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Development of single mode cavity at 1.5 GHz for the third harmonic RF-system in PETRA IV

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The PETRA IV storage ring currently under development at DESY will require a third harmonic 1.5 GHz RF-system to prevent negative effects on both, lifetime and emittance, caused by Touschek effect and Intrabeam scattering. These cavities lengthen the bunches and thereby reduce their charge density.

For this 3rd harmonic system, a one-cell single-mode cavity with a simple mechanical and electrical structure is under design that should also reduce Higher Order Modes (HOMs) to a quality factor less than 100. Therefore, the well-known approach of the Choke Mode Cavity was chosen, that use a radial line damper to attenuate the HOMs and a radial choke that traps the acceleration mode.

The general behaviour of the choke mode structure was simulated, discussed and optimized for the requirements of a one-cell cavity with high effective shunt impedance, high-quality factor and simple manufacturing.

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Footnotes

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Yes

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