Parabolic Trough Activities at DLR, Solar Energy Technology Division

presented by

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at the

2. Parabolic Trough Technology Workshop

in Ontario, CA

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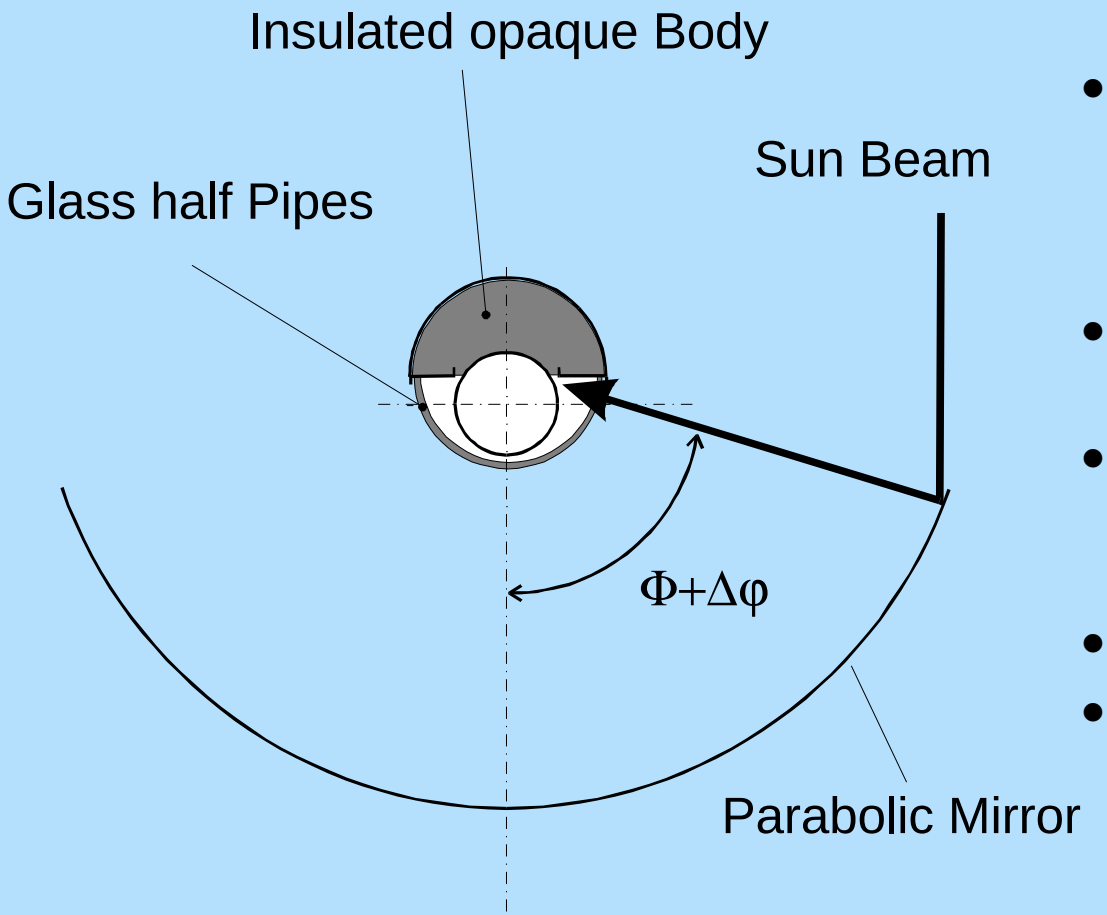
Actual Project Overview

- Annual / Daily Time-Step Simulation of Performance (TRNSYS)
- Broken Glass Tube Provisional Replacement
- End Reflector Mirror
- Optical Flux Measurement System
- Process Heat Collector Development
- Outdoor Reflector Material Testing (International Collaboration in the scope of IEA - SolarPACES)

Broken Glass Tube Provisional Replacement



- for replacement of HCE‘s with broken glass envelops in parabolic trough collectors
- can be easily mounted into the field
- insulation of the not irradiated zone of the absorber tube
- can be reused
- cost of prototype approx. 105 $/m (24 m)

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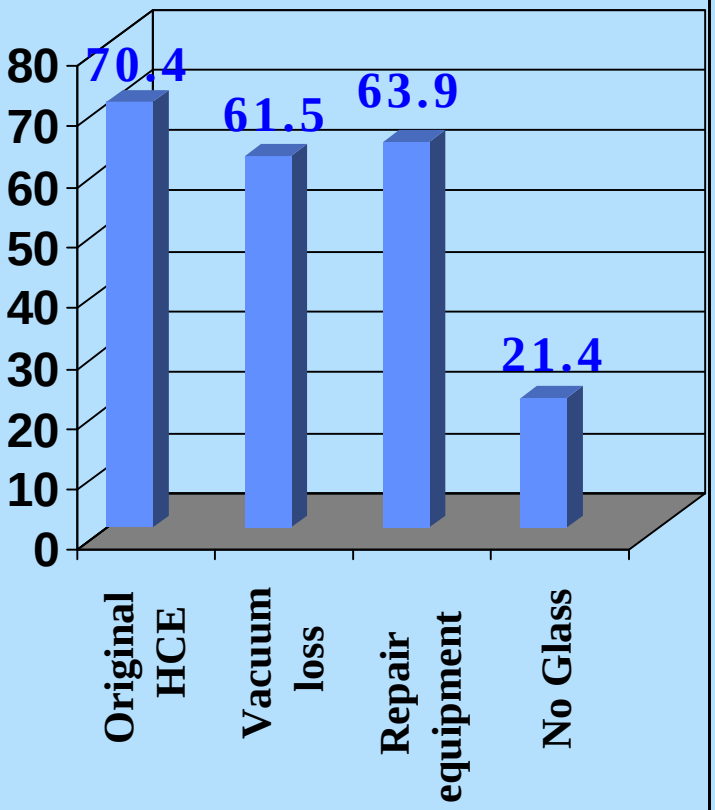
Broken Glass Tube Provisional Replacement:

Theoretical Efficiency Prediction

Assumptions

- Irradiation (normal, direct): 900 W/m²
- Average oil tube temperature: 350 °C
- turbulent oil flow (Re = 42.000)
- Oil: Syltherm 800
- Ambient temperature: 25 °C
- wind velocity: 2.78 m/s
- Emissivity absorber tube: 7 %
- Optical efficiency: 76 %



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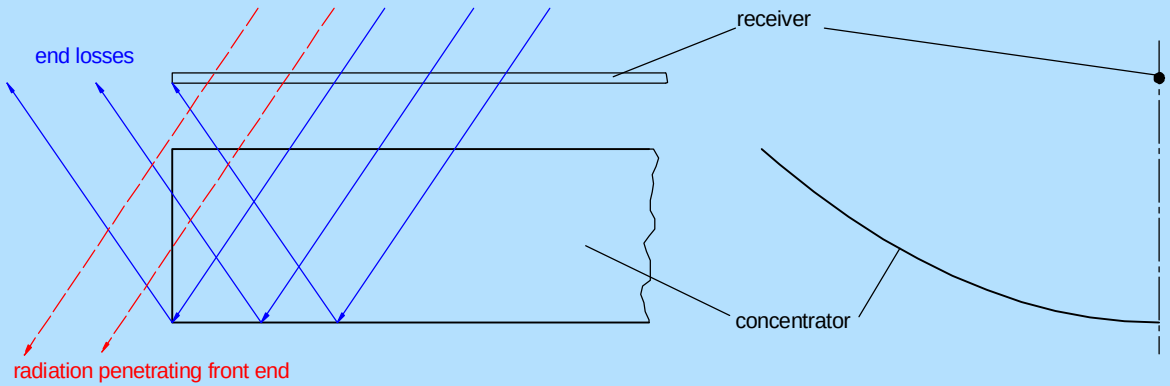
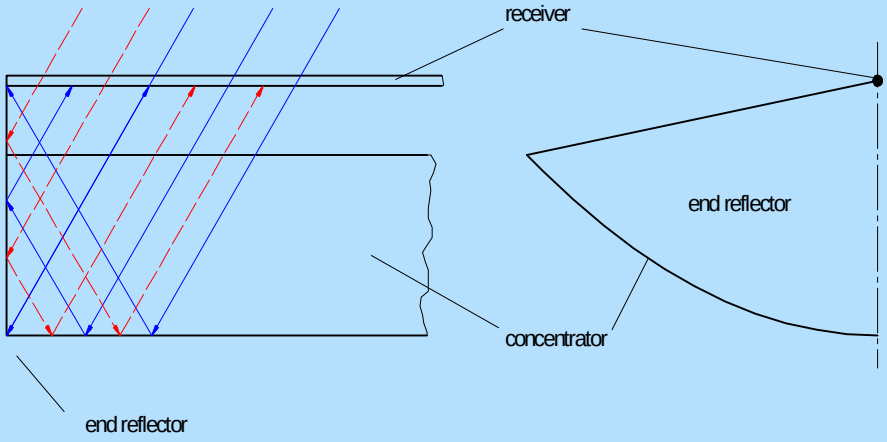
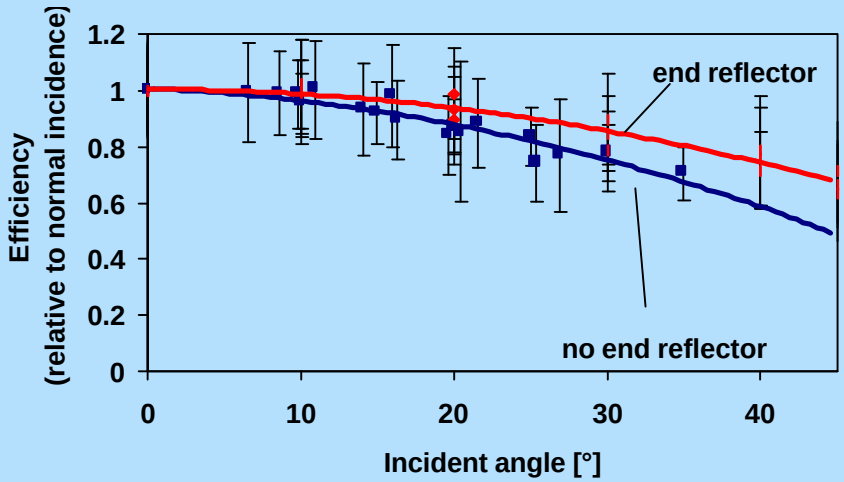
End-Reflector Mirror in Troughs





Prototype Testing on PSA LS-3-loop



Annual Efficiency
of 50 m loop: 39.9 → 42.2 %
Costs (6m²): 1500 Euro
Annual Yield: 13400 kWh

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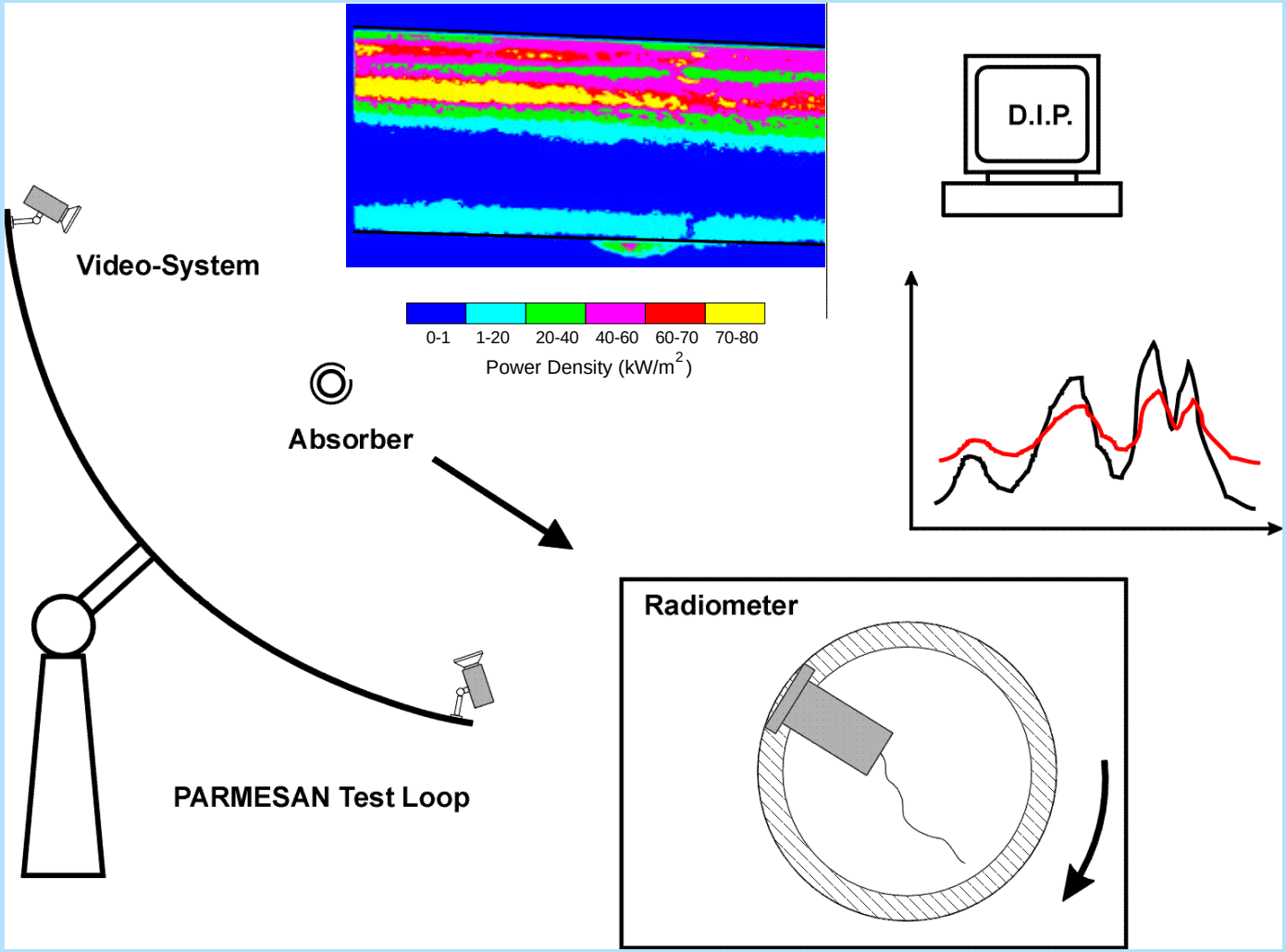
Optical Flux Measurement for Troughs



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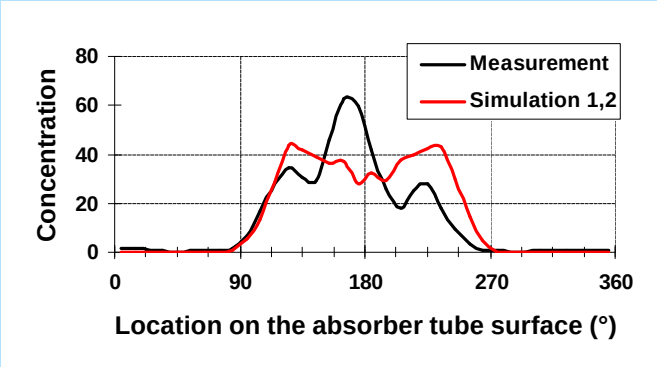
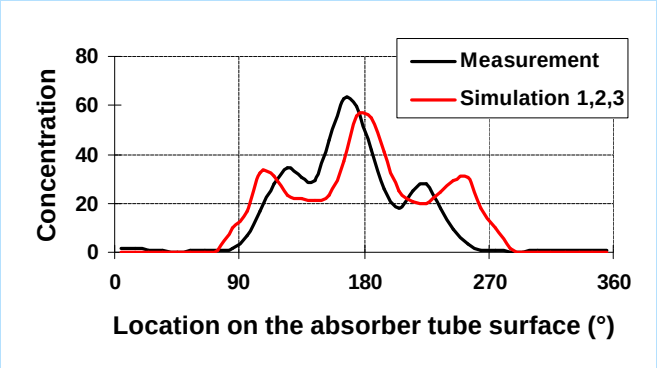
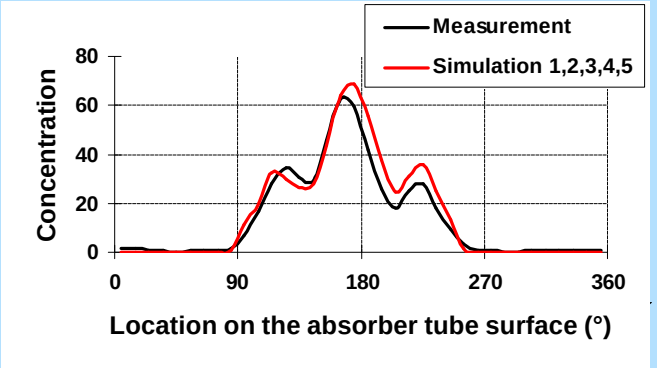
- **Adjustment of Measurement and Simulation considering:**

1. Sunshape
2. Surface Errors
3. Slope Errors
4. Tracking Errors
5. Absorber Displacement







Process Heat Collector Development

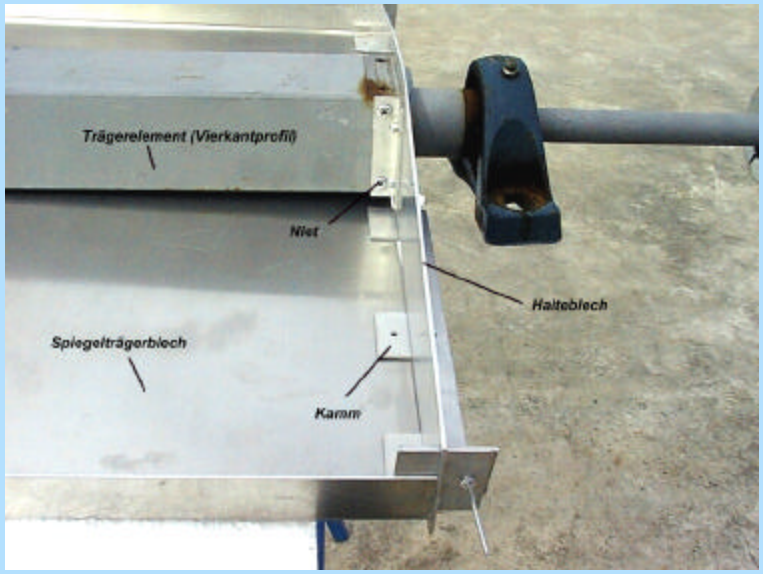
Reference System

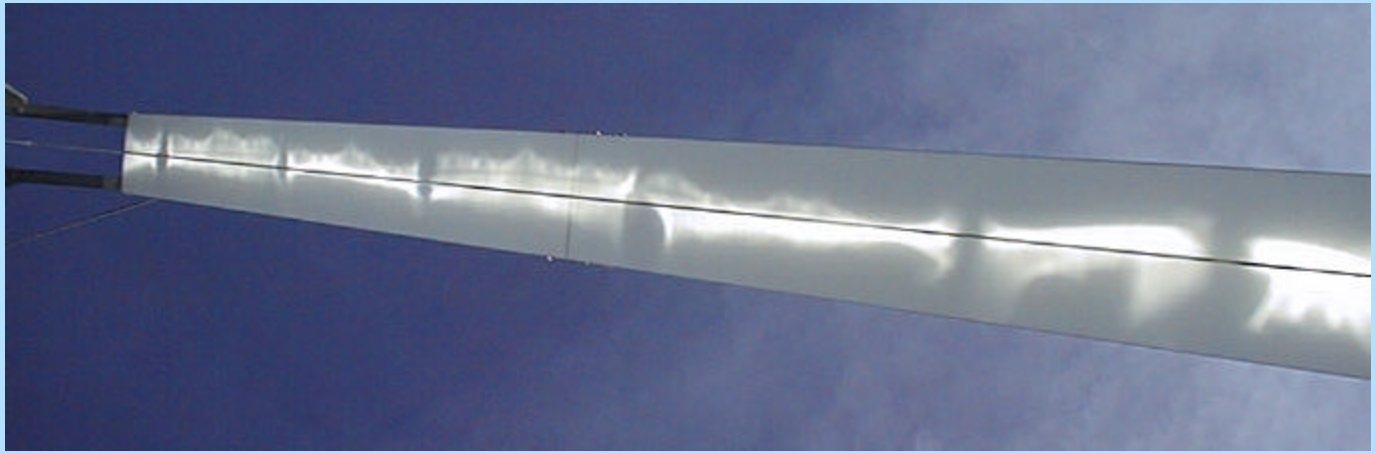
- IST Reference Collector
- 168 m²
- Designed for pressurized water (20 bar)

New Development

- Facetted Fix-Focus Kollektor (36 m²)
- Adapted for flat roof integration
- Water / Air Receiver

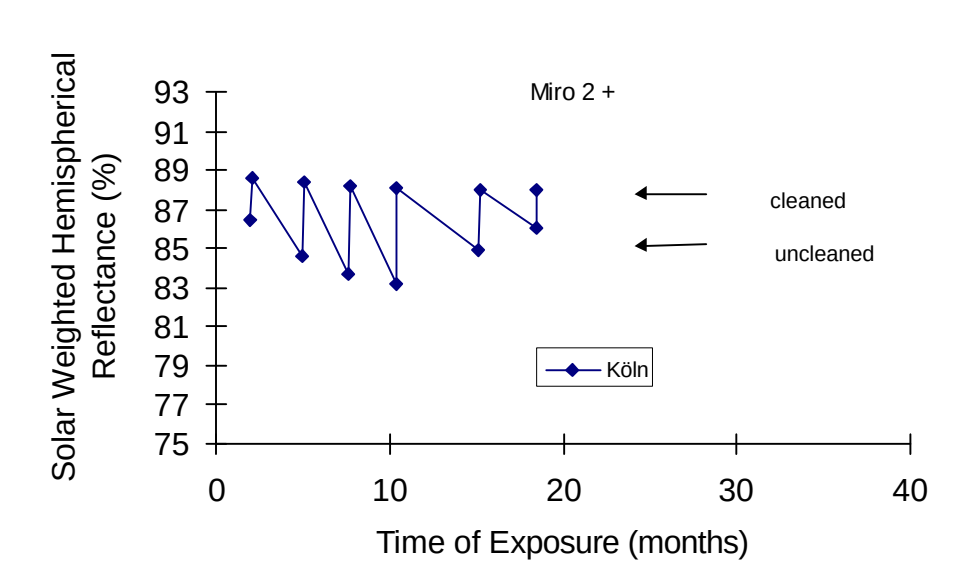
Light-Weight Facet for Fix-Focus



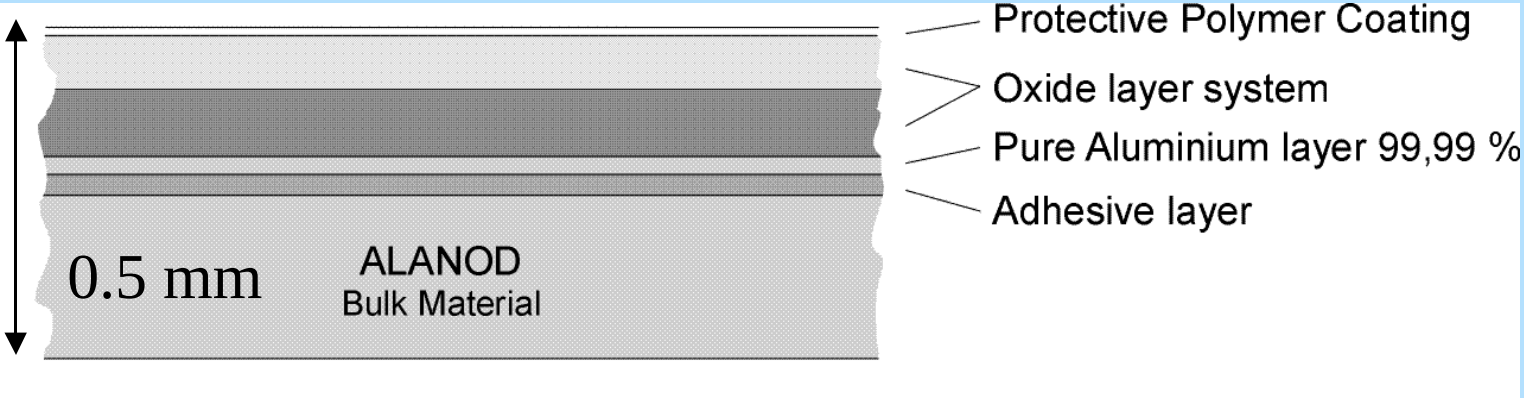


Outdoor Reflector Material Testing

ALANOD Miro 2+



- durable outdoor reflector
- costs of 21 $/m²
- 1 IST collector module equipped with Miro 2+



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