



# Simulation Statistics

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# Contents

2D histograms parameterizing the variation of average energy deposition with pseudorapidity ( $\eta$ ) and polar angle ( $\theta$ ) for all proposed ECCE calorimeters (CEMC, EEMC, FEMC, FHCAL, HCALIN, HCALOUT) using uni-energetic muons.

# Simulation Parameters

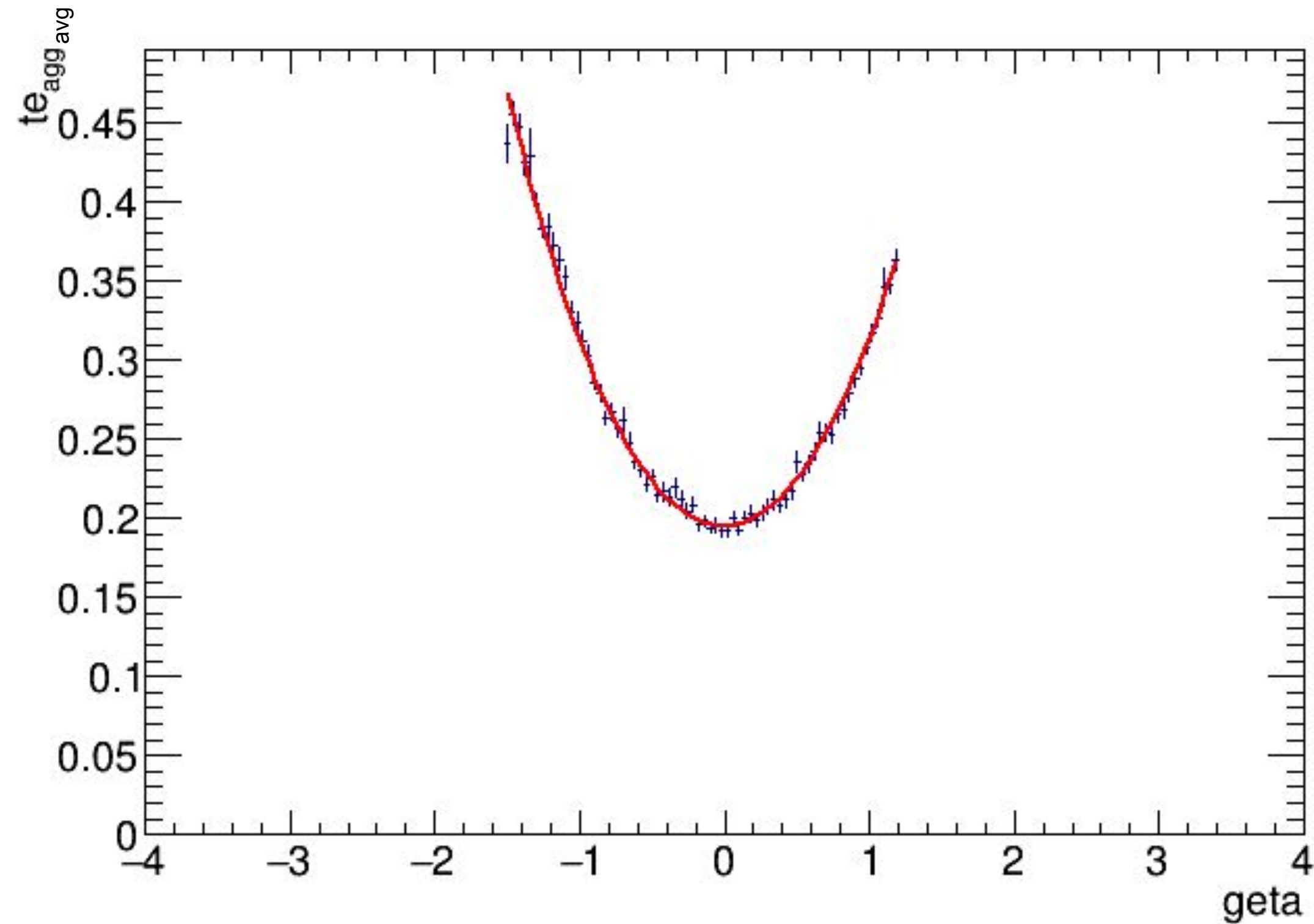
- Particles:  $\mu^-$
- Events: 46900 ( $\mu^-$ )
- momentum ( $p$ ): 4 GeV/c
- Pseudorapidity ( $\eta$ ): -4 to 4
- Azimuth ( $\Phi$ ):  $-\pi$  to  $\pi$

## Cuts:

- Detector-wise  $\eta$  cuts

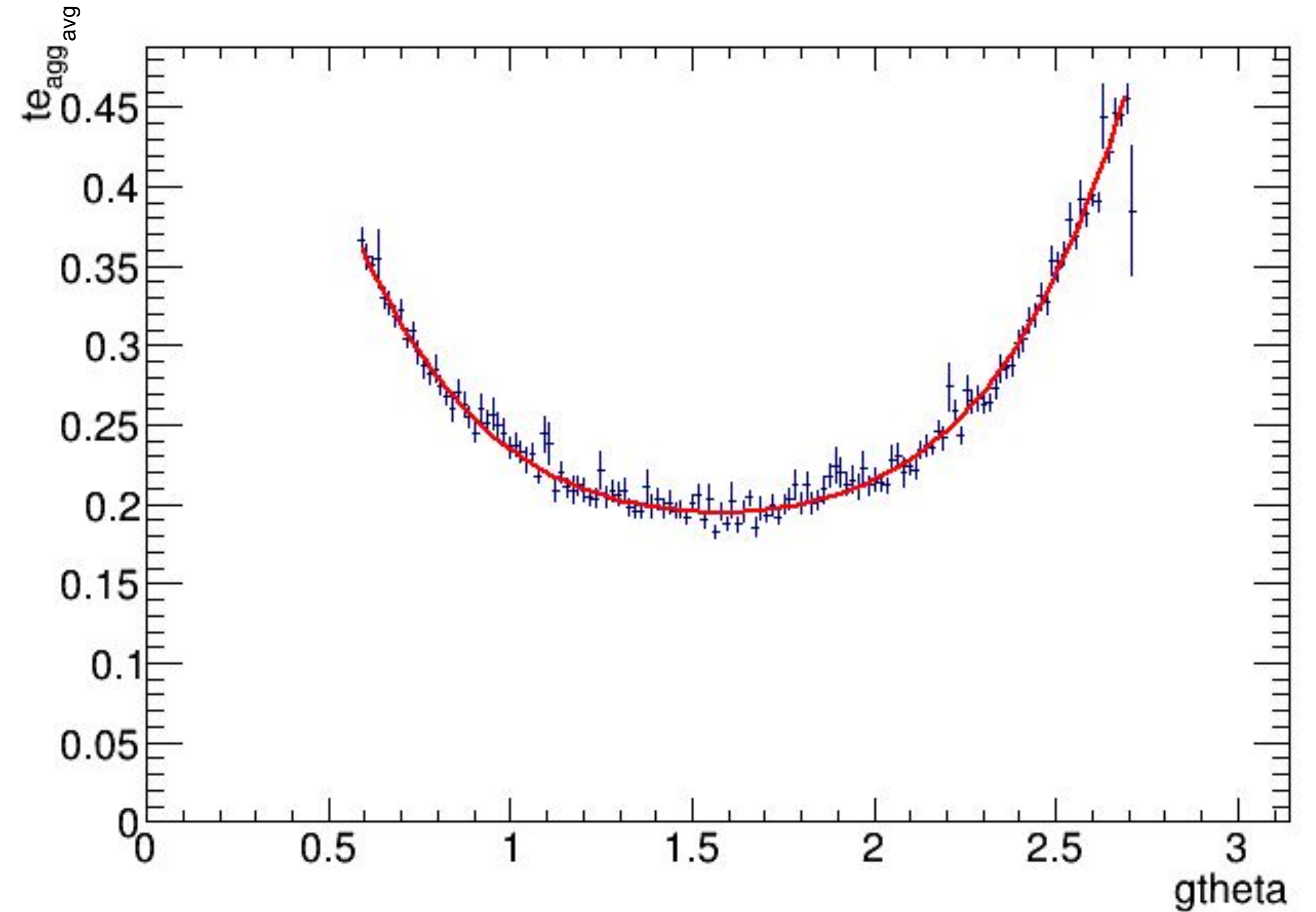
# CEMC ( $\mu^-$ )

Eta Cut: -1.5 to 1.2



NO.	NAME	VALUE	ERROR	STEP SIZE	DERIVATIVE
1	p0	1.94845e-01	9.35383e-04	-0.00000e+00	-1.50770e-06
2	p1	4.94077e-04	2.17832e-03	-0.00000e+00	-4.58798e-05
3	p2	1.15078e-01	3.75753e-03	0.00000e+00	5.91976e-05
4	p3	-1.43306e-03	2.35790e-03	0.00000e+00	-2.72666e-04
5	p4	3.01639e-03	2.66675e-03	2.66675e-03	-1.11749e-04

reduced\_chi2 of eta fit: 1.0485

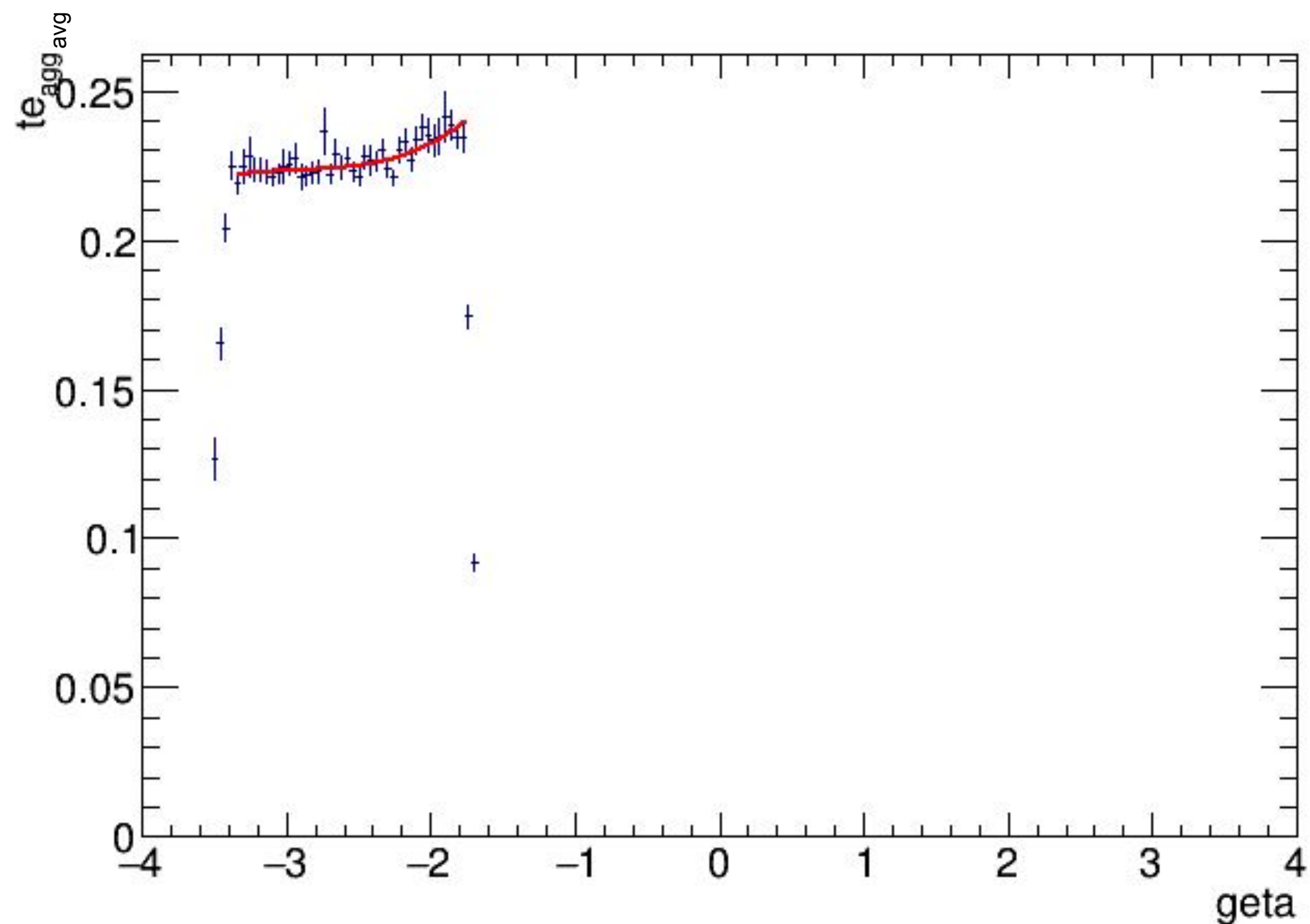


NO.	NAME	VALUE	ERROR	STEP SIZE	DERIVATIVE
1	p0	9.46093e-01	2.68719e-03	-1.23162e-03	4.05204e-08
2	p1	-1.62771e+00	3.43564e-03	3.70185e-03	-5.93767e-07
3	p2	1.37776e+00	1.81743e-03	-3.83630e-03	1.14713e-05
4	p3	-5.49960e-01	8.68094e-04	1.64797e-03	2.56433e-05
5	p4	8.82673e-02	2.50538e-04	2.50538e-04	3.20234e-04

reduced\_chi2 of theta fit: 1.03869

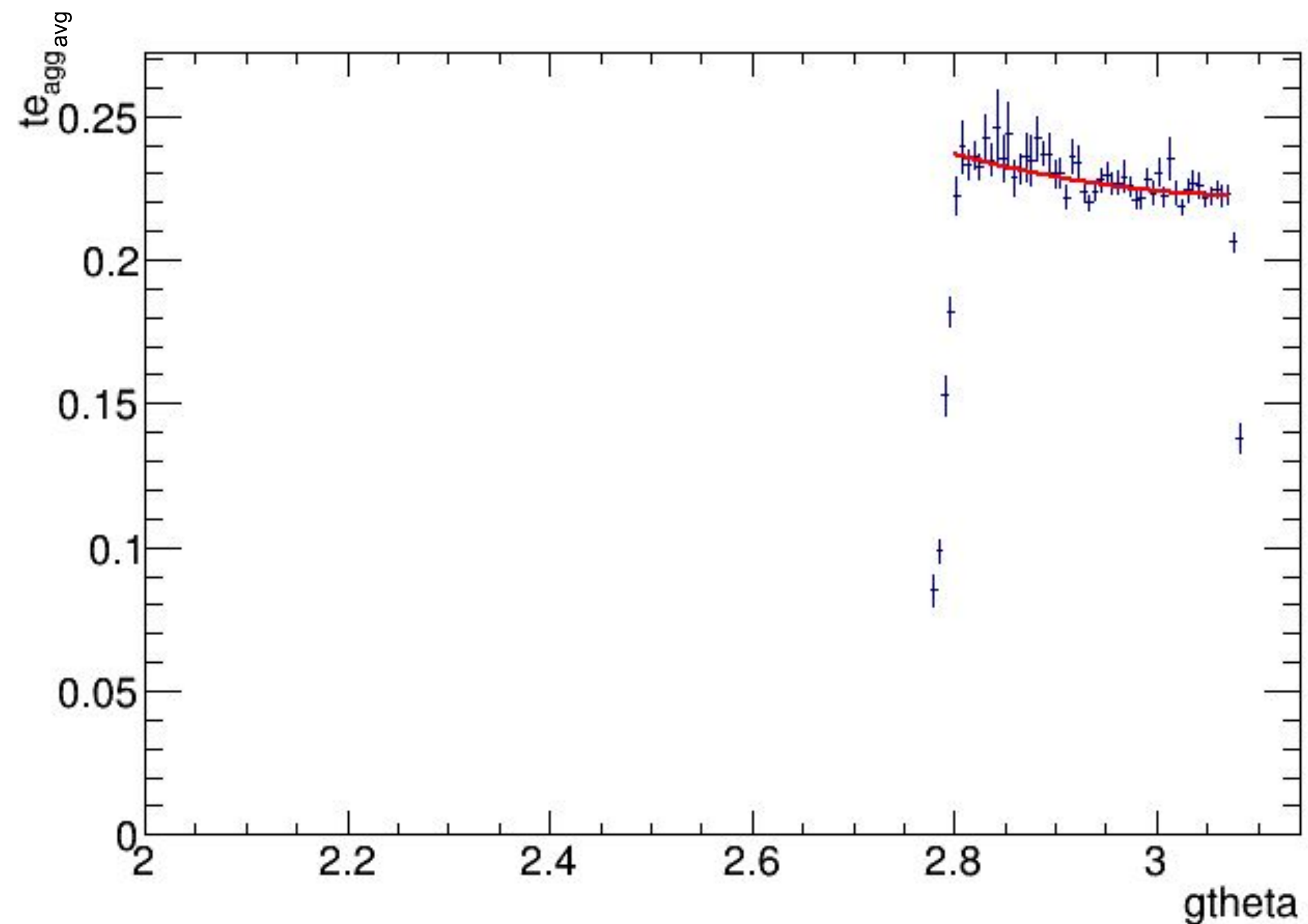
# EEMC ( $\mu^-$ )

Eta Cut: -3.5 to -1.7



NO.	NAME	VALUE	ERROR	STEP SIZE	DERIVATIVE
1	p0	4.51965e-01	5.00583e-03	-4.21678e-03	-5.94867e-08
2	p1	2.31518e-01	3.04097e-03	-5.14272e-03	-8.62813e-07
3	p2	7.88635e-02	1.10185e-03	-2.05023e-03	1.60892e-06
4	p3	9.03567e-03	2.67367e-04	2.67367e-04	-5.27643e-02

reduced\_chi2 of eta fit: 0.814982

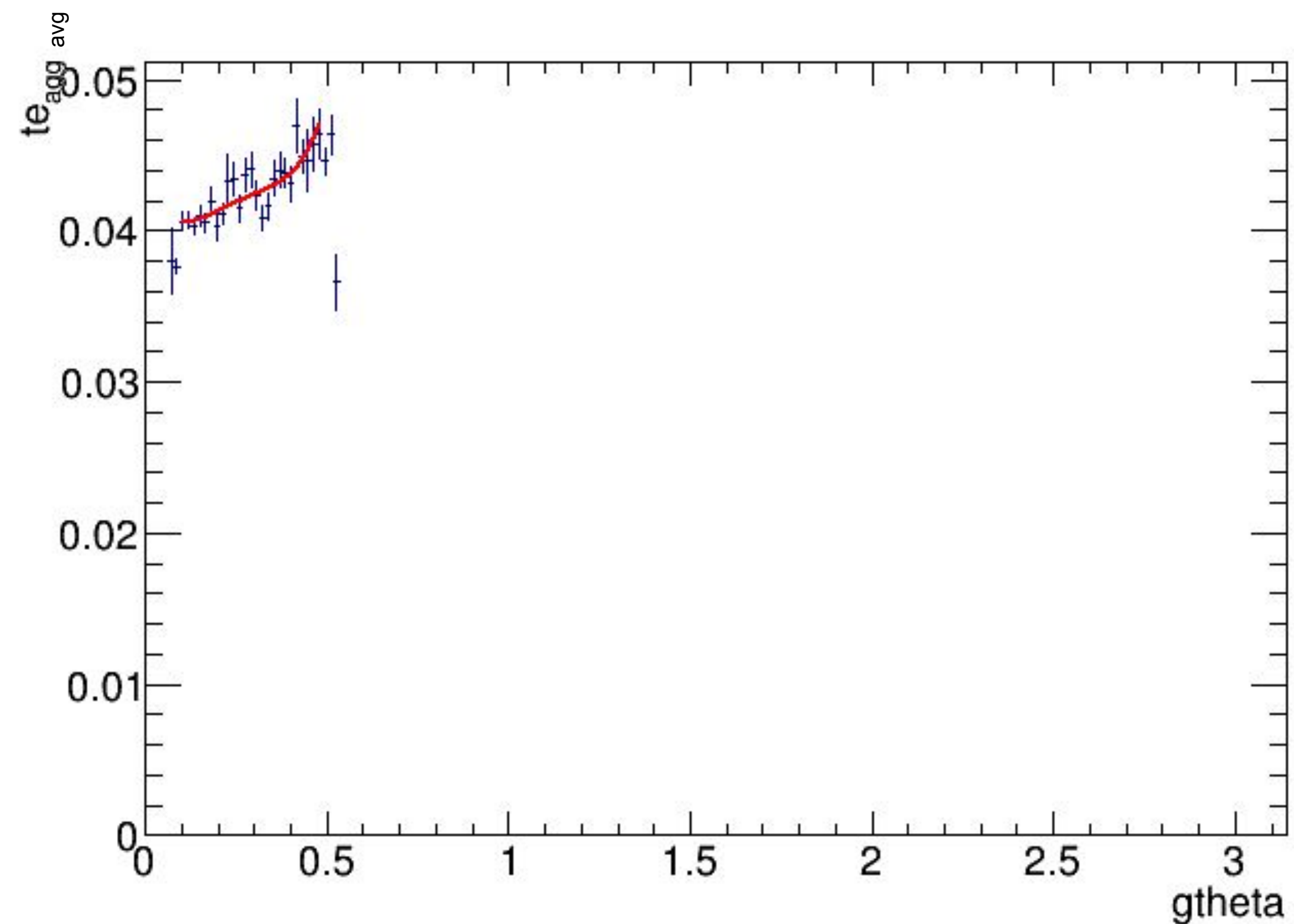
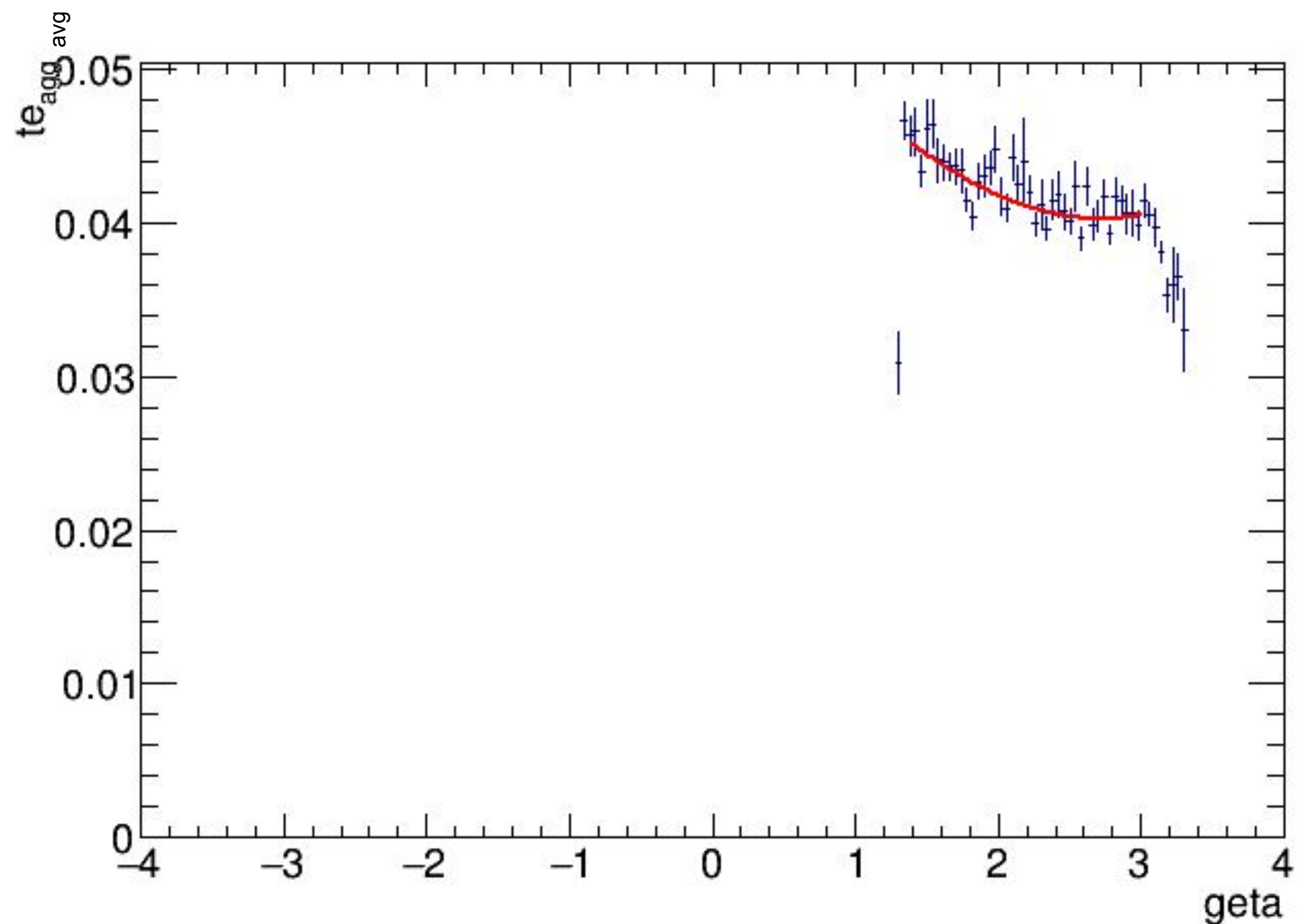


NO.	NAME	VALUE	ERROR	STEP SIZE	DERIVATIVE
1	p0	1.03079e+00	6.99031e-03	-4.65255e-03	-5.18702e-02
2	p1	-2.47907e-01	2.67585e-03	8.35636e-04	2.87235e-01
3	p2	-9.28756e-02	8.98590e-04	1.03799e-03	-4.64340e-01
4	p3	2.86192e-02	2.66376e-04	2.66376e-04	-9.07797e-02

reduced\_chi2 of theta fit: 1.09651

# FEMC ( $\mu^-$ )

Eta Cut: 1.3 to 3.3



NO.	NAME	VALUE	ERROR	STEP SIZE	DERIVATIVE
1	p0	9.35181e-02	1.22226e-03	-8.09464e-04	3.02904e-06
2	p1	-7.89414e-02	8.46330e-04	1.55244e-03	5.29057e-06
3	p2	4.86322e-02	3.51025e-04	-1.09423e-03	1.18692e-06
4	p3	-1.43450e-02	1.34066e-04	3.36191e-04	3.74049e-05
5	p4	1.64902e-03	3.80323e-05	3.80323e-05	-1.85684e+00

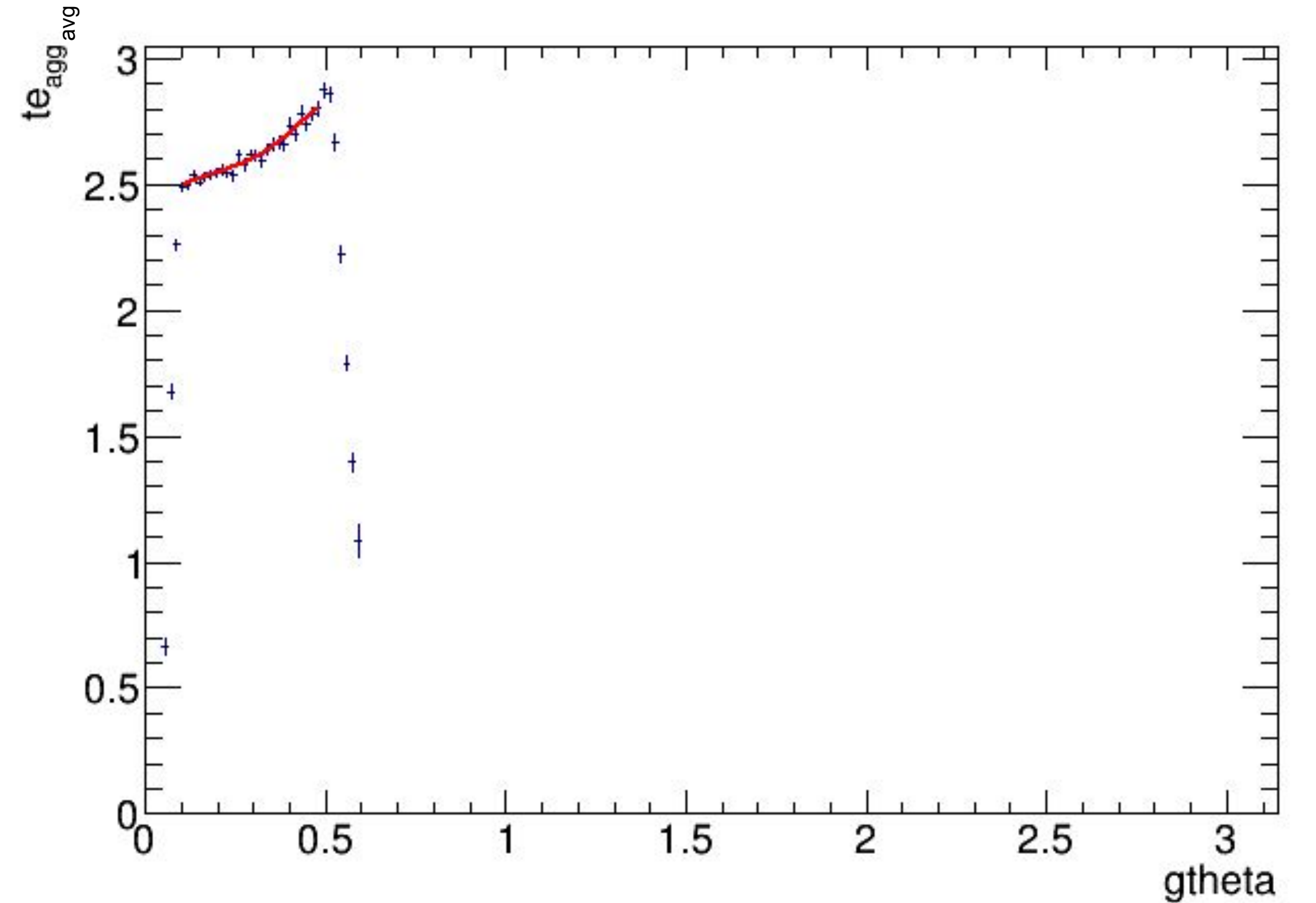
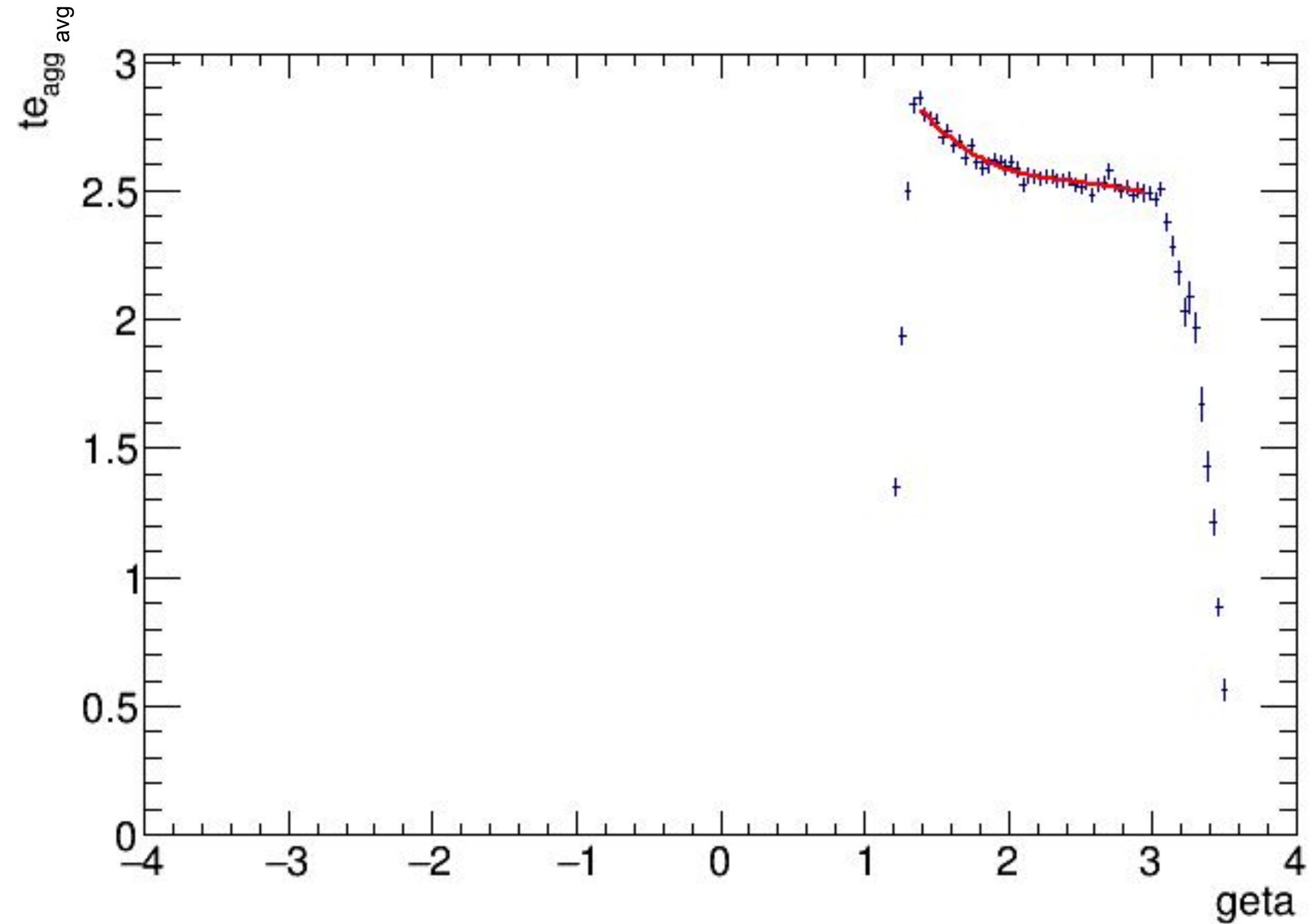
reduced\_chi2 of eta fit: 1.4317

NO.	NAME	VALUE	ERROR	STEP SIZE	DERIVATIVE
1	p0	4.36565e-02	7.74845e-04	-3.89325e-04	1.24100e-07
2	p1	-6.83936e-02	7.24731e-03	7.19970e-03	-2.15257e-09
3	p2	5.00696e-01	2.35243e-02	-4.53787e-02	-1.48674e-08
4	p3	-1.35548e+00	6.59022e-02	1.16653e-01	8.33137e-10
5	p4	1.33188e+00	1.04638e-01	1.04638e-01	-5.47501e-08

reduced\_chi2 of theta fit: 1.08146

# FHCAL ( $\mu^-$ )

Eta Cut: 1.2 to 3.5



NO.	NAME	VALUE	ERROR	STEP SIZE	DERIVATIVE
1	p0	8.30650e+00	2.50419e-02	2.44351e-01	-5.27981e-01
2	p1	-8.63452e+00	1.76507e-02	-3.12121e-01	-1.38084e+00
3	p2	4.08401e+00	7.56450e-03	6.61341e-02	-3.65948e+00
4	p3	-6.76657e-02	3.04020e-03	4.17057e-02	-9.77852e+00
5	p4	-3.74820e-01	1.20352e-03	-5.63498e-03	-2.63566e+01
6	p5	-1.29668e-02	4.55972e-04	-7.38257e-03	-7.16833e+01
7	p6	5.02434e-02	1.59789e-04	1.71170e-03	-1.95763e+02
8	p7	-8.22216e-03	4.88074e-05	4.88074e-05	1.39033e+01

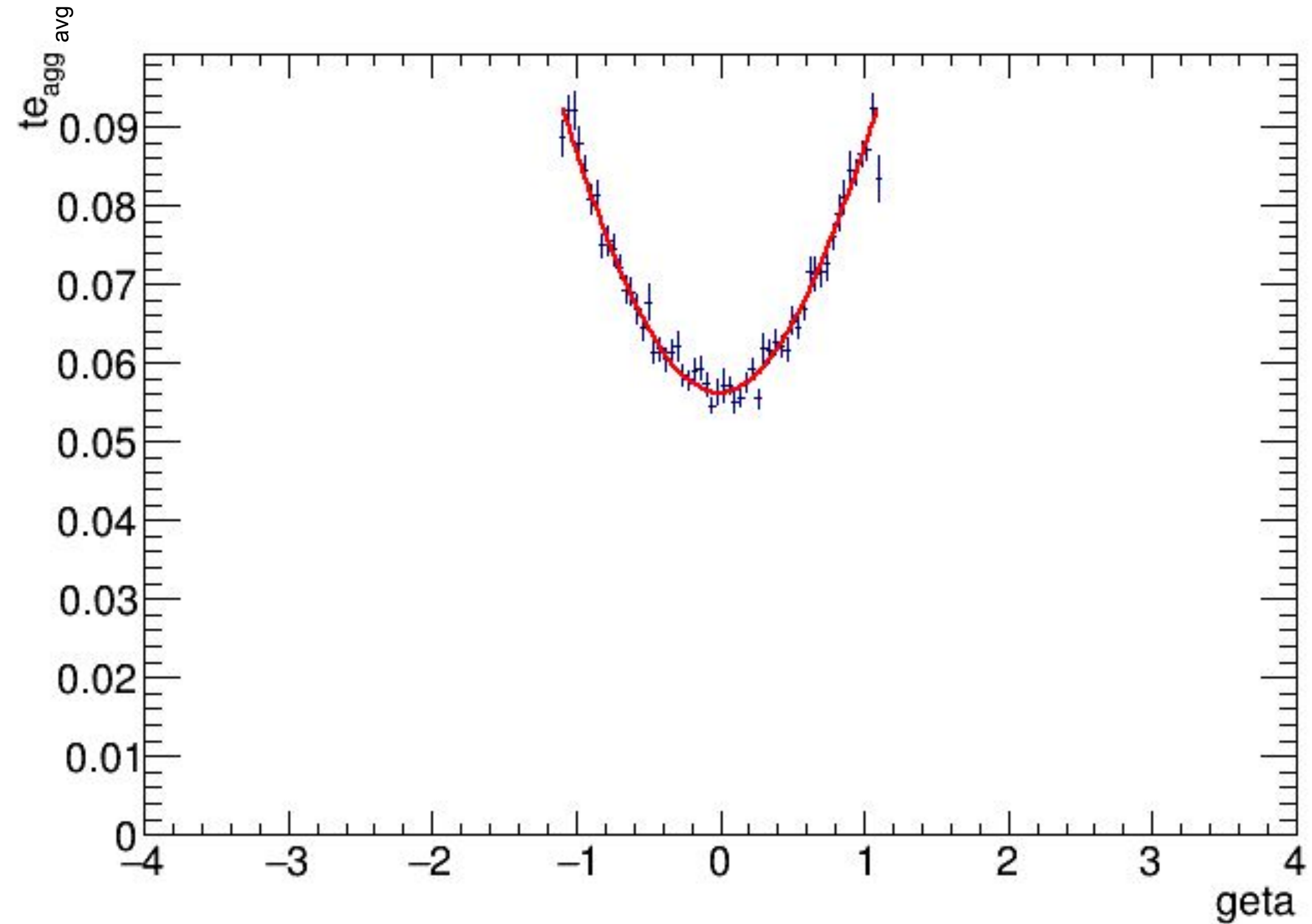
reduced\_chi2 of eta fit: 0.853865

NO.	NAME	VALUE	ERROR	STEP SIZE	DERIVATIVE
1	p0	2.30284e+00	1.81047e-02	5.49815e-03	1.81897e-03
2	p1	3.21492e+00	1.38529e-01	-1.01038e-01	-1.47702e-03
3	p2	-1.86445e+01	4.12235e-01	6.05647e-01	4.55428e-04
4	p3	5.96104e+01	1.10067e+00	-9.77580e-01	-8.92161e-04
5	p4	-1.01093e+02	2.69696e+00	-2.97893e+00	6.91230e-05
6	p5	1.11858e+02	5.98161e+00	1.17641e+01	-9.36758e-05
7	p6	-6.73774e+01	1.06479e+01	1.06479e+01	2.78213e-06

reduced\_chi2 of theta fit: 1.22502

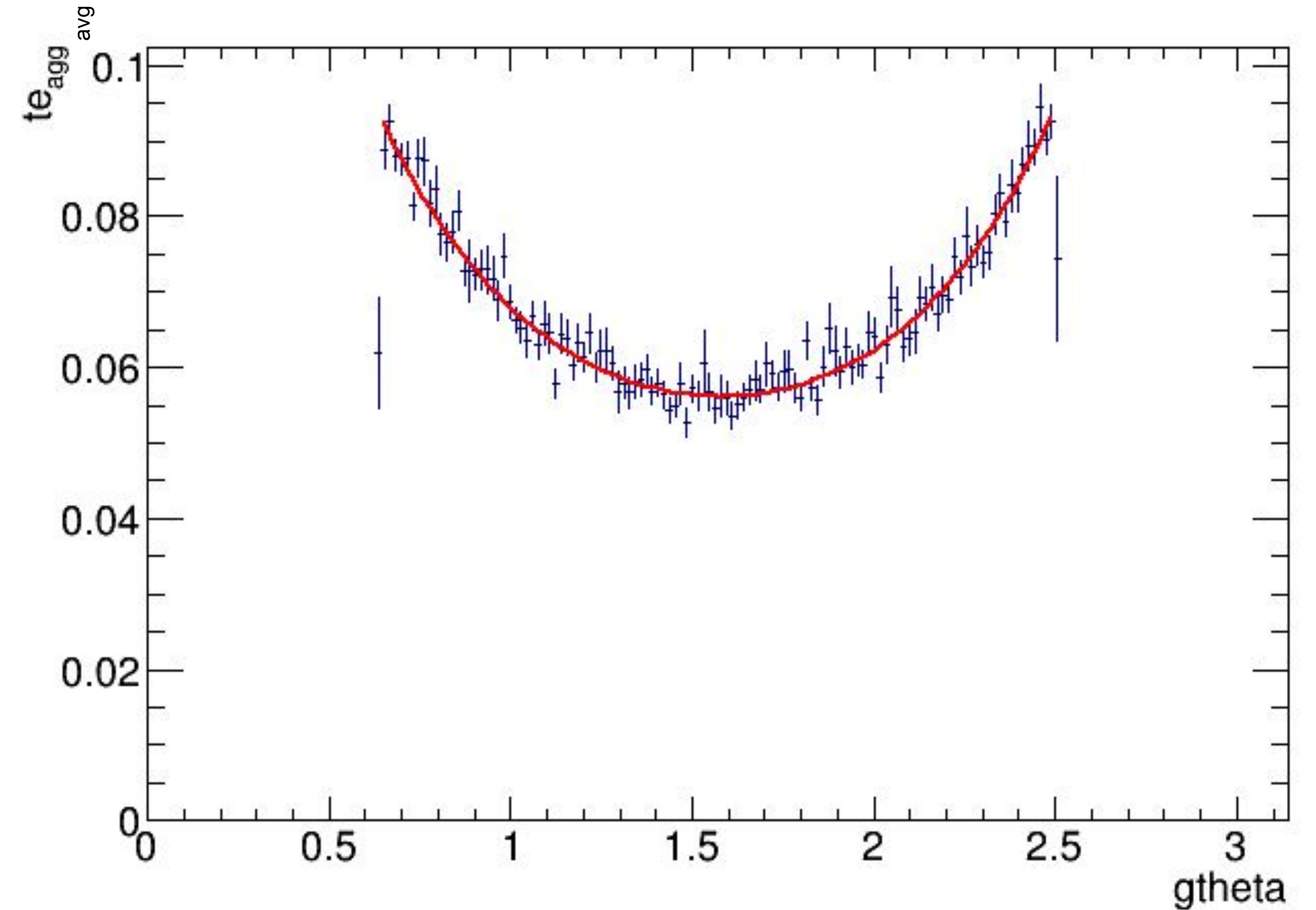
# HCALIN ( $\mu^-$ )

Eta Cut: -1.1 to 1.1



NO.	NAME	VALUE	ERROR	STEP SIZE	DERIVATIVE
1	p0	5.61465e-02	3.41979e-04	2.95035e-10	8.41639e-04
2	p1	3.03267e-04	8.42357e-04	2.17219e-10	1.56243e-04
3	p2	3.47987e-02	2.06406e-03	-5.79626e-10	-2.50745e-04
4	p3	-4.31481e-04	1.09246e-03	-2.18127e-10	3.24973e-05
5	p4	-3.81682e-03	1.97473e-03	1.97473e-03	-3.65148e-09

reduced\_chi2 of eta fit: 1.23514



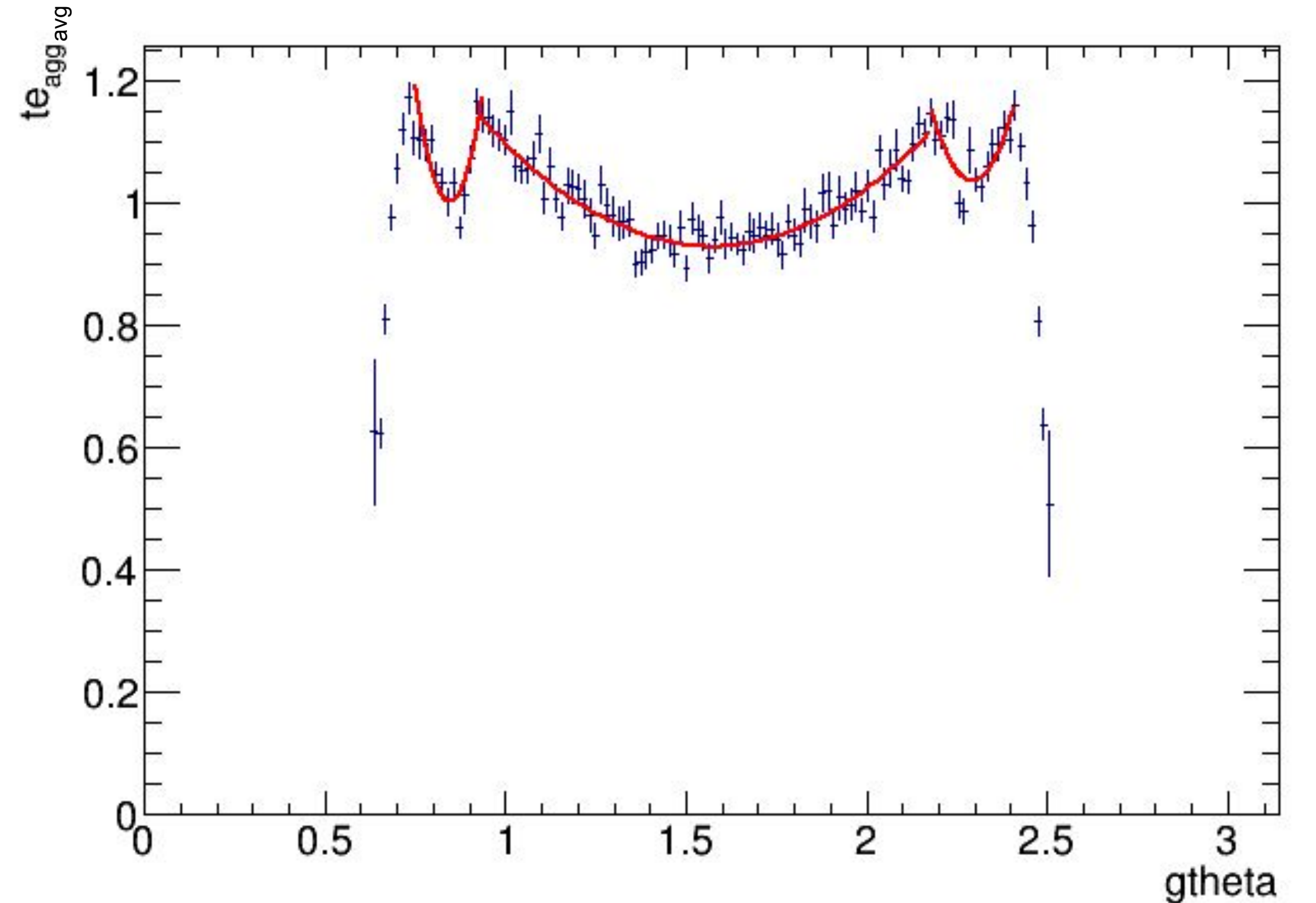
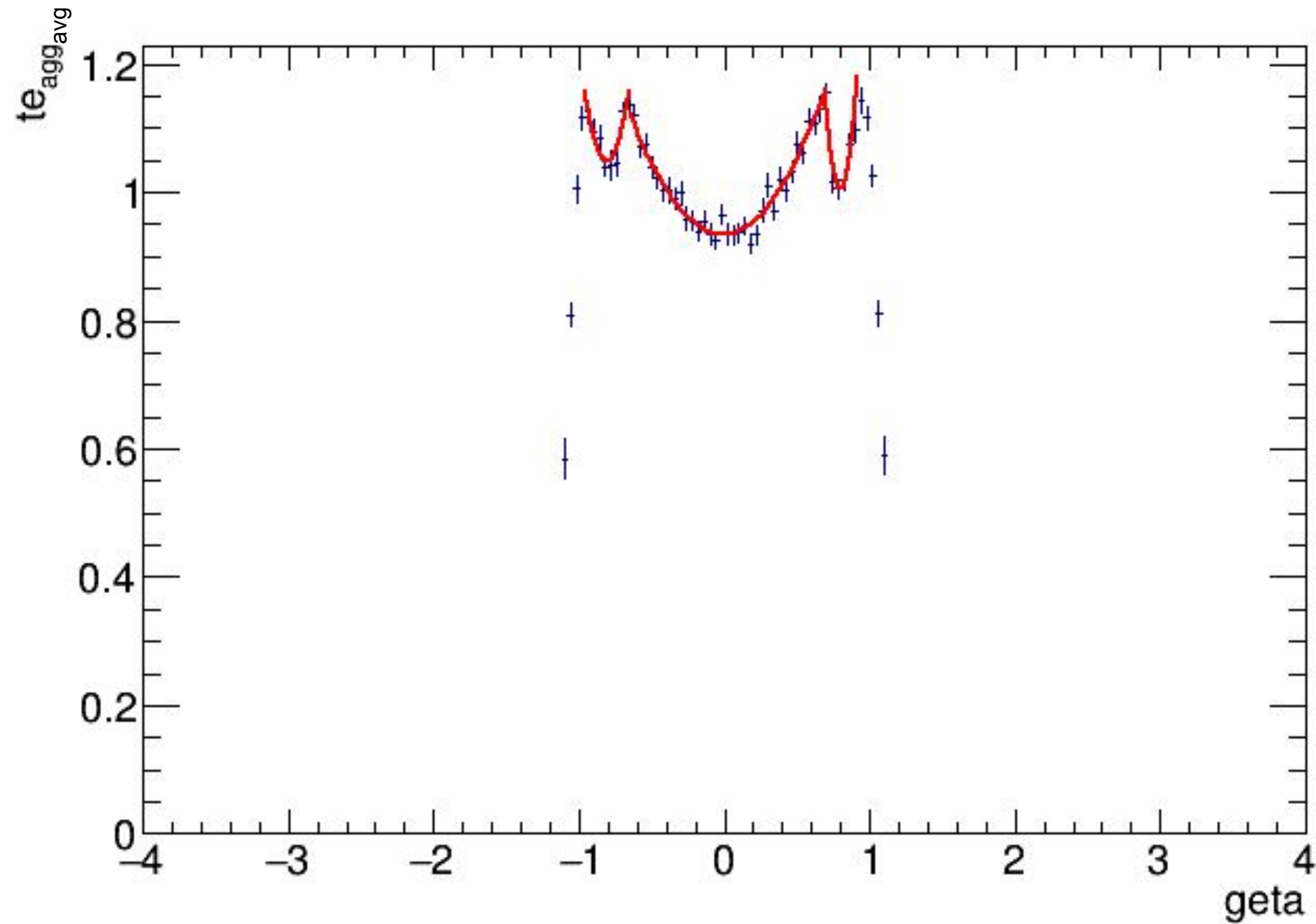
NO.	NAME	VALUE	ERROR	STEP SIZE	DERIVATIVE
1	p0	2.15896e-01	1.03648e-03	-4.88401e-04	-1.20050e-06
2	p1	-3.09861e-01	1.31769e-03	1.48905e-03	1.02986e-06
3	p2	2.35645e-01	7.23488e-04	-1.58968e-03	-7.15912e-07
4	p3	-8.79206e-02	3.65872e-04	7.11033e-04	-1.75619e-05
5	p4	1.41715e-02	1.13378e-04	1.13378e-04	-1.09813e-01

reduced\_chi2 of theta fit: 0.979428



# HCALOUT ( $\mu^-$ )

Eta Cut: -1.1 to 1.1



NO.	NAME	VALUE	ERROR	STEP SIZE	DERIVATIVE
1	p0	4.08095e+00	5.27521e-01	-9.93167e-03	-5.77459e-06
2	p1	7.52848e+00	1.33525e+00	-2.52357e-02	3.78680e-06
3	p2	4.67382e+00	8.35801e-01	8.35801e-01	-7.13959e-06

NO.	NAME	VALUE	ERROR	STEP SIZE	DERIVATIVE
1	p0	9.34219e-01	3.88749e-03	0.00000e+00	-5.22674e-05
2	p1	2.43011e-03	7.50946e-03	0.00000e+00	-2.43201e-05
3	p2	4.56795e-01	1.97596e-02	1.97596e-02	3.93782e-10

NO.	NAME	VALUE	ERROR	STEP SIZE	DERIVATIVE
1	p0	9.29248e+00	1.09423e+00	1.32517e-02	2.61857e-05
2	p1	-2.06757e+01	2.77244e+00	-3.36472e-02	2.32036e-05
3	p2	1.28977e+01	1.74676e+00	1.74676e+00	-6.12366e-06

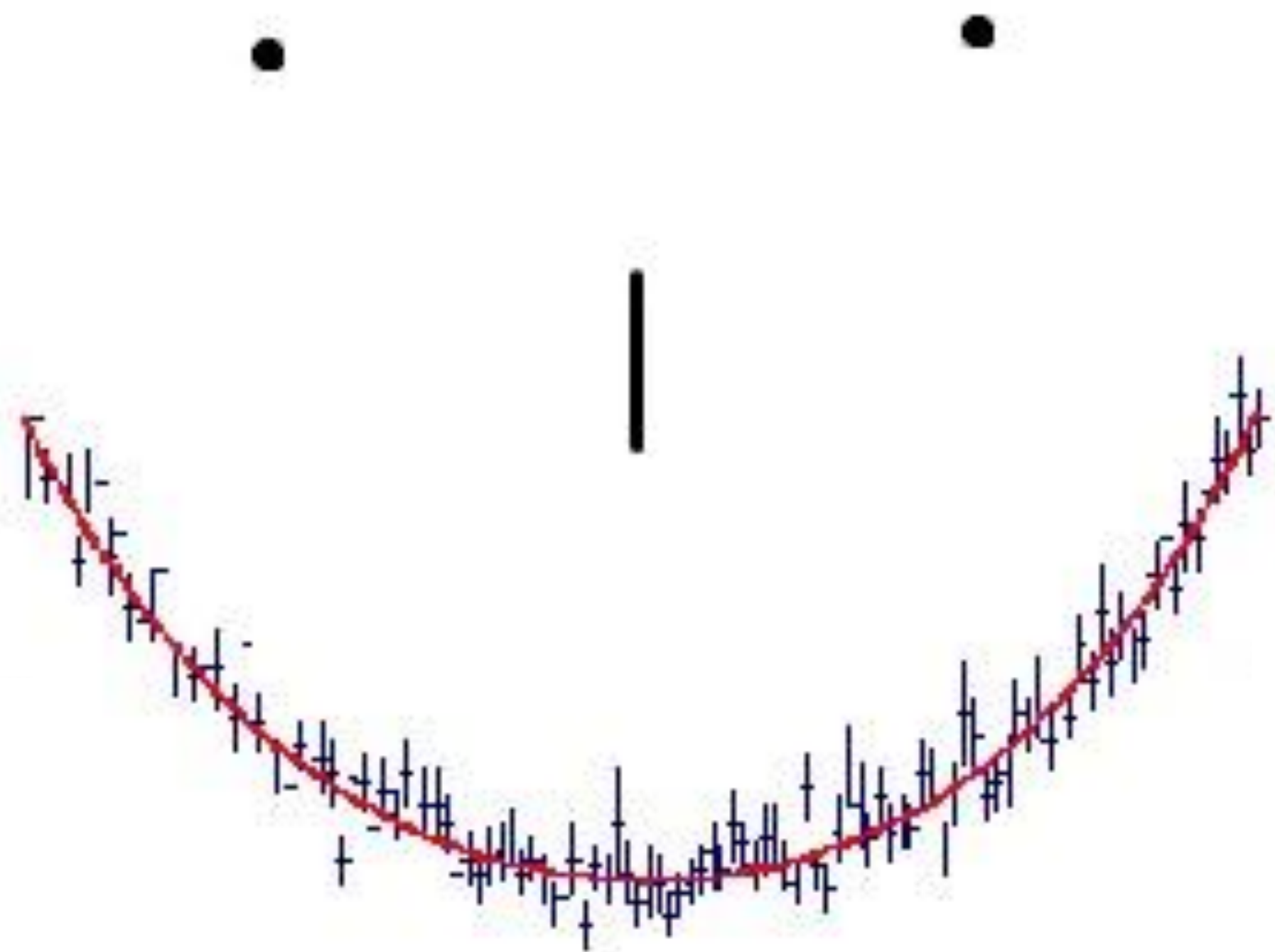
reduced\_chi2 of eta fits from left to right: 1.42869, 0.878345, 3.71622

NO.	NAME	VALUE	ERROR	STEP SIZE	DERIVATIVE
1	p0	4.86677e+01	8.05627e-02	-8.03684e-02	-2.26696e-07
2	p1	-4.15270e+01	4.05824e-02	7.01385e-02	1.74308e-06
3	p2	9.05138e+00	1.52911e-02	1.52911e-02	-3.33788e-04

NO.	NAME	VALUE	ERROR	STEP SIZE	DERIVATIVE
1	p0	2.20021e+00	5.33488e-02	-1.91344e-07	-5.59907e-10
2	p1	-1.61508e+00	7.05121e-02	1.25093e-07	-1.61437e-08
3	p2	5.13099e-01	2.24210e-02	2.24210e-02	1.88085e-08

NO.	NAME	VALUE	ERROR	STEP SIZE	DERIVATIVE
1	p0	1.61510e+01	6.53248e-02	-6.46381e-02	1.28936e-08
2	p1	-3.57654e+01	1.11086e-01	1.52460e-01	-4.21633e-07
3	p2	2.11114e+01	8.95822e-02	8.95822e-02	1.56201e-06

reduced\_chi2 of theta fits from left to right: 2.91675, 1.19352, 3.45801



*That's all folks!*