

PETRA III MACHINE STUDIES PROJECT.

OBJECTIVES FOR THE MACHINE STUDIES PROGRAM IN JULY 2013



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MPE - DESY

PETRA III Beam Dynamics
Meeting

OVERVIEW.

- 1 **REVIEW: TOWARDS PETRA X**
- 2 CHANGE DAMPING PARTITION
- 3 STUDIES AT LOWER ENERGY
- 4 STRONGER FOCUSING OPTICS



POSSIBLE ROADMAP.

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 - Increase horizontal phase advance, while lowering the vertical one: (90/60), (108,36), (144,36)? Sextupole schemes?
 - Change the damping partition (Why not right now?)
 - Go to lower energy: 5 GeV?
 - Take 28 bend achromat more seriously \Rightarrow more quadrupole families



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 - Change the damping partition (Why not right now?)
 - Go to lower energy: 5 GeV?
 - Take 28 bend achromat more seriously \Rightarrow more quadrupole families
- Identify constraints:
 - Necessary DA for injection
 - Changes for booster
 - Change injection scheme (pulsed multipole injection?)
 - Beam lifetime?
- Collective Effects: IBS etc. (Go to 2 GeV as a test?)
- Design a completely new lattice: ?-bend-achromat



POSSIBLE ROADMAP CONT..

- Use PIII extension to develop tools:
 - Tracking studies (already started)
 - Understand collective effects at PIII and PIIIext and consequences at ultralow emittance
- Start with first phase of design study in parallel
- Identify possible experiments at existing machine
- Involve more people (postdocs, other experts, ...)
- Go for something like a conceptual design report



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CHANGE DAMPING PARTITION.

Lower the horizontal emittance as far as possible.

Questions to be answered

- Impact of rf-frequency shift on emittance? What happens to the damping introduced by the wigglers?
- How large must the shift be to achieve a reasonable effect?
- How is it realized?
- Consequences for the dynamic aperture, injection and lifetime?
- Bunch length should become larger. Effect on experiments?



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STUDIES AT LOWER ENERGIES.

Lower the energy to go to as small as possible horizontal emittance. Study beam dynamics and collective effects.

Questions to be answered:

- Energy dependence of the emittance (wigglers)?
- Optics at low energies. Focussing of the wigglers!
- What happens to the dynamic aperture? Energy scaling of wiggler multipoles!?
- Bunch length?
- Diagnostics?
- More questions?



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STRONGER FOCUSGING OPTICS.

Lower the horizontal emittance as far as possible.

Questions to be answered:

- Probably not possible at 6 GeV. May be at 4 or 5?
- Consequences for the dynamic aperture, injection and lifetime?
- Combine with frequency shift?

