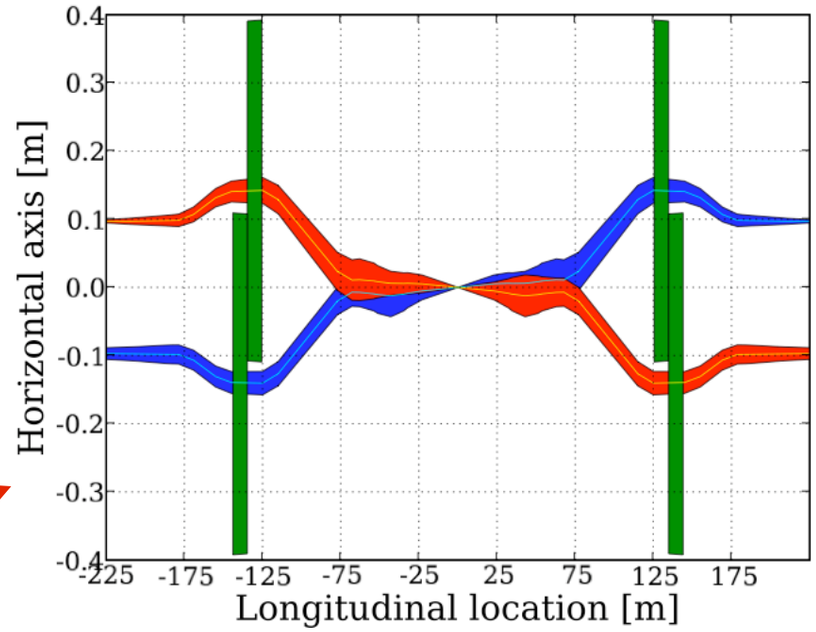
Summary for Optics

K. Oide

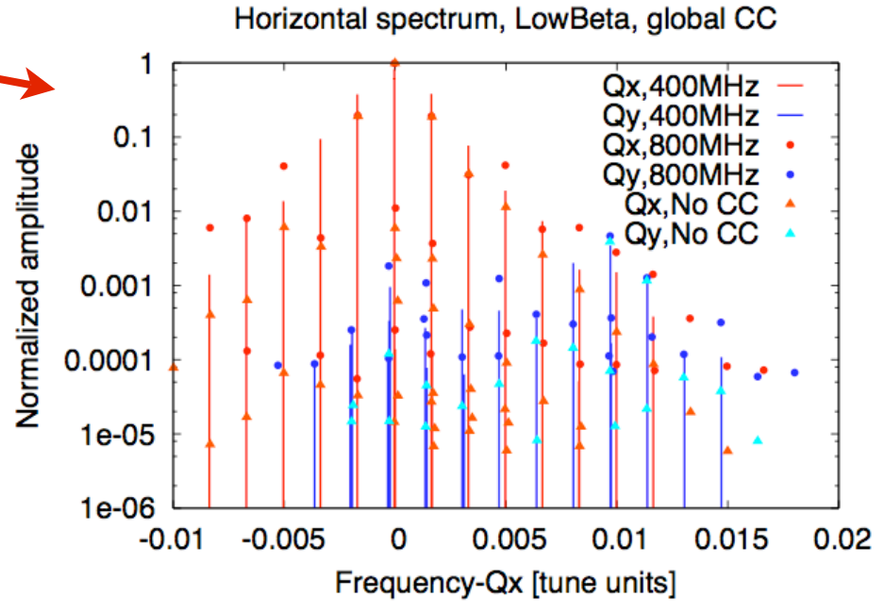
R. Tomas

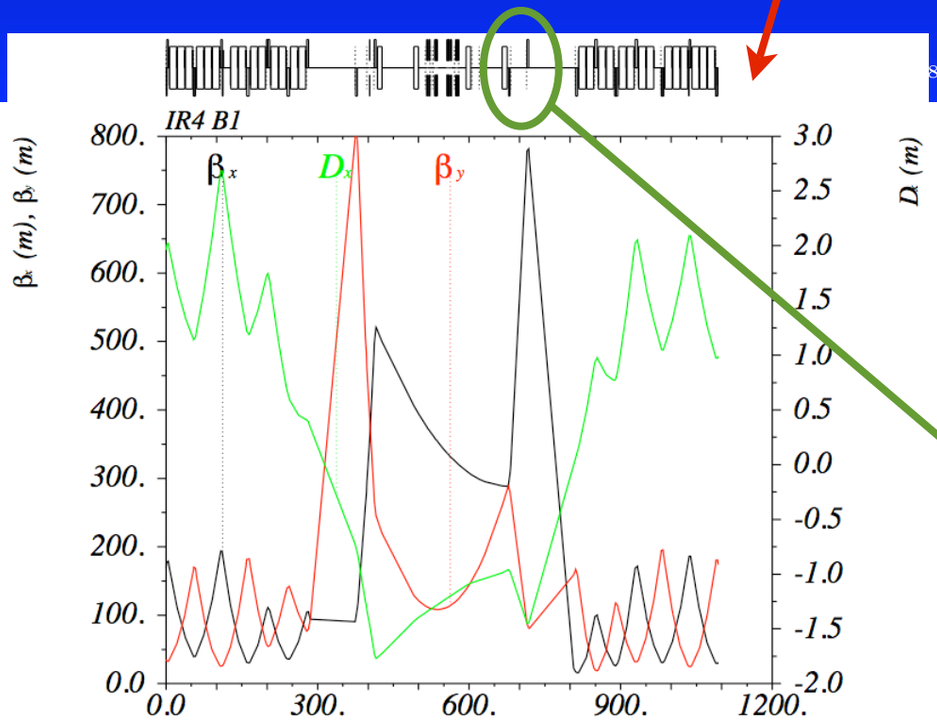
Conclusions

- New idea from S. Fartoukh: move D2! Good for CCs.
- However phase I IR upgrade optics are not ready.
- Separation of beams to 27cm for 20m longitudinally achievable with present technology.
- CCs have an impact on particle stability
- Further studies with Beam-Beam required
- Betas at IP4 CC cannot be increased beyond 320m due to aperture constrains.
- Large phase tunability using arcs.



•Besides the optics, the local scheme needs more attention on the required space for the rf system and cryogenics (K. Mess).



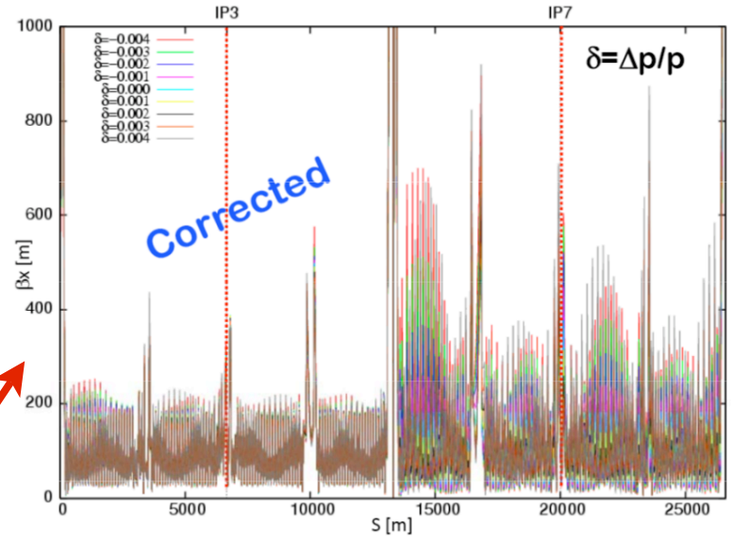


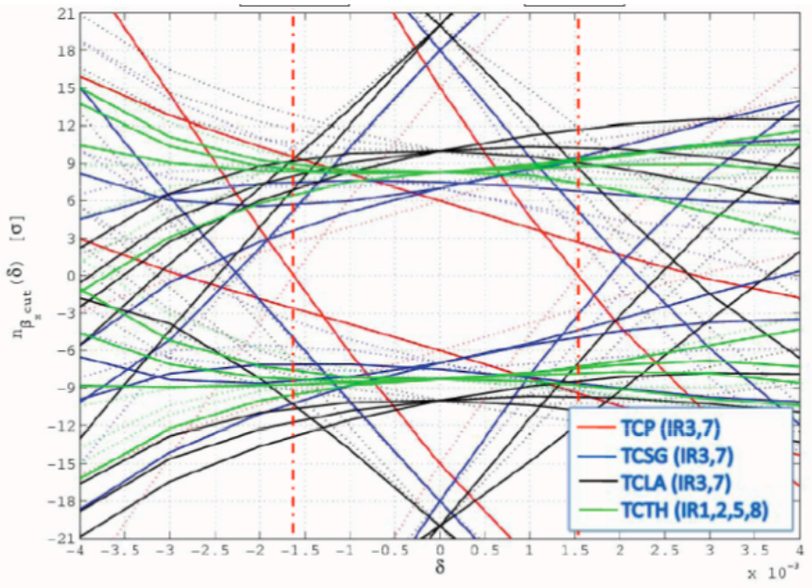
•It may be possible to increase the IR4 beta up to 800 m by switching the polarities of 2 quadrupoles, making symmetrical around the IP.

R. Assmann

Conclusion

- The LHC **collimators must sit very tight** on the beam to provide good passive protection and cleaning.
- As a consequence, the **6D phase space must be well defined**. Tolerances on relative settings (retraction) are critical.
- **Off-momentum beat is important** and is being addressed (S. Fartoukh). Larger off-momentum beta beat with upgrade optics.
- A **global crab cavity scheme will further complicate the situation**, probably to the point where collimation breaks down.
- **Tests with a global crab scheme can be performed** with a few nominal bunches (increase of specific luminosity).
- **Presently, little hope to improve integrated luminosity with global crab scheme.**
- Further work is ongoing and required. Interference local crab cavities and collimation in experimental insertions.





• Off-momentum beat beat mixes up the 6D phase space mixes up the 6D phase space and can corrupt collimation performance
• Already very tight for nominal situation…
• **What is added by crab cavities?**

•The chromatic beta-beat should be cured by additional families of sextupoles, even for nominal operation.

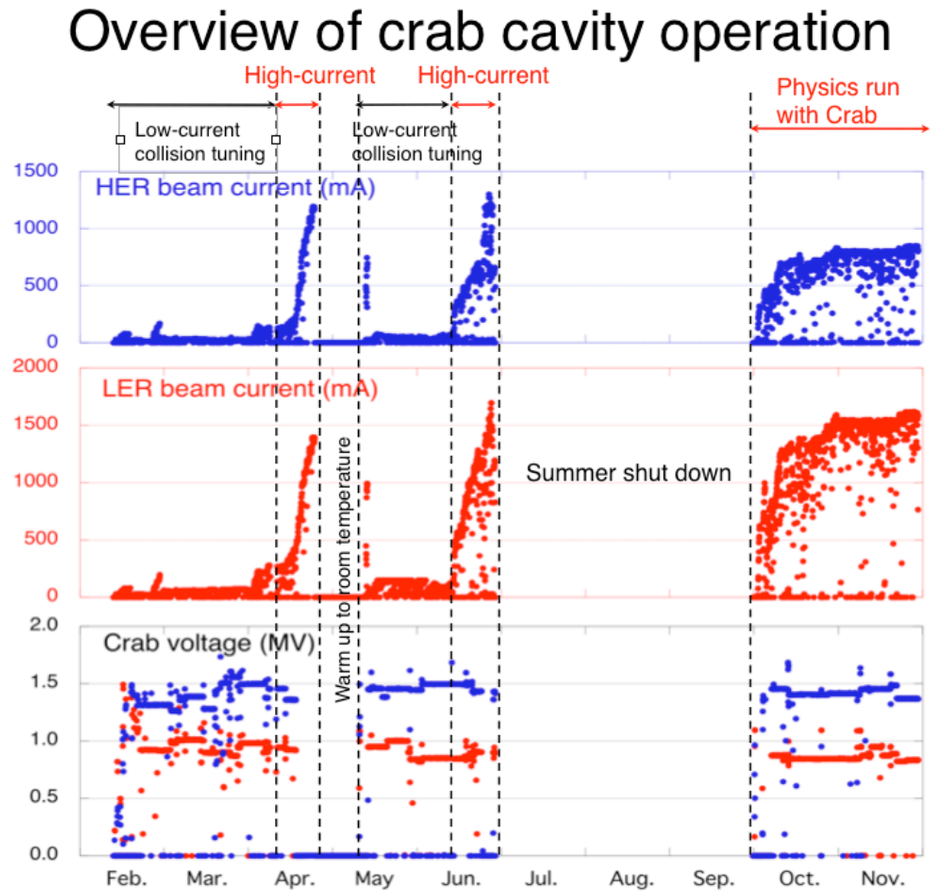
•Placing collimators only at non-beating section may solve the issue, though it is only possible in future.

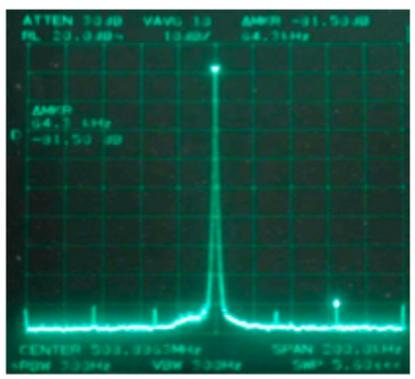
•If it has been already messed up without crab, does global crab really has an impact?

Y. Morita

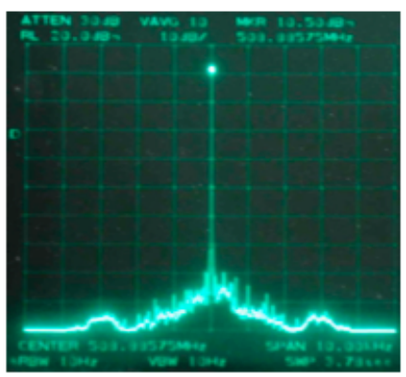
Summary

- High beam currents (1.7/1.35 A) stored with crab cavities.
- No serious beam instability caused by LOM/HOM.
- HOM power successfully absorbed up to 12 kW in the ferrite dampers.
- Physics run with CRAB ON with high beam currents (1.62/0.95 A).
- LER crab voltage degraded to 1.1 MV.
  - Still applicable by increasing beta-x at the LER crab cavity.
- Crab phase well controlled, although the LER tuner phase fluctuates.
- The beam oscillation observed with high current crabbing operation
  - Can be avoided by shifting crab phase by +10 deg.
- Trip rate during the physics run 0.4/3.5 par day (last year).
  - Trip rate of the HER cavity is less than 1/dey this year.
- KEKB crab cavities have been working with high beam currents to conduct physics run with the crab crossing !!

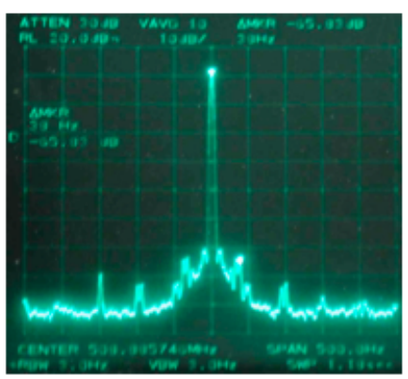




Span 200 kHz
Sideband peaks at 32 kHz and 64 kHz.



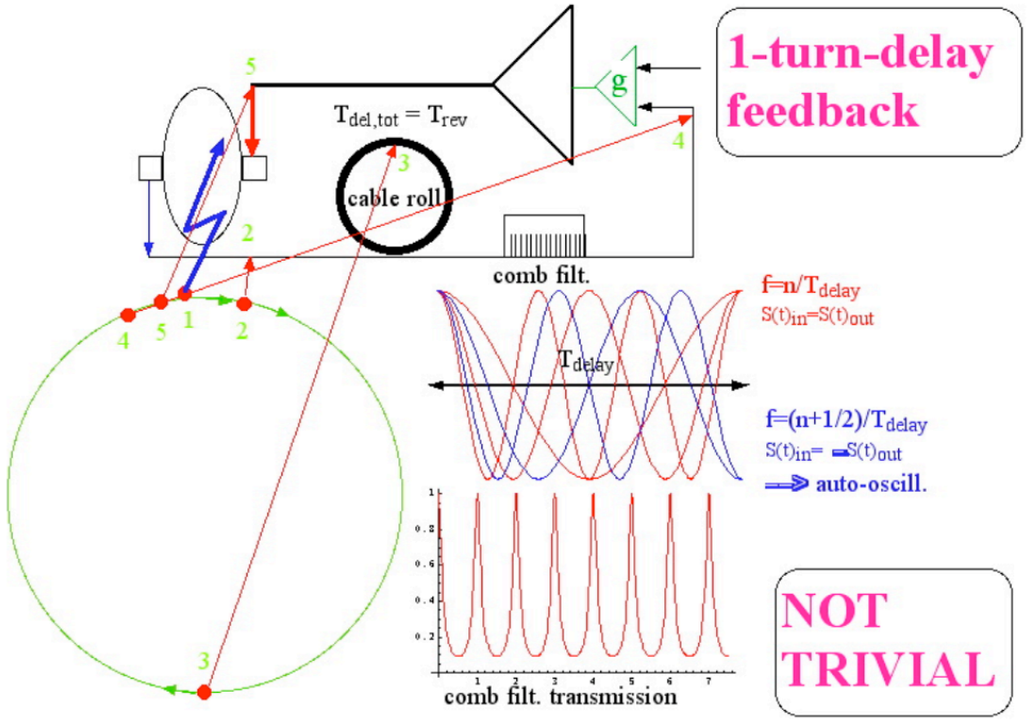
Span 10 kHz

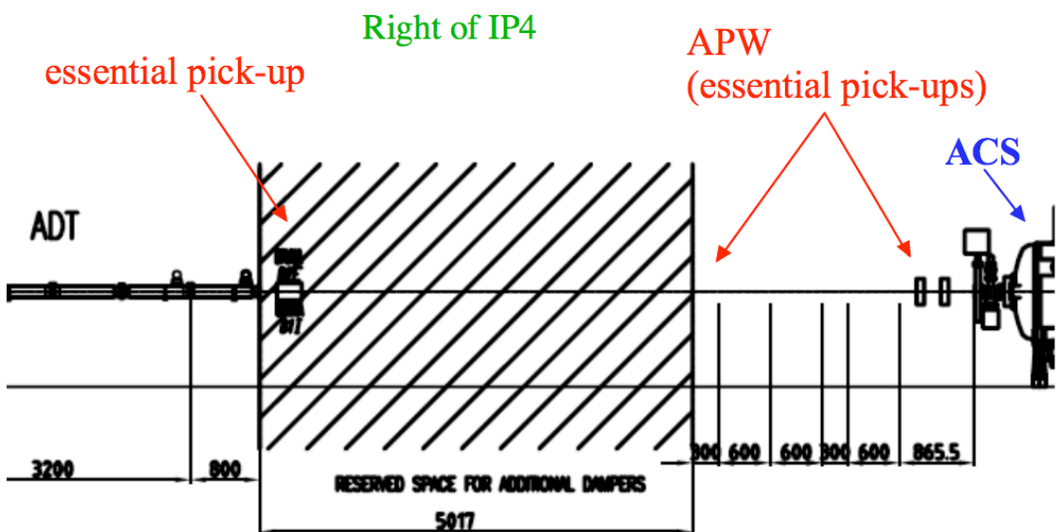


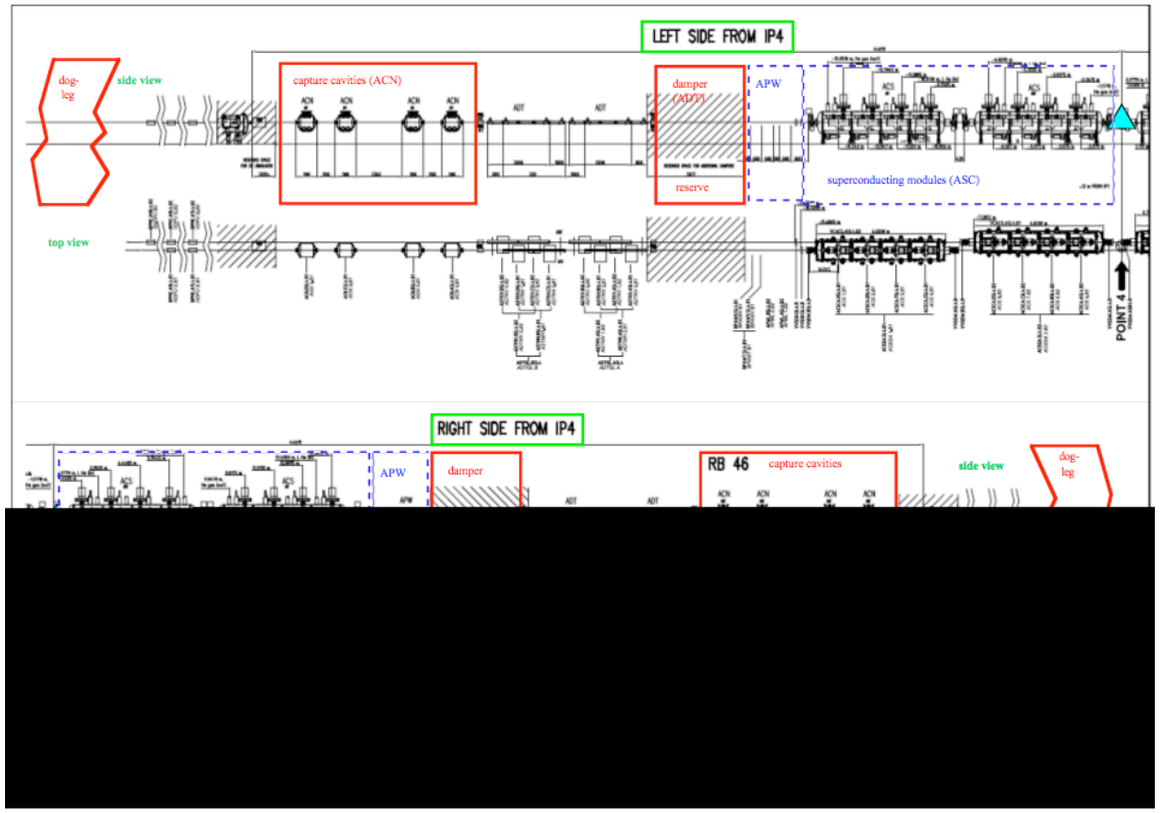
Span 500 Hz
Sideband peaks at 32, 37, 46, 50, 100 Hz.

- Further study on each issue experienced at KEKB may contribute to LHC-CC, including:
  - ~ degradation of the voltage
  - ~ cause of trip
  - ~ nature of the phase noise
  - ~ further analysis of the high-current oscillation
  - ~ tuner motion

J. Tückmantel







chromatic β-beat

Global or Local?

IP Optics

Collimation

2 IP?

rf system cryogenics

higher order resonances

1 cav / ring?

Spaces

Vertical or horizontal?

IP4 β

400 MHz or 800 MHz?

exotic design

cavity voltage

higher harmonics