

SUpport to SAfety ANalysis of Hydrogen and Fuel Cell Technologies

Verification type	Analytical Solutions
Database reference	ANA-2
Topic / Application	Hydrogen LES
Physics	Detonation
Summary	Authors use LES to simulate hydrogen-air detonation. The solution is verified against a simplified /analytical model (ZND).
Description	A large eddy simulation (LES) model of hydrogen—air detonation at very large scales, is presented. The LES model is verified against theoretical solution by the Zel'dovich—von Neumann—Doring (ZND) theory for a case of planar 29.05% hydrogen—air detonation in elongated 3 x 3 x 100 m calculation domain.
	A Riemann problem (RP) is also simulated as it gives an exact solution to non-linear equations like the Euler equations.
	The numerical simulation reproduced theoretical values of von Neumann spike, Chapman–Jouguet pressure, Taylor wave and detonation propagation velocity.
Case Title	LES Model of Large Scale hydrogen-air planar detonations; verification by the ZND theory
Authors	Zibrowski, M. Marakov, D. Volkov, M.
Year	2008
Online reference	International Journal of Hydrogen Energy 33 (2008) 4884-4892
Case image	Comparison between analytical solution and numerical
	simulation of the Riemann problem

The SUSANA project is co-funded by the European Commission within the 7th Framework Program



SUpport to SAfety ANalysis of Hydrogen and Fuel Cell Technologies

Governing equations	
Results	