

E12-10-002 : “Precision measurements of the F_2 structure function at large x in the resonance region and beyond”

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Overview

- (1) Phase I schedule
- (2) Motivation
- (3) SHMS kinematics region
- (4) HMS Kinematics region
- (5) Running parameters for E12-10-002
- (6) Background
- (7) Estimated Production Time

Phase I schedule

Oct 7, 2017- Dec 5, 2017

25 PAC days for Commissioning Experiments

E12-06-107: Search for Color Transparency

E12-10-002: $F_2^{p,d}$ Structure Functions at Large x

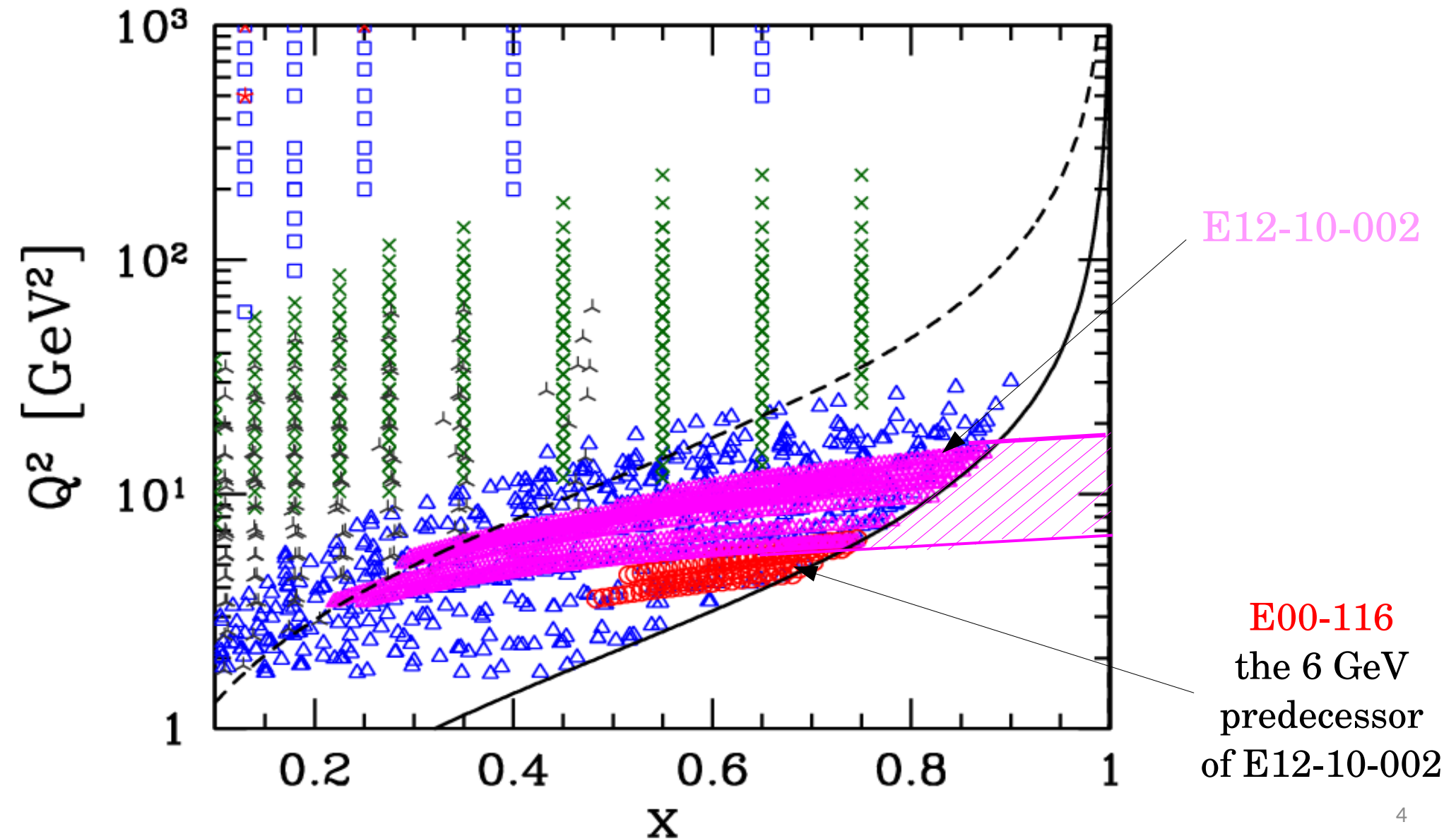
2 days E12-10-108 EMC Effect

3 days of E12-10-003 $d(e,e'p)$

Hall C collaboration meeting

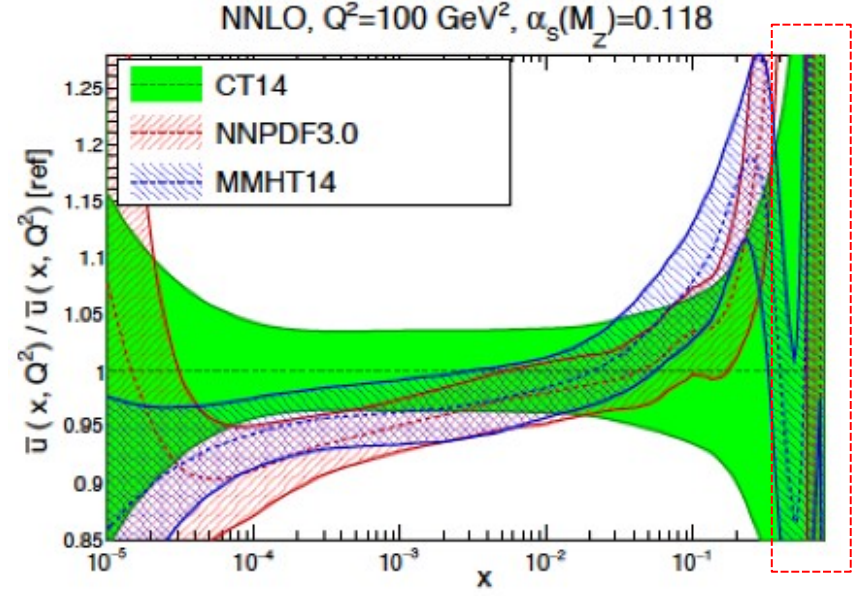
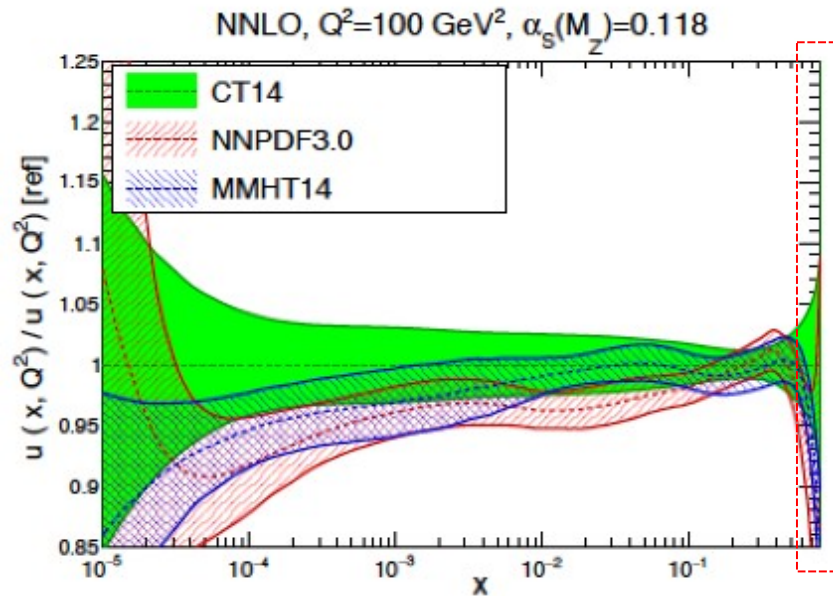
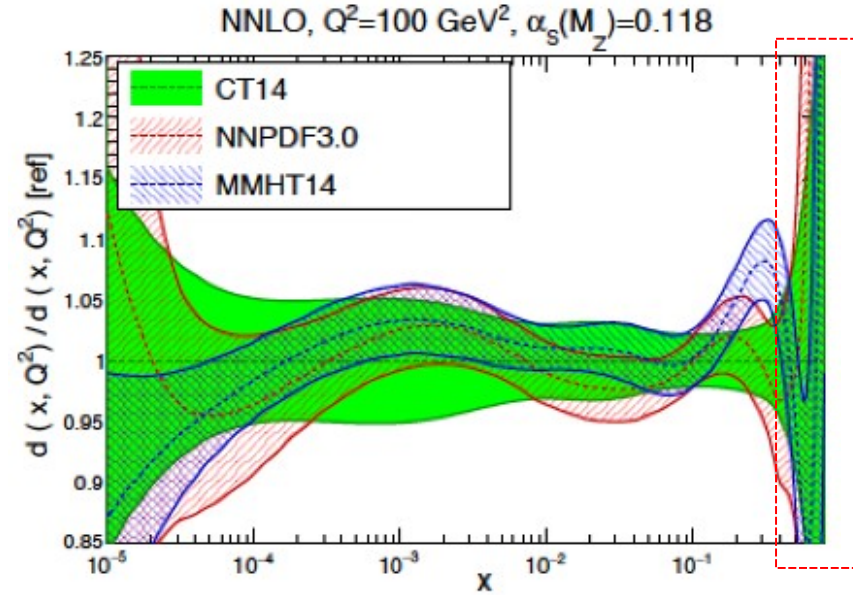
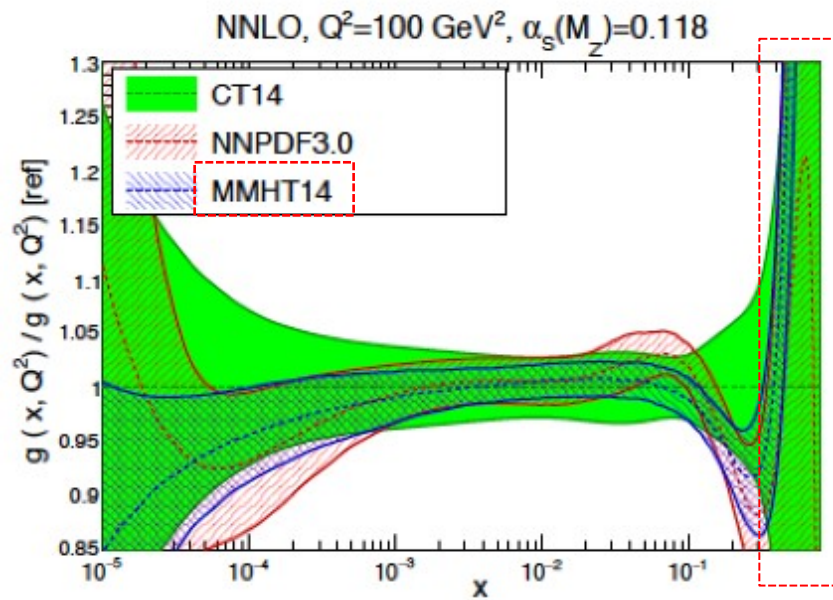
Kinematics in proposed experiment in x and Q^2 (GeV^2)

Improve large- x precision with larger DIS data set on both **proton and deuterium**: relaxing kinematic cuts to push to larger x leads to a factor of 2 increase in number of DIS data points used for fitting



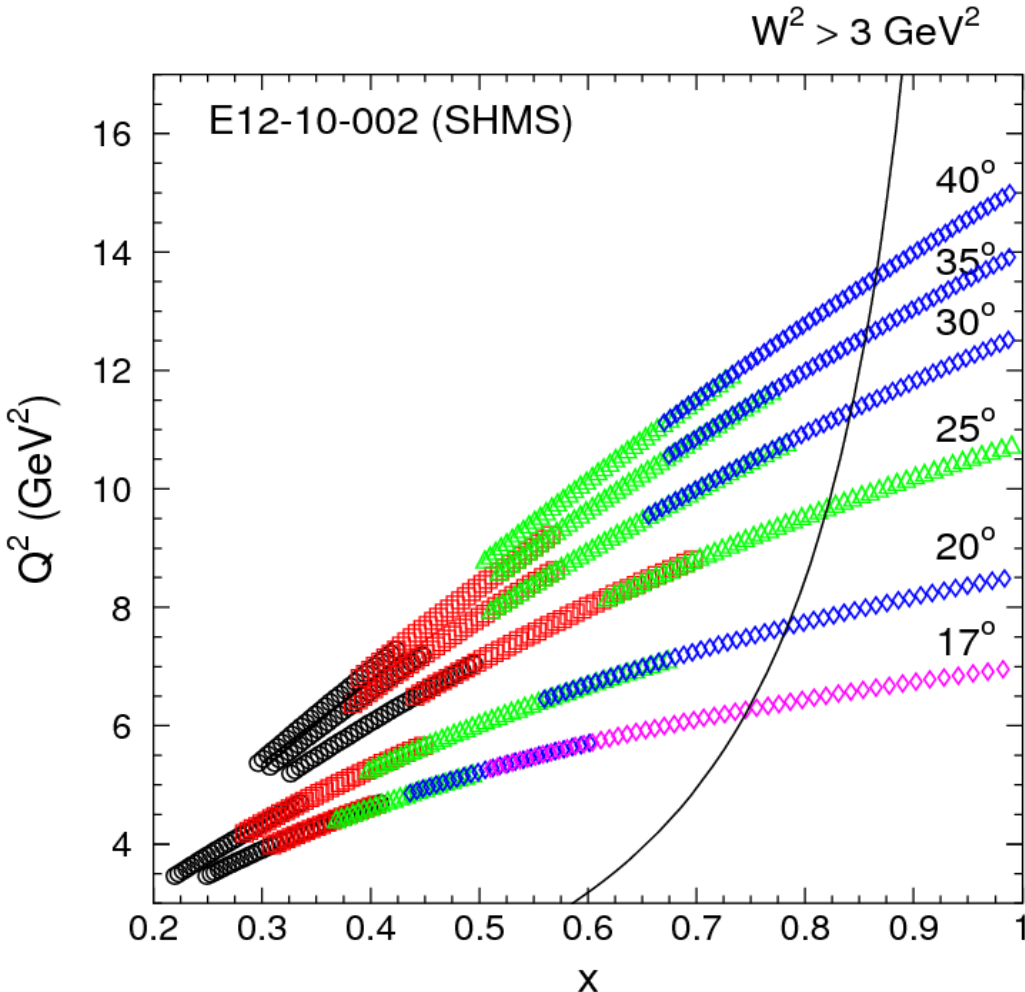
Constrain PDFs at Large x

Typical PDFs extraction still lacking in the required precision at low x and **large x**



Production Kinematics, SHMS

SHMS kinematic settings at with 11 GeV beam



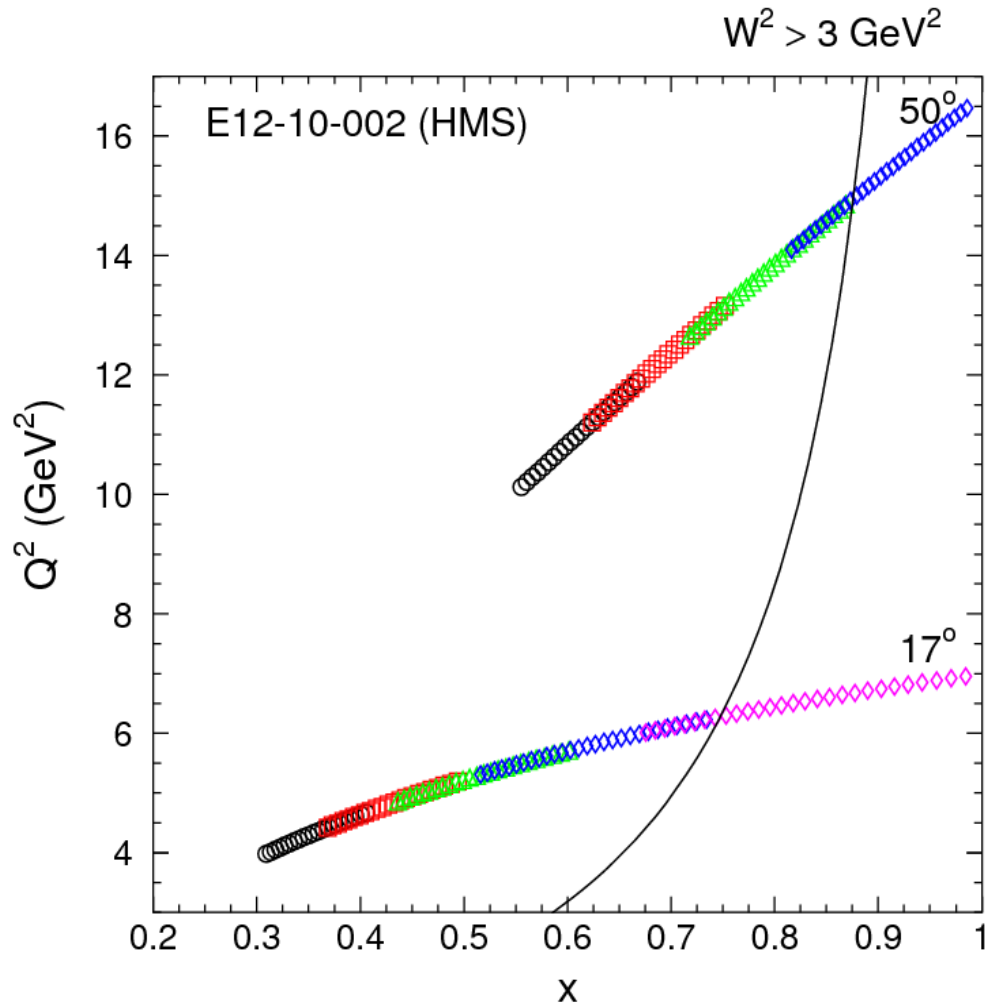
Angle (deg)	Momentum (GeV/c)	Target
17	4, 4.5, 5, 5.5, 6.1	H, D, Al
20	2.9, 3.5, 4.4, 5.4	H, D, Al
25	2.8, 3.5, 4.4	H, D, Al
30	2, 2.4, 3, 3.6	H, D, Al
35	1.5, 1.9, 2.4, 2.95	H, D, Al
40	1.9, 2.4	H, D, Al

- E12-10-008 and E12-10-002 will share the D running and E12-10-008 will add few other nuclei

- Except for the 50 deg data, all of the production measurements will be taken with SHMS
- 6 angles
- 22 momentum changes
- Target Changes : 11 at 17 deg
9 at 20 deg
7 at 25 deg
9 at 30 deg
9 at 35 deg
5 at 45 deg

Production Kinematics, HMS

- HMS kinematic settings at with 11 GeV beam



Angle (deg)	Momentum (GeV)
17	4.5, 5, 5.5, 6, 6.8
50	1.4, 1.55, 1.75, 1.95

50 deg: **Production** to push to highest Q^2 , x

17 deg: **commissioning** data to cross-calibrate HMS and SHMS

- 2 angle changes
- 9 momentum changes

Running parameters E12-10-002

- Beam :

(1) energy : 10.6 GeV & 6.6 GeV

(2) current : 65 μ A

- Targets :

(1) 10 cm hydrogen - production

(2) 10 cm Deuterium – production

(3) 4 cm Hydrogen – acceptance studies

(4) 1-foil C – acceptance studies

(5) 2-foils Al – background measurement

- Spectrometers:

(1)SHMS: mostly production run angles 17, 20, 25, 30, 35, 40 deg

(2)HMS: production run at angles 50, 17 deg (for commissioning)

Background

- **Main sources of background radiation are :**

(1) **Electron scattered on the walls of the crygenic target :**
Dummy runs.

(2) **Pion Contamination :**

Maximum π/e estimated as : SHMS: $\pi/e < 250$
HMS : $\pi/e < 150$

Heavy gas cerenkov and calorimeter are adequate for the pion rejection (same for HMS & SHMS)

(3) **Charge symmetric background :**

Flip polarity of spectrometer and measure positron yield at all angles.

E12-10-002: Running at 6.6 GeV for the determination of R

- We cannot claim a precise extraction of F_2 from cross sections without precise knowledge of R
- Measurements at a different beam energy (6.6 GeV) than 11 GeV to extract R, especially in the region of large x and large Q^2

Estimated Production Time

Activity	Time (PAC hours)
Production (H, D)	180
Background - target endcaps	12
Background - charge symmetric	27
H elastic/D quasielastic	8
Configuration changes	15
R measurement	12

Total: 10.6 PAC days

Background – target endcaps: 20% of D production time

Background – charge symmetric: 15% of H & D production time

H elastics / D quasielastic (to be determined): needed to get systematic uncertainty coming from the elastic / quasielastic subtraction

Configuration changes: 6 minutes per target change, 20 minutes per angle and momentum change combined

Acknowledgement

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Thank you !