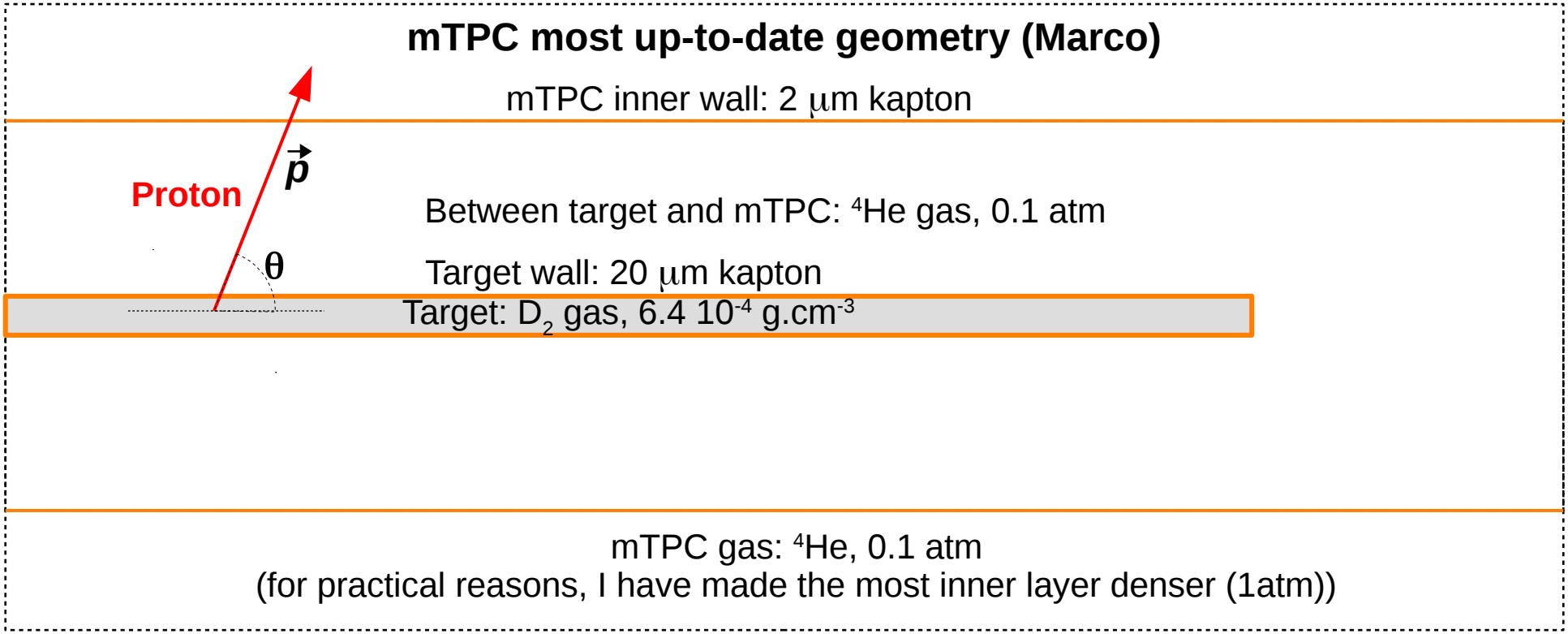
Proton detection threshold and efficiency

Proton generated flat in 0.05 < p (GeV/c) < 2.0, -1 < cosθ < 1, along all target length

Checked which reached the most inner TPC gas layer.

NB: what I call "efficiency" in these slides is a misuse of language: it just represent the probability for the proton to reach the most inner gas layer of the mTPC.



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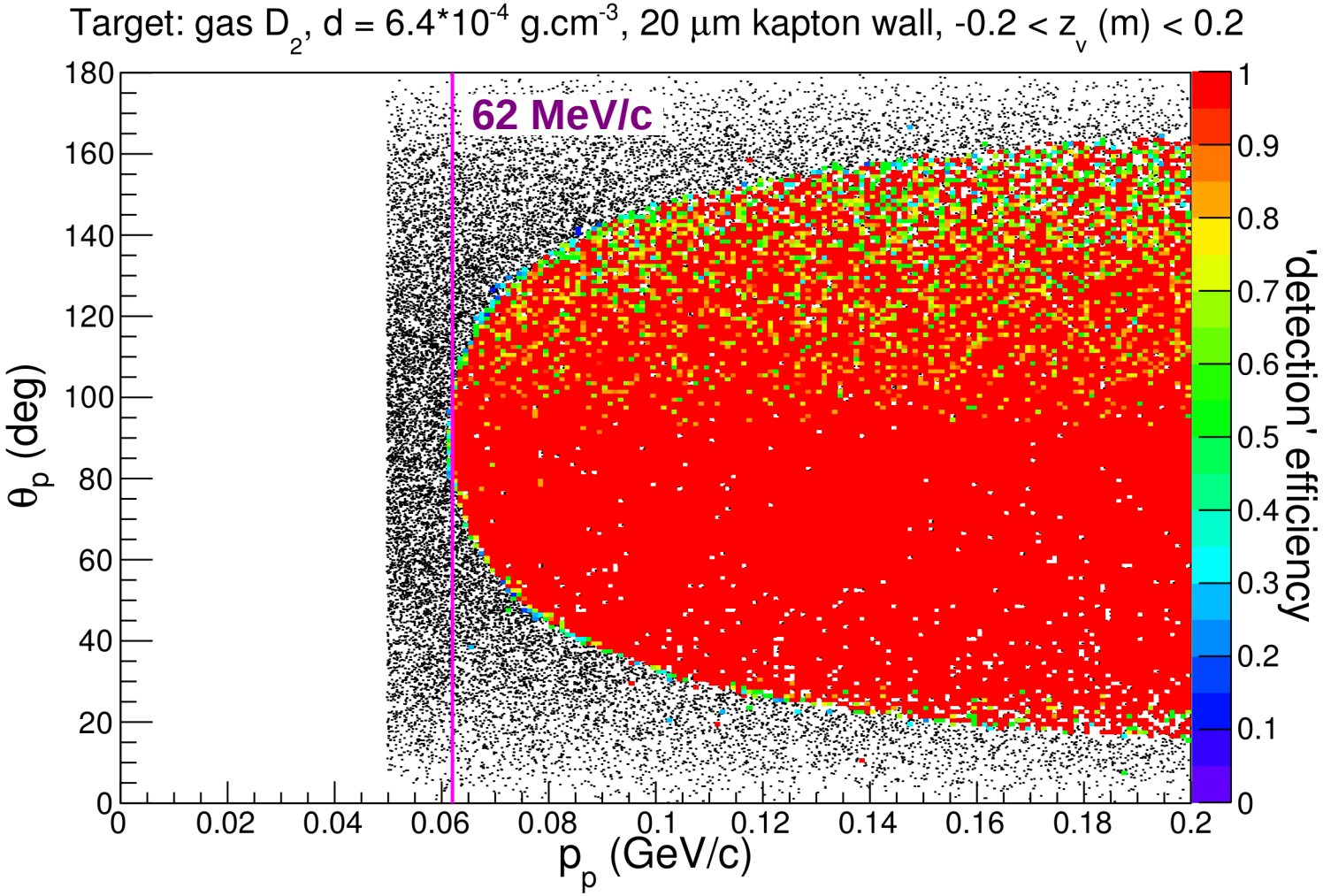
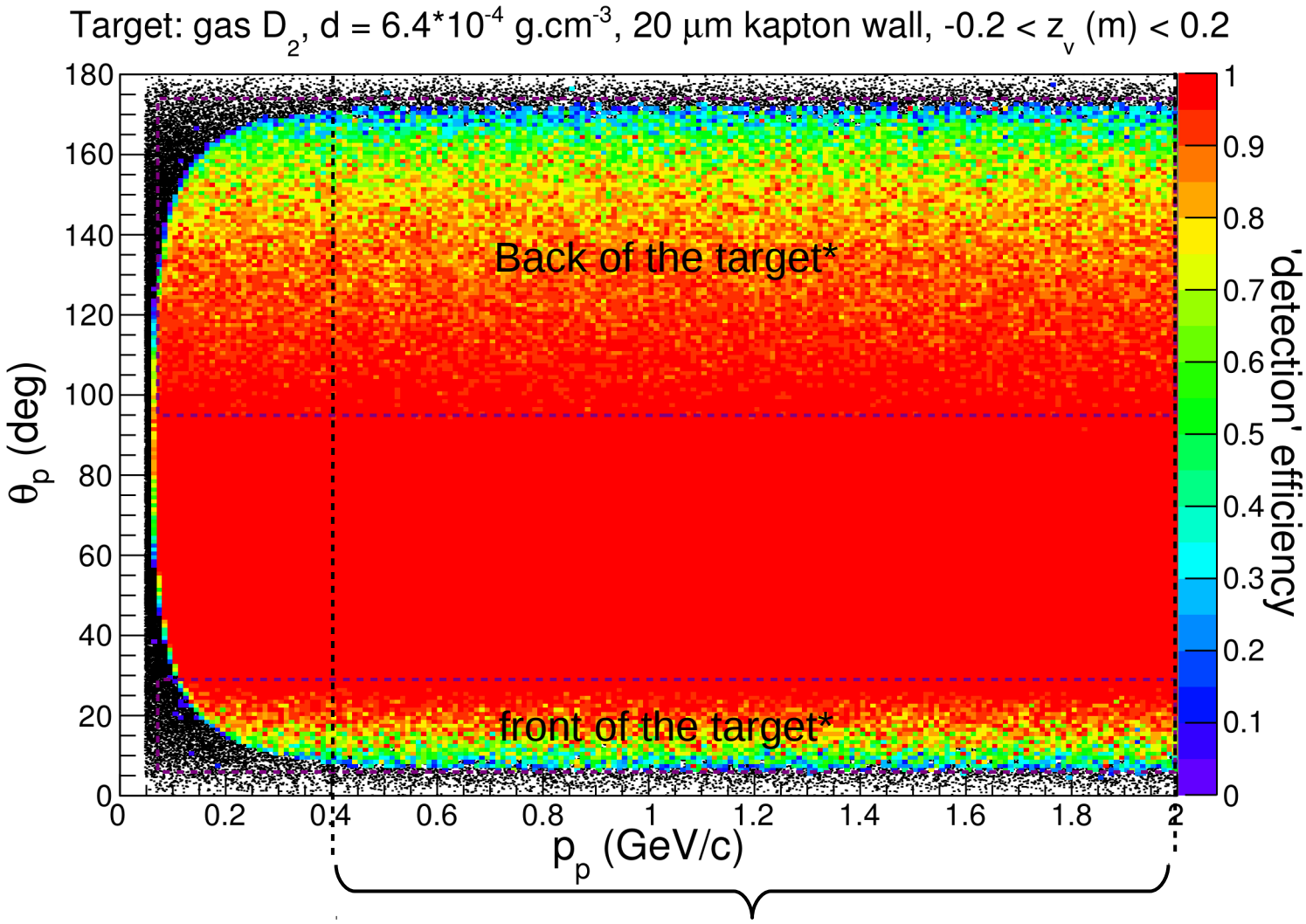
“Efficiency” : angle Vs momentum : Zoom at low momentum



Proton threshold: 62 MeV/c

(with 20 um kapton target wall and Target gas: D_2, 6.4 10^{-4} g.cm^{-3})

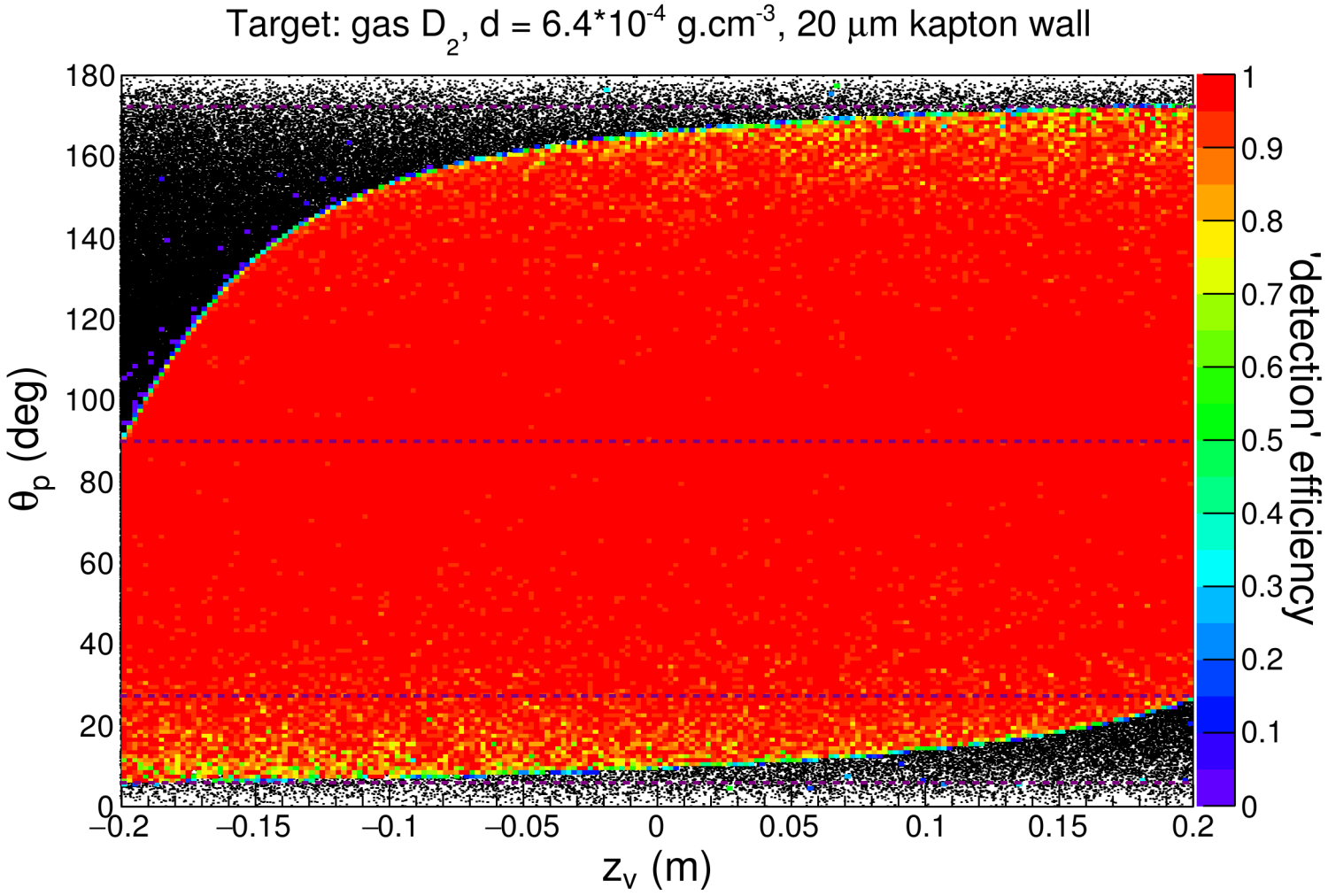
“Efficiency” : angle Vs momentum over a wider momentum range



~82 % efficiency

(*): see next slide

“Efficiency” : angle Vs vertex position



Backup : Luminosity and target density

$$\frac{dL}{dt} = \frac{I_{beam}}{e} \times L_{tgt} \times \frac{d_{tgt} \times N_A}{m_D}$$

Knowing:
dL/dt ~ 3.0 10^{36} cm^{-2} s^{-1};
L_{tgt} = 40 cm;
I_{beam} = 60 μA;
=> d_{tgt} ~ 6.4 g cm^{-3}.

Deuterium gas: 1.68 10^{-4} g cm^{-3} @ T_0 = 293 K, P_0 = 1 atm.
To bring it to 6.4 10^{-4} g cm^{-3}:

$$d_{tgt}(T, P) = d_{tgt}(T_0 = 293\,K, P_0 = 1\,atm) \times \frac{T_0}{T} \times \frac{P}{P_0}$$

T = 77 K, P = P_0 or
T = T_0, P = 3.8 atm (not as much to hold as e.g BONUS).