F_L and F_2 - theory model comparison with HERA data

(Updated with curves from MSTW for protons)

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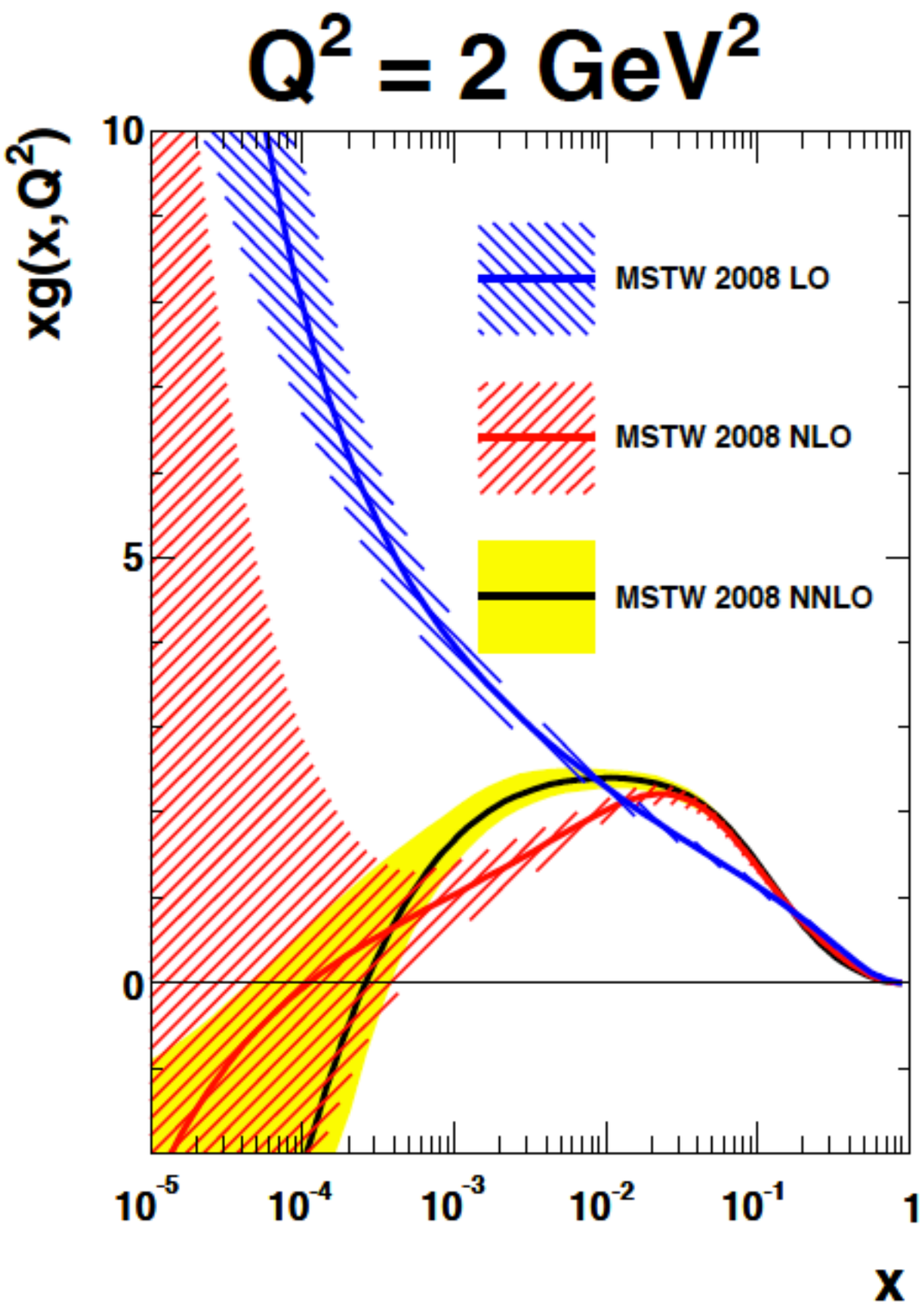
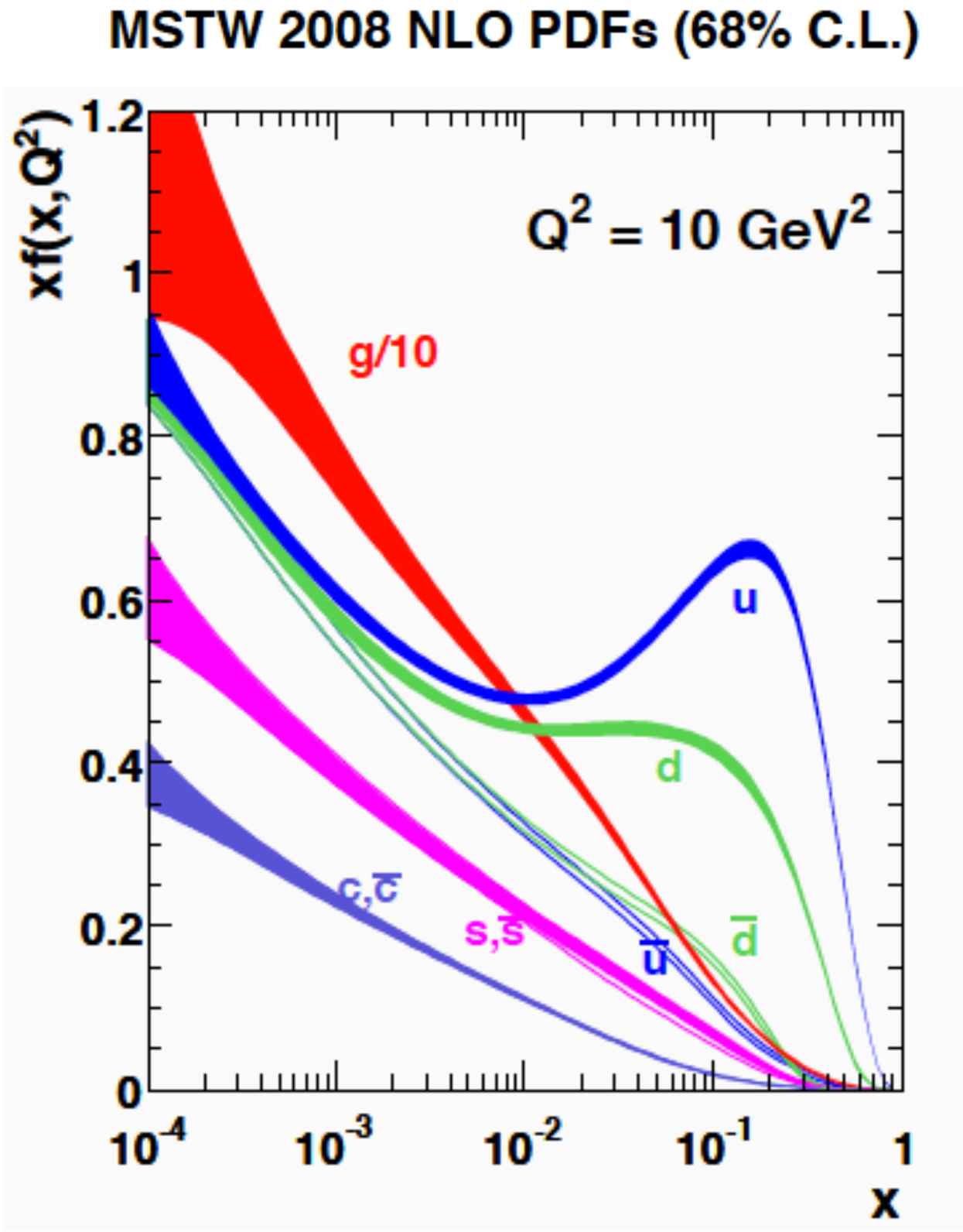
MSTW2008

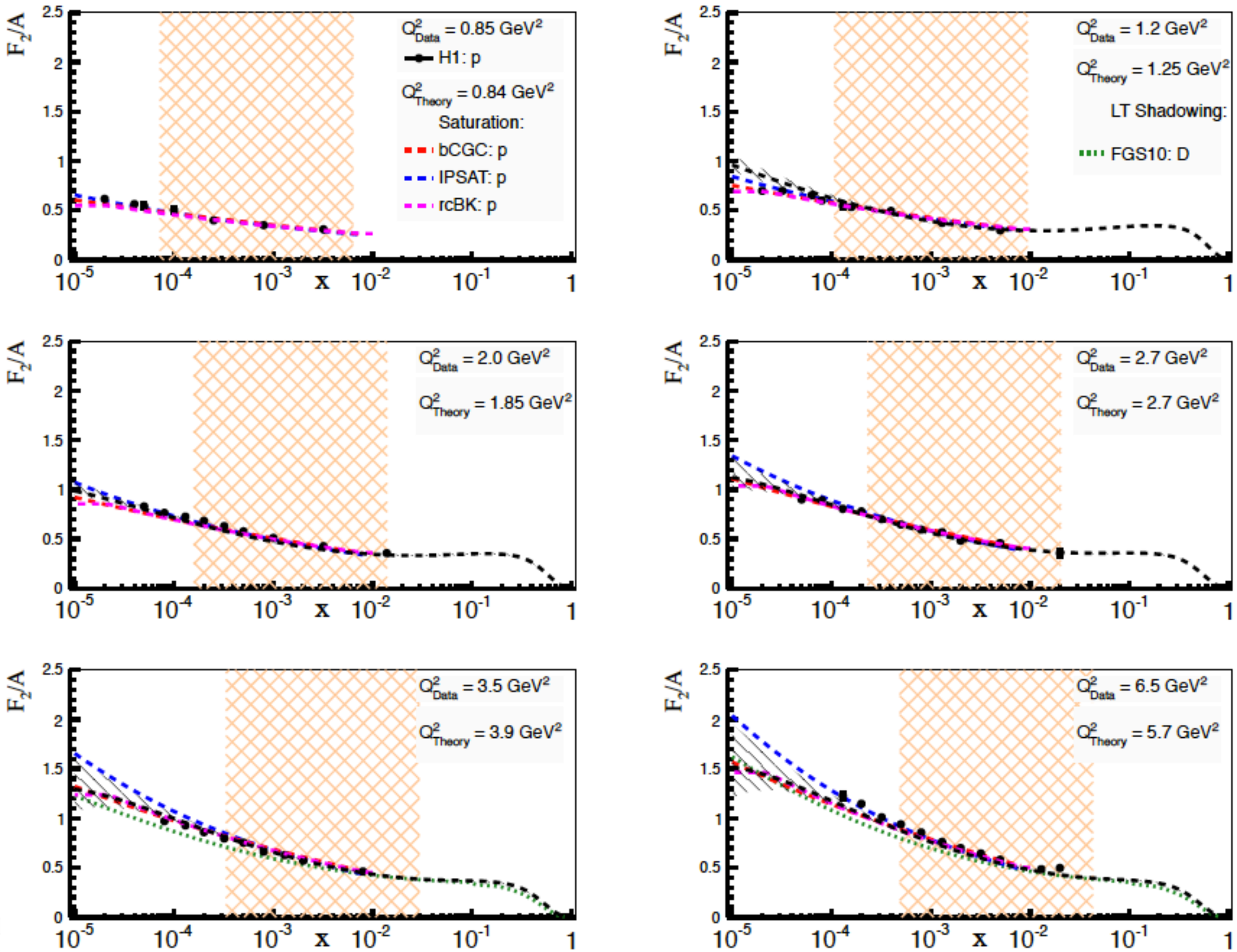
- MSTW2008 supersedes previous MRST curves and includes data not previously used in the global fits:
  - ➡ Fit to reduced cross-section at HERA (F_L+F_2) and not just F_2
  - ➡ New neutrino structure function data from NuTeV and CHORUS
  - ➡ Di-muon production from neutrino DIS experiments NuTeV and CCFR
  - ➡ New improved F_2^{cc} and F_2^{bb} from HERA
  - ➡ Tevatron Run II data on lepton charge asymmetry from Q decays
  - ➡ Rapidity distribution of $Z(\rightarrow \ell^+\ell^-)$ from CDF and D0
  - ➡ Inclusive jet production from Run II Tevatron data from CDF and D0
  - ➡ Data from HERA on inclusive jet production in DIS

MSTW

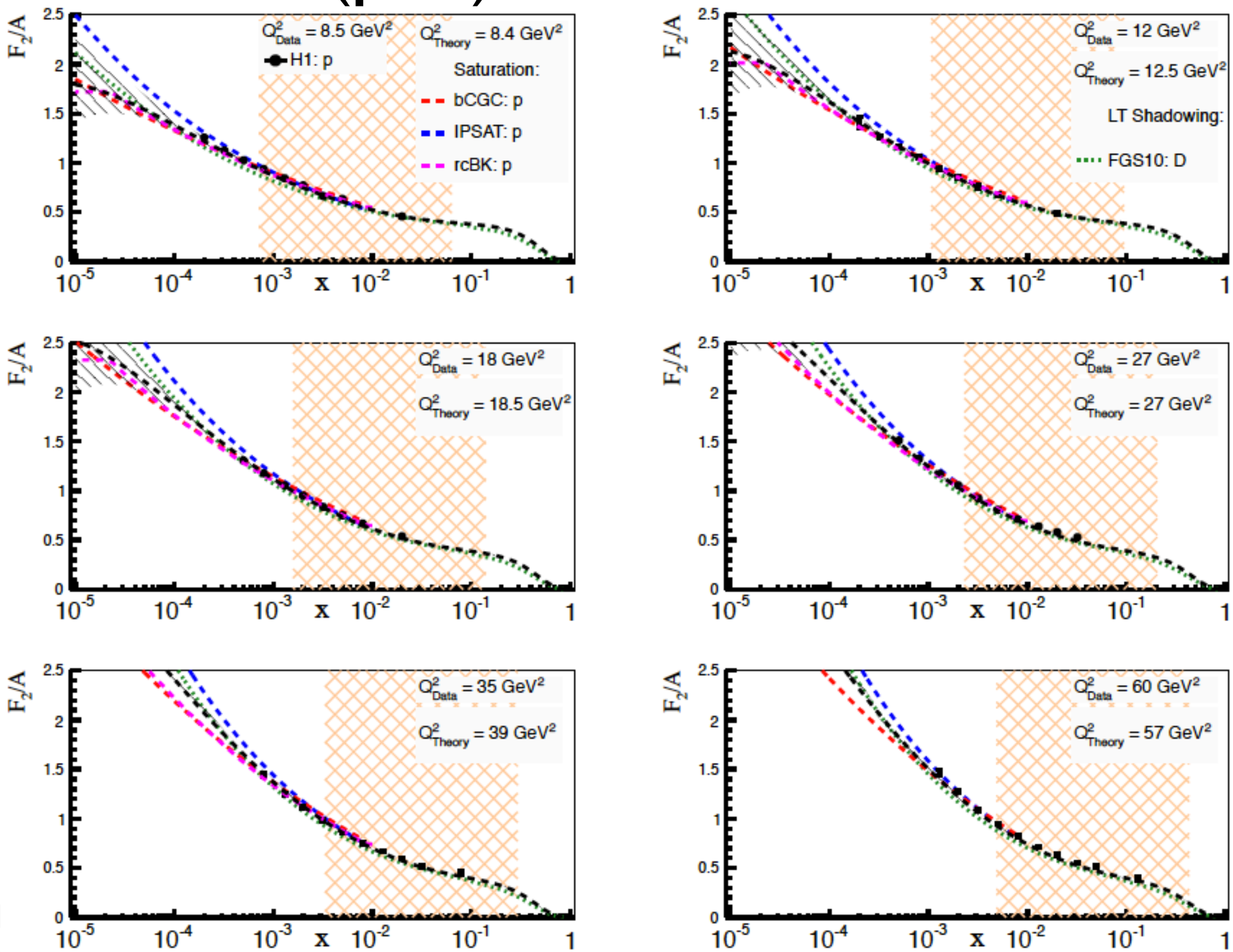

$Q^2 = 2\ GeV^2$
$xg(x,Q^2)$
MSTW 2008 LO
MSTW 2008 NLO
MSTW 2008 NNLO
10
5
0
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
1
x


MSTW 2008 NLO PDFs (68% C.L.)
$xf(x,Q^2)$
$Q^2 = 10\ GeV^2$
g/10
u
d
$\bar{d}$
$\bar{u}$
$c,\bar{c}$
$s,\bar{s}$
1.2
1
0.8
0.6
0.4
0.2
0
10^{-4}
10^{-3}
10^{-2}
10^{-1}
1
x

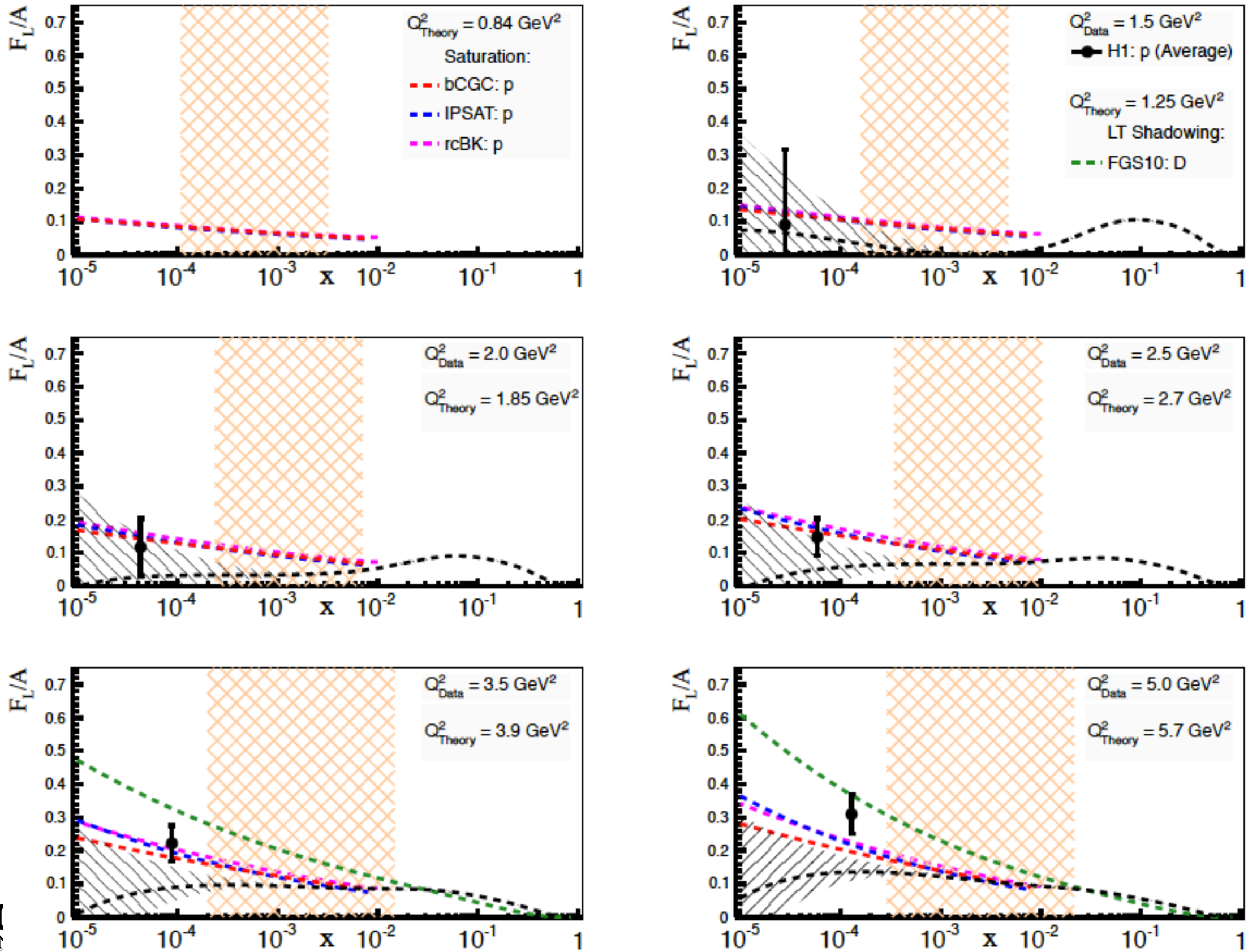
$F_2(p,D)$ - $0.8 < Q^2 < 6$


F_2/A
Q^2_{Data} = 0.85 GeV^2
H1: p
Q^2_{Theory} = 0.84 GeV^2
Saturation:
bCGC: p
IPSAT: p
rcBK: p
Q^2_{Data} = 1.2 GeV^2
Q^2_{Theory} = 1.25 GeV^2
LT Shadowing:
FGS10: D
Q^2_{Data} = 2.0 GeV^2
Q^2_{Theory} = 1.85 GeV^2
Q^2_{Data} = 2.7 GeV^2
Q^2_{Theory} = 2.7 GeV^2
Q^2_{Data} = 3.5 GeV^2
Q^2_{Theory} = 3.9 GeV^2
Q^2_{Data} = 6.5 GeV^2
Q^2_{Theory} = 5.7 GeV^2
x

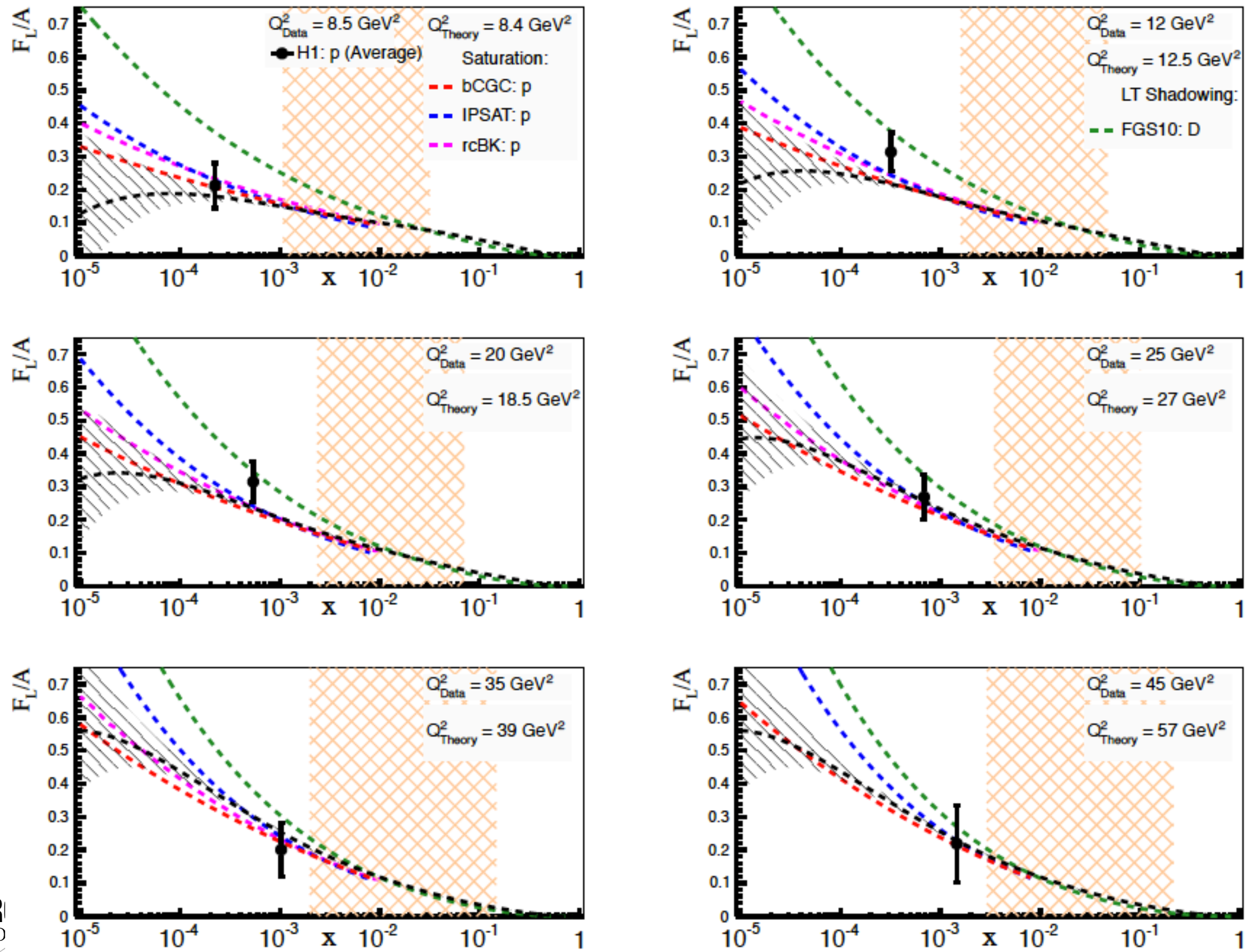
$F_2(p,D)$ - $8 < Q^2 < 60$


F_2/A
Q^2_{Data} = 8.5 GeV^2
Q^2_{Theory} = 8.4 GeV^2
H1: p
Saturation:
bCGC: p
IPSAT: p
rcBK: p
Q^2_{Data} = 12 GeV^2
Q^2_{Theory} = 12.5 GeV^2
LT Shadowing:
FGS10: D
Q^2_{Data} = 18 GeV^2
Q^2_{Theory} = 18.5 GeV^2
Q^2_{Data} = 27 GeV^2
Q^2_{Theory} = 27 GeV^2
Q^2_{Data} = 35 GeV^2
Q^2_{Theory} = 39 GeV^2
Q^2_{Data} = 60 GeV^2
Q^2_{Theory} = 57 GeV^2
x

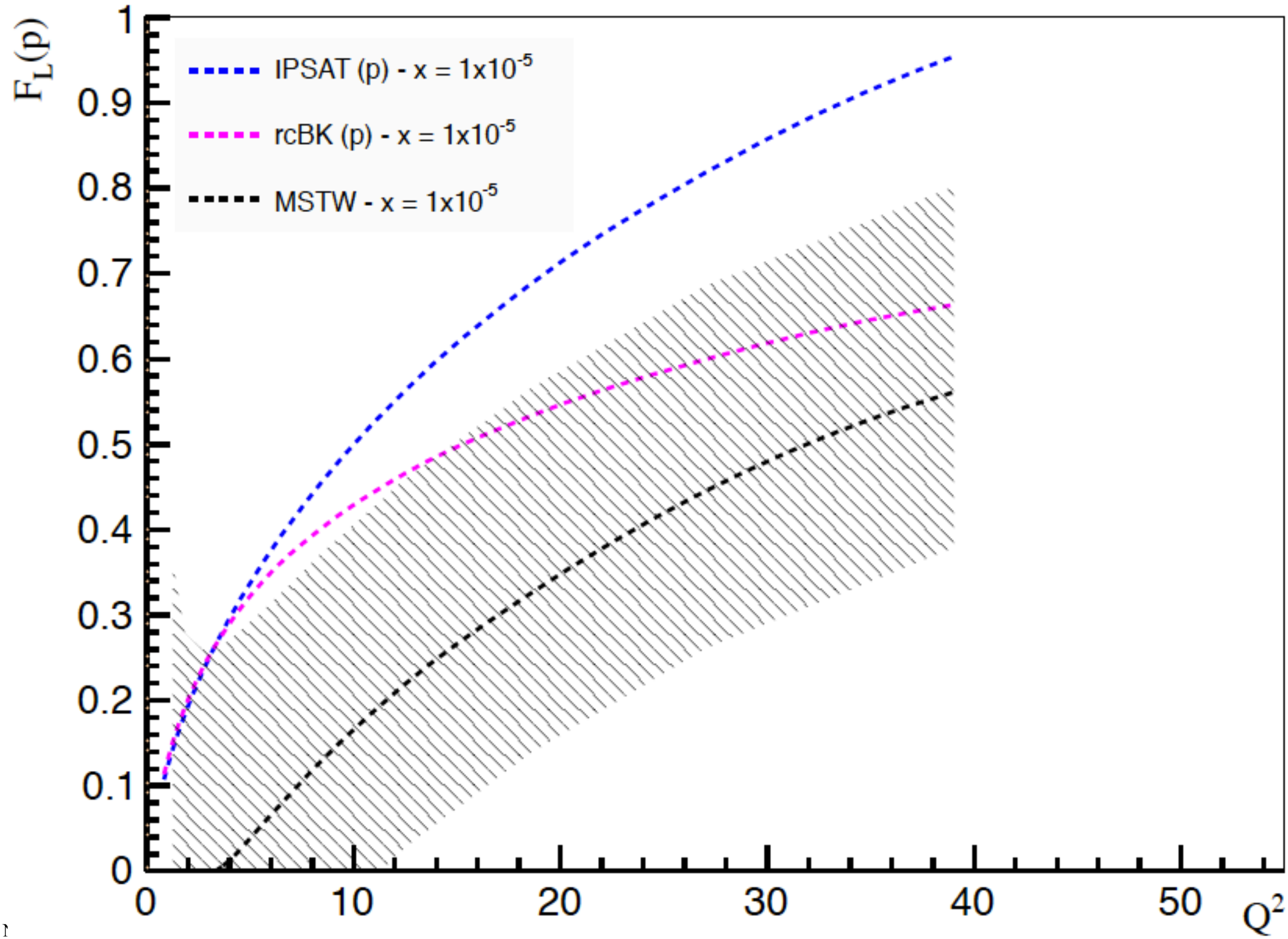
$F_L(p,D)$ - $0.8 < Q^2 < 6$


F_L/A
$Q^2_{Theory} = 0.84$ GeV^2
Saturation:
bCGC: p
IPSAT: p
rcBK: p
$Q^2_{Data} = 1.5$ GeV^2
H1: p (Average)
$Q^2_{Theory} = 1.25$ GeV^2
LT Shadowing:
FGS10: D
$Q^2_{Data} = 2.0$ GeV^2
$Q^2_{Theory} = 1.85$ GeV^2
$Q^2_{Data} = 2.5$ GeV^2
$Q^2_{Theory} = 2.7$ GeV^2
$Q^2_{Data} = 3.5$ GeV^2
$Q^2_{Theory} = 3.9$ GeV^2
$Q^2_{Data} = 5.0$ GeV^2
$Q^2_{Theory} = 5.7$ GeV^2
x

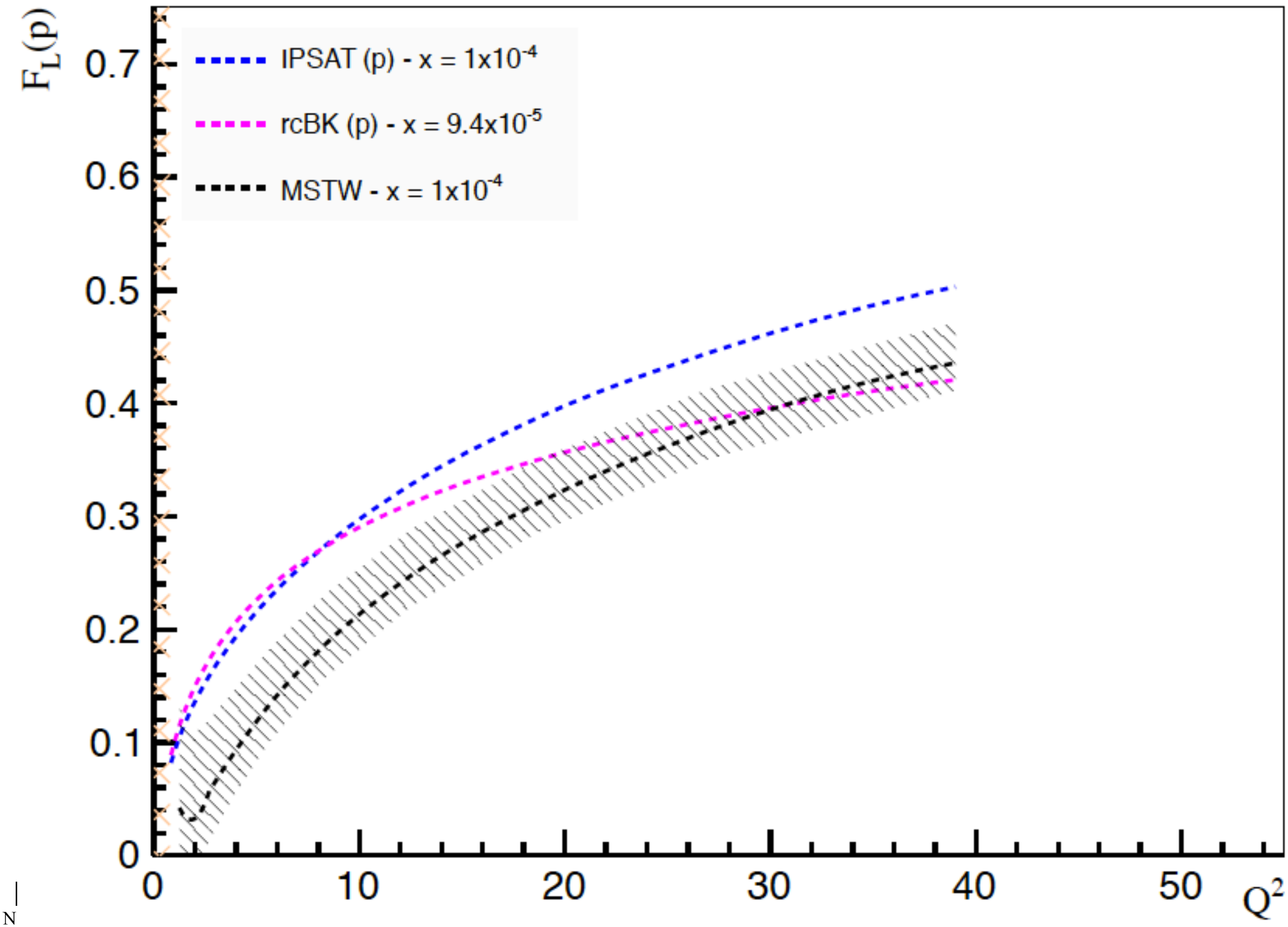
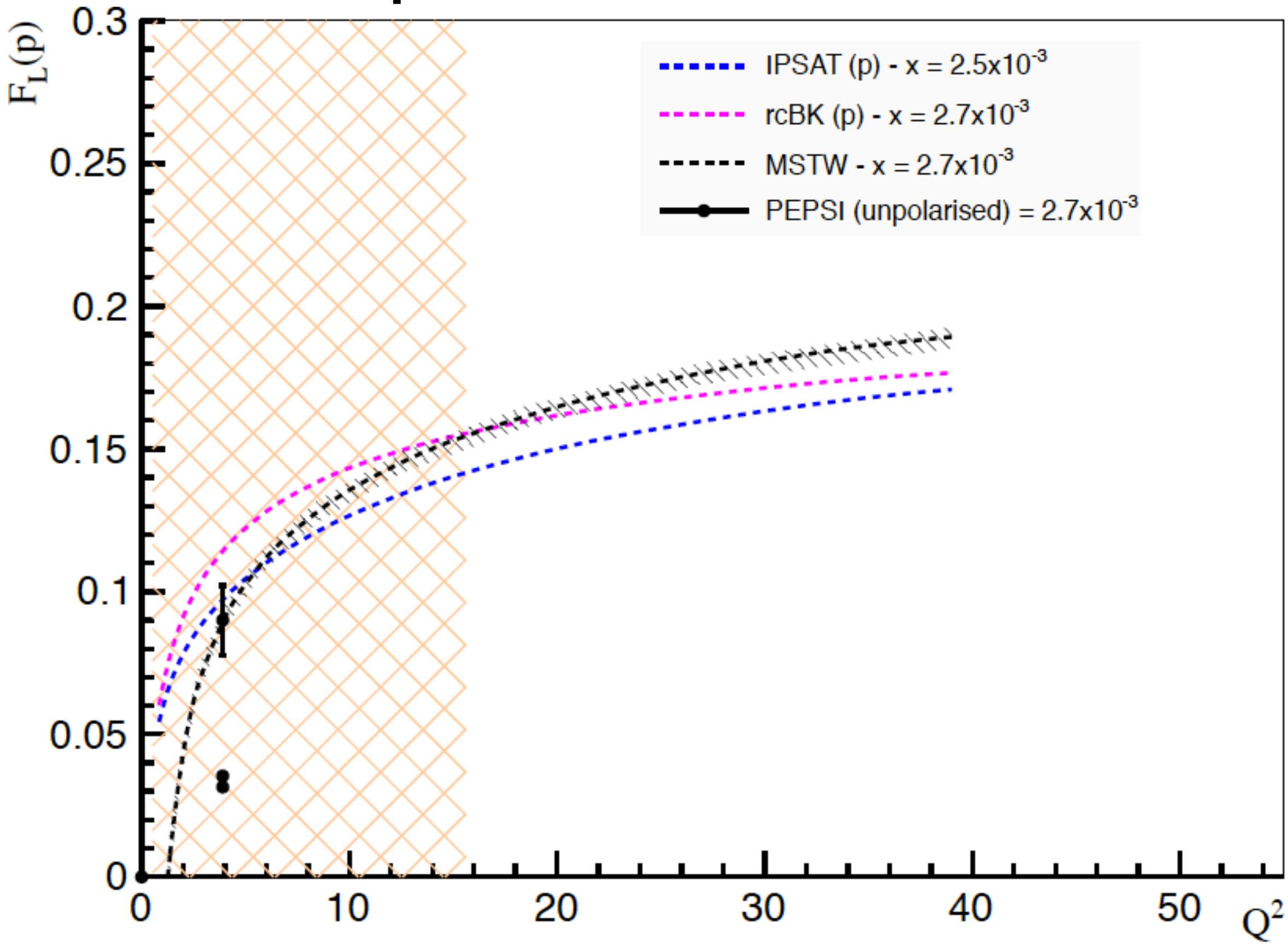
$F_L(p,D)$ - $8 < Q^2 < 60$


F_L/A
Q^2_{Data} = 8.5 GeV^2
Q^2_{Theory} = 8.4 GeV^2
H1: p (Average)
Saturation:
bCGC: p
IPSAT: p
rcBK: p
Q^2_{Data} = 12 GeV^2
Q^2_{Theory} = 12.5 GeV^2
LT Shadowing:
FGS10: D
Q^2_{Data} = 20 GeV^2
Q^2_{Theory} = 18.5 GeV^2
Q^2_{Data} = 25 GeV^2
Q^2_{Theory} = 27 GeV^2
Q^2_{Data} = 35 GeV^2
Q^2_{Theory} = 39 GeV^2
Q^2_{Data} = 45 GeV^2
Q^2_{Theory} = 57 GeV^2
x

Keep x fixed: $x = 1 \times 10^{-5}$



Keep x fixed: x = 1x10^{-4}



Keep x fixed: x = 2.5x10^{-3}