HPrecisionNet

Precision Hadron Physics

From internal structure to Physics Beyond Standard Model

Proposal for a HPH2020 network

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HPH2020 ,Bochum, March 25th, 2014

(MesonNet+ WG RadioMC) → HPrecisionNet

Impact of hadron physics for precision frontier

Two famous puzzles:

- muon anomalous magnetic moment $a_\mu=(g-2)/2$

=> hadronic contributions

- proton radius

=> time like elastic baryon FF, transition FF,

two photon contribution

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proton radius

μH data: $R_E = 0.8409 \pm 0.0004$ fm

Pohl et al.(2010)

Antognini et al.(2013)

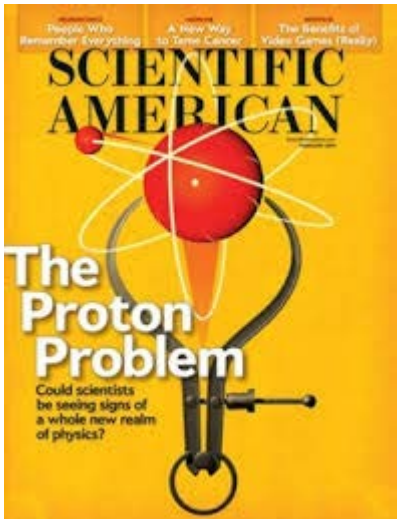
7.7σ difference !?

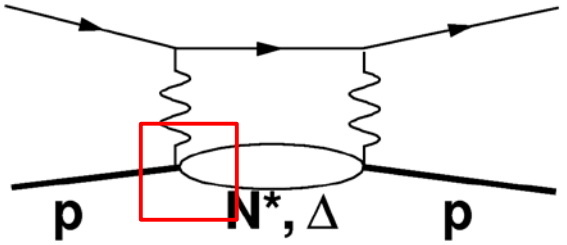
ep-data :
CODATA

$R_E = 0.8772 \pm 0.0046$ fm

Bernauer et al. (2010)

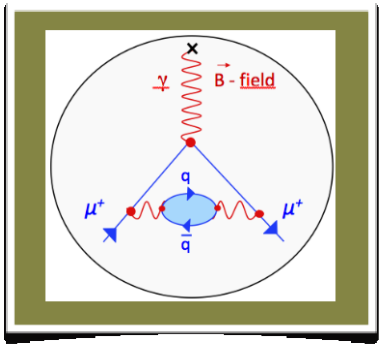
Zhan et al.(2011)



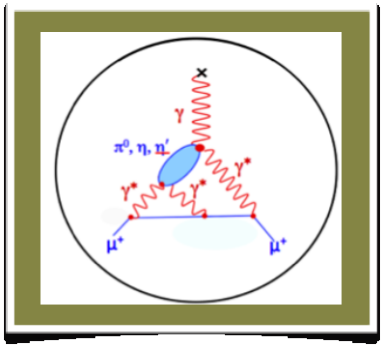


muon magnetic moment

$a_\mu^{exp} - a_\mu^{SM} = (249 \pm 87) \cdot 10^{-11}$ (3σ)



$a_\mu^{had,\,VP} = (692.3 \pm 4.2) \times 10^{-10}$



$a_\mu^{had,\,LbL} = (11.6 \pm 4.0) \times 10^{-10}$

New exp. (2016):
$\Delta a_\mu \approx 16 \cdot 10^{-11}$):

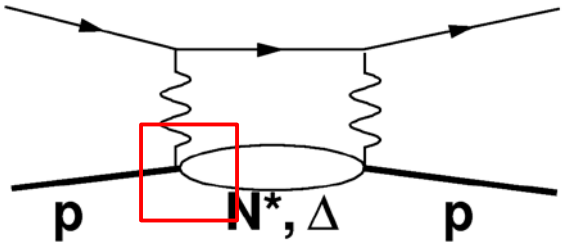
proton radius, baryon FFs

Lattice calculation of baryon FFs

elastic time like FFs, BESIII, PANDA, th

transition FFs exp, th

Two gamma contribution



Scope:

$\gamma^* \rightarrow BB', \ldots$

$B \rightarrow B'e^+e^-$

$pp \rightarrow e^+e^+$

$pp \rightarrow \pi^0 e^+e^+$

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Key activities/deliverables:

A database (LNF+Liverpool)
for low – energy hadronic cross sections.

Framework for comparison of HLbL (LU) + TFF report (UU)

Baryon form factors Lattice+quark model+dispersive (CyI+IST)
report on baryon FFs

MC – radiative corrections + computing workshop (Katowice + Torino)

Workshops, Hadron Physics Summer Preschool, publications
MSc, PhD theses

European Commission - Research - Participants

Proposal Submission Forms

Horizon 2020

Call: H2020-INFRAIA-2014-2015

Topic: INFRAIA-1-2014-2015

Type of action: RIA

Proposal number: 653088

Proposal acronym: HadronPhysicsHorizon

Participants

Work package number	10		**Start date**		01/01/2015		
Work package title	NA9-From Intrinsic Structure to Physics Beyond the Standard Model (HPrecisionNet)						
Participant number	*52*	*5*	*14*	*29*	*38*	*43*	*46*
Short name of participant	UU	UCY	UMainz	CNRS	INFN	US	IST
Person-months per participant:	0	3	3	0	8	8	3

Deliverables (brief description and month of delivery)

We plan for six meetings and workshops, a school for graduate students and a number of small meetings. The main deliverables will be data base on hadronic cross sections a report on HLbL and a new version of the event generator PHOKHARA. Our activities will lead to scientific papers, PhD, Master, and Bachelor theses on the related topics.

D10.1-Data base HVP [month 25].

D10.2-PHOKHARA program [month 27].

D10.3-Report on HLbL [month 35].

Work package number	10
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TASKS/Subtasks	**2015**				**2016**				**2017**			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1. Light meson precision physics												
1.1 Database Hadronic Vacuum Polarization								1				
1.2 Hadronic Light-by-light												3
2. Electromagnetic form factors (FFs) of baryons												
2.1 Dalitz decays of baryon resonances												
2.2 Elastic and transition baryon FFs												
3. Common activities and outreach												
3.1 PHOKHARA program									2			

HPrecisionNet – EU Keywords

Creation of world leading competence center:

hadronic contribution to aμ, meson TFF, Baryon FFs

- Continuation and extension of MesonNet

→ user community for TARI Labs

→ support EU groups for Exp in US,China,Russia,Japan

- Integrate new groups (WG RadioMC Low, …)
- Impact of precision hadron physics

=> Links to particle, atomic physics...

- Program for new EU research infrastructures (MESA, IRIDE)
- Education of young researchers (Preschool,...)