



ACT2 Additional Systems Scans

C. Kessel

Princeton Plasma Physics Laboratory

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Systems Analysis of ACT2 – conservative physics and DCLL blanket

ACT2 is conservative physics

$$\beta_N^{\text{total}} \leq 3.25$$

$$H_{98} \leq 1.3$$

$$n/n_{Gr} \leq 1.0 \quad 1.0 \leq n/n_{Gr} \leq 1.6$$

$$\kappa = 2.0 \text{ or } 2.2? \quad 2.1$$

Inboard DCLL blanket (Laila)

$$\Delta_{\text{SOL}} = 0.10 \text{ m}$$

$$\Delta_{\text{FW/Blkt}} = 0.75 \text{ m}$$

$$\Delta_{\text{Skel}} = 0.25 \text{ m}$$

$$\Delta_{\text{gap}} = 0.02 \text{ m}$$

$$\Delta_{\text{VV}} = 0.33 \text{ m}$$

$$\Delta_{\text{gap}} = 0.06 \text{ m}$$

$$q_{\text{div,peak}}^{\text{OB}} < ??$$

$$B_{T,\text{max}} < ??$$

$$\eta_{\text{th}} = 0.44 - 0.0065(1.5 \langle N_w \rangle \times 1.25 q_{\text{FW,ave}} - 0.3)$$

$$P_{\text{pump}} = 0.04 \times P_{\text{fusion}}, \quad \eta_{\text{pump}} = 0.9$$

$$P_{\text{subs}} = 0.04 \times P_{\text{elec,gross}}$$

$$\eta_{\text{aux}} = 0.4$$

Used different j_{SC} vs $B_{T,\text{max}}$ since I was exceeding 18 T at the coil in some cases

$$\text{Scanned } B_T = 5.5\text{-}10.5 \text{ T}$$

$$\beta_N = 0.02\text{-}0.04$$

$$q_{95} = 3.5\text{-}8.0$$

$$3.5\text{-}9.0$$

$$n/n_{Gr} = 0.9\text{-}1.3$$

$$0.9\text{-}1.6$$

$$Q = 12.5\text{-}40.0$$

$$\kappa = 1.9\text{-}2.1$$

$$R = 5.0\text{-}11.5 \text{ m}$$

$$f_{Ar} = 0.002\text{-}0.003$$

Re-examine solutions with higher n/n_{Gr} and q_{95}

$$975 < P_{elec} \text{ (MW)} < 1025$$

$$\beta_N^{total} (\beta_N^{th} + \beta_N^{fast}) \leq 3.25$$

$$q_{div,peak}^{OB} < 15.0 \text{ MW/m}^2$$

$$H_{98} \leq 1.3$$

Lowest R points

Higher q_{95} and higher n/n_{Gr} have allowed us to access solutions with lower H_{98} and higher Q

R	B_T	I_p	β_N^{th}	q_{95}	n_G	Q	H_{98}	P_{aux}	f_{BS}	B_{Tc}	q_{div}	Nw	Z_{eff}
11.0	7.5	13.5	2.75	8.0	1.44	22.5	1.27	136	0.78	12.2	14.5	1.34	1.94
10.5	7.5	12.2	2.75	8.5	1.60	30.0	1.23	95.6	0.83	12.4	13.9	1.37	1.76
10.0	8.0	13.1	2.75	8.0	1.44	25.0	1.28	120	0.78	13.4	14.9	1.59	2.09
10.0	8.0	12.3	2.75	8.5	1.6	32.5	1.27	90.6	0.83	13.4	13.2	1.55	2.08
10.0	8.0	11.7	2.75	9.0	1.6	35.0	1.30	79.2	0.88	13.4	13.1	1.46	1.77
10.5	8.5	13.0	2.50	9.0	1.52	27.5	1.26	111	0.80	14.0	13.4	1.46	1.94
9.50	8.5	11.8	2.75	9.0	1.60	32.5	1.30	89.2	0.88	14.4	14.4	1.70	1.93

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R	B _T	I _p	β_N^{th}	q ₉₅	n _G	Q	H ₉₈	P _{aux}	f _{BS}	B _{Tc}	q _{div}	Nw	Z _{eff}
11.0	8.0	15.4	2.75	7.5	1.3	20	1.41	162	0.74	13.1	13.0	1.42	1.86
10.0	9.0	15.7	2.75	7.5	1.3	17.5	1.46	198	0.74	15.0	13.7	1.83	2.05
11.5	9.5	17.9	2.25	8.0	1.3	12.5	1.28	328	0.64	15.4	14.7	1.63	2.17
10.5	9.5	16.4	2.50	8.0	1.3	15.0	1.41	252	0.71	15.7	13.4	1.81	2.17
9.5	9.5	15.6	2.50	8.0	1.3	17.5	1.46	200	0.71	16.9	13.9	2.04	1.87
9.0	10.0	14.8	2.75	8.0	1.3	17.5	1.52	199	0.78	17.2	14.1	2.27	2.18

9/27/12

Work to do

Examine systems solutions further....go thru COE determination with Mark

Identify expanded scans, understand trade-offs

Examine our cases versus EU cases (old, are there new ones?)

Start a TSC run on one of the cases to examine the plasma configuration, including some H/CD

Start Eq/stability analysis to identify stable profile combinations with no wall