IRPS BULLETIN

Newsletter of the International Radiation Physics Society

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Contacts :

Items for the Bulletin : **Ron Tosh, Larry Hudson**

Membership Enquiries : **Elaine Ryan**

Layout and distribution of the Bulletin : **Shirley McKeown**

Web Pages : **Shirley McKeown**

Contact addresses are listed in the IRPS information above.

Internet Address : http://www.canberra.edu.au/irps

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Contents of this Journal

New Memberships, Membership Renewals

Membership form for new members, and details for payments by cheque for new and renewing members are on the last 2 pages of this journal and information for payment by credit card is given below.

If you are unsure when your renewal is due, contact

Elaine Ryan

email: **elaine.ryan@sydney.edu.au**

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http://www.canberra.edu.au/irps

You do not need a PayPal account to use this method of payment

Go to the Home Page on our website (as above)
click on Membership, scroll down to the selection of buttons and click on the one that suits your membership.

If you have any queries or problems contact :

Dr William L. Dunn
Department of Mechanical and Nuclear Engineering
Kansas State University
137 F Ward Hall, Manhattan, KS 66506, USA
Phone : 785 532 5628
email : **dunn@mne.ksu.edu**

Season's Greetings from the Editors

Since the last issue of this Bulletin, our colleagues and hosts in Brasil, led by Odair Gonçalves, successfully executed the 12th International Symposium on Radiation Physics in Rio de Janeiro and did so with gracious aplomb.

In this issue Odair offers an overview of those proceedings, a recognition of award winners, and a link to further details. And with the announcement at ISRP-12 of the results of the election of new Society officers, Odair passes the baton of Presidential leadership to Ladislav Musílek whose inaugural "President's Column" appears in this issue. Ladislav, in turn, will be hosting the 1st International Conference on Dosimetry and its Applications in Prague this coming June 2013.

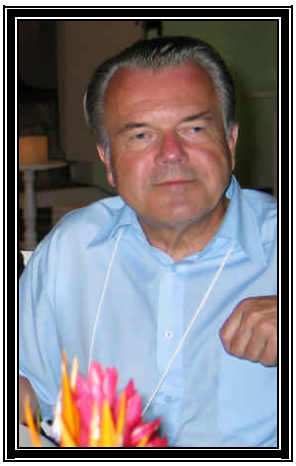
More information within, and to follow. Also in this issue is Dudley Creagh's report on the Australian square kilometer array (radio telescope) as well as remembrances of former members Anselmo Paschoa and Dénes Berényi submitted by David Bradley. Finally we thank membership secretary Elaine Ryan and Shirley McKeown of the editorial staff for posting the new officers and members of the Executive Council.

We offer our support and to all, best wishes for a happy and prosperous new year.

While ISRP-12 was all business, a kilometre from the venue on Sugarloaf Mountain some monkeying around was observed ...

Larry Hudson & Ron Tosh

President's Column



A few years ago, the popular Czech cartoonist Vladimír Renčín made a drawing of a clown standing beside the huge desk of a human resources manager. The cartoon had the caption: "Original profession? Nuclear physicist!" Unfortunately, this reflects a view held by many people, and even by some highly educated non-nuclear specialists, on nuclear sciences and technologies and on those of us who work in this field.

For some others, atoms and everything to do with atomic nuclei and radiation, are an extreme threat to nature, to their lives, and to everything on Earth. Recent hysteria after the Fukushima accident, followed by politically motivated decisions taken by some governments (it is not necessary to go into further details) have shown an imperative need for at least some basic education of the public in physics, in general, and in nuclear and radiation physics, in particular. This problem is more pronounced for the nuclear sciences, but is by no means limited to this field of specialization.

There is a problem of decreasing popularity of the exact and technical sciences, a problem of lack of interest among young people in enrolling at technical universities, and a problem that many pop idols and sports idols of the young generation are proud to state that they have always hated mathematics, physics and chemistry. But let us finish with this pessimistic litany.

In this social environment, the role of societies that bring together scientists from various branches of the natural and technical sciences can be very important. Of course, their main aim is to exchange information and build collaboration among people working in related branches of science or technology. Nevertheless, they should also be open to the outside world, and should promote scientific knowledge to everybody who is willing to listen. The International Radiation Physics Society can also help to reduce public irrationality.

IRPS is a relatively small society, and we have quite a lot of colleagues who could contribute valuably to our activities, who have achieved outstanding results in the field of radiation physics, but who are not members of our Society. We need to make our Society more attractive for them. I ask you to make our Society as visible as possible, and to try to attract your talented colleagues to us. With this in mind, I consider it important to keep our membership fee at a low level. Our annual fee, which is in practice terms the cost of a single dinner in a restaurant, should put off only our most notoriously tight-fisted colleagues.

International Symposia on Radiation Physics, the last of which was held in Rio de Janeiro this October, are very interesting meetings, but they take place only once in three years. IRRMA conferences are topical meetings on applications of radiation applications that should be brought more to the attention of Society members. Co-participation in IRRMA events and the establishment of a new tradition of conferences on dosimetry under the auspices of the Society can cover the long gap between the Society's meetings. These conferences should also be used for promoting the Society and extending its membership.

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President's Column (continued) :

The IRPS Bulletin aims to provide attractive reading and to be a useful source of information. I personally admire its editors, and would like to thank them for their work on preparing the Bulletin. I call on Society members to help them to fill each issue by writing papers and by sending in information on what is new in the world of radiation. In particular, review papers summarising the state-of-the-art in some field of radiation physics (including nuclear and radiation chemistry, nuclear technologies, etc.) would help readers to extend their knowledge in areas of science less directly related to their own work. Review papers can also form a basis for presenting our science to the public. Let me therefore turn to all Society members and ask you to make the IRPS Bulletin as good and as useful as possible.

I feel honoured to have been elected President of the Society. However, it is more than just an honour for me. I feel that I have taken on a duty to work hard for the benefit of the Society and for the benefit of radiation physics as an important aspect of human knowledge and endeavour. I believe that, like me, all members of the Society want to help in efforts to promote our field of science.

Ladislav Musilek

Calendar

2013

23rd - 28th June, 2012

1st International Conference on Dosimetry and its Applications

Prague, Czech Republic

Full information on page 20

Your Elected Councillors for 2012 to 2015

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North America :	**Larry Hudson**	NIST, Gaithersburg, USA
South & Central America :	**Marcelo Rubio**	CEPROCOR and University of Cordoba, Argentina
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North East Asia :	**Ziyu Wu**	University of Science and Technology of China, Hefei Anhui, P.R. China
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	Malcolm Cooper	University of Warwick, UK
	Richard Pratt	University of Pittsburgh, USA

ISRP12 – The 12th INTERNATIONAL SYMPOSIUM ON RADIATION PHYSICS

Rio De Janeiro

October 7th to 12th , 2012

Instituto Militar de Engenharia, Praia Vermelha, Rio de Janeiro

FINAL REPORT

The 12th INTERNATIONAL SYMPOSIUM ON RADIATION PHYSICS, held in Rio de Janeiro, Brazil from 7 to 12 October 2012 was successfully executed with just three speakers unable to attend of the twenty five invited to the Conference. Among the invited speakers, eight were Brazilians and fourteen from other countries around the world.

There were four review sessions, twelve sessions dealing with frontier aspects of radiation physics, one joint session with the International Crystallography Union with three invited speakers, and one round table about the Fukushima accident in Japan. All speakers devoted significant time to prepare their talks, resulting in a broad and very interesting collection of Radiation Physics talks. I would like to thank them all for being so kind and having accepted our invitation. They are responsible for any success that we may have achieved.

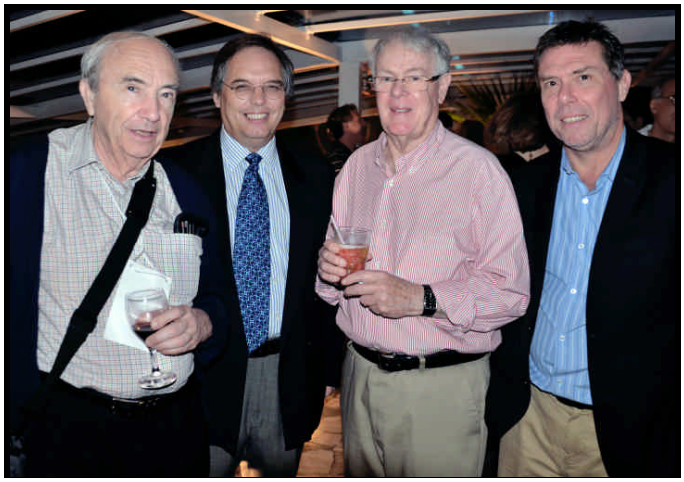
Besides the invited talks we had more than 350 submitted papers with 313 accepted after an evaluation by the Organizing Committee. They were divided into about 240 poster presentations and 60 talks in five oral sessions. A Commission composed by IRPS Council Members did a great job selecting the best young scientist's Poster.

The program and the abstracts, invited and submitted, were included in a USB pen drive distributed to each participant, and are also available at the conference web site (www.cnen.gov.br/hs_isrp12/) as well as some of the invited talks and pictures taken during the event.

On Wednesday we provided a free tour to some touristic points of Rio in order to give to the participants a very short view of this marvellous city.

On Thursday we had the banquet where the participants had the possibility to taste the caipirinha, the most famous and popular Brazilian drink followed by good food and wine During the dinner we were entertained by a famous Brazilian singer Indianna Noma, accompanied by her trio that included Osmar Milito, a well known piano player.

The Dinner .. more photos on next page !!



This 12th symposium of the ISRP was dedicated to Dr. Anselmo Paschoa, one of the founders of the society and deceased on March 26, 2011. Anselmo was always enthusiastic about the society and probably the main reason for ISRP12 being held in Rio. During the banquet a homage was done for him, giving a plaque to his family represented by his son, Claudio Paschoa *(photo page 13)*

During the event three awards were given :

- The Best Poster Award was given to Dr. Yoshitaka Taira from the National Institute of Advanced Industrial Science and Technology (AIST), Japan for his presentation "Development of Positron Annihilation Lifetime Spectroscopy using Ultra-Short Photon Pulses"
- The Isabelle Didier Award for the Best Young Scientist's paper to Dr. Franciska Renner, from the Physikalisch-Technische Bundesanstalt (PTB) Germany, for having presented the paper, "A Benchmark Experiment for The Verification of Radiation Transport Calculations."
- A special award for Lifetime Achievement was conceded for Richard H. Pratt, Professor Emeritus, University of Pittsburgh in appreciation of his longstanding work in fundamental radiation physics, his tireless work on behalf of the International Radiation Physics Society, for his many advances in photon scattering and the interaction of light with matter, and for the development of an understanding of multipole scattering, elastic and Compton scattering processes, as well as discussions of form factor approaches.

(Photos next page)

Dr. Yoshitaka Taira from the AIST, Japan
receipient of The Best Poster Award

Having just been presented a Lifetime Achievement Award by Chris Chantler, Richard Pratt *(left)* presents the Isabelle Didier Award for the Best Young Scientist's paper to Dr. Franciska Renner *(center)* from the PTB, Germany. Master of Ceremonies Odair Gonçalves looks on *(right)*

We hope that everyone who joined us in Rio enjoyed the Congress, not only for the quality of the presented papers but also for our hospitality and desire to satisfy all of you. We have tried hard.

SOME NUMBERS:

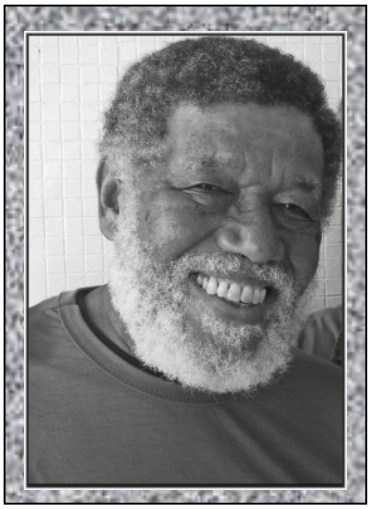
- The 313 accepted abstracts were from 23 countries: Argentina: 6; Brasil: 207; Canada: 1; China: 15; Croatia: 7; Czech Republic: 5; Germany: 3; Hungary: 1; India: 7; Italy: 4; Japan: 4; Libya: 2; México: 9; Namibia: 1; Norway: 2; Poland: 1; Portugal: 4; Romania: 1; Saudi Arabia: 4; Spain, 7; Taiwan, 12; UK: 6; USA: 4.
- During the 5 days we received around 250 participants comprised of roughly 50% Brazilians and 50% from abroad.
- The costs amounted to about US$140,000, of which 50 % was provided by Brazilian Institutions and 50 % by the participant fees. The funds were managed by a University Foundation (COPPETEC) that proceeded according to all Brazilian laws and best practices. A complete balance report will be presented to the IRPS.

Odair Dias Gonçalves
Instituto de Física, UFRJ,
ISRP12 Chair

REMEMBRANCES
Anselmo Paschoa Dénes Berényi

In Memory of Anselmo S. Paschoa, a son of Brazil, husband, father and respected scientist
(this eulogy was presented at ISRP-12 by Professor David Bradley)

1937 - 24 March 2011.



Anselmo was born in 1937 in Rio de Janeiro. He obtained a Bachelors Degree in Physics from the Faculty of Philosophy, National University of Brazil, in 1962, going on to obtain an M.Sc. in Radiological Health from New York University in 1971 and a Ph.D. in Nuclear Sciences and Engineering, again at NYU, in 1975.

He joined the Catholic University of Rio de Janeiro PUC-Rio in 1965, first as an Assistant Professor, rising to full Professor in 1996, retiring in 2005. He was visiting Professor at the University of Utah (1982-1985), a Guest Scientist at Brookhaven National Laboratory (1984) and a Visiting Scientist at Memorial Sloan-Kettering Cancer Center. He was also Director of Radiation Protection, Nuclear Safety and Safeguards of the Nuclear Energy National Commission (CNEN) (1990-1992) and Vice President of the International Radiation Physics Society for Central and South Americas.

Collaborating with Prof. Merril Eisenbud at NYU, he was recognised as one of the initiators of the field of Radioecology in Brazil. He was also a member of the U.S. National Academy of Sciences Committee on the Evaluation of Guidelines for Exposure to Naturally-Occurring Radioactive Materials. During his career he published more than 120 scientific articles and

../Continued

Anselmo S. Paschoa continued :

papers, including by invitation, two articles for the Encyclopaedia of Life Support Systems (EOLSS), developed in scholarly partnership with the United Nations Educational, Scientific and Cultural Organization (UNESCO). He also attended over 110 scientific meetings, throughout the world. It is recorded that he wished to publish in due time (!!), a selection of poems, selected from the few hundreds that he had composed.

First and foremost he was a dear friend and colleague of many of you who are present here today. On Thursday, 24th March, 2011, during a meeting of the Brazilian Physics Society, Anselmo Paschoa collapsed, passing away less than two days later. We were all the more fortunate for having known him.

During the symposium banquet, a homage was paid to Anselmo. Shown above is O. Goncalves presenting a plaque to his family, represented by his son, Claudio Paschoa.

..... In Memoriam - Dénes Berényi

In Memoriam

We note with sadness the passing of Dénes Berényi (26 December 1928 – June 27, 2012). Dénes was a Hungarian atomic physicist, member of the Hungarian Academy of Sciences and Head of the Institute of Nuclear Research of the Hungarian Academy of Sciences from 1976 to 1990. Denes was Executive Councillor of IRPS for the period 1985-1991, IRPS Vice President for East Europe and USSR 1991-1997 and also hosted an IRPS Council Meeting in Debrecen in 1992.

The Kossuth Lajos University physicist earned a diploma in 1953, received the title of Candidate of Physical Science in 1963 and PhD in the Physical Sciences in 1969.

Groeneveld, Karl-Ontjes (Nuclear Instruments and Methods in Physics Research Section B, Volume 154, Issue 1-4, p. 1-9), described him as '…the founder of the successful Debrecen school of atomic collision physics. Very early he recognized the eminent value of scientific communication and international co-operation, and initiated the series of "International Fast Ion-Atom Collision Seminars". He pioneered X-ray and electron-spectrometer development for high precision spectrometry. His important and innovative contributions to the basic and applied physics of inner shell ionisation by ion impact brought him and his group international recognition. He helped to untangle the many mechanisms which contribute to the observed electron energy spectra and angular distributions. In particular, he identified and explained production processes of cusp electron emission, most notably the surprising observation of electron capture into continuum states of neutral atoms.

Square Kilometre Array Astronomical Telescope

The Square Kilometre Array (SKA) will be the largest scientific facility on earth. In simple terms it is a radio telescope. But it differs from the normal radio telescope which many would think of as a simple dish-shaped collector, because of its sheer size and number of collecting elements. There will be thousands of radio dishes and radio antennae, to be situated in Australia and Africa. The effective aperture of the SKA will be one square kilometre, giving the system unprecedented angular accuracy and the ability to scan the sky at 50 times the current rate.

The SKA is situated in the Southern Hemisphere because of its view of the Milky Way Galaxy, with the sites in Africa and Australia located in areas where the RF interference is very low. Experiments to be undertaken with the new highly sensitive, highly directional array include: extreme tests of general relativity, galaxies, cosmology, dark matter and dark energy, re-ionization, the origin of cosmic magnetism, and the search for extra terrestrial intelligence.

The project has been allocated EUR 1.5 billion with the funding provided by as many as twenty countries, the major contributors being Australia, Canada, China, Italy, New Zealand, South Africa, Sweden, The Netherlands, the United Kingdom and the USA. Preliminary operation is scheduled to commence in 2016 with the full operational phase commencing in 2019.

The dishes will be optimized at 15 m diameter and operate at the higher end of the RF range (>1.4 GHz). These are "single pixel" devices: that is, the dish focuses the RF energy collected on to a single horn antenna. Data are collected from a particular region of the sky and then at others, one measurement at a time. *(Figure 1)*

Figure 1. Each element of the Murchison Wide-field array is a conventional dish radio telescope. Reproduced from http://www.icrar.org/multimedia/galleries/dish_gallery.

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At the lower end of the spectrum different antennae are used. A large number of omni-directional antennae are linked electronically and, by altering the phase relations between the antennae, an overall sharp directional antenna response is produced: a "phased array" is created. *Figure 2* shows prototype phased array elements under test at Exloo, The Netherlands. The SKA elements may not look exactly like this, but they will do the same job, providing information in the 0.07 GHz to 0.45 GHz range. Much of the SKA will be phased arrays (referred to by the SKA as "aperture arrays"), and there will be hundreds of them. The antennae themselves are not costly to construct. But the computing power required to operate the system is formidable: a supercomputer at the University of Western Australia will manipulate the multiple terabytes of data received from all sites, and steer the elements of the SKA. Data transfer rates are of the order of 1TB/s for each element.

Figure 2. Elements of the LOFAR array: omni-directional antennae which are part of a phased array system. Reproduced from http://LOFAR.org.

Precursor experiments and construction have been proceeding over the past five years. The SKA project will rejuvenate the African radio telescopes (MeerKAT), utilize the CSIRO-operated Australian Murchison radio-telescope array (Murchison Wide-field Array (MWA, MRO)) which is just coming into operation, and initiate a path-finder facility (ASKAP). Other pathfinder initiatives are the Allen Telescope Array (ATA: Berkeley, USA) and the Low Frequency Array for Radio Astronomy (LOFAR: Exloo, The Netherlands).

The scope of the SKA project is huge, involving the cooperation of many experimental partners, the location of the elements of the SKA on two continents with management in the United Kingdom, funding from many governments, and the coordination of the many diverse elements of the array. Not the least of the problems will be the provision of continuing funding, which, in the current financial climate could be problematic. And the computing problems will be not insignificant. Whilst the technology and beam-steering algorithms are mature, there will be so many elements in the array that safeguarding against local equipment failure will be an ever-present problem.

One can only marvel at the breadth of vision shown by the participants. And wish them well in their endeavours.

Dudley Creagh

More detailed information can be found on the following web sites.

anzSKA: http://ska.gov.au
SKA: http://physicsworld.com/cws/article/news/49783
MRO: http: //www.astro.uwa.edu.au/ska/mro
ATA: http://www.seti.org.ata
MeerKAT: http://www.ska.ac.za/meerkat
LOFAR: http://LOFAR.org

The discovery of a new particle at the LHC ATLAS experiment: is it the Standard Model Higgs boson?

António Onofre

LIP and Universidade de Braga, Portugal
Member of ATLAS Collaboration

The Standard Model of Particle Physics describes the elementary particles that constitute matter and the forces among them. These constituents include six fundamental quarks (u, d, s, c, b, t) and six leptons (e, ν_e, μ, ν_μ, τ and ν_τ). The anti-particles of each one of these fundamental constituents are also part of the Standard Model. Forces and interactions arise when the exchange of another type of particles, called bosons, occurs. Very similar to what happens when a letter (which plays the role of a boson) is exchanged between two individuals (the particles), the interaction between them can be attractive or repulsive depending on the core role of the letter content.

In reality, without the presence of the mediator (the field boson), particles would have no ability to interact with each other. Up to now, the known interactions are four : the electromagnetic, the weak, the strong and the gravitational. The bosons responsible for these interactions are, respectively, the photon, the W and Z, the gluons and the graviton. Only the graviton has not been observed experimentally. While the photon and gluons are massless particles, the W and Z have a very high mass i.e., about 80 to 90 times the mass of a proton, respectively. The attraction or repulsion between electric charges is described by the electromagnetic interaction. The weak interaction is responsible for the radioactive decay. The strong force is present in the interaction between gluons and quarks, which are the fundamental constituents of protons and neutrons that co-inhabit the atomic nuclei.

One of the key issues of the Standard Model has to do precisely with the origin of the mass of fundamental particles. At about half a century ago it was realized that the existence of a field that fills the entire universe, the Higgs field, could explain why some particles, but not all, acquire mass. Despite the indirect evidence of the existence of such a field, one of the predictions of this theory was still to be revealed: the existence of a massive scalar particle (with spin = 0) i.e., the Higgs boson of the Standard Model of Particle Physics. By looking into the electroweak data collected by experiments during decades, it was possible to limit indirectly (despite the considerable uncertainty) possible values for the mass of the Higgs boson, in a region with about 100 times the mass of a proton. Despite these indirect limits, the direct detection was still missing, i.e., the discovery of the Higgs boson. For decades, the direct search for the Higgs boson was part of the priorities of any research program of High Energy Physics around the world. At LEP (Large Electron Positron collider), at CERN (European Organization for Nuclear Research) in Geneva, it was possible to determine, with a 95% confidence level, that the mass of the Higgs boson is greater than 114.4 GeV, i.e. about 114 times the mass of a proton.

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One of the objectives of the LHC (Large Hadron Collider) Physics program, is precisely to discover the Higgs boson and measure its properties or, alternatively, prove that it doesn't exist. ATLAS and CMS, two experiments installed at this collider, have been specially designed to detect the decay products from the Higgs bosons and possibly new physics that may appear at this energy scale. In 2011 proton-proton collisions at the LHC, with a center of mass energy of 7 TeV, were performed. After analyzing the data acquired by both ATLAS and CMS, signs associated with the production of a new particle in the mass region between 124 and 126 GeV, compatible with the Higgs boson, were observed.

In 2012 the LHC centre of mass energy was raised to 8 TeV. If the Higgs boson exists, this energy upgrade results in a significant increase of the number of events produced at the LHC.

Following the analysis of the data collected by the ATLAS experiment during 2011 and 2012 (April-June), it was clear a new particle, with about 126 times the mass of the proton (and compatible with the Standard Model Higgs boson), was discovered. Several decay channels were analyzed and two among them, H->γγ and H->ZZ (where the Z bosons decay in pairs of opposite charge leptons, i.e. electrons or muons), are particularly important since they have the highest sensitivities for the discovery of the Higgs boson.

In ***Figure 1***, the reconstructed mass of the diphoton system is shown. A small, but significant, excess of events is observed in the mass region around 126 GeV.

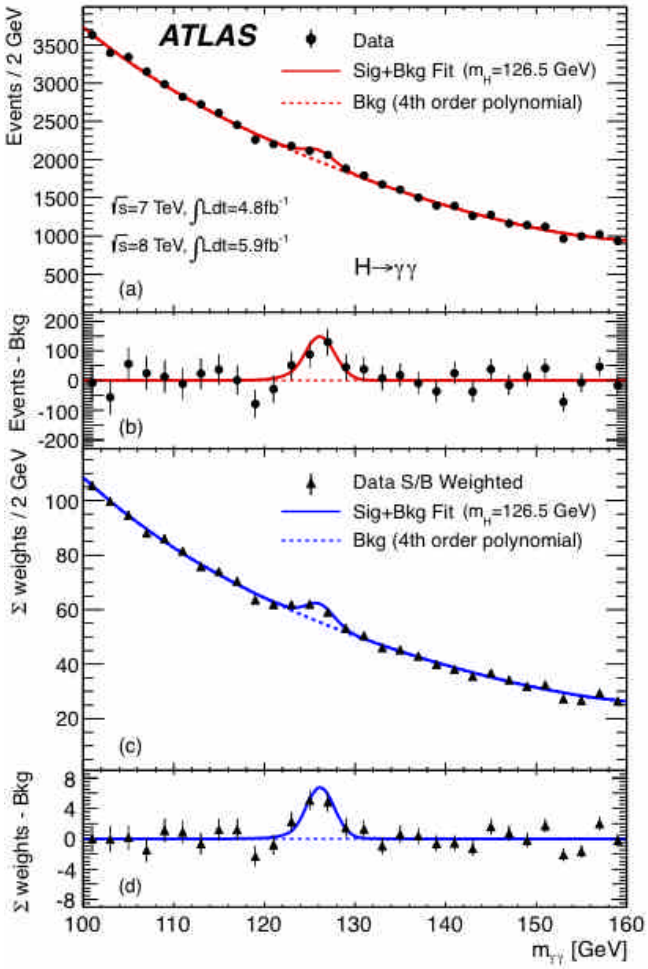

Figure 1. The diphoton mass distribution is shown in (a) and a weighted version in (c); signal plus background fits (colored lines) are represented together with residuals, (b) and (d).

In ***Figure 2***, the mass distribution of events selected as good candidates for a Higgs boson which decayed to two Z bosons (H->ZZ-> 4 leptons), is shown. The narrow peak at about 90 GeV corresponds to a Z boson (only one) that decayed to 4 leptons. A small excess is visible in the mass region around 126 GeV. The intensity of a potential Higgs signal within this mass region is also shown (blue light distribution).

The combination of all data collected by the ATLAS experiment (at 7 TeV in 2011 and 8 TeV between April and June 2012) is shown in ***Figure 3*** as a function of mass.

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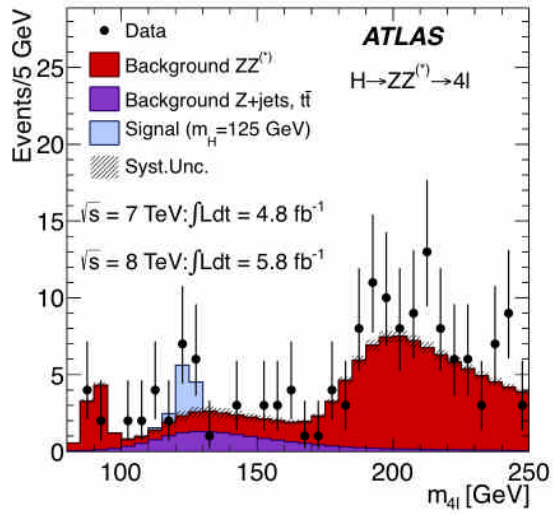

Figure 2. The four-lepton mass distribution is shown together with a representative Higgs signal at 125GeV.

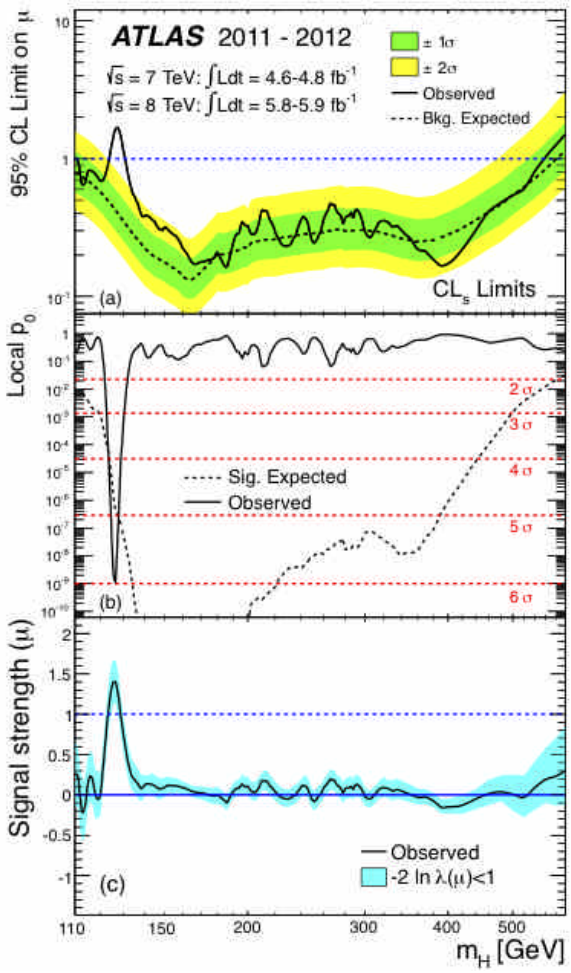

Figure 3. The (a) observed combined result on the Higgs signal strength, (b) the background probability and (c) the best signal fit are shown.

What is shown in ***Figure 3*** is in fact the ratio between the rate measured experimentally by ATLAS and the one expected for the Standard Model Higgs boson. A number close to unity means a better agreement between the experimental measurement and the possibility that this measurement may indeed correspond to the production of the Standard Model Higgs boson. As can be seen, for a mass close to 126 GeV, a peak around 1 is visible in ***Figure 3*** (a,c)

The probability that this peak is due to fluctuations of the total expected background from processes other than the ones corresponding to the Higgs production is approximately 1.7 x 10^{-9} (***Figure 3*** (b)). Following the discovery of this new particle, its properties must now be thoroughly investigated.

Several questions have to be answered:

(1) is its spin consistent with the one expected for the Standard Model Higgs boson?

(2) are the decay rates for the various channels consistent with the predictions of the Standard Model?

(3) are the couplings of this particle to quarks and leptons proportional to their masses as the model predicts?

(4) and what about the mass measurement in the different decay channels? Are they consistent?

These and other questions will be answered in the coming years by the LHC.

CONFERENCES

The conference will be organised by and held at the

Faculty of Nuclear Sciences and Physical Engineering of the Czech Technical University in Prague

under the auspices of the

International Radiation Physics Society.

TOPICS

A. Basic Concepts and Principles in Dosimetry
B. Personnel Dosimetry
C. Accidental Dosimetry
D. High Dose Dosimetry
E. Dosimetry in Environmental Monitoring
F. Dosimetry in Medicine and Biology
G. Dosimetry in the Nuclear Industry and at Accelerators
H. Standardization and Intercomparison in Dosimetry
I. Monte Carlo Calculations in Dosimetry
J. Other Topics

CONTACTS

Web page: http://icda.fjfi.cvut.cz **E-mail: icda@fjfi.cvut.cz**

Chairman of the Organising Committee:
Ladislav Musílek, Czech Technical University in Prague,
Faculty of Nuclear Sciences and Physical Engineering, Břehová 7, 115 19 Praha 1, Czech Republic

INTERNATIONAL RADIATION PHYSICS SOCIETY

The primary objective of the International Radiation Physics Society (IRPS) is to promote the global exchange and integration of scientific information pertaining to the interdisciplinary subject of radiation physics, including the promotion of (i) theoretical and experimental research in radiation physics, (ii) investigation of physical aspects of interactions of radiations with living systems, (iii) education in radiation physics, and (iv) utilization of radiations for peaceful purposes.

The Constitution of the IRPS defines Radiation Physics as "the branch of science which deals with the physical aspects of interactions of radiations (both electromagnetic and particulate) with matter." It thus differs in emphasis both from atomic and nuclear physics and from radiation biology and medicine, instead focusing on the radiations.

The International Radiation Physics Society (IRPS) was founded in 1985 in Ferrara, Italy at the 3rd International Symposium on Radiation Physics (ISRP-3, 1985), following Symposia in Calcutta, India (ISRP-1, 1974) and in Penang, Malaysia (ISRP-2, 1982). Further Symposia have been held in Sao Paulo, Brazil (ISRP-4, 1988), Dubrovnik, Croatia (ISRP-5, 1991) Rabat, Morocco (1SRP-6, 1994), Jaipur, India (ISRP-7 1997), Prague, Czech Republic (ISRP-8, 2000), Cape Town, South Africa (ISRP-9, 2003), Coimbra, Portugal(ISRP-10, 2006), Australia (ISRP-11, 2009) and ISRP-12 will be in Rio de Janiero, Brazil in 2012. The IRPS also sponsors regional Radiation Physics Symposia.

The **IRPS Bulletin** is published quarterly and sent to all IRPS members.

The IRPS Secretariat is : Prof. Jorge E Fernandez (IRPS Secretary),
Universita di Bologna, Laboratorio di Ingegneria Nucleare di Montecuccolino
I-40136 Bologna, Italy
Phone : +39 051 6441718
email: jorge.fernandez@mail.ing.unibo.it

The IRPS welcomes your participation in this "global radiation physics family."

INTERNATIONAL RADIATION PHYSICS SOCIETY

Membership Registration Form

1. Name : _____
(First) (Initial) (Last)

2. Date and Place of Birth : _____

3. Business Address : _____

_____
(Post Code) (Country)

Telephone:_____ Email: _____ Fax: _____

4. Current Title or Academic Rank (Please also indicate if Miss, Mrs., or Ms.): _____

5. Field(s) of interest in Radiation Physics (Please attach a list of your publications, if any, in the field:

_____

_____

6. Please list any national or international organization(s) involved in one or more branches of Radiation Physics, of which you are a member, also your status (e.g., student member, member, fellow, emeritus):

_____

_____

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7. The IRPS has no entrance fee requirement, only triennial (3-year) membership dues. In view of the IRPS unusually low-cost dues, the one-year dues option has been eliminated (by Council action October 1996), commencing January 1, 1997. Also, dues periods will henceforth be by calendar years, to allow annual dues notices. For new members joining prior to July 1 in a given year, their memberships will be considered to be effective January 1 of that year, otherwise January 1 of the following year. For current members, their dues anniversary dates have been similarly shifted to January 1.

Membership dues (stated in US dollars - circle equivalent-amount sent):

Full Voting Member: 3 years	**Student Member: 3 years**
Developed country $75.00	Developed country $25.00
Developing country $30.00	Developing country $10.00

Acceptable modes of IRPS membership dues payment, to start or to continue IRPS membership, are listed below. Please check payment-mode used, enter amount (in currency-type used), and follow instructions in item 8 below. (For currency conversion, please consult newspaper financial pages, at the time of payment). All cheques should be made payable to :

International Radiation Physics Society.

(For payments via credit card - http://www.irps.net/registration.html)

[ ] *(in U.S. dollars, drawn on a U.S. bank)*: Send to Dr W.L. Dunn, Dept. Mechanical and Nuclear Engineering, Kansas State University, 3002 Rathbone Hall, Manhattan, KS, 66506-5205. U.S.A.
Amount paid (in U.S. dollars) _____

[ ] *(in U.K. pounds):* Send to Prof. Malcolm J. Cooper, Physics Dept., University of Warwick, Coventry, CV4 7AL, U.K.. Bank transfer details:
Account number: 30330701. Bank and Branch code: Barclays, code 20-23-55.
Eurochecks in U.K. pounds, sent to Prof. Cooper, also acceptable.
Amount paid (in U.K. pounds) _____

8. Send this Membership Registration Form ***AND*** a copy of your bank transfer receipt (or copy of your cheque) to the Membership Co-ordinator:

Dr Elaine Ryan
Department of Radiation Sciences
University of Sydney
75 East Street, (P.O. Box 170)
Lidcombe, N.S.W. 1825, Australia
email: elaine.ryan@sydney.edu.au

9. _____ _____

Signature *Date*