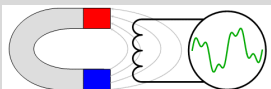


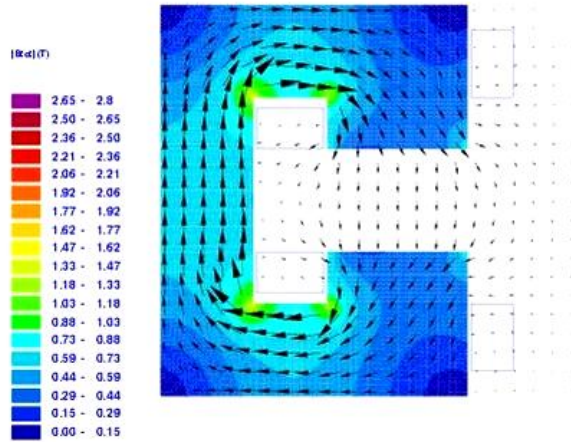
Accelerator Magnet Design, Optimization, Measurement, Quality Assurance, Commissioning

S. Russenschuck
CERN TE-MS-C-MM

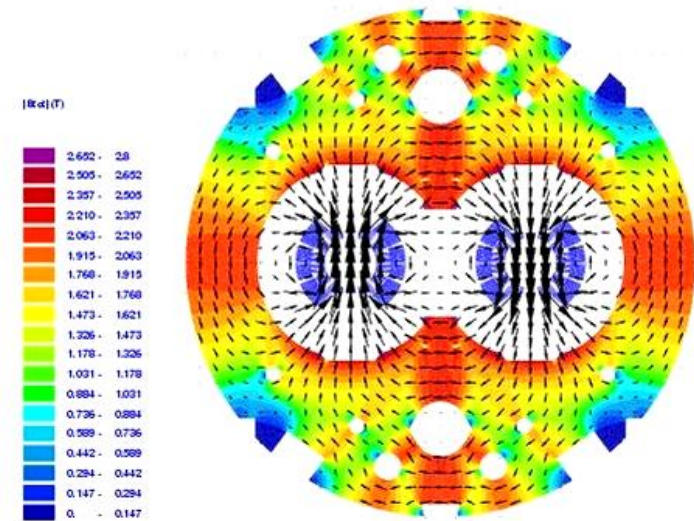
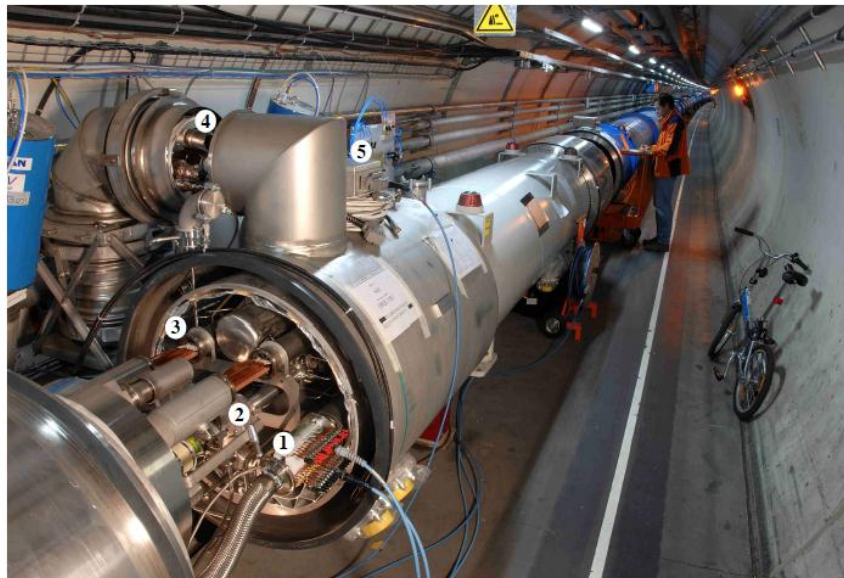
JUAS 2013



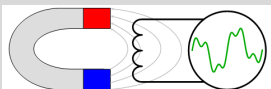
Normal Conducting Versus Superconducting Accelerator Magnets

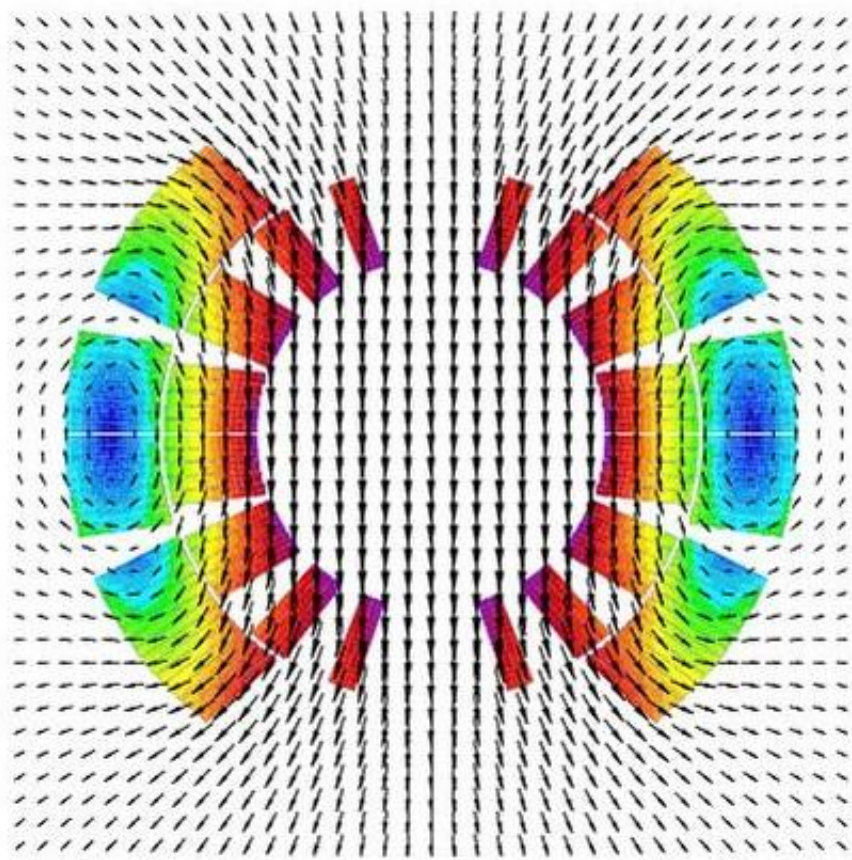


$N \cdot I = 4480 \text{ A}$ $B_1 = 0.13 \text{ T}$ $B_s = 0.042 \text{ T}$ Fill.fac. 0.27

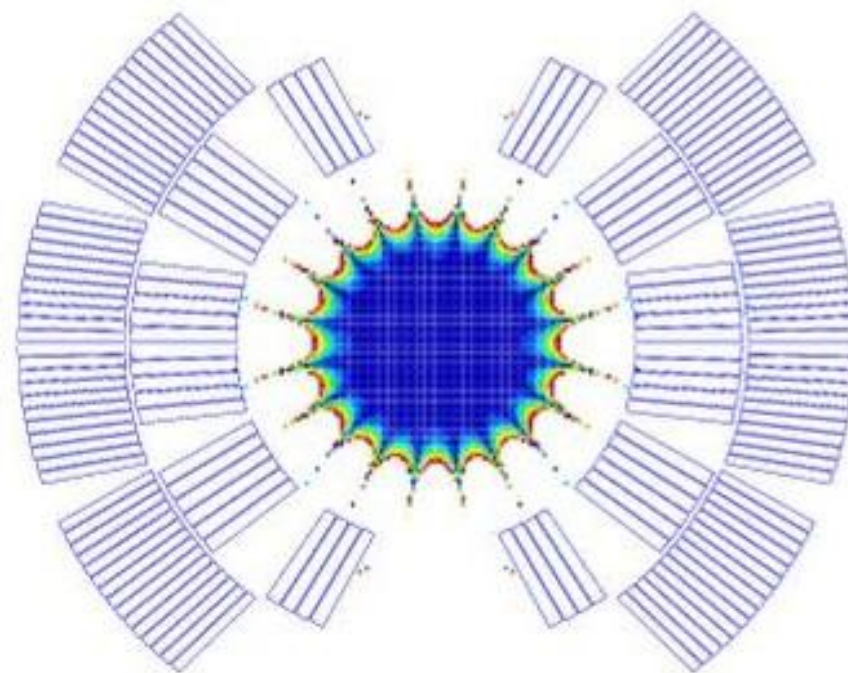


$N \cdot I = 2 \times 944000 \text{ A}$ $B_1 = 8.32 \text{ T}$ $B_s = 7.44 \text{ T}$

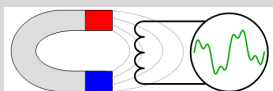




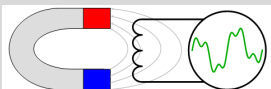
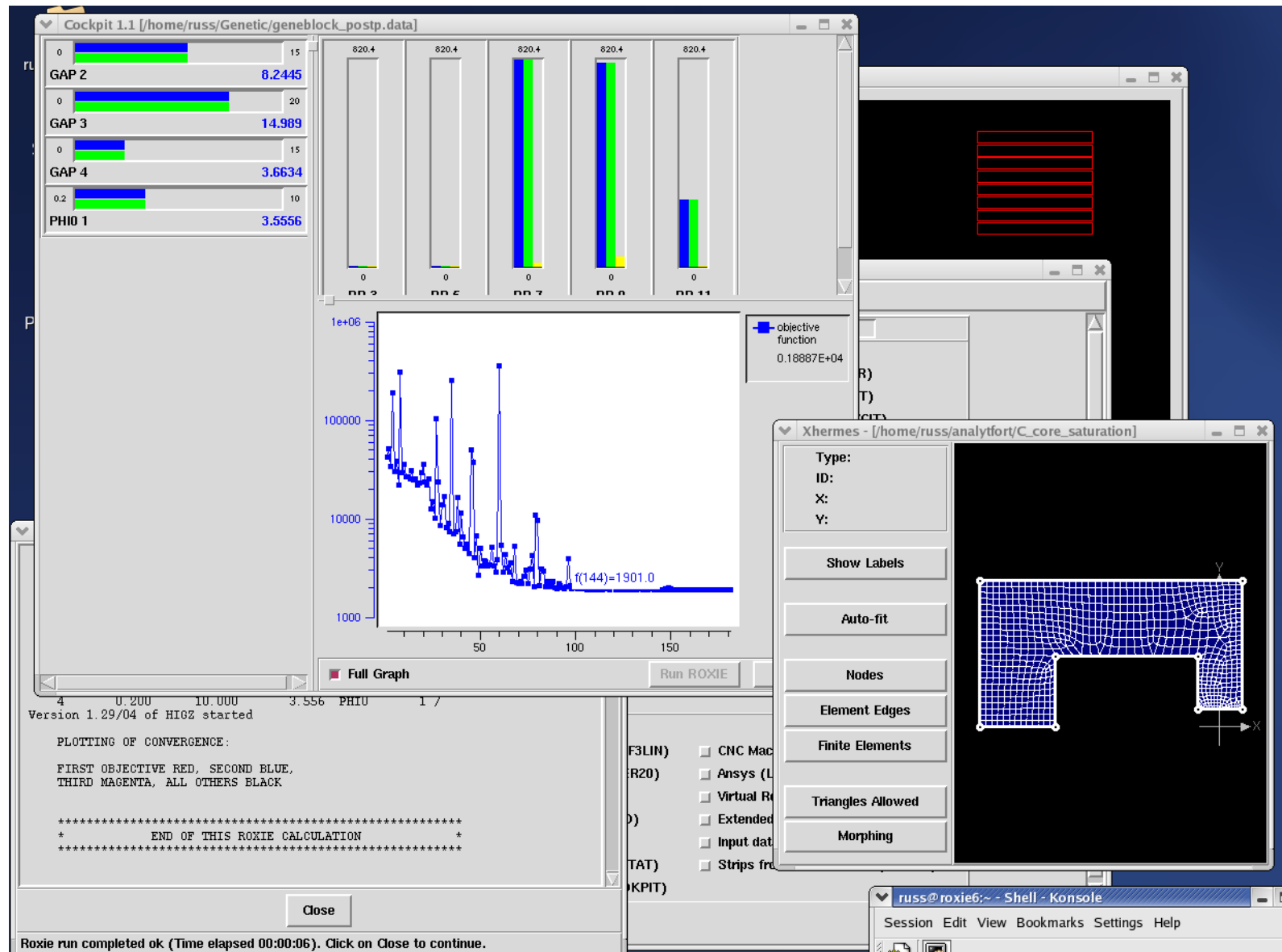
Field map



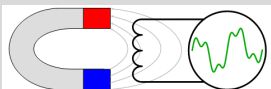
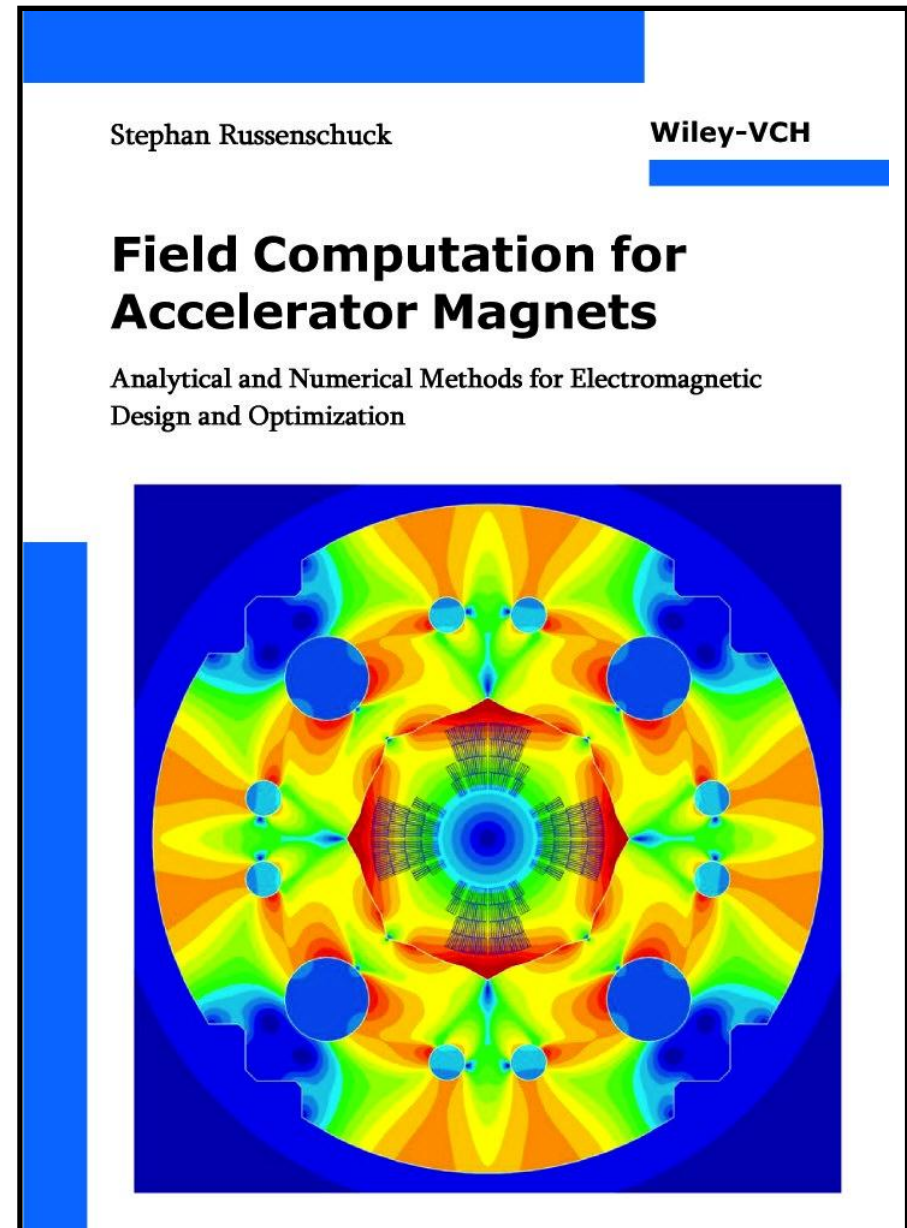
Good field region



ROXIE User's Interface

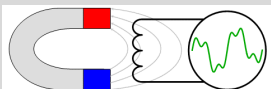


- Linear Algebra
- Vectoranalysis
- Harmonic Fields
- Green's functions and imaging currents
- Complex analysis
- Differential geometry
- Numerical field computation
- Hysteresis modeling
- Coupled Systems
- Mathematical optimization



Expected “Training” Results for Thursday

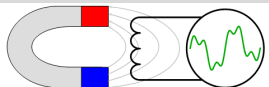
- ➔ Normal conducting magnets
 - Scaling of excitation currents and iron saturation
 - Multipole components
 - Position of the excitation coil
 - Pole shape
 - Yoke thickness
 - Reduced field
- ➔ Superconducting magnets
 - Imaging method
 - Reduced field
 - Saturation and yoke dimension
 - Sensitivity to coil-block deformations
 - Scaling of multipoles
 - Feed-down



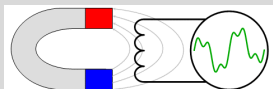
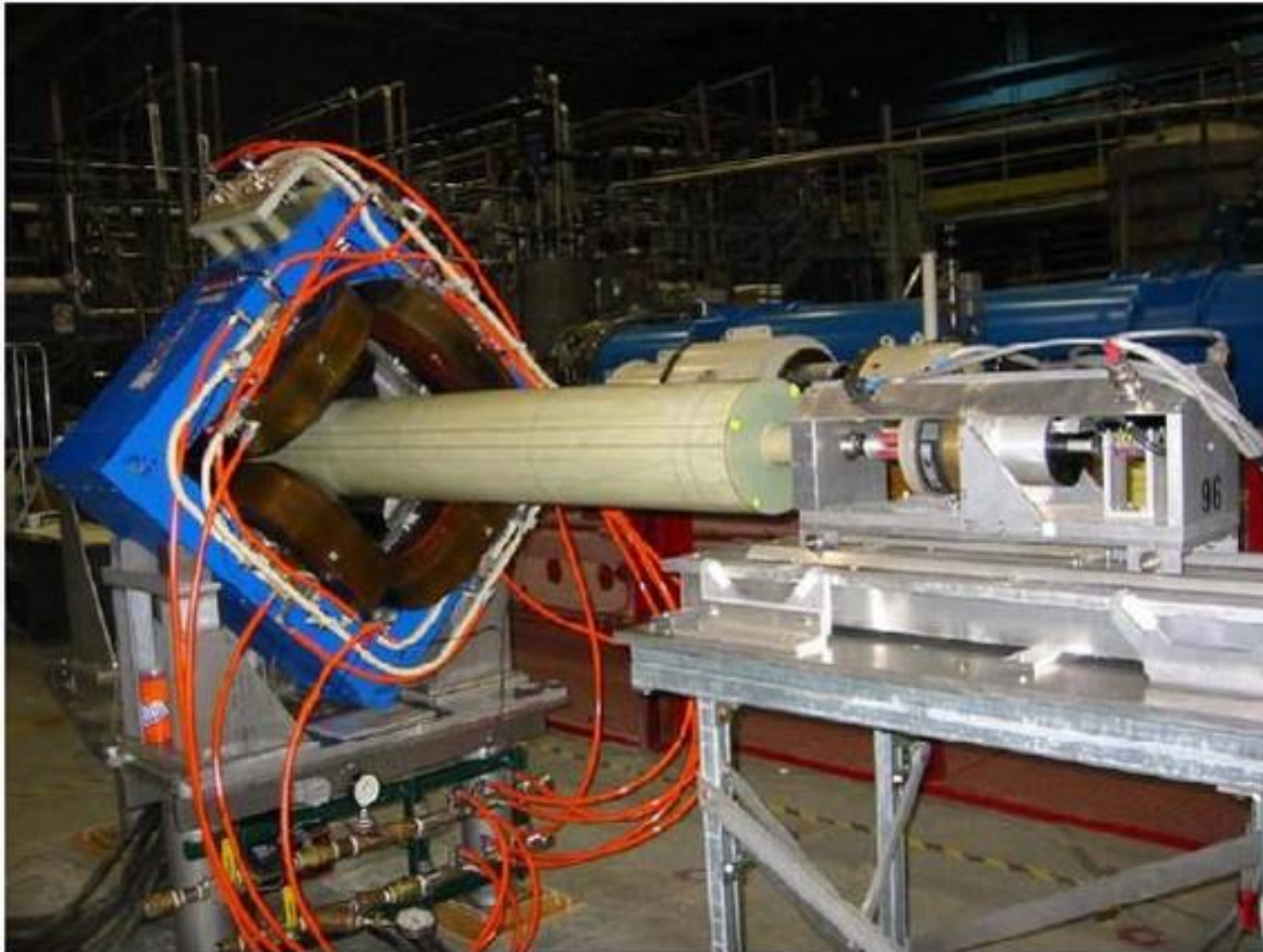
Series Measurements of the LHC Magnets



Stephan Russenschuck, CERN TE-MS-C-MM, 1211 Geneva 23
JUAS 2012



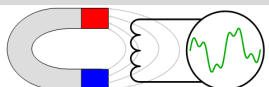
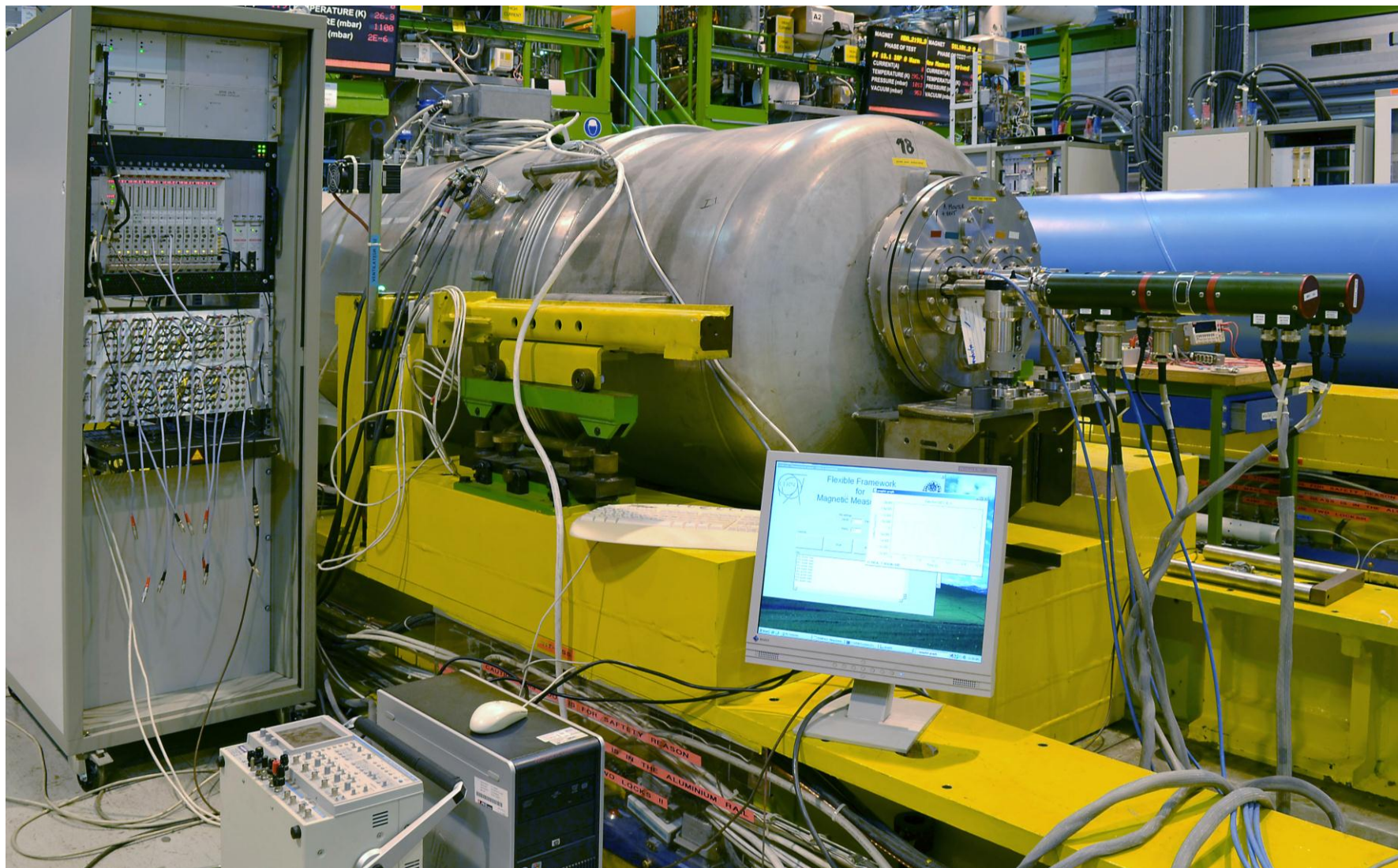
Rotating Coil Measurements: Calibration



Stephan Russenschuck, CERN TE-MS-C-MM, 1211 Geneva 23
JUAS 2012



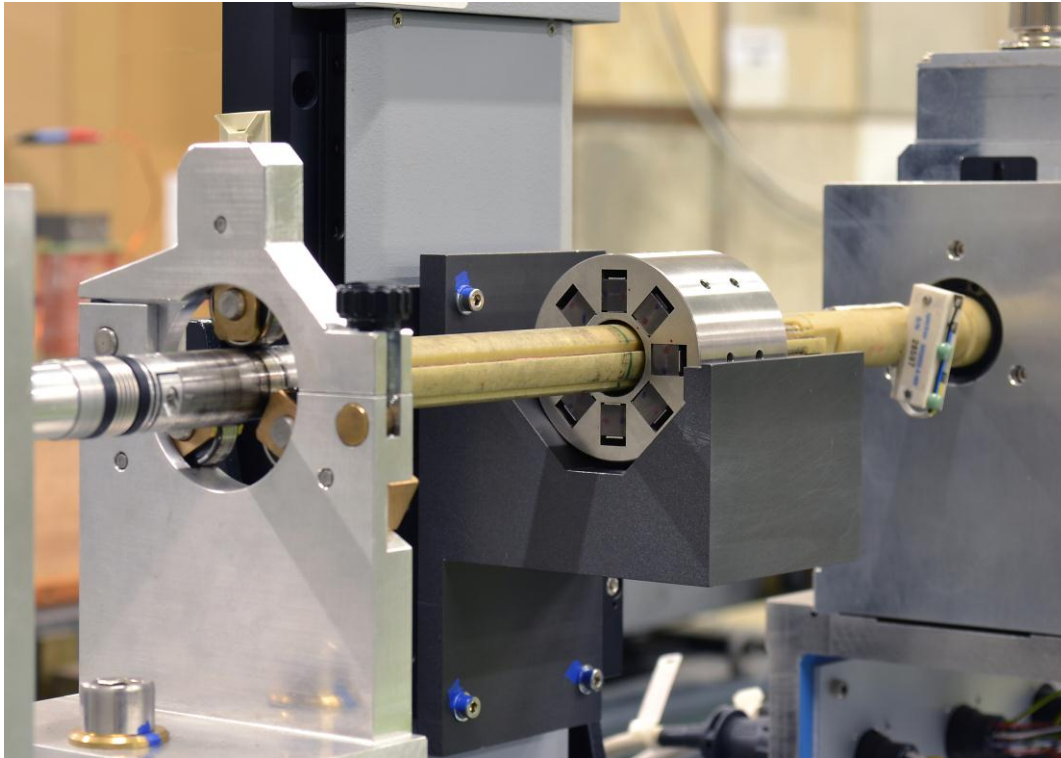
Rotating Coil Measurements



Stephan Russenschuck, CERN TE-MS-C-MM, 1211 Geneva 23
JUAS 2012

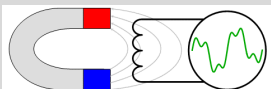
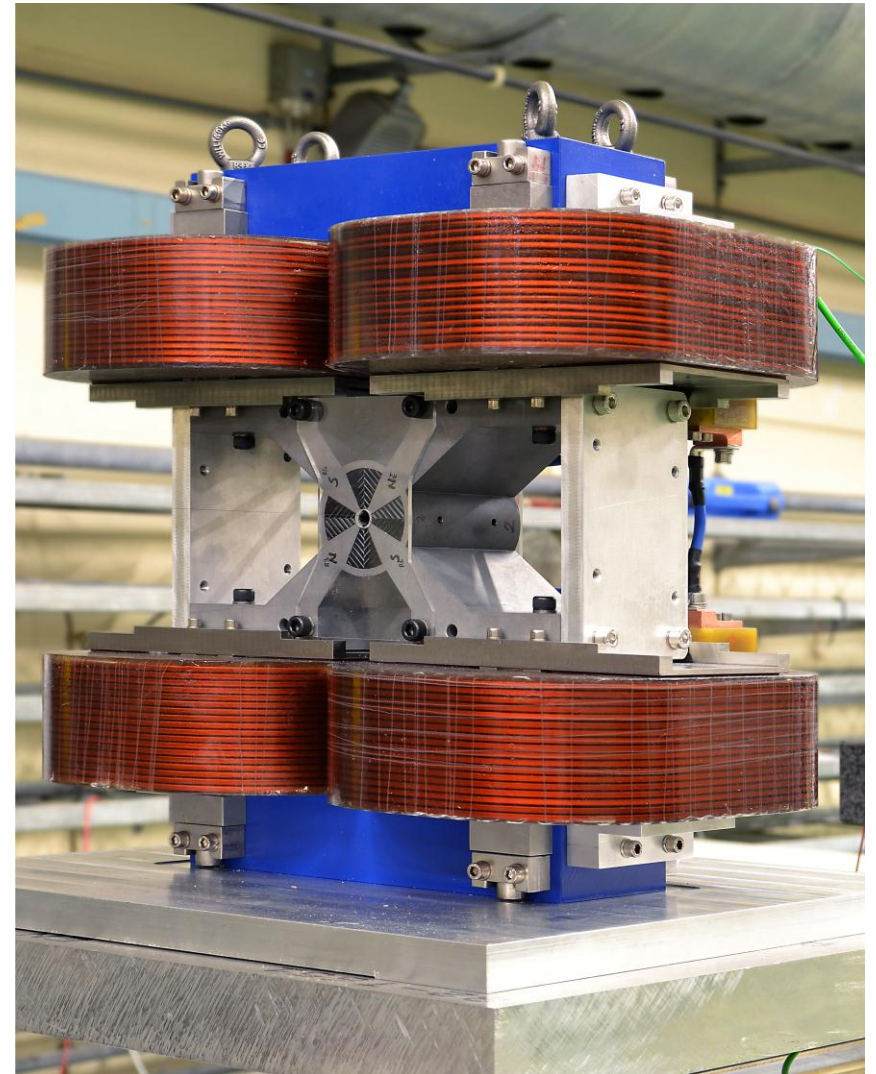


Magnetic Field Measurements



Rotating coil measurement system

Stretched wire



Practical Work on Normal-Conducting Magnets

- ➔ Introduction to different magnet types
- ➔ Manufacturing technologies
 - Coil
 - Yoke
 - Auxiliary parts: Interlock, cooling, alignment targets
 - Materials in NC magnets

- ➔ Practical work – Quality assurance
 - Tests and measurements during and after production

