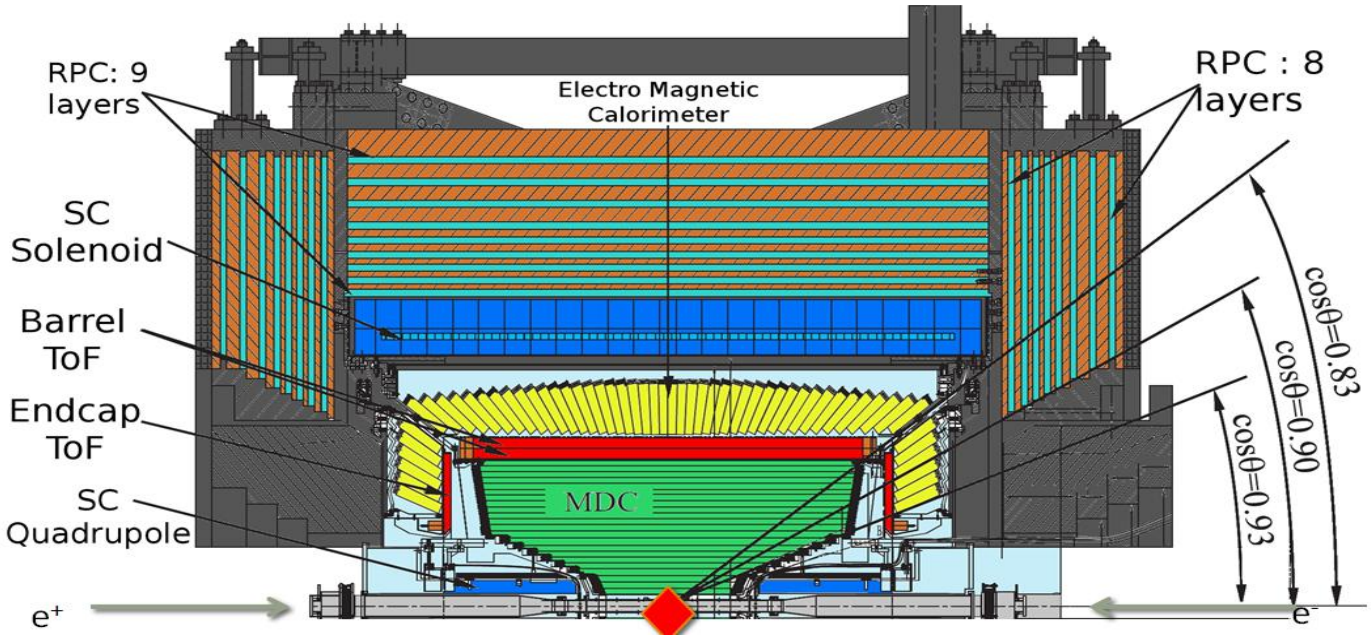
Hardware under BESIII detector

- Drift Chamber (Main Drift Chamber)
- Time of Flight
- Electromagnetic Calorimeter
- Muon Chamber
- Superconducting Magnet



Main Drift Chamber

- The drift chamber is the innermost sub-detector of the BESIII detector. It is one of the most important sub-detectors. Its main functions are:

1. Precise momentum measurement. To achieve this, special cares should be taken to minimize the effects of multiple Coulomb scattering in the design;

2. Adequate dE/dx resolution for particle identification;

3. Good reconstruction efficiency for short tracks from interaction point;

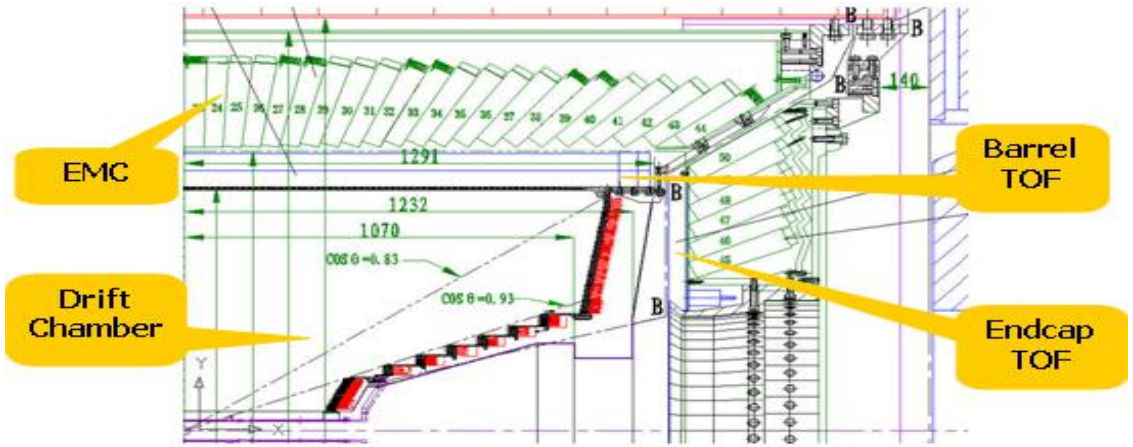
4. Realization of charged particle trigger at level one;

5. Maximum possible solid angle coverage(~ 90%4 π Sr.) for charged track measurement.

- The chamber is designed to consist of two parts, an inner chamber and an outer chamber.
- The inner chamber can be replaced if it malfunctions due to radiation damage. To maximize the polar angle coverage while accommodating the intrusion of the interaction quadruples, the end-plate of the inner chamber is designed to be a tilt shape, while that of the outer chamber has a multi-stepped and tilted shape to reduce the deformation caused by wire tension in large radius.
- The inner diameter of the drift chamber is 118 mm for easy assembly of the beam pipe.
- The physical outer diameter is designed to be 1600 mm to achieve good momentum resolution.
- The length is 2300 mm with the outmost sense wire layer covers a polar angle of $|\cos\theta|=0.83$.

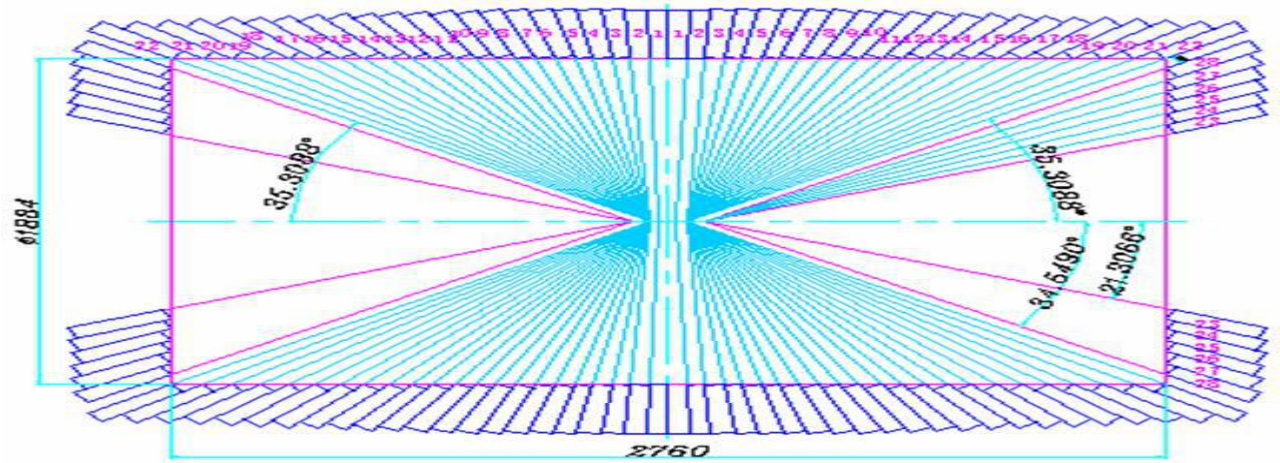
TIme of Flight

- The Time of Flight (TOF) made of plastic scintillator bars and read out by fine-mesh phototubes, is placed in between Drift Chamber and Electromagnetic Calorimeter (EMC).
- It measures the flight time of charged particles in order to identify particle-type.
- The BESIII TOF consists of two parts: The Barrel and Endcap.
- The solid coverage of the barrel TOF is 0.82, and that of the endcap TOF is from 0.85 to 0.95.
- The radius of barrel TOF is from 81 cm to 92.5 cm, and its effective length is 232 cm.



Electromagnetic Calorimeter

- The Electro-Magnetic Calorimeter (EMC) plays an important role in the BESIII detector, whose primary function is to measure precisely energies and positions of electrons and photons.
- The Calorimeter is comprised of one barrel and two endcap sections covering 93% of 4π.
- The barrel has an inner radius of 940mm and a length of 2750mm and covers the polar angle of 0.83.
- The endcap has inner radius of 500mm are placed at z = ± 1380mm from the collission point and cover the polar angle ranges from 0.85 to 0.93.

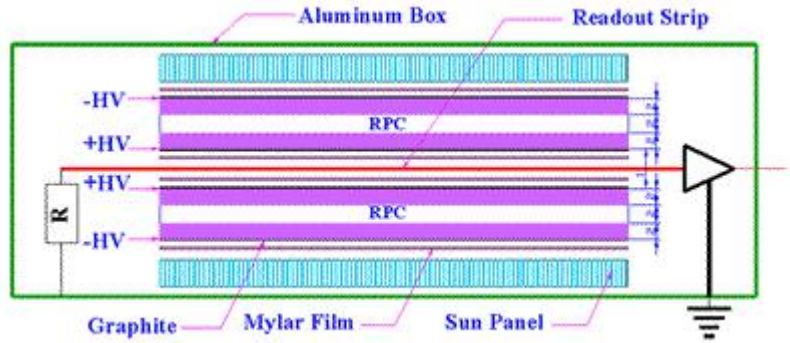


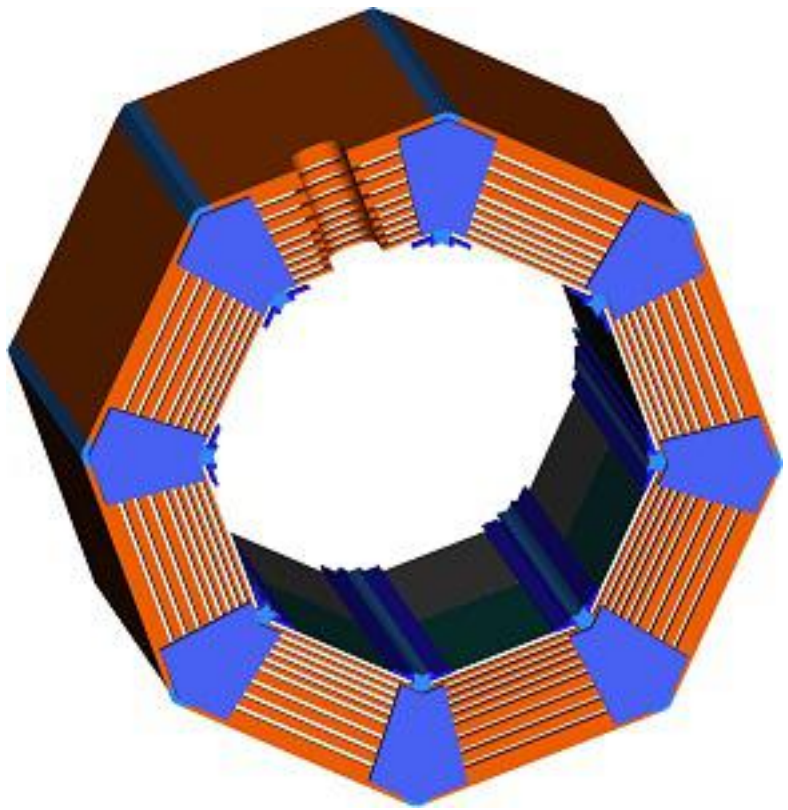
Muon Chamber

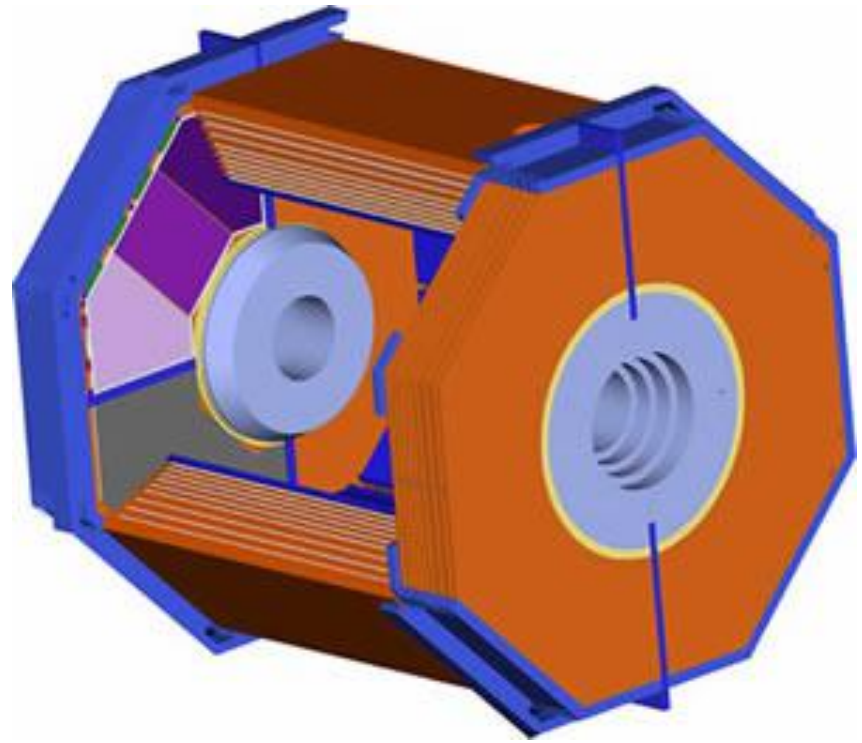
The BESIII muon system is designed to distinguish muons from hadronsby the characteristic hit patterns they produce when penetrating the return yoke of the BESIII magnet

- The BESIII muon counter is a gaseous detector based on Resistive Plate Chambers(RPCs).
- The muon detector consists of endcap(east and west) and barrel.
- There are 8 detecting layers in endcap and 9 in barrel, for each layer, it is made up of one superlayer, in which two RPC layers and one pickup strip layer are compacted as Sandwich.
- The total amount of RPC units is 978, and the yielding area is up to 1272m2. Its coverage of the solid angle is about 0.83(cosθ), and the width of readout strip is from 20mm to 39mm with 12mm intrinsic special resolution for all 9152 electronics channels. The gas mixture of Argon(50%), F134a(42%) and iso-butane(8%) is chosen.

website:http://english.ihep.cas.cn/bes/doc/2765.html


Aluminum Box
Readout Strip
-HV
+HV
+HV
-HV
RPC
RPC
R
Graphite
Mylar Film
Sun Panel





Superconducting Magnet

- Magnet system is one of the important parts in BESIII detector. It can provide an axial magnetic field of about 1.0T with a good field uniformity over the tracking volume.
- Main Drift Chamber will measure the trajectories of charged tracks emerging from the collisions in the field, then after doing some research about interaction and law among basic particles is possible.
- Also, the iron absorber plates of the muon detector not only provide the magnetic flux return, but also support the global BESIII detector.
- Based on the physics requirements, the main drift chamber should have a high momentum resolution which is decided by the multiple Coulomb scattering.
- In this situation, it is impossible to improve momentum resolution by improving space resolution and increasing measurement times (increasing layers of sensitive wires), but increasing the magnetic field can improve momentum resolution.
- On the other hand, if the magnetic field is too high, more low-momentum particle would circle around inside the drift chamber and become difficult to measure. Considering all factors, 1.0T as the field of BESIII solenoid magnet has been used.

Thank You!