Diamond-like Carbon as resistive anode for the ILC TPC

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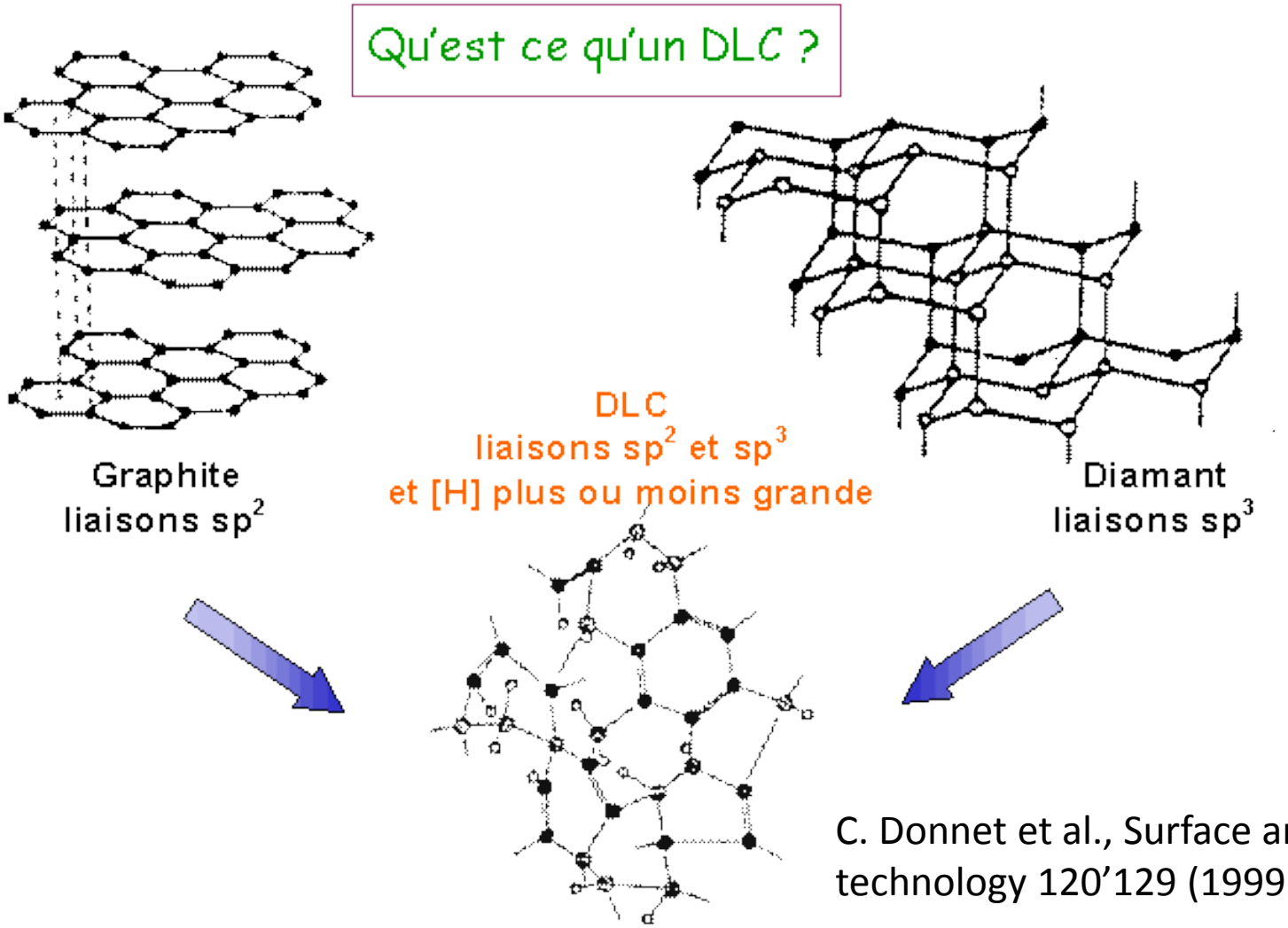
What is a DLC?



C. Donnet et al., Surface and coatings technology 120'129 (1999) 548

DLC properties and applications

- Robust, flexible, resistive with a large range of resistivity, precisely tunable, lubricant
- Available from Japan (by A. Ochi). 100 nm layer deposited on kapton
- Used to make lubricated mechanical parts

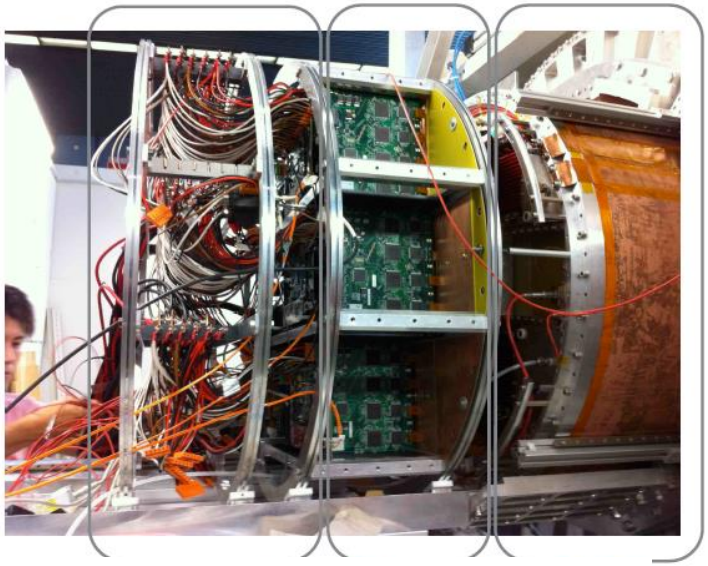
The new context of the ILD TPC

- Triggered by H(125) discovery in 2012
- Detailed site studies are going on in Japan
- The XFEL is being assembled at DESY (March 2015)
- This calls for realism in the design

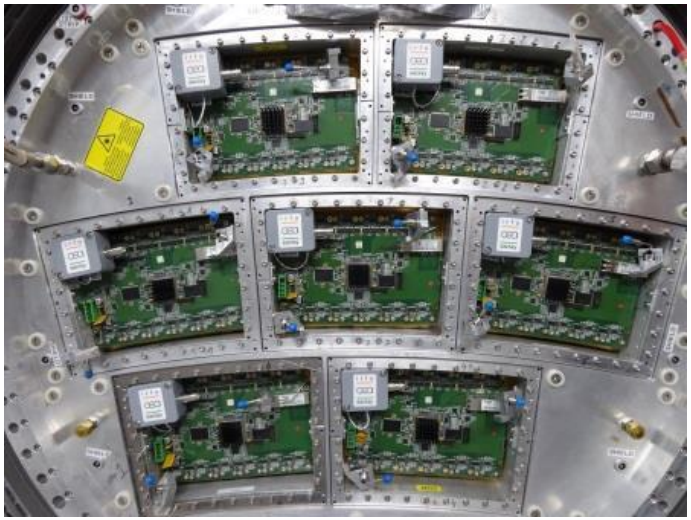
En route for one of the possible locations of the Interaction Region (Sept. 2014)

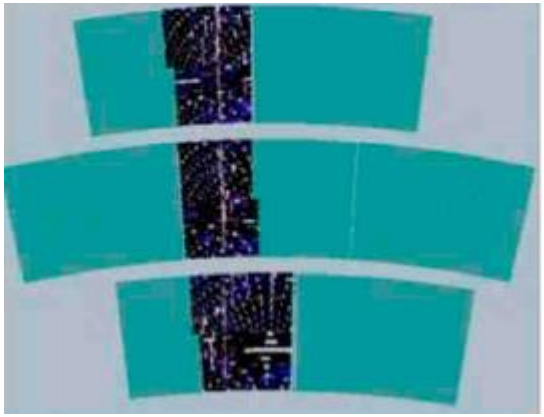
TPC Large Prototype at DESY

GEMs

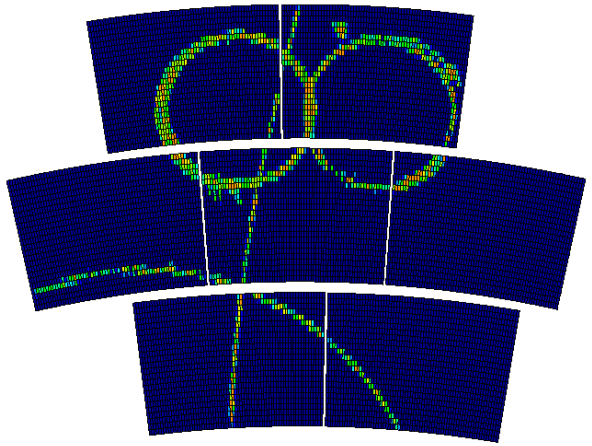


Micromegas



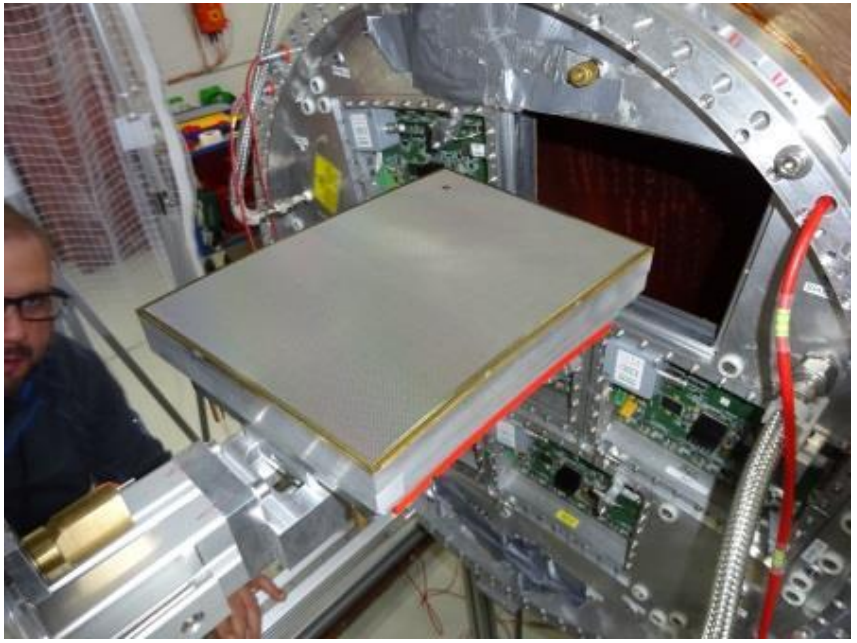


March 2015

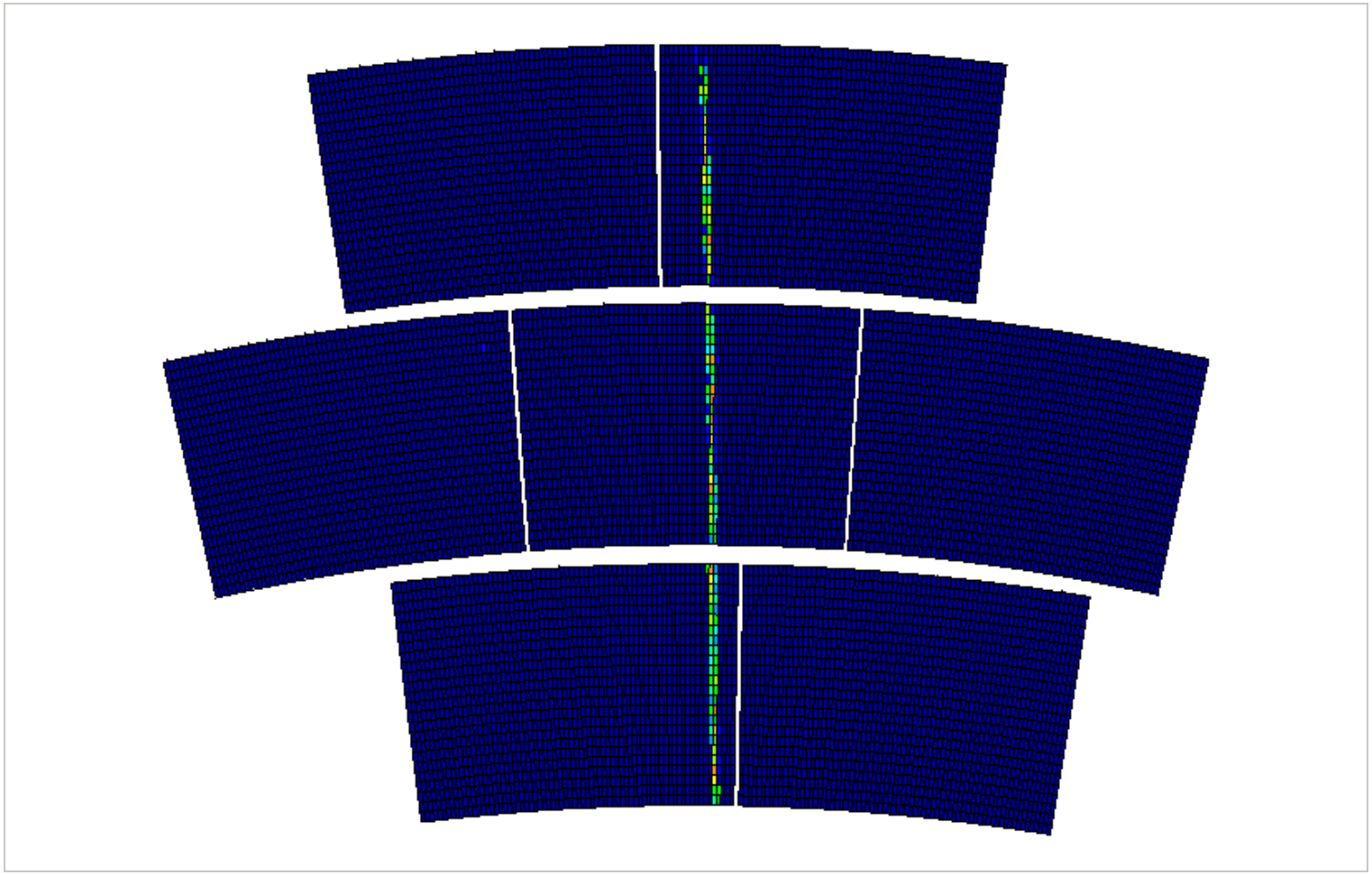


New Micromegas data taking in March 2015 at DESY

- 2 New modules with new (japanese) resistive anode: Diamond-like Carbon rather than Carbon-loaded kapton made at Rui's workshop

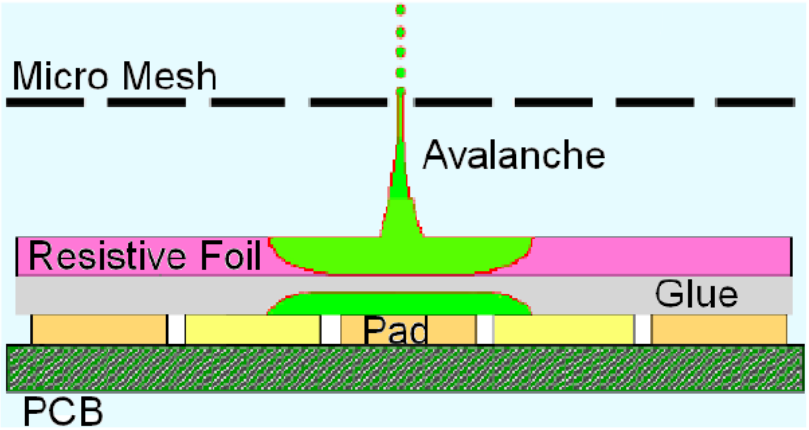


Events in the Large Prototype

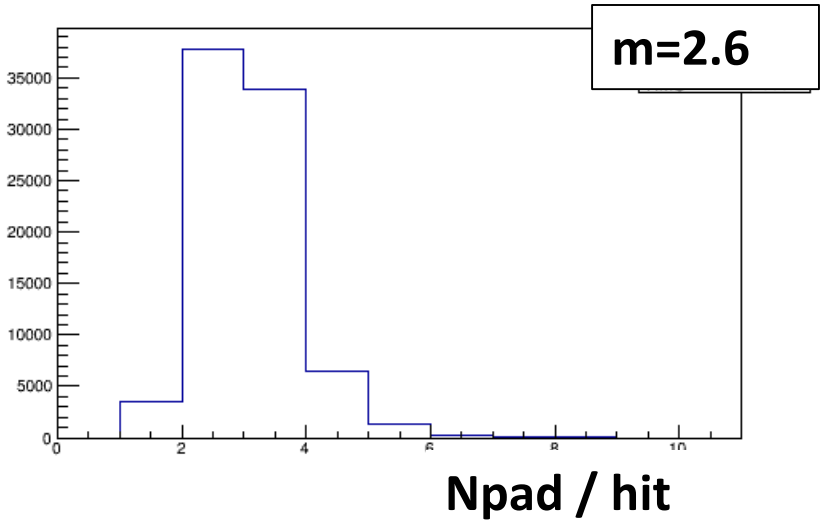


Pad multiplicity

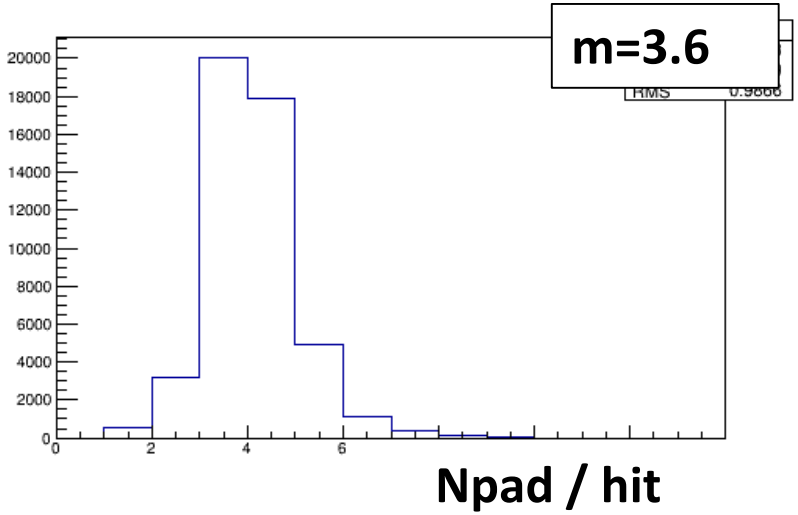
Need to spread the charge to improve resolution.
'Black diamond' spreads better the charge than Carbon-loaded kapton



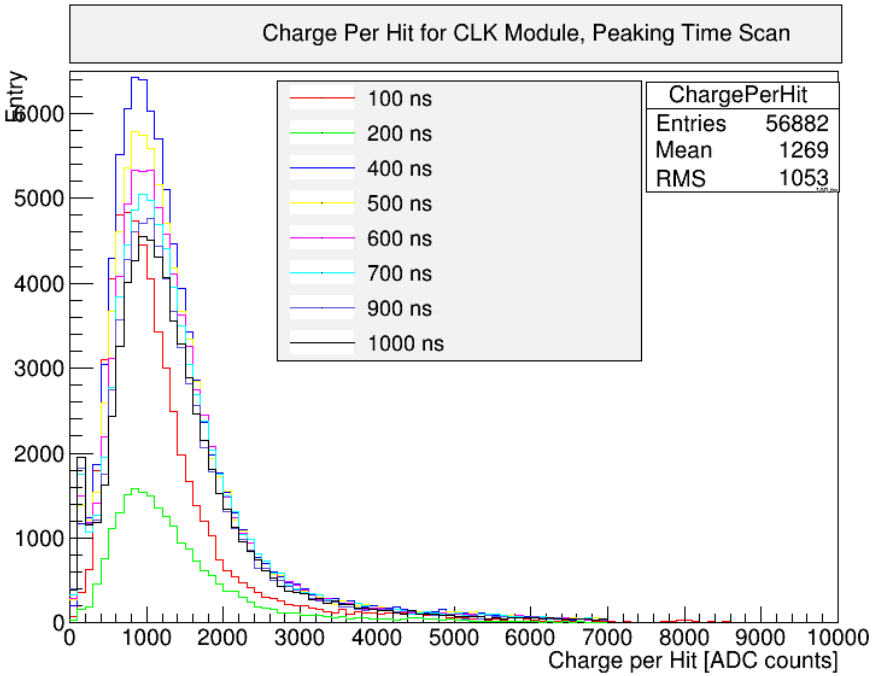
CLK

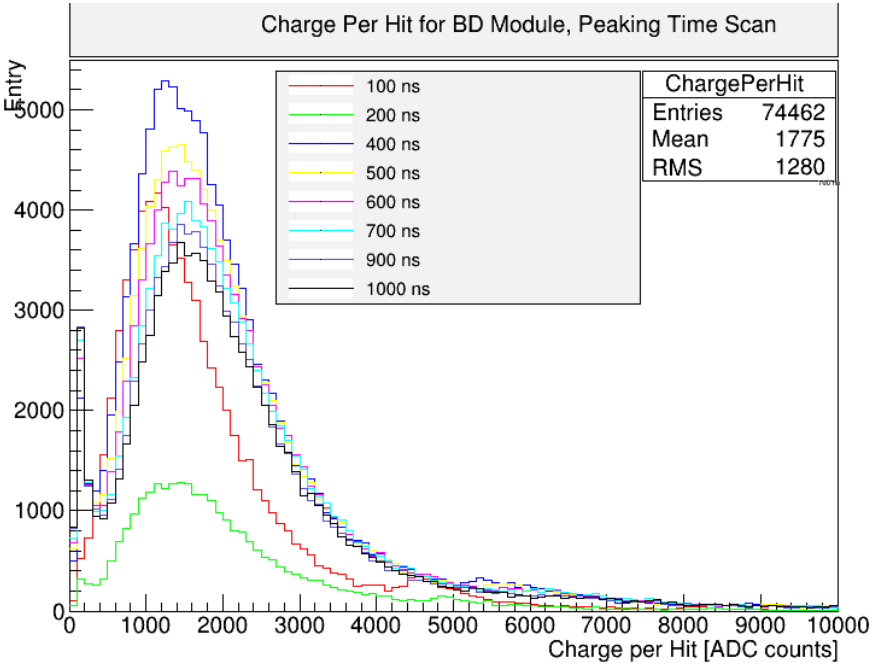


BD



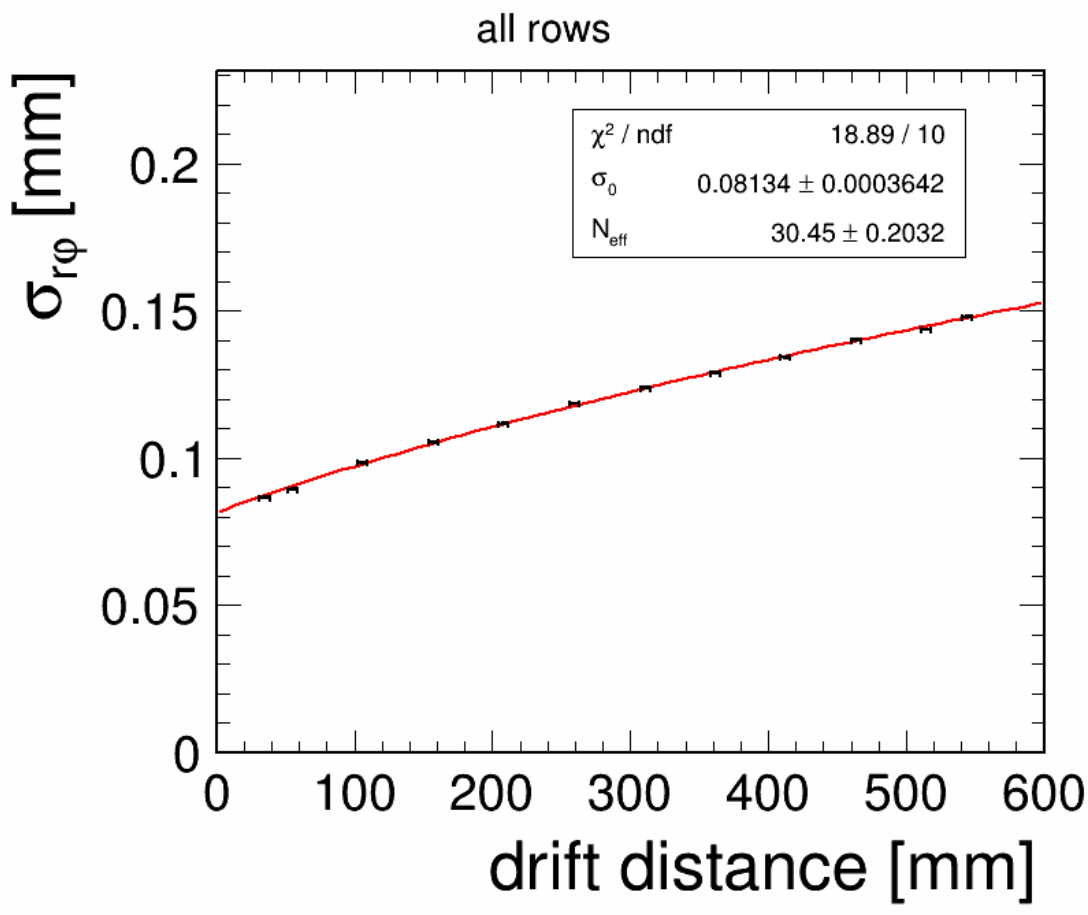
Black Diamond (DLC) modules give more charge than Carbon loaded Kapton (CLK)





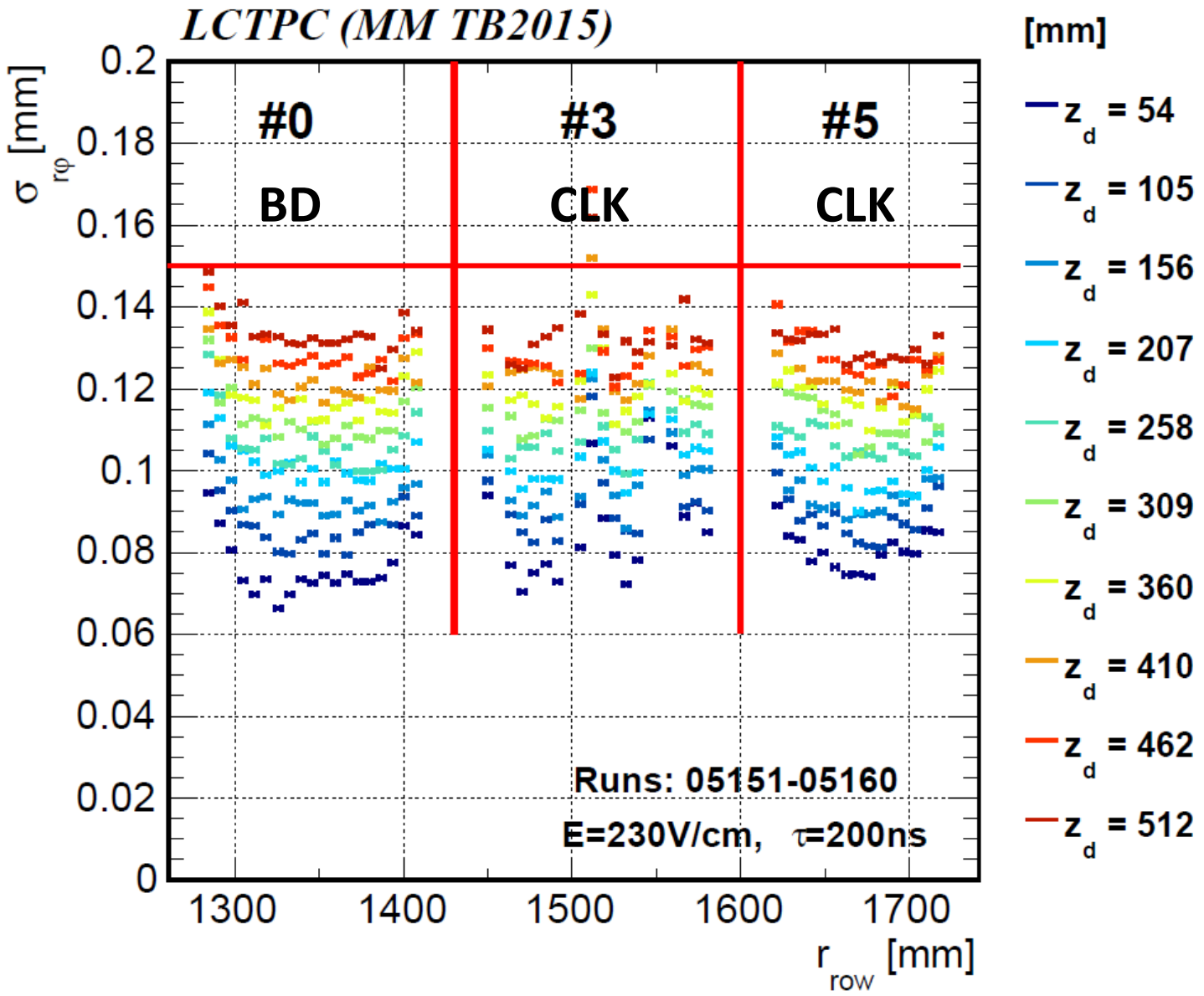
Transverse resolution

PRELIMINARY



Resolution 80 µm in rϕ at zero drift distance
Drift dependence follows expectation from diffusion

CLK and DLC give same resolution



Robustness

- Note that both modules underwent a short (one after 10 days, the second at the very end of the 2-week period)
- However apparently not connected to the layer (but a free wire of the mesh touching the ground; rather frequent in present design)

Conclusion

- In conclusion, a very nice material is now available to make resistive anodes
- It is robust and performant
- DLC will be tested further