Update on LUXE GEANT4 Simulation, Magnetic field.
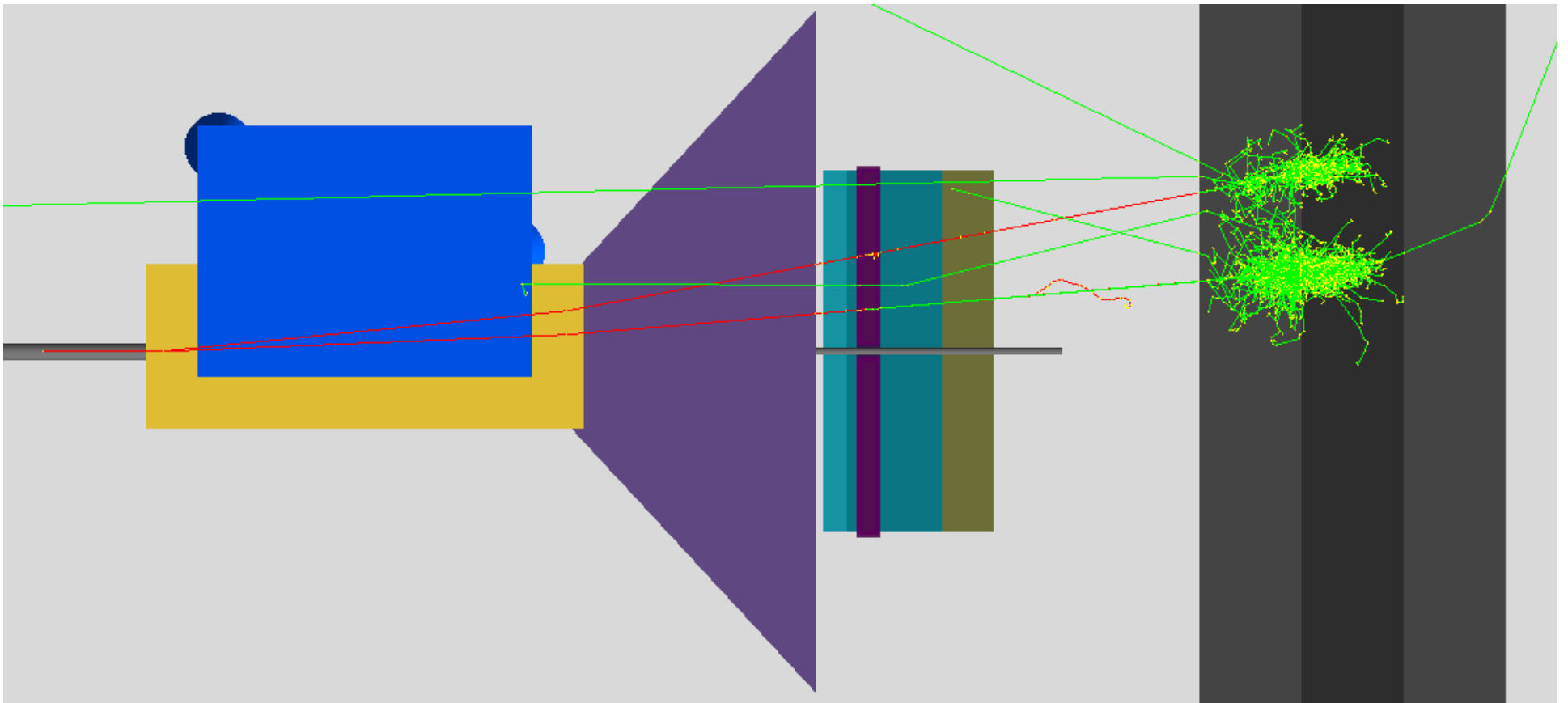
Oleksandr Borysov

LUXE DESY Technical Meeting
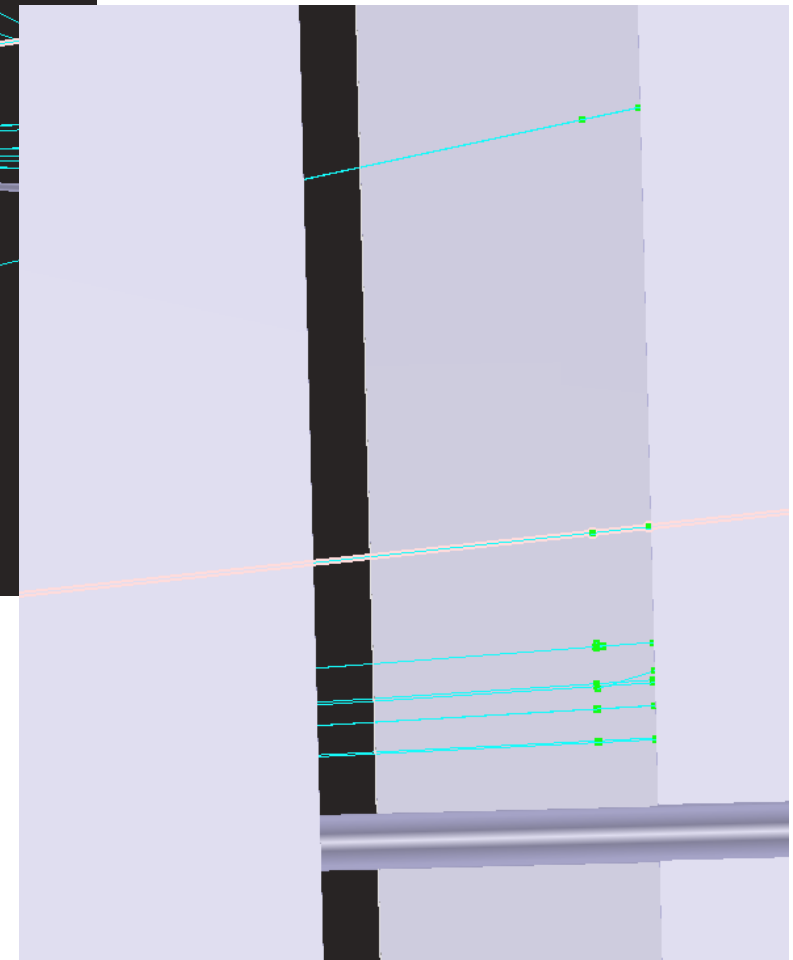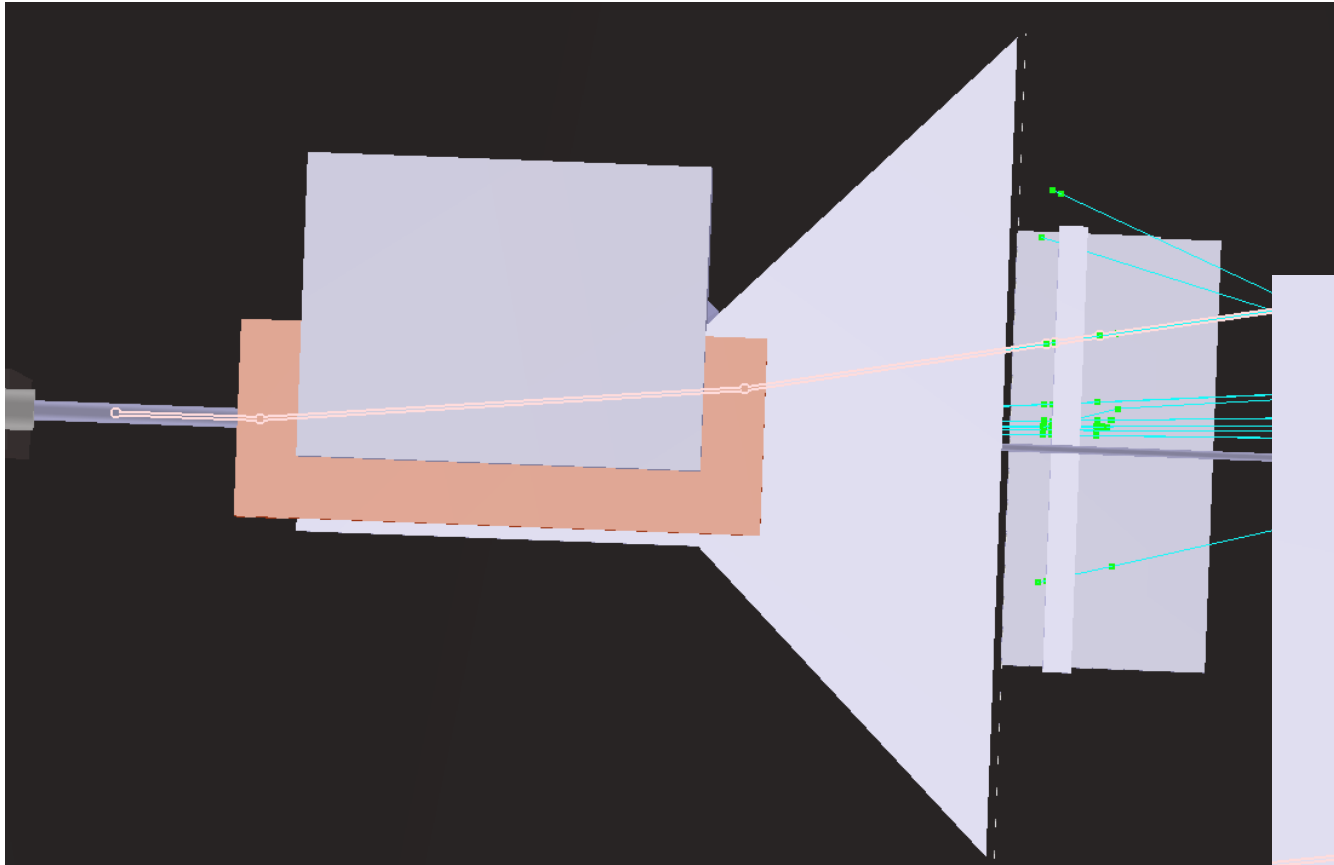June 16, 2021
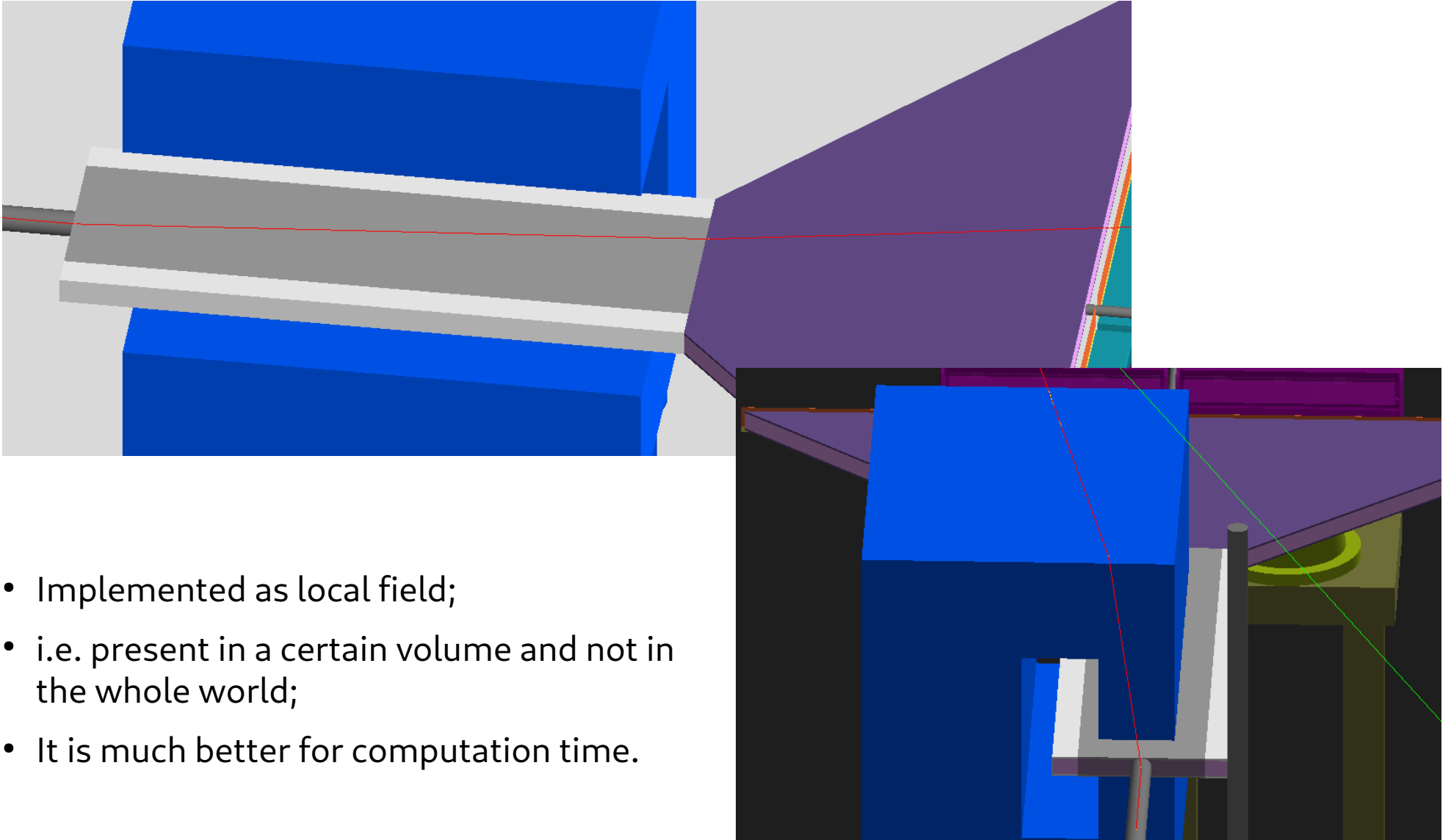
Local Field

- Implemented as local field;
- i.e. present in a certain volume and not in the whole world;
- It is much better for computation time.

Electrons of 2 GeV and 5 GeV

Electrons

Steppers:

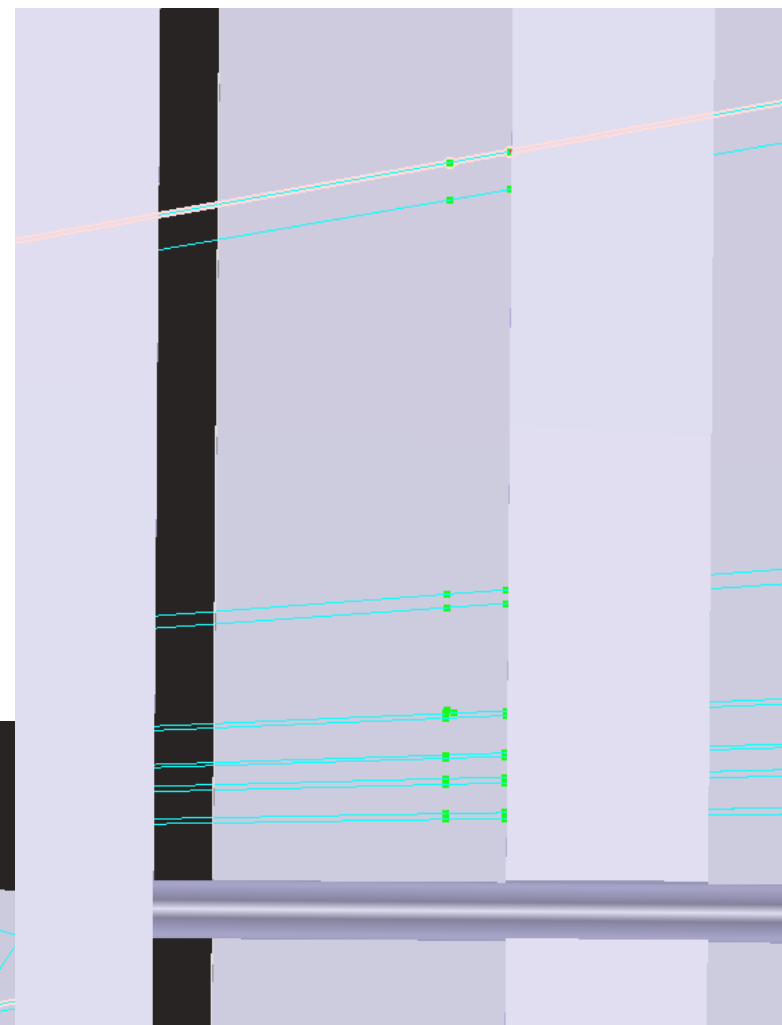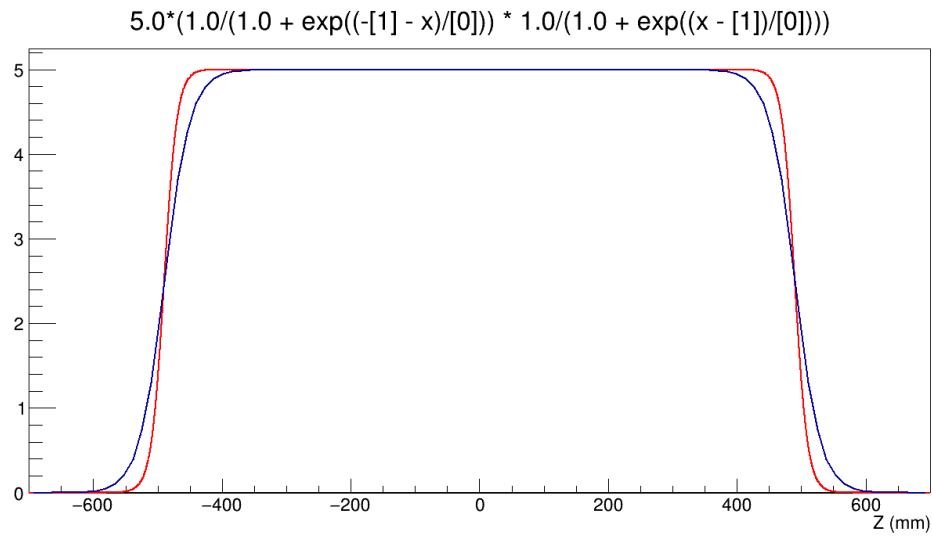- G4DormandPrince745
- G4CashKarpRKF45

    Electrons (GeV): 2, 5, 8, 10, 12, 16.5.

Field shape

5.0*(1.0/(1.0 + exp((-[1] - x)/[0])) * 1.0/(1.0 + exp((x - [1])/[0])))

Steppers:

- G4DormandPrince745

Electrons (GeV): 2, 5, 8, 10, 12, 16.5.

G4 Algorithms (Stepper)

- G4DormandPrince745 - default, fifth order stepper, requires 7 field evaluations;
- G4CashKarpRKF45 - fifth order stepper, requires fewer (6) field evaluations;

```
// Can choose one of the following Steppers
pStepper = new G4SimpleRunge( fEquation );   // 2nd
pStepper = new G4SimpleHeum( fEquation );    // 3rd
pStepper = new G4ClassicalRK4( fEquation ); // 4th
pStepper = new G4HelixExplicitEuler( fEquation );
pStepper = new G4CashKarpRKF45( fEquation );
pStepper = new G4NystromRK4( fEquation );    // New!
```

Field shape

5.0*(1.0/(1.0 + exp((-[1] - x)/[0])) * 1.0/(1.0 + exp((x - [1])/[0])))
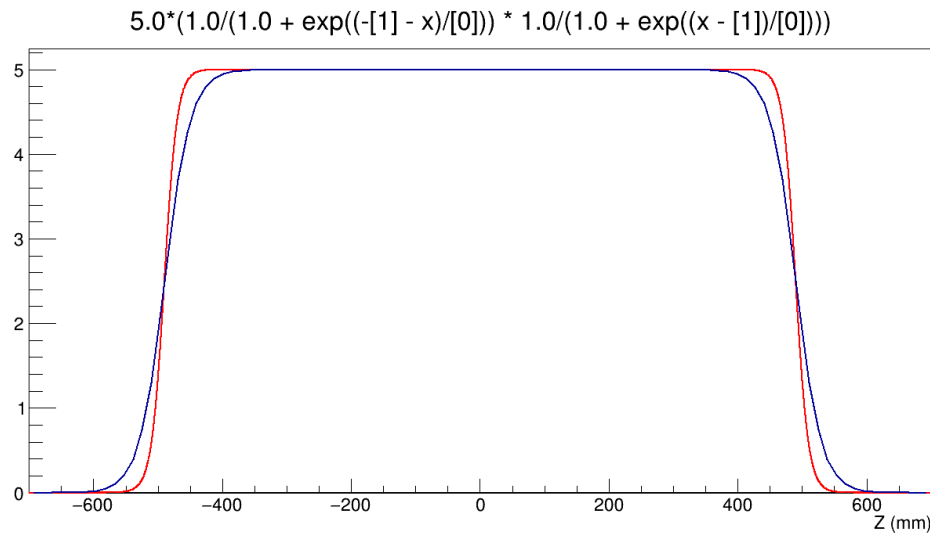
```
root [3] Tracks->Scan("eventid:trackid:E:pdg:x:detid", "detid==3000 && trackid==1")
*********************************************************************************************
*     Row   * Instance *  eventid *  trackid *         E *      pdg *        x *    detid *
*********************************************************************************************
*        0 *        4 *        0 *        1 * 1.9992958 *       11 * 259.85250 *     3000 *
*        1 *        4 *        1 *        1 * 4.9993103 *       11 * 110.02898 *     3000 *
*        2 *        4 *        2 *        1 * 7.9992699 *       11 * 68.644390 *     3000 *
*        3 *        4 *        3 *        1 * 9.9993234 *       11 * 54.222831 *     3000 *
*        4 *        4 *        4 *        1 * 11.971385 *       11 * 46.009013 *     3000 *
*        5 *        4 *        5 *        1 * 16.494729 *       11 * 33.861157 *     3000 *
*        6 *        4 *        0 *        1 * 1.9992959 *       11 * 246.85402 *     3000 *
*        7 *        4 *        1 *        1 * 4.9993103 *       11 * 105.39762 *     3000 *
*        8 *        4 *        2 *        1 * 7.9992699 *       11 * 67.009099 *     3000 *
*        9 *        4 *        3 *        1 * 9.9993234 *       11 * 53.068823 *     3000 *
*       10 *        4 *        4 *        1 * 11.971385 *       11 * 44.012199 *     3000 *
*       11 *        4 *        5 *        1 * 16.494729 *       11 * 31.857435 *     3000 *
*********************************************************************************************
```