CORE OF THE REPORT

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[2] The home page of the website should contain the generic European flag and the FP7 logo which are available in electronic format at the Europa website (logo of the European flag: http://europa.eu/abc/symbols/emblem/index_en.htm logo of the 7th FP: http://ec.europa.eu/research/fp7/index_en.cfm?pg=logos). The area of activity of the project should also be mentioned.

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1.1 Project objectives for the period

Project objectives corresponding to the second reporting period of the project can be summarized as follows:

WP1 Management

The main objective of this WP is the coordination and management of the SFERA II project. CIEMAT is responsible for day-to-day global administrative, technical and scientific coordination of the project, and must act as the primary communication route between the consortium partners and the EU project officers.

WP2 Dissemination and publicity

The objectives and impacts of this WP were clearly stated in the Annex I of the Grant Agreement. Dissemination and publicity activities will be one of the central points of the Networking activities to ensure a sustainable visibility of the project:

- Firstly, this WP will be in close relations with all the other WPs in order to continue fostering internally the culture of communication and cooperation that has already been put in place between the partners of SFERA I.
- Secondly, it will put strong emphasis on external communication towards the general public, dissemination of results, publicity regarding the project, outreach to the user community. A strong experience has been already gained by the WP leader during SFERA I to establish a communication plan but it always needs to be improved.

WP3 Promotion of Innovation in CSP based on SFERA activities

The main objective is to increase the potential of innovation of SFERA by addressing the innovation opportunities created by the project activities and by reinforcing links with companies that drive innovation. The key tasks proposed in this work package aim at developing the conditions to set a world-class eco-system that may speed up the process from knowledge (generated by the activities of the solar concentrating research infrastructures) to new products, processes and services.

In order to reinforce the partnership with industry a strong collaboration is to be established with ESTELA (European Solar Thermal Electricity Association) which is the main industrial association in CSP. The collaboration is increased by offering trainings for industry, bringing research and innovation together.

The expected impacts are targeted at various levels:

- To develop the innovation culture inside the SFERA consortium.
- To educate engineers and technicians in CSP facilities operation.
- To create innovative products and services.
- To increase competitiveness of European industry in the field of CSP.
- To propose new jobs related to CSP development and maintenance.

WP4 Educational outreach activities

The activity on education aims at promoting CSP research and this on two levels:

- The first activity consists of annual summer or winter schools aiming at presenting the SFERA Solar facilities to potential users and at teaching theoretically the scientific basis of CSP activities to a whole range of public. The activity also aims at transferring the knowledge gained in the project to students as well as researchers or engineers from industry.

- The second activity is intended towards internal educational outreach. As far as the project consortium is concerned, the main objective of this task is to organize annual doctoral colloquia with the partners' PhD students (also in the frame of SolLab alliance) in order exchange between SFERA partners' main research results, possible new project proposals and cooperation domains. This action is focused on strengthening the cooperation between the partners of the project in order to improve the services to the users.

Major expected impacts would be to attract talented scientists and potential new PhD students or post-doc and arouse a strong motivation for CSP research, which would then increase and foster the use of the European Infrastructures.

WP5 Exchange of best practices for harmonization of approaches

For a better harmonization of the CSP activities within Europe and a better understanding of what is at stake at each other partners' laboratory, this is important to emphasize the exchange of best practices. This will be implemented in two ways.

- To carry on with what has been worked on in SFERA-I in the JRA tasks on solar flux measurement, 1 inter-comparison campaign of flux measurement instruments used at CNRS will be set up. Best practices on practical and technical aspects of the instruments will be shared in order to standardize the use of these instruments among the partners. A particular attention is turned to solar flux measurement at the focus of concentrating systems because it is a key data for the evaluation of system efficiency (receivers, reactors, output of secondary concentrators…).

- Exchange of personnel will be reinforced between the partners in order to share know-how, participate in common R&D activities and to promote common technical and management methods. It should provide the basis for skill enhancement and skill conservation.

It will result in a better co-operation and interconnectivity between the researchers, engineers, technicians regarding working methodologies and common approaches for CSP activities. These activities are crucial to carry on unified/coherent CSP activities and improve the services to the users at the different facilities.

WP6 Joint Management of 'Transnational Access' activities (WPs 7 – 10)

Transnational access activities were intended to provide access to their state-of-the-art high-flux solar research facilities unique in Europe and in the world. The main objective for the second reporting period (RP2) is to grant the proportional amount of access, that is, approximately the estimated figures shown in Table 2 (total weeks/users/days/projects divided into four years of project duration).

Table 1. Access implementation plan estimated for the second reporting period.

Participant Nº	Organisation short name	Infrastructure short name	Installation ID	Installation short name	Unit of access	Min. Quantity of access to be provided Annex I	Estimated number of users	Estimated number of days spent at the infrastructure	Estimated number of projects
1	CIEMAT	CIESOL	1	CIESOL	Week	6	6	84	3
1	CIEMAT	PSA	1	CRS	Week	5	2	63	2
1	CIEMAT	PSA	2	ACUREX	Week	2	1	11	1
1	CIEMAT	PSA	3	DISS	Week	5	3	84	2
1	CIEMAT	PSA	4	MSL	Week	5	3	84	2
1	CIEMAT	PSA	5	PTTL	Week	2	1	11	0
1	CIEMAT	PSA	6	KONTAS	Week	2	1	11	0
1	CIEMAT	PSA	7	CAPSOL	Week	5	2	32	1
1	CIEMAT	PSA	8	HSF	Week	6	4	53	2
1	CIEMAT	PSA	9	VSF	Week	9	6	84	3
1	CIEMAT	PSA	10	DISTAL	Week	2	2	21	1
1	CIEMAT	PSA	11	DESAL	Week	7	2	32	2
1	CIEMAT	PSA	12	DETOX	Week	11	8	231	3
1	CIEMAT	PSA	13	DISINF	Week	11	6	168	3
2	ENEA	SOLTERM	1	MOSE	Week	8	4	79	3
2	ENEA	SOLTERM	2	PCS	Week	7	5	63	3
4	PSI	STL	1	HFSS	Week	8	7	95	4
7	CNRS	PROMES	1	MWSF	Week	6	6	42	2
7	CNRS	PROMES	2	MSSFs	Week	28	26	197	11
7	CNRS	PROMES	3	SDISH-50kW	Week	2	2	16	1
7	CNRS	PROMES	4	THEMIS	Week	5	5	32	2
7	CNRS	PROMES	5	MiniTrough	Week	3	3	24	1

WP11 Development of Joint Calibration Procedures and Facilities for Sensors

Regarding Task 1 (Standardized Calibration of solar irradiance sensors), the following objectives are planned during the reporting period in Annex I:

Calibration facility for thermal irradiance sensors and Standardization of RSI calibration

- Final set-up and operation of calibration facility for field pyrheliometers and field pyranometers at PSA operated/used by the different research institutions following ISO 9059, ISO 9846 and ISO 9847

- Parallel measurements of the aerosol optical depth, circumsolar radiation and documentation of the sky conditions with all sky imagers
- Ensure WRR (World Radiometric Reference)- traceability of solar radiation calibration by participation in absolute cavity radiometer calibration campaigns with DLR's and Ciemat absolute cavity radiometers
- Calibration campaigns of field irradiance sensors to improve and standardize the quality of European research facilities (DLR, CIEMAT, CNRS)
- A 2-week stay of CNRS to calibrate their pyrheliometers at PSA and to exchange know-how
- Round-Robin test of calibration accuracy for different method and sites (e.g. in Madrid, PSA)(Ciemat, DLR)
- Evaluation of calibration methods for Rotating Shadowband Irradiometers

Regarding Task 2 (Bypass facility for measuring the thermal heat capacity of heat transfer fluids and calibrating mass flow sensors), the following objectives are planned during the reporting period in Annex I:

Increase measurement accuracy of test facility at European research centre

- Campaign to increase accuracy of installed mass flow meters and to measure oil heat capacity in test facility of DLR/CIEMAT at PSA.

WP12 Pyrometric Temperature Measurement Methods for High-Concentration Solar Facilities and Solar Simulators

- Finish implementation of the double modulation pyrometry at PSI is high flux solar simulator (HFSS). Perform calibration and experiments at HFSS and IF. Assess double modulation pyrometry at these two facilities.
- Design and build fast shutter for tests of double modulation pyrometry at PROMES.
- Measure relative emissivity changes at IF.
- Investigation of a novel IR-camera for monitoring temperature patterns under irradiation by concentrated solar light.
- Improve self-adapting temperature control system at small solar furnace including active cooling.

WP13 Determination of physical properties of CSP materials under concentrated solar irradiation

Determination of thermo-mechanical properties under concentrated solar radiation.

- Achievement of a solar experiment design based on acoustic detection for materials assessment and characterisation.
- Implementation of this experiment on reference samples to compare mechanical damage patterns detected by acoustic emission method to the expected modelled behaviour.

Determination of thermo-optical properties: spectral directional emissivity measurements at high
Temperature

- Continuation of the commissioning of an improved setup to determine the spectral directional emissivity of materials depending on the temperature using a spectro-radiometer, including metrological performance assessment.
- Preparation of a comparison campaign between the methods used by the partners to assess the emissivity of reference materials.

Determination of key properties in the case of porous materials in CSP applications

- Improvement of XPS and XRD methods to characterise the surface and the bulk properties of porous materials.
- Development of a solar test bed for determination of heat transfer properties of porous materials.
- Improvement of numerical methods to determine transfer properties of porous materials and compare them with experimental data.

WP14 Characterization of solar concentrators and interconnecting elements

Additionally to the overall management and coordination of WP14 this work package is composed of four Tasks with the following main objectives for the period July 2015 - December 2016:

Characterization of solar concentrators´ geometrical quality

- Definition of a protocol draft for measurement of geometrical quality of concentrators that allows to compare results produced by different methodologies (i.e. photogrametry, deflectometry, laser scanner, …)
- Start the round robin test to compare different methodologies for characterization of solar concentrators´ geometrical quality

Protocols for characterization of parabolic-trough concentrators

- Definition of testing methods for determining of optical quality, thermal losses, incidence angle modifier, and angular torsion of parabolic-trough collectors.

Protocols for characterization of Heliostats

- The final objective of Task 14.3 is the definition of a “protocol for evaluation of optical and geometrical quality of heliostats”. The specific objective for this second period is to discuss a first draft protocol inside the consortium and the international working group of the SolarPACES agreement.

Testing infrastructures for collectors´ inter-connections

- Construction of a test bench and the realization of preoperational tasks that lead to its operation. It should be ready for testing all types of interconnections devices used in parabolic trough collector fields, i.e. ball-joints, flexible hoses or hybrid devices using thermal oil as heat transfer fluid.

WP15 Characterization of heat transfer fluids and heat storage materials

Improvement of performances for laboratory test equipment

The aim of the work done in Task 2 in this reporting period was aiming:

- To increase the allowed analysis temperature range, from ambient up to very high temperatures for chemical/physical analysis of HSM/HTF materials, by new hardware acquisition and by upgrading the present instrumentation. To reach this goal the research team focused on the assessment of an experimental set-up for the measurement of the thermal conductivity of thermal fluids, which required the design and construction of an innovative probe, based on the "hot wire" method.
- To develop a laboratory scale experimental rig for the studies of thermodynamics and kinetic features involved in the thermal degradation of HTF/HSM, in presence of the most common environmental conditions, mainly designing and assembling a set-up for the study of the kinetics presented by the reactions involved in the chemical degradation of thermal fluid. For this purpose, it is necessary to have a batch reactor within which the temperature is homogeneous and constant, and the pressure and composition of the headspace atmosphere is controlled. The evolved gas are detected and quantified by gas chromatography.

Development of an electronic database for materials and components features concerning CSP application

Regarding Task 3, the following objectives are planned during the reporting period in Annex I:

- A complete state of the art research was carried out, in particular concerning the phase diagrams and thermophysical properties of molten salt multicomponent mixtures.
- A study of solid fillers as sensible heat storage fluids was carried, and an investigation of storage configurations where sensible and latent heat systems are employed together was also conducted.
- Also a survey on the most potentially interesting chemical storage systems has been conducted. Chemical storage systems allow, in principle, to make the CSP storage systems more versatile and to design a long period (even seasonal) heat accumulation. A comprehensive review of the most interesting currently proposed techniques was completed. Moreover, also the topic of "solar fuels", i.e. hydrogen or combustibles obtained using solar energy, was addressed.
- The charging of nanoparticles to thermal fluids is reported to have the effect to improve their thermophysical properties. To elucidate this point, it was necessary a complete state of the art research about this topic. Moreover, since the thermal fluids charged with nanoparticles are mainly proposed as phase change materials (PCM), it was also needed a preliminary resume and classification of the most commonly investigated PCM systems.

1.2 Work progress and achievements during the period

Work package no.	**WP 2**	Plan-Start:	**M01**	Plan-End:	**M48**
Lead Participant	**CNRS**	Actual-Start:	**M01**	Actual-End:	**M48**
Work package title	Dissemination and publicity				
Activity Type	Coordination activities				
Participant involved	**CIEMAT, ENEA, DLR, PSI, ETH Zurich, CNRS, U.EVORA, ESTELA**				
Work package summary of progress towards objectives					

Deliverable 2.5 Minutes of internal dissemination meeting

The Internal Dissemination Meeting took place in June 2016 together with all WP leaders via web conference. This was the opportunity to discuss about the dissemination activities more thoroughly than during the project meeting. The discussion raised important points about targeting more adequately the industry. Hence the decision to edit the leaflet with all results of the JRA to be exploited by the industry.

This was combined with a meeting with ESTELA to define the strategy to adopt to boost the dissemination of innovations in SFERA-II and related to the Deliverable 3.5 and Milestone MS11.

This Deliverable 2.5 has been submitted in June 2017 though it was prepared by the WP leader (PROMES) after the internal meeting. Due to a misunderstanding between the WP leader and the coordinator the deliverable was not correctly submitted in ECAS on the date it was just prepared.

The delay in the organization of this internal meeting and so in the preparation of the deliverable 2.5 was due to the common decision of the WP leader (in agreement with the steering committee) and ESTELA to postpone the meeting till enough dissemination experience through activities initially programmed within WP2 could be attained. Then, a more fruitful discussion could take place between ESTELA (as representative of the related industry) and the WP leader (as representative of the scientific part) could be opened.

Deliverable 2.5 is linked to the Milestone MS5.

Deliverable 2.6 Content of the second conference

This deliverable was dedicated to the organization of the second SFERA conference. This gathers the material used for the exhibition. This event was planned for Month 21 of the project and was organized in M21.

For 2015, the second SFERA event was organized in Cape Town, South Africa, from the 13th to the 16th of October, 2015 during the SolarPACES 2015 conference, the annual international event for the CSP community. As every year, an exhibition booth to present the SFERA-II actions was implemented in order to target the whole participants and provide a better visibility. During 4 days, the SFERA-II booth has attracted a lot of people from the industry but also from the R&D public sector. It has enabled again to widespread the information on the SFERA-II activities and especially the Access programme and the campaign for 2016. More than 50 participants have been personally approached.

This Deliverable 2.6 is linked to the Milestone MS6.

Figure 1. SFERA-II exhibition conference in Cape Town at SolarPACES 2015.

Deliverable 2.7 SFERA Second article

This deliverable deals with the publication of a second SFERA-II article in the press. This was planned in M24 and got delayed until M30 to be published in a special edition to be widespread at the international event of the European Commission: the Sustainable Energy week 2016. The article was published in an EU magazine called European Energy Innovation:

http://www.europeanenergyinnovation.eu/

The article is available here, page 52:

http://www.europeanenergyinnovation.eu/OnlinePublication/Summer2016/index.h tml#p=2

It has been the occasion also to advertise on the SFERA-II 2017 access campaign.

This Deliverable 2.7 is linked to Milestone MS7.

52 Summer 2016 European Energy Innovation
COMMUNICATION

SFERA II

Solar Facilities for the European Research Area

The EU-funded research project SFERA II aims to boost scientific collaboration among the leading European research institutions in solar concentrating systems, offering European research and industry access to some of the best research and test infrastructures. The project incorporates the following activities:

- Transnational Access: Researchers will have access free of charge to five state-of-the-art high-flux solar research facilities, unique in Europe and in the world.
- Networking: This includes the organization of training courses for industry, summer schools for the public, doctoral colloquia... The aim is to create a common training framework and provides the researchers with the necessary skills to operate concentrating solar facilities.
- The Joint Research Activities aim to improve the quality and service of the existing infrastructure, extend their services and jointly achieve a common level of high scientific quality.

What is the CSP (Concentrating Solar Power) technology that is promoted through SFERA II? CSP is a very promising renewable source of energy. The best known application so far is bulk electricity generation through thermodynamic cycles, but other applications have also been demonstrated, such as the production of hydrogen and solar fuels, water treatment and research in advanced materials.

How is the electricity produced? CSP systems concentrate energy from the sun's rays to heat a receiver to high temperatures. This heat is then transformed into electricity – solar thermal electricity (STE). When combined with thermal storage capacity of several hours of full-capacity generation, CSP plants can continue to produce electricity even when clouds block the sun, or after sundown or in early morning when power demand steps up, making it a competitive technology to mitigate climate change.

Five SFERA II Partners: PSA-CIEMAT, PROMES-CNRS, PSI, ENEA and CIESOL will provide access to their solar research facilities free of charge. This opportunity enables to realize high-quality research in the following areas :

- Solar thermal electricity generation: thermodynamic cycles, receivers, thermal storage, concentrating optics, control algorithms, etc.
- Solar production of chemical energy carriers: H2, Syngas, etc.
- Cycles for chemical storage of solar energy: ZnO, etc.
- Solar water treatment: desalination, disinfection, detoxification
- Research in basic phenomena and nano-material production processes
- Knowledge-based high-added-value material synthesis: ceramics, glass, etc.
- High-flux photochemistry and photo-physics
- Basic knowledge of materials behaviour and aging under extreme conditions

To access the five infrastructures above, the users have to submit an application through the annual calls that are launched by the project. Travel, accommodation and access to the installations are all paid by the EU project. For the 2017 year, the call will be open from September 2016 to the end of January 2017. The access period will take place from March to November 2017.

SFERA II CSP research infrastructures

FOR MORE INFORMATION

You can visit our website at http://sfera2.sollab.eu or follow us on LinkedIn to get the latest news on the project.

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 312643.

www.europeanenergyinnovation.eu

Figure 2. SFERA-II second article published in European Energy Innovation Magazine.

<u>Deliverable 2.8 Content of third conference</u>

This deliverable intends to present the content of the third SFERA conference. This gathers the material used for the exhibition. This event was planned for Month 33 of the project and was organized in M34.

For 2016, the third SFERA conference was organized in Abu Dhabi, UAE from the 11th to the 14th of October, 2016 during the SolarPACES 2016 conference, the annual international event for the CSP community. For this occasion, two actions were organized. As every year, an exhibition booth to present the SFERA-II actions was implemented. Also, the project was presented during one of the parallel sessions of the SolarPACES conference on the 13th of October.

The presentation can be accessed online here:

http://sfera2.sollab.eu/uploads/images/access/Files/SFERA%20II%20SolarPaces%20Abu%20Dhabi%20EG-MP.pdf

In addition, a special document targeted for the industry was distributed to the participant in order to draw attention onto the results of the project that can be exploited by the industry. The online document can be accessed here:

http://sfera2.sollab.eu/uploads/images/access/Files/Results%20to%20be%20exploited%20by%20the%20industry%20ppt%20v3.pdf

This Deliverable 2.8 is linked to the Milestone MS8.

Figure 3. SFERA-II exhibition conference in Abu Dhabi at SolarPACES 2016.

Other achievements not planned in the DoW

As part of this WP, other achievements have been done in regards to dissemination.

- Participation as exhibitor in the ICRI conference 2016 in Cape Town, the International Conference on Research Infrastructures.

Figure 4. SFERA-II exhibition conference at the ICRI Conference in Cape Town.

- Participation as exhibitor in the CSP Today conference 2016 in Seville, the annual European industrial conference on CSP.

Figure 5. SFERA-II exhibition conference at the CSP Today conference 2016.

- Creation of a group on the professional social network LinkedIn in May 2015. https://www.linkedin.com/grp/home?gid=8313632&sort=POPULAR&trkInfo=clickedVertical%3Agroup%2CclickedEntityId%3A8313632%2Cidx%3A1-1-1%2CtarId%3A1441206052589%2Ctas%3Asfera+II&trk=tyah

At the moment, there are 254 members in the group. A growth up to 300 by the end of the project is expected.

Work package no.	**WP 3**	Plan-Start:	**M01**	Plan-End:	**M48**
Lead Participant	**CNRS**	Actual-Start:	**M01**	Actual-End:	**M48**
Work package title	Promotion of Innovation in CSP based on SFERA activities				
Activity Type	Coordination activities				
Participant involved	**CIEMAT, ENEA, DLR, PSI, ETH Zurich, CNRS, U.EVORA, ESTELA**				
Work package summary of progress towards objectives					

<u>D3.2 Report on Training course for industries Year 2</u>

This deliverable is the report on the training courses organized for the industry in 2015. Within this second year, one course took place, as planned in the DoW, at ENEA premises in Casaccia (Italy), on March 2015, focused on the operation of Molten Salt Systems: Collector Loop, Thermal Storage and Heat Transfer Fluids.

Figure 6. SFERA-II Training Course taking place at ENEA in Casaccia (Italy).

The final agenda was announced in January 2015 through the homepages and mailing lists of SFERA-II and the WP partners CIEMAT, CNRS, ENEA, DLR and ESTELA. Furthermore the course was announced at the info stand of SFERA-II at the CSP Today Conference in Seville in November 2014. The selection process ended in February 2015 with the selection of fourteen industry engineers and researchers from five countries (Spain, Italy, Germany, France and Japan). Table 2 shows the distribution of the participants per land and public or private sector.

Table 2. SFERA II Participants List

1. Italy Project Engineer Private
2. Italy Project Engineer Private
3. Spain Engineer Private
4. Spain Technician Private
5. Germany Project Engineer Private
6. Spain Process Engineer Private
7. Italy Engineer Private
8. Italy Engineer Private
9. Japan Principal Engineer CSP Section Private
10. Germany Senior Project Engineer Private
11. Spain Researcher Mechanical Engineering Private
12. Germany Project Developer Private
13. France R&D Engineer Private
14. Spain Responsible for Solar Technology Private

This training course was a success and attracted only industry participants. Below is the list of training planned during the course of the SFERA-II project.

No.	Topic	Local Course Management	Location	Date
1	Operation & testing of direct steam generation in linear focusing collectors, Reflector Characterization	CIEMAT	Spain PSA	Sept 2014
2	Molten Salt Systems: Collector Loop, Thermal Storage and Heat Transfer Fluids	ENEA	Italy	March 2015
3	Operation & testing of a central receiver plant (Heliostats field and surface receiver operation, maintenance, qualification)	CNRS	France	Spring 2016
4	Thermal component testing of parabolic troughs with oil as HTF (Receivers, Facets, Module Qualification, Connectors)	DLR	Spain PSA	Spring 2017

D3.3 Report on Training course for industries Year 3

The third training course was prepared and conducted by CNRS researchers at PROMES-CNRS facility in Odeillo (France) in June 2016. The course covered the aspects of central receivers and heliostat fields. The course contents were designed by the local course manager PROMES-CNRS in collaboration with the overall program manager DLR. The objective was to offer a course with short theoretical introduction to the subject and predominance of practical aspects of operation and maintenance of infrastructure.

The course has been pre-announced at the SolarPACES Conference 2015 and the final agenda has been published in April 2016 through the homepages and mailing lists of SFERA-II and the WP partners CIEMAT, CNRS, ENEA, DLR and ESTELA. The selection process ended in May 2016 with the selection of twelve industry engineers and researchers from seven countries: France, Spain, Germany, Denmark, UK, Morocco and South Korea. Table 3 shows the distribution of the participants per country and public or private sector.

Table 3. Distribution of the participants per country and public or private sector.

1. France Research Engineer Private
2. Germany Senior CSP Expert Private
3. France Engineer Private
4. France Head of Tendering Private
5. Denmark CEO Private
6. Morocco O&M Manager Private
7. Morocco Operator Private
8. South Korea Associate Researcher Private
9. Spain Project Manager Private
10. Spain Technical Director Private
11. UK Project Developer Private
12. Spain Process Engineer Private
13. France R&D Engineer Private
14. Spain Responsible for Solar Technology Private

D3.5 Mid-term list of potential innovations

Both Access and Joint Research Activities may result in new products and services, for example, new measurement devices, new methods or new materials.

The key objective of this deliverable is to identify the research activities that may lead to an innovation and to help the actors in the process that allows to go from the experimental results at lab scale to a prototype and then to a product or from a knowledge to a new service.

The first most important step, which is gathered in this deliverable, is to identify the promising activities and potential innovations in the JRA activities. The next step will be to support the actors delivering these innovations in order to define commonly the best way to promote and develop the potential innovation. This step will be done with the support of a subcontractor.

This deliverable has been drafted following the meeting with ESTELA to boost innovation, which took place in the framework of the Internal Dissemination Meeting (D2.5). The aim is to disseminate to the industrial community the results produced by SFERA-II and to be potentially exploited by the industry.

For the purpose of disseminating these results to the community, the leaflet as presented below was printed in September 2016 and made available for the first time at SolarPACES 2016 and then this was also distributed it at CSP Today conference 2016 and the ICRI conference also in 2016.

It is already on the website:

http://sfera2.sollab.eu/uploads/images/access/Files/Results%20to%20be%20exploited%20by%20the%20industry%20ppt%20v3.pdf

This Deliverable 3.5 is linked to the Milestone MS12.

Milestone 11 Common meeting with ESTELA to boost CSP innovation

This Milestone deals with the identification of foreground within SFERA-II and the way to disseminate it. The meeting was supposed to take place in Month 18 of the project but for organization purpose with ESTELA, this was postponed to June 2016 together with the meeting on internal dissemination (D2.5 and MS5).

This meeting has enabled to draft the list of potential mid-term innovation (D3.5).

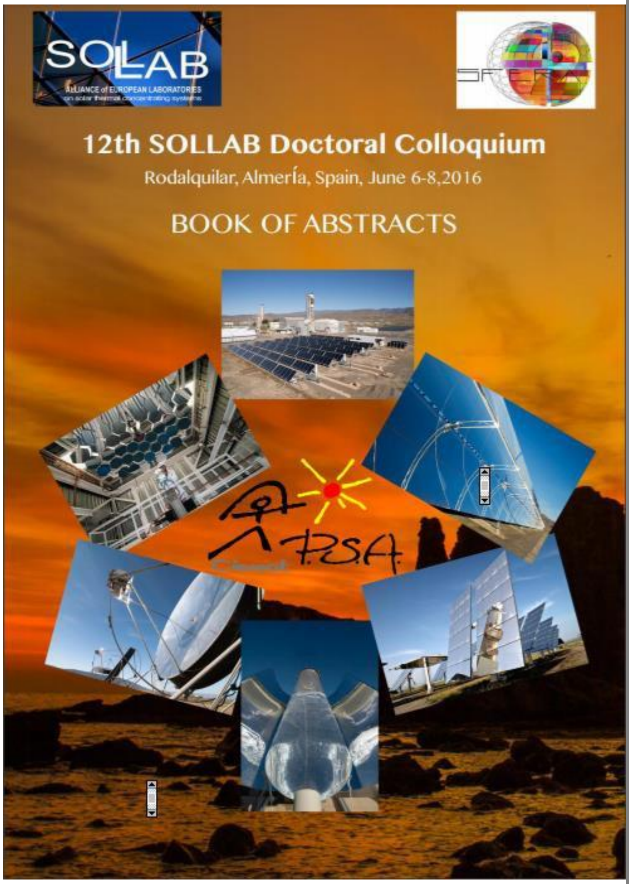
Work package no.	**WP 4**	Plan-Start:	**M01**	Plan-End:	**M48**
Lead Participant	**CNRS**	Actual-Start:	**M01**	Actual-End:	**M48**
Work package title	Educational outreach activities				
Activity Type	Coordination activities				
Participant involved	**CIEMAT, ENEA, DLR, ETH Zurich, CNRS, U.EVORA, ESTELA**				
Work package summary of progress towards objectives					

D4.5 Content of Doctoral Colloquium #3

This deliverable is linked to the organization of the 3rd SFERA Doctoral Colloquium (6-8 June 2016) by PSA-CIEMAT to improve sharing between the PhD students of the different partners' institutions. There were 31 PhD students registered from all partners of the project.

The deliverable is the content of the Doctoral Colloquium (DC) and presents all the abstracts of the participants and the programme of the DC. This is linked to the MS16 Organization of the third school together with the Doctoral Colloquium.

The full content (not only the abstracts of the presentations) are available for the consortium on the intranet of the project.



D4.6 Content of the SFERA School #3

This deliverable is linked to the organization of the 3rd SFERA-II Summer School of the project (CIEMAT-PSA – 8-10 June 2016) together with the Doctoral Colloquium (6- 8 June 2016).

The deliverable is the content of the school and gathers the program. The organization of the SFERA-II school is linked together with the Doctoral Colloquium to the MS16. This 3rd SFERA school was dedicated to Heat Transfer Fluids & Innovative R+D Subjects.

The content of the school can be accessed here online:

http://sfera2.sollab.eu/networking/announcement-summer-schools/announcement-third-sfera-cspschool/third-summer-school-presentations

Figure 7. Participants in the 3rd SFERA-II Summer School.

Work package no.	**WP 5**	Plan-Start:	**M01**	Plan-End:	**M48**
Lead Participant	**CNRS**	Actual-Start:	**M01**	Actual-End:	**M48**
Work package title	Exchange of best practices for harmonization of approaches				
Activity Type	Coordination activities				
Participant involved	**CIEMAT, ENEA, DLR, PSI, ETH Zurich, CNRS, U.EVORA**				
Work package summary of progress towards objectives					

D5.1 Report on inter-comparison of flux measurement instruments #1

In regards to the inter-comparison campaign, this was supposed to start in autumn 2015 but due to maintenance issues with the solar furnace at PROMES in Odeillo, this was impossible to make it before summer 2016. The experimental campaign was conducted in July 2016 but the amount of data to process is important and before finalizing the report, the partners still needs some time. The report is ongoing and should be submitted really soon.

D.5.2 Mid-term report about Exchange of personnel

During the two first years of SFERA-II project (Month 24), no mobility has happened so far. Exchange of personnel initially planned for completing some tasks of WPs from Joint Research Activities have been delayed due to scientific and technical reasons. Following this, 3 exchanges of personnel between SFERA-II partners have taken place in 2016:

- DLR to CNRS: Flux intercomparison campaign at the solar furnace in Odeillo 2016. 1 research engineer – 2 weeks – July 2016
- CNRS to CIEMAT-PSA and DLR (in Spain): Participation at the pyrheliometer calibration campaign (related to WP11). June 2016. 1 research engineer – 2 weeks

- CEA to CNRS for Flux Intercomp #1 (related to WP5, around June 2016): 1 research engineer - 2 weeks

In addition to these 3 mobilities, 2 more have been planned.

- Planned - PSI to CNRS: Senior Researcher and a PhD student are scheduled to spend around one week at CNRS for testing the double modulation pyrometry for a solar furnace. This activity is related to Task 12.2.
- Planned - DLR to CNRS: Joint works to characterize solar furnace (facetted concentrator) at Odeillo. Related to WP14.

This deliverable was submitted on time.

Work package no.	**WP 6**	Plan-Start:	**M01**	Plan-End:	**M48**
Lead Participant	**CIEMAT**	Actual-Start:	**M01**	Actual-End:	**M48**
Work package title	Joint Management of 'Transnational Access' activities				
Activity Type	Support activities				
Participant involved	**CIEMAT (UAL-CIESOL), ENEA, PSI, CNRS**				
Work package summary of progress towards objectives					

Within the framework of the Networking Activities, publicity has been made for SFERA-II and the transnational access to the research facilities offered. On the SFERA-II website (http://sfera2.sollab.eu/home) information regarding the following topics can be found:

- Access conditions and how to apply.
- Research facilities offering transnational access.
- The services offered and access modalities with the application submission online.
- Users' projects selection procedure.

These elements are also available on each partner's website during each opened access campaign.

Publicity has also been made at the 21st SolarPACES Conference in Cape Town and at the 22nd SolarPACES Conference in Abu Dhabi, at the 2015 and 2016 CSP today Seville conference targeted for the industrials, as well as at the ICRI 2016, the International Conferences on Research Infrastructures, which was held in Cape Town. The brochures displaying some of the best access projects were distributed to raise awareness on the different types of R&D projects feasible at the SFERA facilities. Apart from that, the information on TA campaigns has been sent to the different NCPs of infrastructures and Energy topics, who widespread those to the European network. Publicity has also been made on LinkedIn, in different CSP groups. This information has also been sent to the consortium internal updated contact list used for communication through SFERA and SFERA-II TA activity. Furthermore, publicity has also been made through two different industrial associations, i.e. the European Solar Thermal Electricity Association (ESTELA) and the Spanish Solar Thermal Industry Association (Protermosolar) with the aim of attracting the attention of the industry and increase the participation of private companies in this TA Activity.

Access Managers, assisted by the corresponding Installation Project Leaders (IPLs), in charge of providing the users with technical assistance during the period of access, scored the proposals on a Technical Feasibility Report (TFR). TRF plus the complete project proposals were given in advance to the independent User Selection Panel (USP) composed of external experts in related research areas. The Panel was comprised of 4 international independent experts with no link to any of the infrastructures.

The **3rd USP meeting** for free Transnational Access to the SFERA-II facilities took place in Rome (at ENEA premises) on the 31st of March, 2016 with the following experts:

- Armelle Vardelle, University of Limoges, Limoges, France.
- Mira Petrovic, Catalan Institute for Water Research, Spain.
- Michael Epstein, Associate Editor Solar Energy Journal, Rehovot, Israel.
- Stefan Oberholzer, Swiss Federal Office of Energy, Geneva, Switzerland.

Vittorio Brignoli has been finally replaced by a new member, namely Dr. Jörg Petrasch, who is already evaluating the project proposals received for the 2017 Access Campaign.

At the end of the 3rd USP meeting, the USP came up with a list of the proposals that were accepted to benefit from the SFERA-II free TA. Further to that, all applicants, successful or not, received by e-mail an official notification of the results of the selection process (all the letters corresponding to the third access campaign were sent before mid-May 2016. The Group Leaders, which User Projects (UPs) were rejected, were then given the opportunity to respond on the rejection of the proposal by contacting the Access Coordinator and providing an answer to those reasons for rejection given by the USP members.

Of the total of 68 eligible user projects received for the 3rd Transnational Access Campaign, 55 proposals were selected, which means that they passed the evaluation of the IPLs and USP members with a score higher than 3. The number of user projects (UPs) eligible and selected by installation and infrastructure can be seen in the following chart. It should be stressed that some of the installations have received no UPs and some others received only one but they were rejected by the USP members. It should also be noted that some installations like CIESOL, HSF, DETOX and MSSFs have received a large number of proposals comparing with the rest of installations.

In brief, the number of weeks provided during the 1st and 2nd Reporting Periods in each infrastructure and the percentage of the number of these weeks can be found in Table 1. It should be highlighted that the PSA number of access weeks provided is already above 100% of the total of access to be provided according to Annex I. However, some installations at PSA have not delivered any week at all. This is the example of CRS, ACUREX, KONTAS, CAPSOL and DISTAL, see Figure 9. It should also be pointed that CIESOL has already provided one more week that those committed and MSSFs is near that number, with a figure of 75% of the total number of access committed to be provided for this installation before the end of the project, see Figure 10.

It should be underlined that 59% of the total user projects received during the first two reporting periods come from universities, being 31% from research organisations (considering Fraunhofer ISE a research organisation) and 9% from small medium enterprises (SMEs) see

Figure 11. This number is still low, but substantial efforts are being made to raise the participation of the industry in this Transnational Access Activity, which is not always easy due to confidential matters in the experiments to be performed in the installations.

Finally, the participation of Users from Romania should be particularly emphasized. The total number of Users from this country is 25 so far, followed far behind by Italy with 10 Users. Italy is followed by Portugal, United Kingdom and Spain with 9 Users, and Greece with 8 User participating in this Transnational Access Activity, see Figure 12.

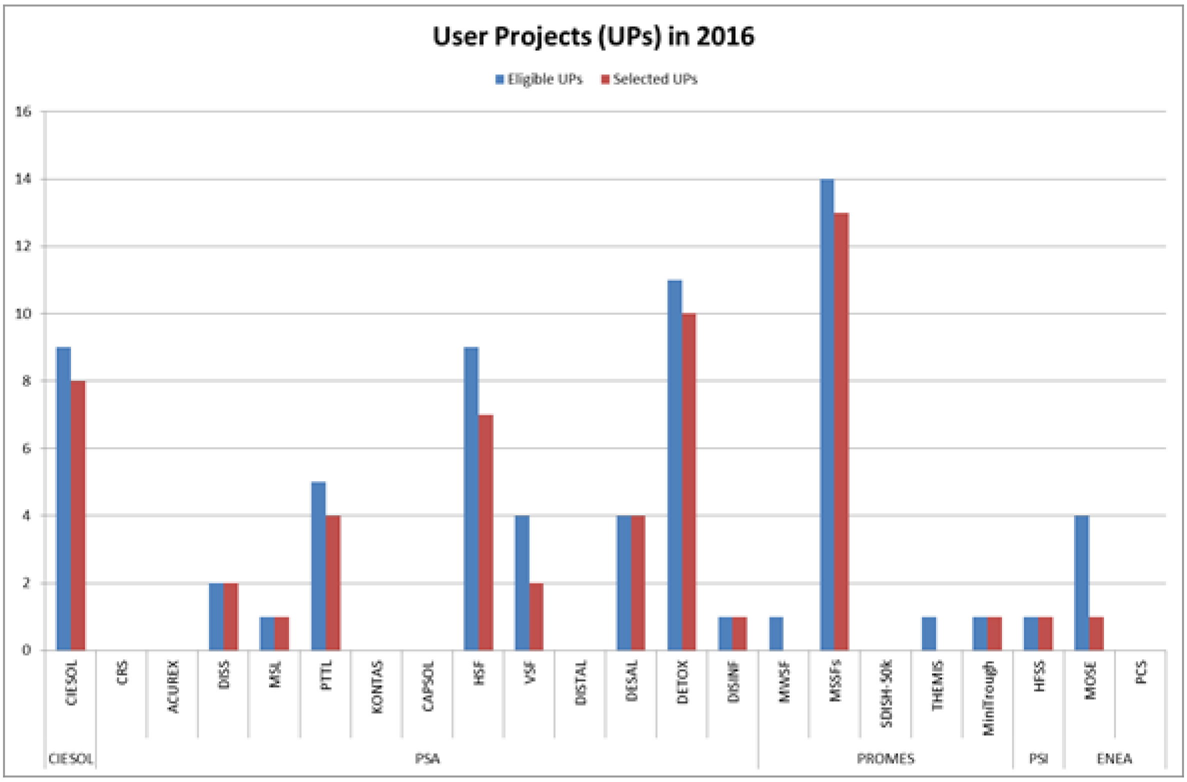


Figure 8. Number of user projects (UPs) eligible and selected by installation and infrastructure in the year 2016.

Table 4. Number of weeks provided during the 1st and 2nd Reporting Period in each infrastructure and the percentage of the total number of access weeks provided.

Infrastructure short name	Access provided in RP1	Access provided in RP2	Total Access provided	Min. Quantity of access to be provided Annex I	Total percentage of access provided
PSA	40.0	169.5	209.5	196	107
PROMES	16.0	48.0	64.0	118	54
ENEA	5.0	2.0	7.0	38	43
PSI	5.0	4.0	9.0	21	18
TOTAL	66.0	223.5	289.5	373	78

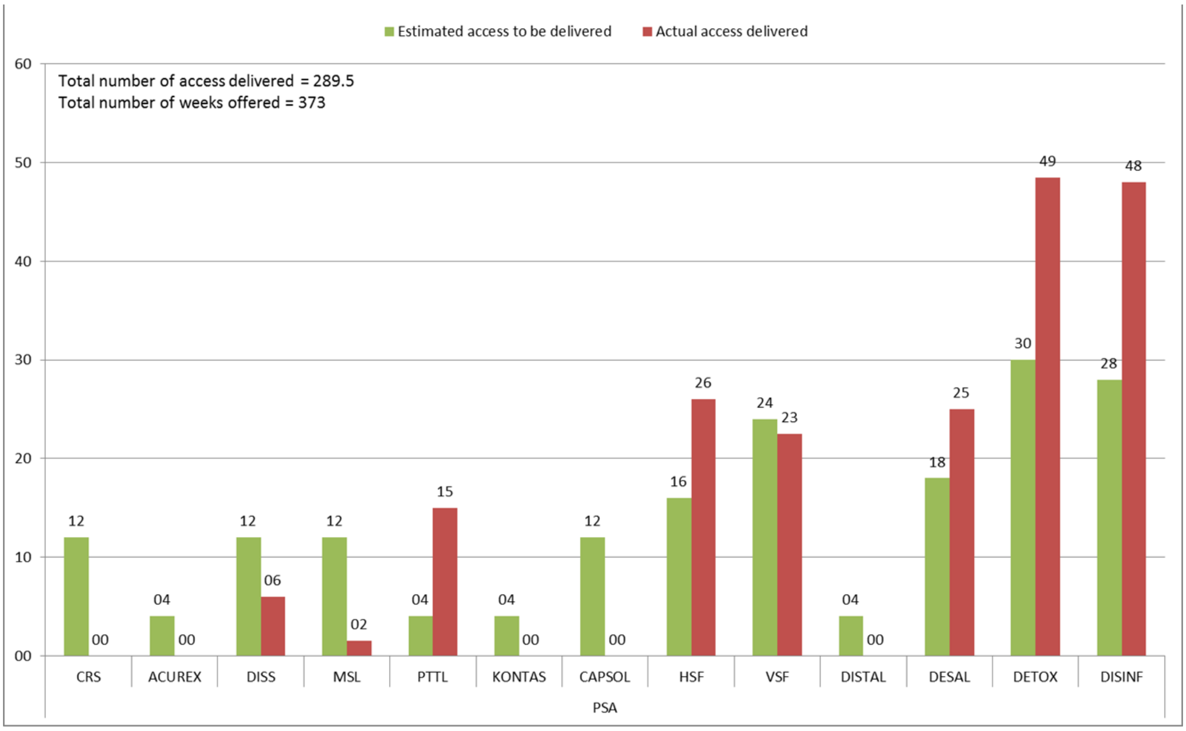


Figure 9. Total number of access weeks delivered by each installation at PSA (excluding CIESOL) compared to the estimated number of access weeks to be delivered at this point of the project by each of the installations.

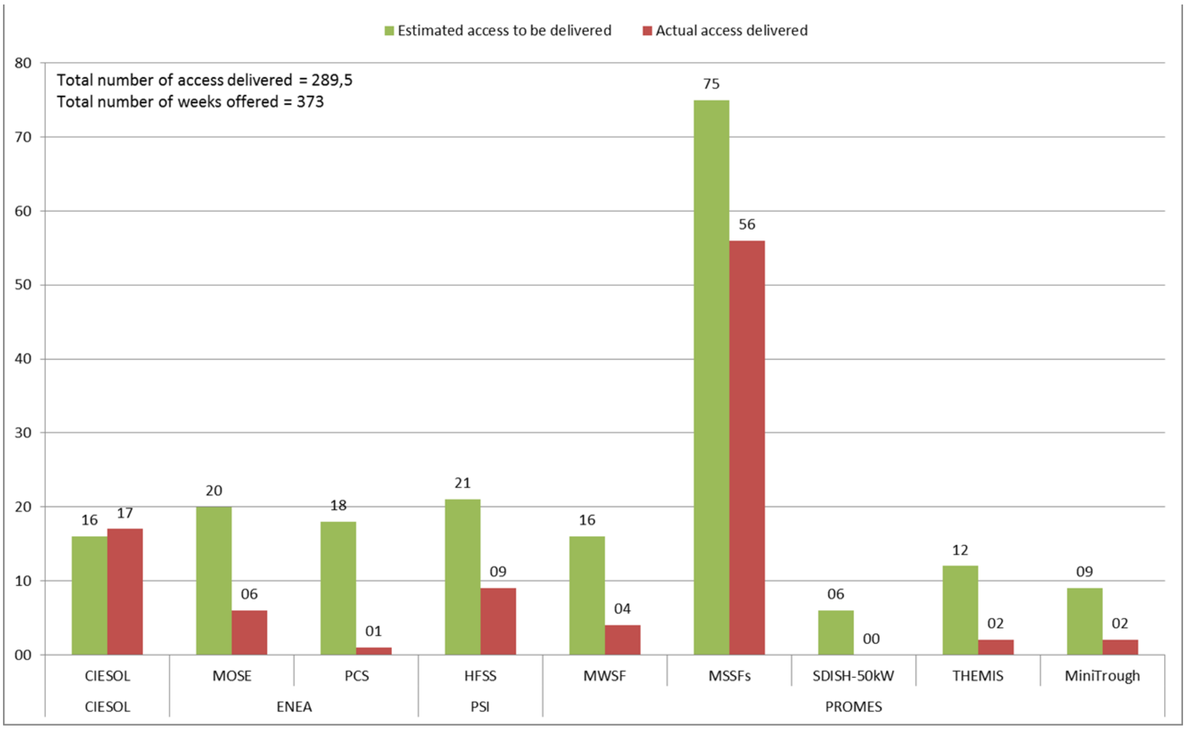


Figure 10. Total number of access weeks delivered by each installation at CIESOL, ENEA PSI and PROMES compared to the estimated number of access to be delivered at this point of the project by each of these installations.

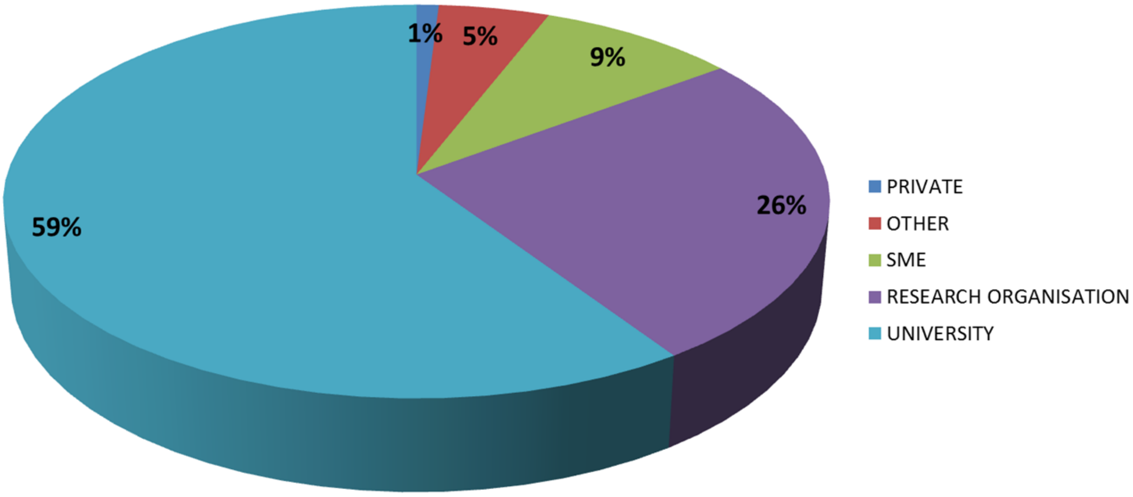


Figure 11. Percentage of User Projects by type of home institution.

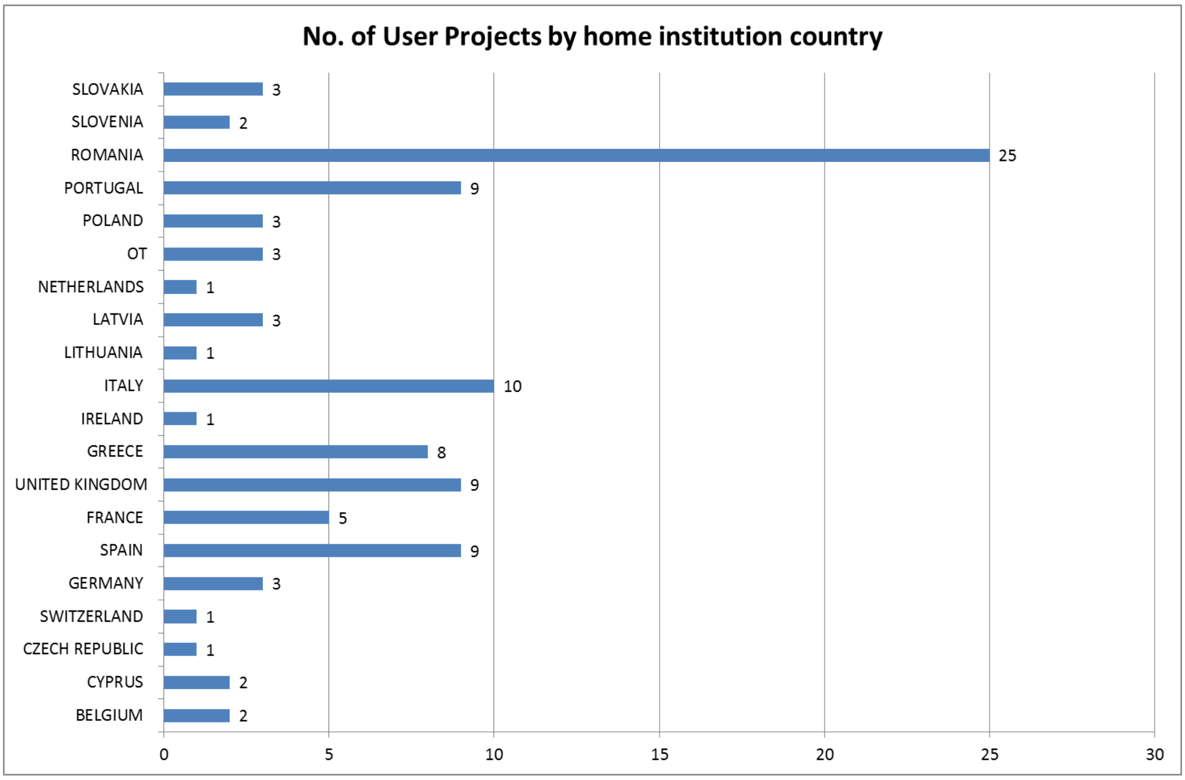


Figure 12. Number of User Projects by Home Institution Country

Work package no.	**WP 7**	Plan-Start:	**M01**	Plan-End:	**M48**
Lead Participant	**CIEMAT**	Actual-Start:	**M01**	Actual-End:	**M48**
Work package title	Transnational Access to Plataforma Solar de Almeria facilities				
Activity Type	Support activities				
Participant involved	**CIEMAT**				

Work package summary of progress towards objectives

For this SFERA-II second reporting period (RP2) that goes from the 1st of July 2015 to the 31th of December 2016, only the user-projects for which costs have been incurred in the RP2 will be declared in this Transnational Access report and in the Form C (which is in accordance with the Access database). This corresponds to our 2015-2016 access campaigns.

CIEMAT-PSA received in **SFERA-II 2016 campaign** 46 user proposal forms, including 9 user proposal forms to access the third-party beneficiary UAL-CIESOL. After the USP meeting, and taking into account the relevant information given by each specific facility manager on the technical feasibility of the proposed projects, 33 user proposal forms were finally accepted while 7 of them were rejected, i.e. 6 user proposals to access CIEMAT-PSA and 1 user proposal to access UAL-CIESOL. Notification letters of proposals accepted and rejected were sent before mid-May 2016.

It should be remarked that some user proposals approved in 2016 are taking place in 2017 due to the lack of availability of the DETOX and CIESOL facilities. These user proposals are:

- Photocatalytio2: *The TiO_2/ZnO/C composites as photocatalytic material for hydrogen production and water treatment* by Radoslaw Belka from the Kielce University of Technology (Poland),
- SOLEFOS: *Decontamination of waters containing synthetic organic micropollutants by a solar-light driven photo-electro-Fenton oxidation system* by Anastasios Karabelas from the Centre for Research and Technology, Hellas (Greece),
- Graph-Comp: *Graphene-Semiconductor nano-composites for water disinfection applications* by Suresh Pillai from the Institute of Technology, Sligo (Ireland),
- PHOTONIFY: *Intensification of photo-Fenton and photo-Fenton-like processes in pilot-scale CPC photoreactors based on computational fluid dynamics* by Manuela Antonelli from the Politecnico di Milano (Italy),
- SOL - PC – INK: *TiO_2 based composites inks for solar photocatalysis applications* by Cristina Bogatu from the Transilvania University of Brasov (Romania),
- KiPE: *Radiation-related study on solar photocatalysis: An energy kinetic model and photonic efficiency* by Gianaurelio Cuniberti from the Technische Universität Dresden (Germany),
- RUSOLCAT: *Solar photochemical activity of water soluble ruthenium complexes* by Joó Feren from University of Debrecen (Hungary), and
- MEETINROOM: *Model parameter estimation for the control of thermal comfort* by Antonio Visioli from University of Brescia (Italy)

Group Leaders of the remaining accepted proposals to access UAL-CIESOL, i.e. BASENSOL, FeCepha, EMRES ZEB and LAUNWA, were informed that even when the proposals were accepted they were not able to access the facility due to lack of availability to the facility. They were also informed that they would keep the same score for the following access campaign in 2017, unless they wanted to resubmit a new proposal in order to improve such score. Only one of the four Group Leaders submitted a new proposal during the last access campaign, i.e. Nikolaos Xekoukoulotakis who submitted in the previous campaign the FeCepha proposal. The acronym of the new proposal is SolFe4AntibDeg and will be evaluated in the next 2017 User Selection Panel meeting to be held in March 2017 at the Plataforma Solar de Almeria.

There is a peculiar situation with the stay of Mariachiara Benedetto and Cecilia del Curto (proposal AOPLLT) that took place in September-October 2016, which should be pointed out. At that time, the landfill leachate they brought for the experiments was obtained from a concentrated of reverse osmosis with an organic load so high that running those experiments took more time than planned. Therefore, it was not possible to finish all the experiments scheduled in the working plan during this first stay and this made necessary to plan another stay in the framework of the SFERA-II TA activity in order to evaluate the results obtained in that first stay, and run those experiments that could not be carried out in that moment. Furthermore, it is of interest to mention that the collaboration between PSA and this company will go beyond the TA activity in SFERA-II, being the cost of the next scheduled visits covered by the Industri de Nora S.p.a.

It should be highlighted that among the 21 user-projects accepted for 2014, two of them (NEWSOLAR and CYTO-REM) have not been carried out.

- The reason for the project NEWSOLAR is that the design of the photoreactor based on mathematical simulations to be carried out at the own user-group institution was never performed. Thus, the stay could never take place at PSA.
- The reason for the project CYTO-REM is that there was no way to obtain a reply from the users' group leader (Dr Crispin Halsall) when trying to agree a date for the stay. Finally, the Installation Project Leader (IPL) stopped trying to contact him and decided to cancel this stay due to the lack of interest by Dr Crispin Halsall.

<u>User-projects hosted in the second reporting period.</u>

A brief summary of the objectives and results of all user-projects are registered in the Access Database file corresponding to this RP2.

Title: Investigation on soiling of tracked solar collectors
User project acronym: 4CSP
Group Leader: Anna Heimsath
Group leader's scientific field: Engeneering and Technology
Home Institution: Fraunhofer Institute for Solar Energy Systems
Users hosted in CIEMAT-PSA PTTL facility under this project:

Researcher (research status)	Total number of weeks / Period of working stay
Anna Heimsath (EXP)	1 week / 23.09.2016 – 30.09.2016
Philip Lindner (PGR)	2 weeks / 23.09.2016 – 06.10.2016
Alan Pino (PGR)	2 weeks / 23.09.2016 – 06.10.2016

Title: Combination of Electrochemical and solar based Advanced Oxidation Processes for Landfill Leachate treatment

User project acronym: AOPLLT
Group Leader: Mariachiara Benedetto
Group leader's scientific field: Chemistry
Home Institution: Industrie De Nora S.p.A.
Users hosted in CIEMAT-PSA DETOX facility under this project:

Researcher (research status)	Total number of weeks / Period of working stay
Mariachiara Benedetto (EXP)	1 week / 26.09.2016 – 30.09.2016
Cecilia Del Curto (EXP)	4 weeks / 26.09.2016 – 20.10.2016

Title: Anti-wear carbide-based coatings using concentrated solar energy-2
User project acronym: CarbiSol-2
Group Leader: Pandora Psyllaki
Group leader's scientific field: Engineering and Technology
Home Institution: Piraeus University of Applied Sciences
Users hosted in CIEMAT-PSA HSF facility under this project:

Researcher (research status)	Total number of weeks / Period of working stay
Athanasios Mourlas (PGR)	2 weeks / 27.07.2015 – 31.07.2015 07/09/2015 – 11/09/2015

Title: Anti-wear carbide-based coatings using concentrated solar energy-2016
User project acronym: CarbiSol-2016
Group Leader: Pandora Psyllaki
Group leader's scientific field: Engineering and Technology
Home Institution: Piraeus University of Applied Sciences
Users hosted in CIEMAT-PSA HSF facility under this project:

Researcher (research status)	Total number of weeks / Period of working stay
Athanasios Mourlas (PGR)	2 weeks / 04.07.2016 – 08.07.2016 31.10.2016 – 04.11.2016

Title: Contact Cleaning of Polymer Film Solar mirrors
User project acronym: CC-PFSM
Group Leader: Christopher Sansom
Group leader's scientific field: Engineering and Technology
Home Institution: Cranfield University
Users hosted in CIEMAT-PSA PTTL facility under this project:

Researcher (research status)	Total number of weeks / Period of working stay
Christopher Sansom (EXP)	4 weeks / 06/06/2016 – 01/07/2016
Heather Almond (EXP)	2 weeks / 06.06.2016 – 17.06.2016

Title: Combined Ceramic Filtration and Solar Disinfection of household water for use in developing countries
User project acronym: CERAMSODIS
Group Leader: Kevin McGuigan
Group leader's scientific field: Life sciences and Biotech
Home Institution: RCSI

Users hosted in CIEMAT-PSA DISINF facility under this project:

Researcher (research status)	Total number of weeks / Period of working stay
Bríd Quilty	1 week / 08.06.2015 – 12.06.2015
Kevin McGuigan	1 week / 07.07.2015 – 10.07.2015
Kineta Valoo	8 weeks / 18.05.2015 – 10.07.2015

Title: Performance improvement by heat treatment in solar furnace of ceramic reinforced aluminium alloy fabricated by friction stir processing
User project acronym: CERASTIR
Group Leader: Milena Folea
Group leader's scientific field: Engineering and Technology
Home Institution: Transilvania University of Brasov
Users hosted in CIEMAT-PSA HSF facility under this project:

Researcher (research status)	Total number of weeks / Period of working stay
Anton Mircea Vasiloni (PGR)	1 week / 24.10.2016 – 28.10.2016
Laurentiu-Aurel Mihail (EXP)	1 week / 24.10.2016 – 28.10.2016

Title: Integration of Multi-Effect Distillation into Concentrated Solar Power plants
User project acronym: CSPMED
Group Leader: Giuseppe Franchini
Group leader's scientific field: Energy
Home Institution: University of Bergamo
Users hosted in CIEMAT-PSA DESAL facility under this project:

Researcher (research status)	Total number of weeks / Period of working stay
Matteo Cornali (UND)	3 weeks / 14.09.2015 – 02.10.2015

Title: Performance and Efficiency of FO-Solar MD System for Seawater Desalination Using Aquaporin Membrane
User project acronym: Desalination
Group Leader: Ali Altaee
Group leader's scientific field: Engineering and Technology
Home Institution: Aquama Ltd
Users hosted in CIEMAT-PSA DESAL facility under this project:

Researcher (research status)	Total number of weeks / Period of working stay
Ali Altaee (EXP)	2 weeks / 16.11.2015 – 27.11.2015

Title: Direct Supercritical Solar ORC
User project acronym: DISSORC
Group Leader: Emiliano Casati
Group leader's scientific field: Energy
Home Institution: Delft University of Technology
Users hosted in CIEMAT-PSA PTTL facility under this project:

Researcher (research status)	Total number of weeks / Period of working stay

Emiliano Casati (PDOC)	1 week / 11.07.2016 – 15.07.2016
Carlo De Servi (PDOC)	0.2 week / 14.07.2016

Title: Direct steam generation for CSP/Biomass hybridisation
User project acronym: DSGBioHyb
Group Leader: Armando Oliveira
Group leader's scientific field: Energy
Home Institution: Institute of Science and Innovation in Mechanical and Industrial Engineering
Users hosted in CIEMAT-PSA DISS facility under this project:

Researcher (research status)	**Total number of weeks / Period of working stay**
João Soares (PGR)	2 weeks / 05.09.2016 – 16.09.2016

Title: Direct steam generation Parabolic Trough plants for solar cooling applications
User project acronym: DSSolCo
Group Leader: Vassiliki Drosou
Group leader's scientific field: Engineering and Technology
Home Institution: CRES
Users hosted in CIEMAT-PSA DISS facility under this project:

Researcher (research status)	**Total number of weeks / Period of working stay**
Vassiliki Drosou (PGR)	2.5 weeks / 01.09.2015 – 08.09.2015 18.04.2016 – 22.04.2016

Title: Removal of emerging contaminants and pathogens from wastewaters by using advanced technologies
User project acronym: EConPath
Group Leader: Adrián Silva
Group leader's scientific field: Engineering and Technology
Home Institution: Faculdade de Engenharia da Universidade do Porto (FEUP)
Users hosted in CIEMAT-PSA DISINF facility under this project:

Researcher (research status)	**Total number of weeks / Period of working stay**
Adrián M. T. Silva (EXP)	1 week / 03.11.2015 – 06.11.2015
Nuno F. Figueiredo Moreira (PGR)	9 weeks / 08.06.2016 – 07/08/2015

Title: Experiment study of the Impacts of heat exchangers type on MED desalination efficiency: Case of PSA, Spain and the pilot plant of UIR, Morocco
User project acronym: ESIHXMEDDE
Group Leader: Said Dhimdi
Group leader's scientific field: Energy
Home Institution: Energy and Fire Safety Engineering (Enerfire)
Users hosted in CIEMAT-PSA DESAL facility under this project:

Researcher (research status)	**Total number of weeks / Period of working stay**
Aicha Chorak (PGR)	5 weeks / 27.07.2015 – 07.08.2015 05.10.2015 – 23.10.2015

Title: Experimental validation of a Modelica-based dynamic parabolic trough collector model
User project acronym: EVDPTCM
Group Leader: Sylvain Quoilin
Group leader's scientific field: Energy
Home Institution: University of Liege
Users hosted in CIEMAT-PSA PTTL facility under this project:

Researcher (research status)	**Total number of weeks / Period of working stay**
Adriano Desideri (PGR)	1 week / 29.06.2016 – 06.07.2016
Rémi Dickes (PGR)	2 weeks / 27.06.2016 – 08.07.2016

Title: Fiber optic sensor coatings for high temperature applications
User project acronym: FIBOSENS
Group Leader: Janusz Daniel Fidelus
Group leader's scientific field: Engineering and Technology
Home Institution: Innovation Photonics Technology, InPhoTech Ltd.
Users hosted in CIEMAT-PSA VSF facility under this project:

Researcher (research status)	**Total number of weeks / Period of working stay**
Tomasz Stańczyk (PGR)	2 weeks / 29.06.2015 – 10.07.2015
Janusz Daniel Fidelus (PDOC)	4 weeks / 29.06.2015 – 10.07.2015 06.10.2015 – 16.10.2015
Karol Wysokiński (EXP)	2 weeks / 06.10.2015 – 16.10.2015

Title: HYdrogen peroxide and PERsulfate ACTivation using Fe(III)-EDDS complexes for pathogen microorganisms contaminated waters disinfection
User project acronym: HYPERACT
Group Leader: Marcello Brigante
Group leader's scientific field: Chemistry
Home Institution: University Balise Pascal
Users hosted in CIEMAT-PSA DISINF facility under this project:

Researcher (research status)	**Total number of weeks / Period of working stay**
Angelica Bianco (PGR)	4 weeks / 22.06.2015 – 17.07.2015
Gilles Mailhot (EXP)	0.6 weeks / 22.06.2015 – 24.06.2015

Title: Inactivation of pathogenic microorganisms and removal of pharmaceuticals from hospital wastewaters with solar photocatalysis
User project acronym: InPathoSolar
Group Leader: Gianluca Li Puma
Group leader's scientific field: Chemistry
Home Institution: Loughborough University
Users hosted in CIEMAT-PSA DISINF facility under this project:

Researcher (research status)	**Total number of weeks / Period of working stay**
Gianluca Li Puma (EXP)	1 week / 18.10.2016 – 21.10.2016
Leonor Ferreira (PGR)	8 weeks / 30.05.2016 – 22.07.2016
Marco Lucas Sousa (EXP)	1 week / 30.05.2016 – 03.06.2016

Title: Innovative Oxide materials for the Solar Photocatalytic degradation of Emerging

Pollutants
User project acronym: IOSPEP
Group Leader: Alessandra Bianco Prevot
Group leader's scientific field: Chemistry
Home Institution: University of Torino
Users hosted in CIEMAT-PSA DETOX facility under this project:

Researcher (research status)	Total number of weeks / Period of working stay
Francesca Rita Pomilla (PGR)	3 weeks / 19.09.2016 – 06.10.2016
Giuseppe Marci (EXP)	1 week / 19.09.2016 – 23.09.2016
Valeria Poliotto (PGR)	3 weeks / 03.10.2016 – 21.10.2016
Valter Maurino (EXP)	1 week / 17.10.2016 – 21.10.2016

Title: Use of Magnetite as Iron Source in AOPs: A promising and innovative way for wastewater treatments
User project acronym: MAISA
Group Leader: Khalil Hanna
Group leader's scientific field: Chemistry
Home Institution: Ecole Nationale Supérieure de Chimie de Rennes
Users hosted in CIEMAT-PSA DETOX facility under this project:

Researcher (research status)	Total number of weeks / Period of working stay
Khali Hanna (EXP)	0.6 week / 24.10.2016 – 26.10.2016
Marcello Brigante (EXP)	0.6 week / 24.10.2016 – 26.10.2016
Wenyu Huang (PDOC)	5 weeks / 24.10.2016 – 24.11.2016

Title: Model development and experimental validation of MD and MED systems for Seawater Desalination
User project acronym: MDEV MD MED
Group Leader: Costas Papanicolas
Group leader's scientific field: Energy
Home Institution: The Cyprus Institute
Users hosted in CIEMAT-PSA DESAL facility under this project:

Researcher (research status)	Total number of weeks / Period of working stay
Elena Guillen Burrieza (PDOC)	3 weeks / 09.11.2015 – 27.11.2015

Title: The application of nanofiltration and Advanced Oxidation Processes for the treatment of water polluted with pharmaceuticals
User project acronym: NFAOP
Group Leader: Sylwia Mozia
Group leader's scientific field: Chemistry
Home Institution: West Pomeranian University of Technology
Users hosted in CIEMAT-PSA DETOX facility under this project:

Researcher (research status)	Total number of weeks / Period of working stay
Agnieszka M. Wanag (PGR)	5 weeks / 06.07.2015 – 07.08.2015
Dominika Darowna (PGR)	5 weeks / 06.07.2015 – 07.08.2015
Sylwia Mozia (PDOC)	0.4 week / 27.07.2015 – 28.07.2015

Title: Solar CPC Advanced Oxidation of Waters for emergent pharmaceutical pollutants' abatement
User project acronym: pharmabat
Group Leader: Anabela Oliveira
Group leader's scientific field: Chemistry
Home Institution: InstitutoPolitécnico de Portalegre
Users hosted in CIEMAT-PSA DETOX facility under this project:

Researcher (research status)	**Total number of weeks / Period of working stay**
Anabela Oliveira (EXP)	1.8 weeks / 15.06.2015 – 18.06.2015 22.02.2016 – 26.02.2016
Margarita Jimenez (PDOC)	9 weeks / 08.01.2016 – 11.03.2016
Wilson Guerra (PGR)	0.8 week / 15.06.2015 – 18.06.2015

Title: Heterogeneous photocatalysis and hydrogen peroxide photolysis for the degradation of quinmerac and its transformation products
User project acronym: QUINTP
Group Leader: Bruce Jefferson
Group leader's scientific field: Life sciences and Biotech
Home Institution: Cranfield University
Users hosted in CIEMAT-PSA DETOX facility under this project:

Researcher (research status)	**Total number of weeks / Period of working stay**
Irene Carra Ruiz (PDOC)	1 week / 31.08.2015 – 04.09.2015
Matthew Hobbs (PGR)	6 weeks / 31.08/2015 – 09.10.2015
Peter Jarvis (EXP)	0.4 week / 05.10.2015 – 06.10.2015

Title: Removal of antibiotic-resistant bacteria and genes from urban wastewater effluents by solar- and UV-C-driven oxidation processes
User project acronym: RESISTANCE
Group Leader: Despo Fatta-Kassinos
Group leader's scientific field: Engineering and Technology
Home Institution: University of Cyprus
Users hosted in CIEMAT-PSA DISINF facility under this project:

Researcher (research status)	**Total number of weeks / Period of working stay**
Michael Stella (PGR)	8 weeks / 08.09.2015 – 30.10.2015

Title: Researches regarding the influence of the heat treatments with solar energy on the alloy steels properties
User project acronym: RIHTSE
Group Leader: Dorin Ioan Catana
Group leader's scientific field: Material Science
Home Institution: Transilvania University of Brasov
Users hosted in CIEMAT-PSA HSF facility under this project:

Researcher (research status)	**Total number of weeks / Period of working stay**
Dorin Ioan Catana (PDOC)	2 weeks / 21.09.2015 – 02.10.2015
Mihai Alexandru Luca (EXP)	2 weeks / 21.09.2015 – 02.10.2015

Title: SOLAR FOTO-FENTON AT NEUTRAL pH
User project acronym: SOLFEN-7
Group Leader: Francesco Parrino
Group leader's scientific field: Chemistry
Home Institution: University of Palermo
Users hosted in UAL-CIESOL CIESOL facility under this project:

Researcher (research status)	**Total number of weeks / Period of working stay**
Marco Race	4 weeks / 01.09.2016 – 30.09.2016
Francesco Parrino (PDOC)	1 weeks / 12.09.2016 – 19.09.2016

Title: Photoelectrocatalytic removal of pesticides on nanostructured TiO_2 photoanodes using LED and solar light of variable light intensity
User project acronym: PERPeNaTiLESo
Group Leader: Josef Krysa
Group leader's scientific field: Chemistry
Home Institution: University of Chemistry and Technology Prague
Users hosted in UAL-CIESOL CIESOL facility under this project:

Researcher (research status)	**Total number of weeks / Period of working stay**
Josef Krýsa (EXP)	2 weeks / 17.09.2015 – 21.10.2016
Šárka Paušová (PDOC)	5 weeks / 26.09.2016 – 30.10.2016

Title: Prediction of the Energy Consumption of CIESOL Building
User project acronym: PECCB
Group Leader: Antonio Ruano
Group leader's scientific field:
Home Institution: University of Algarve
Users hosted in UAL-CIESOL CIESOL facility under this project:

Researcher (research status)	**Total number of weeks / Period of working stay**
Hamid Reza Khosravani (PGR)	2 weeks / 13.07.2015 – 24.07.2015
Antonio Ruano (EXP)	0.4 weeks / 13.07.2015 – 18.07.2015

Peer reviewed publications

Fiorentino, A. Ferro, G. Alferez, M.C. Polo-López, M.I. Fernández-Ibañez, P. Rizzo, L. *Inactivation and regrowth of multidrug resistant bacteria in urban wastewater after disinfection by solar-driven and chlorination processes*. J. Photochem. Photobiol. B. 148 (2015) 43-50.

Ferro, G., Castro-Alferez, M., Polo-Lopez, M.I., Rizzo, L., Fernández-Ibañez, P. *Urban wastewater disinfection for agricultural reuse: effect of solar driven AOPs in the inactivation of a multidrug resistant E. coli strain*. Appl. Catal., B 178 (2015) 65-73.

Ferro, G., Polo-López, M.I., Martínez-Piernas, A.B., Fernández-Ibáñez, P., Agüera, A., Rizzo, L. *Cross-Contamination of Residual Emerging Contaminants and Antibiotic Resistant Bacteria in Lettuce Crops and Soil Irrigated with Wastewater Treated by Sunlight/H_2O_2*. Environ. Sci. Technol. 49 (2015) 11096-11104.

Keogh, M.B. Castro-Alférez, M. Polo-López, M.I. Fernández Calderero, I. Al-Eryani, Y.A. Joseph-Titus, C. Sawant, B. Dhodapkar, R. Mathur, C. McGuigan, K.G. Fernández-Ibáñez, P. *Capability of 19-L polycarbonate plastic water cooler containers for efficient solar water disinfection (SODIS): Field case studies in India, Bahrain and Spain*. Sol. Energy 116 (2015) 1-11.

Byrne, J.A. Dunlop, P.S.M. Hamilton, J.W.J. Fernández-Ibáñez, P. Polo-López, I. Sharma, P.K. Vennard, A.S. *A Review of Heterogeneous Photocatalysis for Water and Surface Disinfection*. Molecules 20 (2015) 5574-5615.

Fernández-Ibáñez, M.I. Polo-López, S. Malato, S. Wadhwa, J.W.J. Hamilton, P.S.M. Dunlop, R. D'Sa, E. Magee, K. O'Shea, D.D. Dionysiou, J.A. Byrne. *Solar photocatalytic disinfection of water using titanium dioxide graphene composites*. Chemical Engineering Journal, 261 (2015) 36–44.

Stefanos Papoutsakis, Sara Miralles-Cuevas, Nicolas Gondrexon, Stephane Baup, Sixto Malato, Cesar Pulgarin. *Coupling between high-frequency ultrasound and solar photo-Fenton at pilot scale for the treatment of organic contaminants: An initial approach*. Ultras. Sonochem., **22**, (2015) 527-534.

Stefanos Papoutsakis, Zahra Afshari, Sixto Malato, César Pulgarin. *Elimination of the iodinated contrast agent iohexol in water, wastewater and urine matrices by application of photo-Fenton and ultrasound advanced oxidation processes*. J. Environ. Chem. Eng., 3 (2015) 2002–2009.

I. Carra, J. A. Sánchez Pérez, S. Malato, O. Autin, B. Jefferson and P. Jarvis. *Performance of different advanced oxidation processes for tertiary wastewater treatment to remove the pesticide acetamiprid*. J. Chem. Technol. Biotechnol. 91 (2016) 72–81, 2016.

L. Andronic, L. Isac, S. Miralles-Cuevas, M.a Visa, Isabel Oller, Anca Duta, Sixto Malato. *Pilot-plant evaluation of TiO_2 and TiO_2-based hybrid photocatalystsfor solar treatment of polluted water*. *J. Hazar. Mat.*, 320 (2016) 469–478.

S. Miralles-Cuevas, D. Darowna, A. Wanag, S. Mozia, S. Malato, I. Oller. *Comparison of UV/H_2O_2, $UV/S_2O_8^{-2}$, solar/Fe(II)/H_2O_2 and solar/Fe(II)/$S_2O_8^{-2}$at pilot plant scale for the elimination of micro-contaminants in natural water: An economic assessment*. Chem. Eng. J. 310 (2017) 514-524.

Rodriguez-Garcia, M. M., Rojas, E., Pérez, M. *Procedures for testing valves and pressure transducers with molten salt*, Appl. Therm. Eng. 101 (2016) 139-146.

V. Drosou, L. Valenzuela, A. Dimoudi. *A new TRNSYS component for parabolic trough collector* simulation. Int. J. Sustainable Energy (2016) 1-21.

Sansom, C., Fernández-García, A., Sutter, F., Almond, H., King, P., Martínez-Arcos, L. *Soiling and cleaning of polymer film solar reflectors*. Energies 9 (2016) 1006-12.

J.D. Fidelus, Ya. Zhydachevskiia, W. Paszkowicz, A. Reszka, P. Dłużewski, A. Suchocki Enhancement of luminescence of nanocrystalline TiO_2:Yb^{3+} nanopowders due to co-doping with Nd^{3+} ions. Opt. Mater. 47 (2015) 361-365.

Ya. Zhydachevskii; J.D. Fidelus; A. Luchechko; A. Cabaj; A. Pieniążek; M. Berkowski; A.

Suchocki; I. Cañadas Martinez; J. Rodriguez Garcia. *Solid-state and solar sintering of YAP: Mn, Hf ceramics applicable for thermoluminescent dosimetry*. Opt. Mater. 45 (2015) 246-251.

Athanasios Mourlas, Pandora Psyllaki, Dimitris Pantelis. *Anti-Wear TiC-Based Surface Layers Using Concentrated Solar Energy*. Key Eng. Mater. 674 (2016) 296-301.

Khosravani, H.R., Castilla, M., Berenguel, M., Ruano, A.E., Ferreira, P.M. *A Comparison of Energy Consumption Prediction Models based on Neural Networks of a Bioclimatic Building*. Energies 9 (2016) 57.

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P. Fernández-Ibáñez. *Drinking water disinfection using solar energy (possibilities in the UK)*. 8th Conference of the UK Network on Potable Water Treatment & Supply. Invited lecture. Cranfield University, London, UK, 23 September 2015.

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S. Miralles-Cuevas, D. Darowna, A. Wanag, S. Mozia, S. Malato, I. Oller. *Economical Assessment of UV/H2O2, UV/S2O82-, solar/Fe(II)/H2O2 and solar/Fe(II)/S2O82- Processes for the Removal of Micro-contaminants*. 9th European meeting on Solar Chemistry and Photocatalysis: Environmental Applications. Strasbourg (France), June 13-17, 2016. Abstract Book Poster P -67, p122, 2015.

Delord, C., Blaise, A., Fernandez-García, A., Martínez-Arcos, L., Sutter, F., Reche-Navarro, T.J. *Soiling and Degradation Analysis of Solar Mirrors*. 21th SolarPACES 2015. International Conference on Concentrating Solar Power and Chemical Energy Systems. Cape Town (South Africa). October, 13-16, 2015. AIP Conf. Proc. 1734, 090001-1: 090001-8 (2016).

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Beschi, Manuel, Berenguel, Manuel, Visioli, Antonio, Yebra, Luis J. *On reduction of control effort in feedback linearization GPC strategy applied to a solar furnace*. Optim. Control Appl. Meth. 37 (2016) 521-536.

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Pilar Fernández-Ibáñez, John Anthony Byrne, M. Inmaculada Polo-López, Patrick S. M. Dunlop, Popi Karaolia, Despo Fatta-Kassinos. *Solar Photocatalytic Disinfection of Water" Chapter 3, in "Photocatalysis: Applications*, Eds. D.D. Dionysiou, G. Li Puma, J. Ye, J.

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ANNEXES to be found in the reporting MS Access Database.

Annex 1 – List of the Selection Panel members
Annex 2 – List of User-Projects
Annex 3 – List of Users.

Work package no.	**WP 8**	Plan-Start:	**M01**	Plan-End:	**M48**
Lead Participant	**CNRS**	Actual-Start:	**M01**	Actual-End:	**M48**
Work package title	Transnational Access to PROMES facilities				
Activity Type	Support activities				
Participant involved	**CNRS**				
Work package summary of progress towards objectives					

For this reporting period that goes from July 1st 2015 to December 31st 2016, only the user-projects for which costs have incurred in the reporting period 2 will be presented in this report and the related Form C, both in accordance with the Access database. This corresponds to our 2015 and 2016 access years.

For the 2015 Access year, at CNRS-PROMES, 16 User Proposal Forms were submitted. According to the User Selection Panel decision, 3 proposals out of the 16 submitted were rejected for the reason of the not sufficient threshold score required regarding the scientific merit and quality of the proposals:

- COUHTC (Coatings based on Ultra High Temperature Ceramics: emissivity and catalycity measurements) and TAMEWAS (TREATMENT AND ACHIEVEMENT OF METALLURGICAL WASTE BY CONCENTRATED SOLAR ENERGY) proposals were not scientifically good enough. Further information on the reasons of refusal has been provided to the applicants in order to help them improve their proposals.
- The MONOR proposal was refused on the ground of lack of consistency and detailed description of the technical feasibility of the project.

It is important to mention that among the 13 user-projects that have been finally accepted for 2015 year, 2 of them – SolarPorous and Sol-MP proposals – have not yet been performed despite the high rated interest. A possible cancelation of the project has to be decided on a common basis between the Installation Project Leaders (IPL) and the User Projects:

- For SolarPorous (Prevention of particle agglomeration and deposition in solar processes by addition of fluidized porous filters) proposal, it was a problem of a solar reactor necessary for the project which was not available at CNRS-PROMES. A detailed design of the reactor was asked to the applicant by CNRS-PROMES before planning any experimental campaign in order to ensure the successful realization of the project, but no concrete answer has been received yet despite several reminders.
- For Sol-MP (Two-phase flow phenomena in one-through direct steam generation for high temperature electrolysis) proposal, which had been rescheduled at the MWSF due to the required insolation size, the issue is similar: to achieve the project's goals, dedicated new mounting equipment is needed. However, despite several reminders, no practical information has been received yet to design and organize this equipment.

One of the projects accepted in 2015 was performed in 2016 because of the project-users' availability.

- HelioLoop *(*Measurement of Flux Distribution Changes due to the Movement of Single Heliostats for the Development of Novel Control Strategies) proposal was delayed from 2015 year to April 12th – 22nd, 2016.

We have welcomed 10 projects in 2015 and for which the costs have incurred during the RP2 (from the July 1st, 2015).

For the 2016 Access year, at CNRS-PROMES, 17 User Proposal Forms were submitted. After the User Selection Panel decision, 3 proposals out of the 17 were rejected:

- SOLMET proposal: SOLAR-ASSISTED METALLURGICAL WASTES RECOVERY.
- Proposal receiver behavior project: A performance transient test on receiver using atmospheric air.
- BOX proposal, already submitted in 2015 year under the name of MONOR and rejected by the Evaluation Panel, was rejected in 2016 year as well because of the lack of clarifications of the proposal's objectives and materials application.

It can be noted that 3 projects accepted in 2016 are not mentioned among the projects with the costs occurred in the reporting period 2: since these projects will be held and finalized in 2017 for various reasons, they will appear in the next reporting period RP3:

- CERASOL project was delayed for 2017 year due to the project users' availability. This project is expected to be performed in June, 2017.
- NEOCOMPOSOL project took place in December 2016, but as the final Summary report on the performed stay will be presented at the end of January 2017, this project will be reported in RP3.
- RESOL-WEAR project has been held in November 2016. According to the usual procedure of the finalization of a SFERA USER ACCESS project – compulsory Summary report from the project participants' and the reimbursement of the project users' expenses, the costs of the RESOL-WEAR project will be considered as occurred in the reporting period 3 since the procedure is still currently ongoing as of January 15th 2017.

One project – EFFECF – selected in 2016 is being performed in 2 stays and will be finalized in February 2017: the 1st stay has been already performed from 19/09/2016 to 23/09/2016. The 2nd stay is planned from 06/02/2017 to 10/02/2017 in order to complete the objectives of the EFFECF proposal. The costs of the 1st visit are considered as occurred in the reporting period 2 and, thus, will be mentioned in this report while those of the second period will be calculated within the next reporting period.

Eventually, we have welcomed 12 projects in 2016 and for which the costs have incurred during the RP2 (from the July 1st, 2015 to December 31st, 2016): all the projects have been selected in 2016, excepted HelioLoop project which was selected in 2015 year and performed in 2016 year due to the project users' availability and EFFECF project the second stay of which will take place in February 2017.

A summary of the projects hosted by CNRS-PROMES, total number of user-projects and total number of the access delivered (weeks) per facility used during the reporting period 2 from the July 1st, 2015 to December 31st, 2016 can be found after listing all projects hosted by CNRS-PROMES.

User-Projects selected in 2015 and hosted in 2015: 10 projects

Title: *10W Continuous-Wave TEM00 Mode Solar Laser Emission in PROMES-CNRS*
Acronym: 10W TEM00-LASER
Project Leader: Dawei LIANG (PORTUGAL)
Scientific Field: Physics
Home Institution: Universidade Nova de Lisboa
Installation: PROMES - WSSFs
Number of access weeks: 4 weeks

Project Users	**Working Stay Period**
Dawei Liang	From: 06/07/15 to: 31/07/15
Filipe Gonçalves	From: 06/07/15 to: 10/07/15
Mariana Oliveira	From: 06/07/15 to: 10/07/15
Joana Almeida	From: 15/07/15 to: 31/07/15
Claudia Vistas	From: 15/07/15 to: 31/07/15

Title: *Clean environmentAlly Metallurgy Processes*
Acronym: CLAMP
Project Leader: José Ignacio Robla (SPAIN)
Scientific Field: Earth sciences and environment
Home Institution: CENIM-CSIC
Installation: PROMES - MSSFs
Total number of access weeks: 2 weeks

Number of access weeks of 1st stay: 1 week

Project Users	**Working Stay Period**
José Ignacio Robla	From: 28/09/15 to: 02/10/15
Alfonso J. Vàzquez	From: 28/09/15 to: 02/10/15

Aurora Lopez-Delgado	From: 28/09/15 to: 02/10/15

Number of access weeks of 2nd stay: 1 week

Project Users	**Working Stay Period**
José Ignacio ROBLA	From: 25/01/16 to:29/01/16
Alfonso J. Vázquez	From: 25/01/16 to:29/01/16
Aurora López-Delgado	From: 25/01/16 to:29/01/16

Title: *Multifunctional Magnetoplasmonic Nanohybrids*
Acronym: MultiMagHybrids
Project Leader: Mavroeidis ANGELAKERIS (GREECE)
Scientific Field: Material Science
Home Institution: Aristotle University
Installation: PROMES - WSSFs
Number of access weeks: 1 week

Project Users	**Working Stay Period**
Mavroeidis Angelakeris	From: 05/10/15 to: 09/10/15
Symeonidis Konstantinos	From: 05/10/15 to: 09/10/15

Title: *Synthesis and investugation of oxide nanopowders and coatings obtained on solar facilities*
Project Leader: Krisjanis SMITS (LATVIA)
Acronym: NanoCoat
Scientific Field: Material Science
Home Institution: Institute of Solid State Physics, University of Latvia
Installation: PROMES - MSSFs
Number of access weeks: 3 weeks

Project Users	**Working Stay Period**
Krisjanis Smits	From: 15/07/15 to: 31/07/15
Aleksejs Zolotarjovs	From: 15/07/15 to: 31/07/15
Larisa Grigorjeva	From: 15/07/15 to: 31/07/15

Title: *New magnetic nanoparticle of enhanced performance for heating agents*
Acronym: NewMaNaHeat
Project Leader: Lluis BALCELLS (SPAIN)
Scientific Field: Material Science
Home Institution: Institut de Ciència de Materials de Barcelona ICMAB-CSIC
Installation: PROMES - MSSFs
Number of access weeks: 1 week

Project Users	**Working Stay Period**
Lluis Balcells	From: 05/10/15 to: 09/10/15
Elisa Pannunzio Miner	From: 05/10/15 to: 09/10/15

Title: *Residual Stress Relieve of Ni Based Coatings Fabricated by Laser Cladding*
Acronym: RSRBCFLC
Project Leader: Alexandru PASCU (ROMANIA)
Scientific Field: Engineering and Technology
Home Institution: Transilvania University of Brasov
Installation: PROMES - MSSFs
Number of access weeks: 2 weeks

Project Users	**Working Stay Period**
Alexandru Pascu	From: 21/09/15 to: 02/10/15
Elena Manuela Stanciu	From: 21/09/15 to: 02/10/15
Ionut Claudius Roata	From: 21/09/15 to: 02/10/15

Title: Using the solar energy to heat treatments of special alloys resistant to low temperatures
Acronym: SE-HTRLT
Project Leader: Ioan MILOSAN (ROMANIA)
Scientific Field: Material Sciences
Home Institution: Transilvania University of Brasov
Installation: PROMES - MSSFs
Number of access weeks: 2 weeks

Project Users	**Working Stay Period**
Ioan Milosan	From: 14/09/15 to: 25/09/15

Title: *Structural and Morphological Modifications of Alloys Upon*
Acronym: SMAPT
Project Leader: Alenka VESEL (SLOVENIA)
Scientific Field: Material Sciences
Home Institution: Jozef Stefan Institute
Installation: PROMES - MSSFs
Number of access weeks: 1 week

Project Users	**Working Stay Period**
Mozetic Miran	From: 2/11/15 to: 7/11/15 **¡Error! La autoreferencia al marcador no es válida.**
Vesel Alenka	From: 2/11/15 to: 7/11/15

Title: *Solar-assisted sintering of Ti-foam coatings for biomedical applications*
Acronym: SOLTIFOAM
Project Leader: Gloria RODRIGUEZ (SPAIN)
Scientific Field: Material Science
Home Institution: University of Castilla-La Mancha
Installation: PROMES - MSSFs
Total number of access weeks: 3 weeks

Number of access weeks of the 1st stay: 1 week

Project Users	Working Stay Period
Ignacio Garcia Diego	From: 20/07/15 to: 24/07/15
Elena Gracia	From: 20/07/15 to: 24/07/15
Mª del Mar Bayod	From: 20/07/15 to: 24/07/15

Number of access weeks of 2nd stay: 1 week

Project Users	Working Stay Period
Gloria Rodriguez	From: 26/10/15 to: 30/10/15
Ana Conde Del Campo	From: 26/10/15 to: 30/10/15

Number of access weeks of 3rd stay: 1 week

Project Users	Working Stay Period
Gloria Rodriguez	From: 25/04/16 to: 29/04/16
Ana Conde Del Campo	From: 25/04/16 to: 29/04/16
Juan José Gonzalez	From: 25/04/16 to: 29/04/16

Title: *Influence Of Structural Transformations Performed By Thermal Shock On Thermal Diffusivity Alloy Zircaloy-4*
Acronym: TERMOSHOCZY
Project Leader: Vasile RIZEA (ROMANIA)
Scientific Field: Material Sciences
Home Institution: University of Pitesti
Installation: PROMES - MSSFs
Number of access weeks: 2 weeks

Project Users	Working Stay Period
Marioara Abrudeanu	From: 17/08/15 to: 21/08/15
Vasile Rizea	From: 17/08/15 to: 28/08/15
Daniel Anghel	From: 17/08/15 to: 28/08/15

User-Projects selected in 2015 and hosted in 2016: 1 project

Title: *Measurement of Flux Distribution Changes due to the Movement of Single Heliostats for the Development of Novel Control Strategies*
Acronym: HelioLoop
Project Leader: Gregor BERN (GERMANY)
Scientific Field: Engineering and Technology
Home Institution: Fraunhofer Institute for Solar Energy Systems
Installation: THEMIS
Number of access weeks: 2 weeks

Project Users	Working Stay Period
Gregor Bern	From: 12/04/16 to: 22/04/16
Peter Schöttl	From: 12/04/16 to: 22/04/16
Anna Heimsath	From: 20/04/16 to: 22/04/16

<u>User-Projects selected in 2016 and hosted in 2016: 11 projects</u>

<u>Title:</u> *Breakthrough in TEM00 solar laser efficiency in PROMES-CNRS*
Acronym: Bright-TEM00-Laser
Project Leader: Dawei Liang (PORTUGAL)
Scientific Field: Physics
Home Institution: Universidade Nova de Lisboa - Campus de Caprica
Installation: PROMES - MSSFs
Number of access weeks: 4 weeks

Project Users	Working Stay Period
Dawei Liang	From: 04/07/16 to: 29/07/16
Cláudia Vistas	From: 04/07/16 to: 29/07/16
Joana Almeida	From: 04/07/16 to: 15/07/16
Rachdi Bouadjenime	From: 17/07/16 to: 22/07/16
Said Mehellou	From: 24/07/16 to: 29/07/16

<u>Title:</u> *Synthesis of nanowires on metals and ceramics by plasma treatment at extreme conditions*
Acronym: CSP-TPS SHIELD
Project Leader: Jorge Pereda Barcena (SPAIN)
Scientific Field: Material Science
Home Institution: Tecnalia Research and Innovation
Installation: PROMES - MSSFs
Number of access weeks: 2 weeks

Project Users	Working Stay Period
Jorge Pereda Barcena	From: 18/07/16 to: 22/07/16
Gorka Garcia Imbuluzqueta	From: 18/07/16 to: 28/07/16
Jesús Ryes Delgado	From: 19/07/16 to: 29/07/16

<u>Title:</u> *Eco eFFicient mElting of Ceramic Frits*
Acronym: EFFECF
Project Leader: Aurora Lopez-Delgado (SPAIN)
Scientific Field: Material Science
Home Institution: National Centre for Metallurgical Research (CSIC)
Installation: PROMES - MSSFs
Total number of access weeks: 2 weeks
Number of access weeks of the 1st stay: 1 week

Project Users	**Working Stay Period**
Aurora Lopez-Delgado	From: 19/09/16 to: 23/09/16
Maximina Romero	From: 19/09/16 to: 23/09/16
José Ignacio Robla	From: 19/09/16 to: 23/09/16

Number of access weeks of the 2nd stay: 1 week (not occurred, delayed to February 2017)

Title: *Synthesis of carbon nanotubes using solar radiation and Al_2O_3-Mn/Cu_2O catalyst*
Acronym: NANOSOL
Project Leader: Alexandru Pascu (ROMANIA)
Scientific Field: Material Science
Home Institution: Transilvania University of Brasov
Installation: PROMES - MSSFs
Number of access weeks: 2 weeks

Project Users	**Working Stay Period**
Alexandru Pascu	From: 19/09/16 to: 30/09/16
Elena Manuela Stanciu	From: 19/09/16 to: 30/09/16

Title: *Researches regarding the influence of the heat treatments with solar energy over the wear resistant steels properties*
Acronym: RESOL-WEAR
Project Leader: Ioan Milosan (ROMANIE)
Scientific Field: Material Science
Home Institution: Transilvania University of Brasov
Installation: PROMES - MSSFs
Number of access weeks: 3 weeks

Project Users	**Working Stay Period**
Ioan Milosan	From: 12/09/16 to: 30/09/16
Daniel Cristea	From: 12/09/16 to: 30/09/16
Alin Mihai Pop	From: 12/09/16 to: 30/09/16

Title: *Standardized characterization with different methodologies and orientations of parabolic trough collectors*
Acronym: SCHMO
Project Leader: Fabienne Sallaberry (SPAIN)
Scientific Field: Energy
Home Institution: Fundación CENER-CIEMAT - Sarriguren
Installation: PROMES_MINITROUGH
Total number of access weeks: 2 weeks
Number of access weeks for the 1st stay: 1 week

Project Users	**Working Stay Period**
Fabienne Sallaberry	From: 11/07/16 to: 15/07/16

Alberto Garcia de Jalón	From: 14/07/16 to: 15/07/16

Number of access weeks for the 2nd stay: 1 week

Project Users	Working Stay Period
Fabienne Sallaberry	From: 19/09/16 to: 23/09/16
Xabier Olano	From: 19/09/16 to: 20/09/16

Title: *Synthesis of nanowires on metals and ceramics by plasma treatment at extreme conditions*
Acronym: SCINT
Project Leader: Krisjanis Smits (LATVIA)
Scientific Field: Material Science
Home Institution: Institute of Solid State Physics, University of Latvia
Installation: PROMES - MSSFs
Number of access weeks: 3 weeks

Project Users	Working Stay Period
Krisjanis Smits	From: 11/07/16 to: 29/07/16
Larisa Grigorjeva	From: 11/07/16 to: 22/07/16
Aleksejs Zolotarjovs	From: 18/07/16 to: 29/07/16

Title: *Improvement of MDF cements properties through metallic oxide coating using solar energy*
Acronym: SOL4COAT
Project Leader: Liana Sanda Baltes (ROMANIA)
Scientific Field: Material Science
Home Institution: Transilvania University of Brasov - Brasov
Installation: PROMES - MSSFs
Number of access weeks: 2 weeks

Project Users	Working Stay Period
Liana Sanda Baltes	From: 19/09/16 to: 30/09/16
Catalin Croitoru	From: 19/09/16 to: 30/09/16

Title: *Preparation by solar physical vapour deposition of thermoelectric nanophases*
Acronym: SPVDNANOTEG
Project Leader: Irina Apostol (ROMANIA)
Scientific Field: Material Science
Home Institution: IPEE AMIRAL TRADING IMPEX S.A.
Installation: PROMES - MSSFs
Number of access weeks: 3 weeks

Project Users	Working Stay Period
Irina Apostol	From: 20/06/16 to: 08/07/16
Venkata Saravanan Kandasamy	From: 20/06/16 to: 08/07/16

Iuliana Pasuk	From: 04/07/16 to: 08/07/16

Title: *Study of variation of the mechanical properties of superalloys inconel 718 and rene 41 under thermal shock*
Acronym: TERMOINCORENE
Project Leader: Daniel-Constantin Anghel (ROMANIA)
Scientific Field: Material Science
Home Institution: University of Pitesti
Installation: PROMES - MSSFs
Number of access weeks: 2 weeks

Project Users	**Working Stay Period**
Daniel-Constantin Anghel	From: 22/08/16 to: 02/09/16
Luminita-Mirela Constantinesku	From: 22/08/16 to: 02/09/16
Vasile Rizea	From: 22/08/16 to: 02/09/16

Title: *Welding of pure Titanium and Titanium Alloys using Concentrated Solar Energy*
Acronym: TiSol
Project Leader: Emmanouil-Marios Kazasidis (GREECE)
Scientific Field: Engineering and Technology
Home Institution: National Technical University of Athens
Installation: PROMES - MSSFs
Number of access weeks: 3 weeks

Project Users	**Working Stay Period**
Panagiotis Karakizis	From: 22/08/16 to: 09/09/16
Emmanouil-Marios Kazasidis	From: 22/08/16 to: 09/09/16

Table 5. Summary of the projects hosted at PROMES-CNRS (M1-M18).

UserProject Acronym	**Installation Short Name**	**Home Institution**	**Country**	**Amount of Access Delivered (weeks)**
10W TEM00-LASER	WSSFs	Universidade Nova de Lisboa	Portugal	4
CLAMP	MSSFs	CENIM-CSIC	Spain	2
MultiMagHybrids	MWSFs	Aristotle University	Greece	1
NanoCoat	MSSFs	Institute of Solid State Physics, University of Latvia	Latvia	3
NewMaNaHeat	MSSFs	Institut de Ciència de Materials de Barcelona ICMAB-CSIC	Spain	1

RSRBCFLC	MSSFs	Transilvania University of Brasov	Romania	2
SE-HTRLT	MSSFs	Transilvania University of Brasov	Romania	2
SMAPT	MSSFs	Jozef Stefan Institute	Slovenia	1
SOLTIFOAM	MSSFs	University of Castilla-La Mancha	Spain	3
TERMOSHOCZY	MSSFs	University of Pitesti	Romania	2
HelioLoop	THEMIS	Fraunhofer Institute for Solar Energy Systems	Germany	2
Bright-TEM00-Laser	MSSFs	Universidade Nova de Lisboa	Portugal	4
CSP-TPS SHIELD	MSSFs	Tecnalia Research and Innovation	Spain	2
EFFECF	MSSFs	National Centre for Metallurgical Research (CSIC)	Spain	1
NANOSOL	MSSFs	Transilvania University of Brasov	Romania	2

Table 6. *(Continued)*.

UserProject Acronym	Installation Short Name	Home Institution	Country	Amount of Access Delivered (weeks)
RESOL-WEAR	MSSFs	Transilvania University of Brasov	Romania	3
SCHMO	MINITROUGH	Fundación CENER-CIEMAT	Spain	2
SCINT	MSSFs	Institute of Solid State Physics, University of Latvia	Latvia	3
SOL4COAT	MSSFs	Transilvania University of Brasov	Romania	2
SPVDNANOTEG	MSSFs	IPEE AMIRAL TRADING IMPEX S.A.	Romania	3
TERMOINCORENE	MSSFs	University of Pitesti	Romania	2
Tisol	MSSFs	National Technical University of Athens	Greece	3
			TOTAL	**50**

Table 6. Number of users per nationality (CNRS-PROMES).

Nationality Country	Number of users
Algeria	2
China	2
France	1
Germany	2
Greece	4
Latvia	6
Portugal	6
Romania	19
Slovakia	4
Spain	18
TOTAL	**64**

Table 7. Number of projects and number of access weeks per facility (CNRS-PROMES).

Installation Short Name	Total of UserProjects	Total number of Access Delivered (weeks)
MSSF	17	41
MWSF	2	5

Table 8. *(Continued)*.

Installation Short Name	Total of UserProjects	Total number of Access Delivered (weeks)
THEMIS	1	2
MINITROUGH	1	2
TOTAL	**21**	**50**

Scientific output of users at the facility

Publications in scientific journals

- G. Plăiaşu, M. Abrudeanu, M. M. Dicu, C. Monty, *Elaboration and nanostructural study of pure and Al doped ZnO nanopowders*, Journal of Optoelectronics and Advanced Materials, 16 (9-10), 2014, pp. 1116-1120;
- Adriana-Gabriela Plăiaşu, Carmen Mihaela Topală, Alice Dinu, Mărioara Abrudeanu, Claudiu Suțan, *Cooper oxides nanopowdres: synthesis by S.P.V.D. and characterisation*, Revista de Chimie, 66.no.10, 2014, pp. 1636-1638;
- Adriana-Gabriela Plăiasu, Alice Dinu, Mărioara Abrudeanu, Vasile Rizea, Denis Negrea, Dionisie Bojin, Marius Enăchescu, Claude Monty, Corneliu Munteanu, *Synthesis and microstructural characterization of CuO nanoparticles elaborated bY S.P.V.D.*, Environmental Engineering and Management Journal, 2014, pp. 763-1038.

- E. Koepf, W. Villasmil, A. Meier, *Demonstration of a 100-kWth High-Temperature Solar Thermochemical Reactor Pilot Plant for ZnO Dissociation*, AIP Conf. Proc., 1734, 120005, 2016; doi: 10.1063/1.4949207.
- E. Koepf, W. Villasmil, A. Meier, *Pilot-scale solar reactor operation and characterization for fuel production via the Zn/ZnO thermochemical cycle,* Appl. Energy, 165, 2016, Pages 1004-1023; doi:10.1016/j.apenergy.2015.12.106.
- E. S. Bârcă, V. Rizea, M. Abrudeanu, A. G. Plaiasu, B. Istrate and C. Munteanu, *Comparative study of morphology and composition on oxide nanopowders elaborated by SPVD.* Materials Science and Engineering 95 Modern Technologies in Industrial Engineering *(ModTech2015)*, IOP Publishing IOP Conf. Series: Materials Science and Engineering, Vol. 95, Conf. 1, 2015; http://stacks.iop.org/1757-899X/95/i=1/a=012028.
- Radu-Robert Piticescu, Adrian Mihail Motoc, Albert Ioan Tudor, Cristina Florentina Rusti, Roxana Mioara Piticescu, Maria Dolores Ramiro-Sanchez, *Hydrothermal Synthesis of Nanostructured Materials for Energy Harvesting Applications*, International Journal of Materials Chemistry and Physics, Vol. 1, No. 1, 2015, Pages 31-42.
- J. Almeida, D. Liang, C. R. Vistas, and E. Guillot, *Highly efficient end-side-pumped Nd:YAG solar laser by a heliostat - parabolic mirror system*, Applied Optics Vol. 54, Issue 8, pp. 1970-1977 (2015), doi: 10.1364/AO.54.001970
- Dawei Liang, Joana Almeida, Cláudia R. Vistas, Emmanuel Guillot, *Solar-pumped TEM00 mode Nd:YAG laser by a heliostat—Parabolic mirror system*, Solar Energy Materials and Solar Cells, Volume 134, March 2015, Pages 305–308, doi: 10.1016/j.solmat.2014.12.015
- Dawei Liang, Joana Almeida, Cláudia R. Vistas, Mariana Oliveira, Filipe Gonçalves, Emmanuel Guillot, *High-efficiency solar-pumped TEM00-mode Nd:YAG laser*, Solar Energy Materials & Solar Cells (2015), doi: 10.1016/j.solmat.2015.11.001i
- J. Almeida, D. Liang, C. R. Vistas, R. Bouadjemine & E. Guillot, *5.5 W continuous-wave TEM00-mode Nd:YAG solar laser by a light-guide/2V-shaped pump cavity*, Appl. Phys. B (2015), DOI: 10.1007/s00340-015-6257-z
- Cláudia R. Vistas, Dawei Liang, Joana Almeida, Emmanuel Guillot, *TEM_{00} mode Nd:YAG solar laser by side-pumping a grooved rod*, Optics Communications, Volume 366, 1 May 2016, Pages 50-56, ISSN 0030-4018, doi: 10.1016/j.optcom.2015.12.038
- Dawei Liang, Joana Almeida, Cláudia R. Vistas, Mariana Oliveira, Filipe Gonçalves, Emmanuel Guillot, *High-efficiency solar-pumped TEM00-mode Nd:YAG laser*, Solar Energy Materials and Solar Cells, Volume 145, Part 3, February 2016, Pages 397-402, ISSN 0927-0248, 10.1016/j.solmat.2015.11.001
- Liang D Almeida J Vistas C Guillot E, *Solar-pumped Nd:YAG laser with 31.5 W/m2 multimode and 7.9 W/m2 TEM00-mode collection efficiencies*, Solar Energy Materials and Solar Cells, vol. 159 (2017).

Book chapters

- A.J. Vázquez-Vaamonde, I. Padilla, J. García-Hierro, J.I. Robla, A.López-Delgado, Energía Solar de Alta Temperatura aplicada a la obtención de metales, Memorias del XXII congreso de la SOMIM y XIV congreso IBEROMAT, ISSN 2448-5551, año 1, nº2, September 2016, Pages 1-5
  Edit: Magdalena Trujillo Barragán, Soc. Mexicana de Ingeniería Mecánica A.C. Coyoacán, México D.F.

Master Degree Dissertation Reports

Reports of Master 2 Degree Dissertation defended within Research Master 2 of INP Toulouse (National Polytechnic Institute of Toulouse, France) and Interdisciplinary Master of University of Pitesti (Romania):

- Marin Marius Liviu, *L'influence du bisulfure de molybdène (MoS_2) sur les propriétés des composites à matrice polyoxyméthylène réalisés par injection. Propriétés tribologiques (The influence of the molybdenum disulphide (MoS_2) on the properties of the injection-molded polyoxymethylene matrix composites. Tribological properties), 2014;*

- Cotoi Florentina Mihaela, *L'influence du bisulfure de molybdène (MoS_2) sur les propriétés des composites à matrice polyoxyméthylène réalisés par injection. Propriétés mécaniques (The influence of the molybdenum disulphide (MoS_2) on the properties of the injection-molded polyoxymethylene matrix composites. Mechanical properties)*, 2014;

- Fica Amalia, *L'influence de la fatigue thermique sur la microstructure des couches d'oxyde formées en surface (The influence of the thermal fatigue on the microstructure of the oxide layers formed on the surface)*;

- Urs Daniel, *L'influence des chocs thermiques réalisés par l'énergie solaire sur la microstructure des couches d'oxyde formées en surface (The influence of the thermal shocks owing to solar energy on the microstructure of the oxide layers formed on the surface).*

Doctoral Research Reports

- Popa Iustin Alexandru, *Recherches concernant l'influence des chocs thermiques réalisés à l'aide de l'énergie solaire sur la microstructure en surface de l'alliages Zy-4 (Research on the influence of the thermal shocks owing to solar energy on the microstructure of the surface of the Zy-4 alloys)*, Report 3;

- Popa Iustin Alexandru, *L'influence des chocs thermiques sur la microstructure et la diffusivité thermique de l'alliage Zy-y (The influence of the thermal shocks on the microstructure and thermal diffusivity of the Zy-y alloy)*, Report 4;

- Rosu Andreea Elena, *Recherches concernant l'influence de la fatigue thermique sur la microstructure en surface de l'alliages Zy-4 (Research on the influence of the thermal fatigue on the microstructure of the surface of the Zy-4 alloys)*, Report 3;

- Rosu Andreea Elena, *L'influence de la fatigue par chocs thermiques sur la microstructure* *et la diffusivité thermique de l'alliage Zy-4 (The influence of the fatigue owing to thermal shocks on the microstructure and thermal diffusivity of the Zy-4 alloy)*, Report 4.

International Conferences

- A.J. Vázquez-Vaamonde, I. Padilla, J. García-Hierro, J.I. Robla, A.López-Delgado, *Energía Solar de Alta Temperatura aplicada a la obtención de metales,* XIV IBEROMAT2016, Mérida, México, 29-30 Sep, 2016 – Oral presentation
- A. López-Delgado, José I. Robla, I. Padilla, A. Vázquez, J. García-Hierro and R. Sánchez-Hernández, *Reduction of iron oxide in hydrogen atmosphere by using concentrated solar Energy: preliminary study,* EUROMAT Junior 2016, 10-14 Jul, 2016, Lausane, Switzerland – Poster presentation
- E. Gracia, M. Bayod, A. Romero, B. Naranjo, G.P. Rodríguez, A. Conde, I. Garcia, *Sinterización de espumas de Titanio usando energía solar concentrada*, XIV Congreso Nacional de Materiales, June 2016, Gijón, Spain
- Joana Almeida, Dawei Liang, Cláudia Vistas, Emmanuel Guillot, *56 W cw Nd:YAG solar laser by a heliostat - parabolic mirror system*, CLEO/Europe-EQEC 2015

ANNEXES to be found in the reporting MS Access Database.

Annex 1 – List of the Selection Panel members
Annex 2 – List of User-Projects
Annex 3 – List of Users.

Work package no.	**WP 9**	Plan-Start:	**M01**	Plan-End:	**M48**
Lead Participant	**PSI**	Actual-Start:	**M01**	Actual-End:	**M48**
Work package title	Transnational Access to PSI facilities				
Activity Type	Support activities				
Participant involved	**PSI**				
Work package summary of progress towards objectives					

For this SFERA-II second reporting period (RP2) that goes from the 1st of July, 2015 to the 31st of December, 2016, only the user-projects for which costs have been incurred in the RP2 will be declared in this Transnational Access report and in the Form C (which is in accordance with the Access database). This corresponds to the 2015-2016 access campaigns.

PSI-STL received in **SFERA-II 2016 campaign** 1 user proposal form, which was accepted by the USP. The notification letter of the proposals accepted was sent before mid-May 2016.

After the notification to the selected users, the offered installation managers had to discuss with each accepted user-project research leader the more convenient working days according to the experimentation planned, as well as the technical support required, the total real time needed at the infrastructure to get useful results, etc.

Both user-projects were completely hosted within this RP2.

User-projects hosted in the first reporting period.

Title: *The ageing time evolution of the solar cells in function of the concentrated light levels*
Acronym: EVOSOLCEL
Group Leader: Daniel Coftas
Group leader's scientific field: Energy
Home Institution: Transilvania University of Brasov
Users hosted in PSI-STL facilities under this project:

Researcher (research status)	Total number of weeks / Period of working stay
Daniel Coftas (PDOC)	2 weeks / 26.07.2015 – 01.08.2015 25.10.2015 – 31.10.2015
Petru Coftas (PDOC)	2 weeks / 26.07.2015 – 01.08.2015 25.10.2015 – 31.10.2015
Dan Florian (PDOC)	1 week / 25.10.2015 – 31.10.2015
Laura Florian (PDOC)	1 week / 26.07.2015 – 01.08.2015

Title: *Study of combined photovoltaic cell/thermoelectric element/solar collector in medium and highly concentrated light*
Acronym: SOLTECOL
Group Leader: Daniel Coftas
Group leader's scientific field: Energy
Home Institution: Transilvania University of Brasov
Users hosted in PSI-STL facilities under this project:

Researcher (research status)	Total number of weeks / Period of working stay
Daniel Coftas (PDOC)	2 weeks / 10.07.2016 – 16.07.2016 04.12.2016 – 10.12.2016
Petru Coftas (PDOC)	2 weeks / 10.07.2016 – 16.07.2016 04.12.2016 – 10.12.2016
Dan Florian (PDOC)	1 week / 10.07.2016 – 16.07.2016
Laura Florian (PDOC)	1 week / 04.12.2016 – 10.12.2016

Peer reviewed publications

S.Q.S. Ahmad, C. Wieckert, R.J. Hand, Glass melting using concentrated solar thermal energy. Glass Technology: European Journal of Glass Science and Technology Part A. ISSN 1753-3554, 2016 (in press). (related to SPGPSDE)

D. T. Cotfas, P. A. Cotfas, D. Floroian, L. Floroian, *Accelerated Life Test for Photovoltaic Cells Using Concentrated Light*, Int. J. of Photoenergy, 2016. Doi: 10.1155/2016/9825683.

International conferences

D.T. Cotfas, P.A. Cotfas, D. Floroian, L. Floroian, M. Cernat, Ageing of Photovoltaic Cells under Concentrated Light, 2015 Intl Aegean Conference on Electrical Machines & Power Electronics (ACEMP), 2015 Intl Conference on Optimization of Electrical & Electronic Equipment (OPTIM) & 2015 Intl Symposium on Advanced Electromechanical Motion Systems (ELECTROMOTION), Side, Turkey, Sep. 2-4, 2015. Oral communication and reviewed publication in IEEEXplore, pp. 599-604. Doi: 10.1109/OPTIM.2015.7427048. (related to AGEPVCELL)

S.Q.S. Ahmad, R. Elder, R.J. Hand, C. Wieckert, Glass Melting Experiments Using Concentrated Solar Radiation, IEA-Solar Heat and Cooling Programme, Task 49 Solar Heat Integration in Industrial Processes, 8th Experts Meeting, Montpellier, France, Sept. 16-17, 2015. Oral communication. (related to SPGPSDE)

S.Q.S. Ahmad, C. Wieckert, R.J. Hand, Concentrated Solar Thermal Energy and Glass Melting – Trials and Challenges, 90th Glastechnische Tagung der Deutschen Glastechnischen Gesellschaft, Goslar, Germany, June 6-8, 2016. Oral communication. (related to SPGPSDE)

Patent application

D. T. Cotfas, P. A. Cotfas, D. Floroian, L. Floroian, "Method and Device of Accelerated Testing of the Aging Time of Photovoltaic Cells – ARCL", submitted to Rumanian Patent office July 31, 2015. Number CBI A/00557/31.07.15 (BI RO 130952 A0). (related to AGEPVCELL)

ANNEXES to be found in the reporting MS Access Database.

Annex 1 – List of the Selection Panel members
Annex 2 – List of User-Projects
Annex 3 – List of Users.

Work package no.	**WP 10**	Plan-Start:	**M01**	Plan-End:	**M48**
Lead Participant	**ENEA**	Actual-Start:	**M01**	Actual-End:	**M48**
Work package title	Transnational Access to ENEA facilities				
Activity Type	Support activities				
Participant involved	**ENEA**				
Work package summary of progress towards objectives					

For this SFERA-II second reporting period (RP2) that goes from the 1st of July, 2015 to the 31st of December, 2016, only the user-projects for which costs have been incurred in the RP2 will be declared in this Transnational Access report and in the Form C (which is in accordance with the Access database). This corresponds to our 2015-2016 access campaigns.

ENEA-SOLTERM received in **SFERA-II 2016 campaign** 4 user proposal forms. After the USP meeting, only 1 user proposal form was finally accepted, i.e., the proposal ALLOYMSR, while the other 4 were rejected. The notification letters of accepted proposals were sent before mid-May 2016. However, this proposal was postponed to 2017. This was decided on a common base between the Installation Project Leader and the User-project's Group Leader. The reason is that due to a madness busy schedule of the group leader it was impossible for him to prepare the samples for the experiments that he planned to carry out at the ENEA-SOLTERM installation. There were several small coated samples (ceramic coating on AlCrFe alloy) which the Group Leader wanted to test in a small bath of melted salt and it was not until December 2016 when he was able to test the samples in melted lead. They are now ready to complete the research testing them with melted salt, so the stay will be carried out during 2017.

User-projects hosted in the first reporting period.

Peer reviewed publications

S. M. Zaharia, C. Lancea, L. A. Chicoș, G. Caputo, *Behaviour and Mean Life Prediction of Solar Mirrors from Parabolic Trough Collectors under Accelerated Degradation/Reliability Testing*, Applied Mechanics and Materials 656 (2014) 442-449.

Paper in Proceedings of a Conference/Workshop

Fabienne Sallaberry, , Loreto Valenzuela, Alberto García de Jalón, Javier Leon, and Ignacio David Bernad *Towards Standardization of in-Site Parabolic Trough Collector Testing in Solar Thermal Power Plants*. 21th SolarPACES 2015. International Conference on Concentrating Solar Power and Chemical Energy Systems. Cape Town (South Africa). October, 13-16, 2015. AIP Conf. Proc. 1734, 130019 (2016).

ANNEXES to be found in the reporting MS Access Database.

Annex 1 – List of the Selection Panel members
Annex 2 – List of User-Projects
Annex 3 – List of Users.

Work package no.	**WP 11**	Plan-Start:	**M01**	Plan-End:	**M48**
Lead Participant	**DLR**	Actual-Start:	**M01**	Actual-End:	**M48**
Work package title	Development of Joint Calibration Procedures and Facilities for Sensors				
Activity Type	Research activities				
Participant involved	**CIEMAT, DLR, CNRS**				
Work package summary of progress towards objectives					

Task 1: Standardized Calibration of solar irradiance sensors.

Calibration facility for thermal irradiance sensors

The work on the calibration test bench for pyrheliometer and pyranometer at the PSA METAS facility started in 2014. A first functional stage of development was reached in June 2014. Since then, the calibration facility and procedures were continuously optimized. The resulting facility enables the PSA staff and guest researchers to calibrate various thermal irradiance sensors at the same time even beyond the project duration.

Three individual calibration campaigns were carried out.

- First campaign period 19.06.2014 to 30.06.2014
- Second campaign period 23.09.2015 to 09.10.2015
- Third campaign period 20.06.2016 to 30.06.2016

The campaigns were jointly operated by Ciemat and DLR personal, with extra support from CNRS at PSA during the third campaign.

All three campaigns include pyrheliometer calibration according to the ISO standard 9059 and pyranometer calibration according to the ISO standard 9846 continuous sun-and-shade method. Additionally, a pyranometer calibration according to the ISO standard 9846 alternating sun-and-shade method was carried out in 2015. A total of 80 sensors were calibrated.

All used ACRs were calibrated in the World Radiation Center (WRC) Davos compared to a reference ACR using the sun as source. The WRC reference ACR is periodically calibrated against the World Standard Group (WSG). In September of 2014 the DLR ACR PMO6-CC 0807 was participating at the NREL pyrheliometer comparison (NPC-2014).

All sky images were taken and the aerosol optical depth and the sunshape were measured during the calibration. The all sky images were used to filter out inadequate data points that are affected by clouds. This sort out method was validated and found to be helpful. The sort out method was presented at the EUPVSEC conference 2016 (Wilbert, Nouri, et al., 2016). Results of the described work were also made public via the deliverable D11.2 and D11.3 at the SFERA -II homepage.

- D11.2 consists of a report describing mainly the implementation of the joint calibration facility at the PSA METAS test site and was delivered in December 2015.
- D11.3 was delivered in December 2016. This report contains the results of all calibrations and investigations carried out during the three calibration campaigns.

Figure 13. Top: Overview of Metas calibration setup (1: Pyranometer test bench; 2: Pyrheliometers test bench; 3: Black Photon tracker with DHI reference; 4: cloud camera); Bottom left: detail view of Black Photon tracker; Bottom left centre: detail view of pyrheliometer test bench; Bottom right centre: two absolute cavity reference pyrheliometers located in the pyrheliometer test bench's front cabinet; Bottom right: Metas wind mast.

Between 01.04.2015 and 06.06.2016, a RSI was installed at the HP meteorological station of the PSA as part of a round robin test for RSI calibration. Currently the same RSI is mounted at a meteorological station in Madrid operated by CIEMAT. The end of the data recording is planned for summer 2017. Calibration accuracy for both sites and different methods will be compared. Results of this investigation will be made public through the deliverable D11.4 "report on Round robin test for RSI" in winter 2017.

With respect to the evaluation of calibration methods for Rotating Shadowband Irradiometers further progress was made in the framework of two publications. One publication presented at SolarPACES 2015 and published in AIP, investigates the spectral errors which greatly affect calibrations, especially short term calibrations (Wilbert, Kleindiek, et al., 2016). The second publication (Vignola et al., 2016) has the title "New Methodology for Adjusting Rotating Shadowband Irradiometer Measurements" and was presented at the SolarPACES conference 2016.Therein SFERA-II scientists from DLR and experts from the US and Germany discussed the possibility of improving RSI correction functions for systematic errors in a more physical and less empirical way. These more physical correction functions allow also a more physical calibration method at defined calibration conditions. This is in contrast to the current calibration methods where mostly long calibration intervals are used to average out varying parameters such a cloud cover and aerosol optical depth. The corresponding work will be included in the deliverable D11.5 Update of report on calibration procedures for RSI sensors which is under preparation.

Task 2 (Calibration facility for heat transfer fluid mass flow sensors and thermal capacity).

Enhancement of measurement accuracy of heat capacity measurement bypass

This subtask was terminated during the first reporting period. More details on the results can be found in the Deliverable D11.6 “Report on measurement uncertainty”. During the second reporting period, we made an update of this Deliverable (updated 19.11.2015) because there were some further insights during the measurement campaigns (please see below).

Upgrading of heat capacity measurement facility

This subtask was terminated during the first reporting period. Further details can be found in Deliverable D11.7 “Report on extended mobile bypass to measure the mass flow rate”

Increase measurement accuracy of test facility at European research centre

The calibration facility for heat transfer fluid mass flow sensors and thermal capacity was used during the reporting period for various measurement campaigns at the parabolic trough rotating platform KONTAS (DLR/CIEMAT) at PSA. Before mounting the system to the KONTAS facility, which contains thermal oil as heat transfer fluid, the validation measurements with water were repeated. Also, a thermal stress simulation regarding the higher temperatures was performed.

The system was terminated in the last reporting period and it should have been ready for highly precise measurements. However, the repeated validation measurements at the water circuit showed that some enhancements of the technical system were necessary. After high effort of investigation, error search, and checks it was found that a commercial sensor mass flow sensor with valid calibration certificate was not measuring correctly. The sensor was dismounted and sent to a calibration facility. After integrating it again, the system could be validated with water as fluid.

Then, it was cleaned from water and mounted to the thermal oil circuit at the KONTAS facility at PSA (see Figure 14).

During the first measurement campaigns with thermal oil, the operation of the system and the evaluation procedures were optimized. Effects of not totally constant inlet conditions had to be accounted for and other thermal time constants had to be considered during the measurements. Additionally, the procedure for heat loss correction was enhanced, having a much higher importance than for the tests with water which were performed at lower temperatures.

Figure 14. Calibration facility (here called “KONTAS-cp”) connected to the KONTAS facility.

Finally, the heat capacity of the HTF Syltherm-800 contained in the KONTAS facility was measured at different temperatures. Also, the mass flow reading of the Coriolis sensor of the bypass was used to compare it with the mass flow meter which is permanently installed in the KONTAS facility. As being modular, the bypass can be mounted to any other installation in order to characterize the specific heat capacity or recalibrate installed mass flow sensors of the installation. Further details can be found in Deliverable D11.8 “Report on Calibration of First Testing Facility Using the Calibration Bypass”.

Regarding WP 11 and its including tasks work is on track. The delays observed in task 2 during the last reporting period due to the much higher complexity than assumed during the preparation of the DoW have been regained. Task 2 is terminated. All due deliverables have been recuperated. Task 1 is on track as described in the DoW.

All due milestones and deliverables of WP 11 are fulfilled. The use of resources is according to the work progress. No corrective actions have to be performed.

Work package no.	**WP 12**	Plan-Start:	**M01**	Plan-End:	**M48**
Lead Participant	**PSI**	Actual-	**M01**	Actual-End:	**M48**

		Start:			
Work package title	Pyrometric Temperature Measurement Methods for High-Concentration Solar Facilities and Solar Simulator				
Activity Type	Research activities				
Participant involved	**CIEMAT, PSI, CNRS, INESC-ID**				
Work package summary of progress towards objectives					

Task 12.1 Develop "double modulation" pyrometry for use in arc lamp based simulators.

The mechanical modulation implemented in the 1 kW solar simulator (Figure 15a) has been evaluated. Temperature was calibrated and validated against a solar blind pyrometer (Figure 15c). Due to the small modulation depth the minimum measureable temperature is about 1250 K.

A Monte-Carlo based error analysis was performed to assess the influence of the statistical errors introduced during calibration and measurement. A sensitivity analysis to assess the most important error sources is in progress. A manuscript (to be submitted to Rev. Sci. Instrum.) is finalized at present.

A large chopper wheel (Figure 15b) has been designed and built for the use of double modulation pyrometry at PSI's 50 kW solar simulator. Calibration and validation experiments have been conducted successfully (Figure 15d). Compared to the implementation at the 1 kW simulator the method allows to measure already temperature around 800 K comparable with the commercial solar blind reference pyrometer.

Task 12.2 Test "Double Modulation" pyrometry at solar furnace using fast shutter.

The development of the setup to test the double modulation technique at a solar furnace at PROMES has been continued. The reference instruments required have also been reviewed.

The design of the single blade modulator has been finished: a single blade will be rotated by a brushless motor from one side, the complete system will be in closed box for safety, and the blade's phase will be monitored by a reference sensor. It has been chosen to prioritize high rotational speeds for this experimental phase, and later as required evolve the design toward other goals such as long life and fast setup time. The 2000x200mm blade is built from a high modulus carbon composite blade with a core in aluminium honeycomb: this arrangement allows a very high stiffness with a very low weight (hence low inertia) while having a very low thickness (4.5 mm), hence a low dead shadow for deep modulation effect. Rotation will be made along the longest axis. The 1.49 kWe brushless motor, capable of reaching 4000 rpm, is driven by a 400 VAC speed controller. These parts have been assembled and control software (LabView) has been developed. For safety reasons, the whole system will be enclosed in a rigid box. In addition, to reduce aerodynamic drag, a partial vacuum will be made inside the box: around 100-200 mbar absolute pressure.

Two sets of optical instruments will be used: a custom designed non-solar blind fast pyrometer and reference existing instruments. The design of the in-house fast pyrometer has been finished, and the components selected and should be delivered in January 2017.

The reference temperature of the sample will be evaluated by at least two methods:

- One solar blind pyrometer: Kleiber 4.7-5.2 µm, 200-2000°C black body range, 2 kHz capable. In case of schedule issues related to weather, a possible backup has been planned with a 5.2-5.5 µm Impac pyrometer.
- Backside thermocouples, depending on the samples.

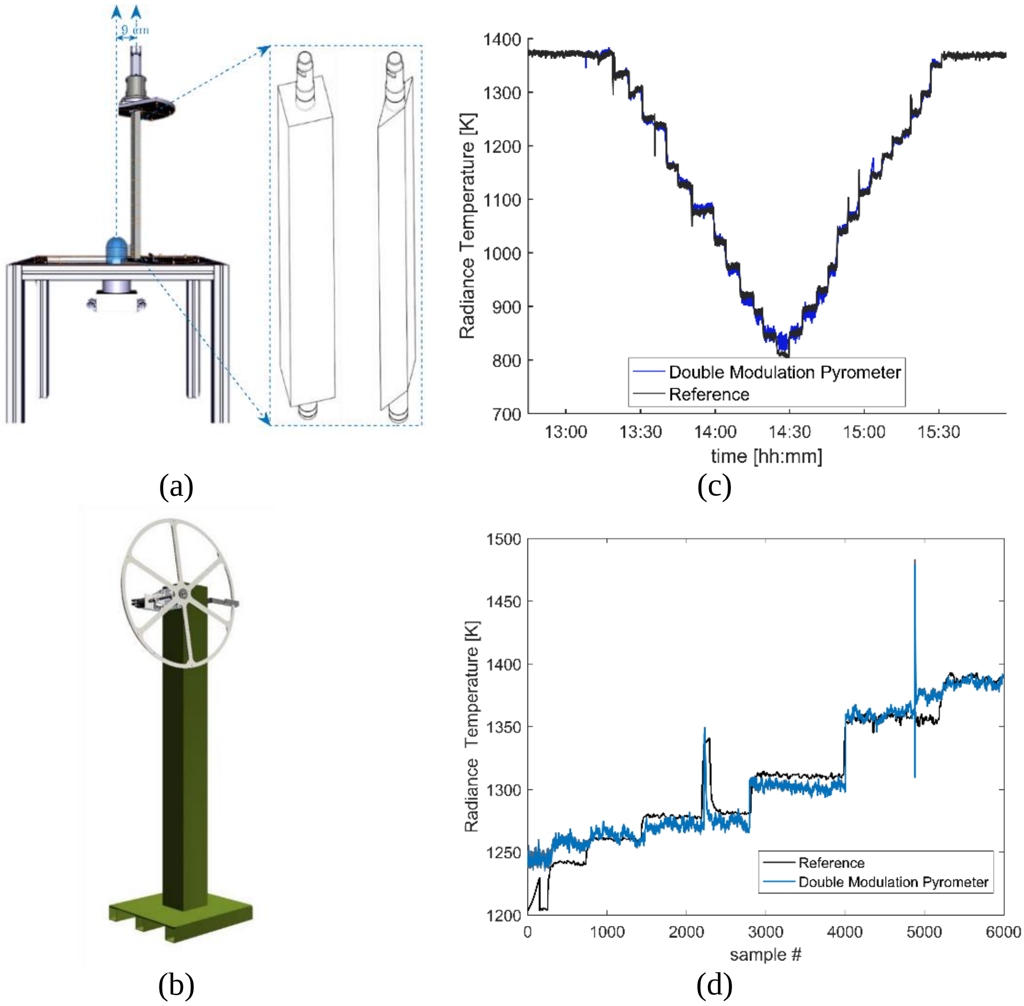


Figure 15. (a) Schematic showing the position and geometry of the rotating blade designs built in the 1-kW Solar simulator. (b) Schematic of the chopper wheel and its supporting structure that has been designed, built and is in use for the modulation of the flux at the 50-kW solar simulator facility (c, d) Radiance temperature readings of the Double Modulation Pyrometer plotted against the reference pyrometer upon observation of an irradiated Platinum sample placed at the focus of the 1-kW solar simulator (c) and of the 50-kW multi-source solar simulator (d).

The use of a new in-house developed bi-color solar-blind pyroreflectometer is also planned, but its commission in time is not guaranteed.

The complete setup will be assembled early 2017, solar testing is planned in around April 2017.

Task 12.3 Assess ability of "Double Modulation" pyrometry to determine (relative) emissivity values at high temperatures for specific cases.

Single waveband pyrometric methods such as the double modulation pyrometry require knowledge of emissivity to yield accurate temperature estimates. Emissivity is an optical property that greatly depends on wavelength, angle of observation, temperature and sample surface topology and is generally not known (tabulated) especially at high temperatures. Moreover, it changes dynamically when irradiated samples undergo chemical reactions. Since sample-specific emissivity values are not known a priori, users resort to assumed emissivity values. The assumptions introduce uncertainty that propagates into the temperature result reducing measurement accuracy. Thus, in-situ emissivity measurement would offer a significant advantage for any pyrometric method, since it would allow reliable temperature measurement especially in dynamic conditions of reacting samples where optical properties may change significantly. The lab-scale implementation has shown that relative emissivity values can be measured for the case of a Platinum sample. Further testing on additional materials such as Zirconia, Alumina, Reticulated Porous Ceria and Silicon Carbide is planned to be completed within the first half of 2017.

Task 12.4 Camera based IR pyrometry aimed at CSP installations.

A joint meeting CNRS-CIEMAT has been held in June 2016 to help CNRS for the selection of interesting infrared cameras. After further investigations, CNRS expects to purchase 2 infrared cameras thanks to French funding in 2017: one for the CNRS big solar furnace (MWSF), and one for the CNRS Themis solar tower. The model for the big solar furnace is expected to benefit from CIEMAT experience, using a rotating filter wheel to change between selected bandwidths and allow extended measurements including reflectivity measures.

A significant part of this task has been completed. A special IR camera system has been installed and was tested for temperature measurements in solar furnaces. The working principle is shown in Figure 16. 2: Band filters at long wavelengths are used, around 3320 nm for measurement of surface temperatures inside a solar reactor and 4720 nm for measurement of the window temperature in windowed reactors. At these wavelengths the reflected radiation - and consequently the error introduced - is very small, in contrast to the situation at smaller wavelengths normally used. This activity is summarised in Marzo, A., Ballestrín, J., Barbero J., Cañadas I., Rodriguez, J., *Solar blind pyrometry not relying on atmospheric absorption bands*, Solar Energy 107 (2014) 415–422.

Currently two of these cameras have been used successfully in the solar furnaces of the PSA. Thanks to their great versatility they are used in many experiments.

The major further activity in task 12.4 targets the determination of emittances as a prerequisite for a precise pyrometric temperature measurement. A suitable setup has been realised and first tests have successfully been performed in a solar furnace using steel samples. It was reported at Ballestrín, J., Rodríguez, J., Carra, M.E., Cañadas, I., Roldán, M. I., Barbero , F. J., Marzo, A., *Pyrometric method for measuring emittances at high temperatures*, Poster at SolarPaces

2015 Conference Concentrated Solar Power and Chemical Energy Systems, Cape Town, South Africa, October 13-16 (2015).

It has recently been published on the American Institute of Physics Conference Proceedings: J. Ballestrín et al., *Pyrometric method for measuring emittances at high temperatures*. American Institute of Physics Conf. Proc. 1734 (2016), 130003-1–130003-8; doi: 10.1063/1.4949213

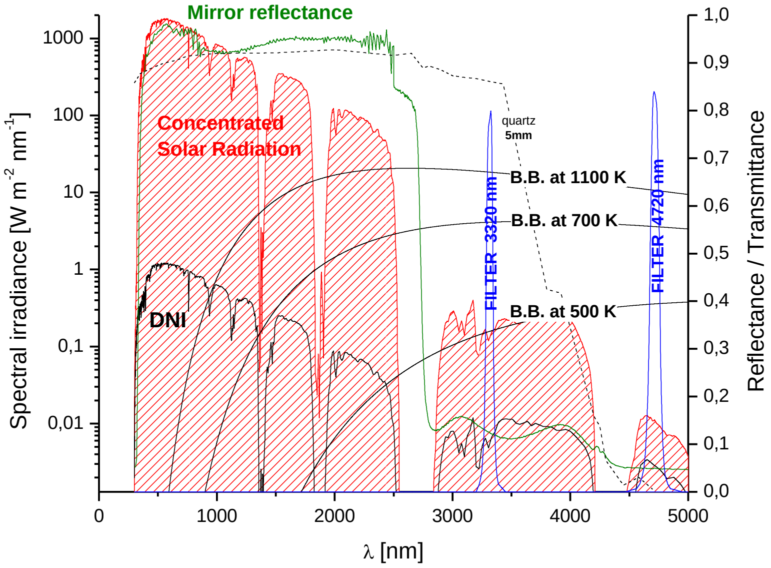


Figure 16. Spectral dependence of DNI and concentrated radiation (at a concentration ratio of 2300) compared to black body radiation at temperatures of interest. The transmittance curves of the two band filters used is shown, as well.

Task 12.5 Active temperature regulation in solar furnaces.

The purpose of this task is to improve the operation and the use of "small" solar furnaces. The task is organized in three subtasks. The first subtask "Self-adapting temperature control system" was concluded during the working visit to CNRS, PROMES/Odeillo on 31.08.2015 to 11.09.2015. This work was reported at 11th IFAC Symposium on Dynamics and Control of Process Systems, June 6-8, 2016, NTNU:

- Costa, B.A. and Lemos, J.M. and Guillot (2016), Control of a Solar Furnace using MPC with Integral Action. 11th IFAC Symposium on Dynamics and Control of Process Systems, including Biosystems June 6-8, 2016. NTNU, Trondheim, Norway. Available at: http://ac.els-cdn.com/S240589631630533X/1-s2.0-S240589631630533X-main.pdf?_tid=77a51720-1242-11e7-88fe-00000aab0f6c&acdnat=1490546414_3542b8b21dd21495cb9b72fdb99ae272

The second subtask "Self-adapting temperature control system" was concluded during the working visit 29.08.2016 to 10.09.2016. Part of the work developed in the second subtask was reported at the European Control Conference, which was held in Aalborg, on June 29 - July 1, 2016: Costa, B.A. and Lemos, J.M. and Guillot (2016), Control of a Solar Furnace using

Active Cooling. European Control Conference June 29 - July 1, 2016. Aalborg, Denmark.

This article describes the methodology used and results obtained using automatic temperature control with manual active cooling. An addition article is being prepared that described the temperature control system that automatically coordinates the shutter positioning and the active cooling. An example of experimental results obtained is present in Figure 17, where the objective is to impose a temperature profile on the upper surface of a COFALIT sample.

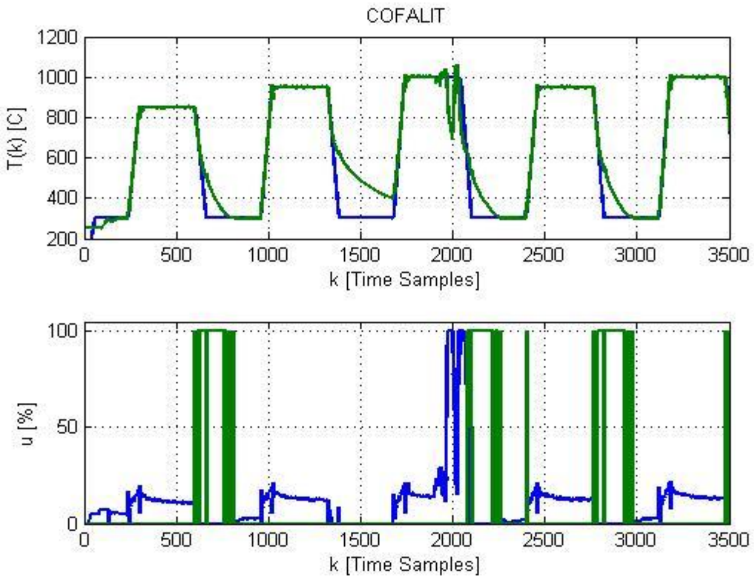


Figure 17. *Top:* Blue curve: Temperature profile that must be tracked. Green curve: Measured temperature from a COFALIT test sample. *Bottom:* Blue curve: Shutter actuation. Green curve: Automatic active cooling actuation, where due to limitations of the cooling system, it is operated according to an ON/OFF strategy. *Impact:* Using a coordinated actuation strategy of the shutter and the active cooling, the temperature control is improved. This can be observed by comparing the second temperature cycle (without active cooling) with the other temperature cycles.

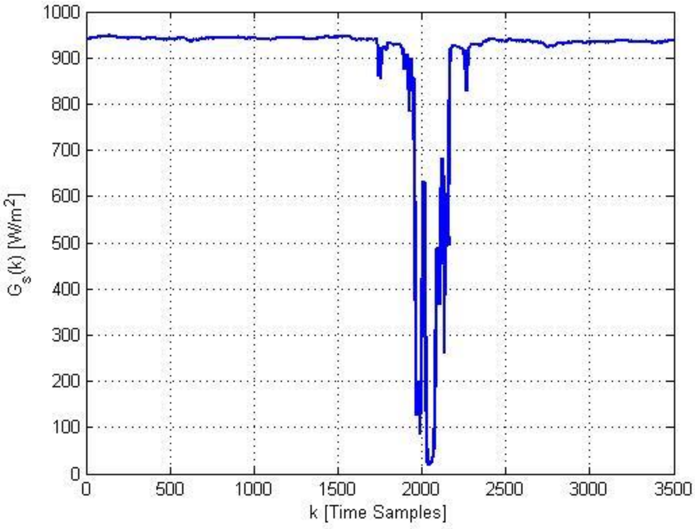


Figure 18. Available direct solar radiation during the experimental test. The presence of clouds blocked the solar radiation, causing the temperature drop (discrete time k = 2000).

The third subtask "Viability study for temperature control of the 1MW solar furnace" is being developed and is on scheduled.

Work package no.	**WP 13**	Plan-Start:	**M01**	Plan-End:	**M48**
Lead Participant	**CNRS**	Actual-Start:	**M01**	Actual-End:	**M48**
Work package title	Determination of physical properties of CSP materials under concentrated solar irradiation				
Activity Type	Research activities				
Participant involved	**CIEMAT, ETH Zurich, CNRS, UNILIM**				
Work package summary of progress towards objectives					

Task 13.1 Determination of thermo-mechanical properties under concentrated solar radiation.

The design of the experimental has been successfully realized for solar-acoustic experiments. As planned in subtask B, the setup has been tested in the solar furnace and the first results have shown its ability to reveal damage occurrence in the selected materials. The thermo-mechanical solicitation has been defined using an experimentally validated model, following a numerical strategy inspired by previous work (SFERA WP 13). Different acoustic behaviours have been observed in function of the studied material and the thermal cycling. Further works will correlate this behaviour to specific type of damage and/or to properties evolution. A more accurate investigation on signals recorded during the tests in under progress to achieve the identification of events acoustic signatures (correlated with microscopic observations) in order to propose damage chronology during solar test. In addition, a setup upgrade for strain measurement by photomechanical method has been designed: it would allow a better evaluation of the materials damages. It is under validation for ex-situ feasibility measurements.

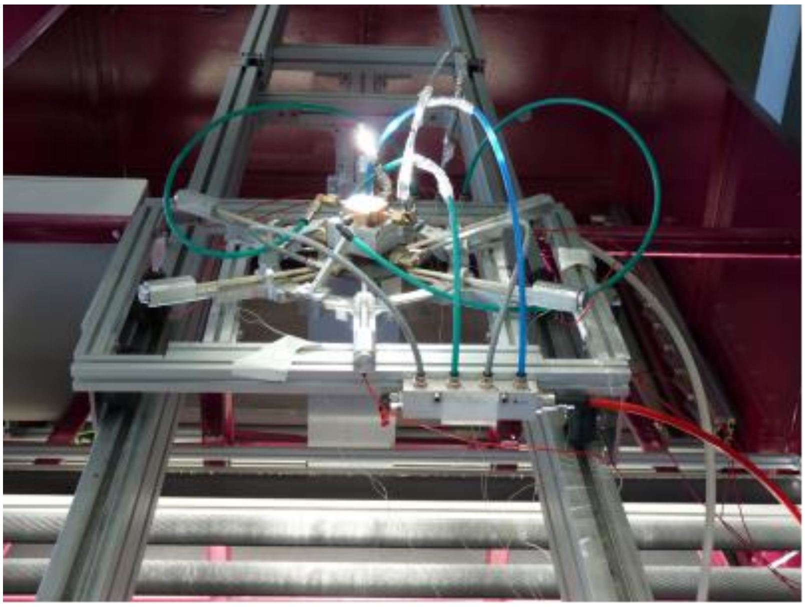


Figure 19. Acoustic set-up at solar furnace for thermal cycling.

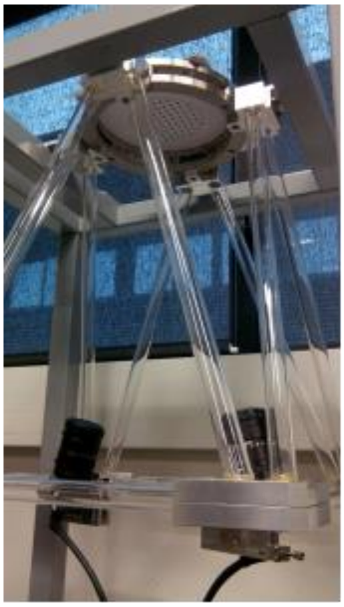


Figure 20. Photo-mechanical set-up at laboratory for test.

This work has been presented at:

- High Temperature Material Chemistry peer reviewed conference (HTMC 2016) in Orléans, France, and
- 12th SolLAB Doctorial Colloquium in Rodalquilar, Spain, 2016.

The starting delay reported in RP1 explained to the SO at mid-term review has been reduced to about 5 months, still without impact to other activities. Deliverables D13.1 has been delivered M25 instead of M24 as planned at mid-term, due to extra delays in the general reviews by all the involved partners during the Christmas holidays break.

A reviewed paper is in preparation to present the experimental tests and their comparison with the proposed thermo-mechanical behaviour: submission is expected in spring 2017. This is deliverable D13.2 due for M36 in the DoW, it is expected M41 or 42 depending on the peer review process. In case of excessive delays due to the reviewing process, we intend to prepare a dedicated report in order to publish the deliverable M43 at latest.

Task 13.2 Determination of thermo-optical properties: spectral directional emissivity measurements at high temperature.

The work on the new CNRS spectro-radiometer has been continued in order to improve the capacity for spectral directional emissivity measurements depending on the sample temperature (subtask A). Further tests have been conducted in laboratory since December 2014 but also with the solar setup in two campaigns, one in January 2015 and another in late spring 2016. The next solar tests are planned to be included in the February to April 2017 campaign for the existing qualified radiometer-based campaign. These tests are conducted on a reference blackbody capable of reaching 1600°C under air and with different samples including stainless steel 316, titanium Ta6V, either in laboratory with cold samples or with solar energy with the MEDIASE setup used up to 1600°C at the CNRS MWSF.

In parallel, CIEMAT has continued the improvements on the method to determine emissivity with pyrometric equipment, in this case an infrared camera on which work is reported in WP12. Experimental commissioning has been conducted at PSA VSF and all the results have been presented at SolarPACES 2015 in Cape Town, South Africa, and reported in a reviewed paper: *Pyrometric method for measuring emittances at high temperatures*, J. Ballestrín, J. Rodríguez, M. E. Carra, I. Cañadas, M. I. Roldan, J. Barbero, and A. Marzo, AIP Conference Proceedings 1734, 130003 (2016); doi: 10.1063/1.4949213.

However, dynamic range issues have appeared during the CNRS tests with the spectroradiometer: additional neutral filters had to be ordered and installed by the spectro-radiometer manufacturer early in 2016. This modification is leading to the current delay of D13.3 due on M36 and expected on M41 in order to include directional measurements of emissivity on the reference samples already provided by CIEMAT with this new innovative CNRS setup.

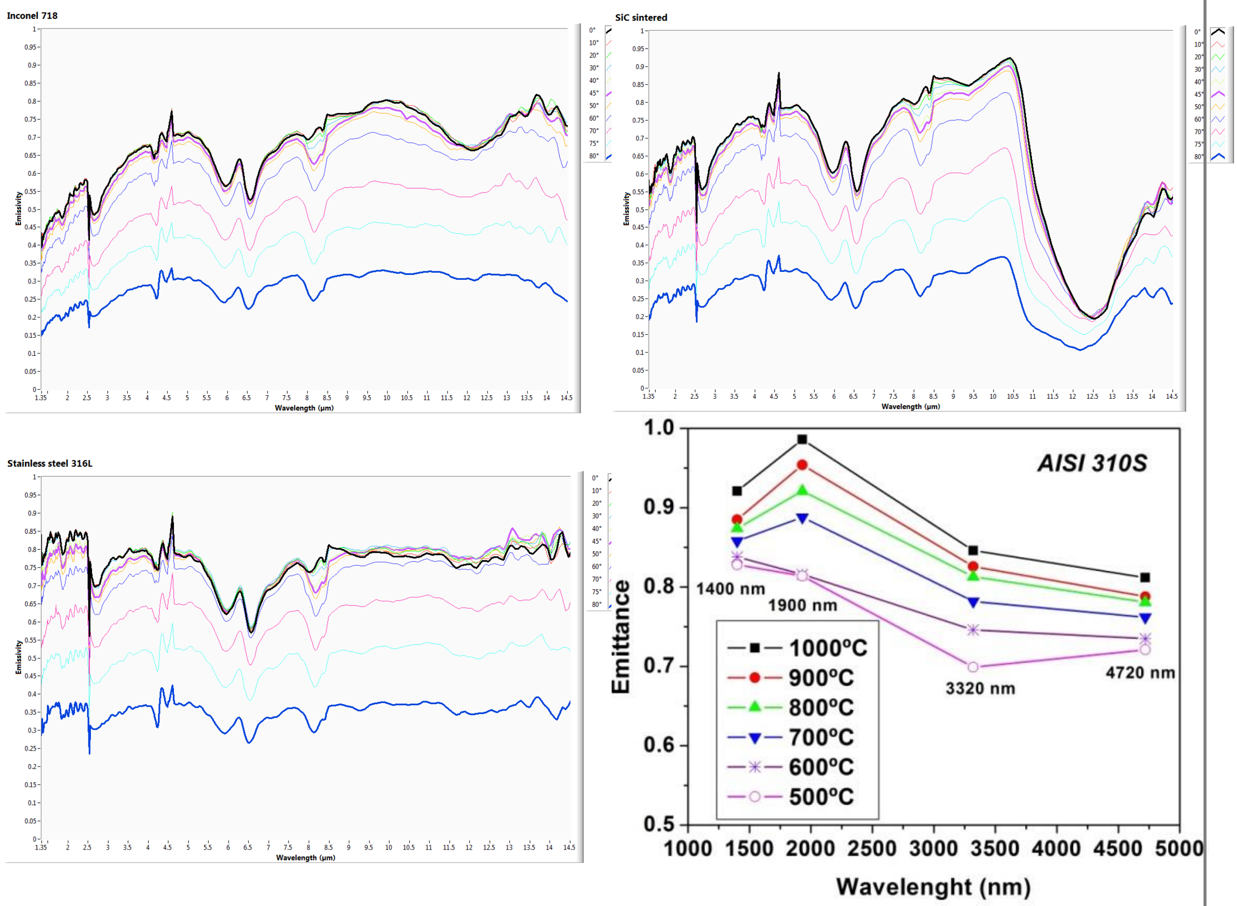


Figure 21. Early directional spectral measurements with spectro-radiometer CNRS setup. On the top left Inconel 718, on the top right sintered SiC, bottom left AISI 316L. Samples

were heated with solar energy at MWSF at 1100°C. Measures from 0 to 80°C in 10°C steps and from 1.35 to 14.5 µm. On the bottom right: measures with pyrometric CIEMAT setup for AISI 310S solar heated at different temperatures and measured at 4 wavelengths, 1.4, 1.9, 3.32 and 4.72 µm.

Task 13.3 Determination of thermo-optical properties: spectral directional emissivity measurements at high temperature.

The improvement of the characterization of the surface cavities of porous materials as ceramics foams used in high temperature volumetric solar absorbers has been conducted by CNRS. Several foam samples currently available in the industry were first characterized by XRD before solar heat ageing: Aluminium oxide Al_2O_3, Zirconium oxide ZrO_2 and silicon carbide SiC. However, Al_2O_3 and white ZrO_2 compounds revealed low solar absorptivity efficiency for thermo-solar conversion without coatings, contrary to SiC foams (measured absorptivity = 0.7-0.8 with CNRS instrument IR-TF SOC 100), considered to be the reference material for volumetric absorber. A new selective foam (Zirconium diboride, ZrB_2) with spectral selectivity i.e. high solar absorptivity (0.7 to 0.8) and low infra-red emissivity was also investigated by XRD.

Indeed if SEM and ATG techniques are usually used for the analyses of the evolution of porous materials, XRD and XPS experimental methods were optimized (source size, surface, bulk, geometric and sources effects...) in order to better characterize the microstructure of the pore walls: XPS is one of the appropriate techniques to analyse oxidized foams, providing both surface and bulk information. The presentation of the parameter optimization was required to allow the reader to understand which variables are needed to be studied to analyse non-flat and small surfaces (< 0.1 mm^2) of cavity wall.

After a heating treatment with solar energy with CNRS test bench (see below), the microstructure (crystalline phases, chemical bonds and environments, chemical composition...) and the oxidation behaviour of the ZrB_2 and SiC foams were determined with the optimised methods.

This completed work was reported in D13.6.

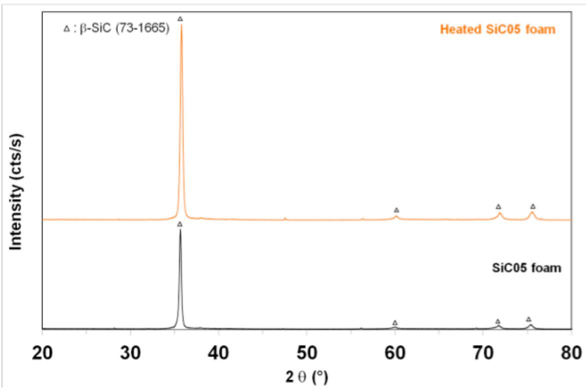


Figure 22. Diffraction patterns collected for no-heated and heated sample SiC05: -SiC (triangle).

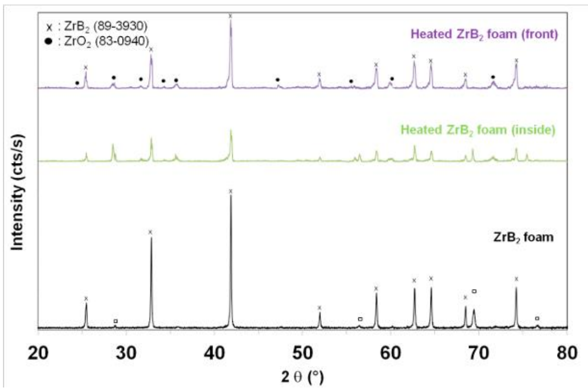


Figure 23. Diffraction patterns collected for no-heated and heated ZrB_2 foams (front side: purple and inside: green): ZrB_2 (cross), ZrO_2 (full round) and Si (square).

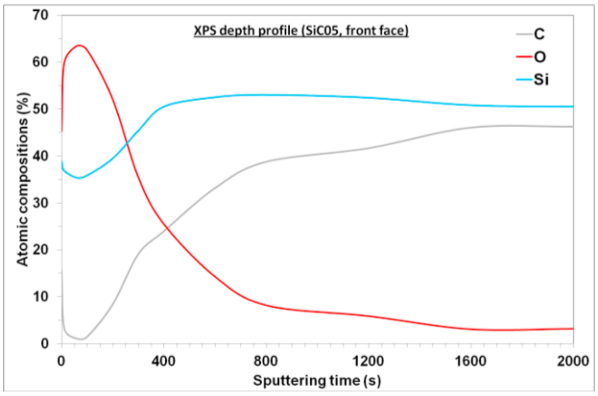


Figure 24. Evolution of the atomic compositions (%): XPS depth profile collected for sample SiC05 on front side (ff).

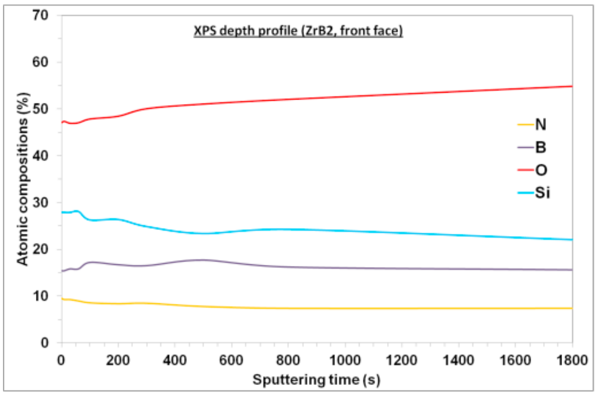
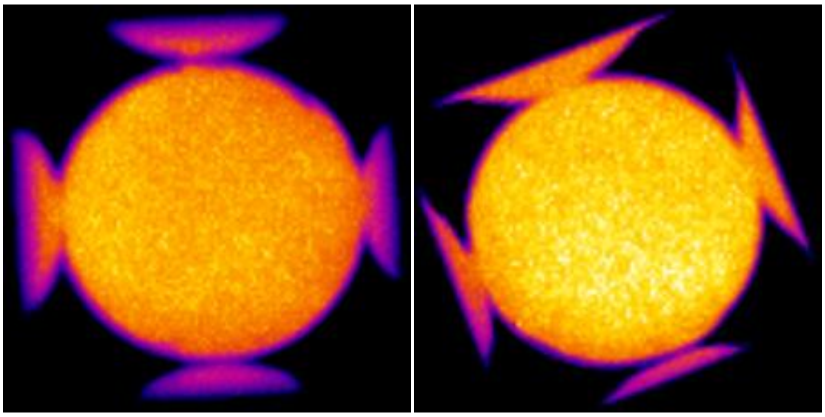


Figure 25. Evolution of the atomic compositions (%): XPS depth profile collected for sample ZrB_2 on front side (ff).

A solar test bench was developed by CNRS in order to characterize the solar-to-thermal efficiency of reticulate porous ceramics made of SiC with open pores: improvements with current state-of-the-art were made by the use of a homogenizer, ensuring quasi-1D incident solar flux irradiation. This solar setup has also been used to age samples used to optimize the techniques to evaluate their surface characteristics (see above). A new selective porous material was also investigated: ZrB_2. The lowest porosity values of our samples led to better performances than state of the art materials. The performances of the selective absorbers were similar to the SiC absorbers but they showed lower thermal emission losses at 4.95µm. The experimental results were compared to simulated characterisation with good agreement (differences ±4%, within the experimental confidence interval) but which pointed a pointed a trend to underestimate the outlet air temperature by the simulation. This bias was attributed to the measurement of the air outlet temperature. Apart from these small discrepancies, the model was found to reproduce the trends with an acceptable accuracy.

This work was reported in the reviewed paper: *Experimental study of ceramic foams used as high temperature volumetric solar absorber*, S. Mey-Cloutier, C. Caliot, A. Kribus, Y. Gray, G. Flamant,Solar Energy, Volume 136, 15 October 2016, Pages 226-235, ISSN 0038-092X, http://dx.doi.org/10.1016/j.solener.2016.06.066.



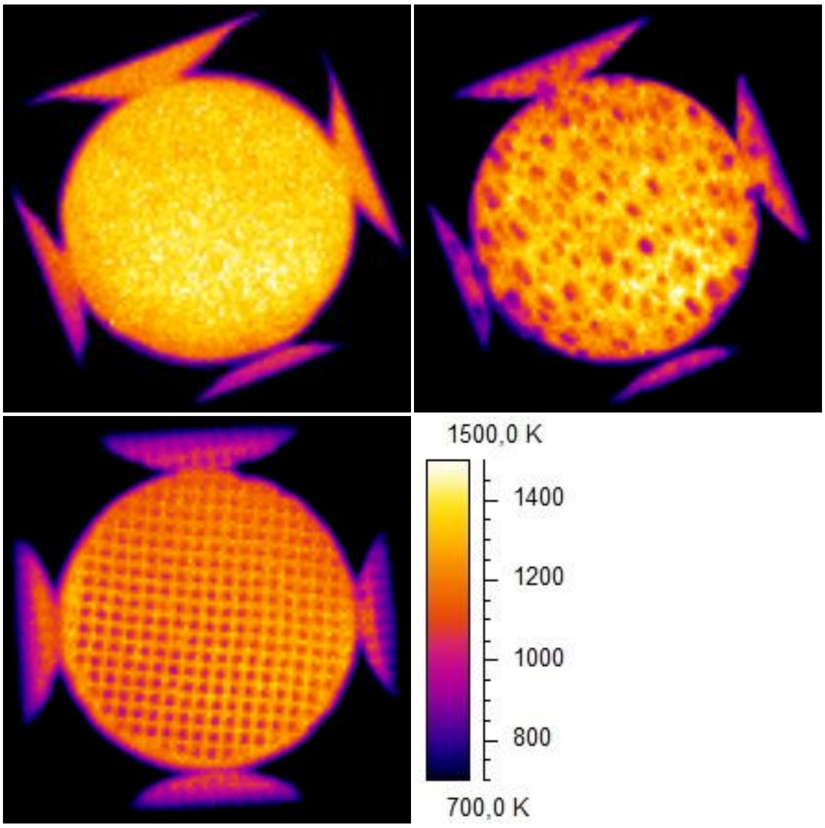


Figure 26. Maps of Blackbody equivalent temperature recorded by the infrared camera with the CNRS solar setup to characterize porous materials: from left to right & top to bottom, ZrB_2, α-SiC (1), Si-SiC (2), $SiC+SiO_2+Al_2O_3$, and SiC honeycombs.

A numerical and experimental analysis of porous materials transfer properties has been performed by ETHZ with the test case of the solar-driven thermochemical reduction of ceria as part of a H_2O/CO_2-splitting redox cycle. A transient heat and mass transfer model has been developed to simulate reticulated porous ceramic (RPC) foam-type structures, made of ceria, exposed to concentrated solar radiation. The RPC features dual-scale porosity in the mm-range and lm-range within its struts for enhanced transport. The numerical model solves the volume-averaged conservation equations for the porous fluid and solid domains using the effective transport properties for conductive, convective and radiative heat transfer. These in turn are determined by direct pore-level simulations and Monte-Carlo ray tracing on the exact 3D digital geometry of the RPC obtained from tomography scans. Experimental validation has been accomplished in terms of temporal temperature and oxygen concentration measurements for RPC samples directly irradiated in a high-flux solar simulator with a peak flux of 1200 suns and heated to up to 1940 K. Effective volumetric absorption of solar radiation was obtained for moderate optically thick structures, leading to a more uniform temperature distribution and a higher specific oxygen yield. The effect of changing structural parameters such as mean pore diameter and porosity has been investigated.

This work was reported in the deliverables D13.5 and D13.7 and in the two reviewed papers:

- S. Ackermann, J.R. Scheffe, J. Duss, A. Steinfeld, *Morphological characterization and effective thermal conductivity of dual-scale reticulated porous structures*, Materials 7 (11) (2014) 7173–7195, and

- Ackermann S., Takacs M., Scheffe J., Steinfeld A.,*Reticulated porous ceria undergoing thermochemical reduction with high-flux irradiation*, International Journal of Heat and Mass Transfer 107, pp. 439–449, 2017.

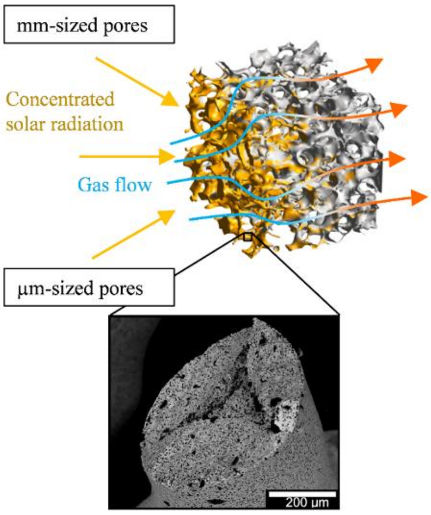


Figure 27. A 3D rendering of a computer tomography (CT) scan of the RPC structure, along with the scanning electron micrograph (SEM) of the strut's cross section. The RPC features dual-scale porosity: the mm-size pores enable efficient volumetric absorption of concentrated solar radiation during the reduction step while the µm-size interconnected pores within the struts provide enhanced kinetic rates during the oxidation step.

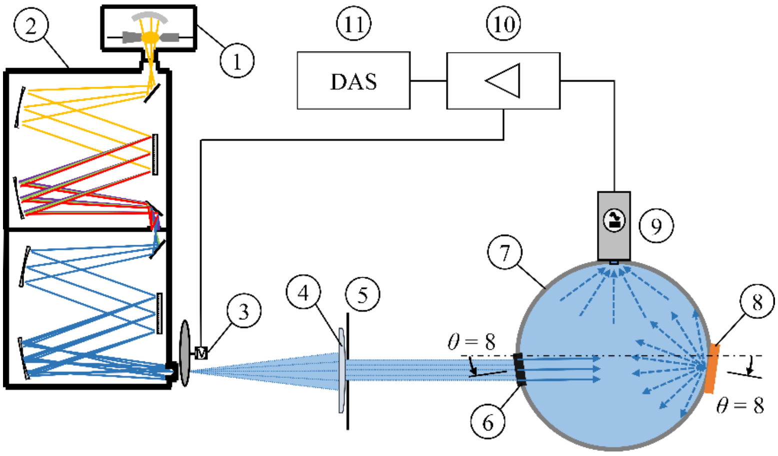


Figure 28. Schematic of the spectroscopic system for reflectivity measurement for porous materials that consists of a: 1) xenon-arc lamp, 2) double monochromator, 3) chopper, 4) imaging lens, 5) iris, 6) mechanical slit, 7) integrating sphere, 8) sample holder, 9) photodetector, 10) lock-in amplifier, 11) data acquisition system.

Work package no.	**WP 14**	Plan-Start:	**M01**	Plan-End:	**M48**
Lead Participant	**CIEMAT**	Actual-Start:	**M01**	Actual-End:	**M48**
Work package title	Characterization of solar concentrators and interconnecting elements				
Activity Type	Research activities				
Participant involved	**CIEMAT, DLR, CNRS**				
Work package summary of progress towards objectives					
The work progress and achievements in each of the four Tasks included in WP14 during the					

period July 2015 – December 2016 is summarized in the following paragraphs.

Task 14.1: Characterization of solar concentrators' geometrical quality.

During the second reporting period a campaign for comparing different methodologies was carried out in the Eurotrogh (ET) facility at the PSA. The campaign took place between 7th and 18th of March, 2016, with the following actuations:

- Geometrical characterization of the whole ET collector with a camera installed on a Drone (Deflectometry) at 0º and 90º orientation.
- Geometrical characterization of module 5 of ET collector with photogrammetry at 0º and 90º orientation.
- Geometrical characterization of the whole ET collector with a laser scanner at 0º and modules 1, 2, 5 and 6 at 90º.
- Installation of inclinometers for torsion measurement (in collaboration with Task 14.2).

A complete evaluation of results and intercomparison of different measuring methodologies is still in progress.

A preliminary draft of testing protocols for both individual facets and complete concentrators has been distributed but, due to some open questions still present, the final version must be delayed (till month 40) for waiting till the inter-comparison of results to corroborate the validity of the proposed measurement methodologies. This delay does not imply significant impact to other WP14 task and/or activities.

The use of resources in this task has been according to the work progress.

Task 14.2: Protocols for characterization of parabolic-trough concentrators.

A preliminary draft of the report D14.6 was prepared by CIEMAT and released for comments to DLR in March, 2015. DLR sent detailed comments in May, 2016. However, since it was agreed in December 2015 to include a test protocol for angular torsion measurements in parabolic-trough collectors, the update and completion of the report was delayed to include details on this protocol after the evaluation of a joint test campaign performed by CIEMAT and DLR in the HTF Test Loop of the Plataforma Solar de Almería, which aimed to measure the angular torsion of the EuroTrough collector prototype using high-resolution inclinometers. The join test campaign was performed in March, 2016 using different type of inclinometers. The complete comparison of results between DLR and CIEMAT has not been yet concluded. It is expected to finish it before March, 2017.

On the other hand, CIEMAT does not finished the integration of comments provided by DLR for the optical and thermal qualification of parabolic-trough collectors, because during 2016 CIEMAT has been actively contributing in the framework of the International Standardization Committee IEC/TC 117/PT 62862-3-2 "General requirements and test methods for parabolic-trough collector", where both CIEMAT and DLR are participating. During this year there were intense discussions within the framework of the committee ISO TC 180, which manages the preparation and update of the standard ISO/DIS 9806:2016 "Solar energy - Solar thermal collectors – Test methods”, and the IEC TC 117 committee about the scope and testing method for large PTCs. Finally, it was decided to adapt the QDT method included in the existing ISO 9806:2013 for its applicability to large-size PTCs, and to define other specific requirements for PTCs used in solar power plants in the framework of the standard that IEC TC 117 is preparing. Because of all this, the final version of the report D14.6 was not ready in month 34. It has been delayed to assure its content is aligned with the decisions and work done by CIEMAT, DLR, and other institutions, within the framework of ISO and IEC standardization committees, and to guarantee there is no discrepancy between the protocols proposed. The completion of the report is expected by the end of April, 2017 (Month 40).

Task 14.3: Protocols for characterization of Heliostats.

During the second reporting period of SFERA-II the first draft protocol which was issued during the first reporting period was internationally discussed. Based on these discussions, DLR included comments, refined definitions, renamed parameters and defined more detailed requirements for the measurement results. Additionally, measurement techniques for the parameters were suggested. The results were presented by DLR and discussed during the:

- SolarPACES Task III-meetings, in Cape Town on Oct, 12^{th}, 2015, and the
- SolarPACES Task III-meetings, in Abu Dhabi on Oct, 10^{th}, 2016.

The protocol has been iterated by email, telephone calls and personal communications. Figure 1 shows an example of the heliostat performance test proposed.

As agreed in the consortium and communicated in the first project report, the activity was extended until the fourth year of the project. By doing so, CNRS has time to learn and apply the evaluation procedure at the heliostats in Odeillo and all the “lessons learned” and the comments of the international community can be included in the protocol. For this reason, the deliverable D14.7 “Protocol for optical and geometrical evaluation of heliostats” will be postponed until the end of the project.

The use of resources in this task has been according to the work progress.

Task 14.4: Testing infrastructures for collectors´ interconnections.

The present report comprises the period of the task devoted to the construction of the heat transfer fluid circuit and the implementation of the test rig on it as well as the preoperational test. Both, oil circuit and test rig were designed previously. The key point has been the difficulty of mounting the upper part of the test rig, the traverse beam, without having the hydraulic equipment into operation. The electrical and mechanical works have been carried out as scheduled, although some unexpected problems due to lack of personnel delayed the SCADA development. The status of the assembly of the new test facility in January 2017 is:

- Civil work finished.
- Heat transfer loop mounted.
- Test bench mounted and connected to the HTF circuit
- Hydraulic system for rotation and translation movement mounted but pending of

connection.

- Official pressure test finished.
- Electrical circuit finished.
- SCADA delayed.

HELIOSTAT PERFORMANCE TEST	
Photo or simplified scheme of general heliostat setup	
Heliostat manufacturer name	HeliostatFactory
Name of heliostat model	Superb
Serial number or other identifier	P4
Total number of heliostats investigated	1
Name and address of testing laboratory	R&D Testing Center, Street Name, City, Country
Testing location	Plataforma Solar de Almería, 04200 Tabernas, Spain
Date of testing period	30.04.17 - 30.07.17
Date of erection of heliostat	'01.04.17
Reference to guideline version	SolarPACES Heliostat Performance Guideline v1.0
Report format	This report and data CD
Date, signature and stamp of testing lab.	

HELIOSTAT PERFORMANCE TEST – PARAMETERS (excerpt)

n	Full Parameter Name (Symbol)	Value	Unit	Meas.Technique	Measurement Report
1	HelioSetup.General.Type	T-shape	-	-	-

17	Optics.Conc. RealShape_SD_RMS	1.6	mrad	Deflectometry	MeasRep1.pdf
18	Optics.Conc. RealShape_SDx	CD	mrad	Deflectometry	MeasRep1.pdf
	---				
50	Cost.Specific	120	€/m^2	-	CostReport.pdf

Figure 29. Example of a heliostat performance test report (excerpt).

Task 14.4 has a delay due to two main reasons:

- some budgetary problems have arisen due to unforeseen extra-costs, and they have been solved with extra contributions by CIEMAT and DLR, and
- an unexpected lack of personnel for developing the SCADA programs. This problem has been solved with the help of students and the PSA staff of the Group devoted to instrumentation and data.

The pictures included below show the status of the new test facility in January 2017. Figure 30 shows the test rig. The black rods holding the targets used for checking the positions through photogrammetry can be seen. Figure 31 shows the expansion tank and pumping area, while Figure 32 shows the whole working area assembly and the wall that for safety reasons has been erected to separate both areas.

Figure 30. Test bench in stow position

Figure 31. Pumping area.

Figure 32. Overall view of the new test facility.

Work package no.	**WP 15**	Plan-Start:	**M01**	Plan-End:	**M48**
Lead Participant	**ENEA**	Actual-Start:	**M01**	Actual-End:	**M48**
Work package title	Characterization of heat transfer fluids and heat storage materials				
Activity Type	Research activities				
Participant involved	**CIEMAT, ENEA, DLR, ETH Zurich, CEA-INES, UTV**				
Work package summary of progress towards objectives					

Task 15.1: Guidelines and procedures for standardized testing protocols.

The activities in this task were completed during the first reporting period. Further information on the results of the different activities can be found in both deliverables:

- Deliverable 15.5, where a complete ranked state of art of the currently available or proposed thermal fluids was elaborated, and
- Deliverable 15.1: where a precise definition of feasible protocols for thermophysical characterization and corrosion tests, mainly focused on molten nitrates/nitrites was agreed.

Task 15.2: Improvement of performances for laboratory test equipment.

ENEA, UTV and DLR are involved in this task, which is concerned with experimental activities. During this reporting period:

- Failure of some hardware components during the experimental activities, in particular:

gasket for the reactor sealing, reactor heating system, sampling system, provoked a delay in deliverable 15.3, which was finally submitted on May 2017.

- An electrochemical "in-situ" measurement techniques for molten salts as HTF/HSM at high temperatures (up to 700°C) was setup successfully at DLR. The activities are ongoing and the related deliverable D15.4 is expected in time for month 48.

- The construction of an innovative probe has been conducted and testing of this probe has been carried out (Figure 33). The probe contains a Pt wire as heater and a type K thermocouple (TC) as temperature sensor, and its size (diameter 0.6 mm and length 60 mm) guarantees a length to diameter ratio of about 100. Calibration tests with glycerol for temperatures between 0°C and 60°C have shown a good agreement with literature data, within 3% (Table 9). Tests on a nitrate ternary salt at 120°C and 150°C have provided good results, and an agreement was found with the thermal conductivity of the standard solar salt (60% $NaNO_3$, 40% KNO_3), even if the data for this last have been extrapolated, being it solid at those temperatures (Table 10).

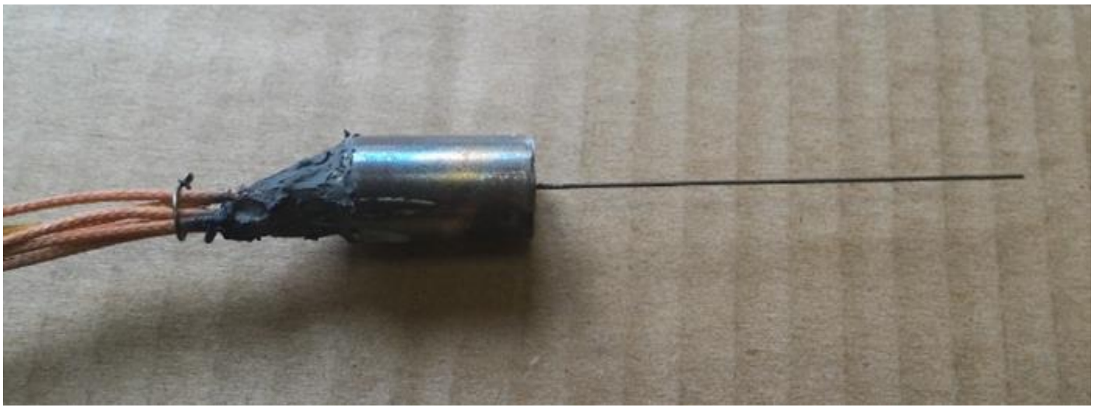


Figure 33. The probe constructed for high temperatures thermal conductivities measuremen

Table 9. Measured values of glycerin thermal conductivity and estimated relative deviations from literature

T [°C]	λ_{ave} [W·m^{-1}·K^{-1}]	StDev [W·m^{-1}·K^{-1}]	Δ %
0	0.2914	0.0011	3.44
20	0.2893	0.0034	1.75
40	0.2940	0.0016	2.47
60	0.2990	0.0023	3.27

Table 10. Measured values of a ternary nitrate thermal conductivity and estimated relative deviations comparing with the data of a very similar salt (namely, the solar salt)

T [°C]	λ_{ave} [W·m^{-1}·K^{-1}]	StDev [W·m^{-1}·K^{-1}]	Δ %
120	0.4102	0.0091	-2.77
150	0.4263	0.0188	-1.36
200	0.5466	0.0170	21.62

- The ENEA experimental set-up for the investigation of molten salts thermal stability was constructed and the activities are still ongoing with some delay due to problems in the hardware of the experimental rig. A dedicated set-up has been assembled (Figure 34), consisting of a stirred batch chemical reactor inserted into a heating system. The reactor is equipped with 18 thermocouples and a pressure sensor on the top, in order to check in real time the homogeneity of the temperature of the melt and the pressure of the headspace gas. The product gases flow and composition are measured by, respectively, a mass flowmeter and a microGC, both placed downstream the reactor.

Figure 34. The experimental rig assembled at ENEA laboratories for the measurement molten salts thermal stability.

<u>Task 15.3: Development of an electronic database for materials and components features concerning CSP.</u>

The task is divided into several subtasks, which cover a state of the art and, where necessary, experimental research about the most interesting materials and techniques proposed to be used for CSP storage systems. In this respect, four deliverables are expected to be completed by month 36 and one of them by month 40. The state of the art requested in the Subtask 15.3.1 was included in D15.5.

During this reporting period:

- A comprehensive state of the art review has been carried out about thermophysical properties and phase diagrams regarding nitrate mixtures in the Subtask 15.3.2. Also the issues regarding the chemical stability and the addition of other inorganics have been addressed and discussed. The results were summarized and discussed.
- A complete revision of the work done by CIEMAT concerning the use of CO_2 in parabolic-trough collectors has been carried out in the Subtask 15.3.3, including theoretical studies and the main lessons learnt during the design, construction and

operation of a parabolic-trough test facility with pressurized CO_2 at the PSA. Both the main conclusions of theoretical analyses and some recommendations and tips regarding the use of CO_2 in solar facilities have been summarized in the Deliverable 15.10 that tries to be helpful for future solar plants and test facilities with either CO_2 or another pressurized gas as working fluid. In addition, the test facility for pressurized CO_2 at the PSA is briefly described and some control strategies and maintenance procedures are also included in the deliverable.

- CEA summarized and discussed the main experimental setups and feedback of the experimental studies in terms of system performances, operation and design (Figure 35) in the Subtask 15.3.4. They also illustrated the main characteristics and some key aspects of filler materials and HTF.

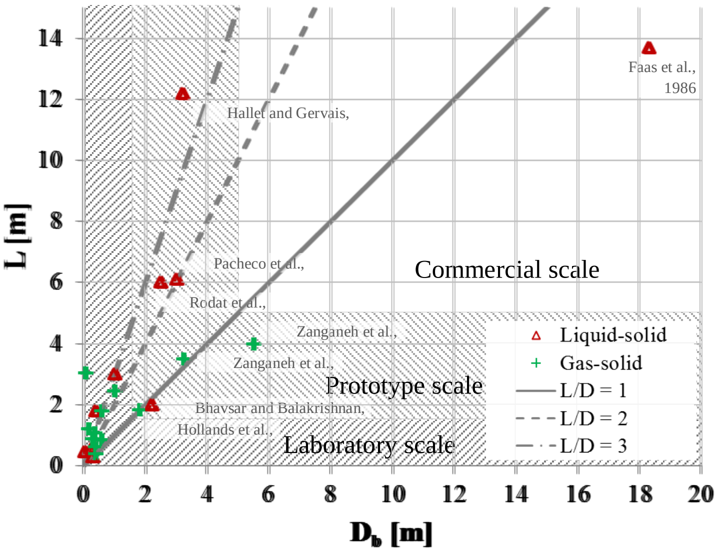


Figure 35. Dimensions of referenced packed-bed storage systems.

- On the other hand ETHZ has published a description of combined latent/sensible heat storage systems like the one shown in Figure 36, in the framework of the same task.

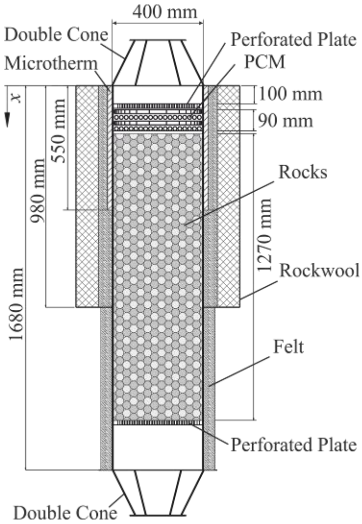


Figure 36. Configuration of the 42 kWhth lab-scale prototype used in the ETH experimental campaign.

- A state of the art review of chemical storage systems has been performed in the Subtask 15.3.6, and also the production of "solar fuels", that is, hydrogen or combustibles obtained using solar energy as well as the solar upgrading of fuels, has been discussed during this reporting period. The chemical storage configurations have been classified according to their thermochemical properties and compared to each other, see Table 11.

Table 11. Advantages and drawbacks of some chemical storage systems.

Storage system	Advantages	Disadvantages
$Ca(OH)_2 \rightleftarrows CaO + H_2O$	-Low cost and good availability -Reagents and products are not toxic -No secondary reactions -No need of catalysts -Chemical stability (over more than 100 cycles)	-Low thermal conductivity (≈0.1 ÷ 0.4 W/K m) -Sintering problems -High change of the molar volume dur hydration (≈ 95%)
$CaCO_3 \rightleftarrows CaO + CO_2$	-High enthalpy of reaction -Low cost and good availability -Reagents and products are not toxic -No secondary reactions -No need of catalysts -Good thermal conductivity (≈4 ÷ 5 W/K m)	-Poor chemical stability and reproduci -Particles agglomeration -Necessity of additives (Ti) -Strong dependence of the calcination kinetics on the CO_2 partial pressure
$MgCO_3 \rightleftarrows MgO + CO_2$	-Low cost and good availability -Reagents and products are not toxic	-Little data available for the CO_2 sorpt reaction
$CaCO_3/CaO/Ca_{12}Al_{14}O_{33}$	-Reagents and products are not toxic -No secondary reactions -Chemical stability (over more than 1000 cycles)	-Synthetic material
$2BaO_2 \rightleftarrows 2\ BaO + O_2$	-Air can be used as HTF -No secondary reactions -Possibility to operate in open cycles	-High toxicity -Non quantitative reactions (direct and back reaction)

		-Not stable (high decrease in efficiency even after the first cycle)
$2Co_3O_4 \rightleftarrows 6CoO + O_2$	-High enthalpy of reaction (with respect to other oxide based systems) -Air can be used as HTF -No subproducts -Possibility to operate in open cycles -Good stability (over ≈ 500 cycles)	-Toxic -Reagents are costly
$6Mn_2O_3 \rightleftarrows 4Mn3O_4 + O_2$	-Air can be used as HTF -Possibility to operate in open cycles	-Very high operating temperatures (near 1000 °C) -Few experimental data available

- A description of the most commonly used and proposed PCM materials, and the technologies associated with their employments (Figure 37) was previously needed in order to carried out the activities planned in the Subtask 15.3.7. Then, a complete state of the art review was carried out concerning storage material charged with nanoparticles. In particular, given the necessity to present chemical compatibility with the molten nitrates, ceramic based nanomaterials (Al_2O_3, SiO_2, TiO_2) were taken into account. In particular, a significant increase in the specific heat is reported, and the most significant results were summarized and discussed.

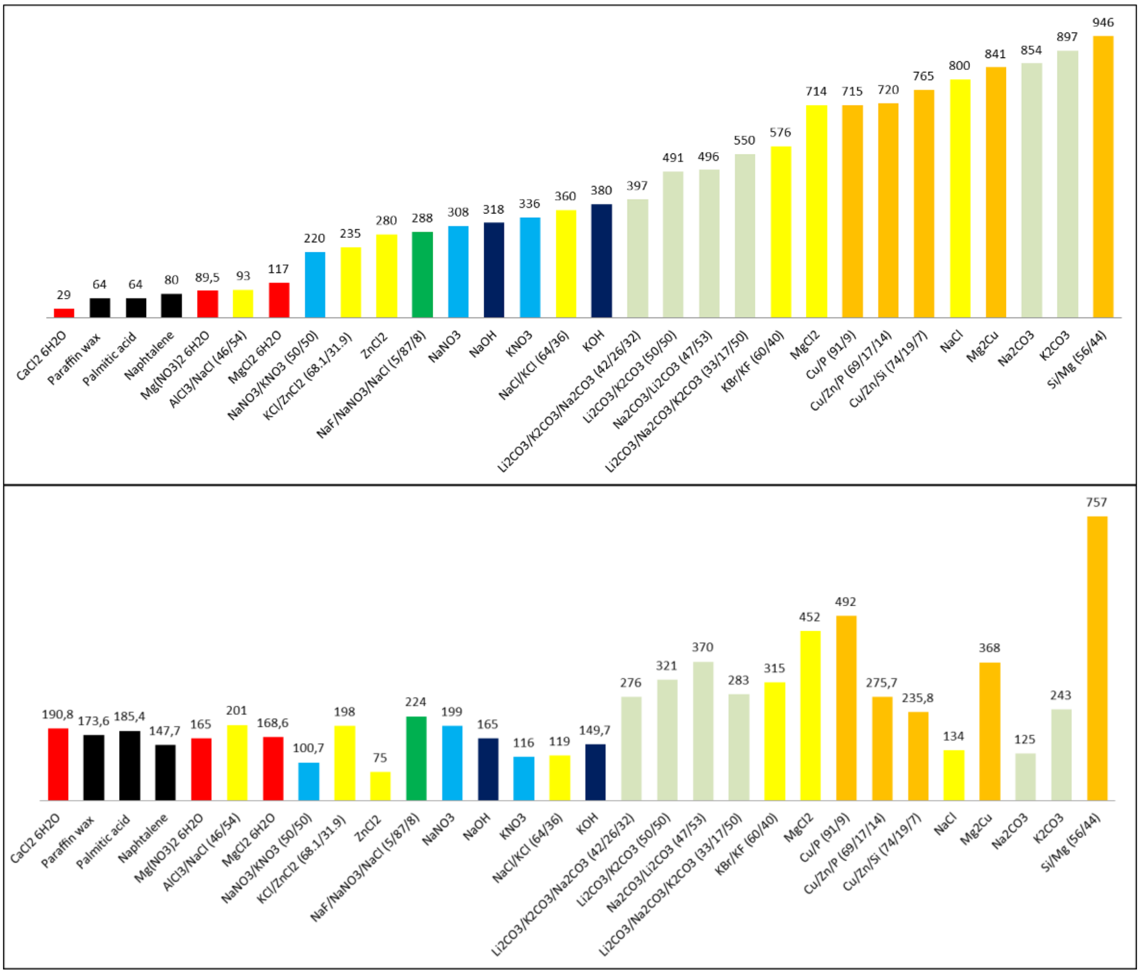


Figure 37. Phase change (melting) temperatures (above, in °C) and latent heats (below, in J/g

of some representative PCMs.

- The activities carried out in the second period in the framework of the Subtask 15.3.7 overlap with the ones present in the other subtasks in Task 15.3. All the experimental and literature data collected by the partners are being classified and, where possible, completed. The aim of the task is the preparation of a database containing information about materials for CSPs, as more complete as possible. At this aim, besides the data obtained in the rest of the WP, dedicated literature researches will be included. The completion of this task is scheduled for month 48.

1.3 Project management during the period

1.3.1 List of Beneficiaries

Participant Number	Participant name	Participant short name	Country	Date enter project	Date exit project
1 (CO)	CENTRO DE INVESTIGACIONES ENERGETICAS, MEDIOAMBIENTALES Y TECNOLOGICAS	CIEMAT	Spain	1	48
2	AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE	ENEA	Italy	1	48
3	DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV	DLR	Germany	1	48
4	PAUL SCHERRER INSTITUT	PSI	Switzerland	1	48
5	EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZURICH	ETH Zurich	Switzerland	1	48
6	COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES	CEA-INES	France	1	48
7	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	CNRS	France	1	48
8	INESC ID - INSTITUTO DE ENGENHARIADE SISTEMAS E COMPUTADORES, INVESTIGACAO E DESENVOLVIMENTO EM LISBOA ASSOCIACAO	INESC-ID	Portugal	1	48
9	UNIVERSIDADE DE EVORA	U.EVORA	Portugal	1	48
10	UNIVERSITE DE	UNILIM	France	1	48

Participant Number	Participant name	Participant short name	Country	Date enter project	Date exit project
	LIMOGES				
11	EUROPEAN SOLAR THERMAL ELECTRICITY ASSOCIATION	ESTELA	Belgium	1	48
12	UNIVERSITA DEGLI STUDI DI ROMA TOR VERGATA	UTV	Italy	1	48

1.3.2 Consortium management tasks and achievements

Work package no.	**WP 1**	Plan-Start:	**M01**	Plan-End:	**M48**
Lead Participant	**CIEMAT**	Actual-Start:	**M01**	Actual-End:	**M48**
Work package title	Management				
Activity Type	Management activities				
Participant involved	**CIEMAT**				
Work package summary of progress towards objectives					

During the second reporting period the private section of the website has been updated regularly as a general coordination activity (http://sfera2.sollab.eu/others).

As it was decided in the second coordination meeting and reported in the first reporting period, the third and last coordination meeting will take place at the end of the project (between October and November 2017). However, and following also the recommendations given by the technical coordinator of SFERA-II to the WPs leaders, several internal WPs' coordination meetings were carried out from July 2015 until December 2016. A summary of the minutes from each one of those meetings is presented here. Complete minutes have been uploaded in the private section of SFERA-II website.

Internal coordination meetings in WP 11:

Different technical meetings were held separately for the two tasks in WP11. Regarding Task 1, continuous informal meetings between the work package leader and task leader have been performed. Additionally, two meetings (the 19th of November, 2015 and 11th of May, 2016) have been celebrated inside Task 1 (corresponding minutes have been uploaded in the private part of the SFERA-II website).

Regarding Task 2, the work was already advanced during reporting period 2 and short informal meetings regarding the optimal operation of the cp measurement device were held with the work package leader, task 2 leader, and scientific staff. The resulting work and conclusions of these informal meetings were reported in deliverable 11.8, submitted on May

2016.

Internal coordination meetings in WP 12:

Several bilateral discussions between the tasks leaders of this WP have been carried out via e-mail, mainly concerning tasks 2 and 3 between PROMES and PSI and task 5 between INESC-ID and PROMES.

On the 7th of April 2016 an internal web-meeting on the subject: “Coordination of planned experiments at CNRS-PROMES” was carried out and was attended by one researcher from CNRS-PROMES and INESC-ID; and two from PSI (coordinators of this WP). In such meeting, it was discussed the importance of knowing thermal diffusivity of samples (sample should maintain constant temperature while concentrated radiation is modulated) and it was concluded that "Double Modulation Pyrometry is free to choose modulation frequency; Frequency allowed by fast shutter is limiting and a few ten Hz seems reasonable”. In addition it was designated as an interesting point to be included in a future project the difficulty on maintaining gain calibration of "Double Modulation Pyrometry".

Internal coordination meetings in WP 13:

In this WP only internal discussions by e-mail and phone were carried out between tasks leaders depending on the activities to be carried out within each task.

Internal coordination meetings in WP 14:

The fifth internal coordination web-meeting of this WP was held the 27th of April 2016. It was attended by five researchers from CIEMAT-PSA (coordinators of this WP) and two from the DLR. The main objective of this meeting was checking the progress of the four Tasks included in this WP14 of SFERA-II project and to evaluate their status according to the planned time schedule. No modification on time scheduled for tasks 14.1, 14.2 and 14.3 was required. Regarding task 14.4 it was indicated that all necessary instrumentation for the installation of the testing infrastructure for collectors´ interconnections was already at PSA and that the maintenance PSA team will provide support for its installation and wiring. The start-up was expected by October/November 2016.

The sixth internal coordination web-meeting of this WP was held the 27th of July 2016. It was attended by four researchers from CIEMAT-PSA (coordinators of this WP) and one from the DLR. The only item that should be highlighted from this meeting is that some delay has affected the delivery of the hydraulic unit and the metallic structure of the test bench for testing collectors’ interconnections. In addition, there is also some delay in the SCADA and electrical systems though it is expected that the new test facility will be ready by month 36.

Internal coordination meetings in WP 15:

In addition to internal exchange of e-mails regarding the activities to be carried out within each task from WP15, one coordination web-meeting was carried out the 4th of October 2016 attended by a researcher from ENEA (coordinators of this WP), UTV, DLR and CIEMAT. The main objective of this meeting was to review the status of each task.

It is important to highlight that there have not been any coordination problems in this first reporting period.
In addition, tight collaboration with other projects focused on CSP topic such as STAGE-STE

and EU-Solaris has been stablished along this second reporting period.

1.3.3 Project planning and status

Project planning initially scheduled in Annex I will be followed.
Actual status of the project is in concordance with what was scheduled in Annex I.

2 Bibliography

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