Plan for Wiggler Turn-on

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- Wiggler issues
  - Increases path length => adjust rf frequency
    - for full wiggler excitation: ≈–300 Hz
    - Changes HER damping partition:
      - shorter bunches, larger ε_x => ok for high current.
  - Changes beam energy
    - see MS memo next slide
    - we have the knobs to fix this fairly easily
  - Wiggler magnets have imperfections
    - understood at the % level
    - measured only at full excitation
      - need to estimate settings for intermediate excitation.

Energy changes from the LER wiggler

The LER wiggler magnets do two things that change the energy of the LER

- The first is a change in the path length
  This one we knew about and from MAD MHD found that the wiggler increases the path length of the LEB by 1.485 mm. With a LER momentum compaction of 1.23×10^{-3} we get a –1.7 MeV energy change in the LER when the wiggler is turned on.

- The second energy term from the wiggler comes from treating it as a horizontal corrector in a nonzero dispersion area (the same as energy corrections for horizontal correctors in the arcs)
  We initially thought that this term cancelled out for the wiggler since the total B·dl is supposed to be zero. But this energy term is zero ***only*** if the dispersion function is perfectly flat throughout the wiggler magnets. This is not the case although the dispersion is close to flat.

Wiggler contribution to the beam energy from the corrector term

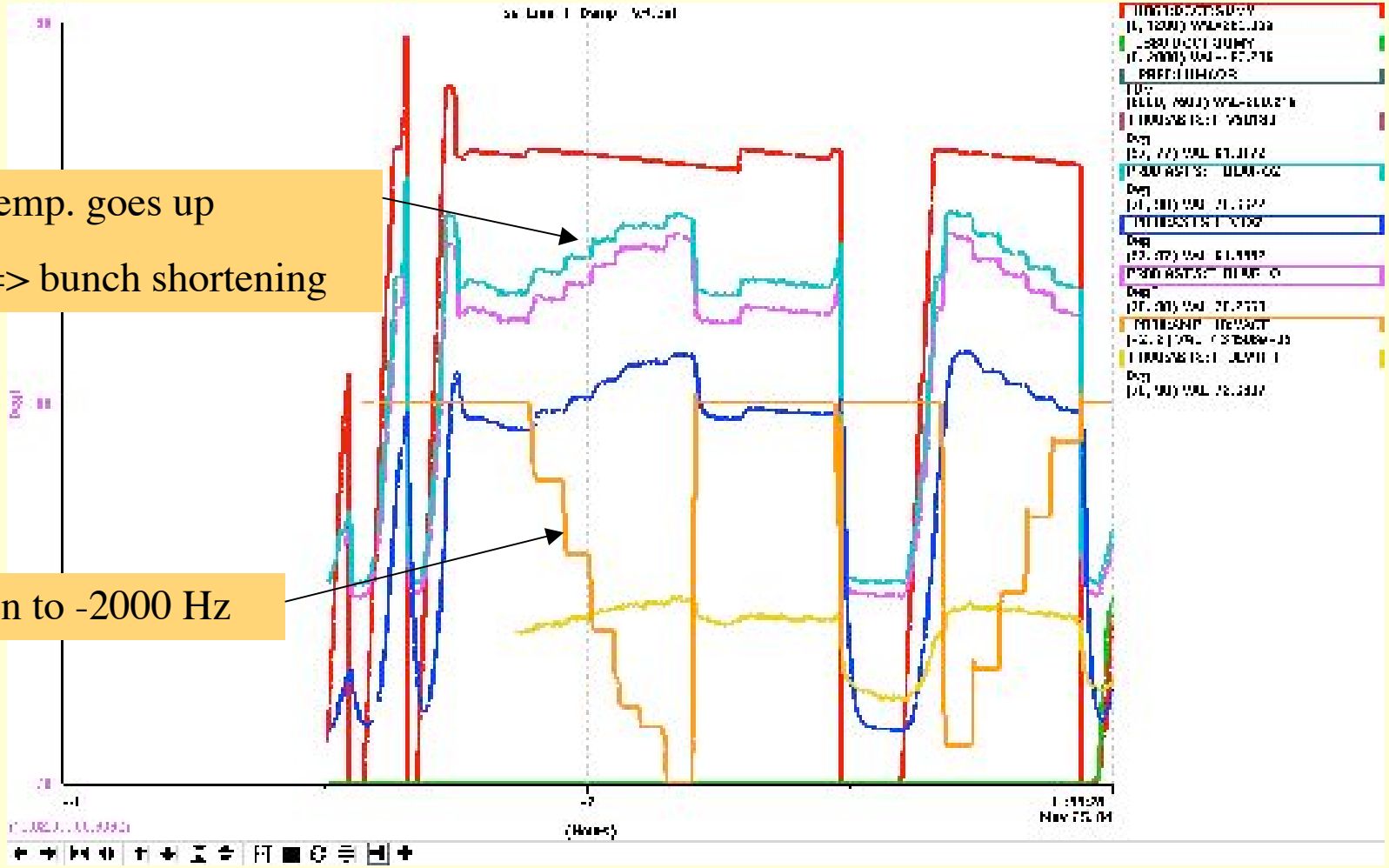
					LER Energy Constant	11.082		
	design eta	length	design B	design B.dl	design energy	actual B?	actual B.dl?	actual E?
BW1-	-0.638	0.225	-18	-4.05	28.63	-17.9	-4.03	28.48
BW1+	-0.651	0.225	18	4.05	-29.22	17.76	4.00	-28.83
BW2+	-0.647	0.225	18	4.05	-29.04	17.76	4.00	-28.65
BW2-	-0.634	0.225	-18	-4.05	28.46	-17.9	-4.03	28.30
BW1-	-0.637	0.225	-18	-4.05	28.59	-17.9	-4.03	28.43
BW1+	-0.651	0.225	18	4.05	-29.22	17.76	4.00	-28.83
BW2+	-0.647	0.225	18	4.05	-29.04	17.76	4.00	-28.65
BW2-	-0.634	0.225	-18	-4.05	28.46	-17.9	-4.03	28.30
BW2+	-0.63	0.225	18	4.05	-28.28	17.9	4.03	-28.12
BW2-	-0.618	0.225	-18	-4.05	27.74	-17.76	-4.00	27.37
BW1-	-0.621	0.225	-18	-4.05	27.87	-17.76	-4.00	27.50
BW1+	-0.634	0.225	18	4.05	-28.46	17.9	4.03	-28.30
					-3.50 MeV			-3.01 MeV

HER MD to Assess l_b change

temp. goes up

=> bunch shortening

∂f down to -2000 Hz



To Do

- Upgrade the wiggler-on lattice model to work in our present environment.
- Decide how much emittance growth we need
  - calculate wiggler setting & required frequency change
- Implement lattice,
  - steer, take data, correct machine, fix energy
- As we increase the emittance, may need to adjust β_x^* to maintain ≈matched beam sizes!
- Turning on the wiggler requires beam-current overhead available, else L suffers