On the basis of the local shielding setup for TOF2,

1. Coordinates to update the database

2. Field evaluation in the KL and SW regions (only $B_{\text{mod}}$ is shown here)
   - 9 coils into account (up to the center of MICE)
   - KL local iron shield NOT in magnetic contact with TOF2’s or Virostek plate
   - TOF2 Local iron shield in contact with Virostek plate
     - Making contact is mechanically difficult or complicated!
     - KL iron is simply put as near as possible to TOF2

3. Presentation of field uniformity at the PMTs of KL
   
   Look for possible options towards improvement
Iron « bridges » to close the frame.
Longitudinal view

... looking upstream from SW!

- Virostek
- TOF2 local shielding
- KL iron bars
- KL active area
- KL frame (aluminium)

Small « overlap » area to make contact with Virostek and to keep access to TOF2 PMTs

Difficult to make contact between KL and Virostek
Distance to center of MICE = 6011 mm

Distances to centers:
- Virostek: 450 mm
- 1st plane TOF2: 537.5 mm
- 2nd plane TOF2: 562.5 mm
- KL: 638 mm

Distances to faces:
- r (mm): 400, 500, 600, 676

Diagram showing:
- Beam
- Solenoid
- Match 1, Match 2, End 1, End 2

Directional indicators:
- X-axis
- Y-axis

Note: The diagram includes a scale for r (mm) and z (mm) axes.
All dimensions of KL are from L. Tortora

Iron in green
Mumetal in blue

This face is at z = 0.676 m
Slot with a thin iron back (22 mm)
$B_{\text{mod}}$ at $z=0.68 \text{ m}$
$B_{\text{mod}}$ at $z=1.20$ m

At all $z$-positions for SW: simple local iron shielding should be adequate
In the planes of the photocathodes (x=0.63 m)

Approximate diameter of PMT sensitive area

PMT 1

$B_{\text{mod}} < 60$ Gauss

PMT 10

$B_{\text{mod}} < 150$ Gauss
Field inside KL iron

At $z = 0.622$ m (corresponding to longest and thinnest part of KL iron bars)
At $z = 0.622 \text{ m}$  

Same but with enlarged color scale!

The KL iron bars are totally saturated at the thin ends around the PMTs.

The iron behaves as air ($\mu \cong 1$) and does not shield at all!
Trial configuration

Iron bridge

It will be beneficial for SW!
Results for PMT 1

In the plane of the photocathode ($x=0.63\ m$)

Approximate diameter of PMT sensitive area

Without iron bridge

With iron bridge

$B_{mod} < 60\ \text{Gauss}$

$B_{mod} < 30\ \text{Gauss}$
Results for PMT 10

In the plane of the photocathode (x=0.63 m)

Without iron bridge

Approximate diameter of sensitive area

With Iron bridge

$B_{\text{mod}} < 150$ G

$B_{\text{mod}} < 30$ G

Comparable to PMT 1

Residual field levels are now back to safer values!
Field in iron with bridge

At $z = 0.622$ m  
Same color scale as before (see slide 10)

Although the iron bridge is saturated, the field is within safe limits for the mumetal of PMT10.

Now $B \sim 0.1$ Tesla = 1 kGauss next to PMT 10
Remarks

1. It is seen that for the first planes of SW, the vertical iron shielding bars of KL provide a useful shield for the downstream SW PMTs.

   The field levels at the anticipated positions of PMTs are sufficiently low for simple local iron shields to be effective

2. The KL design (available to me !) is NOT effective for the shielding of PMTs in the extreme positions. Additional iron lumps are needed to catch a larger fraction of the magnetic flux.

   One possible setup is shown to be adequate in reducing the field levels at the KL photocathodes:

   « Closure » of the KL frame with horizontal iron bars (bridges)

   One additional precaution would be to make the iron bars thicker.

My (minimal ) proposal is to replace the aluminium parts of the frame by similar parts made of iron (and with the same thickness as the vertical bars).