

# Dominance of particle resonances over parametric instabilities in high-intensity linacs

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For high-intensity linear accelerators, space-charge halo mechanisms are largely classified into two families: particle resonances and parametric instabilities. The dominance between the fourth-order particle resonance and the envelope instability has been argued and studied. Our studies and previous literature indicate the dominance of particle resonances over parametric instabilities in high-intensity linear accelerators. Any counter evidence has not been found yet. Furthermore studies indicate that parametric instabilities except the envelope instability are unlikely to be observed in actual linear accelerators unless waterbag or KV distributions are generated. We propose a way to overcome the previous design rule to avoid the zero-current phase advance  $> 90^\circ$  for the high-intensity linac. The interplay is presented of the envelope instability and the fourth-order parametric instability.

## Footnotes

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