

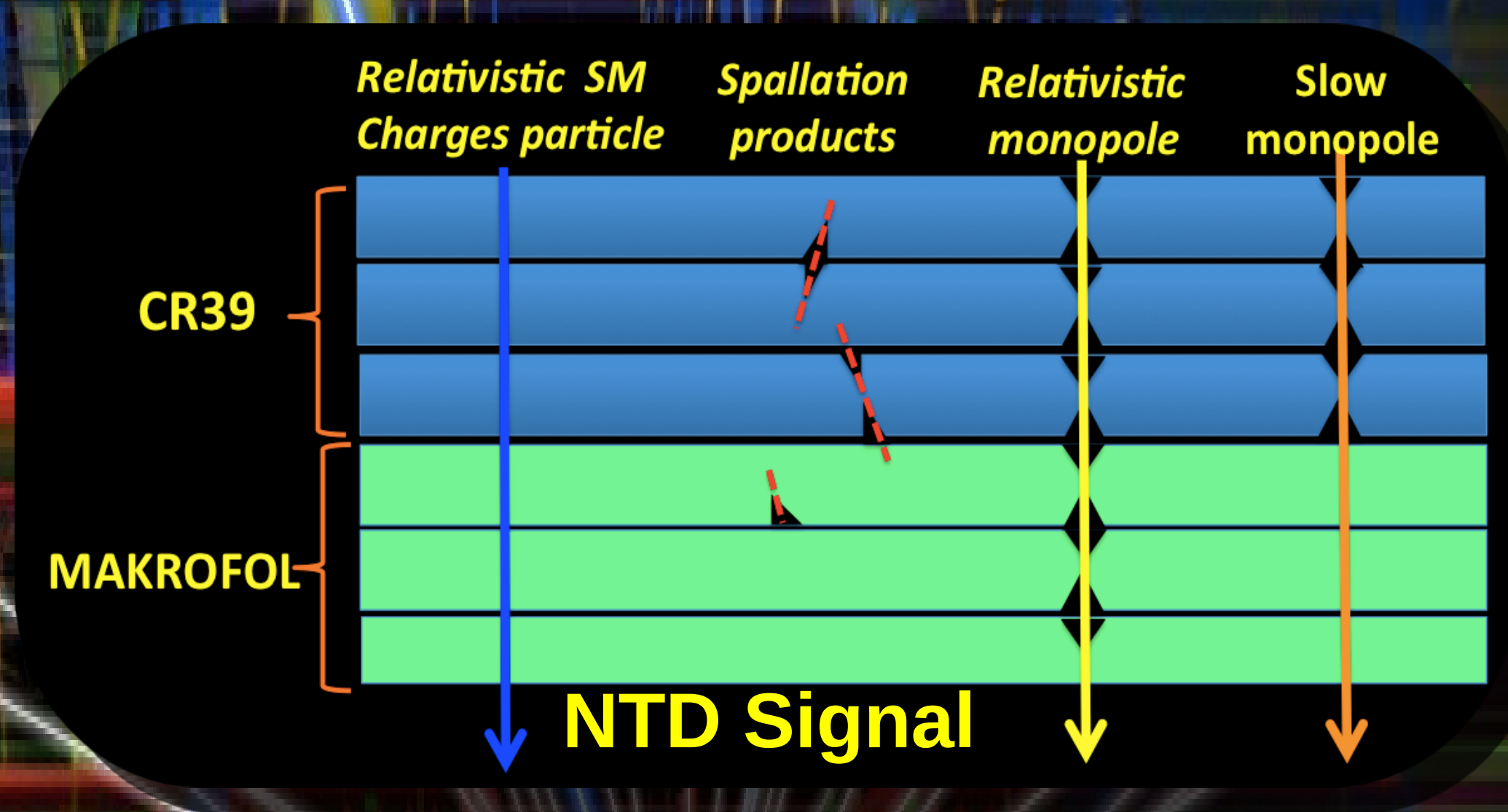
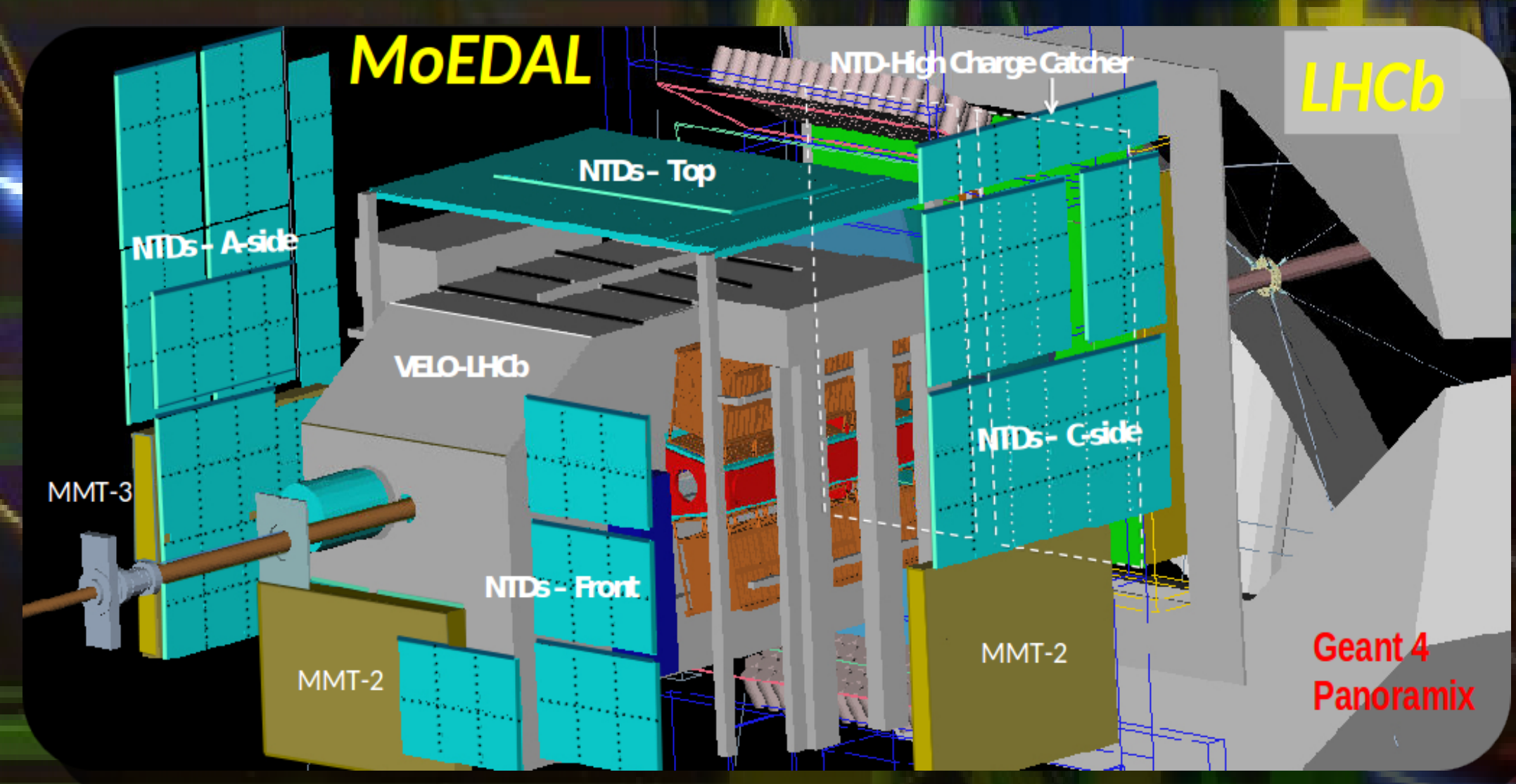
## The Magnificent Seventh!



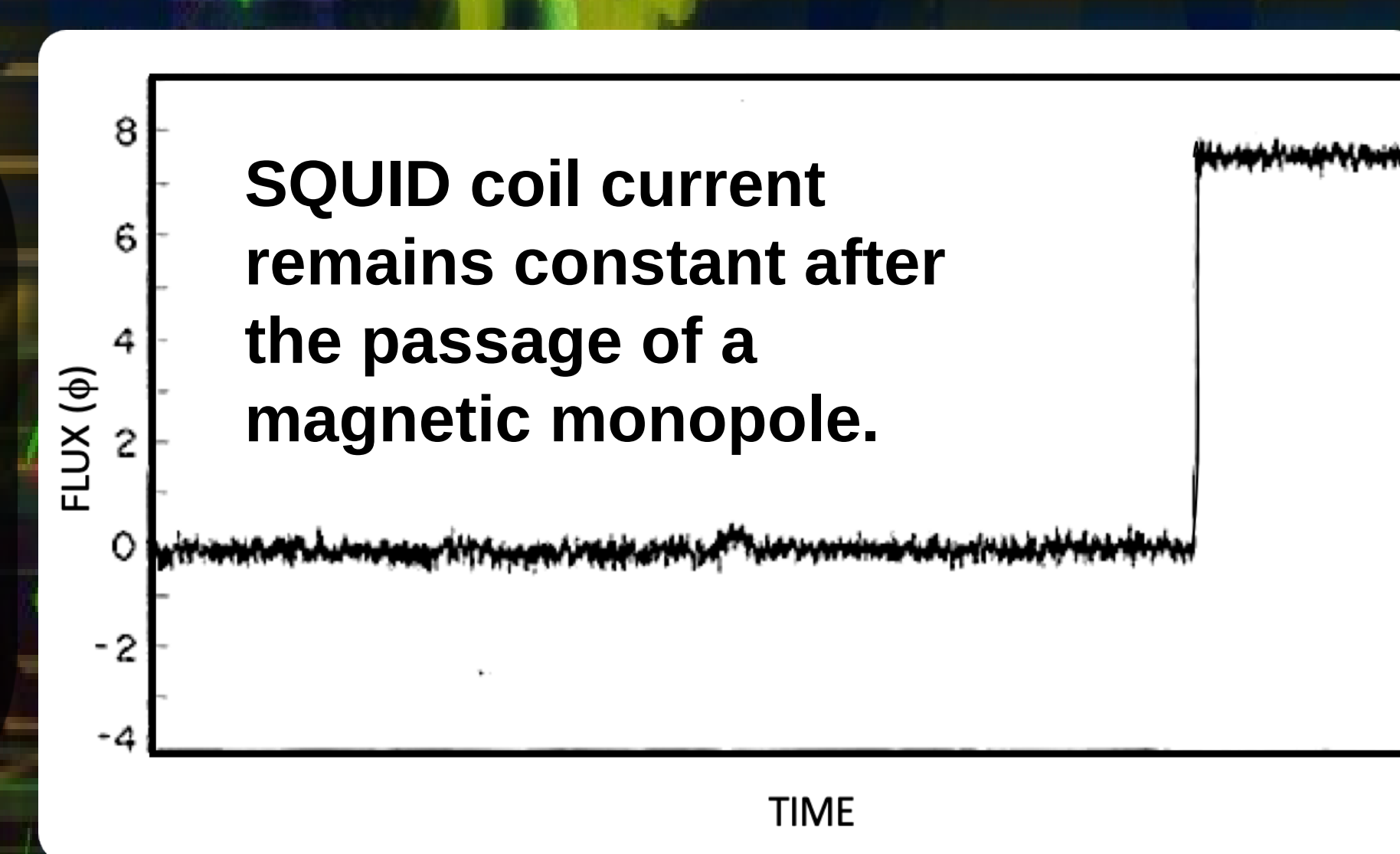
Over 70 scientists from 13 different countries!

MoEDAL (Monopole and Exotics Detector at the LHC) is the 7<sup>th</sup> experiment, specifically dedicated to investigating beyond the Standard Model scenarios by searching for highly ionizing particles, such as magnetic monopoles or massive pseudo-stable charged particles and multiply electrically charged particles as messengers of new physics. Sharing the same intersection point as the LHCb experiment, MoEDAL is complementary to the larger ATLAS and CMS experiments, expanding the discovery reach of the LHC. This largely passive detector is comprised of the following subdetectors: A large array of NTD (Nuclear Track Detector) stacks; a magnetic trapping detector (designed to trap both electrically and magnetically charged highly ionizing particles); and, a TimePix chip array is included as well, in order to monitor particle backgrounds. MAPP (MoEDAL Apparatus for Penetrating Particles), a new MoEDAL subdetector, is currently being prototyped. The aim of MAPP is to enable MoEDAL to search for mini-charged particles. The goal of this poster is to summarize the physics programme of MoEDAL, introduce the detection methods used, and present MoEDAL's latest results.

### Detector + Signal



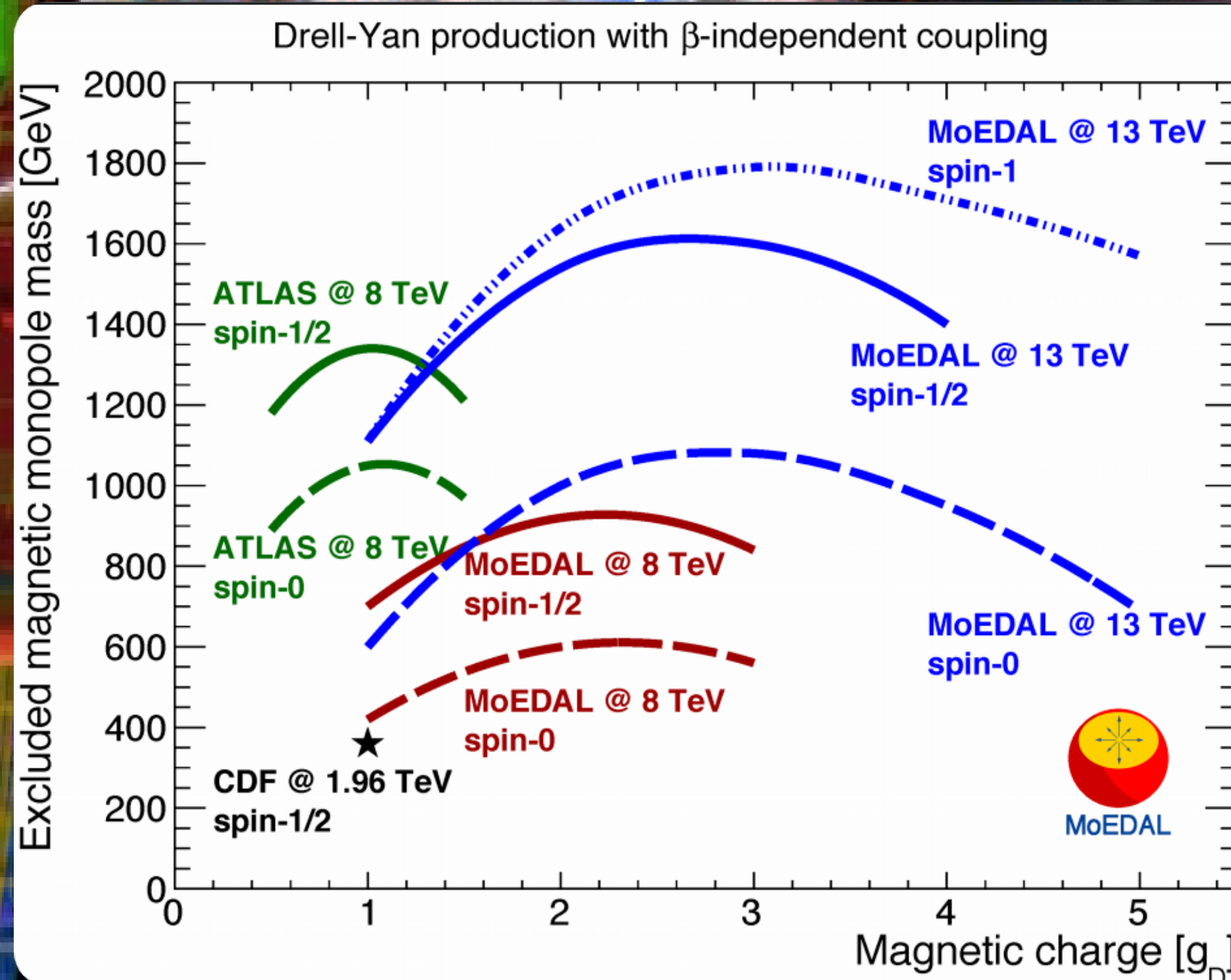
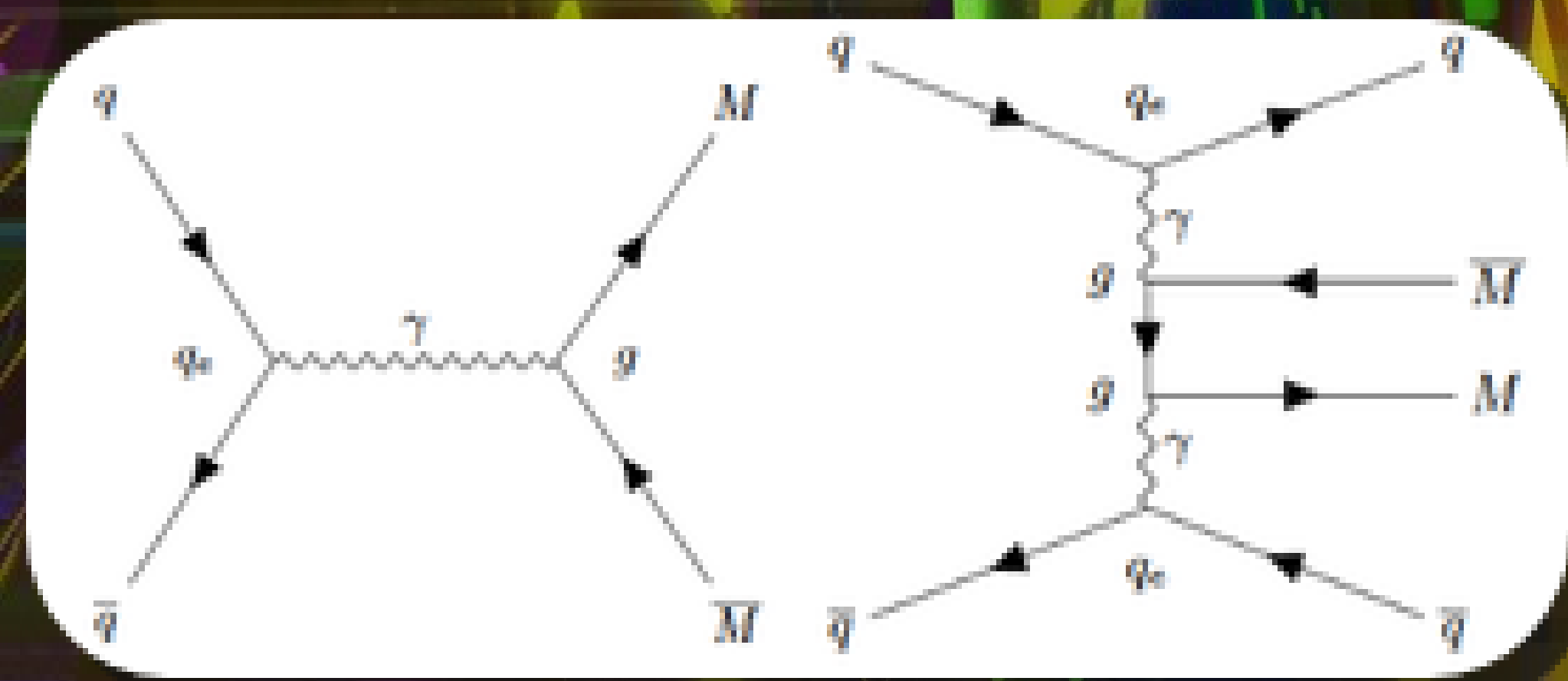
### MMT Signal



Monopole path through an NTD stack is unique and forms conical etch pits, revealed by etching NTD sheets in a caustic NaOH solution. The trapping detector can identify magnetic charge as well as trap new massive electrically charged particles.

### Results

MoEDAL has now improved its lead and placed the LHC's first limits on monopole production via  $\gamma\gamma$  fusion.

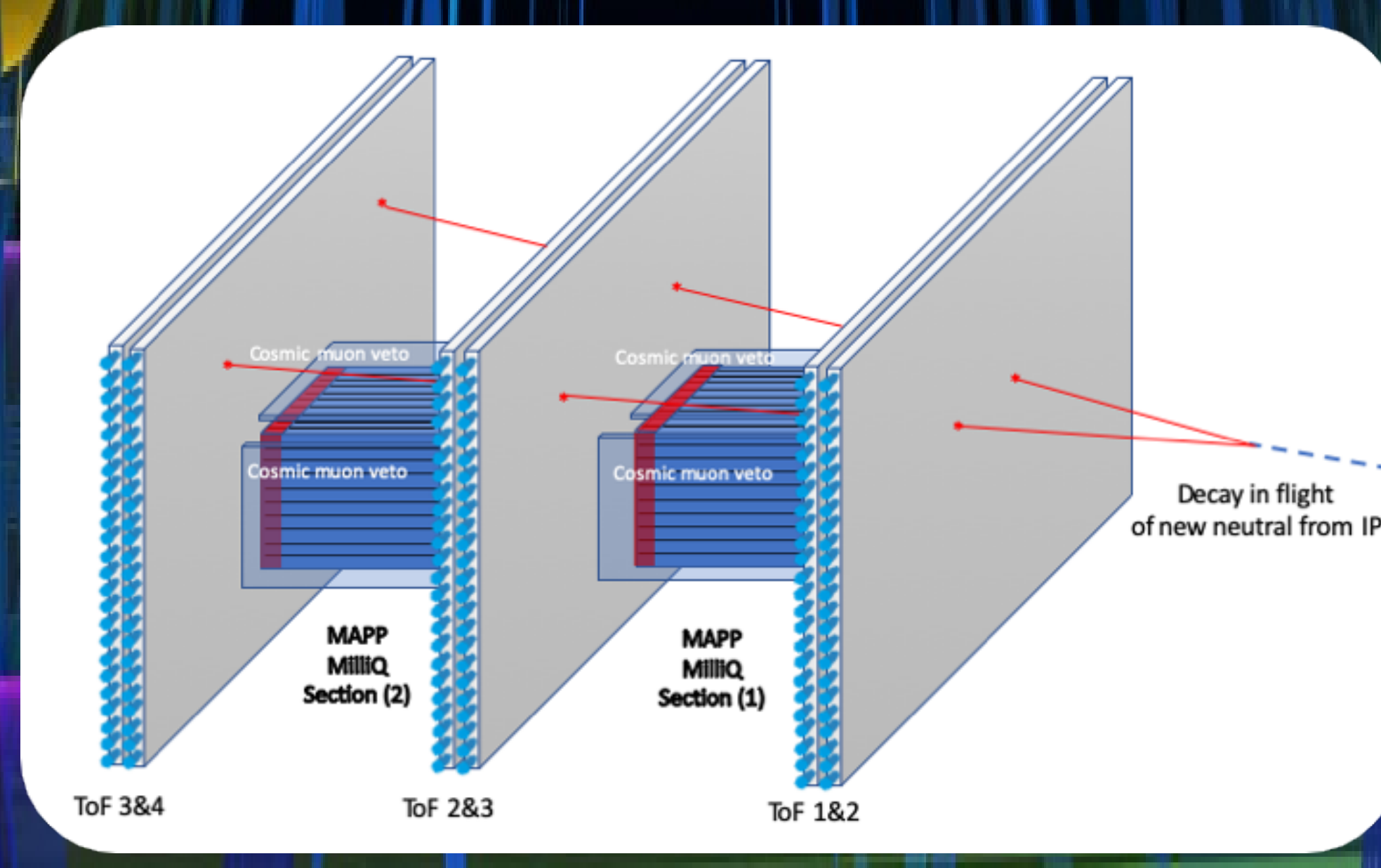
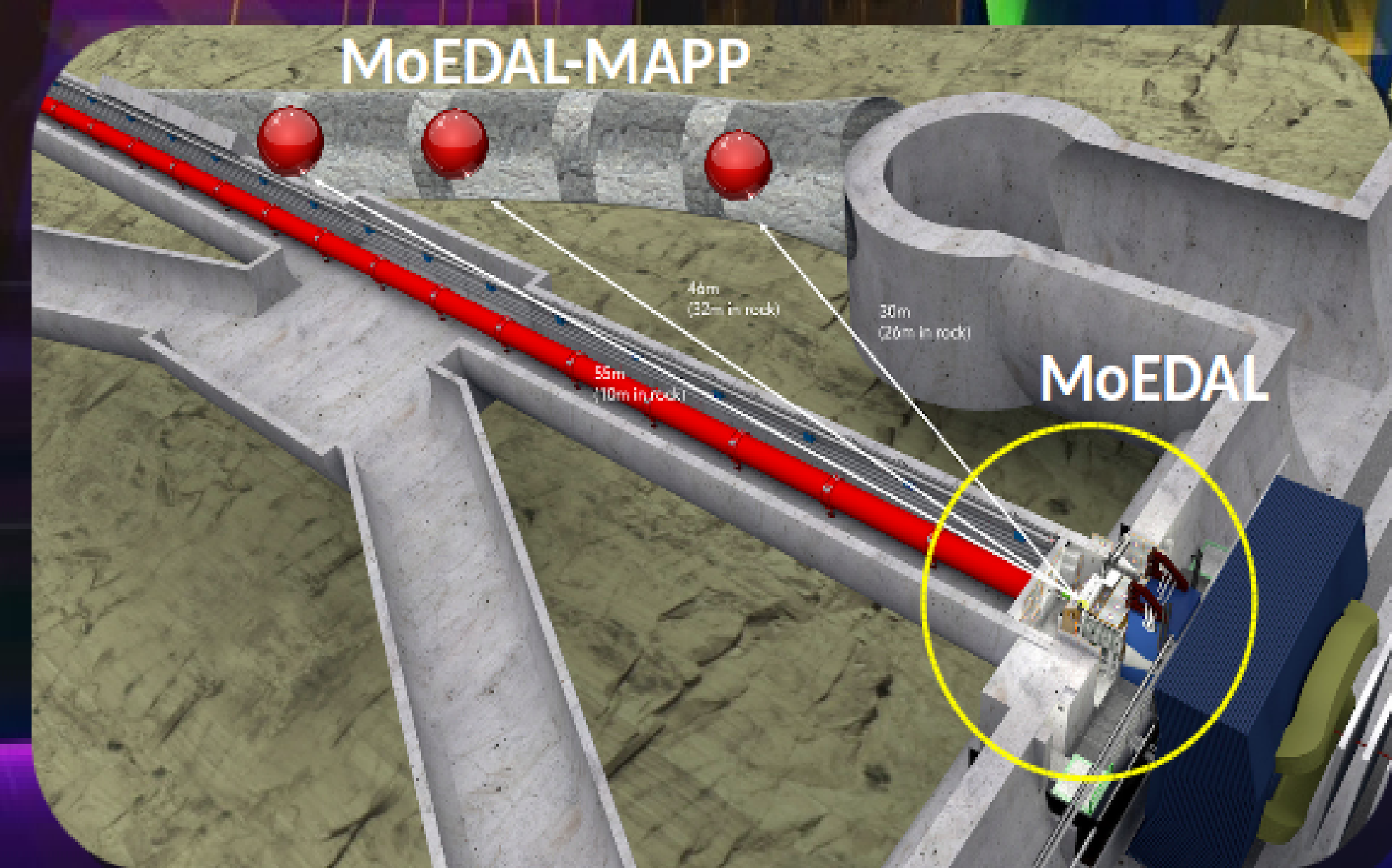


Process / coupling	Spin	Magnetic charge [ $g_D$ ]				
		1	2	3	4	5
95% CL mass limits [GeV]						
DY	0	790	1150	1210	1130	—
DY	1/2	1320	1730	1770	1640	—
DY	1	1400	1840	1950	1910	1800
DY $\beta$ -dep.	0	670	1010	1080	1040	900
DY $\beta$ -dep.	1/2	1050	1450	1530	1450	—
DY $\beta$ -dep.	1	1220	1680	1790	1780	1710
DY+ $\gamma\gamma$	0	2190	2930	3120	3090	—
DY+ $\gamma\gamma$	1/2	2420	3180	3360	3340	—
DY+ $\gamma\gamma$	1	2920	3620	3750	3740	—
DY+ $\gamma\gamma$ $\beta$ -dep.	0	1500	2300	2590	2640	—
DY+ $\gamma\gamma$ $\beta$ -dep.	1/2	1760	2610	2870	2940	2900
DY+ $\gamma\gamma$ $\beta$ -dep.	1	2120	3010	3270	3300	3270

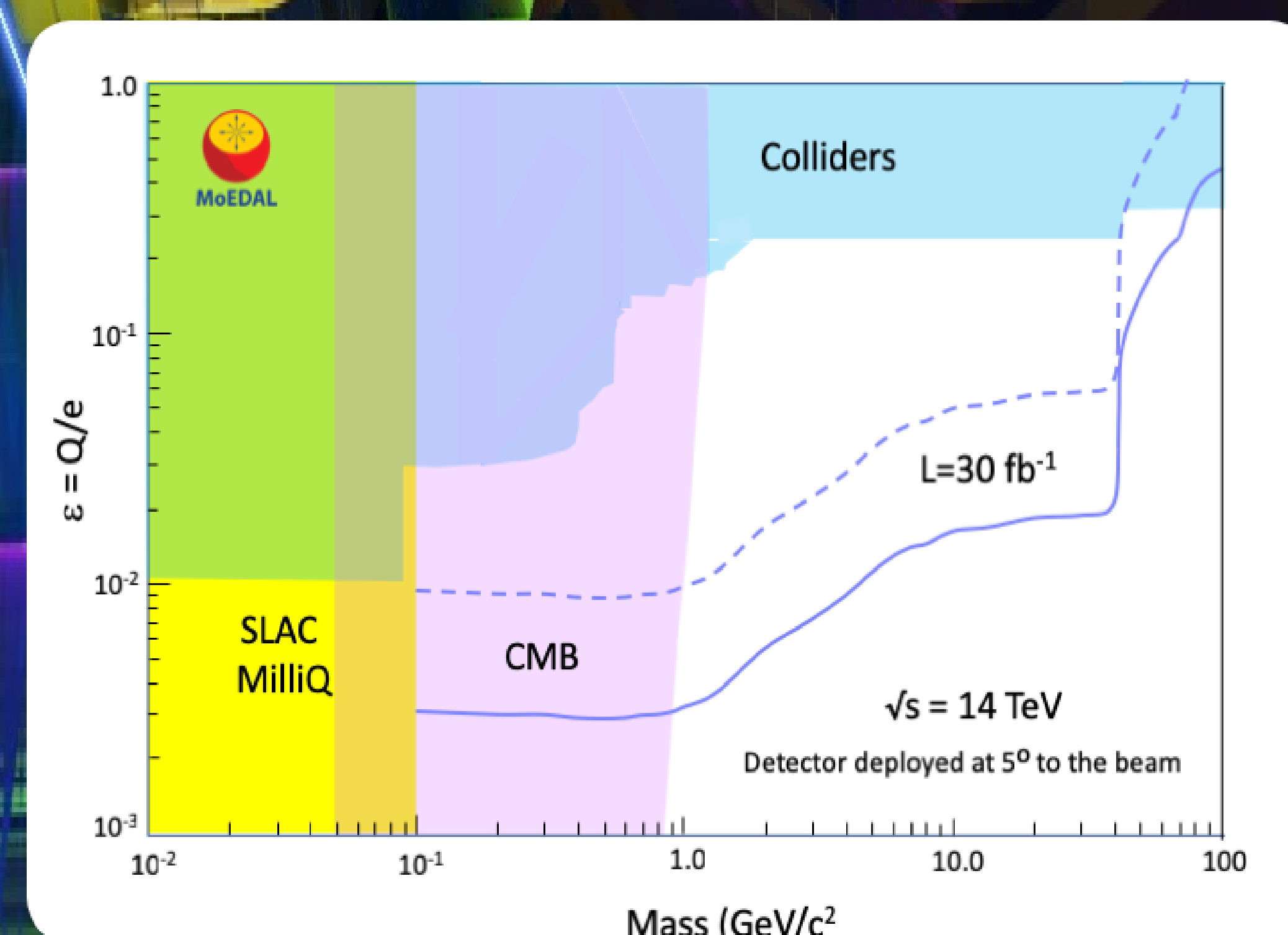
World's best limits on multiply charged monopole production!

### MAPP Upgrades

MoEDAL will deploy a new, scintillation based subdetector in LHC run 3 to search for mini-charged ( $<1e$ ) particles, and long-lived neutral particles.



3D Sketch of MAPP



MoEDAL's expected 95% C.L. on Drell-Yan produced millicharged particles, assuming 100% (solid line) 10% total detector efficiencies.

**References**  
 1 JHEP 1608 (2016) 067  
 2 Int.J.Mod.Phys. A29 (2014) 1430050  
 3 Phys. Lett. B782 (2018) 510-516  
 4 Phys. Rev. Lett. 118 (2017), 061801.  
 5 Magnetic monopole search with the full MoEDAL trapping detector in 13 TeV pp collisions interpreted in photon-fusion and Drell-Yan production. MoEDAL Collaboration (Submitted for Publication)