

## Profile-skjain



Dr. Sushil Kumar Jain is M.Sc. (1974) and Ph.D. (1978) in physics from the University of Delhi. He joined National Physical Laboratory as Scientist B in 1978 and superannuated from here as Chief Scientist in January, 2014. He has made significant S & T contribution in ultrasonic piezoelectric transducers and devices for high power and underwater applications; Metrology of Force and Hardness National Standards at apex level; Solar Photovoltaics, etc. He was Head, Force and Hardness Standards Group, NPL at the time of his superannuation. He is actively associated with NABL in this subject area. He has published more than 110 research papers in national and international journals and conference proceedings. He is Chief Editor of the J. Pure and Appl. Ultrasonics.

### **LIST OF PUBLICATIONS by Dr S K Jain, M Sc, Ph D**

(Including papers published in refereed journals, presented at conferences and published in proceedings, invited talks)

#### Papers published in refereed journals

1. `Hall measurements in CdS' P.C. Mathur, N.D. Kataria, **Sushil Jain**, Vijender Sharma, Physica Status Solidi (a) (Germany) **72** (1975) p.K17
2. `Electron mobility in InSb from 77-300K' P.C. Mathur, N.D. Kataria, **Sushil Jain** and Vijender Sharma, J. Phys. C (UK), **9**, (1975) p.L89-90
3. `Semiconductor and its devices', P.C. Mathur, Vijender Sharma, **Sushil Jain** and S.K. Lomash, J. Physics Education, **3**, No.1 (1976)
4. `Galvanomagnetic effects in n-GaSb' P.C. Mathur, N.D. Kataria and **Sushil Jain**, J. Phys. Chem. Solids (UK), **39** (1978) p.403
5. `Measurements and theoretical interpretation of magneto-microwave Kerr effect in p-Ge', Shiva Prasad and **Sushil Jain**, Physica B&C **94** (1978) p.78
6. `Transport phenomenon in III-V compound semiconductors', (Review Article) P.C. Mathur, Radhey Shyam and **Sushil Jain**, Physica Status Solidi (a) (Germany) **50** (1978) p.11
7. `Hole transport properties in gallium antimonide from 77-300K', P.C. Mathur and **Sushil Jain**, Physical Review (USA) **B19** (1979) p.3152

8. `Electrical transport mechanism in the conduction band of gallium antimonide' P.C. Mathur and **Sushil Jain**, Physical Review (USA) **B19** (1979) p.3159
9. `Electrical transport properties in PbTe films', P.C. Mathur, **Sushil Jain** and K.V. Krishna, Solid State Electronics, **22** (1979) p.117
10. `Porous silicon antireflection coating for solar cells', A. Prasad, S. Balakrishnan, **Sushil Jain** and G.C. Jain, J. Electrochemical Society (USA), **129(3)** (1982) 596-598.
11. `A broadband capacitive transducer for characterizing pulsed ultrasonic systems' V.N. Bindal, T.K. Saksena and **S K Jain**, Indian J. of Technology, **22** (1980) 397-400.
12. `Acoustic Levitation and its application in estimation of high power sound field' V.N. Bindal, T.K. Saksena, **S K Jain** and Gurmukh Singh, Applied Acoustics (UK) **17** (1984) 125-133.
13. `On the performance characteristics of an ultrasonic atomizer developed at NPL' V.N. Bindal, **S K Jain** and Yudhisther Kumar, Indian J. of Technology, **22** (1986) 153-156.
14. `A laser interferometer for vibration amplitude measurements of power ultrasonic sources' V.N. Bindal, **S K Jain** and Yudhisther Kumar, J. Pure and Appl. Phys. **24** (1986)584-587.
15. `A coil-less miniature piezoelectric ceramic transformer' V.N. Bindal, Ashok Kumar and **S K Jain**, Indian J. Technol., **25** (1987) 171-175.
16. `Transducer calibration in a tube by establishing free field conditions using active impedance termination' V.N. Bindal, T.K. Saksena, **S K Jain**, R.P. Tandon and Reeta Gupta, J. Acoust. Soc. India **15** (1987) 158-166.
17. `Tunable sandwich transducer' **S K Jain** and B.V. Smith, Electronic Letters (UK), **24** (1988) 311-312.
18. `Evaluation of receiving sensitivity of transducers used under deep submergence, V.N. Bindal, T.K. Saksena, **S K Jain**, R.P. Tandon and D.R. Chaubey, J. Pure and Appl. Ultrason., **10** (1988) 74-79.
19. `Use of high power ultrasonics in beneficiation of coal' V.N. Bindal, **S K Jain**, R.L. Seth and Yudhisther Kumar, Indian J. Technol., **26** (1988) 275-277.
20. `Workshop on underwater acoustic requirements and facilities' **S K Jain**, Conference report published in J. Pure and Appl. Ultrason., **11** (1989) 73-74.
21. `Study motional admittance of piezoelectric transducers with different pressure release backings at hydrostatic pressure of 300 psi' V.N. Bindal, T.K. Saksena, **S K Jain**, A.K. Gupta and Reeta Gupta, Applied Acoustics (UK), **30** (1990) 69-77.

22. `Wideband constant beamwidth parametric sources for underwater acoustic calibration at low frequencies' V.N. Bindal, T.K. Saksena, **S K Jain**, Mukesh Chandra and Reeta Gupta, J. Acoust. Soc. India, **18** (1990) 201-204.
23. `On the feasibility of detection of perfectly reflecting targets obscured by rubber sheets and sediments using parametric acoustic arrays' V.N. Bindal, T.K. Saksena, **S K Jain**, Mukesh Chandra and Reeta Gupta, Acoustics Letters (UK), **14** (1990) 29-32.
24. `The design and performance characteristics of a 40 kHz mini pinger transducer for marine applications' T.K. Saksena, **S K Jain**, and Reeta Gupta, Indian J. Marine Sciences, **21** (1992) 303-305.
25. `Fifth National symposium on ultrasonics - A report' **S K Jain**, J. Sci. and Ind. Res. **52** (1993) 544-546.
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27. `Sixth national symposium on ultrasonics - A report' **S K Jain**, J. Sci. and Ind. Res., **54** (1995) 175-177.
28. `On a technique for sound velocity measurement in liquids using cavity resonance', **S K Jain**, Reeta Gupta and T.K. Saksena, Acoustics letters (UK), **18** (1995) 130-133.
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30. `The piezoelectric transducer materials and their standardization', V.N. Bindal and **S K Jain**, J. Pure and Applied Ultrasonics, **17** (1995) 88-92.
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32. `Design and development of tonpizl type sandwich transducer for underwater acoustic command applications', **S K Jain**, Reeta Gupta and T.K. Saksena, Indian J. Marine Sciences (CSIR), **24** (1995) 215-219.
33. `Methods of measurement and standards regarding piezoceramics for their use in the manufacture of ultrasonic transducers', V.N. Bindal, **S K Jain** and Reeta Gupta, Research and Industry (CSIR), **40**, (1995) 81-89.

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36. `On the use of polarized PVDF in comparison with some other piezoelectric materials for manufacture of acoustic transducers', **S K Jain**, Reeta Gupta and V.N. Bindal, J. Sci. and Indust. Res. (CSIR), **55** (1996) 523-528.
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45. `A newly developed 5 kN dead weight force machine for reference calibration', Kamlesh K. Jain, **S K Jain**, Anil Kumar, H N P Poddar, Mapan, **17** (2002)147
46. `A proposal of a method for calibration of force transducers to establish traceability in force

- measurement’, **S K Jain**, Kamlesh K Jain and Anil Kumar, *Mapan*, **18** Suppl. Part 2 (2003).
47. ‘Comparison of Calibration Procedures for Force Gauges to Establish Traceability in Force Measurement’, **S K Jain**, Kamlesh K Jain and Anil Kumar Presented at 4<sup>th</sup> International conference on Advances in Metrology, Equivalence of Standards and Global Recognition (AdMet-2003), published in *Mapan- J of Met. Soc. Of India* **19**,1-2, 53 (2004).
  48. ‘Hardness and Microstructure Studies of Standard Hardness Blocks’, S.S.K. Titus, **S.K. Jain**, Anil Kumar and Kamlesh K. Jain, Special Issue of *Mapan- J. of Met. Soc. of India*, 20(1) (2005) 37.
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  51. Metrological Characterization of the 1 MN Force Standard Machine of NPL India, **S K Jain**, Harish Kumar, S S K Titus, F Tegtmeier, N Prenzlów and D Schwind, *Measurement*, 45 (3), (2012) pp. 590-596.
  52. “Establishment of Brinell Hardness Standard at NPL India for Providing Traceability in Brinell Scale” Rajesh Kumar, S. S. K. Titus and **S K Jain**, *Mapan* 27, pp.123-127 (2012)
  53. ‘Design, development and fabrication of 50 kN force standard machines to provide national traceability in force measurement to the industries’, **S K Jain**, S.S.K. Titus, Rajesh Kumar and Kamlesh K. Jain, *Journal of Scientific & Industrial Research*, 72, pp. 333-339 (2013)
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  55. Comparison on hardness measurement Rockwell scale A and B, Tassanai Sanponpute, Apichaya Meesaplak, Febo Menelao, T K Chan, Gun-Woong Bahng, S S K Titus and **S K Jain**, Final report on APMP.M.H-S3: *Metrologia*, 49, doi:10.1088/0026-1394/49/1A/07009
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  57. ‘Conference report on XIX National Symposium on Ultrasonics’ **S K Jain**, *CSIR News*, (Feb. 2013) p 32-34.
  58. Development of a torque comparator machine up to 1000 Nm for calibrating torque wrench testers. S.S.K. Titus, **S K Jain** and Vikram, *J. Instrumentation Society of India*, Vol.45, No.1 pages 75-77.

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60. Ultrasonic attenuation in rare-earth monoarsenides, Vyoma Bhalla, Devraj Singh, **S K Jain** And Raj Kumar, Pramana, **86**, {6}, June 2016 physics pp. 1355–1367
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64. Pranati Purohit, Indu Elizabeth, S. Seela Kumar & Sushil Kumar, Optimization of a Piezoelectric Mechanical Amplifier Actuator for Nano-Indentation, Integrated Ferroelectrics, 202:1, 144-150,
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#### Papers presented in conferences

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3. `An ultrasonic device for uniform atomization' V.N. Bindal and **S K Jain**, Natl. Sym. Instr., hndigarh, April 11-13 (1983).
4. 'Zur Messtechnischen charakterisierung von Ultraschall- leistungs-wandlern' J. Herbertz and **S K Jain**, Presented in annual meeting of German Acoust. Soc., DAGA'85, Stuttgart, March 25-29 (1985).
5. `Transducer calibration in a tube by establishing free field conditions using active impedance termination' V.N. Bindal, T.K. Saksena, **S K Jain**, R.P. Tandon and Reeta Gupta, Natl. Sym. Acoust., I.I.T. Bombay, Dec. 9-12 (1986).

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7. `Investigations on evaluation of transducer performance at high electric drives' V.N. Bindal, T.K. Saksena, **S K Jain** and Reeta Gupta, Presented in Ultrason. International -87, London, (July 1987).
8. `Studies on transmission of parametric acoustic arrays through sediments and materials of equivalent attenuation' V.N. Bindal, T.K. Saksena, **S K Jain**, Mukesh Chandra and Reeta Gupta, presented in Nat. Sym. Ultrason. NSU-89, NPL New Delhi, Sept. 21-22 (1989).
9. `Study of acoustic transmission loss in sand sediments and detection of obscured targets using parametric acoustic arrays' V.N. Bindal, T.K. Saksena, **S K Jain**, Mukesh Chandra and Reeta Gupta, Conf. proc. Int. Cong. Ultrason. (ICU-90), NPL Delhi, (1990) B20-B26.
10. `A programmable x-y-z translation facility for underwater acoustic experiments' V.N. Bindal, A.K. Gupta, T.K. Saksena, **S K Jain**, D.R. Chaubey and Reeta Gupta, Conf. proc. Int. Cong. Ultrason. (ICU-90), NPL Delhi, (1990) B1-B6.
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12. `On the performance characteristics of a mini pinger transducer' T.K. Saksena, **S K Jain** and Reeta Gupta, Conf. Proc. Nat. Sym. Ocean Electronics, Cochin University, Dec. 18-20 (1991).
13. `Investigations on development of an 18 kHz underwater transducer for acoustic command applications' **S K Jain**, Reeta Gupta and T.K. Saksena, Fifth National Symposium on Ultrasonics NSU-92, NPL New Delhi, Nov. 5-6 (1992).
14. `Piezoelectric lead zirconate titanate ceramic polymer composites for transducers for medical applications' T.K. Saksena, J. Singh, **S K Jain**, Ved Singh, N.N. Swami and N.C. Soni, Fifth AGM Mat. Res. Soc. India, Hyderabad, Feb. 7-9 (1994).
15. `On a simple and cost effective sound velocity measurement technique using cavity resonance for detection of adulteration in petrol' **S K Jain**, Reeta Gupta and T.K. Saksena, Sixth Natl. Sym. Ultrason., Tirupati, Sept. 16-17 (1994).
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18. `A temperature sensing pinger device', T.K. Saksena, **S K Jain** and Reeta Gupta, Workshop on underwater sensors technology, NSTL, Visakhapatnam August 18-19 (1994).
19. `Performance characteristics of ultrasonic NDT probes at high hydrostatic pressure for inspection of offshore installations', V.N. Bindal, **S K Jain**, Reeta Gupta and Subhash Chandra, Ultrasonics International 95, Edinburgh, July 4-7 (1995).
20. Design Consideration and characterization of spherically focused normal beam probe for NDT application', V.N. Bindal, **S K Jain**, A.D. Prashad and Reeta Gupta, National Seminar on Advances in non-destructive evaluation for quality assurance in engineering industry NDE-95, New Delhi, November 9-10 (1995).
21. `Development of miniature transducer device for tagging on to fish', **S K Jain** and Reeta Gupta, Workshop on marine bio-acoustic techniques and their applications, National Institute of Oceanography, Goa, March 11-15 (1996).
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24. `Design considerations of low frequency transducers for the NDT testing of concrete, timber and like materials', V N Bindal, **S K Jain**, P S K M Rao, M V B Rao and Subhash Chandra, Proc. of 14th World Conf. on Non-destructive Testing, New Delhi, 8-13 Dec. 1996.
25. `Evaluation of acoustical characteristics of ultrasonic transducer backing materials at high hydrostatic pressures', **S K Jain**, Reeta Gupta and Subhash Chandra, Ultrasonics International 97. Delft, 2-4 July 1997.
26. `Performance characteristics of newly developed water-based couplants for use in ultrasonic NDE of civil structures', Arvind Bindal and **S K Jain**, Ultrasonics International 97, Delft, 2-4 July 1997.
27. `Measurement of acoustical characteristics in polymetallic nodules' **S K Jain**, Reeta Gupta and V N Bindal, Eighth National Symposium on Ultrasonics, November 6-7, 1997, Amritsar.
28. `The acoustic coupling at high temperatures', V N Bindal and **S K Jain**, National Seminar on NDE for life extension, December 11-13,1997, Hyderabad.
29. `Electro-acoustical performance of miniature transducers developed for use as wide bandwidth and large beamwidth underwater acoustic sources in the range 200-300 kHz', **S.K. Jain** and Reeta Gupta, Ninth National Symposium on Ultrasonics, Dec. 14-16,1998, Pondicherry.



30. 'Best Measurement Capability of the newly developed 5 kN dead weight force machine', Kamlesh K. Jain and **S K Jain**, Proceedings of the 18<sup>th</sup>, joint International Conference on Force, Mass, Torque, Hardness and Civil structure, IMEKO TC-3, TC-5 and TC-20, Celle, Germany, Sept. 21-25, 2002, pp 611
31. 'Reliable and Easy use of Transfer Force Standards – Resonant Type', **S K Jain** and Kamlesh K. Jain, Proceedings of the 2<sup>nd</sup> Workshop on Force Metrology, Sept. 17-19, 2003, NPL, New Delhi, pp. 94-101.
32. 'An inter-comparison between NPL(India) and PTB(Germany) force standard machines upto 5 kN', Kamlesh K. Jain, **S K Jain**, Anil Kumar and S. Niehe, APMF '2003/ IMEKO TC3 – Theory, Practice and Application, Proceedings, Nov.3-66, 2003 Shanghai, China.
33. 'International scenario for calibration of force proving and torque measuring devices', **S K Jain**, Indo-Italian Training Program, New Delhi, 5-8 Dec 2006
34. 'Trace-ability of force calibration at National Physical Laboratory', **S.K.Jain**, Presented at 2<sup>nd</sup> Indo-Italian Training Program in Force, Mass, Pressure and Torque, Feb. 18-22, 2008, NPL, New Delhi
35. 'Traceability in Force Measurements from the Center to the Regional Laboratories', S.S.K.Titus, Anil Kumar, H.N.P.Poddar, **S K Jain**, Kamlesh K. Jain, Presented at IMEKO –09, Lisbon, Portugal Sept. 6-11, 2009.
36. 'Metrological Characterization of a high capacity hydraulic force machine using a calibrated build-up system', **S K Jain** and Anil Kumar, Presented in oral session at AdMet-09, February 17-20, 2009.
37. 'Evaluation of axial sensitivity of circular shaped proving ring using FEM', Harish Kumar and **S K Jain**, Presented in poster session at AdMet-09, February 17-20, 2009.
38. "Contribution of NPL(I) in Taking Calibration Capability in Force and Torque to Secondary Level Calibration Laboratories in India", **Jain S K**, Kumar Rajesh and Jain Kamlesh K., Proc. National Symposium on Metrology and Its relevance to Society (Hindi), NPL, 20-21 May, 2010.
39. 'Establishment of Brinell hardness Scale at NPL India', **S K Jain**, Rajesh Kumar and S S K Titus, AdMet 2011, Bangalore, 16-18 Feb 2011
40. 'Performance Evaluation of New 1 MN Force Standard Machine established at NPL(I)', **S K Jain**, Harish Kumar, S S K Titus, AdMet 2011, Bangalore, 16-18 Feb 2011
41. 'Recent trends in low force Metrology and feasibility study of developing facility for low force measurements', S.S.K. Titus and **S K Jain**, AdMet 2011, Bangalore, 16-18 Feb 2011

42. 'An Inter-comparison Study between two Dead Weight Force Machines Established at NPL in the 1-50 kN Force Range', S S K Titus , R Kumar, Harish Kumar and **S K Jain**, 2<sup>nd</sup> National Conference on Advances in Metrology (Admet -2012), Automotive Research Association of India, Pune, India (February 6-8, 2012), (CD-RoM).
43. 'Performance Evaluation of a 100 kN Force Comparator Machine for Calibration of Force Transducers', S. S. K. Titus, **S K Jain**, Rajesh Kumar and Vikram, 2<sup>nd</sup> National Conference on Advances in Metrology (Admet -2012), Automotive Research Association of India, Pune, India (February 6-8, 2012), (CD-RoM).
44. Metrological Characteristics of Supported and Unsupported Beam Torque Machines for Establishment of Torque Scale at NPL, **S K Jain** and S S K Titus, 2<sup>nd</sup> National Conference on Advances in Metrology (Admet -2012), Automotive Research Association of India, Pune, India (February 6-8, 2012), pp. 1-5. (CD-RoM)
45. **S K Jain**, S S K Titus, Falk Tegtmeier, Norbert Prenzlow and Daniel Schwind, Low uncertainty in force values achieved in a lever multiplication dead weight force standard machine of 1MN, XX IMEKO World Congress, Metrology for Green Growth, Sep. 2012, Busan, Republic of Korea.
46. S. S. K. Titus, **S K Jain**, Development and metrological characterization of a 1000 Nm Torque Comparator Machine for calibrating Torque Wrench Testers, XX IMEKO World Congress, Metrology for Green Growth, Sep. 2012, Busan, Republic of Korea.
47. **S K Jain** and S. S. K. Titus, Investigations on development of a piezoelectric force actuator, National Symposium on Ultrasonics, New Delhi, Oct. 30-31, 2012.
48. S. S. K. Titus, **S K Jain**, Rajesh Kumar and Rakesh Khanna, A Study of the influencing quantities in calibration of Force Proving Devices according to the new ISO 376: 2011 Standard, Admet-13, International conference on Advances in Metrology, Feb. 21-23, 2013.
49. S. S. K. Titus, **S K Jain** and Vikram, Metrological characterization of a 1000 Nm Torque Comparator Machine, Admet-13, International conference on Advances in Metrology, Feb. 21-23, 2013.
50. **S K Jain** and S. S. K. Titus, Performance of a piezoelectric force actuator in low force measurement application, Admet-13, International conference on Advances in Metrology, Feb. 21-23, 2013.
51. S. S. K. Titus and **S K Jain**, 'Status of Force, Torque and Hardness Standards at NPL (I)', presented at Advances in Metrology- MAPIKI-2014' (In Hindi), Dec. 7-8, 2014, NPL, New Delhi,

#### Invited Talks

1. 'Developments in resonant transducer technique for measurement of force and related quantities', **S K Jain**, National Symposium on Ultrasonics, Cochin University of Science & Technology, Kochi, Dec. 17-19, 2007 (Invited Talk)
2. 'The Status of Force, Torque and Hardness Measurements at NPL, India' **S K Jain**, Presented at PTB, Germany, Dec. 10, 2009 (Invited talk)
3. 'Some recent activities and the new facilities in force, torque and hardness measurement to keep pace with latest technology and to improve dissemination of standards for societal benefit', **S K Jain**, Presented at N.P.L. Research Council meeting , July 22, 2010 (Invited talk)
4. 'Recent Developments in Force Measurements', **S K Jain**, Invited talk at AdMet 2011, Bangalore, 16-18 Feb 2011 (Invited talk)
5. 'Some recent activities and the new facilities in force metrology' **S K Jain**, Presented at N.P.L. Research Council meeting , Sept. 21, 2011 (Invited talk)
6. 'Developments in force sensors and metrology', **S K Jain**, Presented at Indo-French Seminar on Sensors Technologies, I.I.T. Delhi, March 2-4, 2012 (Invited talk).
7. A Brief Overview of Force, Torque and Hardness Standards at NPL(I), **S K Jain**, Seminar for Delegates from ASEAN countries, NPL, April 2013.
8. **S K Jain**, 'Some Highlight of Ultrasonics Research in India', Invited Talk given at Laboratory for Ultrasonics Therapy, INSERM, University of Leon, Leon (France), Oc. 9, 2014
9. **S K Jain**, 'Measurement Science and Metrology of force related parameters', Talk delivered at ITM University, Gurgaon, June 21, 2014