

## ***SHATENDRA K. SHARMA***

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Present Position : **Professor and Director**  
Office address : University Science Instrumentation Centre,  
Jawaharlal Nehru University  
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New Delhi-110070  
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### **Employment History**

| <b>Period</b>                            | <b>Position Held</b>  |
|--|---|
| Current Position                         | <b>Professor and Director</b><br>University Science Instrumentation Centre<br>Jawaharlal Nehru University<br>New Delhi-110067.  |
| 1994(Dec) -1997(June)<br>(On deputation) | <b>Advisor</b><br>All India Council for Technical Education<br>I.G. Stadium, Sports Complex,<br>New Delhi - 110 002.  |
| 1994(July) - 1994(Dec)                   | <b>Director</b><br>All India Council for Technical Education<br>I.G. Stadium, Sports Complex,<br>New Delhi - 110 002.   |
| 1990(April) - 1993(Dec)                  | <b>Associate Professor and Head</b><br>University Science Instrumentation Centre<br>Jawaharlal Nehru University<br>New Delhi - 110 067.                               |
| 1990(Jan) - 1990(March)                  | <b>Associate Professor</b><br>University Science Instrumentation Centre<br>Jawaharlal Nehru University<br>New Delhi-110067.   |
| 1987(Sept) - 1989 (Dec)                  | <b>Scientist 'B'</b><br>Ministry of Defence<br>Defence Research and Development Organisation<br>Solid State Physics Laboratory, Lucknow Road,<br>Delhi-11054 (India). |
| 1982(Dec) - 1987(Sept)                   | <b>Lecturer in Physics</b><br>S.A. Jain College, Ambala City - 134002<br>Haryana (India).   |
| 1980(July) - 1982 (Nov)                  | <b>Research Fellow</b><br>Nuclear Science Laboratories<br>Department of Physics, Punjabi University<br>Patiala - 147002 (India).                                      |

### **Education :**

|                 |      |            |                               |
|-----------------|------|------------|-------------------------------|
| Ph.D.*          | 1987 | - NA -     | Punjabi University, Patiala   |
| M.Phil.         | 1981 | 'A' Grade  | Punjabi University, Patiala   |
| M.Sc.           | 1979 | Ist Div.   | Punjabi University, Patiala   |
| B.Sc.           | 1977 | IIInd Div. | Kurukshetra Univ. Kurukshetra |
| Cert. in French | 1982 | Ist. Div.  | Punjabi University, Patiala   |

**\*Title of Ph.D. Thesis : Experimental investigations of Photon induced X-rays**

**FELLOWSHIP / MEMBERSHIP OF PRESTIGIOUS SOCIETIES / ASSOCIATIONS :**

1. **Fellow,** Institution of Engineers ( India )
2. **Fellow,** Institution of Electronics & Telecommunication Engineers (India)
3. **Member,** Materials Research Society of India
4. **Member (Life),** Instrument Society of India
5. **Member,** International Radiation Physics Society
6. **Member (Life),** Indian Society for Radiation Physics
7. **Member (Life),** Indian Society for Technical Education

**BOARD & COMMITTEE MEMBERSHIPS**

1. Member, Central Apprenticeship Council, Directorate General of Employment & Training, Ministry of Labour, Govt. of India
2. Member, Steering Committee, Ninth International Workshop on Physics of Semiconductor Devices, Delhi
3. Member , UGC Review committee for performance appraisal of Universities.
4. Expert member on the panel of Dr. B.R. Ambedkar University Agra.
5. Chaired several sessions in the National Seminars / Conferences.
6. Worked as examiner of several M.Tech. and Ph.D. thesis of IIT and other Universities.

**PROFESSIONAL EXPERIENCE :**

**Total (Teaching, R&D and Academic Administration) :** **Twenty three years**  
 Experience in teaching position : **Seventeen years**

**ADMINISTRATIVE WORK EXPERIENCE**

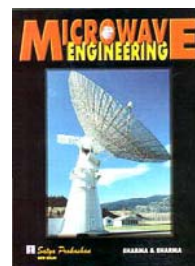
|                          |  |
|--------------------------|--|
| Head                     | Univ. Science Instrumentation Centre<br>JNU                          |
| Senior Warden            | Kaveri Hostel JNU  |
| Warden I/C (Maintenance) | All Hostels of JNU   |
| Member                   | Various committees in JNU and AICTE                                  |
| Director                 | Board of Studies, AICTE  |
| Member -Secretary        | National Board of Accreditation (AICTE)                              |
| Advisor                  | Recognition and Assessment , AICTE                                   |
| Advisor                  | Management, Computer Education and P.G<br>Programmes in Engg. &Tech. |

**AWARDS / PRIZES AND HONOURS :**

- a) **National Ishan Award** for 1998 in recognition of contribution toward development of management education in the country
- b) **Meritorious work award** for the year 1988 as Scientist 'B' in Ministry of Defence, Solid State Physics Laboratory, Delhi-54.
- c) University Merit Scholarship award during M.Sc. studies at Punjabi University, Patiala - 147002.
- d) **University Gold Medal** for the Intra-University Oil Painting Competition
- e) Several other awards/prizes for extracurricular activities like popular talks, painting, quizzes, story writing, poetry etc.

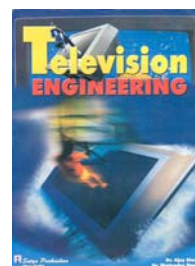
**PUBLICATIONS**

Number of research publications : 26  
 Number of general/popular science publications : 5



**Books Published/ Under print**

1. A text books on "**Microwave Engineering**" has been co-authored.
2. Another book on "**Television engineering**" has been co-authored.
3. A book "**Electronic Instrumentation for Research**" is under preparation.
4. A book on "**Basic Computer and Internet Applications for beginners**" is under print.



## **RESEARCH PROJECTS**

|    | <b>TITLE OF PROJECT</b>  | <b>FUNDED BY</b> |
|----|--|------------------|
| 1. | Investigations of atomic inner-shell x-ray emission processes in high energy ion-atom collisions | NSC/UGC<br>1992  |
| 2. | Experimental investigation of photon induced x-rays.   | UGC<br>1985      |

## **COMPUTER SKILLS**

**Hardware:** Possess state of the art knowledge of latest computer hardware including networking and Multimedia etc. Also have practical experience of assembling PC's to Pentium computers.

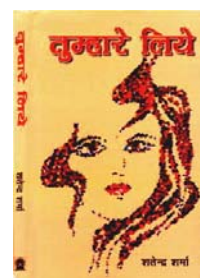
**Software:** Working experience on most of the popular packages such as Windows 95, Autocad-14, 3D Studio Max, Harvard Graphics, Corel Draw, and several graphics and animation packages, multimedia systems and Internet. Also have an experience of working on most of word processing packages such as WordStar, Scientific Word, and Pagemaker-6.5 etc.

## **EXTRA-CURRICULAR ACTIVITIES**

Participated in various activities like Paper reading, Popular talks, Photography, Science and general Quiz, Painting, Dramatics, Poetry etc. and won a large number of prizes therein. A silver medal in paper reading contest and a Gold Medal in University level oil competition have been awarded. A state level prize in story writing has also been awarded.

## **HOBBIES**

Pencil sketching, Oil Painting, Poetry and Writing on scientific and other subjects. A compilation of poems in Hindi has been published by M/s AtmaRam & sons.



## **LANGUAGES KNOWN**

English, Hindi, Punjabi and French

## **WORK EXPERIENCE IN AICTE**

As **Director ( Board of Studies )** in the AICTE , I was responsible for the planning, co-ordinating and monitoring the overall activities of the bureau of Board of Studies, All India Boards, formulation of academic policies of Council through All India Boards for improvement of the quality of technical education in the country in the area of Management (MBA,PGDM), Computer Science(MCA), Pharmacy, Architecture, Hotel Management and Post-graduate programmes in Engineering & Technology. Release of grants for the Post-graduate Engineering and Technology programmes approved by the Council. Conducting and arranging the meetings of various all India Board of Studies. Arranging Expert Task Force meetings, preparing the minutes, communicating decisions, arranging expert committee visits to institutions for initial approvals & for post approval monitoring and appraisal of performance. As Bureau Head of Board of Studies I was responsible for overall supervision and execution of the activities assigned to the bureau.

As **Adviser ( Recognition & Accreditation)** and bureau head I was responsible for the overall activities of the Bureau , majority of which included the work related to the recognition of various programmes in technical education in co-ordination with other concerned agencies such as MHRD, UPSC, AIU etc. The proposals received by the council for recognition and equivalence of qualifications were evaluated through expert committees. The final decisions as per recommendations and approval of the executive committee of the council were submitted to MHRD for gazette notifications.

During the period of December 1994 to May 1995 worked as **Member Secretary of National Board of Accreditation (NBA)** of AICTE ( a statutory Board under AICTE act 1987) and looked after its all secretarial activities of the NBA. During this tenure as Member Secretary of NBA developed the criteria for accreditation for various programmes In Engineering and Technology, Pharmacy, Architecture and Management and devised the mechanism for academic evaluation of approved programmes for relative quality ranking through accreditation process. The standard formats for submission of proposals, parameters for evaluation &

the weightages offered for various parameters were also identified. For initiating the process of accreditation for technical programmes for the first time in the country to create awareness arranged two workshops at Madras and Kurukshetra in the months of February and March, 1995. The parameters to identify & designate the benchmark institutions and programmes were also determined.

***As Adviser (Management, Computers & PG programmes in Engg. & Technology)***

During June, 1995 to December 5, 1996, worked as head of the Bureau (MCP) dealing mainly with the issues related to Management Education, Computer Education and Post Graduate programmes other than Engineering & Technology. As a bureau head in the bureau I was responsible for the overall activities of the bureau. This included processing of proposals for starting new programmes, increase in intake, extension of approvals, monitoring of performances of the existing approved institutions, replying to VIP correspondence, conducting various types of meetings such as expert task force committees, All India boards, sub-committees & others, arranging expert committee visits to the institutions for physical verification of infrastructures for new approvals and performance appraisal, and replying to general correspondence related to bureau, attending and preparing the replies in legal matters, updating the database in the bureau, preparation and revision of application forms, standard formats, guidelines and instructions and Norms and Standards pertaining to the areas under purview of the bureau and interacting with experts and other agencies and institutions in this regard.

***As Advisor (VIP, Parliament and Networking)***

During the period of December 1996 to June 1997, I handled the work related to the VIP matters/correspondence and Parliamentary queries. The reply materials were prepared for submission to the parliament and other dignitaries. In addition the networking, maintenance and installation of internet facilities in the Council were also planned and executed.

## ***WORK EXPERIENCE IN JNU***

**As Director, Head & Associate Professor, University Science Instrumentation Centre** Developed collaborative research programmes for design & development of scientific instruments to impart training in the scientific instrumentation and other allied technologies to the technical staff, research students as required for their research work. Extended the instrumentation services and related facilities to various research and teaching laboratories of the University. Designed & developed several test and measuring devices and the prototypes of new instruments and equipment for research and commercial applications. Took part in teaching and research of instrumentation and related subjects at post-graduate and doctoral level.

### ***Courses Developed/ taught***

- **"Instrumentation for research"** which was offered to the students of M.Sc., M.Phil. and Ph.D. in Centre of Biotechnology.
- **"Fundamental of Computer applications"** a Tool course which is being offered to the students of SLLCS.
- **"Basic Computer applications"** as optional course being offered to the students of SLLCS.
- **"Basic Electronics"** to M.Phil. students of SLS
- **"Undergraduate/(B.Sc.) level Physics"** for about five years as Lecturer in Physics

### ***DETAIL OF RESEARCH EXPERIENCE***

Possess more than twenty years of experience of independent research and development in the field of electronic and mechanical instrumentation, electronic material characterisation and experimental physics. The areas of work include original research work in the fields of Photon induced atomic inner-shell vacancy creation and de-excitation processes; Characterisation of materials using optical methods, Deep level transient spectroscopy, C-V, C-T measurements and carrier life time measurements; Processing of electronic materials like GaAs, Si and MCT and their Surface passivation using anodic oxidation; Development of indigenous

instrumentation needed for all above types of work. The separate details about the above research work are given below.

### ***WORK ON PHOTON –INDUCED ATOMIC INNER-SHELL X-RAYS***

The experimental measurements on the photon induced atomic-inner-shell vacancies and emitted fluorescent X-rays have been made. The parameters like differential and total X-ray production cross-sections, relative x-ray peak intensities; sub-shell radiative decay rates; fluorescence yields of L<sub>III</sub> sub-shell /M-shell are measured. The angular distribution of fluorescent X-rays to investigate their anisotropy have also been measured. The measurements of above parameters are of great importance on account of their numerous applications in the fields of radiation physics, atomic physics, nuclear physics, solid state physics, plasma physics, astrophysics and non-destructive testing of samples of biological, geological, archaeological and technological interests. The topic wise description of above work are as under.

### ***X-RAY PRODUCTION CROSS-SECTIONS***

The partial L shell x-ray production cross-sections with 59.57 keV photon excitation are measured in elements with atomic number  $73 \leq Z \leq 92$ . The measurements have been made in a 90° reflection geometry with <sup>241</sup>Am as source of 59.57 keV gamma rays. The measured cross-sections are also compared with the theoretical calculations in the form of relative intensities  $I(L_{\beta})/I(L_{\alpha})$ ,  $I(L_{\gamma})/I(L_{\alpha})$  and  $I(L_{\beta})/I(L_{\alpha})$ . The results have been interpreted in terms of photo-ionisation cross-sections, fluorescence yields, Coster-Kronig transition probabilities and radiative decay rates.

### ***ENERGY DEPENDENCE OF L-SHELL X-RAY RELATIVE INTENSITIES***

The energy dependence of L shell x-ray relative intensities of some high 'Z' elements has also been investigated in the photon energy region of  $14 \leq E \leq 44$  keV. The external conversion K x-rays of elements in the region  $37 > Z < 64$  induced by 60 keV photons from 1 curie <sup>241</sup>Am source in a double reflection geometry. The results of such measurements are compared with the calculated values using the sub-shell photo-ionisation

cross-sections, fluorescence yield and radiative and non-radiative decay rates. It has been established from above results that unlike K shell, the L shell relative intensities are not independent of photon energy.

### ***THE L<sub>III</sub> SUB-SHELL DECAY RATES***

The L<sub>III</sub> sub-shell relative radiative decay rates in Pb Th and U by selective ionisation of L<sub>III</sub> sub-shell are also measured. The technique of selective ionisation using radioactive sources has been used for the first time to determine above decay rates. As no other experimental data for L<sub>III</sub> sub-shell radiative decay rates are available, the measured values are only compared with the theoretical values and found to show a good agreement.

### ***ANISOTROPY OF PHOTON INDUCED X-RAYS***

The experiments are carried out to investigate the theoretical prediction of Flugge et al (1972) about the anisotropic emission of radiation from the states with  $J > 1/2$ . The measurements of sub-shell relative intensities of resolved peaks are made at emission angle varying from 60° to 150° at 10° intervals. The above measurements have revealed for the first time that x-rays originating from the states  $J > 1/2$  (e.g. L<sub>III</sub> sub-shell  $J = 3/2$ ) and falling under L $\beta$  and L $\gamma$  peaks show an anisotropic angular distribution. However, the peak L $\alpha$  and L $\iota$  do not show any measurable anisotropy. These results, though in conformity with the predictions of Flugge et al (1972) cannot be compared with other results as no other experimental or theoretical data are available.

### ***M-SHELL FLOURESCENT YIELDS***

The average M shell fluorescence yields have also been measured for some high 'Z' elements. The M-Shell vacancies are produced by photo ionisation with 5.597 keV Mn X-rays emitted from <sup>55</sup>Fe radioactive source. The values of measured M-shell x-ray production cross-sections are used to determine using the theoretical values of M-shell photo ionisation cross-sections from Scofield (1973). The results are compared with other data wherever available and in some cases the calculations for are made from the available theoretical data. It is also observed that the average



fluorescence yields are independent of initial vacancy distribution among its sub-shells.

## **RESEARCH WORK IN THE FIELD OF CHARACTERISATION OF SEMICONDUCTOR MATERIALS**

The research work related to the characterisation of semiconductor electronic materials has been conducted at, Solid State Physics Laboratories, Ministry of Defence, Delhi - 110054. During my stay there the work was done in the following areas. (Most of which is classified)

### ***MINORITY CARRIER LIFETIME MEASUREMENTS***

The minority carrier life time measurements were performed in wide range of semiconductor materials like Germanium, Silicon, Gallium Arsenide, Cadmium Telluride and Mercury Cadmium Telluride. The photo-conductive decay method was used for the preliminary characterisation of the solid state electronic materials developed at the laboratory. The electronic and mechanical equipment was set up for above purpose and several types of measurements were made.

### ***FOURIER TRANSFORM UV-VIS-IR SPECTROSCOPY***

The characterisation of above mentioned materials was also carried out using Fourier Transform Spectrometer in UV, visible and IR regions. The materials were tested for their transmittance in the specific wavelength regions of interest. This characterisation was routinely done for the samples developed in the laboratory. The Biorad digital FT-Spectrometer was used for these investigations. The use of Carry-14 spectrometer was also made for some measurements.

### ***CV-CT MEASUREMENTS***

The C-V, C-T measurements were made in various types of semiconductor materials like Si, Ge, GaAs, CdTe, HgCdTe etc. for their characterisation. The samples of the materials grown in the laboratory by different processes like LPE, VPE, MBE, & MOCVD etc. by other working groups, were

generally characterised. The MOS structures were prepared on the material surfaces after etching, polishing and cleaning by standard processes. The oxide coatings of known thickness were deposited and aluminium, indium, silver or gold gate contacts were deposited using vacuum evaporation. The schematic study of samples for C-V and C-T measurements was carried out over a wide temperature range from 77oK to 400oK. These measurements were made on Biorad DL-4600 system with built-in cryostat temperature controller and C-V, C-T measurement facility at 1 MHz frequency. The results have been used in classified defence projects.

### ***DEEP LEVEL TRANSIENT SPECTROSCOPY***

The deep level impurities \ traps play very important role in determining the suitability of material and the device performance. The characterisation of these defects thus assumes great significance in material development. The one of the techniques to do so is by means of deep level transient spectroscopy which offers various advantages over the other available techniques. The EL2 defects in GaAs were (in particular) investigated for the GaAs ingots developed at Solid State Physics Lab. The material samples were prepared in the form of MOS structures and were investigated for deep level defects by Biorad DL-4600 DLTS unit. The samples of GaAs, Si, Ge and MCT were studied. The devices in the form of diodes, LED, solar cells etc. were also used as samples to characterise the deep traps.

### ***PASSIVATION OF MCT***

The MCT wafers were characterised for their suitability for fabrication of IR detector devices like linear arrays and CCDs. For this purpose the raw MCT crystals grown in the lab. were processed and MOS structures were fabricated after growing an oxide film (100 - 500 Å degree thick) by anodic oxidation process. The gate structures were grown by vacuum evaporation of In, Ag, Al and Au and the passivated MCT wafers were characterised for their suitability for making IR devices.

### ***CHARACTERISATION OF a-Si:H SOLAR CELLS***

The hydrogenated amorphous silicon solar cells were characterised by CV,CT and DLTS methods for their intrinsic properties and their performances before and after annealing. The MOS structures using SiO<sub>2</sub> film were used for the characterisation.

## ***RESEARCH WORK ON ION-INDUCED ATOMIC INNER-SHELL PROCESSES***

The availability of high energy ion beams from a 15-UD pelletron at Nuclear Science Centre is being used for some experimental investigations of atomic inner-shell excitation and de-excitation processes. The investigations of K, L, and M-shell ionisation by heavy ion beams and the related processes like x-ray production, REC, RTE and molecular orbital formation are under way. The following experiments have already been performed.

### ***STUDY OF GOLD L X-RAYS IN Ni-Au***

The production of L shell x-rays of gold from thin targets 20 gm/mg with 58-87 MeV Ni<sup>+5</sup>ion bombardment has been studied. The experimental chamber was modified to increase the detector - target solid angle considerably and to reduce the path between detector window and target. The well collimated detector gives very pure L x-ray spectrum free from background noise. Among the interesting features observed in the experiment are the peak height shift and the re-arrangements of intensity distribution among resolved peaks of X-rays. The estimate of multiple vacancy creation in some sub-shells of L shell has been made. The energy dependence of relative L shell X-ray intensities and absolute X-ray production cross-sections are also measured and compared with theory/other data wherever available.

### ***STUDY OF K X-RAYS IN Cu-Cu SYSTEM***

The production of K shell X-rays in Cu-Cu system at high projectile energy and charge state has been investigated. The symmetric molecular orbital effects and some interesting results have been observed. The charge state dependence of molecular orbital formation has also been explored.

### ***DESIGN AND FABRICATION OF X-RAY DETECTION CHAMBER AT NUCLEAR SCIENCE CENTRE***

The light ion beam room (LIBR) chamber at NSC has been modified to insert the Si(Li) detector to improve the solid angle of detection and to reduce the absorption of radiation in the path. This has been done by designing a flange with changeable polypropylene window and Aluminium collimator. A variety of experiments have now therefore become feasible at NSC in the area of Atomic Physics using low energy x-ray and photon detectors.

### ***DESIGN AND DEVELOPMENT OF GAS FLOW POSITION SENSITIVE DETECTOR***

The low cost, single wire gas flow proportional detectors have been designed, fabricated and tested for alpha particles as well as x-rays for their performance of position sensitivity and resolution. These detectors have shown the resolution of better than 19% at 5.9 keV photon energy and the position sensitivity of 0.4 mm. These characteristics are comparable with the commercially available detectors. The efforts to further improve upon these characteristics are on.

### ***MOLECULAR ORBITAL FORMATION AND MO X-RAY EMISSION IN ION ATOM COLLISIONS.***

The molecular orbital K- shell x-rays were studied from the ion excited atom of copper in the copper-copper system. The copper ions with various charge states were obtained from the Pelletron at Nuclear Science Centre

### ***CALIBRATION AND OTHER PROPERTIES OF SOLID STATE DETECTORS.***

The gas flow position sensitive detector designed and fabricated at JNU is further being improved to provide indigenous substitute. The prototypes were fabricated at USIC JNU and were installed and tested at Nuclear Science Centre New Delhi. The performance of the detector has

been evaluated in real working conditions and the characteristics were found to be near desirable.

Some other new designs of detectors are under development for complex experiments.

## **RESEARCH AND DEVELOPMENT IN INSTRUMENTATION**

1. Designed and fabricated a remotely operated 1 Curie  $^{241}\text{Am}$  source handling and sample irradiating apparatus for Photon induced X-ray emission studies.
2. Designed and fabricated an angular distribution and polarisation measurement equipment for the study of anisotropy of photon induced x-rays.
3. Designed and fabricated spring loaded round tip microprobes for electronic characterisation of electronic semiconductor materials at cryogenic and high temperatures. The new design offers several advantages over the pressure contact design of probes used in many equipment. The new design used in Biorad's DL4600 DLTS equipment for characterisation of semiconductor materials.
4. Electronic process control circuit for the controlled anodic oxidation of semiconductor materials like MCT, CdTe, GaAs etc. for their surface passivation has been designed.
5. Designed and developed the prototype of a device to control the pollution caused by auto exhaust emission from automobiles. The device can be used in all kinds of vehicles in place of the muffler. The device has been tested to work satisfactorily and is found to reduce the pollutants up to 80-85%.
6. Designed and developed a commercial water sampler for collecting water samples for the pollution studies. The sampler can collect adjustable amount of water sample from adjustable pre-set depths without intermixing of waters from different depths.
7. Designed and fabricated a dedicated x-ray detection window cum collimator with changeable thin foil window for online experiments at Nuclear Science Centre Pelletron, New Delhi.
8. Designed and developed low cost ,single wire gas flow position sensitive detector for X-rays and charged particles for atomic physics experiments. An import substitute item.
9. A low cost, highly efficient and easy to assemble Solar Cooker for rural applications has been developed in 1982.
10. Designed low cost Solar Water Heater from refuse material in 1980.
11. Fabricated six inches Newtonian reflecting telescope in 1979.

12. A multi-channel Omni-directional VHF antenna for TV reception was designed in 1979.
13. A working model of Wilson cloud chamber was fabricated in 1977.
14. A working model of an electromechanical Robot was fabricated as a college student in 1973.

**LIST OF RESEARCH PUBLICATIONS OF DR.SHATENDRA K. SHARMA.**

1. Measurement of  $L_{\alpha}$ ,  $L_{\beta}$  and  $L_{\gamma}$  X-ray production cross-sections in some high Z elements by 60 keV photons.  
Phys. Rev. A 31 5 (1985) 2918-2921.
2. Measurement of  $L_{\alpha}$ ,  $L_{\beta}$  and  $L_{\gamma}$  X-ray production cross-section in some high Z elements at Sn K X-ray energies.  
Third International Symposium on Radiation Physics.  
University of Ferrara, Ferrara, ITALY (1985)
3. Measurement of L and M shell X-ray production cross-section by 6 keV photons.  
X-Ray Spectrometry 14 4 (1985) 195-198
4. Measurement of anisotropy of LIII subshell fluorescent X-rays of thorium.  
Sixth National Symposium on Radiation Physics.  
Kalpakkam (1986). INDIA.
5. Measurement of relative LIII subshell X-ray intensity ratios in elements Pb, Th and U.  
The Proceedings of National Seminar on X-ray Spectrometry and allied areas. Nagpur (1985) INDIA.
6. Measurement of average M Shell fluorescence yields in Gold and Uranium.  
Ind. J. Phys. 58 A (1984) 366-367
7. Energy dependence of photon induced L shell X-ray intensity ratios in Ta and W.  
Pramana 22, 2 (1984) 79-88
8. Measurement of average M-shell fluorescence yields in some high Z elements.  
Physica C 124 (1984) 279-281
9. Z dependence of photon induced  $L_{\alpha}/L_{\beta}$  X-ray intensity ratios in some elements  $73 \leq Z \leq 92$ .  
Ind. J. Phys. 58 A (1984) 361-362
10. A method for efficiency calibration of Si(Li) and HpGe detectors at low energies.  
Nuc.Phys. & Solid state physics symposium. BARC, Dec.22-27 (1983).  
University of Mysore, Mysore-570 006. INDIA

11. Energy dependence of photon induced L shell X-ray intensity ratios in some high Z elements.  
J.Phys. B : At. Mol. Phys. 16 (1983) 4313-4322
12. Further measurements of relative intensities of L-Shell X-rays in some high Z elements.  
Nat.Acad.Sc.Lett. 5 10 (1982) 345-347
13. Measurement of relative intensities of L-Shell X-rays in some high Z elements.  
J.Phys. B: At Mol. Phys. 15 10 (1982) 3377-3382
14. Measurement of L Shell fluorescence X-ray intensities.  
International Conference on X-ray and Atomic Inner- shell Physics August 23-27 (1982) Oregon, USA
15. Measurement of relative intensities for K and L shell X-rays.  
Fourth National Symposium on Radiation Physics.  
Oct,5-7 (1981) Punjabi University Patiala - 147 002. INDIA
16. Germanium  $K\alpha$  and  $K\beta$  X-ray escape to photo-peak ratios in high purity Germanium detectors.  
Silver Jubilee Physics Symposium, December,28,1981-Jan 1, 1982, BARC, Trombay, Bombay - 400 085 (INDIA)
17. Minimisation of target self absorption correction factor in XRF experiments.  
National Seminar on Atomic Inner-shell ionisation Process and related areas.  
Indian Society for Radiation Physics, February 19-20, Punjabi University Patiala - 147 002. INDIA.
18. Experimental investigation of angular dependence of photon induced L-shell X- ray emission intensity.  
Pramana, 35, 1 (1990) 105-114
19. Some studies of passivation of  $Hg_{1-x} Cdx Te$ .  
National Seminar on Recent Trends in IR materials and devices.  
March 17-19, Solid State Physics Laboratory, Lucknow Road, Delhi
20. A new, simple design of XYZ -micromanipulator for semiconductor experiments  
National Symposium on Instrumentation, Jan 24-26, 1991. Madras, India.
21. A new technique for dactyloscopy.  
Submitted for award to National Bureau of Crimes and Records, 1991
22. A new design of water sampler for pollution studies.

Invention Intelligence, Feb, 1993, 74-75

23. A method of auto-exhaust pollution control.  
National seminar on radiation, environment and man  
Oct. 8-9, 1992 University of Mysore - 570 006. INDIA
  
24. Position sensitive detector for charged particle and low energy photon detection  
Tenth National Symposium on Radiation Physics  
August 17-20, Kalpakkam, Madras, INDIA
  
25. Characterisation of  $\mu\text{cSi:H}$  /  $\text{aSi:H}$  films for solar cell applications with C-V and DLTS measurements  
Journal of the Instrument Society of India  
December 1999.



***LIST OF POPULAR SCIENCE PUBLICATIONS OF  
DR. SHATENDRA K. SHARMA***

- 1      Gravitational waves and gravitons  
         Science Gem Vol.3 No. 3   1981 New Delhi
- 2..    Elementary Particles and Nucleon Structure  
         Science Gem August 1978,   New Delhi
3.     Science Quiz  
         Science Reporter April 1980,   New Delhi
4.     Jobs and satisfaction  
         Science Gem vol. 3 no.6   New Delhi
5.     The Quarks  
         Physics Mag Vol. 1, no. 1 1982
7.     VSAT Communications  
         JNU News September 1999