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Utilizing Raspberry Pi cameras for multipacting observations and beam characterization

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Multipacting is a well-known phenomenon in accelerator cavities,typically appearing at lower RF power levels. To gain a better comprehension and characterization of these resonant discharges, the Institute for Applied Physics at Goethe University Frankfurt has implemented optical diagnostic techniques as part of the FRANZ project. By installing Raspberry Pi cameras both inside and outside the Radio Frequency Quadrupole (RFQ) cavity, we can directly visualize low power multipacting events and even observe the beam passing through the RFQ.
As the conditioning power increases, additional optical phenomena become evident, starting at approximately 15 kW. Moreover, these camera systems enable the detection of beam-induced residual gas fluorescence, providing a direct method to determine the x-y position of the 700 keV proton beam at the RFQ exit.

Footnotes

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