Memo/sommario della Mission Impossible
al PSI nel weekend del 21/22/23 Novembre

Attori:

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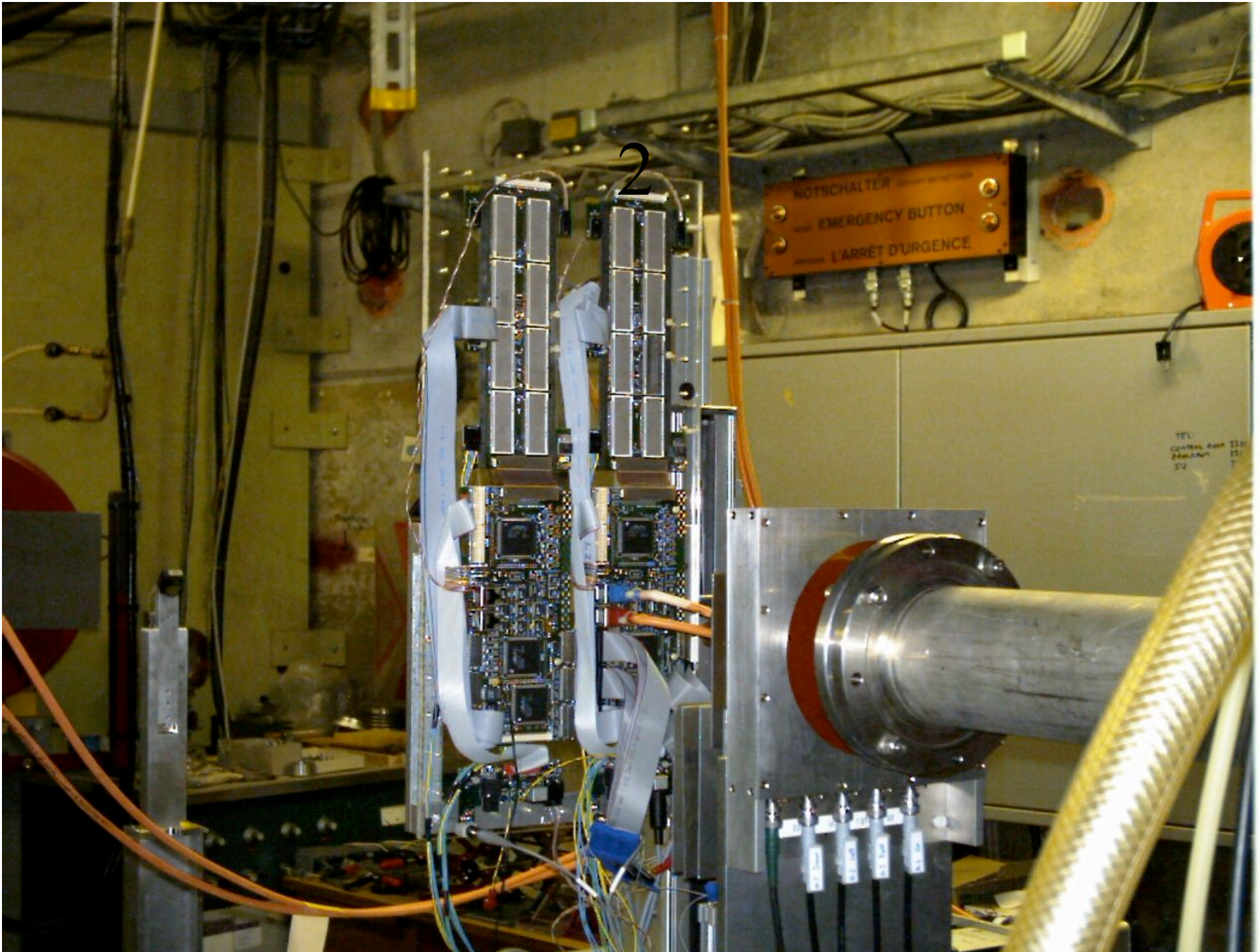Riccardo Travaglini

Pierluigi Zotto
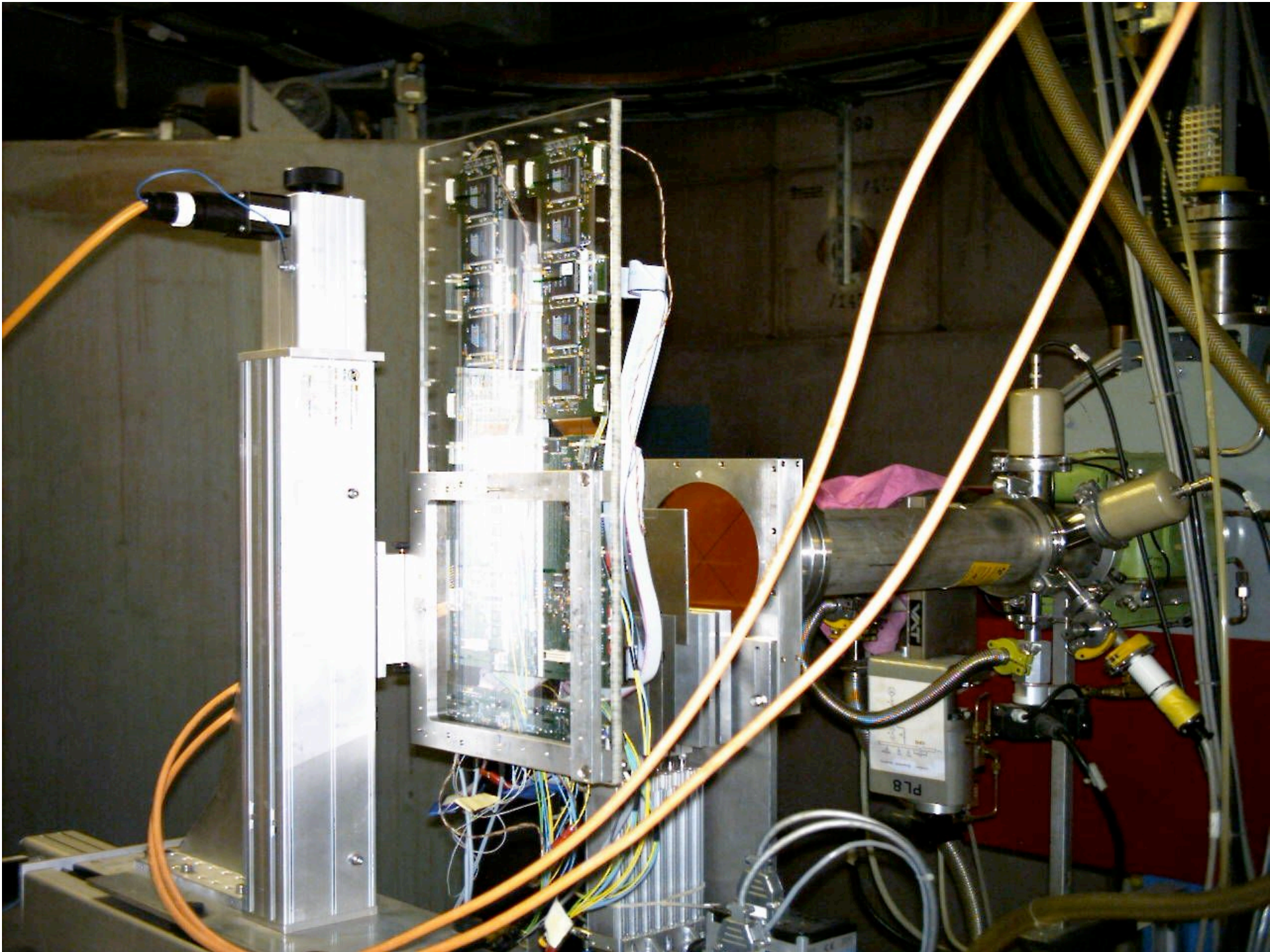
Strumentazione utilizzata:

2 mini MiniCrates e sistema di acquisizione

1 foglio blu all'andata

1 foglio rosa al ritorno

Useful ingredients:

- 1E10 protons >60MeV= 1.4 Krad
- M.Huhtinen's simulation:

  Fluence in 10 LHC years (8.6E7 sec)

  All neutrons   in MB1   2.3E10/cm2

  in MB4   2.9E10

  >20MeV   in MB1   1.2E09

  in MB4   1.0E09

- Dose in 10 LHC years

  in MB1   12 rad

  in MB4   10 rad

PLZotto uses
(CMS Note 2000/068
tab 5 pag 14):
Flux /cm2/sec >20MeV

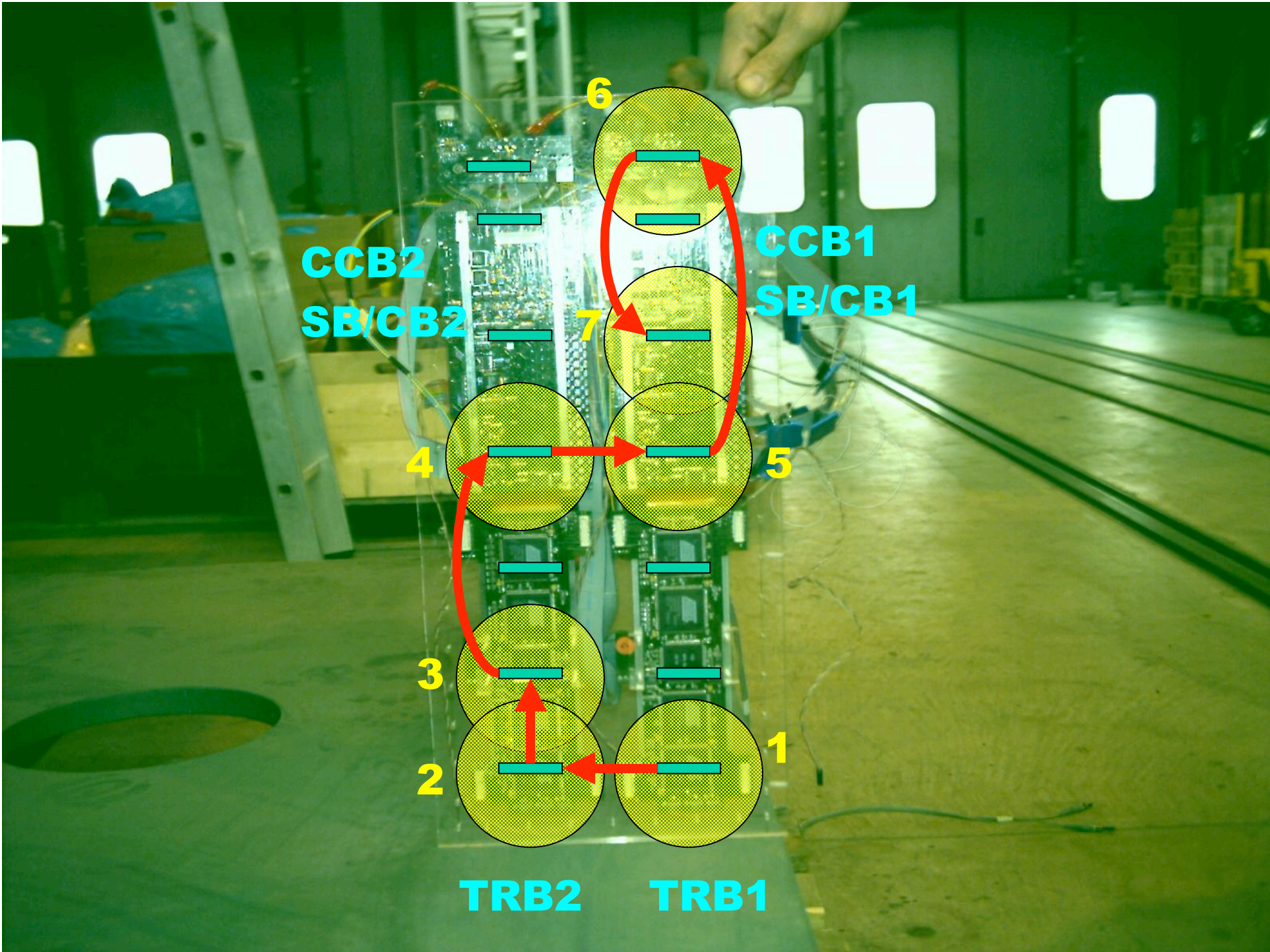|	
in MB1 central	9,60
in MB1 lateral	37,40
in MB2	3,62
in MB3	0,30
in MB4	4,00
in cavern	37,40

Use worst cases: Fluence /cm2 in a LHC year
(240 days of data taking, i.e.   2.1E7 sec, with
PLZ's fluxes):

in MB1 central   2.0E8

in MB1 lateral   7.9E8

6

CCB2

SB/CB2

CCB1

SB/CB1

7

4

5

3

2

1

TRB2   **TRB1**

PSI test summary: device MTBF (hyp.location: MB1 wheel 0)

device	test	total fluence /cm2	#SEE	#units	MTBF
TRB	1,2,3	3.66 E11 (1830 LHCyears)	3	42	14.5 years
BTI SEU	1,2,3	3.66 E11 (439200 LHCdays)	2	1344	163.4 days
TRB/SB buffers	3,6	2.90 E11 (1450 LHCyears)	0	78	>4.6 years
CCB/SB "Low"	4,5	9.24 E10 (462years)	1	12	38.5 years
CCB/SB "Mid"	7	2.60 E10 (130years)	1	12	10.8 years
CCB/SB "Hi"	?				?
RAM SEU	4,5	8.59 E10 (430years) (4959360 LHChours)	22778	36	6.0 hours
Altera FPGAs	4,5,7	1.18 E11 (592years)	1	36	16.4 years
UART	4,5	9.24 E10 (462years)	1	12	38,5 years
LVDS TX	7	7.26 E10 (363years)	1	96	3.8 years
PLL	5	2.40 E10 (120years)	1	24	5 years
Link Board	6	5.0 E10 (250years)	0	12	>5.2 years

comment on MTBF of TRB boards

3 independent occurences (which cover all components)

- Assuming 12 MB1s as MB1 wheel 0: 42 boards

    MTBF = (790+445+595)/3/42 = 14.5 LHC years
- Assuming 12 MB1s as MB1 wheel 2: 42 boards

    MTBF = (199+113+150)/3/42 = 3.7 LHC years

WARNING: this assumes a uniform failure probability with time, i.e. it was a random Single Event producing the failure. Since we have 3 measurements, wouldnt it be more sensible to assume the failure probability be increasing with time as the dose increases, resulting in a much longer MTBF. ($\rightarrow$ f.i. upper limit of Xsection and rate)