1 Inner Ball Photomultiplier Tube Numbering scheme — D.M. Cullen, M.M. Aléonard 25/3/99

1.1 Phase-1 end

Photomultiplier (PM) Tube Numbering scheme for the phase 1 end of the Euroball inner ball. See associated diagram. The PM tubes are grouped into bundles, i.e equivalent detectors pass 1 summed energy output signal to the VXI card input. One bundle of 3 individual PM tubes has the same approximate solid angle. Note that some detector crystals have 2 PM tubes. The table also notes (*) which of the inner PM tubes can be used for an isomer detector, these are the ones which are closest to the beam tube.

Equivalent Detector bundle *=used for isomer	PMT numbers	$\frac{area}{r^2}$ per equivalent detector	Sum Box Number	Side
A1	1,16,17	0.0568	IT-01	3/5
B1	3,18,21	0.0572	IT-01	3/5
C1	2,19,20	0.0570	IT-01	3/5
D1*	46,56,57	0.0657	IT-01	3/5
E1*	47,58,59	0.0656	IT-01	3/5
A2	4,22,23	0.0568	IT-01	3/5
B2	6,24,27	0.0572	IT-01	3/5
C2	5,25,26	0.0570	IT-01	3/5
D2*	48,60,61	0.0657	IT-02	3/5
E2*	49,62,63	0.0656	IT-02	3/5
A3	7,28,29	0.0568	IT-02	3/5
B3	9,30,33	0.0572	IT-02	3/5
C3	8,31,32	0.0570	IT-02	3/5
D3*	50,64,65	0.0657	IT-02	3/5
E3*	51,66,67	0.0656	IT-02	3/5
A4	10,34,35	0.0568	IT-03	2/5
B4	12,36,39	0.0572	IT-03	2/5
C4	11,37,38	0.0570	IT-03	2/5
D4*	52,68,69	0.0657	IT-03	2/5
E4*	53,70,71	0.0656	IT-03	2/5
A5	13,40,41	0.0568	IT-03	2/5
D5*	54,72,73	0.0657	IT-03	2/5
B5	15,42,45	0.0572	IT-04	2/5
C5	14,43,44	0.0570	IT-04	2/5
E5*	55,74,75	0.0656	IT-04	2/5

Innerball Tapered section: labelling for energy signal output from summation box to VXI card: T00a-IBE,.. to T04e-IBE

Note that the sum boxes on the phase-1 end have 8 summing circuits each of which has three inputs. Due to the way the ball is split 2/5 and 3/5 then we require 2 sum boxes (one 8-way plus one 4-way) on the 2/5 side to handle the 10 equivalent detectors and 2 sum boxes (two 8-way) on the 3/5 side to handle the 15 equivalent detectors. In addition we have 2 spare summing boxes (two 4-way and two 8-way).

The actual solid angles for the phase-1 end are:

2/5 side $\rightarrow$ average solid angle per bundle = 0.0604 ± 0.0047 (7.9% spread)

3/5 side $\rightarrow$ average solid angle per bundle = 0.0604 ± 0.0047 (7.9% spread)

which works out at 0.48% of 4π.

1.2 Cluster end

Photomultiplier (PM) Tube Numbering scheme for the Cluster end of the Euroball inner ball. See associated diagram. The PM tubes are grouped into bundles (equivalent detectors) of 4 or 5 so that each bundle has the same approximate solid angle. Note that there are 80 separate detector crystals with 80 PM tubes.

Equivalent Det. bundle	PMT number	detector $\frac{area}{r^2}$	Sum Box Number	Side
A1	1 3 4 5	0.0606	IC-1	3/5
B1	6 7 8 9 10	0.0562	IC-1	3/5
C1	2 14 15 16	0.0535	IC-1	3/5
A2	11 12 13 17	0.0632	IC-2	3/5
B2	18 19 20 22	0.0535	IC-2	3/5
C2	23 30 31 32	0.0580	IC-2	3/5
D2	23 24 25 26 27	0.0588	IC-2	3/5
A3	28 29 33 34	0.0632	IC-3	3/5
B3	35 36 37 38 48	0.0667	IC-3	3/5
C3	44 45 46 47	0.0606	IC-3	3/5
D3	39 40 41 42 43	0.0588	IC-3	3/5
A4	50 51 52 53 54	0.0667	IC-4	2/5
B4	49 62 63 64	0.0606	IC-4	2/5
C4	55 56 57 58 59	0.0588	IC-4	2/5
A5	60 61 65 80	0.0632	IC-5	2/5
B5	66 67 68 69 70	0.0667	IC-5	2/5
C5	76 77 78 79	0.0606	IC-5	2/5
D5	71 72 73 74 75	0.0588	IC-5	2/5

Innerball Cluster section: labelling for energy signal output from summation box to VXI card:

C00a-IBE,.. to C04d-IBE

Note that the sum boxes on the Cluster end have 4 summing circuits each of which has six inputs. Due to the way the ball is split 2/5 and 3/5 then we require 2 sum boxes on the 2/5 side to handle the 7 equivalent detectors and 3 sum boxes on the 3/5 side to handle the 11 equivalent detectors. In addition we have 1 spare summing box.

The actual solid angles for the phase-1 end are:

2/5 side $\rightarrow$ average solid angle per bundle = 0.0622 ± 0.0034 (5.5% spread)

3/5 side $\rightarrow$ average solid angle per bundle = 0.0594 ± 0.0041 (6.9% spread)

which works out at 0.49% and 0.47% of 4π for the 2/5 and 3/5 sides, respectively.