Develop divertor solutions for DEMO that handle extreme heat flux and eliminate target material erosion/damage while maintaining excellent core plasma performance.

- More than 1/3 of ADX poloidal cross-section is allocated for advanced divertor concepts.
- Proves high-field Alcator technology: LN2, copper magnets, external superstucture (HTS also being considered)
- Segmented/removable vacuum vessel allows systems to be configured as needed and fully tested offline, prior to assembly.
- A variety of magnetic configurations can be produced for a fixed poloidal field coil set.
- Flexible/modular AVL allows liquid metal divertor designs.

**ADX – Advanced Divertor and RF Tokamak Experiment**


ADX is a compact, high-field, high-power-density tokamak with three research missions:

1. **Divertor Test Tokamak** – develop and demonstrate divertor and PMI solutions at the power densities and pressures anticipated for a reactor.
2. **RF Sustainment Test Tokamak** – develop and demonstrate advanced RF technologies that scale to efficient, low PMI, SS current drive and heating in a reactor.
3. **Integrated Core-Divertor-Axial Actuator Test Tokamak** – develop/test/demonstrate high core performance (e.g., T = pressure) in reactor-relevant regimes (e.g., coupled ions, low external torque), using only the class of actuators available to a reactor.

**Question:** What is needed to develop and demonstrate divertor solutions for a Pilot Plant or DEMO?

**Answer:** A flexible research tokamak that produces DEMO-like nT, q0, B and divertor geometry – ADX.

**Initial design concept** [Nucl. Fusion 55 (2015) 05320]

![Diagram of ADX](attachment:adx_diagram.png)

- R = 0.73 m, a = 0.2 m, k = 1.7
- B = 6.5 tesla (8 tests with power upgrade)
- \( \epsilon = 1.5 \) MA (2 MA)
- \( P_{\text{E,AVL}} = 19 \) MW LHC
- Surface power density = \( -1.7 \) MW/m²
- \( P_{\text{E,AVL}} / B \times R = 125 – 150 \) MW/Tm (= ITER @ \( q_{\text{e}} \approx 10 \))
- Advanced magnetic divertors
- Tungsten/molybdenum PFCs, high temp. tests
- 3 s pulse with 1s flat-top at max field/current

**Develop high-efficiency (wall-plug to plasma), low PMI, RF current drive and heating actuator technologies that scale to steady state plasma operation.**

**Initial results from UEDGE modeling of ADX X-point Target Divertor:**

Test case: C-Mmod state, \( n_{\text{e,av}} = 0.5 \times 10^{20} \) m⁻³, \( \lambda_{\text{e}} = 1 \) mm, 1% carbon seed

- Result: Stable, fully detached outer divertor leg over a wide range of \( P_{\text{E,AVL}} \), where critical confinement conditions over a large range of SOL powers ...