Status on SDT simulation

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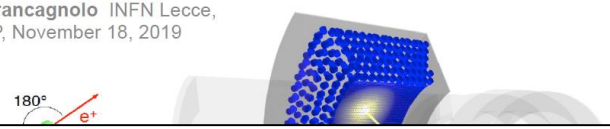
06/09/2020

Status

- Changing the parameters assuming a MDC
  - -- thickness of the wall
  - -- number of wires

Carbon fiber shell

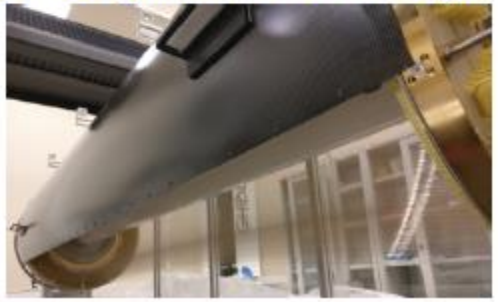
The MEG2 Drift Chamber Experience
F. Grancagnolo INFN Lecce,
IHEP, November 18, 2019

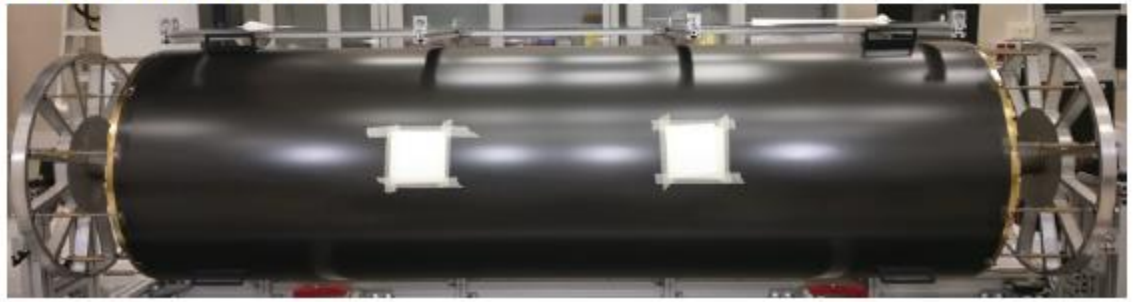


taken from

Wiring completed

Closing with two half cylinder carbon fiber shells



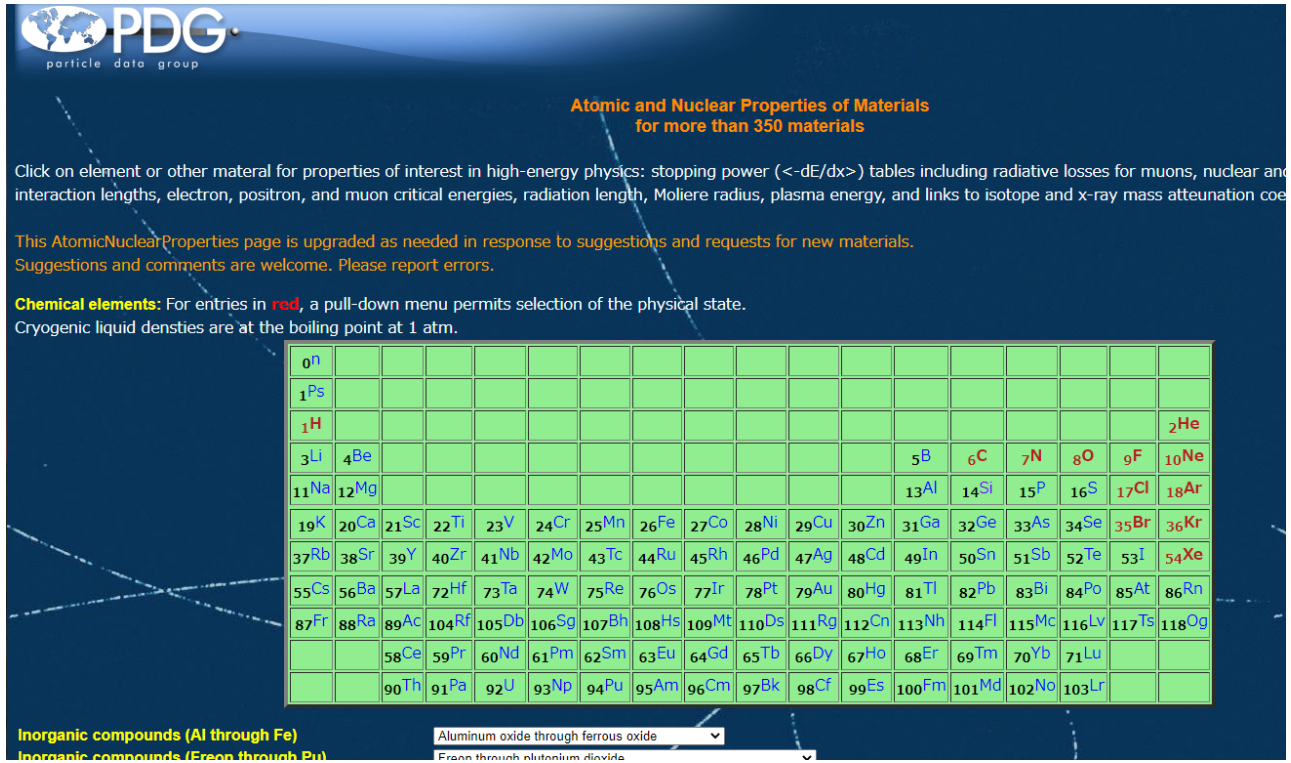


Radiation length

- Referring a value from the PDG http://pdg.lbl.gov/2019/AtomicNuclearProperties/index.html

Atomic and nuclear properties of carbon (amorphous) (C)

Quantity	Value	Units	Value	Units
Atomic number	6			
Atomic mass	12.0107(8)	g mole^{-1}		
Specific gravity	2.000	g cm^{-3}		
Mean excitation energy	78.0	eV		
Minimum ionization	1.749	MeV g^{-1}cm^2	3.497	MeV cm^{-1}
Nuclear collision length	59.2	g cm^{-2}	29.60	cm
Nuclear interaction length	85.8	g cm^{-2}	42.90	cm
Pion collision length	86.5	g cm^{-2}	43.23	cm
Pion interaction length	117.8	g cm^{-2}	58.89	cm
Radiation length	42.70	g cm^{-2}	21.35	cm
Critical energy	82.08	MeV (for e$^-$)	79.85	MeV (for e$^+$)
Molière radius	11.03	g cm^{-2}	5.515	cm
Plasma energy $\hbar\omega_p$	28.80	eV		
Muon critical energy	1060.	GeV		



if its thickness is 0.2 mm, $X = 0.2/213.5 = 0.0009367\ X_0$

but depending on the composition of the carbon fiber

LDT_Matlab.m | cepc-all_3.0T_MDC_config1.bgeom

```
24  24 Number of layers             :   9
25  25 Description (optional)       : |-----------------------------------------------Inner tracker-----------------------------------------------|TPC inner wall|
26  26 Names of the layers (opt.)   :   SIT1,       XSIT1,      XSIT2,      SIT2,       SIT3,       XSIT3,      XSIT4,      SIT4,       XTPCW1
27  27 Radii [mm]                   :   152.9,      153.1,      154.4,      155.4,      299.9,      300.1,      301.4,      302.4,      329
28  28 Upper limit in z [mm]        :   371.3,      371.3,      371.3,      371.3,      644,        644,        644,        644,        2350
29  29 Lower limit in z [mm]        :   -371.3,     -371.3,     -371.3,     -371.3,     -644,       -644,       -644,       -644,       -2350
30  30 Efficiency RPhi              :   0.99,       0,          0,          0,          0.99,       0,          0,          0,          0
31  31 Efficiency 2nd coord. (eg. z):   0,          0,          0,          0.99,       0,          0,          0,          0.99,       0
32  32 Stereo angle alpha [Rad]     :   7*(pi/180),  7*(pi/180),  7*(pi/180),  7*(pi/180),  7*(pi/180),  7*(pi/180),  7*(pi/180),  7*(pi/180),  7*(pi/180)
33  33 Thickness [rad. lengths]     :   0.00213,    0.00468,    0.00468,    0.00213,    0.00213,    0.00468,    0.00468,    0.00213,    0.0009367
34  34 error distribution           :   0
35  35 0 normal-sigma(RPhi) [1e-6m] :   7
36  36          sigma(z)    [1e-6m] :   7
37  37 1 uniform-d(RPhi) [1e-6m]    :
38  38           d(z)    [1e-6m]    :
39  39
40  40 Time Projection Chamber (TPC)
41  41 sigma^2=sigma0^2+sigma1^2*sin(beta)^2+Cdiff^2*6mm/h*sin(theta)*Ldrift[m]
42  42 Number of layers             :   133
43  43 Radii [mm]                   :   384,1716
44  44 Upper limit in z [mm]        :   2225
45  45 Lower limit in z [mm]        :  -2225
46  46 Efficiency RPhi              :   1
47  47 Efficiency z                 :   1
48  48 Thickness [rad. lengths]     :   0.00005194
49  49 sigma0(RPhi) [1e-6m]         :   50
50  50 sigma1(RPhi) [1e-6m]         :   900
51  51 Cdiff(RPhi)  [1e-6m/sqrt(m)] :   25
52  52 sigma0(z)    [1e-6m]         :   400
53  53 sigma1(z)    [1e-6m]         :   0
54  54 Cdiff(z)     [1e-6m/sqrt(m)] :   80
55  55
56  56 Silicon External Tracker (SET)
57  57
58  58 Number of layers             :   6
59  59 Description (optional)       : |TPC outer wall|--------------External Tracker-----------------------------------------------|
60  60 Names of the layers (opt.)   :     XTPCW2,       SET1,       XSET1,      XSET2,      SET2,       SET3
61  61 Radii [mm]                   :     1808,         1810.9,     1811.1,     1812.4,     1813.4,     1847.4
62  62 Upper limit in z [mm]        :     2350,         2300,       2300,       2300,       2300,       2350
63  63 Lower limit in z [mm]        :     -2350,        -2300,      -2300,      -2300,      -2300,      -2350
64  64 Efficiency RPhi              :     0,            0.99,       0,          0,          0,          0
65  65 Efficiency 2nd coord. (eg. z):     0,            0,          0,          0,          0.99,       0
66  66 Stereo angle alpha [Rad]     :     7*(pi/180),   7*(pi/180),  7*(pi/180),  7*(pi/180),  7*(pi/180),  90*(pi/180)
67  67 Thickness [rad. lengths]     :     0.0009367,    0.00213,    0.00468,    0.00468,    0.00213,    0
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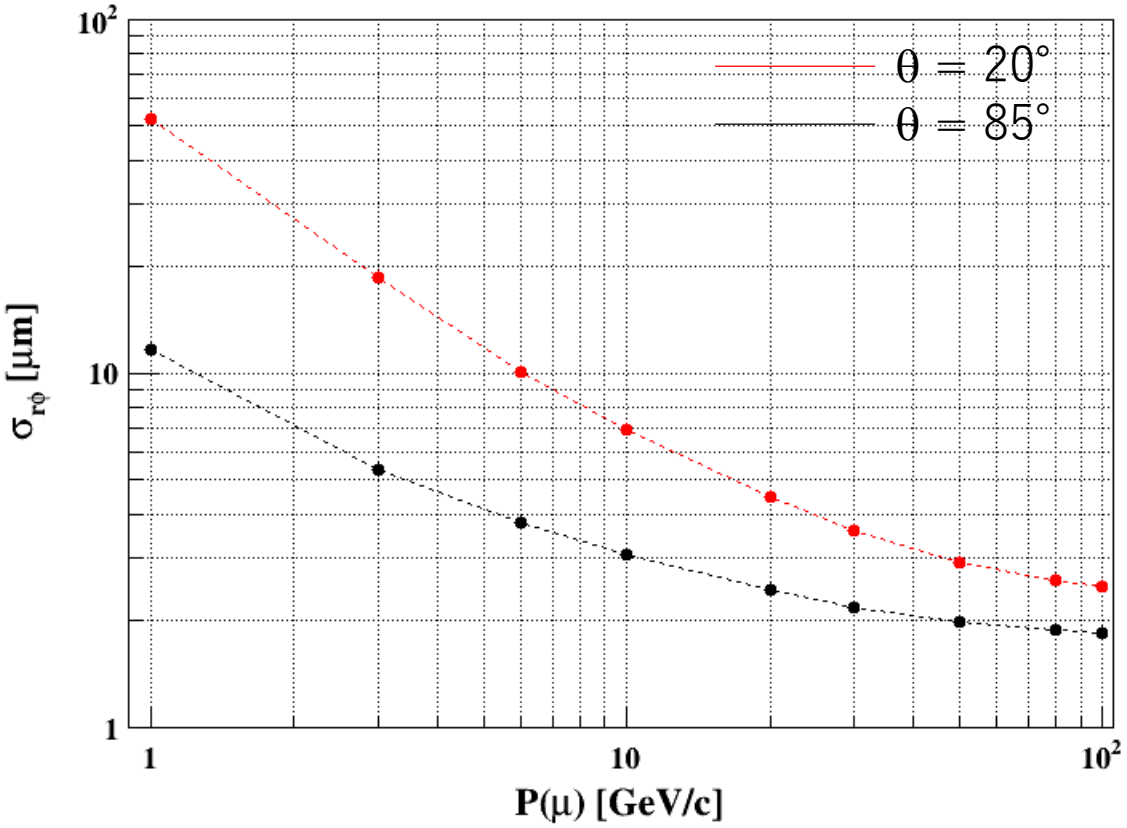
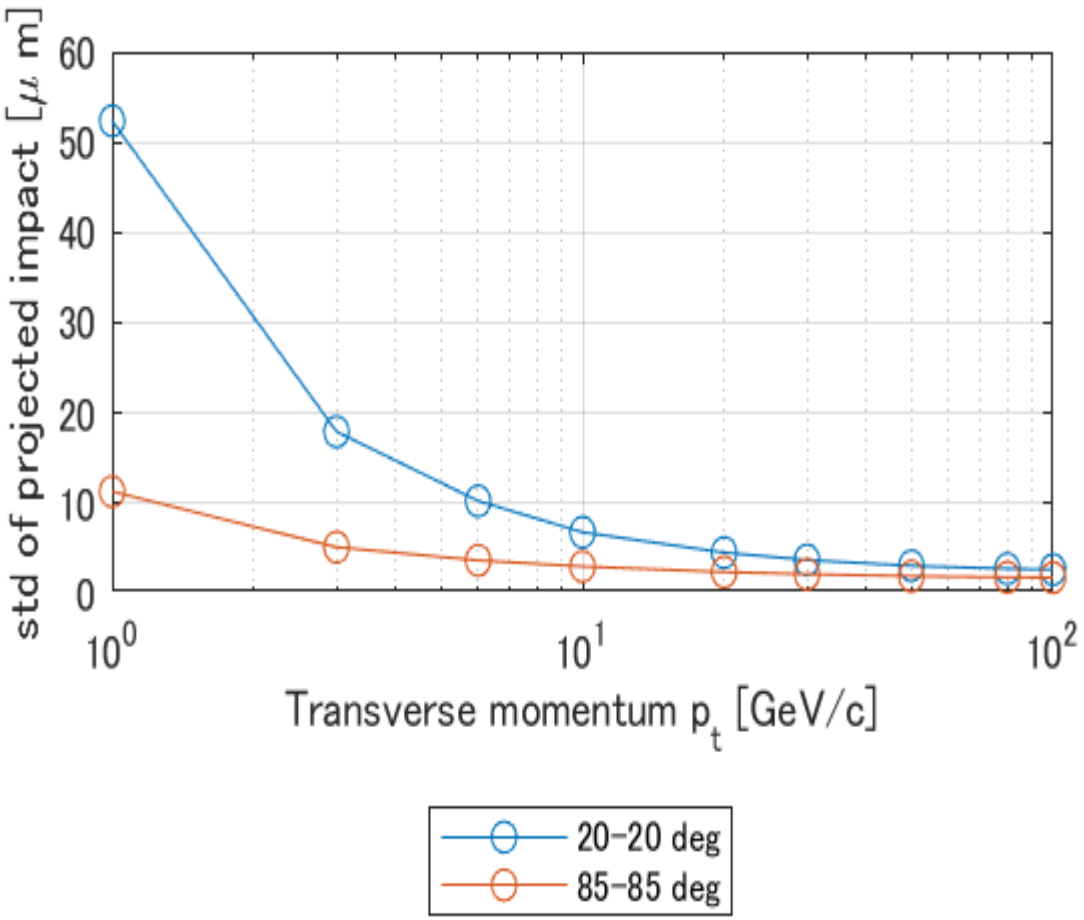
change the thickness

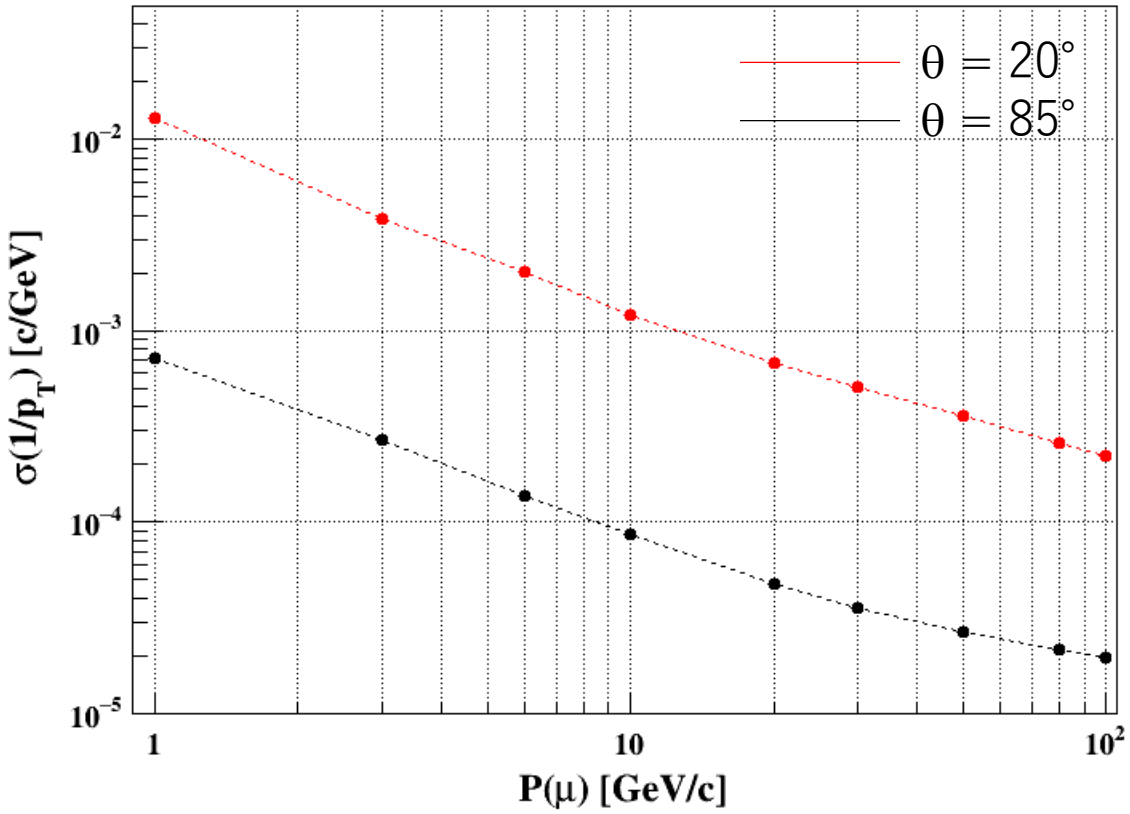
change the number of layers,
(1716-384mm)/10mm ~ 133 cells

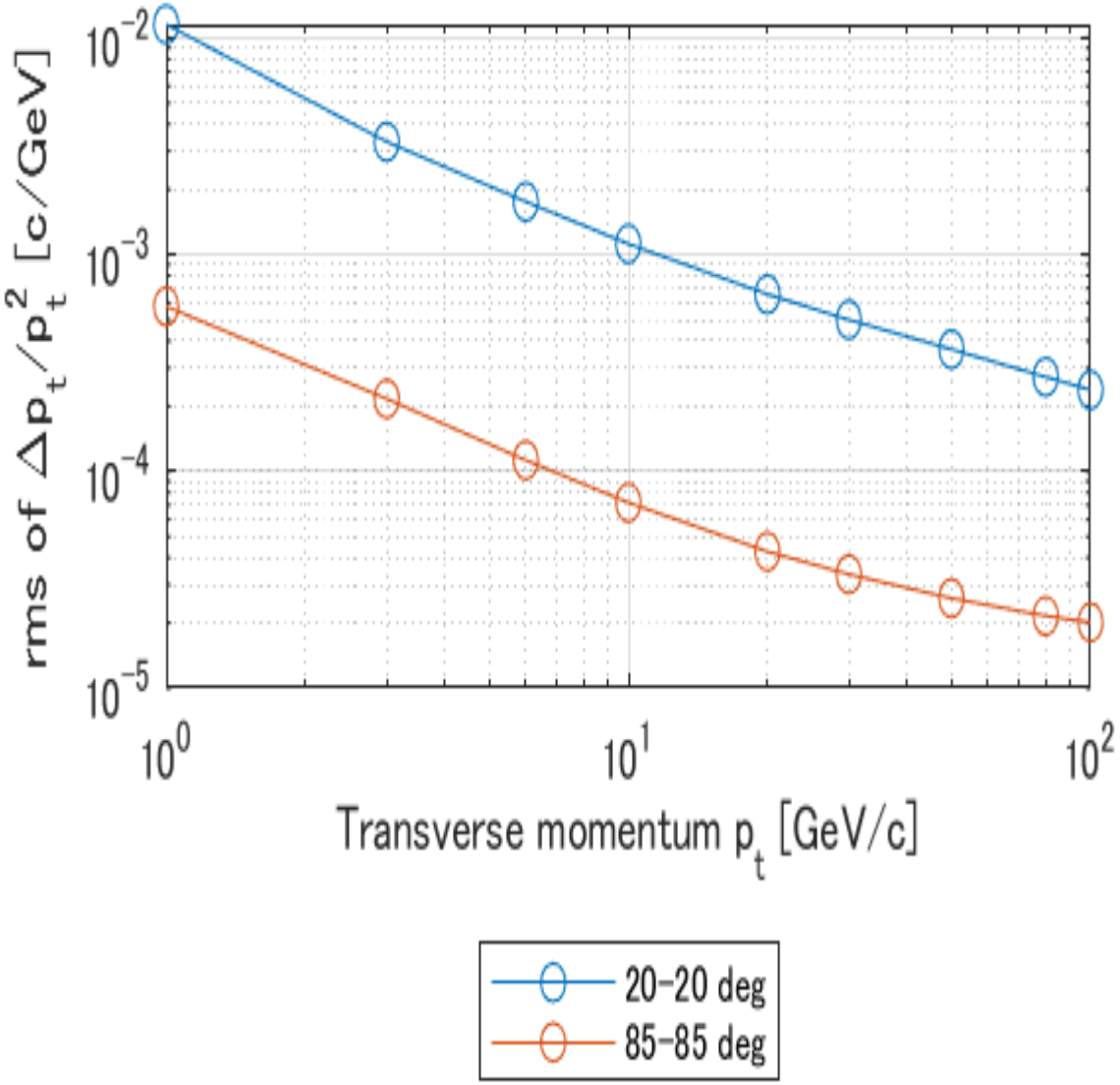
-- Transverse impact parameter resolution --





-- Momentum resolution --





Other items

・ Matlab license was expired … I could (?) register another one month by using the other email account