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## Preparation for Preliminary Design of ITER GDC

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A DC Glow Discharge Cleaning (GDC) system is designed for ITER. The procurement arrangement of GDC was signed between ITER Organization and China Domestic Agency at the end of 2013. However, some critical engineering issues still need to be solved, such as gap insulation and shielding, ceramic spray on U-shape cooling pipe, design of cooling channel inside electrodes, structure, thermal, electromagnetic and seismic analysis.

The GDC electrode works as a shield plug during plasma operation, so water cooling is necessary. The cooling pipes of GDC are used to feed power to electrodes, thus all the components of GDC inside the vacuum vessel are on high potential. The glow discharge between the first walls, or the inner surface of vacuum vessel and the front of electrode is expected, but the one between rod and cooling pipes of electrode and other parts inside port plugs must be avoided. We plan to suppress the unexpected glow discharge by two means, gap insulation and ceramic insulation.

During GDC, the electrode front is impacted by accelerated electrons, so the electrode is heated. Because the cooling water for ITER GDC electrode is the baking water of tokamak ( $240\pm 10$  °C at  $4.4\pm 0.4$  Mpa) which approaches its boiling point, the cooling of electrode during GDC is a big concern. Thus, a four-layer structure for cooling flumes in the head of electrode is designed. Fluid-structure interaction analysis results show that the heat load during GDC which is given in the load specification can be taken by the baking water, but the margin is limited.

The seven GDC electrodes are different with each other due to integration constrains of various diagnostics components in port plugs, so analysis and design for each electrode will be performed in preliminary design stage respectively. To find out experience of the analysis for the coming preliminary design, we perform electromagnetic, structure, thermal and seismic analysis based on the GDC Configuration Management Modules (CMM) presented on the second GDC CDR.

GDC is one of the systems which must be available before plasma operation. The preparation for the preliminary design of GDC makes the potential problems exposed as early as possible and guides the following design work of GDC.

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China

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