Efficiency of SVD in phase-II

SVD general meeting

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Software

- **hlt_mumu_2trk** skim raw data used from KEKCC(/ghi/fs01/belle2/bdata/Data/release-02-00-01/DB00000425/prod00000005/e0003/4S/r*/all/raw/sub00/raw.physics.hlt_mumu_2trk*)
- **hlt_bhabha** skim raw data used from KEKCC(/ghi/fs01/belle2/bdata/Data/release-02-00-01/DB00000425/prod00000005/e0003/4S/r*/all/raw/sub00/raw.physics.hlt_bhabha*)
- The runs without SVD were excluded from analysis
- Details of skim discussed here `https://confluence.desy.de/display/BI/Experiment+3+skims`
- DR2 dimuon sample used as MC sample
- Release used to analysis is **/cvmfs/belle.cern.ch/sl6/releases/releases-02-00-01**

Further Selection criteria applied

For dimuon

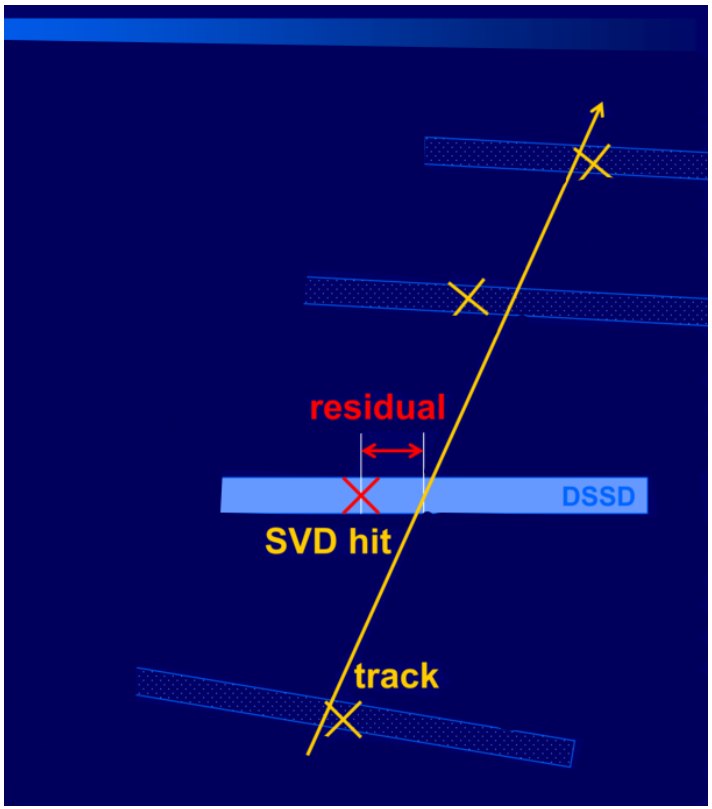
- # of tracks=2
- $35^\circ < \theta < 125^\circ$
- acollinearity$< 10^\circ$
- 0 GeV$<$EClenergy$<$ 0.7GeV
- $|d_0|<$ 2 cm and $|z_0|<$ 4 cm

For Bhabha

- # of tracks=2
- acollinearity$< 10^\circ$
- Momentum of each of two tracks $>$ 3GeV
- $|d_0|<$ 2 cm and $|z_0|<$ 4 cm

Finding residual

- Fit track without the clusters of a layer for which residual wish to calculate(to remove biasness)
- **Residual = (SVD_Cluster_position − SVD_Intercept_position)** where SVD_Intercept_position is position of extrapolation of track to SVD



Residual plot and efficiency

1) Loop on SVD_Intercepts
2) Continue the loop if it does not satisfy following criteria
   => the intercept is within 10 strips from sensor edge
   => the intercept having at least one pxd hit and at least two svd hits

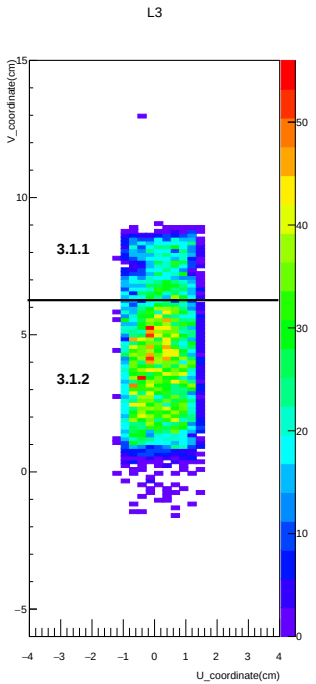
   i) Loop on all the clusters(which are inside ROIs) in the event and
      - > If layer, ladder, sensor matches with SVD_Intercept then residual calculated as **Residual = (SVD_Cluster_position − SVD_Intercept_position)**
      - > For multiple clusters on same sensor, same side(U/V) that cluster is taken as an entry of residual plot for which residual is minimum

- Efficiency$=\frac{\#\text{ of cluster within } \pm 0.05cm \text{ in residual plot}}{\#\text{ of intercepts}}$

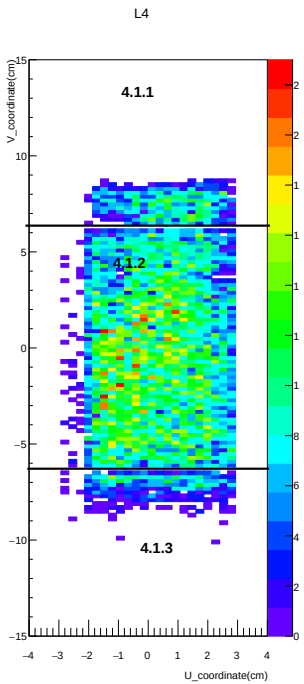
N.B: size of roi is 2.5x2.5 cm^2

Intercept V_coordinate vs U_coordinate

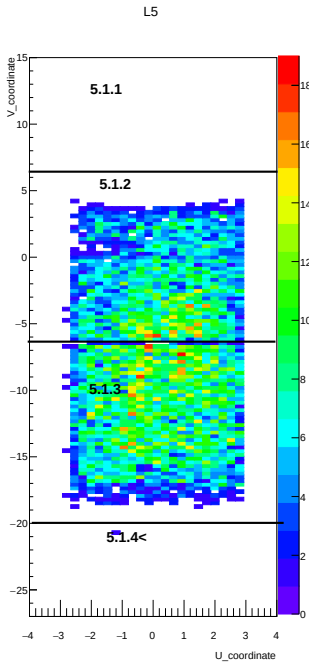
For dimuon data



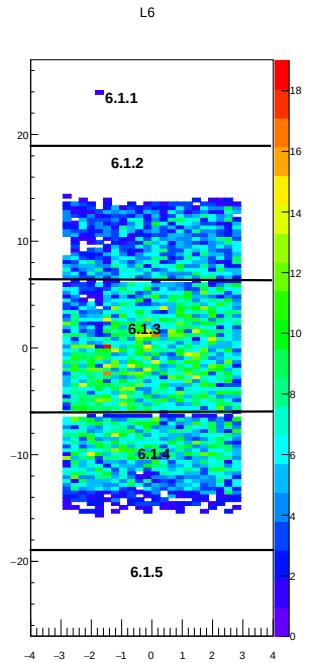
L3



L4



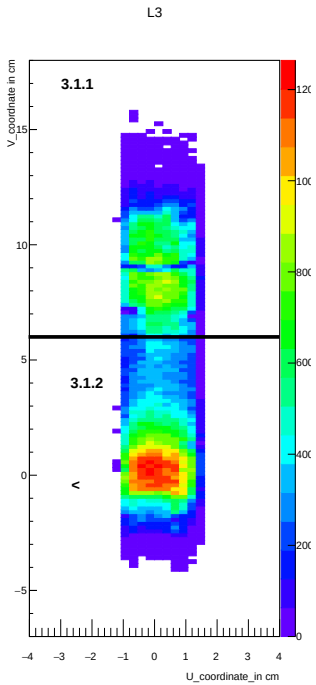
L5



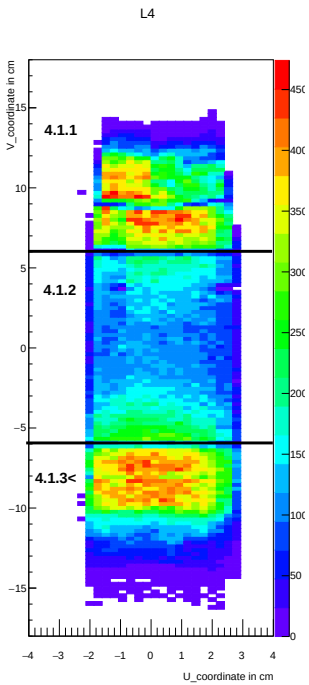
L6

Intercept V_coordinate vs U_coordinate

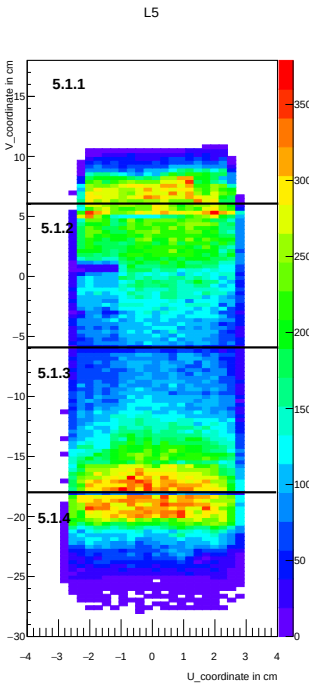
For Bhabha data



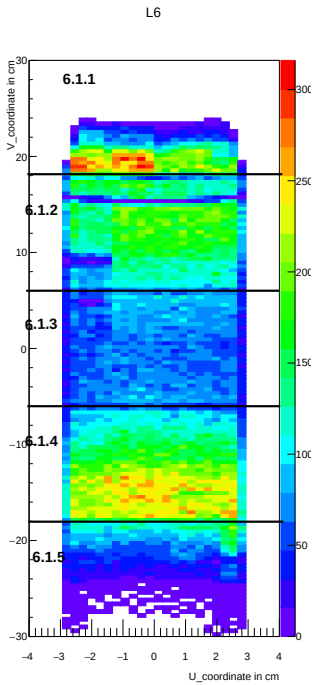
L3



L4



L5

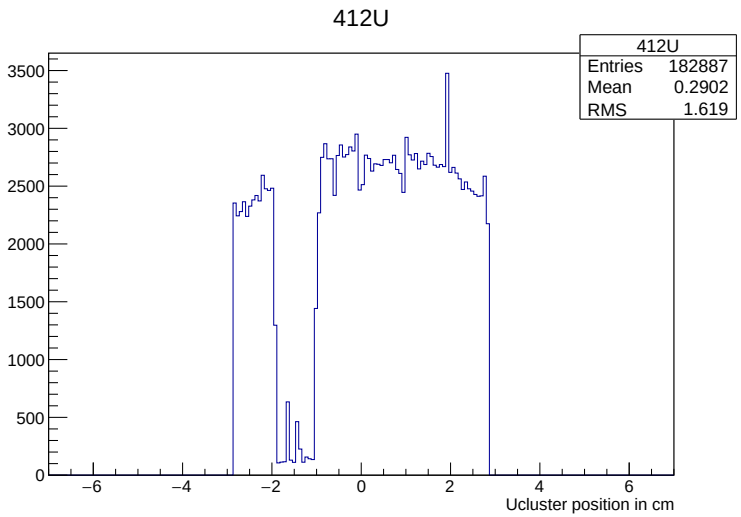


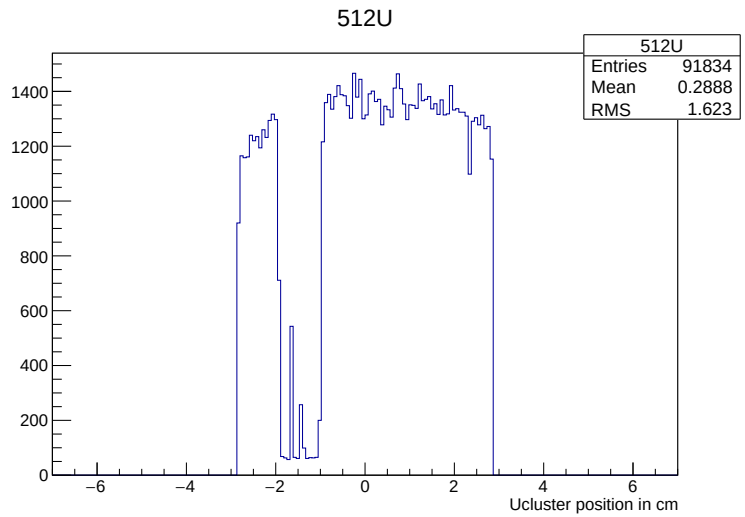
L6

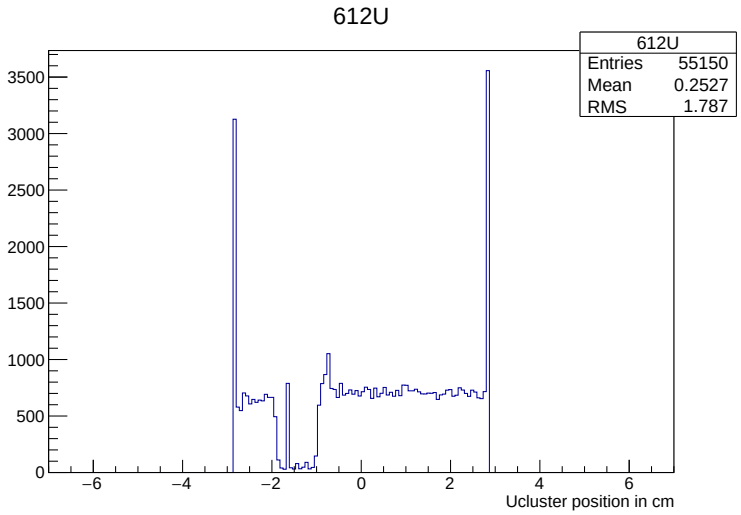
Layer Ladder sensor side	Efficiency for				
	MC dimuon	Data dimuon		Data bhabha	
			modified		modified
311U	0.9971	0.9860		0.9911	
311V	0.9978	0.9973		0.9960	
312U	0.9978	0.9885		0.9911	
312V	0.9985	0.9905		0.9916	
411V	0.9990	0.9986		0.9952	
412U	0.9992	0.7909	0.9930	0.8076	0.9850
412V	0.9991	0.9738		0.9749	
413U	0.9995	0.9919		0.9954	
413V	0.9993	1.0		0.9961	
511V	–	–		0.9803	
512U	0.9995	0.8493	0.9877	0.8466	0.9913
512V	0.9989	0.9931		0.9826	

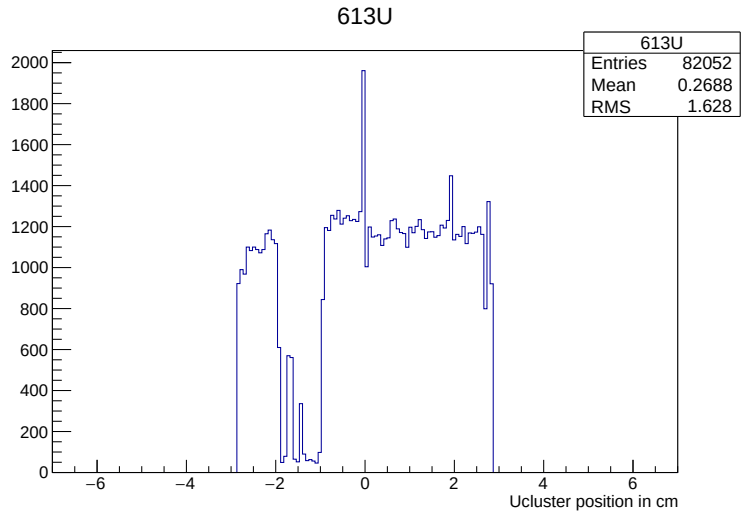
Layer Ladder sensor side	Efficiency for				
	MC dimuon	Data dimuon		Data bhabha	
			modified		modified
513U	0.9994	0.9828		0.9851	
513V	0.9993	0.9402		0.9582	
514U	–	–		0.9982	
514V	–	–		0.9952	
611V	–	–		0.9960	
612U	0.9994	0.8671	0.9943	0.8529	0.9961
612V	0.9991	0.9876		0.9813	
613U	0.9996	0.8287	0.9877	0.8323	0.9872
613V	0.9995	0.9936		0.9935	
614U	0.9996	0.9836		0.9818	
614V	0.9995	0.9902		0.9854	
615U	–	–		0.9972	
615V	–	–		0.9949	

Cluster position distribution









Recalculating efficiency for above sensors

- For above sensors one APV was masked for most of runs. That's why I have recalculated efficiency excluding intercepts having 108<u_stripID<276.

Conclusion

- Without any apparent reason 513V has very low resolution
- Works going on to extract spatial resolution using phase-II data