

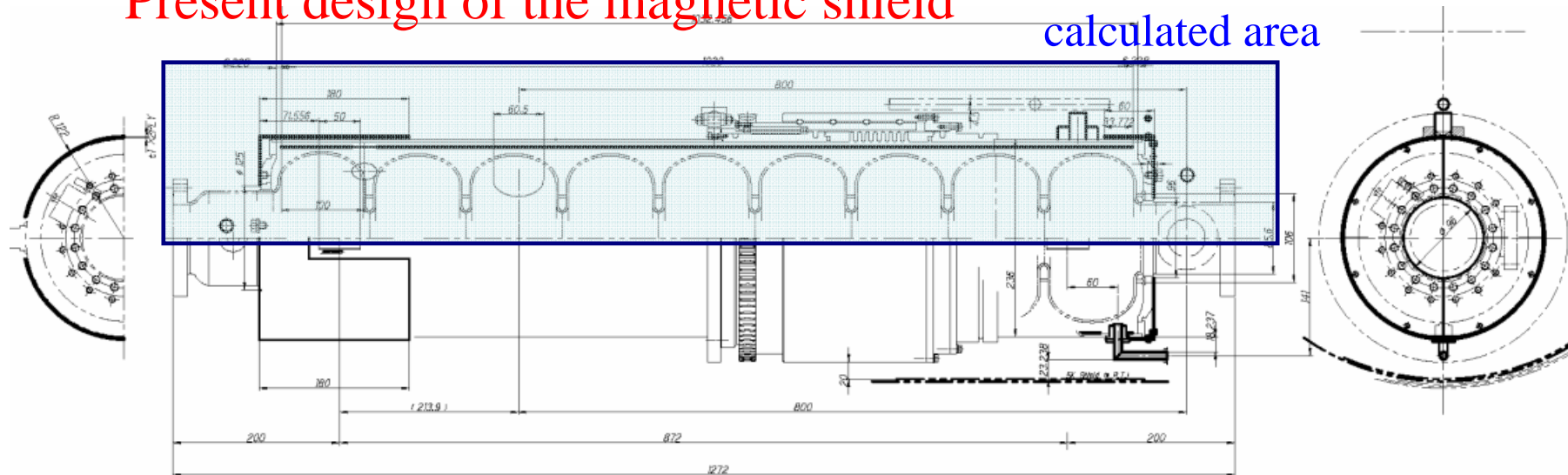
# KEK-Cavity Magnetic Shield Calculation (Preliminary data)

KEK Norihito Ohuchi

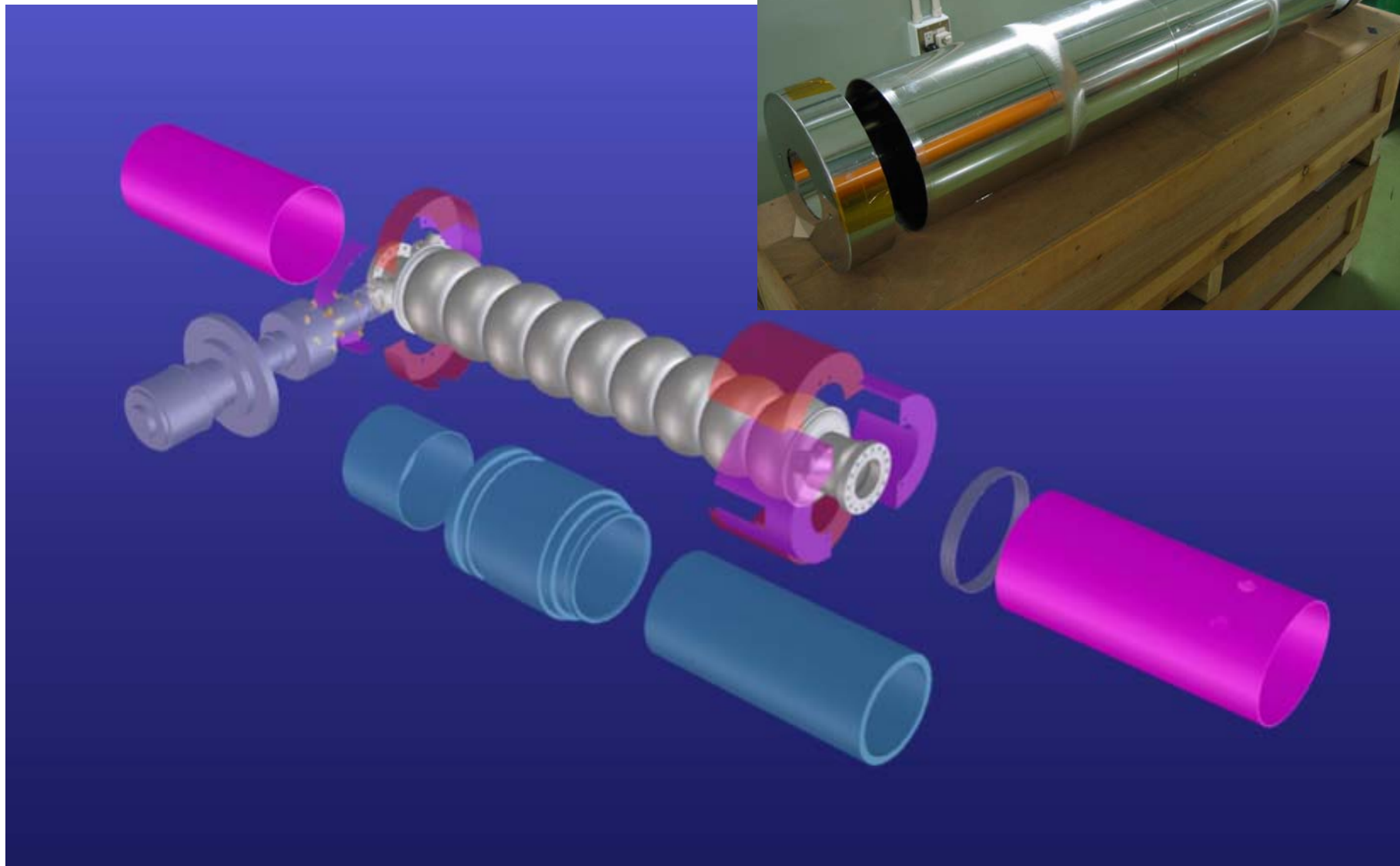
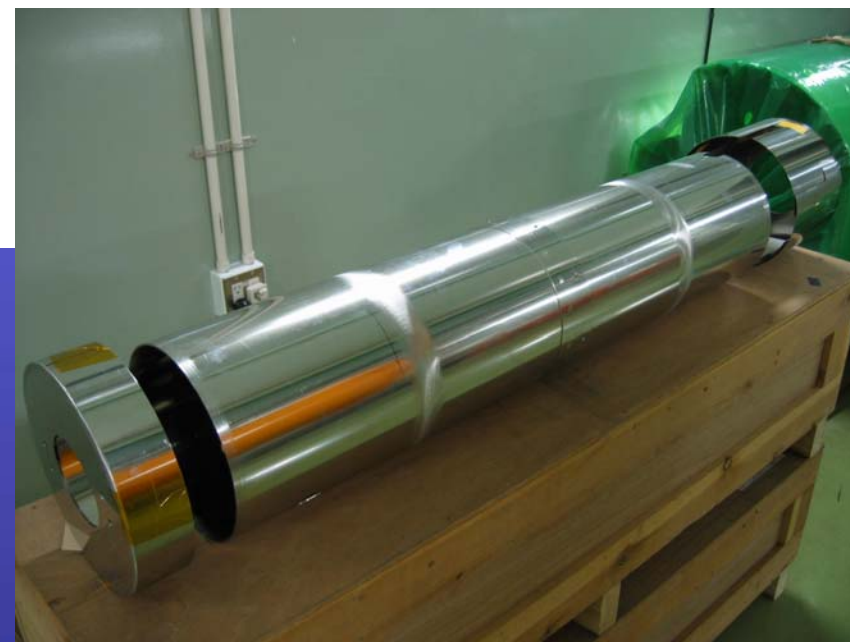
# Conditions of the calculation (2D)

- Magnetic shield : 1mm thickness, 1 layer
- Material property :  $\mu = 40000$
- Outer field :
  - Z direction field by solenoid (referred to the analysis of INFN)
  - Magnetic field : 0.5 Gauss (from the field measurement in the cryostat)
- Shield geometry effect on the magnetic shield in the helium vessel

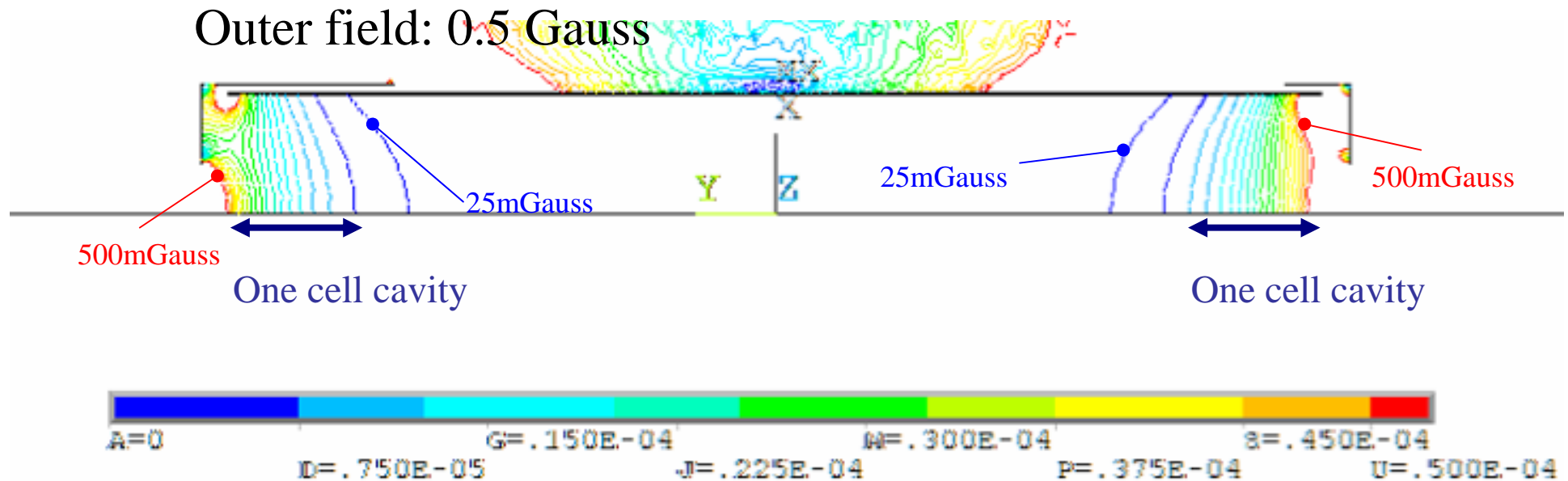
## Present design of the magnetic shield



# Low-Loss Type Cavity Magnetic Shielding



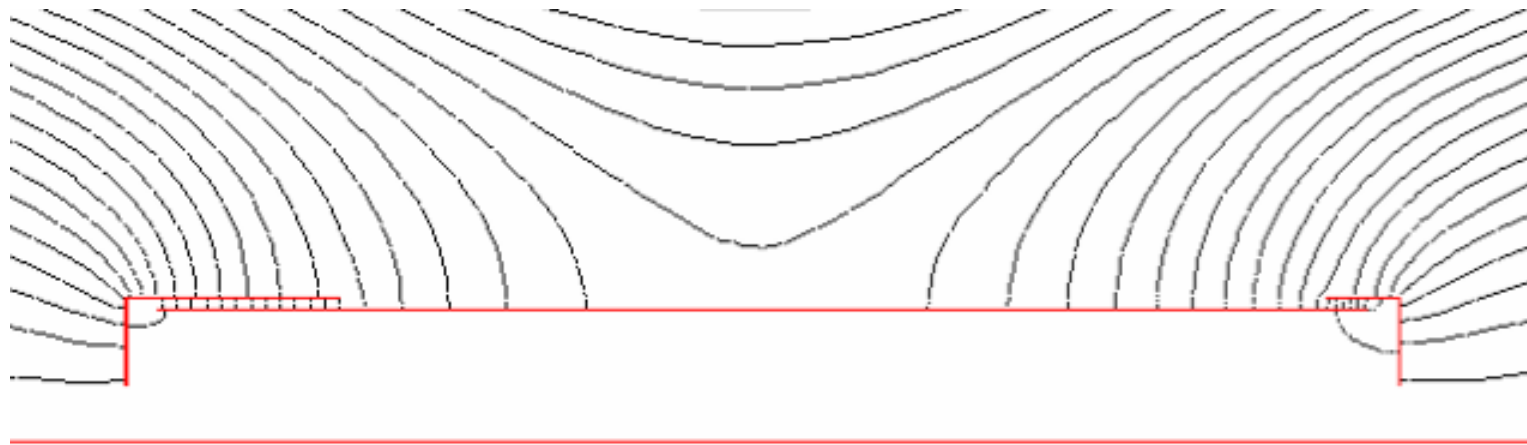
# Magnetic field profile in the shield



- In case of the outer field of 0.5 Gauss, the cavities in the both ends will be in the field from 0.05 Gauss to 0.5 Gauss.

# Reduction of the remnant field in the vessel

- making the gap between the inner shield and the outer shield small.
- making the outer shield ends away from the cavities in the both ends.
  - The remnant field profile strongly depends on the positions of the end caps of the outer shields.
- making the quantity of the magnetic fluxes going into the inner shield small.
  - extending the outer shield to the tuner.

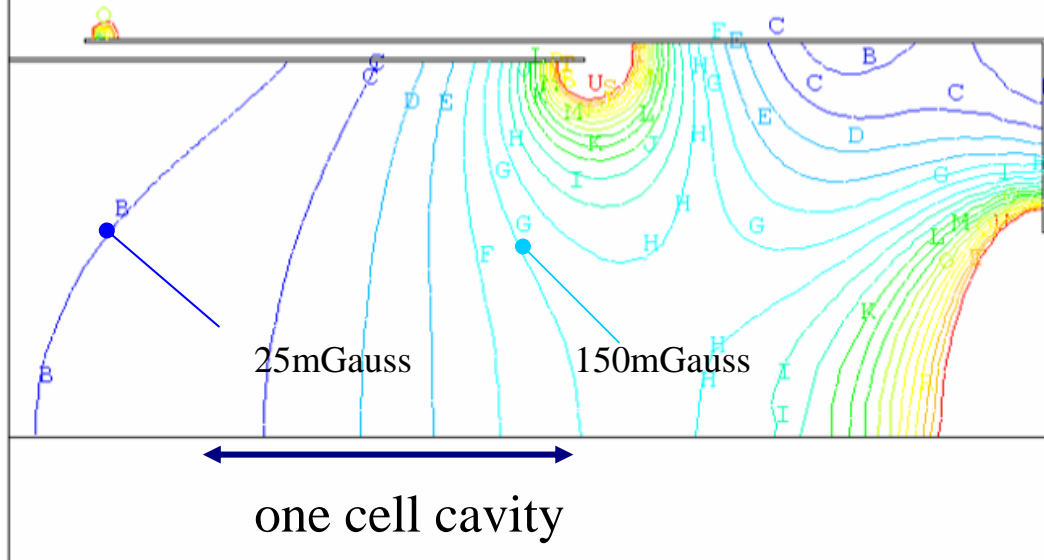


# Calculation results

1. The outer shields are extended to the tuner.
2. The end-caps of the outer shields enclose the input coupler and the HOM couplers.

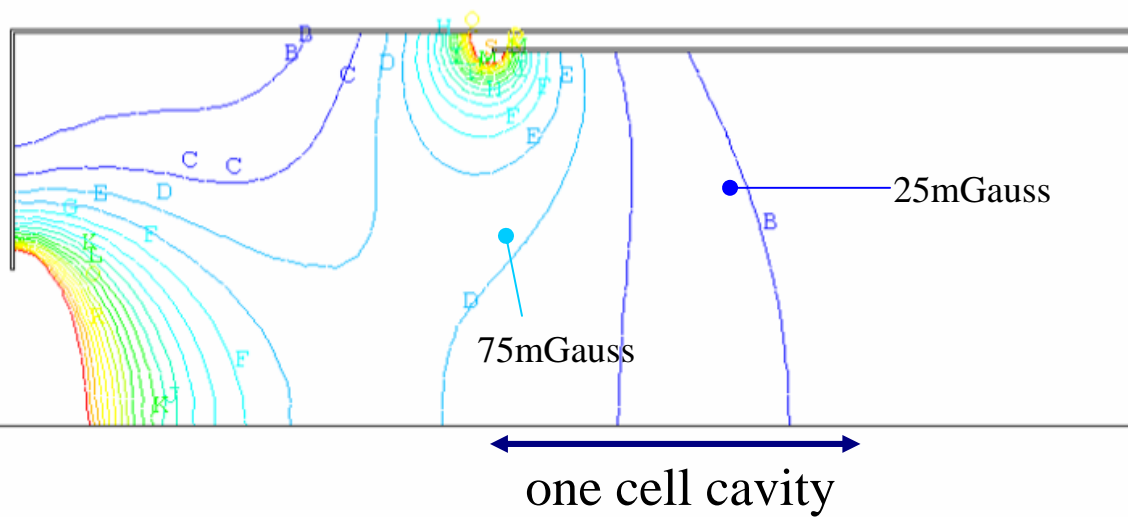


outer field : 0.5 Gauss



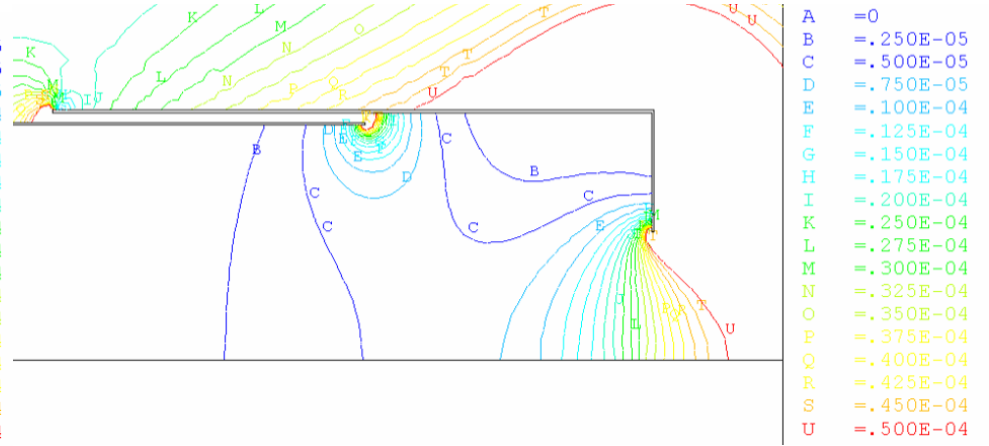
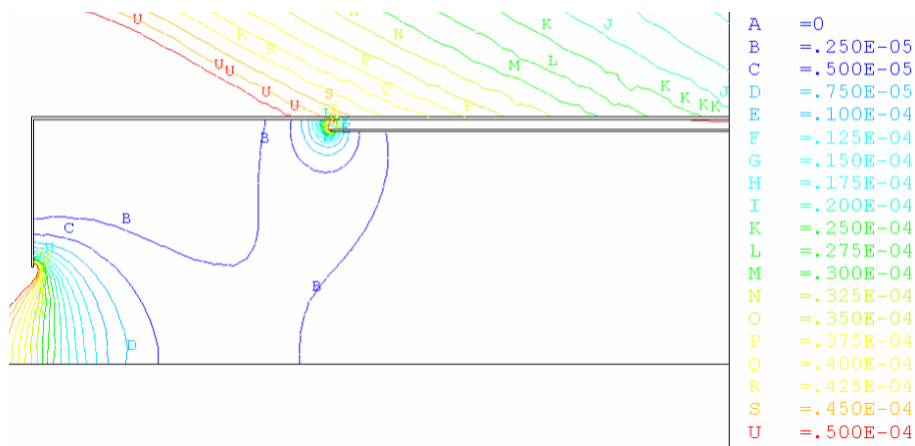
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B	= .250E-05
C	= .500E-05
D	= .750E-05
E	= .100E-04
F	= .125E-04
G	= .150E-04
H	= .175E-04
I	= .200E-04
K	= .250E-04
L	= .275E-04
M	= .300E-04
N	= .325E-04
O	= .350E-04
P	= .375E-04
Q	= .400E-04
R	= .425E-04
S	= .450E-04
U	= .500E-04

200

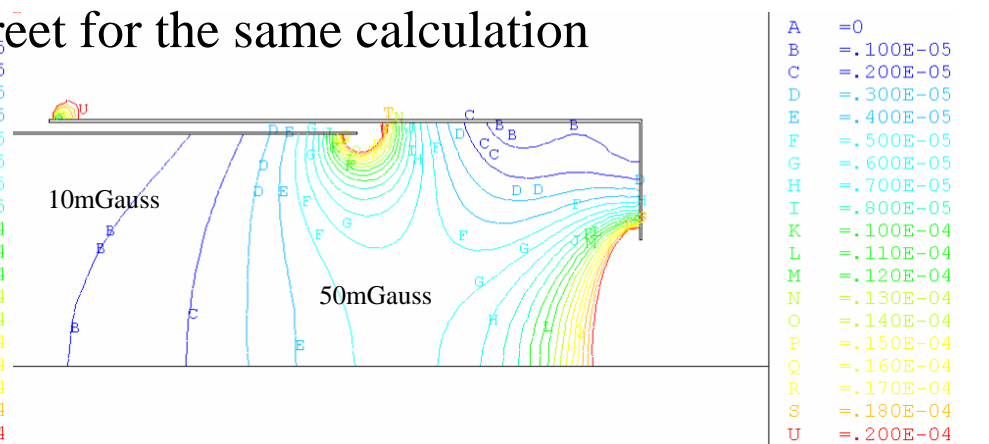
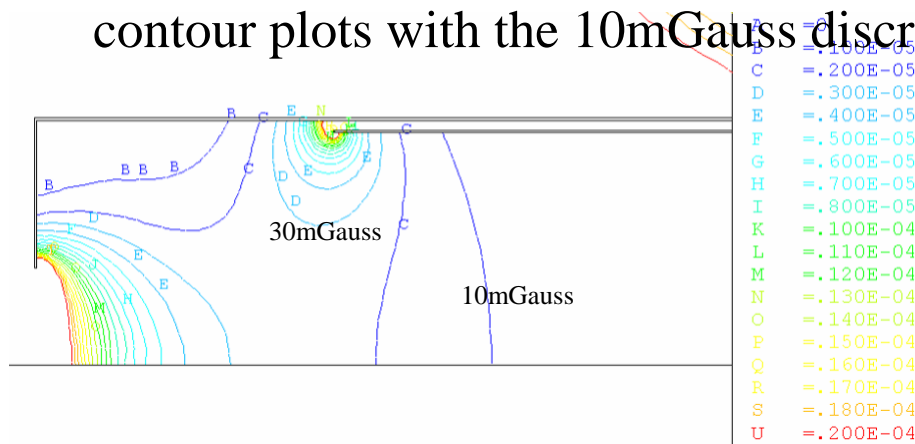


A	=0
B	= .250E-05
C	= .500E-05
D	= .750E-05
E	= .100E-04
F	= .125E-04
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I	= .200E-04
K	= .250E-04
L	= .275E-04
M	= .300E-04
N	= .325E-04
O	= .350E-04
P	= .375E-04
Q	= .400E-04
R	= .425E-04
S	= .450E-04
U	= .500E-04

outer field : 0.17 Gauss



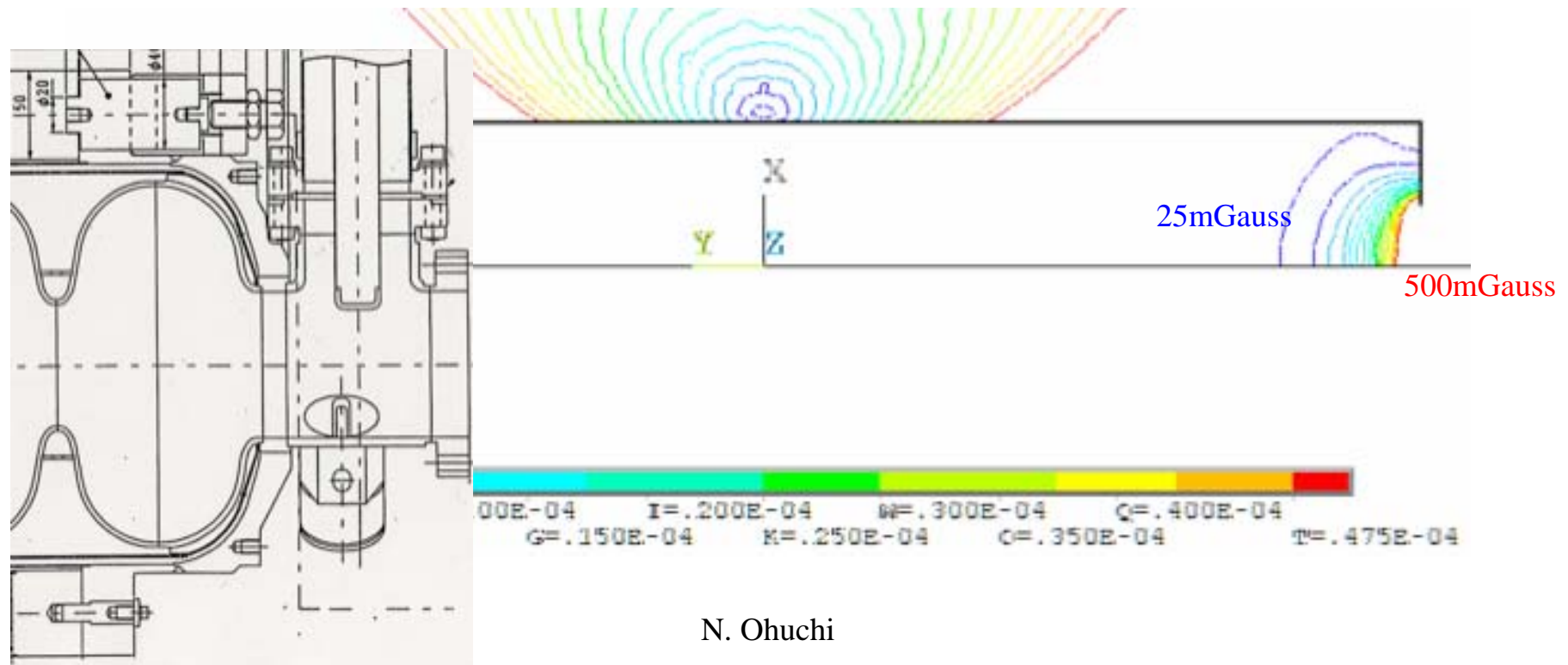
contour plots with the 10mGauss discret for the same calculation





## In case of the shield ends in the helium vessel (35 MV/m cavity case)

- The remnant field around the equator of cavity will be reduced to less than 25 mGauss, however, the field is calculated to be 0.5 Gauss at the iris of the end cavities.



# Summary

- By the present magnetic shield design of the 45MV/m cavity, the cavities at the ends are in the magnetic field from 0.05 ~ 0.5 Gauss for the outer field of 0.5 Gauss.
  - The shield geometry will be optimized for the STF-Phase-1.
  - After optimizing the shield shape by 2D calculation, we will calculate the field profile by 3D calculation.
- For the magnetic shield of the 35MV/m cavity, the remnant field around the equator of the end cavities is calculated at less than 25 mGauss for the outer field of 0.5 Gauss.
- Demagnetization of the vacuum vessel is important, and this study is being performed.