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## Optimizing Touschek lifetime at MAX-IV 1.5 GeV ring with overstretched bunch profiles

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Synchrotron light sources often use higher-harmonic RF cavities for bunch lengthening to enhance Touschek lifetime. By adjusting the harmonic voltage, a flat-potential condition for the longitudinal voltage can be achieved, typically improving Touschek lifetime by 4 to 5 times. It is known that exceeding the flat-potential voltage results in double-peaked bunch profiles, referred to as overstretched conditions. Simulations suggest overstretched profiles can surpass flat-potential improvements on lifetime. In this paper we report on experimental results from MAX-IV 1.5 GeV storage ring, demonstrating a longer beam lifetime with a stable beam in overstretched conditions compared to the flat-potential case. Additionally, a remarkable agreement between measured bunch profiles using a streak camera and predictions from a semi-analytical equilibrium solver was obtained for all tested harmonic voltages.

### Footnotes

### Funding Agency

### Paper preparation format

LaTeX

### Region represented

Europe

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