Offline Computings for Precision Muon Physics at J-PARC

2016 Joint Workshop of FKPPL and TYL/FJPPL
May 18 2016, KIAS, Seoul, Korea
Soohyung Lee (CAPP/IBS)

on behalf of FJPPL muonists[†]

† This word doesn't exist, so don't open you dictionary.

Introduction

- Our French colleagues (IN2P3) are working on the development of software framework for COMET

    ‣ **I**ntegrated **C**OMET **E**xperiment **D**ata **U**ser **S**oftware **T**oolkit (ICEDUST)

    - Software framework for COMET experiment

    ‣ GENFIT2[1] for tracking

    - Tracking simulation within ICEDUST for various tracking studies

    ‣ Computing resources at CCIN2P3

- Muon g-2/EDM also needs a software framework, and ICEDUST is a good candidate

[1] J. Rauch and T. Schluter, arXiv:1410.3498

FJPPL for Muon Physics

- 14 members from 5 institutes are registered

  ‣ **LPNHE/IN2P3**

    - Frederic Kapusta[1,2], Giovanni Calderini, Maurice Benayoun[2], Luigi Delbuono[2]
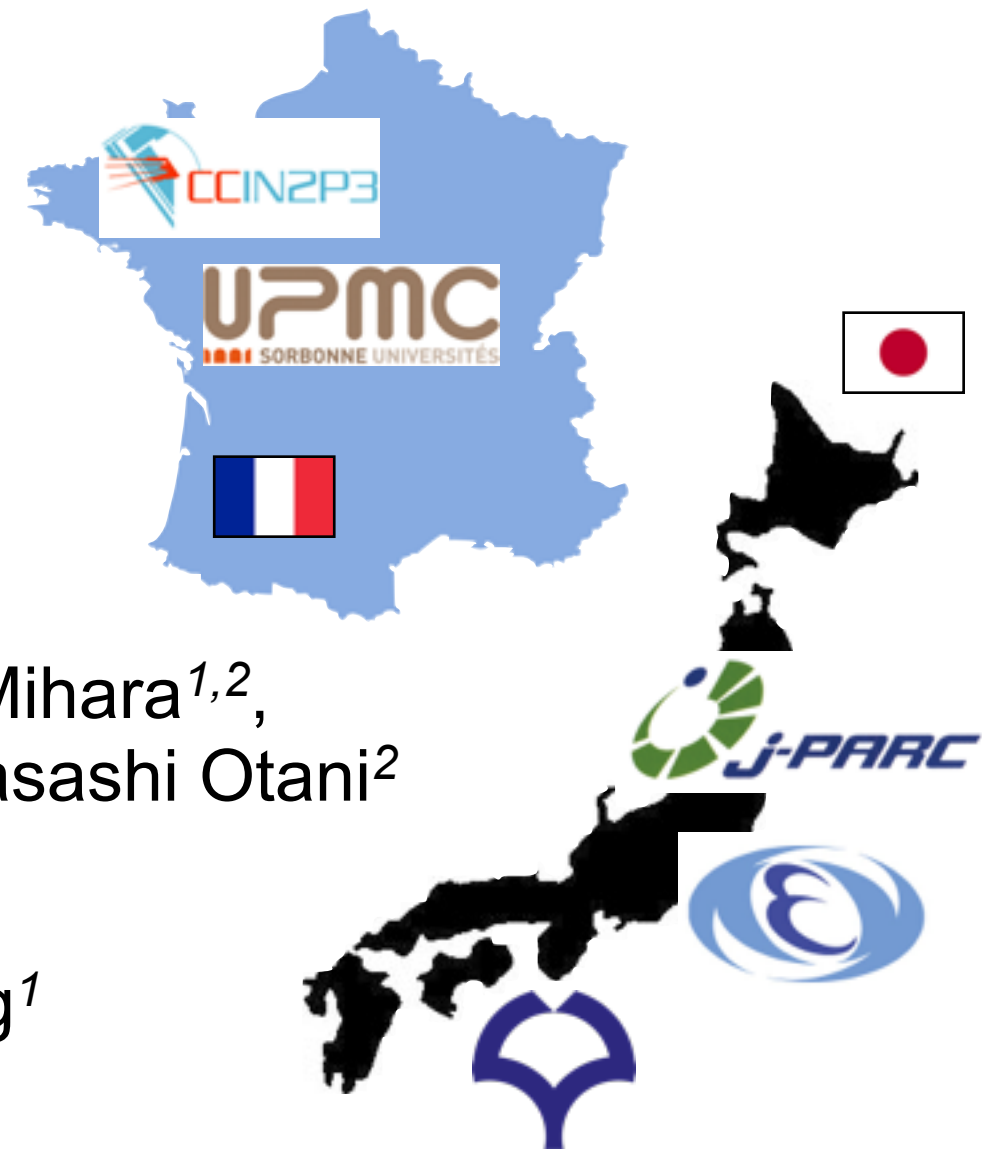
  ‣ **LPNHE/UPMC**

    - Wilfrid da Silva[1,2]

  ‣ **KEK/J-PARC**

    - Tsutomu Mibe[1,2], Naohito Saito[1,2], Satoshi Mihara[1,2], Hajime Nishiguchi[1,2], Yoshinori Fukao[1,2], Masashi Otani[2]

  ‣ **Osaka University**

    - Yoshitaka Kuno[1,2], Akira Sato[1,2], Mark Wong[1]

*[1]COMET collaborator*
[2]Muon g-2/EDM collaborator

ICEDUST

- The structure is based on ND280 software framework

  ‣ ICEDUST covers all the offline-computing

    - Includes; simulation, data handling, calibration, reconstruction, event display, and analysis
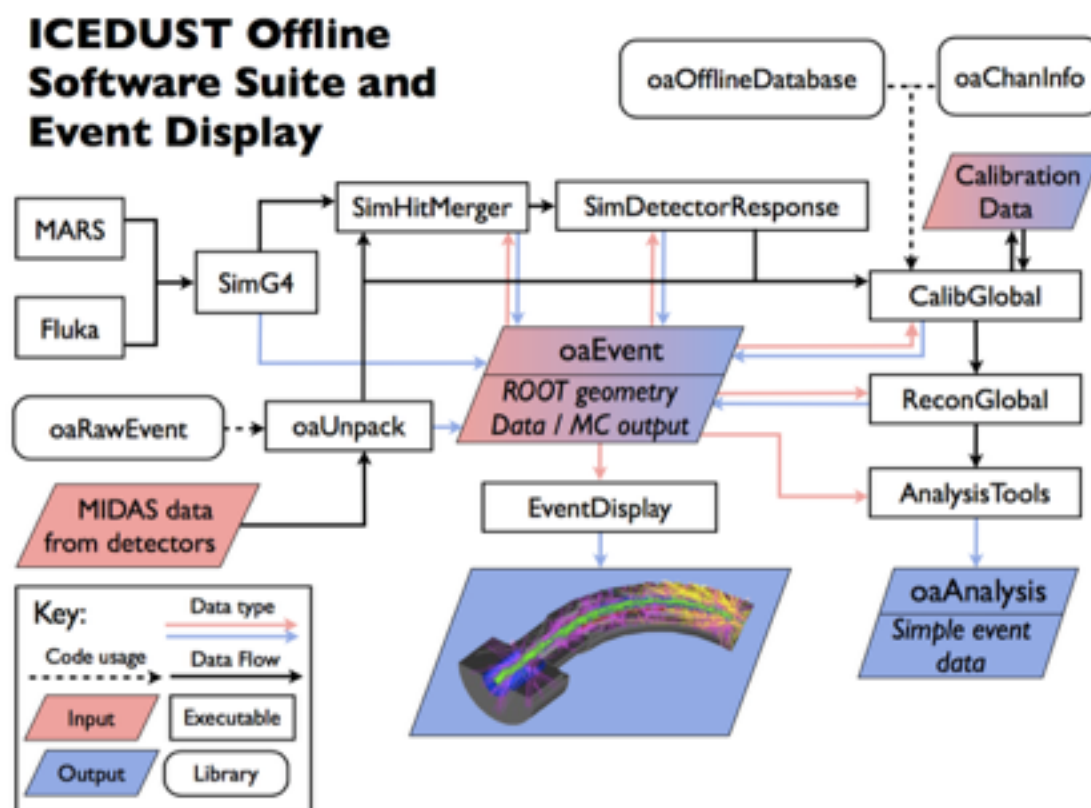
- GENFIT2 within ICEDUST

  ‣ **Mark Wong (Osaka University)**

    - Passive muon stopping target optimization

   - Active muon stopping target studies
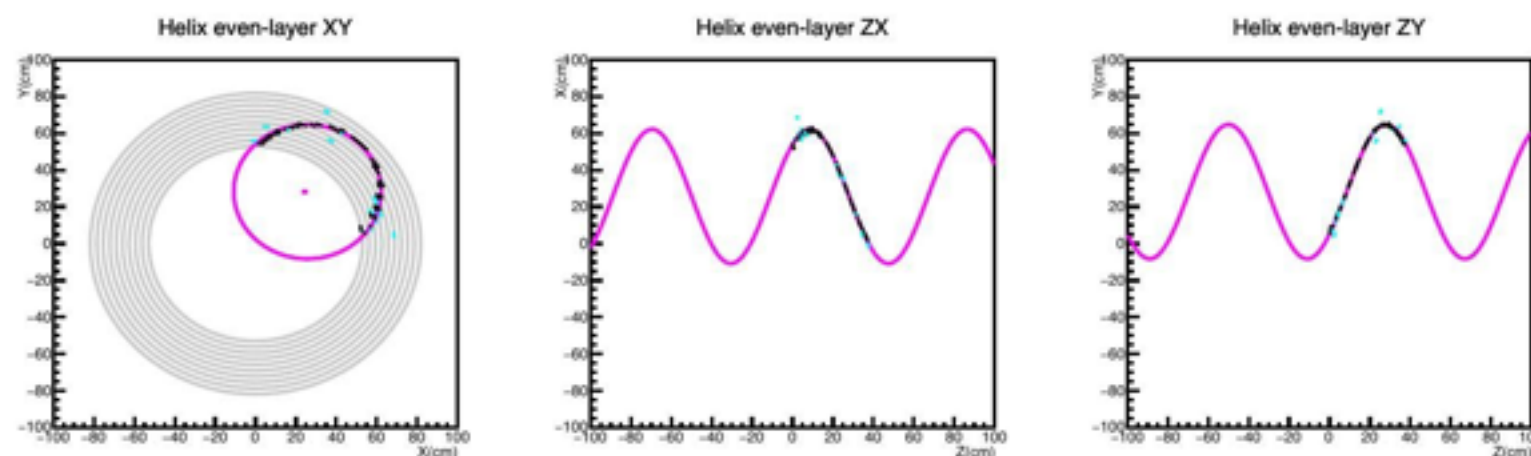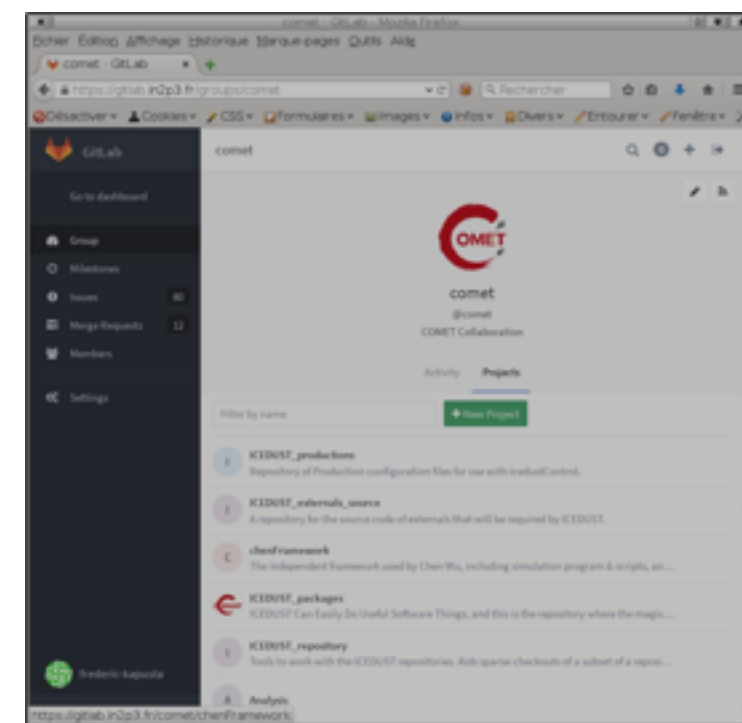
Mark Wong (Osaka University)

R. Akhmetshin et al., COMET Phase-I TDR

Computing Resources at IN2P3

- IN2P3 provided a powerful computing resources in 2015 and is planning even more power in 2016

  ‣ CPU time: 400,000 hours → **4,400,000 hours**

  ‣ Storage: 21 TB → **230 TB**

  ‣ Software libraries are maintained with utilizing gitlab by 39 members, and ICEDUST was successfully installed and tested

  ‣ Massive MC data production is planned in 2016
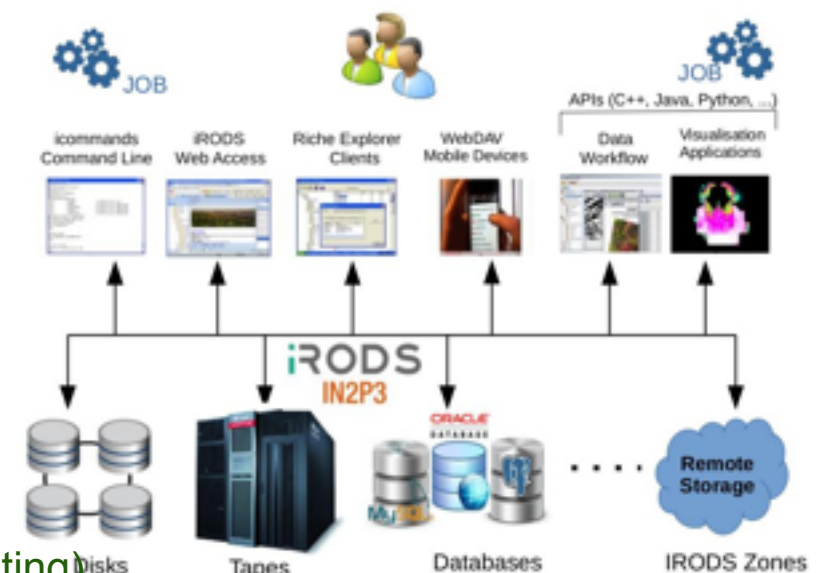
‣ IN2P3 and COMET is going to have MOU
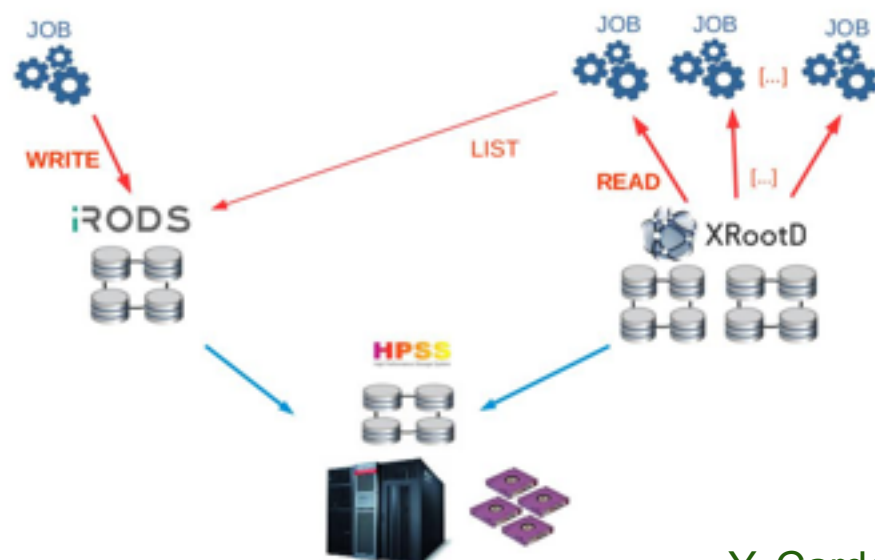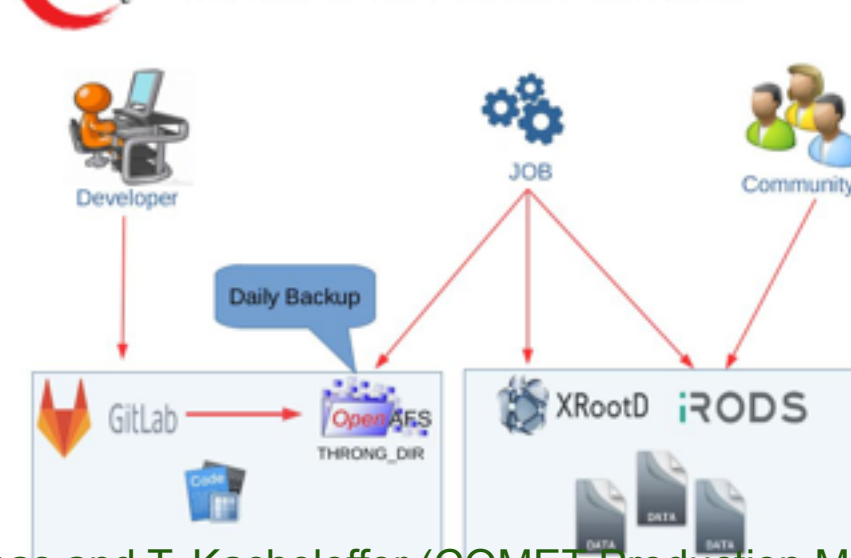
Y. Cardenas and T. Kacheloffer (COMET Production Meeting)

Opportunity for Muon g-2/EDM

- Software framework (both for online and offline) is a green-field in Muon g-2/EDM collaboration

  ‣ ICEDUST is a strong and realistic candidate

    - ROOT/GEANT4/GENFIT2 compatible → data handling and geometry management for simulations are flexible

    - Great opportunity of FJPPL collaboration

Wilfrid de Silva and Frederic Kapusta
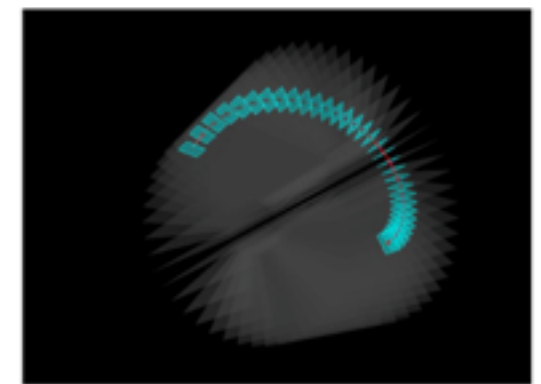(The 9th muon g-2/EDM collaboration meeting)
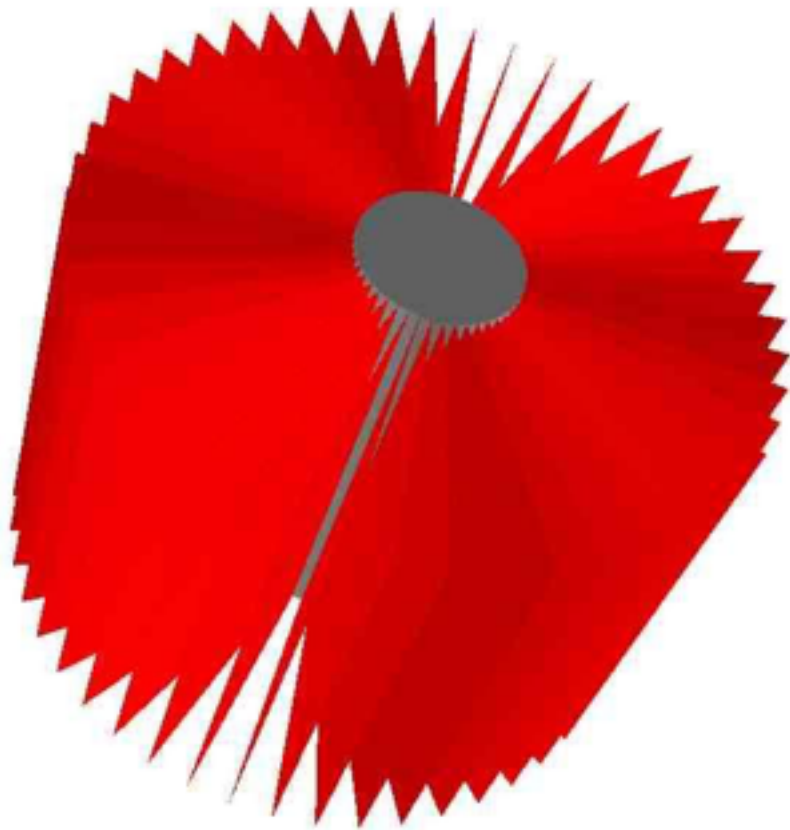
Starting Reconstruction with ICEDUST Using GENFIT

- At the moment : μ decays from a circular beam simulated with GEANT4 (with beam transport) in a first step for tracking and vertexing. ⇒ need to implement the spin tracking !

- Test 1 : Energy deposits are viewed as a detector radiography
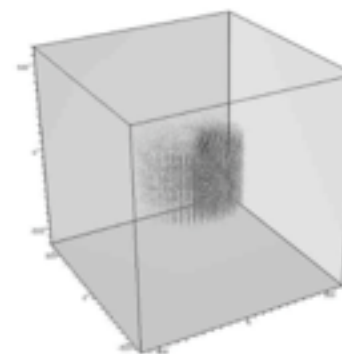
- The ROOT geometry produced by SIMG4 is used by GENFIT (no duplicate geometry) !

- Test 2 : one e^+ Track Fitting (RED) with GENFIT (HITS produced by ICEDUST inside BLUE Detector Planes)

- GENFIT, e^+ tracking, μ^+ vertex reconstruction studies are ongoing

Wilfrid da Silva (UPMC/IN2P3, LPNHE Paris)

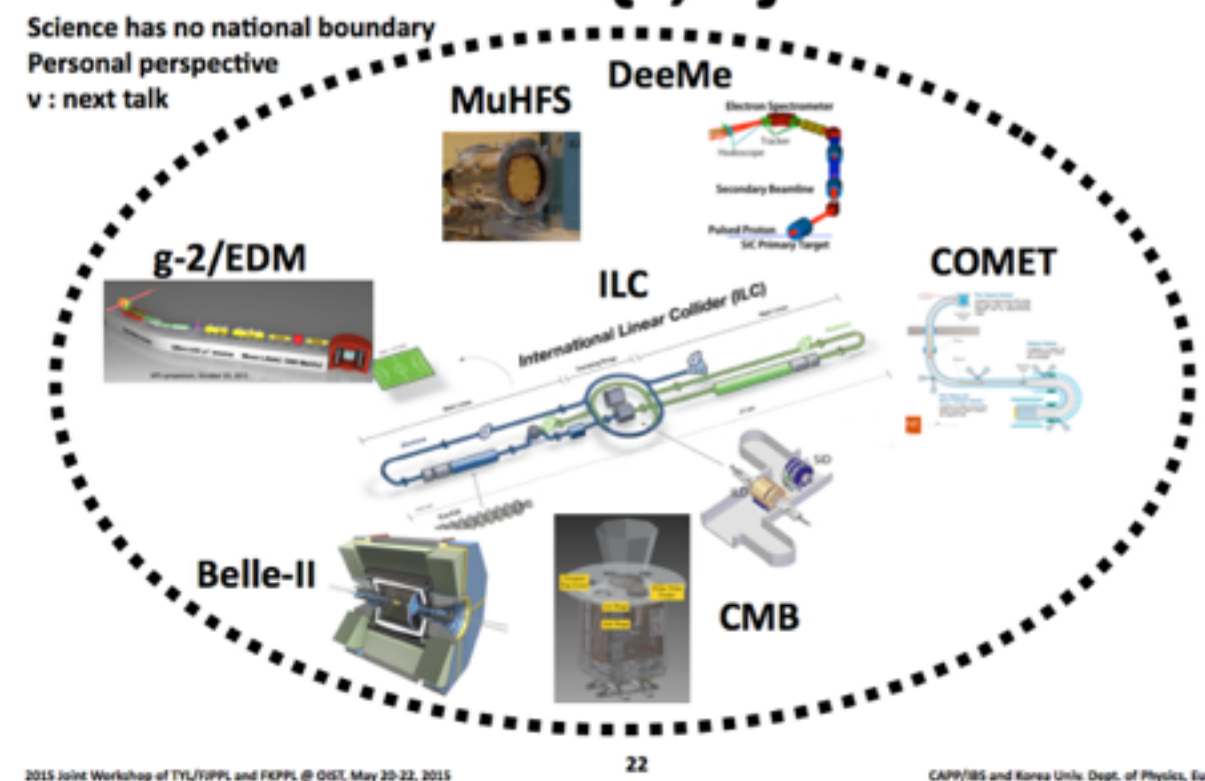g-2/EDM, CM9, 5-9 november 2014   13 / 15

FJPPL and FKPPL

- Collaboration of ICEDUST development for both COMET and Muon g-2/EDM can be an assembly point for FJPPL and FKPPL → FJKPPL(?)

- Looking forward a strong collaboration and synergy between France, Japan, and Korea
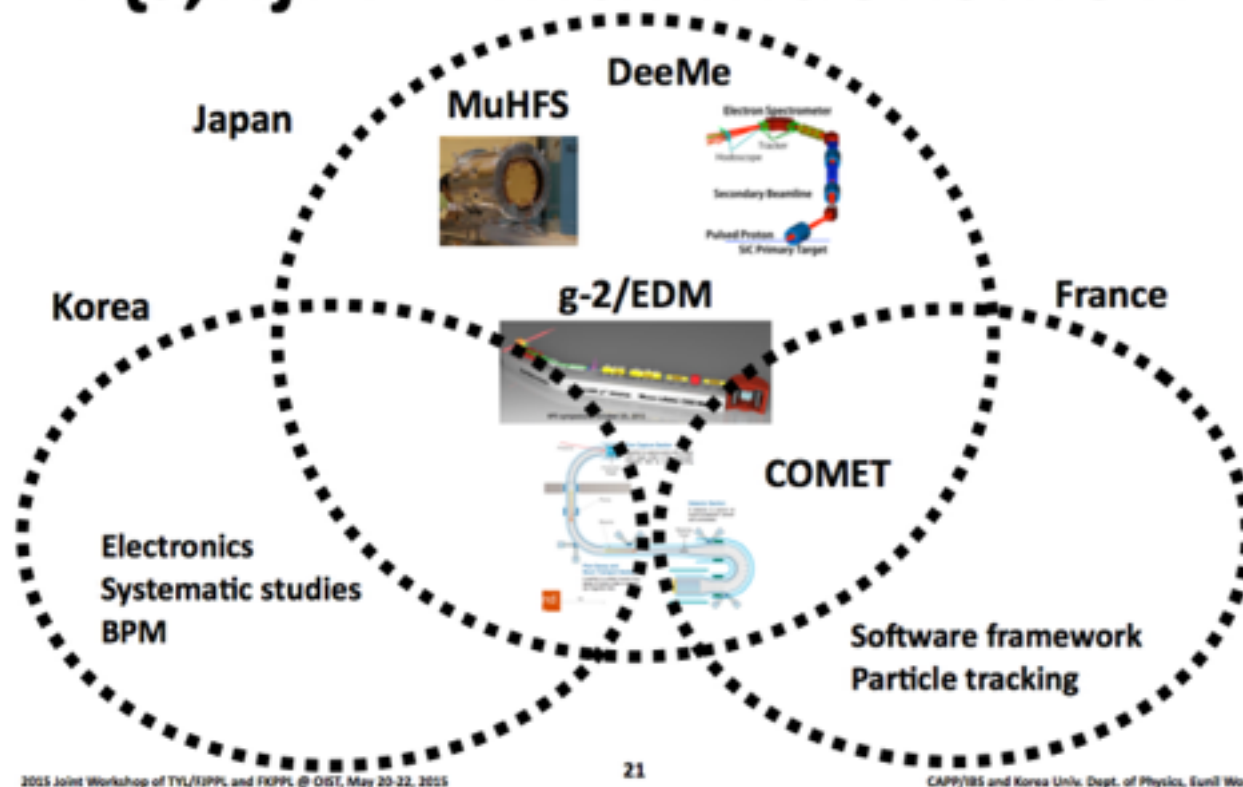
Eunil Won (Joint Workshop of TYL/FJPPL and FKPPL, 2015)

4th Workshop on muon g-2, EDM and LFV in the LHC Era

CPT Marseille, 23-27 mai 2016

This workshop aims to assemble theorists, experimentalists and engineers, involved or interested in the preparation of the g-2/EDM and COMET experiments at JPARC, whose current status and ongoing activities will be presented. The impact of muon g-2, EDM and muon to electron transition measurements will be discussed in the context of the search for New Physics by the LHC experiments.

Summary

- Offline software framework for COMET, ICEDUST, is being developed

  ‣ Tracking simulations for various studies are in progress as a part of FJPPL efforts

  ‣ Successful installation and testings with the powerful CCIN2P3 computing resources

  ‣ Massive MC data production is planned in this year

- ICEDUST will be extended to Muon g-2/EDM

  ‣ Even more collaboration opportunity

- FJPPL and FKPPL open great opportunities of strong collaboration in precision muon physics at J-PARC

  ‣ We are pursuing even more opportunities