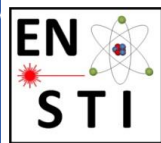




Evaluation of alternative options to protect D2 in P8 for the LS2 LHCb upgrade

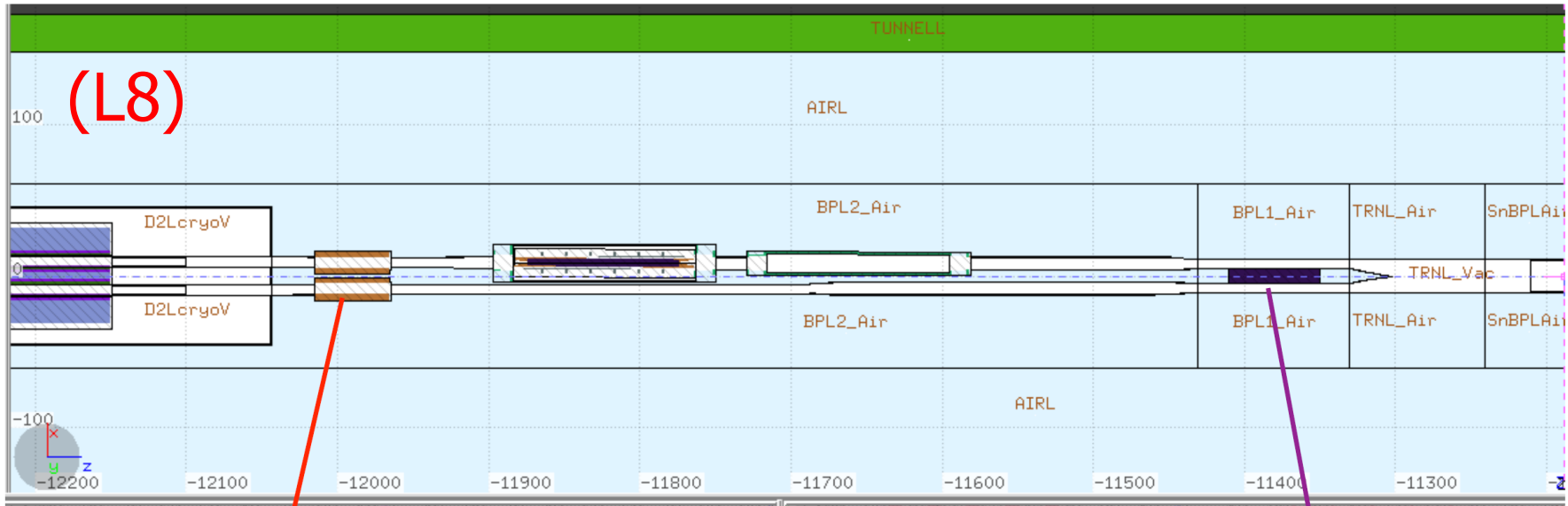
Francesco Cerutti



WP10

Energy deposition & R2E

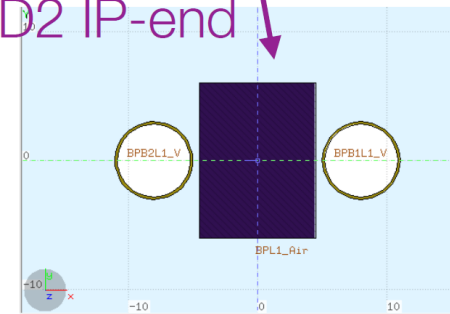
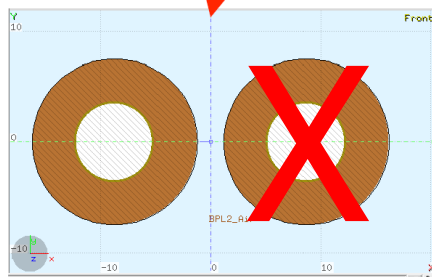
TWO PROTECTION ELEMENTS FOR LS2



69mm ID aperture

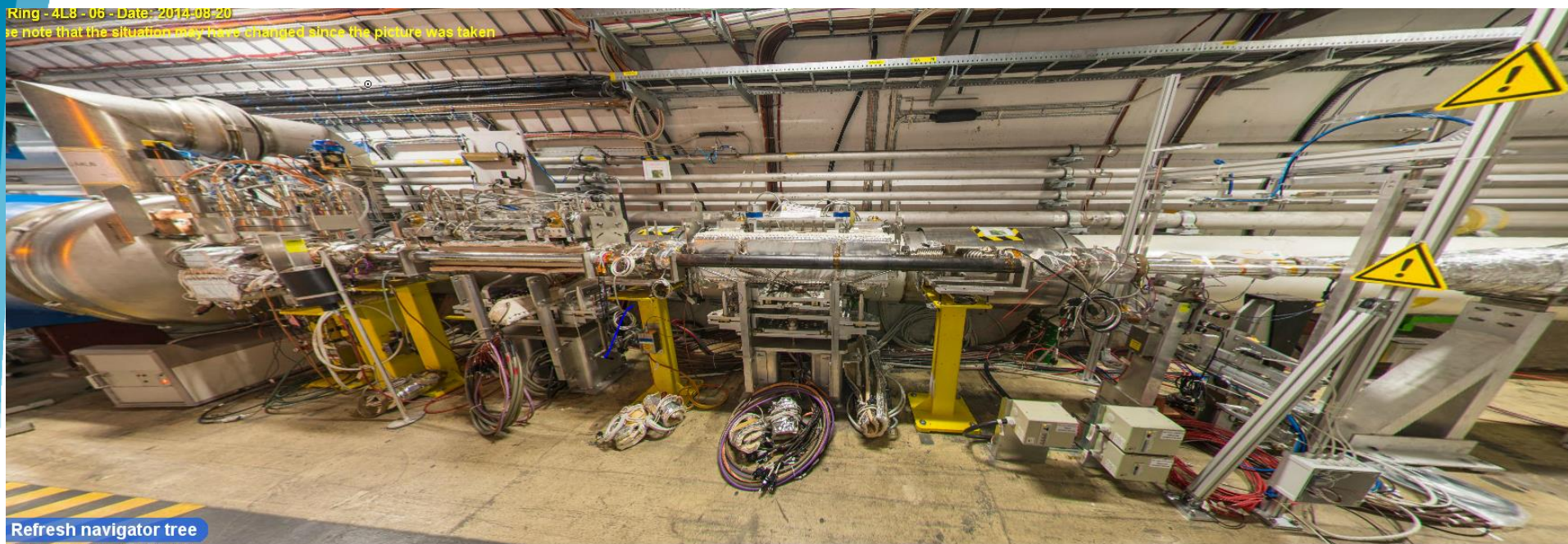
50 cm Cu masks at ~1.35 m from D2 IP-end

9 × 12 × 60 cm³ Inermet180 absorber at ~ 7.5 m from D2 IP-end



i.e. mini-TAN

REALITY



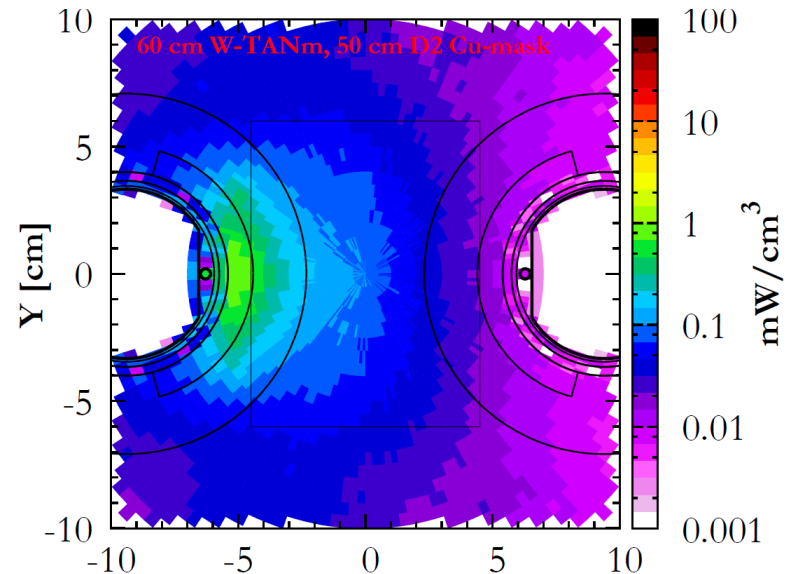
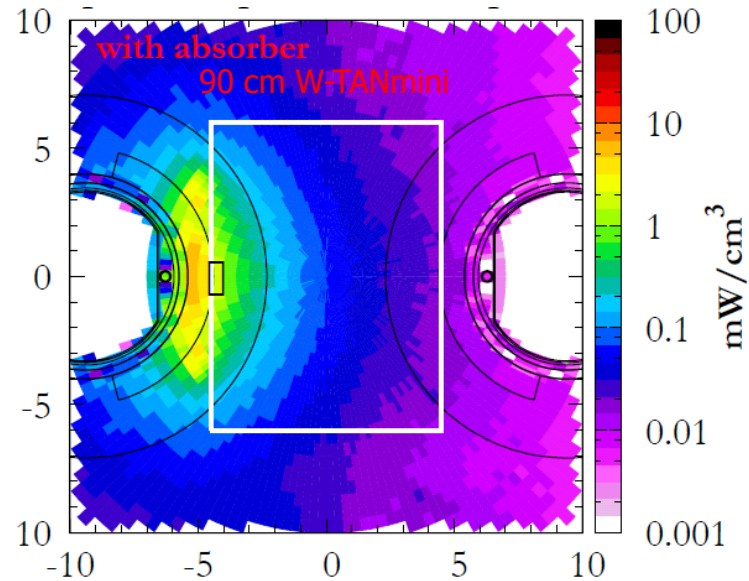
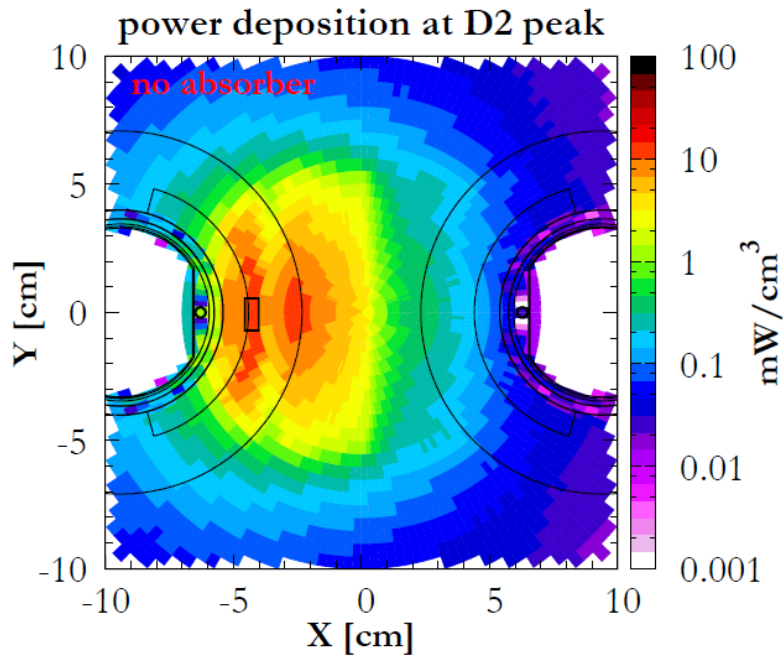
DOCUMENTS

DMS Id : **454857** LAYOUT HALF_CELL C2L8

_0504-v0.plt

DMS Id : **1087307** LHC photo: 66.Q2.B1L8.jpg Version 1 Released

MASK EFFECTIVENESS [I]

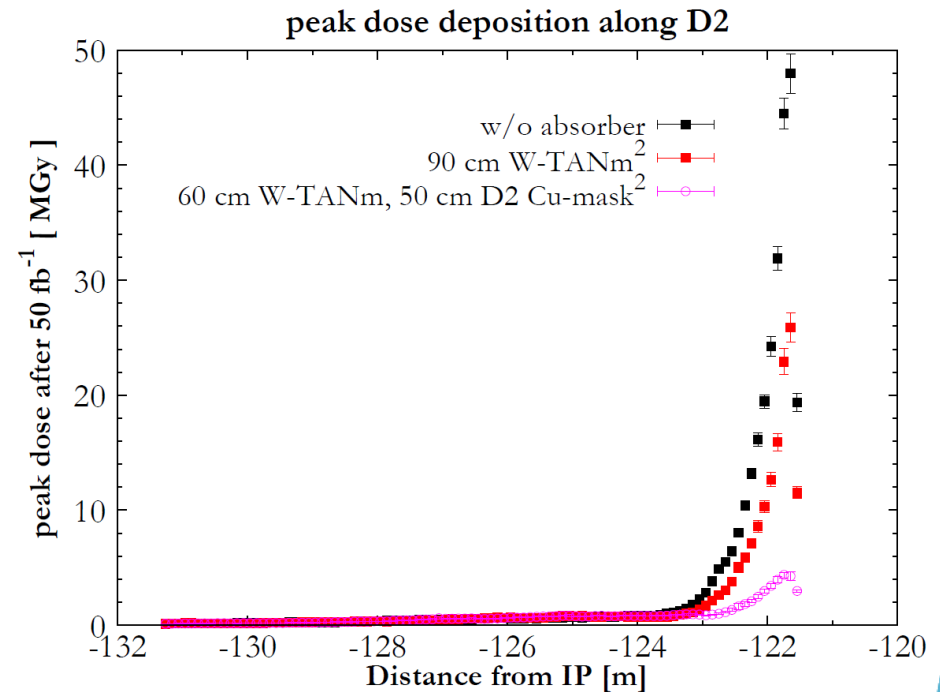
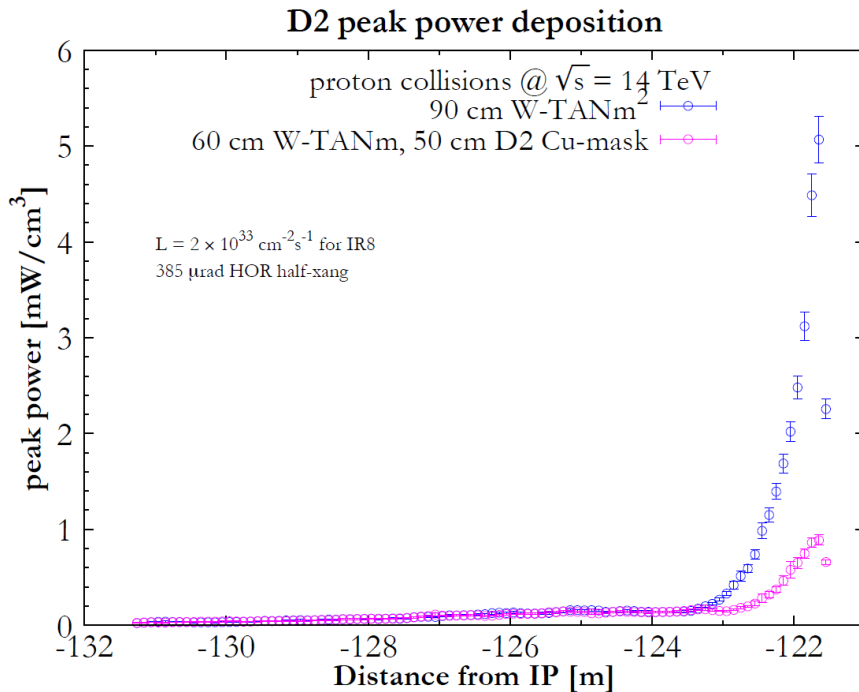


18 W absorbed by the inermet mini-TAN
2 W in the copper mask

MASK EFFECTIVENESS [II]

@ $2 \times 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$ (power), 50 fb^{-1} (dose)

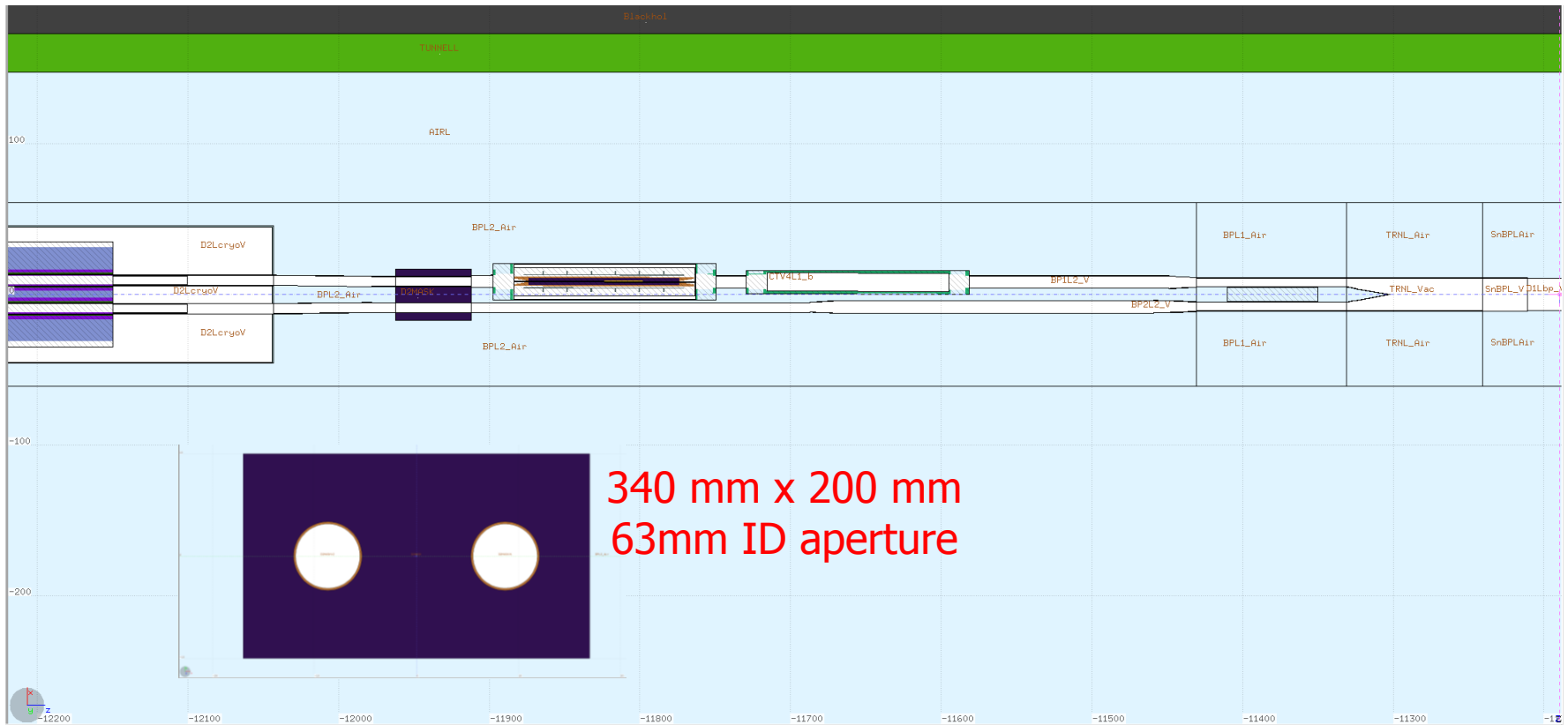
385 μrad half horizontal crossing angle



6 W in the D2 cold mass

factor 5 reduction in peak power density/dose
in addition to the factor 2 provided by mini-TAN

OPTION 2: A DISPLACED mini-TAN ALONE



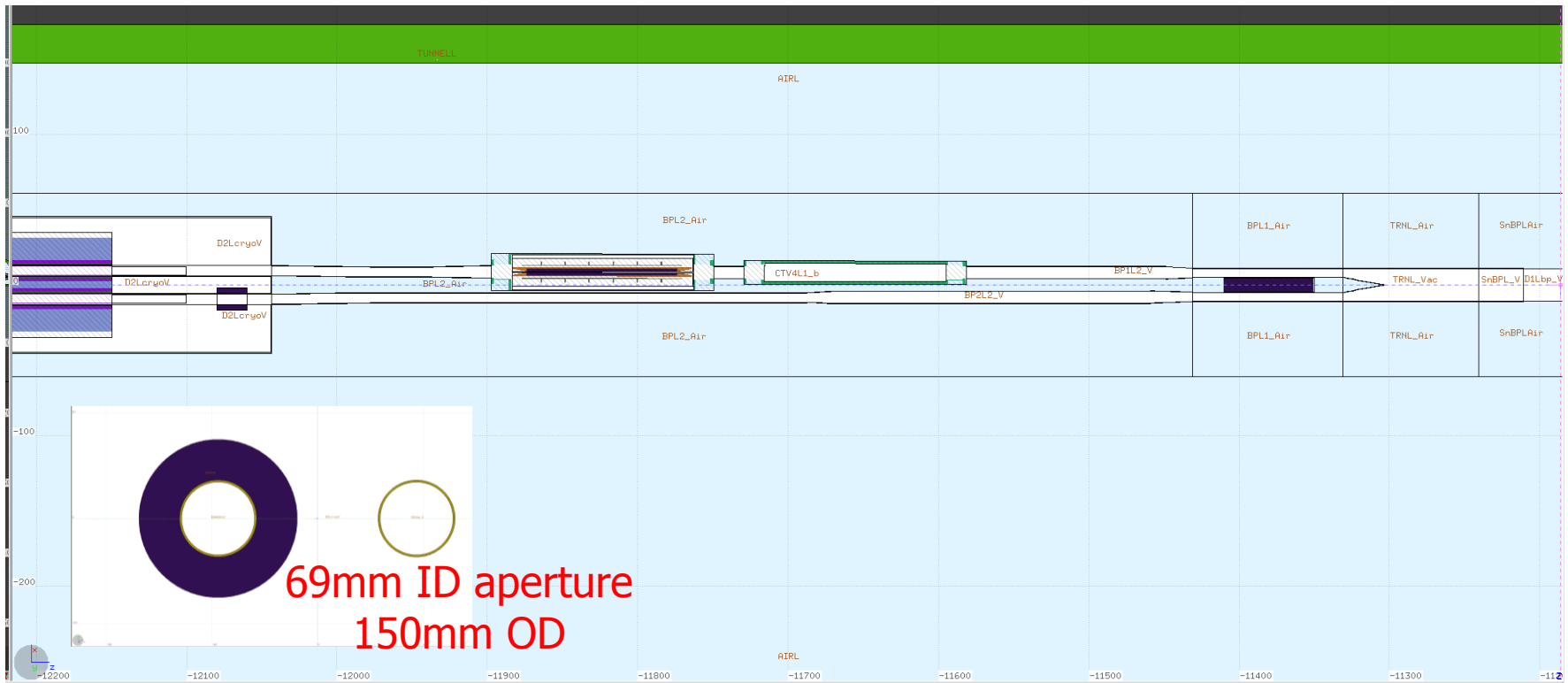
50 cm long Inermet mini-TAN
at ~1.9 m from the D2 IP-face

absorbing 16 W

2.5 W in the TCTH

1.5 W in the TCTV

OPTION 3: COLD MASK (+ FORMER mini-TAN)



20 cm long Inermet mask
at ~0.7 m from the D2 IP-face

absorbing 2 W

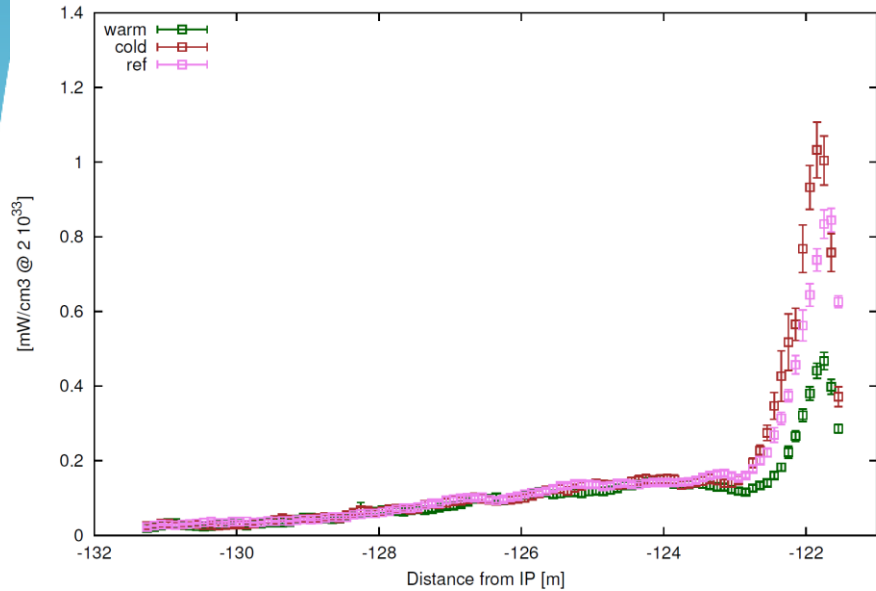
0.4 W in the TCTH

0.4 W in the TCTV

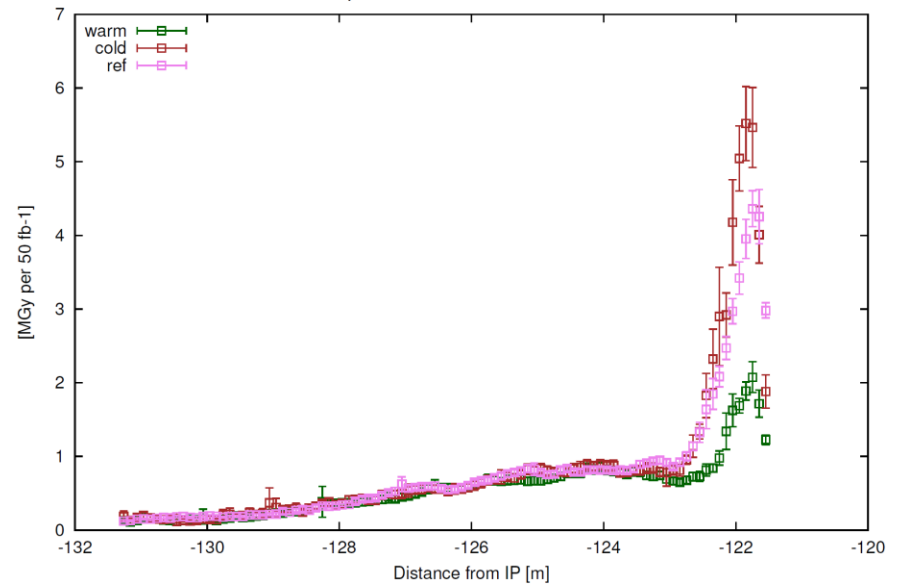
18 W in the mini-TAN

AND THE WINNER IS [I]

peak power density in the D2 coils

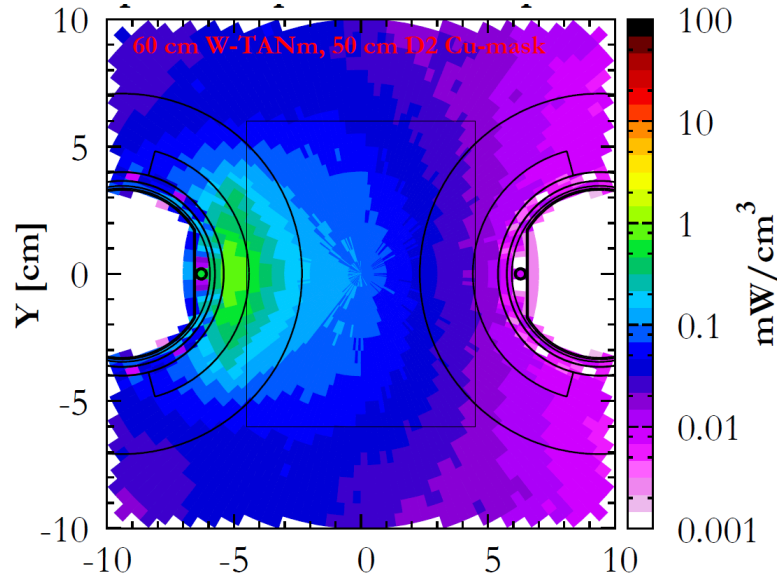


peak dose in the D2 coils

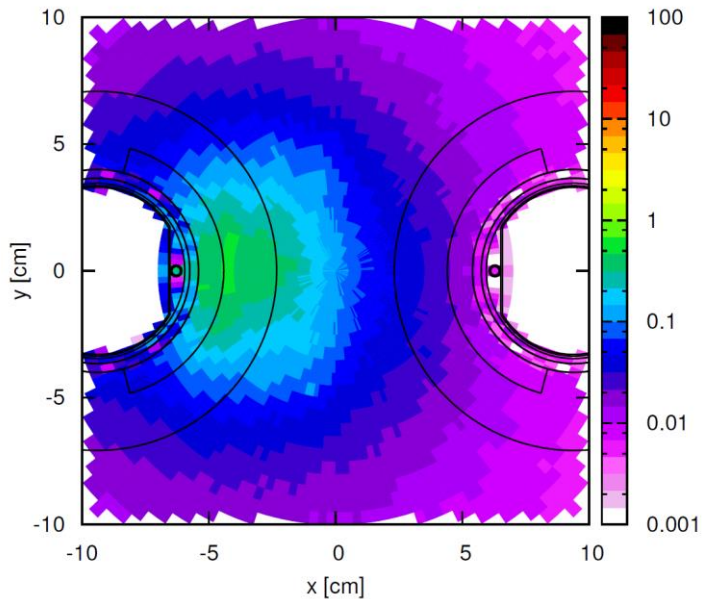


clear benefit from option 2

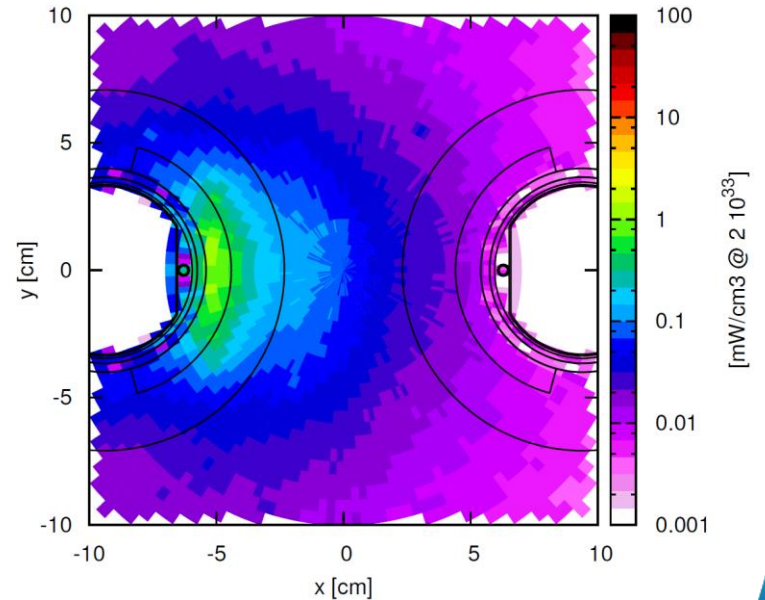
AND THE WINNER IS [II]



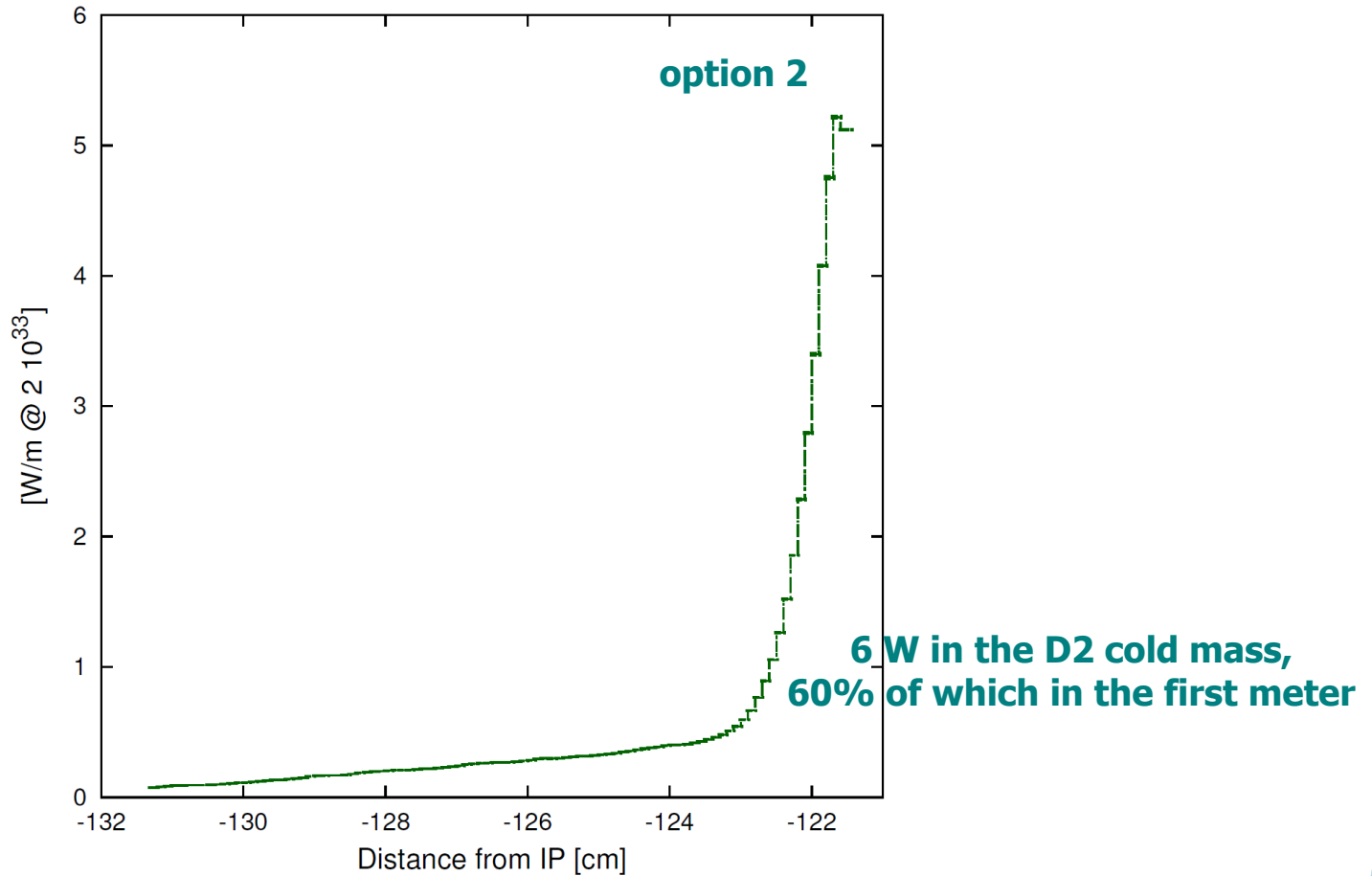
option 2 D2 at peak [WARM option]



D2 at peak [COLD option] **option 3**



D2 TOTAL HEAT LOAD PROFILE



SO

- transforming the D2 mask into a mini-TAN frees space at the Y chamber location and can provide a better protection effectiveness (with 50 cm innermet, implying a minor TCT displacement?).

Thermal load to the TCTs increases up to few watts.

Any other object suffering from increased radiation?

- the option of a short cold mask, still coupled to a mini-TAN at the Y chamber, is less effective

