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**Space and momentum distributions
of pions and kaons from $A_{\pi^+K^-}$**

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Abstract

Pions and kaons from $A_{\pi^+K^-}$ breakup were simulated in the DIRAC setup. Events were selected if π^+ and K^- were detected by all drift chambers. Space distributions and correlation plots were obtained in downstream detector planes. The results obtained are useful for estimation of detector dimensions (especially new Cerenkov counters) in the modified DIRAC setup.

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1 Simulation

Pions and kaons from $A_{\pi^+K^-}$ breakup simulated in the DIRAC setup. Events were selected if π^+ and K^- were detected by all drift chambers. Then different distributions were obtained in DC2, DC3, DC4 planes, in front of CH, in a plane 1 m downstream of the front plane of CH, in back side of CH and in PR. If pions and kaons decay or interact before a plane they are excluded from distributions.

Coordinate systems in simulation:

z – along the detector centers of the positive and negative arms,

x – along the detector planes from positive to negative arm,

y – vertical coordinate from down to up.

2 Pion x-distributions

Table 1 is extraction of boundaries, ranges and mean values from histograms 1, 2, 3, 6, 8, 7, and 9.

Table 1: *Pion x-boundaries, ranges, mean values and ratios.*

plane	x_1 cm	x_2 cm	Δx cm	mv cm	R
DC2	-30.00	40.00	70.00	14.94	1.00
DC3	-34.00	52.00	86.00	20.92	1.00
DC4	-38.00	64.00	102.00	27.20	1.00
CH1	-44.00	82.00	126.00	35.65	0.94
CH3	-55.00	110.00	165.00	47.60	0.97
CH2	-70.00	158.00	228.00	67.41	0.89
PR	-75.00	170.00	245.00	73.34	0.99

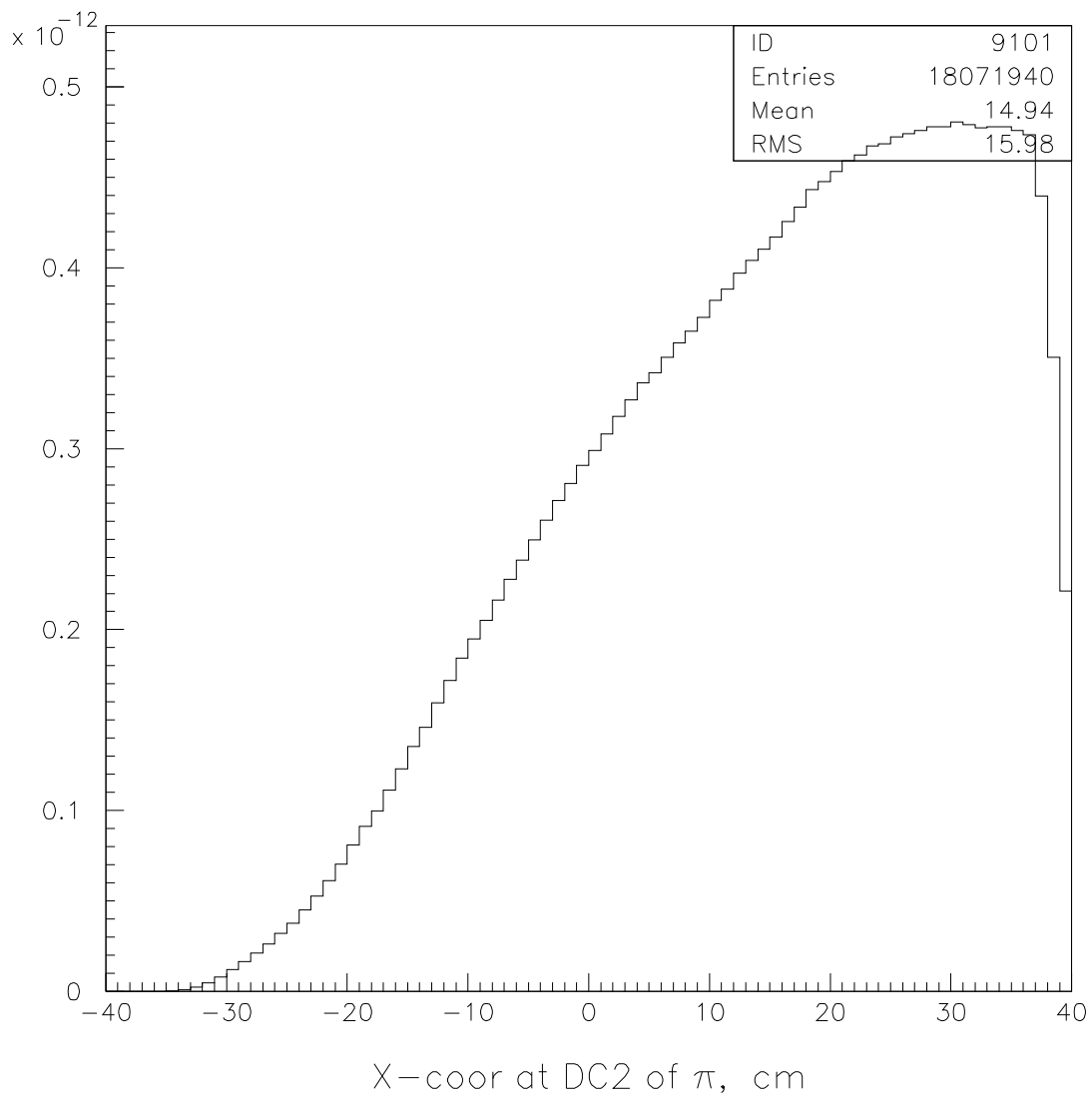


Figure 1: *Pion x-distribution in DC2.*

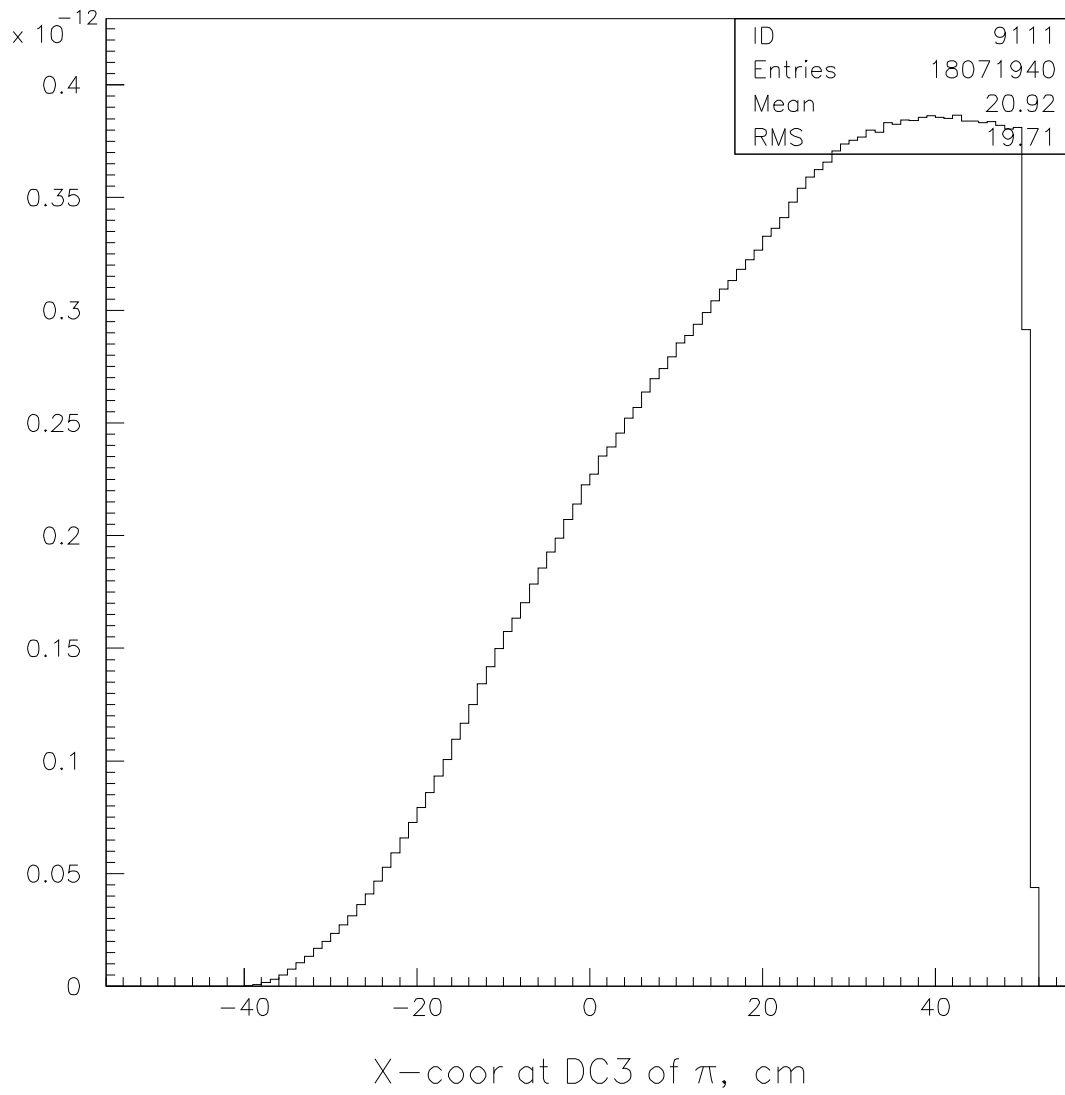


Figure 2: *Pion x-distribution in DC3.*

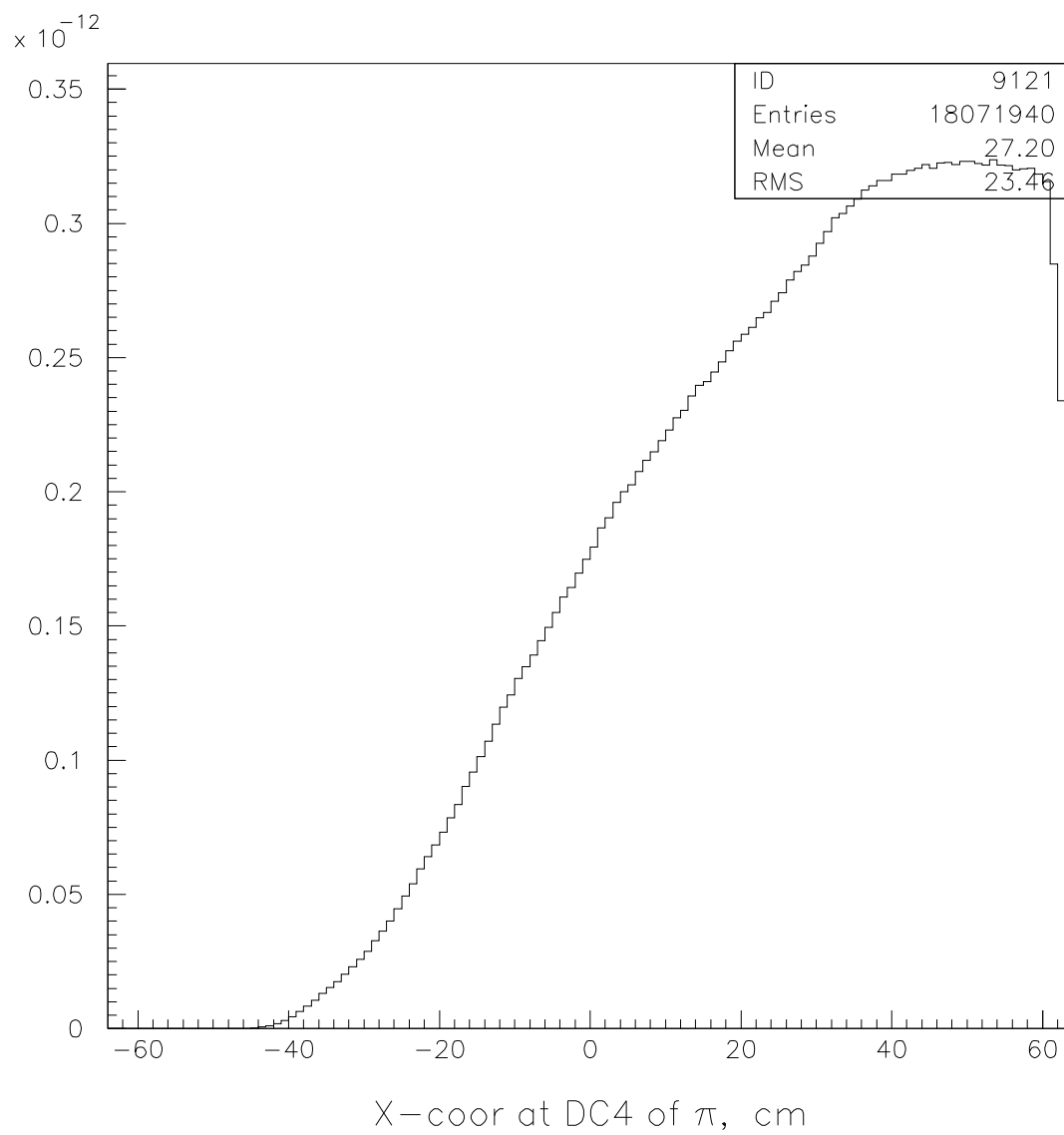


Figure 3: *Pion x-distribution in DC4.*

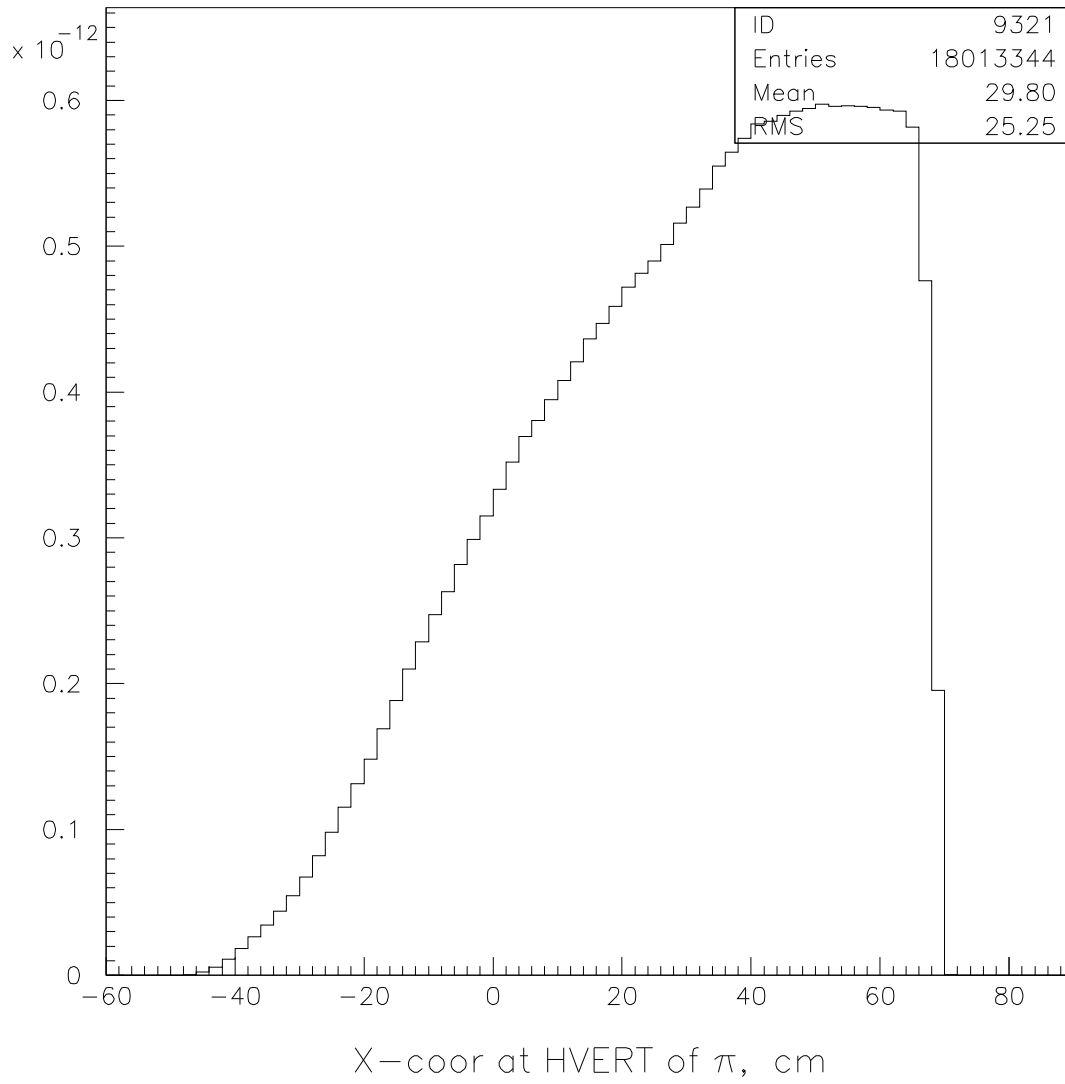


Figure 4: *Pion x-distribution in the Vertical Hodoscope.*

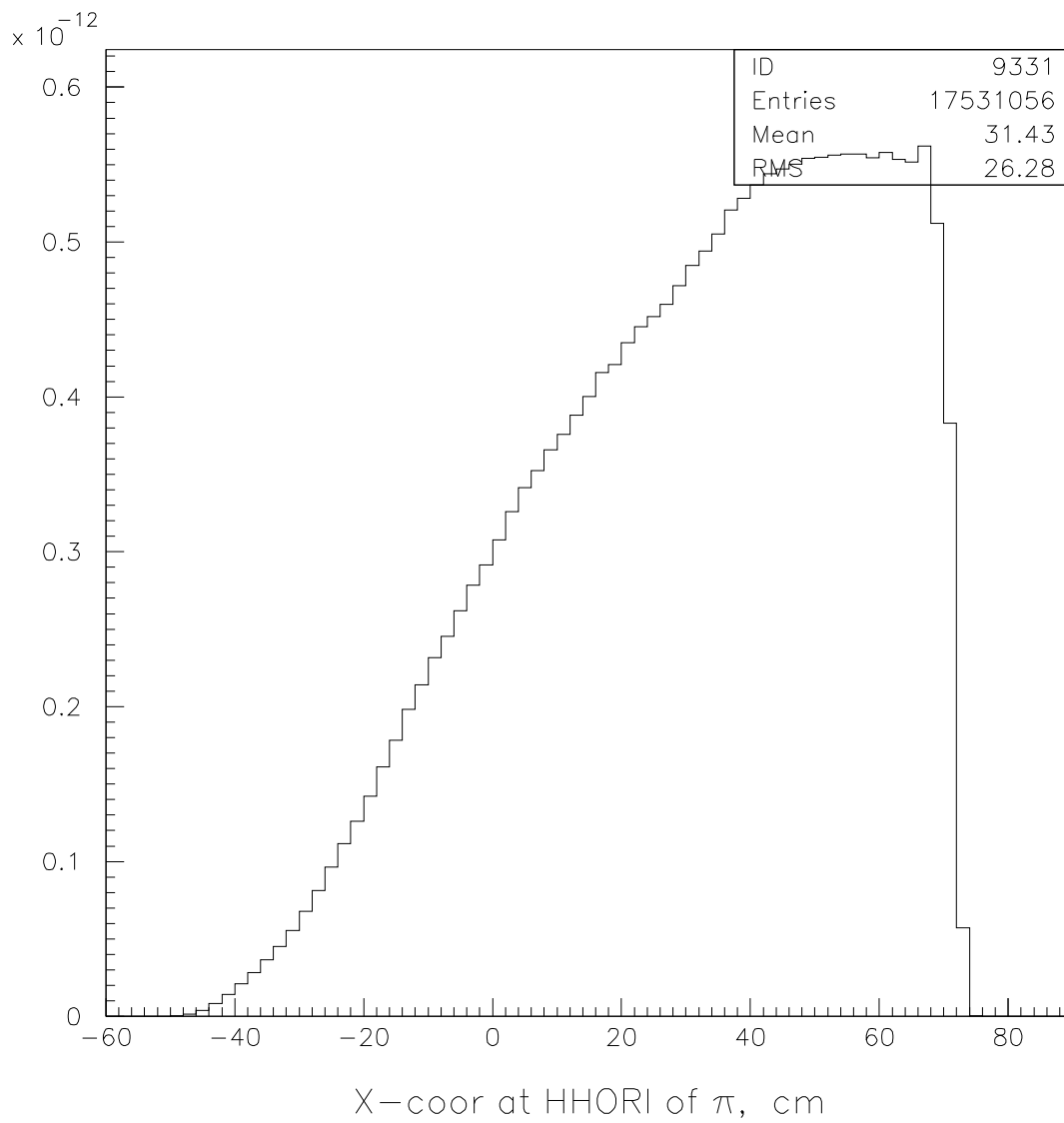


Figure 5: *Pion x-distribution in the Horizontal Hodoscope.*

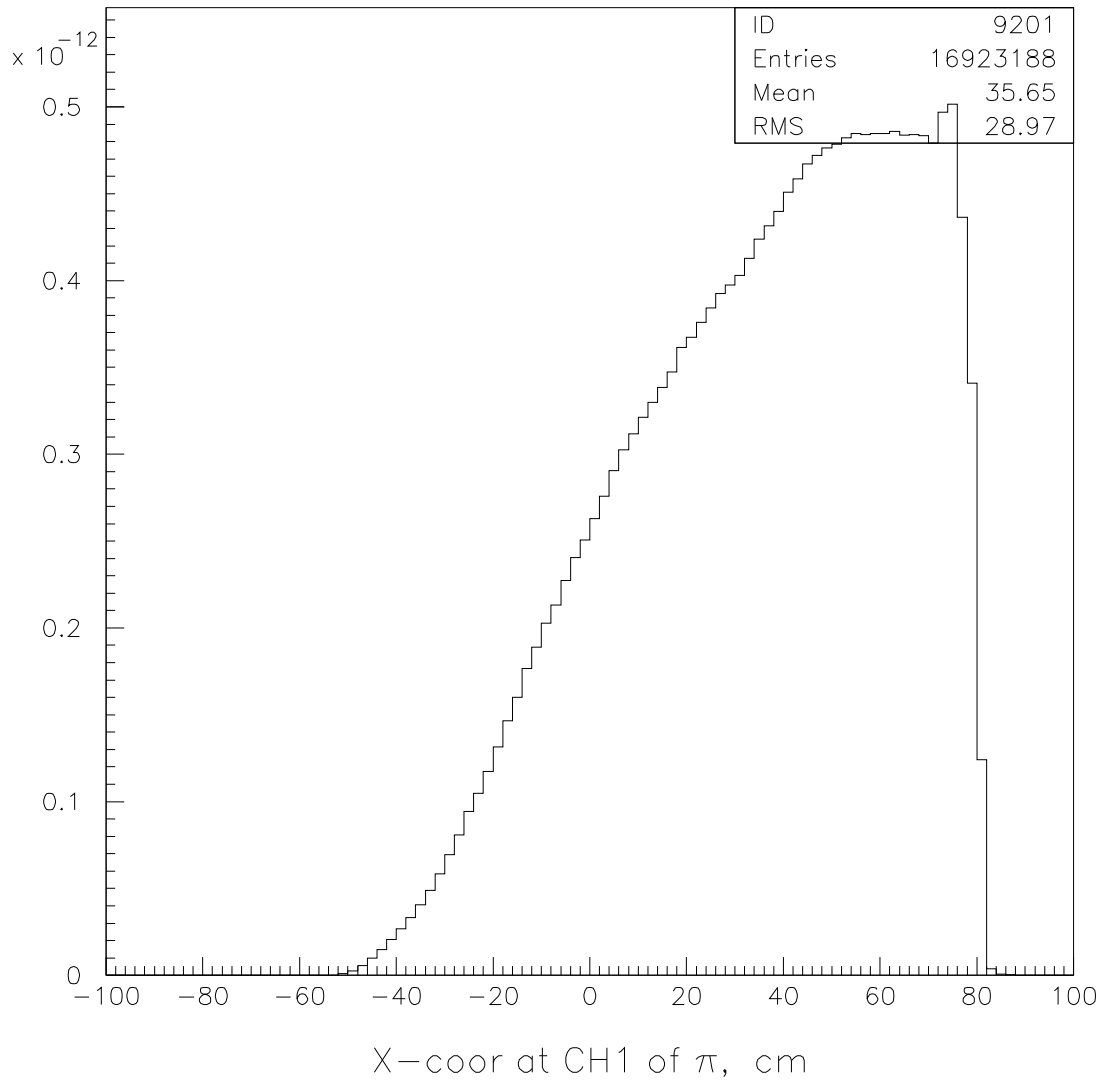


Figure 6: *Pion x-distribution in the front of CH (CH1).*

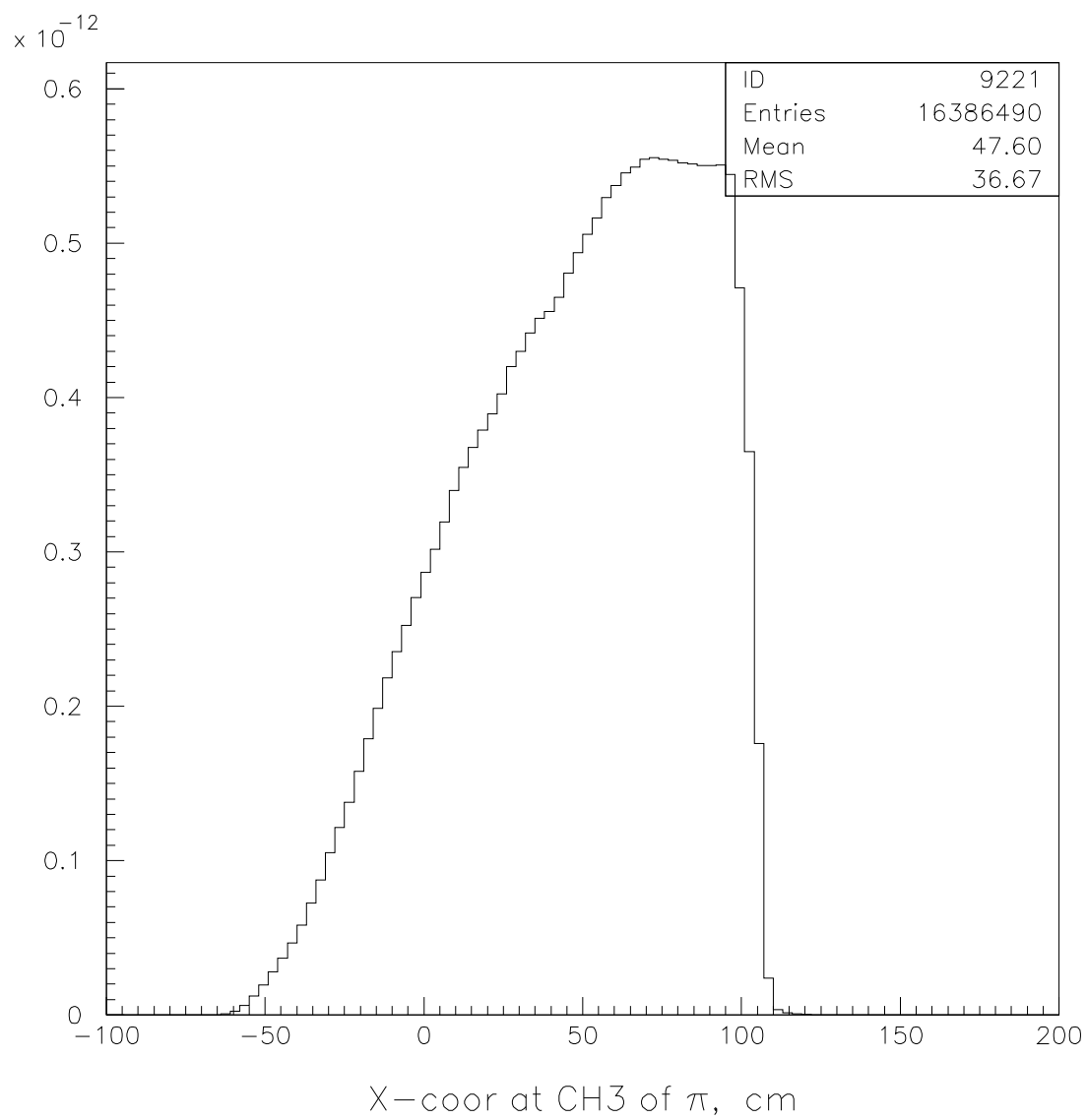


Figure 7: *Pion x-distribution in 1 m from the front of CH (CH3).*

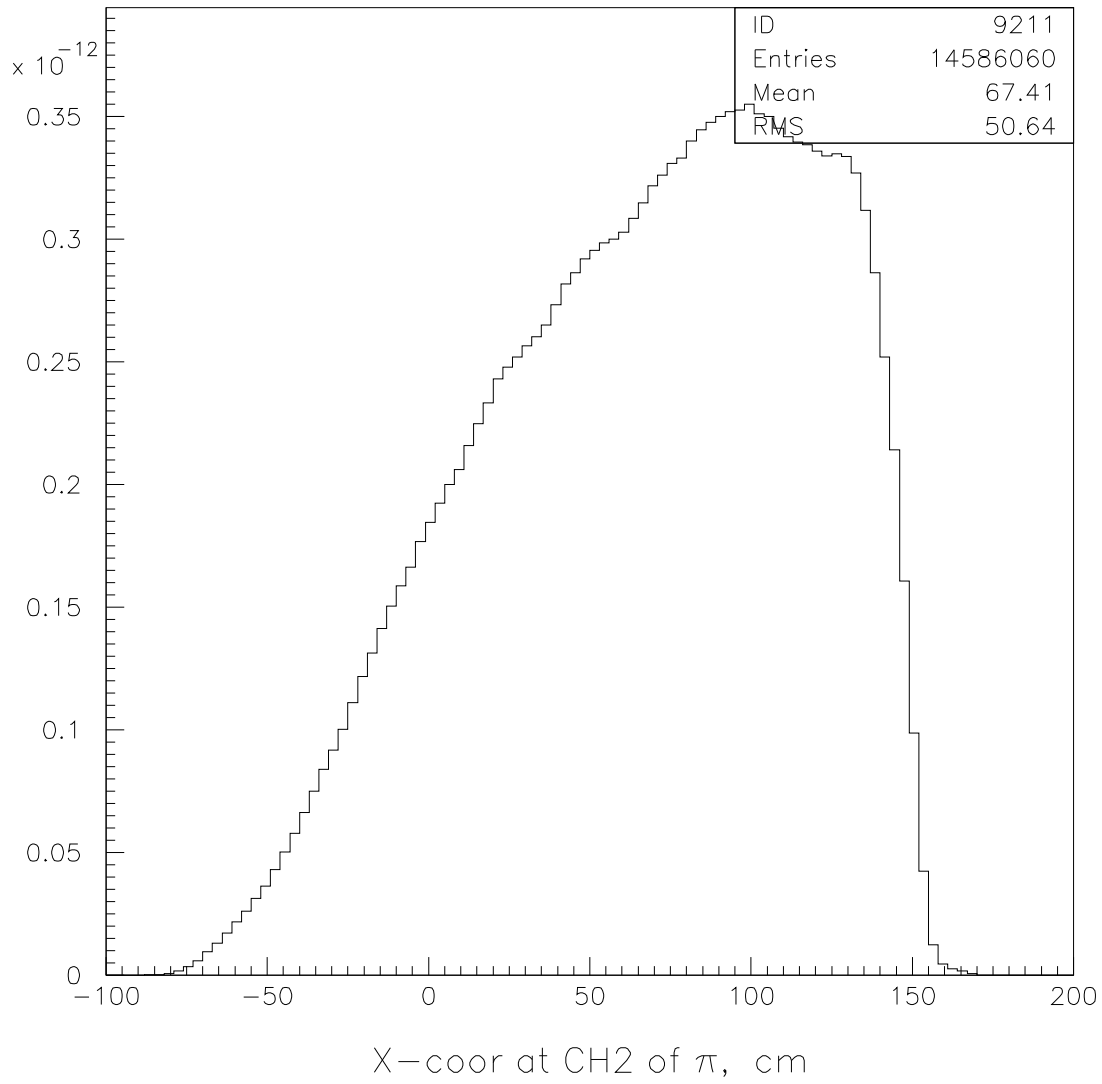


Figure 8: *Pion x-distribution in the back of CH (CH2).*

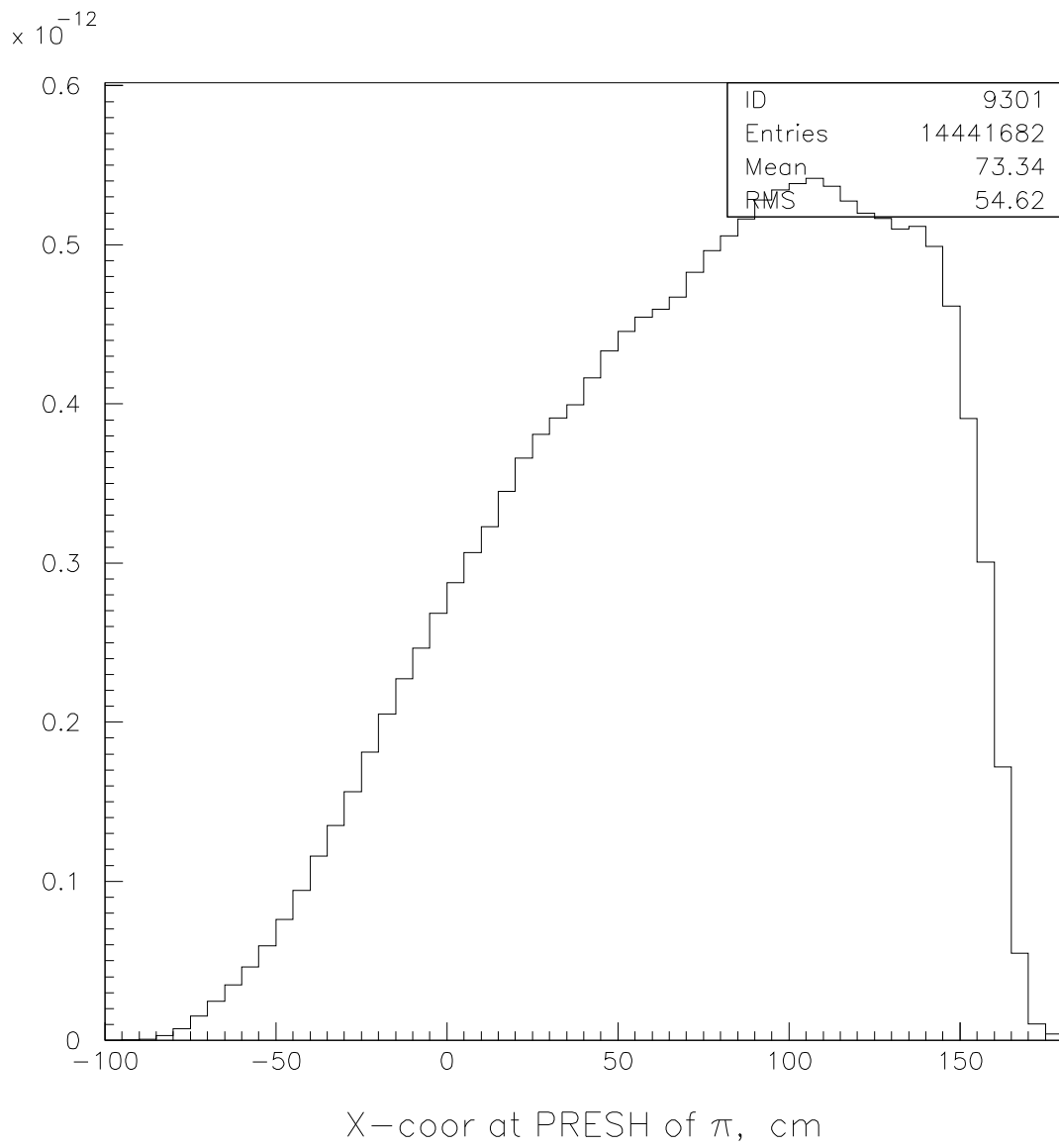


Figure 9: *Pion x-distribution in PR.*

3 Kaon x-distributions

Table 2 is extraction of boundaries, ranges and mean values from histograms 10, 11, 12, 15, 17, 16, and 18.

Table 2: *Kaon x-boundaries, ranges, mean values and ratios.*

plane	x_1 cm	x_2 cm	Δx cm	mv cm	R
DC2	19.50	40.00	20.50	32.56	1.00
DC3	27.50	51.50	24.00	42.57	1.00
DC4	35.00	63.00	28.00	52.29	1.00
CH1	47.00	81.00	34.00	66.89	0.95
CH3	62.00	106.00	44.00	87.07	0.96
CH2	91.00	152.00	61.00	123.50	0.91
PR	99.00	164.00	65.00	133.83	0.99

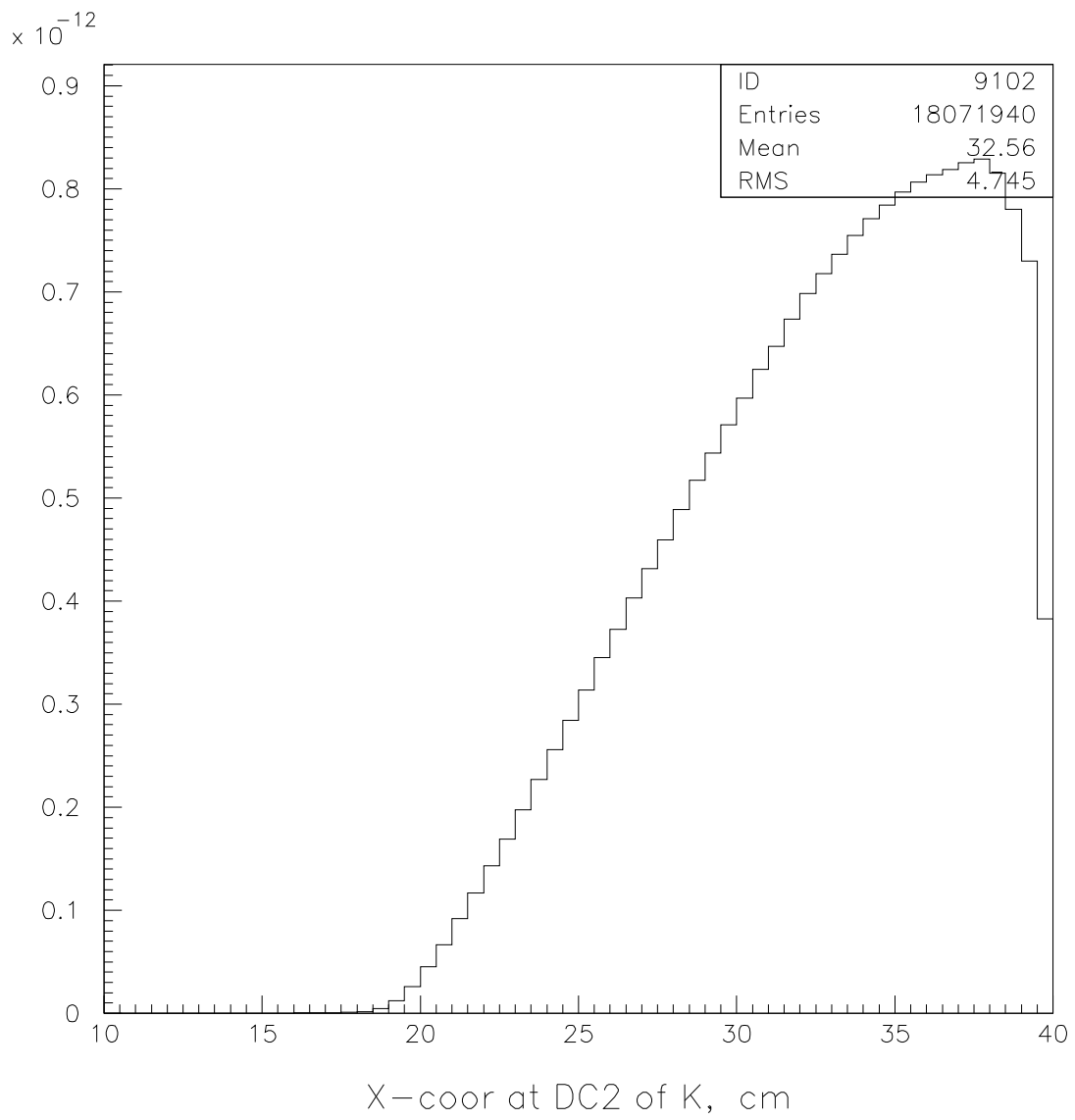


Figure 10: *Kaon x-distribution in DC2.*

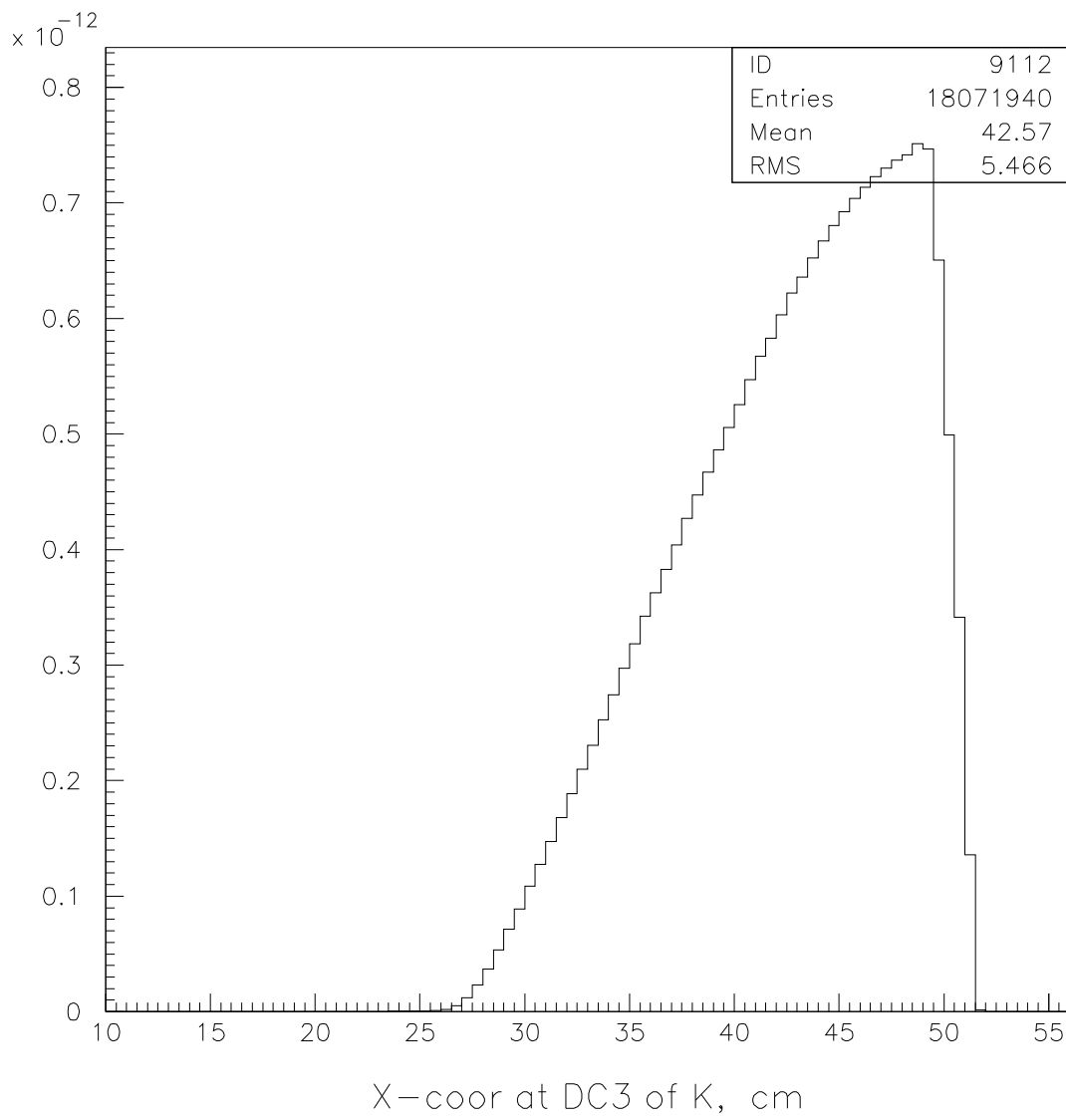


Figure 11: *Kaon x-distribution in DC3.*

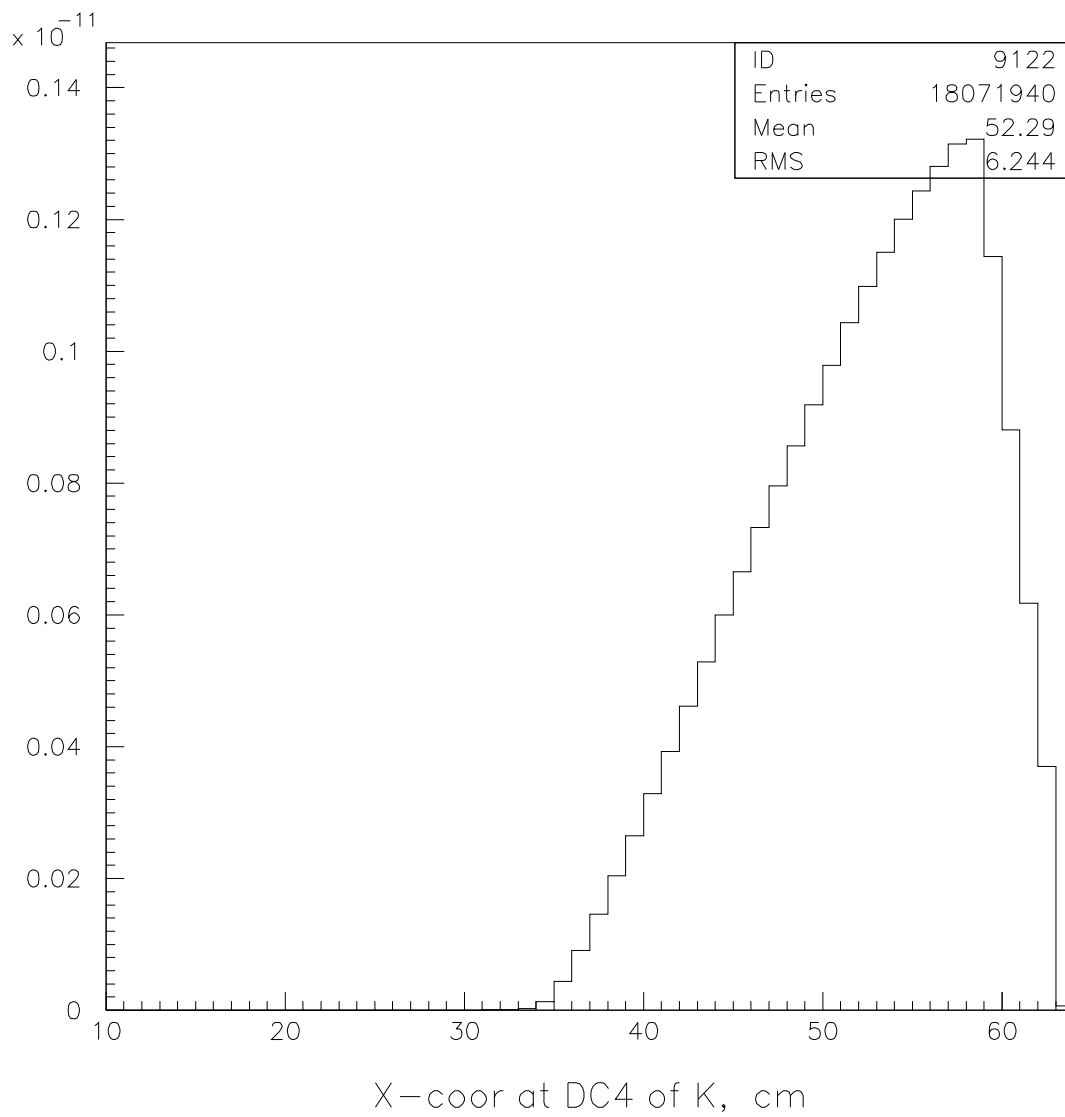


Figure 12: *Kaon x-distribution in DC4.*

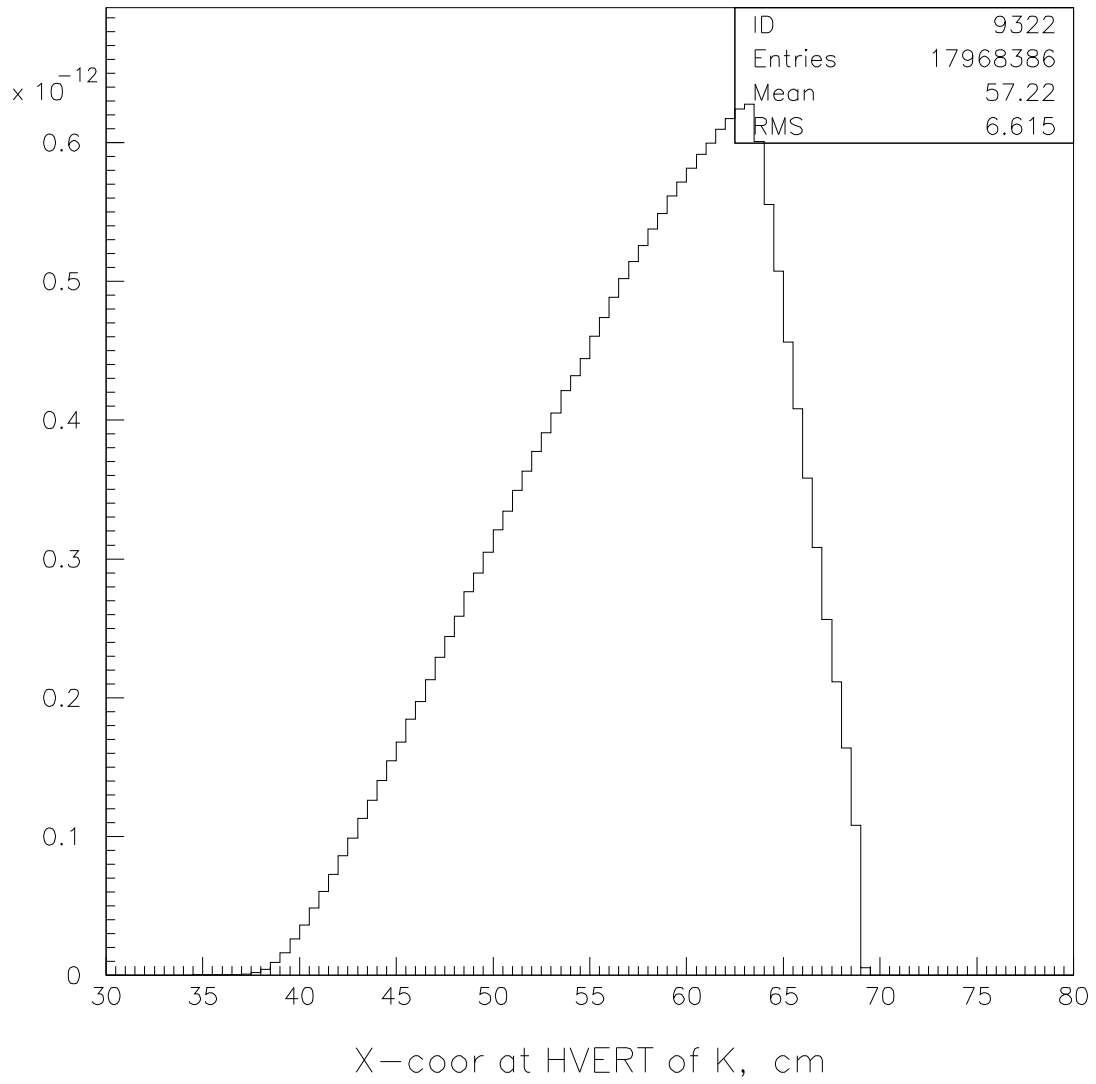


Figure 13: *Kaon x-distribution in the Vertical Hodoscope.*

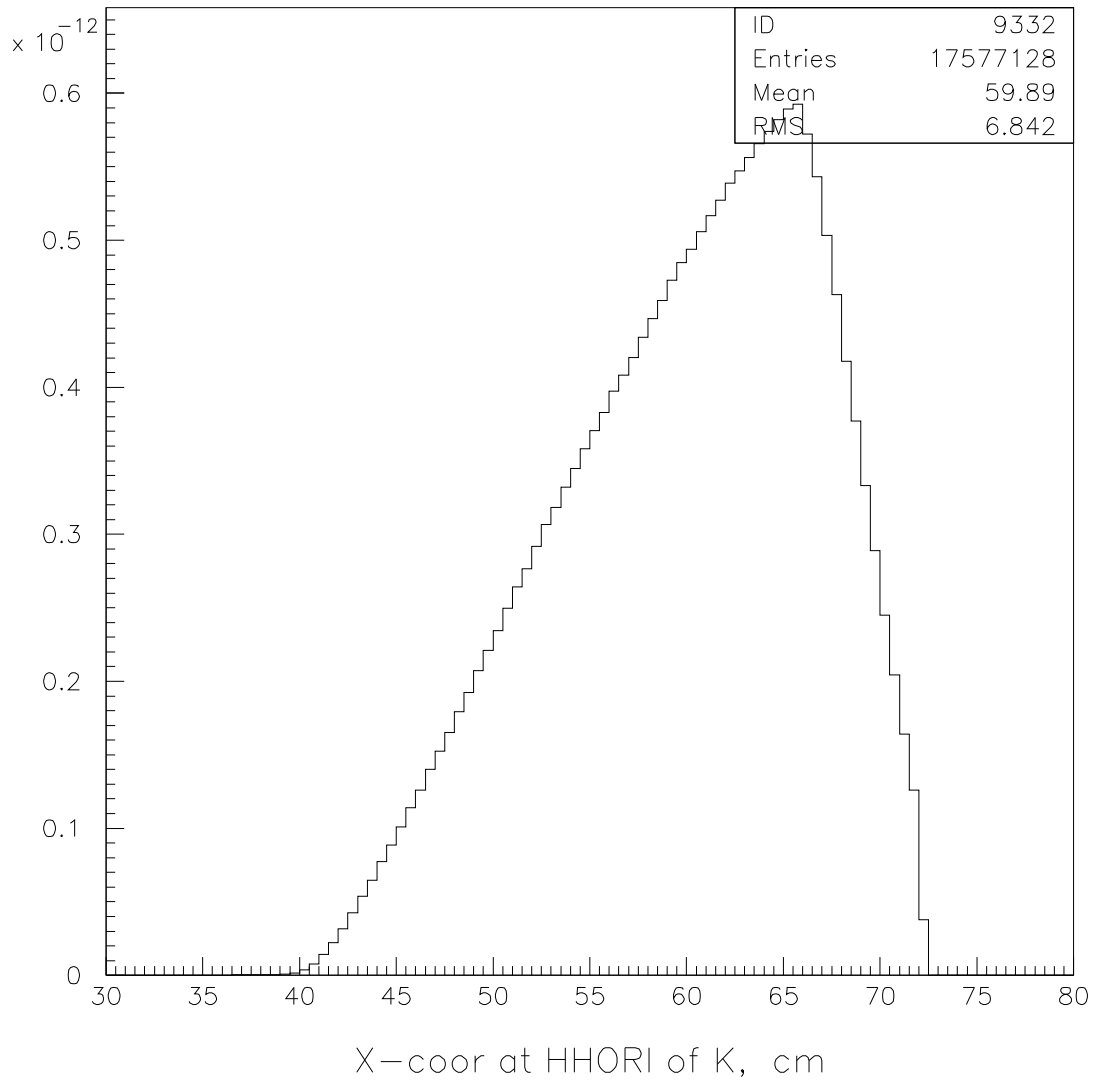


Figure 14: *Kaon x-distribution in the Horizontal Hodoscope.*

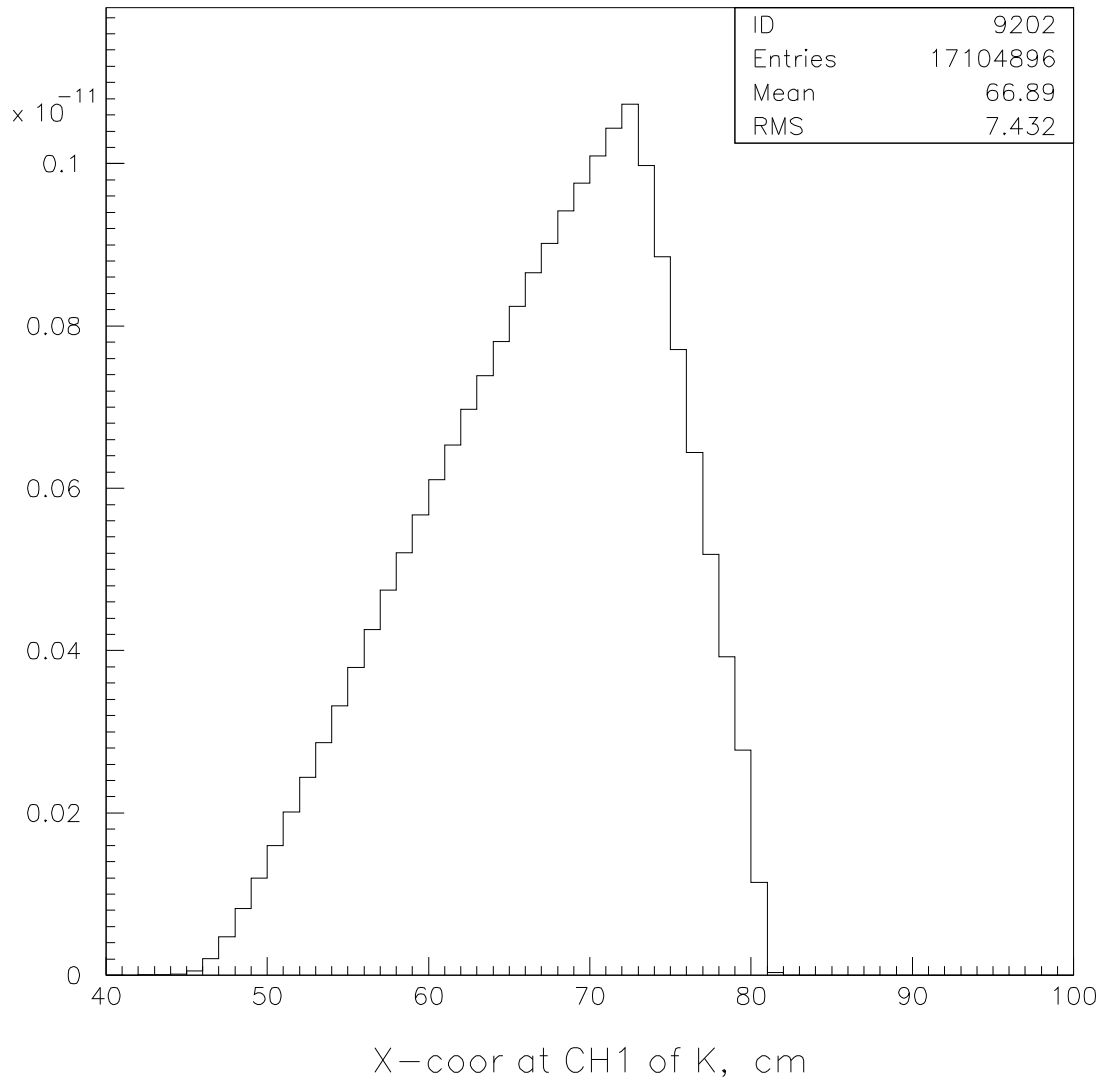


Figure 15: *Kaon x-distribution in the front of CH (CH1).*

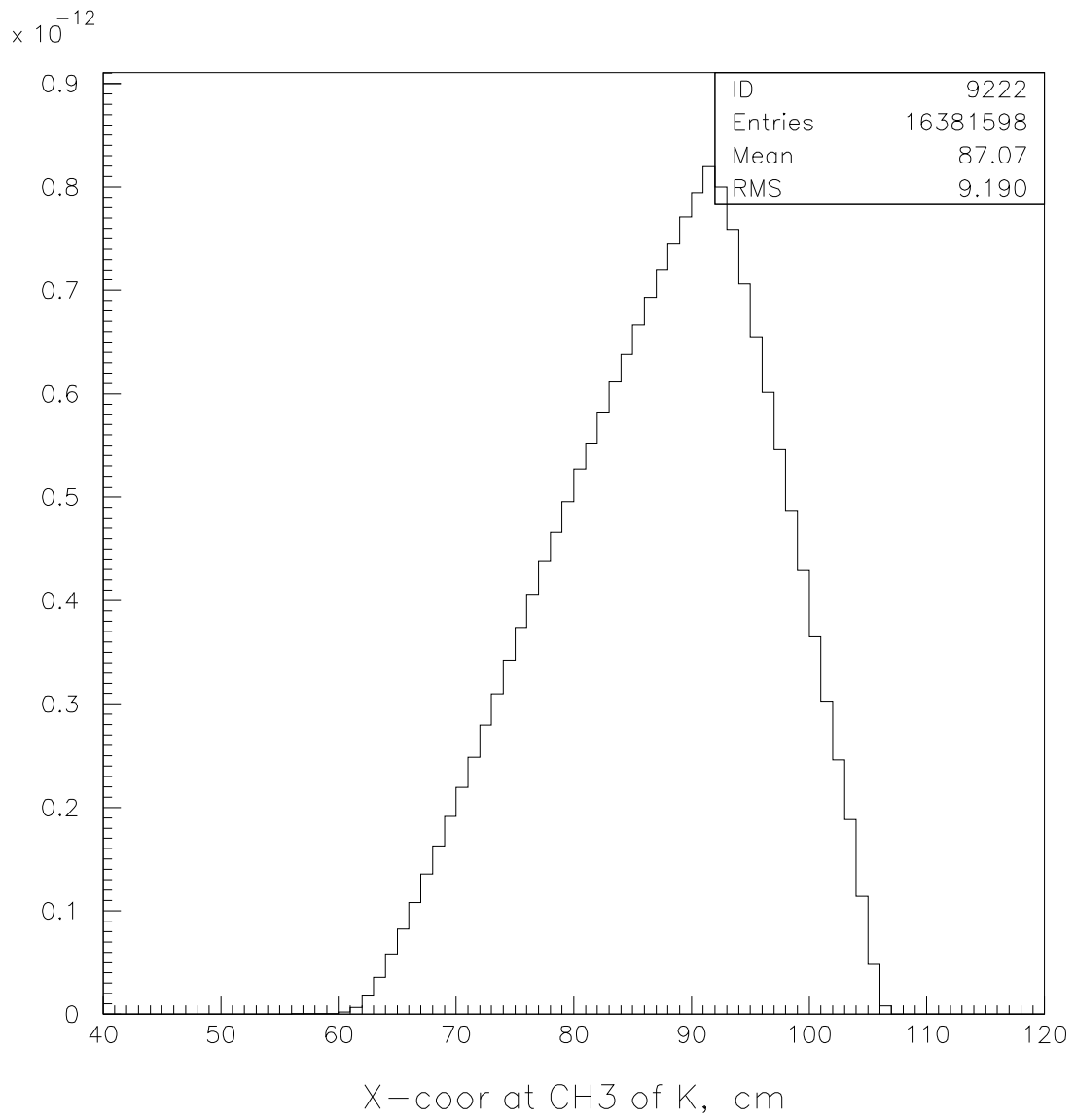


Figure 16: *Kaon x-distribution in 1 m from the front of CH (CH3).*

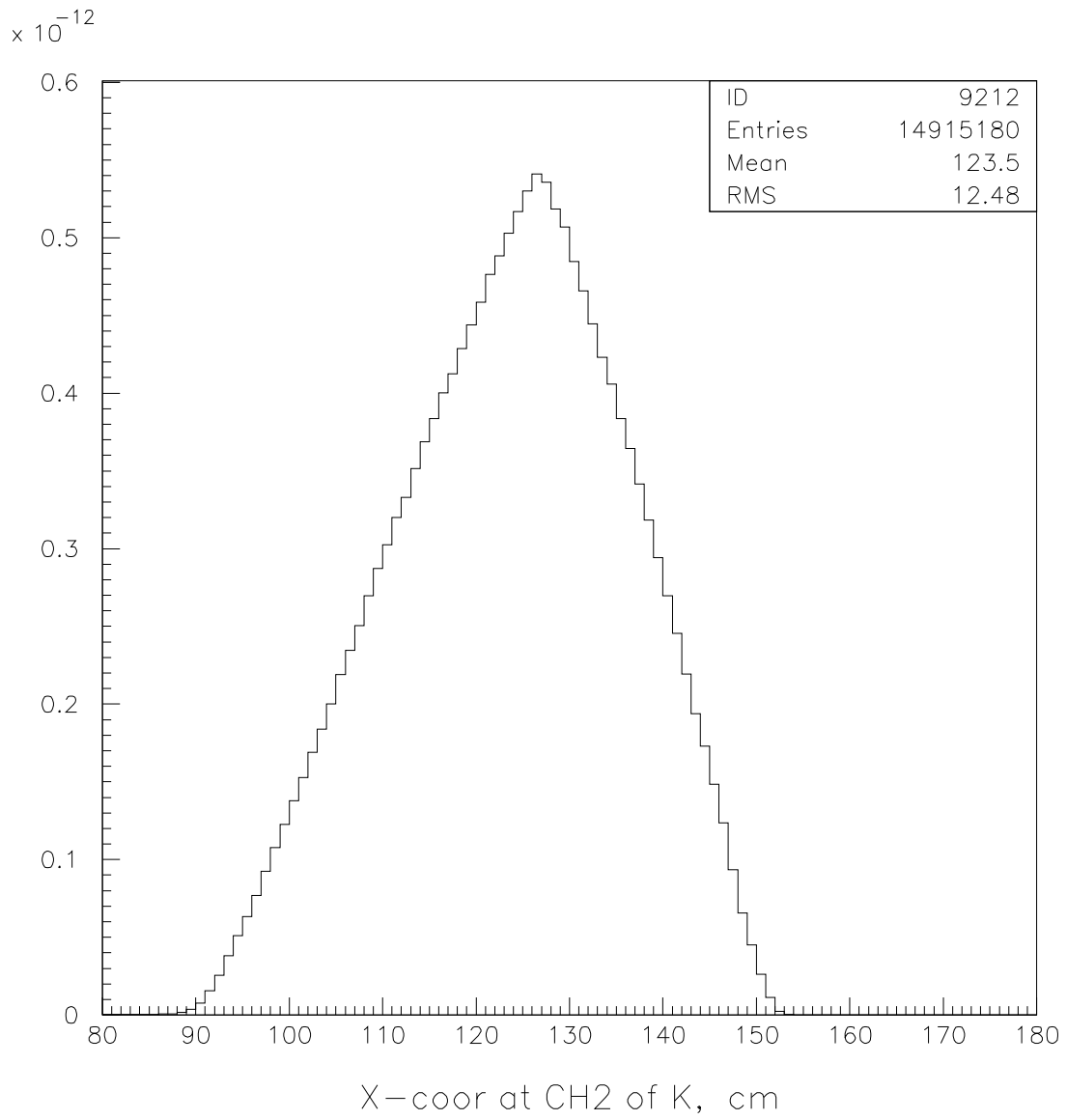


Figure 17: *Kaon x-distribution in the back of CH (CH2).*

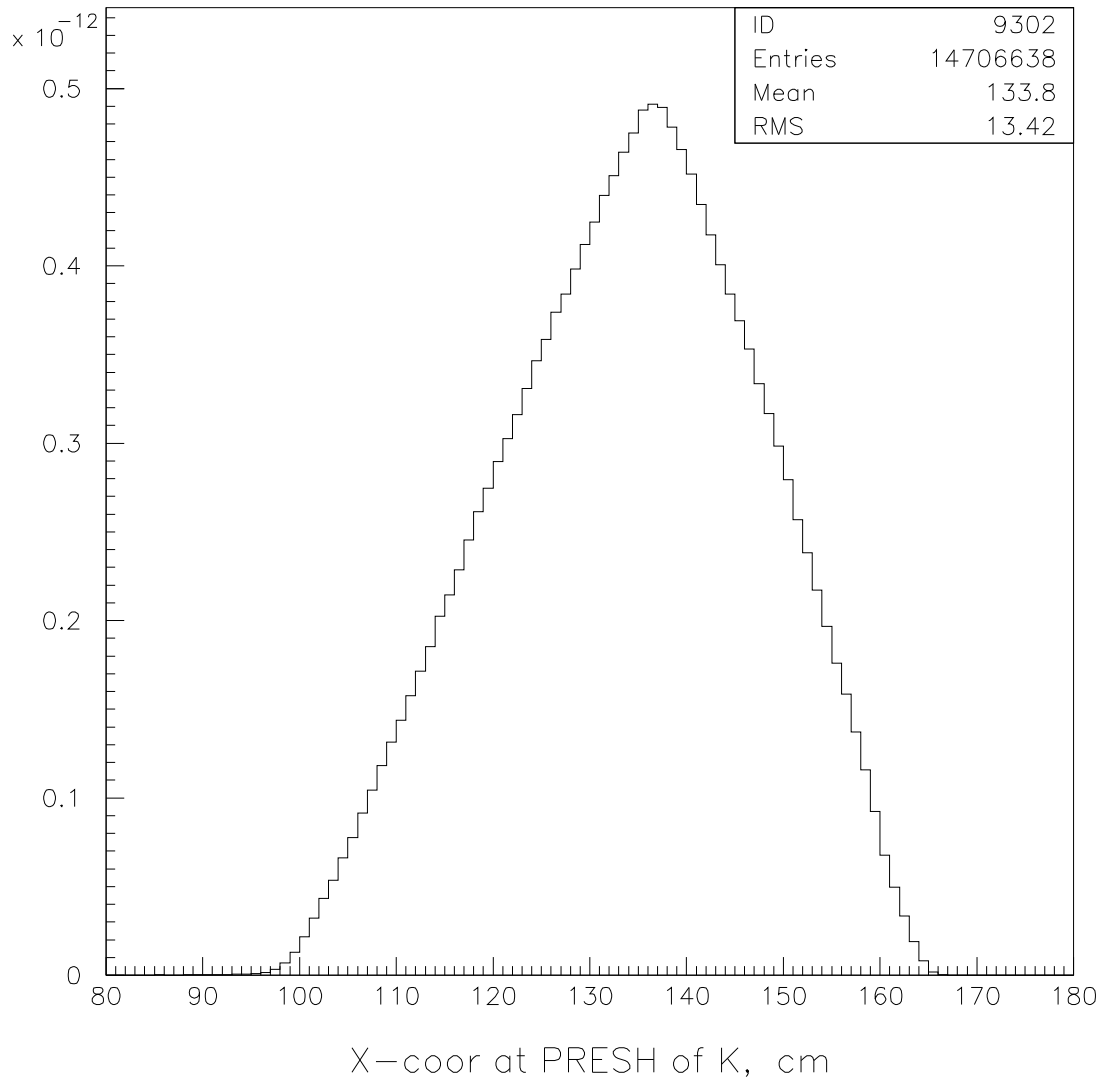


Figure 18: *Kaon x-distribution in PR.*

4 Pion y -distributions

Table 3 is extraction of boundaries and mean values from histograms 19, 20, 21, 24, 26, 25, and 27.

Deep cavity in the histograms 26 and 27 is determined by the Al plate in the Cerenkov counter.

Table 3: *Pion y -boundaries and mean values.*

plane	y_1 cm	y_2 cm	Δy cm	mv cm	R
DC2	-17.00	17.00	34.00	-1.36	1.00
DC3	-18.00	17.00	35.00	-1.06	1.00
DC4	-18.00	18.00	36.00	-0.48	1.00
CH1	-18.00	19.00	37.00	-0.11	0.94
CH3	-19.00	20.00	39.00	0.44	0.97
CH2	-20.00	22.00	42.00	1.55	0.89
PR	-21.00	23.00	44.00	1.82	0.99

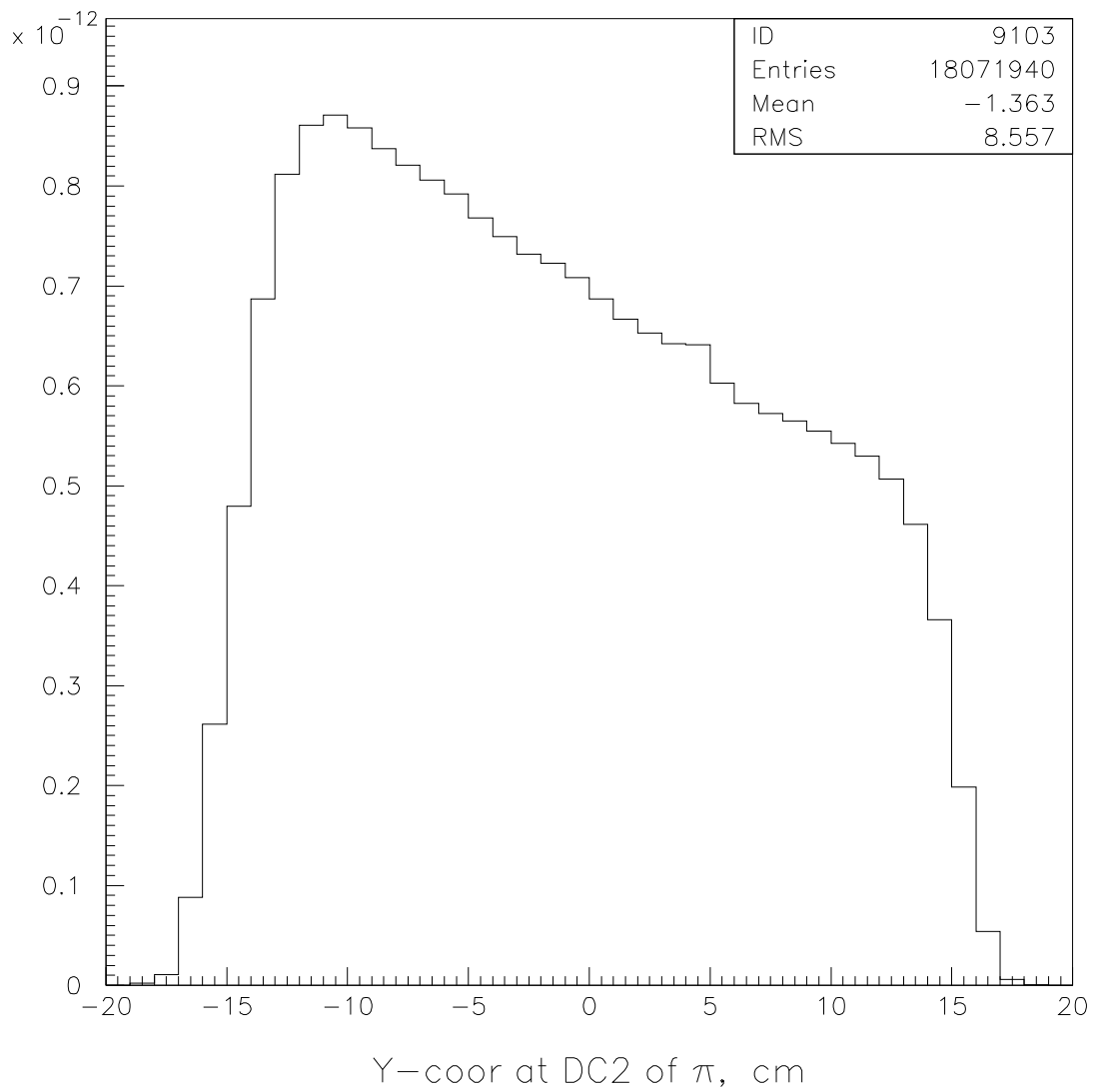


Figure 19: *Pion y-distribution in DC2.*

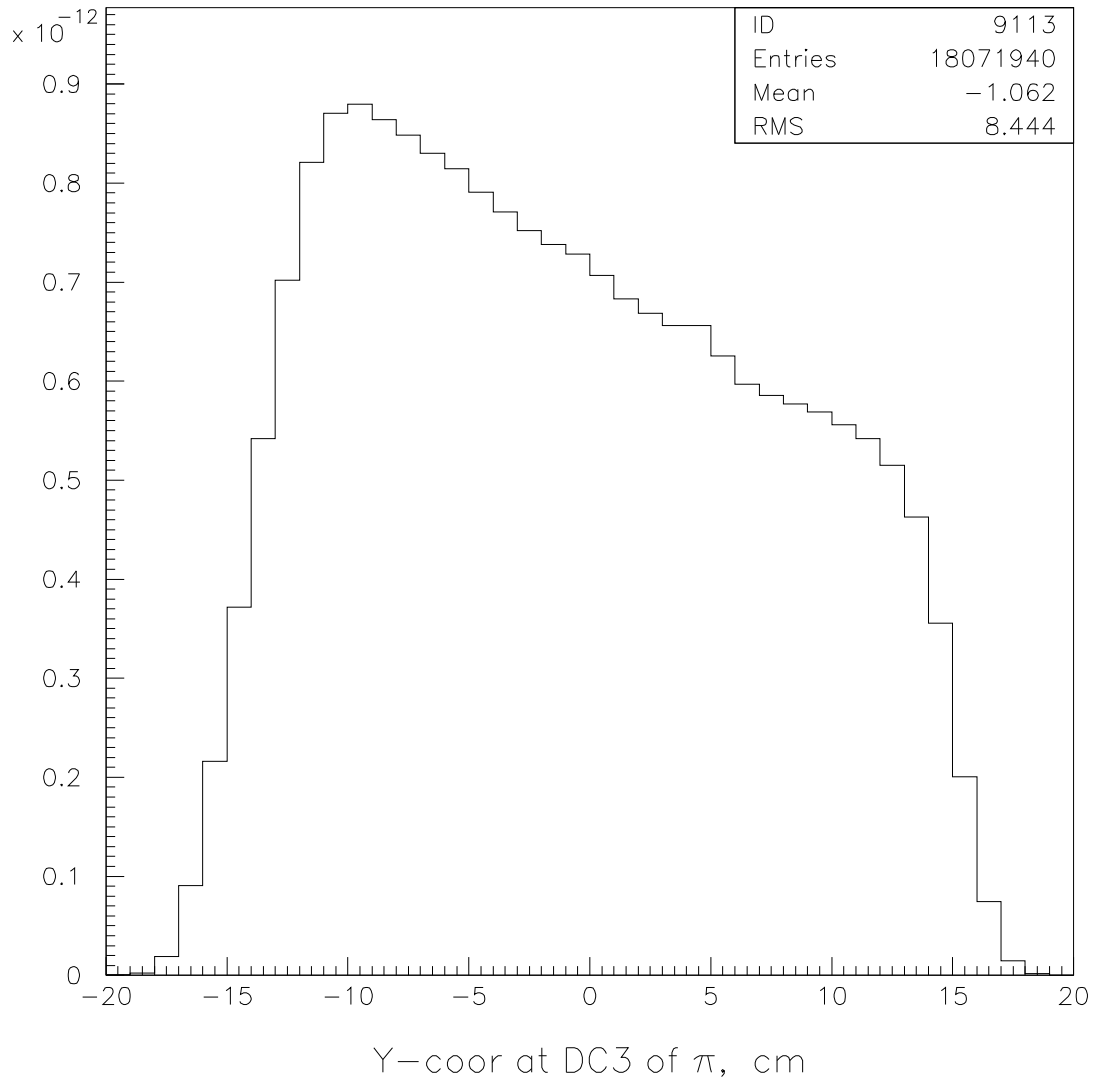


Figure 20: *Pion y-distribution in DC3.*

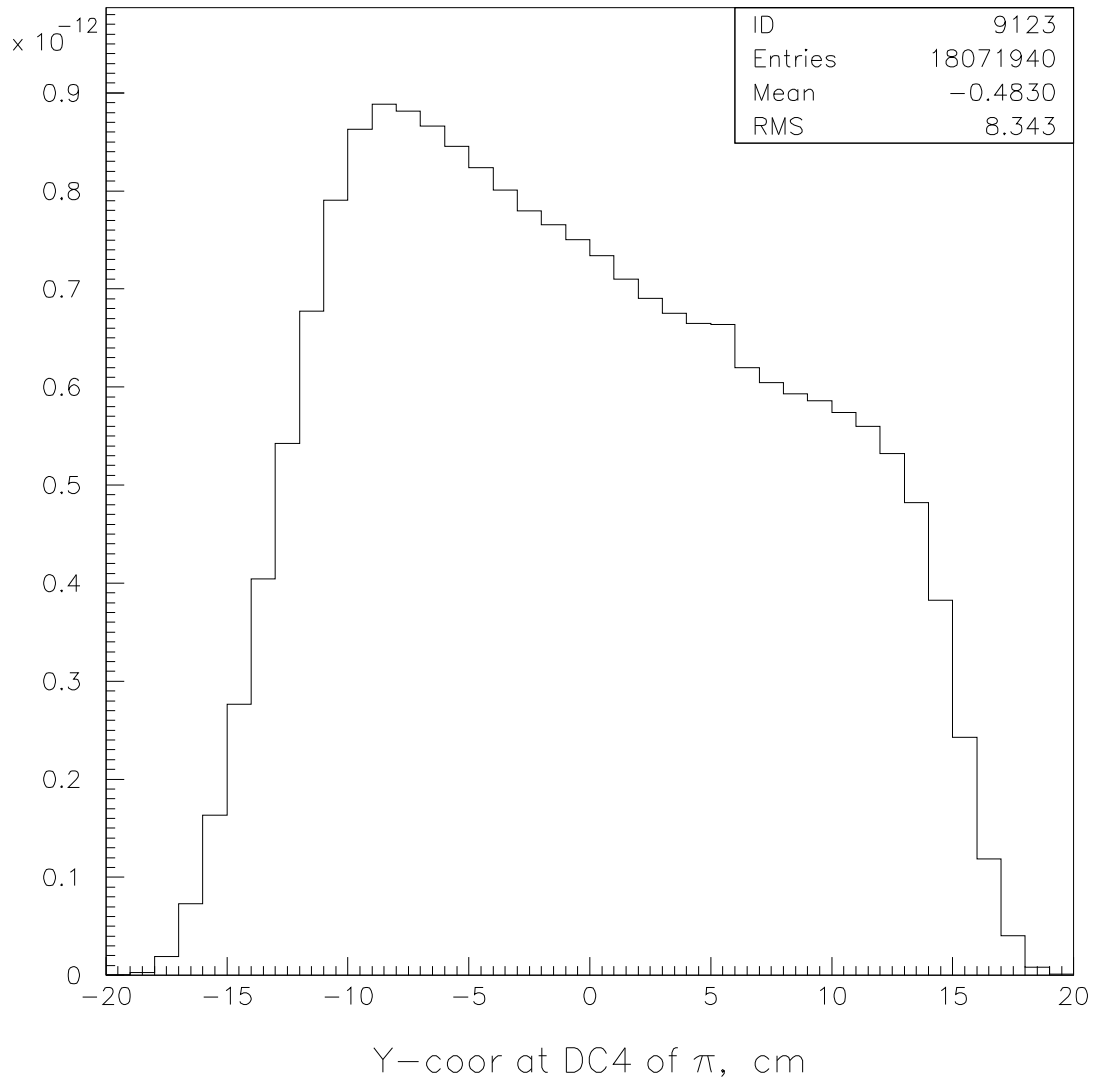


Figure 21: *Pion y-distribution in DC4.*

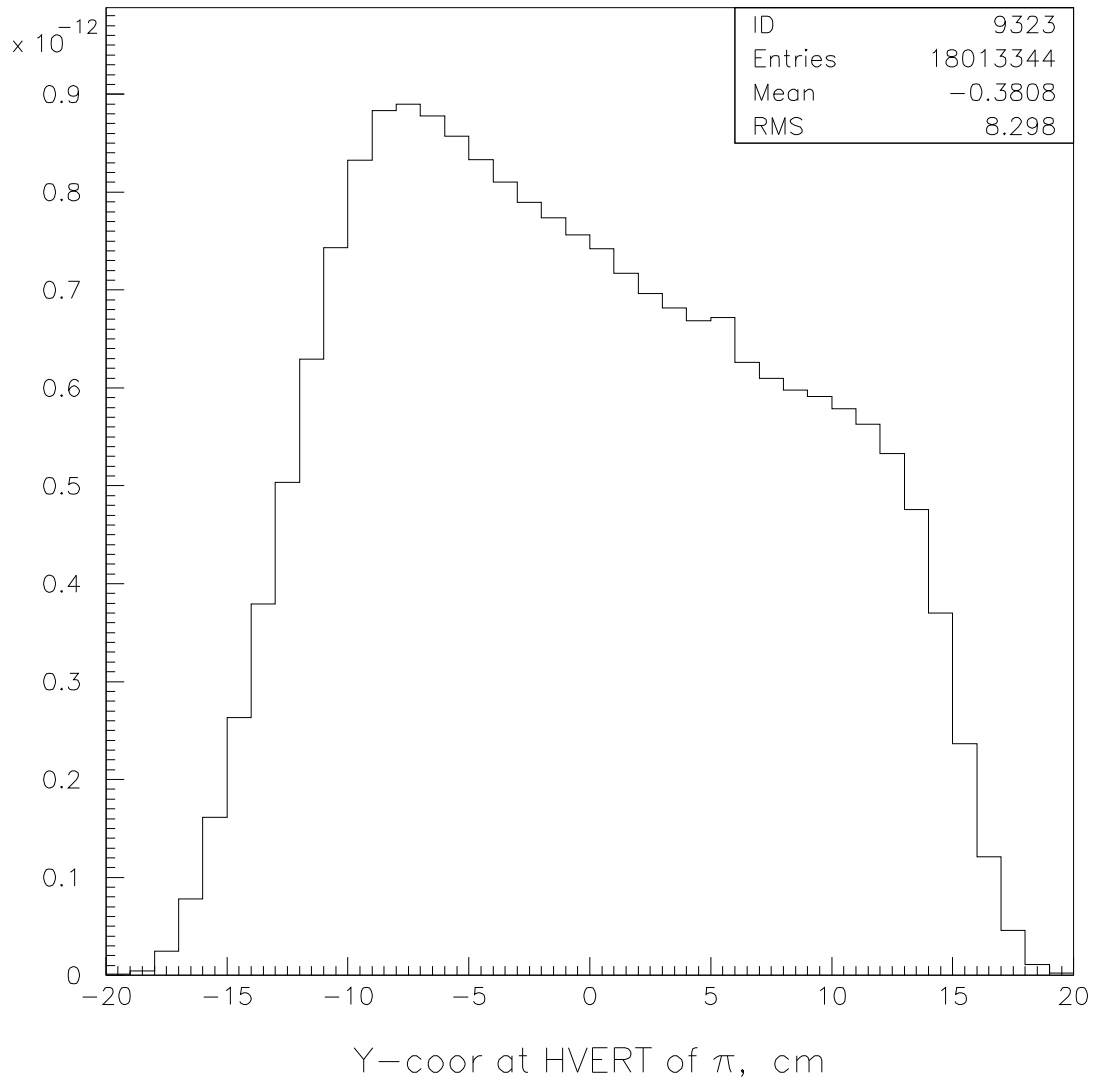


Figure 22: *Pion y-distribution in the Vertical Hodoscope.*

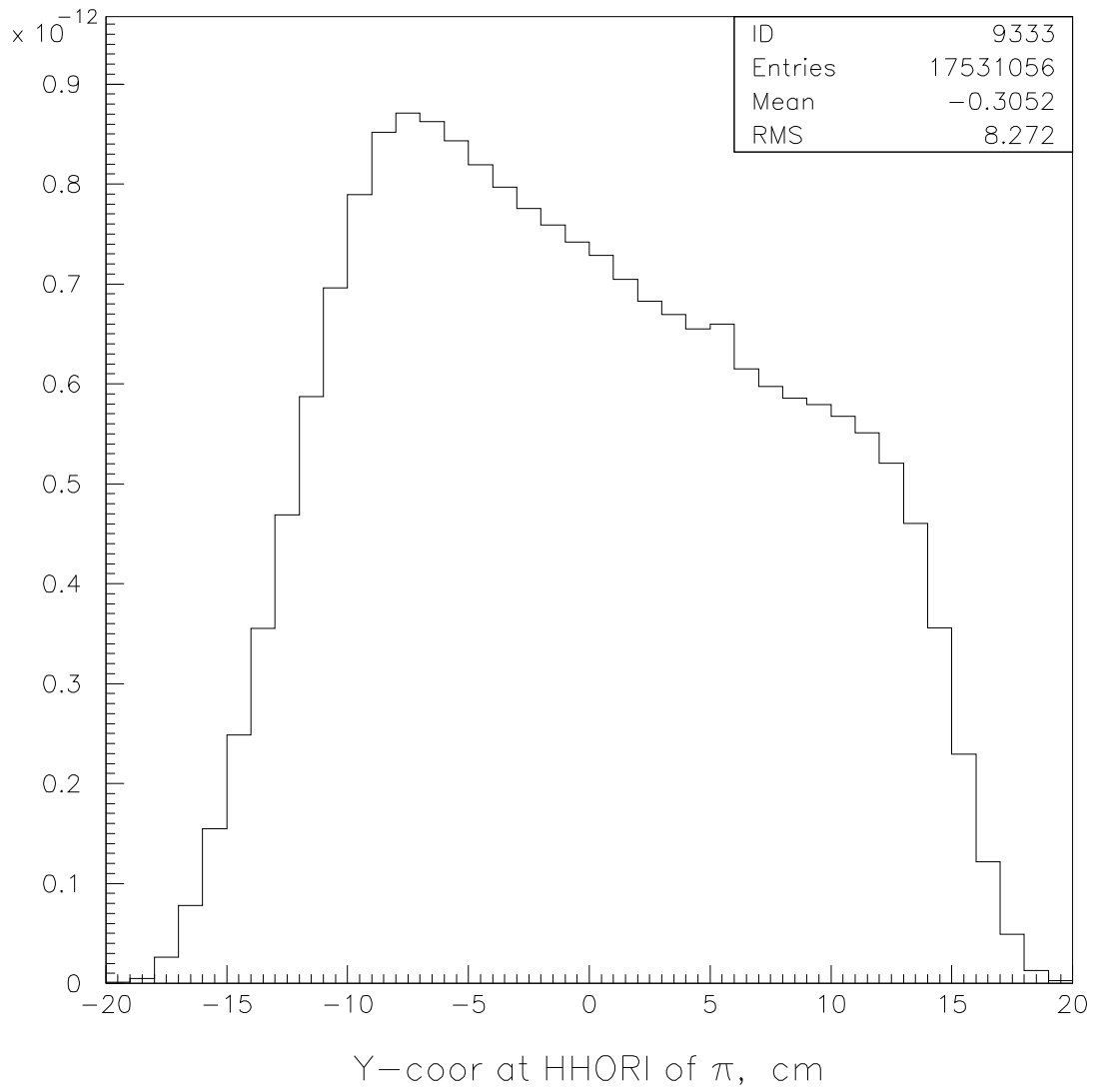


Figure 23: *Pion y-distribution in the Horizontal Hodoscope.*

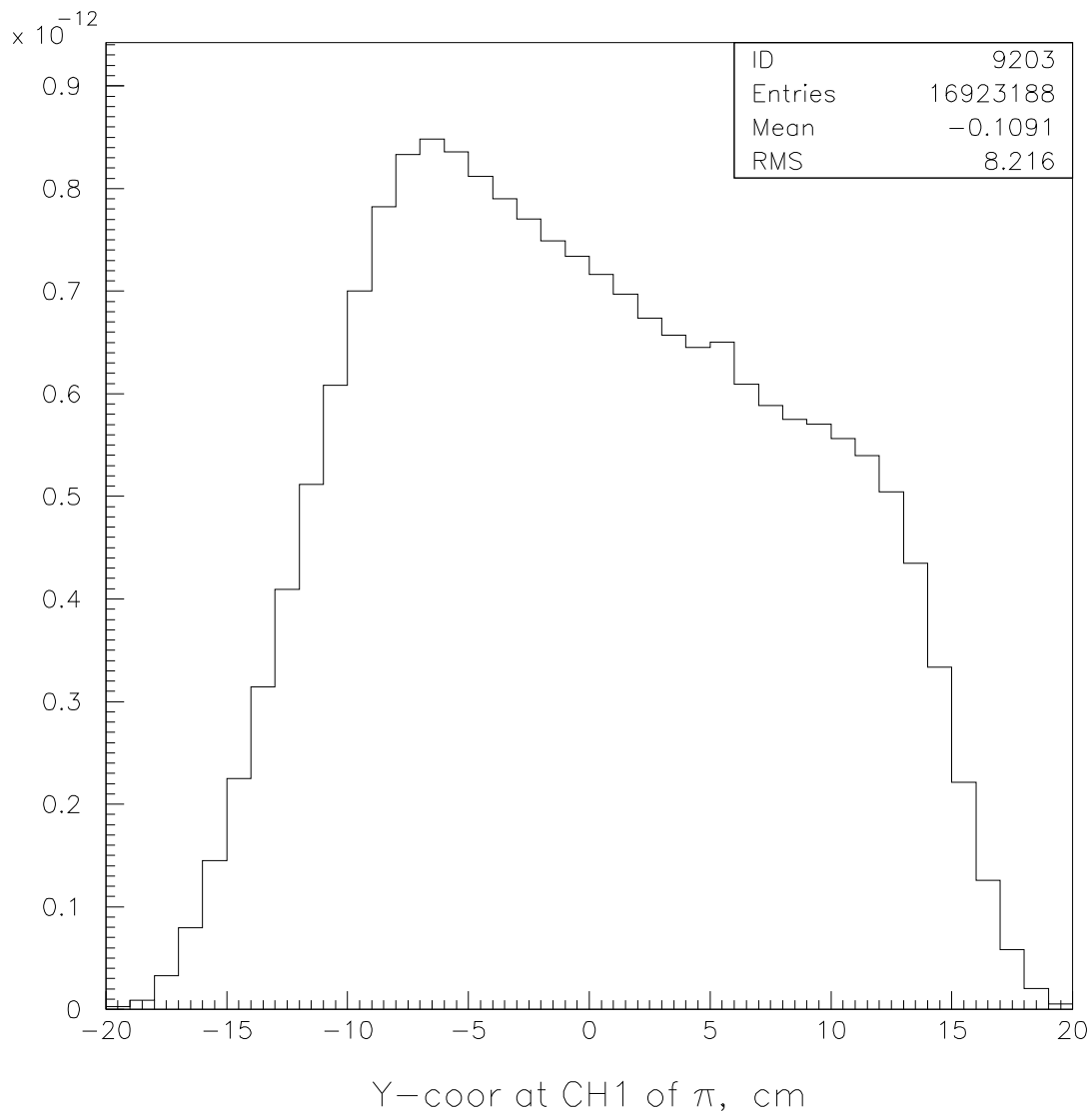


Figure 24: *Pion y-distribution in the front of CH (CH1).*

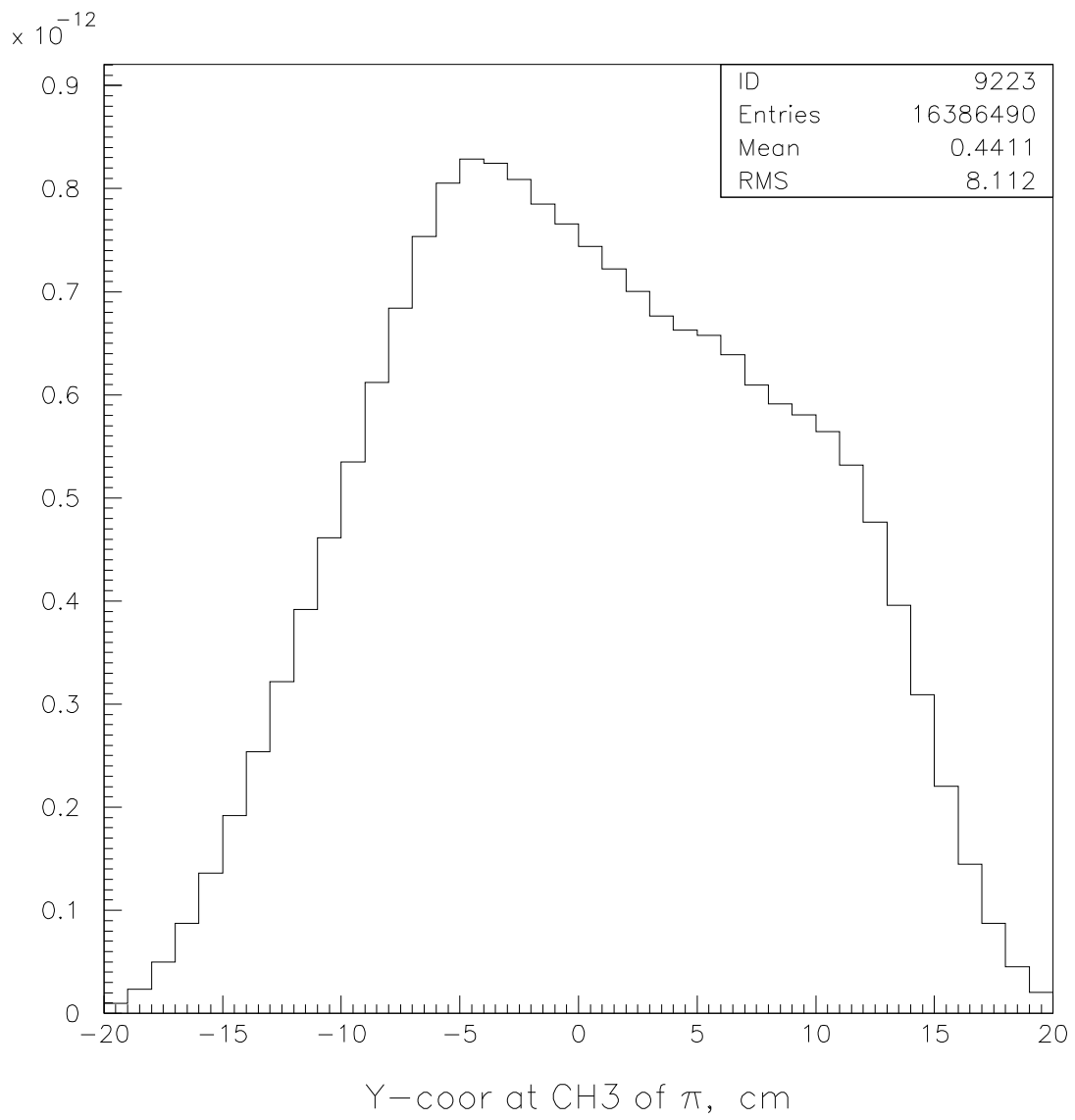


Figure 25: *Pion y-distribution in 1 m from the front of CH (CH3).*

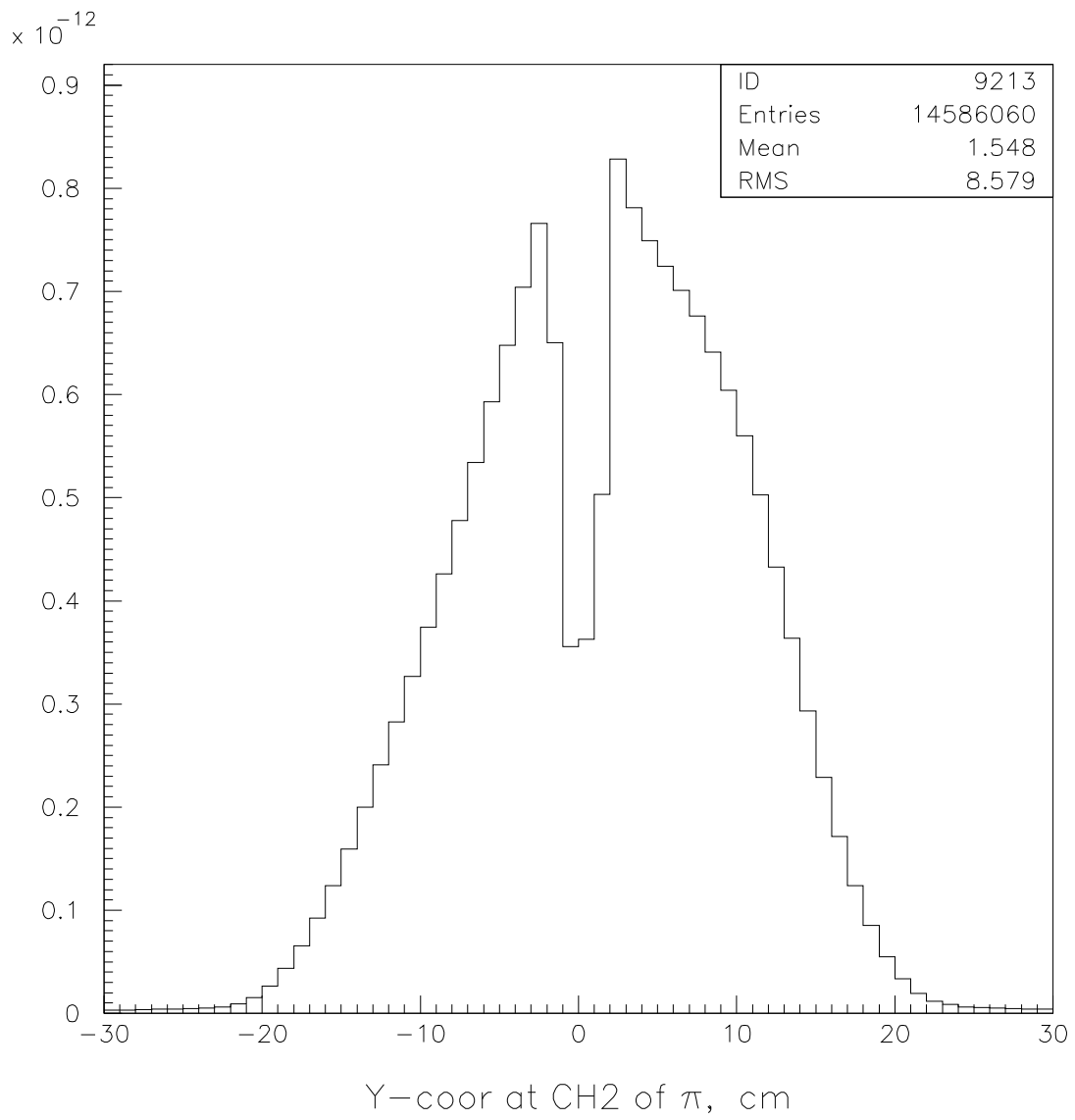


Figure 26: *Pion y -distribution in the back of CH (CH2).*

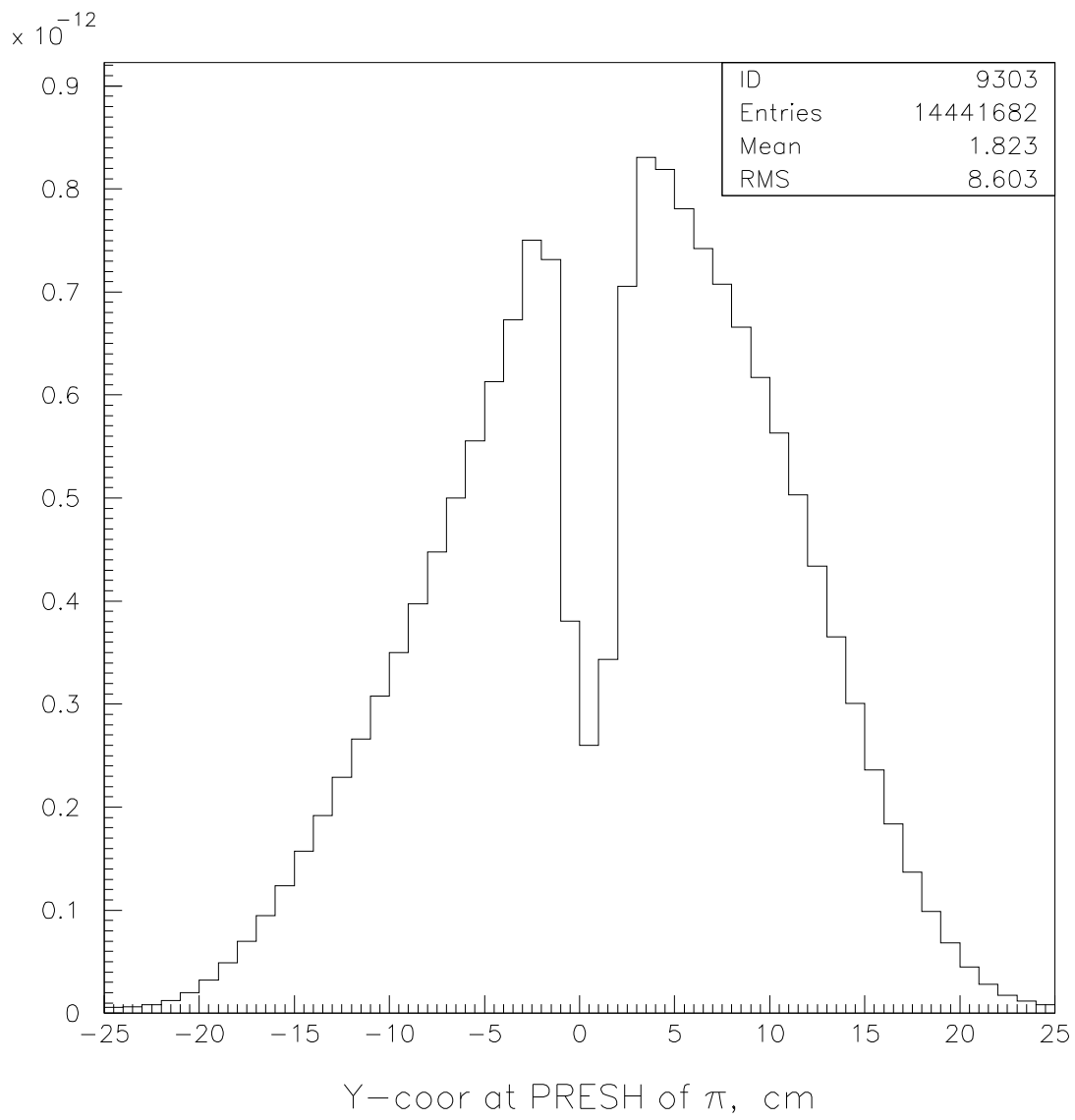


Figure 27: *Pion y -distribution in PR.*

5 Kaon y -distributions

Table 4 is extraction of boundaries and mean values from histograms 28, 29, 30, 33, 35, 34, and 36.

Deep cavity in the histograms 35 and 36 is determined by the Al plate in the Cerenkov counter.

Table 4: *Kaon y -boundaries and mean values.*

plane	y_1 cm	y_2 cm	Δy cm	mv cm	R
DC2	-19.00	18.00	37.00	-2.21	1.00
DC3	-19.00	19.00	38.00	-2.22	1.00
DC4	-20.00	20.00	40.00	-2.02	1.00
CH1	-21.00	21.00	42.00	-2.15	0.95
CH3	-22.50	22.50	45.00	-2.28	0.96
CH2	-26.00	26.00	52.00	-2.60	0.91
PR	-27.00	27.00	54.00	-2.64	0.99

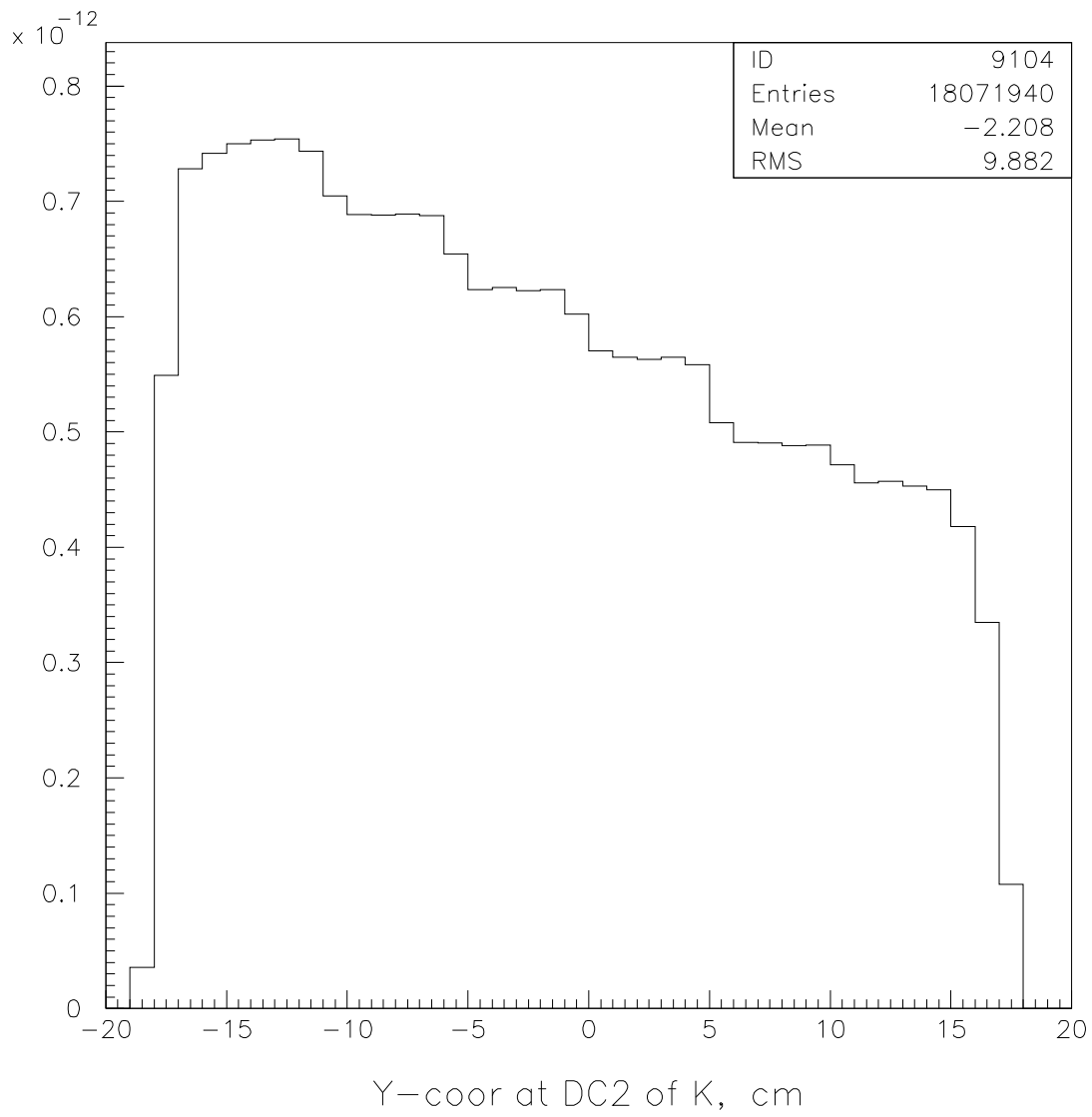


Figure 28: *Kaon y-distribution in DC2.*

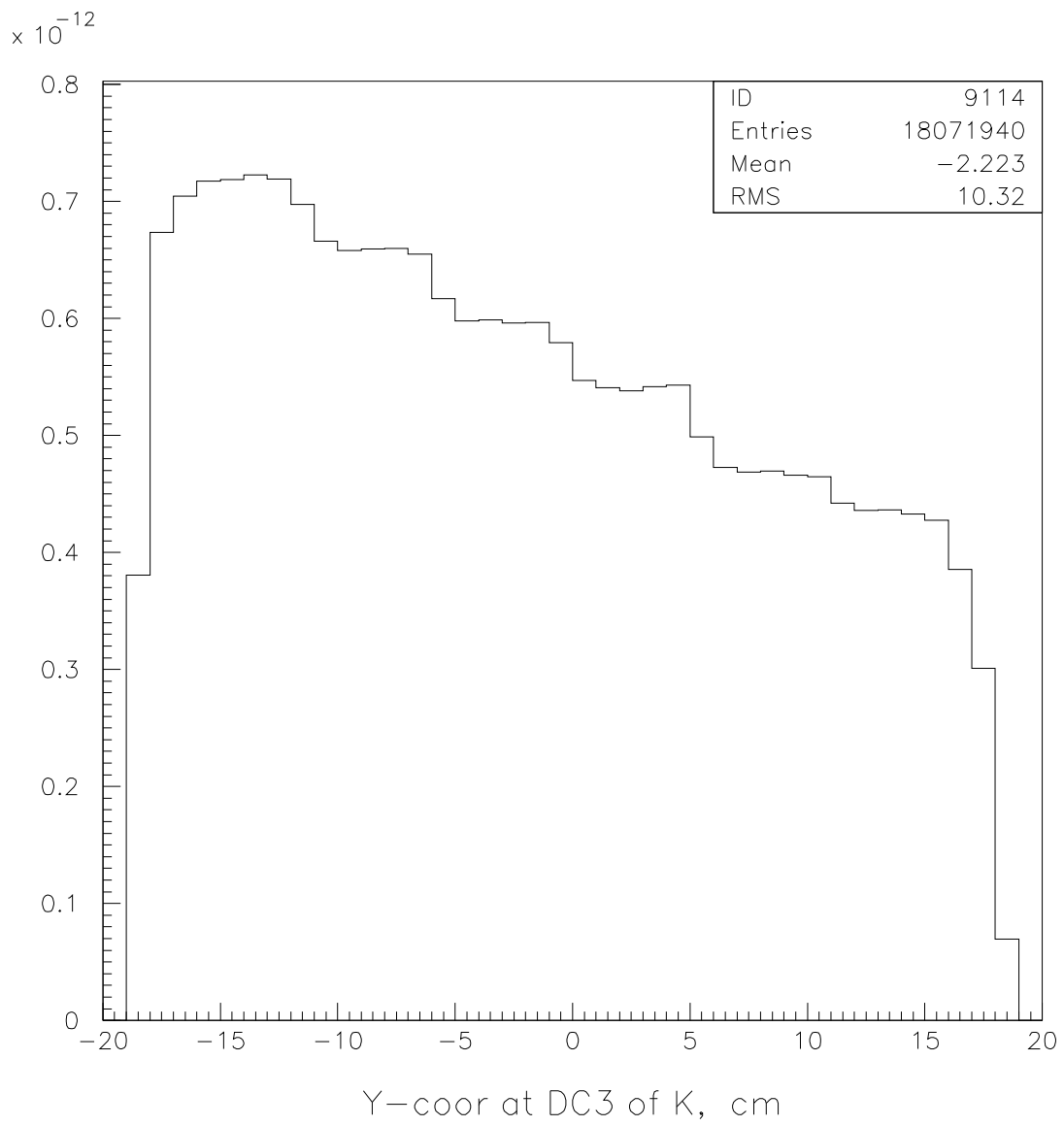


Figure 29: *Kaon y-distribution in DC3.*

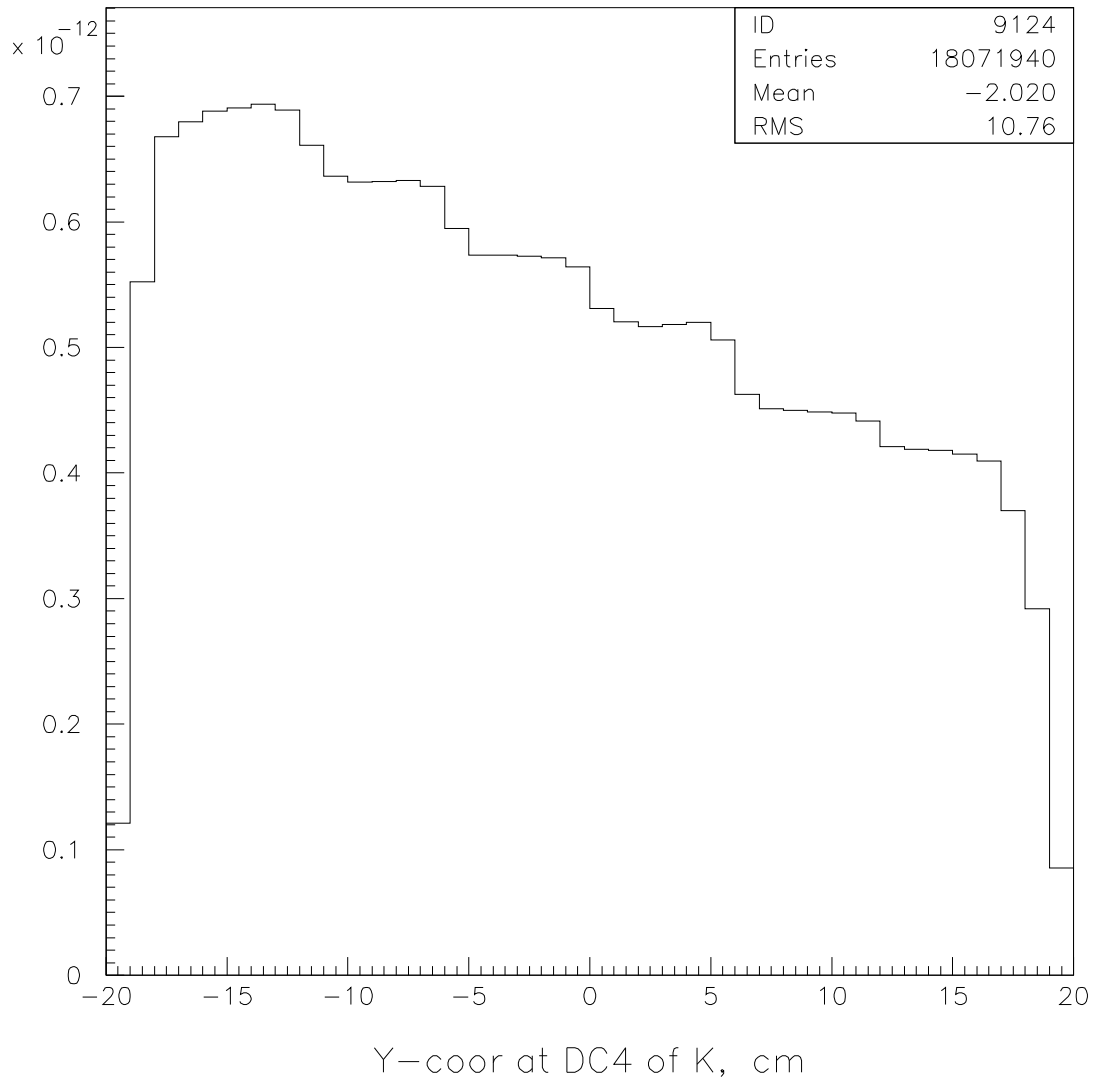


Figure 30: *Kaon y-distribution in DC4.*

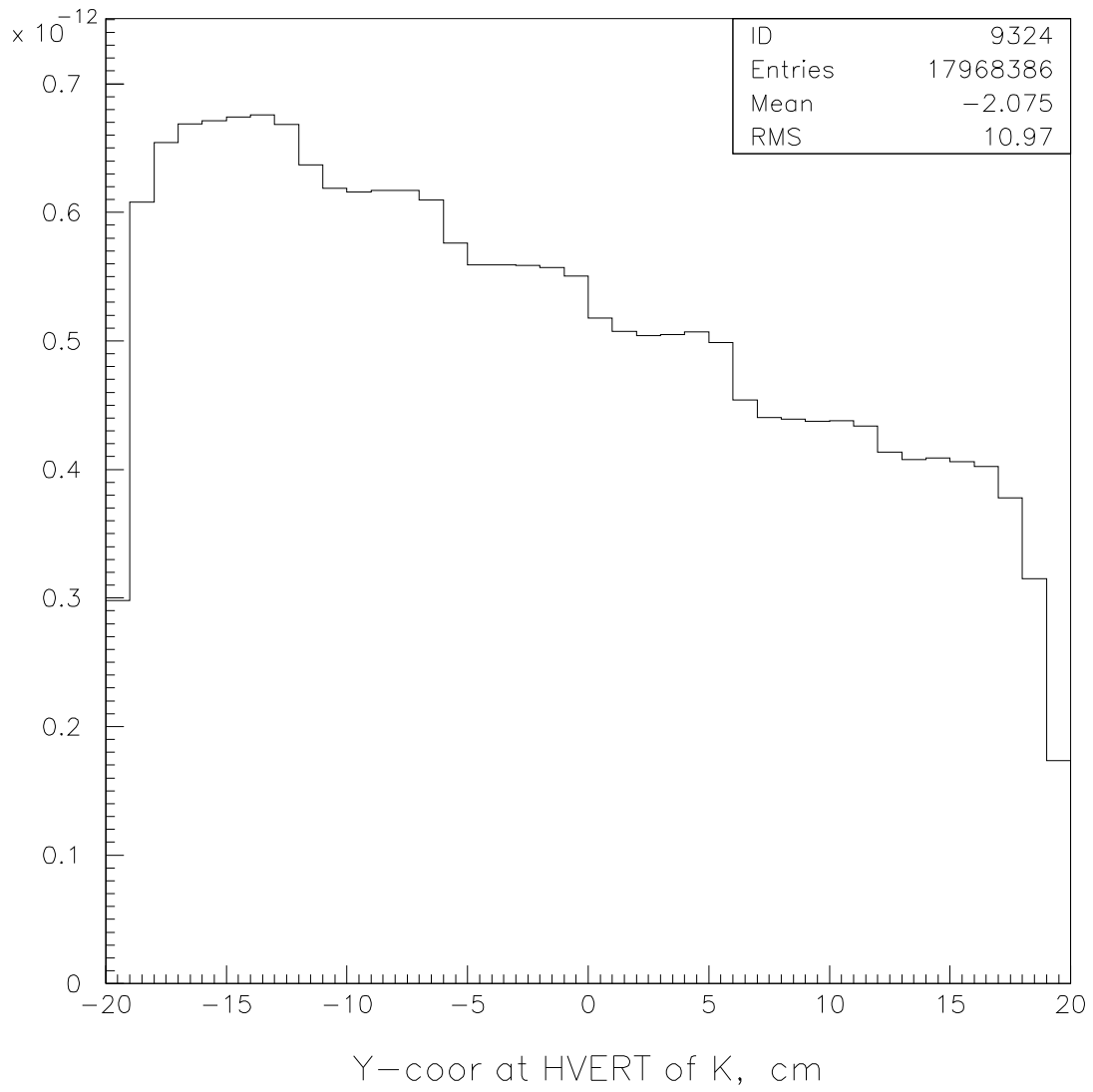


Figure 31: *Kaon y-distribution in the Vertical Hodoscope.*

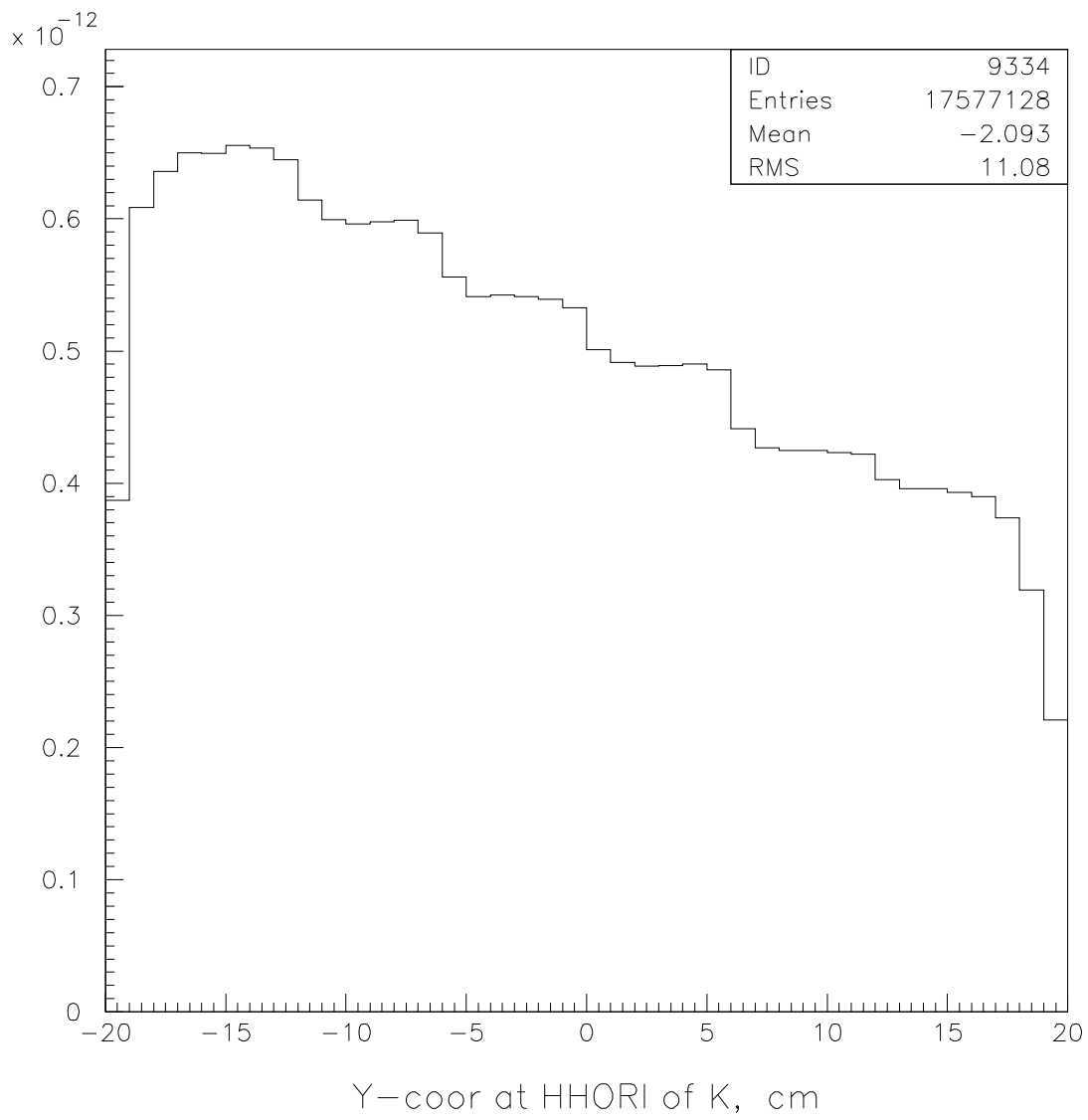


Figure 32: *Kaon y-distribution in the Horizontal Hodoscope.*

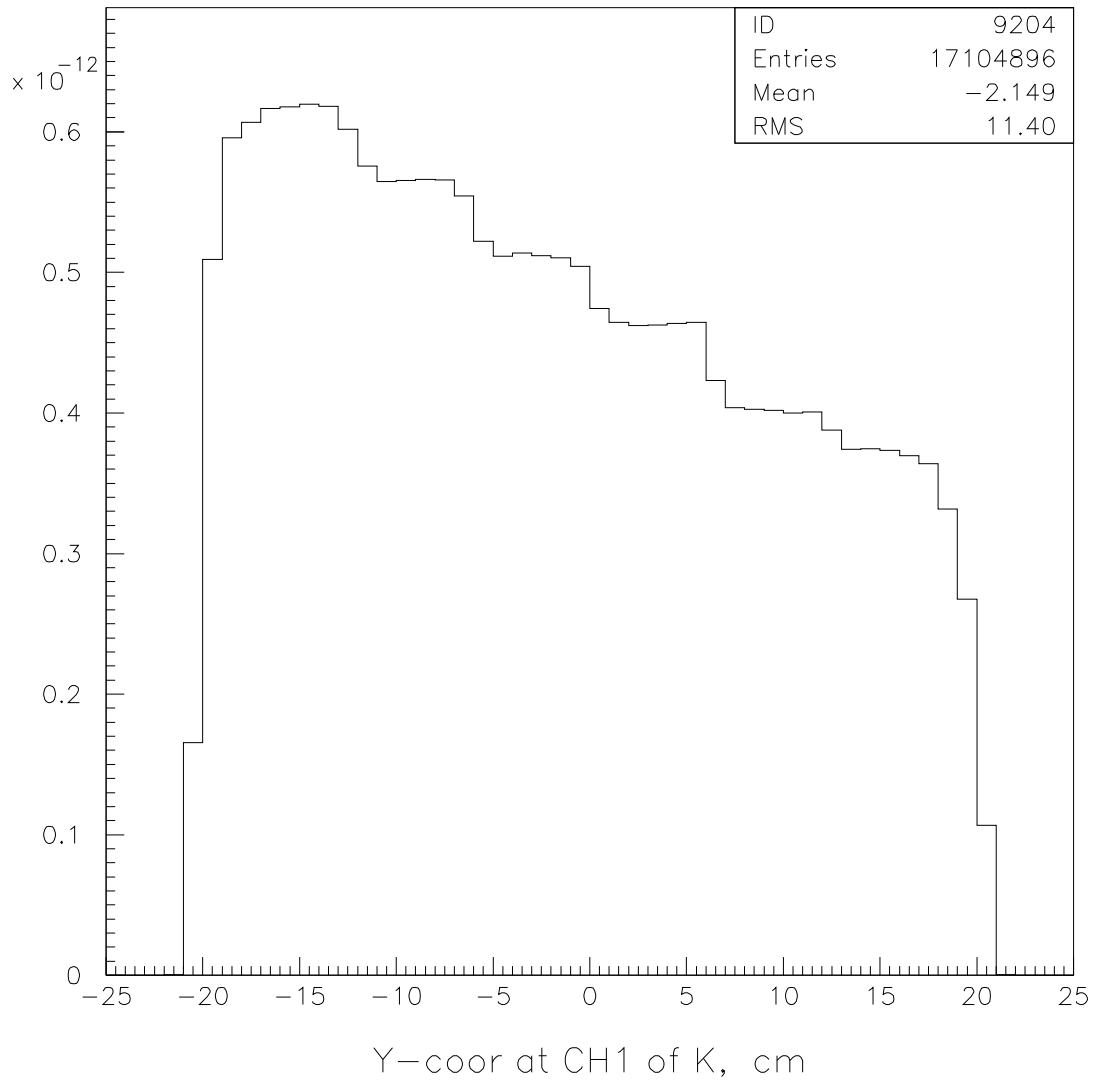


Figure 33: *Kaon y-distribution in the front of CH (CH1).*

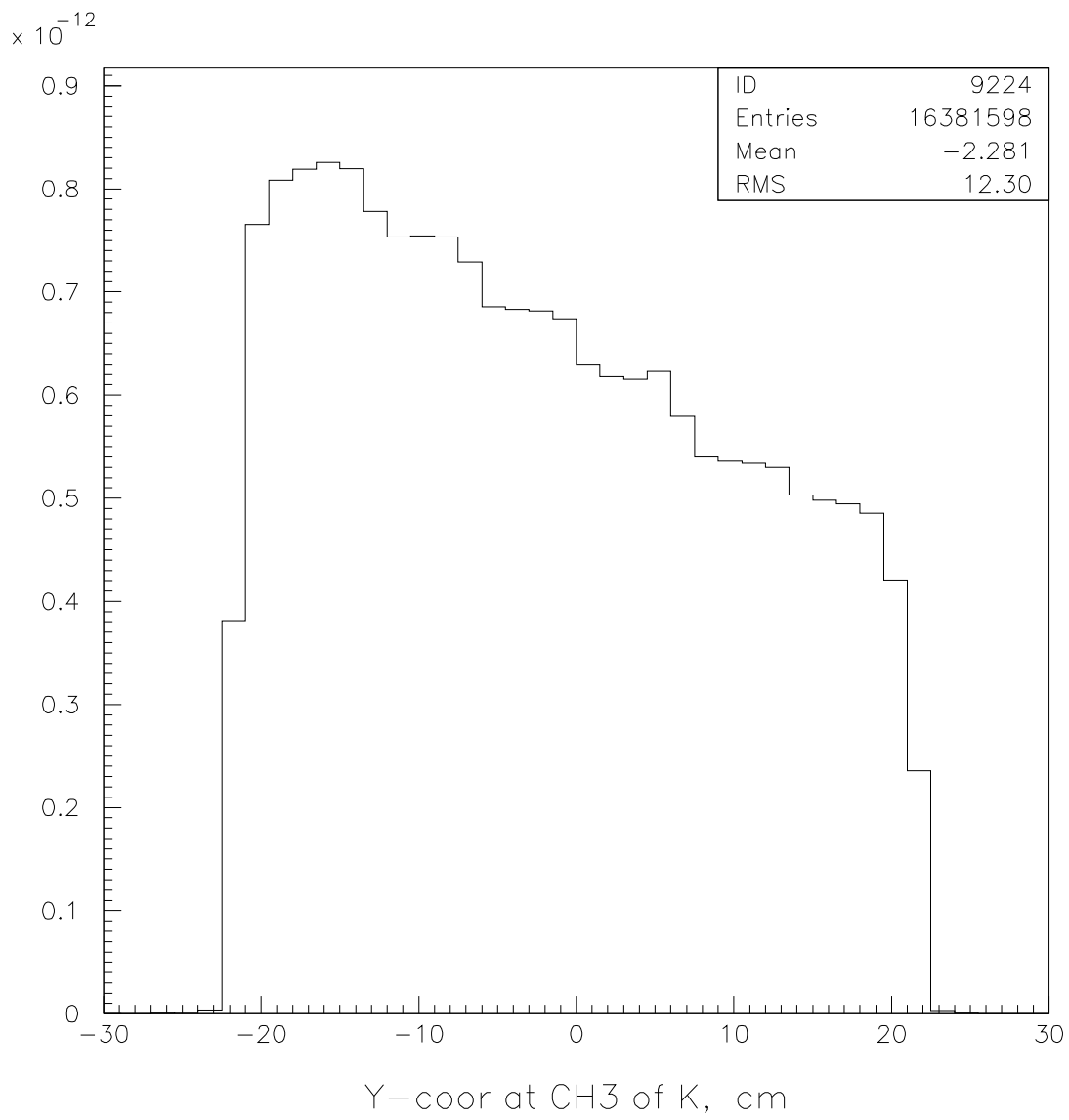


Figure 34: *Kaon y-distribution in 1 m from the front of CH (CH3).*

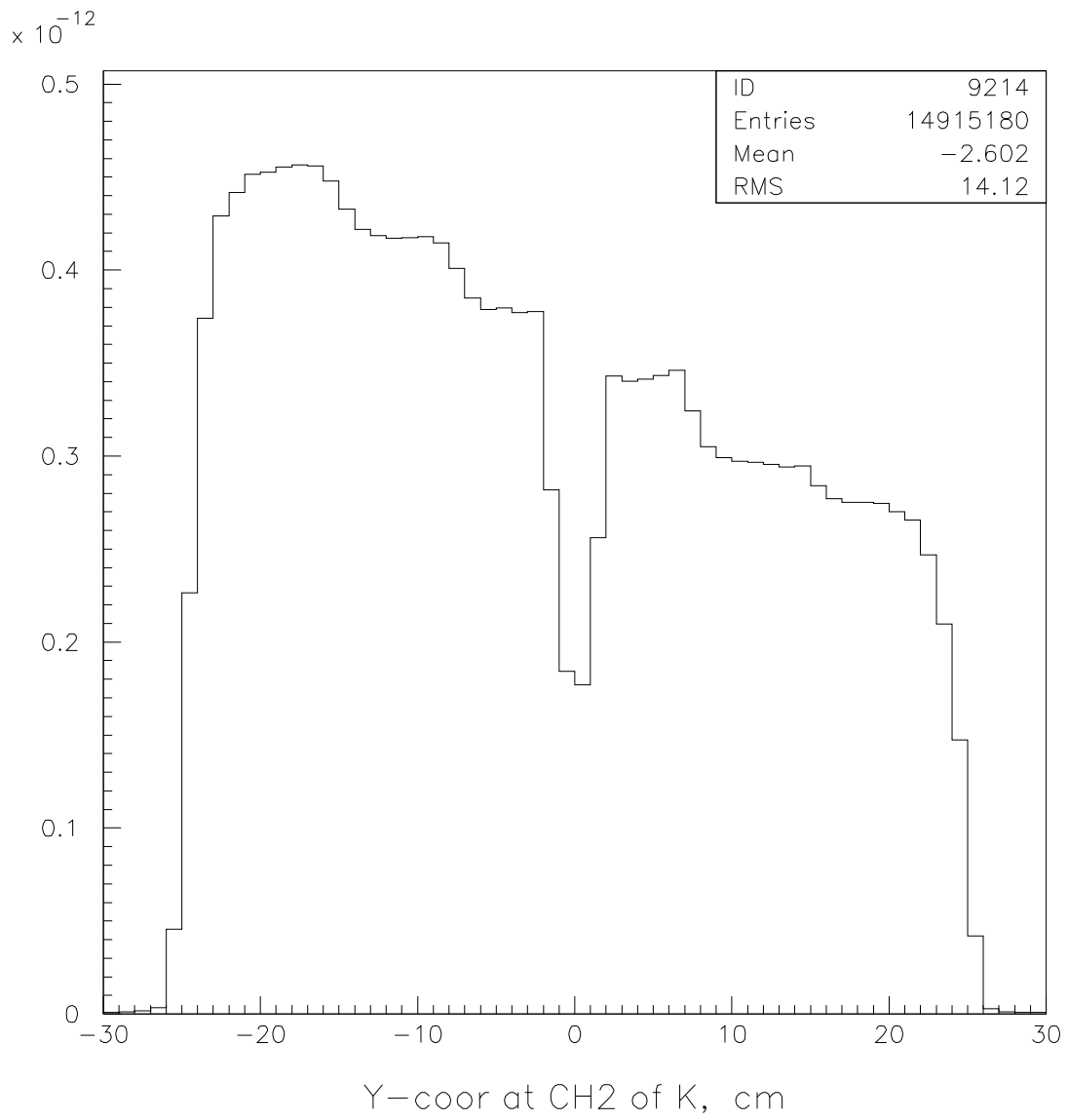


Figure 35: *Kaon y-distribution in the back of CH (CH2).*

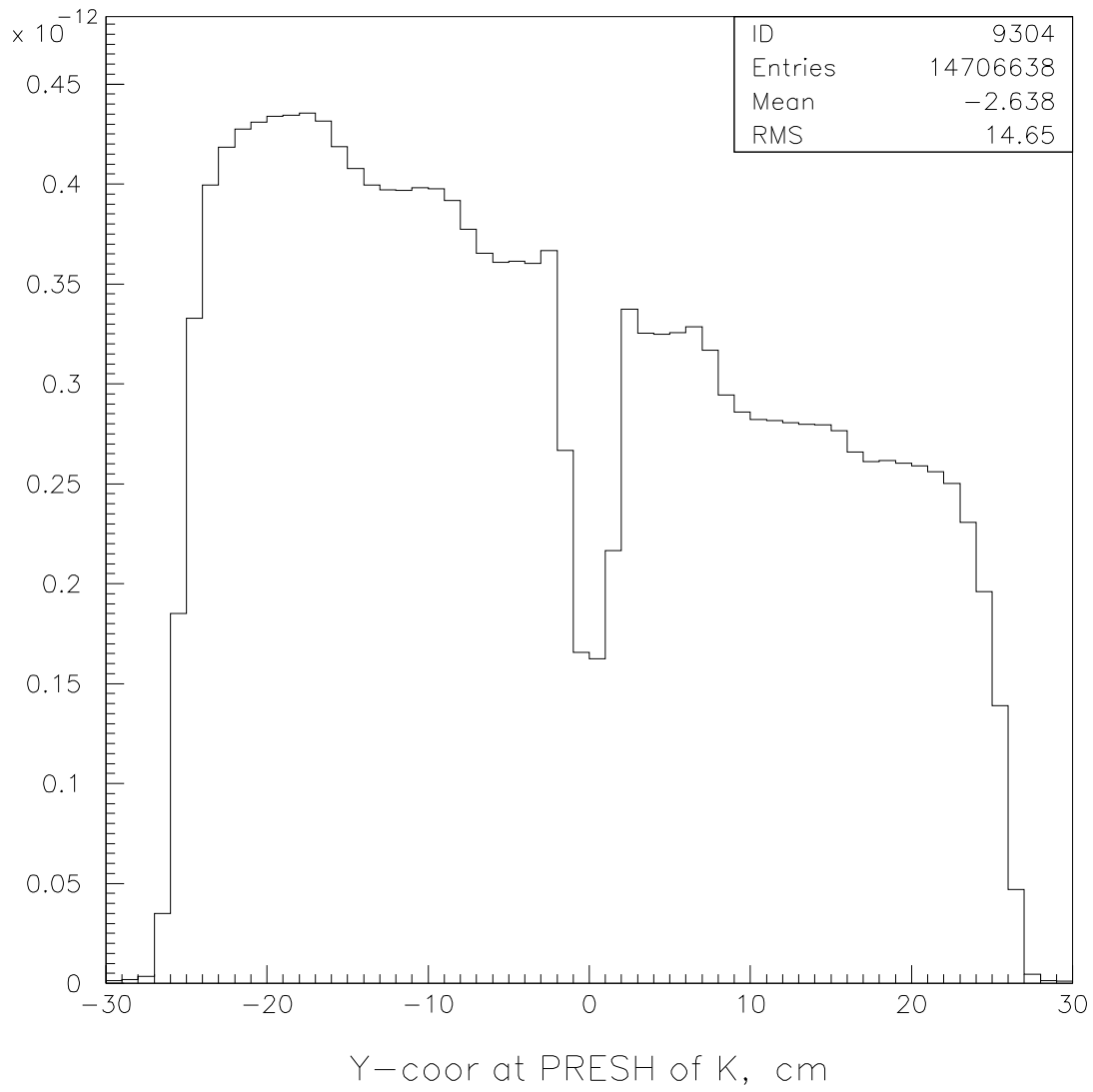


Figure 36: *Kaon y-distribution in PR.*

6 Pion momentum distributions

Table 5 is extraction of boundaries and mean values from histograms 37, 38, 39, 40, 42, 41, and 43.

Table 5: *Pion p -boundaries and mean values, (GeV/c).*

plane	p_{min}	p_{max}	Δp	mv	R
DC2	1.15	2.35	1.20	1.52	1.00
DC3	1.15	2.35	1.20	1.52	1.00
DC4	1.15	2.35	1.20	1.52	1.00
CH1	1.15	2.35	1.20	1.51	0.94
CH3	1.15	2.35	1.20	1.51	0.97
CH2	1.00	2.35	1.35	1.50	0.89
PR	1.00	2.35	1.35	1.50	0.99

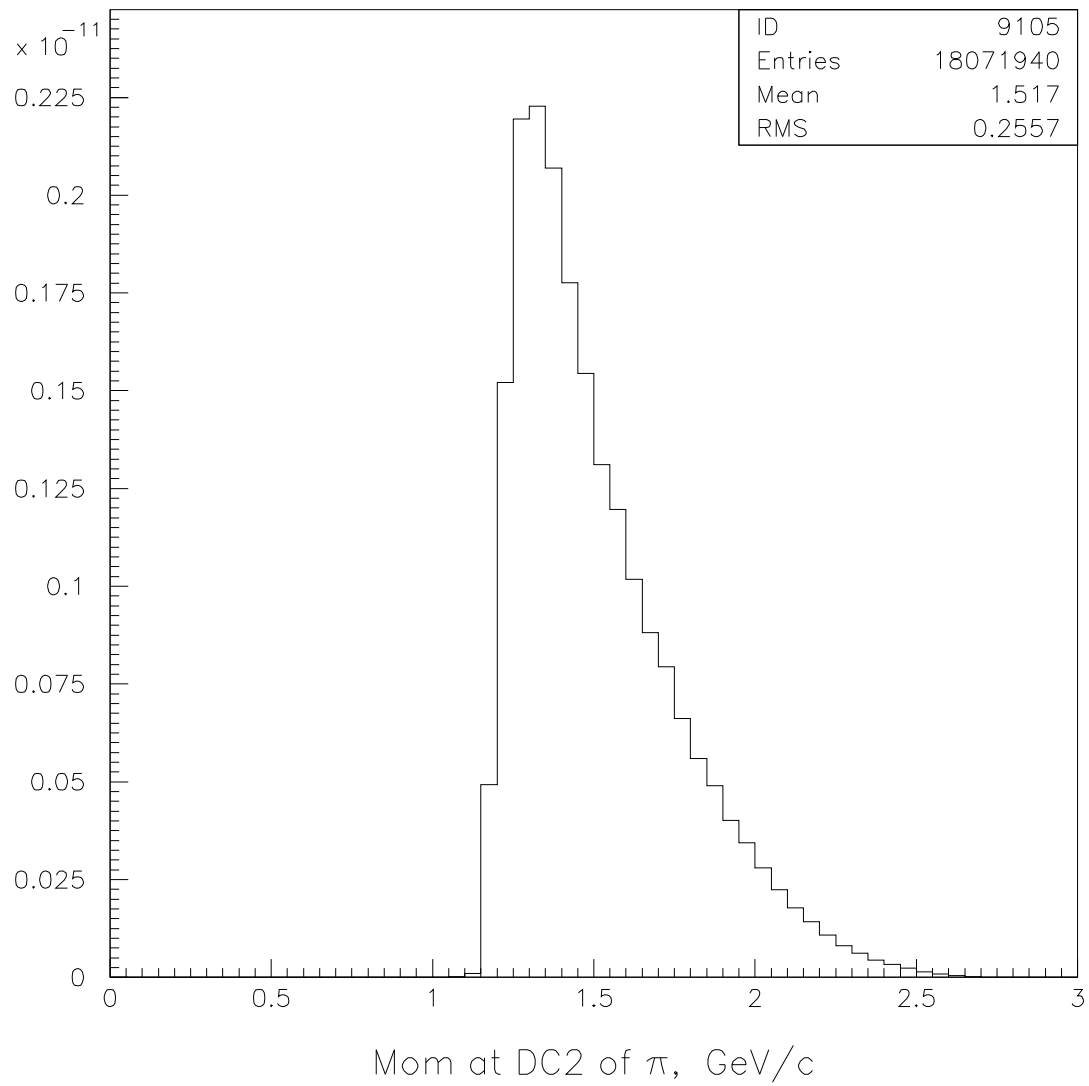


Figure 37: *Pion p -distribution in DC2.*

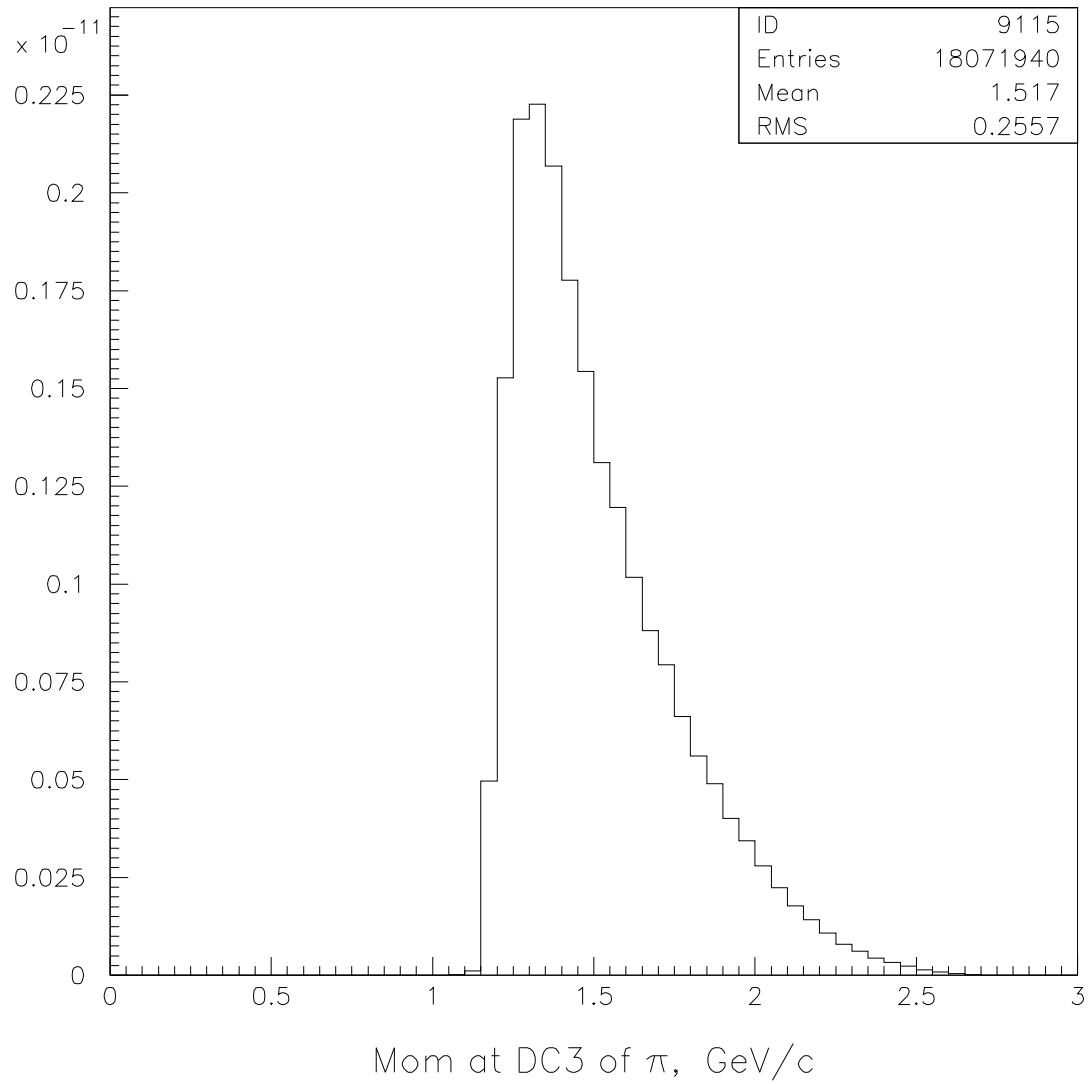


Figure 38: *Pion p -distribution in DC3.*

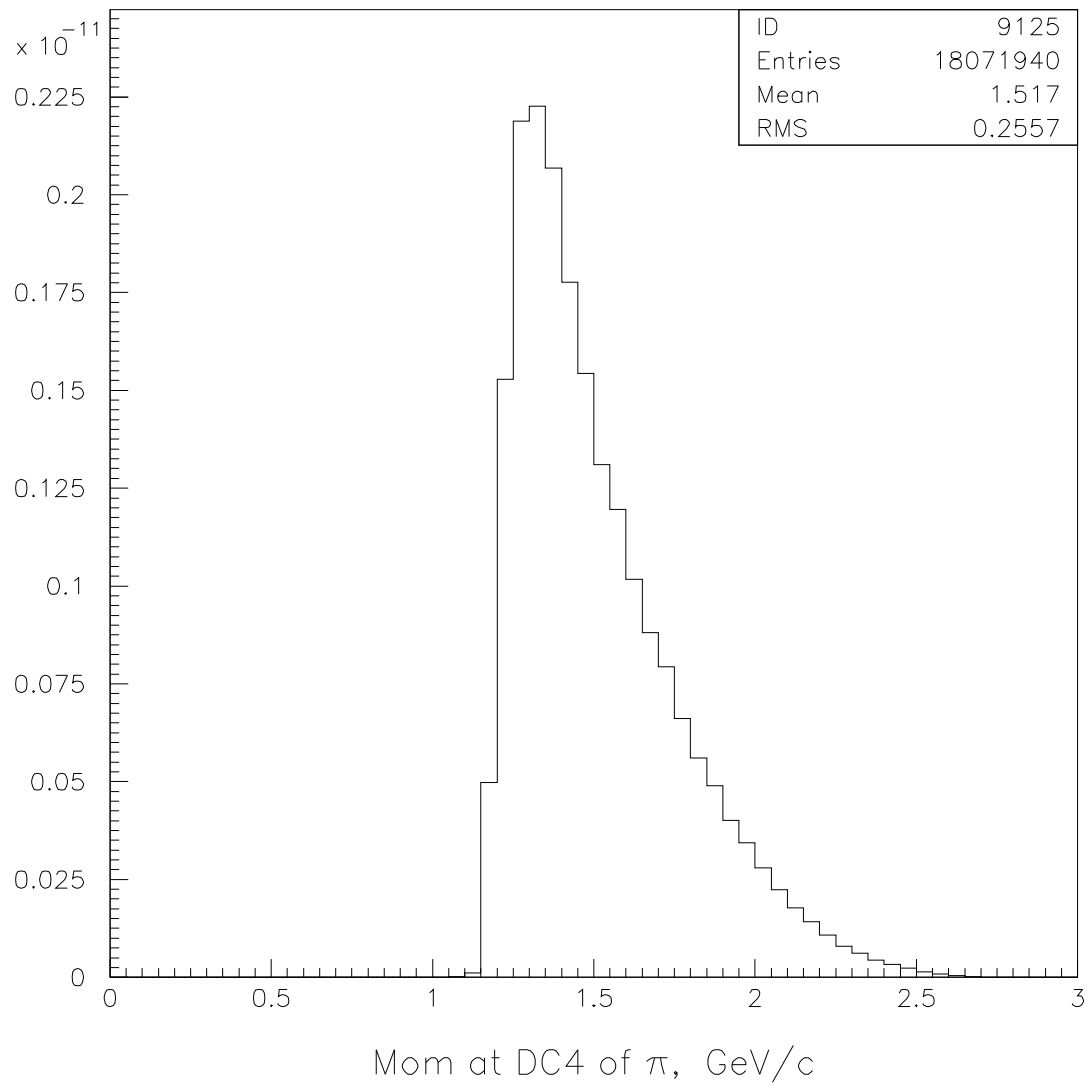


Figure 39: *Pion p -distribution in DC4.*

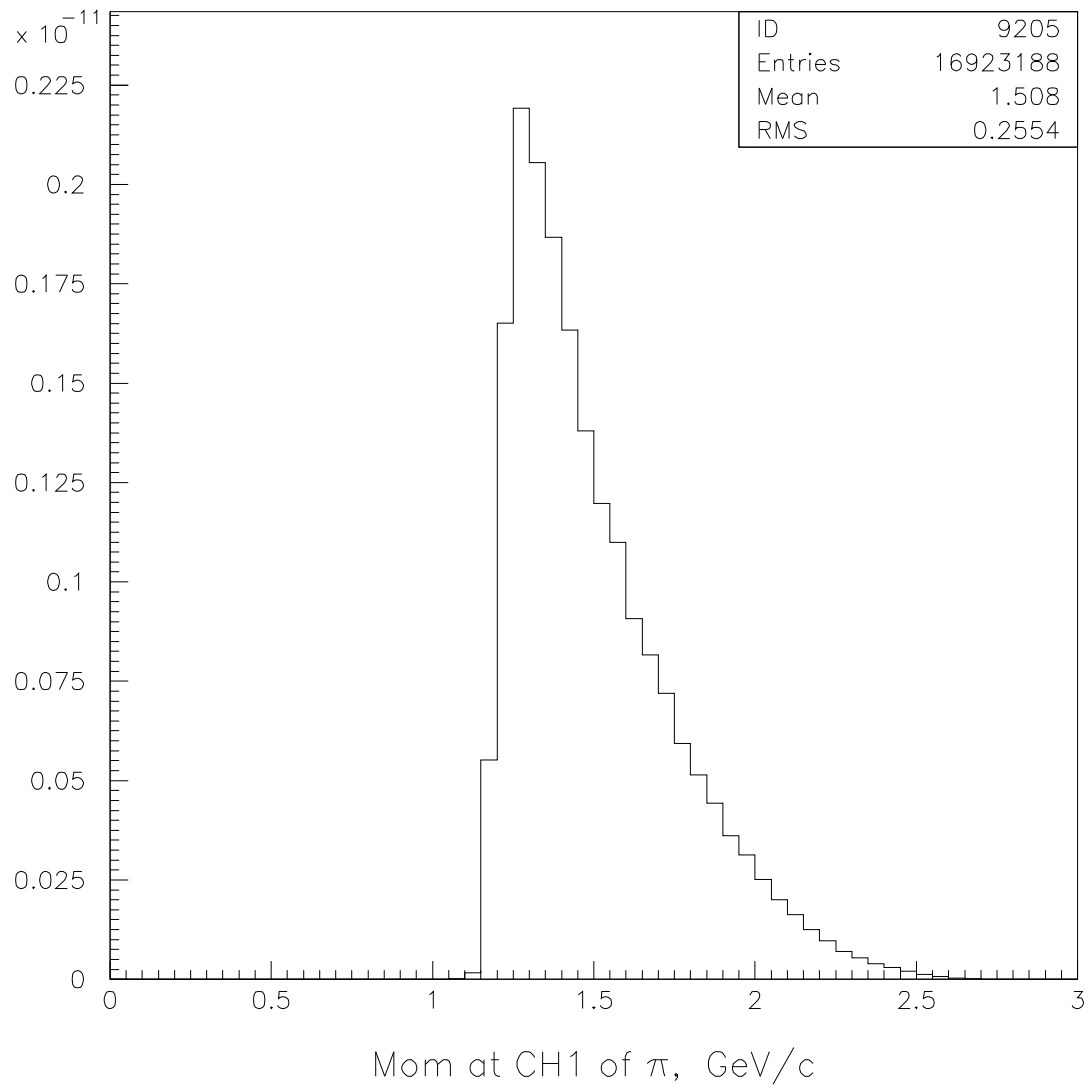


Figure 40: *Pion p -distribution in the front of CH (CH1).*

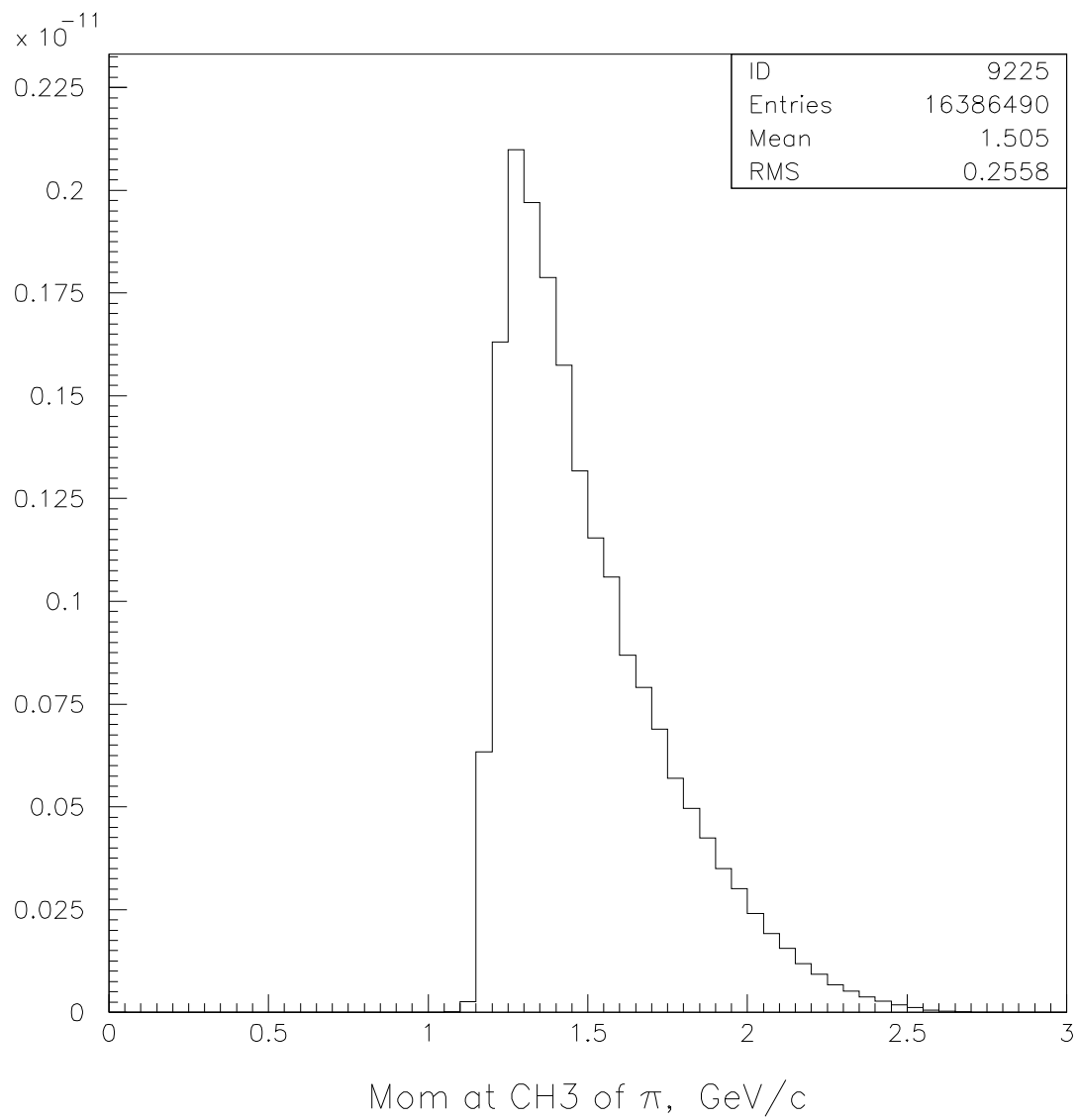


Figure 41: *Pion p -distribution in 1 m from the front of CH (CH3).*

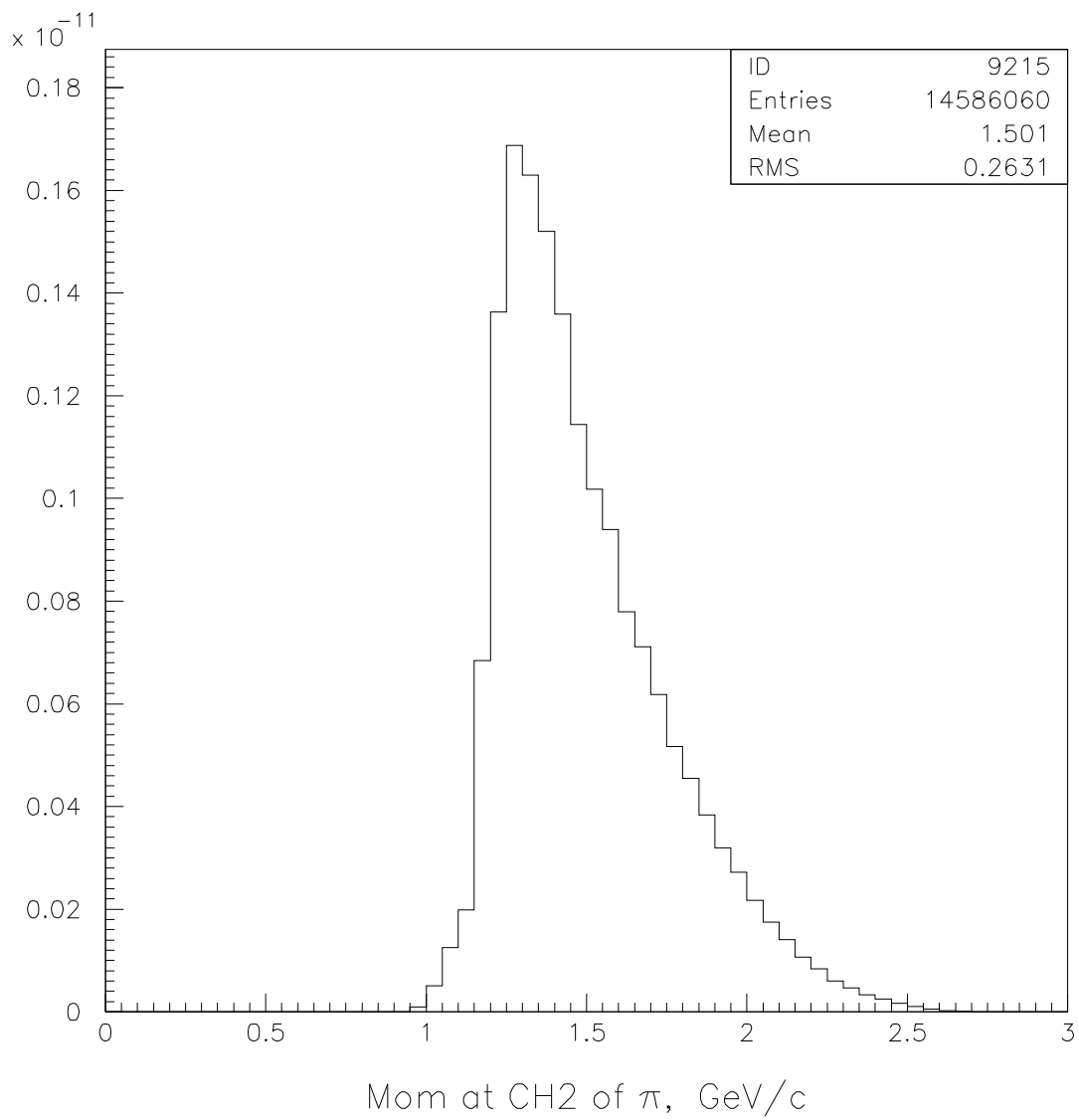


Figure 42: *Pion p -distribution in the back of CH (CH2).*

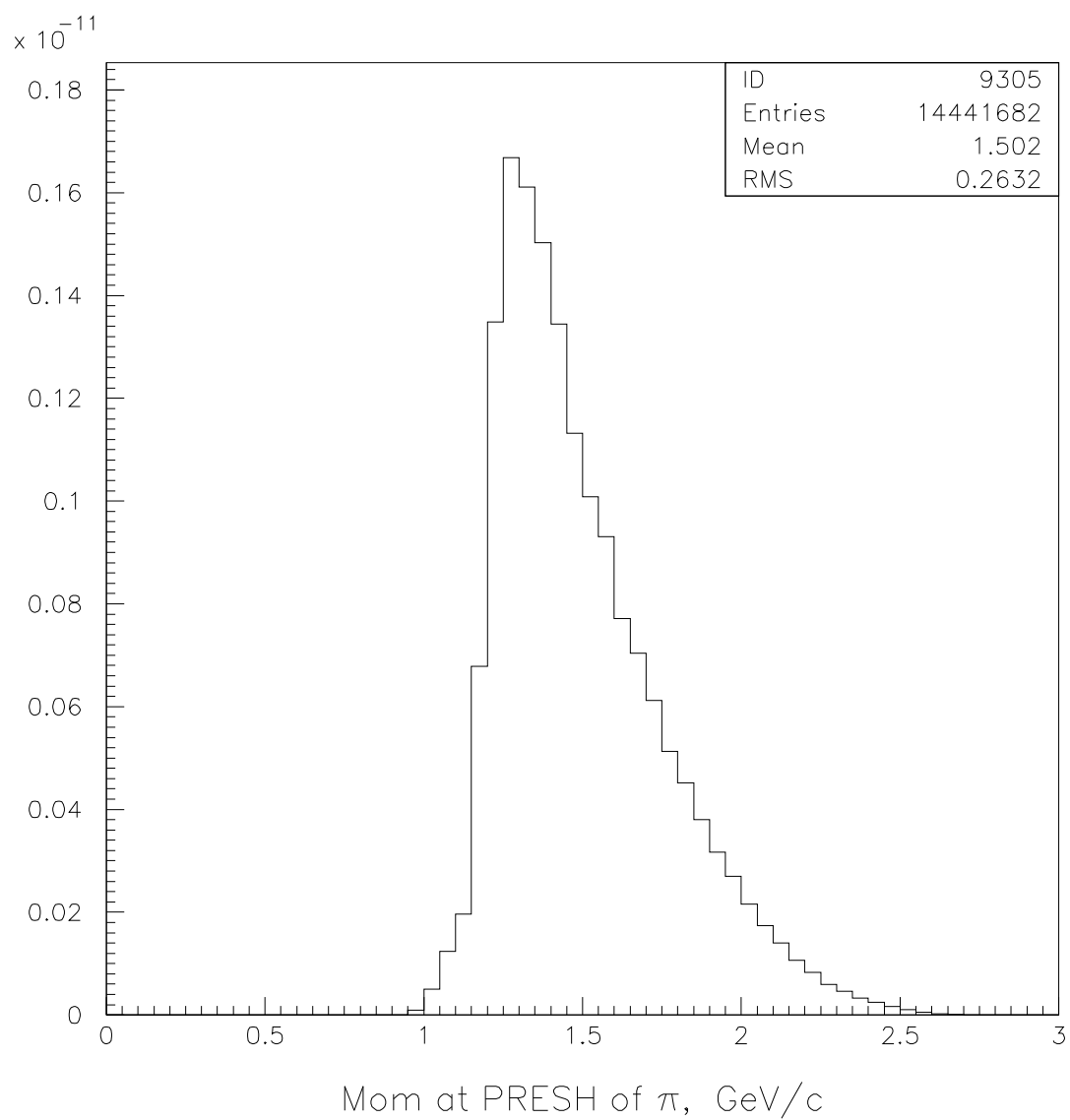


Figure 43: *Pion p-distribution in PR.*

7 Kaon momentum distributions

Table 6 is extraction of boundaries and mean values from histograms 44, 45, 46, 47, 49, 48, and 50.

Table 6: *Kaon p -boundaries and mean values (GeV/c).*

plane	p_{min}	p_{max}	Δp	mv	R
DC2	4.10	8.40	4.30	5.38	1.00
DC3	4.10	8.40	4.30	5.38	1.00
DC4	4.10	8.40	4.30	5.38	1.00
CH1	4.00	8.40	4.40	5.38	0.95
CH3	4.00	8.40	4.40	5.38	0.96
CH2	4.00	8.40	4.40	5.38	0.91
PR	4.00	8.40	4.40	5.38	0.99

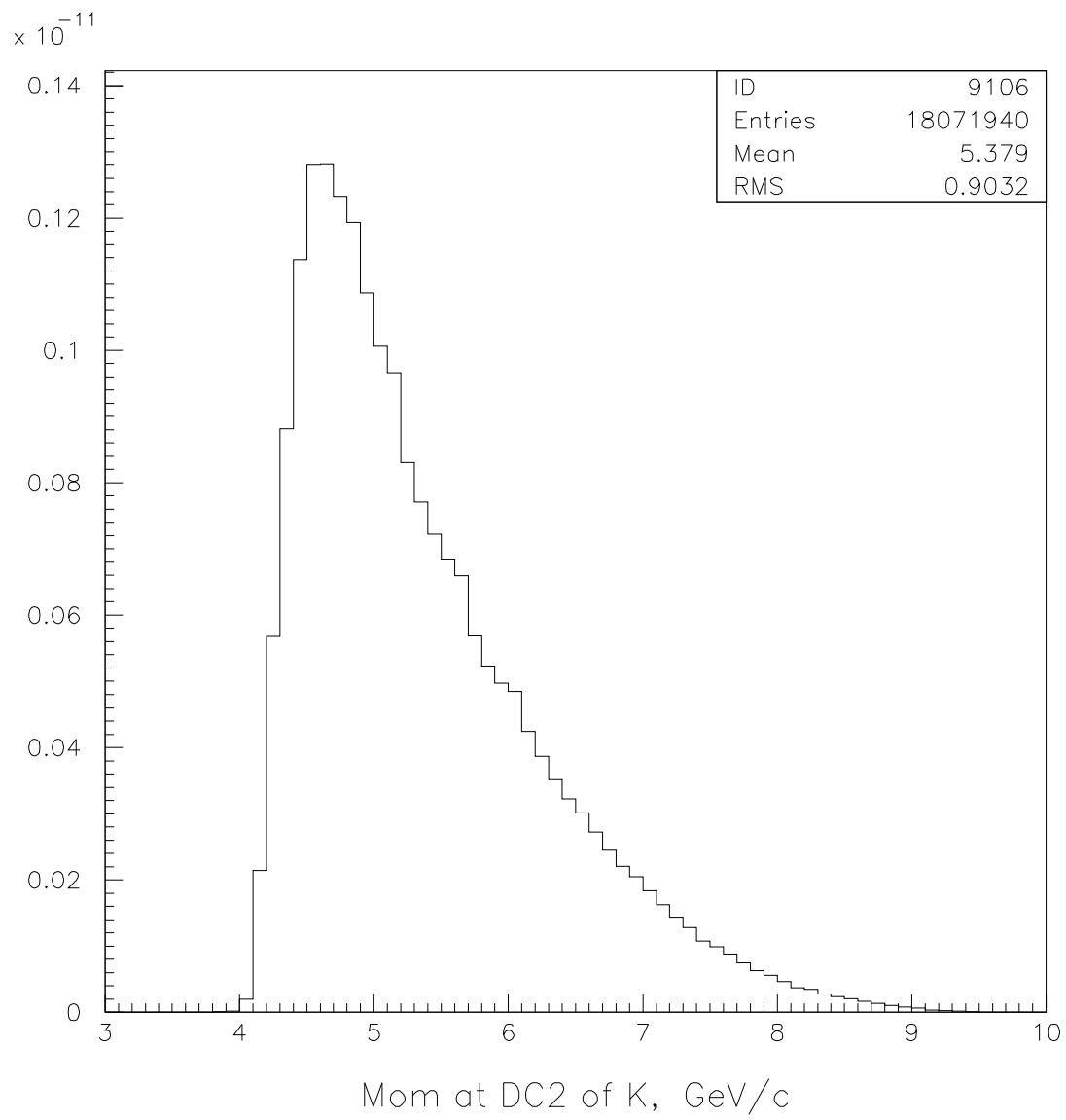


Figure 44: *Kaon p-distribution in DC2.*

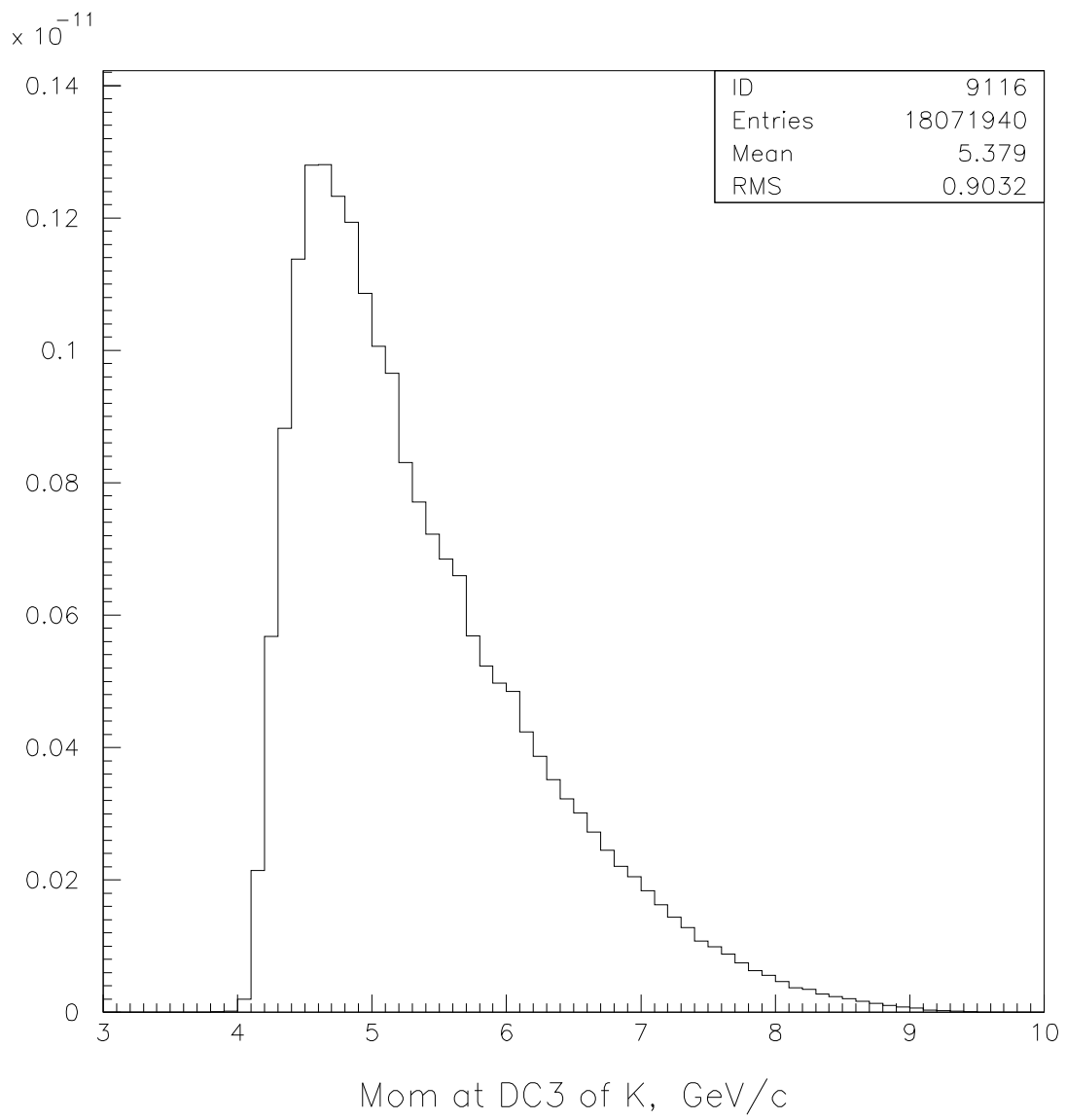


Figure 45: *Kaon p-distribution in DC3.*

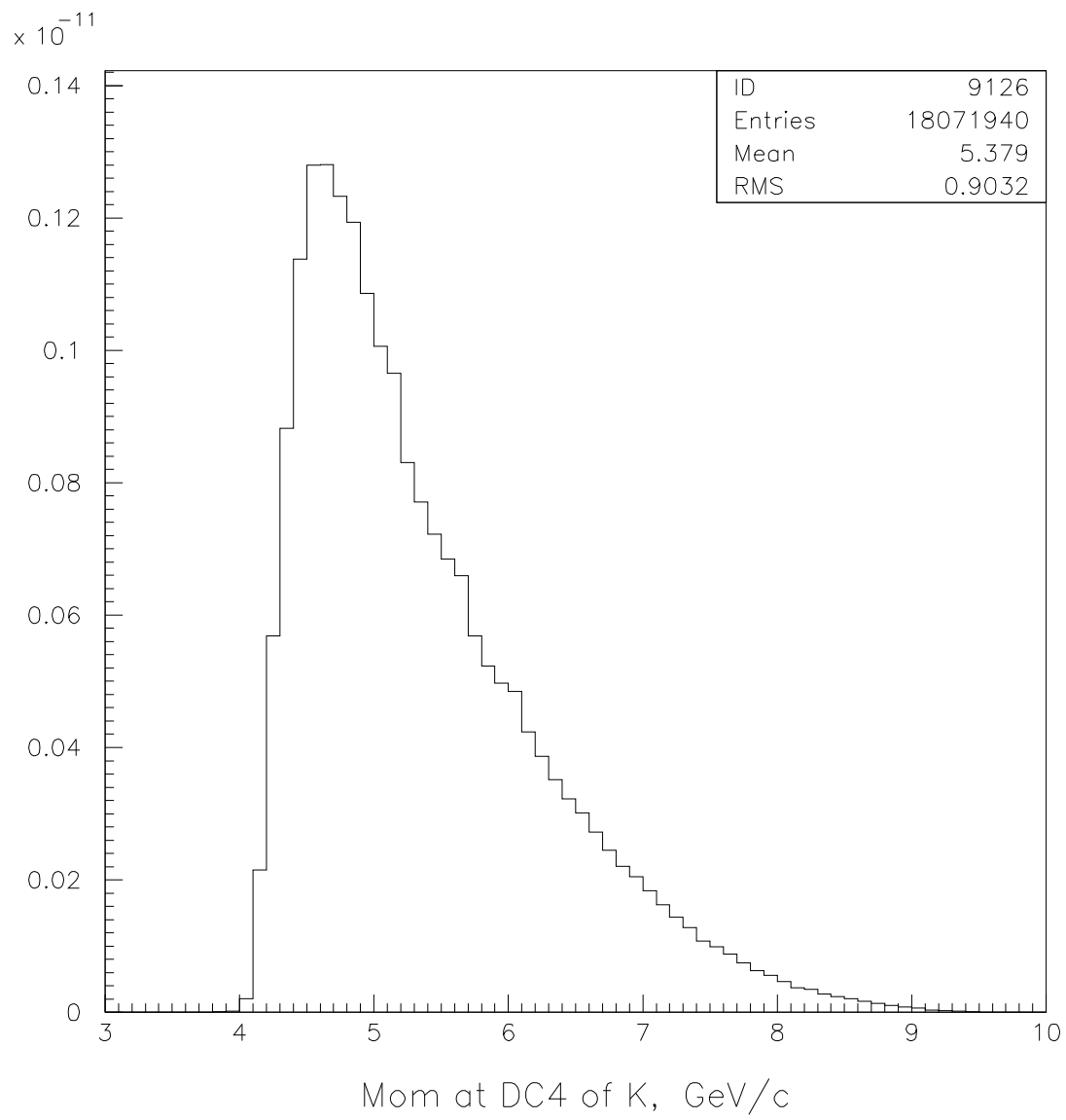


Figure 46: *Kaon p-distribution in DC4.*

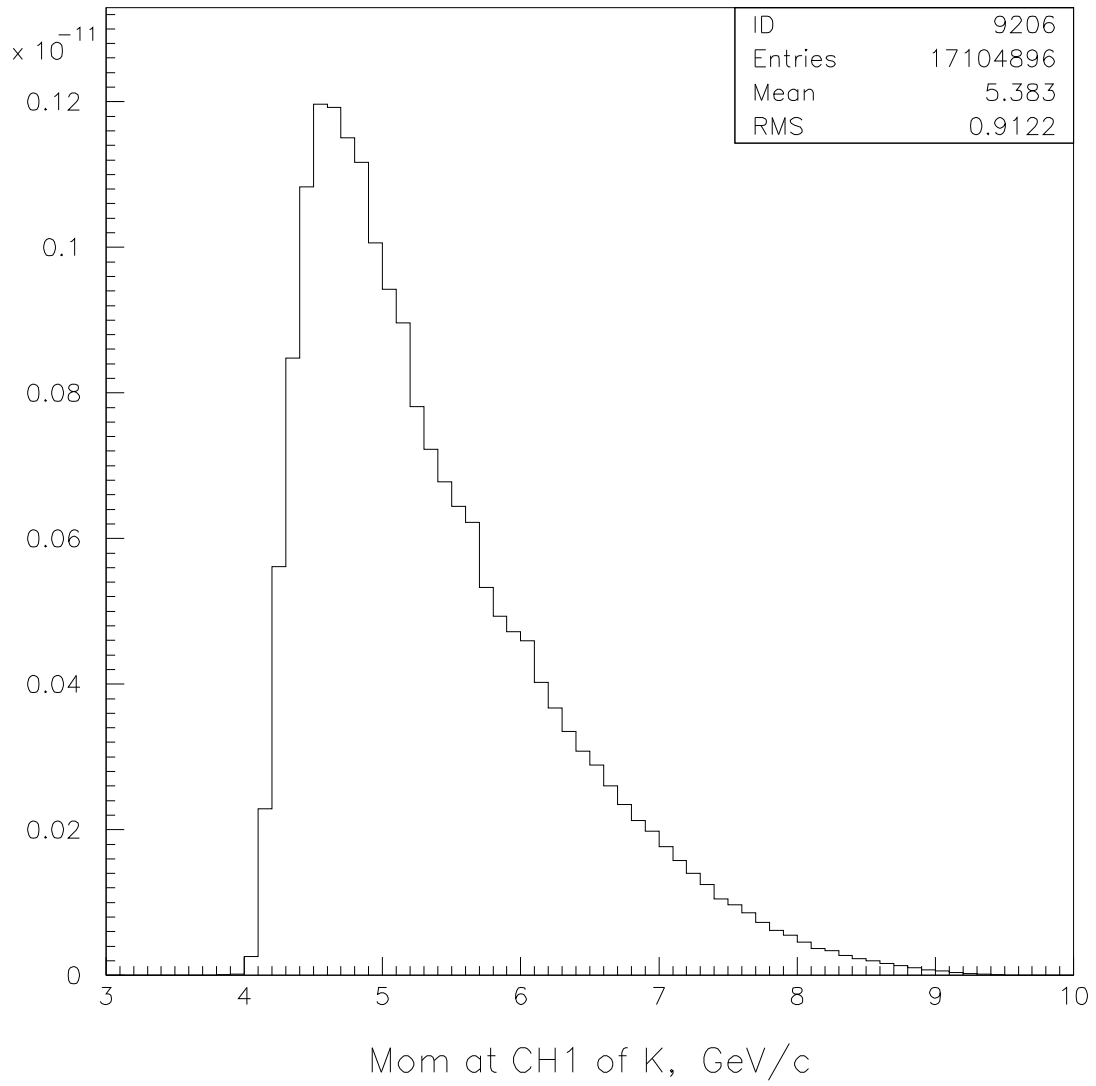


Figure 47: *Kaon p-distribution in the front of CH (CH1).*

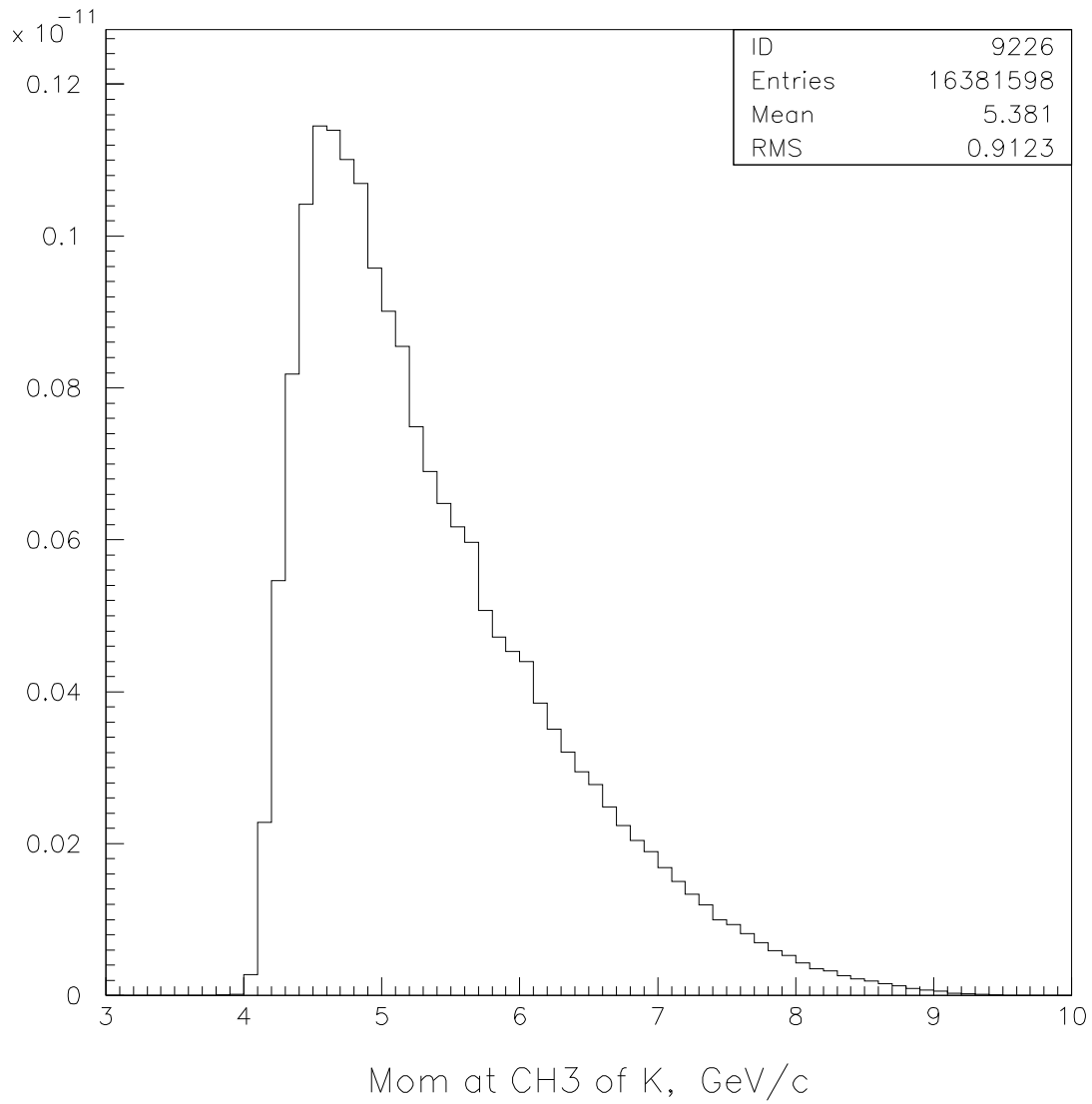


Figure 48: $Kaon$ p -distribution in 1 m from the front of CH (CH3).

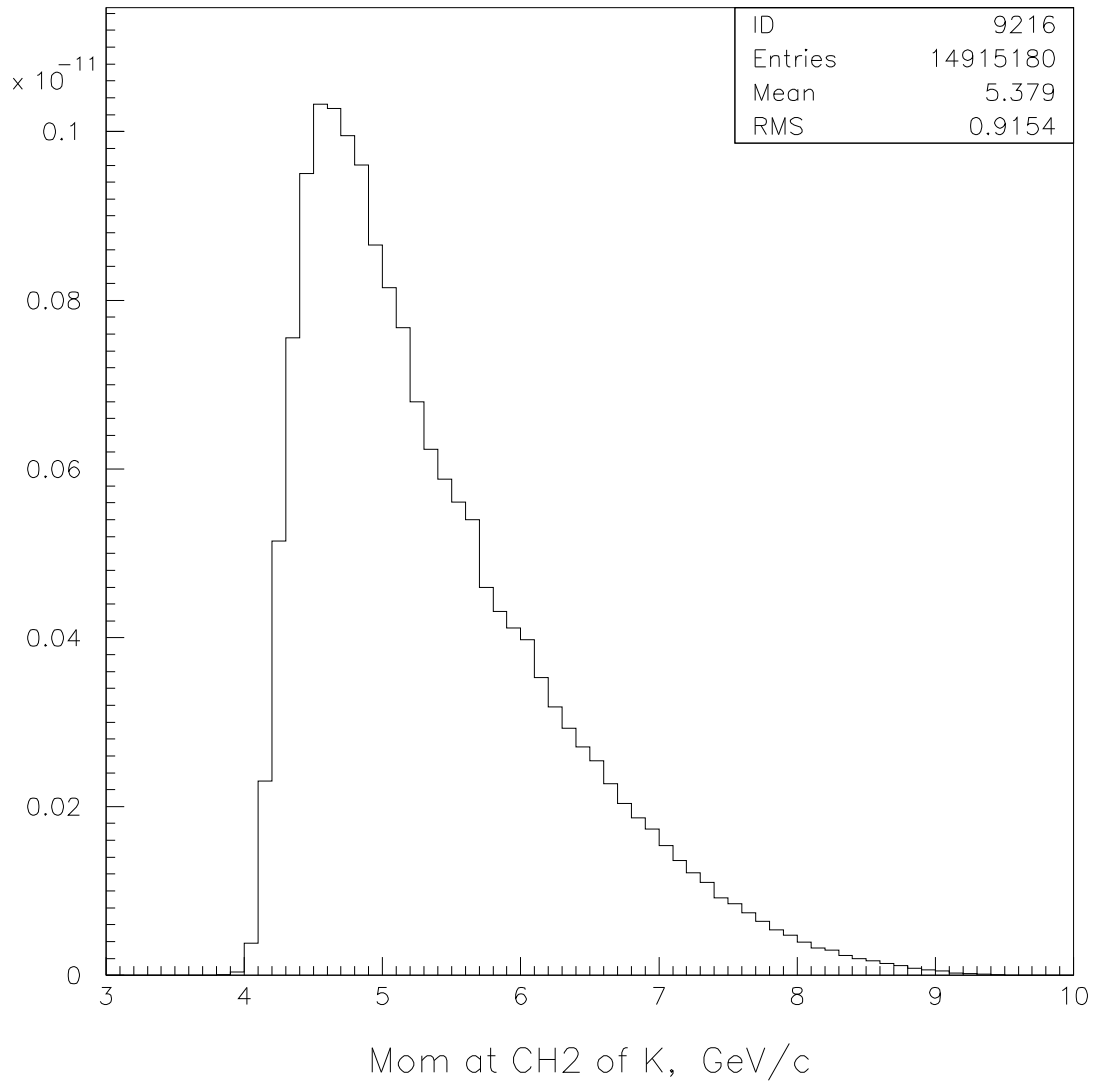


Figure 49: *Kaon p -distribution in the back of CH (CH₂).*

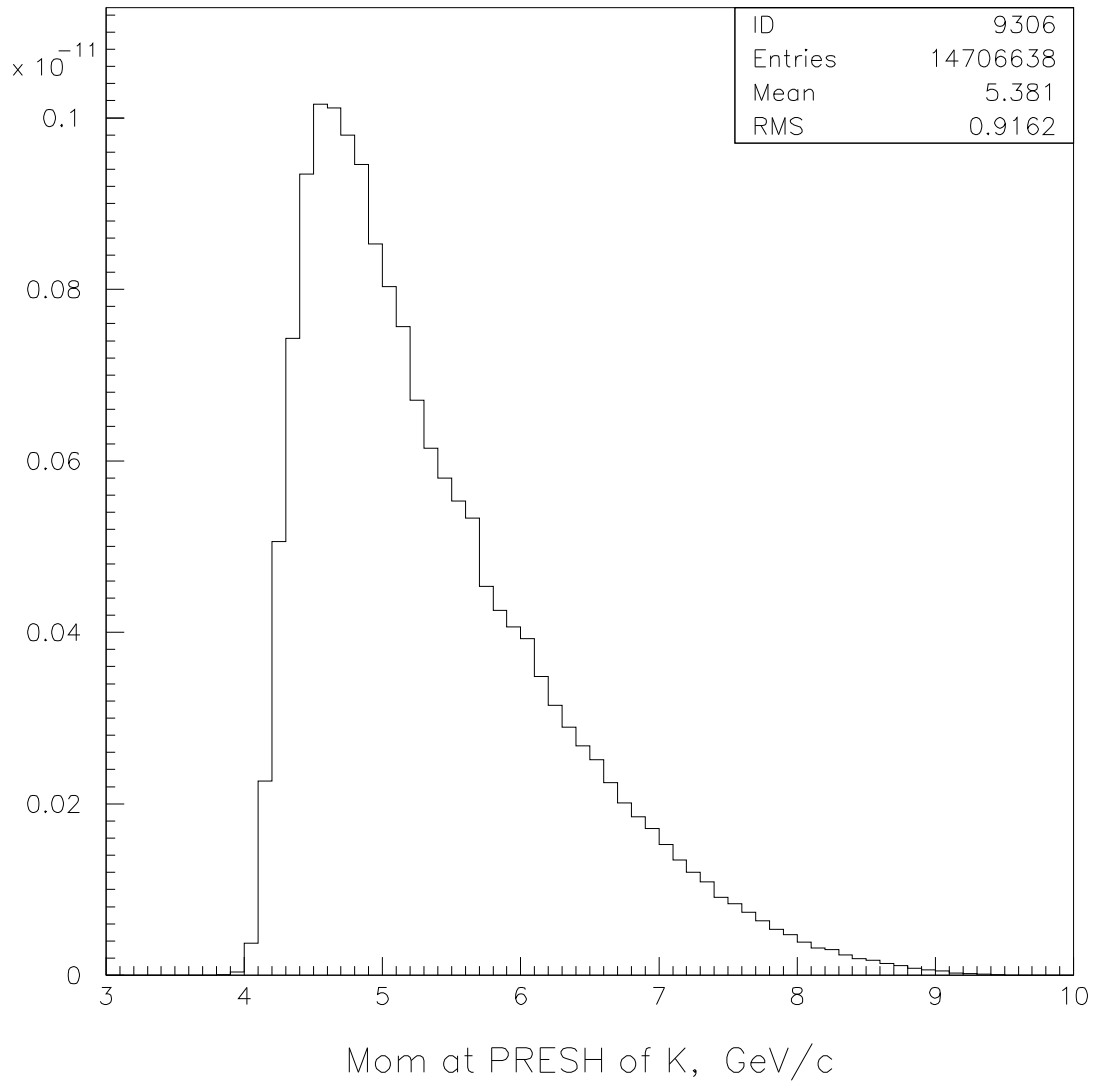


Figure 50: *Kaon p-distribution in PR.*

8 Pion xy-plots

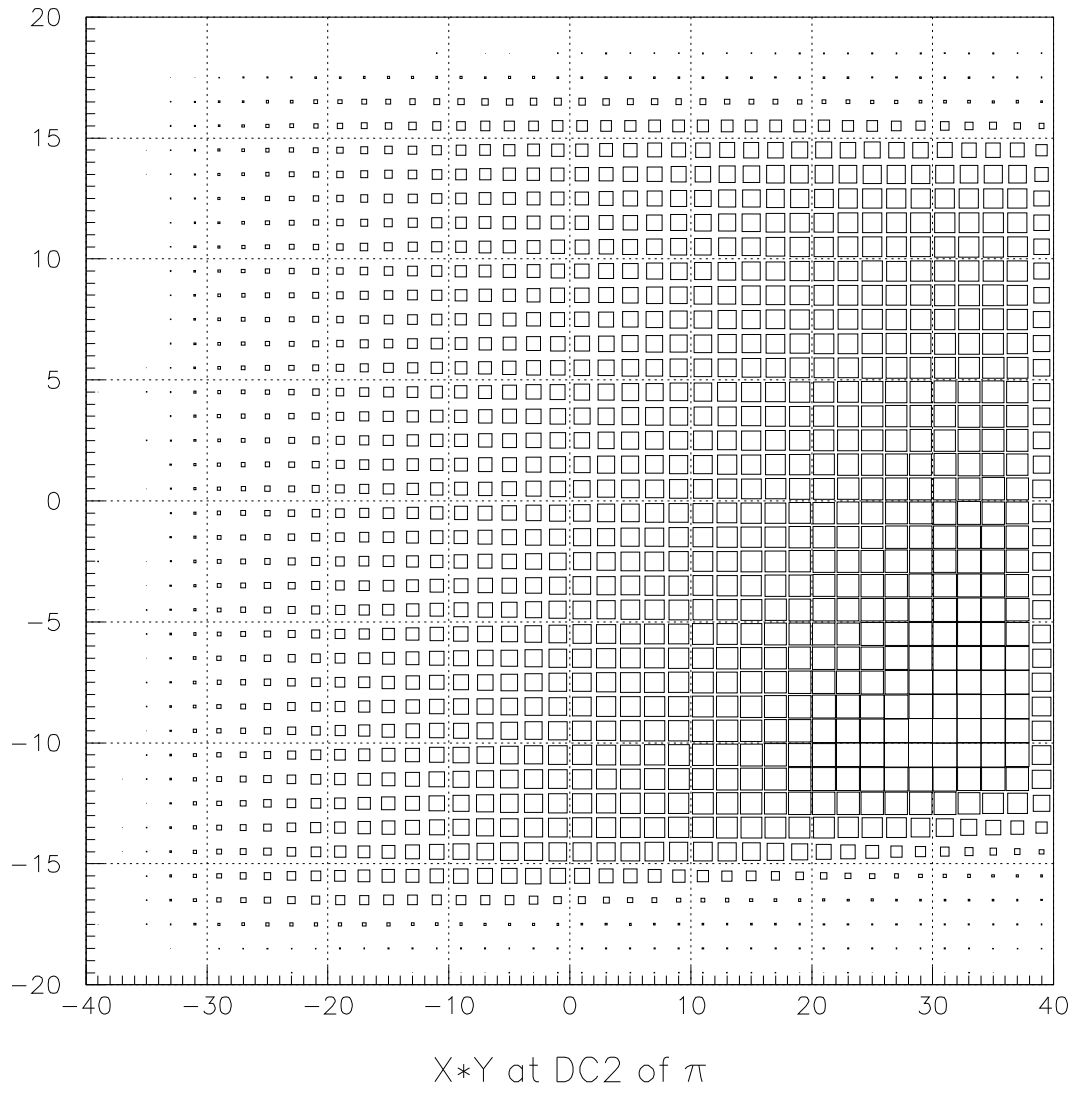
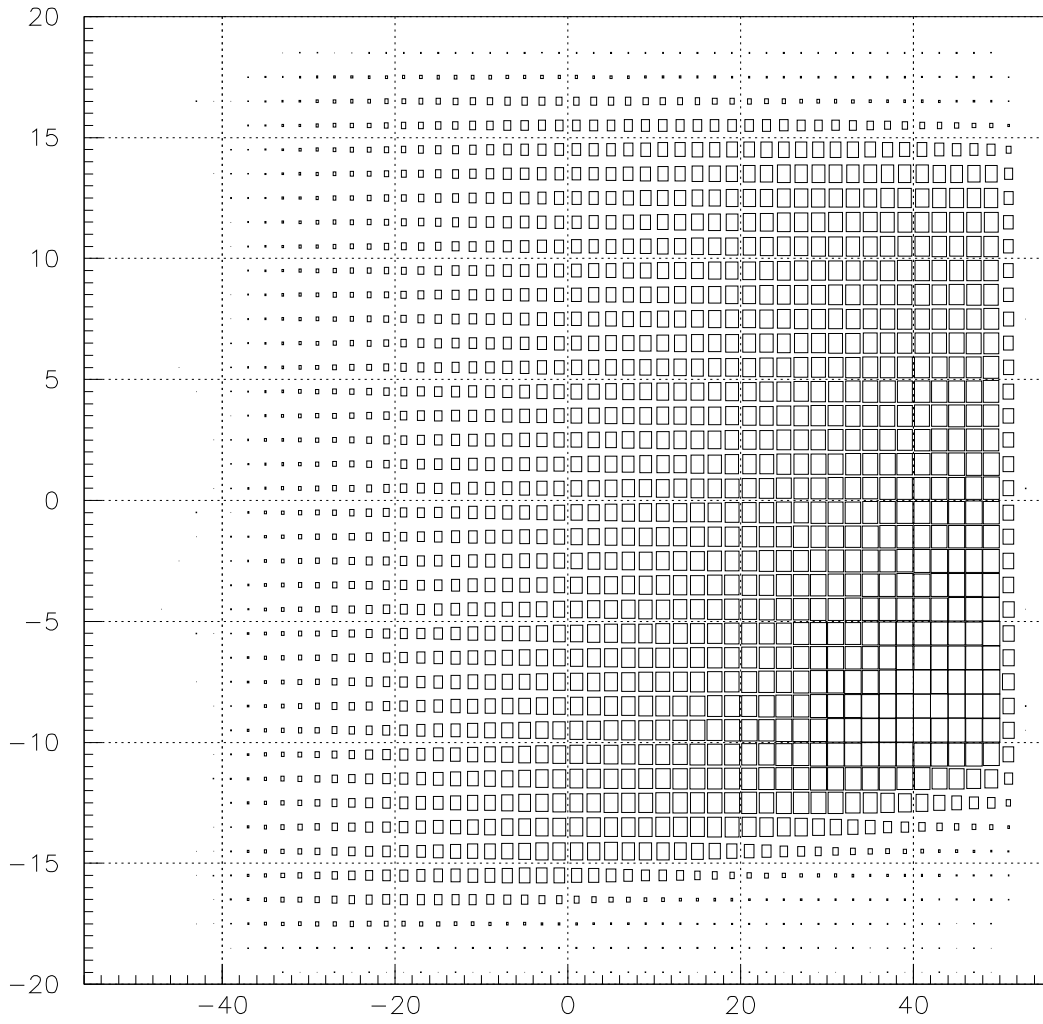


Figure 51: *Pion xy-plot in DC2.*



X*Y at DC3 of π

Figure 52: *Pion xy-plot in DC3.*

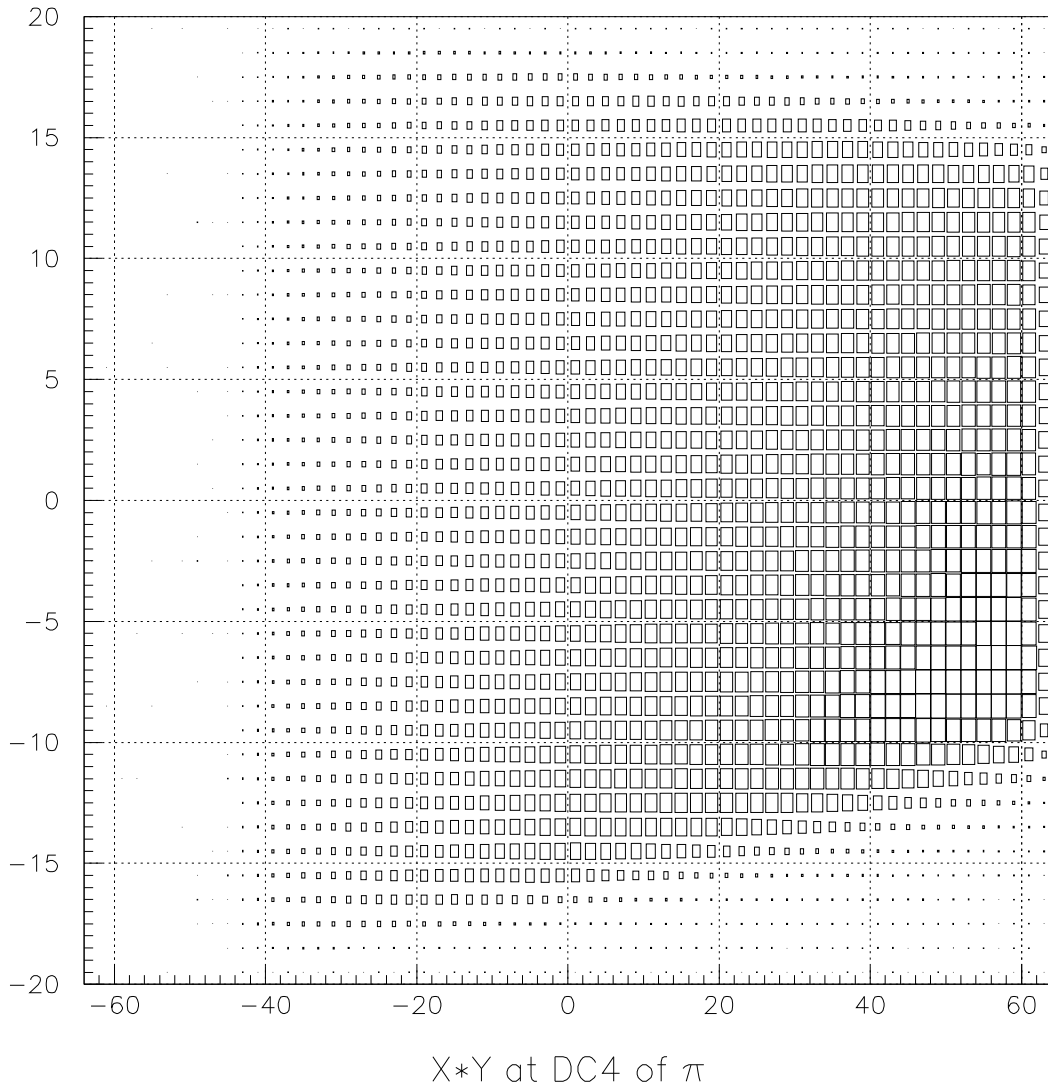


Figure 53: *Pion xy-plot in DC4.*

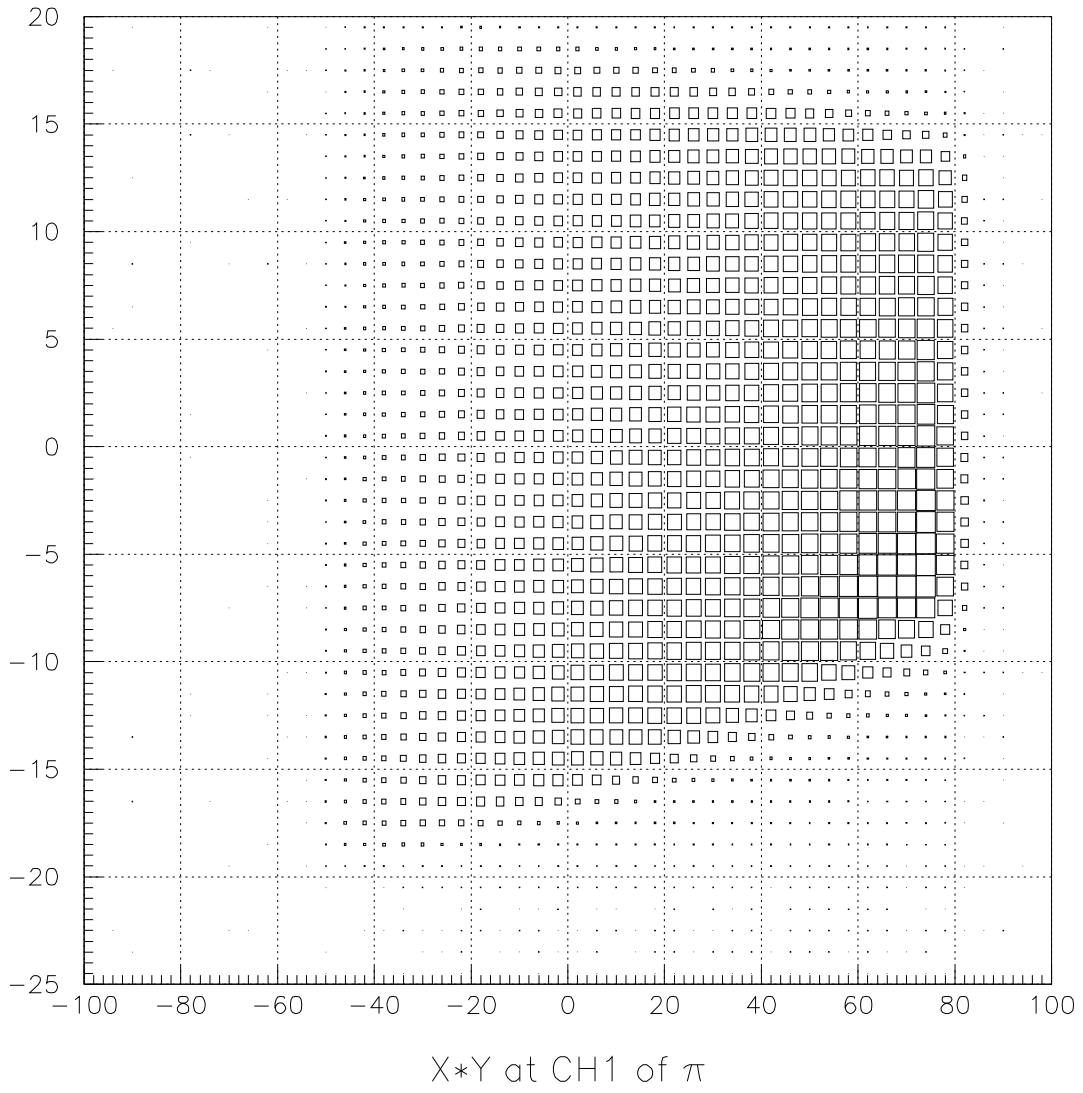


Figure 54: *Pion xy-plot in the front of CH (CH1).*

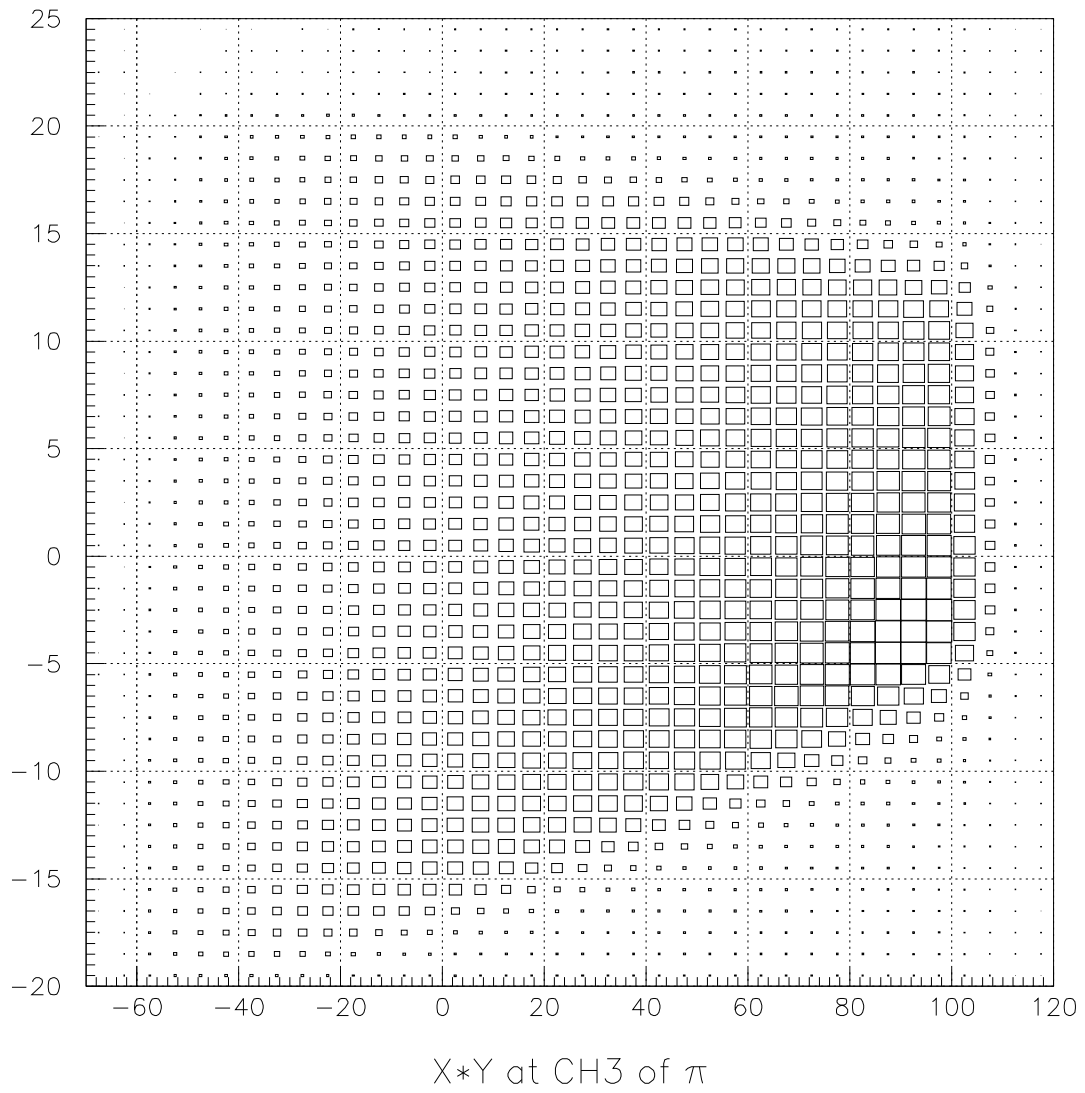


Figure 55: *Pion xy-plot in 1 m from the front of CH (CH3).*

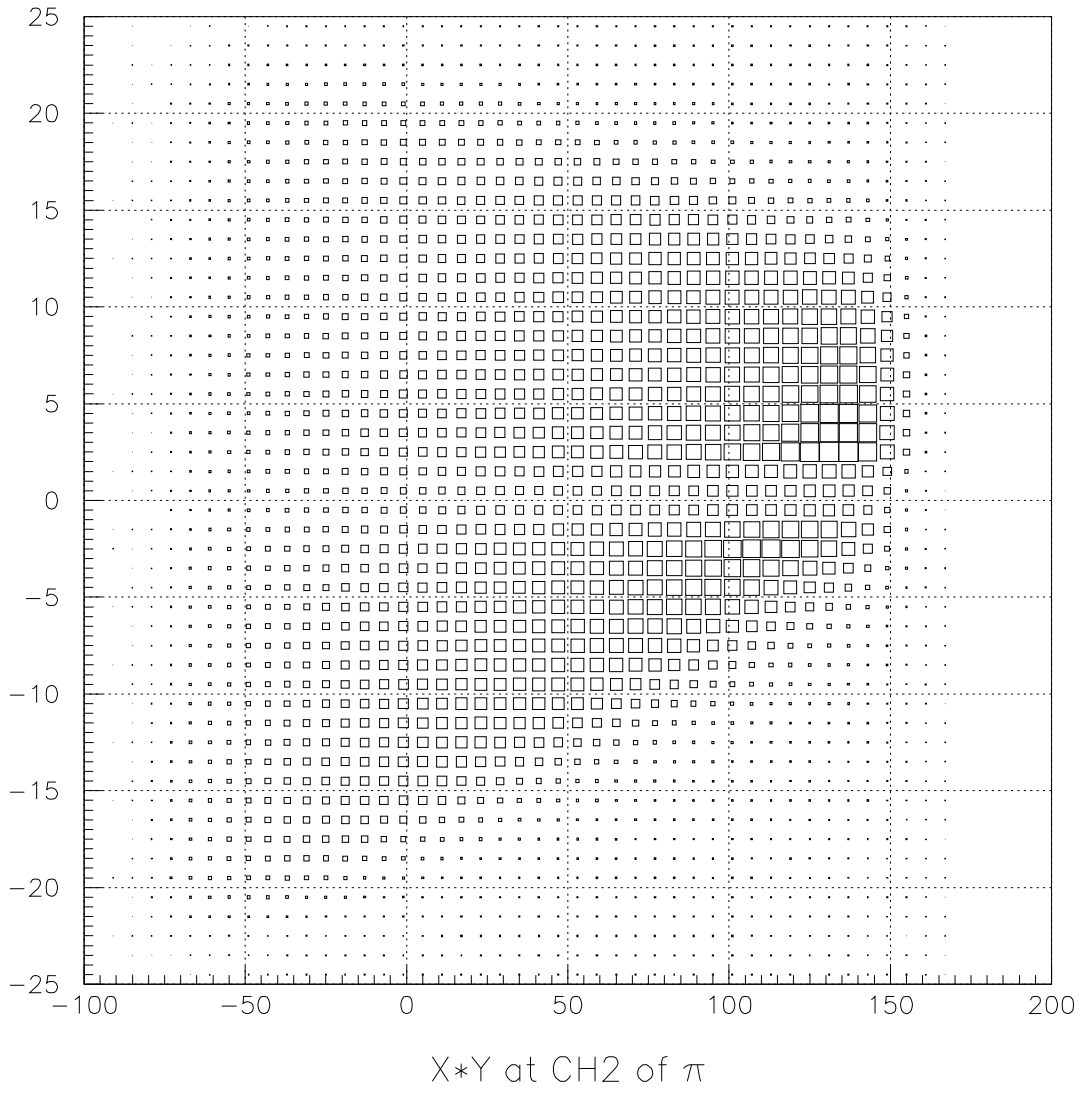
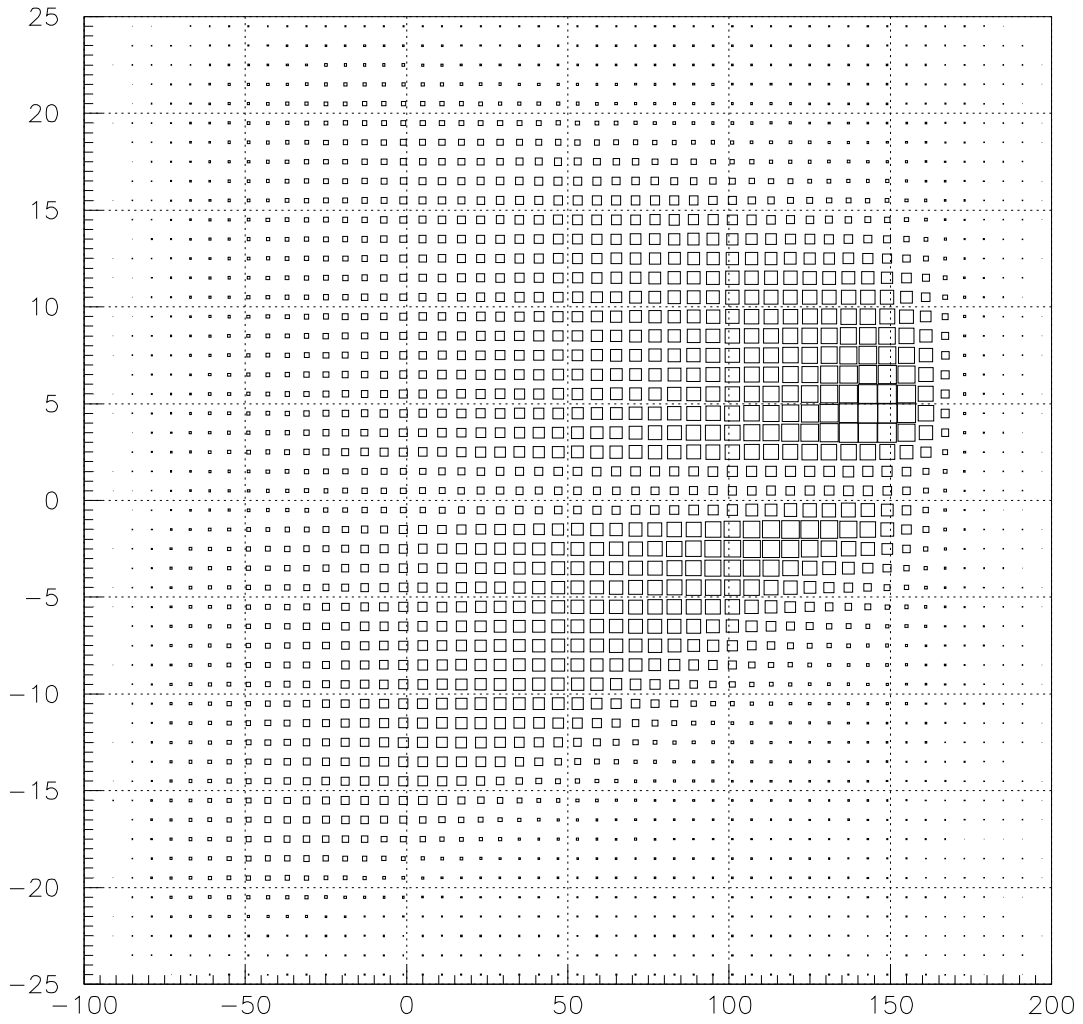


Figure 56: *Pion xy-plot in the back of CH (CH2).*



X*Y at PRESH of π

Figure 57: *Pion xy-plot in PR.*

9 Kaon xy-plots

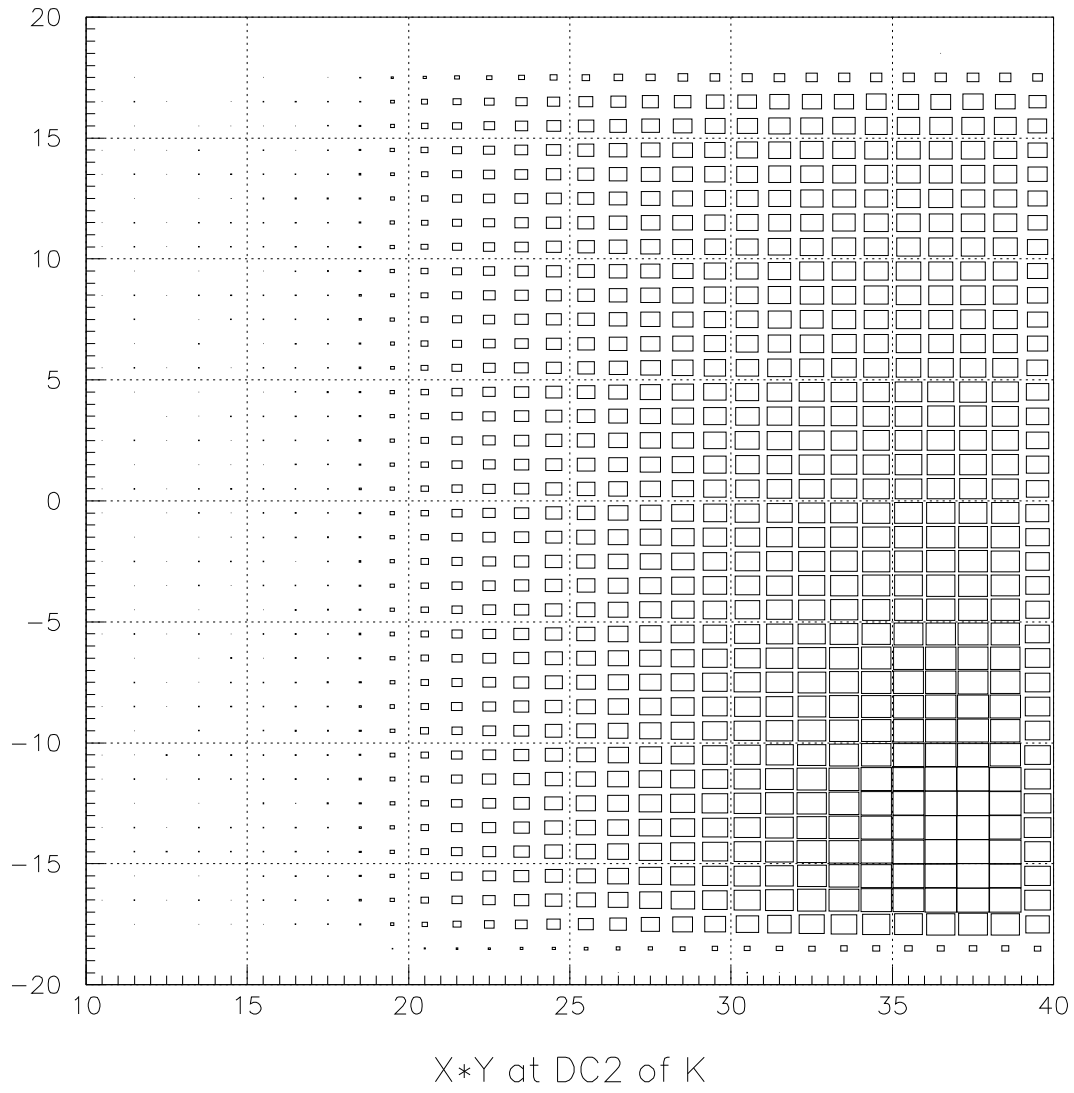


Figure 58: *Kaon xy-plot in DC2.*

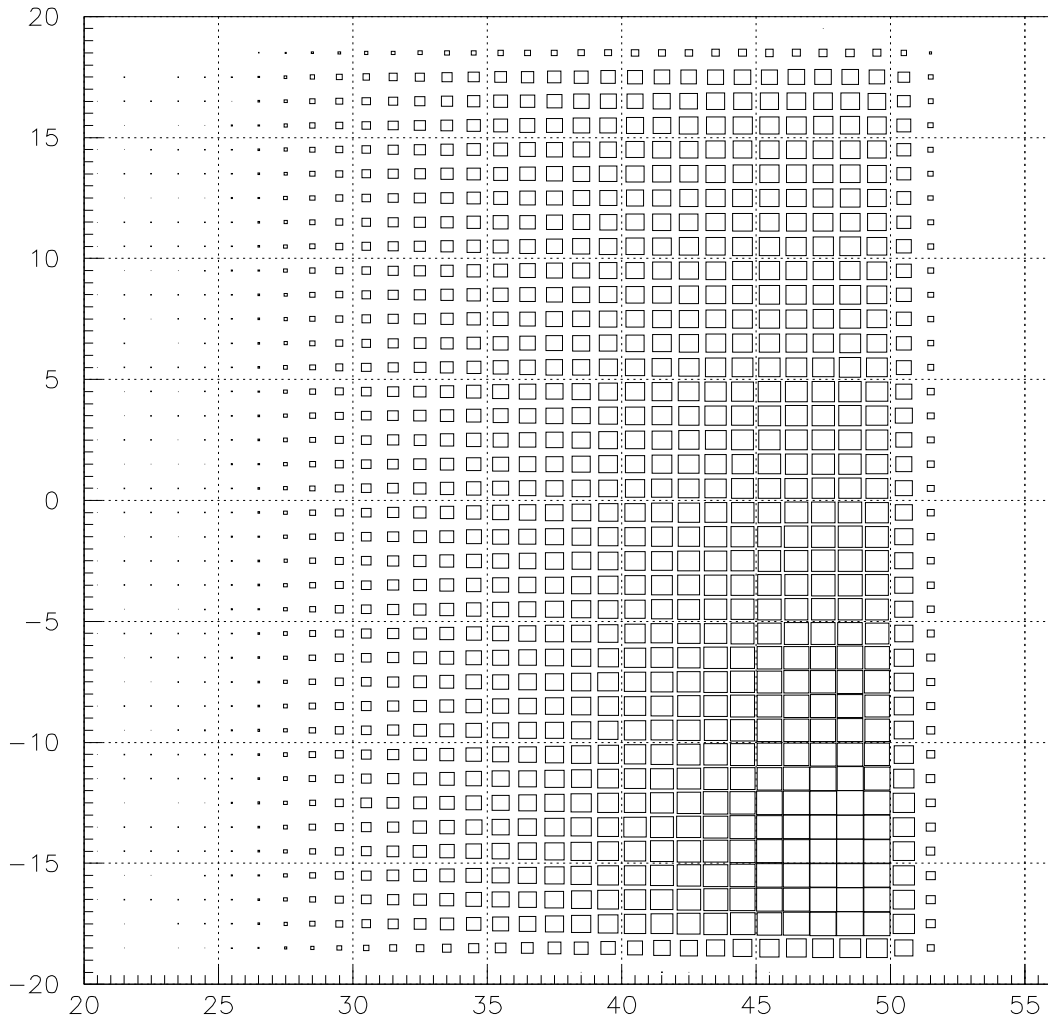
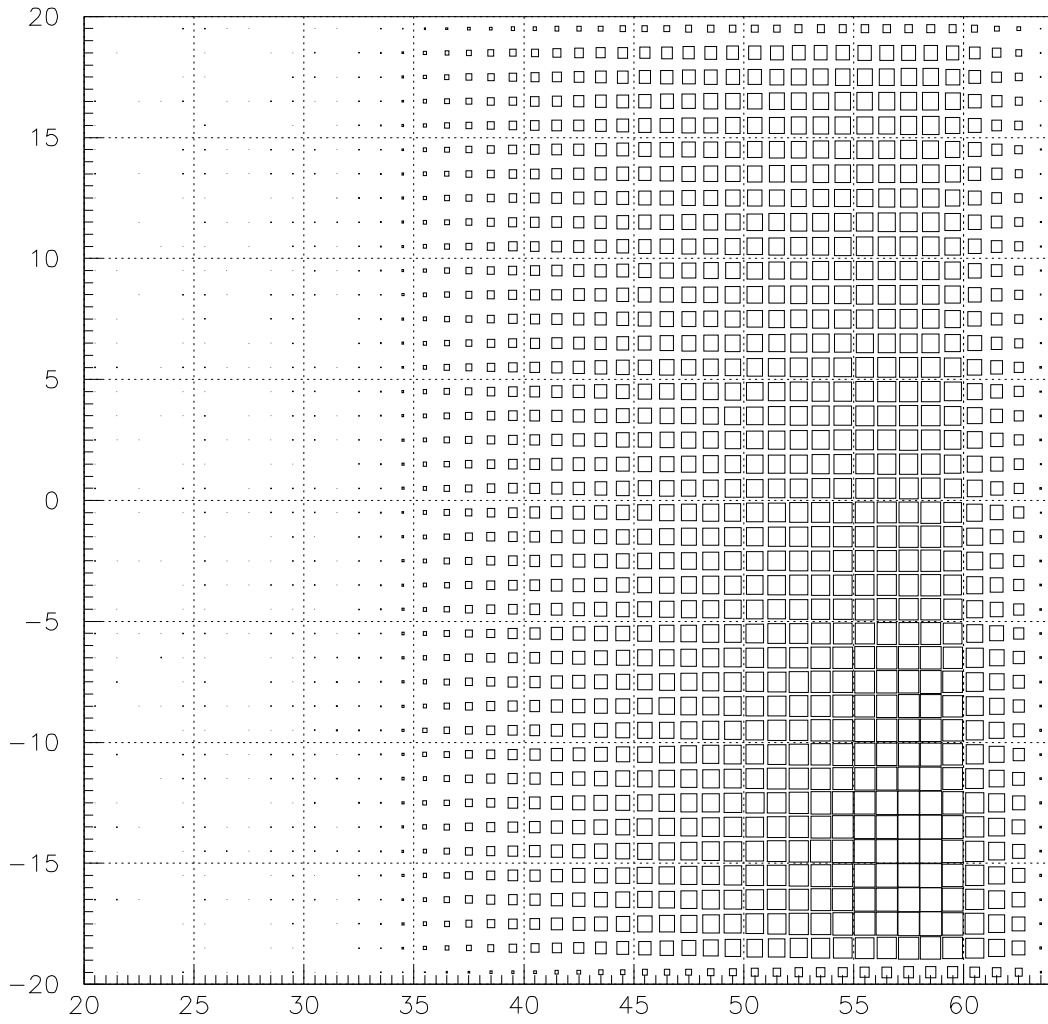


Figure 59: *Kaon xy-plot in DC3.*



X*Y at DC4 of K

Figure 60: *Kaon xy-plot in DC4.*

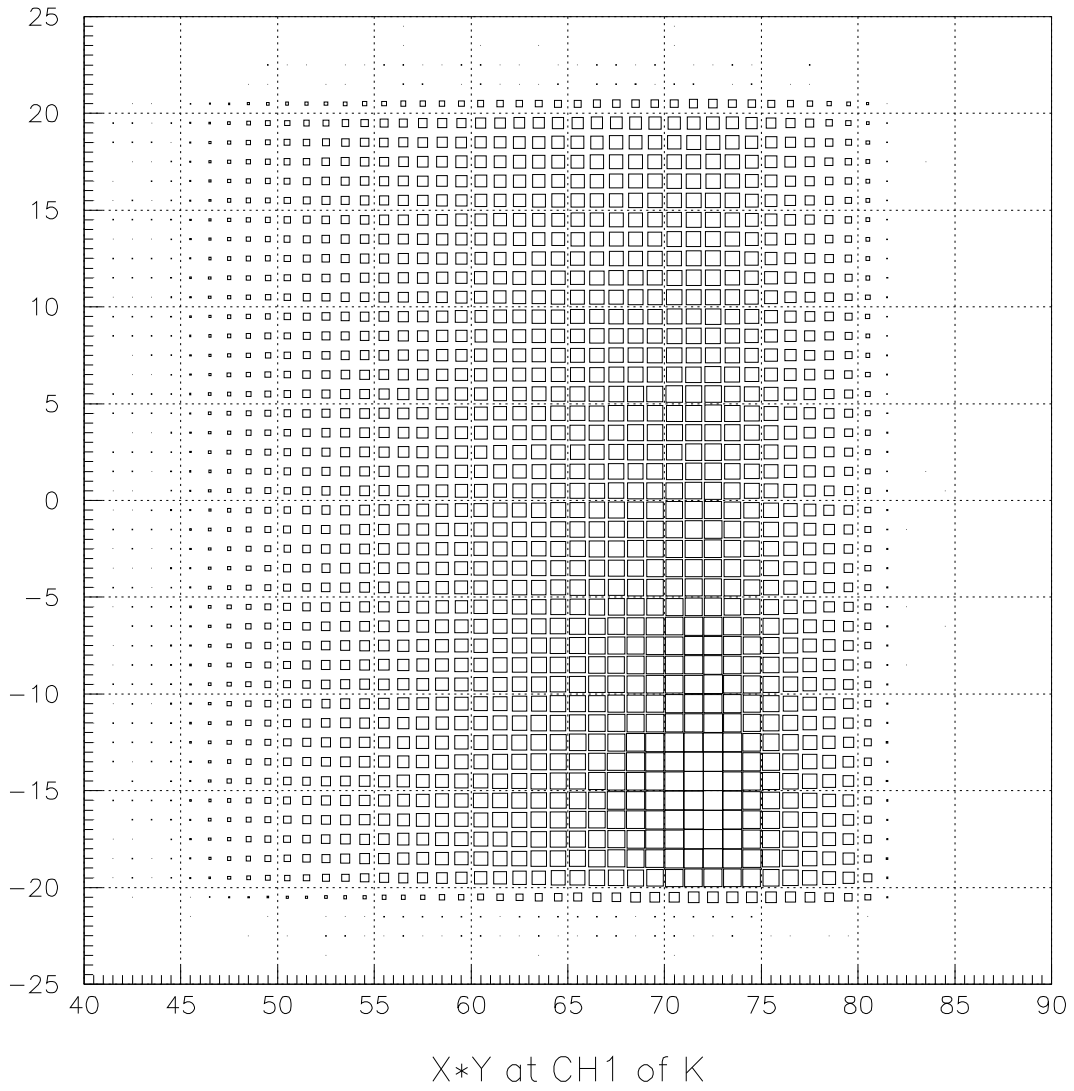


Figure 61: *Kaon xy-plot in the front of CH (CH1).*

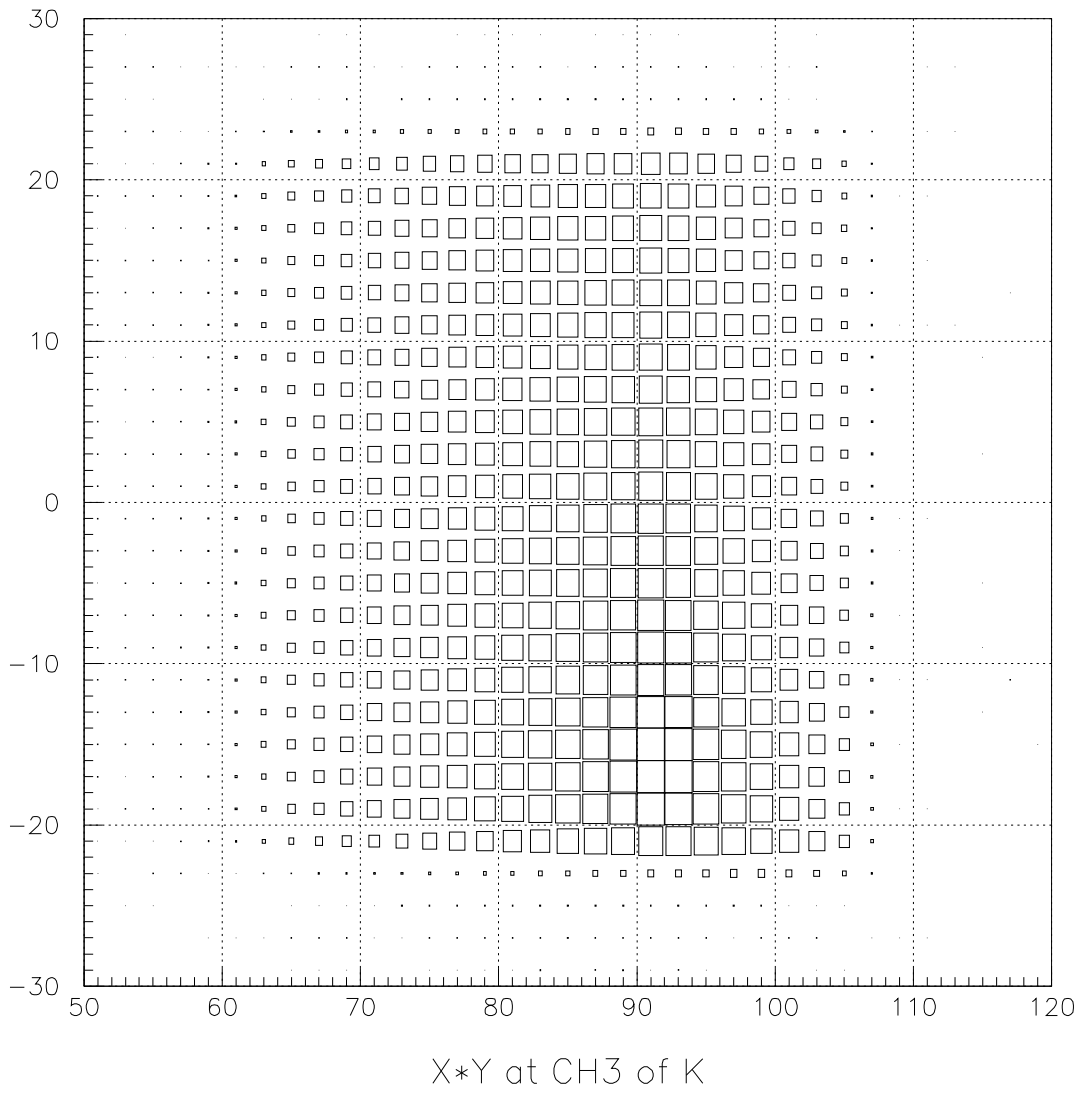


Figure 62: *Kaon xy-plot in 1 m from the front of CH (CH3).*

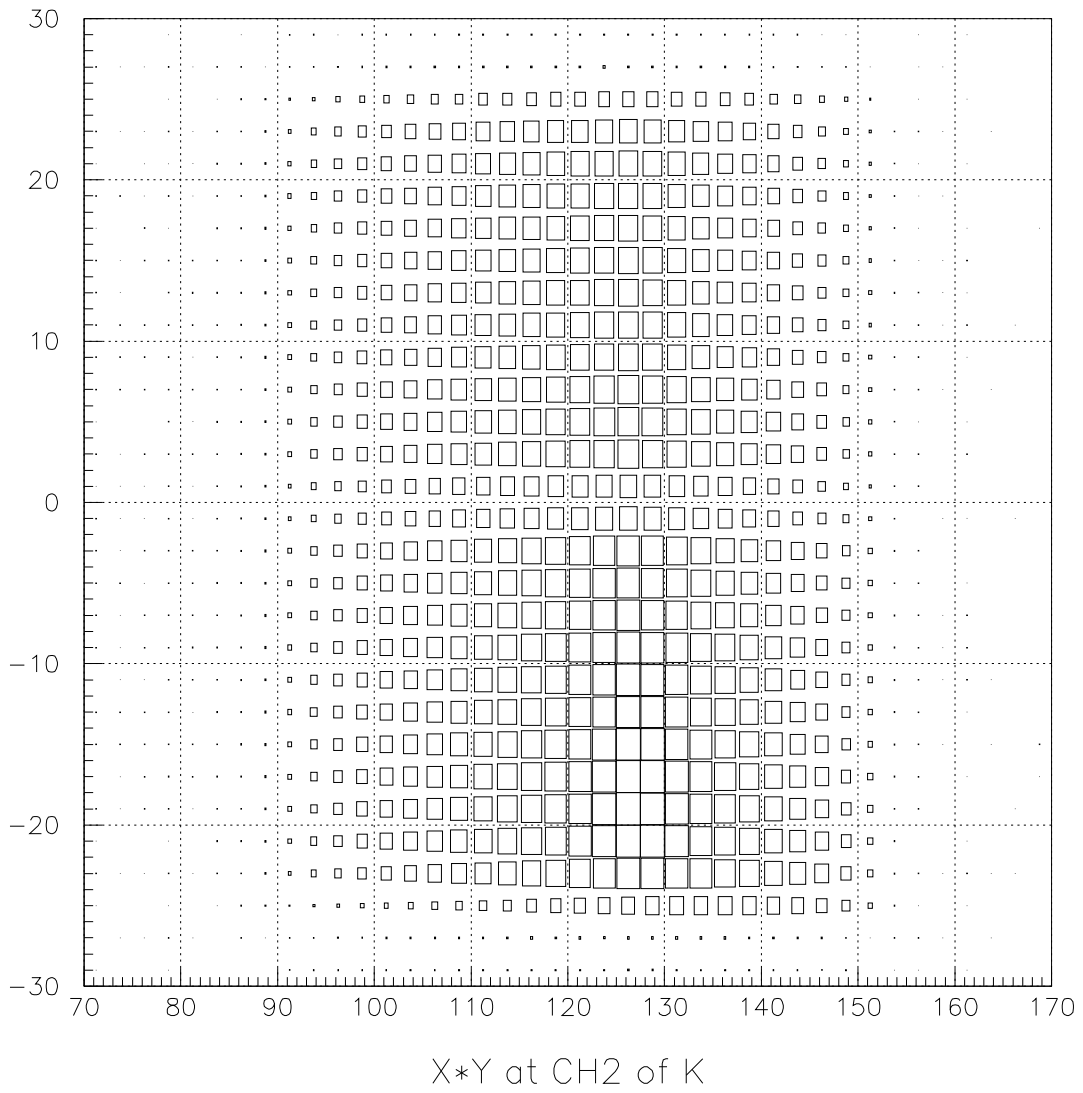
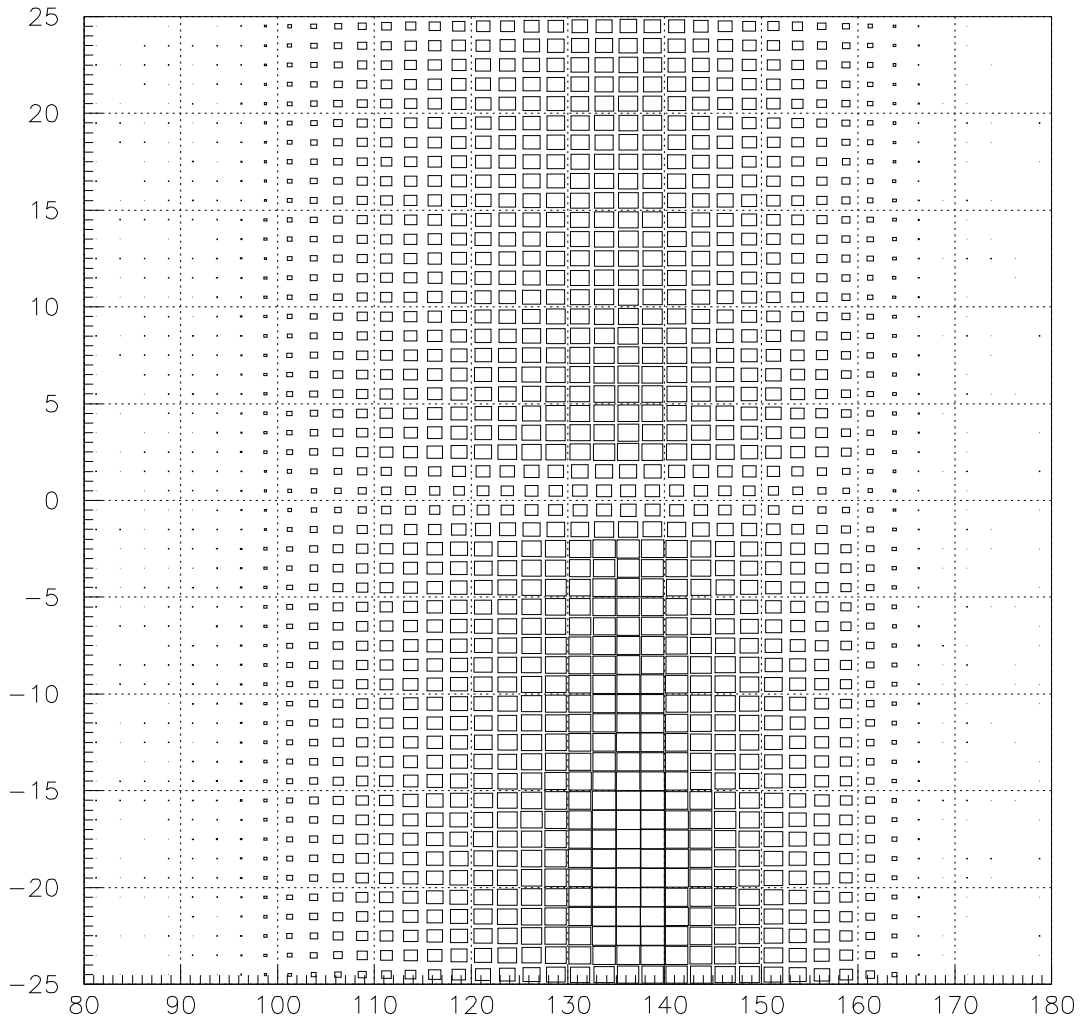


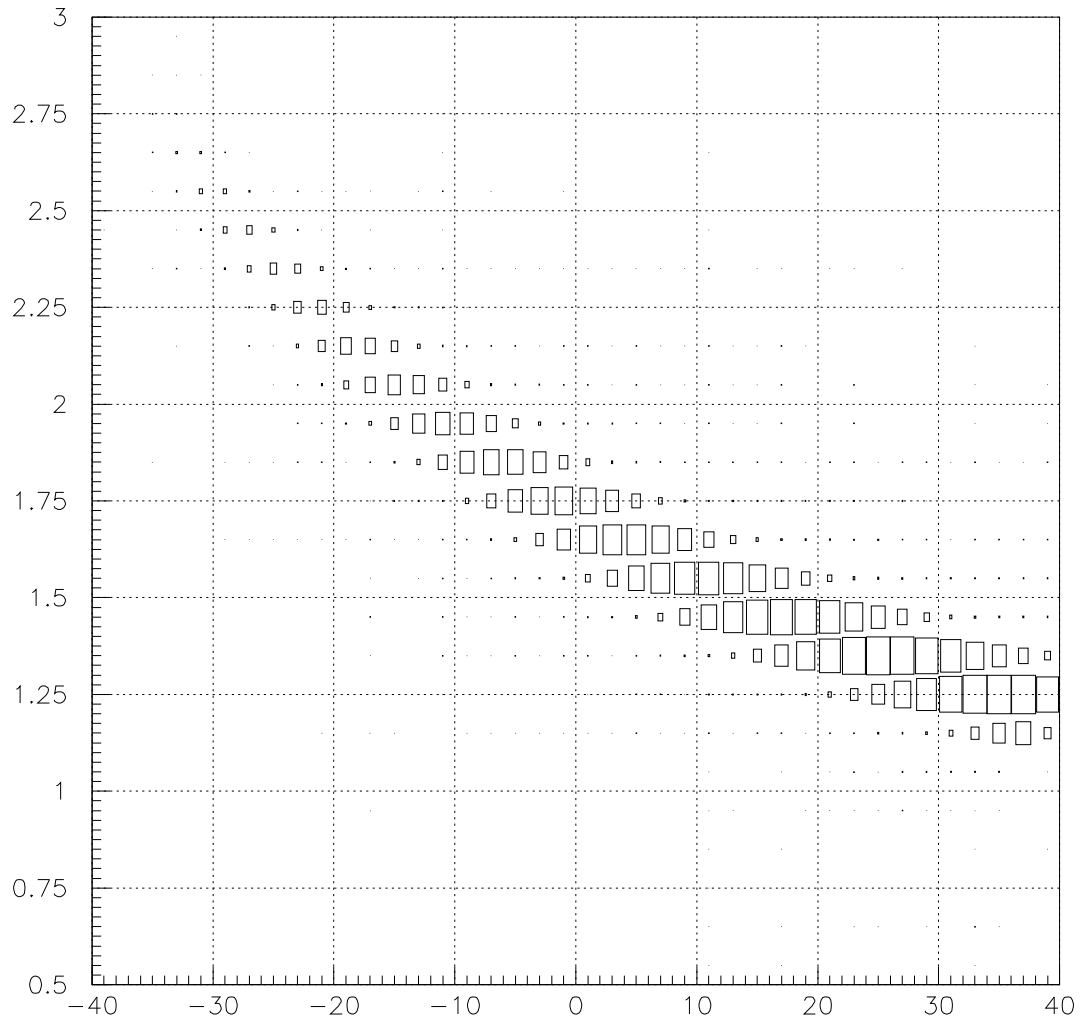
Figure 63: *Kaon xy-plot in the back of CH (CH2).*



X*Y at PRESH of K

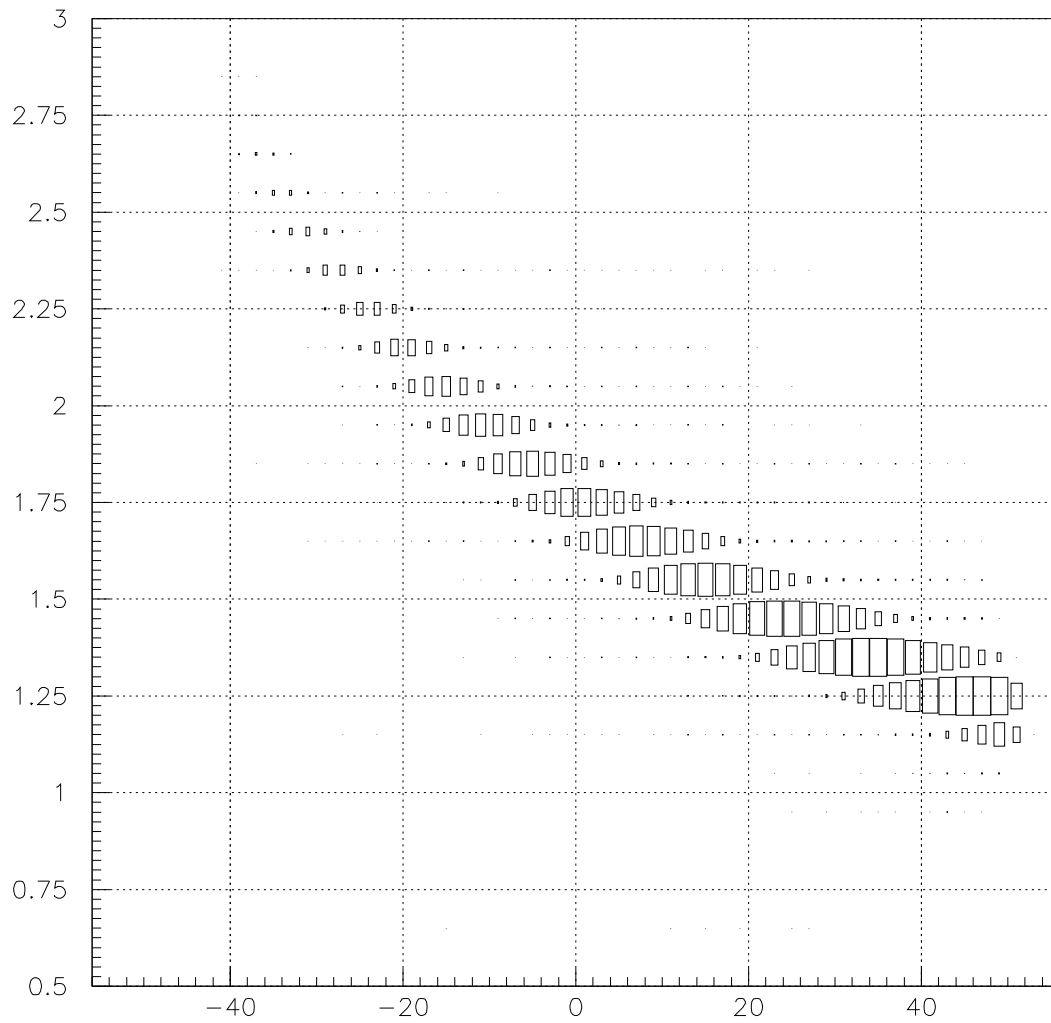
Figure 64: *Kaon xy-plot in PR.*

10 Pion xp-correlations



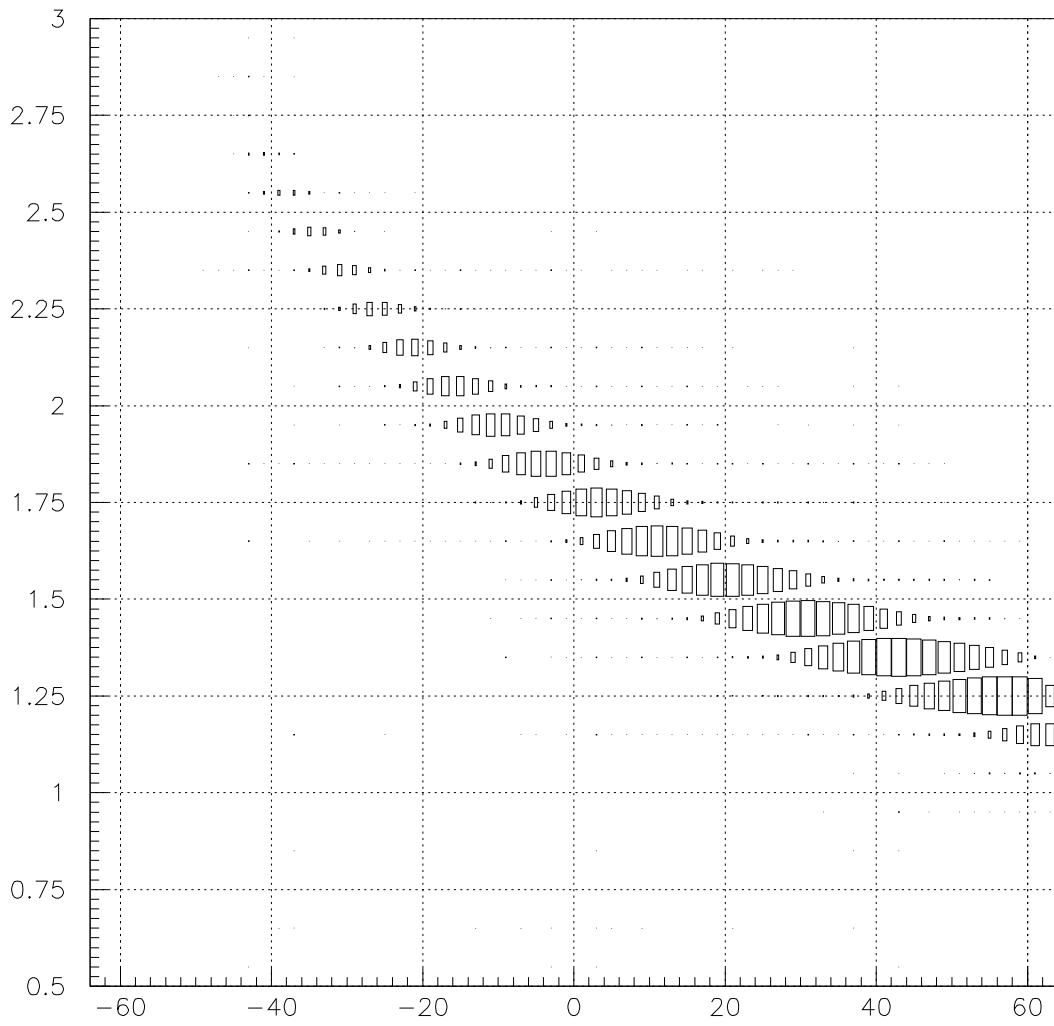
X-coor vs Mom at DC2 of π

Figure 65: *Pion xp-plot in DC2.*



X-coor vs Mom at DC3 of π

Figure 66: *Pion xp-plot in DC3.*



X-coor vs Mom at DC4 of π

Figure 67: *Pion xp-plot in DC4.*

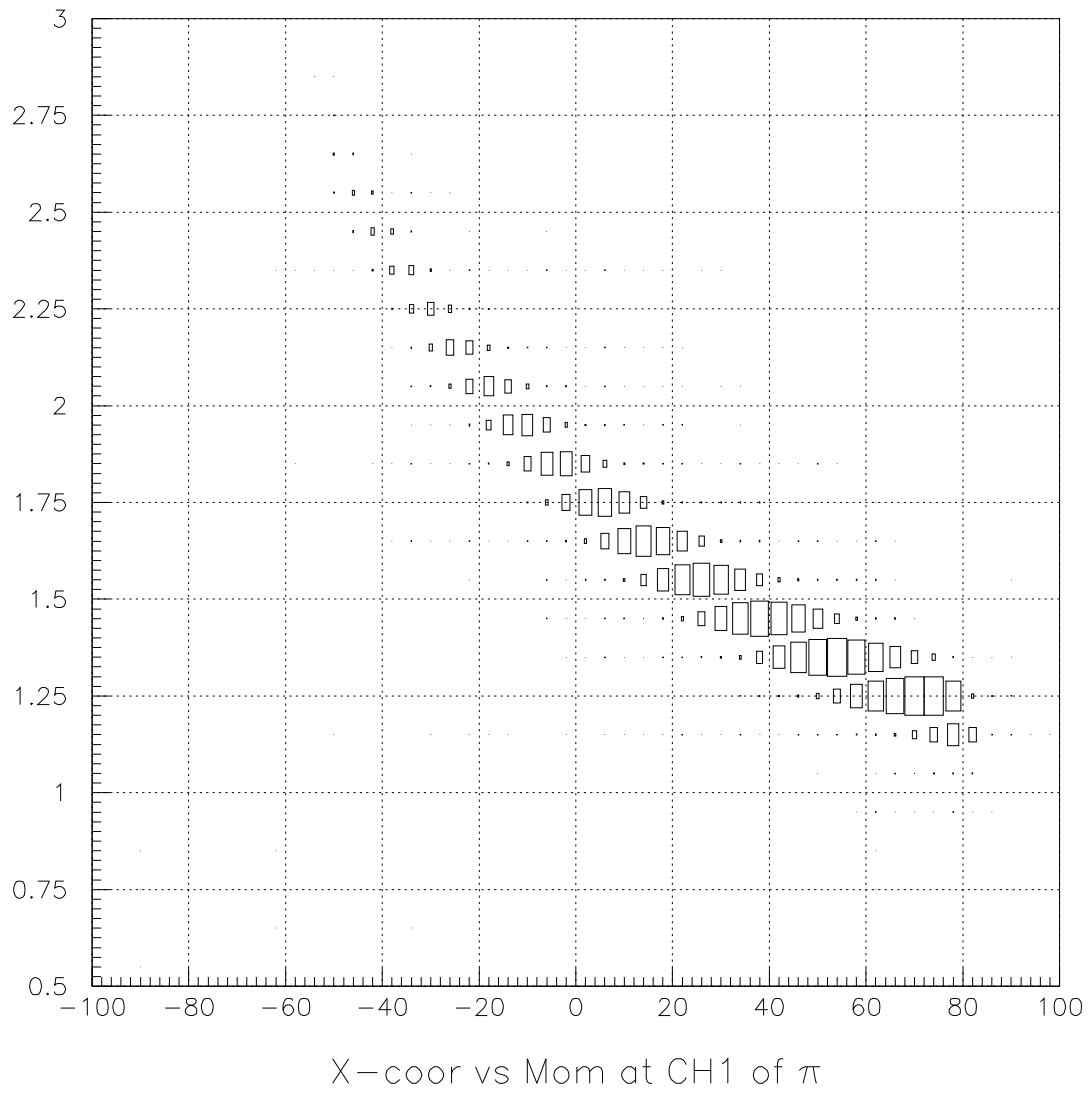


Figure 68: *Pion xp-plot in the front of CH (CH1).*

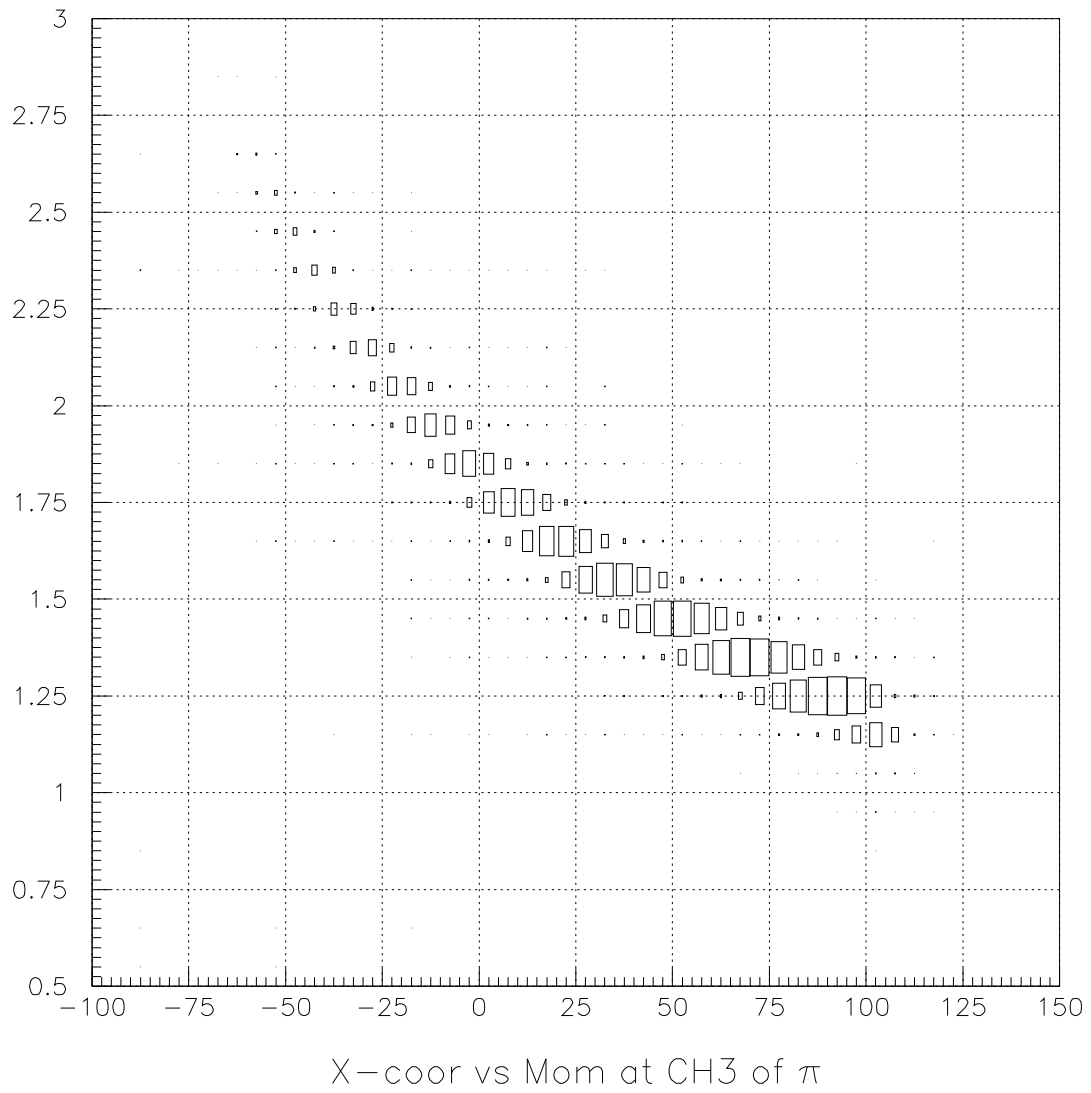
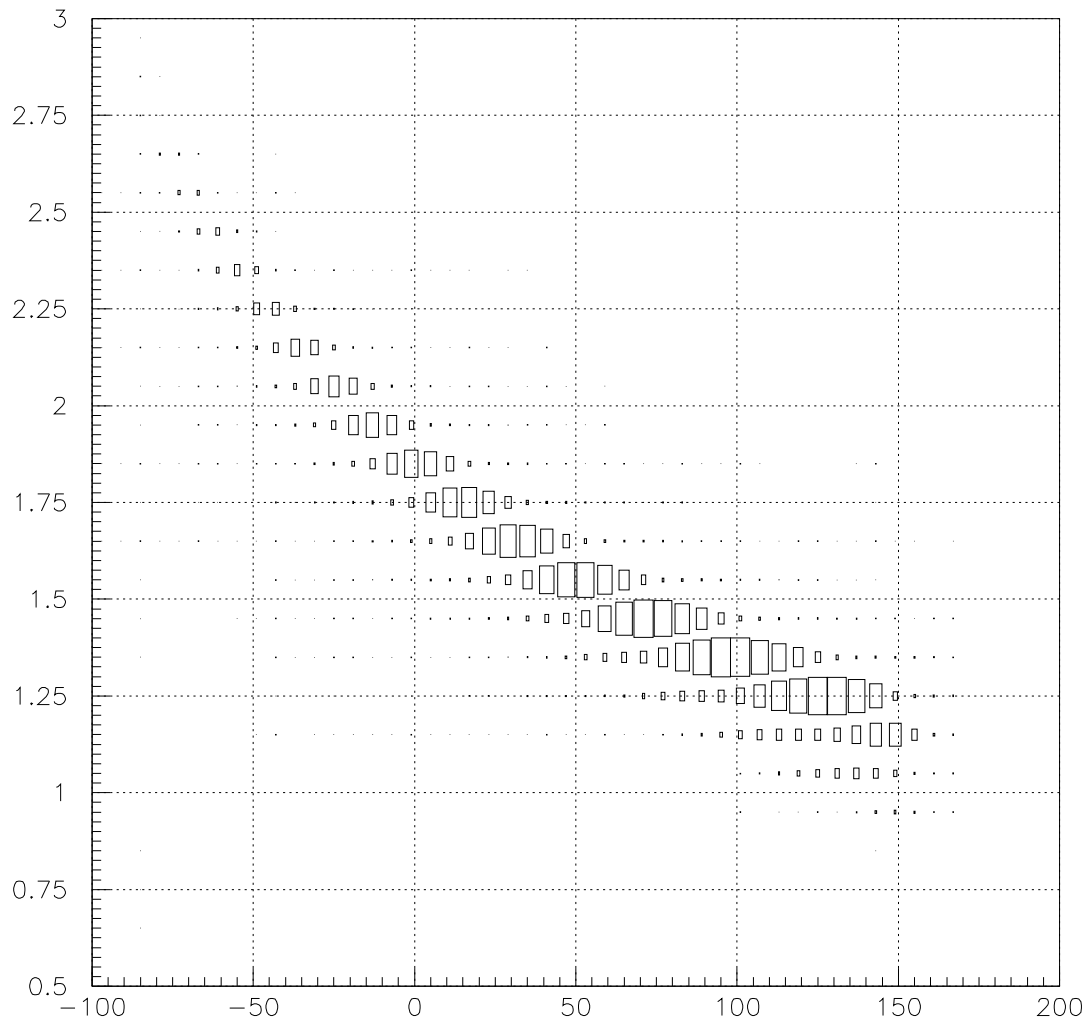
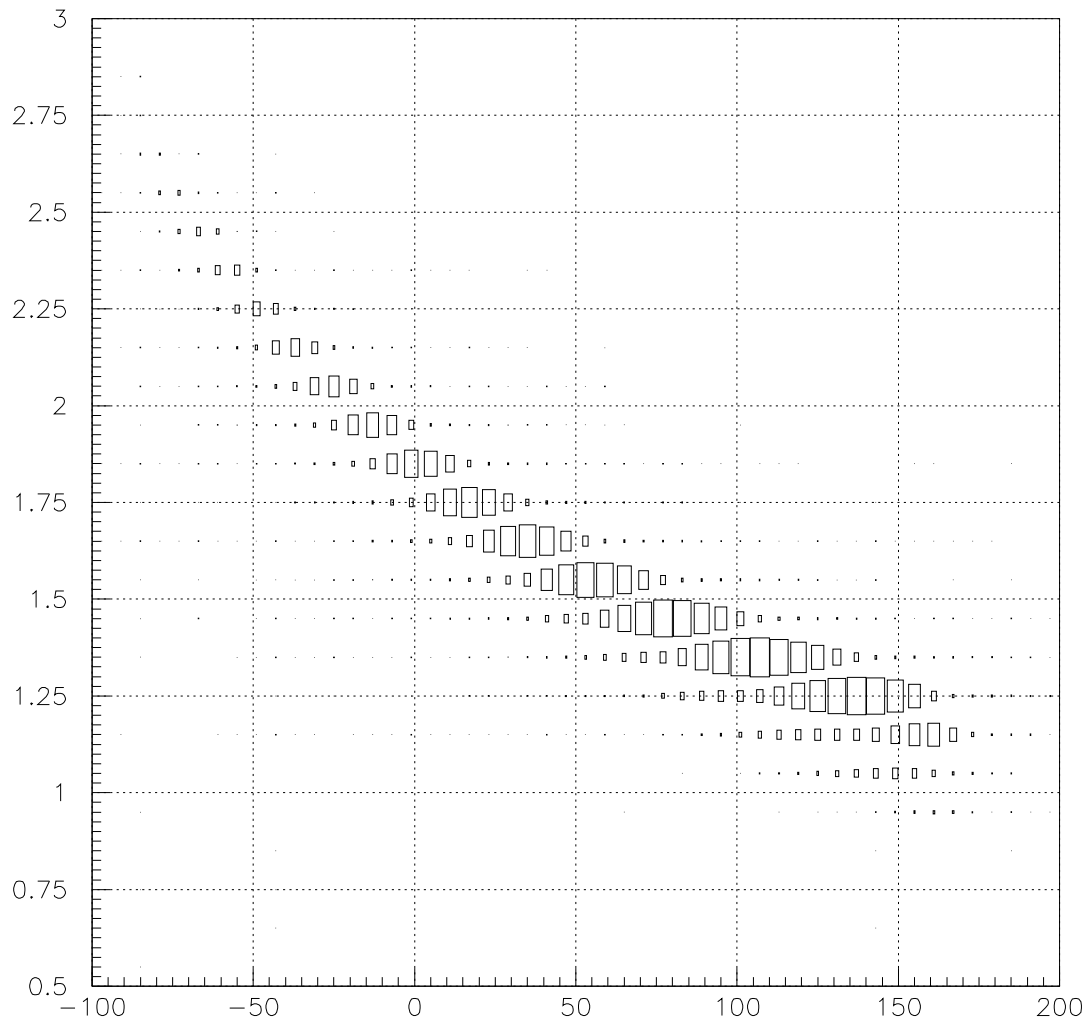


Figure 69: *Pion xp-plot in 1 m from the front of CH (CH3).*



X-coor vs Mom at CH2 of π

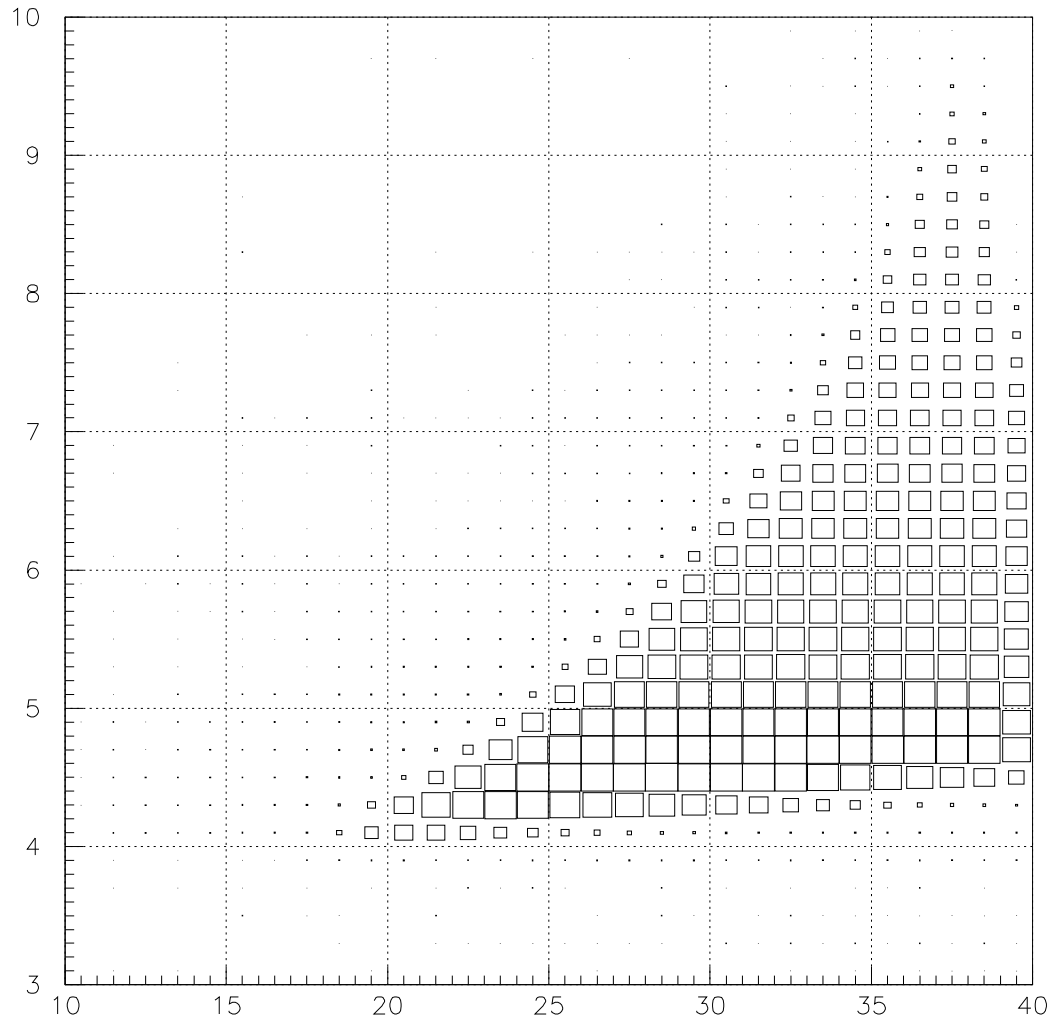
Figure 70: *Pion xp-plot in the back of CH (CH2).*



X-coor vs Mom at PRESH of π

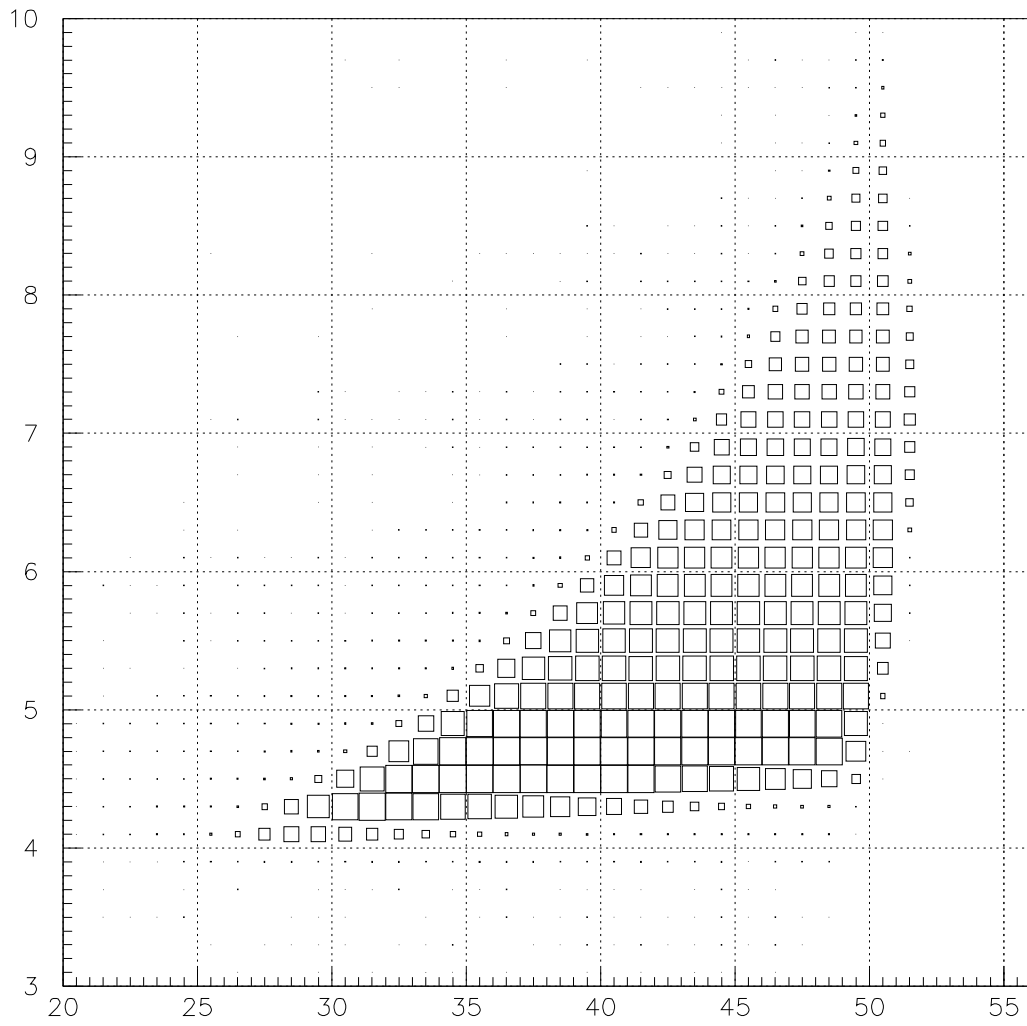
Figure 71: *Pion xp-plot in PR.*

11 Kaon xp-correlations



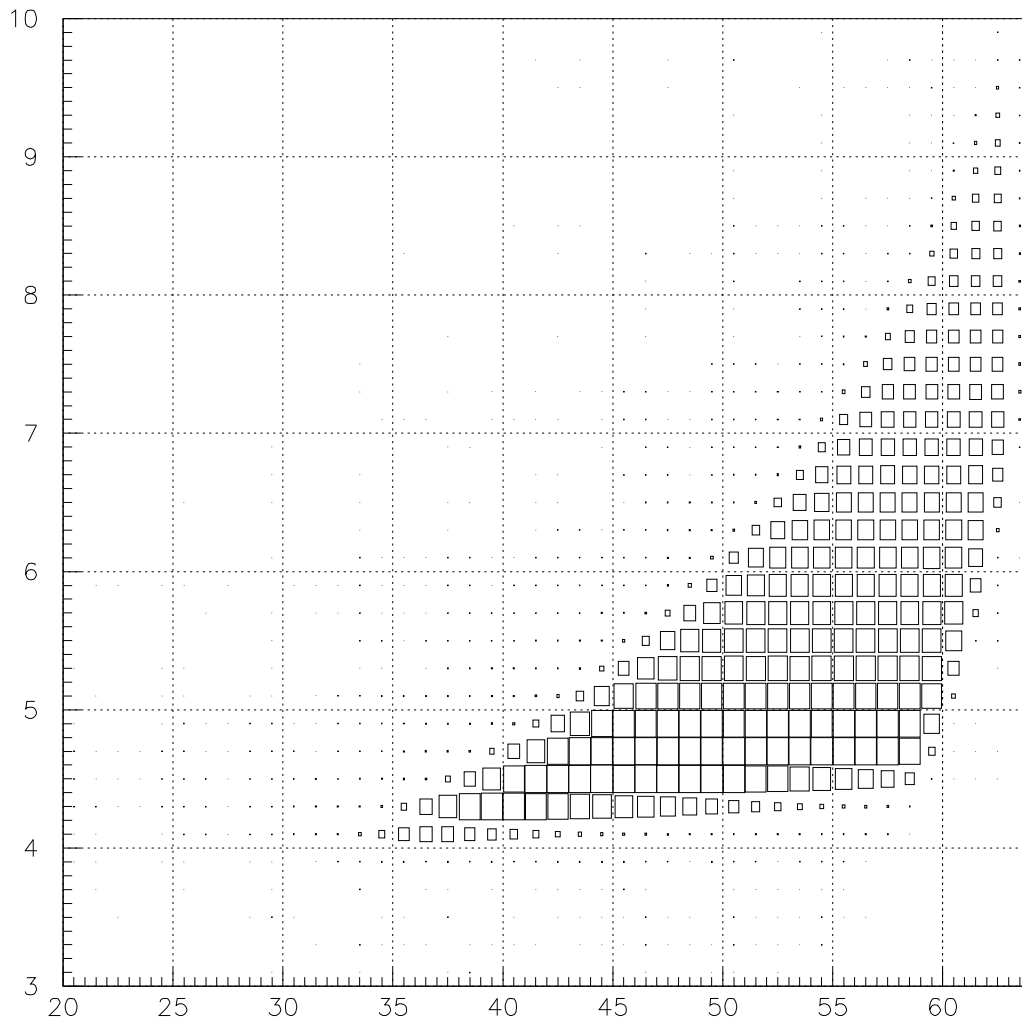
X-coor vs Mom at DC2 of K

Figure 72: *Kaon xp-plot in DC2.*



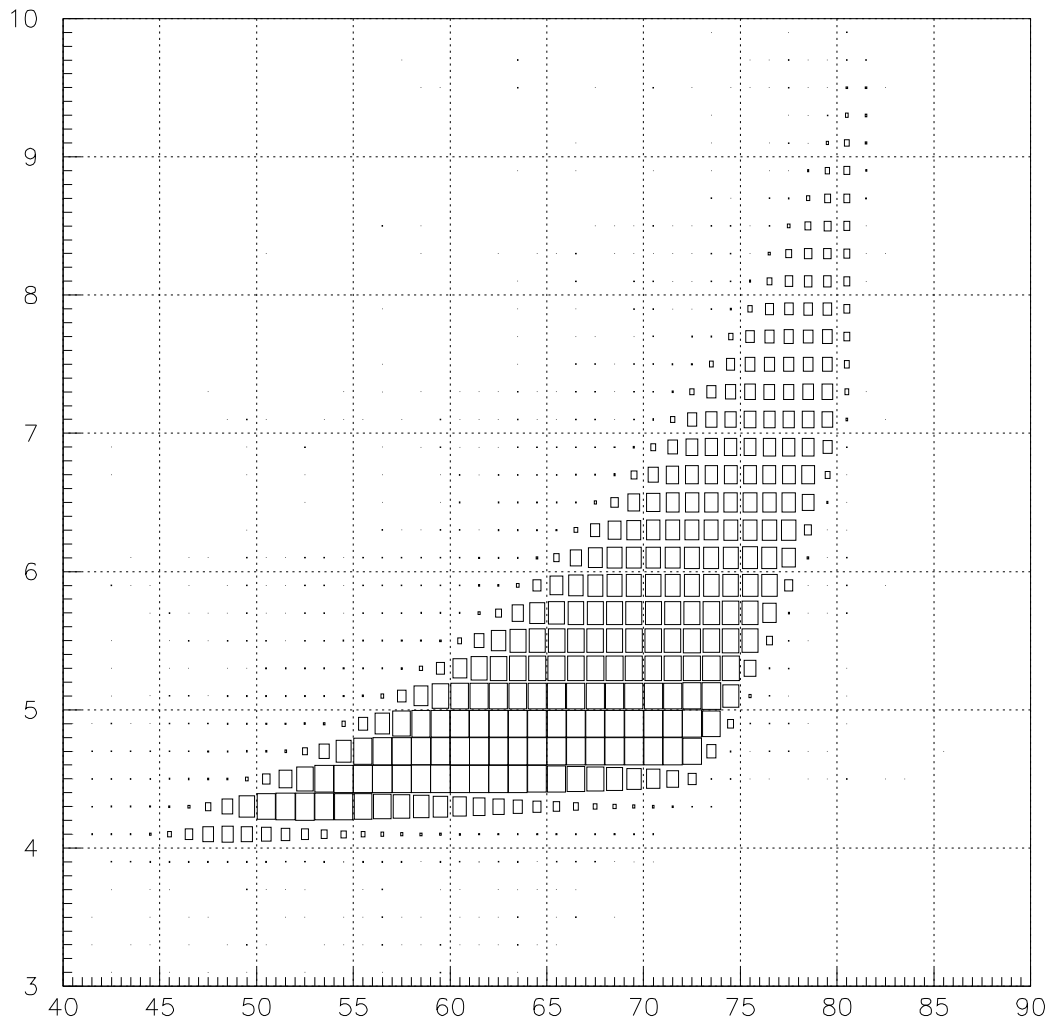
X-coor vs Mom at DC3 of K

Figure 73: *Kaon xp-plot in DC3.*



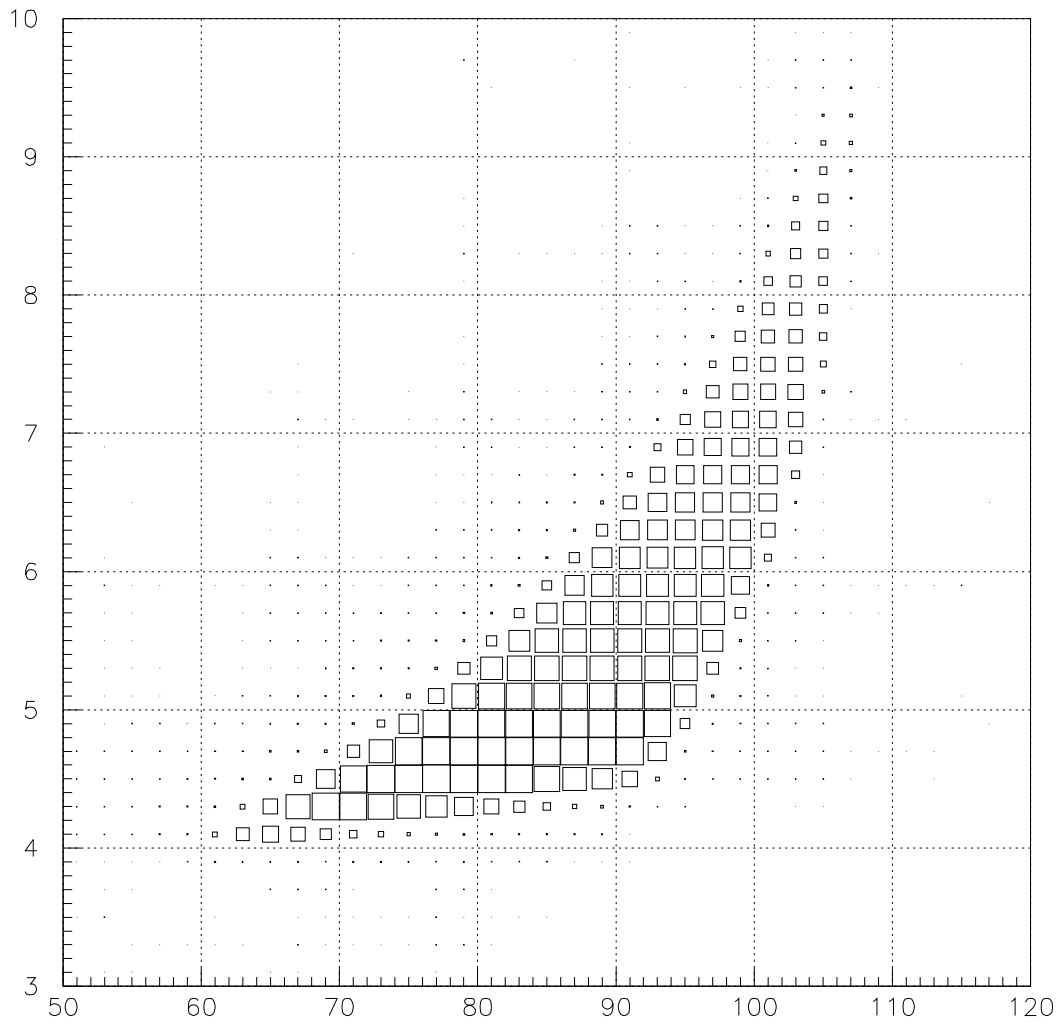
X-coor vs Mom at DC4 of K

Figure 74: *Kaon xp-plot in DC4.*



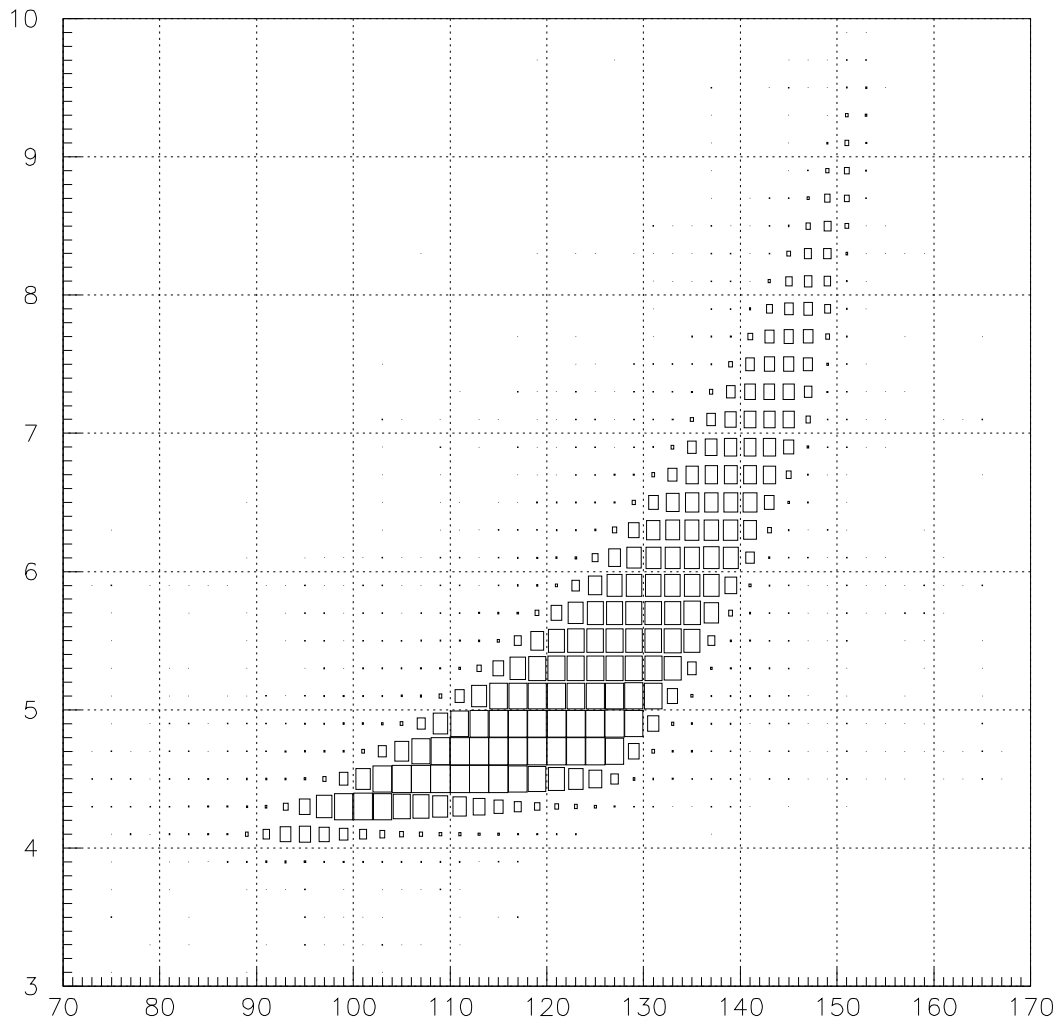
X-coor vs Mom at CH1 of K

Figure 75: *Kaon xp-plot in the front of CH (CH1).*



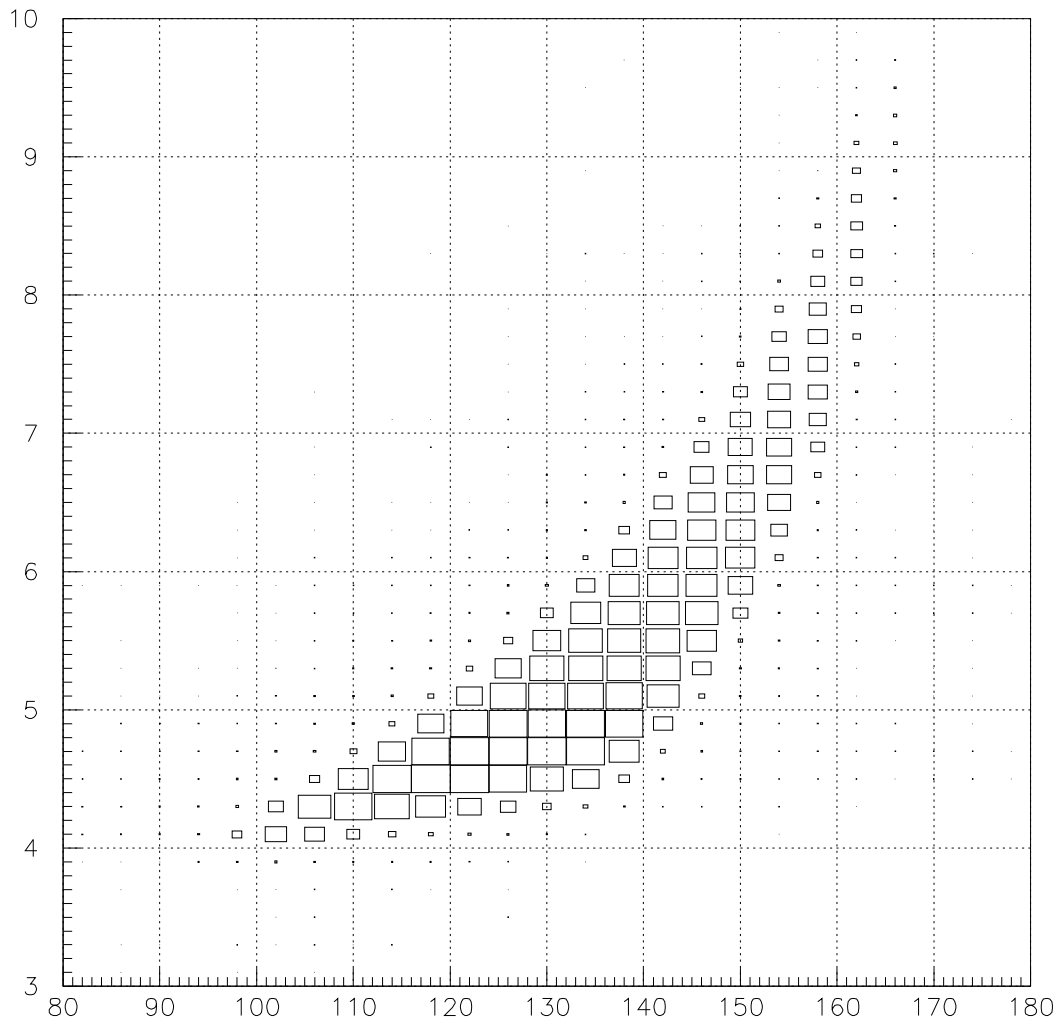
X-coor vs Mom at CH3 of K

Figure 76: *Kaon xp-plot in 1 m from the front of CH (CH3).*



X-coor vs Mom at CH2 of K

Figure 77: *Kaon xp-plot in the back of CH (CH2).*



X-coor vs Mom at PRESH of K

Figure 78: *Kaon xp-plot in PR.*

12 Pion and kaon hit plots in SFD

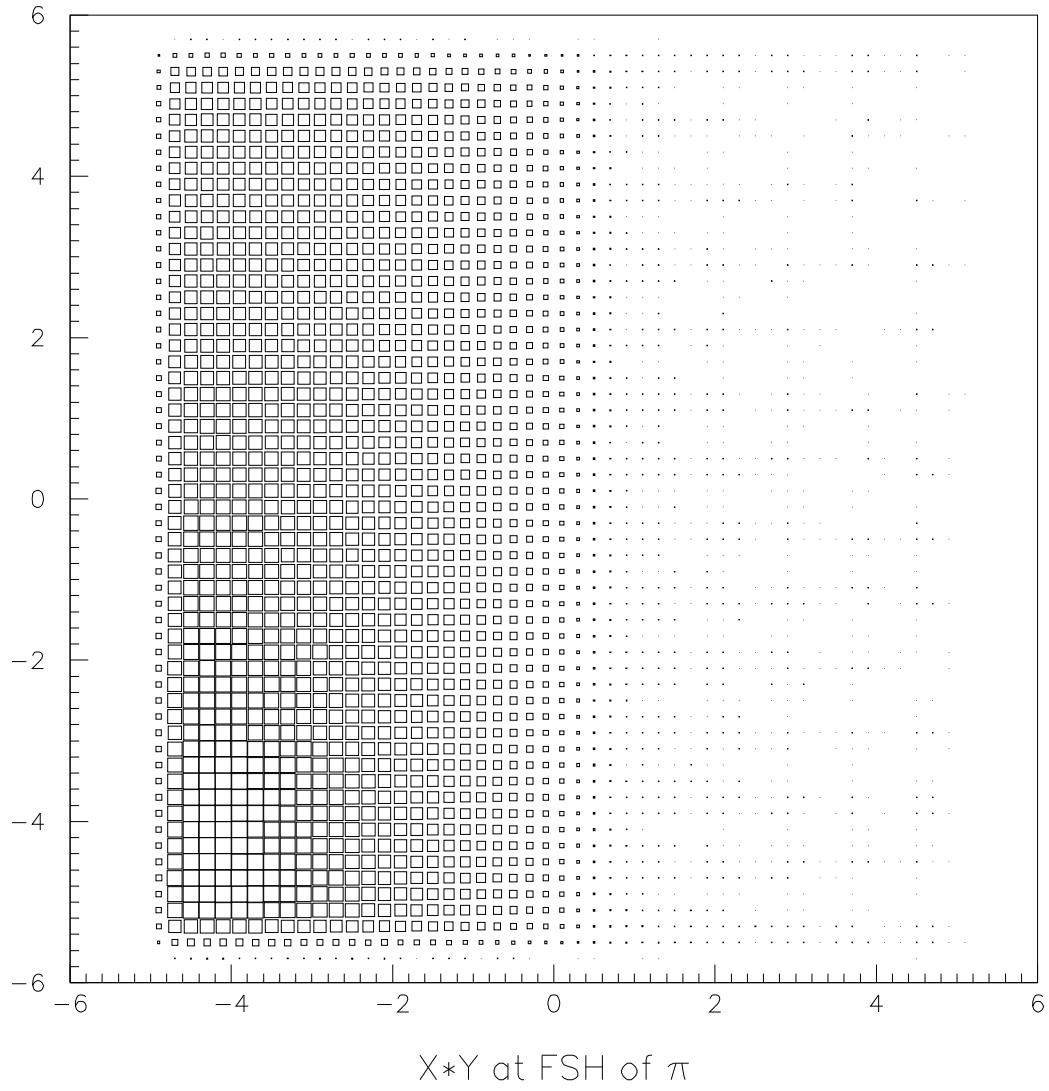


Figure 79: *Pion xy-plot SFD.*

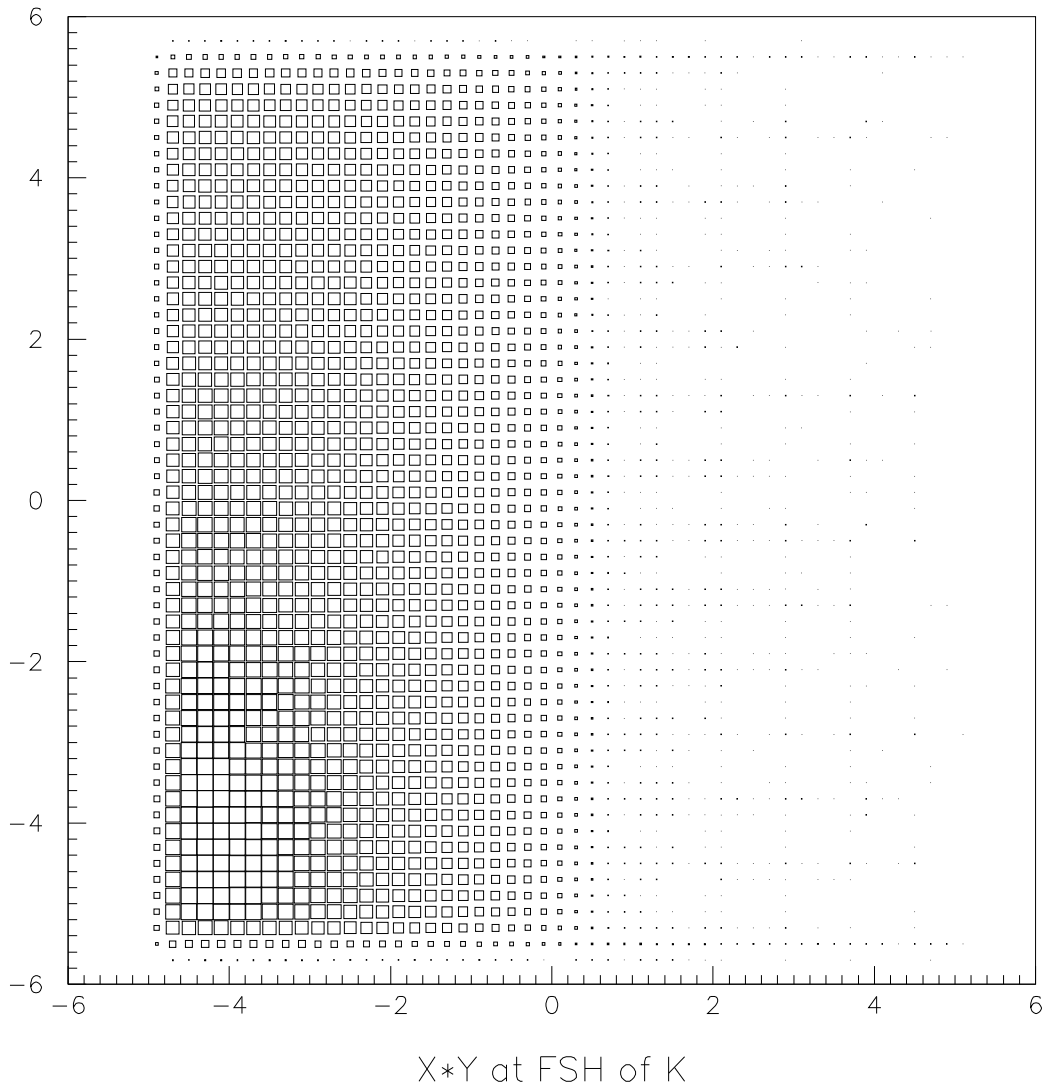


Figure 80: *Kaon xy-plot in SFD.*