HPrecisionNet

Precision Hadron Physics

From internal structure to Physics Beyond Standard Model

Proposal for a HPH2020 network

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A. Kupść

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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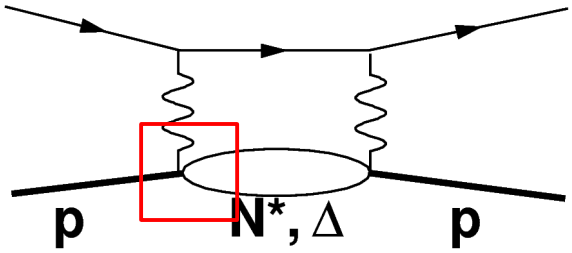
proton radius, baryon FFs

Lattice calculation of baryon FFs

elastic time like FFs, BESIII, PANDA, th

transition FFs exp, th

Two gamma contribution



Scope:

$\gamma^* \rightarrow \bar{B}B'$,...

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

$p\bar{p} \rightarrow e^+e^+$

$p\bar{p} \rightarrow \pi^0 e^+e^+$

Tasks:

1 HVP, hadronic cross sections
2 HLbL, meson TFF,...
3 Light meson decays and dynamics of hadronic FS
4 Electromagnetic form factors of baryons
5 MC generators
6 Search for physics beyond SM
7 Hadron physics program for future EU facilities
MESA,IRIDE, ...
8 Outreach

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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

Participants

Beneficiaries:

Uppsala U, INFN, U Mainz, U Bonn, U Silesia,

IST Lisbon, U Lund, U Liverpool, Cyprus I, CNRS, FZJ,

Jagiellonian U

\+ >32 Institutes (EU,US,China,Russia)

> 75 FTE

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Budget

- travel+workshops 280 kEUR ≈ MesonNet

  + longer visits 3m (Lund+Mainz)

  53% (MesonNet 79% but HP3 avg. Network 50%)

- positions 230 kEUR: administration, data base, software

  7.25 p-years = 2.4 FTE

  shared postdocs: Katowice ↔ Torino

  Frascati ↔ Liverpool

  Nicosia ↔ Lisbon

Dear colleague,

Discussing the validity of the proposals for HadronPhysicsHorizon we would like to give you the possibility to modify your written proposals in respect of the individual challenges for the program. Especially we would like to encourage those who made a cross for a specific challenge to elaborate appropriately in the text, as also mentioned during the kick-off meeting. Secondly, given the financial constraints of the over all budget, which is strictly limited to 10 M€ maximum by the EC, we have defined as a general rule for Networks that a maximum number of 6 equivalent PostDoc years (50 k€ each), which have to be very-well justified e.g. by coordination or integration purposes can be funded. This follows rules suggested by the EC.

Also, we would like you to be a bit more specific on the cost item 'other costs' and ask you to please specify the items "Durables", "Consumables", "Travel", "Workshops" and "Schools" individually within the proposed budget that you have given to us.

We certainly appreciate your help and are looking forward receiving your answer at your earliest convenience, but not later that April 14.

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Contractor Acronym	Personnel (EUR)	Travel and workshops (EUR)	Total direct costs (EUR)	Indirect costs (EUR)	Requested EC contribution (EUR)
INFN	**100,000**	50,000	150,000	37,500	187500
INFN-LNF	**50,000**	40,000	90000	22,500	112500
INFN-TO	**50,000**	5,000	55000	13,750	68750
INFN-GE	**0**	5,000	5000	1,250	6250
UBO	**0**	20,000	20000	5,000	25000
UMainz	**0**	80,000	80000	20,000	100000
UU	**25,000**	30,000	55000	13,750	68750
ULUND.	**0**	30,000	30000	7,500	37500
FZJ	**0**	20,000	20000	5,000	25000
ULiverpool	**50,000**	4,000	54000	13,500	67500
US	**50,000**	4,000	54000	13,500	67500
IST	**50,000**	8,000	58000	14,500	72500
CyI	**25,000**	2,000	27000	6,750	33750
CNRS	**0**	20,000	20000	5,000	25000
JU	**0**	12,000	12000	3,000	15000
TOTAL	**300,000**	**280,000**	580000	145,000	725000

3→6m

1.5→1y

1.5→6m

Max 6 person-year 50k/y

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TASKS/Subtasks	**2015**				**2016**				**2017**			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1. Hadronic Vacuum Polarization for the muon g-2												
1.1 Compilation of an annotated database	1			4				8	9			
1.2 Improved evaluation of a_μ^{HVP} via Lattice QCD	1					5		8			11	
1.3 Evaluation of electroweak precision observables						5		8			11	
2. Hadronic Light-by-Light for the muon g-2, meson form factors, and other processes with off-shell photons												
2.1 Meson transition form factors and production processes	1			4		5		8			11	12
2.3 Study of the contributions to g-2	1			4		5		8			11	
3. Studies of light meson decays and dynamics		2				5					11	
4. Electromagnetic form factors of baryons												
4.1 Exp. studies of time-like elastic and transition form-factors	1		3			5					11	
4.2 Theoretical studies of baryon form-factors	1		3			5					11	
4.3 Two-photon contribution to space- and time-like FF of nucleons	1					5					11	
5. Monte Carlo generators				4					10			

1 Start-up meeting(s): for tasks and for coordinating group
2 Workshop on light meson dynamics
3 Meeting on baryon FFs
4 Meeting on radiative corrections and hadronic cross sections #1
5 1st General Meeting of the Network
6 Hadron Physics Summer Preschool
8 Meeting on radiative corrections and hadronic cross sections #2
9 Data base for low-energy hadronic cross sections
10 Workshop on computing (Turin)
11 2nd General meeting of the Network
12 A program framework for comparison of HLbL

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Milestone number	Milestone name	Work package	Expected date	Means of verification
WPx.1	Start-up meeting(s): individual tasks and coordinating group	x	3	minutes distributed to participants and detailed plan
WPx.2	Workshop on light meson dynamics	x	5	mini-proceedings
WPx.3	Meeting on baryon FFs	x	8	web page with presentations
WPx.4	Meeting on radiative corrections and hadronic cross sections #1	x	11	mini-proceedings
WPx.5	1st General Meeting of the Network	x	18	web page
WPx.6	Hadron Physics Summer Preschool	x	21	web page
WPx.7	Workshop on dark photon searches (Camogli)	x	22	workshop web page
WPx.8	Meeting on radiative corrections and hadronic cross sections #2	x	23	mini-proceedings
WPx.9	Data base for low-energy hadronic cross sections	x	25	data base/web page/report
WPx.10	Workshop on computing (Turin)	x	27	web page/report on MC
WPx.11	2nd General Meeting of the Network	x	33	mini-proceedings
WPx.12	A program framework for comparison of HLbL	x	35	report

Deliverable No.	Deliverable name	WP No.	Nature	Dissemination level	Delivery date
WPx.1	mini-proceedings: light meson dynamics	x	R	PU	9
WPx.2	mini-proceedings: radiative corrections	x	R	PU	14
WPx.3	Hadron Physics Summer Preschool	x	O	PU	21
WPx.4	Workshop on dark photon searches	x	O	PU	22
WPx.5	Report on HVP/data base	x	R,O	PU	25
WPx.6	PHOKHARA program/report on MC	x	R,O	PU	27
WPx.7	Report on baryon FFs	x	R	PU	32
WPx.8	Report on HLbL	x	R	PU	35

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,...)