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**Minutes of the EXL Collaboration Meeting**  
**Liverpool, 22 June 2004**

An EXL collaboration meeting was held in Liverpool on 22 June 2004, followed by a meeting on quasi-free scattering measurements at GSI on 23 June 2004 (see agenda attached), attended by 34 participants.

**EXL – EURONS JRA**

See minutes of Nasser Kalantar attached.

Summary of the organisation of the EURONS JRA:

Task	Participating institutes	Coordinating institute
definition of key-experiments, simulations	IPN, KVI, Madrid, Milan	Milan
internal target	FZJ, GSI, TSL	TSL
detector for target-like recoils (including signal handling)	FZJ, GSI, IPN, TSL	GSI
detector for projectile-like fragments and neutrons (including signal handling)	ATOMKI, UNIBAS, GSI	GSI
digital communication and data acquisition	GSI, IPN, KVI, TSL	KVI

**EXL – LoI at FAIR**

LoI evaluation by the FAIR Program Advisory Committee (Hans Emling)

The planned international facility at GSI is now named 'FAIR' (Facility for Antiproton and Ion Research). A number of boards with international participation were formed accompanying FAIR: a Steering Committee (SC); a board for Administrative and Financial Issues (AFI), a board for Scientific and Technical Issues (STI; chair: S. Gales). The STI formed three Program Advisory Committees, one for nuclear structure, astrophysics and reactions (PAC-NUSTAR; chair: R. Casten), one for QCD related topics (PAC-QCD), one for atomic, plasma, and applied physics (PAC-APPA), and a Technical Advisory Committee (TAC). All four advisory committees did meet at GSI during June 14-16. The PAC-NUSTAR evaluated 15 Letters of Intent (LoI). The EXL LoI received best marks in all three categories under evaluation (physics case; instrumentation; collaboration). A written statement is now available, and will be circulated to the collaboration together with these minutes. At this occasion, the GSI NUSTAR Board of Representatives organised a meeting with the spokes/contact persons of the LoI's; see the respective recent NUSTAR circular.

### Discussion of work packages

See agenda attached for topics and speakers. The electronic files of the presentations will be available on the EXL web site (currently at <http://www-land.gsi.de/exel/>), which will be updated (Haik Simon, Marielle Chartier).

### Formation of Collaboration Board and Organisation of work groups

The NUSTAR BR has requested to be informed of the EXL collaboration structure (spokespersons, tasks groups coordinators...) in order to establish the links between the various Lol's with overlap. Moreover we have been reminded that the parameters of the accelerator design and infrastructure will need to be frozen in the near future (Hans Emling, Hans Geissel and Helmut Weick will ensure the liaison on this matter) so work groups should start working right away!

Five work groups were established. For each group, one institute serves as coordinator with deputy institutes supporting the coordinator; see table below. These institutes name the responsible person (if not yet done during the meeting). These groups meet and work on the various tasks assigned to them and report to the Collaboration Board (internal written reports will be regularly requested by the CB).

The Collaboration Board is formed out of the work groups coordinators and deputies, the collaboration spokesperson and deputy, the GSI liaison, and the spokesperson of the EXL-EURONS JRA. Moreover a list of representatives of all participating institutes (one person named by each institute) will be established (Hans Emling), to facilitate the interaction with the CB and ensure direct input from all institutes. The CB will meet to monitor the progress of the various work groups and ensure links between them, and will prepare, in a first instance, the Technical Proposal to FAIR (deadline 15 January 2005).

Nominated Spokesperson: M. Chartier (Liverpool)

Nominated Deputy: J. Jourdan (Basel)

GSI Liaison: P. Egelhof

EXL-EURONS JRA Spokesperson: N. Kalantar (KVI)

Work Group	Main Task	Coordinator	Deputy	Other participants
Simulations	Key experiments Physics scenarios Detector simulation	Milano (A. Bracco)	Mainz (O. Kiselev)	Basel, GSI, Madrid, UK
Internal target	Gas-jet target Alternative targets Polarised target UHV	Uppsala (C. Ekström or L. Westerberg?)	GSI (T. Stöhlker)	Jülich
Detector system	Target-recoil detector Fast ejectiles Slow neutrons Gamma rays Signal processing	Saclay (E. Pollacco)	UK (R. Lemmon), GSI (P. Egelhof)	Darmstadt, Debrecen, Gatchina, Jülich, Lund, Mainz, Munich, Orsay, Uppsala
Storage ring	Storage rings Fragment spectrometer Infrastructure	GSI (H. Weick)	Munich (T. Fästermann?)	Dubna
Data Acquisition	DAQ concept	UK (I. Lazarus)	GSI (H. Simon)	Munich?, Saclay?

Groups who were not represented at the meeting (Kurchatov, Riken, Osaka), groups who appear with question marks in the table (Munich, Saclay), and others, are invited to contact M. Chartier to clarify/correct which work group(s) they want to join.

Any comments about these minutes, missing statements or changes, are welcome.

### **Quasi-free scattering measurements at GSI**

See minutes of Roy Lemmon and Oleg Kiselev attached.

**EXL Collaboration Meeting**  
**22 – 23 June 2004**  
**University of Liverpool, U.K.**

**Barkla Lecture Theatre, Chadwick Laboratory**

**Revised Programme**

**Tuesday, June 22<sup>nd</sup>**

10h00 Coffee, Registration (Chadwick Laboratory, just outside Barkla Lecture Theatre)

10h30 Welcome (P. Nolan, M. Chartier)

**EXL – Joint Research Activity (EURONS – FP6)**

Convener: N. Kalantar

10h40 EURONS: News and Status (N. Kalantar) 20 min

11h00 Discussion: 105 min

- Management of the JRA and Coordination Board
- Working groups
- Implementation plan

12h45 Lunch (Oliver Lodge Laboratory, Coffee Lounge, 3<sup>rd</sup> floor)

**EXL – Letter of Intent at FAIR**

Convener: M. Chartier

13h30 Lol evaluation by the FAIR Program Advisory Committee (H. Emling) 10 min

13h40 Discussion of work packages:

- Conditions at the NESR storage ring (H. Weick) 15 min
- GSI gas jet target (T. Stöhlker) 15 min
- TSL gas jet target (C. Ekström) 15 min
- EXL recoil detector:
  - comments from U.K. groups (R. Lemmon) 10 min
  - comments from Saclay group (E. Pollacco) 10 min
  - comments from German groups (O. Kiselev) 10 min
  - experience with the Chicksi detector (L. Westerberg) 10 min
- Fragment spectrometer (T. Fästermann) 15 min
- Detection of ejectiles, neutrons,  $\gamma$ -rays (D. Jenkins, K. Boretzky) 20 min
- Data acquisition (H. Simon, I. Lazarus) 15 min
- Cooperation with other FAIR Lol's (H. Emling) 10 min
- Implementation plan; request for tests at ESR 15 min

16h20 Coffee (Oliver Lodge Laboratory, Coffee Lounge, 3<sup>rd</sup> floor)

16h50 Formation of Collaboration Board

17h20 Closed meeting of Collaboration Board

20h00 Dinner at Casa Bella, 25 Victoria Street, City Centre.

**Wednesday, June 23<sup>rd</sup>**

**Quasi-free Scattering Measurements at GSI**

Conveners: R. Lemmon, O. Kiselev

09h30	Physics and measurements using QFS at GSI (R. Lemmon)	30 min
10h00	Theoretical support (I.J. Thompson)	20 min
10h20	Setup for fixed target experiments at GSI and simulation studies (O. Kiselev)	30 min
10h50	Coffee (Oliver Lodge Laboratory, Coffee Lounge, 3 <sup>rd</sup> floor)	
11h20	Report from earlier experiments (T. Nilsson, P. Egelhof)	30 min
11h50	Plans of the R <sup>3</sup> B collaboration (T. Aumann)	20 min
12h10	Discussion (start)	35 min
12h45	Lunch (Oliver Lodge Laboratory, Coffee Lounge, 3 <sup>rd</sup> floor)	
13h35	Discussion (cont'd) <ul style="list-style-type: none"><li>- Physics Topics: what measurements to do in near-term and longer term</li><li>- Experimental Set-up: recoil detector, integration into LAND, existing storage ring, R<sup>3</sup>B?</li><li>- Pilot Experiments – internal target and external target measurements</li><li>- Lols and Proposals for the next GSI EA</li><li>- How to progress: writing of physics cases, simulations, detectors, etc.</li></ul>	
16h35	Coffee (Oliver Lodge Laboratory, Coffee Lounge, 3 <sup>rd</sup> floor) – End of Meeting	

**Minutes of EXL – EURONS JRA Meeting (N. Kalantar)**  
**Liverpool, 22 June 2004**

Dear EXL collaborators,

On June 22, we had a meeting in Liverpool to discuss how to proceed with the EXL project. As you all know, the EXL part of EURONS is asking for 750 kEuro and we hope that the European commission will accept the proposal as handed in. We need to move on and prepare for the work as the negotiations might take several months to finalize. The duration of the project is 4 years as it was before. This means that the real activities have to start in January, 2005. For this purpose, we made 5 working groups with various institutes in each one. For each group we agreed to have one person as the coordinator. These groups are:

- 1) Key experiments with theoretical background and simulations. This group consists of Milan, KVI, Madrid and IPN with Angela Bracco as the coordinator.
- 2) Target recoil detection system. This group consists of GSI, TSL, FZJ and IPN with Peter Egelhof as the coordinator.
- 3) Projectile like detection system and detector for neutrals. This group consists of GSI, Basel, ATOMKI with Helmut Weick as the coordinator.
- 4) Target group with TSL, FZJ and GSI. Curt Ekström is the coordinator.
- 5) Digital communication, trigger system and DAQ. This group consists of KVI, TSL, GSI and IPN with Heinrich Wörtche as the coordinator.

Note that detector development involves everything up to and including the front-end electronics. The tasks starting from digital communication belong to the DAQ group.

I would like to ask the coordinators of these working groups contact their group on short notice and try to come up with a working plan for the coming period. If you look at the proposal, we really need to start the work after the summer in order to be on track.

Furthermore, we decided, as was proposed before, to form a coordination board (CB) which consists of a representative from each institute. These are: H. Emling from GSI, A. Bracco from Milan, A. Krasznahorkay from ATOMKI, F. Rathmann from Jülich, C. Ekström from TSL, J. Jourdan from Basel, E. Moya de Guerra from Madrid, E. Khan from IPN Orsay and myself from KVI. I would like to ask you all to tell me whether this list is correct and up to date and whether I should make any changes to it.

Angela Bracco agreed to act as the deputy coordinator of EXL.

We decided that the CB should meet at least once a year. We should also have a meeting with every one (the whole collaboration on the EURONS EXL proposal) present, once a year. The working groups should decide internally how often they

should meet. We also have agreed to meet with EXOCHAP (and perhaps R3B) once a year. Finally, EURONS meets also once per year. We thought that it would be best to couple the more general meetings together so that we take a week to go somewhere (most probably GSI) and have all these meetings in order to be efficient in the work and the budget. The CB will then meet in between these meetings to coordinate the internal matters.

During the same meeting in Liverpool the collaboration to proceed with the EXL-LoI was also formed. The minutes of that part of the meeting will be sent to those involved by the spokeswoman of the collaboration, M. Chartier.

I will keep you informed on any further developments. If there are any further questions about the details, please do not hesitate to contact me.

Best regards,  
Nasser

**Minutes of the Meeting on Future Quasi-Free Scattering Measurements at GSI**  
**(R. Lemmon, O. Kiselev)**  
**Liverpool, 23 June 2004**

Following the EXL Collaboration Meeting held at Liverpool University on 22<sup>nd</sup> June 2004, a meeting was organised to discuss the possibilities of initiating a programme of quasi-free scattering (QFS) experiments at GSI. Such measurements could use either external or internal (storage ring) targets and would be performed in inverse kinematics using beams of both radioactive and stable nuclei.

The morning was devoted to brief talks on the experimental and theoretical aspects of quasi-free scattering and summaries of experiments that have been performed so far at GSI using radioactive beams. The afternoon was centred around a discussion on the physics to do and how to proceed. A brief summary of the meeting is given below.

Quasi-free scattering is one of the most direct ways of investigating both the single-particle properties of a nucleus and effects on the bound nucleons of their environment in the nucleus. Experiments give access to momentum distributions of the nucleons, spectroscopic factors, occupation numbers, short-range nucleon-nucleon correlations and modification of meson and nucleon properties in the nuclear medium. Brief experimental and theoretical reviews (R.C. Lemmon, I.J. Thompson) were given of the work done over several decades on stable nuclei, using incident proton beams, both polarized and unpolarized, in normal kinematics. The proposed programme at GSI is centred on extending such measurements to unstable nuclei. This is challenging given the small cross sections of the QFS processes, the low intensities of the secondary beams, the inverse kinematics and the coincidence measurements required. Nevertheless, it is possible to perform such experiments using secondary beams from both the existing FRS at GSI and the proposed SUPER-FRS at the new FAIR facility in conjunction with polarized or unpolarized hydrogen targets. Experiments could be performed with external targets using the existing LAND/ALADIN or future R<sup>3</sup>B setups (T. Aumann) and with internal targets at the future NESR storage ring. Analyses of two previous experiments performed at GSI (T. Nilsson, P. Egelhof) have shown evidence for QFS processes, though these experiments were not optimised for such measurements. Dedicated experiments will require the development of a detection system around the target to measure the two high-energy outgoing protons (or proton + neutron) from the QFS and extensive simulations (O. Kiselev).

Discussions followed of how to develop this programme in both the near- and long-term. It was decided that in the near-term the programme should concentrate on external target experiments using the existing LAND/ALADIN setup in Cave C at GSI. This setup will be augmented by a new detection system around the target consisting of layers of Si micro-strip detectors to allow precise tracking and identification of the outgoing protons. These detectors are being ordered now and the system should be available by the beginning of 2005. Initial experiments could be performed using a stable beam where measurements have been made in the past using normal kinematics (e.g. <sup>12</sup>C, <sup>16</sup>O) and followed by experiments using light neutron-rich beams (e.g. C, O, etc.). This would allow the experimental techniques to be developed and 'proven' and initial studies on exotic beams performed. The studies could then be extended to heavier nuclei such as Ni and Sn.

In the long-term, these initial measurements will give us experience in the experimental techniques and analyses that can be applied to both external target experiments with the R<sup>3</sup>B setup and internal target experiments at the EXL storage ring setup. The Si micro-strip detection system will then act as a prototype that will allow us to design and build the detection systems for both R<sup>3</sup>B and EXL.

It was decided to write a Letter of Intent, outlining the above near-term and long-term objectives of the QFS programme for the next GSI EA (PAC), which has a deadline for submission of 31<sup>st</sup> August. The LOI will ask for beam-time to perform a feasibility study using a <sup>12</sup>C stable beam and a new measurement using a light neutron-rich nucleus (e.g. C, O, etc.). The first draft of the proposal will be written before the end of July by a group consisting of R. Lemmon, O. Kiselev, T. Nilsson and T. Aumann. This will then be distributed within the EXL and R<sup>3</sup>B collaborations for comments.

Best regards,  
O. Kiselev and R.C. Lemmon.