖ Module Qualification Testing
- ❖ Routine Module QA
- ❖ Module Calibrations



# Hybrid Qualification Testing

-  Pedestals (mean of zero-calibration output)
  -  consistency across channels (4 chip)
  -  consistency across time, temps, operating conditions
-  Gain Curves (dependence on calibration magnitude)
  -  linearity
  -  consistency across channels
  -  consistency across time, temps, operating conditions
-  Noise (spread of zero-calibration output)
  -  consistency with expectation
  -  consistency across channels
  -  consistency across time, temps, operating conditions
-  Time (reconstructed hit time)
  -  achieved expected time resolution
  -  dependence on input time (linear?)
  -  goodness of fit with expected shaping curve
  -  consistency across channels
  -  consistency across time, temps, operating conditions
-  HV
  -  voltage appears on HV pads
  -  current at 500V
-  Temperature output

Minimum shaping time?



# Routine Hybrid QA

- ❏ Pedestals (mean of zero-calibration output)
  - ❏ consistency across channels
- ❏ Gain Curves (dependence on calibration magnitude)
  - ❏ linearity
  - ❏ consistency across channels
- ❏ Noise (spread of zero-calibration output)
  - ❏ consistency with expectation
  - ❏ consistency across channels
- ❏ Time (reconstructed hit time)
  - ❏ consistent with expected resolution
  - ❏ dependence on input time (linear?)
  - ❏ goodness of fit with expected shaping curve
  - ❏ consistency across channels
- ❏ HV
  - ❏ current at 500V



# Module Qualification Testing

- ❏ Pedestals (mean of zero-calibration output)
  - ❏ consistency across channels
- ❏ Gain Curves (dependence on calibration magnitude)
  - ❏ linearity
  - ❏ consistency across channels
- ❏ Noise (spread of zero-calibration output)
  - ❏ consistency with expectation (biased and unbiased)
  - ❏ consistency across channels (biased)
- ❏ Time (reconstructed hit time)
  - ❏ meets expected resolution
  - ❏ dependence on input time (linear?)
  - ❏ goodness of fit with expected shaping curve
  - ❏ consistency across channels
- ❏ HV
  - ❏ IV curve to 500V
- ❏ Signal generation
  - ❏ Verification of amplitudes with cosmics
  - ❏ Bias scan
  - ❏ Am241 source testing?

Thermal Testing  
Vacuum Testing



# Routine Module QA

- ❏ Pedestals (mean of zero-calibration output)
  - ❏ consistency across channels (identification of bad channels)
- ❏ Gain Curves (dependence on calibration magnitude)
  - ❏ linearity
  - ❏ consistency across channels (identification of bad channels)
- ❏ Noise (spread of zero-calibration output)
  - ❏ consistency with expectation (biased)
  - ❏ consistency across channels (biased) (identification of bad channels)
- ❏ Time (reconstructed hit time)
  - ❏ dependence on input time (linear?)
  - ❏ meets expected resolution
  - ❏ goodness of fit with expected shaping curve
  - ❏ consistency across channels (identification of bad channels)
- ❏ HV
  - ❏ IV curve to 500V



# Module Calibrations

- ❏ Pedestals (mean of zero-calibration output)
  - ❏ per channel
- ❏ Gain Curves (dependence on calibration magnitude)
  - ❏ offset per channel
  - ❏ slope per channel
- ❏ Noise (spread of zero-calibration output)
  - ❏ per channel
- ❏ Time (reconstructed hit time)
  - ❏ shaping time (per channel?)
  - ❏ offset (per channel?)
  - ❏ slope (per channel?)

