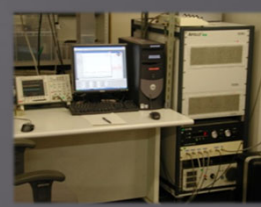
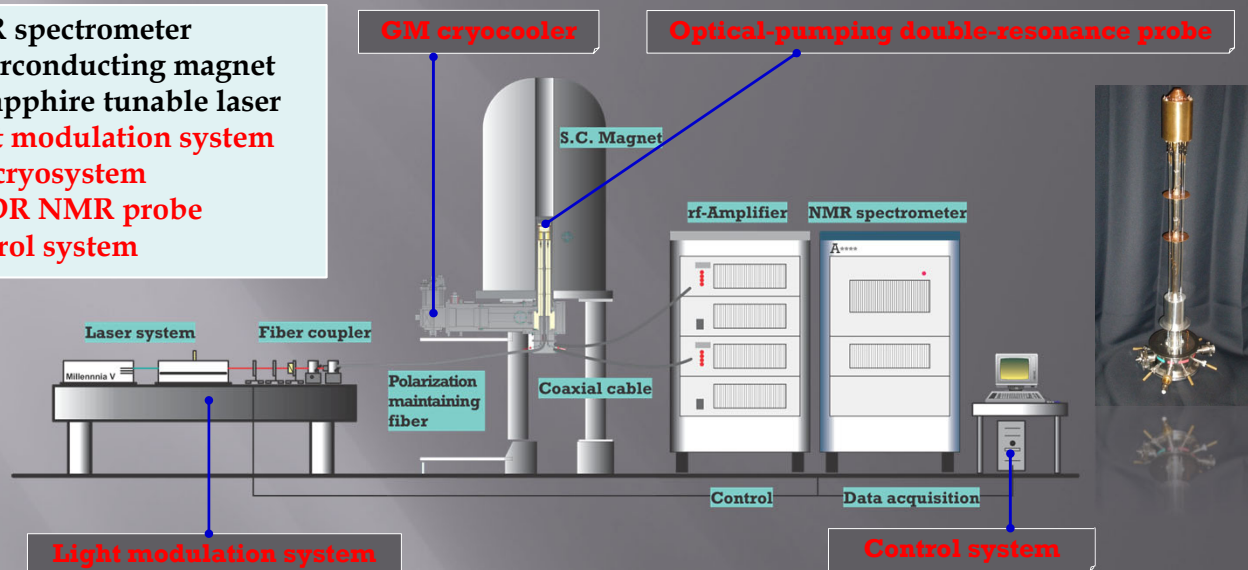


OPTICAL-PUMPING DOUBLE-RESONANCE NMR SYSTEM WITH A GM CRYOCOOLER

- NMR spectrometer
- Superconducting magnet
- Ti: sapphire tunable laser
- **Light modulation system**
- **GM cryosystem**
- **OP-DR NMR probe**
- **Control system**



Source: A. Goto et al., Jpn. J. Appl. Phys. **50**, 126701 (2011). © 2011, The Japan Society of Applied Physics. doi: [10.1143/JJAP.50.126701](https://doi.org/10.1143/JJAP.50.126701)

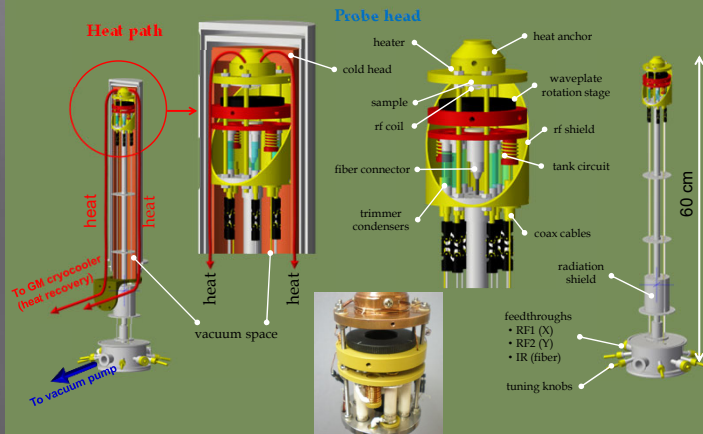
Cryosystem

(with Gifford-McMahon cryocooler)

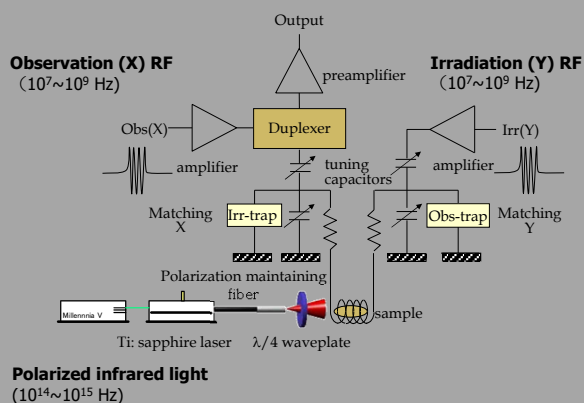
Features (advantages over He-gas flow cryostats)

- (1) Samples directly thermally-contacted to heat bath. Heat is removed quickly, allowing higher IR power. → higher nuclear polarization can be achieved.
- (2) Rf-tank circuits in a vacuum space (less than 10^{-4} torr). No rf-discharges, allowing stronger rf-pulses. → applicable to broader lines (solid & static).

Probe design



Block diagram



Light modulation system

