DESY Test Beam Preparations: Timing Studies

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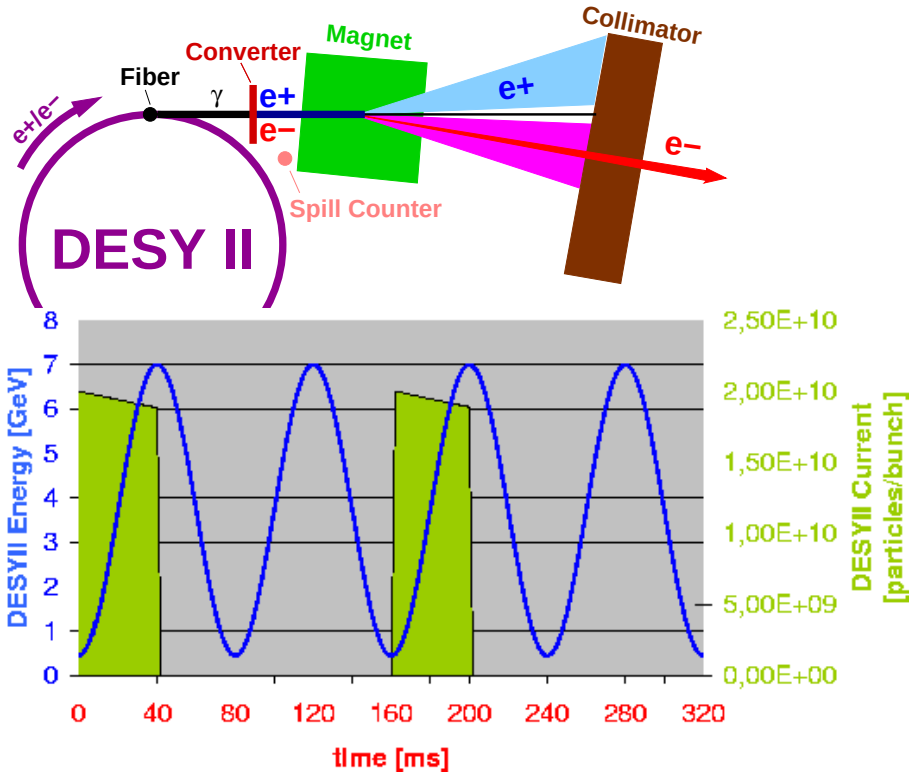
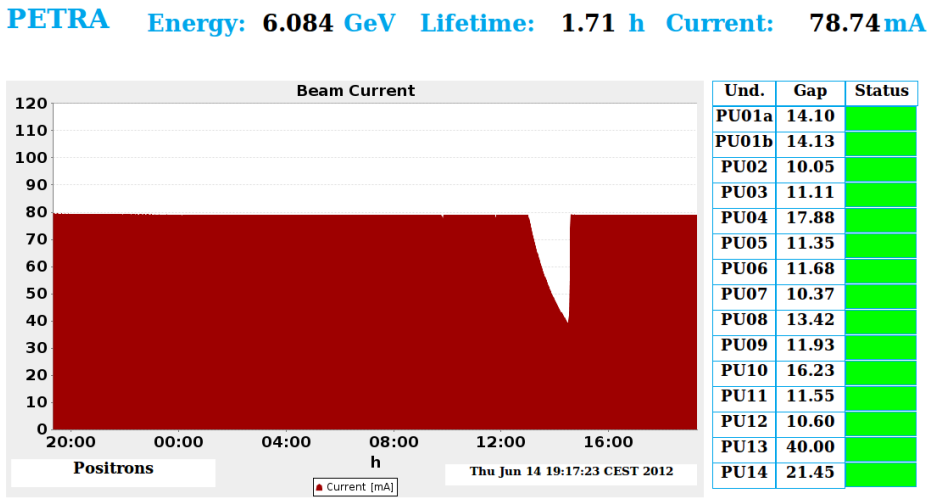
Test Beams versus PETRA

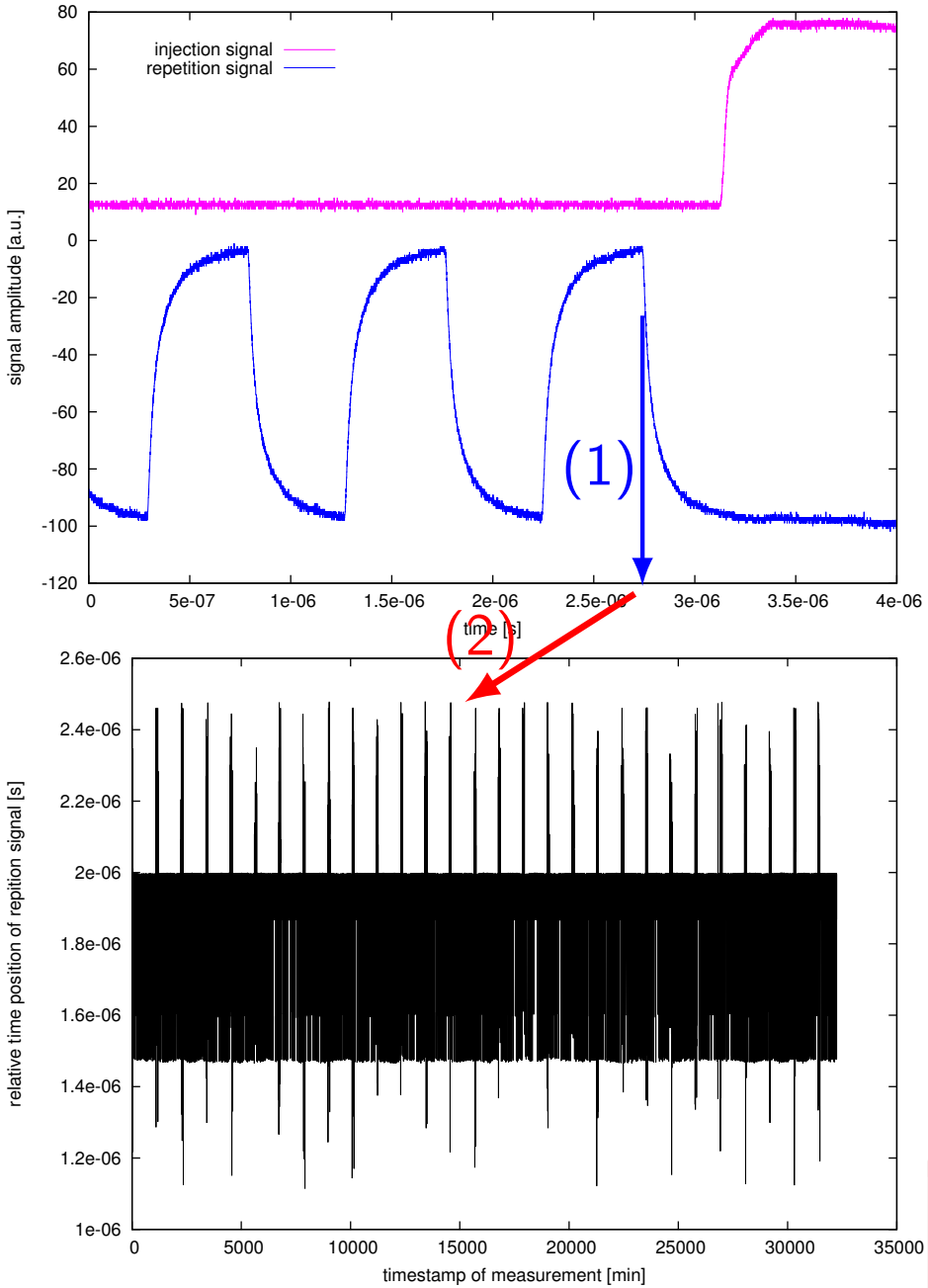




- DESY-II: acceleration in sinusoidal mode (12.5 Hz), revolution frequency 1 MHz
- test beam is not the only (or most important...) user of DESY-II:

→ PETRA is regularly filled (top-up mode) → DESY-II beam extraction

- no test beam during extraction cycle

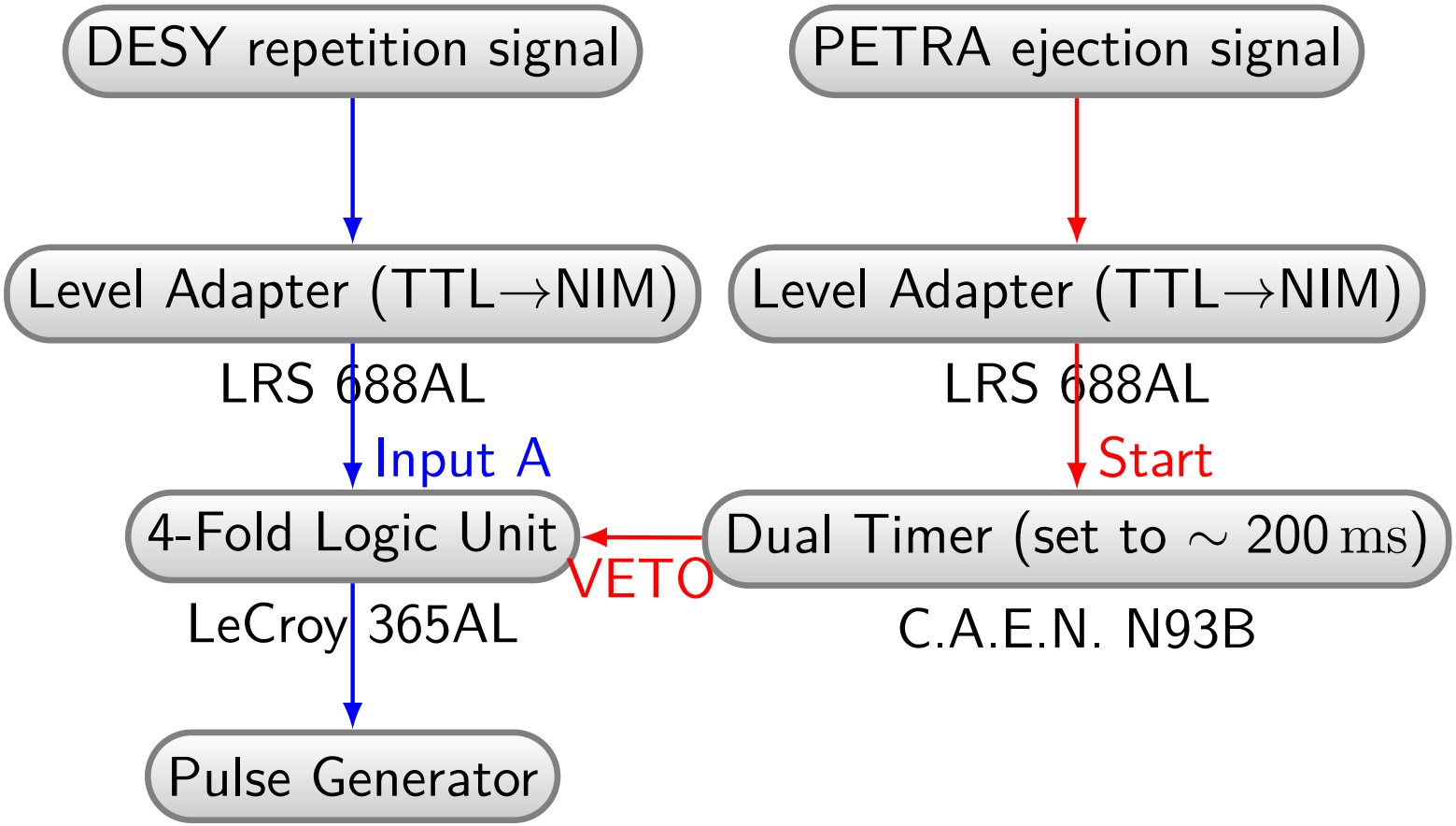


- to be in sync with DESY-II we base our clock on a $1\,\mathrm{MHz}$ repetition signal (blue) using a pulse generator ($1\,\mathrm{MHz} \rightarrow 40\,\mathrm{MHz}$)
- this signal is interrupted every $160\,\mathrm{ms}$ for $\sim 20\,\mu\mathrm{s}$ by injections from LINAC (purple signal)

- repetition signal is not stable!
- causes are: ejections from DESY to PETRA every $\sim 75\,\mathrm{s}$ and power line provider (Vattenfall)
- likely reason for test boards freezes during longer runs

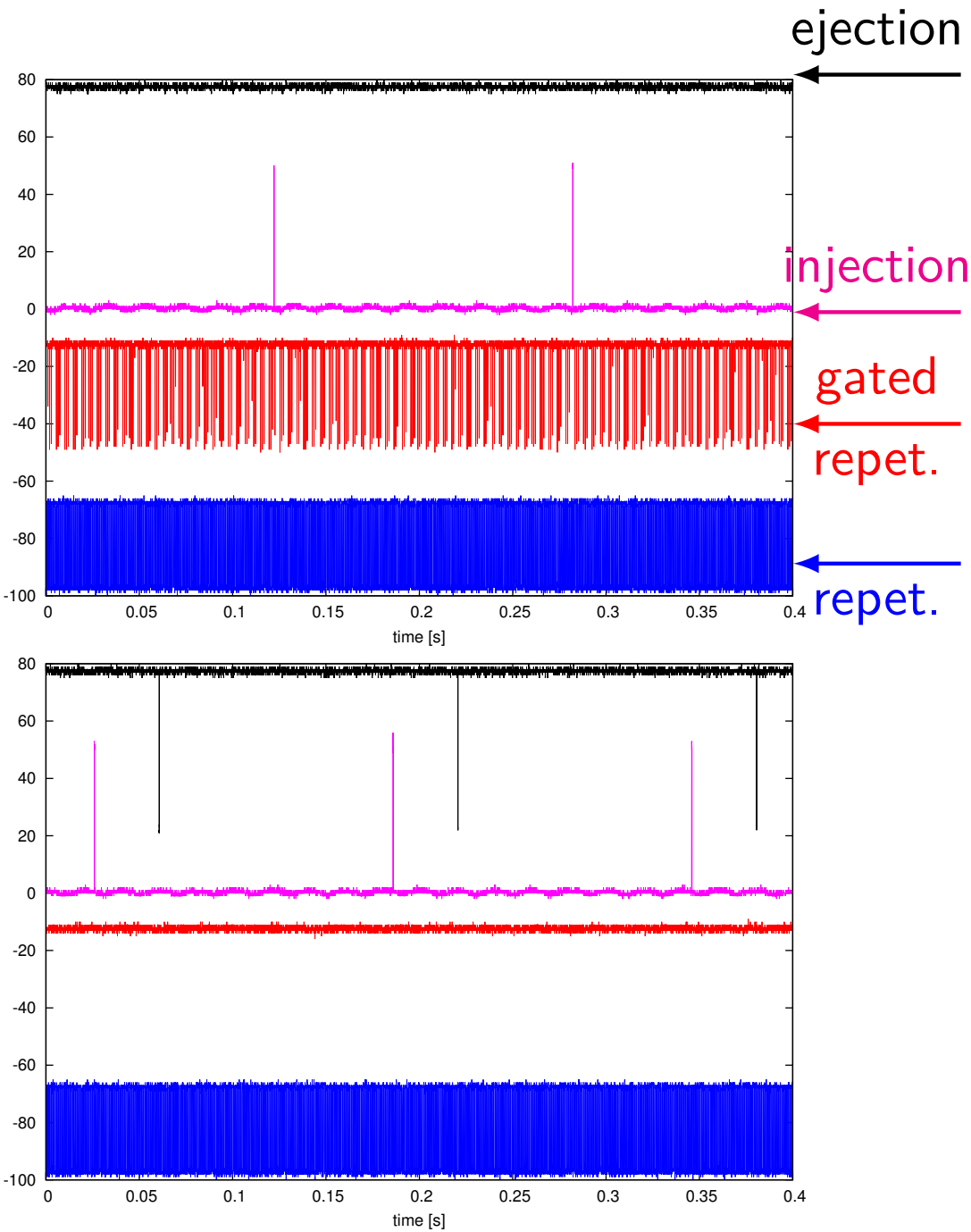
Need to suppress clock to test boards while PETRA is being filled!

Signal Processing for Extraction-Safe Clock



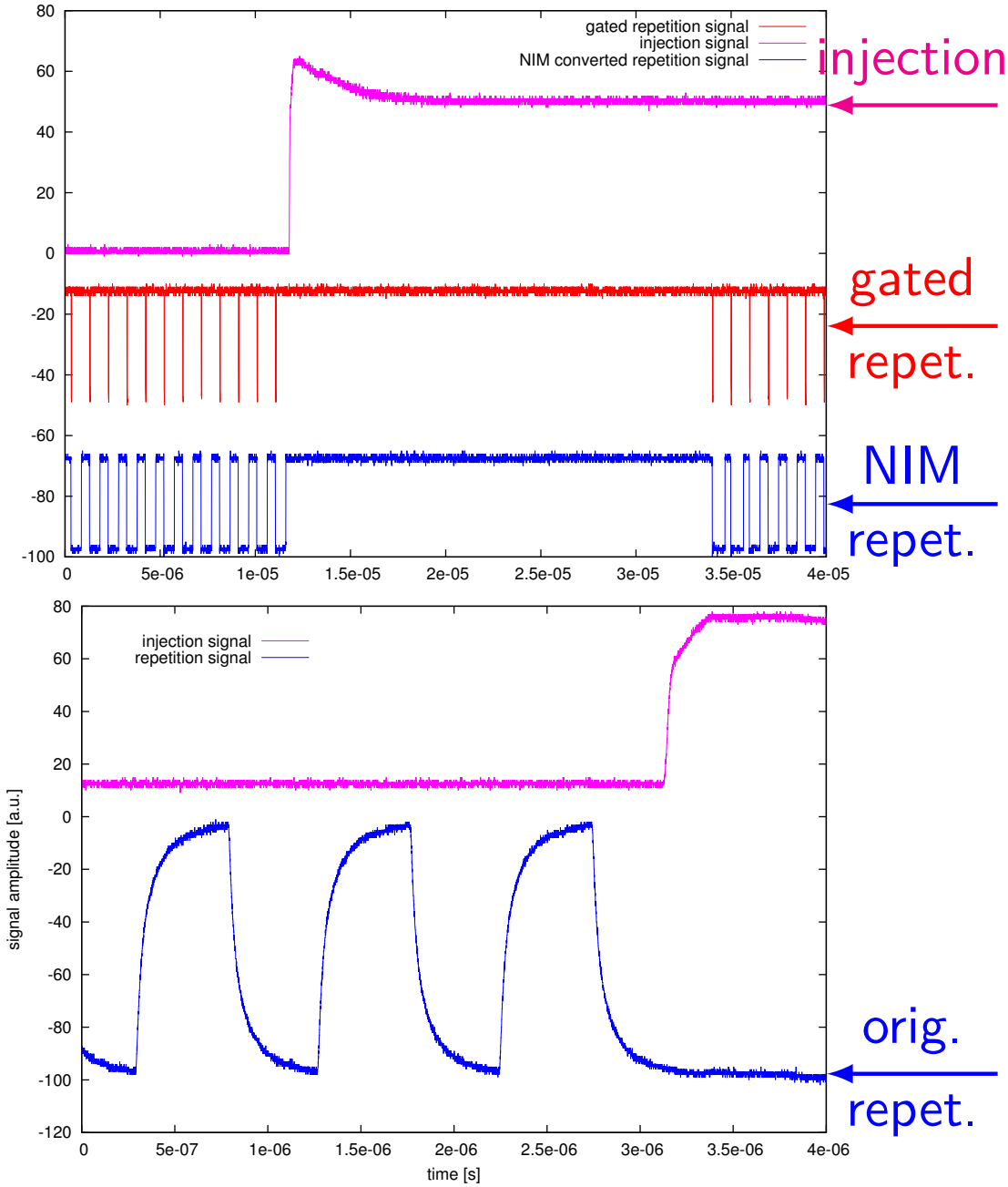
In short: generate gate from ejection signal, use gate as veto

Important: use gate generator that extends gate on each signal to cover full ejection signal burst



Result

- during each ejection the repetition signal is fully suppressed (red)!



Unintended Results

- the NIM-ized repetition signal is nicely rectangular
- the gate-controlled repetition signal is only a short pulse on the falling edge of the signal

→ should be ok for the pulse generator (?)

Summary

- DESY-II repetition signal needed to synchronize our clock to the arrival time of the test beam at the telescope
- signal is modulated and skewed during extraction to PETRA
- during extraction, signal can be masked with NIM electronics