

Novel superconducting magnet  
technologies towards the  
applications in future high-intensity  
accelerators

Toru Ogitsu

KEK, Cryogenics Science Center

# KEK Cryogenics Center

- Support KEK projects by Superconducting Technologies and Cryogenics Engineering



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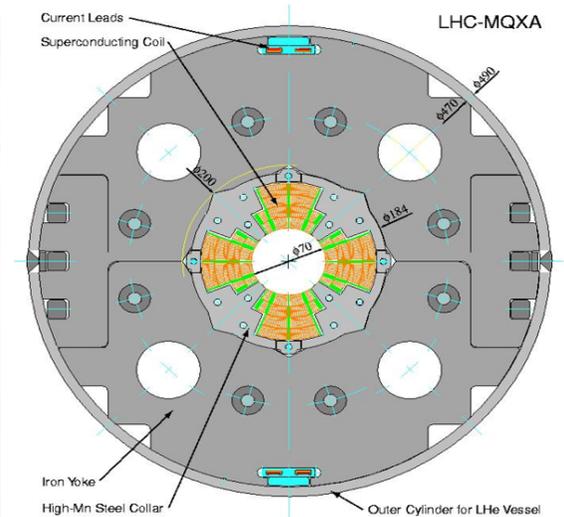
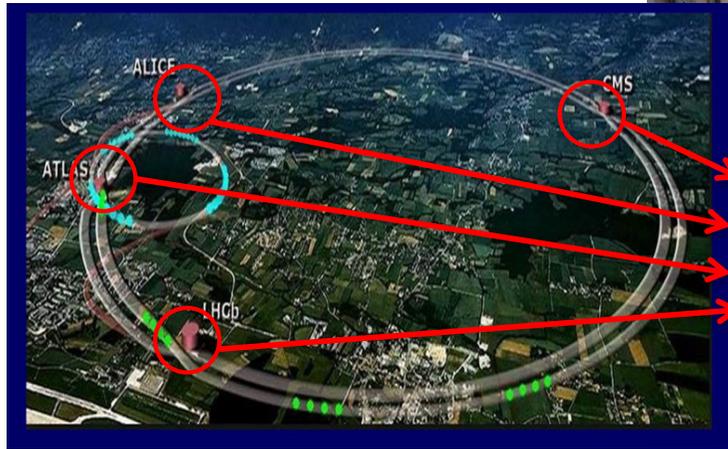
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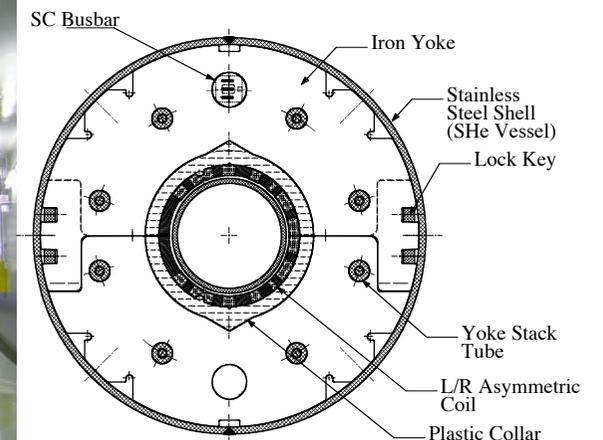
Wanison Ramnarong

# Major works

- LHC Insertion Quadrupole MQXA

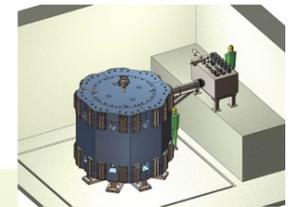


- J-PARC Neutrino Beam Line SC Magnet System

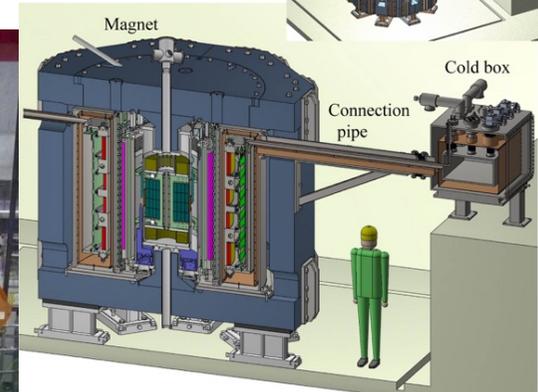
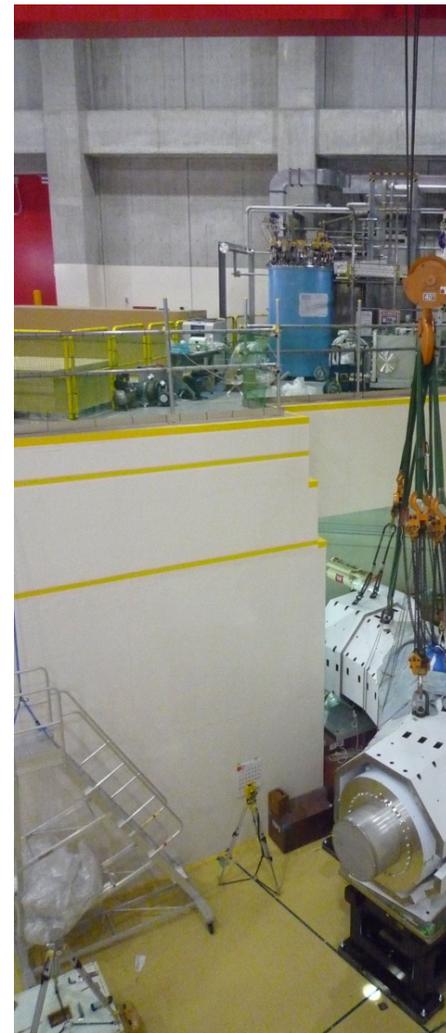


# On going projects at J-PARC: MUSE, COMET, g-2/EDM, etc

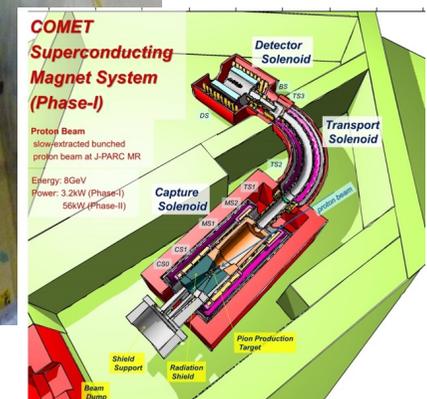
g-2/EDM



SC solenoid for MUSE

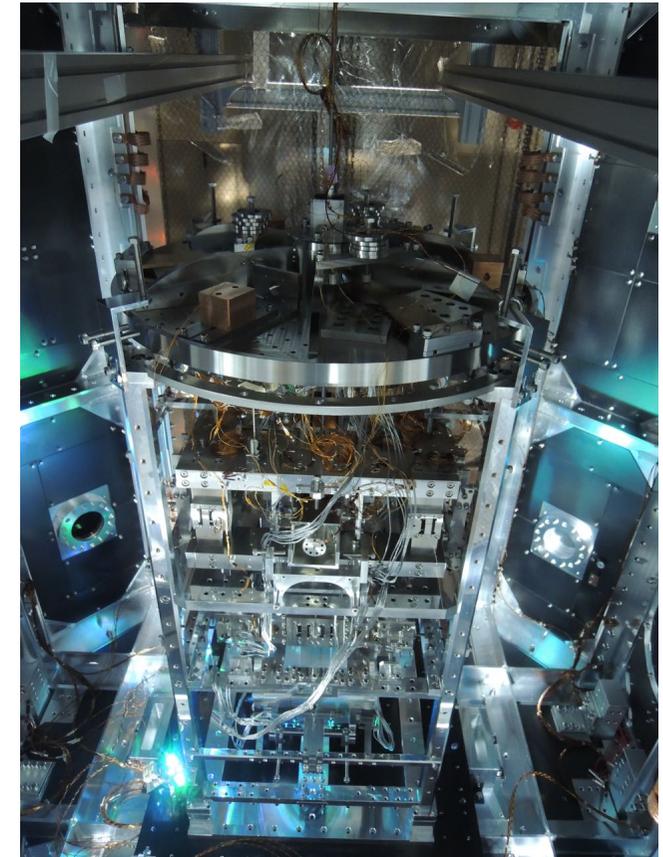
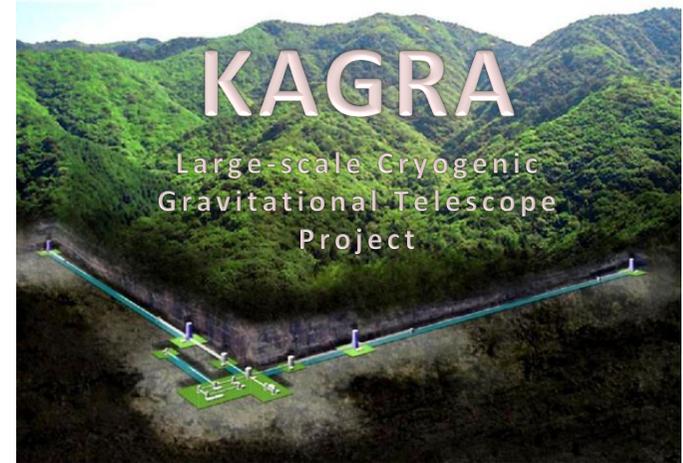


- Just constructed
  - MUSE MUON beam line solenoids
    - SC magnet under high radiation environment
- Under construction
  - COMET
    - SC magnet under high radiation environment with high field  $\sim 6$  T
    - Radiation resistant materials
- Under Development
  - g-2/EDM
    - High accuracy superconducting solenoid

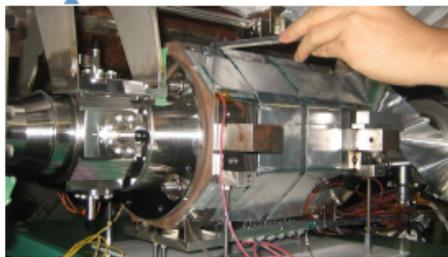
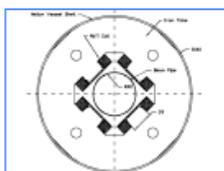
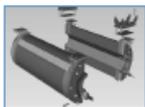


# On going project: KAGRA

- Under construction: since 2010
  - Very low vibration cryogenics



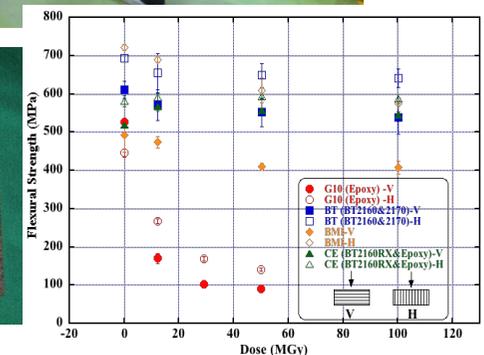
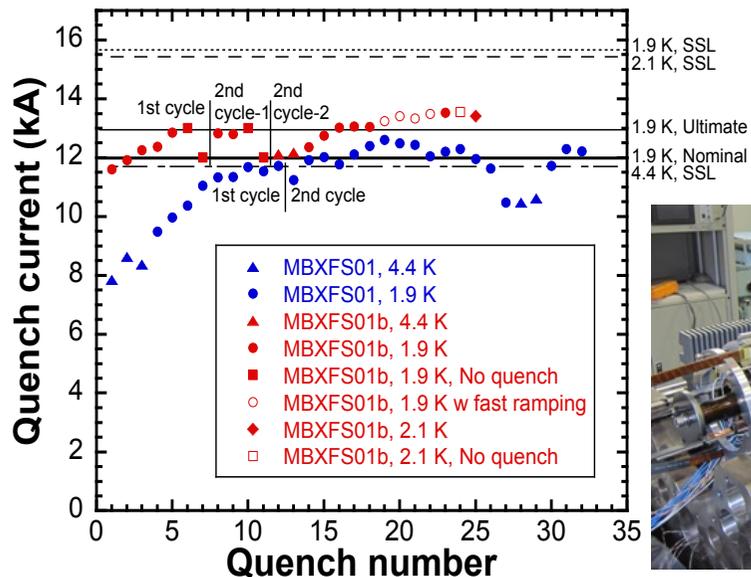
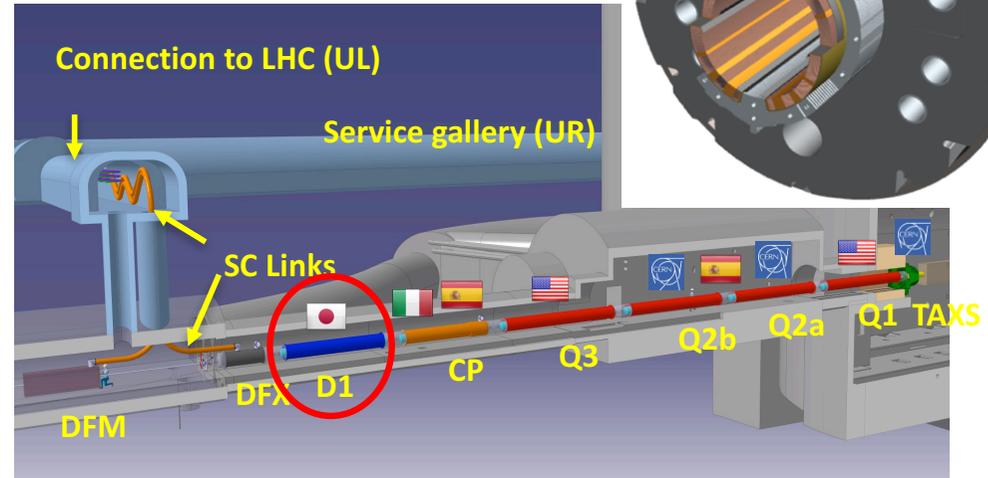
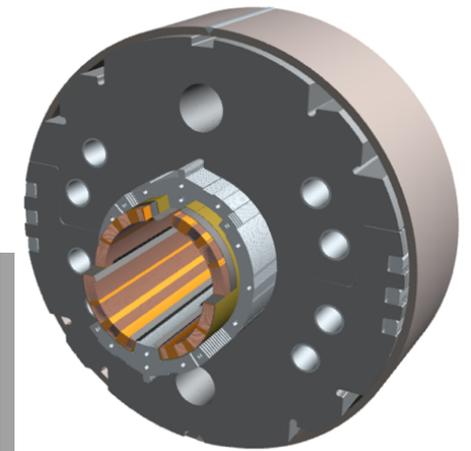
Cryogenic Suspension System



Pure Al heat conduction technology  
Spin out: ILC Q-Mag

# On going project: HL-LHC D1 magnet

- Beam Separation dipole
  - Large aperture: 150mm
  - High Field: 5.57 T beam, 6.56 T peak
  - High radiation: 25 MGy
    - Radiation resistant GFRP



# R&D for Future

- Radiation Resistant Superconducting Magnet

- HTS based



R&D of Ceramic Coating

- SC Accelerator Magnet with Advanced Conductor

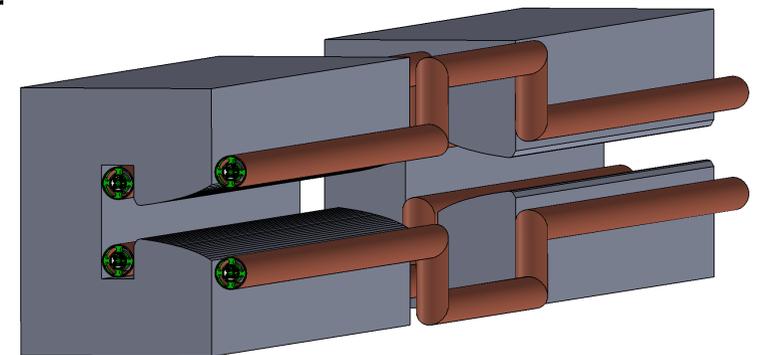
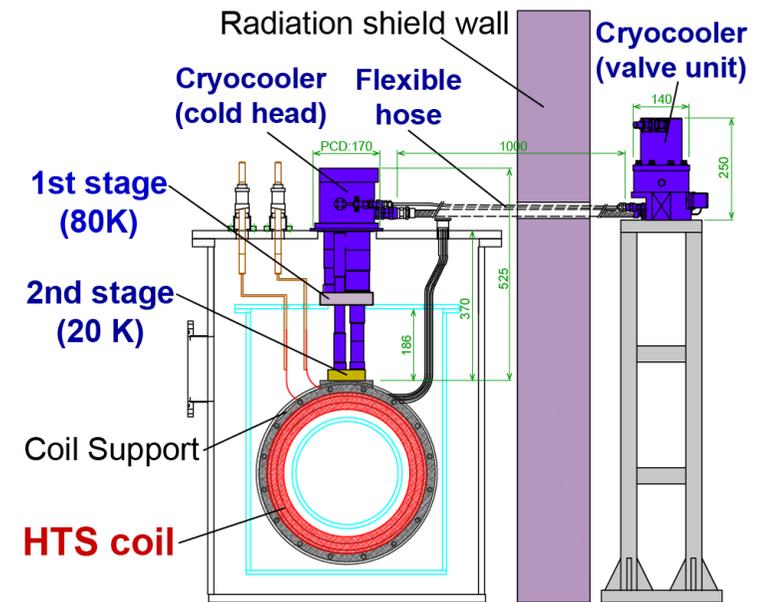
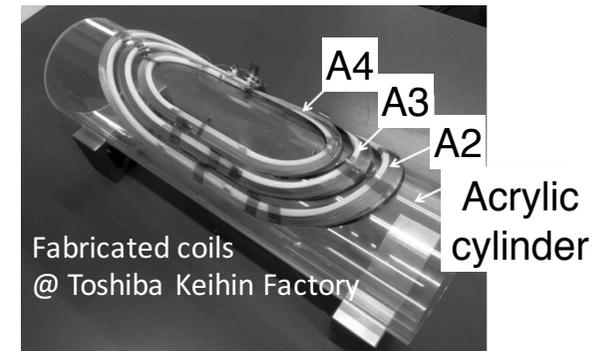
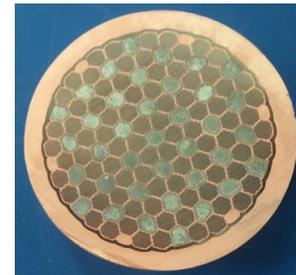
- High  $J_c$   $Nb_3Sn$  conductor

- CERN collaboration

- HTS accelerator magnet

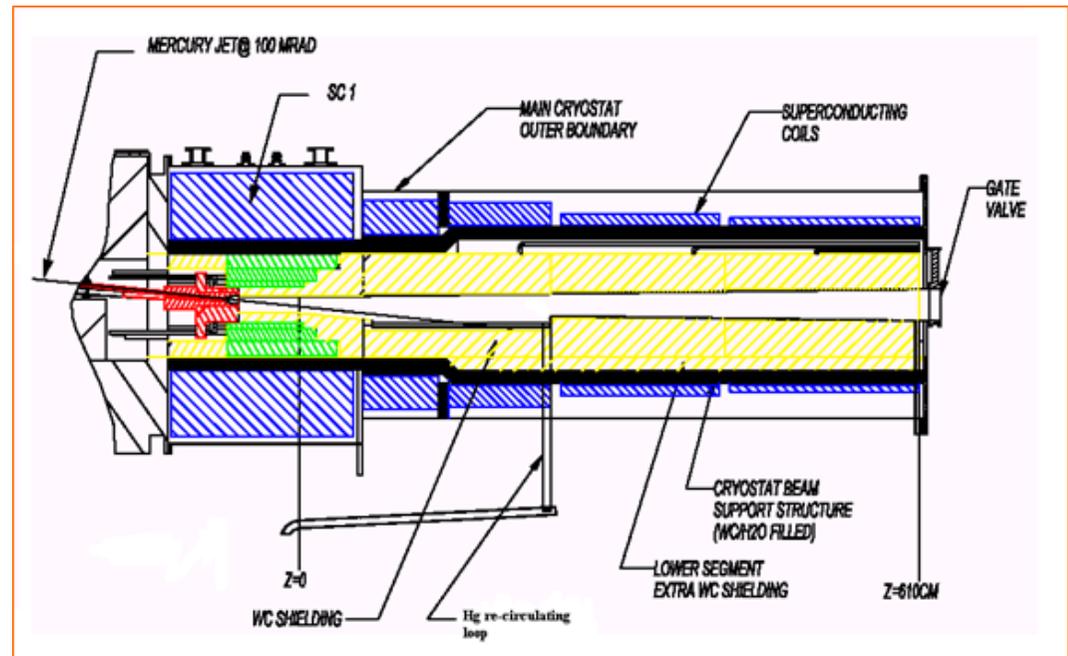
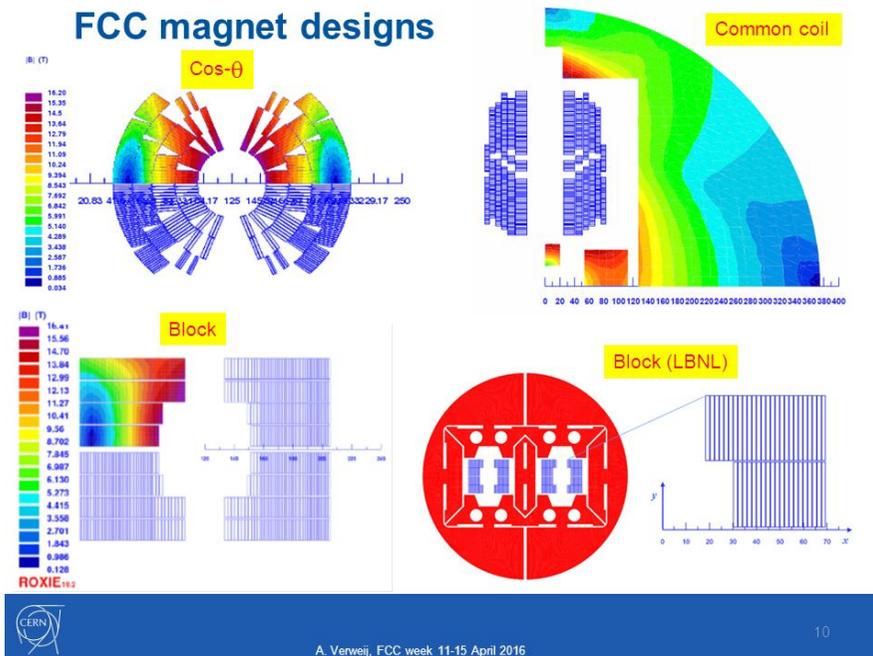
- Company & University collaborator

- High-efficiency superconducting magnet



# Further Future

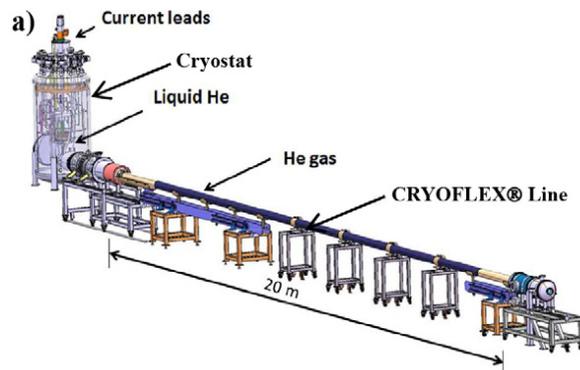
- High Field(>10 T) Magnets for High Radiation Environments (~100 MGy)
  - High field magnets for future hadron collider (IR, etc)
  - High field solenoid for neutrino super beam



# Multinational Lab

Promote R&D for Radiation Resistance Superconducting Magnets with Advanced Superconductors

- KEK (JP)
- TRIUMF (CA)
- CERN (CH): A. Ballarino MgB<sub>2</sub> Transmission Line



- Robinson Research Institute Victoria University of Wellington (NZ)
- Kyoto Univ. (JP)

