Artificial aurora from supra-thermal electron fluxes may be generated by powerful radio waves beamed into the ionosphere. The radio induced aurora (RIA) provides optical diagnostics for measurements of field aligned irregularities, artificial plasma cavities, plasma drifts, neutral winds and diffusion. High power radio waves coupled with low-light-level optical sensors give unique measurements of the upper atmosphere not obtainable with other means. The physical characteristics of the F-region and E-region ionosphere become visible during ionospheric heating experiments where a beam of high power radio waves reflects in the ionosphere. Electromagnetic waves are produced by ground transmitter systems which have effective radiated powers greater than 60 megawatts have sufficient power to excite artificial aurora in the ionosphere. Such radio induced aurora has been generated with transmitters located in Puerto Rico, Russia, Alaska, and Norway. Images of the RIA are obtained using CCD imagers with 20 to 60 second time integrations. The figures show (a) a schematic of the artificial aurora experiments over the HF facility located on the North Coast of Puerto Rico and (b) a two color (red 630.0 nm/green 557.7 nm) composite image of the RIA from Arecibo on 23 January 1998.

Courtesy, Paul A. Bernhardt, Plasma Physics Division, Naval Research Laboratory, Washington, DC