Meeting with Yannis and Jean-Pierre, 8. April, 2004

Yannis has analyzed the 1000-turn data from 2003 MD with a -7mm bump at the wire and a wire excitation of 0 and 67 A. The beam was kicked to amplitudes of 2 mm, 4 mm, 6 mm, and 8 mm for either excitation level.

He looked at all BPMs, and identified a large number of bad ones. There are three types of bad BPMs: 1) BPMs with sudden spikes, 2) BPM that only measure noise, and 3) BPMs which show a slow modulation, perhaps due to synchrotron motion.
He made a statistical analysis of the results. If a BPM is bad, it is likely to be bad for all data sets.
The kicker timing shifted by ~100 turns for 3 of the data sets. We do not think that it was shifted intentionally.

Pictures of the rms amplitudes (over all BPMs) vs. turn number provide clear evidence that the decoherence is larger when the wire is excited, especially for the larger amplitudes. *Idea: simulate the decoherence and compare; compute decoherence analytically and compare; use formula from Meller et al., role of higher order terms? Also compute (and measure?) tune footprints with the wire.* ***Can we see transition to the chaotic region in the decoherence?***

In two of the 8 data sets, a certain number of BPMs give a different tune. The BPMs for which the tune is shifted by about 0.001 (synchrotron tune) are successive BPMs in 6 symmetric regions of the ring (start of each arc).

Plots of tune shift vs. amplitude who opposite detuning in X and Y when wire is excited. The data without excitation shows a variation on a similar scale. Recommendation: **repeat the measurement for a larger excitation!** The tune shift with amplitude is not quadratic which could be a result of filamentation or head-tail damping.

In 2004 we will record turn-by-turn information using 5 new LHC BPMs in the SPS. Actually we should employ both types of pick-ups, to get an insight, if observations are instrumental or related to the beam.
Tune and decoherence analysis should be refined by sliding window, so as to eliminate or quantify the effect of the decoherence on the tune. ***The decoherence should be simulated.***

By using all BPMs it may be possible to get an accurate tune value from a small number of turns, though this is somewhat controversial (it works fine at the ESRF and Yannis presented results at the frequency-map workshop in Paris).

Keywords of this discussion: amplitude detuning, tune footprints, frequency maps, onset of chaotic motion, expected tune shift with amplitude from tracking, decoherence.

Next MDs: take 1000-turn data in the vicinity of low-order resonance, possibly cross the resonance; kick in both planes; more advanced: use damper to excite each bunch in a train at a different amplitude and get tune footprint in a single shot.