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Limitations from LHC RF fingers

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During the third run of the Large Hadron Collider in 2023, which had the highest intensity bunch population compared to previous runs, a beam dump incident occurred due to increased losses attributed to pressure spikes within a warm vacuum sector. Subsequent inspections revealed localized annealing and plasticization of the tension spring in the sliding contact radio-frequency finger module, alongside traces of vapor 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 localized 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.

Footnotes

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Primary author: KRKOTIC, Patrick (European Organization for Nuclear Research)

Co-authors: BAGLIN, Vincent (European Organization for Nuclear Research); CHIGGIATO, Paolo (European Organization for Nuclear Research); PAPAPHILIPPOU, Yannis (European Organization for Nuclear Research); RUMOLO, Giovanni (European Organization for Nuclear Research); ANTUONO, Chiara (European Organization for Nuclear Research); BREGLIOZZI, Giuseppe (European Organization for Nuclear Research); CALATRONI, Sergio (European Organization for Nuclear Research); DE LA FUENTE, Elena (European Organization for Nuclear Research); GALLORO, Alessio (University of Calabria); GIACOMEL, Lorenzo (European Organization for Nuclear Research); SALVANT, Benoit (European Organization for Nuclear Research); SITO, Leonardo (University of Napoli Federico II); ZANNINI, Carlo (European Organization for Nuclear Research)

Presenter: KRKOTIC, Patrick (European Organization for Nuclear Research)

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