First results of MD 4145: Studies of Landau damping with an anti-damper


**The initial proposal** – Measurement at Injection

Many thanks to:

M. Albert, G. Crockford, G. Trad, S. Uzanski (OP)

Q22 MD Team, F. Velotti (OP)
ADT fully qualified to act as a controlled source of impedance

Can measure Landau damping from nonlinearities at injection
• Next step – compare with the measurements (E. McLean et al.)
Epic Results: Can measure stability diagrams!

Things to account for:

- **Nonlinearities?**
  - A few Amps (E. McLean et al.)

- **Uncertainty in damper angle?**
  - Up to ~10% (D. Valuch)

- **Transverse distribution?**
  - Affects the width of SD

- **Space charge?**
  - $\Delta Q_{sc} \sim 10^{-4}$

---

Val Thorens, Photo Credit Paul Thrane

---

S. ANTIPOV, LSWG ON MD#3+MD#4 RESULTS

12/4/2018
Accounting for the space charge: Métral-Ruggiero model

Métral, Ruggiero, CERN-AB-2004-025-ABP

Approximations:
- Coasting beam
- Quasi-parabolic transverse distribution
- Linear space charge

Space charge shifts the maximum of the SD

Bunch intensity: \( N_b = 1.15 \times 10^{11} \) p
Linear SC param.: \( \Delta_0 = -1.1 \times 10^{-3} \)
Good agreement for larger octupole currents

• Real distribution closer to a Gaussian (long tails)?
• Nonlinearities (~ few A equivalent)?
• Uncertainty in the damper angle (up to 10%)?
Thank you for your attention

QUESTIONS?
Good agreement for larger octupole currents

- Real distribution closer to a Gaussian (long tails)?
- Nonlinearities (~ few A equivalent)?
- Uncertainty in the damper angle (up to 10%)?