irradiated to generate defects throughout the sample[2].

abundance of NV–NV pairs is correspondingly low, and instead an NV–N pair was studied.

The NV spin was coherently excited and its evolution observed as a function of time. Coupling between the NV and N spins produces a modulation of the observed signal, whose depth yields a measure of the entanglement, whereas the frequency indicates the coupling strength, in the present case 13 MHz. This may be contrasted with the state-of-the-art demonstration of coherent coupling between spins in semiconductor quantum dots[5] at temperatures of 100 mK, where a tunable exchange coupling with frequency of ~60 MHz was measured between spins with an observed T_2 of ~1 µs. The optically active NV spin does not require such extreme temperatures, and instead can be cooled through optical pumping (while the crystal remains at room temperature). By tuning the magnetic field such that both the N and NV spins are in resonance, the cooling of the NV centre can be efficiently transferred to the N spin.

These experiments show that coupling to light is a powerful tool for initialization and readout at the end of a computation. However, recent ideas have highlighted the enormous power of making measurements on qubits as a way to drive a computation forward[6]. Instead of trying to switch interactions on and off between neighbouring entities in the traditional fashion, measurements on spins are made. Crucially, the system is not measured completely, but rather in such a way as to deliberately not learn about the system fully. Nature itself does not 'know' which of the possible states created the observed outcome. The result is a superposition of the states that could have yielded that measurement. Thus (assuming their coherence lifetimes are long enough), arrays of isolated solid-state qubits can be placed into a highly entangled state (called a graph state) and