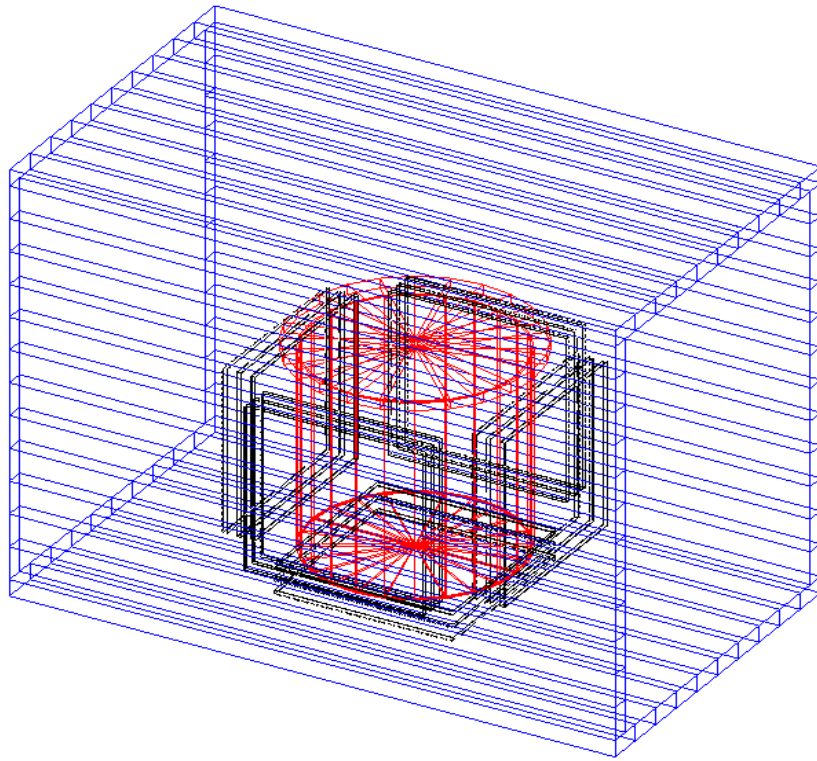


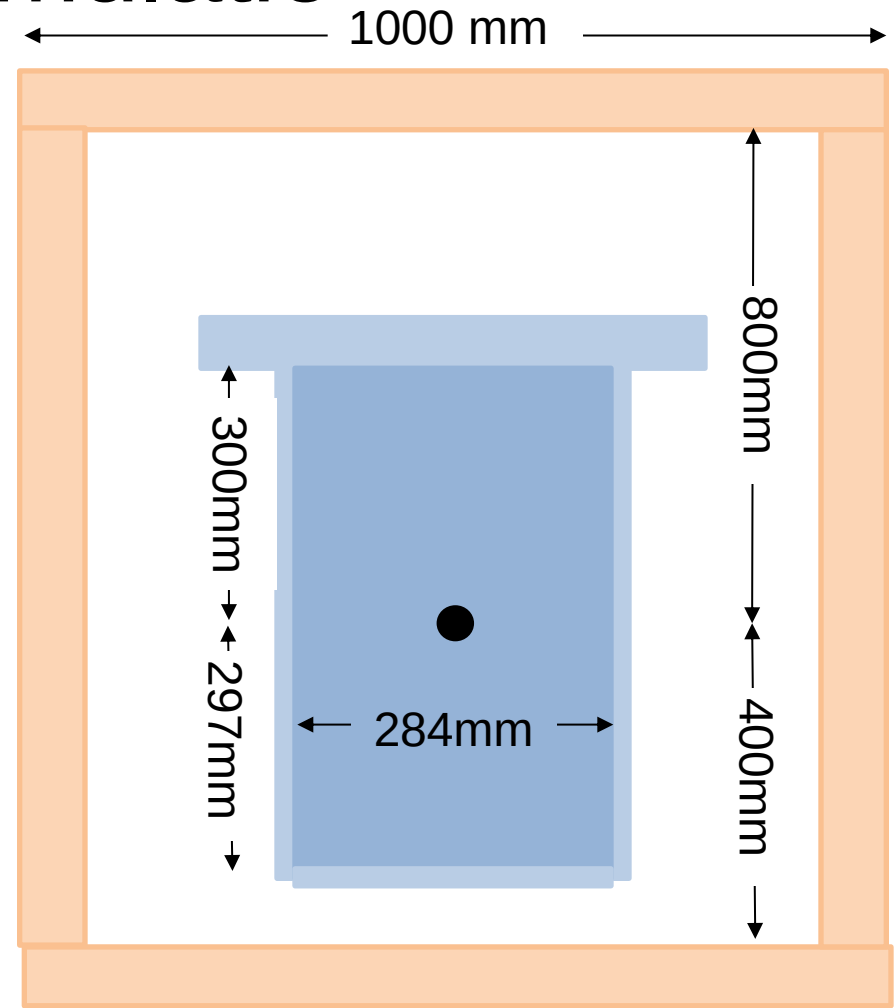
GBAR TOF Final Configuration Simulation Improvement

Seoul National University

Geometry of Simulation



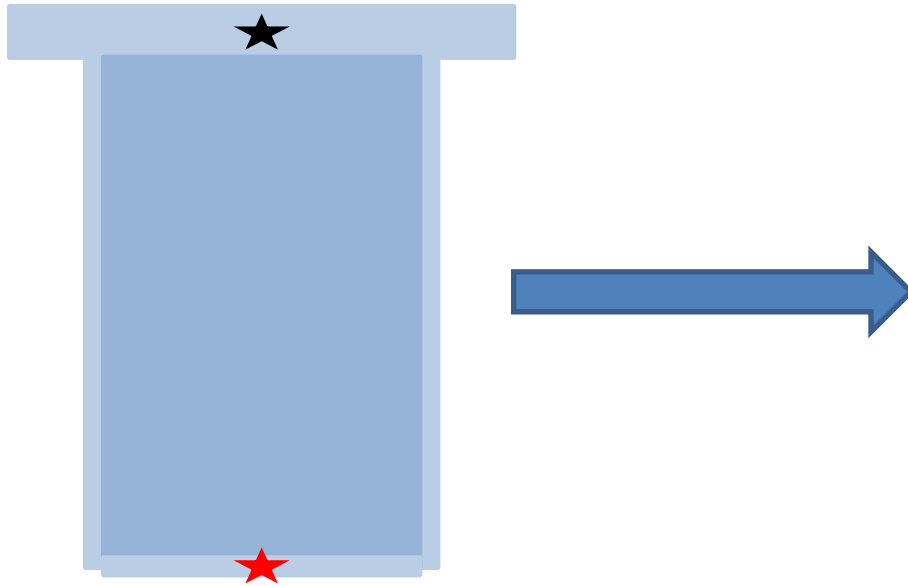
Overall



FF Chamber and TOF detector

Improvement

Add physical process



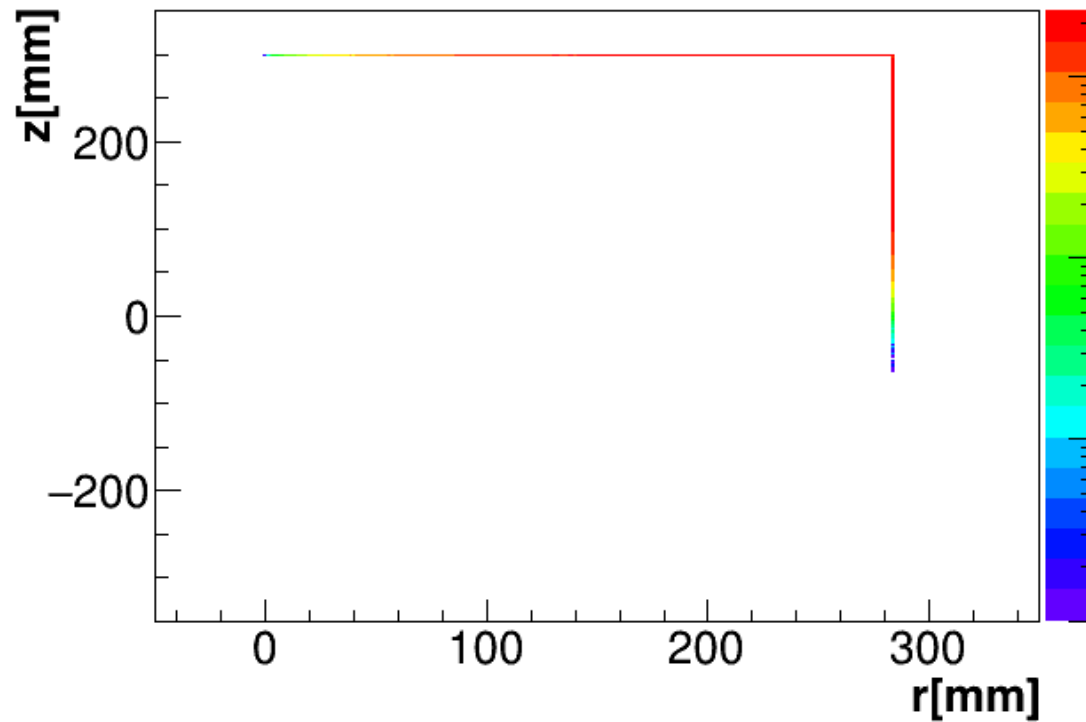
1. Thermal energy of Hbar^+ ion
2. Momentum from laser
3. Recoil momentum from positron detachment
4. Free fall under the gravity
5. Set the chamber hit position to an annihilation position

Originally, an annihilation of a pbar occurs at the top or bottom flange center

Improvement

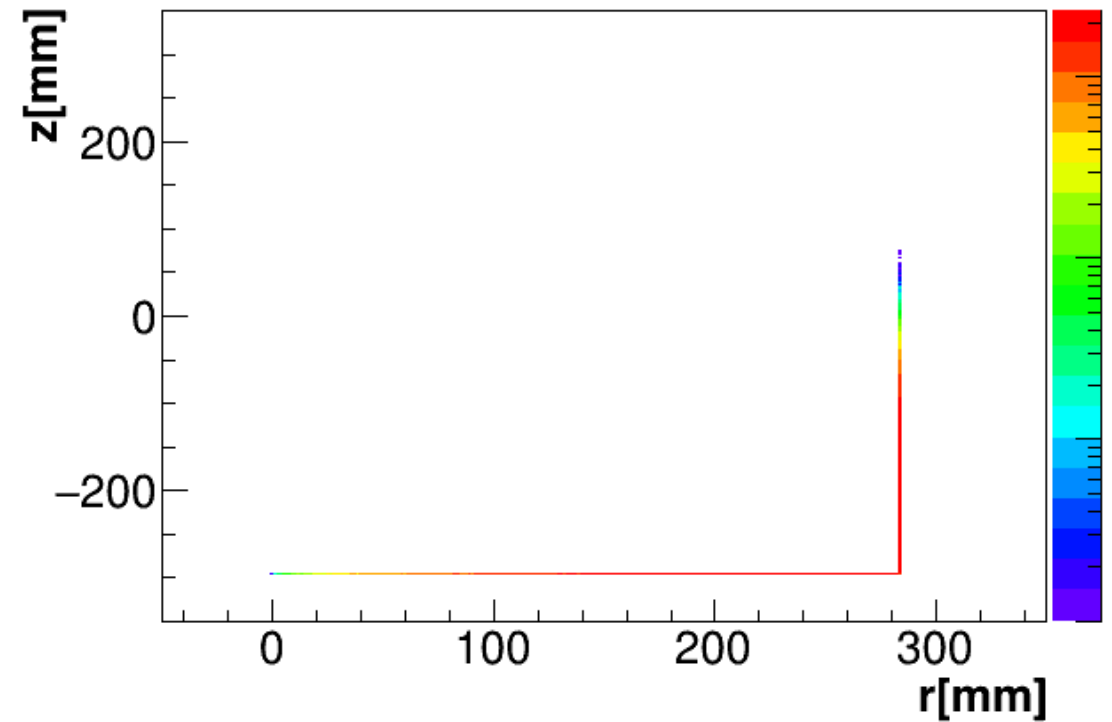
Direction denotes the direction of the motion under the gravity.

Annihilation Position r vs z



Upward direction

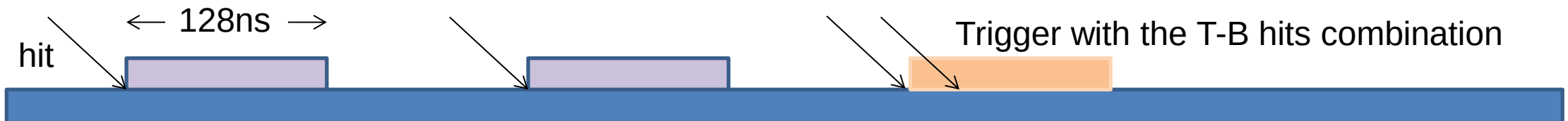
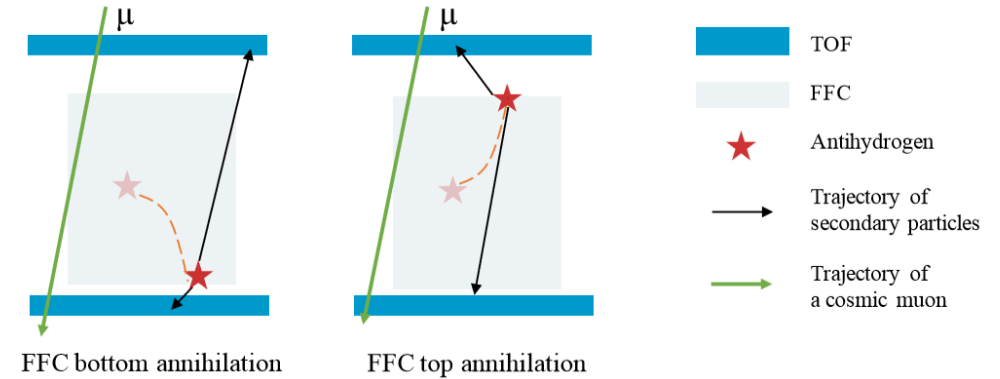
Annihilation Position r vs z



Downward direction

ΔT Distribution Change

- Pbar annihilation : 5×10^5 events
- Cosmic ray : (500ms / pbar annihilation event)
- Denote 500ms as the event window.
- One pbar is annihilated within an event window.
- Pbar annihilation and cosmic ray simulations are independent. (not simultaneous)
- About 5500/(10m x 10m) cosmic rays are generated at 1m above from the FFC center within an event window.
- To integrate the background rejection in the future, Set the trigger window (128 ns).
- If a hit at the TOF detector occurs, a trigger is started.
- $\Delta T = T_{Bottom \text{ fastest TOF hit}} - T_{top \text{ fastest TOF hit}}$ within a trigger
- $R(\text{histogram filling ratio}) = (\# \text{ of triggers with the T-B hits combination}) / (\# \text{ of total triggers})$



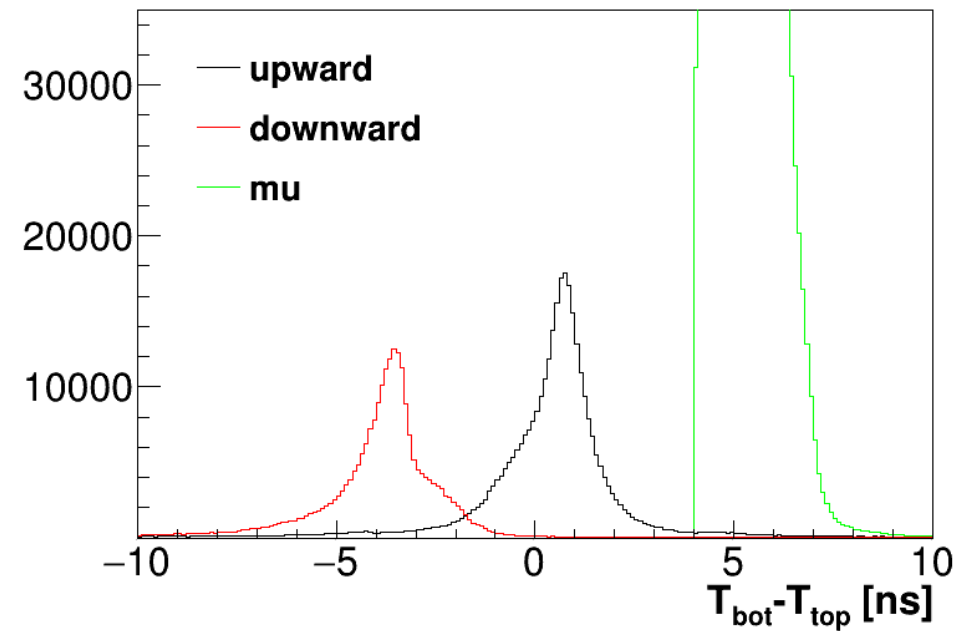
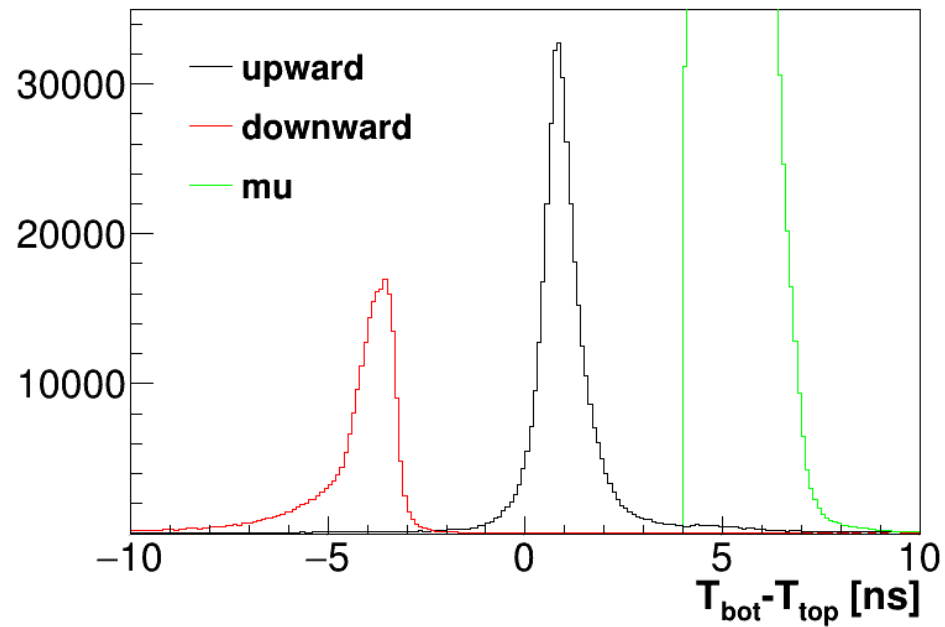
ΔT Distribution Change

- Since the trigger window is much wider than resolution, R remains almost the same when the resolution is changed

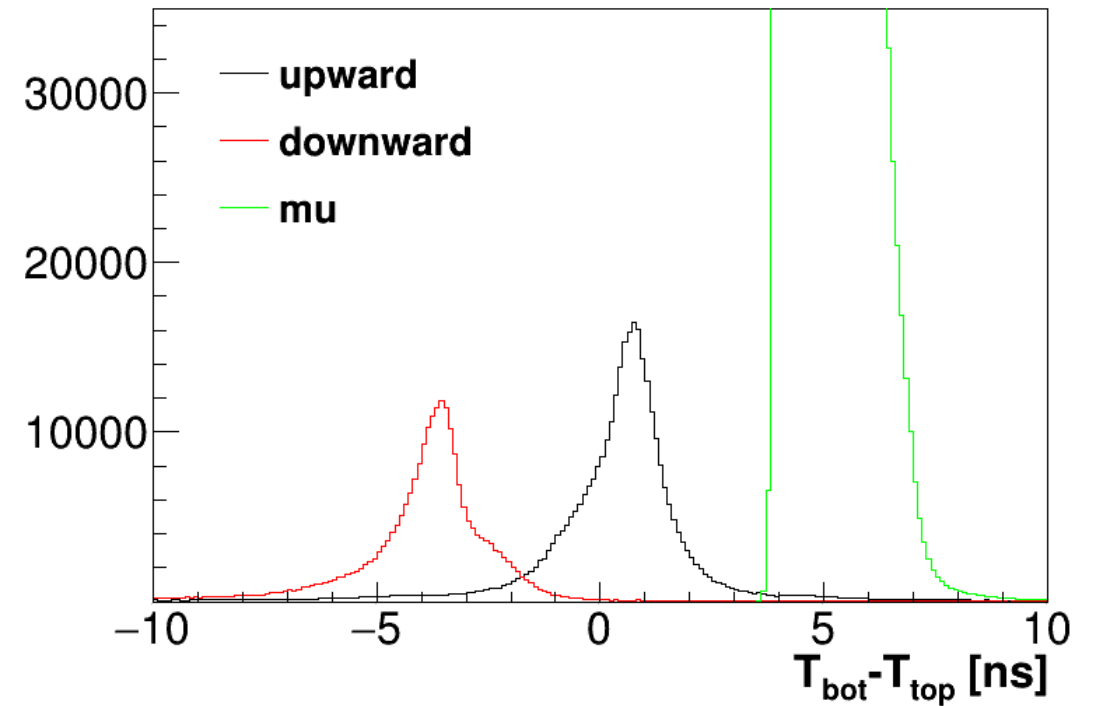
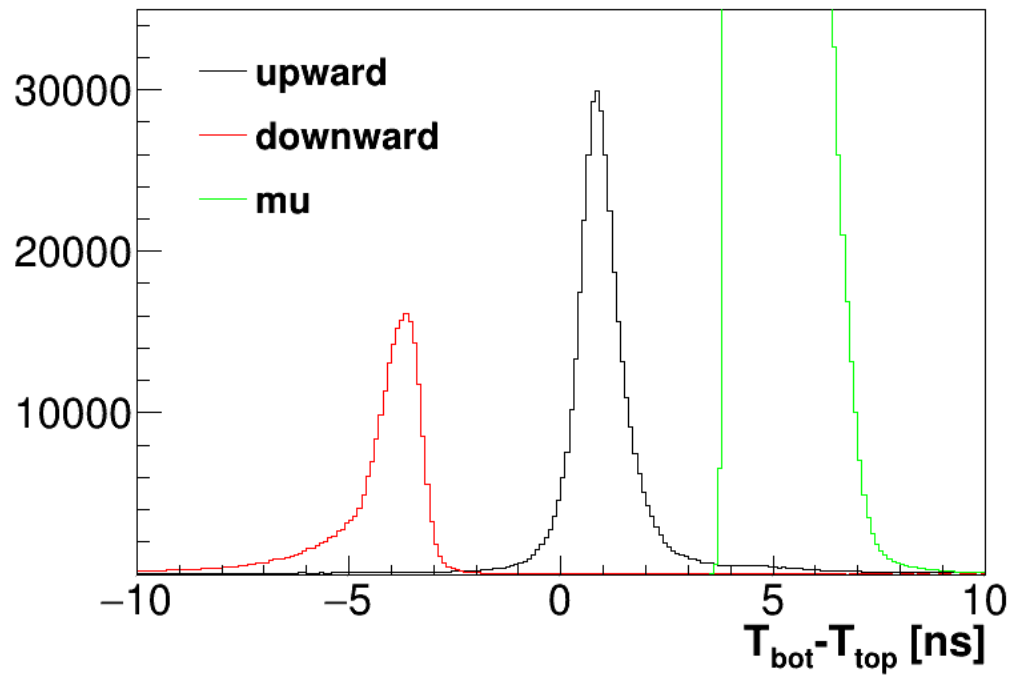
Average # of trigger per event window	Old		New		Cosmic ray
	Up	Down	Up	Down	
0	2.90	2.20	2.44	2.12	206
0.1	2.90	2.20	2.44	2.12	206
0.2	2.90	2.20	2.44	2.12	206

R table	Old		New		Cosmic ray
	Up	Down	Up	Down	
Resolution					
0	0.327	0.273	0.327	0.273	0.172
0.1	0.327	0.273	0.327	0.273	0.172
0.2	0.327	0.272	0.327	0.273	0.172

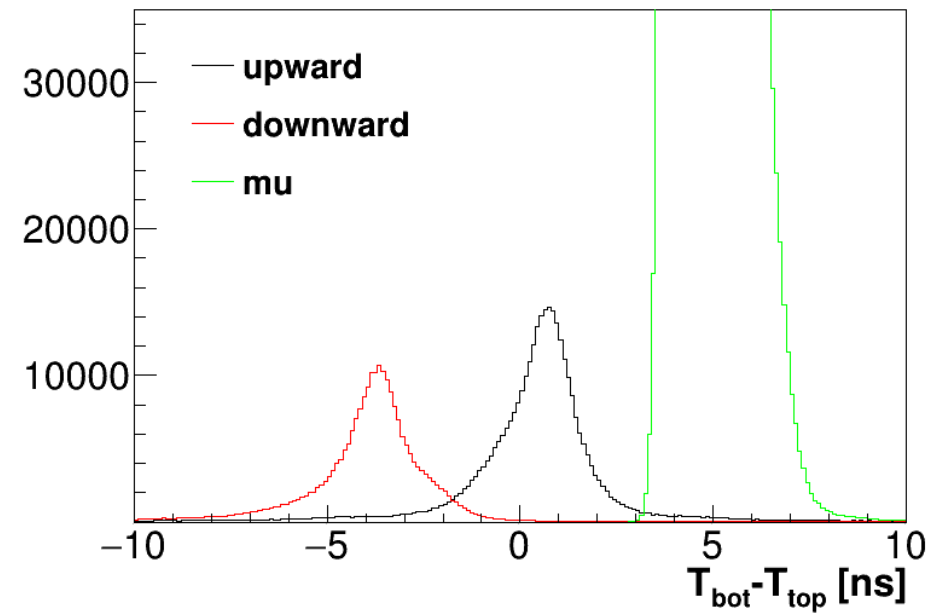
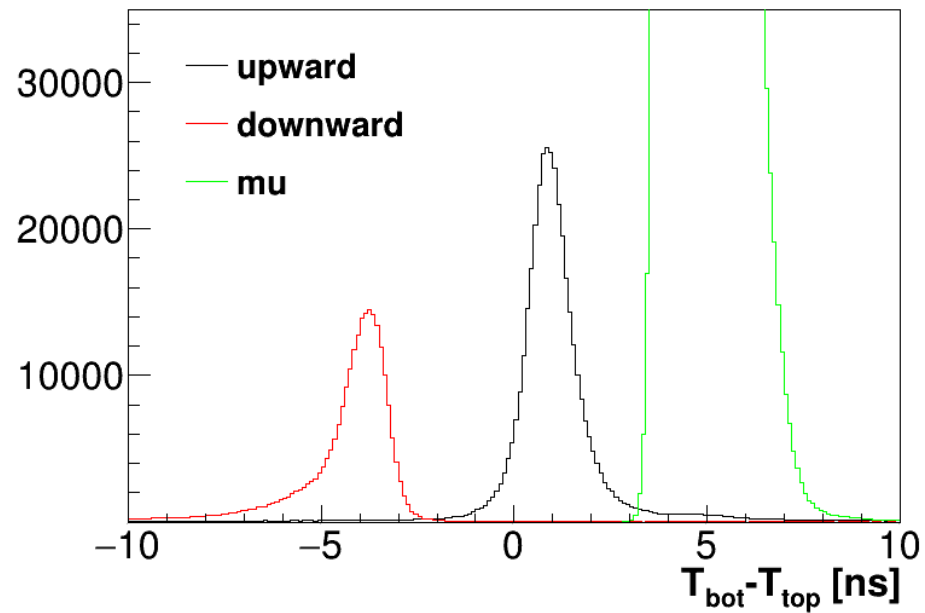
ΔT Distribution Change (resolution: 0 ns)



ΔT Distribution Change (resolution: 0.1 ns)

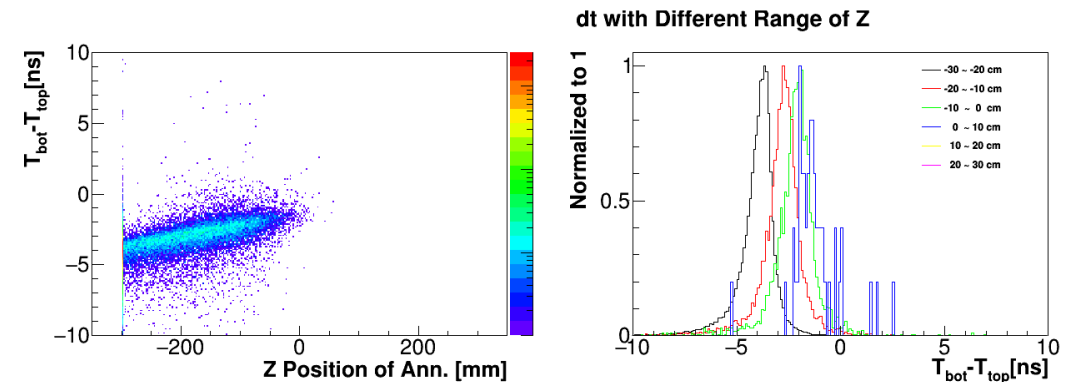
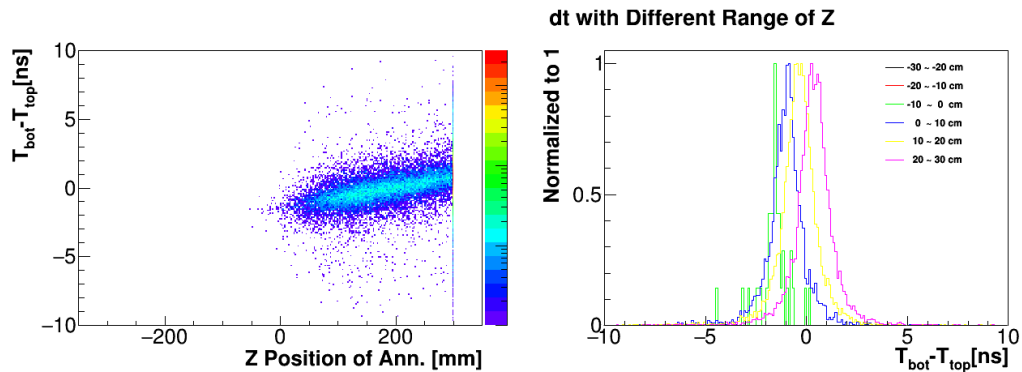
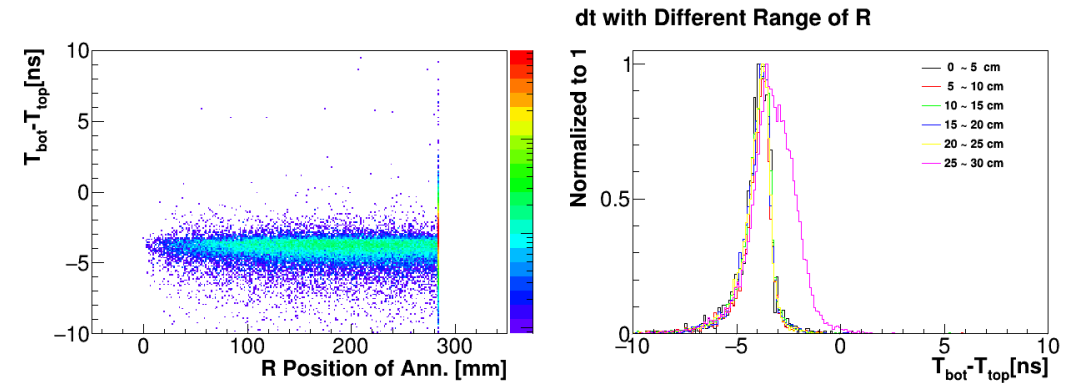
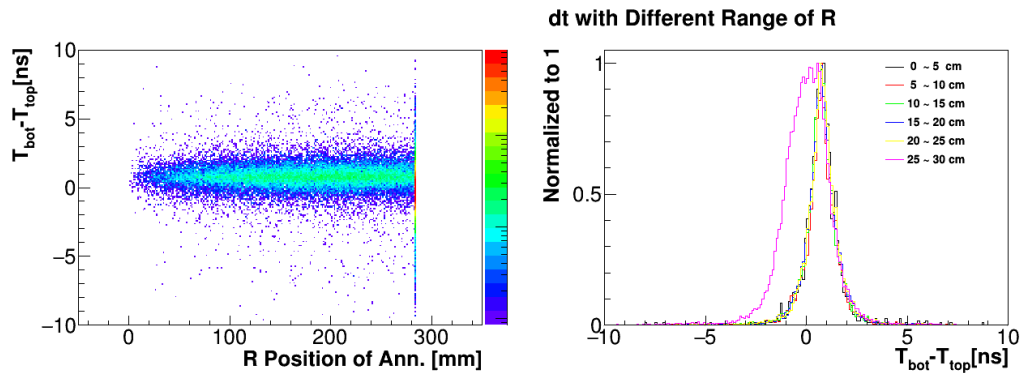


ΔT Distribution Change (resolution: 0.2 ns)



Distribution Broadening (resolution :0ns)

- Because of the Z position of the annihilation

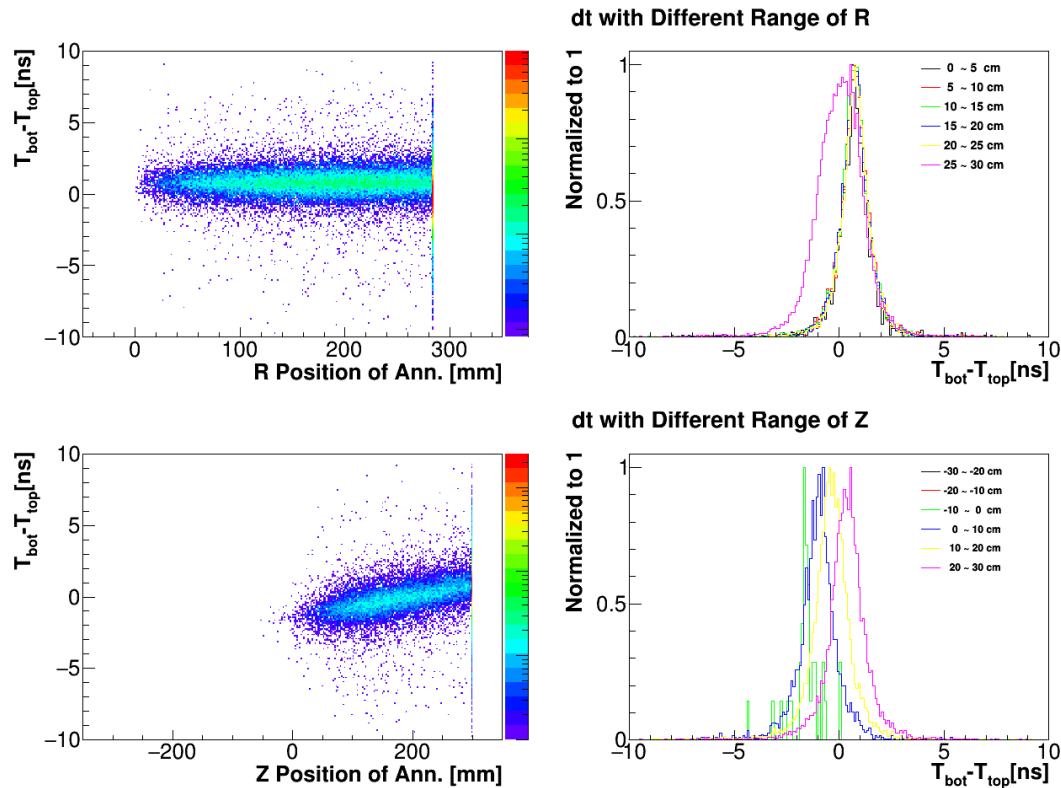


Upward direction

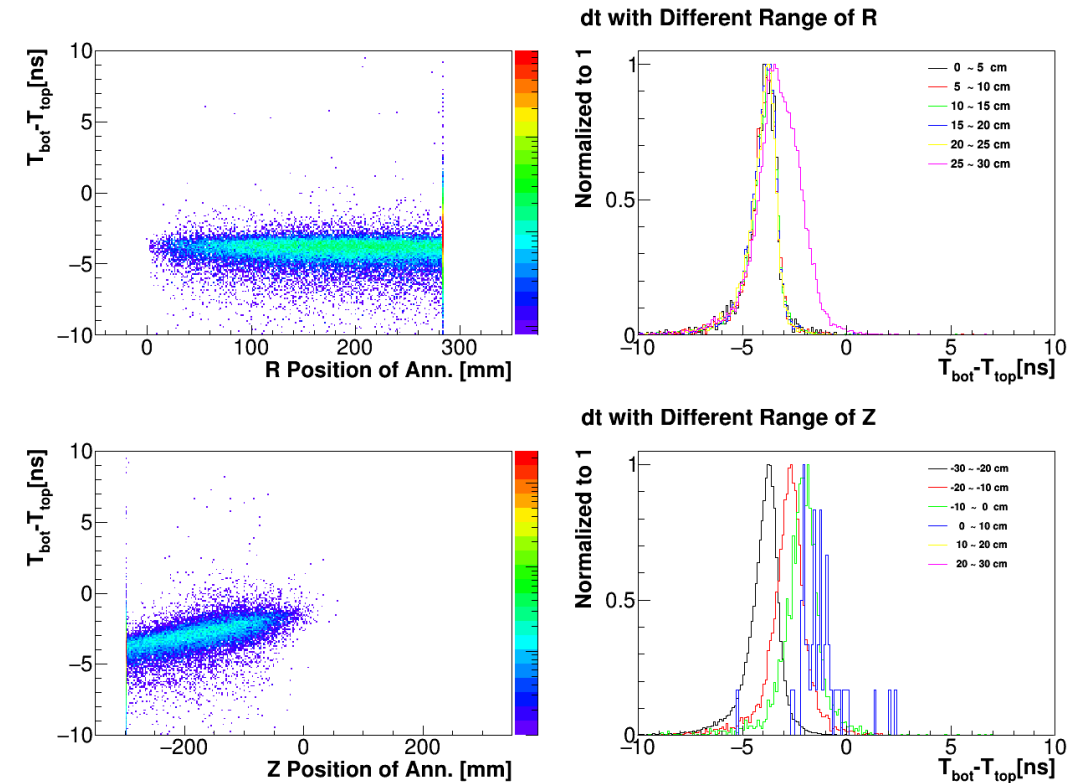
Downward direction

Distribution Broadening (resolution: 0.1ns)

- Because of the Z position of the annihilation



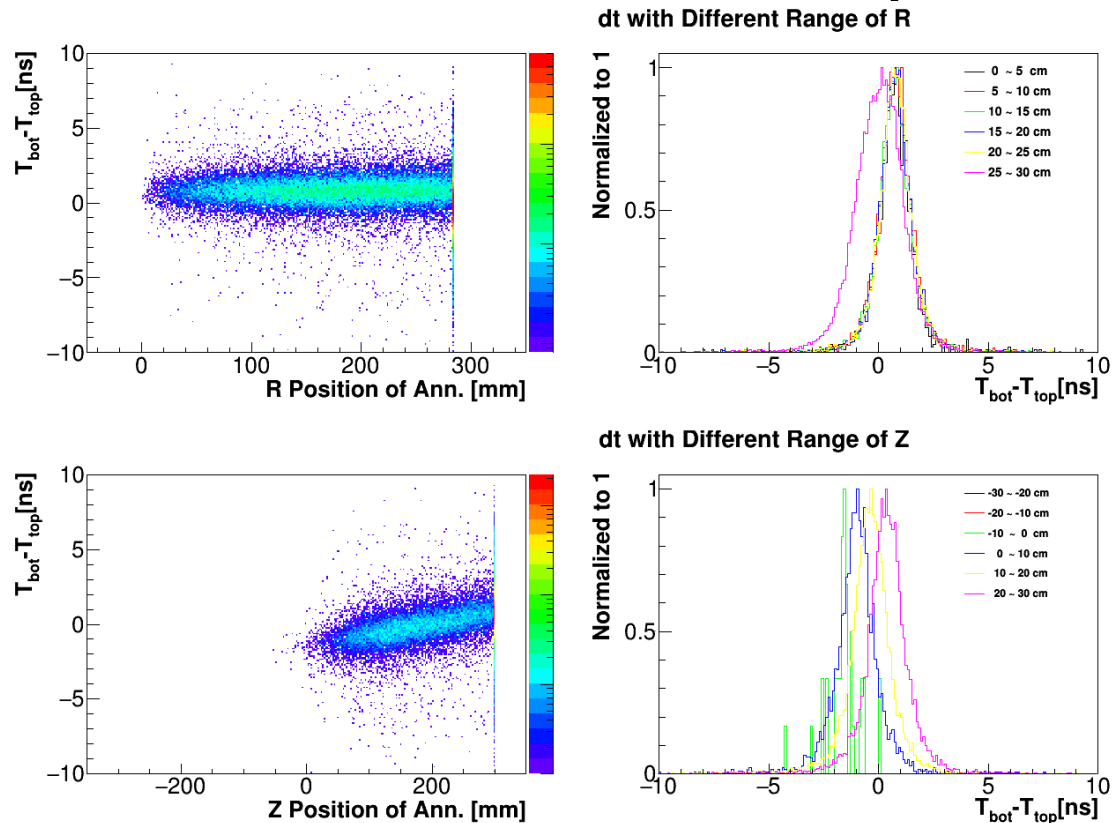
Upward direction



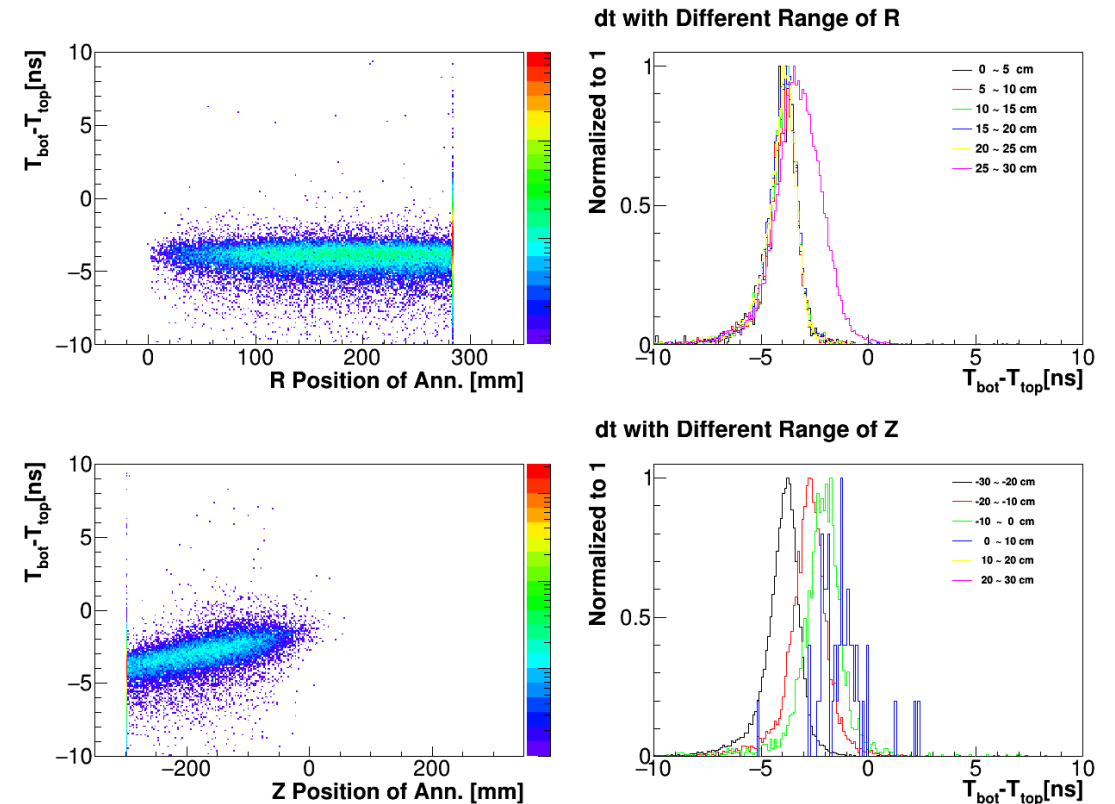
Downward direction

Distribution Broadening (resolution 0.2ns)

- Because of the Z position of the annihilation



Upward direction



Downward direction