

# Beam-induced heating of the LHC warm bellows

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Vacuum modules are an essential component of the room temperature sectors of the LHC. They enable to cope with misalignment and thermal expansion/contraction of equipment while keeping the connection vacuum-tight and ensuring good electrical contact between the beam components. The currently installed modules in the LHC machine are composed of a vacuum body and a RF insert. The RF insert guarantees the electrical contact and carry the image current generated by the circulating particles with the use of a series of thin beryllium copper RF fingers kept in place on a copper transition tube using a stainless-steel spring. This strategy ensures electrical continuity between adjacent vacuum chambers, effectively reducing the beam impedance through electromagnetic shielding of the outer bellows. In 2023, during beam intensity increase up to  $1.6 \cdot 10^{11}$  protons per bunch up to  $\approx 2500$  bunches, some failures of the RF inserts happen limiting the bunch intensity in the LHC machine. An overview of the design and understanding of these failures will be presented and future upgrades discussed.

## Summary

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