# Fracture Mechanics research at *Mechanical Engineering Research Institute* of the *Russian Academy of Sciences*

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**Abstract**

Fracture Mechanics is currently an essential subject for understanding failure mechanisms of engineering materials and components. Accurate and rapid evaluation of singular and non-singular terms of stress, strain and displacement fields in the neighbouring of the tip of a fatigue crack is the foundation of multi-parameter Fracture Mechanics [1]. These terms are normally described by means of the Stress Intensity Factor (SIF) and the T stresses and are very useful to assess the level of safety [2] and the stability of cracks and crack-like defects in mechanical components prone to linear elastic failure, both under constant [2–7] and variable amplitude loading [8–11]. In general, evaluation of such terms cannot be performed only by finite element method [12–14]. This is due to the difficulty in accurately accounting for load level and exact geometry and orientation of defects [3,15]. Consequently, hybrid methods that incorporate experimental information [16,17] into an analytical and/or a numerical approach tend to be more trustworthy. Among these, full-field experimental techniques such as electronic speckle pattern interferometry [18–20], digital image correlation [21–27], thermo-elastic stress analysis [28–30], X-ray diffraction [31–33] and photo-elasticity [34–38] are often preferred. Estimation of Fracture Mechanics parameters requires accurate positioning of the crack tip. Moreover, local deformations as well as rigid body movements need to be taken into consideration. This research will summarise a general methodology including the above-described aspects for Fracture Mechanics analyses.

**Keywords:** Fracture Mechanics; Stress Intensity Factor; T-stress; full-field techniques; constraint factor; Linear Elastic Fracture Mechanics; Elastic Plastic Fracture Mechanics;

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