Nov. 2011 FullSim Production Report

Alejandro Pérez
INFN – Sezione di Pisa

LNF SuperB Collaboration Meeting

Outline

- **New BRN developments:**
  - FDIRC: Cerencov photons and instrumentation
  - Fwd-EMC: New geometry
- **Background frames production for FastSim**
- **Pairs background production**
- **Touschek (LER/HER) production**

Fwd-EMC

- **Request from Stefano Germani to test different options for Fwd-EMC device**
  - Nominal configuration uses LYSO (Geometry_CIPE_V00-00-02)
  - New geometries being tested:
    - CSI: Csi with VPT readout (Geometry_CIPE_V00-00-02_CSI)
    - BGO: Bgo with PMT readout (Geometry_CIPE_V00-00-02_BGO)
    - PWO: Pwo with PMT readout (Geometry_CIPE_V00-00-02_PWO)

- **Nov. 2011 production:**
  - Geometry_CIPE_V00-00-02_PWO: Rad-Bhabha

FDIRC

- **Previously:**
  - Stand Alone G4 simulation (Doug Roberts)
  - BRN: FDIRC geometrical model, no instrumentation
- **Currently:**
  - A lot of work to insert stand alone model in BRN (Andrea Di Simone and Doug Roberts)
  - Many tests show no problems
  - Cerencov photons in the bars can be activates/deactivated. No significant increase on computing-time/output-size
- **Nov. 2011 production:**
  - Cerencov photons activated. See my talk later in this session about FDIRC backgrounds

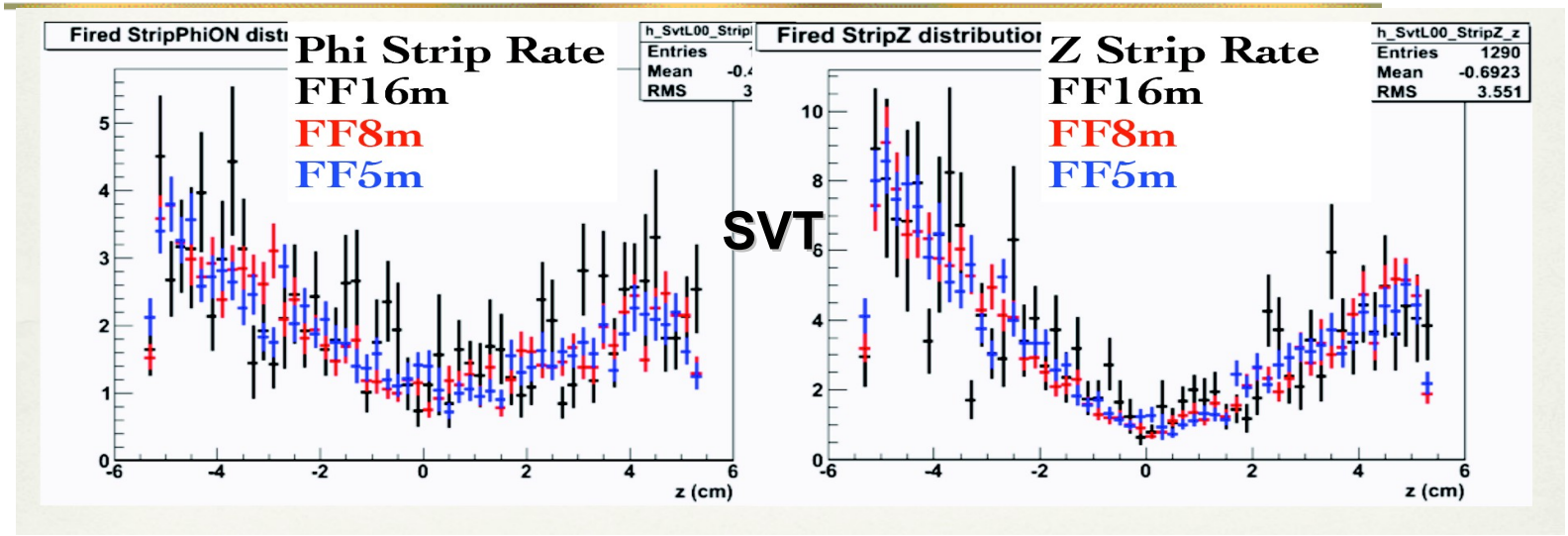
Rad-bhabha bg-frames production (I)

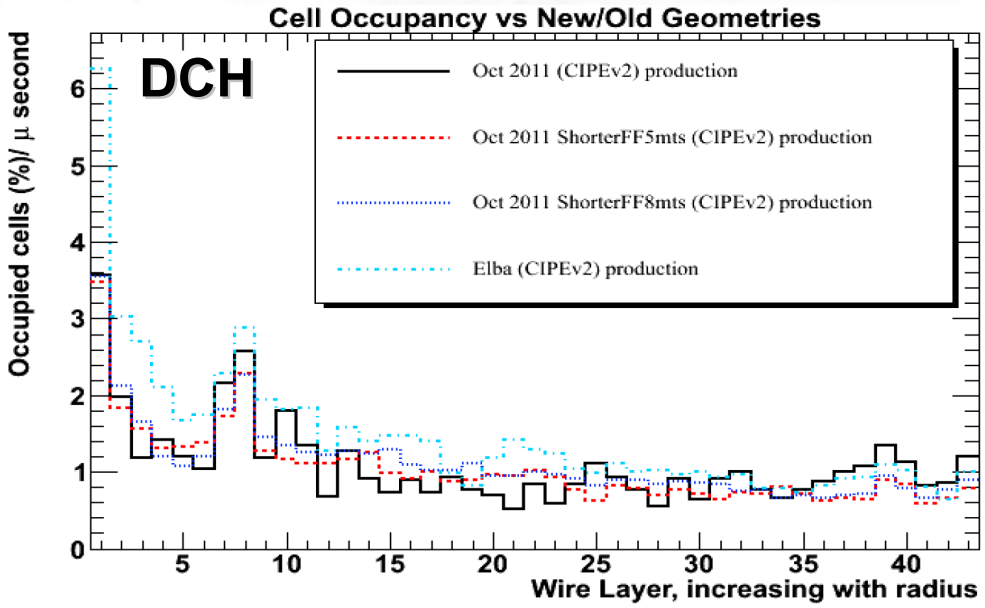
- **Current final focus (FF) model in FullSim is very complete, it covers from -16m to 16m**
  - Rad-bhabha simulation takes ~10min per event
  - Impossible to produce the rad-bhabha bg-frames request of 1M events in a reasonable time

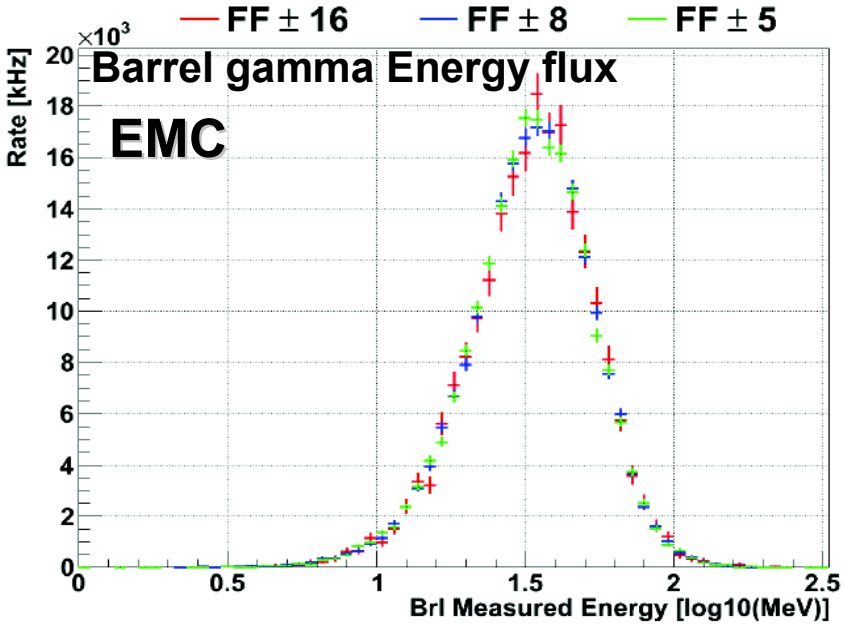
- **Approach to the problem:**
  - The reason of the long FF model is to have a realistic estimation of neutron rates on the subsystems (FDIRC, IFR, EMC)
  - FastSim doesn't have a good simulation for neutrons
  - Propose to build reduced version of the FF: ±8mts and ±5mts
  - Run a small fullsim production with the reduced versions of the FF
    - Compare background rates on different subsystems for the different FF models: nominal (±16mts) and reduced ones (±8mts and ±5mts)

If rates are similar ⇒ can use the reduced FF for the bg-frame production

Rad-bhabha bg-frames production (II)







Rad-bhabha bg-frames production (III)

- **Summary of comparison of FF models:**
  - Most of the subsystems see very similar rates for the different FF models
  - Only the IFR sees different rates. Can we leave with this? FastSim IFR experts yes
  - See link below for the reports full reports on this

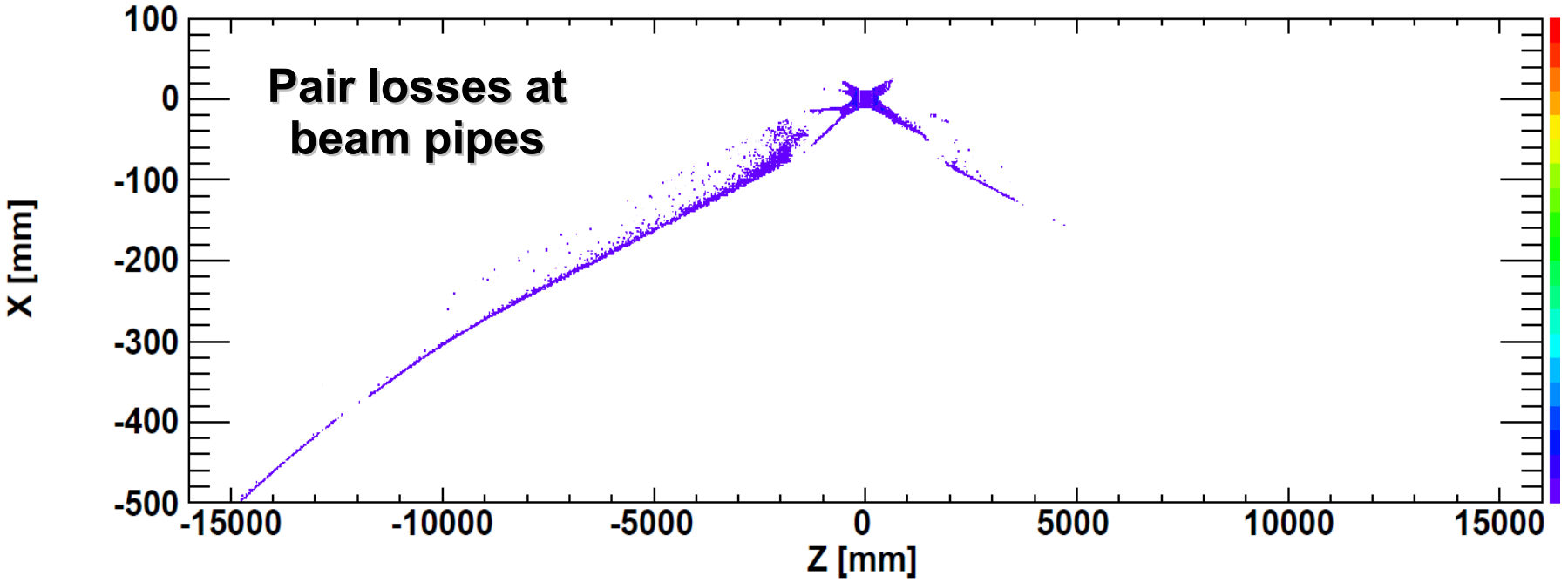
- **The reduced FF model (±5mts) is the only approach that the FullSim group can offer to generate the requested 1M Rad-bhabha events in a reasonable time**

  ⇒ The reduced FF model of ±5mts have a factor of 10 lower execution time per event w.r.t. the nominal FF model (±16mts)

- **Nov. 2011 production:**
  - Use the ±5mts FF model (Geometry_CIPE_V00-00-02_ShorterFF5mts)

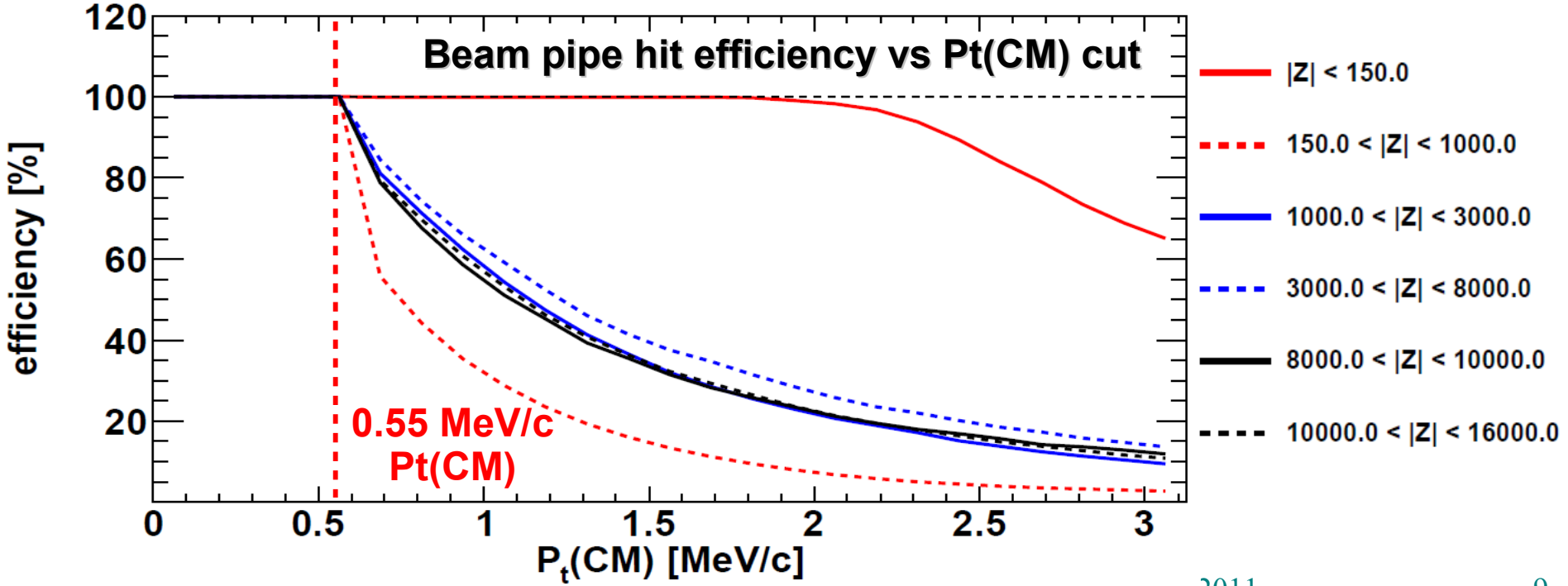
Pairs background production

- **Use fastsim and diag36 generator to generate pairs primaries**
- **Kinematic cuts:**
  - Study the minimum Pt(CM) cut at generator level to not bias the pairs sample
  - Study the losses at the beam pipes from Pairs to set-up the Pt(CM) cut



Pairs background production

- **Use fastsim and diag36 generator to generate pairs primaries**
- **Kinematic cuts:**
  - Study the minimum Pt(CM) cut at generator level to not bias the pairs sample
  - Study the losses at the beam pipes from Pairs to set-up the Pt(CM) cut
  - Selects Pt(CM) > 0.55 MeV/c
  - $\Rightarrow \sigma(\text{Pt(CM)} > 0.55\ \text{MeV/c}) = 4.47\text{mb}$ ($\sigma(\text{total}) = 7.3\text{mb}$)



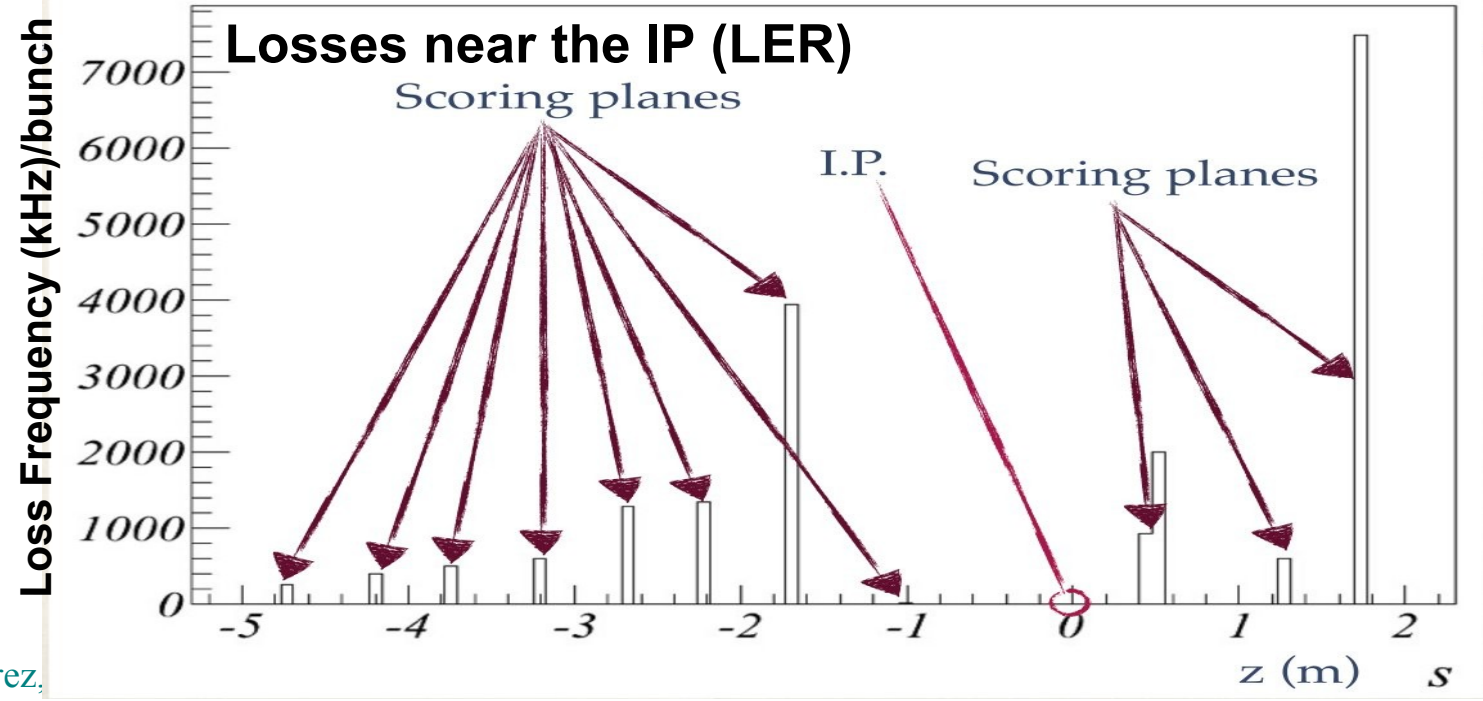
Pairs background production

- **Use fastsim and diag36 generator to generate pairs primaries**
- **Kinematic cuts:**
  - Study the minimum Pt(CM) cut at generator level to not bias the pairs sample
  - Study the losses at the beam pipes from Pairs to set-up the Pt(CM) cut
  - Selects Pt(CM) > 0.55 MeV/c
  - $\Rightarrow \sigma(\text{Pt(CM)} > 0.55\ \text{MeV/c}) = 4.47\text{mb}$ ($\sigma(\text{total}) = 7.3\text{mb}$)
- **Use guinea pig generator to inject pairs primaries in BRN**
  - N-int-bunch = Lumi $\times \sigma / f_c = 19.5$
  - Each events has <N-int-bunch> interactions
  - N primaries/events ~ 78 (500 rad-bhabha) $\Rightarrow$ much faster

Touschek background production: strategy

- **Primaries for BRN: STAR code (Manuela Boscolo)**
  - Simulate both Touschek and the beam gas scattering along the beam line
  - Transport the scattered particles along the lattice
  - Detect the collisions of these particles with the beam pipes (scoring planes)
- **Typical output:**

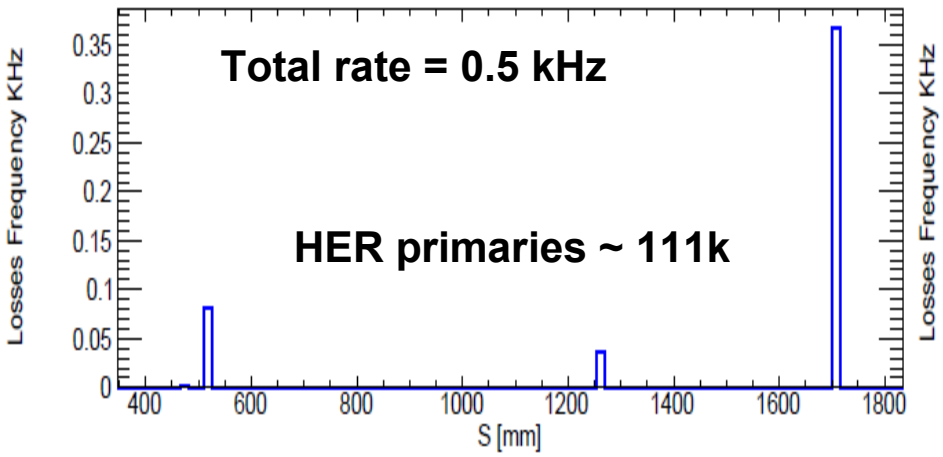
0.445558E-01	-0.550303E-02	-0.126830E-05	0.376408E-06	1.71000	-0.239831E-01	0.818628	1
0.456014E-01	-0.570537E-02	-0.280276E-04	0.113856E-04	1.71000	-0.252154E-01	0.755761	1
0.474620E-01	-0.592261E-02	-0.210435E-04	0.873927E-05	1.71000	-0.249482E-01	0.778852	1
0.432248E-01	-0.531700E-02	-0.179759E-04	0.663319E-05	1.71000	-0.236050E-01	0.997186	1
x (m)	$\frac{dx}{ds}$ (rad)	y (m)	$\frac{dy}{ds}$ (rad)	s (m)	$\frac{\Delta E}{E}$	f (KHz)	#turn

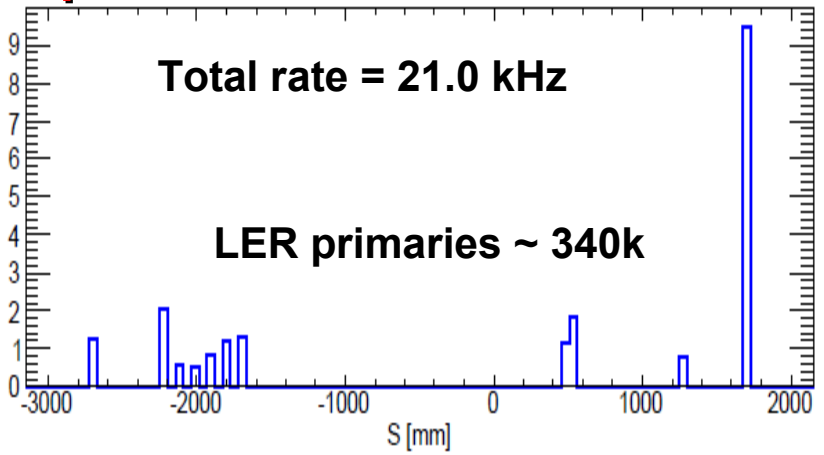


Touschek background production: samples (I)

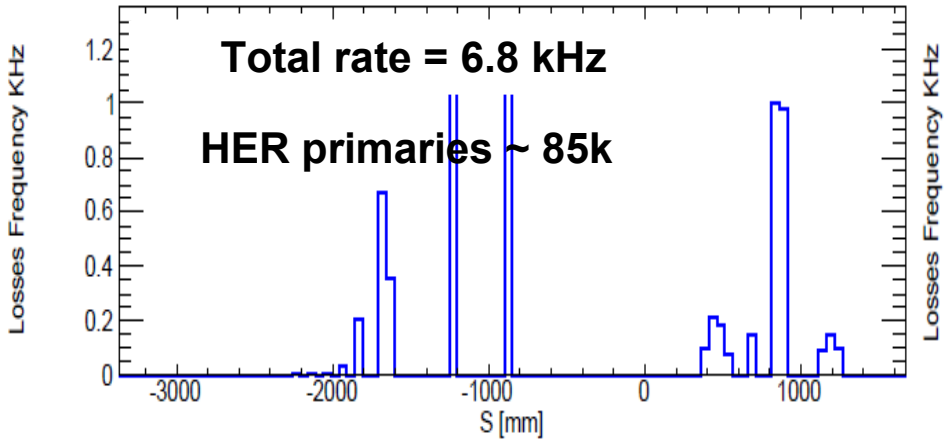
Losses near the IP

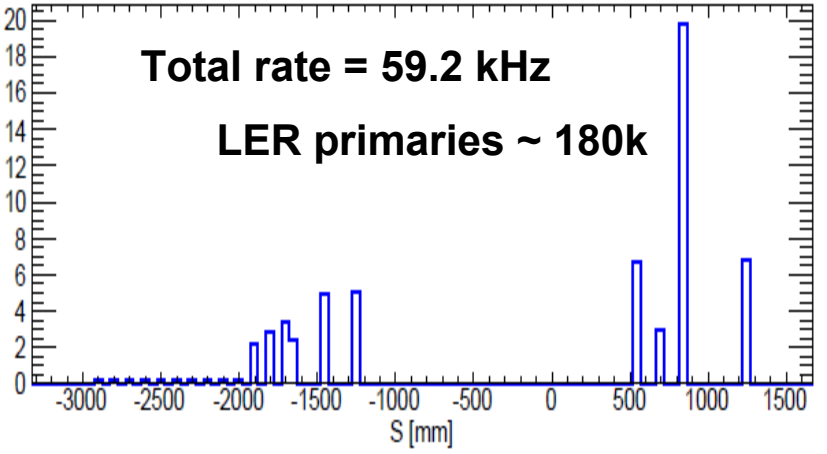
London samples





Nov. 2011 production samples

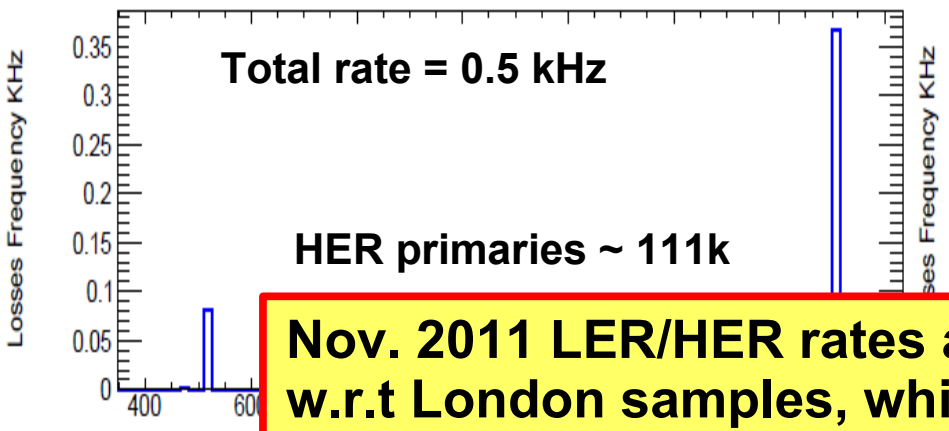


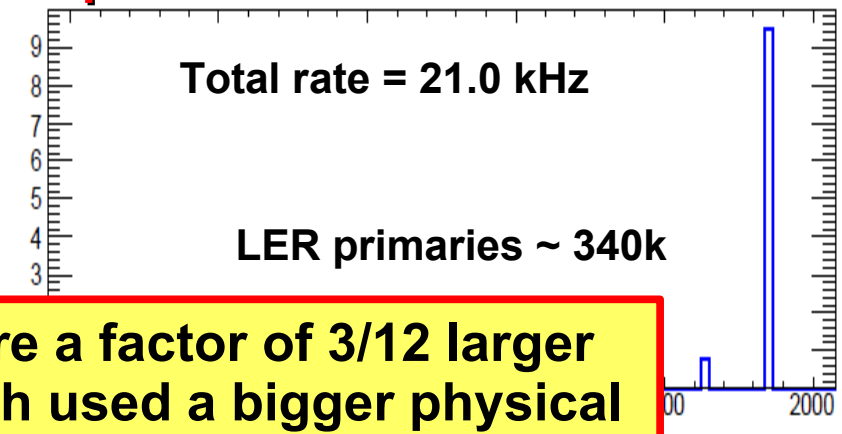


Touschek background production: samples (I)

Losses near the IP

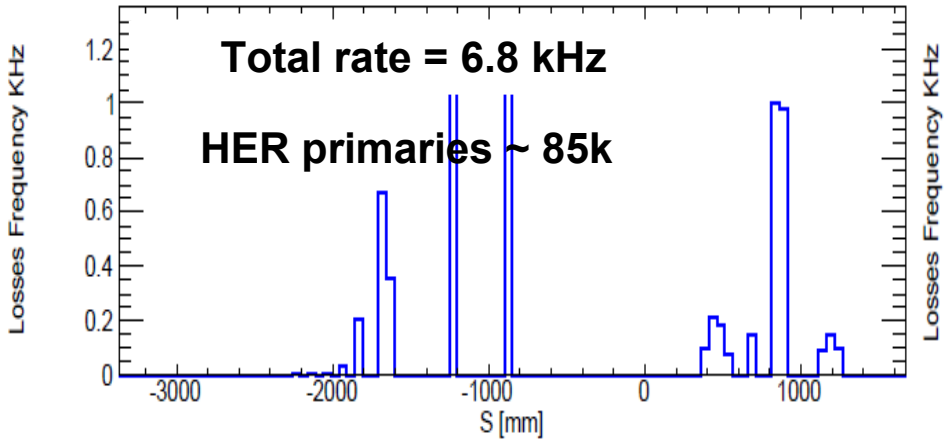
London samples

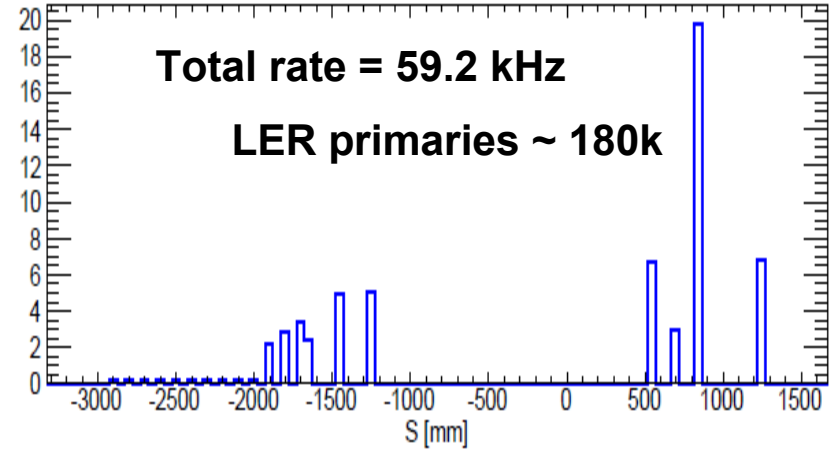




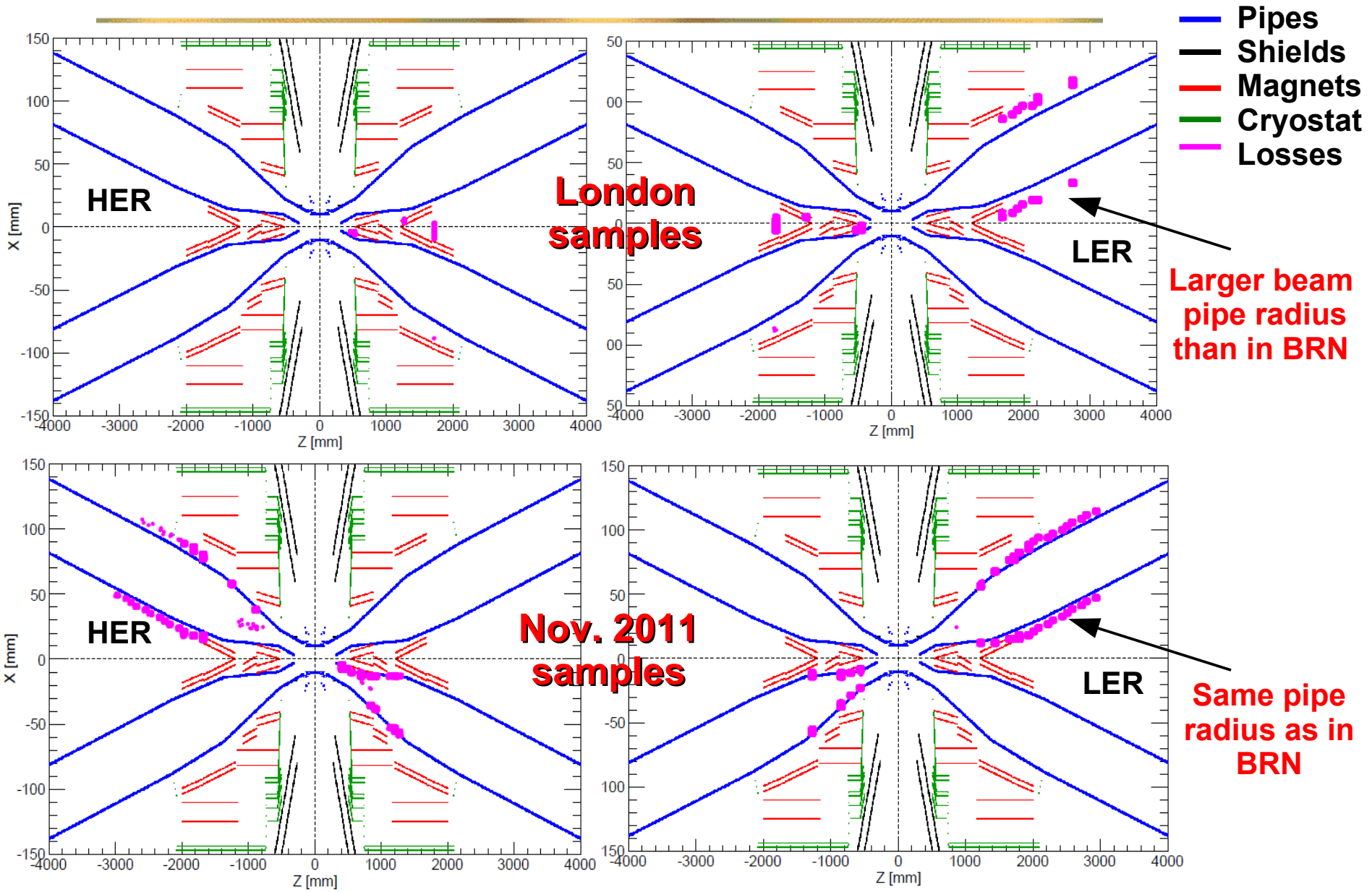
Nov. 2011 LER/HER rates are a factor of 3/12 larger w.r.t London samples, which used a bigger physical than the one implemented in BRN

Nov. 2011 production samples





Touschek background production: samples (II)



Production Work-flow (I)

- **Followed guide-lines proposed by Andrea Di Simone at the Elba SuperB meeting 2011**

(http://agenda.infn.it/getFile.py/access?contribId=51&sessionId=65&resId=0&materialId=slides&confId=3352)

- **Added to the SuperB wiki**
  - Explanation these guide lines: Path to production

(http://mailman.fe.infn.it/superbwiki/index.php/Path_to_production)

  - The implementation of the production work flow to be followed for each production. There will be a wiki-page for each production. The one corresponding to the current production can be look at the link below

November 2011 production:

http://mailman.fe.infn.it/superbwiki/index.php/November_2011_production

Production Work-flow (II)

- **Software preparation:**

Software preparation [edit]

Summary	BrnSvt OK (Cenci)	BrnEmc OK (Germani)	BrnIfr OK (Santoro)	BrnGeoMag OK (Pérez)	Brn3BGen OK (Pérez)	BrnPID OK (Di Simone/Roberts)	BrnRunTime OK (Pérez)	BrnCore OK (Pérez/Di Simone/Paoloni)	BrnApp OK (Pérez/Di Simone/Paoloni)	Packages assembling OK (Pérez/Di Simone/Paoloni)
Tag	V00-00-02	V00-00-02	V00-00-01	V00-00-02	V00-00-01	V00-00-01	V00-00-03	V00-00-03	V00-00-02	OK
Software quality OK	True	True	True	True	True	True	True	True	True	True

Before the creation of a new FullSim release the software need to be tested and fixed. There is a responsible for every BRN package that needs to create a new tag for production and sign-off on the code quality

Production Work-flow (III)

- **Release validation:**

Release validation [edit]

Release number	Release build/validation OK (Stroili)	Remote sites validation OK (Fella/Tomassetti)	Test release for production OK (Pérez/Paoloni)
V0.0.4	True	False	True

Once the tag for the different BRN packaged have being created, we proceed to build a new release.

- Release build/validation: Roberto Stroili
- Remote sites validation: Armando Fella/Luca Tomassetti
- Checkout/validation of the test release to be used for production: Pérez/Paoloni

Production Work-flow (IV)

- **Production requests:**

Production requests [edit]

Geometry	Generator	N. Events	N. Jobs	Event/job	Time/Job (hours)	Size/job (GB)	Total Size (TB)	Pre-approval (Pérez/Paoloni)
Geometry_CIPE_V00-00-02_PWO	Rad-BhaBha	10k	1k	10	~4	1.3	1.3	True
Geometry_CIPE_V00-00-02_PWO	Pairs	100k	340	300	~2	1.3	0.5	True
Geometry_CIPE_V00-00-02_PWO	Touschek	300k	1.5k	200	~2	1.6	1.5	True
Geometry_CIPE_V00-00-02_ShorterFF5mts	Rad-BhaBha FastSim bg-frames	1M	5k	200	~4	0.006	0.03	True

Production request are written in a table. It needs to be specified,

- Geometry
- Generator
- Estimation of: N. events, N. jobs, N. events/job, Time/job, Size/job, Total Size

The production request needs to be pre-approved: Pérez/Paoloni

Production Work-flow (V)

- **Pre-production:**

Pre-production [edit]

Geometry	Generator	N. Events	N. jobs	Events/Job	Time/Job	Disk-space/Job (GB)	Run time OK	Physics Results OK	Final Sign-off (Pérez/Paoloni)
Geometry_CIPE_V00-00-02_PWO	Rad-BhaBha	1k	100	10	~4	1.3	True	True	True
Geometry_CIPE_V00-00-02_PWO	Pairs	10k	34	300	~2	1.3	True	True	True
Geometry_CIPE_V00-00-02_PWO	Touschek	30k	150	200	~2	1.6	True	True	True
Geometry_CIPE_V00-00-02_ShorterFF5mts	Rad-BhaBha FastSim bg-frames	100k	500	200	~4	0.006	True	True	True

For all the pre-approved requests we will launch a pre-production of ~10% of all the total requested events. It need to be tested,

- Time/job, Size/job
- Physics results

If all tests give satisfactory results the request will receive a final sign-off (Pérez/Paoloni) and we will proceed with the full production

Nov. 2011 production summary

- **Rad-Bhabha (fullsim):**
  - Jobs: 1099 (25 exited), ~10k events
  - Size: 1.4 TB
- **Pairs (fullsim):**
  - Jobs: 350 (22 exited), ~100k events
  - Size: 265 GB
- **Touschek HER/LER:**
  - Jobs: 1425 (65), ~180 (80k) primaries for LER (HER)
  - Size: 1.1TB
- **Rad-Bhabha (bg-frames):**
  - Jobs: 7324 (146 exited), ~900k events
  - Size: 39.4G

Exited jobs due to:

- Exceeded CPU memory limit
- Exceeded CPU time limit


Backup