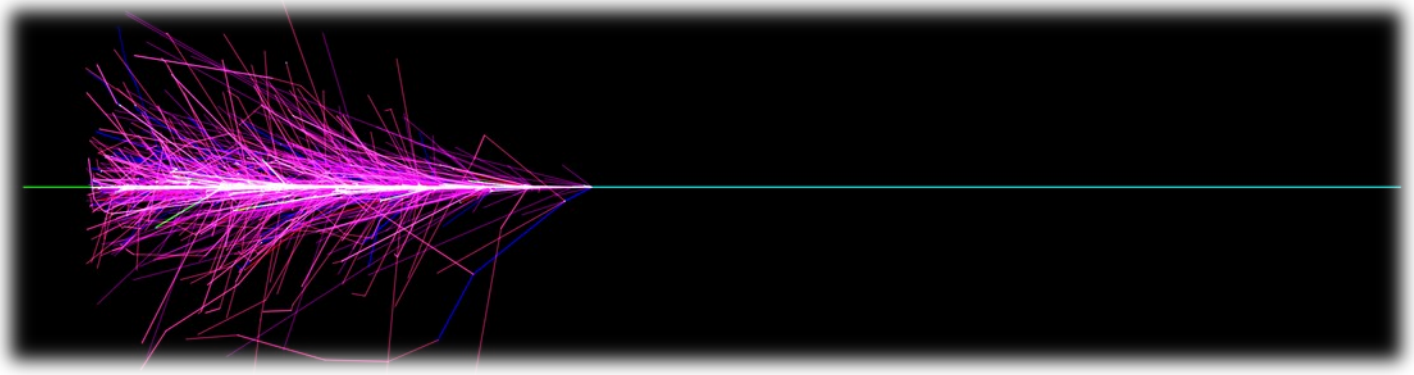
technische universität dortmund

SFB 876 Providing Information by Resource-Constrained Data Analysis

lehrstuhl physik e5



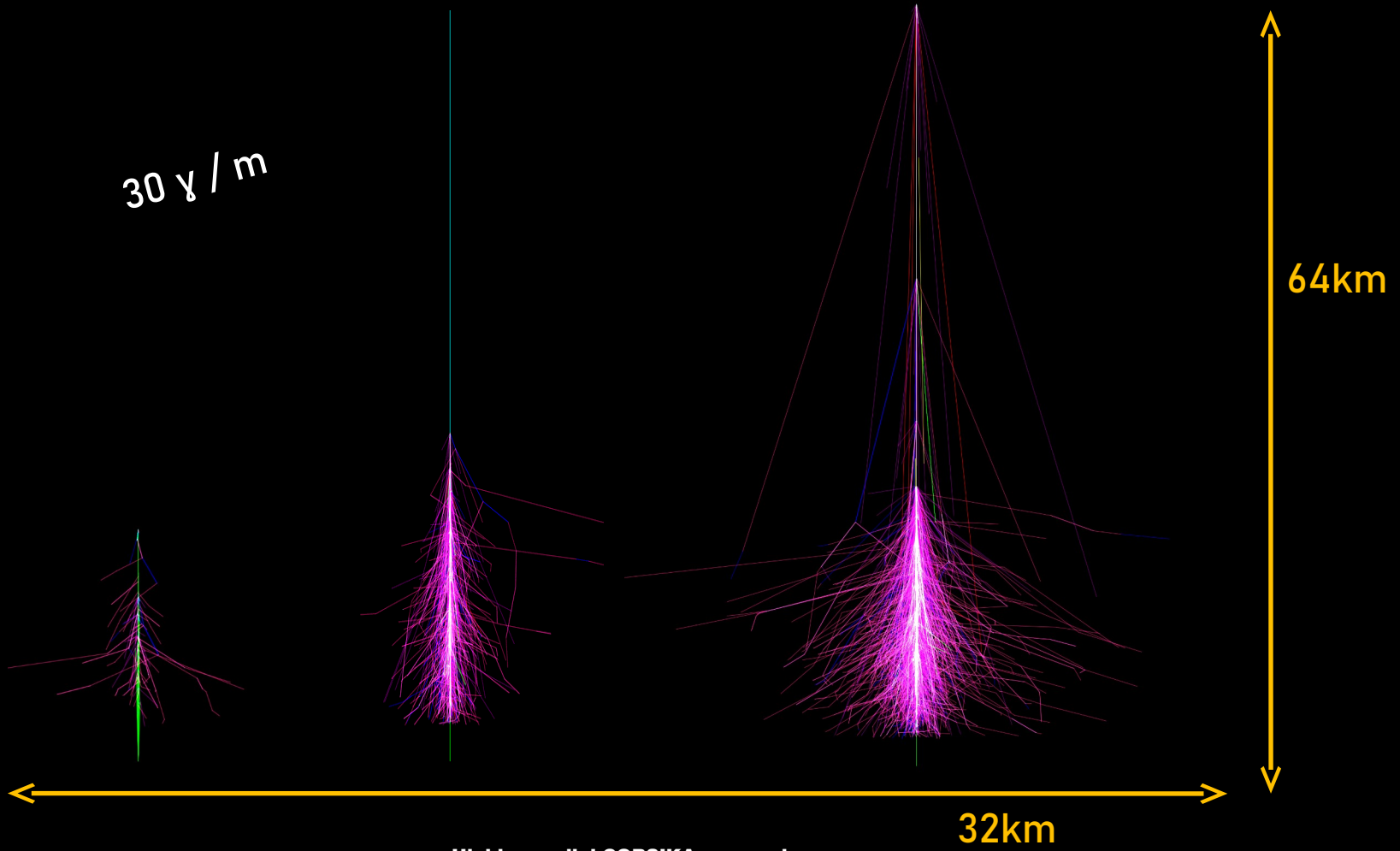
Highly parallel Cherenkov processing

Dominik Baack

Corsika Workshop

Online

24. 06. 2020



Highly parallel CORSIKA processing

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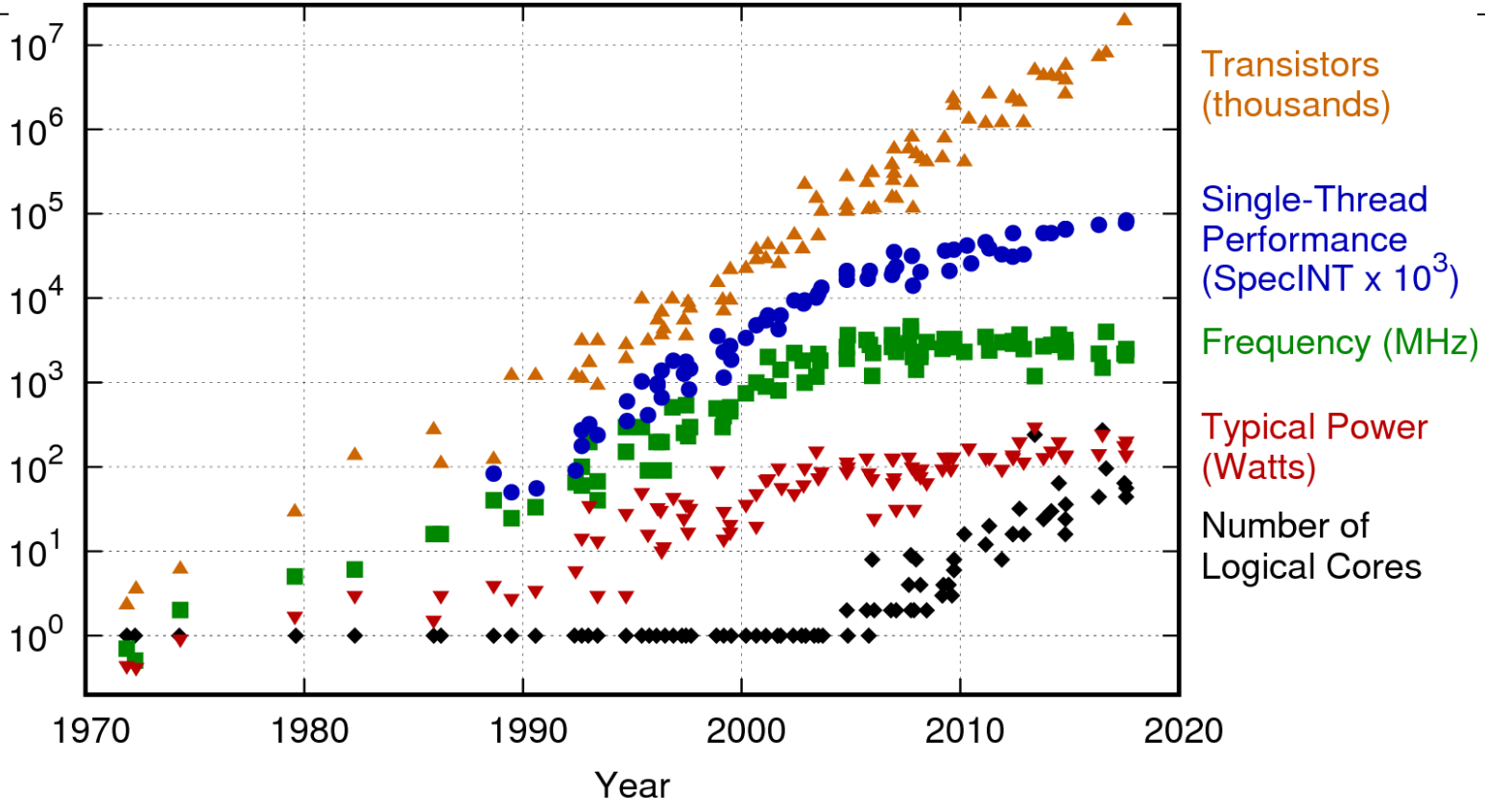
42 Years of Microprocessor Trend Data



Original data up to the year 2010 collected and plotted by M. Horowitz, F. Labonte, O. Shacham, K. Olukotun, L. Hammond, and C. Batten
New plot and data collected for 2010-2017 by K. Rupp

https://www.karlrupp.net/2018/02/42-years-of-microprocessor-trend-data/

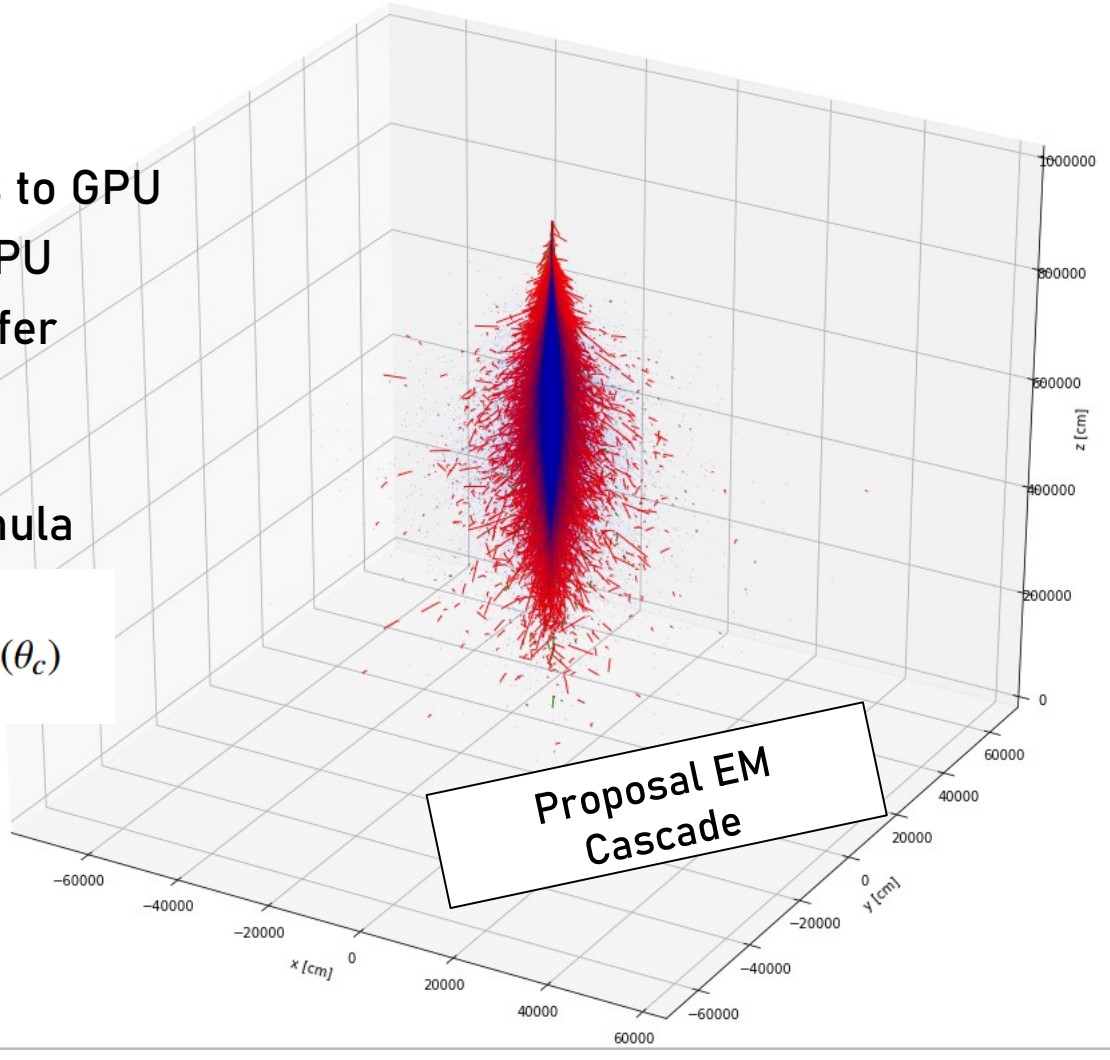
Track Handling

- Charged / All Tracks to GPU
  - More work to GPU
  - Less data transfer

- Use presolved Frank-Tamm Formula

$$\frac{d^2N}{dxd\lambda} = \frac{2\pi\alpha z^2}{\lambda^2} \cdot sin^2(\theta_c)$$

to calculate N and α



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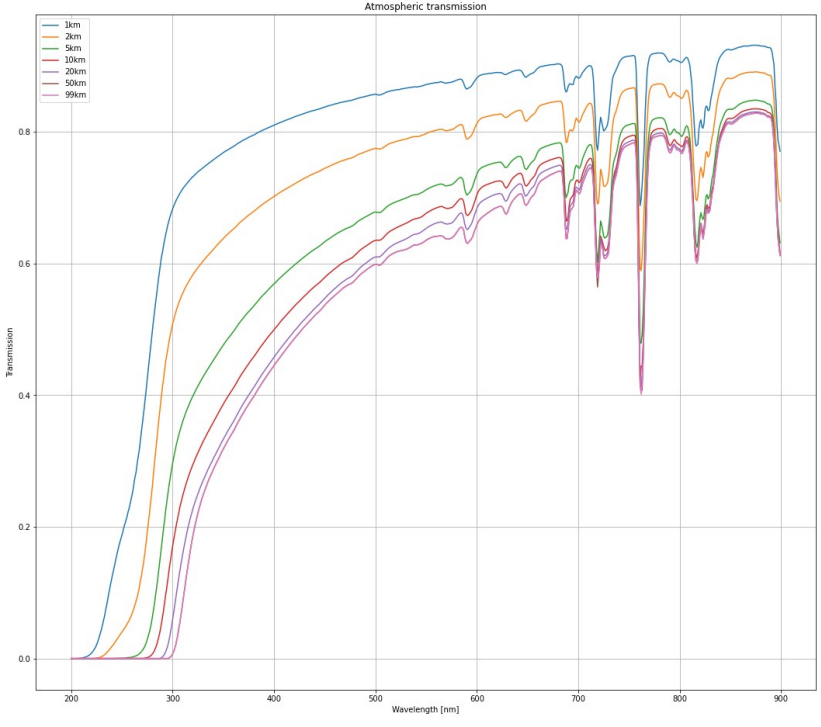
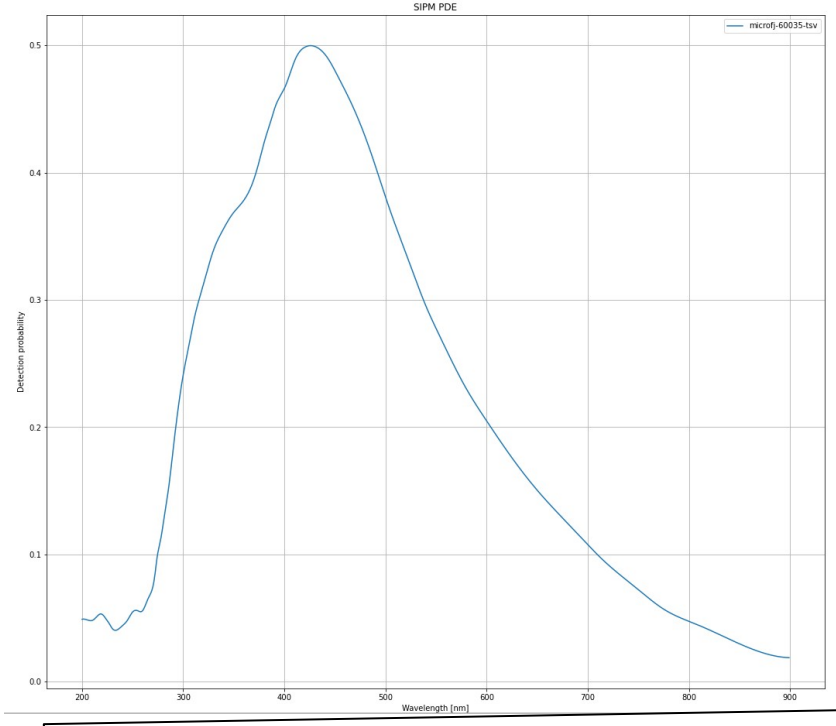
Frank-Tamm Handling





And many more possible:

- Mirror reflection
- Collimator absorption
- Filter ….

Highly parallel CORSIKA processing

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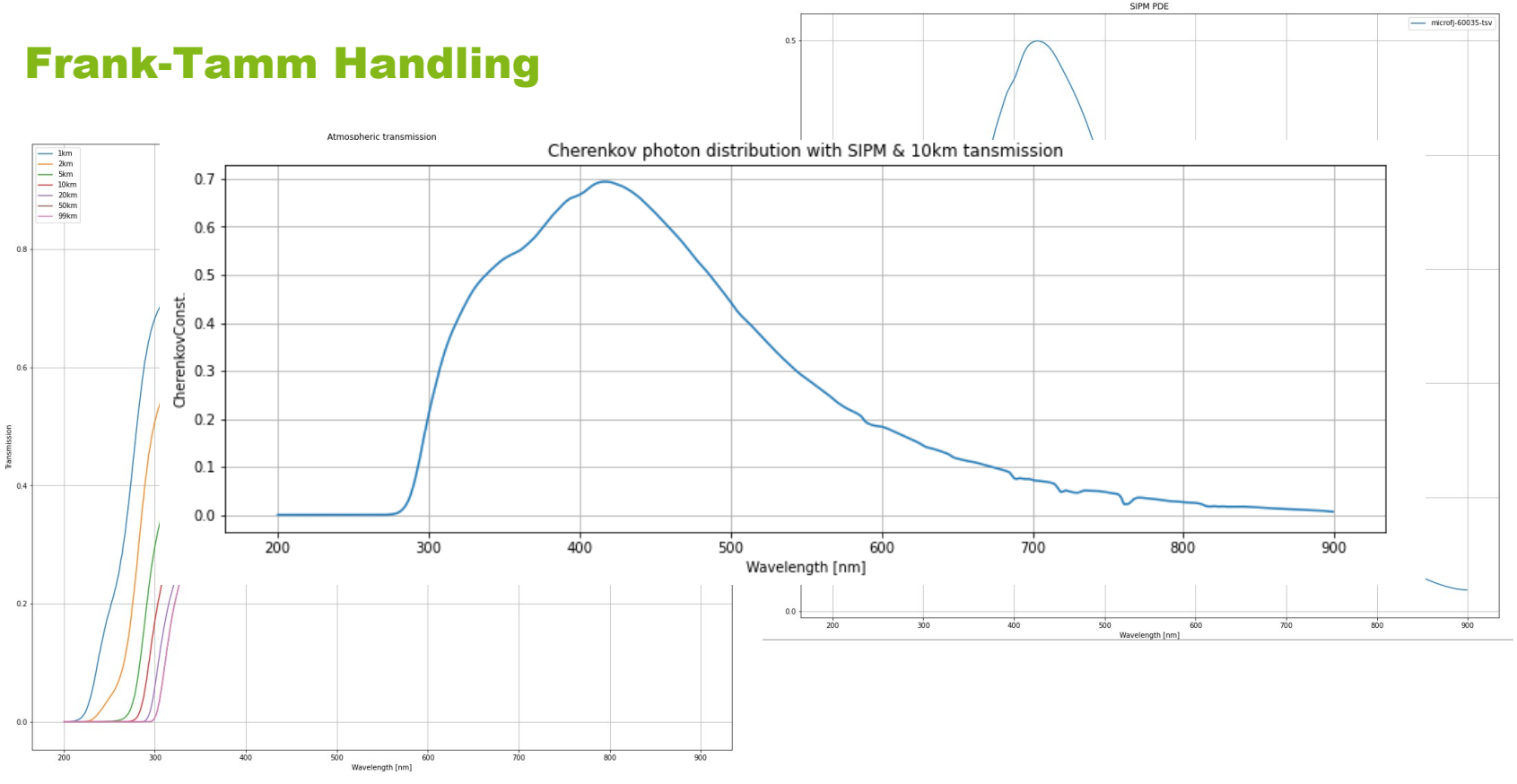
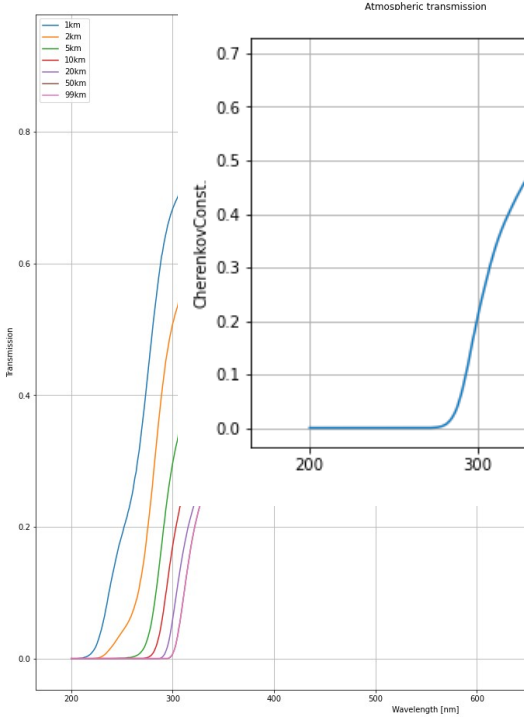
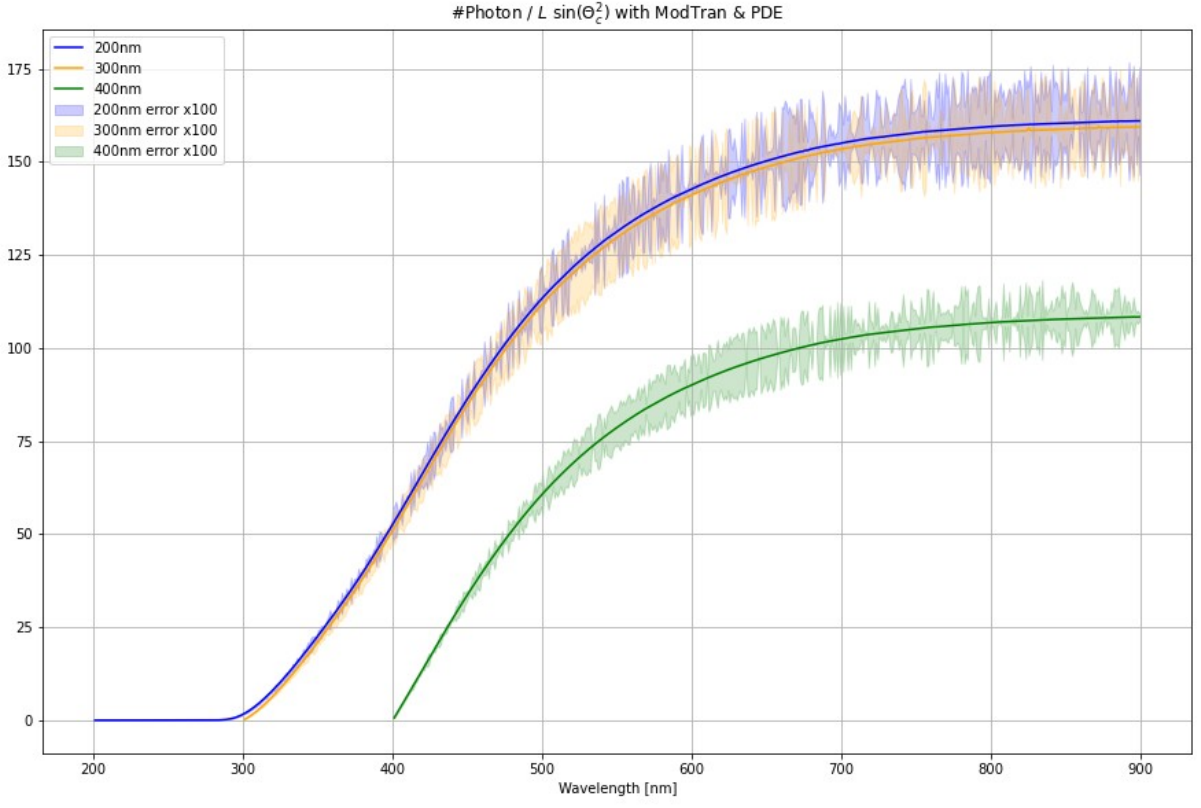
Frank-Tamm Handling



Frank-Tamm Handling





Highly parallel CORSIKA processing

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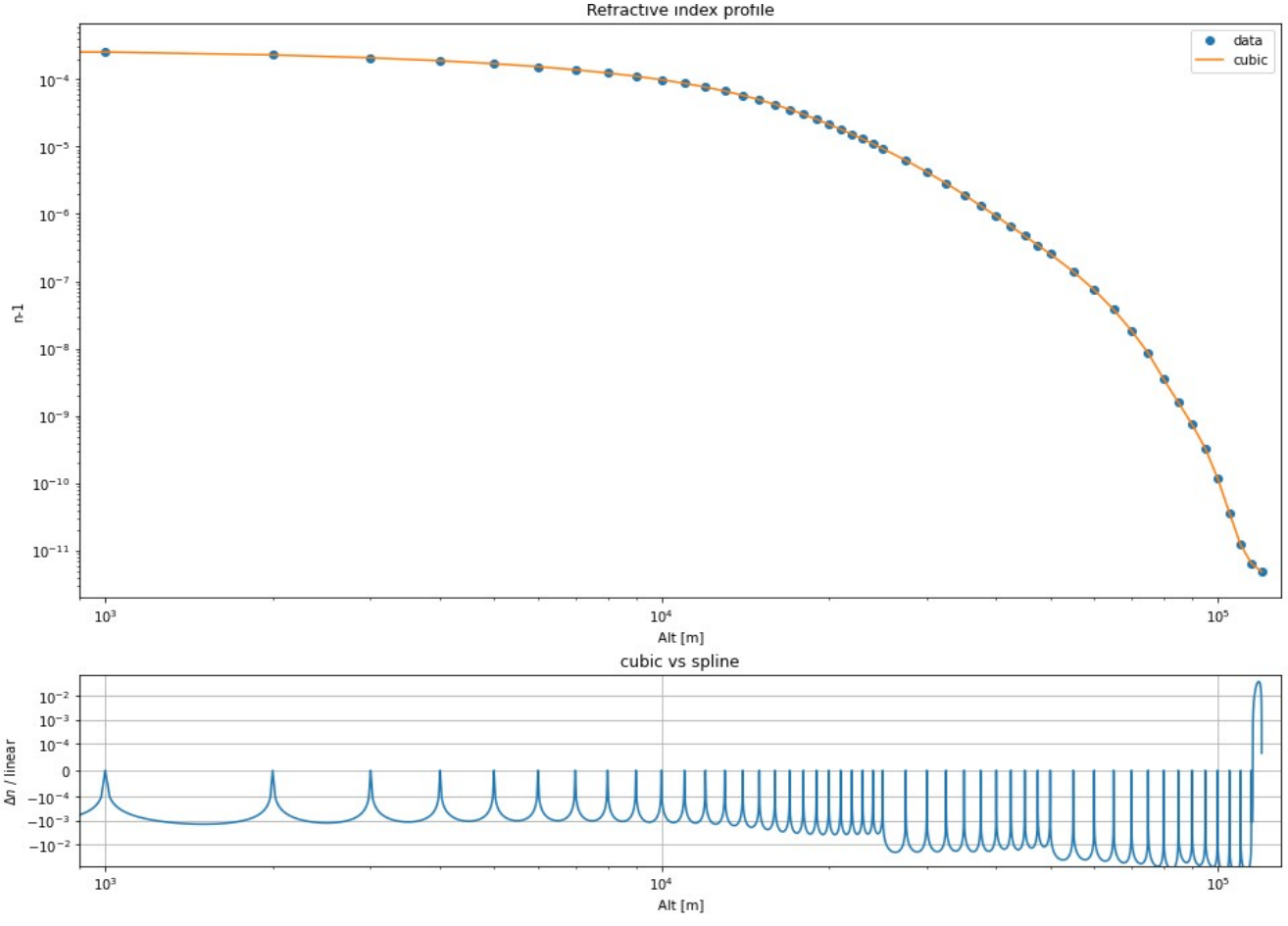
Track Handling



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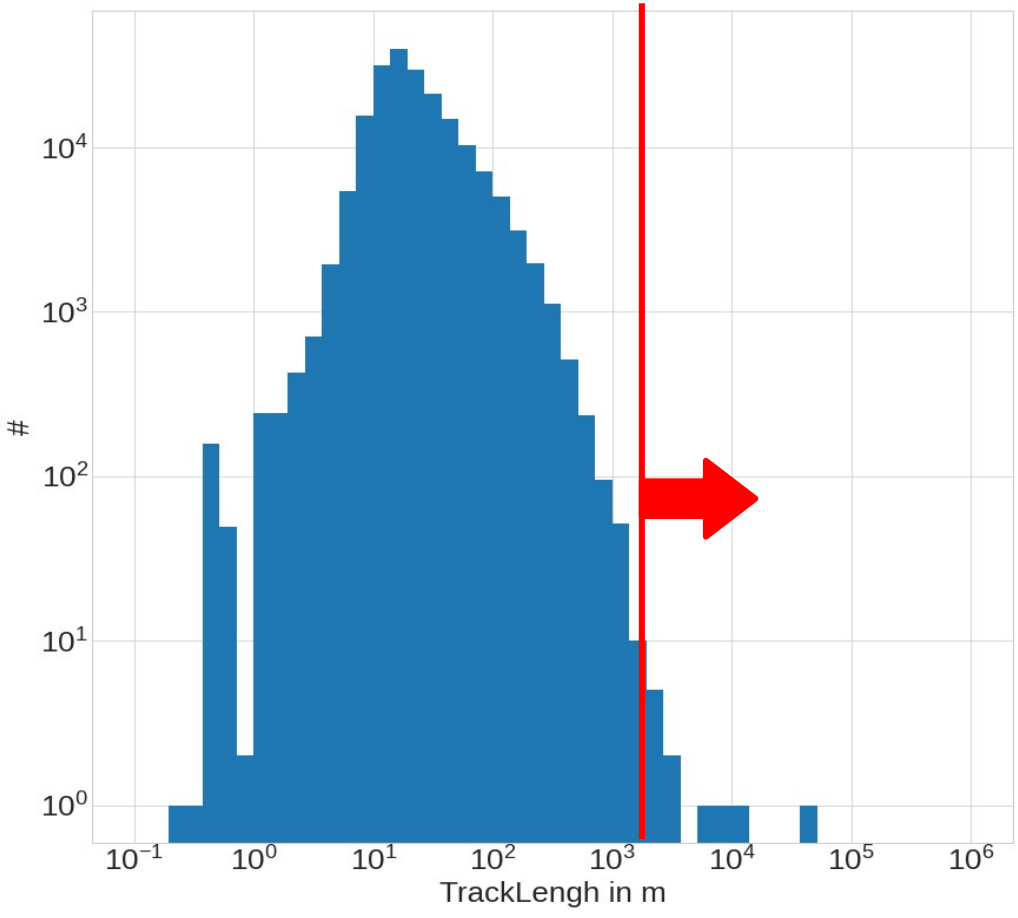
Track-Length

- Over 1km Track-Splitting or local distribution



Highly parallel CORSIKA processing

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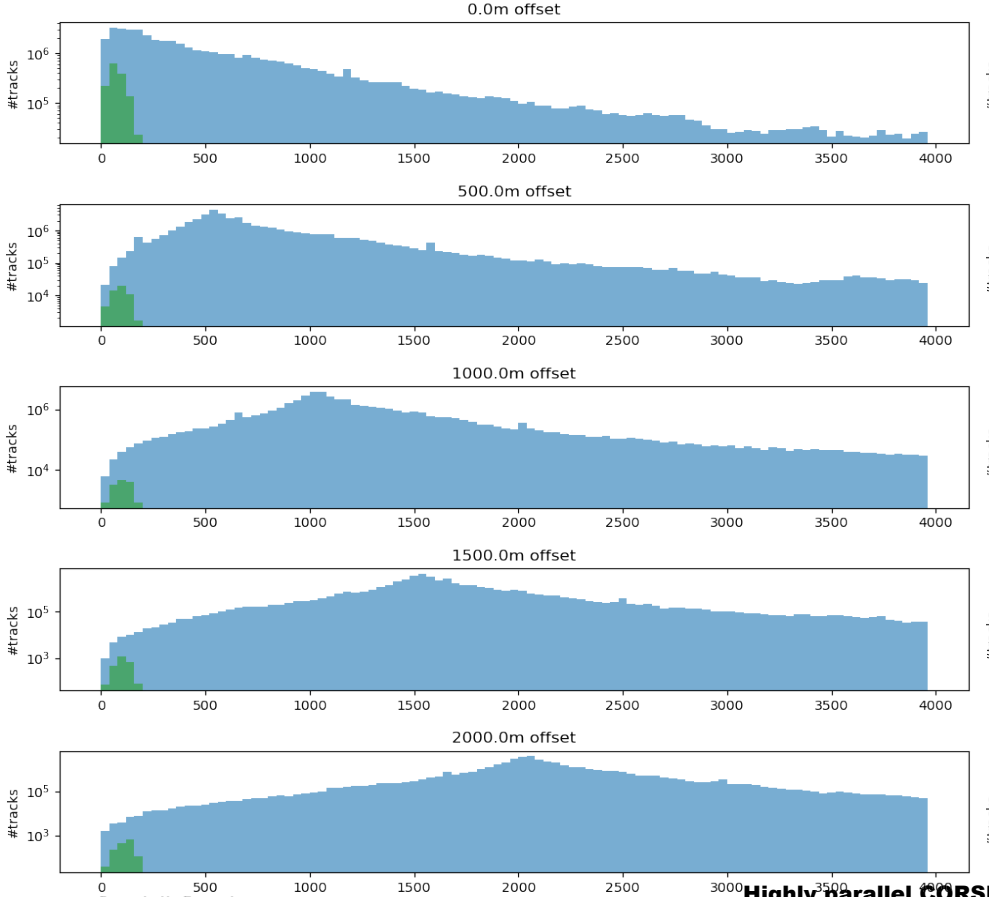
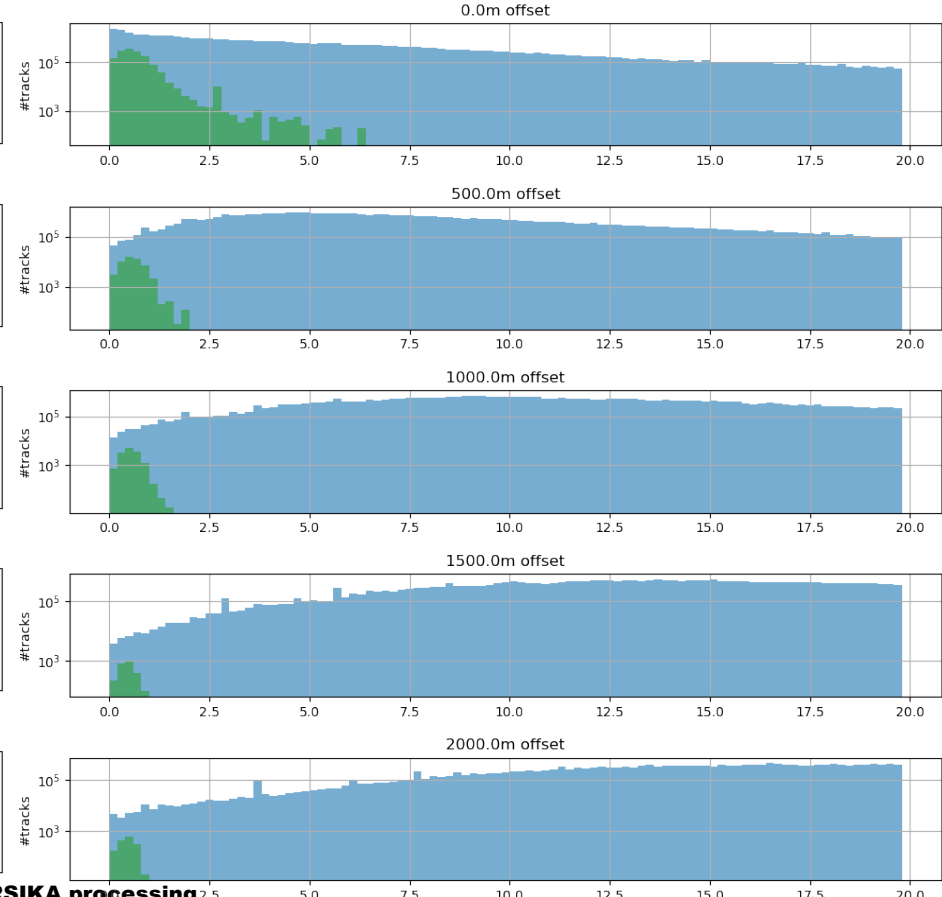
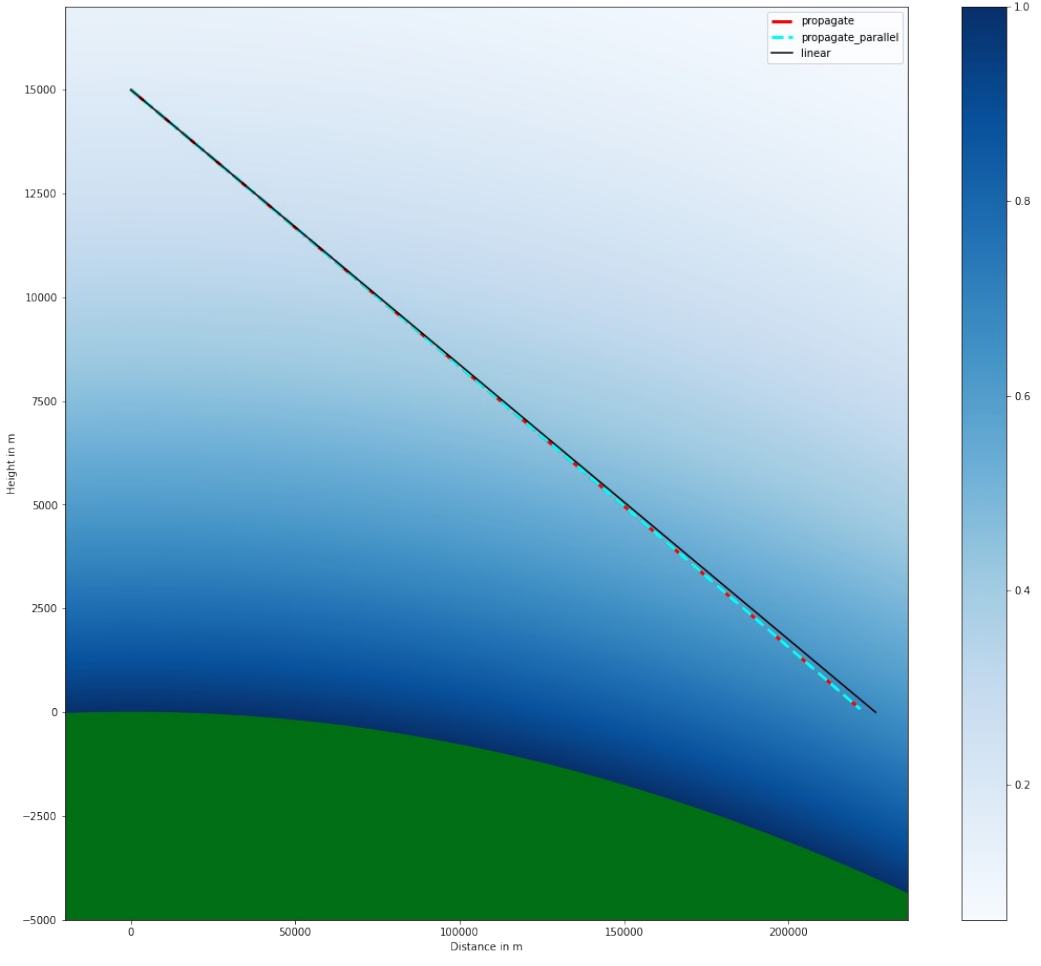
Filter


0.0m offset
500.0m offset
1000.0m offset
1500.0m offset
2000.0m offset
#tracks
Distance from camera center in [m]


0.0m offset
500.0m offset
1000.0m offset
1500.0m offset
2000.0m offset
#tracks
min Angle to camera outer border in [°]

Photon Propagation



Highly parallel CORSIKA processing

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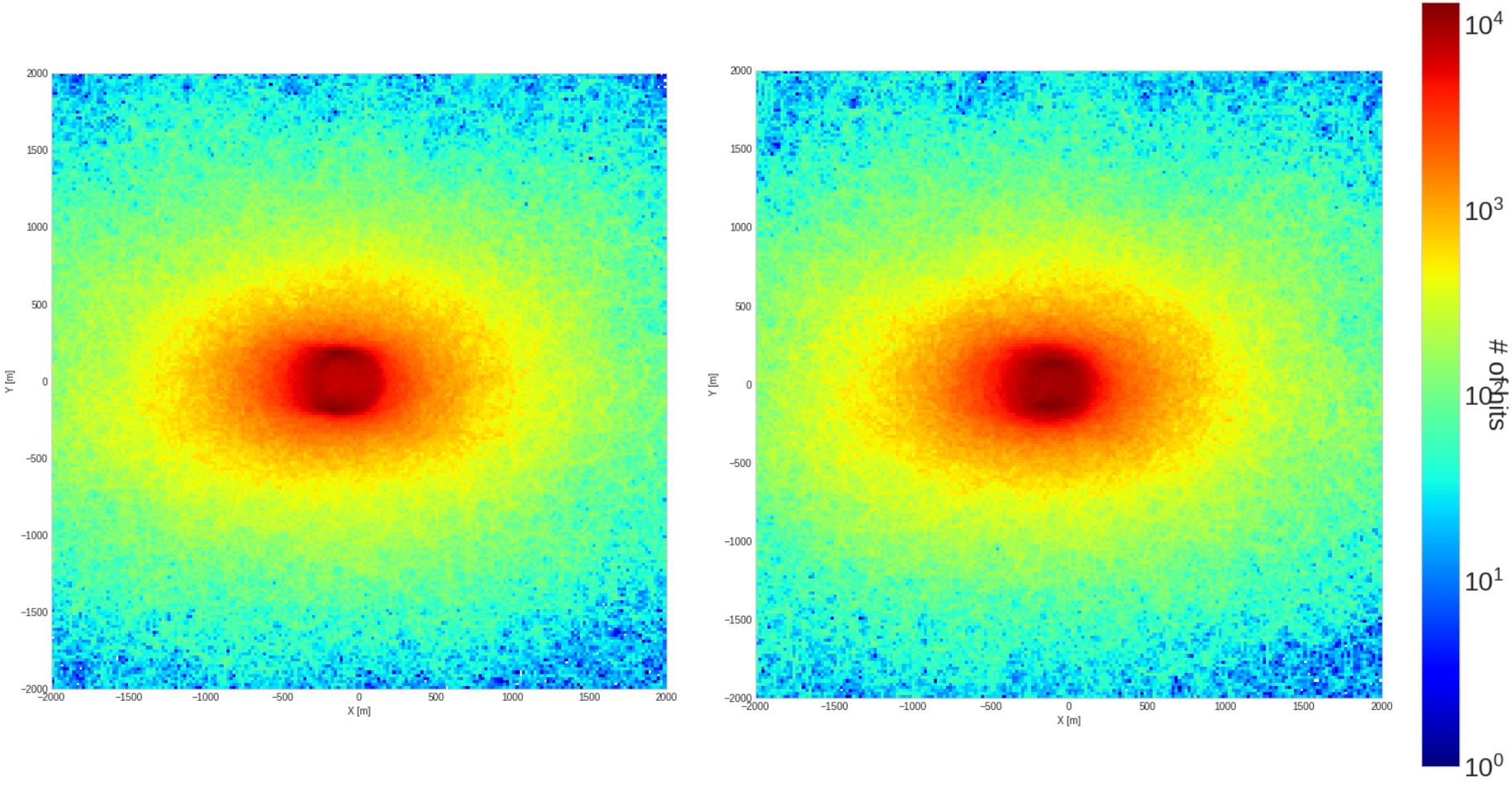
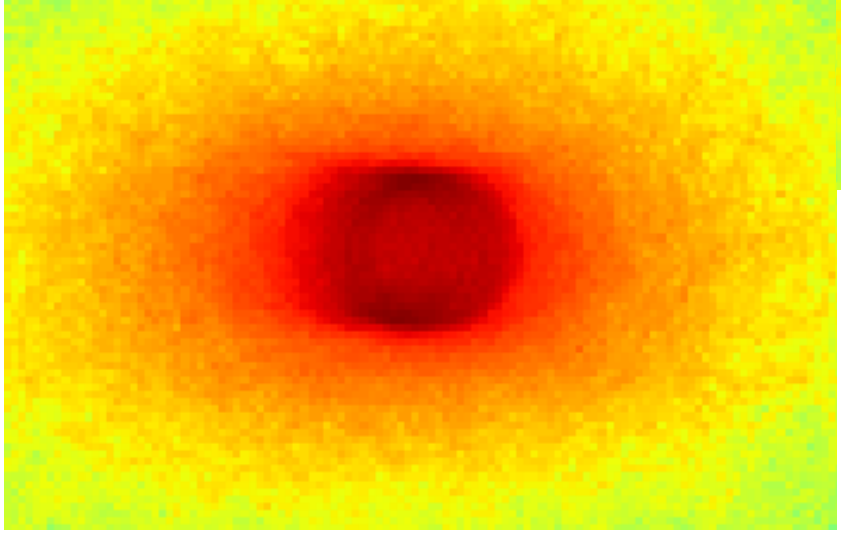
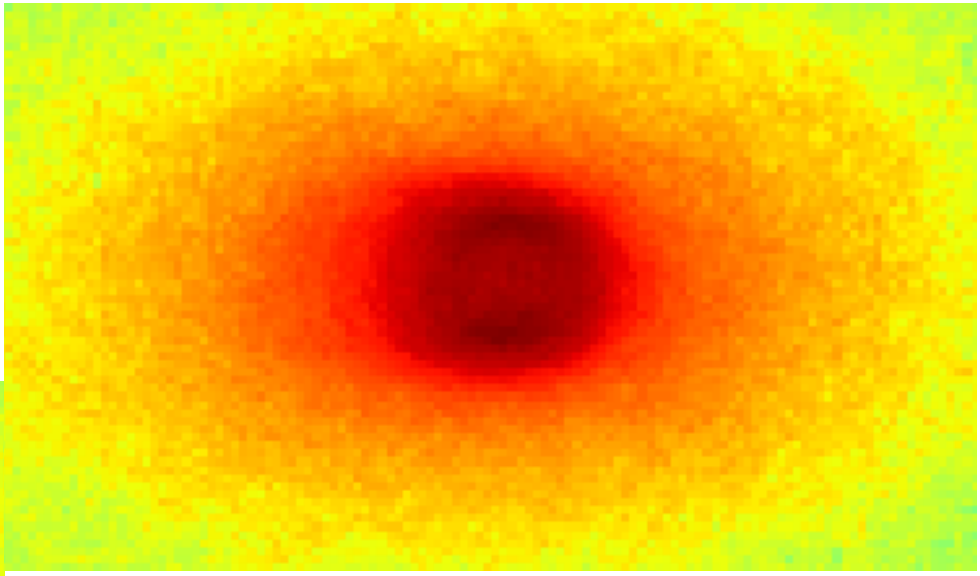

Y [m]
X [m]
# of hits
10^4
10^3
10^2
10^1
10^0

Reduced Artifacts





ToDo

- Compare average distributions between:
  Corsika7, Corsika8 GPU, Corsika8 CPU