

# Updated Fixed Array Counter Layout

Dan Sober, sent March 23, 2013

Please find the new counter table below. The following changes have been made since the version of 19 Feb.

1. I have replaced 13 40-mm-wide counters and 9 26-mm-wide by 22 22-mm-wide counters, extending up to  $E_{\gamma} = 11.78$  GeV. The 22 mm width was chosen to simplify the light pipe construction. I kept the number fixed at 22 for the moment in order to conserve my sanity. To limit the upper energy to 11.70 GeV, we will probably omit counters 1-6.
2. I have added two optional configurations in which we preserve full energy coverage above the Microscope assuming the upper edge of the Microscope has been moved from 9.1 GeV to either 8.1 GeV or 7.9 GeV. In either case, the counting rate limits are preserved if we add (alternating between 8 cm and 12 cm from the focal plane):
  - a. 8 counters of width 5mm (in addition to the original set of 50)
  - b. 36 counters of width 4mm
  - c. either 6 (for 8.1 GeV) or 18 (for 7.9 GeV) counters of width 3mm

The new table includes an approximate number of 3-mm counters needed to cover the region from the top of the Microscope to 3 GeV at fixed 60-MeV spacing. This number will be reduced by approximately 16 counters removed from the region of the Microscope.

Fixed-array counters located 12 cm and 8 cm behind nominal focal plane – using fully smoothed Tosca rays

Criteria:  $9.1 \text{ GeV} < E_\gamma < 11.88 \text{ GeV}$

4 counter widths (22 – 5 mm), closely spaced without gaps (normal to trajectories), relative rate  $< 0.031$

$3.0 \text{ GeV} < E_\gamma < 9.0 \text{ GeV}$

width 3 mm, equally spaced at  $\Delta E = 0.060 \text{ GeV}$

Counters	Num-ber	Width [mm]	Dist. from FP [cm]	Photon energy [GeV]		Energy width [MeV]		Energy spacing [MeV]		Relative rate <sup>1)</sup> [ $\approx 12 \cdot \text{prob./RL}$ ]		Center Position [cm] <sup>2)</sup>		Angle [degrees]	
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1-22 <sup>3)</sup>	22	22.0	12	11.42	11.78	10.1	23.9	10.3	23.5	0.0103	0.0251	-5.5	77.2	27.0	43.1
23-40	18	16.0	12	11.01	11.42	18.0	28.4	18.2	28.0	0.0189	0.0309	81.4	149.5	20.7	26.6
41-64	24	10.0	8/12	10.46	11.01	18.8	26.8	18.9	26.6	0.0205	0.0307	142.7	215.1	16.7	20.5
65-81	17	8.0	8/12	10.06	10.46	21.7	26.0	21.8	25.8	0.0249	0.0309	218.3	265.4	14.9	16.6
82-131	50	5.0	8/12	9.10	10.06	16.4	22.2	16.4	22.1	0.0195	0.0292	267.9	372.2	12.4	14.9
132-231 <sup>4)</sup>	100 <sup>4)</sup>	3.0	8	3.06 <sup>5)</sup>	9.00 <sup>5)</sup>	13.7	26.3	60	60	0.0183	0.1032	383.7	904.2	8.0	12.
Optional configuration, assuming Microscope is moved from $E_{\gamma \text{ max}} = 9.1 \text{ GeV}$ to $E_{\gamma \text{ max}} = 8.1 \text{ GeV}$ :															
132-139	8	5.0	8/12	8.92	9.10	22.3	23.2	22.4	23.1	0.0295	0.0312	374.5	390.9	12.1	12.4
140-175	36	4.0	8/12	8.19	8.92	18.7	21.6	18.7	21.6	0.0251	0.0316	393.1	462.9	11.1	12.1
176-181	6	3.0	8/12	8.10	8.19	16.3	16.5	16.3	16.5	0.0239	0.0244	464.7	472.6	10.9	11.0
182-249 <sup>4)</sup>	68 <sup>4)</sup>	3.0	8	3.06 <sup>5)</sup>	8.04 <sup>5)</sup>	16.7	26.3	60	60	0.0249	0.1032	478.6	904.2	8.0	10.9
Optional configuration, assuming Microscope is moved from $E_{\gamma \text{ max}} = 9.1 \text{ GeV}$ to $E_{\gamma \text{ max}} = 7.9 \text{ GeV}$ : (Counters 132-175 as above)															
176-193	18	3.0	8/12	7.89	8.19	16.3	17.1	16.3	17.1	0.0239	0.0259	464.7	491.7	10.7	11.0
194-257 <sup>4)</sup>	64 <sup>4)</sup>	3.0	8	3.06 <sup>5)</sup>	7.86 <sup>5)</sup>	17.2	26.3	60	60	0.0263	0.1032	495.7	904.2	8.0	10.7

Notes:

- 1) Relative rate  $\equiv E_0/E_\gamma \times \Delta E(\text{width}) \approx 12 \times (\text{uncollimated bremsstrahlung probability per radiation length})$
- 2) Along displaced plane, translated by 12 cm or 8 cm normal to focal plane. Origin is at intersection of 11.7 MeV ray with displaced plane.
- 3) Counters 1-6 may be omitted, giving maximum photon energy 11.71 MeV.
- 4) Not close-packed, skipping possible intermediate counter positions. Approximately 16 counters will be removed to accommodate the Microscope, reducing the total number of counters by 16.
- 5) Central energy value of counter