DD4hep

Material Scans

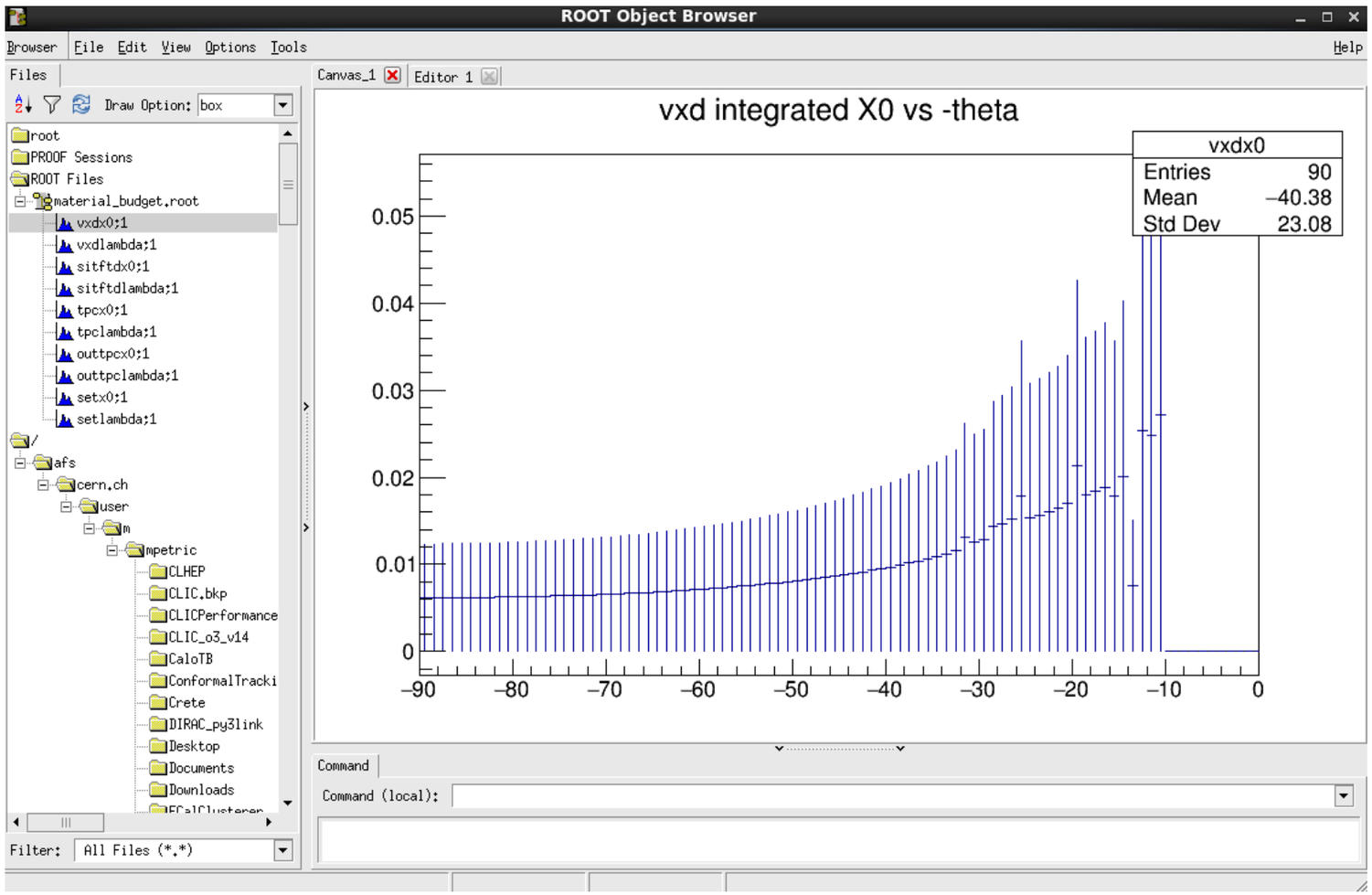
materialScan

```
materialScan --help
 usage: materialScan compact.xml x0 y0 z0 x1 y1 z1
        -> prints the materials on a straight line between the two given points ( unit is cm)
2019-07-03 14:18 mpetric@pclcd24:~$ gedit &


2019-07-03 14:19 mpetric@pclcd24:~$ materialScan /cvmfs/clicdp.cern.ch/iLCSoft/builds/nightly/x86_64-slc6-gcc62-opt/DD4hep/HEAD/examples/CLICSiD/compact/c
 +--------------------------------------------------------------------------------------------------------------------------------------------
 + Material scan between: x_0 = (    0.00,    0.00,    0.00) [cm] and x_1 = ( 100.00,    0.00,    0.00) [cm] :
 +--------------------------------------------------------------------------------------------------------------------------------------------
 |     \   Material            Atomic                 Radiation   Interaction               Path   Integrated  Integrated    Material
 | Num. \  Name            Number/Z   Mass/A  Density    Length      Length    Thickness   Length      X0        Lambda      Endpoint
 | Layer \                          [g/mole]  [g/cm3]     [cm]        [cm]         [cm]     [cm]      [cm]        [cm]    (     cm,       cm,       cm)
 +--------------------------------------------------------------------------------------------------------------------------------------------
 |     1 Vacuum                 7   14.784   0.0000  3.6499e+11  8.43954e+11      2.450     2.45   0.000000    0.000000  (   2.45,    0.00,    0.00)
 |     2 Beryllium              4    9.012   1.8480     34.4683      39.4488      0.050     2.50   0.001451    0.001267  (   2.50,    0.00,    0.00)
 |     3 Air                    7   14.784   0.0012  30415.8271   70329.5413      0.065     2.56   0.001453    0.001268  (   2.56,    0.00,    0.00)
 |     4 Air                    7   14.784   0.0012  30415.8271   70329.5413      0.012     2.58   0.001453    0.001269  (   2.58,    0.00,    0.00)
 |     5 Carbon                 6   12.011   2.0000     21.2483      40.1007      0.013     2.59   0.002067    0.001594  (   2.59,    0.00,    0.00)
 |     6 Air                    7   14.784   0.0012  30415.8271   70329.5413      0.026     2.61   0.002068    0.001594  (   2.61,    0.00,    0.00)
 |     7 Silicon               14   28.085   2.3300      9.3496      45.7532      0.005     2.62   0.002605    0.001704  (   2.62,    0.00,    0.00)
 |     8 Air                    7   14.784   0.0012  30415.8271   70329.5413      0.005     2.62   0.002605    0.001704  (   2.62,    0.00,    0.00)
 |     9 Air                    7   14.784   0.0012  30415.8271   70329.5413      0.275     2.90   0.002614    0.001708  (   2.90,    0.00,    0.00)
 |    10 Air                    7   14.784   0.0012  30415.8271   70329.5413      0.700     3.60   0.002637    0.001718  (   3.60,    0.00,    0.00)
 |    11 Air                    7   14.784   0.0012  30415.8271   70329.5413      0.071     3.67   0.002639    0.001719  (   3.67,    0.00,    0.00)
 |    12 Air                    7   14.784   0.0012  30415.8271   70329.5413      0.012     3.68   0.002640    0.001719  (   3.68,    0.00,    0.00)
 |    13 Carbon                 6   12.011   2.0000     21.2483      40.1007      0.013     3.70   0.003254    0.002045  (   3.70,    0.00,    0.00)
 |    14 Air                    7   14.784   0.0012  30415.8271   70329.5413      0.024     3.72   0.003255    0.002045  (   3.72,    0.00,    0.00)
```

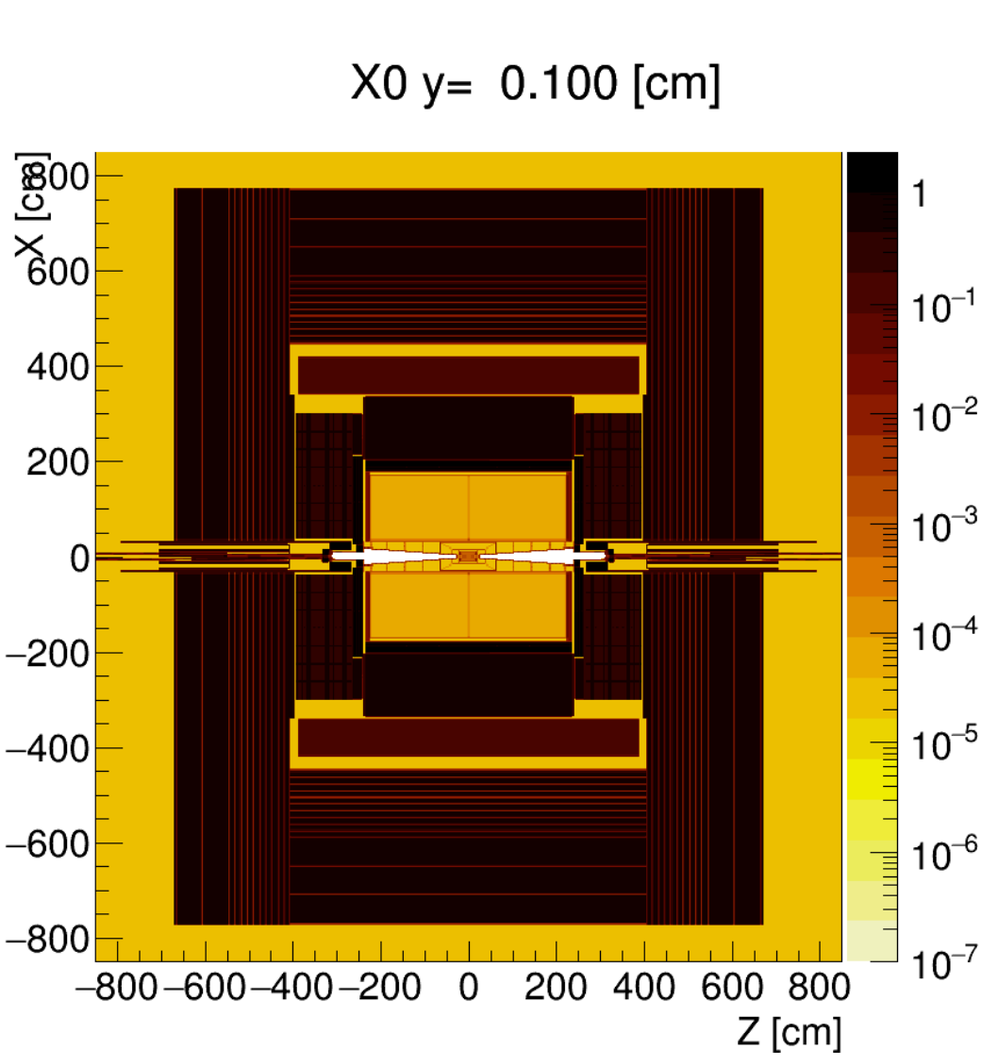
materialBudget

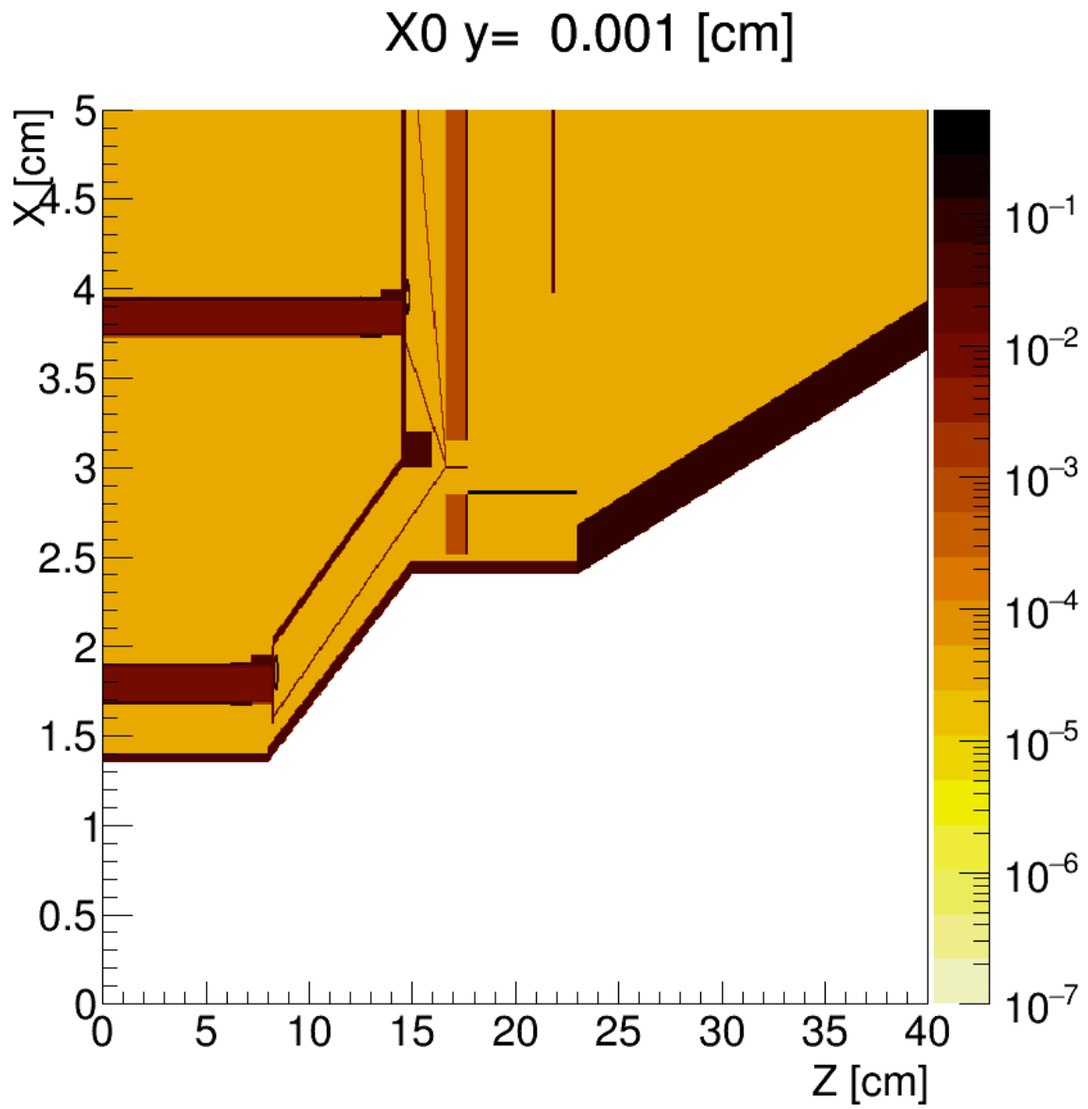
```
2019-07-03 14:21 mpetric@pclcd24:~$ materialBudget
 usage: materialBudget compact.xml steering.txt
     -> create histograms with the material budget as seen from the IP within fixed ranges of (rmin, rmax, zmin. zmax)
        see example steering file for details ...
  -x   : dump example steering file
2019-07-03 14:22 mpetric@pclcd24:~$ materialBudget /cvmfs/clicdp.cern.ch/iLCSoft/builds/nightly/x86_64-slc6-gcc62-opt/DD4hep/HEAD/examples/CLICSiD/compact/co
================================================================================================
theta:f/vxd_x0:f/vxd_lam:f/sitftd_x0:f/sitftd_lam:f/tpc_x0:f/tpc_lam:f/outtpc_x0:f/outtpc_lam:f/set_x0:f/set_lam:f/
8.726646e-03 3.972864e-11  1.718168e-11  3.293947e-07  1.424552e-07  3.293983e-07  1.424568e-07  3.294326e-07  1.424716e-07  3.294189e-07  1.424657e-07
2.617994e-02 3.974074e-11  1.718691e-11  3.294951e-07  1.424987e-07  3.294987e-07  1.425002e-07  3.295329e-07  1.425150e-07  3.295192e-07  1.425091e-07
4.363323e-02 3.976497e-11  1.719739e-11  4.778122e+01  1.725400e+00  4.778126e+01  1.725418e+00  4.778167e+01  1.725596e+00  4.778151e+01  1.725525e+00
6.108652e-02 3.980136e-11  1.721313e-11  4.785424e+01  1.730013e+00  4.785429e+01  1.730032e+00  4.785470e+01  1.730210e+00  4.785453e+01  1.730139e+00
7.853982e-02 3.984997e-11  1.723415e-11  4.794204e+01  1.735168e+00  4.794209e+01  1.735187e+00  4.794250e+01  1.735365e+00  4.794234e+01  1.735294e+00
9.599311e-02 3.991087e-11  1.726048e-11  5.002330e+01  1.945815e+00  5.002334e+01  1.945834e+00  5.002375e+01  1.946012e+00  5.002359e+01  1.945941e+00
1.134464e-01 3.998415e-11  1.729218e-11  9.452191e+01  6.543962e+00  9.452195e+01  6.543981e+00  9.452236e+01  6.544160e+00  9.452220e+01  6.544088e+00
1.308997e-01 4.006993e-11  1.732928e-11  4.338641e+01  1.783509e+00  4.338645e+01  1.783528e+00  4.338687e+01  1.783708e+00  4.338670e+01  1.783636e+00
1.483530e-01 4.016834e-11  1.737184e-11  2.694285e+01  1.178131e+00  2.694352e+01  1.178420e+00  2.694393e+01  1.178600e+00  2.694377e+01  1.178528e+00
1.658063e-01 4.027953e-11  1.741992e-11  2.674044e+01  1.002940e+00  3.914468e+01  1.438369e+00  3.914509e+01  1.438549e+00  3.914493e+01  1.438477e+00
1.832596e-01 2.711067e-02  8.737851e-03  6.323719e-02  2.417266e-02  3.926118e+01  1.441724e+00  4.703002e+01  1.714255e+00  3.926143e+01  1.441832e+00
2.007129e-01 2.482427e-02  8.005708e-03  7.000964e-02  2.631561e-02  6.844193e+01  2.468991e+00  1.009993e+02  3.610577e+00  8.797636e+01  3.153943e+00
```



graphicalScan

```
2019-07-03 14:21 mpetric@pclcd24:~$ graphicalScan
 usage: graphicalScan compact.xml axis xMin xMax yMin yMax zMin zMax nSlices nBins nSamples FieldOrMaterial OutfileName
 axis (X, Y, or Z)              : perpendicular to the slices
 xMin xMax yMin yMax zMin zMax : range of scans
 nSlices                        : number of slices (equally spaced along chose axis)
 nBins                          : number of bins along each axis of histograms
 nSamples                       : the number of times each bin is sampled
 FieldOrMaterial                : scan field or material? F = field, M = material, FM or MF = both
 OutfileName                    : output root file name
        -> produces graphical scans of material and/or fields defined in a compact xml description
```





Geant4 shell

- ddsim --runType=vis --compact=CLIC_o2_v03.xml

- Idle> /control/matScan/region VertexBarrelRegion
  Idle> /control/matScan/scan