

Aug-01-2003

Discussions, Plans and Schedule of Detector R&Ds with JINR based on the MoU

Y. Fujii

Contents

1. Brief Introduction on JINR
2. Brief Explanation on MoU
3. What were done during the visit
4. Plans
 - a) What to do
 - b) A bit detail on scintillator
 - c) Budgetary Issue
 - d) Muon Detector R&D

1. Brief Introduction on JINR

- Locates 120km-north of Moscow, close to Volga River.

- Established in 1956 with 18 member states.

China is thinking of re-joining JINR.

Germany has very close collaboration (East Germany was a member).

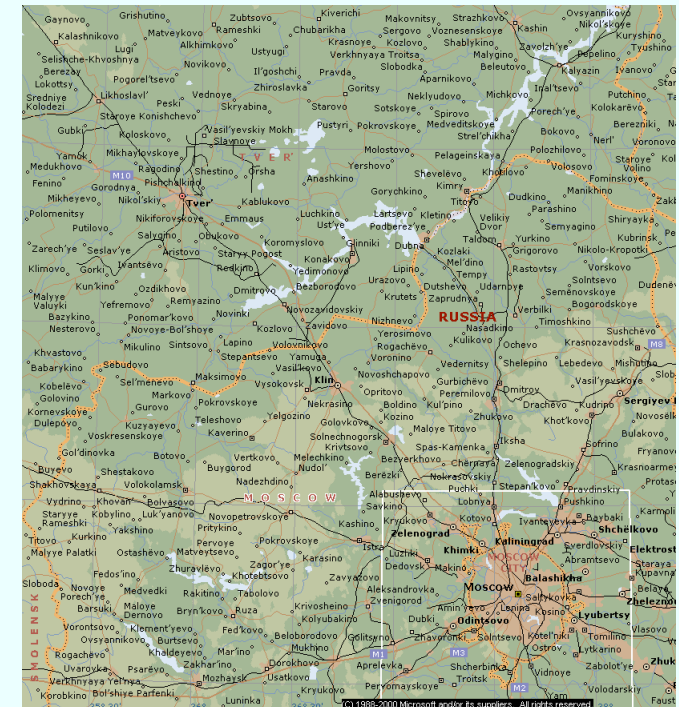
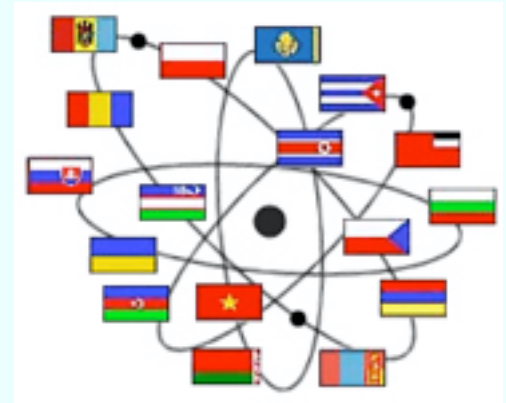
Italy (INFN) and U.S.DoE is establishing close relationship.

India (ATC) and Taiwan is establishing relationship

- 5,600 staff and 2000 visitors.

- Annual Budget = 38M\$

- Has Cyclotrons, a Phasotron (700MeV p) ,
a Synchro-Phasotron (10GeV p) ,
a Nuclotron (6GeV/amu) , and Reactors.



1-b. Structure of JINR

Laboratories

| | |
|-------------|---|
| BLTP | Bogoliubov Laboratory of Theoretical Physics |
| FLNP | Frank Laboratory of Neutron Physics |
| FLNR | Flerov Laboratory of Nuclear Reactions |
| DLNP | Dzhelepov Laboratory of Nuclear Problems |
| VBLHE | Veksler and Baldin Laboratory of High Energies |
| LPP | Laboratory of Particle Physics |
| LIT | Laboratory of Information Technologies |

Subdivisions

| | |
|-------|--|
| DRRR | Division of Radiation and Radiobiological Research |
| UC | University Centre |
| AYSS | JINR Association of Young Scientists and Specialists |
| PD | JINR Publishing Department |
| STLib | JINR Science and Technology Library |

SCAR (Scientific Center of Applied Research)

1-c. Summary Table of JINR programs

| Lab | High Energy | Particle Physics | Nuclear Problems | Nuclear Reactions |
|---------|--|--|---|--|
| on Site | Nuclotron/Phasotron | Serpukov U-70 | Phasotron | Super-Heavy Nuclei Synthesis : Reported Z=108, 110, 112, 114, 115, 116, 118 Z=105 named Dubnium. |
| CERN | NA45 (Pb+Au) NA49 (Pb+Pb) CMS ALICE | NA48 (eps'/eps) NA48/1,2 COMPASS CMS ATLAS | DIRAC NOMAD (neutrino) HARP (neutrino) DELPHI ATLAS | |
| DESY | | HERMES HERA-B H1 | | |
| US | STAR Phenix | STAR | CDF D0 | |
| others | HADES WASA | Borexino | ANCOR TUS (satellite exp) | |
| Acc. | | TESLA accelerator CLIC accelerator | TESLA accelerator | |

PAC recommended to eliminate duplicate efforts.

2. Brief Explanation of MoU

Contents already discussed at weekly meetings in Sep.2002 and March 2003.

No change since the Draft distributed on April 25, 2003 to [jlcstaff:453].

Title : Memorandum of Understanding on Detector Development for **Next-Generation Electron-Positron Colliders** between Institute of Particle and Nuclear Studies, High Energy Accelerator Research Organization (Japan) and Joint Institute for Nuclear Research (Russia)
(was originally on **Linear Collider** but changed)

Signed by : Makoto Kobayashi, KEK INPS Director
Alexei Sissakian, Vice Director of JINR, and other two.

Items : Do efforts on promotion of co-operation on Detector R&D.
Do each work using each-own budget.
Visit each other using each-own budget.

- Very general framework. No specific duties defined.
- Under umbrella MoU between KEK and JINR,
signed by Director Generals H.Sugawara and V.G.Kadyshevsky on Nov.2000.

3. What were done during the visit

July 22

- a) Ceremonial Meeting with JINR Vice-Director A.Sissakian & DLNP Director A.Olchevski. Got signature on MoU.
- b) Discussion with D.Mjavia (David), P.Evtoukhovitch (Peter), W.Kalis (Walter) about plans.
- c) Discussion with D.Mjavia, P.Evtoukhovitch, Z.Tsamalaide(Zviadi), V.Samoilov(Valentine) and W.Kalis over dinner.

July 23

a) Saw activities in JINR

- **pion-N reaction**
- **di-baryon search**
- **muon-catalized atomic/material studies**
- **lepton number violation**
- **Accelerator R&D for TESLA**
- **Aerogel fabrication**
- **Mini-cell Drift Tubes for DELPHI-muon, D0-muon**
- **Single-wire Drift Tubes for ATLAS-muon**
- **Straw Tubes for COMPASS and ATLAS Forward Tracker**
- **Cathode-readout MWPC for CMS-muons**
- **Large-Drift-Length SWDC for CMS-muons**
- **Machine Shop**

b) Detailed discussion with Plastic Scintillator Factory (Mr.Victor)

4. Plans

a) What JINR will do, and KEK will do

* See Budgetary Issue. They can not promise massive work before they get ISTC budget.

- JINR will provide 20 pieces of **machined-glued Rect-Tile Mega-tiles**.

The target delivery date is **early January 2004** => test at the **beam test of March 2004**.

- JINR will try to deliver Strip-Array Mega-Strips also.

- KEK will send detailed engineering drawing of the Mega-Tiles and Mega-Strips.

- JINR and KEK will start discussion on deign of **molded Mega-Tiles/Mega-Strips**.

We hope that these can be tested at **beam tests in 2005**.

- JINR will do **studies on W-plate** fabrication, not as their duty but as purely their interest.

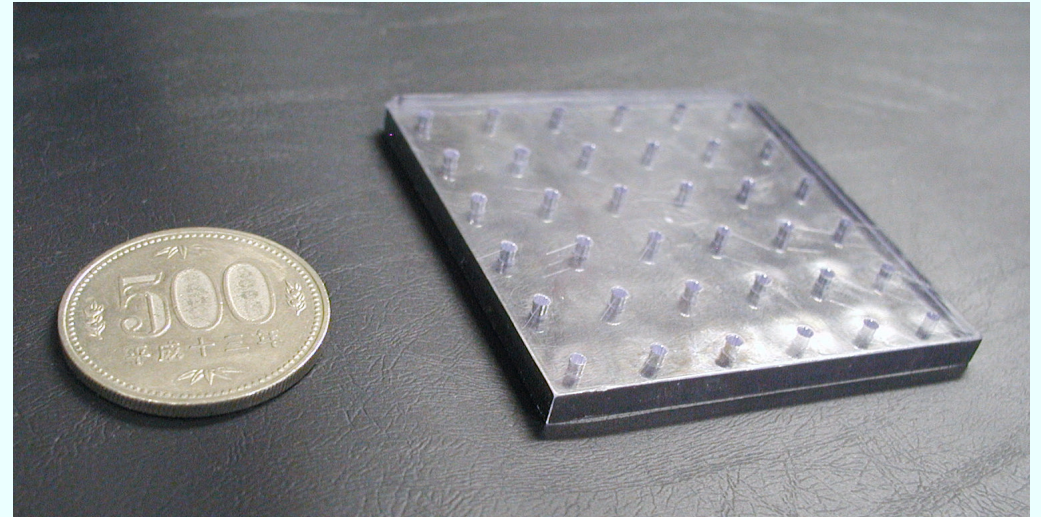
- **JINR has strong interest in muon system**.

Discuss on muon collabration AFTER calorimeter collaboration shows some good results.

4-b) Scintillator Detail

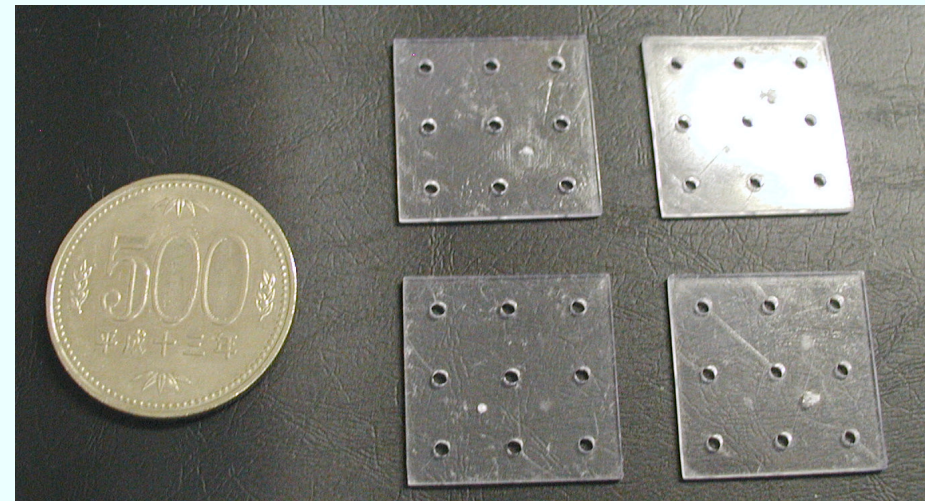
Victor showed several samples of their products;

- molded shashlik tiles
- molded strips with fiber groove
- machined tiles with fiber groove
- White painted, or metal coated, or no process on sides.



Upper = metal-coated on sides.

Lower = HERA-b Fine-EM shashlik



4-b-cont.) Discussions

- Precision of molding is **20 micron** (did for HERA-B EM shashlik)
- One set of die can make 250k tiles (did for Phenix EM shashlik)
- Reflective white paint thickness is **100 micron**. Can be thinner.
- Reflective metal coat thickness is **several microns** (metalization in vacuum).
- White paint gives better light yield and uniformity (<3% everywhere).
- Both coatings are done by machine (not by hands).
- Victor thinks gluing individual tiles on a precise-allocation table should be easier, faster, stronger, cheaper than Mega-Tile fabrication, if you take into account filling isolation groove with paint.
 - Fujii thinks this is worth trying.
- Victor thinks that groove shape need not to be a key-shape to hold the WLS fiber in it. Very slightly trapezoidal groove, very slightly narrower than the WLS fiber diameter, can hold the fiber in place, after temper heat treatment.
 - Fujii thinks this is not so trivial, and careful examination is needed, especially on assembling procedure.

4-c) Budgetary Issues

- They can start small works with their present budget.
However they will need to get ISTC budget to proceed massively.
- They will submit ISTC proposal as soon as possible.
- They will inform us the acception number of their proposal.
- We will write a supporting letter for their proposal.
- ISTC program committee will be late October.

ISTC ; International Science and Technology Center

Established in 1994 by US, Europe and Japan to support

Russian researchers and engineers (especially in military sector).

Japan has donated 56M\$ so far.

4-d) Muon Detectors

JINR has strong interest in muon system.

They have been working on muon systems of **DELPHI, CDF, D0, ATLAS, CMS, ALICE etc.**

They have experience, facility, man power.

They need a new project to use their experience, facility, man power.

(They also work on calorimeters of H1, STAR, PHENIX, COMPASS, ATLAS, CMS, ALICE etc.)

We need to establish muon activities in Japan before initiating collaboration on muon.

We need to demonstrate fruitfulness of CAL collaboration before initiating collaboration on muon.