

SSC DETECTOR SOLENOID DESIGN NOTE #8

TITLE: Weight (Cold Mass) of One-meter and Two-meter Coil-He Vessel Modules

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DATE: Jan 25, 1988

OBJECTIVE: To estimate the weight of two possible coil-He vessel modules

Two-meter Module

Input Parameters, from Design Note #5

Inner He shell, inner radius = 5175 mm
Inner He shell, outer radius = 5225 mm
Coil pack inner radius = 5225 mm
Coil pack outer radius = 5300 mm
Coil pack average diameter = 10525 mm
Outer He shell, inner radius = 5300 mm
Outer He shell, outer radius = 5320 mm
Coil pack length = He shell length = 1940 mm for center module
He vessel annular flat head thickness = 30 mm

Density of stainless steel = 7.6 g/cc

Average density of coil pack = 68% conductor + 16% G-10 + 16% void
= 0.68 (8.9) + 0.16 (1.8) = 6.34 g/cc

Calculated Weights

Coil pack = (6.34 g/cc)(194 cm)(7.5 cm)(1052.5 pi cm) = 30.5 tonnes

Vessel = inner shell + outer shell + flat heads
= (7.6 g/cc)[(194 cm)(5 cm)(1040 pi cm)
+ (194 cm)(2 cm)(1062 pi cm)
+ (2)(3 cm)(14.5 cm)(1049.5 pi cm)]
= 24.1 + 9.8 + (2)(1.1) = 36.1 tonnes (metric tons)

Weight (cold mass) of 2-m module = 66 tonnes

Weight of four, 2-m modules (half magnet) = 264 tonnes

Total cold mass of magnet = 528 tonnes

One-meter Module

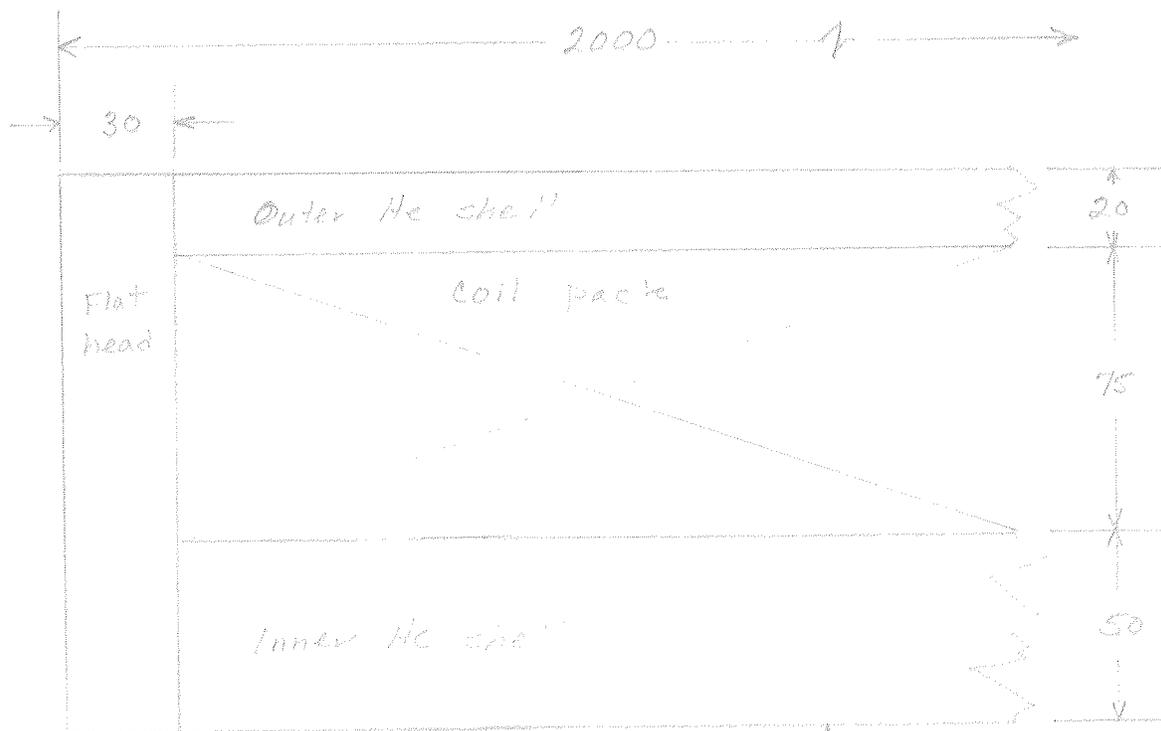
Input Parameters

Radii same as 2-m module, Coil pack/shell length = 940 mm

Calculated Weights

Coil pack = 14.8 tonnes, Vessel = 18.6 tonnes, Module = 34 tonnes

Two-meter Module



All dimensions in mm.

5175