



# Update on SVT/DCH Background studies using FullSim

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# Introduction

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- Better agreement between my and Trieste's results for Svt background rates (see talk in parallel session)
- After Elba meeting, packaged version of FullSim (BrunoApp) was available
- New productions available using this packaged version
- Additional hit information to remove cylindrical approximation in Svt when calculating rates
- Validation of packaged version is needed



# BrunoApp and new productions

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- While finishing transition to packaged version, additional debugging of Bruno (Geant4, too) was done by FullSim people
- Packaged version of FullSim (BrunoApp) was available only late, so not so much time for improvement
- New productions:
  - **Official-London**, RadBhabha ( $\sim 3\text{k}$  evts,  $11\mu\text{s}$ , low stat ): BrunoApp V0.0.0, 1mm step limit
    - Issue: old version of hits, not able to process those files using my macro w/o major changes
  - **Official-London**, Touschek/BeamGas: same as previous one, same issue, additional technical problem with normalization
  - **Personal**, 2photons ( $1.9\text{M}$  evts,  $250\mu\text{s}$ ): BrunoApp V0.0.1, no step limit, single Coulomb scattering, improved hit information
- Following plot only from personal production



# Development on packaged version

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- Approximation: number of fired pixel/strip is calculated over a cylindrical surface, not on a flat one
- Removing that storing hit coordinates for the active silicon volume (plus module and wafer number)
- These coordinates can be retrieved from G4, now added to the hit classes
- Rate wafer by wafer, rate vs phi and more
- Svt hit (BrnSvtGHit, BrnRootSvtHit) are now classes derived from generic hit classes, BrnGHit and BrnRootHit
- Additional work to fix bugs from transition and adapt code to the new frame
  - E.g. compile a shared library to be loaded by Root macros
- Stuck simulation bug now understood: caused by a kind of volume, now replaced (thanks to Andrea and Alejandro)

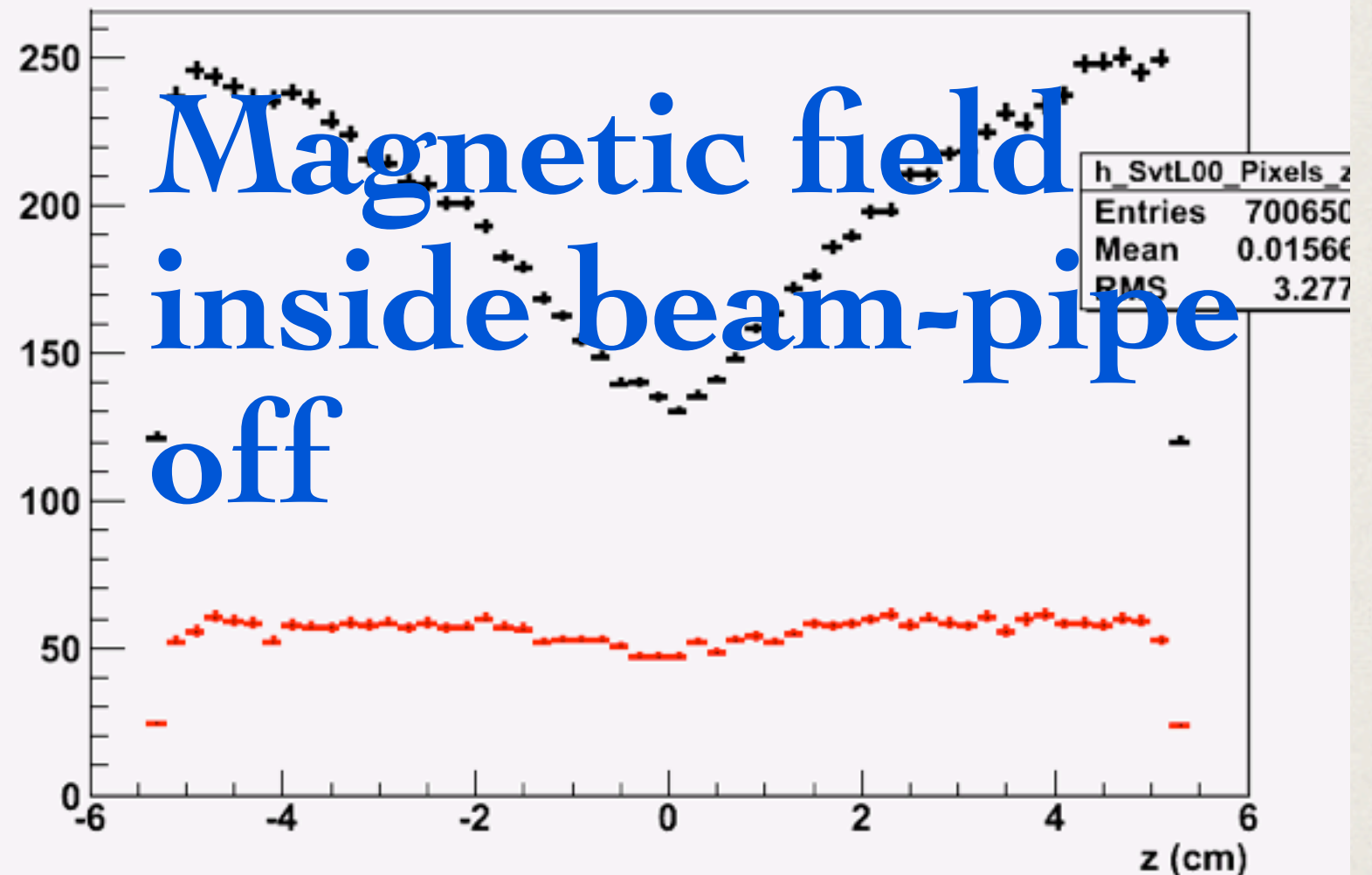


# Preliminary results

- Rates are much higher than before, specially for L0 ( $\sim x4$ )
- Usual problem with magnetic field, need to reprocess them
- Still using global coordinates, need more work to move to local coordinates

2photon (pairs)  
Pixel rate in MHz/cm<sup>2</sup>  
prod 2011 Sep, BrunoApp  
prod 2011 May, Bruno

Fired Pixels distribution vs Z on Svt Layer 0



# Preliminary results

- Rates are much higher than before, specially for L0 ( $\sim x4$ )
- Usual problem with magnetic field, need to reprocess them
- Still using global coordinates, need more work to move to local coordinates

**Magnetic field inside  
beam-pipe off**

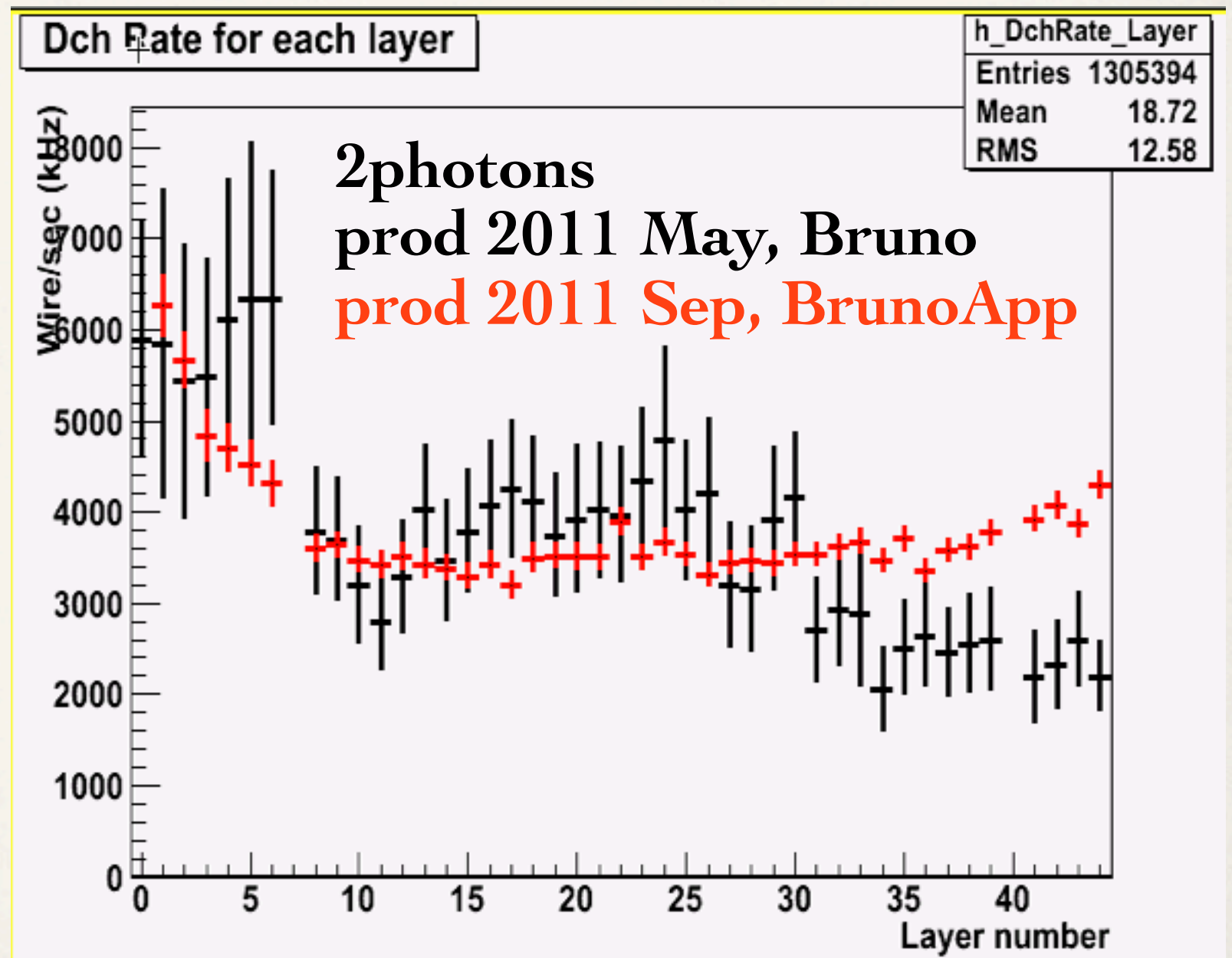
LAYER 0	Dec2010	May2011	Sep2011	
Cluster rate	6.44	6.37	31.3	MHz/cm <sup>2</sup>
Cluster multip	8.1	8.1	6.4	
Pixel rate	56.1	55.6	201.2	MHz/cm <sup>2</sup>
Fluency	4.79E+12	4.73E+12	1.26E+13	cm <sup>-2</sup>
Dose	3.61	3.58	15.6	MRad

LAYER 1	Dec2010	May2011	Sep2011	
Cluster rate	0.43	0.22	0.55	MHz/cm <sup>2</sup>
Cluster multip	2.12	10.88	6.4	
Pixel rate	0.91	2.56	3.5	MHz/cm <sup>2</sup>
Fluency	5.40E+10	1.80E+11	2.80E+11	cm <sup>-2</sup>
Dose	0.03	0.11	0.22	MRad



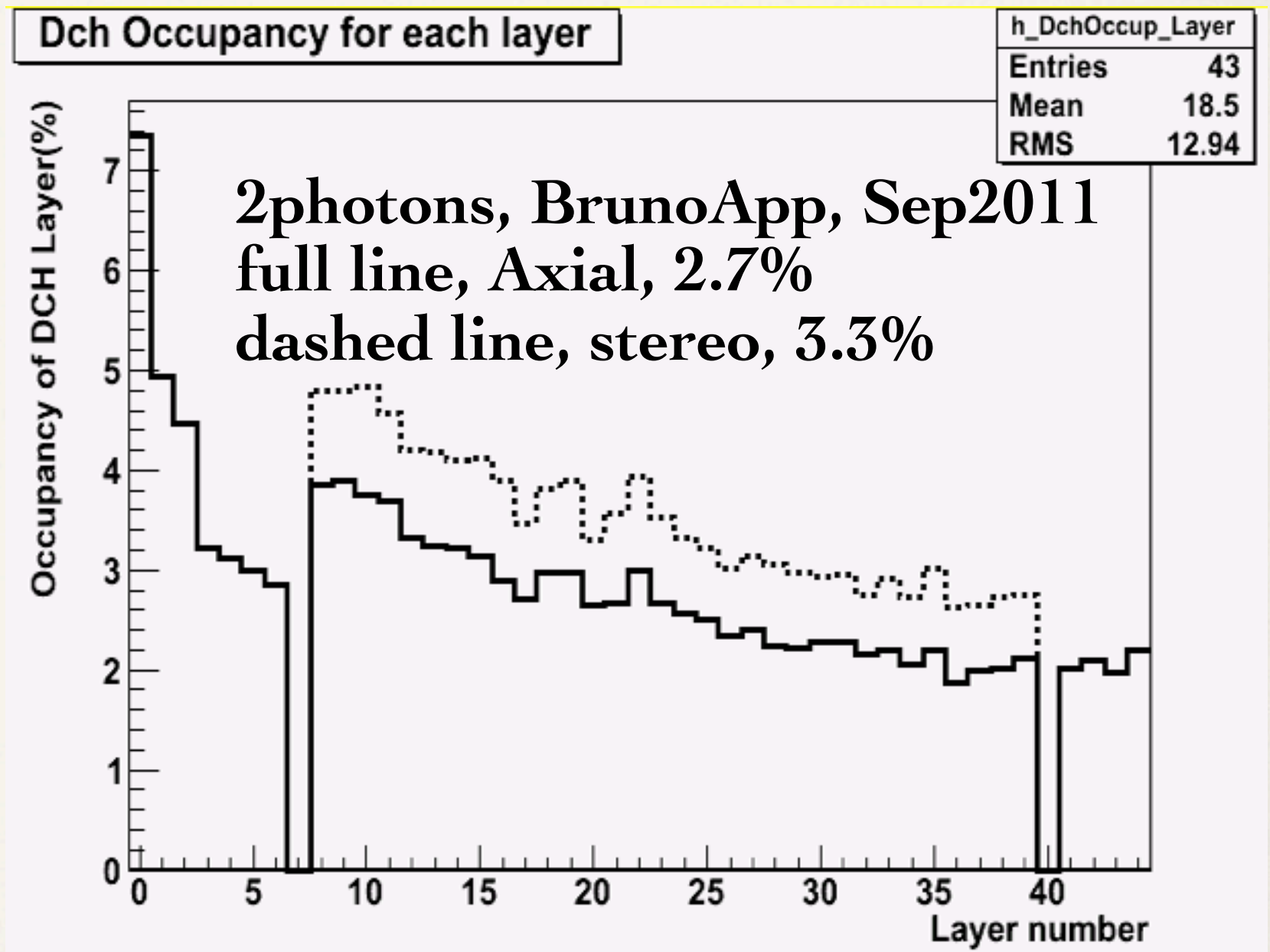
# Dch rate (preliminary)

- Validation of packaged release, similar rate
- It looks higher than what we were observing, is now an important contribution?



# Dch Occupancy (preliminary)

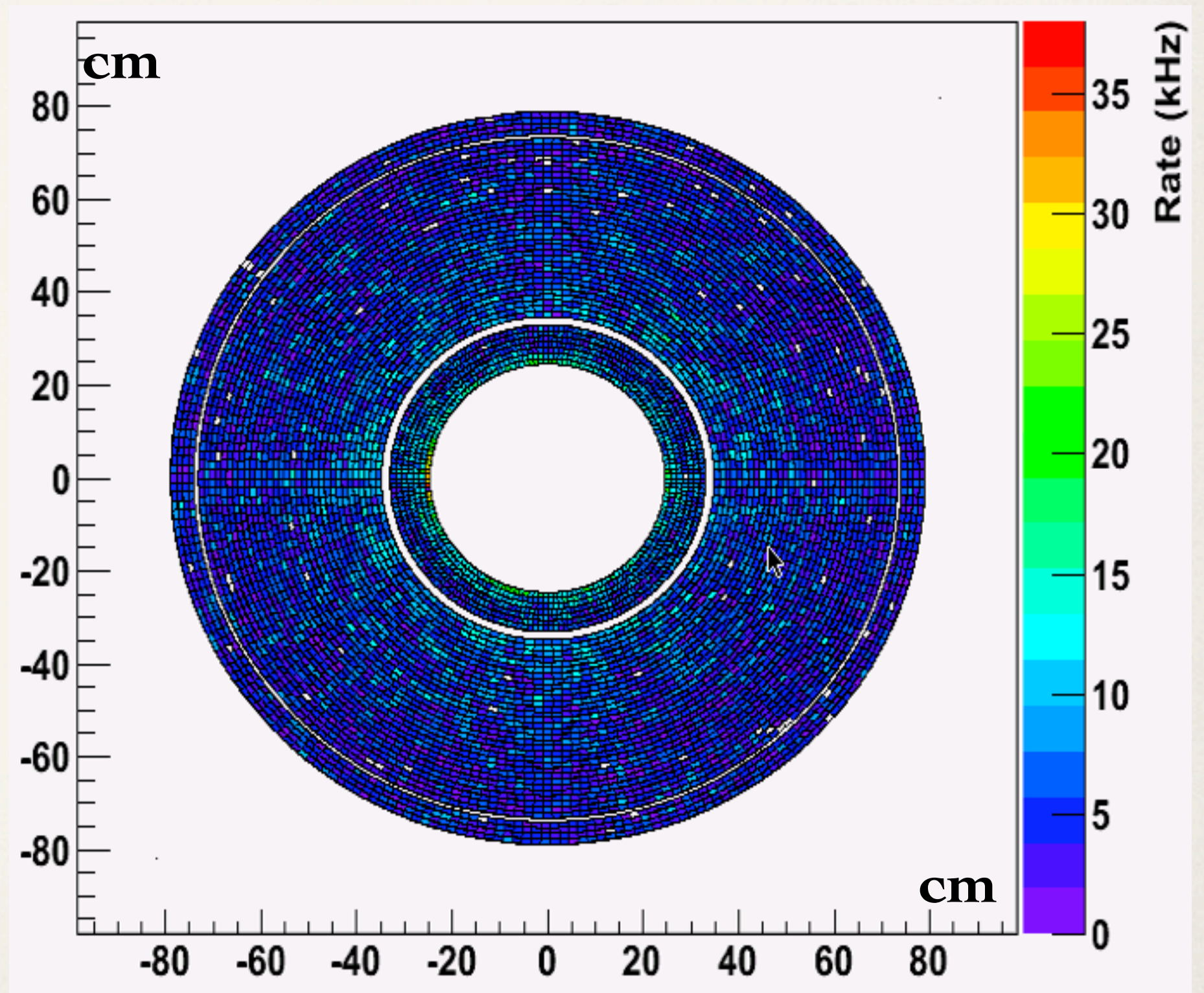
- Stereo contribution is still evident
- Occupancy not so small, effects of magnetic field turned off inside beam-pipe





# Map for cell rate

- Still 2photons
- Fill the map with rate for each cell
- 250us
- A cell fired once during 250us = 4kHz
- Higher statistics needed to spot which ones are the hot areas, it looks still isotropic





# Conclusions

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- Packaged version finally delivered, validation is still pending
- Better agreement between my and Trieste's results for SvT
- Various technical problems to be addressed to process RadBhabha and Touschek (fixes are ready to be committed, then re-run the productions)
- First personal production of 2photons bkg (aka pairs) with BrunoApp, fake high bkg (wrong magnetic field)
- Cylindrical approximation has been removed, soon strip rate module by module







# Results L0,1,2

- Same values for L0
- Lower cluster rate, but higher pixel rate, fluency and dose for other layers

LAYER 1	Dec2010	May2011	
Cluster rate	0.43	0.22	MHz/cm2
Cluster multip	2.12	10.88	
Pixel rate	0.91	2.56	MHz/cm2
Fluency	5.40E+10	1.80E+11	cm-2
Dose	0.03	0.11	MRad

LAYER 0	Dec2010	May2011	
Cluster rate	6.44	6.37	MHz/cm2
Cluster multip	8.1	8.1	
Pixel rate	56.1	55.6	MHz/cm2
Fluency	4.79E+12	4.73E+12	cm-2
Dose	3.61	3.58	MRad

LAYER 2	Dec2010	May2011	
Cluster rate	0.23	0.12	MHz/cm2
Cluster multip	1.98	10.54	
Pixel rate	0.48	1.31	MHz/cm2
Fluency	2.91E+10	9.80E+10	cm-2
Dose	0.017	0.057	MRad



# Results L3-5

- Same values for L0
- Lower cluster rate, but higher pixel rate, fluency and dose for other layers

LAYER 4	Dec2010	May2011	
Cluster rate	7.2	5.8	kHz/cm2
Cluster multip	1.63	7.68	
Pixel rate	11.9	31.6	kHz/cm2
Fluency	5.90E+08	1.88E+09	cm-2
Dose	0.5	1.8	kRad

LAYER 3	Dec2010	May2011	
Cluster rate	67.2	37.6	kHz/cm2
Cluster multip	1.91	9.96	
Pixel rate	131	342	kHz/cm2
Fluency	7.95E+09	2.57E+10	cm-2
Dose	5	15	kRad

LAYER 5	Dec2010	May2011	
Cluster rate	3.8	3.4	kHz/cm2
Cluster multip	1.66	6.97	
Pixel rate	6.1	15.3	kHz/cm2
Fluency	2.18E+08	7.00E+08	cm-2
Dose	0.3	1.0	kRad



# Multiplicity comparison

- Comparison with values from Trieste (Apr 2011)
- Different geometry, but now same pitches
- Updated results from Trieste should be presented tomorrow by Lorenzo V.

LAYERS	Old geometry Apr2011 (Trieste) Multipl.	May2011 Multipl.	May2011 Rates [MHz/cm2]	May2011 Pixel rate [MHz/cm2]
L0 phi	5.3	4.1	23.3	55.5
L0 z	5.2	5.1	29.9	
L1 phi	7.3	6.5	1.5	2.0
L1 z	3.8	3.2	0.7	
L2 phi	7.1	5.9	0.72	0.96
L2 z	3.7	2.9	0.35	
L3 phi	8.2	4.9	0.194	0.25
L3 z	3.9	2.6	0.097	
L4 phi	3.9	2.0	0.012	0.014
L4 z	1.6	1.3	0.0076	
L5 phi	3.1	1.8	0.006	0.007
L5 z	1.9	1.3	0.0041	