Defining a new baseline for beam cooling for a muon accelerator front-end

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Outline

- Review existing baseline with:

  - Engineer requirements for buncher & rotator

  - Engineer requirements for cooler

- Compare this baseline with a bucked coiled front-end with:

  - Bucked coils on rotator

  - Bucked coils on cooler (schemes with longitudinal bucked coils and radial bucked coils)

- New: After optimizations the bucked coil scheme underperform only 13% instead of 20% (reported 15 days ago).
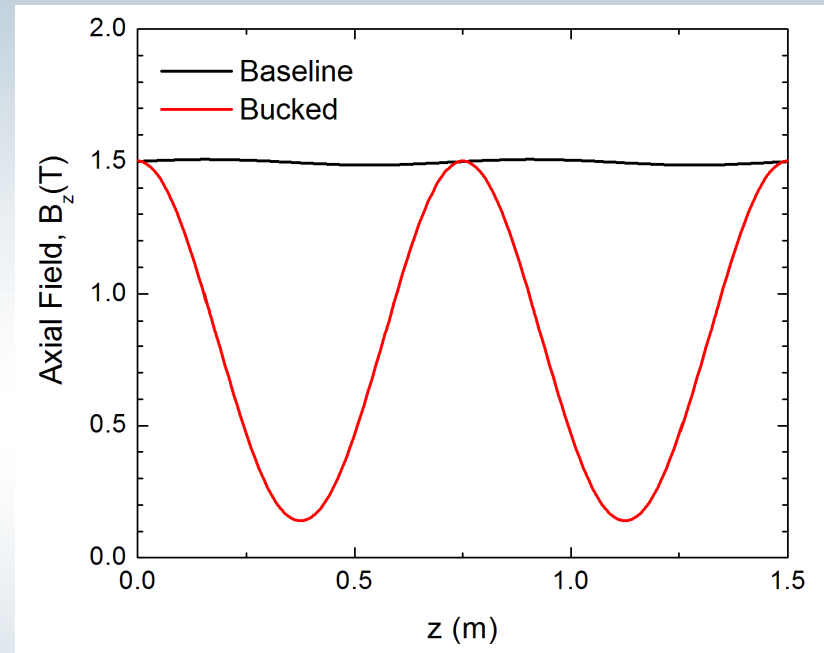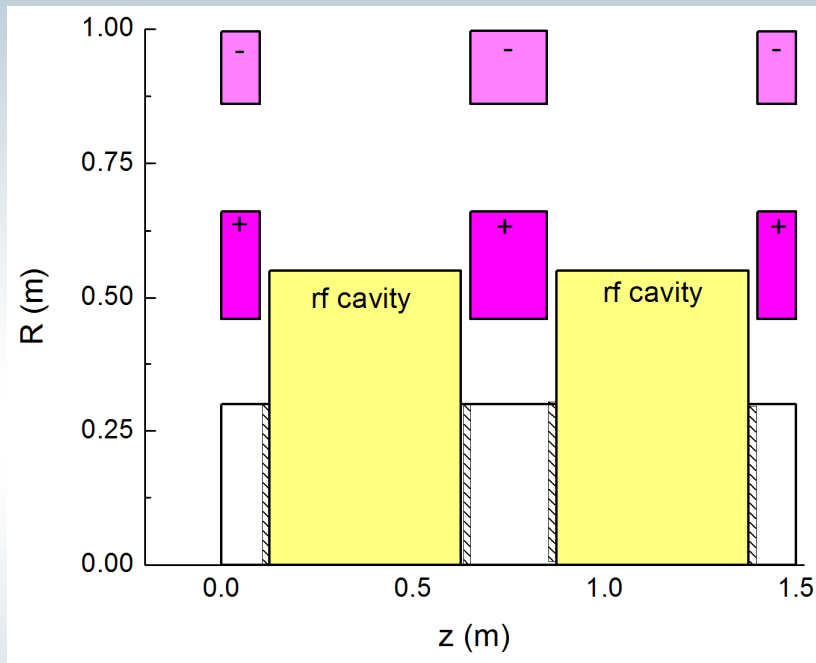
New Buncher/ Rotator for Baseline
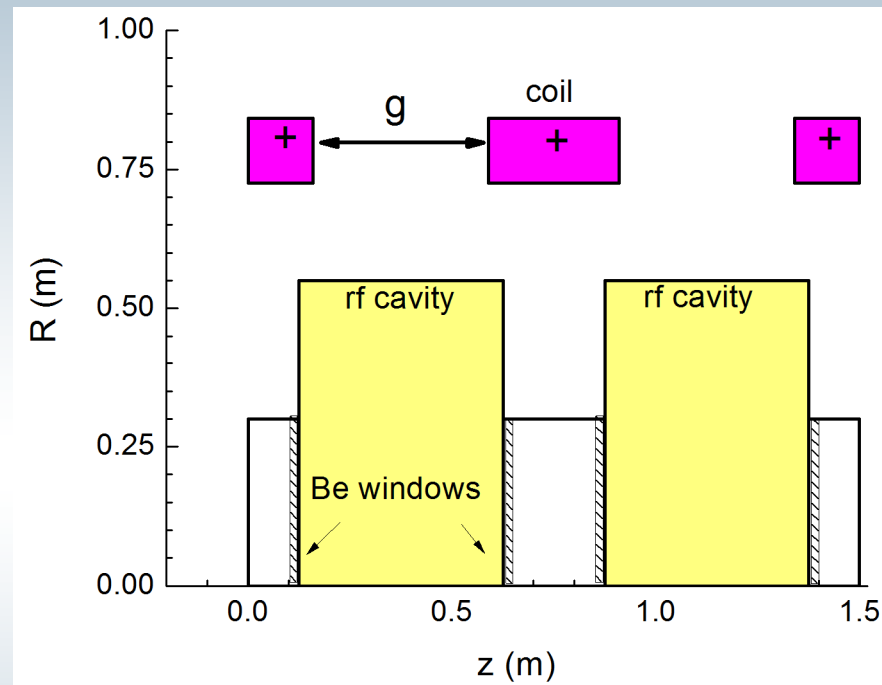
- Simulations suggest that it is safe to increase the gap up to g=0.50 m without loss of performance or presence of stop bands

- Conclusion: Keep g=0.431 m (see engineers report)
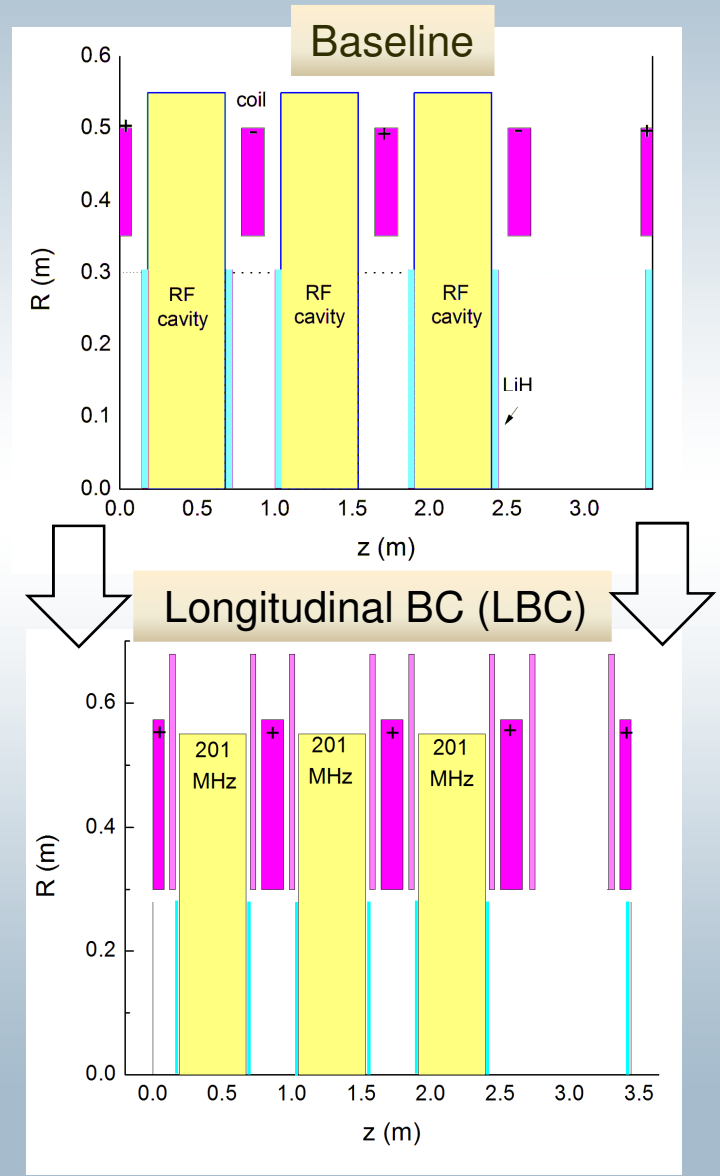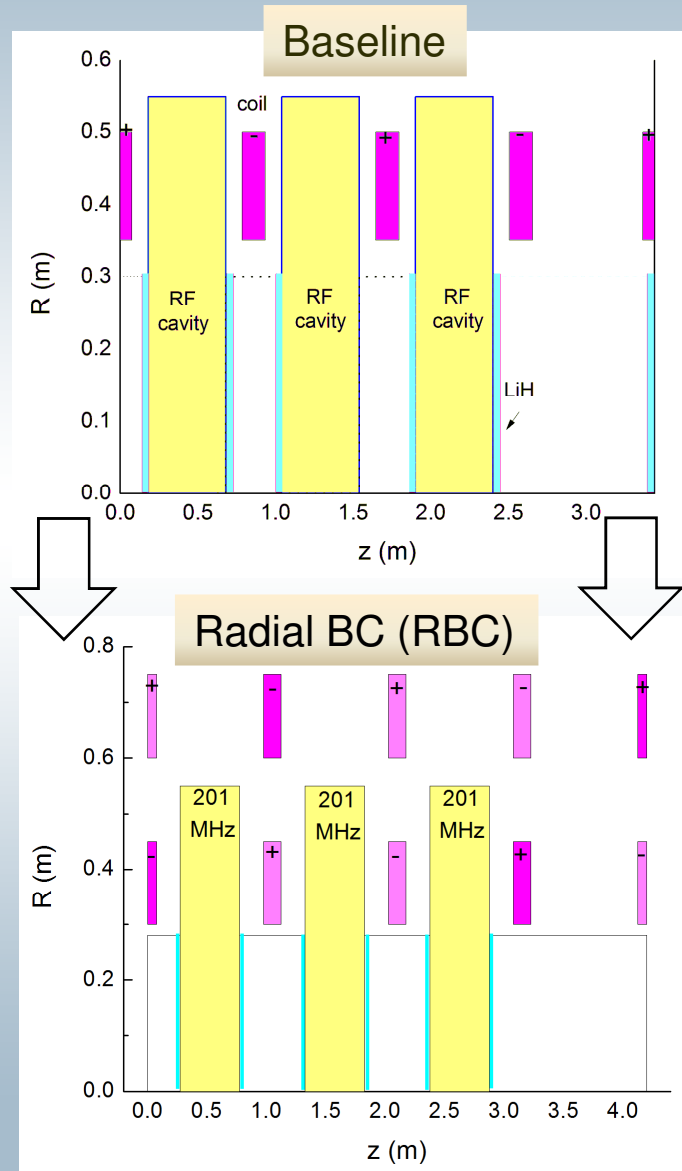
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New cooler for Baseline (empty cell)
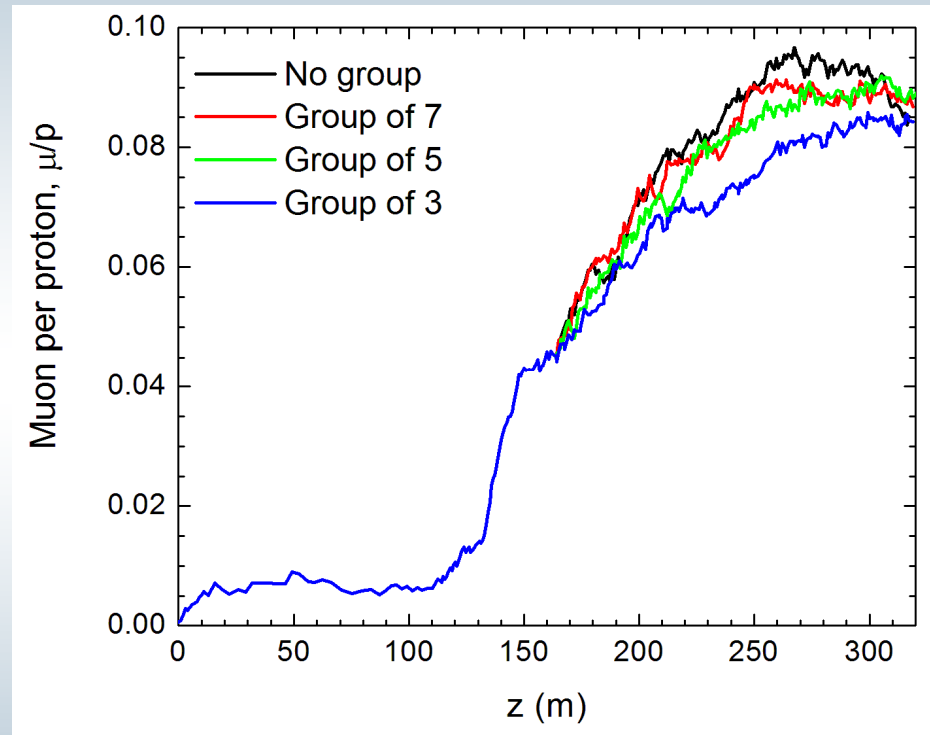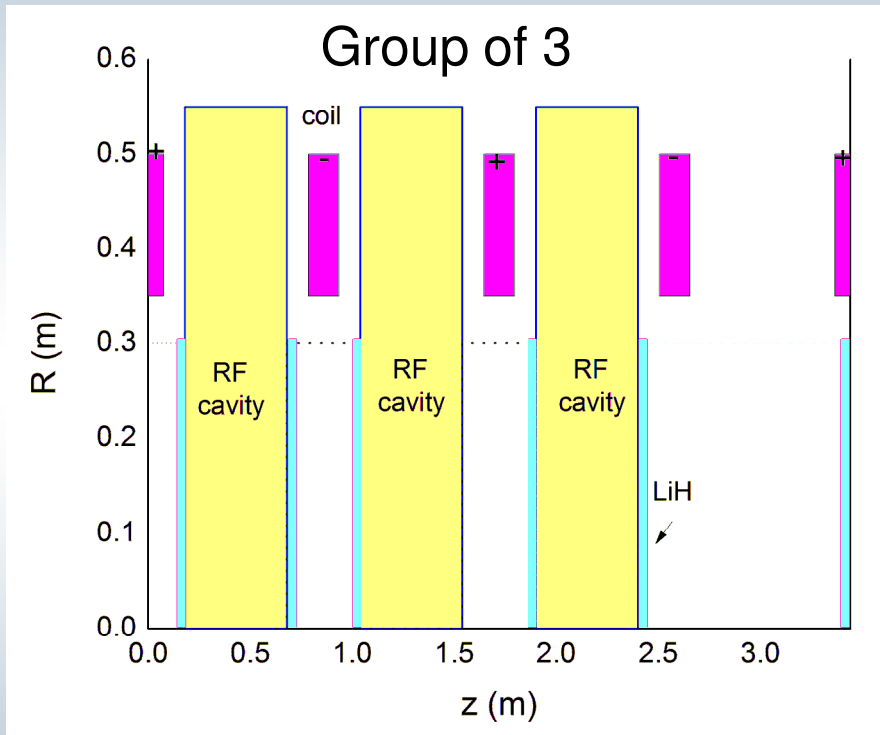
- There is a loss of ~5% if empty cell is after 5 cavities
- <u>Conclusion</u>: Keep a group of five cavities
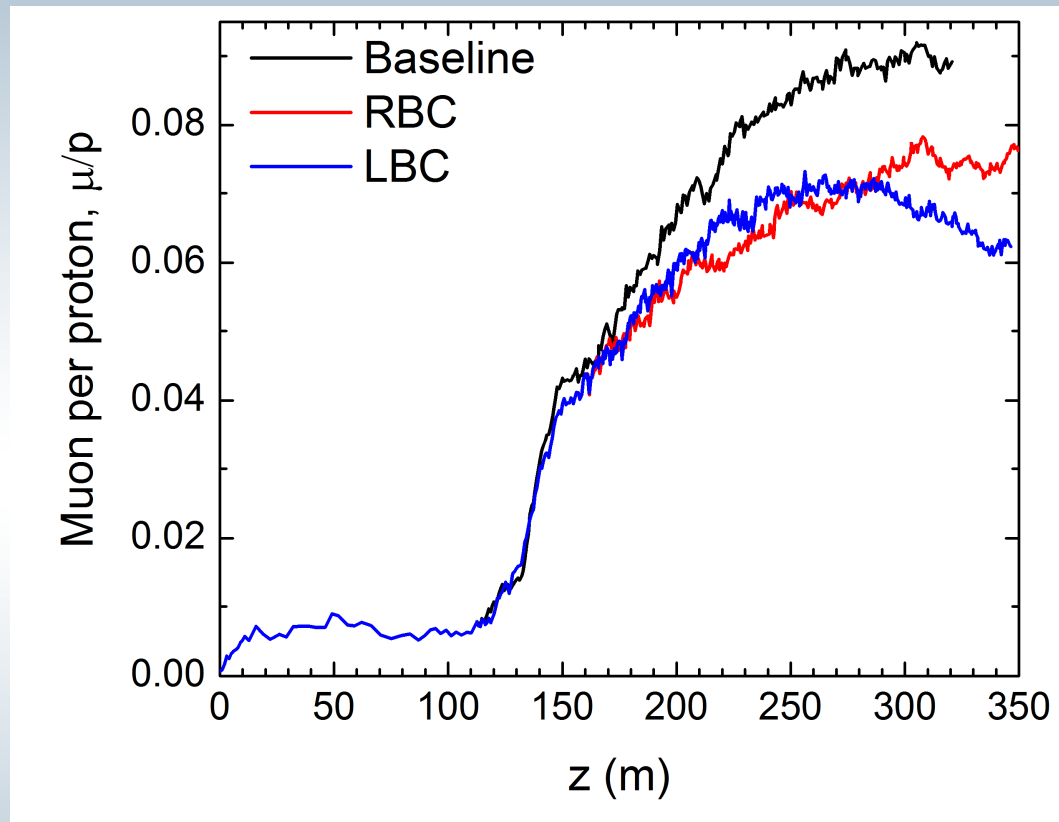
Bucked Coils for Phase-Rotator

- There is a loss of ~3-5% when adding bucked coils on phase rotator. Not a big problem!

Bucked Coils for cooler: Two schemes
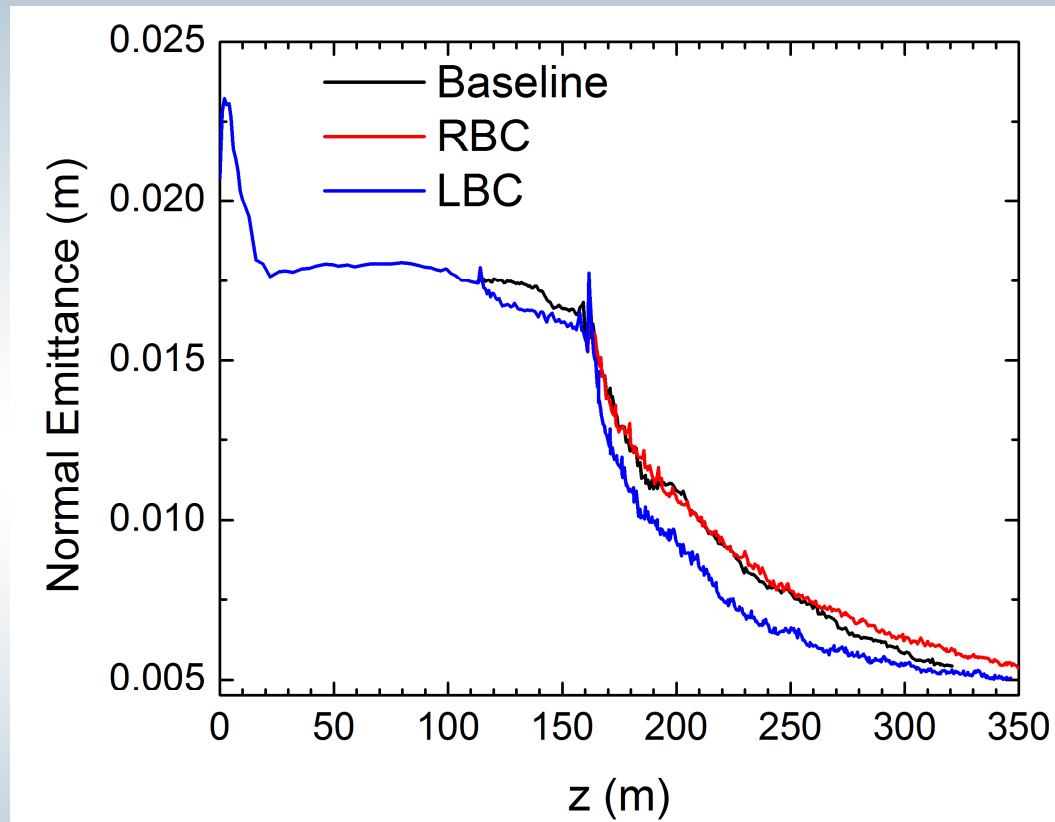
ICOOL simulation (1)

- RBC performs better than LBC
- After optimization RBC gives 13% less muon per protons than baseline

ICOOL simulation (2)

- Cooling performance of BC schemes is comparable to baseline

Summary

- For the baseline:

  - It safe to increase the gap between the coils in the buncher & rotator as desired by the engineering studies. 'Safe' means same good cooling and a high muon/p rate.

  - It is also safe to increase the cooler cell length up to 0.86 m

  - It is better if the gap is placed every 5 or 7 cavities instead of 3

  - Performance goes down by 5-7%

- Bucked Coils (BC) were applied in both rotator and cooler.

- Two schemes tested on cooler, but RBC looks better so far

- With bucked coils and after optimization the losses are ~13% which looks more promising