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Development of key technologies for 4th generation ECR ion sources- microwave launching and innovative solutions for plasma chamber cooling

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Highly efficient microwave coupling and plasma chamber that can handle high power are key technologies for the existing third-generation ECR ion source operating at 24~28 GHz/10 kW and as well for the new fourth-generation ECR ion source operating at 45 GHz/25 kW. The use of a small-diameter waveguide antenna was first demonstrated that changing the microwave power distribution on the ECR surface could enhance the performance of the 24 GHz ion source, and the later proposed a removable Vlasov launcher further improved the source performance. An innovative plasma chamber with micro-channel cooling structure was developed and validated to be durable up to a total power of 11 kW. A plasma chamber for the 4th generation ECR source expected to operate reliably at 25 kW has been developed and is currently being commissioned. This talk will review the details of these two key technologies.

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