Drift Chamber Efficiency

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Further tests were done on the chamber efficiency to verify the results previously obtained. In particular, there was concern over the fact that the efficiency appeared to be better than 99.9% (and sometimes 100%) for most chambers. The concern was whether any of the cuts in the filtering or the tracking is favoring tracks with hits present in all planes. To investigate this possibility, the efficiency was calculated for a case were no cut was imposed on the χ^2 distribution. The results of this test are shown in Figure 1. The efficiency is reduced slightly in this case. The reduction in efficiency with no cuts is expected; however, observing only a slight reduction implies that most of the tracks removed by the χ^2 cut result from real tracks, but the resulting χ^2 distribution is off due to imprecise calibrations (including resolution/weights).

To test the level of accuracy of the efficiency code, a percentage of the TDC hits on plane 15 (chosen for no particular reason) were rejected randomly right after the unpacking and before they were saved in the MOFIA data structures. The percentage rejected and the resulting efficiency is shown in table 1.

Percentage Rejected	Efficiency
1.0	0.989
0.5	0.993
0.1	0.998
0.0	0.999

Table 1: Efficiency of plane 15 when a percentage of the hits in that plane chosen randomly are rejected.

Figure 2 shows the efficiency of all planes when 2% and 1% of the hits in all planes chosen randomly are rejected. Figure 3 shows the efficiency when 0.05% and 0.02% of the hits on all planes are rejected.

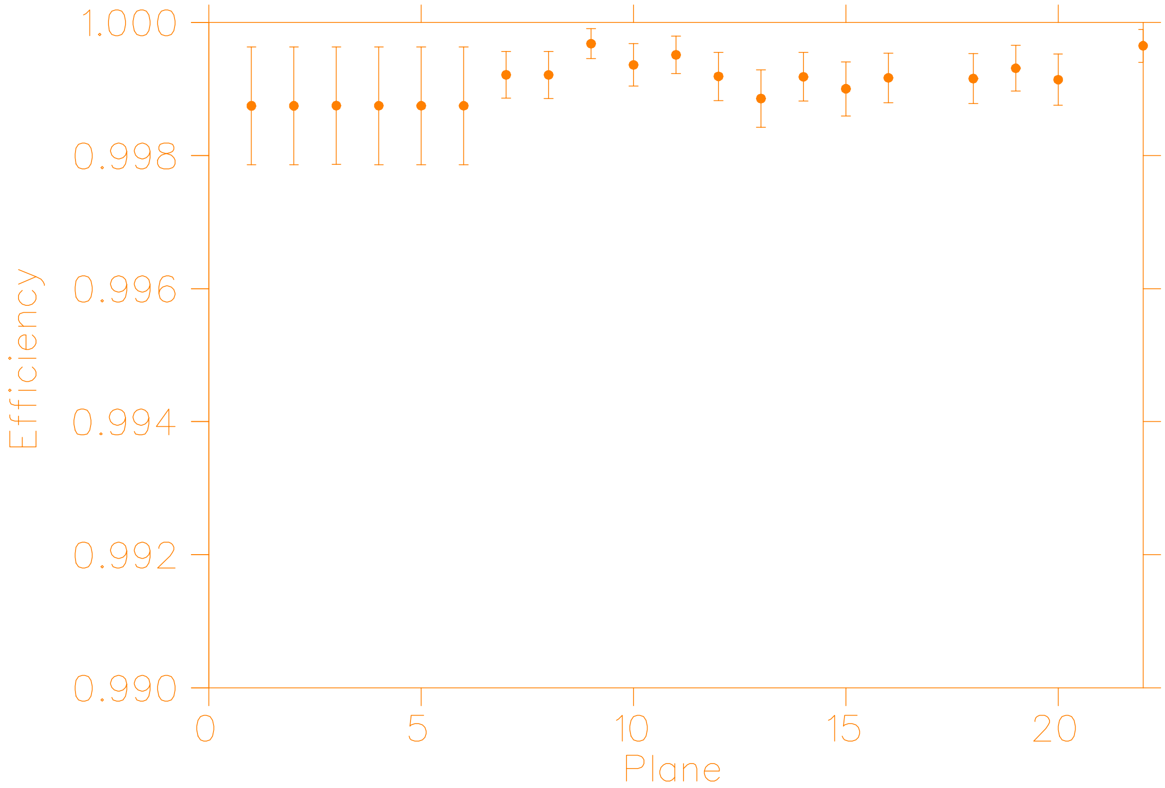

Figure 1: Plane efficiencies calculated with no χ^2 cut.

All these results indicate that the output efficiency is consistent with the input efficiency providing further proof that the filtering/tracking cuts (to within the statistical accuracy of this test) are not biasing the efficiency at any significant level. Possible small biases will be included (or estimated later).

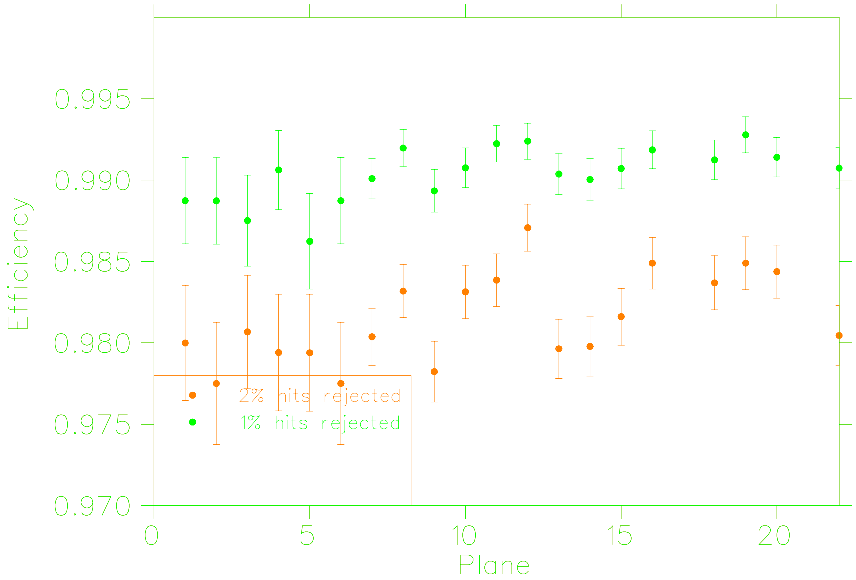

Figure 2: Plane efficiencies calculated with no χ^2 cut in the case when 1% and 2% of the hits on all planes are rejected.

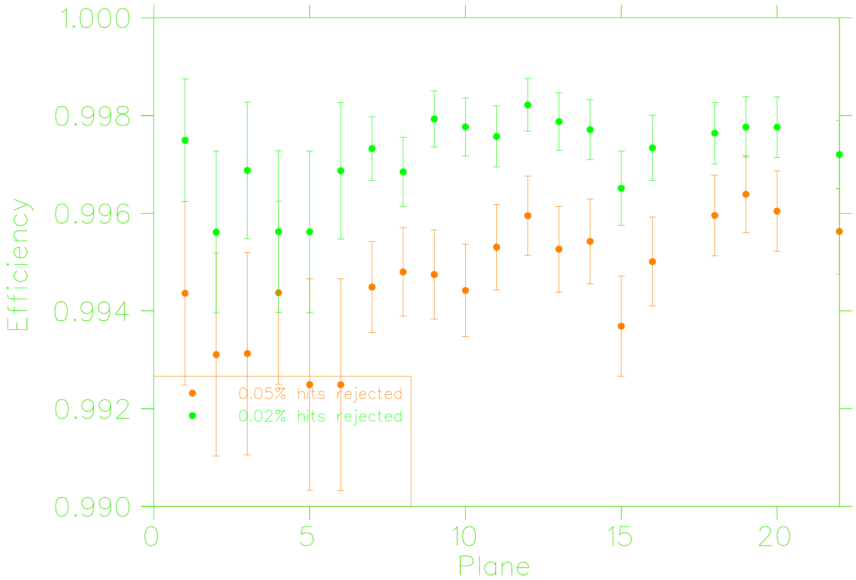

Figure 3: Plane efficiencies calculated with no χ^2 cut in the case when 0.02% and 0.05% of the hits on all planes are rejected.