ECH COMES OF AGE FOR MAGNETIC FUSION RESEARCH

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Advances in gyrotron technology are resulting in new capabilities and scientific results on magnetic confinement devices for fusion research worldwide. Unit output power of 1 MW and higher at frequencies greater than 100 GHz and quasi-cw operation has become possible. This has led to successful experiments on electron cyclotron heating, electron cyclotron current drive, non-inductive tokamak operation, tokamak energy transport, suppression of instabilities and advanced profile control leading to enhanced performance. The synthetic diamond gyrotron output window is being developed as the answer to the requirement for a low loss blocking window with excellent thermal and mechanical properties and the potential for cw operation at high power. Ancillary equipment for efficient microwave transmission over distances of hundreds of meters, polarization control, diagnostics and flexible launch geometry have all been developed and proven in regular service.

The ability to localize current drive and heating in the electron channel, particularly at intermediate radii has been demonstrated in experiments on the restoration of missing bootstrap current in magnetic islands and the suppression of neoclassical tearing modes. Precise control of the location of the driven current in turn can lead to control of the current density profile and overall improvements in tokamak performance. There now is excellent convergence between the experimental measurements and theoretical understanding of the heating and current drive mechanisms and the reliability of high power gyrotron installations is at the level previously achieved by neutral beam systems.

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Prefer:
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Poster

Topic Category:
Heating and Current Drive