Testing of Hall C's PT2026 NMR Unit

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Hall C HMS Dipole's field (maximum ~2 T) is currently measured by a Metrolab model PT2025 NMR precision teslameter. Metrolab has released a new model, PT2026, which Hall C procured for testing. This note discusses the difference between models PT2025 and PT2026 and the problems encountered during the testing of the PT2026.

NMR precision teslameter PT2026 was installed in the HMS dipole magnet because it locks faster on the magnetic field and has a better range than the currently used PT2025. Other differences are in measurement rate—1 Hz for PT2025, 33 Hz for PT2026—and communications—serial and GPIB for PT2025, Ethernet and USB for PT2026.

Both PT2025 and PT2026 have only one probe connection point, so an external multiplexer (also from Metrolab) is required if multiple probes need to be used. With a multiplexer, the PT2025 can handle a maximum of 64 probes, while PT2026 can handle 512. Tables I and II list the probes available from Metrolab for the respective models and their associated ranges.

Probe	Low field [T]	High field [T]
2	0.09	0.26
3	0.17	0.52
4	0.35	1.05
5	0.7	2.1
6	1.5	3.4

TABLE I. PT2025 probes and ranges used by Hall C. Five probes are needed to cover the required field range due to the range limit on the individual probes.

Probe	Low field [T]	High field [T]
1	0.19	0.52
2	0.42	1.29
3	1.13	3.52
4	3.29	10.57
5	8.00	22.80

TABLE II. Standard probes available from Metrolab for PT2026. Probe 3 (highlighted) is the only probe Hall C has on-hand. This probe is being tested.

PT2025, which is currently used in the HMS, has a multiplexer to read five probes and is configured through serial commands. PT2025 probes are in the optimal location since their installation was done during magnet assembly, enabling the probes to be located as close as possible to the magnet field center. However, the PT2026 probe was installed inside the dipole yoke, as close as possible to the PT2025 probes without disturbing them. As a consequence, it is probable that the PT2026 probe does not sit in a uniform field inside the dipole magnet as does the PT2025 probe. Fig. 1 is a photo of the PT2026 probe prior to its installation in the HMS dipole

FIG. 1. PT2026 NMR probe prior to its installation in the HMS Dipole.

During testing, the PT2026 was able to get a field lock between ~1.10 T and ~1.70 T using Probe 3. However, the NMR loses the lock at fields above ~1.70 T. Attempts to manually adjust the period and width of the RF pulse so that the probe locks to a field reading were unsuccessful.

To conclude, the PT2026 does not appear to be as robust as the PT2025 with regards to communication stability and with regards to its ability to lock on to the HMS dipole field. Issues locking on to the field may be due to the PT2026 probe's placement in an area where the magnetic field is not uniform.