Research on Hypersonic Inlet Leading Edge Radius Effect on Wall Static Pressure and Heat Flux

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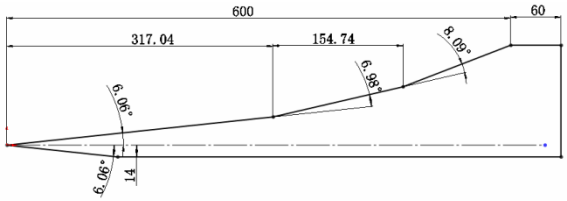
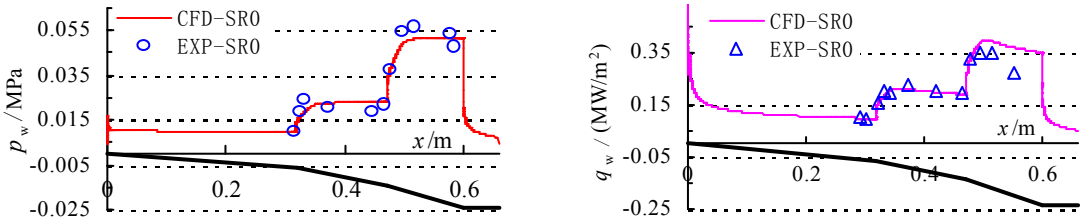
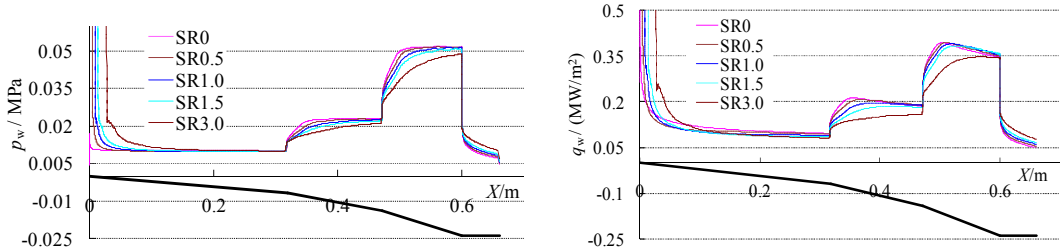
Abstract: The effect of hypersonic Inlet leading edge radius on wall static pressure and heat flux on external compression surfaces was investigated through experiment and CFD, and two dimensional flow field parameters were obtained by FLUENT. The test models have three compression surfaces, the total length of the compression surfaces is 0.6 meter, and the radius of the forebody leading edge is 0～3mm. The test tunnel is shock tunnel, and the test condition is at M5.98, with total temperature of 670K and total pressure of 6.557MPa. The wall static pressure and heat flux datum were repetitious in duplicated experiment. It shows that the wall static pressure distribution is similar with three different viscous models, all of which are coincident with experiment results; the wall heat flux distribution is different with different viscous models, and the results from standard *k*-*ε* model are coincident with experiment results. On the second and third compression surfaces, wall pressure increases gradually downstream shockwave reaching a pressure platform, while heat flux increases gradually downstream shockwave reaching a local maximum, and then decreases gradually on the compression surface. With the radius of the leading edge increasing, the value of pressure platform and heat flux local maximum becomes smaller, and the length reaching pressure platform and heat flux local maximum becomes longer.

Key words: Hypersonic inlet, External compression surface, Wall static pressure, Wall heat flux, Radius of forebody leading edge, Shock tunnel





Wall static pressure and heat flux distribution from experiment and CFD



Wall static pressure and heat flux distribution with different radius of forebody leading edge