CONCEPT FOR LOCALISATION OF COOLING WATER LEAKS IN THE ITER PRIMARY VACUUM SYSTEM

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For a proper leak localisation process, it is essential to have the possibility to isolate all actively cooled in-vessel sub-systems from the main system individually and in some cases down-to component level.

A new concept for leak detection and localisation is proposed. The system assumes that it is possible to introduce a sniffer probe in every port plug. The sniffer probes are to be connected to residual gas analysers. Valve controlled connections to the ITER prevacuum system, the helium supply, the heated nitrogen supply and to the ITER draining system are assumed to be present. When applied to all port plugs the new system will provide a total of 36 detector probes equally spaced around the ITER torus volume. The detectors can be used to detect and localise leaks in the vacuum vessel in the blanket system and in individual port plugs. Two measurement principles, triangulation and the fingerprint method can be used to localise the origin of a leak. The first method is based on the time of flight principle, whereas the second is based on pattern matching of sensor readings. Both methods will be discussed in this paper.

The introduction of the new leak detection elements in the port plugs also make it possible to perform full pre- and post-maintenance leak testing with the plugs in-situ. This will significantly reduce Hot Cell occupation.