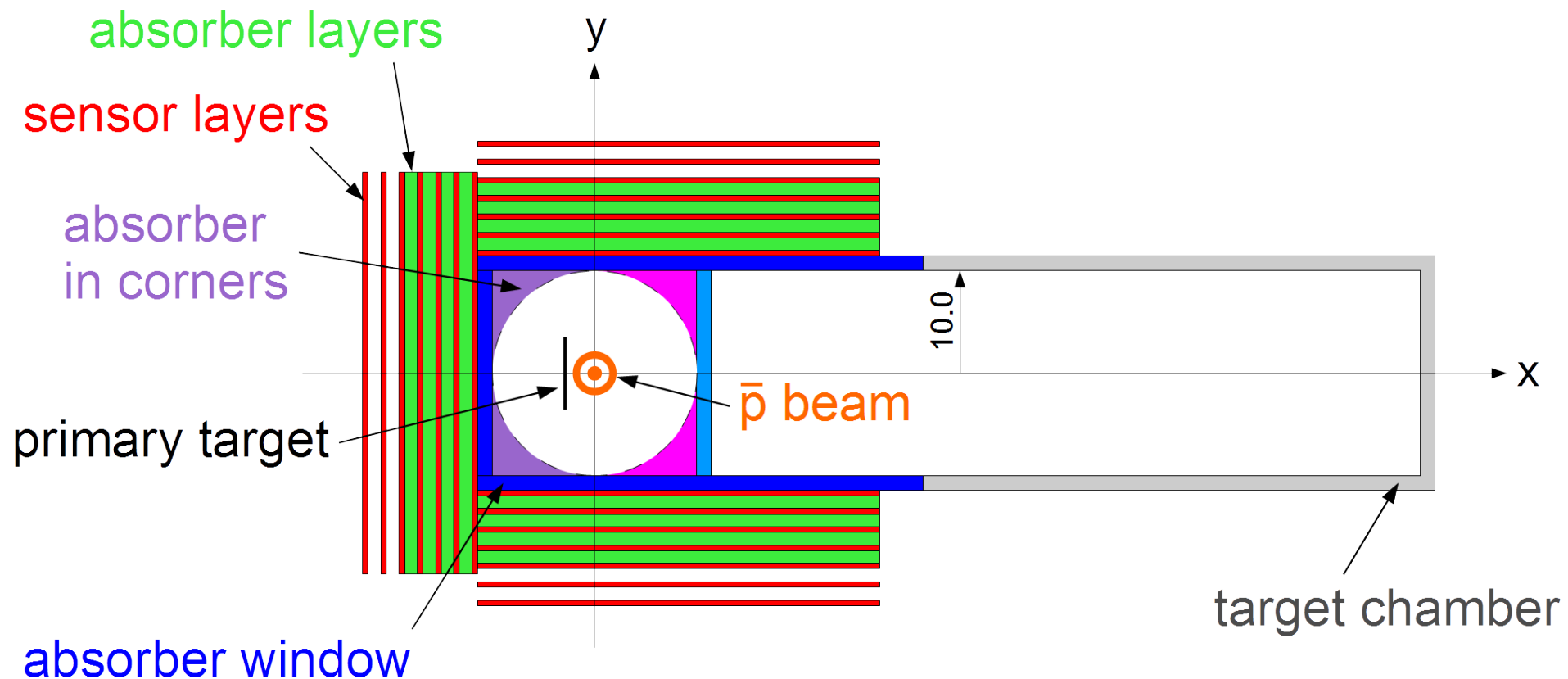


Background suppression by Pion-POCA-Analysis

Sebastian Bleser
Helmholtz-Institut Mainz
Panda Meeting June 2019

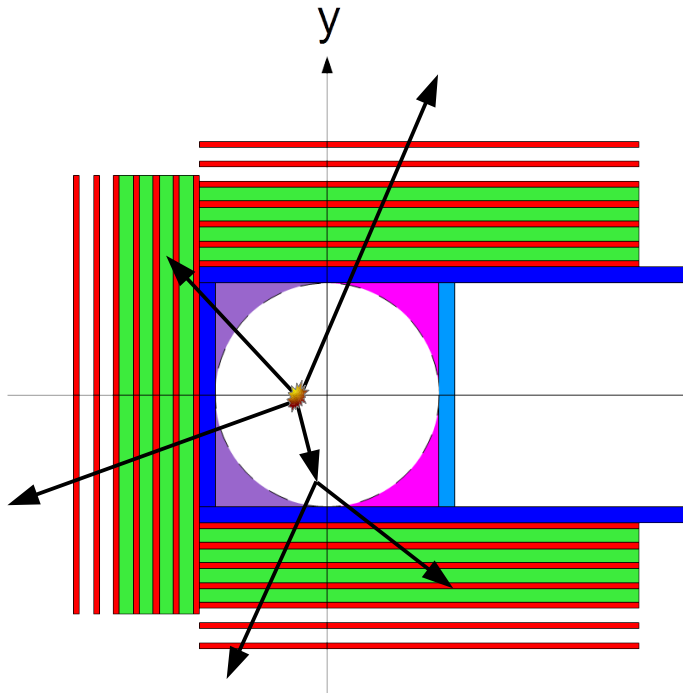
Geometry of the target system



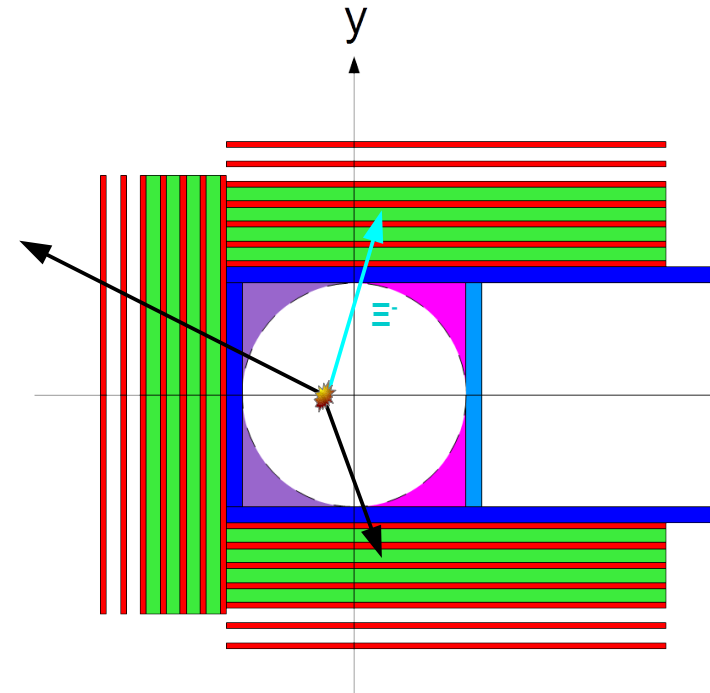
Primary reaction

1. Primary reaction $\bar{p} + {}^{12}\text{C}$ simulated by GiBUU transport model⁽¹⁾
→ classification and separation of the results
2. Geant4 simulation for geometry with boron absorbers

a) inclusive events (without Ξ^-)



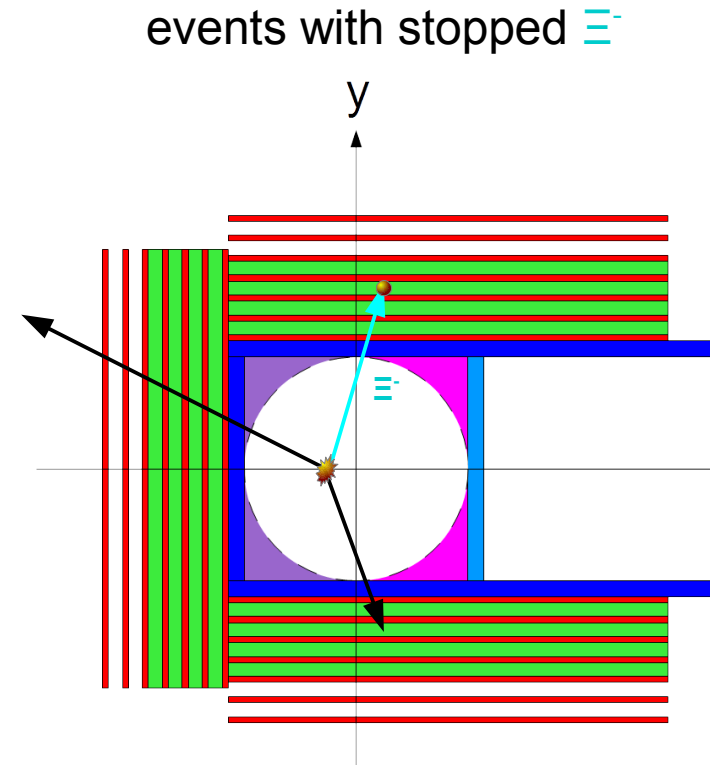
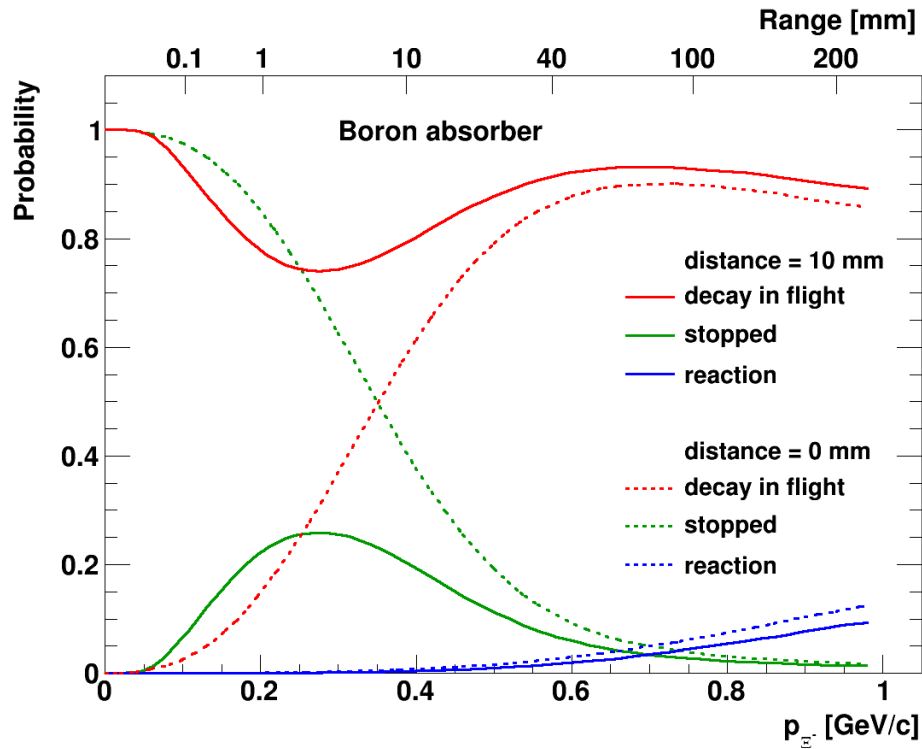
b) events with Ξ^-



⁽¹⁾ O. Buss et al., Phys. Rep. 512 (2012) 1-124

Stopping analysis of Ξ^-

2b) Ξ^- has to be stopped in absorber material



Secondary reaction and decay

Conversion of stopped and captured Ξ^- : $p + \Xi^- \rightarrow \Lambda\Lambda$ in absorber ${}^{11}_5\text{B}$

\Rightarrow excited double hypernucleus ${}^{12}_{\Lambda\Lambda}\text{Be}^*$

Fragmentation simulated by SMM (Statistical Multifragmentation Model ⁽²⁾):

Example: ${}^{12}_{\Lambda\Lambda}\text{Be}^* \rightarrow {}^{10}_{\Lambda\Lambda}\text{Be}^* + n + n$ (1.9 %)

Weak decay of double Λ hypernucleus ($\Lambda \rightarrow p + \pi^-$, 63,9 %)

${}^{10}_{\Lambda\Lambda}\text{Be} \rightarrow {}^{10}_{\Lambda}\text{Be} + \pi_1^-$ $p(\pi_1^-) = 97.89 \text{ MeV}/c$ Phase Space Decay

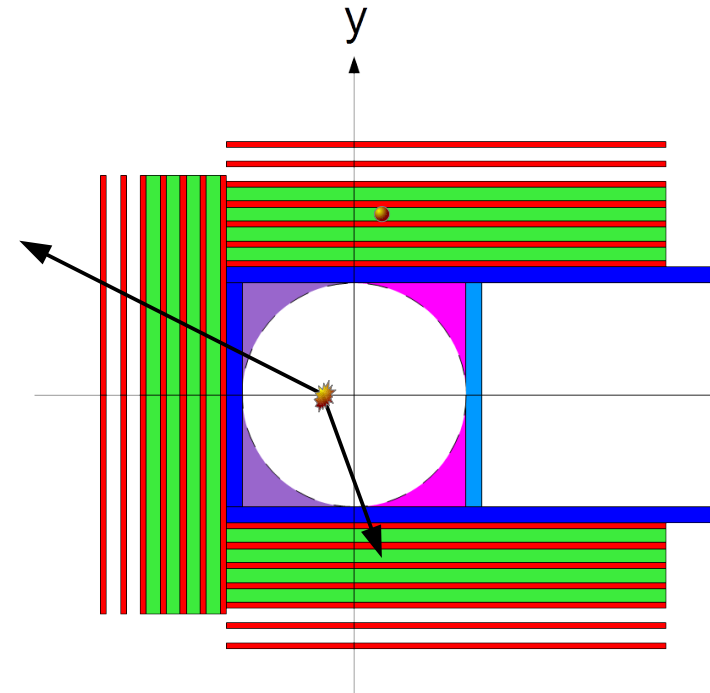
${}^{10}_{\Lambda}\text{Be} \rightarrow {}^{10}\text{C} + \pi_2^-$ $p(\pi_2^-) = 100.49 \text{ MeV}/c$ Phase Space Decay

⁽²⁾ A.S. Lorente, A.S. Botvina, J. Pochodzalla,
Phys. Lett. B 697 (2011) 222-228

Simulation of $\Lambda\Lambda$ hypernuclei

Full simulation of a double hypernucleus event:

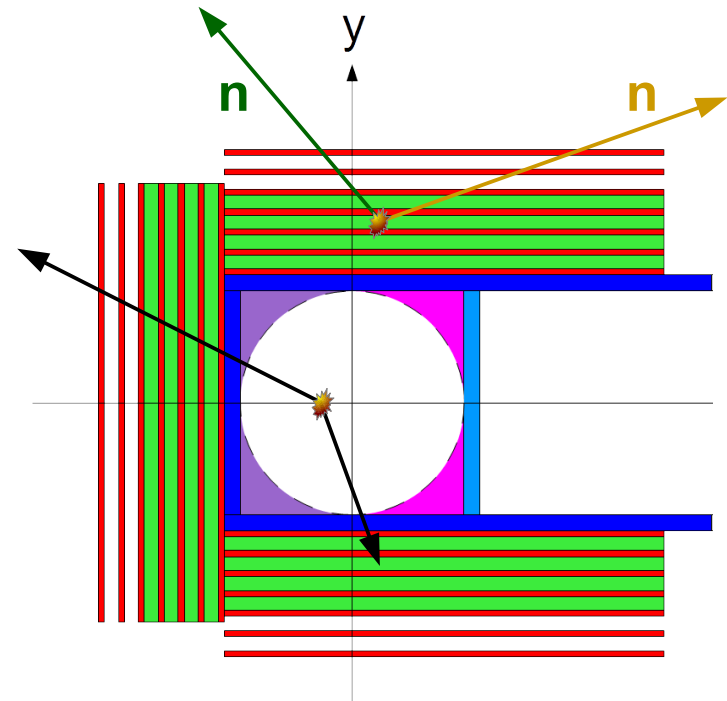
1. Particles from primary reaction without Ξ^-



Simulation of Λ hypernuclei

Full simulation of a double hypernucleus event:

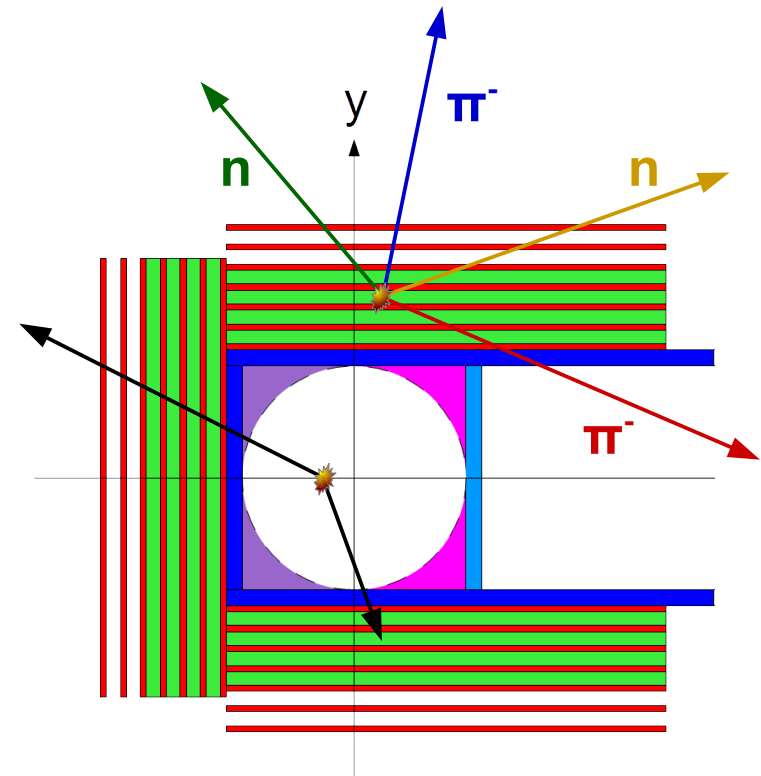
1. Particles from primary reaction without Ξ^-
2. 2 neutrons from fragmentation



Simulation of Λ hypernuclei

Full simulation of a double hypernucleus event:

1. Particles from primary reaction without Ξ^-
2. 2 neutrons from fragmentation
3. 2 π^- from weak decay

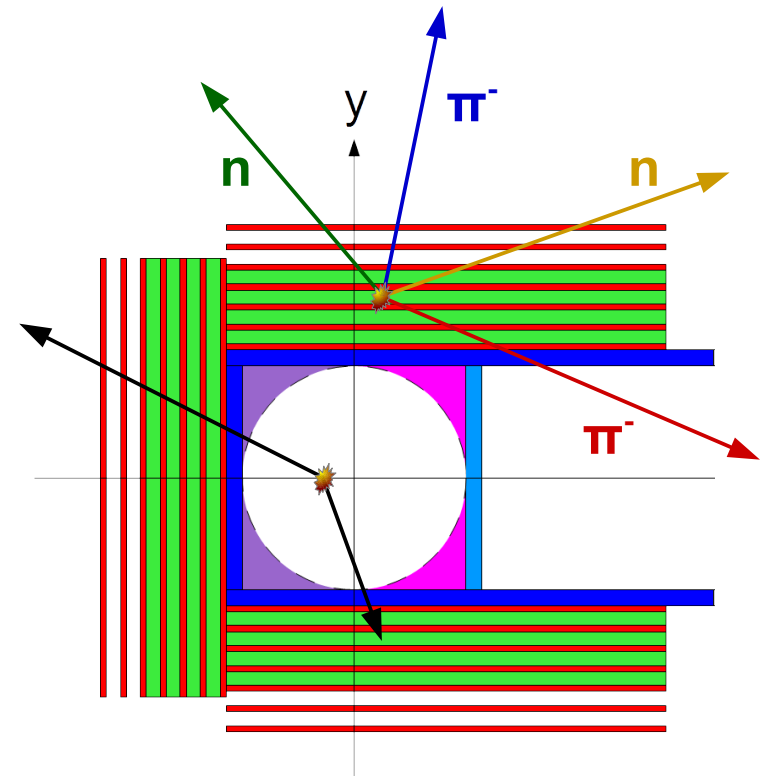


Simulation of $\Lambda\Lambda$ hypernuclei

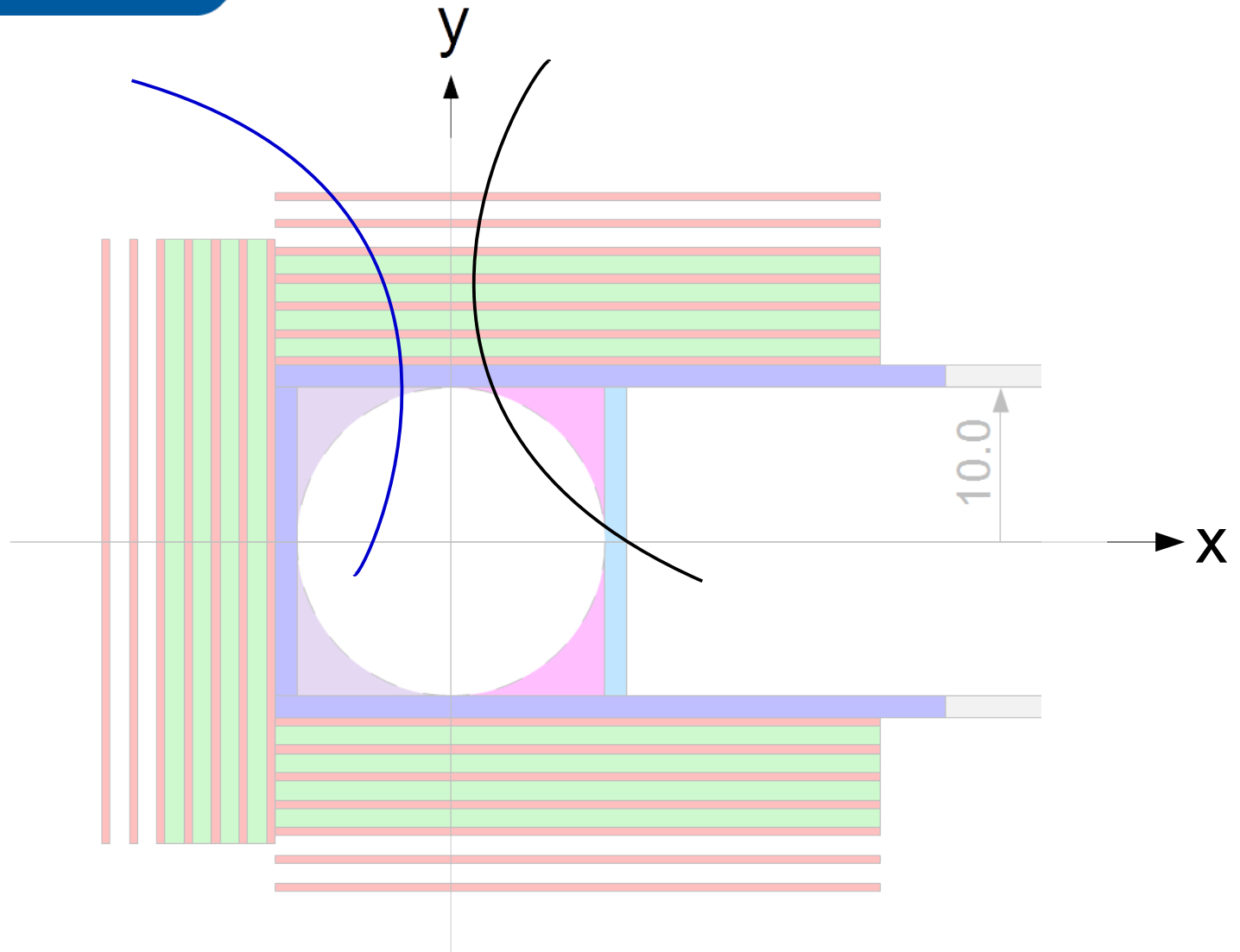
Full simulation of a double hypernucleus event:

1. Particles from primary reaction without Ξ^-
2. 2 neutrons from fragmentation
3. 2 π^- from weak decay

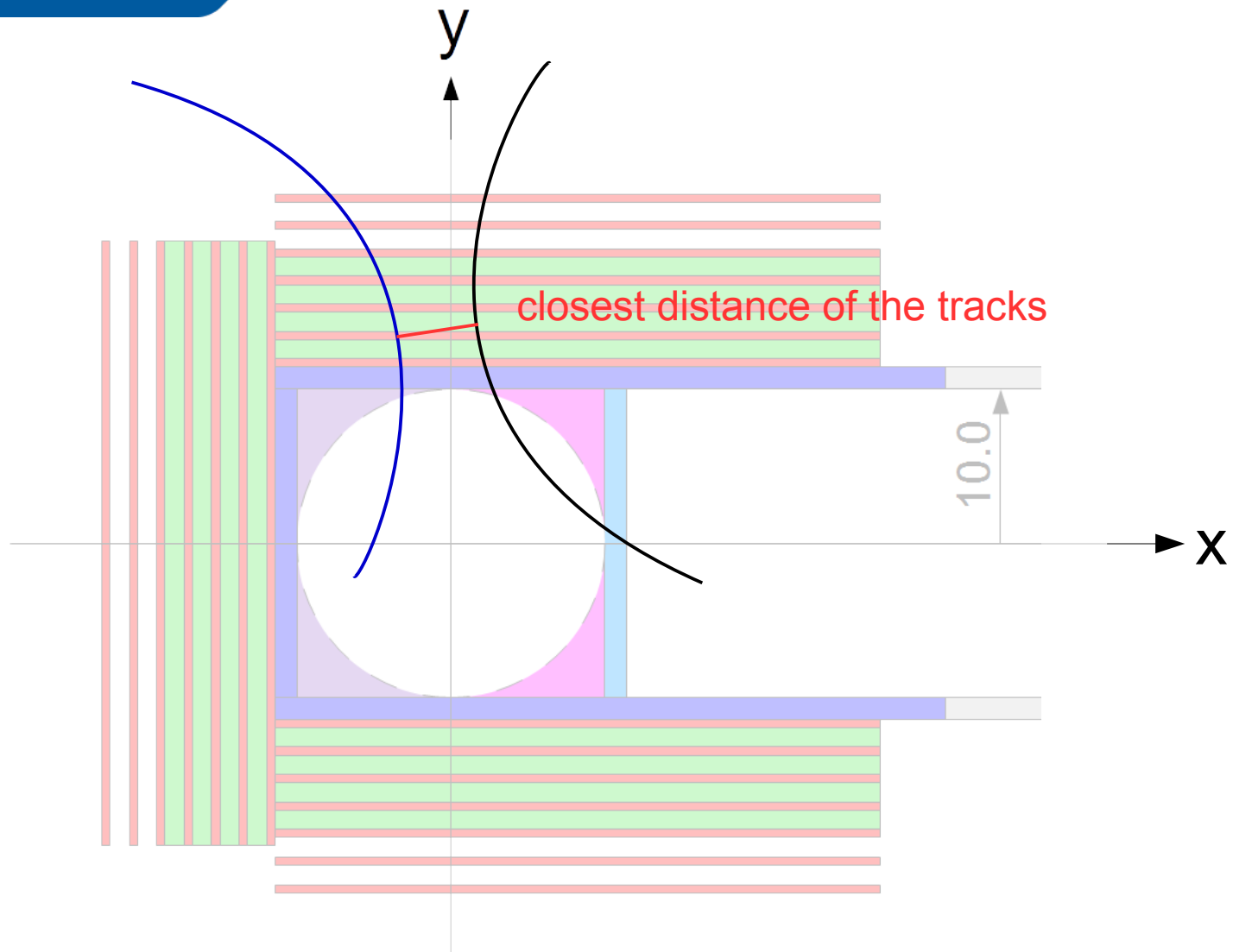
Detection of double Λ hypernuclei
by tracking of both π^-
from a common vertex



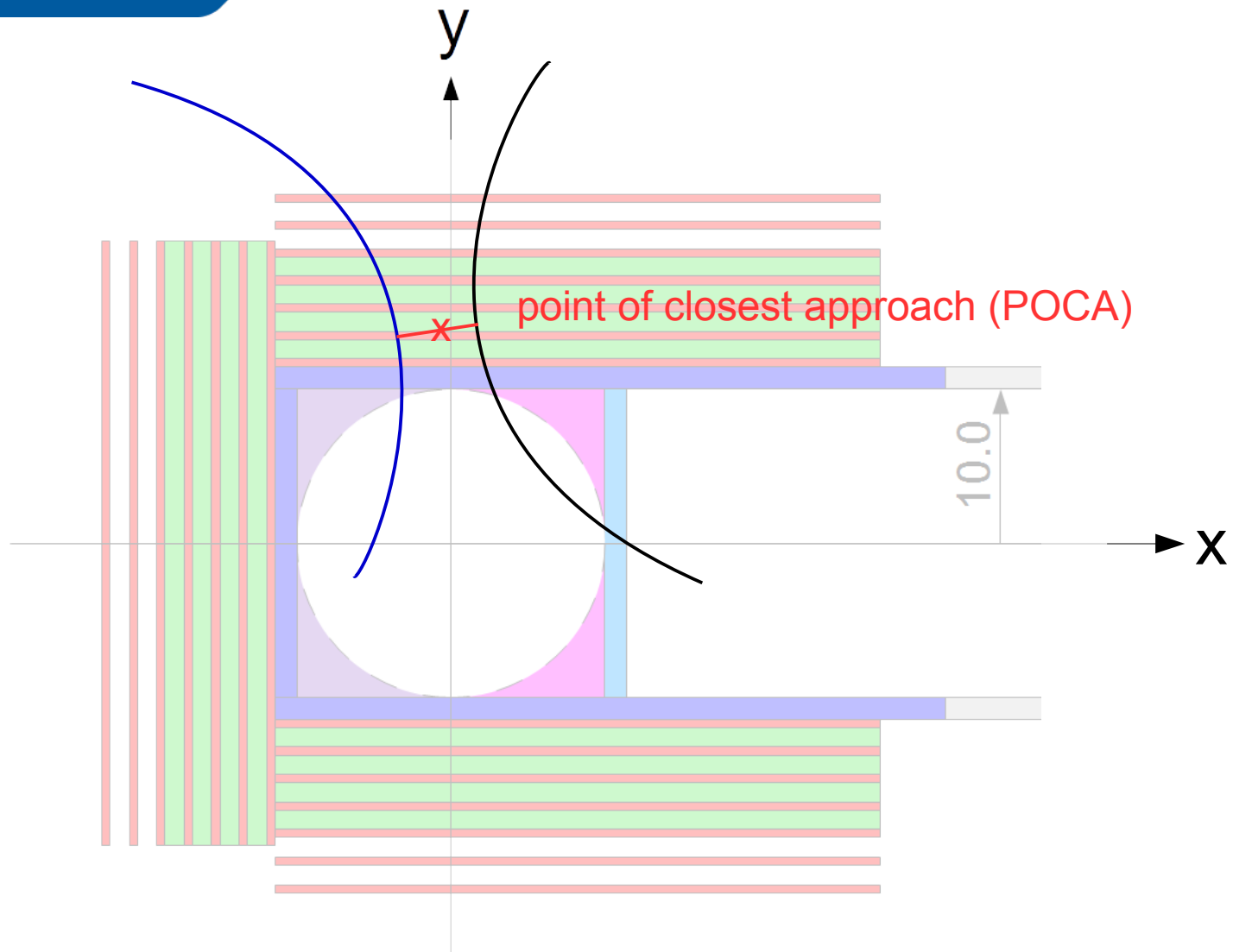
Point of closest approach



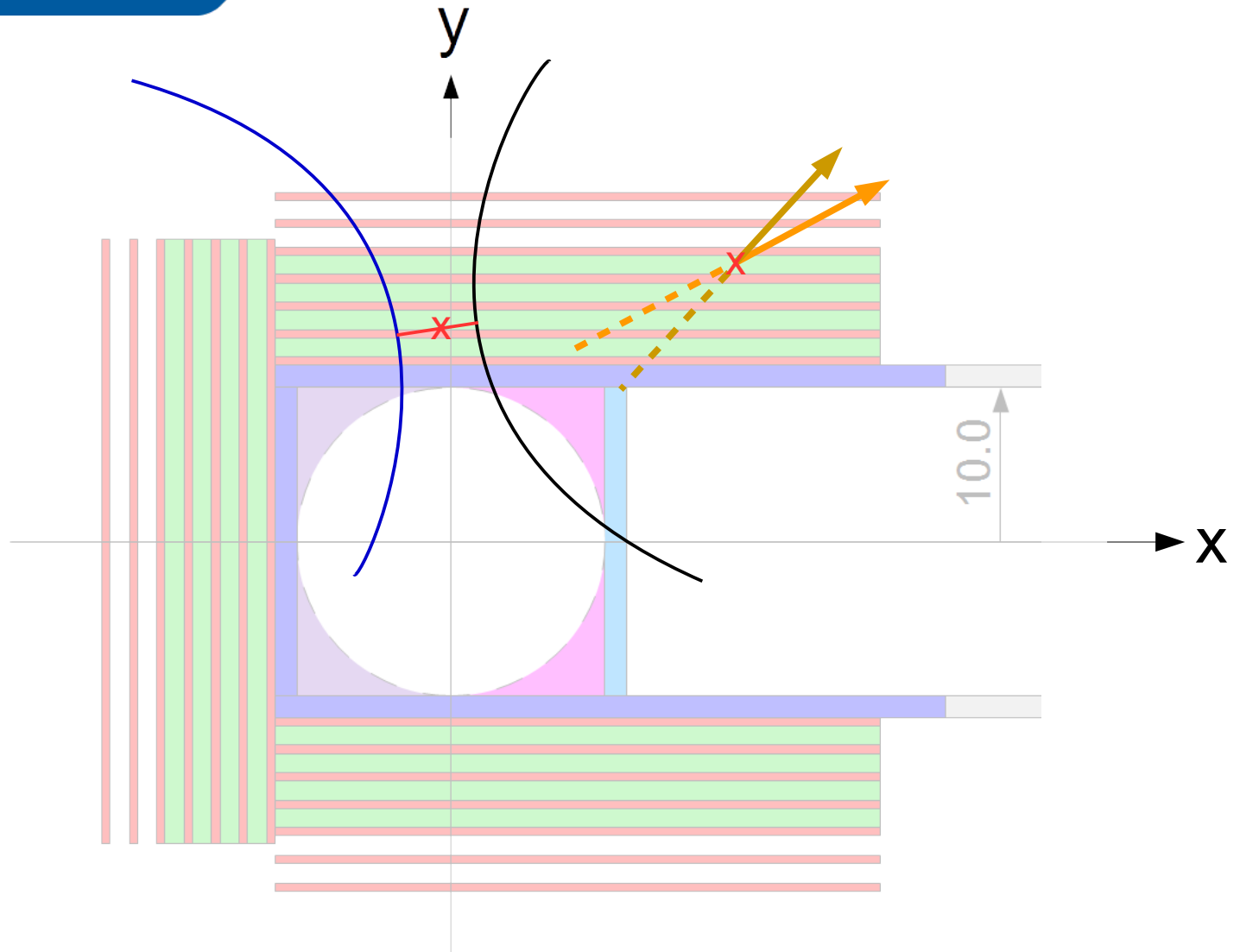
Point of closest approach



Point of closest approach



Point of closest approach



Point of closest approach

