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The Centre has two main research laboratories located at the UNSW@ADFA campus – the Laser Laboratories in the School of Engineering and Information Technology and the Very Low Temperature Laboratories located in the School of Physical, Environmental and Mathematical Sciences.

Laser Laboratory

The School of Engineering and Information Technology's Laser Laboratory is the base for Optical Quantum Computation experiments on the UNSW@ADFA campus. The Centre has access to four dedicated laser laboratories sharing an acoustically isolated foundation. Housed within these laboratories are three pneumatically isolated optical tables, two of which can be further isolated with compressed gas. One of laboratories makes use of an infra-red Nd:YAG laser with feedback control of intensity noise (500 mW CW @ 1064 nm) as well as a visible, frequency-doubled Nd:YAG laser with feedback control of intensity noise (1W CW @ 532 mm), which in turn drives an optical parametric amplifier. Another laboratory makes use of an infra-red fibre laser with feedback control of intensity noise (1W CW @ 1550 nm) which drives a home-built second-harmonic generator and which, in turn, drives two optical parametric amplifiers. The optical parametric amplifiers are used as sources of non-classical light in several subsequent experiments. There are also several infra-red semiconductor lasers (10mW CW @ 1550 nm) as well as free-space and telecommunications optoelectronics. The UNSW@ADFA laboratories have an international reputation for their fast, quantum noise limited, linear photodetectors with associated electronics and they also make use of two infra-red single photon detector modules; as well as microwave digital and analogue test and measurement equipment.

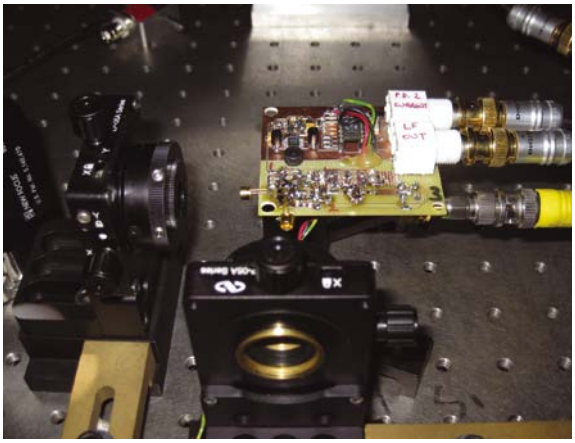

FIGURE 1

A dual-homodyne detection system using state-of-the-art photo-detectors developed at UNSW@ADFA.

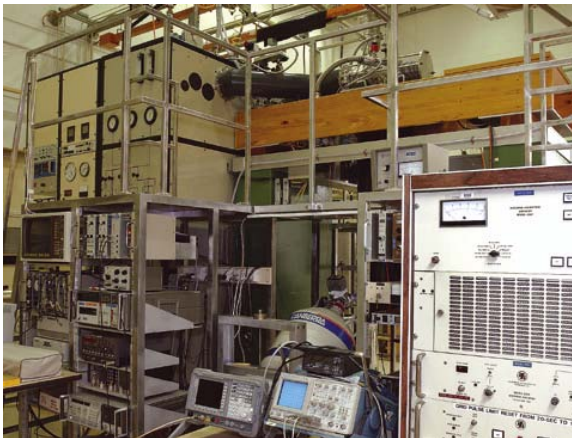

FIGURE 2

A top-loading dilution refrigerator at UNSW@ADFA.

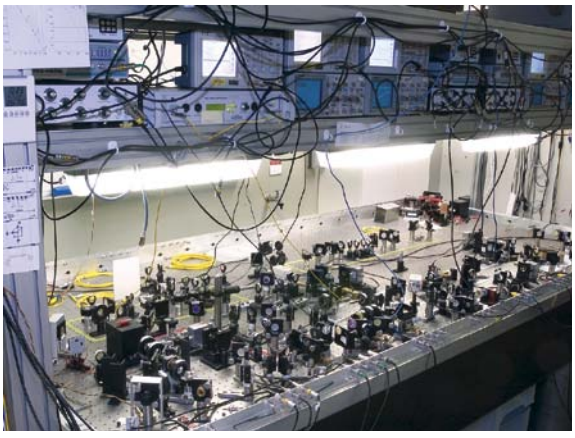

FIGURE 3

Laser Laboratory at UNSW@ADFA.

Very Low Temperature Laboratories

The magnetic resonance program is centred on the very low temperature laboratories in the School of Physical, Environmental and Mathematical Sciences, UNSW@ADFA. Facilities include; two 5 millikelvin dilution refrigerators (Figure 2), which can be coupled with a range of magnets up to 12 tesla (9 tesla at high homogeneity); as well as a range of 1 K and 4 K platforms. The School has its own helium recovery and liquefaction plant servicing these cryostats. Magnetic resonance experiments are core to the program and the laboratories have rf capability to 20 GHz. In particular, an x-band pulsed electron spin resonance system has been developed. The pulsed system, capable of pulses down to 10 ns width, and up to 1 kW peak microwave power can operate in conjunction with a dilution refrigerator and superconducting magnet system. The pulsed system can also be used with an electromagnet and 4 K cryostat. Program researchers also have access to sweep field electron spin resonance facilities at the ANU. Additionally there is access, within the School of PEMS, to x-ray and magnetic measurement equipment, as well as electron microscopes, a specimen preparation area and a 150 kV ion implanter.