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Fundamental resonance induced by a 3D shallow roughness IGOR PAULA, USP - EESC/Universität Stuttgart, MARCELLO MEDEIROS, USP - EESC, WERNER WÜRZ, Universität Stuttgart, MARCIO MENDONCA, CTA - IAE — The present work consists in a experimental study of the effect that a shallow in 3D roughness element has on the evolution of a 2D Tollmien-Schlichting wave in a Blasius boundary layer. The experiments were carried out in the laminar wind tunnel of the Universität Stuttgart. The TS source and the roughness element were mounted in an airfoil model. The roughness used in these experiments was a cylindrical element. The height of the roughness was slowly oscillated. The oscillation frequency was approximately 1500times lower than the frequency of the studied TS waves. The synchronization of all equipments permitted the using of ensemble average techniques. Thus, time signal from hot-wire was averaged and the results corresponding to different roughness heights were obtained by windowing of this time series. Two amplitudes of TS waves were studied and the results are reported. The experimental growth rates of the 2D and 3D modes were measured. The results show a strong amplification in a small spanwise wave number range. The growth rates of this wave numbers were compared with the secondary instability theory provided by a PSE solver. The comparison shows that the oblique modes selected are in agreement with the most unstable ones predicted by theory.

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