

# FINALISATION OF LONGITUDINAL ASPECTS OF LHCINDIV AND LHC PROBE PRODUCTION

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BE-RF-BR

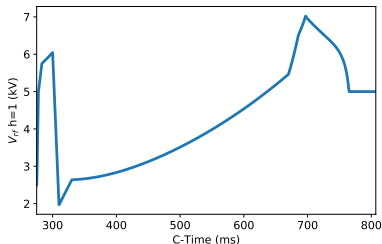
December 5, 2019

**1 RECAP OF VERSIONS 1 & 2**

**2 (HOPEFULLY) FINAL VERSION**

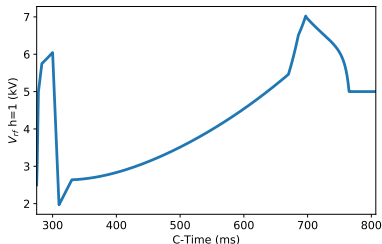
**3 CONCLUSION**

## Version 1 - Objective: Produce LHCINDIV

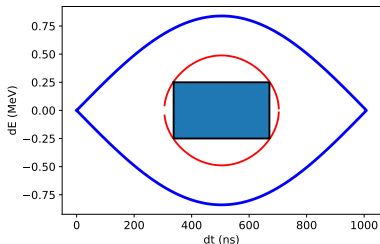


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- Fixed bucket area through most of acceleration to preserve Landau Damping
- Linear change in  $\varphi_s$  at transition to flat top

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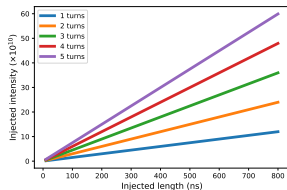


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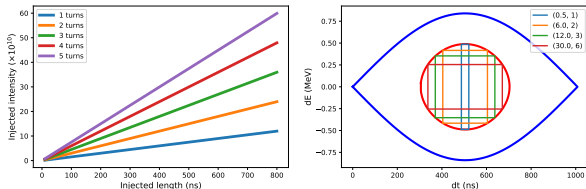
- Fixed injection ( $15 \times 10^{10}$ ), 3 turns of 333ns by 250 keV half height ( $\approx 100$  keV RMS)
- Target 0.3 eVs at injection
- Shave unwanted beam to cover needed intensity and  $\epsilon_I$  range

## Version 2 - Objective: Produce LHCINDIV and minimise losses



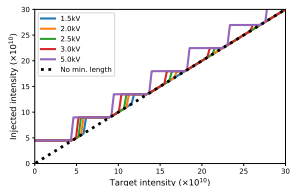
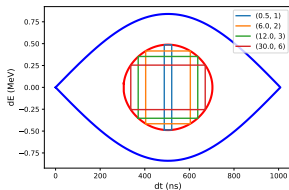
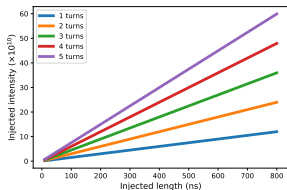
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- Due to minimum pulse length allowed from Linac 4 the intensities and lengths that can be injected become semi-discretised not (completely) free parameters

## Objective: LHCINDIV with low losses and easy for operations

### Request:

- Fix pulse length and energy spread, vary number of turns for coarse intensity variation
- Use longitudinal shaving and RF choke for fine control of emittance and intensity
- Emittance up to 0.6 eVs, intensity up to  $30 \times 10^{10}$
- Single cavity possibility



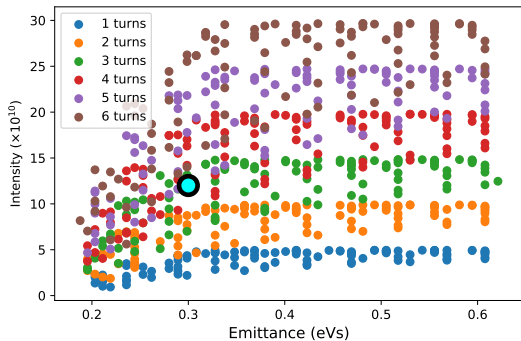
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### Parameters used:

- Injected length: 330 ns
- Energy half height: 250 keV
- Number of turns: 1  $\rightarrow$  6
- Choke voltage: 1.2 kV  $\rightarrow$  3 kV
- High harmonic fraction: 5%  $\rightarrow$  30%



Operational LHCINDIV (0.3 eVs,  $12 \times 10^{10}$ ) shown by blue spot

- Fixed injection pulse length and energy spread
- Variable number of turns
- All RF voltage from a single cavity
- Full parameter space of interest available