

IFE Dry Wall “Strawman” (October 23/01)

	Direct-Drive Target	Indirect-Drive Target
Driver	KrF Laser	Heavy Ion Beam
Driver energy (MJ)	1.2	3.3
Driver efficiency (%)	7	25
Repetition rate (Hz)	14.2	4
Target	NRL Direct-Drive Target	HI Indirect-Drive Target
Gain	128	139
Target yield (MJ)	154	458
Spectra	From J. Perkins’ calc.	From J. Perkins’ calc.
Photon energy (MJ)	2.14	115
Burn product fast ion energy (MJ)	18.1	8.43
Slow ion energy (MJ)	24.9	18.1
Neutron energy (MJ)	109	316
Gamma energy (MJ)	0.0046	0.36
Injection velocity (m/s)	400	100
Initial temperature (K)	18	18
Calculated D-T temperature rise (K)	1.8	<<1
Chamber		
Chamber radius (m)	7.3	6.9
Protective gas	Xe	Xe
Gas density (mTorr)	10	(D. Haynes)
Number of penetrations	100	(W. Meier)
Size of penetrations @ FW (m)	0.1	(W. Meier)
Conductance (liter/s)	36,420	(J. Pulsifer)
Continuous pumping flow rate (mbar-liter/s)	1,141	(J. Pulsifer)
Chamber Wall		
Chamber armor	W	W
Armor thickness (mm)	0.1-1	0.1-1
Structural material	SiC _f /SiC	SiC _f /SiC
First wall thickness (mm)	4	4
First wall channel dimension (mm)	5	5
Coolant	Pb-17Li	Pb-17Li
Coolant inlet pressure (MPa)	~1.5	~1.5
Coolant inlet temperature (°C)	529	529
Coolant chamber wall outlet temperature (°C)	715	725

Coolant flow rate (kg/s)	2.19x10 ⁴	1.8x10 ⁴
Coolant pressure drop (MPa)	~1	~1
Maximum armor temperature (°C)	(D. Haynes)	(D. Haynes)
Armor evaporation per shot (μm)	(D. Haynes)	(D. Haynes)
Armor evaporation per year (μm)	(D. Haynes)	(D. Haynes)
Blanket	ARIES-AT	ARIES-AT
Structural material	SiC _f /SiC	SiC _f /SiC
Breeder	Pb-17Li	Pb-17Li
Total thickness (m)	0.4	0.4
⁶ Li enrichment (%)	90	90
Coolant (in series with FW)	Pb-17Li	Pb-17Li
Coolant inlet pressure (MPa)	~0.7	~0.8
Coolant inlet temperature (°C)	715	725
Coolant outlet temperature (°C)	1100°C	1100°C
Coolant pumping power (MW)	~ 5 MW	~ 4 MW
Neutronics		
Neutron wall loading (MW/m ²)	2.3	5.8
Tritium breeding ratio	1.1	1.1
Nuclear energy multiplication	1.1	1.1
Overall energy multiplication	1.078	1.076
Volumetric Heat Generation in FW (MW/m ³)		
1 mm W armor	22	57
0.5 cm SiC/SiC	9.8	25
0.5 cm Pb-17Li	15.5	38
0.5 cm SiC/SiC	9.4	23
Power		
Fusion power (MW)	2181	1847
Total thermal power (MW)	2335	1961
First wall power from neutron (MW)	128	105
Total first wall power (MW)	761	673
Blanket power (MW)	1398	1143
Blanket/shield power (MW)	1575	1288
Power Cycle	Brayton	Brayton
Cycle efficiency (%)	55.7	55.7
Auxiliary Power (MW)	52	44
Driver Power (MW)	243	53
Gross Electric Power (MW)	1300	1092
Net Electric Power (MW)	1005	996