ACIS Memo #171 Rev A

Massachusetts Institute of Technology

Center for Space Research
Cambridge, MA 02139
Room 37-558

To: ACIS Team
From: Beverly LaMarr (fergason@space.mit.edu)
Subject: ACIS Flight Energy Scale and Resolution as a Function of Row
Date: 05 November 1999

This memo presents the energy scale and resolution of the ACIS devices as a function of row position for days 262 through 286 of 1999 where the CTI was stable. Figure 1 is a plot of the average CTI of s2 at -110C.

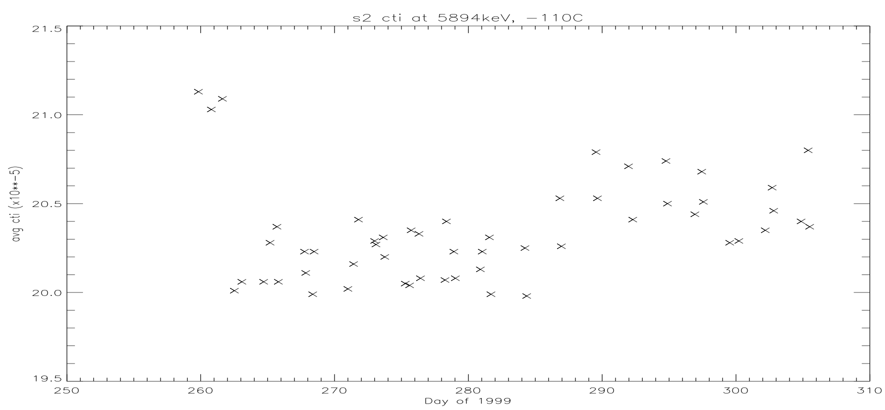

Figure 1: s2 Average CTI at -110C.

The data from all -110C external calibration source measurements from days 262 through 286 of 1999 have been summed. For i0, i1, i2 and i3 this includes OBSIDs 1310 1313 1315 1316 62373 62380 62377 62508 62371 62367 62366 62362 62361 62357 62353 and 62350. For s0, s1, s4 and s5 this includes OBSIDs 1311 1312 1314 1317 62375 62509 62379 62378 62370 62368 62365 62363 62360 62358 62354 and 62351. For s2 this includes OBSIDs 1304 1306 1310 1311 1312 1313 1314 1315 1316 1317 62375 62373 62509 62380 62379 62378 62377 62508 62371 62370 62368 62367 62366 62365 62363 62362 62361 62360 62358 62357 62354 62353 62351 and 62350. For s3 this includes OBSIDs 1304 1306 1310 1311 1312 1313 1314 1315 1316 1317 62375 62373 62509 62380 62379 62378 62377 62508 62371 62370 62368 62367 62366 62365 62362 62361 62360 62358 62357 62354 62351 and 62350.

After the data for each chip was summed, the data from each output node has been broken into thirty-two thirty-two row bins and only the summed pulse heights of ASCA grade 02346 events were considered. For each of the 256x32 pixel bins, a gaussian was fit to each of the three main peaks (Mn Kalpha at 5894 keV, Ti Kalpha at 4510 keV, and Al K at 1487 keV).

Table 1 summarizes the total number of ASCA g02346 events from 0 to 2000ADU, as well as the average number of counts in each of the gaussian fits for each CCD.

Figures 2 through 31 are plots of the peak location of the gaussian fit to the ASCA g02346 events for each of the thirty-two row bins.

Figures 32 through 61 are plots of the full width half max in eV of the gaussian fit to the ASCA g02346 events for each of the thirty-two row bins.

Figures 62 through 81 are plots of slope and intercept of the energy scale for each of the thirty-two row bins.

Also plotted here, as Figures 82 through 91, are the total number of ASCA g02346 events from 0 to 2000 ADU in each of the thirty-two row bins. The first of the bins is low due to shadowing of the framestore cover over the first several rows. These plots are included to give an indication of the number of "good" events that are lost into "bad" grades due to the CTI.

Similar plots for ground data taken of the external calibration source at -110C can be found following the plots of flight data.

CCD	Total Exposure (seconds)	Total g02346	Average Al	Average Ti	Average Mn
i0	33352	2.99604e+06	3876	3846	12815
i1	33955	3.04854e+06	3952	3980	12953
i2	31807	3.04854e+06	3952	3980	12953
i3	32895	2.97459e+06	3911	4057	12499
s0	23046	1.95522e+06	2624	2548	8409
s1	68227	5.53978e+06	9728	7396	19728
s2	73236	6.76518e+06	9092	9470	28645
s3	157486	1.50408e+07	23393	21105	56346
s4	26292	2.46304e+06	3176	3470	10184
s5	26082	2.33158e+06	2983	3383	9731

Table 1: Number of Counts

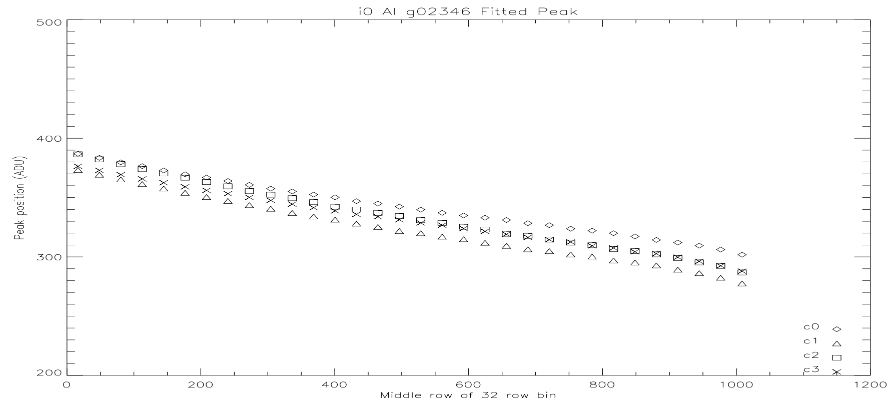

Figure 2: i0 Al Peak Vs Row at -110C.

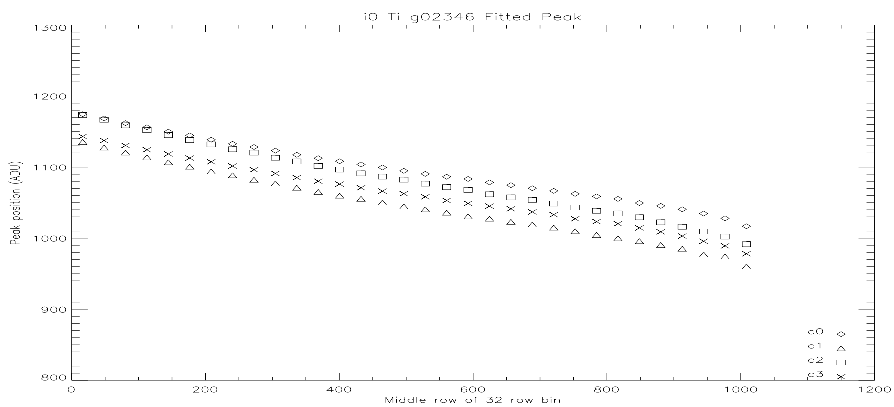

Figure 3: i0 Ti Peak Vs Row at -110C.

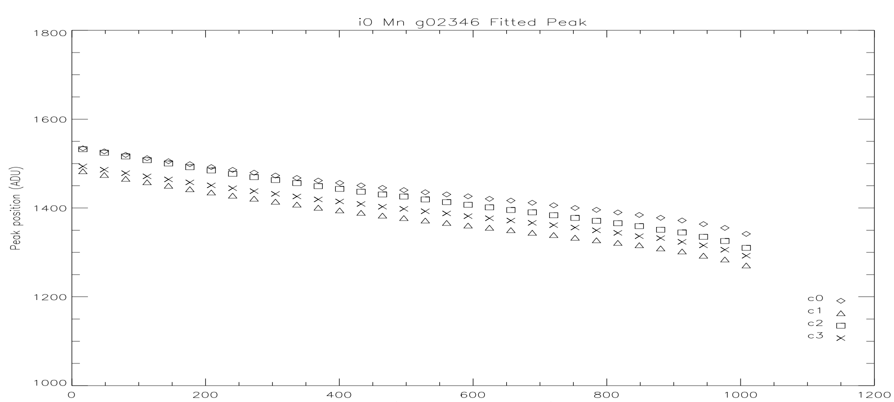

Figure 4: i0 Mn Peak Vs Row at -110C.

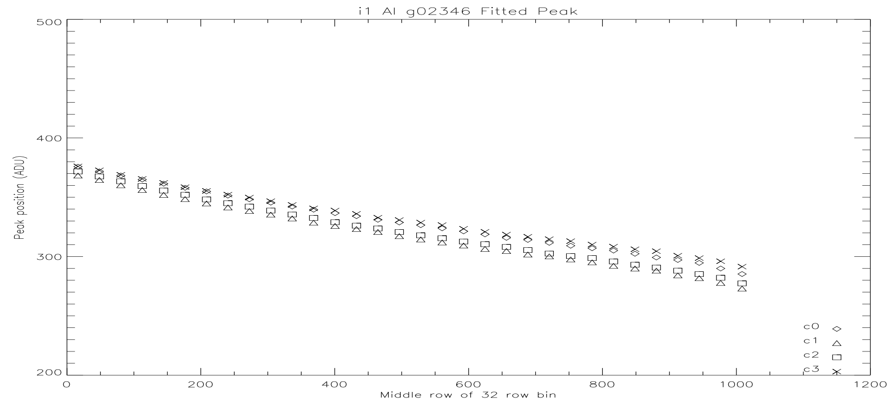

Figure 5: i1 Al Peak Vs Row at -110C.

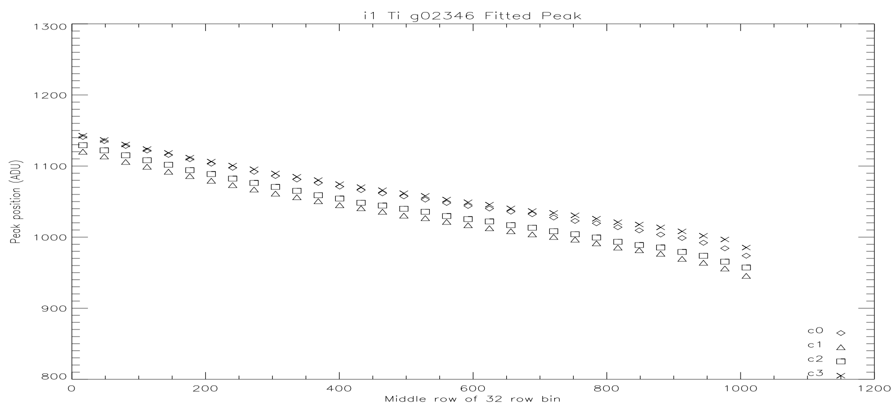

Figure 6: i1 Ti Peak Vs Row at -110C.

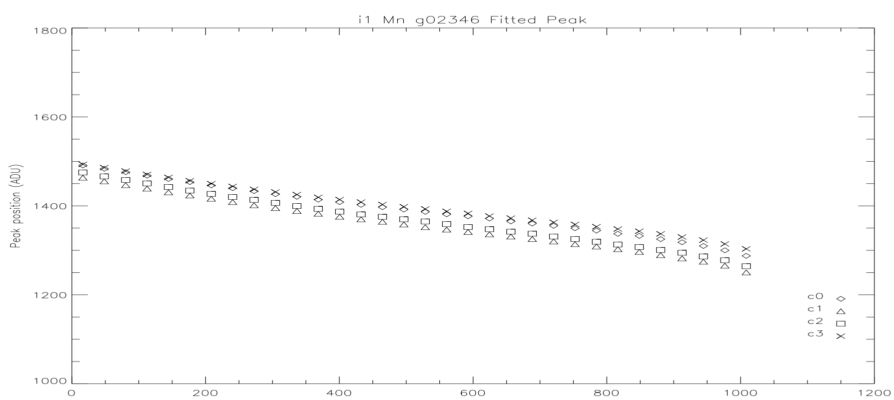

Figure 7: i1 Mn Peak Vs Row at -110C.

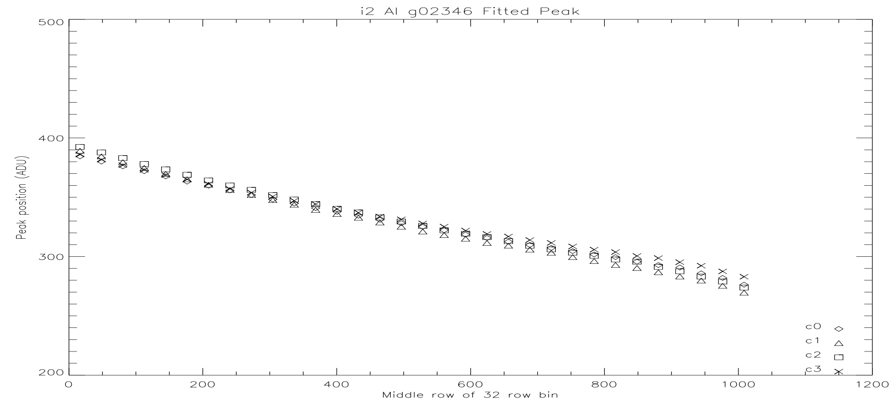

Figure 8: i2 Al Peak Vs Row at -110C.

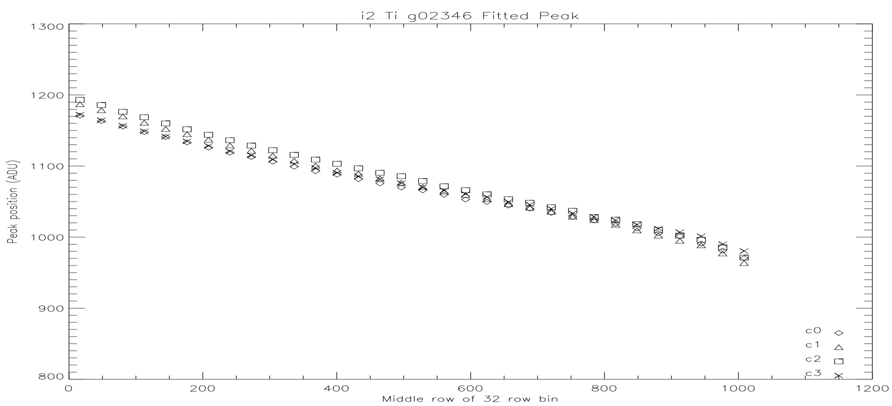

Figure 9: i2 Ti Peak Vs Row at -110C.

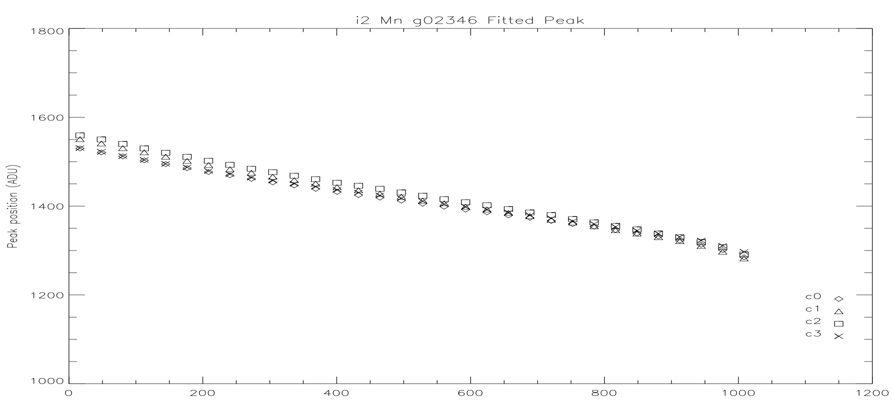

Figure 10: i2 Mn Peak Vs Row at -110C.

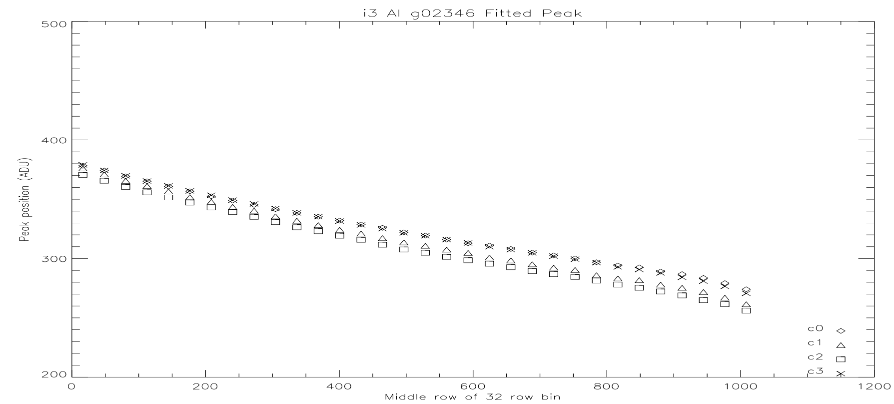

Figure 11: i3 Al Peak Vs Row at -110C.

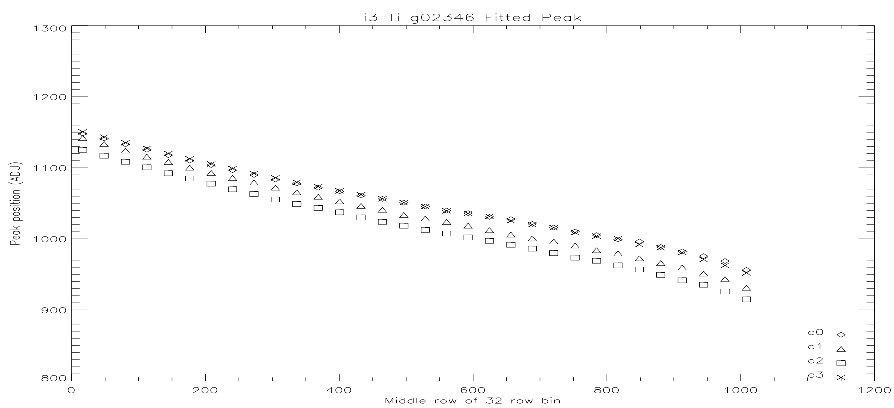

Figure 12: i0 Ti Peak Vs Row at -110C.

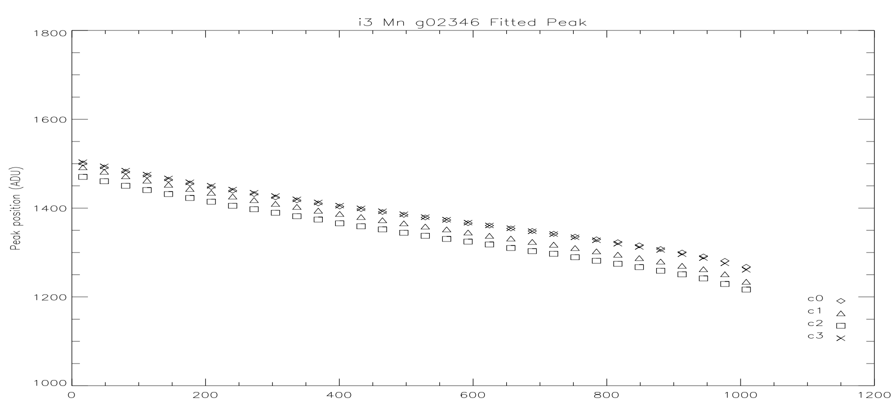

Figure 13: i3 Mn Peak Vs Row at -110C.

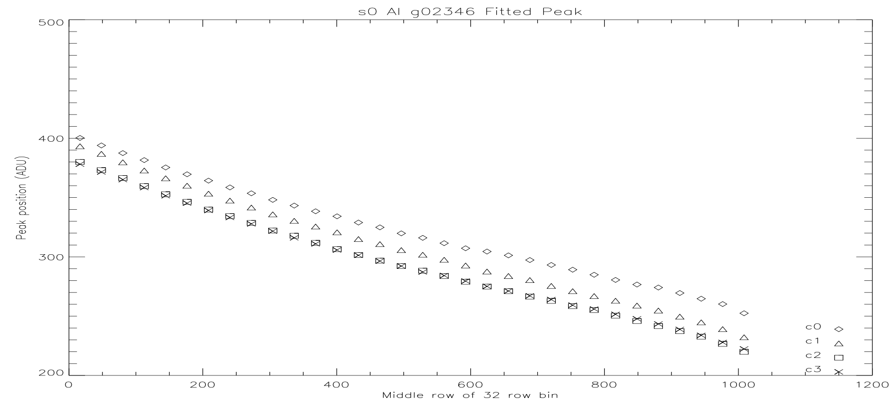

Figure 14: S0 Al Peak Vs Row at -110C.

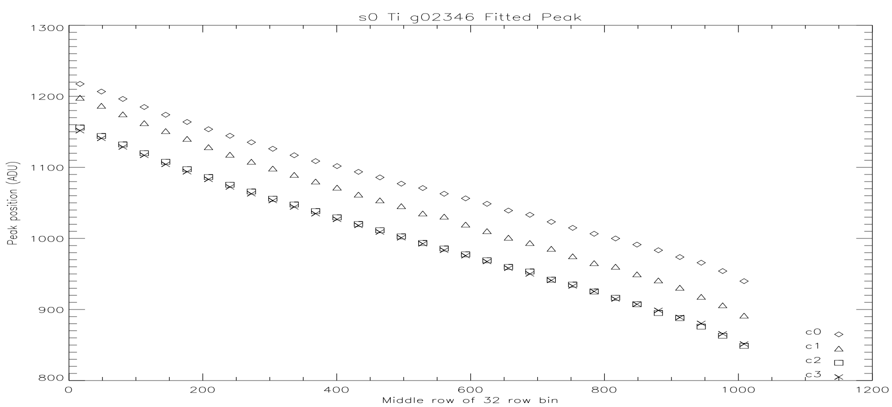

Figure 15: S0 Ti Peak Vs Row at -110C.

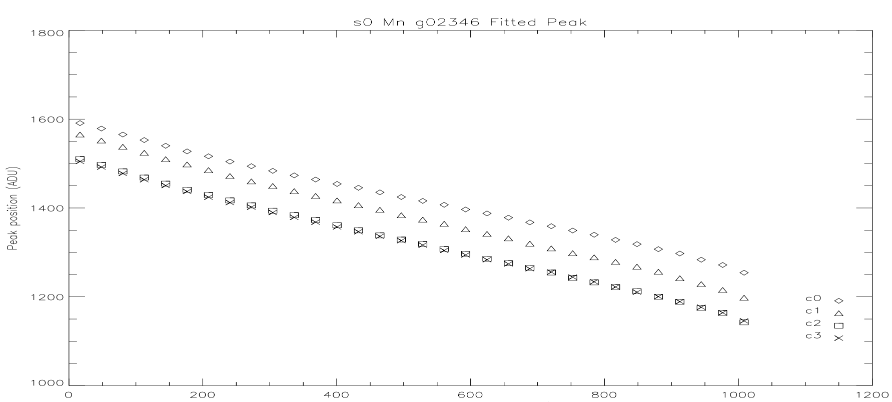

Figure 16: S0 Mn Peak Vs Row at -110C.

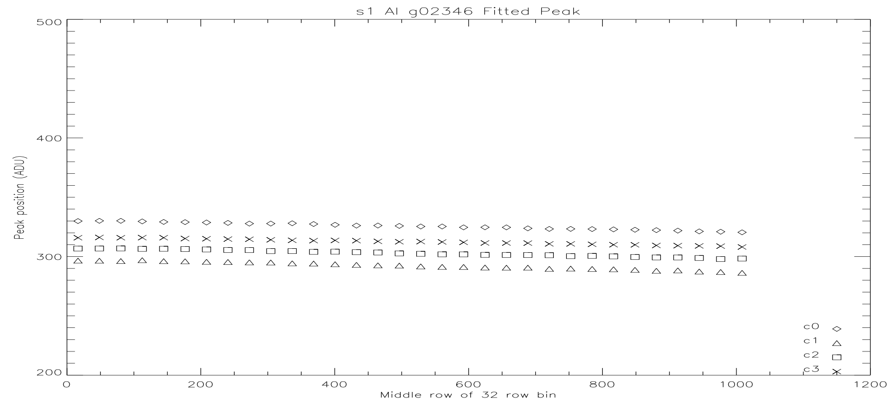

Figure 17: S1 Al Peak Vs Row at -110C.

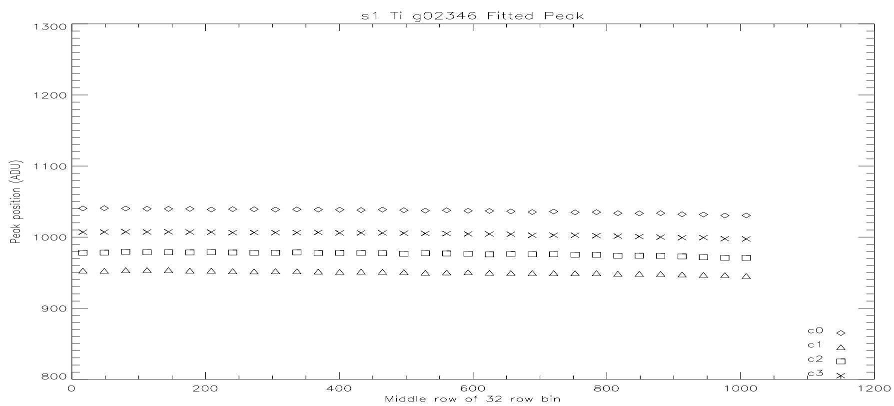

Figure 18: S1 Ti Peak Vs Row at -110C.

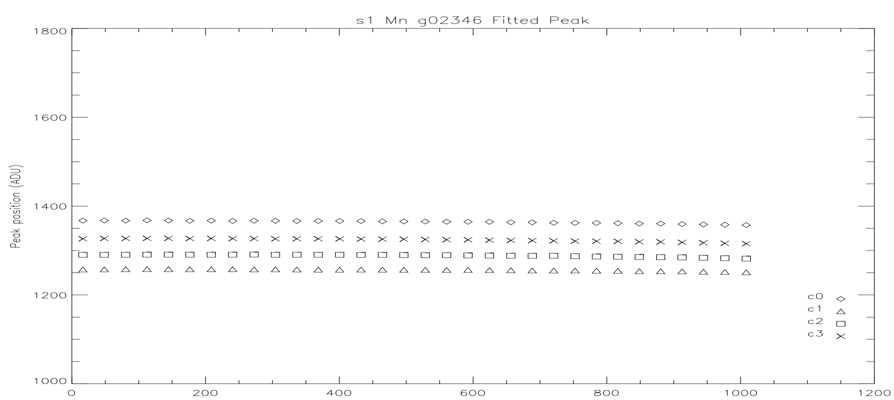

Figure 19: S1 Mn Peak Vs Row at -110C.

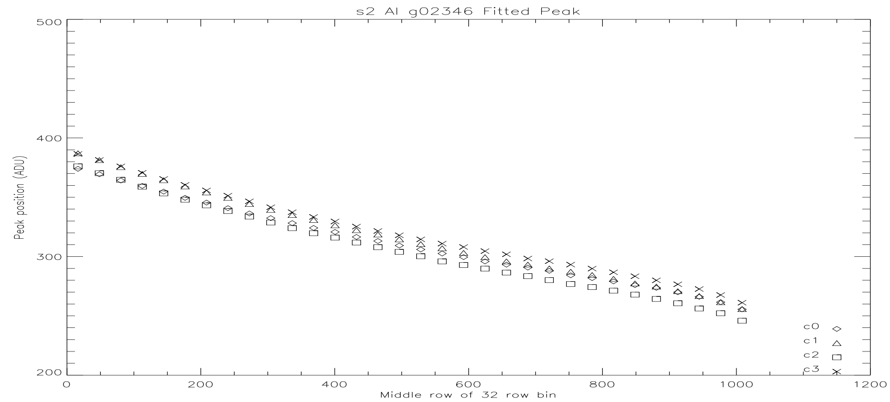

Figure 20: S2 Al Peak Vs Row at -110C.

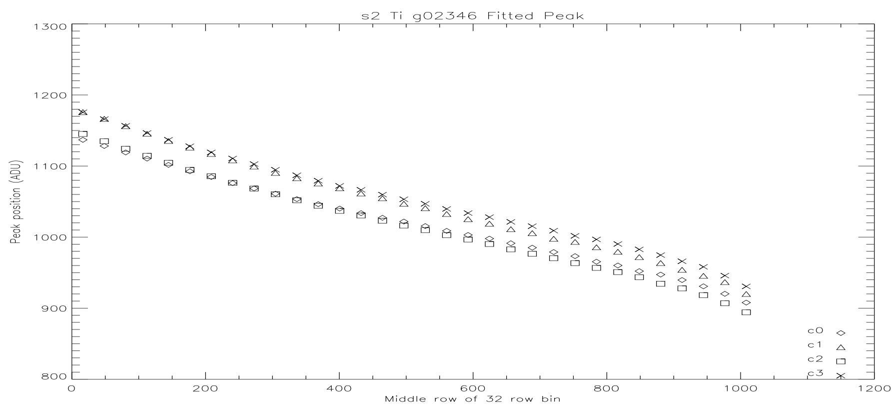

Figure 21: S2 Ti Peak Vs Row at -110C.

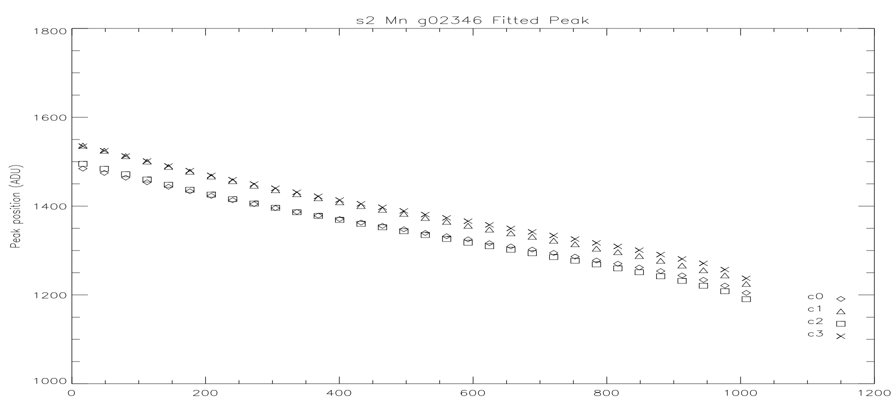

Figure 22: S2 Mn Peak Vs Row at -110C.

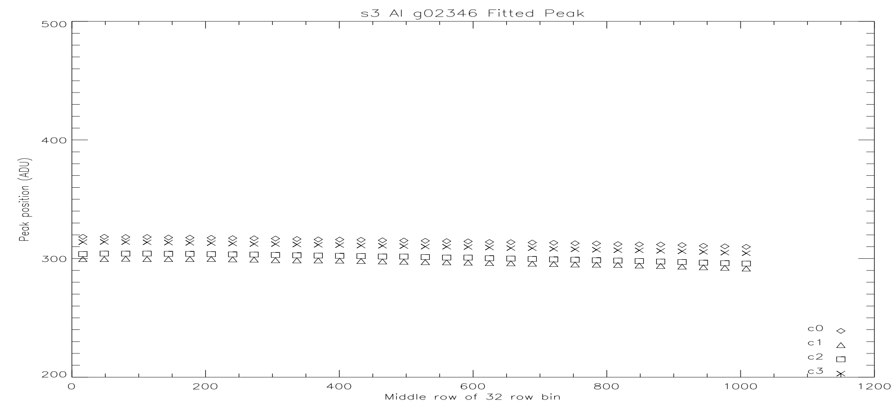

Figure 23: S3 Al Peak Vs Row at -110C.

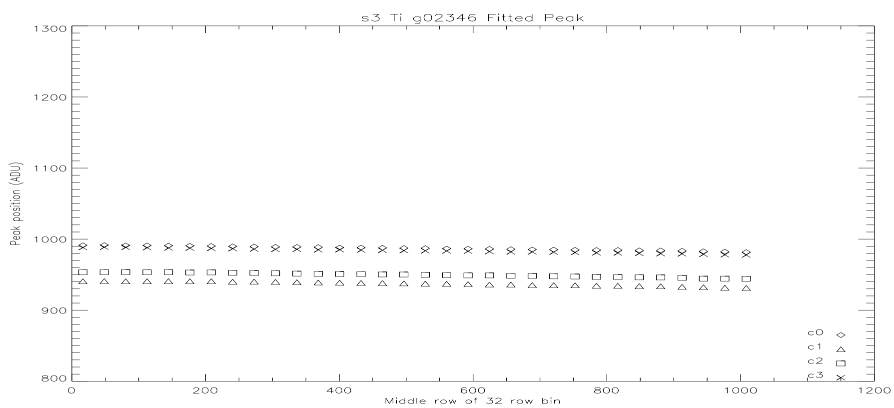

Figure 24: S3 Ti Peak Vs Row at -110C.

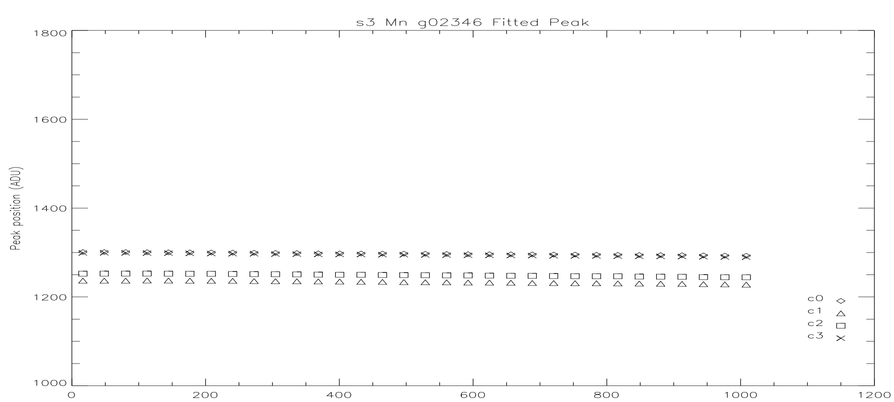

Figure 25: S3 Mn Peak Vs Row at -110C.

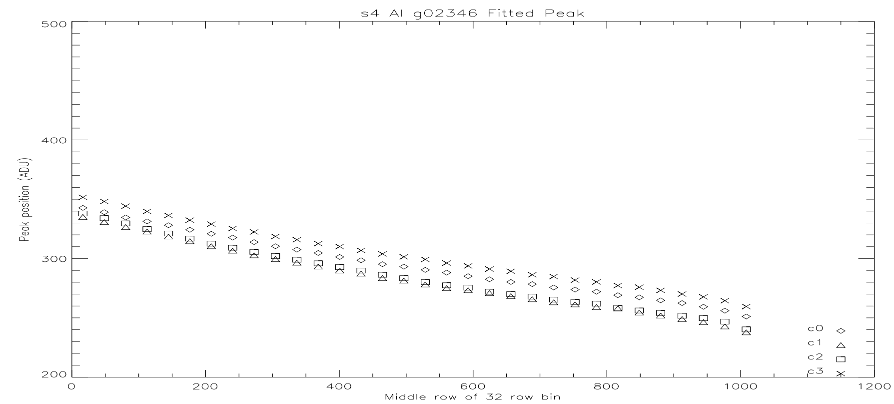

Figure 26: S4 Al Peak Vs Row at -110C.

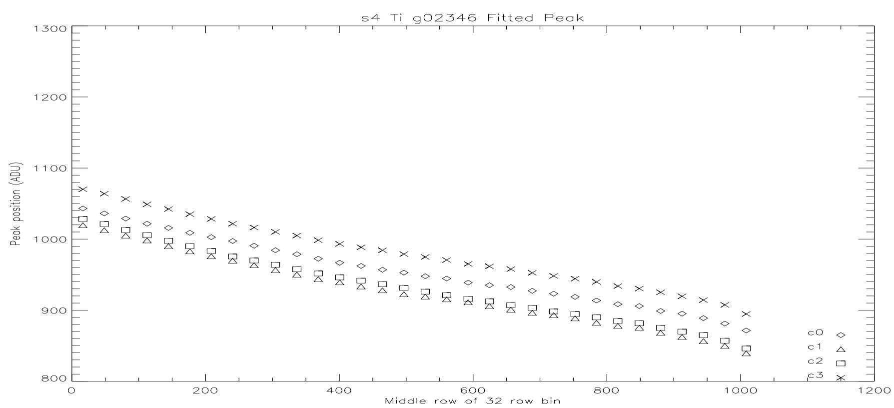

Figure 27: S4 Ti Peak Vs Row at -110C.

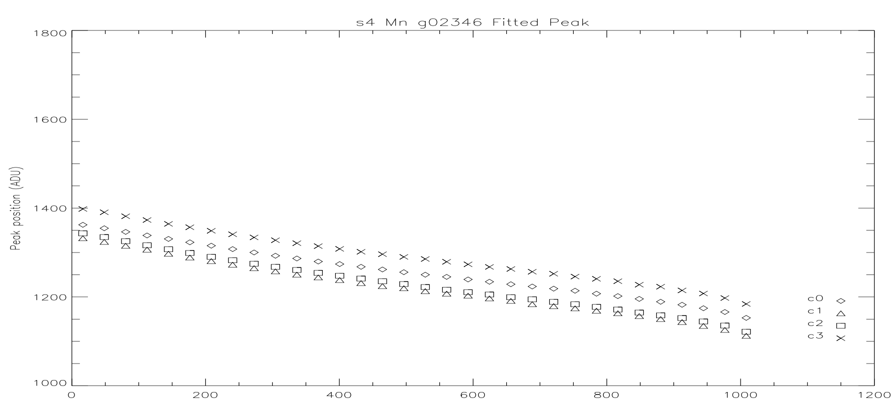

Figure 28: S4 Mn Peak Vs Row at -110C.

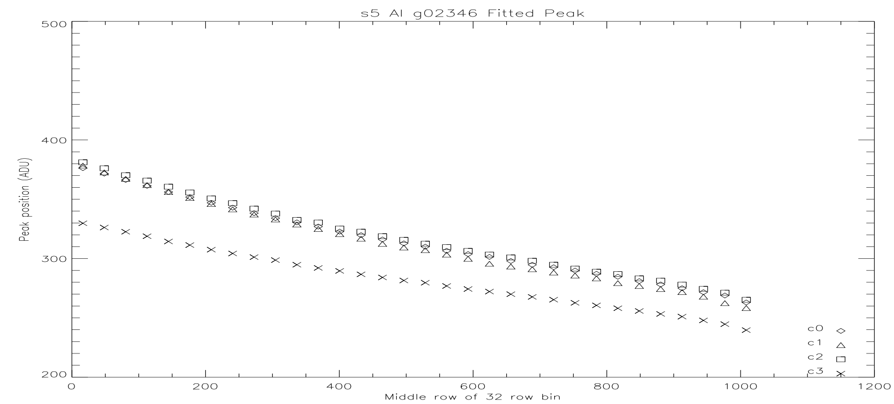

Figure 29: S5 Al Peak Vs Row at -110C.

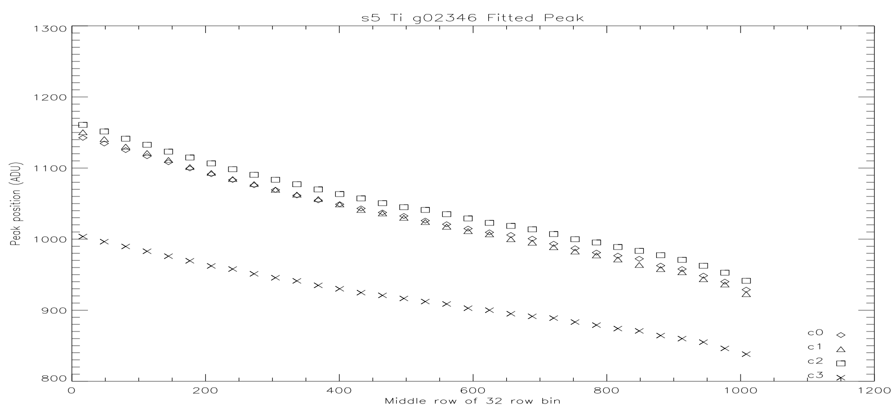

Figure 30: S5 Ti Peak Vs Row at -110C.

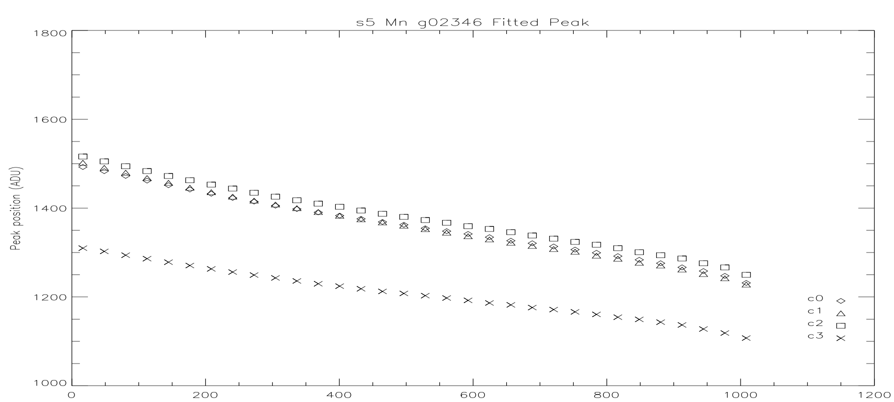

Figure 31: S5 Mn Peak Vs Row at -110C.

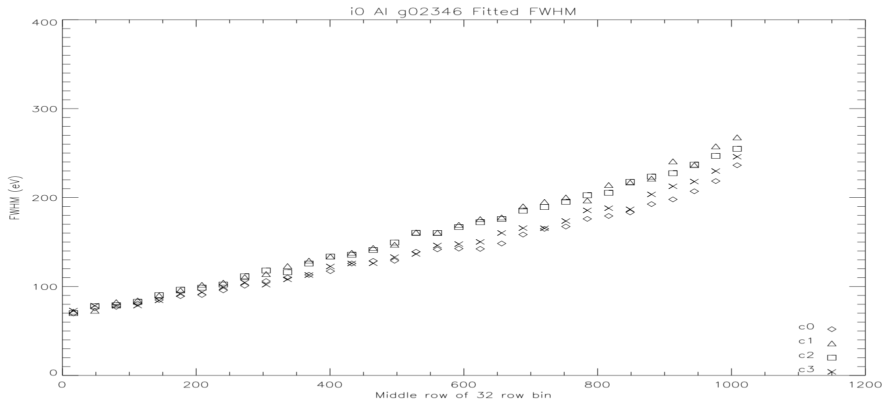

Figure 32: i0 Al FWHM Vs Row at -110C.

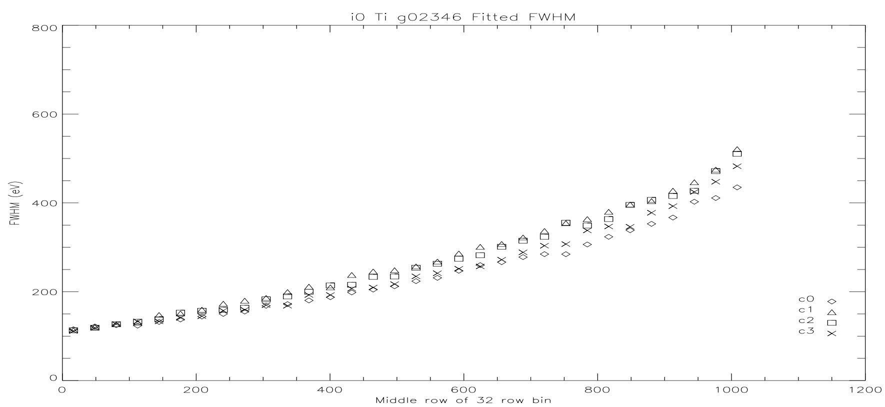

Figure 33: i0 Ti FWHM Vs Row at -110C.

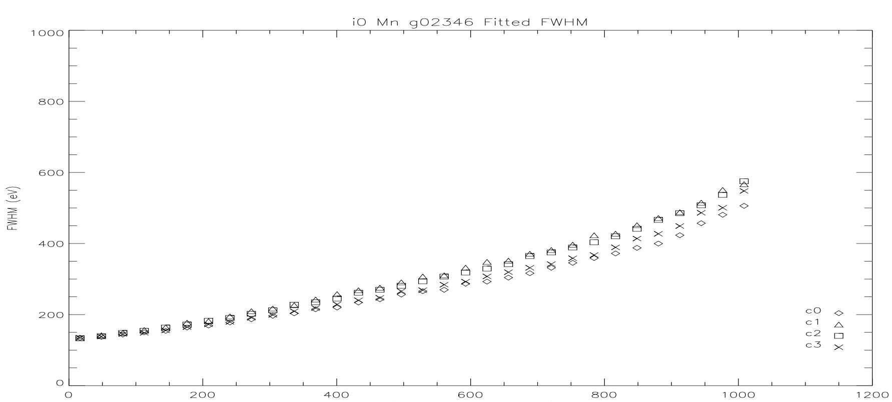

Figure 34: i0 Mn FWHM Vs Row at -110C.

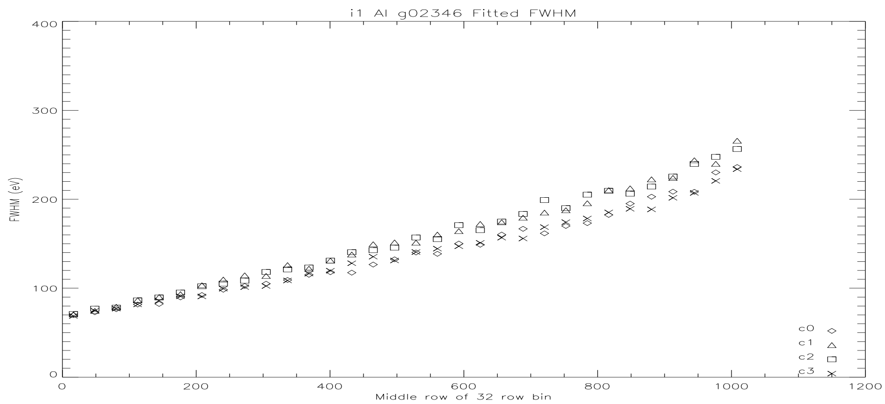

Figure 35: i1 Al FWHM Vs Row at -110C.

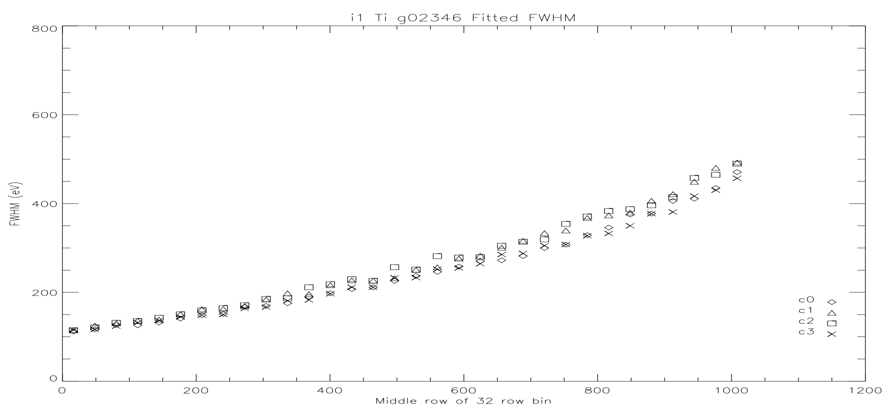

Figure 36: i1 Ti FWHM Vs Row at -110C.

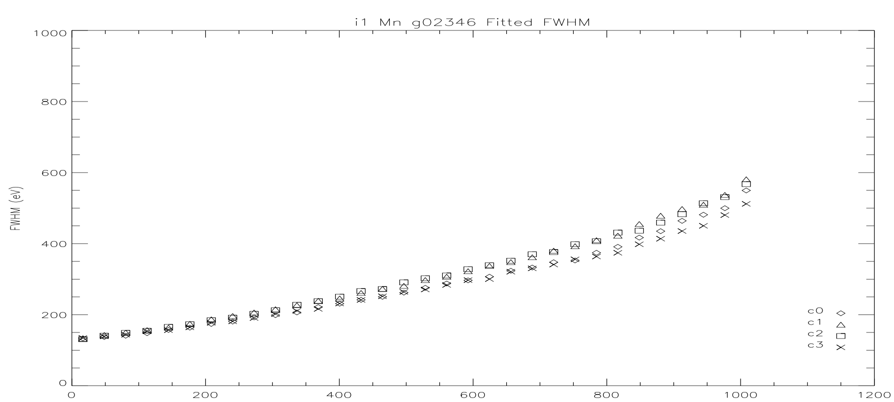

Figure 37: i1 Mn FWHM Vs Row at -110C.

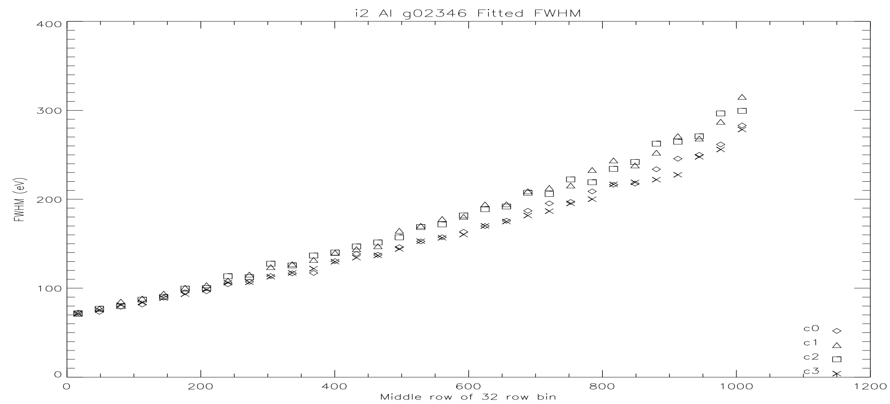

Figure 38: i2 Al FWHM Vs Row at -110C.

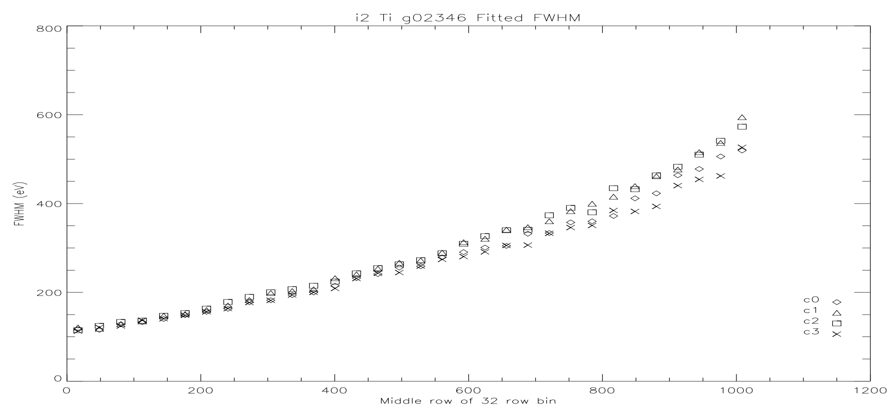

Figure 39: i2 Ti FWHM Vs Row at -110C.

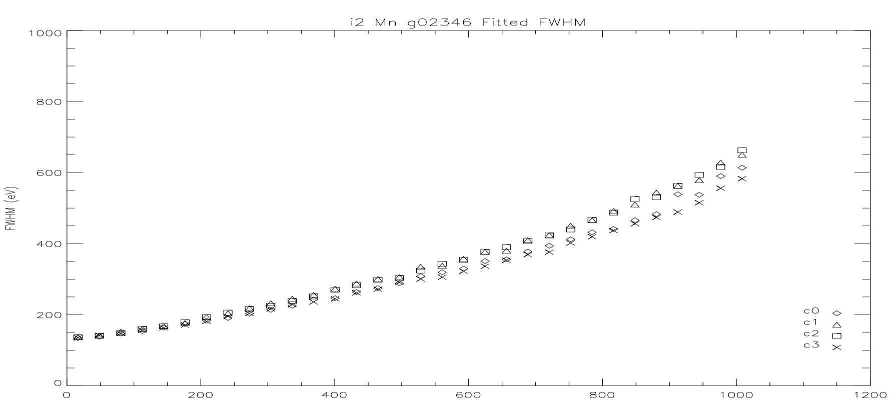

Figure 40: i2 Mn FWHM Vs Row at -110C.

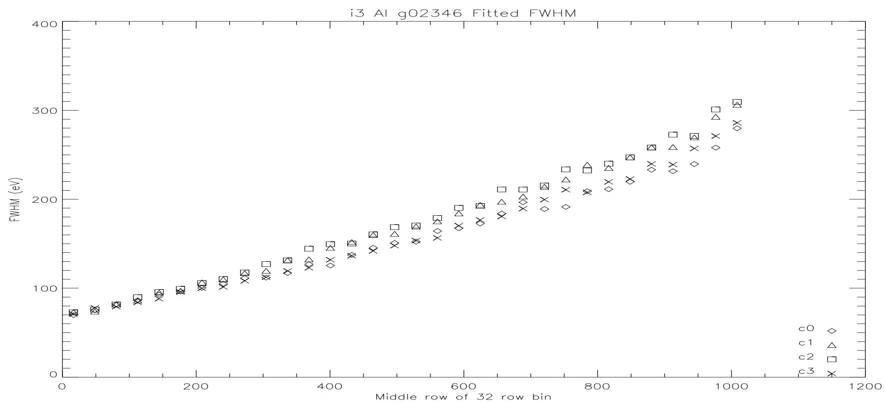

Figure 41: i3 Al FWHM Vs Row at -110C.

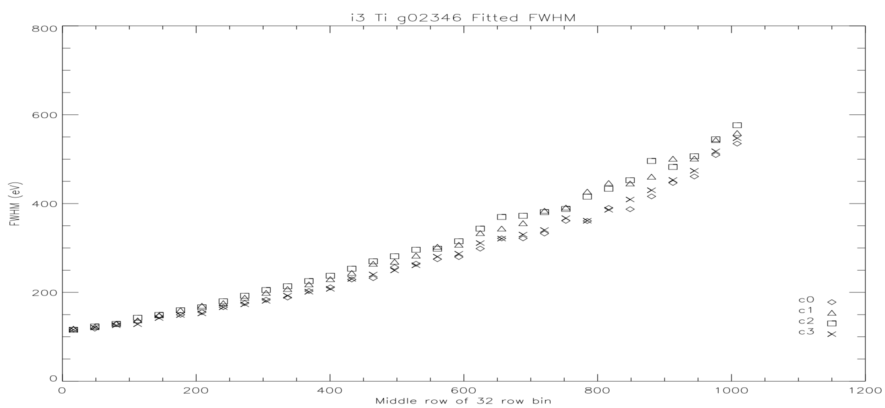

Figure 42: i3 Ti FWHM Vs Row at -110C.

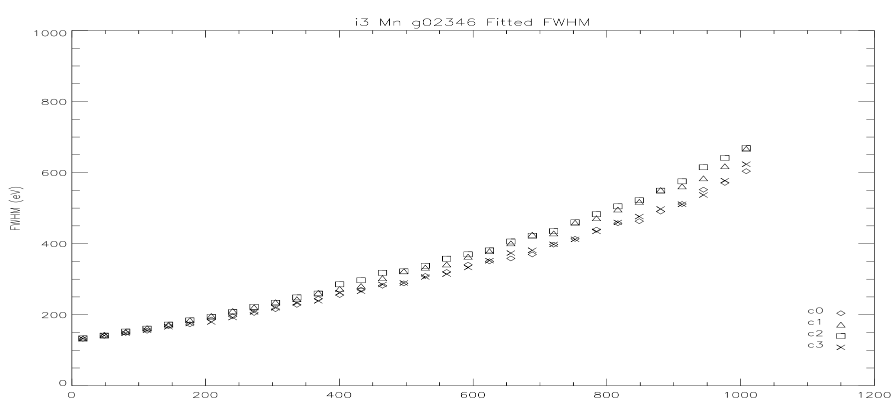

Figure 43: i3 Mn FWHM Vs Row at -110C.

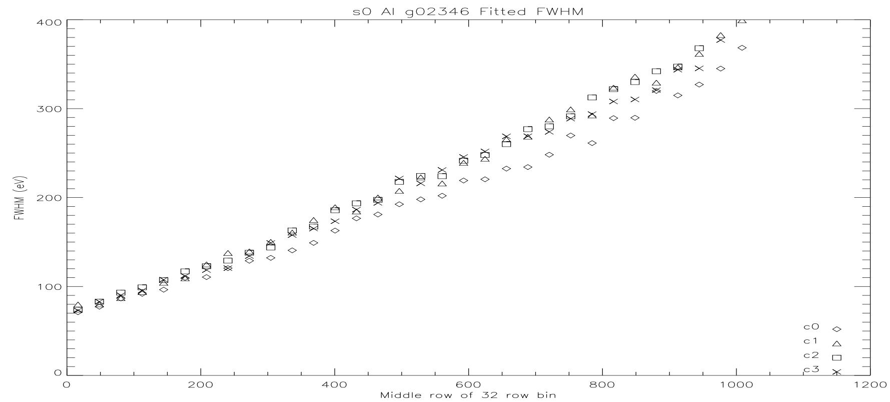

Figure 44: S0 Al FWHM Vs Row at -110C.

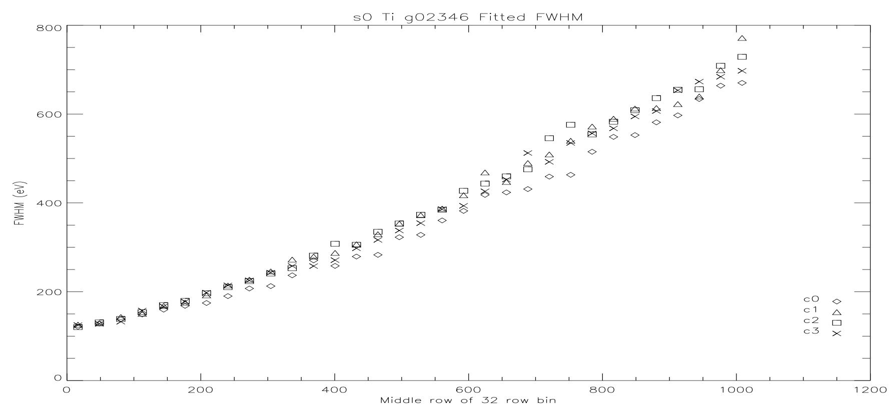

Figure 45: S0 Ti FWHM Vs Row at -110C.

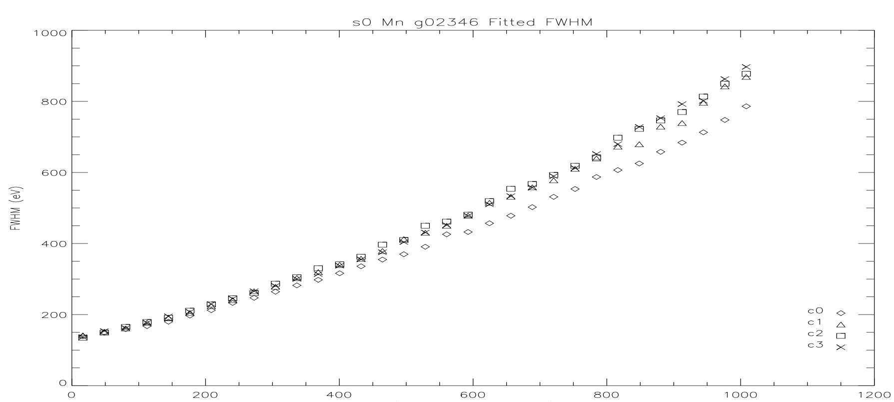

Figure 46: S0 Mn FWHM Vs Row at -110C.

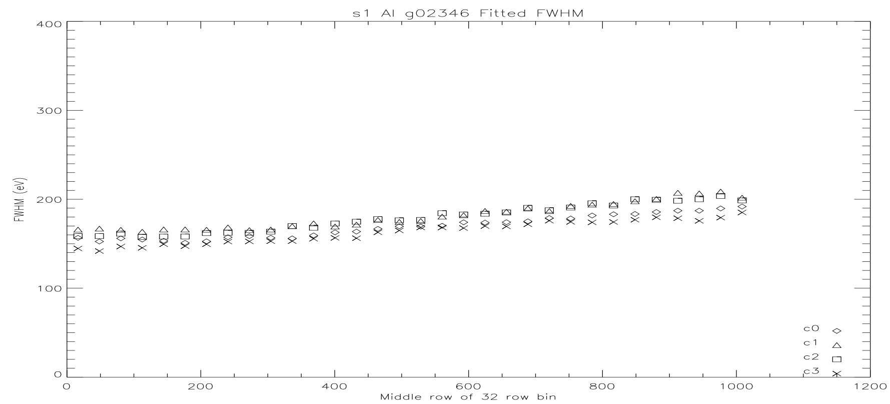

Figure 47: S1 Al FWHM Vs Row at -110C.

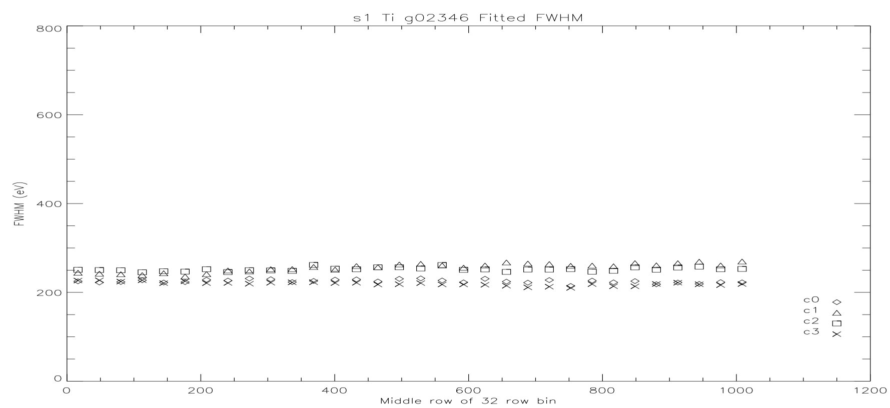

Figure 48: S1 Ti FWHM Vs Row at -110C.

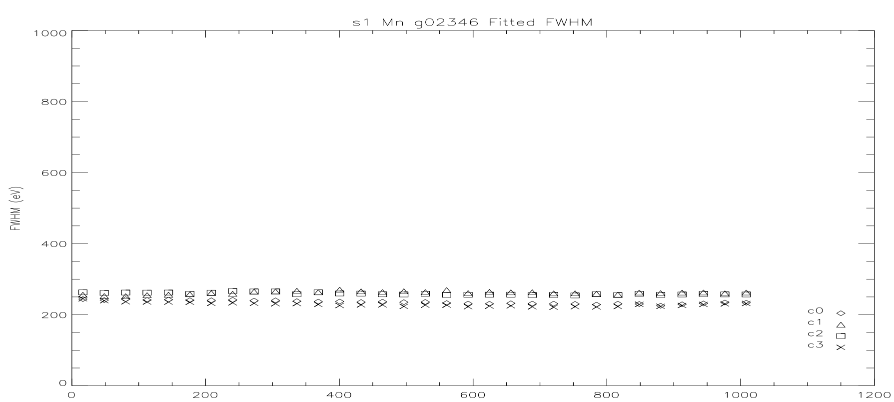

Figure 49: S1 Mn FWHM Vs Row at -110C.

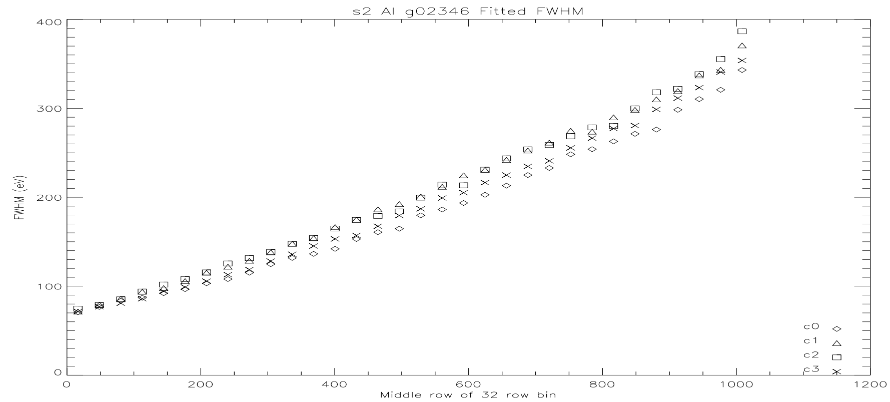

Figure 50: S2 Al FWHM Vs Row at -110C.

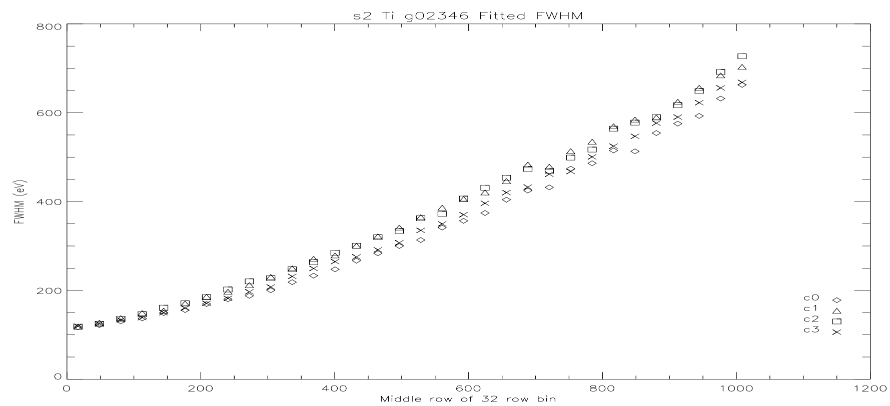

Figure 51: S2 Ti FWHM Vs Row at -110C.

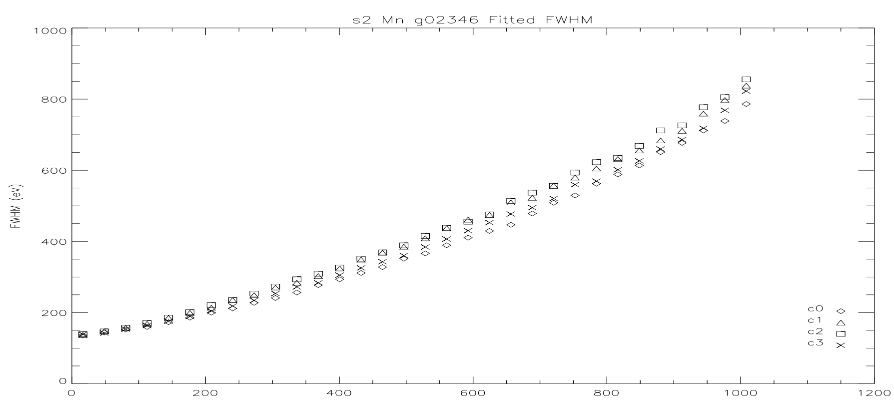

Figure 52: S2 Mn FWHM Vs Row at -110C.

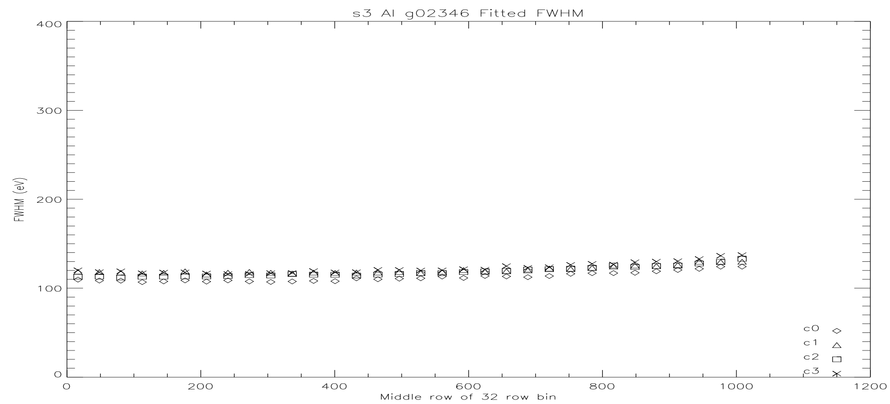

Figure 53: S3 Al FWHM Vs Row at -110C.

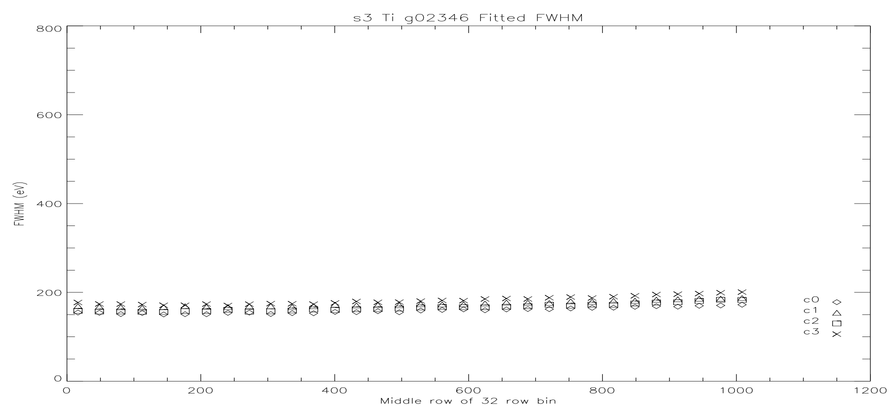

Figure 54: S3 Ti FWHM Vs Row at -110C.

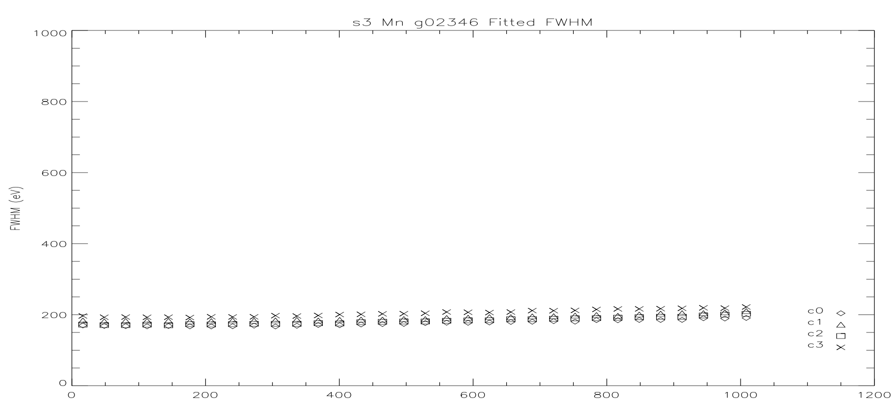

Figure 55: S3 Mn FWHM Vs Row at -110C.

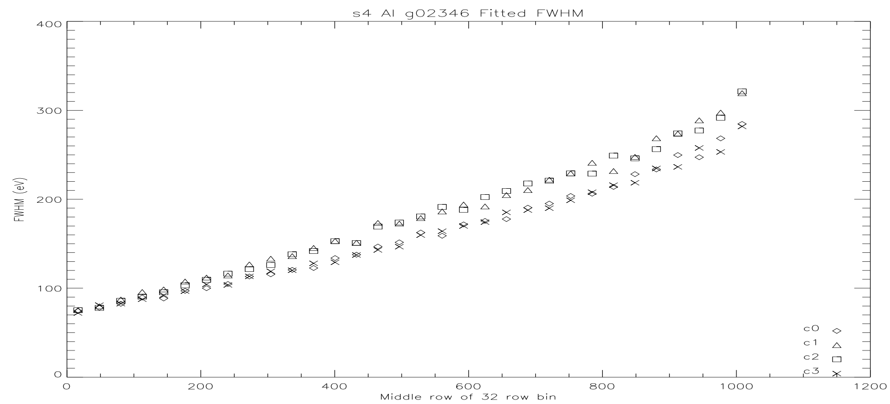

Figure 56: S4 Al FWHM Vs Row at -110C.

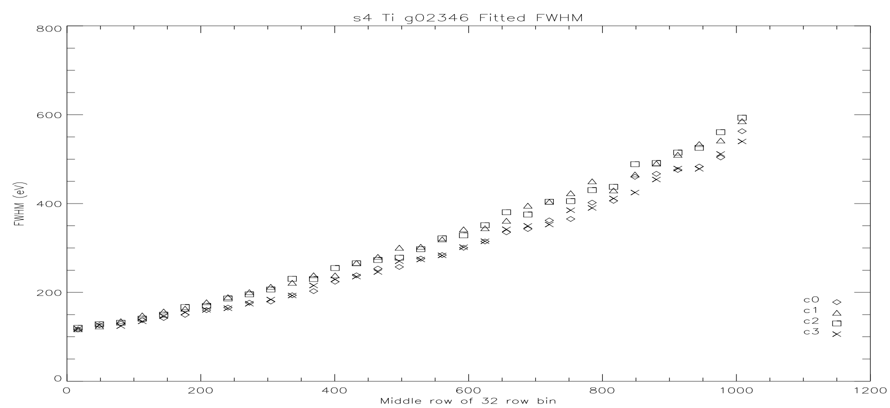

Figure 57: S4 Ti FWHM Vs Row at -110C.

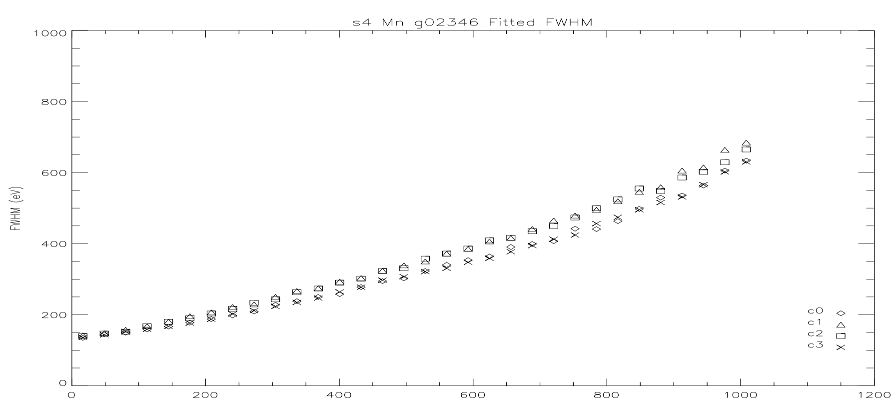

Figure 58: S4 Mn FWHM Vs Row at -110C.

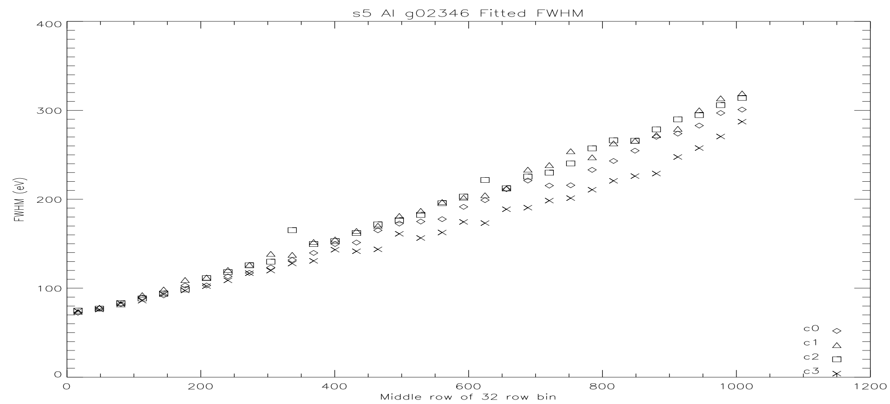

Figure 59: S5 Al FWHM Vs Row at -110C.

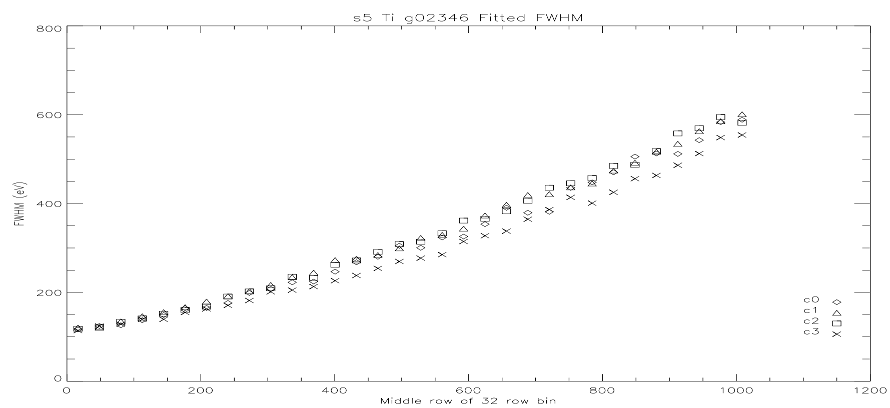

Figure 60: S5 Ti FWHM Vs Row at -110C.

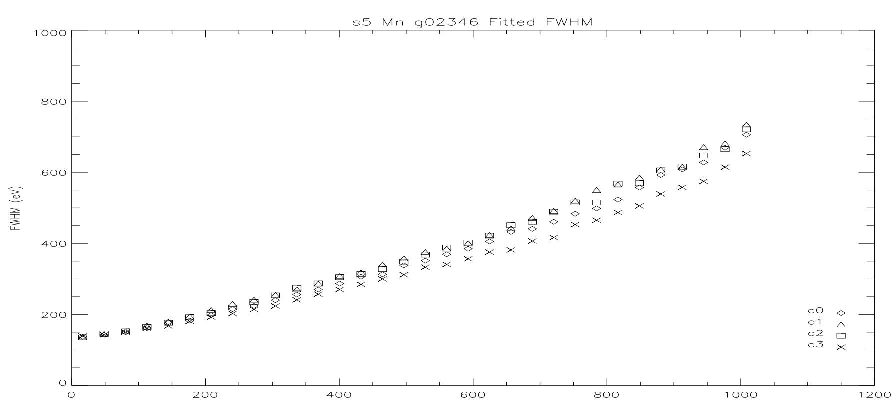

Figure 61: S5 Mn FWHM Vs Row at -110C.

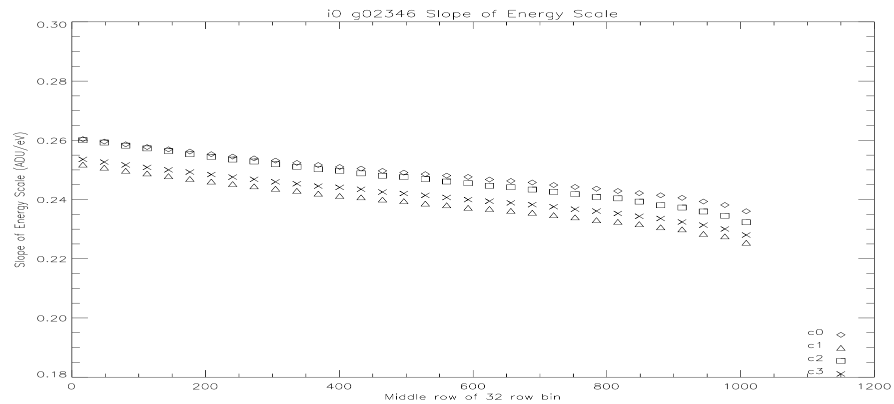

Figure 62: i0 Slope of the Energy Scale Vs Row at -110C.

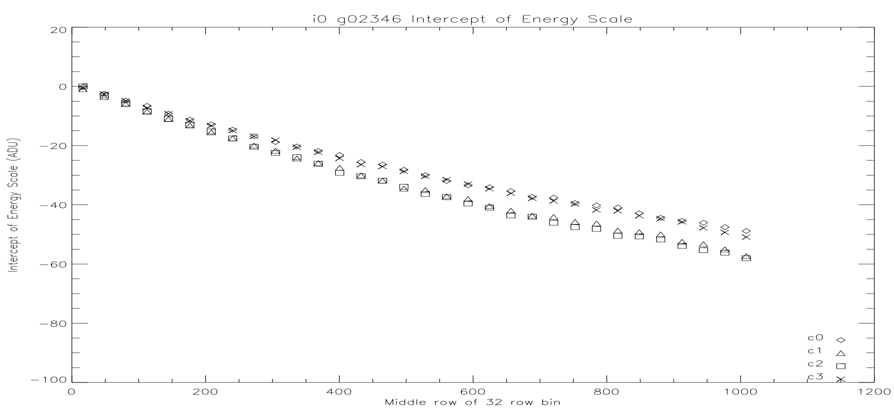

Figure 63: i0 Intercept of the Energy Scale Vs Row at -110C.

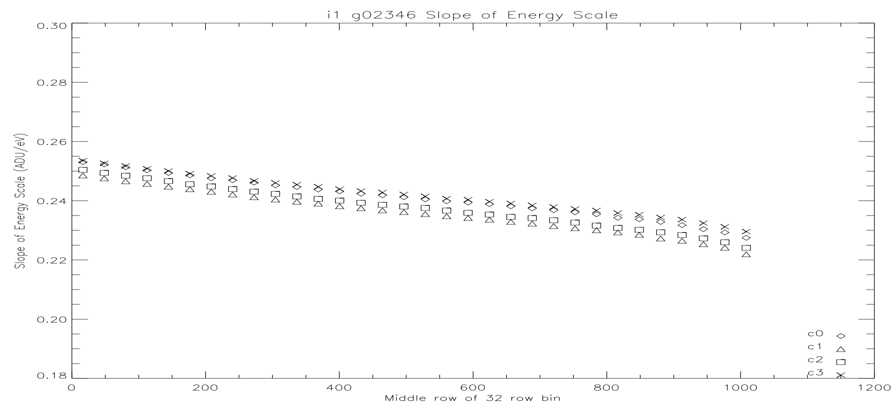

Figure 64: i1 Slope of the Energy Scale Vs Row at -110C.

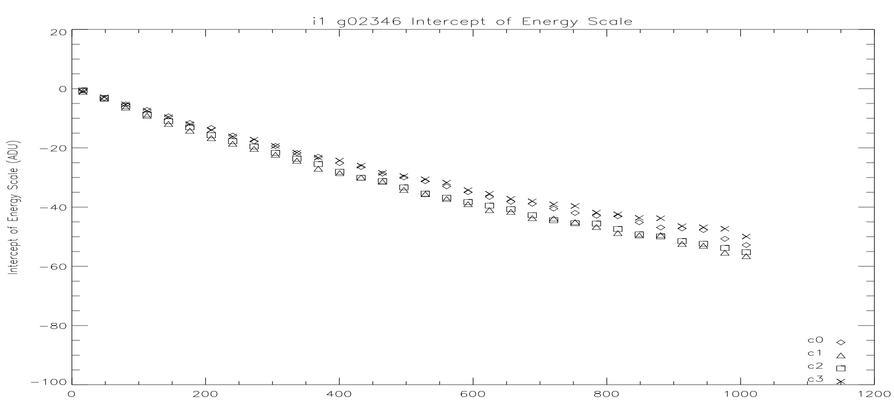

Figure 65: i1 Intercept of the Energy Scale Vs Row at -110C.

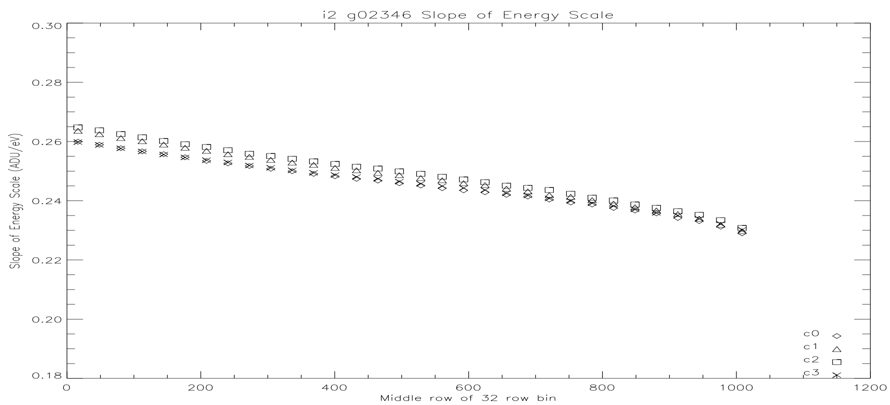

Figure 66: i2 Slope of the Energy Scale Vs Row at -110C.

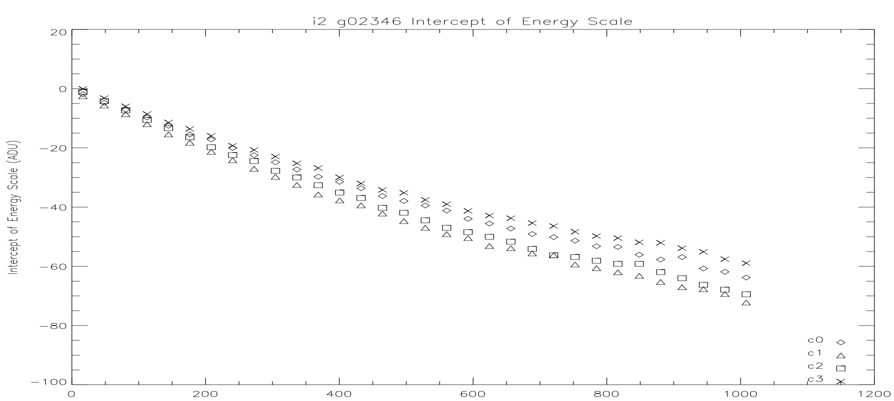

Figure 67: i2 Intercept of the Energy Scale Vs Row at -110C.

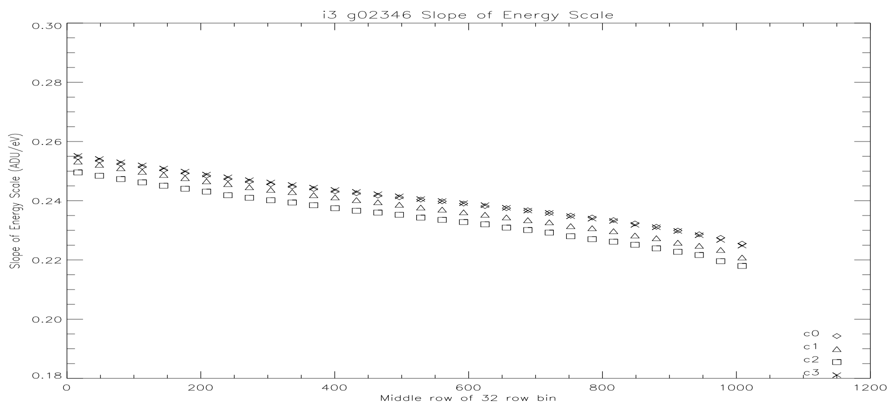

Figure 68: i3 Slope of the Energy Scale Vs Row at -110C.

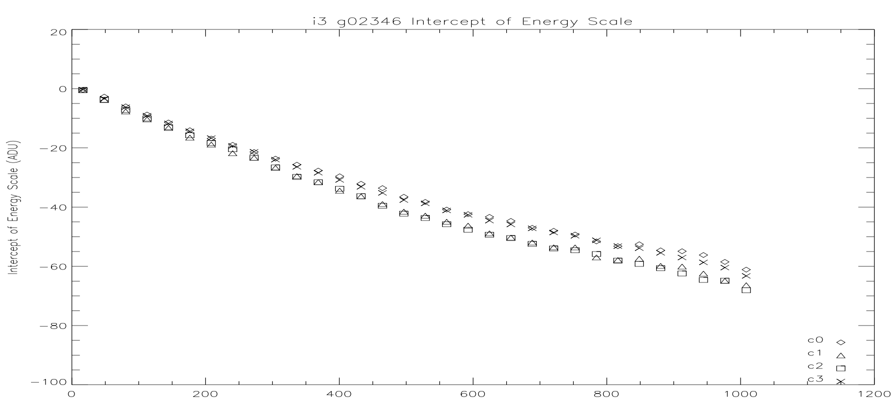

Figure 69: i3 Intercept of the Energy Scale Vs Row at -110C.

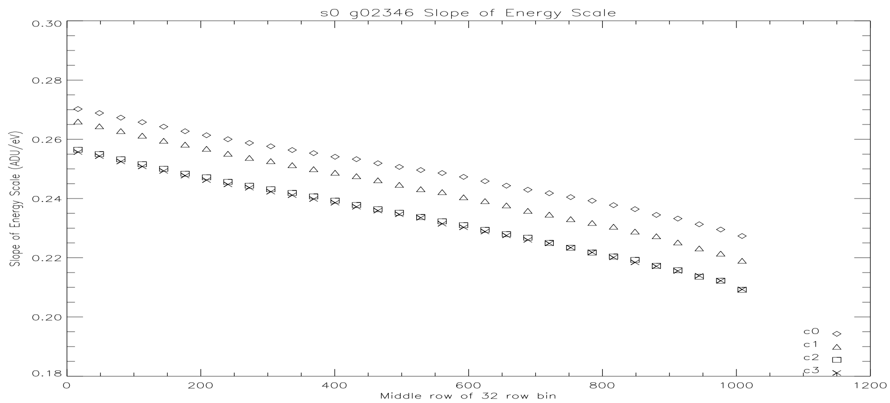

Figure 70: S0 Slope of the Energy Scale Vs Row at -110C.

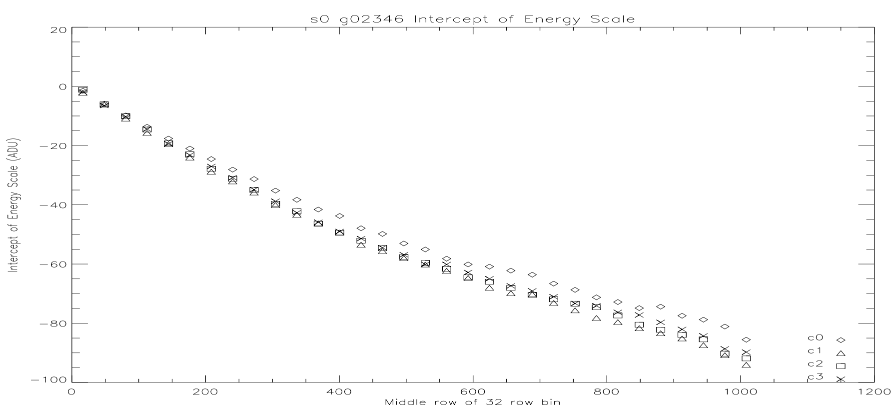

Figure 71: S0 Intercept of the Energy Scale Vs Row at -110C.

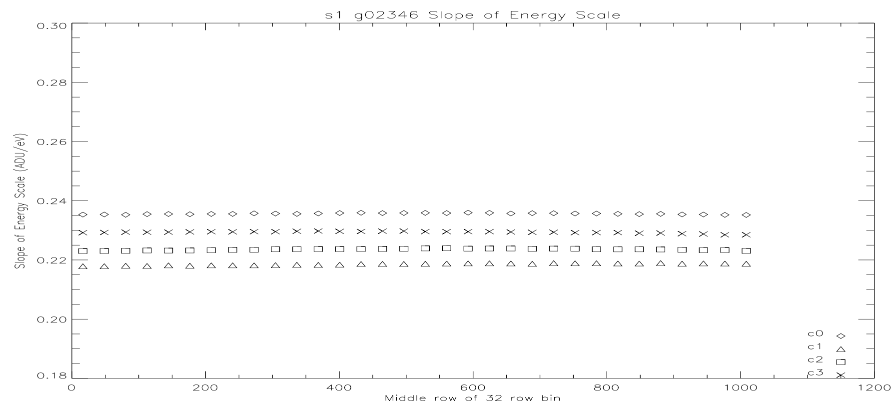

Figure 72: S1 Slope of the Energy Scale Vs Row at -110C.

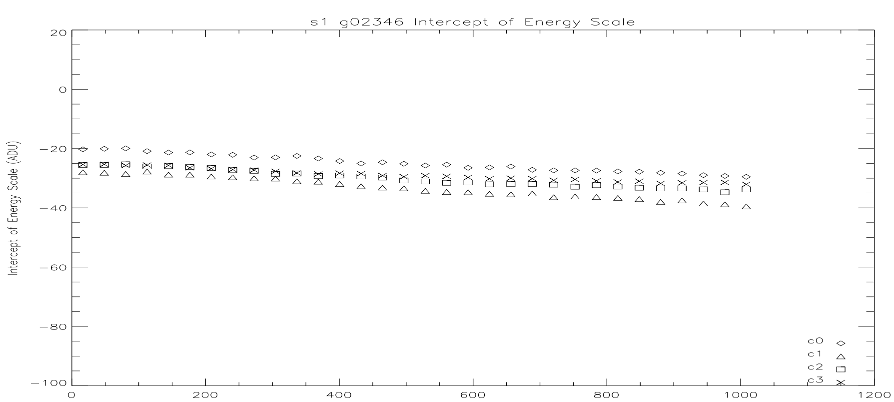

Figure 73: S1 Intercept of the Energy Scale Vs Row at -110C.

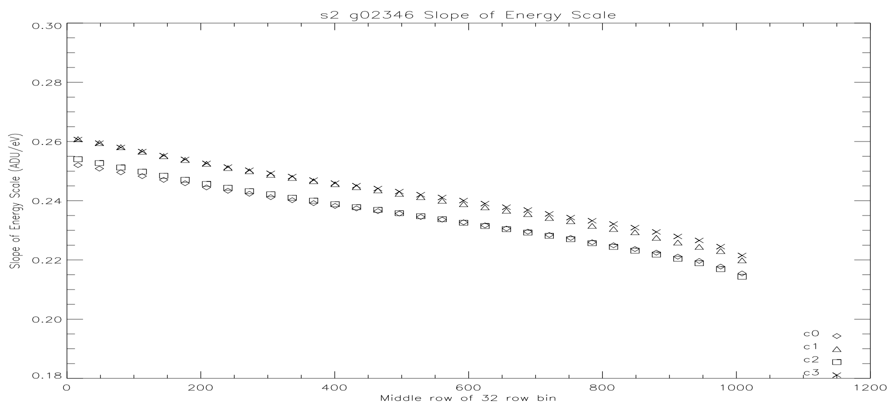

Figure 74: S2 Slope of the Energy Scale Vs Row at -110C.

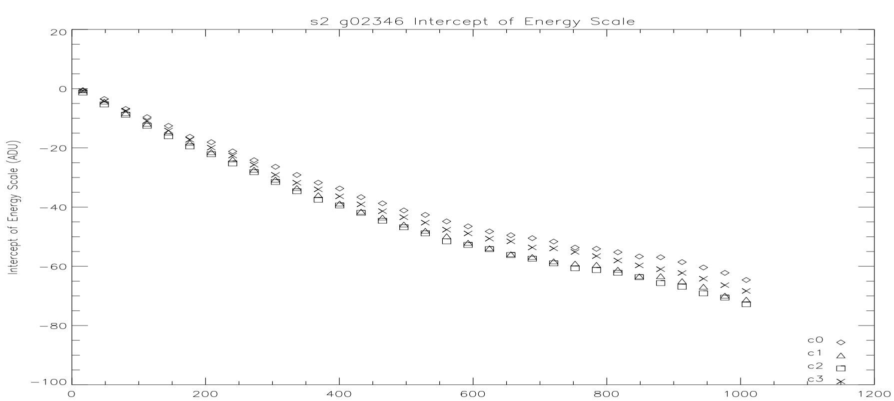

Figure 75: S2 Intercept of the Energy Scale Vs Row at -110C.

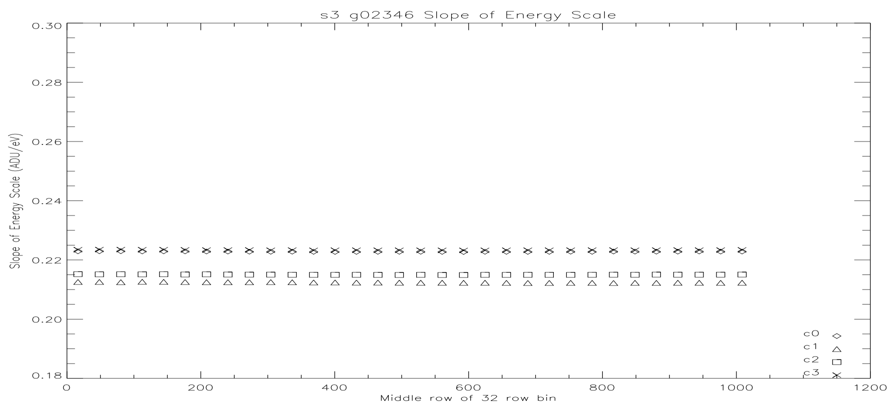

Figure 76: S3 Slope of the Energy Scale Vs Row at -110C.

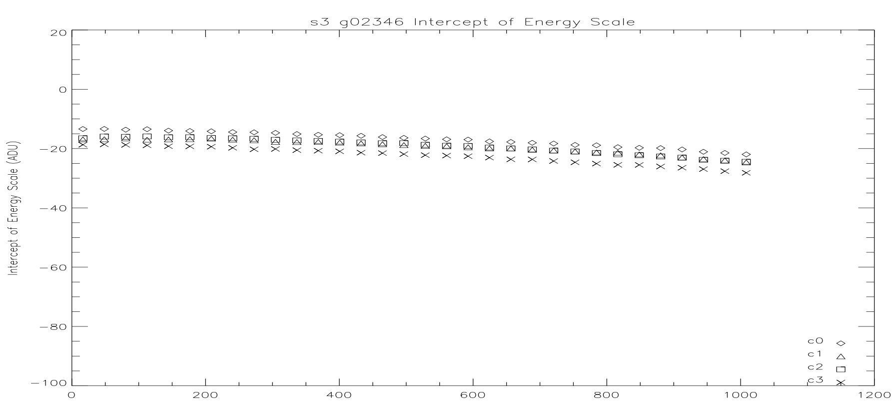

Figure 77: S3 Intercept of the Energy Scale Vs Row at -110C.

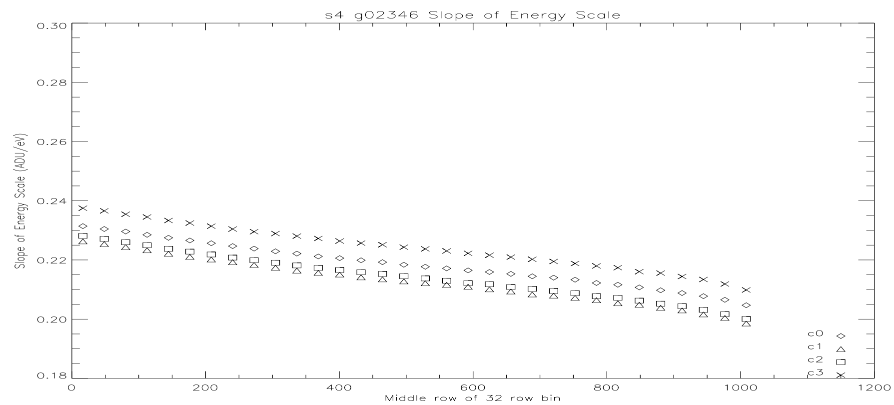

Figure 78: S4 Slope of the Energy Scale Vs Row at -110C.

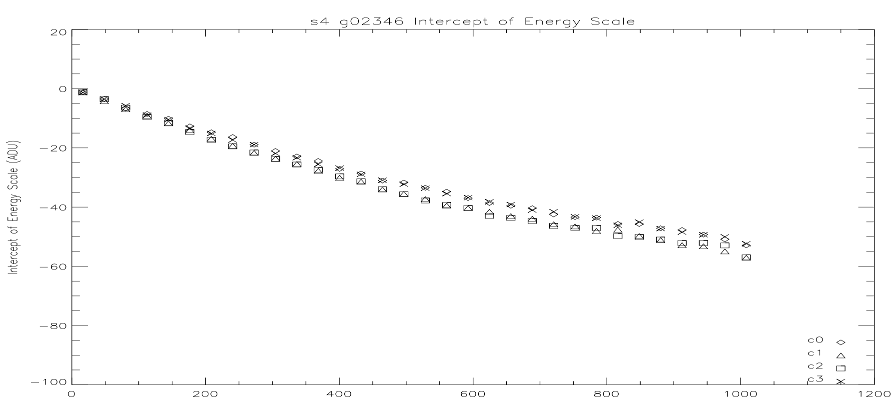

Figure 79: S4 Intercept of the Energy Scale Vs Row at -110C.

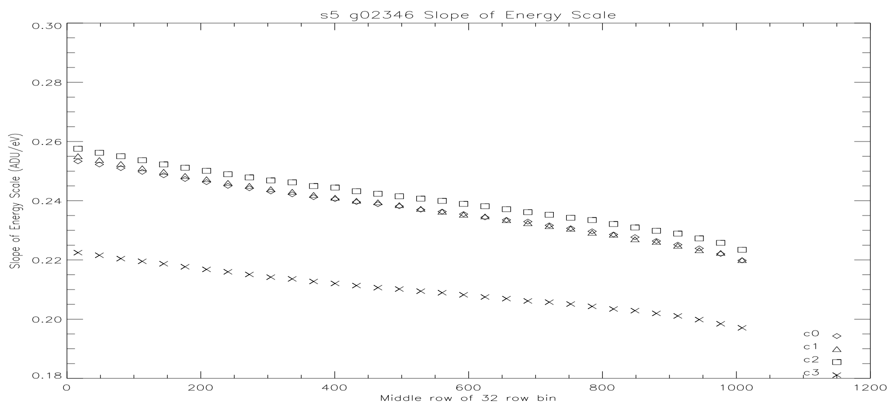

Figure 80: S5 Slope of the Energy Scale Vs Row at -110C.

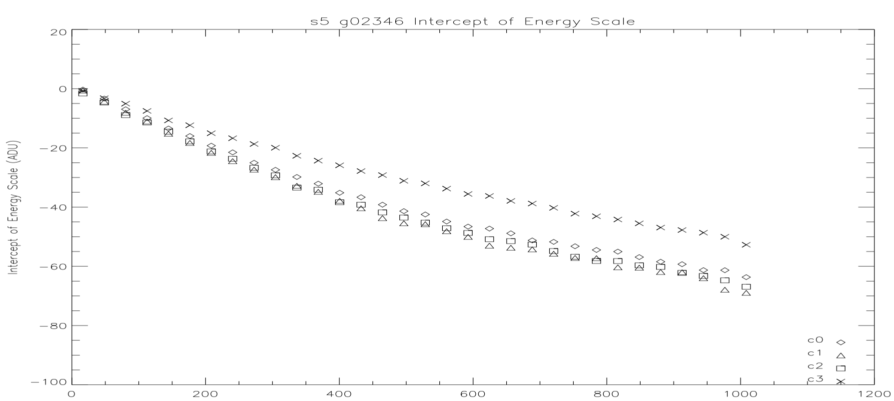

Figure 81: S5 Intercept of the Energy Scale Vs Row at -110C.

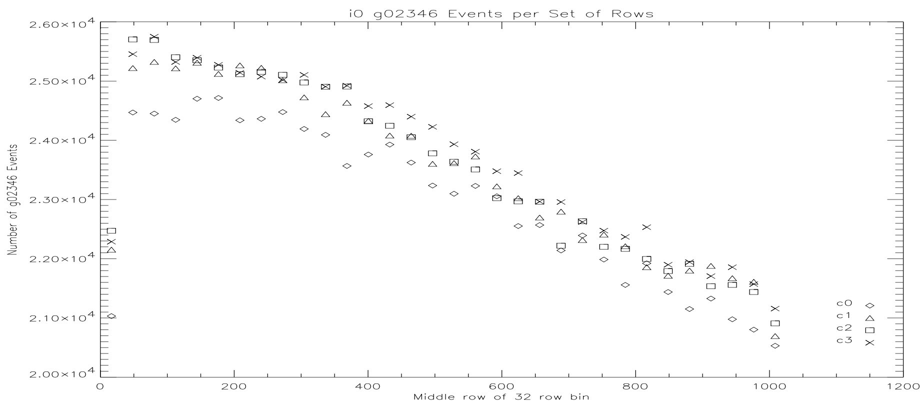

Figure 82: i0 ASCA G02346 Counts Vs Row at -110C.

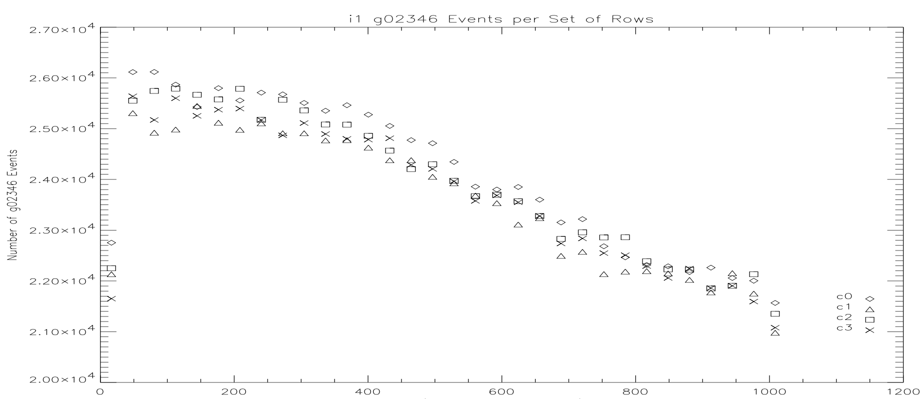

Figure 83: i1 ASCA G02346 Counts Vs Row at -110C.

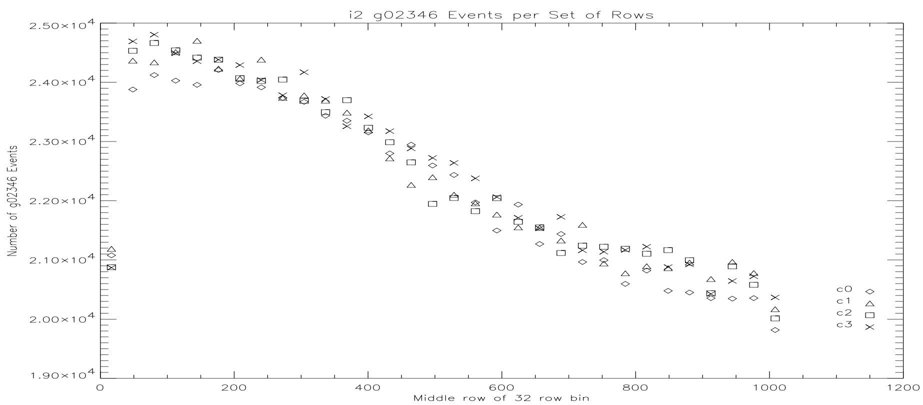

Figure 84: i2 ASCA G02346 Counts Vs Row at -110C.

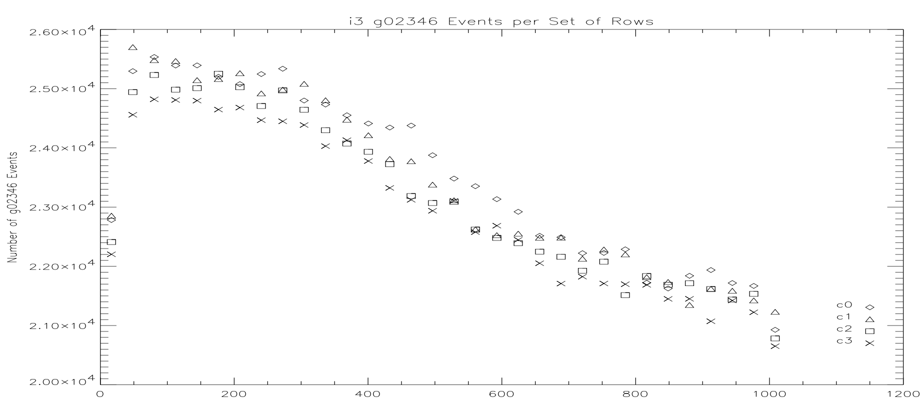

Figure 85: i3 ASCA G02346 Counts Vs Row at -110C.

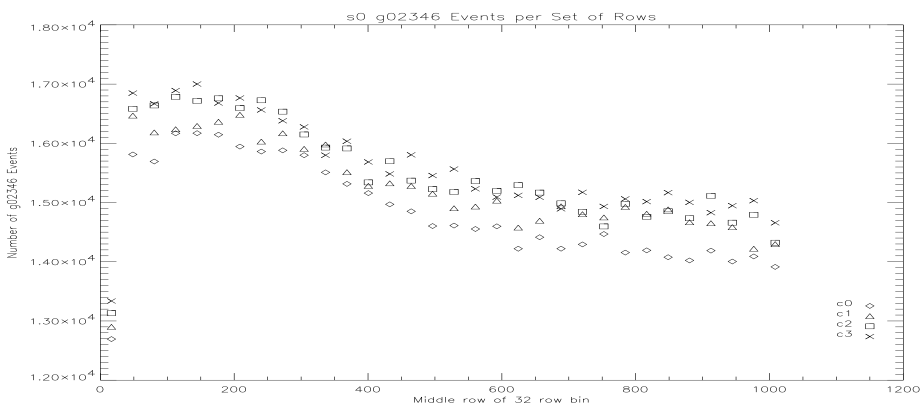

Figure 86: S0 ASCA G02346 Counts Vs Row at -110C.

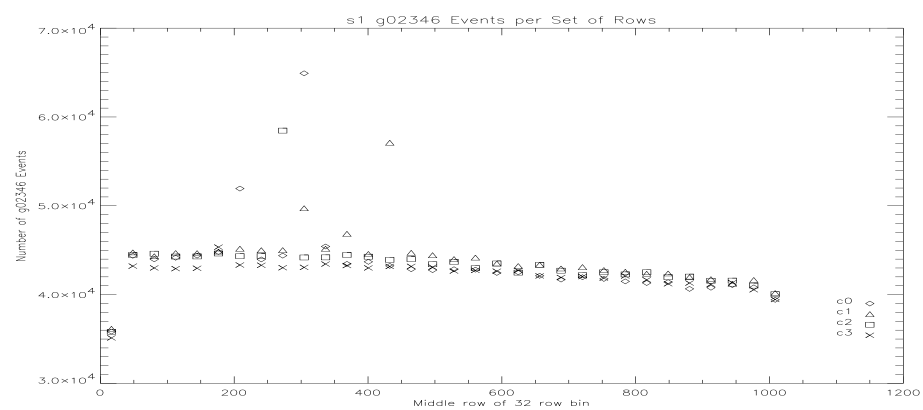

Figure 87: S1 ASCA G02346 Counts Vs Row at -110C.

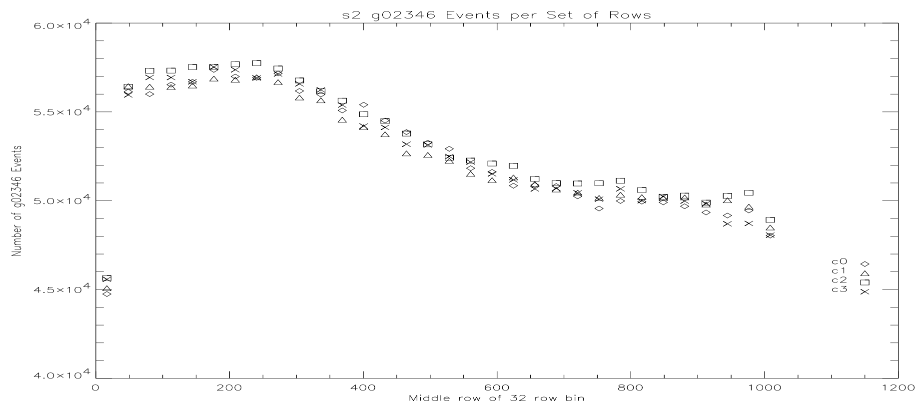

Figure 88: S2 ASCA G02346 Counts Vs Row at -110C.

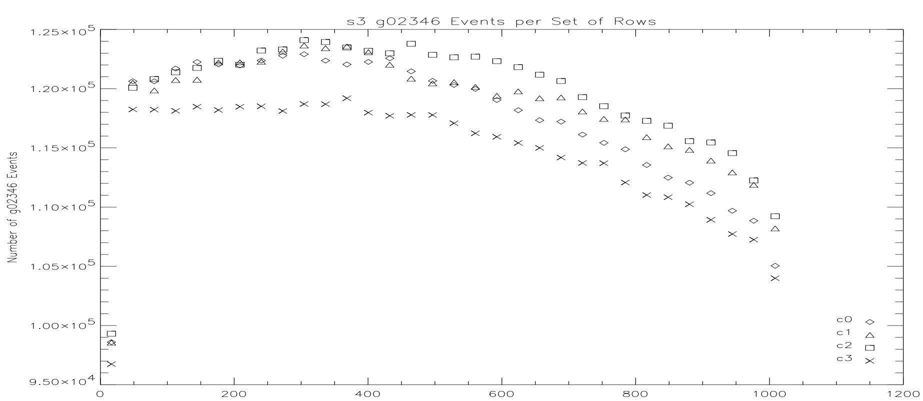

Figure 89: S3 ASCA G02346 Counts Vs Row at -110C.

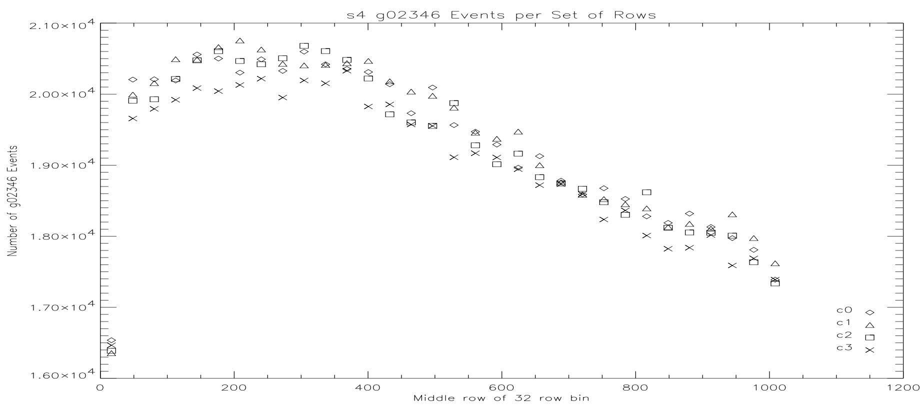

Figure 90: S4 ASCA G02346 Counts Vs Row at -110C.

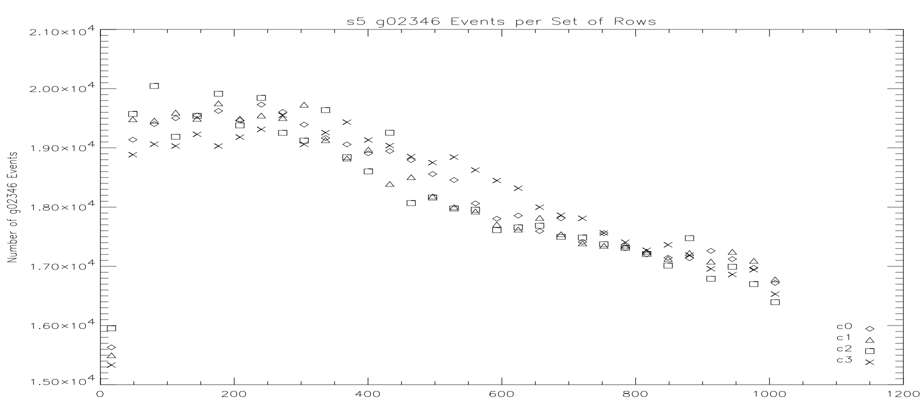

Figure 91: S5 ASCA G02346 Counts Vs Row at -110C.

External calbration source data was take with the focal plane at -110C while the ISIM was in thermal vac testing at Ball in October of 1997.

Table 2 summarizes the total number of ASCA g02346 events from 0 to 2000ADU, as well as the average number of counts in each of the gaussian fits for each CCD.

CCD	Total Frames	Total g02346	Average Al	Average Ti	Average Mn
i0	1489	8.09393e+05	1003	995	3483
i1	1489	8.09802e+05	1005	1009	3473
i2	744	4.10817e+05	513	521	1756
i3	1487	8.19236e+05	1022	1057	3474
s0	1496	7.91077e+05	996	956	3407
s1	1451	6.21725e+05	1116	831	2235
s2	3527	2.00456e+06	2498	2595	8478
s3	4241	2.17237e+05	3429	3051	8120
s4	1475	8.23350e+05	1013	1106	3442
s5	1426	7.75356e+05	928	1055	3258

Table 2: Number of Counts

The data from each output node has been broken into thirty-two thirty-two row bins and only the ASCA grade 02346 events were considered.

Figures 92 through 121 are plots of the peak location of the gaussian fit to the ASCA g02346 events for each of the thirty-two row bins.

Figures 122 through 151 are plots of the full width half max in eV of the gaussian fit to the ASCA g02346 events for each of the thirty-two row bins.

Figures 152 through 171 are plots of slope and intercept of the energy scale for each of the thirty-two row bins.

Also plotted here, as Figures 172 through 181, are the total number of ASCA g02346 events from 0 to 2000 ADU in each of the thirty-two row bins. The first of the bins is low due to shadowing of the framestore cover over the first several rows. These plots are included to give an indication of the illumination pattern of the external calibration source.

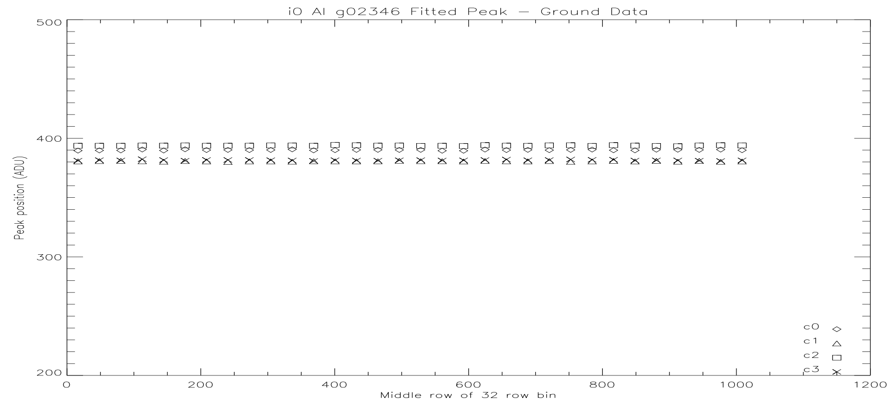

Figure 92: i0 Al Peak Vs Row at -110C.

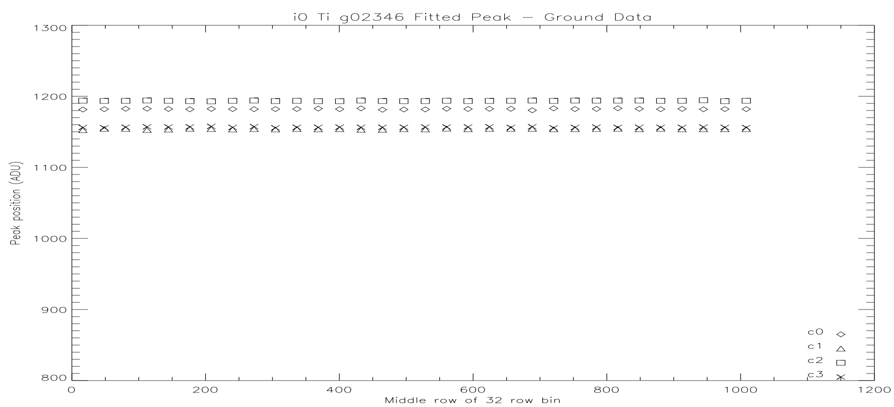

Figure 93: i0 Ti Peak Vs Row at -110C.

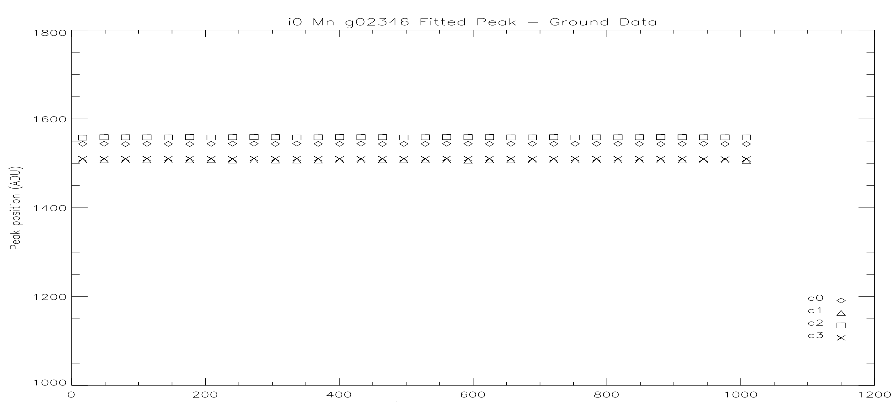

Figure 94: i0 Mn Peak Vs Row at -110C.

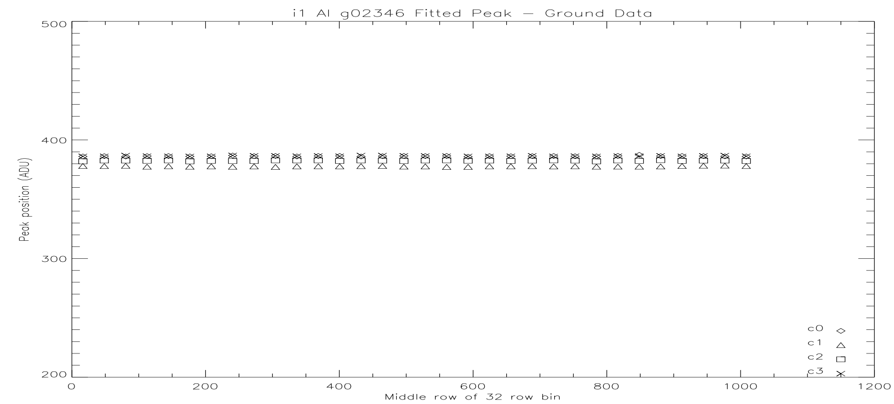

Figure 95: i1 Al Peak Vs Row at -110C.

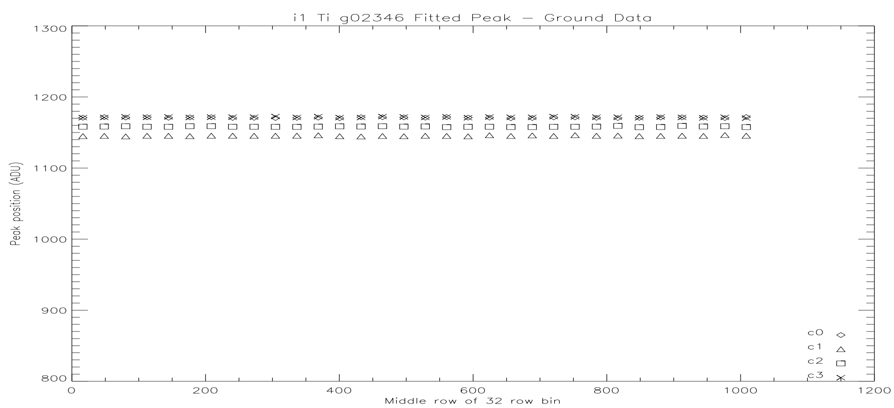

Figure 96: i1 Ti Peak Vs Row at -110C.

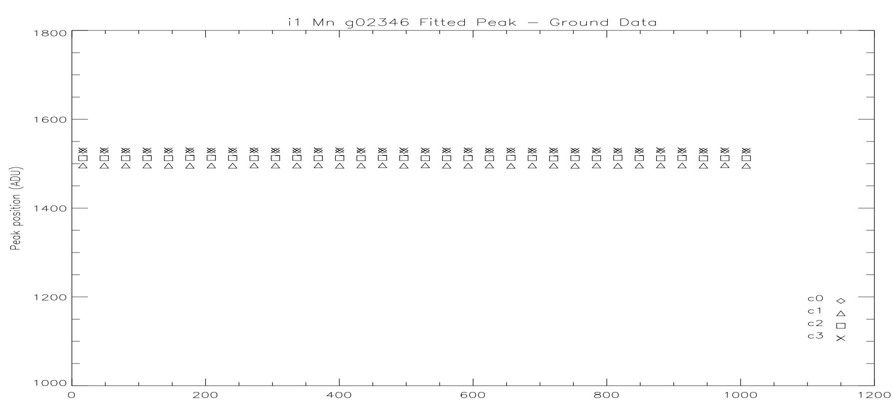

Figure 97: i1 Mn Peak Vs Row at -110C.

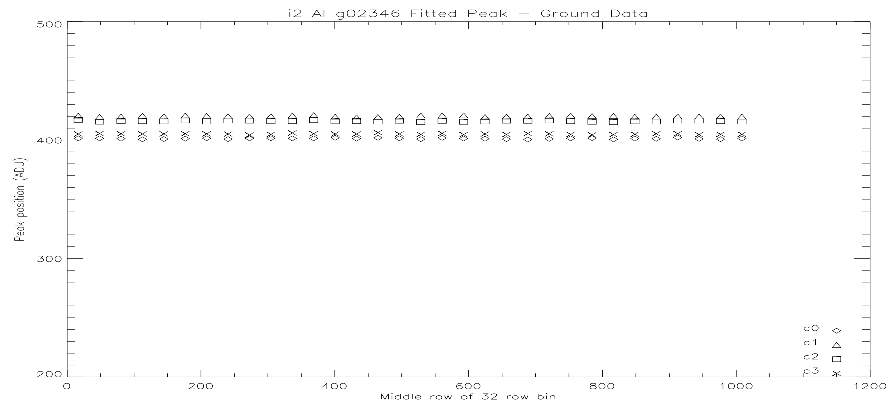

Figure 98: i2 Al Peak Vs Row at -110C.

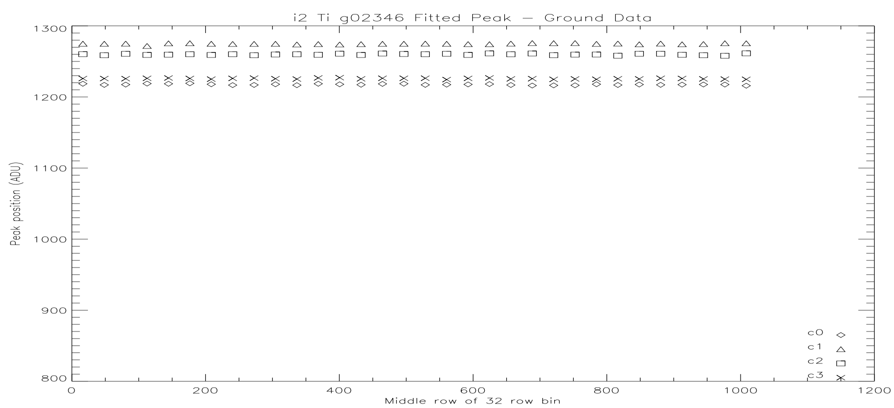

Figure 99: i2 Ti Peak Vs Row at -110C.

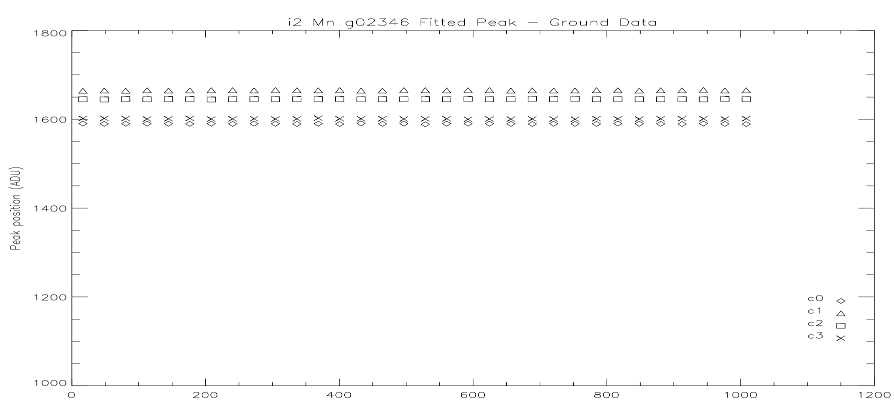

Figure 100: i2 Mn Peak Vs Row at -110C.

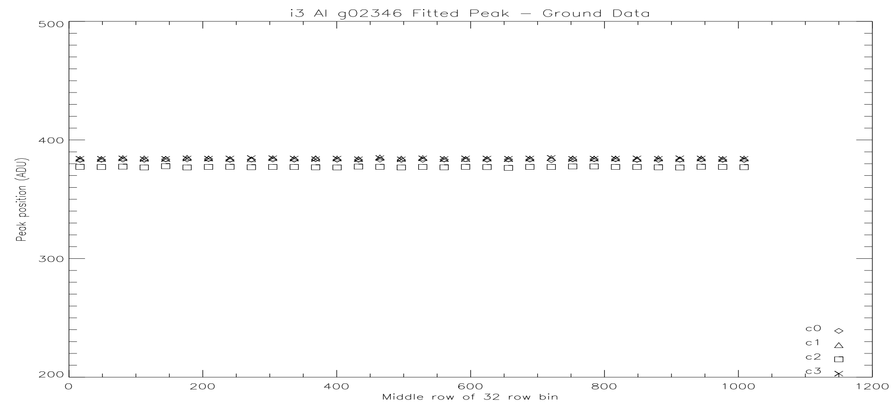

Figure 101: i3 Al Peak Vs Row at -110C.

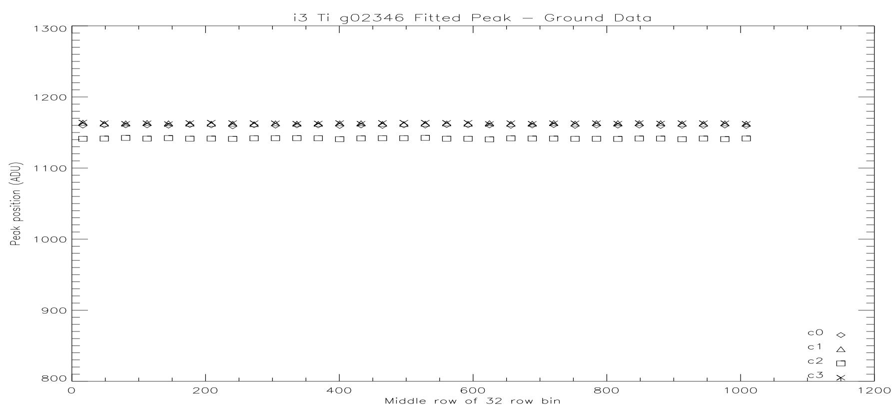

Figure 102: i0 Ti Peak Vs Row at -110C.

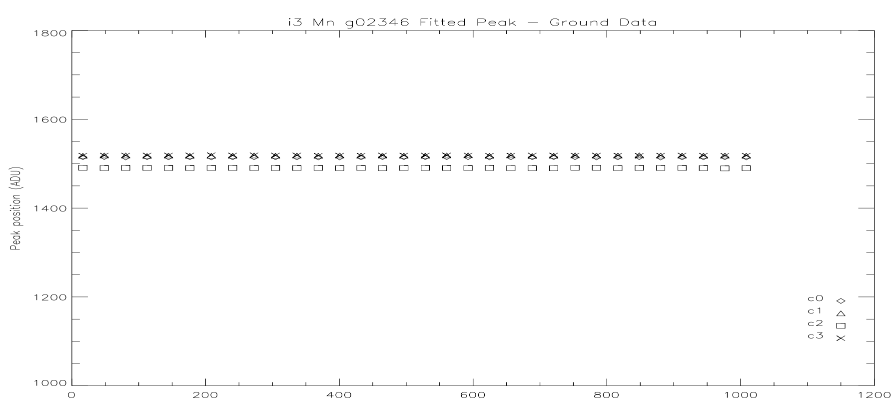

Figure 103: i3 Mn Peak Vs Row at -110C.

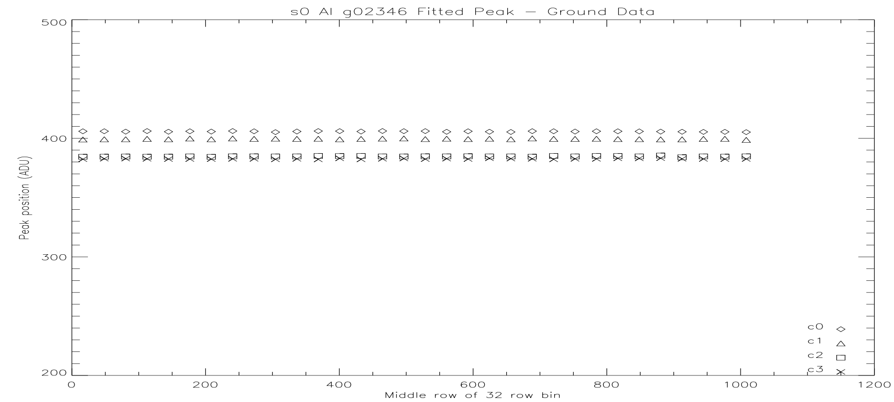

Figure 104: S0 Al Peak Vs Row at -110C.

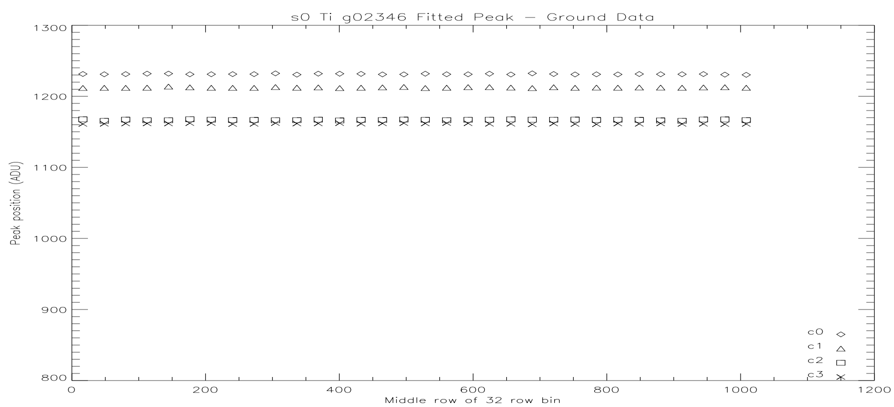

Figure 105: S0 Ti Peak Vs Row at -110C.

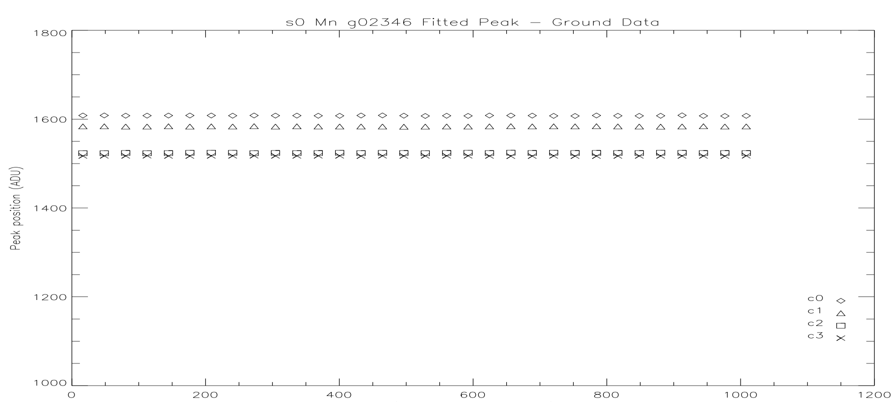

Figure 106: S0 Mn Peak Vs Row at -110C.

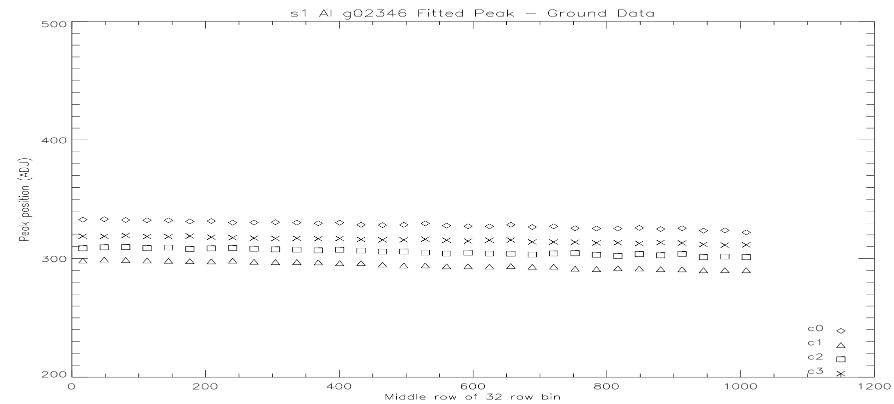

Figure 107: S1 Al Peak Vs Row at -110C.

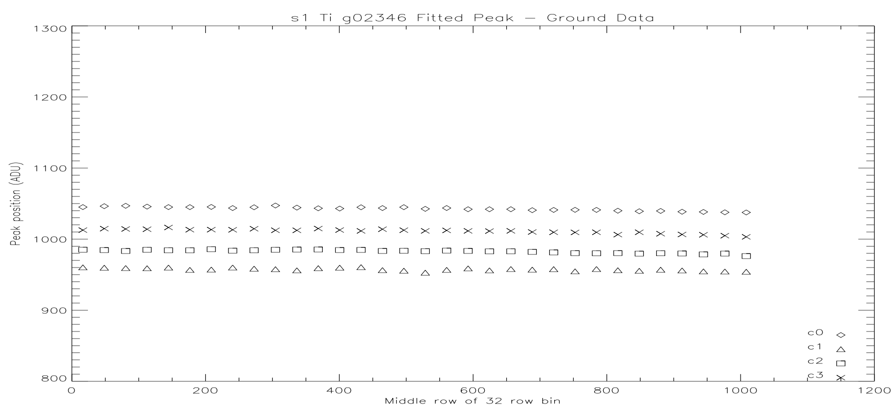

Figure 108: S1 Ti Peak Vs Row at -110C.

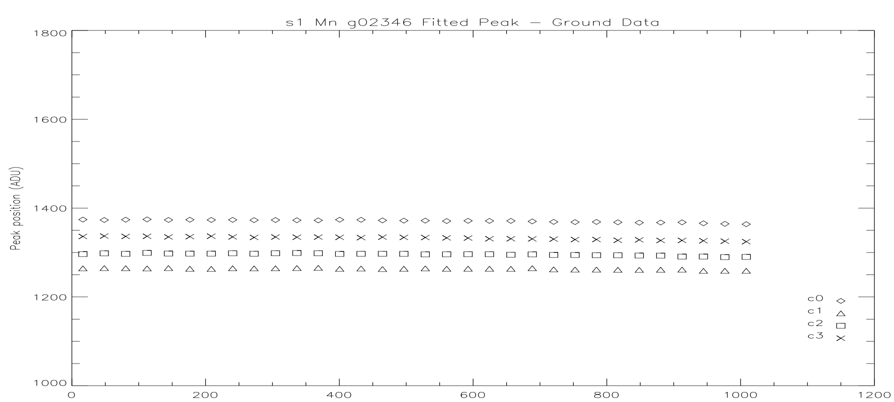

Figure 109: S1 Mn Peak Vs Row at -110C.

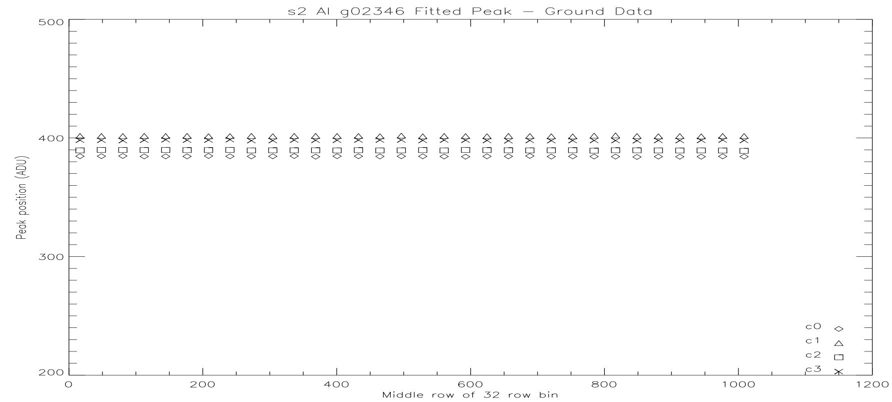

Figure 110: S2 Al Peak Vs Row at -110C.

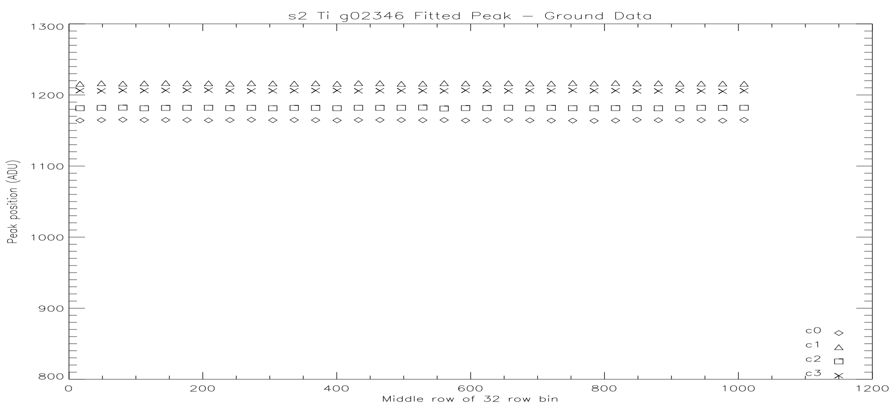

Figure 111: S2 Ti Peak Vs Row at -110C.

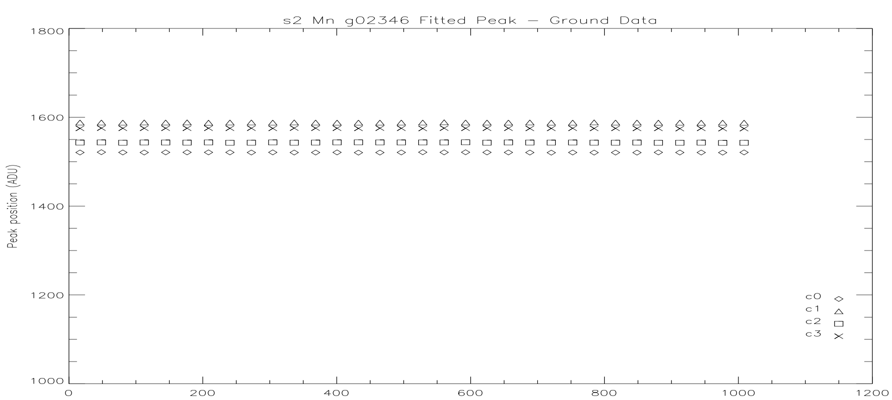

Figure 112: S2 Mn Peak Vs Row at -110C.

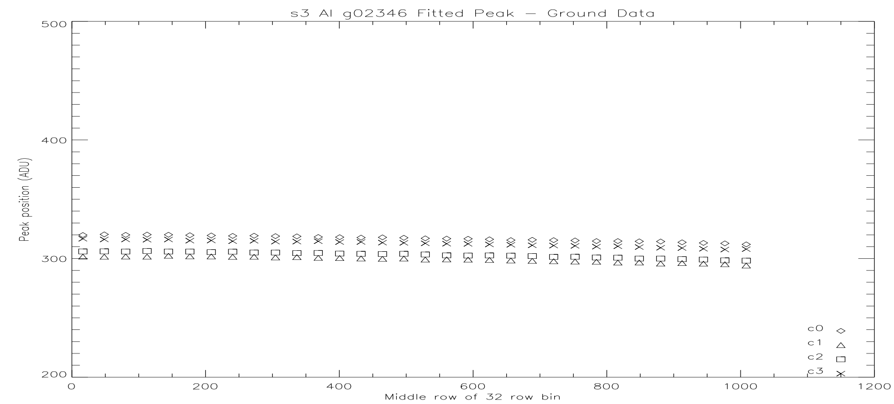

Figure 113: S3 Al Peak Vs Row at -110C.

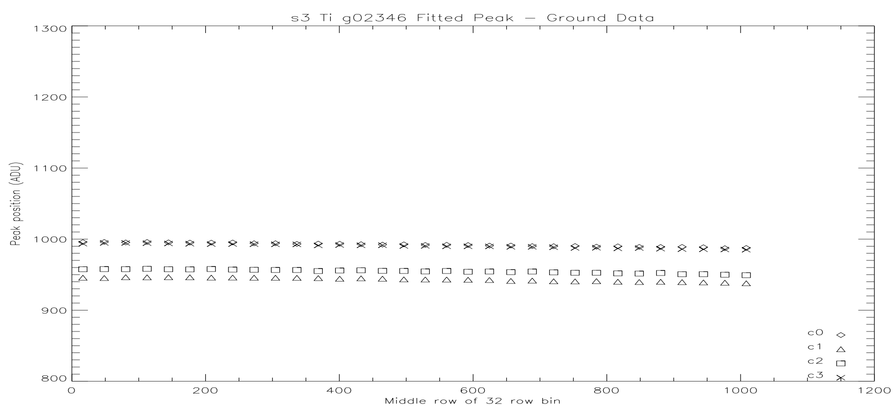

Figure 114: S3 Ti Peak Vs Row at -110C.

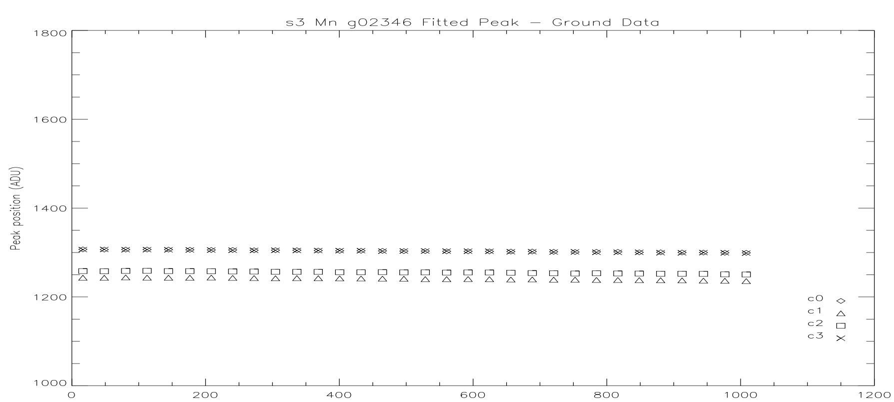

Figure 115: S3 Mn Peak Vs Row at -110C.

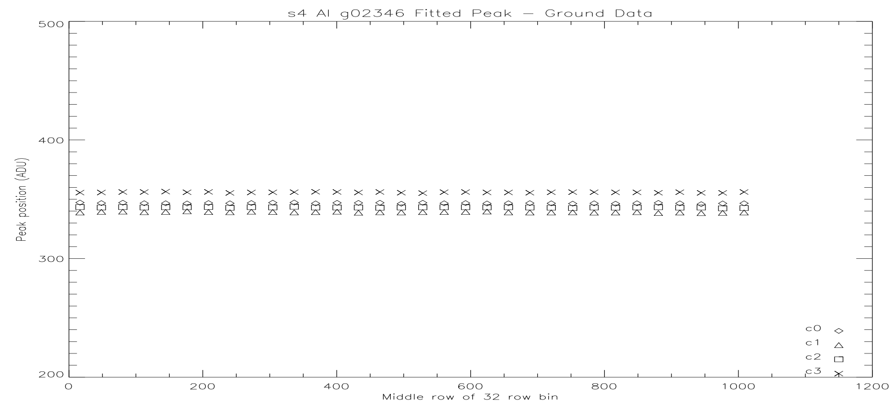

Figure 116: S4 Al Peak Vs Row at -110C.

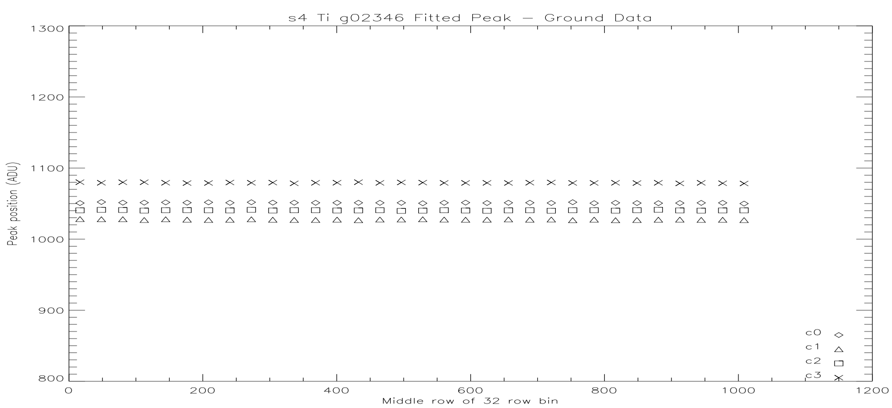

Figure 117: S4 Ti Peak Vs Row at -110C.

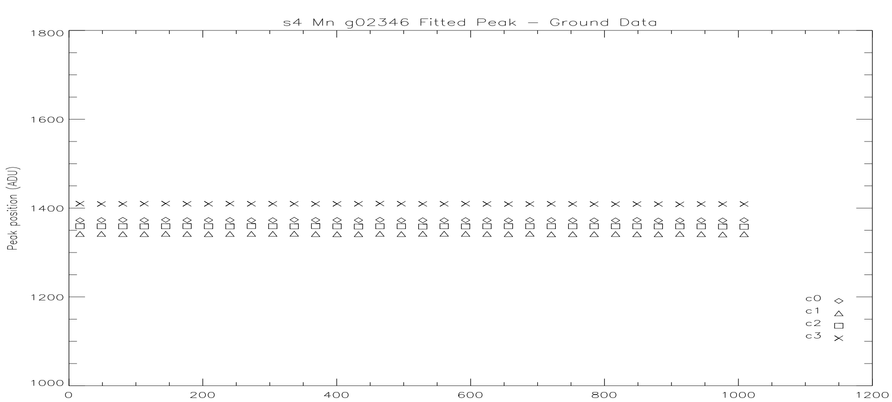

Figure 118: S4 Mn Peak Vs Row at -110C.

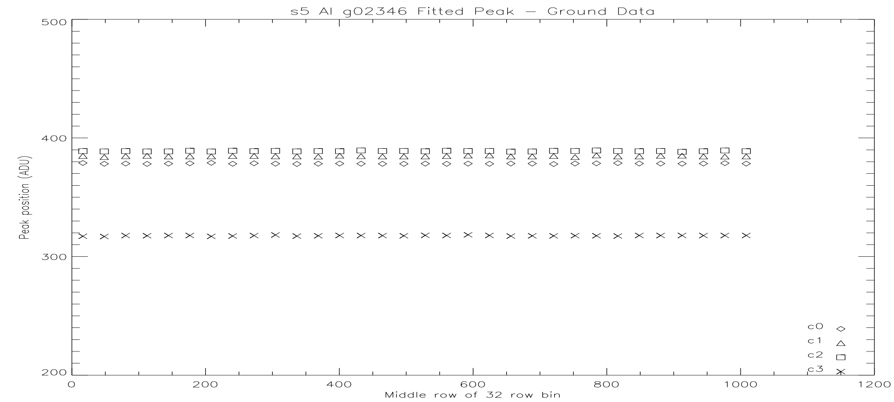

Figure 119: S5 Al Peak Vs Row at -110C.

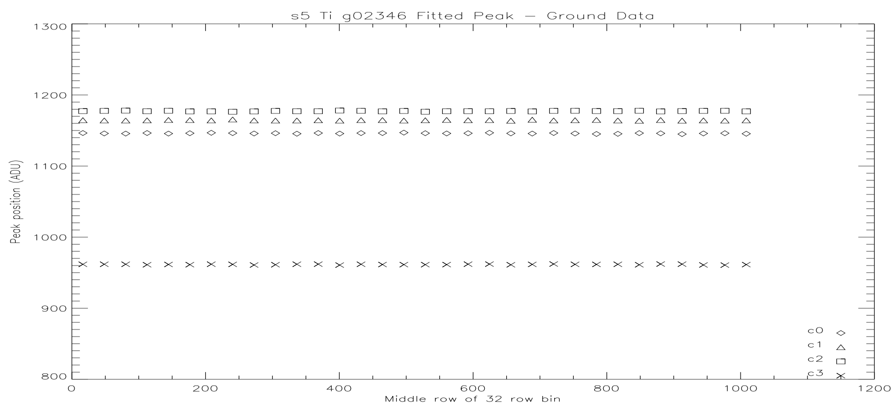

Figure 120: S5 Ti Peak Vs Row at -110C.

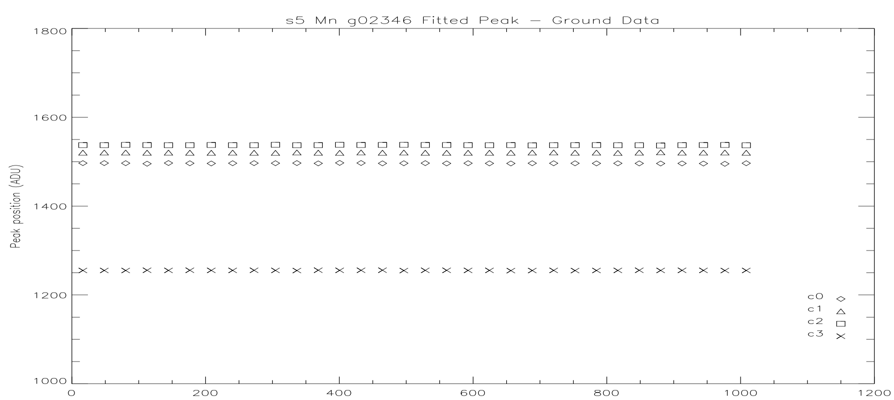

Figure 121: S5 Mn Peak Vs Row at -110C.

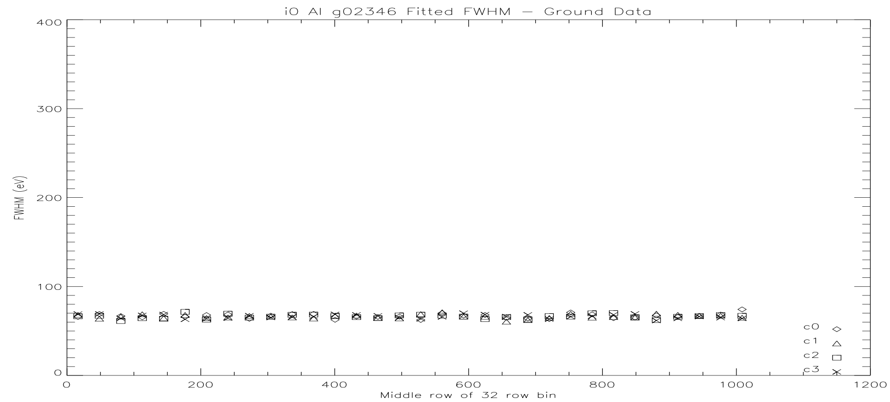

Figure 122: i0 Al FWHM Vs Row at -110C.

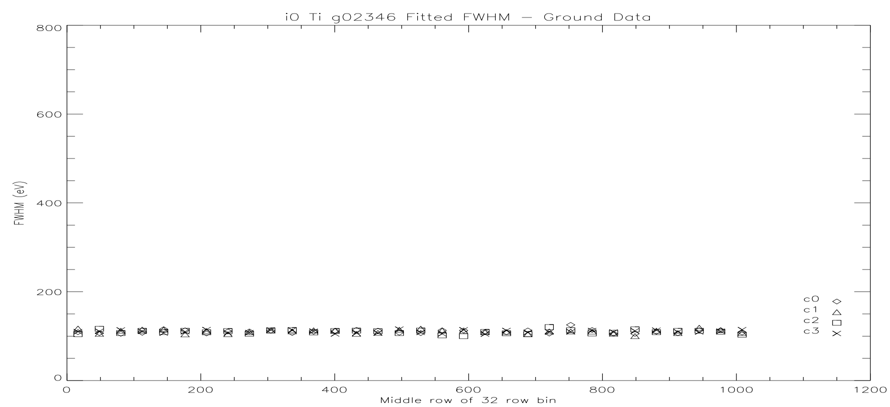

Figure 123: i0 Ti FWHM Vs Row at -110C.

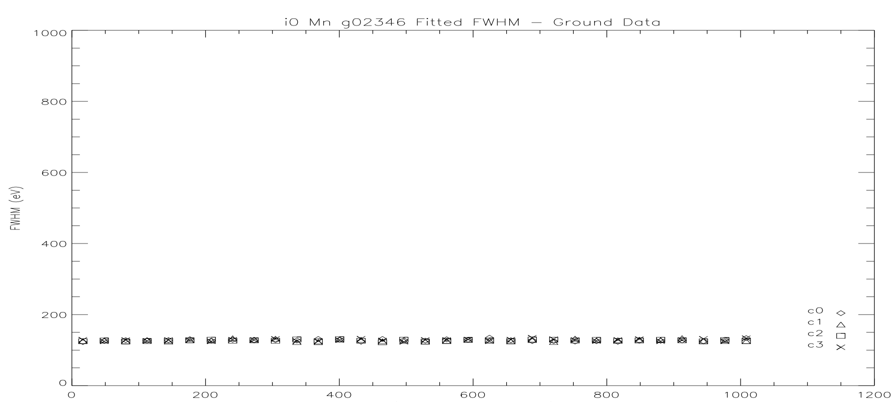

Figure 124: i0 Mn FWHM Vs Row at -110C.

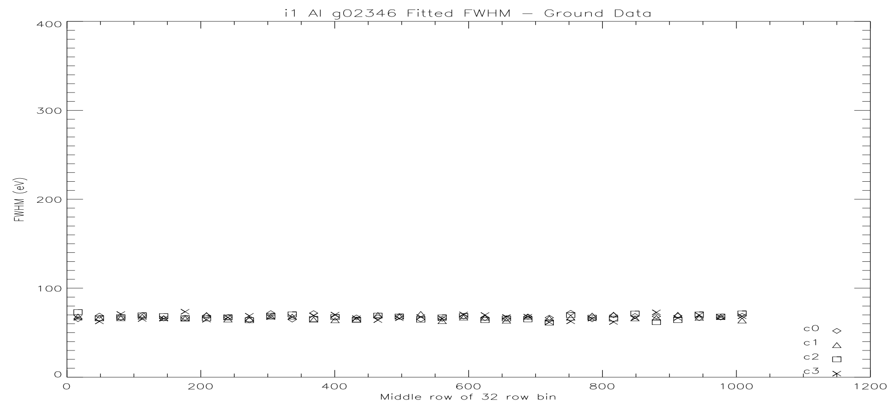

Figure 125: i1 Al FWHM Vs Row at -110C.

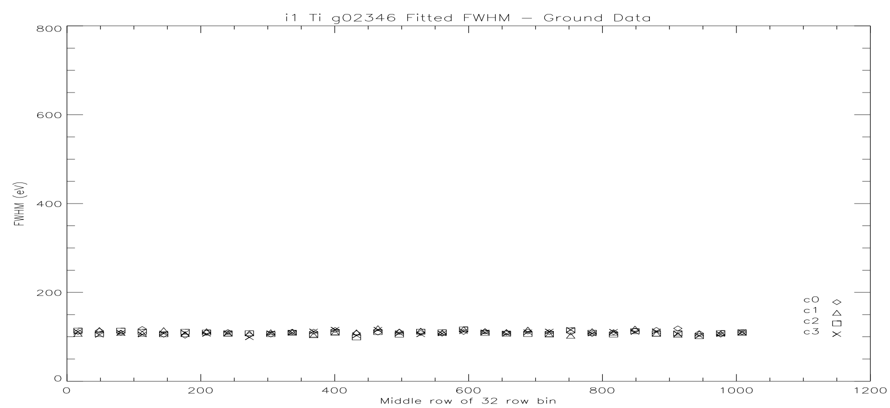

Figure 126: i1 Ti FWHM Vs Row at -110C.

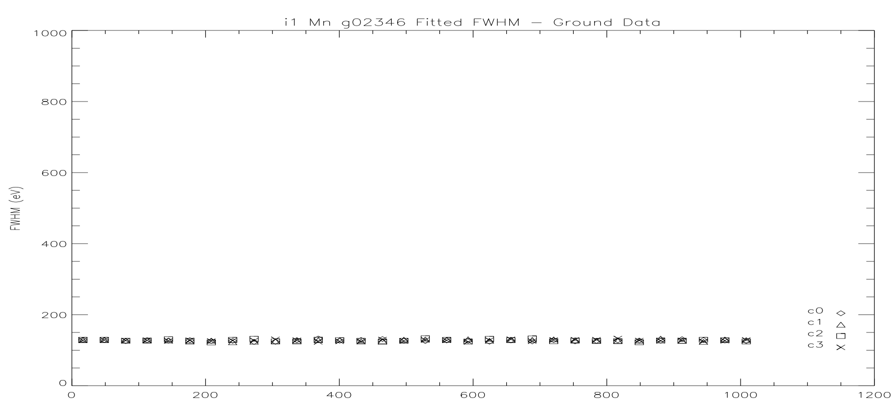

Figure 127: i1 Mn FWHM Vs Row at -110C.

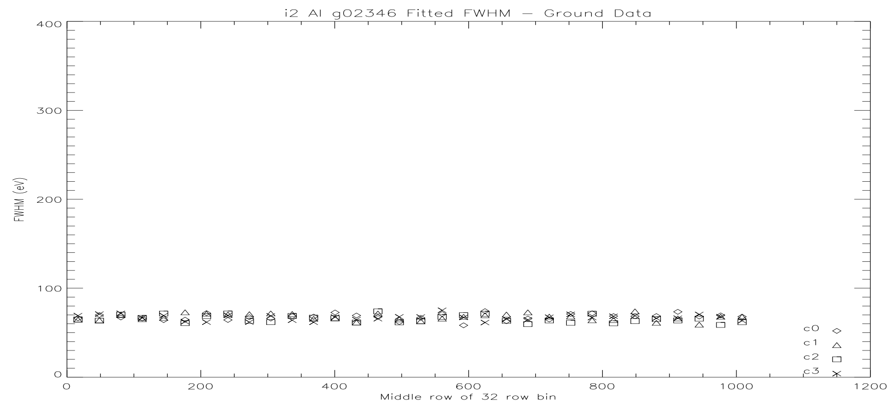

Figure 128: i2 Al FWHM Vs Row at -110C.

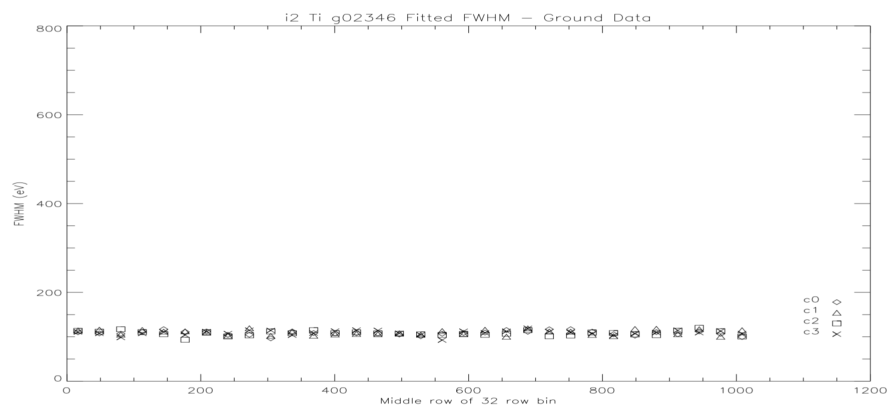

Figure 129: i2 Ti FWHM Vs Row at -110C.

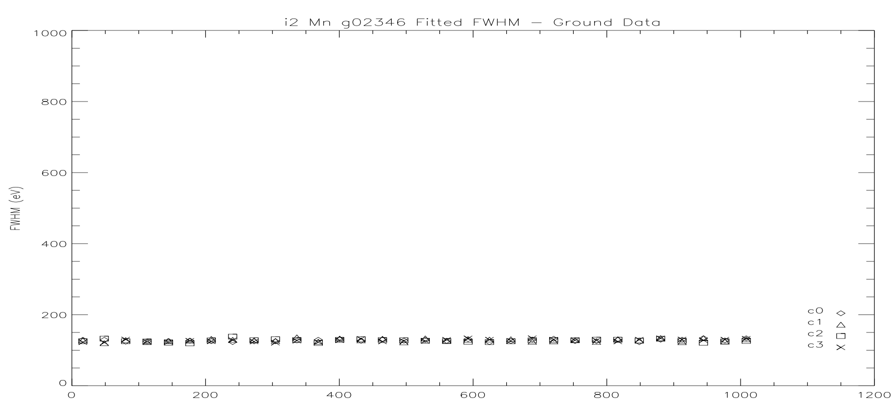

Figure 130: i2 Mn FWHM Vs Row at -110C.

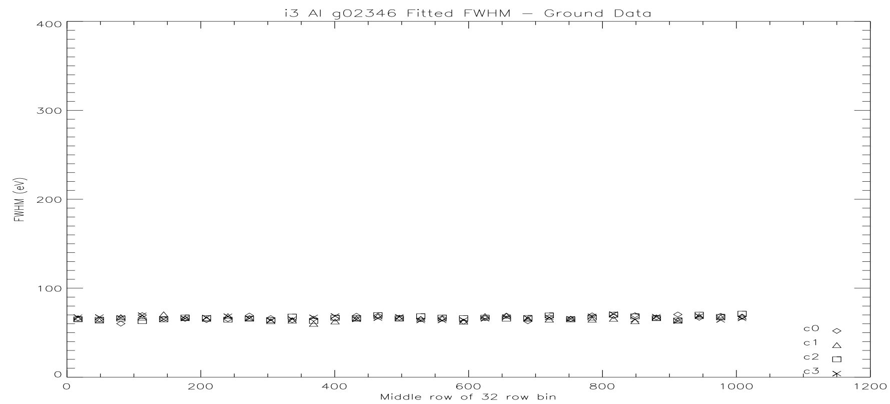

Figure 131: i3 Al FWHM Vs Row at -110C.

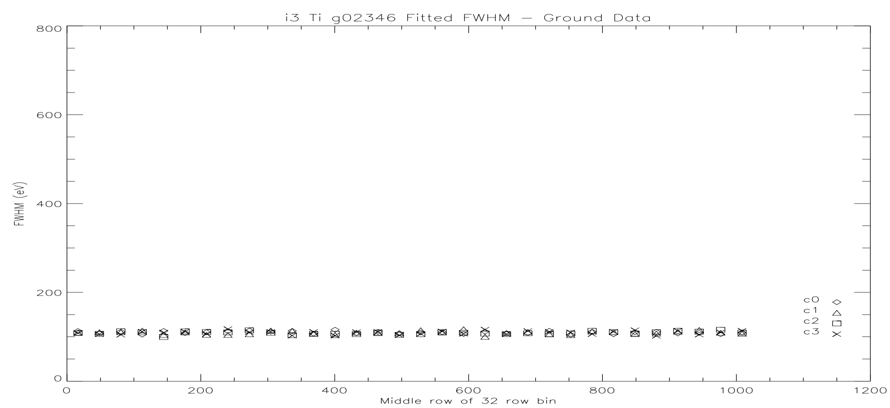

Figure 132: i3 Ti FWHM Vs Row at -110C.

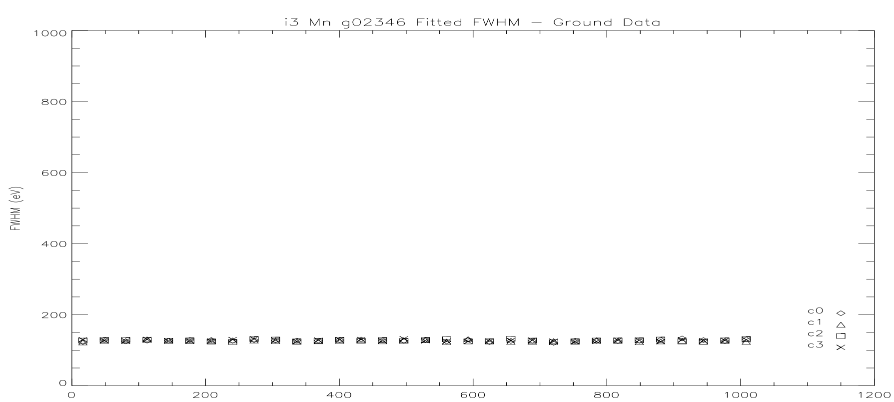

Figure 133: i3 Mn FWHM Vs Row at -110C.

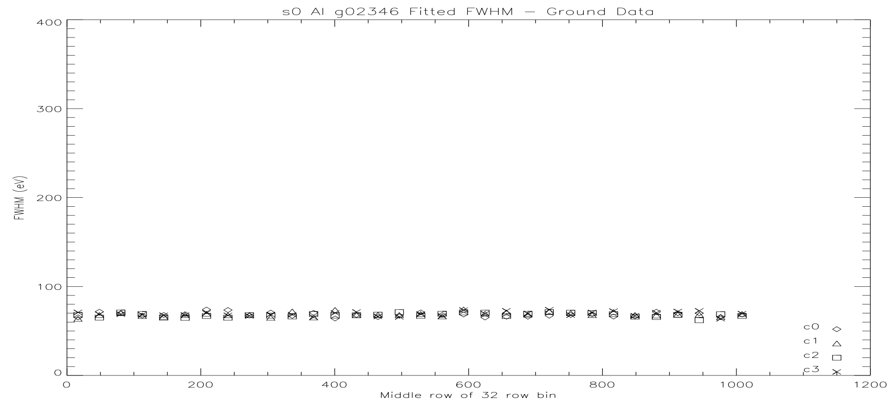

Figure 134: S0 Al FWHM Vs Row at -110C.

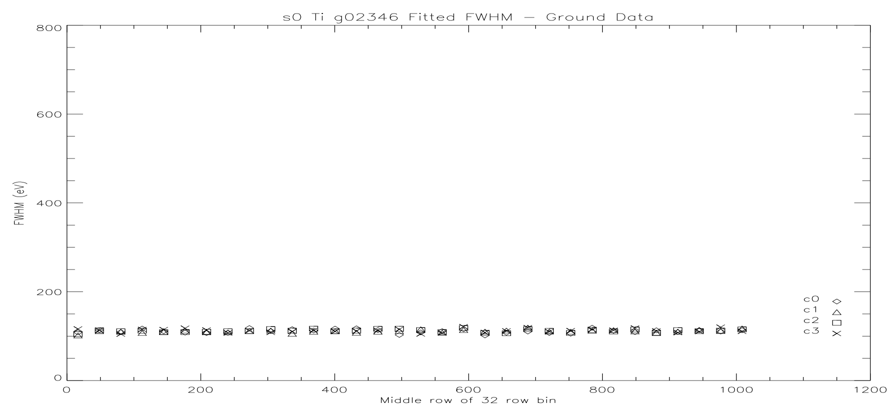

Figure 135: S0 Ti FWHM Vs Row at -110C.

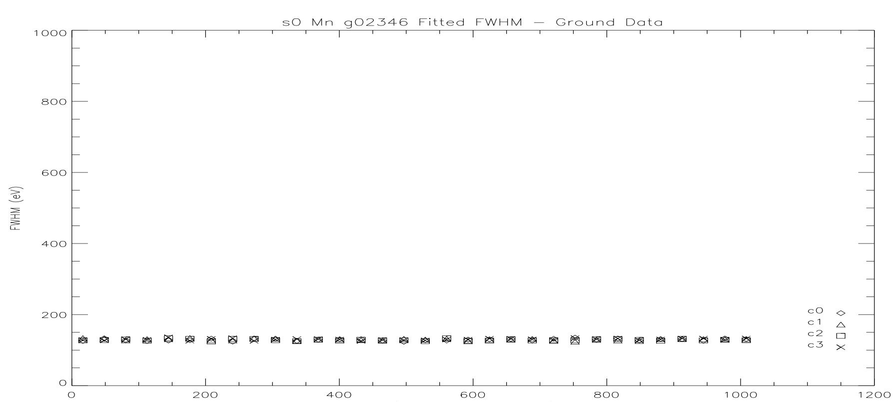

Figure 136: S0 Mn FWHM Vs Row at -110C.

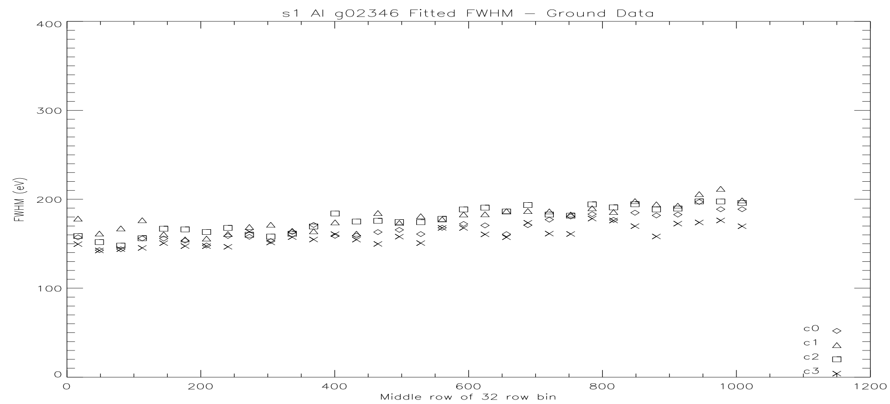

Figure 137: S1 Al FWHM Vs Row at -110C.

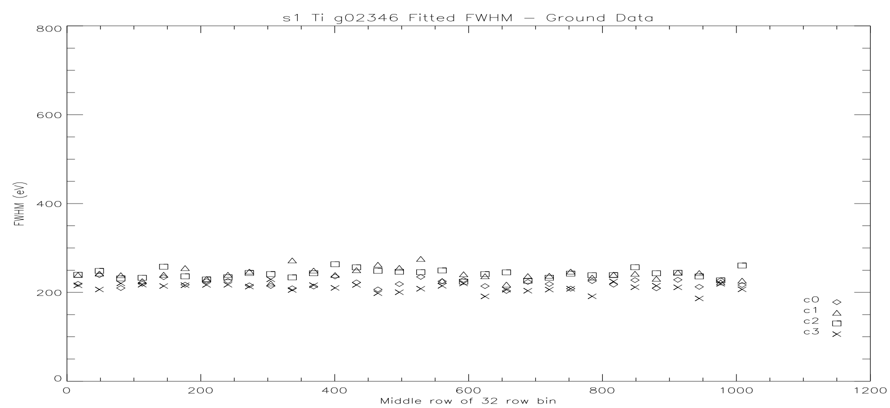

Figure 138: S1 Ti FWHM Vs Row at -110C.

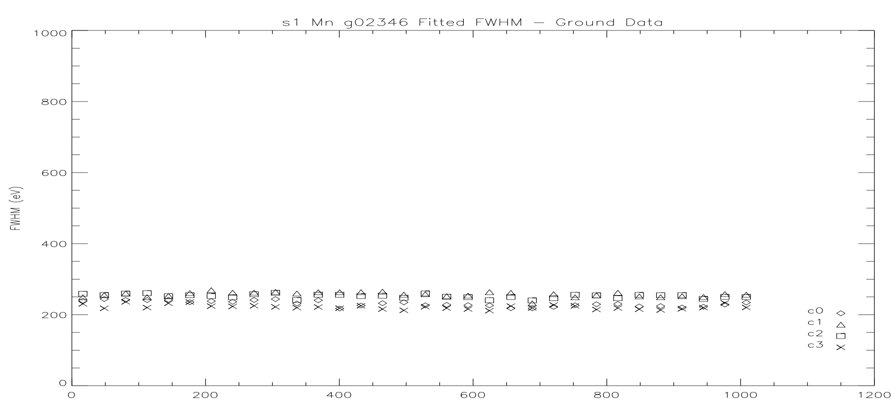

Figure 139: S1 Mn FWHM Vs Row at -110C.

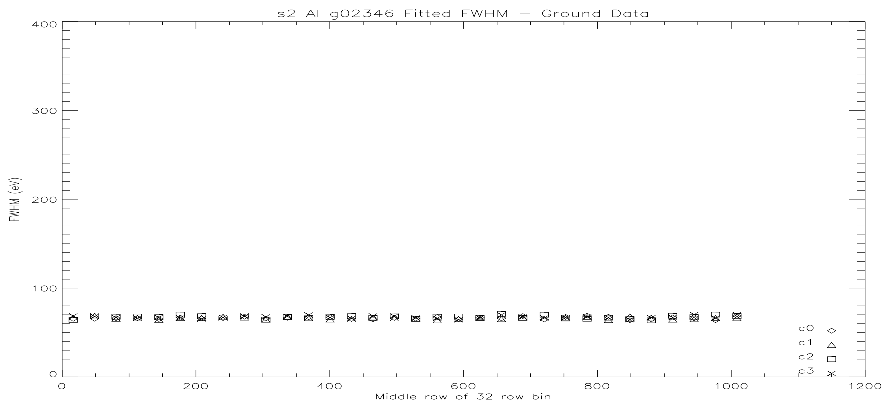

Figure 140: S2 Al FWHM Vs Row at -110C.

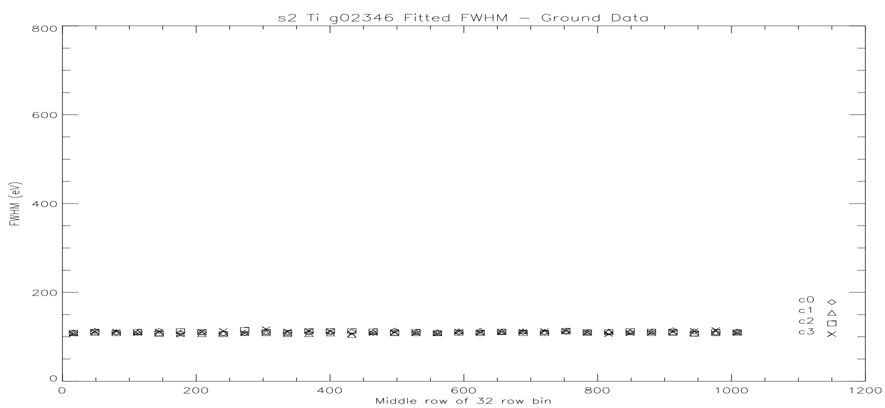

Figure 141: S2 Ti FWHM Vs Row at -110C.

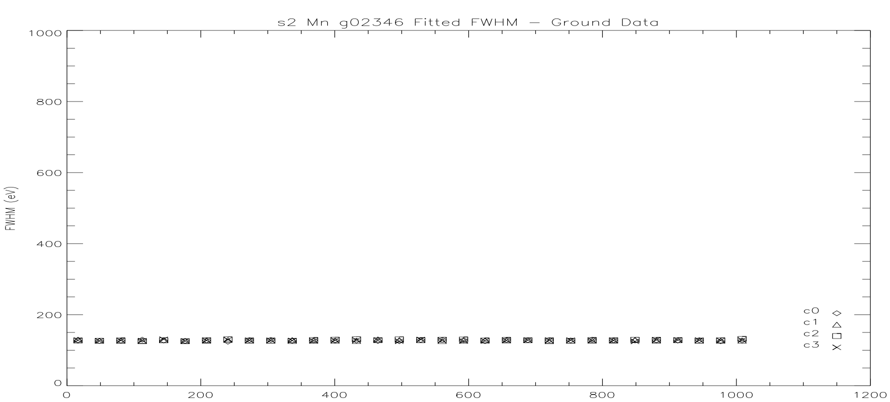

Figure 142: S2 Mn FWHM Vs Row at -110C.

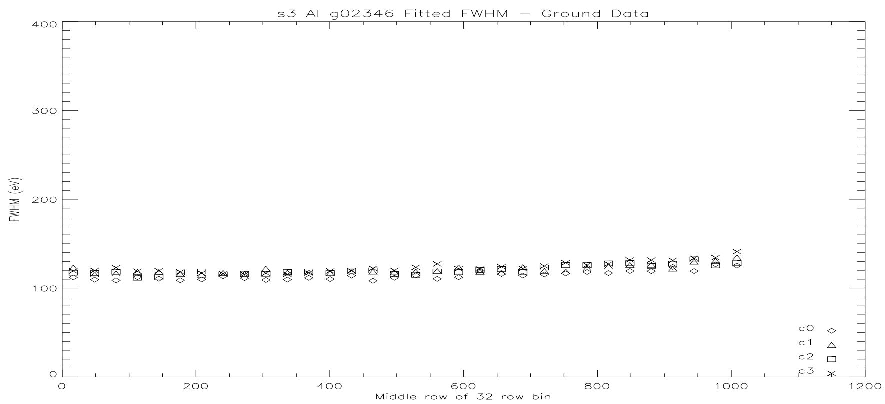

Figure 143: S3 Al FWHM Vs Row at -110C.

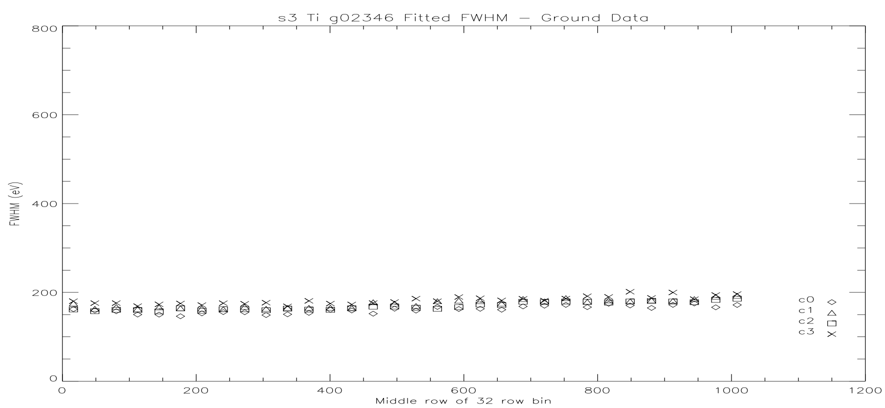

Figure 144: S3 Ti FWHM Vs Row at -110C.

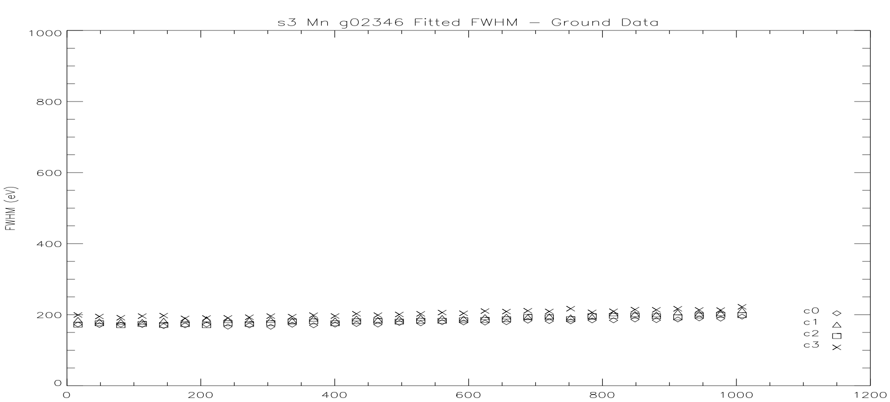

Figure 145: S3 Mn FWHM Vs Row at -110C.

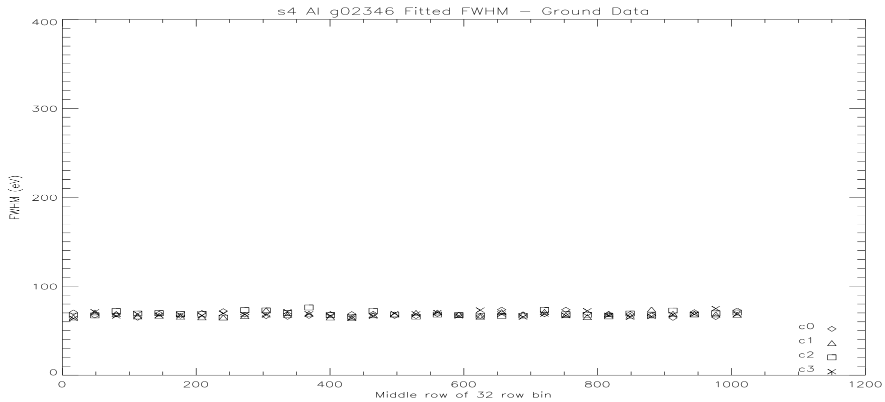

Figure 146: S4 Al FWHM Vs Row at -110C.

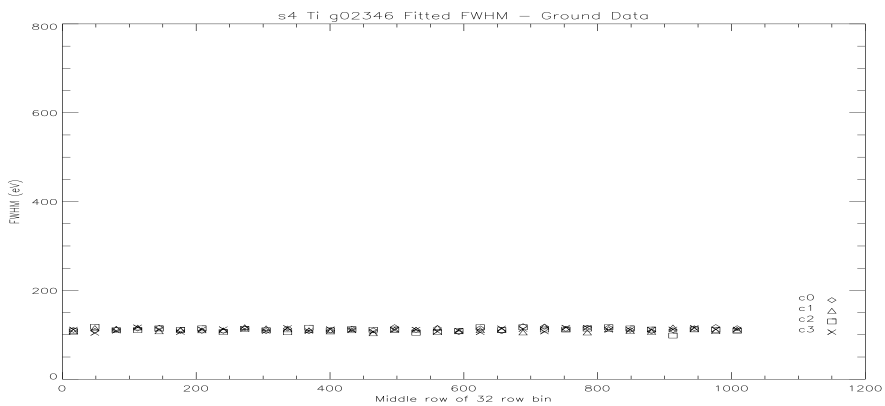

Figure 147: S4 Ti FWHM Vs Row at -110C.

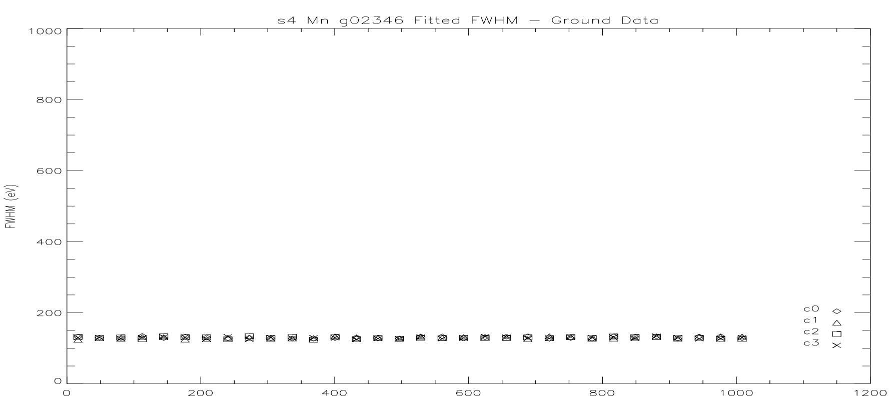

Figure 148: S4 Mn FWHM Vs Row at -110C.

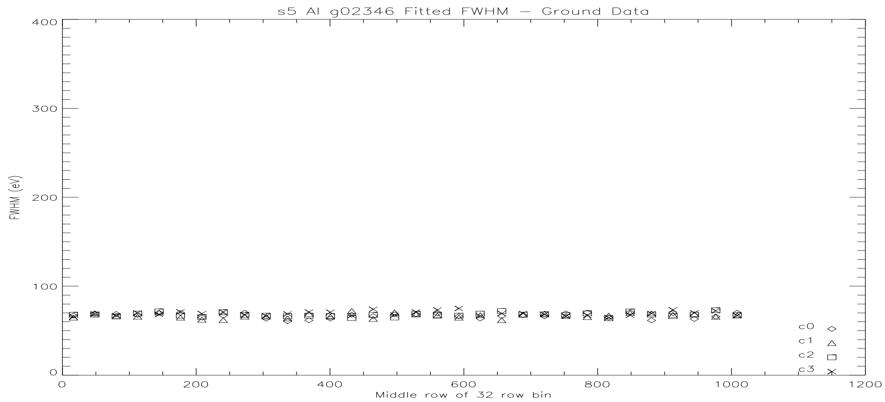

Figure 149: S5 Al FWHM Vs Row at -110C.

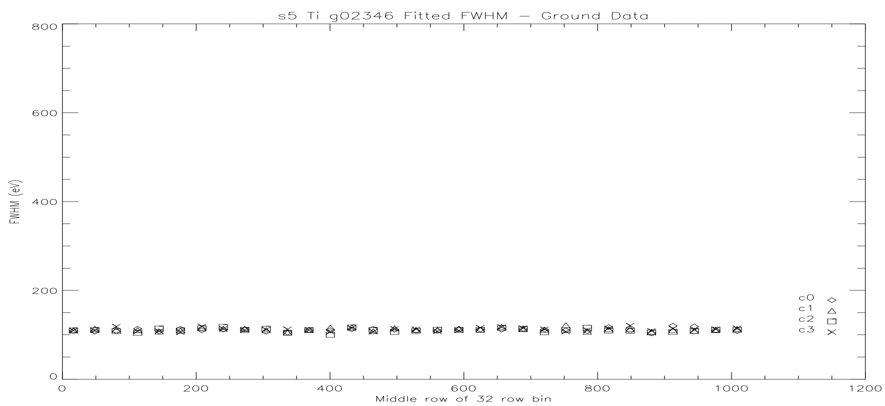

Figure 150: S5 Ti FWHM Vs Row at -110C.

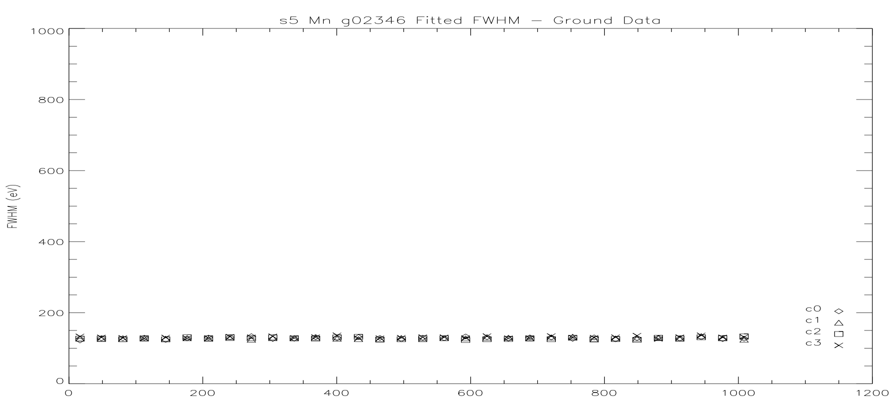

Figure 151: S5 Mn FWHM Vs Row at -110C.

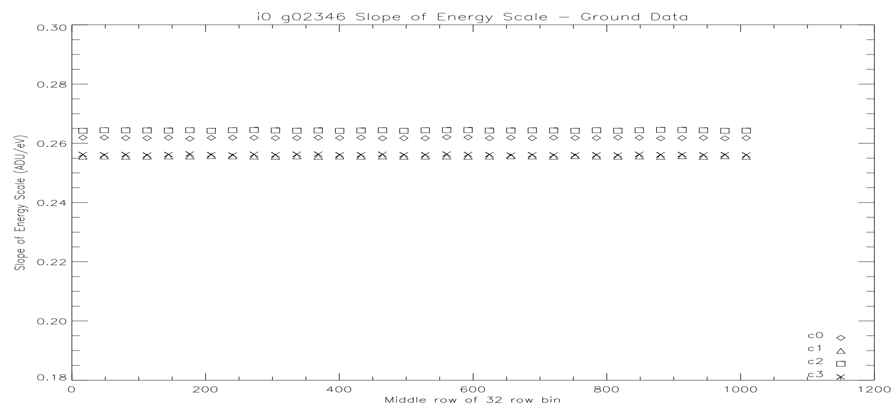

Figure 152: i0 Slope of the Energy Scale Vs Row at -110C.

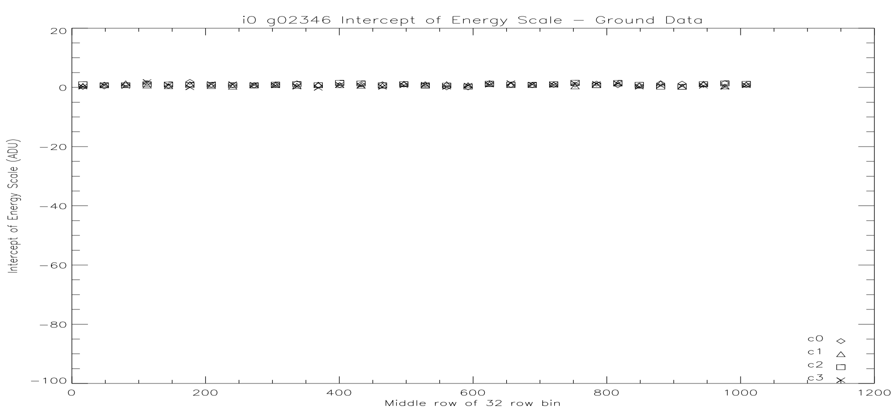

Figure 153: i0 Intercept of the Energy Scale Vs Row at -110C.

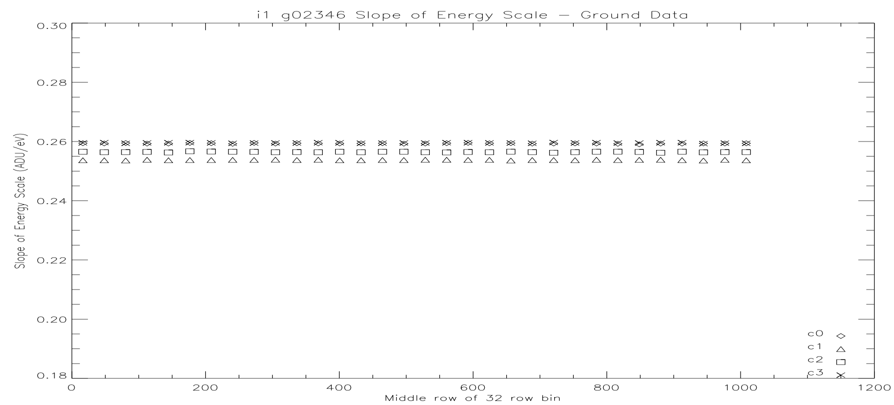

Figure 154: i1 Slope of the Energy Scale Vs Row at -110C.

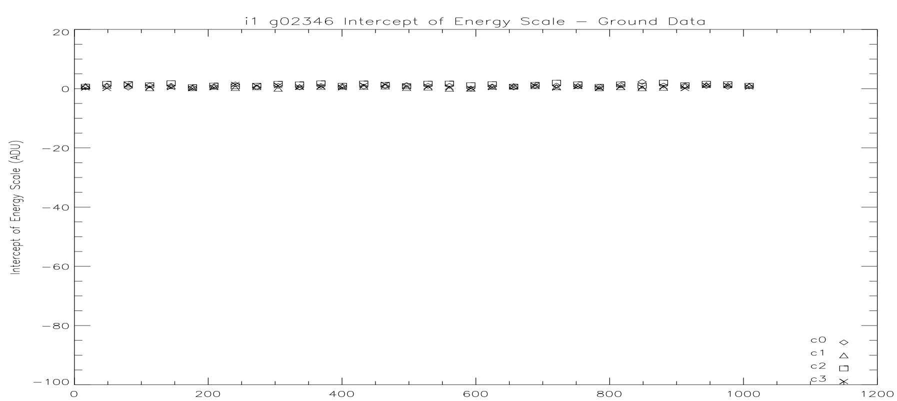

Figure 155: i1 Intercept of the Energy Scale Vs Row at -110C.

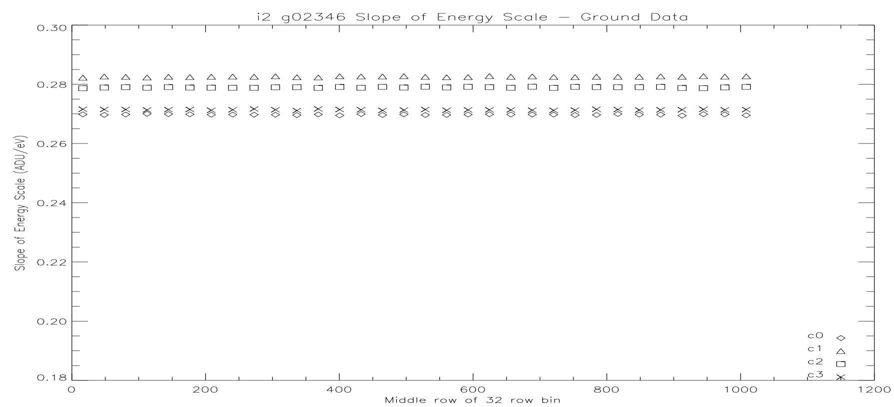

Figure 156: i2 Slope of the Energy Scale Vs Row at -110C.

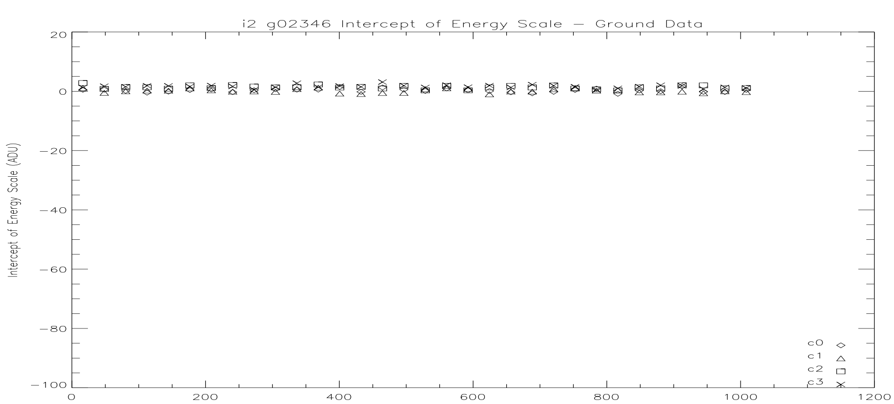

Figure 157: i2 Intercept of the Energy Scale Vs Row at -110C.

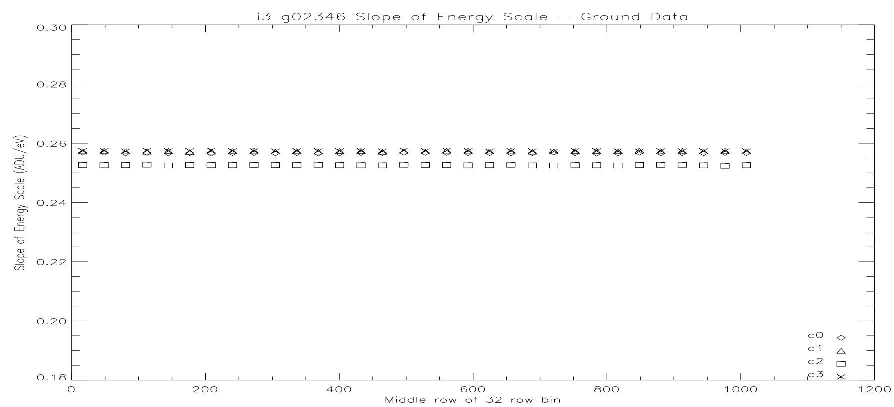

Figure 158: i3 Slope of the Energy Scale Vs Row at -110C.

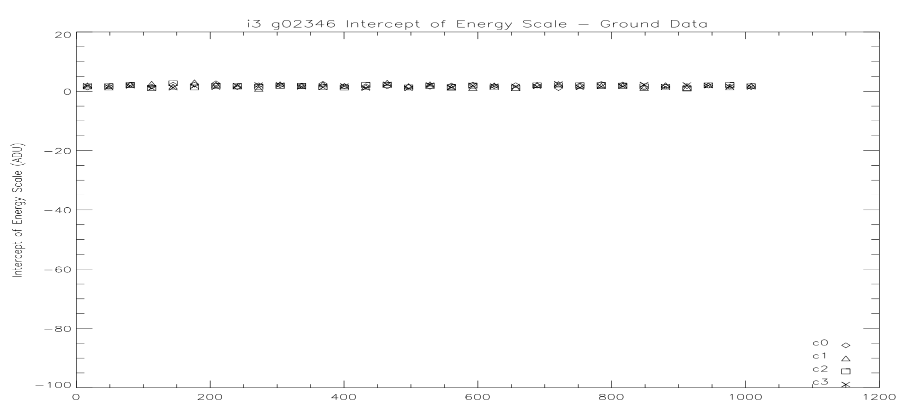

Figure 159: i3 Intercept of the Energy Scale Vs Row at -110C.

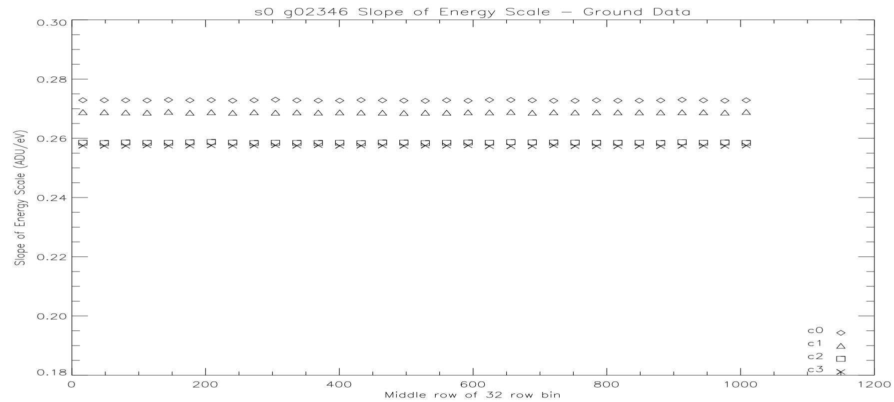

Figure 160: S0 Slope of the Energy Scale Vs Row at -110C.

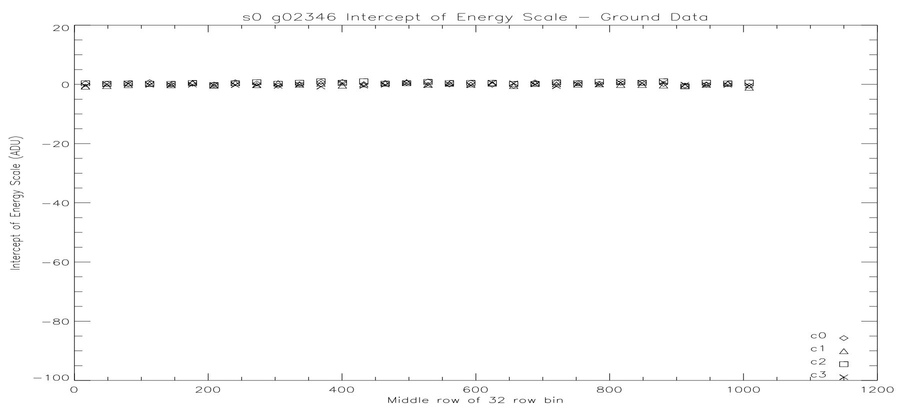

Figure 161: S0 Intercept of the Energy Scale Vs Row at -110C.

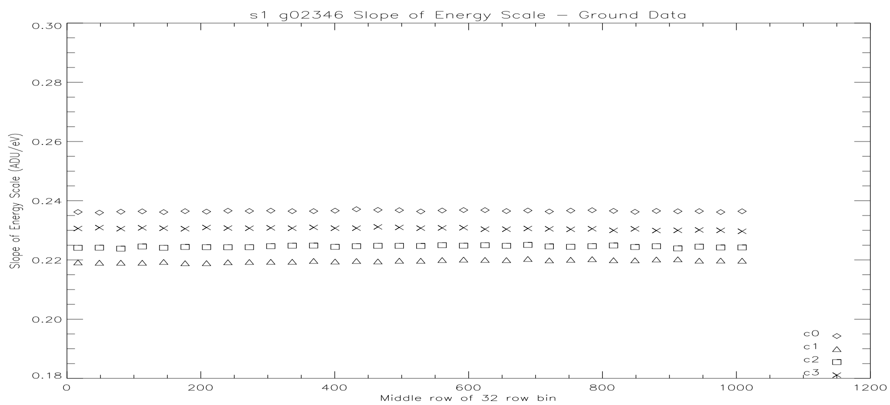

Figure 162: S1 Slope of the Energy Scale Vs Row at -110C.

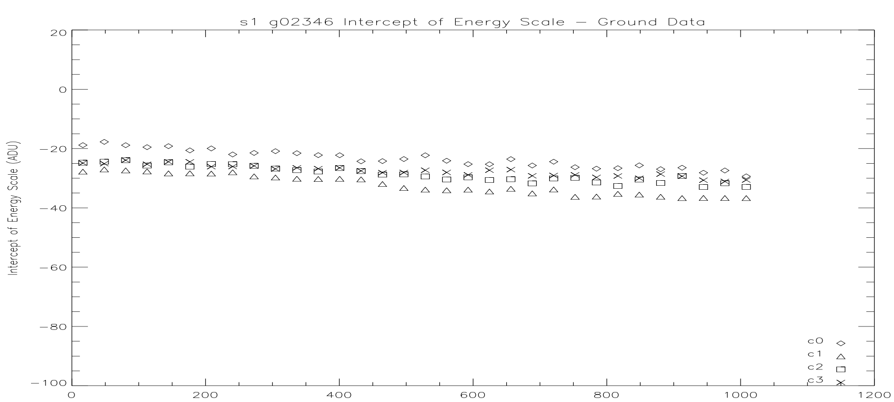

Figure 163: S1 Intercept of the Energy Scale Vs Row at -110C.

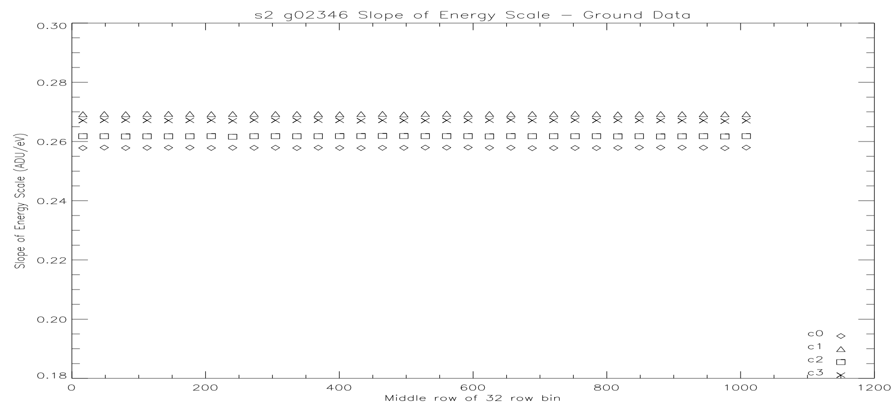

Figure 164: S2 Slope of the Energy Scale Vs Row at -110C.

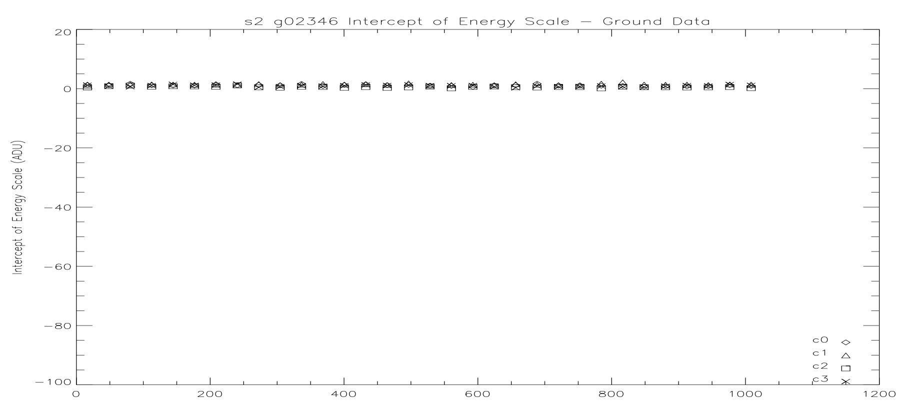

Figure 165: S2 Intercept of the Energy Scale Vs Row at -110C.

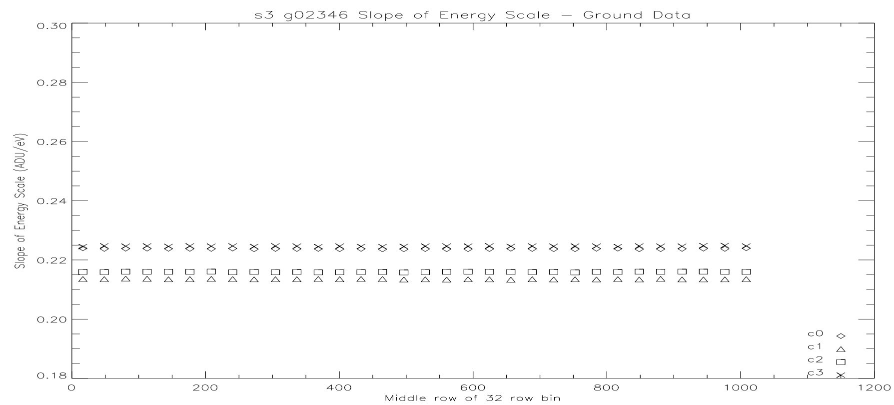

Figure 166: S3 Slope of the Energy Scale Vs Row at -110C.

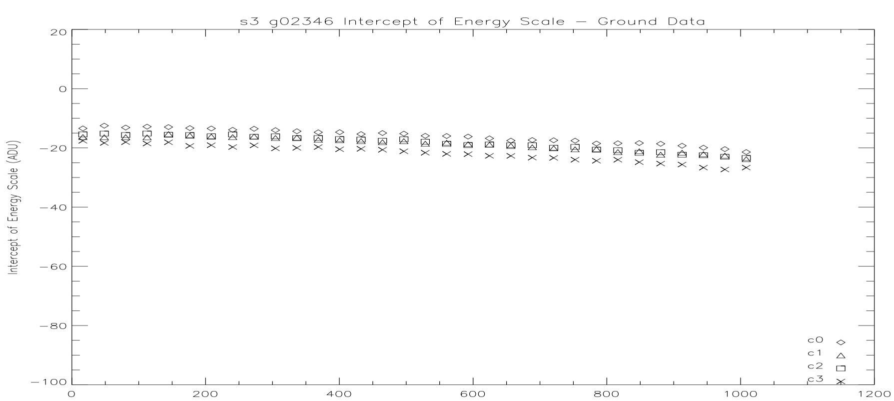

Figure 167: S3 Intercept of the Energy Scale Vs Row at -110C.

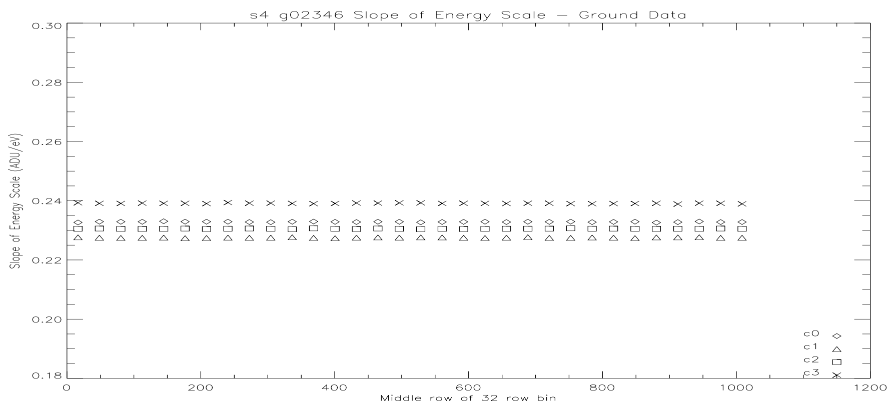

Figure 168: S4 Slope of the Energy Scale Vs Row at -110C.

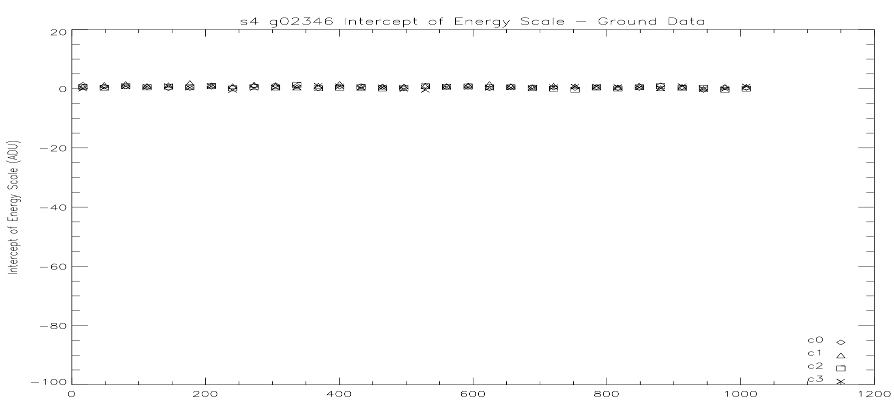

Figure 169: S4 Intercept of the Energy Scale Vs Row at -110C.

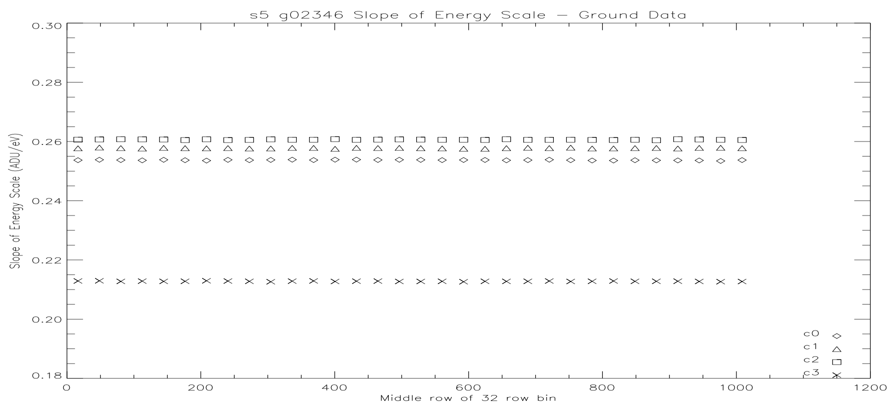

Figure 170: S5 Slope of the Energy Scale Vs Row at -110C.

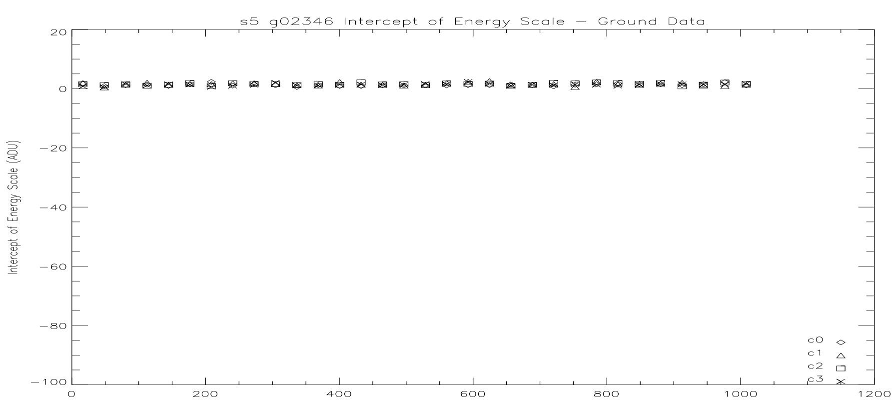

Figure 171: S5 Intercept of the Energy Scale Vs Row at -110C.

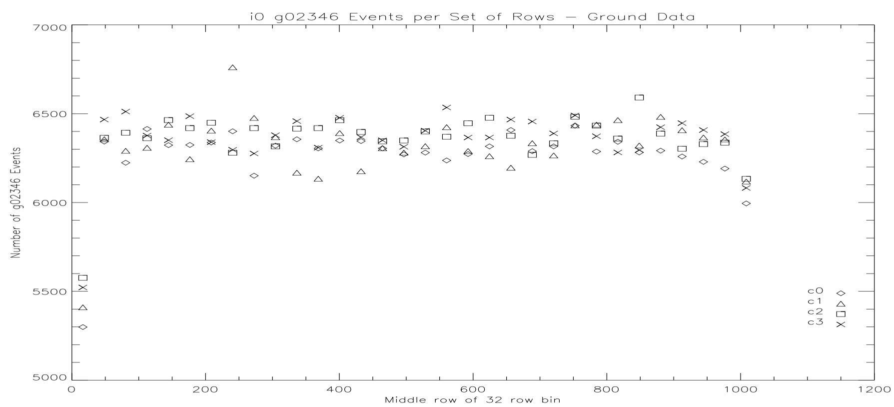

Figure 172: i0 ASCA G02346 Counts Vs Row at -110C.

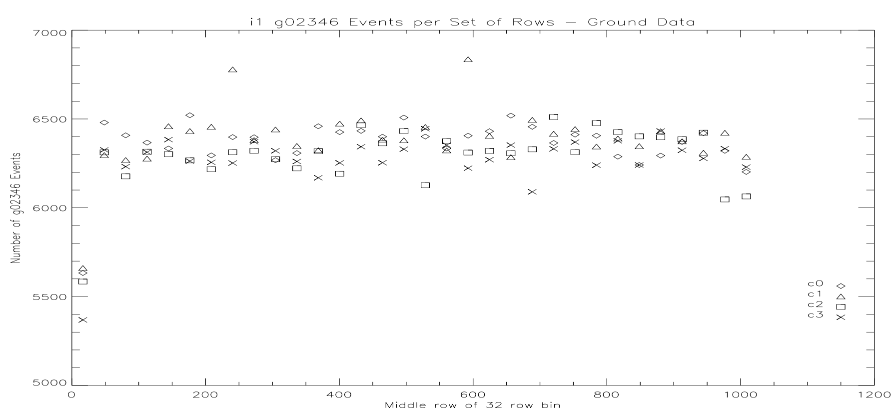

Figure 173: i1 ASCA G02346 Counts Vs Row at -110C.

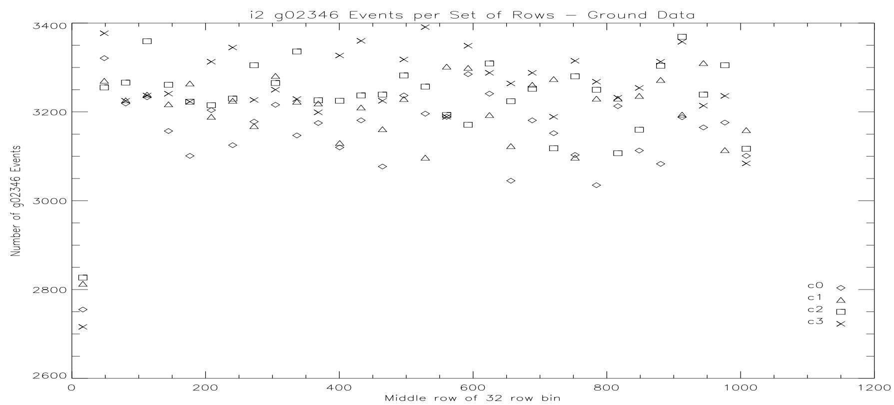

Figure 174: i2 ASCA G02346 Counts Vs Row at -110C.

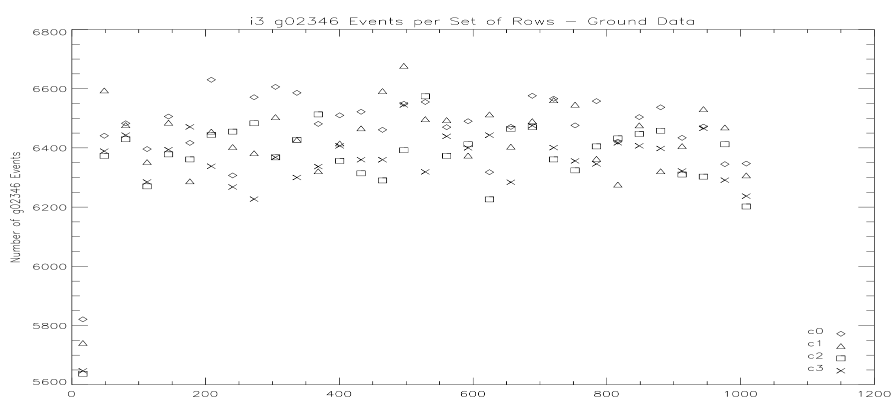

Figure 175: i3 ASCA G02346 Counts Vs Row at -110C.

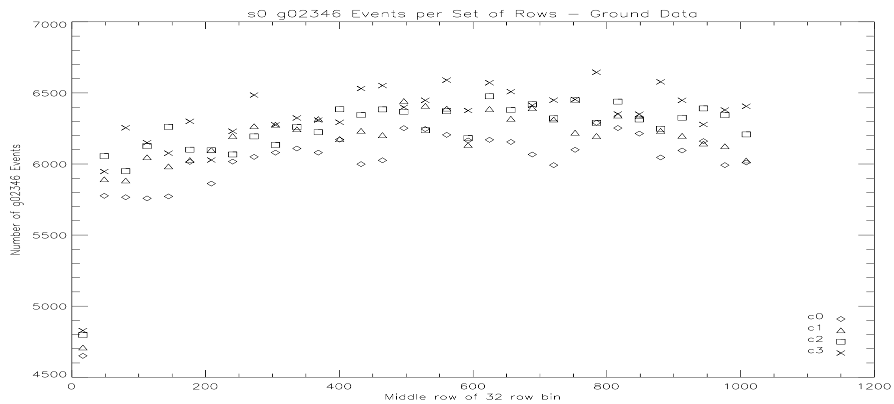

Figure 176: S0 ASCA G02346 Counts Vs Row at -110C.

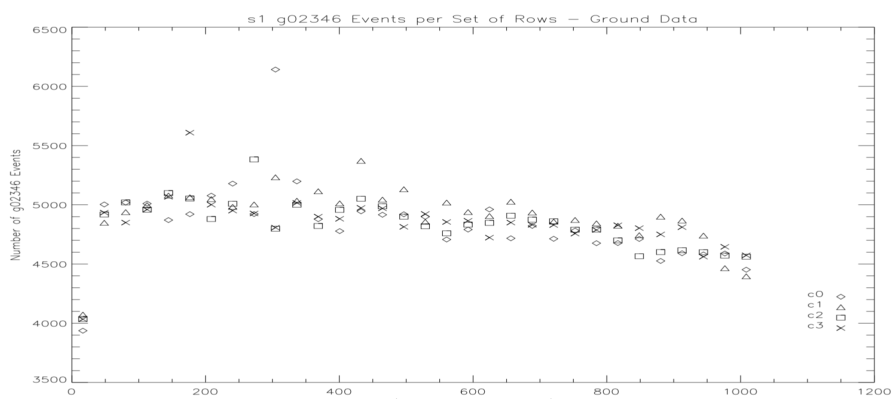

Figure 177: S1 ASCA G02346 Counts Vs Row at -110C.

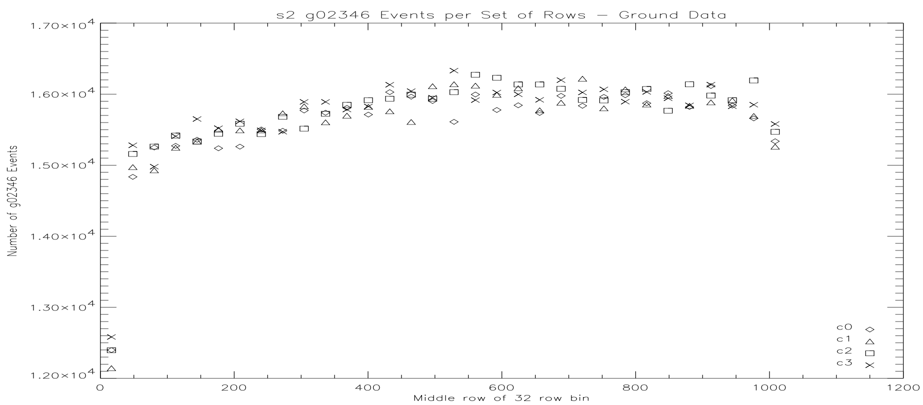

Figure 178: S2 ASCA G02346 Counts Vs Row at -110C.

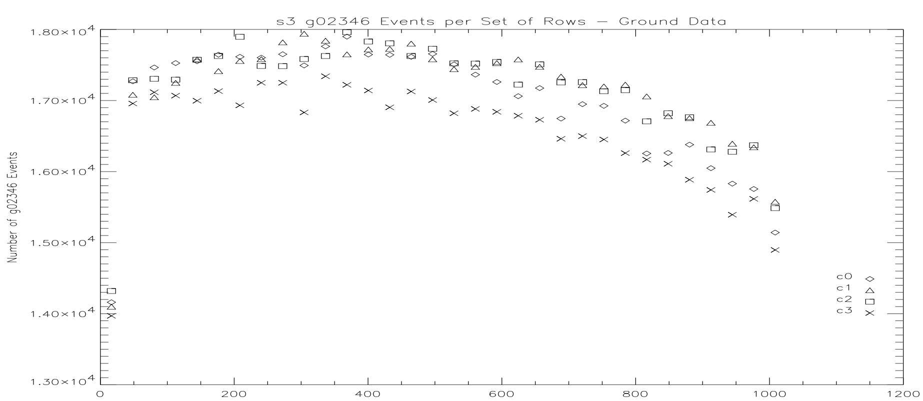

Figure 179: S3 ASCA G02346 Counts Vs Row at -110C.

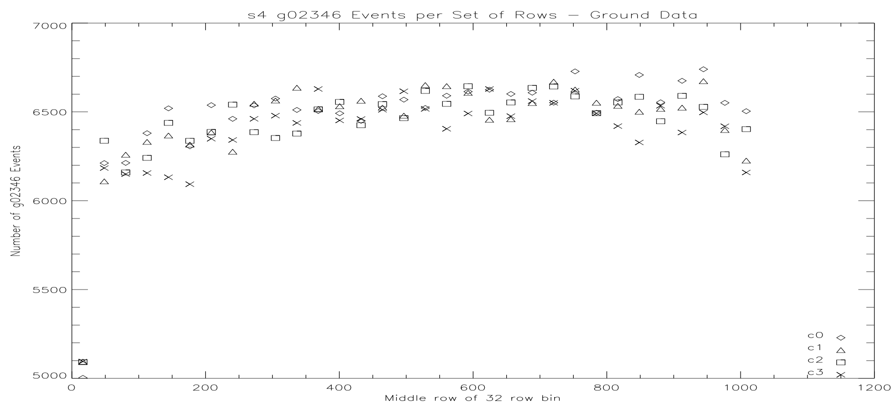

Figure 180: S4 ASCA G02346 Counts Vs Row at -110C.

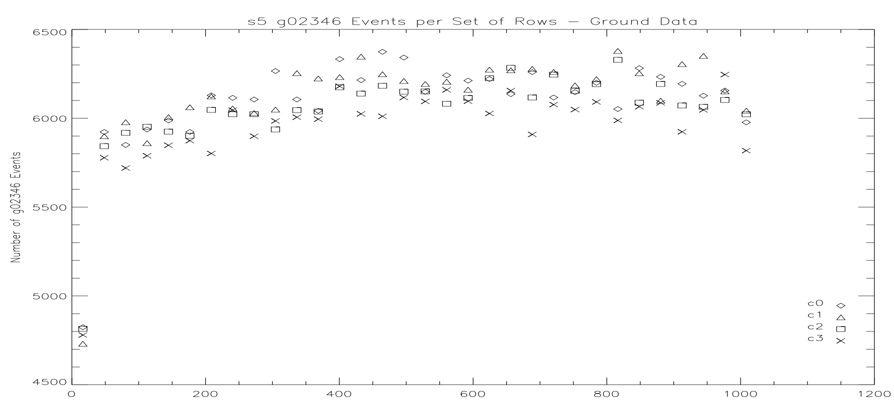

Figure 181: S5 ASCA G02346 Counts Vs Row at -110C.