

Plasma antenna

On earth we live upon an island of ordinary matter. The different states of matter generally found on earth are solid, liquid, and gas. Sir William Crookes, an English physicist identified a fourth state of matter, now called plasma, in 1879. Plasma is by far the most common form of matter.

Plasma in the stars and in the tenuous space between them makes up over 99% of the visible universe and perhaps most of that which is not visible. Important to ASI's technology, plasmas are conductive assemblies of charged and neutral particles and fields that exhibit collective effects. Plasmas carry electrical currents and generate magnetic fields. When the Plasma Antenna Research Laboratory at ANU investigated the feasibility of plasma antennas as low radar cross-section radiating elements, Redcentre established a network between DSTO ANU researchers, CEA Technologies, Cantec Australasia and Neolite Neon for further development and future commercialization of this technology. The plasma antenna R & D project has proceeded over the last year at the Australian National University in response to a DSTO (Defence Science and Technology Organisation) contract to develop a new antenna solution that minimizes antenna detectability by radar. Since then, an investigation of the wider technical issues of existing antenna systems has revealed areas where plasma antennas might be useful. The project attracts the interest of the industrial groups involved in such diverse areas as fluorescent lighting, telecommunications and radar. Plasma antennas have a number of potential advantages for antenna design. When a plasma element is not energized, it is difficult to detect by radar. Even when it is energized, it is transparent to the transmissions above the plasma frequency, which falls in the microwave region. Plasma elements can be energized and de-energized in seconds, which prevents signal degradation. When a particular plasma element is not energized, its radiation does not affect nearby elements. HF CDMA Plasma antennas will have low probability of intercept (LP) and low probability of detection (LPD) in HF communications. Plasma antennas are radio frequency antennas that employ plasma as the guiding medium for electromagnetic radiation. The concept is to use plasma discharge tubes as the antenna elements. When the tubes are energized, they become conductors, and can transmit and receive radio signals. When they are de-energized, they revert to non-conducting elements and do not reflect probing radio signals. Plasma antenna can be Steered electronically. Another feature of the plasma antenna is that it can be turned off rapidly, reducing ringing on pulse transmission.