The electron cyclotron (EC) equatorial launcher design is undergoing a series of prototype tests and design enhancements all aimed at improved reliability and functionality of the equatorial launcher. The design enhancements include adaptation of the launcher steering angles such that one of three beam rows of the launcher is necessary flipped to perform counter current drive (to conform to a new ITER physics requirement). Also the top and bottom steering rows have been tilted with angle of 5º in the top and bottom beam rows are tilted to allow all beams access from one axis to near mid-radius. A quasi-optical configuration for the in-vessel millimetre (mm)-wave transmission line of the launcher has also been adopted that increases the design reliability and simplifies the manufacturability, which includes a reduction in fabrication cost. Nuclear analysis of the launcher indicates that the launcher has the shield capability to satisfy the dose rate criteria (100 µSv/h). However, the dose rate at the launcher back-end can be increased by the influence from the surroundings. High power performance of the mock-up of the mm-wave launching system confirmed the successful steering capability of 20º~40º. It was found that some of stray RF propagated in the beam duct and behind the mirrors. Prototype tests include the fabrication of mock-ups for the blanket shield modules showed no technological issue on the fabrication and the cooling functionality except the quality control procedure.

**Development of ITER Equatorial EC Launcher**


**Japan Atomic Energy Agency**

**ITER Organization**

**Summary**

1. **Modification mm wave design**: Fixed mirror recessed for the purpose of incremental nuclear shield

   → Neutron flux: 20% degradation @ EL back-end

2. **MM wave design performance**:

   - Trans. Efficiency 99%, Max heat load of 3.6MW/m² @ steering mirror surface

   - Relatively low heat load without reducing transmission efficiency of mm wave

3. **Port plug design**:

   - Single wall structure (Thickness: 65mm), HIP is applied to form cooling channel inside.

   - Stiffness was analytically confirmed.

4. **Nuclear shield**:

   - Nuclear heat to TF coils and fluence at EL back-end are less than the criteria.

   - Shut-down dose rate at EL back-end is 100~120 μSv/h.

5. **EL full scale mock-up (1/3 unit)**, BSM mock-up and port plug mock-up were fabricated.

   → Prospect of their fabrication method was obtained.

**Outlook**

High power long pulse experiment, flow tests, etc are being carried out → The results will be reflected for the final design.