

Planned background studies in coordination with Physics WGs

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Studies done so far

- In the Tracking WG, we have done a study of the tracking performance at 18x275GeV with the updated SR rates (see next slide).
- For these studies, we defined an 'event' as a 2us time window. Within that window, we placed a single DIS collision (with $Q^2 > 1 \text{ GeV}^2$) and then overlayed all the beam-induced backgrounds at their respective rates
- The results (which can be found [here](#)) showed that we are able to suppress background effects if we impose a simple track quality criteria where at least 4 good measurements are used in the track fit.

Background rates

- On the ePIC background [wiki page](#), the rates for the various backgrounds are listed.
- The SR background is very large. The background that exits the beampipe consists of photons in 5-100 keV range, which are usually absorbed on a single detector. See [these slides](#) for details.

rates in kHz	5x41 GeV	5x100 GeV	10x100 GeV	10x275 GeV	18x275 GeV	Vacuum
Total ep	12.5 kHz	129 kHz	184 kHz	500 kHz	83 kHz	
hadron beam gas	12.2kHz	22.0kHz	31.9kHz	32.6kHz	22.5kHz	10000Ahr
	131.1kHz	236.4kHz	342.8kHz	350.3kHz	241.8kHz	100Ahr
electron beam gas (Bremsstrahlung scatterings)	2181.97 kHz	2826.38 kHz	3177.25 kHz	3177.25 kHz	316.94 kHz	10000Ahr
electron beam gas (Coulomb losses - w/ collimators)		116.57 kHz		29.56 kHz	0.86 kHz	10000Ahr
electron intrabeam (Touschek losses - w/ collimators)		1112.3 kHz		233.5 kHz	0.55 kHz	
DIS eA	kHz	kHz	kHz	/	/	
hadron beam (Au) gas	7.36kHz	10.3kHz	10.3kHz	/	/	10000Ahr
	79.1kHz	110.7kHz	110.7kHz	/	/	100Ahr
electron SR		36608 MHz		36608 MHz	3324 MHz	

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			kHz	/	/	
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SR rates for photons exiting the beampipe near the interaction point. For 18x275 GeV, for example, we have about 6,600 photons per 2us window.

What additional studies we want to do

➤ We plan to simulate four configurations to start:

1. For 18x275 GeV, a single DIS ($Q^2 > 1 \text{ GeV}^2$) collision per event (i.e., 2us window) along with the overlayed background rates. **This is what we have studied so far in the tracking WG.**
2. For 10x275 GeV, a single DIS ($Q^2 > 1 \text{ GeV}^2$) collision per event (i.e., 2us window) along with the overlayed background rates. **Check the impact of the higher SR radiation rates.**
3. For 18x275 GeV, study events (i.e., 2us windows) where only beam-induced backgrounds are included. **How often do empty windows 'trick' us into thinking we have a high Q^2 event, or a rare exclusive process like DVCS.**
4. For 18x275 GeV, a single photoproduction ($0 \text{ GeV}^2 < Q^2 < 1 \text{ GeV}^2$) collision per event (i.e., 2us window) along with the overlayed background rates. **Test updated electron finder to see if we can remove mixed low- Q^2 plus background events.**

Mixing generation script

- The code we are using is located on the [snippets](#) repository. I'm working with the Production WG to get these configurations as part of the official campaign.

```
38 #####
39 ## background sources
40 ## SR, brems, coulomb, touschek, pgas
41 ## generatorStatus ID:
42 ## 2000, 3000, 4000, 5000, 6000
43 #####
44 echo "Please select an option:"
45 echo "1: DIS 18x275" ← 1
46 echo "2: DIS 18x275, no SR"
47 echo "3: minbias 18x275" ← 4 (if sf = 0)
48 echo "4: DIS 10x275, SR scaled from 18GeV" ← 2
49 echo "5: DIS 5x100, SR scaled from 18GeV"
50 echo "6: Backgrounds only 18x275" ← 3
```