Solar Facilities for the European Research Area

SFERA-III

Solar Facilities for the European Research Area

Definition and dissemination of the short-term trainings

Deliverable D2.3

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1.0	12/12/2019	Initial
1.3	02/12/2021	Dates updated due to covid pandemic and content changes in STT 13 & STT14 from UAL and STT 8 from FRA

VALIDATION

Reviewers		Validation date
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DISTRIBUTION LIST

Date	Recipients
22.12.2021	All partners

Disclaimer

Executive Summary

This deliverable D2.3 “Definition and dissemination of the short-term trainings” is a public report describing the short-term trainings organized by eight laboratories involved in the SFERA-III work package WP 2.2.

It was expected that this report covers the definition and dissemination of the short-term trainings, but due to the travel restrictions generated by the prolonged crisis of COVID-19 pandemic, until now no event could be done. Good weather conditions and physical presence of the participants and trainers are very important to transmit the knowledge with hands-on excercises. All trainings should have held in 2020 have been postponed. All the seventeen short-term trainings should be organized before the end of 2022.

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1. General overview of the short-term trainings SFERA-III

SFERA III short-term trainings, half a week, is addressed to scientific communities the training of researchers and technical staff of the partners involved in the SFERAIII project to enable them to make optimum use of solar facilities through short-term training visits.

17 short-term trainings are defined and organised by 8 institutes.

The researches institutes involved in these trainings are :

CEA, CIEMAT, CNRS, CYI, ENEA, IMDEA, UAL, FRA.

- **CEA (France) :** Commissariat à l'énergie atomique et aux énergies alternatives
- **CIEMAT-PSA (Spain)** : Centro de Investigaciones Energeticas, Medioambientales, y Tecnologicas –Plataforma Solar de Almería
- **CNRS (France) :** Centre National de la Recherche Scientifique
- **CYI (Cyprus) :** The Cyprus Institute
- **ENEA (Italia) :** Agenzia Nazionale per le Nuove tecnologie, l'Energia e lo Sviluppo economico sostenibile
- **IMDEA (Spain)** : Instituto Madrileño De Estudios Avanzados en Energía
- **UAL (Spain) :** Universidad de Almeria
- **FRA (Germany) :** Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V.

The short-term trainings are covering basic needs training, but also high level of knowledge of Concentrating Solar technologies and Solar Water Treatment processes including both theoretical and practical aspects of specific experimental experiences.

Each short-term training is set up to give a quick but complete overview of the current situation of the related technology (CST or water treatment or optical and thermal characterisation...) processes. It will provide an adequate theoretical knowledge and

practical know-how on these technologies. It is structured in a rational and logical way considering attendees learning process.

The excellence of the research centres involved in its design and delivery ensure a high level of quality and the latest developments in the state of the art.

Experts will be internationally recognized authorities on CST and solar water treatment from the research centres working on these technologies.

1.1. Objectives of SFERA III trainings

The objective is primary to facilitate the exchange of knowledge and best practice among staff working in SFERA Research Infrastructures and also to reinforce the scientific collaboration between SFERA-III partners.

Upon completion of these trainings, the researchers and the technical staff should have increased their 'hands-on' experience and improving specific experimental skills an overview of the latest developments and knowledge in the following fields related to Concentrating Solar Thermal and Solar Water Treatment Technologies :

- Optical Characterisation
- Water treatment and disinfection
- Hydrogen production
- Pilot plant
- Thermocline storage
- Modelling ,control and automation for solar-based installations
- High concentration Solar Furnaces

These training assuring that the operators and technicians of SFERA infrastructures are trained at the highest possible level through

- sharing of expertise, procedures and best practices, and addressing primarily technical staff,
- testing if standards and protocols are understandable by users.

1.2. **Organisation**

During the first year of the project, the laboratories hosting have worked on the definition of their short-term trainings.

An excel file has been sent by CEA in February 2019 to all institutes to schedule the work for trainings. In July an example of the definition model of training with the objectives, description, agenda, accommodation has been sent to all institutes.

All have updated with their information to have a schedule and a description for every training. Now with all the inputs, we propose in the §2 the booklet of trainings of SFERA-III.

This booklet provides the opportunity for the different partners to highlight disponible tools, differentiating elements, while spreading common good practices. The capacity, duration and dates of the different training have been fixed by each institute to avoid overlaps of trainings.

These trainings will be of particular interest to technical staff, scientists, engineers, managers, technologists, and postgraduate researchers who wish to gain a better understanding of CST and solar water treatment technologies, its opportunities, and its best practices.

Each year, depending on the number of trainings actually delivered, the schedule may be revised. Applications from young and senior scientists and technicians will be evaluated with regard to the capacity of the sending facility, to the appropriateness of the approach and to the appropriateness of the host facility. Applications will be possible at any time. The evaluation of the proposals will be carried out by a technical committee chaired by WP2 leader: Estelle Le Baron (CEA). The technical committee will be constituted by the committee composed of the training host organizer + the WP1 leader : alain.dollet@promes.cnrs.fr + the project coordinator : ricardo.sanchez@psa.es + WP2 leader : estelle.lebaron@cea.fr

The training will be taught in the place designated in the framework of the booklet, the duration is 1 to 3 consecutive days, limited for 2 to 5 people as described in the § 1.2.1. People from SFERAIII consortium who attend the training will not have to pay any amount for the training. Each participant will pay for travel and subsistence but there will be no fee (free of charge) for the training course itself. The local course

managers have prepared the details of the training program with their local staff.

The persons concerned have to send to the host organizing body an e-mail explaining the reasons for the request and the expectations of the training, together with a brief curriculum vitae. Once approved by the committee, they may proceed to formalize the admission. The admission will take place by strict order of requests arrival.

1.3. Summary of short-term trainings: capacity, host contact

The trainings summary including host contact e-mail is presented in the next table and has been updated since 2019 due to contacts changes:

Short training	Partner name	Installation	Short description	Capacity	Duration (days)	host contact
STT1	CEA	OPTI-Lab	Optical Characterisation of reflectors and receivers	5	2	estelle.lebaron@cea.fr
STT2	CEA	INDOOR	Durability of reflectors and receivers	5	2	estelle.lebaron@cea.fr
STT3	CIEMAT	SolWATER	Solar photo-reactors using Compound Parabolic Collectors (CPC) combined or not with other	3	3	isabel.oller@psa.es
STT4	CIEMAT	HyWATOx	Pilot plant connected to a solar CPC for simultaneous removal of contaminants and solar	2	2	sixto.malato@psa.es
STT5	CYI	PROTEAS	Supervision test bench	2 to 3	2 to 3	m.c.georgiou@cyi.ac.cy
STT6	ENEA	SMQ	Evaluation of solar reflectance versus incidence and acceptance angle of solar mirrors	4	2	marco.montecchi@enea.it
STT7	ENEA	VISFIELD	In field optical characterization of parabolic trough modules by VISfield	4	2	marco.montecchi@enea.it
STT8	FRA	CLab	Central receiver systems – optical simulation and measurement	5	2	peter.schoettl@ise.fraunhofer.de
STT9	FRA	WTLab	Water treatment and separation, material charectarisation methods for membranes	5	1	Joachim.Koschikowski@ise.fraunhofer.de
STT10	FRA	TESLab	Thermocline storage modelling and testing	5	1	thomas.fluri@ise.fraunhofer.de
STT11	IMDEA	VHCST	Dynamic control and automation of heliostat fields for solar fuels production	2 to 3	2	jose.gonzalez@imdea.org ivan.bravo@imdea.org
STT12	IMDEA	KIRAN-42	Optical and Thermal Characterisation of solar receivers and reactors in High-Flux Solar	2 to 3	2	jose.gonzalez@imdea.org
STT13	UAL	Water treatment	Wastewater disinfection and removal of organic microcontaminants using low-cost solar open	3	2	jsanchez@ual.es
STT14	UAL	Control	Modelling and control for solar-based installations in buildings	3	2	mcn910@ual.es
STT15	CNRS	OTP	Optical Characterisation of reflectors and receivers	2 to 5	1-2	christophe.escape@promes.cnrs.fr
STT16	CNRS	MSSF	Power flux measurements	2 to 5	2-4	emmanuel.guillot@promes.cnrs.fr
STT17	CNRS	MWSF	Maintenance and operation of solar facilities, their heliostats and their associated core instruments	2 to 5	2-4	emmanuel.guillot@promes.cnrs.fr

1.4. **Schedule of short-term trainings in the end of 2019**

As stated in SFERA-III's Grant Agreement, the first year of project we worked on the definition of short-term trainings: the capacity, duration and dates. The planning of short-term trainings has been defined in the end of 2019 (the first year) before the Covid-19 pandemic to avoid overlapping of trainings. It is presented in the next table. Before the Covid-19 pandemic hits Europe (mid-March 2020) the trainings were mostly prepared, as described in §2 with the topics selected, the agenda, the localisation and the speakers. Thirteen of the seventeen STT were planned for 2020.

The first deliverable D2.3 V1 with the booklet of STT has been submitted at the end of 2019.

Short training	Partner name	Installation	Short description	When?
STT1	CEA	OPTI-Lab	Optical Characterisation of reflectors and receivers	mid-20
STT2	CEA	INDOOR	Durability of reflectors and receivers	Q1/2021
STT3	CIEMAT	SolWATER	Solar photo-reactors using Compound Parabolic Collectors (CPC) combined or not with other	29th-30th of September and 1st of October, 2020
STT4	CIEMAT	HyWATOx	Pilot plant connected to a solar CPC for simultaneous removal of contaminants and solar	12th and 13th of May 2020
STT5	CYI	PROTEAS	Supervision test bench	Spring or Autumn 2020. jointly decided with participants
STT6	ENEA	SMQ	Evaluation of solar reflectance versus incidence and acceptance angle of solar mirrors	jointly decided with participants
STT7	ENEA	VISFIELD	In field optical characterization of parabolic trough modules by VISfield	jointly decided with participants
STT8	FRA	CLab	Central receiver systems – optical simulation and measurement	In the week 20-21 Mai 2020
STT9	FRA	WTLab	Water treatment and separation, material charectarisation methods for membranes	Oct 2020
STT10	FRA	TESLab	Thermocline storage modelling and testing	Q1/2021
STT11	IMDEA	VHCST	Dynamic control and automation of heliostat fields for solar fuels production	Summer 2021
STT12	IMDEA	KIRAN-42	Optical and Thermal Characterisation of solar receivers and reactors in High-Flux Solar	Spring 2022
STT13	UAL	Water treatment	Wastewater disinfection and removal of organic microcontaminants using low-cost solar open	18-19 May 2020
STT14	UAL	Control	Modelling and control for solar-based installations in buildings	June 29-30, 2020
STT15	CNRS	OTP	Optical Characterisation of reflectors and receivers	Q3/2020
STT16	CNRS	MSSF	Power flux measurements	Q3/2020
STT17	CNRS	MWSF	Maintenance and operation of solar facilities, their heliostats and their associated core instruments	Q3/2020

1.5. Follow-up of short-term trainings in 2021

Sixteen of the seventeen STT were planned for 2020-2021 in order to meet each other, improve the collaboration to reinforce the scientific collaboration between SFERA-III partners and further develop joint research activities. The main interest of this type of short trainings is face-to-face interactions and operation of systems and platforms. Unfortunately, the five waves of the pandemic in 2020-2021 and related institutes rules did not allow programming them on sites. All the short-term trainings planned in 2020 have been postponed in 2021 with the hope of better evolution in this year. However, the COVID-19 pandemic in 2021 obliged us to cancel all events and postpone them.

However, two trainings have been organized by UAL STT 13 & STT 14 in 21-23 September 2021 in Almería, in the South-East of Spain (see booklet in §2.13 & 2.14). The on-site program and topics were available early July 2021 and registrations were opened at the same time to all the partners of SFERA-III project. Four people showed interest in participating by completing the registration form but ultimately refused to come due to COVID-19 restrictions at their institutions.

Also, one training STT8 have been organized by FRA in 13-14 October 2021 in Freiburg (Germany) (see booklet in §2.8). The on-site program and topics have been sent in middle of September 2021 to all the partners of SFERA-III and published on SFERA III website to attract potential participants. No sufficient registrations were received due to the very limited time for registration and not enough advertisement. Indeed, they had more requests for registration, when it was already too late.

CIEMAT wanted to organize STT3 & STT 4 for 29-3 December & 13-17 December 2021 (see 2.3 & 2.4) but due to the short time for registration and the COVID situation, they prefer to postpone the program.

To improve the communication and help to organize a training, Estelle Le Baron, as WP2 leader, sent a procedure aiming to give the chance to have more participants. To organize a training, we need to announce the training well in advance, at least 3 months before the event, to disseminate widely through the participants inside their own institution, to publish on the institute website as well as on the project website. To present an application for a training session, a brief curriculum vitae and

explanation of the reasons for the request and the expectations of the training need to be sent to the technical committee at least 2 months before the event. This committee is composed of the training host organizer, WP1 leader (alain.dollet@promes.cnrs.fr), the project coordinator (ricardo.sanchez@psa.es) and WP2 leader (estelle.lebaron@cea.fr). The committee should approve or disapprove the candidate and formalize the admission and registration one month before.

The publication of the training on the website and social media should attract more potential participants. To have a strong dissemination in 2022, SFERA-III project will announce through all communication channels within the own consortia and institutes to achieve the required number of attendants.

1.6. Schedule of short-term trainings in the end of 2021

We are entering in the COVID-19 pandemic's fifth wave and many institutions are still closed or encourage home working as since the beginning of the pandemic. The planning of short-term trainings is updated every 3 months. At the end of 2021 (the third year of project), the next table shows the new expected dates of short-term trainings for 2022. All trainings are planned for next year, during spring or summer 2022. Some trainings need good weather and in summer are the best weather conditions.

If even in the next months pandemic situation does not improve, we will opt for online version. The 12 months extension of the project could allow organizing them on site in 2022-2023 with a physical presence of participants.

Some STT15, 16 & 17 proposed by CNRS by a session per year will be reduced to only one session.

Short training	Partner name	Installation	Short description	Delayed due to COVID-19
STT1	CEA	OPTI-Lab	Optical Characterisation of reflectors and receivers	9-10 june 2022
STT2	CEA	INDOOR	Durability of reflectors and receivers	9-10 june 2022
STT3	CIEMAT	SolWATER	Solar photo-reactors using Compound Parabolic Collectors (CPC) combined or not with other	beginning of February 2022
STT4	CIEMAT	HyWATOx	Pilot plant connected to a solar CPC for simultaneous removal of contaminants and solar	beginning of February 2022
STT5	CYI	PROTEAS	Supervision test bench	
STT6	ENEA	SMQ	Evaluation of solar reflectance versus incidence and acceptance angle of solar mirrors	summer 2022
STT7	ENEA	VISFIELD	In field optical characterization of parabolic trough modules by VISfield	summer 2022
STT8	FRA	CLab	Central receiver systems – optical simulation and measurement	Spring 2022
STT9	FRA	WTLab	Water treatment and separation, material charectarisation methods for membranes	Spring 2022
STT10	FRA	TESLab	Thermocline storage modelling and testing	Q1/2022
STT11	IMDEA	VHCST	Dynamic control and automation of heliostat fields for solar fuels production	
STT12	IMDEA	KIRAN-42	Optical and Thermal Characterisation of solar receivers and reactors in High-Flux Solar	Spring 2022
STT13	UAL	Water treatment	Wastewater disinfection and removal of organic microcontaminants using low-cost solar open	May-June 2022
STT14	UAL	Control	Modelling and control for solar-based installations in buildings	May-June 2022
STT15	CNRS	OTP	Optical Characterisation of reflectors and receivers	Q3/2022
STT16	CNRS	MSSF	Power flux measurements	Q3/2022
STT17	CNRS	MWSF	Maintenance and operation of solar facilities, their heliostats and their associated core instruments	Q3/2022

2. Booklet of short-term trainings

2.1. STT1 : CEA OPTI-LAB

Short-term Training for technical staff and scientists

Optical Characterisation of reflectors and receivers

Location: France – CEA

Date: June 9-10, 2022 (to be confirmed)

Target group: The training is designed for engineers, researchers and technical staff of the partners involved in the project to enable them to make optimum use of CEA optical facilities through short-term training visit.

Objective: This course focuses on optical properties of reflectors and receivers. The training consists of both theoretical and practical modules.

Trainers: Scientists and Specialists from CEA

The training will include visits, procedures, standards and best practices theoretical and experimental 'hands-on' experience, and will cover the following topics:

- Reflectors & Receivers technologies: overview, materials, geometries
- Optical and mechanical characterisations
- Optical quality determination techniques review: CCD Camera imaging, form measurement, photogrammetry, deflectometry
- Optical modelling tools: Raytracing
- Optical laboratory characterisation facilities
- Optical portable characterisation facilities on field
- Practical test cases

Agenda

First day

09:00 - 09:15	Arrival-Registration and delivery of documentation	E. Le Baron (CEA)	15 min
09:15 – 09:30	Introduction and Goals	E. Le Baron (CEA)	15 min
09:30 – 10:00	OPTI-LAB indoor facilities Visit 30 min, Discussion	E. Le Baron (CEA)	30 min
10:00 – 10:30	Reflectors & Receivers technologies: overview, materials, geometries	TBD	30 min
10:30 – 10:45	- Coffee break -		15 min
10:45 – 11:15	Optical laboratory characterisation facilities	TBD	30 min
11:15 –12:00	Optical portable characterisation facilities on field	TBD	45 min
12:00 – 13:00	- Lunch break -		60 min
13:00 – 15:00	Standards-Guidelines on transmittance, reflectance, absorptance and best practices experience methods	TBD	120 min
15:00 – 17:00	'hands-on' experience on laboratory and portable equipment	TBD	120 min

Agenda

Second day

	Morning		
09:00 - 09:15	Arrival- welcome coffee	E. Le Baron (CEA)	15 min
09:15 – 09:30	Introduction and Goals		15 min
09:30 – 10:00	Optical and mechanical characterisations	TBD	30 min
10:00 – 10:15	- Coffee break -		15 min
10:15 – 12:00	Optical quality determination techniques review: CCD Camera imaging, form measurement, photogrammetry, deflectometry	F. Vidal/ R. Albert TBC	60 min
12:00 – 13:00	- Lunch break -		60 min
13:00 – 15:00	Optical modelling tools: Raytracing theory and practical exercise	R. Albert TBC	120 min
15:00 – 16:00	Outdoor optical 'hands-on' experience	R. Albert TBC	60 min
16:00	End of meeting		

MEETING PLACE & ACCOMMODATION

Training place	CEA-INES Commissariat à l'énergie atomique et aux énergies alternatives
Address Training Location:	50 Avenue du lac Léman 73375 Le Bourget-du-Lac FRANCE
How to get to the Training place from the airport	
Restaurant place	To be decided
Accommodation	Hotel in Chambery and Le Bourget-du-Lac downtown. Hotel contact and special rates will be provided to participants.
Contacts for the Training	Estelle Le Baron (CEA) Tel. : +33 479 792 019 E-mail : estelle.lebaron@cea.fr
Participation confirmation for the Training	SFERA III website : https://sfera3.sollab.eu/events/list/

2.2. **STT2 : CEA INDOOR**

Short-term Training for technical staff and scientists

Durability of reflectors and receivers

*Location:*France – CEA

Date: June 9-10, 2022 (to be confirmed)

Target group: The course is designed for engineers, researchers and representatives from European CSP industry and companies who want to be trained on real CSP hardware.

*Objective:*This course focuses on accelerated ageing under controlled conditions of reflectors and receivers. The training consists of both theoretical and practical modules.
*Trainers:*Scientists and Specialists from CEA

The training will include visits, procedures, standards and best practices theoretical and experimental 'hands-on' experience and will cover the following topics:

- Indoor laboratory and outdoor aging facilities
- Accelerated ageing of material subjected to high solar flux, thermal, humidity and corrosive environments
- Optical and mechanical characterisations before and after aging
- Accelerated aging test modelling durability method
- Practical test cases

Agenda

First day

09:00 - 09:15	Arrival-Registration and delivery of documentation	TBD (CEA)	15 min
09:15 – 09:30	Introduction and Goals	TBD (CEA)	15 min
09:30 – 10:30	Generality on durability method studies	TBD (CEA)	60 min
10:30 – 10:45	- Coffee break -		15 min
10:45 – 11:45	INDOOR and OUTDOOR aging facilities Visit and discussion	TBD	60 min
11:45 –12:00	Conventional and advanced tests	TBD	30 min
12:00 –12:30	Sample and data management	TBD	30 min
12:30 – 13:30	- Lunch break -		60 min
13:30 – 14:30	qualification measurement tools	TBD	60 min
14:30 – 16:30	'hands-on' experience on laboratory and portable characterisation tools	TBD	120 min
16:30	End of meeting		

Agenda

Second day

	Morning		
09:00 - 09:15	Arrival- welcome coffee	TBD (CEA)	15 min
09:15 – 10:15	Overview of studies on accelerated ageing of materials subjected to high solar flux, thermal, humidity and corrosive environments	TBD	60 min
10:15 – 10:30	- Coffee break -	TBD	15 min
10:30 – 11:30	Accelerated aging test modelling durability method	TBD	60 min
11:30 – 12:30	Environmental analyses: measurement of stress factors, weather, data processing	TBD	60 min
12:30 – 13:30	- Lunch break -		60 min
13:30 – 14:30	Acceleration factor calculation/site selection	TBD	60 min
14:30 – 15:30	Lifetime extrapolation	TBD	60 min
15:30 – 16:30	Coupling stress factors and conclusion on lifetime prediction and durability studies	TBD	60 min
16:30	End of meeting		

MEETING PLACE & ACCOMMODATION

Training place	CEA-INES Commissariat à l'énergie atomique et aux énergies alternatives
Address Training Location:	50 avenue du lac Léman 73375 Le Bourget-du-Lac FRANCE
How to get to the Training place from the airport	
Restaurant place	To be decided
Accommodation	Hotel in Chambery and Le Bourget-du-Lac downtown. Hotel contact and special rates will be provided to participants.
Contacts for the Training	Estelle Le Baron (CEA) Tel.: +33 479 792 019 E-mail: estelle.lebaron@cea.fr
Participation confirmation for the Training	SFERA III website : https://sfera3.sollab.eu/events/list/

2.3. **STT3 : CIEMAT SolWATER**

Short-term Training for technical staff and scientists

Solar photo-reactors using Compound Parabolic Collectors (CPC) combined or not with other conventional and advanced technologies for wastewater (urban and industrial) treatment/ disinfection and reuse in different applications (crops irrigation, industrial processes, etc.)

Location: Spain – PSA (CIEMAT)

Date: beginning of February 2022 (to be confirmed)

Target group: The course is designed for technicians, PhD-students and postdoctoral researchers from European Research Centres/ Universities and companies who want to be trained on technologies for non-conventional wastewater treatment and reuse.

Objective: This course focuses on the application of solar advanced technologies for wastewater decontamination, disinfection and reuse. The training consists of both theoretical and practical modules.

Trainers: Scientists and Specialists from PSA

The training will include visits, procedures, standards and best practices theoretical and experimental 'hands-on' experience and cover the following topics:

- A review of the common problems of water (scarcity, contaminants and pathogens)
- Conventional and advanced technologies for wastewater (urban and industrial) treatment/ disinfection and reuse: overview.
- Wastewater reclamation standards for different applications
- Physico-chemical and microbiological water quality monitoring review
- Solar photocatalysis fundamentals.
- Solar reactors for photocatalysis. Theoretical and practical insights.
- Practical sessions to reinforce the theoretical work covered in the course.

Agenda

First day

09:00 - 09:15	Arrival-Registration and delivery of documentation		15 min
09:15 – 10:00	Introduction and Goals General introduction to water problems (scarcity, contaminants and pathogens) and conventional/advanced technologies for wastewater reclamation.	TBD	45 min
10:00–11:00	Visit to the outdoor and indoor facilities of the Solar Treatment Water Unit of the PSA	TBD	60 min
11:00- 11:15	Coffee break		15 min
11:15- 12:00	Wastewater reuse standards. Water analysis techniques and equipment Physico-chemical water quality monitoring	TBD	45 min
12:15- 13:00	Chemical contaminants and micro-contaminants in water. Analytical methods	TBD	45 min
13:00 – 14:00	Lunch		60 min
14:00-15:00	*Laboratory practice* Wastewater sample analysis monitoring (pH, turbidity, Suspended solids, organic pollution parameters, ionic chromatography)	TBD	60 min
15:00-16:00	*Laboratory practice* (Contaminant concentration determination by Ultra-Performance Liquid Chromatography with diode array detector (UPLC/DAD).	TBD	60 min
16:00	End of meeting		

Agenda

Second day

09:00 - 09:15	Arrival- welcome coffee		15 min
09:15 – 11:00	Chemical and Biological analytical tools for monitoring wastewater reuse parameters.	TBD	105 min
11:00- 11:15	Coffee break		15 min
11:15- 12:15	Microbiological water quality monitoring (bacteria identification and quantification methods)	TBD	60 min
12:15- 13:00	Chemical analysis for water quality monitoring (conventional and advanced analytical methods)	TBD	45 min
13:00 – 14:00	Lunch		60 min
14:00-15:00	*Laboratory practice* (Microcontaminants detection and quantification-liquid chromatography)	TBD	60 min
15:00-16:00	*Laboratory practice* (Bacteria identification and quantification methods)	TBD	60 min
16:00	End of meeting		

Agenda

Third day

09:00 - 09:15	Arrival- welcome coffee		15 min
09:15 – 11:00	Solar photocatalysis fundamentals. Solar reactors for photocatalysis.	TBD	105 min
11:00- 11:15	Coffee break		15 min
11:15- 12:00	Overview: conventional and advanced technologies for water decontamination and disinfection.	TBD	45 min
12:00-13:30	Practical experience in decontamination and disinfection in a CPC-solar pilot plant	TBD	90 min
13:30 – 14:30	Lunch		60 min
14:30-16:00	Practical experience in decontamination and disinfection by the combination of advanced oxidation/separation technologies with solar photo-reactors	TBD	90 min
16:00	End of meeting		90 min

MEETING PLACE & ACCOMMODATION

Training place	Solar Treatment Water Unit. Plataforma Solar de Almería (CIEMAT)
Address Training Location:	Ctra. de Senés km. 4,5 Tabernas (04200) Almería
How to get to the Training place from the airport	A transport will be organized from Almeria downtown
Restaurant place	To be decided
Accommodation	Hotel in Almeria downtown. Hotel contact and special rates will be provided to participants.
Contacts for the Training	Dr. Isabel Oller (isabel.oller@psa.es)
Participation confirmation for the Training	SFERA III website : https://sfera3.sollab.eu/events/list/

2.4. **STT4 : CIEMAT HyWATOx**

Short-term Training for technical staff and scientists

Hydrogen production by solar photocatalysis in presence of organic electrons donors.

Location: Spain – PSA (CIEMAT)

Date: beginning of February 2022 (to be confirmed)

Target group: The course is designed for technicians, PhD-students and postdoctoral researchers from European Research Centres/ Universities and companies who want to be trained on technologies for hydrogen production by solar photocatalysis.

Objective: This course focuses on the application of solar technologies for hydrogen production in presence of organic electrons donors. The training consists of both theoretical and practical modules.

Trainers: Scientists and Specialists from PSA

The training will include visits, procedures, standards and best practices theoretical and experimental 'hands-on' experience and cover the following topics:

- Water-energy nexus
- Solar heterogeneous photocatalysis fundamentals. Application to hydrogen production.
- Solar reactors for hydrogen production.
- Practical sessions to reinforce the theoretical work covered in the course.

Agenda

First day

09:00 - 09:15	Arrival-Registration and delivery of documentation		15 min
09:15 – 10:30	Introduction and Goals Water-energy nexus. Challenges in recent years. Solar energy and hydrogen. Solar heterogeneous photocatalysis fundamentals, application to hydrogen production.	TBD	75 min
10:30–11:00	Visit to the outdoor and indoor facilities of the Solar Treatment Water Unit of the PSA.	TBD	30 min
11:00- 11:15	Coffee break		15 min
11:15- 12:00	Practice 1. Solar pilot plant for hydrogen production. Operation and hydrogen determination by Gas chromatography with Thermal Conductivity Detector (GC/TCD).	TBD	45 min
12:15- 13:00	Practice 2. Hydrogen production by naked TiO_2 P25 in solar pilot plant. Low efficiency case.	TBD	45 min
13:00 – 14:00	Lunch		30 min
14:00-16:00	Practice 2. Hydrogen production by naked TiO2 P25 in solar pilot plant. Low efficiency case.	TBD	120 min
16:00	End of meeting		

Agenda

Second day

09:00 - 09:15	Arrival- welcome coffee		15 min
09:15 – 11:00	Practice 3. Hydrogen production by CuO + TiO_2 P25 in solar pilot plant. High efficiency case.		105 min
11:00- 11:15	Coffee break		15 min
11:15- 13:00	Practice 3. Hydrogen production by CuO + TiO_2 P25 in solar pilot plant. High efficiency case.		105 min
13:00 – 14:00	Lunch		
14:00-16:00	Practice 3. Hydrogen production by CuO + TiO_2 P25 in solar pilot plant. High efficiency case.		120 min
16:00	End of meeting		

MEETING PLACE & ACCOMMODATION

Training place	Solar Treatment Water Unit. Plataforma Solar de Almería (CIEMAT)
Address Training Location:	Ctra. de Senés km. 4,5 Tabernas (04200) Almería
How to get to the Training place from the airport	A transport will be organized from Almeria downtown
Restaurant place	To be decided
Accommodation	Hotel in Almeria downtown. Hotel contact and special rates will be provided to participants.
Contacts for the Training	Dr. Sixto Malato (sixto.malato@psa.es)
Participation confirmation for the Training	SFERA III website : https://sfera3.sollab.eu/events/list/

2.5. **STT5 : CYI PROTEAS**

Short-term Training for technical staff and scientists

The PROTEAS CONTROL SYSTEM will be used as a supervision test bench, where mathematical models can be implemented and tested. These models will be operating in slave mode under the supervision of the PROTEAS control system and several subroutines can be applied and tested.

The purpose of the training is the enhancement of capabilities regarding the implementation of best practises on a control system.

Location: CYPRUS – CYI

Date: 17th – 18th of September 2020. It will be jointly decided with the participants

Target group: The course is designed for technicians, PhD-students and postdoctoral researchers from European Research Centres/ Universities and companies who want to be trained on technologies for non-conventional wastewater treatment and reuse.

Objective: This course focuses on the application of training models under the supervision of the PROTEAS Facility control system. The overall objective is to test and validate the operation of these models in a real environment, such as the PROTEAS Facility.

Trainers: Professors, Scientists and Specialists from CYI

The training will include visits, best practices theoretical and experimental 'hands-on' experience and cover the following topics:

- An introduction to the PROTEAS Facility
- Introduction to PROTEAS Control architecture and structure
- Demonstration of the PROTEAS control capabilities
- Implementation of the proposed models to the PROTEAS control system
- Training of the models and application in real environment.

Agenda

First day

09:00 - 09:15	Arrival-Registration and delivery of documentation		15 min
09:15 – 10:00	Introduction and Goals	TBD	45 min
10:00–11:00	Visit to the PROTEAS Facility	TBD	60 min
11:00- 11:15	Coffee break		15 min
11:15- 12:00	Introduction to PROTEAS control architecture	TBD	45 min
12:15- 13:00	Implementation of monitoring and controlling strategy	TBD	45 min
13:00 – 14:00	Lunch		60 min
14:00-15:00	Demonstration of PROTEAS control system operation	TBD	60 min
15:00-16:00	Interlocks and decision taking implemented through the PROTEAS control system	TBD	60 min
16:00	End of meeting		

Agenda

Second day

09:00 - 09:15	Arrival- welcome coffee		15 min
09:15 – 10:00	Visit to the PROTEAS Facility	TBD	45 min
10:00- 11:00	Implementation of the training model into the PROTEAS control system		60 min
11:00 – 11:15	Coffee break		
11:15- 13:00	Training of the model and the users based on the supervision of the master control room (master – slave)	TBD	105 min
13:00 – 14:00	Lunch		60 min
14:00-15:00	*Laboratory practice* (Demonstration of the master – slave operation)	TBD	60 min
15:00-16:00	*Laboratory practice* (Demonstration of the master – slave operation)	TBD	60 min
16:00	End of meeting		

MEETING PLACE & ACCOMMODATION

Training place	Platform for Research, Observation and Technological Applications in Solar Energy, PROTEAS
Address Training Location:	Governors Beach, Pentakomo, Limassol, Cyprus
How to get to the Training place from the airport	A transport will be organized from CYI headquarters in Nicosia
Restaurant place	To be decided
Accommodation	Hotel in Nicosia downtown or in Pentakomo near the facility. Hotel contact and special rates will be provided to participants.
Contacts for the Training	Dr. Marios C. Georgiou (m.c.georgiou@cyi.ac.cy)
Participation confirmation for the Training	

2.6. **STT6 : ENEA SMQ**

Short-term Training for technical staff and scientists

Evaluation of mirror solar reflectance versus incidence and acceptance angle

Location:Italy – ENEA-Casaccia (Rome)

Date: summer 2022 (to be confirmed)

Target group: The course is designed for engineers, researchers and representatives from European CSP industry and companies who want to be trained on the latest procedure recommended by SolarPACES reflectance guidelines.

Objective: This course focuses on the equivalent model algorithm successfully used for modelling solar reflectance behaviour versus incidence and acceptance angle. The required input data, measured at near-normal incidence, are:
1) hemispherical spectral reflectance in the solar range
2) experimental values of single-wavelength near-specular reflectance (or conic reflectance) at different acceptance angles.

*Trainers:*ENEA scientists

The training will include visits, procedures, standards and best practices theoretical and experimental 'hands-on' experience and cover the following topics:

- Mirrors in CSP and measurement of the concerning reflectance
- Dual beam spectrophotometers and best practice to obtain reliable measurements of hemispherical reflectance spectra
- Review of Standard Solar spectrum; Solar and UV weighting
- Theory of the Equivalent Model for Solar Mirrors
- Review of the proposed instruments for measuring near-specular (conic) reflectance

- Theory and practice on the Solar Mirror Qualification set-up version 2
- Characterization exercises on several commercial mirrors

Agenda

First day

08:30 - 09:15	Arrival-Registration and delivery of documentation
09:15 – 09:30	Training overview and goals
09:30 – 09:45	Mirrors in CSP: approaching to the problem of reflectance measurement
09:45 – 10:30	Hemispherical reflectance measurement: dual beam commercial spectrophotometers, integrating sphere, reference mirrors, errors, and best practice
10:30 – 10:45	- Coffee break -
10:45 – 12:00	Near-specular solar reflectance, the two ways to get it: direct measurement or modelling of single-wavelength experimental data. Theory of the equivalent model for solar mirrors.
12:00 – 13:00	- Lunch break -
13:00 – 14:30	Visit to PCS facility, OMSoP dish, and Perkin Elmer Lambda 950 spectrophotometer
14:30 – 15:30	Review of the proposed instruments by the SolarPACES expert group
15:30 – 16:30	SolarPACES reflectance guidelines

Agenda

Second day

09:00 - 09:30	Open discussion on the first day
09:30 – 10:30	Short training on SMQ2 set-up
10:30 – 10:45	- Coffee break -
10:45 – 12:00	Theory and practice on the processing software SMQexpo
12:00 – 13:00	- Lunch break -
13:00 – 14:00	Visit to the solar collector optics laboratory – how to measure mirror 3D shape
14:00 – 15:30	Hand-on experience with SMQ2 on several commercial products
15:30 16:30	Final discussion and feedback on the training

MEETING PLACE & ACCOMMODATION

Training place	ENEA-Casaccia
Address Training Location:	Via Anquillarese 301, Santa Maria di Galeria (Roma), Italy
How to get to the Training place from the airport	• **By train (Leonardo Express → MetroA → FL3)** • By taxi • By car for rent
Restaurant place	Launch at ENEA canteen; dinner free
Accommodation	Next to ENEA-Casaccia or in Rome city
Contacts for the Training	Marco Montecchi (ENEA) Tel.: +39 06 3048 3587 E-mail: marco.montecchi@enea.it
Participation confirmation for the Training	SFERA III website : https://sfera3.sollab.eu/events/list/

2.7. STT7 : ENEA VISFIELD

Short-term Training for technical staff and scientists

In-field optical characterization of parabolic trough modules by VISfield

Location:Italy – ENEA-Casaccia (Rome)

Date: summer 2022 (to be confirmed)

Target group: The course is designed for engineers, researchers and representatives from European CSP industry and companies who want to be trained on the in-field optical characterization of parabolic trough modules by VISfield

Objective: This course focuses on the VISfield approach in both translational and rotational mode for evaluating the intercept factor.

*Trainers:*ENEA scientists

The training will include visits, procedures, standards and best practices theoretical and experimental 'hands-on' experience and cover the following topics:

- Visual Inspection System: innovation and benefit
- VIS instrument family
- VISfield in translational and rotational mode: pros and cons

Agenda

First day

08:30 - 09:15	Arrival-Registration and delivery of documentation
09:15 – 09:30	Training overview and goals
09:30 – 09:45	Visual Inspection System principles
09:45 – 10:30	Overview of the several instruments based on VIS
10:30 – 10:45	- Coffee break -
10:45 – 12:00	VISfield: the instrument for parabolic trough modules. Translational and rotational modes, pros and cons.
12:00 – 13:00	- Lunch break -
13:00 – 14:30	Visit to PCS facility, OMSoP dish, and VISfield
14:30 – 15:30	Basics of image processing and VIS software
15:30 – 16:30	Indoor training on VISfield

Agenda

Second day

09:00 - 09:30	Open discussion on the first day
09:30 – 10:30	Outdoor training on VISfield setting
10:30 – 12:00	Outdoor measurements in translational and rotational modes
12:00 – 13:00	- Lunch break -
13:00 – 14:00	Visit to the solar collector optics laboratory – how to measure mirror 3D shape
14:00 – 15:30	Processing of the measurements
15:30 16:30	Final discussion and feedback on the training

MEETING PLACE & ACCOMMODATION

Training place	ENEA-Casaccia
Address Training Location:	Via Anquillarese 301, Santa Maria di Galeria (Roma), Italy
How to get to the Training place from the airport	• **By train (Leonardo Express → MetroA → FL3)** • By taxi • By car for rent
Restaurant place	Launch at ENEA canteen; dinner free
Accommodation	Next to ENEA-Casaccia or in Rome city
Contacts for the Training	Marco Montecchi (ENEA) Tel.: +39 06 3048 3587 E-mail: marco.montecchi@enea.it
Participation confirmation for the Training	SFERA III website : https://sfera3.sollab.eu/events/list/

2.8. **STT8 : FRA Clab**

Short-term Training for technical staff and scientists

Optical characterization of reflectors and receivers

Location: Germany – Freiburg – Fraunhofer ISE

Date: spring 2022 (to be confirmed)

Target group: The course is designed for engineers, researchers and representatives from European CSP industry and companies who want to be trained on real CSP hardware.

Objective: Sharing expertise in the theoretical and practical competences needed for optical characterization and measurements on solar collectors.

Trainers: Scientists and Specialists from Fraunhofer ISE

The training will include visits, procedures, standards and best practices theoretical and experimental 'hands-on' experience and cover the following topics:

- Optical modelling tools
- Optical laboratory characterization facilities
- Optical portable characterization facilities in field
- Practical test cases

Agenda

First day

09:15 – 09:45	Welcome coffee		30m
09:45 – 10:00	Introduction of Agenda	Peter Schöttl	15m
10:00 – 11:00	Optical Modelling Tools- Raytrace3D, DevISE– material models	Peter Schöttl	60 min
11:00 – 11:15	Coffee break		15m
11:15 – 12:15	Introduction Optical Labs, mirror and absorber characterization	Gregor Bern	60 min
12:15 – 13:15	Lunch Break		60 min
13:15 – 14:15	Lab Visit	Thomas Schmidt	60 min
14:15 – 14:30	Break		15m
14:30 – 16:30	Optical Labs: hands on experiments - Deflectometry, VLABS reflectance measurements	Gregor Bern / Thomas Schmidt	120 min

Agenda

Second day

09:00-09:15	Welcome coffee		15m
09:15-10 :00	Introduction Field Instrumentation – Camera based measurement and 3-D laser scanning for the assessment of concentrating collectors	Gregor Bern	45m
10 :15-12 :15	Visit and measurements at field lab – hands on experience	Thomas Schmidt/ Gregor Bern	120 min
12 :15-13 :15	Lunch Break		60 min
13:15-14:30	Discussion and wrap up	Gregor Bern	75 min

MEETING PLACE & ACCOMMODATION

Training place	Fraunhofer Institute for Solar Energy
Address Training Location:	Heidenhofstraße 2, 79110 Freiburg im Breisgau
How to get to the Training place from the airport	Airport Shuttle from EuroAirport Basel, Mulhouse, Freiburg to Freiburg
Restaurant place	On site
Accommodation	Hotel close to Fraunhofer ISE We will send a list of suitable hotels after confirmed registration
Contacts for the Training	Peter Schöttl peter.schoettl@ise.fraunhofer.de Lina Graf noa.lina.graf@ise.fraunhofer.de
Participation confirmation for the Training	SFERA III website : https://sfera3.sollab.eu/events/list/

APPLICATION FORM FOR SHORT-TERM TRAINING FRA 13.-14.10.21

First Name

Last Name

Affiliation

E-Mail

Which topic are you most interested in?

Please send the filled-out form to peter.schoettl@ise.fraunhofer.de

2.10. **STT9 : FRA WTLab**

Short-term Training for technical staff and scientists

Water treatment and separation, material characterisation

Location: Germany - FRA

Date: spring 2022 (to be confirmed)

Target group: The course is designed for engineers, researchers and representatives from European CSP industry and companies who want to be trained on real CSP hardware.

Objective: Sharing expertise in water treatment and separation and the characterisation of components needed for those activities. It will include theoretical lectures and hands-on experiences.

Trainers: Scientists and Specialists from FRA

The training will include visits, procedures, standards and best practices theoretical, experimental 'hands-on' experience, and cover the following topics:

- Introduction to desalination and water treatment technologies
- Theoretical background of transport phenomena and membrane characteristics
- Conduction of laboratory tests on different membrane processes as Membrane Distillation and reverse Osmosis

Agenda

09:15-09:45	Welcome coffee		30m
09:45-10:00	Introduction of Agenda	Joachim Koschikowski	15min
10:00-11:00	Introduction to water treatment technologies for desalination and industrial water treatment	Joachim Koschikowski / Joachim Went	1h
11:00-11:15	Coffee break		15min
11:15-12:15	Characterization of different membranes and membrane elements for Membrane Distillation and Reverse Osmosis	Daniel Winter, Joachim Wentc	1h
12:15-13:15	Lunch Break		1h
13:15-14:15	Safety instructions and introduction WaterLab	Daniel Winter	1h
14:15-14:30	Break		15min
14:30-18:00	Conduction of membrane tests in the WaterLab	Daniel Winter Joachim Went	3.5h

MEETING PLACE & ACCOMMODATION

Training place	Fraunhofer Institute for Solar Energy
Address Training Location:	Heidenhofstraße 2, Auerstraße 8, Freiburg im Breisgau
How to get to the Training place from the airport	Airport Shuttle from EuroAirport Basel, Mulhouse, Freiburg to Freiburg
Restaurant place	On site
Accommodation	Hotel close to Fraunhofer ISE Please get in contact with Vera Walliser (vera.walliser@ise.fraunhofer.de) to get a full list of available hotels
Contacts for the Training	Joachim Koschikowski Joachim.Koschikowski@ise.fraunhofer.de Julian Michel Julian.michel@ise.fraunhofer.de
Participation confirmation for the Training	SFERA III website : https://sfera3.sollab.eu/events/list/

2.11. STT10 : FRA TESLab

Short-term Training for technical staff and scientists

Thermocline storage modelling and testing

Location: Germany - FRA

Date: Q1/2022

Target group: The course is designed for engineers, researchers and representatives from European CSP industry and companies who want to be trained on real CSP hardware.

Objective: Sharing experience with experimental evaluation and modelling of thermocline storage concepts. It will include theoretical lectures and hands-on experiences.

Trainers: Scientists and Specialists from FRA

The training will include visits, procedures, standards and best practices theoretical and experimental 'hands-on' experience and cover the following topics:

- Thermocline storage testing
- Thermocline storage modelling

Agenda

First day

9:00 – 9:30	Welcome coffee	tbd	30 min
9:30 – 10:30	Introduction: Thermocline storage at Fraunhofer ISE	tbd	60 min
10:30 – 10:45	Break		15 min
10:45 – 12:00	Introduction: Thermocline modelling approaches at Fraunhofer ISE	tbd	75 min
12:00 – 13:00	Lunch break		60 min
13.00 – 15:00	Hands on experience of laboratory testing	tbd	120 min
15:00 – 15:15	Break		15 min
15:15 – 16:30	Data evaluation and discussion	tbd	75 min
16:30 – 17:00	Closing round	tbd	30 min

MEETING PLACE & ACCOMMODATION

Training place	Fraunhofer Institute for Solar Energy
Address Training Location:	Heidenhofstraße 2, 79110 Freiburg im Breisgau
How to get to the Training place from the airport	Airport Shuttle from EuroAirport Basel, Mulhouse, Freiburg to Freiburg
Restaurant place	On site
Accommodation	Hotel close to Fraunhofer ISE Please get in contact with Vera Walliser (vera.walliser@ise.fraunhofer.de) to get a full list of available hotels
Contacts for the Training	Thomas Fluri thomas.fluri@ise.fraunhofer.de Julian Michel Julian.michel@ise.fraunhofer.de
Participation confirmation for the Training	SFERA III website : https://sfera3.sollab.eu/events/list/

2.12. **STT11 : IMDEA VHCST**

Short-term Training for technical staff and scientists

Dynamic Control and Automation of Heliostat Fields for Solar Fuels Production

Location: Móstoles (Spain) – IMDEA Energy

Date: Summer 2021 (exact dates to be confirmed)

Target group: The course is designed for engineers, researchers and representatives from European CSP industry and companies who want to be trained on real CSP hardware.

Objective: This course focuses on dynamic control and automation of heliostat fields for solar fuels production. The training consists of both theoretical and practical modules.

Trainers: Scientists and Specialists from IMDEA Energy

The training will include visits to the Very-High Concentration Solar Tower (VHCST) and the laboratory facilities at IMDEA Energy, theoretical and experimental training covering the following topics:

- Concentrated solar power: overview and technologies
- Compact and very high concentration heliostat fields
- Solar thermochemical fuel production
    - Solar reactors
    - SUN-to-LIQUID project
- Dynamic control and automation of a heliostat field (TBD)
- Control of heliostat fields: Instruction to Supervisory Control and Data Acquisition (SCADA) systems
- Visit to the research facilities and VHCST at IMDEA Energy
- Demonstration of the VHCST facility

Agenda

First day

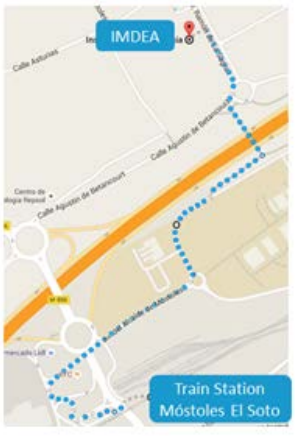
09:00 – 09:30	Arrival - Welcome coffee at IMDEA Energy and registration	José Gonzalez-Aguilar (IMDEA)	30 min
09:30 – 09:45	Welcome to IMDEA Energy Introduction	José Gonzalez-Aguilar (IMDEA)	15 min
09:45 – 10:15	Concentrated solar power: overview and technologies	TBD	30 min
10:15 – 10:45	Concentrated solar power: heliostat fields	TBD	30 min
10:45 – 11:00	--- Coffee break and Networking---		15 min
11:00 – 11:30	Introduction to the very high concentration heliostat field of IMDEA Energy	TBD	30 min
11:30 –12:00	Control of heliostat fields: Introduction to Supervisory Control and Data Acquisition (SCADA) systems	TBD	30 min
12:00 – 13:00	--- Lunch break ---		60 min
13:00 – 14:00	Dynamic control and automation of heliostat fields: overview and state-of-the-art	TBD	60 min
14:00 – 16:00	Visit to the solar field of IMDEA Energy and Practical case	TBD	120 min

Agenda

Second day

09:00 - 09:15	Arrival - Welcome coffee at IMDEA Energy	José Gonzalez-Aguilar (IMDEA)	15 min
09:15 – 09:30	Introduction to the topics of the day	José Gonzalez-Aguilar (IMDEA)	15 min
09:30 – 10:15	Visit to the laboratories of IMDEA Energy	TBD	45 min
10:15 – 10:30	--- Coffee break and Networking---		15 min
10:30 – 11:15	Solar thermochemical fuel production: overview and reactor technologies	TBD	45 min
11:15 – 12:00	From Sun to fuel production I: overview and challenges	TBD	45 min
12:00 – 13:00	--- Lunch break ---		60 min
13:00 – 14:00	From Sun to fuel production II: SUN-to-LIQUID European project	TBD	60 min
14:00 – 16:00	Practical case in the solar field of IMDEA Energy	TBD	120 min
16:00	End of meeting		

MEETING PLACE & ACCOMMODATION

Training place	IMDEA Energy Institute
Address Training Location:	Avenida Ramón de la Sagra, 3. 28935 Móstoles, Madrid, Spain
How to get to the Training place from the airport	In case you would prefer staying in Madrid downtown, you will be able to easily reach IMDEA Energy either by metro or by train (see information below). Please count with about 30 minutes journey each way. The city of Móstoles is located in the Southwest of Madrid and the Airport Madrid-Barajas is in the North East of the city.  IMDEA Energy premises are about 15 to 20 minutes walking distance from the regional train station Móstoles El Soto. It is recommended to **follow a path via the Rey Juan Carlos University Campus** as shown on the right map above.  

	By taxi - From the airport to IMDEA Energy or Hotel Ciudad de Móstoles: count with 30 minutes and between 50-60€ - From Madrid centre to IMDEA Energy or Hotel Ciudad de Móstoles: count with 25 minutes and between 25-30€ By public transport - From the airport, it is recommended to take the regional train called "Cercanias" and departing from terminal 4 at Madrid Barajas. There is a bus connection between terminal 2 and terminal 4. - In terminal 4, you will have to buy a train ticket to Móstoles El Soto. - From the terminal 4, take the line C1 heading to Atocha Railway Station and get off at Atocha Station. - From Atocha Station, take the line C5 heading to Móstoles EL Soto, which is the final station. Get off there. - It will take you ca. 1:10 hour and cost around 2.70 €. The line C1 to Atocha departs every 30 minutes and the line C5 to Móstoles El Soto departs every 10 minutes. - Timetables for regional train can be consulted here. Alternative route: - Atocha Station can be reached with the Express bus airport departing from the airport every 15-20 minutes. The journey to Atocha Station by bus takes ca. 30 minutes depending on the traffic. You will need to purchase separate ticket for the train and the regional train. - Further information on the Express bus airport can be found here. - From Atocha Station to Móstoles El Soto, please follow instructions above.
Restaurant place	
Accommodation	IMDEA Energy recommends the following hotels: Hotel Ciudad de Móstoles (Closest hotel) Ctra. Móstoles-Villaviciosa de Odón Km. 0,200; 28931, Móstoles, Madrid Tel: +34 916 140 669, Email: recepcion@h-ciudadmostoles.com http://www.hotelciudaddemostoles.es/en Hotel is 10 minutes walk away from IMDEA Energy premises, 8 minutes walk from the train station El Soto and 20 minutes walk from the metro station Universidad Rey Juan Carlos (see map below). Booking can be made by phone or per e-mail. Please provide the booking reference IMDEA Energy to benefit from IMDEA Energy reduced rates:65€ for a single room, breakfast and VAT included 75€ for a double room, breakfast and VAT included Sercotel Spa La Princesa Carretera M-506 Km. 9, salida Móstoles centro, 28922 Móstoles, Spain https://www.laprincesa.com/ Hotel is about 1.9 km from the train station renfe Mostoles central. From there you may take a train to Mostoles El Soto station to IMDEA Energy. Price about 65 euro per night (breakfast not included)

	Hotel Ibis budget Madrid Alcorcón Móstoles (cheapest option) Travesía de Móstoles n°3 N 40°20'2.75"W 3°51' 14.60, 28921, Alcorcón, Spain http://www.ibis.com/gb/hotel-3201-ibis-budget-madrid-alcorcon-mostoles/index.shtml Hotel is about 1.2 km from train Station of Mostoles Central. From there you may take a train to Mostoles El Soto station to visit IMDEA Energy. Price about 43 Euro per night (breakfast not included) Hotel NH Alcorcon (another option) Edificio A, Av. de Europa, 2, 28922 Alcorcón, Madrid, Spain Hotel website : Hotel NH Alcorcon From hotel you can take metro at station "Parque Oeste" and get out at the next stop "Universidad Rey Juan Carlos". From University just cross the campus and the bridge to IMDEA Energy. Prices between 60-80 Euro per night.
Contacts for the Training	José Gonzalez Aguilar (IMDEA Energy), Ivan Bravo Gonzalo (IMDEA Energy) Tel.: +34 917371136 E-mail: jose.gonzalez@imdea.org; ivan.bravo@imdea.org
Participation confirmation for the Training	SFERA III website : https://sfera3.sollab.eu/events/list/

2.13. **STT12 : IMDEA KIRAN-42**

Short-term Training for technical staff and scientists

Optical and Thermal Characterisation of Solar Receivers and Reactors in High-Flux Solar Simulators

Location: Móstoles (Spain) – IMDEA Energy

Date: Spring 2022 (exact dates to be confirmed)

Target group: The course is designed for engineers, researchers and representatives from European CSP industry and companies who want to be trained on real CSP hardware.

Objective: This course focuses on optical and thermal characterisation and measurements of solar receivers and reactors in high-flux solar simulators. The training consists of both theoretical and practical modules.

Trainers: Scientists and Specialists from IMDEA Energy

The training will include visits to the solar simulators at IMDEA Energy Institute, including the High-Flux Solar Simulator (KIRAN-42), and also the laboratory facilities of the institute. All the activities, theoretical and experimental training, are within the scope of the following topics:

- High flux solar simulators: overview, technology and applications
- Optical characterisation: overview and technology
- Thermal characterisation: overview and technology
- Solar receivers and reactors technologies and applications
- Application of high flux solar reactors for characterisation of solar receivers and reactors
- Visit to the research facilities and solar simulators at IMDEA Energy
- Practical test cases

Agenda

First day

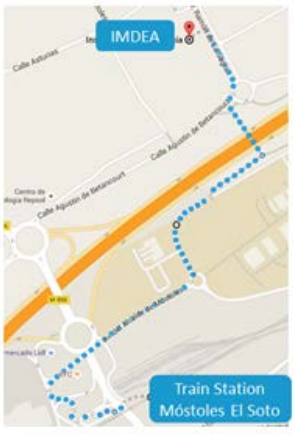
09:00 – 09:30	Arrival - Welcome coffee at IMDEA Energy and registration	José Gonzalez-Aguilar (IMDEA)	30 min
09:30 – 09:45	Welcome to IMDEA Energy Introduction	José Gonzalez-Aguilar (IMDEA)	15 min
09:45 – 10:15	High flux solar simulators: overview and technology	TBD	30 min
10:15 – 10:45	High flux solar simulators: applications	TBD	30 min
10:45 – 11:00	--- Coffee break and Networking---		15 min
11:00 – 11:30	Optical characterisation in solar simulators: overview and technology	TBD	30 min
11:30 –12:00	Thermal characterisation in solar simulators: overview and technology	TBD	30 min
12:00 – 13:00	--- Lunch break ---		60 min
13:00 – 14:00	Visit to the solar simulators at IMDEA Energy	TBD	60 min
14:00 – 16:00	Introduction on how to use a high flux solar simulator. Practical case	TBD	120 min

Agenda

Second day

09:00 - 09:15	Arrival - Welcome coffee at IMDEA Energy	José Gonzalez-Aguilar (IMDEA)	15 min
09:15 – 09:30	Introduction to the topics of the day	José Gonzalez-Aguilar (IMDEA)	15 min
09:30 – 10:15	Solar receivers and reactors technologies I: Solar receivers – state-of-the-art	TBD	45 min
10:15 – 10:30	--- Coffee break and Networking ---		15 min
10:30 – 11:15	Solar receivers and reactors technologies II: Solar reactors and applications	TBD	45 min
11:15 – 12:00	Application of high flux solar reactors for characterisation of solar receivers and reactors	TBD	45 min
12:00 – 13:00	--- Lunch break ---		60 min
13:00 – 14:00	Visit to the laboratories at IMDEA Energy	TBD	60 min
14:00 – 16:00	Characterisation of volumetric receivers in high flux solar simulators Practical case	TBD	120 min
16:00	End of meeting		

MEETING PLACE & ACCOMMODATION

Training place	IMDEA Energy Institute
Address Training Location:	Avenida Ramón de la Sagra, 3. 28935 Móstoles, Madrid, Spain
How to get to the Training place from the airport	In case you would prefer staying in Madrid downtown, you will be able to easily reach IMDEA Energy either by metro or by train (see information below). Please count with about 30 minutes journey each way. The city of Móstoles is located in the Southwest of Madrid and the Airport Madrid-Barajas is in the North East of the city.  IMDEA Energy premises are about 15 to 20 minutes walking distance from the regional train station Móstoles El Soto. It is recommended to **follow a path via the Rey Juan Carlos University Campus** as shown on the right map above.  

	By taxi - From the airport to IMDEA Energy or Hotel Ciudad de Móstoles: count with 30 minutes and between 50-60€ - From Madrid centre to IMDEA Energy or Hotel Ciudad de Móstoles: count with 25 minutes and between 25-30€ By public transport - From the airport, it is recommended to take the regional train called "Cercanias" and departing from terminal 4 at Madrid Barajas. There is a bus connection between terminal 2 and terminal 4. - In terminal 4, you will have to buy a train ticket to Móstoles El Soto. - From the terminal 4, take the line C1 heading to Atocha Railway Station and get off at Atocha Station. - From Atocha Station, take the line C5 heading to Móstoles EL Soto, which is the final station. Get off there. - It will take you ca. 1:10 hour and cost around 2.70 €. The line C1 to Atocha departs every 30 minutes and the line C5 to Móstoles El Soto departs every 10 minutes. - Timetables for regional train can be consulted here. Alternative route: - Atocha Station can be reached with the Express bus airport departing from the airport every 15-20 minutes. The journey to Atocha Station by bus takes ca. 30 minutes depending on the traffic. You will need to purchase separate ticket for the train and the regional train. - Further information on the Express bus airport can be found here. - From Atocha Station to Móstoles El Soto, please follow instructions above.
Restaurant place	
Accommodation	IMDEA Energy recommends the following hotels: Hotel Ciudad de Móstoles (Closest hotel) Ctra. Móstoles-Villaviciosa de Odón Km. 0,200; 28931, Móstoles, Madrid Tel: +34 916 140 669, Email: recepcion@h-ciudadmostoles.com http://www.hotelciudaddemostoles.es/en Hotel is 10 minutes walk away from IMDEA Energy premises, 8 minutes walk from the train station El Soto and 20 minutes walk from the metro station Universidad Rey Juan Carlos (see map below). Booking can be made by phone or per e-mail. Please provide the booking reference IMDEA Energy to benefit from IMDEA Energy reduced rates:65€ for a single room, breakfast and VAT included 75€ for a double room, breakfast and VAT included Sercotel Spa La Princesa Carretera M-506 Km. 9, salida Móstoles centro, 28922 Móstoles, Spain https://www.laprincesa.com/ Hotel is about 1.9 km from the train station renfe Mostoles central. From there you may take a train to Mostoles El Soto station to IMDEA Energy. Price about 65 euro per night (breakfast not included)

	Hotel Ibis budget Madrid Alcorcón Móstoles (cheapest option) Travesía de Móstoles n°3 N 40°20'2.75"W 3°51' 14.60, 28921, Alcorcón, Spain http://www.ibis.com/gb/hotel-3201-ibis-budget-madrid-alcorcon-mostoles/index.shtml Hotel is about 1.2 km from train Station of Mostoles Central. From there you may take a train to Mostoles El Soto station to visit IMDEA Energy. Price about 43 Euro per night (breakfast not included) Hotel NH Alcorcon (another option) Edificio A, Av. de Europa, 2, 28922 Alcorcón, Madrid, Spain Hotel website : Hotel NH Alcorcon From hotel you can take metro at station "Parque Oeste" and get out at the next stop "Universidad Rey Juan Carlos". From University just cross the campus and the bridge to IMDEA Energy. Prices between 60-80 Euro per night.
Contacts for the Training	José Gonzalez Aguilar (IMDEA Energy), Ivan Bravo Gonzalo (IMDEA Energy) Tel.: +34 917371136 E-mail: jose.gonzalez@imdea.org; ivan.bravo@imdea.org
Participation confirmation for the Training	SFERA III website : https://sfera3.sollab.eu/events/list/

2.14. **STT13 : UAL Water treatment**

Short-term Training for technical staff and scientists

Wastewater disinfection and removal of organic microcontaminants using low-cost solar open photo-reactors

Location: Spain – UAL

Date: May-June 2022 (to be confirmed)

Target group: The course is designed for engineers, researchers and representatives from European Water industry and companies who want to be trained on wastewater treatment by solar advanced oxidation processes.

Objective: This course focuses on solar advanced oxidation processes in low-cost photoreactors for wastewater reclamation. The training consists of both theoretical and practical modules.

Trainers: Scientists from UAL

The training will include visits, procedures, standards and best practices theoretical and experimental 'hands-on' experience and cover the following topics:

- Fenton and photo-Fenton chemistry
- Wastewater characterization and treatment objectives
- Description and operation of open photoreactors for photo-Fenton (raceway pond reactors)
- Analysis of microcontaminants
- Microbial characterization

Agenda

First day

09:00 - 09:15	Arrival-Registration and delivery of documentation		15 min
09:15 – 10:00	Introduction and Goals: General introduction to solar advanced oxidation processes in low-cost photoreactors for wastewater reclamation	José A. Sánchez	45 min
10:00–11:00	Visit to the outdoor and indoor facilities of the Solar Energy Research Center, CIESOL, at the University of Almería	Paula Soriano	60 min
11:00- 11:15	Coffee break		15 min
11:15- 12:15	Wastewater characterization and treatment objectives	Paula Soriano	60 min
12:15- 13:15	Fenton and photo-Fenton chemistry	José A. Sánchez	60 min
13:15 – 14:30	Lunch		75 min
14:30-16:30	*Laboratory practice* Conducting a solar photo-Fenton experiment. Design, experimental, sample analysis, results and discussion	Elisabeth Gualda/ Solaima Belachqer	120 min
16:30	End of meeting		

Agenda

Second day

09:00 - 09:15	Arrival- welcome coffee		15 min
09:15 – 11:00	Analysis of microcontaminants	Ana Agüera	105 min
11:00- 11:15	Coffee break		15 min
11:15- 12:15	Description and operation of open photoreactors for photo-Fenton (raceway pond reactors)	Paula Soriano	60 min
12:15- 13:15	Microbial characterization	Elisabeth Gualda	60 min
13:15 – 14:30	Lunch		75 min
14:30-16:30	*Laboratory practice* Analysis of microcontaminants, target and non-target contaminants.	Patricia Plaza	120 min
16:30	End of meeting		

MEETING PLACE & ACCOMMODATION

Training place	Solar Energy Research Center, CIESOL, at the University of Almería
Address Training Location:	University of Almería, Ctra. de Sacramento s/n, 04120, Almería, SPAIN
How to get to the Training place from the airport	Taxi
Restaurant place	Restaurants of the Almería University campus.
Accommodation	Hotel in Almeria downtown. Hotel contact and special rates will be provided to participants.
Contacts for the Training	Dr. José Antonio Sánchez Pérez (jsanchez@ual.es)
Participation confirmation for the Training	

2.15. **STT14 : UAL control**

Short-term Training for technical staff and scientists

Modelling and control for solar-based installations in buildings

Location: Spain – UAL

Date: May-June 2022 (to be confirmed)

Target group: Scientists, engineers and technical staff interested in the applications of solar energy

Objective: Providing theoretical and practical skills for the optimization of the design and operation of solar installations in buildings by the use of specific modelling and control techniques.

Trainers: Scientists from UAL

The training will include visits, procedures, standards and best practices theoretical and experimental 'hands-on' experience and cover the following topics:

- Dynamic modelling of buildings and solar installations
- Development and implementation of specific control techniques applied to process and systems in building and solar installations.
- Sensors and actuators for energy efficiency monitoring and control in buildings.
- Design and operation of SCADA (Supervisory Control and Data Acquisition System) for solar buildings.

Agenda

First day (September 22, 2021)

09:00 – 09:30	Arrival - Welcome coffee at CIESOL Center and registration	TBD	30 min
09:30 – 09:45	Welcome to CIESOL Center and introduction to the activities of the Modeling and Automatic Control Unit	TBD	15 min
09:45 – 11:00	Dynamic modelling of buildings and solar installations	TBD	75 min
11:00 – 11:30	--- Coffee break and Networking---		30 min
11:30 – 13:00	Dynamic modelling of buildings and solar installations	TBD	90 min
13:00 – 14:30	--- Lunch break ---		90 min
14:30 – 16:00	Analysis of sensors and actuators for energy efficiency monitoring and control in buildings.	TBD	90 min

Agenda

Second day (September 23, 2021)

09:00 – 09:15	Arrival - Welcome coffee at CIESOL Center	TBD	15 min
09:15 – 11:00	Development and implementation of specific control techniques applied to process and systems in building and solar installations	TBD	105 min
11:00 – 11:30	--- Coffee break and Networking---		30 min
11:30 – 13:00	Development and implementation of specific control techniques applied to process and systems in building and solar installations	TBD	90 min
13:00 – 14:30	--- Lunch break ---		90 min
14:30 – 16:00	Design and operation of SCADA (Supervisory Control and Data Acquisition System) for solar buildings.	TBD	90 min
16:00	End of meeting		

MEETING PLACE & ACCOMMODATION

Training place	Solar Energy Research Center, CIESOL, at the University of Almería
Address Training Location:	University of Almería, Ctra. de Sacramento s/n, 04120, Almería, SPAIN
How to get to the Training place from the airport	Taxi
Restaurant place	Restaurants of the Almería University campus.
Accommodation	Hotel in Almeria downtown. Hotel contact and special rates will be provided to participants.
Contacts for the Training	Dra. María del Mar Castilla Nieto (mcn910@ual.es)
Participation confirmation for the Training	

2.16. STT15 : CNRS OTP

Short-term Training for technical staff and scientists

Optical Characterization of CSP reflectors and solar receivers

Location: France – CNRS-PROMES

Date: Q3 2022 (to be confirmed)

Target group: Scientists, engineers and technical staff interested in the applications of solar energy

Objective: Providing theoretical and practical skills for the optical characterization of reflectors and receivers using CNRS-PROMES instruments

Trainers: Engineers from CNRS-PROMES.

The training will include visits, procedures, standards and best practices theoretical and experimental 'hands-on' experience on CNRS-PROMES commercial and custom instruments. The precise content is to be agreed between trainer and trainees.

The main instruments:

- Spectral emissivity hemispheric-directional with SOC 100 and Nicolet 6700.
  - ➔ 20 to 500 °C
  - ➔ 1.5 to 20 µm.
- Spectral reflectivity bidirectional with CASI instrument.
  - ➔ room temperature
  - ➔ 633 nm
- Eventually: directional monochromatic emissivity measurement with DISCO using solar heating of the sample.

Agenda

The precise content is to be agreed between trainer and trainees.

MEETING PLACE & ACCOMMODATION

Training place	CNRS-PROMES laboratory in Font Romeu Odeillo
Address Training Location:	CNRS-PROMES, Centre Félix Trombe, 7 rue du Four Solaire, 66120, Font Romeu Odeillo Vla, France https://www.promes.cnrs.fr
How to get to the Training place from the airport	Four airports possible: Barcelona (suggested), Toulouse, Montpellier, Perpignan (nearer but less connections) • From Barcelona: Shuttle + train to Puigcerda + taxi • From Toulouse: Shuttle + train to Latour de Carol + taxi • Rented car
Restaurant place	Restaurant inside the laboratory for lunch. Restaurants in Font Romeu for dinner (ski resort)
Accommodation	Hotels in Font Romeu or other towns. Suggested: • Hôtel Le Grand Tétras https://www.hotelgrandtetras.fr/ • Hôtel l'Oustalet http://www.hotelloustalet.com
Contacts for the Training	Christophe ESCAPE christophe.escape@promes.cnrs.fr
Participation confirmation for the Training	SFERA III website : https://sfera3.sollab.eu/events/list/

2.17. **STT16 : CNRS MSSF**

Short-term Training for technical staff and scientists

Power flux measurements

Location: France – CNRS-PROMES

Date: Q3 2022 (to be confirmed)

Target group: Scientists, engineers and technical staff interested in the applications of solar energy

Objective: Providing theoretical and practical skills for the power characterization of concentrated solar furnaces.

Trainers: Engineers from CNRS-PROMES.

The training will include visits, procedures, standards and best practices theoretical and experimental 'hands-on' experience on CNRS-PROMES commercial and custom instruments. The precise content is to be agreed between trainer and trainees.

The proposed topics:

- Presentation and usage of water-calorimeters, and/or radiometers.
- Presentation and usage of camera and white targets.
- Presentation of moving bars on the Thémis solar tower and at Odeillo's Big solar furnace MWSF.
- Calibration of the instruments and uncertainty evaluation.
- Data processing to provide flux maps: from raw data to paper ready plots.

The practical activities are proposed on the MSSF solar furnaces at CNRS-PROMES which offer a wide range of conditions:

- From 0.9 to 6 kW full power (1.5 to 10 cm full spot diameter).
- From 6000 to 16000 suns peak power.

The discussions and presentations will include the conditions at Odeillo Big Solar Furnace MWSF and at the Thémis Solar Tower:

- Big Solar Furnace MWSF: 63 heliostats incident angle; up to 1000 kW, up to 10000 suns, 1 m spot diameter.
- Thémis solar tower: 110 heliostats, up to 4500 kW and 1500 suns, 4m spot diameter.

Agenda

The precise content is to be agreed between trainer and trainees.

MEETING PLACE & ACCOMMODATION

Training place	CNRS-PROMES laboratory in Font Romeu Odeillo and in Thémis, Targassone.
Address Training Location:	CNRS-PROMES, Centre Félix Trombe, 7 rue du Four Solaire, 66120, Font Romeu Odeillo Vla, France https://www.promes.cnrs.fr
How to get to the Training place from the airport	Four airports possible: Barcelona (suggested), Toulouse, Montpellier, Perpignan (nearer but less connections) • From Barcelona: Shuttle + train to Puigcerda + taxi • From Toulouse: Shuttle + train to Latour de Carol + taxi • Rented car
Restaurant place	Restaurant inside the laboratory for lunch. Restaurants in Font Romeu for dinner (ski resort)
Accommodation	Hotels in Font Romeu or other towns. Suggested: • Hôtel Le Grand Tétras https://www.hotelgrandtetras.fr/ • Hôtel l'Oustalet http://www.hotelloustalet.com
Contacts for the Training	Emmanuel Guillot emmanuel.guillot@promes.cnrs.fr
Participation confirmation for the Training	SFERA III website : https://sfera3.sollab.eu/events/list/

2.18. STT17: CNRS MWSF

Short-term Training for technical staff and scientists

Maintenance and operation of solar facilities, their heliostats and their associated core instruments

Location: France – CNRS-PROMES

Date: Q3 2022 (to be confirmed)

Target group: Scientists, engineers and technical staff interested in the applications of solar energy

Objective: Providing theoretical and practical skills for the power characterization of concentrated solar furnaces.

Trainers: Engineers and technicians from CNRS-PROMES.

The training will include visits, procedures, standards and best practices theoretical and experimental 'hands-on' experience on CNRS-PROMES solar facilities. The precise content is to be agreed between trainer and trainees.

The topics cover the maintenance and the operation of solar furnaces and associated instruments:

- Heliostats fields: electrical and mechanical aspects.
- Heliostats fields: 3 different control command systems
- Optical quality assessment and canting of mirrors
- Experimental setups design and operation at laboratory scale (MSSFs) and pilot scales (MWSF, Thémis, MicroSol'R)
- Solar weather stations and associated database.
- Cooling loops

The practical activities are proposed on the CNRS-PROMES facilities which offer a wide range of conditions:

- Focus on the Big Solar Furnace MWSF: 63 heliostats incident angle; up to 1000 kW, up to 10000 suns.
- Thémis solar tower: 110 heliostats, up to 4500 kW and 1500 suns.
- MSSFs: 11 solar furnaces from 6000 to 16000 suns, 5 heliostats of 2 types.
- MicroSol'R: 150 kWth trough with oil and steam loop, dry cooler, ORC.

Agenda

The precise content is to be agreed between trainer and trainees.

MEETING PLACE & ACCOMMODATION

Training place	CNRS-PROMES laboratory in Font Romeu Odeillo and in Thémis, Targassone.
Address Training Location:	CNRS-PROMES, Centre Félix Trombe, 7 rue du Four Solaire, 66120, Font Romeu Odeillo Vla, France https://www.promes.cnrs.fr
How to get to the Training place from the airport	4 airports possible: Barcelona (suggested), Toulouse, Montpellier, Perpignan (nearer but less connections) • From Barcelona: Shuttle + train to Puigcerda + taxi • From Toulouse: Shuttle + train to Latour de Carol + taxi • Rented car
Restaurant place	Restaurant inside the laboratory for lunch. Restaurants in Font Romeu for dinner (ski resort)
Accommodation	Hotels in Font Romeu or other towns. Suggested: • Hôtel Le Grand Tétras https://www.hotelgrandtetras.fr/ • Hôtel l'Oustalet http://www.hotelloustalet.com
Contacts for the Training	Emmanuel Guillot emmanuel.guillot@promes.cnrs.fr
Participation confirmation for the Training	SFERA III website : https://sfera3.sollab.eu/events/list/