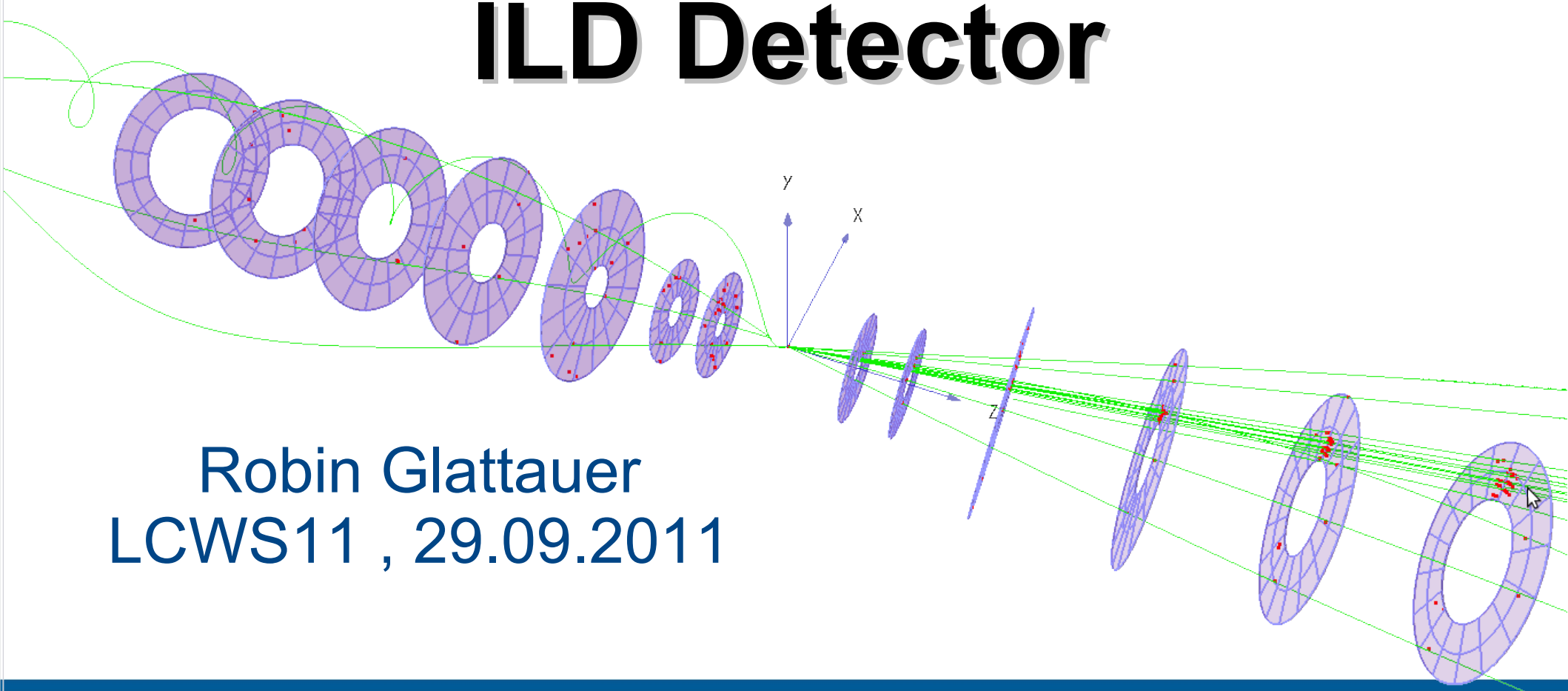
HEPHY Institute of High Energy Physics

iLCSOft

ÖAW Österreichische Akademie der Wissenschaften

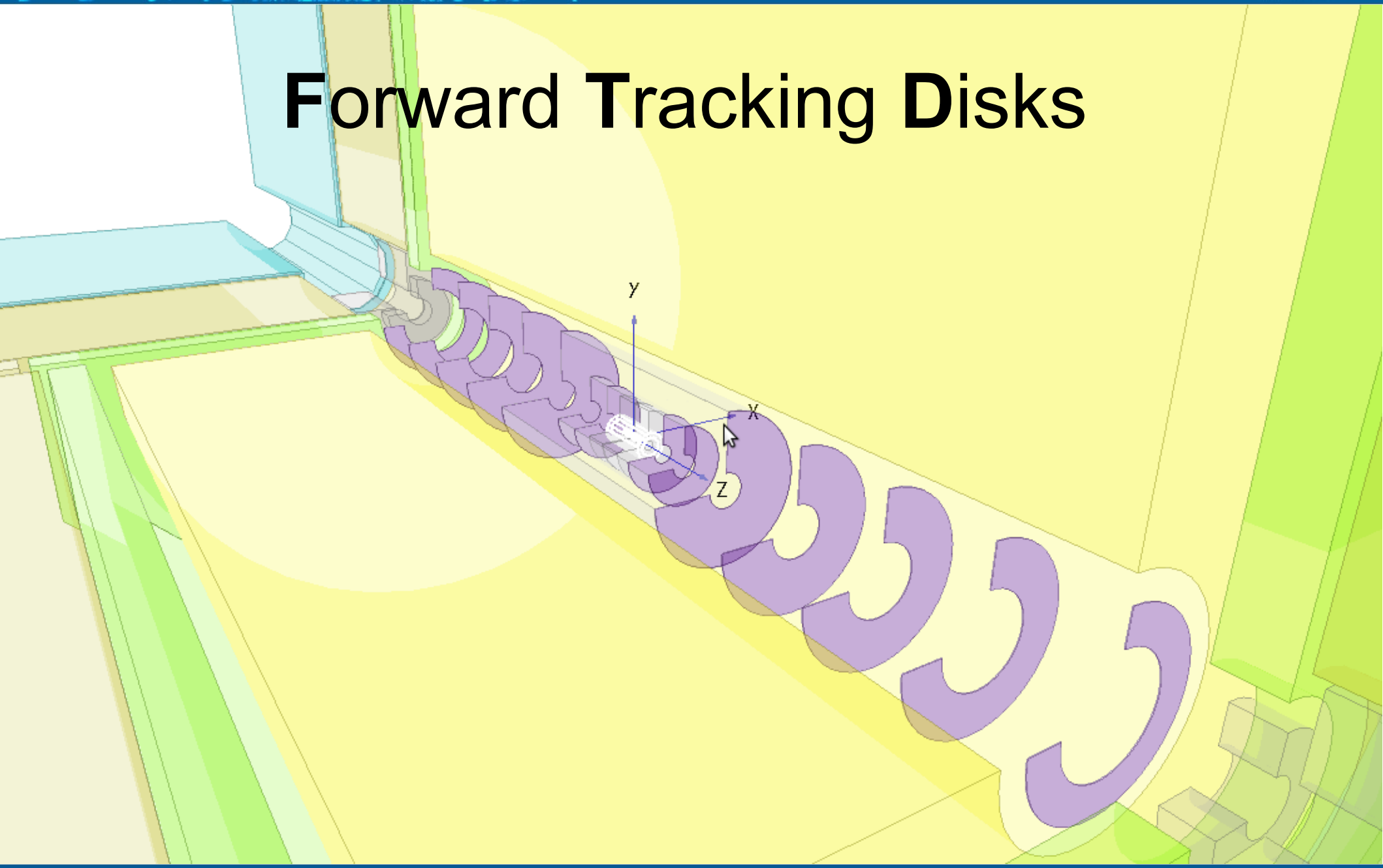
Forward Tracking in the ILD Detector



Robin Glattauer

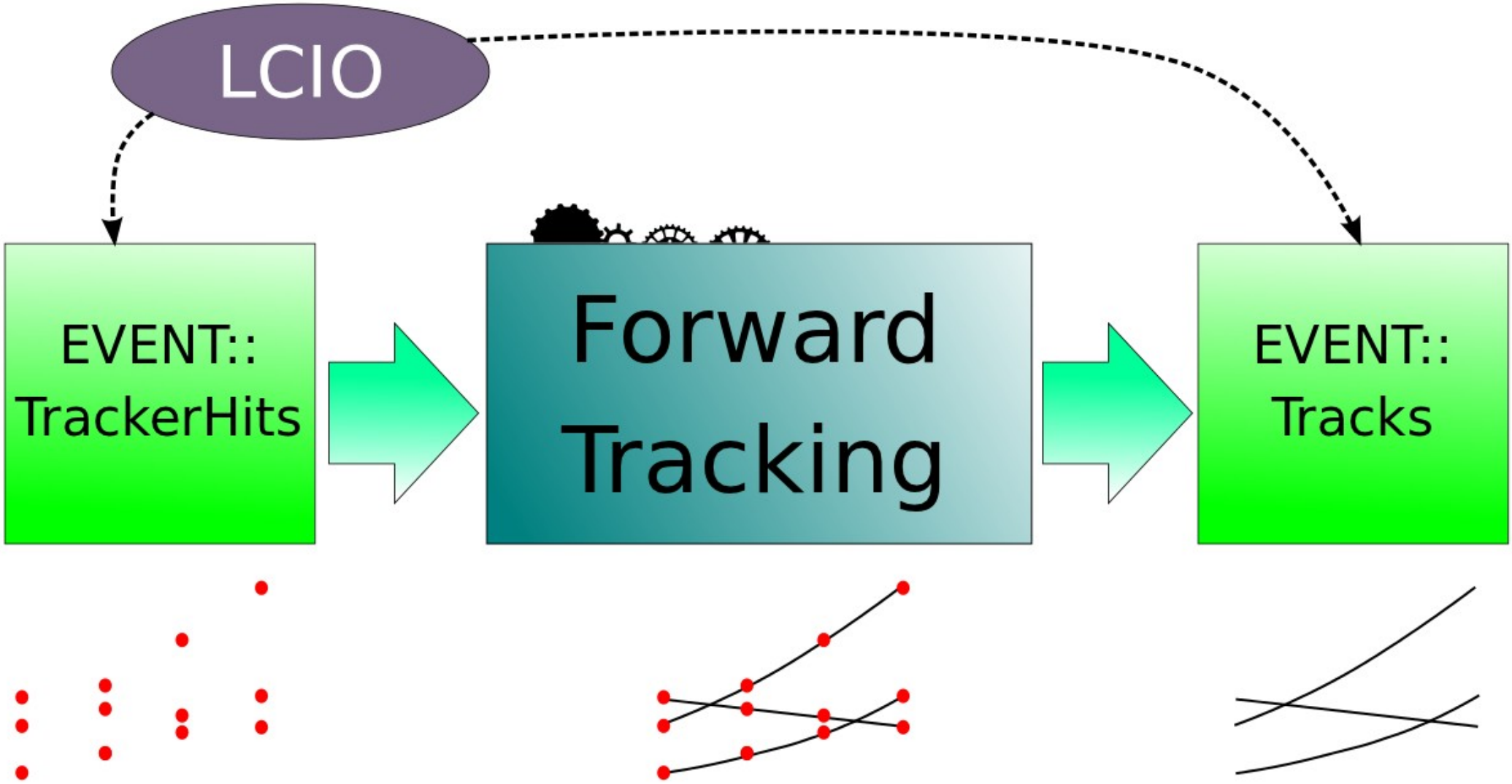
LCWS11 , 29.09.2011

Forward Tracking Disks

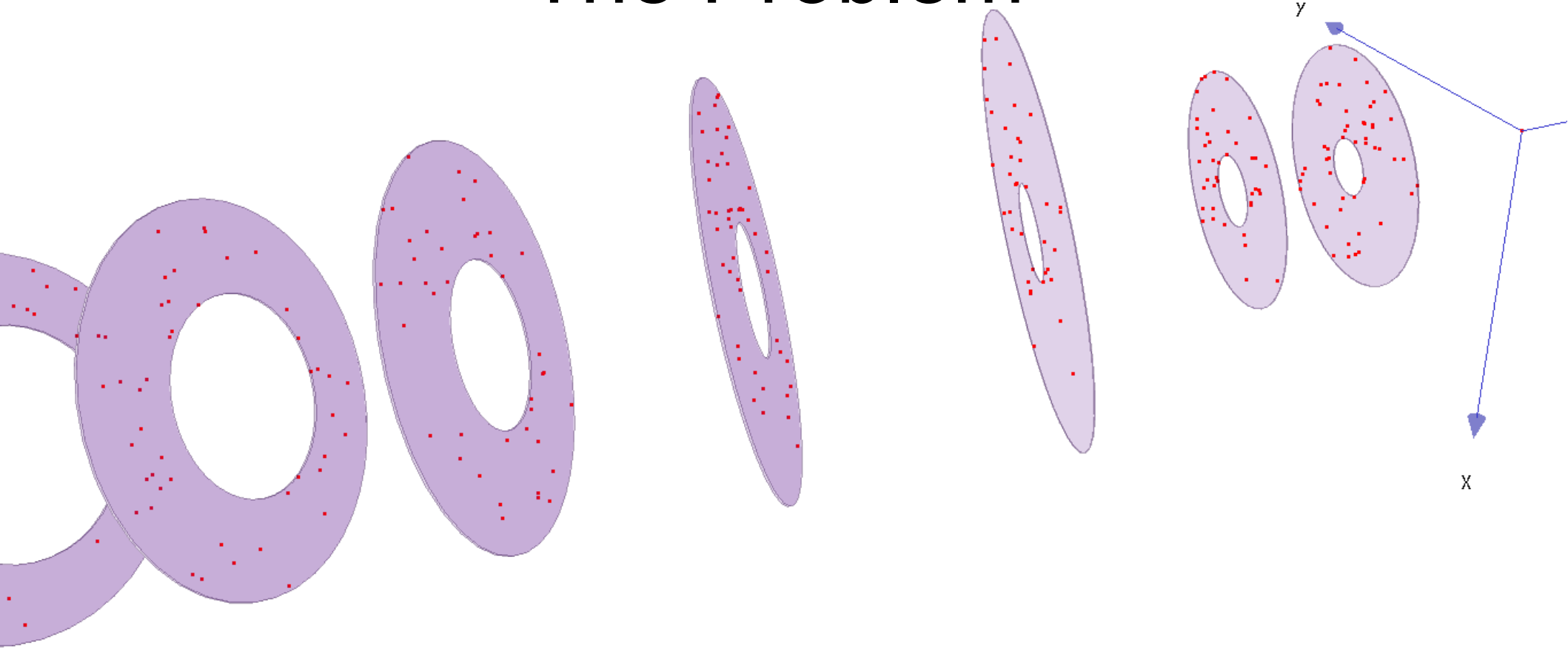


the goal

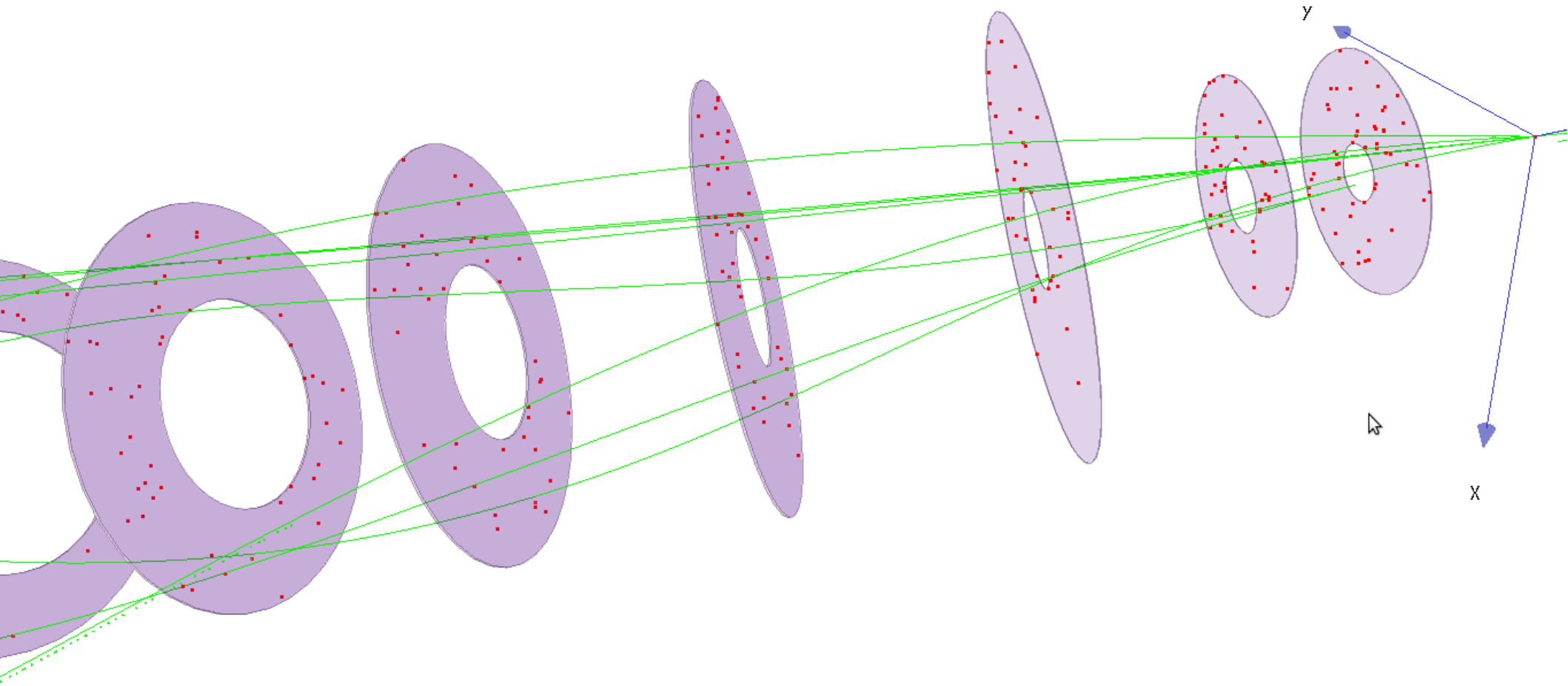
- Standalone track search for the FTDs (Forward Tracking Disks)


LCIO
EVENT::
TrackerHits
Forward
Tracking
EVENT::
Tracks

The Problem



The Solution

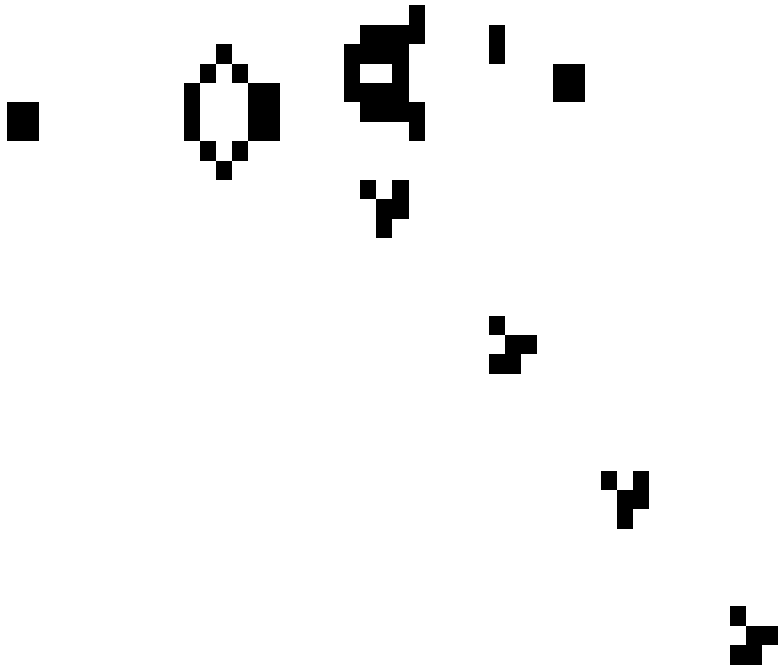


Methods

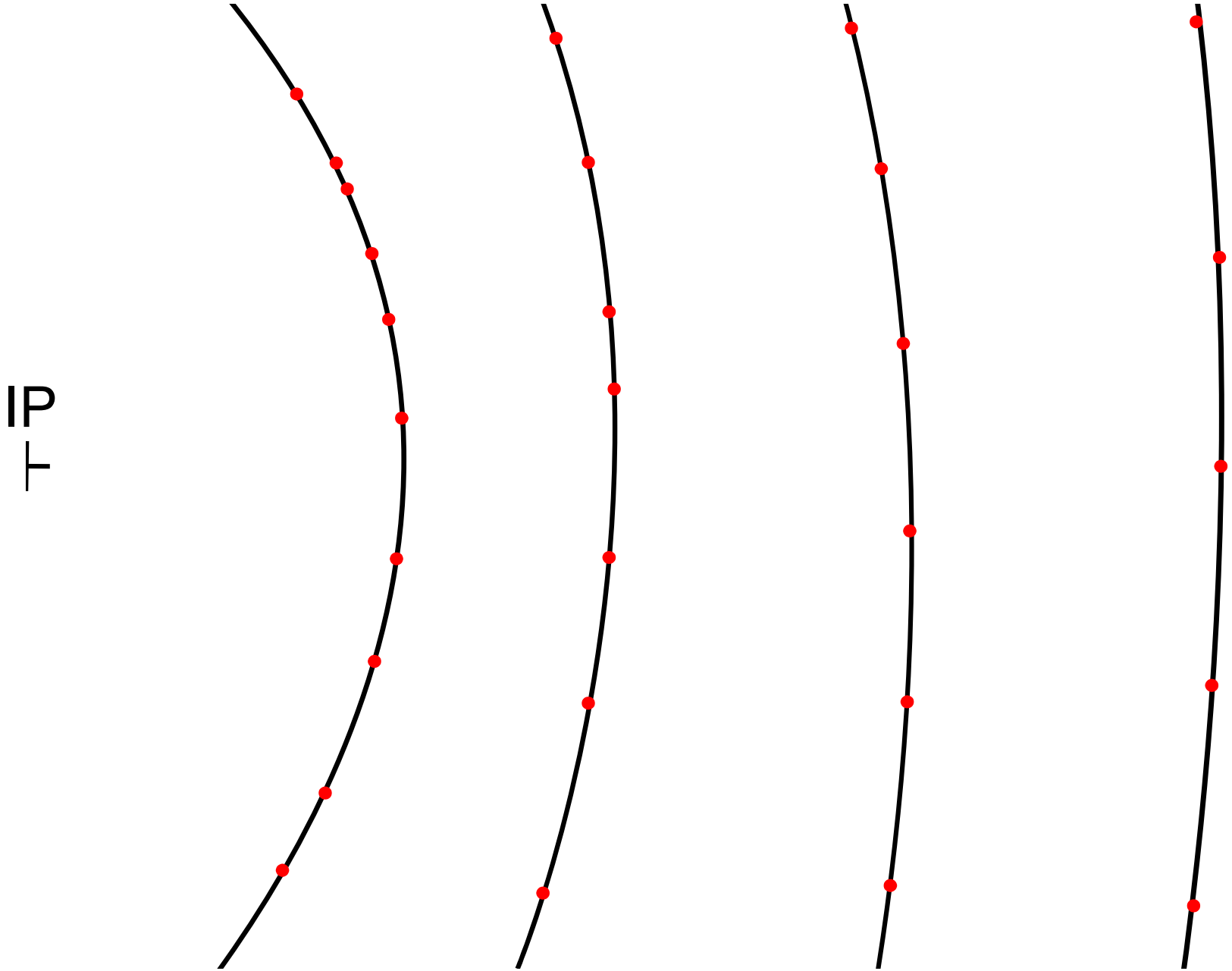
- Cellular Automaton
- Kalman Filter
- Hopfield Neural Network

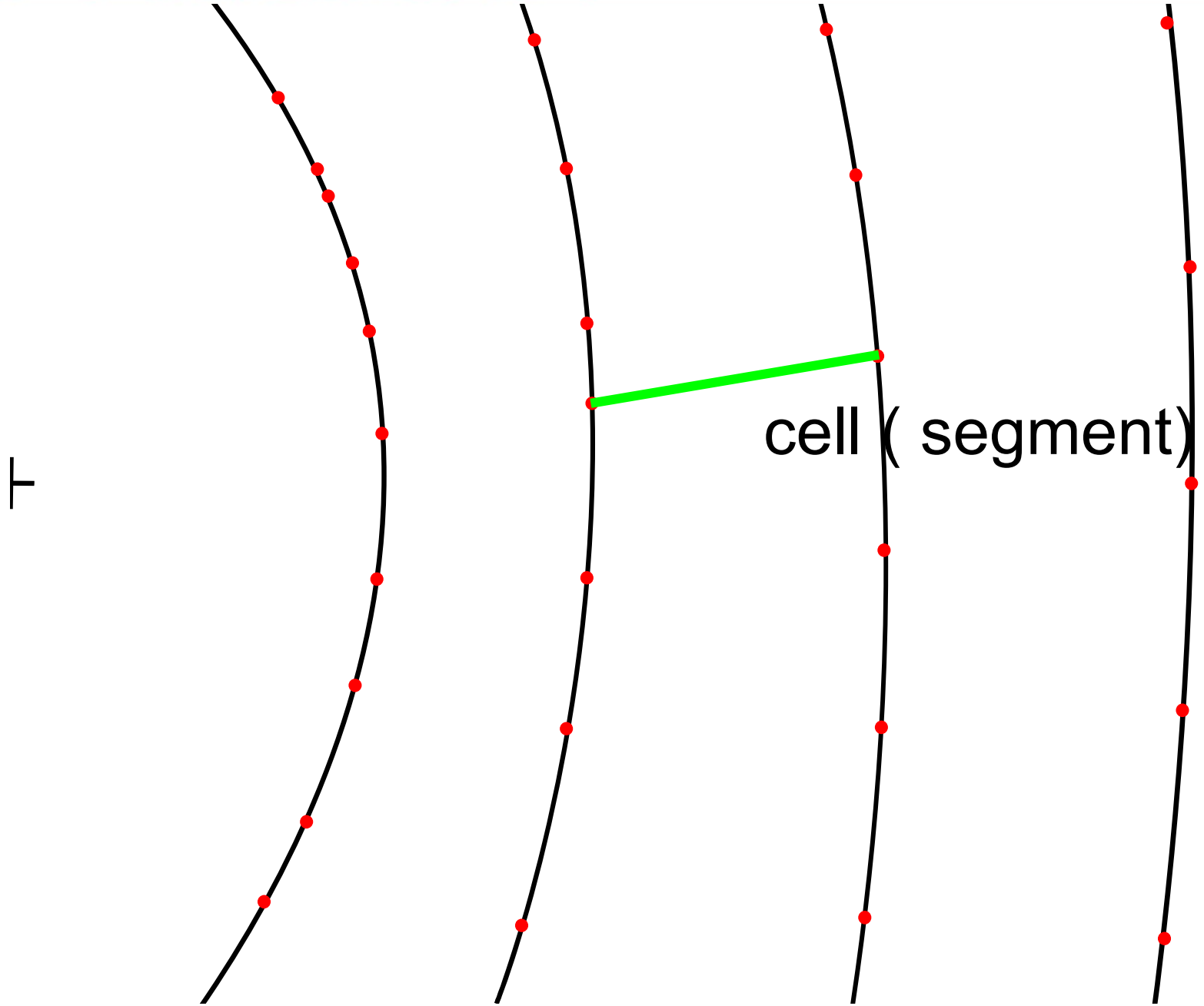
The Cellular Automaton

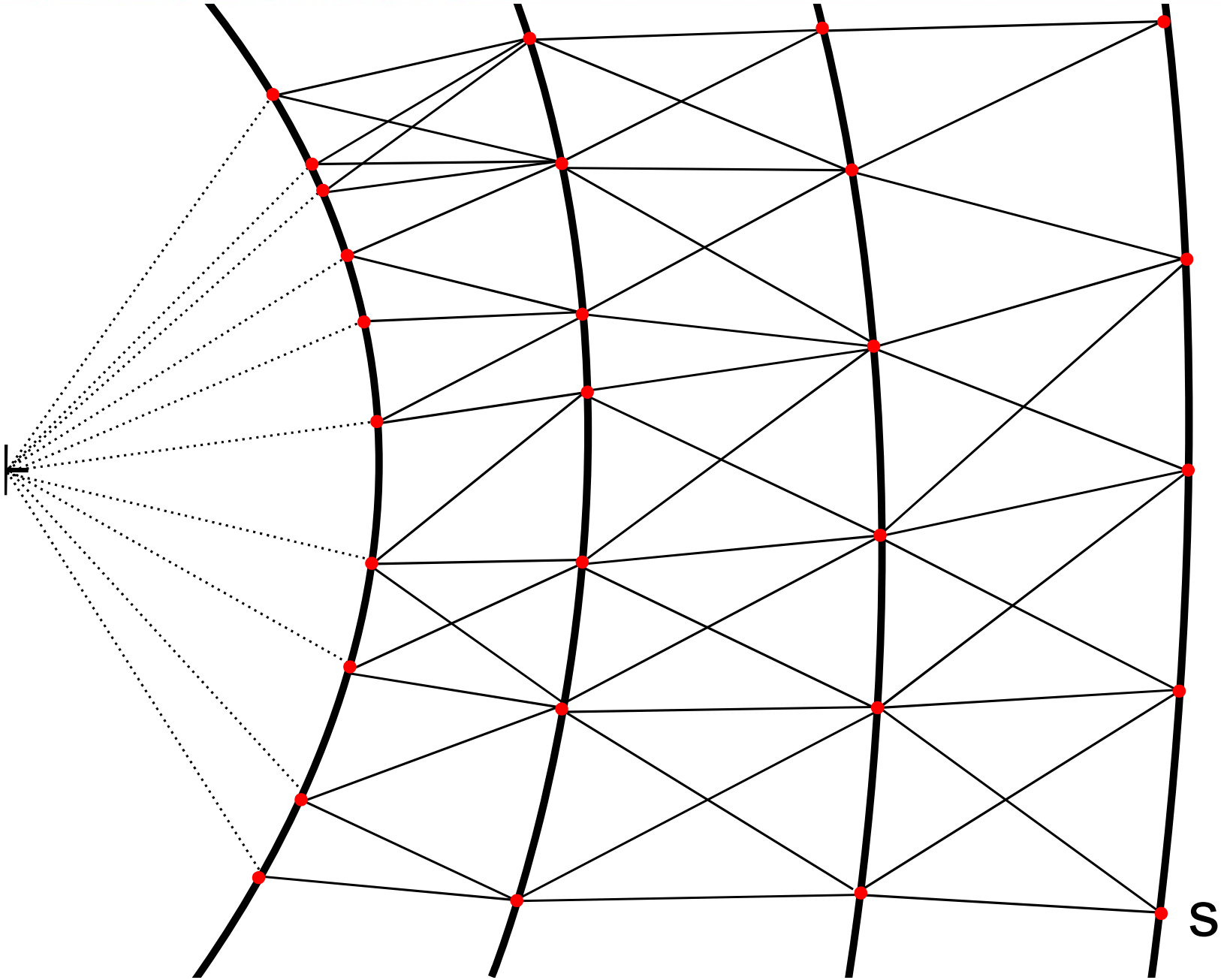
The Cellular Automaton

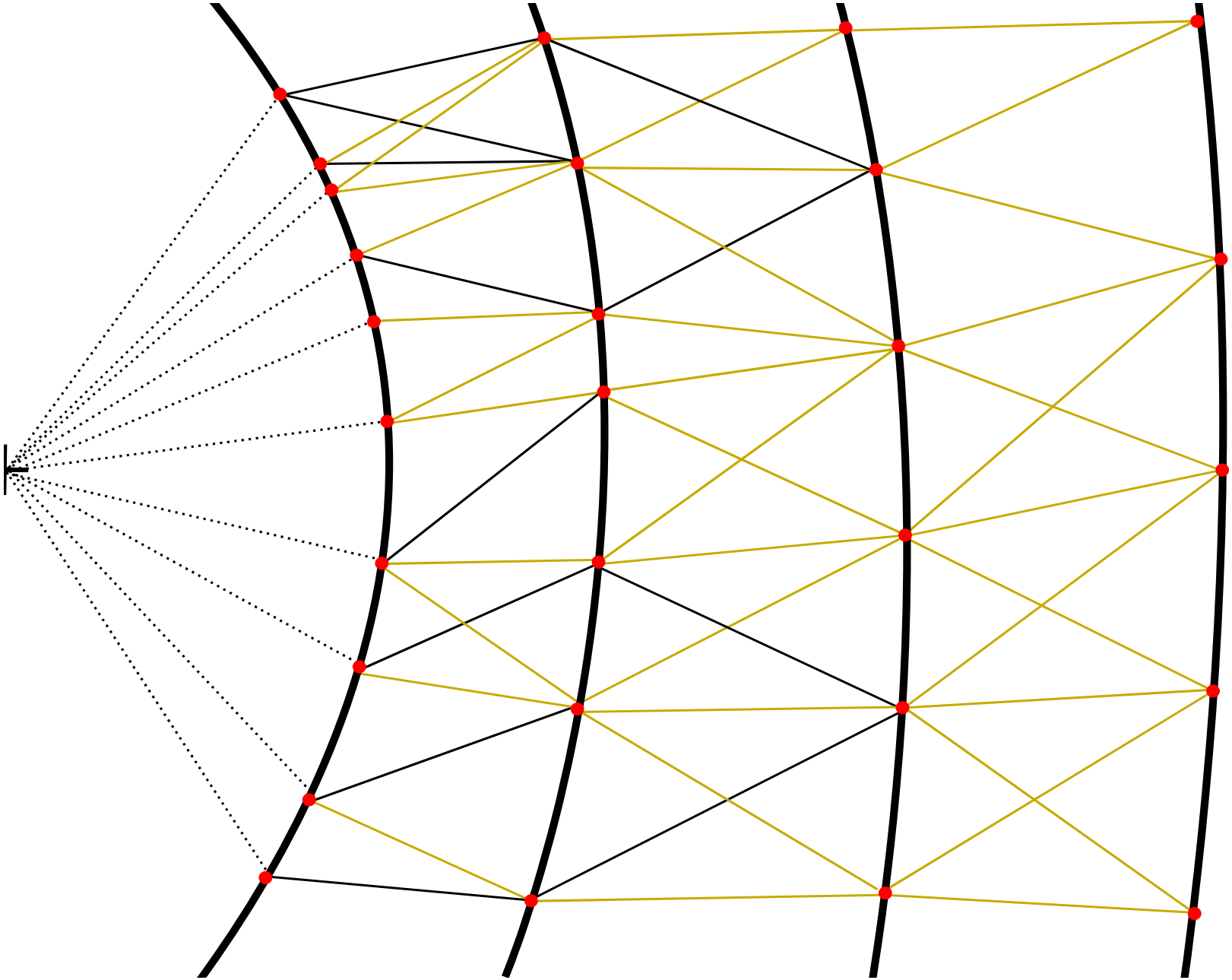


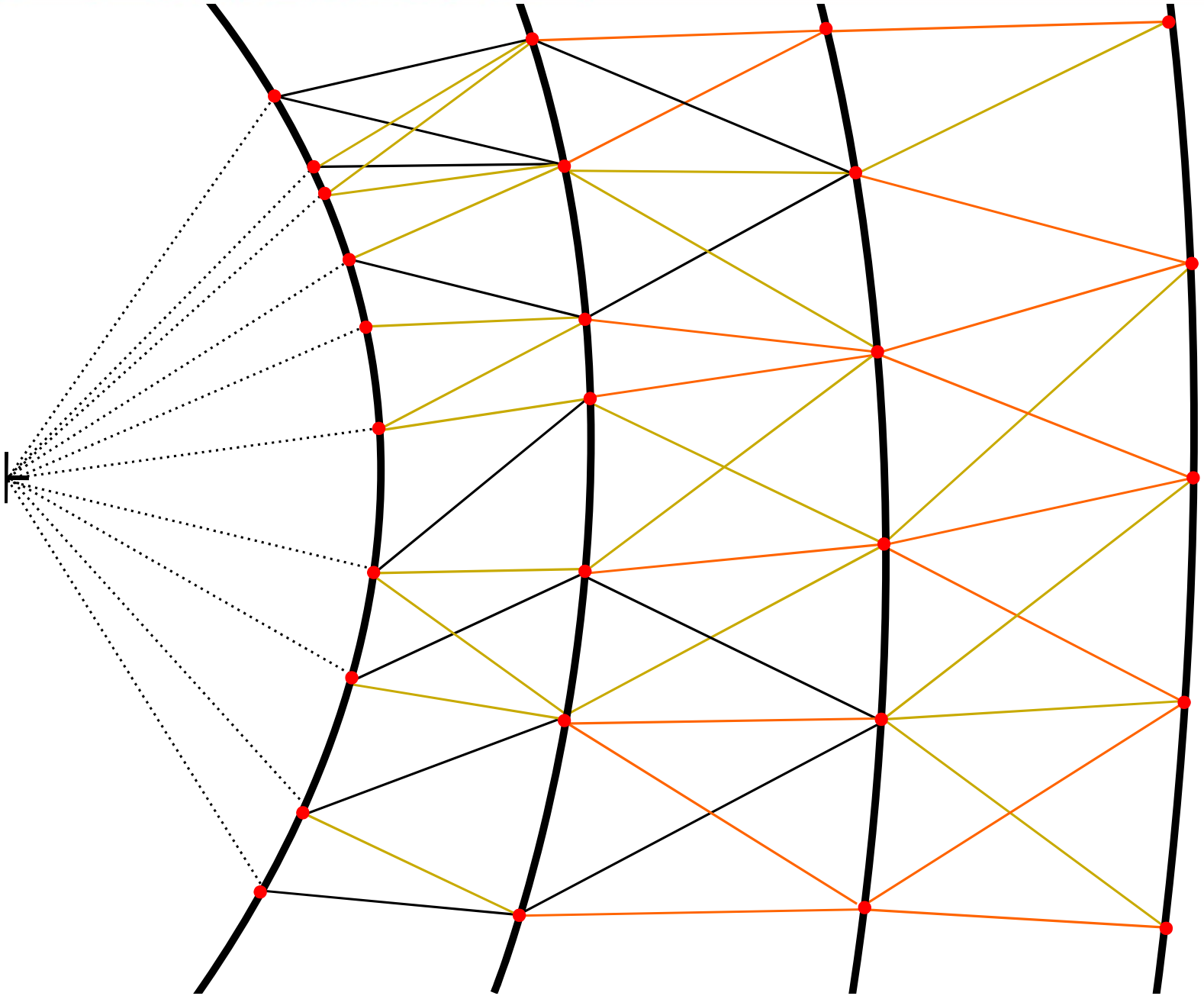
It's about rules

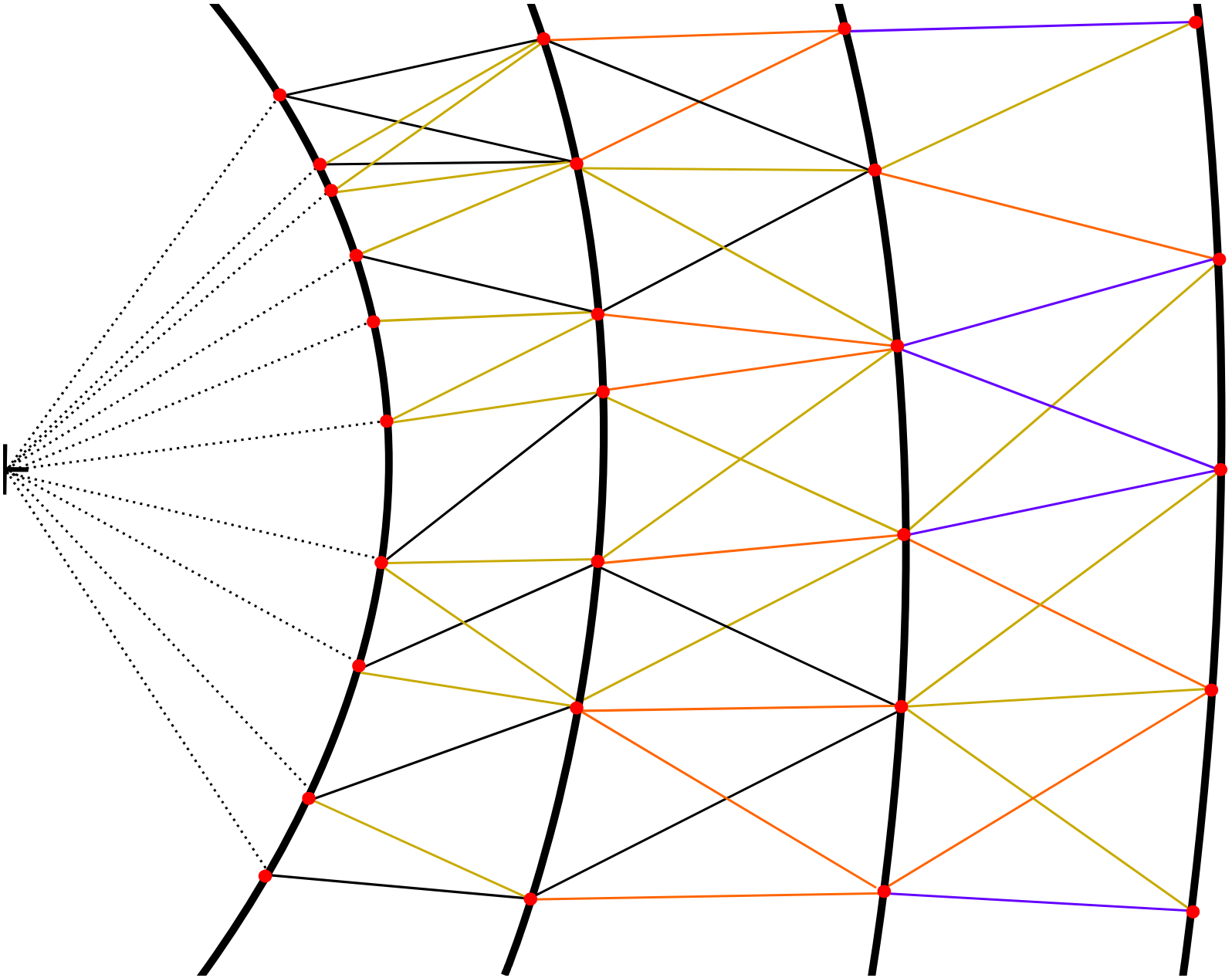

IP

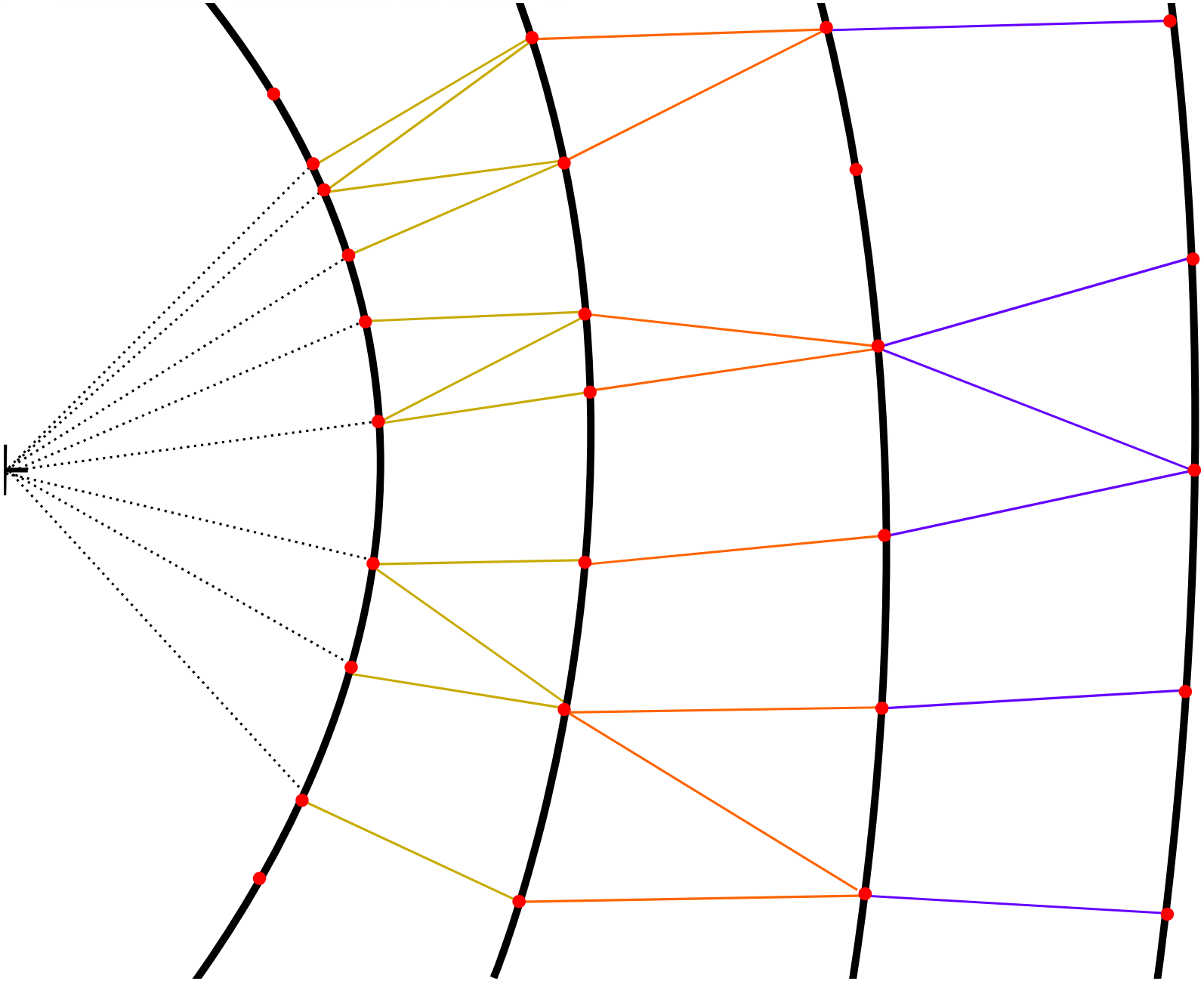

cell (segment)


state 0



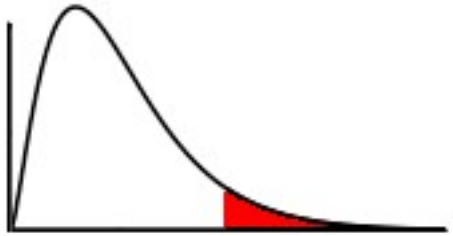


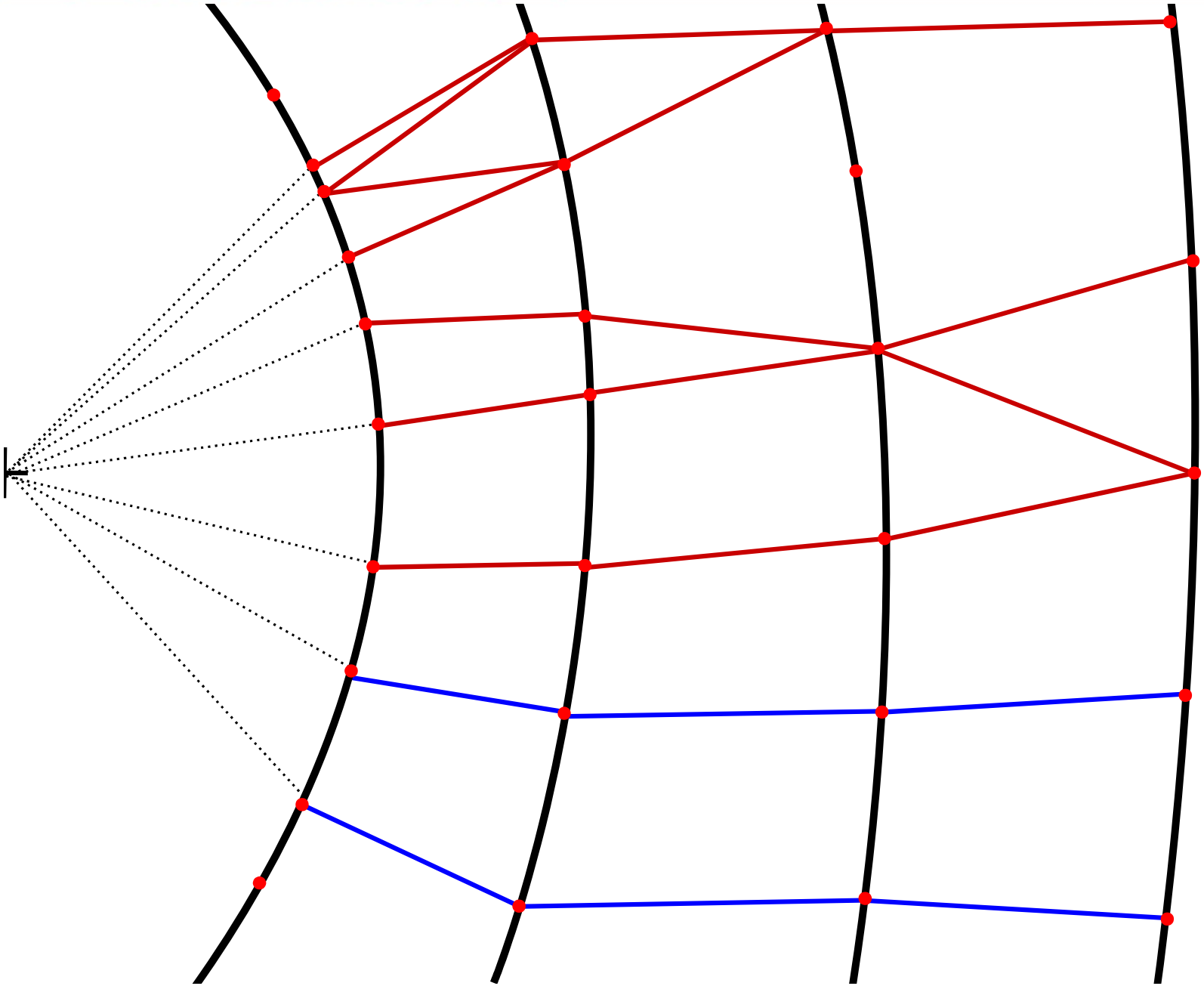


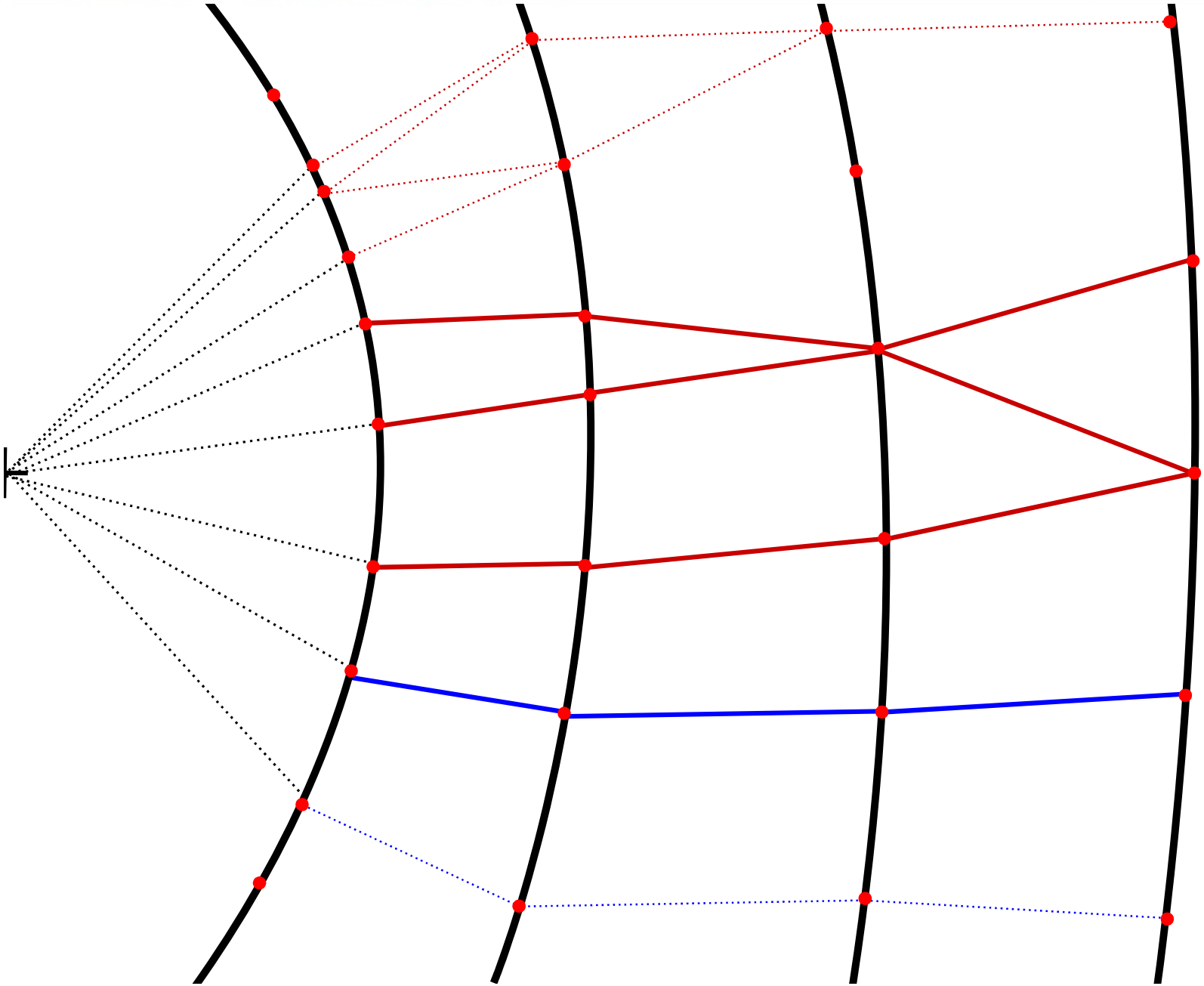


Kalman Filter

- KalTest + KalDet + MarlinTrk
- Quality Indicator: χ^2 probability

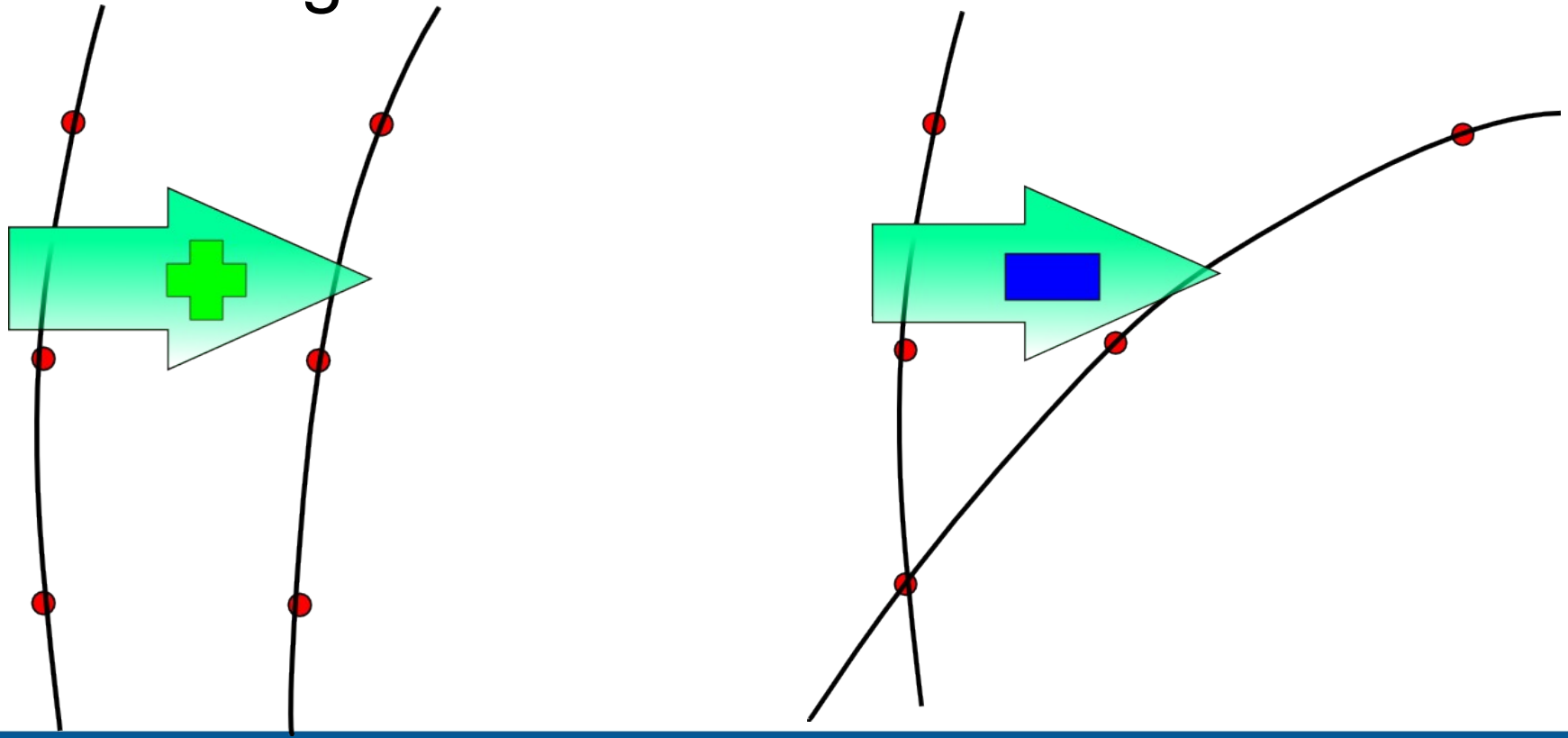


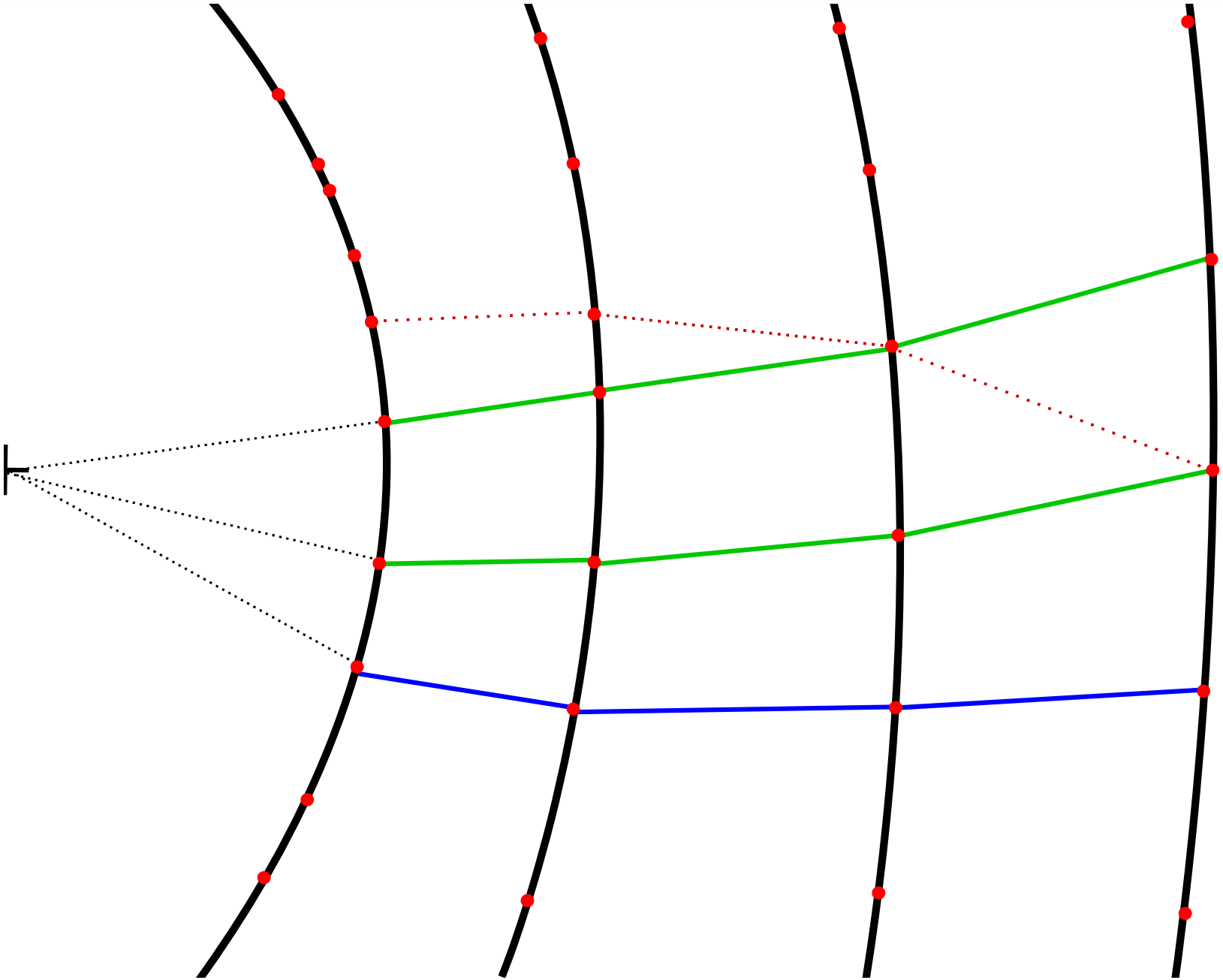




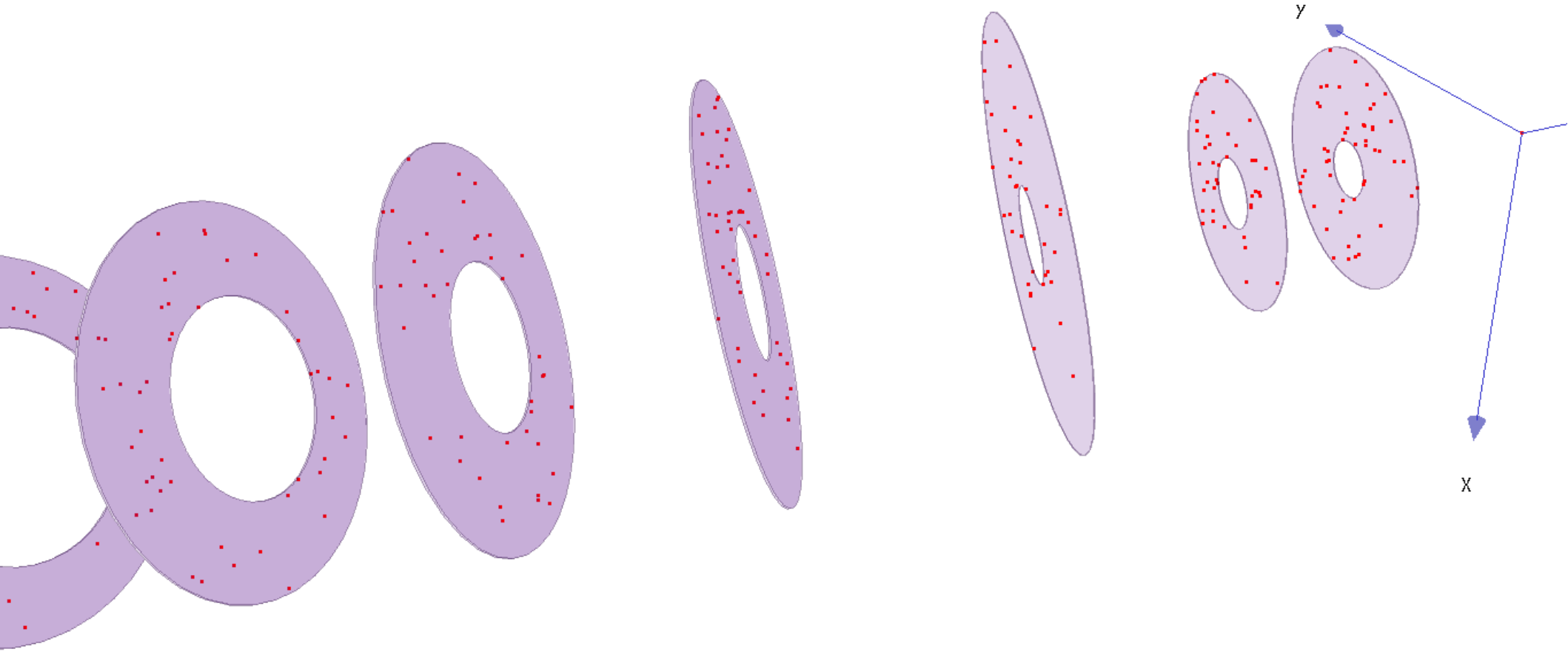
The Hopfield Neural Network

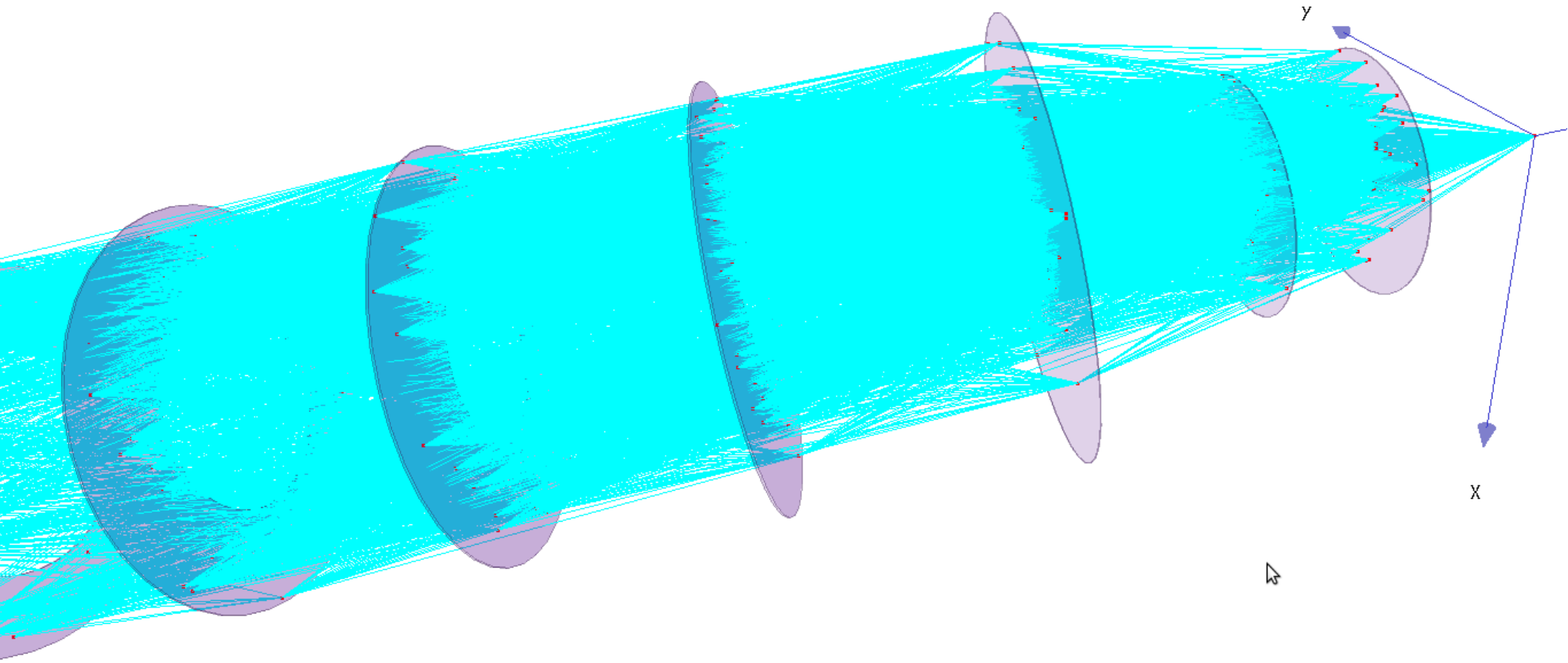
- Track ↔ Neuron
- Goal: the global minimum

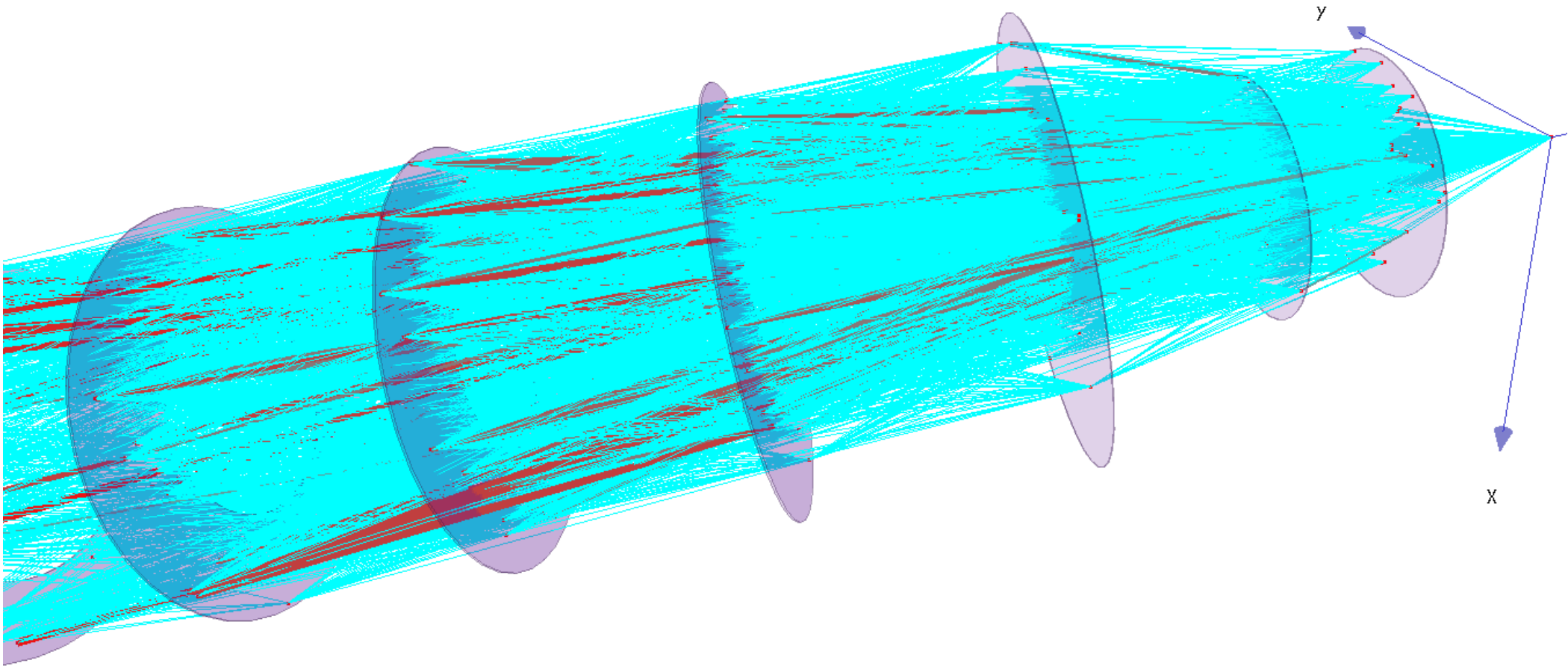


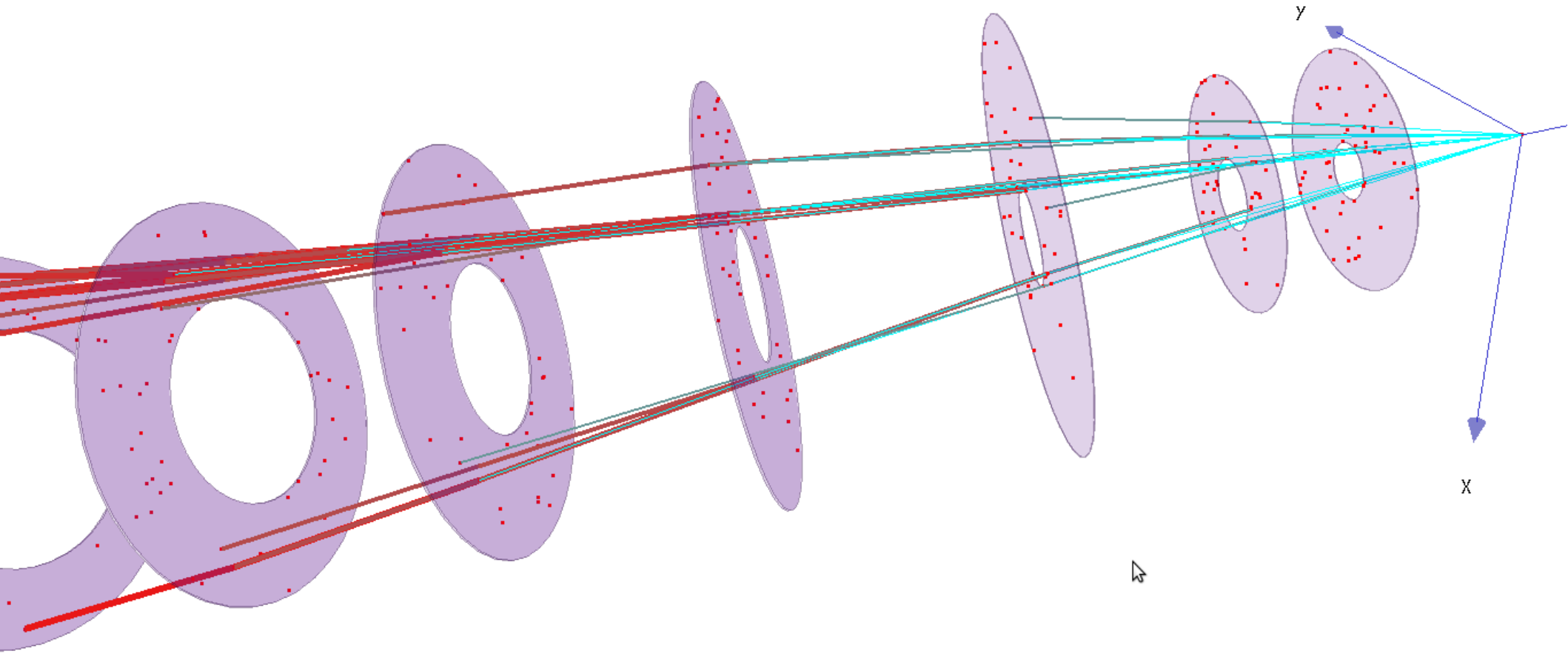


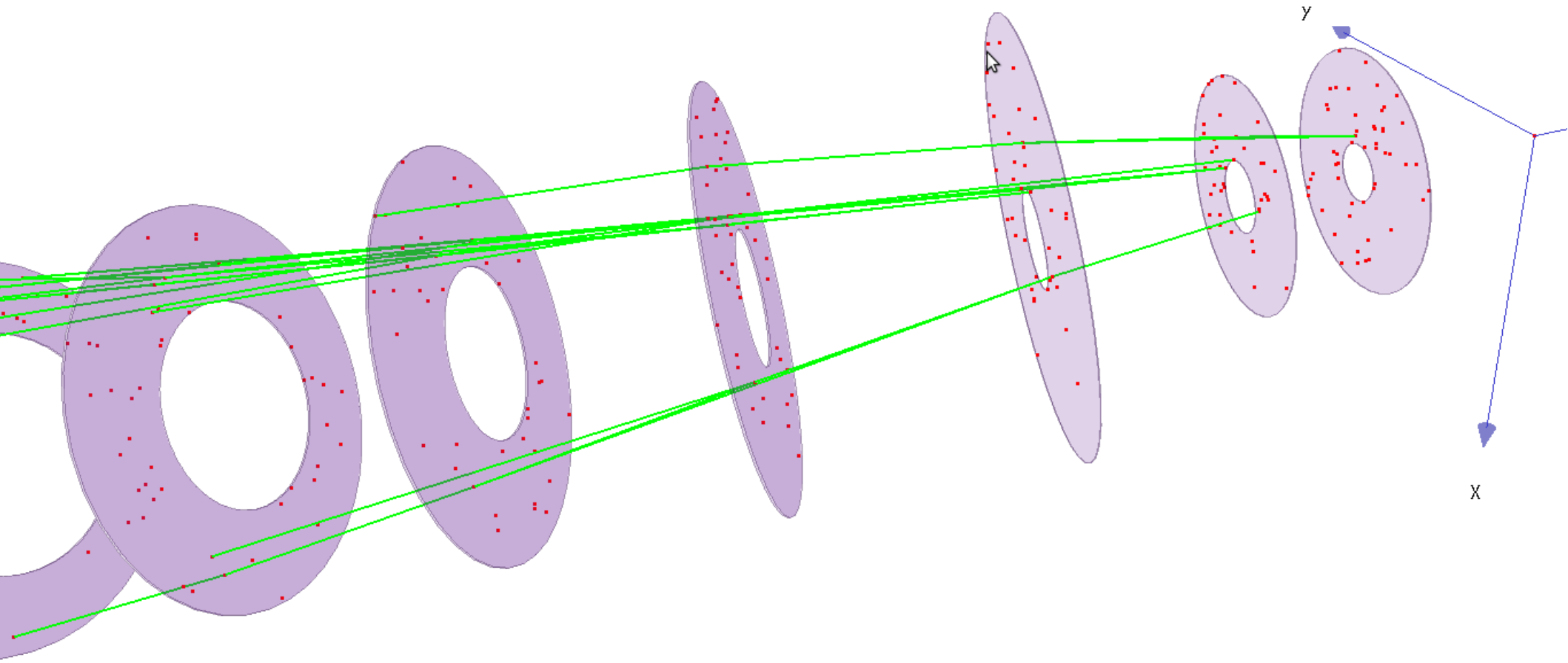
Once more for the FTDs


y
X


y
X


y
X

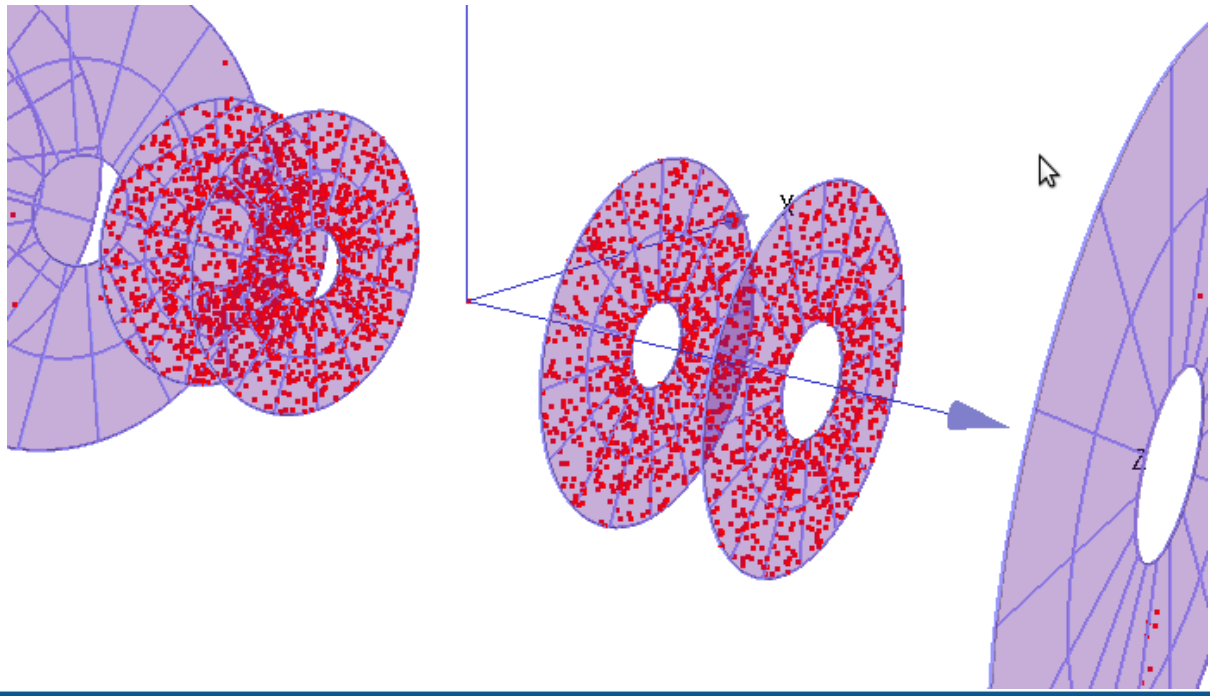

y
X


y
X

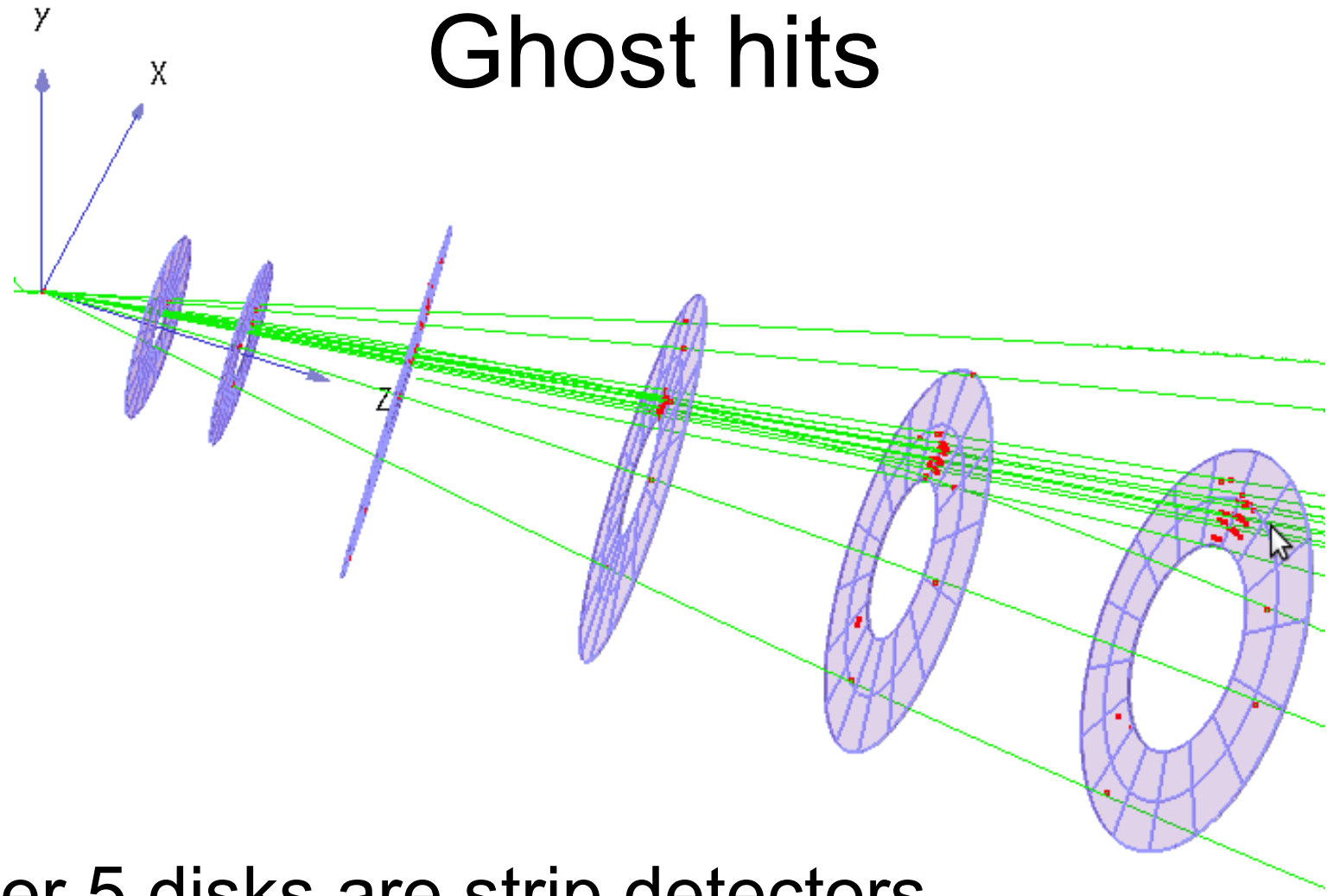
And now some reality

Background

- Inner 2 disks are pixel detectors
- How many bunch crossings?
- 100 BX * hit density ≈ 900 hits / pixel disk



Ghost hits



- Outer 5 disks are strip detectors

At the moment

- Criteria
- Analysis tools
  - Step Analyser
  - Criteria Analyser
  - True Track Analyser
  - Jet Analyser
- Adding flexibility (strategy pattern)

Thanks to

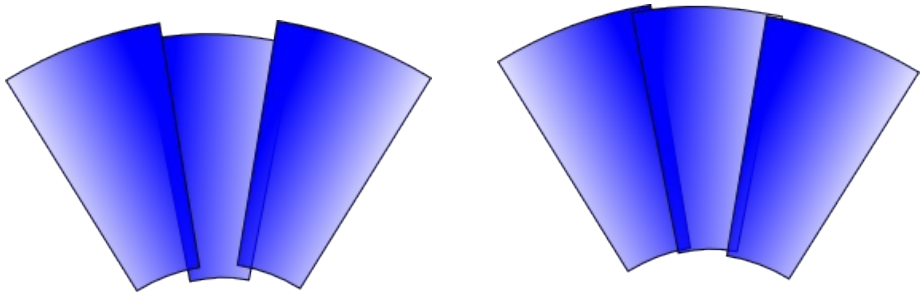
- Winfried Mitaroff
- Steve Aplin, Frank Gaede and Jan Engels
- Rudi Frühwirth
- And Jakob Lettenbichler (Belle 2)

Thank you!

Back Up

Future

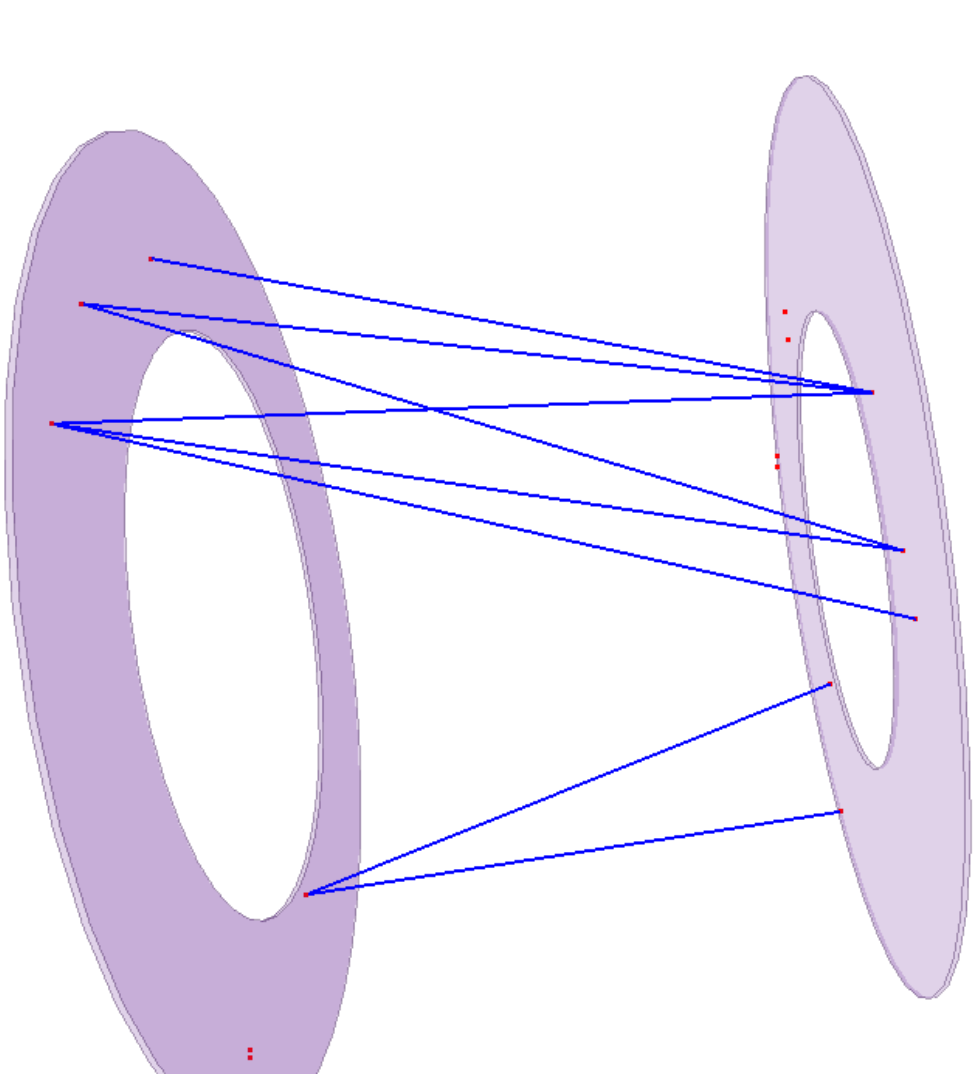
- staggered / tilted petals

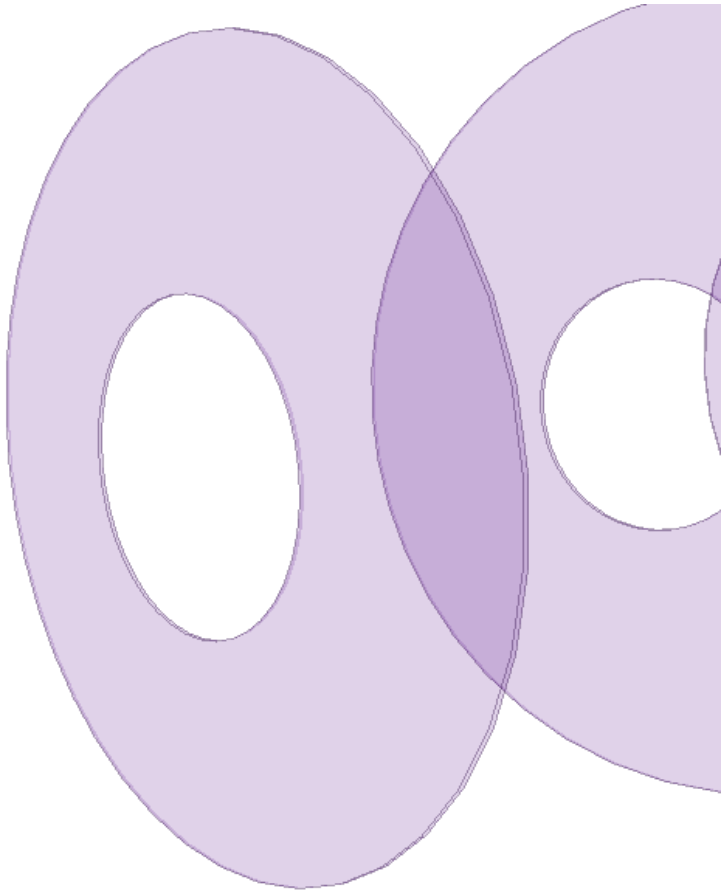


- Neural Network
- Intermediate Region: TPC + FTD
- Robustification (DAF, GSF)

Dependencies

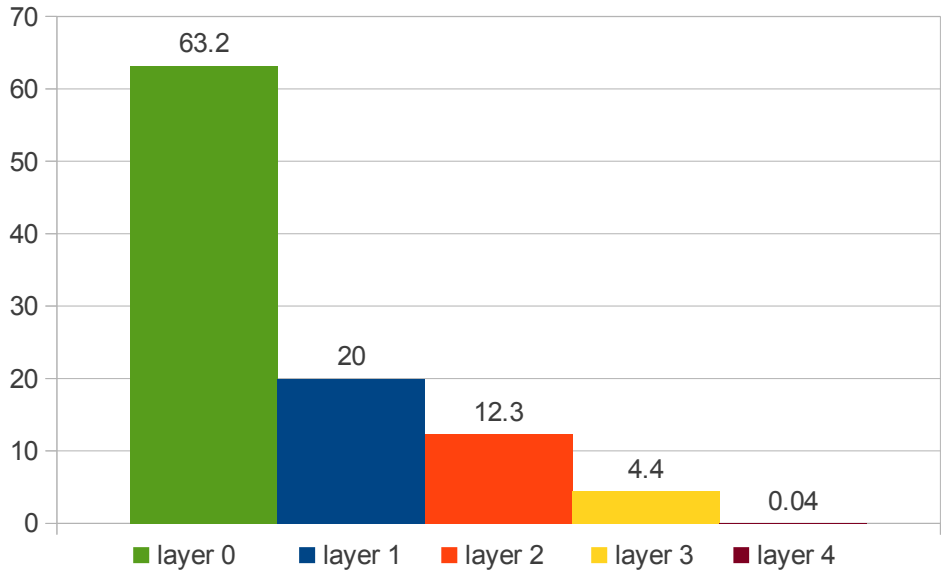
- FTD drivers and gear
- Time stamps?
- Number of integrated bunchcrossings

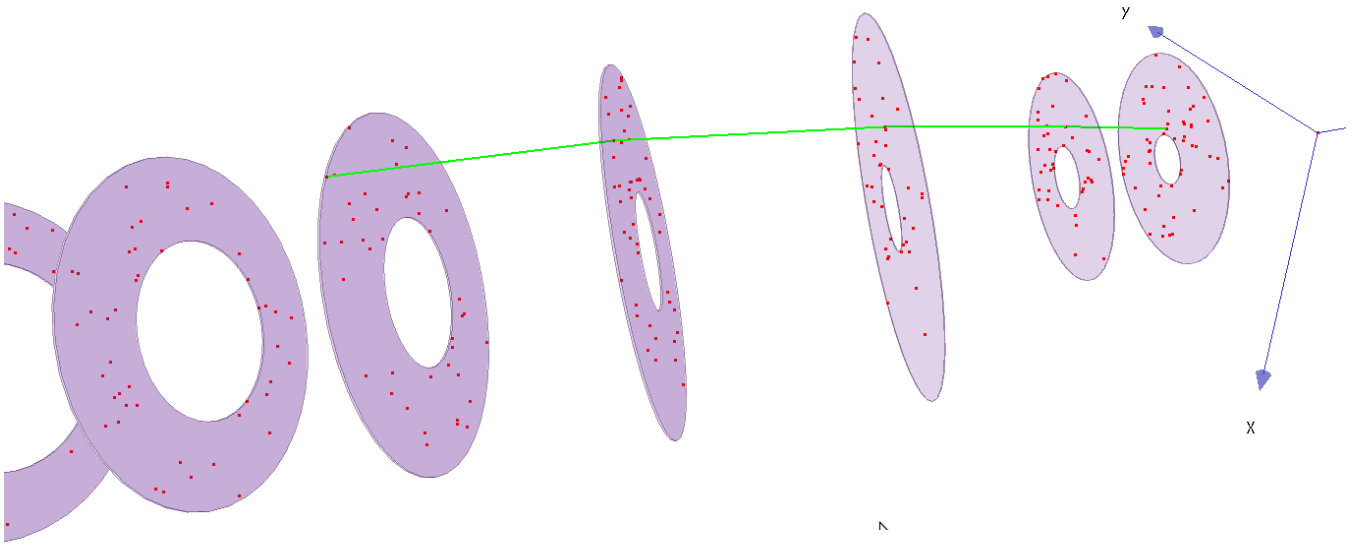


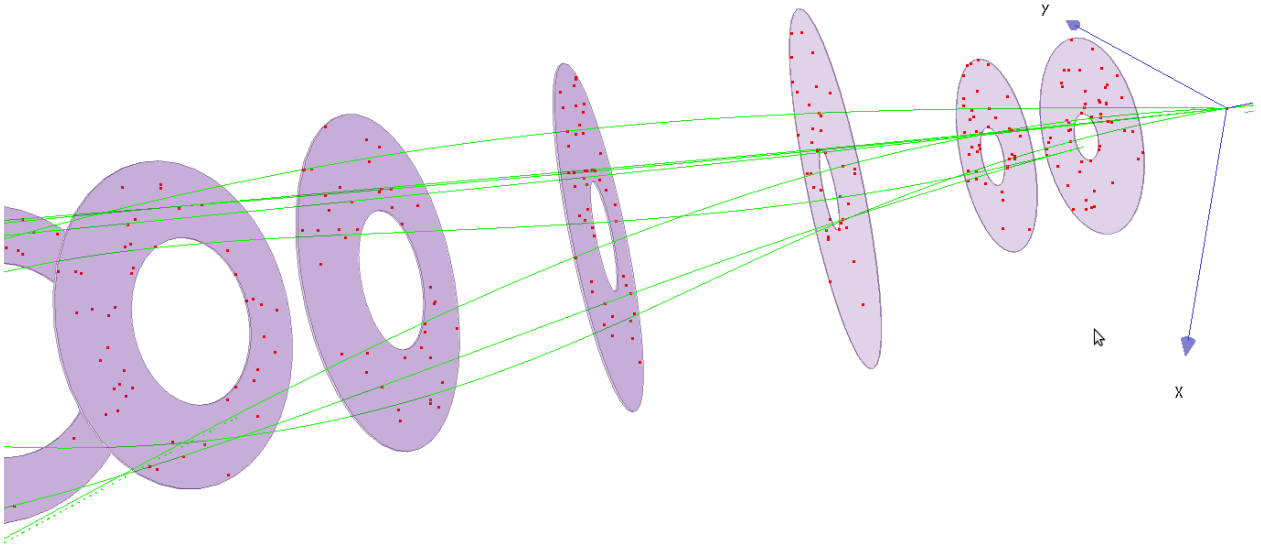


tracks will

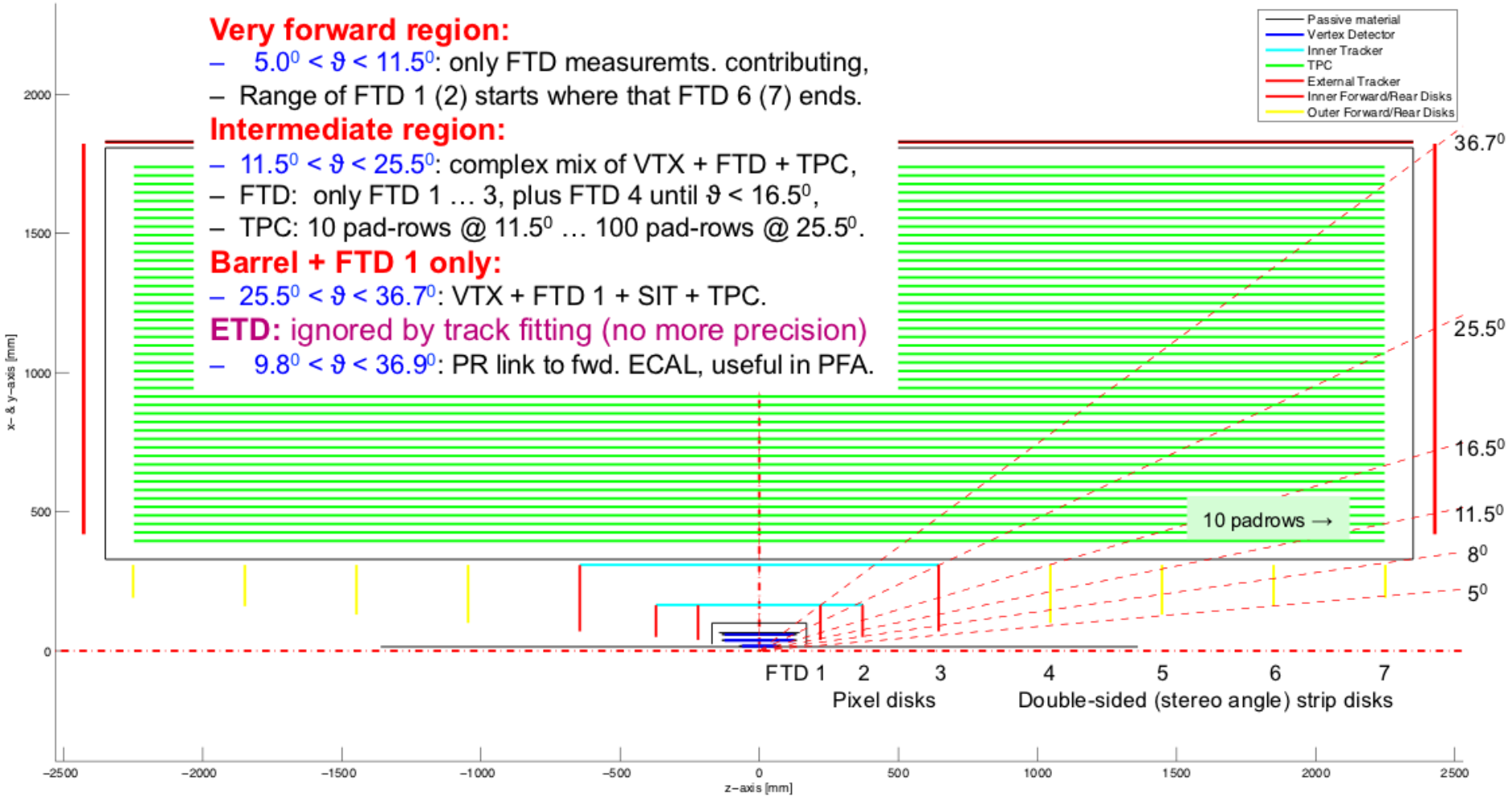
- Skip a layer
- Connect directly to the IP




y
X


y
X

regions


Very forward region:
– 5.0⁰ < ϑ < 11.5⁰: only FTD measuremts. contributing,
– Range of FTD 1 (2) starts where that FTD 6 (7) ends.
Intermediate region:
– 11.5⁰ < ϑ < 25.5⁰: complex mix of VTX + FTD + TPC,
– FTD: only FTD 1 … 3, plus FTD 4 until ϑ < 16.5⁰,
– TPC: 10 pad-rows @ 11.5⁰ … 100 pad-rows @ 25.5⁰.
Barrel + FTD 1 only:
– 25.5⁰ < ϑ < 36.7⁰: VTX + FTD 1 + SIT + TPC.
ETD: ignored by track fitting (no more precision)
– 9.8⁰ < ϑ < 36.9⁰: PR link to fwd. ECAL, useful in PFA.
Passive material
Vertex Detector
Inner Tracker
TPC
External Tracker
Inner Forward/Rear Disks
Outer Forward/Rear Disks
36.7⁰
25.5⁰
16.5⁰
11.5⁰
8⁰
5⁰
10 padrows →
FTD 1 2 3 4 5 6 7
Pixel disks
Double-sided (stereo angle) strip disks
x– & y–axis [mm]
z–axis [mm]