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Tolerances on Chamber Assembly

Cathode Planes

Vladimir Selivanov and I measured the accuracy of positioning of several cathode planes in order to try and determine which of permanent or removeable cathode planes provided the most accurate positioning relative to the anode plane in an assembly. The method of measurement consisted of mounting the plane on the glass table stringing jig and with gage blocks of various thicknesses under the cathode plane. It is important that the cathode plane be securely clamped to the glass table by nuts over the citals, as clamping or not clamping affects the amount of sag of the glass frame. The maximum amount of sag with the plane securely clamped was estimated to be 8 µm. The gage blocks consisted of 5 of each of the following thicknesses: 1.970 mm, 1.985 mm, 1.997 mm, 2.015 mm, 2.030 mm. Tolerances on the gage block thicknesses were ±5 µm, but given that the plane sags, estimated measurement accuracy is ±10 µm.

Results

Plane	Type	Deviation from 2 mm above table	
5DC	removeable	+0	-15 µm
6DC	removeable	+0	more than -30 µm
12	permanent	more than +30 µm	-0
test plane	permanent	+15 µm	-15 µm

Conclusions

Although the statistics are rather small, it appears that both techniques are capable of the same level of accuracy. Vladimir is of the opinion that an accuracy of positioning of ±15 µm for the cathode planes is required for this experiment.

Wire Planes

Accuracy of wire positions were measured for several planes using a travelling microscope. The travelling microscope has an accuracy of ±10 µm. It also may have a cumulative error of .0001 mm per mm. The travelling microscope used was a prototype and a more accurate version is under construction. The following results were for planes 1DC and 2DC, the sense wires only (no guard wires), and misplaced wires were not replaced at this stage.

Frame #	Side	σ	range	
		μm	μm	
2	pad	6	-12 to +19	
2	readout	7	-42 to +16	
1	pad	18	-27 to +94	
1	readout	19	-103 to +30	
1	pad	15	-25 to +48	(excluding wire 56)
1	pad	15	-45 to +27	(excluding wire 56)