

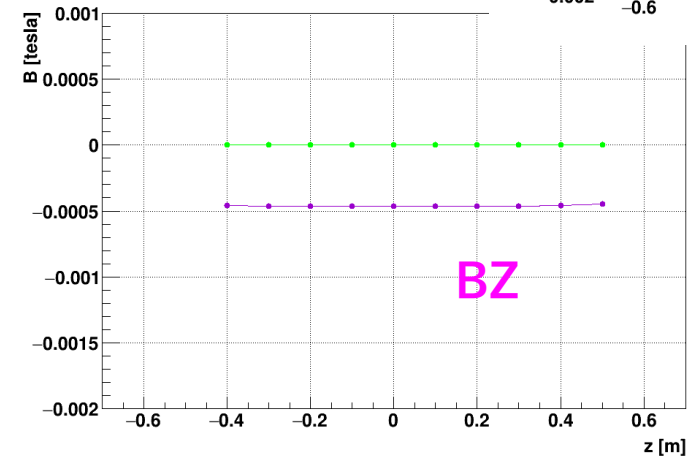
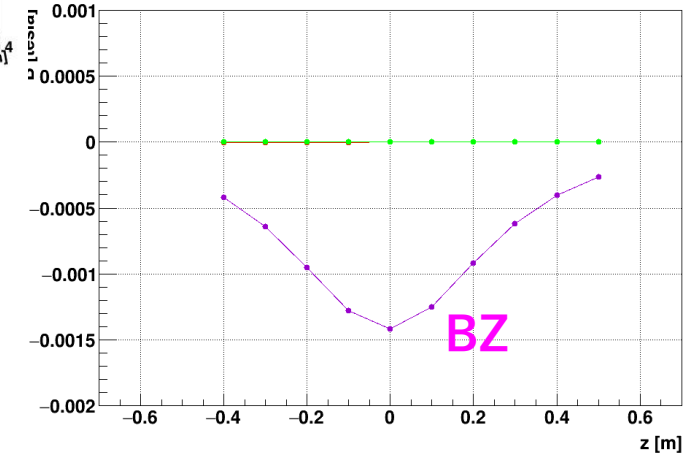
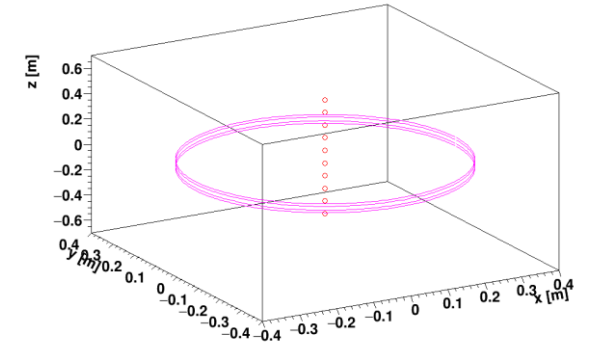
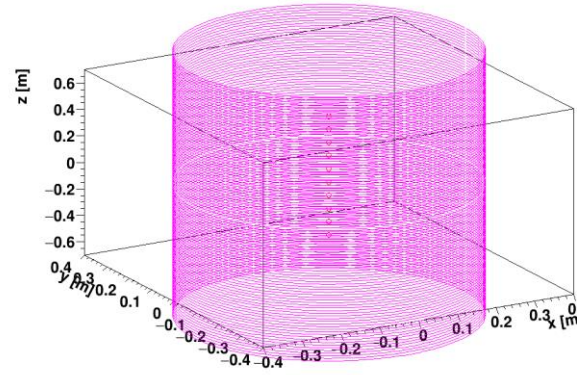
# 課題：

1) 1本の円電流を用いた磁場計算～100本の円電流を用いた磁場計算

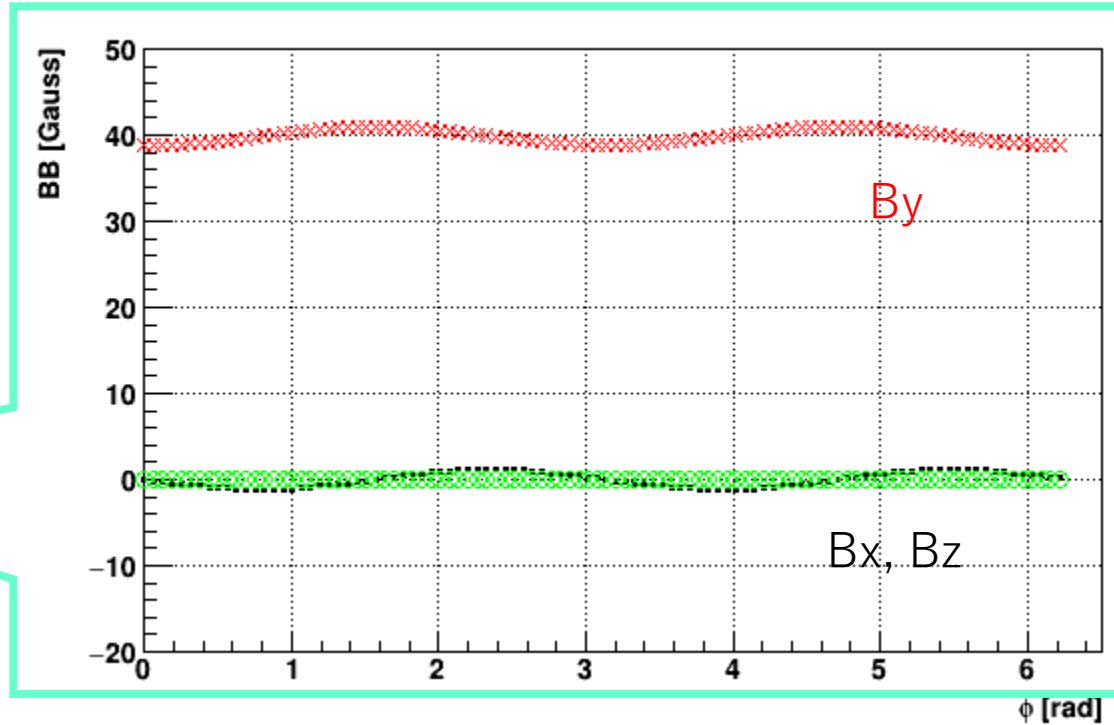
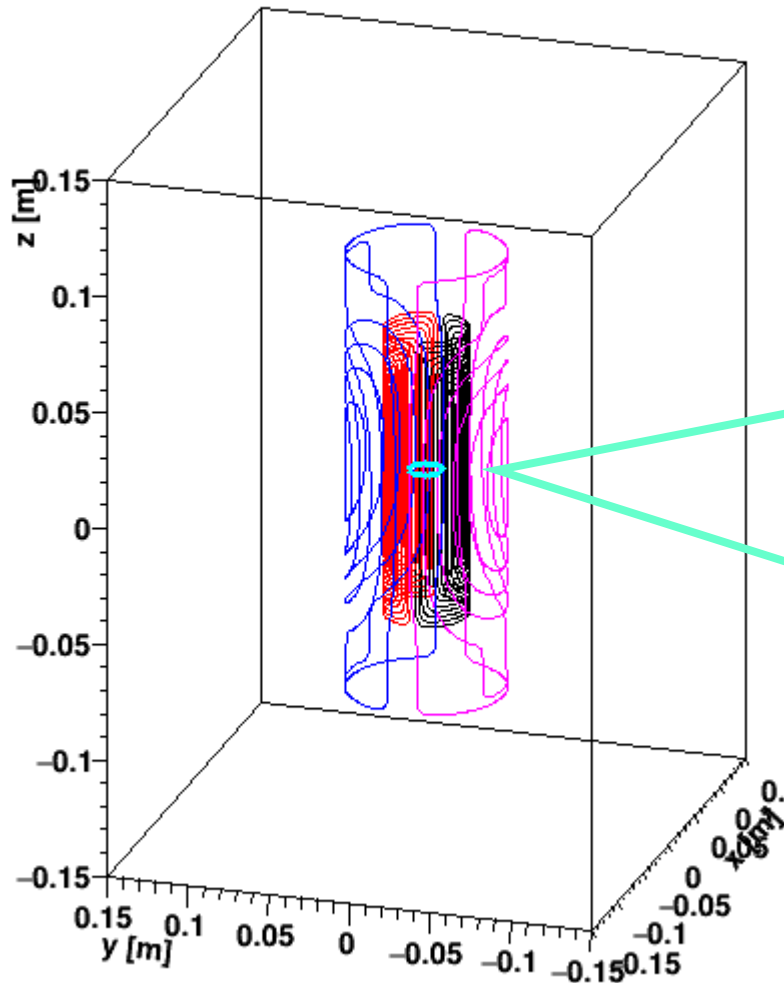
ビオサバールの法則を用いて、微小電流要素からなる任意の形状のコイル磁石の磁場計算を行います。

目標：

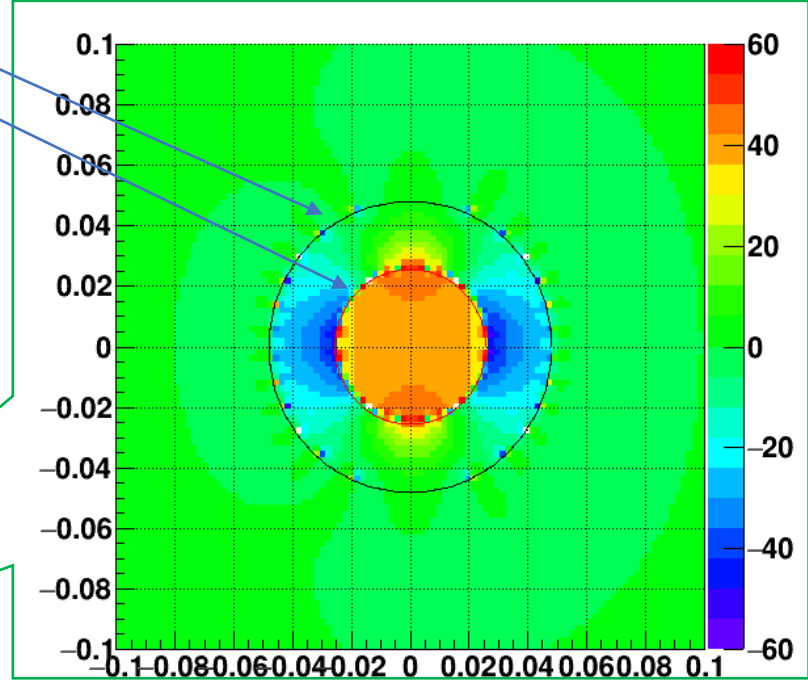
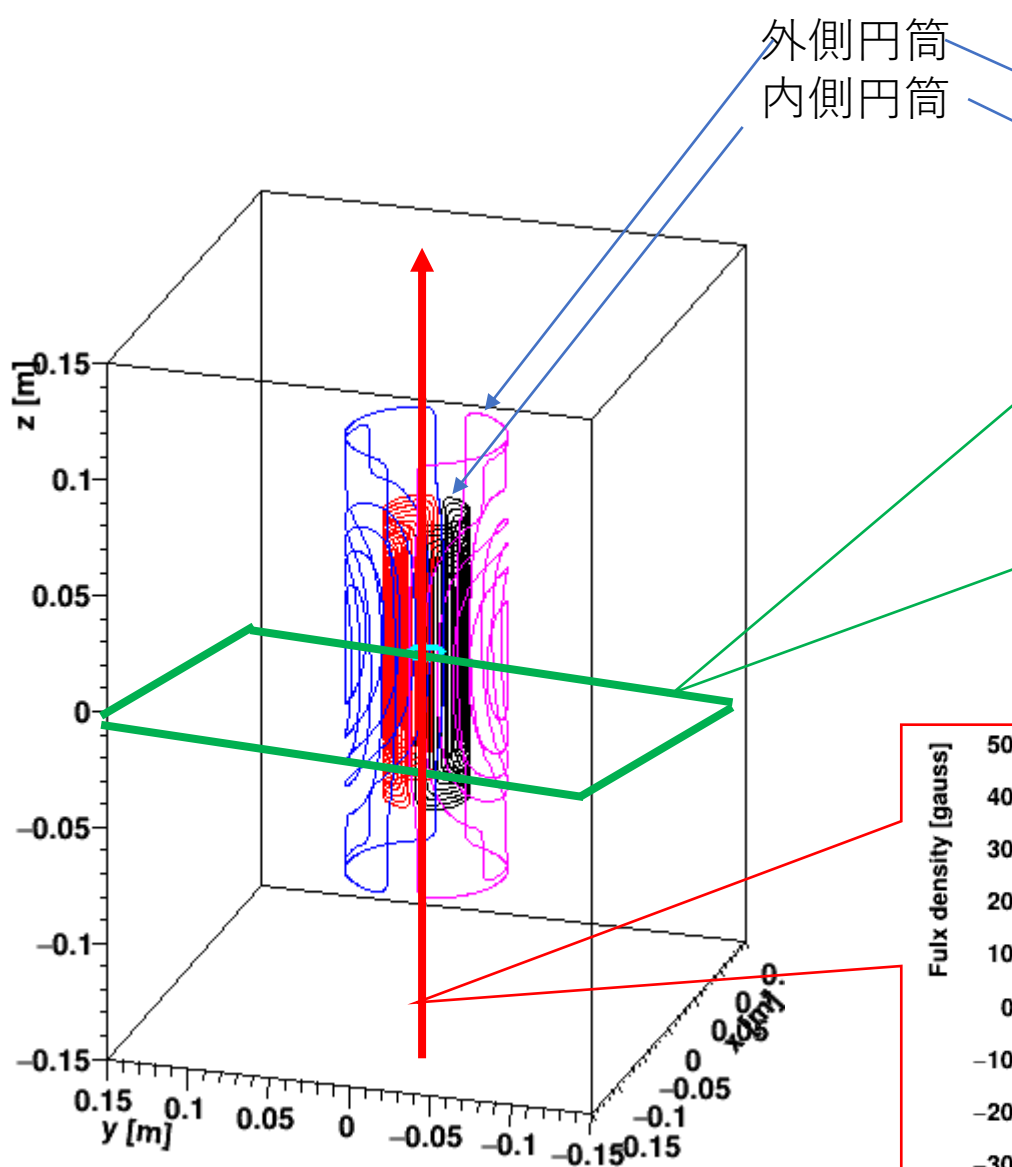
- ❑ キッカーコイルの詳細設計
- ❑ ASSM (Active Shield Steering Magnet) を3-Dプリンターと銅コイル手巻きで作る
- ❑ 磁場測定テストベンチ@東海キャンパスで磁場測定します。
- ❑ 1.7T 内強磁場中で磁場測定を行う。



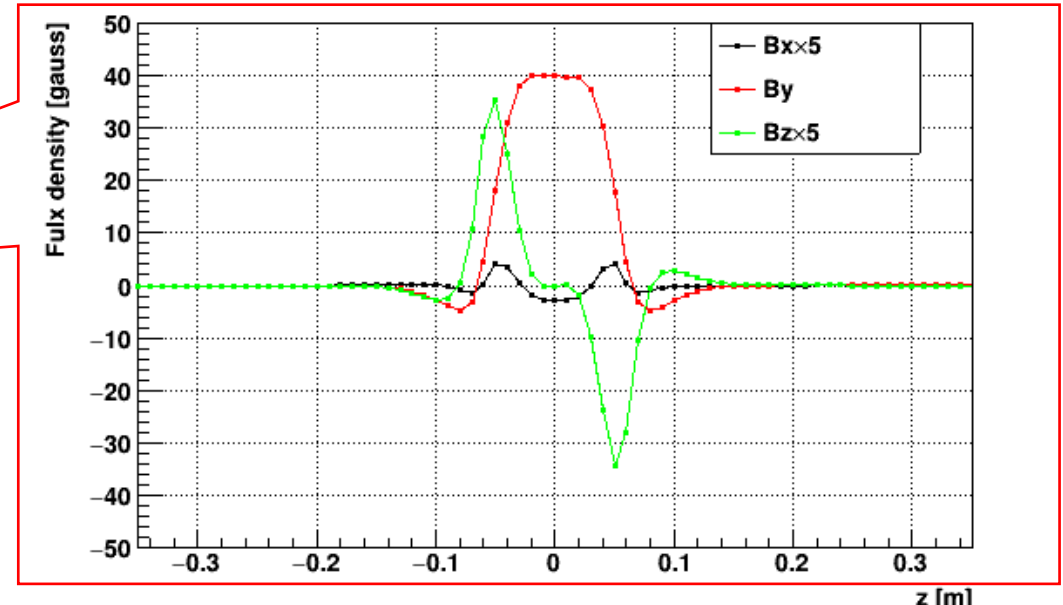
# Y方向に一様な磁場をつくる磁石



外側円筒状のコイル = 外部への洩れ磁場をキャンセル  
内側円筒状のコイル = 内側コイル内部の  $B_y$  磁場を作る

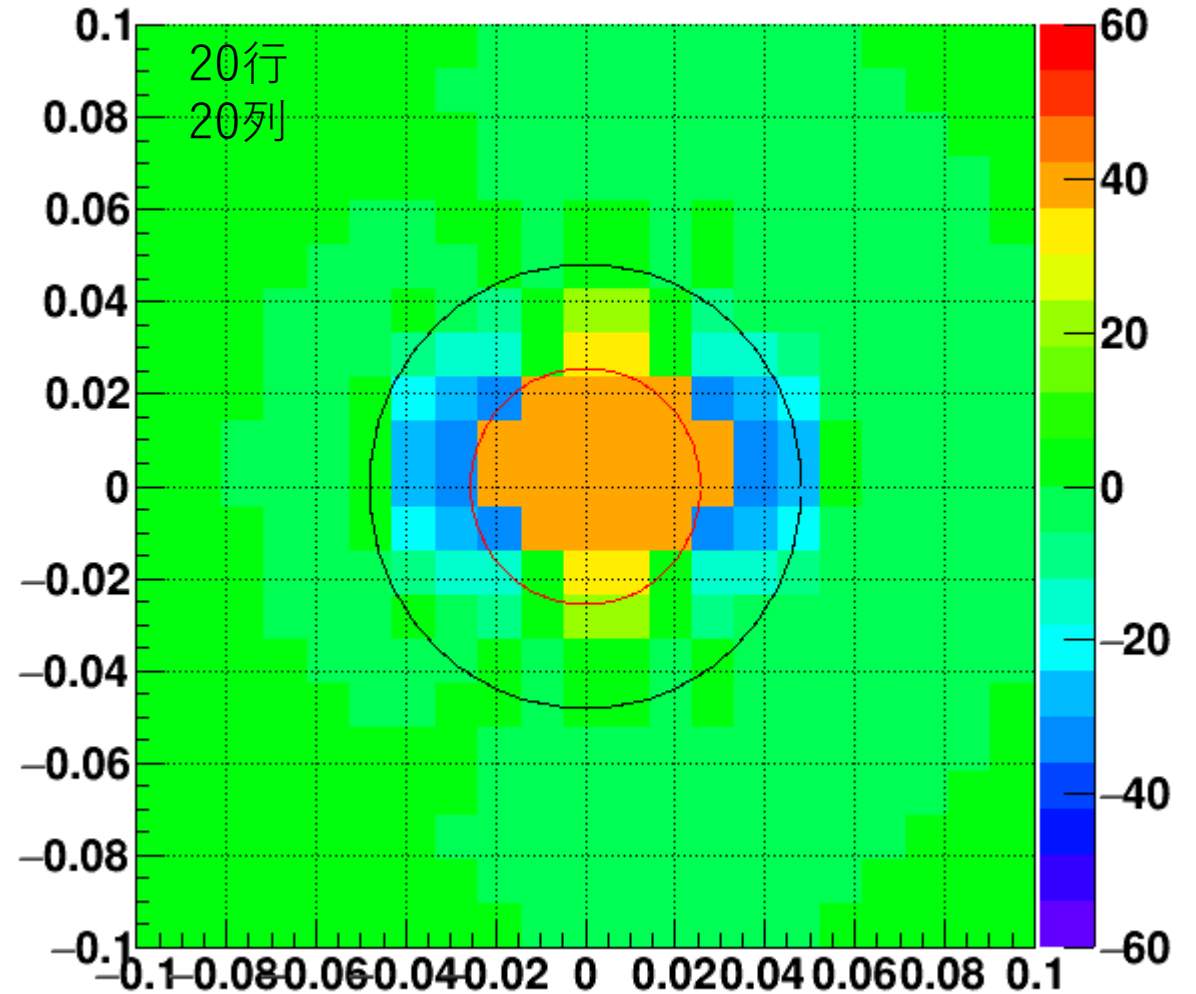
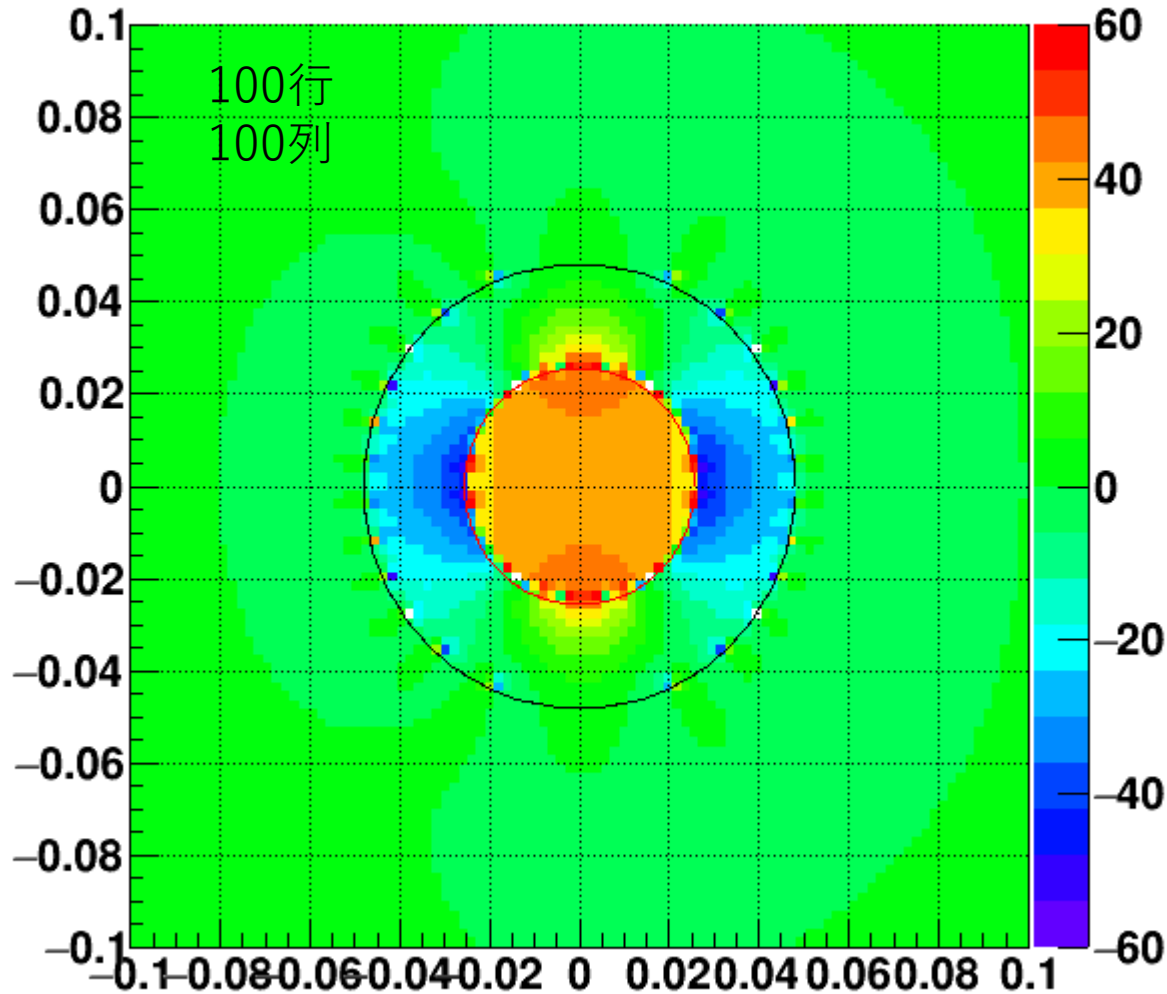


Z=0 平面でのBy成分の強さを表示。  
外側のコイルの外は洩れ磁場なし。

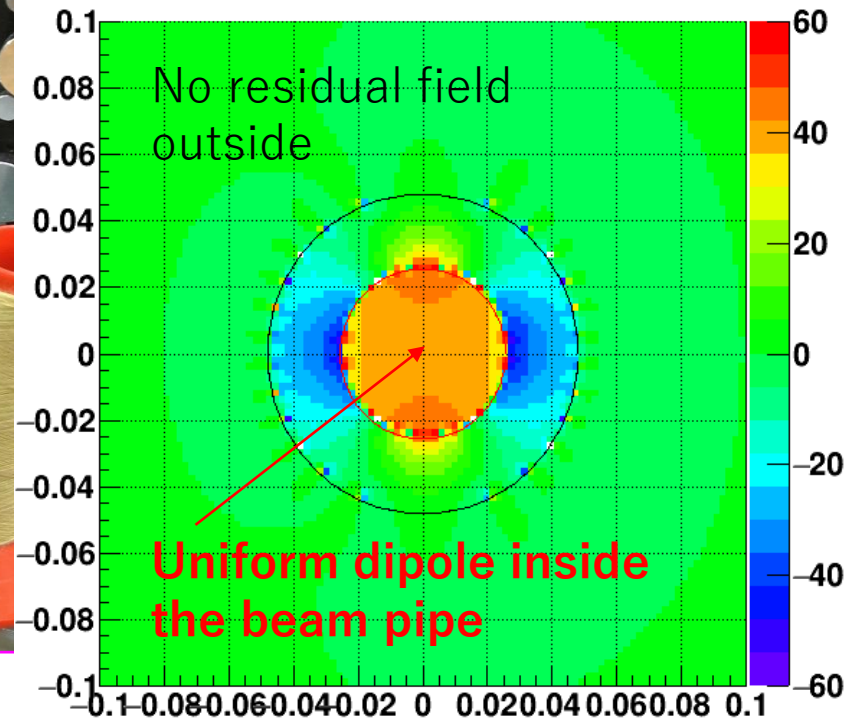
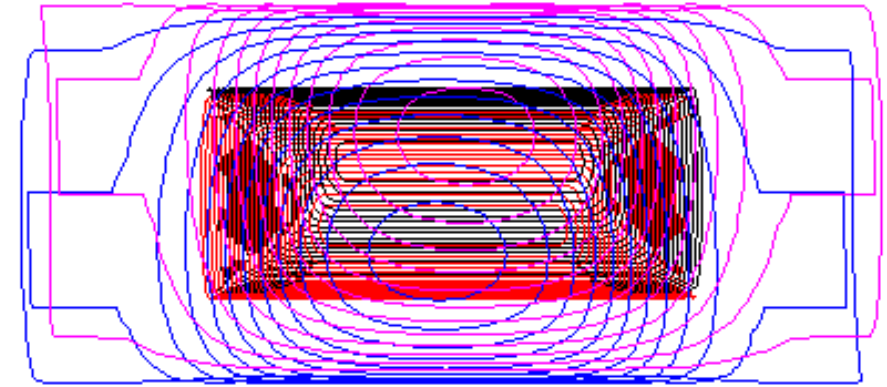
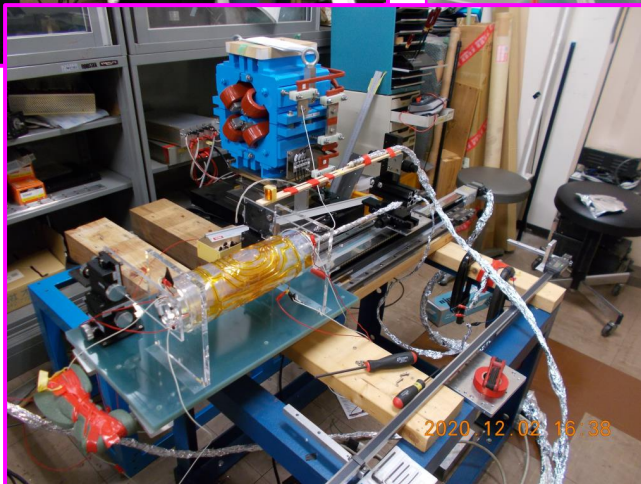
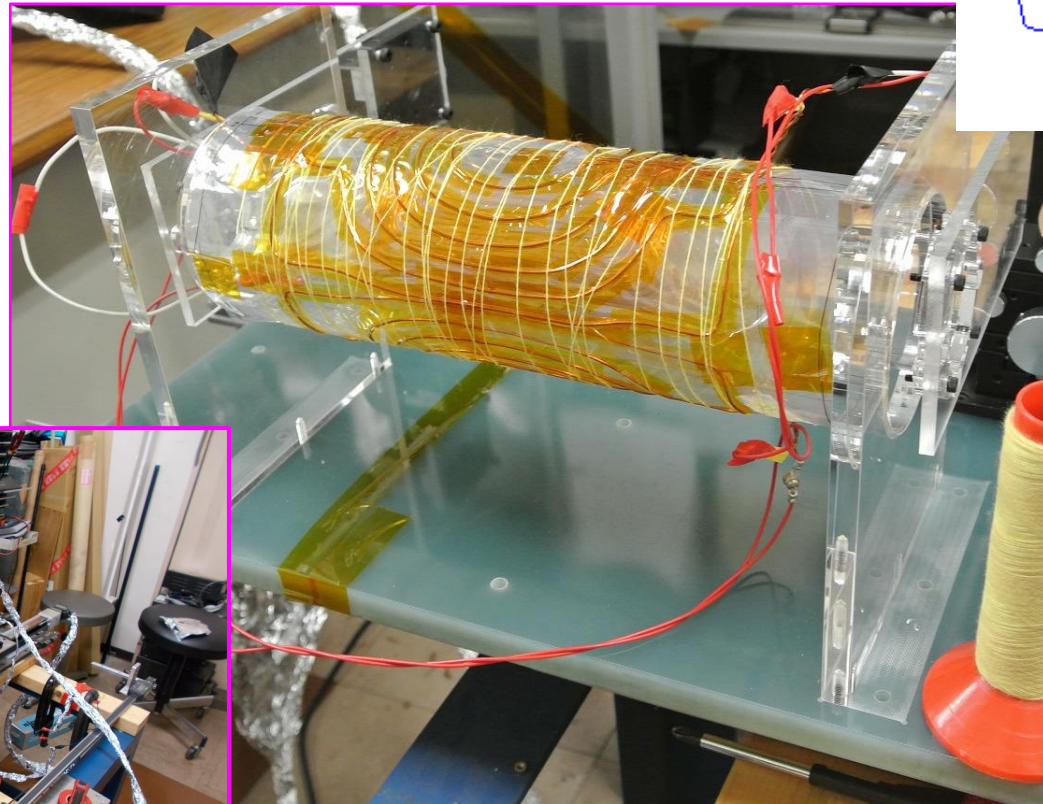


X=0, y=0 でソ  
レノイド軸方向  
= z 軸方向に磁  
場分布を確認

# 2次元ヒストグラムのビン数を変えたときの磁場分布の見え方の違い



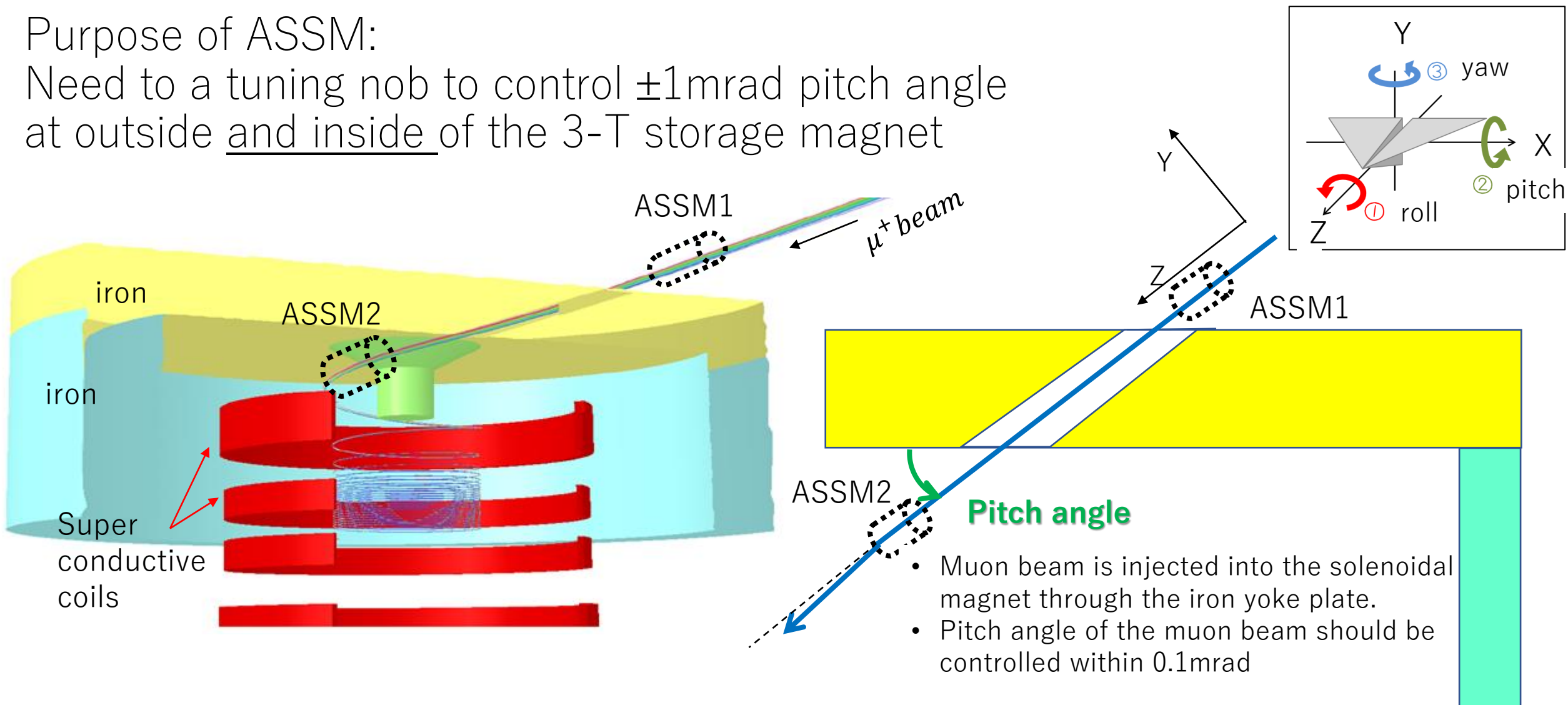
# Active Shield Steering Magnet



# Precise Control of Three-Dimensional Beam Trajectory by an **A**ctive **S**hield **S**teering **M**agnet in the Solenoid Fringe Field

Purpose of ASSM:

Need to a tuning knob to control  $\pm 1\text{mrad}$  pitch angle at outside and inside of the 3-T storage magnet



# Specification of ASSM2

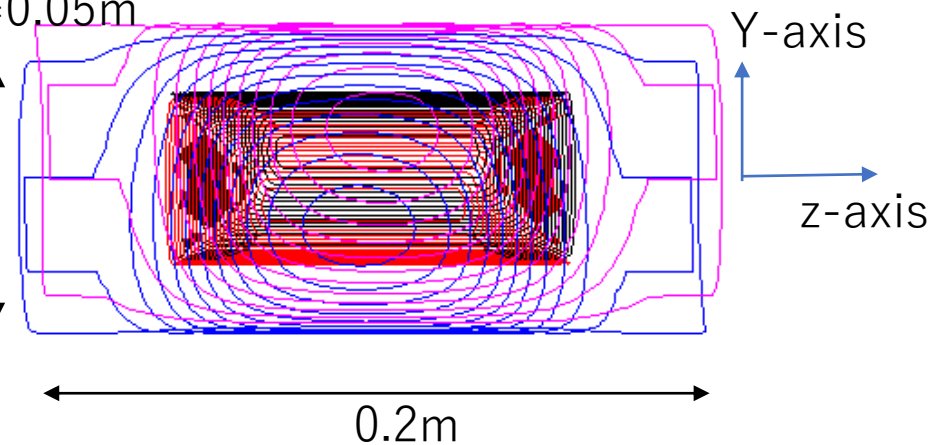
ID 2484

Because we install ASSM in the storage magnet: main field 3T and 0.1 ppm uniformity, we set three specifications:

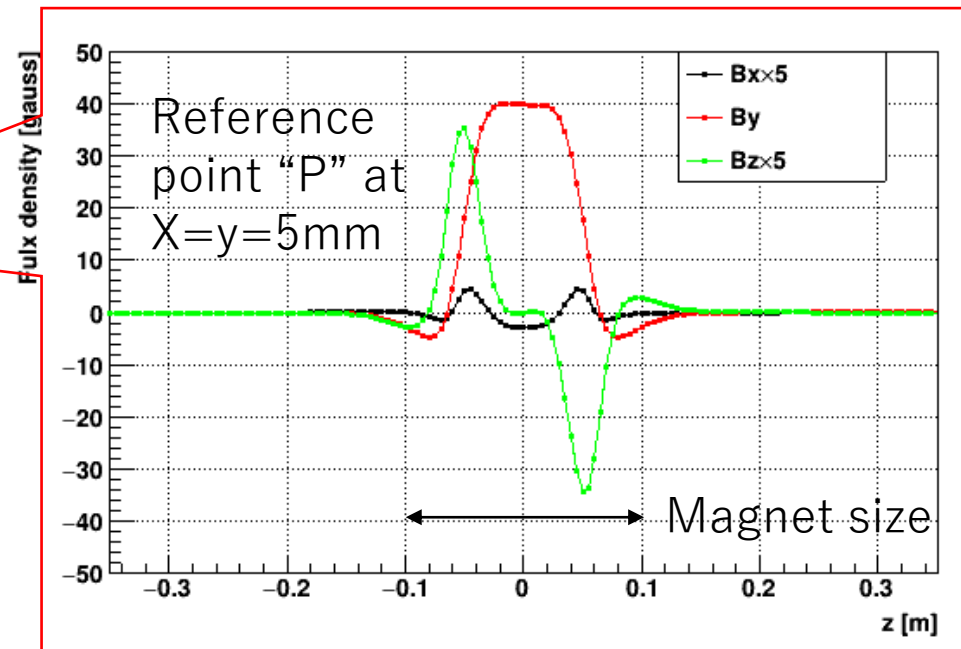
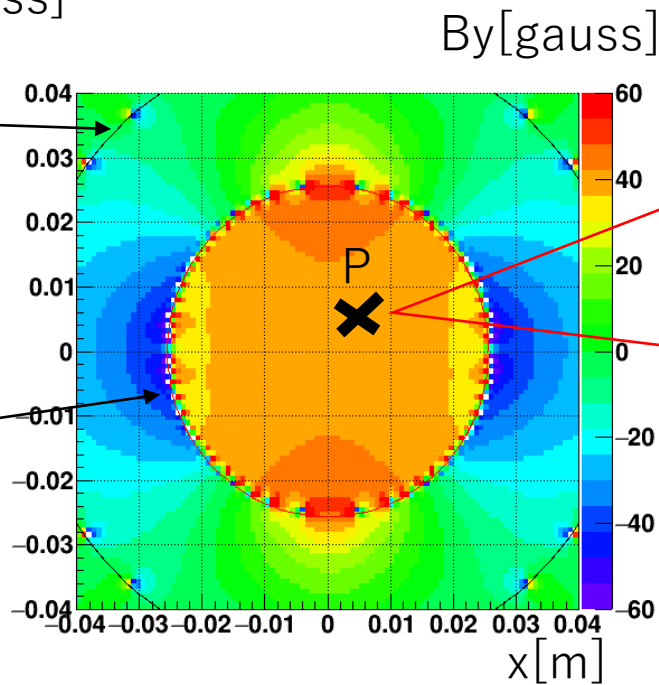
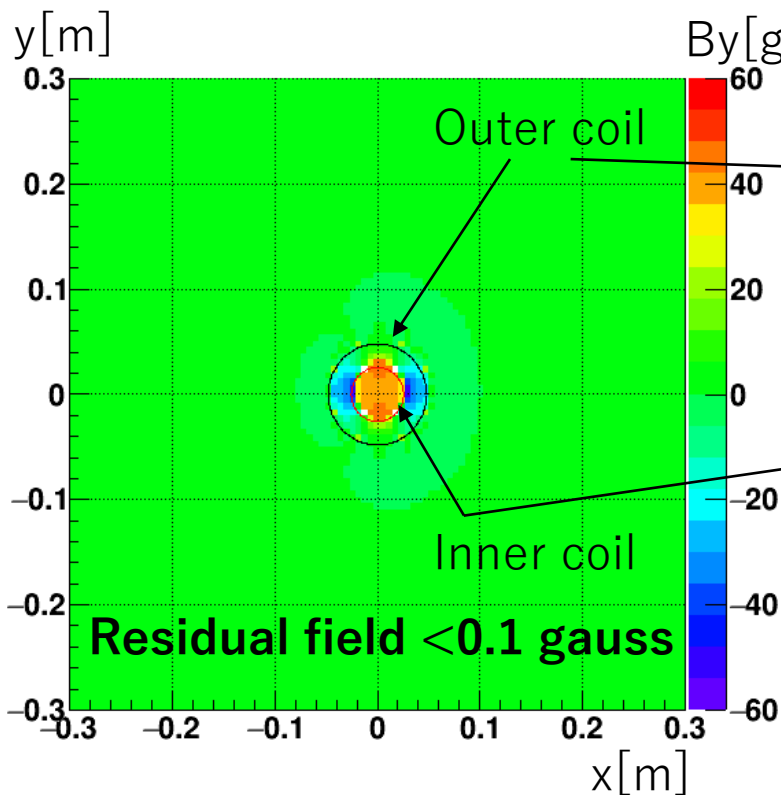
- No iron yoke, coil current only
  - Uniform dipole ( $B_y$ ) field  $R < 0.01\text{m}$
  - No residual field at  $R > 0.2\text{m}$ ,  $|z| > 0.2\text{m}$
- double layers coil magnet design is done.

Inner coil  
 $D = 0.0245\text{m}$

Outer coil  
 $D = 0.05\text{m}$



X-Y cross section views



# Handmade proto-type magnet

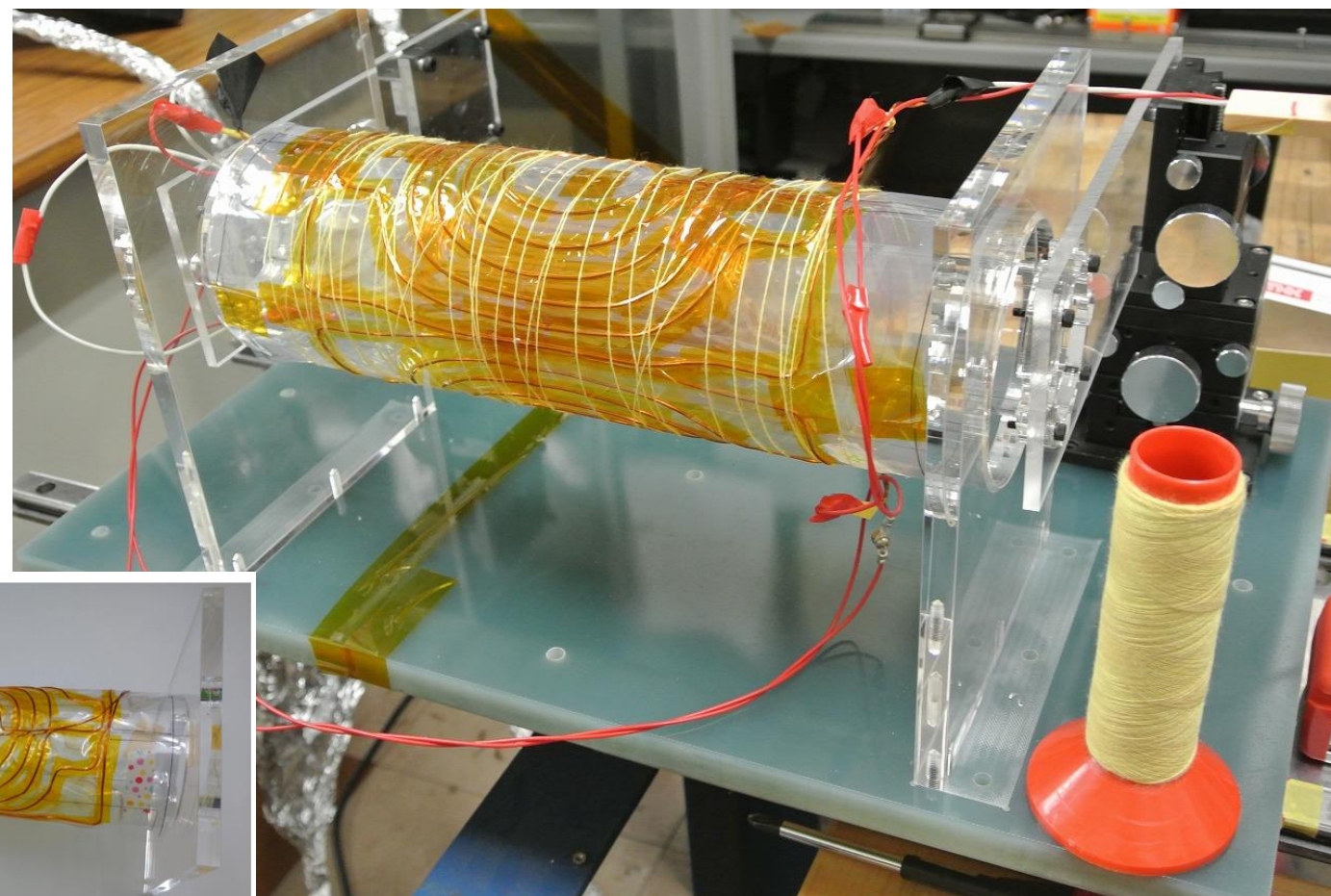
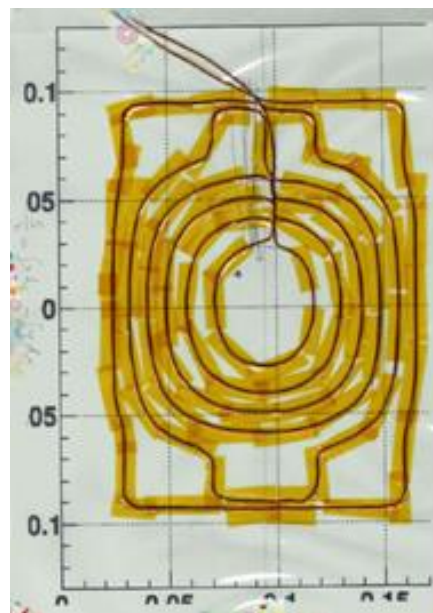
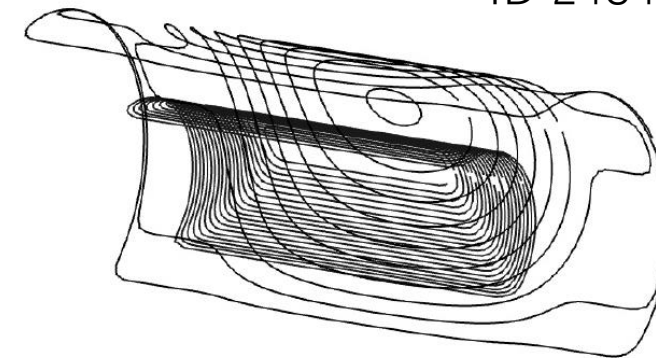


図 4.17 平面で巻いたコイルを治具に巻き付けたメインコイル

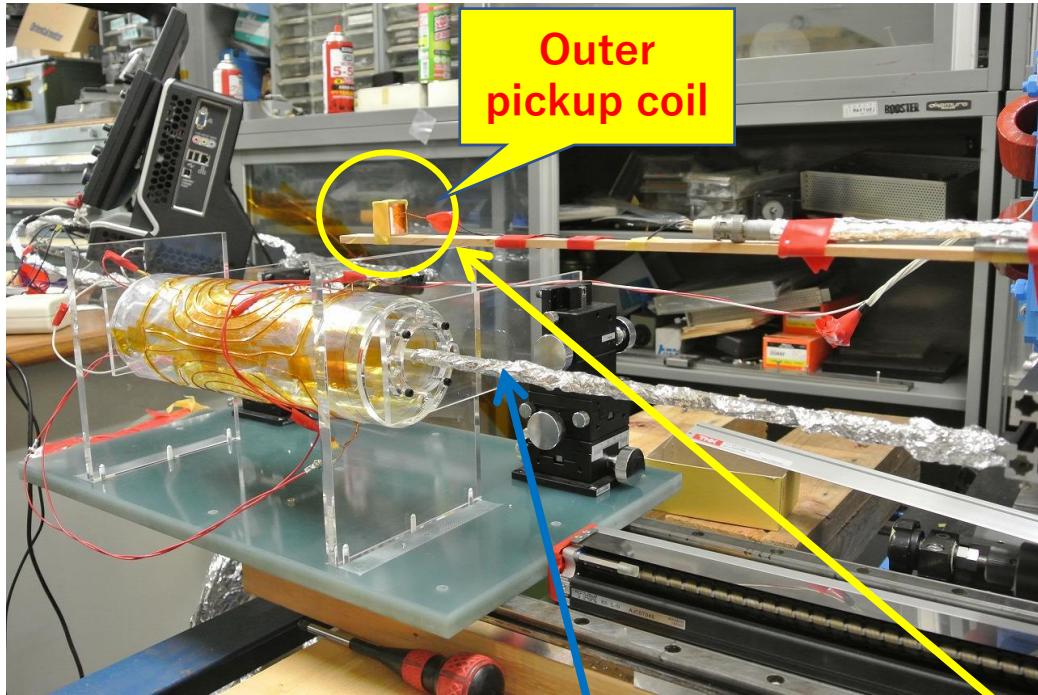


図 4.19 平面で巻いたコイルを治具に巻き付けたシールドコイル



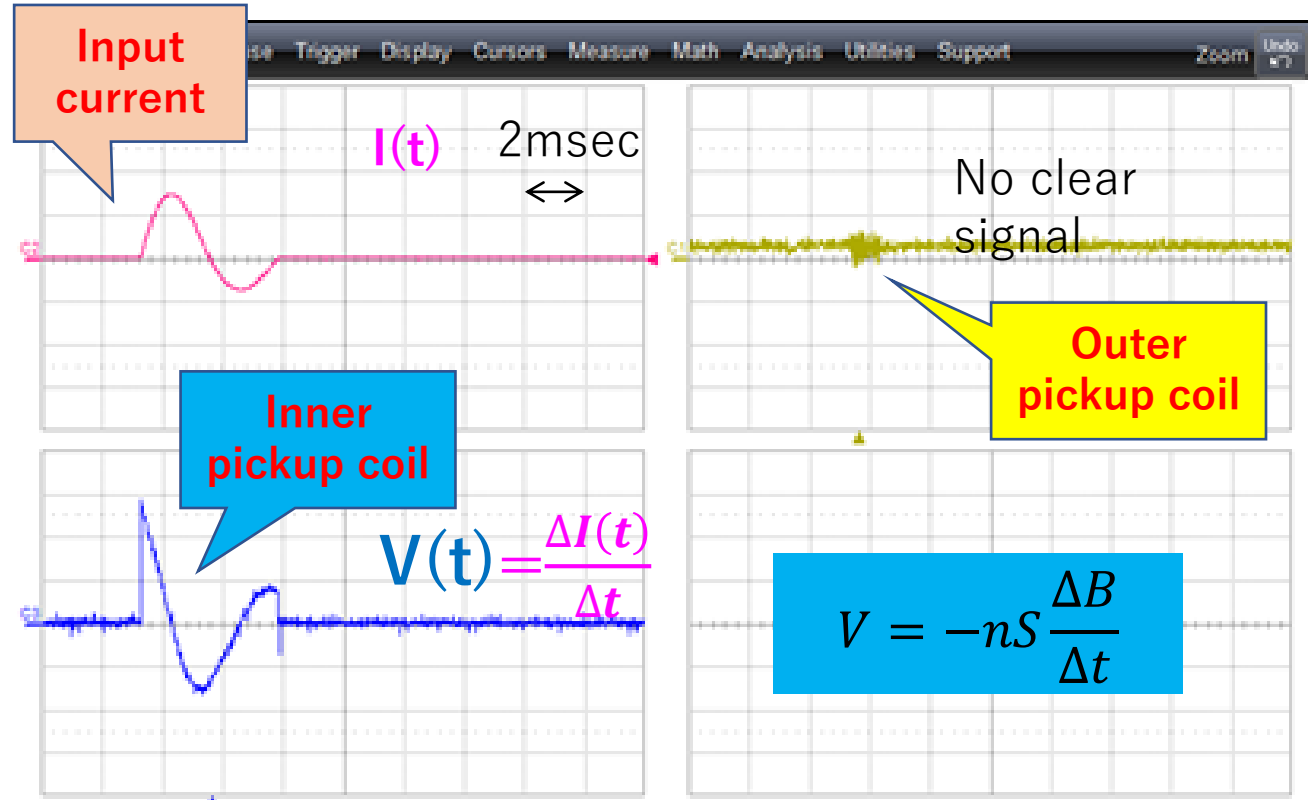
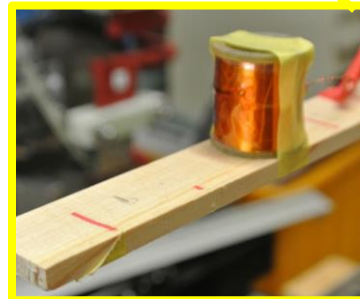
# Pickup coil signals of inside and outside of the magnet

ID 2484



Outer pickup coil

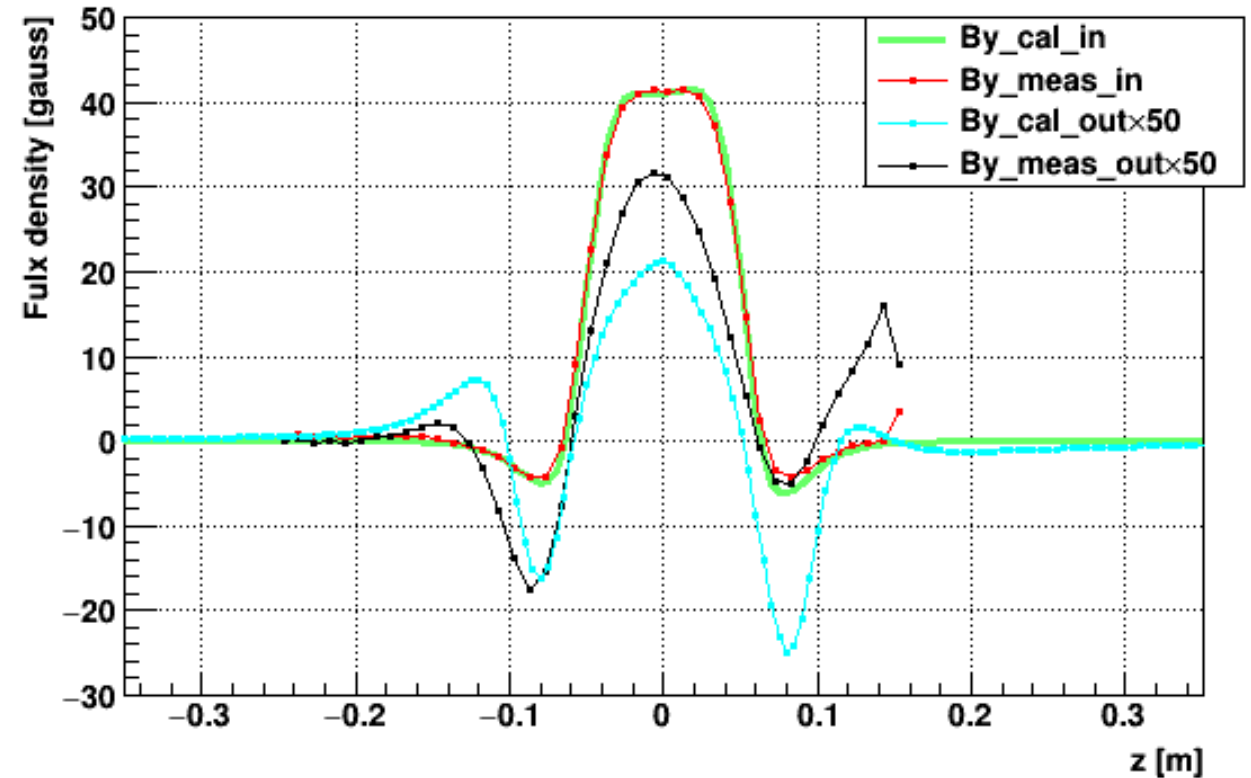
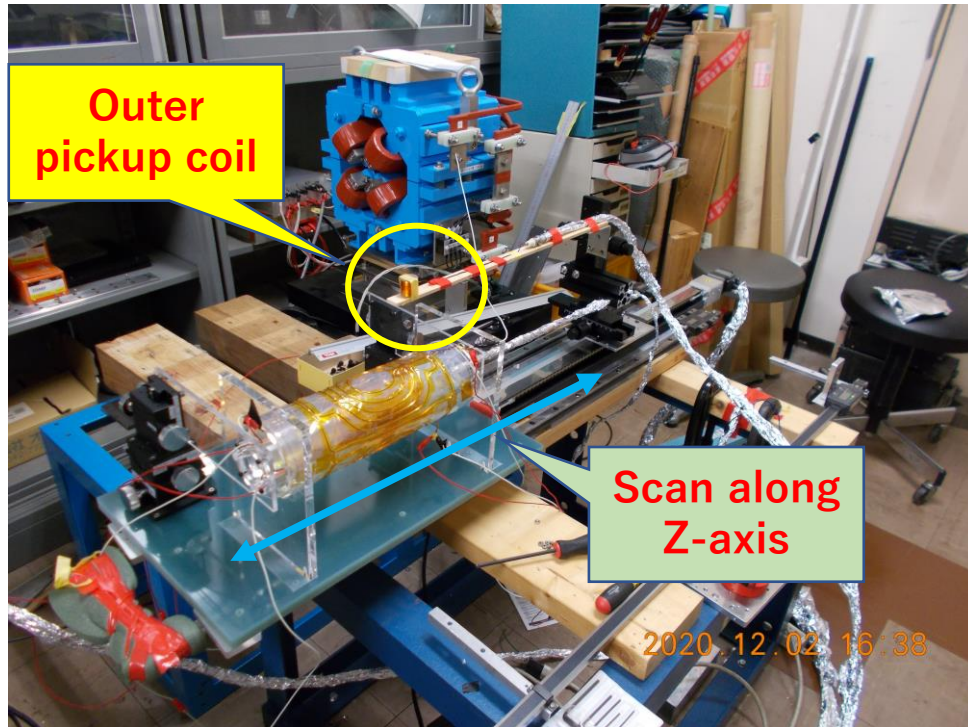
Inner pickup coil



Proto-type Active Shield Steering Magnet is now at KEK-Tsukuba for field measurement.

- At the first-look, we confirm dipole inner volume and quite small residual field !

# Preliminary result of field scan along Z-axis



- 以前KEKつくばにあったときの写真。ここで測った結果を右に示す。
- 今は磁場測定テストベンチ@東海キャンパスに移設済