

Plotting the error bands for Off-Shell function was implemented successfully and some results are summarized as follows.

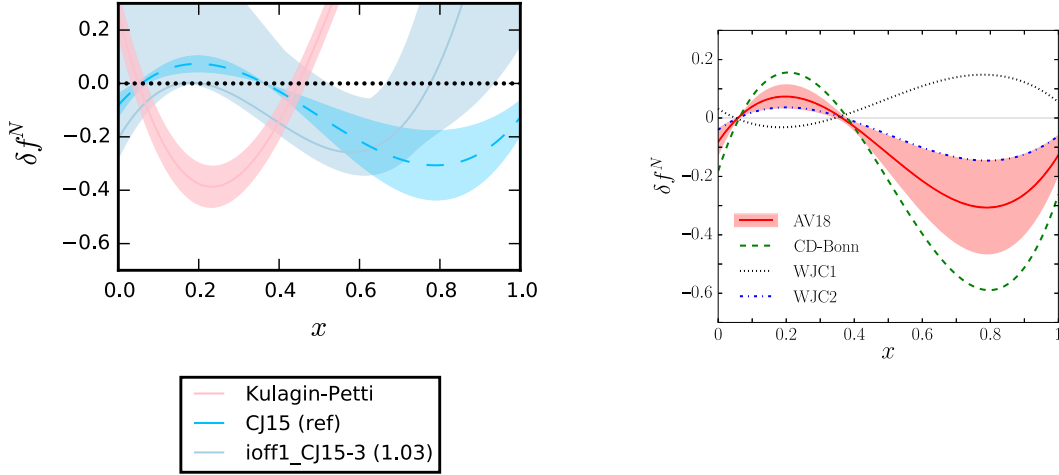
As the preliminary step, three types of fits were considered as follows.

- 1) CJ15 (In the original CJ15 work, the parameter  $x_1$  was fixed by considering the constraint by quark sum rule)

$$\delta f = N(x - x_0)(x - x_1)(1 + x_0 - x)$$

- 2) CJ15 with ioff1 for 3-degree polynomial

$$\delta f_3 = N(x - x_0)(x - x_1)(x - x_2)$$



Observations:

- 1) CJ15 Off-Shell function's uncertainty band is reproduced
- 2) The uncertainty bands for ioff1 is not symmetrical because the parameters  $x_0$  and  $x_1$  are strongly correlated negatively. For example (correlation matrices for  $x_0$  and  $x_1$ ):

$$\text{ioff1} \begin{pmatrix} 1.000 & -0.976 \\ -0.976 & 1.000 \end{pmatrix}$$

The parameters for ioff1 are the following.

$$N = 8.2851 \pm 5.2739$$

$$x_0 = 0.20480 \pm 0.39590$$

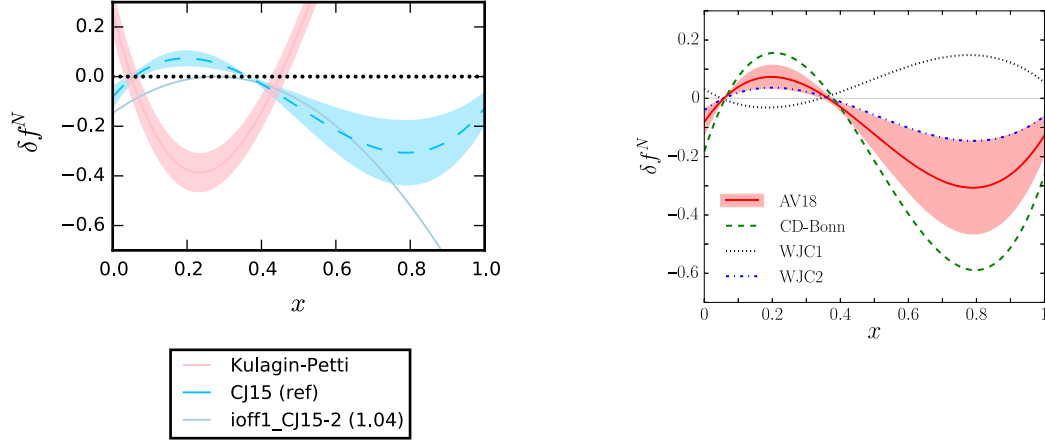
$$x_1 = 0.15685 \pm 0.37412$$

$$x_2 = 0.77609 \pm 0.11280$$

Correlation matrix for  $N, x_0, x_1$  and  $x_2$  :

$$\begin{pmatrix} 1.000 & 0.460 & -0.503 & -0.816 \\ 0.460 & 1.000 & -0.976 & -0.235 \\ -0.503 & -0.976 & 1.000 & 0.307 \\ -0.816 & -0.235 & 0.307 & 1.000 \end{pmatrix}$$

3) CJ15 with ioff1 2-degree polynomial  $\delta f = N(x - x_0)(x - x_1)$



Observations:

Correlation matrices for  $N, x_0$  and  $x_1$  in ioff1 2-degree polynomial is the following.

$$\text{ioff1} \begin{pmatrix} 1.000 & 0.602 & -0.608 \\ 0.602 & 1.000 & -0.999 \\ -0.608 & -0.999 & 1.000 \end{pmatrix}$$

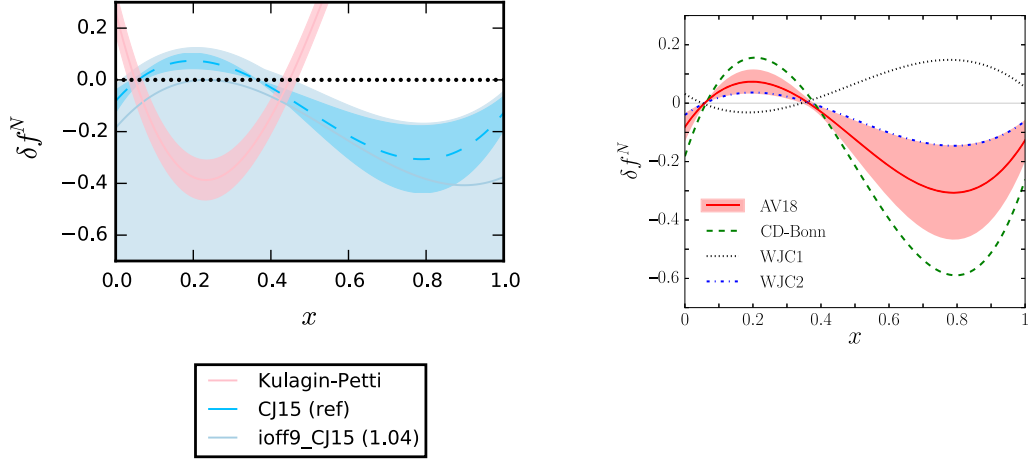
The parameters for ioff1 2D are the following.  $N = -1.9052 \pm 1.0349$

$$x_0 = 0.27550 \pm 9.0427$$

$$x_1 = 0.28029 \pm 9.0625$$

4) CJ15 with ioff9 (In this case, the parameter  $x_1$  was kept free and purely determined by the fit) with same Off-Shell function as CJ15

$$\delta f = N(x - x_0)(x - x_1)(1 + x_0 - x)$$



Observations:

Correlation matrix for  $N, x_0$  and  $x_1$  in ioff9 is the following.

$$\text{ioff9} \begin{pmatrix} 1.000 & 0.983 & -0.984 \\ 0.983 & 1.000 & -0.997 \\ -0.984 & -0.997 & 1.000 \end{pmatrix}$$

The parameters for ioff9 are the following.  $N = -2.7758 \pm 5.3158$

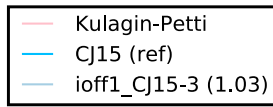
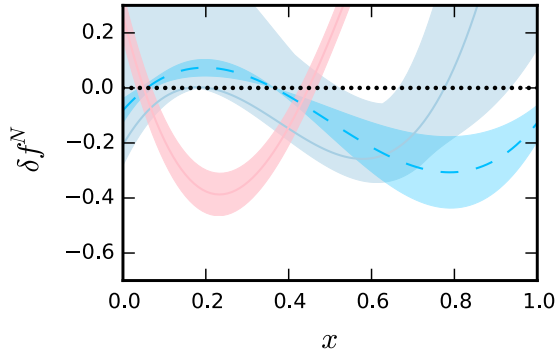
$$x_0 = 0.22976 \pm 1.3858$$

$$x_1 = 0.23625 \pm 1.3608$$

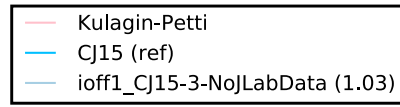
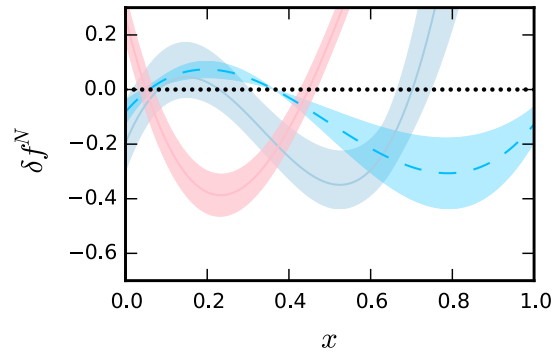
5) CJ15 ioff1 with Vs without JLab data (Simona + BoNuS)

$$\delta f_3 = N(x - x_0)(x - x_1)(x - x_2)$$

With JLab Data



Without JLab data



$$N = 8.2851 \pm 5.2739$$

$$x_0 = 0.20480 \pm 0.39590$$

$$x_1 = 0.15685 \pm 0.37412$$

$$x_2 = 0.77609 \pm 0.11280$$

$$N = 15.027 \pm 5.773$$

$$x_0 = 0.080580 \pm 0.071163$$

$$x_1 = 0.229570 \pm 0.086896$$

$$x_2 = 0.701960 \pm 0.039769$$

Correlation matrix for  $N, x_0, x_1$  and  $x_2$  :

$$\begin{pmatrix} N & x_0 & x_1 & x_2 \\ 1.000 & 0.460 & -0.503 & -0.816 \\ 0.460 & 1.000 & -0.976 & -0.235 \\ -0.503 & -0.976 & 1.000 & 0.307 \\ -0.816 & -0.235 & 0.307 & 1.000 \end{pmatrix}$$

$$\begin{pmatrix} N & x_0 & x_1 & x_2 \\ 1.000 & -0.391 & 0.452 & -0.606 \\ -0.391 & 1.000 & -0.753 & 0.225 \\ 0.452 & -0.753 & 1.000 & -0.178 \\ -0.606 & 0.225 & -0.178 & 1.000 \end{pmatrix}$$