

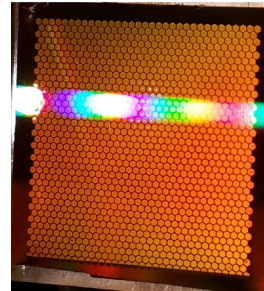
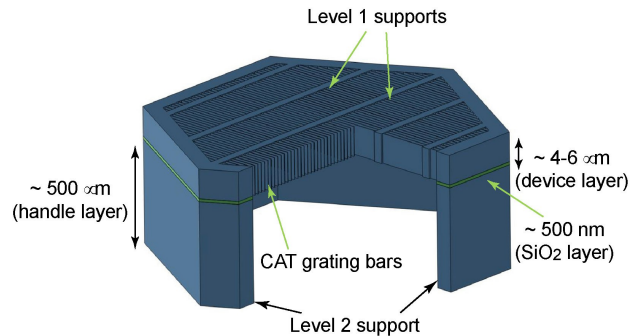


Embarrassingly parallel ray-tracing for the Arcus X-ray spectrometer

H. Moritz Günther
Kavli Institute for Astrophysics

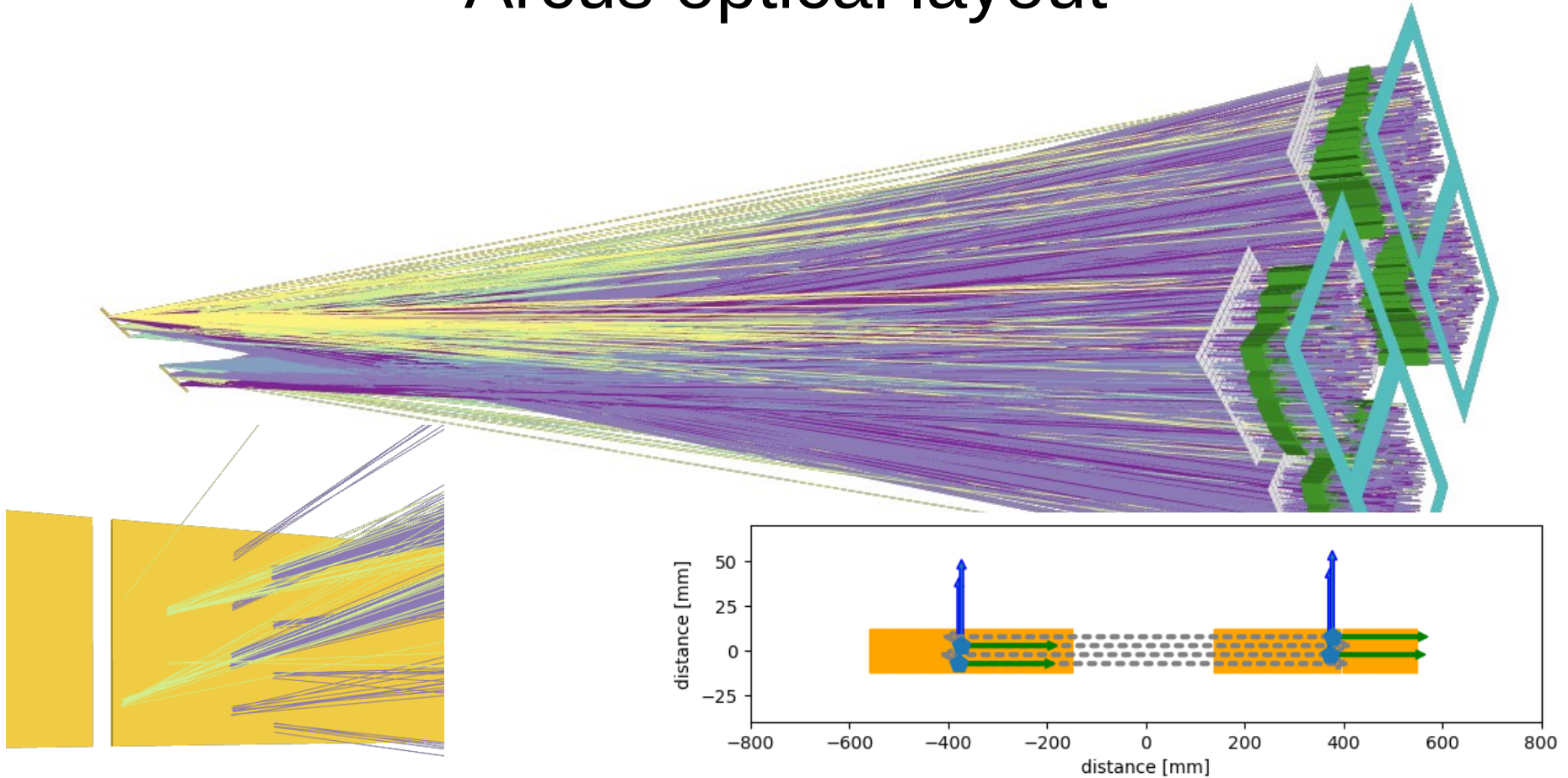
Arcus

- Undergone several revisions, currently proposed as NASA probe (10^9 \$, launch in 2028, > 5 year mission live time)
- Several technological highlights, many of them from MIT



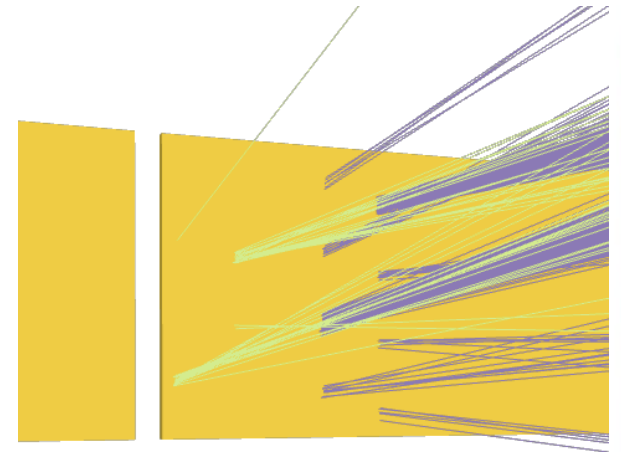
- Important here: It's an X-ray spectrograph.

Arcus optical layout

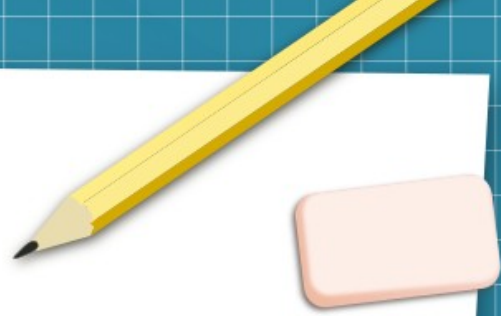


Arcus optical layout

- Need to get number of rays and distribution (e.g. width) of rays in the detector
- Obviously, depends on energy – it's a spectrograph, duh!
- Don't need ray-trace for every wavelength, because we can interpolate, but for ~a few hundred.
- Every ray-trace is independent →
Embarrassingly parallel!



Submit



- Simulation coded on Python
 - much faster to develop than C, and my time is valuable
 - Single run takes ~3-5 min.
- 300 points * 5 min: Doable over night.
- 300 points * 5 min / 300 CPUs on submit : Doable while getting coffee.
- Install conda and my python package on submit.
- Run simulation as SBATCH.
- Every run writes out results to separate datafile.

Slurm script

Run n simulations

```
#!/bin/bash
```

```
#SBATCH --job-name=arf_rmf
```

```
#SBATCH --ntasks=1
```

```
#SBATCH --cpus-per-task=1
```

```
#SBATCH --array=0-58
```

With this Python script

```
python ../RAeff_single_simulation.py /work/submit/hgunther/ARCUS/arfrmf/ \
```

```
  ${SLURM_ARRAY_TASK_ID} \
```

```
  --wave_lo=1.5 --wave_hi=60. --wave_step=1.0 \
```

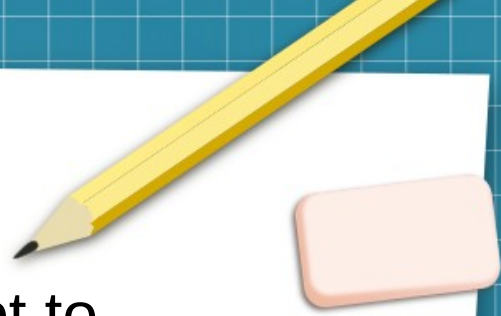
```
  -n 500000 --channels 1
```

That takes a number as parameter

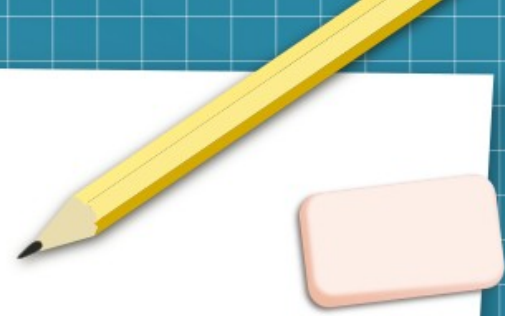
And some other parameters

Submit

- Once all jobs are done, manually run Python script to summarize all results.
- Use “scp” to get summary file.



submit



- Before submit:
 - Run over night. Annoying if something fails and you have to wait a day to try again.
 - Ssh into several machines in our group and start individual jobs there. Annoying to do by hand what a job scheduler should do.
- Submit is great
 - even though I only need it a few times per year
 - I need it when I need it.
- Will not replace office desktop PC, that's unused > 98 % of the time.





The slide design licensed under a Creative Commons Attribution-ShareAlike 3.0 Unported License.
It makes use of the works of Mateus Machado Luna.

