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A. Tarifeño (UPC-Barcelona)**Numbering and distribution of tubes, preamps and digitizers**

(Without 10 GSI tubes and 18 JINR tubes)

**1. General**

Tubes		
Type	Used	Spare
RIKEN	24	2
UPC	40	1
ORNL1	16	1
ORNL2	60	4
<b>Total</b>	<b>140</b>	<b>8</b>

Preamps					
Type	HV	Tube type	Units	Ch. Used	Ch. Spare
Differential	1450	RIKEN/UPC	4	64	0
Unipolar	1350	ORNL1	1	16	0
Unipolar	1750	ORNL2	4	60	4
<b>Total</b>			<b>9</b>	<b>140</b>	<b>4</b>

Digitizers					
Crate	Type	Tube type	Units	Ch. Used	Ch. Spare
VME1	SIS3316+D/U	RIKEN/UPC	4	64	0
VME1	SIS3316	ORNL1	1	16	0
VME1	SIS3316	ORNL2	1	16	0
<b>Total</b>			<b>6</b>	<b>96</b>	<b>0</b>

Crate	Type	Tube type	Units	Ch. Used	Ch. Spare
VME2	SIS3302	ORNL2	6	44	4
<b>Total</b>			<b>6</b>	<b>44</b>	<b>4</b>

<b>Total</b>	<b>12</b>	<b>140</b>	<b>4</b>
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## **2. Tube numbering criteria**

In general tubes are numbered left to right, first the upper half then the lower half in order of increasing distance to center. The numbering try to follow “rows” or “rings”. Tubes of the same type are numbered consecutively.

RIKEN tubes are numbered first (1-24):

Front left: 1-6

Front-right: 7-12

Back-left: 13-18

Back-right: 19-24

UPC tubes are numbered next (25-64):

Upper-1<sup>st</sup>-row: 25-35

Upper-2<sup>nd</sup>-row: 36-41

Upper-3<sup>rd</sup>-row: 42-44

Lower-1<sup>st</sup>-row: 45-55

Lower-2<sup>nd</sup>-row: 56-61

Lower-3<sup>rd</sup>-row: 62-64

ORNL 1” tubes are next (65-80):

Upper-1<sup>st</sup>-row: 65-68

Upper-2<sup>nd</sup>-row: 69-72

Lower-1<sup>st</sup>-row: 73-76

Lower-2<sup>nd</sup>-row: 77-80

ORNL 2” tubes are the last (81-140):

Upper-4<sup>th</sup>-ring: 81-85

Upper-5<sup>th</sup>-ring: 86-91

Upper-6<sup>th</sup>-ring: 92-100

Upper-7<sup>th</sup>-ring: 101-110

Lower-4<sup>th</sup>-ring: 111-115

Lower-5<sup>th</sup>-ring: 116-121

Lower-6<sup>th</sup>-ring: 122-130

Lower-7<sup>th</sup>-ring: 131-140

## **3. Ring distribution**

The definition of rings and distribution of tubes into rings is somewhat arbitrary. Currently we defined 7 rings:

1<sup>st</sup> Ring: 22 tubes (12-RIKEN + 10-UPC)

2<sup>nd</sup> Ring: 16 tubes (8-RIKEN + 8-UPC)

3<sup>rd</sup> Ring: 26 tubes (4-RIKEN + 22-UPC)

4<sup>th</sup> Ring: 14 tubes (4-ORN1 + 10-ORN2)

5<sup>th</sup> Ring: 16 tubes (4-ORN1 + 12-ORN2)

6<sup>th</sup> Ring: 18 tubes (ORN2)

7<sup>th</sup> Ring: 28 tubes (8-ORN1 + 20-ORN2)

#### 4. Table with the detailed distribution

ID	Type	2R(mm)	X(mm)	Y(mm)	RING
1	RIKEN	27.5	-77.45	-39.25	1
2	RIKEN	27.5	-77.45	0	1
3	RIKEN	27.5	-77.45	39.25	1
4	RIKEN	27.5	-106.052	-19.625	2
5	RIKEN	27.5	-106.052	19.625	2
6	RIKEN	27.5	-134.655	0	3
7	RIKEN	27.5	77.45	-39.25	1
8	RIKEN	27.5	77.45	0	1
9	RIKEN	27.5	77.45	39.25	1
10	RIKEN	27.5	106.053	-19.625	2
11	RIKEN	27.5	106.053	19.625	2
12	RIKEN	27.5	134.655	0	3
13	RIKEN	27.5	-77.45	-39.25	1
14	RIKEN	27.5	-77.45	0	1
15	RIKEN	27.5	-77.45	39.25	1
16	RIKEN	27.5	-106.052	-19.625	2
17	RIKEN	27.5	-106.052	19.625	2
18	RIKEN	27.5	-134.655	0	3
19	RIKEN	27.5	77.45	-39.25	1
20	RIKEN	27.5	77.45	0	1
21	RIKEN	27.5	77.45	39.25	1
22	RIKEN	27.5	106.053	-19.625	2
23	RIKEN	27.5	106.053	19.625	2
24	RIKEN	27.5	134.655	0	3
25	UPC	27.5	-118.3	77.45	3
26	UPC	27.5	-69.7	77.45	1
27	UPC	27.5	-34.85	77.45	1
28	UPC	27.5	0	77.45	1
29	UPC	27.5	34.85	77.45	1
30	UPC	27.5	69.7	77.45	1
31	UPC	27.5	118.3	77.45	3
32	UPC	27.5	-97.2	116.7	3
33	UPC	27.5	-60.362	112.3	2
34	UPC	27.5	-17.425	107.631	2
35	UPC	27.5	17.425	107.631	2
36	UPC	27.5	60.362	112.3	2
37	UPC	27.5	97.2	116.7	3
38	UPC	27.5	-73.928	151.378	3
39	UPC	27.5	-34.85	137.812	3
40	UPC	27.5	0	147.15	3

41	UPC	27.5	34.85	137.812	3
42	UPC	27.5	73.928	151.378	3
43	UPC	27.5	-27.0595	178.438	3
44	UPC	27.5	27.0595	178.438	3
45	UPC	27.5	-118.3	-77.45	3
46	UPC	27.5	-69.7	-77.45	1
47	UPC	27.5	-34.85	-77.45	1
48	UPC	27.5	0	-77.45	1
49	UPC	27.5	34.85	-77.45	1
50	UPC	27.5	69.7	-77.45	1
51	UPC	27.5	118.3	-77.45	3
52	UPC	27.5	-97.2	-116.7	3
53	UPC	27.5	-60.362	-112.3	2
54	UPC	27.5	-17.425	-107.631	2
55	UPC	27.5	17.425	-107.631	2
56	UPC	27.5	60.362	-112.3	2
57	UPC	27.5	97.2	-116.7	3
58	UPC	27.5	-73.928	-151.378	3
59	UPC	27.5	-34.85	-137.812	3
60	UPC	27.5	0	-147.15	3
61	UPC	27.5	34.85	-137.812	3
62	UPC	27.5	73.928	-151.378	3
63	UPC	27.5	-27.0595	-178.438	3
64	UPC	27.5	27.0595	-178.438	3
65	ORNL1	27.5	-215.5	77.45	5
66	ORNL1	27.5	-166.9	77.45	4
67	ORNL1	27.5	166.9	77.45	4
68	ORNL1	27.5	215.5	77.45	5
69	ORNL1	27.5	-301.012	214.133	7
70	ORNL1	27.5	-252.393	235.169	7
71	ORNL1	27.5	252.393	235.169	7
72	ORNL1	27.5	301.012	214.133	7
73	ORNL1	27.5	-215.5	-77.45	5
74	ORNL1	27.5	-166.9	-77.45	4
75	ORNL1	27.5	166.9	-77.45	4
76	ORNL1	27.5	215.5	-77.45	5
77	ORNL1	27.5	-301.012	-214.133	7
78	ORNL1	27.5	-252.393	-235.169	7
79	ORNL1	27.5	252.393	-235.169	7
80	ORNL1	27.5	301.012	-214.133	7
81	ORNL2	53	-139.932	142.007	4
82	ORNL2	53	-70.014	198.718	4
83	ORNL2	53	0	217.478	4
84	ORNL2	53	70.014	198.718	4
85	ORNL2	53	139.932	142.007	4

86	ORNL2	53	-214.903	127.3	5
87	ORNL2	53	-133.044	210.494	5
88	ORNL2	53	-48.6976	259.192	5
89	ORNL2	53	48.6976	259.192	5
90	ORNL2	53	133.044	210.494	5
91	ORNL2	53	214.903	127.3	5
92	ORNL2	53	-273.203	102.2	6
93	ORNL2	53	-263.894	172.91	6
94	ORNL2	53	-204.385	193.709	6
95	ORNL2	53	-118.139	282.073	6
96	ORNL2	53	0	313.728	6
97	ORNL2	53	118.139	282.073	6
98	ORNL2	53	204.385	193.709	6
99	ORNL2	53	263.894	172.91	6
100	ORNL2	53	273.203	102.2	6
101	ORNL2	53	-339.453	102.2	7
102	ORNL2	53	-323.857	159.305	7
103	ORNL2	53	-201.103	278.553	7
104	ORNL2	53	-166.264	365.428	7
105	ORNL2	53	-73.6089	352.162	7
106	ORNL2	53	73.6089	352.162	7
107	ORNL2	53	166.264	365.428	7
108	ORNL2	53	201.103	278.553	7
109	ORNL2	53	323.857	159.305	7
110	ORNL2	53	339.453	102.2	7
111	ORNL2	53	-139.932	-142.007	4
112	ORNL2	53	-70.014	-198.718	4
113	ORNL2	53	0	-217.478	4
114	ORNL2	53	70.014	-198.718	4
115	ORNL2	53	139.932	-142.007	4
116	ORNL2	53	-214.903	-127.3	5
117	ORNL2	53	-133.044	-210.494	5
118	ORNL2	53	-48.6976	-259.192	5
119	ORNL2	53	48.6976	-259.192	5
120	ORNL2	53	133.044	-210.494	5
121	ORNL2	53	214.903	-127.3	5
122	ORNL2	53	-273.203	-102.2	6
123	ORNL2	53	-263.894	-172.91	6
124	ORNL2	53	-204.385	-193.709	6
125	ORNL2	53	-118.139	-282.073	6
126	ORNL2	53	0	-313.728	6
127	ORNL2	53	118.139	-282.073	6
128	ORNL2	53	204.385	-193.709	6
129	ORNL2	53	263.894	-172.91	6
130	ORNL2	53	273.203	-102.2	6

131	ORNL2	53	-339.453	-102.2	7
132	ORNL2	53	-323.857	-159.305	7
133	ORNL2	53	-201.103	-278.553	7
134	ORNL2	53	-166.264	-365.428	7
135	ORNL2	53	-73.6089	-352.162	7
136	ORNL2	53	73.6089	-352.162	7
137	ORNL2	53	166.264	-365.428	7
138	ORNL2	53	201.103	-278.553	7
139	ORNL2	53	323.857	-159.305	7
140	ORNL2	53	339.453	-102.2	7

## 5. Distribution into preamplifiers

The HV value determines the separation into different preamps. The distribution into differential preamplifiers (connected with D/U converter cards to digitizers) is fixed by the distribution into digitizers (see below). These contain both RIKEN and UPC tubes (1450V). One unipolar preamplifier contains ORNL1 tubes (1350V). The remaining 4 unipolar preamps contain the ORNL2 tubes (1750V) distributed in quadrants. Color indicates tube type:

	RIKEN		UPC
	ORNL1		ORNL2

Differential			
1	13	10	42
2	14	11	43
3	15	16	44
7	19	17	37
8	20	22	31
9	21	23	45
26	33	6	52
27	34	12	58
28	35	18	59
29	36	24	60
30	53	25	61
46	54	32	62
47	55	38	63
48	56	39	64
49	4	40	57
50	5	41	51

Unipolar				
65	83	81	111	113
66	84	82	112	114
67	85	86	116	115
68	89	87	117	119
69	90	88	118	120
70	91	92	122	121
71	97	93	123	127
72	98	94	124	128
73	99	95	125	129
74	100	96	126	130
75	106	101	131	136
76	107	102	132	137
77	108	103	133	138
78	109	104	134	139
79	110	105	135	140
80				

## 6. Distribution into digitizers

The distribution facilitates the distribution into rings. Color indicates ring number:

	Ring 1		Ring 2		Ring 3
	Ring 4		Ring 5		Ring 6
	Ring 7				

SIS3316					
1	13	10	42	66	65
2	14	11	43	67	68
3	15	16	44	74	73
7	19	17	37	75	76
8	20	22	31	81	86
9	21	23	45	82	87
26	33	6	52	83	88
27	34	12	58	84	89
28	35	18	59	85	90
29	36	24	60	111	91
30	53	25	61	122	116
46	54	32	62	113	117
47	55	38	63	114	118
48	56	39	64	115	119
49	4	40	57		120
50	5	41	51		121

SIIS3302					
92	100	129	107	135	69
93	122	130	108	136	70
94	123	101	109	137	71
95	124	102	110	138	72
96	125	103	131	139	77
97	126	104	132	140	78
98	127	105	133		79
99	128	106	134		80



## 7. Drawing

The color code indicates tube type. The line connects tubes in the same "ring".

