Final Radial/Vertical Builds And Nuclear Heat Load To ARIES-AT Components

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Major Changes

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- IB Blanket thickness
- OB Blanket-II thickness
- HT shield thickness
- 1 cm thick W Kink shell added on OB B-II
- 0.35 cm thick W coating for divertor plates
- Latest TF magnet composition
- 5-14 cm inner coil case*; 14 cm outer coil case*
- 6/14/00 Strawman parameters
- Key nuclear parameters:

Overall TBR	1.1
Overall Mn	1.1
FW lifetime	3.8 FPY#

* Will change as magnet design progresses
# Shorter lifetime due to higher n wall loading

Nuclear Heat Load to All Components

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(P_f= 1755 MW , P_n= 1404 MW)

Nuclear Heating (MW):	Inboard	Outboard	Divertor**	**Total**	
FW or DP	39	96	43#	**178**	(12%)
Blanket:				**1207**	(78%)
B-I	302	727	---		
B-II (45 cm)	---	141	---		
1 cm W Kink Shell	---	8	---		
4 cm W V.S. Shells	---	24	---		
16 Wedges*	---	5	---		
HT Shield/IB W Shells	37 / 3	9	112##	**161**	(10%)
Total	**381** (25%)	**1010** (65%)	**155** (10%)	**1546**	

Low Grade Heat:				
Vacuum Vessel (MW)	9	4	2	15*** (1% of total htg)
Magnet (kW):				
Inner Coil Case	0.3	73	~1	74###
Winding Pack	0.4	2.4	~0.5	3
Outer coil case	0.06	0.1	~0.04	0.2

** upper and lower divertor regions
# 27 MW in dome, 9 MW in outer divertor plates, 7 MW in inner divertor plates
* 3% of B-II heeting
58 MW in replaceable shield, 26 MW in vertical shield, 29 MW in IB shield above/below X point
*** does not include thermal heat leak from HT shield (5-10 MW)
requires 0.8 MW of cryogenic load @ 10 W/W

Inboard Radial Build*

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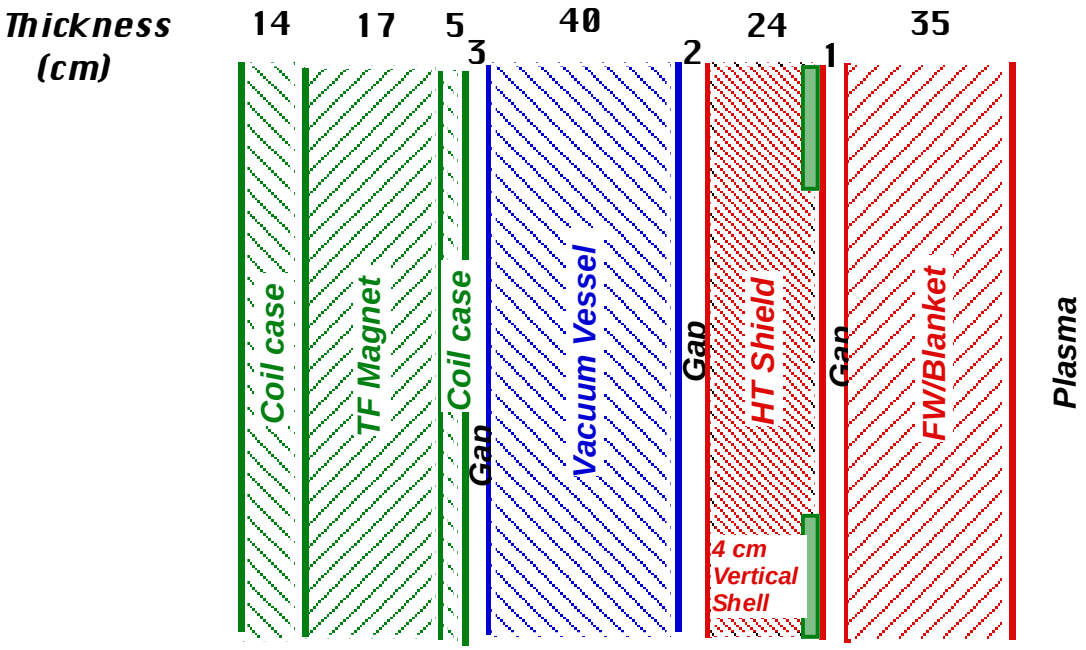

Component	Composition#
FW (1.4 cm)	73% SiC , 27% LiPb
Blanket (33.6 cm)	17% SiC , 83% LiPb
HT Shield	15% SiC, 10% LiPb , 70.3% B-FS, 4.7% W
Vacuum Vessel	13% FS, 22% H_2O, 65% WC
Coil Case	95% 304SS, 5% LN
Winding Pack	72% Inconel, 7% $Y_1Ba_2Cu_3O_5$, 7% CeO_2, 0.5% Ag, 13.5% GFF Polyimide

- VV/case gap contains 15% superinsulation

* Safety factor of 3 considered in all shielding calculations
# SiC and WC are 95% dense

Outboard Radial Build*

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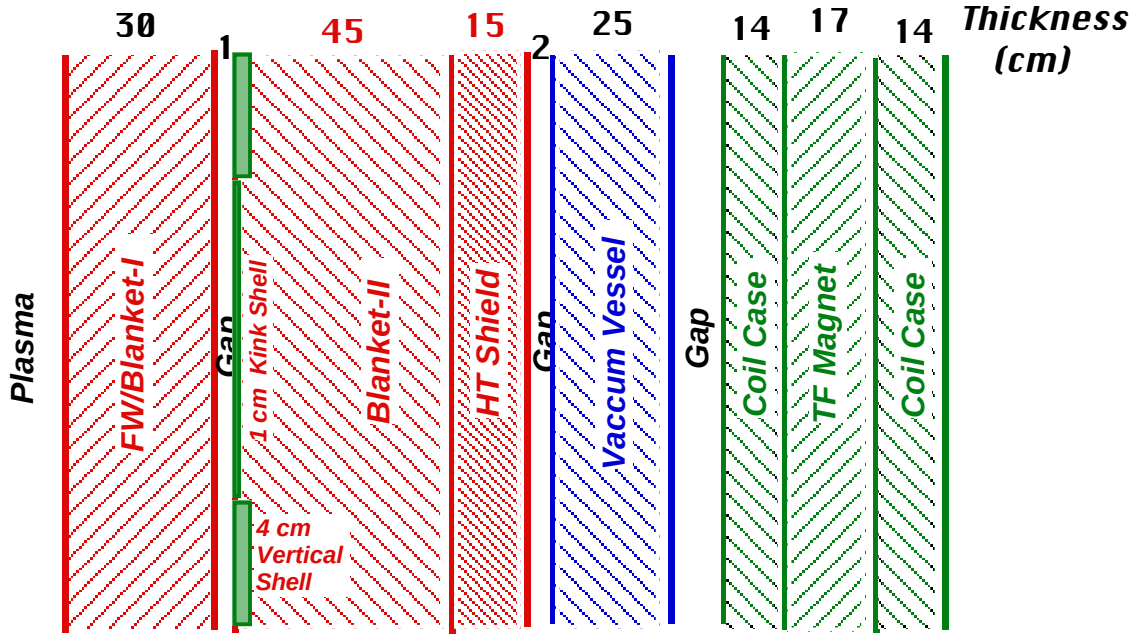

Component	**Composition#**
FW/Blanket-I:	
FW (1.4 cm)	73% SiC , 27% LiPb
B-I (28.6 cm)	17% SiC , 83% LiPb
Blanket-II	19.3% SiC , 77.3% LiPb , 3.4% W
HT Shield	15% SiC , 10% LiPb , 75% B-FS
Vacuum Vessel**	30% FS , 70% H_2O
Coil Case	95% 304SS, 5% LN
Winding Pack	72% Inconel, 7% $Y_1Ba_2Cu_3O_5$, 7% CeO_2, 0.5% Ag, 13.5% GFF Polyimide

- Along with blanket/shield/V.V., 5 cm thick port enclosures and 5 cm side coil case provide shielding for sides of winding pack

- Wedge underneath magnet is composed of B-II, HT shield, and V.V.

* Safety factor of 3 considered in all shielding calculations
# SiC and WC are 95% dense
** Composition is slightly of-optimum to simplify V.V. design

Vertical Build*

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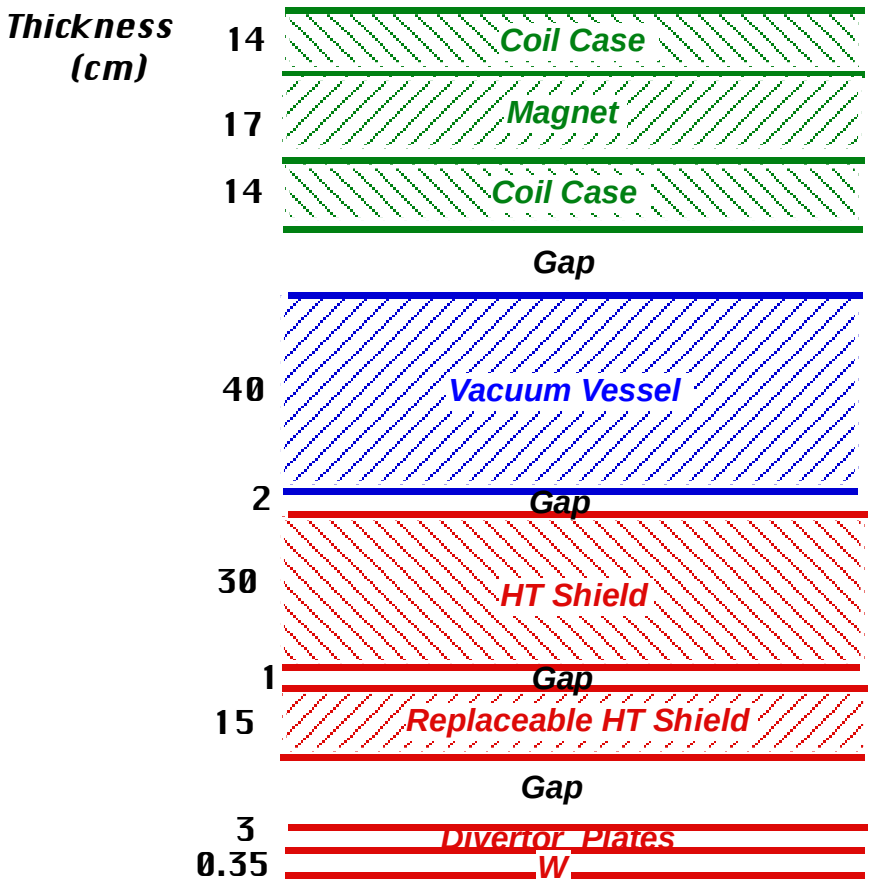

Component	**Composition#**
W coating	100% W-0.2%TiC alloy
Divertor Plates	46% SiC , 54% LiPb
Replaceable HT Shield	15% SiC , 10% LiPb, 75% FS
HT Shield	15% SiC , 10% LiPb , 75% B-FS
Vacuum Vessel	13% FS, 22% H_2O, 65% B-FS
Coil Case	95% 304SS, 5% LN
Winding Pack	72% Inconel, 7% $Y_1Ba_2Cu_3O_5$, 7% CeO_2, 0.5% Ag, 13.5% GFF Polyimide

- Need info on size of pumping ducts to design penetration shield

* Safety factor of 3 considered in all shielding calculations
# SiC and WC are 95% dense