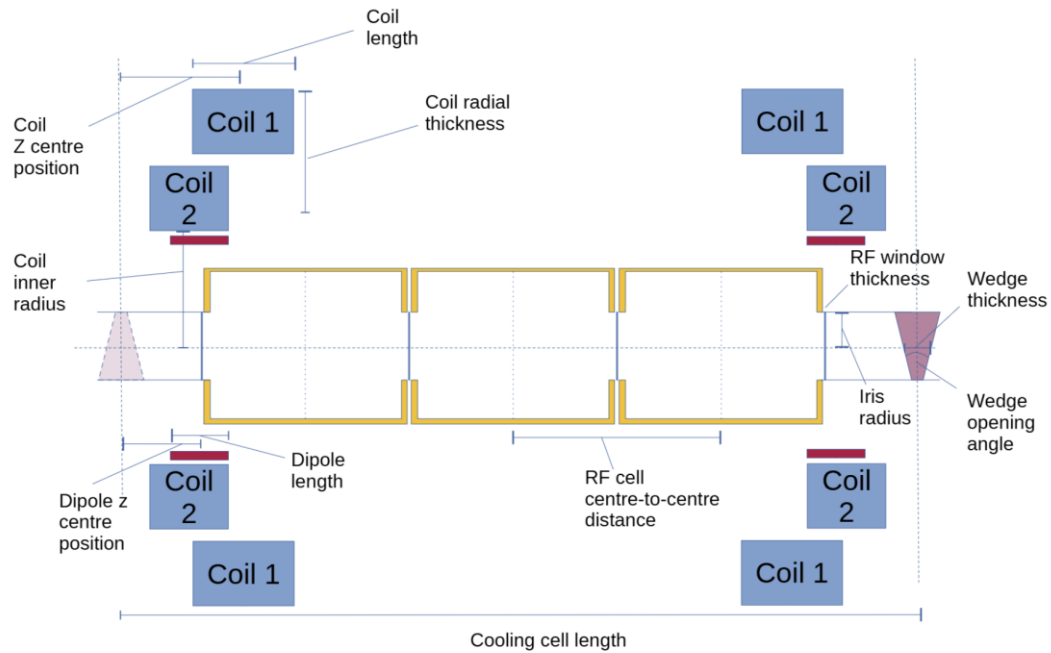
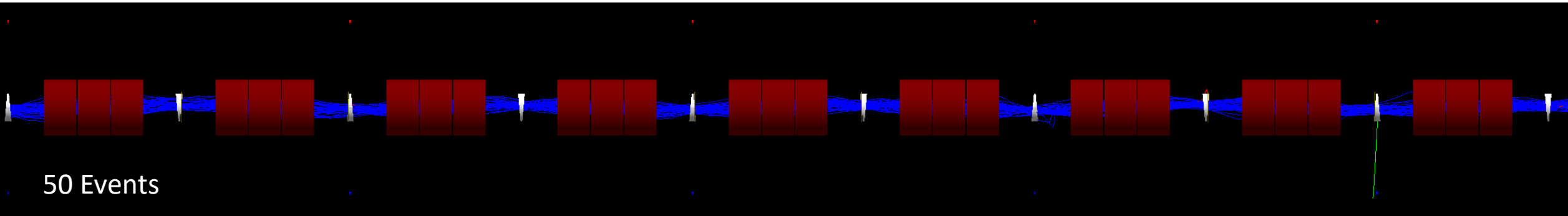




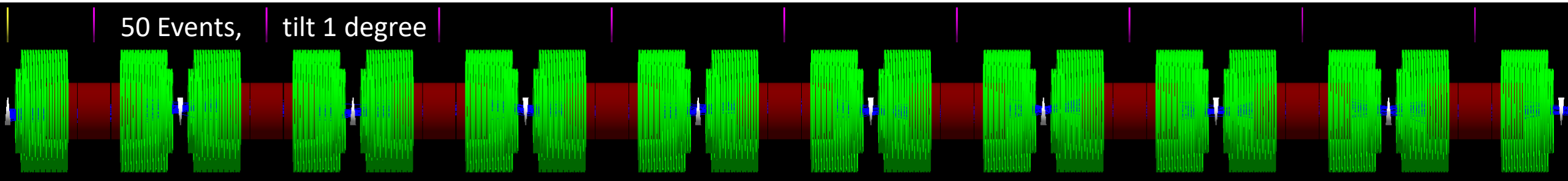
# Studies on Muon Collider's Target with G4Beamline(04/07/2026)

Cheng-Hsu (Bryan) Nee

# IMCC Cooling Cell Design

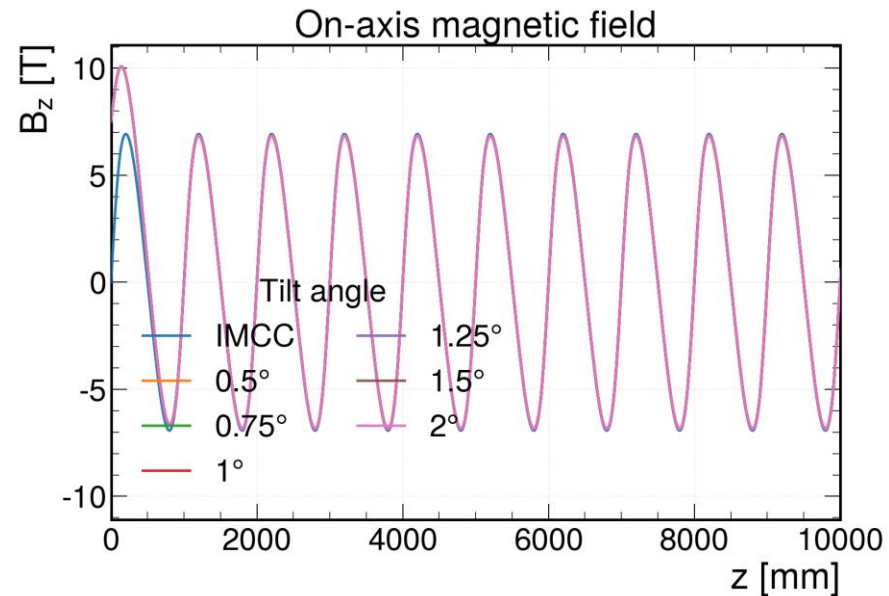
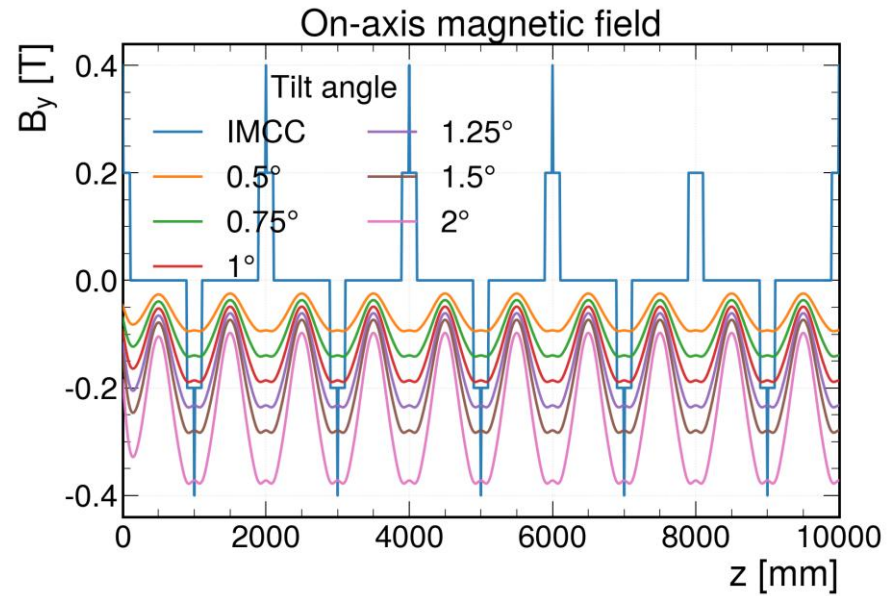
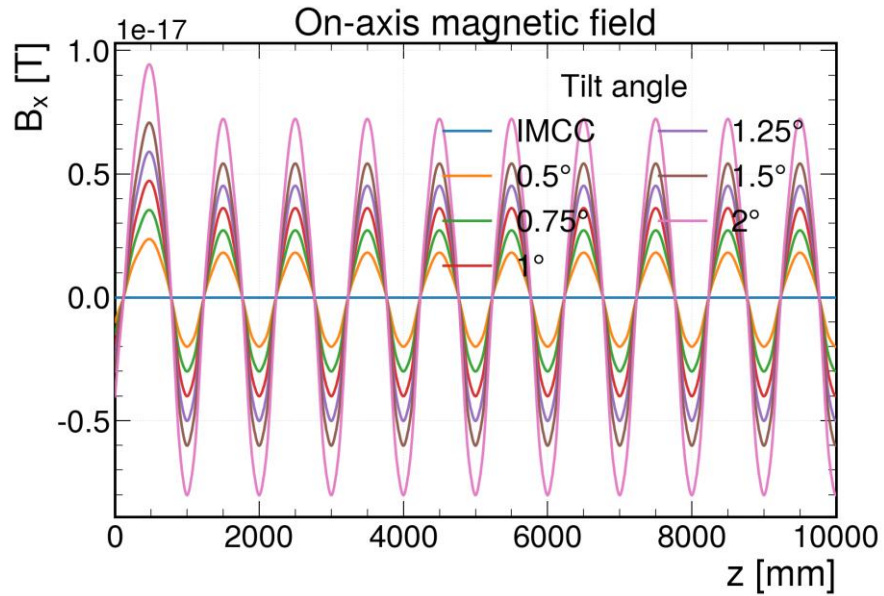


# Recreation of IMCC Cooling Cell Design (without Dipole, Tilt Solenoid)



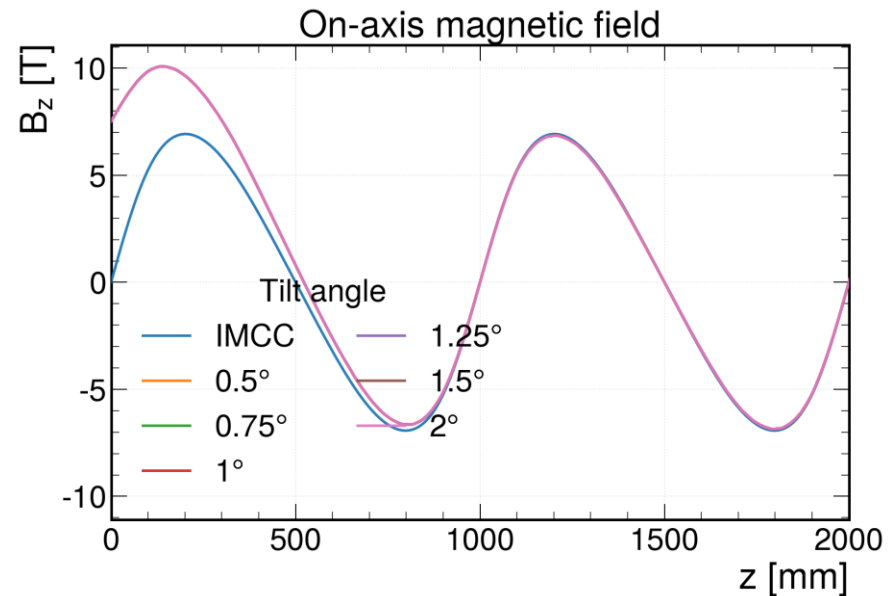
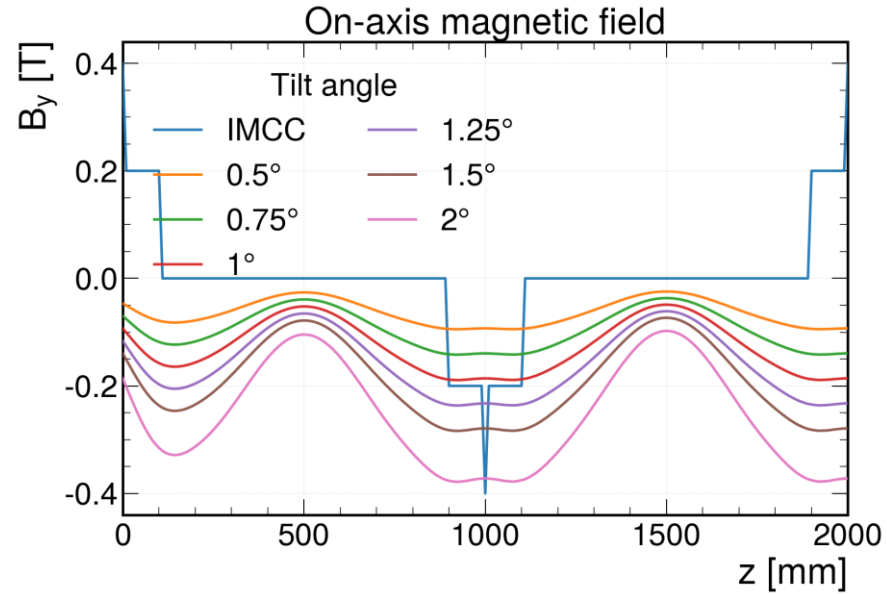
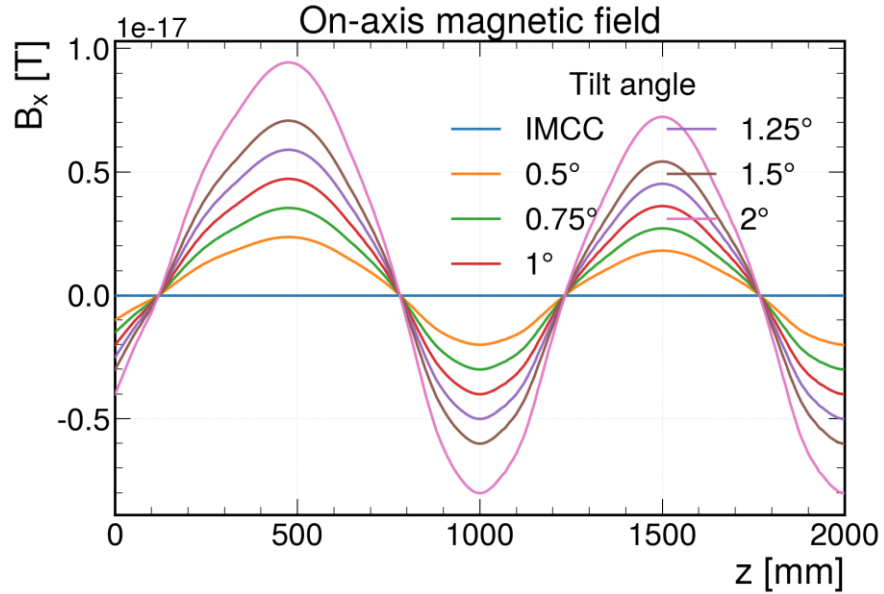


# On Axis Field (Tilting Angle Scan)

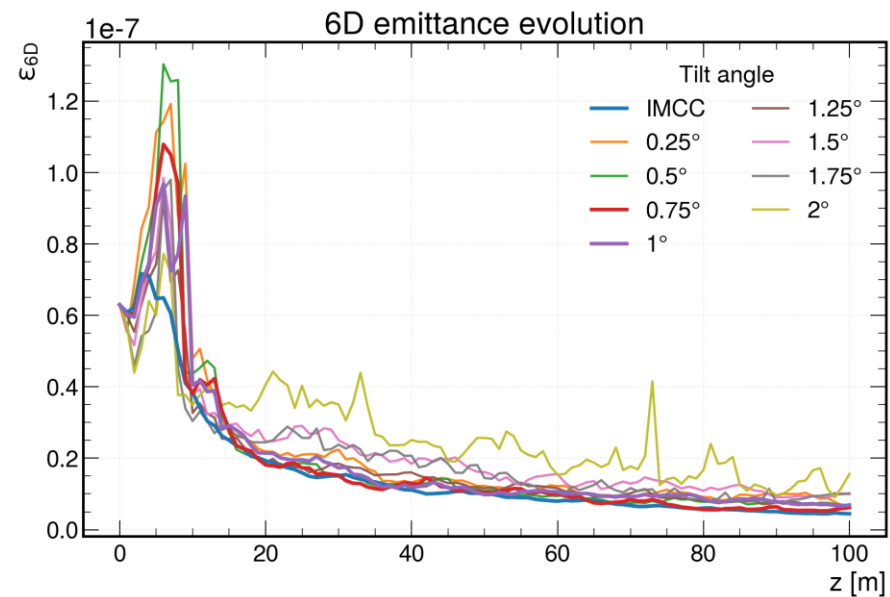
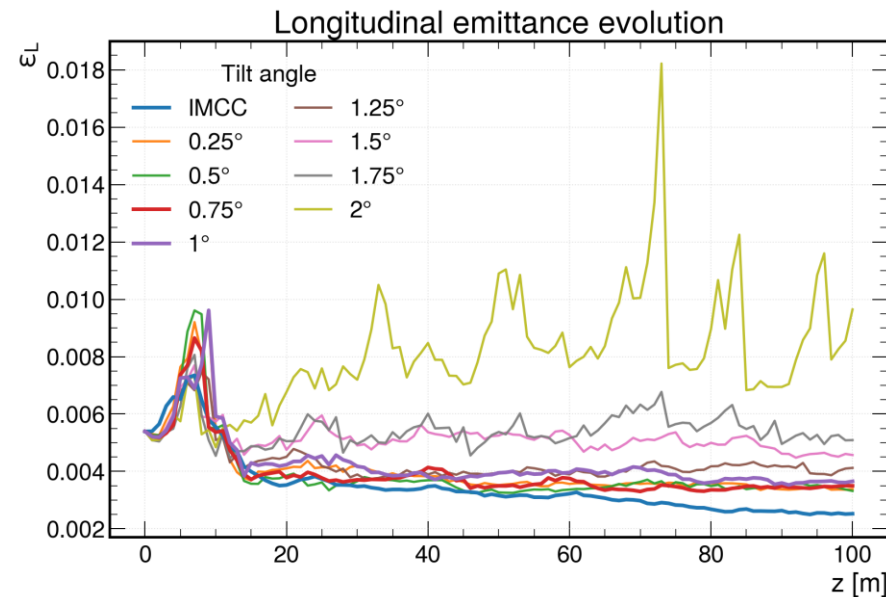
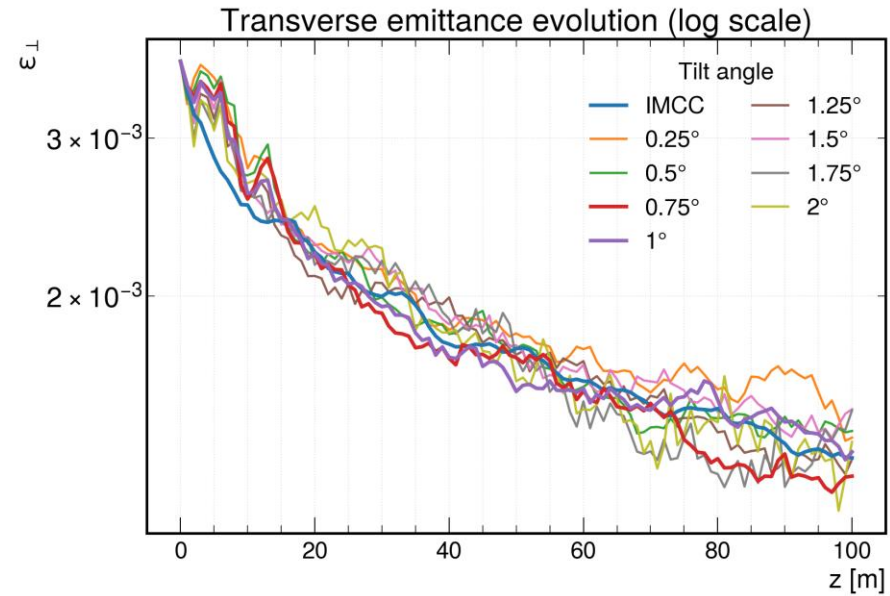
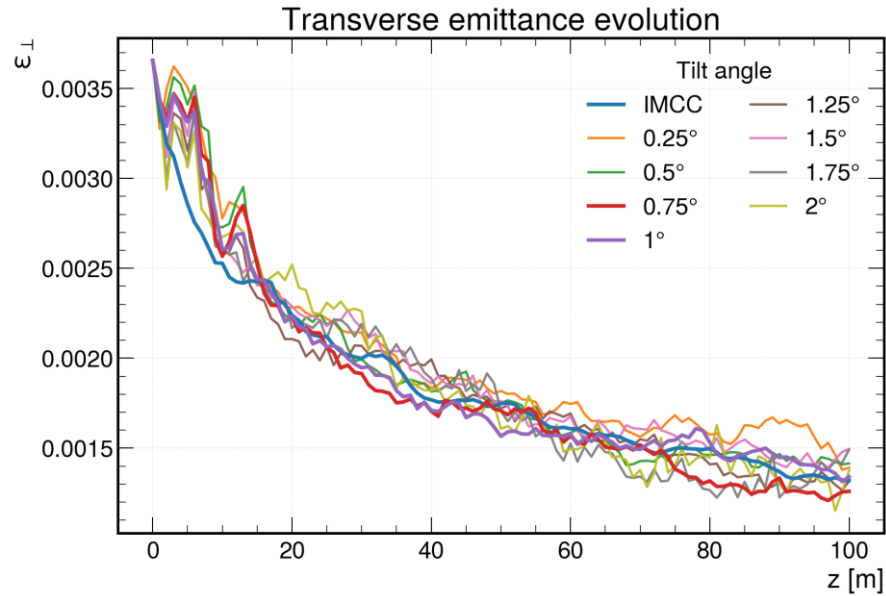




# On Axis Field First 2 Cells (Tilting Angle Scan)



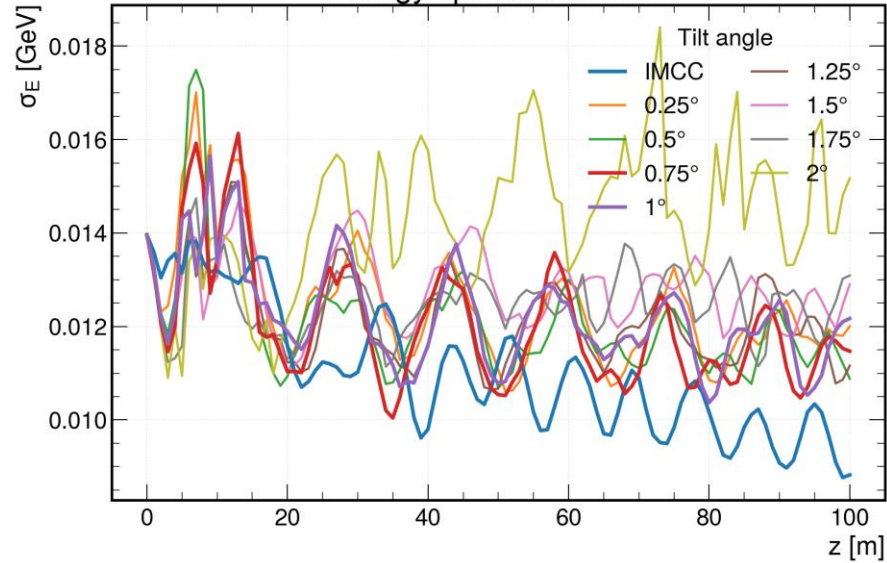
# Beam Properties Calculate by ECALC9 (Tilting Angle Scan)



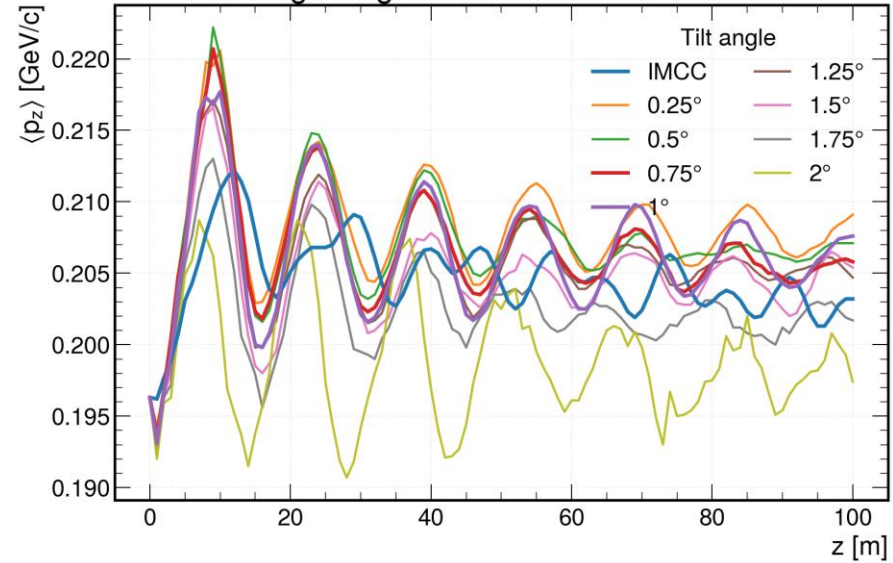
# Beam Properties Calculate by ECALC9 (Tilting Angle Scan)



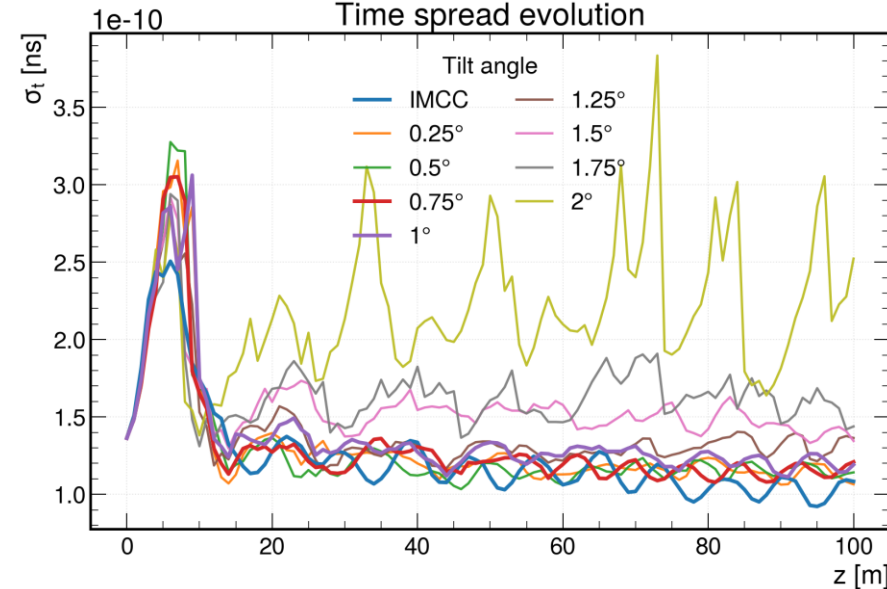
Energy spread evolution



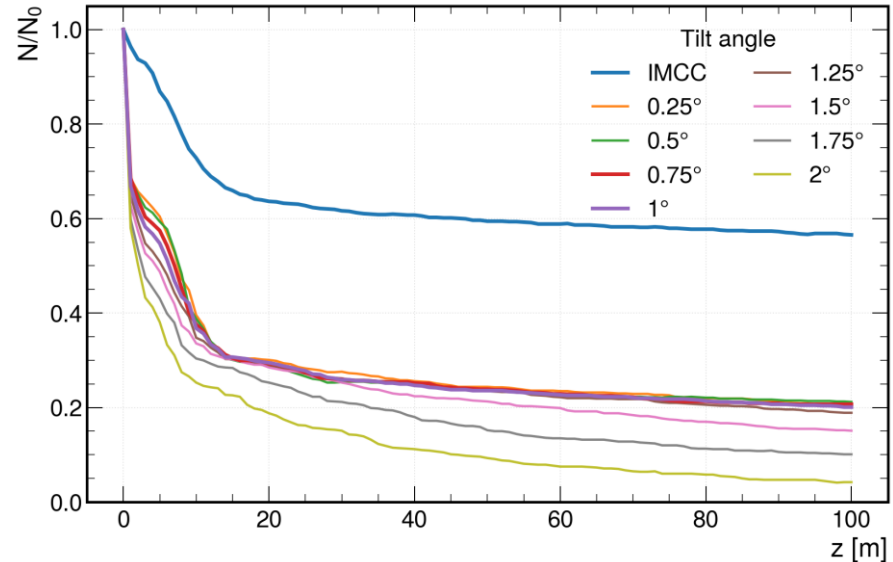
Average longitudinal momentum evolution



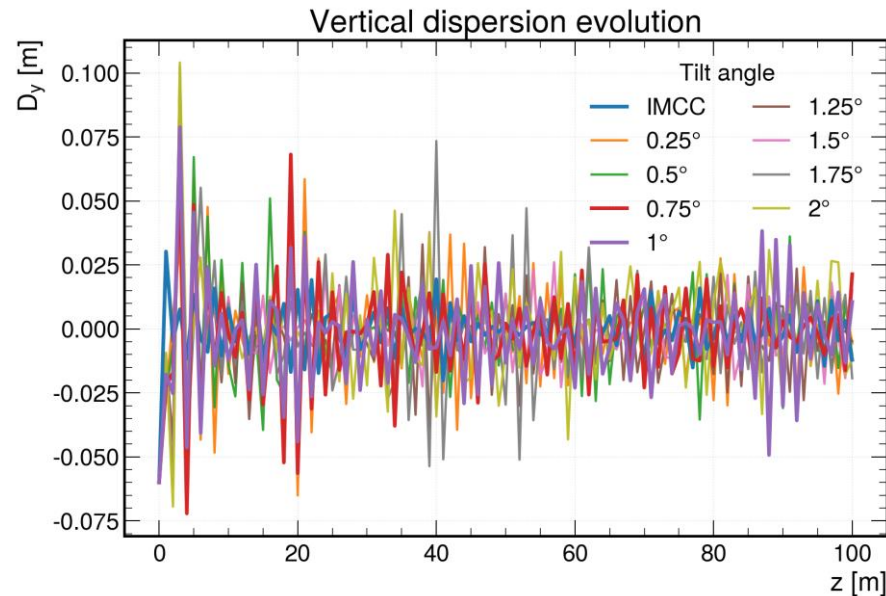
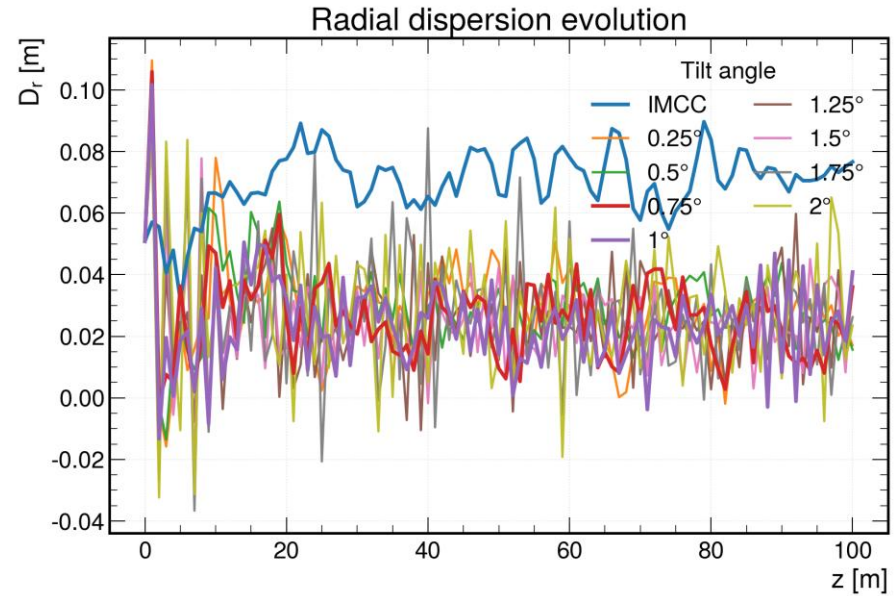
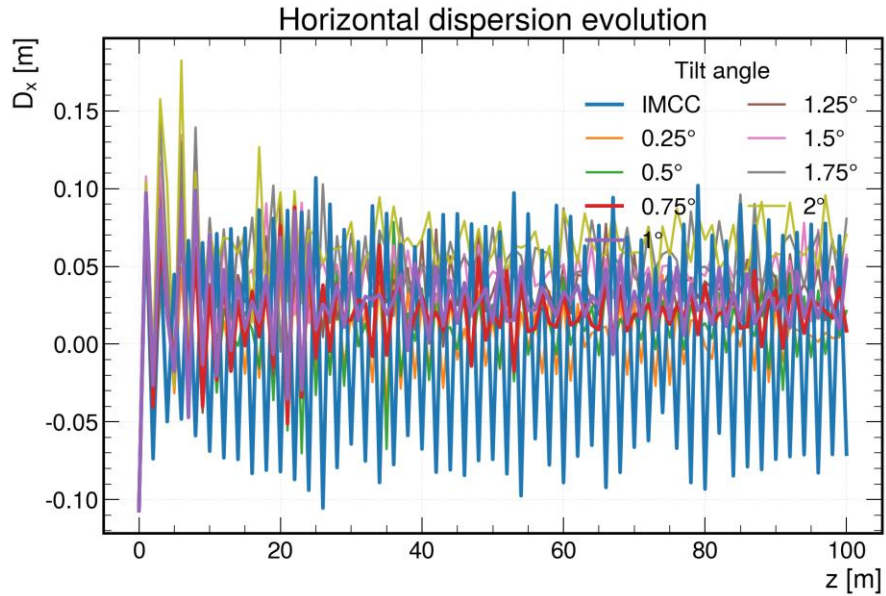
Time spread evolution



Transmission evolution



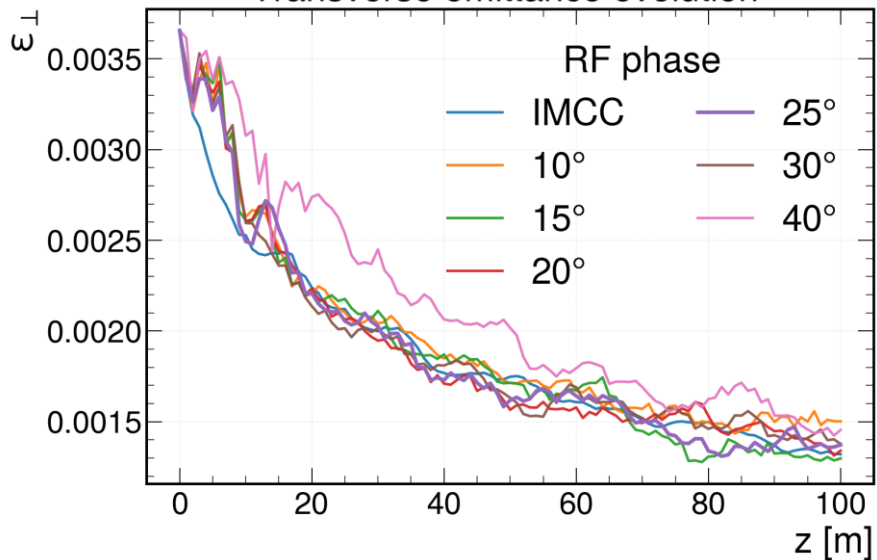
# Beam Properties Calculate by ECALC9 (Tilting Angle Scan)



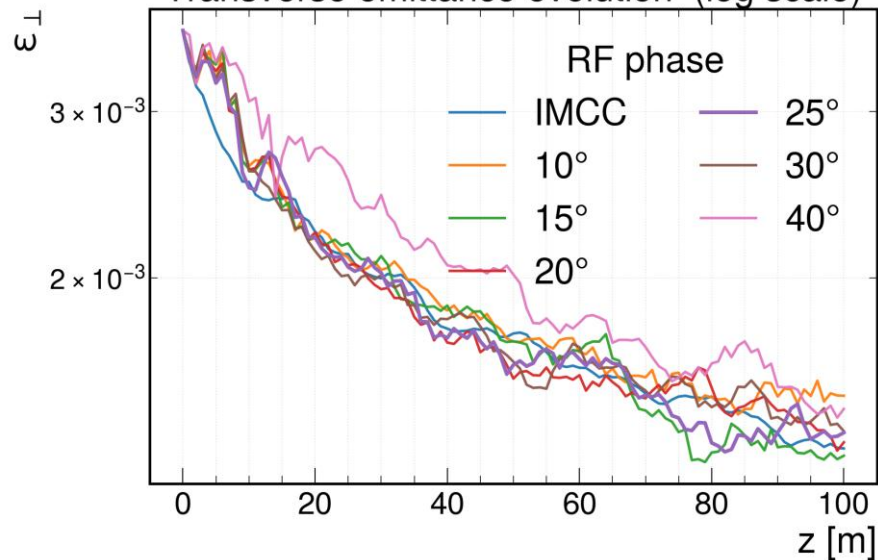
# Beam Properties Calculate by ECALC9 (Tilt 1 Degree, RF Scan)



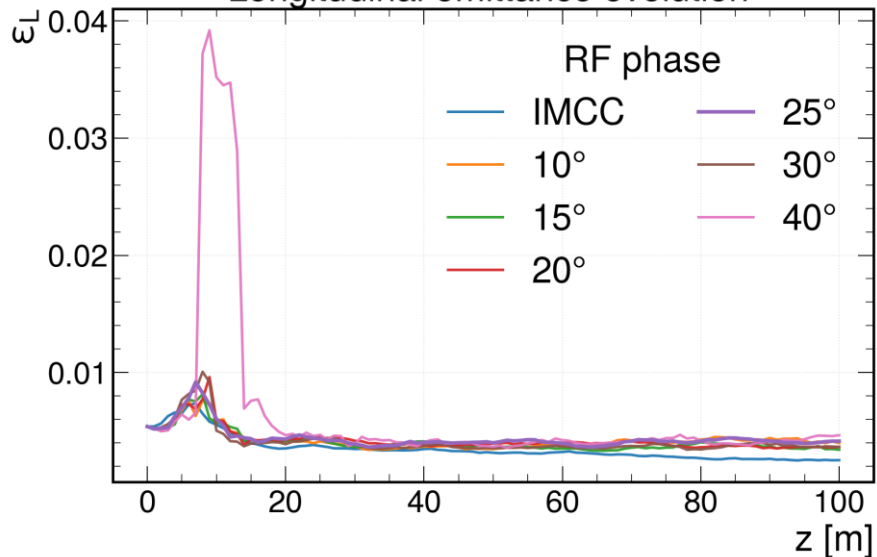
Transverse emittance evolution



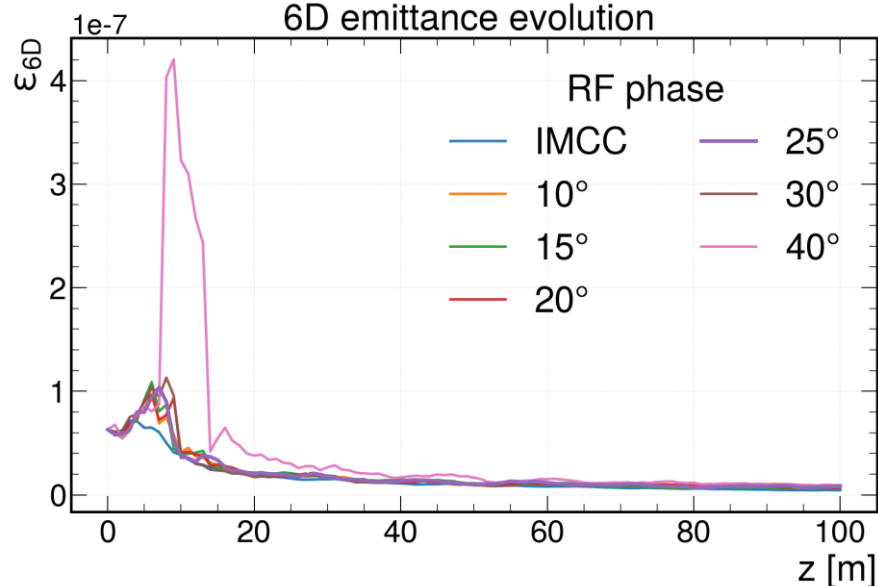
Transverse emittance evolution (log scale)



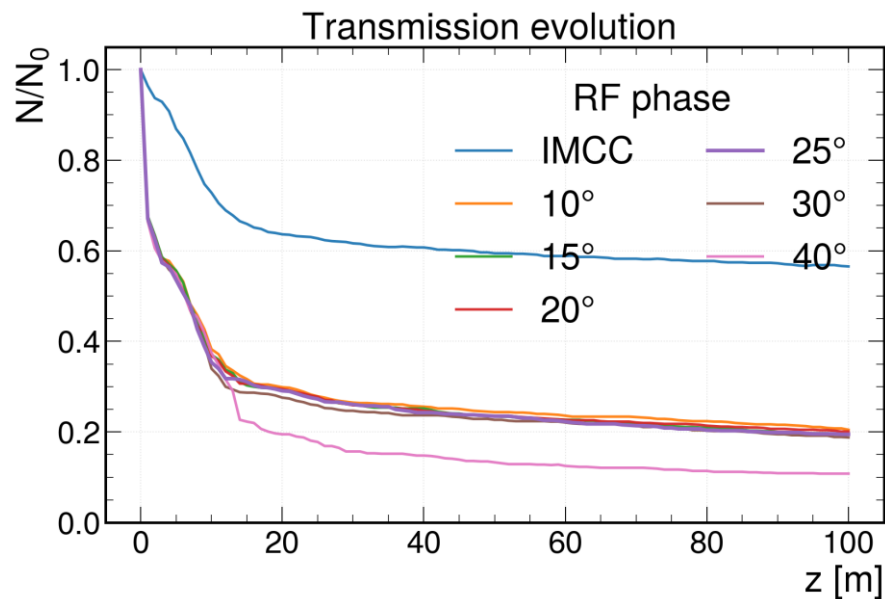
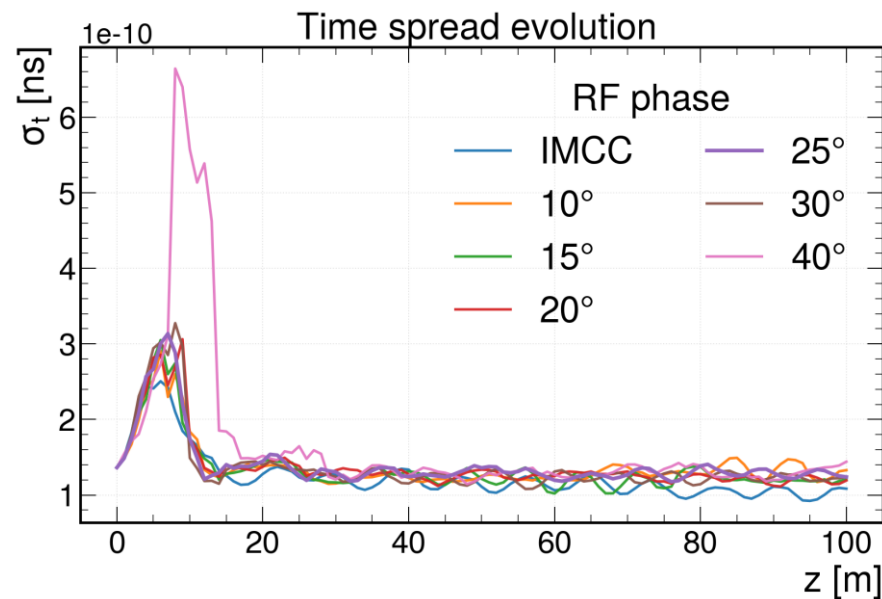
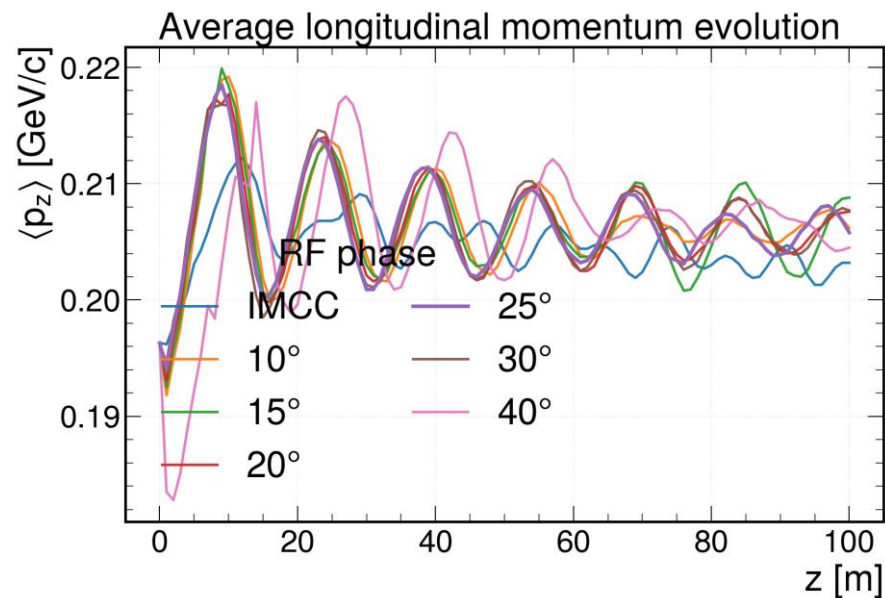
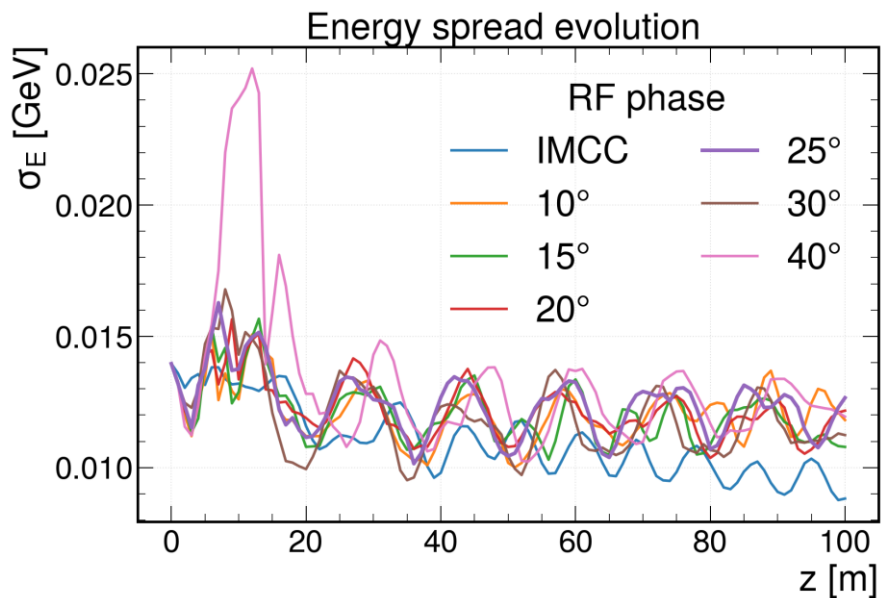
Longitudinal emittance evolution



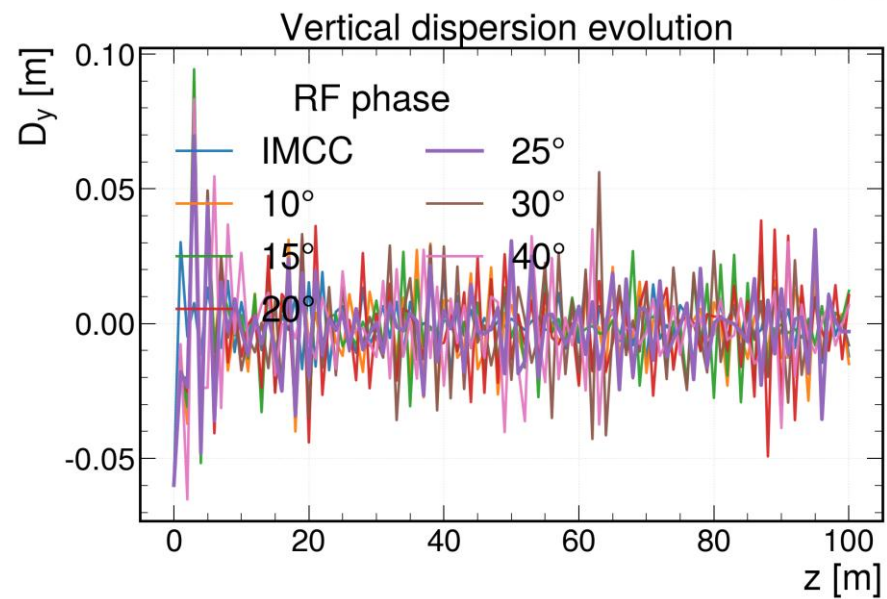
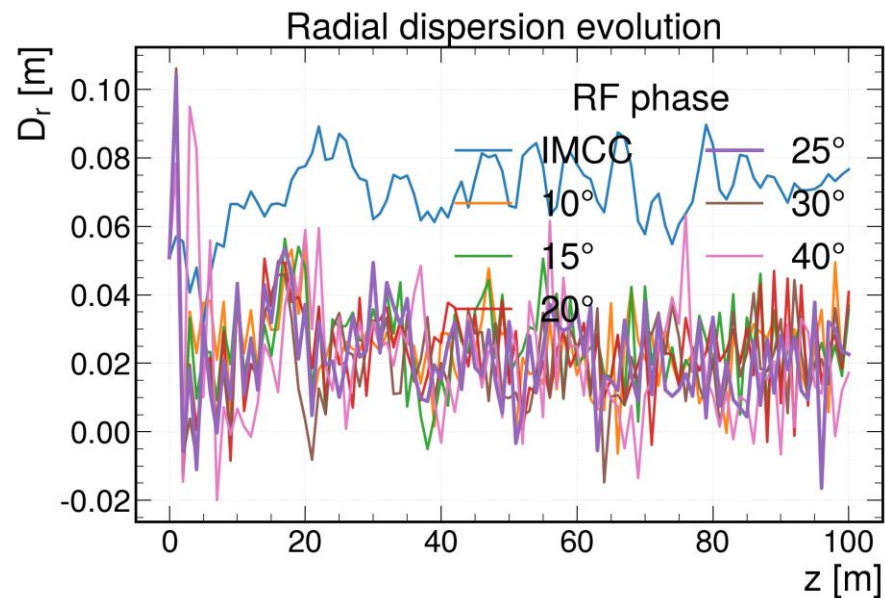
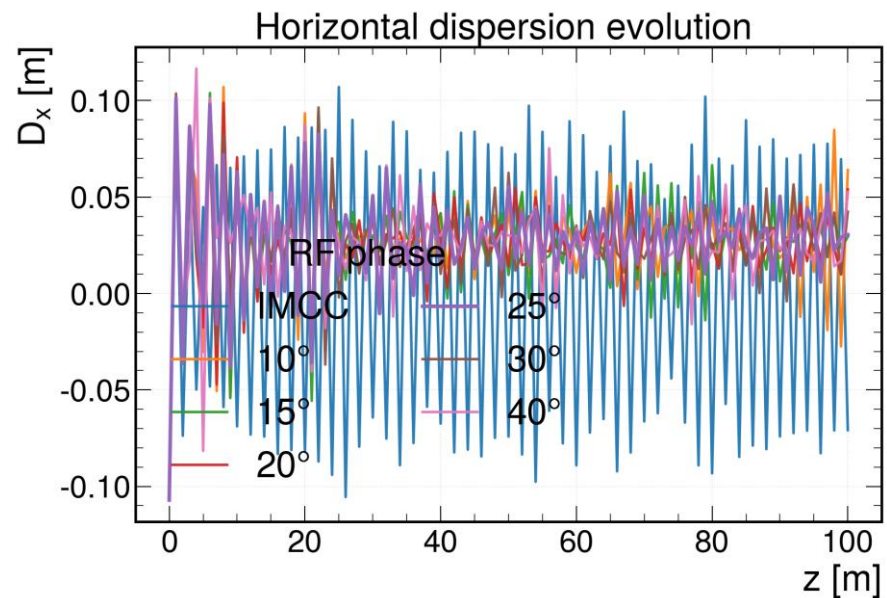
6D emittance evolution



# Beam Properties Calculate by ECALC9 (Tilt 1 Degree, RF Scan)



# Beam Properties Calculate by ECALC9 (Tilt 1 Degree, RF Scan)



# Next Step

## Current Issue

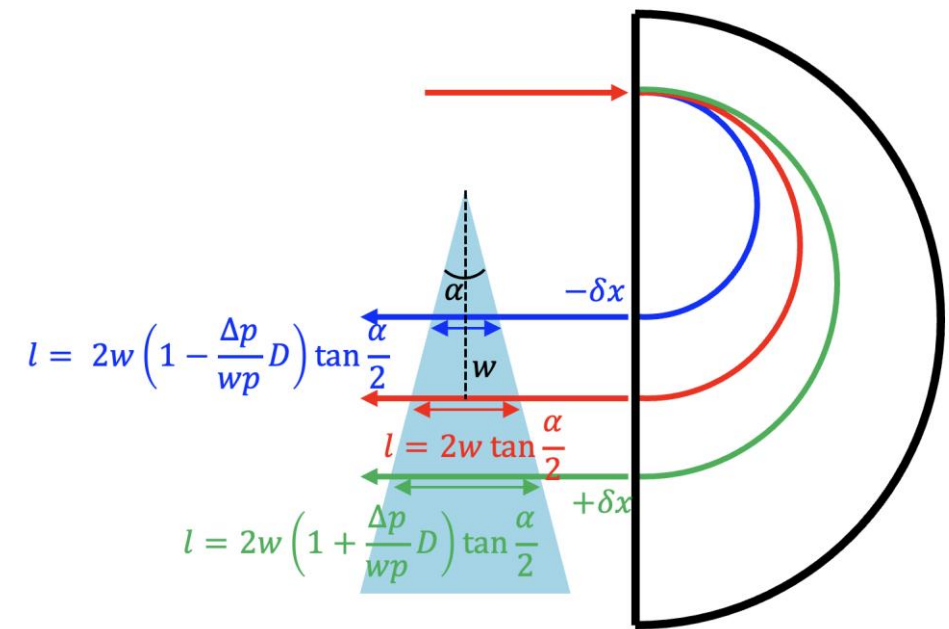
- Reduced dispersion → **insufficient position–momentum separation**
- Wedge is no longer properly matched
- → Inefficient cooling and phase-space exchange

## Proposed Solution

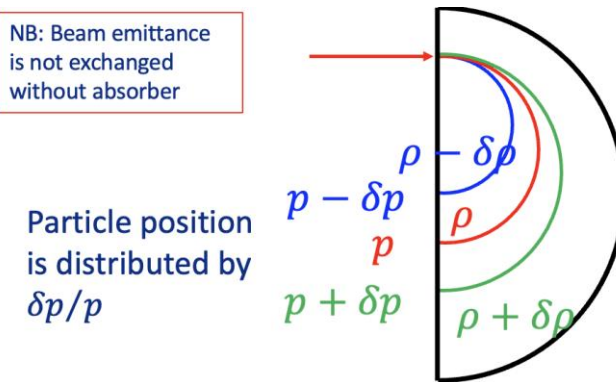
- Use measured **dispersion**  $D(z)$  from tilted solenoid
- Recalculate:
  - wedge angle  $\alpha$
  - wedge thickness / geometry
- Ensure wedge thickness matches:
  - particle displacement  $x(D, \delta p/p)$

## Goal

- Restore optimal **longitudinal–transverse emittance exchange**
- Fix mismatch in early cells
- Improve overall cooling performance



NB: Beam emittance is not exchanged without absorber



Top view of dipole magnet

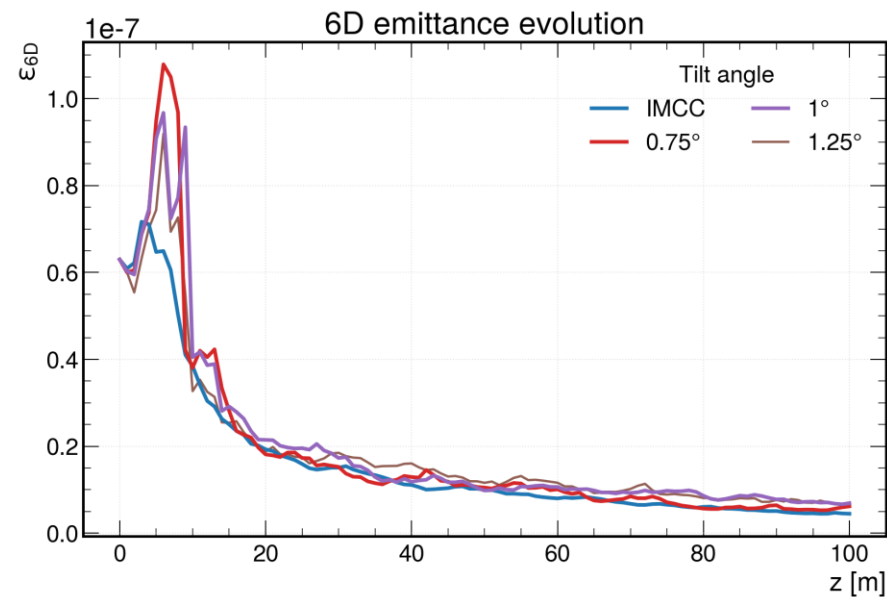
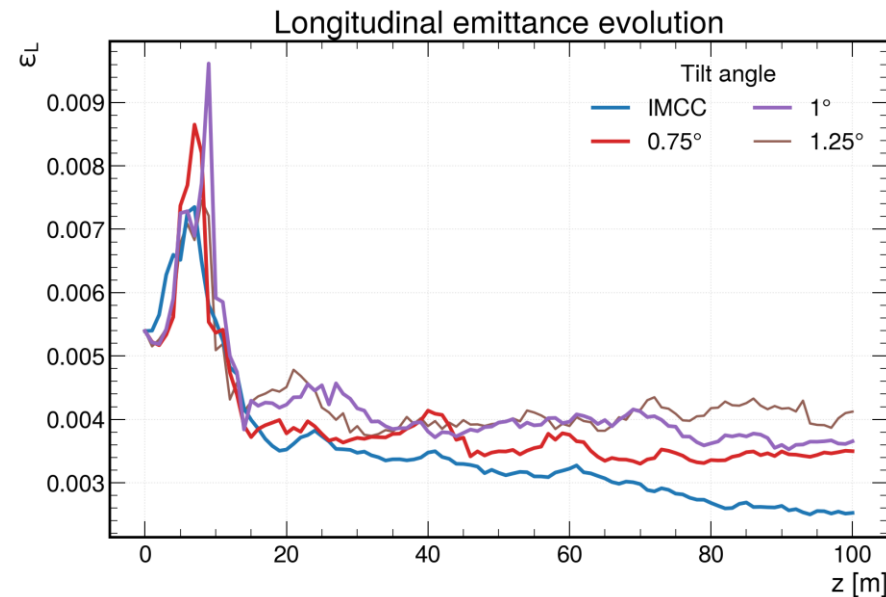
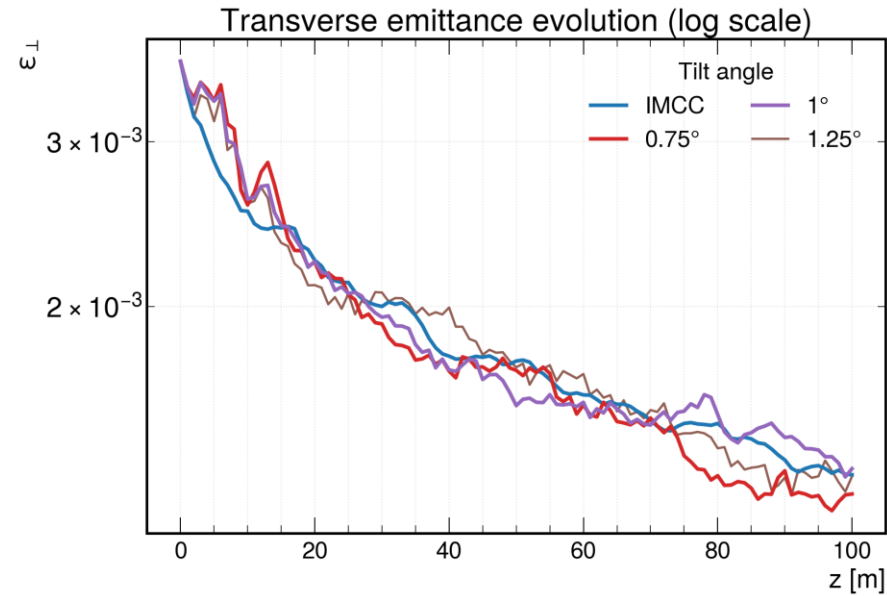
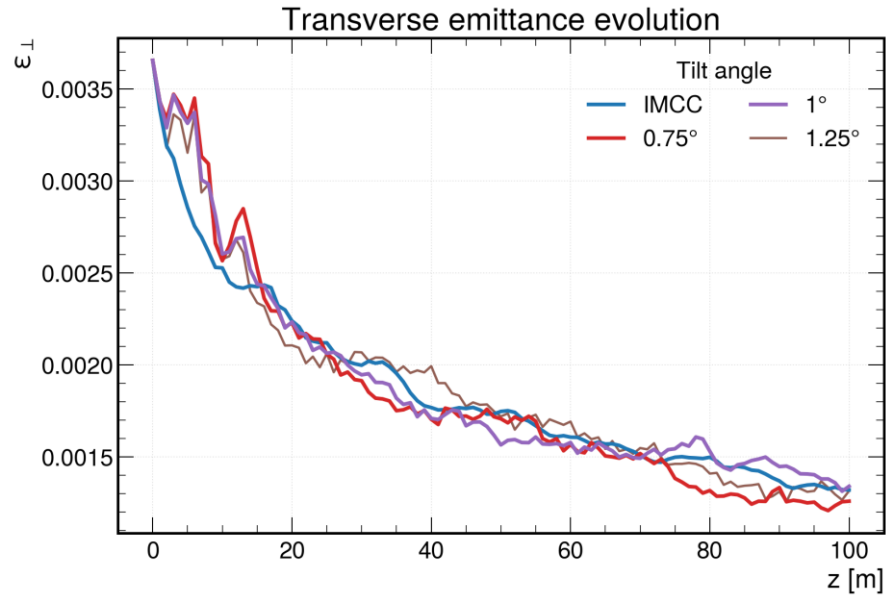
This phenomenon is called dispersion

$$D = p \frac{d\rho}{dp}$$

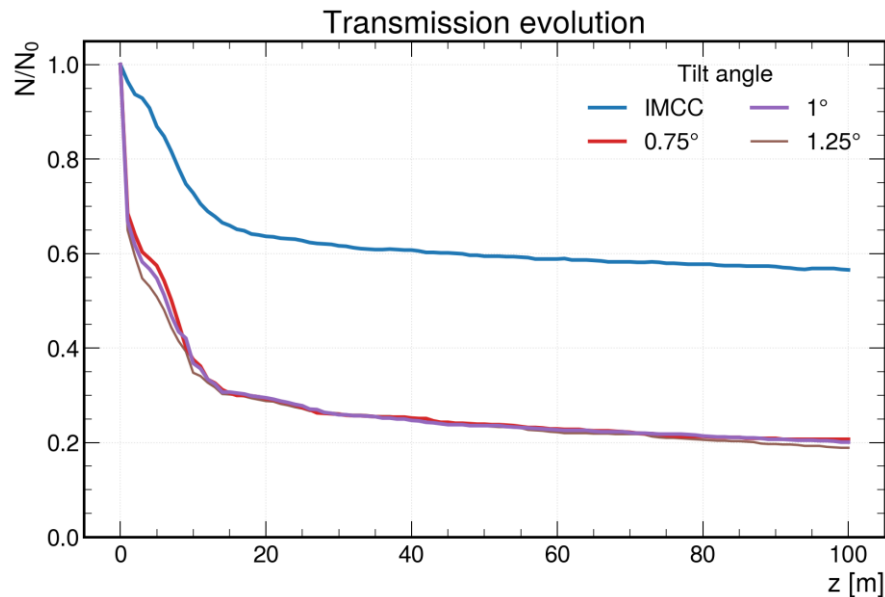
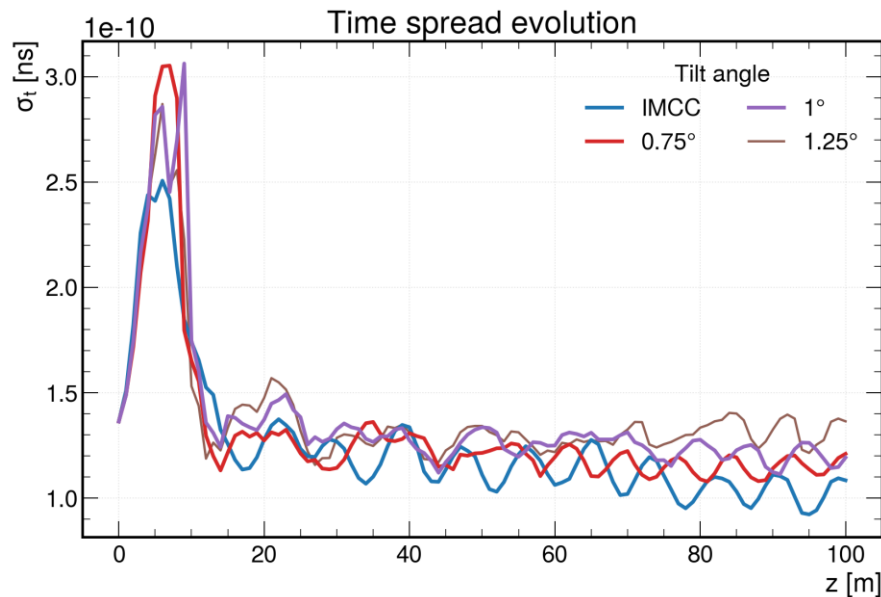
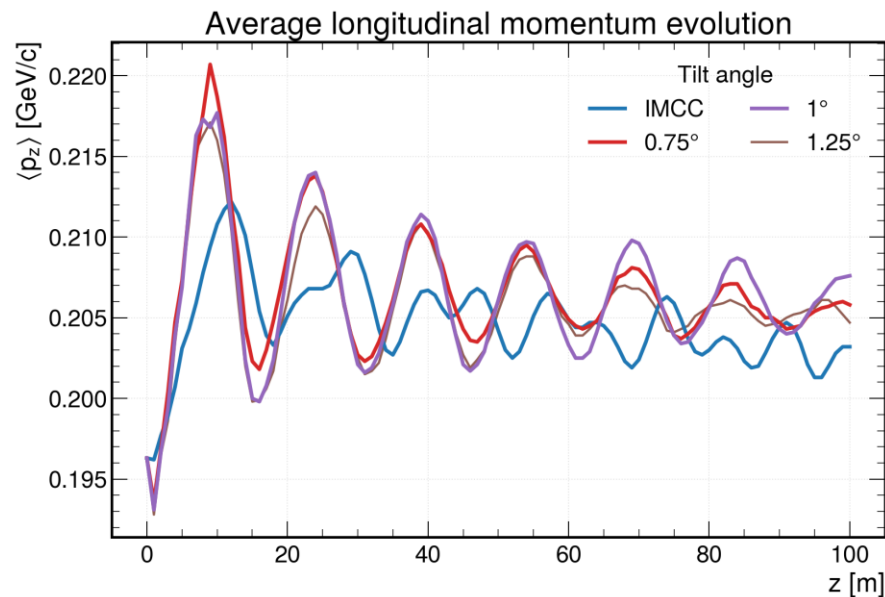
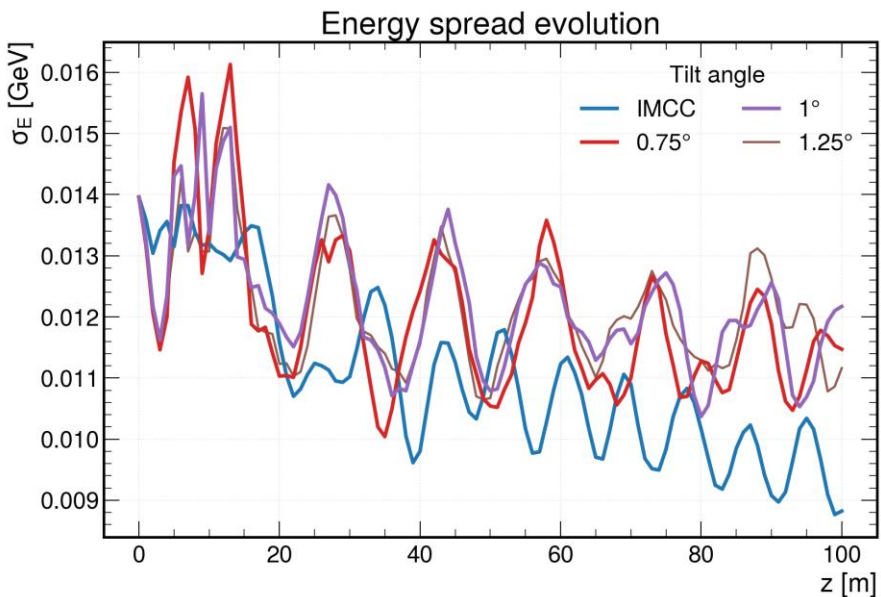
Katsuya



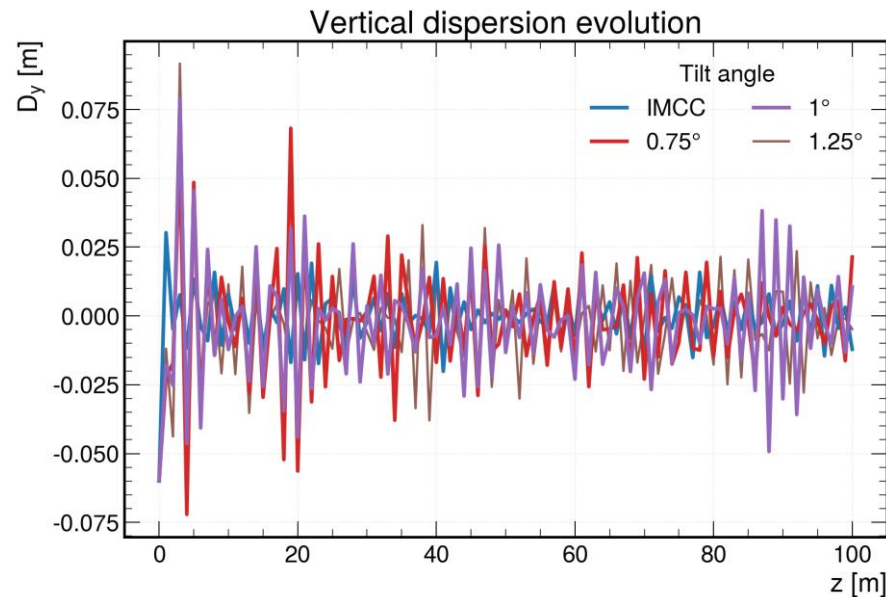
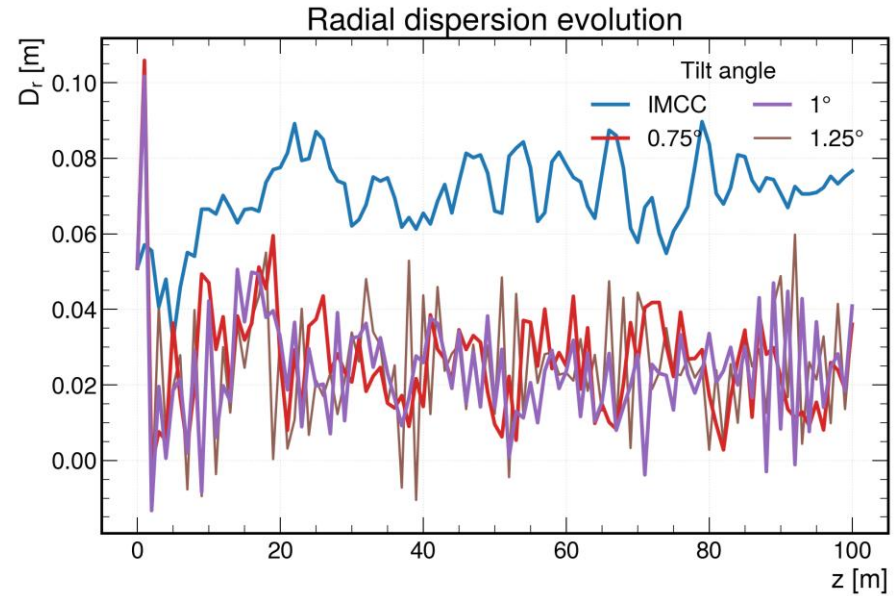
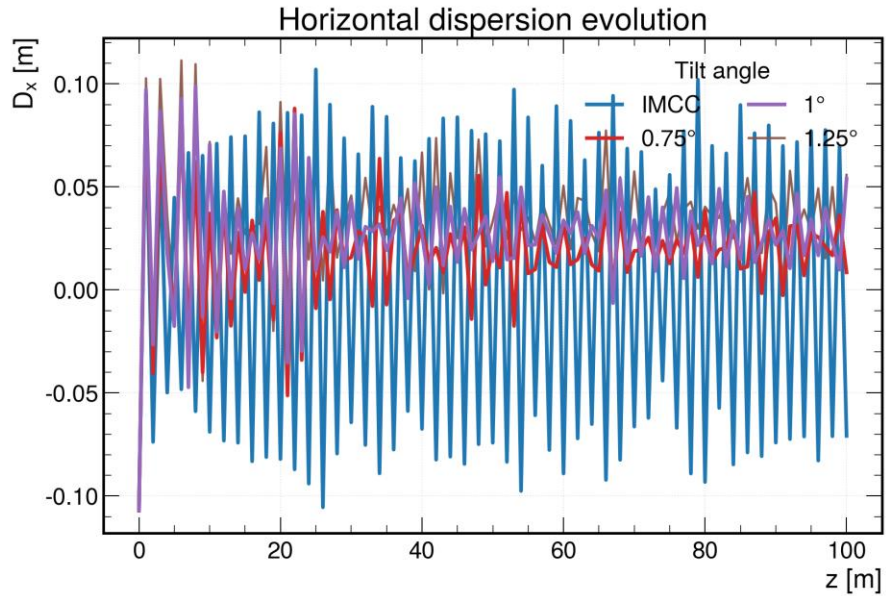
# Beam Properties Calculate by ECALC9 (Tilting Angle Scan)



# Beam Properties Calculate by ECALC9 (Tilting Angle Scan)



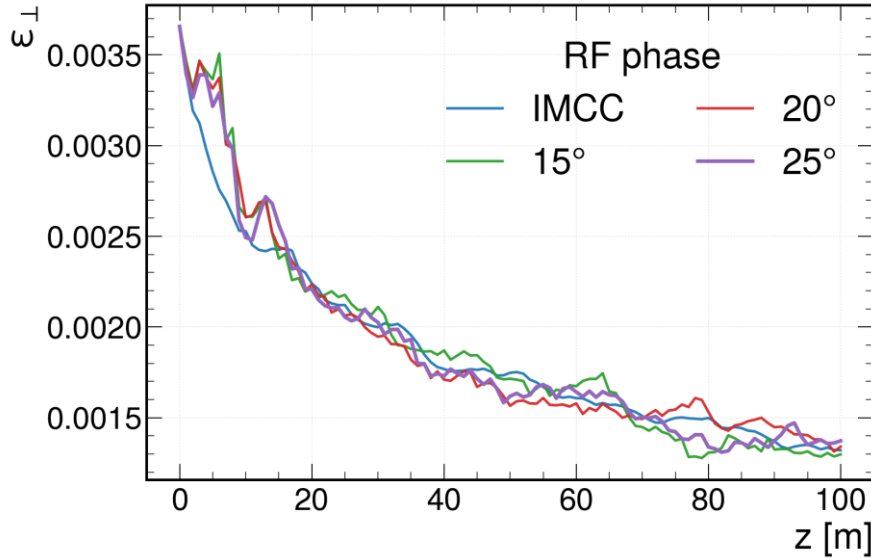
# Beam Properties Calculate by ECALC9 (Tilting Angle Scan)



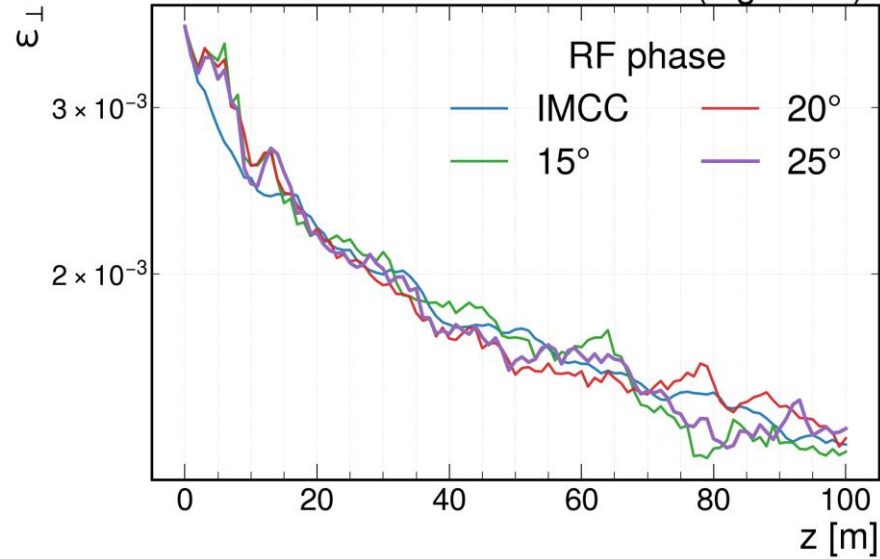
# Beam Properties Calculate by ECALC9 (Tilt 1 Degree, RF Scan)



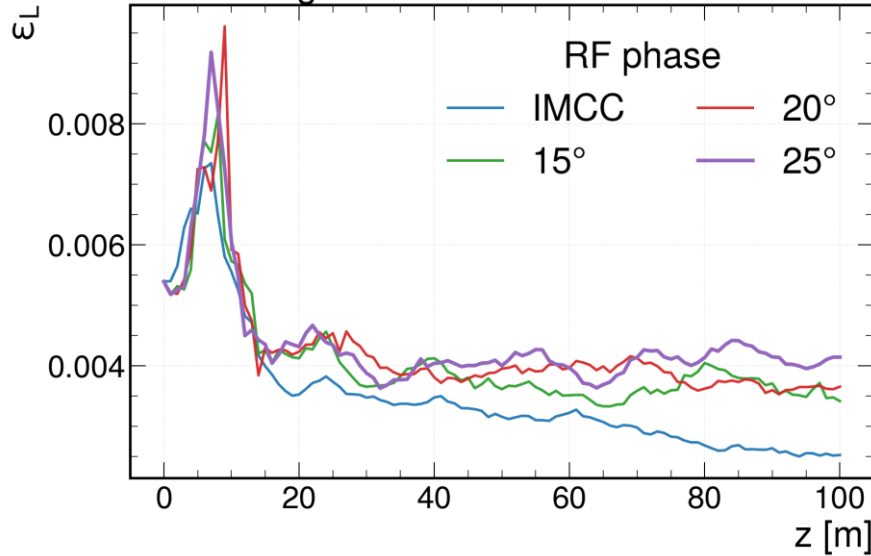
Transverse emittance evolution



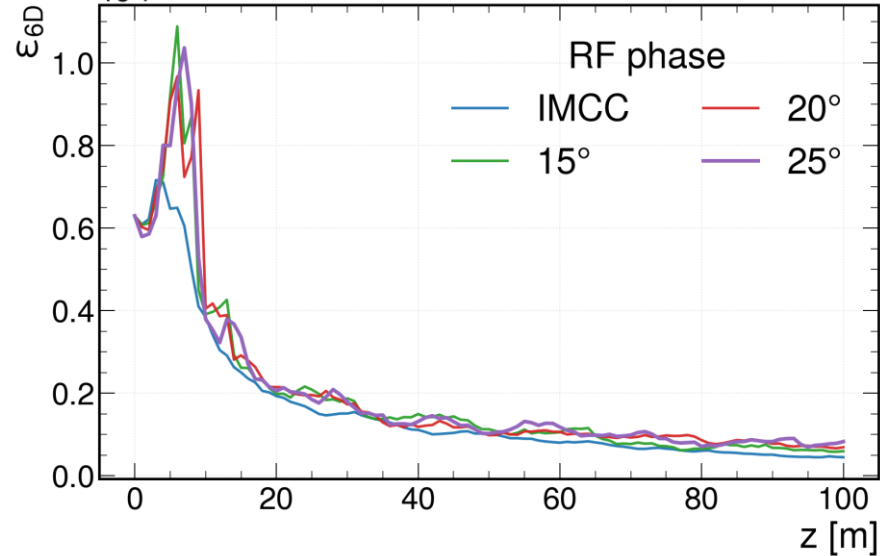
Transverse emittance evolution (log scale)



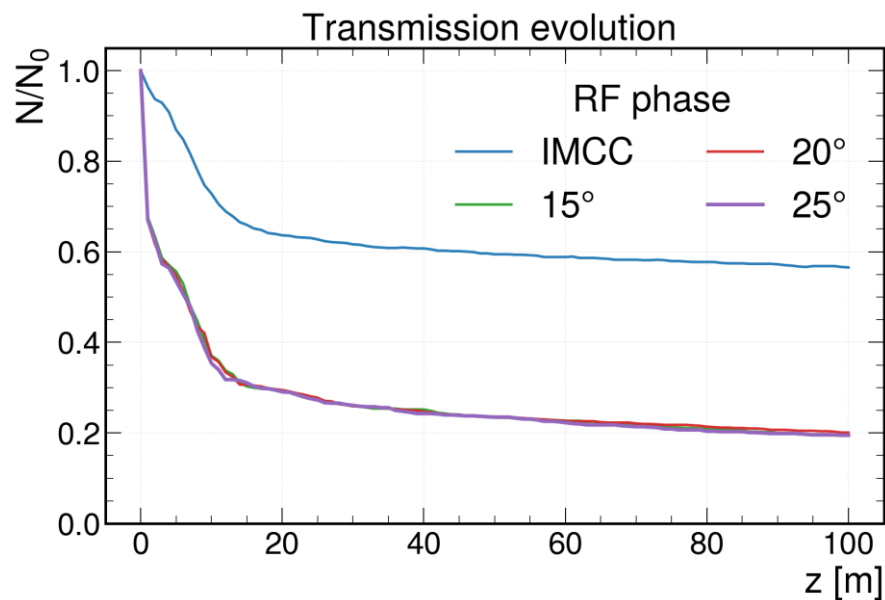
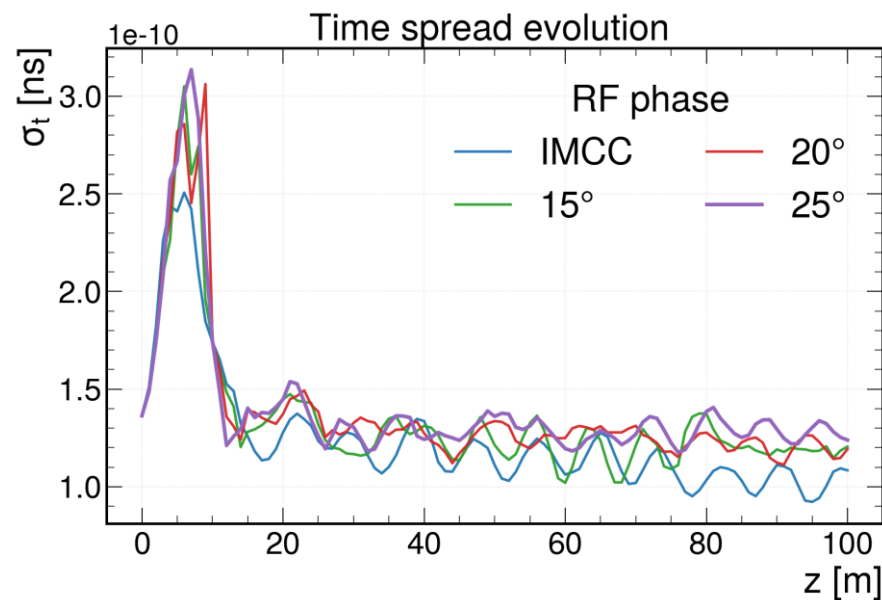
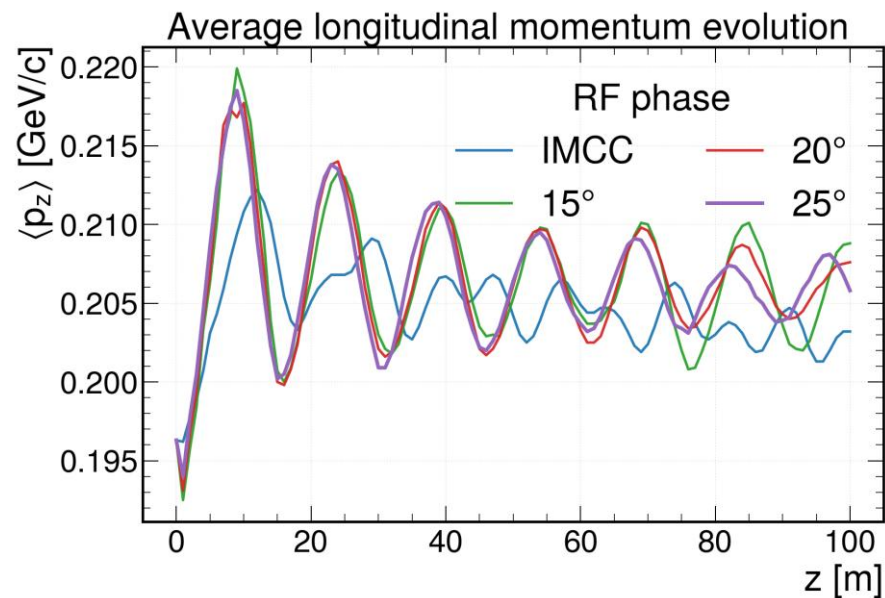
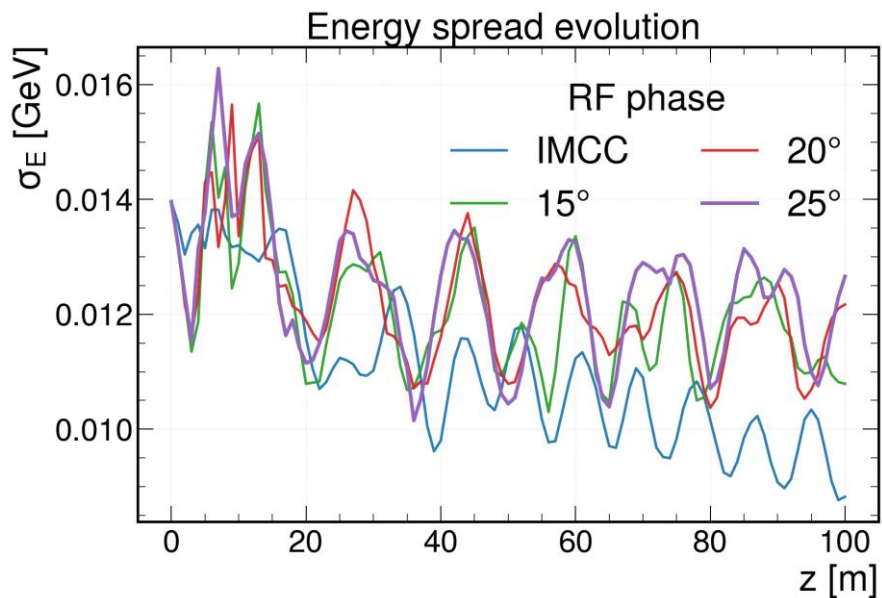
Longitudinal emittance evolution



6D emittance evolution



# Beam Properties Calculate by ECALC9 (Tilt 1 Degree, RF Scan)



# Beam Properties Calculate by ECALC9 (Tilt 1 Degree, RF Scan)

