# SVT hit rates at 10x275 GeV: 5um vs. 10 um gold coating

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# Motivation

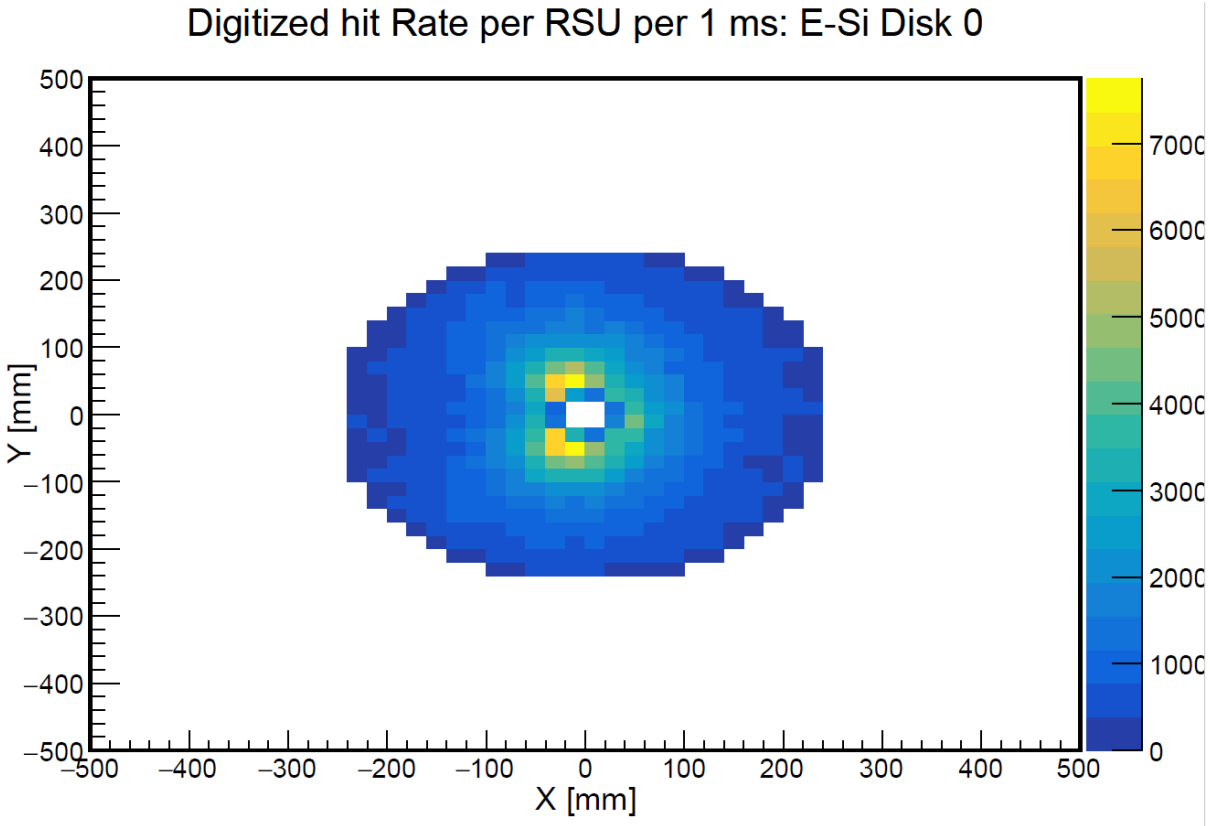
- Our previous studies showed high hit rates and data rates for some SVT tiles with a 10 GeV electron beam at full current.
- Andrii produced some new SR simulations with the thickness of the gold coating on the beampipe increased from 5 um to 10 um.
- This decreased to overall SR rate for photons exiting the beampipe in the detector region from 36608 MHz to 13277 MHz.
- Using these new files, we ran some local simulations to check the impact on each SVT layer.

# Local simulation

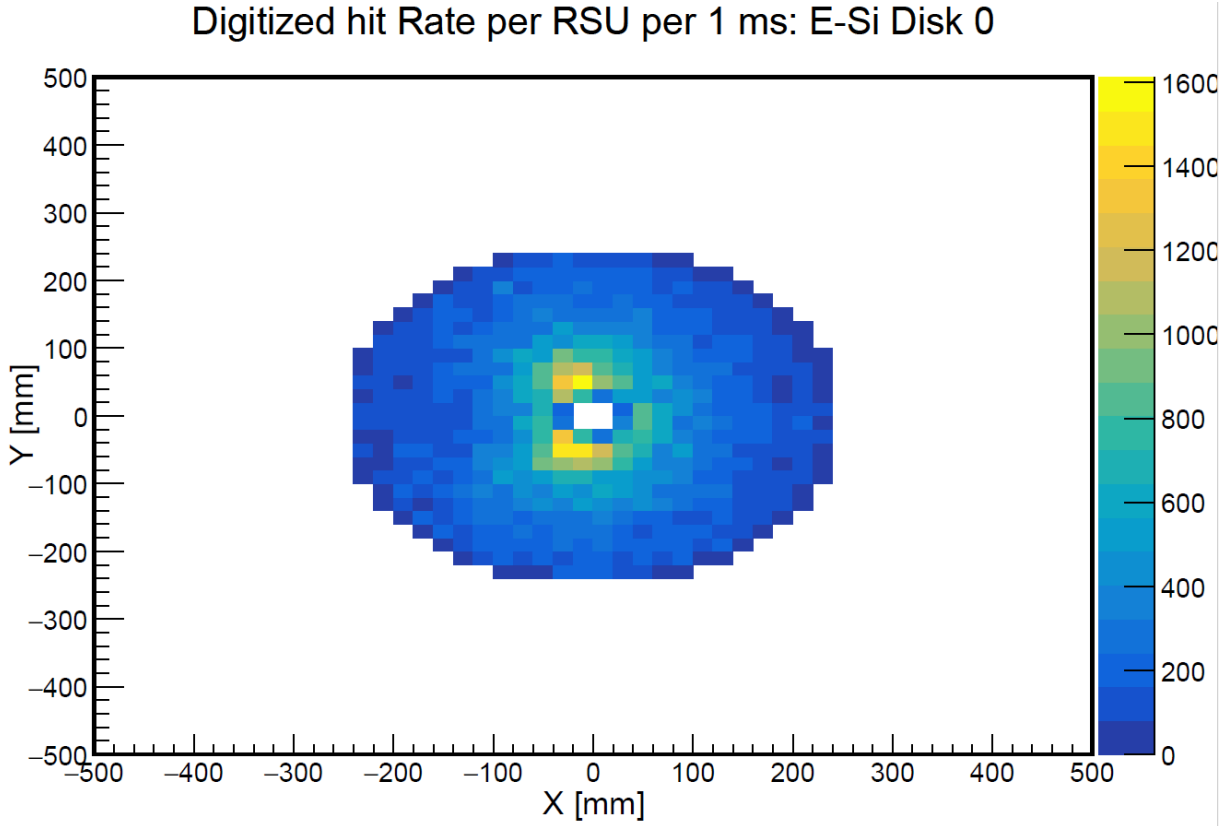
- Generated 1000 events (i.e., 2us time windows).
- Each event has a single 10x275 GeV DIS collision, as well as backgrounds at the correct rates. For SR, the mixing rate is set to 13277 MHz.

# SVT disks digitized hit rates: E-Si Disk 0

**Previous results with 5um gold coating**




**Results with 10um gold coating**




Maximum average RSU rate decreases by about a factor of 4.5

# Table of SVT rate comparison

**10x275 GeV setting with 10um gold beampipe coating**

**All counts are per millisecond (ms)**

**1ms of mixed data = 1000 events x (one DIS collision at Q2 >1 GeV2 per 2us + beam background per event) / 2**

source file: **Barak: bgmerged_forced_10x275_scaled_SR_10um_n1000.hepmc3.tree.root**

| Layer name | Total hits | MAX hit on a single RSU (20x20mm) | Tile (9.8x3.5mm) added by Shujie | RSU rate ratio (5/10um) | Tile rate ratio (5/10um) |
|---|---|---|---|---|---|
| E-Si Disk 4 | 30795.5 | 46 | 12 | 3.43 | 2.42 |
| E-Si Disk 3 | 144893.5 | 394 | 71 | 4.64 | 3.65 |
| E-Si Disk 2 | 222633.5 | 1326 | 212 | 4.92 | 3.73 |
| E-Si Disk 1 | 231321 | 1718.5 | 230 | 4.28 | 4.39 |
| E-Si Disk 0 | 129167.5 | 1611.5 | 258 | 4.75 | 4.16 |
| H-Si Disk 0 | 111486 | 1405.5 | 201 | 4.60 | 4.10 |
| H-Si Disk 1 | 155315 | 1301 | 250 | 4.45 | 3.63 |
| H-Si Disk 2 | 36344.5 | 144.5 | 35 | 2.12 | 2.23 |
| H-Si Disk 3 | 6601.5 | 137 | 28 | 1.18 | 1.50 |
| H-Si Disk 4 | 5000.5 | 86 | 18 | 1.37 | 1.11 |
| L0 | 360928.5 | 4330 | 594 | 4.89 | 3.87 |
| L1 | 251520 | 2188.5 | 250 | 3.99 | 3.84 |
| L2 | 154420 | 538 | 73 | 3.66 | 3.11 |
| L3 | 493530 | 711.5 | 110 | 2.95 | 2.70 |
| L4 | 314902 | 217.5 | 39 | 2.53 | 2.46 |

# Conclusions

- Doubling the thickness of gold coating has a sizeable impact on the SVT hit rates. For layers with high rate, the maximum hit rate decreases by more than the change in the SR mixing frequency – suggesting that the SR photon energy, angle, and position distribution outside the beam pipe is modified.
- Next steps:
  1. Study frame-by-frame fluctuations in the SVT hit rates
  2. Begin to look at tracking performance at 10x275 GeV
  3. Review previous work on pointing resolution with increased coating thickness