Titan-CPET PPG Specs.   (P. Delheij, 20091102 update)

In the cooler Penning Trap ions are injected, manipulated by RF and an electron or proton beam, and subsequently ejected. This process has many similarities with the procedure at the Titan-MPET and the Titan-EBIT. For those traps the timing is controlled by ppg-s that were build at Triumf under a Spincore-Pulsblaster license. None of these units is available and in informal discussion with Pierre Amaudruz and Daryl Bishop it was stated that the development of a new modern version for another application has been started by the the Electronics group. Particularly, a more straightforward progamming and maintenance structure is sought.
It is foreseen that CPET needs such a ppg unit around Easter 2010.

The trapping structure for CPET will have about 45 electrodes (this could still change by a few) with a number of them being pulsed. The same (Rb stabilized) master clock as used for MPET and EBIT, must drive this ppg at 100 MHz. At present 24 outputs are sufficient.
But at MPET almost all are used. Therefore, 32 NIM outputs would provide a wider margin for future developments.
These units need the option to operate in slave mode which implies that they have an external trigger input. In short, the functionality is essentially the same as for the present ppg-s.

The front panel connectors of the present MPET/EBIT ppg modules are listed below.

The new CPET ppg module will have :
(all connectors will be lemo)

32 nim outputs
output # 32 will carry the internal 100 MHz clock

4 nim inputs

1) clk in (Rb stabilized oscillator)
2) ext trig (for running in slave mode)
3) ext reset (for aborting a sequence in slave mode)
4) as yet unassigned

The design is based on the pcb board that is configured as an I/O module for the daq group. Testing of this board will finish around the middle of November. Once it is established that there are no flaws in the board design, then a larger production run can be scheduled.
Once the board is populated and assembled, still a fair effort of programming the firmware is required to turn it into a ppg. The firmware programming will likely go to Chris P. as indicated in a discussion with him and Pierre A.

CPET timing has the highest priority in the immediate future.

But this year several issues have arisen that require a broader consideration of the timing control at Titan. Therefore, the following punchlines are listed :

- At MPET occasionnally the timing sequence got compressed which could only be remedied by extracting the ppg module from the VME crate and reinserting it. No cause has been identified.
- The first ppg cycle at both MPET and EBIT is different from subsequent ones. It is assumed that a firmware upgrade should correct this.
- The Titan-RFQ ppg runs independently at 20 MHz. This gives a jitter of 50 ns on ion pulses that can be as narrow as 300 ns. Particularly for the EBIT this is a nuisance.
- For reverse extraction from the RFQ into the polarized beamline it is foreseen that more outputs are required in the future. Therefore, doubling the outputs from 2 to 4 for both reverse and forward extraction is recommended.

From this outlook it follows that a run of pc boards should contain 5 units for Titan (CPET, MPET, EBIT, RFQ and spare).

It was suggested by Daryl B. to order a run of 10 boards in view of the small incremental cost once the initial setup fee has been allocated.

It seems appropriate to complete 2 ppg units (CPET and spare) by April 2010.

The <u>present MPET/EBIT ppg modules</u> have the following connectors :

24 timing outputs (16 LEMO and 8 BNC)
<u>control connectors (IN USE):</u>
CLK IN (LEMO, used at MPET)
EXT CLK IN (BNC, used at EBIT; could use CLK IN could be used with TTL->NIM)
EXT TRIG IN (lemo, used at EBIT)
CLK OUT   (lemo, needed if external clock fails)
<u>unused connectors 1 (but conceivably useful) :</u>
RUN OUT
RST OUT
STOP OUT
EXT RST
<u>unused connectors 2 (not needed)</u>
VME IN
SYNC OUT