Multipixel Detector Calibration Report

Natalia Auricchio, John B. Stephen, Ezio Caroli, Ariano Donati, Giulio Ventura, Filippo Frontera

Istituto di Astrofisica Spaziale e Fisica Cosmica

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1 Introduction & Scope

This document is a summary of the tests carried out at the Danish Space Research Institute (Copenhagen) in the period 31 March –24 April and contains a complete description of the results of all characterization tests performed on two pixellated detectors of CdZnTe. The logbook with all test details is in Annex 1.

The purpose of the activity was to verify the matrix performances.
For each pixel the following parameters have been evaluated:

- ✓ electronic noise;
- ✓ leakage current, which is a key parameter in characterising spectroscopic performances. This is particularly true for room-temperature semiconductor detectors. In fact, it has been already demonstrated that fluctuations in leakage current are the most important source of noise in CdTe;
- ✓ energy resolution and charge collection efficiency (centroid position). The performances have been evaluated by exposing the pixels to various sources and for different operating modes (independent and dependent mode);
- ✓ information about the interaction depth of the radiation (only for some two samples' pixel).

Some pixels are noisy and the short-term performances have been monitored with ^{241}Am source in order to study the changes in the behaviour of pulse height spectrum.

2 Experimental set-up

The detectors tested are two CdZnTe single crystals (discriminator grade) with platinum contacts, produced by eV, of size 10x10x3 mm^3. The cathode is a continuum electrode, whereas the anode is pixellated and the size of each pixel is 2x2x3 mm^3. The code numbers of the two matrices are K18#4 and K30#10. The anode configuration is schematically sketched in fig 1:

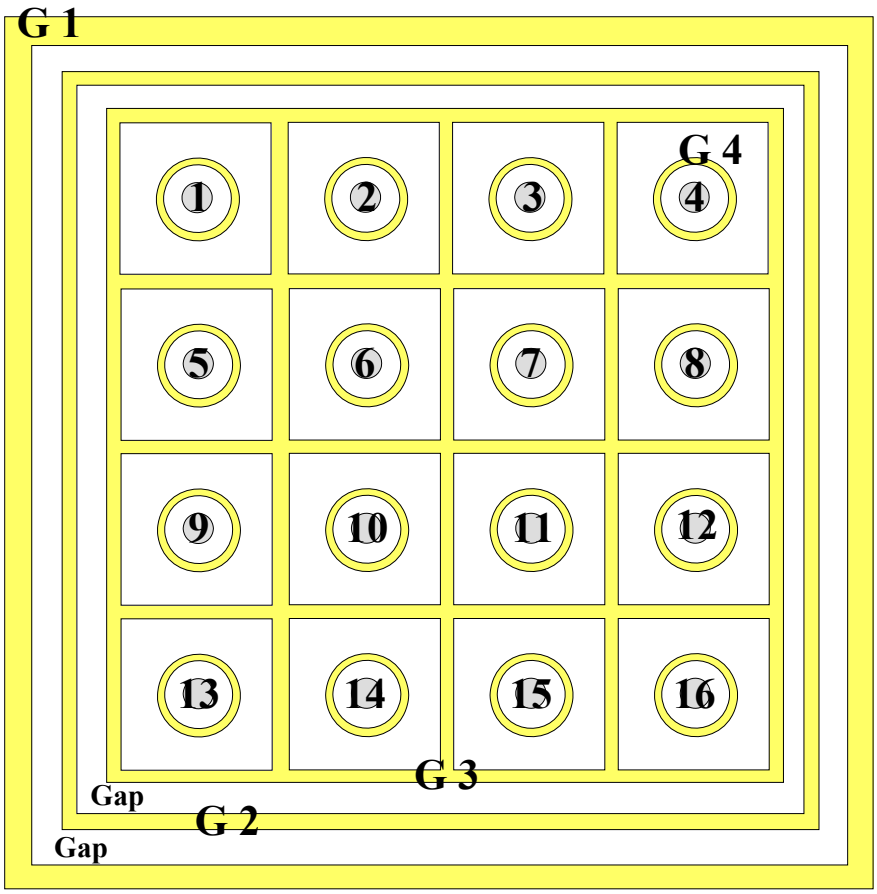


Fig. 1. Schematic design of the detector anode configuration (not to scale).

G1 and G3 are connected to a voltage divider providing -100 V (V4), whereas G2 and G4 are connected to V2 = -75 V.

The electronic chain used for testing the detectors is shown in fig. 2. The voltage of the anode, V_a, is 0 V (to ground), the planar electrode voltage, V_p, ranges from - 150 V to – 300 V, whereas the drift strips voltage, $V_{d,\ ranges}$ from 0 V to – 100 V.
The modules used are:

- Planar electrode preamplifier: eV 550;
- Planar electrode amplifier: Ortec 572. The shaping time used for all measurements is 1 microsecond;
- Planar electrode ADC: ND 579 ADC;
- High-Voltage Power Supplies Ortec 556 (Planar electrode);
- Pixel preamplifier: eV 550;
- Pixel amplifier: Ortec 572. The shaping time used for all measurements is 1 microsecond;
- Pixel ADC: ND 579 ADC;
- Voltage Power Supplies Ortec 456 (Drift electrode).

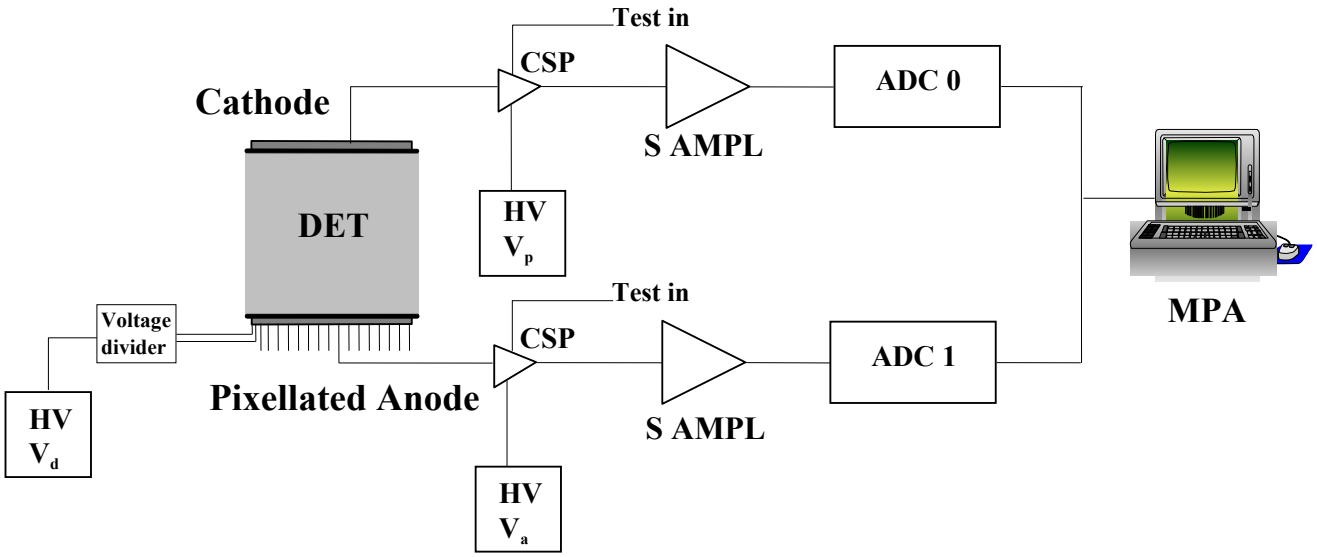


Fig. 2. Schematic drawing of the electronic chain.

3 Measurement Strategy

The characterisation of the detectors involved the measurement of some key parameters: the leakage current, the electronic noise, the energy resolution at different energies, and the stability of the charge collection efficiency. The following functional tests have been performed:

- electronic noise measurements: the FWHM of the gaussian distribution of the pulse generator peak was studied as a function of the drift voltage from 0 to -100 V in steps of –25 V for the planar electrode voltage of -300 V. The measurements were acquired with a Pulser Ortec Research Pulser 448 Pulse Height;
- leakage current measurements: the current versus drift voltage curves have been generated by employing an Pico ammeter (Keithley 6485) on a bias range spanning from 0 to -100 V in steps of –25 V for two planar electrode voltage: 0, -300 V;
- calibration measurements using an uncollimated ^{241} Am radioactive source in order to determine the detector performances such as the centroid position and the energy resolution at 60 keV of each pixel in independent mode (e.g. without coincidence).
- calibration measurements have been performed with two radioactive sources: uncollimated ^{241}Am and ^{137}Cs, at different detector bias in dependent mode (time window of 2.90 microsecond). In this mode we have produced two bi-parametric diagrams: the planar signal vs. the pixel signal and the ratio (planar signal/pixel signal) vs. the pixel signal for some pixels (the best and worst internal and external pixels of the matrix). The aim of these measurements was to evaluate the depth information which can be derived from the ratio planar signal/pixel signal at different energies.

3.1 Analysis of the spectra

The spectra have been analysed using the PeakFit software package [3] in order to obtain several parameters (e.g. efficiency, photopeak pulse amplitude, energy resolution). The main characteristics of the spectra are: a Gaussian photopeak component corresponding to the energy of the incident photons and an asymmetric component caused by trapping effects. The first component has been modelled using a Gaussian distribution and the second was fitted using a typical chromatographic asymmetric function known as a Half-Gaussian Modified Gaussian (see Annex 2).

4. Results

The results are reported in the following sections for two pixellated detectors.

- **4.1 Detector k18#4**
  - **4.1.1 Electronic noise**

The behaviour of the pulser peak FWHM as a function of the bias voltage applied to the drift strips is reported in fig. 1 and FWHM values are reported in table 1. The bias voltage of the planar electrode is – 300 V:

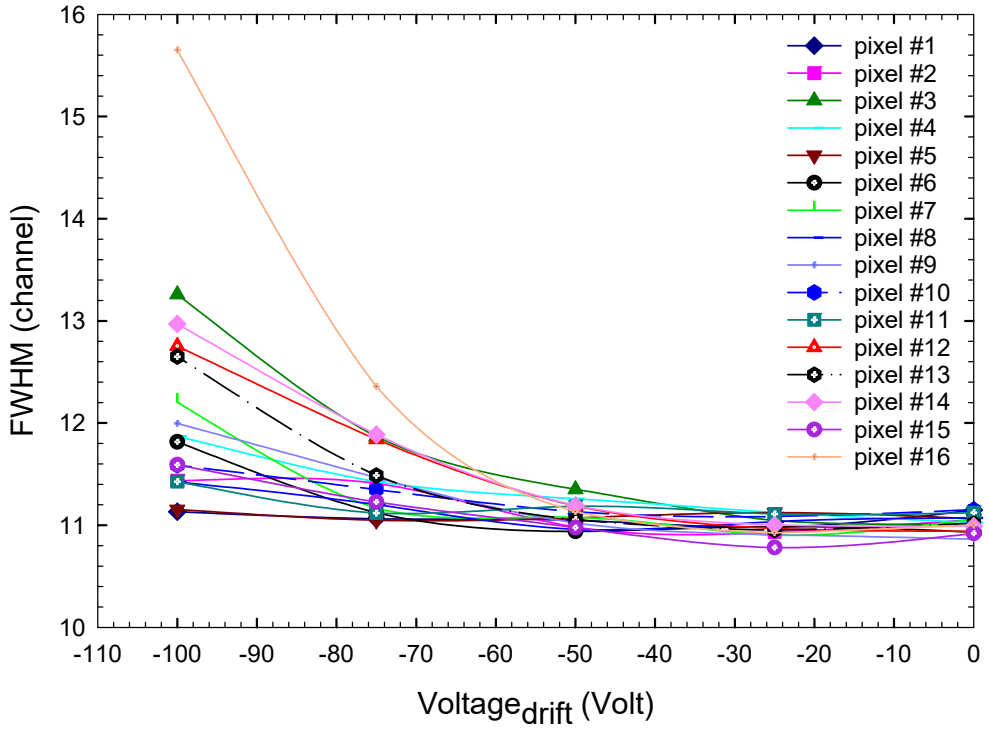


Fig. 1. Pulser peak FWHM as a function of the bias voltage.

Table 1: FWHM at different drift strip voltage.

	FWHM (channel)				
pixel	0 V	-25 V	-50 V	-75 V	-100 V
1	11.148	10.981	11.047	11.063	11.131
2	11.054	10.933	10.981	11.410	11.435
3	11.016	11.046	11.351	11.866	13.259
4	11.025	11.124	11.259	11.427	11.871
5	11.064	11.123	11.072	11.048	11.154
6	10.932	10.985	10.939	11.122	11.816
7	11.058	10.902	11.078	11.167	12.203
8	11.072	11.034	10.959	11.202	11.423
9	10.863	10.907	11.021	11.465	11.996
10	11.150	11.085	11.132	11.348	11.587
11	11.123	11.110	11.185	11.119	11.426
12	10.941	10.968	11.189	11.840	12.754
13	11.017	10.952	11.054	11.487	12.650
14	10.99	11.002	11.192	11.887	12.970
15	10.92	10.781	10.976	11.227	11.591
16	11.001	10.925	11.133	12.358	15.652

- **4.1.2 Leakage Current**

The behaviour of leakage current of the detector k18#4 as a function of the drift strips voltage is reported in fig. 2, where, at first, Vplanar is 0 V for monitoring the surface leakage effects and, later on, Vplanar is fixed to - 300 V in order to measure the bulk leakage current too:

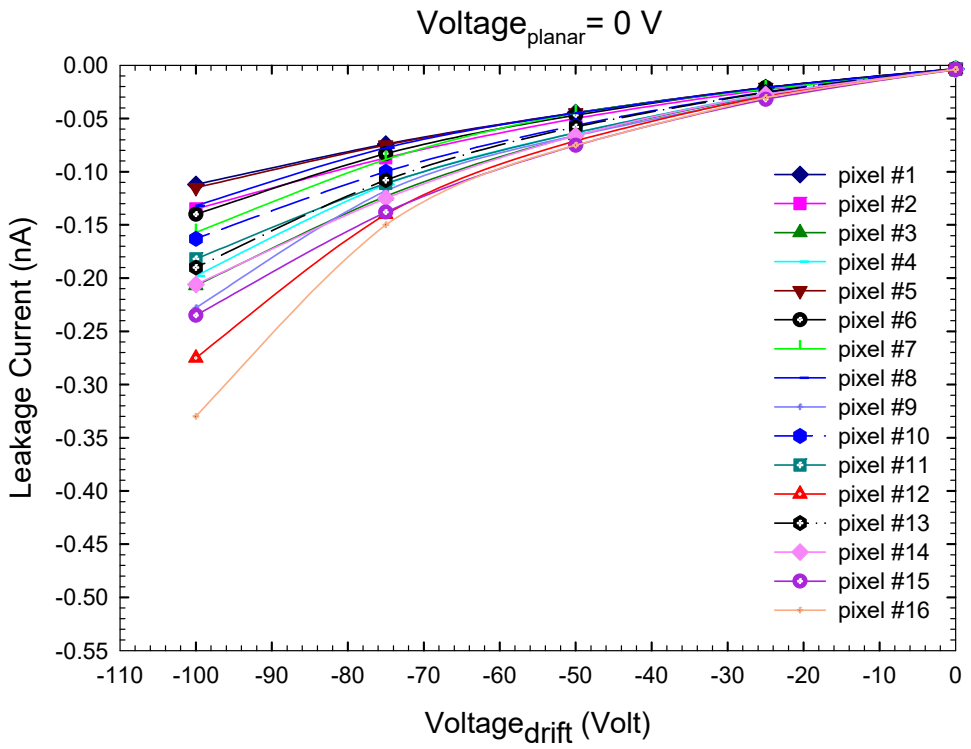


Fig. 2a. The leakage current of each pixel vs. the drift voltage for Vplanar = 0 Volt.

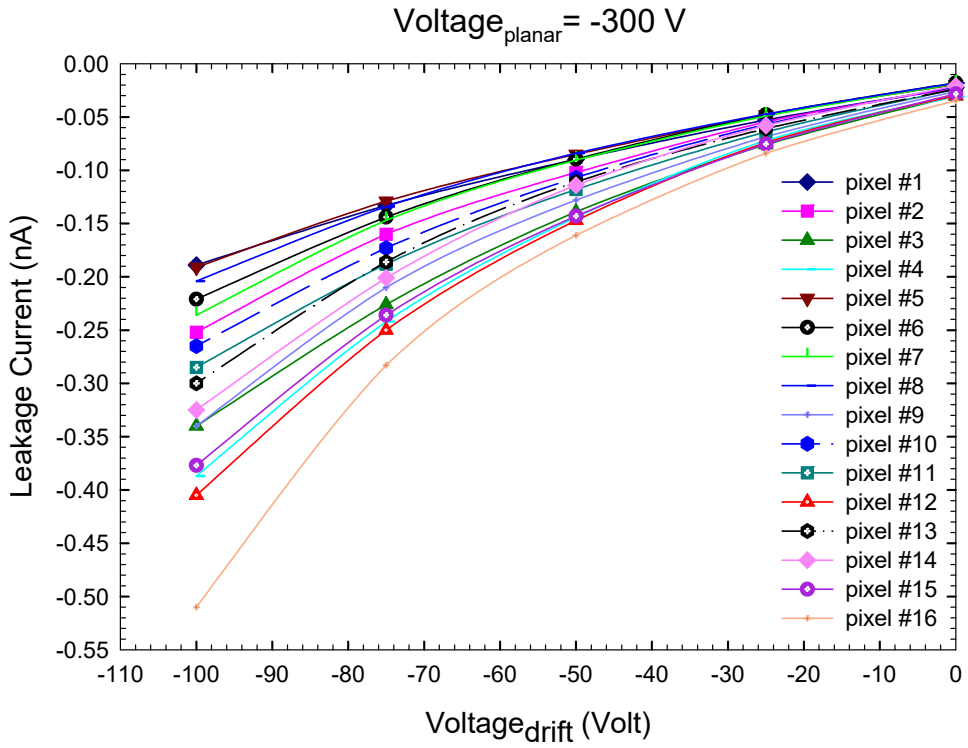


Fig. 2b. The leakage current of each pixel vs. the drift voltage for Vplanar = -300 Volt.

In table 2a and 2b we report the value of leakage current for two planar electrode voltages:

Table 2a: The leakage current at Vplanar = 0 Volt.

	LEAKAGE CURRENT (nA) at Vp = 0 V				
pixel	0 V	-25 V	-50 V	-75 V	-100 V
1	-0.0038	-0.0210	-0.0445	-0.0740	-0.112
2	-0.0036	-0.0230	-0.0500	-0.0870	-0.135
3	-0.0039	-0.0281	-0.0660	-0.1230	-0.207
4	-0.0037	-0.0270	-0.0633	-0.1120	-0.198
5	-0.0034	-0.0208	-0.0447	-0.0749	-0.115
6	-0.0032	-0.0210	-0.0468	-0.0830	-0.140
7	-0.0036	-0.0222	-0.0450	-0.0885	-0.157
8	-0.0034	-0.0210	-0.0449	-0.0775	-0.132
9	-0.0042	-0.0297	-0.0660	-0.1180	-0.228
10	-0.0036	-0.0252	-0.0566	-0.1000	-0.163
11	-0.0037	-0.0280	-0.0634	-0.1110	-0.182
12	-0.0038	-0.0290	-0.0710	-0.1400	-0.275
13	-0.0038	-0.0257	-0.0580	-0.1080	-0.190
14	-0.0038	-0.0275	-0.0660	-0.1250	-0.206
15	-0.0040	-0.0320	-0.0752	-0.1380	-0.235
16	-0.0040	-0.0303	-0.0750	-0.1500	-0.330

Table 2b: The leakage current at Vplanar = -300 Volt

	LEAKAGE CURRENT (nA) at Vp = -300 V				
pixel	0 V	-25 V	-50 V	-75 V	-100 V
1	-0.0224	-0.0528	-0.0898	-0.1330	-0.189
2	-0.0230	-0.0546	-0.1020	-0.1600	-0.252
3	-0.0302	-0.0760	-0.1390	-0.2260	-0.340
4	-0.0310	-0.0720	-0.1440	-0.2420	-0.387
5	-0.0195	-0.0480	-0.0850	-0.1290	-0.191
6	-0.0180	-0.0478	-0.0895	-0.1440	-0.221
7	-0.0190	-0.0490	-0.0904	-0.1470	-0.236
8	-0.0181	-0.0472	-0.0840	-0.1340	-0.204
9	-0.0260	-0.0685	-0.1280	-0.2100	-0.340
10	-0.0218	-0.0570	-0.1070	-0.1730	-0.265
11	-0.0239	-0.0640	-0.1180	-0.1880	-0.285
12	-0.0299	-0.0740	-0.1470	-0.2500	-0.405
13	-0.0240	-0.0610	-0.1110	-0.1860	-0.300
14	-0.0208	-0.0580	-0.1140	-0.2010	-0.325
15	-0.0283	-0.0754	-0.1430	-0.2360	-0.377
16	-0.0347	-0.0840	-0.1610	-0.2830	-0.510

4.1.3 ^{241}Am measurements in independent mode

In the following figures the ^{241}Am spectra measured at the planar electrode and at each pixel are reported. In table 3 the values of the centroid position, the FWHM and the energy resolution at 59.6 keV for each pixel are reported and plotted in figures 5 and 6. The bias voltages are:

- V_d = - 75 V
- V_p = - 200 V

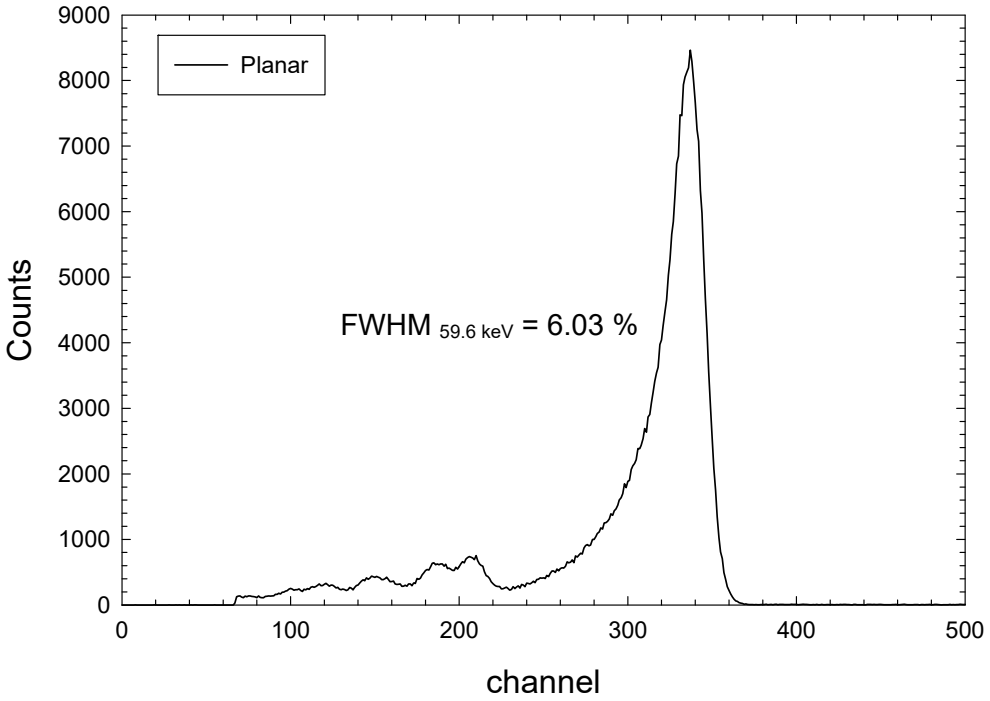


Fig. 3. Spectrum of ^{241}Am obtained with planar electrode.

Table 3: Main parameters of the ^{241}Am spectra at 59.6 keV.

pixel	Centroid position (channel)	FWHM (channel)	Energy Resolution (%)
1	342.61	15.23	4.45
2	342.84	14.66	4.28
3	341.91	17.71	5.18
4	342.58	16.66	4.86
5	342.02	15.84	4.63
6	341.86	17.04	4.98
7	342.38	16.10	4.70
8	341.70	16.49	4.83
9	342.25	16.21	4.74
10	342.18	17.01	4.97
11	341.91	18.11	5.30
12	342.17	16.58	4.85
13	342.22	16.08	4.70
14	343.26	16.01	4.66
15	343.49	16.25	4.73
16	342.48	17.19	5.02

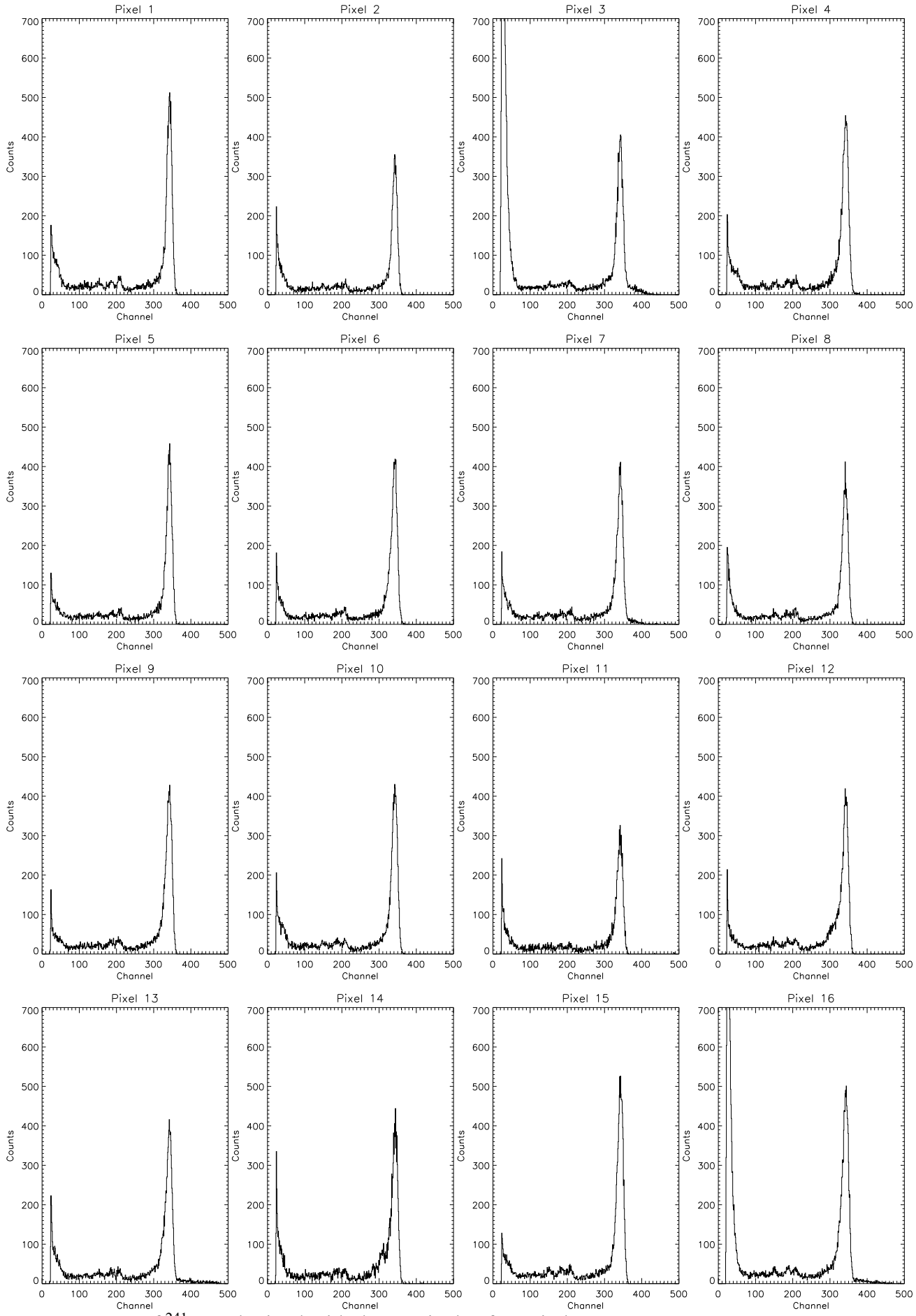


Fig. 4. Spectra of ^{241}Am obtained with the 16 pixels of matrix k18#4.

The spectra of pixels 3, 7, 13 and 16 show a tail to the high-energy side, that is still present even reducing Vdrift to a lower value (-45 Volt).

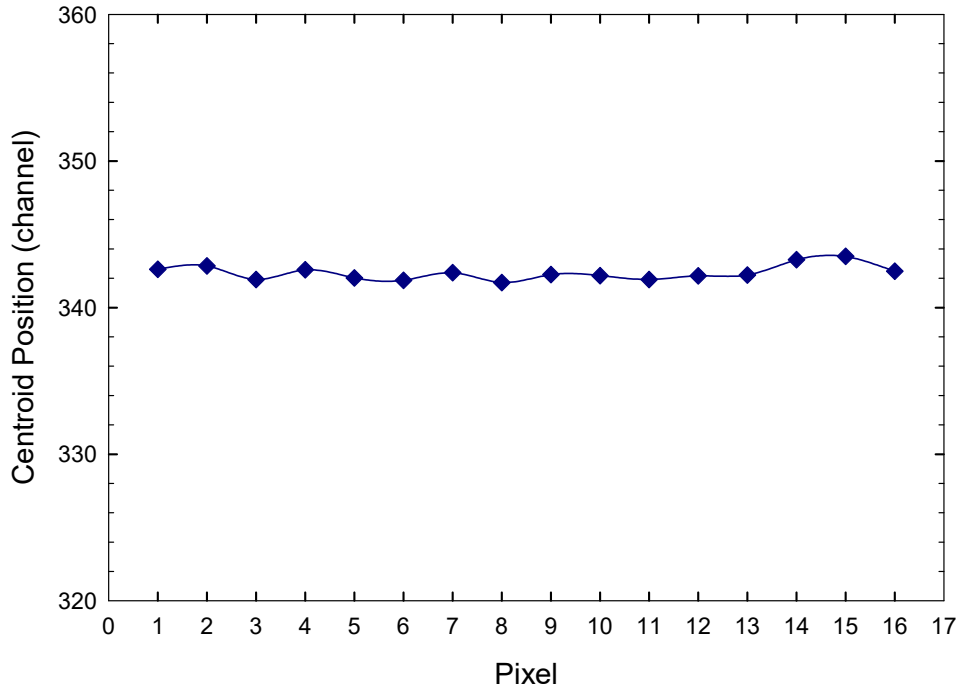


Fig. 5. Centroid position at 59.6 keV for the 16 pixels.

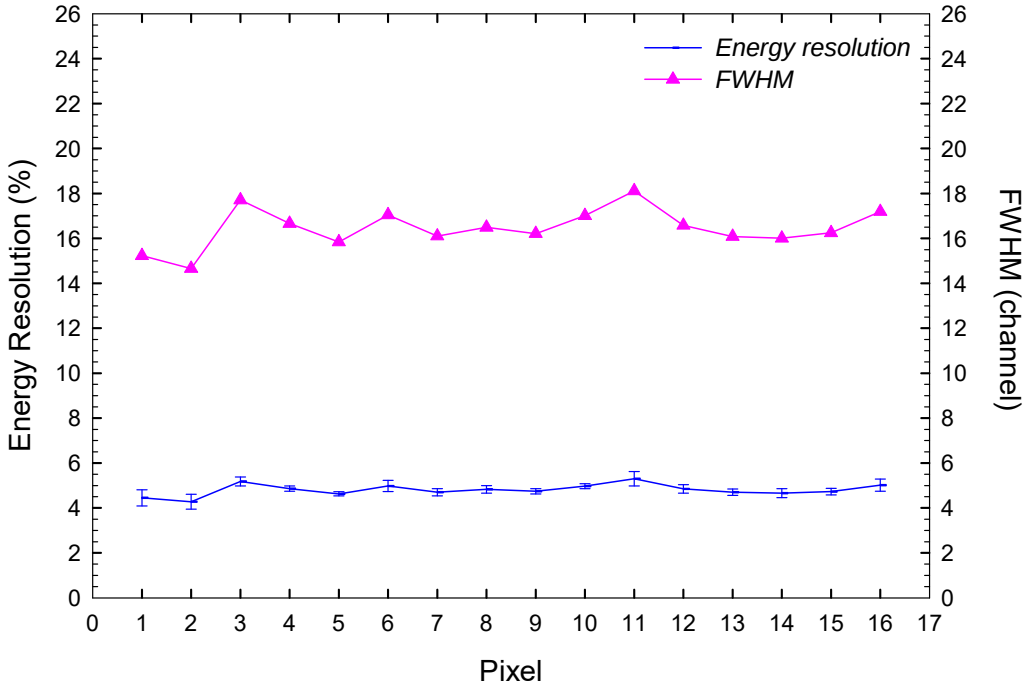


Fig. 6. Energy resolution (axis on the left) and FWHM (axis on the right) at 59.6 keV for the 16 pixels.

The valuation of low-energy tail, due to trapping effects, is important in assessing the quality of the detector. To quantify the tail, the peak-to valley ratio is calculated at several points below the peak. The peak-to-valley ratio is the ratio of the peak counts at the centroid channel, to the channel contents at a point in the spectrum below the peak. The valley is calculated as the average of the 5 channels centred at the following channels: 1) a distance of 0.5 FWHM from the centroid channel; 2) a distance of 2 FWHM from the centroid channel; and 3) a distance of 5 FWHM from the centroid channel.
Some quantitative results, concerning this parameter, are reported in table 3a.

Table 3a: Peak – to - Valley Ratio at 59.5 keV.

pixel	Peak-to-Valley Ratio (1)	Peak-to-Valley Ratio (2)	Peak-to-Valley Ratio (3)
1	1.44	11.58	23.38
2	1.41	11.07	19.11
3	1.83	10.18	25.13
4	1.42	9.91	26.31
5	1.83	11.04	28.62
6	1.75	12.30	25.77
7	1.68	10.13	25.96
8	1.54	10.76	26.49
9	1.59	8.94	26.25
10	1.71	11.48	24.26
11	1.61	11.04	23.92
12	1.77	5.87	23.88
13	1.37	8.43	25.19
14	1.71	5.07	21.68
15	1.67	12.80	29.44
16	1.69	10.42	31.13

The pixels 3, 11, 14, 16 are noisy; therefore we have performed a set of measurements with an ^{241}Am source in order to study the stability of the spectrum over time. In fig. 7 the comparison between the spectra taken at different times is presented: pixels 3 and 16 are still noisy at low energy.

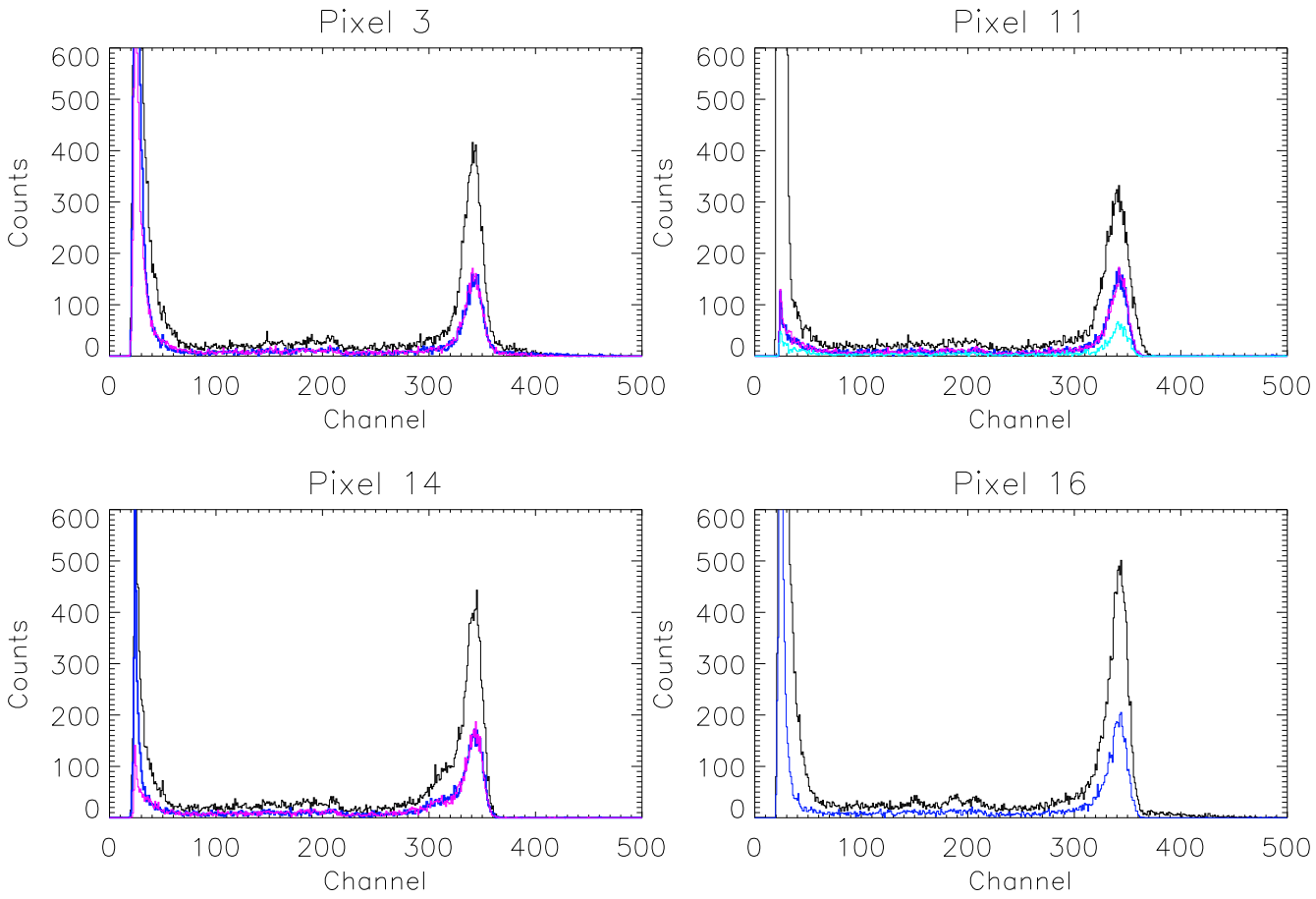


Fig. 7. Stability for some pixel.

4.1.4 ^{241}Am measurements in dependent mode

In the following figure the ^{241}Am spectra obtained in dependent mode from some pixels are shown. The values of the centroid position, the FWHM and the energy resolution at 59.6 keV are given in table 4 and plotted in figures 9 and 10. The bias voltages are:

- V_d = - 100 V
- V_p = - 300 V

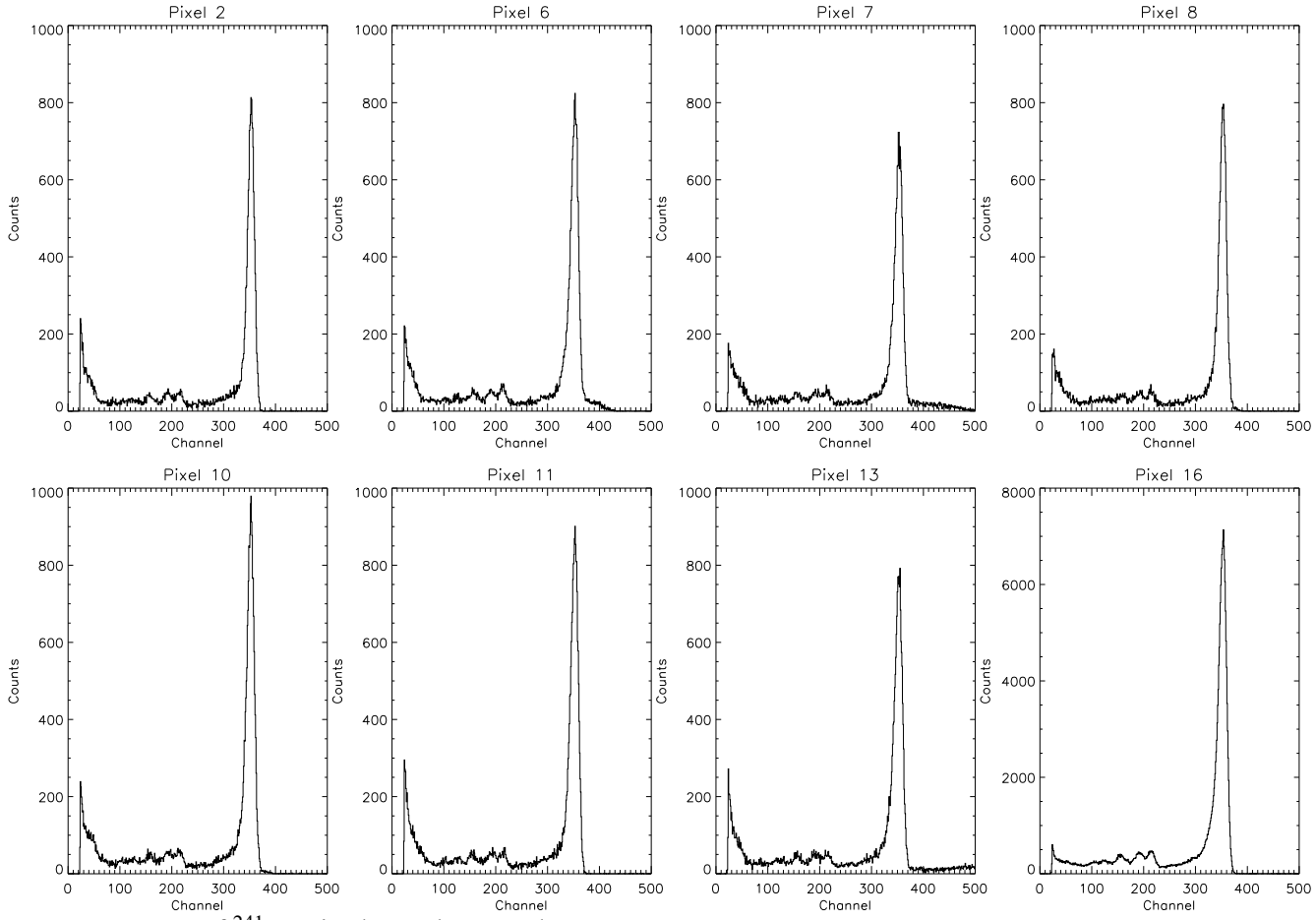


Fig. 8. Spectra of ^{241}Am in dependent mode.

Table 4: Main parameters of the ^{241}Am spectra at 59.6 keV.

pixel	Centroid position (channel)	FWHM (channel)	Energy Resolution (%)
2	353.17	14.26	4.04
6	352.75	15.37	4.36
7	353.11	15.39	4.36
8	353.07	15.70	4.45
10	352.49	15.49	4.39
11	352.81	15.36	4.35
13	352.91	15.93	4.51
16	352.94	15.96	4.52

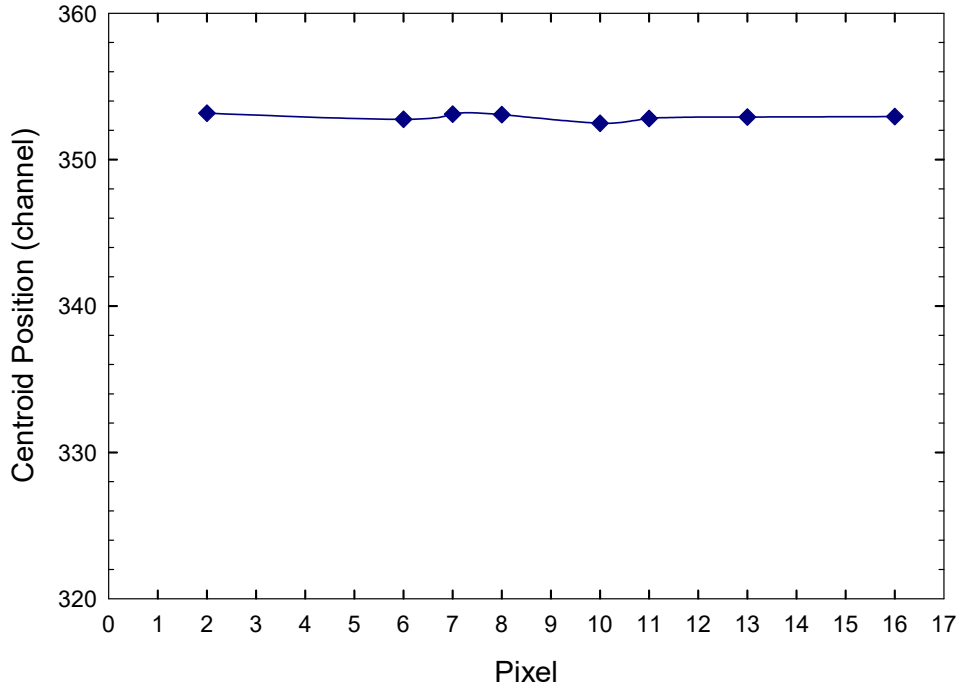


Fig. 9. Centroid position at 59.6 keV.

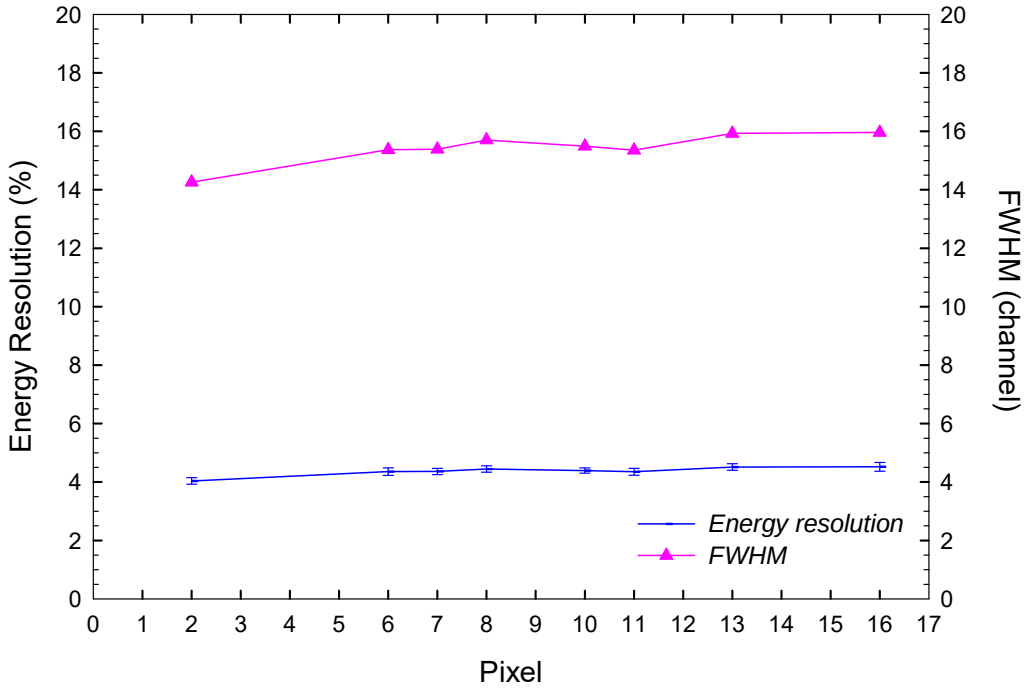


Fig. 10. Energy resolution (axis on the left) and FWHM (axis on the right) at 59.6 keV.

The pixel 2 performances have been evaluated when the surrounding pixels are set to ground, in this case it is evident that the photopeak efficiency (total area under the peak) is significantly increased (see fig. 11), but it is also interesting to observe that the peak shape is the same.

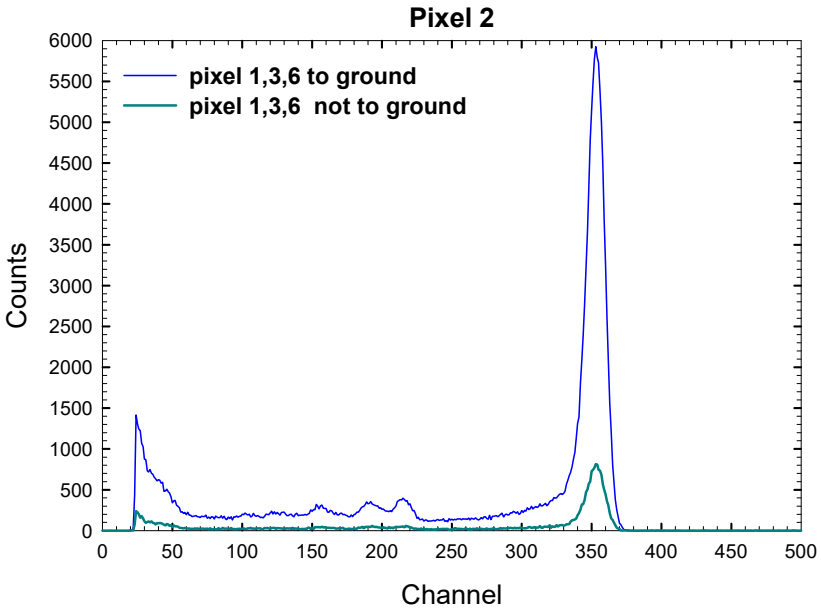


Fig. 11. Comparison between the spectra obtained when the pixels 1, 3 and 6 are to ground or not.

Pixel 16 was illuminated with photons from a ^{241}Am source, keeping Vdrift = -100 V, whereas Vplanar has been changed from –200 V to –300 V.
The charge collection efficiency is increased because the electric field is increased (see fig. 12).

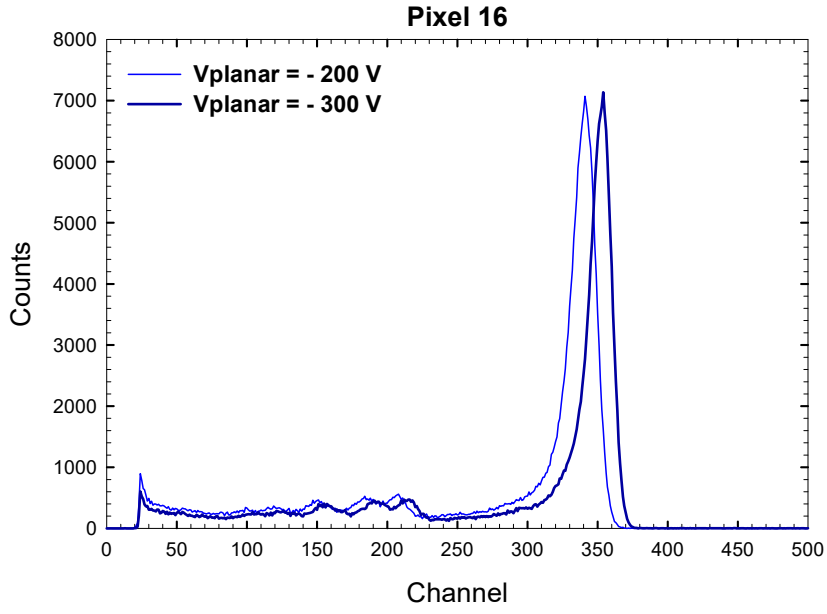


Fig. 12. Comparison between the spectra obtained using different voltages of the planar electrode.

The data collected and saved with the experimental set-up shown in figure 2 are used to fill a two-dimensional map. In figure 13 the bi-parametric distributions measured for ^{241}Am gamma rays are reported. In the horizontal axes are reported the pixel signals while on the vertical axes there are the Qplanar/Qpixel ratios. The logarithmic scale indicates the number of counts.

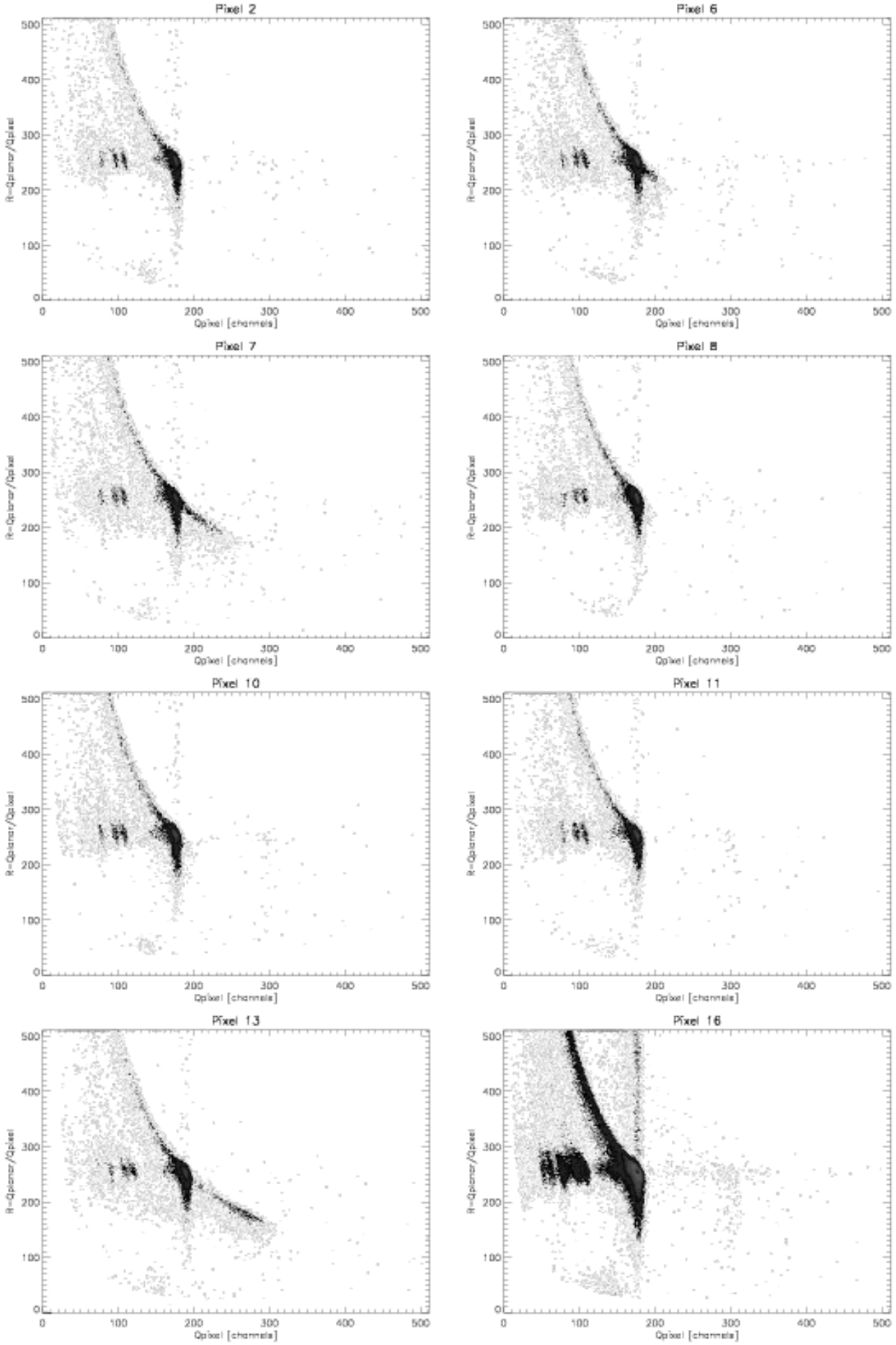


Fig. 13. Bi-parametric diagrams measured for ^{241}Am gamma rays.

In order to study the spectroscopic performance of tested pixels, we can use the signal bi-parametric information to perform a selection of the detected events: a selection can be performed by considering events having signal ratio values inside a rectangular region of good collection and projecting it on the axis X (see fig. 14). In table 5 the main parameters of the X-projections are reported.

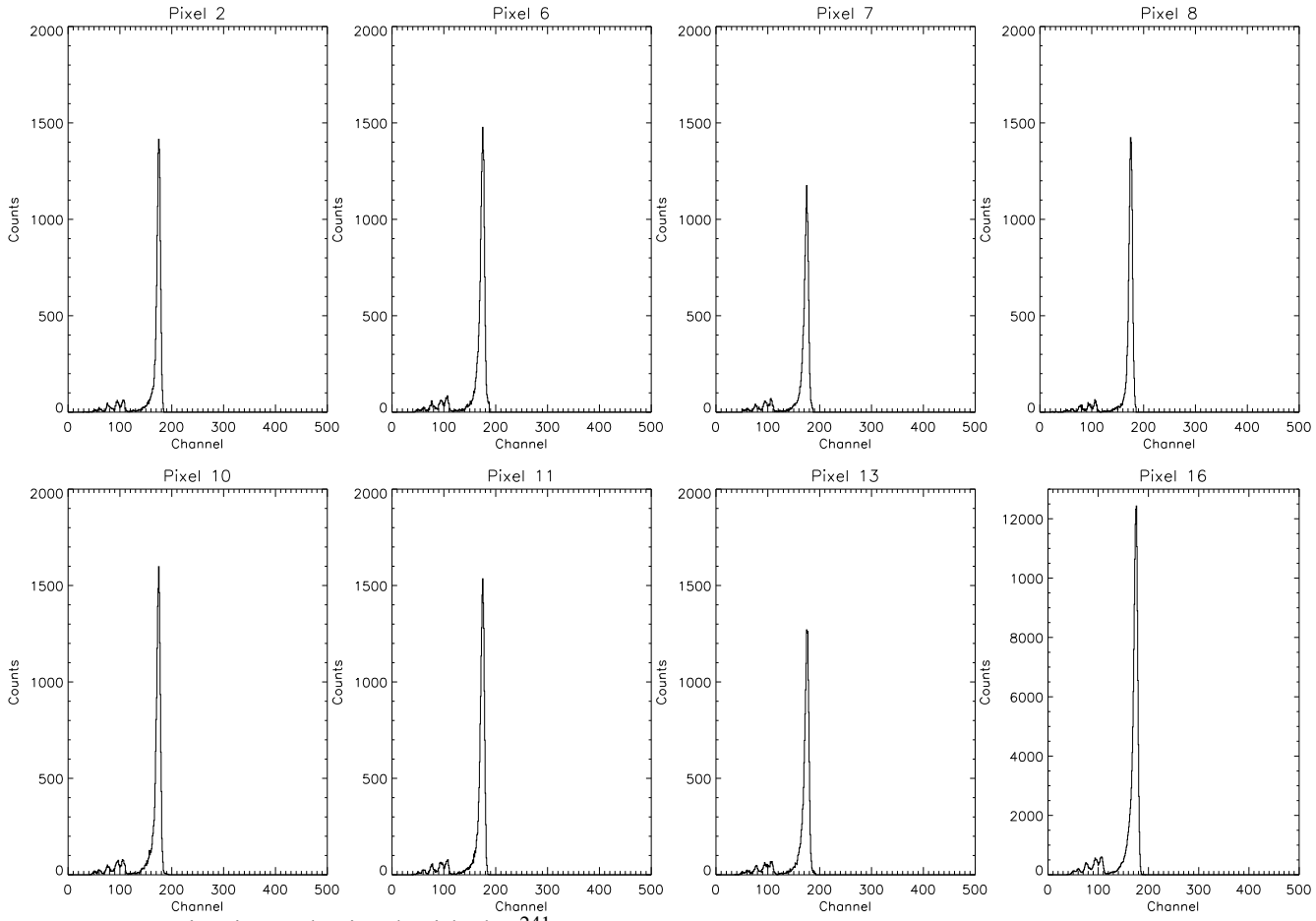


Fig. 14. X-projections obtained with the ^{241}Am maps.

Table 5: Main parameters of the X-projections.

pixel	Centroid position (channel)	FWHM (channel)	Energy Resolution (%)
2	176.11	7.22	4.10
6	176.32	7.34	4.16
7	176.26	7.16	4.06
8	176.33	7.43	4.21
10	175.61	7.60	4.33
11	175.91	7.67	4.36
13	175.99	7.32	4.16
16	176.11	8.11	4.60

4.1.5 ^{137}Cs measurements in dependent mode

The ^{137}Cs spectra taken in dependent mode are reported in fig 15 (in fig 15b there are the total spectra). The voltages are V_d = - 100 V and V_p = - 300 V. The pixel 5 live time is three times longer than the others.

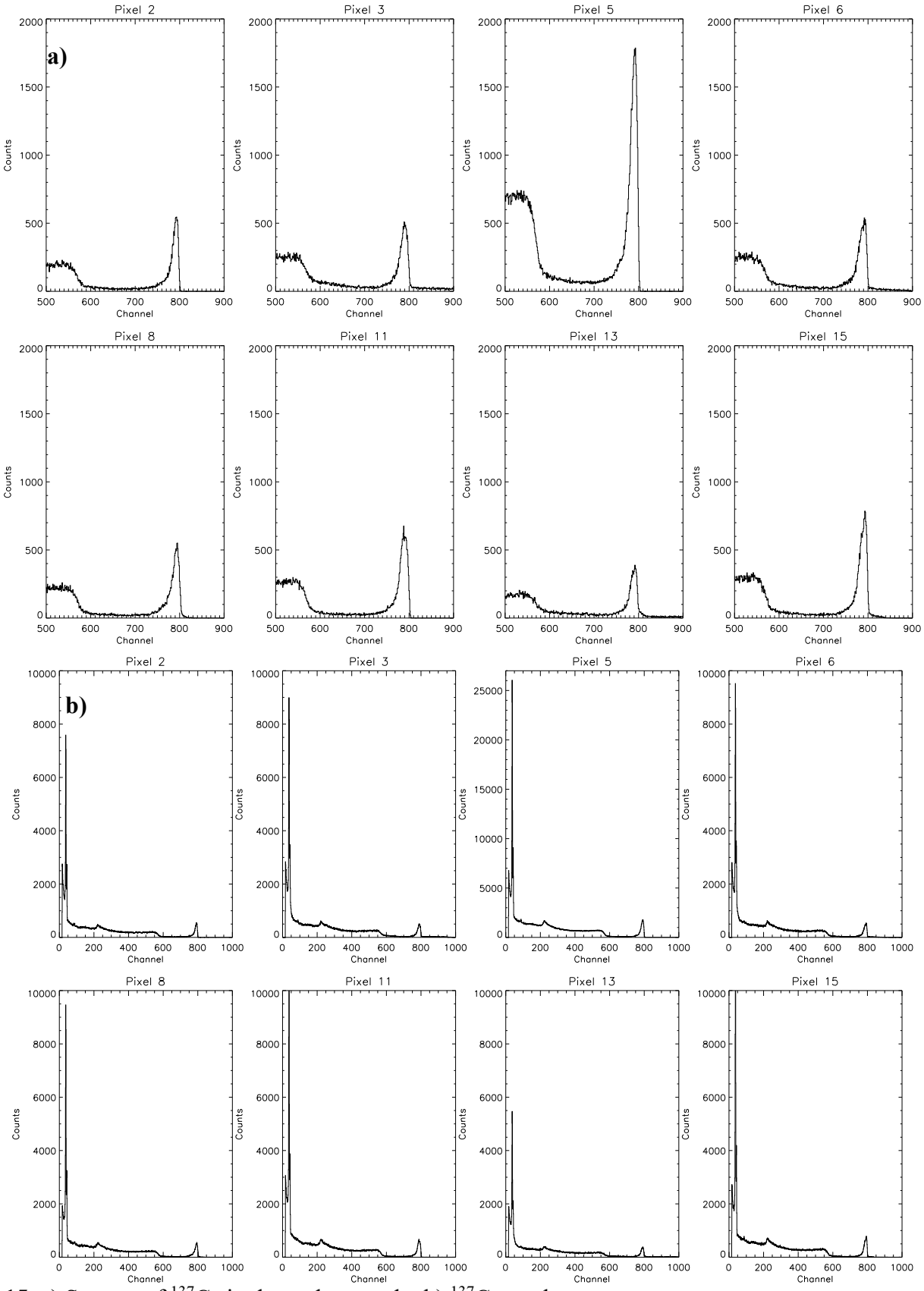


Fig. 15. a) Spectra of ^{137}Cs in dependent mode; b) ^{137}Cs total spectra.

In table 6 the values of the centroid position, the FWHM and the energy resolution at 662 keV are reported and plotted in figures 16 and 17.

Table 6: Main parameters of the ^{137}Cs spectra at 662 keV.

pixel	Centroid position (channel)	FWHM (channel)	Energy Resolution (%)
2	792.24	10.09	1.27
3	790.65	13.95	1.76
5	791.87	12.67	1.60
6	789.91	13.92	1.76
8	794.36	11.53	1.45
11	792.36	12.06	1.52
13	791.47	11.70	1.48
15	793.05	10.86	1.37

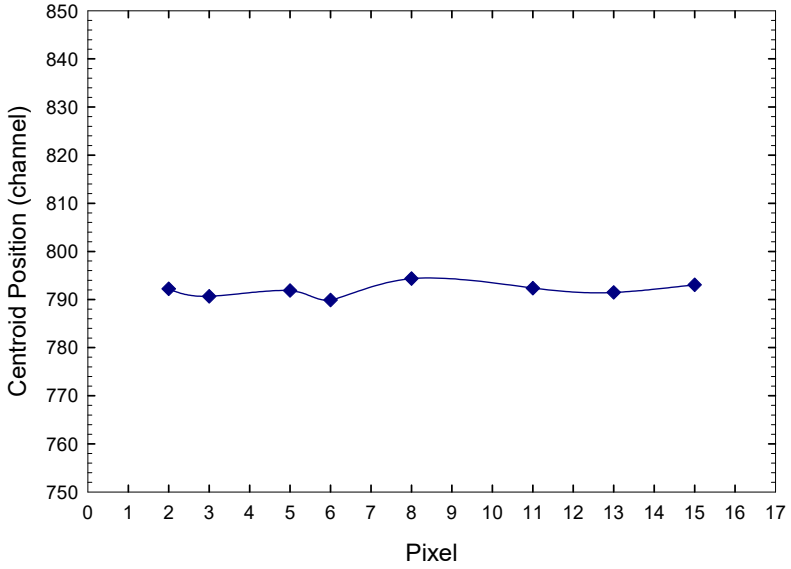


Fig. 16. Centroid position at 662 keV.

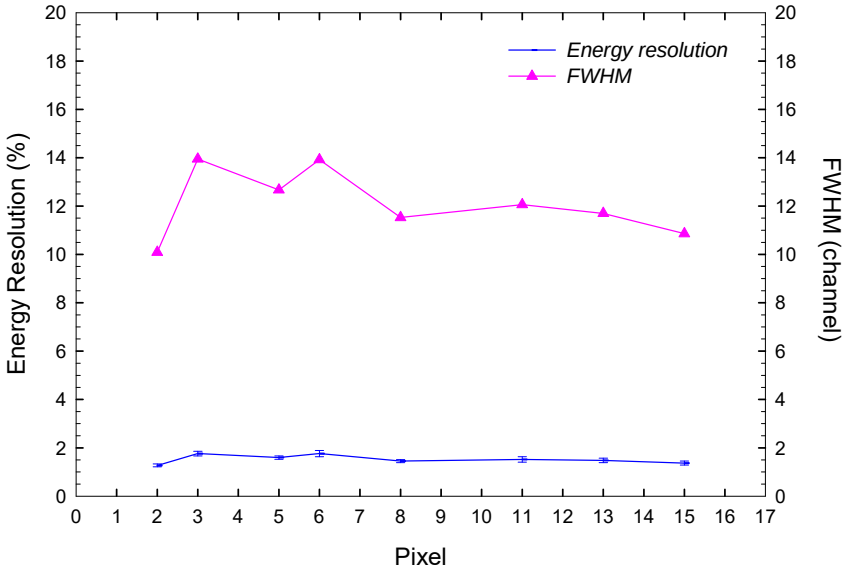


Fig. 17. Energy resolution (axis on the left) and FWHM (axis on the right) at 662 keV.

In figure 18 the bi-parametric distributions measured for ^{137}Cs gamma rays are shown.

The logarithmic scale indicates the number of counts.

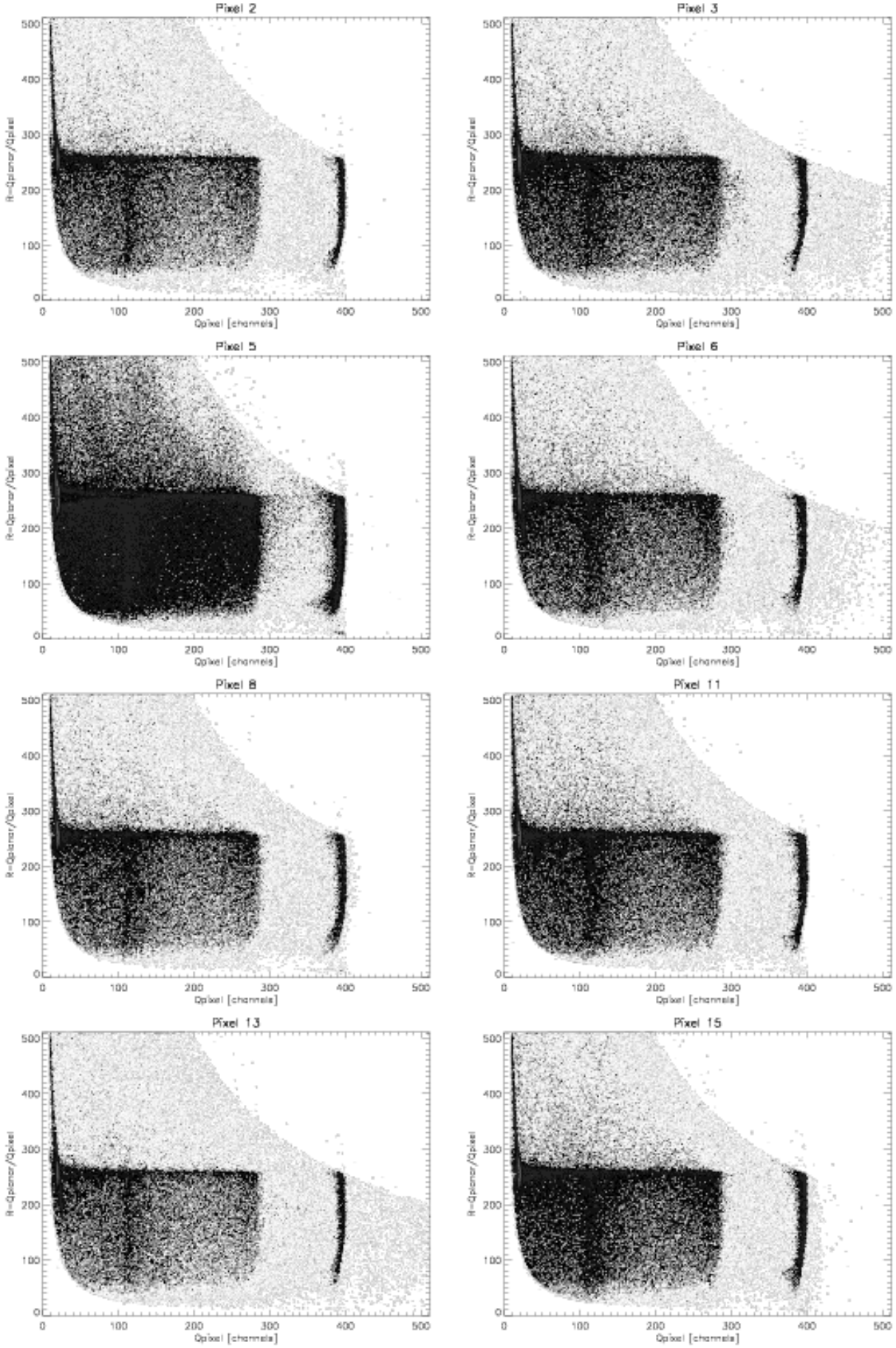


Fig. 18. Bi-parametric diagrams obtained irradiating the detector with a ^{137}Cs source.

The depth information can be derived from the ratio Qplanar/Qstrip, which has a value 1.0 (~ channel 260) for interactions close to the planar electrode and has a value 0.0 for interactions near the strip electrodes.
In table 7 the main parameters of the X-projections (see fig.19) obtained from the event selection are reported.

Table 7: Main parameters of the X-projections.

pixel	Centroid position (channel)	FWHM (channel)	Energy Resolution (%)
2	395.20	5.08	1.29
3	394.51	7.25	1.84
5	395.21	6.63	1.68
6	394.69	7.31	1.85
8	395.20	6.71	1.70
11	394.42	7.46	1.89
13	394.68	7.46	1.89
15	395.52	6.76	1.71

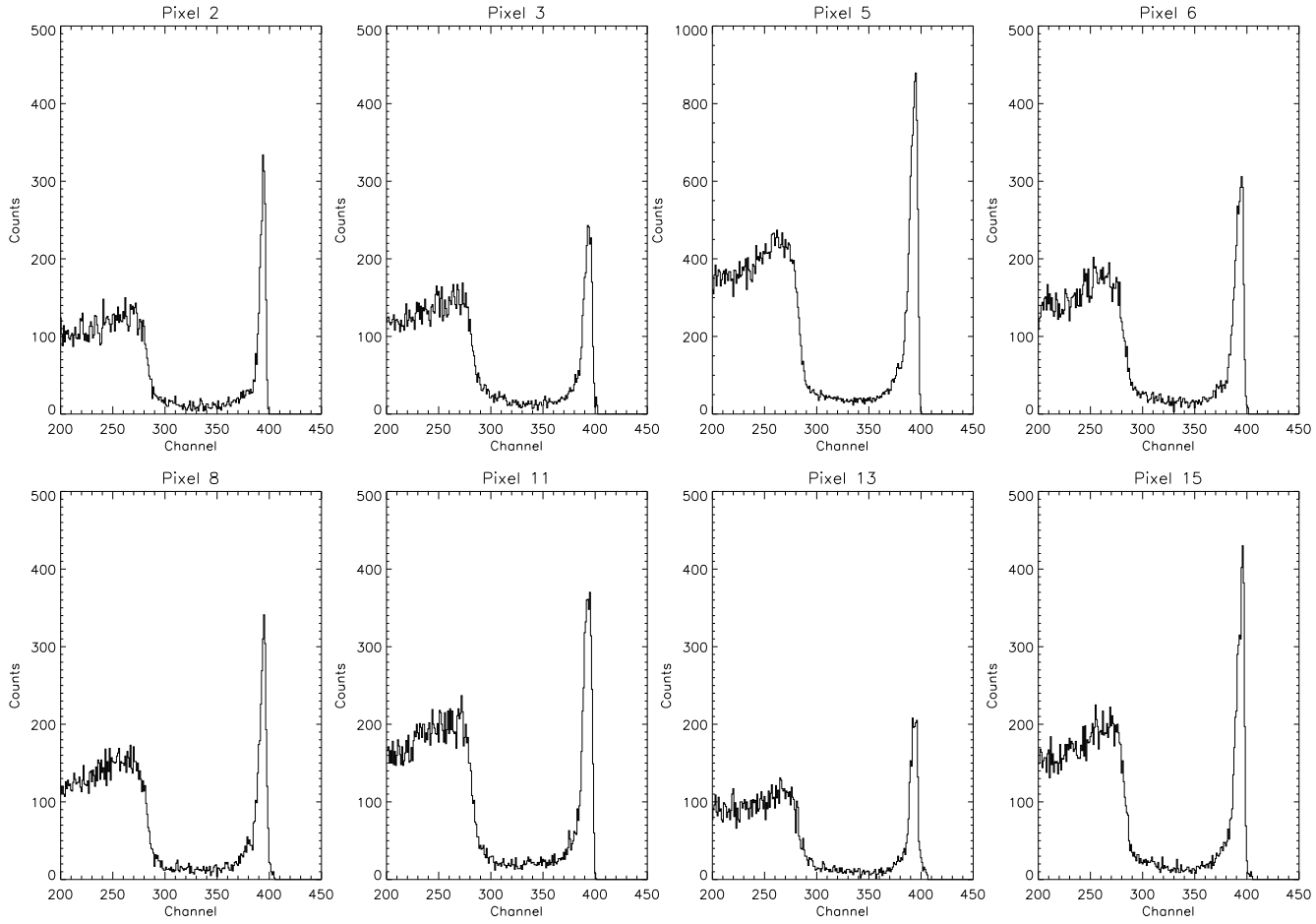


Fig. 19. X-projections obtained with the ^{137}Cs maps.

- **4.2 Detector k30#10**
  - **4.2.1 Electronic noise**

The behaviour of the pulser peak FWHM as a function of the bias voltage applied to the drift strips is reported in fig. 20 and FWHM values are reported in table 8. The bias voltage of the planar electrode is – 300 V:

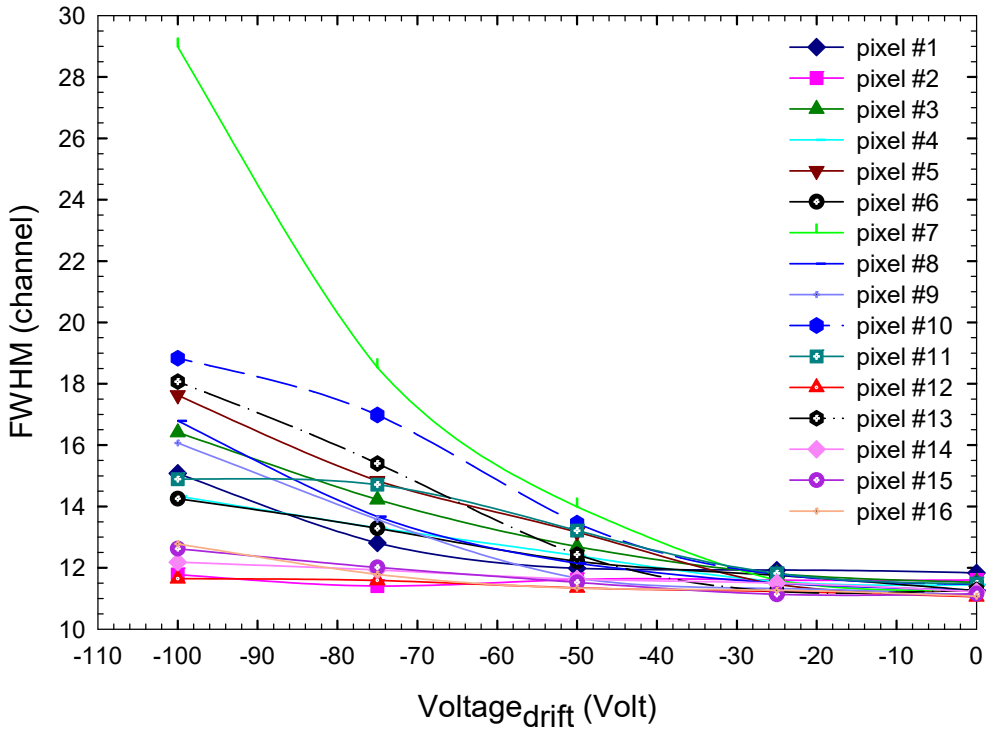


Fig. 20. Pulser peak FWHM as a function of the bias voltage.

Table 8: FWHM at different drift strip voltage.

	FWHM (channel)				
pixel	0 V	-25 V	-50 V	-75 V	-100 V
1	11.835	11.923	11.982	12.808	15.080
2	11.604	11.600	11.623	11.404	11.780
3	11.532	11.806	12.691	14.224	16.415
4	11.451	11.556	12.394	13.301	14.337
5	11.271	11.460	13.166	14.838	17.629
6	11.251	11.754	12.213	13.288	14.255
7	11.276	11.595	13.987	18.528	28.984
8	11.259	11.500	12.152	13.671	16.792
9	11.107	11.323	11.667	13.578	16.066
10	11.462	11.786	13.457	16.982	18.832
11	11.484	11.820	13.215	14.712	14.890
12	11.055	11.231	11.345	11.590	11.647
13	11.285	11.230	12.432	15.399	18.071
14	11.221	11.503	11.631	11.928	12.186
15	11.154	11.136	11.528	12.012	12.622
16	11.072	11.266	11.336	11.786	12.781

4.2.2 Leakage Current

The behaviour of leakage current of the detector k30#10 as a function of the drift strips voltage is reported in fig. 21 for Vplanar = 0 V and Vplanar = - 300 V:

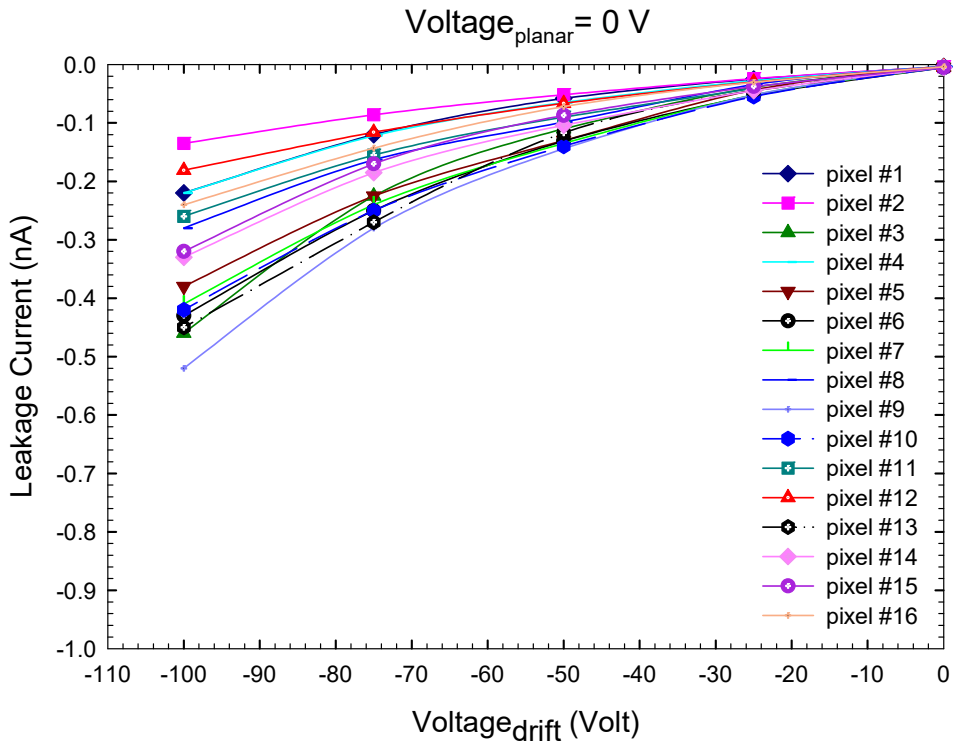


Fig. 21a. The leakage current of each pixel vs. the drift voltage for Vplanar = 0 Volt.

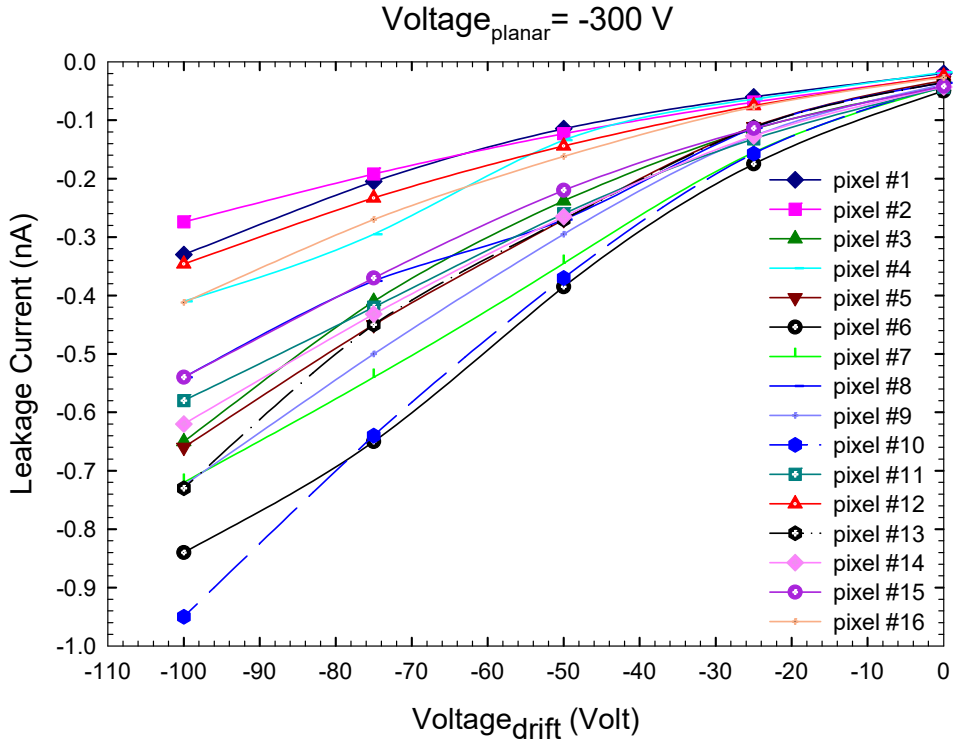


Fig. 21b. The leakage current of each pixel vs. the drift voltage for Vplanar = -300 Volt.

In table 9a and 9b we report the value of leakage current for two planar electrode voltages:

Table 9a: The leakage current at Vplanar = 0 Volt.

	LEAKAGE CURRENT (nA) at Vp = 0 V				
pixel	0 V	-25 V	-50 V	-75 V	-100 V
1	-0.0035	-0.0250	-0.0580	-0.1200	-0.22
2	-0.0037	-0.0243	-0.0517	-0.0860	-0.14
3	-0.0045	-0.0390	-0.1100	-0.2250	-0.46
4	-0.0035	-0.0279	-0.0650	-0.1220	-0.22
5	-0.0046	-0.0435	-0.1300	-0.2250	-0.38
6	-0.0055	-0.0530	-0.1310	-0.2500	-0.43
7	-0.0054	-0.0520	-0.1350	-0.2400	-0.41
8	-0.0041	-0.0343	-0.0986	-0.1630	-0.28
9	-0.0053	-0.0520	-0.1440	-0.2800	-0.52
10	-0.0055	-0.0550	-0.1400	-0.2500	-0.42
11	-0.0049	-0.0401	-0.0900	-0.1550	-0.26
12	-0.004	-0.0300	-0.0665	-0.1160	-0.18
13	-0.005	-0.0450	-0.1170	-0.2700	-0.45
14	-0.005	-0.0448	-0.1040	-0.1850	-0.33
15	-0.005	-0.0377	-0.0870	-0.1700	-0.32
16	-0.004	-0.0305	-0.0720	-0.1430	-0.24

Table 9b: The leakage current at Vplanar = -300 Volt

	LEAKAGE CURRENT (nA) at Vp = -300 V				
pixel	0 V	-25 V	-50 V	-75 V	-100 V
1	-0.0197	-0.0600	-0.1145	-0.205	-0.33
2	-0.0258	-0.0690	-0.1230	-0.192	-0.27
3	-0.0422	-0.1150	-0.2380	-0.410	-0.65
4	-0.0180	-0.0640	-0.1340	-0.295	-0.41
5	-0.0320	-0.1110	-0.2700	-0.450	-0.66
6	-0.0500	-0.1750	-0.3850	-0.650	-0.84
7	-0.0430	-0.1550	-0.3450	-0.540	-0.72
8	-0.0360	-0.113	-0.2700	-0.375	-0.54
9	-0.0390	-0.1270	-0.2950	-0.500	-0.73
10	-0.0410	-0.1570	-0.3700	-0.640	-0.95
11	-0.0440	-0.1320	-0.2600	-0.420	-0.58
12	-0.0245	-0.0750	-0.1441	-0.233	-0.35
13	-0.0357	-0.1120	-0.2700	-0.450	-0.73
14	-0.0430	-0.1270	-0.2650	-0.432	-0.62
15	-0.0420	-0.1140	-0.2200	-0.370	-0.54
16	-0.0270	-0.0775	-0.1620	-0.270	-0.41

4.2.3 ^{241}Am measurements in independent mode

In the following figures the ^{241}Am spectra measured at the planar electrode and at each pixel are shown. In table 10 the values of the centroid position, the FWHM and the energy resolution at 59.6 keV for each pixel are reported and plotted in figures 24 and 25. The bias voltages are:

- V_d = - 75 V
- V_p = - 200 V

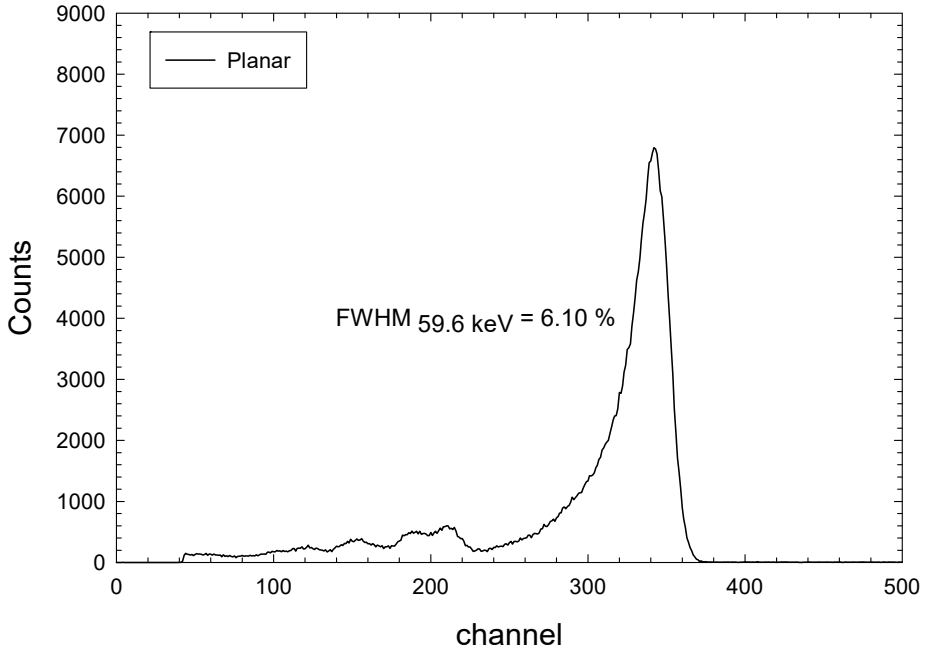


Fig. 22. Spectrum of ^{241}Am obtained with planar electrode.

Table 10: Main parameters of the ^{241}Am spectra at 59.6 keV.

pixel	Centroid position (channel)	FWHM (channel)	Energy Resolution (%)
1	355.08	14.03	3.95
2	352.70	12.61	3.58
3	349.70	18.80	5.38
4	346.63	24.89	7.18
5	352.19	20.38	5.79
6	354.95	16.40	4.62
7	355.60	17.04	4.79
8	353.91	14.64	4.14
9	354.18	18.51	5.23
10	355.21	15.93	4.48
11	352.75	15.00	4.25
12	353.20	14.89	4.21
13	349.98	19.39	5.54
14	354.87	14.92	4.20
15	355.51	16.57	4.66
16	355.40	13.47	3.79

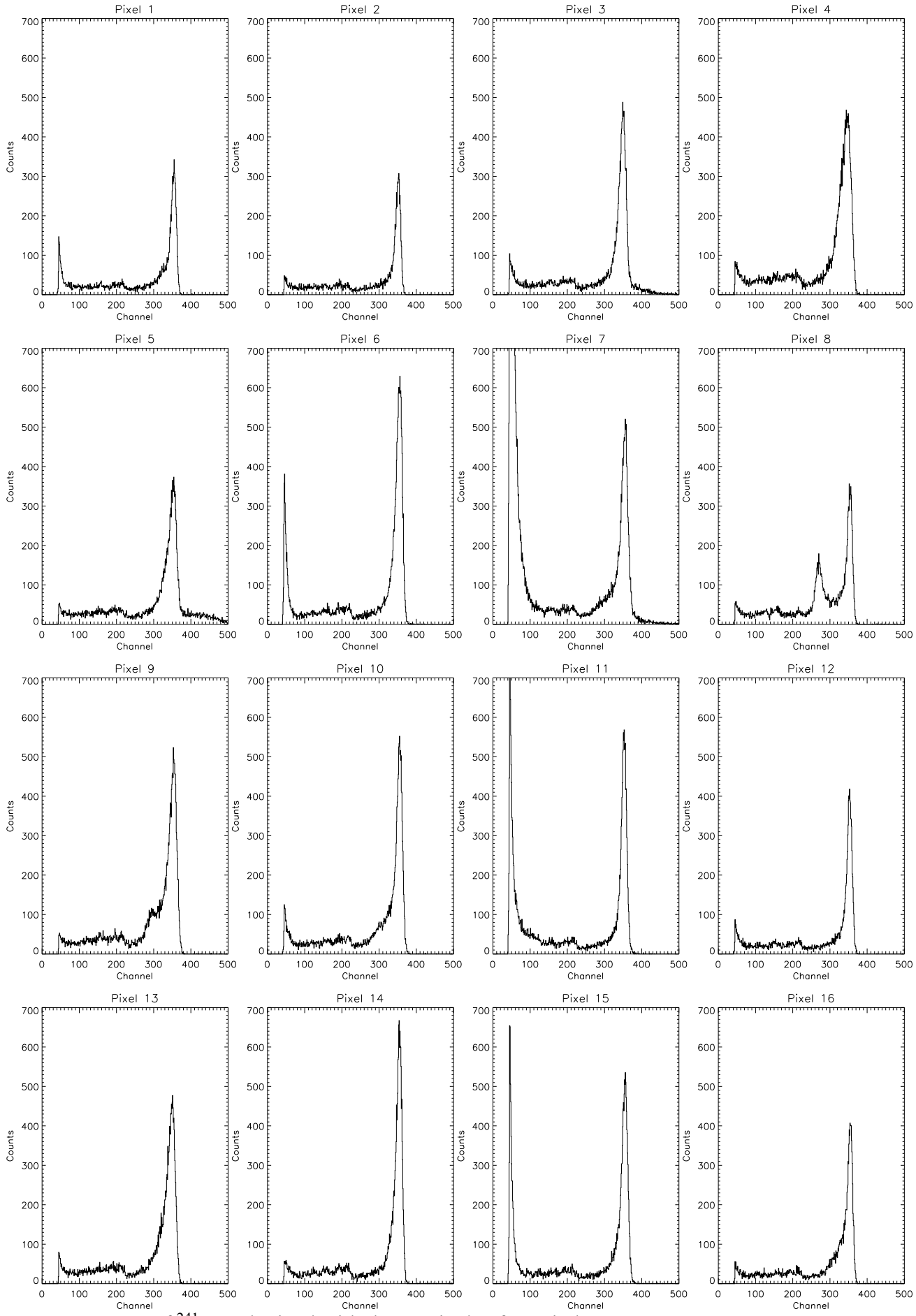


Fig. 23. Spectra of ^{241}Am obtained with the 16 pixels of matrix k30#10.

The spectra of pixels 3 and 5 show a tail to the high-energy side, similar to that observed in the case of the matrix n. k18#4.

The pixels 8 and 9 show a double peak in the spectrum, clearly evident for pixel 8.

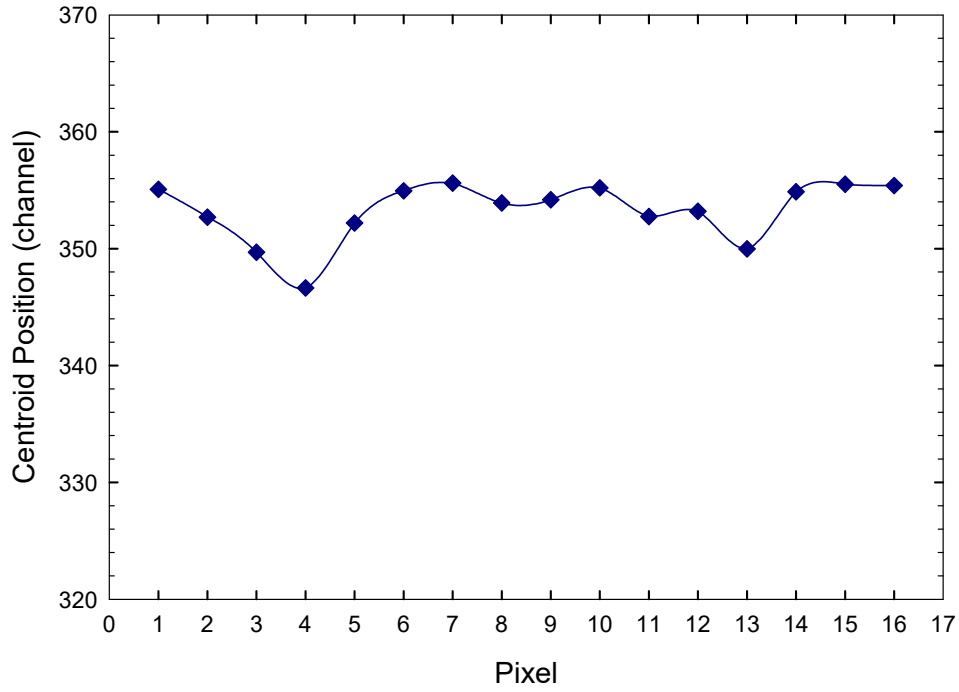


Fig. 24. Centroid position at 59.6 keV for the 16 pixels.

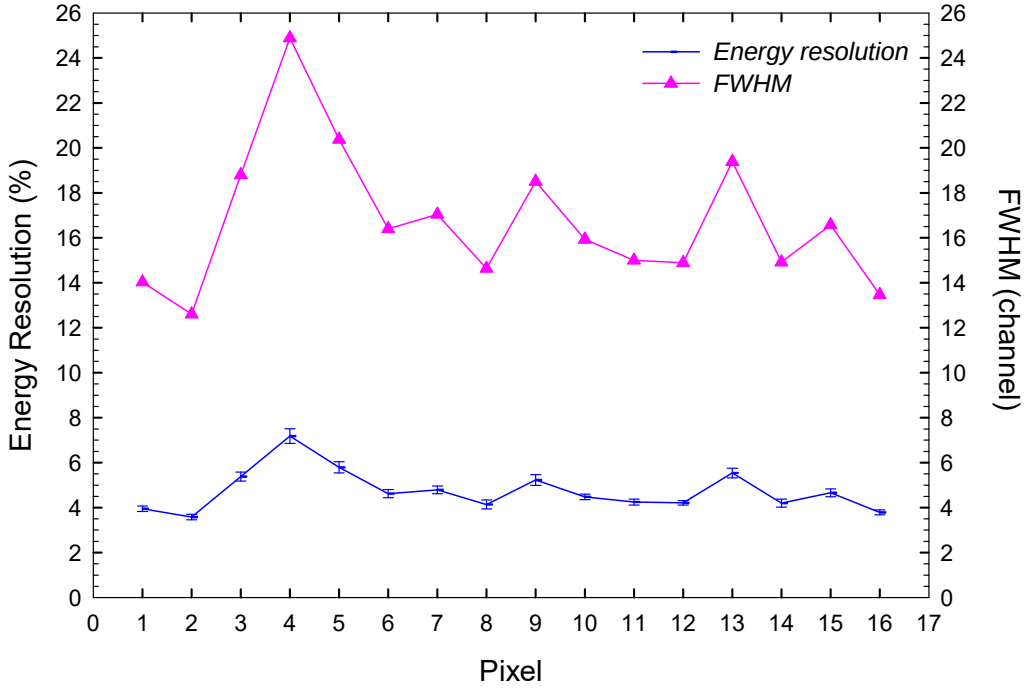


Fig. 25. Energy resolution (axis on the left) and FWHM (axis on the right) at 59.6 keV for the 16 pixels.

The table reports the trend of the peak-to-valley ratios at 59.6 keV (see 4.1.3.)

Table 10a: Peak – to - Valley Ratio at 59.6 keV.

pixel	Peak-to-Valley Ratio (1)	Peak-to-Valley Ratio (2)	Peak-to-Valley Ratio (3)
1	1.38	4.90	12.36
2	1.31	6.38	13.68
3	1.47	8.57	19.30
4	1.35	6.19	12.56
5	1.50	5.53	16.38
6	1.58	8.59	23.14
7	1.26	5.54	12.81
8	1.51	5.39	3.05
9	1.32	4.11	13.14
10	1.62	5.19	15.03
11	1.57	10.70	26.29
12	1.75	8.47	23.06
13	1.93	5.01	17.52
14	1.54	7.25	25.77
15	1.41	7.49	28.28
16	1.36	3.76	11.08

Figure 26 shows two spectra, taken in identical experimental conditions, of pixel 5 irradiated with an uncollimated ^{241}Am source. The planar electrode voltage is -200 V, while the Vdrift values are – 75 V and – 45 V.
It is evident that the photopeak efficiency (total area under the peak) depends on the drift strips voltage.

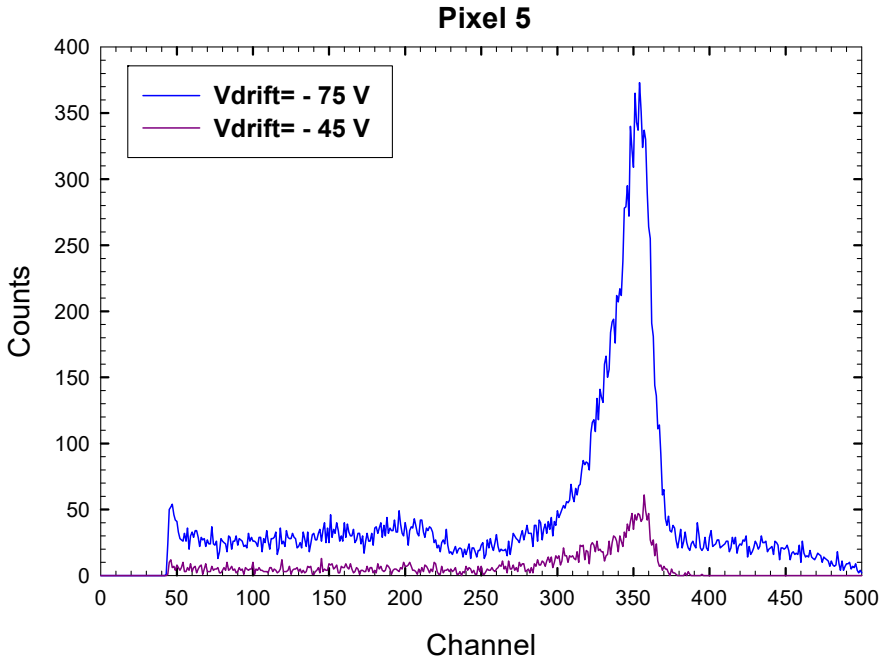


Fig. 26. ^{241}Am spectra of pixel 5 acquired as a function of Vdrift.

▪ 4.2.4 ^{241}Am measurements in dependent mode

In the following figure the ^{241}Am spectra obtained in dependent mode from some pixels are shown. The values of the centroid position, the FWHM and the energy resolution at 59.6 keV are given in table 11 and plotted in figures 28 and 29. The bias voltages are:

- V_d = - 100 V, V_p = - 300 V for pixel 2, 4 and 6;
- V_d = - 75 V, V_p = - 300 V for pixel 7, 10 and 11;
- V_d = - 75 V, V_p = - 200 V for pixel 8 and 9.

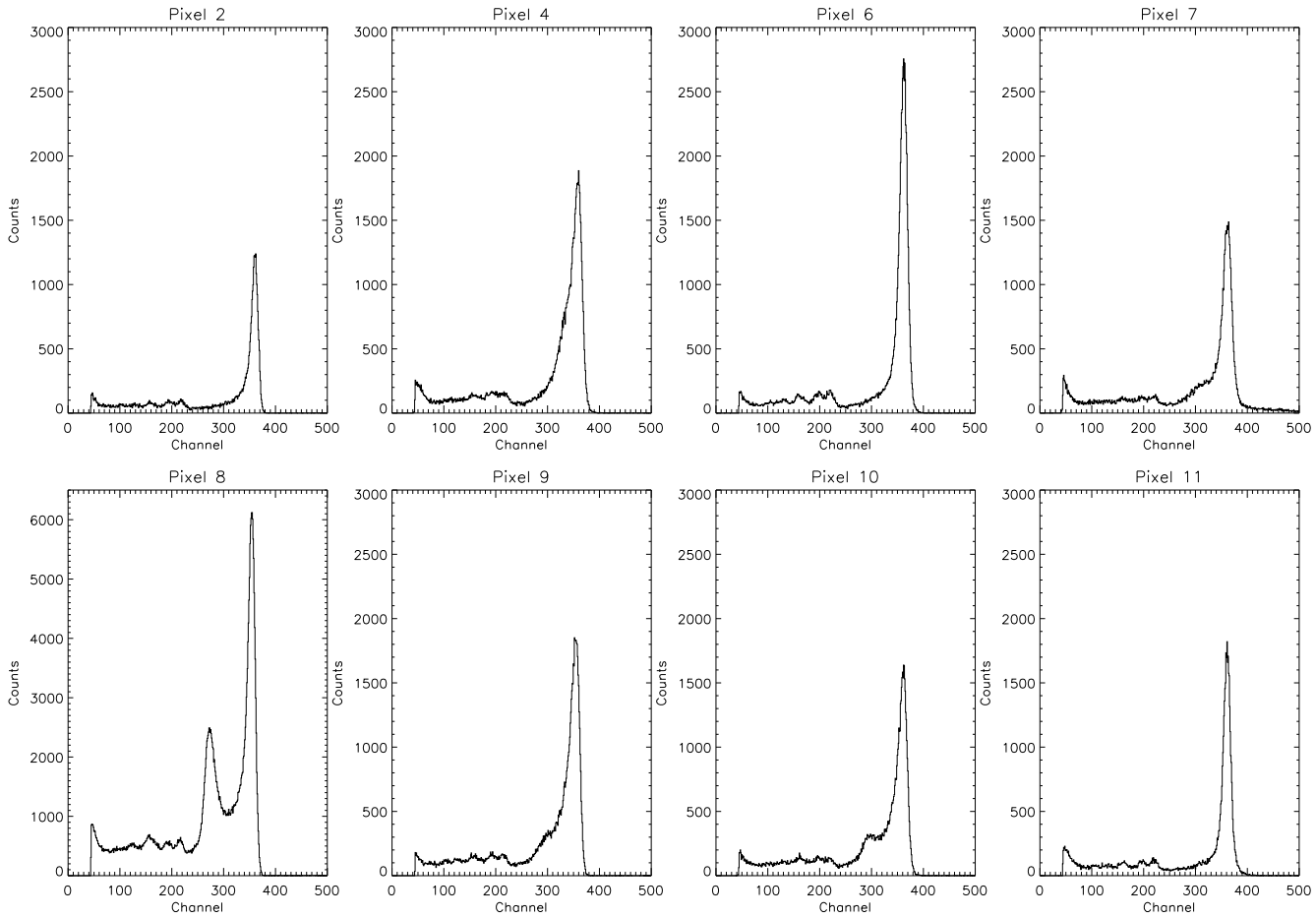


Fig. 27. Spectra of ^{241}Am in dependent mode.

Table 11: Main parameters of the ^{241}Am spectra at 59.6 keV.

pixel	Centroid position (channel)	FWHM (channel)	Energy Resolution (%)
2	360.64	13.50	3.74
4	359.10	17.50	4.87
6	362.42	15.74	4.34
7	362.97	15.88	4.37
8	354.69	14.06	3.96
9	354.66	17.00	4.79
10	361.63	16.11	4.45
11	361.04	15.68	4.34

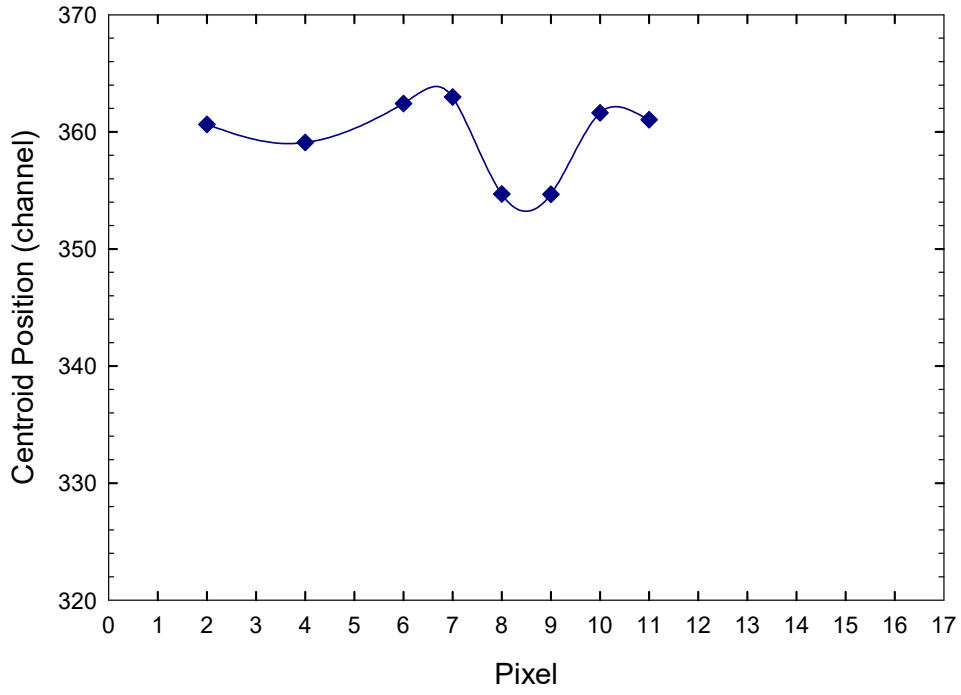


Fig. 28. Centroid position at 59.6 keV.

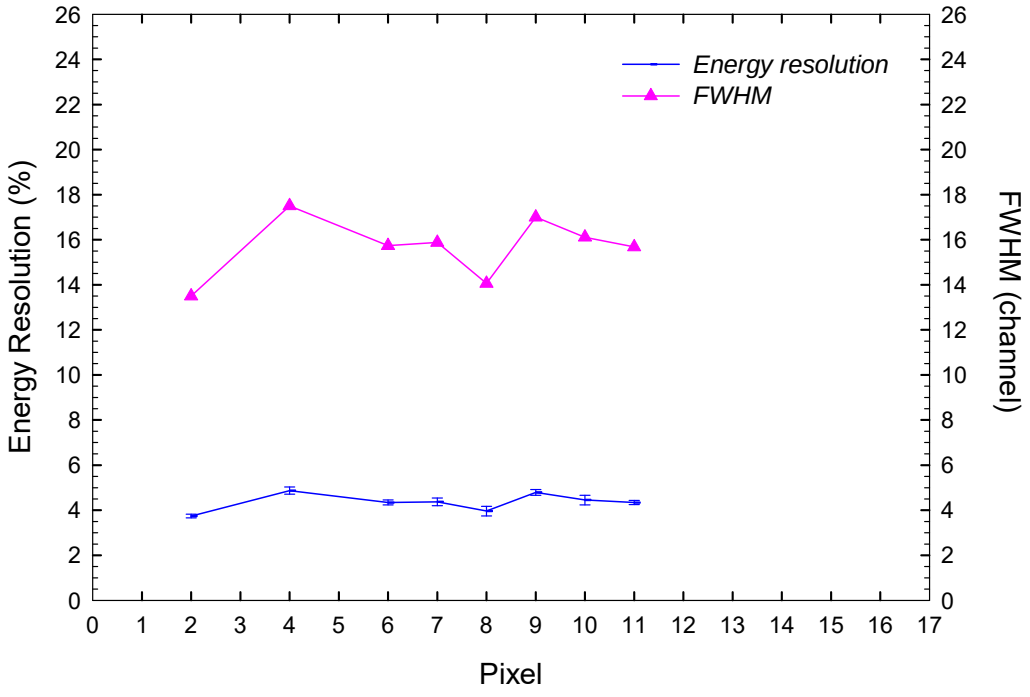


Fig. 29. Energy resolution (axis on the left) and FWHM (axis on the right) at 59.6 keV.

In figure 30 the bi-parametric distributions measured for ^{241}Am gamma rays in dependent mode are shown. The logarithmic scale indicates the number of counts.

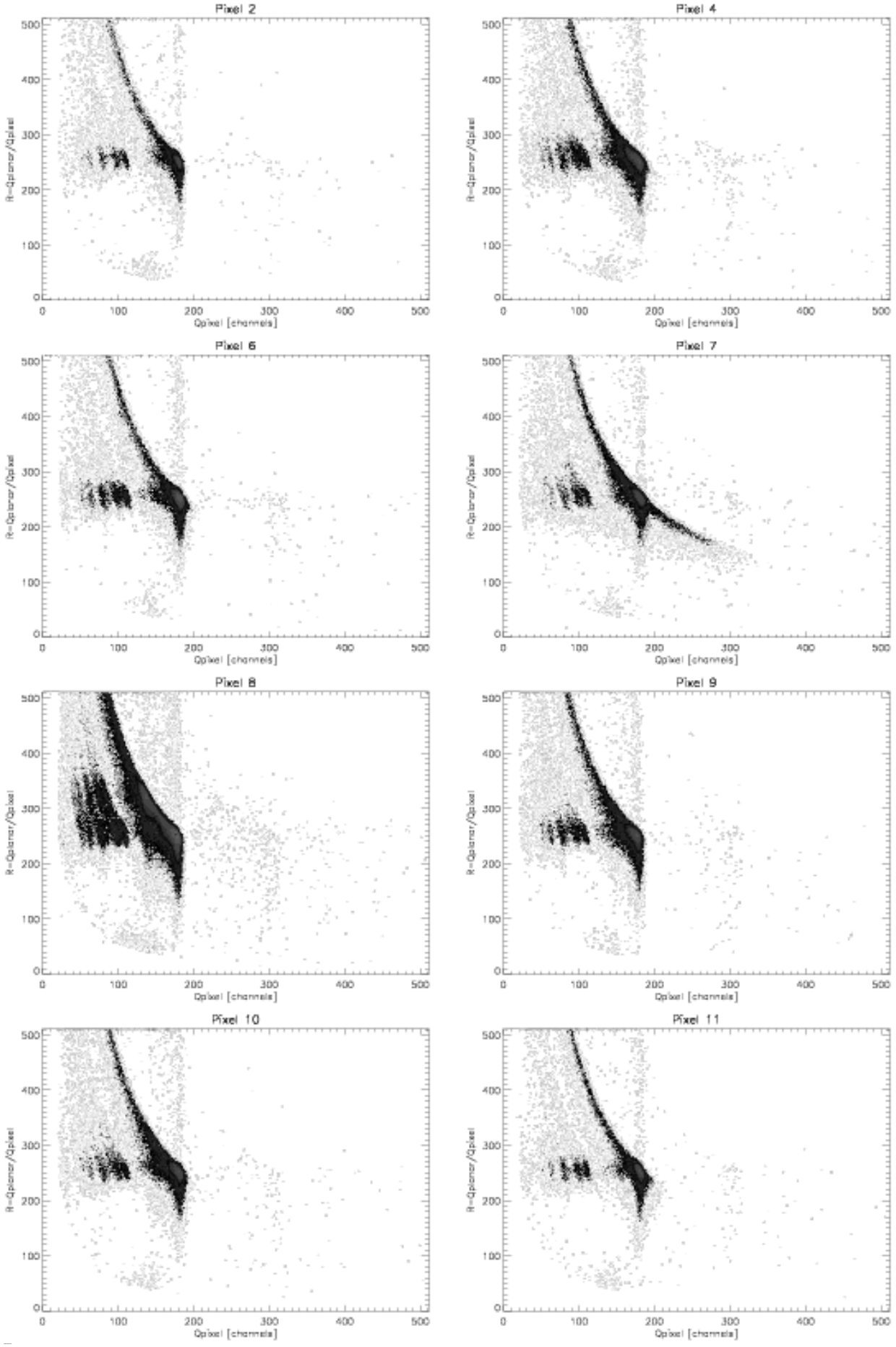


Fig. 30. Bi-parametric diagrams measured for ^{241}Am gamma rays.

In table 12 the centroid position, the FWHM and the energy resolution of the X-projections (see fig. 31) obtained from the events selection are reported.

Table 12: Main parameters of the X-projections.

pixel	Centroid position (channel)	FWHM (channel)	Energy Resolution (%)
2	179.67	7.28	4.05
4	179.03	8.55	4.77
6	181.02	7.90	4.37
7	180.59	8.10	4.48
8	176.68	7.09	4.01
9	176.87	7.97	4.51
10	180.28	8.29	4.60
11	180.21	7.87	4.37

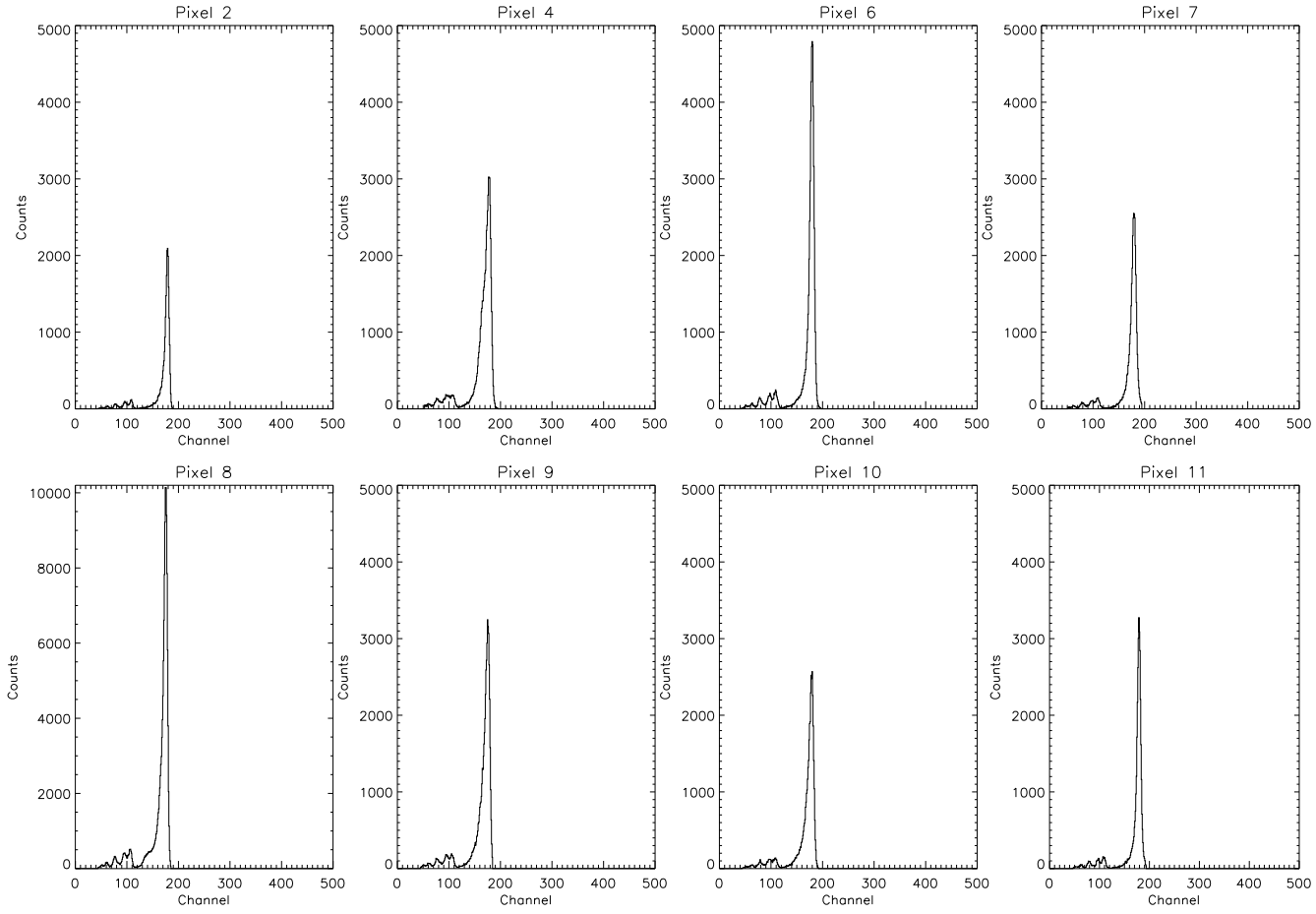


Fig. 31. X-projections obtained with the ^{241}Am maps.

- **4.2.5 ^{137}Cs measurements in dependent mode**

The ^{137}Cs spectra obtained in dependent mode are reported in fig 32.

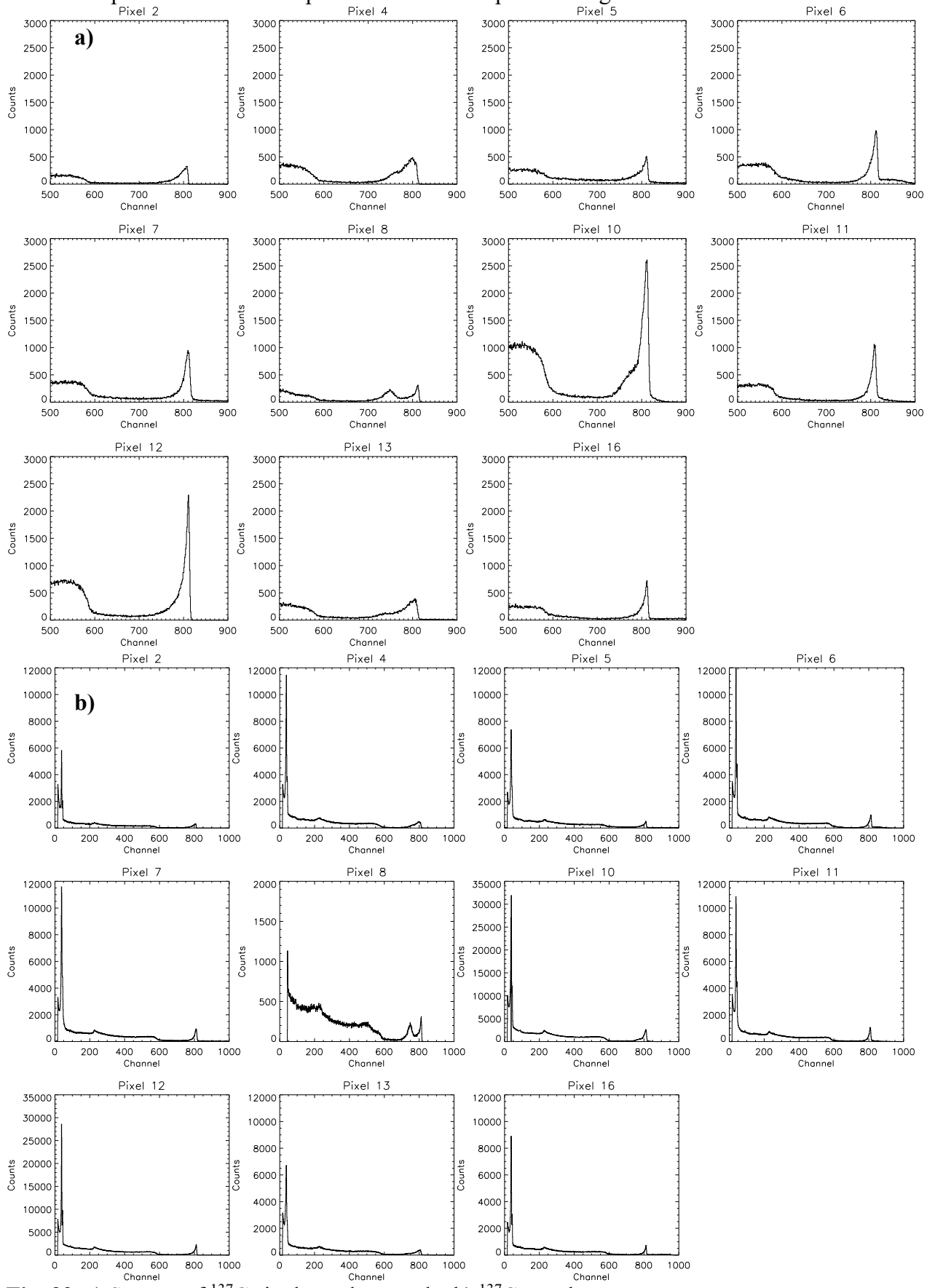


Fig. 32. a) Spectra of ^{137}Cs in dependent mode; b) ^{137}Cs total spectra.

The bias voltages are:

- V_d = - 100 V, V_p = - 300 V, except for pixel 8, for which V_d = - 75 V.

In table 13 the values of the centroid position, the FWHM and the energy resolution at 662 keV are reported and plotted in figures 33 and 34. The spectra of pixels 4 and 13 are too broad for fitting.

Table 13: Centroid, FWHM and energy resolution at 662 keV.

pixel	Centroid position (channel)	FWHM (channel)	Energy Resolution (%)
2	806.48	7.05	0.87
5	810.46	7.12	0.88
6	812.17	7.12	0.88
7	810.84	7.88	0.97
8	811.38	6.52	0.80
10	811.14	8.34	1.03
11	809.01	6.52	0.81
12	810.63	5.77	0.71
16	811.28	6.43	0.79

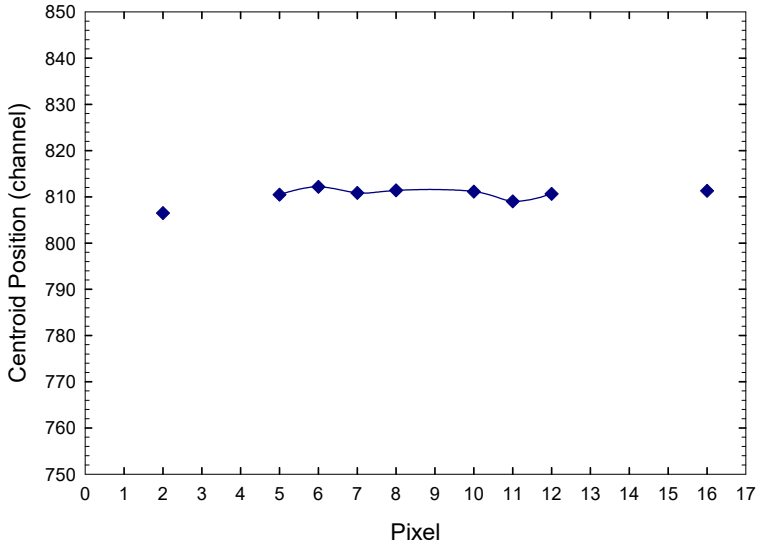


Fig. 33. Centroid position at 662 keV.

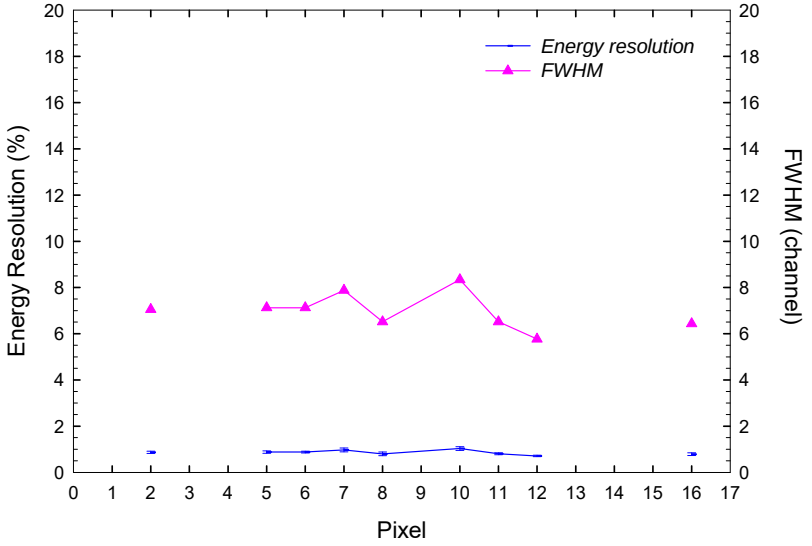


Fig. 34. Energy resolution (axis on the left) and FWHM (axis on the right) at 662 keV.

In figure 35 the bi-parametric distributions measured for ^{137}Cs gamma rays are reported. The logarithmic scale indicates the number of counts.

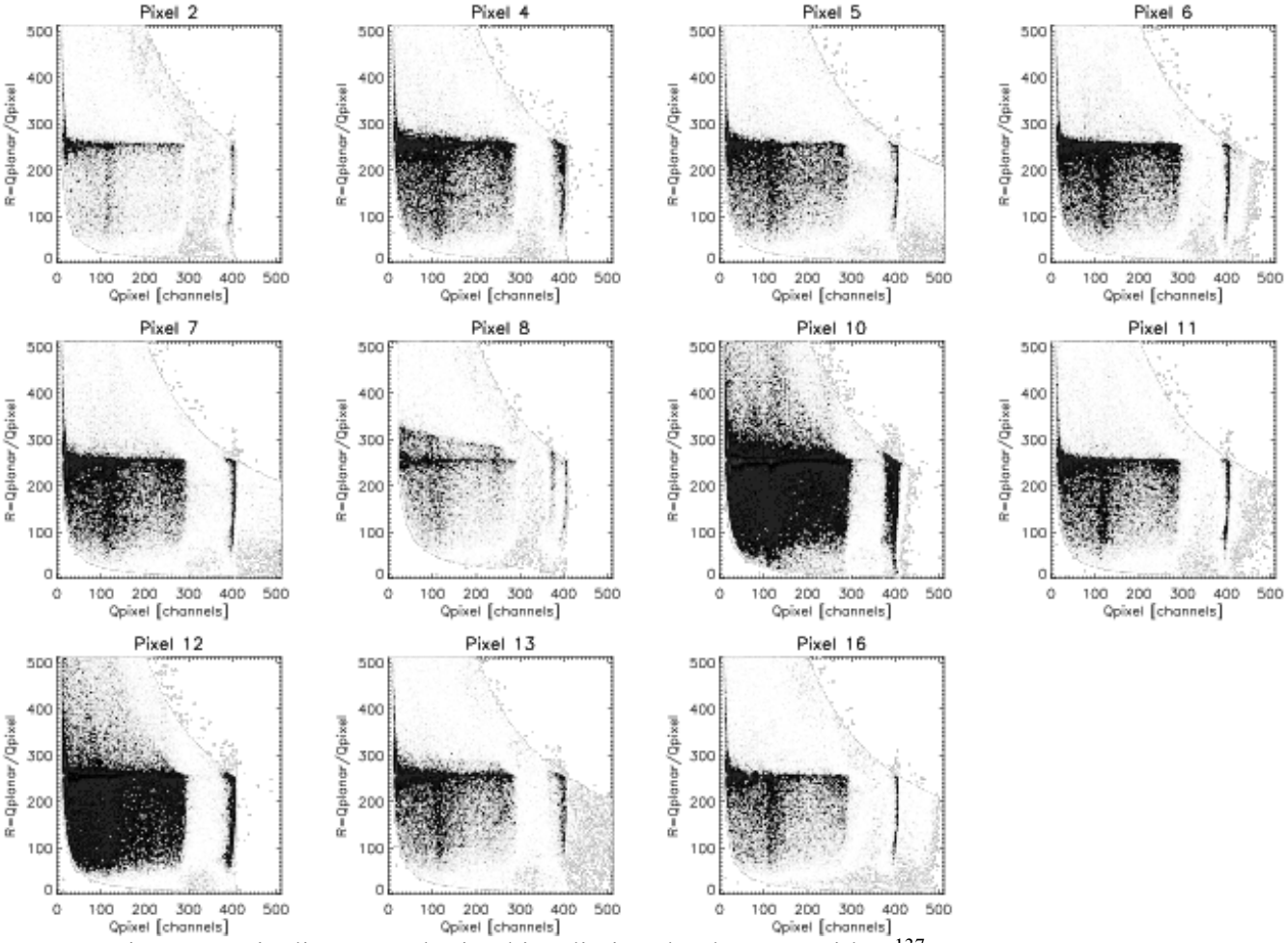


Fig. 35. Bi-parametric diagrams obtained irradiating the detector with a ^{137}Cs source.

In figure below an example of the region selected, in order to extract the projection on the axis X, is shown for a measurement with a ^{241}Am radioactive source irradiating the pixel 10.

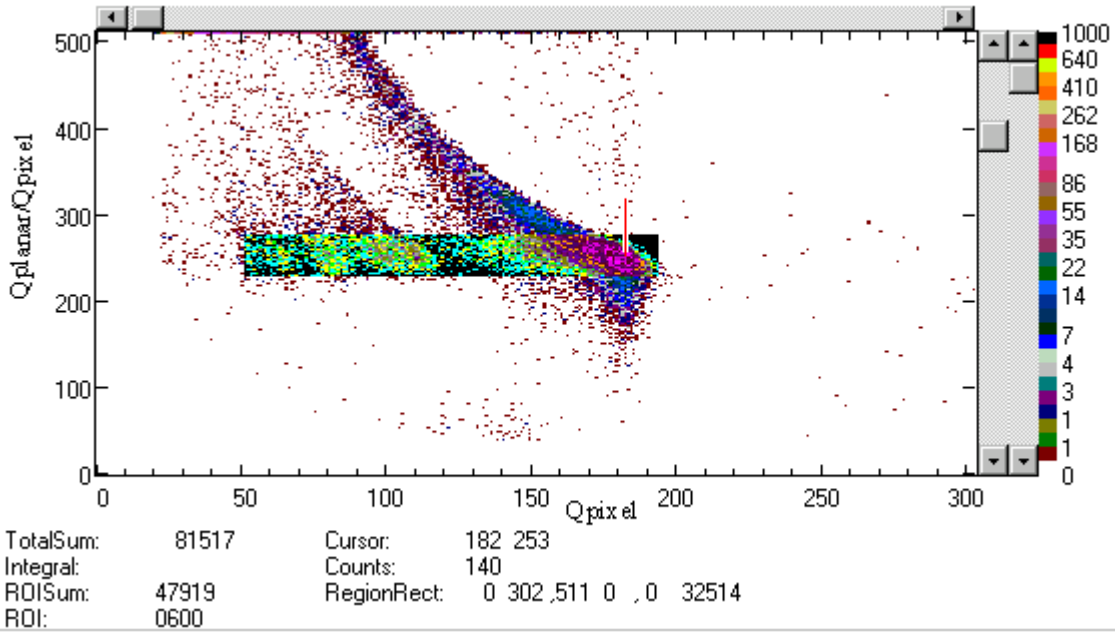


Fig. 36. Example of region selected.

The X-projections are shown in fig. 37, while in table 14 the centroid, FWHM and the energy resolution of the spectra without smoothing are reported.
The spectra of pixels 4 and 13 are too broad for fitting.

Table 14: Main parameters of the X-projections.

pixel	Centroid position (channel)	FWHM (channel)	Energy Resolution (%)
2	402.55	4.20	1.04
4			
5	405.36	4.79	1.18
6	405.90	3.87	0.95
7	405.84	3.97	0.98
8	405.89	3.74	0.92
10	405.93	3.88	0.96
11	404.41	3.53	0.87
12	405.01	3.06	0.75
13			
16	405.54	3.08	0.76

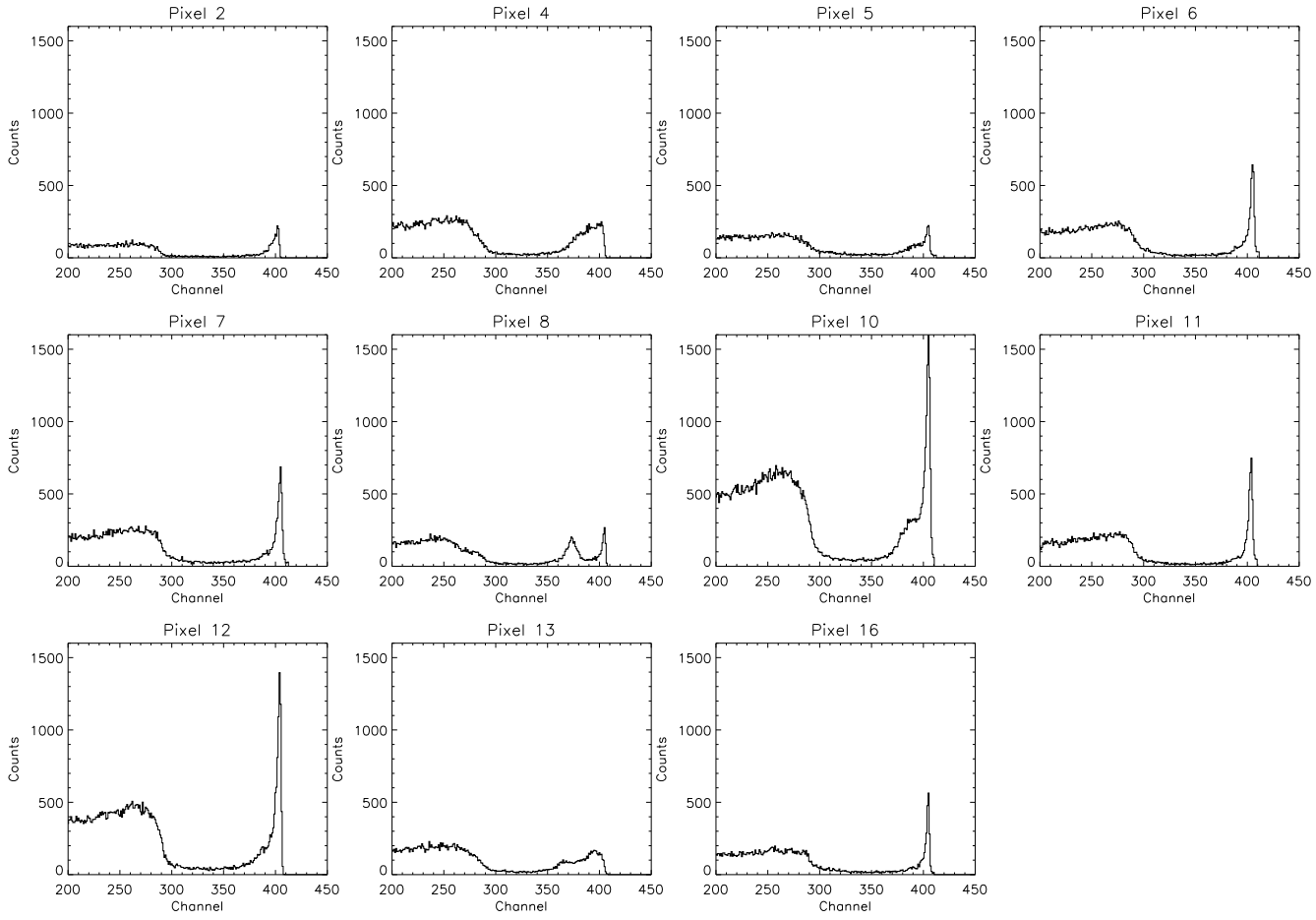


Fig. 37. X-projections obtained from the maps at 662 keV.

5 Conclusions

The experimental data analysis allows us to draw some major conclusions:

- The leakage current of both detectors is low, and detector k18#4 shows lower values and a smaller spread than k30#10;
- Detector k18#4: the charge collection efficiency is quite stable both at 59.6 and at 662 keV, the energy resolution at 59.6 keV is about 4.5 %, except for pixel 3, 11 and 16, that present 5.2%, 5.3% and 5 % respectively; the energy resolution at 662 keV is about 1.5 %;
- Detector k30#10: the charge collection efficiency is not quite stable both at 59.6 and at 662 keV, the energy resolution at 59.6 keV is about 4.5 %, except for pixels 3, 4, 5, 9 and 13, that present 5.4%, 7.2%, 5.8%, 5.2% and 5.5 % respectively; the energy resolution at 662 keV is about 1.0 %.
- There are some features in the spectra to investigate: a tail to the high-energy side (perhaps a distortion caused by pileup) and a double peak observed in the pixel 8 and 9 spectra.
- The experimental results obtained with the application of the bi-parametric technique indicate a good photon interaction depth.

Annex 1. Measurement Logbook

DETECTOR K18#4							
File	V_{drift} Volt	V_{planar} Volt	Gain Planar/ Gain Pixel ADC=0 / 1	Live Time sec	Date	Mode	Note
pixel1.dat Pixel1as.as$	- 75	- 200	500x0.94/ 500x1.0	200	9/4/03 16.21	independent	^{241}Am
pixel2.dat Pixel2as.as$	- 75	- 200	500x0.94/ 500x1.0	200	9/4/03 16.21	independent	^{241}Am, higher threshold
pixel3.dat pixel3as.as$	- 75	- 200	500x0.94/ 500x1.0	200	9/4/03 16.38	independent	^{241}Am, noisy
pixel3_1.dat pixel3as_1.as$	- 75	- 200	500x0.94/ 500x1.0	200	9/4/03 16.58	independent	^{241}Am, noisy
pixel4.dat pixel4as.as$	- 75	- 200	500x0.94/ 500x1.0	200	9/4/03 16.49	independent	^{241}Am
pixel5.dat pixel5as.as$	- 75	- 200	500x0.94/ 500x1.0	200	9/4/03 17.06	independent	^{241}Am
pixel6.dat pixel6as.as$	- 75	- 200	500x0.94/ 500x1.0	200	9/4/03 17.15	independent	^{241}Am
pixel7.dat pixel7as.as$	- 75	- 200	500x0.94/ 500x1.0	200	9/4/03 17.26	independent	^{241}Am
pixel8.dat pixel8as.as$	- 75	- 200	500x0.94/ 500x1.0	200	9/4/03 17.35	independent	^{241}Am
pixel9.dat pixel9as.as$	- 75	- 200	500x0.94/ 500x1.0	200	9/4/03 17.45	independent	^{241}Am
pixel10.dat pixel10as.as$	- 75	- 200	500x0.94/ 500x1.0	200	9/4/03 17.57	independent	^{241}Am
pixel11.dat pixel11as.as$	- 75	- 200	500x0.94/ 500x1.0	200	9/4/03 18.12	independent	^{241}Am, noisy
pixel12.dat pixel12as.as$	- 75	- 200	500x0.94/ 500x1.0	200	9/4/03 18.20	independent	^{241}Am
pixel13.dat pixel13as.as$	- 75	- 200	500x0.94/ 500x1.0	200	9/4/03 18.28	independent	^{241}Am
pixel114.dat pixel14as.as$	- 75	- 200	500x0.94/ 500x1.0	200	9/4/03 18.37	independent	^{241}Am ,noisy
pixel15.dat pixel15as.as$	- 75	- 200	500x0.94/ 500x1.0	200	9/4/03 18.47	independent	^{241}Am
pixel16.dat pixel16as.as$	- 75	- 200	500x0.94/ 500x1.0	200	10/4/03 9.07	independent	^{241}Am, noisy
CEN-RES.doc					10/4/03 10.01		Centroid, energy res @ 60 keV
pixel16-100-200g.dat pixel16-100-200asg.as$	-100	-200	500x0.94/ 500x1.0	1000	10/4/03 12.17	dependent	^{241}Am, pixel 11,12,15 to ground
pixel16-100-300.datg pixel16-100-300asg.as$	-100	-300	500x0.94/ 500x1.0	1000	10/4/03 13.51	dependent	^{241}Am pixel 11,12,15 to ground
pixel2-100-300g.dat pixel2-100-300asg. as$	-100	-300	500x0.94/ 500x1.0	1000	10/4/03 14.15	dependent	^{241}Am pixel 1,3,6 to ground
pixel7-100-300.dat pixel7-100-300as. as$	-100	-300	500x0.94/ 500x1.0	1000	10/4/03 15.01	dependent	^{241}Am
pixel2-100-300.dat pixel2-100-300as. as$	-100	-300	500x0.94/ 500x1.0	1000	10/4/03 15.21	dependent	^{241}Am
pixel6-100-300.dat pixel6-100-300as. as$	-100	-300	500x0.94/ 500x1.0	1000	10/4/03 15.44	dependent	^{241}Am

pixel11-100-300.dat pixel11-100-300as. as$	-100	-300	500x0.94/ 500x1.0	1000	10/4/03 16.04	dependent	^{241}Am
pixel13-100-300.dat pixel13-100-300as. as$	-100	-300	500x0.94/ 500x1.0	1000	10/4/03 16.28	dependent	^{241}Am
am2-100-300.doc					10/4/03 16.41		^{241}Am Spectra
am6-100-300.doc					10/4/03 17.07		^{241}Am Spectra
am7-100-300.doc					10/4/03 17.15		^{241}Am Spectra
am11-100-300.doc					10/4/03 17.23		^{241}Am Spectra
am13-100-300.doc					10/4/03 17.29		^{241}Am Spectra
am16-100-300.doc					10/4/03 17.36		^{241}Am Spectra
pixel13_2.dat pixel13as_2.as$	- 75	- 200	500x0.94/ 500x1.0	200	10/4/03 18.42	independent	^{241}Am
pixel11_2.dat pixel11as_2.as$	- 75	- 200	500x0.94/ 500x1.0	200	10/4/03 18.50	independent	^{241}Am
pixel11as_3.as$	- 75	- 200	500x0.94/ 500x1.0	200	11/4/03 9.06	independent	^{241}Am
pixel11as_4.as$	- 75	- 200	500x0.94/ 500x1.0	200	11/4/03 9.10	independent	^{241}Am
pixel3as_2.as$	- 75	- 200	500x0.94/ 500x1.0	200	11/4/03 9.18	independent	^{241}Am
pixel14as_2.as$	- 75	- 200	500x0.94/ 500x1.0	200	11/4/03 9.27	independent	^{241}Am
pixel14as_3.as$	- 75	- 200	500x0.94/ 500x1.0	200	11/4/03 9.35	independent	^{241}Am
pixel14as_4.as$	- 75	- 200	500x0.94/ 500x1.0	200	11/4/03 9.39	independent	^{241}Am
pixel16as_2.as$	- 75	- 200	500x0.94/ 500x1.0	200	11/4/03 9.47	independent	^{241}Am
pixel16as_3.as$	- 75	- 200	500x0.94/ 500x1.0	200	11/4/03 9.55	independent	^{241}Am
pixel2as_2.as$	- 75	- 200	500x0.94/ 500x1.0	200	11/4/03 10.03	independent	^{241}Am
pixel3as_3.as$	- 75	- 200	500x0.94/ 500x1.0	200	11/4/03 10.15	independent	^{241}Am
pix1-0.as$	0	-300	500x0.94/ 500x1.0	80	11/4/03 12.22	independent	Pulser,amp:06170 attenuations
pix1-25.as$	-25	-300	500x0.94/ 500x1.0	80	11/4/03 12.24	independent	Pulser, amp:06170 attenuations
pix1-50.as$	-50	-300	500x0.94/ 500x1.0	80	11/4/03 12.26	independent	Pulser, amp:06170 attenuations
pix1-75.as$	-75	-300	500x0.94/ 500x1.0	80	11/4/03 12.29	independent	Pulser, amp:06170 attenuations
pix1-100.as$	-100	-300	500x0.94/ 500x1.0	80	11/4/03 12.31	independent	Pulser, amp:06170 attenuations
pix2-0.as$	0	-300	500x0.94/ 500x1.0	80	11/4/03 12.07	independent	Pulser, amp:06170 attenuations
pix2-25.as$	-25	-300	500x0.94/ 500x1.0	80	11/4/03 12.10	independent	Pulser, amp:06170 attenuations
pix2-50.as$	-50	-300	500x0.94/ 500x1.0	80	11/4/03 12.13	independent	Pulser, amp:06170 attenuations
pix2-75.as$	-75	-300	500x0.94/ 500x1.0	80	11/4/03 12.15	independent	Pulser, amp:06170 attenuations
pix2-100.as$	-100	-300	500x0.94/ 500x1.0	80	11/4/03 12.18	independent	Pulser, amp:06170 attenuations
pix3-0.as$	0	-300	500x0.94/	200	11/4/03 12.04	independent	Pulser, amp:06170

			500x1.0				attenuations
pix3-25.as$	-25	-300	500x0.94/ 500x1.0	200	11/4/03 11.59	independent	Pulser, amp:06170 attenuations
pix3-50.as$	-50	-300	500x0.94/ 500x1.0	200	11/4/03 11.44	independent	Pulser, amp:06170 attenuations
pix3-75.as$	-75	-300	500x0.94/ 500x1.0	200	11/4/03 11.50	independent	Pulser, amp:06170 attenuations
pix3-100.as$	-100	-300	500x0.94/ 500x1.0	200	11/4/03 11.54	independent	Pulser, amp:06170 attenuations
pix4-0.as$	0	-300	500x0.94/ 500x1.0	80	11/4/03 12.35	independent	Pulser, amp:06170 attenuations
pix4-25.as$	-25	-300	500x0.94/ 500x1.0	80	11/4/03 12.38	independent	Pulser, amp:06170 attenuations
pix4-50.as$	-50	-300	500x0.94/ 500x1.0	80	11/4/03 12.41	independent	Pulser, amp:06170 attenuations
pix4-75.as$	-75	-300	500x0.94/ 500x1.0	80	11/4/03 12. 43	independent	Pulser, amp:06170 attenuations
pix4-100.as$	-100	-300	500x0.94/ 500x1.0	80	11/4/03 12.46	independent	Pulser, amp:06170 attenuations
pix5-0.as$	0	-300	500x0.94/ 500x1.0	80	11/4/03 12.50	independent	Pulser, amp:06170 attenuations
pix5-25.as$	-25	-300	500x0.94/ 500x1.0	80	11/4/03 11.52	independent	Pulser, amp:06170 attenuations
pix5-50.as$	-50	-300	500x0.94/ 500x1.0	80	11/4/03 13.32	independent	Pulser, amp:06170 attenuations
pix5-75.as$	-75	-300	500x0.94/ 500x1.0	80	11/4/03 13.34	independent	Pulser, amp:06170 attenuations
pix5-100.as$	-100	-300	500x0.94/ 500x1.0	80	11/4/03 13.36	independent	Pulser, amp:06170 attenuations
pix6-0.as$	0	-300	500x0.94/ 500x1.0	80	11/4/03 13.54	independent	Pulser, amp:06170 attenuations
pix6-25.as$	-25	-300	500x0.94/ 500x1.0	80	11/4/03 13.57	independent	Pulser, amp:06170 attenuations
pix6-50.as$	-50	-300	500x0.94/ 500x1.0	80	11/4/03 13.59	independent	Pulser, amp:06170 attenuations
pix6-75.as$	-75	-300	500x0.94/ 500x1.0	80	11/4/03 14.02	independent	Pulser, amp:06170 attenuations
pix6-100.as$	-100	-300	500x0.94/ 500x1.0	80	11/4/03 14.04	independent	Pulser, amp:06170 attenuations
pix7-0.as$	0	-300	500x0.94/ 500x1.0	80	11/4/03 14.08	independent	Pulser, amp:06170 attenuations
pix7-25.as$	-25	-300	500x0.94/ 500x1.0	80	11/4/03 14.10	independent	Pulser, amp:06170 attenuations
pix7-50.as$	-50	-300	500x0.94/ 500x1.0	80	11/4/03 14.13	independent	Pulser, amp:06170 attenuations
pix7-75.as$	-75	-300	500x0.94/ 500x1.0	80	11/4/03 14.16	independent	Pulser, amp:06170 attenuations
pix7-100.as$	-100	-300	500x0.94/ 500x1.0	80	11/4/03 14.33	independent	Pulser, amp:06170 attenuations
pix8-0.as$	0	-300	500x0.94/ 500x1.0	80	11/4/03 14.37	independent	Pulser, amp:06170 attenuations
pix8-25.as$	-25	-300	500x0.94/ 500x1.0	80	11/4/03 14.40	independent	Pulser, amp:06170 attenuations
pix8-50.as$	-50	-300	500x0.94/ 500x1.0	80	11/4/03 14.42	independent	Pulser, amp:06170 attenuations

pix8-75.as$	-75	-300	500x0.94/ 500x1.0	80	11/4/03 14.57	independent	Pulser, amp:06170 attenuations
pix8-100.as$	-100	-300	500x0.94/ 500x1.0	80	11/4/03 14.59	independent	Pulser, amp:06170 attenuations
pix9-0.as$	0	-300	500x0.94/ 500x1.0	80	11/4/03 15.03	independent	Pulser, amp:06170 attenuations
pix9-25.as$	-25	-300	500x0.94/ 500x1.0	80	11/4/03 15.06	independent	Pulser, amp:06170 attenuations
pix9-50.as$	-50	-300	500x0.94/ 500x1.0	80	11/4/03 15.08	independent	Pulser, amp:06170 attenuations
pix9-75.as$	-75	-300	500x0.94/ 500x1.0	80	11/4/03 15.11	independent	Pulser, amp:06170 attenuations
pix9-100.as$	-100	-300	500x0.94/ 500x1.0	80	11/4/03 15.13	independent	Pulser, amp:06170 attenuations
pix10-0.as$	0	-300	500x0.94/ 500x1.0	80	11/4/03 15.16	independent	Pulser, amp:06170 attenuations
pix10-25.as$	-25	-300	500x0.94/ 500x1.0	80	11/4/03 15.19	independent	Pulser, amp:06170 attenuations
pix10-50.as$	-50	-300	500x0.94/ 500x1.0	80	11/4/03 15.21	independent	Pulser, amp:06170 attenuations
pix10-75.as$	-75	-300	500x0.94/ 500x1.0	80	11/4/03 15.24	independent	Pulser, amp:06170 attenuations
pix10-100.as$	-100	-300	500x0.94/ 500x1.0	80	11/4/03 15.26	independent	Pulser, amp:06170 attenuations
pix11-0.as$	0	-300	500x0.94/ 500x1.0	80	11/4/03 13.40	independent	Pulser, amp:06170 attenuations
pix11-25.as$	-25	-300	500x0.94/ 500x1.0	80	11/4/03 13.42	independent	Pulser, amp:06170 attenuations
pix11-50.as$	-50	-300	500x0.94/ 500x1.0	80	11/4/03 13.45	independent	Pulser, amp:06170 attenuations
pix11-75.as$	-75	-300	500x0.94/ 500x1.0	80	11/4/03 13.47	independent	Pulser, amp:06170 attenuations
pix11-100.as$	-100	-300	500x0.94/ 500x1.0	80	11/4/03 13.50	independent	Pulser, amp:06170 attenuations
pix12-0.as$	0	-300	500x0.94/ 500x1.0	80	11/4/03 15.30	independent	Pulser, amp:06170 attenuations
pix12-25.as$	-25	-300	500x0.94/ 500x1.0	80	11/4/03 15.32	independent	Pulser, amp:06170 attenuations
pix12-50.as$	-50	-300	500x0.94/ 500x1.0	80	11/4/03 15.34	independent	Pulser, amp:06170 attenuations
pix12-75.as$	-75	-300	500x0.94/ 500x1.0	80	11/4/03 15.36	independent	Pulser, amp:06170 attenuations
pix12-100.as$	-100	-300	500x0.94/ 500x1.0	80	11/4/03 15.39	independent	Pulser, amp:06170 attenuations
pix13-0.as$	0	-300	500x0.94/ 500x1.0	80	11/4/03 15.42	independent	Pulser, amp:06170 attenuations
pix13-25.as$	-25	-300	500x0.94/ 500x1.0	80	11/4/03 15.45	independent	Pulser, amp:06170 attenuations
pix13-50.as$	-50	-300	500x0.94/ 500x1.0	80	11/4/03 15.47	independent	Pulser, amp:06170 attenuations
pix13-75.as$	-75	-300	500x0.94/ 500x1.0	80	11/4/03 15.50	independent	Pulser, amp:06170 attenuations
pix13-100.as$	-100	-300	500x0.94/ 500x1.0	80	11/4/03 15.52	independent	Pulser, amp:06170 attenuations
pix14-0.as$	0	-300	500x0.94/	80	11/4/03 15.56	independent	Pulser, amp:06170

			500x1.0				attenuations
pix14-25.as$	-25	-300	500x0.94/ 500x1.0	80	11/4/03 15.58	independent	Pulser, amp:06170 attenuations
pix14-50.as$	-50	-300	500x0.94/ 500x1.0	80	11/4/03 16.00	independent	Pulser, amp:06170 attenuations
pix14-75.as$	-75	-300	500x0.94/ 500x1.0	80	11/4/03 16.03	independent	Pulser, amp:06170 attenuations
pix14-100.as$	-100	-300	500x0.94/ 500x1.0	80	11/4/03 16.05	independent	Pulser, amp:06170 attenuations
pix15-0.as$	0	-300	500x0.94/ 500x1.0	80	11/4/03 16.09	independent	Pulser, amp:06170 attenuations
pix15-25.as$	-25	-300	500x0.94/ 500x1.0	80	11/4/03 16.11	independent	Pulser, amp:06170 attenuations
pix15-50.as$	-50	-300	500x0.94/ 500x1.0	80	11/4/03 16.14	independent	Pulser, amp:06170 attenuations
pix15-75.as$	-75	-300	500x0.94/ 500x1.0	80	11/4/03 16.16	independent	Pulser, amp:06170 attenuations
pix15-100.as$	-100	-300	500x0.94/ 500x1.0	80	11/4/03 16.18	independent	Pulser, amp:06170 attenuations
pix16-0.as$	0	-300	500x0.94/ 500x1.0	80	11/4/03 16.22	independent	Pulser, amp:06170 attenuations
pix16-25.as$	-25	-300	500x0.94/ 500x1.0	80	11/4/03 16.24	independent	Pulser, amp:06170 attenuations
pix16-50.as$	-50	-300	500x0.94/ 500x1.0	80	11/4/03 16.26	independent	Pulser, amp:06170 attenuations
pix16-75.as$	-75	-300	500x0.94/ 500x1.0	80	11/4/03 16.29	independent	Pulser, amp:06170 attenuations
pix16-100.as$	-100	-300	500x0.94/ 500x1.0	80	11/4/03 16.32	independent	Pulser, amp:06170 attenuations
pixel7-45.as$	- 45	- 200	500x0.94/ 500x1.0	200	14/4/03 9.30	independent	^{241}Am
pixel3-45.as$	- 45	- 200	500x0.94/ 500x1.0	200	14/4/03 9.38	independent	^{241}Am
pixel13-45.as$	- 45	- 200	500x0.94/ 500x1.0	200	14/4/03 9.45	independent	^{241}Am
pixel6-75-300.dat pixel6-75-300as. as$	-75	-300	500x0.94/ 500x1.0	1000	14/4/03 10.12	dependent	^{241}Am
pixel13-45-300.dat pixel13-45-300as. as$	-45	-300	500x0.94/ 500x1.0	1000	14/4/03 10.24	dependent	^{241}Am
pixel8-100-300.dat pixel8-100-300as. as$	-100	-300	500x0.94/ 500x1.0	1000	14/4/03 10.44	dependent	^{241}Am
pixel10-100-300.dat pixel10-100-300as. as$	-100	-300	500x0.94/ 500x1.0	1000	14/4/03 11.03	dependent	^{241}Am
LeakageK18#4.xls					15/4/03 9.02		Leakage Current Data
am8-100-300.doc					15/4/03 9.53		^{241}Am Spectra
am10-100-300.doc					15/4/03 9.56		^{241}Am Spectra
am13-45-300.doc					15/4/03 10.02		^{241}Am Spectra
am6-75-300.doc					15/4/03 10.08		^{241}Am Spectra
analysisk18#4.xls					16/4/03 9.15	independent mode	Am–241 Data Analysis
FWHMK18#4.xls					22/4/03 9.02		Pulser Data Analysis
pix1.xls					22/4/03 16.46	independent	^{241}Am spectrum
pix2.xls					22/4/03 17.04	independent	^{241}Am spectrum

pix3.xls					23/4/03 14.04	independent	^{241}Am spectrum
pix4.xls					23/4/03 11.10	independent	^{241}Am spectrum
pix5.xls					23/4/03 11.19	independent	^{241}Am spectrum
pix6.xls					23/4/03 11.33	independent	^{241}Am spectrum
pix7.xls					23/4/03 11.55	independent	^{241}Am spectrum
pix8.xls					23/4/03 12.13	independent	^{241}Am spectrum
pix9.xls					23/4/03 12.15	independent	^{241}Am spectrum
pix10.xls					23/4/03 12.24	independent	^{241}Am spectrum
pix11.xls					23/4/03 15.31	independent	^{241}Am spectrum
pix12.xls					23/4/03 12.28	independent	^{241}Am spectrum
pix13.xls					23/4/03 12.32	independent	^{241}Am spectrum
pix14.xls					23/4/03 15.33	independent	^{241}Am spectrum
pix15.xls					23/4/03 12.34	independent	^{241}Am spectrum
pix16.xls					23/4/03 15.35	independent	^{241}Am spectrum
pix3_45.xls					23/4/03 15.43	independent	^{241}Am spectrum
pix13_45.xls					23/4/03 15.49		^{241}Am spectrum
pix7_45.xls					23/4/03 15.51		^{241}Am spectrum
pix10.txt					24/4/03 9.44		X-projects
pix11.txt					24/4/03 9.45		X-projects
pix13.txt					24/4/03 9.46		X-projects
pix16.txt					24/4/03 9.47		X-projects
pix2.txt					24/4/03 9.48		X-projects
pix6.txt					24/4/03 9.48		X-projects
pix7.txt					24/4/03 9.49		X-projects
pix8.txt					24/4/03 9.50		X-projects
pix8_2.txt					24/4/03 9.51		X-projects
Am_K18#4.doc					24/4/03 9.53	independent	Am-241 Spectra
analysisdepK18#4.xls					24/4/03 11.02	dependent mode	Am–241 Data Analysis
pix2-100-300cs.dat pix2-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	3600	23/4/03 11.38	dependent	^{137}Cs
pix2_cs.doc					23/4/03 11.44		^{137}Cs Spectra
pix3-100-300cs.dat pix3-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	3600	23/4/03 12.43	dependent	^{137}Cs
pix3_cs.doc					23/4/03 11.48		^{137}Cs Spectra
pix6-100-300cs.dat pix6-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	3600	23/4/03 13.50	dependent	^{137}Cs
pix6_cs.doc					23/4/03 13.58		^{137}Cs Spectra
pix11-100-300cs.dat pix11-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	3600	23/4/03 14.56	dependent	^{137}Cs
pix11_cs.doc					23/4/03 15.02		^{137}Cs Spectra
pix8-100-300cs.dat pix8-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	3600	23/4/03 16.03	dependent	^{137}Cs
pix15-100-300cs.dat pix15-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	3600	23/4/03 11.38	dependent	^{137}Cs
pix15_cs.doc					23/4/03 17.17		^{137}Cs Spectra
pix8_cs.doc					23/4/03 17.22		^{137}Cs Spectra
pix13-100-300cs.dat pix13-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	2700	23/4/03 18.47	dependent	^{137}Cs
pix5-100-300cs.dat pix5-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	10800	24/4/03 9.21	dependent	^{137}Cs

pix5.txt					24/4/03 9.29		X-projects
pix5_cs.doc					24/4/03 9.30		^{137}Cs Spectra
pix13.txt					24/4/03 9.34		X-projects
pix13_cs.doc					24/4/03 9.35		^{137}Cs Spectra
pix2.txt					24/4/03 9.38		X-projects
pix3.txt					24/4/03 9.39		X-projects
pix6.txt					24/4/03 9.40		X-projects
pix8.txt					24/4/03 9.41		X-projects
pix11.txt					24/4/03 9.42		X-projects
pix15.txt					24/4/03 9.43		X-projects
analysisdep.xls					24/4/03 11.03	dependent mode	Cs–137 Data Analysis
DETECTOR K30#10							
File	V_{drift} Volt	V_{planar} Volt	Gain Planar/ Gain Pixel ADC=0 / 1	Live Time sec	Date	Mode	Note
pixel1dat.dat pixel1.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 12.08	independent	^{241}Am, noisy
pixel2dat.dat pixel2.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 12.21	independent	^{241}Am
pixel1dat_1.dat pixel1_1.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 12.32	independent	^{241}Am higher threshold
pixel3dat.dat pixel3.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 12.38	independent	^{241}Am
pixel4dat.dat pixel4.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 14.22	independent	^{241}Am
pixel5dat.dat pixel5.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 14.40	independent	^{241}Am
pixel5-45.as$	- 45	- 200	500x0.94/ 500x1.0	250	15/4/03 14.43	independent	^{241}Am
pixel6dat.dat pixel6.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 14.50	independent	^{241}Am
pixel7dat.dat pixel7.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 14.58	independent	^{241}Am, noisy
pixel8dat.dat pixel8.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 15.28	independent	^{241}Am, double peak
pixel9dat.dat pixel9.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 15.35	independent	^{241}Am, noisy
pixel10dat.dat pixel10.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 15.43	independent	^{241}Am
pixel11dat.dat pixel11.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 15.54	independent	^{241}Am
pixel12dat.dat pixel12.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 16.05	independent	^{241}Am
pixel13dat.dat pixel13.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 16.44	independent	^{241}Am
pixel114dat.dat pixel14.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 16.52	independent	^{241}Am
pixel15dat.dat pixel15.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 16.58	independent	^{241}Am
pixel16dat.dat pixel16.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 11.55	independent	^{241}Am
pixel16dat_1.dat pixel16_1.as$	- 75	- 200	500x0.94/ 500x1.0	250	15/4/03 17.05	independent	^{241}Am
pixel9dat_1.dat	- 75	- 200	500x0.94/	250	15/4/03 17.11	independent	^{241}Am

pixel9_1.as$			500x1.0				
cen-resk30#10.doc					15/4/03 17.42		Centroid, energy res @ 60 keV
pix11-75-300.dat pix11-75-300as. as$	-75	-300	500x0.94/ 500x1.0	1000	15/4/03 18.08	dependent	^{241}Am
pix7-75-300.dat pix7-75-300as. as$	-75	-300	500x0.94/ 500x1.0	1000	15/4/03 18.29	dependent	^{241}Am
pix2-100-300.dat pix2-100-300as. as$	-100	-300	500x0.94/ 500x1.0	1000	15/4/03 18.48	dependent	^{241}Am
pix8-75-200.dat pix8-75-200as. as$	-75	-200	500x0.94/ 500x1.0	1000	16/4/03 9.05	dependent	^{241}Am
pix4-100-300.dat pix4-100-300as. as$	-100	-300	500x0.94/ 500x1.0	1000	16/4/03 9.27	dependent	^{241}Am
pix10-75-300.dat pix10-75-300as. as$	-75	-300	500x0.94/ 500x1.0	1000	16/4/03 9.50	dependent	^{241}Am
pix6-100-300.dat pix6-100-300as. as$	-100	-300	500x0.94/ 500x1.0	1000	16/4/03 10.10	dependent	^{241}Am
pix9-75-200.dat pix9-75-200as. as$	-75	-200	500x0.94/ 500x1.0	1000	16/4/03 10.30	dependent	^{241}Am
analysisk30#10.xls					16/4/03 11.06	independent mode	Am–241 Data Analysis
LeakageK30#10					22/4/03 16.27		Leakage Current Data
pix1-0.as$	0	-300	500x0.94/ 500x1.0	80	16/4/03 16.11	independent	Pulser, amp 06170, attenuations
pix1-25.as$	-25	-300	500x0.94/ 500x1.0	80	16/4/03 16.13	independent	Pulser, amp 06170, attenuations
pix1-50.as$	-50	-300	500x0.94/ 500x1.0	80	16/4/03 16.17	independent	Pulser, amp 06170, attenuations
pix1-75.as$	-75	-300	500x0.94/ 500x1.0	80	16/4/03 16.19	independent	Pulser, amp 06170, attenuations
pix1-100.as$	-100	-300	500x0.94/ 500x1.0	80	16/4/03 16.21	independent	Pulser, amp 06170, attenuations, noisy
pix2-0.as$	0	-300	500x0.94/ 500x1.0	80	16/4/03 16.24	independent	Pulser, amp 06170, attenuations
pix2-25.as$	-25	-300	500x0.94/ 500x1.0	80	16/4/03 16.27	independent	Pulser, amp 06170, attenuations
pix2-50.as$	-50	-300	500x0.94/ 500x1.0	80	16/4/03 16.29	independent	Pulser, amp 06170, attenuations
pix2-75.as$	-75	-300	500x0.94/ 500x1.0	80	16/4/03 16.31	independent	Pulser, amp 06170, attenuations
pix2-100.as$	-100	-300	500x0.94/ 500x1.0	80	16/4/03 16.33	independent	Pulser, amp 06170, attenuations
pix3-0.as$	0	-300	500x0.94/ 500x1.0	200	16/4/03 16.36	independent	Pulser, amp 06170, attenuations
pix3-25.as$	-25	-300	500x0.94/ 500x1.0	200	16/4/03 16.38	independent	Pulser, amp 06170, attenuations
pix3-50.as$	-50	-300	500x0.94/ 500x1.0	200	16/4/03 16.41	independent	Pulser, amp 06170, attenuations
pix3-75.as$	-75	-300	500x0.94/ 500x1.0	200	16/4/03 16.43	independent	Pulser, amp 06170, attenuations
pix3-100.as$	-100	-300	500x0.94/ 500x1.0	200	16/4/03 16.45	independent	Pulser, amp 06170, attenuations, noisy
pix4-0.as$	0	-300	500x0.94/ 500x1.0	80	16/4/03 16.48	independent	Pulser, amp 06170, attenuations

pix4-25.as$	-25	-300	500x0.94/ 500x1.0	80	16/4/03 16.50	independent	Pulser, amp 06170, attenuations
pix4-50.as$	-50	-300	500x0.94/ 500x1.0	80	16/4/03 16.53	independent	Pulser, amp 06170, attenuations
pix4-75.as$	-75	-300	500x0.94/ 500x1.0	80	16/4/03 16.55	independent	Pulser, amp 06170, attenuations
pix4-100.as$	-100	-300	500x0.94/ 500x1.0	80	16/4/03 16.57	independent	Pulser, amp 06170, attenuations
pix5-0.as$	0	-300	500x0.94/ 500x1.0	80	16/4/03 17.00	independent	Pulser, amp 06170, attenuations
pix5-25.as$	-25	-300	500x0.94/ 500x1.0	80	16/4/03 17.03	independent	Pulser, amp 06170, attenuations
pix5-50.as$	-50	-300	500x0.94/ 500x1.0	80	16/4/03 17.05	independent	Pulser, amp 06170, attenuations
pix5-75.as$	-75	-300	500x0.94/ 500x1.0	80	16/4/03 17.07	independent	Pulser, amp 06170, attenuations
pix5-100.as$	-100	-300	500x0.94/ 500x1.0	80	16/4/03 17.09	independent	Pulser, amp 06170, attenuations
pix6-0.as$	0	-300	500x0.94/ 500x1.0	80	16/4/03 17.13	independent	Pulser, amp 06170, attenuations
pix6-25.as$	-25	-300	500x0.94/ 500x1.0	80	16/4/03 17.15	independent	Pulser, amp 06170, attenuations
pix6-50.as$	-50	-300	500x0.94/ 500x1.0	80	16/4/03 17.17	independent	Pulser, amp 06170, attenuations
pix6-75.as$	-75	-300	500x0.94/ 500x1.0	80	16/4/03 17.22	independent	Pulser, amp 06170, attenuations
pix6-100.as$	-100	-300	500x0.94/ 500x1.0	80	16/4/03 17.24	independent	Pulser, amp 06170, att
pix7-0.as$	0	-300	500x0.94/ 500x1.0	80	16/4/03 17.27	independent	Pulser, amp 06170, att
pix7-25.as$	-25	-300	500x0.94/ 500x1.0	80	16/4/03 17.29	independent	Pulser, amp 06170, attenuations
pix7-50.as$	-50	-300	500x0.94/ 500x1.0	80	16/4/03 17.31	independent	Pulser, amp 06170, attenuations
pix7-75.as$	-75	-300	500x0.94/ 500x1.0	80	16/4/03 17.34	independent	Pulser, amp 06170, attenuations, noisy
pix7-100.as$	-100	-300	500x0.94/ 500x1.0	80	16/4/03 17.37	independent	Pulser, amp 06170, attenuations
pix8-0.as$	0	-300	500x0.94/ 500x1.0	80	16/4/03 17.40	independent	Pulser, amp 06170, attenuations
pix8-25.as$	-25	-300	500x0.94/ 500x1.0	80	16/4/03 17.42	independent	Pulser, amp 06170, attenuations
pix8-50.as$	-50	-300	500x0.94/ 500x1.0	80	16/4/03 17.45	independent	Pulser, amp 06170, attenuations
pix8-75.as$	-75	-300	500x0.94/ 500x1.0	80	16/4/03 17.47	independent	Pulser, amp 06170, attenuations
pix8-100.as$	-100	-300	500x0.94/ 500x1.0	80	16/4/03 17.49	independent	Pulser, amp 06170, attenuations
pix9-0.as$	0	-300	500x0.94/ 500x1.0	80	16/4/03 17.52	independent	Pulser, amp 06170, attenuations
pix9-25.as$	-25	-300	500x0.94/ 500x1.0	80	16/4/03 17.54	independent	Pulser, amp 06170, attenuations
pix9-50.as$	-50	-300	500x0.94/ 500x1.0	80	16/4/03 17.57	independent	Pulser, amp 06170, attenuations
pix9-75.as$	-75	-300	500x0.94/	80	16/4/03 17.59	independent	Pulser, amp 06170,

			500x1.0				attenuations
pix9-100.as$	-100	-300	500x0.94/ 500x1.0	80	16/4/03 18.01	independent	Pulser, amp 06170, attenuations
pix10-0.as$	0	-300	500x0.94/ 500x1.0	80	17/4/03 10.49	independent	Pulser, amp 06170, attenuations
pix10-25.as$	-25	-300	500x0.94/ 500x1.0	80	17/4/03 10.51	independent	Pulser, amp 06170, attenuations
pix10-50.as$	-50	-300	500x0.94/ 500x1.0	80	17/4/03 10.54	independent	Pulser, amp 06170, attenuations
pix10-75.as$	-75	-300	500x0.94/ 500x1.0	80	17/4/03 10.56	independent	Pulser, amp 06170, attenuations
pix10-100.as$	-100	-300	500x0.94/ 500x1.0	80	17/4/03 10.59	independent	Pulser, amp 06170, attenuations,noisy
pix11-0.as$	0	-300	500x0.94/ 500x1.0	80	17/4/03 11.03	independent	Pulser, amp 06170, attenuations
pix11-25.as$	-25	-300	500x0.94/ 500x1.0	80	17/4/03 11.05	independent	Pulser, amp 06170, attenuations
pix11-50.as$	-50	-300	500x0.94/ 500x1.0	80	17/4/03 11.07	independent	Pulser, amp 06170, attenuations
pix11-75.as$	-75	-300	500x0.94/ 500x1.0	80	17/4/03 11.09	independent	Pulser, amp 06170, attenuations
pix11-100.as$	-100	-300	500x0.94/ 500x1.0	80	17/4/03 11.12	independent	Pulser, amp 06170, attenuations
pix12-0.as$	0	-300	500x0.94/ 500x1.0	80	17/4/03 11.17	independent	Pulser, amp 06170, attenuations
pix12-25.as$	-25	-300	500x0.94/ 500x1.0	80	17/4/03 11.19	independent	Pulser, amp 06170, attenuations
pix12-50.as$	-50	-300	500x0.94/ 500x1.0	80	17/4/03 11.22	independent	Pulser, amp 06170, attenuations
pix12-75.as$	-75	-300	500x0.94/ 500x1.0	80	17/4/03 11.24	independent	Pulser, amp 06170, attenuations
pix12-100.as$	-100	-300	500x0.94/ 500x1.0	80	17/4/03 11.26	independent	Pulser, amp 06170, attenuations
pix13-0.as$	0	-300	500x0.94/ 500x1.0	80	17/4/03 11.30	independent	Pulser, amp 06170, attenuations
pix13-25.as$	-25	-300	500x0.94/ 500x1.0	80	17/4/03 11.32	independent	Pulser, amp 06170, attenuations
pix13-50.as$	-50	-300	500x0.94/ 500x1.0	80	17/4/03 11.34	independent	Pulser, amp 06170, attenuations
pix13-75.as$	-75	-300	500x0.94/ 500x1.0	80	17/4/03 11.43	independent	Pulser, amp 06170, attenuations
pix13-100.as$	-100	-300	500x0.94/ 500x1.0	80	17/4/03 11.46	independent	Pulser, amp 06170, attenuations, noisy
pix14-0.as$	0	-300	500x0.94/ 500x1.0	80	17/4/03 12.01	independent	Pulser, amp 06170, attenuations
pix14-25.as$	-25	-300	500x0.94/ 500x1.0	80	17/4/03 12.04	independent	Pulser, amp 06170, attenuations
pix14-50.as$	-50	-300	500x0.94/ 500x1.0	80	17/4/03 12.06	independent	Pulser, amp 06170, attenuations
pix14-75.as$	-75	-300	500x0.94/ 500x1.0	80	17/4/03 12.09	independent	Pulser, amp 06170, attenuations
pix14-100.as$	-100	-300	500x0.94/ 500x1.0	80	17/4/03 12.12	independent	Pulser, amp 06170, attenuations
pix15-0.as$	0	-300	500x0.94/ 500x1.0	80	17/4/03 12.30	independent	Pulser, amp 06170, attenuations

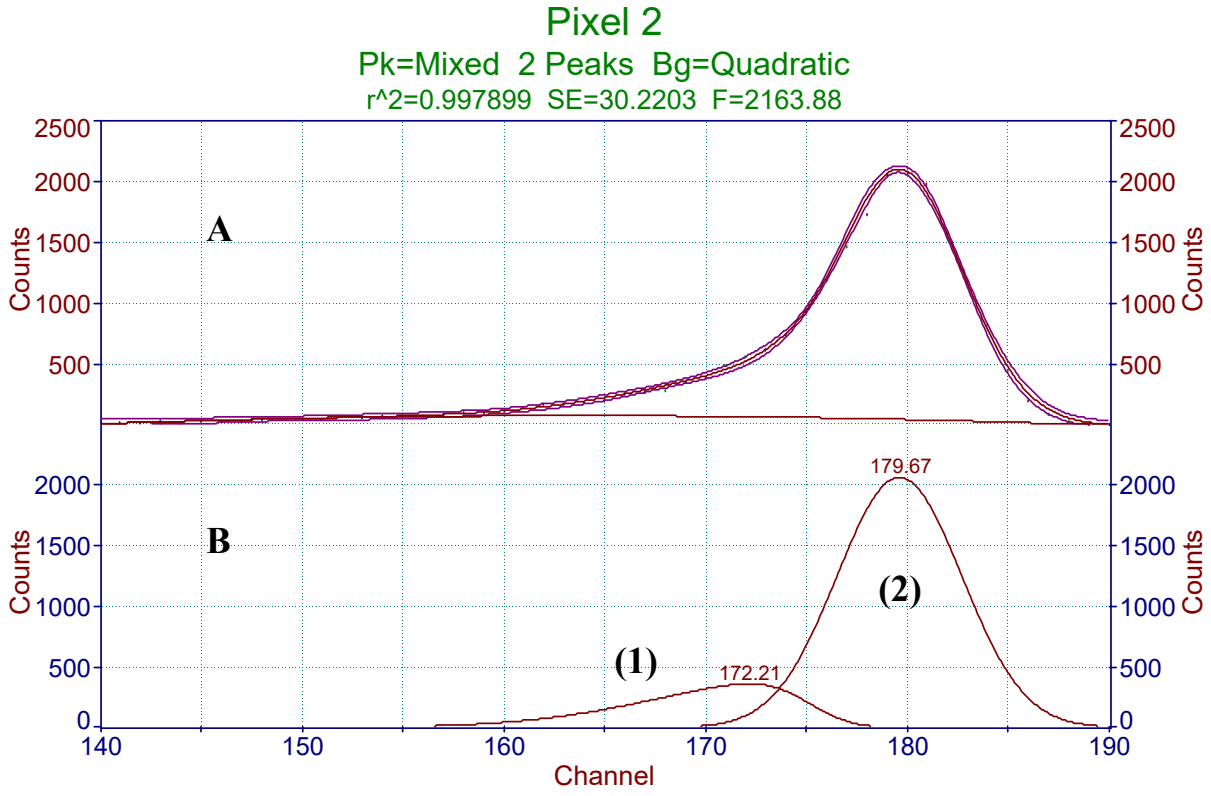
pix15-25.as$	-25	-300	500x0.94/ 500x1.0	80	17/4/03 12.32	independent	Pulser, amp 06170, attenuations
pix15-50.as$	-50	-300	500x0.94/ 500x1.0	80	17/4/03 12.35	independent	Pulser, amp 06170, attenuations
pix15-75.as$	-75	-300	500x0.94/ 500x1.0	80	17/4/03 12.38	independent	Pulser, amp 06170, attenuations
pix15-100.as$	-100	-300	500x0.94/ 500x1.0	80	17/4/03 12.40	independent	Pulser, amp 06170, attenuations
pix16-0.as$	0	-300	500x0.94/ 500x1.0	80	17/4/03 12.44	independent	Pulser, amp 06170, attenuations
pix16-25.as$	-25	-300	500x0.94/ 500x1.0	80	17/4/03 12.48	independent	Pulser, amp 06170, attenuations
pix16-50.as$	-50	-300	500x0.94/ 500x1.0	80	17/4/03 12.52	independent	Pulser, amp 06170, attenuations
pix16-75.as$	-75	-300	500x0.94/ 500x1.0	80	17/4/03 12.56	independent	Pulser, amp 06170, attenuations
pix16-100.as$	-100	-300	500x0.94/ 500x1.0	80	17/4/03 12.58	independent	Pulser, amp 06170, attenuations
pix16-25_2.as$	-25	-300	500x0.94/ 500x1.0	80	17/4/03 12.50	independent	Pulser, amp 06170, attenuations
pix13-100_2.as$	0	-300	500x0.94/ 500x1.0	80	17/4/03 11.50	independent	Pulser, amp 06170, attenuations
pix13-75_2.as$	-25	-300	500x0.94/ 500x1.0	80	17/4/03 11.55	independent	Pulser, amp 06170, attenuations
pix13-100_3.as$	-50	-300	500x0.94/ 500x1.0	80	17/4/03 11.57	independent	Pulser, amp 06170, attenuations
pix13-0_02.as$	0	-300	500x0.94/ 500x1.0	80	17/4/03 12.16	independent	Pulser, amp 06170, attenuations
pix13-25_02.as$	-25	-300	500x0.94/ 500x1.0	80	17/4/03 12.18	independent	Pulser, amp 06170, attenuations
pix13-50_02.as$	-50	-300	500x0.94/ 500x1.0	80	17/4/03 12.21	independent	Pulser, amp 06170, attenuations
pix13-75_02.as$	-75	-300	500x0.94/ 500x1.0	80	17/4/03 12.24	independent	Pulser, amp 06170, attenuations
pix13-100_02.as$	-100	-300	500x0.94/ 500x1.0	80	17/4/03 12.26	independent	Pulser, amp 06170, attenuations, noisy
pix10-0_2.as$	0	-300	500x0.94/ 500x1.0	80	17/4/03 18.08	independent	Pulser, amp 06170, attenuations
pix10-25_2.as$	-25	-300	500x0.94/ 500x1.0	80	17/4/03 18.10	independent	Pulser, amp 06170, attenuations
pix10-50_2.as$	-50	-300	500x0.94/ 500x1.0	80	17/4/03 18.13	independent	Pulser, amp 06170, attenuations
pix10-75_2.as$	-75	-300	500x0.94/ 500x1.0	80	17/4/03 18.15	independent	Pulser, amp 06170, attenuations
pix10-100_2.as$	-100	-300	500x0.94/ 500x1.0	80	17/4/03 18.18	independent	Pulser, amp 06170, attenuations, noisy
FWHMk30#10.xls					22/4/03 9.23		Pulser Data Analysis
pix2-100-300cs.dat pix2-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	3600	17/4/03 15.53	dependent	^{137}Cs
pix8-75-300cs.dat pix8-75-300cs_as. as$	-75	-300	100x0.94/ 100x1.0	3600	17/4/03 16.57	dependent	^{137}Cs
pix6-100-300cs.dat pix6-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	3600	17/4/03 18.01	dependent	^{137}Cs
pix4-100-300cs.dat	-100	-300	100x0.94/	3600	18/4/03 11.49	dependent	^{137}Cs

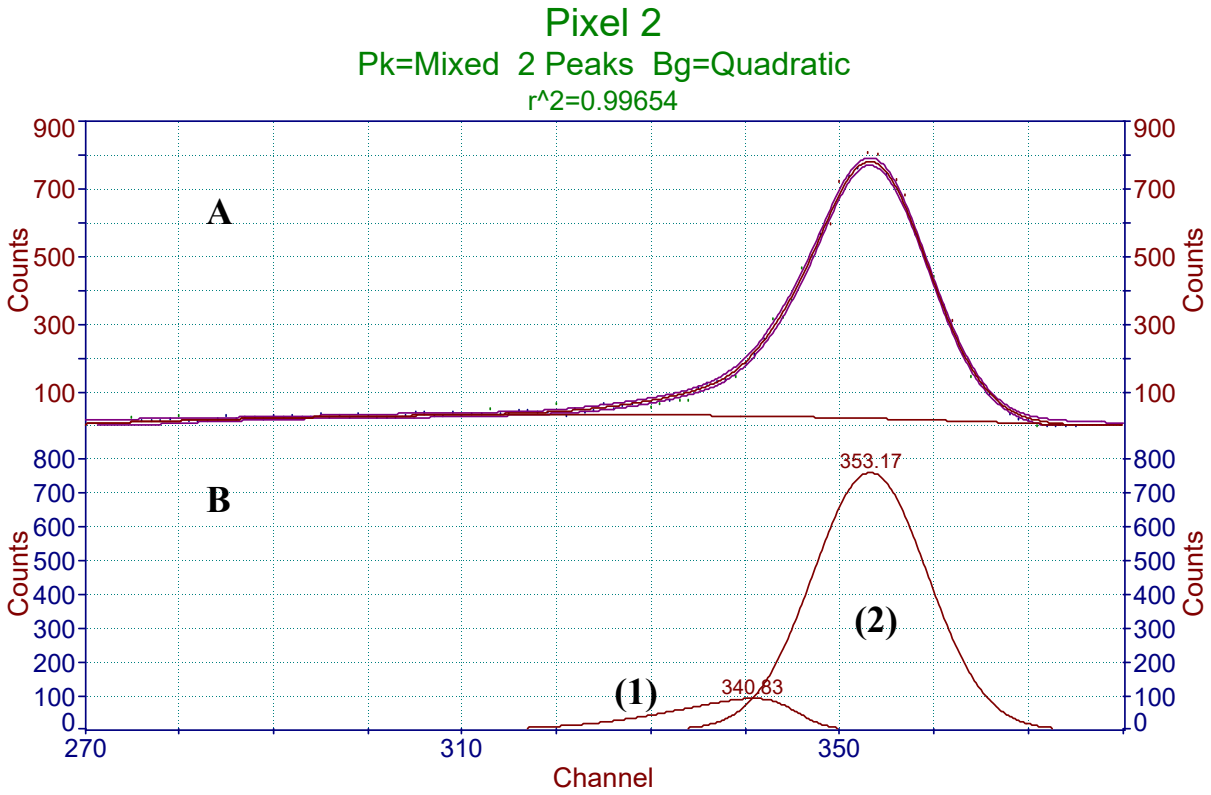
pix4-100-300cs_as. as$			100x1.0				
pix16-100-300cs.dat pix16-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	3600	18/4/03 12.54	dependent	^{137}Cs
pix2-100-300cs.dat pix2-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	3600	18/4/03 13.57	dependent	^{137}Cs, higher threshold
pix6-100-300cs.dat pix6-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	3600	22/4/03 9.34	dependent	^{137}Cs, higher threshold
pix11-100-300cs.dat pix11-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	3600	22/4/03 10.44	dependent	^{137}Cs
pix7-100-300cs.dat pix7-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	3600	22/4/03 11.48	dependent	^{137}Cs
pix10-100-300cs.dat pix10-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	10800	22/4/03 14.58	dependent	^{137}Cs
pix13-100-300cs.dat pix13-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	3600	22/4/03 16.01	dependent	^{137}Cs
pix5-100-300cs.dat pix5-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	3600	22/4/03 17.04	dependent	^{137}Cs
pix12-100-300cs.dat pix12-100-300cs_as. as$	-100	-300	100x0.94/ 100x1.0	10800	23/4/03 8.23	dependent	^{137}Cs
pix4_cs.doc					23/4/03 8.48	dependent	^{137}Cs Spectra
pix5_cs.doc					23/4/03 8.52	dependent	^{137}Cs Spectra
pix7_cs.doc					23/4/03 8.56	dependent	^{137}Cs Spectra
pix2_cs.doc					23/4/03 8.59	dependent	^{137}Cs Spectra
pix6_cs.doc					23/4/03 9.03	dependent	^{137}Cs Spectra
pix12_cs.doc					23/4/03 9.08	dependent	^{137}Cs Spectra
pix8_cs.doc					23/4/03 9.12	dependent	^{137}Cs Spectra
pix10_cs.doc					23/4/03 9.17	dependent	^{137}Cs Spectra
pix11_cs.doc					23/4/03 9.20	dependent	^{137}Cs Spectra
pix13_cs.doc					23/4/03 9.24	dependent	^{137}Cs Spectra
pix16_cs.doc					23/4/03 9.28	dependent	^{137}Cs Spectra
pix4_am.doc					23/4/03 9.44	dependent	^{241}Am Spectra
pix2_am.doc					23/4/03 9.48	dependent	^{241}Am Spectra
pix6_am.doc					23/4/03 9.50	dependent	^{241}Am Spectra
pix7_am.doc					23/4/03 9.54	dependent	^{241}Am Spectra
pix8_am.doc					23/4/03 9.58	dependent	^{241}Am Spectra
pix9_am.doc					23/4/03 10.25	dependent	^{241}Am Spectra
pix10_am.doc					23/4/03 10.31	dependent	^{241}Am Spectra
pix11_am.doc					23/4/03 10.33	dependent	^{241}Am Spectra
pix1.xls					23/4/03 13.35	independent	^{241}Am spectrum
pix2.xls					23/4/03 13.42	independent	^{241}Am spectrum
pix3.xls					23/4/03 13.57	independent	^{241}Am spectrum
pix4.xls					23/4/03 14.07	independent	^{241}Am spectrum
pix5.xls					23/4/03 14.16	independent	^{241}Am spectrum
pix6.xls					23/4/03 14.20	independent	^{241}Am spectrum
pix7.xls					23/4/03 14.22	independent	^{241}Am spectrum
pix8.xls					23/4/03 14.25	independent	^{241}Am spectrum
pix9.xls					23/4/03 14.29	independent	^{241}Am spectrum
pix10.xls					23/4/03 14.32	independent	^{241}Am spectrum
pix11.xls					23/4/03 14.37	independent	^{241}Am spectrum

pix12.xls					23/4/03 14.39	independent	^{241}Am spectrum
pix13.xls					23/4/03 14.42	independent	^{241}Am spectrum
pix14.xls					23/4/03 15.24	independent	^{241}Am spectrum
pix15.xls					23/4/03 14.49	independent	^{241}Am spectrum
pix16.xls					23/4/03 14.54	independent	^{241}Am spectrum
pix5_45.xls					23/4/03 15.24	independent	^{241}Am spectrum
Am_K30#10.doc					24/4/03 9.59	independent	^{241}Am spectra
pix10cs.txt					24/4/03 9.59	dependent	X-projects
pix10am-75.txt					24/4/03 10.00	dependent	X-projects
pix11cs.txt					24/4/03 10.00	dependent	X-projects
pix11am-75.txt					24/4/03 10.01	dependent	X-projects
pix12cs.txt					24/4/03 10.02	dependent	X-projects
pix13cs.txt					24/4/03 10.03	dependent	X-projects
pix16cs.txt					24/4/03 10.04	dependent	X-projects
pix2am.txt					24/4/03 10.05	dependent	X-projects
pix2cs.txt					24/4/03 10.06	dependent	X-projects
pix6cs.txt					24/4/03 10.07	dependent	X-projects
pix4am.txt					24/4/03 10.08	dependent	X-projects
pix4cs.txt					24/4/03 10.09	dependent	X-projects
pix5cs.txt					24/4/03 10.10	dependent	X-projects
pix6am.txt					24/4/03 10.12	dependent	X-projects
pix7cs.txt					24/4/03 10.13	dependent	X-projects
pix7am-75.txt					24/4/03 10.14	dependent	X-projects
pix8am-75.txt					24/4/03 10.15	dependent	X-projects
pix8cs-75.txt					24/4/03 10.17	dependent	X-projects
pix9am-75.txt					24/4/03 10.18	dependent	X-projects
Analysisdepk30#10					24/4/03 11.05	dependent	^{241}Am and ^{137}Cs Data Analysis

Annex 2. Fitting models

In following figures an example of the fitting models used is shown. In panel (A) the 60 keV photopeak region of an ^{241} Am measured spectrum is shown with the best-fit function (continuous line). A 95% confidence interval is shown. In panel (B) the two distributions used for the best-fit procedure are plotted: (1) is the GMG asymmetric function used to model the trapping component, while (2) is the Gaussian photopeak component.





Annex 3. Q_{planar} vs. Q_{pixel} distributions

In figures below the Q_{planar} signal as a function of the Q_{pixel} signal is reported:

- sources: ^{241}Am, ^{137}Cs;
- acquisition mode: dependent.

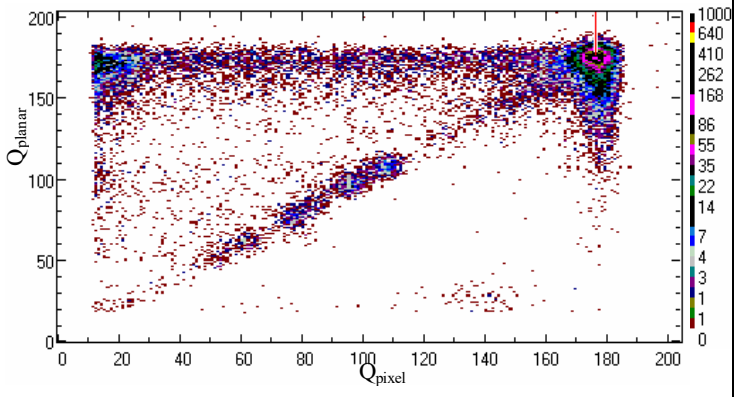
The bias voltages are:

- V_d = - 100 V
- V_p = - 300 V

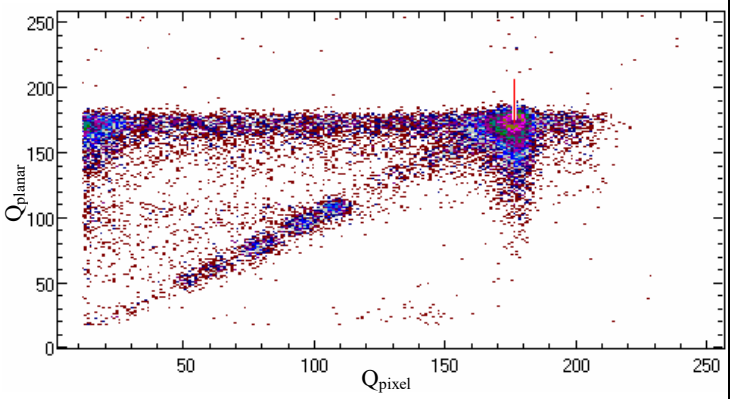
The colour palette of pixel 2 is effective for the other pixels.

Detector K18#4 Source ^{241}Am

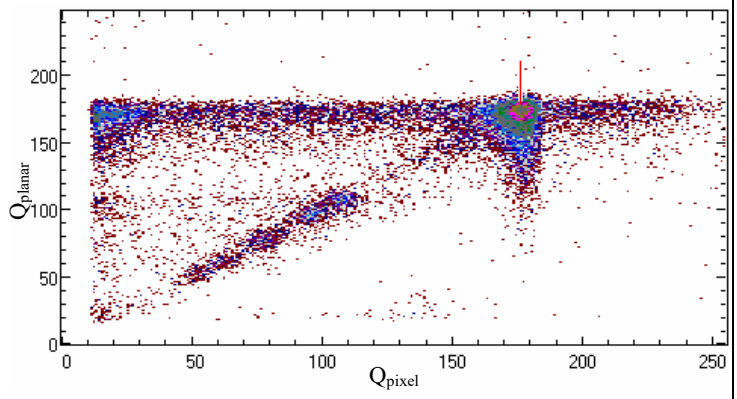
Pixel 2



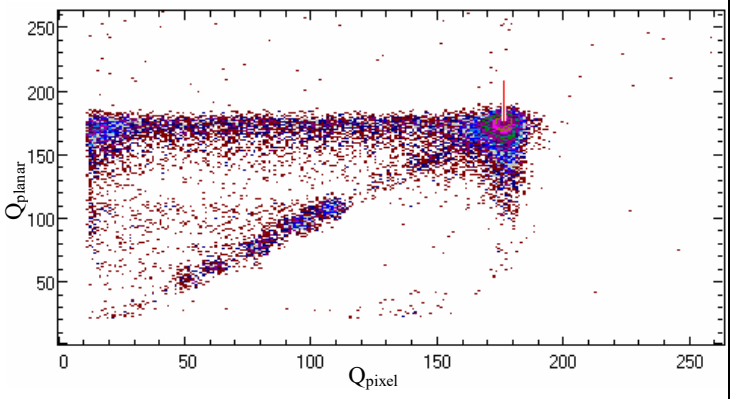
Pixel 6



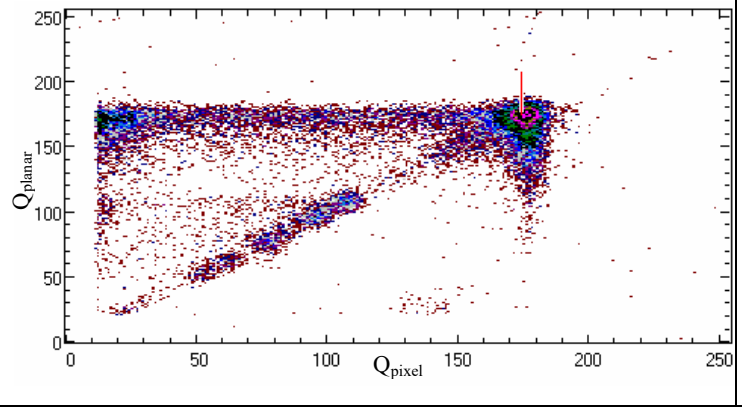
Pixel 7



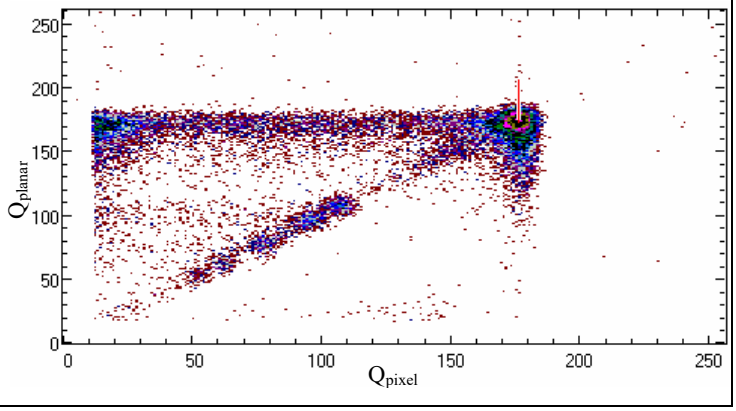
Pixel 8



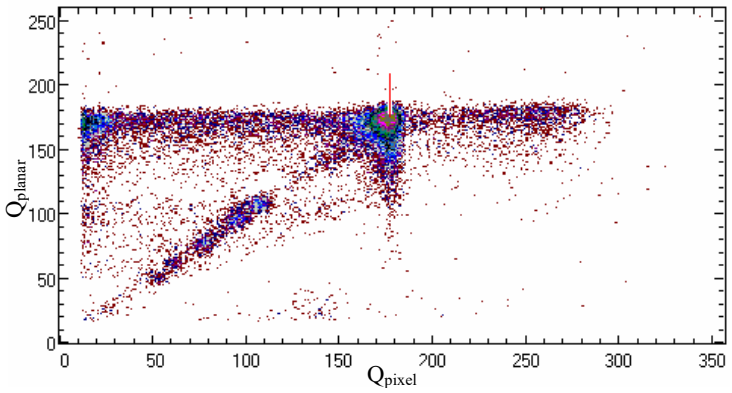
Pixel 10



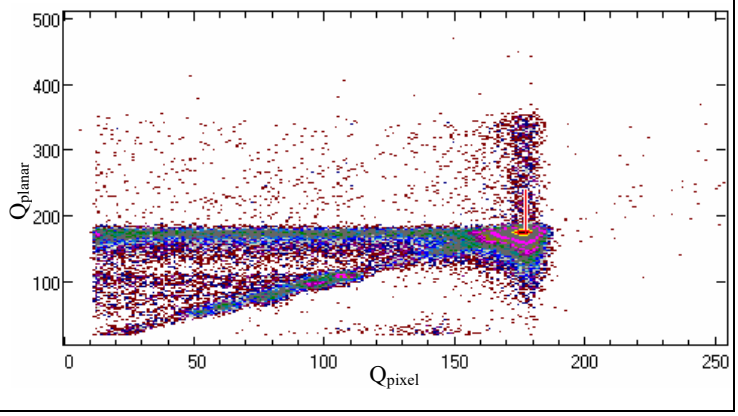
Pixel 11



Pixel 13

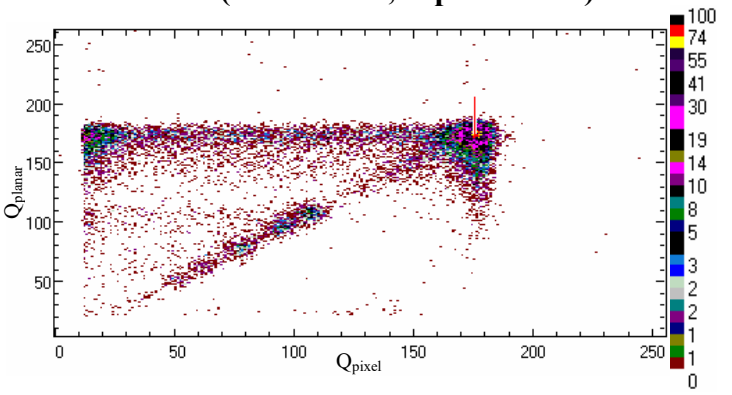


Pixel 16

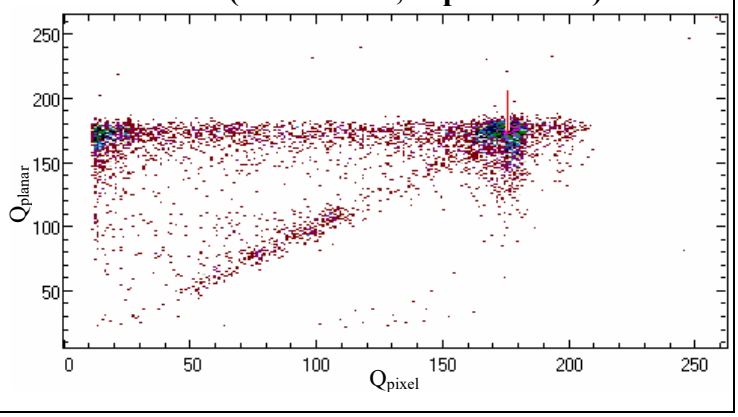


The colour palette of pixel 6 is effective for pixel 13.

Pixel 6 (Vd = - 75 V, Vp = - 300 V)



Pixel 13 (Vd = - 45 V, Vp = - 300 V)



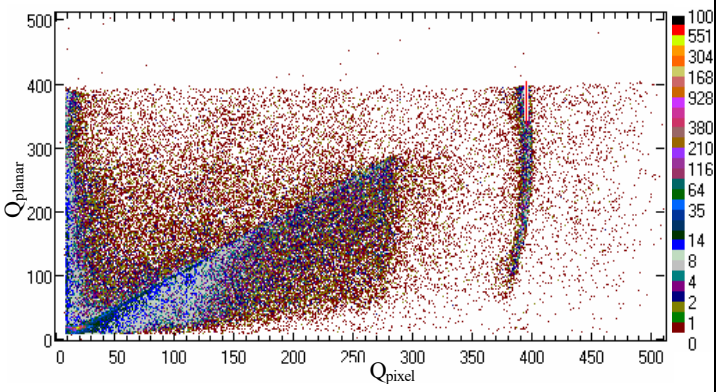
The bias voltages are:

- V_d = - 100 V
- V_p = - 300 V

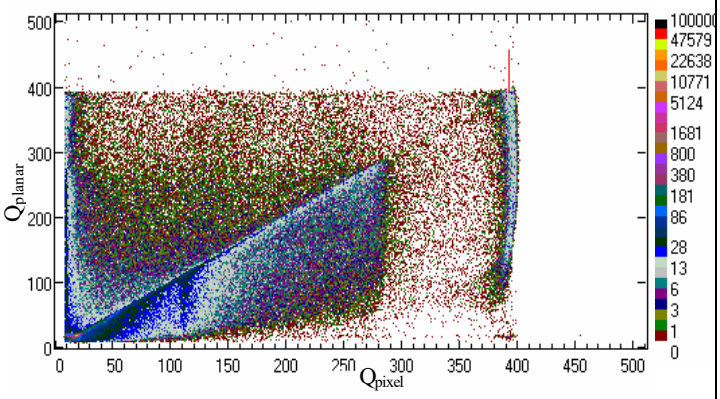
The colour palette of pixel 3 is effective for the other pixels, except for pixel 5.

Detector K18#4 Source ^{137}Cs

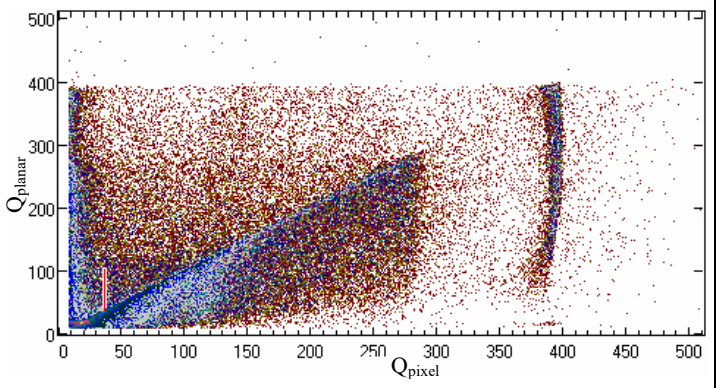
Pixel 3



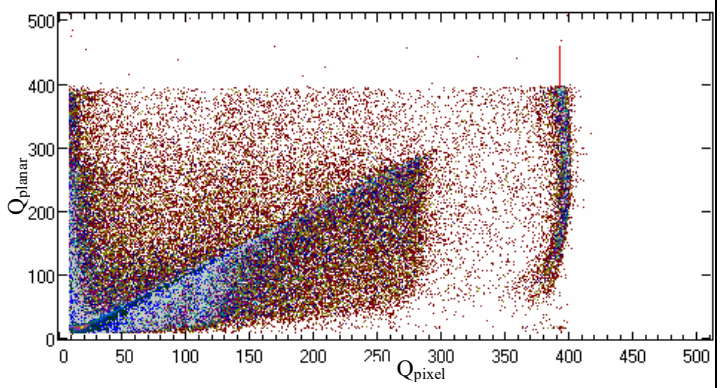
Pixel 5



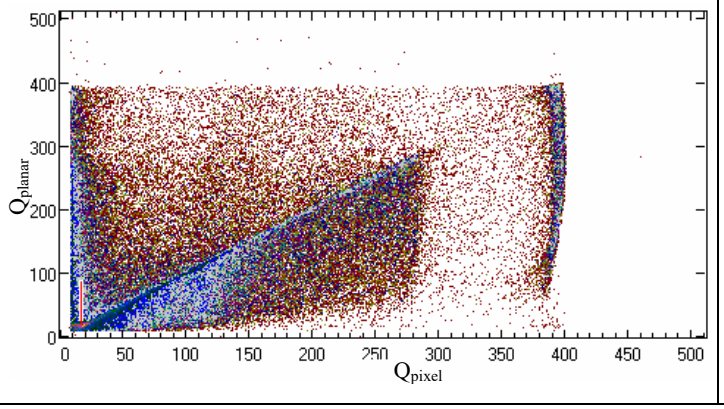
Pixel 6



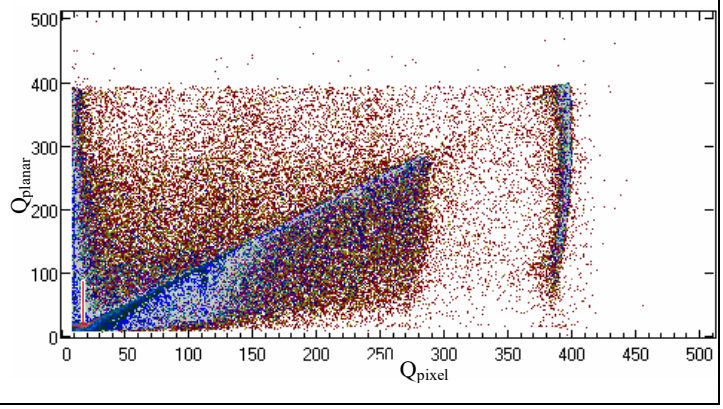
Pixel 8



Pixel 11



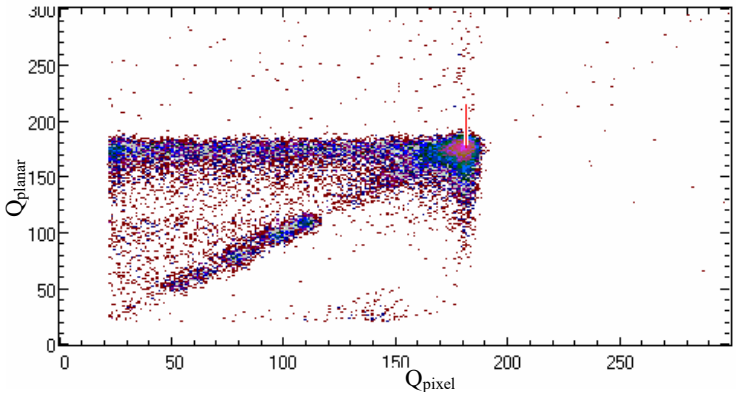
Pixel 15



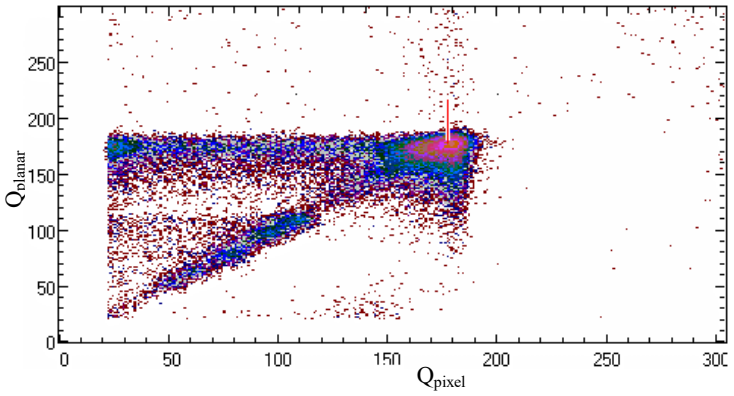
The bias voltages are: V_d = - 100 V and V_p = - 300 V. The colour palette is that of det. k18#4 pixel 2.

Detector K30#10 Source ^{241}Am

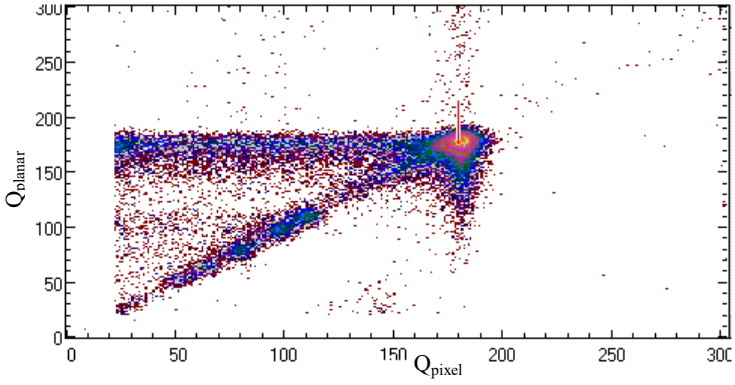
Pixel 2



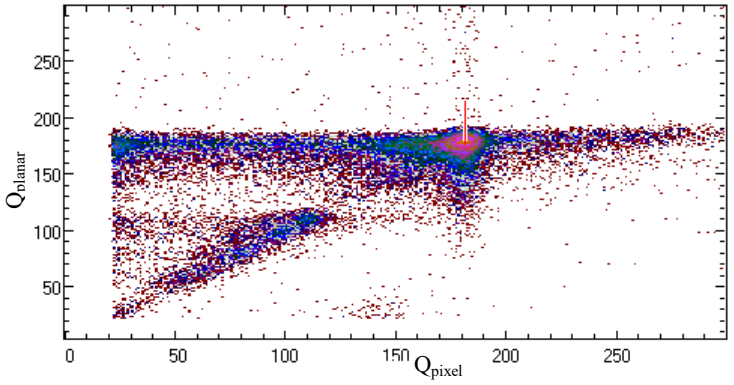
Pixel 4



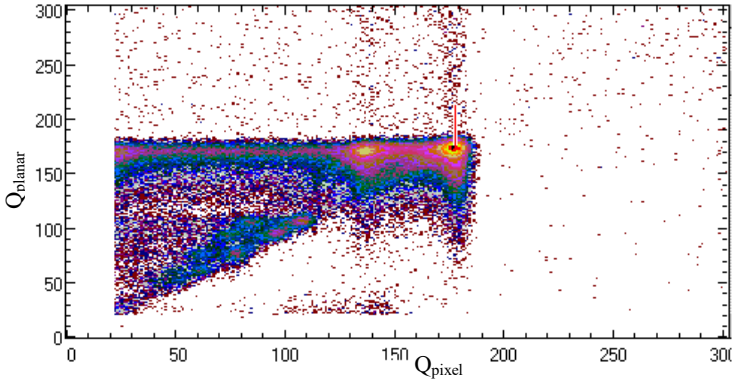
Pixel 6



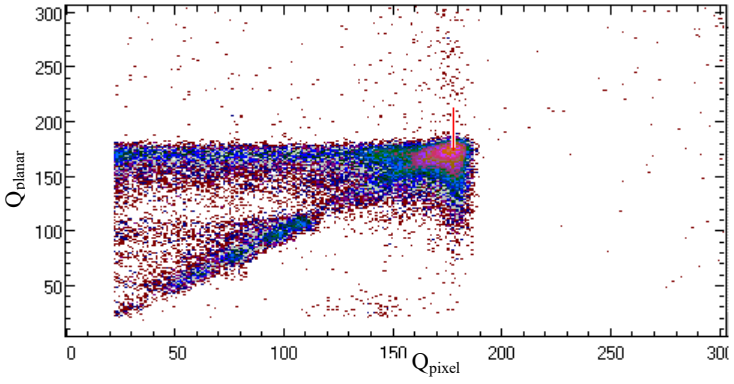
Pixel 7 (Vd = - 75 V, Vp = - 300 V)



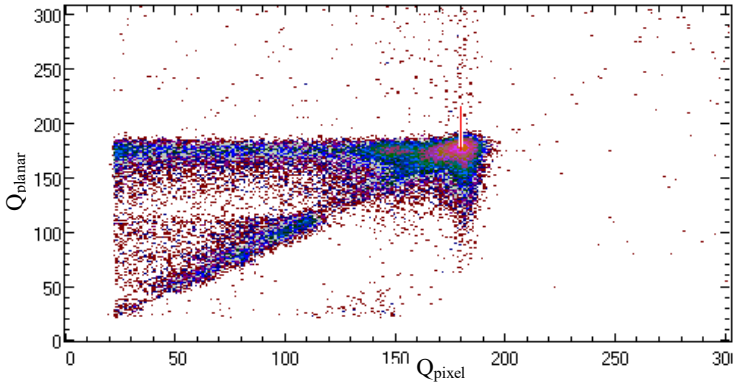
Pixel 8 (Vd = - 75 V, Vp = - 200 V)



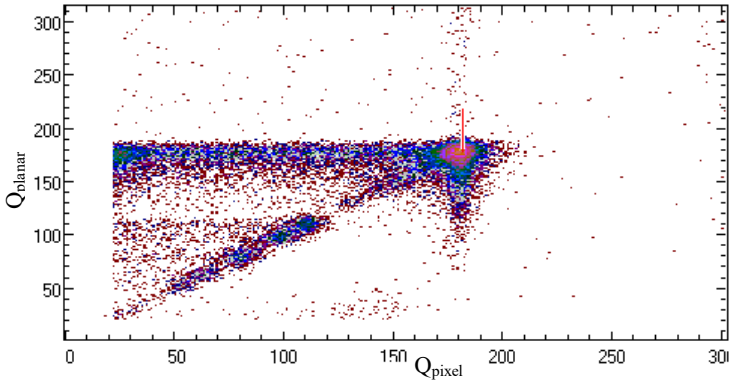
Pixel 9 (Vd = - 75 V, Vp = - 200 V)



Pixel 10 (Vd = - 75 V, Vp = - 300 V)



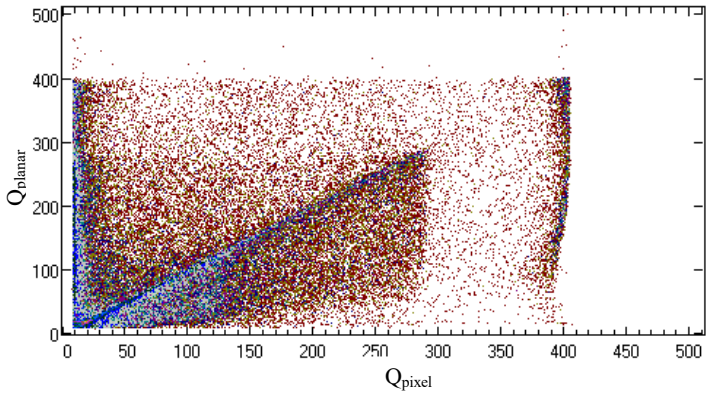
Pixel 11 (Vd = - 75 V, Vp = - 300 V)



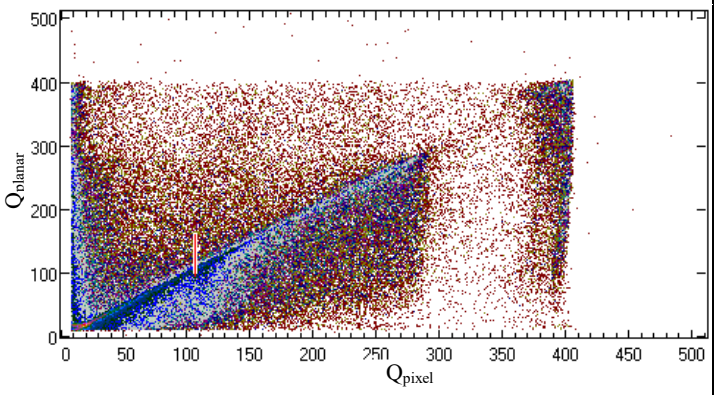
The bias voltages are: V_d = - 100 V and V_p = - 300 V.

Detector K30#10 Source ^{137}Cs

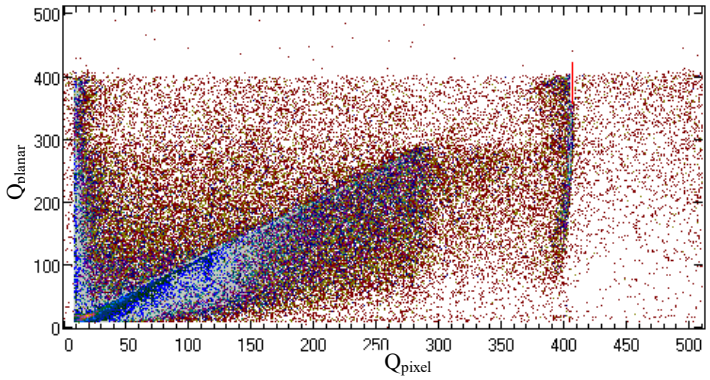
Pixel 2



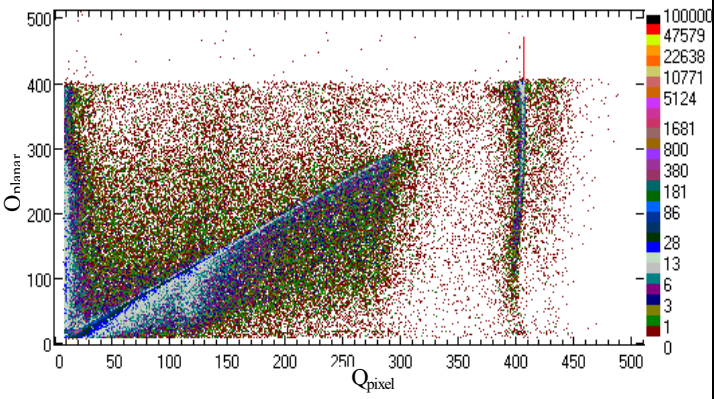
Pixel 4



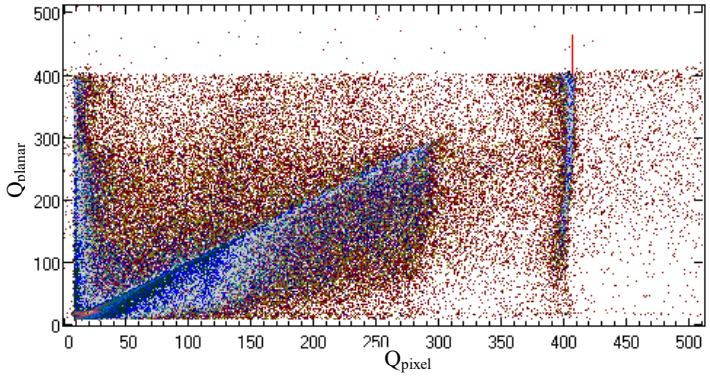
Pixel 5



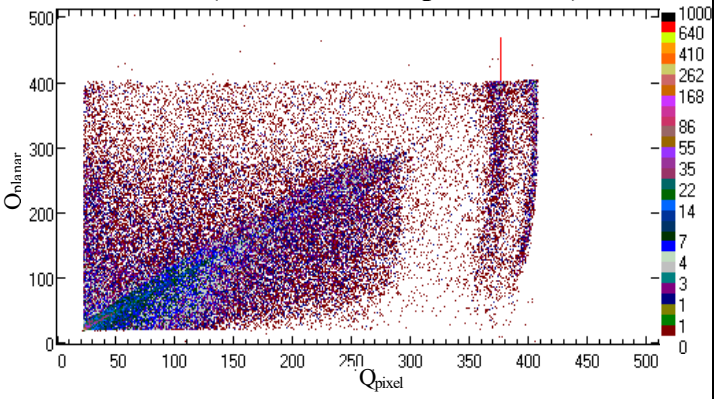
Pixel 6



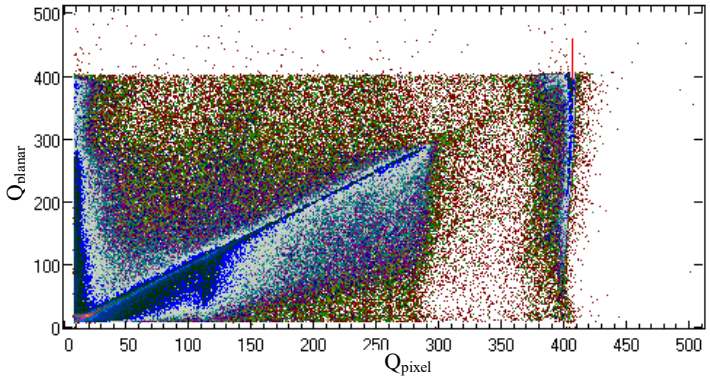
Pixel 7



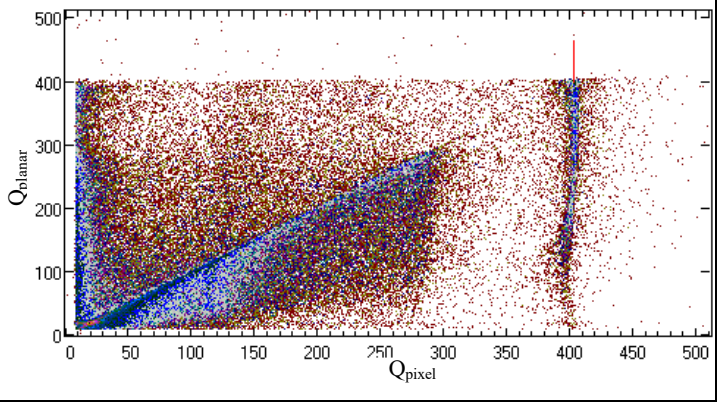
Pixel 8 (Vd = - 75 V, Vp = - 300 V)

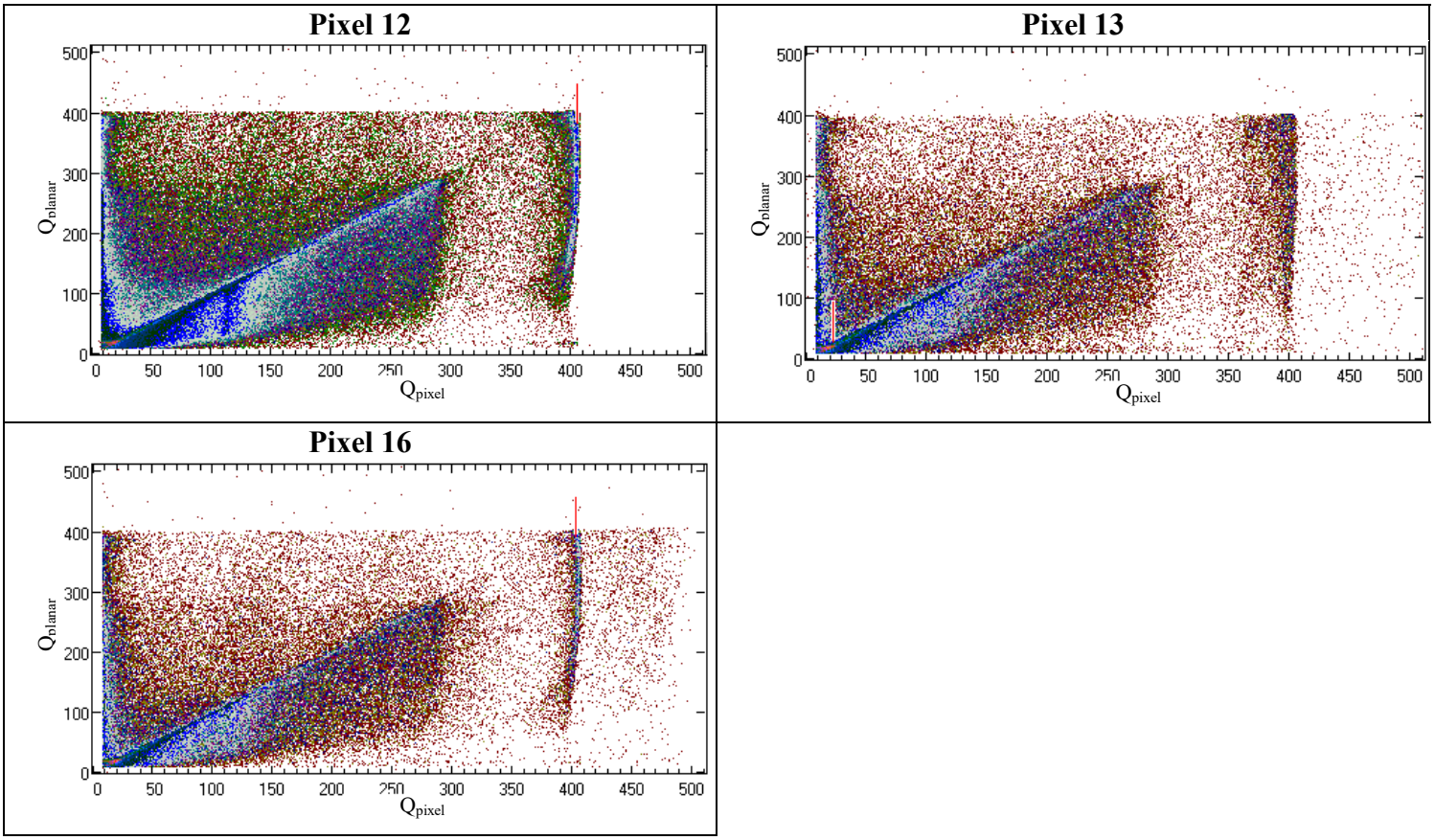


Pixel 10



Pixel 11





The colour palette is that of detector k18#4 pixel 3, except for pixel 8. The colour palette reported by side of the pixels 6 is effective for pixel 10 and 12.

Acknowledgment

This work was supported financially by Program Short-Term Mobility – 2002/2003 of Italian National Research Council.