

**Canadian Institute of
Nuclear Physics**

**Institut canadien de
physique nucléaire**

Individual Members' Annual General Meeting, Montreal, May 27, 2013.

2013 Individual Members' AGM - Agenda

- 1. Approval of Agenda**
- 2. Membership Report**
- 3. Major Activities of 2012-13**
- 4. Financial Report**
- 5. Some Plans for 2013-14**
- 6. Highlights provided by the Scientific Working Groups**
- 7. Discussion, Comments and Suggestions from the Membership**
- 8. Other Business**
- 9. Adjourn**

CINP mission statement

- **The mission of the Institute is to provide a formal organization to fairly represent and effectively advocate the interests and goals of the Canadian Nuclear Physics research community to relevant agencies and parties.**

The CINP mission

- **In support of this mission, the Institute's activities include:**
 - **soliciting, assembling, and organizing the physics research plans of the Canadian Nuclear Physics research community into a broad-based road-map for presentation to bodies such as the NSERC Grant Selection Committee and long range planning committees.**
 - **representing the broad-based interests of the Canadian Nuclear Physics community to relevant institutes, in Canada and abroad.**
 - **providing a forum for the advancement of the interests of students and alumni of higher education programs in Nuclear Physics in Canada.**
 - **organizing workshops or other initiatives of interest to the Canadian Nuclear Physics community.**
 - **facilitating Canadian participation in new Nuclear Physics initiatives in Canada and abroad.**

Individual Membership Report

- As of April 30, 2013

- Strong membership growth in past year.
- Many Associate Member applications are associated with Graduate Fellowship and Travel Support Programs.

	Now	1 Year Ago	Change
Faculty Level Members	68	64	+4
Associate Members	31	21	+10
Experiment Major Interest	74	67	+7
Theory Major Interest	24	17	+7

Associate Membership Review

- Since many Associate Members are grad students and PDFs, we have instituted a policy to periodically review Associate members to see if they are still active in the field.
- In 2012-13, 7 Associate Members were reviewed.
 - 3 applied for renewal.
 - 2 did not renew because they have left the field for industry.
 - 2 did not renew because of retirement or other personal reasons.
- In next 12 months, 3 Associate Members are scheduled to be reviewed (original applications in 2010).

Scientific Working Group (SWG) Participation

- SWGs are intended to facilitate collaboration among researchers with common interests, and to enhance the profile of a specific research area within Canada.
- Individual Members are eligible to apply for membership in one or more SWGs.
- Activities include:
 - holding topical workshops or other initiatives.
 - input to CINP external scientific briefs.
 - encouraging new collaborative efforts.

Working Group	Members	Contact
Nuclear Astrophysics	29	Barry Davids, TRIUMF
Nuclear Structure	40	Kris Starosta, SFU
Beyond the Standard Model	39	Gerald Gwinner, Manitoba
Hadrons/QCD	25	Charles Gale, McGill
Nuclear Physics Education & Training	30	Corina Andreiou, SFU

Institutional Membership Report



THE UNIVERSITY OF
WINNIPEG
ASSOCIATE VICE-PRESIDENT
RESEARCH AND INNOVATION

THINK  LINK
UWINNIPEG RESEARCH

May 9, 2013

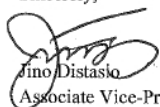
Dr. Garth Huber
Membership Director
Canadian Institute for Nuclear Physics
c/o Dept. of Physics
Univ. of Regina
Regina, SK
S4S 0A2

Re: University of Winnipeg Membership to the Canadian Institute of Nuclear Physics

Dear Dr. Huber:

I write you today to formally apply for the admission of the University of Winnipeg to the Canadian Institute of Nuclear Physics as an institutional member. I am aware that the University will be expected to pay institutional membership dues, and I understand that these fees will initially amount to \$1500 per annum, and shall not exceed \$2000 per annum. The payment of the fees will be handled through the Research Office. If our application is accepted, Dr. Jeffery Martin (204.786.9443; j.martin@uwinnipeg.ca) would serve as the University's representative at institutional member meetings. Please let us know if you require further information or clarification.

Sincerely,



Dino Distasio
Associate Vice-President, Research and Innovation

cc: Dr. Jeffery Martin, Physics

- The CINP is pleased to welcome the University of Winnipeg as its 8th institutional member!



CINP Institutional Members

- Canadian universities, labs, etc. actively involved in Nuclear Physics research.
- Meet annually to elect the Board of Directors.
- Pay annual membership dues.

Institution	Representative
McGill University	Charles Gale
Mount Allison University	David Hornidge
Saint Mary's University	Adam Sarty
TRIUMF	Jens Dilling
University of Guelph	Paul Garrett
University of Manitoba	Kumar Sharma
University of Regina	Zisis Papandreou
University of Winnipeg	Jeff Martin

CINP Board of Directors

- Elected by the Institutional Members.
- Responsible for the property and business affairs of the CINP.
- Hires the Executive Director to manage the day to day operations.

Name	Institution	Position	Term Expiry
Jean Barrette	McGill		2016
Peter Blunden	Manitoba	Secretary	2014
Jens Dilling	TRIUMF		2015
Paul Garrett	Guelph	Treasurer	2015
David Hornidge	Mt. Allison	Vice-President	2014
Ritu Kanungo	St. Mary's		2016

Thank you to Kumar Sharma

- I would like to thank Kumar Sharma, who is stepping down after serving as the CINP President since 2008.
- Kumar played a very significant role in the 2010-11 NSERC Long Range Planning exercise, and has served the CINP well in some difficult circumstances.

Thanks also to Zisis Papandreou

- Zisis has served as webmaster of the CINP website www.cinp.ca since its inception.
- In 2013, Zisis has performed an extensive upgrade of the server software (drupal) for both the CINP and DNP sites, hosted in Regina.
- Various documents on the CINP website are out of date, and GH will be updating them as he learns the new software.
- Your comments and suggestions for CINP website content are welcomed!

2012-13 Accomplishments

- Conference and Workshop support

- Conference and workshop support is provided to help fulfill the scientific aims of CINP.

Conference or Workshop	Year support provided	Amount of support
Canadian Undergrad Physics Conference	2012	\$1500 (travel grants, booth)
TRIUMF Summer Institute	2012	\$2000
CIPANP2012	2012	\$4000
WNPPC2013	2013	\$2000 (4 travel grants of \$500)

- We would like to thank Corina Andreiou and the Education & Training Working Group for their hard work in evaluating applications.
- Funds are available for 2013-14. Please see GH for details.

2012-13 Accomplishments

- CINP Graduate Fellowships

- **Two scholarships valued at \$12,000, which must at least be matched by the supervisor or university.**
- **Aim:** To foster excellence in graduate nuclear physics research, and to make Canada a more attractive place for graduate students in nuclear physics
- **Judges:**
 - Roby Austin, Saint Mary's
 - Sonia Bacca, TRIUMF
 - David Hornidge, Mt. Allison
 - Kumar Sharma, Manitoba (Chair, ex-officio)

CINP Graduate Fellowship 2013-14 Awardees

- **Gojko Vujanovic, McGill**
 - Studying strongly interacting matter at high temperatures via electromagnetic probes
- **Igor Kozlov, McGill**
 - Hydronamical model of heavy ion collision bulk viscosity
- We do not yet know if funds will be available for a competition in 2014-15, but our intention is to have future fellowship competitions as funds permit.

2012-13 Accomplishments

- Consultations with External Agencies

- 12-Dec: KS attended TRIUMF ACOT meeting as observer.
 - ACOT is considering a possible enhancement in the role of observers, and we are awaiting further details.
- 13-Jan: CINP Board wrote to Suzanne Fortier, NSERC President, re. upcoming Reallocations Exercise.
 - Urged that the SAP funding envelope be maintained, that the LRPC exercises be continued to provide periodic review of the management of the envelope, and that the cost of research, and the trends in these costs, be given significant weight in any Reallocation.
- 13-Feb: KS, GH in-camera presentation to SAP-ES Large Projects Day in Ottawa.
- 13-Apr: GH provided input to NRC evaluators as part of their decision process for TRIUMF's core funding 2015-20.

Financial Report

- **The CINP has two sources of revenue:**
 - **NSERC MRS Grant.**
 - Prescribed use only.
 - e.g. Conference support, Scholarships and NSERC-related travel (CINP input to LRPC, Large Projects Day).
 - 2013 is 2nd year of 3 year grant: \$22,500.
 - **General Operating Funds provided from Institutional Membership dues.**
 - Used for not-NSERC eligible expenses, such as the room rental fee for this meeting.
 - Major expense: Teaching relief coverage for Executive Director.
 - Funds approximately \$19,000/year.

Interim Financial Report

- Prepared by Paul Garrett, May 10, 2013

- A formal report on CINP finances will be available in the near future. In its place our treasurer has submitted this summary.

NSERC Funds	
Carry forward from FY11	\$33,362
FY12 installment	\$8,500
FY12: CINP Grad Fellowships	\$24,000
FY12: Travel Support	~\$9,500
End FY12 Balance	~\$8,300
FY13 installment	\$22,500

General Operating	
Current balance	~\$55,000
FY12 invoices sent	\$17,500
FY13: Audit fees	\$5,000
FY13: Exec Director	\$23,333
FY13: Other expenses	~\$1,200
FY13: Projected year end	~\$47,000

Interim Financial Report

- Prepared by Paul Garrett, May 10, 2013

- **“Regarding the audit: the accountant has essentially gone through everything as of summer 2010, with the only outstanding issue being the dues owed by Guelph (\$5,000). It is my intention to complete this during the summer for the remaining period ending FY12.”**

CINP – Next 3 years

- **CINP will continue to foster and promote Nuclear Physics in Canada**
 - **Conference and workshop support**
 - Growing trend of sponsorship:
 - 2 in FY09, 3 in FY10, 6 in FY11, 6 in FY12.
 - **Emphasis is on access for graduate students and PDF's, fostering of collaborations – NA institute**
 - **Invited speakers at CAP Congress to promote field to wider physics community**
 - **Promote field to undergraduate students**
 - e.g. CINP booth at CUPC 2011, 2012

2013-14 – SWG Review

- **The SWG Chairs have done an excellent job and we should all thank them for their hard work.**
- **One of the responsibilities of the Board is to periodically review the terms of reference of the SWG's to ensure their continued relevance. GH will assist the Board in this.**
- **In addition, Chair elections within each SWG should be held.**
- **Comments and suggestions?**

Input requested re. Bylaws Update

- **The Canada Not-for-profit Corporations Act (NFP Act) came into force in October, 2011, replacing the Canada Corporations Act that currently governs the CINP. We must transition to the terms of the NFP Act by October 2014 or lose our Federal Incorporation.**
- **As part of the transition, we can take the opportunity to make changes to the Bylaws, reflecting the first 5 years of CINP operational experience.**

1. Eligibility Requirements for Associate Members

- **Current requirement: “Canadian resident who supports the goals and objectives of the CINP”**
- **We probably want to loosen the residency requirement. An issue which has arisen is whether we want to lose all contact with Associate Members who became a member of the CINP while they were a graduate student at a Canadian university, and are presently a PDF working offshore for a foreign institution. It would probably be better to maintain contact with these persons for at least a few years, in the hope they will eventually return to Canada.**
- **Faculty Members have a similar residency requirement, but we probably should not change that case, as the intention is for Faculty Members to be NSERC-eligible.**

2. Role of Applied Nuclear Physics?

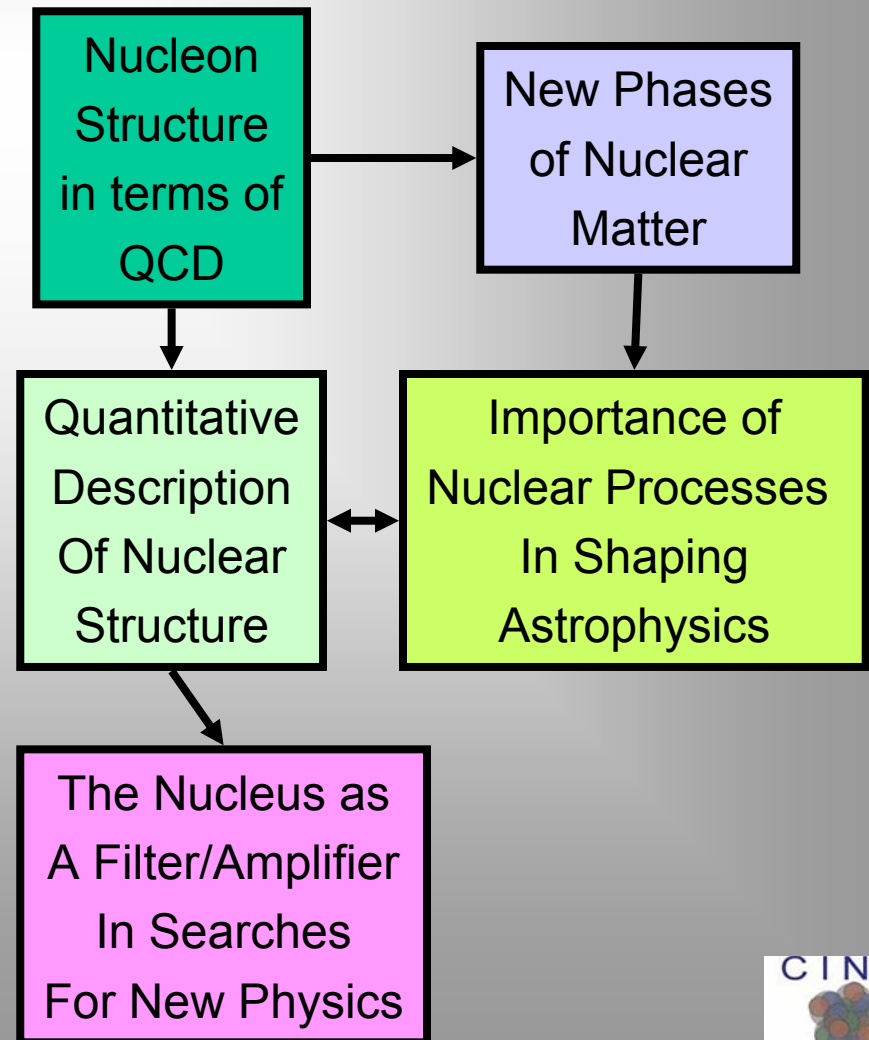
- The issue of creating an Applied Nuclear Physics Scientific Working Group has been raised a few times, such as by the IsoTrace Group at the University of Toronto.
- However, it is not clear whether this is consistent with the bylaws, which clearly refers to academic research within the subject index of Physical Review C.
- We should think whether we want the CINP to accommodate this field, and if so, how we can best do so while keeping a strong and clear definition of academic research in nuclear physics.

Scientific Highlights from Large Projects Day Presentation

- The CINP is asked to make an in-camera presentation to the SAP-ES Large Projects Day each February. Total time allotted is typically 25 minutes (including questions).
- This year, we decided to include some brief scientific highlights from CINP members, hoping that the broad overview would lend some context to the SAP-ES discussions to follow.
- SWG Chairs were asked to provide input. You were most likely contacted by them to provide information for this presentation.

Nuclear Physics is driven by fundamental investigations on the origin, evolution and structure of strongly interacting matter.

- A far reaching mission that requires a *balanced program* of experimental and theoretical effort.
- Broad international consensus on the key questions of significance to the broader community.



Hadrons/QCD – Big Questions

- **How do the nucleon's properties (mass, spin, charge radius, etc.) arise from its quark and gluon constituents?**
 - Requires a quantitative (as opposed to qualitative) understanding of QCD in the non-perturbative regime.
 - Transition from pQCD to Strong QCD needs data with high precision for a quantitative understanding of confinement.
- **What is the phase diagram of QCD?**
 - Nuclear collisions are the only way to probe QCD at high temperature/density in the laboratory.

Hadrons/QCD – 2012 Highlights

JEFFERSON LAB 12 GeV UPGRADE

- **Hall A:** Super Big Bite Spectrometer detectors, St. Mary's.
- **Hall C:** Heavy Gas Cherenkov construction at Regina funded by NSERC is proceeding well. Installation at JLab expected in late 2013.
- **Hall D (GlueX):**
 - Considerable national media coverage of the Regina completion of the BCAL more than 5 months ahead of schedule and on budget, including recognition by Sask. legislative assembly.
 - 2.2 T superconducting solenoid cooled down since early December and the installation of the Forward Calorimeter lead glass blocks began. First data taking expected in 2015.

MAINZ (MAMI)

- Proton polarizabilities program (D. Hornidge, et al.) received highest possible 'A' scientific rating by Mainz PAC in December, 2012.
- Second of three measurements needed to determine the proton spin polarizabilities completed in 2012.

THEORY

- New calculations by McGill group confirm that the quark-gluon plasma created at RHIC, LHC is fluid with surprisingly small shear viscosity/entropy density ratio. PRL 110, 012302 (2013).
 - Gale & Jeon awarded 1000 core-year time & 100TB storage space in recent Compute Canada National Resource Allocation.
- First ever predictions for the electric, magnetic and spin-dependent dynamical polarizabilities of SU(3) octet of baryons. A. Aleksejevs and S. Barkanova, arXiv:1301.1383



Nuclear Structure - Big Questions

- Where are the limits of nuclear existence and can these limits be understood and/or predicted from first principles?
- How do the properties of nuclei evolve as a function of the neutron-proton asymmetry and also as a function of proton and neutron number?
- What are the mechanisms responsible for the organization of individual nucleons into the collective motions that are observed?

Nuclear Structure – 2012

Highlights

TIGRESS γ Spectrometer (ISAC-II/TRIUMF)

- A reorientation-effect Coulomb-excitation study of the 21^+ state in ^{10}Be was performed. This is the first Coulomb-excitation measurement that enables one to obtain information on diagonal matrix elements for such a high-lying first excited state from γ -ray data.
Orce et al., PRC86, 041303(R) (2012)

8π Spectrometer (ISAC-I/TRIUMF)

- High-Precision Measurement of the ^{19}Ne Half-Life. The result is important for placing bounds on predicted right-handed interactions that are absent in the current standard model. Two competing systematic effects that influence the accuracy of such measurements were identified, which will prompt a reassessment of results from previous high-precision lifetime measurements. Triambak et al., PRL109, 042301 (2012)
- Collective structure of ^{94}Zr is deduced from a measurement of weak decay branches observed following the β^- decay of ^{94}Y and on lifetime data from a study of ^{94}Zr by inelastic neutron scattering, collective structure is deduced in the closed-subshell nucleus ^{94}Zr .
Chakraborty et al., PRL110, 022504 (2013)

TITAN Penning Trap (ISAC-I/TRIUMF)

- Precision Mass Measurements of Neutron-Rich Calcium ($^{51,52}\text{Ca}$) and Potassium (^{51}K) Isotopes show a dramatic increase of the binding energy compared to those reported in the atomic mass evaluation. The results agree remarkably with the evolution of masses with neutron number, making neutron-rich calcium isotopes an exciting region to probe 3N forces.
Gallant et al., PRL109, 032506 (2012)

Nuclear Structure – 2012

Highlights

OSAKA Spin Polarization Line (TRIUMF/ISAC-I)

- As the first step of systematic studies on neutron-rich Mg isotopes, the structure of ^{28}Mg was investigated by β -decay spectroscopy of spin-polarized ^{28}Na . Spin-parity assignments were successfully made, and the high performance of the method promises successful application to heavier Mg isotopes to elucidate the shell evolution in the region of the $N=20$ island of inversion. Kura et al., PRC85, 034310 (2012)

RDM Lifetime Measurements (Michigan State)

- Excited states in ^{18}C were populated by the one-proton knockout reaction of an intermediate energy radioactive ^{19}N beam. Comparison of the results with large scale ab initio no-core shell model calculations provides strong evidence that the inclusion of three-body forces is needed to describe the low-lying excited-state properties of this $A=18$ system.
P.Voss et al, PRC86, 011303(R) (2012)

THEORY

- Medium-Mass Nuclei with Normal-Ordered Chiral $\text{NN}+3\text{N}$ Interactions were studied using truncated normal-ordered 3-N interactions in nuclear structure calculations starting from chiral two- plus three-nucleon Hamiltonians evolved consistently with the similarity renormalization group. We show that the normal-ordered two-body approximation works very well beyond the lightest isotopes and opens a path for studies of medium-mass and heavy nuclei with chiral two- plus three-nucleon interactions.
R. Roth et al. Phys. Rev. Lett. 109, 052501 (2012)

Nuclear Astrophysics – Big Questions

- How, when, and where were the chemical elements produced?
- What role do nuclei play in the liberation of energy in stars and stellar explosions?
- How are nuclear properties related to astronomical observables such as solar neutrino flux, rays emitted by astrophysical sources, light emitted by novae and X-ray bursts, etc.?

Nuclear Astrophysics – Recent Highlights

NUCLEAR EXPERIMENTS

- TUDA: Measurement of the $^{18}\text{Ne}(\alpha, p0)^{21}\text{Na}$ reaction cross section in the burning energy region for X-ray bursts. PJC Salter, et al., PRL 108, 242701 (2012).
- Measurement of $^{17}\text{O}(p, \gamma)^{18}\text{F}$ reaction rate at astrophysically relevant energies using DRAGON, U. Hager, et al., PRC 85, 035803 (2012).
- Mass measurements near the r-process path using the CPT mass spectrometer., J. Van Schelt, et al., PRC 85, 045803 (2012).

THEORY

- Ab initio many-body calculations of the $^3\text{H}(d, n)^4\text{He}$ and $^3\text{He}(d, p)^4\text{He}$ fusion reactions. P. Navratil, S. Quaglioni, PRL 108, 042503 (2012).
- Neutrino processes in Partially Degenerate Neutron Matter. S. Bacca, et al., Astrophys. J. 758, 34, (2012).

ASTRONOMICAL OBSERVATIONS AND ASTROPHYSICAL MODELING

- The effect of $^{12}\text{C}+^{12}\text{C}$ rate uncertainties on the evolution and nucleosynthesis of massive stars. ME Bennett, et al., Royal Astr. Soc. 420, 3047 (2012).
- Constraints on Neutron Star Mass and Radius in GS 1826-24 from Sub-Eddington X-ray bursts. M. Zamfir et al., Astrophys. J. 749, 69 (2012).

Beyond the Standard Model

– Big Questions

- **Studies of fundamental symmetries via very precise low and intermediate-energy experiments have been part of nuclear physics since its inception.**
- **Complementary to direct probes by high energy physicists since precision lower-energy experiments indirectly probe mass scales and parameter spaces not otherwise accessible.**
- **Is there additional CP & T violation beyond that identified in Kaons and B-mesons?**
- **What is the structure of the Weak Interaction?**
 - 100% V-A? CKM unitarity? CVC?
- **Can we find violation of CPT and Lorentz invariance?**
 - superstrings, quantum gravity?

Beyond the Standard Model

– 2012 Accomplishments

FRANCIUM (ISAC/TRIUMF)

- The francium trapping facility was successfully commissioned in 2012.
- During two beamtimes, several francium isotopes were captured in the laser trap. Hyperfine anomaly (\rightarrow distribution of nuclear magnetism) and isotope shift measurements have been carried out on isotopes 213, 209, 207, 206.
- Work towards atomic parity violation measurements starts in 2013.

ALPHA (CERN LEAR)

- First spectroscopic measurement on antihydrogen atoms demonstrated it is possible to do measurements even with one atom at a time [Nature 2013]:
 - A Canadian-led initiative with microwave expertise
 - Progress towards precision spectroscopy with the new ALPHA-2 apparatus
 - Construction of the ALPHA-2 cryostat at TRIUMF and Calgary
 - Demonstration of Lyman-alpha laser at UBC

QWEAK (Jefferson Lab)

- Full data set needed to determine the weak charge of the proton via parity-violating electron scattering was acquired in 2011-12.
- In fall, 2012, a result of the first 4% of the data was released at the APS DNP meeting - this is the first ever direct measurement of the weak charge of the proton. (Not yet published; in preparation). This is in agreement with the Standard model (1 sigma higher).
- With 25x more data including many systematic calibrations etc, and analysis underway at full speed, expect to be able to report a final result in 2014-15, which should be a sensitive Standard Model test.

Beyond the Standard Model

– 2012 Highlights

ULTRA COLD NEUTRONS (TRIUMF/UCN)

- Design work of the facility is improved and construction has started.
- Canadians are taking a leading role in key parts of the nEDM experiment: e.g. the Xe co-magnetometer, magnetic shielding, HV, and UCN detector.
 - Group grew in 2012, including new research scientists at TRIUMF (R. Picker) and Winnipeg (R. Mammei), each with extensive UCN experience, and one new faculty member at Manitoba (J. Mammei).
- International nEDM review conducted by the KEK-IPNS director (Dec. 29-30, 2012) to decide whether to support the TRIUMF nEDM or the J-PARC nEDM project. TRIUMF nEDM project was endorsed.

CANADIAN PENNING TRAP (Argonne/CPT)

- 1st results from β - ν correlation measurements made in an open geometry Paul Trap (PhD thesis of Gang Li, McGill 2012, accepted for PRL, January 2013):
- Tensor interaction limit derived from the α - β - ν correlation in trapped ^8Li ions.
- α - β - ν angular correlation in the Gamow-Teller decay $^8\text{Li} \rightarrow ^8\text{Be}^* + \nu + \beta$, $^8\text{Be} \rightarrow \alpha + \alpha$ performed. The measured energy difference spectrum of the α particles emitted along and opposite the direction of the β particle is consistent with the Standard Model prediction and places a 3.1% limit (95% confidence level) on any tensor contribution to the decay.

THEORY

- Precision calculations of the electroweak radiative correction for 11 GeV Møller experiment at the NLO level, completed; good progress on NNLO

A. Aleksejevs and S. Barkanova, arXiv:1301.1384



Final Items

- **Open discussion**
- **Adjourn**