RSVP Language

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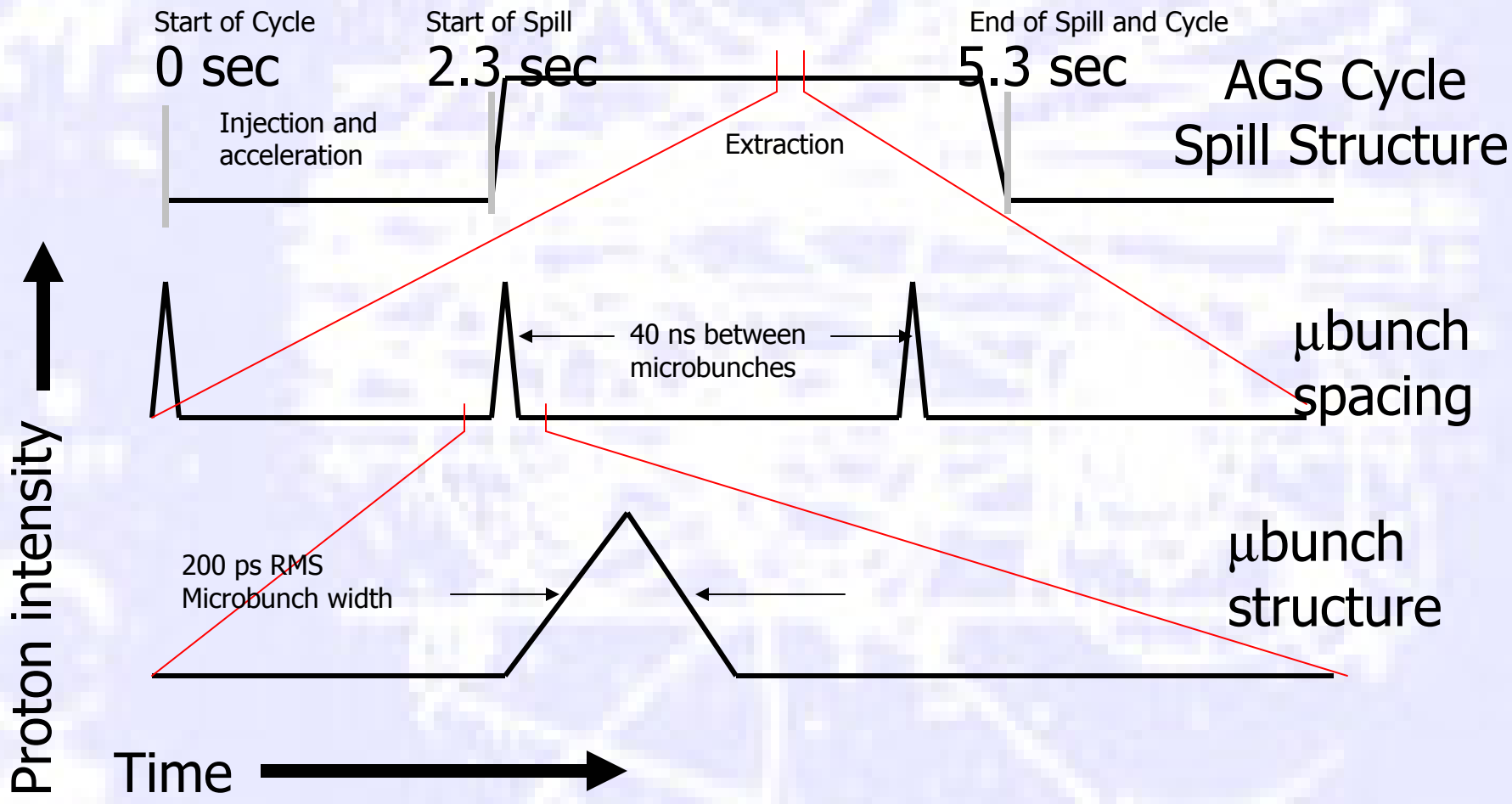
KOPIO related terms

1. **Micro-bunching** : a technique to create time structure on a slowly extracting beam employing an RF bucket structure through which the beam is forced. The frequency of the RF is the frequency of the resulting "micro-bunches" in the extraction line.
2. **Micro-bunch**: This is the (assumed Gaussian) time distribution of primary protons incident on the KOPIO target. The micro-bunch spacing for KOPIO is defined by the "25" MHz RF cavity to be ~40 ns.
3. **Inter-bunch**: This is the time interval between the micro-bunchs;
4. **Micro-bunch Width**: This always refers to the RMS (1 sigma for a Gaussian distribution) of the time distribution of the protons arriving at the KOPIO target center. It is 200 psec in the KOPIO TDR.
5. **Extinction**: This is the ratio of the number of protons between the micro-bunches to the number inside the micro-bunches. For calculation purposes, I will define the region within the micro-bunch as +/-5 sigma = +/-1ns. The inter-bunch region is then the 38 ns before the next micro-bunch starts.
6. **Punch Through**: This refers to protons in the AGS ring that cross the extraction resonance without being extracted. (Shane calls these "crossing“ particles.) Punch Through doesn't insist on where these particles end up. They might result in spray that contributes to extinction deterioration
7. **Extraction Efficiency**: This is the ratio of the beam that is measured on the first secondary emission chamber (or current transformer) in Switchyard to the circulating beam intensity measured just before extraction starts. It is defined by three basic components, an early beam loss usually associated with beam just starting to be ramped into the resonance, the loss during extraction on the septa devices, and a late loss, consisting of particles which did not get extracted.

Time Structure of Beam



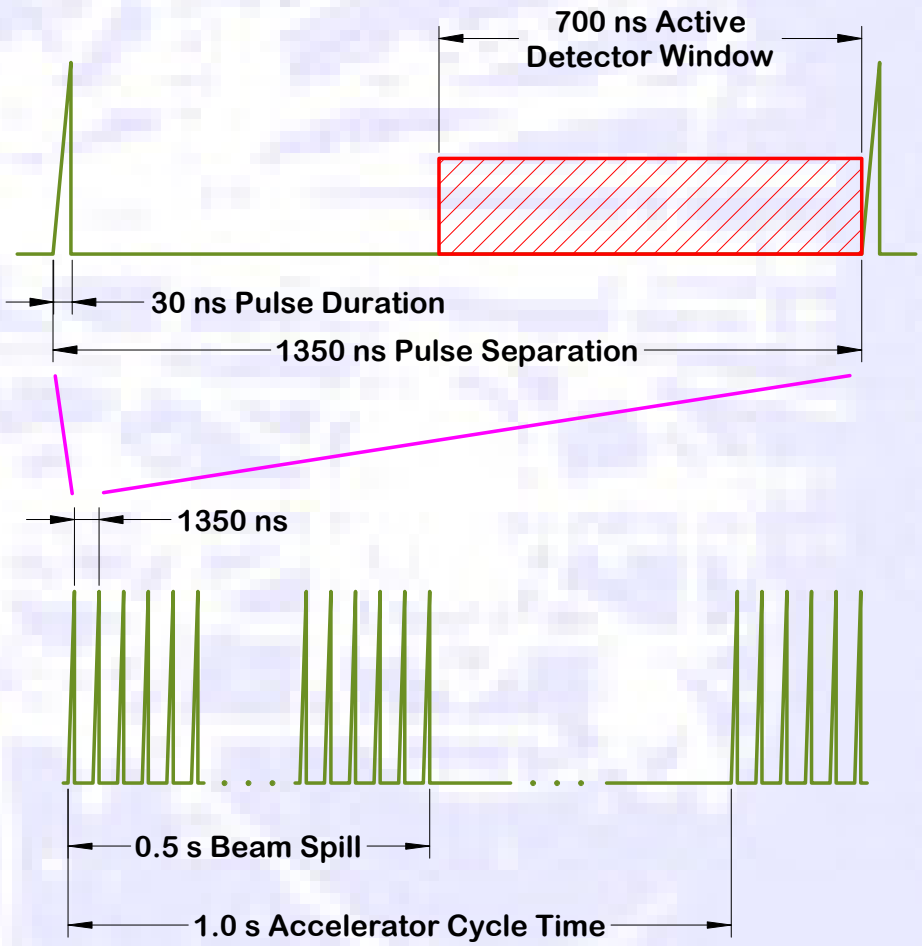
MECO related terms

1. Mini-bunching : a technique to create time structure on a slowly extracting beam employing bunched beam slow extraction. The frequency of the RF fixes the frequency of the resulting "mini-bunches" in the extraction line. Since only 2 out of 6 RF buckets are populated, the bunch frequency is 2x the revolution frequency, or ~740kHz.
2. Mini-bunch: This is the (assumed Gaussian) time distribution of primary protons incident on the MECO target. The mini-bunch spacing for MECO is defined by the revolution frequency of the extracted beam. Two bunches in the accelerator are equally separated at 7.5 GeV/c, giving a bunch spacing of 1.35 microseconds.
3. Inter-bunch: This is the time interval between the mini-bunches
4. Mini-bunch Width: This always refers to the RMS (1 sigma for a Gaussian distribution) of the time distribution of the protons arriving at the MECO target center. The width depends on the beam emittance in the accelerator before extraction and on the momentum width of the resonance for the slow extraction.
5. Extinction: This is the ratio of the number of protons between the mini-bunches to the number inside the mini-bunches. For calculation purposes, I will define the region within the mini-bunch as +/-5 sigma ~ +/-30ns. The inter-bunch region is then the 1.32 usec before the next mini-bunch starts.

MECO's Pulsed Beam

The $\mu^- N \rightarrow e^- N$ signal persists much longer than many potential background sources due to the ~1 μs muon lifetime when bound to an Al nucleus

We suppress prompt backgrounds by accepting conversion e^- candidates that arrive *well* after the proton beam strikes the target.

This necessitates pulsing the proton beam:

- ✓ Beam pulse duration << μ lifetime
- ✓ Pulse separation ≅ μ lifetime
- ✓ Extinction (the fraction of beam arriving between pulses) < 10^{-9}