

10.2: MICROWAVES AND SOLID STATE

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The interaction between solid state research and microwaves has been a mutually beneficial one. The current developments in this marriage between these fields is opening new vistas for the microwave scientist in the millimeter and submillimeter regions as well. However, important innovations in the microwave region are taking place also in the form of acoustical excitation in solids. Applications are already on the horizon. Microwave resonance techniques have been extended into the millimeter region. Cyclotron, antiferromagnetic, and ferrimagnetic resonance in new materials are providing selective sensitive detectors and nonreciprocal devices. With the advent of superconducting magnets, resonance and related applications can now be usefully extended into the millimeter and submillimeter regions of the spectrum. But perhaps the most exciting prospect to physicists and engineers is that to be brought about by the advent of the optical maser. With the discovery of nonlinear phenomena in insulators and solid state plasmas the coherent spectrum is now to be extended in a practical way from the millimeter through the infrared to the optical region. The microwave engineer and the solid state physicist can peer together with great anticipation into this crystal ball and dream of things to come. Potential tools for research and for the development of new devices will be outlined.