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European Nuclear Science and Application Research 2

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D3.3 – Report on a series of workshops

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TABLE OF CONTENTS

List of Figures.....	4
References and applicable documents.....	4
List of acronyms and abbreviations.....	4
Executive Summary	5
Introduction.....	5
Section 1 Programme for the Annual Workshops.....	5
Section 2 Implementation of Workshops.....	5
Conclusion	6
Annex 1 Agenda of the First Annual MIDAS Meeting.....	7
Annex 2 Minutes of the First Annual MIDAS meeting.....	8
Annex 3 Agenda of the Second Annual MIDAS Meeting.....	11
Annex 4 Minutes of the Second Annual MIDAS Meeting.....	13
Annex 5 Agenda of the Third Annual MIDAS Meeting.....	17
Annex 6 Minutes of the Third Annual MIDAS Meeting.....	19
Annex 7 Agenda of the Fourth Annual MIDAS Meeting.....	24
Annex 8 Minutes of the Fourth Annual MIDAS Meeting.....	26

*LIST OF FIGURES**REFERENCES AND APPLICABLE DOCUMENTS*

[1]

LIST OF ACRONYMS AND ABBREVIATIONS

ATOMKI	Magyar Tudományos Akadémia Atommagkutató Intézet
ECR	Electron Cyclotron Resonance
GANIL	Grand Accélérateur National d'Ions Lourds
GSI	Gesellschaft für Schwerionenforschung
JYFL	Jyväskylän Yliopiston Fysiikan Laitos (Department of Physics, University of Jyväskylä)
KVI-CART	Kernfysisch Versneller Instituut-Centre for Advanced Radiation Technology
LPSC	Laboratoire de Physique Subatomique et de Cosmologie
UCLM	Universidad de Castilla-La Mancha
MIDAS	Minimisation of Destructive pLASma processes in ECRIS

EXECUTIVE SUMMARY

This deliverable report describes the series of annual MIDAS-NA workshops organised as planned during the ENSAR2 period. The workshops were realised in accordance with the original plan. Four workshops were organised with a total participant number of 64.

INTRODUCTION

The main objectives of the annual workshops were to present the most important results of the participating teams and to present new requirements set by the infrastructures of partner institutes regarding the research and development of ECR ion sources and their beams. The workshops are also an open forum for fruitful discussions and brainstorming. The workshops could also promote an open discussion with the users of nuclear-physics large-scale facilities. The link between the European ECR ion-source community and users was realised by inviting the representative of the institute organising the workshop to give a dedicated seminar focusing on the future requirements of the ion beams and to participate in discussions. The workshops offered also an opportunity to optimise different research resources making new and more advanced research and development possible.

SECTION 1 PROGRAMME FOR THE ANNUAL WORKSHOPS

MIDAS-NA kick-off-meeting was held 21-22 June 2016, at the Department of Physics, University of Jyväskylä (JYFL). All scientific partner institutes were represented: ATOMKI/Hungary, GANIL/France, GSI/Germany, KVI-CART/Netherlands, LPSC/France and UCLM/Spain. Both industrial partners, AVS and Pantechnik, had a representative in the workshops as well.

During the kick-off-meeting the guidelines and programme for the MIDAS-NA were defined. This included guidelines, for example, for the hands-on-trainings, the MIDAS database and annual workshops. In the case of the annual workshops it was concluded that each annual workshop should include the following points:

- Presentation by the representative of the hosting institute
- Status report of MIDAS-NA including the relevant news and instructions from the ENSAR2 management
- Status report of each partner
- Open discussion about problems and challenges. Brainstorming for the problem solving
- Collaboration planning
- Laboratory visit

A preliminary schedule and the hosting laboratories for the workshops were also defined during the kick-off-meeting. According to this plan the remaining workshops will be held annually in May or June and will be hosted by KVI-CART (2017), UCLM (2018) and GANIL (2019).

SECTION 2 IMPLEMENTATION OF WORKSHOPS

The overall information of the workshops is shown in the following Table 1. The workshops were organised in accordance with the original plan. The agenda of each meeting was prepared by the steering committee and the host of the workshop. The agenda of each workshop can be found at the end of this report (Annexes 1, 3, 5 and 7) and from the MIDAS website:

<https://wiki.jyu.fi/display/ensar2/Meetings>

The duration of each workshop was 2 days. The first day of the meeting focussed on the status reports and the second day on the collaboration planning and open discussion about the scientific problems and challenges. The first and the second annual workshop emphasised the organisation and the follow-up of the MIDAS Networking Activity. The third and the fourth workshops emphasised the developed networking and also the planning of the future collaboration.

All workshop presentations, agendas, minutes and other documents have been uploaded on the MIDAS website. The minutes include the main points and highlights of the workshops and consequently they can be found also at the end of this report (Annexes 2, 4, 6 and 8). All workshop related documents can be found as follows:

- 1) MIDAS kick-off-meeting (hosted by JYFL):
<https://wiki.jyu.fi/display/ensar2/MIDAS+kick+off+meeting+2016>
 Main objective/achievement:
 - organisation and boundary conditions for MIDAS Networking Activity.
- 2) Second Annual MIDAS Meeting (hosted by KVI):
<https://wiki.jyu.fi/display/ensar2/Annual+meeting+2017>
 Main objective/achievements:
 - Follow-up of hands-on-training and MIDAS database.
 - First brainstorming session: stimulated new discussion and ideas.
 - Dedicated session for collaboration planning: discussion especially about the European ECR ion source and ion-beam stability.
- 3) Third Annual MIDAS Meeting (hosted by UCLM):
<https://wiki.jyu.fi/display/ensar2/Annual+meeting+2018>
 Main objective/achievements:
 - What beyond MIDAS-NA: next EU programme.
 - Discussion about the problems and failures: on-line solutions.
 - Collaboration planning session.
- 4) Fourth Annual MIDAS Meeting (hosted by GANIL):
<https://wiki.jyu.fi/display/ensar2/Annual+Meeting+2019>
 Main objective/achievements:
 - Follow-up of tasks 1, 2 and 3. All commitments have been fulfilled.
 - Discussion about Horizon2020 programme, application and objectives.

Table 1: Annual Workshops organised during the MIDAS Networking Activity. The agenda and the minutes of each annual workshop can be found at the end of this document (Annexes 1-8) and from: <https://wiki.jyu.fi/display/ensar2/Meetings>

Name of Workshop	Host lab	Location	Dates	Participants	Presentations	Agenda/ Minutes
MIDAS Kick-off-Meeting	JYFL	Jyväskylä, Finland	21-22.6.2016	14	available	available
Second Annual MIDAS Meeting	KVI	Groningen, Netherlands	30-31.5.2017	20	available	available
Third Annual MIDAS Meeting	UCLM	Toledo, Spain	23-24.5.2018	13	available	available
Fourth Annual MIDAS Meeting	GANIL	Caen, France	26-27.6.2019	17	available	available

CONCLUSION

The objective of the MIDAS-NA was to enhance the networking between partner teams. After realisation of four workshops it can be concluded that workshops are a favourable tool to promote the networking. They have offered an inspiring environment for open discussions and problem solving. As an example, a brainstorming session was organised during the second annual meeting. This fruitful and inspiring session paved the way, for example, for a collaboration to measure the confinement time of highly charged ions. The status reports presented during the meetings generated lively discussions and planning. That way, they have affected the research programmes of the European ECR ion source community. For example, multi-diagnostic experimental setups for highly charged plasmas, developed for the ECR ion sources during the last 5 years, have opened new research opportunities and new collaboration among the MIDAS partner teams. The annual meetings have also played a crucial role in the successful planning and implementation of the MIDAS database and hands-on-training.

ANNEX 1: AGENDA OF THE FIRST ANNUAL MIDAS MEETING

**MIDAS-NA/EURONS2 kick-off-meeting****Place: Department of Physics, 2nd floor, FL266 (Lecture room 5)****Agenda of the meeting:****Tuesday 21st June 2016:**

8:30 – 9:00	JYFL Acc. Lab.: status and future requirements	(A. Jokinen)
9:00 -9:20	MIDAS-NA: objectives, status and plans	(H. Koivisto)
9:20 -9.50	GSI: projects, future plans, challenges, MIDAS-NA	(K. Tinschert)
9:50 -10:15	Coffee break	
10:15 – 10:45	LPSC: projects, future plans, challenges, MIDAS-NA	(T. Thuillier)
10:45 – 11:15	UCLM: projects, future plans, challenges, MIDAS-NA	(D. Cortazar)
11:15 – 11:45	GANIL: projects, future plans, challenges, MIDAS-NA	(C. Barue)
11:45 – 12:45	Lunch	
12:45 – 13:15	ATOMKI: projects, future plans, challenges, MIDAS-NA	(S. Biri)
13:15 - 13:45	KVI: projects, future plans, challenges, MIDAS-NA	(R. Kremers)
13:45 – 14:15	Pantechik: presentation of company, MIDAS-NA	(G. Gaubert)
14:15 – 14:30	Coffee break	
14:30 – 15:00	AVS: presentation of company, MIDAS-NA	(A. Garbayo)
15:00 – 15:20	JYFL: projects, future plans, challenges, MIDAS-NA	(H. Koivisto)
15:20 – 15:50	Organization of annual workshops (schedule, etc.)	(P. Jardin)
15:50 – 16:45	Hands-on-training programs and realisation (discussion)	(K. Tinschert)
16:45 – 17:30	Laboratory tour	(T. Kalvas)

Wednesday 22nd June 2016:

9:00 – 9:30	Common database: objective, content and structure	(T. Kalvas)
9:30 – 10:15	Discussion about the common database	(T. Kalvas)
10:15 – 10:40	Coffee break	
10:40 – 11:00	List of devices available for the research and experiments	(H. Koivisto)
11:00 – 11:30	Collaboration between the academic and industrial partners: possible common projects, planning etc.	(A. Garbayo)
11:30 – 12:00	Discussion about the annual meetings and AOB	
12:00 – 12:30	Lunch: Fast food at meeting room...	
12:30 – 13:00	A realisation plan for industrial/academic networking and conclusion of the meeting	(Garbayo/Koivisto)

ANNEX 2: MINUTES OF THE FIRST ANNUAL MIDAS MEETING (PAGE 1/3)

**ENSAR2/MIDAS-NA: Kick-off-meeting**

Minutes:



MIDAS-NA kick-off-meeting was held 21-22 June, 2016, at the Department of Physics, University of Jyväskylä (JYFL). All partner institutes were represented: Hannu Koivisto (JYFL), Olli Tarvainen (JYFL), Taneli Kalvas (JYFL), Klaus Tinschert (GSI/FAIR), Fabio Maimone (GSI/FAIR), Alberto Garbayo (AVS), Ana Megia Macias (UCLM), Daniel Cortazar (UCLM), Sandor Biri (ATOMKI), Rob Kremers (KVI), Gabriel Gaubert (Pantechnik), Pascal Jardin (GANIL/SPIRAL2), Thomas Thuillier (LPSC), Christophe Barue (GANIL/SPIRAL2).

The agenda of the meeting was sent to all participants about two months before the meeting. The agenda has been included as an appendix of this summary. The relevant subjects for the meeting can be listed as follows:

- 1) introduce the general objectives and rules of MIDAS-NA,
- 2) present the status report of each partner,
- 3) present the R&D requirements and challenges of each partner
- 4) define the possible collaboration subjects
- 5) prepare the list of different devices offered for MIDAS networking
- 6) prepare the realization and organization plan for the annual meetings
- 7) prepare the realization plan for hands-on-training
- 8) prepare the realization plan for common database

The outcome of the kick-off meeting, reflecting the afore-shown list, can be summarized as follows:

1) General objectives and rules of MIDAS-NA

- ENSAR2 consortium, including TAs, NAs and JRAs and organization, was presented
- Milestones and deliverables and current status of MIDAS-NA were presented
- It was advised that responsible person of each partner reads the relevant parts of the consortium agreement.
- Some issues regarding the agreement was highlighted like dissemination of results (29.1), open access (29.2), acknowledgments (29.4), consequences of non-compliance (29.6).

2) Status report of each partner

Each partner gave the status report including the future projects and requirements. The presentations will be placed on the www-pages of MIDAS-NA.

3) Requirements and wishes

- Following ion beams have been requested and needs to be developed: Mo, Ti, Zr, Cd, Ta, V,....
- Oven capable of reaching higher temperature is needed (GANIL)
- 500 W large band 14 GHz emitter is needed (LPSC)
- Challenges: reproducibility of ion beams has to be understood and improved (KVI)
- Ionization efficiency of metal ion beams have to be studied and improved further (GSI; JYFL; GANIL)
- Performance of ECRIS has to be developed further (common requirement)
- Beam stability has to be improved (common requirement)

Laboratory projects

GSI:

- Project for 28 GHz ECRIS
- Replacement of 14.5 GHz ECRIS by 18 GHz ECRIS

ANNEX 2: MINUTES OF THE FIRST ANNUAL MIDAS MEETING (PAGE 2/3)



LPSC:

- High performance, $f \geq 28$ GHz, ECRIS project
- 60 GHz ECRIS project
- booster development to enhance CSD

GANIL:

- tests for V, Si and K
- Hot screen development for ^{48}Ca recycling
- Development with ECR4 and ECR4M
- Beam intensity and stability development for Ni^{19+} ion beam

JYFL:

- construction and commissioning of 18 GHz ECRIS, HIISI
- development of plasma diagnostics
- plasma research: plasma instability and light emission
- development of ion beam formation and stability
- further development of metal ion beam production (foil oven, inductively heated oven, sputtering, MIVOC)

4) Possible collaboration subjects

- Multicusp ion source development (LPSC/UCLM)
- Ionization efficiency of metal elements has to be improved (JYFL/GSI/GANIL)
- Beam/plasma instabilities (JYFL/LPSC/GANIL)
- 1+ injection studies (GANIL/LPSC)
- improvement of CSD (all)
- reproducibility of ion beams has to be developed and understood (KVI/GSI)

5) Devices offered for networking:

LPSC:

- water cooled Allision type emittance scanner
- 3 ion source benches

UCLM:

- Langmuir probes
- fast camera
- wien filter
- ion spectrometer
- combination of all afore-mentioned

ATOMKI:

- 14 GHz ECRIS, table plasma generator
- TWTA: 8-12 GHz, 40 W
- HP sweep oscillator 2-20 GHz,
- SDD and HpGe detectors,
- CCD and x-ray cameras.

JYFL:

- 6.4 GHz ECRIS, 14 GHz ECRIS, HIISI (18 GHz)
- visible light spectrometers (2 nm/30 pm resolution),
- UV/VUV spectrometers
- diagnostics for plasma: Si and Ge detectors, PMT, BGO, diodes
- 2 TWTA's, 2 signal generators

GSI:

- Versatile test bench EIS (ECR Injector Setup) with CAPRICE ECRIS, LEBT, various diagnostics.
- Klystron HPA 2000 W (14.5 GHz).
- Traveling Wave Tube CPI 750 W power amplifier (8-18 GHz bandwidth).

ANNEX 2: MINUTES OF THE FIRST ANNUAL MIDAS MEETING (PAGE 3/3)



- Microwave signal generators (up to 31 GHz and 15 dBm).
- Arbitrary Waveform generator.
- Various viewing targets.
- Analyzers (Spectrum, VNA, Frequency Counter).
- Power meter including various CW/Pulsed power probes.
- Various coaxial and rectangular waveguide components.

6) Annual workshops

- the duration of workshop should be two-four days
- next meeting: June 2017
- suggestion: send the question or discussion topics for the meeting before-hand
- laboratory visit during the workshop should be organized
- reserve time for discussion and planning
- define the hot new results which should be presented to community
- next workshops (preliminary) has to be clarified...
(2016: Jyväskylä)
2017: will be defined (KVI confirmed their availability on 29th June)
2018: Spain?
2019: GANIL?
- Regarding the presentations presented during the workshop: permission has to be asked and received before make it public.

7) Hands-on-training

- is it allowed to use institute funding for participation of hands-on-training: clarify this from Ketel. Answer: “My comment is very positive: If the labs are ready to pay extra to participate in hands-on-training, this is possible and you should mention it in your future progress report. ”
- how to organize the training?
- Ask about the template from Ketel (template for the hands-on-training)
- **Action:** Organizer of each training has to contact the trainees and will set the dates for the training (complete by the end of July)
- Ask about the property of photos etc taken during the trainings (permit, acknowledgmenet, publications). Answer: “In France, the rule is that the photo belongs to the photographer (lab of the photographer). But if you want to publish it with the names of the persons on the pictures, you need their authorization with a formal document signed. I guess that it is the same for the equipment. You should need the authorization of the lab. If you want more information, I found this web page of EC: http://ec.europa.eu/ipg/basics/legal/notice_copyright/index_en.htm”

8) Common database

- A) The database is implemented as a Wiki page:
 - Wiki will be made and is maintained by JYFL at first
 - Information will be open access
 - Write access given to MIDAS participants
- B) The Wiki will include:
 - List of papers published in the field of ECR ion sources
 - Publications in conferences and within MIDAS collaboration
 - Database on production of beams in different laboratories
 - Ion beam related requirements
 - Pooling on resources and equipment
 - List of on-going projects
- C) A discussion-forum email-list will be implemented

ANNEX 3: AGENDA OF THE SECOND ANNUAL MIDAS MEETING (PAGE 1/2)

MIDAS-NA/EURONS2, 2nd Annual Meeting

Place: Groningen, Het Kasteel

Agenda for KVI meeting (30-31.5.2017)

**Tuesday 30th May 2017**

9:00-9:30	Status and future requirements of KVI	(S. Brandenburg)
9:30-9:45	MIDAS-NA: status, milestones and deliverables	(H. Koivisto)
9:45-10:15	Status of website	(T. Kalvas)
10:15-10:45	Progress of hands-on-training, feedback and possible improvements	(K. Tinschert)
10:45-11:00	Coffee break?	
Progress reports		
11:00-11:30	GSI: ECR Ion Sources – ECRIS@GSI Experiments Tips&Tricks and More	(F. Maimone, Tinschert)
11:30-12:00	GANIL: Current ECR studies at GANIL	(Maunoury, Barue)
12:00-12:30	LPSC: Progress report on R&D at LPSC	(T. Thuillier, Angot)
12:30-13:30	Lunch	
13:30-14:00	KVI: 10 π Emittance measurements	(R. Kremers)
14:00-14:30	ATOMKI: plasma diagnostics with cameras and probes	(R. Racz)
14:30-15:00	UCLM: Preliminary results on time resolved H ⁺ , (H ₂) ⁺ and (H ₃) ⁺ Ion Energy Distribution Functions measurements in a 2.45 GHz hydrogen plasma	(D. Cortazar)
15:00-15:15	Coffee break	
15:15-15:45	JYFL: plasma diagnostics, new 18 GHz ECRIS	(Koivisto, Kalvas)
15:45-16:15	Pantehnik: subject will be given	(P. Salou)
16:15-17:00	Discussion and conclusion	(Chair: H.R. Kremers)

Wednesday 31st May 2017

Brainstorming session:		
9:00-10:45	Subject will be given at the beginning of session	(Koivisto, Kalvas)
10:45-11:00	Coffee break	
Collaboration planning session: During this session		
11:00-12:30	Planning of collaboration projects	
	- ion beam requirements at GANIL and GSI: new ECRIS for ENSAR2 facilities?	(Jardin, Tinschert)
	- ion beam quality vs. different ECRIS generations	(T. Kalvas)
	- Proposal 3 (Let's try to define this during the meeting)	
12:30-13:30	Lunch	
13:30-15:00	Collaboration planning continues...	
	- Proposal 4 (Let's try to define this during the meeting)	
	- Industrial partners, commercialization (waiting suggestions)	
15:00-15:15	Coffee break	
15:15-17:00	KVI visit	

ANNEX 3: AGENDA OF THE SECOND ANNUAL MIDAS MEETING (PAGE 2/2)

Progress reports: Each laboratory should prepare a progress report (20 + 10 min.). Include “tips and tricks” which could be interesting for the community and if possible remarks and conclusions, which could help to understand the factors limiting the ion source performance or ion beam intensities. Adequate time has to be reserved for discussions about interpretations of experimental results or calculations, and about experiments, which could be done in the future.

Brainstorming session: Let’s try if quantity breeds quality. The following structure will be used for session: A) problem and its background will be presented, B) call for ideas (no criticism/ discussion is allowed at this point, write a list of ideas), C) discussion about all ideas, judgement of ideas, D) elaborate and improve selected ideas, E) solution?/conclusion

Collaboration planning session: The objective of this section is to advance MIDAS collaboration, including industrial collaboration, by defining the common interests and motivations. Each participant may give an own proposal for the collaboration project. The collaboration projects may be generated also as a result of brainstorming and open discussion hopefully motivated by the progress reports. The collaboration project should solve the problem limiting the performance of ECRIS or intensity of ion beams. Lets also try to define the most important future steps for our community to make more beams, produce new ion beams, develop new technology, etc.

ANNEX 4: MINUTES OF THE SECOND ANNUAL MIDAS MEETING (PAGE 1/4)



MIDAS-NA/EURONS2 Annual meeting

Place: Het Kasteel, Groningen, The Netherlands

Minutes of Groningen meeting (30-31.5.2017)



The second annual MIDAS-meeting was held at Het Kasteel, in Groningen 30-31st May, 2017. The KVI ion source group organized the meeting where 20 attendees gathered from eight partner institutes in 6 EU countries. The agenda of the meeting, all presentations and reports can be found from (<https://webapps.jyu.fi/wiki/display/ensar2/Meetings>). The first day of the meeting focused on the status of MIDAS-NA and progress reports of each partner. The second day was reserved for brainstorming, collaboration discussions and planning.

Participants

Hans Beijers, Sytze Brandenburg, Rob Kremers, KVI-CART, The Netherlands,
 Taneli Kalvas, Hannu Koivisto, JYFL, Finland
 Christophe Baru , Pascal Jardin, Laurant Maunoury, GANIL, France,
 Julien Angot, Thomas Thuillier, LPSC, France,
 P. Salou, Pantechnik, France,
 Ralf Lang, Fabio Maimone, K. Tinschert, GSI, Germany,
 Sandor Biri, Richard R acz, ATOMKI, Hungary,
 Daniel Cortazar, Ana Megia Macias, UCLM, Spain,
 Jan Mulder, RuG, Groningen, Arne Drentje (retired from KVI) Groningen.

Tuesday 30th May 2017**Welcome**

The welcome speech was given by Professor Sytze Brandenburg, group leader of Medical and Accelerator physics at the KVI-CART (Centre of Advanced Radiation Techniques). During the speech the status and future requirements of the institute were highlighted. Among these prof. Brandenburg focussed on the radiation testing program in which a mixture of ions, having approximately the same mass-to-charge ratio, are injected into the AGOR cyclotron from the ECR ion source. The separation of different elements is realised by slightly changing the frequency of cyclotron. More details about the program can be found from the presentation given by R. Kremers.

Status of MIDAS-NA:MIDAS-NA: status, milestones and deliverables (**H. Koivisto**):

- milestone and deliverable reports have been completed on time
- status of different tasks was presented. Notes: mostly OK but following subtasks require attention: a) optimization of resources, b) R&D collaboration, c) collaboration with the industrial partners
- **next annual meeting will be hosted by UCLM in 2018**

Status of website (**T. Kalvas**):

- status of website was presented
- discussion about the list of publications
- partners were invited to add all ion beam data and information

Progress of hands-on-training, feedback and possible improvements (**K. Tinschert**):

- status: altogether 25 MIDAS members have been trained in different laboratories
- LPSC training topic and content will be modified

ANNEX 4: MINUTES OF THE SECOND ANNUAL MIDAS MEETING (PAGE 2/4)



- KVI oven training program will be planned
- 2nd training round has to be fixed

Progress reports

ECR Ion Sources – ECRIS @ GSI Experiences, Tips & Tricks and more (**F. Maimone, K. Tinschert**):

- best Ca intensities are produced from metallic calcium
- condensation problem in the front-end of the oven: **collaboration project?**
- hot liner to minimize the material consumption
- discussion about the inductively heated oven: **collaboration project?**

Current ECR studies at GANIL (**L. Maunoury, C. Barue**):

- ionization and production efficiency of metal ion beams plays a crucial role: efficiency needs to be improved (**collaboration subject?**).
- efficiency comparison of different evaporation methods
- 1+ injection for metal ion beams?
- discussion about 1+ injection
- discussion about 2 stage operation

Progress report on R&D at LPSC (**T. Thuillier, J. Angot**):

- charge breeder development, together with plans, was presented
- development of heated COMIC source

10 π Emittance measurements (**R. Kremers**):

- main beam users: space irradiations (up to 30 MeV/u) and medical applications
- main requirement: improve Xe ion beams in terms of intensity and stability
- xenon results were presented
- means to improve the performance?

Plasma diagnostics with cameras and probes (**R. Rácz**):

- X-ray pinhole camera setup to measure the spectrally and spatially resolved X-ray emission from the ECR plasma.
- langmuir probe setup to measure the spatial dependence of plasma parameters
- strong effect on the plasma structure as function of the rf-frequency
- high-energy ions escape radially and low energy ions axially

Preliminary results on time resolved H⁺, (H₂)⁺ and (H₃)⁺ Ion Energy Distribution Functions measurements in a 2.45 GHz hydrogen plasma (**D. Cortazar**):

- setup for ion energy analyser was presented
- first results with the analyser
- discussion about the current situation of UCLM group (TIPS will be moved to ESS Bilbao)

Plasma diagnostics, new 18 GHz ECRIS (**H. Koivisto, T. Kalvas**):

- latest microwave emission experiments and results were presented
- cavity tuning measurements
- development status of visible light spectrometer was given
- status of new 18 GHz ECRIS (HIISI) was given
- the intensities of the first run was presented (145 μ A of O⁷⁺ beam at 10 kV)

ANNEX 4: MINUTES OF THE SECOND ANNUAL MIDAS MEETING (PAGE 3/4)



Pantechnik (**P. Salou**):

- presentation and discussion about the beam stability problem (*see the collaboration section*)

Discussion and conclusion (*Chair: R. Kremers*):

- short conclusion and casual discussion: end of the meeting.

Wednesday 31st May 2017

Brainstorming session (*H. Koivisto, T. Kalvas*):

At the beginning of session rules for the brainstorming were given. The brainstorm problem was defined by pinpointing the most critical factor limiting the ion beam intensity of highly charged ions from the ion source to the injection of accelerator. As a result of the discussion *the amount of ions inside the plasma chamber* was selected as the most important factor. As a next step the ideas/factors affecting the amount of ions were collected (see Fig. 1). This brainstorm-session was a good exercise and can be concluded as follows:

- the problem has to be well defined and specific to excite and maintain efficient brainstorming. In this exercise the problem was too generic and discussion suffered from time limitations.
- it was noticed that safe solutions and ideas were offered – we were not able to step out of the box!

Collaboration planning session:

During this session 3 collaboration projects were proposed:

- 1) Ion beam requirements at GANIL and GSI: new ECRIS for ENSAR2 facilities? (**P. Jardin, K. Tinschert**):
 - the future ion beam requirements of GANIL and FAIR were presented. The present ECR ion sources are not able to meet the given requirements: new better performing ECRIS is needed. It was emphasized that the beam stability and quality cannot be compromised.
 - Discussion about the possibility to design and construct a new European ECR ion source. The steering committee continues the discussion together with the MIDAS partners.
- 2) Ion beam stability (**P. Salou**):
 - Pantechnik has a true need of understanding the phenomena of the current instabilities of ECR ion beams. This represents a key points for the use of ECRIS for medical applications and therefore it is topical subject to discuss with the MIDAS community. Moreover Pantechnik could, if the schedule is favorable, welcome MIDAS participants to perform tests/training/studies on Pantechnik test benches. The discussion will be continued as soon as possible (after vacation season)
- 3) Ion beam quality vs. different ECRIS generations (**T. Kalvas**):
 - Processes affecting the beam quality from ECRIS are not well known. How does the beam intensity and emittance scale with plasma electrode aperture? How does the beam accelerated to high energy scale with the plasma electrode aperture? How does the aperture size affect pumping of neutrals from the source and the space charge of beam transport?

ANNEX 4: MINUTES OF THE SECOND ANNUAL MIDAS MEETING (PAGE 4/4)



- Experimental campaign is proposed to study the aperture size. JYFL plans to do this. Also KVI and LPSC presented their interest.

KVI visit: visit was organized by **R. Kremers and H. Beijers** End of the meeting.



Figure 1: Brainstorming mind map for factors affecting the amount of ions.

ANNEX 5: AGENDA OF THE THIRD ANNUAL MIDAS MEETING (PAGE 1/2)



MIDAS-NA/EURONS2, 3rd Annual Meeting
 Place: Toledo, UCLM
 Agenda for UCLM meeting (23-24.5.2018)



23rd May 2018

Chair person: D. Cortázar

Welcome and MIDAS status

9:00-9:30	Welcome at UCLM	(UCLM authority)
9:30-9:45	Status of MIDAS-NA	(H. Koivisto)
9:45-10:15	Discussion about the work to be done to fulfil our commitments: website, trainings, next annual meeting	(H. Koivisto)

Progress reports

10:15-10:45	GSI report	(K. Tinschert)
10:45-11:00	Coffee break	
11:00-11:30	Existing and future techniques for the production of Some specific metallic beams	(P. Jardin)
11:30-12:00	LPSC report	(T. Thuillier)
12:00-12:30	Status report of the AECR ion source at KVI-CART	(H.R. Kremers)
12:30-13:00	Plasma diagnostics at the Atomki-ECRIS: latest results	(S. Biri)
13:30-14:00	Lunch	
14:00-14:30	Beam stability and feedback of hands-on-training	(C. Barue)
14:30-15:00	UCLM report	(A. Megía)
15:00-15:30	JYFL report: plasma diagnostics and HIISI	(H. Koivisto)
15:30-15:45	Coffee break	
15:45-16:15	Recent development about plasma diagnostics and modelling for Ion Sources design, Astrophysics and Nuclear Astrophysics at INFN	(D. Mascali)
16:15-16:35	AVS report	(A. Garbayo)
16:35-17:55	Pantechnik report	(P. Salou)
16:55-17:15	Conclusion/discussion	(D. Cortazar)

ANNEX 5: AGENDA OF THE THIRD ANNUAL MIDAS MEETING (PAGE 2/2)



24th May 2018

Chair person: A. Megía

Discussion about the technical problems and failures

9:00-10:45 Subject will be given at the beginning of session (Koivisto)
 10:45-11:00 Coffee break

Collaboration planning session: During this session

11:00-13:00 Planning of collaboration projects
 - 60 GHz ECR R&D prospect (T. Thuillier)
 - AVS collaboration proposal (A. Garbayo)
 - Plasma research using JYFL visible light spectrom.,
 collaboration for inductively heated ovens (H. Koivisto)

13:00-14:00 **Lunch**

14:00-14:45 Collaboration planning continues...
 - MIDAS community vs ENSAR3: open discussion

14:45-15:00 Concluding remarks (D. Cortazar/H. Koivisto)

15:00-15:15 **Coffee break**

15:15-17:00 TOLEDO tour visit

Progress reports: Each laboratory should prepare a progress report (5+20+5min). Please dedicate first minutes "general summary": people in your group, trainings attended, trainings organised, trainings planned, budget status. Regarding the progress report, please, include "tips and tricks" which could be interesting for the community and if possible remarks and conclusions, which could help to understand the factors limiting the ion source performance or ion beam intensities. Adequate time has to be reserved for discussions about interpretations of experimental results or calculations, and about experiments, which could be done in the future. *Each status report should include the amount of the remaining MIDAS budget and plan how to use it. Action: group leader takes care that each partner prepares and presents this plan during the Toledo meeting.*

Discussion about the problems and failures: H. Koivisto will collect a list of small technical/scientific problems and different failures. The discussion of this session will be based on the collected list. Motivation: can we find a solution to small technical/scientific questions during the session as has happened several times during the hands-on-training?

Collaboration planning session: The objective of this section is to find common R&D topics, which could be transformed into a collaboration project. We should also discuss about the ENSAR3. How would we like to place MIDAS community in this consortium and what would be our vision? Should we create a dedicated planning group?

ANNEX 6: MINUTES OF THE THIRD ANNUAL MIDAS MEETING (PAGE 1/5)

P. Jardin, C. Barué, the 30th of May, 2018, GPI-2018-036

**ENSAR2/MIDAS Meeting****Toledo 23-24 May, 2018**

Notes (all presentations on MIDAS website)

The third annual MIDAS-meeting was held at Campus Fabrica de Armas of UCLM in Toledo, Spain, 23-24th May, 2018. The UCLM ion source team organized the meeting where 13 attendees gathered from nine partner institutes in 6 EU countries. The agenda of the meeting, all presentations and reports can be found from (<https://webapps.jyu.fi/wiki/display/ensar2/Meetings>). The first day of the meeting focused on the status of MIDAS-NA and progress reports of each partner. The second day was reserved for problem solving, collaboration discussions and planning.

Participants:

Rob Kremers, KVI-CART, The Netherlands,
 Hannu Koivisto, JYFL, Finland
 Christophe Barué, Pascal Jardin, GANIL, France,
 Thomas Thuillier, LPSC, France,
 P. Salou, Pantechnik, France,
 A. Garbayo, AVS, Spain/UK
 Fabio Maimone, K. Tinschert, GSI, Germany,
 Sandor Biri, Richard Rácz, ATOMKI, Hungary,
 Daniel Cortazar, Ana Megia Macias, UCLM, Spain,

JYFL: H. Koivisto

- Deliverable report on hands-on training expected in November 2018. End of ENSAR 2 in February 2020.
- Criticisms regarding the web page: not homogeneous with the other web sites of NAs: can be solved by putting an interface web page.
- The web nuclide chart of beam receipts must be completed
- The meaning of the intensities given in the tabular "best beam intensity" must be explained: it is not clear if each charge state has been optimized. It could be clarified by adding a comment on the specific line. In the relevant laboratory sub-page, a spectrum optimized on a given charge state would be a useful information together with a footnote about the optimized conditions.
- Rapprochement of people within the collaboration has changed the individual mentality regarding the benefit of sharing our "secret" knowledges
- Participants and associated partners must express their wishes to eventually add training sessions
- We all have to give the budget status of our laboratory
- Could it be interesting to add on-going tests on the nuclide chart as information for possible collaboration?

How to give the information necessary to deduce the beam performances on the target of physicist after different post-accelerations? A common method of emittance measurement must be defined to make the different beam performances comparable.

GSI (K. Tinschert)

- Not enough funds up to the end of the collaboration (4 Hands-on-training sessions, 2 participants to workshops)

ANNEX 6: MINUTES OF THE THIRD ANNUAL MIDAS MEETING (PAGE 2/5)

P. Jardin, C. Barué, the 30th of May, 2018, GPI-2018-036



- 2 ovens for standard operation (1600°C and 2000°C) based on spring filaments
- Material protection systems of the source renewed using PLC in place of old electromechanical relay technique. Will that be more reliable?
- Looking for collaborations for developing new difficult isotopes. See the list in Klaus' presentation. Several subjects of collaboration.

GSI hands on training (F. Maimone)

Report under writing, some points are still under analysis. Fabio is working on it.

GANIL: (P. Jardin)

- On-going R&D, and possible items for collaboration (see presentation).
- Carbonyls and other molecules containing metallic atom are sometime very dangerous and their use is therefore restricted (experienced at JYFL and GSI). Their use must be studied closely with the safety services.
- The 2000°C oven made with a helicoidal filament works at GSI, without short-circuit between the turns, once the tungsten of the filament has been annealed after the realization of the filament to relax the inner constraints. GANIL should try this solution.
- Recall of ENSAR2 objectives and short introduction to the R&D directions, which could be taken within the coming ENSAR3 collaboration. How can we identify common and clear R&D objectives at the European level, which will serve the European community of physicists.

LPSC (T. Thuillier)

- Presentation of the on-going R&D, with the liner and the metallic oven for Ca production.
- Metis R&D: 50µA Ca¹⁴⁺. Leak problem due to welding difficulties still occurs. No reliable oven for Ca evaporation presently. Looking for a technical solution.
- Concerning the failure at 600°C of the copper-stainless steel brazing of the low temperature oven, INFN is using a solution withstanding 1000°C (Ni brazing).
- Two frequency heating (18 GHz + 14 GHz) tested at LPSC with Phoenix-V3, showing an improvement of 20% for Ar¹⁴⁺ and 40% for Ar¹⁶⁺, respectively, when compared to experiments in optimized single frequency heating mode on a same day (in collaboration with GSI).
- Complete disassembly of the Phoenix-V3 beam line for replacement of the analyzing dipole.
- Experiments on the LPSC charge breeder with a magnetic plug to boost the injection field dramatically increased high charge state production and improved the charge breeding efficiency of gaseous and condensable ions.
- The 60 GHz R&D program is presented and LPSC proposes to open the collaboration to any EU partners interested in.

KVI-CART . (R. Kremer)

Interesting measurements of the current on the bias disc ask the question of the balance between the different currents within the source. Clear description is needed to clarify a point rarely addressed.

Atomki. Sandor Biri

Instabilities depend on the balance between powers at each frequency in the case of double frequency injection (see presentation).

ANNEX 6: MINUTES OF THE THIRD ANNUAL MIDAS MEETING (PAGE 3/5)

P. Jardin, C. Barué, the 30th of May, 2018, GPI-2018-036

**GANIL: (C. Barué)**

- To make the instabilities observed on the current extracted from the different sources comparable, a spectra of the standard deviation at different frequencies should be extracted from the measurements.
- High intensities have been obtained with Phoenix-V2 installed at SPIRAL 2 (4.0 mA He²⁺) mainly by optimizing the medium coil current (lowering B_{min}).
- The excellent stability ($\pm 2\%$) measured can be reproduced on a short period but nevertheless with significantly different ion source parameters. The long-term stability has to be proved.
- The O⁶⁺ beam (0.9 mA) is much less stable than He²⁺ ($\pm 10\%$). No explanation.

UCLM : Ana. See presentation

Interesting considerations about the plasma behavior: we are waiting for the publication of the results!

JYFL (H. Koivisto). See presentation

- Nice analysis of the visible light emission from Ar^{9+,13+} ions versus the extraction of the ions out of the source. More information can be found from the ICIS2017 proceedings.
- Promising results obtained with the HIISI ECRIS at JYFL. Under active testing up to the beginning of august. GANIL interested in participating.

INFN : D. Mascali. See presentation

- PANDORA : Study of beta absorbants versus charge state, as it can change by several orders of magnitude their half-lives (Be, 85Kr, 176Lu, 187Re, 87Rb...). David is interested in the possibility to inject some of the element of interest in ECR ion sources using high vapor pressure molecules. The supplying or synthesis ways of molecules enriched with particular isotopes could be evaluated (GANIL, Catania, JYFL)
- Production of radioactive isotopes of interest using SPIRAL1 facility could be studied to perform a test of feasibility (Catania, GANIL).

Pantchnik: P. Salou

- Different demands of industrial companies for metallic beams. (Al, B, C, Si, Ge, As ...). See the list given in the presentation
- For Al, possible production with Aluminium nitride. Few μA obtained at Catania. "Triméthyl" of aluminium suggested by Thomas. Could Al simply be produced using standard method, oven or sputtering ? Test of Al production by sputtering proposed by GANIL.
- Recycling time ((10min)) of ¹⁴C deposited on the chamber wall. Where is deposited the C. Are there solutions to limit the deposition or the recycling time? All suggestions are welcome.

Discussion about the technical problems and failures (H. Koivisto)

- Put on the web site the different questions
- Put the presentation on the website, removing information which must not be spread at that time
- Let difficulties appear to let our hierarchy know them, and what is the status of their solving

ANNEX 6: MINUTES OF THE THIRD ANNUAL MIDAS MEETING (PAGE 4/5)

P. Jardin, C. Barué, the 30th of May, 2018, GPI-2018-036



- How to maintain the website beyond ENSAR2, in a way beneficial for our community? Cost is not a pb (400€/year)
- AVS needs more information about molecular plasmas and interaction cross sections between electrons and moving atoms up to 2keV of kinetic energy. Meeting at Legnaro scheduled by July 2018, where people of astrophysics and plasma ion-sources communities can meet, and where information about such data should be available. A plasma model is needed to determine the improvement ways. Ongoing R&D: 22cm Xe ECR gridded ion engine with ECR neutralizer. LPSC must study the possibility to collaborate. See link for Academia-Industry meeting: <https://www.ensar2-nupia.eu/workshop>
- D. Mascali: ask for the participation of Legnaro students to some hands-on-training sessions. Possible, must be managed directly with laboratories where hands on trainings remain.
- C. Barué: technical pbs mentioned during the debriefing session of the GANIL hands on trainings. 1600°C oven for Fe production: Condensation of Fe at the exit of the crucible. GSI has also had to face similar pb and solved it partially by placing an alumina ring inside the crucible and by using extra filament turns at the front-end of the oven. INFN ECR4 injection has been refurbished to host a 22mm oven. Could that transformation be transferred to GANIL. And Ana has started a thermal simulation of the oven to help its evolution towards a more homogeneous temperature: a molybdenum crucible should be use. Pb and studies to be addressed in collaboration.
- KVI-CART: R. Kremer. Transmission through the beam line. Adaptation of beam elements, electrostatic lens of solenoid upstream the magnetic separator for an extracted current of ~4mA.
- ATOMKI, S. Biri: Extraction of the source including two consecutive electrostatic lens. Current ranges from 1 to 3 mA. Transmission limited to 22% in the case of O⁶⁺ as the first lens cannot be properly polarized, due to a Penning discharge between electrodes of the lens. The source do not include any iron yoke, which could help reducing the penning pb and also help getting a better mirror ratio. Advices are required to choose the best and simplest solution.
- T. Thuillier: Difficulty to braze the coaxial heater, having an inconel envelope, on a Ta chamber. There are at GSI specialists for specific welding. There are also welding institution in Netherland (ref R. Kremer) and in France (ref P. Jardin) to which such pb could be submitted. Second problem: How to bond Cu and stainless steel? Same advice as for the coaxial brazing.

Collaboration planning session

T. Thuillier: Research activity proposal: 60GHz R&D. Motivation given in the presentation. Similar R&D are under progress (China FECR, 45 GHz, Mars in USA). Need a lot of deep upstream research on ECR plasma, high beam intensity transport, RF...

Existing prototype (coil) at LPSC+ 60GHz gyrotron+ magnetic separator+ 2 years of PhD

An ERC application for a magnetic structure including an hexapole realized using the same technology is considered.

Program of 5 to 6 years (or more)

Budget 1-2 M€

Proposal of work package on this subject within the ENSAR3/MIDAS JRA

Remarks:

Is the long term study sufficient if no facility can host such ECRIS?

Physics cases must be defined to convince the investors

Could a 28 GHz step be considered?

ANNEX 6: MINUTES OF THE THIRD ANNUAL MIDAS MEETING (PAGE 5/5)

P. Jardin, C. Barué, the 30th of May, 2018, GPI-2018-036



Is there no other direction to improve ECRIS performances which could be explored rather than the one based on the scaling RF rules? Breakthrough technology?

Could that prototype help to progress toward a 60 GHz fully Super conducting ECRIS, and how?

H. Koivisto: JYFL monochromator. See presentation

High resolution spectrometer available at JYFL (<10pm). Doppler effect Atomic speed of the N+ in the source extractable from the measurements, but no Zeeman effect was observed: Why?

Who is interested in collaborating on this subject? D. Mascali

Inductively heated oven: already developed and tested at Jyvaskyla. Home made unit, not reliable.

Can be improved. GANIL is interested to collaborate. Do not forget to proposed IPHC (B. Gall) to join the collaboration

Laboratories interested in the next ENSAR3/MIDAS JRA

Jyväskylä, GANIL, INFN, ATOMKI, LPSC, GSI

Possible new group: IPHC?

Possible associated group: Nizhny Novgorod? Pantechnik?

ENSAR3: Guidelines for MIDAS2-JRA

All agreed to apply for MIDAS-JRA in "ENSAR3"

Hannu will coordinate JRA.

Proposals of Work Packages given by Hannu

Conclusions (D. Cortazar)

Narrow work and confidence established between people. Knowledge exchanged, we now know what we have to do.

Home work: proposal for our next objectives within the next MIDAS (dead line march 2019)

ANNEX 7: AGENDA OF THE FOURTH ANNUAL MIDAS MEETING (PAGE 1/2)

MIDAS-NA/EURONS2 Annual meeting
 Place: CAEN, GANIL
 Agenda (26-27th of June 2019)



26th June 2019

Chair person: P. Jardin

Welcome and MIDAS status

9:00-9:15	Welcome at GANIL	(GANIL authority)
9:15-10h00	Status of MIDAS-NA: presentation and discussion	(H. Koivisto)

Progress reports

10:00-10:30	Status of activities at Atomki	(S. Biri)
10:30-11:00	Coffee break	
11:00-11:30	Plasma diagnostic at the Atomki Laboratory	(R. Racz)
11:30-12:00	Summary of the latest ion source developments at JYFL	(V. Toivanen)
12:00-12:30	Status of activity at LPSC	(T. Thuillier)
12:30-14:00	Lunch	
14:00-14:30	Report on ECRIS activities	(K. Tinschert)
14:30-15:00	Report of UCLM Plasma Laboratory	(A. Megía)
15:00-15:30	Ongoing projects at INFN-LNS	(L. Celona)
15:30-16:00	Coffee break	
16:00-16:30	Status of metallic beam production at GANIL	(C. Barué)
16:30-17:00	1+/N+ applied to metallic ion beam production	(L. Maunoury)

ANNEX 7: AGENDA OF THE FOURTH ANNUAL MIDAS MEETING (PAGE 2/2)

27th June 2019

Chair person: C. Barué/L. Maunoury

Collaboration session:

9:00-9:20	ERINS: global orientations	(M. Lewitowicz/P. Jardin)
9:20-9:40	ERINS/IBIS task1 presentation	(H. Koivisto)
9:40-10:00	ERINS/IBIS task2 presentation	(A. Ghribi)

Subtask presentation and discussions

10:00-10:30	<i>Subtask 1.1</i> : Development of solid ion beams	(C. Barué/L. Maunoury)
10:30-11:00	Coffee break	
11:00-11:30	<i>Task 1.2</i> : R&D for higher intensity beams from ECR ion sources	(H. Koivisto)
11:30-12:00	<i>Task 1.3</i> : Improvement of ion beam temporal stability	(S. Biri)
12:00-13:30	Lunch	
13:30-14:00	Hot topics? Ideas in parallel with the ERINS collaboration? Common interest on particular technical subjects, out of the ERINS scope? To be discussed	
14:00-14:15	Conclusion	(P. Jardin)
14:30-17:00	Visit of SPIRAL2 installation	

ANNEX 8: MINUTES OF THE FOURTH ANNUAL MIDAS MEETING (PAGE 1/3)

**ENSAR2/MIDAS Meeting****CAEN 26-27 June, 2019**

Notes (all presentations on MIDAS website)

The last (4th) annual MIDAS-meeting was held at GANIL in Caen, France, 26-27th June, 2019. The GANIL ion source team organized the meeting where 17 attendees gathered from seven partner institutes in 5 EU countries. The agenda of the meeting, all presentations and reports can be found from (<https://webapps.jyu.fi/wiki/display/ensar2/Meetings>). The first day of the meeting focused on the status of MIDAS-NA and progress reports of each partner. The second day was reserved for collaboration discussions and planning.

Participants

H. Koivisto, V. Toivanen, JYFL, Finland
 C. Barué, P. Jardin, L. Maunoury, O. Bajeat, M. Dubois, V. Maradia, GANIL, France,
 T. Thuillier, LPSC, France,
 M. Cavellier, Pantechnik, France,
 K. Tinschert, R. Lang, J. Mäder, GSI, Germany,
 Sandor Biri, Richard Rác, ATOMKI, Hungary,
 Daniel Cortazar, Ana Megia Macias, UCLM, Spain,

Welcome speech and GANIL presentation were given by the GANIL deputy leader, Héloïse Goutte.

H. Koivisto (JYFL):

Presentation of the commitments made to EU and then historical review of the work completed. All commitments have been fulfilled and, in some cases, significantly exceeded. Discussion about the last deliverable report and future collaboration.

S. Biri (ATOMKI):

By adding a middle coil (1 pancake), and then by optimization of coil axial location and plasma electrode axial location yielded a factor of two increase in beam current performance. Extraction side resonance point moved from 65 mm to 35 mm from the extraction aperture. Nice beam intensities when a low beam transport is taking into account. Furthermore, the modified middle coil opens the possibilities to study the plasma instabilities appearing at high B_{min}/B_{ecr} values.

R. Racz (ATOMKI):

Theory and results of 2 close frequency heating were presented. The theory predicts that D_f should be smaller than 0.5 GHz to achieve the beneficial impact of multiple frequency heating. Plasma radio emission was detected by a spectrum analyzer through rf probe, and the recorded spectra was used to determine (a quantitative parameter) the strength of the plasma instabilities, in a consistent way. It was shown that the two close frequency heating can effectively decrease the instability parameter. X-ray pinhole camera photos were presented showing strong correlation between the plasma losses and the instability strength.

ANNEX 8: MINUTES OF THE FOURTH ANNUAL MIDAS MEETING (PAGE 2/3)

**V. Toivanen (JYFL):**

The status and the latest development of HIISI were presented. HIISI has met and even exceeded the requirements set for the project. Research and development work for the extraction will be started soon to deploy the full potential of HIISI. The status of high resolution JYFL spectrometer was presented. The results of ion temperature measurements by using the JYFL spectrometer were presented as well.

T. Thuillier (LPSC):

Presentation of the low temperature oven development results, specially adapted to modern ECRIS where high density plasma and high RF power is required. The oven mark II is reliable up to ~700°C and controls metallic ion evaporation (like Ca, Mg, etc) in the PHOENIX 3 ion source operated up to 2 KW RF at least at 18 GHz. A temperature probe included in the design helps to stabilize the oven behavior under operation. Recently, the ion source test bench was upgraded to install a 1m radius, 13 cm gap bending magnet to enhance beam transport and separation. After a long period of mismatch and misunderstanding between simulation results and experiments, the upgraded bench is now fully understood and the mass resolution has double ($M/dM > 60$) with a much better beam transmission (70 to 90%).

K. Tinschert (GSI):

Also GSI team is expanding activities to OES, goal is to use it in oven studies, perhaps online monitoring of oven/ECRIS-plasma during operation. Oven temperature is investigated with and without microwave heating. Microwave shielding of oven is investigated to reduce the effect of plasma heating on the oven temperature. The upgrade of the ECRIS facility is ongoing.

Megia (UCLM):

R&D for low temperature plasma (see the presentation)

C. Barue (GANIL):

GANIL hto (see the presentation).

L. Maunoury (GANIL):

1+/n+ (see the presentation)

M. Lewitowicz presentation was given by P. Jardin (GANIL):

Presentation of ERINS: motivation, objectives and time lines were given. Different programs (TN, JRA and NA), management and plans of ERINS were presented (see presentation)

H. Koivisto (JYFL):

Presentation of IBIS in ERINS. The objectives and total budget. Presentation of ECRIS collaboration, MIB4TNA, in IBIS: three subtasks, participants, distribution of work, milestones and deliverables.

A. Ghribi (GANIL):

ANNEX 8: MINUTES OF THE FOURTH ANNUAL MIDAS MEETING (PAGE 3/3)



Presentation of task 2 in IBIS (AMS²: Advanced Model based control of cryogenic systems for superconducting nuclear accelerator). Motivation and all subtasks of AMS² were presented. The complicated control requirements and system were highlighted.

C. Barue (GANIL):

Presentation of task 1 in MIB4TNA. This subtask focuses on technological development of solid ion beam production. Special attention will be paid on beam stability, durability and contamination issues.

H. Koivisto (JYFL):

Presentation of task 2 in MIB4TNA. The main objective of this subtask is to increase the beam intensity available for the ERINS TNA facilities. This will be done by increasing the microwave power available for the plasma heating. This will need multiport microwave injection and more efficient cooling of plasma chamber. Innovative plasma chamber structures will be tested to increase the heating efficiencies and microwave-plasma coupling. Discussion about the cooling and geometrical issues.

S. Biri (ATOMKI):

Presentation of task 3 in MIB4TNA. The main objective is to find means to suppress plasma instabilities and to study the impact of innovative plasma chamber structures on the plasma stability. Earlier work to stabilize plasma and results were presented.

General discussion:

- Midas website: it was concluded, as a result of its value, that MIDAS website will be maintained also after the completion of MIDAS-NA. The JYFL ion source group will be responsible on the management and collaboration of website. Each team will make upgrades upon their progress and new results. In each laboratory, one contact person must be clearly identified.
- Continuation of collaboration beyond MIDAS: several collaboration projects have started and will continue beyond the present EU program. Each laboratory likes to continue the collaboration and will seek different funding possibilities.
- Exchanges with industrial partners. How to reinforce their participation and on which subjects?
- Cryogenic task. Organizing constraints have led to associate ECRIS and cryogenic activities. Would it be possible to take advantage of this opportunity to improve our knowledge in the field of cryogenic techniques, by organizing courses dedicated to ECRIS needs?
- Data Management Plan: Discussion about the DMP: what it means and what it will require. We concluded that ERINS management will be contacted for further information in the case of positive funding decision.
- Organisation/preparative work for MIB4TNA: We decided that we will not invest more person months before the funding decision has been announced. The evaluation report of ERINS application should be available by September, 2019.
- Europe objectives. Would it be possible to get from physics challenges more precise orientations to follow in the field of ECRISs R&D?