Modelling and Design of a Pressurized Solar Air Receiver for Concentrating Solar Power (CSPCore-2)

A joint India-U.S. research consortium funded under the *Joint Clean Energy Research & Development Center (JCERDC)*

Scientific Achievement:

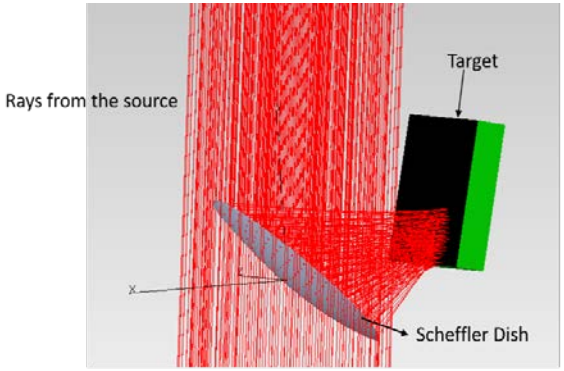
A Scheffler optical concentrator was geometrically modelled and ray-tracing analysis was performed to obtain input power to the receiver. A novel cavity-air-receiver with porous absorber was subjected to CFD and CHT analysis for design optimization.

Significance and Impact:

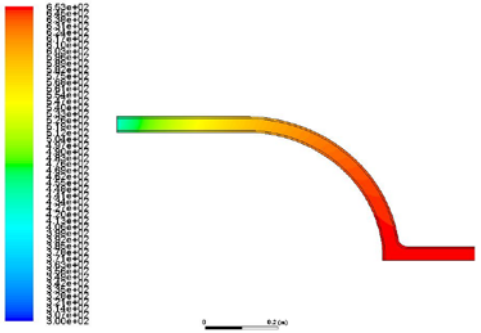
A simplified model assuming a 2D steady-state axisymmetric model of the cavity receiver is analyzed by modelling using the commercially available ANSYS FLUENT software package.

Research Details:

- Ray tracing analysis of the Scheffler concentrator was carried out using Monte Carlo simulation implemented in TracePro software.
- Novel cavity-air-receiver with the flexibility of using steel and SiC porous media in the flow domain.
- Constant heat flux is assumed on the cavity surface. Loss modelling of the receiver involves natural convection loss and re-radiation from the cavity receiver. A Fluent UDF script was used for the same.
- Porous medium thermal model is assumed to be Local Thermal Equilibrium model.



Ray-tracing analysis of Scheffler concentrator using target at focal point for receiver input power determination.



Temperature distribution in the receiver with steel as porous medium solid for flow rate 0.02 Kg/s and pressure of 20 bar.

Publication(s): S. Sasidharan, P. Dutta, Modelling and Design of a Pressurized Solar Air Receiver for Concentrating Solar Power, Proceedings of the 24th National and 2nd International ISHMT-ASTFE Heat and Mass Transfer Conference (IHMTC-2017), Dec. 27–30, 2017, BITS Pilani, Hyderabad, India.

Contact(s): Sayuj S (sayujs1@gmail.com); Pradip Dutta (pradip@iisc.ac.in)