NTD Hits – Cut conditions and 'nintperstep' (G4)

Are there any NTD Stopped MMs ?

(longer version)

Daniel Felea

Bucharest Group

MoEDAL Software & Analysis Group Meeting

02nd of March 2018

INSTITUTE OF SPACE SCIENCE
A subsidiary of INFLPR

MoEDAL COLLABORATION

To Do List

2b.) and 2c.) → Top Priorities !

- **1.) Geometry (G4 Material Map) :**

1a.) NTD Run 1, NTD 2015 and HCC geometries ←→ Lexan introduced and order of sheets changed ✓

1b.) Variable VELO side material densities in the MoEDALMaterials Work in Progress

- **2.) Simulation and Analysis software :**

2a.) VeloGaussMoni to be used ? (Not sure yet, DEBUG needed…) Work in Progress

2b.) Working : different simulations + comparison → nintperstep >> 1 && ntdhit_n <= 6 Work in Progress

2c.) Working : efficiencies for the NTD stacks (exposed to the highest luminosities) + … Work in Progress

2d.) Dyon simulations (Philippe: high electric charges (>1e, up to ~500e) – understand effects of possible corrections to dE/dx (eg, charge screening))

2e.) Dyon simulations (Philippe: high magnetic charges (>6gD, up to ~10gD) – test if the simulation can handle very high dE/dx)

Issue solved - Many Thanks to Jim, Laura and Vincent !

MoEDALMaterials

Laura :

"Info for Makrofol and CR39

Makrofol : C16H14O3 , density : 1.21 g/cm3

CR39 : C12H18O7 density : 1.31 g/cm3"

Issue solved - Many Thanks to Jim, Laura and Vincent !

MoEDALMaterials

Laura : "The stack composition is :

(from upstream to downstream wrt particles coming from the interaction region)

Lexan, CR39, CR39, CR39, Lexan, Makrofol, Makrofol, Makrofol, Lexan

- Lexan and Makrofol are both polycarbonate, simply of a different brand :

GE and Bayer, respectively.

- They are the same material as far as your simulation is concerned

(they may differ only on thickness)"

Short Recap : NTD Hits – Short Preliminary Analysis

Are there any NTD Stopped MMs ?

and now… some preliminary statistics with respect to NTD hits :

Investigated NTD :

N_ev. (0 Hits) = 73,608 ; N_ev. (1 Hit) = 19 ; N_ev. (2 Hits) = 34 ; …

… N_ev. (5 Hits) = 49 ; N_ev. (6 Hits) = 19,009 ; N_ev. (7 Hits) = 877 ; …

… N_ev. (11 Hits) = 484 ; N_ev. (12 Hits) = 1,927 ; N_ev. (13 Hits) = 388 ; …

… N_ev. (17 Hits) = 153 ; N_ev. (18 Hits) = 109 ; N_ev. (19 Hits) = 87 ; …

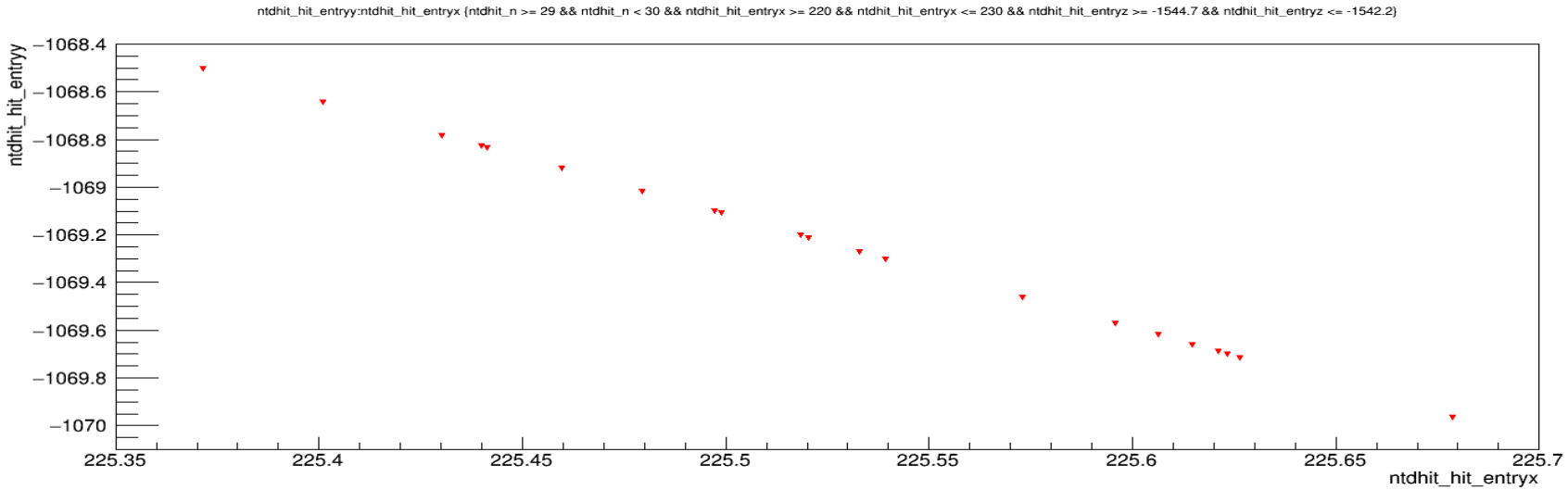
… *N_ev. (29 Hits) = 1* ; N_ev. (30 Hits) = 2 ; N_ev. (34 Hits) = 2 ; …

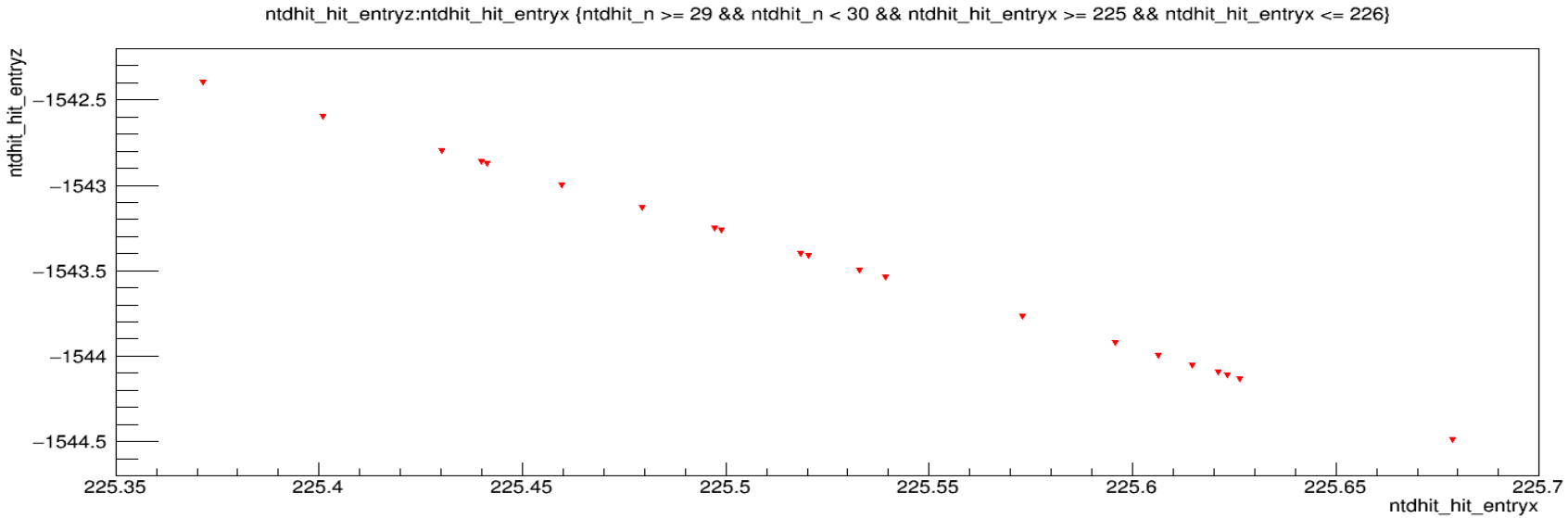
N_Total_Hits = 195,686

N_Events_without_Hits = 73,608

NTD Hits – Cut conditions and 'nintperstep' (G4)

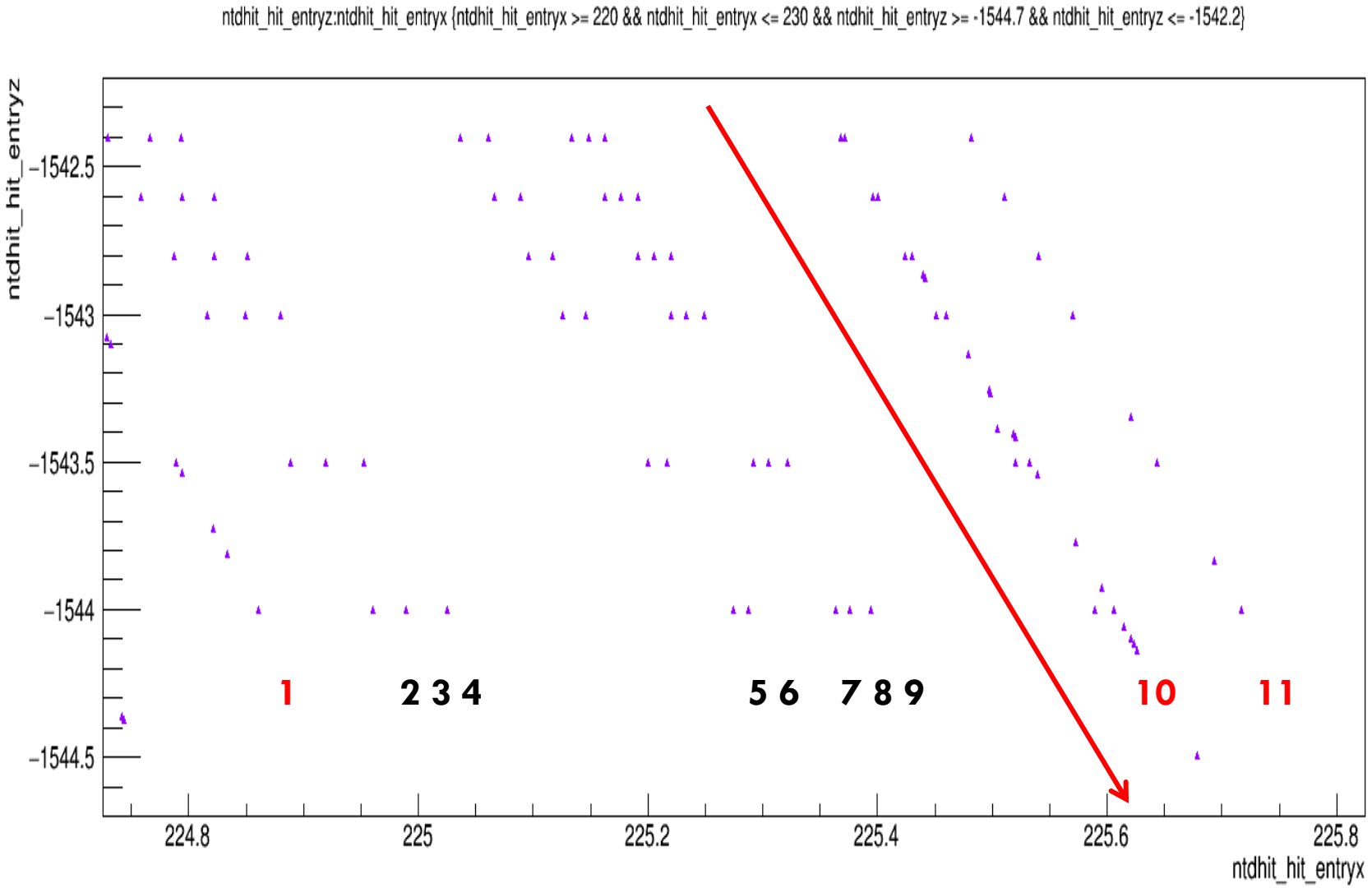
Y & Z vs X – Cuts: NTDHIT_N = 29 → 21 NTDHits_in_rows





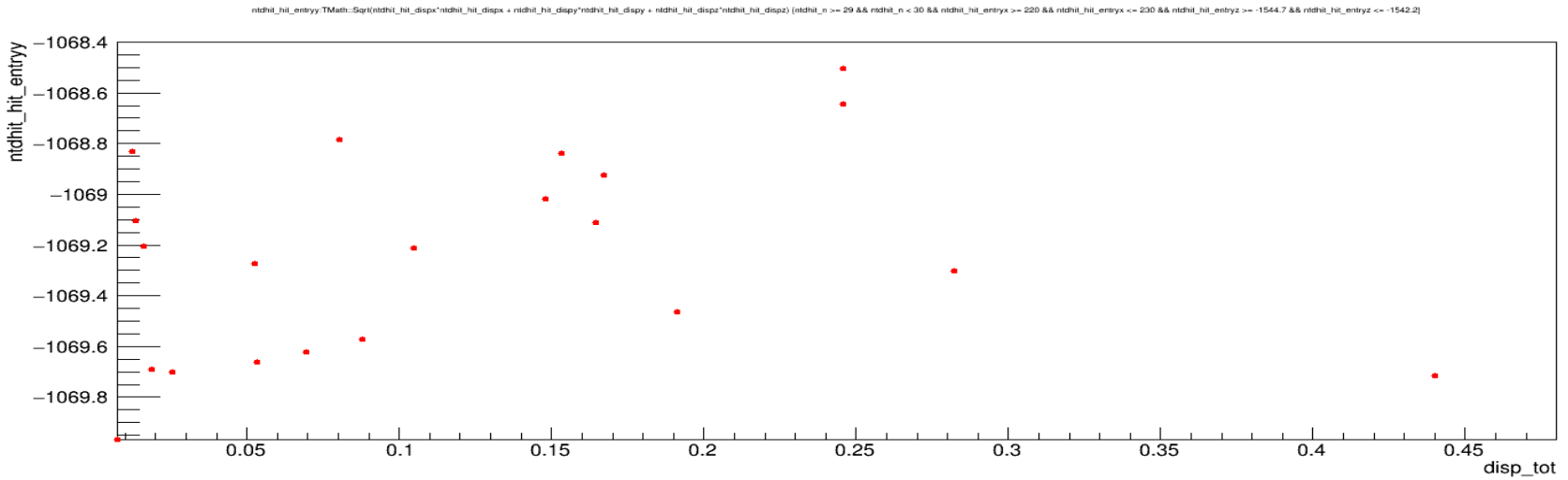
NTD Hits – Cut conditions and 'nintperstep' (G4)

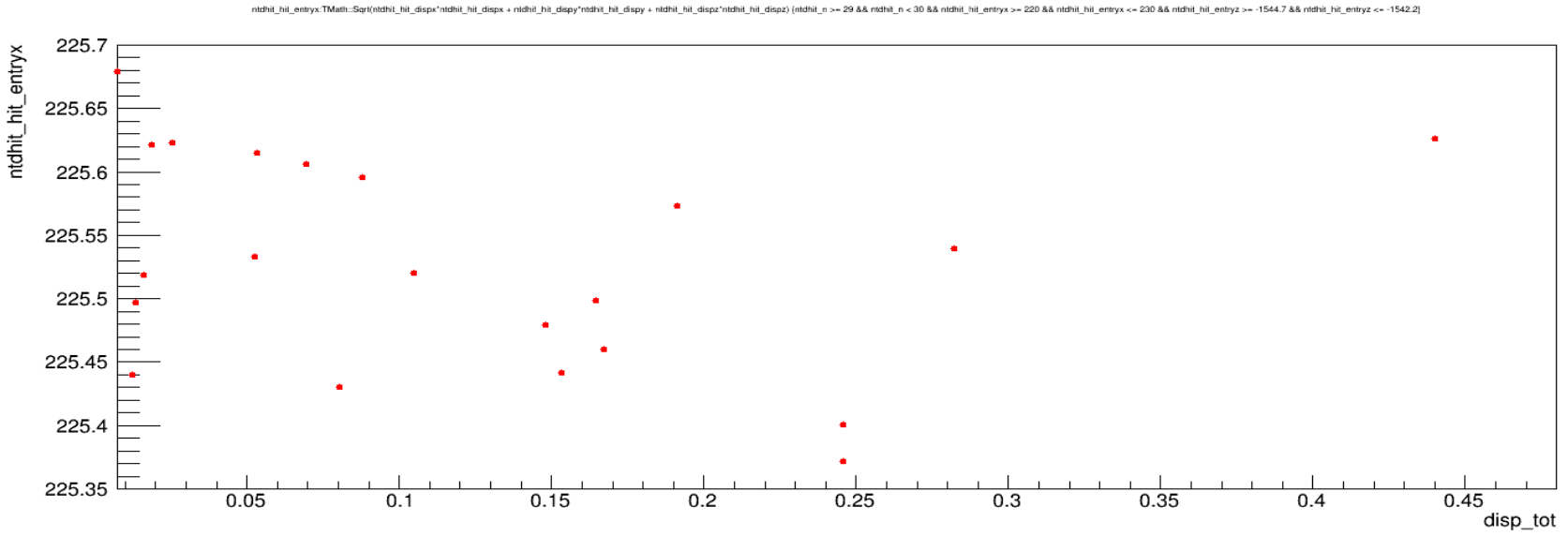
Z vs X – NO Cuts in NTDHIT_N → LOTS of NTDHits in rows



NTD Hits – Cut conditions and 'nintperstep' (G4)

Y & X vs Disp – Cuts: NTDHIT_N = 29 → 21 NTDHits_in_rows



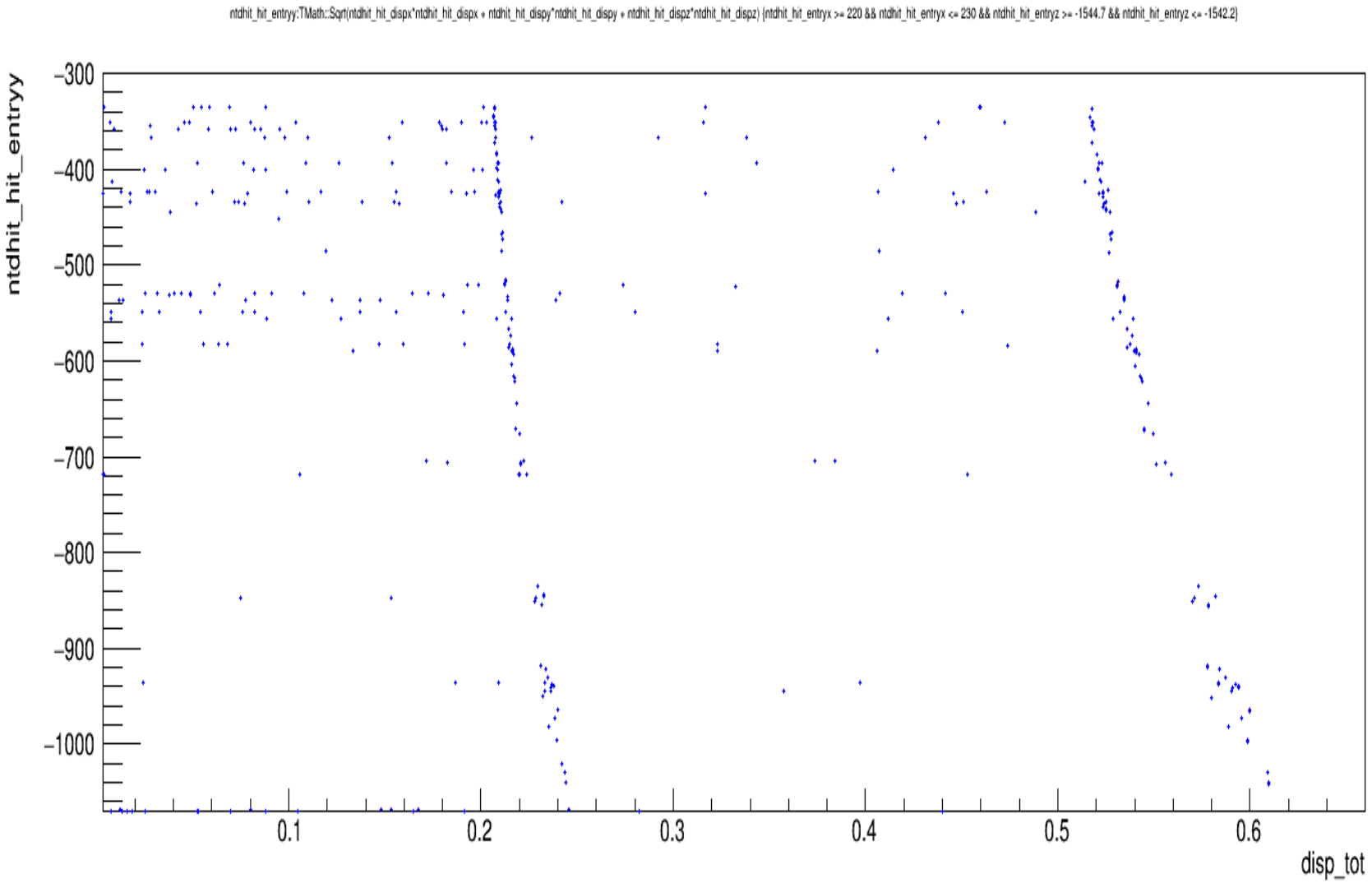


NTD Hits – Cut conditions and 'nintperstep' (G4)

MoEDAL

INSTITUTE OF SPACE SCIENCE
A subsidiary of INFLPR

Y vs Disp – NO Cuts in NTDHIT_N → LOTS of NTDHits in rows

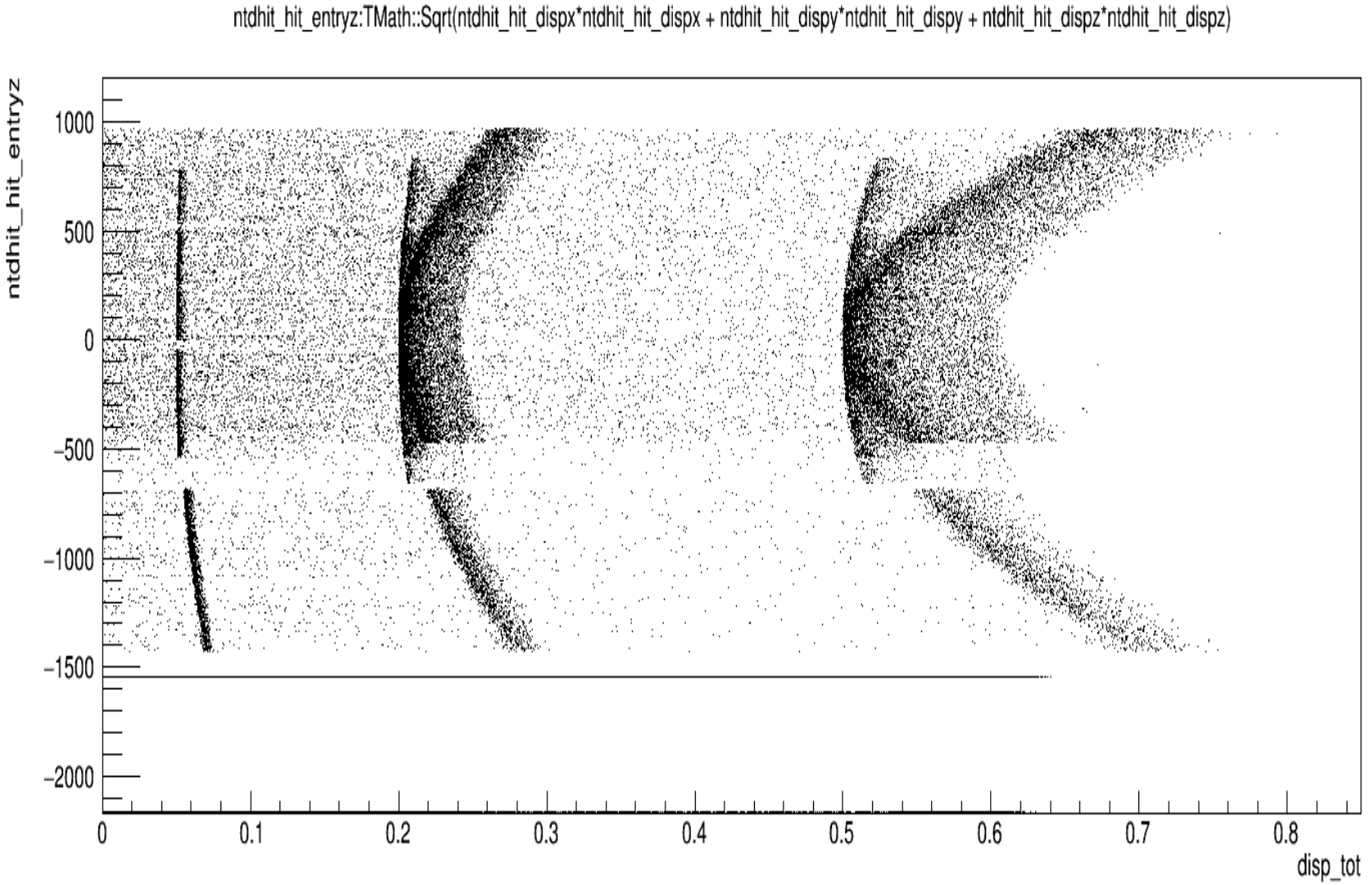


NTD Hits – Cut conditions and 'nintperstep' (G4)

MoEDAL

INSTITUTE OF SPACE SCIENCE
A subsidiary of INFLPR

Z vs Disp – NO Cuts in NTDHIT_N → ALL of NTDHits in rows

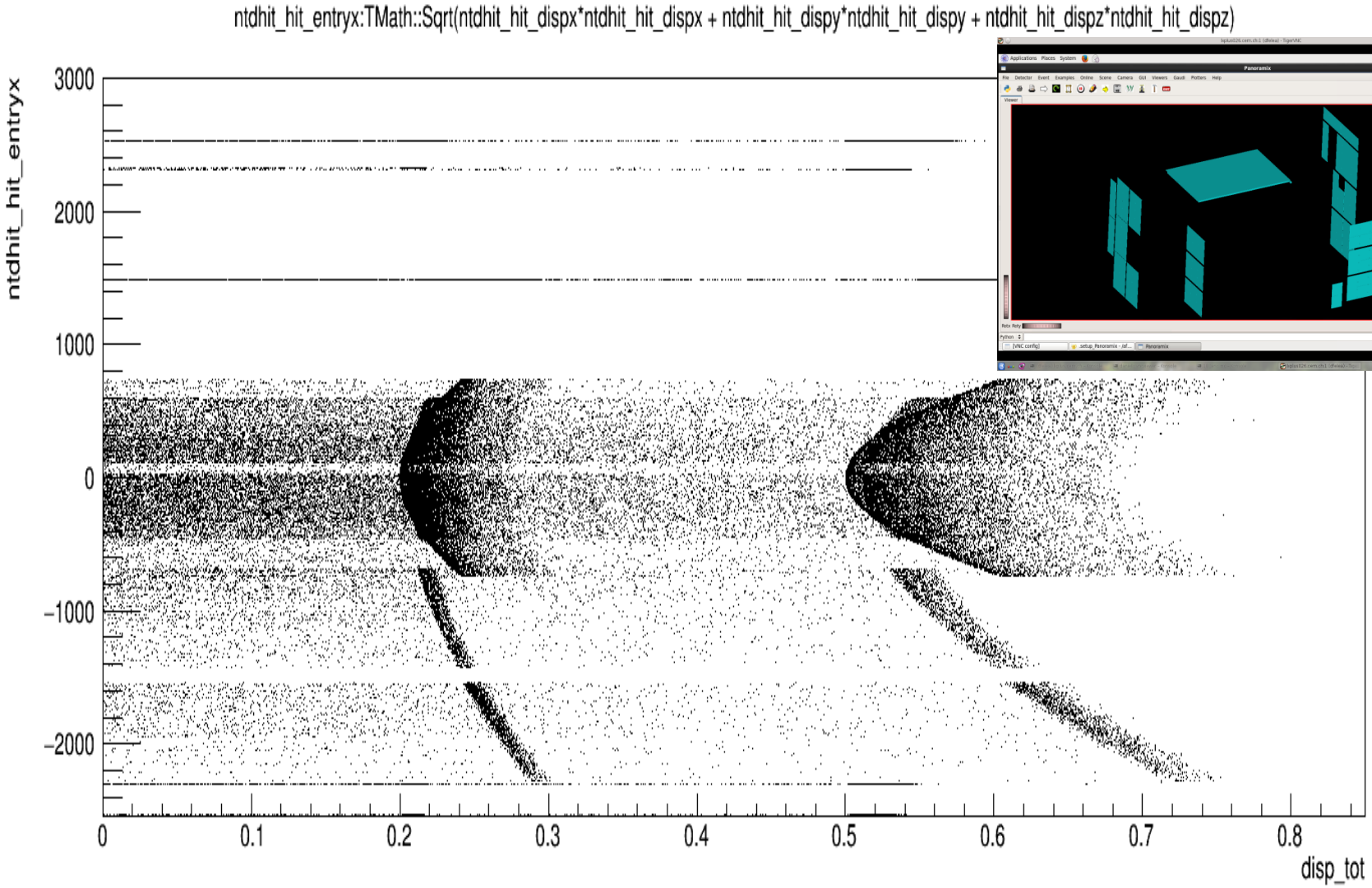


NTD Hits – Cut conditions and 'nintperstep' (G4)

MoEDAL

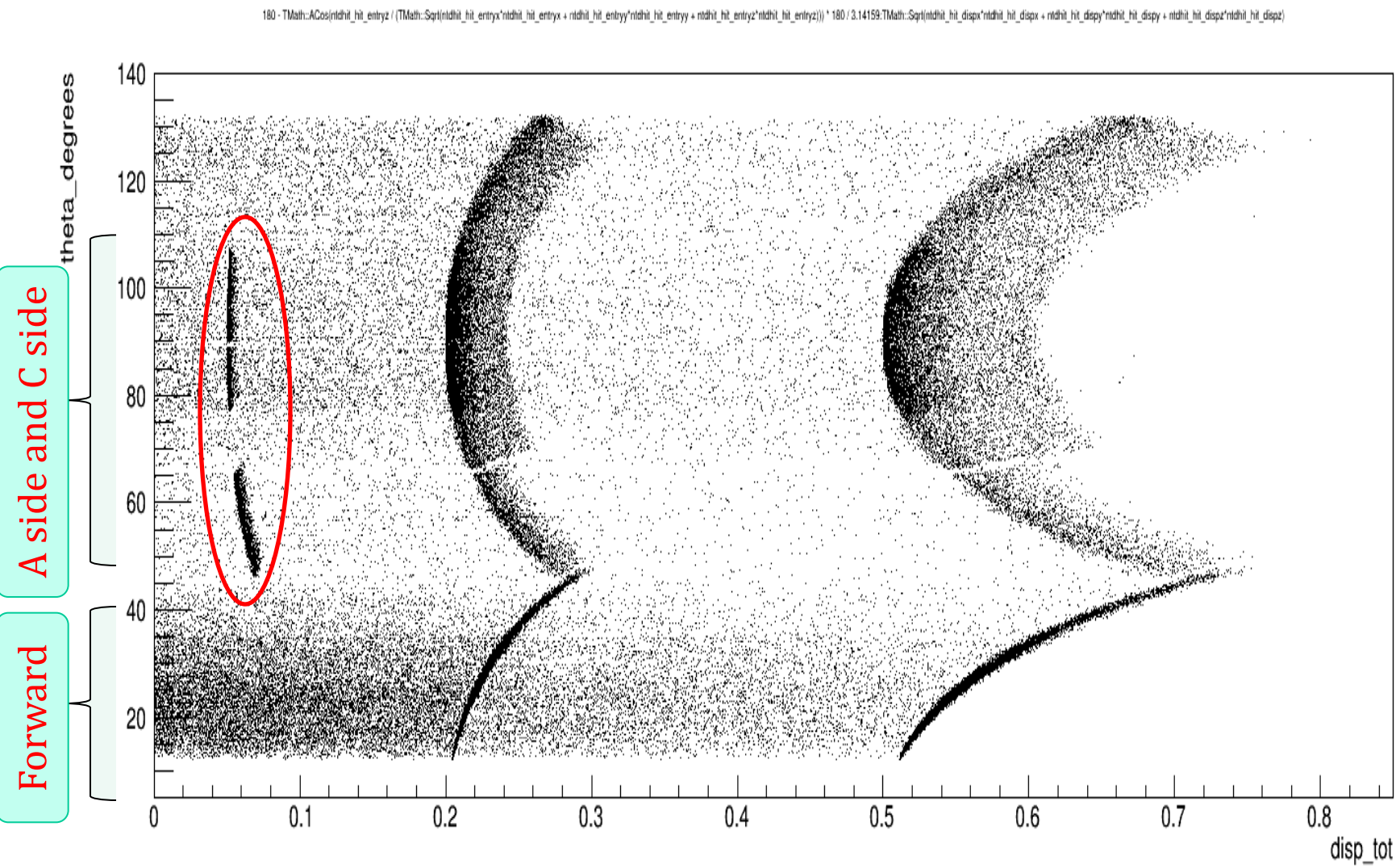
INSTITUTE OF SPACE SCIENCE
A subsidiary of INFLPR

X vs Disp – NO Cuts in NTDHIT_N → ALL of NTDHits in rows



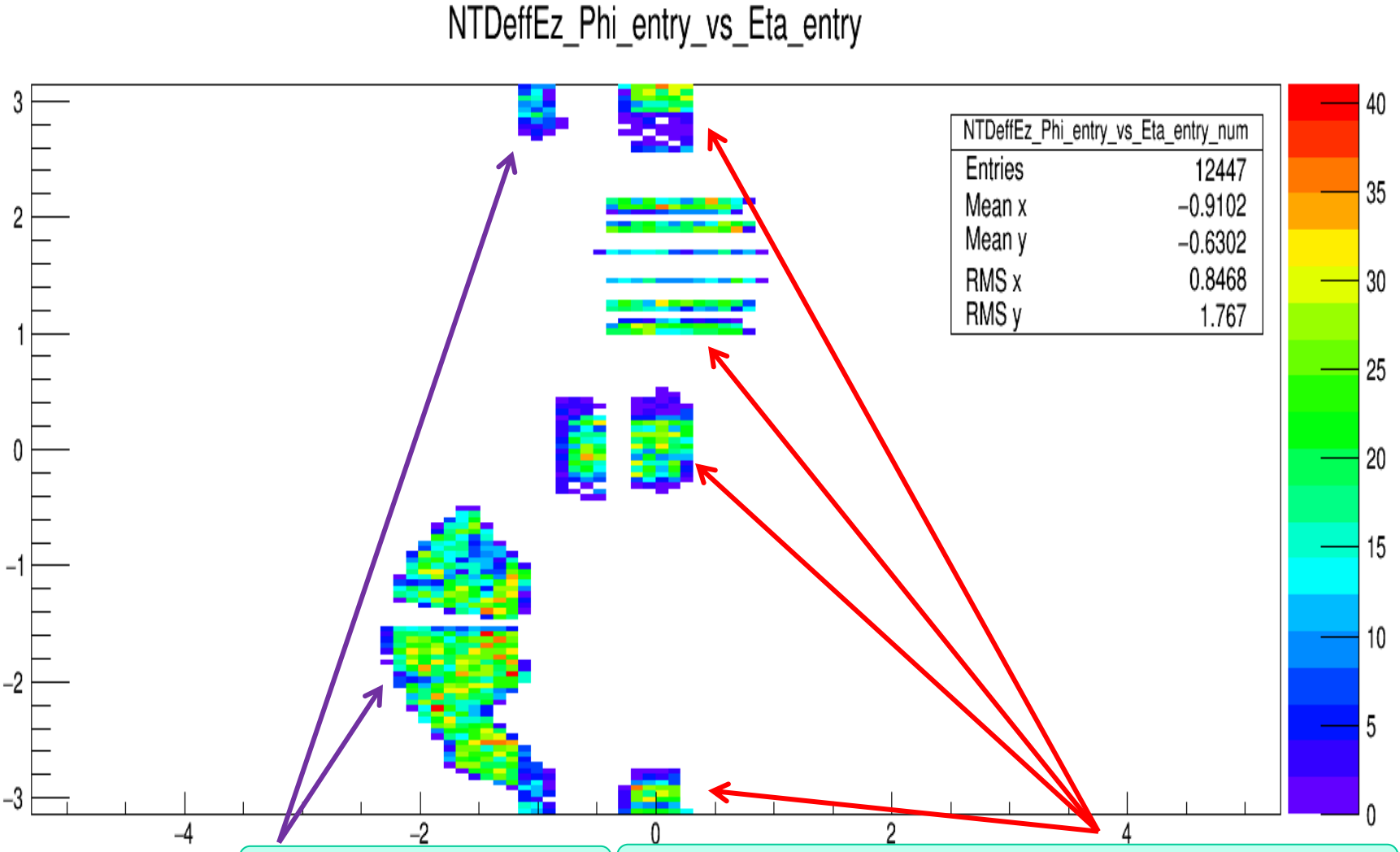
NTD Hits – Cut conditions and 'nintperstep' (G4)

θ vs Disp – NO Cuts in NTDHIT_N → ALL of NTDHits in rows



NTD Hits – Cut conditions and 'nintperstep' (G4)

η=f(θ) vs φ (old, faulty geometry though)

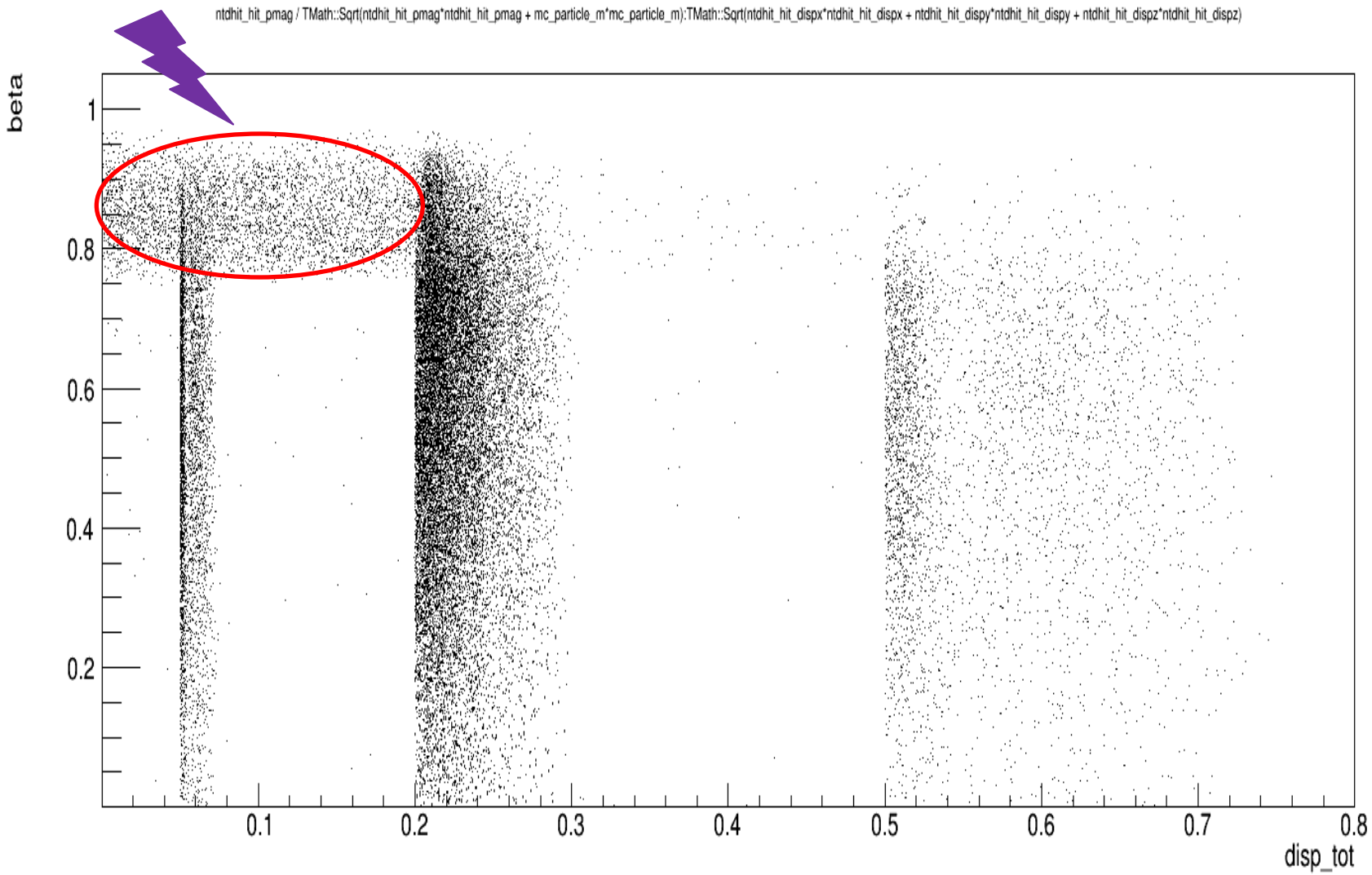


NTD Hits – Cut conditions and 'nintperstep' (G4)

MoEDAL

INSTITUTE OF SPACE SCIENCE
A subsidiary of INFLPR

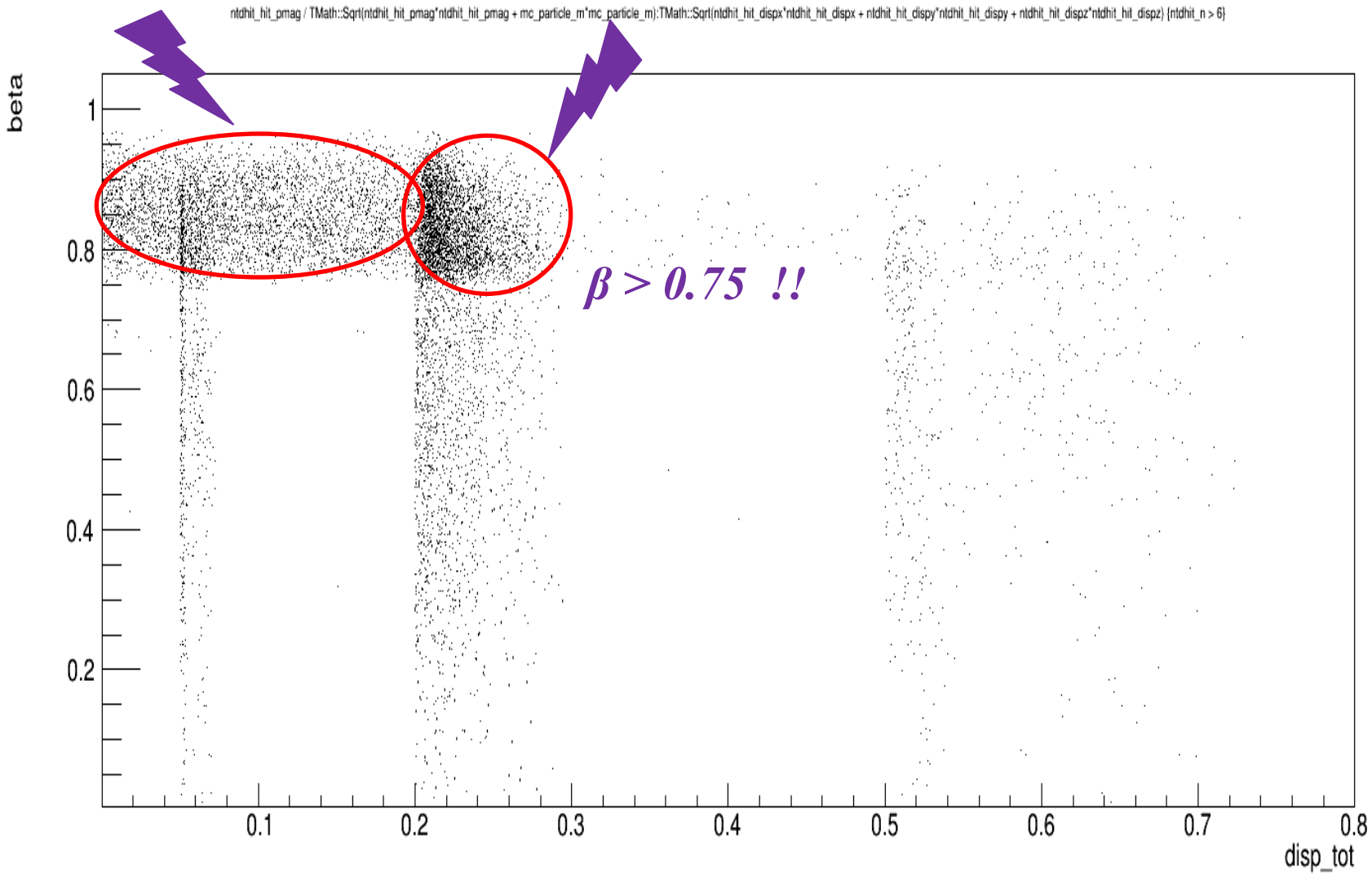
β vs Disp – NO Cuts in NTDHIT_N → ALL of NTDHits in rows



NTD Hits – Cut conditions and 'nintperstep' (G4)

MoEDAL *β vs Disp – Cuts: NTDHIT_N > 6 → ALL of NTDHits in rows*

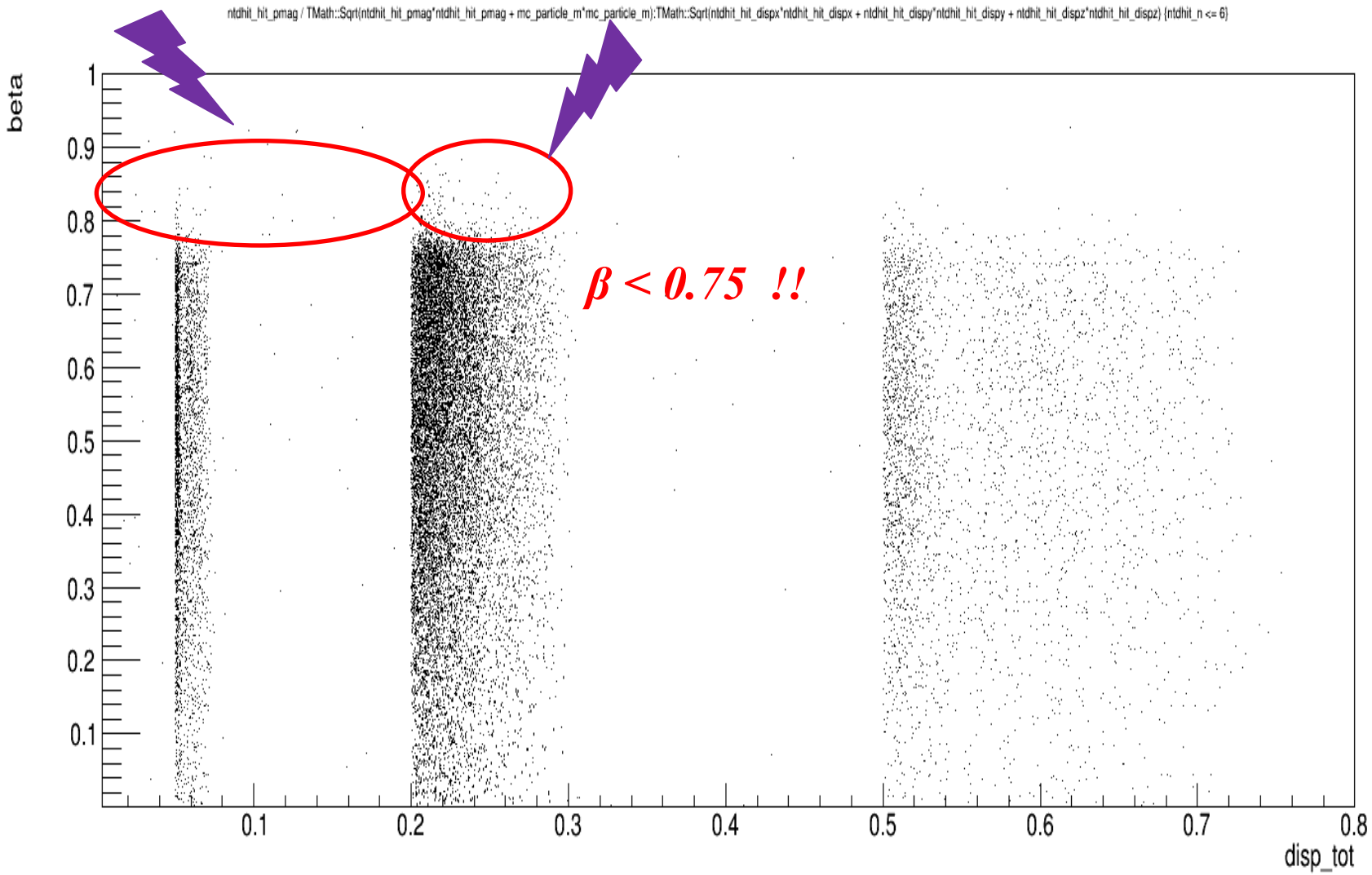
INSTITUTE OF SPACE SCIENCE
A subsidiary of INFLPR



NTD Hits – Cut conditions and 'nintperstep' (G4)

INSTITUTE OF SPACE SCIENCE
A subsidiary of INFLPR

MoEDAL *β vs Disp* – *Cuts:* ***NTDHIT_N <= 6 → ALL of NTDHits in rows***



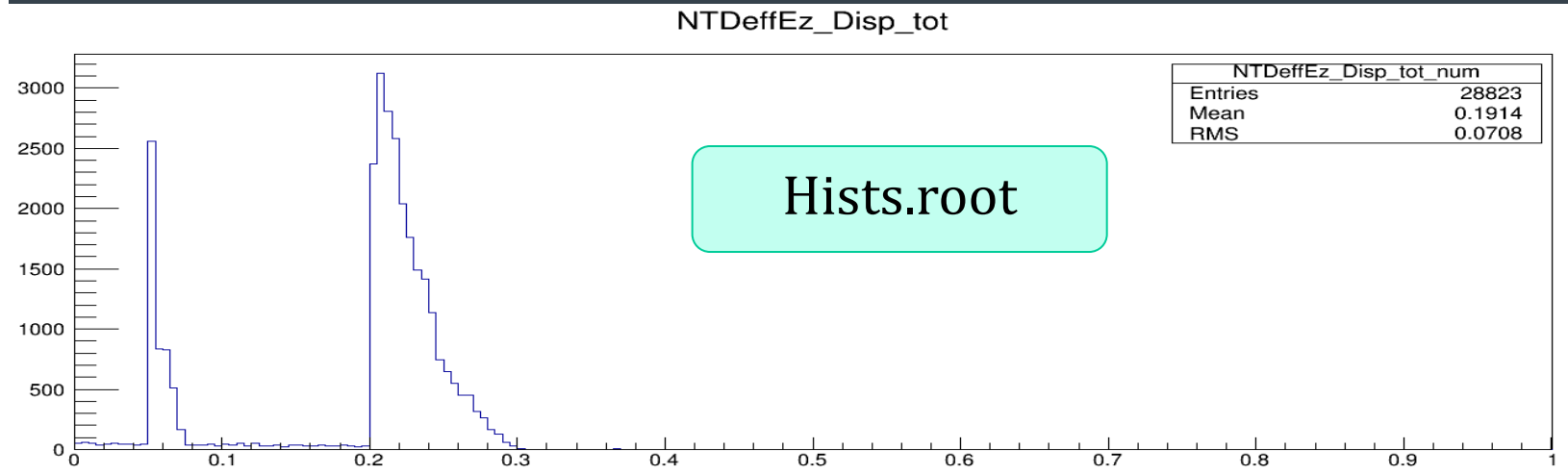
Short Recap : NTD Hits – Short Preliminary Analysis

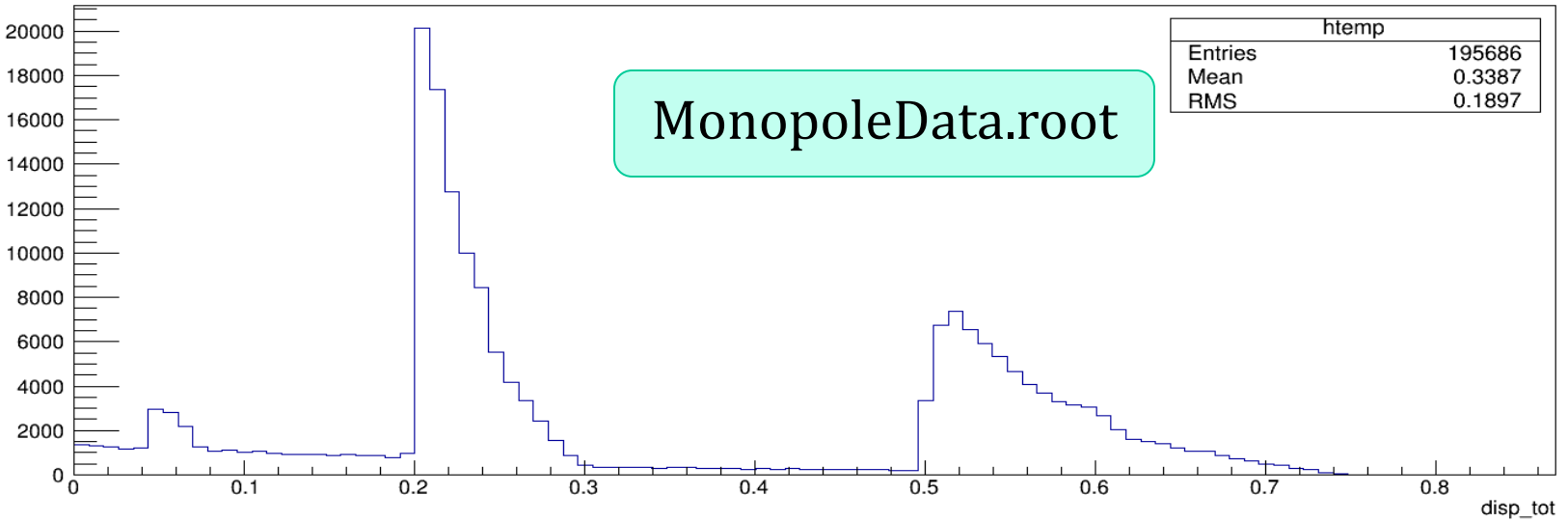
Are there any NTD Stopped MMs ?

MoEDAL

INSTITUTE OF SPACE SCIENCE
A subsidiary of INFLPR

NTD Hits





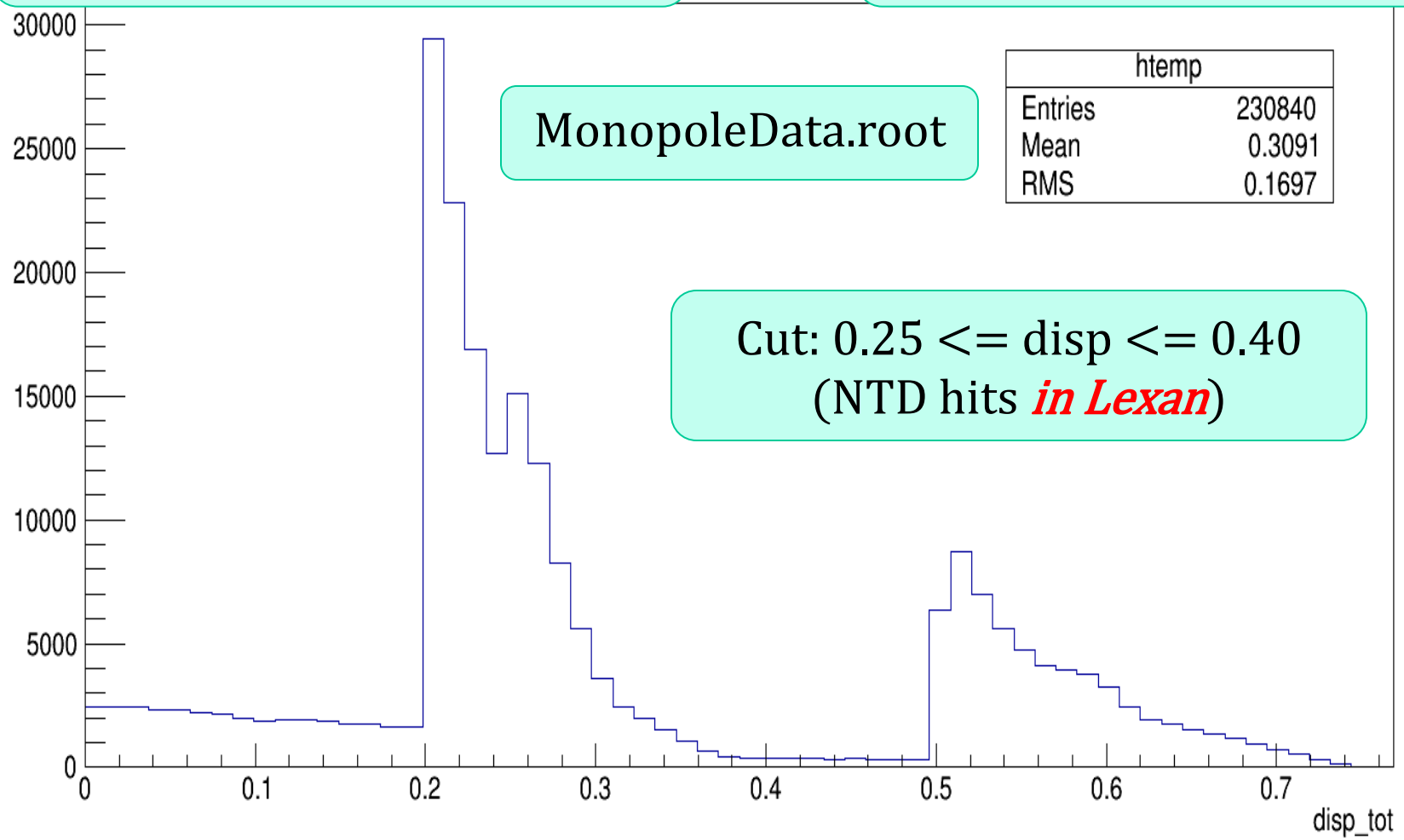
NTD Hits – Cut conditions and 'nintperstep' (G4)

Makrofol & Lexan & CR39 – Default MoEDAL : nintperstep = 10

ALL VALUES for NTDHIT_N

Cut: 0.20 <= disp <= 0.25
(NTD hits *in Makrofol*)

Cut: 0.5 <= disp <= 0.75
(NTD hits *in CR 39*)

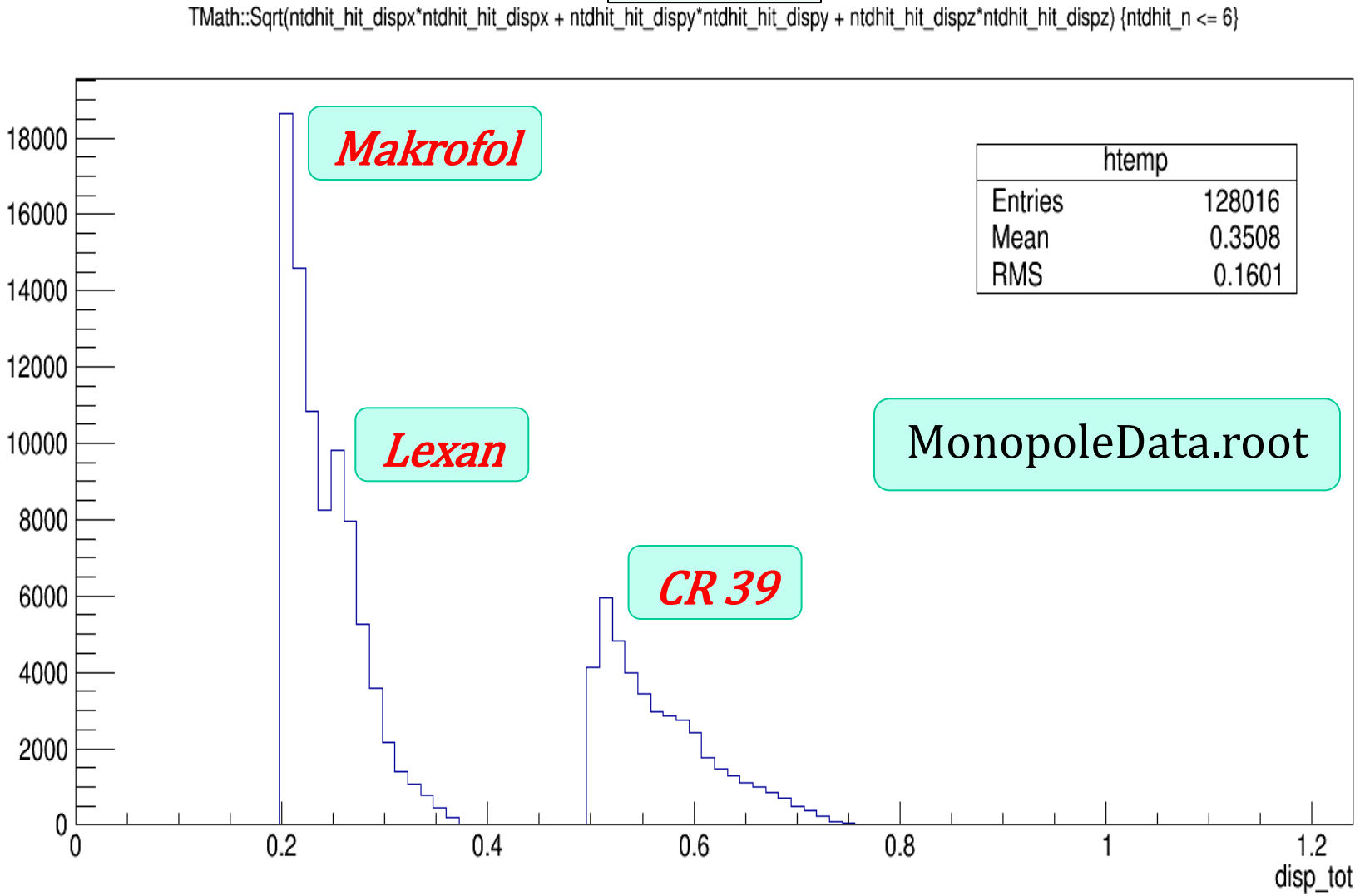


NTD Hits – Cut conditions and 'nintperstep' (G4)

Makrofol & Lexan & CR39 – Default MoEDAL : nintperstep = 10

Cuts : NTDHIT_N <= 6

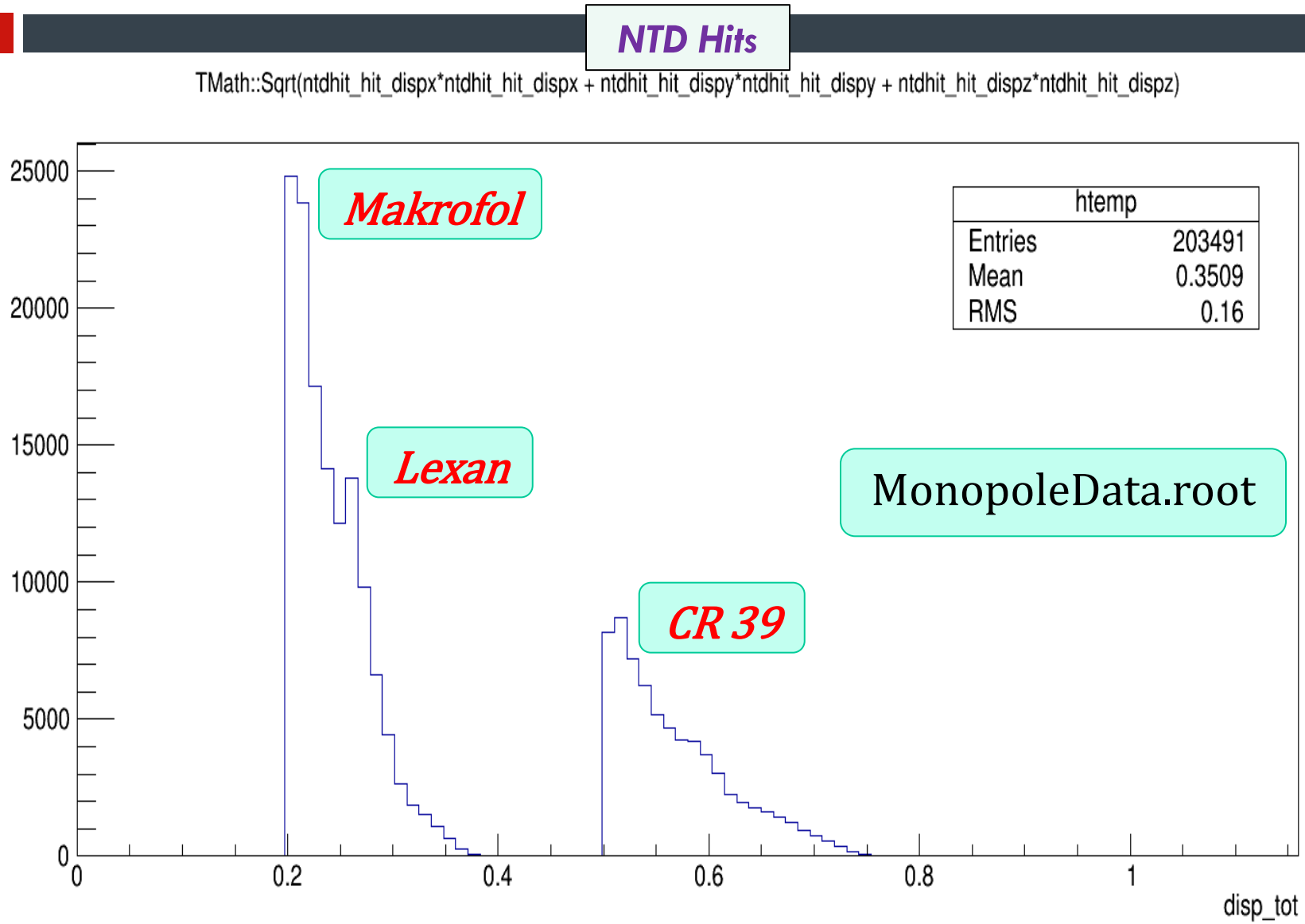
NTD Hits



NTD Hits – Cut conditions and 'nintperstep' (G4)

Makrofol & Lexan & CR39 – nintperstep = 10,000

ALL VALUES for NTDHIT_N

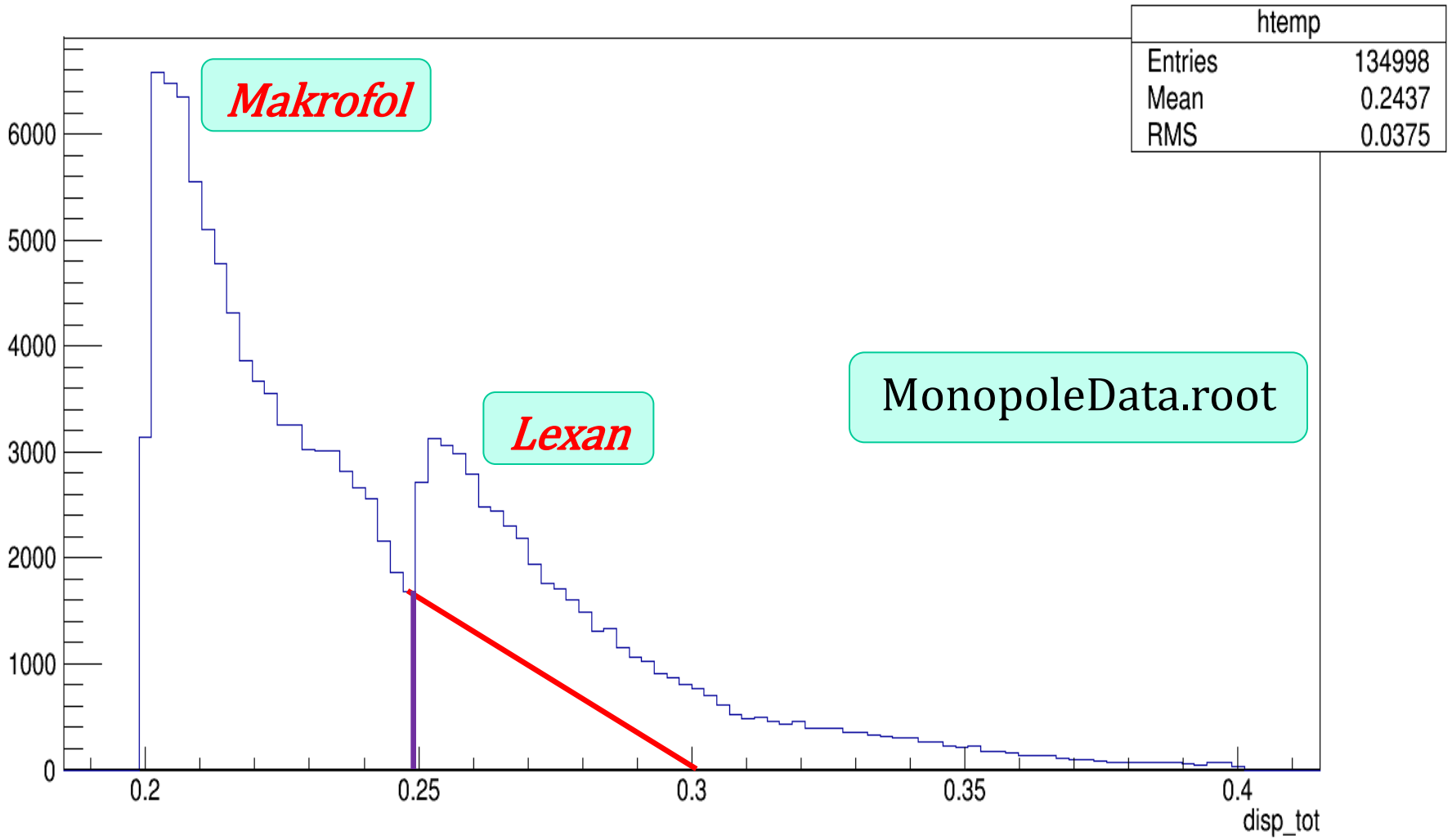


NTD Hits – Cut conditions and 'nintperstep' (G4)

Makrofol & Lexan – Default MoEDAL : nintperstep = 10

ALL VALUES for NTDHIT_N

NTD Hits

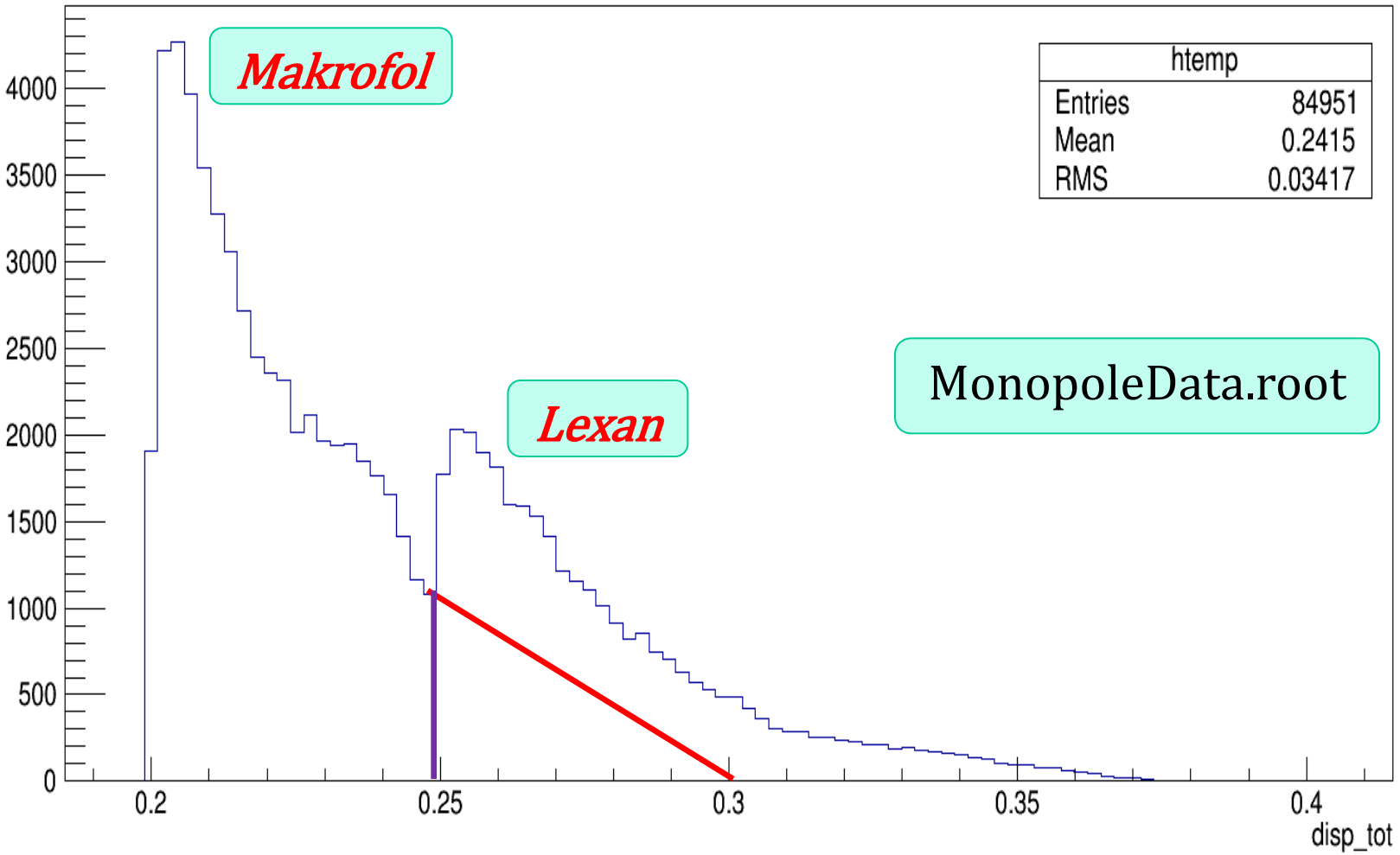


NTD Hits – Cut conditions and 'nintperstep' (G4)

Makrofol & Lexan – Default MoEDAL : nintperstep = 10

Cuts : NTDHIT_N <= 6

NTD Hits

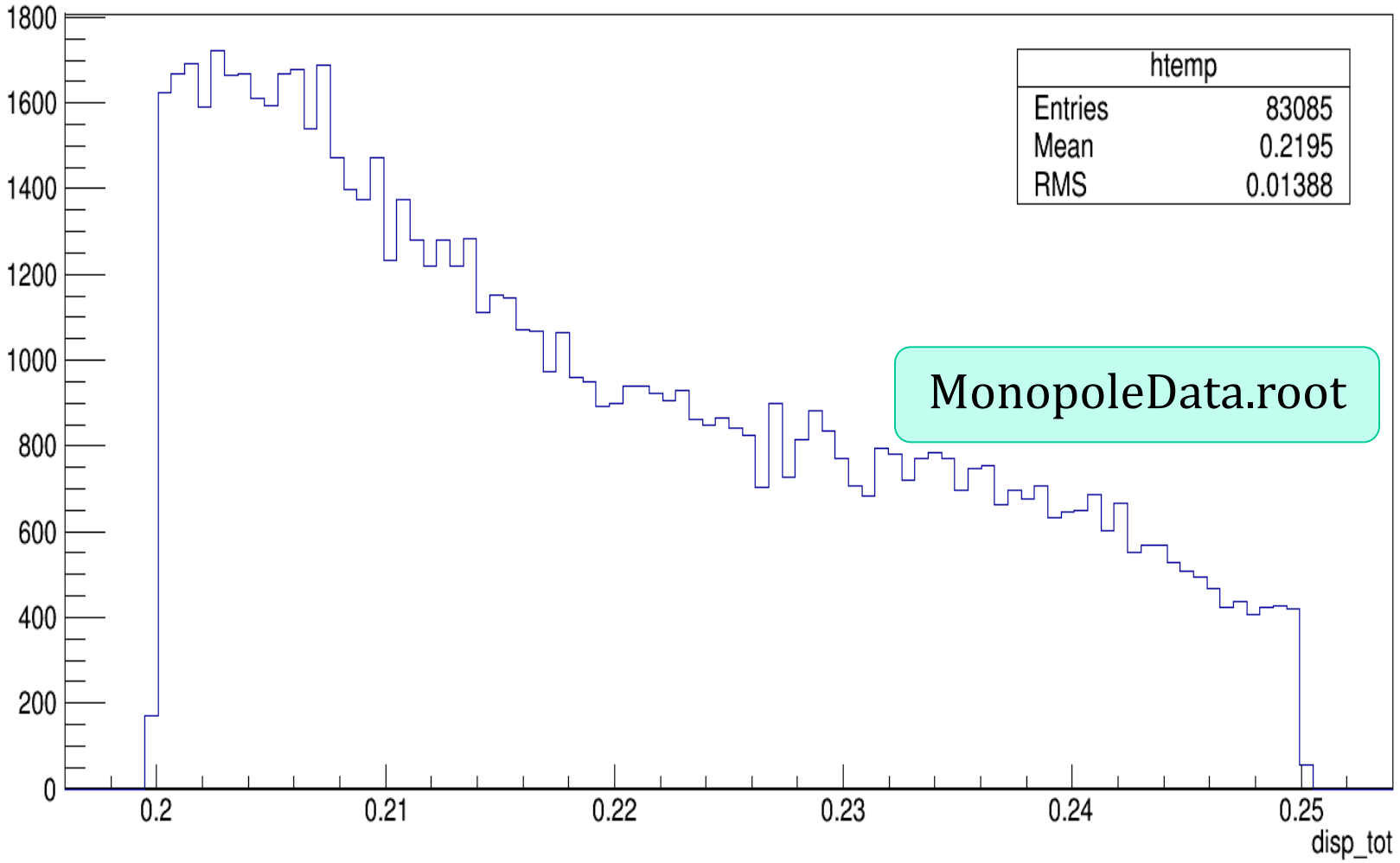


NTD Hits – Cut conditions and 'nintperstep' (G4)

Makrofol ONLY – Default MoEDAL : nintperstep = 10

ALL VALUES for NTDHIT_N

NTD Hits

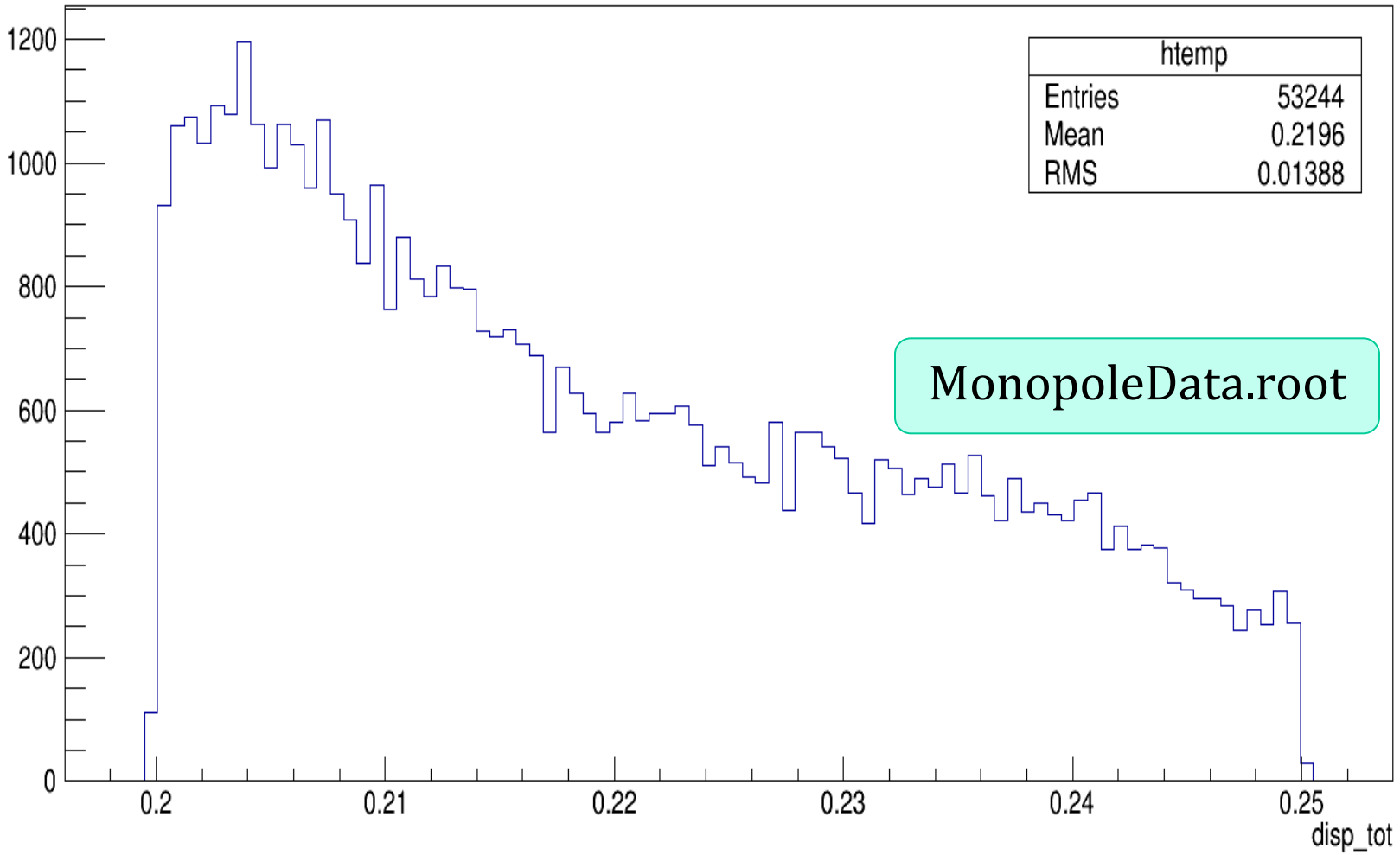


NTD Hits – Cut conditions and 'nintperstep' (G4)

Makrofol ONLY – Default MoEDAL : nintperstep = 10

Cuts : NTDHIT_N <= 6

NTD Hits

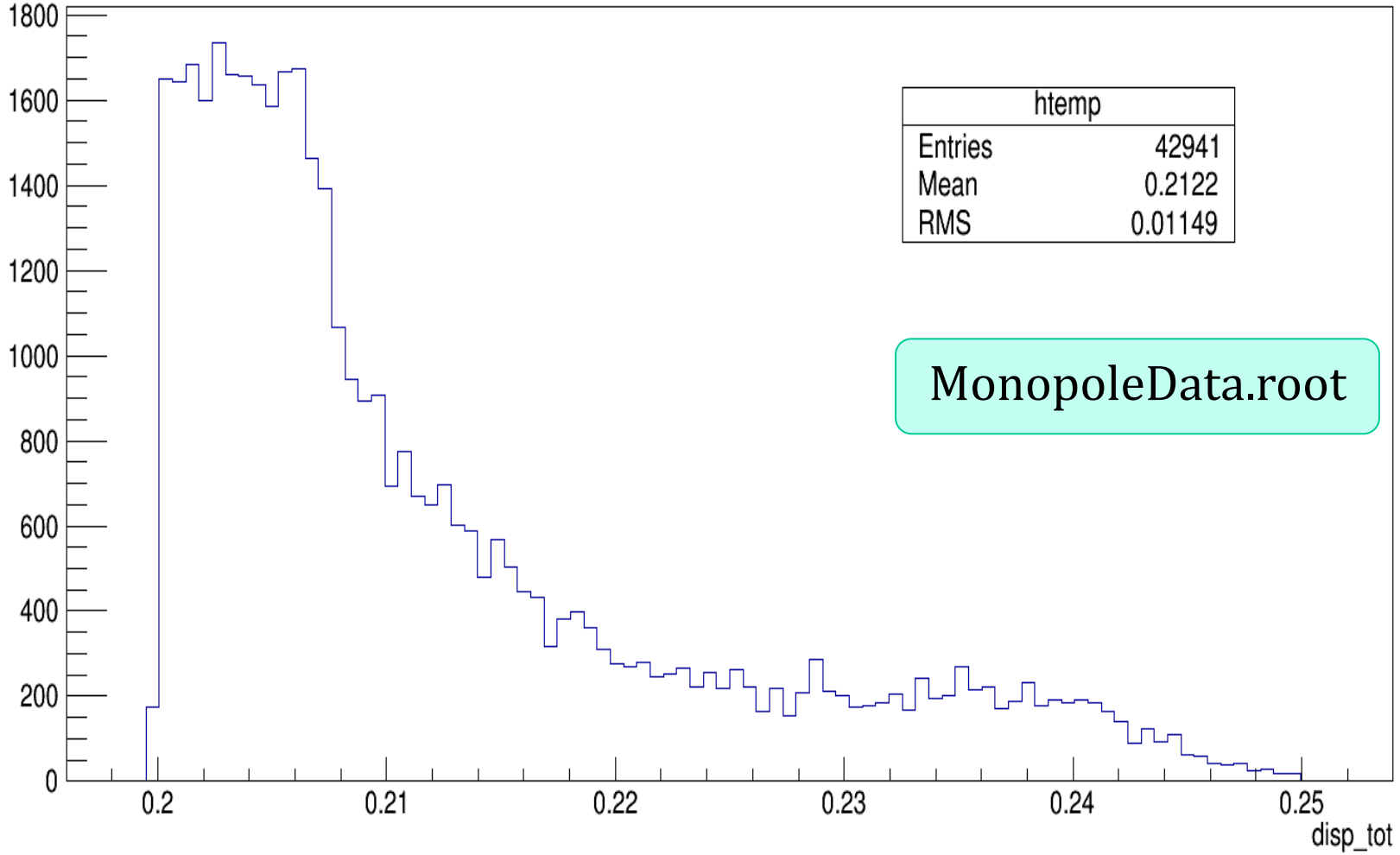


NTD Hits – Cut conditions and 'nintperstep' (G4)

Makrofol ONLY – nintperstep = 10,000

ALL VALUES for NTDHIT_N & $\theta < 15^{o}$

NTD Hits

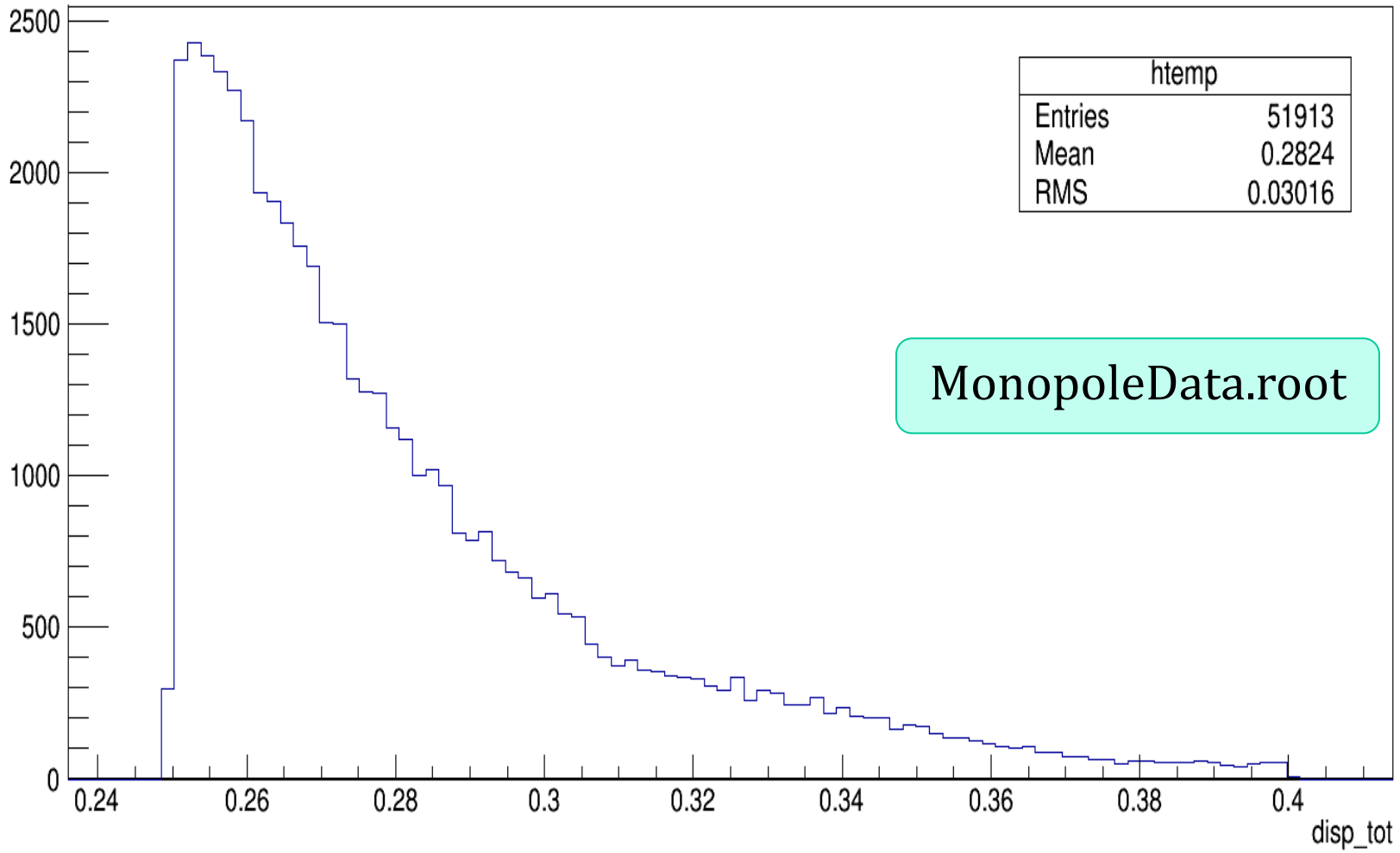


NTD Hits – Cut conditions and 'nintperstep' (G4)

Lexan ONLY – Default MoEDAL : nintperstep = 10

ALL VALUES for NTDHIT_N

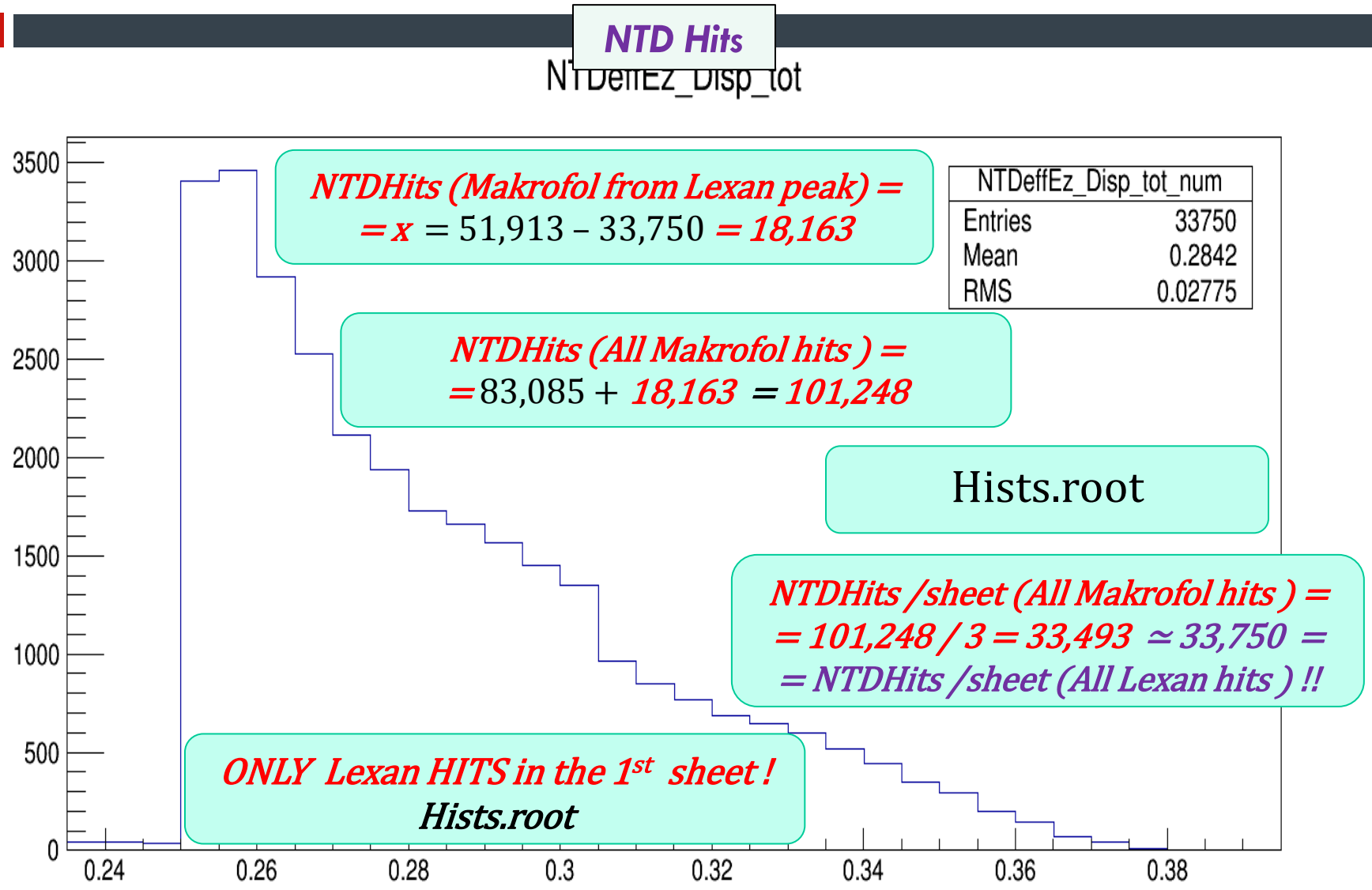
NTD Hits



NTD Hits – Cut conditions and 'nintperstep' (G4)

Lexan ONLY – Default MoEDAL : nintperstep = 10

ALL VALUES for NTDHIT_N

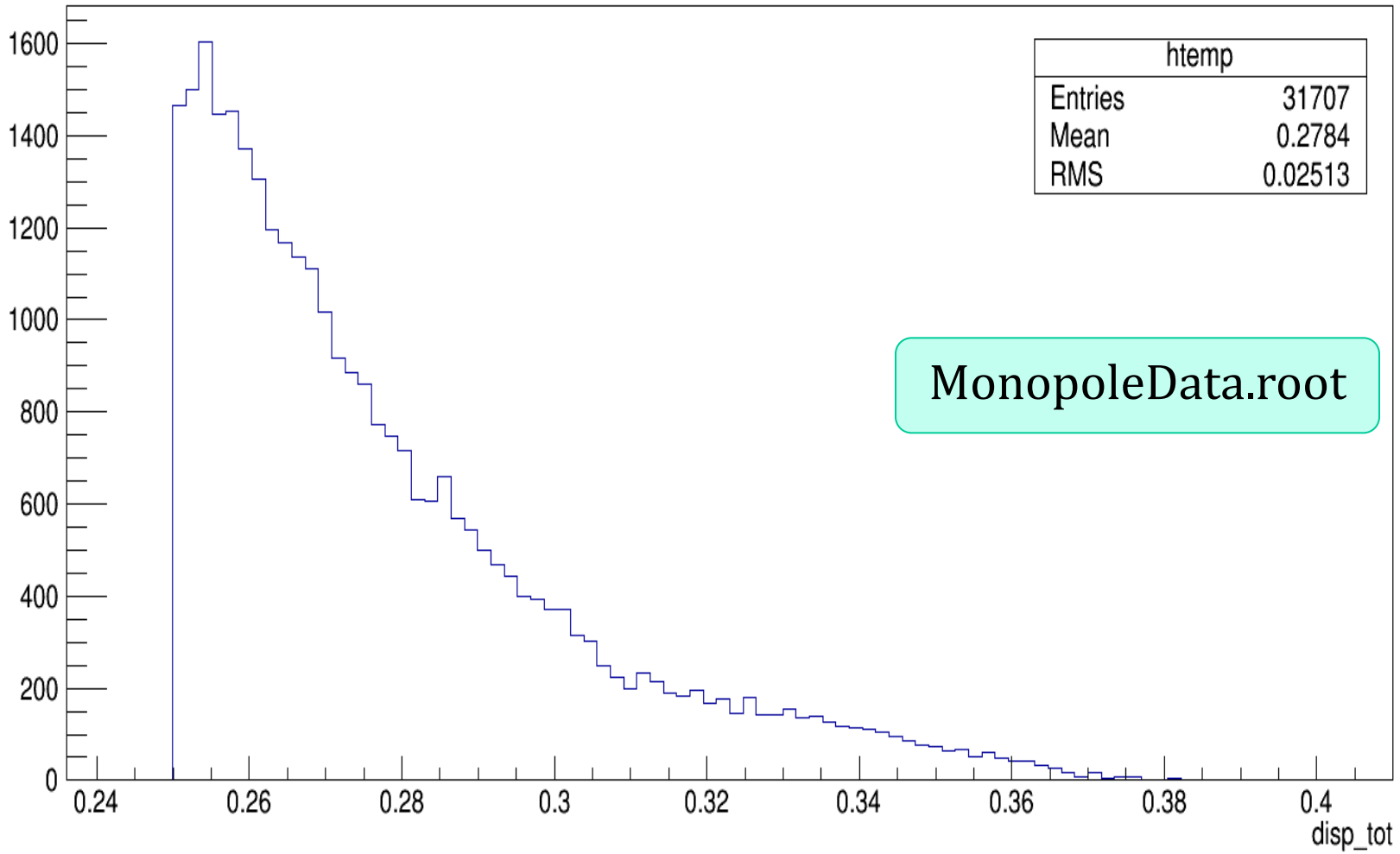


NTD Hits – Cut conditions and 'nintperstep' (G4)

Lexan ONLY – Default MoEDAL : nintperstep = 10

Cuts : NTDHIT_N <= 6

NTD Hits

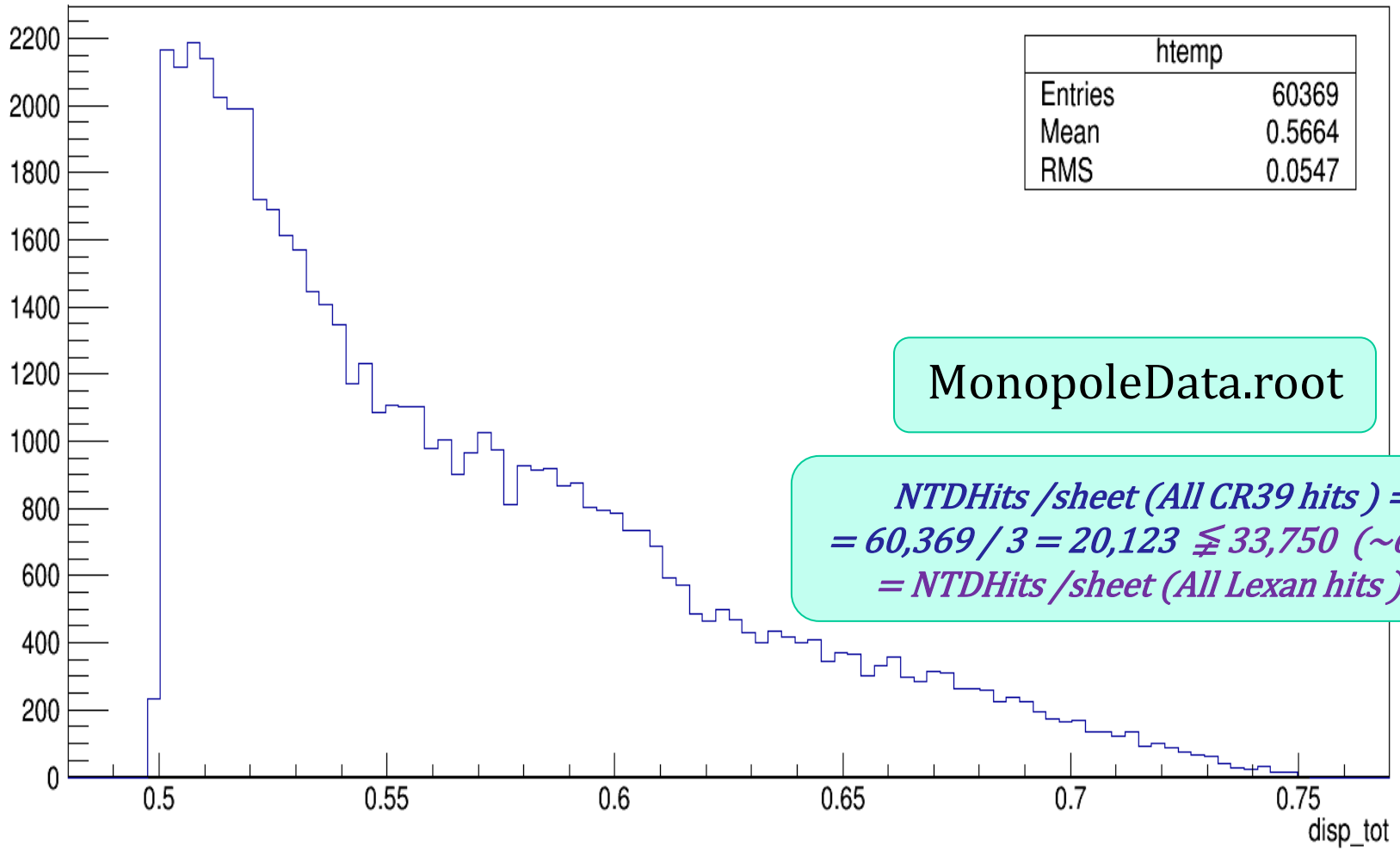


NTD Hits – Cut conditions and 'nintperstep' (G4)

CR39 ONLY – Default MoEDAL : nintperstep = 10

ALL VALUES for NTDHIT_N

NTD Hits



MonopoleData.root

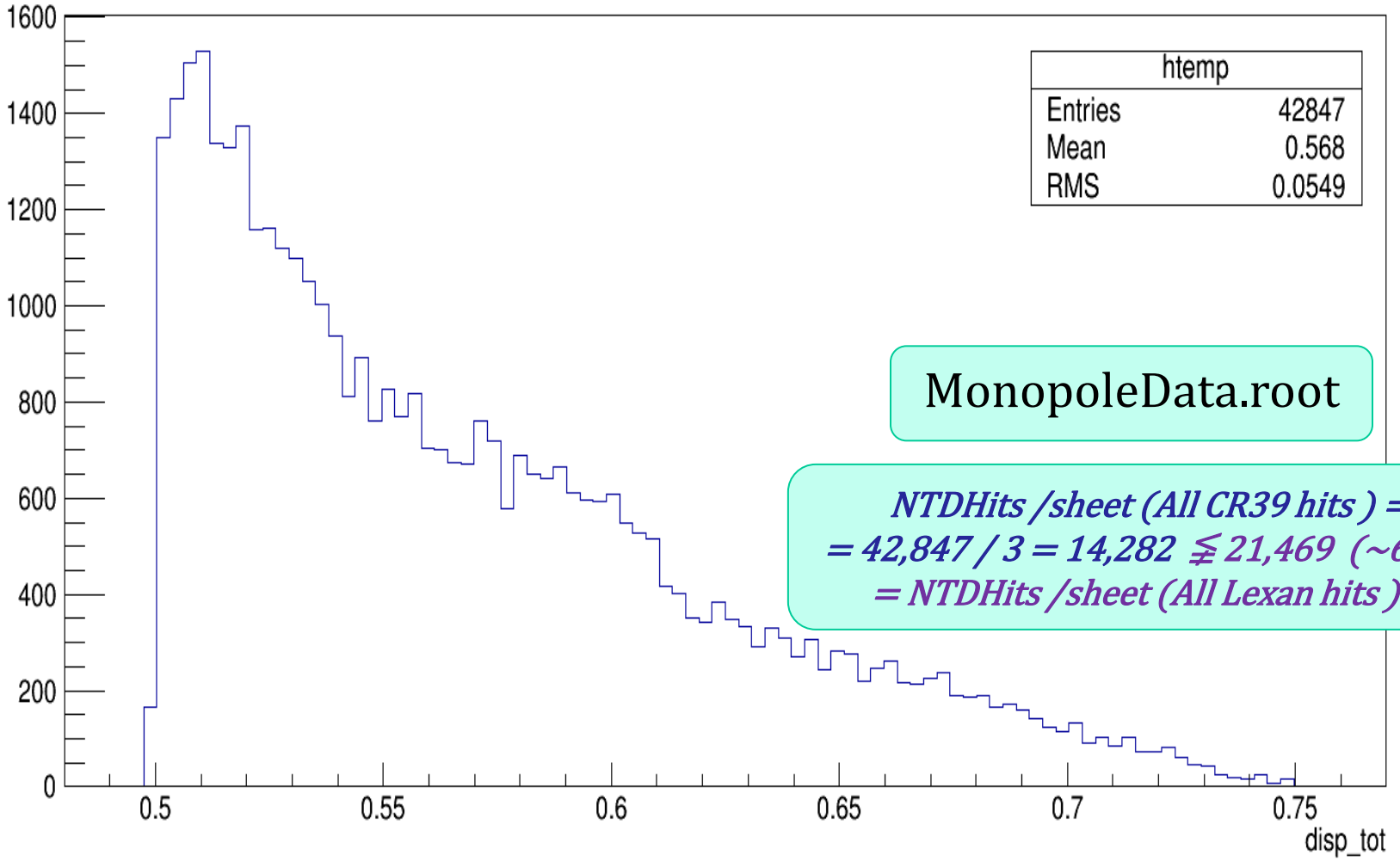
NTDHits /sheet (All CR39 hits) =
= 60,369 / 3 = 20,123 ≨ 33,750 (~60%)
= NTDHits /sheet (All Lexan hits) !!

NTD Hits – Cut conditions and 'nintperstep' (G4)

CR39 ONLY – Default MoEDAL : nintperstep = 10

Cuts : NTDHIT_N <= 6

NTD Hits



MonopoleData.root

NTDHits /sheet (All CR39 hits) =
= 42,847 / 3 = 14,282 ≲ 21,469 (~68%)
= NTDHits /sheet (All Lexan hits) !!

2b.) Working : different simulations + comparison

→ nintperstep >> 1 && ntdhit_n <= 6

NTD Hits

nintperstep	MMT Hits	NTD Hits (NO CUTS)	NTD Hits (WITH CUTS in NTDHIT_N)	
			<= 6	> 6
Default = 10	1,263	230,840	128,016 (55.46 %)	102,824 (44.54 %)
80	1,263	206,989	154,707 (74.74 %)	52,282 (25.26 %)
10,000	1,268	203,491	168,484 (82.80 %)	35,007 (17.20 %)

Short Recap : NTD Hits – Short Preliminary Analysis

Are there any NTD Stopped MMs ?

NTD Hits

Predictions for next time :

$$\frac{\lim_{\theta \to 0} N_{Hits\,Makrofol}}{3} = 28,823$$

$$\lim_{\theta \to 0} N_{Hits\,CR39} = N_{Hits\,Makrofol}$$

Investigated

Presumably : NTD are NOT STOPPI… the NTDs !!

But… a hit was considered as STOPPED when …

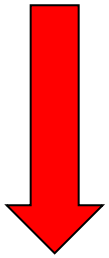
… NOT detected after exiting from a Makrofol sheet and entering in a determined area…

2b.) Working : different simulations + comparison

→ nintperstep >> 1 && ntdhit_n <= 6

Preliminary conclusions : Cuts needed : nintperstep >> 1 && ntdhit_n <= 6

Presumptions : $\lim_{\theta \to 0}(N_{\text{Makrofol Hits}} / 3) = \lim_{\theta \to 0}(N_{\text{CR39 Hits}} / 3) = N_{\text{Lexan Hits}}$



Results so far : $\lim_{\theta \to 0}(N_{\text{Makrofol Hits}} / 3) = N_{\text{Lexan Hits}}$

(from MonopoleData.root and Hists.root)

Results so far : $\lim_{\theta \to 0}(N_{\text{Makrofol Hits}} / 3) \gneqq \lim_{\theta \to 0}(N_{\text{CR39 Hits}} / 3)$

(from MonopoleData.root)

Thank you !