RGH beamline instrumentation



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U.S. DEPARTMENT of ENERGY

Hall B Standard Beamline Instrumentation

- Harps
  - 2C21, 2C24, 2H01
- BPMs
  - 2C21A, 2C24A, 2H01 nA BPMs
  - 2C24B, 2H00, 2H01A strip line BPMs for currents >10 nA
- BCMs
  - Cavity BCMs 2C21A, 2C24A, 2H01 coupled to nA BPMs
  - Faraday cup

Chicane magnet

CRYOMAGNETICS, INC.
INNOVATIVE TOOLS FOR SCIENTIFIC RESEARCH

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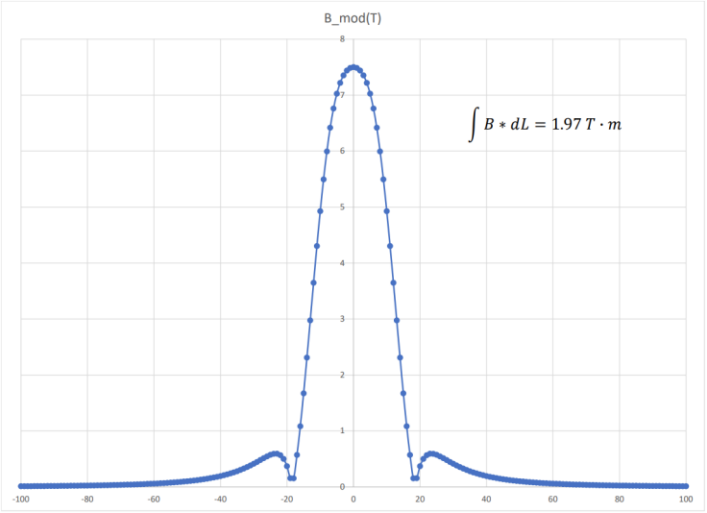
- 7.5 Tesla split pair field strength
- ±0.1% homogeneity over 10mm DSV
- Vertical bore 2.375 in (60.3mm) ID; horizontal bore 2.00 in (50.8mm) ID
- Single remotely-mounted Sumitomo Pulse Tube cryocooler
- Cryogen-free operation



This compact superconducting magnet system features dual room temperature bores compatible with optical cryostats. The split-pair configuration operates at 7.5 Tesla field strength without requiring liquid cryogen.

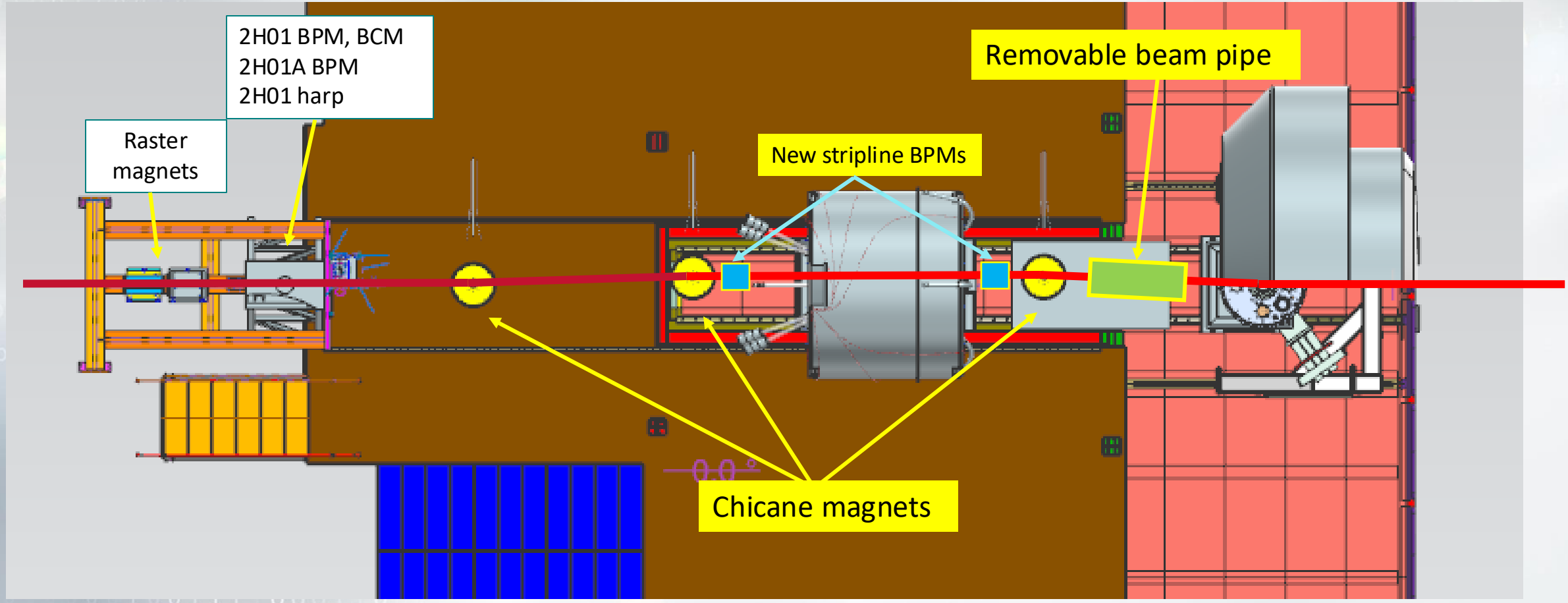
Customer Location: Florida, USA

Delivered: June 2018

Needs some modifications:

- Rotate cooling head
- Modification of the bore so that we can feed the beam pipe through and keep the magnet vessel insulating vacuum and the beamline vacuum separate.
- Add NMR probe

RGH beamline layout



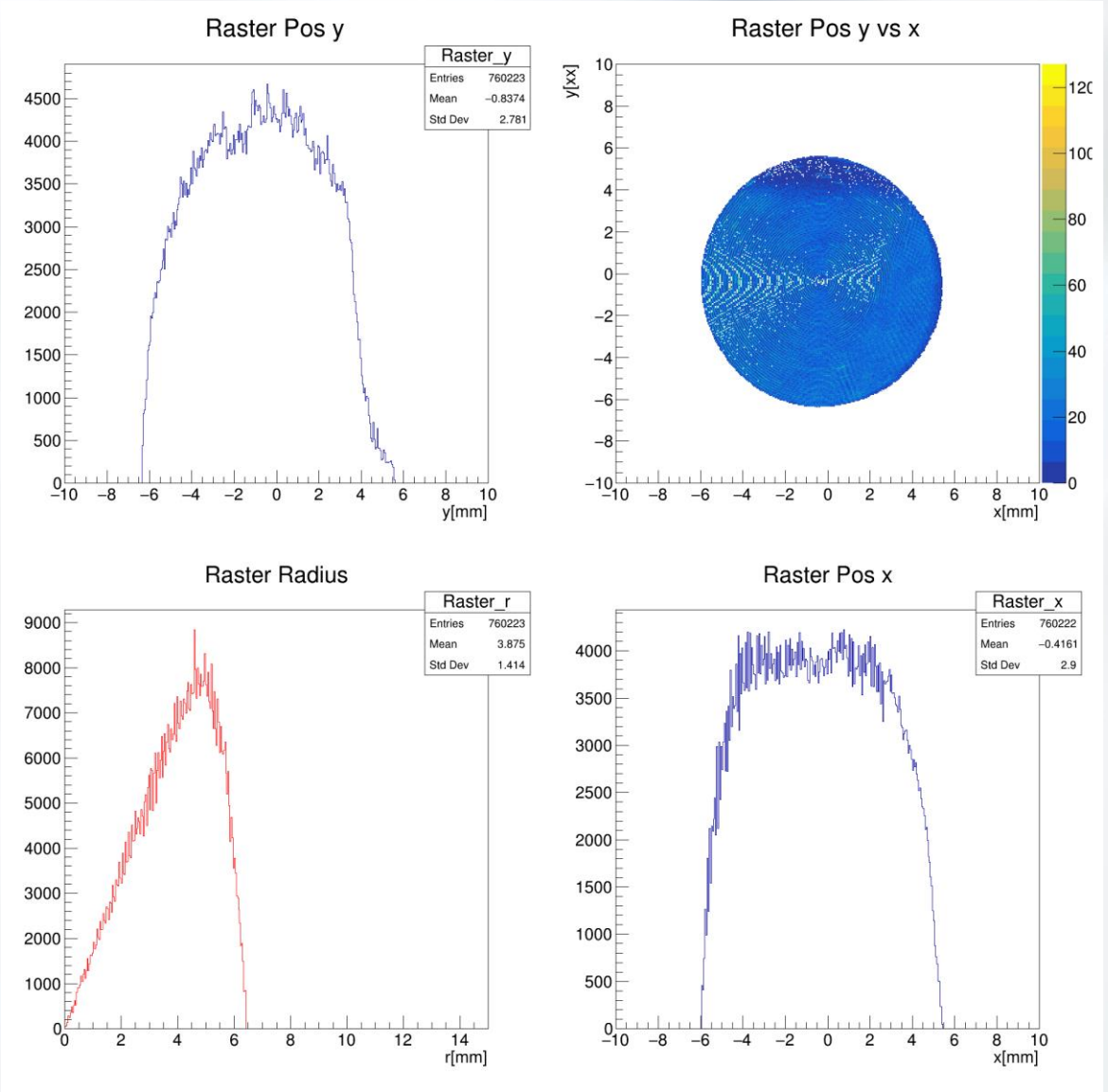
Hall B spiral raster

RGC distance between rasters was ~17 m.

Magnet currents were < 30% of maximum.

Current RGH layout the distance is ~10 m.

Horizontal and vertical sizes and offsets can be adjusted independently. This allows fine centering of the beam on target.



Beam tuning and low beam current operation

For chicane tuning, in addition to existing beam diagnostic devices, we need to install two new stripline BPMs between the second and third chicane magnets. Initial beam tuning will be done with an empty target and a beam current of ~20 nA. To verify that the beam goes through the center of the torus, we can use the downstream viewer. We can also install 2H02 stripline BPM downstream of the torus. Fine-tuning and beam centering will be done using raster.

Production currents are expected to be of the order 1-5 nA. In our latest experience running the X17 search experiment, we had stable operation with beam current in the range 0.7-3.5 nA, with and without orbit locks. During RGC we had beam current ~15 nA. We did not use orbit locks, so the lock would not fight with the raster.