COMPARISON OF RADIATIVE HEAT TRANSFER METHODS USING BENCHMARK TEST CASES

Klaus-Peter Helbig[*], Pedro Coelho[**], Joaquim Chamiço[***], John Marakis[***], Aristide Mbiock[****], Roman Weber[****] and Sauro Pasini[*]

[*]Enel Produzione, Research,
Via Andrea Pisano 120, 56122 Pisa, Italy

[**] Instituto Superior Técnico, Mechanical Engineering Dept.,
Av. Rovisco Pais, 1049-001 Lisboa, Portugal

[***]Institute of Fluid Mechanics, University of Erlangen,
Cauerstrasse 4, 91058 Erlangen, Germany

[****]International Flame Research Foundation, Research Station b.v.
PO Box 10 000, 1970 CA IJmuiden, The Netherlands

ABSTRACT. This paper describes the numerical calculation of radiant heat exchange within thermal enclosures using four different radiation models: Monte Carlo-, Discrete Transfer-, Discrete Ordinates- and Boundary Element- Method. A comparison of the incident heat flux and heat source predicted by the four models is reported for two test cases representing combustion chambers. Conclusions are drawn concerning accuracy of the numerical methods, sensitivity of angular discretisation, spatial discretisation and computational performance. It is shown that the predictions of all the methods are in close agreement, within an error margin generally below 5%.