Academic Report*

(27 September 2003 - 15 May 2006)

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Courses Taught

1. **Fall Semester** (September 2003 - January 2004)
   - Mathematics-I (2 Sections)
   - Mathematics-II (2 Sections)
2. **Spring Semester** (February-June 2004)
   - Foundation Mathematics & Statistics (2 Sections)
   - Mathematics-I (1 Section)
   - Mathematics-II (2 Sections)
3. **Summer Semester** (July-September 2004)
   - Mathematics-II (1 Section, done jointly with Colleagues)
4. **Fall Semester** (September 2004 - January 2005)
   - Physics
   - Engineering Mechanics
   - Mathematics-II (2 Sections)
5. **Spring Semester** (February-June 2005)
   - Physics
   - Engineering Mechanics (2 Sections)
   - Mathematics-II (2 Sections)
6. **Fall Semester** (September 2005 - January 2006)
   - College Mathematics (3 Sections)
   - Calculus with Numerical Methods (4 Sections)
   - Engineering Physics (2 Sections)
7. **Spring Semester** (February-May 2006)
   - Calculus with Numerical Methods (6 Sections)
   - Advanced Calculus (1 Section)
   - Engineering Physics (2 Sections)

*Updated on Friday the 13 April 2007

Professional Achievements
In March 2005, I was appointed as the *Regular Correspondent* for the ICFA Beam Dynamics Panel Newsletters, for the regions of Middle East & Africa. ICFA, the International Committee for Future Accelerators, provides a forum to discuss and implement plans for further promoting collaborative accelerator-based science. Its primary purpose is to strengthen collaboration in accelerator-based science, to encourage future projects, and to make recommendations to governments. The formal announcement appeared in the International Committee for Future Accelerators (ICFA) *Beam Dynamics Panel Newsletter*, **No. 36** (April 2005). Further details are available at: http://icfa-usa.jlab.org/archive/newsletter.shtml

Committees

1. **Disciplinary Committee**
   (October 2003 - September 2004).
2. **Journal Committee**
   (January 2004 to May 2006).
3. **Library Committee**
   (November 2003 to May 2006)
   Actively involved in the Library affairs including correspondence leading to free subscription of Journals/Newsletters/Magazines.
4. **Web-Site Committee**
   (October 2004 to May 2006)
5. **Prizes and Awards Committee**
   (February 2005 to May 2006)
6. **Accreditation Steering Committee**
   (February 2006 to May 2006)

Homepages

I was instrumental in designing and installing the Department Homepages on the College Intranet: http://stfsvr03/mathsandstats/index.html and http://stfsvr03/physics/index.html. Also available at: http://stdsvr03/mathsandstats/index.html and http://stdsvr03/physics/index.html respectively. The above homepages contain the in-house prepared *Lecture Notes* and *Question Banks*, meeting most of the requirements of all the courses (three-semester sequence in Mathematics, Statistics and Physics respectively) offered by the Department.

Mathematics Olympiad

I was part of the three-member team, which jointly conducted the *first* Mathematics Olympiad in the College, on Wednesday the 26th May 2004. The other two members of the team were my Colleagues from the Department, Ms. Lavanya Venkatesan and Ms. Usha Ramanathan. The second Olympiad was conducted on Tuesday the 21 March 2006. These events are now evolving into a National Olympiad with the first *Intercollegiate Mathematics Olympiad* held on Sunday the 07 May 2006, during the Intercollegiate Meet, **QUEST** (6-8 May 2006, http://www.mecit-quest.com/).

Research Summary

Main Fileds of Research: *Mathematical Optics*
I am working towards a unified treatment of light beam optics and polarization, using the standard mathematical machinery of quantum mechanics. Dirac-*like* form of the Maxwell equations is well known in literature. Starting with the Dirac-*like* form of the Maxwells equations a unified treatment of light beam optics and polarization has been obtained. The traditional results (including aberrations) of the scalar optics are modified by the wavelength-dependent contributions. Some of the well-known results in polarization studies are realized as the leading-order limit of a more general framework of our formalism. The existing matrix representations of the Maxwells equations were found to be approximate for the formalism developed here; hence, an exact matrix representation of the Maxwells equations was derived.

A related study was made starting with the scalar approximation of the Maxwells equations. Using the analogy of the Helmholtz equation with the Klein-Gordon equation and the Feshbach-Villars approach to the Klein-Gordon equation a formalism utilizing the powerful techniques of quantum mechanics has been developed for scalar optics including aberrations. This provides an alternative to the traditional *square-root* approach and gives rise to wavelength-dependent contributions modifying the aberration coefficients.

PUBLICATIONS

A. Review Article

- Sameen Ahmed Khan,
  Wavelength-Dependent Effects in Light Optics,
  in *New Topics in Quantum Physics Research*,
  Editors: Volodymyr Krasnoholovets and Frank Columbus,
  (Nova Science Publishers, New York, 2006, http://www.novapublishers.com/).
  pp. 163-204 (30 December 2006).
  (ISBN-10: 1600210287 and ISBN-13: 978-1600210280).

B. Refereed Publications

1. Sameen Ahmed Khan,
   Wavelength-dependent modifications in Helmholtz Optics,
   International Journal of Theoretical Physics, **44**(1), 95-125 (January 2005).
   (Kluwer Academic Publishers, https://www.editorialmanager.com/ijtp/).

2. Sameen Ahmed Khan,
   An Exact Matrix Representation of Maxwells Equations,
   Physica Scripta, **71**(5) 440-442 (2005).
   (http://www.physica.org/).

3. Sameen Ahmed Khan,
   The Foldy-Wouthuysen Transformation Technique in Optics,
   Optik-International Journal for Light and Electron Optics, **117**, Issue 10, pp. 481-488 (October 2006).
   (http://www.elsevier-deutschland.de/ijleo/).

C. In Proceedings

- Fathiya Khamis Al Rawahi, Sameen Ahmed Khan and Abdul Huq,
  Microsoft Excel in the Mathematics Classroom: A Case Study,
  in *Proceedings* of **The Second Annual Conference for Middle East Teachers of Mathematics, Science and Computing** (**METSMaC 2006**), The Petroleum Institute, Abu Dhabi, United Arab Emirates, 14-16 March 2006. *Editors*: Seán M. Stewart, Janet E. Olearski and Douglas Thompson, pp. 131-134 (2006).

- ..., Sameen Ahmed Khan, ...,
  Numerical Methods with Microsoft Excel. (*in preparation*).

The corrections to the traditional descriptions rigorously derived in the above articles have a significant bearing on the celebrated Scherzer Theorem in the wavelength-dependent regime in electron microscopy and the algebraically equivalent system of fiber optics. An application shall be made for a patent in the near future!

Contributions to International Reports:

- $\cdots$, Sameen Ahmed KHAN, $\cdots$, (*one of the 250+ Contributors, from 79 Institutions*),
  GLD Detector Outline Document (**GLD DOD**),
  GLD: A Large Detector Concept study for International Linear Collider for TeV Physics
  Report of the
  GLD Concept Study Group,
  World Wide Study of Physics and Detectors for future Linear e^+e^- Colliders, (March 2006).
  GLD: Gaseous tracker based Large Detector.
  E-Print: http://arXiv.org/abs/physics/0607154/.

Non-Technical Writings[†]

1. Sameen Ahmed Khan and Azher Majid Siddiqui,
   A German Synchrotron Radiation Facility for the Middle East,
   Renaissance, Vol. **14**, No. 2, pp. 37-40 (February 2004).
2. Sameen Ahmed Khan,
   SESAME Synchrotron-Light for Experimental Science and Applications in the Middle East,
   Islamic Voice, Vol. bd 17-03 No. 207, pp. 20 (March 2004, Muharram-Safar 1425).
3. Sameen Ahmed Khan,
   E-Learning Challenges in the Middle East.
   in Proceedings of the International Conference in E-Business
   E-Business in GCC Challenges and Prospects (**EGCC'04**),
   (19 May 2004, Majan College (University College), Muscat, Sultanate of Oman).
4. Sameen Ahmed Khan,
   Need to Create Science Centres in the Muslim World,
   Young Muslim Digest, **Vol. 26**, Issue 7, pp. 13-16 (September 2004).

[†]This List is Incomplete!

5. Sameen Ahmed Khan, **The Plague of Spam: The Unsolicited E-Mails**,
   Youth Observer, **Vol. No. 3**, pp. 11 (November 2004 - Ramadhan 1425).
   Supplement to Oman Observer, **Vol. 23, No. 358**, (Saturday the 06 November 2004).
   (**OEPNPA**: Oman Establishment for Press, News, Publication and Advertising in co-operation with the Ministry of Education).

6. *Reported by* Sameen Ahmed Khan,
   Oman Issues Stamp in Braille,
   Islamic Voice, Vol. **17-11, No. 215**, pp. 3 (November 2004).

7. Sameen Ahmed Khan,
   Joint visits to CERN with SESAME,
   Letter in *CERN Courier*, **44** (10), pp. 34 (December 2004).
   (**CERN**: European Organization for Nuclear Research).

8. Sameen Ahmed Khan,
   Google Scholar Launched,
   Science Reporter, **42**(1) pp. 16 (January 2005).
   (National Institute of Science Communication and Information Resources, India).

9. Sameen Ahmed Khan,
   The Google Scholar,
   Youth Observer, pp. 7 (February 2005 - Dhul Hajjah 1425).
   Supplement to *Oman Observer*, **Vol. 24, No. 83**, (Saturday the 05 February 2005).
   (**OEPNPA**: Oman Establishment for Press, News, Publication and Advertising in co-operation with the Ministry of Education).

10. Sameen Ahmed Khan,
    Sergio Fubini (1928-2005),
    Obituary in *IAMP News Bulletin*, pp. 4-5 (April 2005).
    (**IAMP**: International Association of Mathematical Physics);
    AAPPS Bulletin, **15**(3), pp. 31 (June 2005).
    (**AAPPS**: Association of Asia Pacific Physical Societies).
    Archived in:
    the *Biographies Collection*,
    Center for History of Physics, *Niels Bohr Library & Archives*,
    American Institute of Physics, http://www.aip.org/history/.

11. Sameen Ahmed Khan,
    CERN's Early History Revisited,
    Letter in *Physics Today*, **58**(4) pp. 87 (April 2005).

12. Sameen Ahmed Khan,
    The Google Desktop Search,
    Youth Observer, pp. 5 (April 2005 - Safar 1426).
    Supplement to *Oman Observer*, **Vol. 24, No. 139**, (Saturday the 02 April 2005).
    (**OEPNPA**: Oman Establishment for Press, News, Publication and Advertising in co-operation with the Ministry of Education).

13. Sameen Ahmed Khan,
    Forty Years of ICTP; Atomic and Molecular Physics Programmes at ICTP,
    ISAMP News Letter, **Vol. 1, Issue 1**, pp. 4-6 (21 April 2005).
    (**ISAMP**: Indian Society of Atomic and Molecular Physics).
    ICTP, the Abdus Salam International Centre for Theoretical Physics is located in Trieste, the Science City in Italy.

14. Sameen Ahmed Khan,
Conference Report: **Higher Education in Developing Countries: With a Focus on Muslim Contexts**,
(Held at the Aga Khan University Institute for the Study of Muslim Civilisations, **AKU-ISMC**, 24-25 February 2005, London, UK),
Islamic Voice, Vol. **18-05** No. 221, pp. 29 (May 2005, Rabbi-Al-Awwal 1426);
Young Muslim Digest, **Vol. 27**, Issue 4, pp. 41 (June 2004);
Pakistan Link, pp. ??? (Friday the 10 June 2005). (Published from Irvine, California, USA);
Renaissance, Vol. **15**, No. 7, pp. 44-45 (July 2005).

15. Sameen Ahmed Khan,
CERN and the World Wide Web,
Youth Observer, pp. 6 (May 2005 - Rabee Al Awwal 1426).
Supplement to *Oman Observer*, **Vol. 24, No. 174**, (Saturday the 7 May 2005).
(**OEPNPA**: Oman Establishment for Press, News, Publication and Advertising in co-operation with the Ministry of Education).

16. Sameen Ahmed Khan,
Sergio Fubini, MESC and SESAME,
Letter in *CERN Courier*, **45**(4), pp. 44 (May 2005).
(**MESC**: Middle East Scientific Cooperation;
CERN: European Organization for Nuclear Research).

17. Sameen Ahmed Khan,
Three Physicists win the King Faisal International Prize,
AAPPS Bulletin, **15**(3), pp. 34-35 (June 2005).
(**AAPPS**: Association of Asia Pacific Physical Societies).
The Prizes are awarded every year by the King Faisal Foundation (**KFF**), Saudi Arabia.

18. Sameen Ahmed Khan,
2004 - the Year of Jubilees; Fifty Years of CERN; Forty Years of ICTP, Ten Years of ESRF User Operation,
IRPS Bulletin, **19** (1), 4-8 (June 2005).
(**IRPS**: International Radiation Physics Society);
ICFA Beam Dynamics Newsletter, **37**, pp. 12-18 (August 2005).
(**ICFA**: International Committee for Future Accelerators).

19. Sameen Ahmed Khan,
Hans Bethe Dead,
Science Reporter, **42**(6) pp. 20-21 (June 2005).
(National Institute of Science Communication and Information Resources, India).
Physics Nobel Laureate: Hans Albrecht Bethe, (1967).

20. Sameen Ahmed Khan,
SESAME a mini-CERN in the Middle East,
Youth Observer, pp. 7 (June 2005 - Rabee Al Thani 1426).
Supplement to *Oman Observer*, **Vol. 24, No. 202**, (Saturday the 04 June 2005).
(**OEPNPA**: Oman Establishment for Press, News, Publication and Advertising in co-operation with the Ministry of Education).

21. Sameen Ahmed Khan,
King Faisal International Prize 2005,
The Washington Report on Middle East Affairs, Vol. **XXIV**, No. 5, pp. 82 (July 2005).
Available at *Encyclopedia Britannica Online*, Article No. 9045247.
(http://www.britannica.com/eb/topic-316098/article-9045247/).
The Prizes are awarded every year by the King Faisal Foundation (**KFF**), Saudi Arabia.

22. Sameen Ahmed Khan,
King Faisal Foundation & its Prizes,
Young Muslim Digest, Vol. **27**, Issue 6, pp. 33-35 (August 2005).
The Prizes are awarded every year by the King Faisal Foundation (**KFF**), Saudi Arabia.

23. Sameen Ahmed Khan,
Forty Years of Plasma Physics at ICTP,
PSSI Newsletter, Vol. **20**, No. 2, pp. 3 (2005).
(**PSSI**: Plasma Science Society of India).
ICTP, the Abdus Salam International Centre for Theoretical Physics is located in Trieste, the Science City in Italy.

24. Sameen Ahmed Khan,
India and the Jubilees of CERN and ICTP,
Bulletin of the IAPT, **22**(9), pp. 322-326 (September 2005).
(**IAPT**: Indian Association of Physics Teachers).

25. Sameen Ahmed Khan,
Synchrotron Light in the Middle East,
Europhysics News **36**(5), pp. 169 (September/October 2005).
(Publication of **EPS**: the European Physical Society).

26. Sameen Ahmed Khan,
A Date with Dates,
Youth Observer, pp. 4 (October 2005 Ramadhan 1426 AH).
Supplement to *Oman Observer*, **Vol. 24, No. 328**, (Saturday the 08 October 2005).
(**OEPNPA**: Oman Establishment for Press, News, Publication and Advertising in co-operation with the Ministry of Education).

27. Sameen Ahmed Khan,
Forty Years of ICTP and its Materials Science Programmes,
MRSI Newsleteer, Vol. **B 05**, Number 4, pp. 4-5 (October 2005).
(**MRSI**: Materials Research Society of India).
ICTP, the Abdus Salam International Centre for Theoretical Physics is located in Trieste, the Science City in Italy.

28. Sameen Ahmed Khan,
Role of Physics Institutions in International Collaborations,
10 pages Poster under the theme, *Physics & Economic Development*,
For the *Proceedings* of the
World Conference on Physics and Sustainable Development (**WCPSD**),
(31 October - 02 November 2005, Durban, South Africa).

    `http://www.wcpsd.org/posters/economic/Sameen_Ahmed_KHAN.pdf`

29. Sameen Ahmed Khan,
Report of the World Conference on Physics and Sustainable Development,
(31 October - 02 November 2005, Durban, South Africa, http://www.wcpsd.org/)
ICFA Beam Dynamics Newsletter, **38**, pp. 7-10 (December 2005).
(**ICFA**: International Committee for Future Accelerators);
Bulletin of the IAPT, **23**(1), pp. 20-22 (January 2006).
(**IAPT**: Indian Association of Physics Teachers);
AAPPS Bulletin, **16**(1), pp. 37-38 (February 2006).
(**AAPPS**: Association of Asia Pacific Physical Societies).
IRPS Bulletin, **20**(1), 33-35 (April 2006).
(**IRPS**: International Radiation Physics Society).

30. Sameen Ahmed Khan,
Physics and Sustainable Development,
ISAMP News Letter, **Vol. 1, Issue 5**, pp. 8-11 (21 December 2005).
(**ISAMP**: Indian Society of Atomic and Molecular Physics).

31. Fathiya Khamis Al Rawahi, Sameen Ahmed Khan and Abdul Huq,
Microsoft Excel in the Mathematics Classroom: A Case Study,
in *Proceedings* of **The Second Annual Conference for Middle East Teachers of Mathematics, Science and Computing** (**METSMaC 2006**),
The Petroleum Institute, Abu Dhabi, United Arab Emirates, 14-16 March 2006.
Editors: Seán M. Stewart, Janet E. Olearski and Douglas Thompson, pp. 131-134 (2006).

32. *Reported* by Sameen Ahmed Khan,
2006 UNESCO Avicenna Prize for Ethics in Science awarded to Dr. Abdullah Daar of Oman,
Islamic Voice, **19-05** No. 233, pp. 8 (May 2006);
Radiance Viewsweekly, **Vol. XLIII**, No. 49, pp. 28 (07-13 May 2006);
Renaissance, **Vol. 16**, No. 11, pp. ??-?? (November 2006).

33. Shaima Ahmed Abdul Rasool Al Zadjali and Sameen Ahmed Khan,
Sultan Qaboos Grand Mosque the Crowning Glory of Oman,
Islamic Voice, Vol. **19-05** No. 233, pp. 38 (May 2006).
(in the section, *History & Heritage*).

34. Sameen Ahmed Khan,
Medieval Arab Understanding of the Rainbow Formation,
Europhysics News **37**(3), pp. 10 (May/June 2006).
(Publication of **EPS**: the European Physical Society).

35. Sameen Ahmed Khan,
Abdus Salam and the International Centre for Theoretical Physics,
Review of Religions, **101** (8), pp. 58-63 (August 2006).

36. Zahra Mohammed Ambu Saidi and Sameen Ahmed Khan,
Satellites,
Youth Observer, pp. 14 (December 2006 Dhul Qaada 1427 AH).
Supplement to Oman Observer, **Vol. 26, No. 18** (Saturday the 02 December 2006).
(**OEPNPA**: Oman Establishment for Press, News, Publication and Advertising in co-operation with the Ministry of Education).

37. Sameen Ahmed Khan,
Need to Create Regional Science Centres in the Developing Countries,
For the *Proceedings* of **Higher Education in Developing Countries: With a Focus on Muslim Contexts**, The Aga Khan University Institute for the Study of Muslim Civilisations, (**AKU-ISMC**),
(24-25 February 2005, London, UK).
10 pages (*communicated*).

38. Sameen Ahmed Khan,
E-Learning Challenges and Prospects in the Middle East,
The Online Virtual Conference of the **World Forum on Information Society** (**WFIS**),
(31 March - 13 November 2005), *Pre-Cursor* to the **IRFD World Forum 2005**,
14-16 November
Conference on Digital Divide, Global Development and the Information Society,
Organized by **United Nations World Summit on the Information Society**,
Tunis, Tunisia.
(**IRFD**: International Research Foundation for Development).
06 pages (*submitted*).

Participation in Conferences & Visits to Institutions‡

1. 19 May 2004
International Conference in E-Business
E-Business in GCC Challenges and Prospects (**EGCC'04**),
Majan College (University College)
Muscat, Sultanate of Oman.
Presentation: **E-Learning Challenges in the Middle East**.
2. 23-30 August 2004
The Institute of Mathematical Sciences (**IMSc/Matscience**),
Chennai (Madras), India.
3. 24-25 February 2005
Higher Education in Developing Countries: With a Focus on Muslim Contexts,
The Aga Khan University Institute for the Study of Muslim Civilisations (**AKU-ISMC**), London, UK.
Talk: **Need to Create Regional Science Centres in the Developing Countries**.
4. 31 March - 13 November 2005
The Online Virtual Conference of the **World Forum on Information Society** (**WFIS**),
Pre-Cursor to the **IRFD World Forum 2005**
14-16 November
Conference on Digital Divide, Global Development and the Information Society,
Organized by **United Nations World Summit on the Information Society**,
Tunis, Tunisia.
(**IRFD**: International Research Foundation for Development).
Presentation: **E-Learning Challenges and Prospects in the Middle East**.
5. 08-09 May 2005
ICT 2005: The business value of IT
Muscat, Sultanate of Oman.
6. 31 October - 02 November 2005
World Conference on Physics and Sustainable Development (**WCPSD**)
Durban, South Africa.
Poster Presentation: **Role of Physics Institutions in International Collaborations**.
7. 14-15 November 2005
The Second Engineering Students Gathering
College of Engineering
Sultan Qaboos University
Muscat, Sultanate of Oman.
(Participated as a *Referee* for the Project Presentations).
8. 23-24 January 2006
PEIE's Smart Manufacturing Conference,
Muscat, Sultanate of Oman.
(**PEIE:** Public Establishment for Industrial Estates, http://www.peie.om/).
9. 14-16 March 2006 (**SCHEDULED**)
The Second Annual Conference for Middle East Teachers of Mathematics, Science and Computing (**METSMaC 2006**)
The Petroleum Institute
Abu Dhabi, United Arab Emirates.
Presentation: **Microsoft Excel in the Mathematics Classroom: A Case Study**.

‡Towards the end of my stay at MECIT, I had invitations to several Conferences, which I did not attend. All these are marked as *scheduled*.

10. 27-29 March 2006 (**SCHEDULED**)
International Conference on Distance Education (**ICODE 2006**)
Center for Educational Technology
Sultan Qaboos University
Muscat, Sultanate of Oman.
Presentation: **Distance Education and the Millennium Development Goals**.
11. 19-23 June 2006 (**SCHEDULED**)
Euro-Southeast Asia ICT Forum 2006 (**EUSEA 2006**)
Singapore.
12. 26-30 June 2006 (**SCHEDULED**)
European Particle Accelerator Conference (**EPAC-2006**)
Edinburgh International Conference Centre
Edinburgh, Scotland
UK.
Poster: **Quantum Theory of Accelerator Optics** (**ID: 2482**).
Under the
Main Classification: 05 Beam Dynamics and Electromagnetic Fields.
Sub Classification: D01 Beam Optics - Lattices, Correction Schemes, Transport.
13. 24-27 July 2006 (**SCHEDULED**)
International Symposium on Quantum Optics (**ISQO-2006**)
Physical Research Laboratory (PRL)
Ahmedabad, India.
Presentation: **Quantum Methodologies in Light Beam Optics**.
14. August 2006 (**SCHEDULED**)
The Institute of Mathematical Sciences (**IMSc/Matscience**),
Chennai (Madras), India.
15. 12-15 November 2006 (**SCHEDULED**)
The Fourth Symposium on Scientific Research Outlook in the Arab World
Dubai, UAE
Presentation: **Need to Create International Science Centre in the Arab World** (**Abstract ID: 165**),
Under the
TRACK: [T2] Arab Scientific Community
TOPIC: [T2-3] ArabInternational Cooperation in R&D.
16. 29 January 02 February 2007 (**SCHEDULED**)
Asian Particle Accelerator Conference (**APAC 2007**)
http://apac07.cat.ernet.in/
Centre for Advanced Technology (CAT), Indore, India.
Presentation: **Quantum Theory of Accelerator Optics**.
17. 17-19 March 2007 (**SCHEDULED**)
The Third Annual Conference for Middle East Teachers of Mathematics, Science and Computing (**METSMaC 2007**)
The Petroleum Institute
Abu Dhabi
United Arab Emirates.
Presentation: **Microsoft Excel in the Physics Classroom**.