Specifications for ISL 4" Detectors

Note: Dimensions in these specifications refer to the detectors themselves, not the masks.

Specifications for detectors

Sensor type:	double-sided, both sides AC-coupled p-side stereo at 1.207°
Bulk:	
type:	n-type
thickness:	$300 \pm 15\ \mu$m
flatness:	$< 60\ \mu$m (any detector shall fit between two parallel plates which are separated by 375 μm)
Biasing method (both sides)	poly-silicon resistors
n-side strip direction:	strips run along the long edge
p-side strip direction:	strips run at 1.207° with respect to the n-strip
n-side isolation method:	p+ stop channel surrounding n-strip
Passivation:	thickness : $0.5 \sim 1.0\ \mu$m
p-stop implant density:	$\geq 1 \times 10^{14}$ borons/cm^2
Implant+diffusion depth:	$\sim$1 (1.5 preferable) μm for p and n-strips, and p+ stop
Dead channels, p and n-side each:	<2% dead channels per detector and <3% per side
Dimensions (see figure 1)	
sensitive area:	5.723 cm $\times$ 6.750 cm
outer size:	5.926 cm $\times$ 6.902 cm
Number of strips:	p-side: 512 readout and 1+13 dummy n-side: 512 readout and 1+1 dummy (Dummy strips are also biased.)
Strip pitch:	p-side: 112 μm n-side: 112 μm
Implant strip width:	p-side: 22 μm n-side: 22 μm
Al electrode, n and p-sides:	16 μm
Bonding pads:	$60 \times 200\ \mu$m one raw of pads per strip at each end (see figure 2)

Electric Properties:

initial full depletion voltage (V_F):	$40 < V_F < V_F^{max}$ with $V_F^{max} < 80$ V
initial leakage current (bulk, surface and edge contribution):	< 100 nA/cm^2, 50 nA/cm^2 typical at Vb=V_F^{max}+10V and T=20-25°
junction breakdown*1 with open readout electrodes:	$> V_F^{max}$+100 V
dark current slope (dI/dV) in [nA/cm^2/V]:	$dI/dV < 0.2$ at Vb from V_F to V_F^{max}+80V (Vb=2V_o when p and n sides are at $\pm V_o$)*2
breakdown voltage of coupling capacitor n-side and p-side:	> 100 V (200 V typical)
interstrip resistance :	> 2 GΩ
poly-silicon resistor value	
mean value:	4 ± 1.5 MΩ
variation within one detector:	$\pm$ 10%
resistance of Al electrode, n and p-sides:	< 20 Ω/cm
capacitance of coupling capacitor, n and p sides:	> 14 pF/cm (20 pF/cm typical)
interstrip capacitance (full length)*3	
p-side:	< 10 pF
n-side:	< 12 pF (10 pF typical)

*1 junction breakdown voltage is defined as $I_{\rm break} > 10 \times I_{\rm leak}(V_F+10\text{ V})$
*2 p and n side balanced bias, both side readout electrodes grounded
*3 The interstrip capacitance is measured at Vb of 1.2 $\times V_F$ with both neighbor strips grounded.

Specifications for radiation damage tests for pilot detectors

Ten days after irradiation of 200 krad gamma-ray:

leakage current at 20°:	< 3 μA/cm^2
bias resistor change:	$< 20\%$
p-strip and n-strip isolation resistance:	> 1 GΩ
junction breakdown voltage:	$> V_F^{max}$+100 V
onset voltage of the micro breakdown:	$> V_F^{max}$+70V
interstrip capacitance	
p-side:	< 11 pF
n-side:	< 13 pF

Alignment marks and others:

1. 8 alignment marks (crosses of 140 μm long lines in 10 μm wide) per side along the sides of the detector. (see figure 1)
2. Mark points at every 10 bonding pads and print the corresponding strip number near the bias ring. (see figure 2)
3. Detector ID number should be indicated on the detector. (see figure 1)

Test items:

1. Visual inspection
2. Measure the leakage current as a function of Vb (each detector).
3. Measure the detector capacitance as a function of Vb (each detector). Extract the full depletion voltage.
4. Measure the capacitance of each strip. Record the dead strips.
5. Measure the Al electrode resistance (some per detector).
6. Measure the interstrip resistance (some per detector).
7. Measure the implant electrode resistance (some per detector).
8. Measure the polysilicon resistance (some per detector).