Error analysis for the Systematic correction

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MARATHON ANALYSIS MEETING

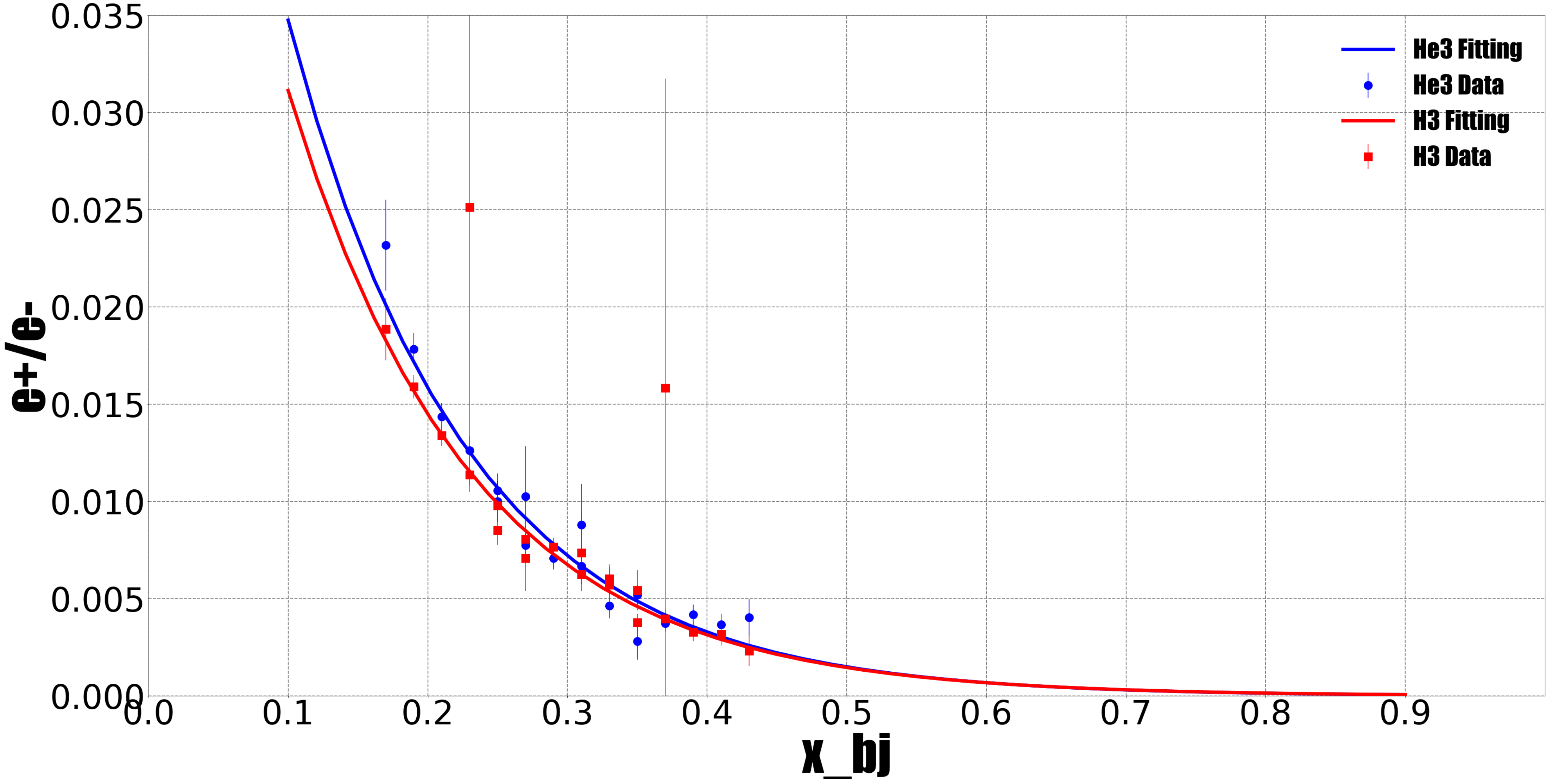
2018/08/16

Positron

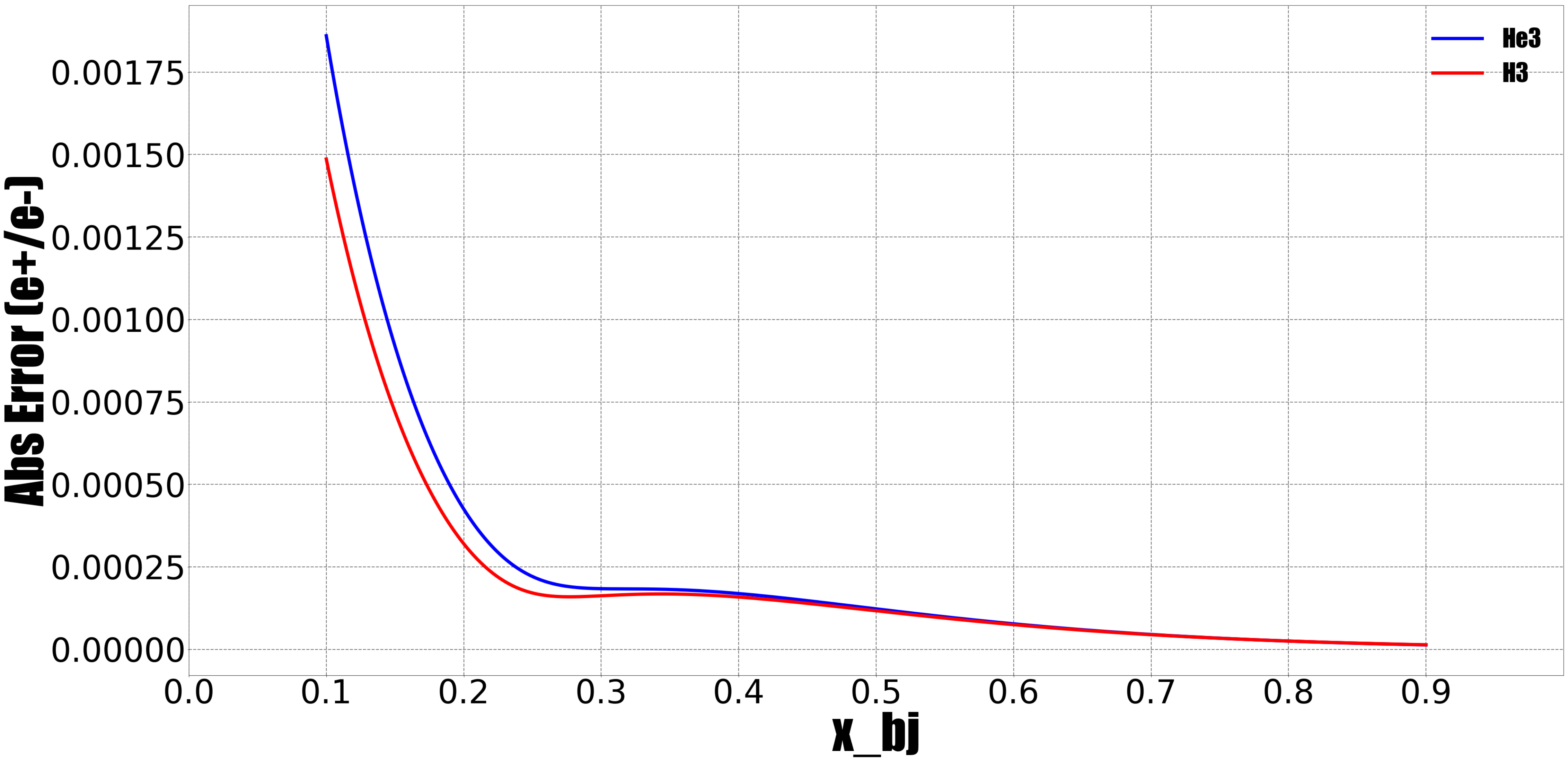
- Use the least square method to fit the e+/e- : $ln\frac{e+}{e-} = \alpha + Bx$
- The fitting value error are determined by covariance matrix
- Propagate the error to the positron corrector of the ratio $\frac{1-\left(\frac{e+}{e-}\right)_{H3}}{1-\left(\frac{e+}{e-}\right)_{He3}}$
- The fitting parameters and covariance matrix of the H3 and He3 target :

$$\binom{\alpha}{B}_{He3} = \binom{-2.573}{-7.862} \; \mathcal{V}_{He3} = \begin{pmatrix} 0.0071 & -0.0263 \\ -0.0263 & 0.1036 \end{pmatrix}$$

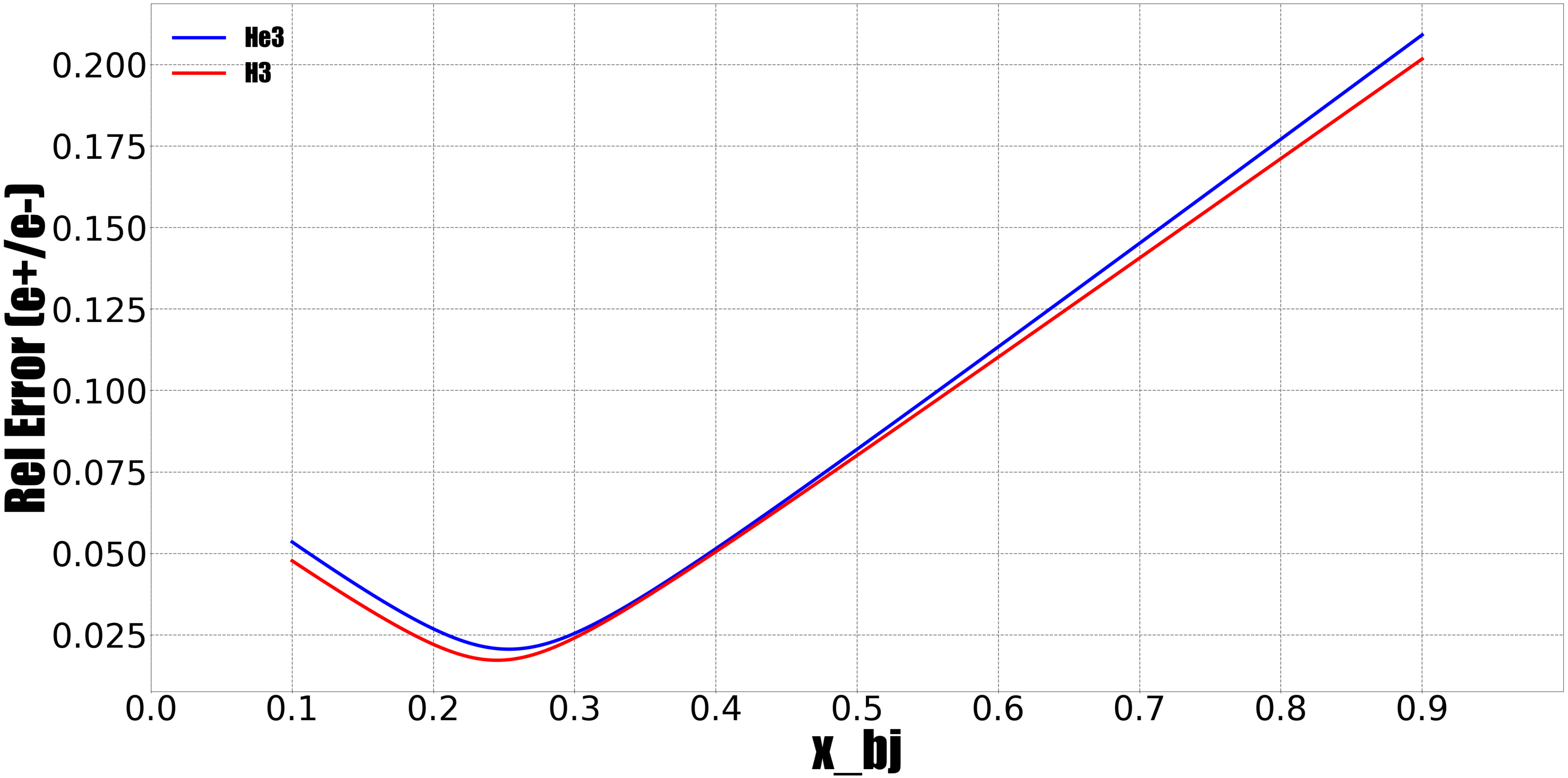
$$\binom{\alpha}{B}_{H3} = \binom{-2.704}{-7.652} \; \mathcal{V}_{He3} = \begin{pmatrix} 0.0059 & -0.0231 \\ -0.0231 & 0.0942 \end{pmatrix}$$



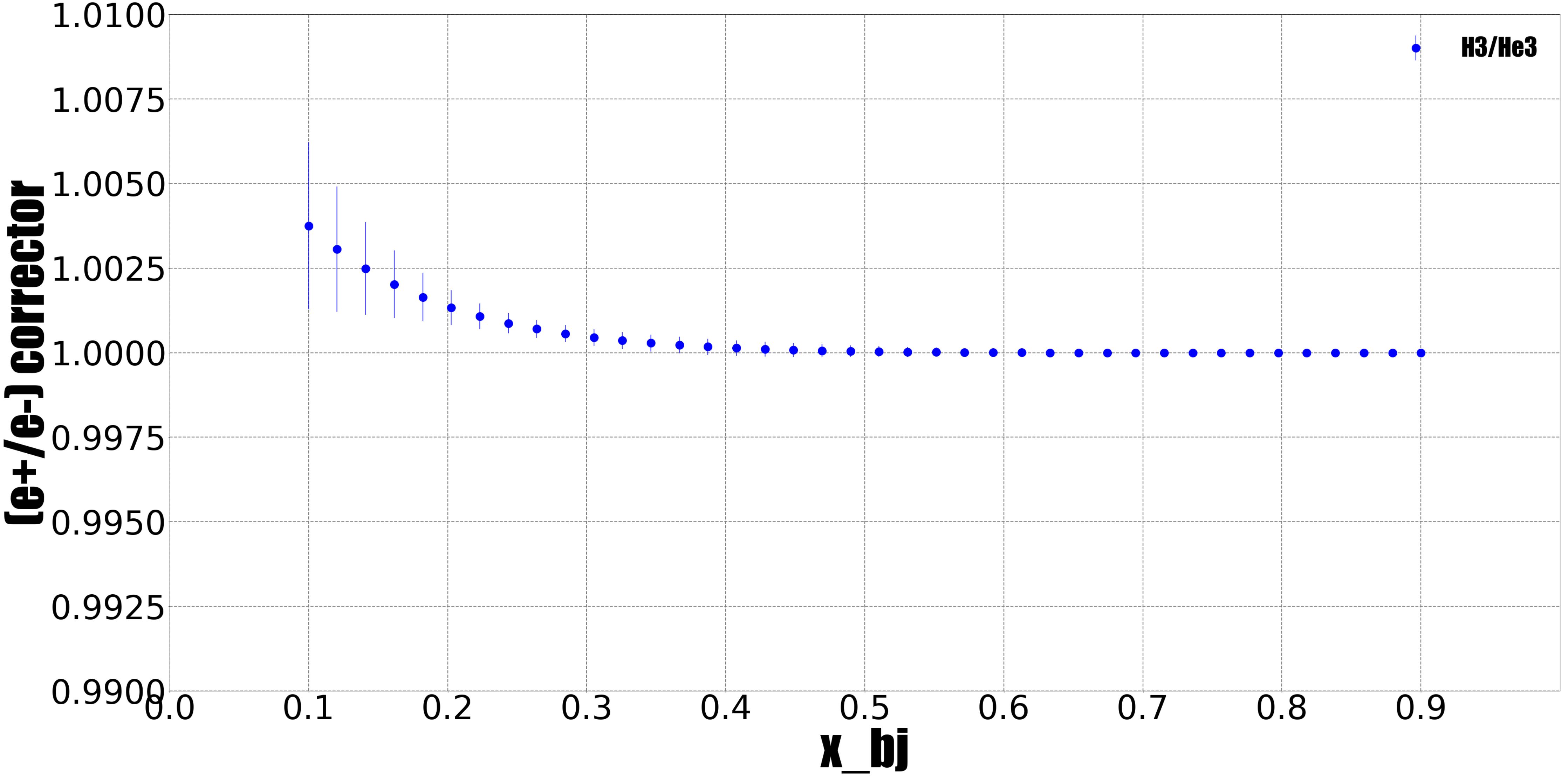
He3 Fitting
He3 Data
H3 Fitting
H3 Data
e+/e-
x_bj
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9



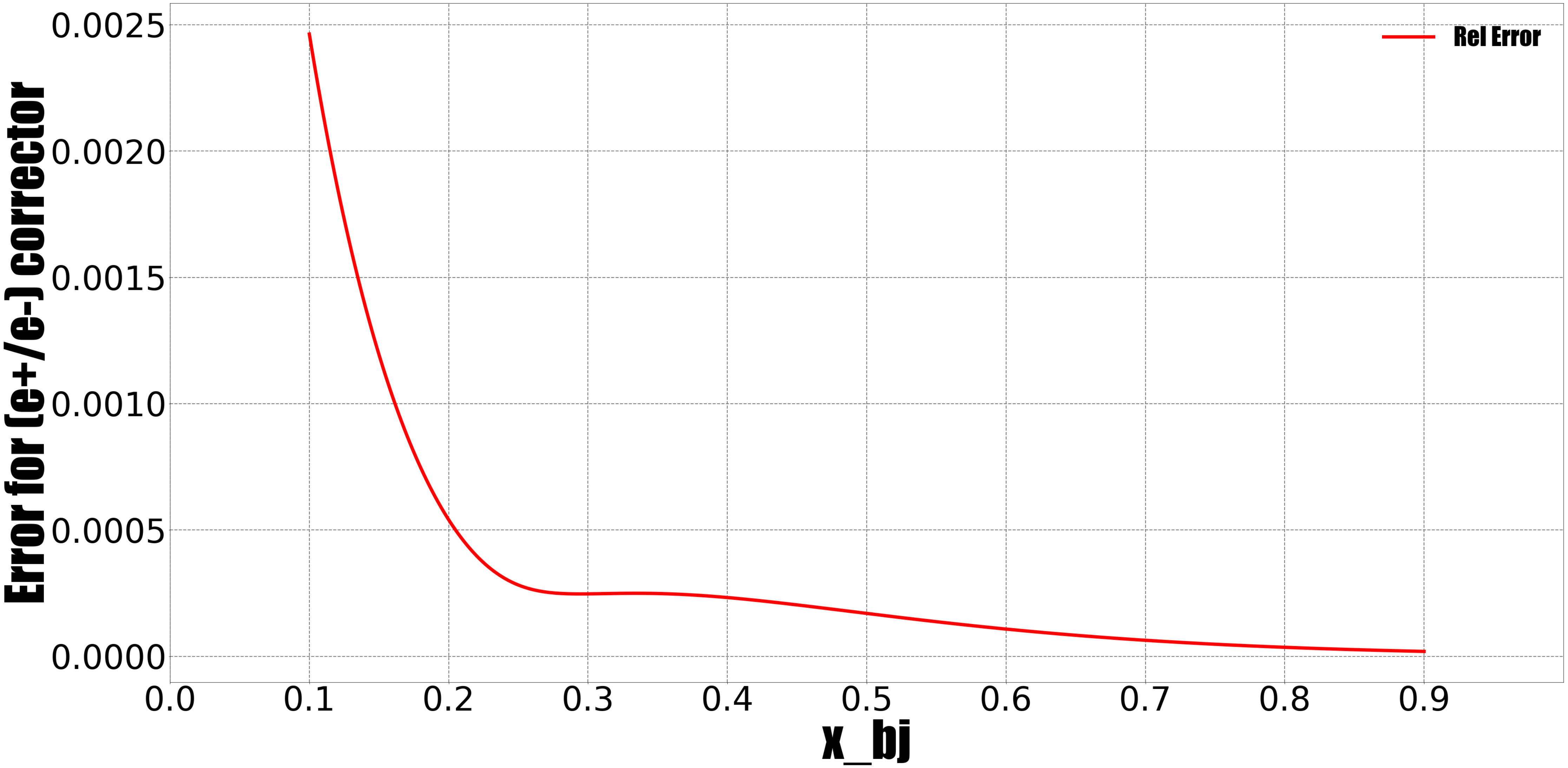
He3
H3
Abs Error (e+/e-)
0.00175
0.00150
0.00125
0.00100
0.00075
0.00050
0.00025
0.00000
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
x_bj



He3
H3
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
Rel Error (e+/e-)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
x_bj



H3/He3
1.0100
1.0075
1.0050
1.0025
1.0000
0.9975
0.9950
0.9925
0.9900
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
[e+/e-] corrector
x_bj

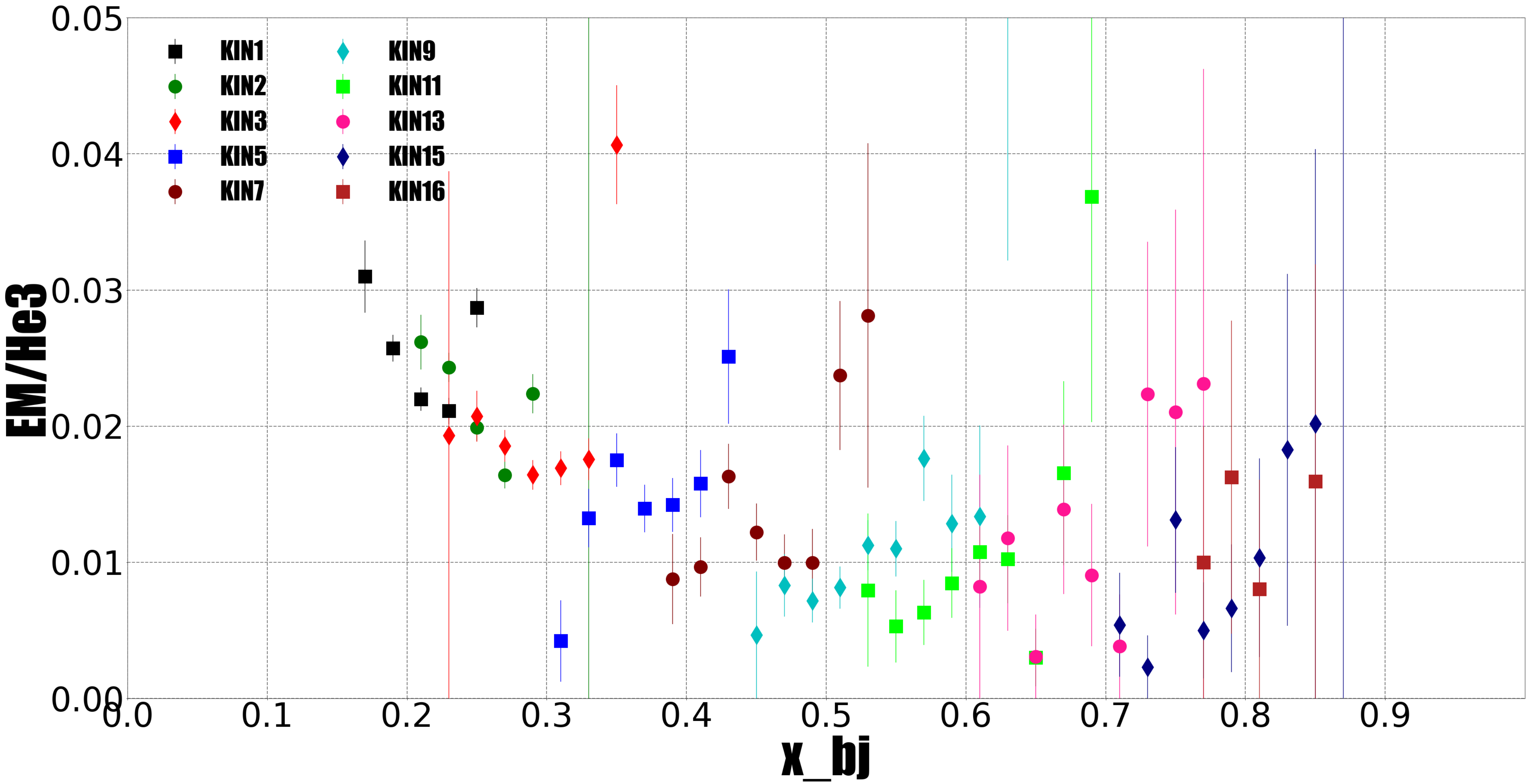


Rel Error
Error for (e+/e-) corrector
x_bj
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9

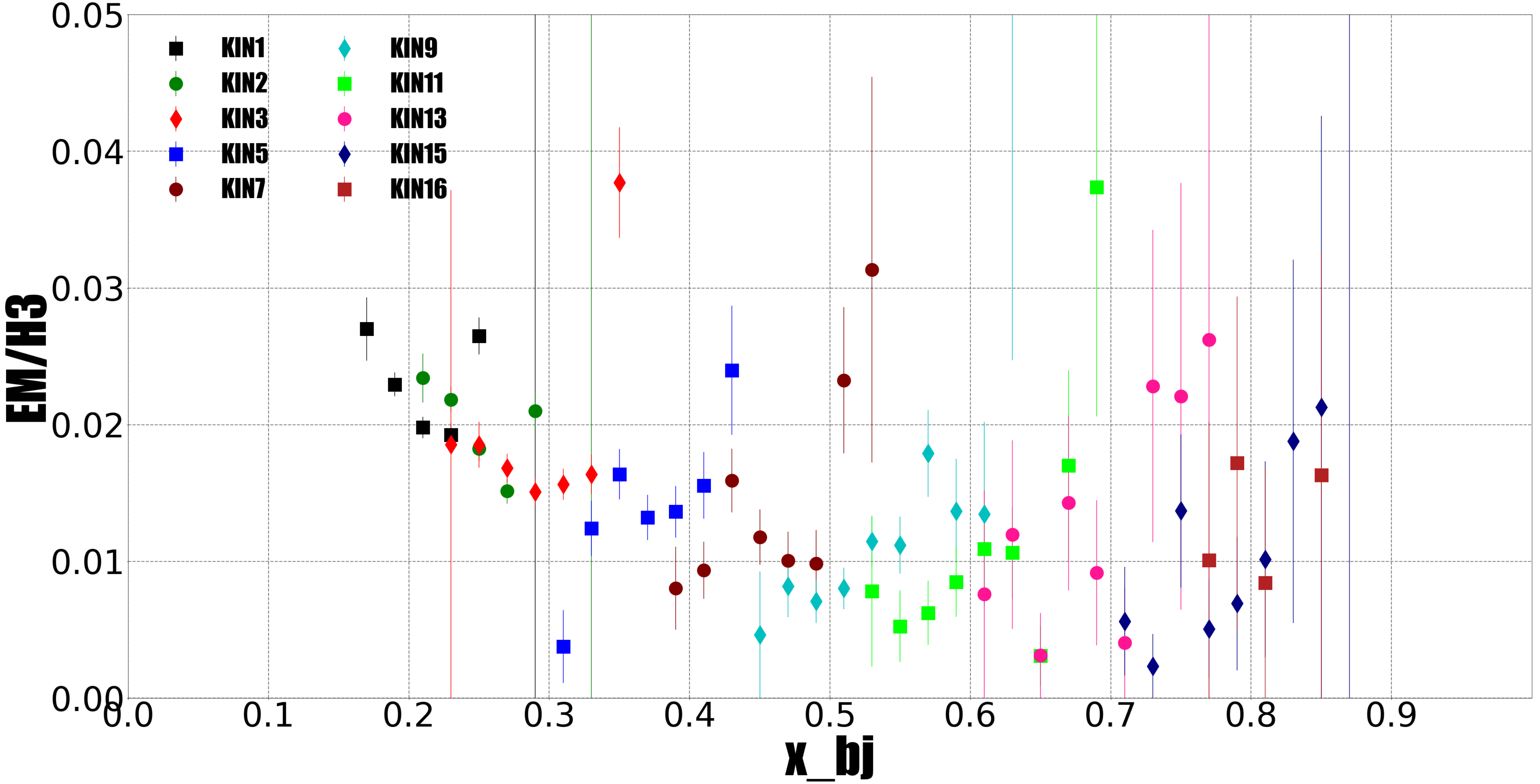
EndCap Contamination

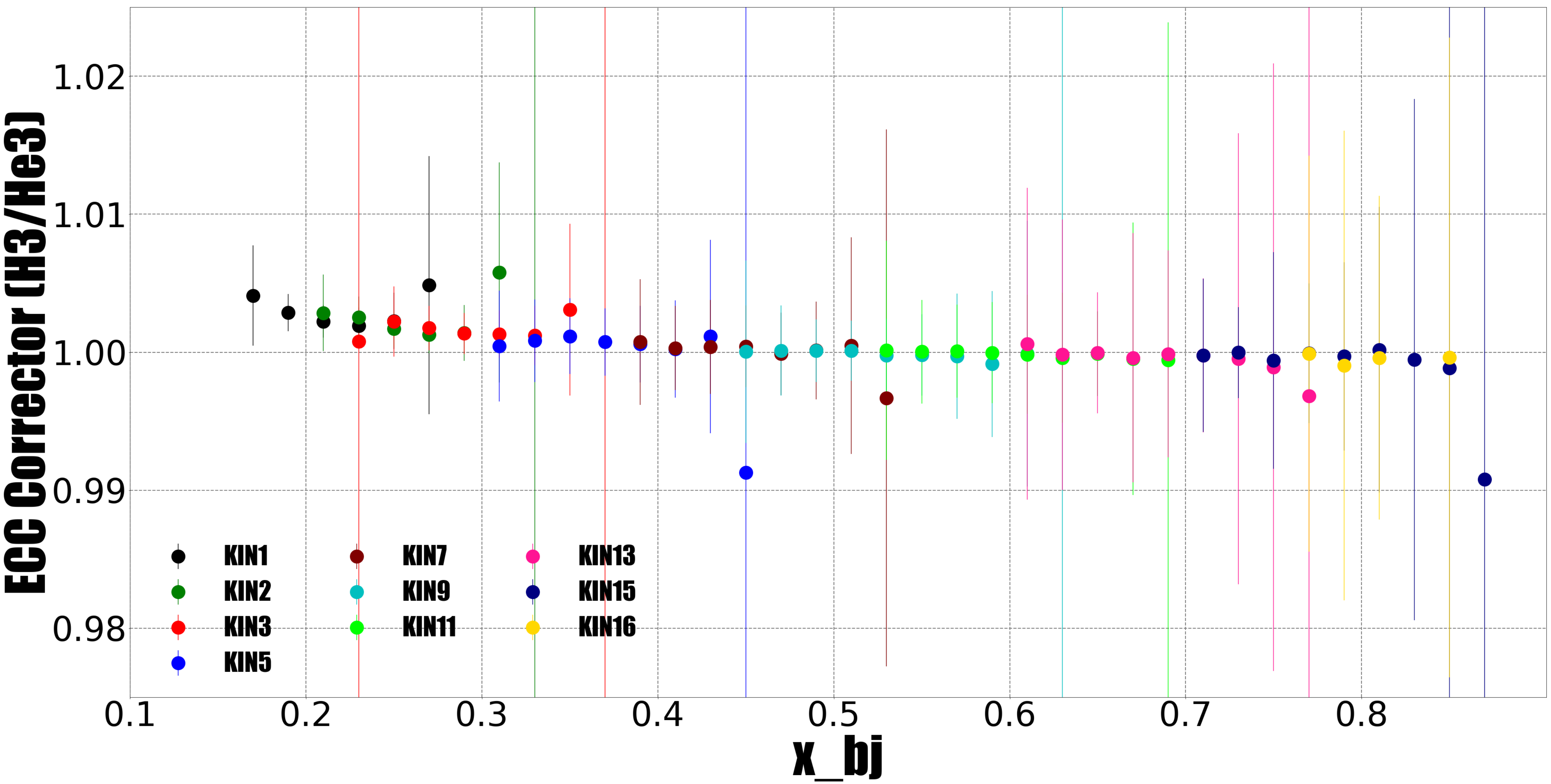
- The contamination is get $\frac{Y_{EM}}{Y_{gas}}$ (function of x_bj)
- $Y = \frac{Ne}{Charge * LT * \rho}$
  1) Ne: same ACC ,PID for both empty cell and gas cell , for VZ just cut the gas part
  2) ρ : the upstream endcap thickness
- Error of the endcap contamination is propagated from statistic error of the individual yields, then propagated the error to the endcap contamination corrector :

$$\frac{1 - ECC_{H3}}{1 - ECC_{He3}}$$

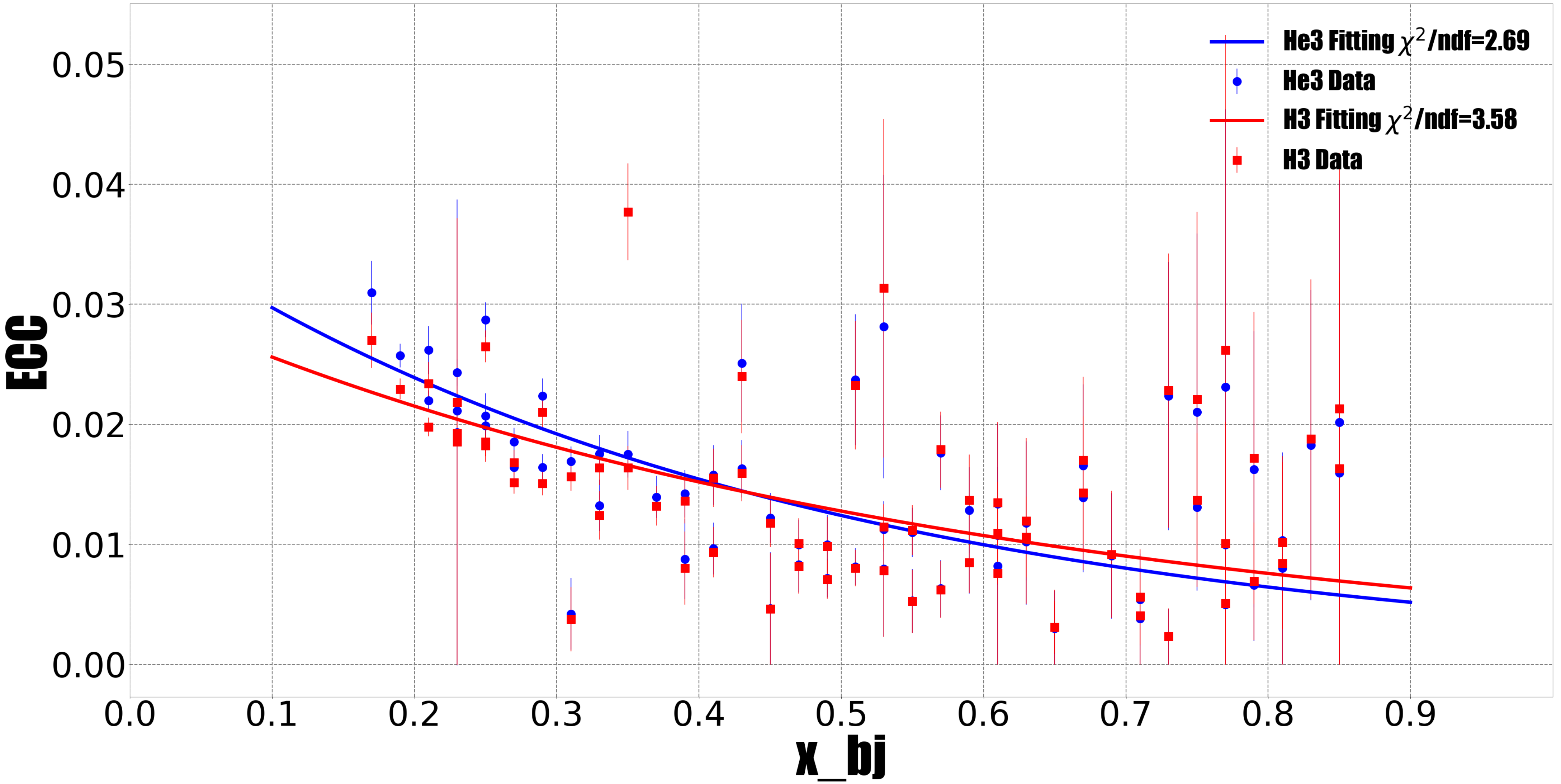


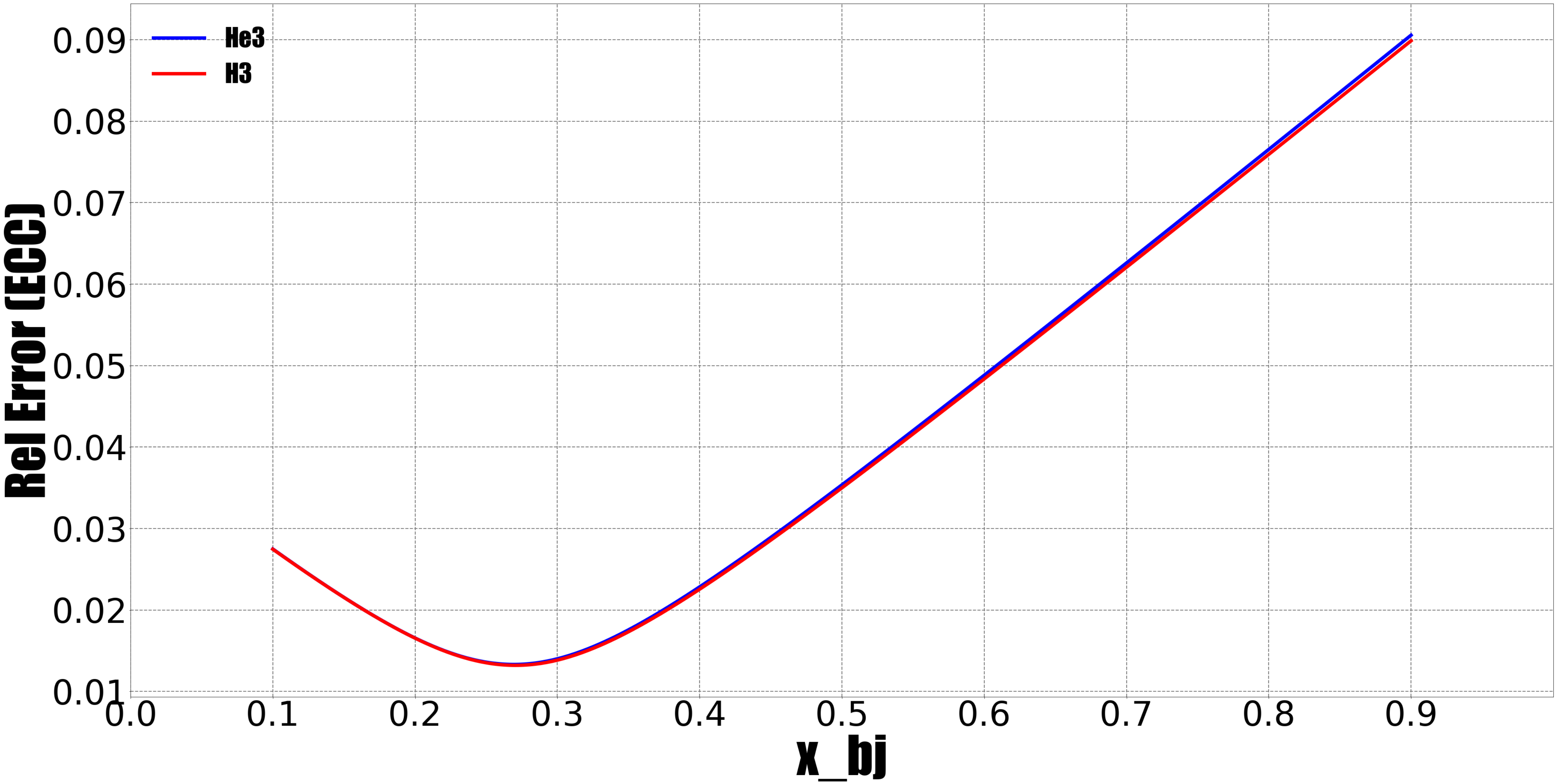
0.05
0.04
0.03
0.02
0.01
0.00
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
EM/He3
x_bj
KIN1
KIN2
KIN3
KIN5
KIN7
KIN9
KIN11
KIN13
KIN15
KIN16


KIN1
KIN2
KIN3
KIN5
KIN7
KIN9
KIN11
KIN13
KIN15
KIN16
EM/H3
x_bj
0.00
0.01
0.02
0.03
0.04
0.05
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9

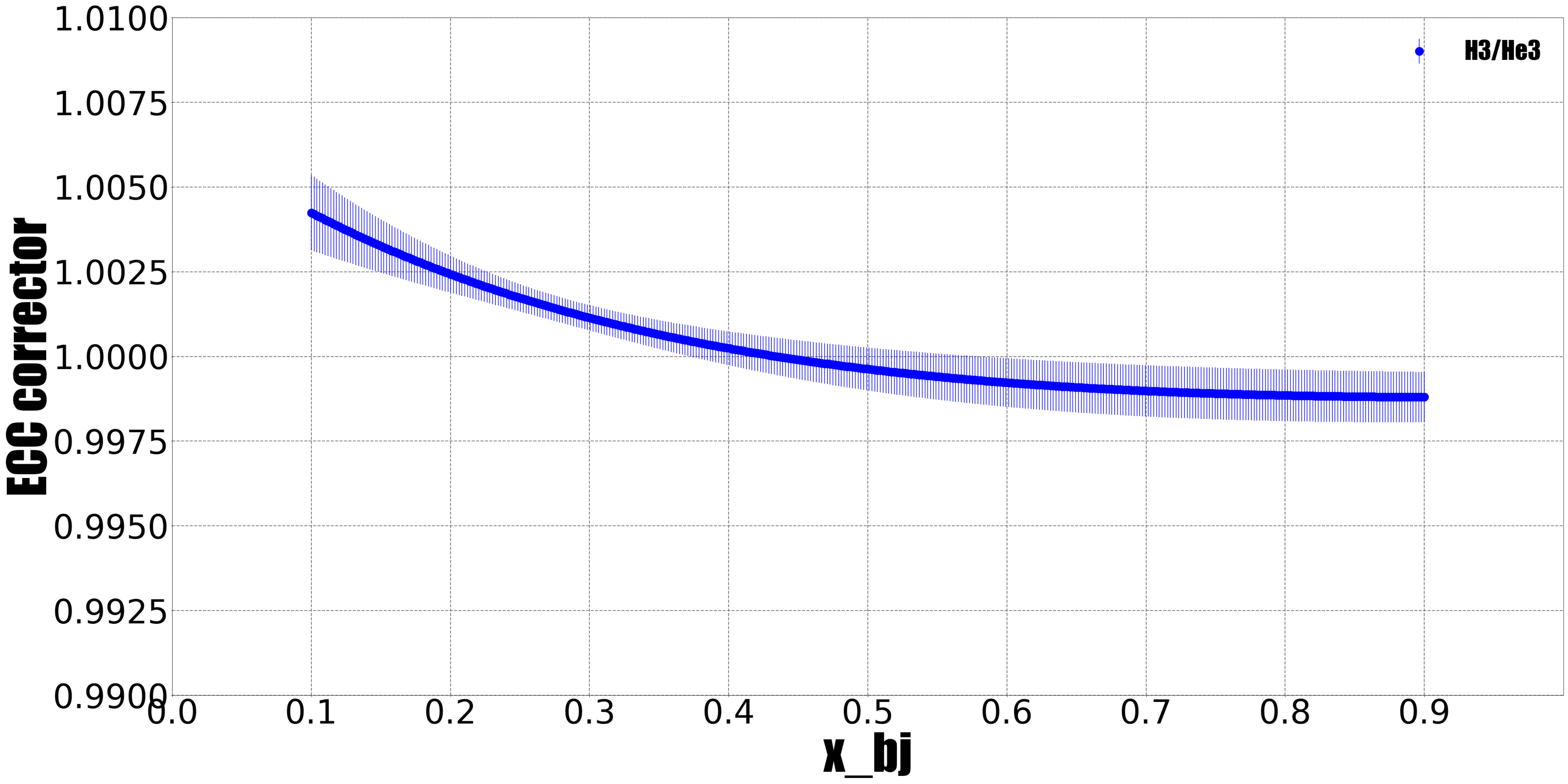


ECC Corrector (H3/He3)
1.02
1.01
1.00
0.99
0.98
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
x_bj
KIN1
KIN2
KIN3
KIN5
KIN7
KIN9
KIN11
KIN13
KIN15
KIN16

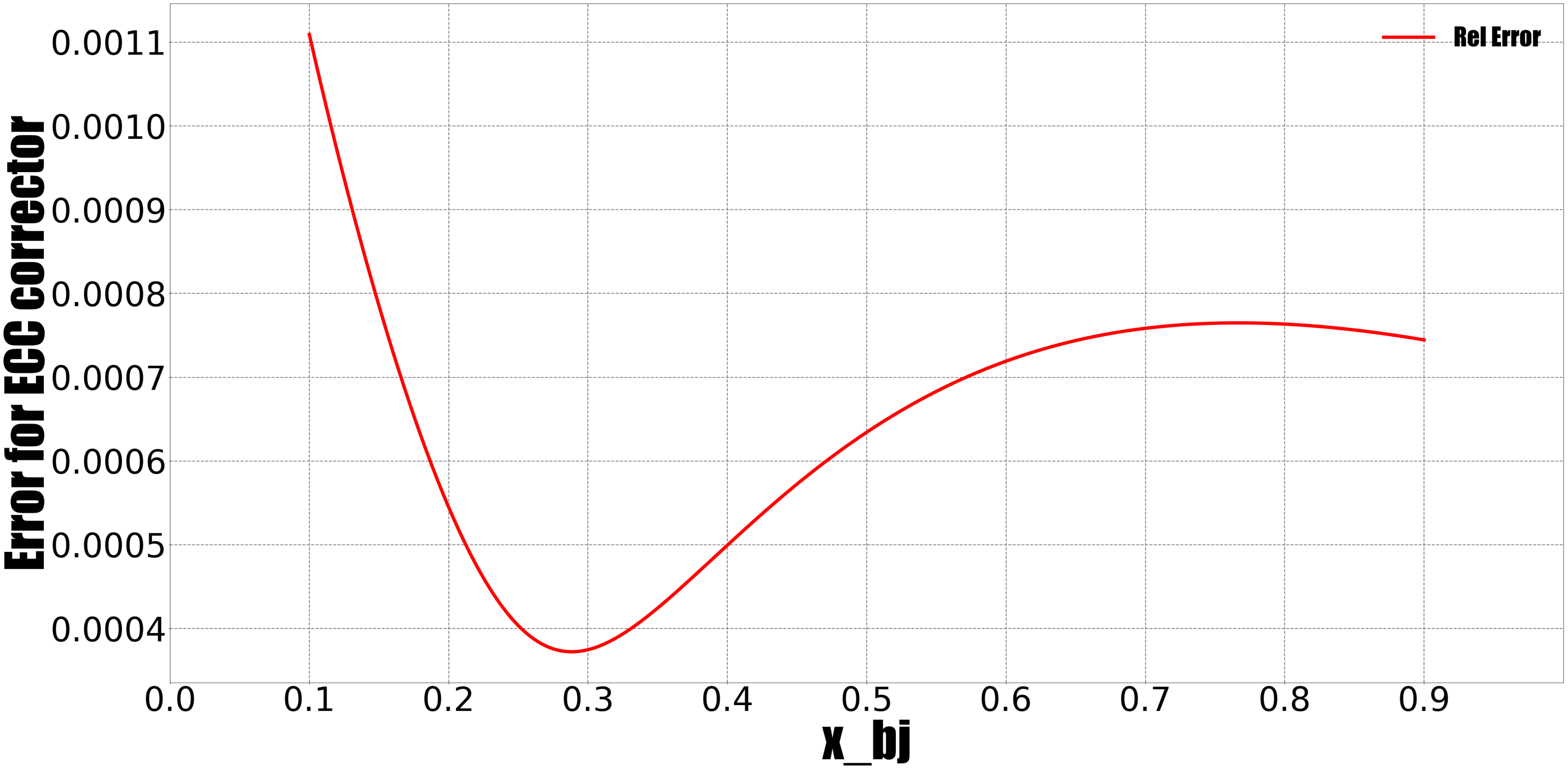

He3 Fitting χ^2/ndf=2.69
He3 Data
H3 Fitting χ^2/ndf=3.58
H3 Data
ECC
x_bj
0.00
0.01
0.02
0.03
0.04
0.05
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9



He3
H3
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
Rel Error (ECC)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
x_bj



H3/He3
ECC corrector
x_bj
1.0100
1.0075
1.0050
1.0025
1.0000
0.9975
0.9950
0.9925
0.9900
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9


Rel Error
Error for ECC corrector
x_bj
0.0011
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
0.0004
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9