

Cosmic Ray Trigger Status

Rachid Ayad University of Tabuk

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1) basf2 cosmic Rays simulation to set scintillators size

- 2) Mechanical Frame design
- 3) Overal schedule/plan until cosmic tests on Fall 2017
- 4) Bench Cosmic setup at Tabuk
- 5) Conclusion

Setup (simple)

Basf2 simulation with just VXD





Reminder

 With Cosmics (i.e. Belle default) generator transverse (x) hit distribution on scintillator plane to be much broader w.r.t. longitudinal (z)





Generator validation

- We switched to CRY generator, recently included in basf2
- After some testing we found reasonable settings
- Atan(mcPx/mcPy), Atan(mcPz/mcPy) \rightarrow we fit by a+b*cos(x)+c*cos²(x)





Generator validation

• Effect of change in generator can clearly be seen on the hit distribution on scintillator plane

Cosmics, all tracks Position on the XZ plane of the upper scintillator xzPlane1 X (cm) 48287 Entries 40 6.125 Mean x Mean y 1.154 RMS x 16.72 RMS 14.57 20 25 10 F 20 -10 15 -20 10 Z (cm) Cosmics, nPXD hits>1 Position on the XZ plane of the upper scintillator xzPlane1 X (cm) Entries 4279 40 1.953 Mean x 0.3842 Mean y 8.274 Std Dev x Std Dev y 13.8 12 -20

40

60

Z (cm)

40

CRY, E>2GeV, all tracks



60

Z (cm)



CRY: the 2 GeV cut-off

- E > 2 GeV cut-off is used to remove "soft" component of cosmic rays which results in steeper distribution
- 2 GeV cut is assumed in the following if not otherwise specified





Generator comparison

• 2 GeV Cut has no big effect on efficiency





Fits







Installation height

• Distribution on y-z plane

nPXD_hits>1



All tracks





Installation height

• h = 15, 20, 25, 30, 35 Efficiency vs Z, Positive • nPXDHits > 1 Efficiency 0.1 Efficiency vs X 0.6 Efficiency 0.4 0.8 0.3 0.6 10 20 30 0.4 Efficiency 0.2 0.8 0 10 20 30 40 50 60 X (cm) 0.6 0.2 10 20 30 12





• Similar to what we have done for PXD we can optimize for SVD

VXD

• h = 15, 20, 25, 30, 35 Efficiency vs Z, Positive Efficiency 3.0 Efficiency vs X 0.6 Efficiency 0.4 0.8 0.2 0.6 0 10 20 30 50 60 40 Z (cm) Efficiency vs Z, Negative 0.4 Efficiency 0.2 0.8 20 30 40 50 10 60 X (cm) 0.6 0.4 0.2 0 10 20 30 40 50 60 Z (cm)

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Frame Design(for B1 room)



Overall Plan

Task	2016									2017										2018									
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
Simulation																													
Design																													
Mechanics																													
PMs																													
Scintillators																													
Electronics																													
Assembly Tabuk																													
Tests Tabuk																													
Shipped to KEK																													
Tests at KEK																													
Analysis Code																													
Data Analysis																													
Publish																													

Cosmic Setup at Tabuk (Final Setup)



Shelf to mount Scintillator 1 Shelf to mount Alibava Tracker Plane 1 Shelf to mount the PXD module Shelf to mount Alibava Tracker Plane 2 Shelf to mount Scintillator 2 Shelf to mount Alibava Trigger Card (TC)

A more developed frame with Micro-step moving table will be built by ALIBAVA

A shelf with Alibava Plane detector installed

Coincidence on two Alibava Planes with Beta source





Trigger: Two scintillators

A 10cmx1cmx0.5cm scintillator two crossed scints so a 1x1cm^2 cross section to match the Alibava Tracker sensible area



Scintillators coincidence: Muon





PXD testing setup available at Tabuk (PXD module cured at MPI from cooling leak)

Slow Control powering ASICs and DEPFET

SC (PSs) program works fine and stab

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HMP40401	COM14	-	DEPFET Voltages okayl				med Inchester								
GHI GLo CHI CLo		COM5	-	opened			C			EDCET	when monocompany				
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Source Dr	COMIC	-	hereace			STO	P	wei Low	UEFFE	Swechweight					
PolyCover HV		COMI	2 -	- Switcher		ar v2 volatages ok			ower Dov	in digtal					
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DCD VDDD	1.8	0.800	1.800	0.3	1	ClearLow	19.0	0.050	19.000	0	1105 2 104				
DCD VDDA	1.9	0.900	1.900	0.3	4	ClearHigh	22.0	0.050	22 000	01	and the American Ref.				
DCD Refin	1.2	0.300	1.200	0.3		GateLow	6 45	0.050	6 450	0	0340 0340				
DCD AmpLow	1.5	0 600	1.500	01		GateHigh	3.0	0.050	3.000	0.3	DCD V000 0340 0340				
DHP VDDD	1.8	0.250	1.800	0.4		ClearGate	2.0	0.012	0002.0	0	0 150 0 150 0 190				
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All items in the Rack including the PC





Outlook

- New generator shows good performance, strange x-z asymmetry has disappeared.
- Huge effect from installation height → nearing scintillator planes, even few cm, would significantly increase efficiency
- Segmenting scitillators? As we need them collected at the cemtral the central region ...
- We are now at work to implement the segmented geometry → it is important to agree about installation height to test the effect of spacing. This will be showed in next B2GM to close this issue and design the frame at MPP.



Backups















Generator comparison

- Generator change has no big effect on efficiency as f(x)
- Slower rise on z

