A Comparison of Hybrid Confinement with ELMy H-mode Confinement

ITPA CDBM H-mode Confinement Database Working Group[1)], presented by K. Thomsen[2)]

E-mail contact of main author: knud.thomsen@efda.org

1) See Ref. [1] plus the Hybrid data providers i.e. ASDEX Upgrade: F. Ryter, G. Sips, C.J. Fuchs, W. Schneider, A. Stäbler, J. Stober and ASDEX Upgrade Team; DIII-D: J.C. DeBoo, T.C. Luce, M.R. Wade and DIII-D Team; JET: D.C. McDonald, E. Joffrin and JET Team; JT-60U: H. Takenaga, T. Takizuka and the JT-60U Team; NSTX: S. Kaye and NSTX Team;

2) EFDA Close Support Unit - Garching, Boltzmannstr. 2, D - 85748 Garching, Germany

Five Tokamaks have for this comparison made global confinement data available from experiments in their Hybrid regimes (improved H-mode confinement regimes). The range in the main plasma parameters for the ASDEX Upgrade [2]; DIII-D Hybrid [3, 4]; JET [5]; JT-60U [6] and NSTX [7] subsets of the Hybrid dataset is summarised in Table 1.
A first comparison of the Hybrid confinement data with the IPB98(y,2) scaling expression [8] shows that the JET data and part of the JT-60U data follow the scaling with an enhancement factor $H_{98} \sim 1$. The other part of the JT-60U dataset shows $H_{98} \sim 1.5$ at intermediate values of loss power. The ASDEX Upgrade, DIII-D, NSTX data clearly deviate from the scaling, because the values of H_{98} approach 1 at high power but increase to values ~ 1.6-1.7 at low loss power. The Hybrid definitions and the results of a detailed comparison with the ELMy H-mode confinement data [1] will be discussed in the paper and presented at the meeting.

Table 1. *Number of observations N and the mean value +/- 1 std. dev. of plasma current I_P; toroidal magnetic field B_T; safety factor q_{95}; elongation κ_a; triangularity δ; line average density nel and thermal loss power $P_{L,th}$ for each tokamak subset of the Hybrid dataset.*

	AUG	DIII-D	JET	JT-60U	NSTX
N	295	103	56	12	2
I_P [MA]	0.98 +/- 0.11	1.20 +/- 0.01	1.72 +/- 0.42	1.21 +/- 0.46	0.71 +/- 0.04
B_T [T]	2.15 +/- 0.28	1.72 +/- 0.04	2.09 +/- 0.52	2.55 +/- 1.12	0.43 +/- 0.02
q_{95}	4.00 +/- 0.48	4.32 +/- 0.17	3.86 +/- 0.15	3.84 +/- 0.73	9.54 +/- 0.03
κ_a	1.59 +/- 0.05	1.59 +/- 0.03	1.55 +/- 0.04	1.37 +/- 0.11	2.13 +/- 0.02
δ	0.26 +/- 0.08	0.54 +/- 0.04	0.30 +/- 0.11	0.31 +/- 0.10	0.72 +/- 0.02
nel [10^{19} m^{-3}]	6.08 +/- 1.51	4.41 +/- 0.92	3.23 +/- 1.10	2.44 +/- 0.80	6.87 +/- 0.30
$P_{L,th}$ [MW]	7.52 +/- 2.18	6.36 +/- 1.39	12.37 +/- 3.73	11.63 +/- 5.86	5.01 +/- 0.58

[1] D.C. McDonald, et al., Nucl. Fusion **47** (2007) 147.
[2] A. Sips, et al., IAEA 2006, submitted to Nucl. Fusion.
[3] M.R. Wade, et al., Nucl. Fusion **45** (2005) 407.
[4] T.C. Luce, et al., Nucl. Fusion **45** (2005) S86.
[5] E. Joffrin, et al., Nucl. Fusion **45** (2005) 626.
[6] Y. Kamada et al., Nucl. Fusion **41** (2001) 1311.
[7] J. E. Menard et al. Phys. Rev. Lett. **97** (2006) 095002.
[8] ITER Physics Basis, Nucl. Fusion **39** (1999) 2175.