

RHIC/Experiments Coordination Meeting: Run 22, 11/16/2021

- Setup Status
- Review of (an) improvement relative to Run 17
 - Why?
- Startup plan modifications with the delay

Status

- RHIC cooldown started Mon 11/15
 - Full cooldown delays first beam to ~12/5 (for cryo work)
- AGS setup paused for BtA obstruction remediation
 - Replacement of valve piece with bellows with nitrogen scrubbing and partial bake to hopefully avoid a full bakeout (Fri 11/19 eve—Mon 11/22 morning).
 - Resumption of AGS setup Monday if pressure checks out.
 - Leaves 2 calendar weeks for AGS setup.

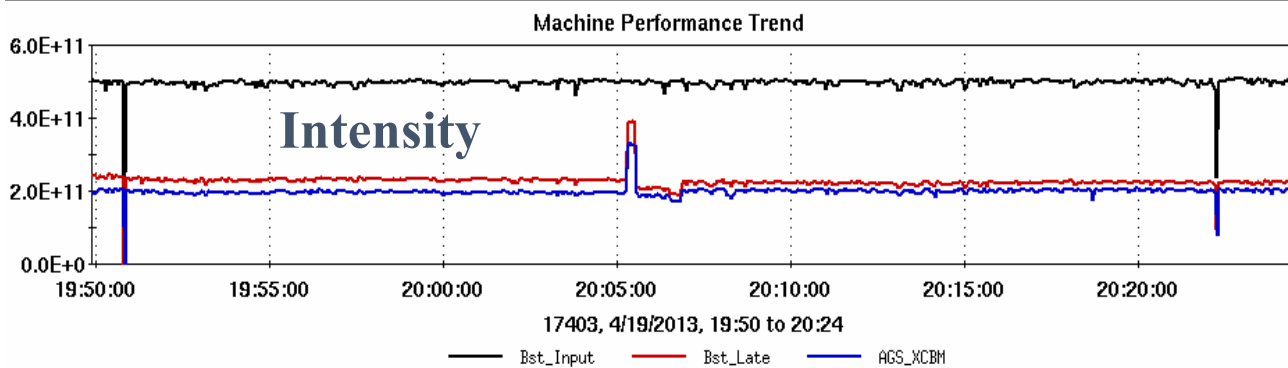
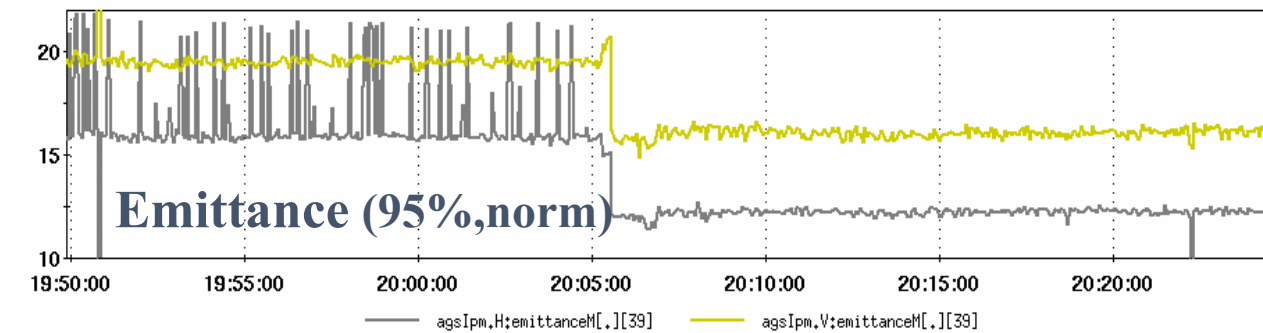
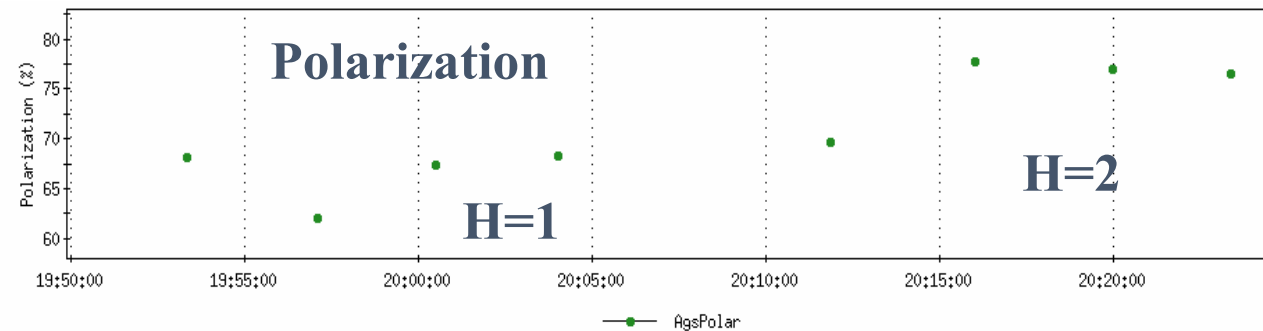
Two bunches in AGS from Run 13

In Run 13, proton bunches were captured on h=2 at Booster injection and accelerated to AGS extraction as two bunches as a test

Improvement at the time

- 20% emittance improvement
- 12% (relative) polarization improvement
 - Center-measured in AGS

The proposed scheme splits in the Booster instead of h=2 capture to preserve dual harmonic capture (which gives lower peak currents at Booster injection)



4/19/2013	B	B_{input}	B_{late}	A_{CBM}	$MW006_H$	$MW006_V$	AGS_H	AGS_V	$P_{ave.}$
	h	10^{11}	10^{11}	10^{11}	μm	μm	μm	μm	%
19:53 - 20:04	1	5.0	2.30	2.00	10.5	3.49	16.0	19.8	66.5
20:11 - 20:23	2	5.0	2.25	2.02	11.9	3.13	12.3	16.1	75.2

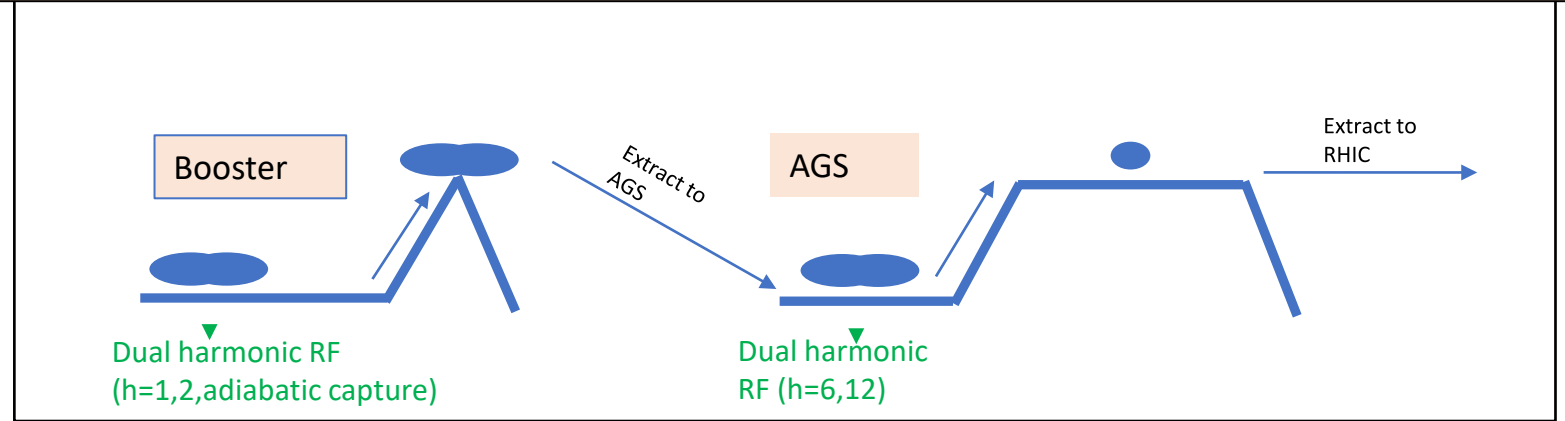
Bunch split and merge scheme

Present scheme:

A single pulse from the source remains a single bunch from source to collision

Booster and AGS injection both have defocusing RF harmonics

Present scheme: Single bunch from source to RHIC, dual harmonic RF at Booster and AGS injection

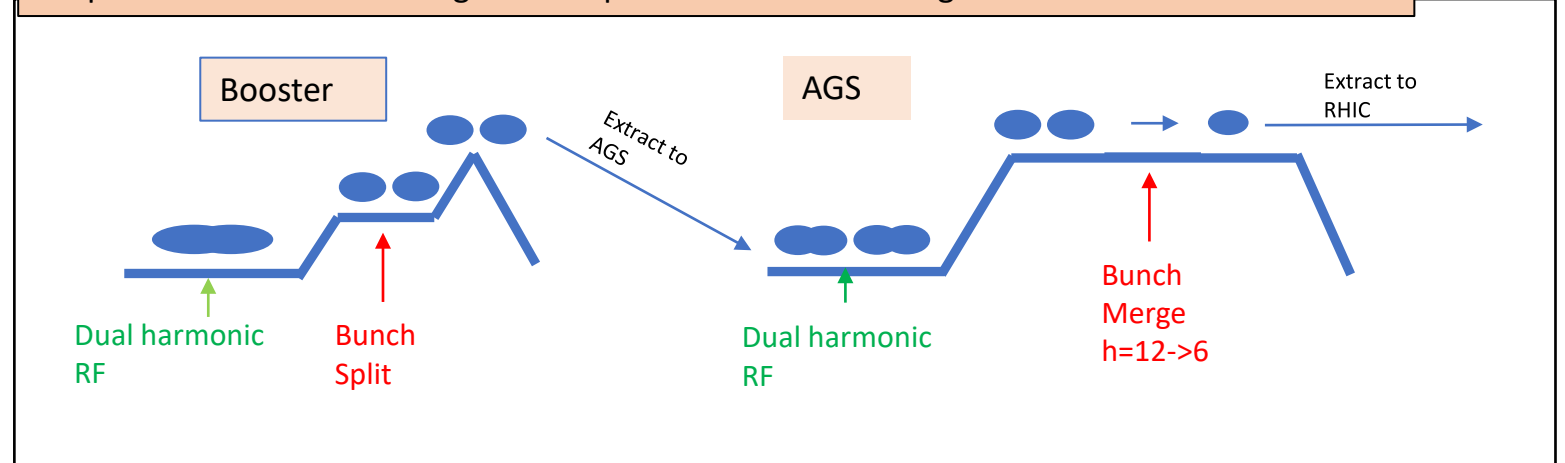


Add a 1->2 bunch split during acceleration in the Booster

Reduces peak current at AGS injection by $\sqrt{2}$ (optimally)

Requires a 2->1 merge at AGS extraction energy of 25 GeV to recovery the per bunch intensity

Proposed scheme: Add a longitudinal split in Booster and merge in AGS at 25.5 GeV



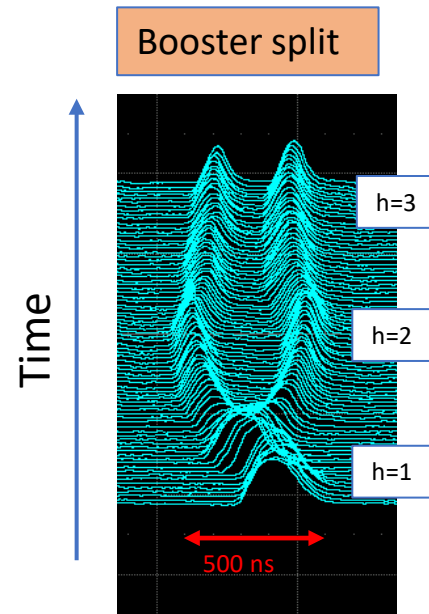
Run 21 Split/merge test

January 2021 pre-run test

- Test the longitudinal mechanics
- Basic *unpolarized* proton setup (no snakes)
- Interleaved with two other proton efforts

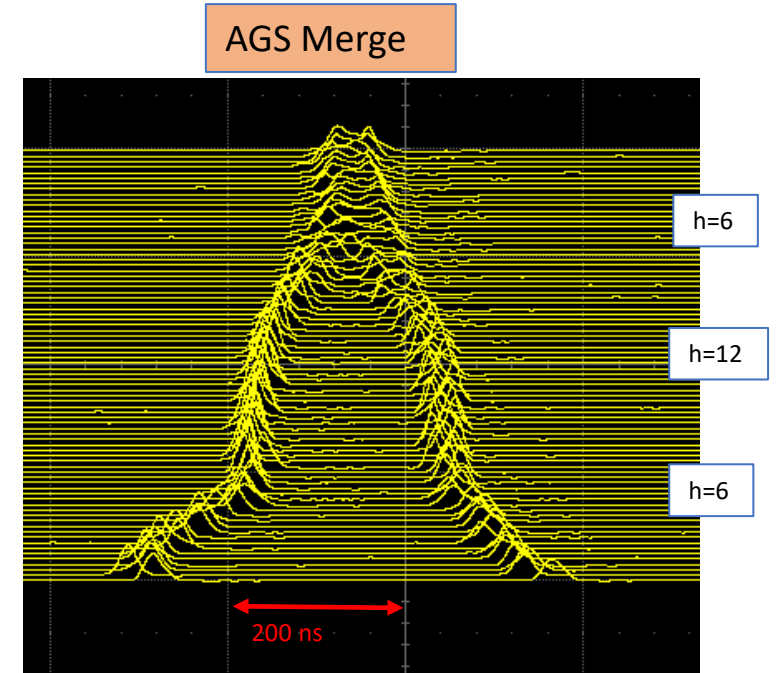
- Synch period at AGS flattop is 12 ms
 - Merge takes a full second
 - Hard to maintain constant, adiabatic conditions

- In ~2 day test: **20% longitudinal emittance increase from merge**



Booster RF:

- Capture on h=1, defocus (h=2)
- Accelerate to merge porch
- Split h=1 → h=2
- 'Squeeze' h=3 to get bunch spacing for BtA transfer



AGS RF:

- Capture on h=6, defocus (h=12)
- Accelerate to flattop
- Squeeze h=6 → 12
- Merge h=12 → 6

RHIC Startup

Since *both* RHIC and the AGS startups are delayed, options are limited

- RHIC setup
 - Most of the ring can still be cooled: p.s. group doing checkout in all available areas as ready
 - Some tests *require fully cooled rings* (high current checkout, shutoff tests) , cannot be done early
 - Early tests could get us to 24/7 beam setup 1-2 days earlier in startup than normal
 - Injection to physics in Run 17: 12 days with a modified lattice (*no new lattice this year*).
- Injector setup:
 - Booster setup of proton split and Au for CeC *already done*
 - Aim to have the split-merge ready prior to physics declaration.