Test Run Mechanical and Cooling Specifications

Design Specifications

Property	Specified Value	Comment
Vacuum Pressure	10^{-6} Torr	
Maximum Radiation Dose	$1X10^{14}$ 2 GeV electrons (~$3X10^{13}$ 1MeV NEQ)	
Maximum Magnetic Field	0.55 Tesla	
Target	0.125% X_0 Tungsten (approx. 4 microns thickness)	
# tracking planes	5	two modules per plane, one above and one below the dead zone
Sensors per module	2, in small angle stereo configuration	
Stereo angles L1; L2; L3; L4; L5 (mrad)	(0/100); (0,100); (0,50); (0,50); (0,50)	stereo sensors dip away from dead zone on electron side. Stereo sensors rotated about centers.
Nominal dead zone between non-bend sensors w.r.t. photon line (y positions)	+/- 15 mrad	between sensitive regions
z-positions from target (mm)	100, 200, 300, 500, 700	
x-positions w.r.t. photon line	0 in all layers	
y movement (motorized)	top and bottom halves move separately in y with +/- 20 mm range	for nominal positions see dead zone specification above
pitch movement (motorized)	+/- 20 mrad	implied by y adjustability above at both ends in z
yaw movement (manual)	+/- 20 mrad	
module power consumption	3.45 W	345 mW/chip, 5 chips per hybrid, 2 hybrids per module
nominal bias voltage	150V	
maximum bias voltage	500V	
total leakage current @ 500V and after irradiation	< 100 uA	< 50 mW
vacuum chamber wall temperature	< 40 C	
radiative heat load on each sensor	< 0.5 W	assumes silicon at -10C, vac. chamber at 40C, silicon emissivity of 0.7
Material	<1% X0 per measurement pair averaged over tracking volume	
Sensor Temperature	<0C over entire sensor before irradiation	
APV25 Temperature	<30C for all chips	
APV25 Temperature Stability	constant within 3C during physics running	does not include chip to chip variations, which can be larger
Flatness	all sensors planar within 50 microns total	includes thermal deformation
Inter-plane alignment of non-bend sensors	within 0.5 mrad for all modules on each side of dead zone	means non-bend strips are projective to within 1 strip over entire solid angle
Stereo Angle Consistency	within 0.5 mrad of nominal in all layers	
Bend-plane (y) position stability	within 10 microns over all sensor surfaces on each side of dead zone during all running	
Non-bend (x) position stability	within 25 microns over all sensor surfaces on each side of dead zone during all running	
z position stability	within 50 microns over all sensor surfaces on each side of dead zone during all running	

Materials and Techniques

- Wirebonds shall be encapsulated with Sylgard 186, vacuum permitting
- Back of detector shall be passivated from any conductive support to 1000V test
- Conductive supports shall have low impedance connection to the reference voltage of the APV25 front end (<5? ohms to entire support)
- Bias voltage shall be supplied to back side directly by wirebonds
- Sensor modules shall be removable from base plates