1 Dependence on Distance and Strength

First several simulations were performed for LHC parameters, addressing the question whether one can increase the distance between the beam and the wire, and the associated optimum choice of the wire strength. The results are illlustrated in Figs 1, 2 and 3. The simulation included two IPs with alternating crossings and wire on either side of each IP. It appears that a 26% increase in the distance is acceptable, but for a 50% increase we observe a clear degradation in the compensation efficiency.

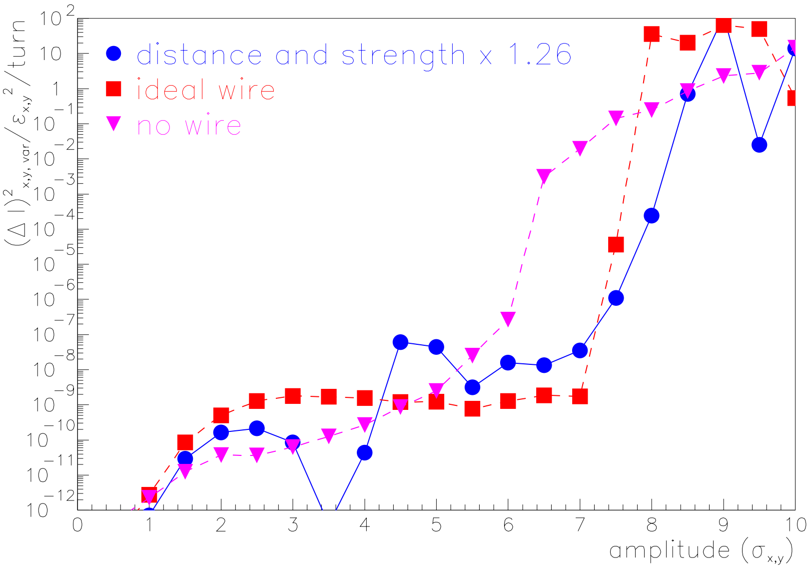

Figure 1: Variation of simulated LHC transverse diffusion rate in the presence pof long-range beam-beam collisions for three different cases: no wire, nominal wire, wire whose strength and position are increased by factor 1.26.

2 Simulations for the SPS Experiment

The following simulations were done for a reduced wire current, modelling the case of a single-wire experiment in the SPS. The wire current is limited by the power supply, and/or by the temperature increase of the wire. Then it is advantageous to reduce the wie current.

In order to still maintain a clear diffusive aperture, the single wire could be replaced by three wires, mounted on top of each other, and the beam emittance be reduced by scraping. Then reducing the physical distance between beam and wire(s) increases the nonlinear force and compensates for the smaller wire current.

Simulation results are illustrated in Figs. 4, 5, 6, 7 and 8. In particular, the case of Fig. 7 should have a clear signature in the experiment. Figure 8 illustrates the effect of the beam-wire separation.

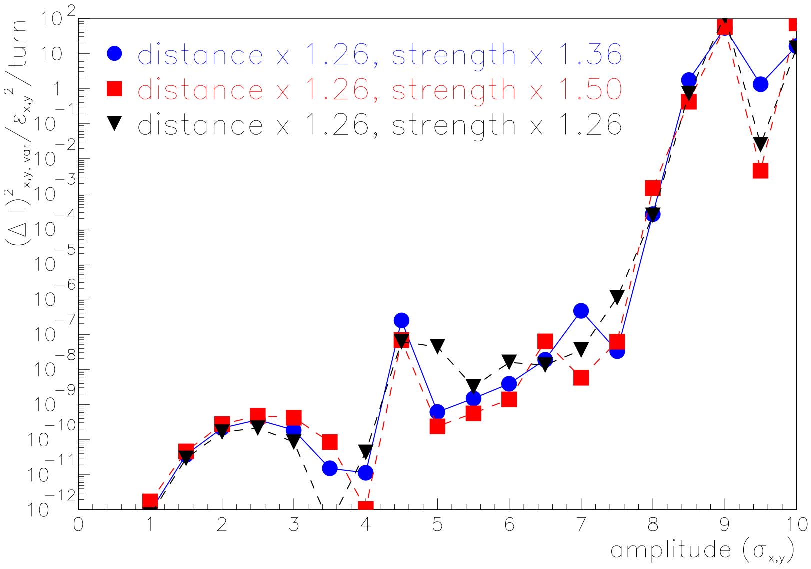

Figure 2: Variation of simulated LHC transverse diffusion rate in the presence pof long-range beam-beam collisions for three different wire strengths: nominal value, and increased by factors 1.26 and 1.5; all for a distance equal to 1.26 times the nominal.

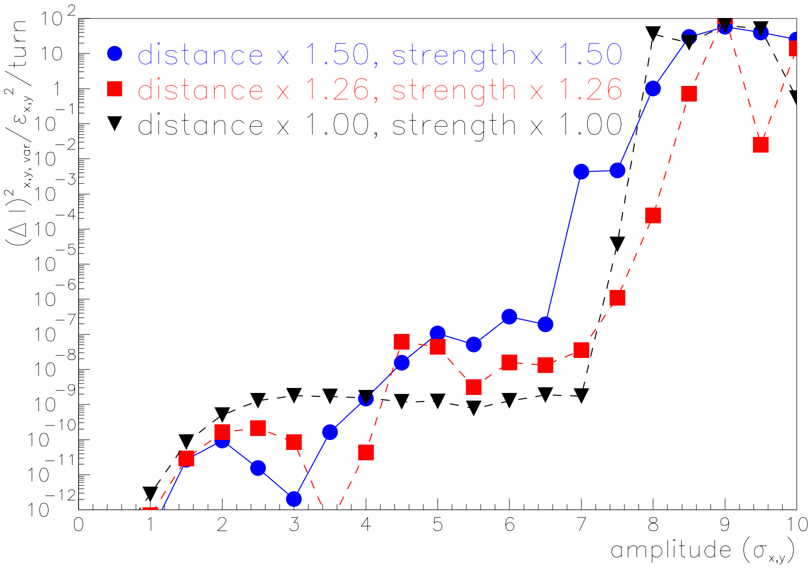

Figure 3: Variation of simulated LHC transverse diffusion rate in the presence pof long-range beam-beam collisions when wire strengths and distances are varied simultaneously.

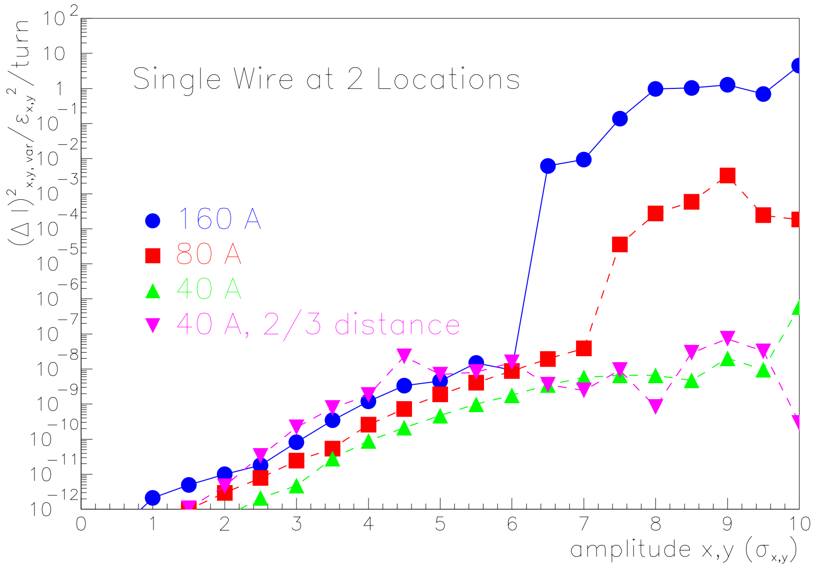

Figure 4: Variation of simulated transverse diffusion rate in the SPS for different wire currents, assuming two wires in alternating planes.

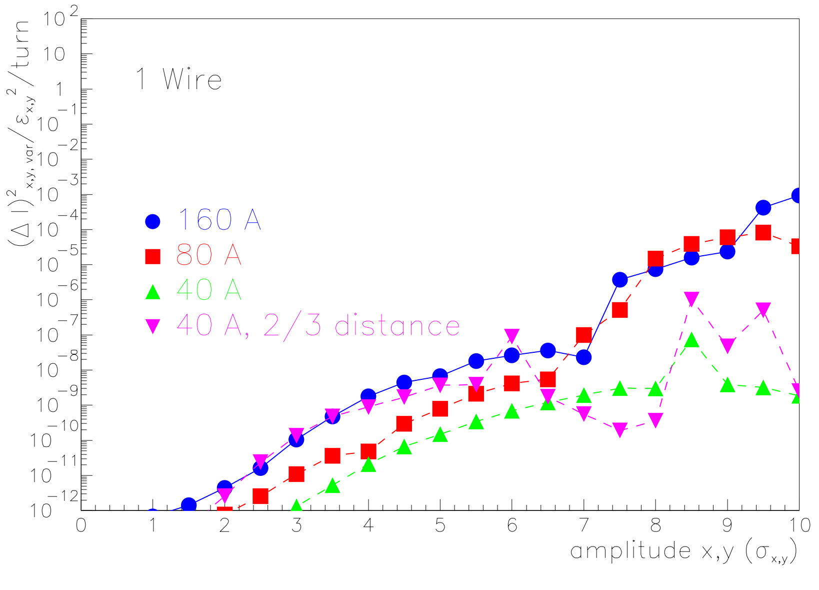

Figure 5: Variation of simulated transverse diffusion rate in the SPS for different wire currents, assuming a single wire.

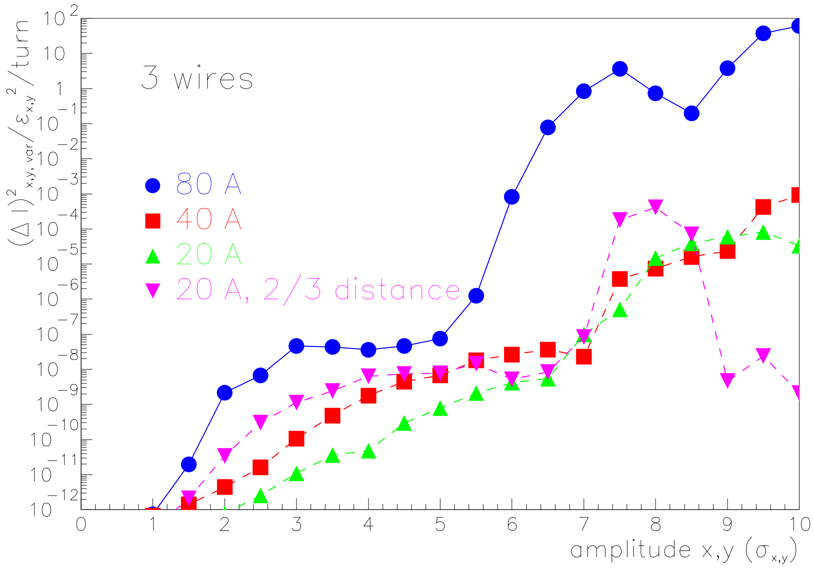

Figure 6: Variation of simulated transverse diffusion rate in the SPS for different wire currents, assuming the nominal normalized emittance and 3 wires at the same longitudinal location. The first wire is horizontally separated from the beam; the two others are located above and below with a vertical separation that equal half the horizontal.

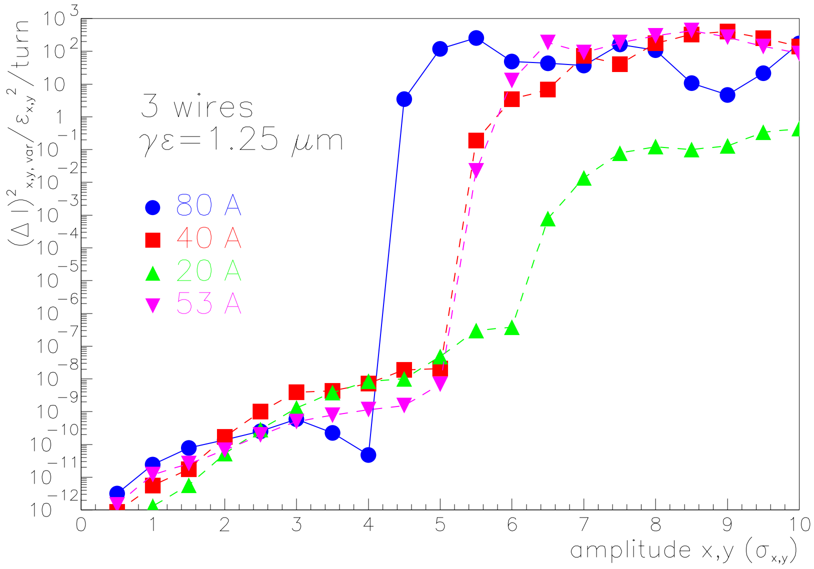

Figure 7: Variation of simulated transverse diffusion rate in the SPS for different wire currents, assuming a reduced emittance (1/3 of nominal) and 3 wires at the same longitudinal location. The first wire is horizontally separated from the beam; the two others are located above and below with a vertical separation that equal half the horizontal.

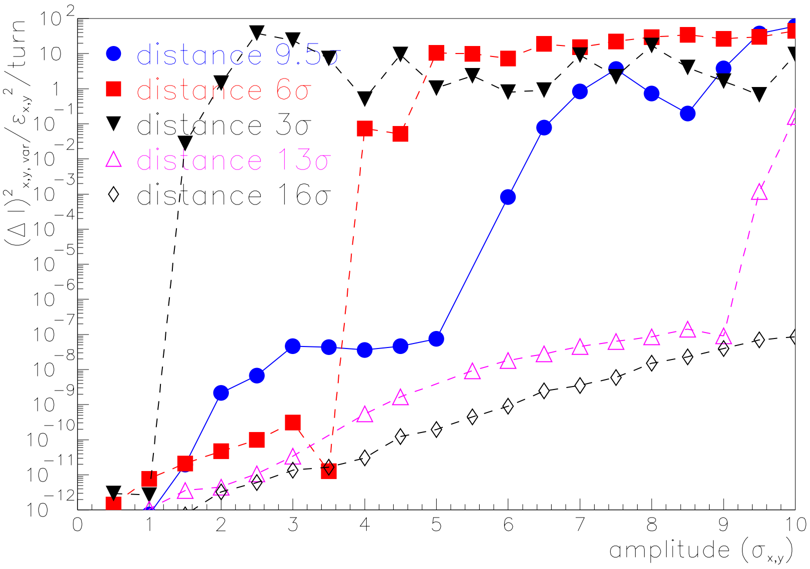

Figure 8: Variation of simulated transverse diffusion rate in the SPS with amplitude for different beam-wire separations, assuming the nominal LHC emittance and a single wire.