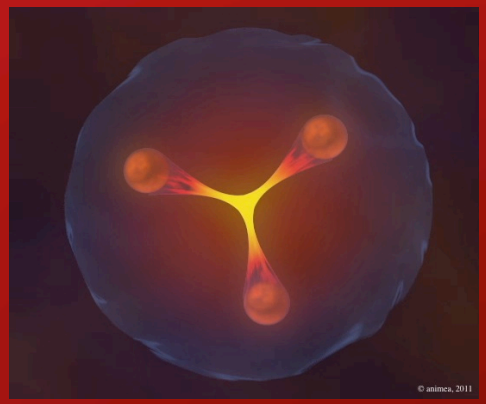
DE LA RECHERCHE À L'INDUSTRIE



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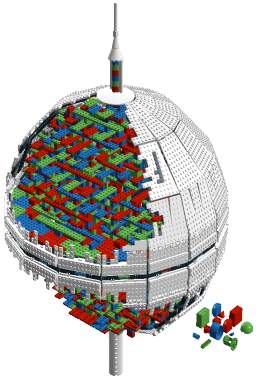
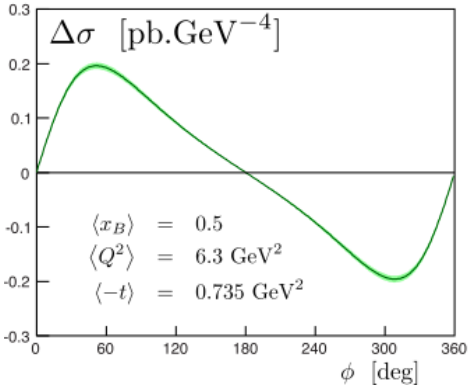
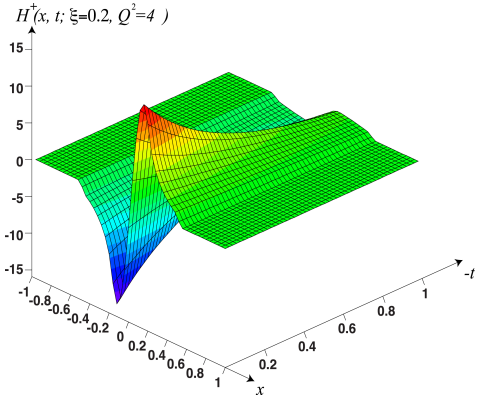
PARTONS global fits of Compton form factors







CNF workshop | Hervé MOUTARDE

Dec. 9, 2020

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824093.

Almost all existing DVCS data sets.

2600+ measurements of 30 observables published during 2001-17.

PARTONS fits

DVCS data

Parametric fit

Non parametric fit

No.	Collab.	Year	Ref.	Observable		Kinematic dependence	No. of points used / all
1	HERMES	2001	40	A_{LU}^{+}		ϕ	10 / 10
2		2006	41	$A_{C}^{\cos i\phi}$	$i=1$	t	4 / 4
3		2008	42	$A_{C}^{\cos i\phi}$	$i=0,1$	x_{Bj}	18 / 24
				$A_{UT,\mathrm{DVCS}}^{\sin(\phi-\phi_S)\cos i\phi}$	$i=0$		
				$A_{UT,\mathrm{I}}^{\sin(\phi-\phi_S)\cos i\phi}$	$i=0,1$		
				$A_{UT,\mathrm{I}}^{\cos(\phi-\phi_S)\sin i\phi}$	$i=1$		
4		2009	43	$A_{LU,\mathrm{I}}^{\sin i\phi}$	$i=1,2$	x_{Bj}	35 / 42
				$A_{LU,\mathrm{DVCS}}^{\sin i\phi}$	$i=1$		
				$A_{C}^{\cos i\phi}$	$i=0,1,2,3$		
5		2010	44	$A_{UL}^{+,\sin i\phi}$	$i=1,2,3$	x_{Bj}	18 / 24
				$A_{LL}^{+,\cos i\phi}$	$i=0,1,2$		
6		2011	45	$A_{LT,\mathrm{DVCS}}^{\cos(\phi-\phi_S)\cos i\phi}$	$i=0,1$	x_{Bj}	24 / 32
				$A_{LT,\mathrm{DVCS}}^{\sin(\phi-\phi_S)\sin i\phi}$	$i=1$		
				$A_{LT,\mathrm{I}}^{\cos(\phi-\phi_S)\cos i\phi}$	$i=0,1,2$		
				$A_{LT,\mathrm{I}}^{\sin(\phi-\phi_S)\sin i\phi}$	$i=1,2$		
7		2012	46	$A_{LU,\mathrm{I}}^{\sin i\phi}$	$i=1,2$	x_{Bj}	35 / 42
				$A_{LU,\mathrm{DVCS}}^{\sin i\phi}$	$i=1$		
				$A_{C}^{\cos i\phi}$	$i=0,1,2,3$		
8	CLAS	2001	47	$A_{LU}^{-,\sin i\phi}$	$i=1,2$	—	0 / 2
9		2006	48	$A_{UL}^{-,\sin i\phi}$	$i=1,2$	—	2 / 2
10		2008	49	A_{LU}^{-}		ϕ	283 / 737
11		2009	50	A_{LU}^{-}		ϕ	22 / 33
12		2015	51	A_{LU}^{-}, A_{UL}^{-}, A_{LL}^{-}		ϕ	311 / 497
13		2015	52	$d^4\sigma_{UU}^{-}$		ϕ	1333 / 1933
14	Hall A	2015	34	$\Delta d^4\sigma_{LU}^{-}$		ϕ	228 / 228
15		2017	35	$\Delta d^4\sigma_{LU}^{-}$		ϕ	276 / 358
16	COMPASS	2018	36	$d^3\sigma_{UU}^{\pm}$		t	2 / 4
17	ZEUS	2009	37	$d^3\sigma_{UU}^{+}$		t	4 / 4
18	H1	2005	38	$d^3\sigma_{UU}^{+}$		t	7 / 8
19		2009	39	$d^3\sigma_{UU}^{\pm}$		t	12 / 12
						SUM	2624 / 3998

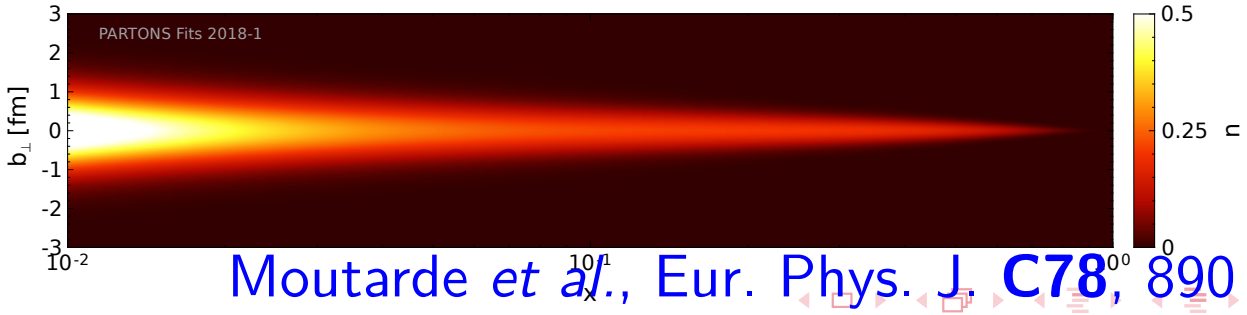
Moutarde *et al.*, Eur. Phys. J. **C78**, 890 (2018)

Moutarde *et al.*, Eur. Phys. J. **C79**, 614 (2019)

Modeling of H, $\widetilde{H}$, E and $\widetilde{E}$.

Implementation of DVCS dispersion relations at leading order.

- From **LO dispersion relation** work only with **border function** $H(\xi, \xi, t)$ and D-term $D(t)$.
- Write border function in terms of **skewness function** $H(\xi, \xi, t)/H(\xi, 0, t)$.
- Implement large- and small-ξ behaviors in modeling of skewness function, PDF and elastic form factor limits.
- D-term fixed by assumption of **analytic continuation**.
- Get direct access to **transverse plane density**.
- Fit remaining free parameters from DVCS. (Only) 13 free parameters to describe all four H, $\widetilde{H}$, E and $\widetilde{E}$.

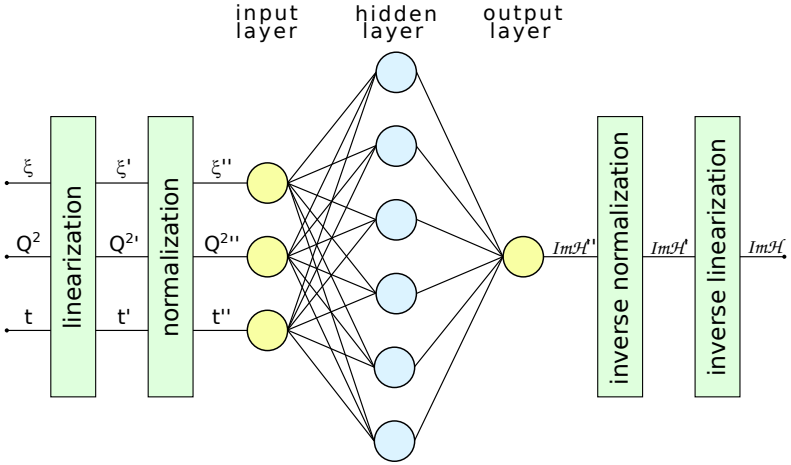


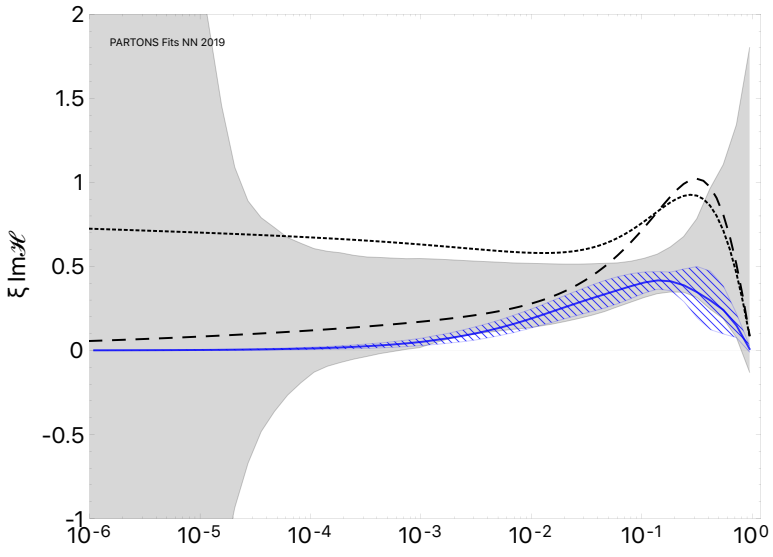
Moutarde *et al.*, Eur. Phys. J. **C78**, 890 (2018)

Modeling of $\mathcal{H}$, $\widetilde{\mathcal{H}}$, $\mathcal{E}$ and $\widetilde{\mathcal{E}}$.

Independent descriptions of real and imaginary parts.

- Real and imaginary parts of CFFs parameterized by **neural networks**.
- Propagation of uncertainties through **replica method** and evaluation of 68 % **confidence levels**.





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Commissariat à l'énergie atomique et aux énergies alternatives
Centre de Saclay | 91191 Gif-sur-Yvette Cedex
T. +33(0)1 69 08 73 88 | F. +33(0)1 69 08 75 84

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