DHP DATA ISSUES

- Observations
  - At KEK: Sometimes data streams (DHP-DHE) crash during injections
    - Exact conditions unclear (occupancy, trigger frequency)
  - At TUM and DESY: Data streams crash with high occupancy and high trigger rate
    - Always large number of triggers necessary (O(30))
    - Way out of specification, e.g. 16 % occ. for 110 µs continuous trigger (10 overlapping frames) with 80 µs breaks 25 times in a row
  - At Bonn lab system
    - Temporary delayed data output for out of spec occupancy (verified DHP feature)
    - Trigger patterns for data stream crashes cannot be reproduced because of DHE firmware restrictions

PRIORITIZE PROBLEMS

- Short term the system should run as stable as possible
  - Implement fast fixes/workarounds
  - Analyse problems with respect to quick implementation

- Long term we need to make sure nothing can crash the PXD
  - Understand root of particular problems
    - May take time (DHP simulation, direct DHP testing difficult)
    - Systematic DHH (+DHP) tests over all conditions

- We cannot do everything at once, problems and actions need to be disentangled and prioritized

PROBLEM ANALYSIS

- KEK data should be anlaysed in more detail
  - „empty“ DHP frames observed without crashes (Maiko)
  - Trigger/occupancy patterns analysed as input for lab tests
- TUM/DESY
  - Parameter space more similar to problems at KEK should be evaluated
- DHP simulation
  - Tomek will try simulating a known bad pattern from TUM tests to verify problem
  - DHP code: https://stash.desy.de/projects/B2G/repos/pxd_dhp-logic
- Long term:
  - Full system simulation of at least DHH + DHP would be helpful or even necessary for final firmware verification and understanding of problems

PROPOSED ACTIONS

- Short term
  - Possibility for reset when data streams are lost (Stefan is working on it)
  - Extended injection trigger veto („vFull“)
- Medium term
  - Gated Mode operation after injection to ensure PXD occupancies are in specified range
- Long term **Reset during every injection trigger veto ←** should be discussed and globally decided
  - Reset of link is possible in 8 µs
  - After reset of state machines max. ~ 25 µs until everything in DHP is back in sync (fsync + latency)
  - Configuration registers are not affected by reset

  → Reset during every injection would be feasible and ensure DHP can never get stuck in a bad state for a extened time. This would also safe the DHP logic against SEU problems.