News about magnetic field simulation and progress ‘Towards magnetic field measurement benches’

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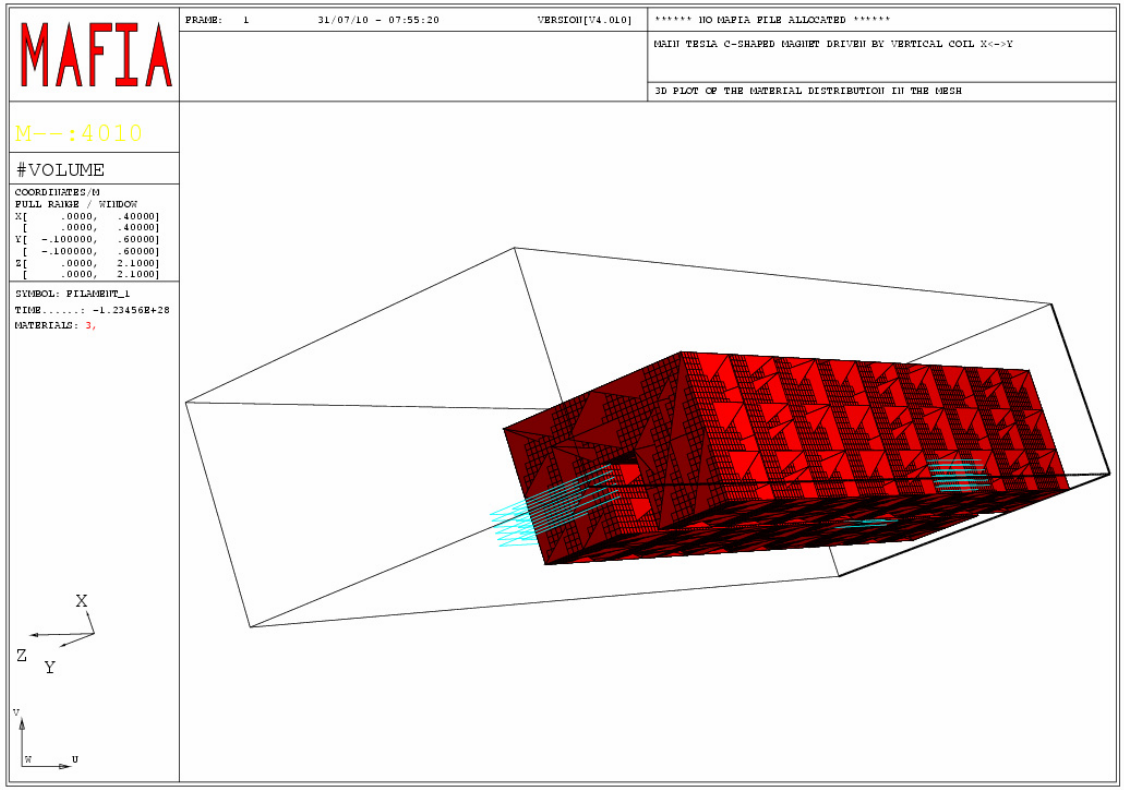
New 3D code was involved for the magnet design – TOSCA Vector Fields UK

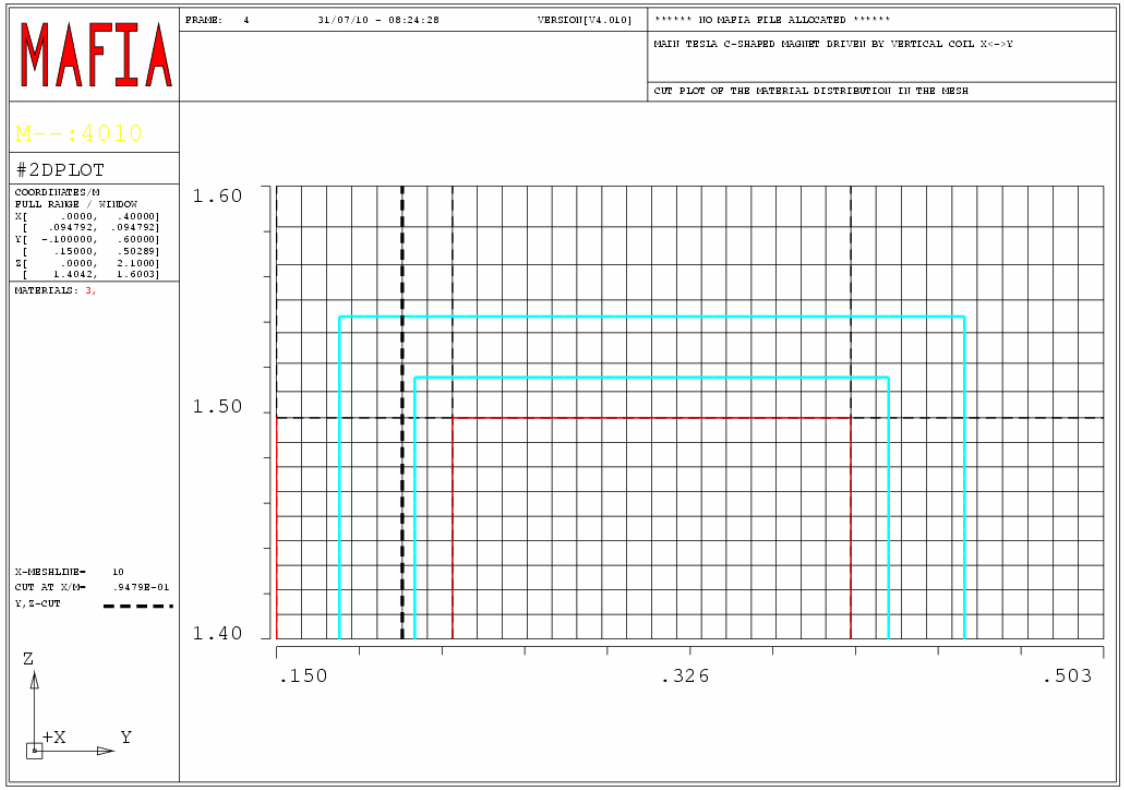
- Advantages of the TOSCA code:

1. Dedicated code for the magnet simulation
2. PC version with fine Pre and Post processing
3. Easy to realize different and complicated shapes for the current coils simulation
4. Meshing is irregular and elements are tetrahedra

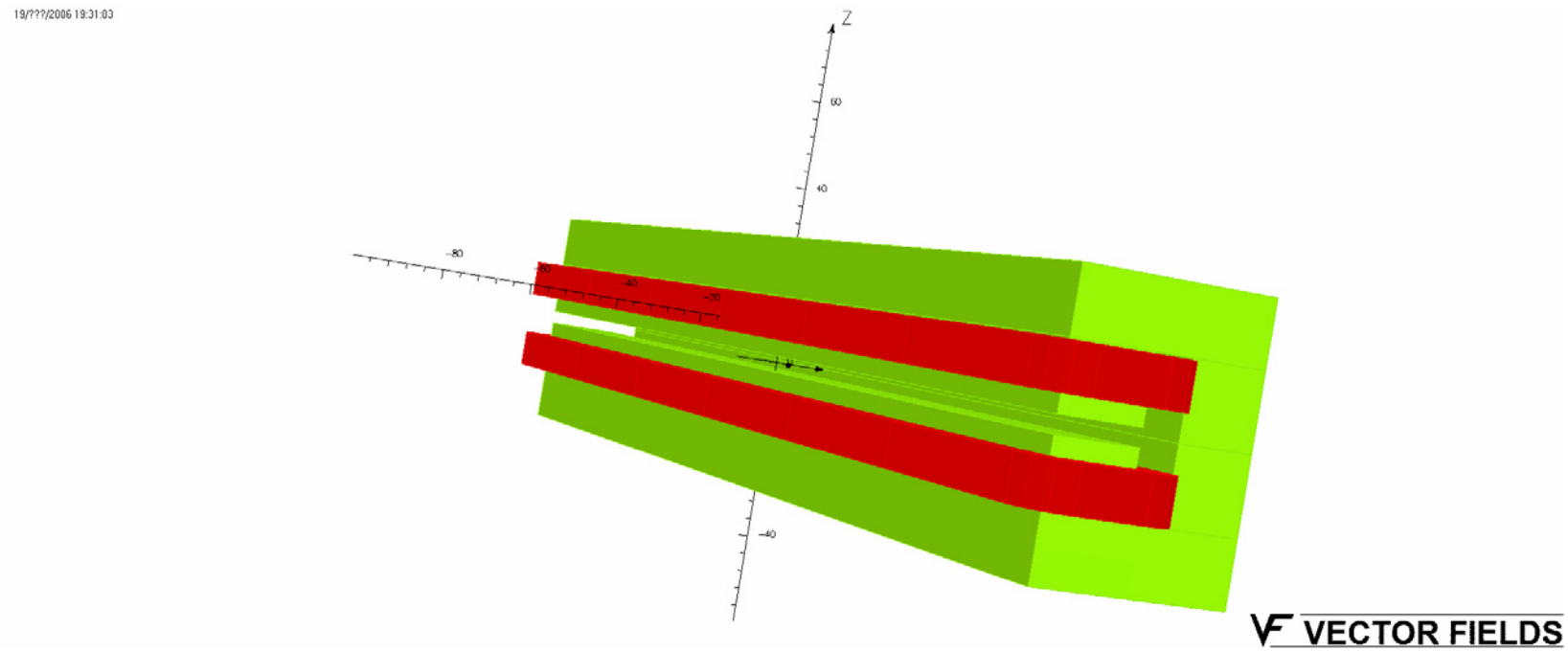
Technical design of the magnets was realized by 2D code POISSON and 3D one MAFIA



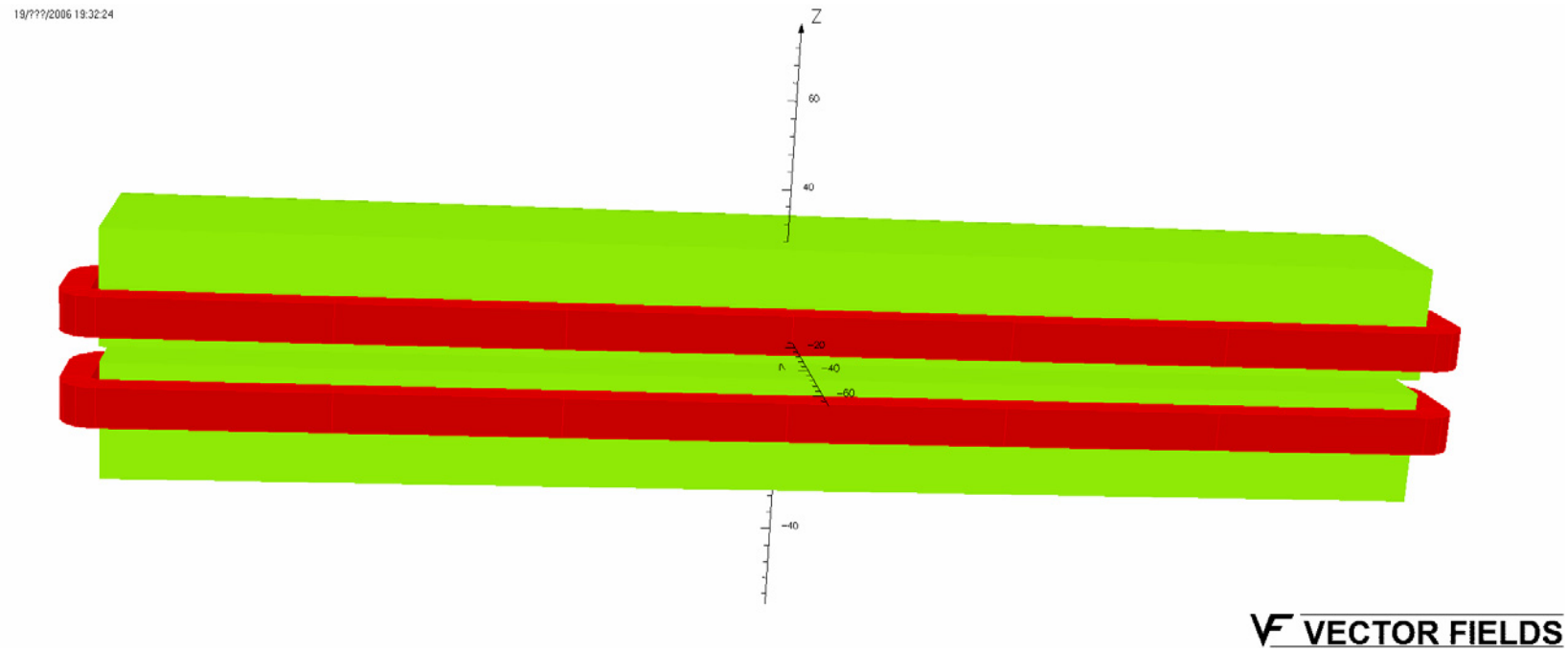
MAFIA simulation



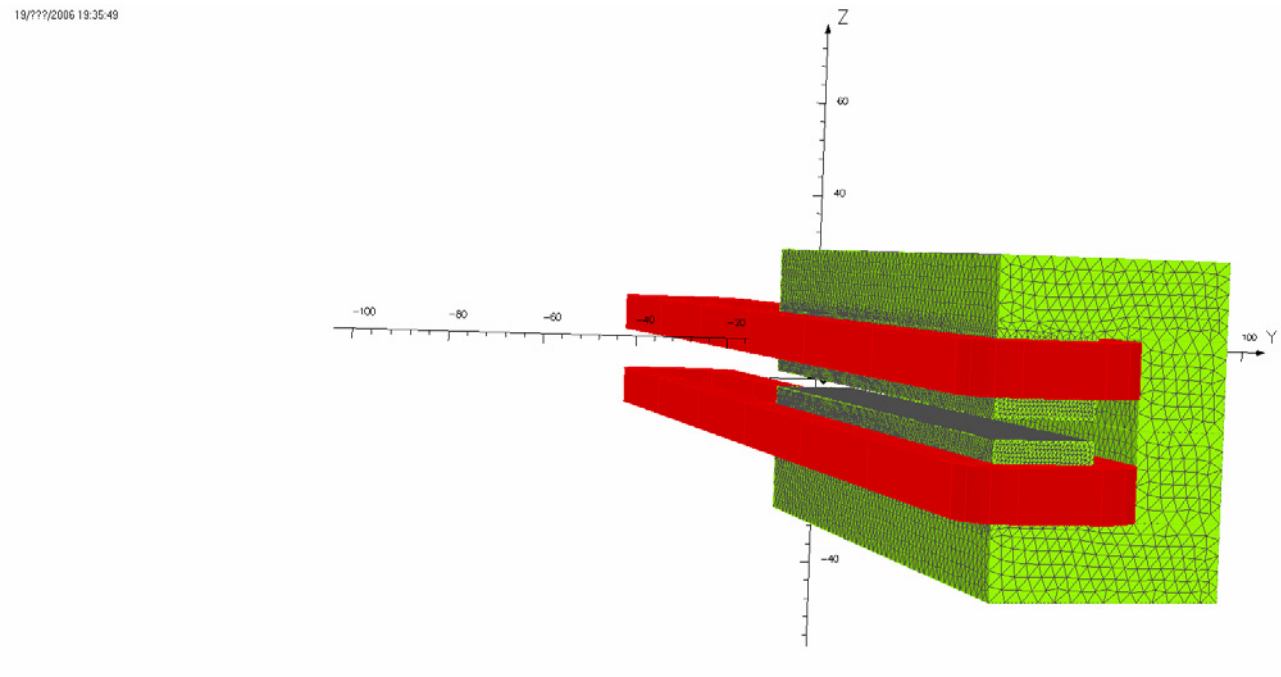
TOSCA simulation



TOSCA simulation



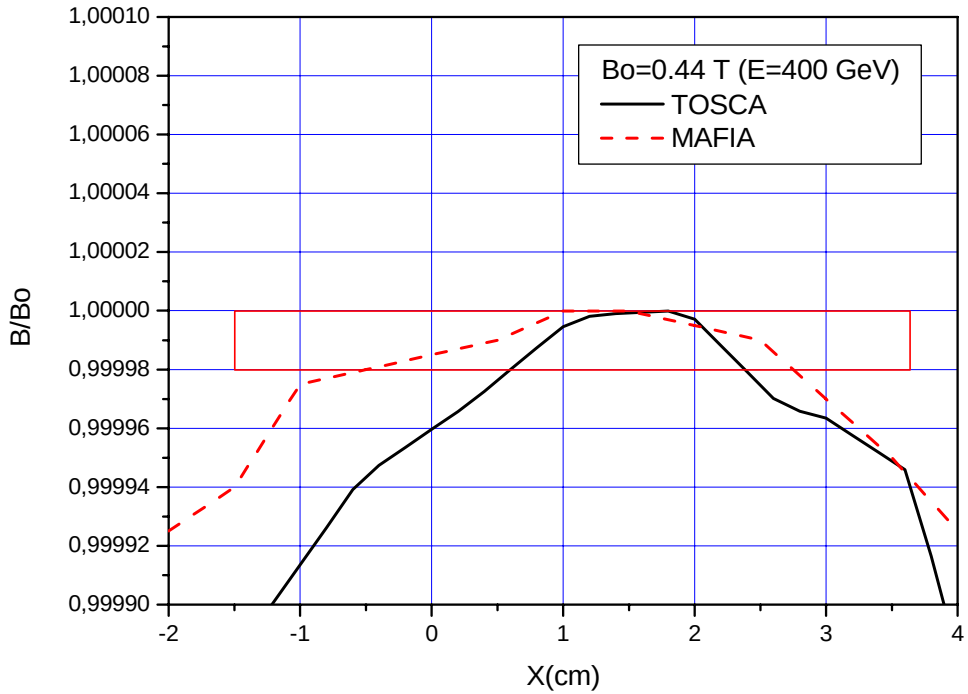
TOSCA simulation



VECTOR FIELDS

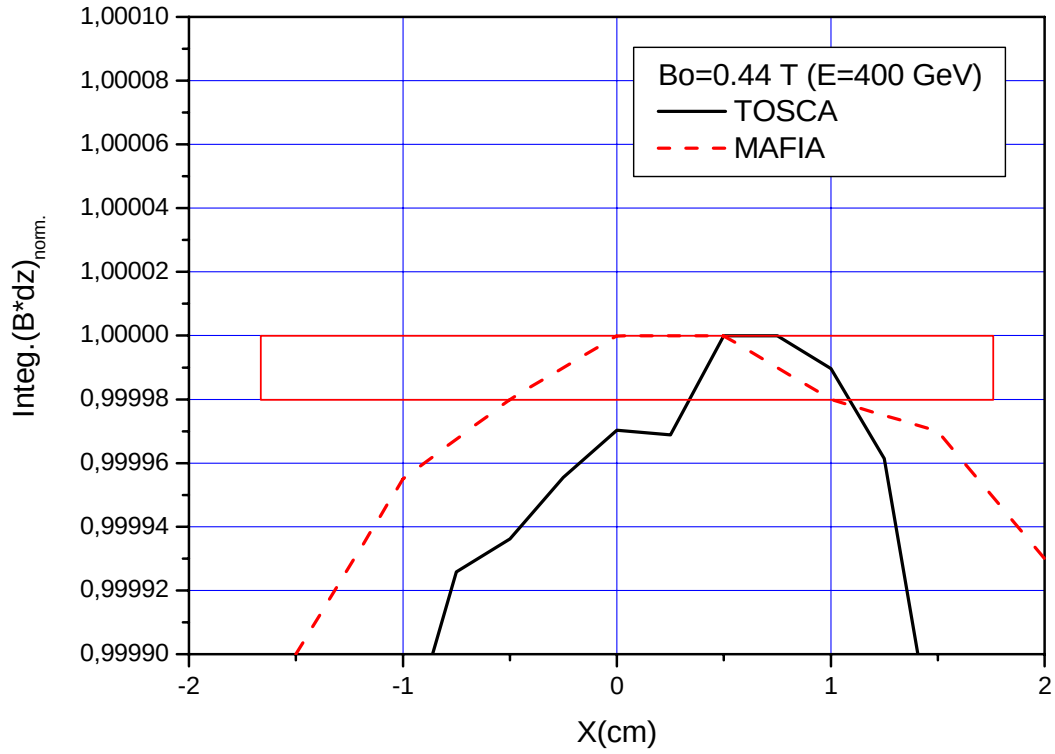
TOSCA simulation

- Magnetic field in the middle cross-section



TOSCA simulation

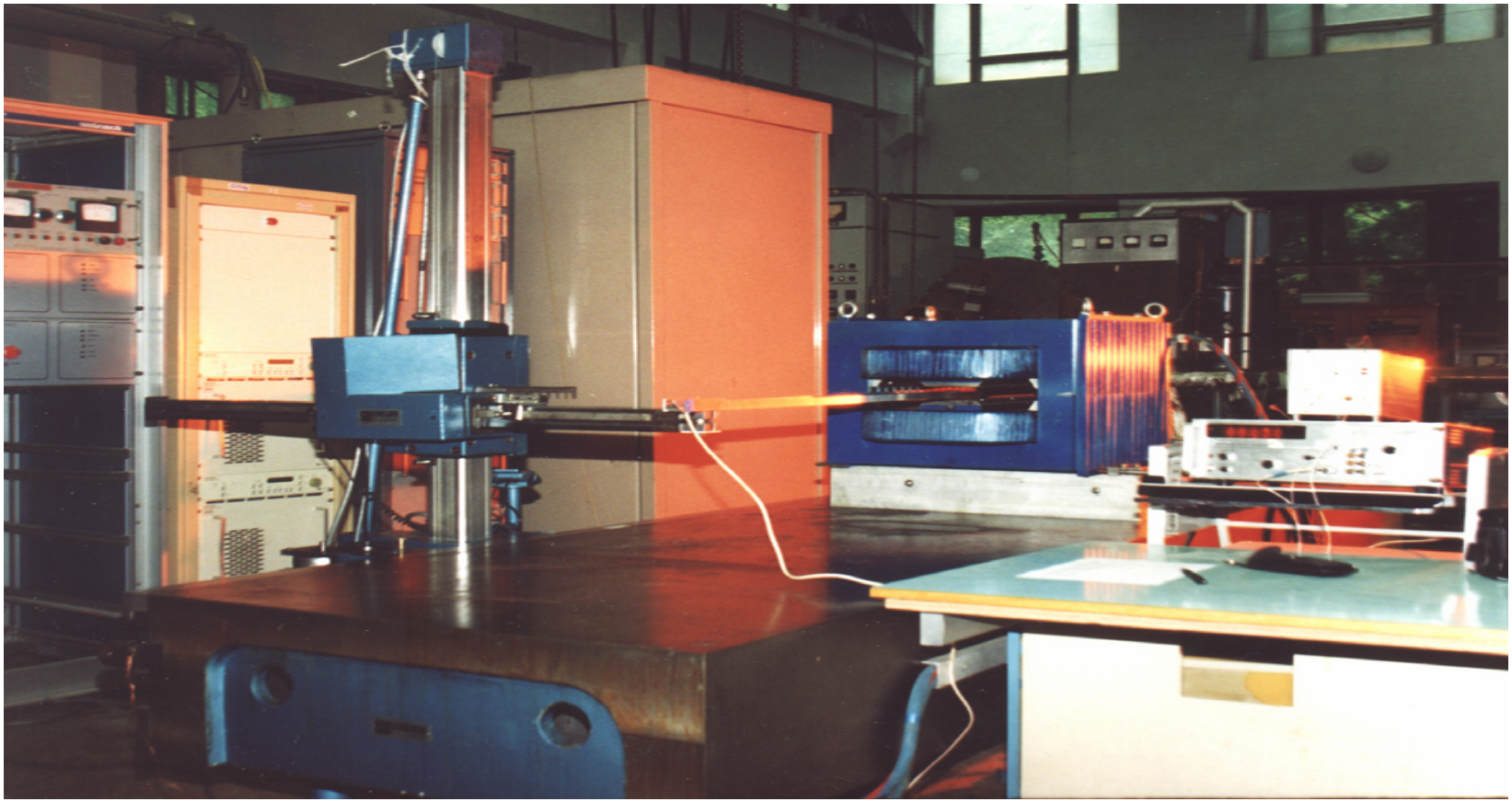
- Magnetic field longitudinal integral



Conclusion for this part

- TOSCA code shows not so optimistic result for the magnetic field uniformity region width as MAFIA one
- To increase the uniformity region width the more wide pole will be required for the future magnet design

Modification of the magnetic field measurement bench



Modification of the magnetic field measurement bench

- Elongation of the longitudinal measurement base (3.5 -> 5 m)
- Installation of the high accuracy (~ some μm) linear encoder (HEIDENHAIN LIDA-485)
- Change of the old DC motors by modern stepping ones
- Change of the old control hardware (70-th) by the modern one

Modification of the magnetic field measurement bench

- The design of the new mechanical elements is finished (separate report will be presented)
- The mechanical elements were manufactured, the table has moved to the LNP experimental workshop and the mounting of the elements is started
- The linear encoder was bought. It is waiting the mounting on the bench
- The new hardware design is very close to finishing and the same is for the software (separate report will be presented)

BPMs calibration requires - the main magnet field integral has to be zero with accuracy 10^{-5} from the working one

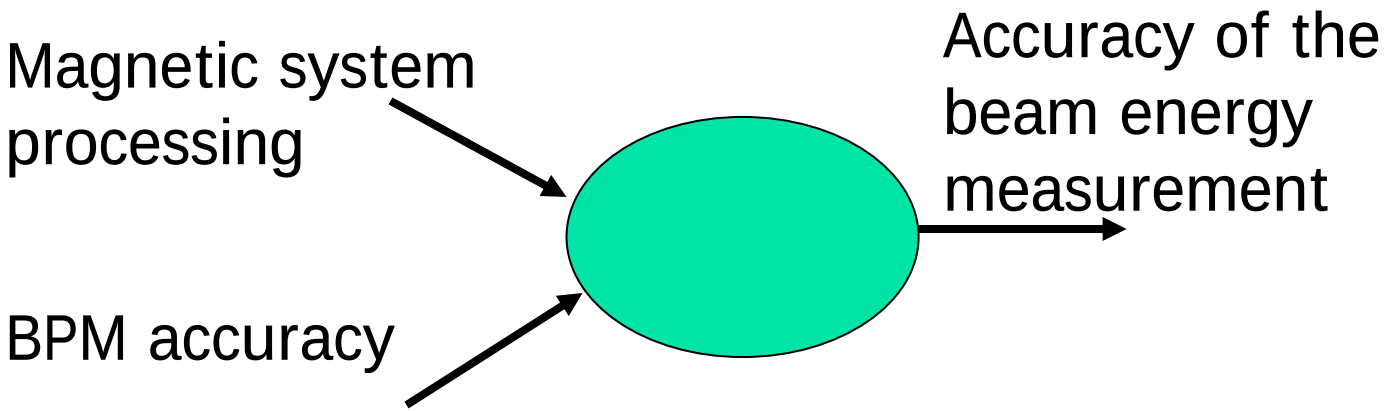
- The possible way for measurement zero field integral (1 – 10 G*cm required) – vibrating wire technique (VWT)
- Test measurement bench for VWT was designed and commissioned in 2004 – beg.2005 (accuracy 0.1 G*cm was demonstrated)

Vibrating wire technique working bench

- The design of the mechanical elements is finished (separate report). The elements manufacturing is in progress
- The control hardware design is near finishing, the same is for software (separate report)

Proposals for participation at the SLAC experiments

- Both sources have to be evaluated



Magnetic system processing

- magnetic field measurements of the spectrometer magnets (accuracy of the field integral 10^{-4} or better)
- magnetic field reproducibility (hysteresis)
- magnetic field stability (temperature effects)
- remanent field (measurements)
- background field (measurement, stability, reproducibility, screening)
- magnetic field history during beam measurement

Participation in the SLAC experiments

- Because of the visa process delay I was not able to participate in the SLAC May test run
- New person was involved into magnet design – Sergey Kostromin: young but rather experienced scientist in magnet and beam dynamic simulation

Magnetic system proposal for ILC spectrometer (based on the prototype experience)

- magnetic system principal choice (3 or 4 magnets)
- basic parameters (distance between magnets, beam deviation angle)
- magnetic field simulation (by different 3D codes)
- beam dynamic simulation in the spectrometer line
- technical proposal

Conclusion
2006 plan

- Manufacturing and mounting of the mechanical elements for modified magnetic field measurement bench
- The same for the VWT
- Manufacturing and commissioning of new control hardware for both benches
- Test of the benches and first magnetic measurements at the test magnet

2006 plans

- Provide residual magnetic field measurements by fluxgate and Hall magnetometer for the test magnets

2006 plans

- Provide the technical proposal for new option of the spectrometer magnetic system
- Start technical design of the test magnet (if it will be approved by the collaboration)
- Participation in the SLAC experiments