The Scientific Program of ASP2022

Sunday, 27 November 2022 - Saturday, 10 December 2022

Book of Abstracts

Contents

1

Arrival

2

Departures

3

Free time

4

ICTP in Africa

Corresponding Author: bobby.samir.acharya@cern.ch

5

Introduction to the Standard Model of Particle Physics (1)

Corresponding Author: james.keaveney@uct.ac.za

6

@Students: Introduction to the Standard Model of Particle Physics (2)

Corresponding Author: james.keaveney@uct.ac.za

7

@Students: Fundamentals of statistical analysis in Physics

Corresponding Author: harry.prosper@cern.ch

8

@students: Fundamentals of statistical analysis in Physics (2)

Corresponding Author: harry.prosper@cern.ch

9

@Students: Basics of accelerators

Corresponding Author: kbadgley@fnal.gov

10

@Students: Basics of accelerators (2)

Corresponding Author: kbadgley@fnal.gov

11

@Students: 100 Years of Fundamental Physics & Future

Corresponding Author: young-kee.kim@cern.ch

12

Women in Physics—Producing thinkers from daughter in Physics

Corresponding Author: mmantsae.diale@up.ac.za

In the pool of women in physics community, there exist lost talent as a result of lack of guidance and knowledge. This is due to the status of women in many developing world communities. The GBV term also adds to all other topics that affects women in physics from achieving great height at early career times. Discussing with many retired women from academia, there is a cry for mentoring and support. Our desire as experienced women in physics are to have young women in physics achieving professorship at early career ladder and eventually win prizes of excellence, even towards Nobel awards. This lecture is about supporting our daughters, girls, young and older women in Physics to realize their potential.

13

@Students: Basics of accelerators

Corresponding Author: kbadgley@fnal.gov

14

@Students: Week of science and technology in the Democratic Republic of Congo

Corresponding Author: raissa.malu@iip-training.com

15

@Students: Fundamentals of Statistical Analysis in Physics (3)

Corresponding Author: harry.prosper@cern.ch

16

@Students: Fundamentals of Statistical Analysis in Physics (4)

Corresponding Author: harry.prosper@cern.ch

17

@Students: Particle interactions with matter

Corresponding Author: ulrich.goerlach@ires.in2p3.fr

18

@Students: Particle interactions with matter (2)

Corresponding Author: ulrich.goerlach@ires.in2p3.fr

19

@Students: Fundamentals of Detectors

Corresponding Author: sally.seidel@cern.ch

20

@Students: Fundamentals of Detectors (2)

Corresponding Author: sally.seidel@cern.ch

21

A Deeper Understanding of Our Universe from Far Underground

Corresponding Author: art@snolab.ca

Prof. Art McDonald, Gray Chair, Emeritus, Queen's University, Kingston, Ontario, Canada

By going deep underground and creating ultra-clean conditions it is possible to produce the lowest radioactivity laboratory in the world. There we can address very fundamental questions about our Universe: How does the Sun burn? What are the abundant dark matter particles in the spaces between the stars? What are the properties of neutrinos, elusive particles that are one of the fundamental building blocks of nature? How do these particles influence how our Universe evolves? Experiments addressing these questions are taking place at underground labs internationally and will be described.

22

@Students: Standard Model of Astrophysics & Cosmology

Corresponding Author: chanda@fastmail.com

23

@Students: Standard Model of Astrophysics & Cosmology (2)

Corresponding Author: chanda@fastmail.com

24

@Students: Basics of accelerators (3)

Corresponding Author: kbadgley@fnal.gov

25

@Students: Basics of accelerators (4)

Corresponding Author: kbadgley@fnal.gov

26

@Students: Fundamentals of Detectors (3)

Corresponding Authors: sally.seidel@cern.ch, seidel@unm.edu

27

@Students: Fundamentals of Detectors (4)

Corresponding Author: sally.seidel@cern.ch

Students Parallel session 1 / 28

Advanced detector concepts

Corresponding Author: ulrich.goerlach@ires.in2p3.fr

Students Parallel session 1 / 29

Advanced detector concepts (2)

Corresponding Author: ulrich.goerlach@ires.in2p3.fr

Students Parallel session 2 / 30

ROOT Tutorial

Corresponding Authors: claire.david@cern.ch, simonhconnell@gmail.com, nikolina.ilic@cern.ch

Students Parallel session 2 / **31**

ROOT Tutorial

Corresponding Authors: nikolina.ilic@cern.ch, simonhconnell@gmail.com, claire.david@cern.ch

32

Enabling capacity development in physics in Africa through science, technology, and innovation policy and governance

Corresponding Author: azwinndini.muronga@mandela.ac.za

Science, and physics in particular has increasingly become a global enterprise. This phenomena of the movement of scientists beyond sovereignty is accelerating. This is partly because science, by its nature, resists to be confined in boundaries. Even within the confined boundaries science needs enabling environment for creativity. No one nation can afford to do big science alone.

For Africa's physics community to actively participate in the international science landscape and to contribute positively to the continent's sustainable development, governments should make enabling and supportive STI policies.

In this public lecture we will discuss STI policy in relation to capacity building in physics in Africa.

33

@Students: Fundamentals of Statistical Analysis in Physics (5)

Corresponding Author: harry.prosper@cern.ch

34

@Students: Fundamentals of Statistical Analysis in Physics (6)

Corresponding Author: harry.prosper@cern.ch

Students Parallel session 1 / **35**

Fundamentals of condensed matter and materials physics (1)

Corresponding Author: nithaya.chetty@wits.ac.za

Students Parallel session 1 / **36**

Fundamentals of condensed matter and materials physics (2)

Corresponding Author: nithaya.chetty@wits.ac.za

Students Parallel session 1 / **37**

Laser physics (1)

Corresponding Author: andrew.forbes@wits.ac.za

Students Parallel session 1 / **38**

Laser physics (2)

Corresponding Author: andrew.forbes@wits.ac.za

Students Parallel session 2 / **39**

biophysics (1)

Corresponding Author: tjaart.kruger@up.ac.za

Students Parallel session 2 / **40**

biophysics (2)

Corresponding Author: tjaart.kruger@up.ac.za

Students Parallel session 1 / **41**

An Introduction to Theoretical Fluid and Plasma Physics (1)

Corresponding Author: makinded@gmail.com

Abstract: Plasma refers to an electrically conducting medium in which there are roughly equal numbers of positively and negatively charged particles, produced when the atoms in a gas become ionized. In this presentation, an introduction to theoretical study of plasma that treats the plasma as a fluid governed by a combination of Maxwell's equations and the Navier–Stokes equations knows as magnetohydrodynamics. Relevant applications of fluid and plasma in engineering, industrial and technology will be discussed.

Students Parallel session 1 / **42**

An Introduction to Theoretical Fluid and Plasma Physics (2)

Corresponding Author: makinded@gmail.com

Abstract: Plasma refers to an electrically conducting medium in which there are roughly equal numbers of positively and negatively charged particles, produced when the atoms in a gas become ionized. In this presentation, an introduction to theoretical study of plasma that treats the plasma as a fluid governed by a combination of Maxwell's equations and the Navier–Stokes equations knows as magnetohydrodynamics. Relevant applications of fluid and plasma in engineering, industrial and technology will be discussed.

Students Parallel session 2 / **43**

Beyond the Standard Model of particle physics (1)

Corresponding Author: nikolina.ilic@cern.ch

Students Parallel session 2 / **44**

Beyond the Standard Model of particle physics (2)

Corresponding Author: nikolina.ilic@cern.ch

45

Large scale research infrastructures for Africa

Corresponding Author: maaza@tlabs.ac.za

Students Parallel session 1 / **46**

flavor physics (1)

Corresponding Author: mario.campanelli@cern.ch

Students Parallel session 1 / **47**

Flavor physics (2)

Corresponding Author: mario.campanelli@cern.ch

Students Parallel session 1 / **48**

Atomic & Molecular Physics (1)

Corresponding Author: stephane.kenmoe@uni-due.de

Students Parallel session 1 / **49**

Atomic & Molecular Physics (2)

Corresponding Author: stephane.kenmoe@uni-due.de

Students Parallel session 1 / **50**

Digital libraries (1)

Corresponding Author: jens.vigen@cern.ch

Students Parallel session 1 / **51**

Digital libraries (2)

Corresponding Author: jens.vigen@cern.ch

Students Parallel session 1 / **52**

Earth Physics (1)

Corresponding Author: bvon@sun.ac.za

Students Parallel session 1 / **53**

Earth Physics (2)

Corresponding Author: bvon@sun.ac.za

54

Enabling technology transfer from National labs - lessons learnt

Corresponding Author: farah.fahim@cern.ch

To maximize the technology transfer potential, it is important to create an ecosystem for the scientists/engineers/inventors to adapt the technologies developed for basic science to successful commercial ventures. In the Snowmass process we reviewed technology transfer programs at high energy physics (HEP) laboratories across the world. I will present the opportunities that we identified and the recommendations for increasing partnerships and commercialization at HEP-centric laboratories.

55

@Higher School Teachers: Work, Energy & Power (1)

Corresponding Authors: molamo.letsoalo@ul.ac.za, makonde.netsianda@ul.ac.za

56

@Higher School Teachers: Work, Energy & Power (2)

Corresponding Authors: makonde.netsianda@ul.ac.za, molamo.letsoalo@ul.ac.za

57

@Higher School Teachers: Vertical Projectiles/Free Fall (1)

Corresponding Authors: makonde.netsianda@ul.ac.za, molamo.letsoalo@ul.ac.za

58

@Higher School Teachers: Vertical Projectiles/Free Fall (2)

Corresponding Authors: makonde.netsianda@ul.ac.za, molamo.letsoalo@ul.ac.za

59

@Higher School Teachers: Newton's Laws (1)

Corresponding Authors: makonde.netsianda@ul.ac.za, molamo.letsoalo@ul.ac.za

60

@Higher School Teachers: Newton's Laws (2)

Corresponding Authors: makonde.netsianda@ul.ac.za, molamo.letsoalo@ul.ac.za

61

@Higher School Teachers: Newton's Second Law (1)

Corresponding Authors: makonde.netsianda@ul.ac.za, molamo.letsoalo@ul.ac.za

62

@Higher School Teachers: Newton's Second Law (2)

Corresponding Authors: makonde.netsianda@ul.ac.za, molamo.letsoalo@ul.ac.za

63

@High School Teachers: Electromagnetism (1)

Corresponding Authors: makonde.netsianda@ul.ac.za, molamo.letsoalo@ul.ac.za

64

@High School Teachers: Electromagnetism (2)

Corresponding Authors: makonde.netsianda@ul.ac.za, molamo.letsoalo@ul.ac.za

65

@High School Teachers: Registration, curriculum discussion, and introductory HEP activities (1)

Corresponding Authors: swood5@nd.edu, kenneth.william.cecire@cern.ch

Short URL for Timetable: http://cern.ch/go/gC8f
0. Registration and introductions (15 min)
1. Shuffling the Particle Deck (25 mon)

66

@High School Teachers: Registration, curriculum discussion, and introductory HEP activities (2)

Corresponding Authors: swood5@nd.edu, kenneth.william.cecire@cern.ch

1. Slides (10 min)
2. Human Particle Tricks (20 min)

3. Q&A, discussion (10 min)

(during break: Cloud Chambers and Cosmic Ray Detector)

67

@High School Teachers: Electrostatics (1)

Corresponding Authors: makonde.netsianda@ul.ac.za, molamo.letsoalo@ul.ac.za

68

@High School Teachers: Electrostatics (2)

Corresponding Authors: makonde.netsianda@ul.ac.za, molamo.letsoalo@ul.ac.za

69

@High School Teachers: Electricity (1)

Corresponding Authors: molamo.letsoalo@ul.ac.za, makonde.netsianda@ul.ac.za

70

@High School Teachers: Electricity (2)

Corresponding Authors: makonde.netsianda@ul.ac.za, molamo.letsoalo@ul.ac.za

71

@High School Teachers: Review of and activities related to particle and astroparticle physics (1)

Corresponding Author: kenneth.william.cecire@cern.ch

1. Rolling with Rutherford

72

@High School Teachers: Review of and activities related to particle and astroparticle physics (2)

Corresponding Authors: swood5@nd.edu, kenneth.william.cecire@cern.ch

1. Group discussions: how can you use one idea from today (so far)? (20 min)
2. Report out (20 min - each group has 1 min to speak)

73

@High School Teachers: Muons with MINERvA (1)

Corresponding Authors: swood5@nd.edu, kenneth.william.cecire@cern.ch

- Mean Lifetime Part 1: Dice
- Mean Lifetime Part 3: MINERvA

74

@High School Teachers: Muons with MINERvA (2)

Corresponding Authors: kenneth.william.cecire@cern.ch, swood5@nd.edu

- Mean Lifetime Part 3: MINERvA (continue and complete)
- Discussion

75

@High School Teachers: Neutrinos with MINERvA (1)

Corresponding Authors: swood5@nd.edu, kenneth.william.cecire@cern.ch

76

@High School Teachers: Neutrinos with MINERvA (2)

Corresponding Authors: swood5@nd.edu, kenneth.william.cecire@cern.ch

77

@High School Teachers: Higgs@10 part I (1)

Corresponding Authors: swood5@nd.edu, kenneth.william.cecire@cern.ch

The LHC and the Z boson
- Calculate the Z-mass
- Discussion of results

78

@High School Teachers: Higgs@10 part I (2)

Corresponding Authors: swood5@nd.edu, kenneth.william.cecire@cern.ch

Z-mass, continued
- finish calculations
- results
- discussion

79

@High School Teachers: Higgs@10 part II (1)

Corresponding Authors: swood5@nd.edu, kenneth.william.cecire@cern.ch

Where and What Are the Higgs Boson?

80

@High School Teachers: Higgs@10 part II (2)

Corresponding Authors: swood5@nd.edu, kenneth.william.cecire@cern.ch

81

@High School Teachers: ATLAS or CMS masterclass measurement (1)

Corresponding Author: kenneth.william.cecire@cern.ch

82

@High School Teachers: ATLAS or CMS masterclass measurement (2)

Corresponding Author: kenneth.william.cecire@cern.ch

ASP Forum / **83**

Introduction

Corresponding Author: azwinndini.muronga@mandela.ac.za

ASP Forum / **84**

Capacity development and retention strategies in South Africa

Corresponding Author: amlisa@sansa.org.za

ASP Forum / **85**

The African School of Physics

Corresponding Author: mounia.laassiri@gmail.com

ASP Forum / **86**

African School of Physics 2024 in Morocco —capacity development in Morocco

Corresponding Author: abdeslam.hoummada@cern.ch

ASP Forum / **87**

BNL-SA physics consortium

Corresponding Author: tribble@comp.tamu.edu

88

@Students: Light sources

Corresponding Author: leonid.rivkin@psi.ch

89

@Students: Light sources 2

Corresponding Author: leonid.rivkin@psi.ch

90

@Students: Quantum computing

Corresponding Author: mourad.telmini@fst.utm.tn

91

@Students: Quantum computing 2

Corresponding Author: mourad.telmini@fst.utm.tn

92

@Students: Nuclear physics —Nuclear Reaction, Structure and Astrophysics

Corresponding Author: iyabo.usman@wits.ac.za

Nuclear Reaction, Structure and Astrophysics
Nuclear Physics has evolved in recent years studying nuclei from Fundamental Interactions to Structure and Stars, with wide areas of research in fundamental nuclear structure dealing with behaviours of nucleons inside the nuclei across the periodic table; nuclear reactions on different mechanisms of interactions, as well as nuclear astrophysics linking phenomenon that exists inside our galaxies and sun with the practical analogy through experimental investigations in the state-of-the-art nuclear facilities and theoretically using Super-computers to predict many outstanding effects in the life beyond. Since the properties of nuclei, their existence, excitations and decays are all encoded in the nuclear chart, it represents the boundary condition for the complete evolution of properties of nuclear matter in neutron stars, supernovae, and mergers and from the Big Bang to today. The physics of nuclear forces, both strong and electroweak, therefore connects nuclear structure physics with nuclear astrophysics. Experimentalists and theorists work closely together on a variety of scientific topics for increased understanding with novel findings towards sustainable development goals. Summary of the basic nuclear physics knowledge including available theoretical codes will be discussed.
Iyabo Usman
School of Physics
University of the Witwatersrand, Johannesburg, South Africa
Iyabo.Usman@wits.ac.za

93

@Students: Nuclear physics —Nuclear Reaction, Structure and Astrophysics 2

Corresponding Author: iyabo.usman@wits.ac.za

Nuclear Reaction, Structure and Astrophysics
Nuclear Physics has evolved in recent years studying nuclei from Fundamental Interactions to Structure and Stars, with wide areas of research in fundamental nuclear structure dealing with behaviours of nucleons inside the nuclei across the periodic table; nuclear reactions on different mechanisms of interactions, as well as nuclear astrophysics linking phenomenon that exists inside our galaxies and sun with the practical analogy through experimental investigations in the state-of-the-art nuclear facilities and theoretically using Super-computers to predict many outstanding effects in the life beyond. Since the properties of nuclei, their existence, excitations and decays are all encoded in the nuclear chart, it represents the boundary condition for the complete evolution of properties of nuclear matter in neutron stars, supernovae, and mergers and from the Big Bang to today. The physics of nuclear forces, both strong and electroweak, therefore connects nuclear structure physics with nuclear astrophysics. Experimentalists and theorists work closely together on a variety of scientific topics for increased understanding with novel findings towards sustainable development goals. Summary of the basic nuclear physics knowledge including available theoretical codes will be discussed.
Iyabo Usman
School of Physics
University of the Witwatersrand, Johannesburg, South Africa
Iyabo.Usman@wits.ac.za

94

@Students: Quantum computing 3

Corresponding Author: mourad.telmini@fst.utm.tn

95

@Students: Quantum computing 4

Corresponding Author: mourad.telmini@fst.utm.tn

96

@Students: Nucleon Physics —The Structure of the Nucleon

Corresponding Author: hgao@bnl.gov

97

@Students: Nucleon Physics —The Structure of the Nucleon 2

Corresponding Author: hgao@bnl.gov

98

@Students: Gravitational waves

Corresponding Author: eugenio coccia <eugenio.coccia@gssi.it>

99

@Students: Gravitational waves 2

Corresponding Author: eugenio coccia <eugenio.coccia@gssi.it>

100

@Students: Heavy ion physics

Corresponding Author: edith.zinhle.buthelezi@cern.ch

101

@Students: heavy ion physics 2

Corresponding Author: edith.zinhle.buthelezi@cern.ch

102

@Students: Computational Fluid Dynamics (CFD) 1

Corresponding Author: muaazb@uj.ac.za

This session has the lectures loaded as pre-recorded videos. I will be availble online during the session if you have any questions.

Other Useful Resources:

K. Versteeg and W. Malalasekera, An Introduction to Computational Fluid Dynamics : The Finite Volume Method. Pearson, 2nd ed., 2007. https://www.pearson.com/en-us/subject-catalog/p/introduction-to-computational-fluid-dynamics-an-the-finite-volume-method/P200000005670?view=educator

Patankar, S. (1980). Numerical Heat Transfer and Fluid Flow (1st ed.). CRC Press. https://doi.org/10.1201/9781482234213

M. C. Sukop and J. D. T. Thorne, Lattice Boltzmann Modelling: An Introduction for Geoscientists and Engineers, 2nd ed. Miami. FL: Springer-Verlag, 2006. https://link.springer.com/book/10.1007/978-3-540-27982-2

103

@Students: Computational Fluid Dynamics (CFD) 2

Corresponding Author: muaazb@uj.ac.za

This session has the lectures loaded as pre-recorded videos. I will be availble online during the session if you have any questions.

I have also uploaded the code so that you can run it and modify it.

Other useful opersource CFD codes (quite complete codes):

OpenFOAM: https://openfoam.com/ or https://openfoam.org/
Palabos: https://palabos.unige.ch/
OpenLB: https://www.openlb.net/
PyFR: https://www.pyfr.org/

For post-processing:

Paraview: https://www.paraview.org/

For geometry creation:

FreeCAD: https://www.freecadweb.org/
MeshLab: https://www.meshlab.net/

104

ASFAP Young Physicists Forum

Corresponding Authors: diallo.boye@cern.ch, benard.mulilo@gmail.com

The Young Physicists Forum (YPF) was formulated in 2021 under the African Strategy for Fundamental and Applied Physics (ASFAP) alongside other Engagement and Physics Working Groups. The objectives of the Forum include, among others, to solicit for a wider community input of ideas of the challenges and opportunities early-career physicists on the African continent face and solutions thereof. The Forum's main mandate, therefore, is to promote good-quality education and high scientific research output on the African Continent. The Continent currently produces less than 1% of the total global scientific research output. This is quite low considering the large continental size. In this lecture, the challenges and opportunities young physicists face and possible solutions are outlined so as to build capacity for education and high scientific research output in Africa.

105

@Students: Particle physics

Corresponding Author: deepak.kar@cern.ch

106

@Students: Particle physics 2

Corresponding Author: deepak.kar@cern.ch

107

@Students: Materials Physics

Corresponding Author: daniel.wamwangi@wits.ac.za

108

@Students: Materials physics 2

Corresponding Author: daniel.wamwangi@wits.ac.za

109

@Students: Particle physics 3

Corresponding Author: deepak.kar@cern.ch

110

@Students: Particle physics 4

Corresponding Author: deepak.kar@cern.ch

111

@Students: Materials physics 3

Corresponding Author: daniel.wamwangi@wits.ac.za

112

@Students: Materials physics 4

Corresponding Author: daniel.wamwangi@wits.ac.za

113

@Students: Particle Physics 5

Corresponding Author: deepak.kar@cern.ch

114

@Students: Particle physics 6

Corresponding Author: deepak.kar@cern.ch

115

@Students: Cosmic ray detection

Corresponding Author: kenneth.william.cecire@cern.ch

116

@Students: Cosmic ray detection 2

Corresponding Author: kenneth.william.cecire@cern.ch

117

@Students: Astrophysics & cosmology

Corresponding Author: denauroi@in2p3.fr

118

@Students: Astrophysics & cosmology 2

Corresponding Author: denauroi@in2p3.fr

119

@Students: Renewable energies & energy efficiency

Corresponding Author: musembirj@uonbi.ac.ke

120

@Students: Renewable energies & energy efficiency 2

Corresponding Author: musembirj@uonbi.ac.ke

121

@Students: CV writing workshop

Corresponding Author: esyitamben@hotmail.com

122

@Students: Advanced accelerator concepts

Corresponding Author: luca.serafini@mi.infn.it

123

@Students: Advanced accelerator concepts 2

Corresponding Author: luca.serafini@mi.infn.it

124

@Students: Small detector labs

Corresponding Authors: uli.raich@gmail.com, stefan.ritt@psi.ch, martin.grossmann@psi.ch

125

@Students: Small detector labs

Corresponding Authors: martin.grossmann@psi.ch, stefan.ritt@psi.ch, uli.raich@gmail.com

126

@Students: High performance computing

Corresponding Authors: jaehoonyu@uta.edu, pskubic@ou.edu, hs@nhn.ou.edu

All computing tutorials will be run from https://osg-htc.org/dosar/ASP2022/ASP2022_Schedule/

127

@Students: High performance computing

Corresponding Authors: pskubic@ou.edu, jaehoonyu@uta.edu, hs@nhn.ou.edu

128

@Students: Small detector labs

Corresponding Authors: uli.raich@gmail.com, stefan.ritt@psi.ch, martin.grossmann@psi.ch

129

@Students: Small detector labs

Corresponding Authors: uli.raich@gmail.com, stefan.ritt@psi.ch, martin.grossmann@psi.ch

130

@Students: High performance computing

Corresponding Authors: pskubic@ou.edu, jaehoonyu@uta.edu, hs@nhn.ou.edu

131

@Students: High performance computing

Corresponding Authors: pskubic@ou.edu, jaehoonyu@uta.edu, hs@nhn.ou.edu

132

@Students: High performance computing

Corresponding Authors: pskubic@ou.edu, jaehoonyu@uta.edu, hs@nhn.ou.edu

133

@Students: High performance computing

Corresponding Authors: pskubic@ou.edu, jaehoonyu@uta.edu, hs@nhn.ou.edu

134

Mental well-being

Corresponding Author: palesa.asp@gmail.com

Throughout time humans have faced different kinds of challenges. Most recently the main challenge involves 'the mind'. Behaviorists have talked about the different stimuli that influence our response or explain our behaviors collectively with context. Recently data shows that context, the environment, social factors, and other psychological variables play a big role towards our mental health. It is worth it to stop and take stock of our collective thinking patterns in the context of community, society, nations and even as an individual. Mental well-being is one of the most under rated phenomenon. This talk will briefly look into the history of cognitive based therapies and how far we have come, how we can use what we have learnt to not only help ourselves but impact the next generation. Hopefully, we can gain some perspective, learn to direct mental activities, and help move us forward more informed about the processes of change within, and most importantly start a journey towards psychological flexibility.

135

@Students: Small detector labs

Corresponding Authors: uli.raich@gmail.com, stefan.ritt@psi.ch, martin.grossmann@psi.ch

136

@Students: Small detector labs

Corresponding Authors: uli.raich@gmail.com, stefan.ritt@psi.ch, martin.grossmann@psi.ch

137

@Students: Small detector labs

Corresponding Authors: uli.raich@gmail.com, stefan.ritt@psi.ch, martin.grossmann@psi.ch

138

@Students: Small detector labs

Corresponding Authors: uli.raich@gmail.com, stefan.ritt@psi.ch, martin.grossmann@psi.ch

139

@Students: High performance computing

Corresponding Authors: pskubic@ou.edu, jaehoonyu@uta.edu, hs@nhn.ou.edu

140

@Students: High performance computing

Corresponding Authors: pskubic@ou.edu, jaehoonyu@uta.edu, hs@nhn.ou.edu

141

@Students: Medical accelerators, radionuclide production and radiation therapy

Corresponding Author: marco.silari@cern.ch

142

@Students: Medical accelerators, radionuclide production and radiation therapy 2

Corresponding Author: marco.silari@cern.ch

143

@Students: High performance computing

Corresponding Authors: pskubic@ou.edu, jaehoonyu@uta.edu, hs@nhn.ou.edu

144

@Students: High performance computing

Corresponding Authors: pskubic@ou.edu, jaehoonyu@uta.edu, hs@nhn.ou.edu

145

@Studens: Radiation measurements & dosimetry

Corresponding Author: marco.silari@cern.ch

146

@Students: Radiation measurements & dosimetry 2

Corresponding Author: marco.silari@cern.ch

147

@Students: Astrophysics & cosmology 3

Corresponding Author: denauroi@in2p3.fr

148

@Students: Astrophysics & cosmology 4

Corresponding Author: denauroi@in2p3.fr

149

@Students: Medical physics

Corresponding Authors: peyton.irmen@inova.org, kkisling@health.ucsd.edu, avery@uphs.upenn.edu

150

@Students: Medical physics 2

Corresponding Authors: kkisling@health.ucsd.edu, peyton.irmen@inova.org, avery@uphs.upenn.edu

151

@Students: radiation sources - FEL's, ICS and photo-muons

Corresponding Author: luca.serafini@mi.infn.it

152

@Students: radiation sources - FEL's, ICS and photo-muons 2

Corresponding Author: luca.serafini@mi.infn.it

153

@Students: Medical physics 3

Corresponding Authors: peyton.irmen@inova.org, kkisling@health.ucsd.edu, avery@uphs.upenn.edu

154

@Students: Medical physics 4

Corresponding Authors: kkisling@health.ucsd.edu, peyton.irmen@inova.org, avery@uphs.upenn.edu

155

The Long Journey to the Higgs Boson and Beyond

Corresponding Author: peter.jenni@cern.ch

156

@Students: Machine learning & artificial intelligence

Corresponding Author: claire.david@cern.ch

157

@Students: Machine learning & artificial intelligence 2

Corresponding Author: claire.david@cern.ch

158

@Students: Nuclear science and technologies at the International Atomic Energy Agency (IAEA) - ensuring future energy and water security (IAEA)

Corresponding Author: m.denecke@iaea.org

The International Atomic Energy Agency (IAEA), located in Vienna Austria, is an independent intergovernmental, science and technology-based organization, in the United Nations (UN) family, that serves as the global focal point for nuclear cooperation. Its mandate strapline is "atoms for peace and development."The Agency's development activity is focused on helping to achieve the sustainable development goals (SDGs), such as clean water and sanitation for everyone, affordable and clean energy, and climate action, through applications of nuclear technologies. Atoms for peace not only reflects the IAEA's nuclear safeguard mandate, but also its decided contributions to peace by bringing people from around the world together to address global challenges.
The IAEA's efforts to achieve SDGs is delivered through its Science & Technology pillar, defined by

two of its technical departments, the Department of Nuclear Sciences and Applications (NA) and the Department of Nuclear Energy (NE) plus its 12 laboratories in Vienna, Seibersdorf and Monaco. The Division of Physical and Chemical Sciences (NAPC) bridges both NA and NE departments and supports the IAEA's 174 Member States in building capacities and optimising benefits for safe and economical applications of existing nuclear technologies as well as in developing new, innovative nuclear technologies for the future. The four sections comprising NAPC are responsible for the IAEA's Water Resource, Radioisotope Products and Radiation Technologies and Nuclear Sciences programmes.
The talk will briefly outline NAPC activities directed towards securing future clean energy and water resource, of particular importance to the African Continent. Specifically, the IAEA role in development of fusion energy, in chemical recycling of plastic waste to generate fuel and in managing water resource for energy, agriculture, industrial applications and human consumption will be highlighted. In addition, how activities collaboratively supporting Member States to achieve their development goals and joining forces to tackle global challenges contribute to atoms for peace will be discussed.

159

@Students: Nuclear science and technologies at the International Atomic Energy Agency (IAEA) - ensuring future energy and water security (IAEA)

Corresponding Author: m.denecke@iaea.org

The International Atomic Energy Agency (IAEA), located in Vienna Austria, is an independent intergovernmental, science and technology-based organization, in the United Nations (UN) family, that serves as the global focal point for nuclear cooperation. Its mandate strapline is "atoms for peace and development."The Agency's development activity is focused on helping to achieve the sustainable development goals (SDGs), such as clean water and sanitation for everyone, affordable and clean energy, and climate action, through applications of nuclear technologies. Atoms for peace not only reflects the IAEA's nuclear safeguard mandate, but also its decided contributions to peace by bringing people from around the world together to address global challenges.
The IAEA's efforts to achieve SDGs is delivered through its Science & Technology pillar, defined by two of its technical departments, the Department of Nuclear Sciences and Applications (NA) and the Department of Nuclear Energy (NE) plus its 12 laboratories in Vienna, Seibersdorf and Monaco. The Division of Physical and Chemical Sciences (NAPC) bridges both NA and NE departments and supports the IAEA's 174 Member States in building capacities and optimising benefits for safe and economical applications of existing nuclear technologies as well as in developing new, innovative nuclear technologies for the future. The four sections comprising NAPC are responsible for the IAEA's Water Resource, Radioisotope Products and Radiation Technologies and Nuclear Sciences programmes.
The talk will briefly outline NAPC activities directed towards securing future clean energy and water resource, of particular importance to the African Continent. Specifically, the IAEA role in development of fusion energy, in chemical recycling of plastic waste to generate fuel and in managing water resource for energy, agriculture, industrial applications and human consumption will be highlighted. In addition, how activities collaboratively supporting Member States to achieve their development goals and joining forces to tackle global challenges contribute to atoms for peace will be discussed.

160

@Students: Machine learning & artificial intelligence 3

Corresponding Author: claire.david@cern.ch

161

@Students: Machine learning & artificial intelligence 4

Corresponding Author: claire.david@cern.ch

162

@Students: Materials physics

Corresponding Author: andre.venter@mandela.ac.za

163

@Students: Materials physics

Corresponding Author: andre.venter@mandela.ac.za

164

@Students: Astrophysics & cosmology 5

Corresponding Author: denauroi@in2p3.fr

165

@Students: Astrophysics & cosmology 6

Corresponding Author: denauroi@in2p3.fr

166

@Students: Neutrinos 1: A Biography of the ”Little Neutral One”

Corresponding Author: mbishai@bnl.gov

167

@Students: Neutrinos 2: Neutrino physics in the 21st Century

Corresponding Author: mbishai@bnl.gov

168

@Students: ERL's, energy sustainability of particle accelerators

Corresponding Author: luca.serafini@mi.infn.it

169

@Students: ERL's, energy sustainability of particle accelerators 2

Corresponding Author: luca.serafini@mi.infn.it

170

@Students: Physics at undergound laboratories

Corresponding Author: fernando.ferroni@gssi.it

171

@Students: Physics at undergound laboratories 2

Corresponding Author: fernando.ferroni@gssi.it

172

Students survey

Corresponding Author: julia.ann.gray@gmail.com

Students parallel session 3 / 173

Fermi potential & Neutron optics

Corresponding Author: maaza@tlabs.ac.za

Students parallel session 3 / **174**

Neutron trapping in nanostructure & neutron lifetime

Corresponding Author: maaza@tlabs.ac.za

Teachers Parallel Session 2 / **175**

Electron-positron tomography (PET) —EaseyPET: demo of PET imaging

Corresponding Author: martin.grossmann@psi.ch

Teachers Parallel Session 2 / **176**

Time Of Flight —simple particle physics experiment with cosmic rays

Corresponding Author: stefan.ritt@psi.ch

Teachers Parallel Session 2 / **177**

Embedded systems & Internet of Things

Corresponding Author: uli.raich@gmail.com

Teachers Parallel Session 2 / **178**

Embedded systems & Internet of Things

Corresponding Author: uli.raich@gmail.com

Teachers Parallel Session 2 / **179**

Time Of Flight —simple particle physics experiment with cosmic rays

Corresponding Author: stefan.ritt@psi.ch

Teachers Parallel Session 2 / **180**

Electron-positron tomography (PET) —EaseyPET: demo of PET imaging

Corresponding Author: martin.grossmann@psi.ch

Teachers Parallel Session 2 / **181**

Embedded systems & Internet of Things

Corresponding Author: uli.raich@gmail.com

Teachers Parallel Session 2 / **182**

Electron-positron tomography (PET) —EaseyPET: demo of PET imaging

Corresponding Author: martin.grossmann@psi.ch

Teachers Parallel Session 2 / **183**

Time Of Flight —simple particle physics experiment with cosmic rays

Corresponding Author: stefan.ritt@psi.ch

@Students: Small detector labs / **184**

Electron-positron tomography (PET) —EaseyPET: demo of PET imaging

Corresponding Author: martin.grossmann@psi.ch

@Students: Small detector labs / **185**

Embedded systems & Internet of Things

Corresponding Author: uli.raich@gmail.com

@Students: Small detector labs / **186**

Time Of Flight —simple particle physics experiment with cosmic rays

Corresponding Author: stefan.ritt@psi.ch

@Students: Small detector labs / **187**

Time Of Flight —simple particle physics experiment with cosmic rays

Corresponding Author: stefan.ritt@psi.ch

@Students: Small detector labs / **188**

Electron-positron tomography (PET) —EaseyPET: demo of PET imaging

Corresponding Author: martin.grossmann@psi.ch

@Students: Small detector labs / **189**

Embedded systems & Internet of Things

Corresponding Author: uli.raich@gmail.com

@Students: Small detector labs / **190**

Embedded systems & Internet of Things

Corresponding Author: uli.raich@gmail.com

@Students: Small detector labs / **191**

Electron-positron tomography (PET) —EaseyPET: demo of PET imaging

Corresponding Author: martin.grossmann@psi.ch

@Students: Small detector labs / **192**

Time Of Flight —simple particle physics experiment with cosmic rays

Corresponding Author: stefan.ritt@psi.ch

@Students: Small detector labs / **193**

Embedded systems & Internet of Things

Corresponding Author: uli.raich@gmail.com

@Students: Small detector labs / **194**

Time Of Flight —simple particle physics experiment with cosmic rays

Corresponding Author: stefan.ritt@psi.ch

@Students: Small detector labs / **195**

Electron-positron tomography (PET) —EaseyPET: demo of PET imaging

Corresponding Author: martin.grossmann@psi.ch

ASP Forum / **196**

@students: From ASP2010 to probing longitudinal VBS at a future hadron collider

Corresponding Author: chilufya.mwewa@cern.ch

The Vector Boson Scattering (VBS) process of massive vector bosons is predicted by the Standard Model (SM) as being sensitive to ElectroWeak Symmetry Breaking (EWSB). Prior to EWSB, all vector bosons are massless and only have transverse polarization states. However, after EWSB, □ and □ bosons become massive and gain an extra polarization state - the longitudinal polarization, whereas photons and gluons remain massless. In the absence of the SM Higgs boson, cross-sections of the scattering of longitudinal components would keep increasing as a function of energy. VBS is sensitive to interactions between the longitudinal components of massive vector bosons, hence making it a good platform for the study of EWSB. There have been various studies of prospects for the cross-section measurement of longitudinally polarised vector bosons at the high luminosity Large Hadron Collider (LHC) and also at a future high-energy muon collider.

Accompanied by a very short tale of my journey from attending ASP 2010 to date, this talk will present a study on the sensitivity to longitudinal VBS at a future 27 TeV, 50 TeV and 100 TeV □□ collider in the same sign □□ VBS process.

ASP Forum / **197**

Panel discussion on the support for ASP

Introduction / **198**

Acknowledgements, orientation, and introductions by ASP2022 LOC&ROC Chair

Corresponding Author: azwinndini.muronga@mandela.ac.za

Introduction / **199**

Welcome to Mandela University, Gqeberha, South Africa by the Deputy Vice Chancellor for Learning and Teaching

Introduction / **200**

Introducing Faculty of Science at Mandela University by the Deputy Dean

Introduction / **201**

Introducing Physics Department at Mandela University by the Head of Department

Corresponding Author: andre.venter@mandela.ac.za

Introduction / **202**

Introducing ASP2022 by the ASP-IOC Chair

Corresponding Author: ketevi.adikle.assamagan@cern.ch

203

@Teachers: Photoelectric effect (1)

Corresponding Authors: makonde.netsianda@ul.ac.za, molamo.letsoalo@ul.ac.za

204

@Teachers: Photoelectric effect (2)

Corresponding Authors: makonde.netsianda@ul.ac.za, molamo.letsoalo@ul.ac.za

Students parallel session 3 / **205**

Lecture 1: dark matter

Corresponding Author: mohlabeng319@gmail.com

Students parallel session 3 / **206**

Lecture 2: searching for dark matter

Corresponding Author: mohlabeng319@gmail.com

207

ATLAS or CMS masterclass measurement

Corresponding Authors: swood5@nd.edu, kenneth.william.cecire@cern.ch

208

@Students: Event generation & detector simulation

Corresponding Authors: diallo.boye@cern.ch, mounia.laassiri@gmail.com

209

@Students: Event generation & detector simulation

Corresponding Author: mounia.laassiri@gmail.com

210

@Students:Event generation & detector simulation

Corresponding Authors: benard.mulilo@gmail.com, diallo.boye@cern.ch, mounia.laassiri@gmail.com

211

@Students: Event generation & detector simulation

Corresponding Authors: benard.mulilo@gmail.com, mounia.laassiri@gmail.com, diallo.boye@cern.ch

212

Large scale research infrastructures for Africa

Corresponding Author: maaza@tlabs.ac.za