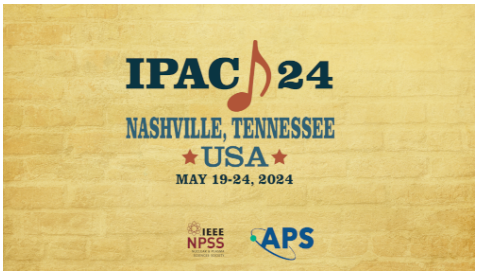

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Understanding of the LHC warm vacuum module heating

Tuesday, 21 May 2024 10:10 (20 minutes)

During the third run of the Large Hadron Collider in 2023, which had the highest intensity bunch population compared to previous runs, increased losses attributed to pressure spikes within a warm vacuum sector triggered a beam dump. Subsequent inspections revealed localised annealing and plasticisation of the tension spring in the sliding contact radio-frequency finger module, alongside traces of vapour deposition on the various module components with the stainless-steel spring material. A comprehensive analysis involving vacuum and beam impedance studies was conducted to investigate the triggering mechanisms behind the radio-frequency finger module failure. The findings indicate localised beam-induced heating, which could lead to the annealing of the spring with a consequent cascade of effects. Additionally, investigations of potential mitigation measures were performed.

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