

## ITER Relevant Outgassing and Leakage from Different Types of In-vessel Cabling.

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On JET there is approximately 8 km of in-vessel cabling serving magnetics and other diagnostics. This is split between two main types, namely solid metal sleeved mineral insulated cable (MI) and metal braided fibre insulated cable. On ITER the electrical connections to most in-vessel diagnostics, in particular the magnetic diagnostics, will require cables to be routed through the main vacuum vessel. The total in-vessel cabling requirement is predicted to be of order 80 Km. Due to the large quantity of cabling, the JET experience shows that the cabling has the potential to cause issues for the ITER vacuum and hence operability.

Extensive tests have been performed in the laboratory to assess experimentally the outgassing of different types of MI cable, in both damaged, undamaged and deliberately perforated conditions. The deliberate perforation of cabling was performed to ascertain if the postulated prolonged gas supply from damaged cable, in the form of virtual leaks, could be mitigated. The tests have been performed after exposure to various conditioning environments including ITER fault conditions such as 2 bar steam. These results are summarised. Key points are concluded for the necessary manufacturing and installation techniques required for MI cable to be used successfully on ITER. Assuming these controls it is specifically concluded that damage to cable sleeves would not jeopardise ITER operations and overall perforation of cables is not beneficial.

Metal braided fibre insulated cable has been successfully used on JET. Due to the ease in achieving high packing density and tight bend radii, it is under consideration for some in-vessel applications on ITER. The main disadvantage, over MI cable, is in nuclear heating due to the difficulty in achieving good thermal contact of the cable with its surroundings. Controls required if this type of cable is to be used successfully on ITER, are presented.

Overall this paper shows that there are a number of different cable types which can be compatible with the ITER vacuum requirements, but to ensure compatibility then specific controls are needed in manufacturing and testing prior to installation.

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