

Mass budget for detector elements

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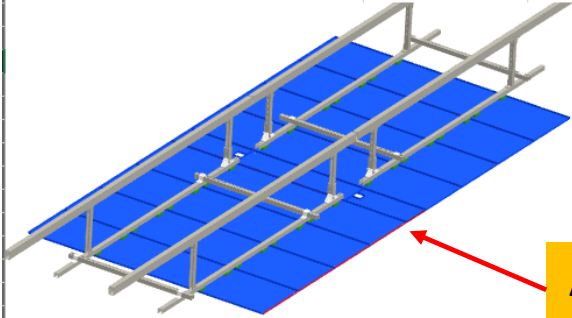
Mass budget requirements

- A mass budget concerning either structures, installations or equipment shall be provided together with the level of confidence on the estimation and the contingency applied on the mass.
- For equipment immersed, a dry and wet mass budget must be provided.
- Reference to the previous experience on prototypes is highly recommended.
- The mass budget will be provided in both metric and imperial units.
- A description of the configuration represented is needed.
- How the mass is estimated is needed (eg: actual weights of prototypes, developed from solid models, etc)
- This information is a deliverable for your design reviews

Recent example from HVS

Confidence level

HVS Componets		Dec. 3, 2019		Estimate based on the Oct-2019 model		Dry		Wet		Confidence Level	Comment
Module name	Main composition	Quantity	unit volume [m^3]	Unit weight [kg]	total weight [kg]	Unit weight [kg]	total weight [kg]				
Upper ground plane module with DSS support	SS, Al	50	0.02822	150.1	7505	110.6	5530	80%	these are double sided modules including the above-CPA filler pieces, see figure below		
Top/bottom field cage module	Al, FRP	200	0.025438	58.9	11785	23.3	4663	90%	DFD-22-2100, plus components for RDB		
CPA panel, endwall section	FR4	4	0.119833	222.2	889	54.4	218	90%	DFD-20-F000, 1.16m x 12m unit, + HV cup		
CPA panel, middle section	FR4	96	0.1135	205.3	19709	46.4	4,54	90%	DFD-20-3000, 1.16m x 12m unit, 96 panels missing features to support the ground plane filler pieces		
CPA panel lift bars and trolleys	Al, SS, G10	100	0.003277	19.3	1930	14.7	1,471	70%	DFD-22-5100, + components on RDBs, + 1/2 short cross beam under CPA DSS,		
Endwall FC column	Al, FRP	8	0.152598	436.3	3490	222.7	1781	90%	The high voltage feedthroughs are supported directly on the cryostat top, not on the DSS beams. They are partially submerged in LAr, with about ~5kg each bouyancy. HV cable/filter are not estimated		
HV Feedthroughs	SS, UHMWPE	2		84.0				50%	each unit is 4 sets of latches mating with 1 top and 1 bottom FC. The latches are being redesigned with aluminum parts.		
APA Latches	SS	100	0.0033058	26.5	2645	21.8	2192	50%			
Total					47954		20300				
CPA panel average weight				225.276		61.402552					
TBFC with APA latches				72.153		34.22574					
LAr density		1.4 g/cc									



A visual representation of the configuration and what is included

What's needed: the basis of how these numbers were calculated

If contingency is added, please be very specific how much so this can be considered in other uses of these numbers

Information storage

- A location in EDMS will be developed for this information.
- The information should only be edited by the consortia or technical leads
- Kyle should be notified if any of these numbers are edited
- Primary masses should be listed in kg, secondary units will be lbs.
- This will be a living document and will evolve as the designs mature
- Numbers will be used to calculate combined masses during various installation stages
- Do we need CG information?

