Update on SVT Background rates using Bruno simulation

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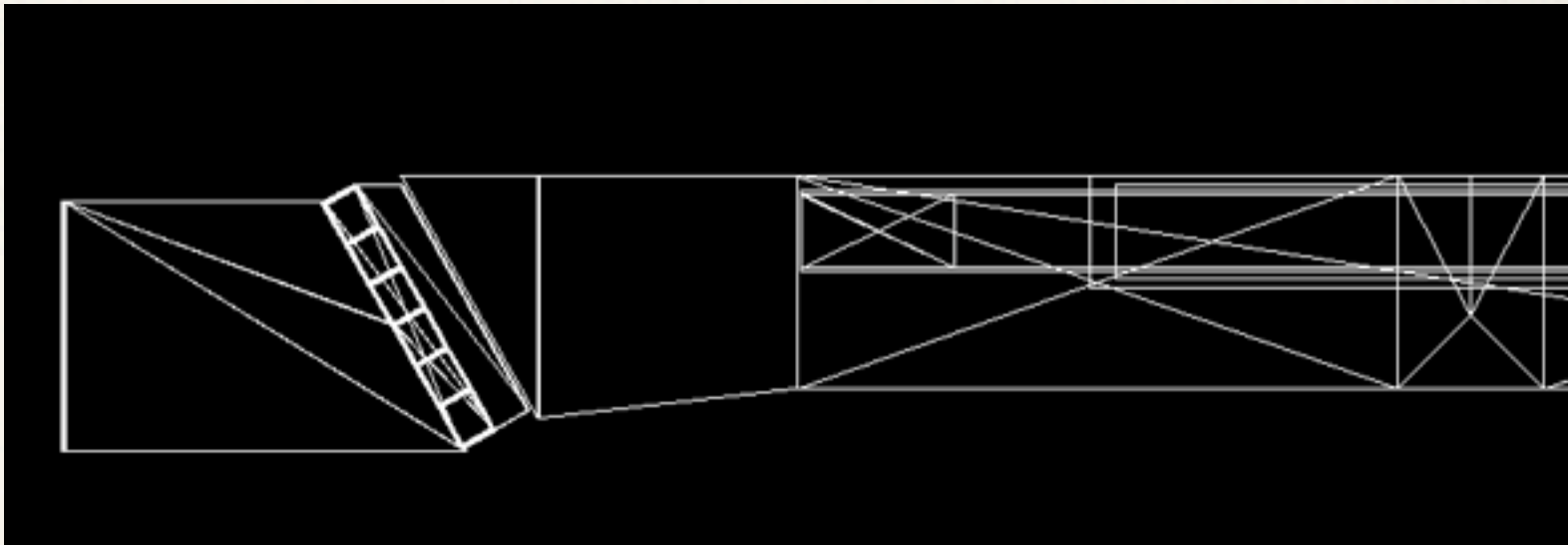SuperB Collaboration Meeting, Elba, ITALY - Svt Parallel Session
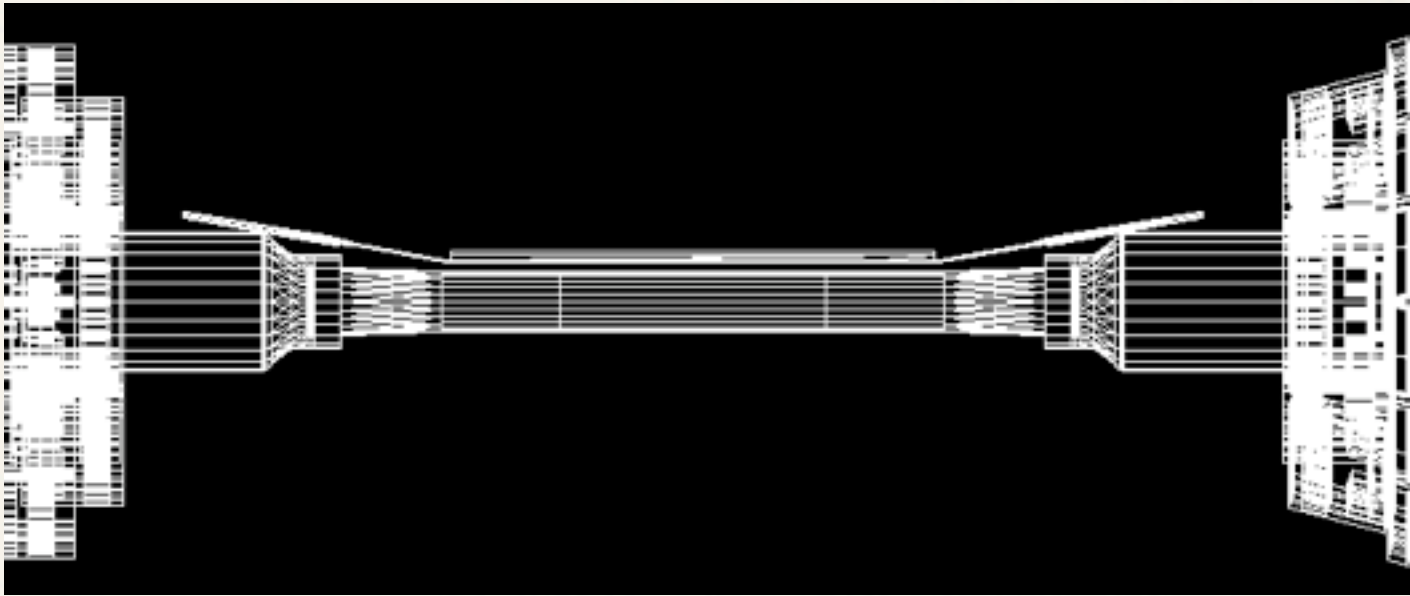
Jun 1st, 2012

SVT striplets geometry

- **Not to be used for the next production**

- GDML version is ready and tested for overlaps

- Based on Geometry_CIPE_V00-00-02 revision 359, tag for V00-00-05

- Beampipe and final focus modifications were easy

- Tungsten shielding is completely symmetric wrt IP

- Relevant changes on how container volumes are implemented but no changes to the internal volumes of the final focus (apart for the beampipe and shortened split pipes)

- IMPORTANT: RadMon need to be re-inserted
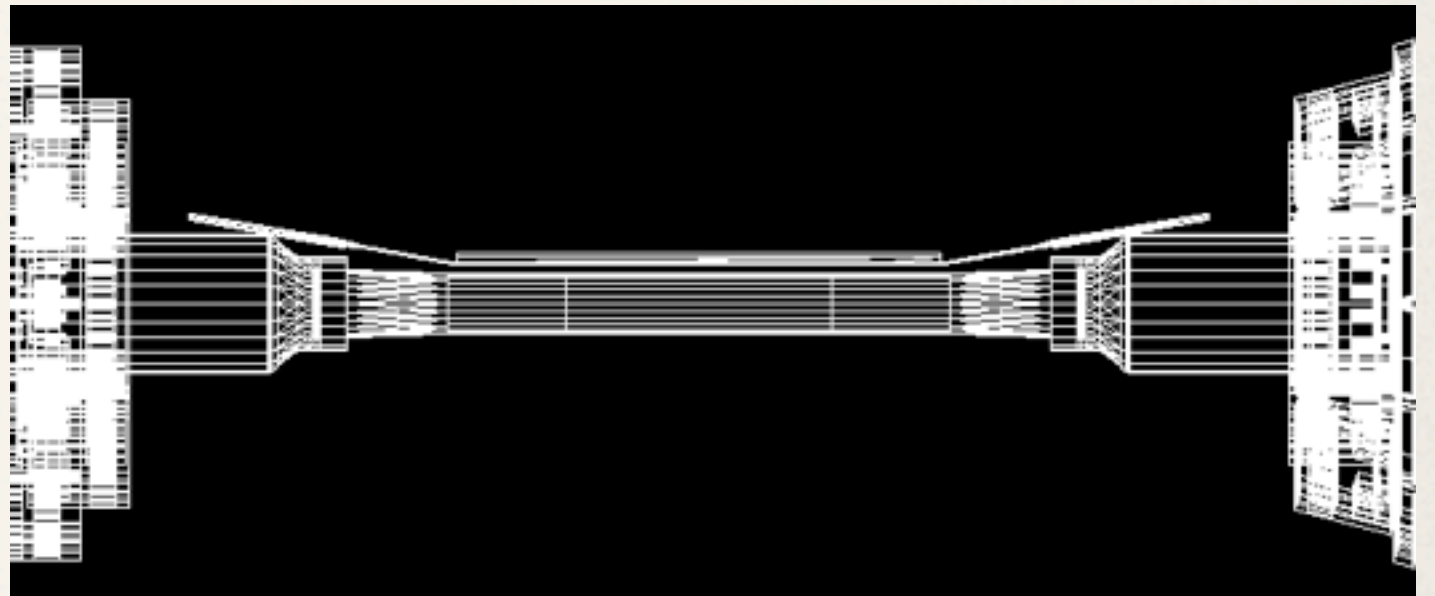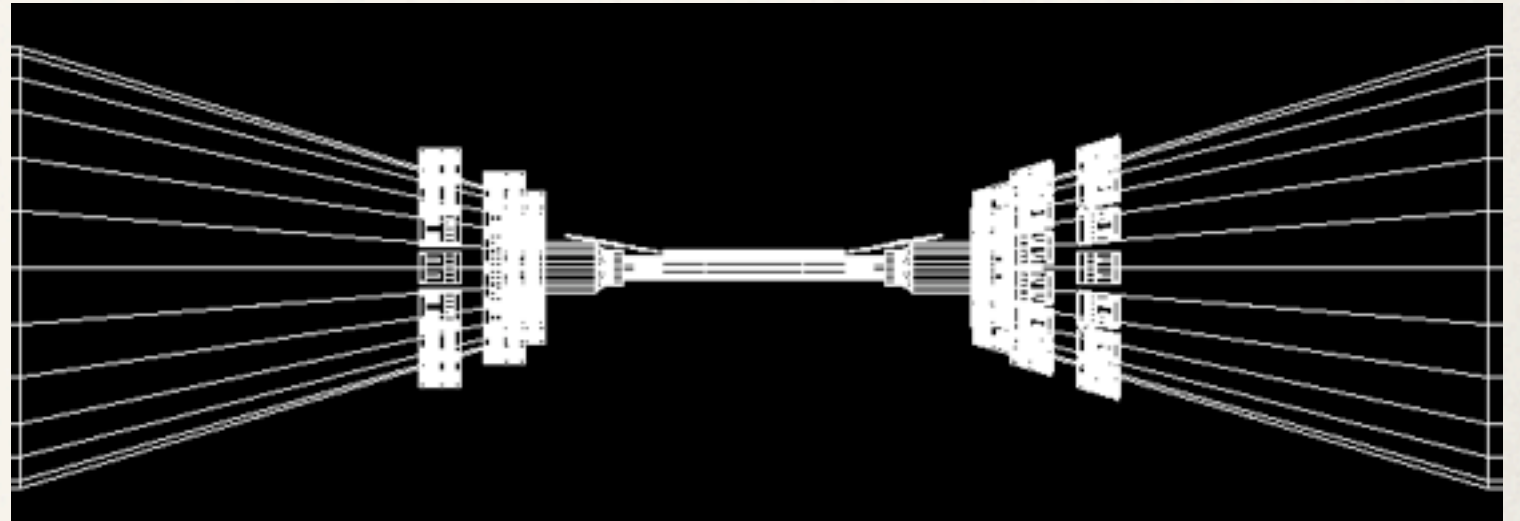
SVT striplets geometry

- **Not used for the May production**

- Svt L0 striplets plus electronics by F. Bosi

  - Si[200um] (0.2 X0)

  - FanOut x 2, Si[40um]-Kapton [50um]-Si[40um] (0.21 X0)

- Materials can be easily changed, but total X0 is correct

- Carbon fiber support (only ribs over the active silicon), fanout tails, hydrids, FEE chips

- Missing parts for L0: carbon fiber supports over the hybrids, buttons
- Outer layers: some support parts have been removed due to overlaps, FEE moved out closer to the updated position but silicon is still like in Babar
- Matching cards: monitor volume moved to the correct position (according last drawings)

Productions

- 2012 official productions (**thicker tungsten shielding**):

  - **2photons** (~100k evts, 372us) solenoidal field limited in z, **±40 cm**

  - **RadBhabha** (~10k evts, 37us)

  - **Touschek**: (~87k evts HER, ~198k LER, weighted evts)

  - **Beamgas** (~284k evts HER, ~282k evts LER, weighted evts)

  New entry

- 2012, additional productions:

  - **RadBhabha** (~10k evts, 37us) old tungsten shielding

  - **RadBhabha** (~10k evts, 37us) CSI, only for EMC studies

Rate comparison, updated

- Rates from previous production

OLD

LAYERS	May2011 2photons	Dec 2011 2photons	Dec 2011 2photons Extend B	Dec 2011 2photons ExtB-Alum	Dec 2011 Bhabha	Dec 2011 Touschek HER	Dec 2011 Touschek LER	Mar 2012 BeamGas HER
L0 phi	23.3	27.4	29.4	31.9	0.87	0.57	1.91	0.635
L0 z	29.9	34.5	37.2	39.0	1.42	1.71	5.06	1.72
L1 phi	1.5	1.45	1.56	1.54	0.12	0.20	0.81	0.24
L1 z	0.7	0.72	0.74	0.73	0.077	0.22	0.869	0.26
L2 phi	0.72	0.75	0.78	0.79	0.078	0.135	0.61	0.16
L2 z	0.35	0.38	0.40	0.39	0.059	0.158	0.68	0.19
L3 phi	0.194	0.37	0.14	0.15	0.047	0.031	0.20	0.045
L3 z	0.097	0.23	0.13	0.13	0.051	0.061	0.32	0.072
L4 phi	0.012	0.042	0.022	0.02	0.0135	0.005	0.021	0.027
L4 z	0.0076	0.026	0.014	0.014	0.0078	0.004	0.014	0.018
L5 phi	0.006	0.016	0.012	0.011	0.0057	0.0024	0.0094	0.0027
L5 z	0.0041	0.012	0.0082	0.0082	0.0038	0.0018	0.007	0.0020

Rate comparison, updated

- No major changes
- Beamgas LER not ready yet but expected as Touschek LER
- Beamgas HER -30%, Touschek LER -20%

LAYERS	2photons		Bbbrem		Touschek HER		Touschek LER		BeamgasHER		Beamgas LER
	01/2012	05/2012	12/2011	05/2012	12/2011	05/2012	12/2011	05/2012	03/2012	05/2012	05/2012
L0 phi	29.4	30.1	0.87	0.83	0.57	0.62	1.91	1.70	0.635	0.47	
L0 z	37.2	38.1	1.42	1.58	1.71	1.94	5.06	4.73	1.72	1.37	
L1 phi	1.56	1.60	0.12	0.13	0.20	0.19	0.81	0.67	0.24	0.16	
L1 z	0.74	0.76	0.077	0.08	0.22	0.20	0.869	0.69	0.26	0.18	
L2 phi	0.78	0.81	0.078	0.079	0.135	0.135	0.61	0.51	0.16	0.12	
L2 z	0.40	0.41	0.059	0.056	0.158	0.15	0.68	0.55	0.19	0.13	
L3 phi	0.14	0.15	0.047	0.049	0.031	0.035	0.20	0.165	0.045	0.029	
L3 z	0.13	0.14	0.051	0.055	0.061	0.057	0.32	0.255	0.072	0.048	
L4 phi	0.022	0.027	0.0135	0.013	0.005	0.0042	0.021	0.014	0.027	0.0035	
L4 z	0.014	0.019	0.0078	0.0081	0.004	0.0031	0.014	0.010	0.018	0.0026	
L5 phi	0.012	0.016	0.0057	0.0062	0.0024	0.0020	0.0094	0.0070	0.0027	0.0015	
L5 z	0.0082	0.011	0.0038	0.0039	0.0018	0.0015	0.007	0.0054	0.0020	0.0012	

Radiation dose on Electronics

- Max dose accumulated after integrating 10 ab^{-1}

Max. Dose (krad)	0	1	2	3	4	5	Card
Pairs	336	55	55	23.7	7.0	3.2	0.8
RadBhabha	47.7	10.2	12.4	15.3	6.5	1.15	0.5
Touschek HER	46.4	11.6	13.1	6.3	1.76	0.62	0.18
Touschek LER	142	38.0	49.3	23.6	3.9	1.8	0.7
Beam-gas HER (old)	59.3	15.3	17.2	7.74	2.41	0.8	0.26
Beam-gas LER	123	33	41	19	3.5	1.56	0.65
TOTAL	754	163	188	96	25	8	3.1

| TOTAL (old) | 838 | 154 | 182 | 145 | 64.6 | 15 | |

No BeamgasLER

Conclusions

- New geometry with striplets and updated configuration is ready for a test production

- Thicker shielding has a small effect on total rate, 20-30% decrease for BeamgasHER and TouschekLER contributions

- Smaller radiation dose but additional contribution from BeamgasLER. Small variation

- Updated detailed plots will be ready soon

Radiation dose on Electronics

OLD

- Max dose accumulated after integrating 10 ab^{-1}

Max. Dose (krad)	0	1	2	3	4	5
Pairs	442	60	72	81	41	6.8
RadBhabha	81	13	12	19	9	1.7
Touschek HER	57	12	14	7.5	3	1.2
Touschek LER	180	52	64	29	8.2	3.9
Beam-gas HER	78	17	20	8.4	3.4	1.3
TOTAL	838	154	182	145	64.6	15

SVT issues

- Ingredients for estimation of offline occupancy:

    - strip rates on forward region, with 5x safety factor

    - electronics specifications

    - Occupancy should be less than 5%, but it is not easy to fix a threshold because SuperB reconstruction algorithm is not yet finalized

- All the rate should be reduced by 50%

- Beamgas from HER (first 100k evts) similar to Touschek HER

- Beamgas from LER is still missing, hopefully same or less than Touschek from LER

- Outer layers rates (pairs+Touschek): improved geometry (missing magnets, new shields), magnetic fields and collimators should reduce them

- Layer0: still 20% more than May 2011 estimation. No handle to reduce 2photon particles coming directly from IP. Need to check if it could still work when combined with outer layers at low occupancy

Conclusions

- Many progresses in bkg understanding and checks

- Significant amount of work for a more organic report on background rates (track, cluster, strip) plus improved plots for particle fluxes. Easy to use as input for other tests and simulations

- Updated background report including beamgas contribution

- Extended magnetic field affect only rates for outer layers

- Comparison with FastSim

- Significative changes in shield shape between the present production and the previous one

- **Bkg rate for SVT is still pretty high and can create serious problems in reconstruction**

Future plans

- Svt L0 geometry: a new design is ready for L0 with striplets. Some modification to the beampipe and split pipe are possible. Hopefully to be included in the next production

- Strip rate estimation for L0 with 45 degree striplets inside official macro's (Trieste, pending funding for PhD student)

- Svt geometry for outer layers: outer layers are the same as in Babar, but SuperB acceptance is wider. Need symmetric fwd/bwd modules