ISL: R-ϕ Cluster Model

Simple Cluster Model:

The cluster size, $\mathbf{N_{cl}}$, is generated at random with a **gaussian distribution** with mean, **<Ncl>**, computed as follows:

$$\langle N_{cl}\rangle = x/p + 1.5,$$

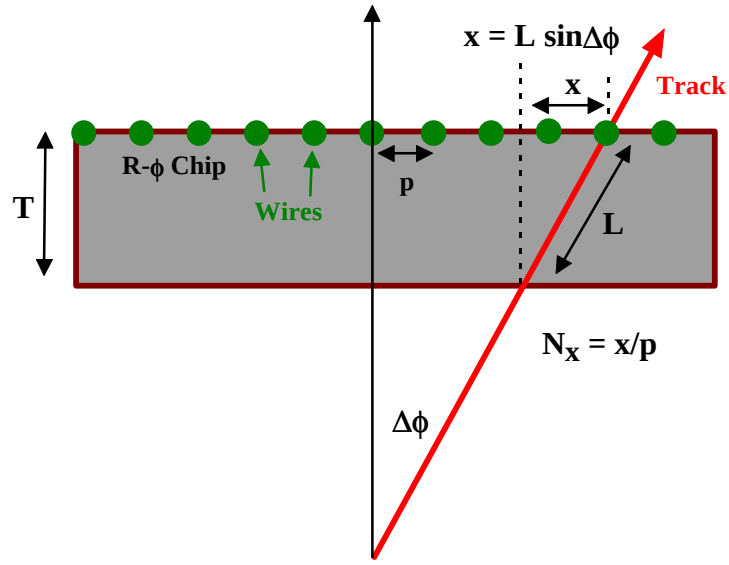
where **x** is the x-component of the track length **L** (**x = Lsin$\Delta\phi$**) and **p is the pitch** (**1/p is the density of wires**). The standard deviation , σ, is given by

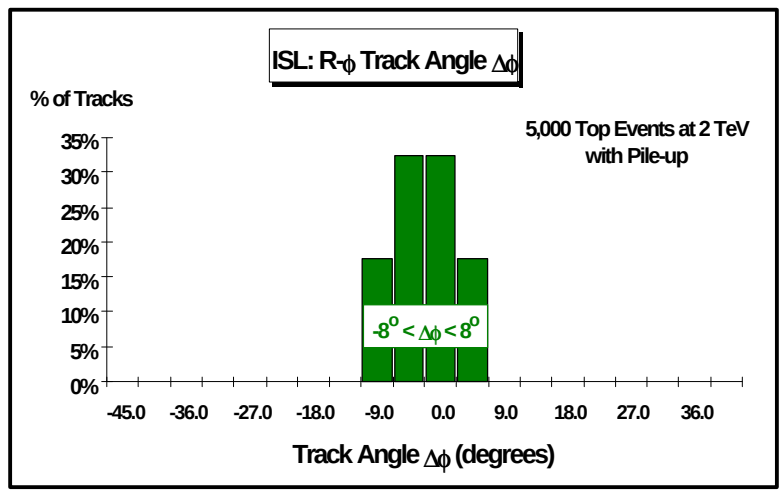
$\sigma = f_\sigma\, \sigma_0$, where $\sigma_0 = 0.8$.

The factor

$$f_\sigma = (x/p+1)Q_0/Q,$$

where **Q** is the amount of charge produced by the track (**Q** = λ**L**) and $\mathbf{Q_0} = \lambda\mathbf{T}$ (**1/f is the amount of charge per wire divided by Q_0**).





"Hits" per Track:

The number of "hits" per **t**rack is given by

$$N_{hit} = N_{cl} + NN + N_{over}$$

where **NN = 2** for **nearest neighbor** (**one on each side of the cluster**) and where the **overhead** is

$$N_{over} = 1 \text{ (no noise)}$$

$$N_{over} = 1 + 6 = 7 \text{ (with noise of 2 per chip + NN).}$$

ISL: Average R-ϕ Cluster Size

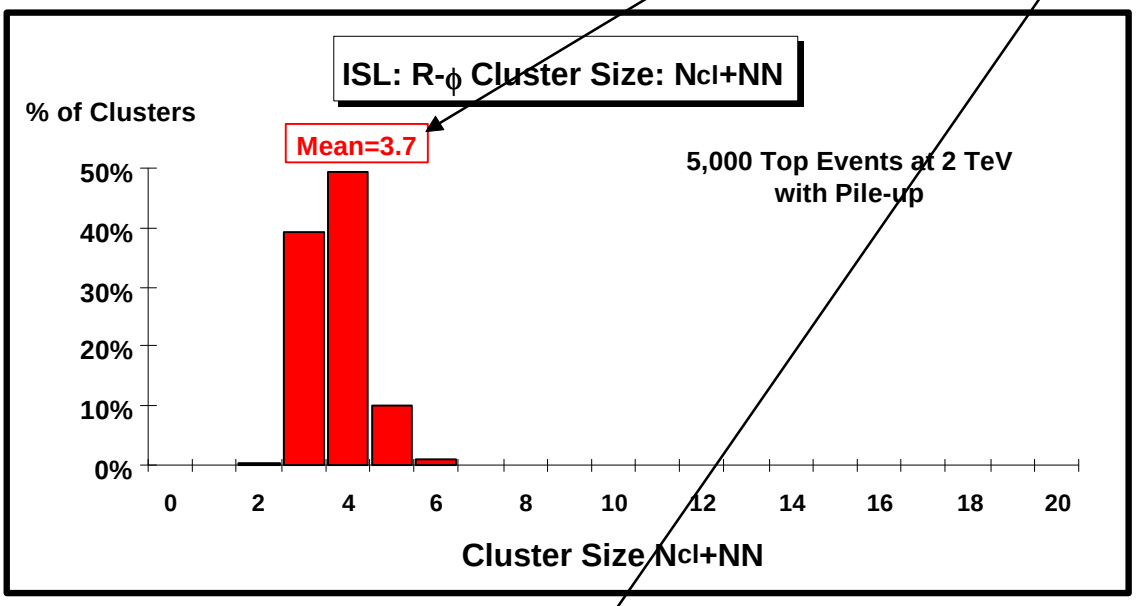
5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):

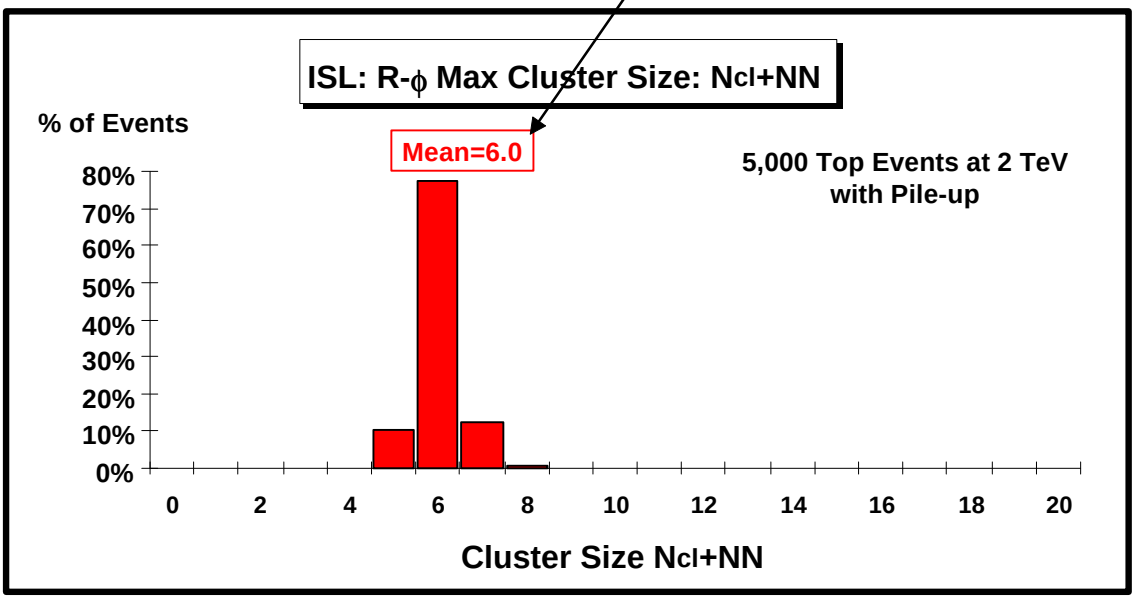
ISL		Average R-ϕ Cluster: Ncl+NN				5,000 Top + <3>MB				
iz = 1	2	3	4	5	6	7	8	9	10	all
		3.7	3.7			3.7	3.7			
				3.8	3.7					
3.7	3.7							3.7	3.7	

3.7

ISL		Average Max R-ϕ Cluster: Ncl+NN				5,000 Top + <3>MB				
iz = 1	2	3	4	5	6	7	8	9	10	all
		4.7	5.1			5.1	4.7			
				5.2	5.2					
4.3	4.8							4.7	4.3	

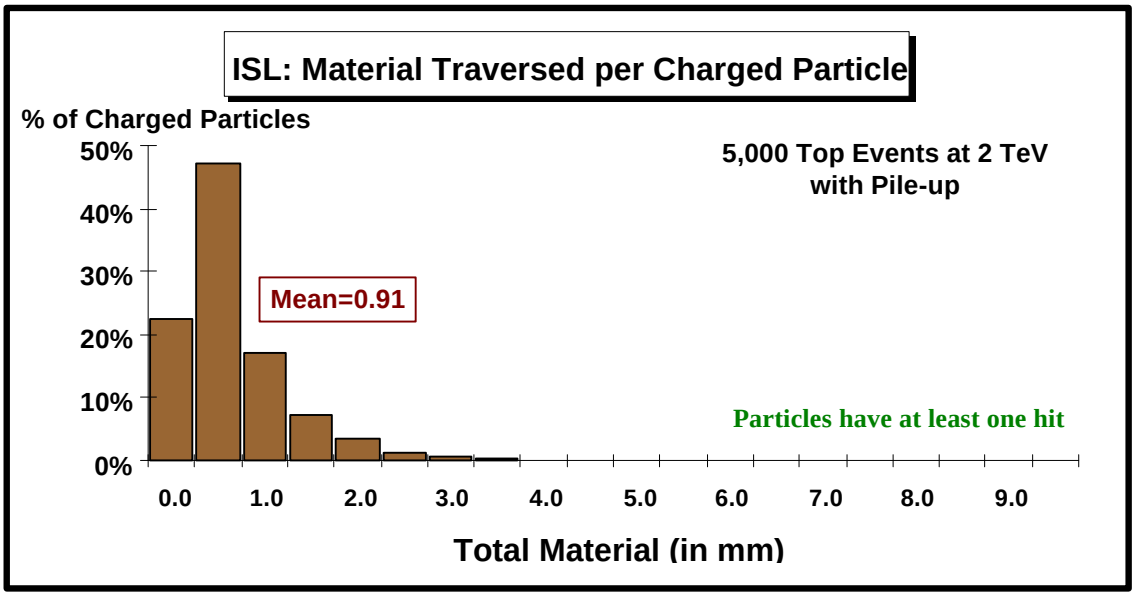
6.0



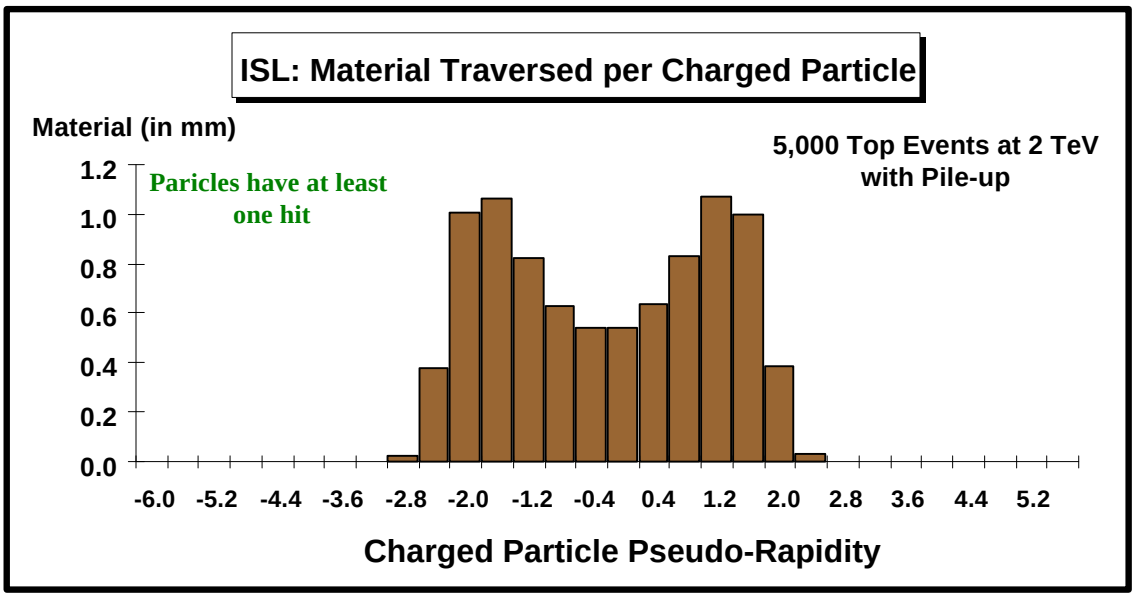


ISL: Material Traversed

5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):

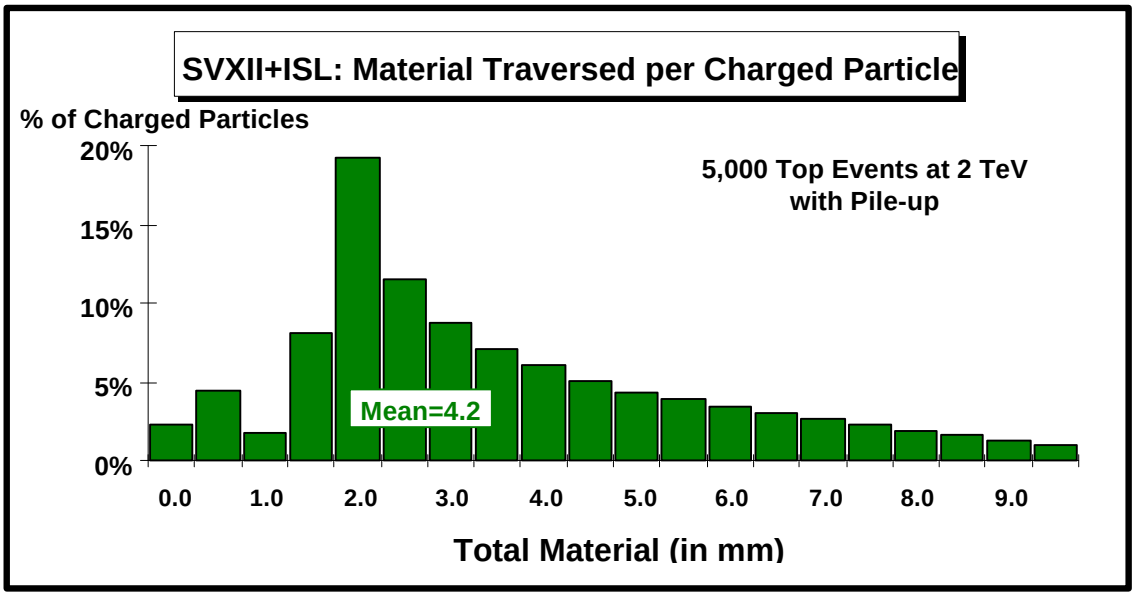


5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):

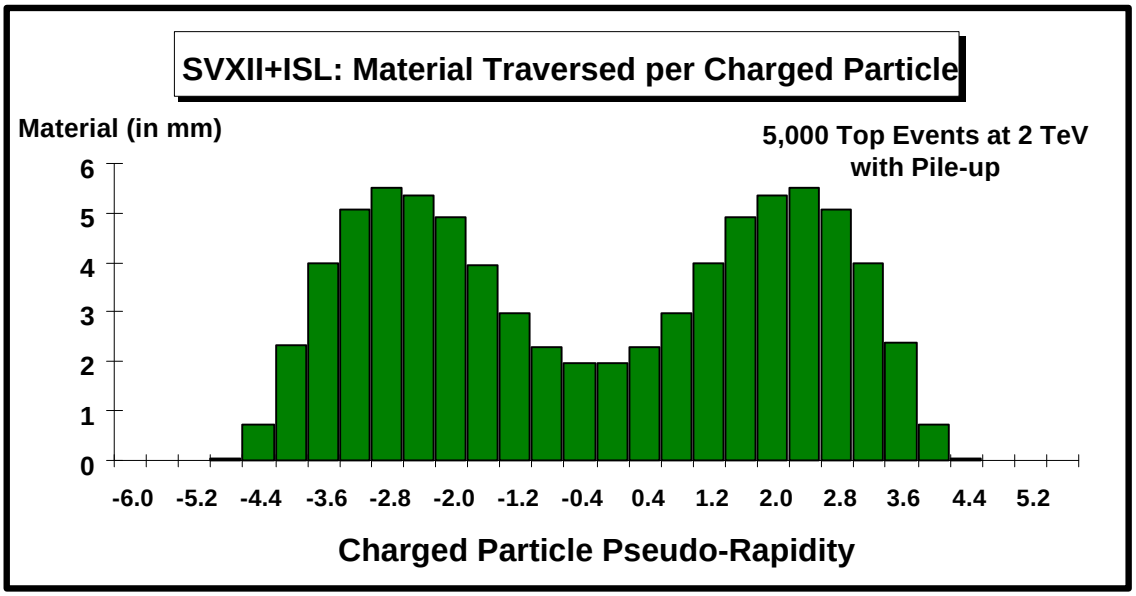


SVXII+ISL: Material Traversed

5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_Z=30 cm):

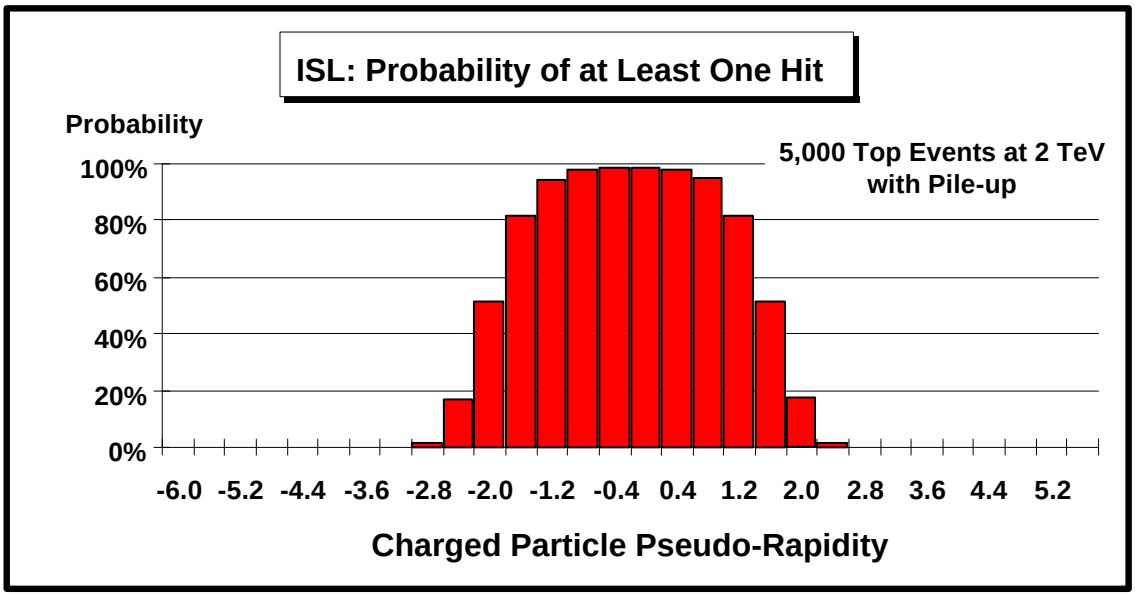


5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_Z=30 cm):

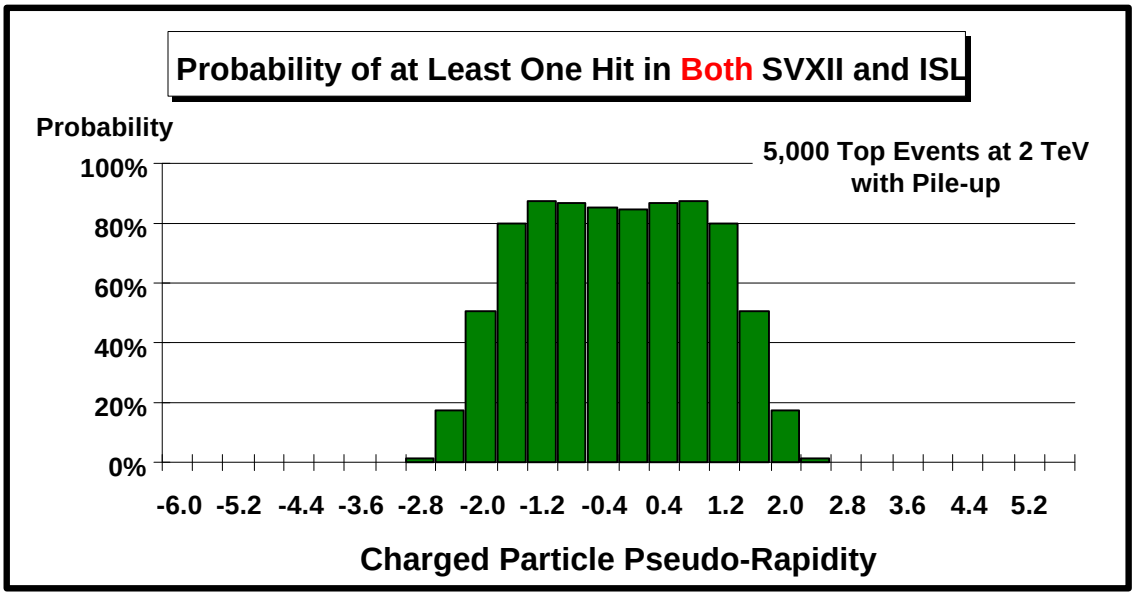


ISL: Geometric Acceptance

5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):

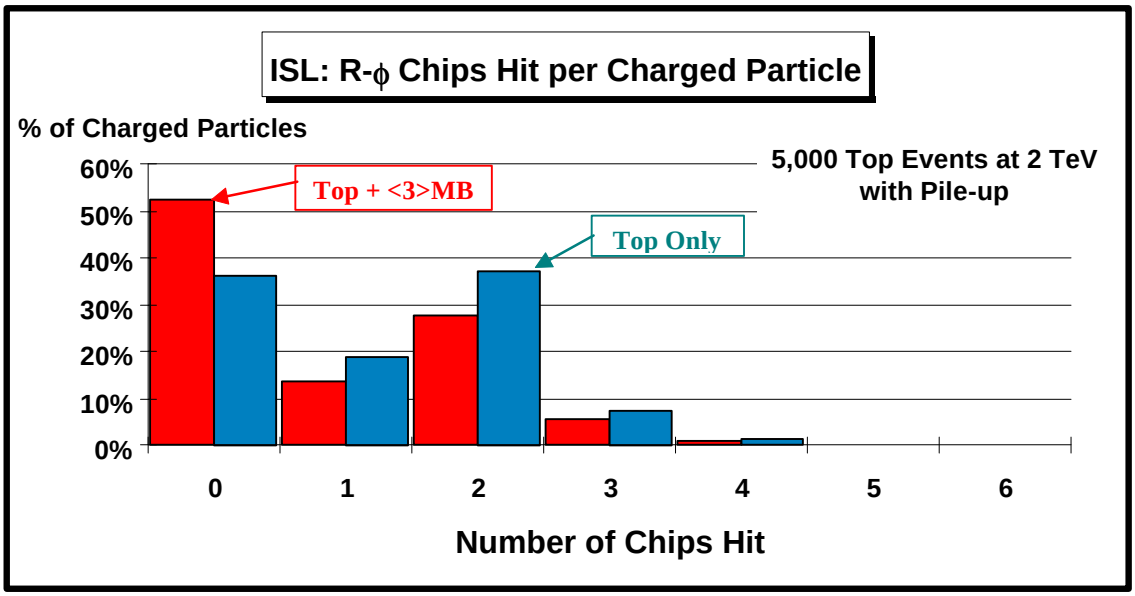


5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):

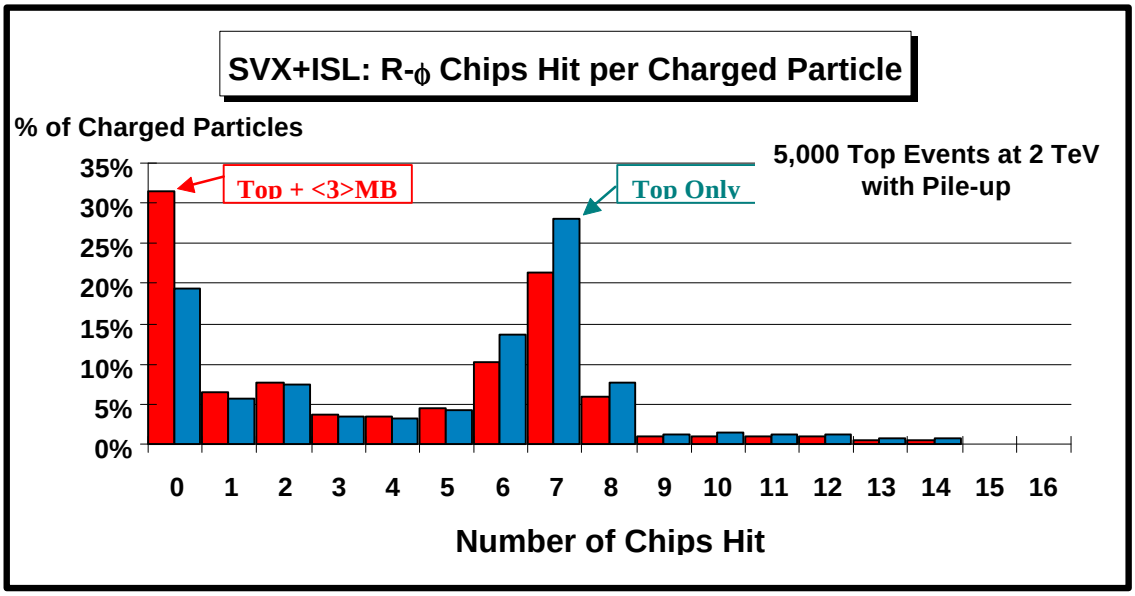


ISL: R-ϕ Chips Hit per Charged Particle

5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):



5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):



ISL: R-ϕ Chip with Maximum Hits

One Event at 2 TeV (Event #1):

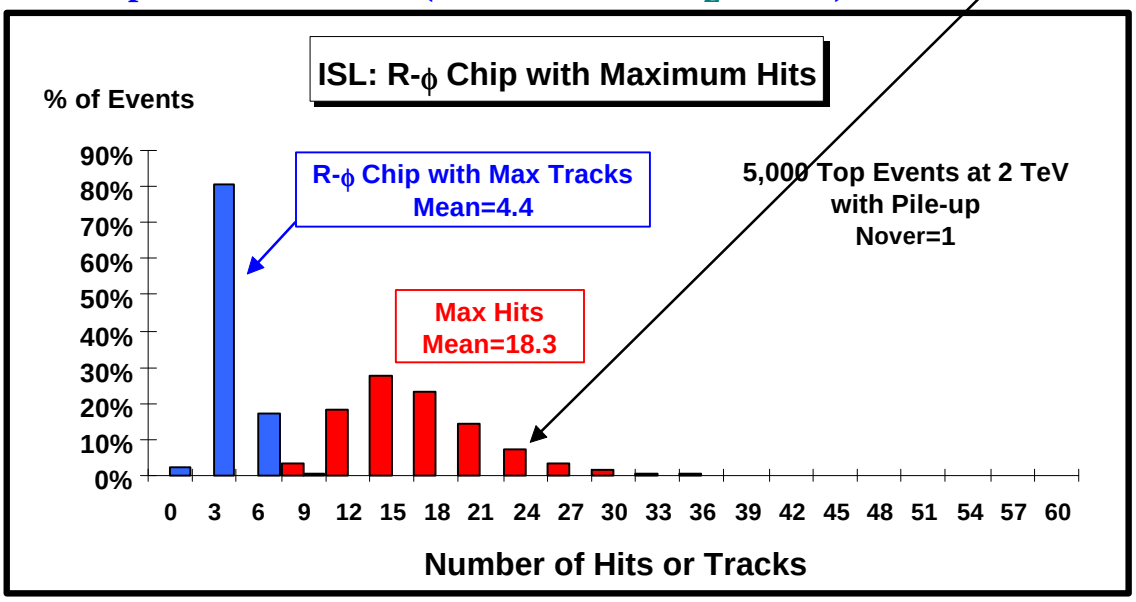
Reaction:	Top	Min-Bias	Min-Bias	Min-Bias	Min-Bias	Min-Bias
Z(int):	28.87	-30.42	21.9	-19.93	17.3	-73.45

ISL		Maximum R-Phi Chip Tracks				Event #1				
iz = 1	2	3	4	5	6	7	8	9	10	all
1	3	3	6	2	4	4	4	2	1	
										6

ISL		Maximum R-Phi Cluster: Ncl+NN				Event #1				
iz = 1	2	3	4	5	6	7	8	9	10	all
5	5	5	5	5	5	6	5	5	4	
										6

ISL		Maximum R-Phi Chip Hits				Event #1				
iz = 1	2	3	4	5	6	7	8	9	10	all
6	13	14	24	9	15	17	16	9	5	
										24

5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):



ISL: Average Maximum R-ϕ Chip

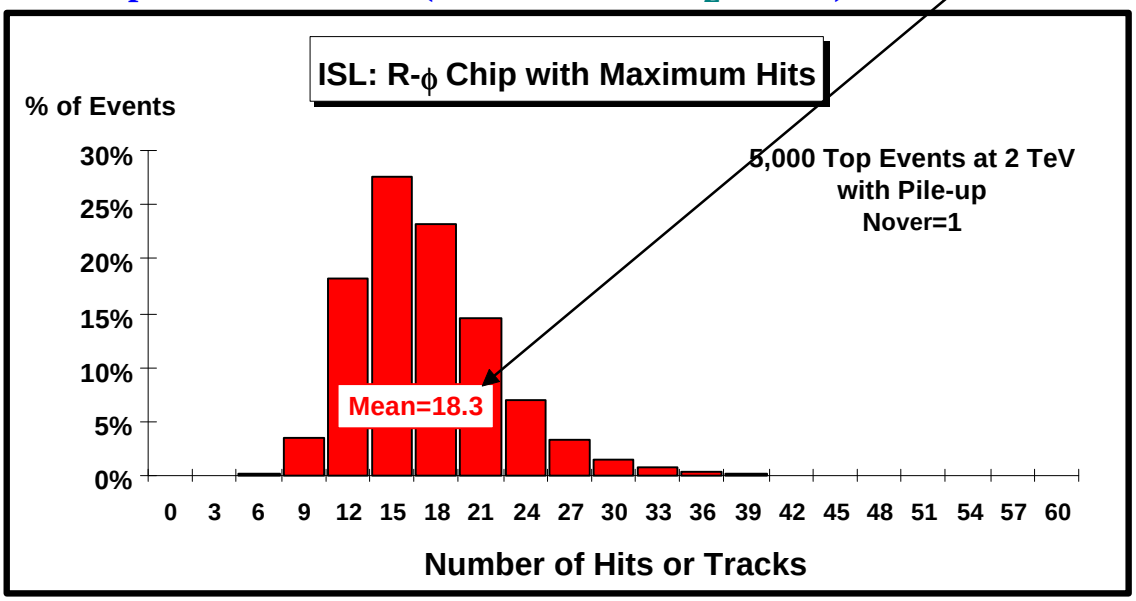
5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):

ISL		Average Max R-Phi Chip Tracks						5,000 Top + <3>MB		
iz = 1	2	3	4	5	6	7	8	9	10	all
		2.2	2.8			2.8	2.1			
				2,83	2.8					
1.6	2.0							2.0	1.6	
										4.4

ISL		Average Max R-ϕ Cluster: Ncl+NN						5,000 Top + <3>MB		
iz = 1	2	3	4	5	6	7	8	9	10	all
		4.7	5.1			5.1	4.7			
				5.2	5.2					
4.3	4.8							4.7	4.3	
										6.0

ISL		Average Max R-Phi Chip Hits						5,000 Top + <3>MB		
iz = 1	2	3	4	5	6	7	8	9	10	all
		9.5	11.9			11.7	9.2			
				12.0	11.9					
7.1	8.9							8.8	7.1	
										18.3

5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):



ISL: R-ϕ Chip with Maximum Occupation

One Event at 2 TeV (Event #1):

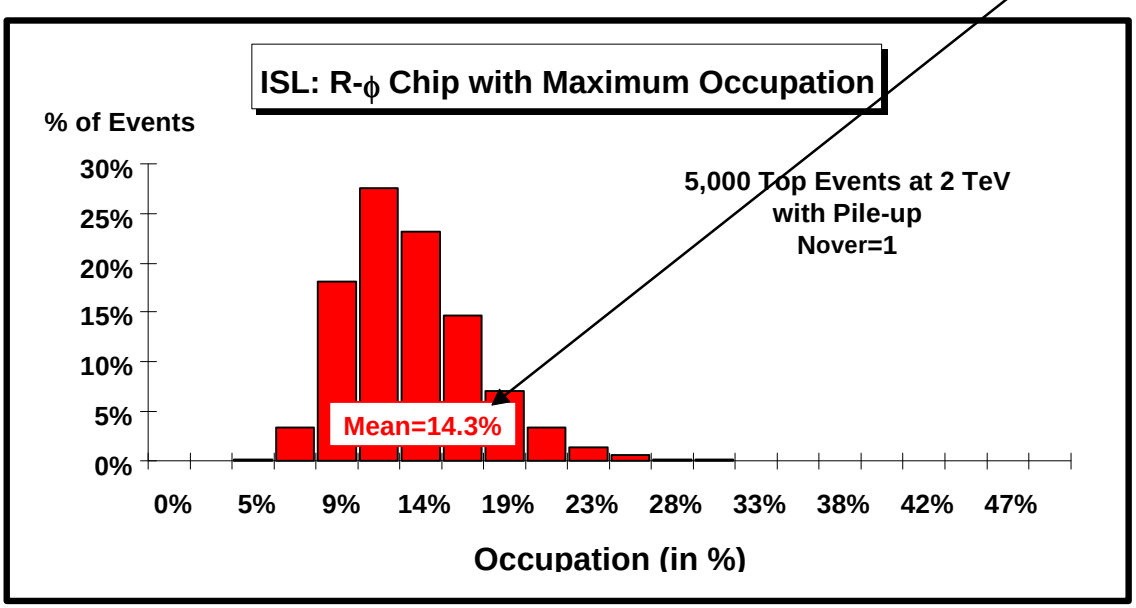
Reaction:	Top	Min-Bias	Min-Bias	Min-Bias	Min-Bias	Min-Bias
Z(int):	28.87	-30.42	21.9	-19.93	17.3	-73.45

ISL		Maximum R-ϕ Chip Occupancy				Event #1				
iz = 1	2	3	4	5	6	7	8	9	10	all
		10.9%	18.8%			13.3%	12.5%			
				7.0%	11.7%					
4.7%	10.2%							7.0%	3.9%	
										18.8%

5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):

ISL		Average Max R-ϕ Chip Hits				5,000 Top + <3>MB				
iz = 1	2	3	4	5	6	7	8	9	10	all
		9.5	11.9			11.7	9.2			
				12.0	11.9					
7.1	8.9							8.8	7.1	
										18.3

ISL		Average Max R-ϕ Chip Occupancy				5,000 Top + <3>MB				
iz = 1	2	3	4	5	6	7	8	9	10	all
		7.4%	9.3%			9.1%	7.2%			
				9.4%	9.3%					
5.5%	7.0%							6.8%	5.5%	
										14.3%



ISL: Number of Pathway Hits

One Event at 2 TeV (Event #1):

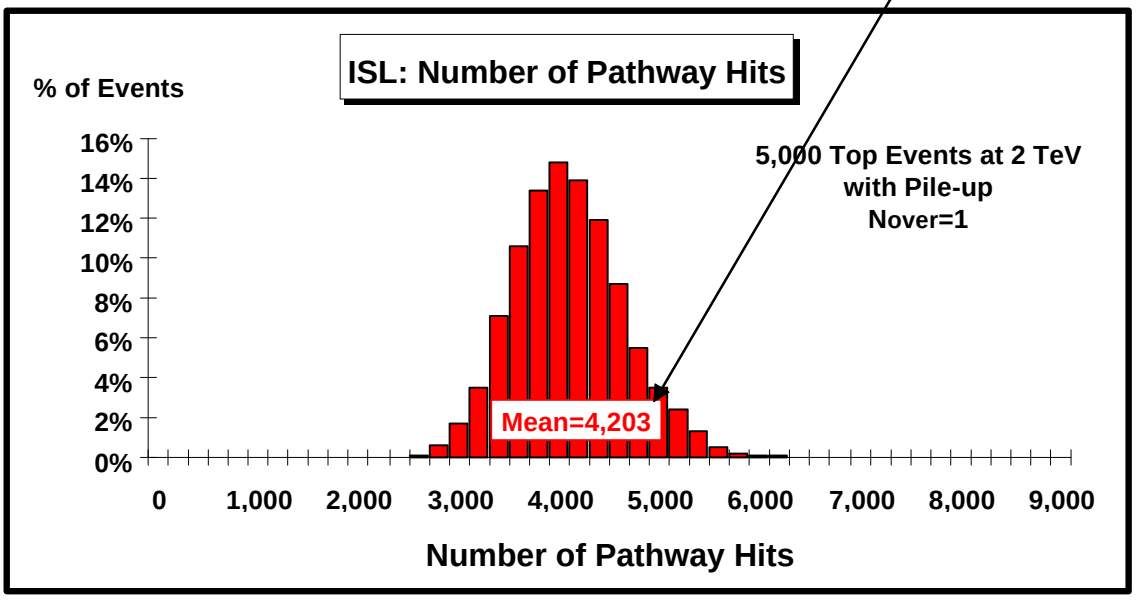
Reaction:	Top	Min-Bias	Min-Bias	Min-Bias	Min-Bias	Min-Bias
Z(int):	28.87	-30.42	21.9	-19.93	17.3	-73.45

ISL		Number of Pathway Hits				Event #1				
iz = 1	2	3	4	5	6	7	8	9	10	sum
		359	419			605	421			
				498	552					
405	490							576	367	
										4,692

5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):

ISL		Averate Total Pathway Hits				5,000 Top + <3>MB				
iz = 1	2	3	4	5	6	7	8	9	10	all
		350	431			427	346			
				487	485					
390	451							448	388	
										4,203

ISL		Average Pathway Occupancy				5,000 Top + <3>MB				
iz = 1	2	3	4	5	6	7	8	9	10	all
		1.4%	1.8%			1.7%	1.4%			
				1.7%	1.7%					
1.1%	1.2%							1.2%	1.1%	
										1.4%



ISL: Pathway with Maximum Hits

One Event at 2 TeV (Event #1):

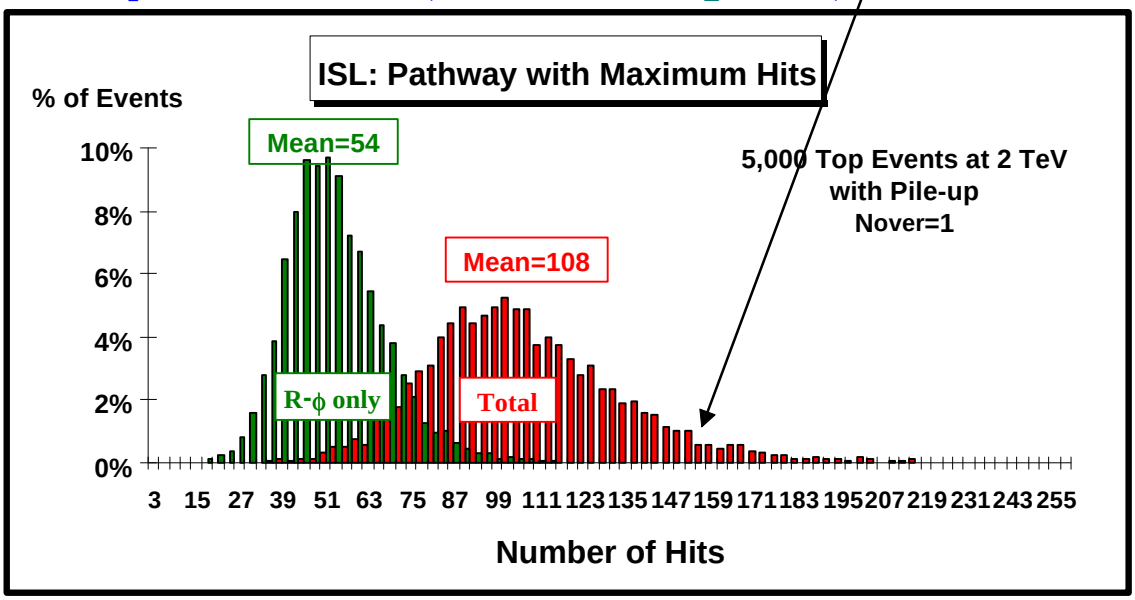
Reaction:	Top	Min-Bias	Min-Bias	Min-Bias	Min-Bias	Min-Bias
Z(int):	28.87	-30.42	21.9	-19.93	17.3	-73.45

ISL		Maximum Pathway Hits				Event #1				
iz = 1	2	3	4	5	6	7	8	9	10	all
40	51	54	93	76	93	152	57	54	38	
										152

ISL		Max Path Hits (R-ϕ only)				Event #1				
iz = 1	2	3	4	5	6	7	8	9	10	all
20	26	27	47	38	46	77	30	28	19	
										77

ISL		Maximum Pathway Occupancy				Event #1				
iz = 1	2	3	4	5	6	7	8	9	10	all
2.0%	2.5%	2.6%	4.5%	3.7%	4.5%	7.4%	2.8%	2.6%	1.9%	
										7.4%

5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):



ISL: Average Maximum Pathway

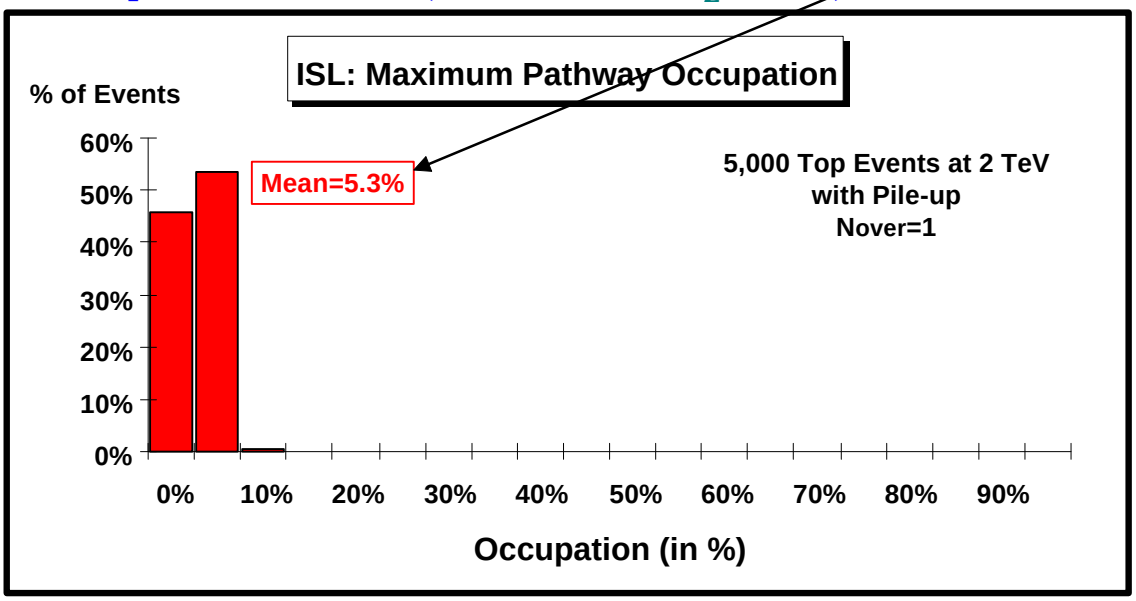
5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):

ISL		Average Maximum Pathway Hits				5,000 Top + <3>MB				
iz = 1	2	3	4	5	6	7	8	9	10	all
40	51	54	69	71	70	68	53	49	40	
										108

ISL		Average Max Path Hits (R-ϕ only)				5,000 Top + <3>MB				
iz = 1	2	3	4	5	6	7	8	9	10	all
20	25	27	35	35	35	34	26	25	20	
										54

ISL		Average Max Pathway Occupancy				5,000 Top + <3>MB				
iz = 1	2	3	4	5	6	7	8	9	10	all
1.9%	2.5%	2.6%	3.4%	3.4%	3.4%	3.3%	2.6%	2.4%	1.9%	
										5.3%

5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):



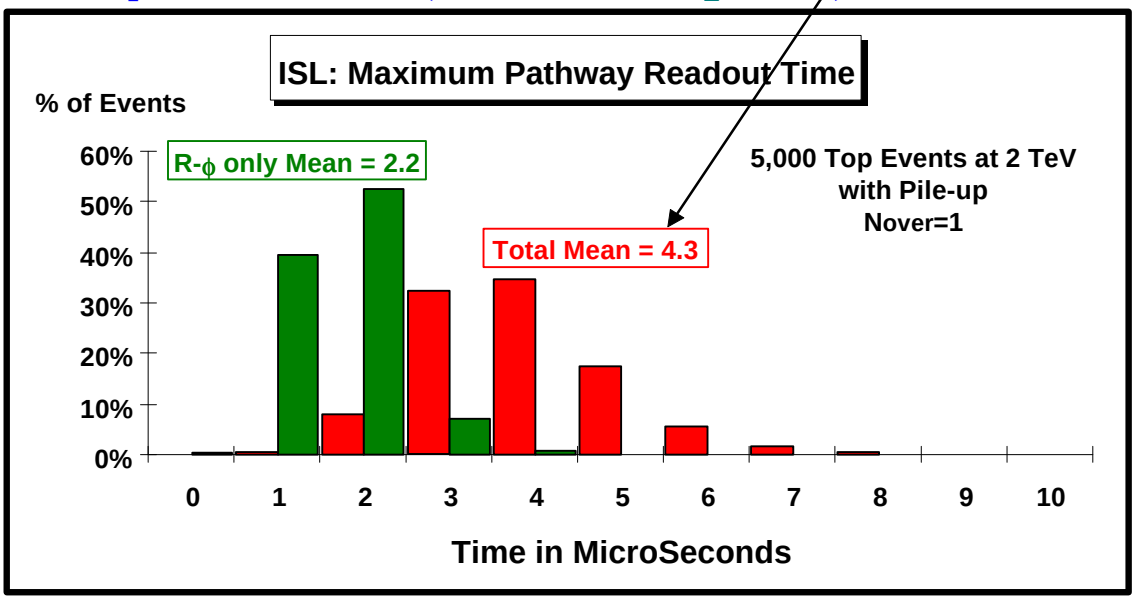
ISL: Maximum Readout Time

5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):

ISL		Ave Max Readout Time (μs)				5,000 Top + <3>MB				
iz = 1	2	3	4	5	6	7	8	9	10	all
		2.1	2.8			2.7	2.1			
				2.8	2.8					
1.6	2.0							2.0	1.6	
										4.3

ISL		Ave Max Readout Time (R-ϕ only)				5,000 Top + <3>MB				
iz = 1	2	3	4	5	6	7	8	9	10	all
		1.1	1.4			1.4	1.1			
				1.4	1.4					
0.8	1.0							1.0	0.8	
										2.2

5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):



ISL: Average Max Pathway (with noise)

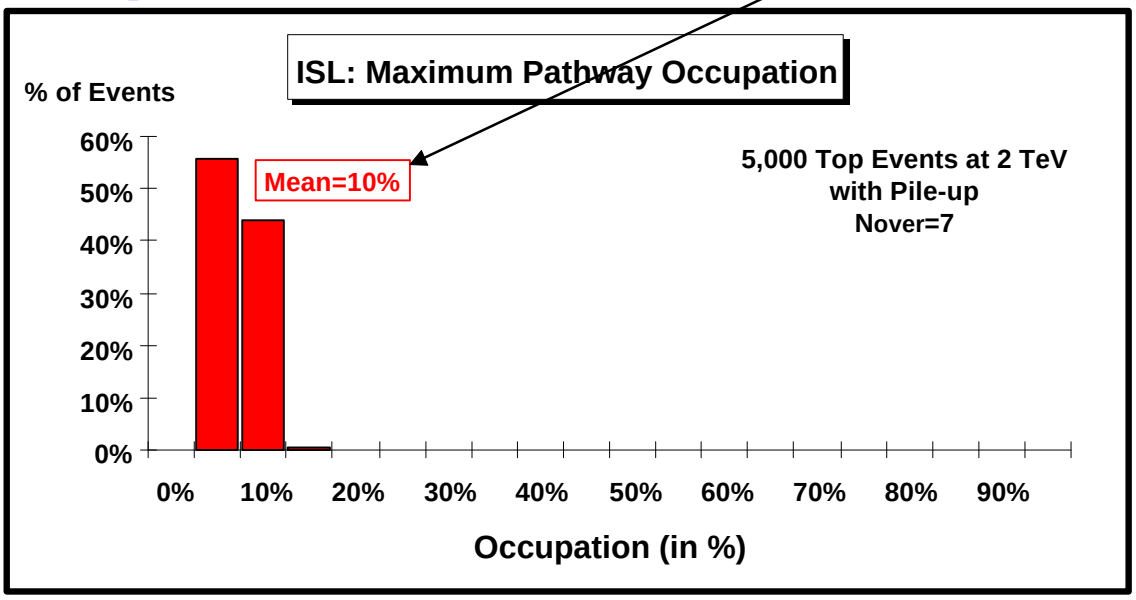
5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):

ISL		Ave Max Pathway Hits (Nover=6+1)				5,000 Top + <3>MB				
iz = 1	2	3	4	5	6	7	8	9	10	all
		150	165			164	149			
				167	166					
136	147							145	136	
										204

ISL		Average Max Path Hits (R-ϕ only)				5,000 Top + <3>MB				
iz = 1	2	3	4	5	6	7	8	9	10	all
		75	83			82	74			
				83	83					
68	73							73	68	
										102

ISL		Ave Max Path Occupancy (Nover=6+1)				5,000 Top + <3>MB				
iz = 1	2	3	4	5	6	7	8	9	10	all
		7.3%	8.1%			8.0%	7.3%			
				8.1%	8.1%					
6.6%	7.2%							7.1%	6.6%	
										10.0%

5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):



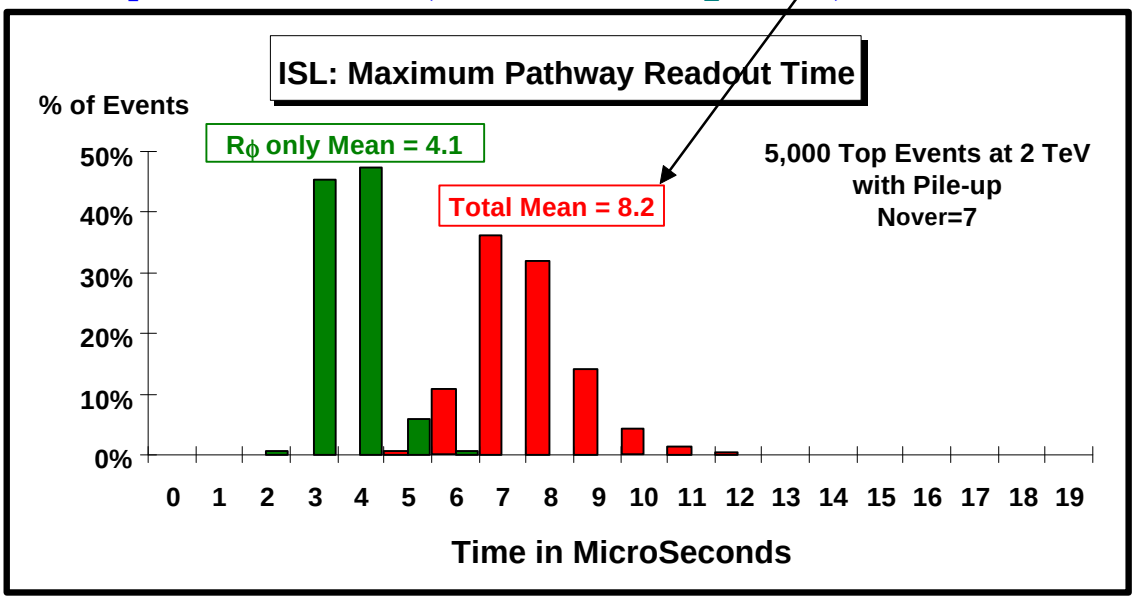
SVXII: Max Readout Time (with noise)

5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):

ISL Ave Max Readout Time (μs) Nover =6+1 5,000 Top + <3>MB										
iz = 1	2	3	4	5	6	7	8	9	10	all
		6.0	6.6			6.6	5.9			
				6.7	6.6					
5.4	5.9							5.8	5.4	
										8.2

ISL Ave Max Readout Time (R-ϕ only, Nover=6+1) 5,000 Top + <3>MB										
iz = 1	2	3	4	5	6	7	8	9	10	all
		3.0	3.3			3.3	3.0			
				3.3	3.3					
2.7	2.9							2.9	2.7	
										4.1

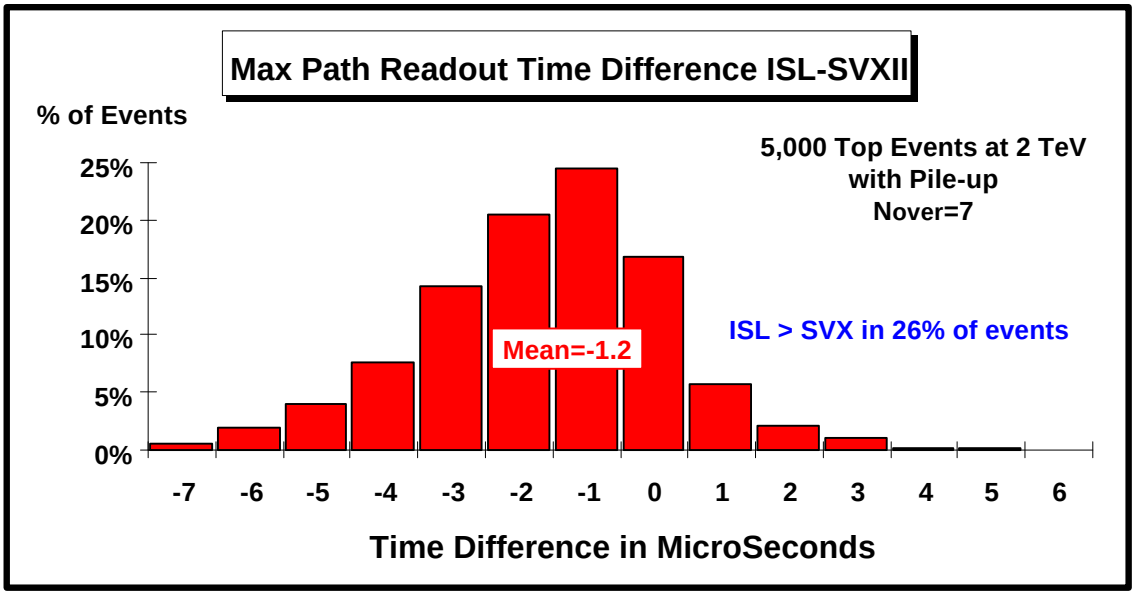
5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):



ISL: Readout Time Comparisons

Maxium Readout Time (event by event) SVXII versus ISL

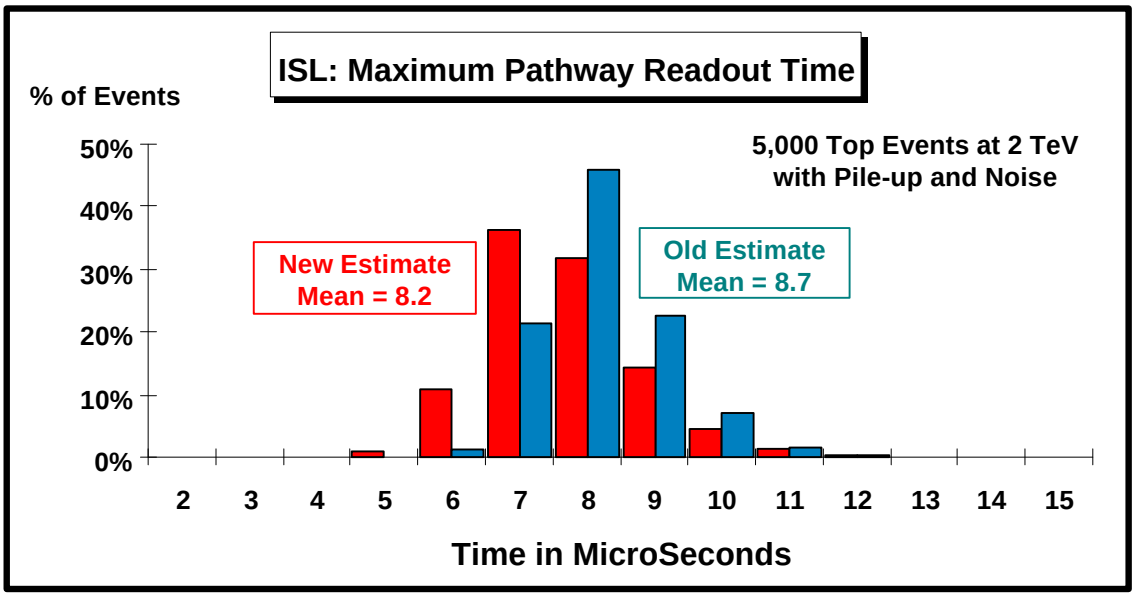
5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):



Comparison with "Super-Naive" Prediction

Last Time: $N_{hit} = 3(1+2+1) = 12$ **(old estimate)**

Now: $N_{hit} = N_{cl} + NN + 6 + 1$ **with** $\langle N_{cl} + NN \rangle = 3.7$

$\langle N_{hit} \rangle = 10.7$ **(new estimate)**

5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_z=30 cm):