SIS GEOMETRY AND GLOBAL COORDINATE SYSTEM

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To: CRIS/SIS Data Analysis Teams
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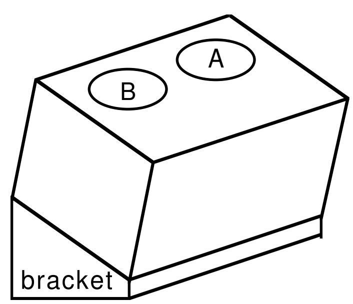
inre: The geometry of SIS is reviewed for the purposes of data analysis, including:

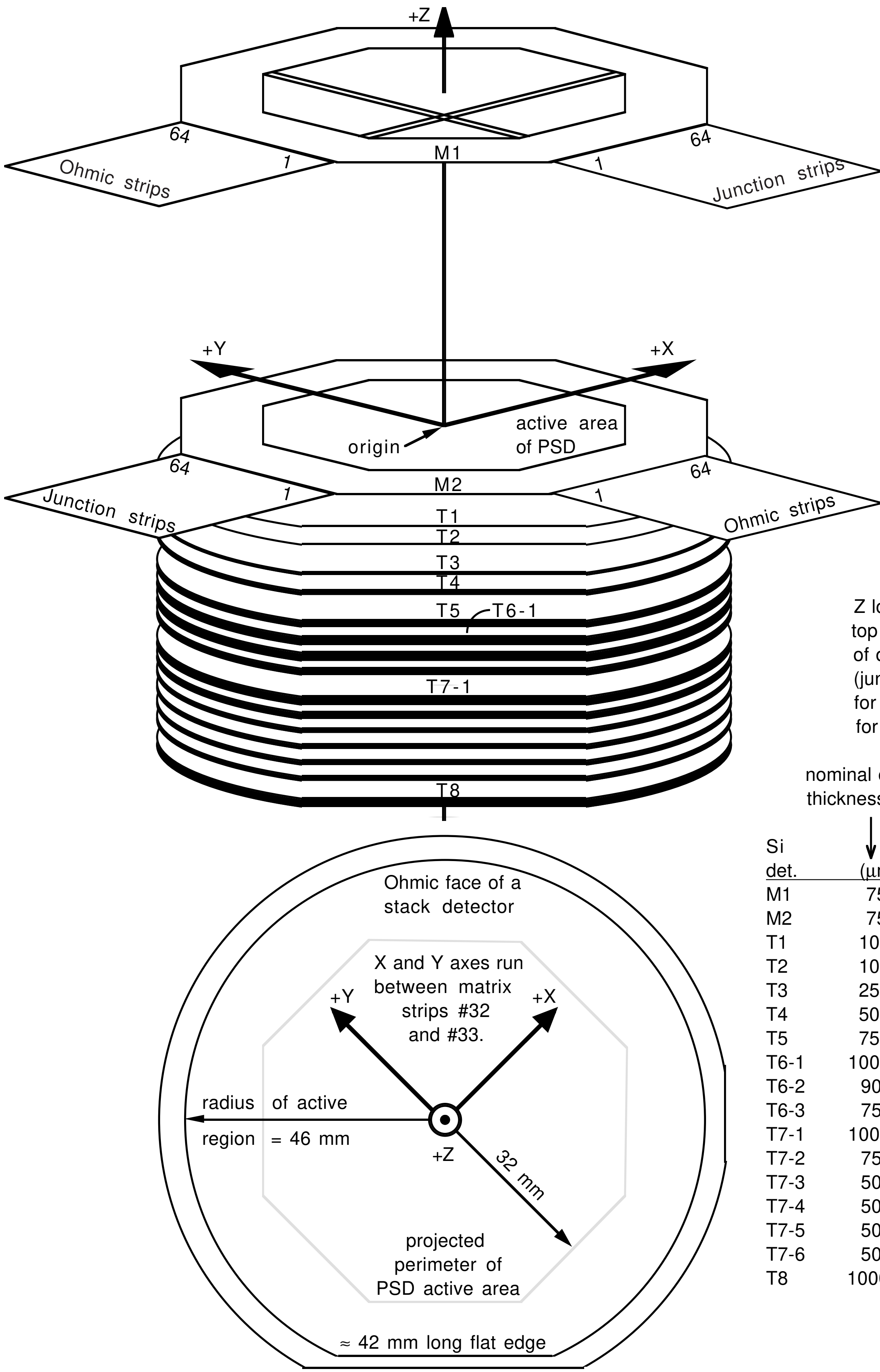
- a standardized coordinate system placed on the entire instrument
- nominal locations and orientations of detector elements
- estimated tolerances for these locations

As shown below, telescope A is to the right as one looks down on the instrument. The A and B telescopes are centered 8.125 inches apart, and mechanically isolated by a significant amount of intermediate physical material. Therefore, we treat each telescope separately, with its own coordinate system.



In the following figure a detector stack is shown nearly to scale. As agreed at the Data Analysis meeting in St. Louis last November, the Z = 0 origin coincides with the top surface of the botom-most hodoscope detector, Matrix 2. The positive Z direction points generally in the opposite sense from incoming particles. The (X,Y) = (0,0) origin is now aligned on the stack axis.

All detectors but M2 have their ohmic faces oriented upper-most. The long flats on all stack detectors are aligned parallel to a line described by the equation Y = -X. These flats are ≈ 41 mm away from the stack axis.



Z location at top surfaces of detectors (junction face for M2, ohmic for all others

nominal det. thickness

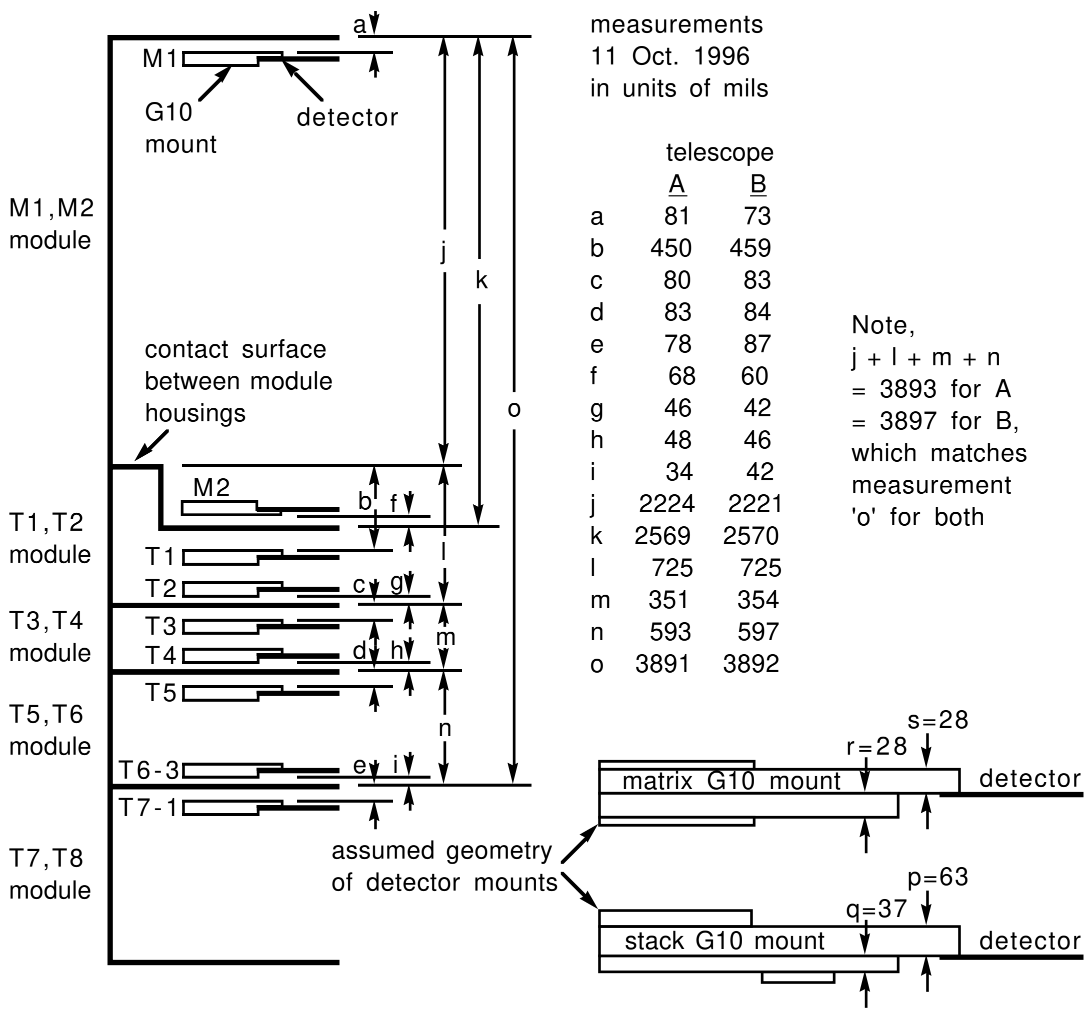
Si det.	(µm)	(cm)
M1	75	+6.00
M2	75	+0.00
T1	100	-0.64
T2	100	-0.96
T3	250	-1.59
T4	500	-1.91
T5	750	-2.48
T6-1	1000	-2.80
T6-2	900	-3.11
T6-3	750	-3.43
T7-1	1000	-4.03
T7-2	750	-4.35
T7-3	500	-4.67
T7-4	500	-4.99
T7-5	500	-5.43
T7-6	500	-5.74
T8	1000	-6.06

The strips on a Matrix detector are 975 μm wide and spaced 1 mm apart; i.e the gap between strips is 25 μm wide. They vary in length as follows:

	=	25.5 + 2*(strip No.)	, for strips No. 1 - 19
strip length (mm)	=	64	, for strips No. 20 - 45
	=	25.5 + 2*(65 - strip No.)	, for strips No. 46 - 64

Strips less than 64 mm long are trapazoidal in outline, and their average length is calculated here. Note that strips are numbered from 1 to 64, not from 0 to 63: i.e. the X and Y axes run between strips #32 and #33. The total active area of a Matrix detector is 34 cm^2.

The Z locations listed above are taken from the latest design drawings provided by Sandy Shuman last November. These match reasonably well with physical measurements of SIS taken after assembly last October. A schematic of these measurements is shown below.



We compare measurements with design in the following table. The deviations may be due to vagaries in the detector mount geometries.

det.	position eqn.	A	B	design
M1	u-a-s+j	+6.00	+6.04	+6.00 cm
M2	0	+0.00	+0.00	+0.00
T1	b+p-u	-0.68	-0.67	-0.64
T2	l-g-q-u	-1.01	-0.99	-0.96
T3	l+c+p-u	-1.58	-1.56	-1.59
T4	l+m-h-q-u	-1.89	-1.87	-1.91
T5	l+m+d+p-u	-2.48	-2.46	-2.48
T6-3	l+m+n-i-q-u	-3.43	-3.40	-3.43
T7-1	l+m+n+e+p-u	-3.97	-3.98	-4.03

where u = k - j - f - s - t = 246 mils for A, 258 mils for B, and t is the thickness of a matrix detector (about 3 mils).

TOLERANCES

Sandy Shuman estimates that the X, Y, and Z coordinates for any silicon detector could be out by as much as 0.25 mm. He also estimates that a detector could be rotated by 0.1° beyond its nominal postion, and that it could be tilted in its mount by 0.1° at most with respect to normal.