Global Dead Time Correction

1. Quick Reminder of the Global Dead Time Correction
2. Summary of the “Wells Plot Issue”
3. Contributions to Dead Time Correction:
   - Elastic electrons
     - 362 LD2
     - 362 LH2
   - Inelastic electrons
     - 362 LD2
     - 362 LH2

(Global) Dead Time Correction

- 3 different corrections applied sequentially :
  - Coincidence Dead Time : Applied on all CED.FPD coincidences

    Involves CFD, MT, Trigger dead time corr., MH corr.

$$\mathrm{Coinc}_{i,j}^{corrDT} = \frac{\mathrm{Coinc}_{i,j}^{meas}}{(1 - DT_{CFD_i} - DT_{MT_i}) \cdot (1 - DT_{CFD_j} - DT_{MT_j})\,(1 - DT_{Trig} - MH22_{i,j}) \cdot \overline{MH12}_{i,j}}$$

  - Contamination : Applied separately on dead time corrected e and π coincidences

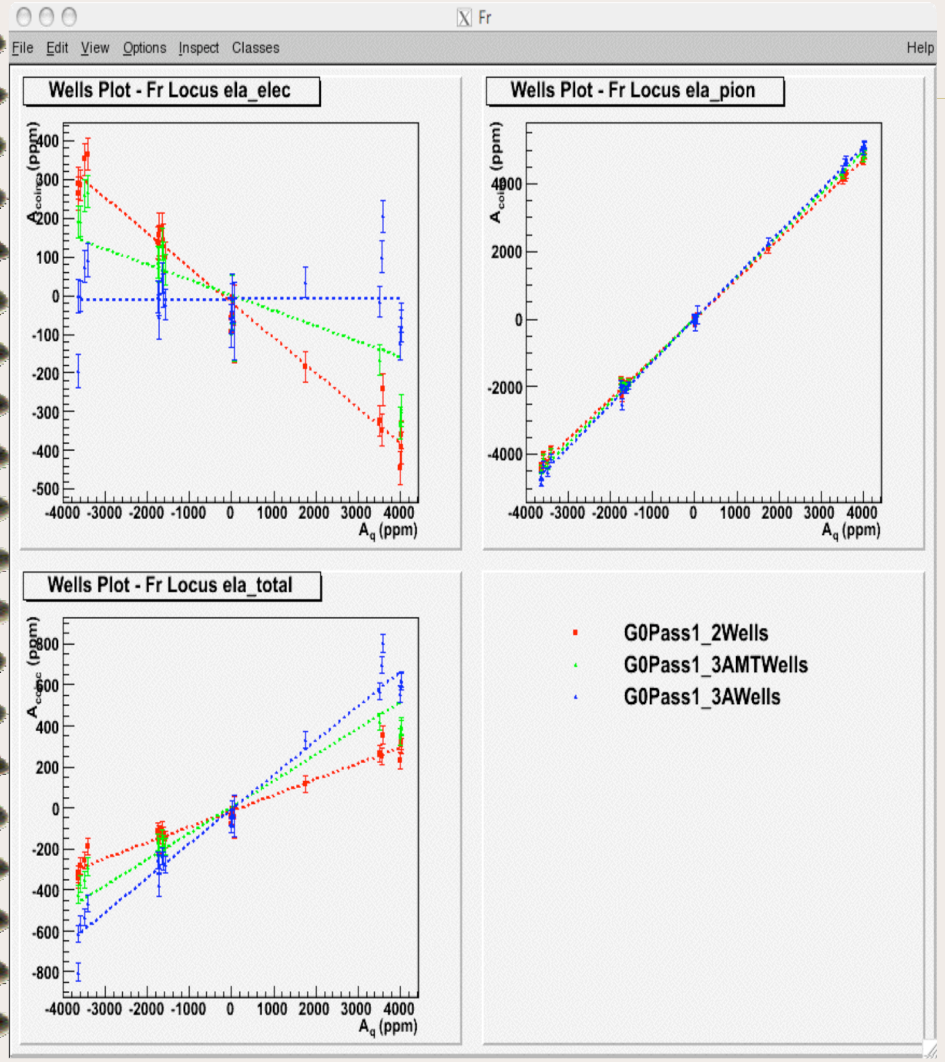
    Involves Cerenkov randoms and dead time

$$\mathrm{eCoinc}_{i,j}^{corr} = \begin{cases} \dfrac{\left(\mathrm{eCoinc}_{i,j}^{corrDT} + \pi\mathrm{Coinc}_{i,j}^{corrDT}\right) \cdot \mathrm{Rdm}\check{C}_2 - \mathrm{eCoinc}_{i,j}^{corrDT}}{\mathrm{Rdm}\check{C}_2 + DT_{\check{C}} - 1} & \text{in pion mode} \\ \dfrac{\left(\mathrm{eCoinc}_{i,j}^{corrDT} - \mathrm{rCoinc}_{i,j}^{corrDT} \dfrac{\mathrm{Rdm}\check{C}_2}{\mathrm{Rdm}\check{C}_1}\right)}{1 - \mathrm{Rdm}\check{C}_2 - DT_{\check{C}}} & \text{in random mode} \end{cases}$$

  - Coincidence Randoms : Applied to π coincidences

    Consists in the subtraction of calculated random CEDxFPD coincidences

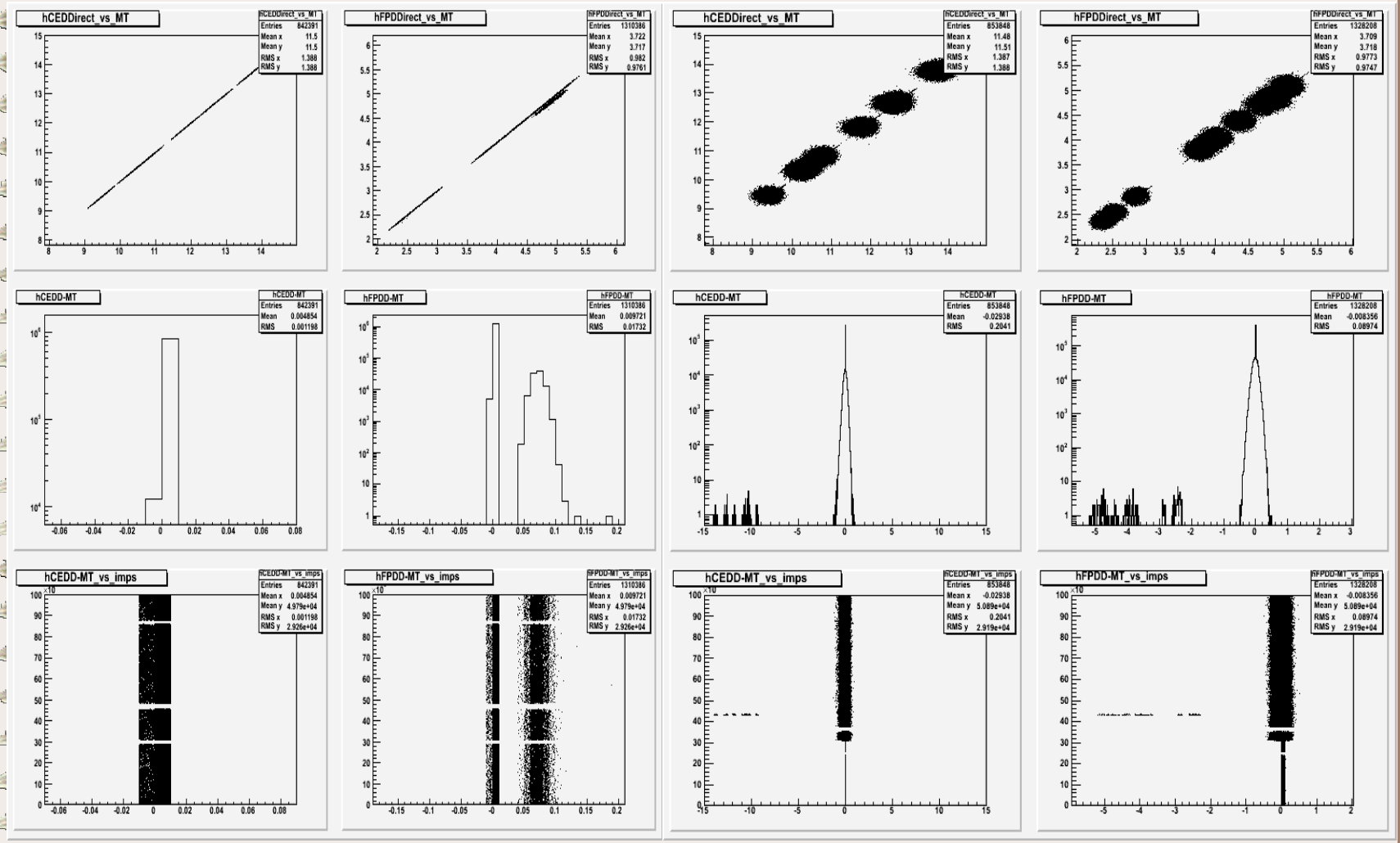
1.Wells Plots (January 2007) French Octants



- Wells Plot = A_{det} vs A_{charge}
- Pass1_3 only with coincidence dead time correction
- Issue :
  - No significant decrease of A_{det} vs A_{charge} dependance from Pass1_2 to Pass1_3MT
  - ⇨ as if DT was not applied
  - Improvement when using DIRECT counters instead of MT for DT correction.

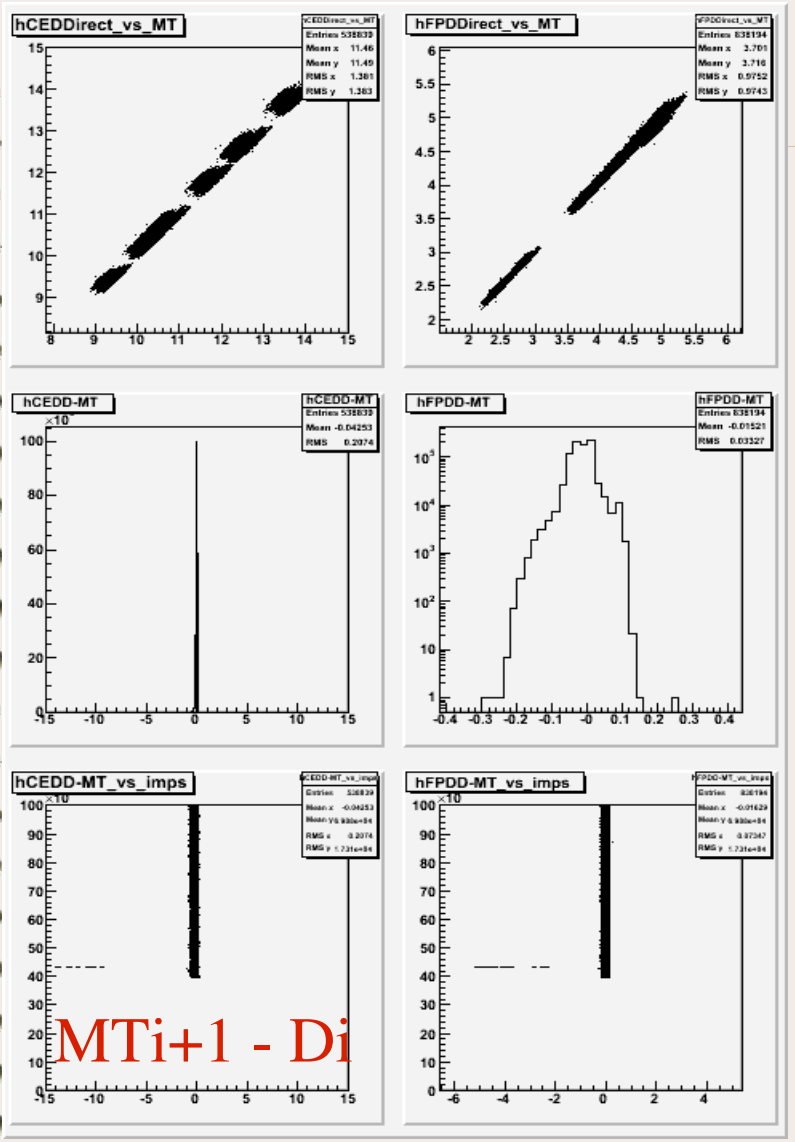
Difference in g0analysis between french MTs and DIRECTs

1. French DIRECTs ≠ MTs



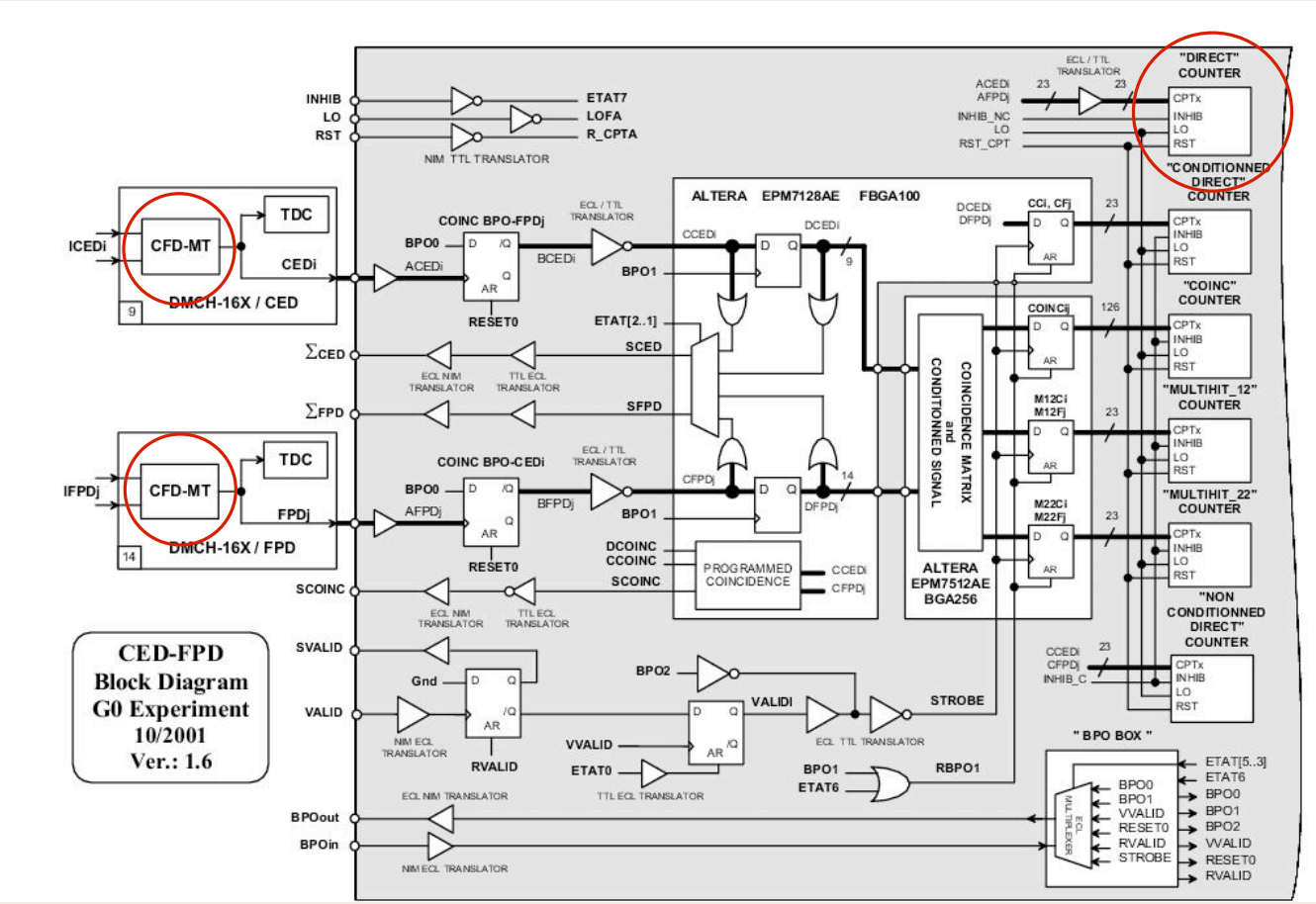
Run 33741 Run 33742

1. MT shifted by 1 MPS ?



MPS #	DIRECTi	MTi	DIRECTi-1
mps=94000	2.49731	2.38519	2.40901
mps=94001	2.39923	2.4892	2.49731
mps=94002	2.41274	2.40755	2.39923
mps=94003	2.51429	2.40873	2.41274
mps=94004	2.33743	2.47912	2.51429
mps=94005	2.37716	2.33228	2.33743
mps=94006	2.4055	2.35406	2.37716
mps=94007	2.47228	2.38509	2.4055
mps=94008	2.46162	2.48491	2.47228
mps=94009	2.46382	2.44403	2.46162
mps=94010	2.46192	2.43284	2.46382
mps=94011	2.462	2.44322	2.46192
mps=94012	2.39684	2.46908	2.462
mps=94013	2.49512	2.37912	2.39684
mps=94014	2.50313	2.46472	2.49512
mps=94015	2.50492	2.49382	2.50313
mps=94016	2.45928	2.51263	2.50492
mps=94017	2.4925	2.4225	2.45928
mps=94018	2.34398	2.50231	2.4925
mps=94019	2.44053	2.32783	2.34398
mps=94020	2.38588	2.40889	2.44053

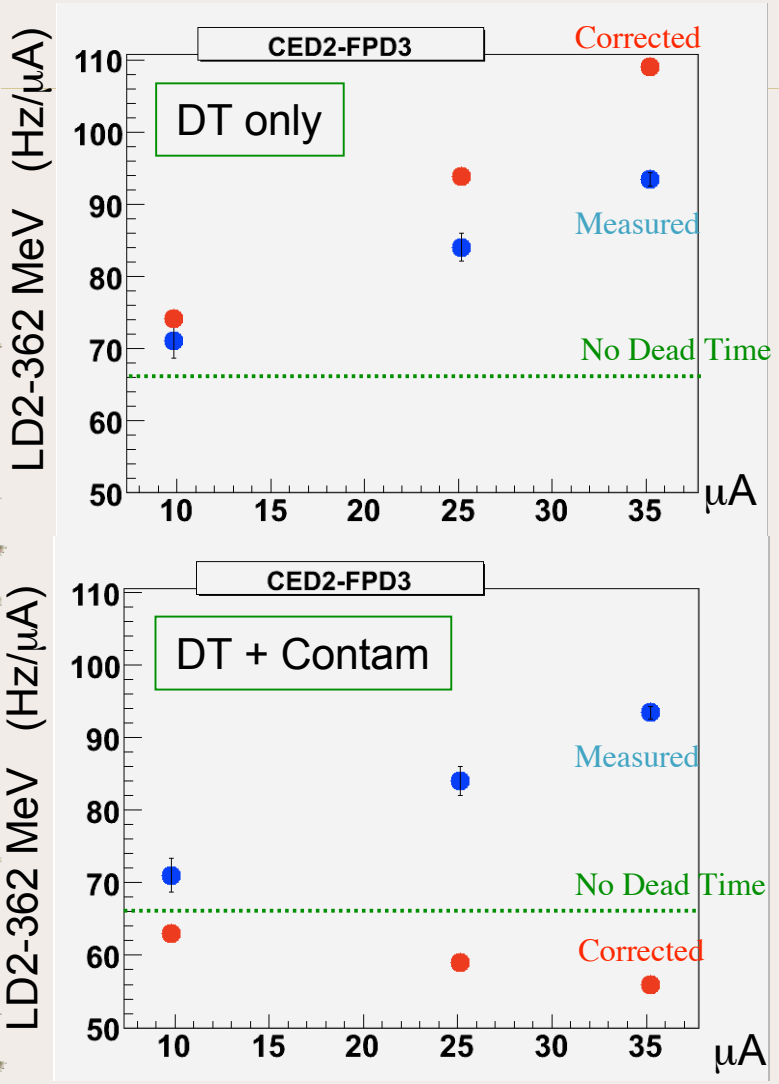
1. Implications



- MTs extracted from DMCHs
- DMCHs also contain Singles CFD Left and Right used in the coincidence DT correction

2. Study of Dead Time Contributions

Electron Measured-Corrected Yield



- Each contribution is applied separately :
  - Coincidence dead time correction
  - Contamination
  - CEDxFPD randoms subtraction
- The applied correction is measured via :

$$\text{Correction}_{\text{APPLIED}} = \frac{Y_{\text{CORRECTED}} - Y_{\text{MEASURED}}}{Y_{\text{TRUE}}}$$

  - A correction that increases the yield has a positive contribution
  - A correction that decreases the yield has a negative contribution

2. Elastic Electrons

- LD2 362 :

  ~10-20% of DT. Contamination⊖: π contamination in e matrix

Octant	1	2	3	4	5	6	7	8
Total correction (%)	9.37	5.46	8.67	4.47	4.55	5.02	5.92	4.83
Dead Time correction (%)	15.40	10.84	15.66	12.51	20.41	11.49	15.34	10.85
Contamination correction (%)	-6.02	-5.48	-6.99	-8.04	-15.85	-6.63	-9.42	-6.10
Random correction (%)	0	NA	0	NA	0	NA	0	NA

Table 3: "(Corrected - Measured)/True" %.LD2 362 MeV. Electron, elastic locus.

- LH2 362 :

  Much lower DT. Contamination ⊕ : electrons brought back from π matrix

Octant	1	2	3	4	5	6	7	8
Total correction (%)	8.43	7.00	9.03	6.73	10.22	5.88	8.70	5.09
Dead Time correction (%)	5.91	4.21	6.46	4.59	8.02	4.37	7.04	4.30
Contamination correction (%)	2.51	2.79	2.57	2.13	2.19	1.51	1.66	0.79
Random correction (%)	0	NA	0	NA	0	NA	0	NA

Table 5: "(Corrected - Measured)/True" (%).LH2 362 MeV. Electron, elastic locus.

➡ Global correction of ~ 5-10% on elastic locus

2. Inelastic Electrons

- LD2 362

Octant	1	2	3	4	5	6	7	8
Total correction (%)	-71.24	-65.99	-74.41	-85.36	-121.8	-70.07	-89.48	-83.83
Dead Time correction (%)	33.00	24.11	34.82	30.92	65.41	23.96	36.15	26.39
Contamination correction (%)	-104.2	-94.5	-109.2	-119.7	-187.2	-97.65	-125.6	-114
Random correction (%)	0	NA	0	NA	0	NA	0	NA

Table 9: "(Corrected - Measured)/True" en %.LD2 362 MeV. Electron, inelastic locus.

Very high DT correction (20 to 35% - except oct 5). Why?
Very high contamination due to corresponding high counting rates in π

- LH2 362 :

Octant	1	2	3	4	5	6	7	8
Total correction (%)	6.18	3.95	6.73	3.33	7.71	2.61	5.59	1.95
Dead Time correction (%)	5.95	3.90	6.84	4.28	8.61	4.07	7.44	4.12
Contamination correction (%)	0.22	0.044	-0.10	-0.94	-0.90	-1.45	-1.84	-2.17
Random correction (%)	0	NA	0	NA	0	NA	0	NA

Table 11: "(Corrected - Measured)/True" (%).LH2 362 MeV. Electron, inelastic locus.

3. False Asymetry and Dead Time Correction

- Christophe …

Pions

- Elastic LD2 362 :

Octant	1	2	3	4	5	6	7	8
Total correction (%)	13.4	11.52	13.95	11.05	16.86	11.73	14.62	11.7
Dead Time correction (%)	14.5	10.72	15.18	10.82	17.97	10.22	13.92	9.51
Contamination correction (%)	3.46	3.075	3.672	3.56	6.59	3.65	4.39	4.10
Random correction (%)	-4.56	-2.28	-4.906	-3.33	-7.7	-2.14	-3.69	-1.91

Table 15: "(Corrected - Measured)/True" %.Pion-mode Runs-LD2 362 MeV (33202, 33203, 33204). Pion, elastic locus.

- Inelastic LD2 362 :

Octant	1	2	3	4	5	6	7	8
Total correction (%)	17.82	14.46	18.08	14.86	20.57	15.2	17.92	15.36
Dead Time correction (%)	12.61	9.00	13.29	9.57	14.36	9.00	12.3	8.81
Contamination correction (%)	6.11	6.10	5.89	6.24	8.67	6.89	6.70	7.04
Random correction (%)	-0.90	-0.65	-1.10	-0.96	-2.46	-0.70	-1.09	-0.48

Table 17: "(Corrected - Measured)/True" en %.Pion-mode Runs-LD2 362 MeV (33202, 33203, 33204). Pion, inelastic locus.

➡ Global correction of ~ 10-20% on elastic locus