Comparison of the BIB SimHits of v02-07-MC and v02-08-MC

M. Casarsa[a] and A. Gianelle[b]

[a]*INFN-Trieste, Italy,* [b]*INFN-Padova, Italy*

Muon Collider Detector Performance and MDI Meeting, May 23, 2023

The context

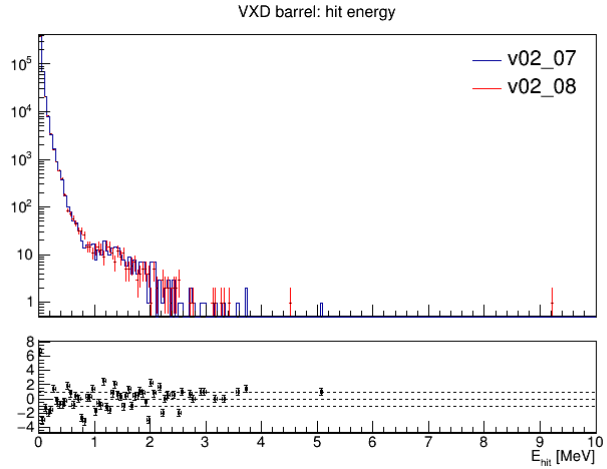
- The MuonColliderSoft release v02-08-MC comes with a new version of GEANT4 (v11.1.0 vs v10.6.3). All the other details on the new release v02-08-MC may be found in the official release notes.

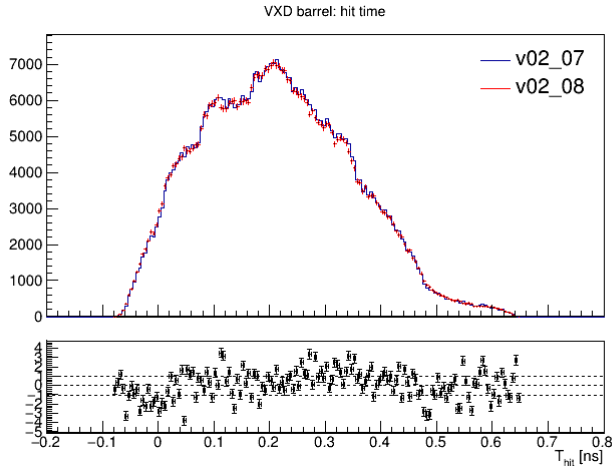
- The question is:

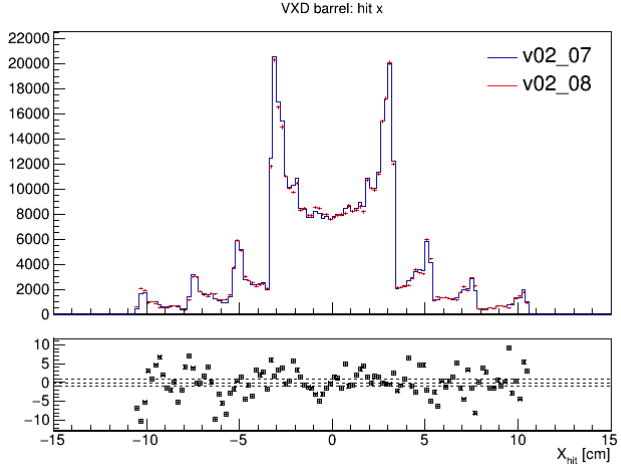
  can we still use the BIB samples produced with the old release v02-07-MC?

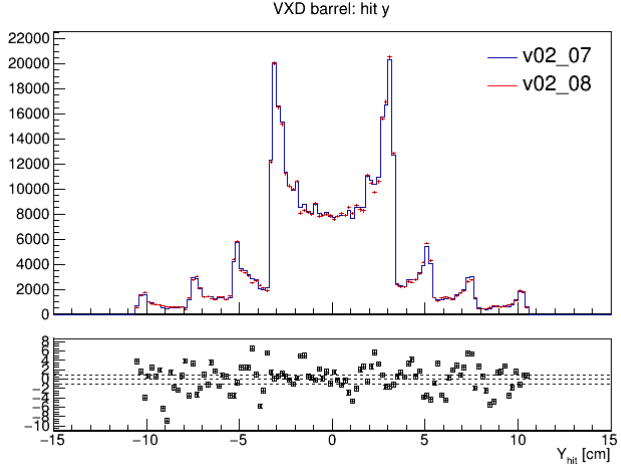
- We re-simulated a sample of BIB particles with v02-08-MC and compared all the detector SimHits (E_{hit}, T_{hit}, X_{hit}, Y_{hit}, Z_{hit}) with those of the corresponding old sample.

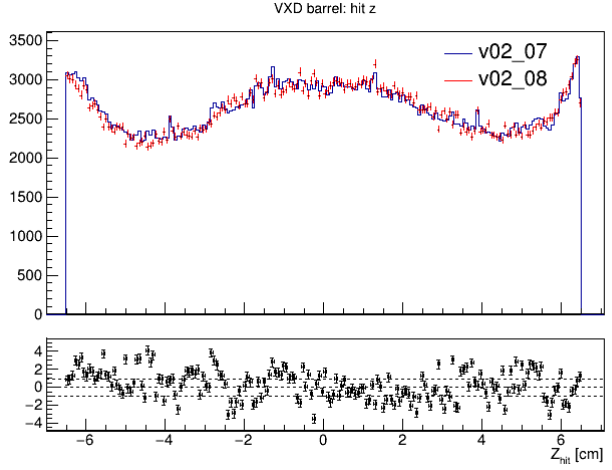
Vertex detector barrel



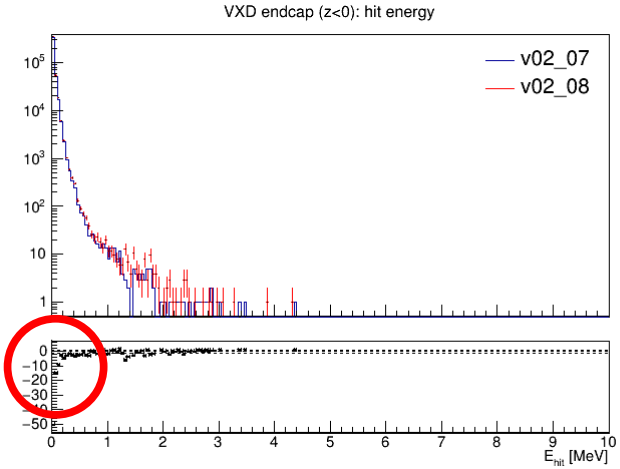


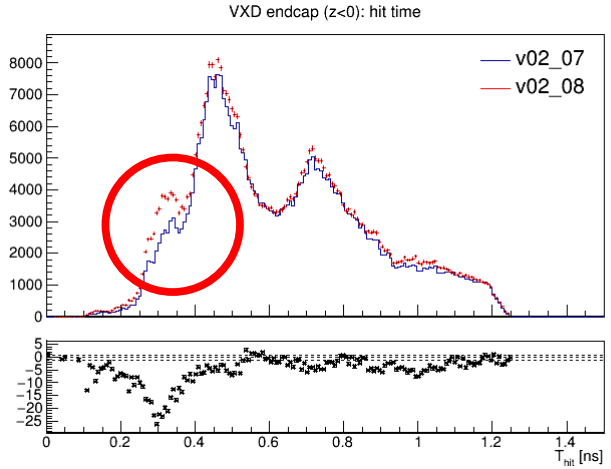


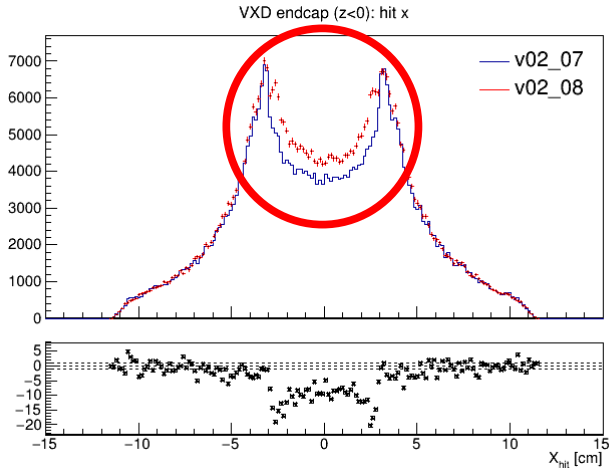


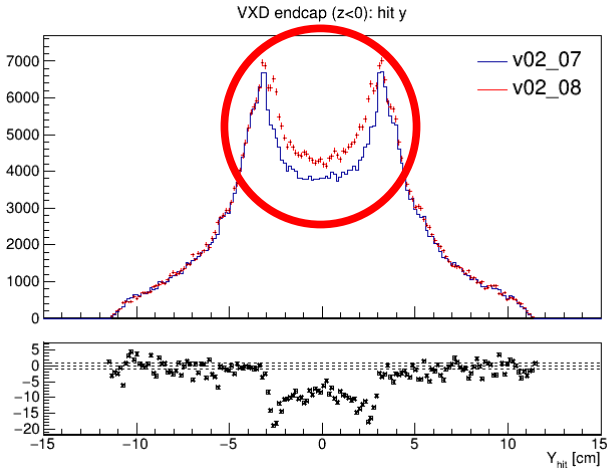


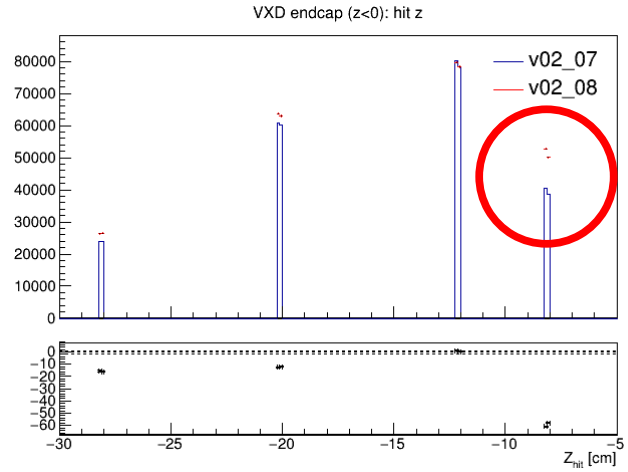
Vertex detector endcap (z < 0)



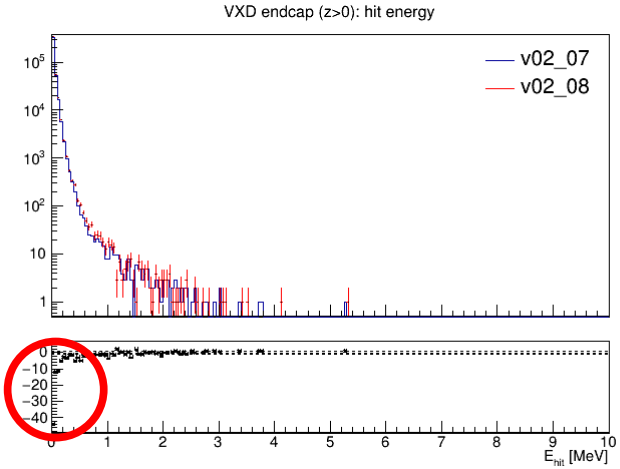


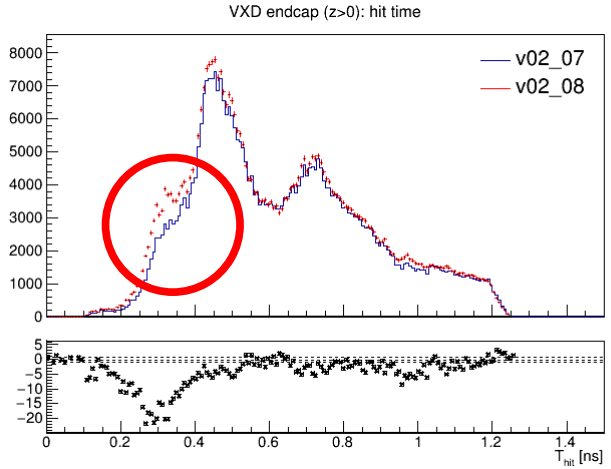


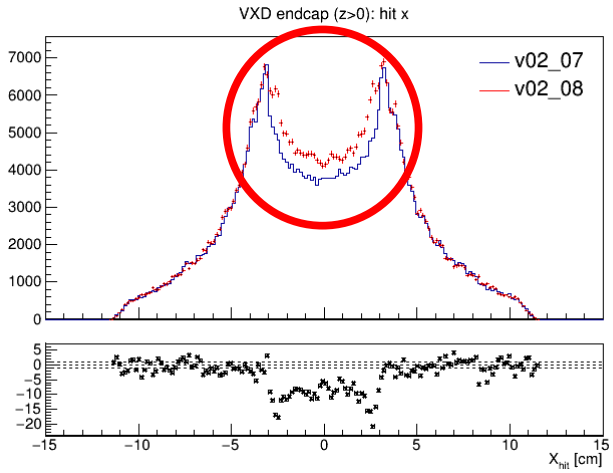


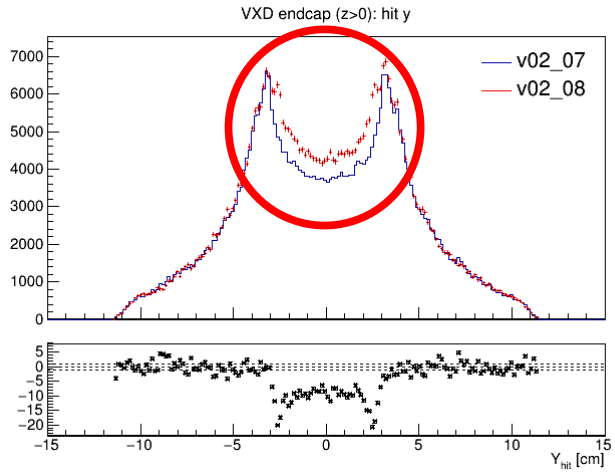


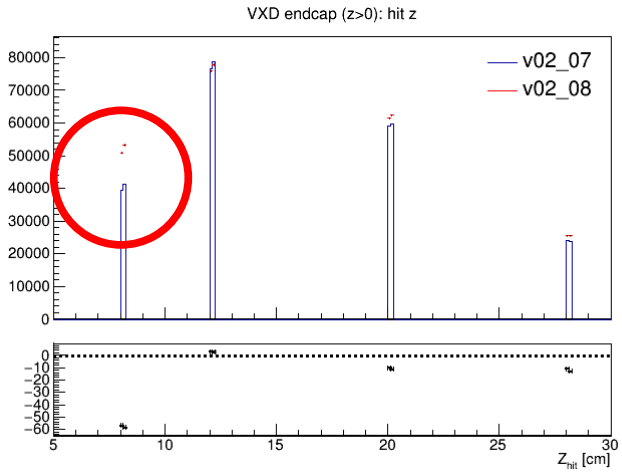
Vertex detector endcap (z > 0)



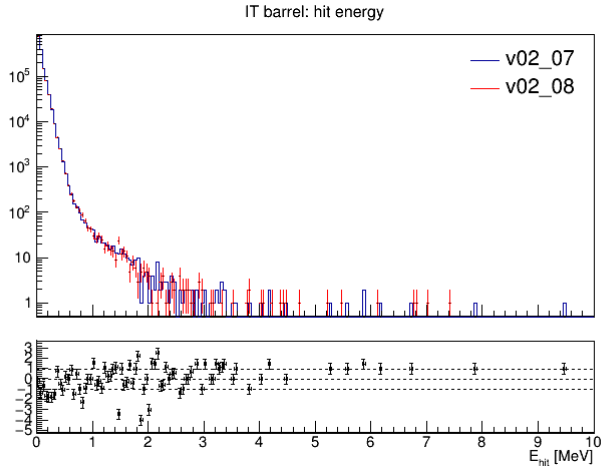


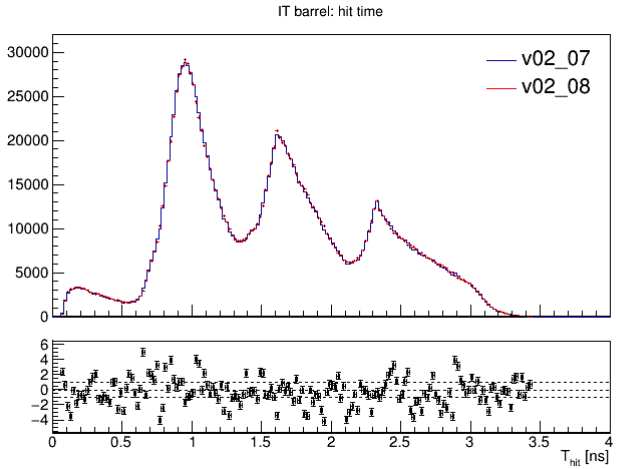


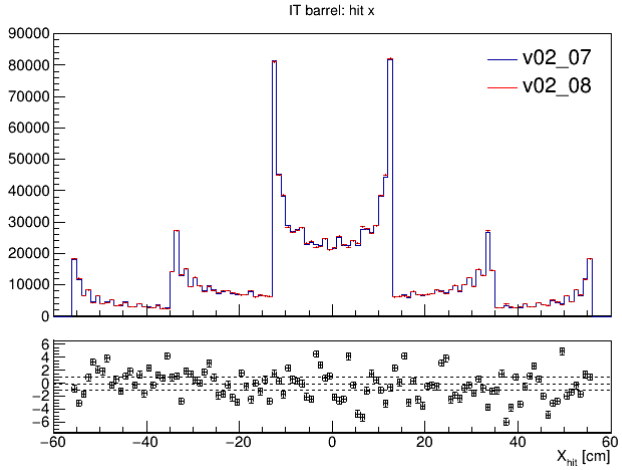


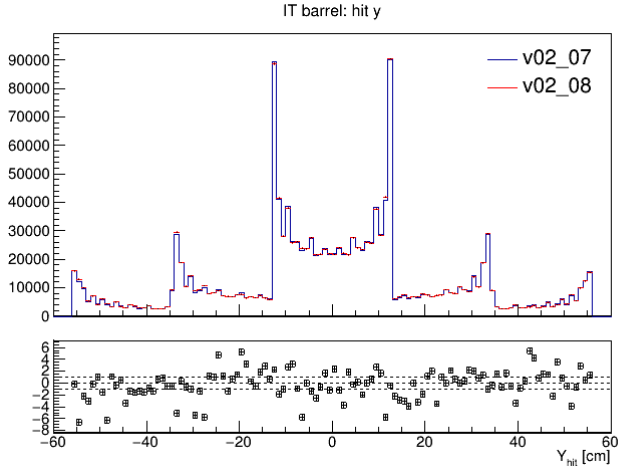


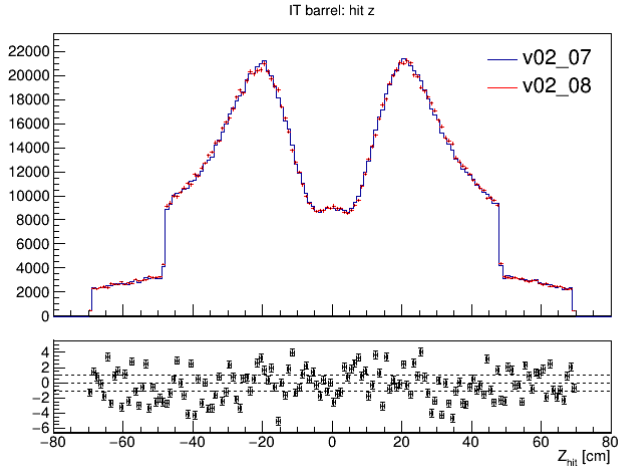
Inner tracker barrel



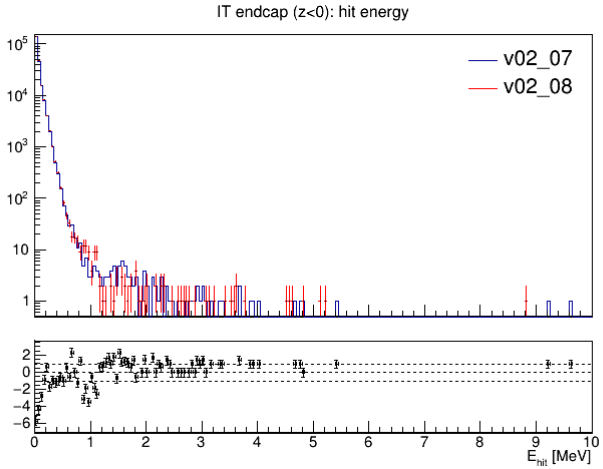


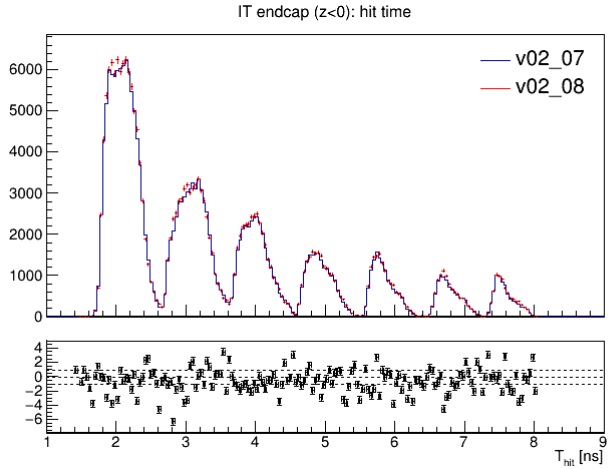


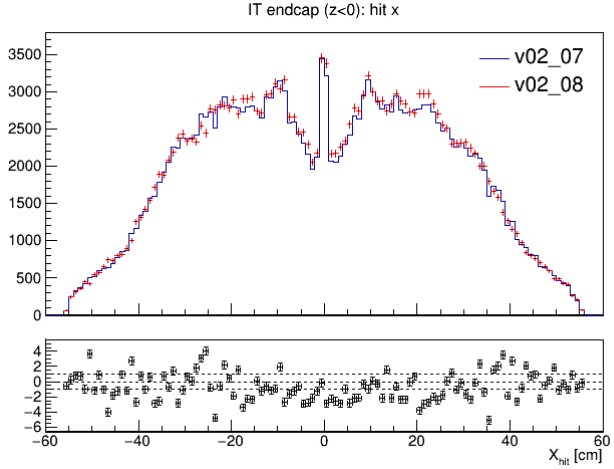


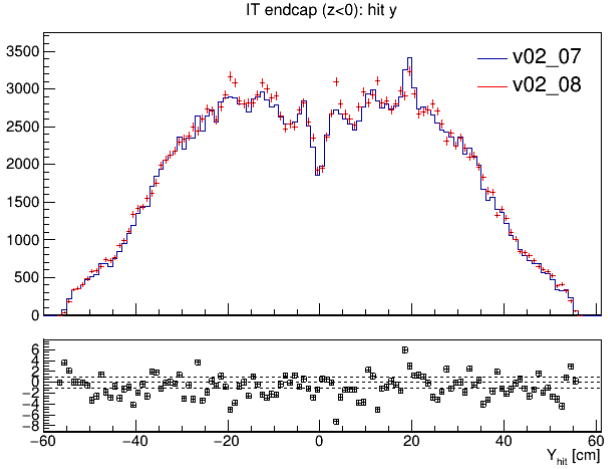


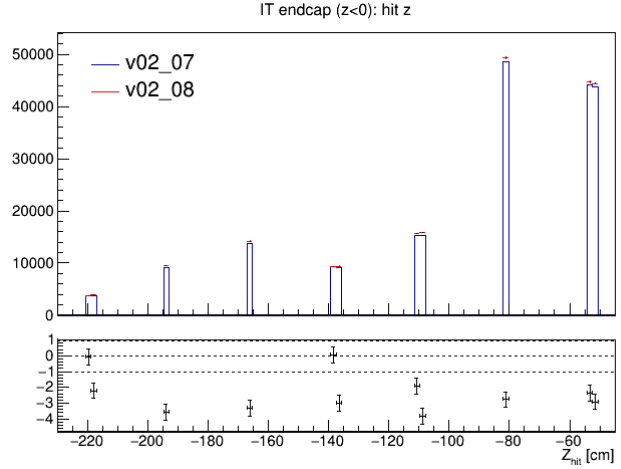
Inner tracker endcap (z < 0)



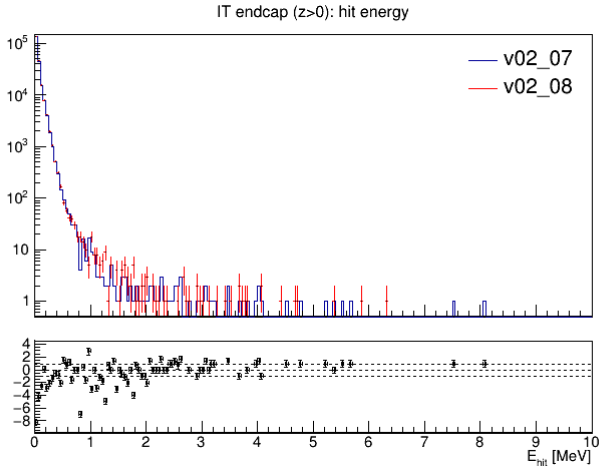


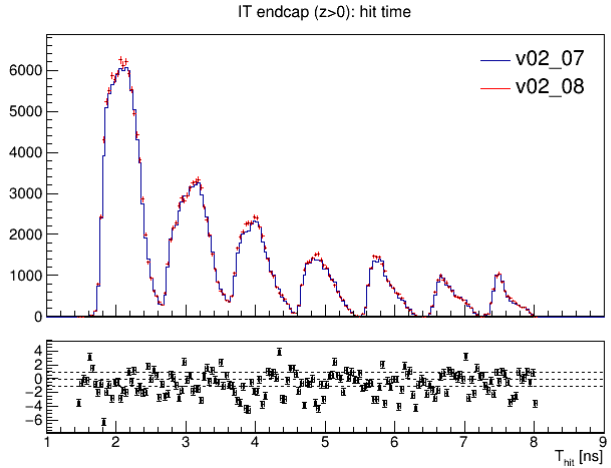


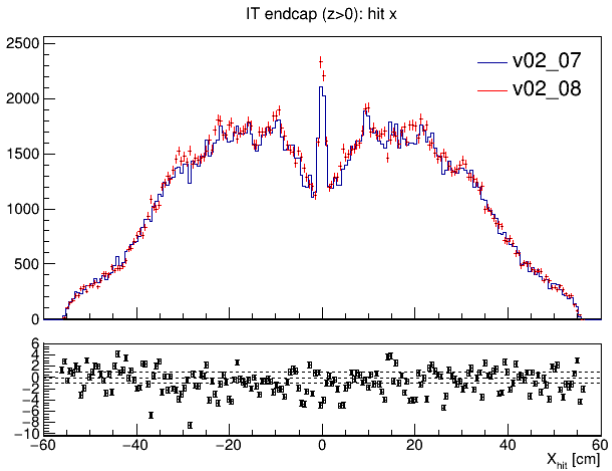


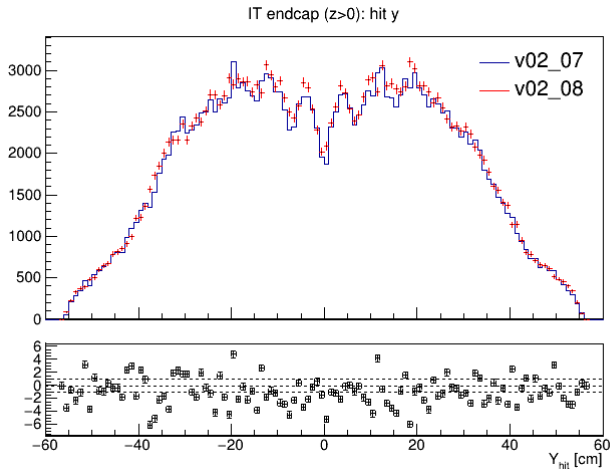


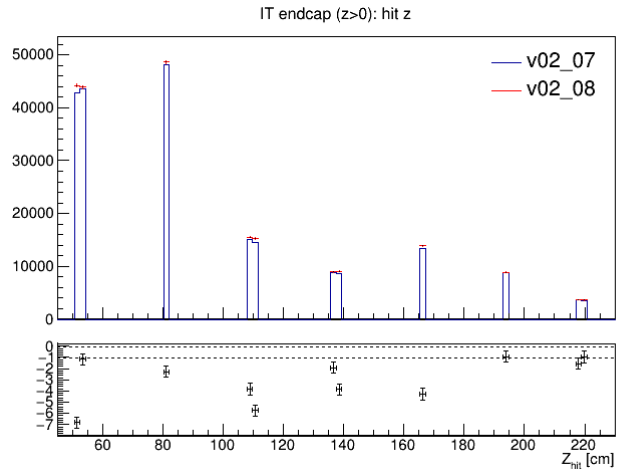
Inner tracker endcap (z > 0)



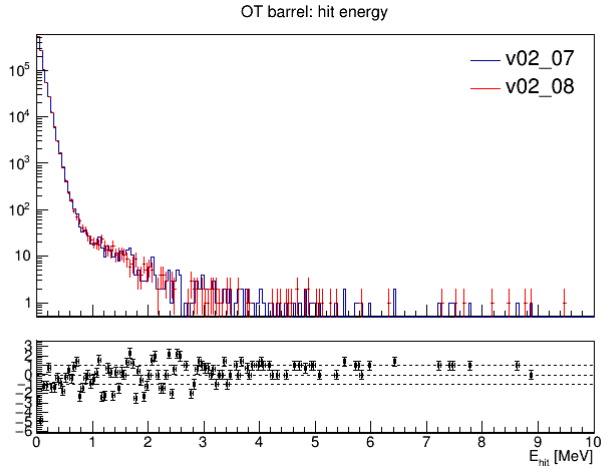


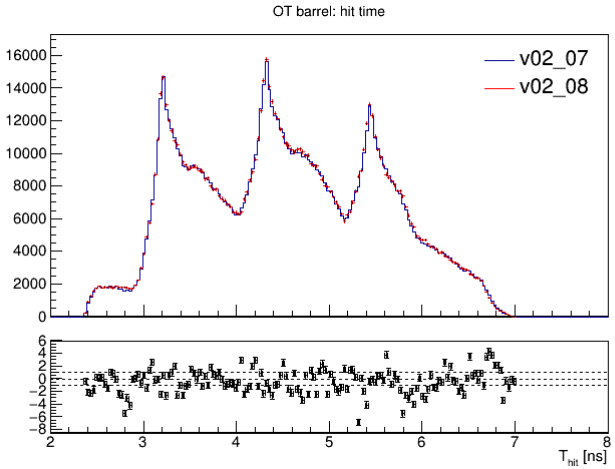


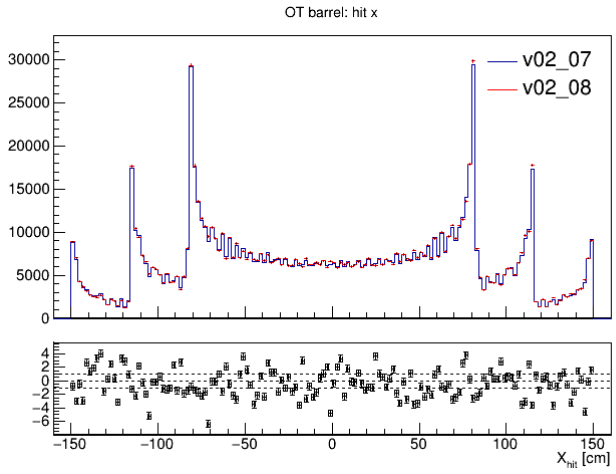


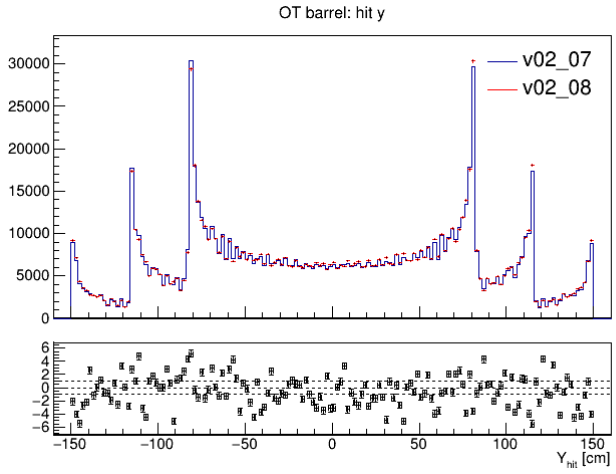


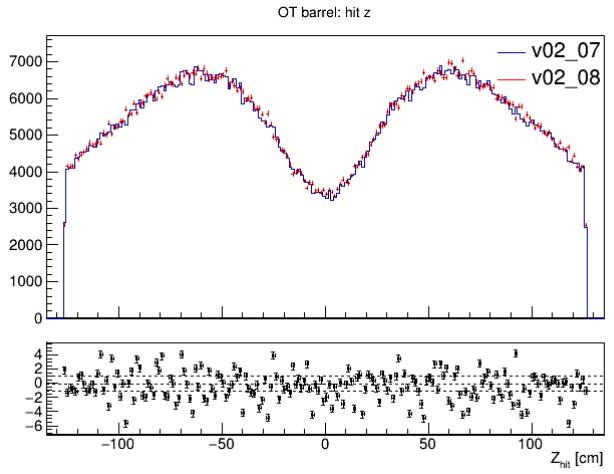
Outer tracker barrel



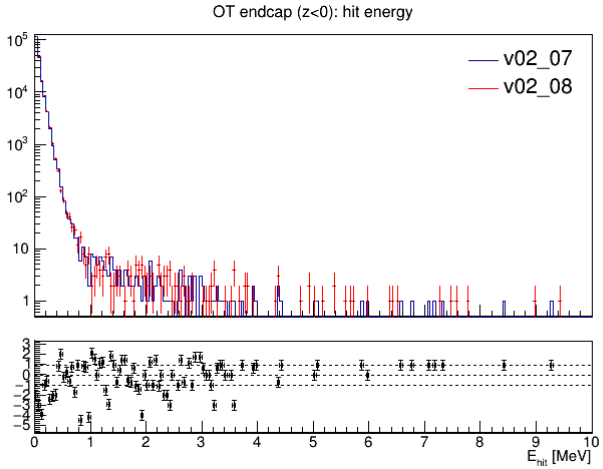


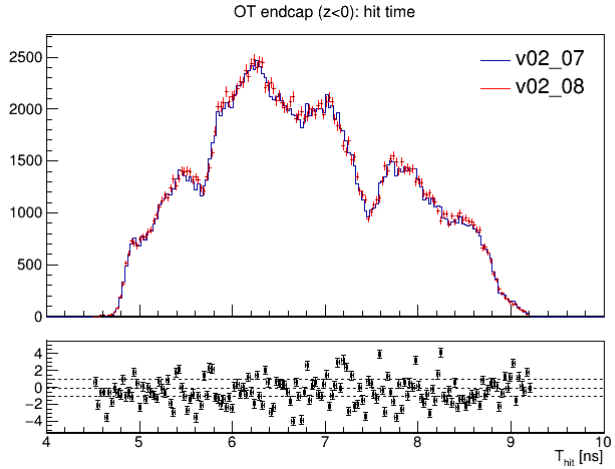


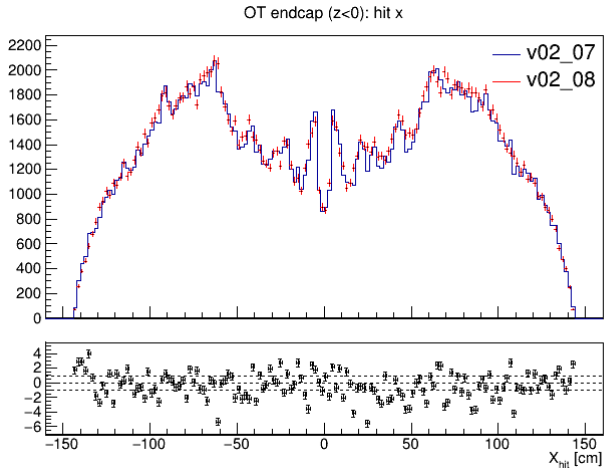


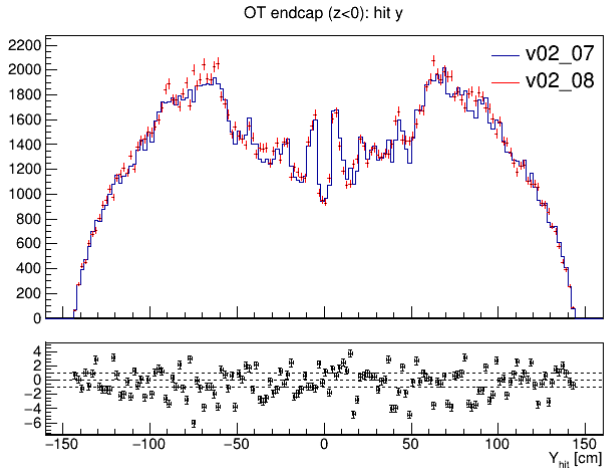


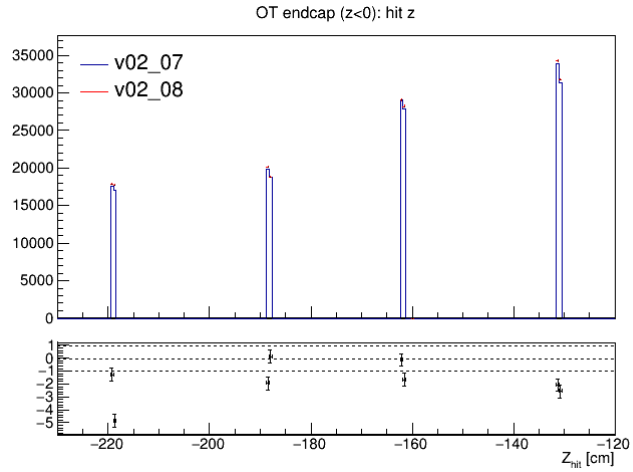
Outer tracker endcap (z < 0)



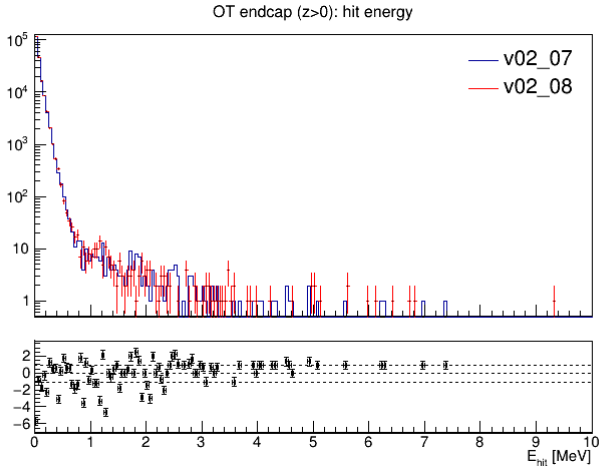


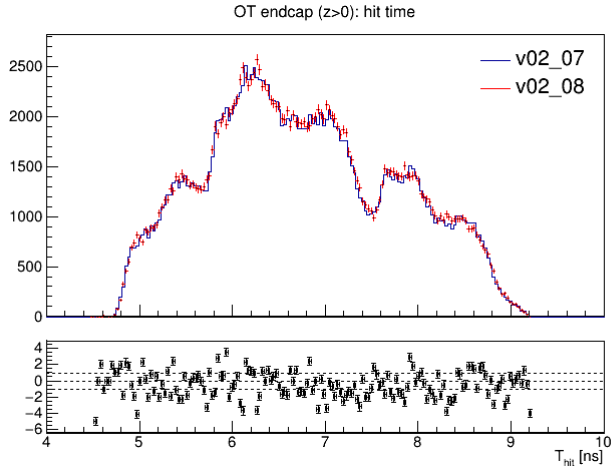


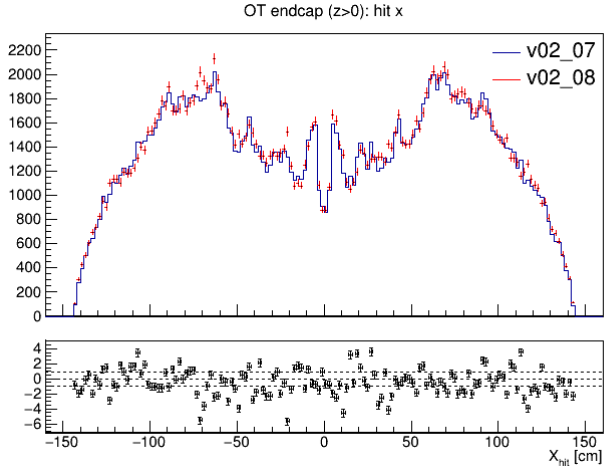


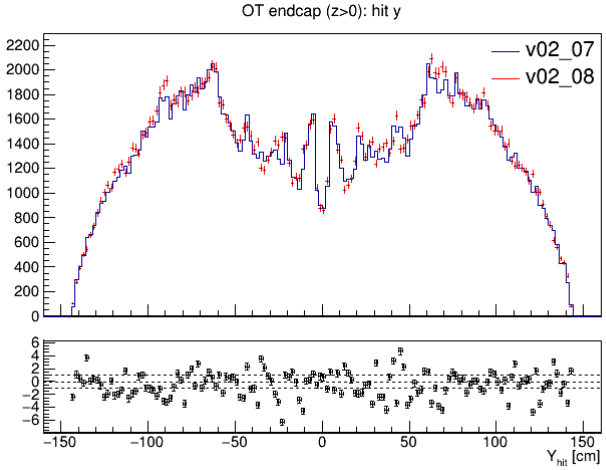


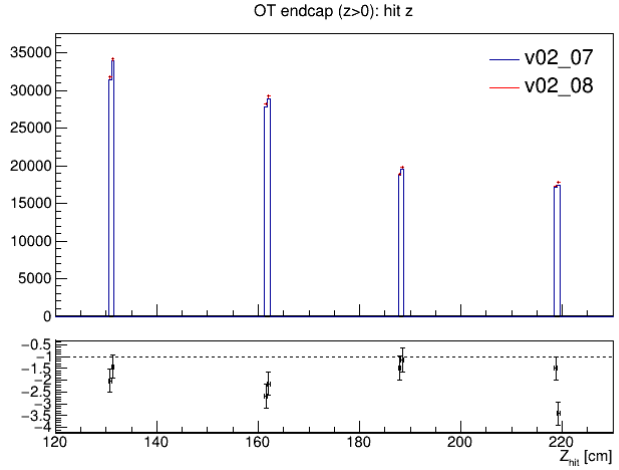
Outer tracker endcap (z > 0)



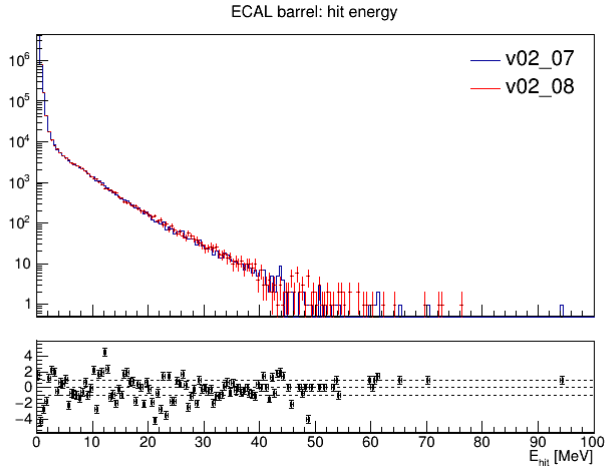


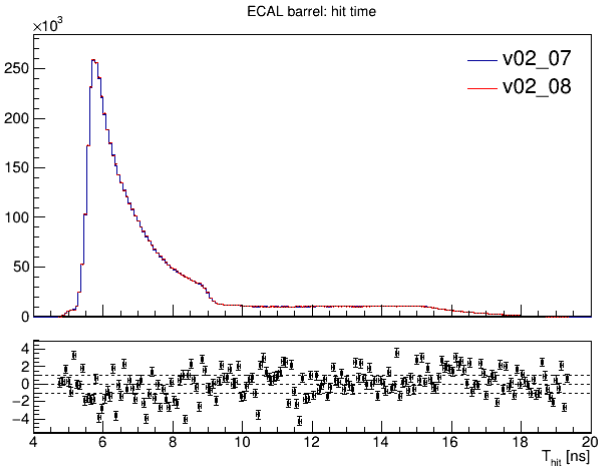


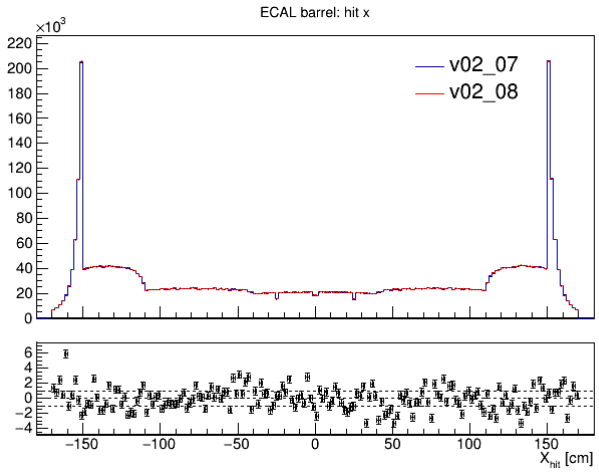


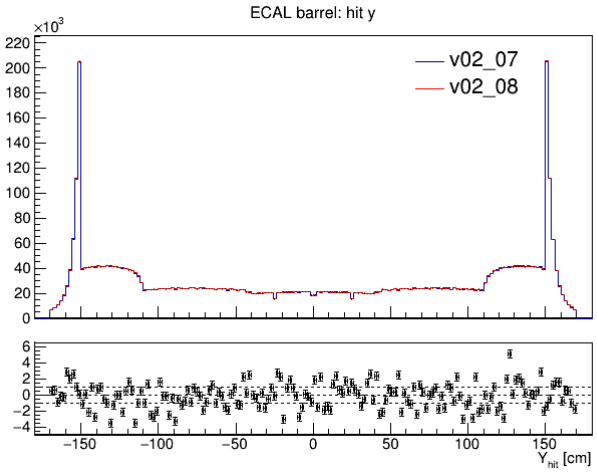


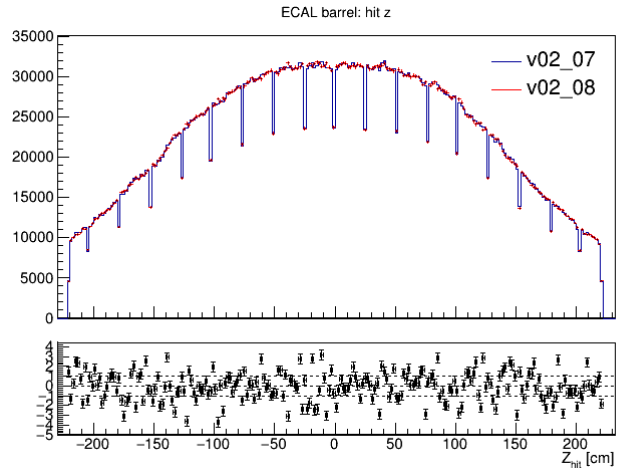
ECAL barrel


ECAL barrel: hit energy
v02_07
v02_08
E_{hit} [MeV]

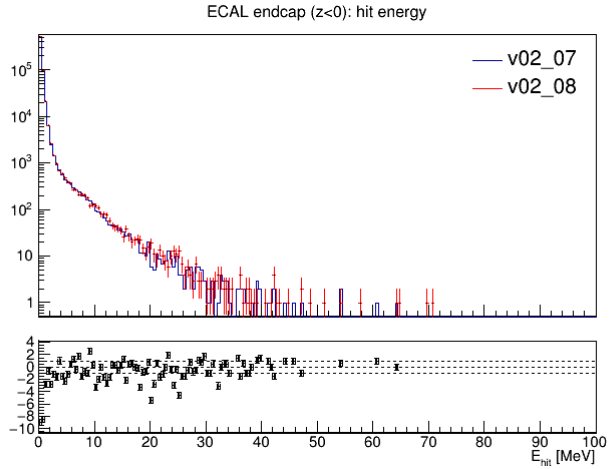

ECAL barrel: hit time
v02_07
v02_08
T_{hit} [ns]

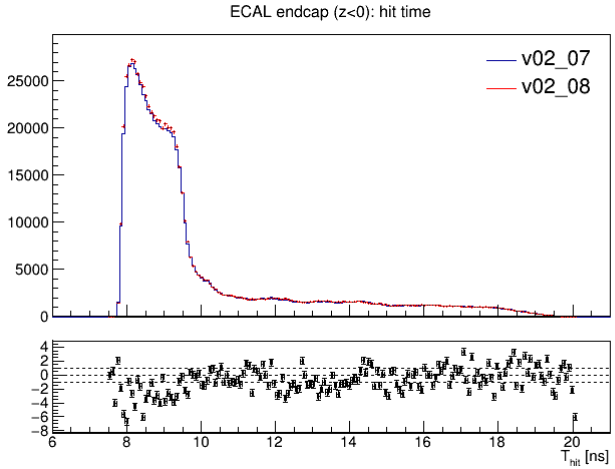

ECAL barrel: hit x
v02_07
v02_08
X_{hit} [cm]

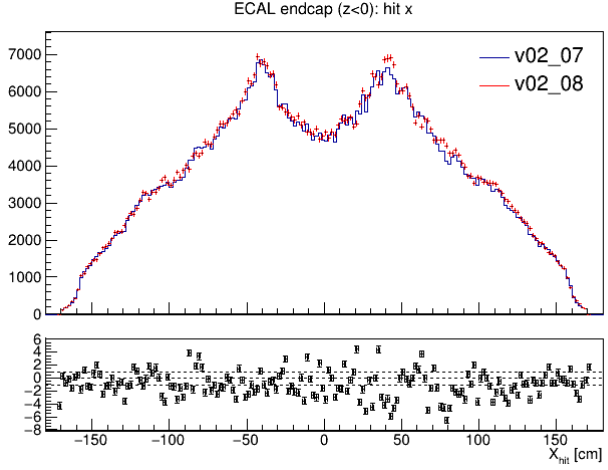

ECAL barrel: hit y
v02_07
v02_08
Y_{hit} [cm]

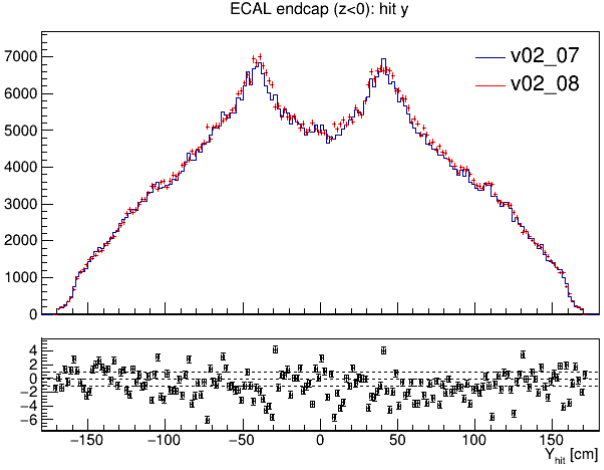

ECAL barrel: hit z
v02_07
v02_08
Z_{hit} [cm]

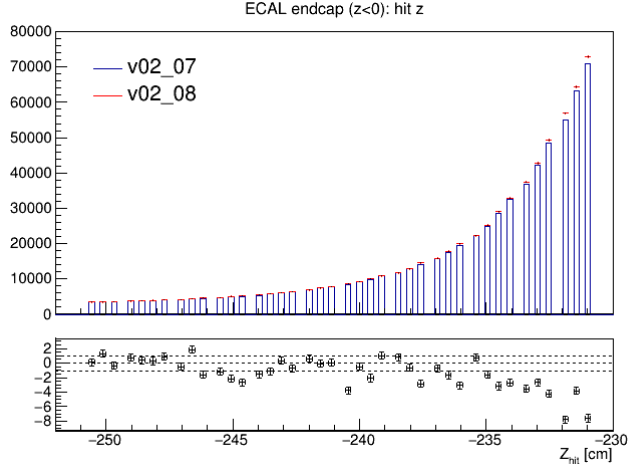
ECAL endcap (z < 0)



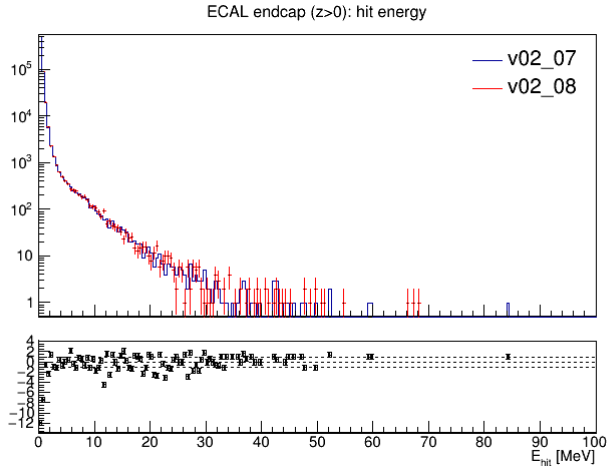


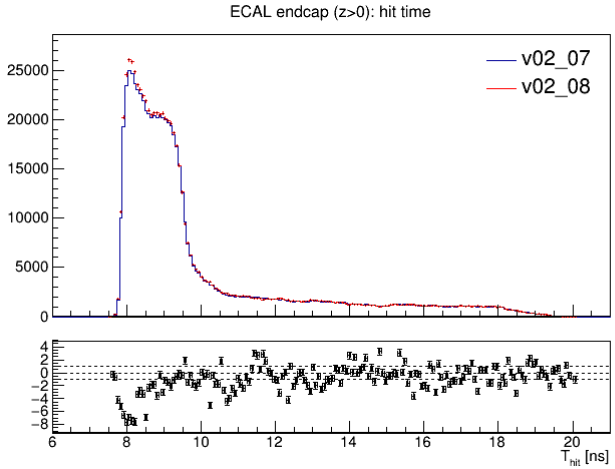


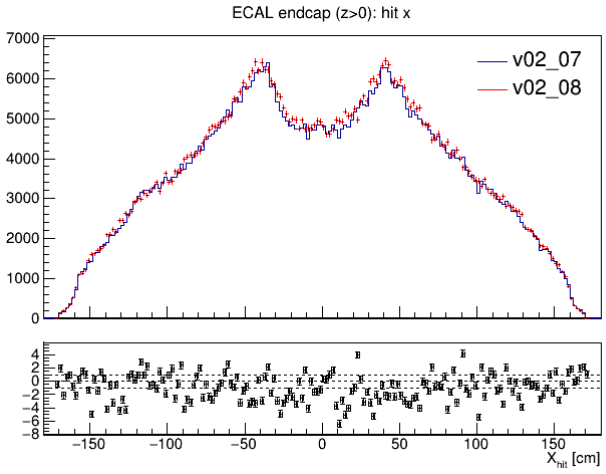


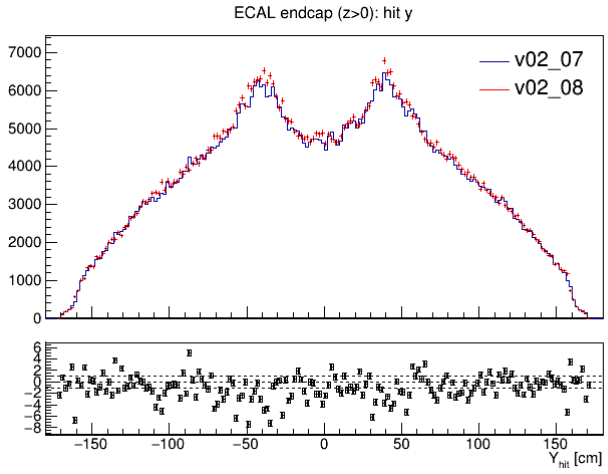


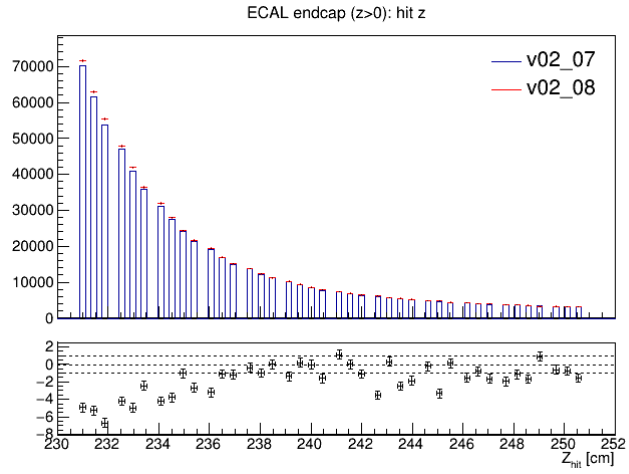
ECAL endcap (z > 0)



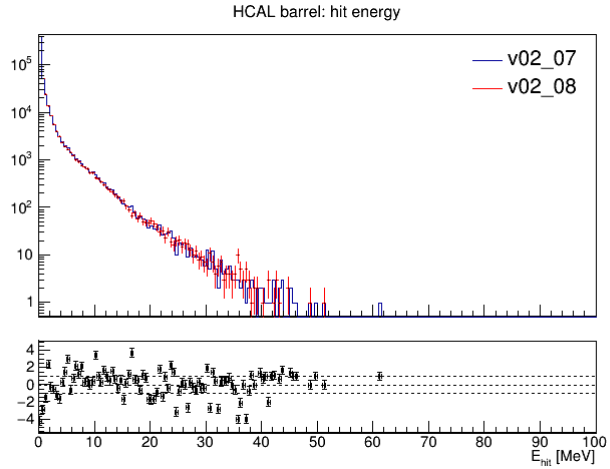


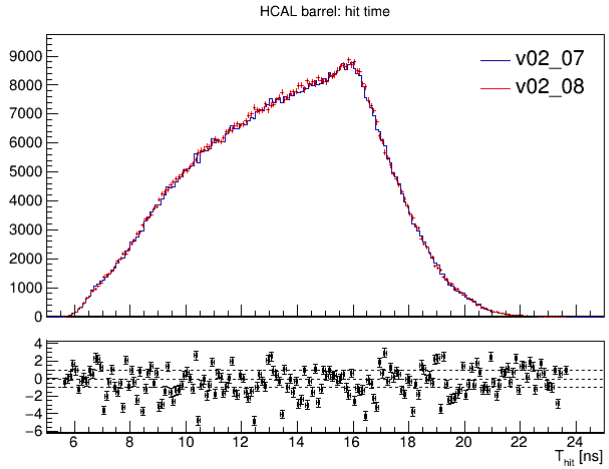


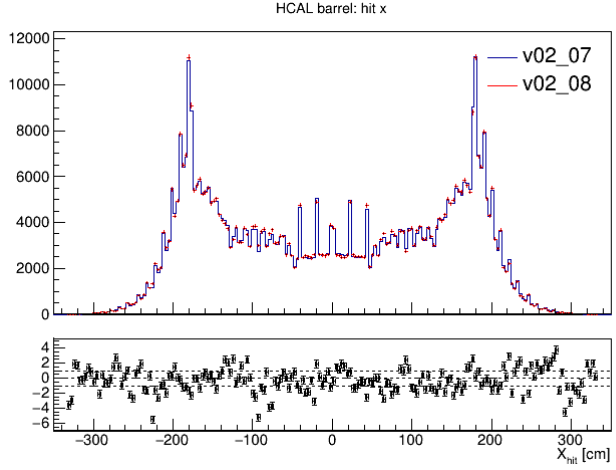


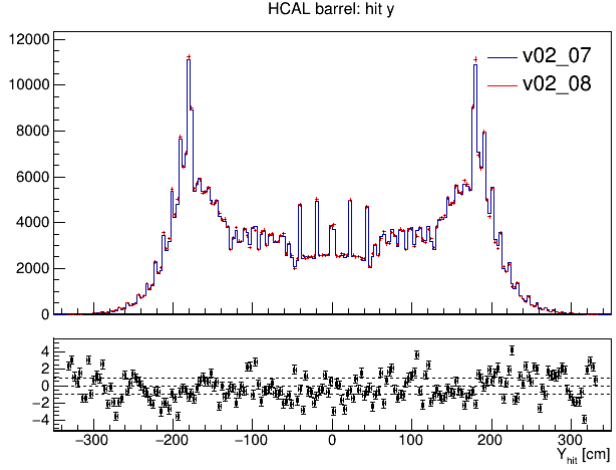


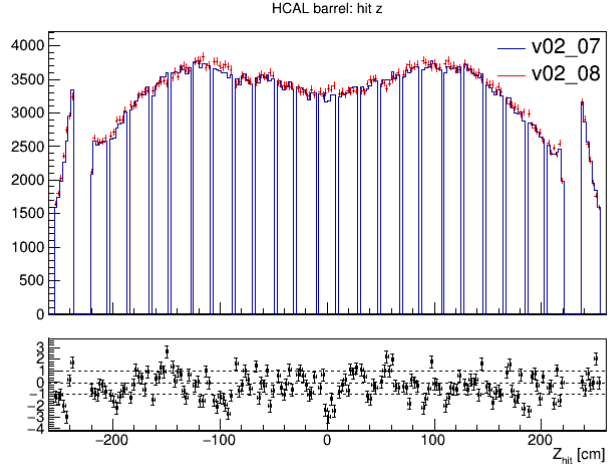
HCAL barrel


HCAL barrel: hit energy
v02_07
v02_08
E_hit [MeV]

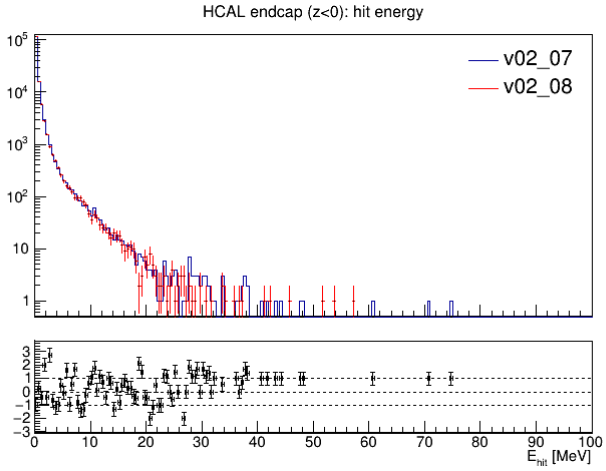

HCAL barrel: hit time
v02_07
v02_08
T_hit [ns]

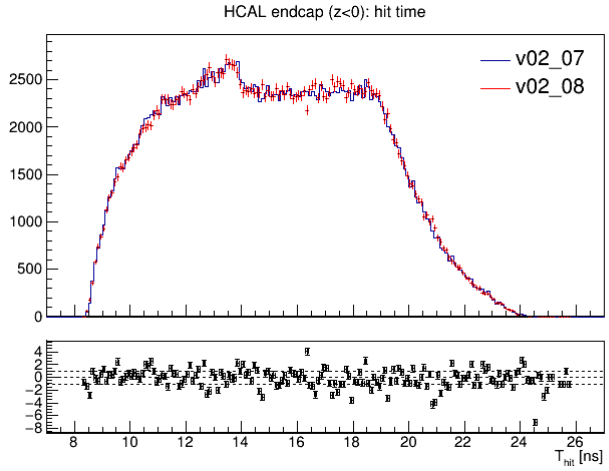

HCAL barrel: hit x
v02_07
v02_08
X_hit [cm]

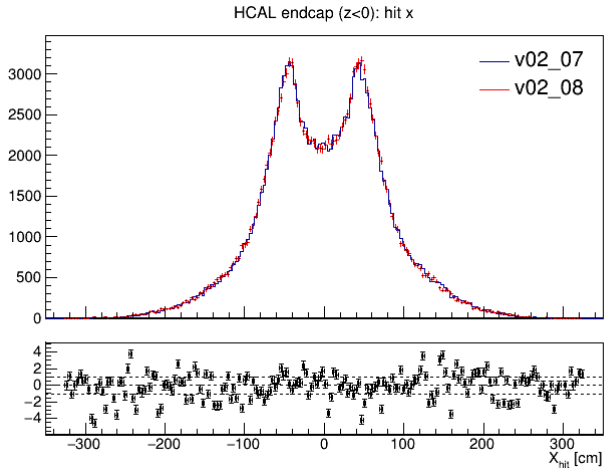

HCAL barrel: hit y
v02_07
v02_08
Y_hit [cm]

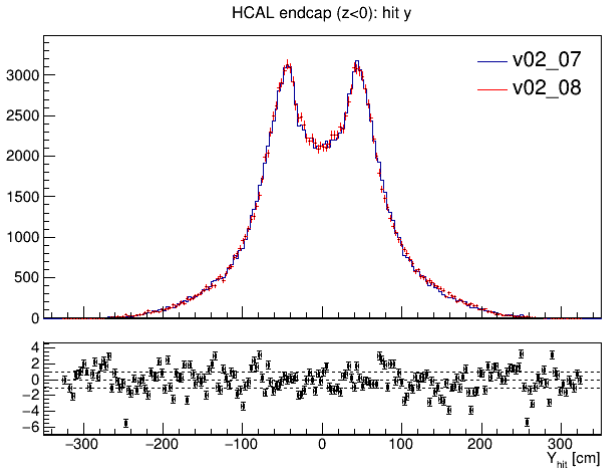

HCAL barrel: hit z
v02_07
v02_08
Z_hit [cm]

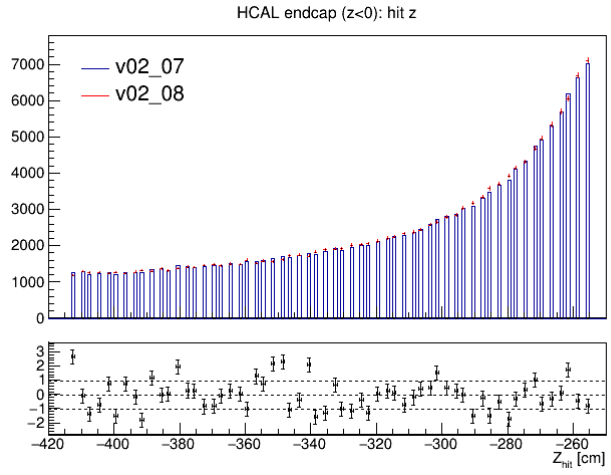
HCAL endcap (z < 0)



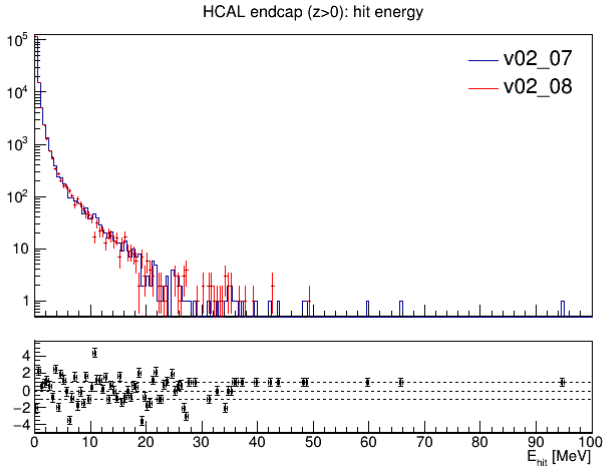


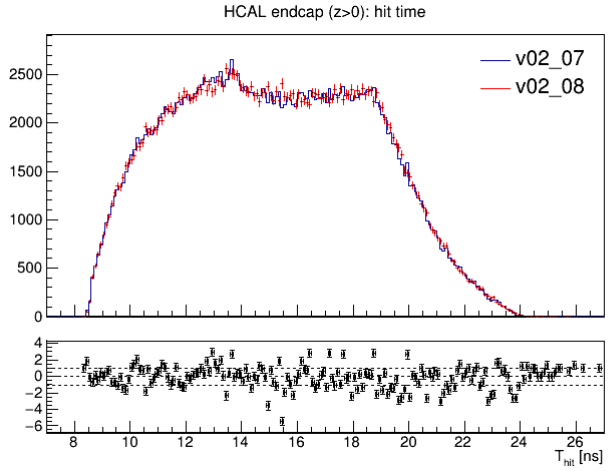


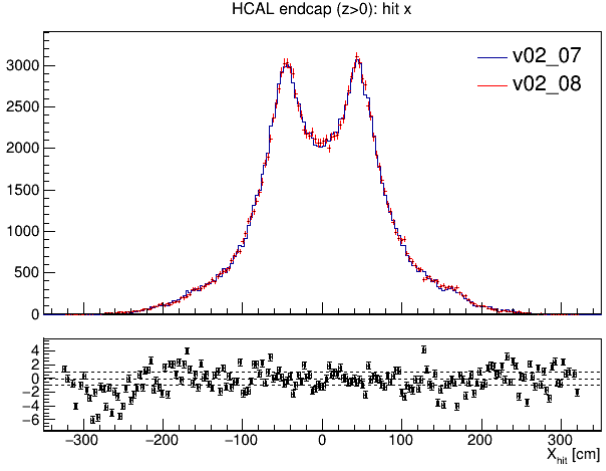


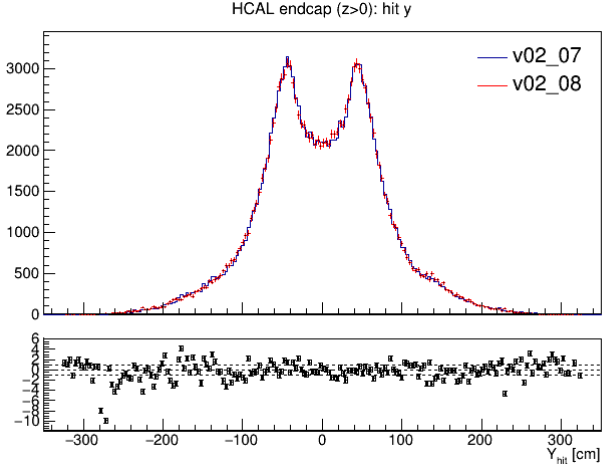


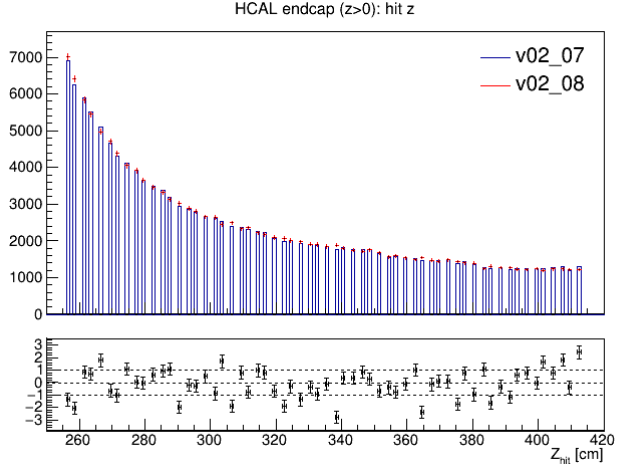
HCAL endcap (z > 0)



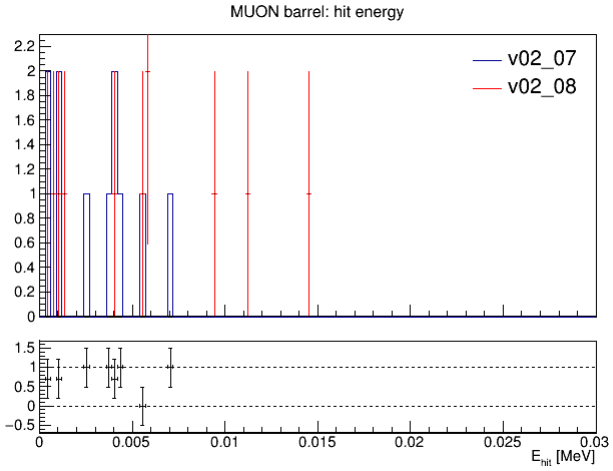


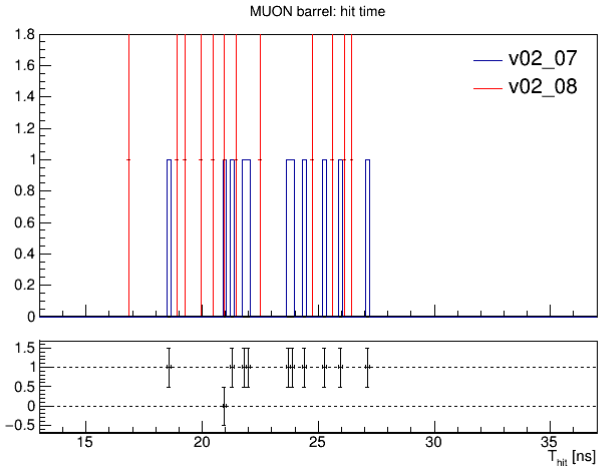


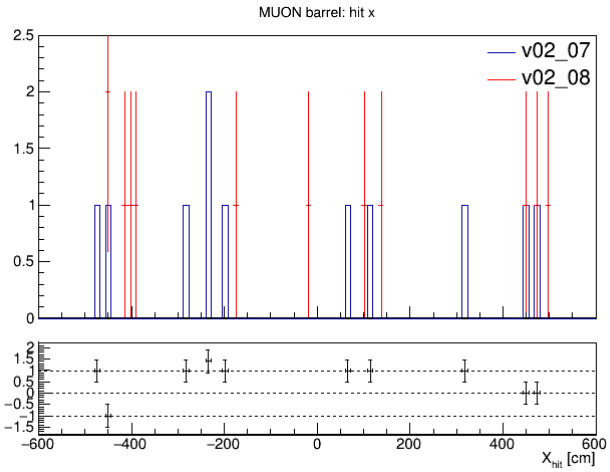


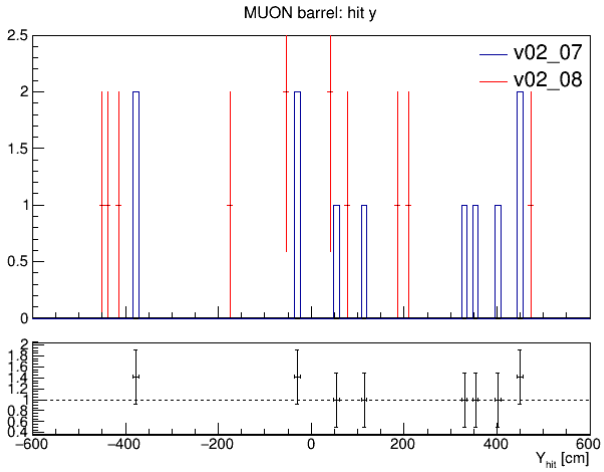


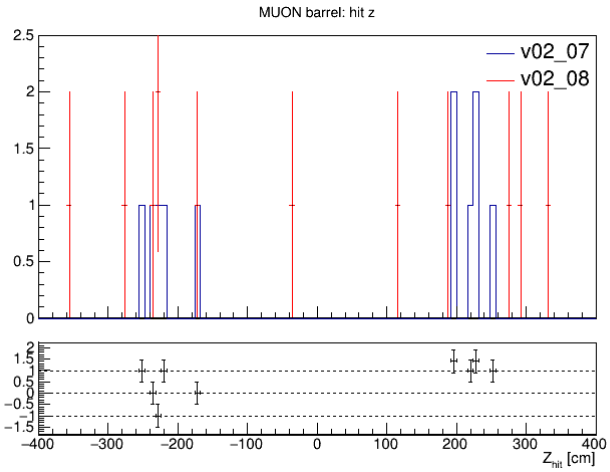
Muon detector barrel



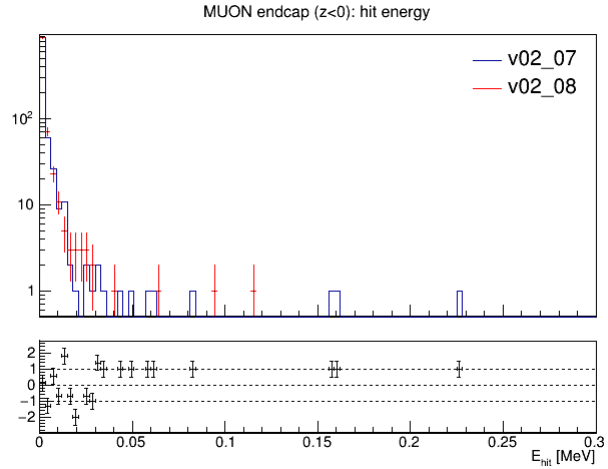


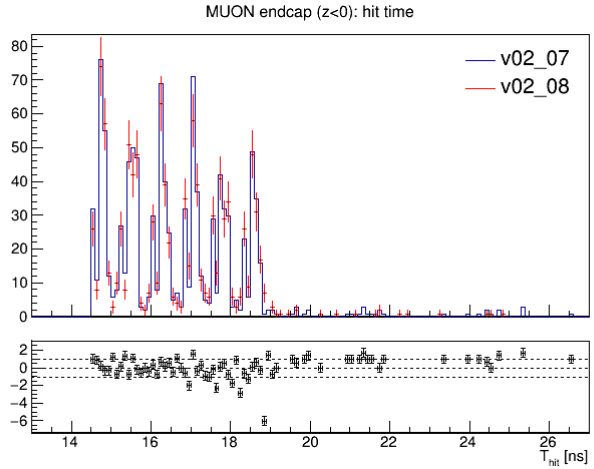


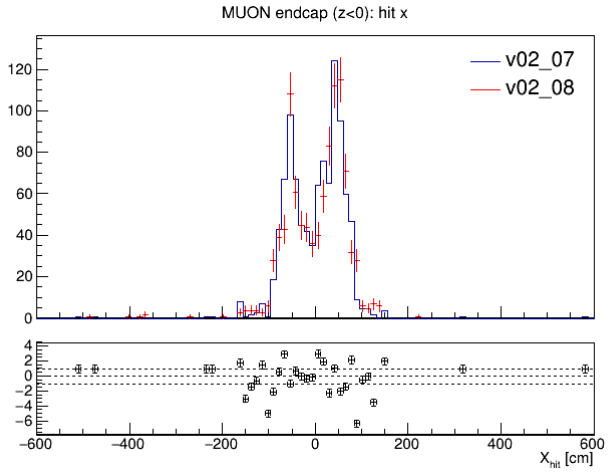


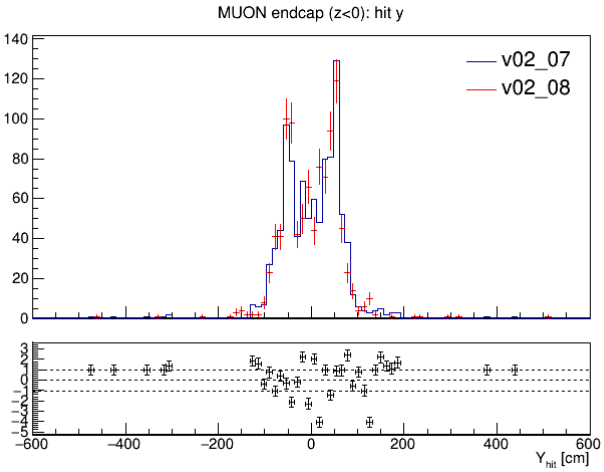


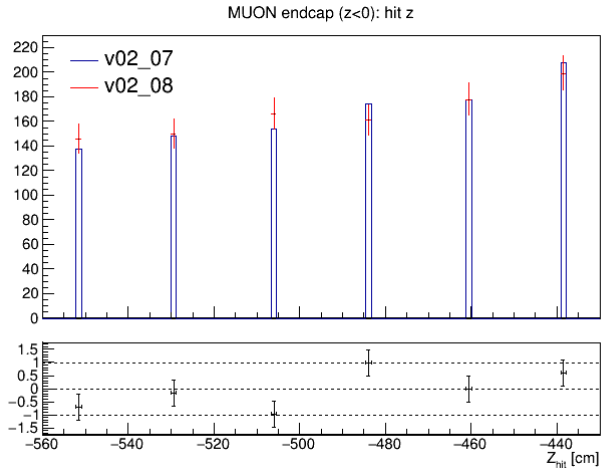
Muon detector endcap (z < 0)



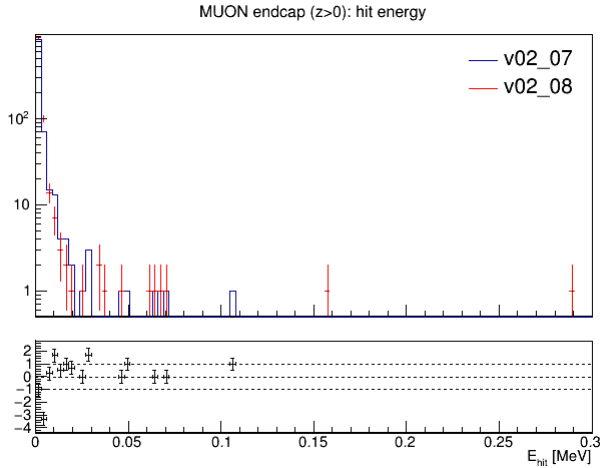


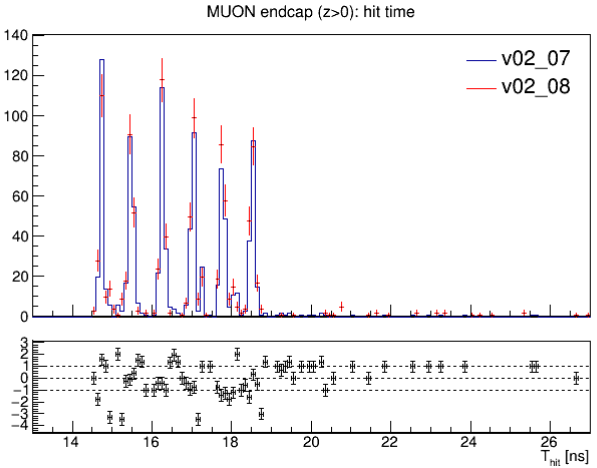


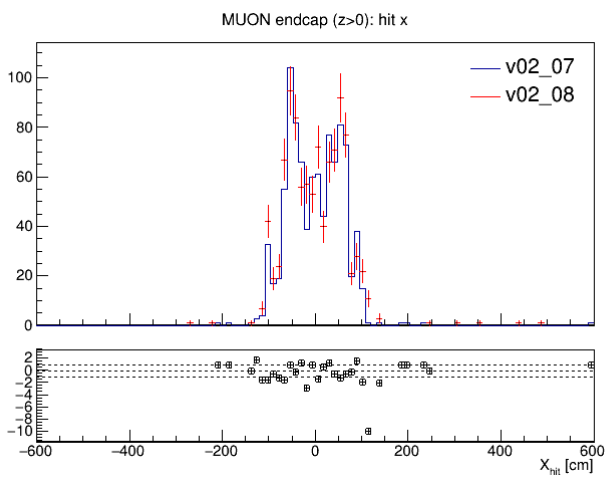


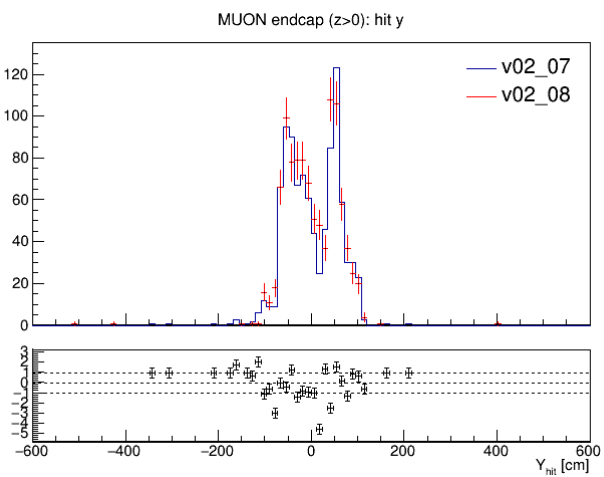


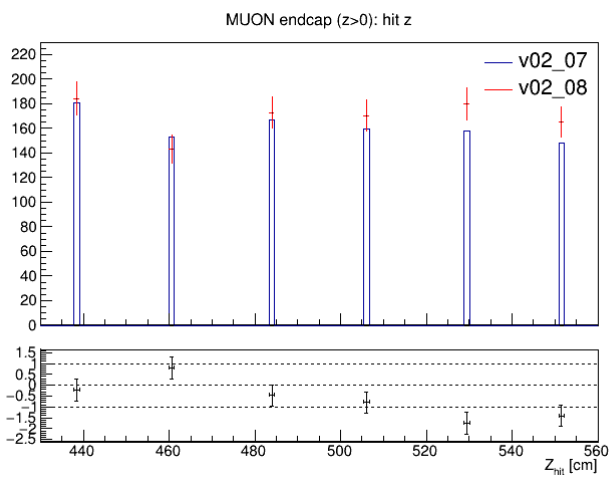
Muon detector endcap (z > 0)



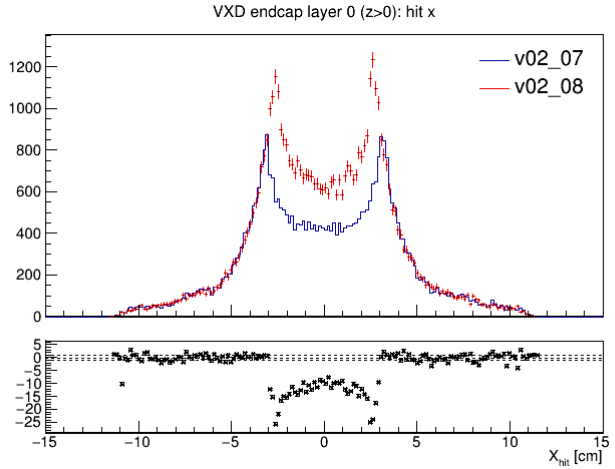


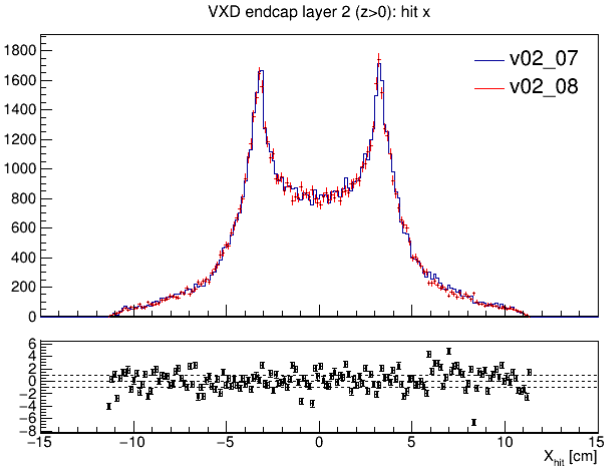


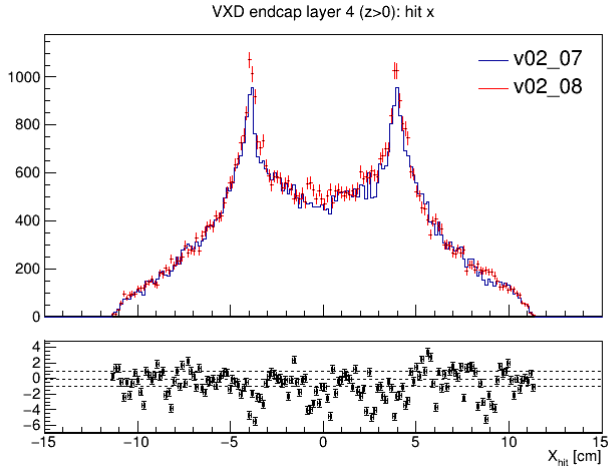


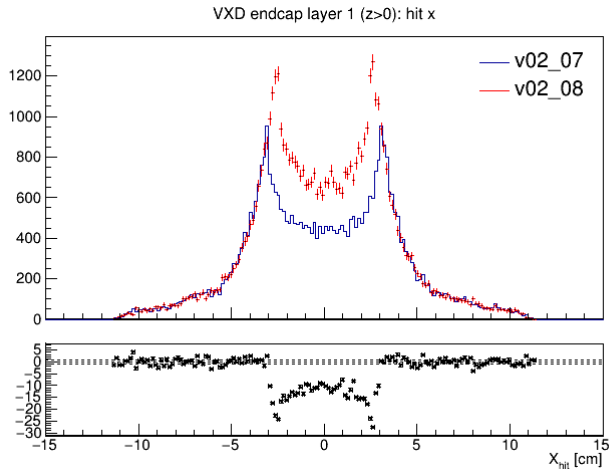


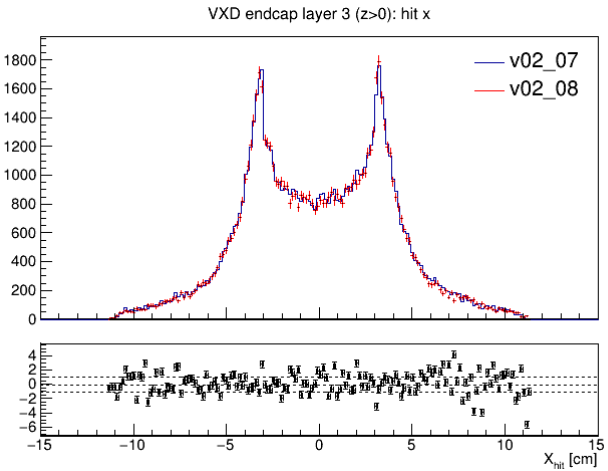
Back to the VXD endcaps: layers 0-5

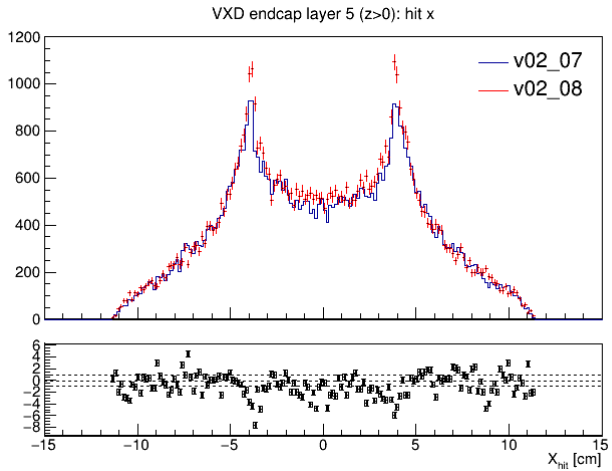






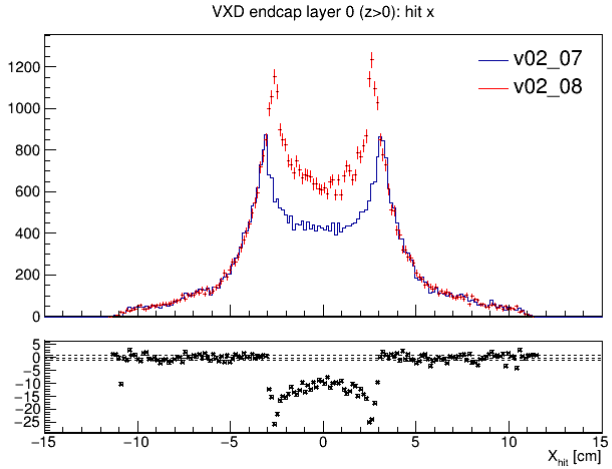


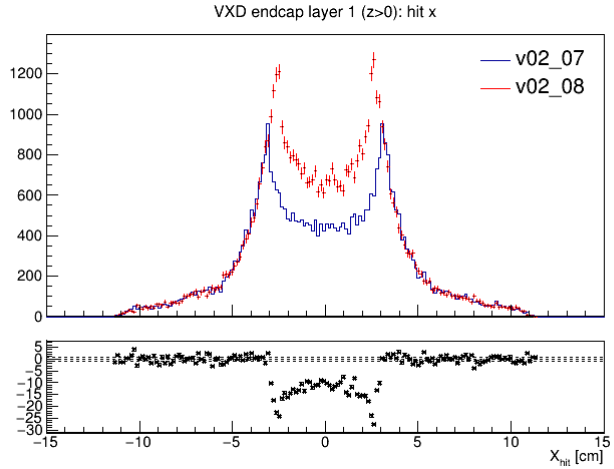




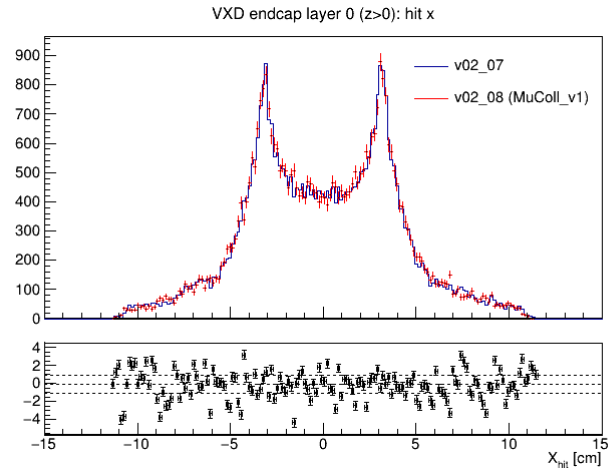
v02_08+MuColl_v1.1 vs v02_08+MuColl_v1

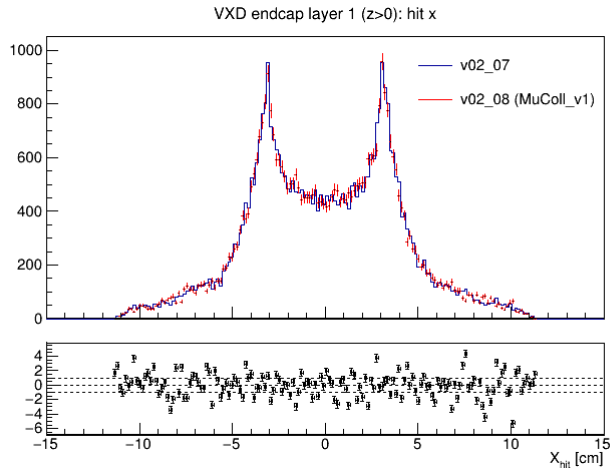
MuColl_v1.1





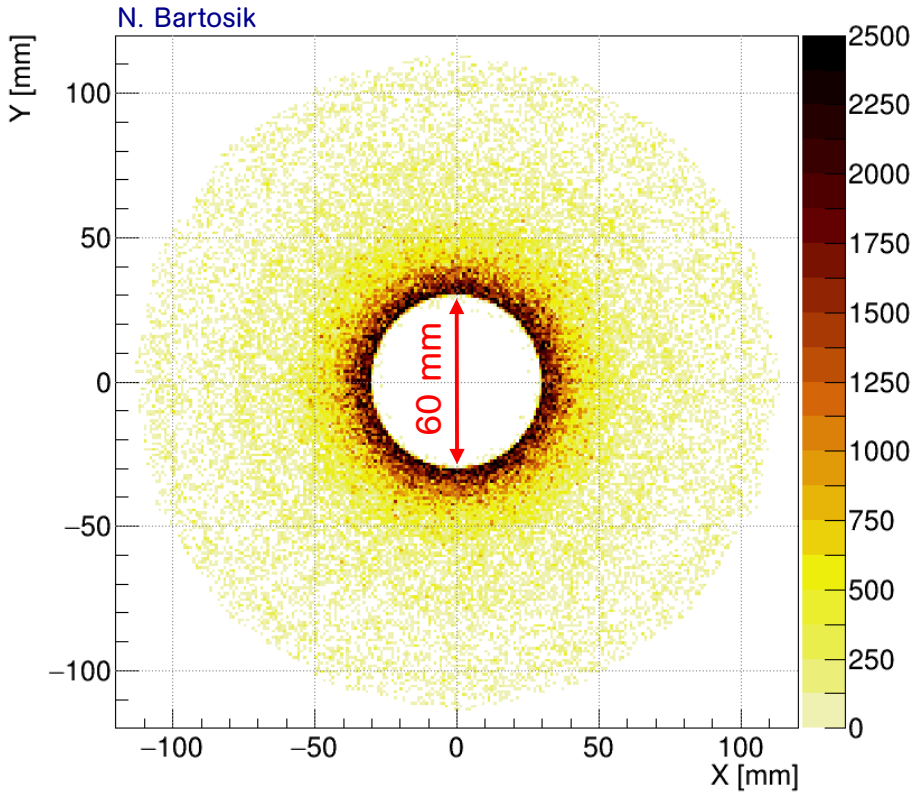
MuColl_v1



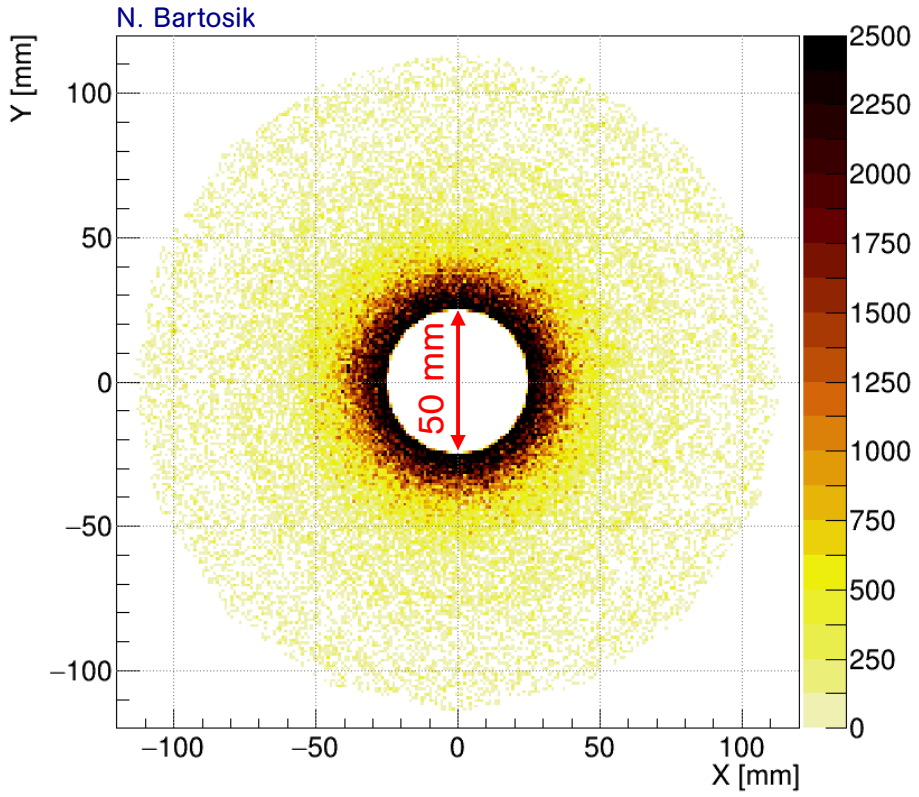


Inner radius of VXD endcap layers 0 and 1

MuColl_v1



MuColl_v1.1



v02-07-MC forward incompatibility?

- `anajob` and `dumpevent` of v02-07-MC crash when accessing SLCIO files produced with v02-08-MC:

```
terminate called after throwing an instance of 'sio::exception'
  what():  /opt/ilcsoft/sio/v00-01/include/sio/api.h (l.375) in read: Can't read 4
bytes out of buffer (pos=176) [invalid_argument]
/opt/ilcsoft/muonc/lcio/v02-16-01-MC/src/cpp/src/SIO/SIOCollectionHandler.cc
(l.63) in read: Couldn't read out object of type 'SimCalorimeterHit' at index 0
[io_failure]
/opt/ilcsoft/sio/v00-01/source/src/api.cc (l.305) in read_blocks: Failed to decode
block buffer (YokeBarrelCollection) [io_failure]
/opt/ilcsoft/muonc/lcio/v02-16-01-MC/src/cpp/src/MT/LCReader.cc (l.201) in
readNextEvent: Couldn't read next event! [io_failure]
Aborted (core dumped)
```

Conclusions

- Results of the GEANT4 detector simulations with versions v11.1.0 and v10.6.3 are consistent.
- Found an inconsistency between the default detector geometries in v02-08-MC (MuColl_v1.1) and v02-07-MC (MuColl_v1): the inner radii of the VXD endcap disks 0-1 are different by 5 mm.
- For consistency with v02-07-MC samples the detector geometry MuColl_v1 should be used also in v02-08-MC.