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SI LAB
Silizium Labor Bonn

Status of DATCON

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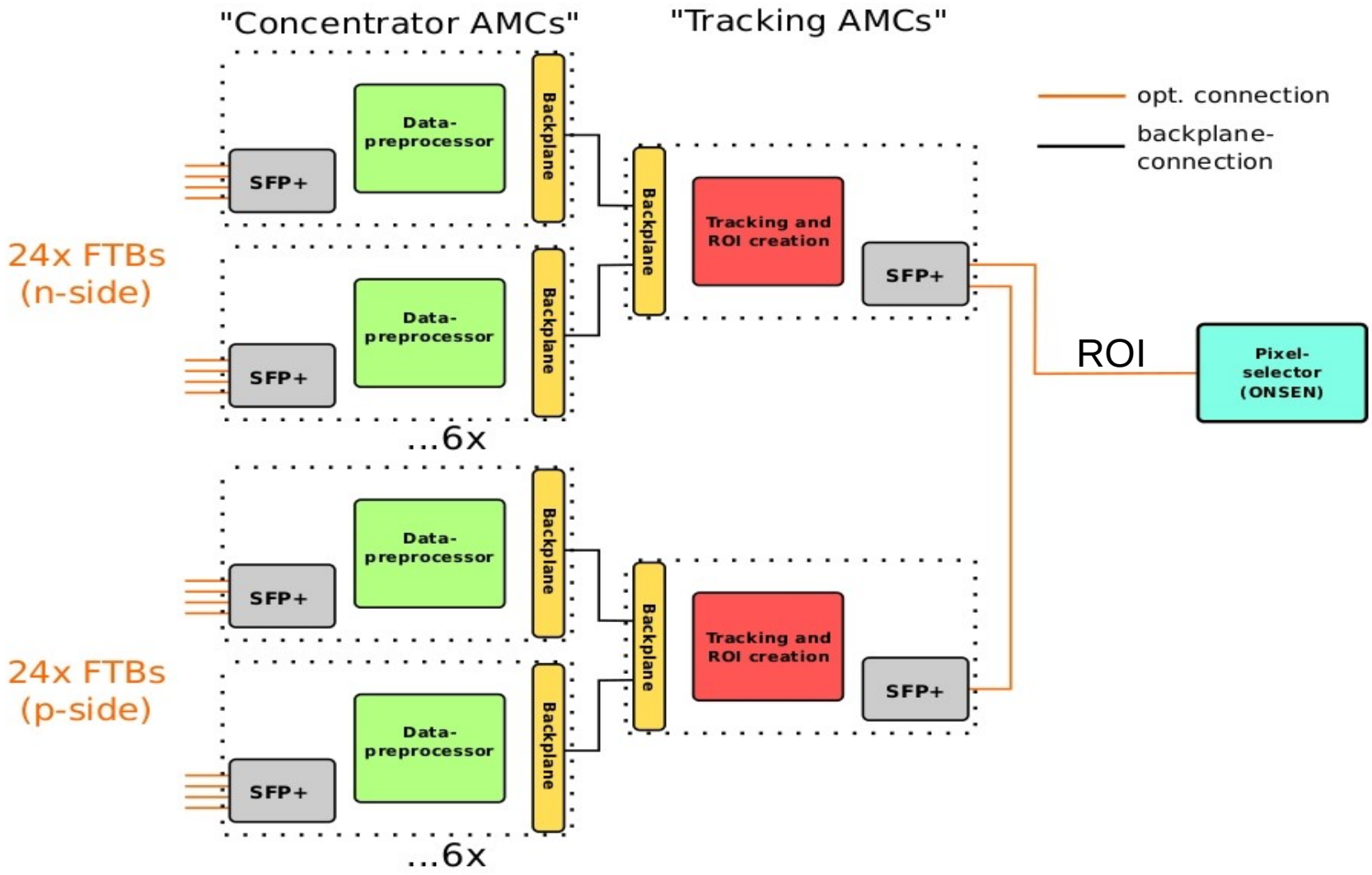
Connection topology of the DATCON



AMC cards

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- **AMC v3.1**
  - **Used as concentrator**
  - **15 produced by IHEP-Bejing**

- **DHE v3**
  - **Used as tracking unit**
  - **3 received and recently tested by Igor**

- **SFP extension boards**
  - **Designed by Igor**
  - **5 received and tested**

New backplane design

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Concentrator AMCs (AMCv3)

Tracking AMC (DHHC)

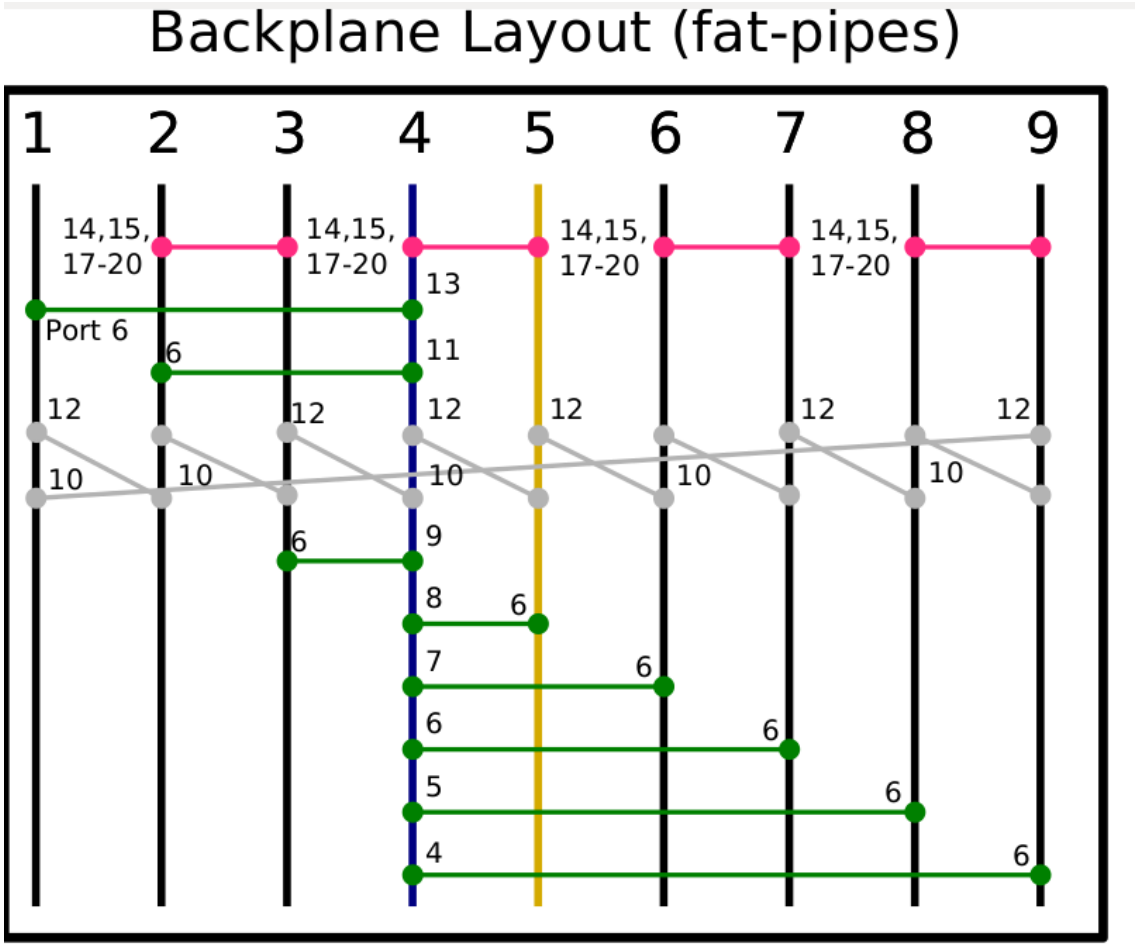
SFP ext. card

opt. fibre

DATCON backplane

optional (ONSEN) Daisy-Chain

SFP extension card



Chassis

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- **Backplane designed by Pentair**
- **MTCA format**
- **Expected delivery : March**
- **2 for DATCON, 2 for ONSEN**
  1 for backup
- **JTAG connection**
  problem solved

DESY Test Beam plans

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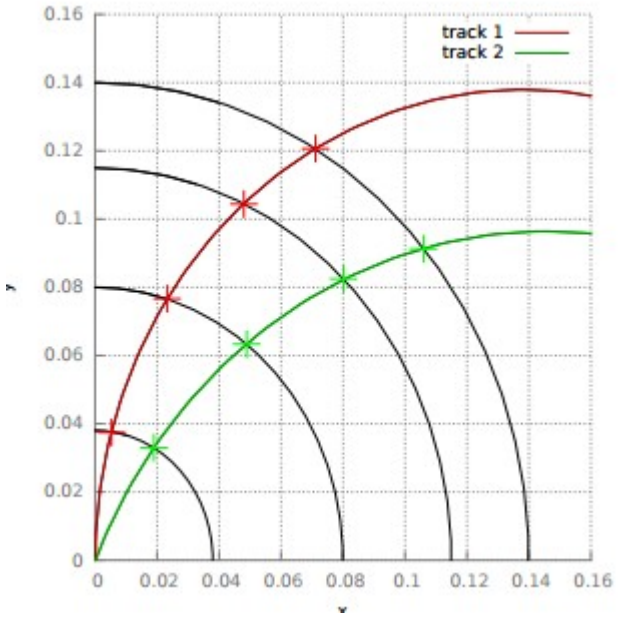
- **Default system for test beam → try to be as close as possible to final system**
  - **2 DHE for the tracking on n and p side**
  - **6 AMCs v3.1**
  - **2 MTCA crate equipped with new backplane**
  - **2 SFP extension boards**

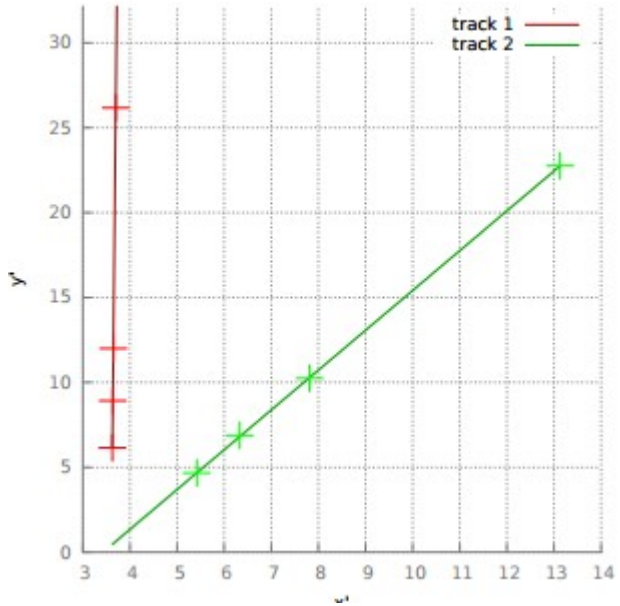
- **If new crates don't arrive on time**
  - **Need to reduce to 3 layer tracking**
  - **P and n side tracking on only one DHE**

SVD Track Reconstruction

- **Use of the Hough transformation**
- $d = x \cdot \cos(\theta) + y \cdot \sin(\theta)$
- **Can only be applied for straight line (as previously implemented on FPGA)**
- **For circular track a conformal transformation is needed**

- $x', y' = \frac{x, y}{x^2 + y^2}$

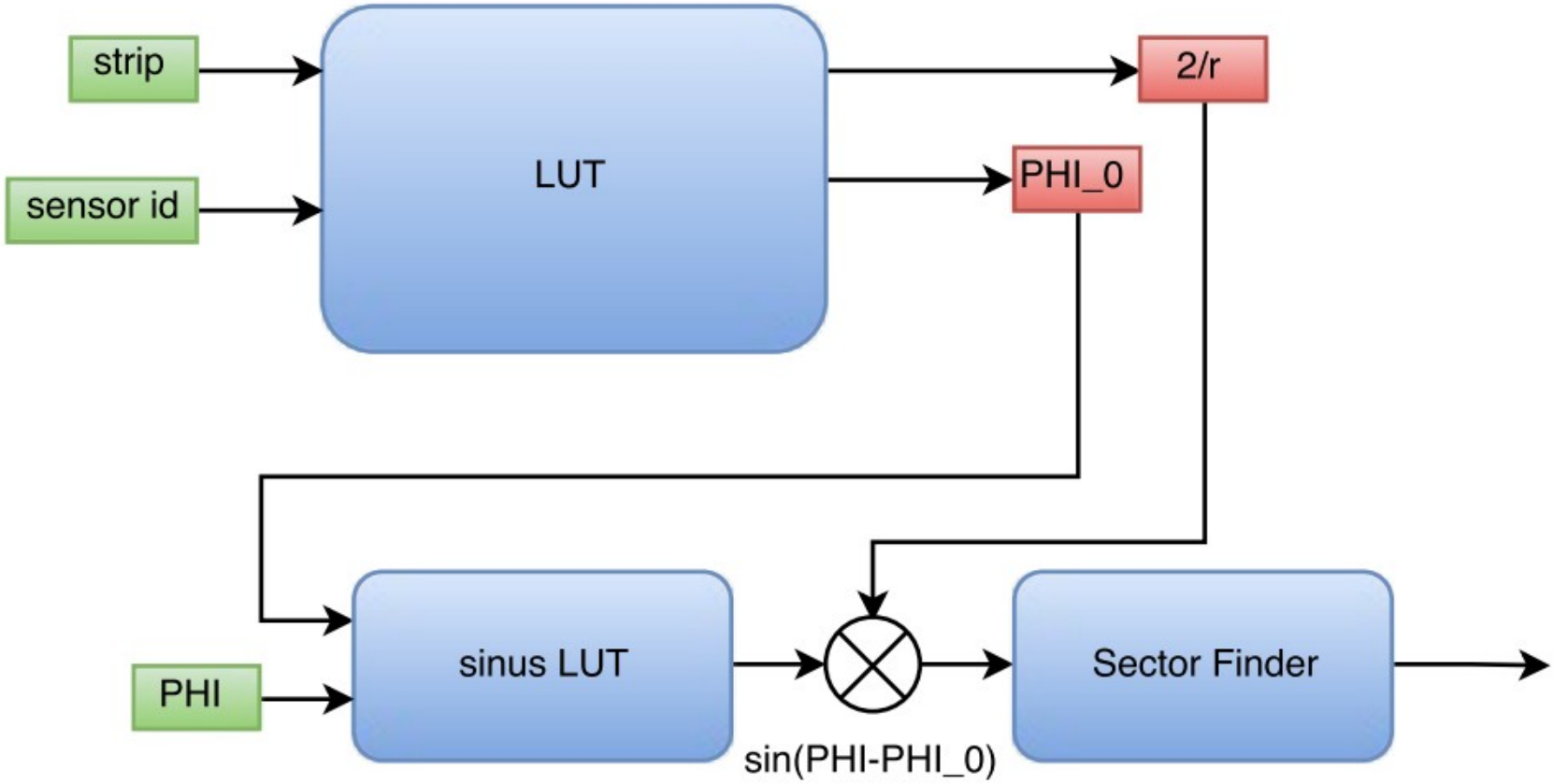




Another approach

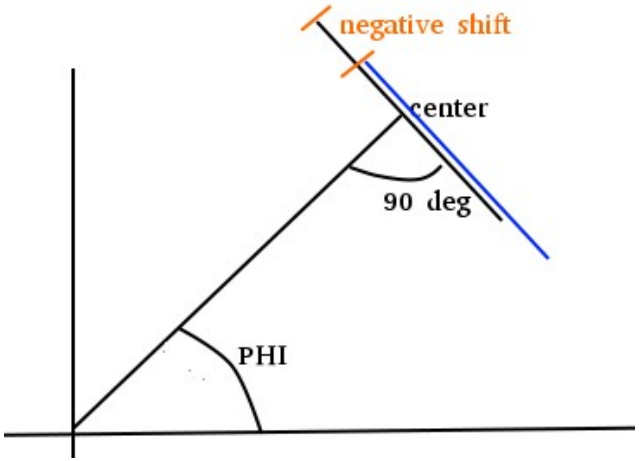
- **Hough transformation**
- **Works directly on circle**
- **Conformal mapping included**
- $$\rho = \frac{2 \cdot \sin\left(\varphi - \varphi_0\right)}{r}$$
- **Implementation with LUT**

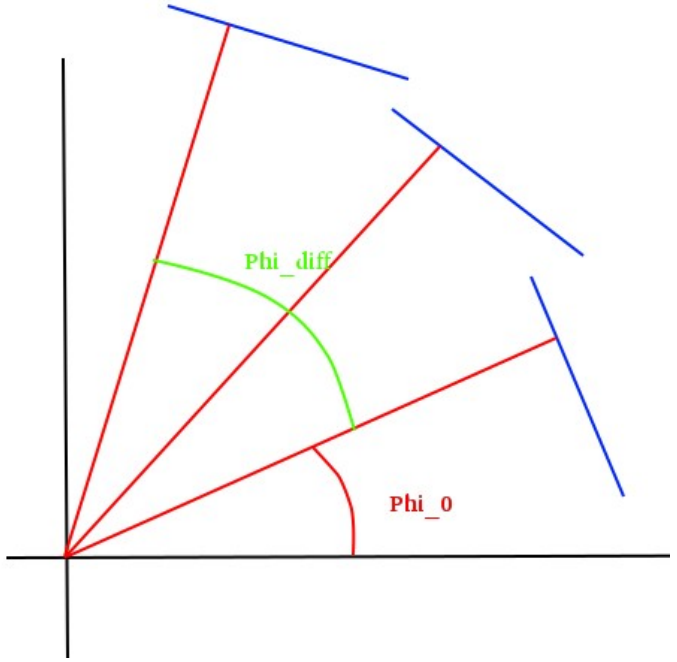
FPGA implementation for phi



For phi

- **Sensor position defined by angle, radius and shift**
- **Only one sensor of each layer stored**
- **Each strip angle and radius can be returned from reference sensor**



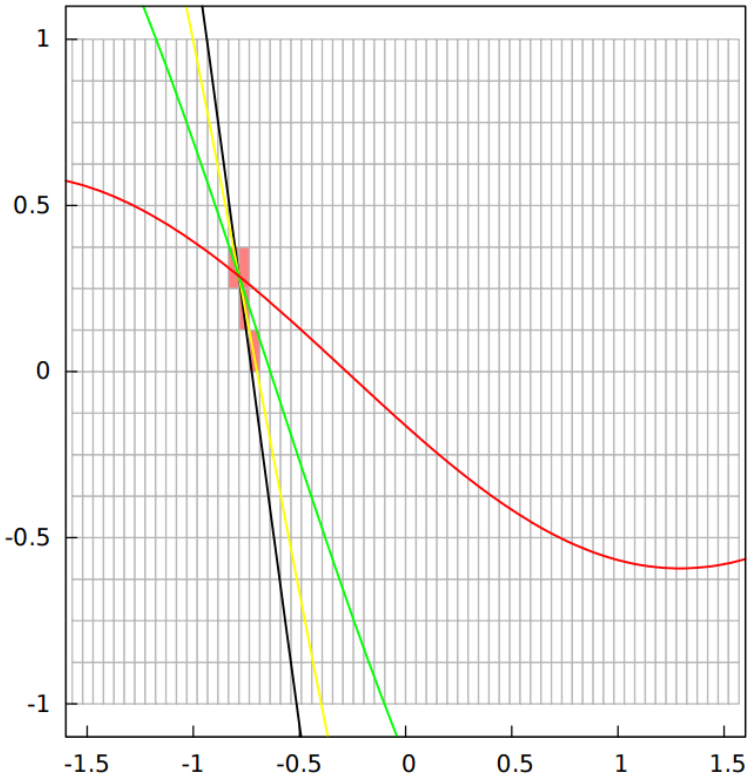


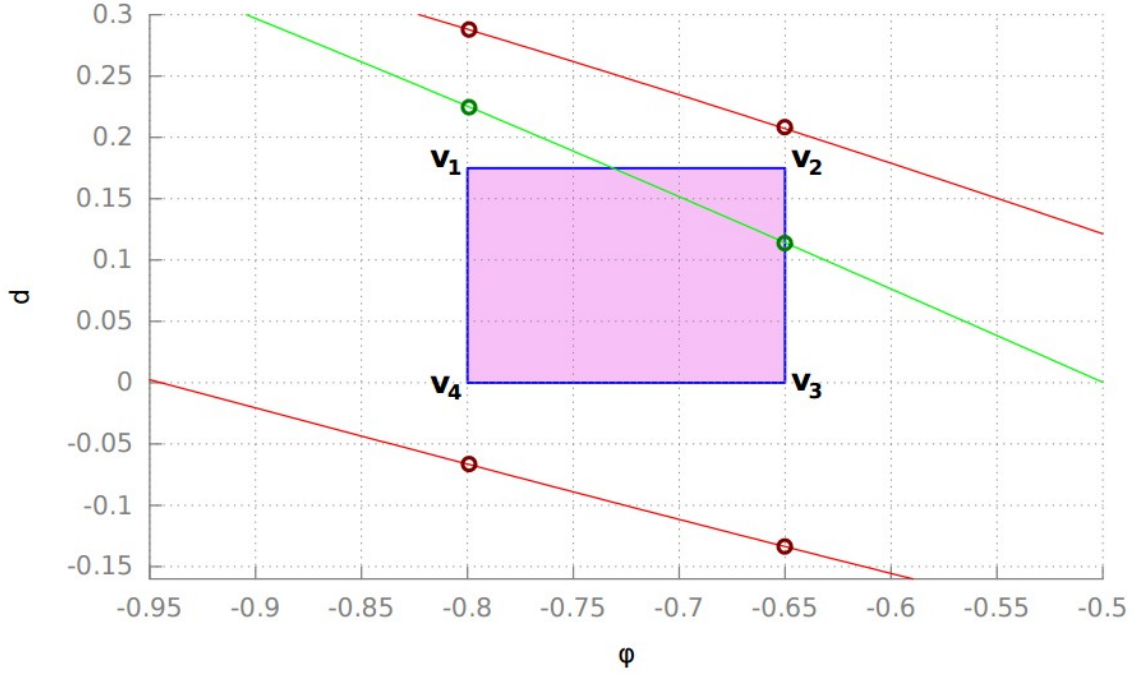
For theta

- **For test beam**
  - **N strip only defined on y-z axis**
  - **Strip position, pitch and sensor position are known**
  - **No LUT needed**
  - **Not too much resource consuming function returns exact coordinate**
- **For full geometry x-y-z, solution has to be investigated**

Sector finder

Intersection finder





BASF2 Simulation Results

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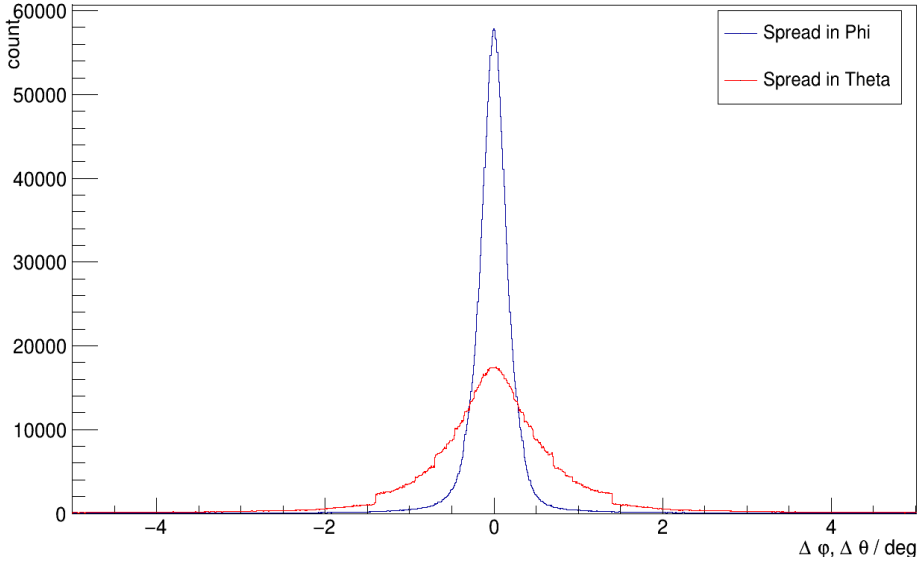
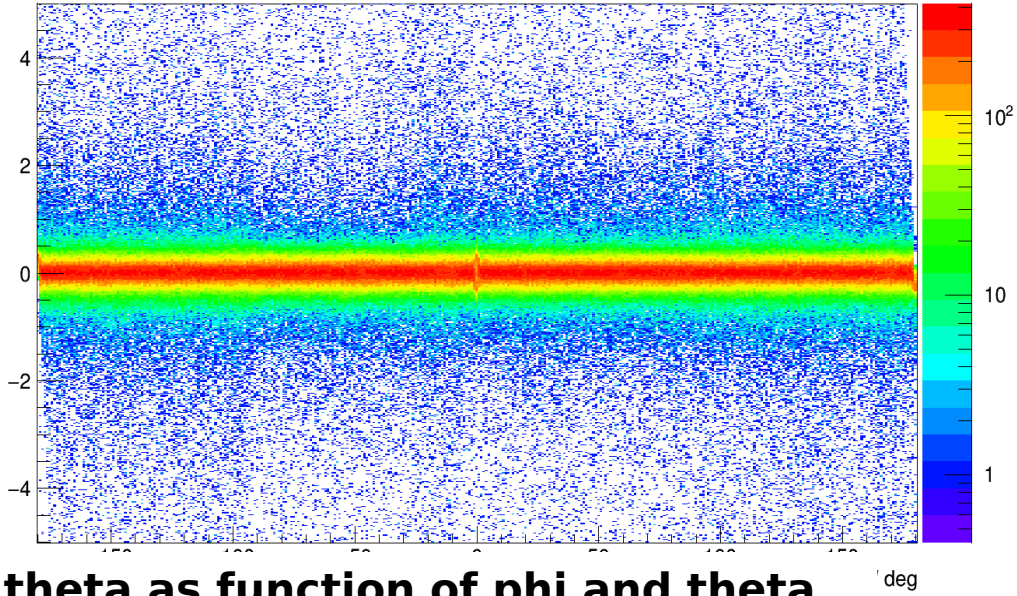
- **Setup:**
  - **Electrons only**
  - **p ∈ [0 GeV, 3 GeV]**
  - **θ ∈ [17°, 150°]**
  - **φ ∈ [-180°, 180°]**
  - **256 sectors for φ (yields φ and curvature of the track) and 64 sectors for θ (yields θ of the track)**
  - **3 layer reconstruction**

Reconstruction results

Phi and Theta resolution

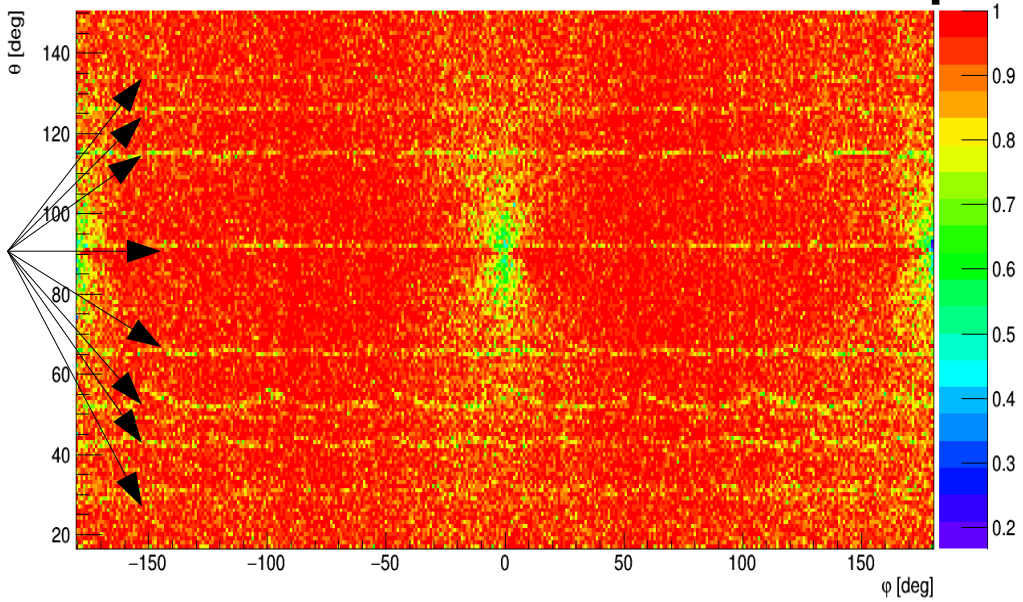


Phi resolution

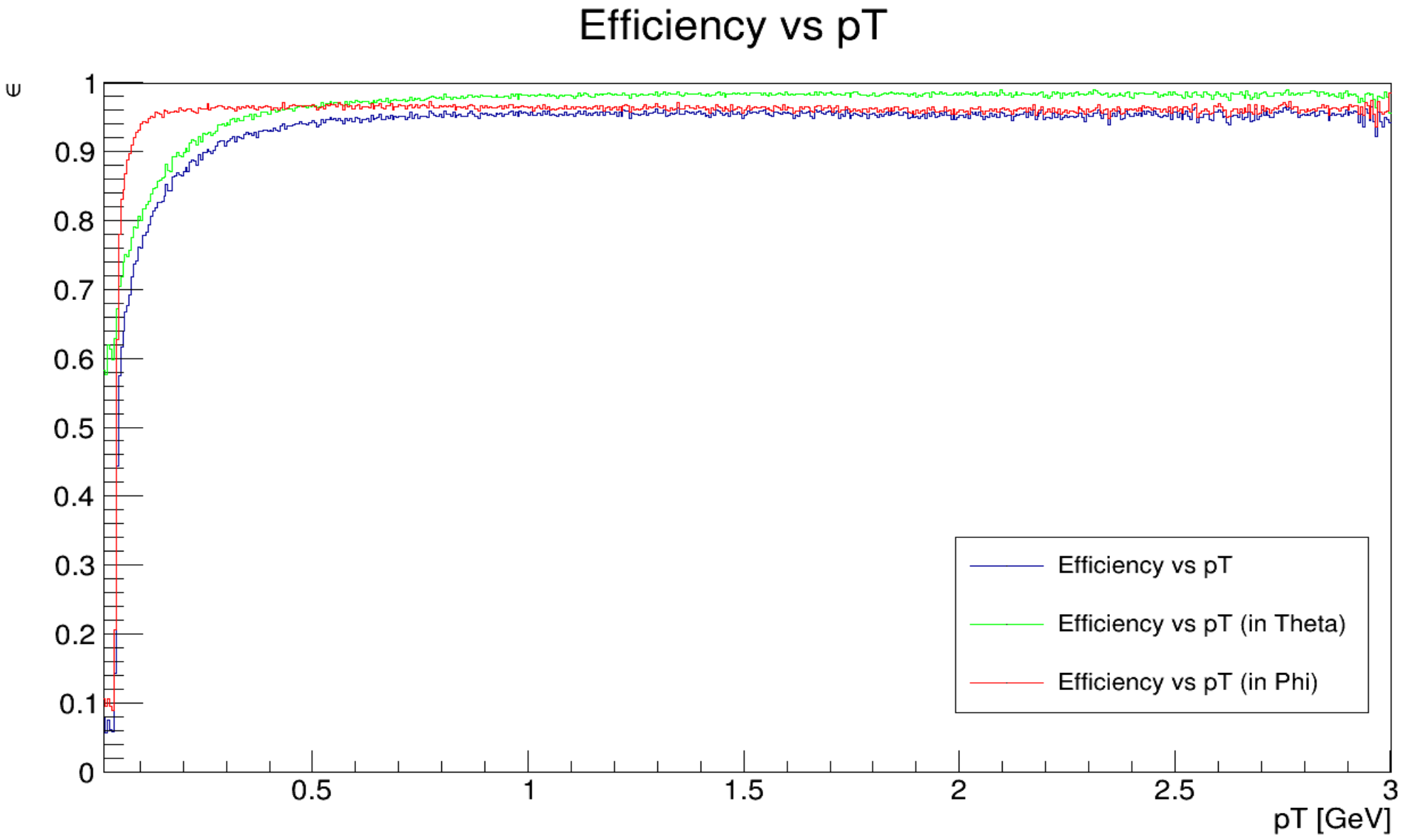


Efficiency of the reconstruction of theta as function of phi and theta

SVD sensors glued



Simulation Results



ROI calculation

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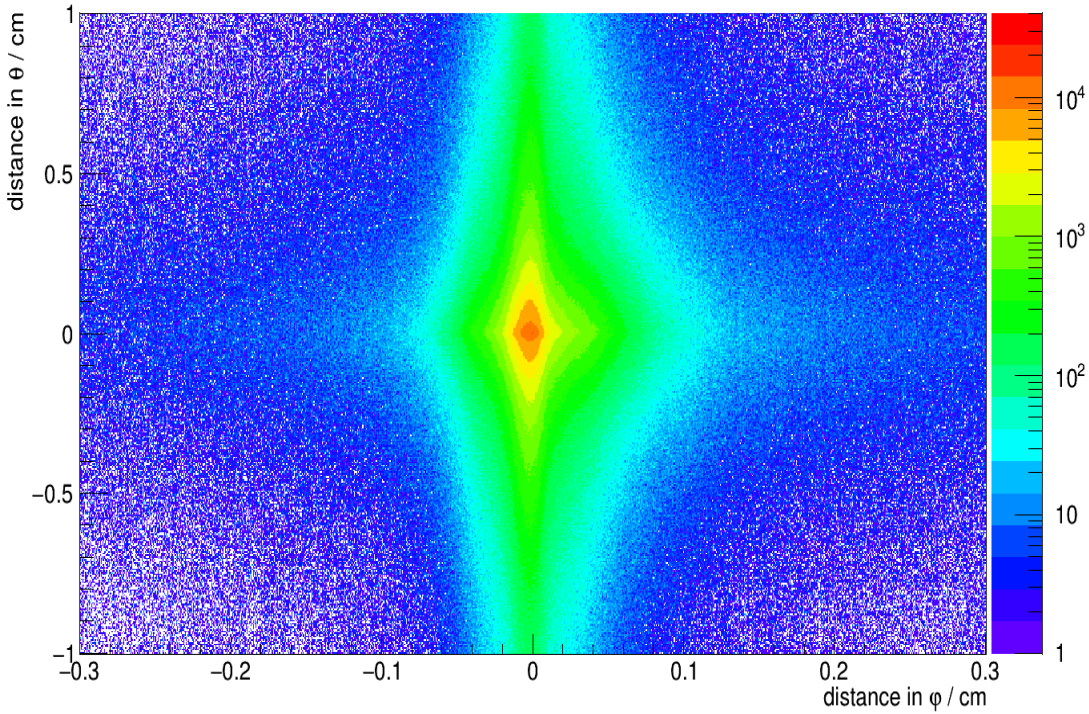
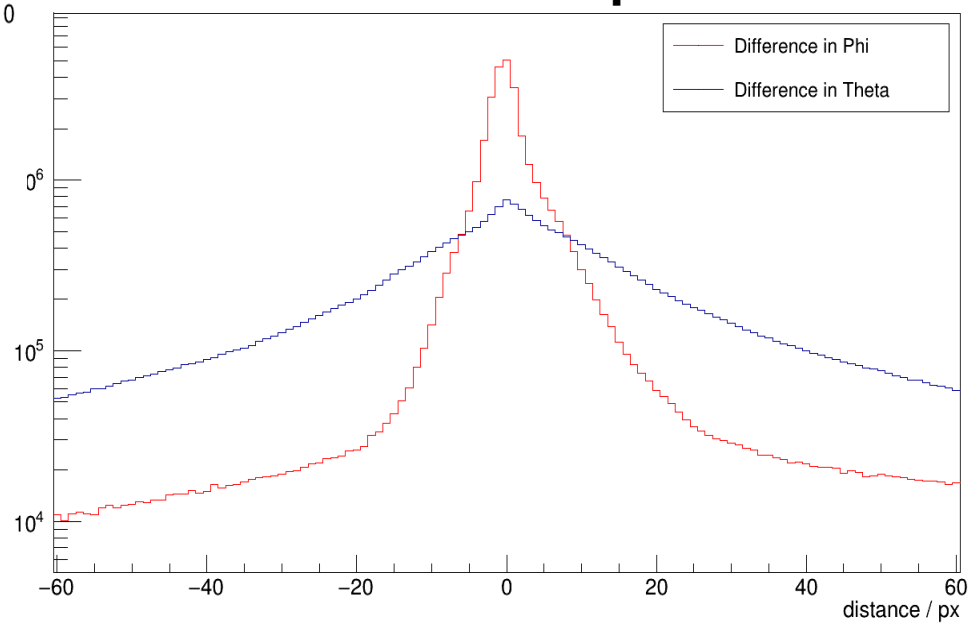
MPH resolution in phi and theta



MPH resolution in phi and theta



Track finder and DATCON summary

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- **The concentrators do not send coordinate anymore but strip ID**
- **The two methods work, tested on simulations**
- **Circle finding method on φ**
- **Straight line finding method on θ**
- **Works better for high p_T**
- **Problems with ROI calculation, esp. for positively charged particles**
- **Next steps**
  - **Prepare test beam (simulation and FPGA)**
  - **Make extrapolation work for positively charged particles**
  - **Improve the tracking and extrapolation algorithm (e.g. hits at detector edge only produce partial ROI)**
  - **Extrapolation on FPGA**
  - **Monitoring of the boards on EPICS**

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Thank you

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BACKUP

Simulation Results

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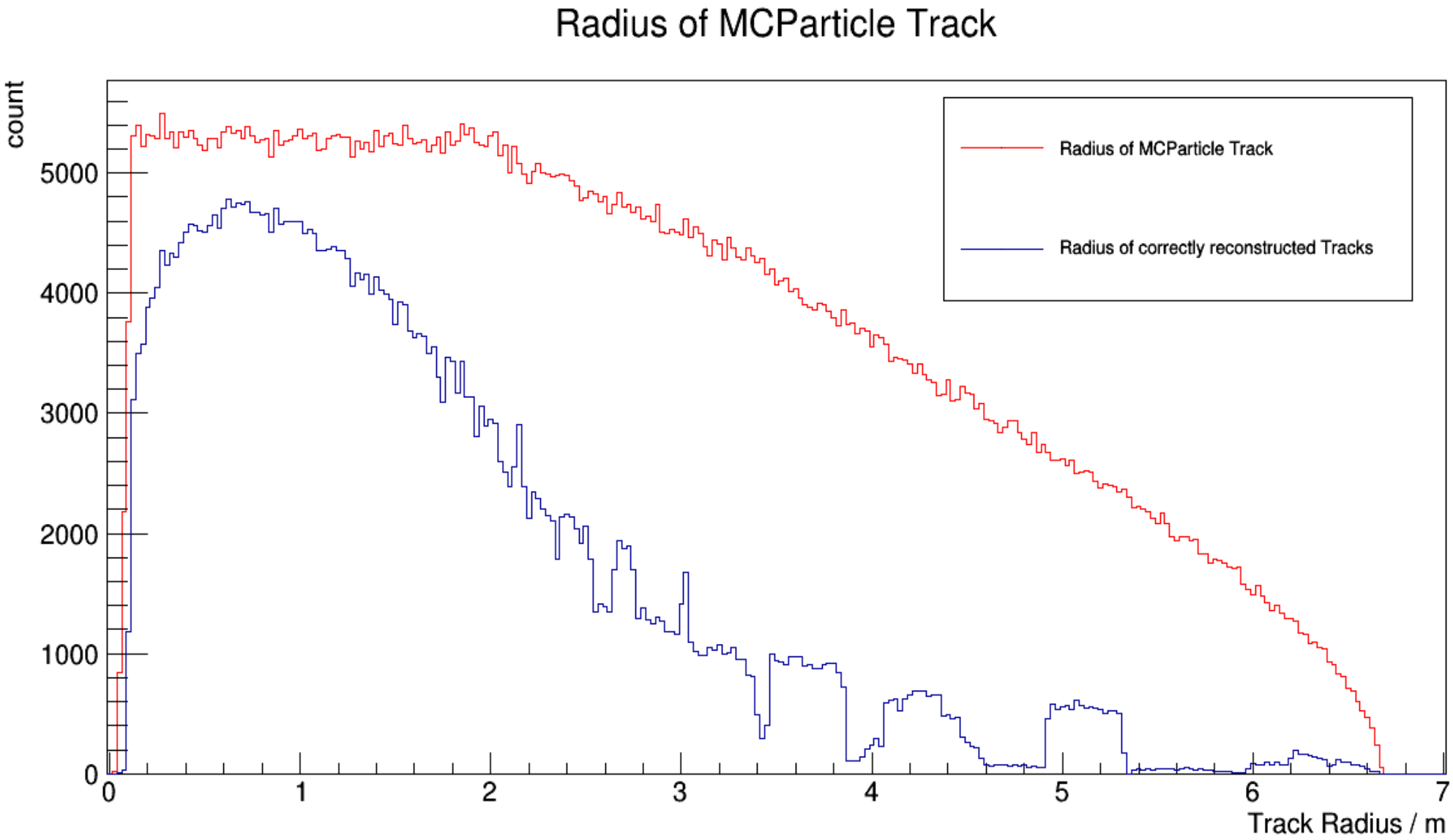

Simulation Results

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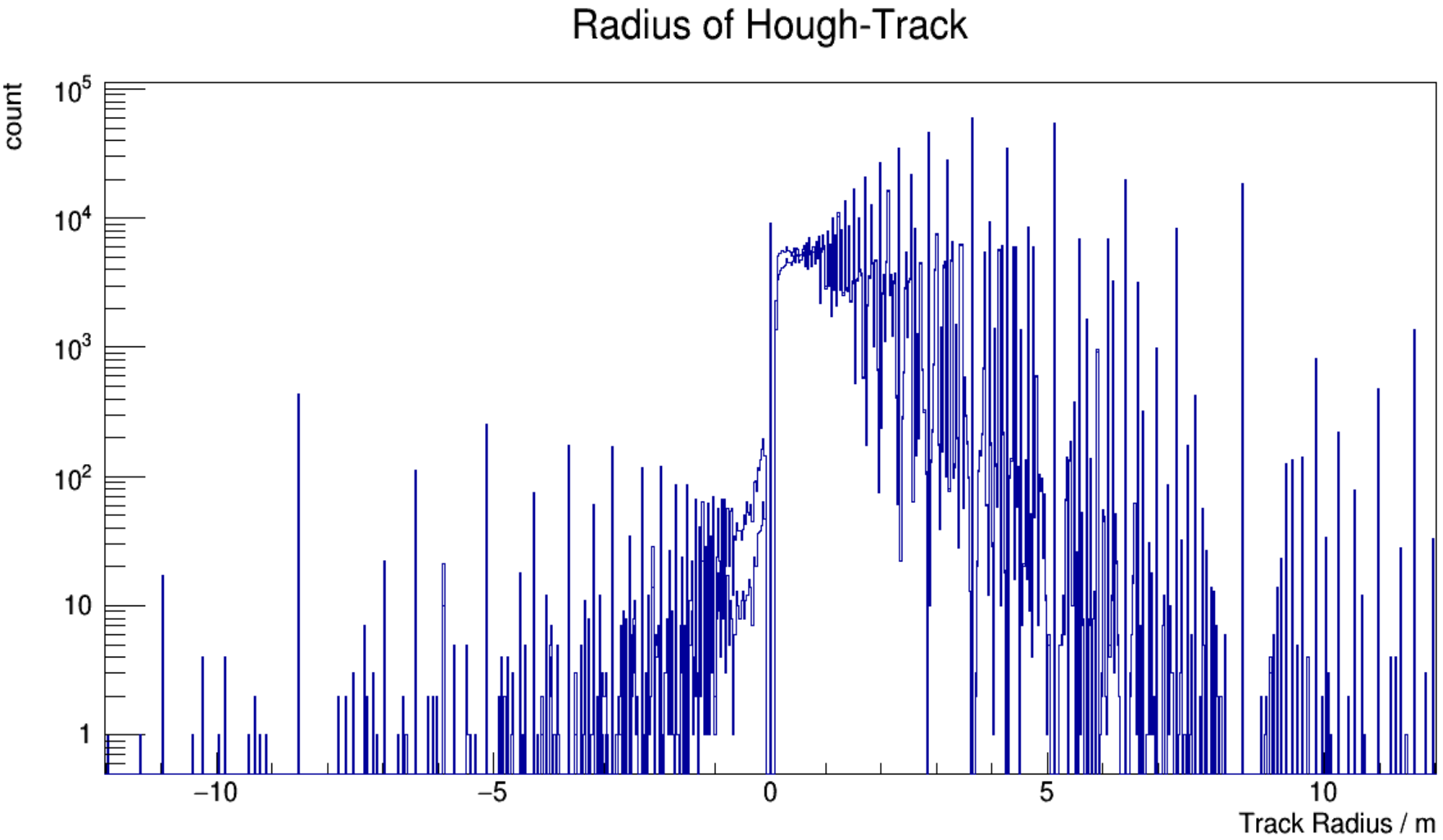

Simulation Results

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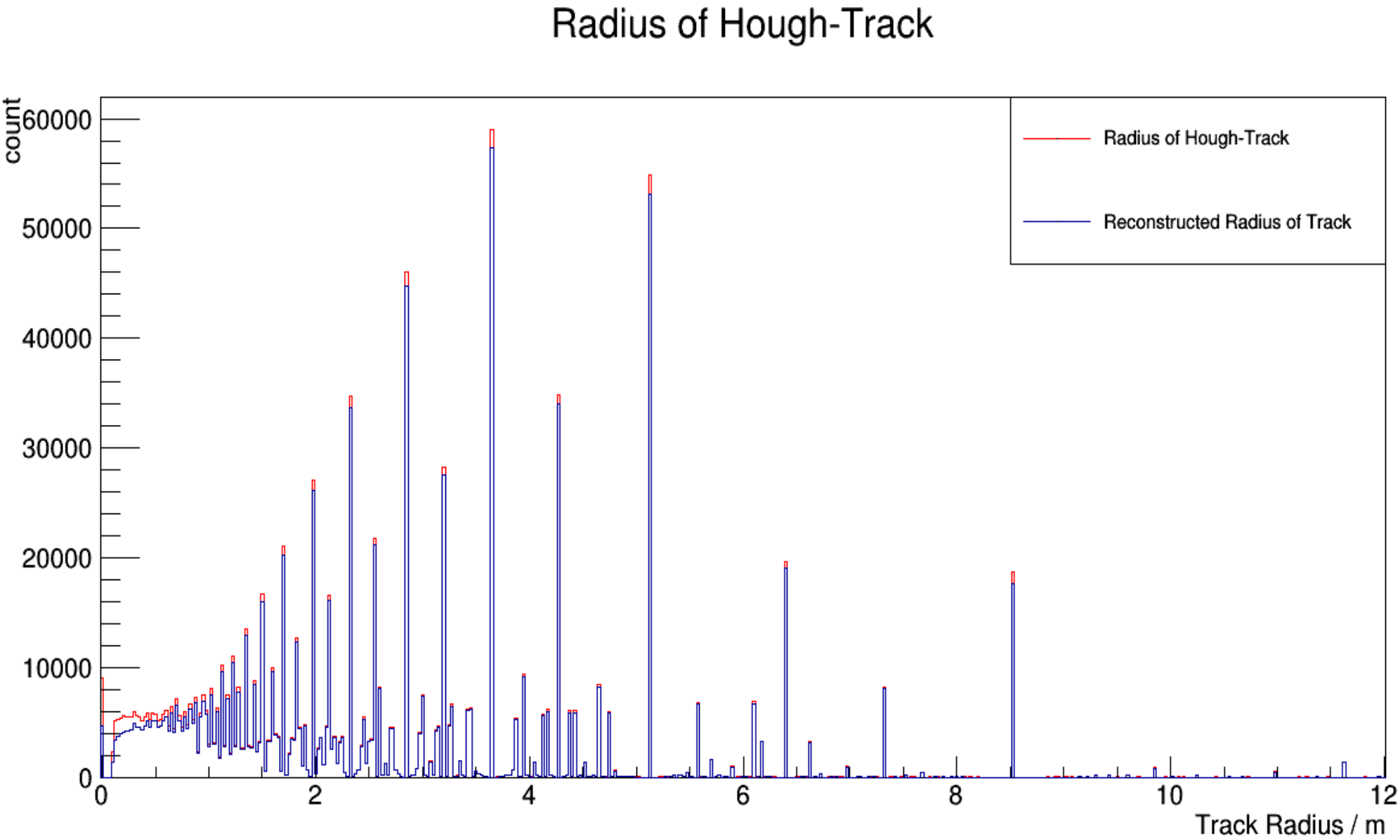

Simulation Results

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