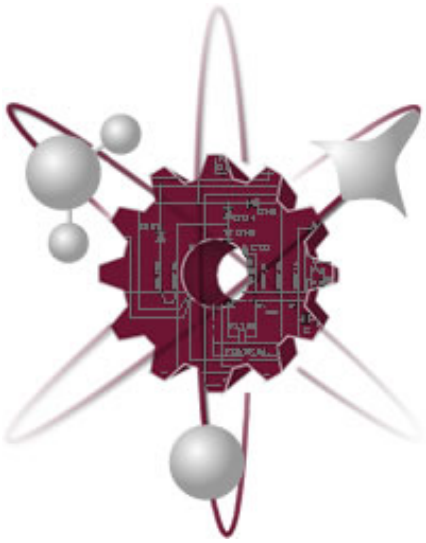
Appendix C: Equipment

Engineering Physics

Bachelor of Science in Engineering Physics



Self-Study Report

New Mexico State University

This is a summary of major pieces of equipment used in support of instruction based in the Department of Physics. The participating departments in the College of Engineering offer major pieces of equipment in support of engineering course and/or teaching labs for each of the four EP concentrations. Those pieces of equipment are listed in the respective Self-Study Reports for NMSU's Aerospace, Chemical, Electrical and Mechanical Engineering programs. Since the Department of Physics has no control or ownership over equipment in other departments, those pieces of equipment are not listed here.

The Department of Physics has the following pieces of major equipment:

Computer clusters – We have 15 computer workstations in our computer lab, most with the Linux operating system but several with the Windows operating system. These are used in support of the PHYS 150 and PHYS 476 computational physics courses. Students in the physics and EP programs can have accounts on these computers for use in other projects. In addition, wireless is available throughout Gardiner Hall as well as most the NMSU campus.

Optical spectroscopy – There are several different optical spectrometers in use in the advanced instructional laboratories, which can observe photons in the UV, visible, and IR frequency ranges. In addition there is a large collection of optical sources (H, He, Na, Hg, etc.) for both calibration and measurement.

Franck-Hertz Experiment – There are two working Franck-Hertz Hg tubes, with associated control and measurement equipment.

Rutherford Scattering – We have a small vacuum chamber with an Am alpha-source, gold foils and a silicon surface-barrier detector; equipment for biasing the detector and reading out the charge pulses; and a multi-channel analyzer for recording the pulses.

Millikan Oil Drop Experiment – We have two setups for measuring the electron charge using oil droplets between large capacitor plates, with associated control and measurement equipment.

Geiger-Muller counters – We have a large collection of GM tubes for performing simple experiments in statistics, radioactive decay, and absorption of photons in matter.

Hall Effect – We have a nice apparatus for observing the Hall Effect in a metal and also in both p- and n-type semiconductors; the observations can be done as a function of temperature, magnetic field strength, and current.

Speed of Light – We have a version of the "Foucault spinning mirror" apparatus for measuring the speed of light, and an optical table on which to set it up.

Photoelectric Effect – We have two setups for measuring Planck's constant via observation of the stopping voltage of electrons emitted from a metal, as a function of wavelength of the incident photons.

Electron Diffraction – We have two tubes containing a few kV electron accelerator, graphite target, and electron viewing screen, in which the atomic spacing in graphite is measured via electron diffraction.

Zeeman Effect – We have a magnet and Cadmium tube arranged so that the Zeeman splitting may be observed, both transversely and longitudinally with respect to the field direction.

Nuclear Magnetic Resonance – We have a setup with a magnet, source holder, and oscillator circuit, whereby the NMR line-shape may be recorded.

Nuclear Spectroscopy – We have a variety of NaI(Tl) detectors which are suitable for observing gamma-rays from radioactive sources, and the associated electronics.

Muon Lifetime – We have a tank of liquid scintillator for observing the arrival and decay of a cosmic-ray muon, associated scintillator paddles for observing the incoming muon, and associated electronics for operating the detectors and recording the signals.

Compton Scattering – We have a suitable radioactive source, active target, and recoil photon detector for observing the scattering of photons from electrons.

Neutron Source – We have a strong Pu-Be source which produces few-MeV neutrons which can be used for material activation. This is housed in a special access-controlled room in the basement.

Co-60 Angular Correlation – We have an angular-correlation measurement table, with two NaI(Tl) detectors and associated electronics, which can be used to observe the gamma-gamma angular-correlation in the radioactive decay of Co-60.

Introductory Laboratory Equipment – We have numerous sets of lab equipment that are used to teach the introductory level physics laboratories (Phys 213L, 214L, 217L, and 315L). These include equipment for undergraduate mechanics, electricity, magnetism, optics, and thermodynamics experiments. Some of the introductory mechanics equipment developed in-house by Dr. Kanim as part of his laboratory development for Phys 213L. We pride ourselves on having hands-on laboratories for these classes rather than paper or on-line laboratories.

Physics Demonstration Equipment – We have numerous pieces of demonstration equipment ranging from simple balls to tesla coils and Van de Graff generators. Live demonstrations are an important part of our undergraduate teaching. Moreover, some of the physics demonstrations were build by EP students as part of the major design experience.