TECH/3-2Rb

Plasma Exhaust and Divertor Designs in Japan and Europe Broader Approach, DEMO Design Activity

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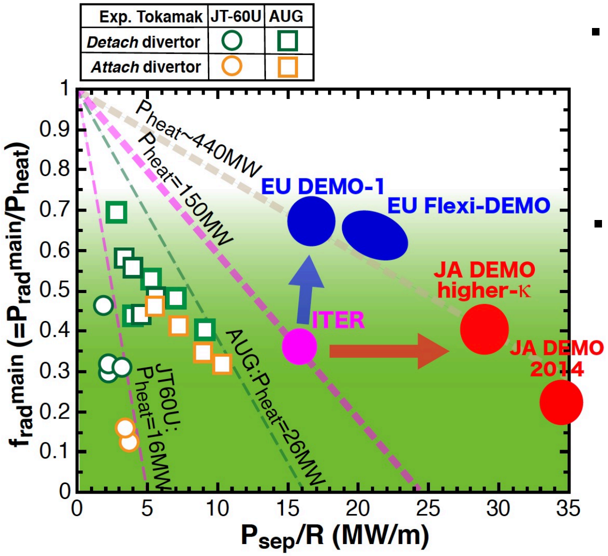
- EU and JA BA-DDA study covers common aspects of divertor physics and engineering design: water-cooled single-null divertor and appropriate geometry for plasma detachment.
- Both concepts handle similar thermal heating power (P_{heat}), and require large total radiation fraction ($f_{rad} = P_{rad}/P_{heat} \geq 80\%$) in order to reduce the peak heat load ($\leq$10 MWm^{-2}):

Divertor power handling is determined by requirements of f_{rad}^{main} and the plasma performance.

JA DEMO challenge (steady-state operation):
Lower I_p and higher *HH* with ITER-level f_{rad}^{main}
⇒ Large divertor power handling: P_{sep}/R ~30MWm^{-1}

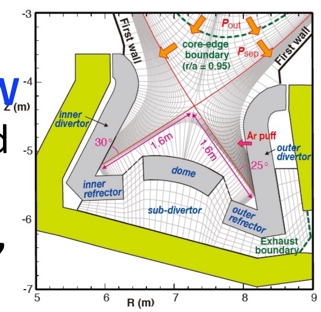
EU DEMO challenge (pulse operation):
Higher I_p and ITER-level *HH* with large f_{rad}^{main} by high-Z seeding ⇒ ITER-level P_{sep}/R =17MWm^{-1}

- **Same leg length (1.6 m: longer than ITER)** but **different geometry** (**JA:** ITER-like closer baffle, **EU:** rather open without dome and baffle) were proposed as baseline designs.



- **Power exhaust simulations of P_{sep}~JA: 250-300 MW, EU:150-200MW with Ar seeding** have been performed
- **Integrated design of *divertor target, cassette* and *coolant pipe routing* has been developed:** water cooled ITER-like target (W-PFC and Cu-alloy heat sink) is a common baseline design.

JA DEMO divertor



EU DEMO divertor