Meeting on Debuncher Cavity 9. July 2010

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LLRF simulations

- slides in EDMS
- AKB presented results for simulations with a larger phase swing (-+112 degrees instead of -+ 81.4 degrees) for a period length of 20/40 us and for currents of 20/40 mA.
- The simulations now contain loop delays, ripples from the power supplies and the frequency detuning.
- At the moment the model assumes klystron characteristics for the driver.
- The simulations were done using a perfectly triangular phase swing.
- The resulting power needs for various phase swings with a cavity voltage of 0.7 MV -+ 25% are:

phase swing (deg)	time period (us)	beam current (mA)	power needed (kW)
-71.5 to 71.5	20	40	~56
-71.5 to 71.5	20	20	~54
-71.5 to 71.5	40	40	~28
-71.5 to 71.5	40	20	~27
-81.0 to 81.9	20	40	~68
-81.0 to 81.9	20	20	~68
-81.0 to 81.9	40	40	~29
-81.0 to 81.9	40	20	~29
-112 to 112	20	40	~114
-112 to 112	20	20	~114
-112 to 112	40	40	~40
-112 to 112	40	20	~40

From the results one can see that the reduction from 40 to 20 mA average bunch current is not very effective. However, the change from 20 to 40 us cycling period reduces considerably the power needs, such that one can operate even with the largest phase swing.

Actions:

- PB, JT, WH will re-iterate on the physics, which is now in AKBs model. The goal is to confirm that time domain and frequency domain calculations converge. The simulation model will be compared with the LHC injection model for SC cavities. Joachims approach on paper
- AL will organise a dedicated BCC meeting on the debuncher cavity on September 2nd.
- FG will quantify the available power levels at the cavity position. **50 kW (for both positions)**
- AKB will apply power supply ripples and loop delay for the ramping and debuncher cavities.
- CC: verify behaviour of transverse phase space when using a 40 us "single sweep" injection into PSB rings.
- CC: verify number of foil hits and cross-check additional emittance growth via scattering.
- dont forget: to foresee a 50-70 kW circulator so that the solid state amplifier powering the debuncher does not get damaged.
- CC: long term: test different wave shapes for injection. Now we are assuming a triangular voltage rise/fall, but we should try to use the other extreme: sinusoidal.

-- FrankGerigk - 13-Jul-2010

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