Surface to Surface Radiation Benchmarks

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Abstract

The paper presents a student guide on how to implement surface to surface radiation within COMSOL Multiphysics® for case studies found within the built environment. The paper is based on the work of Eck and Klep [1]. We included four benchmarks: (1) Radiation in a triangular cavity with infinite length; (2) Radiation between two infinitely long rectangular plates; (3) Radiation in a three dimensional rectangular enclosure; (4) Radiation in an ice rink building. We conclude that COMSOL benchmark results are satisfactory. The files are available at the HAMLab website [2].

Reference

[1] R. v. Eck, COMSOL Multiphysics: Surface-to-Surface Radiation Modeling Guide, 7LS4M0 Report, Eindhoven University of Technology (2016)
[2] HAMLab, http://archbps1.campus.tue.nl/bpswiki/index.php/Hamlab (2016)
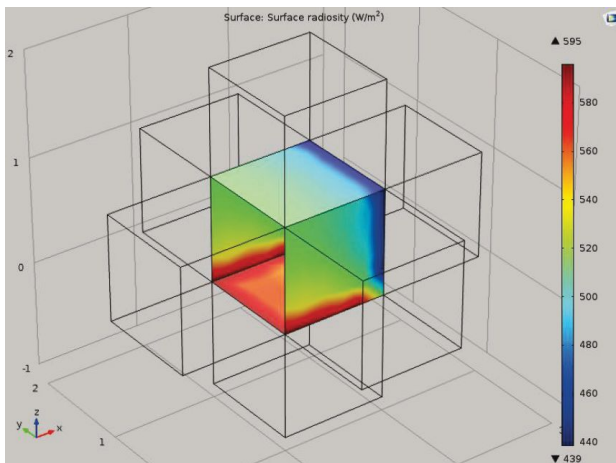
Figures used in the abstract

Figure 1: The result of Surface to surface Radiation benchmark.

Table 1: Case study 2: comparison analytical solution and model output

Parameter	Analytical	COMSOL Multiphysics	Difference [%]
High temperature case:			
Black body surface temp [K]:	1265.00	1247.50	1.38
Heat flux [kW]	77.40	75.95	1.87
Low temperature case:			
Black body surface temp [K]:	309.24	308.44	0.27
Heat flux [W]	54	53.75	0.46

Figure 2: Case study 2: comparison analytical solution and model output.