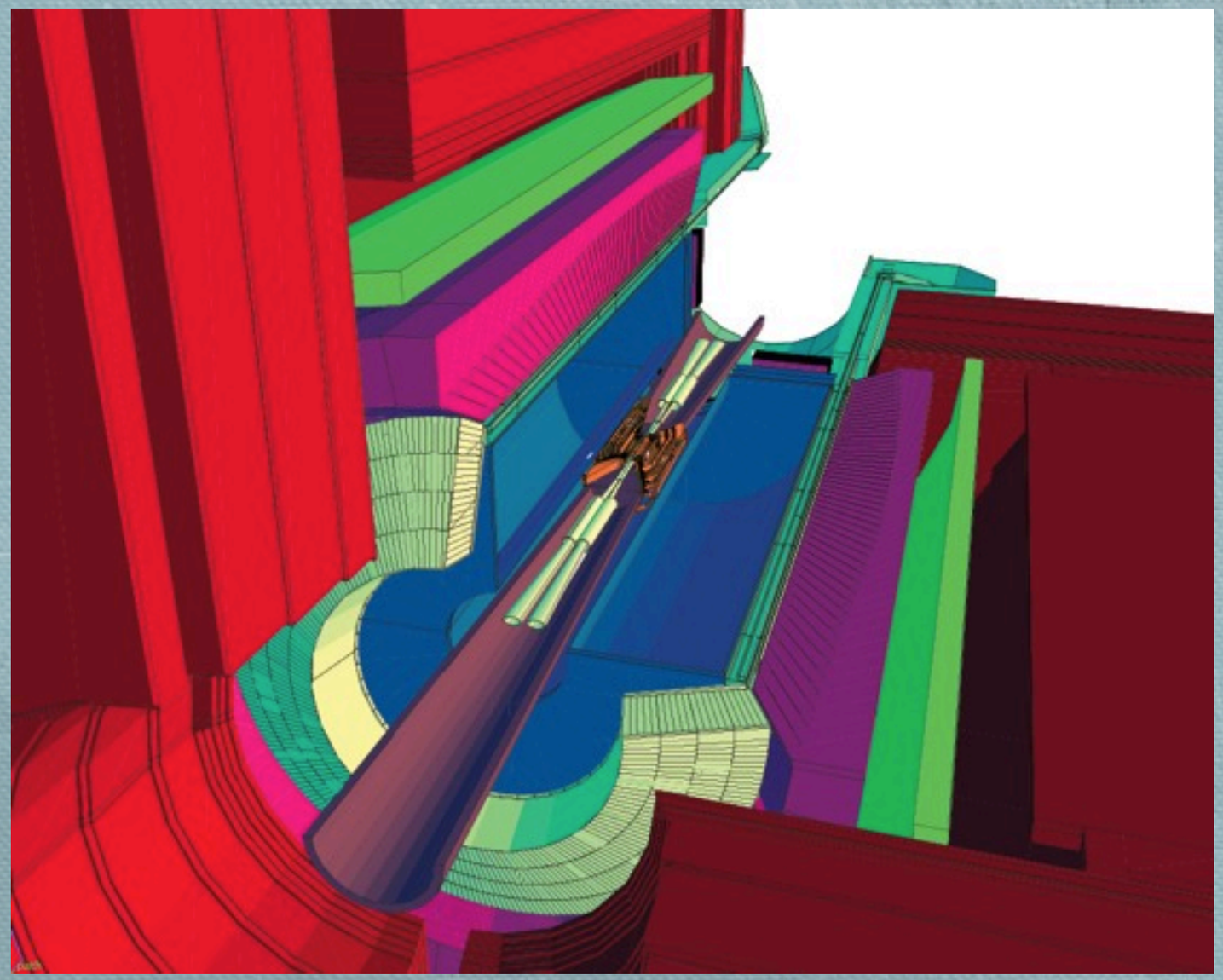


MDI Summary

Machine Detector Interface

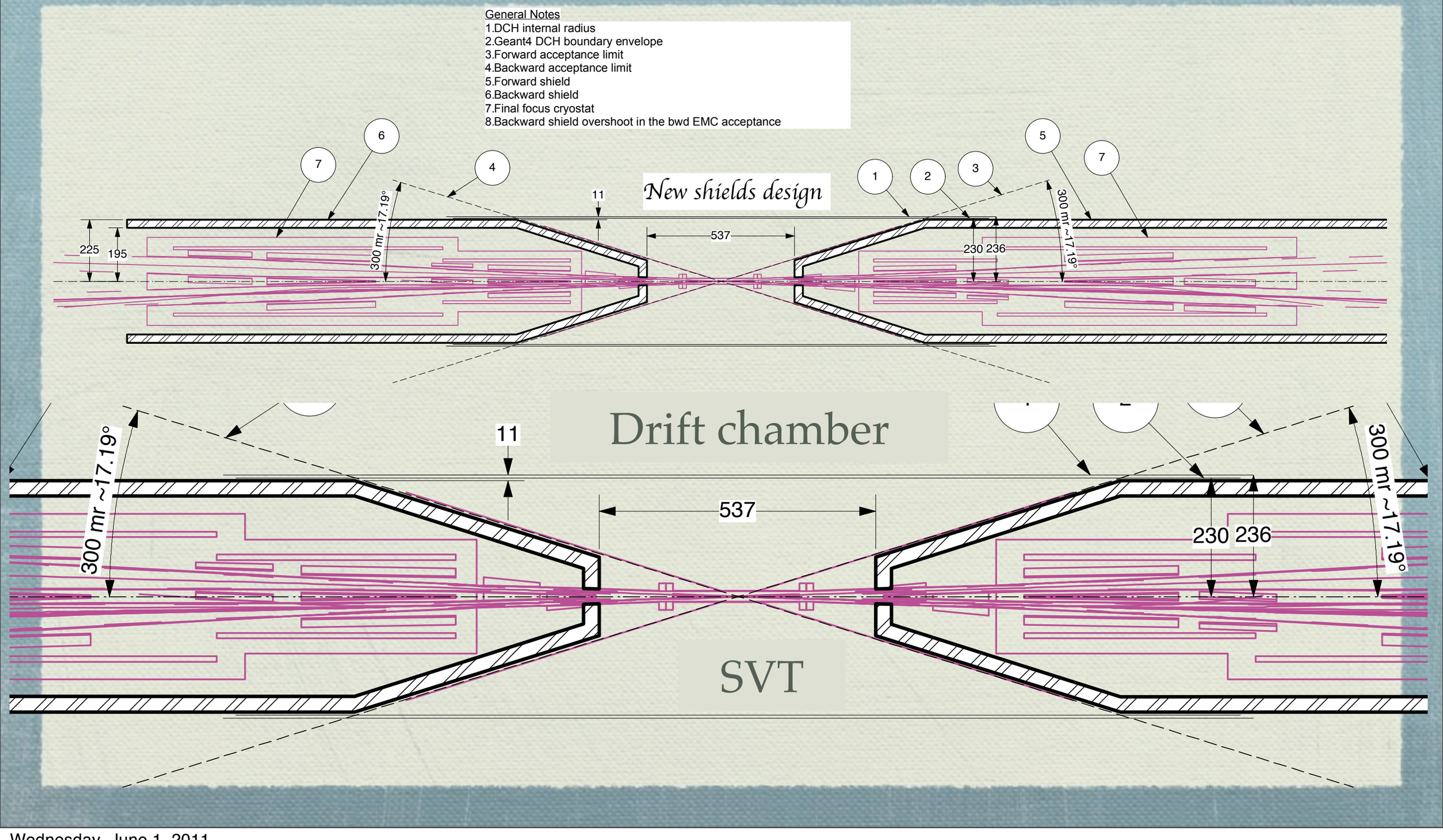
Talk outline

- A short introduction for the newcomers
- Report from the subsytems
- Some of the future activities

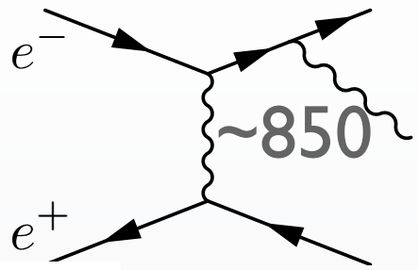
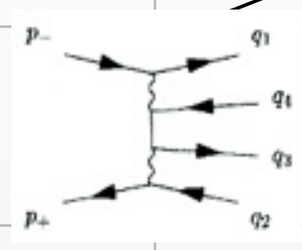
The MDI group now

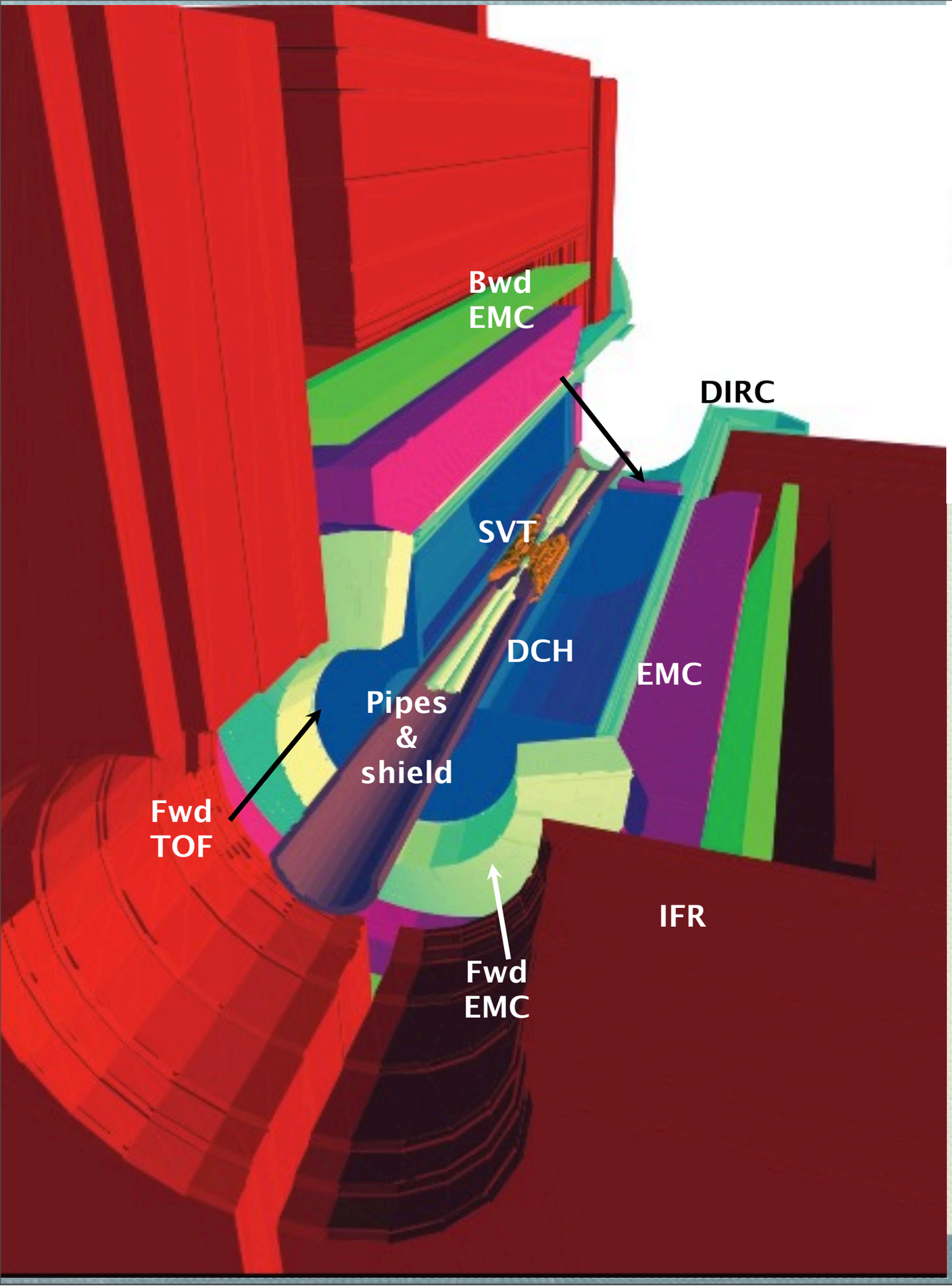
- Mike Sullivan (SLAC). Reference person from the Machine.
  - IR mechanical layout design (magnets , pipe, synchrotron radiation, supports)
- Manuela Boscolo (LNF). Reference person for the evaluation of the Touschek and beam gas loss rates + beam scraping placement.
- Andrea di Simone (Rome) Geant4 main expert and “Master of the Bruno code”.
- Eugenio Paoloni (Pisa). “Machine Detector Messanger”
  - Geant4 backgrounds simulations + final focus SC quadrupoles (Air core option)
- Alejandro Perez (Pisa).
  - Geant4 model of the beam pipe, software tools to validate the Geant 4 beam line model
- Filippo Bosi (Pisa). Reference person for the mechanical interface with the innermost vertex detector.
- Riccardo Cenci, Dana Lindemann, Stefano Germani, Leonid Burmistrov, Valentina Santoro: Reference persons from the subdetector lands (SVT,DCH, etc. etc.)

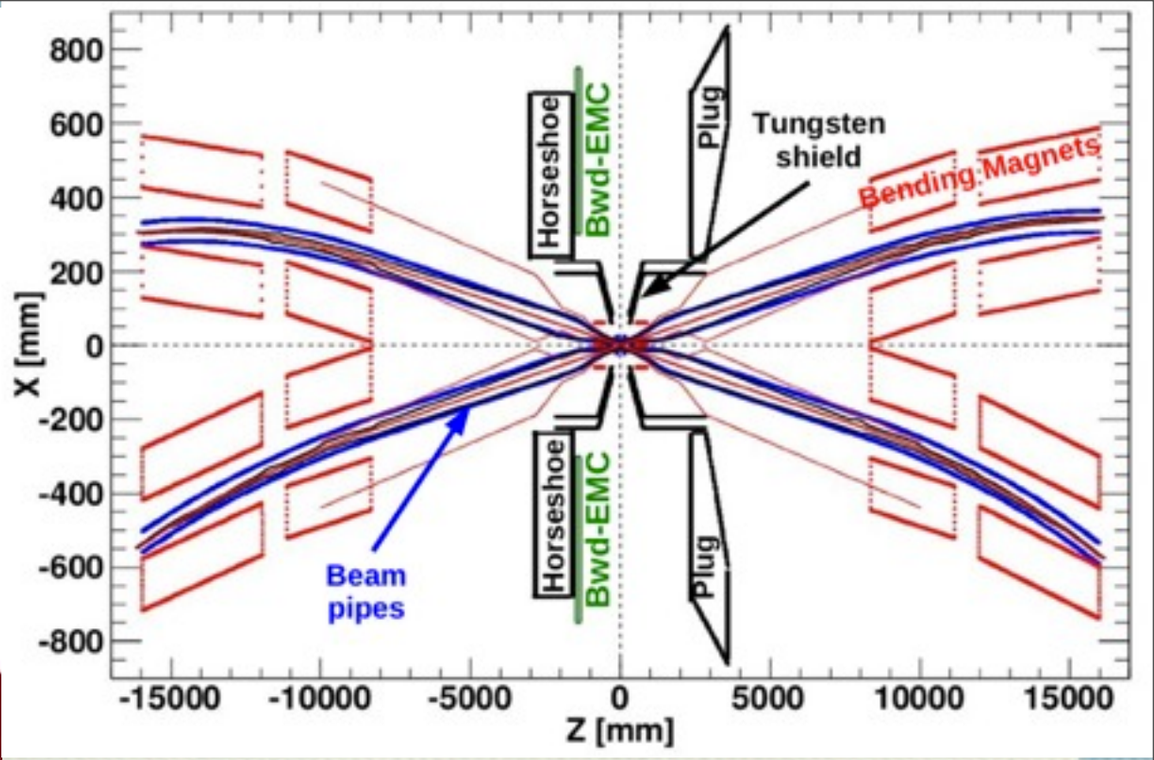
Mechanical interface: present boundaries



Loss rates

	Cross section	Evt/bunch xing	Rate
Radiative Bhabha	~340 mbarn (Eγ/Ebeam > 1%)		0.3THz
e^+e^- pair production	~7.3 mbarn	 ~18	7GHz
e^+e^- pair (seen by L0 @ 1.5 cm)	~0.3 mbarn	~0.8	0.3GHz
Elastic Bhabha	O(10^{-4}) mbarn (Det. acceptance)	~250/Million	100KHz
$\Upsilon(4S)$	O(10^{-6}) mbarn	~2.5/Million	1 KHz
	Loss rate	Loss/bunch pass	Rate
Touschek (LER)	14kHz / bunch (+/- 2 m from IP)	~7/100	14 MHz



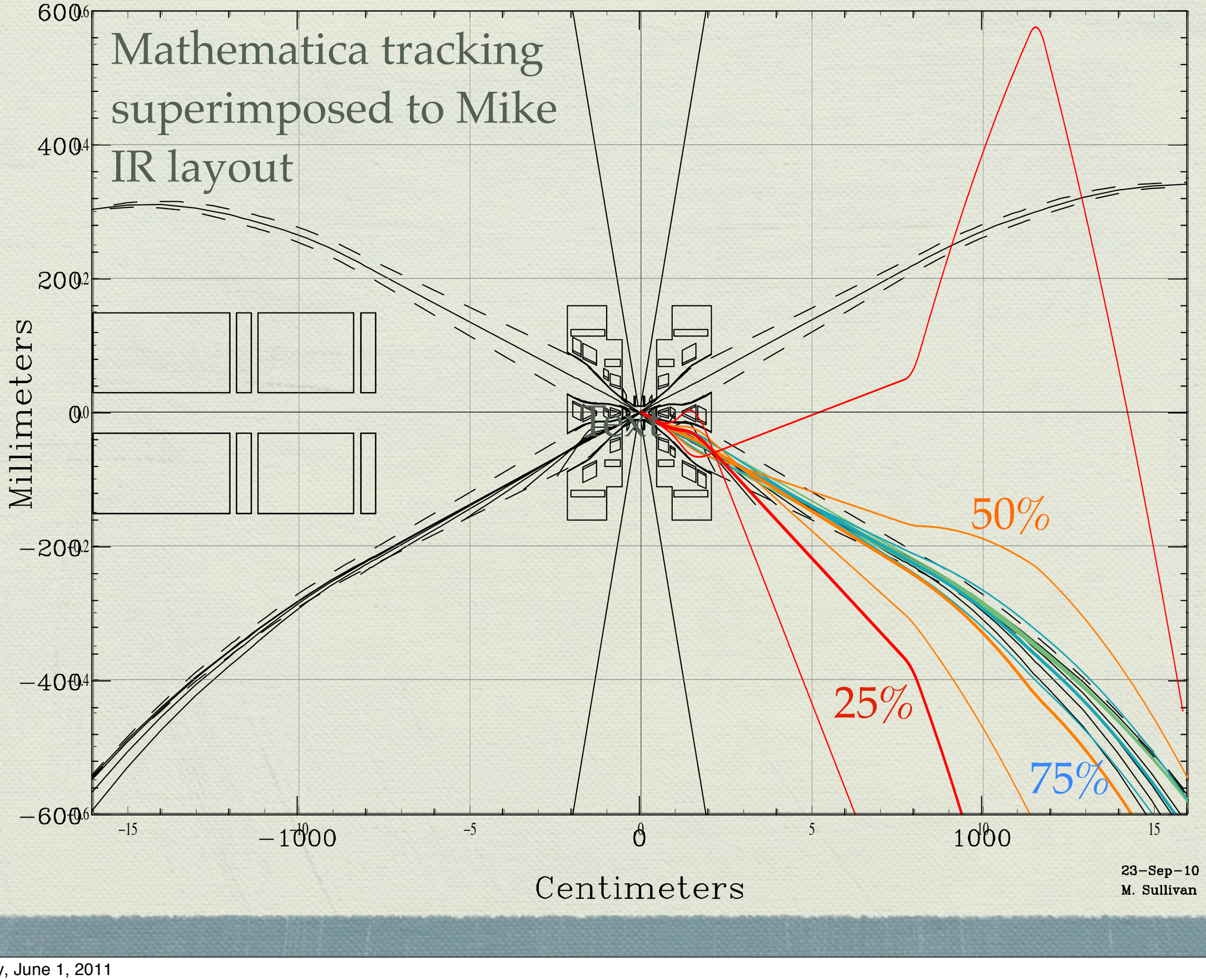


BRUNO

(TOUSCHEK'S FIRST NAME)

- The whole detector is modeled
- The beam lines and their magnets are modeled +/- 15m from IP
- Radiative Bhabha generator (BBREM) embedded in the code
- Recent developments:
- fixes and tuning
- packaging
- newest IR layout
- additional truth informations

SuperB V12 SF11 Radiative Bhabhas

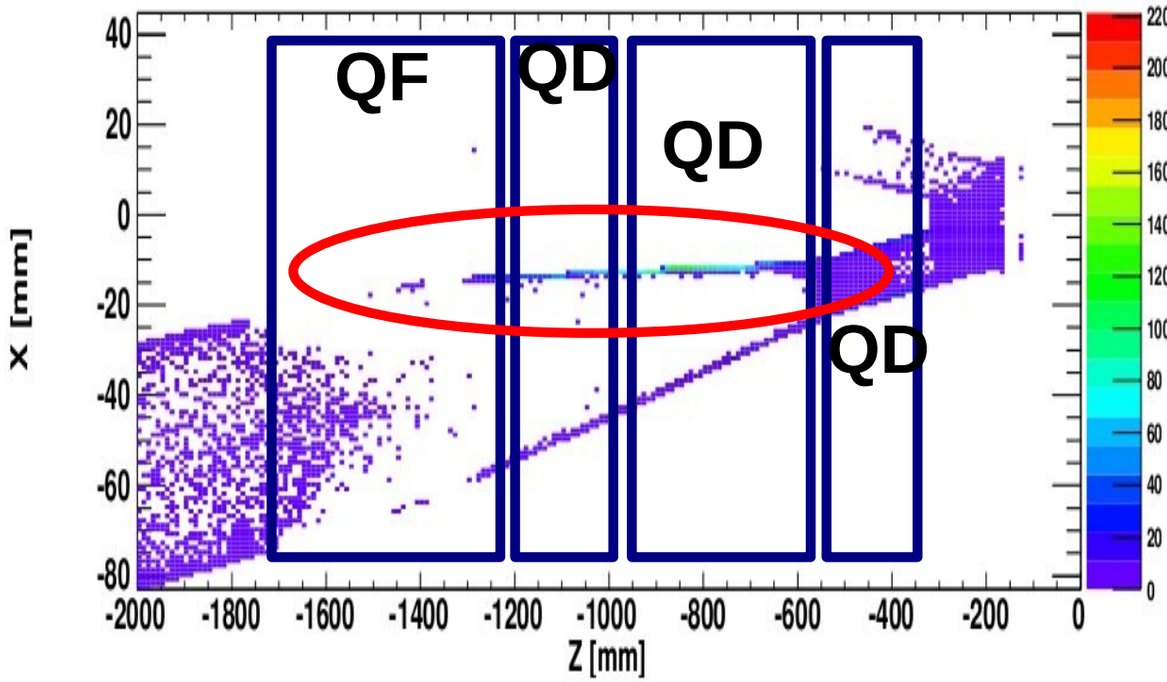


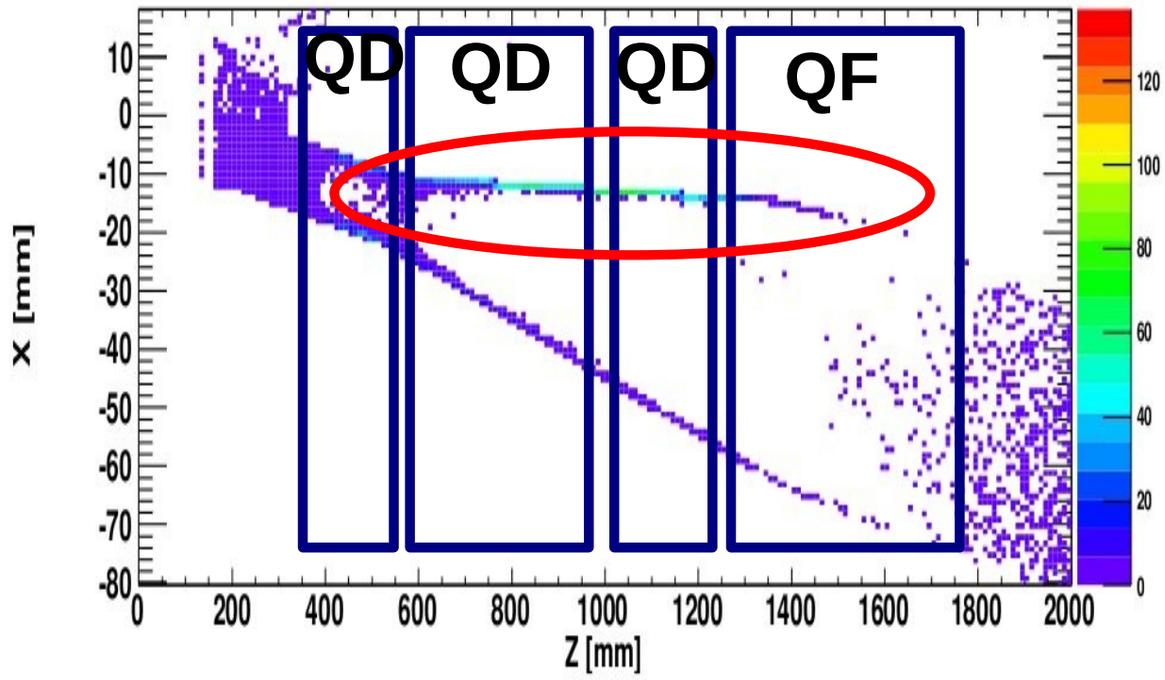
Background estimates

- Geant 4 model of the beam transport system from the IP up to the first dipoles (magnetic fields, beam pipes)
- Geant4 model of the detector
- Primaries generation:
  - BBBrem (Radiative Bhabha)
  - Diag36 (pairs production)
  - Star (M. Boscolo) Touschek and Beam gas

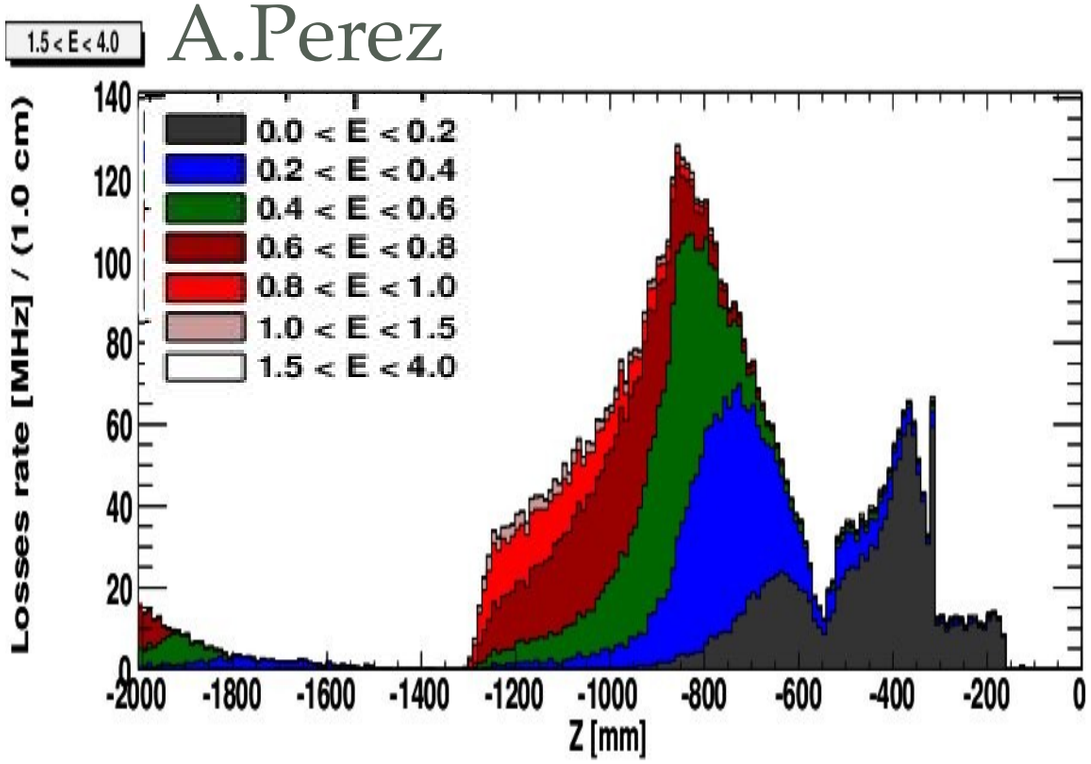
Losses rates: results v12-sf11 (leptons)

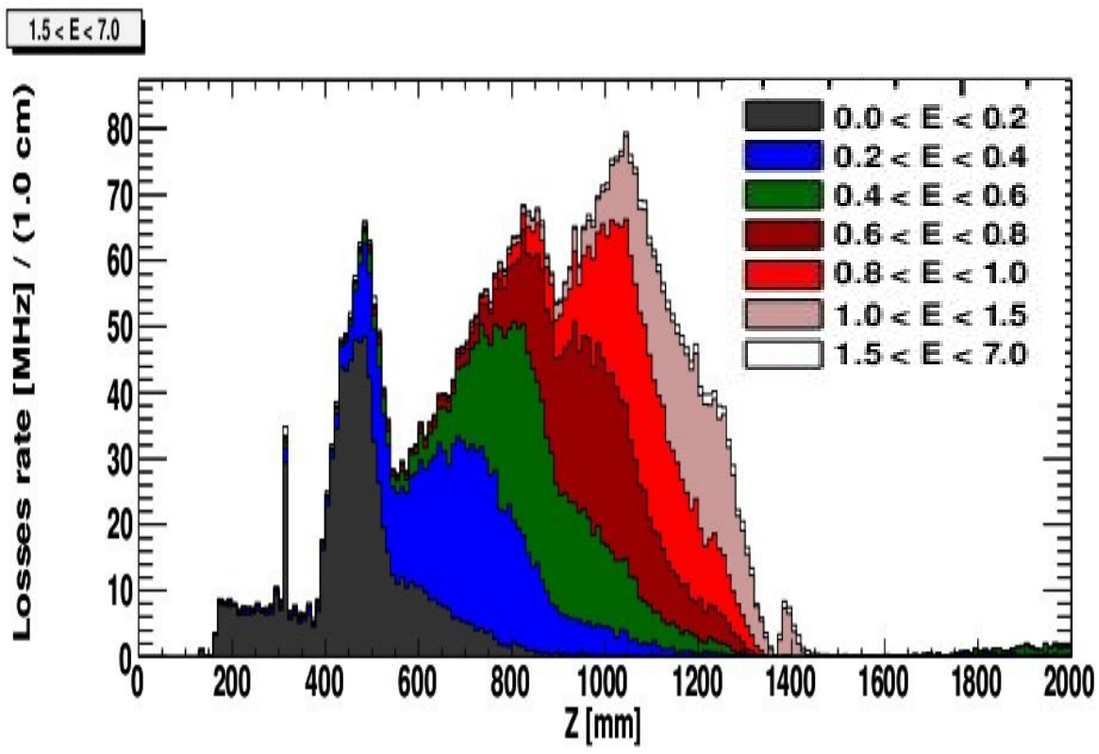
- V12-sf11 layout: HER = e^+ (6.69 GeV) and LER = e^- (4.18 GeV)





A.Perez





Total rates near by the IP (-2,2)m

- Total rates around the IP

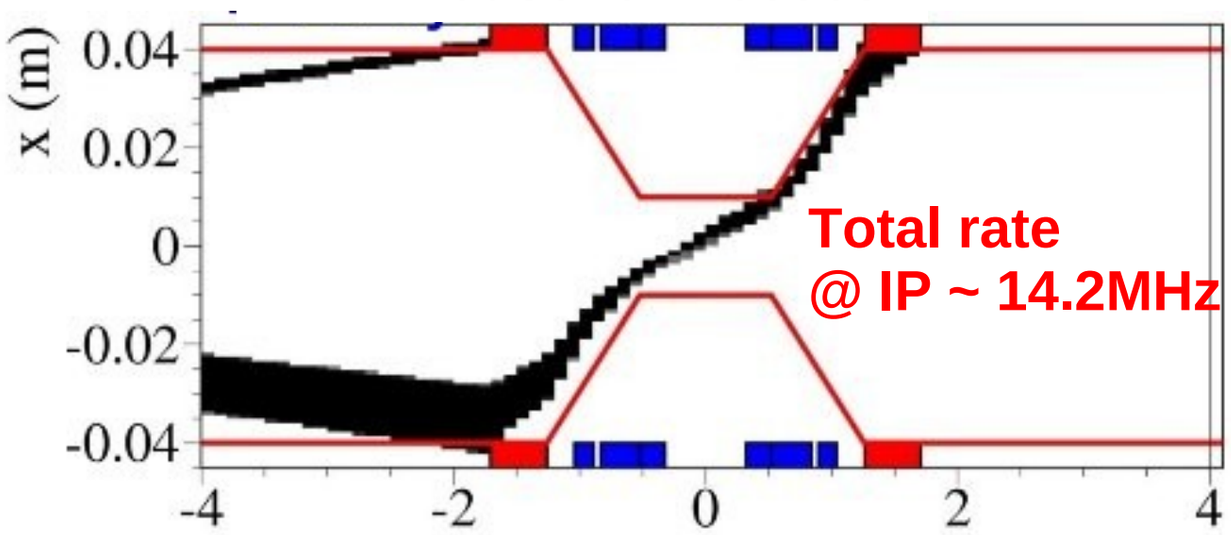
LER rates (MHz) around the IP (-2.0,2.0) m

E range (GeV)	P3	v12 sf11	v12 sf10
(0.0,1.0)	4501.60	6080.05	5619.19
(1.0,1.5)	61.81	129.75	80.80
(1.5,2.0)	12.97	15.13	12.88
(2.0,2.5)	5.25	6.41	5.13
(2.5,3.0)	3.51	3.97	3.75
(3.0,3.5)	3.98	4.48	3.58
(3.5,4.0)	4.37	3.23	2.62
all	4593.50	6243.01	5727.95

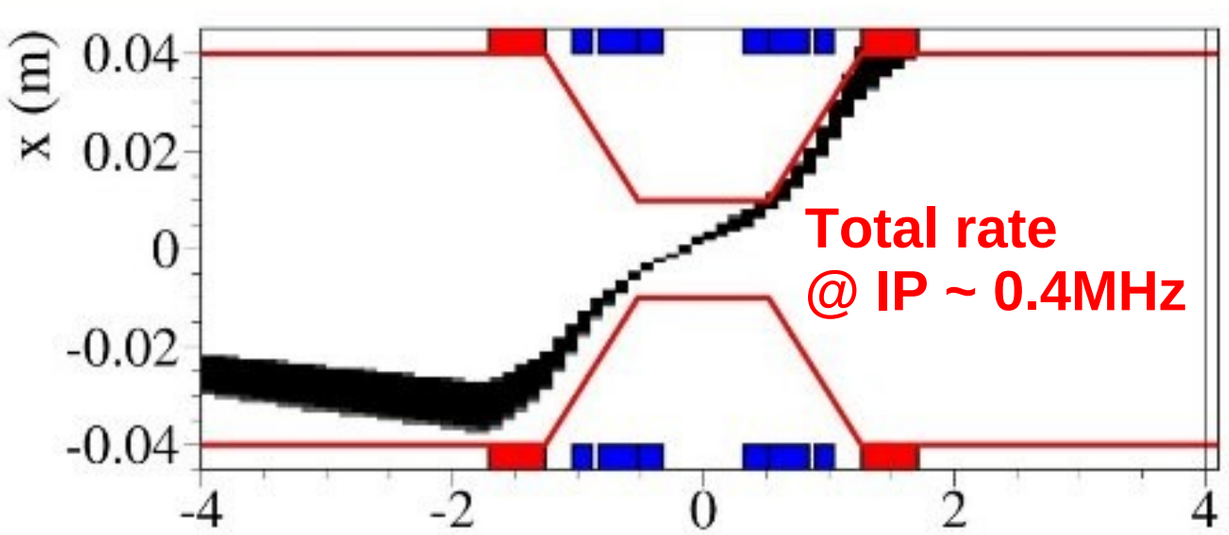
HER rates (MHz) around the IP (-2.0,2.0) m

E range (GeV)	P3	v12 sf11	v12 sf10
(0.0,1.0)	3489.64	4289.28	4215.48
(1.0,2.0)	88.85	683.76	522.91
(2.0,3.0)	7.54	15.64	12.28
(3.0,4.0)	2.03	2.89	3.77
(4.0,5.0)	1.17	2.66	1.89
(5.0,6.0)	1.37	3.00	2.54
(6.0,7.0)	1.70	5.04	4.68
all	3592.31	5002.29	4763.55

LER Touschek Losses



HER Touschek Losses



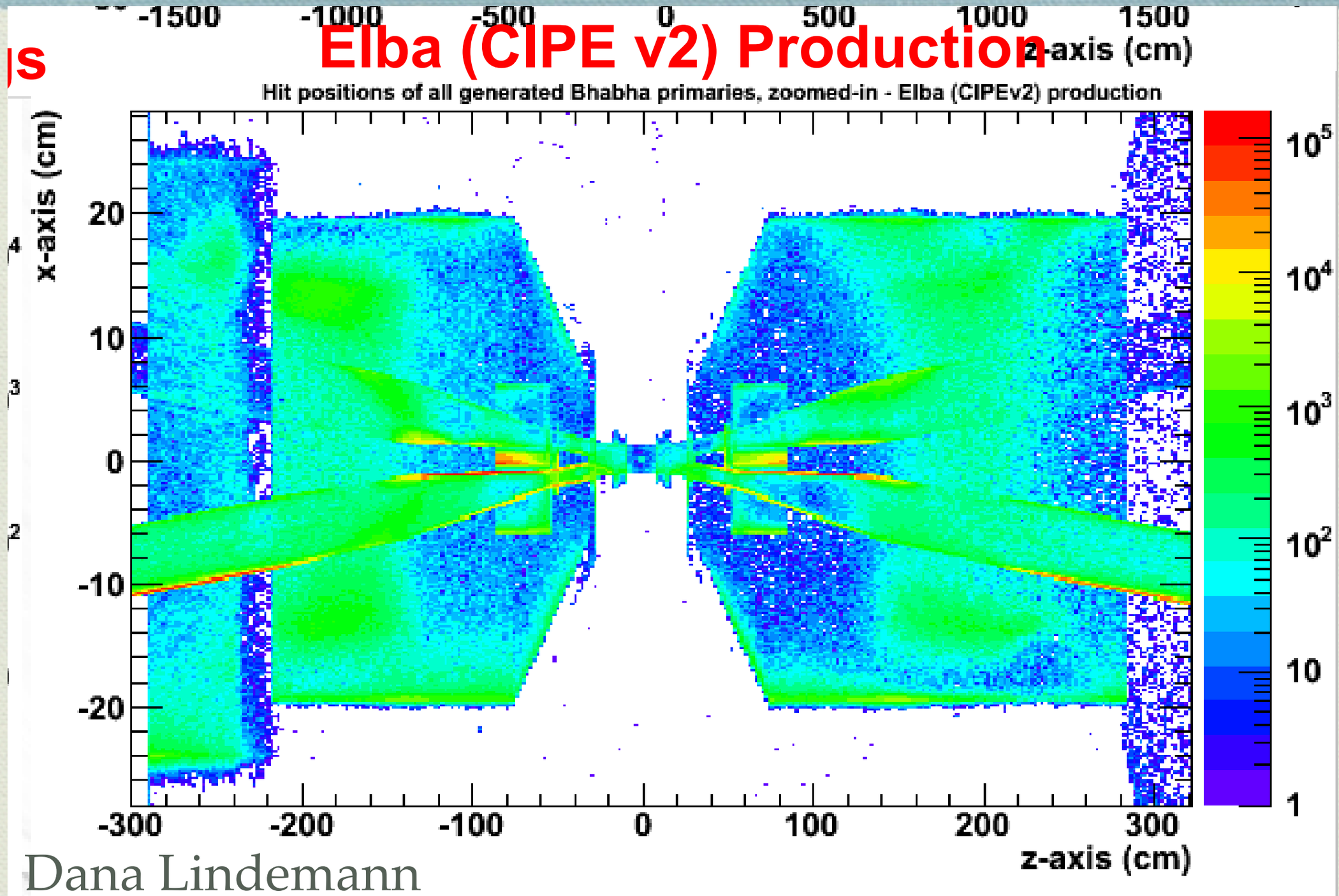
Conclusions (2): IR rates summary

	HER	**LER**
Touschek	Hz/bunch	Hz/bunch
No collimators, ε_x with IBS	$1.1 \cdot 10^6$	6.510^6
With Collimators, ε_x with IBS	$4.5 \cdot 10^2$	$1.4\ 10^4$

Coulomb No collimators, ε_x with IBS	$1.1 \cdot 10^6$	$6.4 \cdot 10^6$
Coulomb with collimators, ε_x with IBS	$4.4 \cdot 10^4$	$9.1 \cdot 10^3$
Bremsstrahlung	400	600

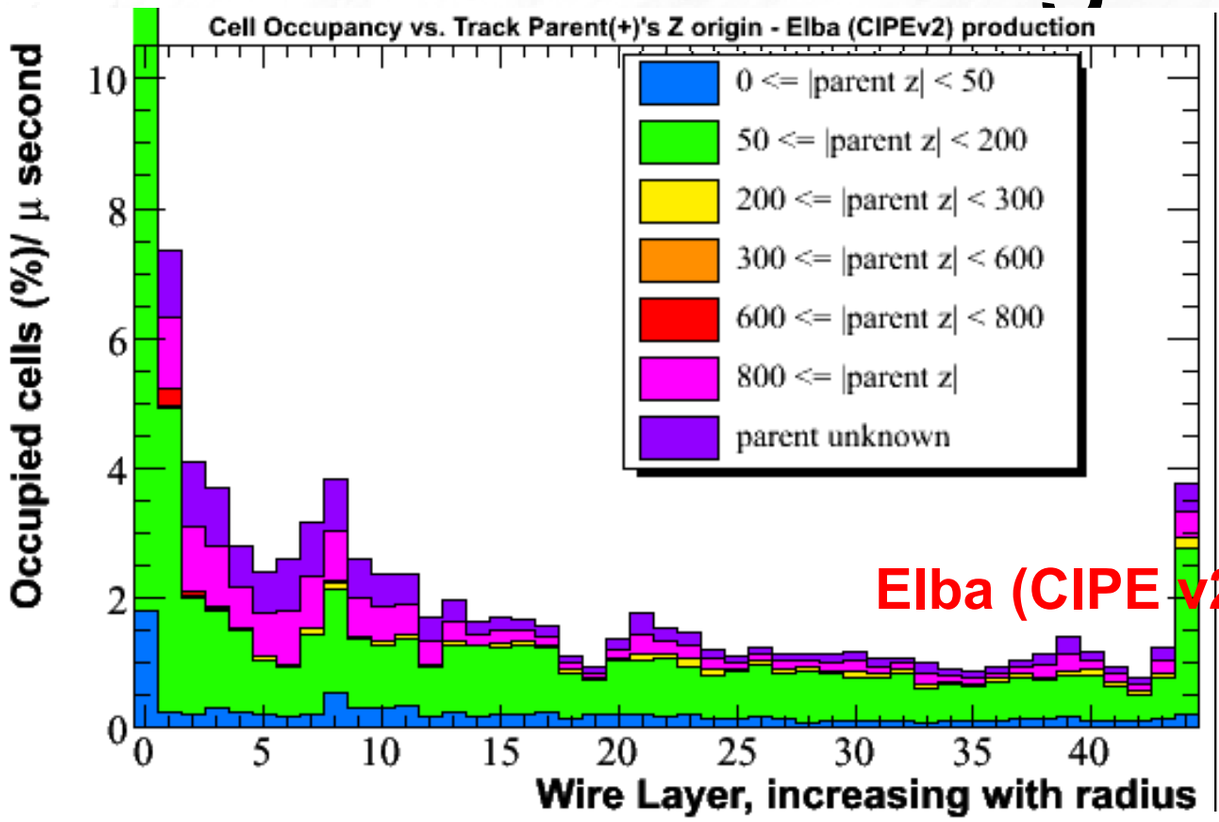
Radiative Bhabha

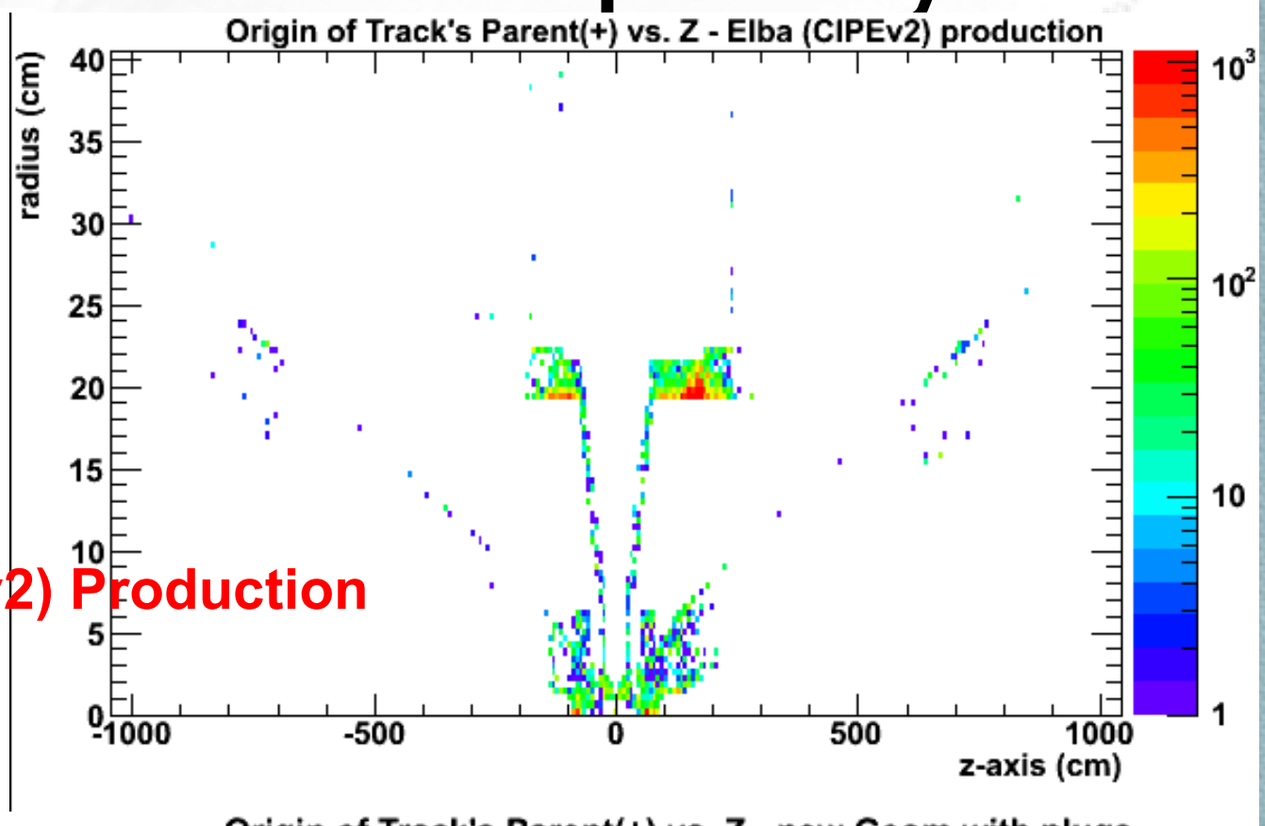
Where the showering occurs



Dana Lindemann

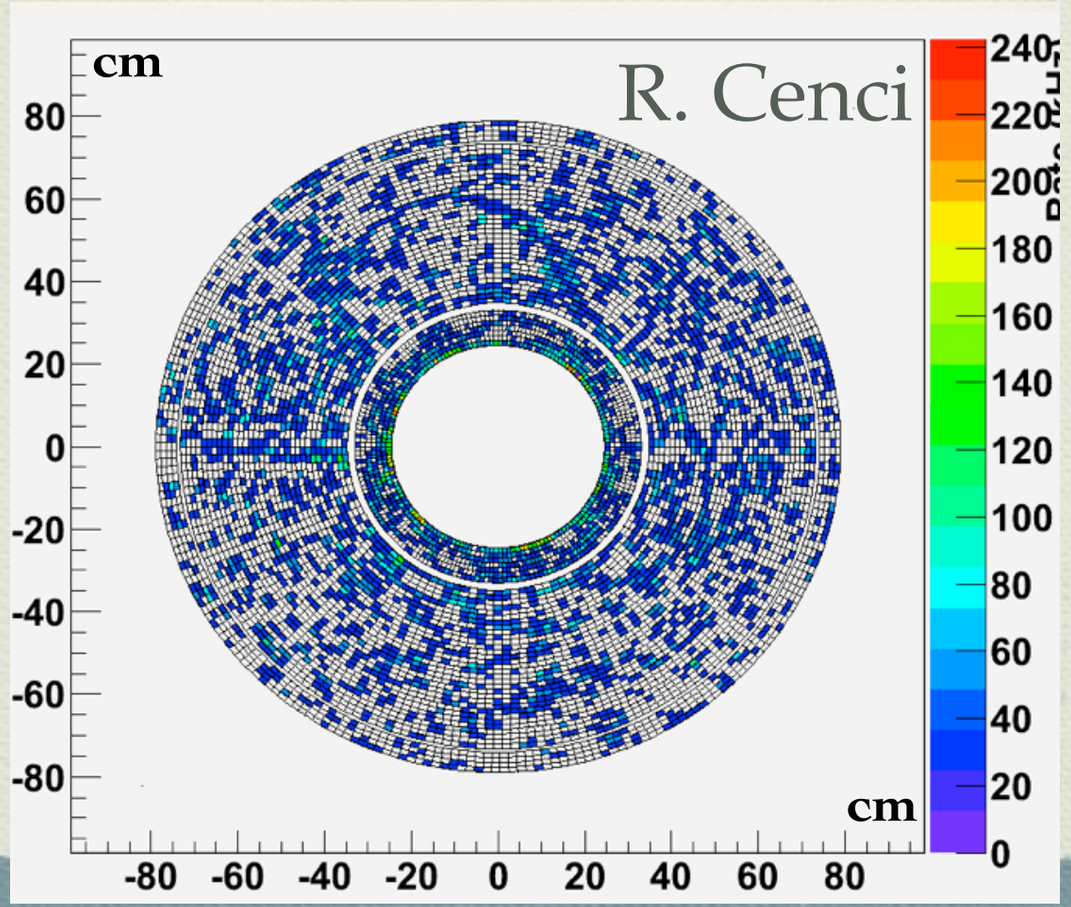
Parent's Z origin vs. Occupancy





Elba (CIPE v2) Production

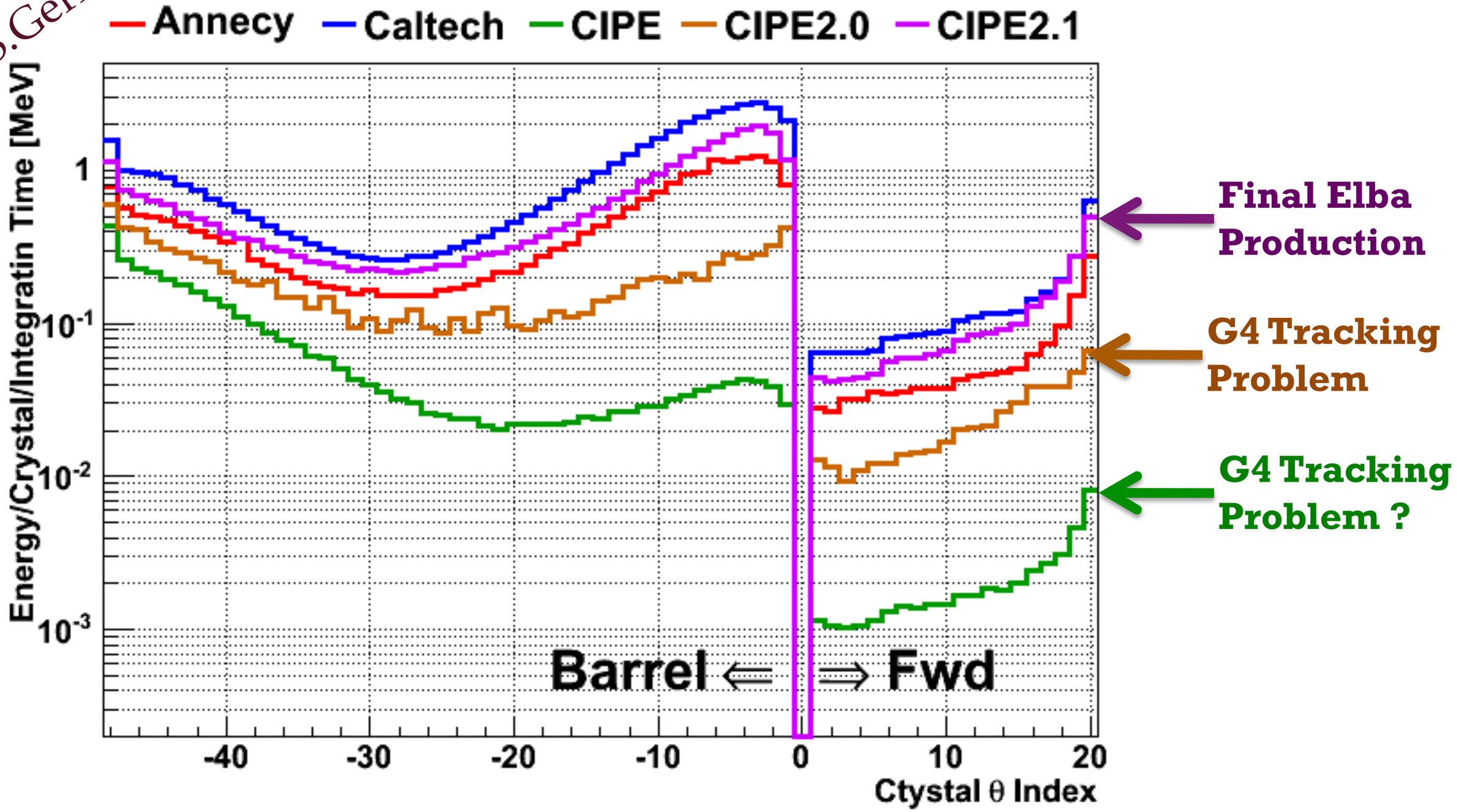
- It seems that an increase of the tungsten thickness in the forward region hot ring can significantly reduce the background rate, but the space is a precious and limited resource: cryostats in the interior are asking for more space.



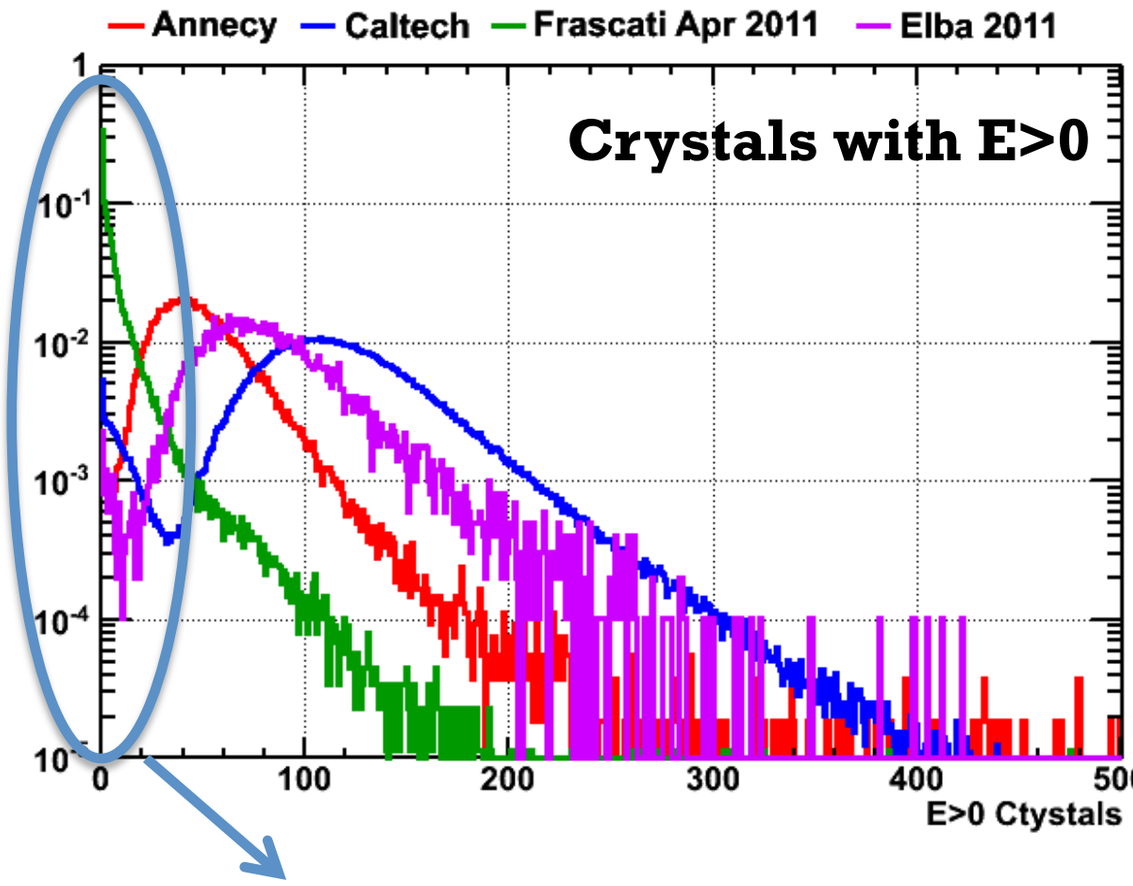
Backgrounds as seen from the EMC

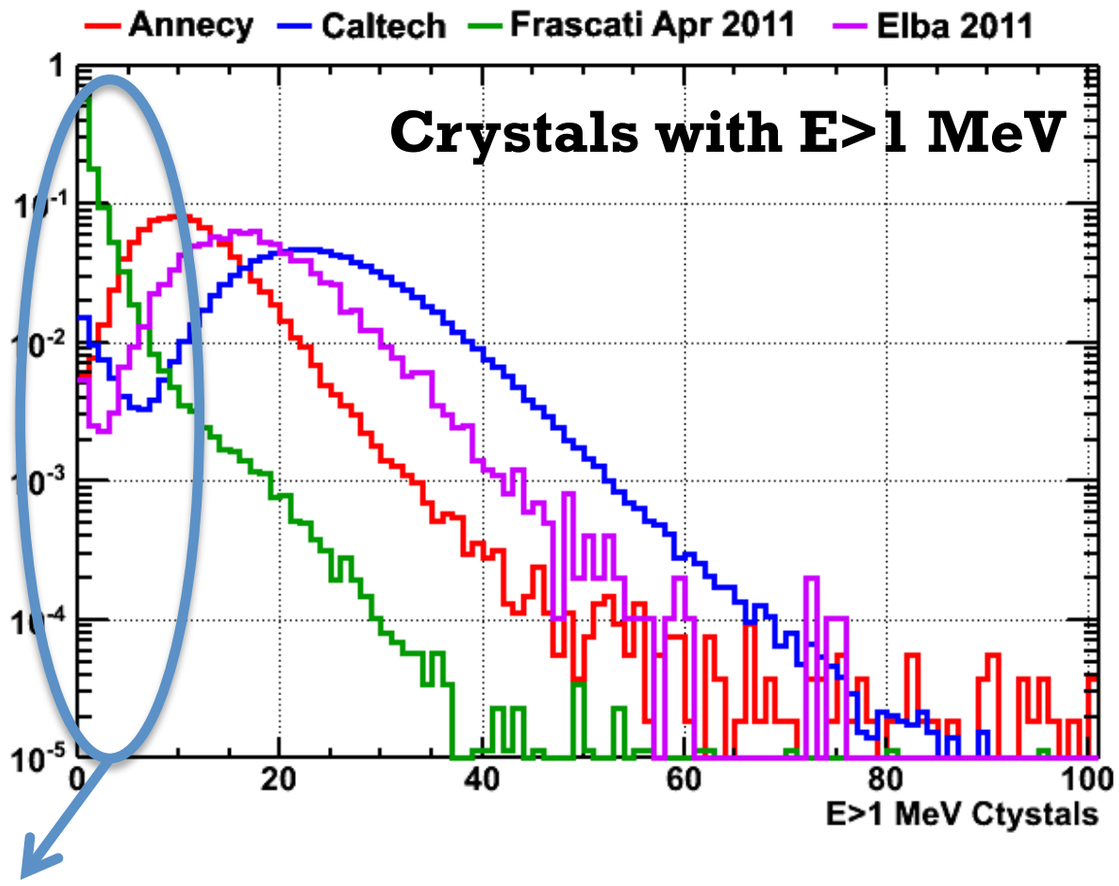
Energy / Crystal / Integration Time

S.Germani



Number of EMC Hits / Bunch Crossing



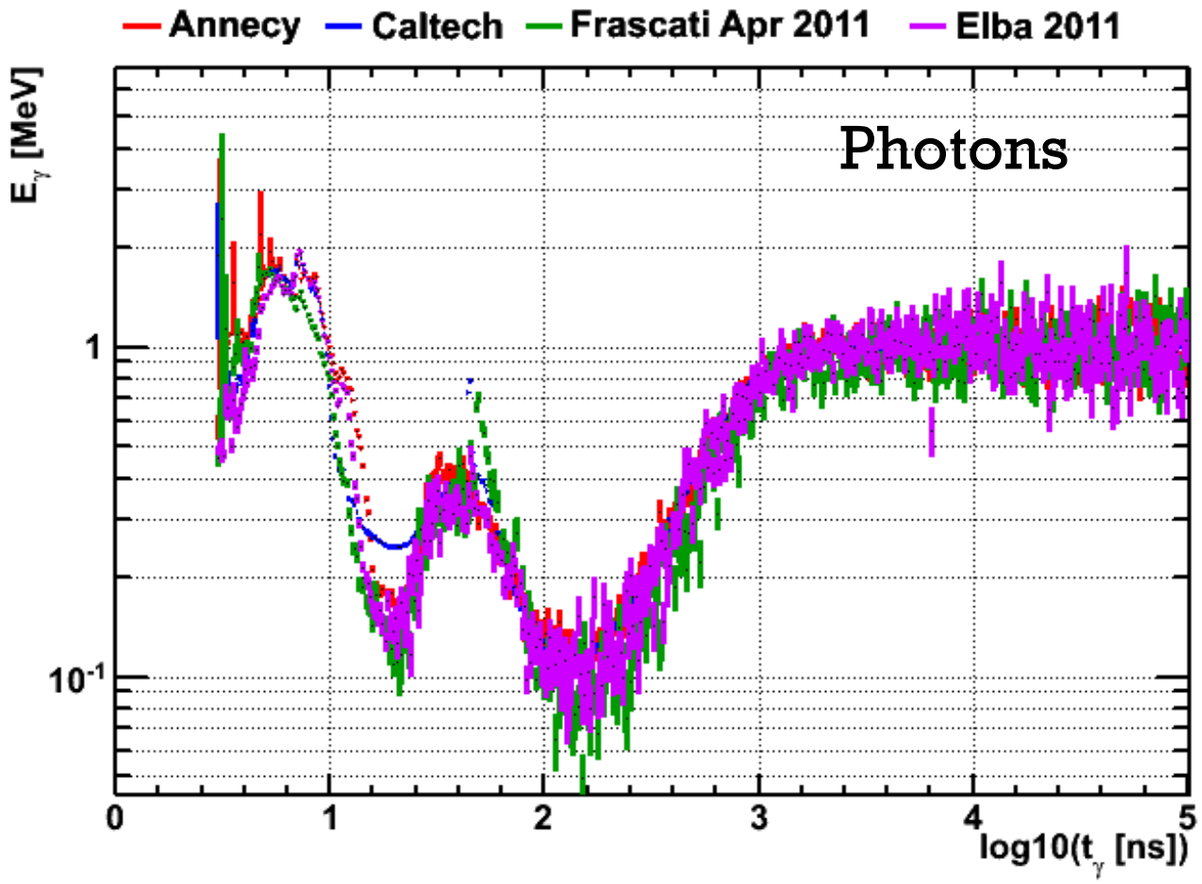


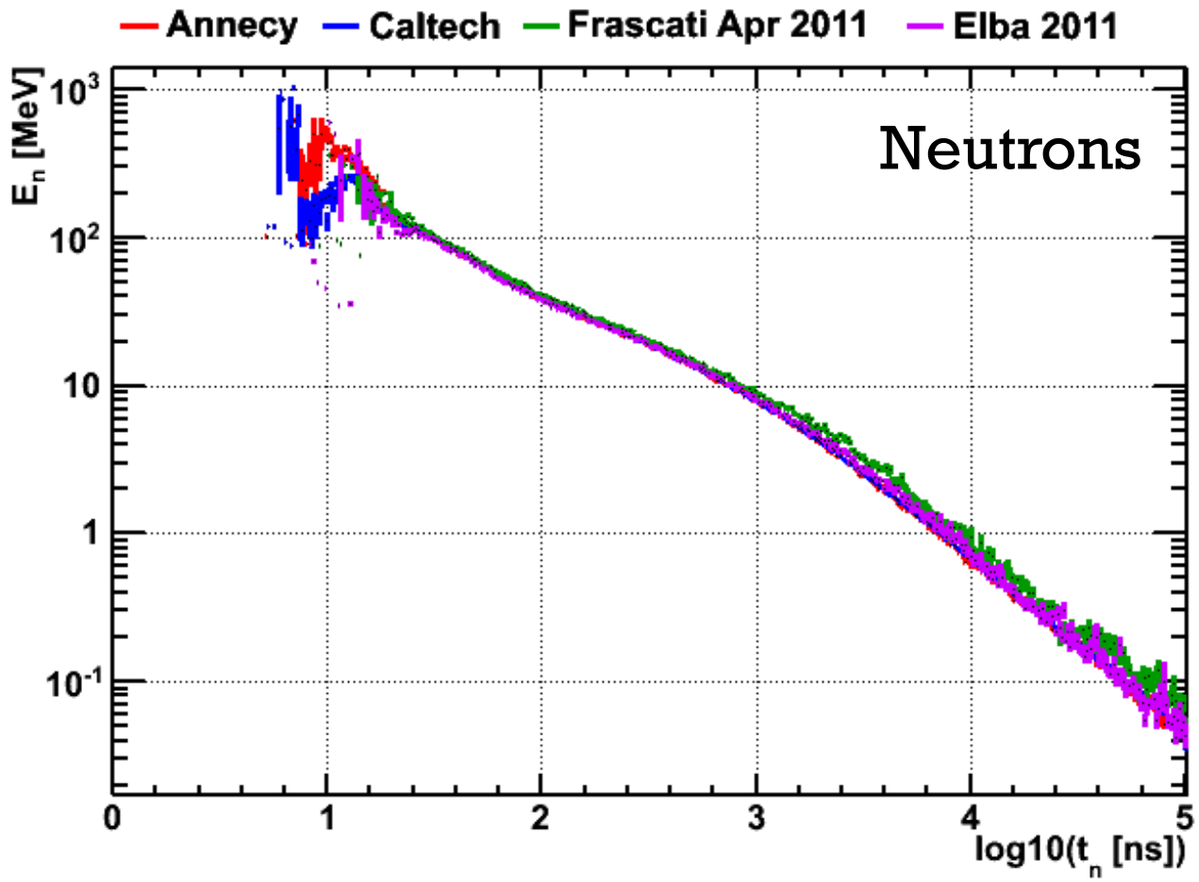
This low multiplicity events behaviour was never really understood
My GUESS is they are realted to the Genat4 crach issue.
Need to be investigated

A Dangerous Signal…

Particles energy vs time

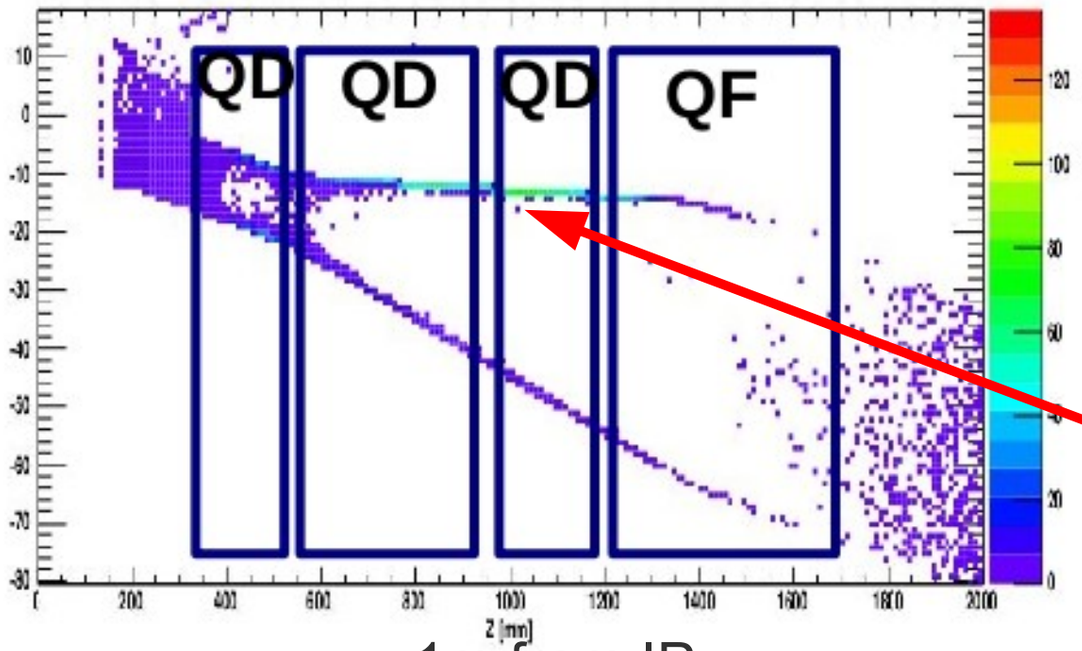
Mean energy vs time for particles crossing the EMC volume boundary



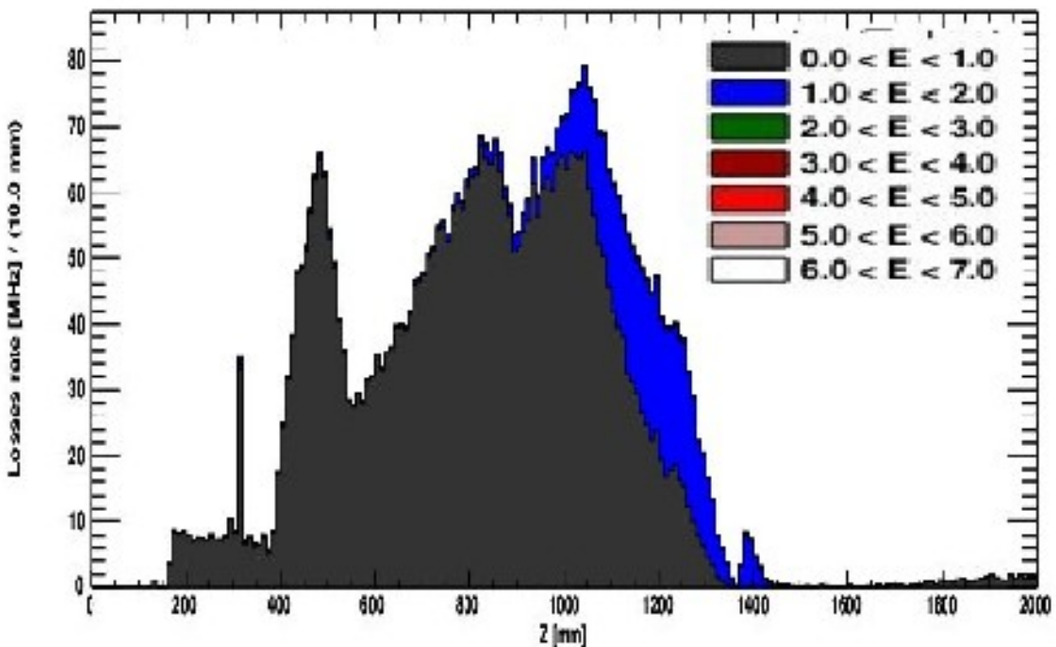


Hot spot caused by Radiative BhaBha effect

Positron losses along beam pipe



z ~1m from IP

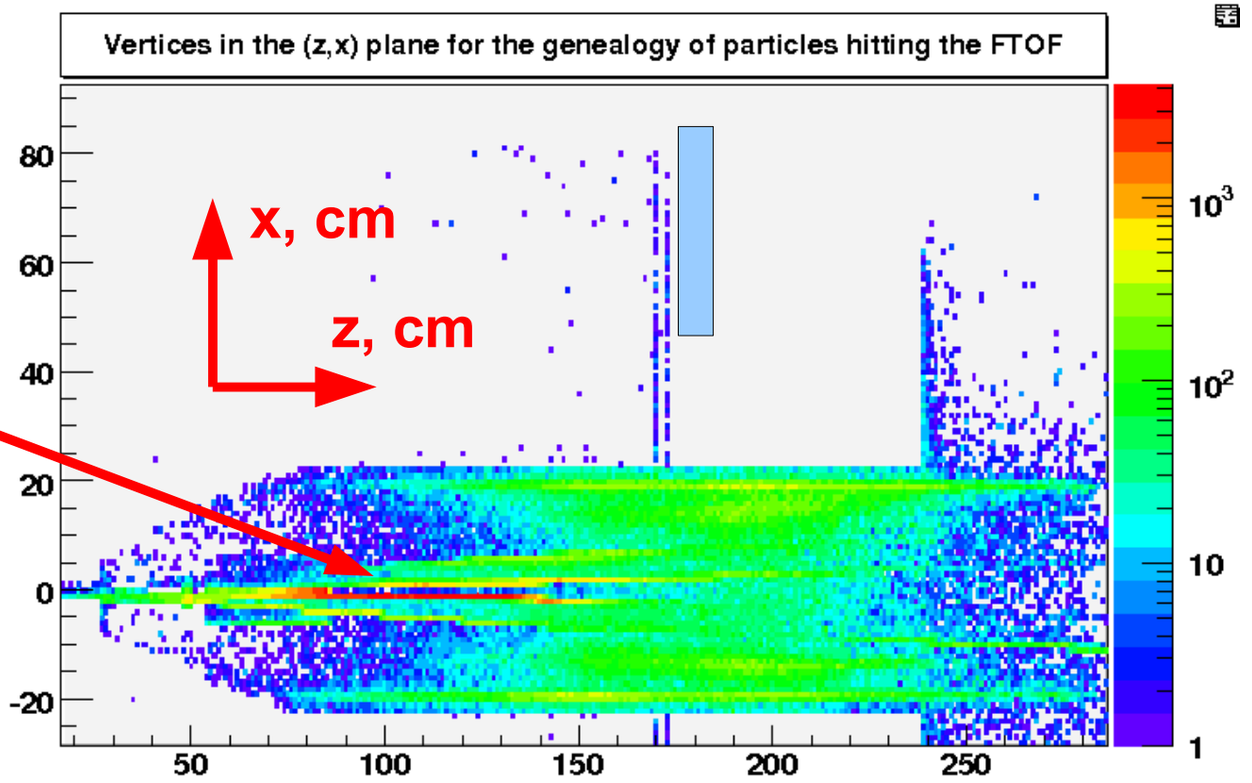


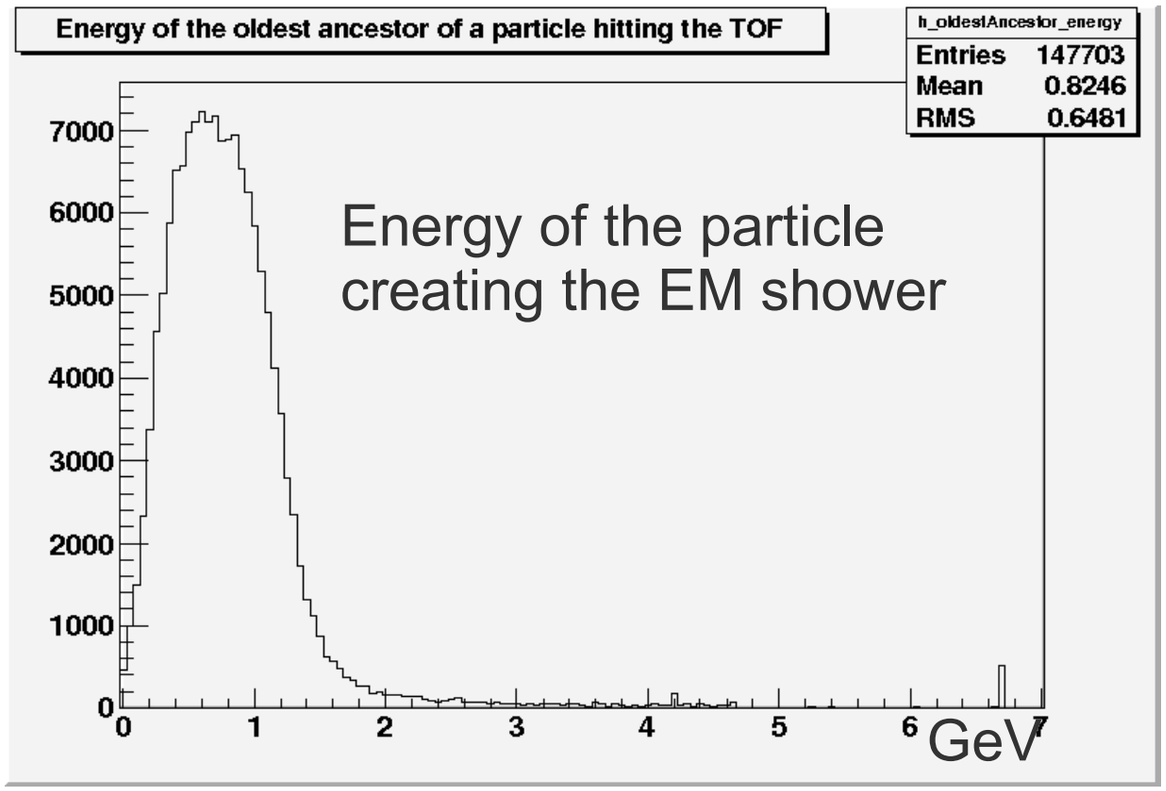
See this presentation (page 7)

http://agenda.infn.it/getFile.py/access?contribId=6&resId=0&materialId=slides&confId=3808

28.05.2011

Vertices of the genealogy of particle hitting the FTOF



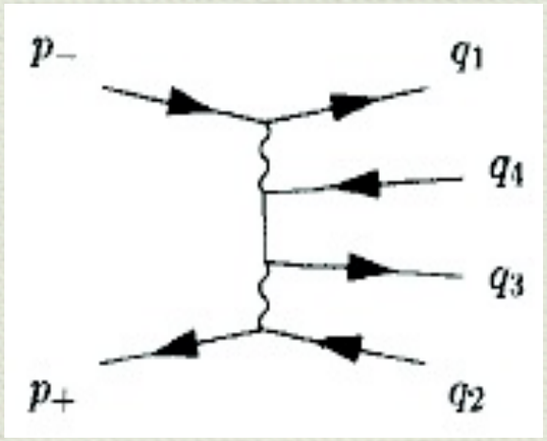


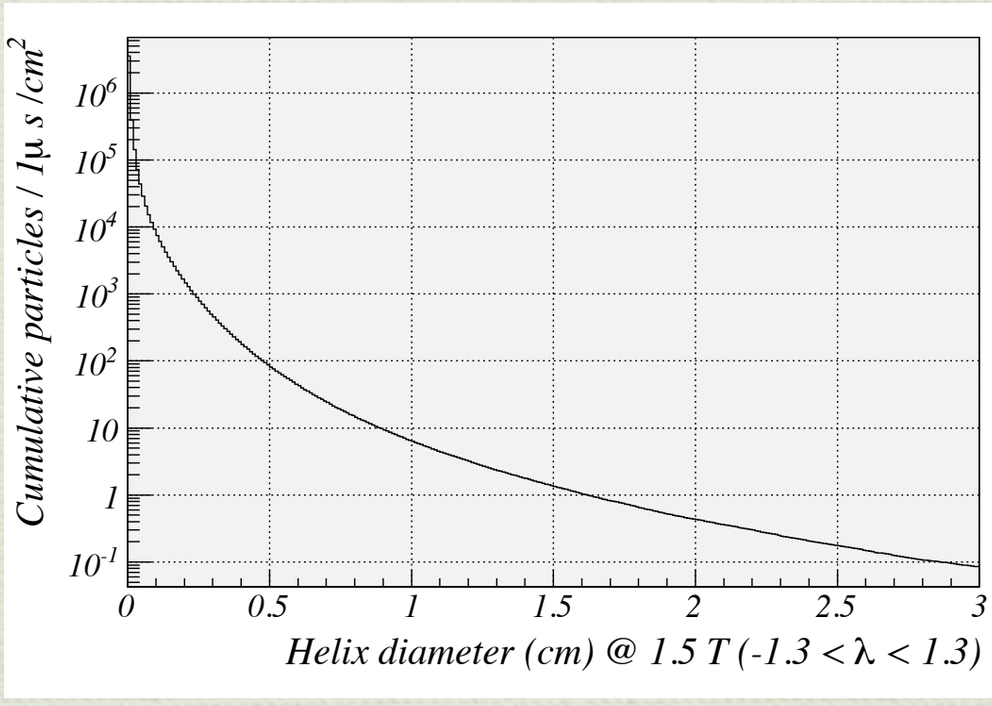
Energy of the particle creating the EM shower

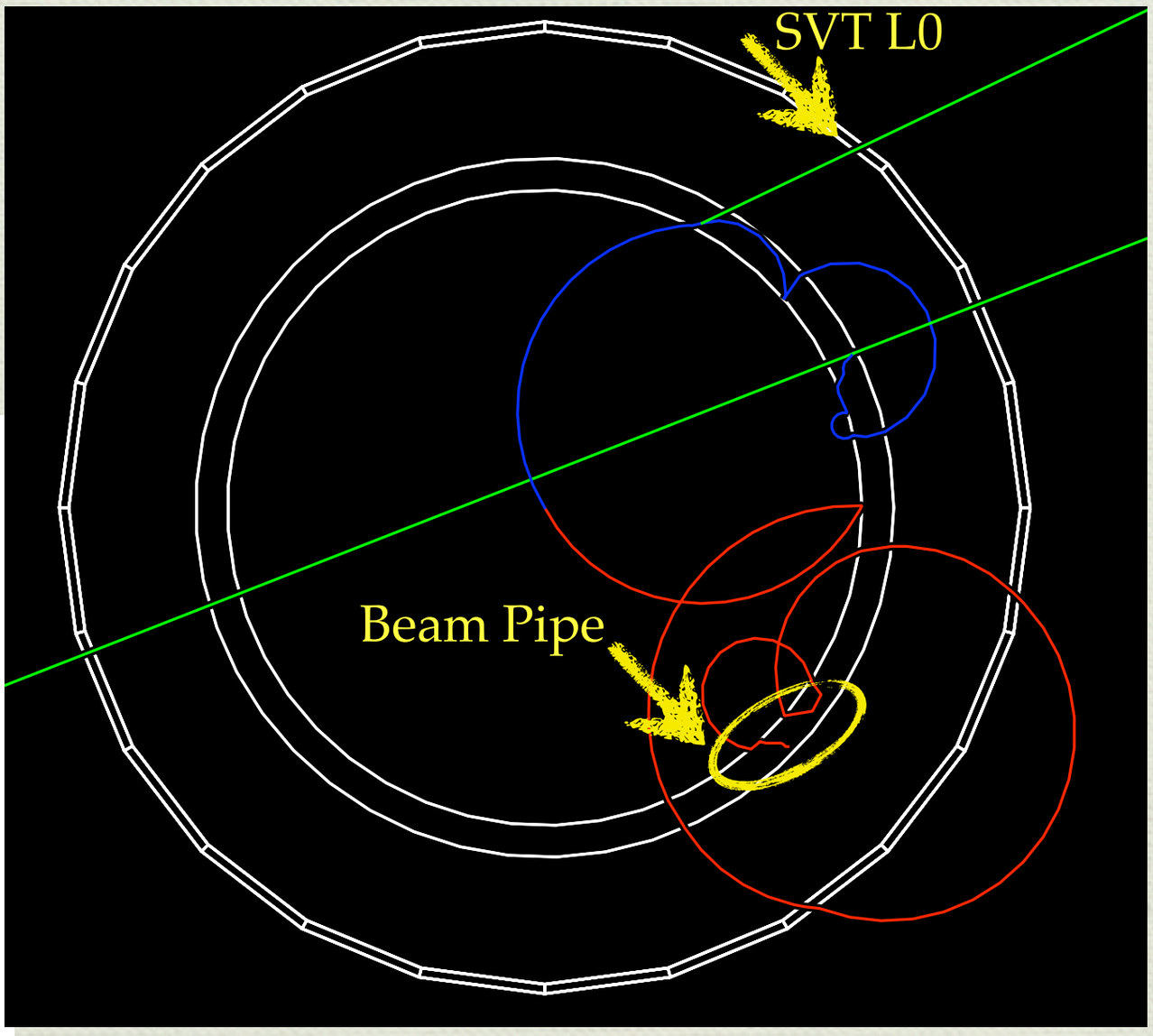
Pairs Production

SVT L0 bkg. Pairs production

Track rate: Geant4 sim. ~ 6.5 MHz/cm^2







SVT L0: SuperB - SuperBelle

- SuperBelle claim that the pairs rate @ L0 is way smaller
- The distribution at Monte Carlo generator level of SuperB (Diag36) & Belle-II (BDK) are not in agreement
- Diag36 is BDK rebranded, i.e. same original fortran code
- Cécile Rimbault (she pointed out this dangerous source of background to us in SuperB IV Villa Mondragone) volunteered to lead a small task force to investigate on the topic

Luminometry

- Several groups are interested in luminosity monitor
- First step is to write a document with the requirements from the machine and the detector side
  - luminosity range
  - precision
  - integration time
- Formation of a task force for common problems (simulation, bkg rates)

Conclusion

- I hope you enjoyed this meeting at much as I did
- Lot of fun work foreseen to
  - deliver more accurate and reliable background predictions
  - reduce the backgrounds to lower levels
    - shields
    - scrapers
    - IR layout
- See you soon at the next SuperB meeting