

Room temperature solid state MASERS

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One of the main uses of masers is for deep space communication, due to their ability to function as extremely low noise amplifiers. However, most masers work under inconvenient conditions, such as low temperatures, that require liquid helium for cooling. In this talk, I will describe how we conceived and realised a room-temperature, continuous-wave, solid-state maser using NV- centres in diamond [1]. We used a 532 nm laser to polarize the electron spins in the $S = 1$ ground state ($\nu \sim 2.87$ GHz), a sapphire resonator ($\nu \sim 9.6$ GHz, $Q \sim 30,000$) to enhance the stimulated emission and an external magnetic field to tune the resonance via the Zeeman interaction [1]. The figure shows how the microwave output depends on the applied external magnetic field. The three lines are due to the hyperfine coupling to the ^{14}N nucleus.

[1] Breeze et al. Nature 555 (2018) 493-496.

