CURRICULUM VITAE

Personal

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Area of Research **Preparation and electrical & magnetic characterization of high T_C Superconductors**
Vortex phase diagram in high Tc Superconductors
Simulation of I-V characteristic of Josephson junctions arrays
Carbon Nano Tube

Academic Qualification :

Examination	University/board	Year	CPI / % marks	Subject
Ph.D.	*I.I.T. Kanpur. India*	*1993*	*9.15/10 in course work*	*Microwave Absorption in High T_c Super conductors*
M.Sc.	*I.I.T. Kanpur India*	*1986*	*7.5/10*	*Physics.*
B.Sc.	*University of Bihar Muzaffar Pur*	*1983*	*69.0%*	*Physics.(Major), Math. & Chem.(minor)*
I.Sc.	*University of Bihar Muzaffar Pur*	*1980*	*75.77*	*Phy., Chem , Math, Bio*
Matric	*S.S.E. Board PATNA, BIHAR*	*1978*	*72.00*	*Phy., Math, chem, English*

Employment Details:

Dept and University	Duration	Designation	Responsibility
Dep of Phys. King Saud Univ. Riyadh	Sep 2004 to present	Associate Prof.	Teaching and Research
Dept of Physics, Jamia Millia Islamia, New Delhi	*Jan 2000 to the present*	*Reader*	*Teaching and research (Presently on Leave)*
Dept of Phys, University of Southampton, U.K	*One year (Sep 2000to Sep 2001)*	*Post Doctoral Visiting Fellow*	*Research, Vortex dynamics in HTSC*
Institute of Solid State Phys, University of Jena, Germany	*Six months (Nov 96 – May 97)*	*Post Doctoral Fellow under DAAD Fellowship*	*Research in the area of Josephson Junction arrays*
Dept of Physics, Jamia Millia Islamia, New Delhi	*Jan 1995 to Jan 2000.*	*Senior Lecturer*	*Teaching. and research*
-do-	*Jan 1990 to Jan 1995*	*Lecturer*	*Teaching and research*

Scholarship and Fellowship awarded

(i) Commonwealth Fellowship of U.K. for one year (Sep 2000 to Sep 2001)
(ii) DAAD Fellowship of Germany for six months (Nov. 1996 to May 1997)
(iii) CSIR Fellowship for four years through national level test (NET) during Ph.D..
(iv) Merit scholarship throughout B.Sc. and M.Sc.

Name of the Country Visited:

(i) **Germany** - under DAAD Fellow (ii) **Italy** – to work in High Tc Lab at ICTP (iii) **U.K.**-under commonwealth Fellowship (iv)**Pakistan**- to attend International Nathia Gali Summer college on Physics.

Teaching Experiences (ten years)

Courses taught*:*

Theory Courses in M.Sc.

a. Novel Materials (presently)
b. Atomic and Molecular Physics (two years)
c. Statistical Mechanics (one years)
d. Mathematical Physics (three years)
e. Advanced solid State physics (two years)

Theory Courses in B.Sc.

a. Experimental technique in Physics
b. Instrumentation and Digital Electronics
c. Digital Electronics
d. Microprocessor
e. Structure of matter
f. Basic Electronics

Lab courses

a. M. Sc. Physics Lab
b. B.Sc. Physics Lab
c. Microprocessor lab in B.Sc. Instrumentation course.
d. Analog Lab in B.Sc. Instrumentation course.
e. Digital Electronics lab in B.Sc. Instrumentation course.

Administrative job:

Worked as co-ordinator of B.Sc. Instrumentation course April 1994 – Sep 2000. The University Grant Commission has given this course to our department from 1994-95 academic session. I establish the instrumentation labs, designed the course structure and syllabus.

Ph.D. Thesis supervised: *Five*

Name	***Thesis title***	***Awarded***
A..S.M. Abddel-Maksoud	***Studies of Effect of Substitution and Columnar Defects on the Transport and Magnetic Properties of High Temperature Superconductors***	***1998***
Rajveer Singh	***Magnetic and transport properties of doped Cuprate superconductors***	***2000***
Jamal Akhter	***Studies on Microwave Response of High T_c Superconductors Josephson nctions and Arrays***	***2002***
K. Premjit Singh	***Synthesis and Physical Property Characterization of Pure and Nano-Magnetic Ions Doped Vacuum Annealed MgB_2 Superconductor***	***2007***
Intikhab A. Ansari	***Study of Fluctuation Induced Conductivity and Magnetic Properties of Nano-Metal Oxide Doped MgB_2 Superconductors***	***2007***
Krishan Pal Singh	***Study of Electronic and transport properties of nanostructures using computer simulation***	***Continuing***

Supervised the projects of M.Sc. students: ***nine***

Computational experience

Language known: Fortran and Pascal and C

worked on main frame : DEC-10 system and HP 9000/850s supermini system (with Unix environment).

Software used: Window,95, 97,2000, Microsoft office, Origin, Grapher, Pine, Test Point (for interfacing the equipment with PC through GPIB card)

Research Experience

Experimental Technique used

- ***(i)*** Transport Rig based on Oxford Instruments 14 T Cryostat for Simultaneous measurement of Transport and magnetization measurement
- ***(ii)*** Varien E109 EPR Spectrometer for Field Dependent Microwave Absorption Studies
- ***(iii)*** XRD for characterizing the Poly-crystalline Samples
- ***(iv)*** SEM for finding the Particle size of the samples
- ***(v)*** Sample preparation of YBCO and BSCCO in Polycrystalline form.
- ***(vi)*** Experience in growing Single Crystals of BSCCO
- ***(vii)*** Interfacing of Instruments with Pc using GPIB Interface

Summary of Present Research Work

Studying the vortex phase diagram in BSCCO single crystals and the effect of intrinsic pinning on vortex motion and localization in layered HTSC

High T_c Superconductors (HTSC) are highly anisotropic layered compound consisting of weakly coupled Cu-O planes separated by buffer layers that serve as charge reservoirs. The magnetic and transport properties of HTSC , for a large range of angles α between applied magnetic field and Cu-O planes can be understood within the frame work of 3D anisotropic Ginzberg –Landau model. However this description fails when the field is closely aligned with superconducting layers ($\alpha<0.5°$). In this case the vortices become confined between Cu-O layers. As a result of such confinement, the pinning strength of the vortex system is strongly dependent up on the relation between the vortex lattice spacing (s) and distance between the Cu-O planes (d). With increasing s/d the pinning strength changes periodically, having local maxima where the ratio s/d is integer (commensurate states). In the experiment when the magnetic field is increased the critical current should show oscillation with a period which is proportional to $B^{-1/2}$. These commensurate states have been studied in YBCO and are understood up to certain extent. While these studies in BSCCO have not been done in details. Due to high anisotropy of the BSCCO the phase diagram of it especially for B ab has not been understood well. We are studying transport and magnetisation of BSCCO single crystals as function of α.

In addition to above we are starting the fabrication and transport measurement of Carbon Nano Tube (CNT).

Summary of Previous Research Work

I have been working on HTSC materials since 1987. My doctoral thesis is on ***Electron Paramagnetic resonance (EPR) and Low Field Dependent Microwave Absorption in High Tc Cuprate Superconductors (HTCS) and I did following studies.***

Ac susceptibility and STM studies on BSCCO single crystals irradiated with heavy ion Beam .

A good quality of the single crystals of BSCCO 2212 was grown by self-flux method. Three BSCCO single crystal were irradiated with 250 MeV Ag^{+17} ions with respective dose of 2.5, 5.0, $10.0x10^{10}$ ions/cm^2 to create columnar defect in them. The defect structure was characterized at nano level using scanning tunneling microscope (STM) technique. Low ac field (B_{ac}) magnetic susceptibility measurements in a frequency range of 0.016 – 1kHz and field range of 0.01 – 10 Gauss were performed on the crystals before and after irradiation. Considerable frequency dependence of the susceptibility transition is observed. Using an Arrhenius-like expression, flux creep activation barriers were determined which show B_{ac} dependence. Introduction of defects leads to a shift of susceptibility transitions to higher temperatures and an increase in activation barriers. The results show the dependence of Bulk pinning rather than surface/geometrical barriers in determining the flux line dynamics at low fields and temperature very near to critical temperature.

Substitution studies

We have also measured the resistivity and ac susceptibility of Zn doped $LaBaCaCu_3O_{7-d}$ systems having Zn content of .5%, 1.0%, !.5%,2.0%, 2.5% and 3.0% at wt. From above studies following conclusions have been drawn about the role of Zn in LBCCO samples. (1) The conduction mechanism of electrons appears to follow a crossover from the purely metallic regime to localization regime due to either weak localization or electron-electron interaction effects after about 1.5% Zn. (2) The superconducting transition as revealed by resistivity vs temperature curves or susceptibility vs temperature curves becomes sharper with zn-content increasing up to 1.0%. After 1.5% the resistive and ac susceptibility transition become broader with increasing Zn. (3) Tc depression up to Zn content of 1% seems due to direct suppression of the effective pairing interaction, while at and above 2.5% Zn Tc depression is expected due to disorder effects such as reduction of density of states at the fermi energy.

Simulation of I-V Characteristic of intrinsically stacked Josephson Junction arrays

We did the simulation of I-V curve of intrinsically stacked JJ arrays as a function of magnetic field taking noise into consideration on the basis of RCSJ Model. The simulated results show good agreement with experimental results.

EPR and Field Dependent Microwave Absorption Studies

EPR is a very sensitive tools to characterize the presence of impurity phases in HTCS and it also gives some clue about the localized charge on the copper atoms and their interaction with their environments.

As a probe of the material properties, a microwave measurement is a useful complement to low frequency susceptibility and resistivity measurements for at least two reasons. Firstly, it is contact less measurement. Secondly, it permits the study of the resistive behavior below super conducting transition temperature Tc

We prepared the polycrystalline samples YBCO by different methods and characterized them by resistivity measurements, XRD, EPR and SEM. LFDMA was studied in details in these well characterized samples as a function of temperature, modulation field, microwave power and grain size.

All HTCS give intense LFDMA at and below T_c. The derivative signal of LFDMA shows peak and hysteresis. Peak position (H_m) of derivative signal of LFDMA gives the measure of grain size of HTSC materials.

The LFDMA signal arises due to the microwave loss in weak links forming Josephson junctions in granular superconductors. In polycrystalline samples there are a large number of inter-granular Josephson junctions (JJ) of different sizes and oriented randomly. All these junctions can be approximated by a single representative resistively shunted JJ. Microwave loss was calculated in the single representative JJ on the basis of the RSJ model. The calculated results agree with that of the experimental results qualitatively. From this we conclude that microwave loss in the polycrystalline samples is due to the intergranular JJ.

We studied the field cooling (FC) and field exposure (FE) effect on the LFDMA in YBCO & TlBCCO. The measurement of hysteresis area under field cooling and field exposure gives the measure of lower critical field of inter granular junction (Hc1j) and that of grain (Hc1g). From above measurements it has been concluded that TlBCCO have lower pinning force than YBCO. Thus the above measurements gives the measure of relative pinning strength of the materials.

Other area of interest

In addition to above, I am also interested in t*he transport and magnetic properties of Carbon Nano Tube.*

Scientific Conferences Attended

Title of conference	**Subject**	**Place of conference**	**Remarks**
National workshop on High Tc Superconductors Principle and Application	*Superconductiv-ity*	*I.I.Sc. Bangalore India*	*March 1988.*
Department of atomic energy workshop on High T_C Superconductors	*Superconductiv-ity*	*University of Bhopal, Bhopal, India*	*Dec. 1988*
National workshop on High T_C Superconductors	*Superconductiv-ity*	*I.I.T. Kanpur, India*	*Oct. 1989.*
International workshop on High T_C Superconductors	*Superconductiv-ity*	*I.I.Sc.Bangalore, India*	*Jan 1990.*
IAEA and IUC Regional Workshop on Applied Aspect of Neutron Scattering	*Solid state Physics*	*BARC Bombay, India*	*Nov. 1993*
Miniworkshop on Josphson junction Array	*Superconductiv-ity*	*ICTP, Trieste, Italy*	*Aug 1995.*
International 21st Nathiagali Summer Collage on Physics and its Contemporary needs.	*Physics*	*Islamabad Pakistan*	*Jun 1996*

Invited Talk On:

1. *"Low field Microwave Absorption in High Tc Superconductors"* at Institute of Festkorper-physik, Friedrich Schiller University, Jena, Germany, **in April 1997.**

2. *"Effect of Temperature and Field cooling on Low Field Microwave Absorption in High Tc Super conductors"* at

Institute Fur Festkorper-und Werkstofforschung, Dresden, Germany in **May 1997.**

Seminar given on:

3. *" Simulation of I-V characteristics of Intrinsic Stacked Josephson junctions Array as a function of Magnetic field and Microwave power"* **on April 4, 1997** at Institute of Festkorper-physik, Friedrich Schiller University, Jena, Germany, in April 1997.

References:

1. Prof. Q.N. Usmani; Department of Physics; Jamia Millia Islamia, New Delhi; 110025; e-mail: usmani@fsas.upm.edu.my. qnusmani@hotmail.com fax no.: 0091-11-6927707
2. Dr. A.V. Narlikar; Superconductivity Division; National Physical Laboratory New Delhi 110012. India. Fax no. 0091 11 5752678 e-mail: narlikar@yahoo.com

LIST OF PUBLICATION

1. K.P.Singh, V.P.S. Awana, **M. Shahabuddin,** R.B. Saxena, Rashmi Nigam, M. A. Ansari, Anurag Gupta, Himanshu Narayan, S.K. Halder, and H. Kishan
   Nano Fe3O4 Induced Fluxoid Jumps and Low Field Enhanced Critical Current Density in MgB2 Superconductor
   J. Superconductivity and Novel Magnetism DOI 10.1007/s10948-007-0294-8 ***(2007).***

2. Intikhab A Ansari[1]**, M Shahabuddin,** Khalil A Ziq, A F Salem, V P S Awana, M Husain[1] and H Kishan[4]
   The effect of nano-alumina on structural and magnetic properties of MgB_2 superconductors
   Supercond. Sci. Technol. **20**, 827–831 (2007)

3. Intikhab A. Ansari, V.P.S Awana, Rajeev Rawat, **M. Shahabuddin, M. Hussain, H. Kishan, and A.V. Narlikar**
   Fluctuation induced conductivity of polycrystalline MgB_2 superconductor
   J. Mater. Sci. **42,** 6306-6309 (2007)

4 **Mohammed. Shahabuddin** and Nasser Saleh Alzayed
   Design of ac susceptometer using closed cycle helium cryostat
   Phys. Stat. Sol., **C 3,** 3002 (2006)

5. K.P.Singh, V.P.S. Awana, **M. Shahabuddin,** R.B. Saxena, Rashmi Nigam, M. A. Ansari, Anurag Gupta, Himanshu Narayan, S.K. Halder, and H. Kishan
   Phase formation and superconductivity of Fe-tube encapsulated and vacuum annealed MgB_2
   Mod. Phys. Lett., **20**, 1-7 (2006)

6. Jamal Akhtar Khan and **M. Shahabuddin**
   Simulation of I-V characteristics of Josephson junctions array: Magnetic field effect
   Indian J. Phys. **78**(8), 841-844 (2004)

7. G. Ahmed, A. Hashizume, S. Iwasaki, K. Yoshii, B. J. Reddy, **M. Shahabuddin,** S. Uthayakumar, R. Jayavel and T. Endo
   Microwave Absorption Spectrum and reentrant phase in Bi2212 Single Crystal: Microwave power dependece
   Physica C, 388-389, 687 (2003).

8. R.D. Kale, A. Hashizume, T. Li, H. Kohmoto, S. Iwasaki, , **M. Shahabuddin**, S. Uthayakumar, E. Srinivasan and T. Endo
   Microwave Absorption Spectrum and reentrant phase in Bi2212 Single Crystal: Temperature dependece
   Physica C, **378-381** , 470 (2002)

9. A. Hashizume, J. Yamada, H. Kohmoto, Y. Yamada, T. Endo and **M. Shahabuddin**

Near-zero-field hysteretic anomaly in microwave absorption and indication of reentrant phase in Bi2212 single crystal
Physica C, **357-360** , 481 (2001)

10. Anurag gupta, Ahmed Sedky, S.B. Smanta, **Md. Shahabuddin,** Ravi kumar and A.V. Narlikar
Ac susceptibility and STM studies on BiSrCaCuO single crystals irradited with heavy ion.
Nucl. Instr. and Methods in Physics Research, **B 156,** 35-39 (1999)

11. Rajvir Singh, R.Lal, U.C. Upreti, D.K. Suri, A. V. Narlikar, V.P.S. Awana, J. Albino Aguiar, and **Md. Shahabuddin**
Superconductivity in Zn Doped Tetragonal $LaBaCaCu_3O_{7-x}$ Systems
Phys Rev B. **55,** 1216 (1997)

12. **M. Shahabuddin**, H. D. Bist, Prem Chand and A.V. Narlikar
EFFECT OF TEMPERATURE ON LOW FIELD DEPENDENT MICROWAVE ABSOPTION IN PURE $YBa_2Cu_3O_{7-x}$ NEAR T_c.
Physica C 235-240, 2054 (1994)

13. **Md. Shahabuddin**, A.G. Vedeshwar, H.D. Bist, Prem Chand, S.K. Agarwal and A.V. Narlikar
EFFECT OF MODULATION AMPLITUDE ON LOW FIELD MICROWAVE ABSORPTION IN HAFNIUM DOPED YBaCuO;
Bull. Mater. Sci. 14, 789 (1991).

14. A.G. Vedeshwar, **Md. Shahabuddin**, H.D. Bist, Prem Chand, S.K. Agarwal and A.V. Narlikar
MICROWAVE ABSORPTION STUDIES IN FIELD COOLED HAFNIUM DOPED YBaCuO;
Bull. Mater. Sci. 14, 777 (1991).

15. A.G. Vedeshwar, H.D. Bist, **Md. Shahabuddin**, S.K. Agarwal, V.N. Moorthy, C.V.N. Rao and A.V. Narlikar
TEMPERATURE DEPENDENCE OF MICROWAVE LOSS SIGNAL IN HAFNIUM DOPED YBaCuO;
Phys. Lett. A 139, 415 (1989).

16. A.G. Vedeshwar, **Md. Shahabuddin**, Prem Chand, H.D. Bist, S.K. Agarwal,V.N. Moorthy, C.V.N. Rao and A.V. Narlikar
EPR AND LOW MAGNETIC FIELD MICROWAVE ABSORPTION IN HAFNIUM DOPED YBaCuO ;
Physica C 158, 385 (1989)

17. H.D. Bist, P.K. Khulbe, **Md. Shahabuddin,** Prem Chand, A.V. Narlikar, B. Jayaraman and S.K. Agarwal
EPR AND RAMAN SPECTROSCOPY OF HIGH T_c SUPERCONDUCTOR YBaCuO
Solid State Commun. 65, 899 (1988).

Papers Published in Proceedings

16. T. Shakurada, Hong Zhu, Ajay K Sarkar, M Okada, Tamio Endo, H Yamasaki, K Endo and **M. Shahabuddin**
Anisotropic Vortex Dynamics Related to Screening Currents and Microwave currents under magnetic Fields on High T_c Super Conductors
Proceeding of Progress in Electromagnetics Research Symposium 2005, Hangzhaou China Aug 22-26

17. Jamal Akhtar Khan and **M. Shahabuddin**
Effect of noise on Shapiro steps in high-T_c Josephson Junctions
Proceeding of the DAE Solid State Physics Symposium Solid State Physics (India) **46**, 629-630 (2003)

18. T. Li, A. Hashizume, KI. Itoh, H. Kohmoto, S. Iwasaki, M. Yamasaki, K. Yamaguchi, T. Endo and **M. Shahabuddin**,
Temperature rises by microwave absorption in superconducting materials and liquid nitrogen bubbling
Proceeding of the Third Asia Pacific EPR/ESR Symposium, Kobe , Japan October 29-Nov. 1, 2001
Edited by A. Kawamori, J. Yamauchi and H. Ohta , Elsevier Science B.V. (2002)

Papers Presented in conferences/symposium/workshop

19. Jamal Akhter Khan and **M. Shahabuddin**
Simulation of I-V characteristics of Josephson junction and array
Presented in Symposium on Condensed Matter Physics Aug27-29, 2003 organised by Department of Physics , Jadav pur University,Kolkata, India

20. **M. Shahabuddin** and Mushahid Hussain
Effect of Zero Field Cooling and Field Cooling on Field Dependent Microwave Absorption in High T_c Superconductors and Determination of Inter&Intra granular Lower Critical Field.
Presented in National Symposium in Condensed Matter Physics Aug29-31, 2002 organised by Department of Physics , T.M.Bhagalpur University, India.

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21. Tao Li, A. Hashizume, R.D. Kale, S. Iwasaki, H. Kohmoto, M. Kohmoto, **M. Shahabuddin**, S. Uthayakumar, R. Jayavel, and T. Endo
Microwave Absorption Spectrum and reentrant phase in Bi2212 Single Crystal: Microwave power dependence

Presented in International Symposium on Superconductivity (ISS) Japan 2001

22. R.D. Kale, A. Hashizume, T. Li, H. Kohmoto, S. Iwasaki, , **M. Shahabuddin**, S. Uthayakumar, E. Srinivasan and T. Endo
Microwave Absorption Spectrum and reentrant phase in Bi2212 Single Crystal: Temperature dependece
Presented in International Symposium on Superconductivity (ISS) Japan 2001

23**. Md. Shahabuddin**
TEMPERATURE DEPENDENCE OF LOW FIELD DEPENDENT MICROWAVE ABSORPTION IN YBa-Cu-O PREPARED BY DIFFERENT ROUTES: RESISTIVELY SHUNTED JOSEPHSON JUNCTION MODEL
Presented at 21st International Nathiagali Summer College on Physics and Contemporary Needs ; held at Islamabad Pakistan (27th Jun to 11th July 1996.)

24**. Md. Shahabuddin**
EPR and Low Field Dependent Microwave Absorption in High Tc Cuprate Superconductors
Proceeding of DAE Solid State Symposium 36 C, (1993).

25.**Md. Shahabuddin**, A.G. Vedeshwar, H.D. Bist, Prem Chand, S.K. Agarwal and A.V. Narlikar
EFFECT OF MODULATION AMPLITUDE ON LOW FIELD MICROWAVE ABSORPTION IN HAFNIUM DOPED YBaCuO;
International workshop on High T_C Superconductors, I.I. Sc. Bangalore (Jan1990)

26. A.G. Vedeshwar, **Md. Shahabuddin**, H.D. Bist, Prem Chand, S.K. Agarwal and A.V. Narlikar **MICROWAVE ABSORPTION STUDIES IN FIELD COOLED HAFNIUM DOPED YBaCuO**; Bull. Mater. Sci. 14, 777 (1991).

27 **Md. Shahabuddin**, P.K. Khulbe, H.D. Bist and V.A. Singh
POLARIZATION OF RAMAN BANDS IN HIGH T_c SUPERCONDUCTOR YBaCuO.
Proceeding of DAE Solid State Symposium 30 C, E 149(1987).