I. NEWS

- Account in PDF modulation of intensity along the azimuthal angle ϕ.

- Fits to separate rings and double rings, define an alignment parameters whenever possible.

- Combine all histograms in a single array.

II. PARAMETERIZATION

PDF for azimuth-uniform ring intensity is defined by the Gaussian distribution

$$\mathcal{P}(x, y | x_c, y_c, r_0, \sigma, A) = \frac{A}{\sqrt{2\pi}\sigma} e^{-\frac{(r-r_0)^2}{2\sigma^2}} \tag{1}$$

where $r = \sqrt{(x - x_c)^2 + (y - y_c)^2}$, (x_c, y_c) are the ring center coordinates, r_0, σ, and A are the ring radial, Gaussian width, and amplitude parameters, respectively.

Azimuthal angle ϕ is extracted using `atan2` function,

$$\phi = \frac{180°}{\pi} \texttt{atan2}(y - y_c, x - x_c). \tag{2}$$

Thus extracted angle ϕ is defined in the range [-180°,180°]. Then, modulation of intensity along the ϕ is done as a 10-bin histogram in the range [$\phi_{\min}$, $\phi_{\max}$]. These azimuthal angle limits are defined in the configuration file for each ASIC.

III. RESULTS

See plots in Figs. 1 - ...

TABLE I: Fit results for single ring.

ASIC	Ring	x_c	y_c	r_0	σ	A
#	#		(in pixels)			(arb. units)
8	1	217.06±0.02	292.49±0.06	180.87±0.05	1.9748±0.0004	1482.2±0.3
8	2	215.07±0.07	293.72±0.13	214.77±0.15	1.8426±0.0024	409.2±0.2
12	1	22.178±0.004	297.3±0.0005	180.87-fixed	2.3321±0.0003	2030.0±0.3
12	2	33.500±0.006	286.50±0.02	202.94±0.02	1.7032±0.0006	808.1±0.2
10	4	387.34±0.03	289.65±0.05	362-fixed	4.69±0.01	204.4±0.3
10	3	389.7±0.9	290.2±0.6	294.5±0.6	3.266±0.008	210.3±0.4
13	3	-157.60±0.03	268.01±0.02	295-fixed	2.538±0.003	299.2±0.3
13	4	-125.276±0.002	303.2±0.004	362-fixed	1.3704±0.0003	1305.7±0.2
9	4	208.4±0.8	462.1±1.9	361.3±2.0	4.84±0.02	114.6±0.4
9	4	219.5-fixed	495.1-fixed	395.55 ±0.01	4.297±0.016	115.1-modul.
14	4	40.87±0.08	487.94±0.02	362-fixed	2.355±0.009	136.3±0.3

TABLE II: Fit results for double rings using uniform over ϕ PDF.

ASIC #	Ring #	x_c	y_c	r_0	σ	A
				(in pixels)		(arb. units)
8	1	218.27±0.02	297.22±0.03	185.73±0.03	1.9690±0.0004	1473.7±0.3
	2			219.30±0.03	1.880±0.001	411.8±0.2
12	1	27.355±0.002	302.7±0.0004	185.89±0.0004	2.3144±0.0003	1958.8±0.3
	2			218.97±0.0001	1.9044±0.0006	838.7±0.2

TABLE III: Fit results using modulated over ϕ PDF.

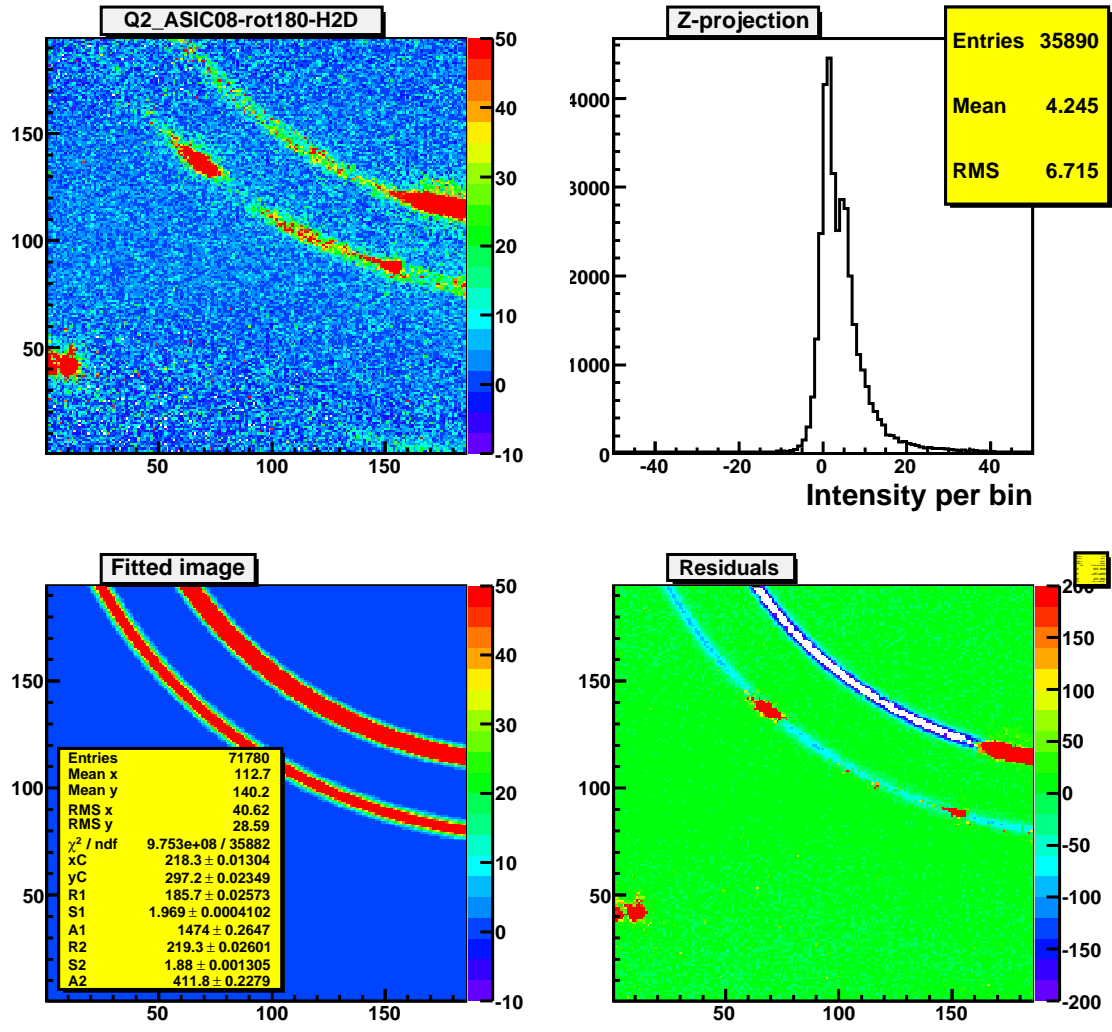| ASIC #	Ring #	x_c	y_c	r_0	σ	A
				(in pixels)		(arb. units)
8	1	219.56±2e-5	297.07±2e-5	185.83±2e-4	1.8976±0.0002	1536.8±0.1
	2			219.97±8e-4	1.876±0.0008	418.4±0.2
12	1	27.609±2e-5	302.7±3e-5	185.96±0.0002	2.2758±0.0002	1936.7±0.2
	2			218.83±0.0004	1.7533±0.0004	824.9±0.2
9	4	219.56 fixed	297.07+194+4-fixed	395.55±0.01	4.297±0.016	115-modul.
				single ring fit		
10	3	414.1±3e-5	311.2±2e-5	326.581±0.004	2.804±0.003	188.1±0.2
	4			395.6-fixed	4.456±0.007	202.9±0.3

FIG. 1: r0547-s00-asic08, event 51: fit to the rings 1 and 2 with unifom in ϕ PDF.
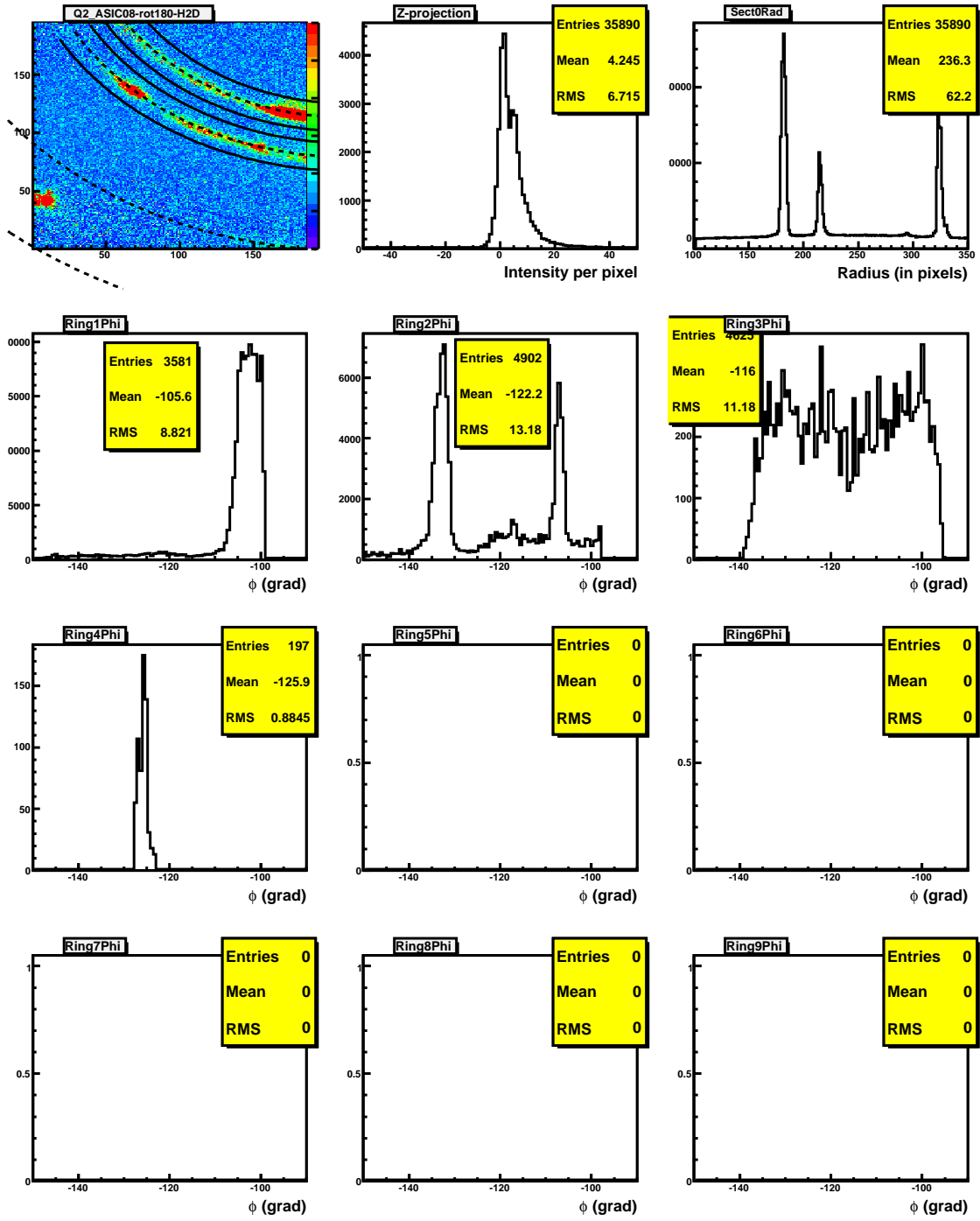
FIG. 2: r0547-s00-asic08, event 51: $r - \phi$ projections.

Q2_ASIC12-rot270-H2D

Z-projection

Entries 35890

Mean 5.452

RMS 6.424

Intensity per bin

Fitted image

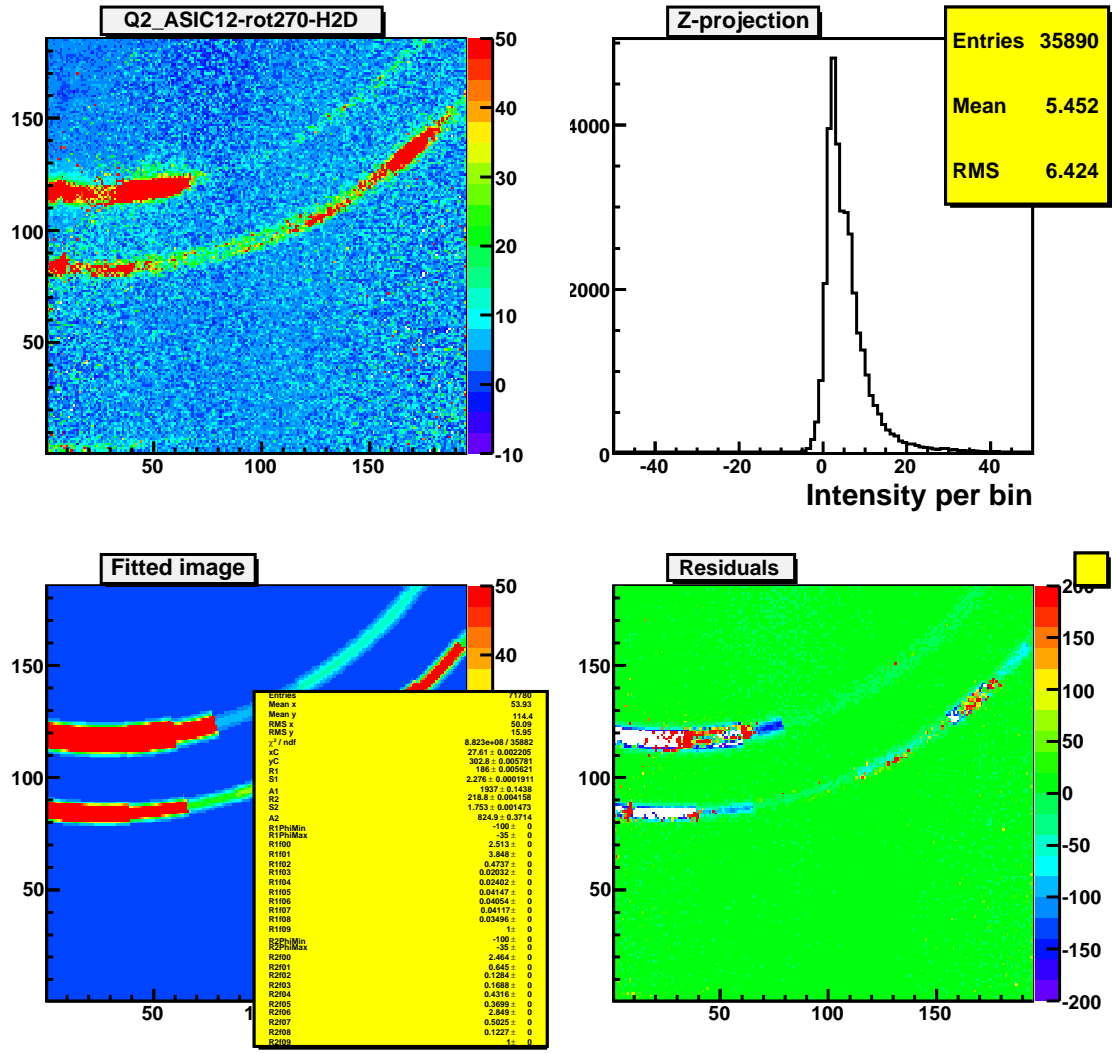|	
Entries	71780
Mean x	53.93
Mean y	114.4
RMS x	50.09
RMS y	15.95
χ^2 / ndf	8.823e+08 / 35882
xC	27.61 ± 0.002205
yC	302.8 ± 0.005781
R1	186 ± 0.005621
S1	2.276 ± 0.0001911
A1	1937 ± 0.1438
R2	218.8 ± 0.004158
S2	1.753 ± 0.001473
A2	824.9 ± 0.3714
R1PhiMin	-100 ± 0
R1PhiMax	-35 ± 0
R1f00	2.513 ± 0
R1f01	3.848 ± 0
R1f02	0.4737 ± 0
R1f03	0.02032 ± 0
R1f04	0.02402 ± 0
R1f05	0.04147 ± 0
R1f06	0.04054 ± 0
R1f07	0.04117 ± 0
R1f08	0.03496 ± 0
R1f09	1 ± 0
R2PhiMin	-100 ± 0
R2PhiMax	-35 ± 0
R2f00	2.464 ± 0
R2f01	0.645 ± 0
R2f02	0.1284 ± 0
R2f03	0.1688 ± 0
R2f04	0.4316 ± 0
R2f05	0.3699 ± 0
R2f06	2.849 ± 0
R2f07	0.5025 ± 0
R2f08	0.1227 ± 0
R2f09	1 ± 0

Residuals

FIG. 3: r0547-s00-asic12, event 51: fit to the single rings 1 and 2 with modulated in ϕ PDF.
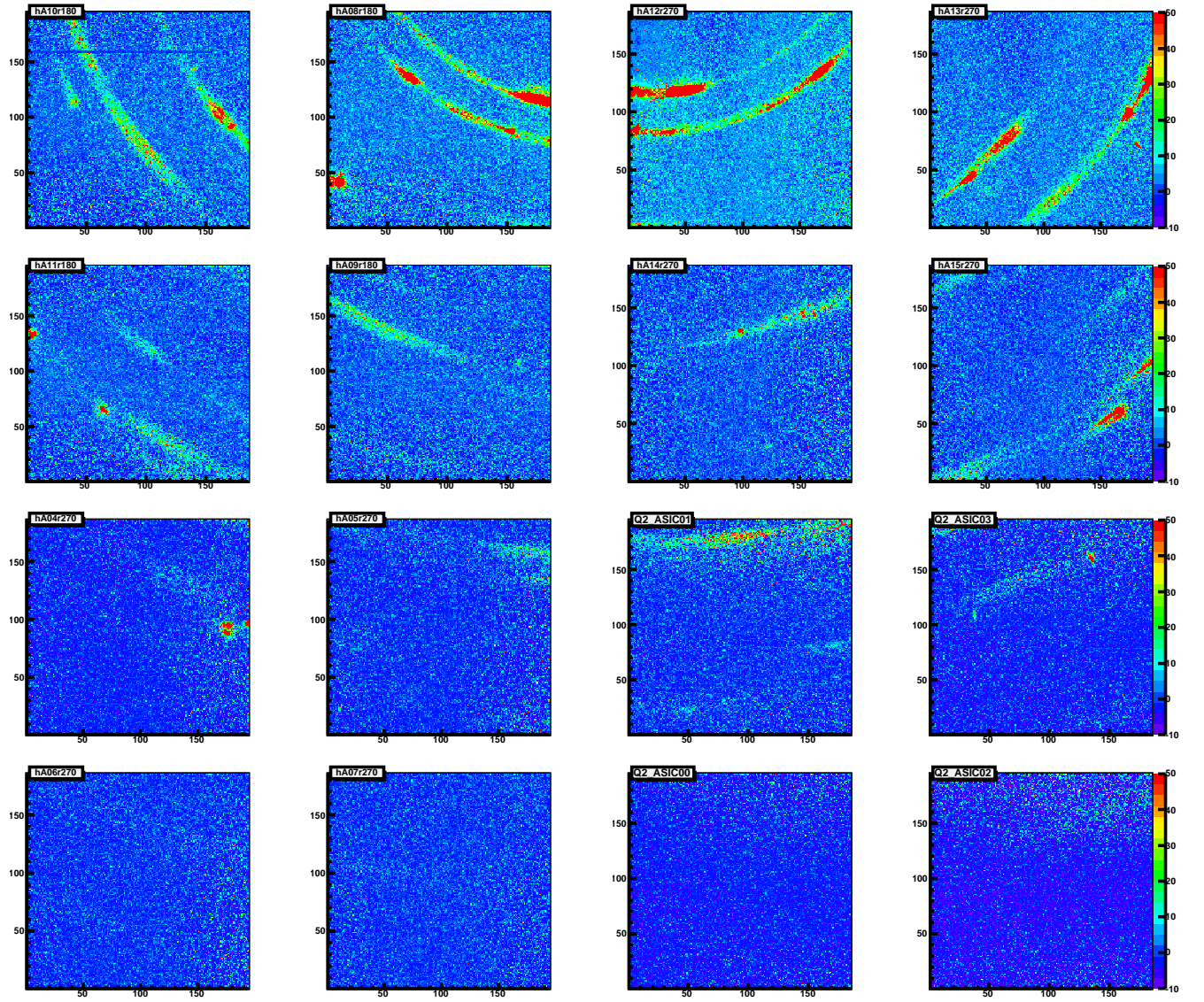
FIG. 4: r0547-s00-asic07, event 51, background is subtracted.
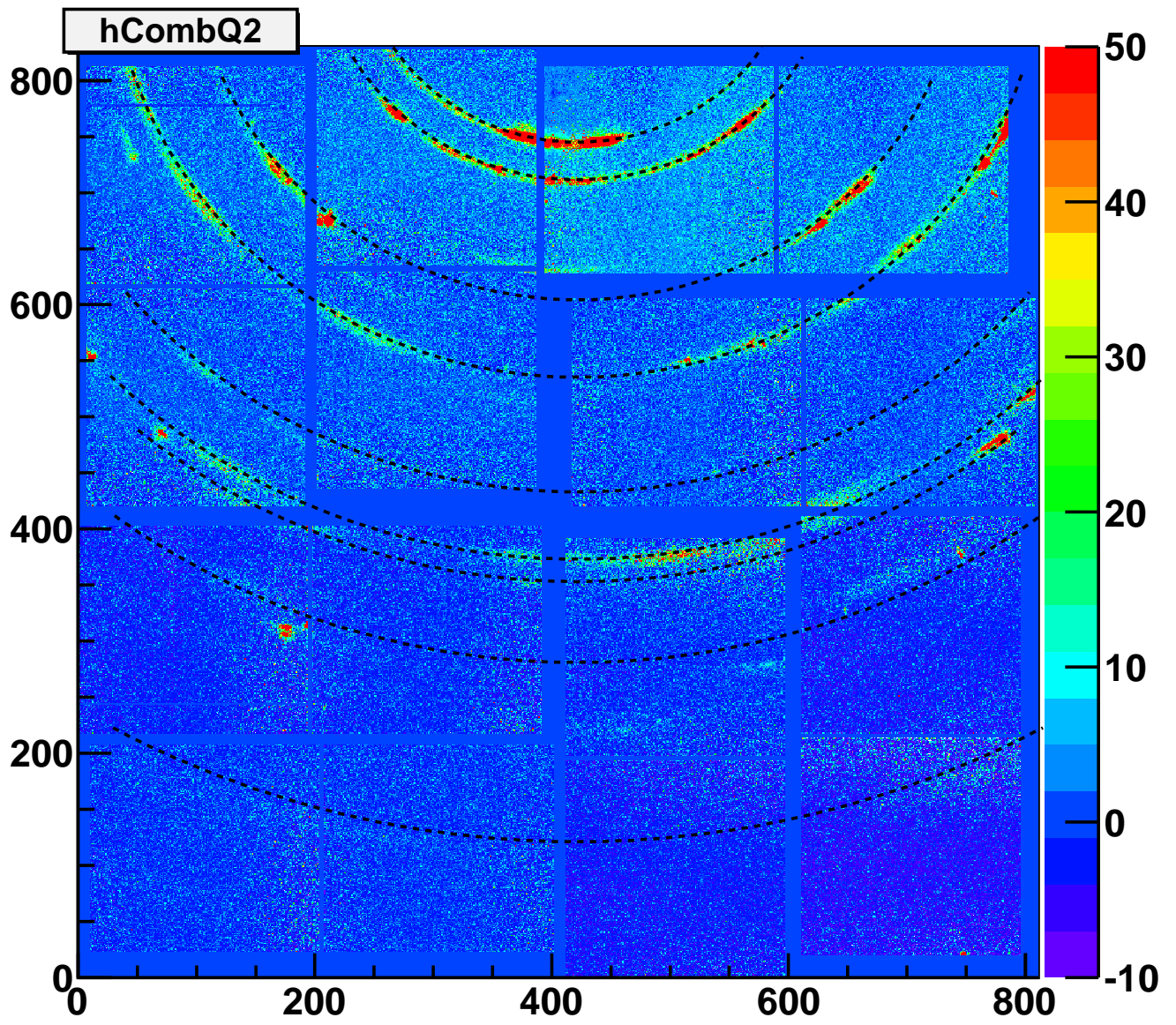
FIG. 5: r0547-s00, event 51, combined histogram array.

IV. CONFIGURATION PARAMETERS

TABLE IV: Configuration parameters. gap = 194+4 (pixel).

ASIC	orientation ($\circ$)	x_c (pixel)	y_c (pixel)
00	0	10	733+gap
01	0	10	733
02	0	-189	713+gap
03	0	-189	713
04	270	224+gap	713
05	270	224	713
06	270	214+gap	908
07	270	214	908
08	180	219.6	297
09	180	219.6	297+gap
10	180	414.1	311.2
11	180	414.1	311.2+gap
12	270	27.6	302.7
13	270	27.6-gap	302.7
14	270	5	510
15	270	5-gap	510

```
double ring1R = 185.9; // 1) from averaged asic 8,12

double ring2R = 219.4; // 1) from averaged 8,12

double ring3R = 326.5;

double ring4R = 395.6; // 2) from fit to asic 9 with fixed Xc,Yc

double ring5R = 498;

double ring6R = 558;

double ring7R = 578;

double ring8R = 650;

double ring9R = 810;
```

9