

New Light, Weakly Coupled Particles

part of

Community Summer Study 2013

(“Snowmass” on the Mississippi)
Minneapolis, 7/29 - 8/6, 2013

<http://www.snowmass2013.org>

Introduction & Goals

Why should you care and how can you help?

Aim of CSS 2013

- American Physical Society (APS) Division of Particles and Fields has initiated a long-term planning exercise for the high-energy physics community.
- Its goal is to develop the community's long-term physics aspirations
- Its narrative will communicate the opportunities for discovery in high-energy physics to the broader scientific community and to the government.

Structure of “Snowmass 2013”

Divided into 8 study groups,
each with two group conveners

- Energy Frontier
- Intensity Frontier (our subgroup)
- Cosmic Frontier
- Frontier Capabilities
- Instrumentation Frontier
- Computing Frontier
- Education and Outreach
- Theory Panel

Intensity Frontier

conveners are JoAnne Hewett & Harry Weerts

divided into 6 subgroups, one of which is:

IF5: New Light, Weakly Coupled particles

subgroup conveners:

Rouven Essig, John Jaros, William Wester

Topics:

- A' physics
- axions & axion-like particles (accelerator based searches)
- chameleons
- anything else that is new, light and weakly-coupled...

Our group's goals

- update physics case, including latest constraints
- update on planned experiments
- projection of where we think the field can be in 10 to 20 years
- how improve searches?
- outline of what new detectors, technologies, and/or facilities are needed for future progress

Provide a new document that includes all this...

We again need contributors!
Please help!

Why should you help?

We just went through this exercise Dec 2011 (Intensity Frontier Workshop), and these meetings are costly and time-consuming, but...

- An opportunity to investigate how to improve future searches, what facilities do we need, where do we see field in 10-20 years... these are important physics questions!
- An opportunity to bring the physics we care about to the attention of a much wider audience (not just intensity frontier!)
- as a small group, need to make sure we're not forgotten when focus will be on neutrinos, ILC, ... showing enthusiasm and community support for this physics is vital
- We've done some of this recently, so not *that* much work!

How can you help?

- Please spread the word
- Are we missing any physics that should be included?
- Which experiments should we be doing now, in 5 years, in 10 years? What is physics motivation? What do we need to do these experiments?
- Attend **Intensity Frontier workshop** at Argonne National Lab from **April 25-27, 2013**
- Attend "**Snowmass**" meeting in Minneapolis on **7/29 - 8/6, 2013**

John & William will now discuss concrete requests & way forward

Preparing for Argonne Workshop

New, Light, Weakly Coupled Particles

Intensity Frontier Subgroup IF5

NLWCP Phone Meeting

February 11, 2013

John Jaros

Register and Attend

Intensity Frontier Workshop

- There will be an Intensity Frontier Workshop at Argonne National Laboratory on April 25-27, 2013. Please register at: <https://indico.fnal.gov/event/intensity-frontier>
- The registration fee is \$82 and includes attendance at all sessions, lunch on Saturday, coffee breaks, and administrative costs of organizing the meeting. There will be an optional banquet on April 25, 2013 at the Argonne Guest House. Please make your hotel reservations by April 9, 2013.
- Program being planned.
 - ½ day opening plenaries
 - 1 - 1½ days parallel session
 - closing plenaries
- NLWCP will want to know your plans to attend, your desires to present a talk, your thoughts about what's needed for the meeting.

Last Time at IFW

- Hidden Sector Photons...Agenda at IFW
<https://twindico.hep.anl.gov/indico/conferenceOtherViews.py?view=standard&confId=751>
- Topics Last Time = Topics This Time.
 - * Theory Overviews: Axions, Chameleons, WISPS, Heavy Photons
 - * Experimental results, updates, and plans
 - * New Ideas and Long Term Plans
 - * Planning for Written Report
- This Time: More emphasis on New Ideas, Long Range Plans, New Technologies and Facilities

Wednesday 30 November 2011

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14:00	Introduction to WG (10)	John Jaros (SLAC)
14:10	Axion Theory Overview (35)  	Pierre Sikivie (Univ. Florida)
14:45	Discussion	
14:50	Chameleon Theory Overview (35)  	Amol Upadhye (ANL)
15:25	Discussion	
15:30	Coffee break (Plaza Foyer Area)	
16:00	CAST & Helioscopes (25)  	Konstantinos Zioutas (Univ. Patras, Greece)
16:25	Discussion	
16:30	The Axion Dark Matter eXperiment (ADMX): Phase II and ADMX-HF (15)  	Gianpaolo Carosi (LLNL)
16:45	Discussion	
16:50	IAXO (15)  	Michael Pivovarov (LLNL)
17:05	Discussion	
17:10	REAPR and New Developments (15)  	David Tanner (Univ. Florida)
17:25	Discussion	
17:30	Axion Detection with Cold Molecules (15)  	Surjeet Rajendran (Stanford)
17:45	Discussion	
17:50	Discussion: Needed Advances in Technology (45)      	
19:00	Reception and Poster Session (Atrium Area)	

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08:30	WISPs Theory Overview (35)	Javier Redondo (<i>Max-Planck-Institut für Physik</i>)
09:05	Discussion	
09:10	ALPS and SHIPS (15)	Axel Lindner (<i>DESY</i>)
09:25	Discussion	
09:30	LIPSS (15)	Oliver Baker (<i>Yale Univ.</i>), Andrei Afanasev (<i>George Washington Univ.</i>)
09:45	Discussion	
09:50	Search for Hidden Gauge Scalar Bosons in $X \rightarrow \gamma\gamma$ Neutral Channel (15)	Ashot Gasparian (<i>JLAB</i>)
10:05	Discussion	
10:10	Coffee Break (Plaza Foyer Area)	
10:40	Heavy Photon Theory Overview (35)	Philip Schuster (<i>Perimeter Institute for Theoretical Physics</i>)
11:15	Discussion	
11:20	APEX (15)	Natalia Toro (<i>Perimeter Institute for Theoretical Physics</i>)
11:35	Discussion	
11:40	Dark Photon Searches with the Mainz Microtron (15)	Harald Merkel (<i>Mainz University</i>)
11:55	Discussion	
12:00	Heavy Photon Search (15)	Mathew Graham (<i>SLAC</i>)
12:15	Discussion	
12:30	Lunch (Atrium Area)	
14:00	DarkLight (15)	Ray Cowan (<i>MIT</i>)
14:15	Discussion	
14:20	Searches with e^+e^- Colliders (15)	Bertrand Echenard (<i>California Institute of Technology</i>)
14:35	Discussion	
14:40	Tevatron/LHC Searches (15)	Andrew Haas (<i>New York Univ.</i>)
14:55	Discussion	
15:00	Probing Hidden Sectors with Proton Beams (15)	Brian Batell (<i>Univ. Chicago</i>)
15:15	Discussion	
15:20	Parity-Violating Muonic Forces (15)	David McKeen (<i>Univ. Victoria</i>)
15:35	Discussion	
15:40	Coffee Break (Plaza Foyer Area)	
16:10	VEPP-3 (15)	Bogdan Wojtsekhowski (<i>Jefferson Lab</i>)
16:25	Discussion	
16:30	Hidden Sector Photons: Accelerator Parameters (15)	Arne Freyberger (<i>Jefferson Lab</i>)
16:45	Discussion	
	Led by Freyberger	

17:15->18:10 Open Forum for New Ideas

Description:

includes: theory, experiments, future directions

18:10->18:30 Plans for summary talk/written report

Preparations Needed for Argonne

- **Volunteers needed for theory talks**
Make the physics case accessible to the whole field
Identify and motivate critical areas of parameter space
Are HSPAW motives still viable? New motives?
- **Volunteers needed for experimental status/plans talks**
Want to thoroughly update the experimental situation for all NLWCPs
(lots of progress since last meeting)
- **Volunteers needed for New Ideas Forum for 10-20 Year Timescale**
How to search in new regions of parameter space?
What new technologies, new facilities needed?

Updating HSPAW Data Sheets -> NLWCP

- Last time around, collected “data sheets” from different experiments and areas of study to help identify critical areas to be covered in our report.

Data Sheet

In order to survey all the current and planned experiments, we ask all interested participants to fill out the following form, preferably in latex, and send it to the convenors. [template.pdf](#) [template.tex](#)

Here are some data sheets that we have already received:

Oliver Baker (LIPSS) ([pdf](#), [figure](#))

Fabio Bossi (KLOE) ([pdf](#))

Ray Cowan (Dark Light) ([pdf](#))

Achim Denig (Mainz) ([pdf](#))

Bertrand Echenard (BaBar, Super-B) ([pdf](#))

Matt Graham (HPS) ([pdf](#))

Andrew Haas (ATLAS, D0) ([pdf](#))

Igor Irastorza (IAXO) ([pdf](#))

Jaegle (Belle) ([pdf](#))

A. Lindner, J. Redondo, A. Ringwald, M. Schwarz, G. Wiedemann (SHIPS) ([pdf](#))

Axel Lindner & Andreas Ringwald (ALPS) ([pdf](#))

Rhys Povey, John Hartnett, Michael Tobar (UWA microwave cavity) ([pdf](#))

Surjeet Rajendran (MADAME) ([pdf](#))

Philip Schuster (APEX) ([pdf](#))

David Tanner (REAPR) ([pdf](#))

Devin Walker, L. A. Moustakas, and K. Sigurdson (OMEGA) ([pdf](#))

William Wester (GammeV, GammeV-CHASE) ([pdf](#))

Bogdan Wojtsekhowski (VEPP-3) ([pdf](#))

Konstantin Zioutas (CAST) ([pdf](#))

New “data sheets” requested to update results, find new participants, and survey all experiments.

Current Status

- Using snowlwcp@slac.stanford.edu mailing list
- A few data sheets have been received
- Speakers for the Argonne workshop have been contacted
 - Open to self-nominated speakers especially those with new ideas
 - Program being put together
 - Cosmic Frontier Workshop has had a nice mix of semi-informal talks/discussion
- We have just started to organize four initial working groups ... hopefully a white paper from each with new theoretical motivations and experimental thoughts with focus on future efforts
 - Hidden sector searches at electron machines
 - Hidden sector searches at proton machines
 - Other new light weakly coupled particles
 - Laser searches for New Light Weakly Coupled Particles

Working towards the
Community Summer Study
(“Snowmass 2013”)

Minneapolis MN July 29-Aug 6

New, Light, Weakly Coupled Particles
Intensity Frontier Subgroup IF5

<http://www.snowmass2013.org>

Facebook and Twitter groups too!

Planning Processes affecting US HEP

Jan 30, 2013 message from: Jim Siegrist, DOE, Assoc. Head Office of HEP and
F. Fleming Crim, NSF, Ass't Director Mathematical and Physical Sciences

“DOE Office of Science (SC) Director Bill Brinkman issued a charge in December to the SC advisory committees to get their advice on the scientific impact and technical maturity of planned and proposed SC Facilities" (~\$100M + within 10 yrs). HEPAP Facilities Subcommittee chair is Andy Lankford, Univ California at Irvine.

“The DPF-led Snowmass process has been established to identify compelling science opportunities over an approximately 20 year time frame. This process necessarily encompasses a wider portfolio of activities than that considered by the HEPAP Facilities subpanel, and can make more detailed studies of new and existing concepts... DPF Snowmass process will produce a report which summarizes the science case and highlights selected areas which need additional research and/or technology R&D. “

The funding agencies expect to charge HEPAP with establishing a new program prioritization subpanel (a.k.a. P5) around the time of the completion of the Snowmass process to recommend a strategic plan for US HEP in various scenarios.

Prior to Minneapolis

- To be done prior to Minneapolis
 - Existing and new studies in our topic areas ...
new ideas are certainly welcome
 - Focus on the physics case
 - Focus on longer term and possible new facilities
or new technologies
- Document
 - We hope many of you will help write up the final
report of our subgroup.

In Minneapolis

- A chance to make the physics case for New Physics emerging as new light weakly-coupled particles
- Joint session with “Non-WIMP” dark matter (includes axions/axion-like particles from cavities, the sun, etc.)
- We want and value your input