

Jefferson Science Associates, LLC
Managing and Operating the Thomas Jefferson National Accelerator Facility
for the U.S. Department of Energy

FY2018 JSA Initiatives Fund Proposal Summary Sheet

Proposal title

Project Start Date (month/year)

Project End Date (month/year)

New
proposal

Renewal

**Total funds
requested**

Total leveraged support / matching
funds. Details of funds must be
included in budget proposal.

To be completed by JSA: Total funds awarded

Principal Investigator (PI)

Institutional affiliation
Mailing address
Email / phone #

Co-PI (if more than 1, add
pages with information)

Institutional affiliation
Mailing address
Email / phone #

Check one category: If PI is a Lab employee, your identification of the appropriate Associate Director below represents the acknowledgement of that AD with your submittal of proposal. No signature required.

Lab employee: Identify Associate Director (email /
phone)

Lab user: Identify University affiliation (email / phone)
Joint appointee: identify University and Lab division
association (email / phone)

Other: Identify Institutional affiliation (email /
phone)

Proposal: Attach file with

- (1) **Executive summary and technical proposal**
- (2) **Synopsis of scientific, educational, technical, and/or business merits, and alignment with and significance to Lab's current program**
- (3) **Proposed evaluation plan to measure success.** If this is a request for renewal of funds, assessment of prior year performance,

Your proposal may include letters of endorsement and other supporting information (maximum of 12 pages including this summary sheet and budget sheet)

Budget Proposal

Proposal Title

Principal Investigator (PI)

Total funds requested

To be completed by JSA: Total funds awarded

	Item Description		Amount
<p>Equipment. Lab users submitting proposals that include equipment to be used at the Lab must review with the appropriate Lab Associate Director. The provision of the name of the AD below represents the AD's acknowledgement. No signature required.</p>			
	Associate Director: _____		
	_____	_____	
	_____	_____	
		Subtotal Equipment	
<p>Travel Support. Provide break-out of estimates for registration fees, lodging and transportation, catering, and facility charges (room rentals, AV equipment; etc.)</p>			
	_____	_____	
	_____	_____	
	_____	_____	
		Subtotal Travel	
<p>Supplies</p>			
	_____	_____	
	_____	_____	
		Subtotal Supplies	
<p>Consultants/Subcontracts</p>			
	_____	_____	
	_____	_____	
		Subtotal Consultants/Subcontracts	
<p>Other Expenses. Examples include stipends and honoraria, prizes, awards.</p>			
	_____	_____	
	_____	_____	
		Subtotal Other Expenses	
		Total Budget Proposal	

Budget Justification: Include narrative to explain need for each line item in the budget, showing breakdown of calculations used to arrive at the amount in each line of the budget. Note that the JSA Initiatives Fund Program does not support salaries and salary-related expenses, or indirect expenses.

Leveraged Support/Matching Funds information. Identify the source, type and amount of dollar funds from each institution. Include **separately** estimated value of in-kind support. Your identification of the authorized representative who has committed institutional support for your proposal represents the acknowledgement of that individual. If support or funds are provided by the Lab, identify the associate director (or equivalent) as the authorized representative. Information may be included on separate page.

Transversity 2017

Organizers: M. Anselmino (Turin Univ. & INFN), A. Bacchetta (Pavia Univ. & INFN), M. Contalbrigo (INFN - Ferrara), E. De Sanctis (INFN -LNF), U. D'Alesio (Cagliari U. & INFN) , A. Martin (Trieste Univ. & INFN), M. Mirazita (co-PI, INFN-LNF), E. Pace (Roma Univ. Tor Vegata & INFN) , P. Rossi (PI, JLab & INFN-LNF), G. Salme' (INFN Roma).

Executive Summary

In the last decade, our grasp of the fundamental quark and gluon structure of the nucleon founded on QCD have entered a new era where a framework suitable for a comprehensive and quantitative approach to the description of nucleon structure has emerged. In this framework our knowledge of nucleon structure is encoded in the quantities known as generalized parton distributions (GPDs) and transverse momentum-dependent distributions (TMDs). While GPDs are key to the spatial tomography of the nucleon, TMDs allow for its momentum tomography. Research focuses on these novel tools to unearth the three-dimensional structure of nucleon in the valence quark region, is one of the main driving forces behind the 12-GeV Upgraded Jefferson Lab (JLab). These programs will be dramatically extended at the proposed Electron-Ion Collider (EIC), which has been identified in the 2015 NSAC Long-Range Plan as the highest priority for new facility construction following the completion of FRIB. There, the role of the gluons and sea quarks will be explored in determining the nucleon and nuclei structure and properties.

In order to expand the international support to the JLab 12 physics program and possible future EIC, and attract more collaborators, we will have a week-long workshop on **Transverse Polarisation Phenomena in Hard Processes - Transversity 2017-** at INFN Frascati Lab (Italy) from December 11 to December 15, 2017

(<http://www.roma1.infn.it/conference/Transversity2017/index.html>).

The Workshop follows the successful editions held in 2005 on Lake Como (Italy), 2008 Ferrara (Italy), 2011 in Losinj (Croatia), 2014 Chia-Sardinia (Italy).

The focus of the program will be threefold: i) on the question how we can increase — on the basis of already existing and future data as well as theory interpretations — our understanding of the 3D structure of nucleons and nuclei; ii) on the extraction of the 3D-PDFs from semi-inclusive and exclusive deep inelastic scattering data; iii) on how to contribute to the development of research programs and unified treatments of some of the crucial problems in the theory of strong interaction involving 3D PDF and low-x communities.

The proposed workshop will provide a forum in which the future program of global studies of 3D PDFs will be shaped. We anticipate that the workshop will attract new collaborators to join JLab12 and a possible future EIC project, and ultimately significantly broaden the worldwide support to our entire physics program.

The Science Motivation

Transversity and transverse-spin effects in high-energy hadronic collisions are of ever-growing theoretical and experimental interest within the particle physics community. Modern

developments in hadron physics emphasise the role of parton intrinsic motion and spin, and their correlations, which are crucial to our full understanding of the nucleon structure in terms of the quark and gluon degrees of freedom in QCD, beyond the collinear approximation.

The aim of this workshop is to provide an environment in which present theoretical and experimental knowledge in the field of transversity, transverse-momentum dependent distribution and fragmentation functions as well as generalised parton distribution functions will be presented and discussed in depth, together with new theoretical ideas and new experimental perspectives. In addition, as the 3D-PDFs are not direct physical observables, part of the workshop will focus on the development of frameworks for their extraction and validation from experimental measurements of hard exclusive and semi-inclusive production of photons and mesons.

This workshop represents a valuable opportunity to gather the hadron physics community involved in the study of the 3D imaging of the nucleon, with a broad participation of theorists, as well as of experimentalists working in international collaborations at BEPC-II, BNL, CERN, DESY, KEK and JLab, all deeply involved in this area of research. The workshop will also be a unique occasion for young researchers to form a detailed and up-to-date perspective on this fast-developing research field, and to present and discuss their own work and projects in a highly stimulating and reactive context.

Major Outcomes

The phenomenology of 3D-PDFs is extremely rich, and many experiments are currently trying to pin down various effects through semi-inclusive deep-inelastic scattering and hard exclusive processes (in experiments such as at upgraded Jefferson Lab in Halls A, B and C and COMPASS at CERN), polarized proton-proton collisions (PHENIX and STAR at RHIC), electron-positron annihilation (Belle/Belle II and BESIII) and DY production (COMPASS, Fermilab). 3D-PDFs have also been widely recognized as one of main driving forces behind construction of the Electron Ion Collider.

Our understanding of the 3D-PDFs physics increased enormously during the last years. Currently, we already have a *qualitative* understanding at least. However, in order to turn this into a *quantitative* picture and to have maximum benefit from the enormous amount of current and future data, several problems have to be solved.

We expect the proposed workshop to be an important opportunity in order to efficiently address unsolved current issues of the physics of the transverse structure of the nucleon and also to identify directions for further development of this quickly developing field. Key points of the field of the transverse parton structure of hadrons will be addressed by the proposed workshop, among those:

1) QCD issues associated with 3D structure

Despite enormous efforts in the past years, studies are still needed to in order to get answers to many fundamental questions, such as:

Energy evolution of TMD observables

The TMD-experiments are performed at rather different energies. Therefore, in order to get a quantitative relation between the experiments, which allows one to reliably extract TMDs from data, the energy dependence of the TMD observables, as predicted by perturbative QCD, has to be studied carefully.

Factorization

It is still unclear how various spin-azimuthal asymmetries observed in pp-scattering can be described in terms of QCD factorization using TMDs.

Origin of single spin asymmetries in hadron-hadron collisions

Significant single spin asymmetries in polarized hadron-hadron collisions with hadronic final states have been observed but it is not yet clear what is their origin.

2) Phenomenology of 3D PDFs

Distribution functions are not directly accessible from experiments and QCD-based models are normally applied for their extraction from the measured structure functions. We will review the available non-perturbative models and what new insights on 3D PDFs can we get from them.

3) Extraction and Validation Framework of 3D-PDFs

Although the interest to 3D-PDFs has grown enormously since first measurements of SSAs performed by the HERMES collaboration in 1996, one of the main challenges still remaining is the extraction of actual 3D PDFs (GPDs and TMDs) from different spin and azimuthal asymmetries and cross sections in a model independent way. The standard approach to global parton fits have several shortcomings, one being the bias introduced by choosing fixed functional forms to parametrize the parton distributions. Novel strategies to address the problem of constructing unbiased parametrizations of parton distributions with a faithful estimation of their uncertainties, will be discussed. We specifically focus on the question how to extract underlying 3D parton distribution and fragmentation functions from the wealth of data expected from semi-inclusive deep inelastic scattering (SIDIS), pp and e+e- experiments including the future electron-ion collider.

4) Relevance of the knowledge of the proton structure for the LHC physics, and viceversa

The transverse momentum dynamics may be very important at low x . For example, the transverse-momentum spectrum of vector bosons produced in Drell-Yan-like processes at the LHC is influenced by the contribution of intrinsic partonic transverse momentum. Higgs production is influenced by gluon TMDs and is also sensitive to linear gluon polarization. LHC data can offer unique insights to improve the knowledge of TMDs and, on the contrary, the knowledge of TMDs can be necessary to achieve high-precision results demanded by the search for new physics. TMDs can also be affected by the nuclear environment in heavy-ion collisions, leading to the concept of Nuclear TMDs. Double parton distribution functions (dPDFs) represent, also, a tool to explore the 3D partonic structure of the proton. They can be measured in high energy proton-proton and proton nucleus collisions and encode information on how partons inside a proton are correlated among each other.

All the above themes will be discussed during the workshop. We will have 14 review talks, 44 shorter research talks and a round table.

5) Attract new collaborators

The measure of the success of the workshop, will be the addition of new collaborators and coordination of efforts on studies of the transverse structure of the nucleon worldwide in addition to JLab12 including also possible future facilities such as the Electron Ion Collider. Key personalities of the field have already accepted our invitation and will contribute to a

vivid discussion on the crucial problems in strong interactions involving 3D PDF. Moreover, the participation of the low-x community will increasing the international support for a multifaceted effort to study the fundamental 3D structure of matter.

Budget Needs for a Successful Workshop

In order to make this workshop successful some financial support will be needed. The most expensive component of such an endeavor is the travel expenses that would need to be covered for key speakers and students at the workshop. There are also costs associated with local amenities such as coffee breaks and reception. The organizing committee has already gotten committed support from Jefferson Lab at the level of \$3.000,00, from INFN Euro 3.000,00, EPJA Euro 1.500,00, ERC 3DSPIN Euro 2.000,00, Argonne National Lab \$1.500,00, University of Connecticut \$3.000,00, CAEN Euro 300,00. With this proposal, we are requesting support from JSA for this workshop at the level of \$4.000,00.

JSA Initiatives Fund Request—-Budget Page

Salary		
	Subtotal Salary	\$ 0.0
Fringe		\$ 0.0
Equipment		\$ 0.0
	Subtotal Equipment	\$ 0.0
Travel Support for key workshop participants and students		\$ 4000.0
	Budget Total	\$4,000.00

Budget Justification

The travel amount, supplemented by money from the non-JSA money will be used to support key people to attend the conference. It is likely that we will need to provide some level of support to bring in international participants. Our anticipated numbers are comparable to other workshops of this serie (~ 80 - 100 people).



Kawtar Hafidi
Director

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August 4, 2017

Letter of Support for the Frascati Workshop
"Transversity 2017"

I am writing this letter to Jefferson Science Associates in strong support for the upcoming workshop "Transversity 2017" to be held at the INFN Laboratori Nazionali di Frascati, December 11 to December 15, 2017.

The workshop follows four very successful prior editions and has always provided a vibrant environment for in depth discussion of theoretical and experimental knowledge in the field of transverse-momentum dependent distribution and fragmentation functions as well as generalized parton distribution functions.

In order to make also this edition successful Argonne National Laboratory's Physics Division has committed a support of \$1,500

Sincerely,

A handwritten signature in black ink, appearing to read "Kawtar Hafidi", with a long horizontal stroke extending to the right.

Kawtar Hafidi, PhD
Director, Physics Division
Argonne National Laboratory

From: Patrizia Rossi rossi@jlab.org
Subject: Re: Transversivity 2017 Workshop
Date: 07 febbraio 2017 14:10
To: Caron, Christian, Springer DE Christian.Caron@springer.com

PR

Dear Chris,

this is fantastic! Thank you very much for your quick and positive response!
I will let you know as soon as we have decided on the list of the invited speakers.

Cheers
patrizia

P.S. Is London your home residency?

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On 07/feb/2017, at 14:06, Caron, Christian, Springer DE <Christian.Caron@springer.com> wrote:

dear patrizia,
sure, can we do that as usual by picking one invited lecture as the "epja lecture". we would as usual provide 1500 eur.
just let me know as soon as you have decided on the list of invited speakers...
greetings from london
chris

Von meinem Samsung Gerät gesendet.

----- Ursprüngliche Nachricht -----
Von: Patrizia Rossi <rossi@jlab.org>
Datum: 2017.02.07 7:22 PM (GMT+01:00)
An: "Caron, Christian, Springer DE" <Christian.Caron@springer.com>
Cc: rossi@jlab.org
Betreff: Transversivity 2017 Workshop

Dear Chris,

Italian physicists, are organizing a workshop on Transverse Polarization Phenomena in Hard Processes "Transversivity 2017" which will take place at the Frascati National Laboratories - Frascati, (Italy) from December 11th to 15th, 2017. The workshop belongs to a series organized in the frame of the Italian Ministry-funded inter-university Research Project of National Interest (PRIN), and follows those held in 2005 on Lake Como (Italy), 2008 in Ferrara (Italy), 2011 in Lošinj (Croatia), and 2014 in Cagliari (Italy) . In 2011 and 2014 I was a member of the Local Organizing Committee and I have been asked to continue to be in duty also for this edition.

The main aim of the workshop is to provide an environment in which present theoretical and experimental knowledge in the field of transversivity, transverse-momentum dependent distribution and fragmentation functions as well as generalised parton distribution functions will be presented and discussed in depth, together with new theoretical ideas and experimental perspectives. It represents a valuable opportunity to gather the spin physics community, with a broad participation of theorists, as well as of experimentalists working in international collaborations at BEPC-II, BNL, CERN, DESY, KEK and JLab, all deeply involved in this area of research. The workshop will also be a unique occasion for young researchers to form a detailed

and up-to-date perspective on this fast-developing research field, and to present and discuss their own work and projects in a highly stimulating and reactive context.

On the basis of the previous experience, a total of ~80 participants are expected and a number of theoretical and experimental presentations with approximately 50 speakers (by invitation only) and one or two round-table discussions are planned. It is still under discussion, as to the previous editions, all speakers will be requested to submit a written version of their contribution to be published in the workshop proceedings.

As I said, progress in this field (as in any other field) depends strongly on the close collaboration and communication but also in the capability to disseminate the knowledge to young scientists (students and post-docs). In our workshop they will also be invited to gain further educational insight by hearing the latest results in the field and presenting their work. In order to ensure that young people will attend and receive the educational benefit, we aim to provide a reduced registration fee, or in some cases waivers, to them.

To maintain an affordable registration fee for the attendees (we have in mind ~ 300 Euro) and to support students and some participants we are trying to obtain additional sources of funding. We have already received contributions from INFN, Jefferson Lab, and from the 3DSPIN ERC Consolidator Grant. I am sending you this e-mail to know if also EPJ can give some support...it will be very helpful and very much appreciated!

Many thanks for considering this request.

My warmest regards

patrizia

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From: Bob McKeown bmck@jlab.org
Subject: Re: Request for financial support
Date: 04 agosto 2016 15:55
To: Patrizia Rossi rossi@jlab.org
Cc: Pat Stroop Stroop@jlab.org

BM

Patrizia,

Yes of course, we can commit \$3K again. You might also consider a contribution from JSA - the Initiatives Fund proposals are due August 8.

Bob

On 8/4/2016 3:41 PM, Patrizia Rossi wrote:

Dear Bob,

three years ago I asked you to support the "Transversity 2014" workshop and you kindly agreed to support it (see e-mail below). It is time, now, to organize the next edition of this series that we plan to have in Frascati in Spring 2017. May we still count on Jlab's support?

Many thanks for considering this request

patrizia

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cell: +1 (757) 528 7606

On 02/ago/2013, at 13:30, Bob McKeown <bmck@jlab.org> wrote:

Hi Patrizia,

We are happy to support this workshop, and commit US\$3000. Pat Stroop can arrange for the transfer of funds.

Bob

On 8/2/2013 9:29 AM, [rossi patrizia](mailto:rossi@jlab.org) wrote:

Dear Bob,

Italian physicists, are organizing a workshop on "Transversity and transverse spin Physics" which will take place in Sardinia (Italy) in the period June 8-13, 2014.

The workshop belongs to a series organized in the frame of the Italian Ministry-funded inter-university Research Project of National Interest (PRIN) specifically dedicated to the study of Transversity and Transverse spin. The workshop in 2014 will follow the ones held in Como in 2005, in Ferrara in 2008 and in Losinj in 2011.

The members of the PRIN, among which Mauro Anselmino, have planned these workshops to gather together world experts, theorists and experimentalists, engaged in investigating the nature of transverse spin in hadron physics, with the aim of exchanging up-to-date theoretical and experimental ideas and news on the subject. Progress in this field depends strongly on the close collaboration and communication among physicists working on experimental and theoretical aspects of the field.

Undoubtedly, the topics addressed by this International Workshop represent a major part of the current and future experimental and theoretical program at Jlab.

On the basis of the previous experience, a total of ~80 participants are expected and a number of theoretical and experimental presentations with approximately 40 speakers (by invitation only) and one or two round-table discussions are planned. The talks presented in the past editions have been collected in proceedings books and the plan is the same this time. You can access the websites of the previous editions (<http://scienze-como.uninsubria.it/phil/WS2005/>, <http://www.fe.infn.it/transversity2008>, <http://ecsac.ictp.it/transversity2011>) for a look at the detailed programs.

In 2011 I was a member of the local organizing committee and I have been asked to continue to be in duty also for this edition (even if my actual location is several thousand miles from Italy!). Before accepting I talked to Rolf and he encouraged me to take in.

The members of the LOC are U. D'Alesio, F. Murgia, A. Bacchetta, M. Boglione, A. D'Angelo, A. Martin, M. Mirazita, L. Pappalardo, P. Rossi

For The International Advisory Committee (IAC) we plan to make small modification to the one used in Transversity 2011 which was composed by:

- Mauro Anselmino / Torino
- Harut Avakian / JLAB

- Sigfrido Boffi / Pavia
- Franco Bradamante / Trieste
- Stanley J. Brodsky / SLAC
- John Collins / Penn State
- Anatoly Efremov / Dubna
- Wolfgang Eyrich / Erlangen
- Enzo De Sanctis / LNF
- Elliot Leader / London
- Gerhard Mallot / CERN
- Piet Mulders / Amsterdam
- Wolf-Dieter Nowak / DESY
- Bernard Pire / CPHT
- Philip G. Ratcliffe / Insubria
- Klaus Rith / Erlangen
- Jianwei Qiu / BNL
- Werner Vogelsang / Tübingen
- Feng Yuan / Beijing

As I said, progress in this field (as in any other field) depends strongly on the close collaboration and communication but also in the capability to disseminate the knowledge to young scientists (students and post-docs). In our workshop they will be also invited to gain further educational insight from hearing the latest results in the field and to present their work. In order to ensure that young people will attend and receive the educational benefit, we aim to provide a reduced registration fee, or in some cases waivers to them.

To maintain an affordable registration fee for the attendees (we have in mind ~ 300 Euro) and to support students and some participants we are trying to obtain additional sources of funding. To this end we are asking funding from International National Laboratories and Institutions. We have already received contributions from INFN, the HP3 of the Seventh Framework Programme (FP7) of European Union and the Sardinia region. I am sending you this e-mail to know if also Jlab can give some support...it will be very helpful and appreciated!!

Many thanks for considering this request

patrizia

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August 4, 2017

To whom it may concern:

I am writing this letter to confirm that the University of Connecticut is committed to provide \$3,000 in matching funds to support **Transversity 2017** which will be held on December 11-15, 2017 in Frascati, Italy. Thanks.

Sincerely yours,

Kyungseon Joo

Kyungseon Joo, Ph.D.
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