Status on LDT runs

01/25/2021

Basic Geometry Setting

** Detector parameters, make the structure as simple as possible, just take it as starting points and validating tools

Sub-detector	layer	+/-z(mm)	R(mm)	sigma_xy(mm)	sigma_z(mm)	X/X0(%)
BeamPipe	0	4225	14.5	---	---	0.15
vertex	1	62.5	16	0.0028	0.0028	0.15
vertex	2	62.5	18	0.006	0.006	0.15
vertex	3	125.	37	0.004	0.004	0.15
vertex	4	125.	39	0.004	0.004	0.15
vertex	5	125.	58	0.004	0.004	0.15
vertex	6	125.	60	0.004	0.004	0.15
VXTShell	7	145.	65	---	---	0.15
Si_pixel	8	371.	78	0.0072	0.0866	0.65
Si_pixel	9	665.	189	0.0072	0.0866	0.65
Si_pixel	10	2350	298	0.0072	0.0866	0.65
DC	11-160	2350	300-1800	0.1000	2/9999	1.20 (inner wall 0.2, outter wall 1.0 for temporary)
Si_pixel	161	2350	1811	0.0072	0.0866	0.65

** using theta = pi/ firstly, and total matertials at theta=pi/2 is 5%

** Expected plots (if not available, drop DC off but keep the materials):

delta pt/pt vs. pt
delta(1/pt) vs. pt
sigma(r¥phi) vs. pt
sigma(z) vs. pt

** Alternative plots:
only fit, no materials

distributed on the mailing list last week

```
Silicon Inner Tracker (SIT)

Number of layers             :   5
Description (optional)       :   |---------------Inner tracker----------|TPC inner wall|
Names of the layers (opt.)   :   SIT1,          SIT2,         SIT3,         XTPCW1,        XTPCW2
Radii [mm]                   :   78.0,          189.0,        298.0,        299,           1805
Upper limit in z [mm]        :   371.0,         665.0,        2350,         2350,          2350
Lower limit in z [mm]        :  -371.0,        -665.0,       -2350,        -2350,         -2350
Efficiency RPhi              :   1.00,          1.00,         1.00,         0,             0
Efficiency 2nd coord. (eg. z):  -1,
Stereo angle alpha [Rad]     :   pi/2,
Thickness [rad. lengths]     :   0.0065,        0.0065,       0.0065,       0.0009367,     0.009367
error distribution           :   0
0 normal-sigma(RPhi) [1e-6m] :   7.2
           sigma(z)    [1e-6m] :   86.6
1 uniform-d(RPhi) [1e-6m]    :
            d(z)     [1e-6m]    :

Time Projection Chamber (TPC)
sigma^2=sigma0^2+sigma1^2*sin(beta)^2+Cdiff^2*6mm/h*sin(theta)*Ldrift[m]
Number of layers             :   150
Radii [mm]                   :   300,1800
Upper limit in z [mm]        :   2350
Lower limit in z [mm]        :   -2350
Efficiency RPhi              :   1
Efficiency z                 :   1
Thickness [rad. lengths]     :   0.00005194
sigma0(RPhi) [1e-6m]         :   100
sigma1(RPhi) [1e-6m]         :   0
Cdiff(RPhi)  [1e-6m/sqrt(m)] :   0
sigma0(z)    [1e-6m]         :   2000
sigma1(z)    [1e-6m]         :   0
Cdiff(z)     [1e-6m/sqrt(m)] :   0
```

Sensor & Support material is bundled

coefficients are set at 0

Layout

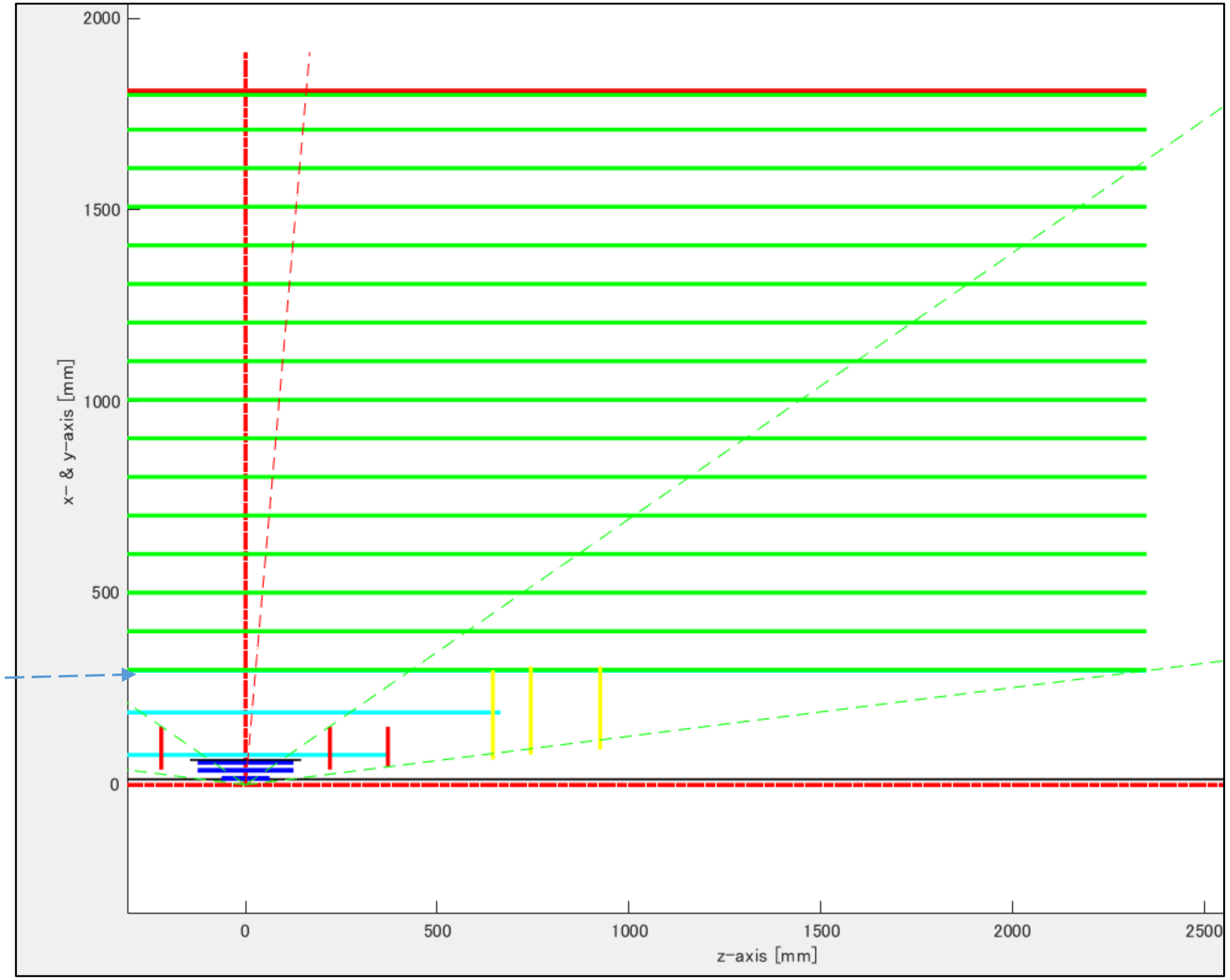
- VXD : ~ as previous (=default)

- SIT : total 4 layers with half material compared with the previous

=> thickness of first 3 SIT layers < first 2 SIT layers in the baseline

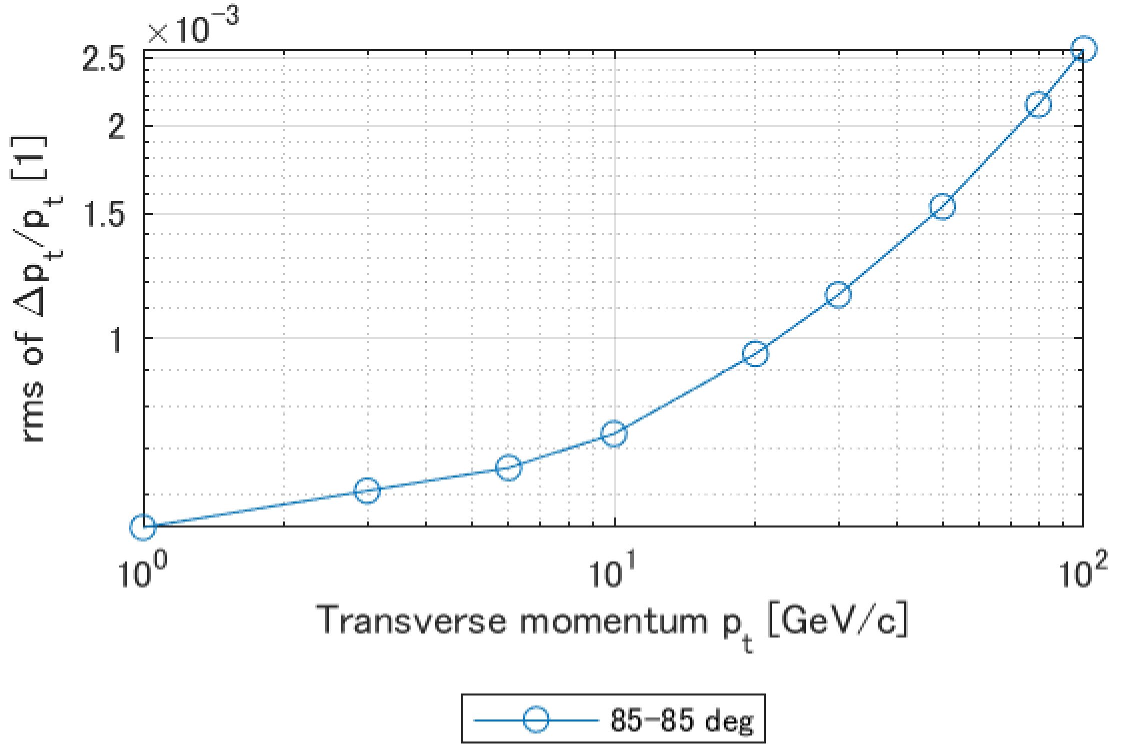
- DCH : one DCH ~ much like a TPC

it is hard to see with this scale but there is another SIT layer (and the inner DCH wall) here.

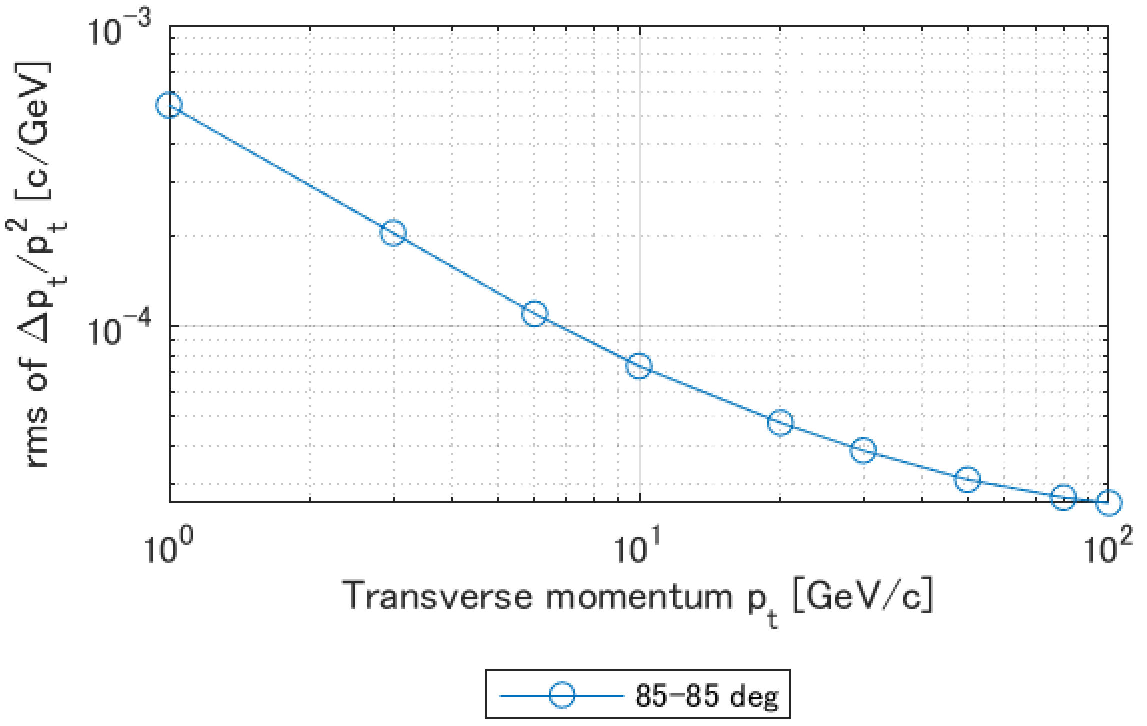


Plot 1 : $\Delta P_t/P_t$, $\Delta P_t/P_t^2$

$\Delta P_t/P_t$

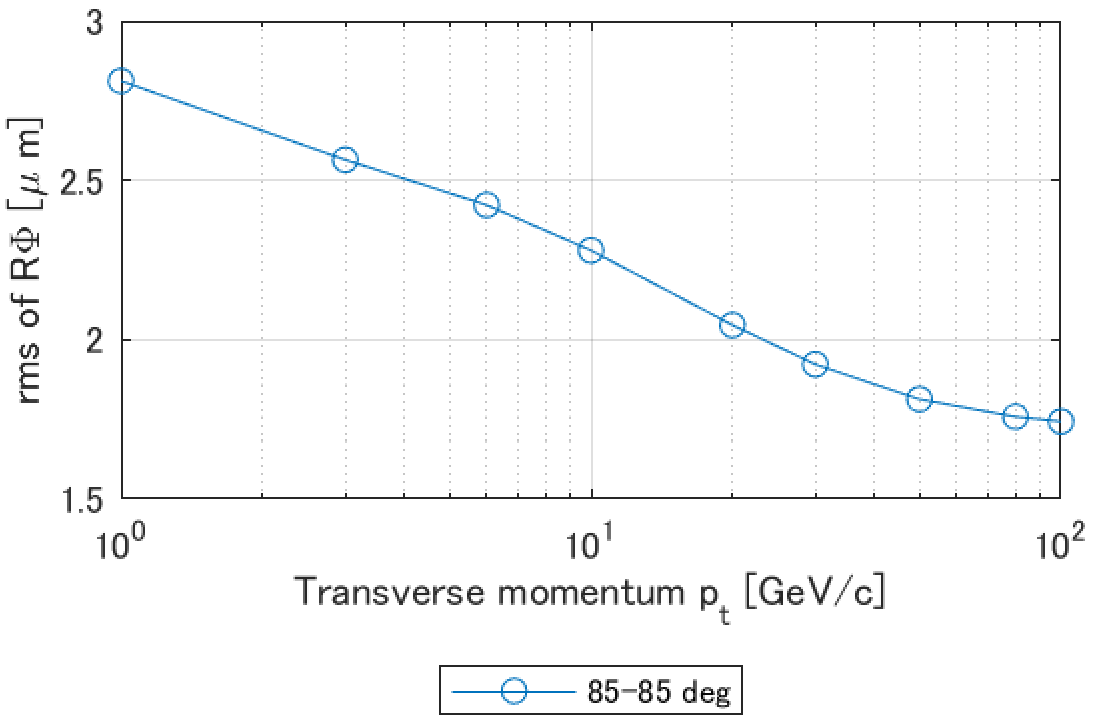


$\Delta P_t/P_t^2$

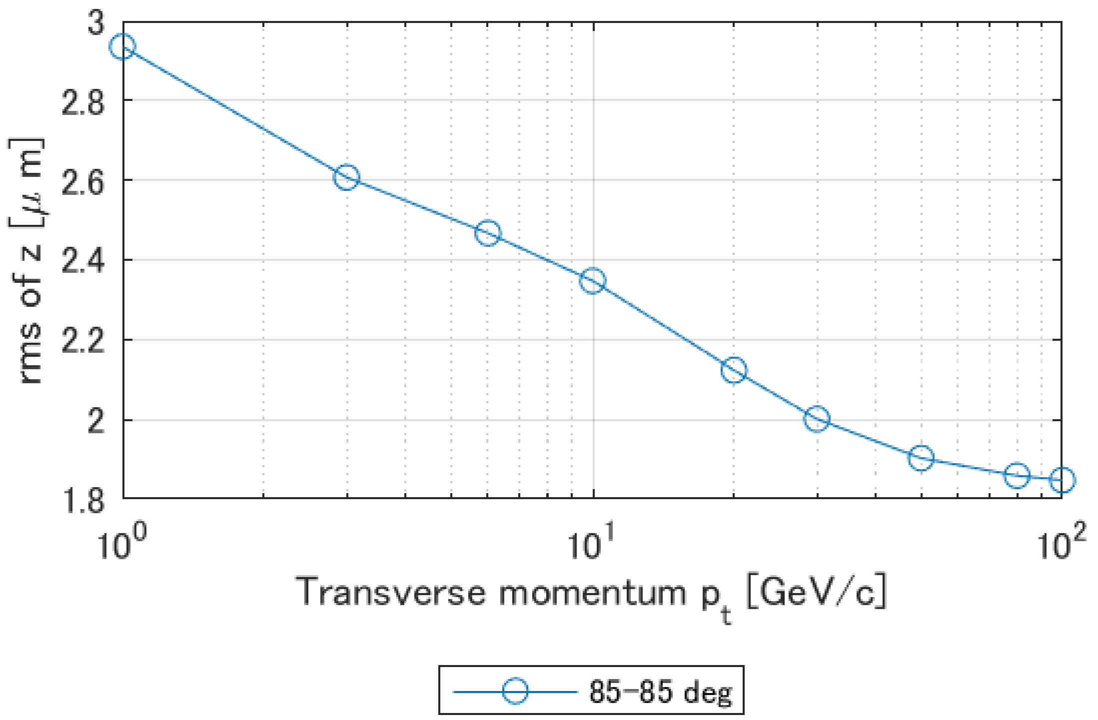


Plot 2 :　RMS value of RΦ & Z

RMS of RΦ



RMS of Z



Reference

・ Residual of R×Phi and Z is calculated at the inner side of beam tube , the very first layer.

・ For momentum resolution, it is the value at inner side of beam tube = would be the same as at the origin, since there is no material between the origin and the beam tube.

```
function [rms,hist]=mcrms(Radius,MC_res,res_true,param_start,param_fit,MCpullhi

% function rms
% Called by LDT_main
% Main program: LIC_Detector_Toy
%
% Input:    MC_res      Array of residuals at the inner side of the
%                       beamtube, for every track and every coordinate
%           res_true    Residuals between the true simulated parameters and
%                       the fitted parameters at the inner side of the
%                       beamtube, for every track and coordinate
%                       (Phi,z,theta,beta,kappa)
%           param_start Simulated start parameters at inner side of
%                       beamtube, for every track
%           Radius      Radius of beamtube
%           MCpullhit   Logical array, which indicates the tracks for those
%                       Monte-Carlo pulls can be computed
% Output:   hist        arrays for histogramming MC-pulls
%           rms         rms values of hist
%                       rms(1) => RPhi
%                       rms(2) => z
%                       rms(3) => theta
%                       rms(4) => phi
%                       rms(5) => dpt/pt
%                       rms(5) => dpt/pt^2
%
%   RMS calculates the pull quantities at the inner side of the
%   beamtube and and delta p_t/(p_t) and delta p_t/(p_t)^2

```