Simulation of two ARCA building blocks

Thijs van Eeden

tjuanve@nikhef.nl

Nikhef

KM3NeT

Simulation parameters

Simulations done using data_processing

- Generator: gSeaGen
  - ν_μ and a-ν_μ
  - 1 TeV < E < 100 PeV
- Light: JSirene
- Trigger: JTE
- Reconstruction: Arca reconstruction

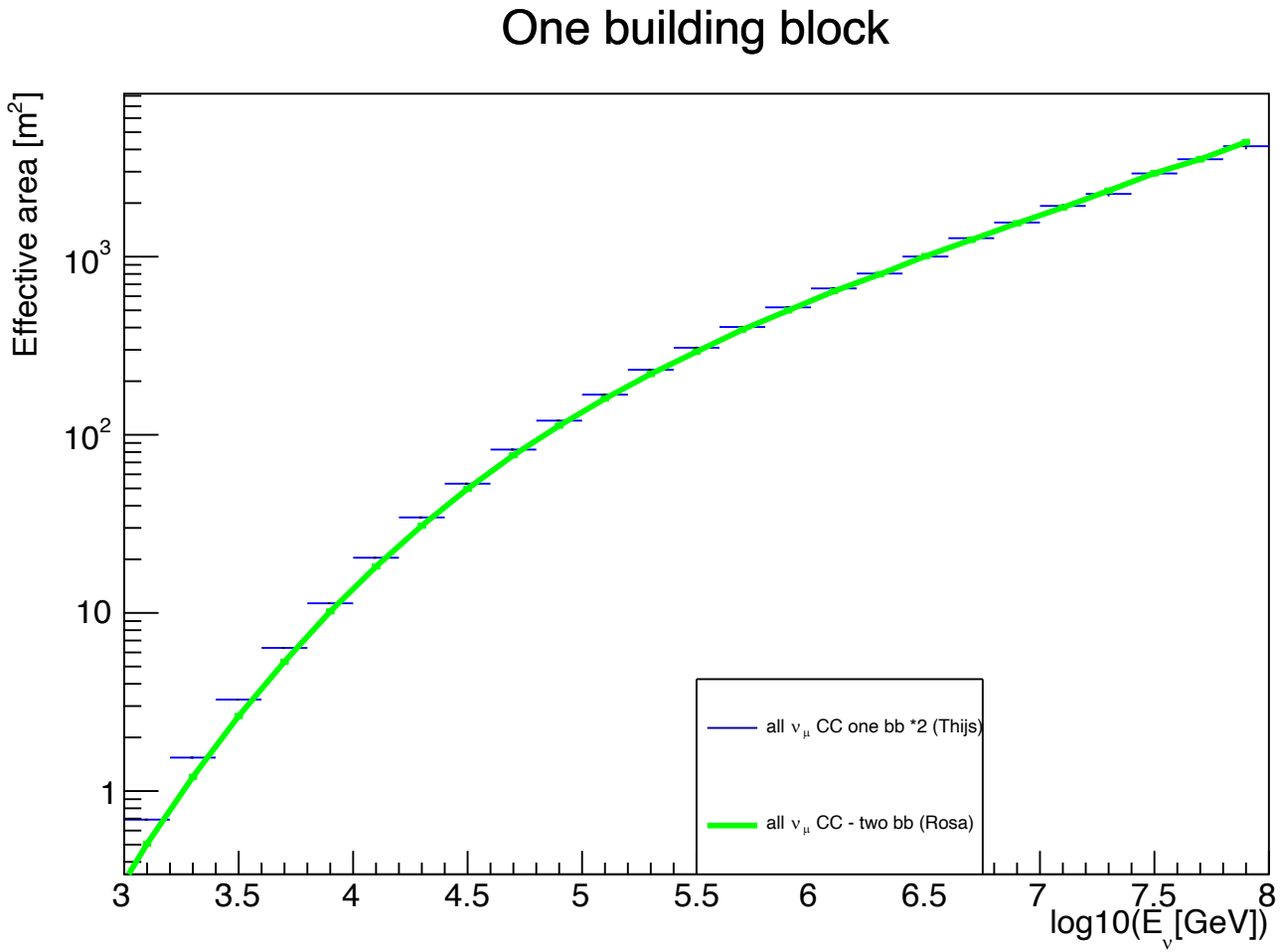
One building block benchmark

Event rate for LOI flux on reco level:

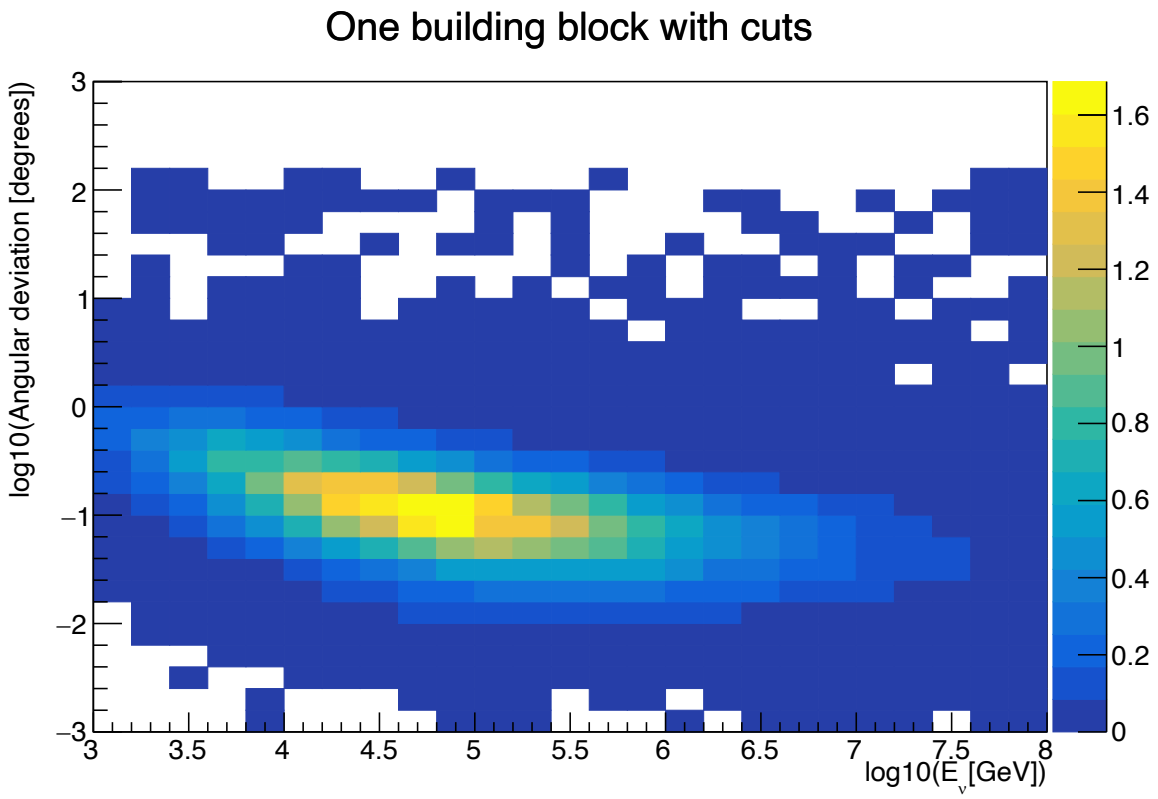
- 188.9/yr
- 1889 for 2 building blocks in 5 years

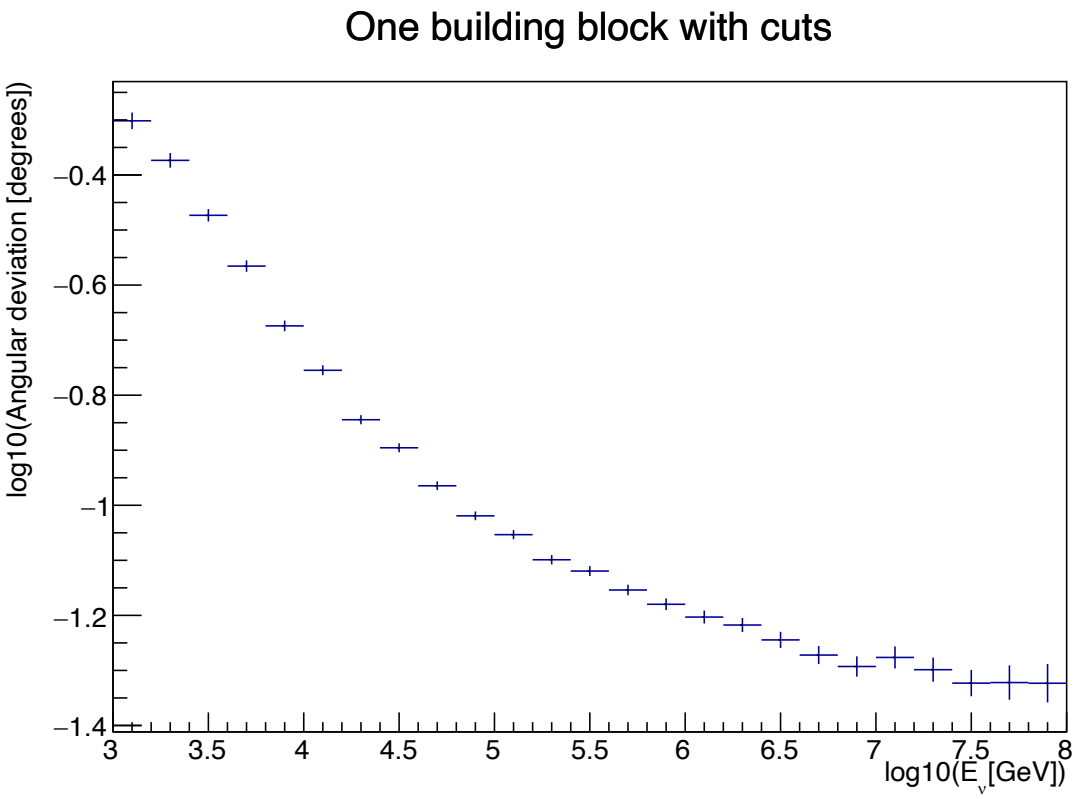
LOI: 1.8e3 events

LOI flux: $1.2*10^{-4}\ (E/GeV)^{-2}$
$\exp(-E/3PeV)\ GeV^{-1}\ m^{-2}\ s^{-1}\ sr^{-1}$

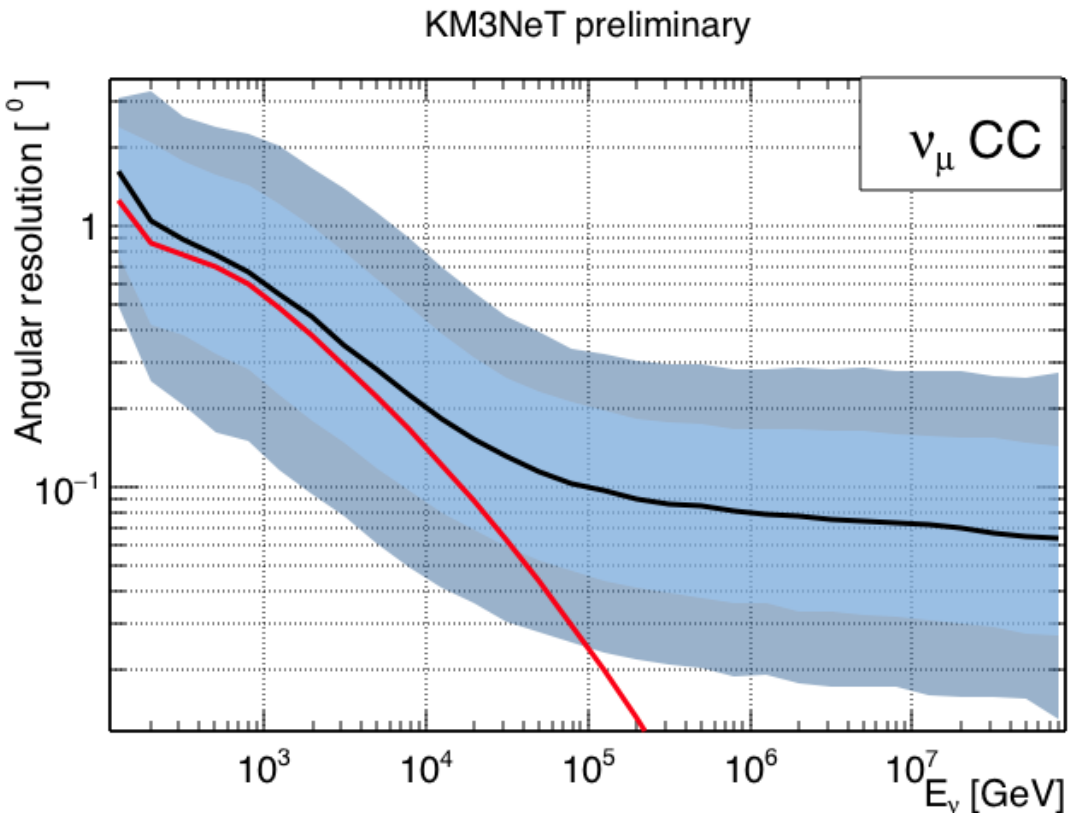


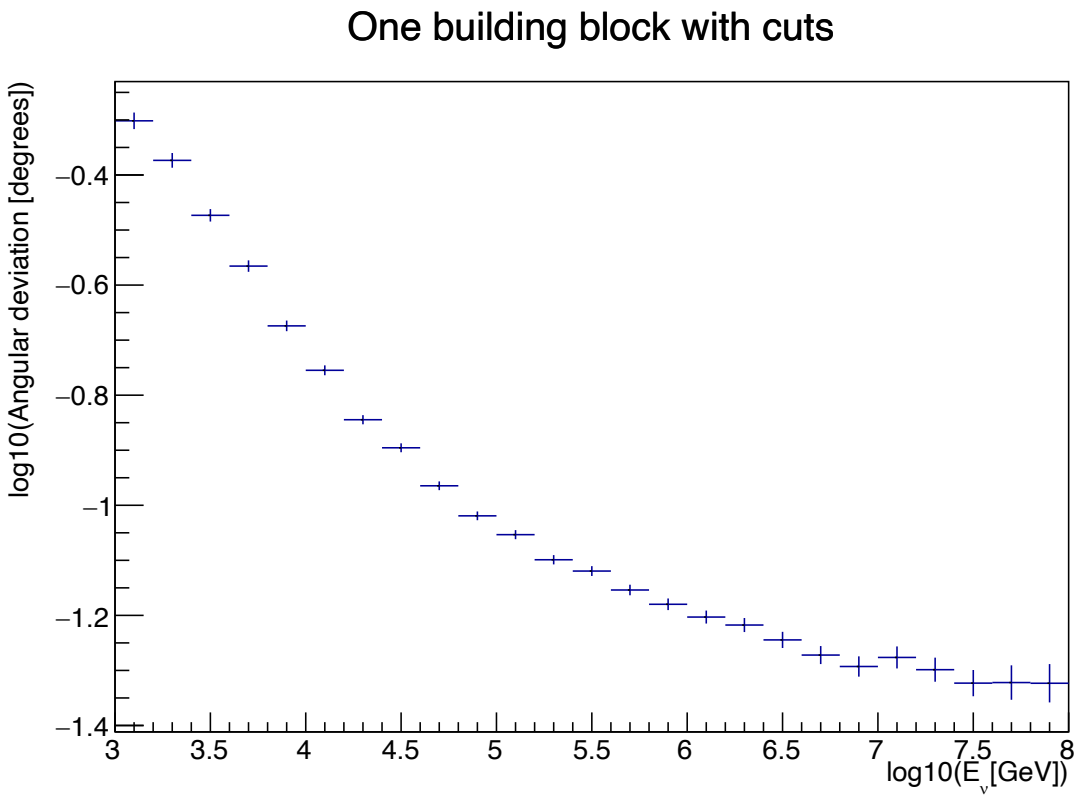
One building block benchmark





One building block benchmark





From now I use:

Flux: 10^{-4} $(E/GeV)^{-2}$ GeV^{-1} m^{-2} s^{-1}

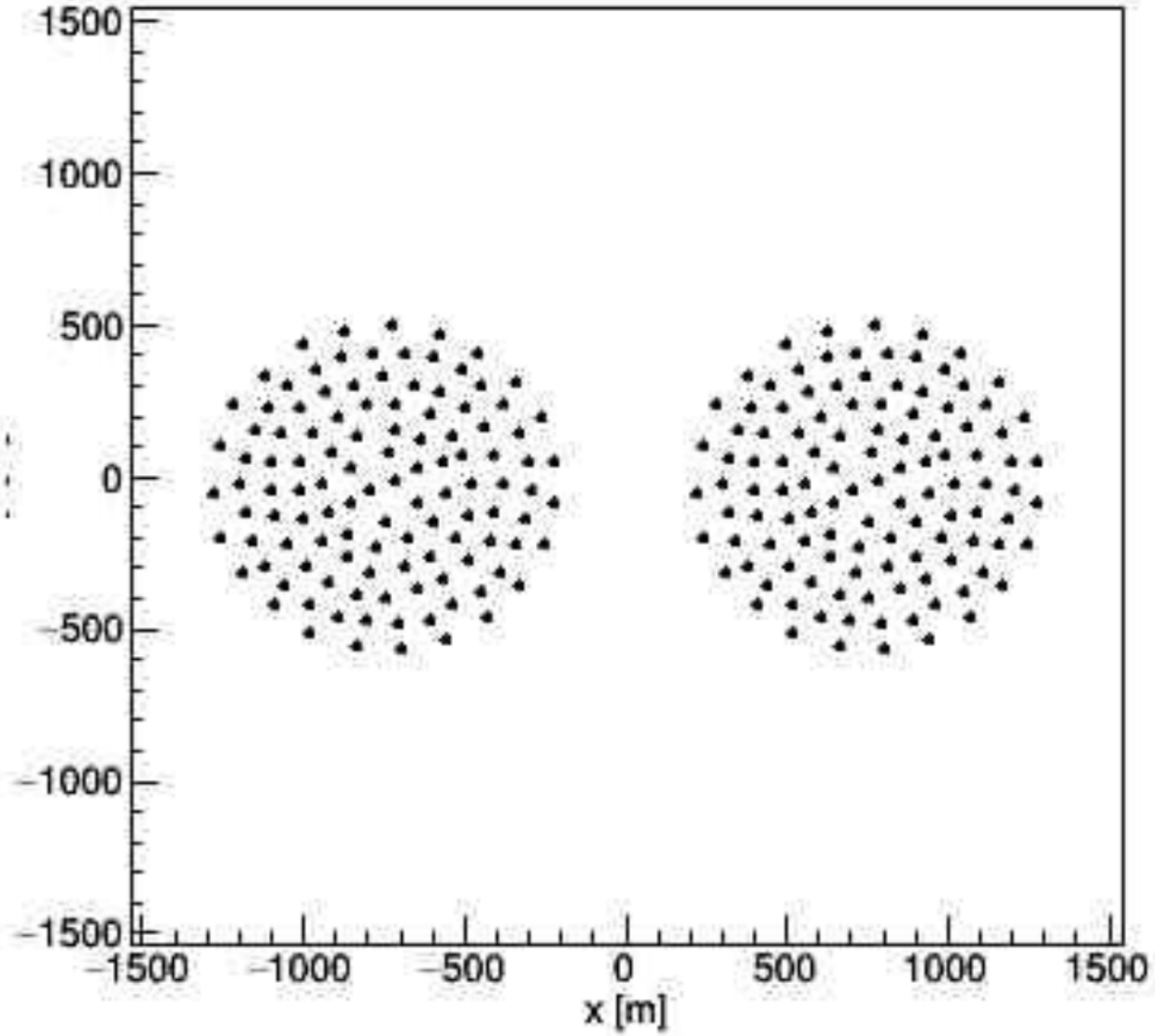
Two building blocks

Distance (d) between centers

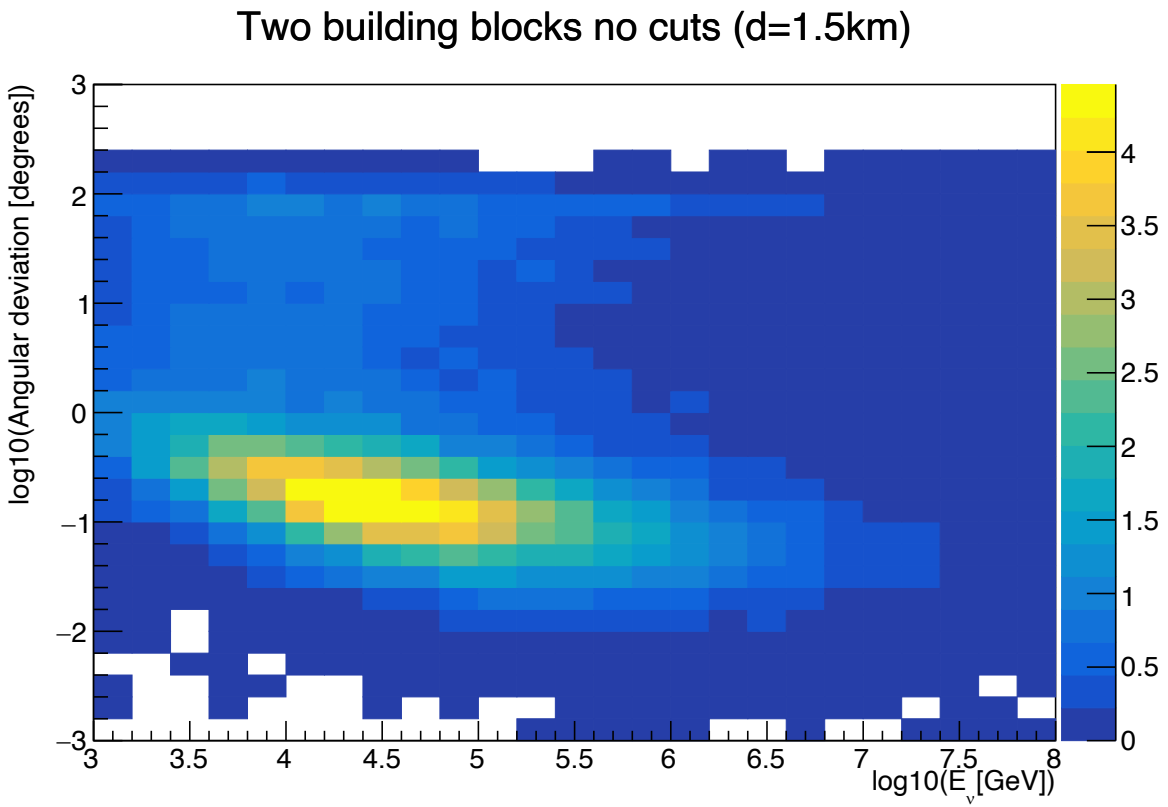
- If d = 1.5 km, then ~0.5 km distance between edges

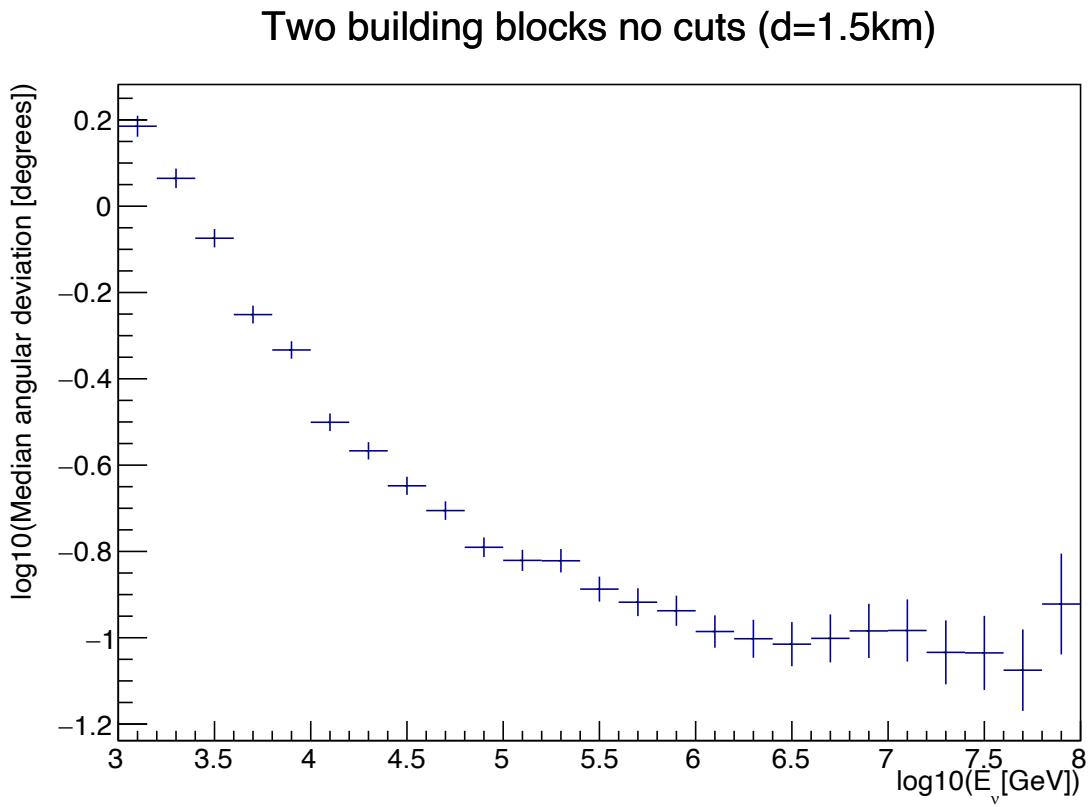
Done for:

- d = 1.5 km (= 0.5 km distance from
- d = 2.0 km (= 1.0 km “ ”)
- d = 3.5 km (= 2.5 km “ ”)
- d = 5.0 km (= 4.0 km “ “)

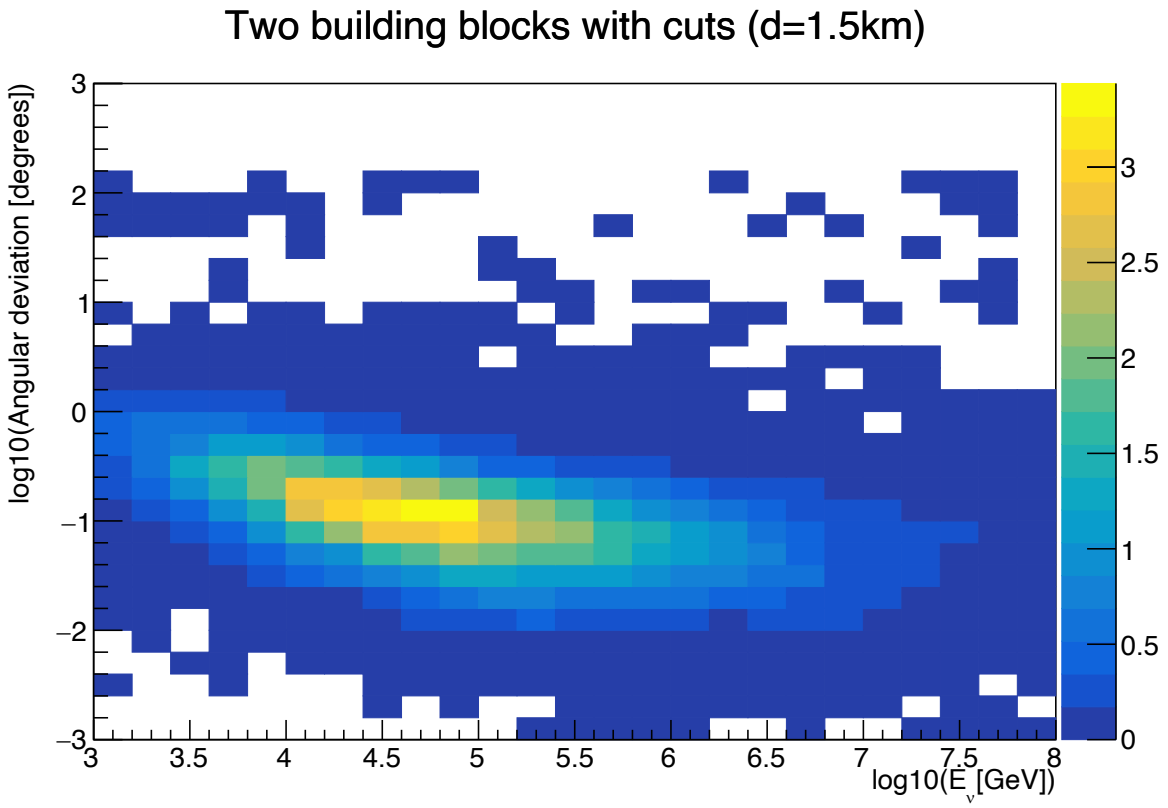


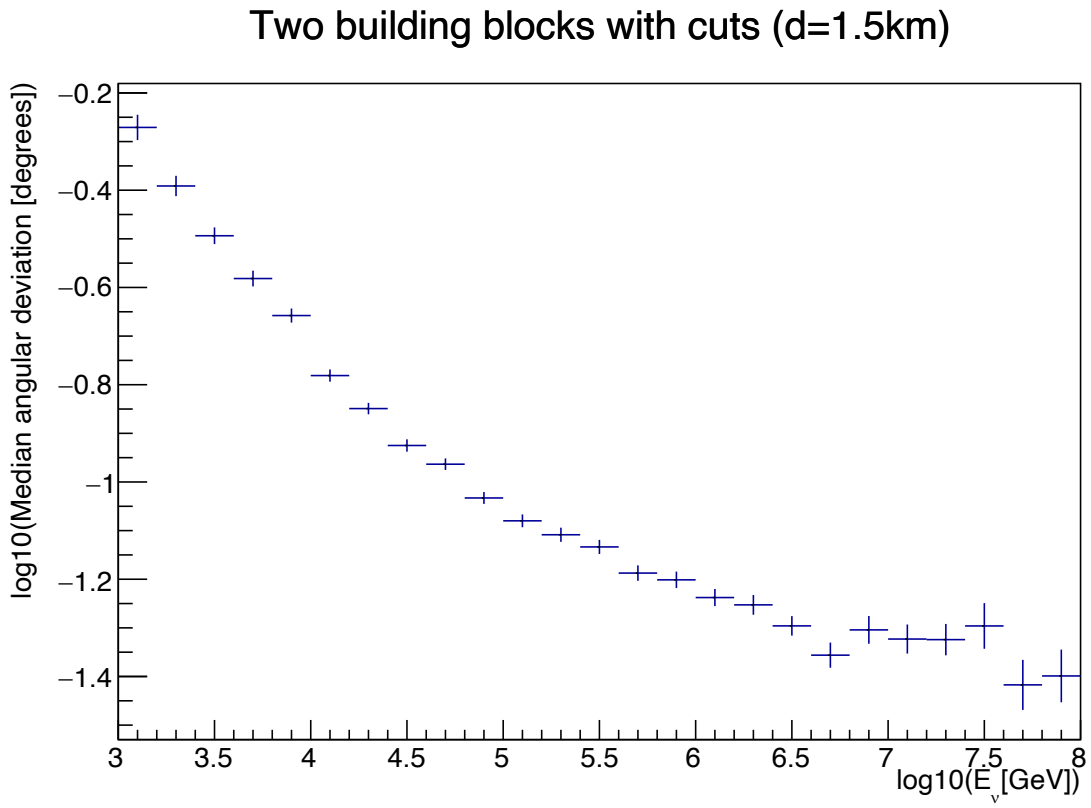
Two building blocks (d=1.5 km) no cuts





Two building blocks (d=1.5 km) with cuts



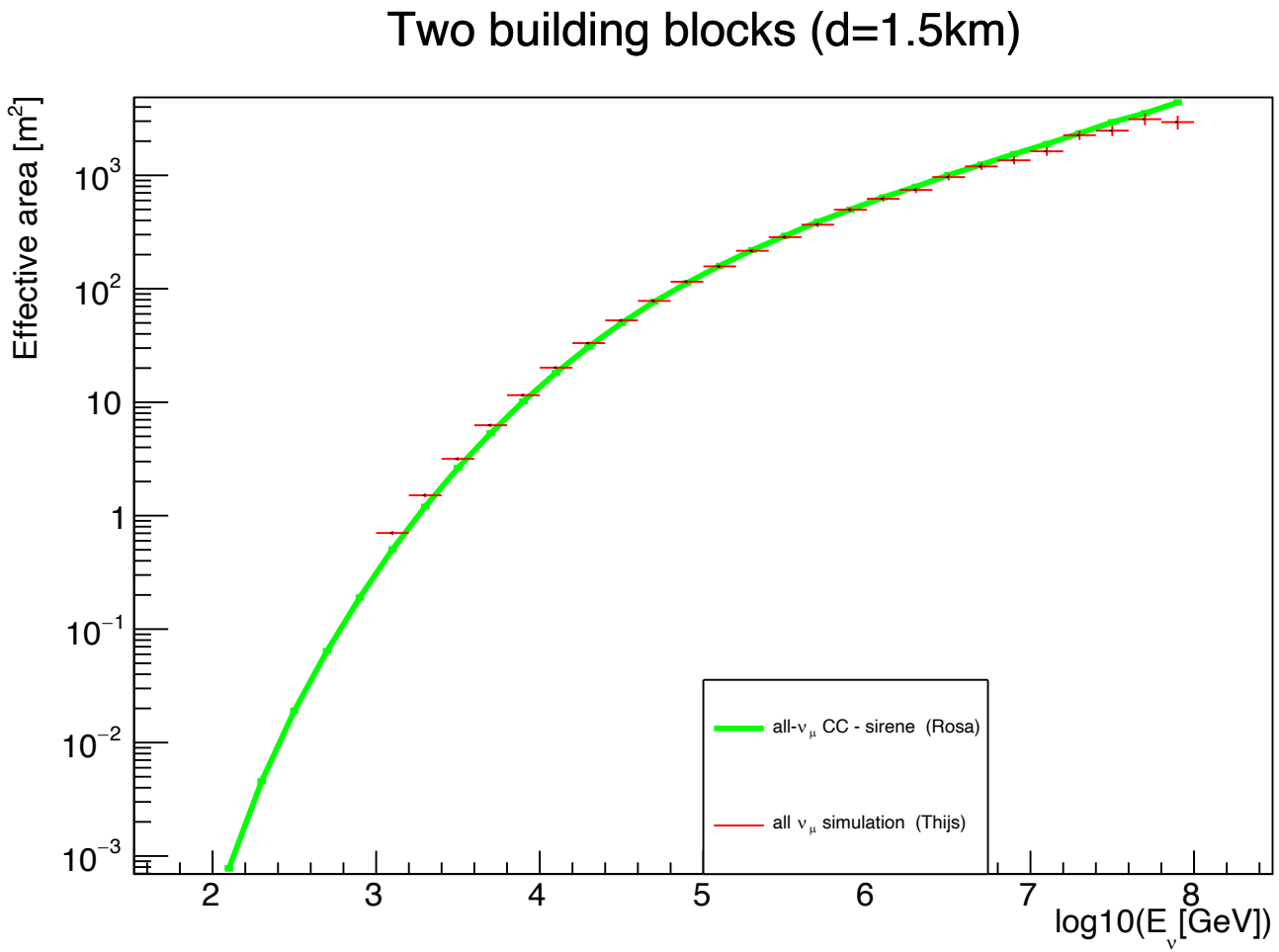


Effective area (d=1.5 km)

Compare with benchmark Rosa:

- Rosa simulated 1bb and multiplied it with 2

A_{eff} lower for high energies

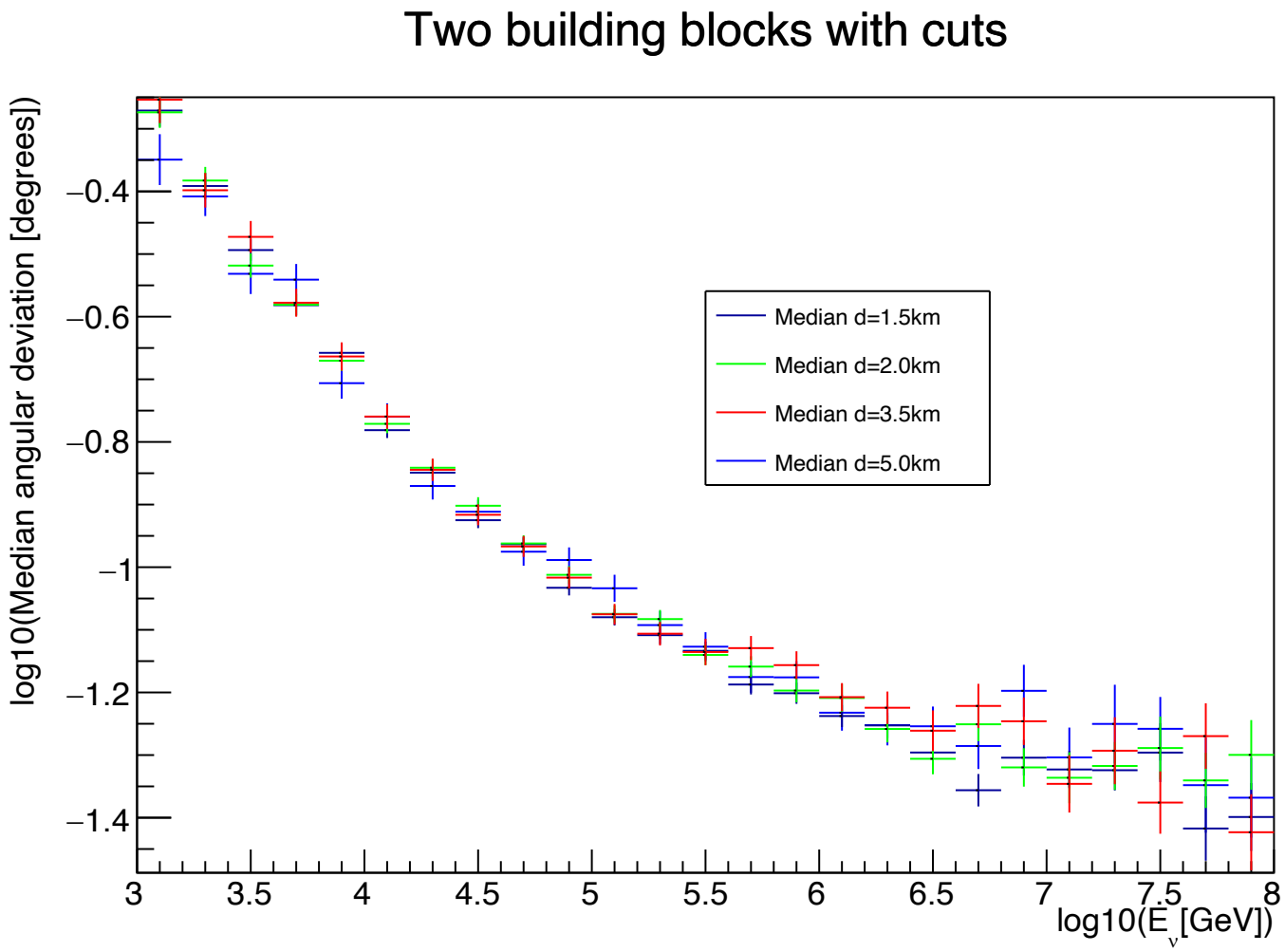


Two building blocks

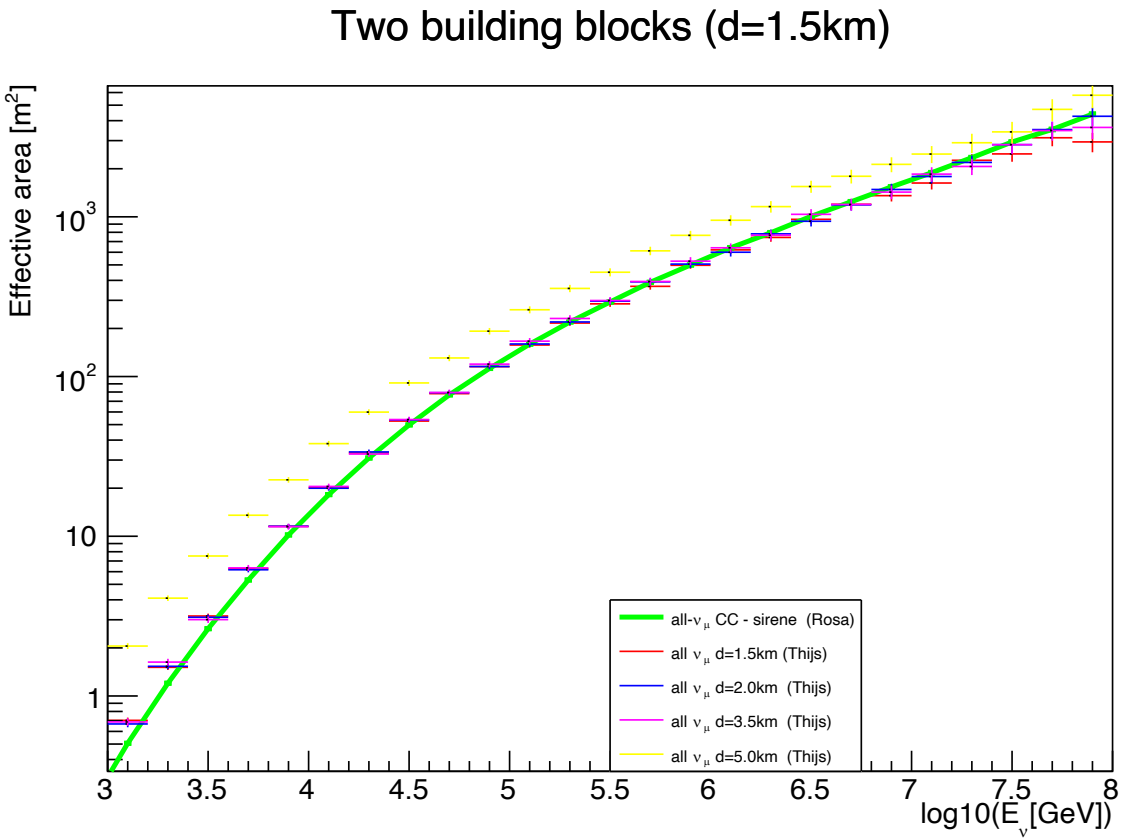
Repeated for several distances

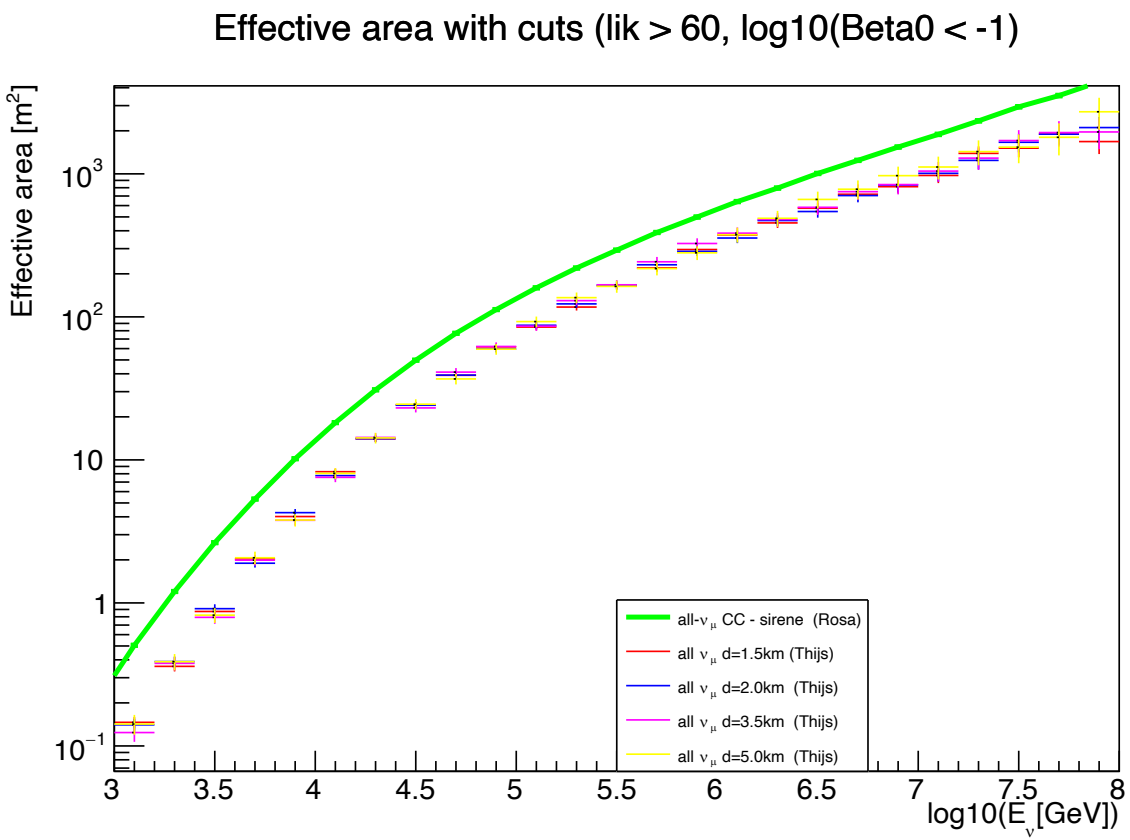
- d = 1.5 km (= 0.5 km distance from edge to edge)
- d = 2.0 km (= 1.0 km “ ”)
- d = 3.5 km (= 2.5 km “ ”)
- d = 5.0 km (= 4.0 km “ “)

Two building blocks



Two building blocks





Event rates

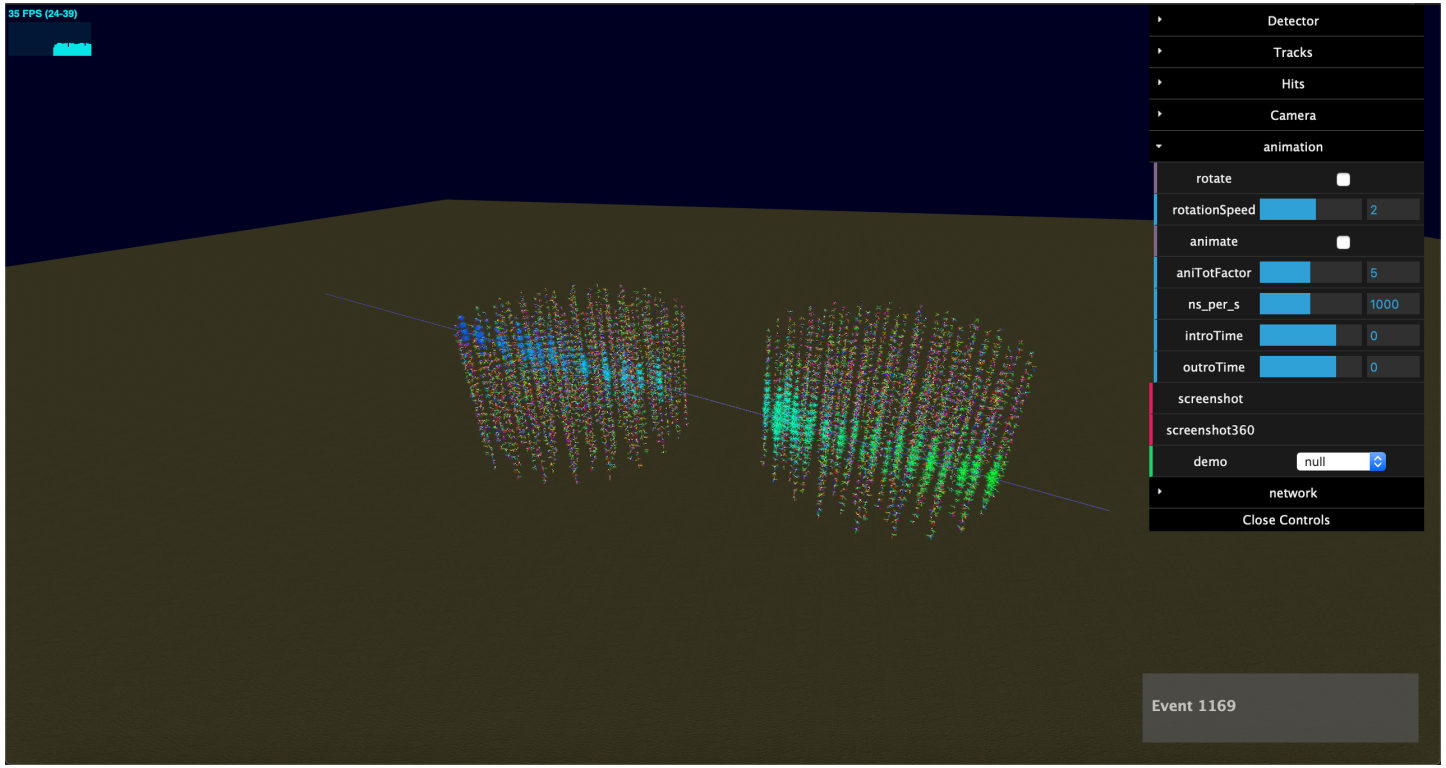
Detector	Evts/yr	Evts/yr (r< .1°)	Evts/yr (r< .063°)	Evts/yr (r< .016°)
One bb	81.5	77.7	38.7	2.4
One bb * 2	163	155.4	77.4	4.8
Two bb (d=1.5km)	162.3	154.3	77.5	6.7
Two bb (d=2.0km)	162.7	154.3	76.1	5.99
Two bb (d=3.5km)	164.4	156.2	78.7	5.2
Two bb (d=5.0km)	164.7	157.1	78.5	4.88

Golden events

- Events that hit at least 10 lines in both building blocks

See event display at:

https://www.nikhef.nl/~tjuanve/www_750/index.html?f=BB1169.js.gz



Golden events

d (km)	Golden Evts/yr	% of events	Gold Evts/yr ($r < 0.1°$)	Gold Evts/yr ($r < 0.016°$)
1.5	11.9	7.3	11.4	2.0
2.0	6	3.7	5.7	1.3
3.5	1.7	1	1.6	0.5
5.0	0.8	0.5	0.6	0.3