Heliostats field for a hybrid Brayton concentrated solar power plant

Rosa Pilar Merchán Corral[1,2,*], María Jesús Santos Sánchez[1,2], Alejandro Medina Domínguez[1,2], Irene Heras Pérez[1,2] and Antonio Calvo Hernández[1,2]
[1]*Department of Applied Physics, Universidad de Salamanca, Salamanca (Spain)*
[2]*IUFFYM, Universidad de Salamanca, Salamanca (Spain)*
**rpmerchan@usal.es*

Concentrated solar power plants, a renewable energy technology, constitute one of the best ways of producing dispatchable and clean energy. In central receiver plants, a heliostats field concentrates the Sun energy into a receiver located in the top of a central tower. This receiver transfers the solar heat to a power cycle. The present work is focused on modeling the heliostat field of the power plant. For that, some geometric and size parameters of the receiver, the tower and the heliostats are taken into account. In the solar energy transfer process, there exist several losses factors as the solar radiation blocking between heliostats or the solar radiation attenuation due to the atmospheric particles. The heliostats field model has been implemented in Mathematica®, creating our own software. For the model validation process, Campo Code software (a standard well-accepted package) [1] has been employed. Results from our model have been compared to the ones of Campo Code getting similar values. Optical efficiency has been evaluated at the design point (see Fig. 1) and at dynamic conditions through different seasons and along a day. For the design point (21st June 2013 at 12h), this efficiency gets values around 0.674. Heliostats field efficiency maps for the different simulations show that the highest efficiency is always related to the heliostats opposite the Sun, which agrees with the results obtained by W. Stine and M. Geyer [2].

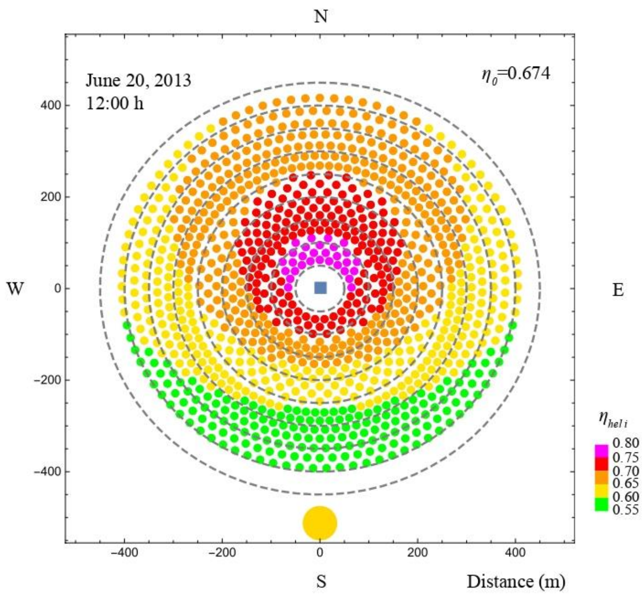

Figure 1. Heliostats field efficiency map at design point.

Referencias

[1] F. J. Collado and J. Guallar. A review of optimized design layouts for solar power tower plants with campo code. Renew. Sust. Energ. Rev. 2013; 20, 142-154.

[2] W. Stine and M. Geyer. Power from the Sun. Chapter 10: Central Receiver Systems. [Internet]. [revised 10/06/2019; cited 26/07/2019]. Available from: http://www.powerfromthesun.net/