

Cooling Tasks in MAP

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Comment

This is the beginning of a paradigm shift:

Instead of concentrating solely on the challenge of cooling design and evaluation, we must start thinking about all aspects of the system.

Top Level Cooling Tasks (Design & Simulation)

1. Develop approach for comparing, assessing, and selecting cooling techniques
2. 6D Cooling
3. Final Cooling
4. Additional Components
5. Simulation Code Development (ICOOOL & G4beamline)
6. Target-to-accelerator simulation of Front End and Cooling
7. RF Systems
8. DFS Report preparation

Develop approach for comparing, assessing, and selecting cooling techniques

- Characterize input beam from front end
- Characterize internal beam interface(s) within cooling section
- Characterize output beam to accelerator
- Approach for selecting 6-D cooling method
- Approach for selecting final cooling method

This has thorns – different cooling methods may well require different overall layouts, and thus different beam interfaces.

Examples of Different Cooling Layouts

- Charge separation (high emittance)
- **Two** Guggenheims
- **Two** Low-energy bunch mergings
- **Two** Guggenheims
- **Two** Lithium Lenses
- Charge recombination

- **One** Helical FOFO Snake
- Charge separation (lower emittance)
- **Two** Low-energy bunch mergings
- **Two** HCCs
- Charge recombination
- **One** 50 T solenoid channel

6D Cooling

- Guggenheim
- Helical Cooling Channel
- Helical FOFO-Snake

Final Cooling

- 50 Tesla HTS channel
- Lithium Lens channel
- Low β bucked coil lattice
- PIC - REMEX

Additional Components

- Charge separation
- Charge recombination
- Low-energy bunch merging
- High-energy bunch merging

Target-to-accelerator simulation of Front End and Cooling

- Join baseline subsystems into single model
- Final optimization of selected channel
- Both ICOOL and G4beamline (other codes?)
- Study sensitivities:
 - Physics models
 - Hardware parameters
 - Mechanical tolerances
 - Polarization
 - Space charge
 - Other effects (absorber polarization, wake fields, ...)

RF Systems

- Design of RF system
- Breakdown in RF cavities
 - Simulate beam breakdown in pressurized cavities
 - Develop model of breakdown in vacuum
 - Space charge simulations
 - Optimize magnetic-insulated cavity
 - Breakdown code development

Summary

- Down-selecting of the cooling channel is scheduled in 2012.
- That is a challenging date.
- There is much to do....