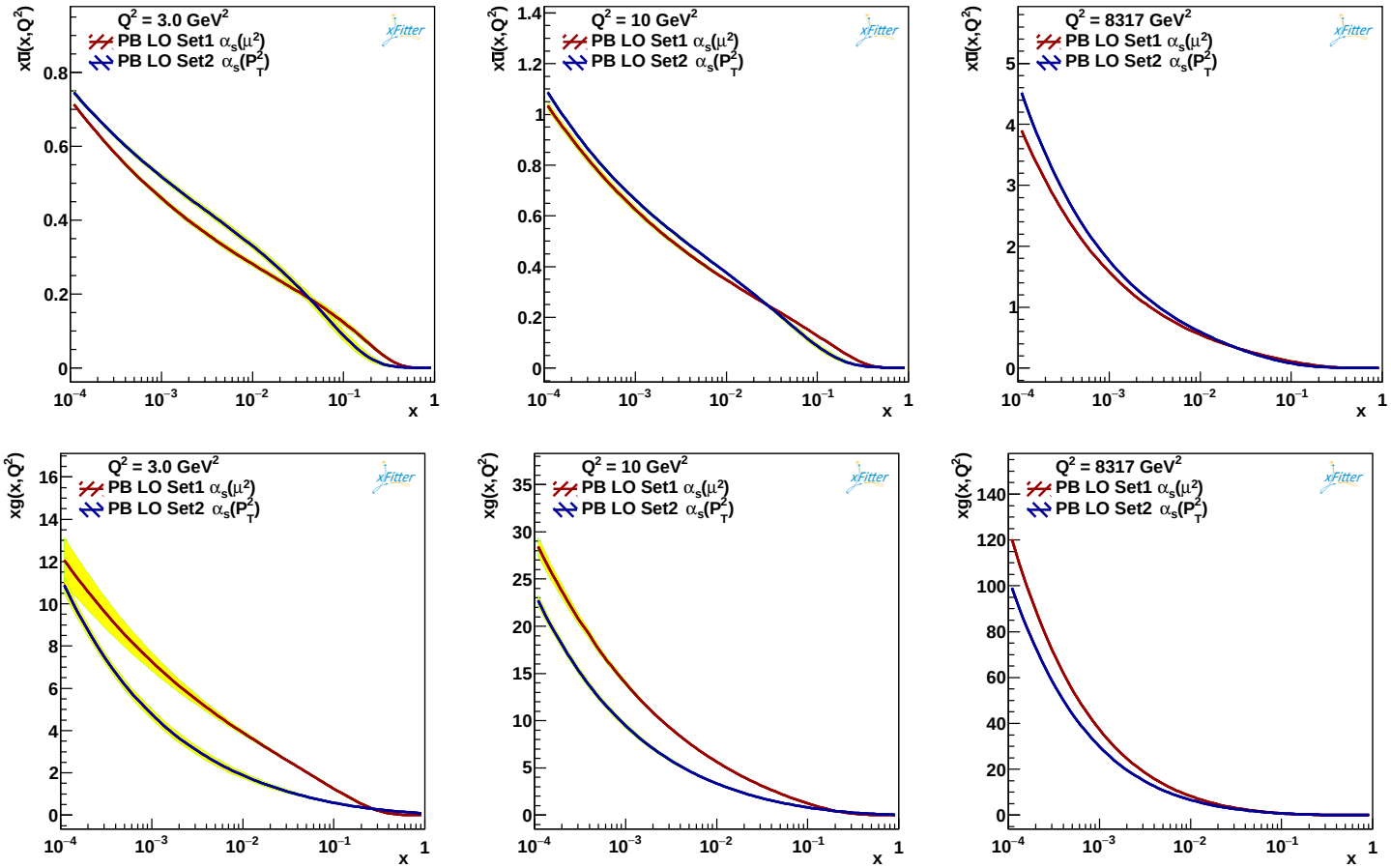
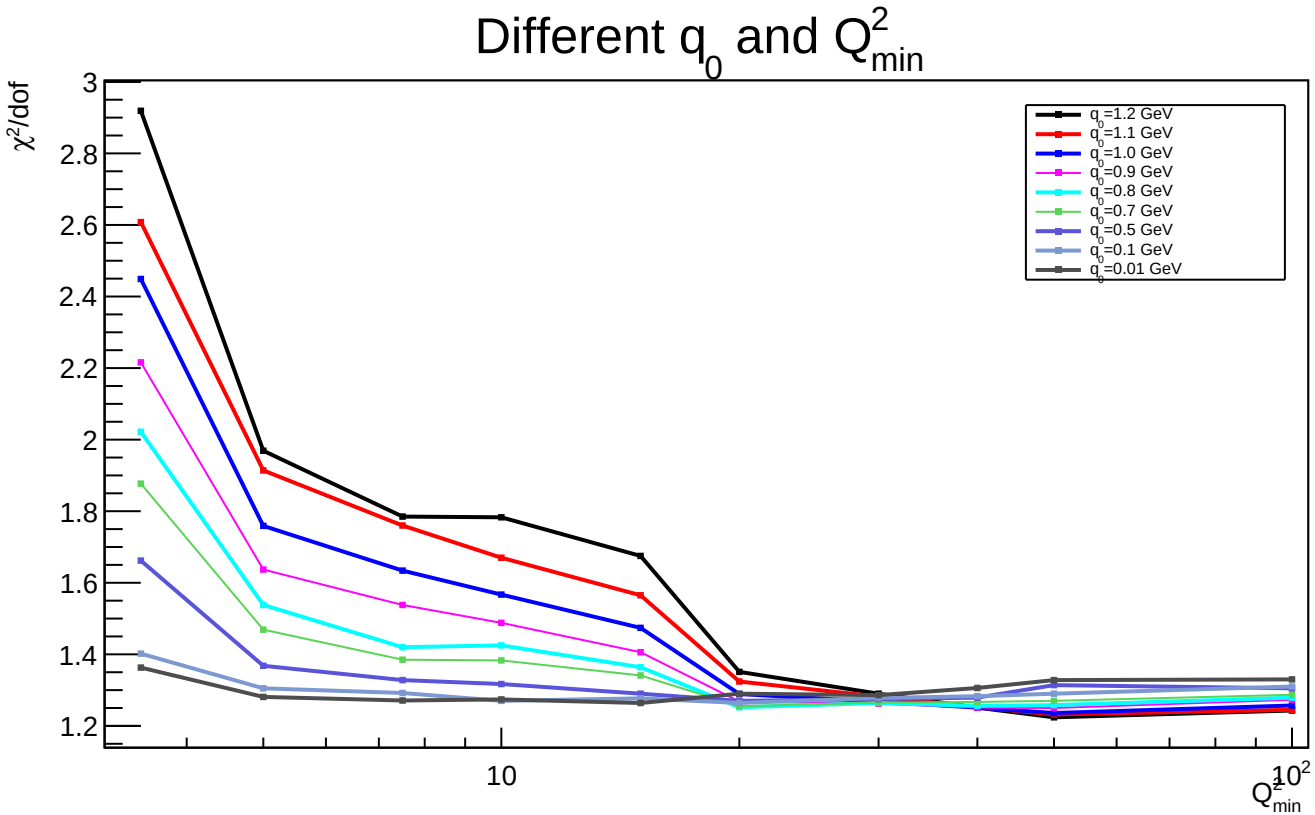
Standard LO full fit with different scale in α_s



- Set1 with $\alpha_s(\mu_i^2)$ $\chi^2/dof = 1,236$
- Set2 with $\alpha_s((1-z_i)^2\mu_i^2)$ $\chi^2/dof = 1,368$

Improved ordering dynamic z_M

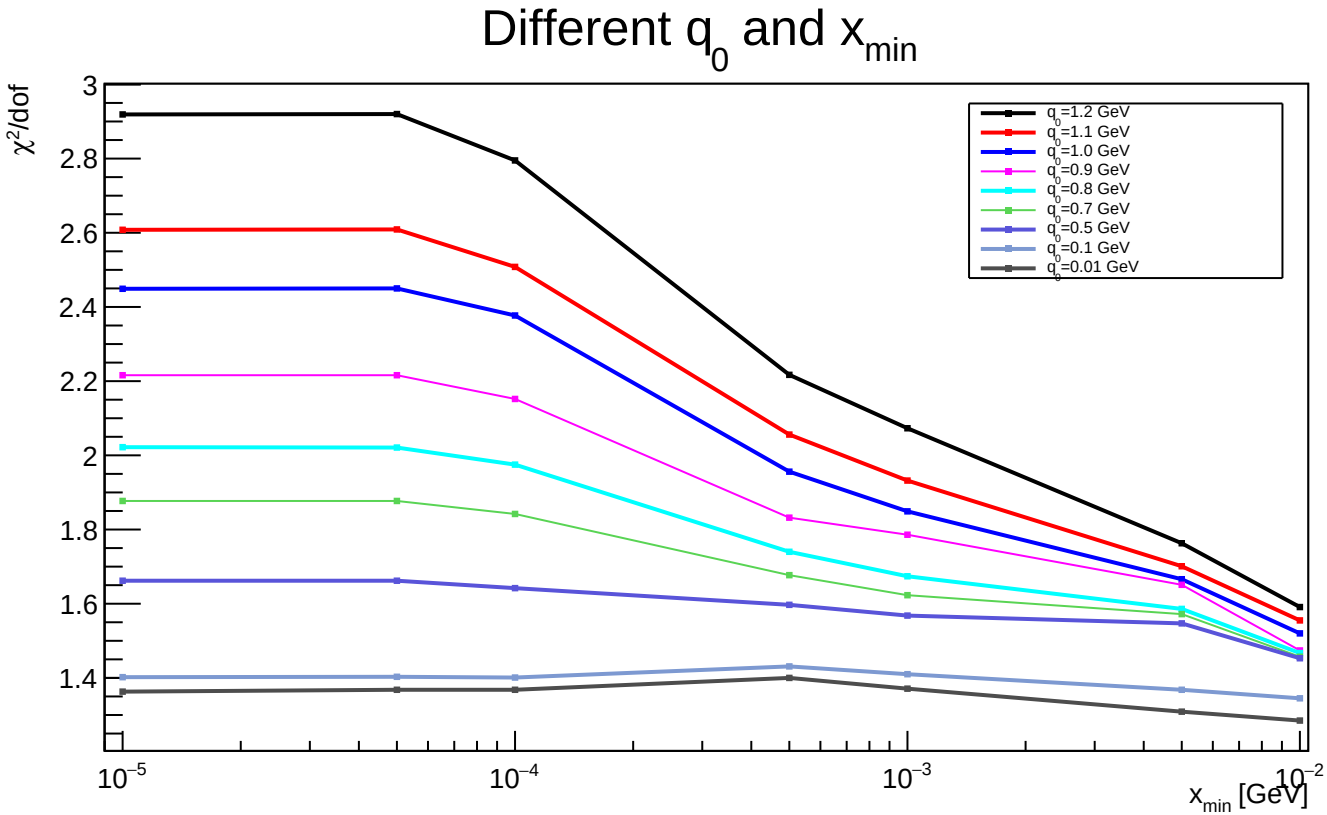
- $z_M = 1 - \frac{q_0}{q_i}$ and q_0 is chosen to be $q_0 = 0.01$ GeV.
- We require q_0 to be above λ_{QCD}.



- Increasing q_0, the χ^2/dof increases.
- The very low Q^2 data are not well described with this requirement but above 5 GeV^2 already works.

x_{min} dependency

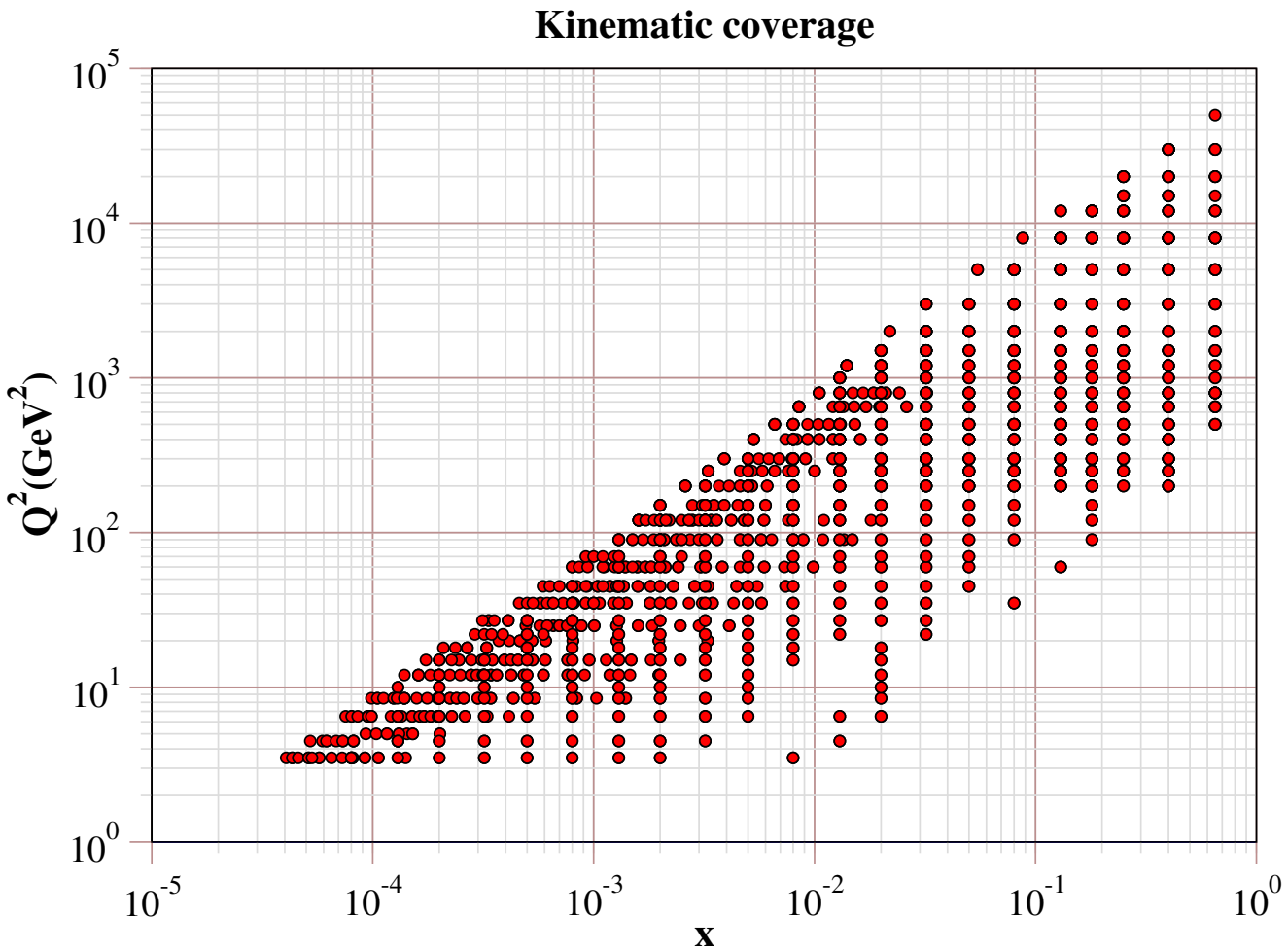
- The effect of enlarging x_{min} with Q^2_{min}=3.5 GeV^2.



- Significant increase for large q_0, when having a fixed Q^2_{min} = 3.5 GeV^2 and lowing x_{min}.

Kinematic coverage of the HERA data in the (x, Q^2) plane

- This is mainly small Q^2 effects rather than small x one.



- Going from $Q_{min} = 3.5$ to 5 GeV^2, no obvious change on x while χ^2 change significantly.
- No x dependence $\rightarrow$ No direct need for any small-x modification

Small Q^2 effects

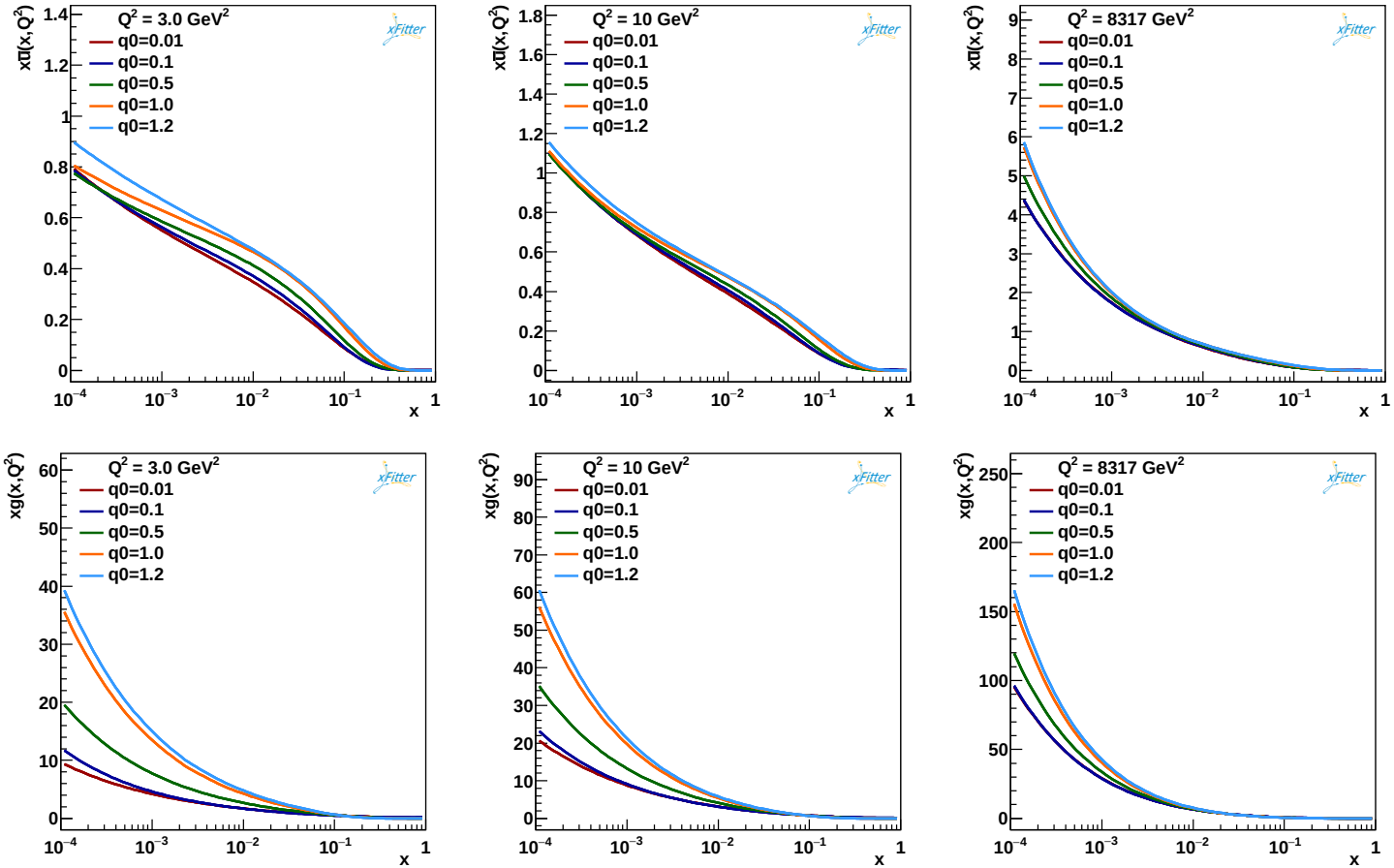
Q^2_{min}	1.2	1.1	1.05	1.0	0.95	0.9	0.8	0.7	0.5	0.1	0.01	N.D.F.
3.5	2.920	2.608	2.586	2.449	2.234	2.216	2.022	1.877	1.662	1.402	1.363	1133
5	1.969	1.914	1.833	1.759	1.692	1.637	1.538	1.469	1.368	1.305	1.281	1091
7.5	1.785	1.760	1.695	1.634	1.581	1.538	1.420	1.385	1.328	1.292	1.271	1044
10	1.783	1.670	1.619	1.567	1.462	1.488	1.425	1.383	1.317	1.270	1.274	1004
15	1.675	1.565	1.518	1.474	1.439	1.406	1.364	1.341	1.290	1.277	1.264	955
20	1.351	1.324	1.306	1.289	1.274	1.268	1.252	1.255	1.270	1.264	1.290	901
30	1.290	1.282	1.275	1.268	1.264	1.262	1.264	1.265	1.275	1.278	1.286	830
40	1.251	1.252	1.251	1.251	1.248	1.251	1.256	1.267	1.279	1.283	1.306	787
50	1.224	1.232	1.238	1.236	1.241	1.250	1.258	1.270	1.314	1.290	1.328	746
100	1.243	1.245	1.258	1.257	1.263	1.273	1.279	1.287	1.305	1.310	1.330	746

Table: Q^2_{min} *study for different* q_0 *while* x_{min} *=E-6.*

x_{min}	1.2	1.1	1.05	1.0	0.95	0.9	0.8	0.7	0.5	0.1	0.01	N.D.F.
$\leq$E-5	2.920	2.608	2.586	2.449	2.234	2.216	2.022	1.877	1.662	1.402	1.363	1133
5E-5	2.920	2.609	2.587	2.450	2.235	2.216	2.021	1.877	1.662	1.403	1.368	1130
E-4	2.795	2.508	2.504	2.377	2.166	2.152	1.975	1.842	1.642	1.401	1.368	1104
5E-4	2.217	2.056	2.023	1.956	1.889	1.832	1.740	1.677	1.597	1.431	1.400	973
E-3	2.073	1.932	1.958	1.849	1.797	1.786	1.674	1.623	1.568	1.410	1.371	889
5E-3	1.763	1.701	1.699	1.666	1.650	1.651	1.586	1.572	1.547	1.368	1.409	672
E-2	1.591	1.555	1.535	1.520	1.506	1.474	1.467	1.457	1.453	1.345	1.285	560

Table: x_{min} *study for different* q_0 *while* $Q^2_{min} = 3.5\ GeV^2$

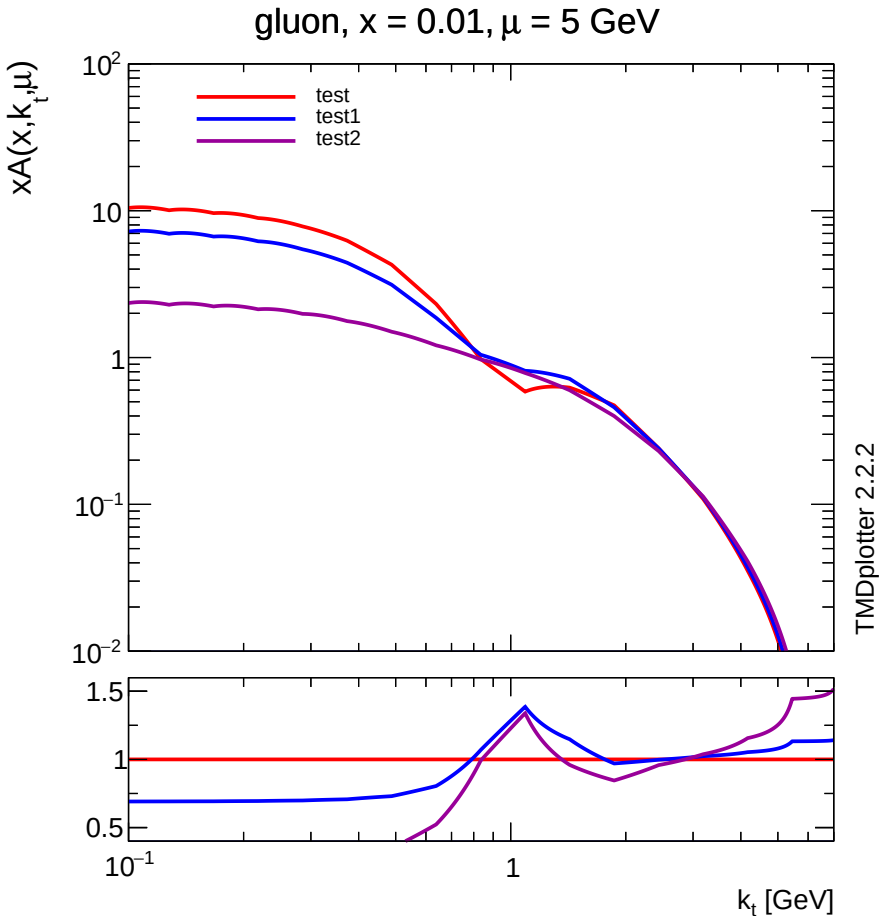
iTMDs with different q_0



- Enlarging q_0, we have significant increase at small x region

TMDs with different q_0 and q_s=0.5

- test : q_0=1.2 GeV
- test1 : q_0=1.0 GeV
- test2 : q_0=0.5 GeV



- q_s = the transverse momentum of the propagator.
- q_0 = the minimum transverse momentum that can be emitted purturbatively.
- Fill from perturbative evolution down to q_0 & from zero up to q_s.