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P2.016 Physics of the Traveling Wave Array for DEMO with proof of principle on WEST

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To decrease the power density and associated high voltage a distributed antenna system is proposed as ICRH system for the reactor. Among the different solutions a layout made from a set of TWA sections is considered as the most promising [1, 2]. It optimizes coupling to the plasma, is load resilient and avoids large values for the VSWR in the feeding lines. The total radiated power scales as the number of independently fed sections such that high reliability can be expected. A first electromagnetic design for DEMO consisting in 16 sections integrated in the breeding blanket is proposed. This system would have a power capability of 50MW in front of a low coupling reference plasma profile with only 15kV maximum strap voltage. The TWA concept for ICRH is innovative and very different from the traditional IC antennas. A test on WEST should provide a proof of principle of the validity of the TWA approach together with a comparison with the existing WEST IC antennas. The chosen geometry of the TWA section is compatible with one unit of the complete set for a future reactor.

The paper describes the underlying physics, the antenna design and expected performances from complete modeling of the antenna system including its resonant ring feeding layout. A resonant ring feeding is used to ensure that the total generator power is radiated in the plasma. A comparative modeling with the present WEST antennas will also be discussed.

The proposed extrapolation to DEMO is discussed together with the problem of its integration in the breeding blanket in an accompanying paper [3].

[1] R. Ragona and A. Messiaen, EPJ Web Conf. 157(2017)03044.

[2] A. Messiaen and R. Ragona, EPJ Web Conf. 157(2017)03033.

[3] J-M. Noterdaeme et al., “Progress with the Ion Cyclotron Range of Frequency System for DEMO”, this conference

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