

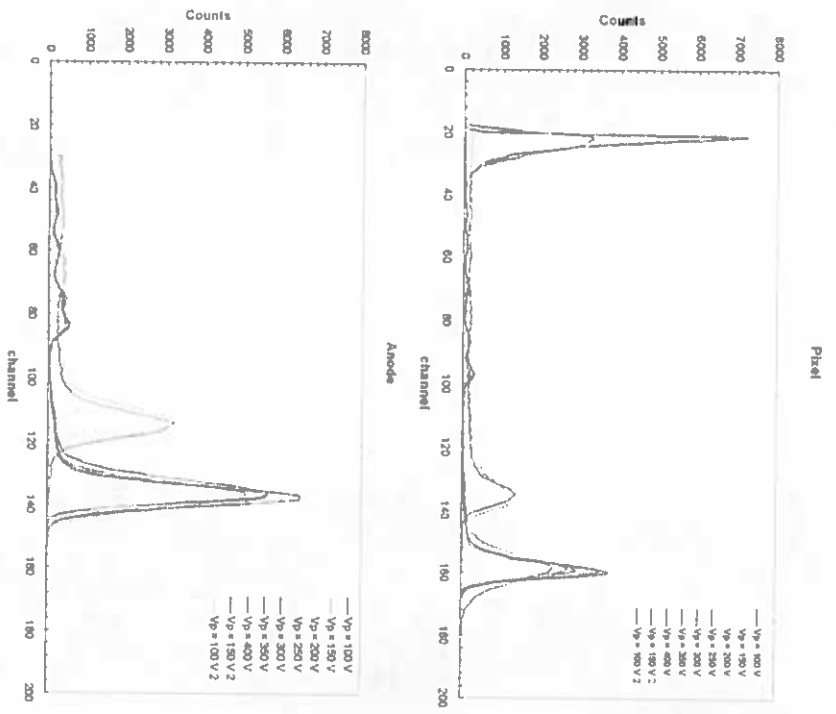
**Study of the stability of In/CdTe/Pt detectors.**

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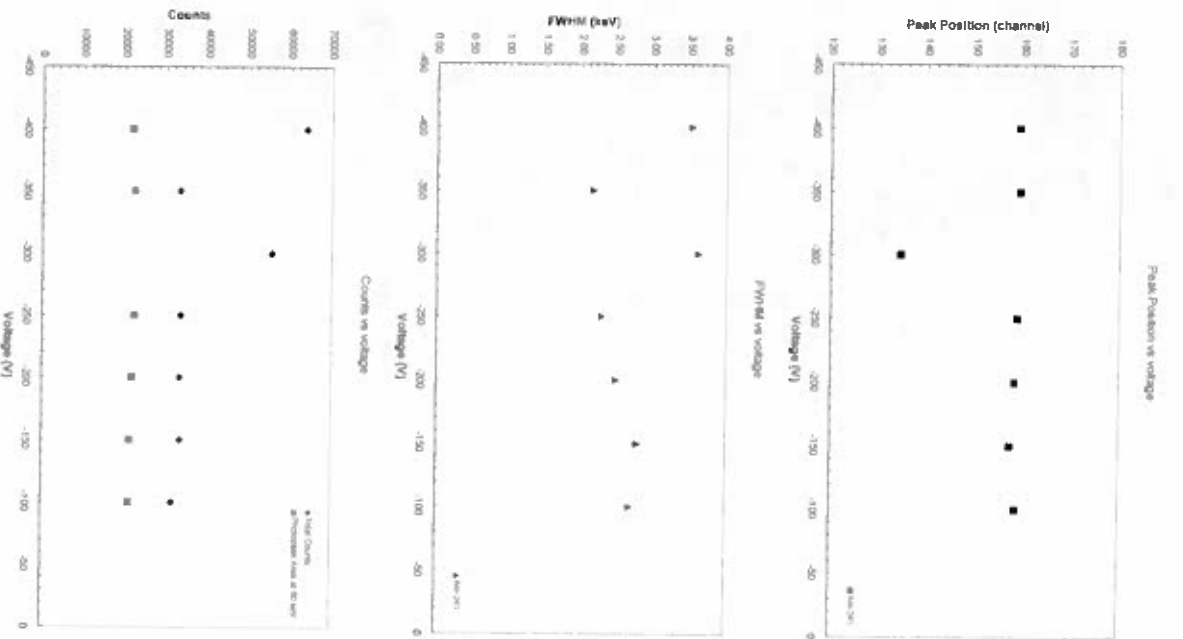
*Internal report n. 399*

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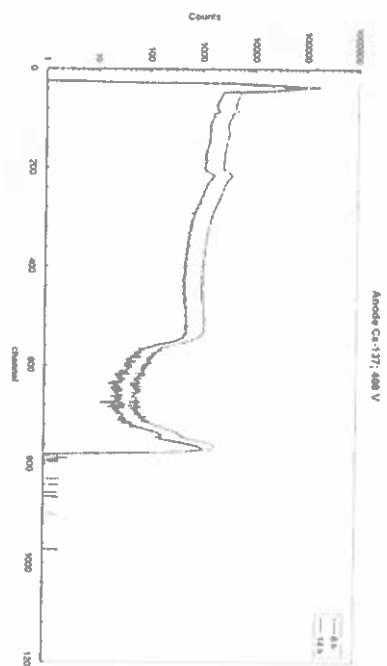
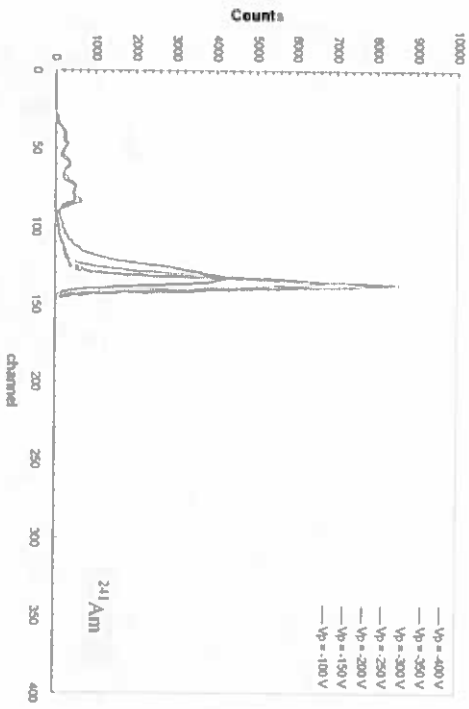
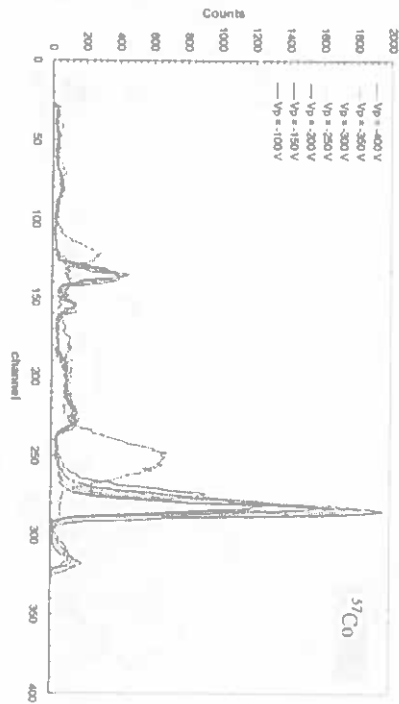


Voltage (V)	FWHM(keV)	Peak Position	Total Counts	Peak area
-100	2.69	158.49	31609	21254
-150	2.79	157.34	33525	21304
-200	2.49	158.27	33352	21824
-250	2.29	158.78	33548	22340
-300	3.62 (noisy)	154.58	55562	
-350	2.16	159.20	33315	22341
-400	3.52 (noisy)	159.11	63853	21747



$^{137}\text{Cs}$					
Voltage (V)	FWHM (channel)	Peak Position (channel)	Total Counts (counts)	PhotoPeak area at 662 keV (counts)	Energy Res. (%)
-400 (14h)	14.39	890.21			1.62
-400 (6h)	11.56	893.64	5127	517185	1.29

Anode

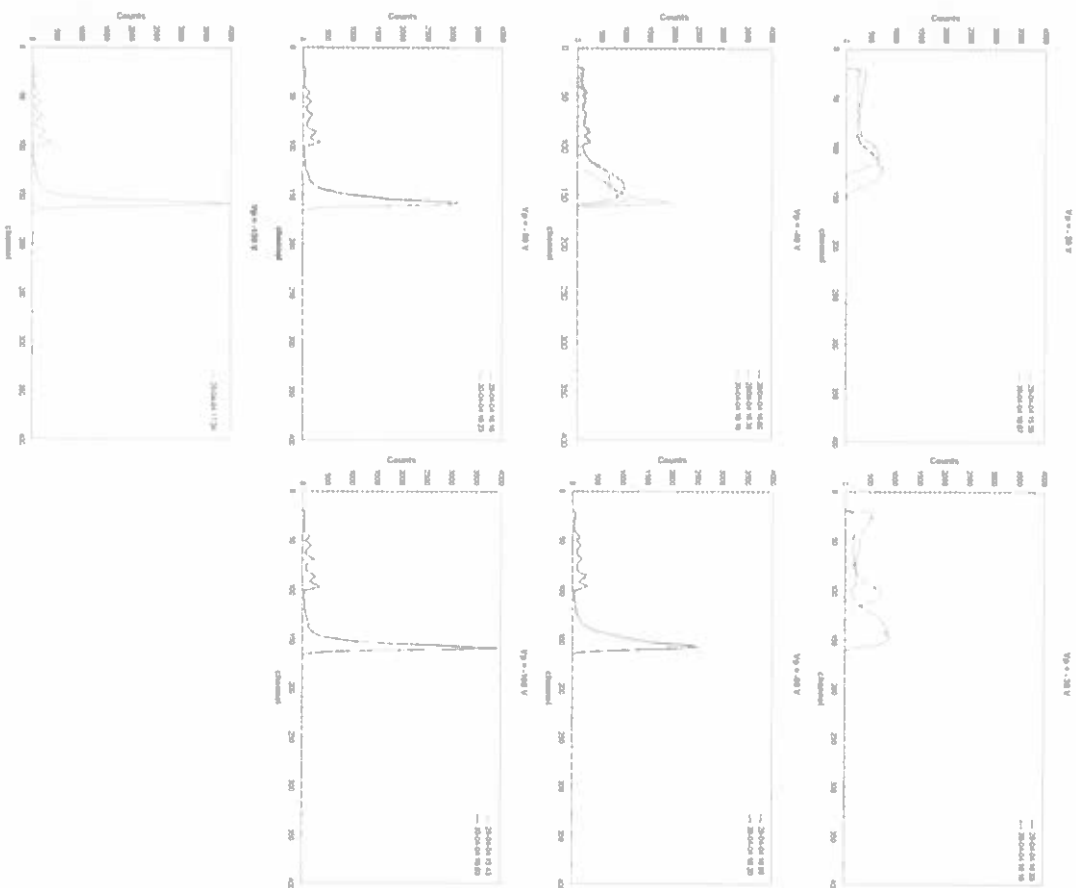


$^{137}\text{Cs}$					
Voltage (V)	FWHM (channel)	Peak Position (channel)	Total Counts (counts)	PhotoPeak area at 122 keV (counts)	Energy Res. (%)
-100	24.06	251.79	35843	16542	9.56
-150	13.53	277.50	36388	16586	4.87
-200	10.33	280.09	36470	16629	3.69
-250	9.57	281.11	35843	16815	3.41
-300	9.02	281.83	36607	17229	3.20
-350	8.90	282.29	36064	17196	3.15
-400	8.95	282.66	17784	36547	3.17

$^{241}\text{Am}$					
Voltage (V)	FWHM (channel)	Peak Position (channel)	Total Counts (counts)	PhotoPeak area at 60 keV (counts)	Energy Res. (%)
-100	11.43	130.68	88689	51669	8.75
-150	7.65	135.83	89267	60253	5.63
-200	7.20	136.63	90156	63249	5.27
-250	7.21	136.95	90321	63980	5.26
-300	7.19	137.21	89624	63821	5.24
-350	7.35	137.38	90461	63543	5.35
-400	7.76	137.41	90268	65490	5.65

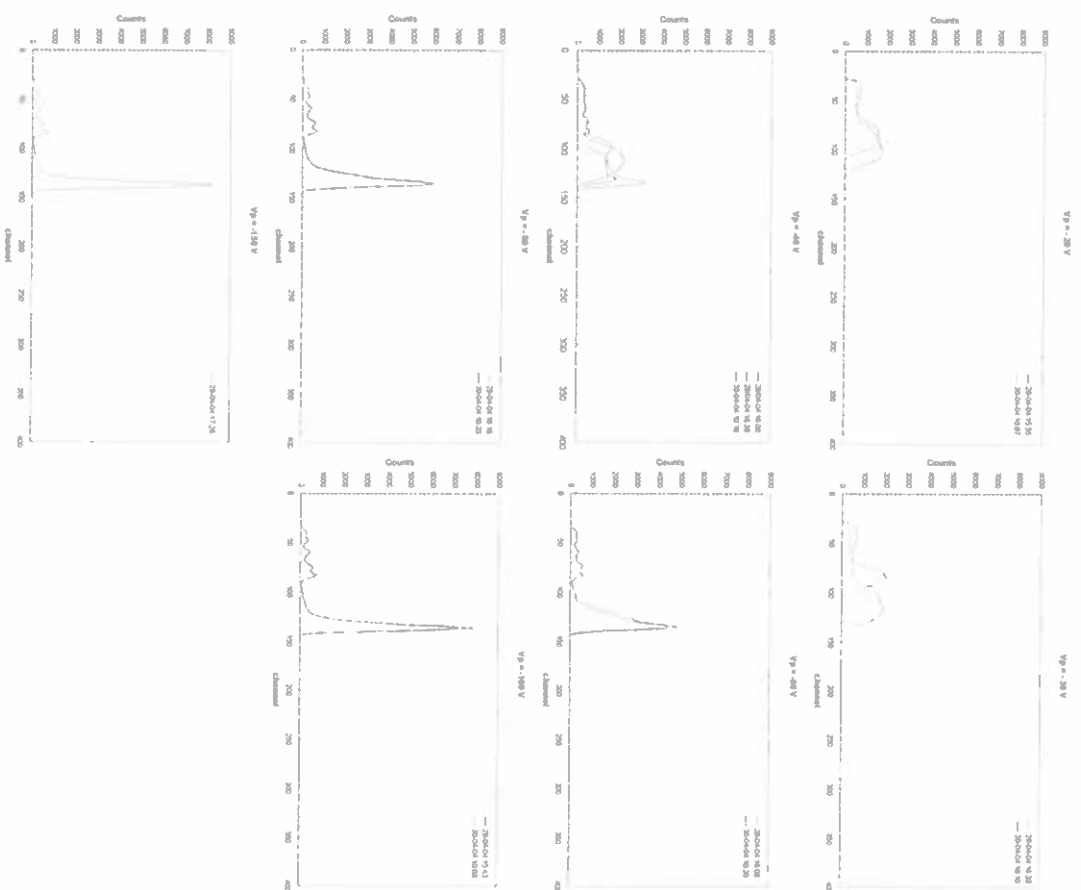
$^{137}\text{Cs}$					
Voltage (V)	FWHM (channel)	Peak Position (channel)	Total Counts (counts)	PhotoPeak area at 662 keV (counts)	Energy Res. (%)
-400 (6h)	10.96	765.09	12578	1079150	1.43

The following figures report the pixel spectra acquired at low voltage by irradiating the detector with a source of  $^{241}\text{Am}$ . The real time is 100 s.

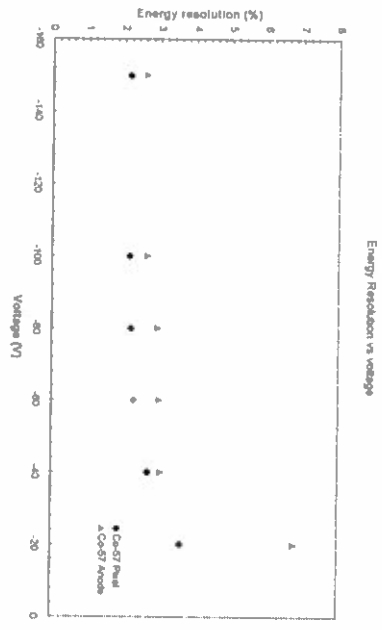


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The following figures report the anode spectra acquired at low voltage by irradiating the detector with a source of  $^{241}\text{Am}$ . The real time is 100 s.



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**<sup>57</sup>Co - Pixel - 29/04/04**

Voltage (V)	FWHM (channel)	Peak Position (channel)	Total Counts (counts)	Energy Res. (%)
-20	11.48	317.84	13379	3.61
-40	8.77	325.65	12773	2.69
-60	7.52	327.43	12621	2.30
-80	7.24	327.90	12327	2.21
-100	7.11	328.45	12290	2.16
-150	7.11	328.66	12410	2.16

**<sup>57</sup>Co - Anode - 29/04/04**

Voltage (V)	FWHM (channel)	Peak Position (channel)	Total Counts (counts)	Energy Res. (%)
-20	17.81	262.46	24163	6.78
-40	8.54	279.56	24403	3.06
-60	8.46	281.02	24603	3.01
-80	8.34	281.55	24377	2.96
-100	7.52	282.16	24154	2.66
-150	7.40	282.35	24692	2.62

**<sup>51</sup>Am - Pixel - 29/04/04**

Voltage (V)	FWHM (channel)	Peak Position (channel)	Total Counts (counts)	Energy Res. (%)
-20	26.84	108.12	40395	24.82
-30	18.69	104.36	38228	17.91
-40	6.86	157.24	42119	4.36
-40	9.47	153.94	43310	6.15
-60	6.83	157.97	42002	4.33
-80	6.42	158.34	41972	4.06
-100	6.22	158.79	41578	3.92
-150	6.22	158.95	42724	3.91

**<sup>51</sup>Am - Anode - 29/04/04**

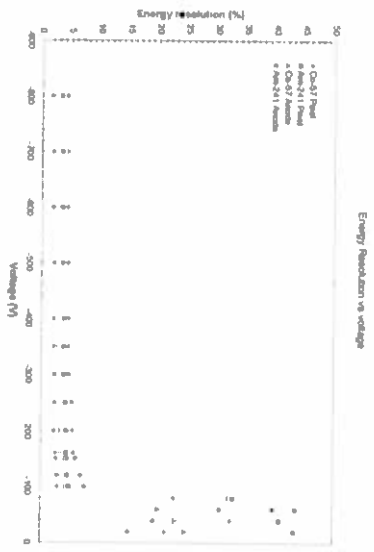
Voltage (V)	FWHM (channel)	Peak Position (channel)	Total Counts (counts)	Energy Res. (%)
-20	28.30	87.51	72399	32.34
-30	19.05	85.34	65848	22.33
-40	7.52	134.69	89191	5.58
-40	8.01	131.69	90026	6.08
-60	8.09	135.48	90096	5.97
-80	7.04	136.28	90110	5.17
-100	6.81	136.75	89996	4.98
-150	6.83	136.90	92244	4.99

**<sup>241</sup>Am - Pixel - 30/04/04**

Voltage (V)	FWHM (channel)	Peak Position (channel)	Total Counts (counts)	Energy Res. (%)
-20	34.28	122.52	44511	27.98
-30	33.23	140.78	46113	23.60
-40	30.30	142.26	46171	21.30
-60	7.02	157.29	44880	4.46
-80	6.30	158.24	44564	3.98
-100	6.38	158.78	44705	4.02

**<sup>241</sup>Am - Anode - 30/04/04**

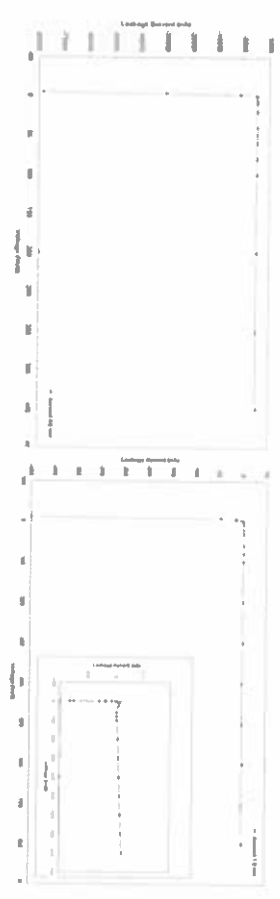
Voltage (V)	FWHM (channel)	Peak Position (channel)	Total Counts (counts)	Energy Res. (%)
-20	35.93	98.45	85955	36.49
-30	33.17	112.69	95247	29.43
-40	28.38	114.44	95167	24.80
-60	8.50	134.62	96316	6.31
-80	7.06	136.10	95500	5.19
-100	6.83	136.90	96465	4.99



### 3.3 Current - Voltage characteristics

We have measured the leakage current of two detectors. As shown in figure below, the detectors show the current-voltage characteristics typical to a diode. A significant suppression of the leakage current is obtained in the reverse bias operation of the In(anode)/CdTe/Pr(cathode) configuration at room temperature.

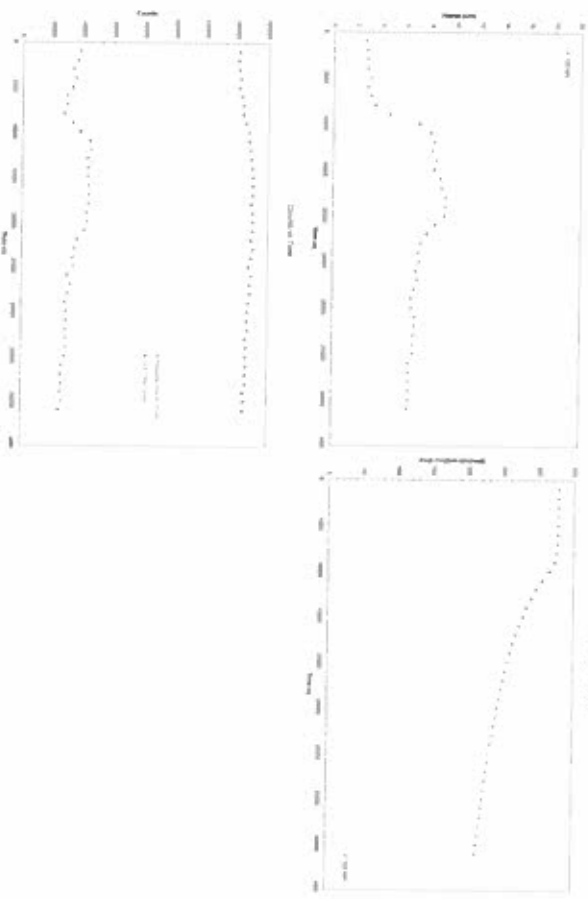
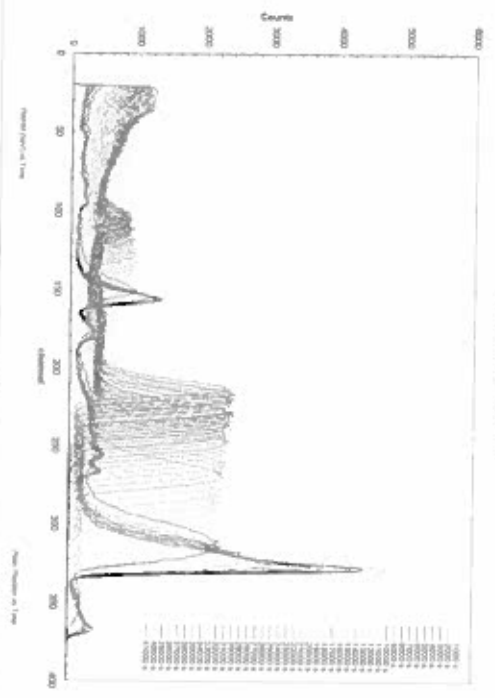
The leakage current of the 4 mmx4 mmx0.5 mm detector is 0.32 nA with a bias voltage of 400 V at 20°C.

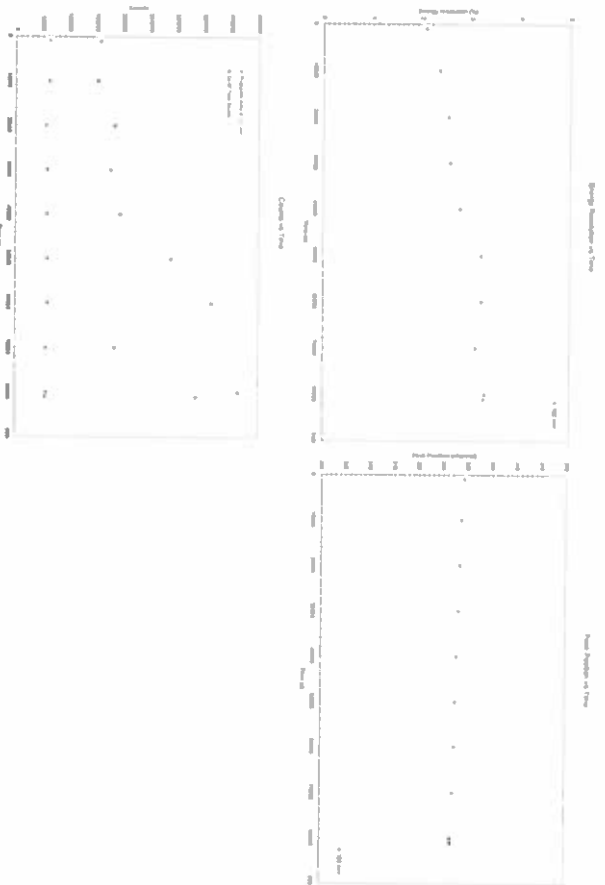


### 3.4 Detector long term stability

We have studied the behavior of two detector as a function of the acquisition time when the sensors are illuminated continuously with radioactive sources. Although the improvement of the energy resolution obtained by adopting the Schottky junction is drastic, we found that when operated with a low bias voltage (below 200 V for 0.5 mm thick detector) at room temperature, the time-dependent drift of the pulse height becomes significant. The peak centroid channel of the  $\gamma$ -ray line started to drift after a stable period. This phenomenon is named polarization effect observed in semiconductor detectors. It should be noted that the spectral performance recovers after the bias voltage is re-applied.

**Detector 03090101-1.** We have illuminated the detector thick 0.5 mm, polarized at  $-100$  V and at  $-400$  V, with a  $^{57}\text{Co}$  source. The acquisition time is 1000 s. The spectra and the analysis results are illustrated in the following figures and tables.





**Detector 03090101-2.** We have irradiated the detector thick 1 mm, polarized at  $\sim 800$  V, with a  $^{57}\text{Co}$  source. The acquisition time is 1000 s. The spectra and the analysis results are illustrated in the following figures.

