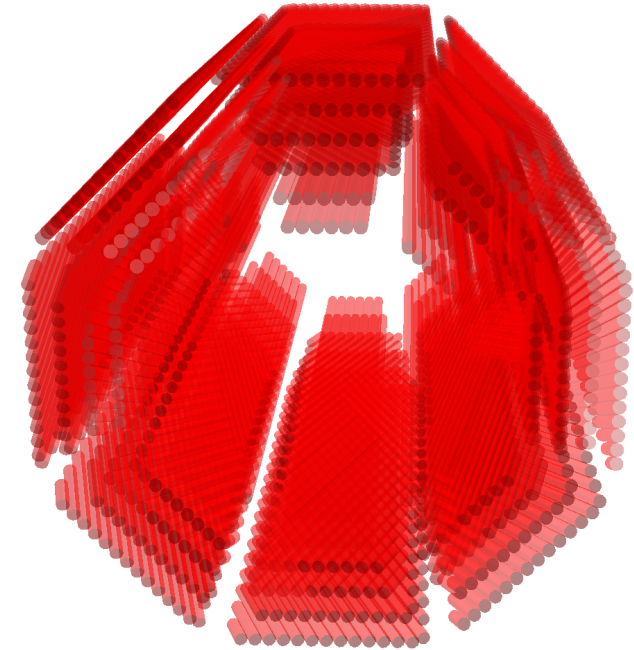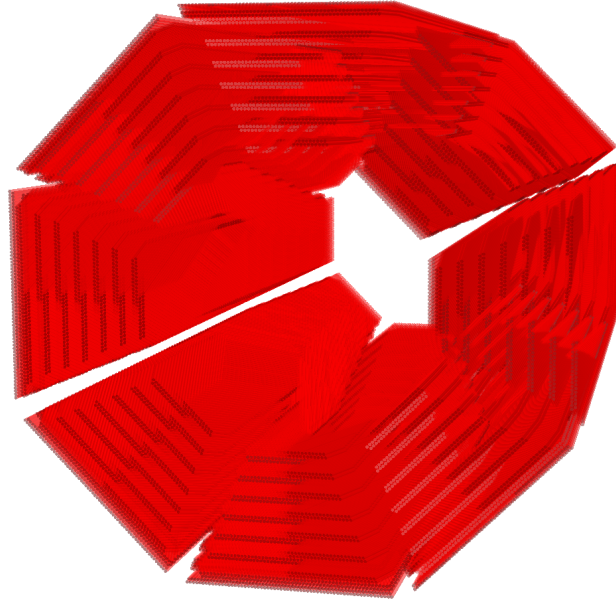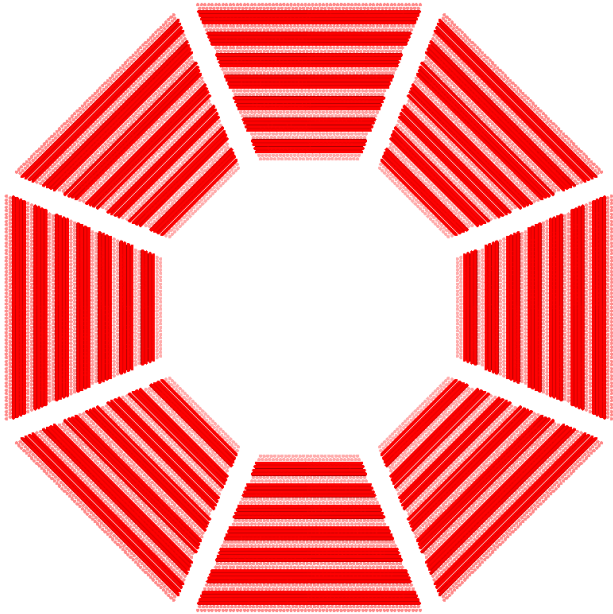# Momentum resolution dependence on the polar angle

Ruslan Akhunzyanov
JINR

SPD S&C meeting, Nov 2, 2021

Straw tracker geometry


```
SpdTsTBGeoMapper* mapper = SpdTsTBGeoMapper::Instance();

mapper->SetStrawModulePars(1,    0., 'e', 1.0, 0);

mapper->SetStrawLayerPars(1,     0., 'e', 1.0, 0.);
mapper->SetStrawLayerPars(1,     0., 'o', 1.0, 0.);
mapper->SetStrawLayerPars(1,    deg, 'e', 1.0, 0.);
mapper->SetStrawLayerPars(1,    deg, 'o', 1.0, 0.);
mapper->SetStrawLayerPars(1,   -deg, 'e', 1.0, 0.);
mapper->SetStrawLayerPars(1,   -deg, 'o', 1.0, 0.);
```

(picture with enlarged tubes and gaps between layers for better visibility)

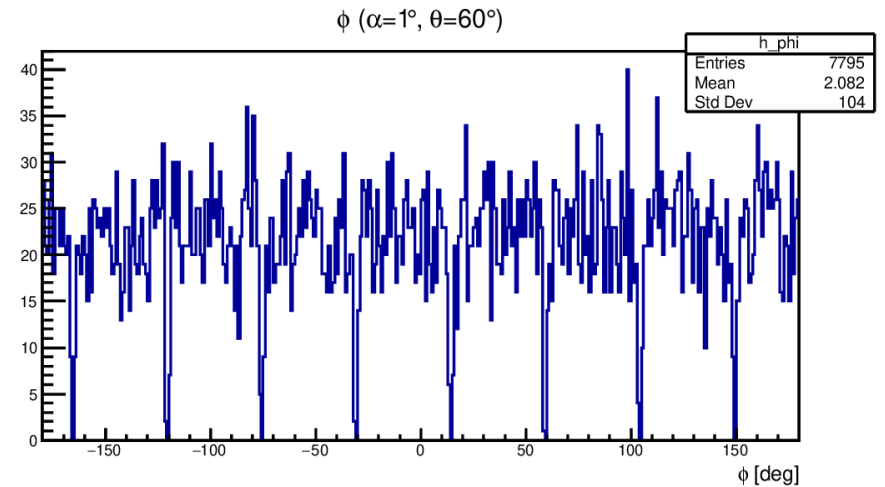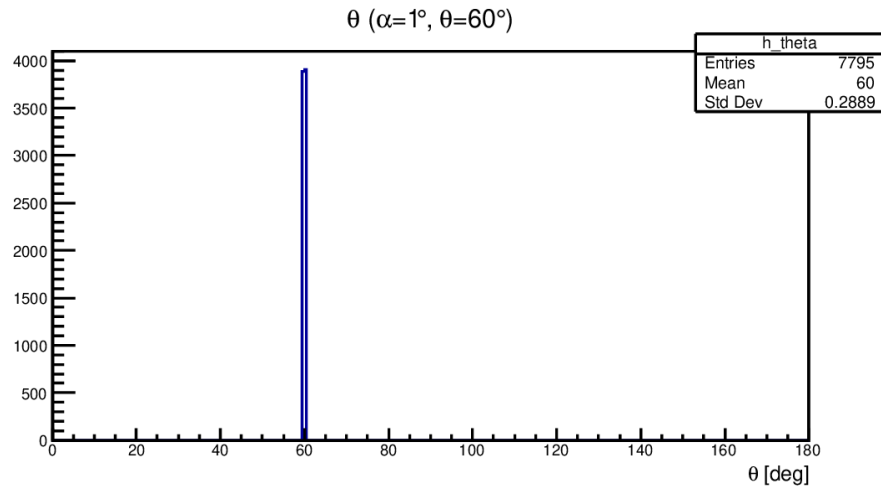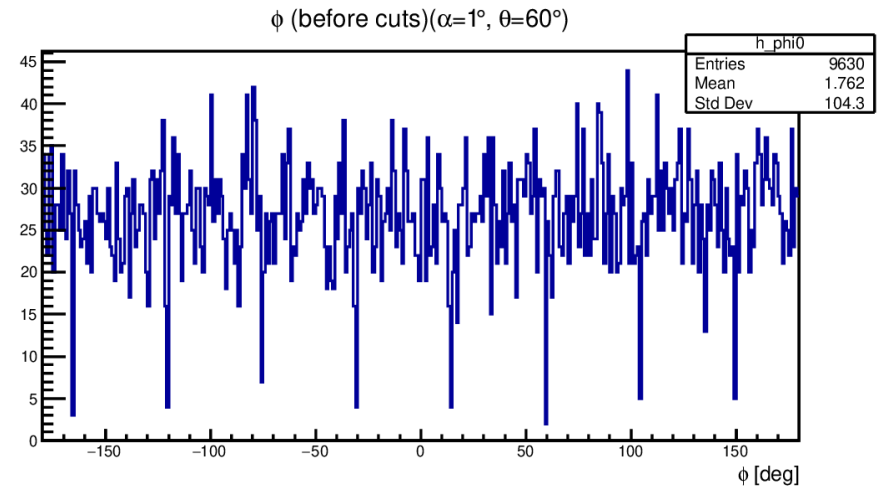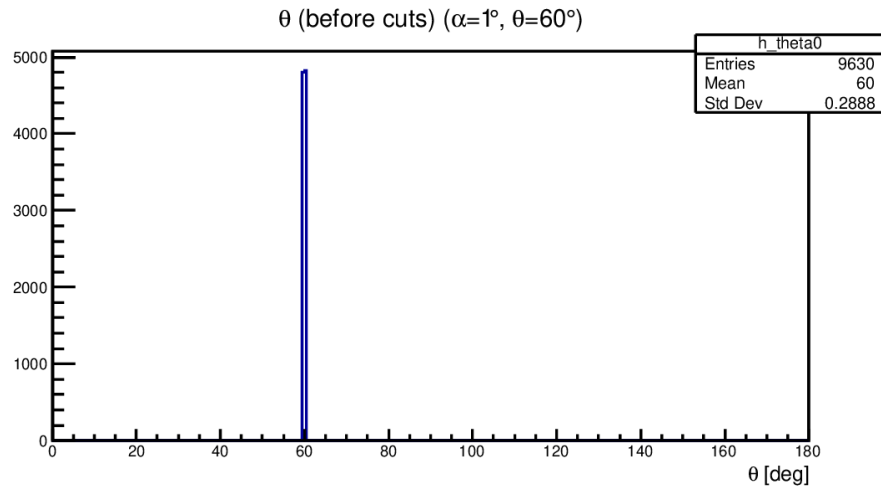Angle (α) is varied from 0.1 to 20 degrees.

No vertex detector.

Generation of events

- `SpdIsotropicGenerator`

- Pions with p = 1 GeV/c.

- Polar angle θ is varied within range ±0.5° from the central value.

- Azimuthal angle φ is varied from 0° to 360°.

- 100 events with 100 tracks in each event.

- Scan over values:

  - ◆ θ: from 40° to 90° with step 5°.

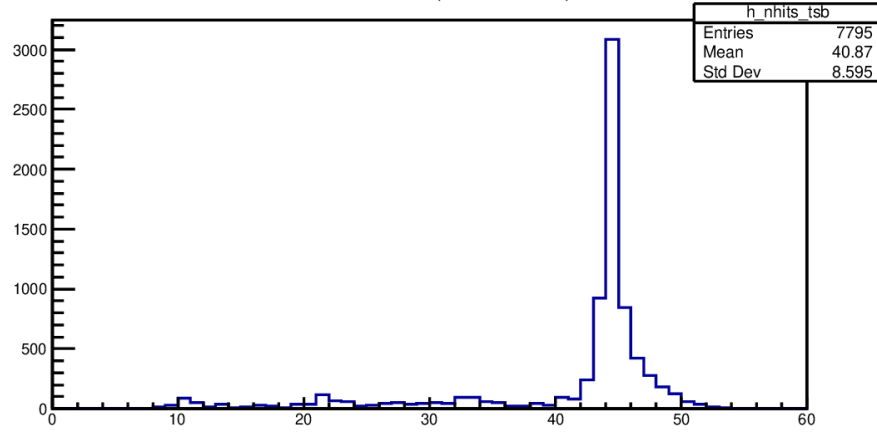 - ◆ α: 0.1°, 0.2°, 0.3°, 0.5°, 1°, 2°, 5°, 10°, 20°.

Cuts on tracks used in the analysis

- Only tracks from primary vertex.

- Fit parameters exist.

- `GetIsAcceptable()`
  (no fit error flags, ndf ≥ 3, χ^2/ndf ≥ 2)
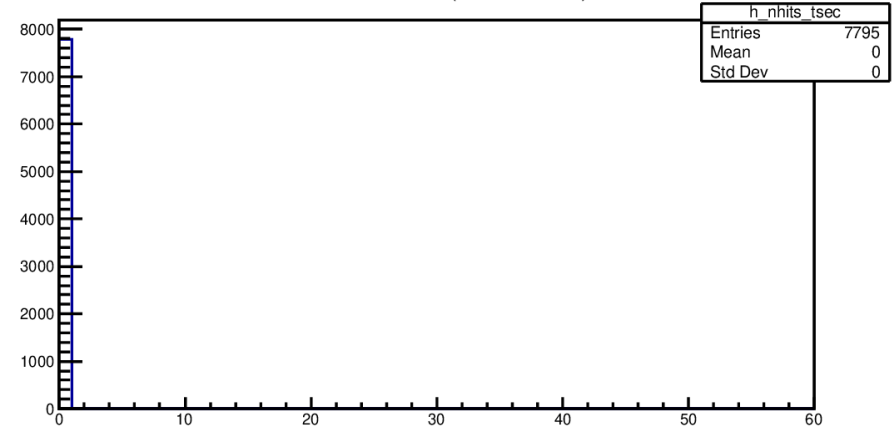
- No hits in endcaps.

Angular distributions

θ (before cuts) (α=1°, θ=60°)

h_theta0	
Entries	9630
Mean	60
Std Dev	0.2888

φ (before cuts)(α=1°, θ=60°)

h_phi0	
Entries	9630
Mean	1.762
Std Dev	104.3

θ (α=1°, θ=60°)

h_theta	
Entries	7795
Mean	60
Std Dev	0.2889

φ (α=1°, θ=60°)

h_phi	
Entries	7795
Mean	2.082
Std Dev	104

Hits distribution

Relative momentum resolutions
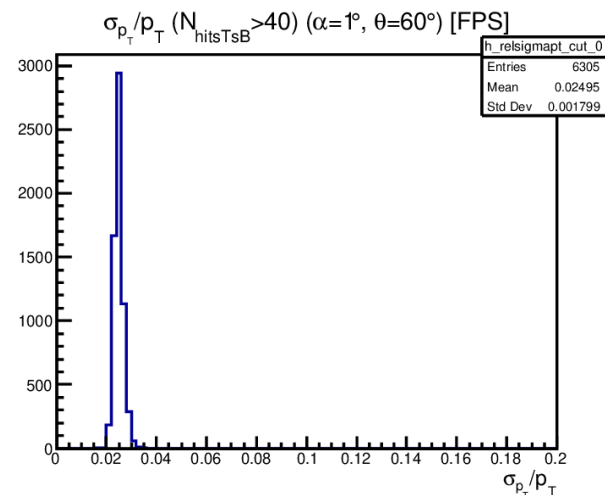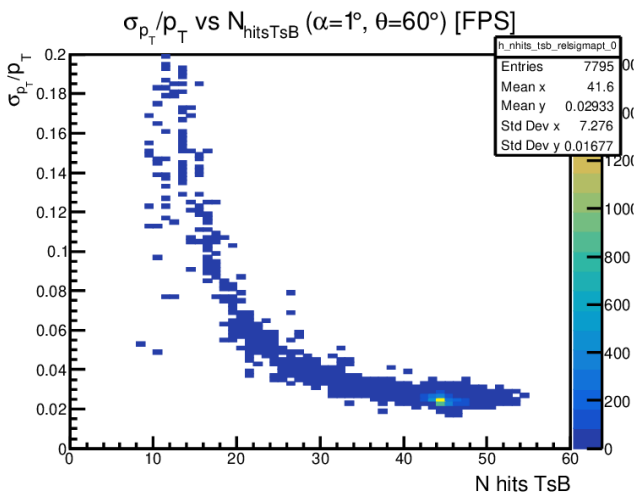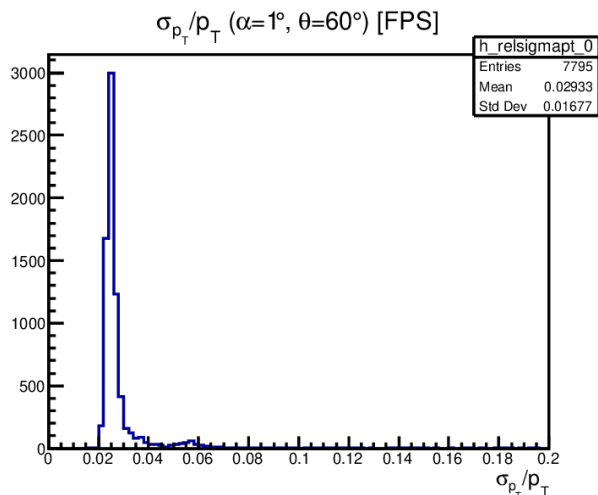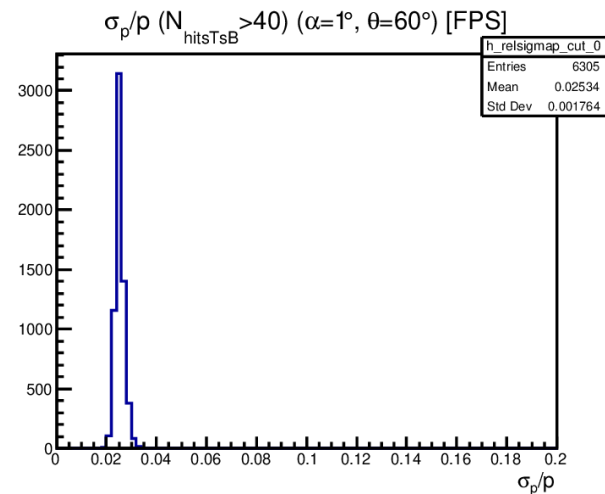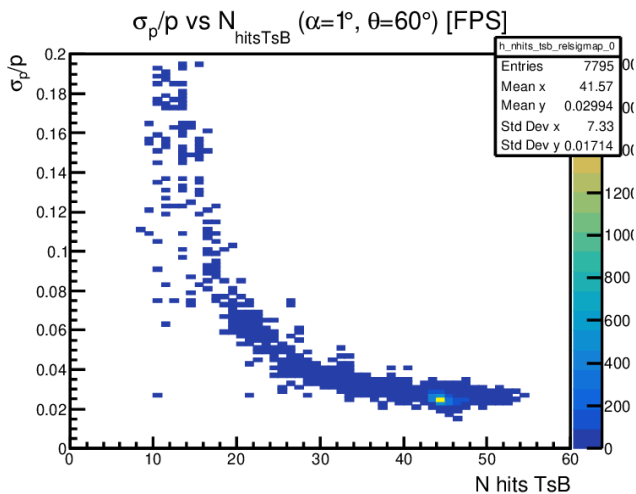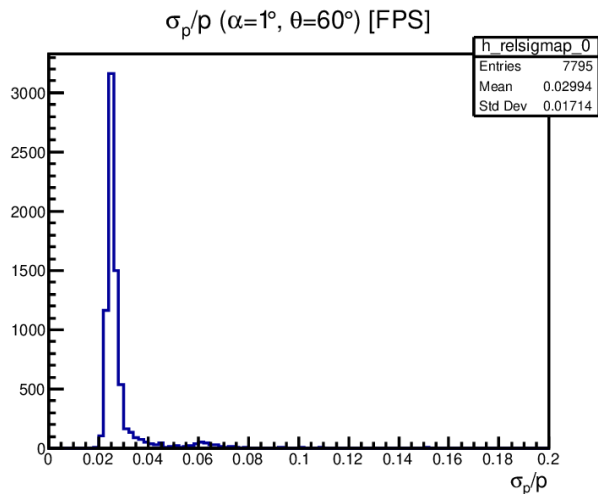
Hits distribution
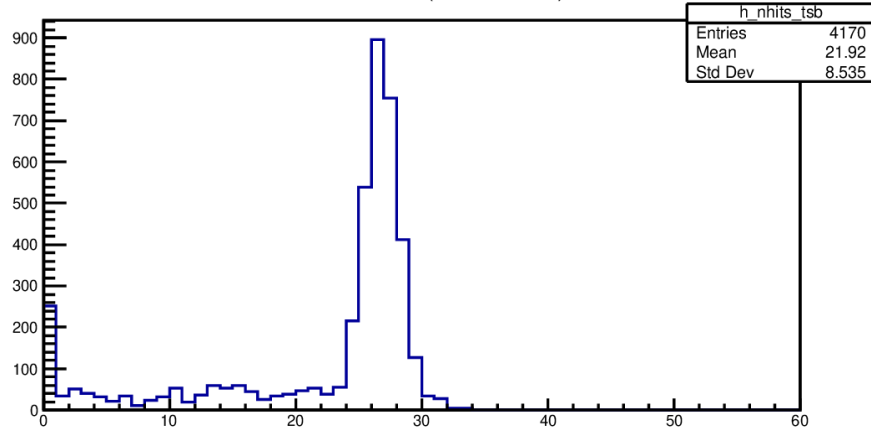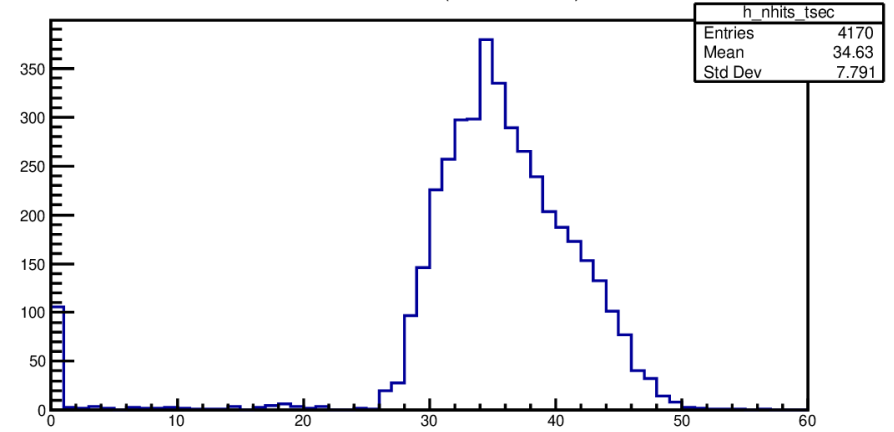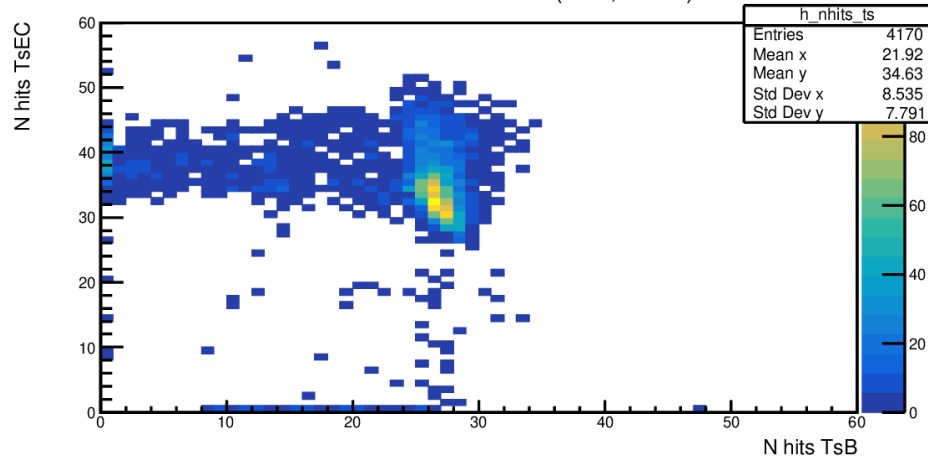
Dependence on the polar angle
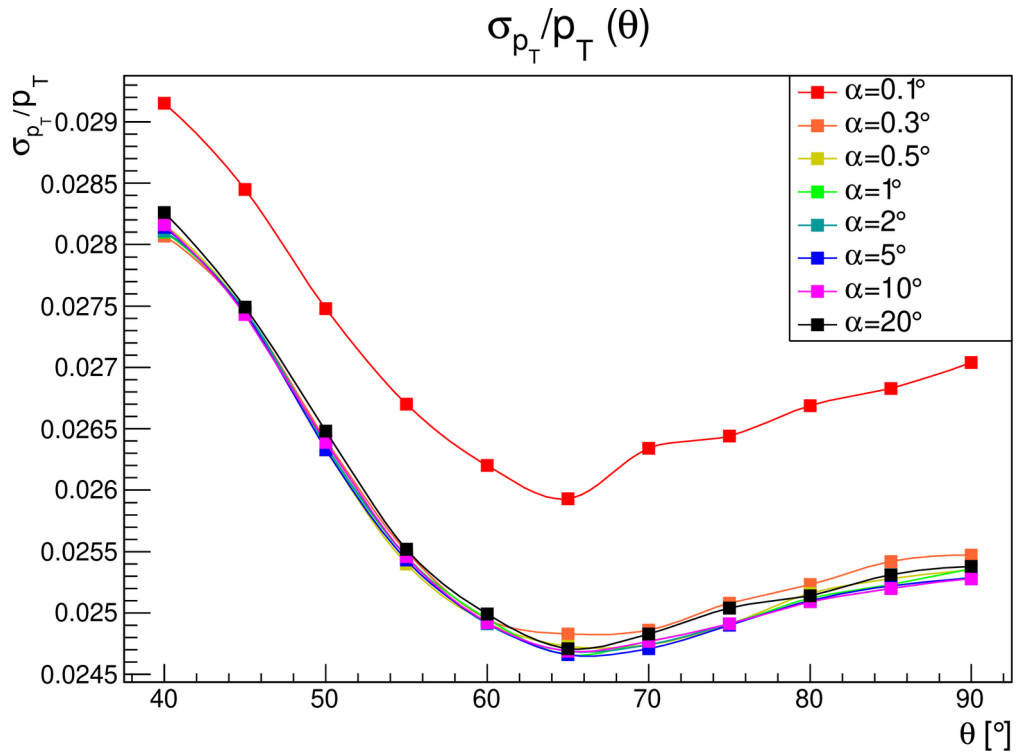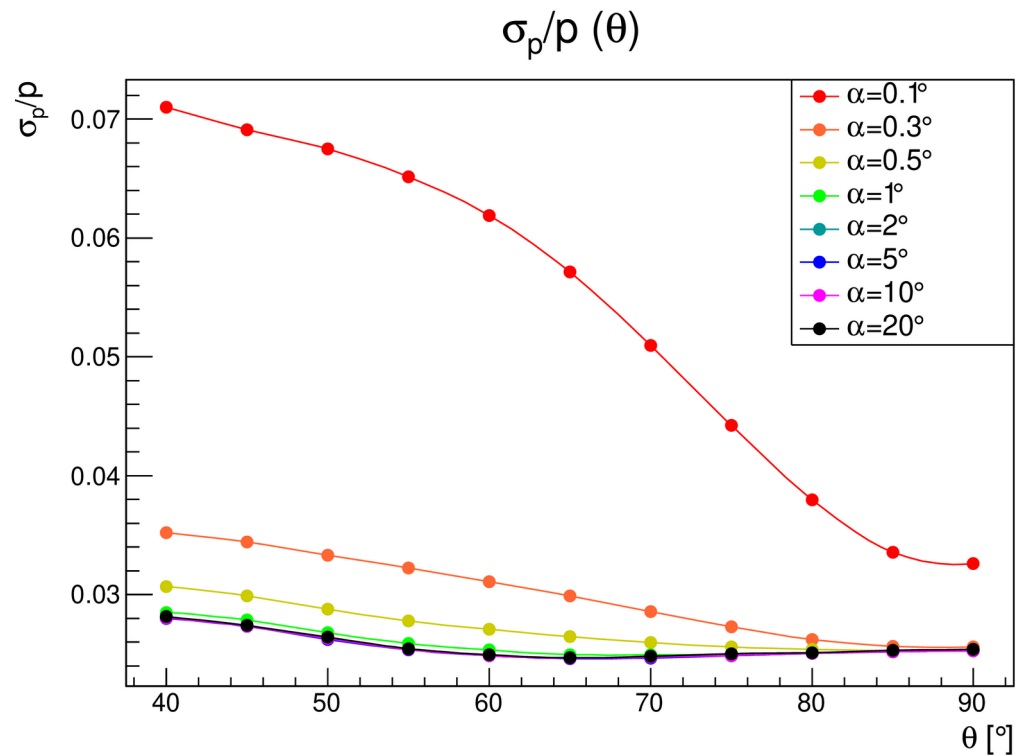
Conclusions

- As obtained earlier, the momentum resolution almost does not change starting from the straw angle value = 1°.

- Full momentum resolution increases (or is almost constant) with θ.

- Transverse momentum resolution varies even smaller with the straw angle.
  It achieves minimum at θ = 65°.