Title: Conceptual design of DTT vacuum system

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The conceptual designing of the vacuum system for the new tokamak DTT (Divertor Tokamak Test) is hereafter presented.

The vacuum equipment is composed by three main sub systems: divertor (DIV), vacuum vessel (VV) and cryostat (CR). The first is devoted to remove the high flux of exhaust gas during the plasma operation and it will be composed by custom cryo-pumps. The VV system must provide a high-vacuum in the vessel in order to ensure the adequate environment for the plasma, whereas the CR system has the role to reduce the thermal conduction between the cryo-cooled coils and vessel and ambient atmosphere. This work is focus on the VV and CR system to provide the adequate vacuum level for both environments and to exhaust gasses during conditioning processes of the first wall and vacuum vessel.

The pumping system is divided in the high vacuum and fore-vacuum subsystems. The first one, to cope with the intense magnetic field near the vessel, provides the combined use of turbomolecular pumps and cryopumps mounted on a connecting manifold between two bottom ducts. Both turbos and cryos are used during the start-up, whereas only cryo pumps are used during the operating phases because the turbo pumps cannot work inside the intense magnetic field and turbomolecular pumps are also used alone during conditioning processes. Instead, the fore-vacuum side involves the use of mechanical roots and dry screw pumps located in a fire protection zone in the torus hall about 50 meters from the torus. The pneumatic lines of both systems are equipped with different kinds of pressure gauges to monitor the pressure distribution, leak detectors, sensors for safety control and valves and gates to manage the facility. In this work the details of the system's functioning are explained, and estimations of regeneration and evacuation times are carried out.