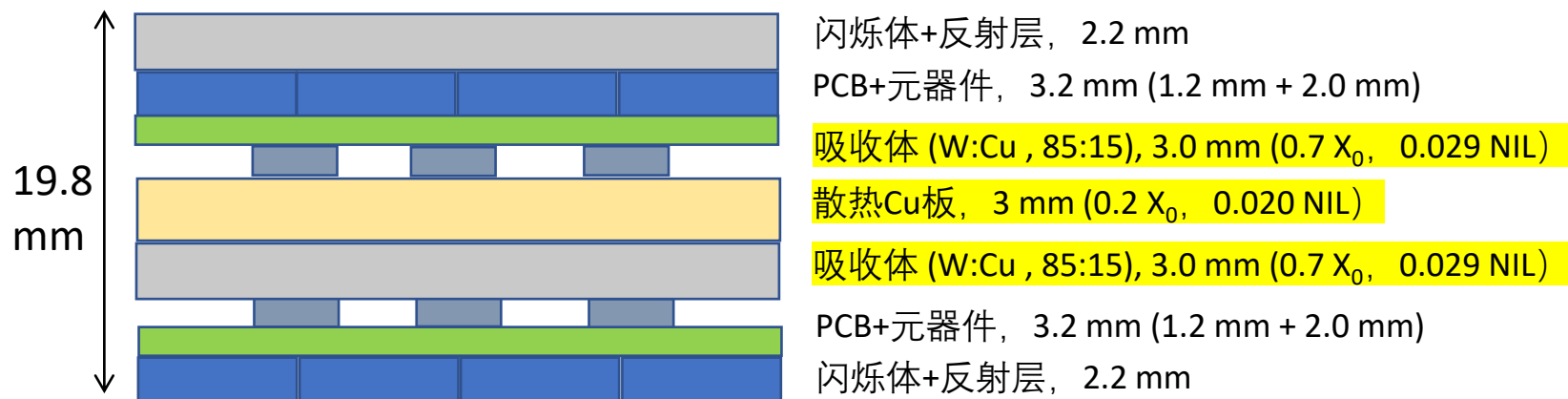


CEPC塑闪ECAL

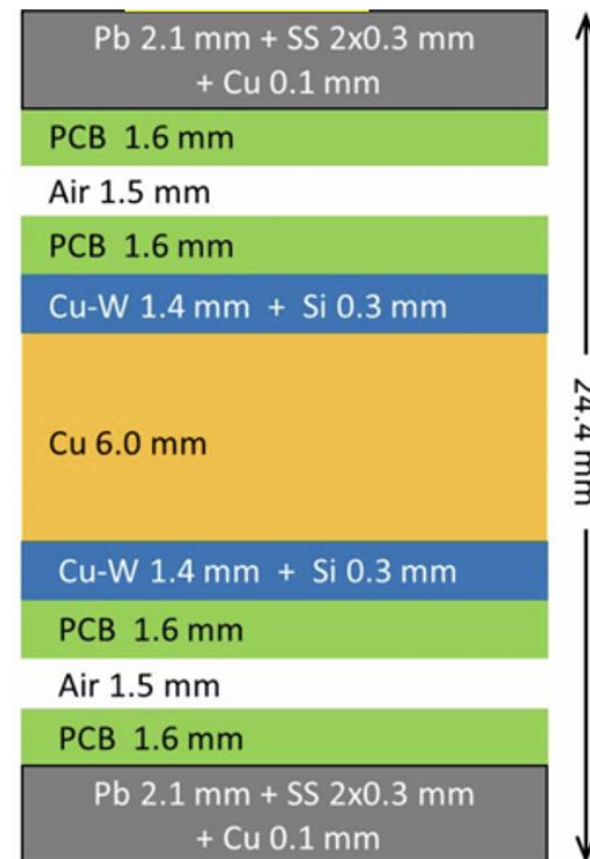
ECAL 超层 (一个超层包含二层)



19.8 mm

单个超层: $1.6 X_0$, 0.08 NIL
 15个超层, $24 X_0$, 1.2 NIL, 348 mm \rightarrow 297mm

CMS硅ECAL



24.4 mm

14个超层, $25 X_0$, 341.6 mm

2024.4.25 讨论会议上主要考虑了两点: (1)钨铜合金也有良好导热率, 单个超层可以只用一层散热铜板, 即单个超层减少3mm厚度; (2)钨铜合金参考了ECAL样机的合金比例, 即W:Cu=85%:15%, 降低吸收层厚度



CEPC正交长条晶体ECAL：总厚度 ~ 290 mm

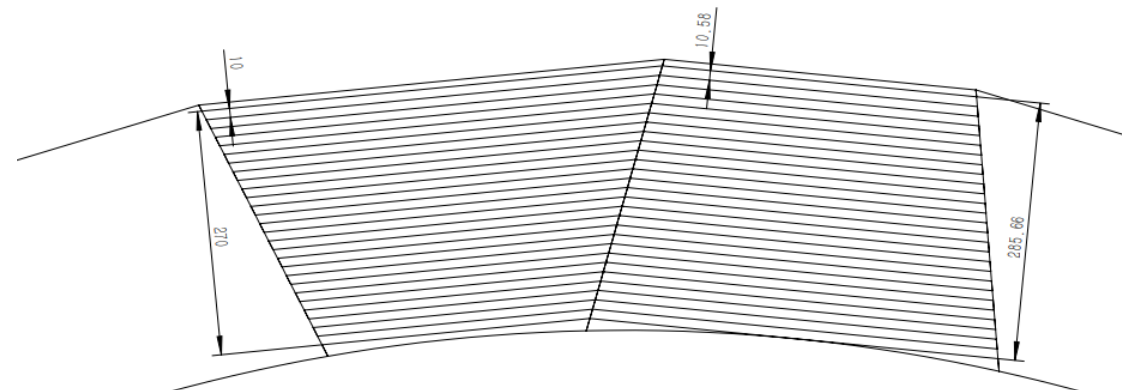
晶体ECAL：相邻两层为正交排布的晶体条



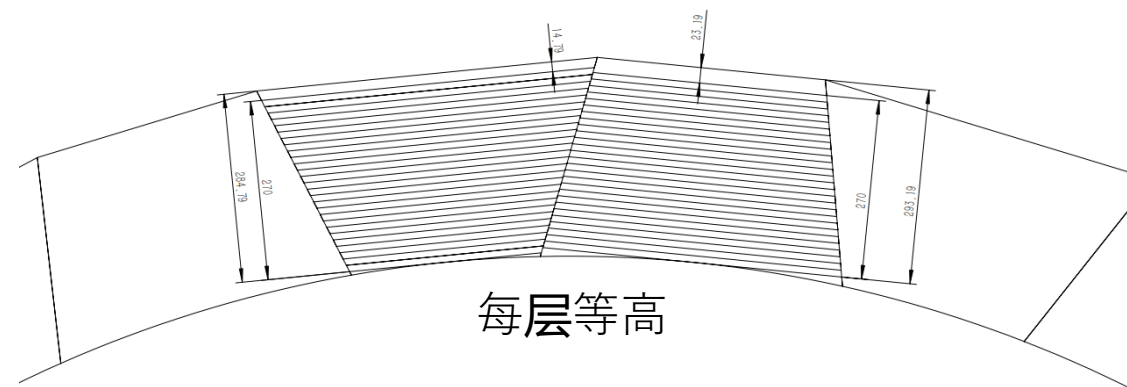
- 单根BGO闪烁晶体厚度: 10 mm
- 共27层晶体, 晶体总厚度为270mm, 对应 $24.1 X_0$, 1.21 NIL
- 如果每根晶体每个面的包装层厚度为0.1mm, 则包装层总厚度约5mm, 此时晶体总厚度为275mm
- 模块顶部的数据汇总和传输, 以及冷却系统占用厚度预期不超过10mm, 则量能器总厚度约285mm
- 碳纤维支撑结构在厚度上的额外贡献 ~ 5 mm

晶体长度约为400mm, 实际长度跟所在层数相关
(以上仅为示意图, 不按比例)

晶体模块侧面包括电子学读出板和被动冷却层 (铜)



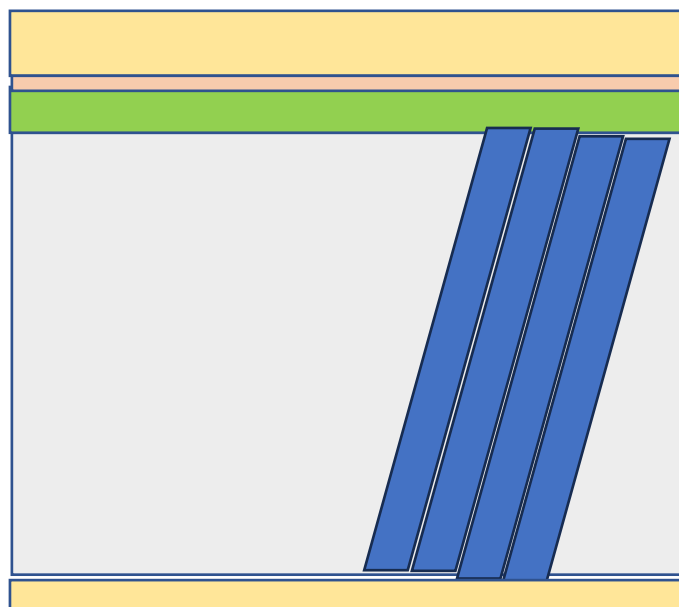
每层对应, 但每层不等高



每层等高



CEPC 倾斜长条晶体ECAL：圆柱形轮廓，总厚度~297 mm



碳纤维支撑圆桶10mm

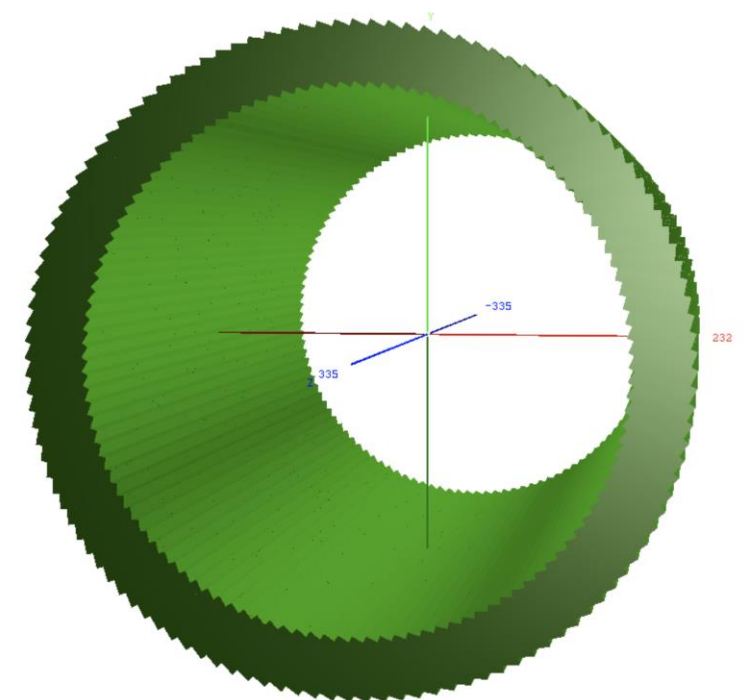
散热铜片3mm

PCB+光电器件+电子学+传输线缆+供电电缆：10mm

BGO晶体269mm (24X0, 1.21NIL)

ESR 外包装厚度~80 um/面, ESR总厚度= $80 \text{ um}/\sin(20^\circ)*2\text{面}*10\text{层} = 4.7\text{mm}$

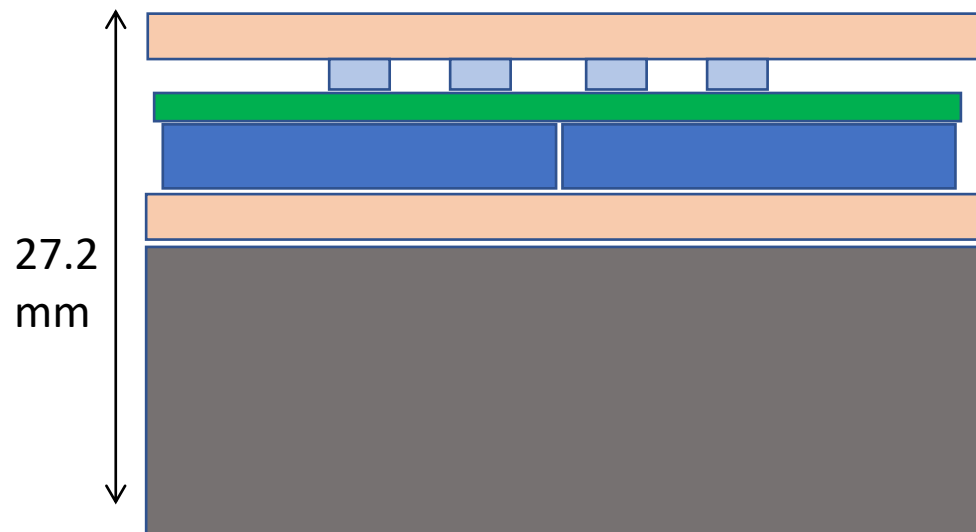
共计274mm



保守设计可以在内部增加3mm碳纤维支撑层



CEPC PS-AHCAL



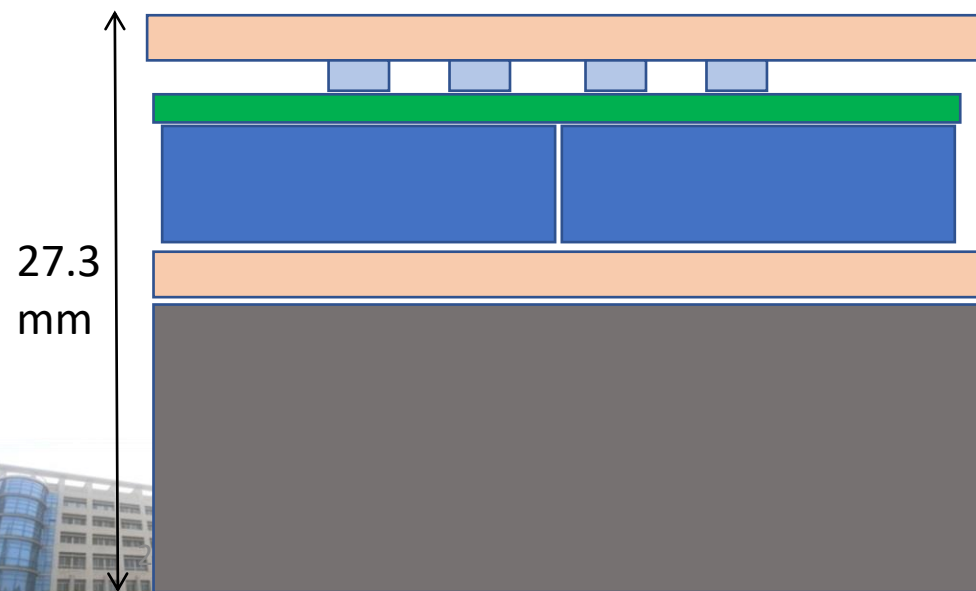
上盖板 2 mm
PCB+元器件, 3.2 mm
闪烁体+反射层, 3.2 mm
下盖板 2 mm

吸收体, 16.8 mm

单层 (未考虑闪烁体和PCB) : $1.18 X_0$, 0.125 NIL
48层: $56.8 X_0$, 6.0 NIL, 1305.6 mm

注: 塑闪的总厚为14.4cm, 约0.19 NIL, 对应31.6mm的铁。如果考虑这部分贡献, 在相同总NIL下, PS-AHCAL相比GS-AHCAL可以更薄, 即 $1305.6 - 31.6 = 1274$ mm

CEPC GS-AHCAL

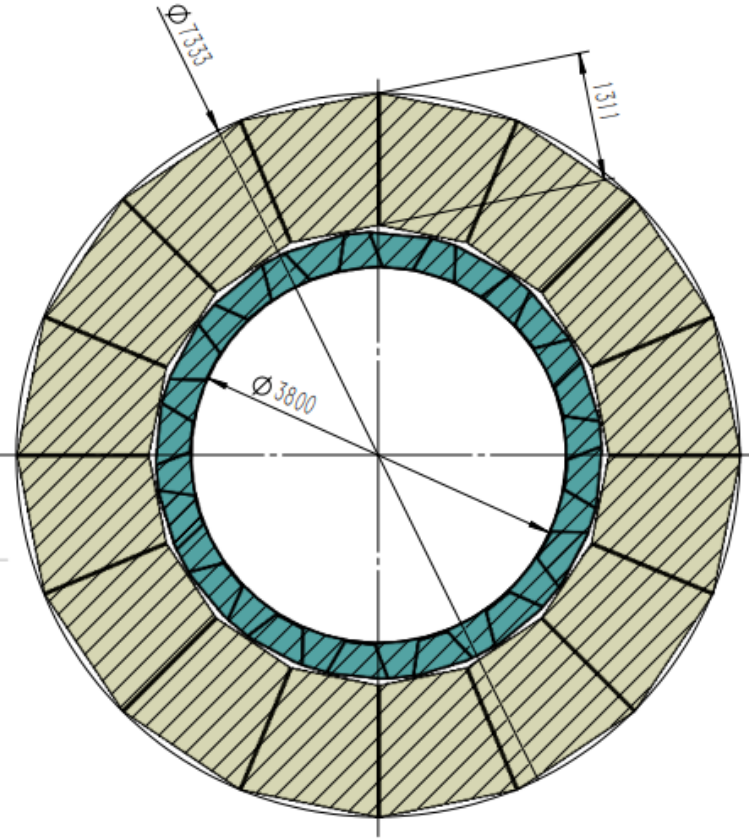


上盖板 2 mm
PCB+元器件, 3.2 mm
闪烁玻璃+反射层, 10.2 mm
下盖板 2 mm

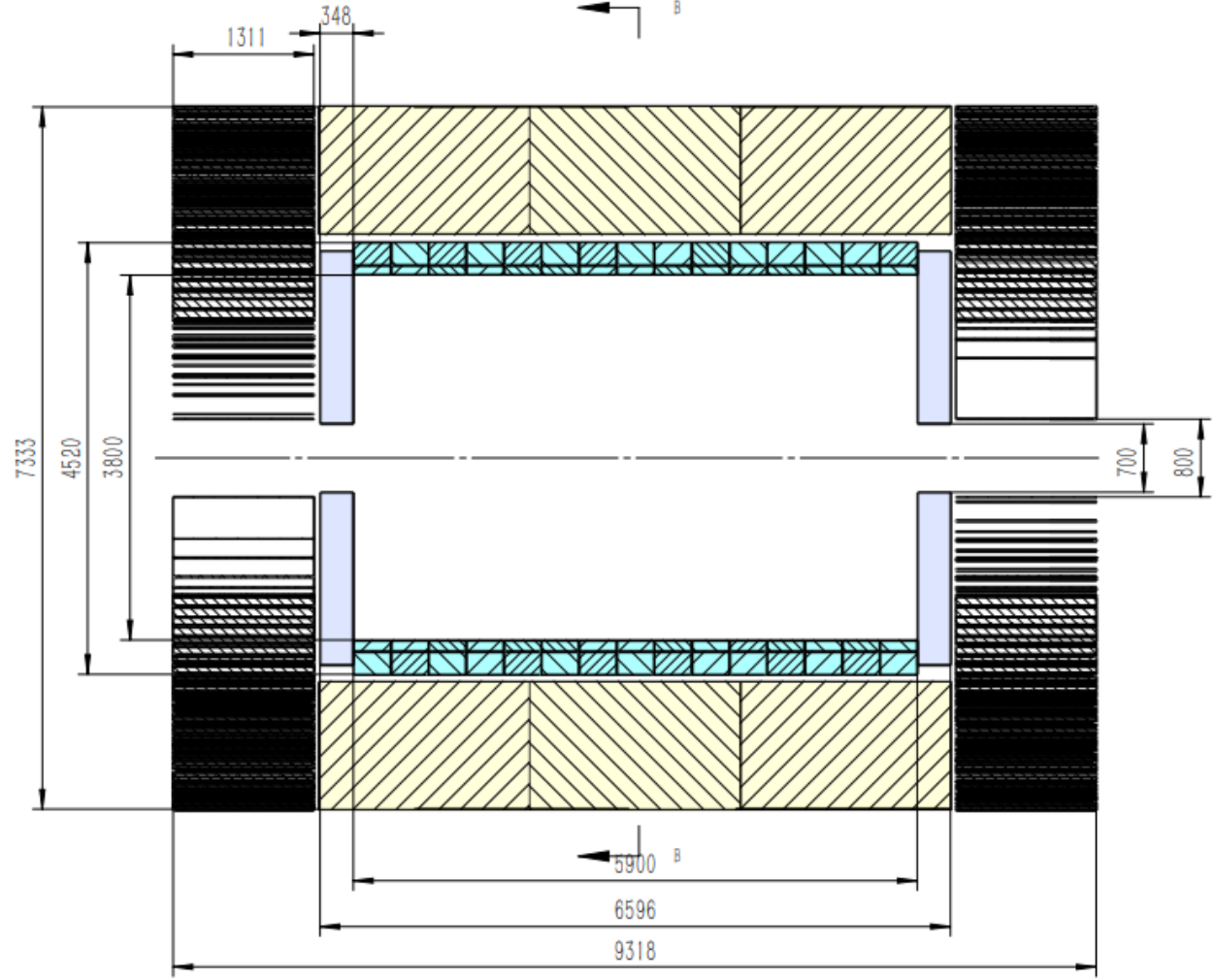
吸收体, 9.9 mm

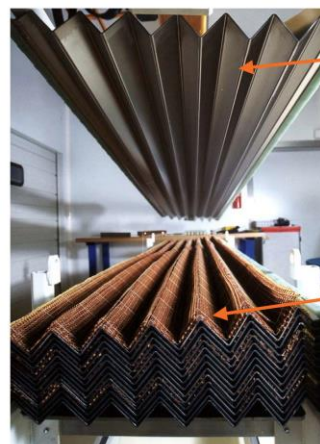
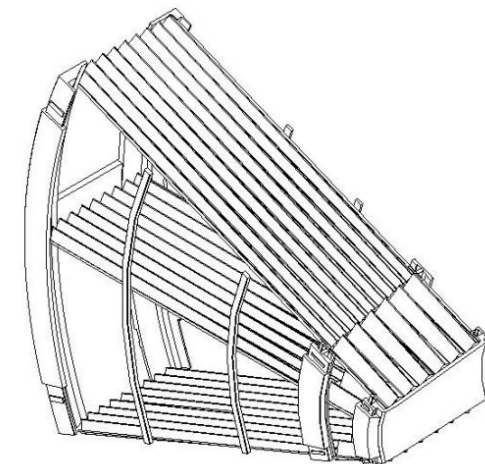
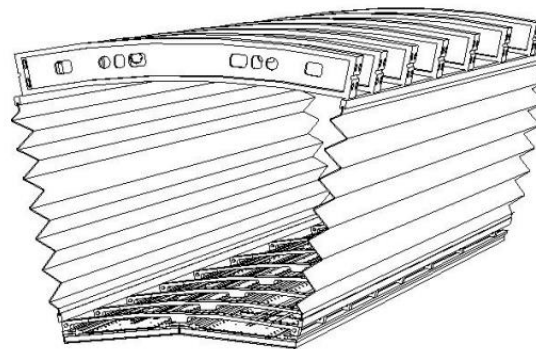
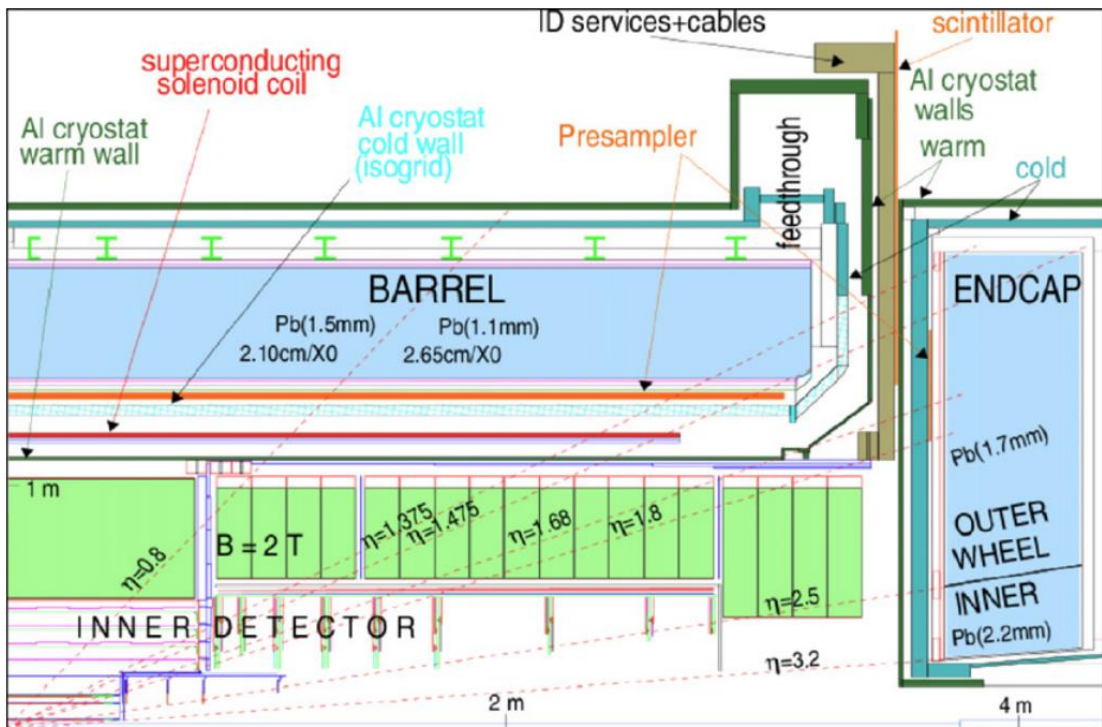
单层: (未考虑PCB) $1.41 X_0$, 0.125 NIL
48层: $67.7 X_0$, 6.0 NIL, 1310.4 mm

B-B
1 : 50



A-A
1 : 50





Pb Absorber

Honeycomb spacer & Cu/Kapton electrode

