

Current Levels & Expectations

- Injection Intensity: ‘high-intensity’ injection up to 10^{11} /bunch
 - $\sim 0.1\%$ of nominal
- LHC Intensity: long time at few 10^9 , now around 10^{11} :
 - we operate(d) between: $0.001 - 0.04\%$
- Energies: we operate(d) at 450GeV up to 3.5TeV
 - Up to $\frac{1}{2}$ nominal
- LHC Losses: very long beam-lifetime
 - Losses can be ‘seen’ (*e.g.*, around collimators), still we’re not getting higher than $\sim 0.1\%$ of nominal

Where Can We 'See' Something

- Only Close to loss locations
 - Collimators, TCDQ, TED,...
- Most at injection, especially when dumped on the TED (as well as losses on the TDI)
- Other 'good' example are losses on the TCDQ (especially during early operation tests)
- For direct observations in critical areas we'll (luckily) have to wait longer
- Passive detectors are placed to give an estimate
- Can we use Ramses (RP) data -> R2E Workshop

Where Can We 'See' Something

- © D. Kramer (newer version available!)

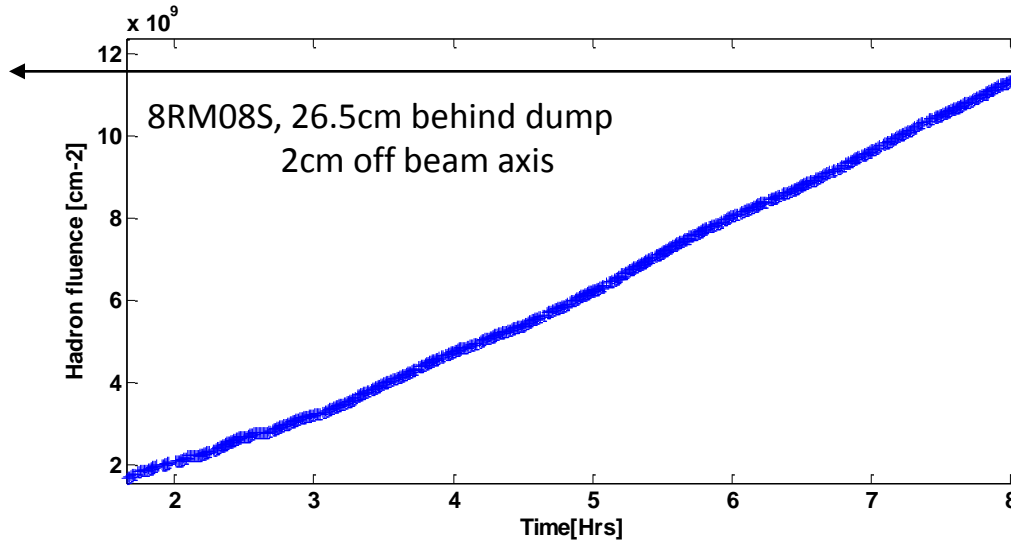
date	duration	AREA	radmon name	serial ID	voltage	SEUs	Δdose [Gy]	Δ1MeV [Gy]	remark1
26/1/2010 9:30	0h	UA67	UA67.6RM06S		3	1	0	0	no beam in LHC ...!
03.07.2010 11:13	3h	IR8	4R8.8RM02S	V41013	5	140	0.2	0	large fluence in short time
03.07.2010 13:56	0h	UA87	UA87.8RM03S	V41004	3	1	0	0	1 thermal SEU after the maze from TDI
03.07.2010 15:37	0h	RR77	RR77.7RM06S	V41047	5	1	0	0	1 SEU inside and one outside
03.07.2010 15:51	0h	RR77	RR77.7RM07S	V41046	3	1	0	0	1 SEU inside and one outside
03.09.2010 16:59	0h	RR73	RR73.7LM05S		3	1	0	0	1 SEU inside
13/3/2010 17:41	10min	UJ88	UJ88.8RM08S		5	39	0.03	0	1,2 SEUs also on 8RM07S
15/3/2010 2:17	1h	UJ88	UJ88.8RM07S		5	17	0.04	0	collimator setup TC DIV 87804
15/3/2010 1:53		IR7	RR77.7RM07S		3	1	0	0	1 SEU inside
16/3/2010 16:46	2min	LHC				x2			ALL COUNTS doubled after restart!!
16/3/2010 17:10	2min	LHC					jump		linear calibration applied ->
03.09.2010	8days	RR13	RR13.1LM10S			0	0.4	0	temperature cycles, no temp remote
17/3/2010 18:35	2h	UJ22	UJ22.2LM06S		5	7	0.006	0	collimator setting?
17/3/2010 17:18	6h	UJ88	UJ88.8RM08S		5	918	0.6/0.46	0!	5e10p+/shot on TED since 21:22, TC DIV87645 and 441 moved
17/3/2010 17:21	6h	UJ88	UJ88.8RM07S		5	6	0.006	0	5e10p+/shot on TED since 21:22, TC DIV87645 and 441 moved
17/3/2010 17:32	0h	UJ87	UA87.8RM05S		3	1	0	0	5e10p+/shot on TED since 21:22, TC DIV87645 and 441 moved
19/3/2010 17:41		UJ16	UJ16.1RM01S		3	1	0	0	1st SEU
20/3/2010 19:12	0h	UJ23	UJ22.2LM04S		3	1	0	0	1st SEU in UJ23, SPIKES ON BLMQI.08L2.B1E30_MQML
23/3/2010 2:06	0h	IR8	8RM01,2,5,6,7S						STATUS 31
23/3/2010 2:03	0h	IP5	5RE05,6,7,9S						STATUS 64
24/3/2010 20:44	2.5h	UJ22	UJ22.2LM06S		5	58	0.035/0.04	0	29012 started moving at 22:36 only!
24/3/2010 20:44	2.5h	UJ22	UJ22.2LM05S		5	2	0.002	0	29013 started moving at 22:36 only!
25/3/2010 18:25	4h	UJ88	UJ88.8RM08S		5	263	0.17	0	2 SEUs on 07S
21/4/2010 00:00	48h	IR7	5R7.7RM04S		5	13	0.03	0	2 jumps of 0.015Gy
21/4/2010 00:00	48h	IR7							
21/4/2010 00:00	48h	IR7							
05.01.2010 00:37		IR6							
05.01.2010 00:37		IR6							
05.01.2010 01:02	8days	UJ88							
05.01.2010 04:07	15days	IR3							
05.05.2010 18:56	0h	UJ88							
05.05.2010 19:54	0h	UJ88							
05.06.2010 17:00	0h	UJ22							
05.04.2010 19:22	10days	UJ22							
14/5 2010 20:54	0h	IR4							

- Most counts close to injection
- Only 1, 2 counts in critical areas (e.g., RRs), they come from collimation setup



RADMON

$1.2 \times 10^{10} \text{ cm}^{-2}$



FLUKA

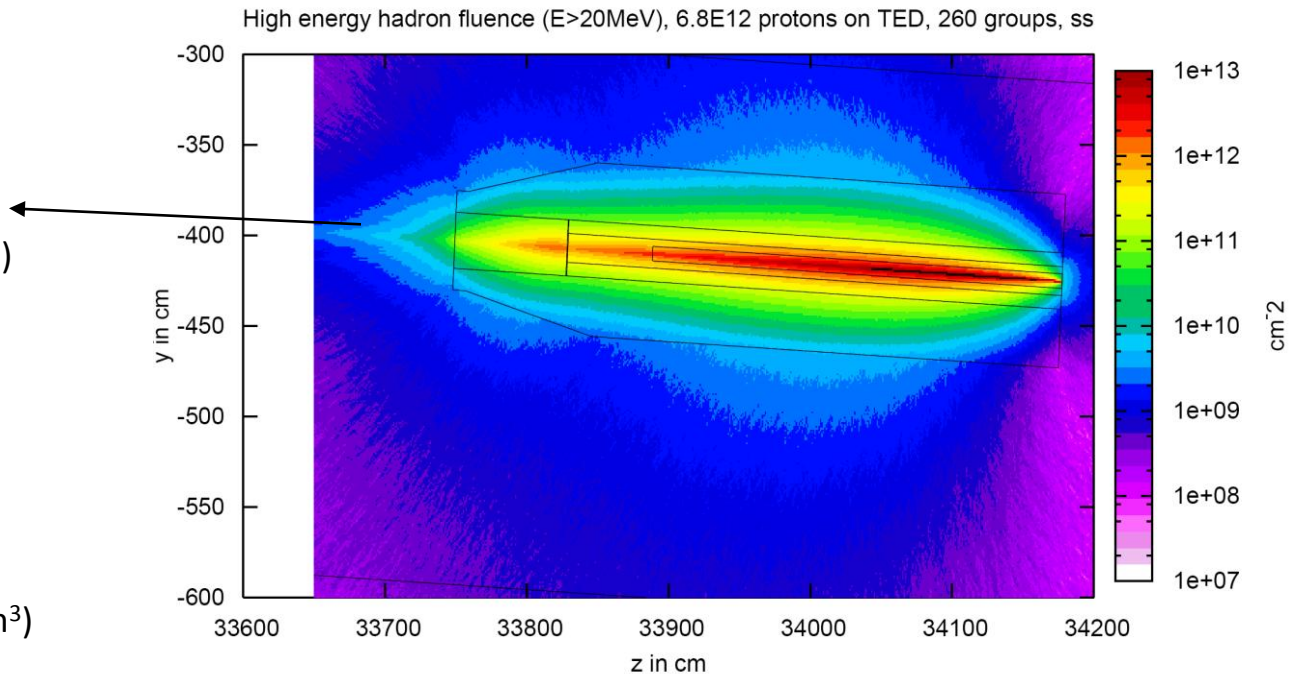
$0.96 \times 10^{10} \text{ cm}^{-2}$ 3.2%

(scoring in a volume of $2 \times 2 \times 2 \text{ cm}^3$)

- protons: 9.8%
- neutrons: 34.1%
- pos. pions: 21.9%
- neg.pions: 22.4%
- others: 11.8%

$(1.03 \times 10^{10} \text{ cm}^{-2}$ 3.2%

scoring in a volume of $5 \times 5 \times 5 \text{ cm}^3$)



RADMON

$2 \times 10^{10} \text{ cm}^{-2}$

FLUKA

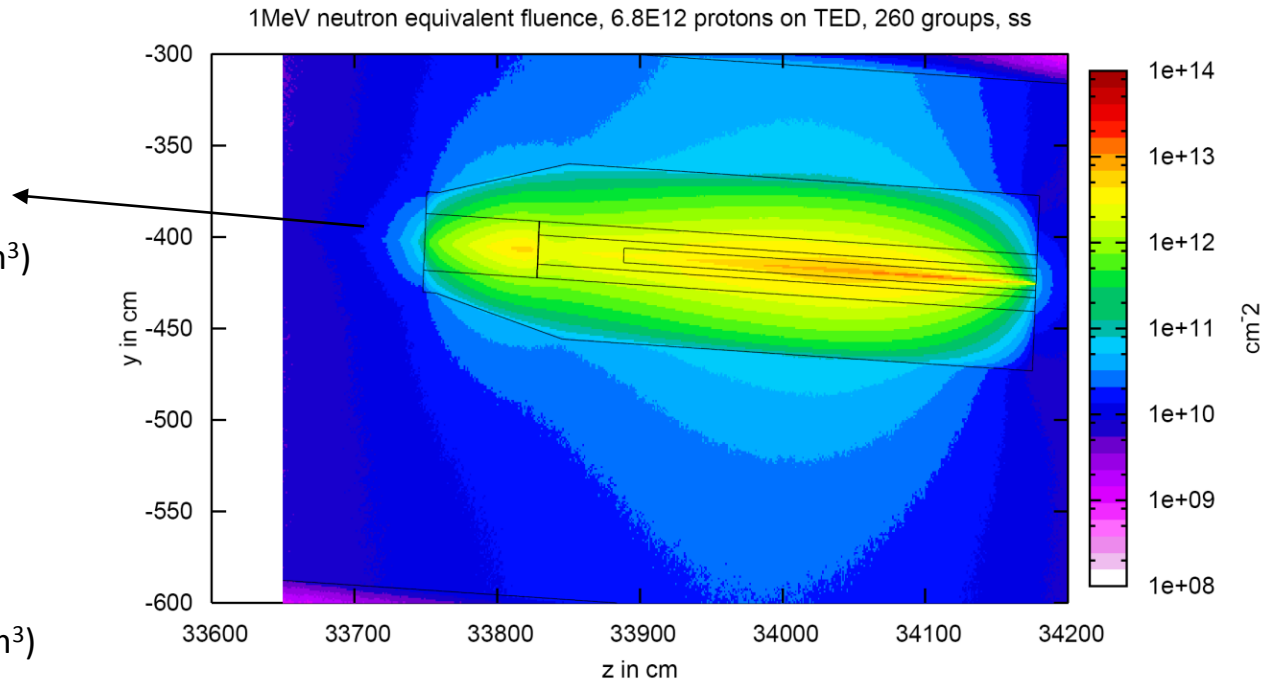
$2.1 \times 10^{10} \text{ cm}^{-2}$ 2.5%

(scoring in a volume of $2 \times 2 \times 2 \text{ cm}^3$)

- protons: 4.6%
- neutrons: 81.6%
- pos. pions: 5.3%
- neg. pions: 5.6%
- others: 2.9%

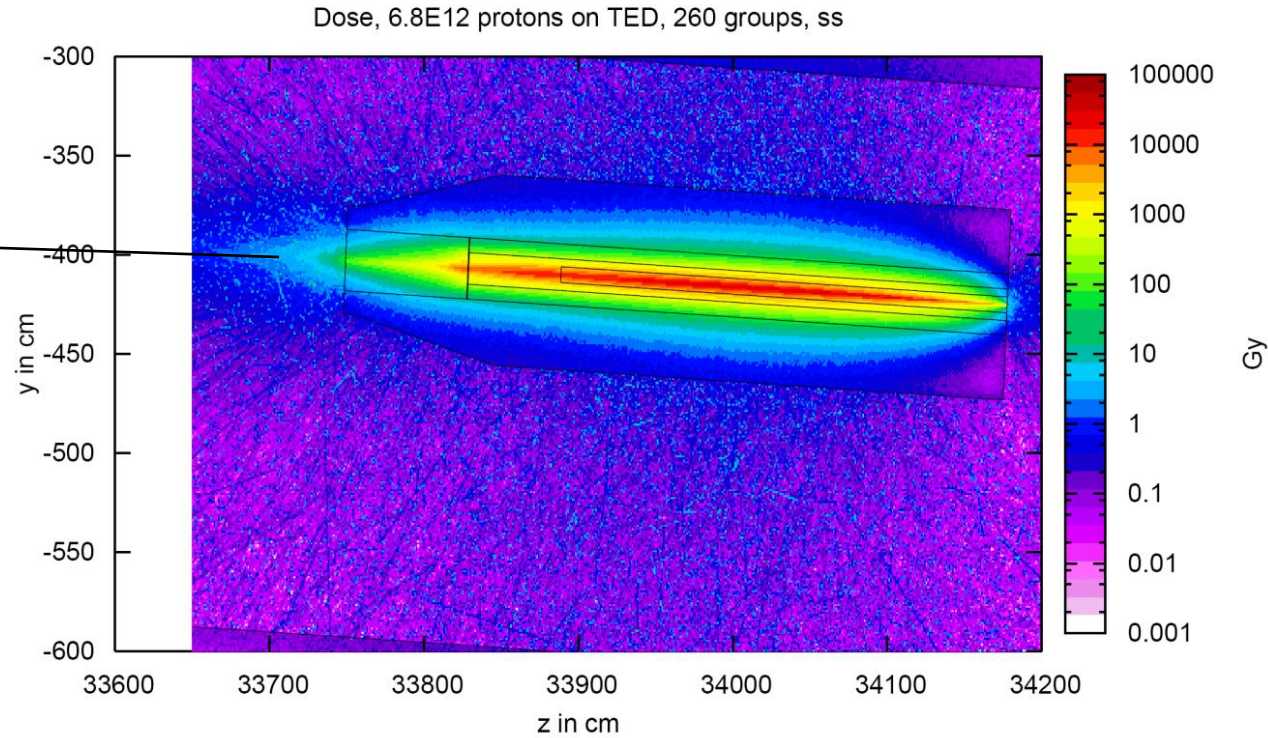
$(2.25 \times 10^{10} \text{ cm}^{-2}$ 1.8%

scoring in a volume of $5 \times 5 \times 5 \text{ cm}^3$)



RADMON
4.73 Gy (Si)

FLUKA
5.0 Gy (air) 10%
(scoring in a volume of $5 \times 5 \times 5 \text{cm}^3$)

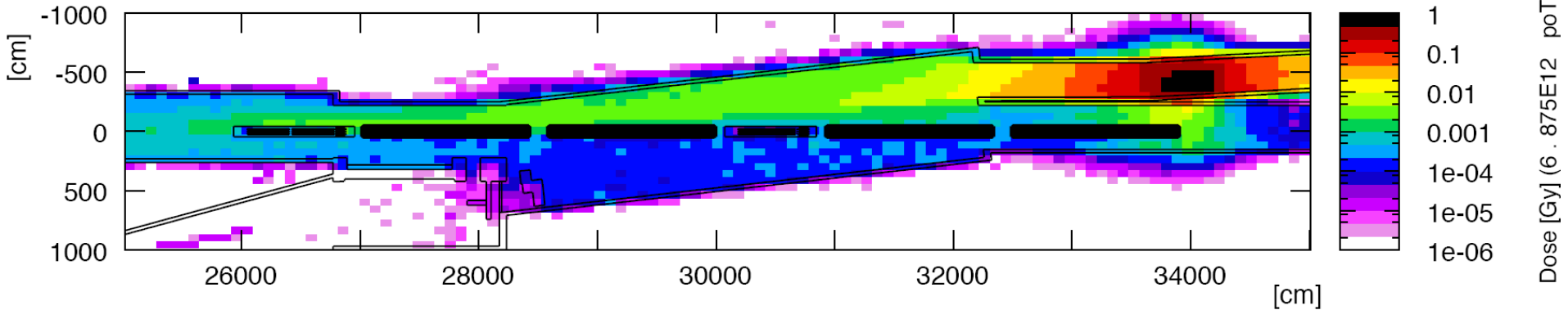


	RADMON	FLUKA	FLUKA/RADMON	
High energy hadrons	$1.2 \times 10^{10} \text{ cm}^{-2}$	$0.96 \times 10^{10} \text{ cm}^{-2}$	3.2%	0.8
1 MeV neutron equiv.	$2 \times 10^{10} \text{ cm}^{-2}$	$2.1 \times 10^{10} \text{ cm}^{-2}$	2.5%	1.05
Dose	4.73 Gy (Si)	5.0 Gy (air) \pm 10%		1.06

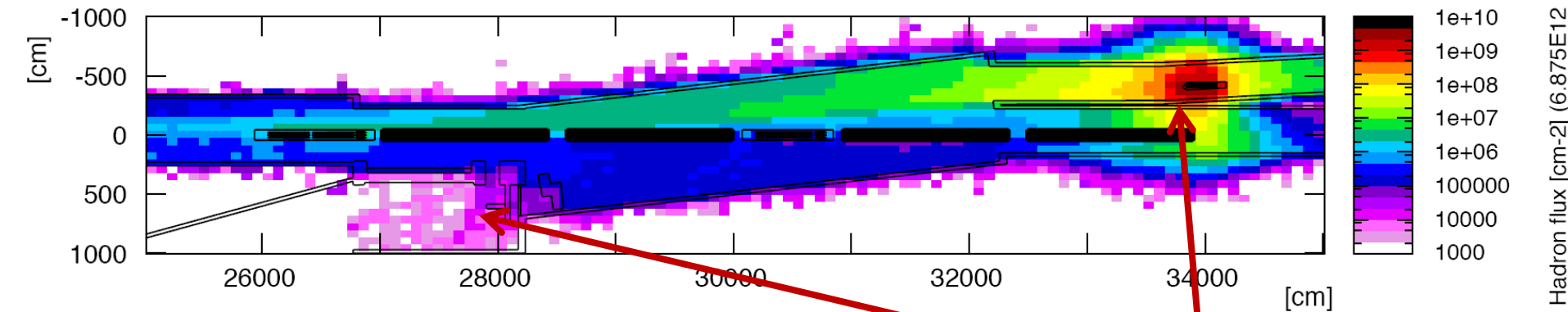
Simulations for T18/2

- © V. Boccone (FLUKA Team)

Dose over the T18-IR8 area

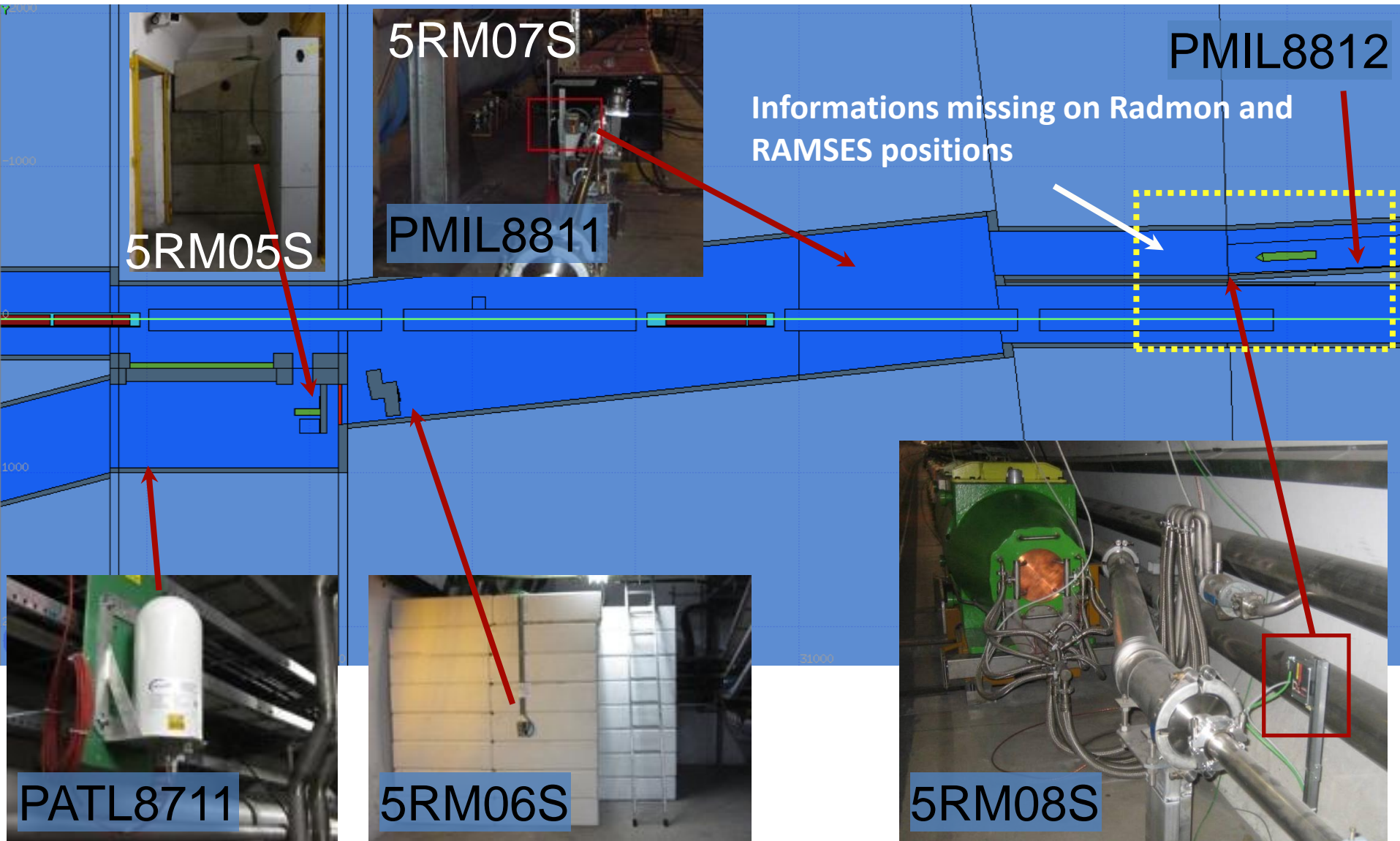


Hadron flux over the T18-IR8 area



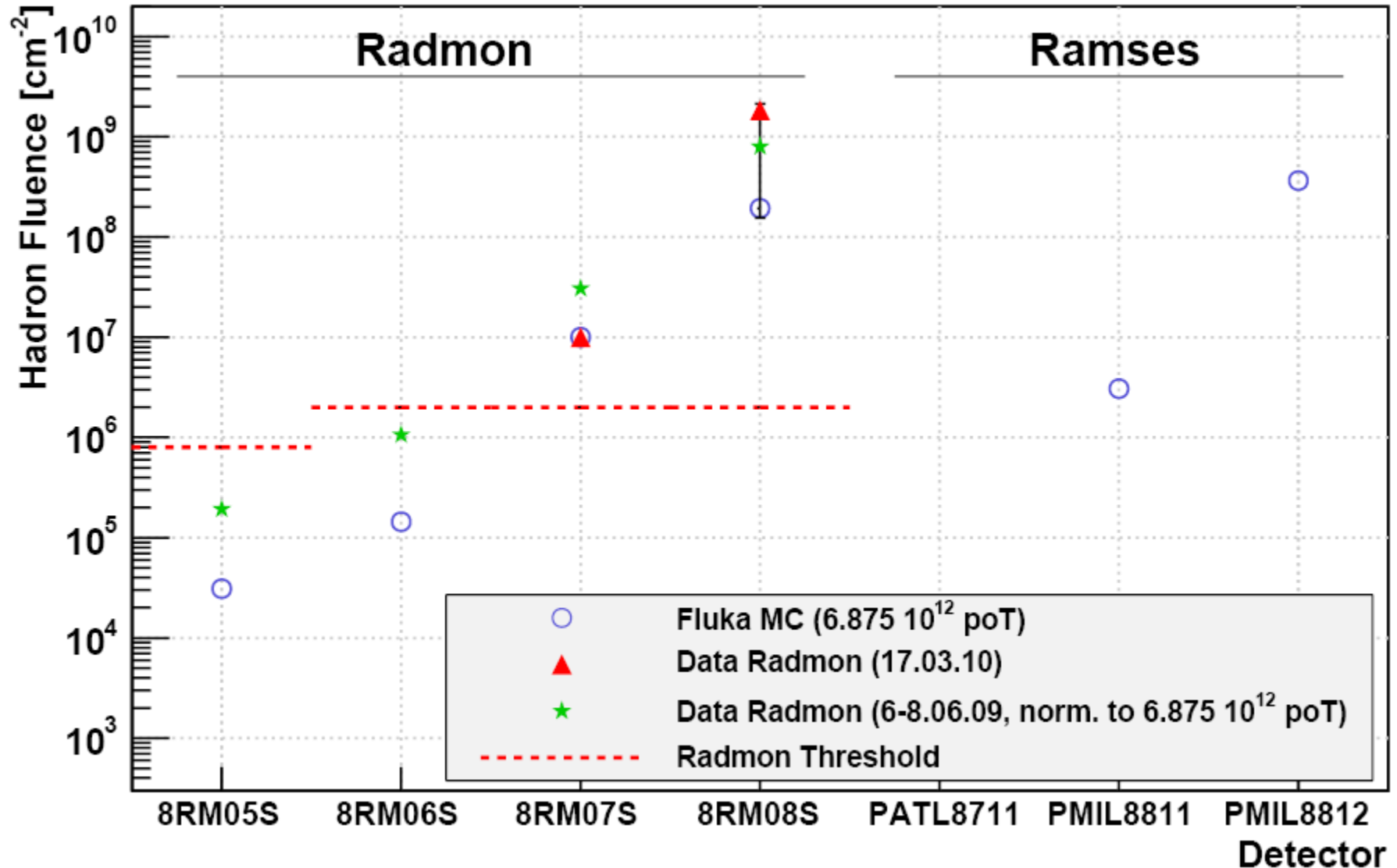
Large Gradient

IP8/TI8 Radiation Detectors



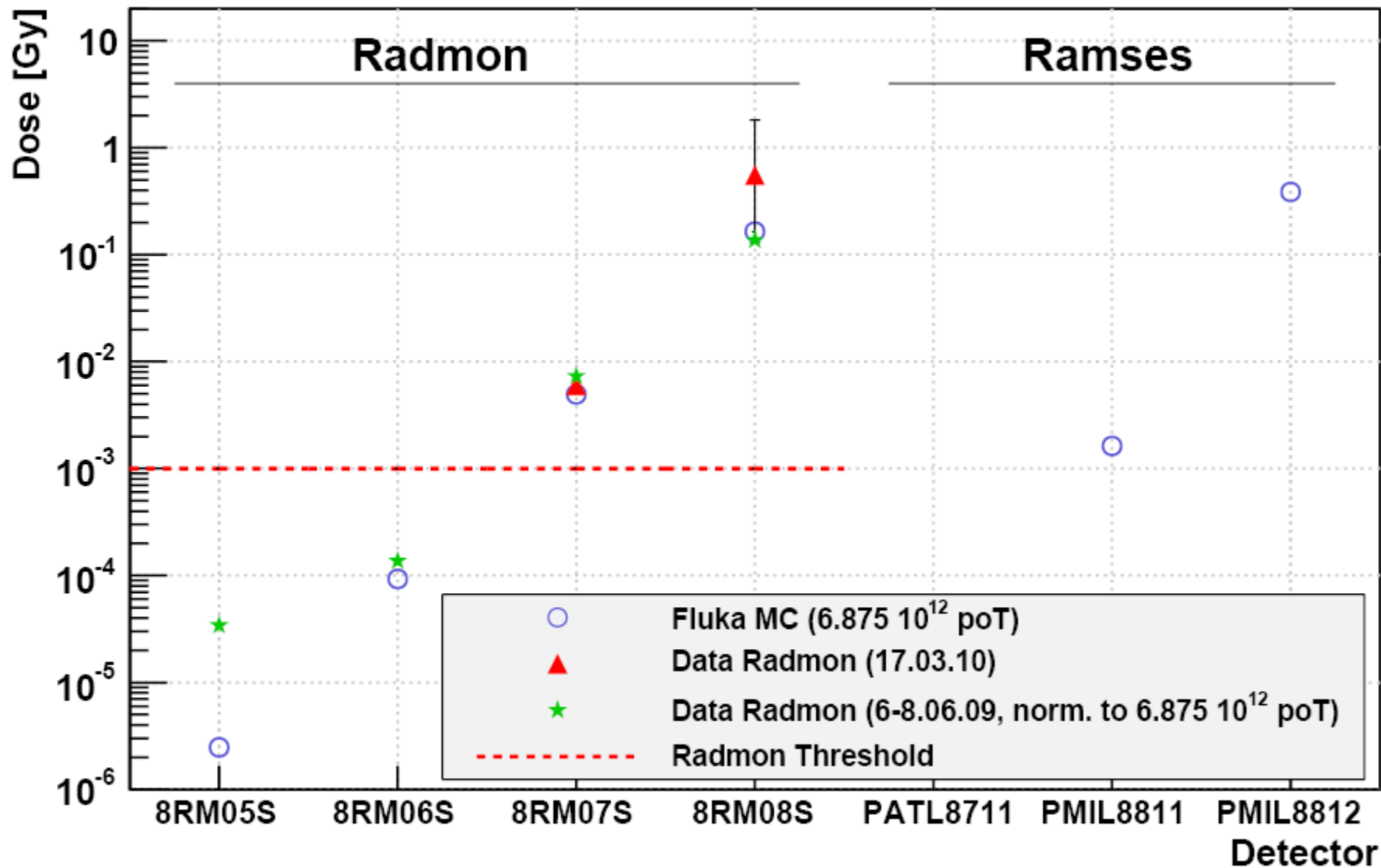
Hadron Fluence Comparison

Hadron Fluence in UJ87/UJ88 - Radmon and Ramses

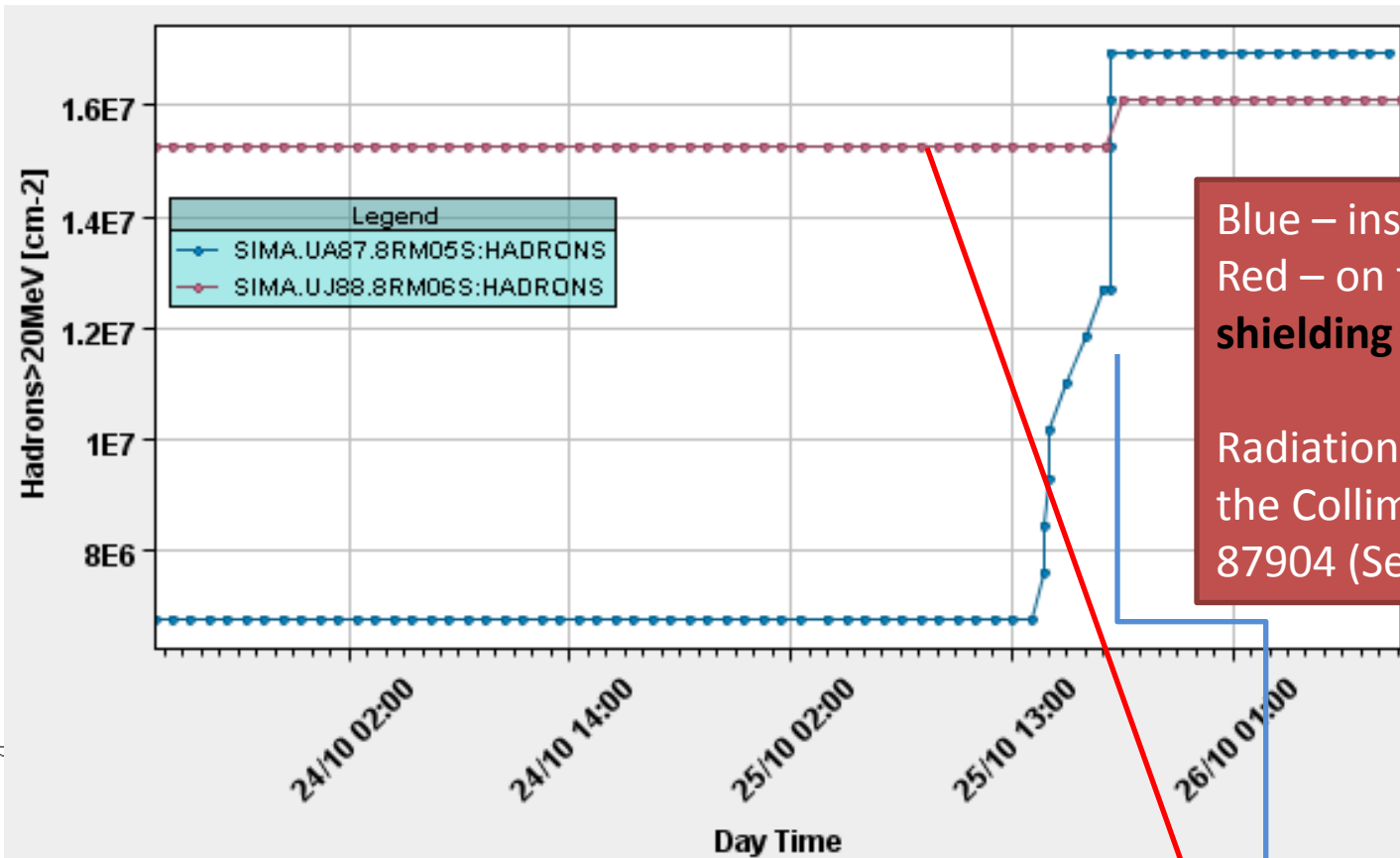


Dose Comparison

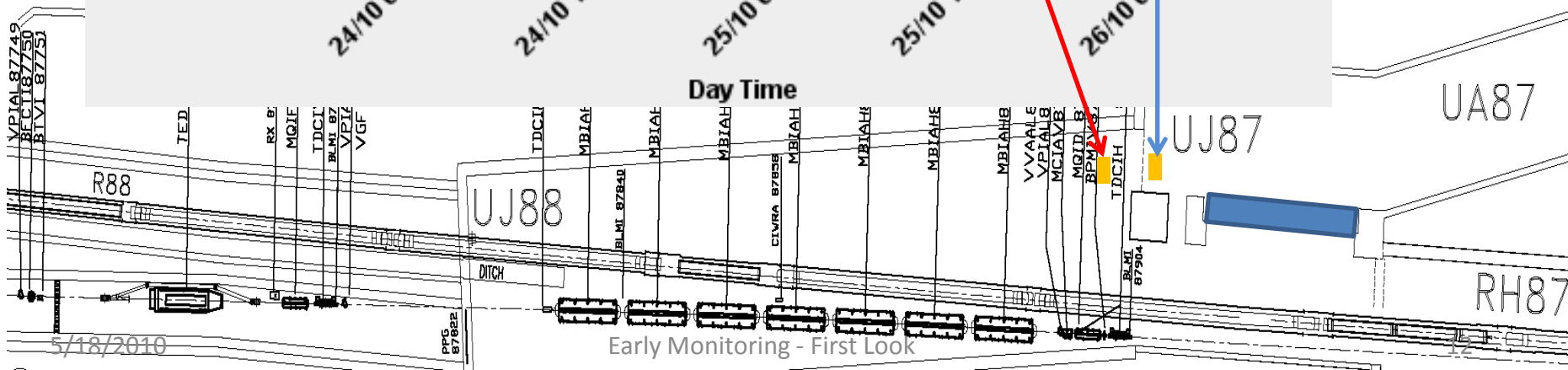
Dose in UJ87/UJ88 - Radmon and Ramses



UJ87: setup of TCDIH.87904 – 25.10.2009

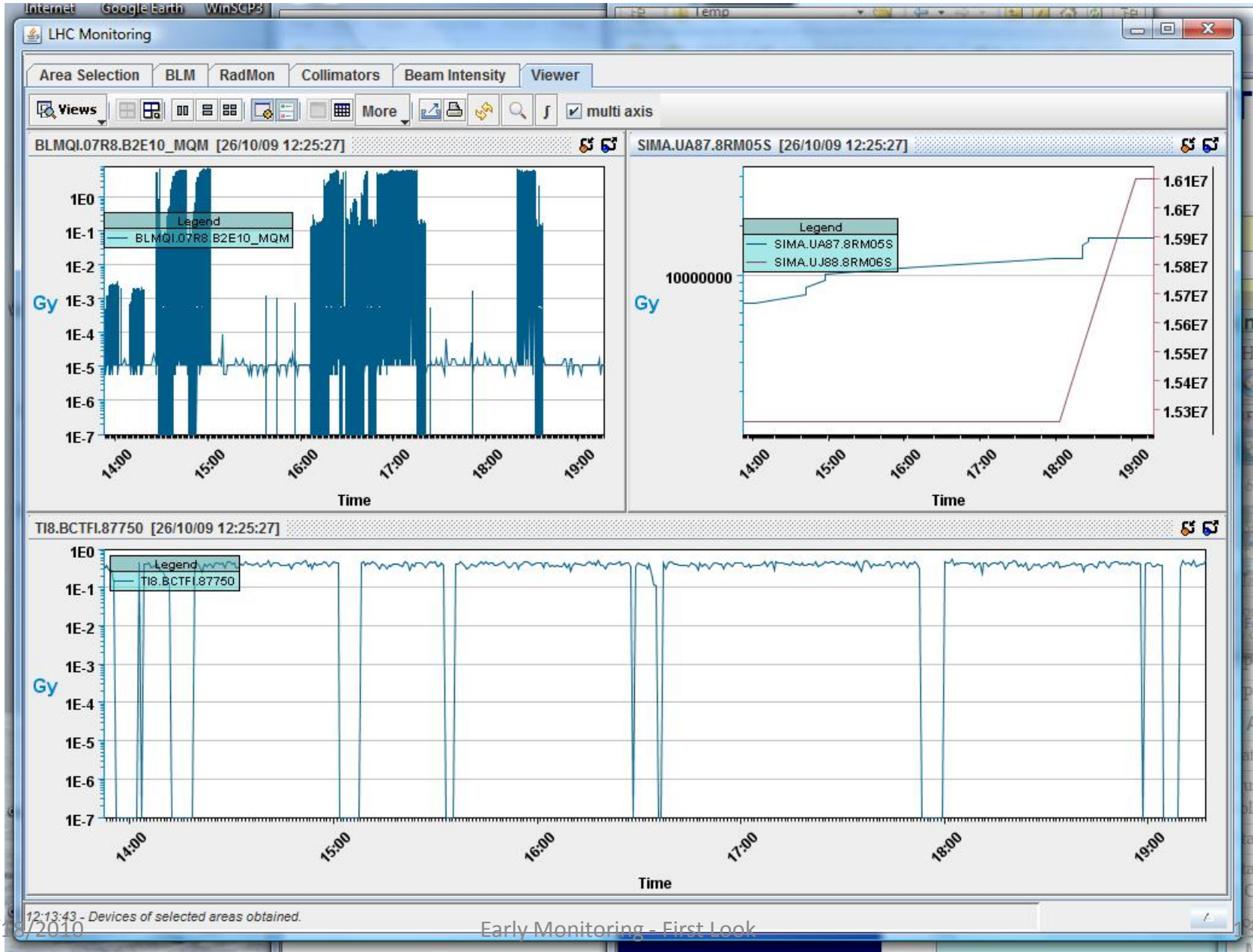


Blue – inside UJ87 (3V)
 Red – on the **new shielding in UJ88** (5V)
 Radiation directly from the Collimator TCDIH 87904 (Setup)

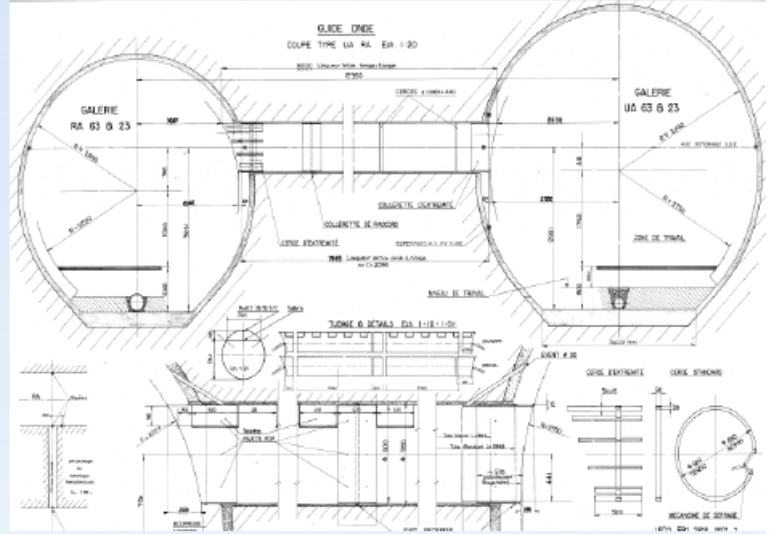
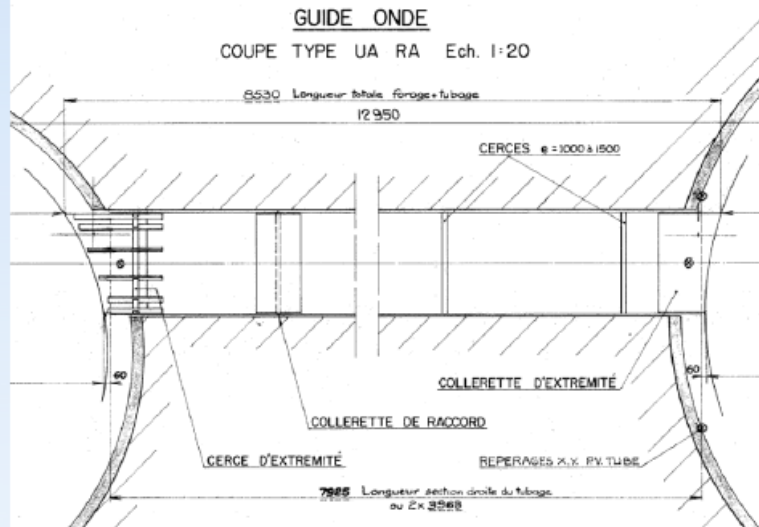
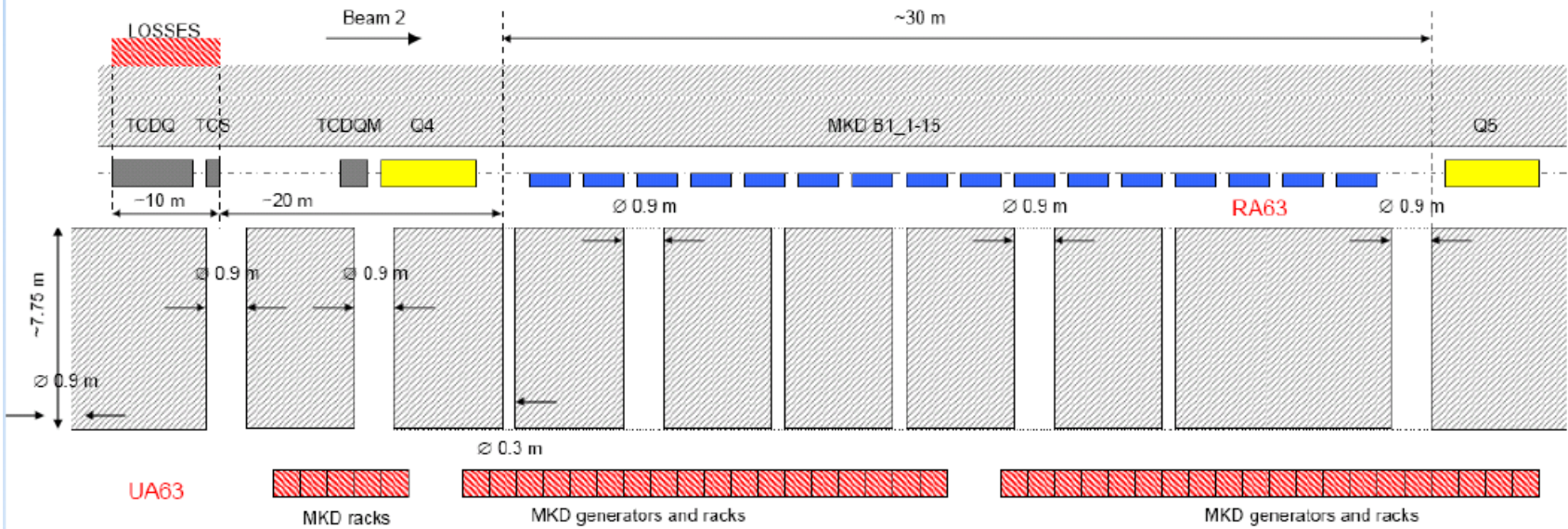


Early Monitoring - First Look

Combined Monitoring Tool (see [link](#))

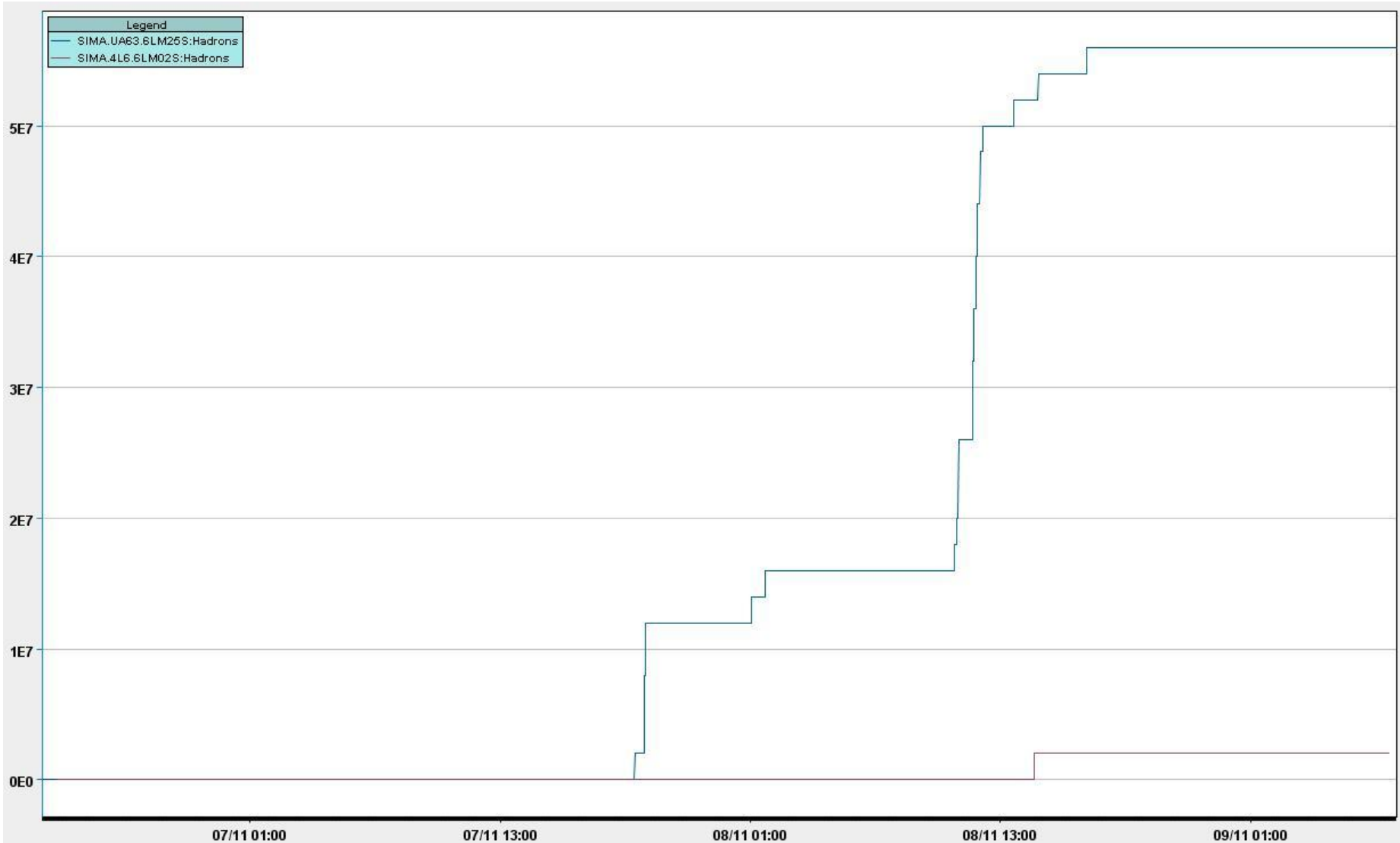


TCDQ Losses 07-09.11.2009

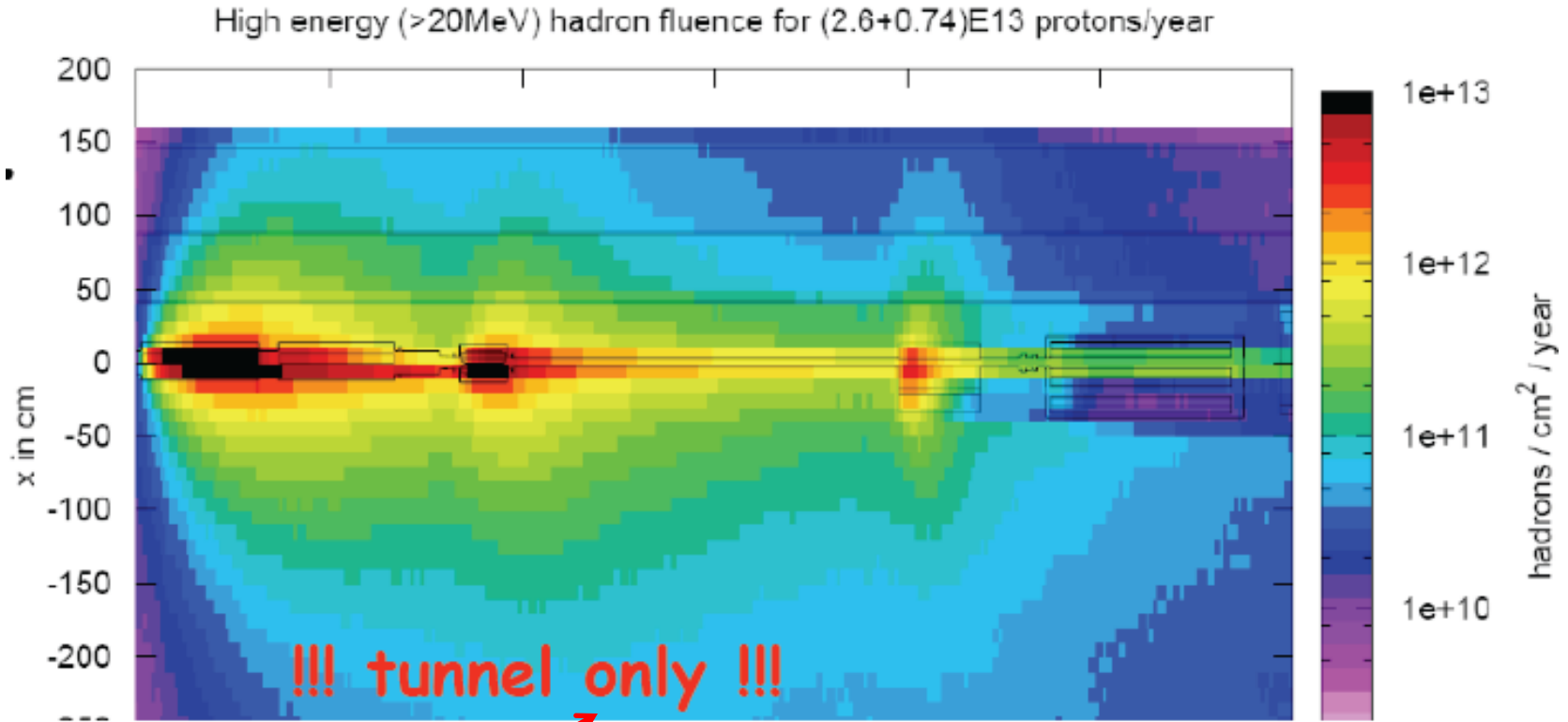


TCDQ Losses 07-09.11.2009

“dedicated losses”



TCDQ Losses 07-09.11.2009



- $\sim 3 \times 10^{10} \text{ cm}^{-2}$ high-E hadrons for 7TeV and 2.6×10^{13}
- rough scaling: $\sim 2 \times 10^9 \text{ cm}^{-2}$ at 450GeV
- this results in $\sim 4 \times 10^5$ per 5×10^9 shot
- We had about 50 (full) shots on the TCDQ -> $\sim 2 \times 10^7$ expected
- 5.6×10^7 measured at the tunnel location (~ 30 counts!)
- In the UA, the monitor is set to 3V (factor of 10 more sensitive) -> nothing measured -> confirms the expected attenuation factor of ~ 1000

Next

- Deeper Analysis -> Session-6 R2E Workshop
- Continuously iterate on early readings
- Possibility of 'dedicated losses', proposed and will be discussed in the R2E workshop
- Check equivalent (and dedicated) FLUKA benchmarks
- Start first analysis of placed TLDs (passive detectors) -> this summer/autumn