ISL: R-ϕ Cluster Model

Simple Cluster Model:

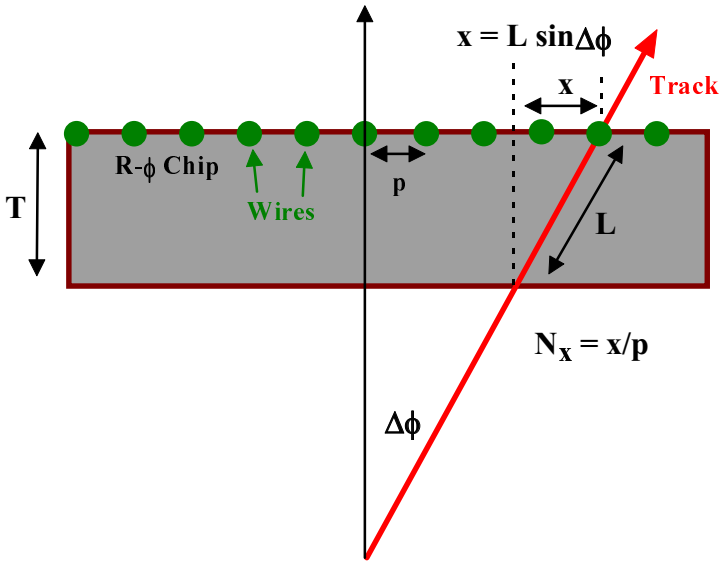
The cluster size, N_{cl}, is generated at random with a **gaussian distribution** with mean, $\langle N_{cl} \rangle$, computed as follows:

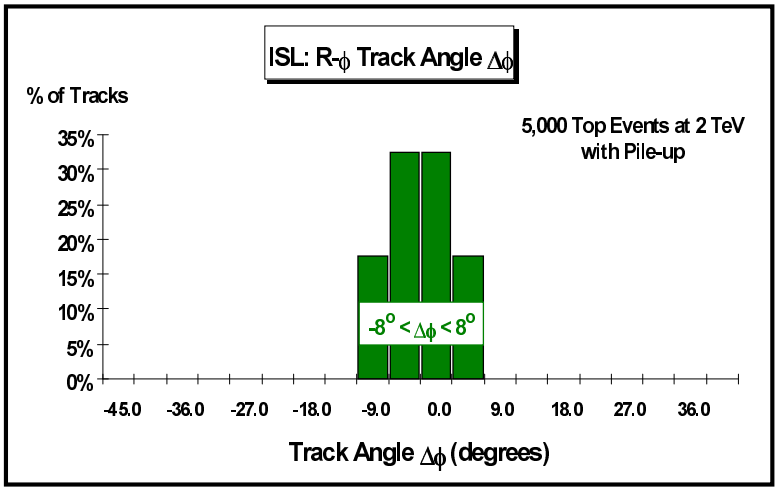
$$\langle N_{cl} \rangle = x/p + 1.5,$$

where **x** is the x-component of the track length **L** ($x = L\sin\Delta\phi$) 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 ($Q = \lambda L$) and $Q_0 = \lambda T$ (**1/f is the amount of charge per wire divided by Q_0**).





"Hits" per Track:

The number of "hits" per track 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

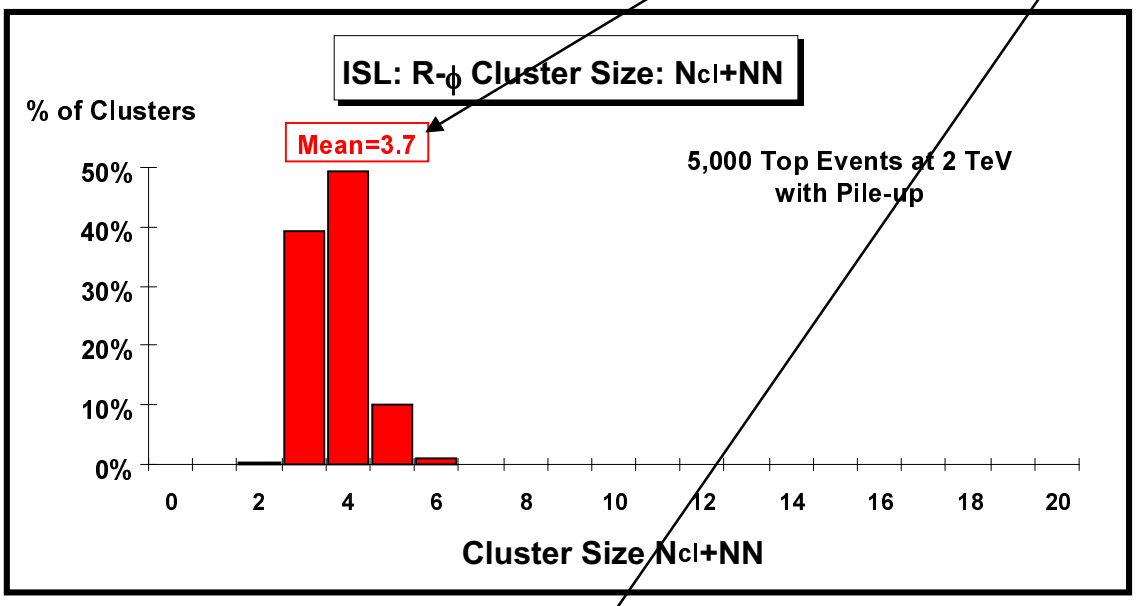
5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_Z=30 cm):

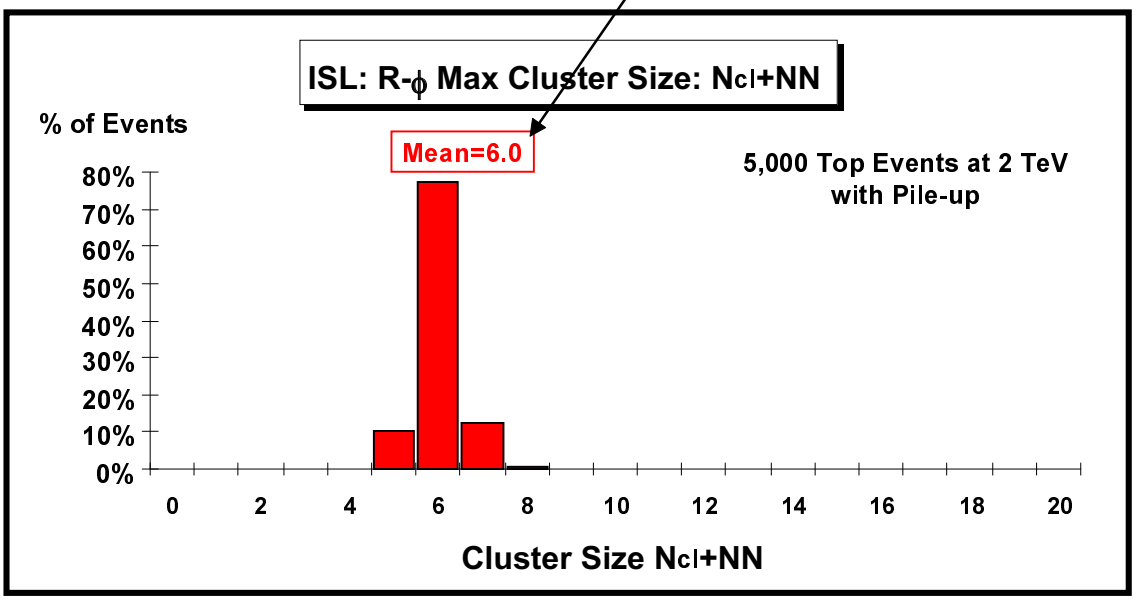
ISL		Average R-ϕ Cluster: Ncl+NN				5,000 Top + <3>MB				
iz = 1	2	3	4	5	6	7	8	9	10	all
		3.7	3.7			3.7	3.7			
				3.8	3.7					
3.7	3.7							3.7	3.7	

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	

3.7

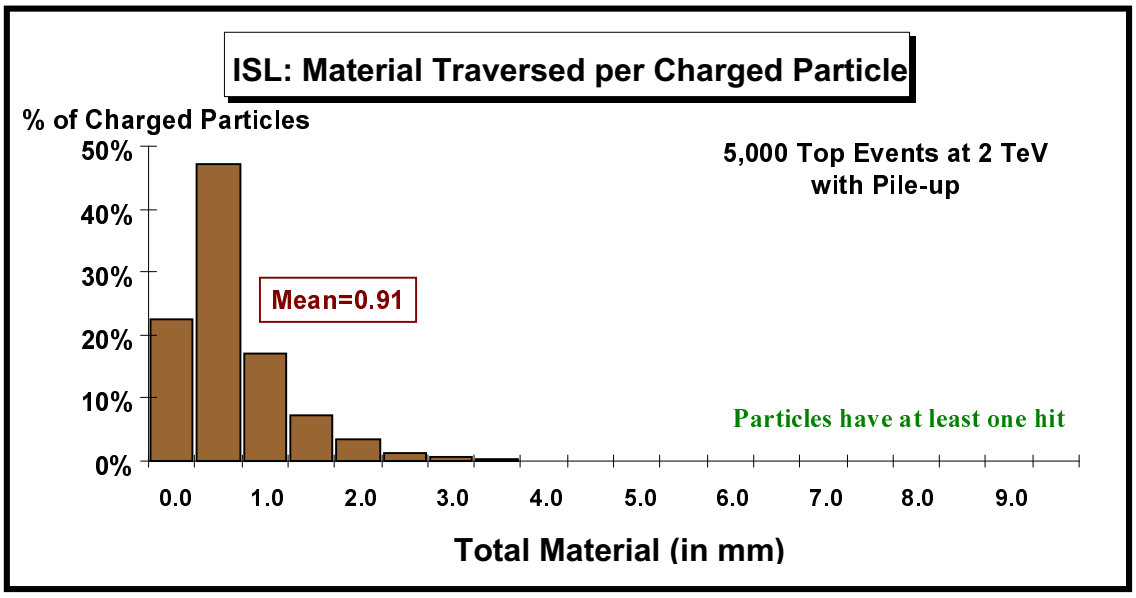
6.0



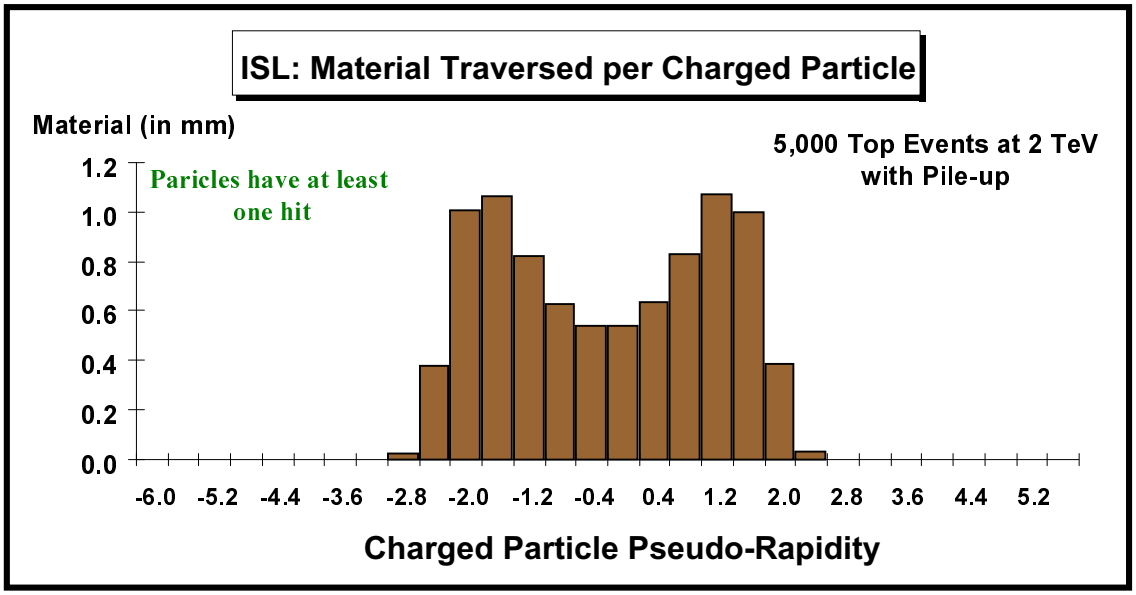


ISL: Material Traversed

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

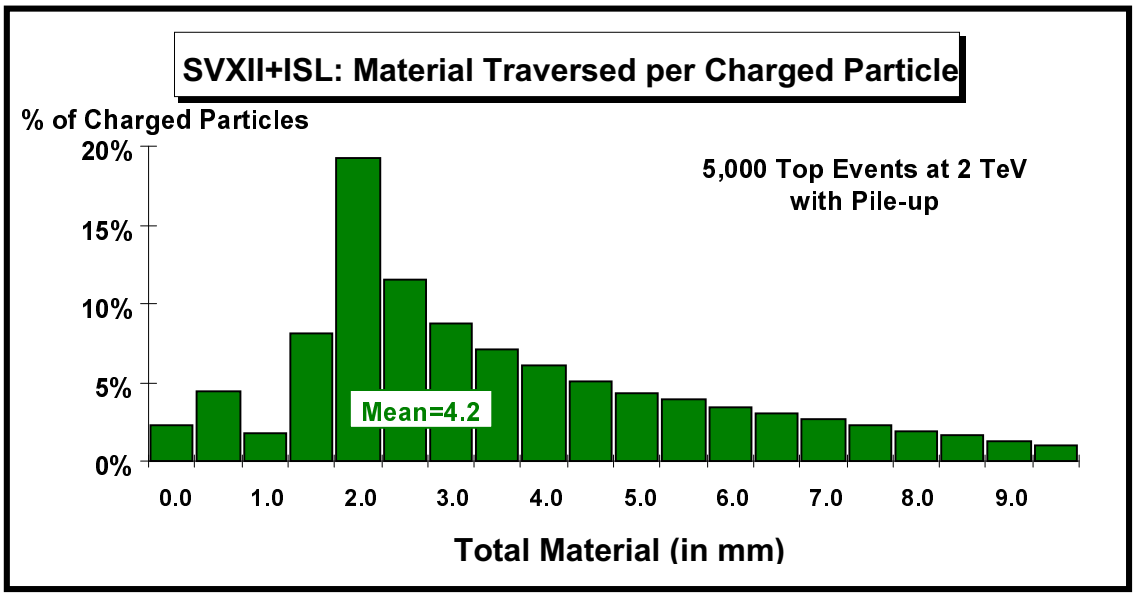


5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_Z=30 cm):

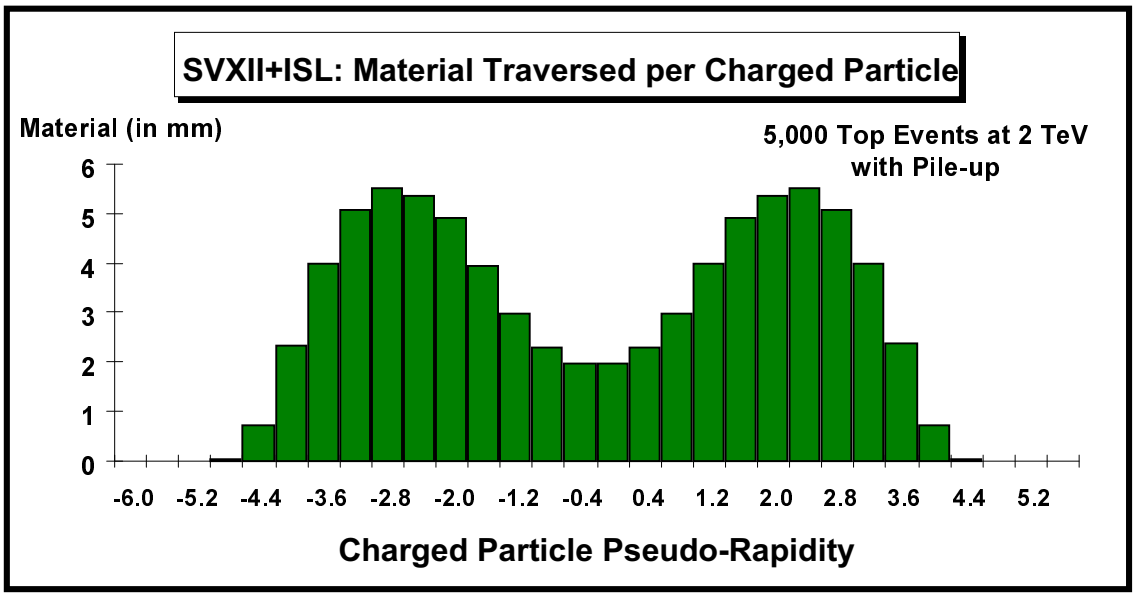


SVXII+ISL: Material Traversed

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

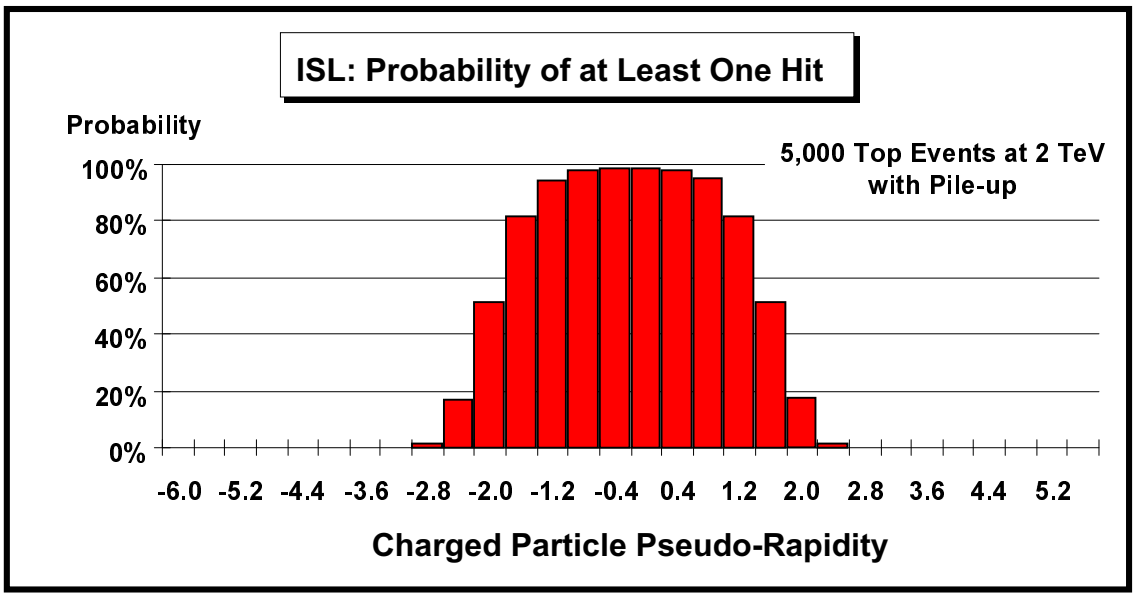


5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_Z=30 cm):

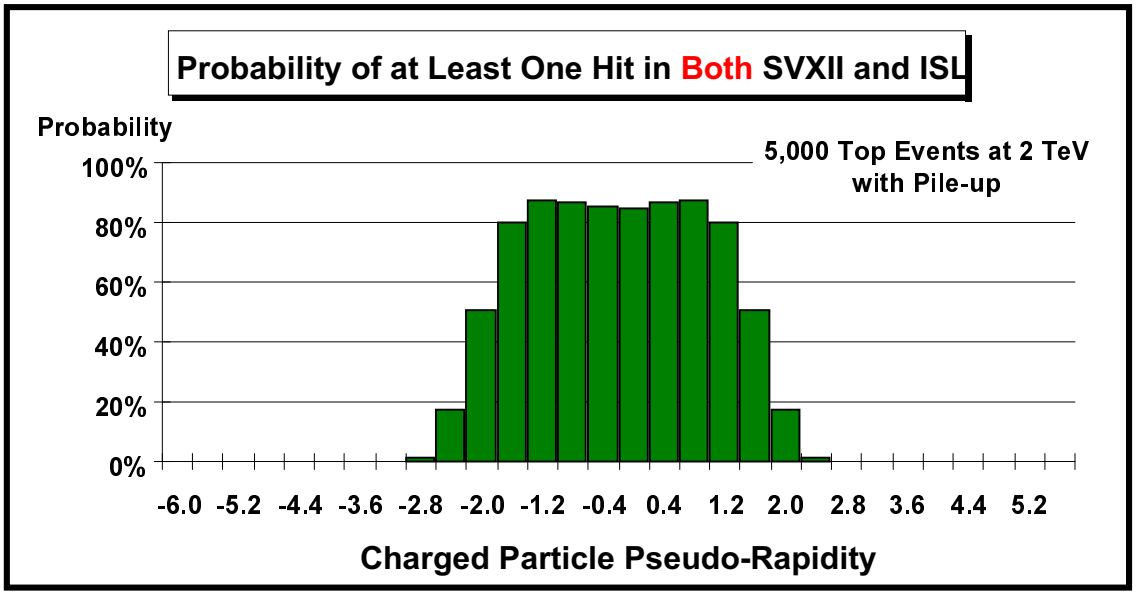


ISL: Geometric Acceptance

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

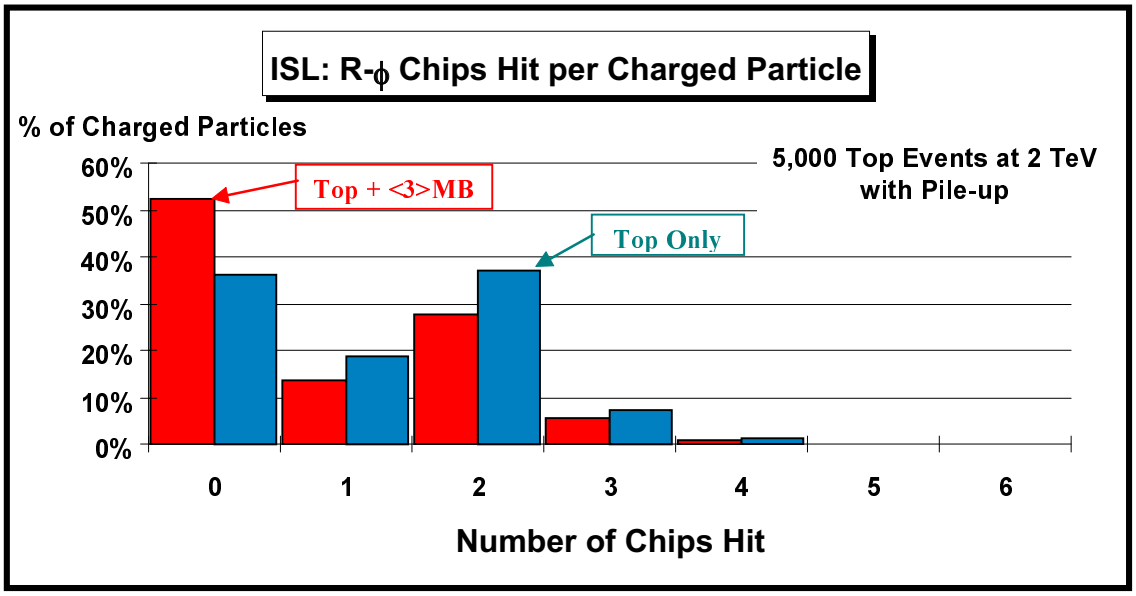


5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_Z=30 cm):

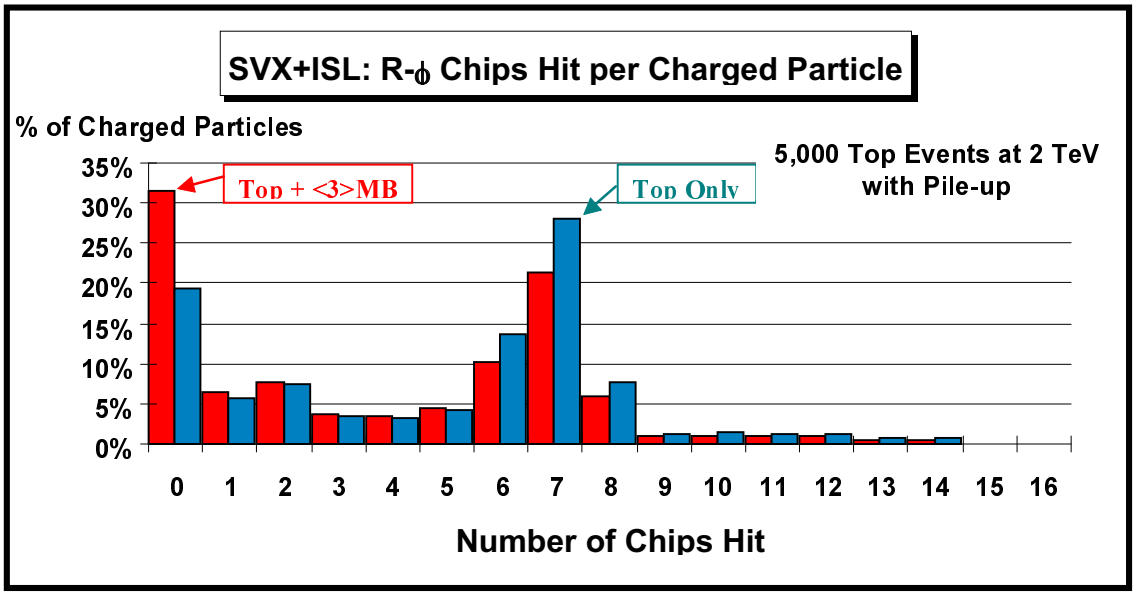


ISL: R-ϕ Chips Hit per Charged Particle

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):

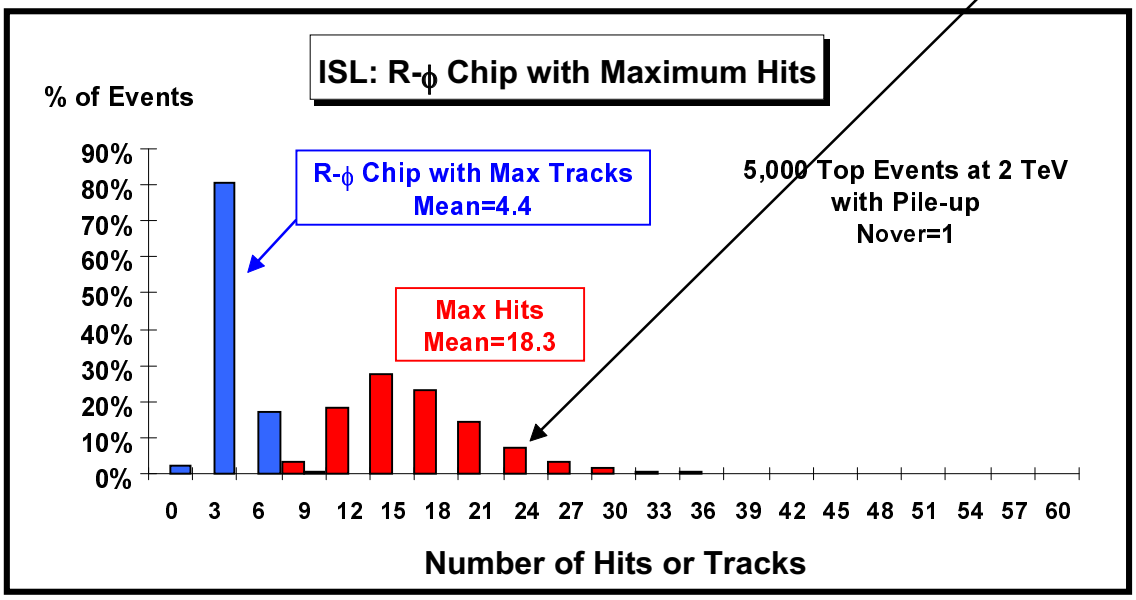
Reaction:	Top	Min-Bias	Min-Bias	Min-Bias	Min-Bias	Min-Bias
Z(int):	28.87	-30.42	21.9	-19.93	17.3	-73.45

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

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

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



ISL: Average Maximum R-ϕ Chip

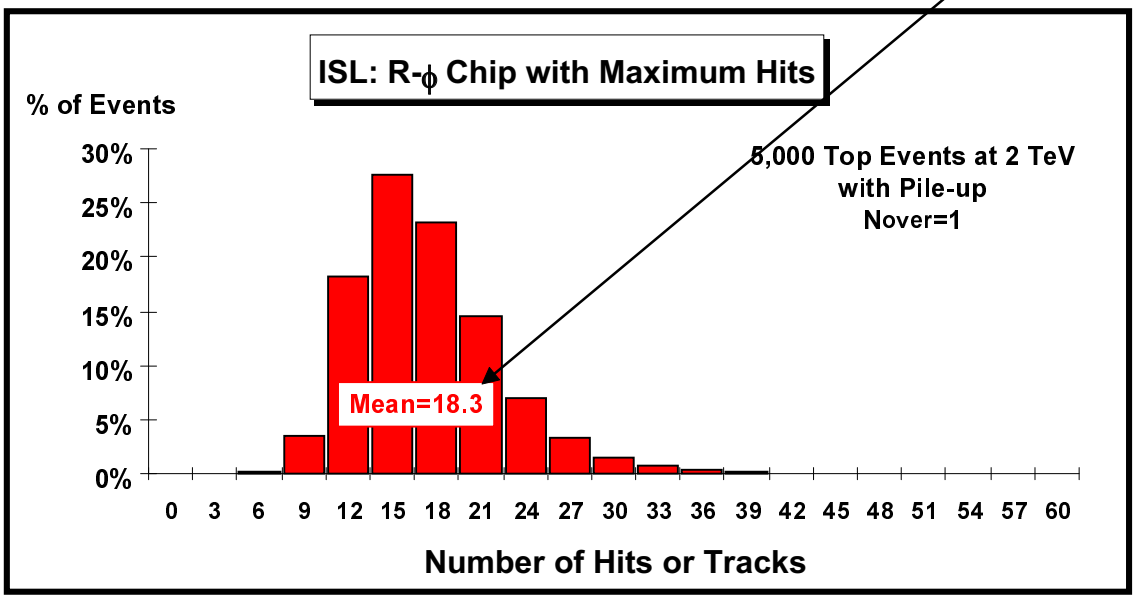
5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_Z=30 cm):

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):

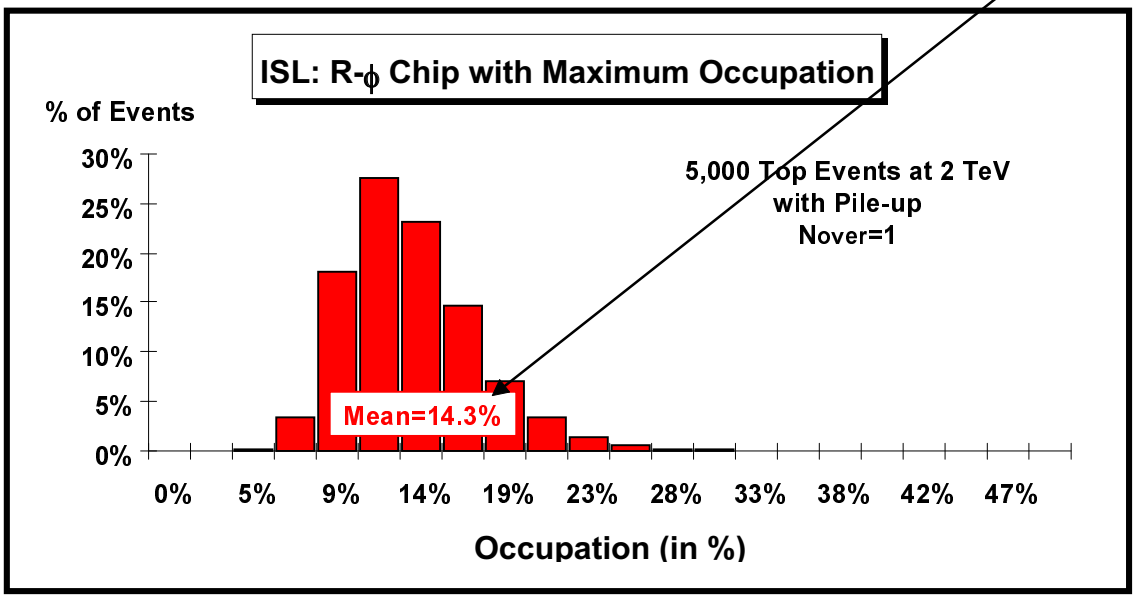
Reaction:	Top	Min-Bias	Min-Bias	Min-Bias	Min-Bias	Min-Bias
Z(int):	28.87	-30.42	21.9	-19.93	17.3	-73.45

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):

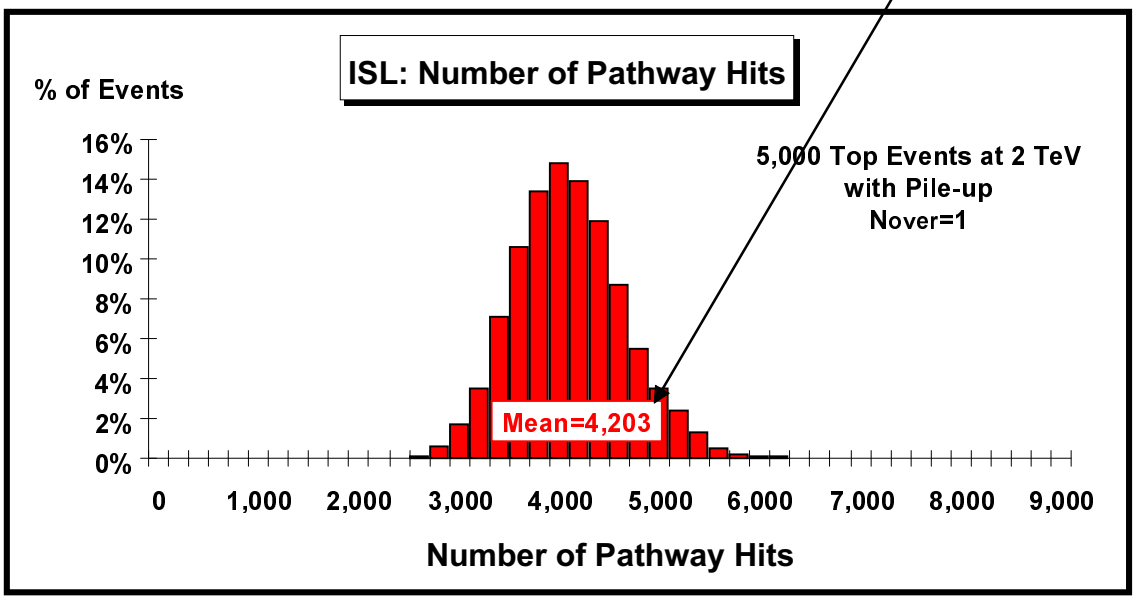
Reaction:	Top	Min-Bias	Min-Bias	Min-Bias	Min-Bias	Min-Bias
Z(int):	28.87	-30.42	21.9	-19.93	17.3	-73.45

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
		54	93			152	57			
				76	93					
40	51							54	38	

152

ISL Max Path Hits (R-ϕ only) Event #1

iz = 1	2	3	4	5	6	7	8	9	10	all
		27	47			77	30			
				38	46					
20	26							28	19	

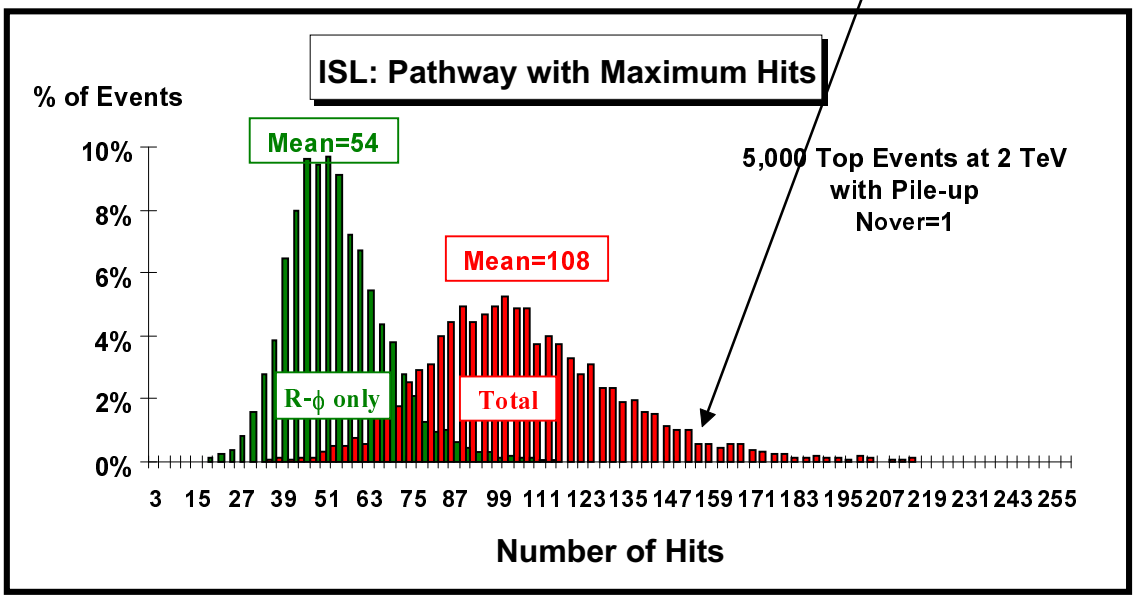
77

ISL Maximum Pathway Occupancy Event #1

iz = 1	2	3	4	5	6	7	8	9	10	all
		2.6%	4.5%			7.4%	2.8%			
				3.7%	4.5%					
2.0%	2.5%							2.6%	1.9%	

7.4%

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



ISL: Average Maximum Pathway

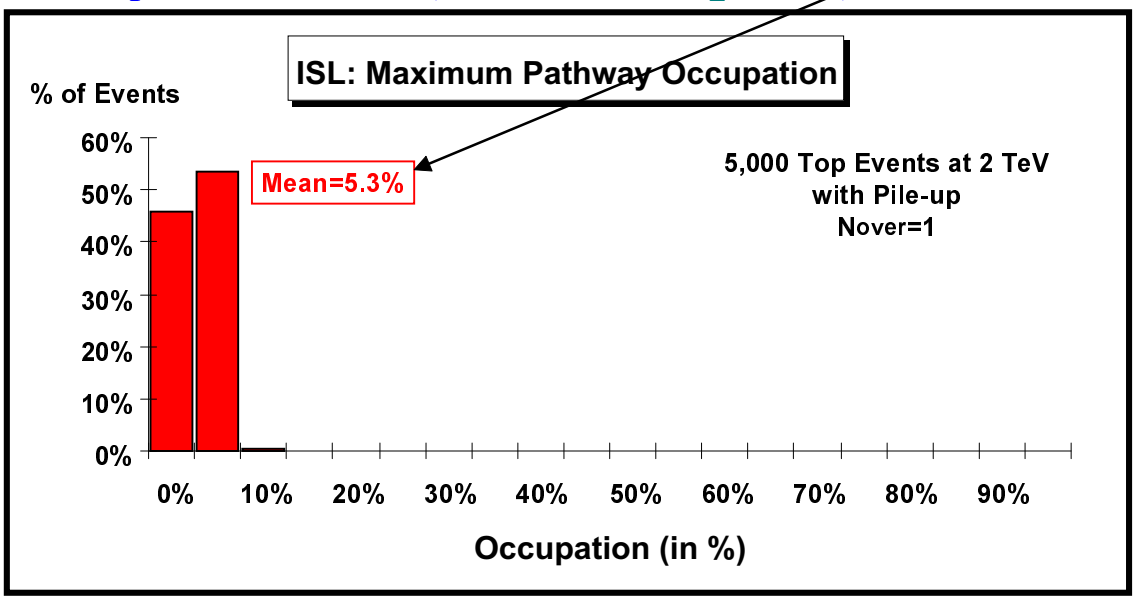
5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_Z=30 cm):

ISL	Average Maximum Pathway Hits								5,000 Top + <3>MB
iz = 1	2	3	4	5	6	7	8	9	10	all
		54	69			68	53			
				71	70					
40	51							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
		27	35			34	26			
				35	35					
20	25							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
		2.6%	3.4%			3.3%	2.6%			
				3.4%	3.4%					
1.9%	2.5%							2.4%	1.9%	
										5.3%

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

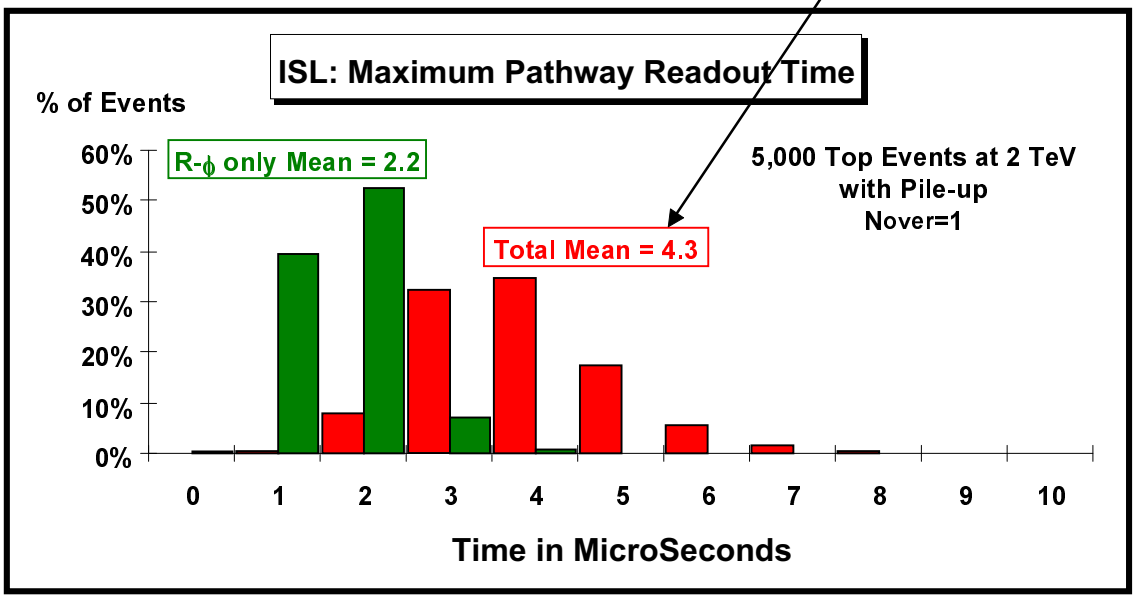


ISL: Maximum Readout Time

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
1.6	2.0	2.1	2.8	2.8	2.8	2.7	2.1	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
0.8	1.0	1.1	1.4	1.4	1.4	1.4	1.1	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)

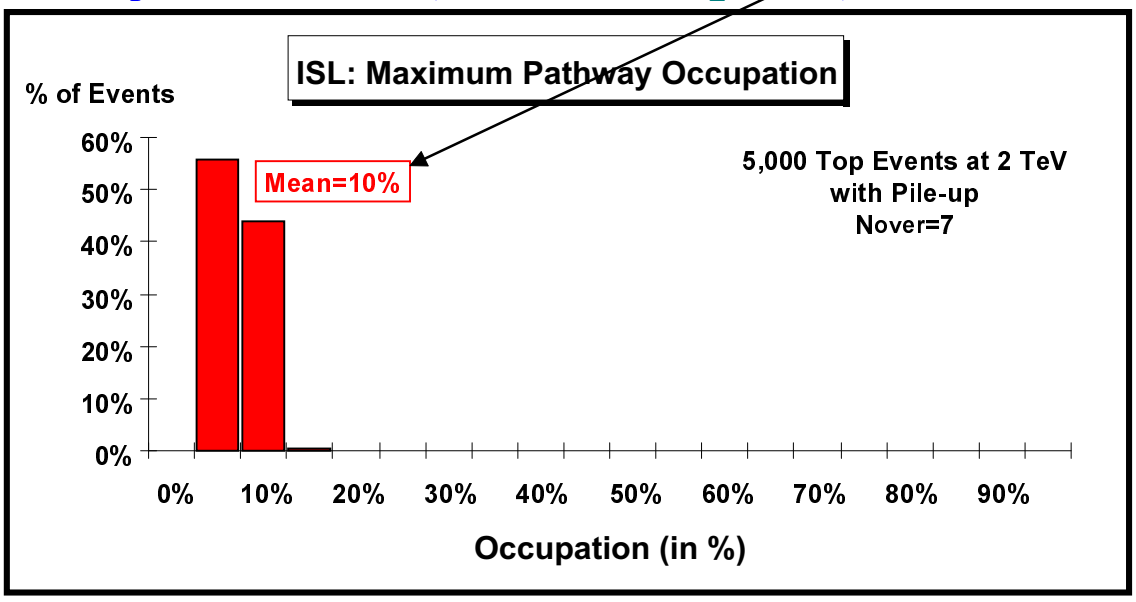
5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_Z=30 cm):

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):



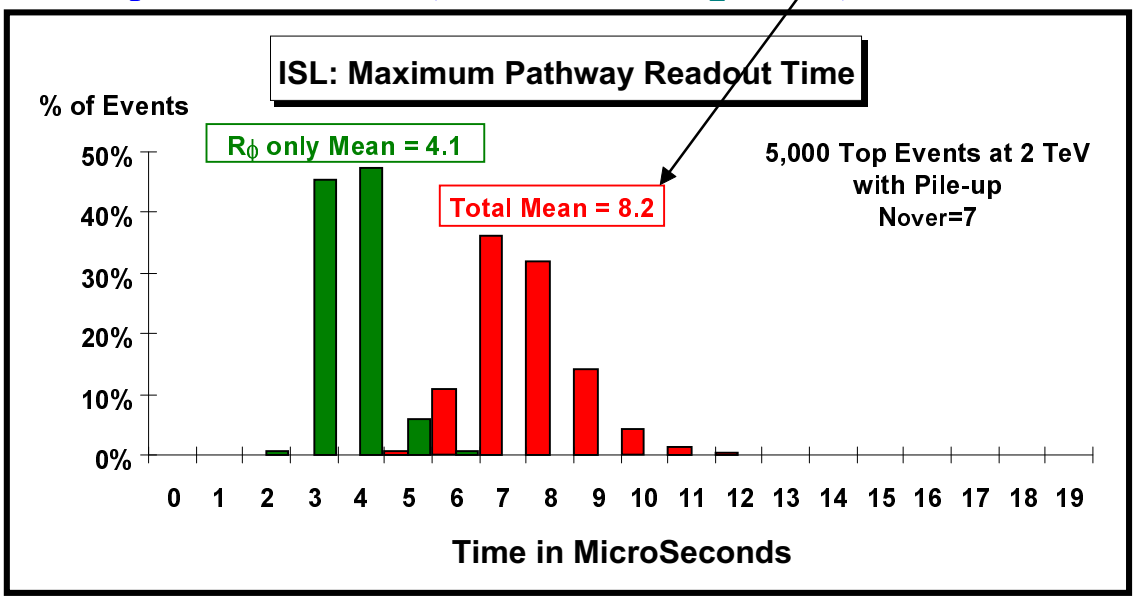
SVXII: Max Readout Time (with noise)

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

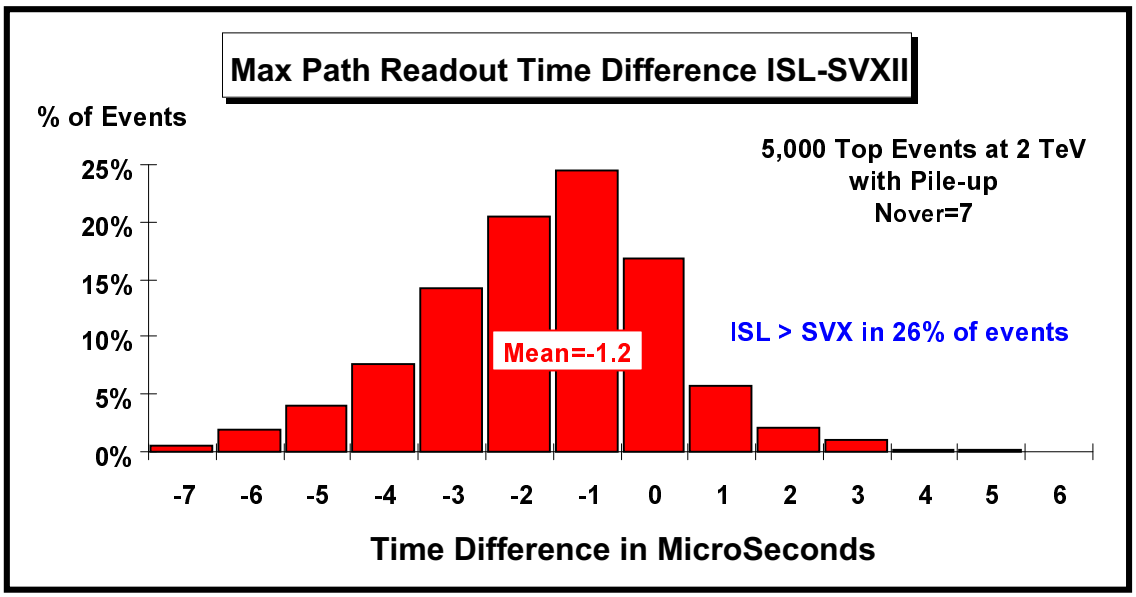
5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_Z=30 cm):



ISL: Readout Time Comparisons

Maxium Readout Time (event by event) SVXII versus ISL

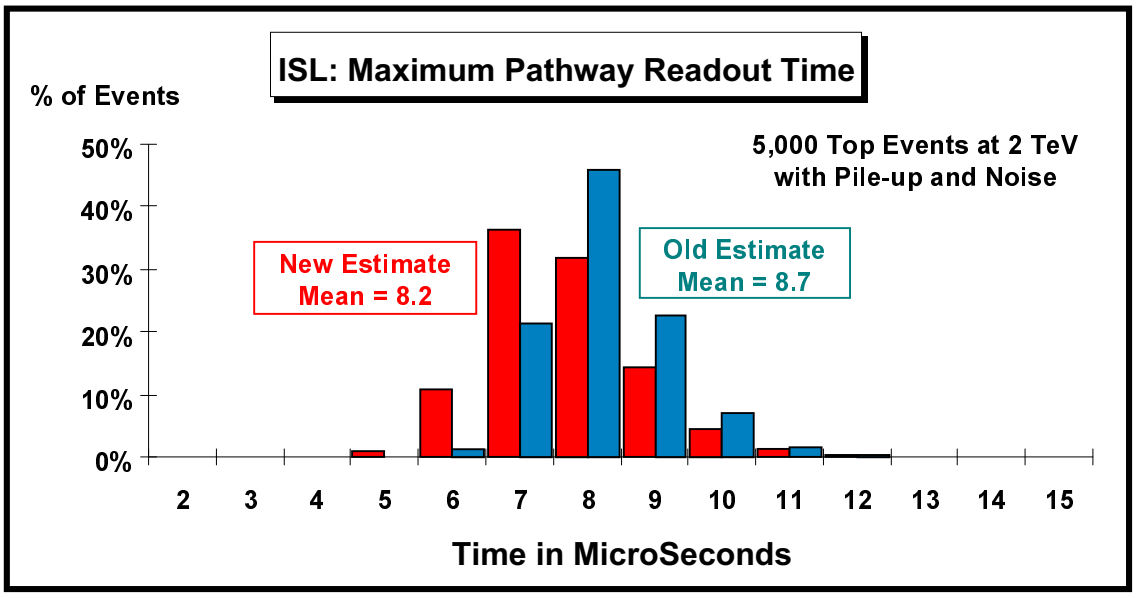
5,000 Top Events at 2 TeV (<Min-Bias>=3, σ_Z=30 cm):



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):