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Structural integrity assessment of an ITER ECH&CD Upper Launcher mirror (LM1)

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The Lower Mirror one (LM1) is part of the in-vessel quasi-optical beam propagation system for the ITER Electron Cyclotron (EC) Upper Launcher (UL), in which each of eight beams of mm-waves are reflected from four mirrors during passage to the plasma. 60000 thermal cycles are foreseen at frequencies lower than 3Hz and power levels up to 1.31MW per beam.
This paper reports the means used to accurately ascertain resistance against the following failure modes: 1) plastic collapse, 2) thermal fatigue and 3) ratcheting. Analyses are carried out in accordance with the design-by-analysis approach. Transient thermo-mechanical effects are investigated via finite elements to support the assessment during the thermal cycle.
This structural integrity study of the LM1 mirror using the American code and standards for pressure vessels and piping aims to confirm the compliance of the proposed design.
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