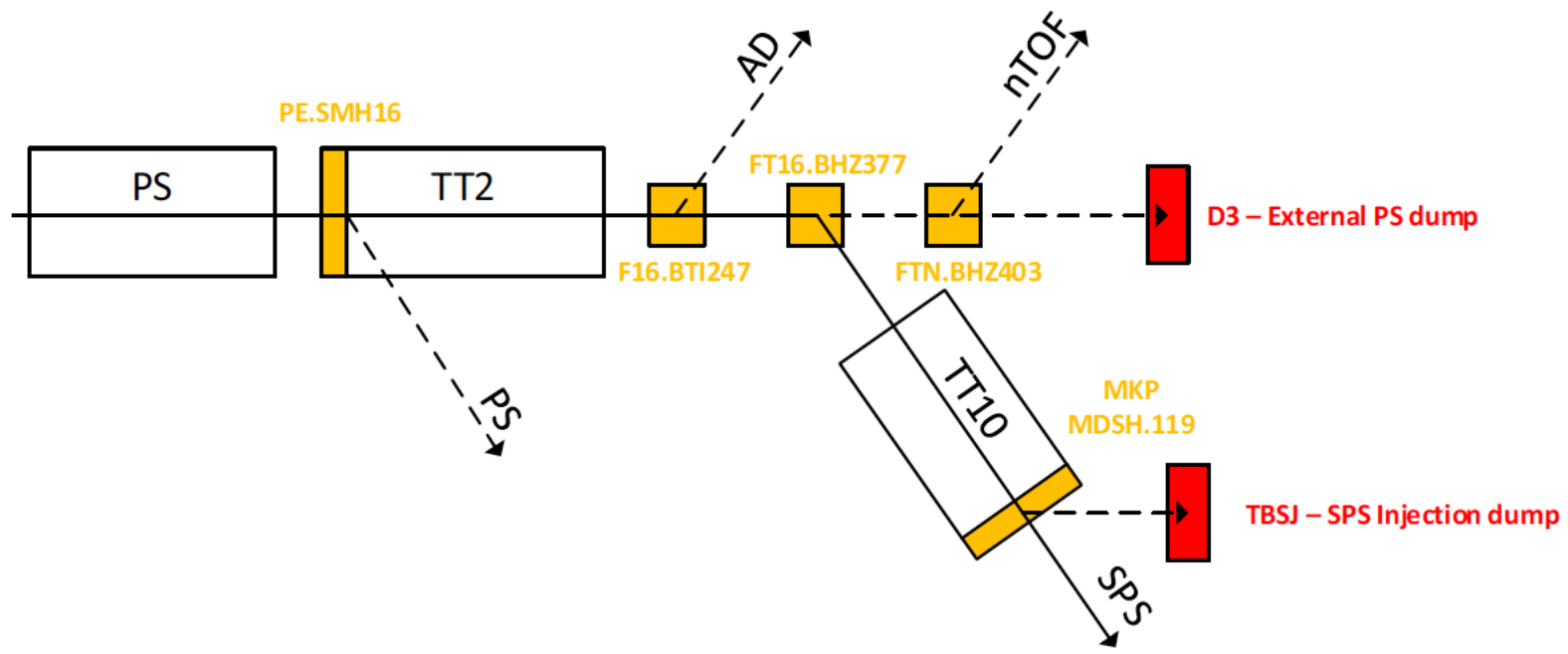


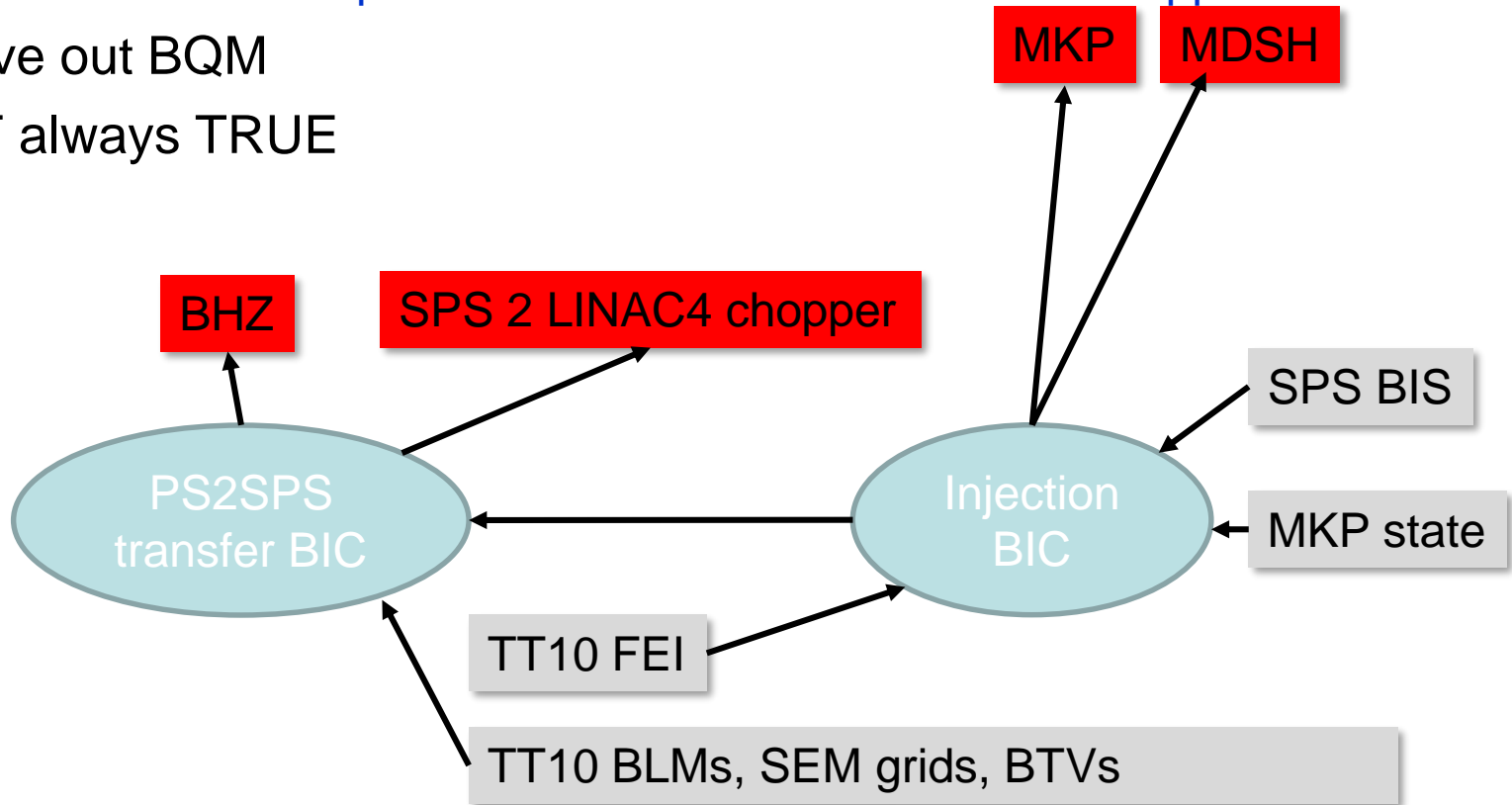
Injection BIS – next iteration



Proposed layout: Hierarchical

Basic principal:

- ❑ Two permits:
 - Injection permit → MKP and MDSH
 - PS2SPS transfer permit → BHZ and SPS 2 LINAC4 chopper
- ❑ Leave out BQM
- ❑ SBF always TRUE



Use cases of MDSH

- ❑ If no injection permit → MDSH needs to pulse
 - As soon as MDSH goes above 0 A, circulating beam needs to be dumped
 - MDSH current interlock to ring BIC (same value for all users; 0 A)
- ❑ Injection studies: injection kicker MKP disabled (all kicks)
 - Beam permit TRUE
 - Injection permit TRUE
 - MDSH cannot pulse (otherwise no beam permit)
 - Should only be done with low intensity.
- ❑ If 4 injections programmed and only 2 enabled
 - Beam permit TRUE
 - Injection permit TRUE
 - MDSH will not pulse for the two injections that are not enabled.
 - This is not ideal.
 - For LHC/HiRadMat beams, that are tagged LHC/HiRadMat OK.
 - Should we extend concept of beam on request also for fixed target beams?

- Functional specification
 - Pulse if there is no injection permit
 - Be able to ramp up to required value for any injection on the flat bottom (degauss to be taken into account when going down again)
 - Now only function defined for entire cycle
 - It should only ramp if it receives injection forewarning, with a flattop for a sufficient time for injection and then degauss down again.
 - Otherwise if injection permit is removed later on in the cycle, MDSH will ramp up and the circulating beam will be lost

- ❑ Very fruitful discussion with EPC

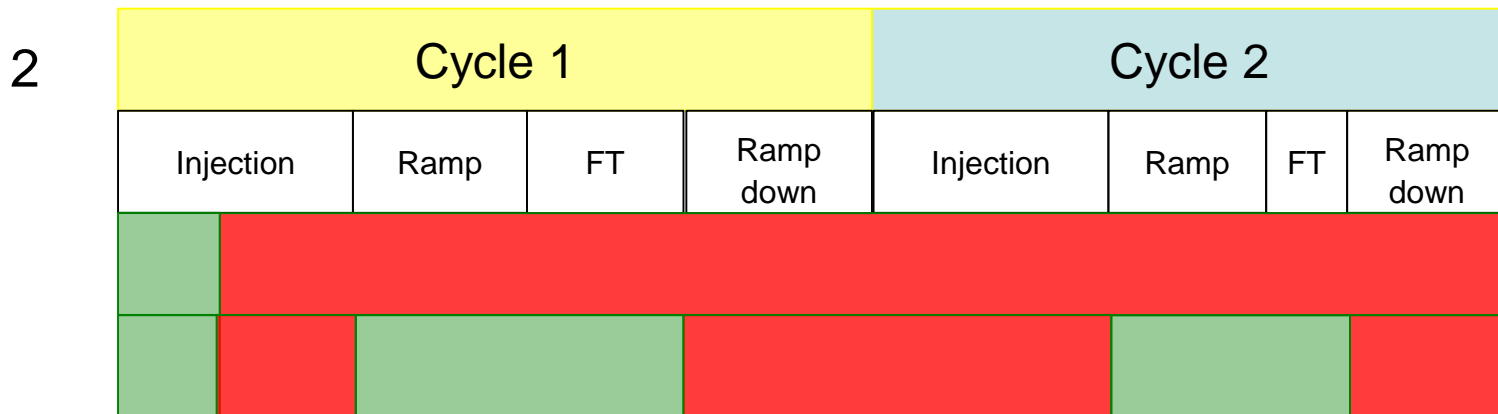
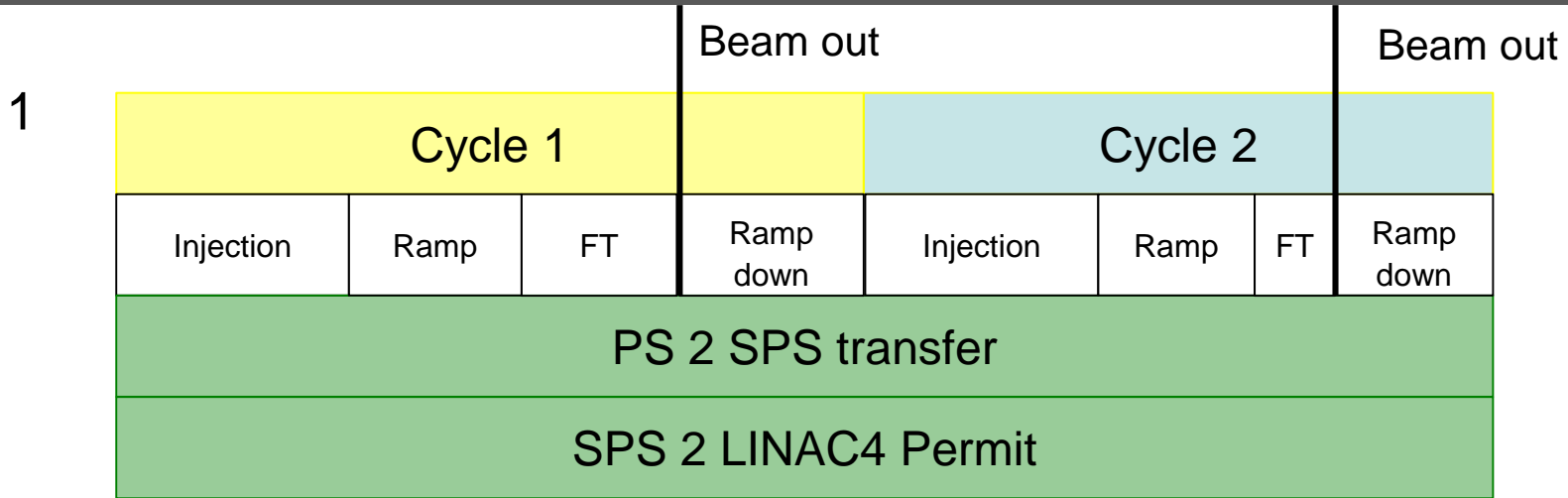
- ❑ New BHZ power converter will cycle every extraction.
 - No predefined cycle, only set value. FGC will decide how to get to that value including degauss

- ❑ Functional spec:
 - Receiving one injection still on the TBSJ is acceptable after injection permit removable
 - If the beam arrives with bad trajectory and does not end up on TBSJ, losses will not damage
 - Asynchronous permit of BIC will be taken into account if cycling has not started yet on FGC side and the power converter will not go to the SPS value (no state change e.g. standby)
 - Should not interrupt if already started cycle to avoid spraying beam around in TT10
 - Cards and details on how to get the permit into the power converter controls being discussed.

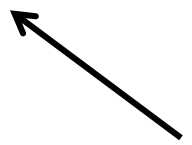
Interlock SPS 2 LINAC

- ❑ Needs to only cut SPS beams
- ❑ Needs to cut beams in the right moment and make sure that beams are produced again for next cycle in the SPS
- ❑ To guarantee this the PS 2 SPS transfer cannot be asynchronously transferred to the LINAC (tail clipper or chopper), but using the same approach as the Nicolas' gadget.

Use cases



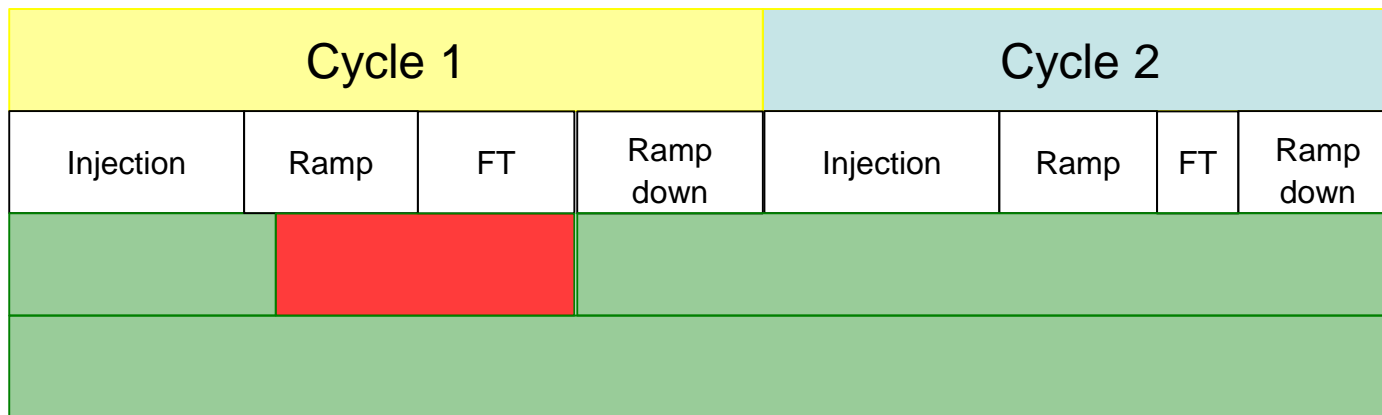
Power supply trip during injection



Force to TRUE at the end of injection until beam-out

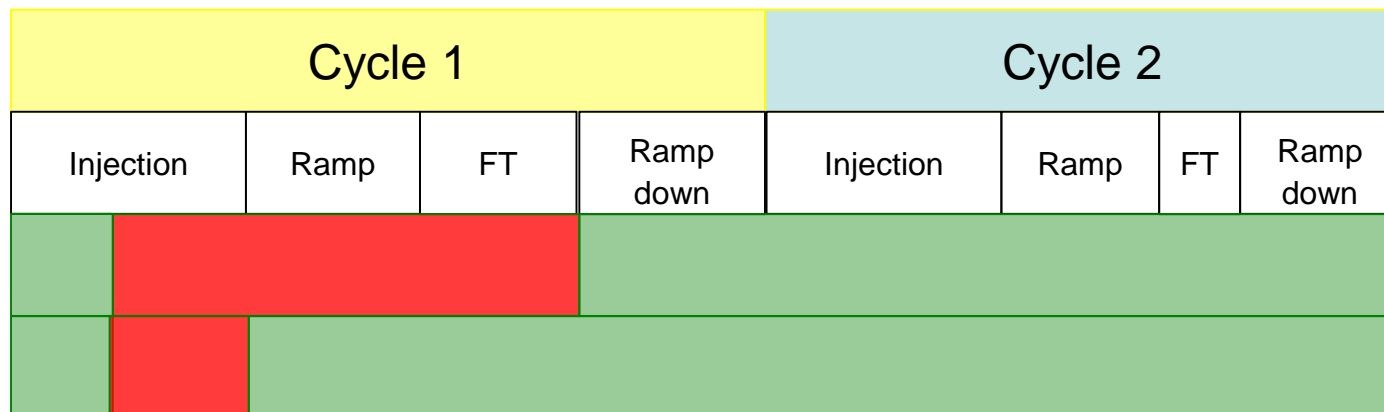
Use cases

3



Beam loss during ramp

4



Beam loss during injection

This is already implemented like this in Nicolas' card.

Another subject: How to interlock **Timing**

- ❑ Watch dogs on user side
 - Beam dump
 - Main power supplies
 - BLMs
 - Only work if receive timings
- ❑ Timing input in BA3: general timing problem
 - To be defined with Jean-Claude
 - Diagnostics in the control room would have to be available
- ❑ Timing BIS input on the TT60 BIC/TT40 BIC
 - SPS – LHC clock drifts
 - Anything else?