

MD9544: Emittance growth from incoherent electron cloud effects at injection

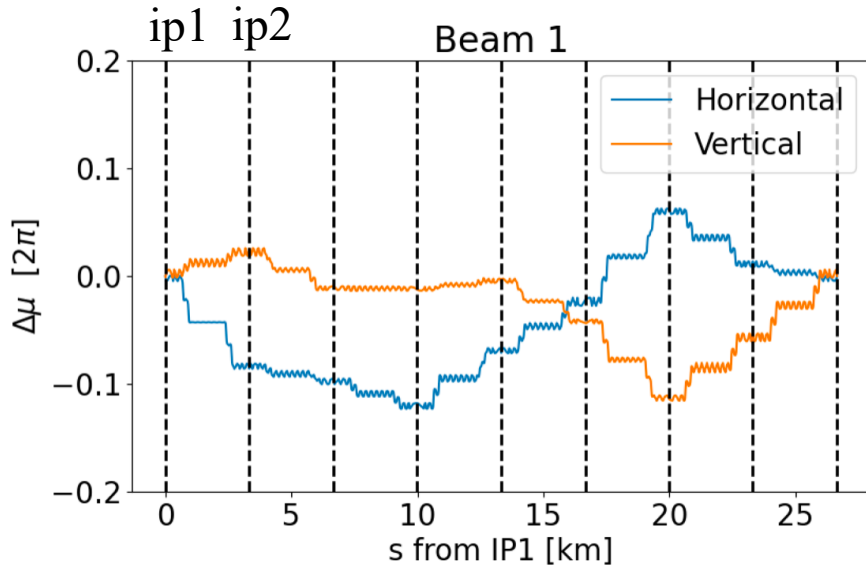
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rMPP meeting on MD Block 2 2024 Approval
28th May 2024

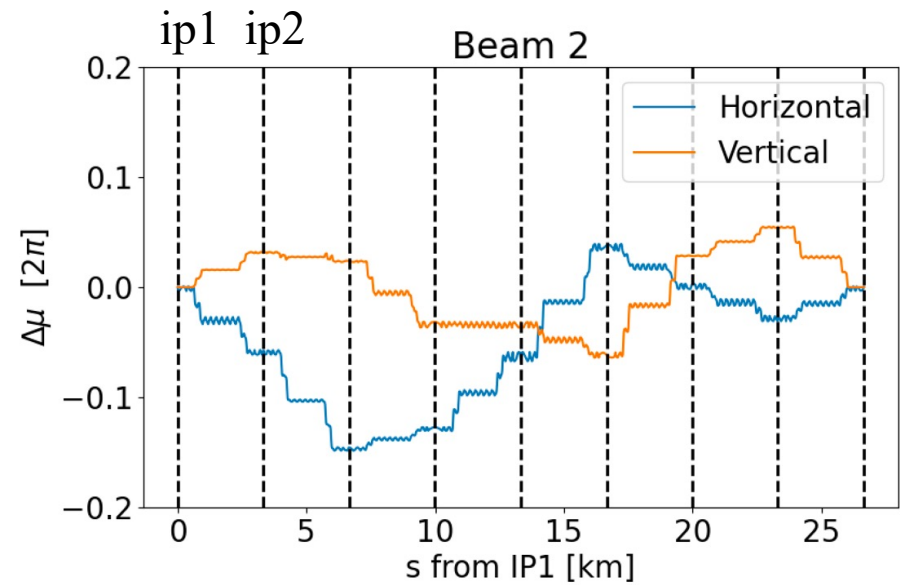
Phase knob

Point of MD is to measure **effect of phase knob** on emittance growth (and betatron tails).

Phase difference



Phase difference



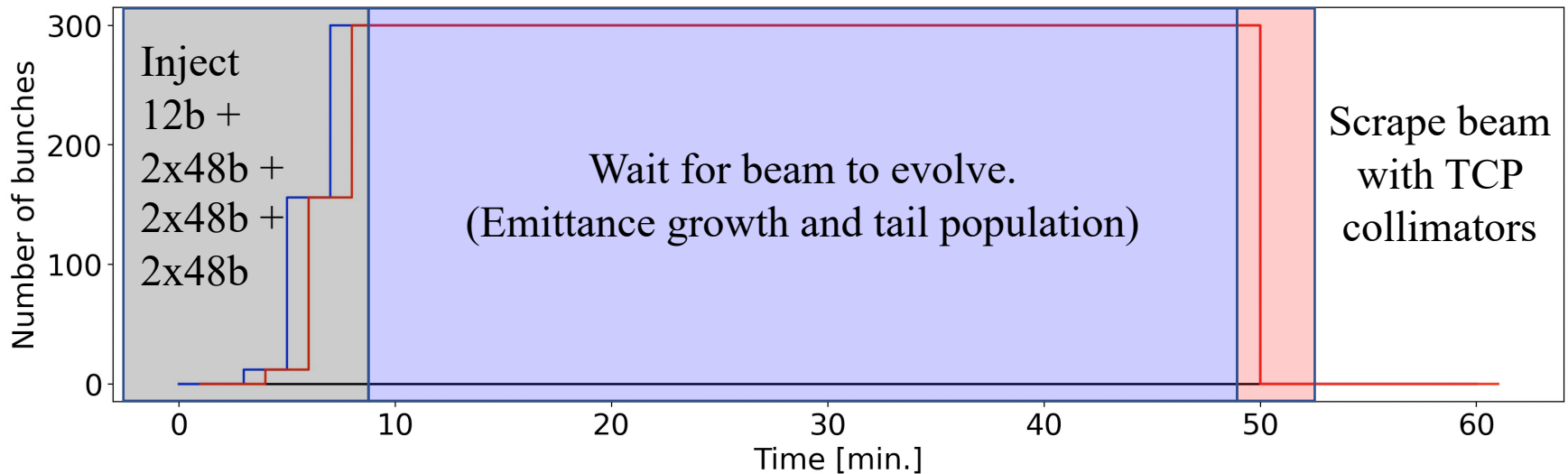
Phase knob acts on trim quadrupoles MQT (next to Q14-Q21)

- **Knob was measured** to have the desired effect on phase advance during its commissioning in 2023.
- On the first turn, **first change** encountered by beam is in **Q14**.
- Induces a **betatron function change** generally of $< 5\%$.

Example fill

Fills to always stay at injection energy.

Example fill during the measurements (bunch intensity = $1.4e11$ p/b):



Original plan was to inject 3x48b. When filling scheme of physics operation changed, **AGK/MKI settings became incompatible with 3x48b.**

Instead of **two** injections of **3x48b**, we propose **three** injections of **2x48b**.

Two parts:

1. **Fills with phase knob set to 0.** (Old operational configuration until 2022)
2. **Fills with phase knob set to 1.** (Operational configuration since 2023)

Trimming the phase knob

We assume we will do validation with loss maps and phase knob = 0.

Power converter interlock on MQT trim quadrupoles prevents trimming of phase knob.

Possibilities for fills with phase knob set to 0:

1. Switch to a cycle (phase knob = 0) with **re-centered power converter limits**.
2. Mask PC interlock and trim phase knob before injection. (**Not preferred**)
3. Mask PC interlock and trim phase knob after injection. (**Not preferred**)

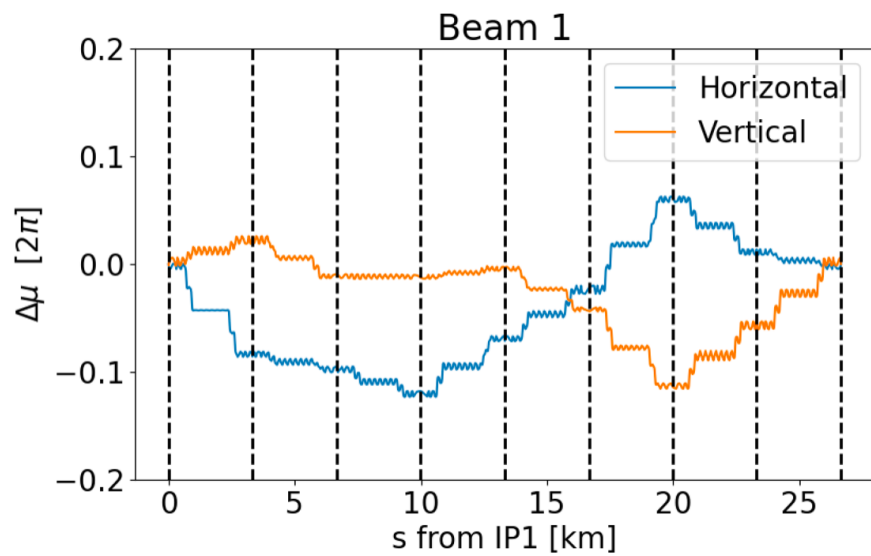
Last time the MD was approved ([rMPP meeting on MD2 2023 approval](#)), option 1 was decided.

Do we retract the injection protection (TDIS) after the injection phase?

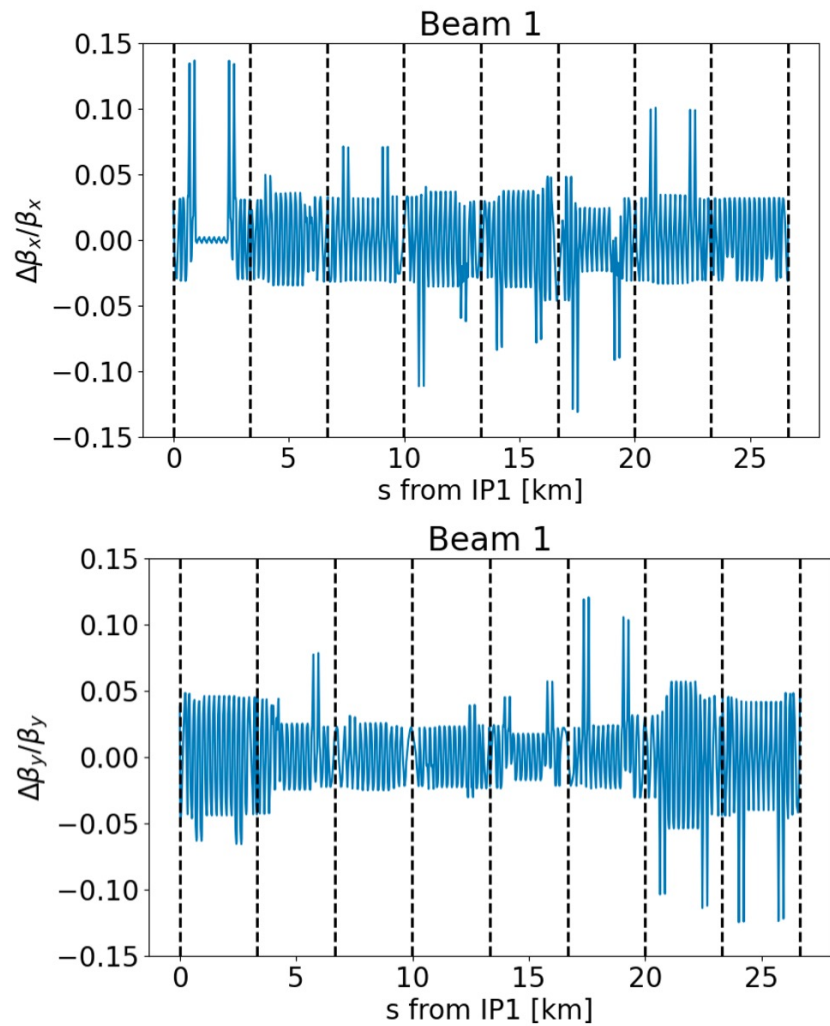
Backup slides

Effect of phase knob

Phase difference

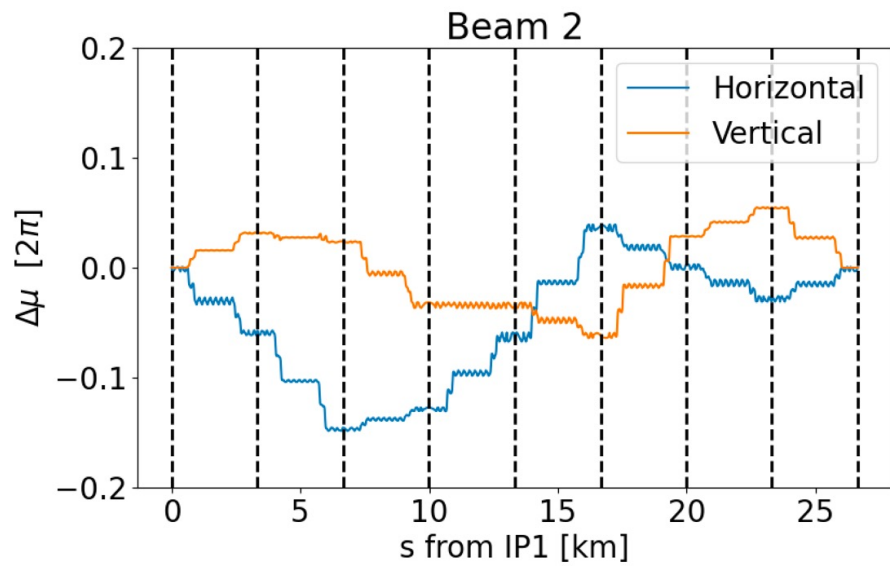


Beta-Beating



Effect of phase knob

Phase difference



Beta-Beating

