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Ion trapping and instabilities in SLS 2.0

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Residual gas atoms, ionized by the electron beam, may create two effects in an electron accelerator. One is the trapping of ions in the beam channel by the Coulomb forces of the beam and the other is the fast beam ion instability, a dynamic mutual transverse oscillation between ions and electrons.

While the strongly reduced beam emittance of the accelerator upgrade SLS 2.0 is helpful in that situation, it will not suppress ion related effects completely. To avoid ion trapping, a small ion clearing gap of 30 buckets is still required. Enlarged pressures of 1e-9 mBar, as expected before complete vacuum conditioning, may lead to sufficient build up of ions during the passage of the bunch train to provoke fast beam ion instabilities, requiring to employ multiple clearing gaps. At nominal conditions with 1e-10 mBar, a stable operation is expected.

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Footnotes

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Yes

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