IAEA
International Atomic Energy Agency

INDC(NDS)-0511
Distr. G, NC

INDC International Nuclear Data Committee

Summary Report

Second Research Coordination Meeting on Development of a Reference Database for Ion Beam Analysis

IAEA Headquarters, Vienna, Austria
18 – 21 June 2007

Prepared by

I. Vickridge
SAFFR, Institut des Nano Sciences de Paris

and

O. Schwerer
IAEA Nuclear Data Section
Vienna, Austria

July 2007

Selected INDC documents may be downloaded in electronic form from http://www-nds.iaea.org/indc_sel.html or sent as an e-mail attachment. Requests for hardcopy or e-mail transmittal should be directed to services@iaeand.iaea.org or to:

Nuclear Data Section
International Atomic Energy Agency
PO Box 100
Wagramer Strasse 5
A-1400 Vienna
Austria

Produced by the IAEA in Austria
July 2007

INDC(NDS)-0511
Distr. G, NC

Summary Report

Second Research Coordination Meeting on Development of a Reference Database for Ion Beam Analysis

IAEA Headquarters, Vienna, Austria
18 – 21 June 2007
Prepared by

I. Vickridge
SAFFR, Institut des Nano Sciences de Paris

and

O. Schwerer
IAEA Nuclear Data Section
Vienna, Austria

Abstract

Abstract

Highlights of the 2nd Research Coordination Meeting (RCM) are given with respect to the progress achieved in the first 1½ years of the Co-ordinated Research Project (CRP) on Development of a Reference Database for Ion Beam Analysis. Participants presented the results of their work to date, and identified and assigned key tasks required to ensure that the final output of the CRP is achieved. In addition, a number of lively and productive discussions took place concerning technical issues such as accelerator energy calibration, error reporting, accuracy of the existing IBANDL and EXFOR datasets for IBA, and procedures for producing recommended cross-section data. The main conclusions as well as lists of actions and tasks are presented in this report.

July 2007

TABLE OF CONTENTS

1. Introduction

The Coordinated Research Project (CRP) "Development of a Reference Database for Ion Beam Analysis" was initiated by the IAEA after consultation with the ion beam analysis (IBA) community with the aim to produce a nuclear reaction cross-section database containing recommended data of relevance to the IBA community. Initially, the total duration of the CRP was set for three years. The 1st research coordination meeting (RCM) assembled participants in order to define the scope of the CRP and identify priority reactions for compilation, assessment and evaluation, including measurement or re-measurement where necessary. This second RCM was scheduled at that time in order to assess progress at the half-way mark and define actions necessary to meet the goals of the CRP. During the second RCM all of the participants presented summaries of their work for comment and discussion by all participants, which has resulted in the development of a continued coordinated research plan.

Lively and productive discussions took place concerning technical issues such as accelerator energy calibration, error reporting, accuracy of the existing IBANDL and EXFOR datasets for IBA, and procedures for producing recommended cross-section data. In addition, a preliminary program was presented that allows R33 data to be extracted from EXFOR; furthermore, the steps necessary to arrive at full compliance with the R33 format were identified.

At the 1st RCM (21 – 23 November 2005) participants decided that strong emphasis should first be given to elastic reactions of protons and alphas with light elements, since these reactions are widely used and nuclear theory exists which enables valid evaluations to be made. A secondary emphasis was placed on deuteron-induced nuclear reactions such as $^{16}O(d,p_n)^{17}O$ since application of the underlying nuclear reaction theory for evaluation purposes is substantially complicated by the large number of reaction channels that need to be accounted for. The results presented at this RCM reflect this choice, with the majority of assessments and evaluations being performed for (α,α) and (p,p) scattering reactions.

A second activity within the CRP concerns the development of the IBANDL database and harmonisation of experimental data in IBANDL and EXFOR. This work was ongoing even before the CRP (see report INDC(NDS)-0481, January 2006, of the 1st RCM,) and substantial progress has been made in developing a computer code for format conversion and data transfer between these two databases, opening the possibility of automation in the future.

Participants´ progress reports are included in this report, along with a synopsis of the conclusions reached and the tasks and deadlines agreed to by the participants.

2. Meeting Summary

Opening

The meeting was opened by the Head of the Nuclear Data Section (NDS), A. Nichols, who welcomed the participants to Vienna and looked forward to a successful meeting. He thanked the Technical Officer, O. Schwerer, who will retire later this year, for his efforts to run the CRP smoothly, and introduced NDS staff member Daniel Abriola who will take over the CRP after this meeting. D. Abriola briefly introduced himself to RCM participants.

O. Schwerer gave a brief introduction to the objectives of this RCM, and nominated A. Gurbich as chairman and I. Vickridge as rapporteur, both of whom were elected unanimously. A. Gurbich took over the chair. The agenda was adopted without change.

A. Nichols gave an introduction to the possible structure of the final CRP report to be published by the IAEA.

Progress reports

All participants presented progress reports on their measurements as well as on their assessment tasks which had been assigned at the 1st RCM (see Appendix C). An assessment report by CRP member E. Rauhala, who could not attend the meeting, had been received just before the meeting and was distributed. All reports were followed by brief discussions.

O. Schwerer pointed out that, the assessment reports received prior to the meeting had been compared with EXFOR. Many works which were until recently not available in EXFOR and/or IBANDL have recently been added to EXFOR. A summary of this comparison was sent to the participants and had been placed on the CRP web page in March. The table given therein also lists cases of differences between IBANDL and EXFOR for the same work (e.g., discrepancies in the numerical values, different number of angles, etc.).

A. Gurbich reported on the progress of the evaluations (see Appendix C).

Digitizing data

Participants use various software for digitizing, such as *Datathief*.
S. Dunaeva demonstrated her digitizing program, which has been successfully used at NDS for EXFOR compilation for several years, and agreed to digitize any upcoming data for this CRP.

Assessments: Task for all

Participants agreed to finalize assessments for all reactions assigned to them at the 1st RCM. In particular, to include all data available in the literature and, if not yet done, to upload those data to IBANDL, and correct any mistakes and gaps in IBANDL.

Whenever work is added to IBANDL, all data should be included, in particular data at all angles (also forward angles) since they are needed for the evaluation, and, as far as feasible also data which are outside the energy range of immediate interest to IBA. The assessments should follow a template format to be sent by M. Mayer. The assessments should analyse the data situation and clearly emphasize gaps and inconsistencies in the available experimental data. The deadline for this task has been set for 31 December 2007.

Dunaeva and Schwerer pointed out that for some data given in IBANDL, the actual experiment could not be be traced. Wherever possible, every effort should be made to identify and include a reference to the original experiment.

Benchmark experiments

Several discussions concerned the role of benchmark experiments that consist of measuring charged-particle spectra from thick targets. Whilst it should be possible in principle to derive cross-sections from such experiments, it was reported that even using advanced inversion

techniques (simulated annealing with nuclear data furnace), the derived cross-sections were inferior to those obtained from thin targets. Nevertheless, thick target benchmark experiments provide a convincing test of the overall validity of the measured cross-sections for IBA. Such validation depends on the availability of tested simulation codes and valid stopping powers. Within this CRP, it is recommended to use the SIMNRA or Data Furnace simulation code and SRIM-2003 stopping powers to simulate particle spectra that correspond to a given cross-section. In cases where there is no evaluated data, an attempt will be made to recommend cross-sections based on the assessments of the participants. In these cases, one legitimate approach is to generate recommended cross sections by adjusting measured cross-sections to reproduce benchmark experiments.

Recommended and evaluated data in IBANDL

Recommended and evaluated data are also included in IBANDL and should be clearly identified. To this end, a new field should be added to R33 format to flag such data.

Concerning the presentation of recommended data in the final database, it is envisaged to present them in a suitable way within the IBANDL interface.

Energy calibration of accelerators

The importance of accurate energy calibration of accelerators was emphasized and, after discussion, it was agreed to use the primary calibration points of Al(p,g) 991.86 +- 0.03 keV and the Li-7(p,n) threshold at 1880.6 keV. Participants are urged to use other points as cited in Marion, Rev. Mod. Phys. 38, 1966, p.660.

The participants recognized that e.g. the Mg(p,p) 1483 keV resonance (well known to better than 2 keV and Al(p,p'g) (1664.4 +- 0.2 and 1683.6 +- 0.1 keV) are particularly useful. However, the difficulty of accurate calibration at higher energies was recognized.

Choice of reactions for evaluations and recommended data

One of the objectives of the CRP is the identification of the most pressing reactions for assessment and evaluation for IBA. After some discussion it was decided that this list consists of those reactions already assigned for assessment at the 1st RCM. The choice of reactions for evaluation is made on the basis of relevance to IBA, the feasibility of development of appropriate nuclear reaction theory, and available manpower. These factors have guided the choice of reactions for evaluation throughout the CRP. Where evaluation is not feasible, participants felt that it was nevertheless important to produce recommended data that reflect our best estimate of the cross-sections based on existing experimental data.

Participants decided that it would be useful to extend the list of the reactions assigned at the 1st RCM to include K(p,p), S(α,α), Cl(p,p), (α,α) for which literature data are either non-existent or sparse. These reactions have been assigned to participants as further optional tasks.

EXFOR to R33 conversion

Recent progress by NDS in implementing R33 as an EXFOR output was presented and discussed. It was pointed out that R33 includes some information not normally included in EXFOR and contains cross-sections only referred to in the laboratory frame. In order to produce complete R33 files from EXFOR, it is necessary to identify appropriate product nucleus levels, calculate associated Q values, and perform CM to lab transformation when necessary. The participants expressed their appreciation for the progress already achieved.

Relation IBANDL - EXFOR

After discussion of the relationship between EXFOR and IBANDL, it was recognized that data should be ideally compiled in one authoritative database, but that the convenient interface of IBANDL and the focus of the data have been significant contributing factors to its adoption by the IBA community. In view of this, it appears desirable to maintain IBANDL in its present form. Inclusion of new EXFOR data into IBANDL may be done by manual selection of data chosen from an automatically generated preselection. In the longer term, it is envisaged that automatic filtering alone may suffice and ultimately it may be possible to respond to IBANDL requests directly on the fly from EXFOR.

Structure of final report

After extensive discussions the meeting decided to structure the final report such that various chapters are drafted by individual CRP members. The distribution of chapters is listed in Section 3.3. Reports on measurements are to be submitted to Bogdanovic by 1 September 2008 so that the chapter on measurements can be written. The deadline for submitting the draft chapters of the final report to all members is 1 January 2009.

Third RCM

The 3rd RCM is envisaged to take place in the first quarter of 2009.

Request of CRP-extension by one year for validation of data

Although the participants expect to produce a set of recommended cross-sections based on existing experimental data and cross-sections measured in the framework of the CRP, it has become apparent that benchmark experiments play a much greater role for the validation of the recommended cross-sections than initially foreseen. An extensive set of benchmark experiments with thick targets followed by spectral simulation will add substantial value to the recommended database with incorporation of the results in the recommended data sets that constitute the final output of the CRP. These considerations led to the proposal for an extension of the CRP by one year.

Proposal of a follow-up CRP on PIGE data for IBA

The results achieved so far have shown that great progress in the problem of nuclear cross-section data for IBA can be achieved by coordinated efforts in a CRP framework.

A significant number of particle-induced gamma-ray emission (PIGE) cross-section data, which fall outside the scope of the present CRP, have been uploaded to IBANDL by members of the IBA community other than participants of the CRP. The IBA community has shown by this action that there is an overwhelming need for the compilation, assessment and evaluation of PIGE data which would require the constitution of a new CRP. This proposed new CRP could benefit from the experience of those present members with appropriate PIGE expertise, that would be reinforced by participation of new members chosen for their specific PIGE expertise.

3. Action lists

3.1. Table of special Actions

Action	Subject
All concerned	Submit (provisional) assessment on those reactions where no report has been produced yet.
Dunaeva	On request of participants, digitize data for inclusion in IBANDL and EXFOR.
Dunaeva	Check and, if necessary, redigitize data which were taken from SigmaBase and NRABase.
Kokkoris	Decide whether he can do measurement of S(α,α) in addition.
Mayer	Provide CM-to-Lab calculator as a tool for SigmaCalc users; also calculator for Rutherford cross-sections if possible.
Gurbich	In addition to elemental data, make data for main isotope available in SigmaCalc.
Zerkin	Continue development of EXFOR – R33 converter with high priority.
Gurbich and Zerkin	Implement automatic Q_0-value calculation and CM – Lab transformation for the EXFOR to R33 conversion.
Gurbich and Zerkin	Define and implement a strategy to identify excited states of product nucleus corresponding to outgoing particles in order to calculate the associated Q values.
All	Communicate to Zerkin feedback concerning the EXFOR to R33 converter.
Vickridge	Implement R33 format upgrade for gamma production data.
Mayer	Provide an example of a recommended data set for a reaction suitable for an “averaging” approach to participants.

3.2. Assignment of recommended data

(after selection of appropriate approach, depending on reaction)

Proposed approaches (more options may arise in the course of the work):

- "Averaging"
- Adjust cross-sections based on results of simulation of benchmark experiments

Deadline: 1 September 2008

Vickridge	^{13}C(d,p), ^{15}N(d,α)
Bogdanovic	O(d,p), (d,α)
Kokkoris	B reactions, S reactions, S(,p,p) optional, ^{14}N reactions
Mayer	Selected from: Be(p,p), (α,α), Be,B,C,O,D(^{3}He,x)
Chiari	^{6,7}Li, ^{19}F (p,p), Na(p,p)
Shi	^{4}He (p,p) up to 5 MeV
Ramos	N(α,α)
Jeynes	Cl(p,p), (α,α)

3.3. Assignment of chapters for final report

Deadline for submission of draft chapters: 1 January 2009
Submission of measurements to Bogdanovic: 1 September 2008

Introduction	Vickridge
Compilation	Gurbich, NDS
Assessments	Mayer
Measurements	Bogdanovic
Elaboration of recommended data	*to be decided*
Evaluations	Gurbich
Description of databases (in general, and about attached CD):	
EXFOR	NDS
IBANDL, R33 format	Gurbich, Vickridge
SigmaCalc	Gurbich

3.4. List of basic tasks and assessment tasks (as updated at the 2nd RCM, June 2007)

Name	Basic tasks	Assessment tasks
Bogdanovic-Radovic	**Year 1:** 1. Determine energy and angular ranges where new measurements are most urgently needed. 2. Preparation of target and scattering chamber for the experiment. 3. Detector calibration by measuring scattering chamber and detector solid angles. 4. Measure the **N(p,p)** non-Rutherford elastic scattering cross-section **up to 5 MeV** and provide results to IBANDL. **Year 2:** 1. Measure the **O(p,p)** and **Al(p,p)** non-Rutherford elastic scattering cross-section **up to 5 MeV** and provide results to IBANDL. 2. Measure the **N(α,α)** and **Si(α,α)** non-Rutherford elastic scattering cross-section **between 2 and 8 MeV** and provide results to IBANDL.	nat C (p,p) 3.5 to 5 MeV, (α,α) up to 8 MeV
Chiari	**Year 1:** Install and test the multiple-detector scattering chamber. **Year 2:** Measure **N(p,p)** elastic scattering cross-section at energies **up to 6 MeV** as function of scattering angle. **Year 3:** Measure **C(p,p)** elastic scattering cross-section in energy range **3 - 6 MeV** as a function of scattering angle. Measure **F(p,p**) and **Li(p,p)** elastic scattering cross-sections at energies **up to 6 MeV** as a function of scattering angle.	^{23}Na(p,p) ^{19}F, ^{7}Li, ^{6}Li
Gurbich	**Year 1:** 1. Search literature and include 20 additional works in IBANDL database. 2. **Evaluate** differential cross-sections for elastic scattering of **alphas on O and Si**, based on critical assessment of existing experimental data and on nuclear model calculations, and supply the results in tabular form to NDS. 3. **Measure** the differential cross-section of **(d,p) and (d,α)** reactions on **Al**, as well as the thick-target **gamma-ray yield on Al**, in the energy range **1 to 2 MeV**, and include the new data in IBANDL. **Year 2:** 1. Continue support for IBANDL database by adding new data sets from literature or supplied by authors and by including improvements of database structure. 2. Evaluate differential cross-sections for elastic scattering of protons on N, based on critical assessment of existing experimental data and on nuclear model calculations, and supply the results in tabular form to NDS. 3. Measure the differential cross-section of (d,p) and (d,α) reactions on N in the energy range from 1 to 2 MeV with an energy step of 20 KeV, and include the new data in IBANDL. **Year 3:** 1. Continue support for IBANDL database by adding new data sets from literature or supplied by authors and by including improvements of internal structure of database.	nat C, nat O (d,p) (d,α)

Gurbich	2. Extend evaluation of differential cross-sections for elastic scattering of protons on N to energy range 3.5 – 5 MeV. 3. Evaluate differential cross-sections for elastic scattering of protons on B-10, B-11 and F. **4. Extend evaluation of C(p,p) to 4.5 MeV (added at RCM2)**	nat C, nat O (d,p) (d,α)
Jeynes	**Year 1:** Measure and evaluate Mg(p,p). Experiment up to 4 MeV at 2 angles as a benchmark. **Year 2:** Measure and evaluate Si(α,α)**.** Experiment at 2 angles. Extract cs from bulk target data using Bayesian Inference. Evaluate stopping cs using Sb implanted ref. Standard from IRMM Geel. Measure Ti(α,α)**, V**(α,α**)** and ^{14}N(α,α**)** up to 6 MeV at 2 angles from bulk targets using BI. **Year 3:** Measure Ti(p,p**), V**(p,p) and ^{14}N (p,p) to 4 MeV at 2 angles from bulk targets using BI.	
Kokkoris	**Year 1:** Measure **^{10,11}B(d,p) and (d,α)** reactions (on natural and enriched targets) at 8 angles from **900 to 2000 keV.** **Year 2:** Measure **^{14}N(d,p), (d,α), (d,d).** **Year 3:** Measure **^{19}F(d,p), (d,α), ^{6}Li(d,p),(d,α).**	^{10,11}B, ^{6}Li, ^{7}Li (d,p) (p,α) (d,α), ^{14}N, ^{19}F(d,p), (d,α), nat S(NRA)
Lopes Ramos	**Year 1:** 1. Obtain appropriate samples and perform detailed compositional analysis by PIXE and RBS. 2. Measure **N(p,p)** elastic cross-section by thin film technique in energy range **500 - 2500 keV** at scattering angles **130 - 160 degrees** in 10 deg. steps. 3. Develop and validate "bulk sample method" for proton elastic scattering cross-section measurements. 4. Apply bulk sample method to measurement of **Li(p,p)** elastic scattering cross section. **Year 2:** 1. Perform reproducibility tests for ^{14}N(p,p$_0$) ^{14}N cross-sections measured during the first year using thin films. 2. Application of the previously developed algorithm to the determination of ^{14}N(p,p$_0$) ^{14}N cross-sections using a bulk nitride sample and comparison of results with the thin film measurements of the first year. 3. Benchmarking of evaluated/measured (p,p) cross-sections in the 500 – 2500 keV range for C, N and Si using standard bulk samples. **Year 3:** 1. Perform reproducibility tests for the Li(p,p) cross sections measured during the first and second year. 2. Finalize the benchmarking of evaluated/measured N(p,p) and C(p,p) cross-sections in the energy range 500-2500 keV.	nat N (p,p) (α,α)

Mayer	**Year 1: Identify** most important cross-sections for **incident p, d, He-3 and alpha particles** for backscattering, elastic recoil analysis, and nuclear reactions. **Year 2: Analysis and synthesis** of assessments from participants, and preparation of manuscript for submission to international journal. **Year 3: Assessment** of the existing data (experimental and theoretical) for incident **^{3}He, alphas and heavier ions.**	B (p,p) and (α,α) Be (p,p) and (α,α) Be, B, nat C, nat O, D (^{3}He,charged particle)
Rauhala	**Year 1:** Measure **O(α,α)** at **7-9 MeV** over wide angular region. **Year 2:** Measure **D(p,p)** at **0.5-1 and 2-4 MeV** at several angles > 100 deg. in cooperation with Vickridge and Mayer. **Year 3:** Measure nuclear reactions of **^{3}He + d** system.	D (p,p) B (p,p) and (α,α)
Shi	**Year 1:** 1. Measurement of the differential elastic scattering cross-section of **alphas incident on D and T** in the energy range **3 - 8 MeV** at scattering angle of **30 degrees.** 2. Measurement of the differential elastic scattering cross-section of **protons incident on D and T** in the energy range **1 - 3 MeV** at scattering angles of **151 and 165 degrees.** 3. Provide results to IAEA Nuclear Data Section in tabular form for inclusion in IBANDL database. **Year 2:** Measurement of the differential elastic scattering cross-section of **alphas incident on D and T** in the energy range **3 - 8 MeV** at scattering angle of **20 and 40 degrees.**	D,T (α,α), (p,p)
Vickridge	**Year 1: Identification of most important reactions** based on needs for NRA and feasibility of measurements, and identification of optimal energy and angular ranges, with input from 1st RCM. Preparation of **trial targets** and tests of target stability under the beam. Evaluation of interferences from parasite reactions. **Year 2: Measurement** of cross sections for **deuteron-induced reactions on ^{13}C**, and inclusion of results in IBANDL. Preparation of thin ^{15}N films for measurements in Year 3. Measure **D(p,p)** at **1-2 MeV** at several angles > 100 deg. in cooperation with Rauhala and Mayer. **Year 3:** Measurement of cross-sections for **deuteron-induced reactions on ^{15}N**, and inclusion of results in IBANDL.	^{13}C, ^{15}N (p,p) (α,α) (d,p) (p,α) (d,α)

Appendix A

International Atomic Energy Agency
Second Research Co-ordination Meeting on

Development of a Reference Database for Ion Beam Analysis

IAEA Headquarters, Vienna, Austria

18-21 June 2007
Meeting Room ACV U1U 6400

AGENDA (draft)

Monday 18 June

08:30 – 09:20	Registration (IAEA Registration Desk, Gate 1)
09:30 – 10:15	Opening Session
	Opening (A. Nichols) Introduction: Objectives of this RCM (O. Schwerer) Election of Chairman and Rapporteur Discussion and Adoption of the Agenda (Chairman) Explanation of Technical Report: scope, format, authorship, etc. (A. Nichols)
10:15 – 11:00	Coffee break and Administrative Matters
11:15 – 12:35	Progress Reports on Measurements (15 mins per presentation + 5 mins discussion) Bogdanovic Radovic Chiari Gurbich Jeynes
12:35 – 14:00	LUNCH
14:00 – 15:20	Progress Reports on Measurements (cont'd) Kokkoris Lopes Ramos Wahl Shi Vickridge
15:20 – 15:50	Coffee break
15:50 – 17:30	Progress Reports on Assessments (15 mins per presentation + 5 mins discussion) Bogdanovic Radovic Chiari Gurbich Kokkoris Lopes Ramos Wahl
Evening	Social event to be announced

Tuesday 19 June

09:00 – 10:00	Progress Reports on Assessments (cont'd) Mayer Shi Vickridge
10:00 – 10:40	Progress Reports on Evaluations Gurbich Jeynes
10:40 – 11:10	Coffee break
11:00 – 12:30	Review of Tasks from RCM-1
	New Task List
	Results of assessments: How to deal with gaps and inconsistencies
12:30 – 14:00	LUNCH
14:00 – 15:30	List of reactions for final database
	IBANDL Status Report (Gurbich)
	EXFOR/IBANDL comparison, completeness (S. Dunaeva)
15:30 – 16:00	Coffee break
16:00 – 17:30	General discussion

Wednesday 20 June

09:00 – 10:30	Format questions; experimental data r33 format Conversion EXFOR -> r33, plotting (V. Zerkin)
10:30 – 11:00	Coffee break
11:00 – 12:30	Formats for evaluated data SigmaCalc, tabulated data, ENDF-6
	Recommended data: elaboration and presentation
12:30 – 14:00	LUNCH
14:00 – 17:30	Discussion of structure of the final CRP report (Technical Report) Assignment of chapters to authors

Thursday 21 June

09:00 – 12:30	CRP paper for IBA-18 (September 2007, Hyderabad) (A. Gurbich)
	Time frame for rest of CRP Deadlines for tasks Date of 3rd RCM (also deadline for draft of final report) Deadline for preparation of final database
	Summarize results of RCM Review of tasks and conclusions
12:30	Closing of the meeting

2nd Research Coordination Meeting on
"Development of a Reference Database for Ion Beam Analysis"
IAEA Headquarters, Vienna, Austria
18 to 21 June 2007

LIST OF PARTICIPANTS

P. R. CHINA
Liqun Shi
Institute of Modern Physics
Applied Ion Beam Physics Laboratory
Fudan University
Shanghai 200433
Tel.: +86-21-65642292
Fax: +86-21-6567372
E-mail: lqshi@fudan.edu.cn

CROATIA
Iva Bogdanovic Radovic
Department of Experimental Physics
Laboratory for Ion Beam Interactions
Rudjer Boskovic Institute (RBI)
P.O. Box 180
10002 Zagreb
Tel.: +385-1-4571-227
Fax: +385-1-4680-239
E-mail: iva@irb.hr

FRANCE
Ian Vickridge
SAFFR, Institut des Nano Sciences de Paris
Université de Pierre et Marie Curie
4, Place Jussieu
75252 Paris Cedex 05
Tel.: +33-1-44-27-47-10
Fax: +33-1-44-27-47-11
E-mail: ian.vickridge@insp.jussieu.fr

GERMANY
Matej Mayer
Max-Planck-Institut für Plasmaphysik
Boltzmannstr. 2
D-85748 Garching
Tel.: +49-89-32991639
Fax: +49-89-32992279
E-mail: matej.mayer@ipp.mpg.de

GREECE
Michael Kokkoris
National Technical University of Athens (NTUA)
Department of Physics
Zografou Campus
157 80 Athens, Zografou
Tel.: +30-210-7723049
Fax: +30-210-7723025
E-mail: kokkoris@central.ntua.gr

ITALY
Massimo Chiari
Instituto Nazionale Fisica Nucleare
Via Sansone 1
Sesto Fiorentino
I-50019 Firenze
Tel.: +39-055-457-2273
E-mail: chiari@fi.infn.it

PORTUGAL
Ana Rita Lopes Ramos Wahl
Departamento de Fisica
Nuclear and Technological Institute (ITN)
Ministry of Science
Estrada Nacional 10
2686-953 Sacavem
Tel.: +351-21-9946126
Fax: +351-21-994-1039
E-mail: ariel@itn.pt

RUSSIAN FEDERATION
Alexander Gurbich
SSC RF
Institute of Physics and Power Engineering
Bondarenko Sq. 1
249 020 Obninsk, Kaluga Region
Tel.: +7-08439-94169
Fax: +7-095-2302326
E-mail: gurbich@ippe.ru

UNITED KINGDOM

Christopher Jeynes
University of Surrey
Ion Beam Centre Guildford
GU2 7XH
Tel.: +44-1483-689828
Fax: +44-1483-689091
E-mail: c.jeynes@surrey.ac.uk

IAEA

Otto Schwerer
NAPC Nuclear Data Section
Wagramer Strasse 5
1400 Vienna
Tel. +43-1-2600 21715
Fax +43-1-2600 7
E-mail: o.schwerer@iaea.org

Alan L. Nichols
NAPC Nuclear Data Section
Wagramer Strasse 5
1400 Vienna
Tel. +43-1-2600 21709
Fax +43-1-2600 7
E-mail: a.l.nichols@iaea.org

IAEA cont'd

Daniel Abriola
NAPC Nuclear Data Section
Wagramer Strasse 5
1400 Vienna
Tel. +43-1-2600 21712
Fax +43-1-2600 7
E-mail: d.abriola@iaea.org

Svetlana Dunaeva
NAPC Nuclear Data Section
Wagramer Strasse 5
1400 Vienna
Tel. +43-1-2600 21727
Fax +43-1-2600 7
E-mail: s.dunaeva@iaea.org

Viktor Zerkin
NAPC Nuclear Data Section
Wagramer Strasse 5
1400 Vienna
Tel. +43-1-2600 21714
Fax +43-1-2600 7
E-mail: v.zerkin@iaea.org

PAPERS PRESENTED AT THE MEETING

Presentations can be accessed at the CRP website

http://www-nds.iaea.org/iba/rcm2/Presentations/index.html