Required studies ...

- Footprints, hh, vv, hv, up to 1.7 10^{11}
- All for nominal and PACMAN bunches
  - Nominal (ideal) parameters
  - Scenarios with non-ideal parameters
    - What happens when emittance slightly larger ?
    - What happens crossing angle slightly smaller ?
    - What happens if we have to run at slightly lower energy ?
- Orbit effects, self-consistent, hh, vv, hv, up to 1.7 10^{11}
- Some tracking according to recipe in LHCPR 628
- Look at dispersion effects (hh and vv)

Some (provocative) questions and thoughts

- **Does anybody believe we are beam-beam limited the first years ? (assuming lower emittance, lower intensity, 75 ns etc.)**
- **Our main problems are at injection where we separate in both planes already.**
- **Wires and 45 deg crossings are apparently meant for collision (??)**
- **Wires and 45 deg crossings do not address the problem of different orbits of pacman bunches in collision.**
- **For 45 deg crossings we need twice the number of orbit correctors to control the orbit effects and the collision (and have to maintain two crossing bumps in collision). Why this should make it**

EASIER to equalize IP1 and IP5 ??

- **For 45 deg crossings the total strength of the closest MCBX correctors at Q1 is $\sqrt{2}$ larger (.. and they are unavailable for triplet corrections).**
- **Should we contribute to the commissioning by defining a simple and robust scheme or concentrate on possible 'problems' at the (far away ?) beam-beam limit (and leave the real commissioning issues to others) ?**
- **Should we make the commissioning more difficult in order to solve (possibly non-existing) problems in the future ?**

Beam-beam experiments outside CERN

Why not at CERN ?

Lack of collider

Commitment ?

All experiments are outlined in a memorantum to the 2002 DOE review of US-LHC funding for AP activities

W. Herr

Beam-beam experiments outside CERN

General:

What ? Emittance growth, background rates and stability of collisions with transverse offsets

Why ? At LHC bunches will collide with small offset. Unavoidable and had bad effects on LEP performance

Where ? RHIC

What ? Beam-beam compensation with electron lens and possibly wire

Why ? Study feasibility of compensation techniques

Where ? Tevatron, electron lenses operational

Beam-beam experiments outside CERN

Crossing angle, SBR:

What ? Effect of bunch length and crossing angles on τ_l, SBR, background

Why ? Shows effect of synchro-betatron coupling

Where ? Tevatron, better RHIC: 2 RF-systems available, wide range of crossing angle

What ? Beam-beam tune shift with long bunches and large crossing angle

Why ? Could be used for very high luminosity upgrading

Where ? Tevatron, better RHIC: 2 RF-systems available, wide range of crossing angle

Beam-beam experiments outside CERN

Optics:

What ? Measurement of beam-beam resonance driving terms

Why ? Complement other measurements and study interplay between beam-beam driven and lattice driven resonances

Where ? RHIC

What ? Effect of phase advance between IPs on stability, lifetime, background

Why ? Suppression and anhancement of resonances expected.

Where ? RHIC

Beam-beam experiments outside CERN

Coherent effects:

What ? Coherent mode observation and suppression with: Q-scan, I variation etc.

Why ? Confirm the expectations and prove principle of suppression

Where ? RHIC (only place to observe coherent modes)

What ? Effect of synchrotron motion and crossing angle on coherent modes

Why ? Has important consequences for LHC expectations

Where ? RHIC (only place to observe coherent modes)