Task III: Solar Technology and Advanced Applications

Activity Overview

Peter Heller, DLR, OA Task III

EXCO Meeting 09.09.2012, Marrakech, Morocco

Task III Activities and Goals

- Prioritization of R&D activities with high impact on cost reduction
- Reliability Evaluation of solar components and systems
- Methods for durability and life time predictions
- Tools and methods for quality assurance of concentrator systems
- Guidelines for component performance measurements
- Component performance in desert environment (soiling, extinction, cleaning)

SolarPaces Cooperations towards Standards

Task Meetings

Date	Place	Participants
19.9.2011	Granada	56
10.9.2012	Marrakech	40

Work Groups for development of standards:

Guideline	Leader	Participants	Guideline Status
Reflectance Characterisation	C. Kennedy	NREL, DLR, CIEMAT	Draft finished
Mirror Shape Characterisation	E. Luepfert	DLR, NREL, CIEMAT, ISE	30.4.2012 (31.9.2012)
Receiver Performance Characterization	C. Kutscher	NREL, DLR, CIEMAT, CENER	Expected 2013
Lifetime and Durability Testing	P. Heller/ C.Kennedy	NREL, DLR, ISE, CIEMAT	Expected 2014

Status Standardisation Activities

IEC (International Electrotechnical Commission)

- **TC 117, Mirror Committees in several countries established**
- **2nd working group meeting October 2012, Israel**

ASTM/USA:

- **PTC 52 (Performance test code), 4 working group for CSP established**
- **contributions mainly by industry**

AENOR/Spain:

- **Subcommittee AEN/CTN206/SC1**
- **working groups for CSP established („WG1-WG3“: systems, storage, components)**

DKE /Germāny:

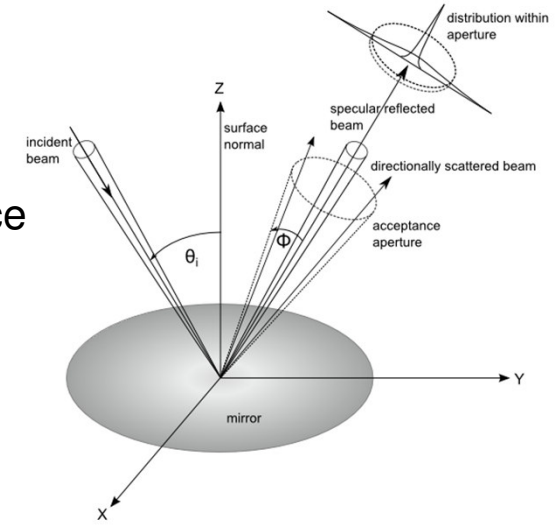
- **Mirror Committee 374 established**
- **DKE project for standards preparation for reflectance and mirror shape measurement**

SolarPACES Project, Phase 1:
Development of guidelines for standards for CSP components

Titel: Measurement of solar weighted reflectance of mirror materials for concentrating solar power technology with commercially available instrumentation

Scope:

- guidelines for measurement of
  - solar weighted specular reflectance
  - solar weighted hemispherical reflectance
- applicable to solar mirrors as
  - 1st or 2nd surface mirrors
  - silver or aluminium as reflective layers



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SolarPACES Project, Phase 1:
Status

- ✓ Reliable results due to improved calibration
- ✓ Draft of guideline published by SolarPACES in 5/2011
- ✓ Sharepoint has been created at „solarpaces.net“ for editing of documents and public discussion
- ✓ Technical meeting concerning the technical issues of discrepancy has been held last Friday 07.09.2012, results will be presented on Monday 10.09.2012
- ▪ Second interim draft guideline version is aimed to be prepared by spring 2013
- ✓ Actually discussed in AENOR, ASTM, DKE, IEC
- ✓ Initiation of development of new instruments

Working meeting results

- Purpose of guideline to serve R&D, customers and manufacturers
- Different proposals for improved measurement procedures for future
- Set of parameters that are relevant for all solar mirror materials
- Simplifications that might be applicable for mirrors with certain characteristic
- Dividing of procedures for complete product characterization and procedures for production line qualification
- Action items:
    - Draft and review second version of guideline
    - Perform a round robin test to validate the proposed methods

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SolarPACES Project, Phase 2:
Development of guidelines for standards for CSP components

Titel: Measurement guideline for mirror (and module) shape (MGM-12)

Scope:

- Preparation of a publishable guideline
- Measurements under laboratory conditions
- Include different measurement technologies
- Include different mirrors (size, shape, composition, materials)
- Introduce relevant measurement configurations and evaluation criteria for different CSP technologies

Participants: DLR, NREL, CIEMAT, ENEA, Sandia

Budget: 25.000 €

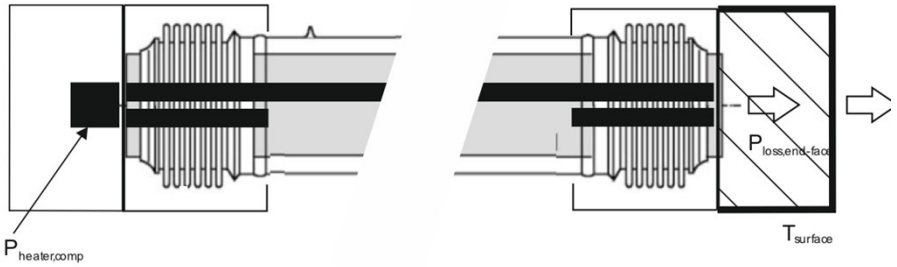
Duration: 01.05.2011 – 30.04.2012

Status MGM-12

- ✓ Draft guideline for mirror shape measurement finalized
- Discussion with experts at Task III Meeting , Marrakech
- Publication at SolarPACES website 10/2012
- … and introduced in IEC and Mirror Comittees in AENOR, DKE, ASTM etc.
- Round Robin test
- Finalization of guideline by 03/2013

Phase 3: Receiver Performance Characterization

- **To develop uniform guidelines for the performance testing of evacuated receiver tubes**



a) Compensation heater

b) Insulation plus heat flux correction

Phase 3: Receiver Performance Characterization

Status

- Guideline cover laboratory heat loss measurement; optical performance may be covered in future
- DLR sent out 13-page draft for review July 19
- NREL collected comments, and revised; sent out revision on September 6
- At Sept. 10 Task III meeting in Marrakech will review major points, discuss issues such as direct heating requirements and required temperature test conditions
- Barring any unexpected new concerns raised on Monday, current document appears to be close to final review

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Lifetime and durability testing

Status

- Several labs are well equipped for ageing and durability test
- AENOR proposes the use of existing standards for glass mirrors
- Nevertheless more knowledge necessary for more systematic approaches to reduce certification efforts at industry and improve lifetime prediction
  - SolarPACES community should increase efforts
- Systematic approaches under way for aluminum mirrors
- Films and foils not yet covered satisfactorily

Topics of the task meetings

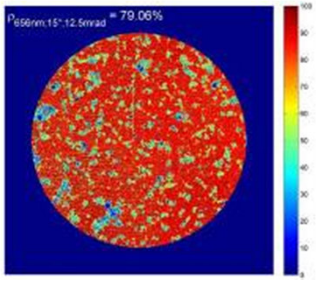
- Progress of actual activities
- How proceed with Phase 3 of the SolarPACES project ?
- New activity: guideline for testing of storage system and components
- New heliostats guideline initiative
- Durability testing and lifetime prediction: create substructure for working groups

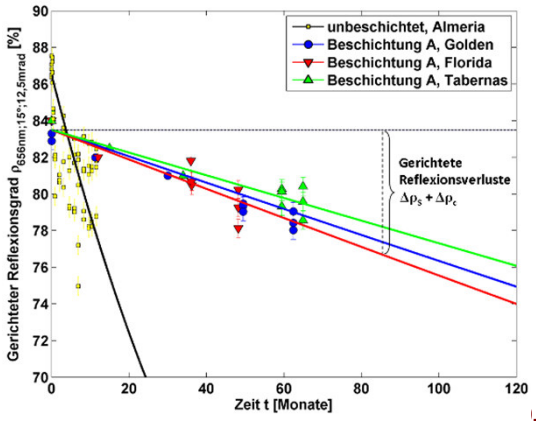
Alumir: Development of methods for accelerated ageing of aluminum reflectors

- Partner: DLR, Alanod, Alcan, Almeco, (Ciemat)
- Start: 1.11.2011, 3 years
- Funding: German Ministry of environment, nature protection and nuclear safety

Goals:

- Develop improved reflectance function measurements
- Exposure of reflector samples in desert and sea climates
- Identification of ageing mechanisms
- Development of accelerated ageing tests



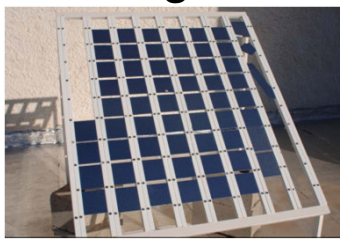


Helmholtz-NREL Solar Energy Initiative

- Analysis of typology of different desert environments concerning **soiling** and weather characteristics
- Measurement of **extinction** in different desert zones and implementation in models for tower plants simulations.
- New instruments to monitor soiling and extinction
- Development of **cleaning** procedures with low **water consumption**

extinction

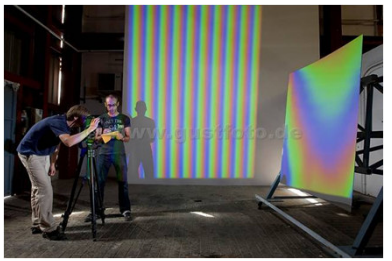
soiling



cleaning

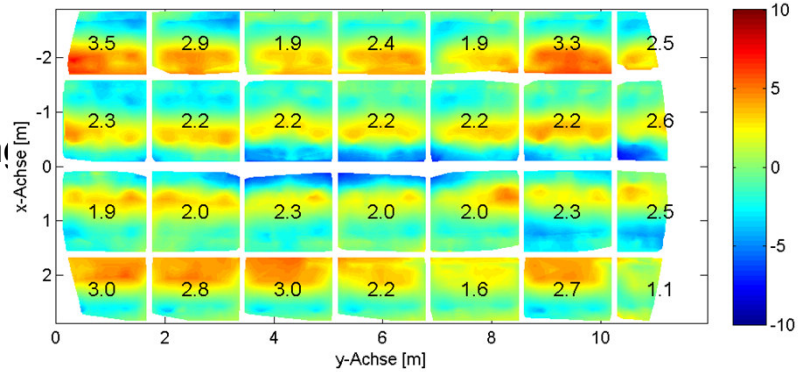
Stamep: Development of standardized test methods for CSP components

- Partner: DLR, ISE
- Start: 1.05.2012, 3 years
- Funding: German Ministry of environment, nature protection and nuclear safety



Goals:

- Improve methodology of test procedures
- Develop improved methods and instruments
- Support standardization activities of IEC and DKE Mirror Committee
- Topics:
    - Specualr reflectance measurements
    - Mirror shape measurements
    - Optical and thermal absorber performance testing
    - Field acceptance testing
    - Flexible hoses testing



Thank you for your attention…