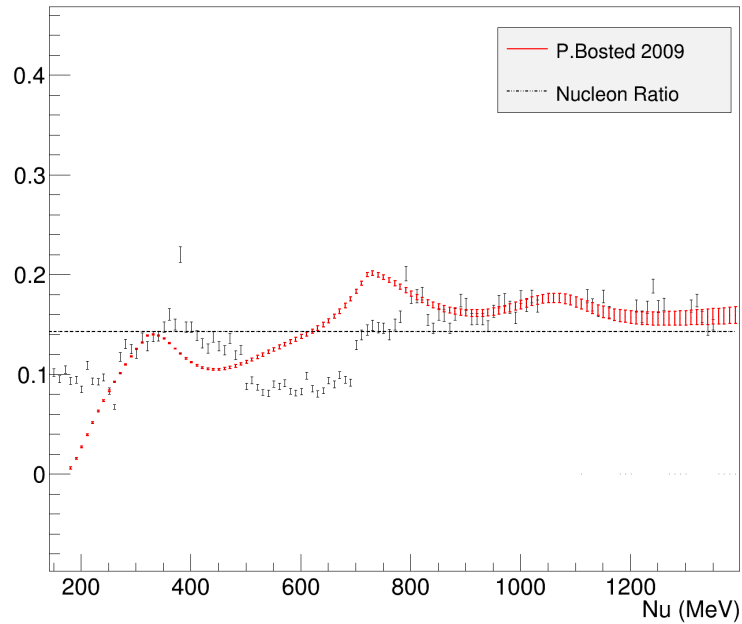


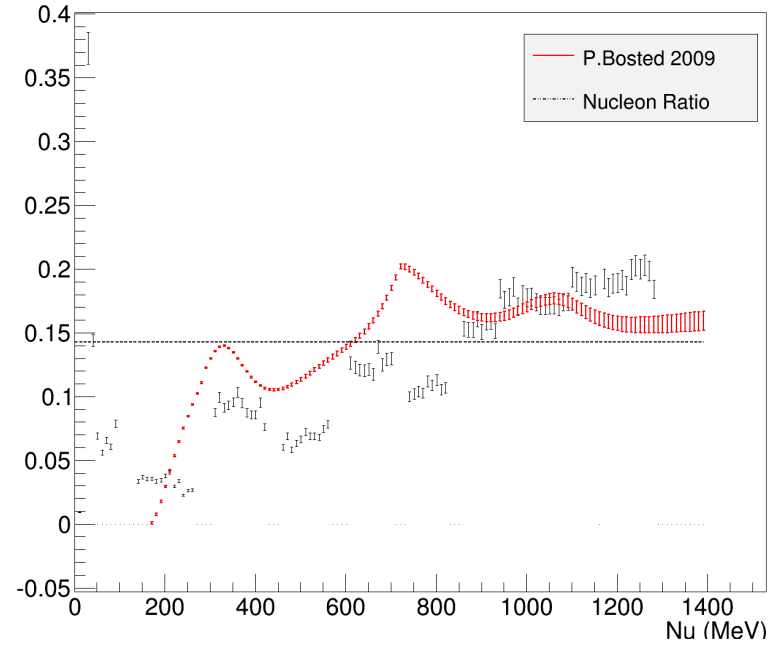
Dilution Update  
3/25/15

# Dilution - all completed settings

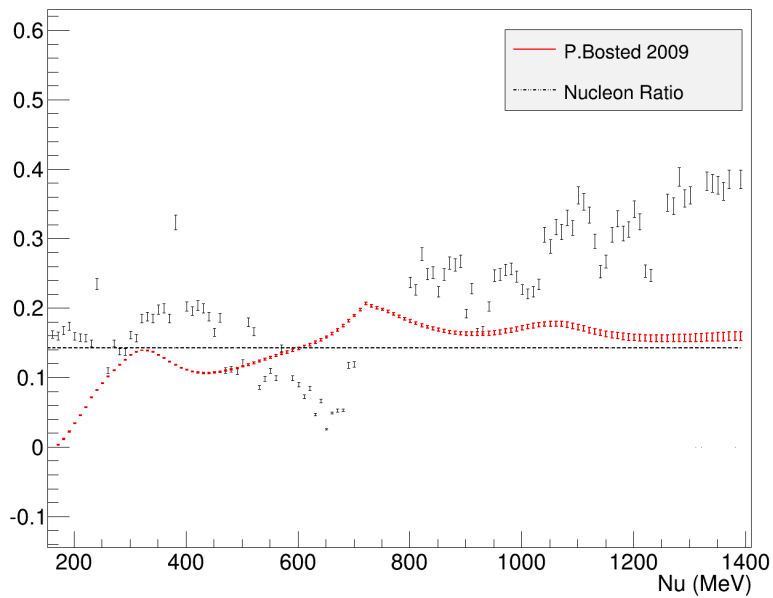
2254\_5T\_trans\_L Dilution



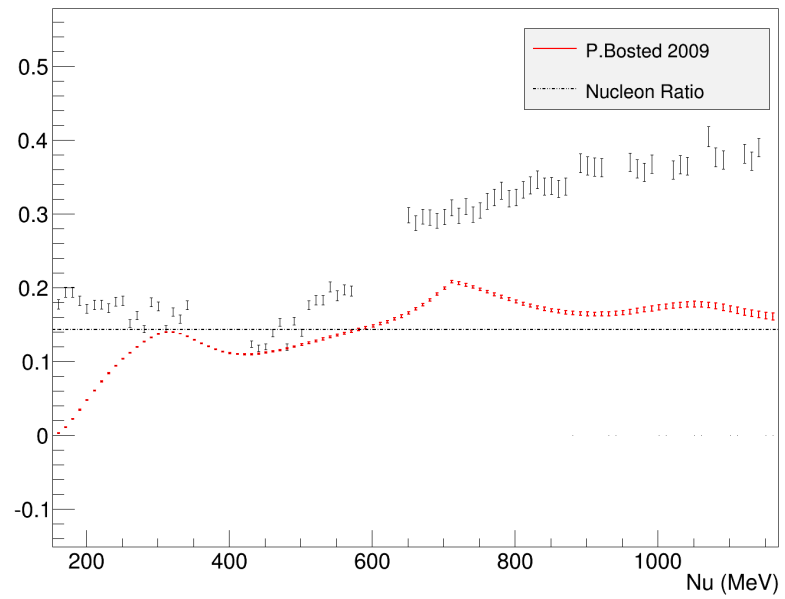
2254\_5T\_long\_L Dilution



2254\_25T\_L Dilution



1710\_25T\_L Dilution



# Alternative PF calculation

- $$Y_P = \frac{AN_o \rho_A L l_A}{e M_A} (\sigma_N^P + 3\sigma_H^P) + \frac{AN_o \rho_f l_f}{e M_f} \sigma_f^P + \frac{AN_o \rho_{He} L (1-l_A)}{e M_{He}} \sigma_{He}^P$$

where

$M_X, \rho_X, l_X$  = mass, density, length of material X

$A$  = HRS acceptance

$N_o$  = Avagadro's number

- $$Y_E = \frac{AN_o \rho_{He} L}{e M_{He}} \sigma_{He}^E$$

$$Y_D = \frac{AN_o \rho_f l_f}{e M_f} \sigma_f^E + Y_E$$

$$Y_C = \frac{AN_o \rho_c l_c}{e M_c} \sigma_c^C + \frac{L-l_c}{L} Y_E$$

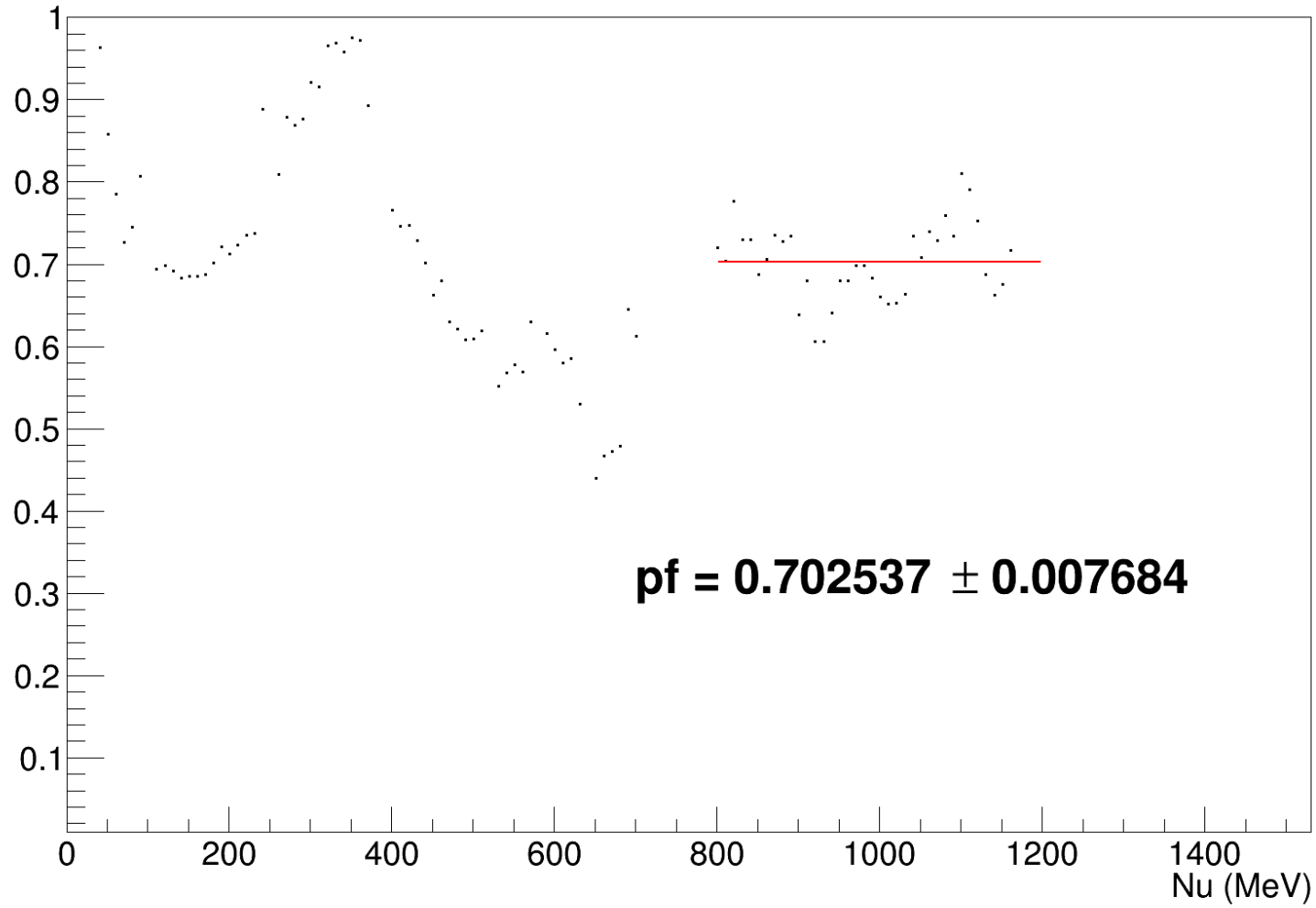
- $$l_A = \frac{Y_P - Y_D}{\frac{M_c \rho_A}{M_A \rho_c l_c} \left( Y_C - \frac{L-l_c}{L} Y_E \right) \left( a + 3 \frac{\sigma_H}{\sigma_c} \right) - \frac{1}{L} Y_E}$$

- $a = 1.167$
- XS ratio found using P.Bosted model

This equation is only valid in DIS, but since the p.f. is kinematic independent we can fit a 0<sup>th</sup> order polynomial at large Nu to find the packing fraction everywhere.

Should provide a good cross check to Melissa's method in the elastic region.

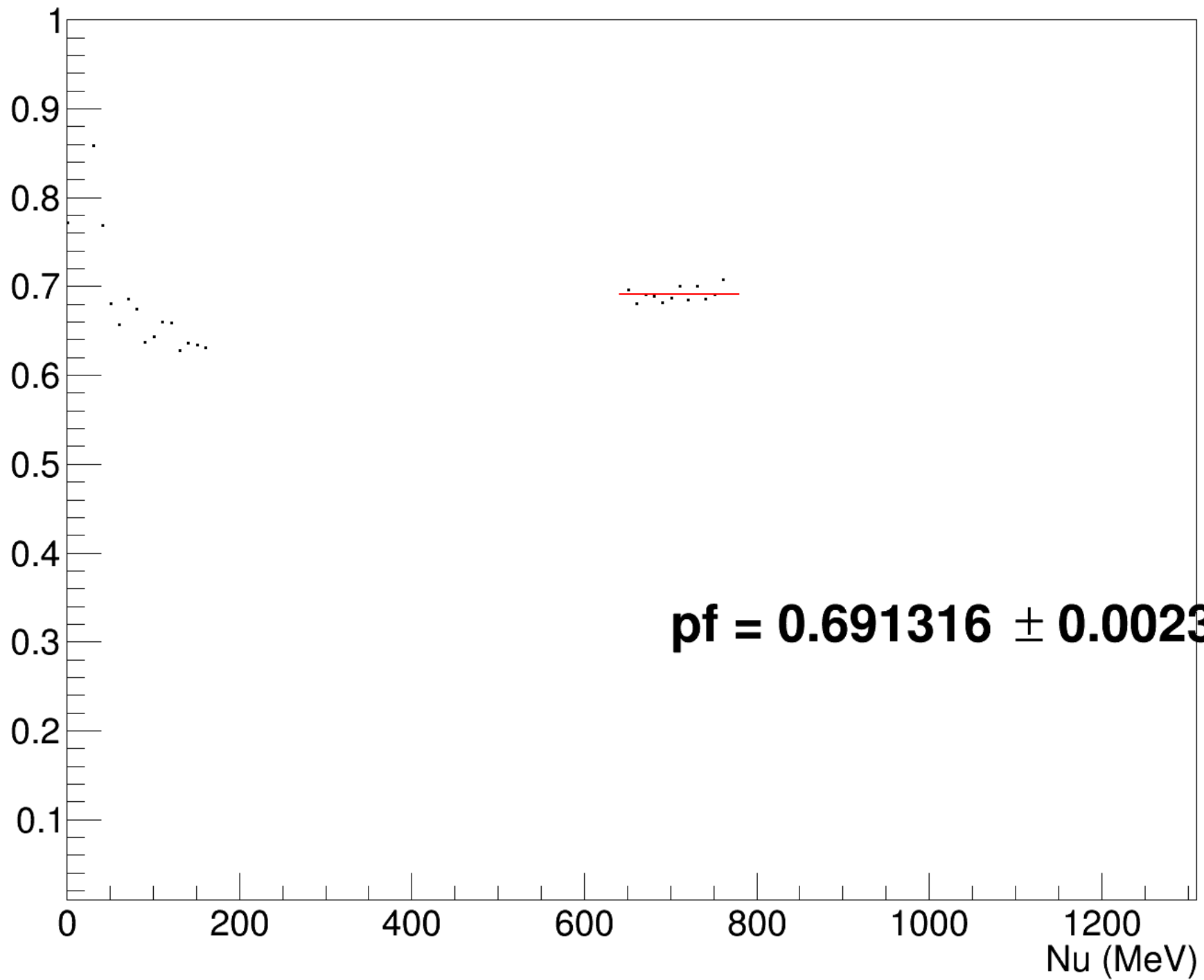
# 2.254GeV 2.5T material 7 Packing Fraction



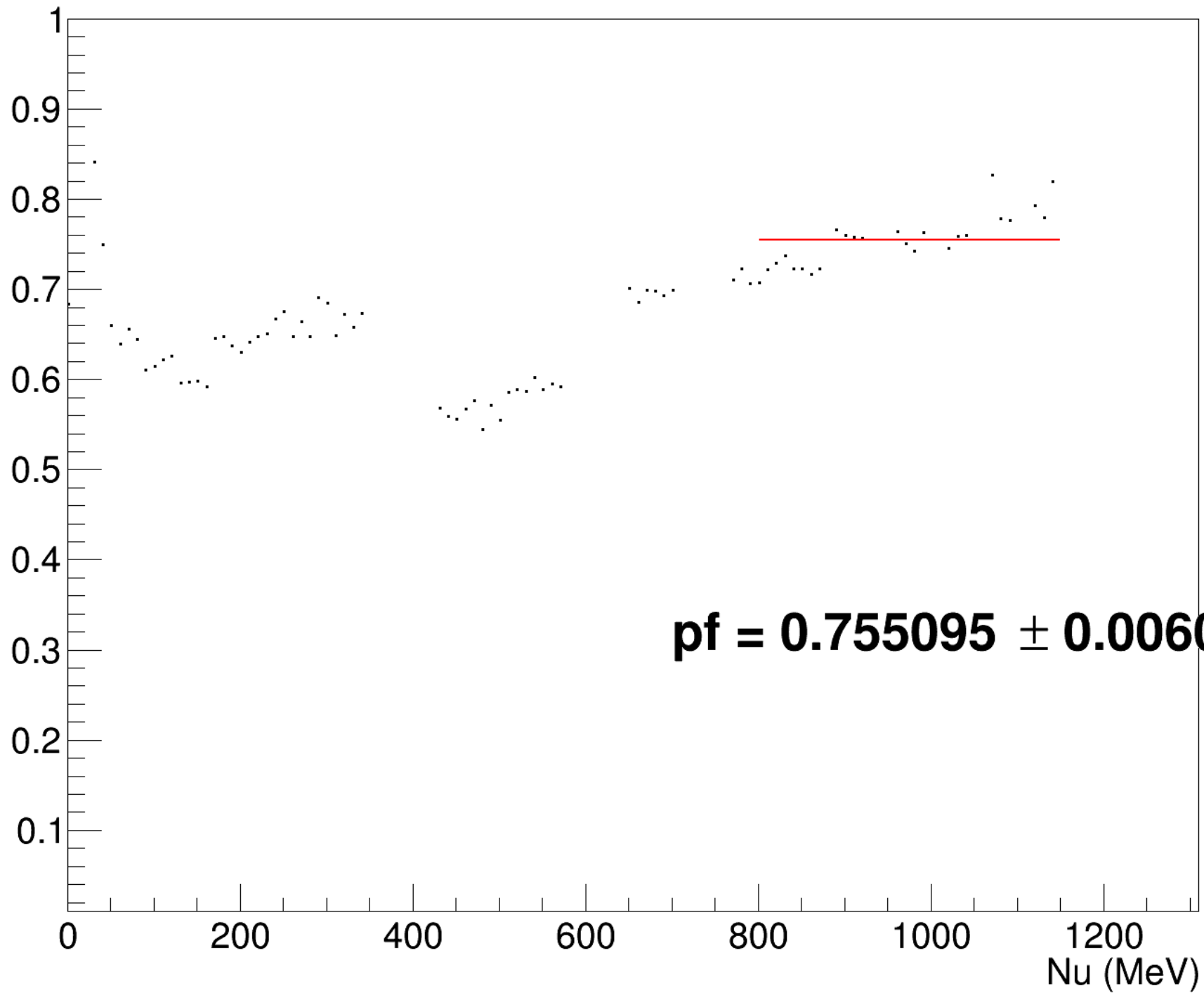
E0 (GeV)	Target Field	Orientation	Material	Packing Fraction	PF uncertainty
1.710	2.5T	T	7	0.6913	0.0024
1.710	2.5T	T	8	0.7551	0.0060
2.254	2.5T	T	7	0.7025	0.0078
2.254	2.5T	T	8	0.7341	0.0104
2.254	5T	L	17	0.6021	0.0011
2.254	5T	L	18	0.6466	0.0012
2.254	5T	T	19	0.7972	0.0028
2.254	5T	T	20	0.8139	0.0039

- Right now 'PF uncertainty' is just the error in the linear fit.
- All packing fractions seem about 5-10% larger than typical values. Possibly missing some component? (I closely follow the p.f. derivation done by Y.Prok and R.Fersch for our target setup)
- Some setting/material combinations have minimal kinematic coverage so the fit is not very good (shown on backup slides)
- In the process of writing a dilution tech note.

# 1.710GeV 2.5T material 7 Packing Fraction

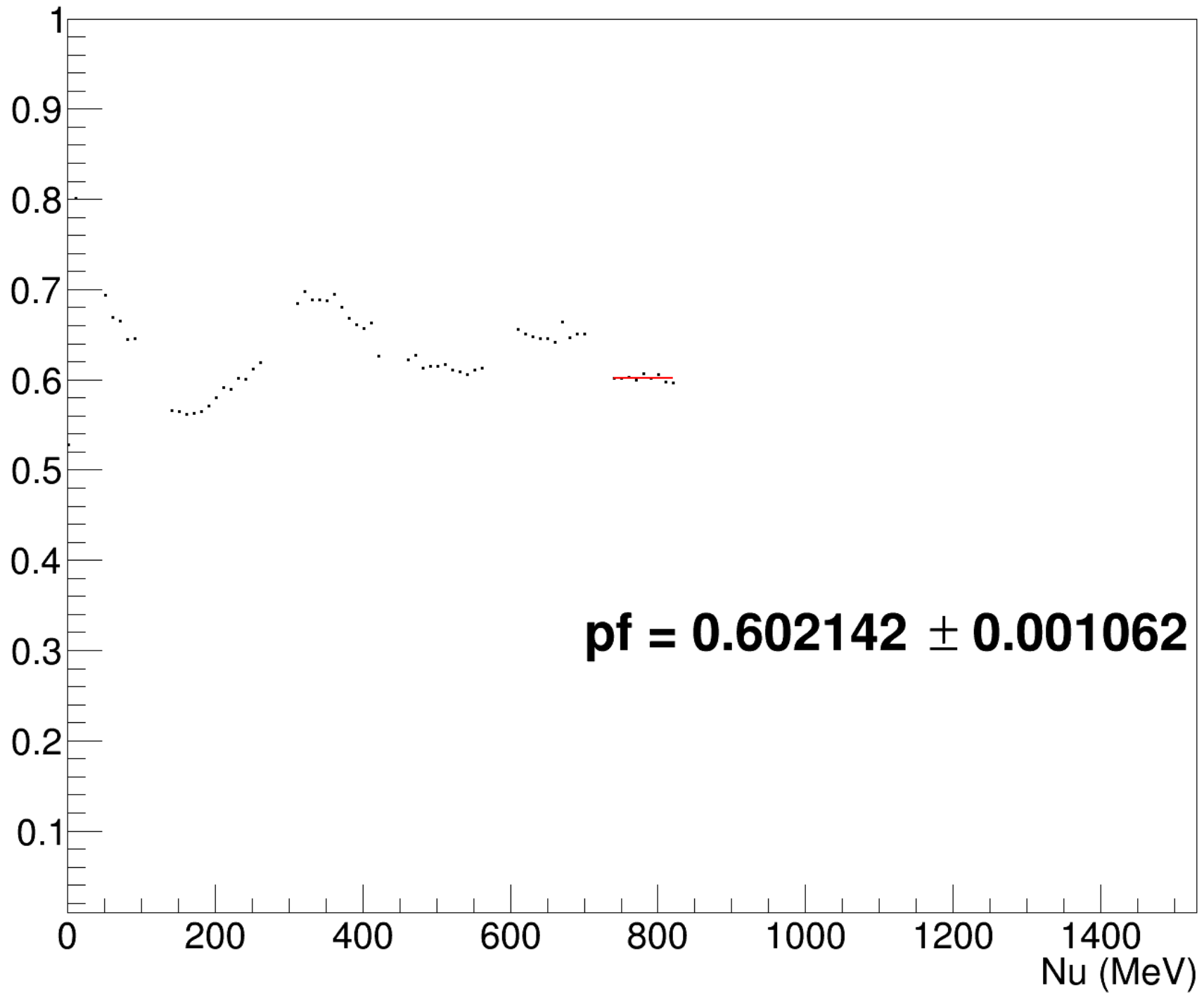


# 1.710GeV 2.5T material 8 Packing Fraction



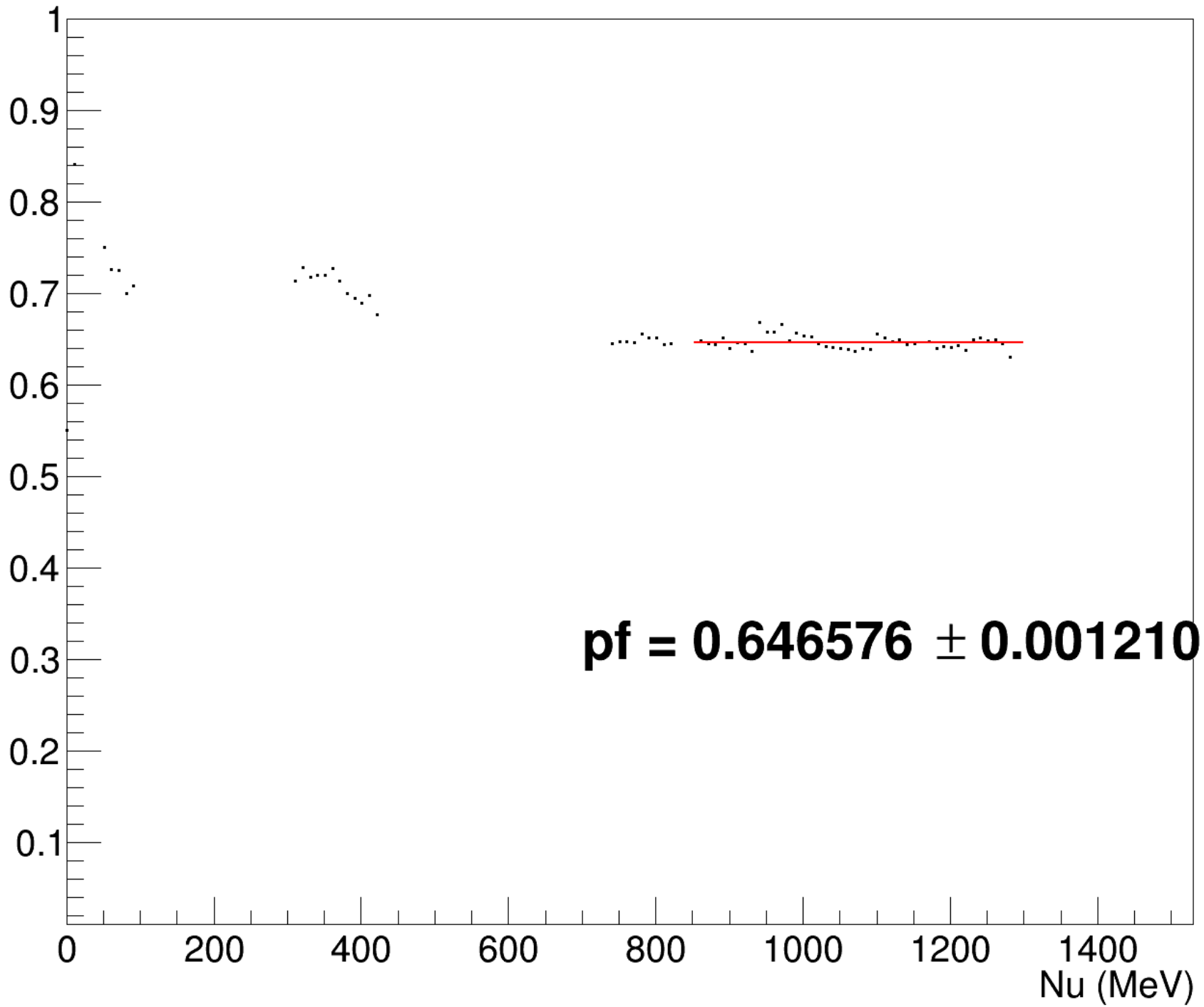
**pf = 0.755095 ± 0.006014**

# 2.254GeV 5T Longitudinal material 17 Packing Fraction

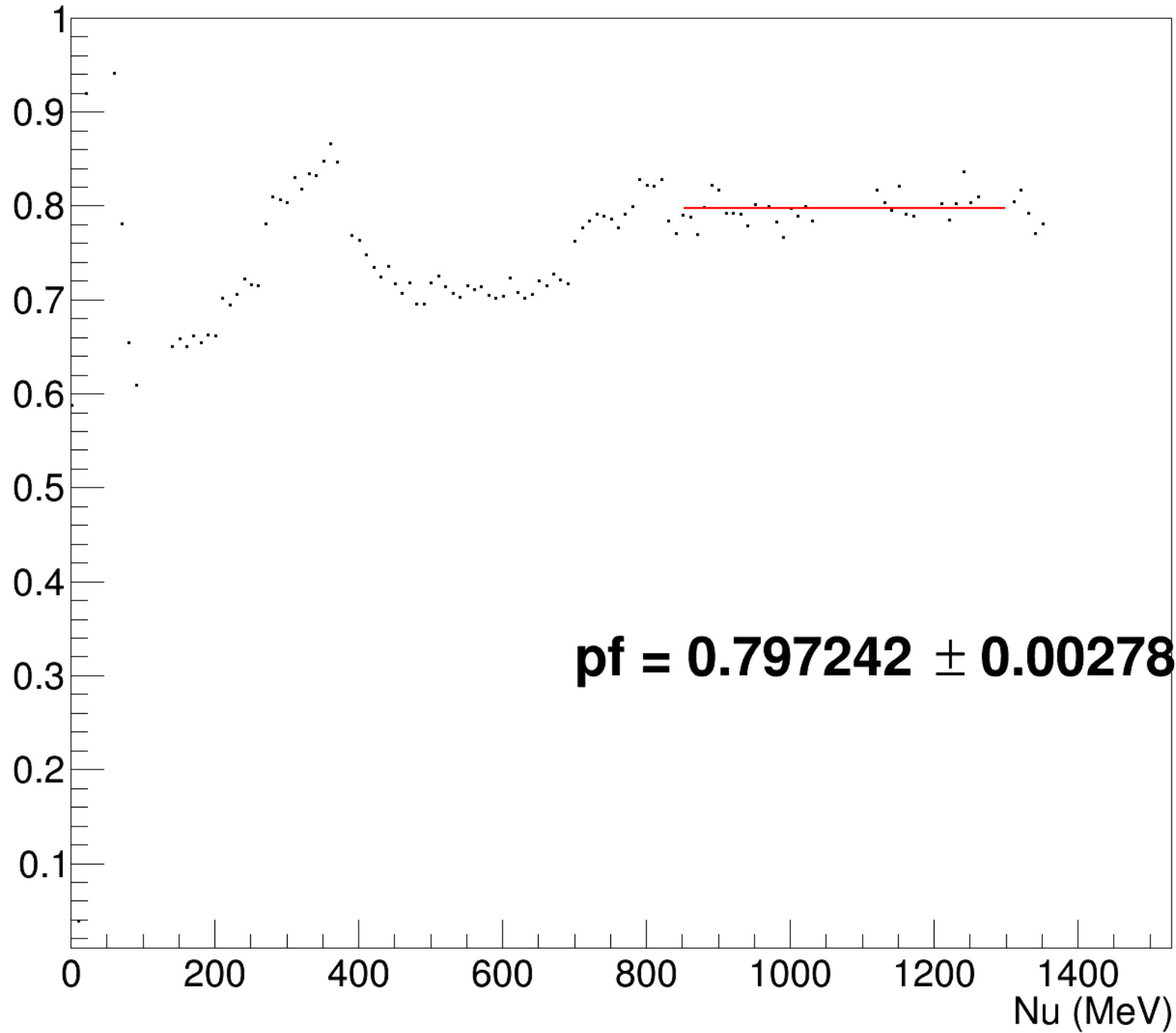




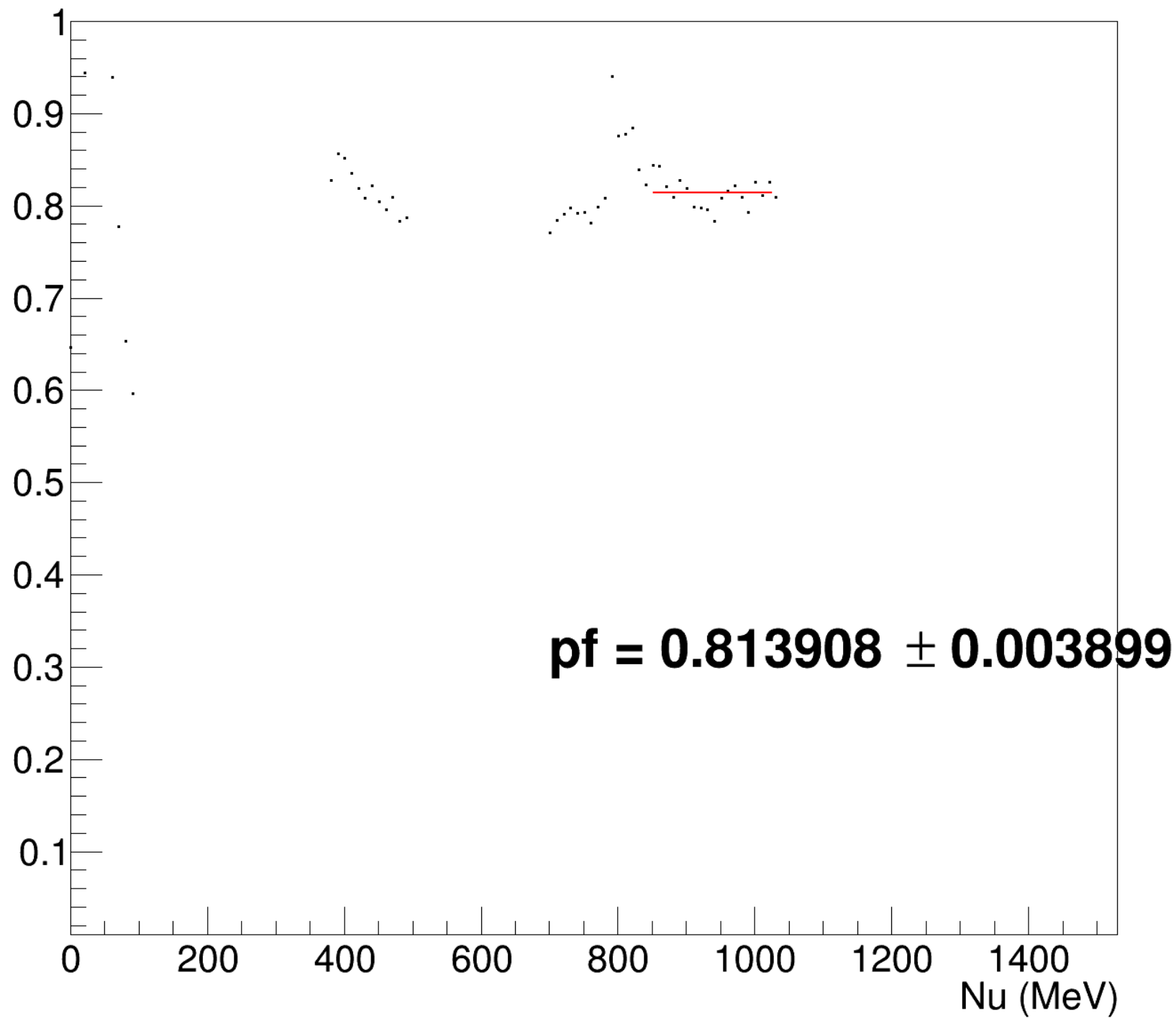
2.254GeV 5T Longitudinal material 18 Packing Fraction



# 2.254GeV 5T Transverse material 19 Packing Fraction



# 2.254GeV 5T Transverse material 20 Packing Fraction



# 2.254GeV 2.5T material 8 Packing Fraction

