

Quality Control Parameters

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Introduction

With this document we would like to establish a set of common parameters and procedures for module assembly and testing at Princeton, Ohio State and SLAC.

Resistance

Purpose	Detect broken wires by measuring the resistance of each HV segment with respect to (tube) ground.
Setup/Parameter	In shipping box, no extra ground shield, measured at HV endcap
What to record	Time, Tube Id, Resistance for each segment
Accept/Fail	Resistance below 1 MOhm

Capacitance

Purpose	Detect broken or loose wires by measuring the capacitance of each HV segment with respect to (tube) ground.
Setup/Parameter	In shipping box, no extra ground shield but AL foil in box is connected to tube ground, measured at HV endcap
What to record	Time, Tube Id, Capacitance for each segment
Accept/Fail	Capacitance too low (need value) or too high (need value)

Weather Information

Purpose	Keep a record of air pressure and temperature (humidity is optional) in case it will be necessary to re-calibrate tests made at different locations
Setup/Parameter	None – although ideally temperature and air pressure are measured directly in the assembly/storage room
What to record	Time, Pressure, Temperature (Humidity)
Accept/Fail	n.a.

Plateau Curves

Purpose	Detect bad tubes by measuring the singles rates as function of the applied high voltage.
Setup/Parameter	In shipping box, no extra ground shield but AL foil in box is connected to tube/HV ground. The HV is decoupled with a 1nF HV capacitor. The wire signals are picked up with a 10 KOhm resistor. The discriminator threshold is set to 30 mV. The pulse width is set to 3 μ s. The high voltage is varied between 5000 V and 6000 V in 100 V increments. The rates for each HV segment are measured separately. Our standard ZEUS gas mixture is used and the tubes have been flushed (at least 4 volume exchanges)
What to record	Time, Tube Id, For each data point: HV, current (per tube), segment 0 rate, segment 1 rate, segment 2 rate, segment 3 rate
Accept/Fail	Need to define

Source Scan

Purpose	Detect bad tubes by placing a radioactive source over the tube and measuring the current each HV segment while the position of the source is changed.
Setup/Parameter	Outside of shipping box, ground shields on both sides of tube(s). The source activity and position (height) is adjusted to reach a current of 500 nA for each segment at a voltage of 5600 V. The source is moved with a speed of 10 cm/s. Each wire of every tube will be scanned. Our standard ZEUS gas mixture is used and the tubes have been flushed (at least 4 volume exchanges) <i>(these numbers in particular need adjustment. Send your comments)</i>
What to record	Time, Tube Id, HV, for each wire a set of current measurements vs. position.
Accept/Fail	Need to define

Long Term Test

Purpose	Detect bad tubes by placing them under high voltage and record the current periodically. This test is performed on tubes when they first arrive at the assembly site and on modules before they are shipped to SLAC. Module testing continues in the SLD hall at SLAC.
Setup/Parameter	Inside shipping box, no extra ground shields. AL foil in box connected to tube ground. Our standard ZEUS gas mixture is used. Conditioning phase: Ramp up HV from 1000V in 100 V increments while monitoring the tube current. If the current remains below xxx nA after yyy minutes the voltage is increased (Should these intervals depend on the HV, i.e short waiting periods at low HV, longer waits at higher HV?) Monitoring phase: HV set to 5800 V. Current and actual HV monitored every yyy minutes. Using the ZEUS circuit in the OSU power supply the actual voltage will be adjusted automatically. I guess we need to gain some experience with this before we can define our procedure.
What to record	Time, Tube Id, HV, Current
Accept/Fail	Need to define