**Program of ESFR-SMART European workshop on**

# Liquid Metal facilities; focus on sodium facilities design & safe operation

**ENEA Roma & La Casaccia, May 22nd-24th, 2018**

**Day 1 (May 22nd, 2018) ENEA-Roma** Lungotevere Grande Ammiraglio Thaon di Revel, 76, 00196 Roma

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| **12-30** | **Registration** | | |
| **Session 1: Introduction** | | | |
| **Time** | **Title** | **Lecturer** | **Organization** |
| 13-00 | Welcome ESFR-SMART; introduction of Seminar | C. Latgé | CEA |
| 13-10 | Introduction of ENEA (organization who welcomes W1) | M. Ciotti | ENEA |
| **Session 2: Introduction to Fast Reactors systems and Sodium Fast Reactors** | | | |
| 13-30 | Status of FBRs and main features of ESFR-SMART reactor system | C. Latgé K Mikitiuk | CEA PSI |
| 14-00 | Introduction to ASTRID project. | E. Abonneau | CEA |
| 14-30 | Na properties; comparison with HLM properties | L. Buligins C. Latgé | UL CEA |
| 15-00 | Na fire: phenomenology and mitigation | L. Herranz | CIEMAT |
| **15-30** | **Coffee break** | | |
| **Session 3: Sodium facilities design N°1** | | | |
| 15-50 | Sodium facilities: functional analysis *;(short reference with HLM properties)* | L. Ayrault | CEA |
| 16-20 | Liquid Metal facilities: main design rules | L. Ayrault | CEA + SCK contribution |
| 16-50 | Introduction of student's activity | C. Latgé<br>M. Ciotti | CEA ENEA |
| 17-00 | Students session N° 1 (4 Teams) | 4 Tutors | |
| **18-30** | **End of the first day** | | |

**Day 2 (May 23rd, 2018) ENEA-La Casaccia** Via Anguillarese, 301 00123 Roma

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| **Session 4: Sodium & Liquid Metal facilities design N°2** | | | |
| 07-30 ? | Transfer from Roma to La Casaccia | | |
| 08-20 | Thermal-hydraulics in LM systems | (tbc) | (tbc) |
| 09-00 | Instrumentation for Liquid metal facilities | (Th. Gundrun) | HZDR |
| 09-40 | Main components 1: EM pumps | (I Bucenieks) | UL |
| **10-10** | **Coffee break** | | |
| 10-30 | Main components 2: Heat exchangers | (tbc) | KIT + CEA contribution or CEA + KIT contribution |
| 11-00 | Materials choice/corrosion/behaviour in LM | S. Bassini | ENEA + CEA contribution |
| 11-40 | Codes & Standards for innovative system design | Th. Lebarbe | CEA-AFCEN |
| **12-10** | **Lunch** | | |

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| **Session 5: Na chemical control** | | | |
| 13-30 | Impurities sources & mass transfer in LMFR | K. Rosseel | SCK + CEA contribution |
| 14-00 | Na purification: design and operation; HLM case | C. Latgé | CEA + SCK contribution |
| **Session 6: Components qualification, Handling and maintenance** | | | |
| 15-00 | Components Qualification for SFR | L. Cachon | CEA |
| 15-30 | Liquid Metal Facilities: handling & maintenance | (tbc) | XXX+ ENEA contribution |
| **16-10** | **Coffee break** | | |
| 16-30 | The ENEA-CEA experimental loop: main characteristics and thermo-hydraulics simulations | I.Balog | ENEA |
| 17-10 | **Visit of ENEA facilities** | M. Ciotti, G. Caputo | ENEA |
| **18-30** | **End of the second day** | | |
| **19:30** | **Dinner then transfer to Roma** | | |
| **Day 3 (May 24th , 2018) ENEA-Roma** Lungotevere Grande Ammiraglio Thaon di Revel, 76, 00196 Roma | | | |
| 08-20 | Students session N° 2 (4 Teams) | 4 Tutors | |
| **10:10** | **Coffee break** | | |
| **Session 7: Validation & simulation** | | | |
| 10:30 | Validation & simulation for SFR | (tbc) | XXX |
| 11:20 | Propagation of uncertainties on the simulation results | N. Garcia Herranz | UPM |
| **12:10** | **Lunch** | | |
| **Session 8: Liquid Metal facilities** | | | |
| 13-30 | Overview on LM facilities and focus on some operational feedback (Duration for each tbd) | (L. Buligins or I Bucenieks UL)<br>(TH Gundrum HZDR )<br>(KIT tbc)<br>(L. Cachon CEA)<br>(Di Piazza ENEA )<br>(SCK tbc)<br>(KIT tbc) | Synthesis from 4 SFR platforms (UL, KIT, HZDR and CEA) & 2 HLM platform |
| 14-30 | Students session N° 3 (4 Teams): feedback (15' for each group) | All | |
| 15:30 | Discussion | All | |
| 15:50 | Conclusions | C. Latgé, ENEA | CEA, ENEA |
| **16:00** | **End of the Seminar** | | |

**G1: Loop dedicated to the qualification of Decay Heat Removal System**

Tutor : University Roma La Sapienza (tbc) and co-tutor ENEA (M. Ciotti OK)

**G2: Loop dedicated to material studies**

Tutor: University of Lorraine LEMTA (M Gradeck OK) and co-tutor PSI (tbc)

**G3: Loop dedicated to chemistry**

Tutor: University of Madrid (tbc) and co-tutor CEA (C. Latgé OK)

**G4 : Loop dedicated to thermal-hydraulics**

Tutor : University of Cambridge (E. Schwageraus OK) and co-tutor KIT (tbc)

## List of PhD students:

| Name of Student | Organization University | Status | Title |
|---|---|---|---|
| P. Brazzale | CEA | PhD | |
| A Lecoanet | CEA - LEMTA | PhD | |
| Arturs Brekis | UL (Riga) | PhD | |
| Niko Krauter | HZDR | PhD | |
| Antonio JIMENEZ CARRASCOSA | UPM | ? | |
| Irena Balog | ENEA (Th) | Post Doc | |
| Emiliana Mansi | ENEA (chemist) | | |
| Janos Bodi | PSI | PhD | Modeling and assessment of new safety measures for Generation-IV European Sodium Fast Reactor |
| Paul Cosgrove - | CAM | | Numerical methods for coupled Monte Carlo – multi-physics simulations |
| Alisha Kasam - | CAM | | Design of molten salt-cooled breed and burn fast reactor |
| Nathaniel Read - | CAM | | Nuclear space propulsion systems with low enriched uranium |