CONTENTS

1.	ACC	ELERAT	OR	1
	1.1	Operati	ional Summary	1
	1.2	Mainte	nance And Development Activities	3
	1.3	Ion Sou	rce Activities	6
	1.4	Beam F	Pulsing System	7
	1.5	Develop	pment Activities	8
	1.6	Acceler	cator Mass Spectrometry (AMS)	9
		1.6.1	Modifications made in the system	10
		1.6.2	¹⁰ Be Study of Antarctic Lake and southern ocean sediment samples	10
		1.6.3	Preparation of ¹⁰ Be and ²⁶ Al AMS standards	11
		1.6.4	Determination of Sedimentation Rate using ¹⁰ Be Studies on Lagoonal Sediments from Kaluveli, Pondicherry	11
2.	ACC	ELERAT	TOR AUGMENTATION PROGRAM	13
	2.1	LINAC	1	13
		2.1.1	Activities related to superconducting Linear accelerator	13
		2.1.1.1	Off-line (without beam) cold test of the resonators in superbuncher, linac and Rebuncher cryostat to test the different modified accessories of the resonators	13
		2.1.1.2	On-line beam acceleration with superbuncher, linac (the first module) and Rebuncher	15
		2.1.2	Superconducting Niobium Resonators	17
	2.2	Cryoge	enics	20
		2.2.1	Cryogenic Facility	20
		2.2.2	Performance Report of Cryostats	21
		2.2.3	Other Projects	23
		2.2.4	Other Developments	24
	2.3	RF Ele	ctronics	26
		2.3.1	Status Report of the Multi-harmonic Buncher & the High Energy Sweeper and associated jobs	26
		2.3.2	VHF Preamplifier for Linac Phase Detectors	26

	2.3.3	New Developments in resonator control Scheme	27
	2.3.4	Development of 291 MHz VHF Amplifier	27
2.4	Beam T	Transport System	
	2.4.1	Beam Optics for LEIBF Facility in New Low Energy Ion Beam Laboratory	27
	2.4.2	Design of Switching Magnet for LEIBF	29
	2.4.3	Beam Optics of High Current Injector	30
	2.4.4	Fabrication of Spark Counter Chamber	31
	2.4.5	Power Supplies for HYRA Quadrupoles	31
	2.4.6	BGO/ACS Detector Bias Supply for INGA	33
	2.4.7	Germanium Detector Bias Supply for INGA	33
	2.4.8	Pre-amplifier Power Supply for INGA	34
	2.4.9	1kV/20uA Surface barrier detector bias supply (Prototype development)	34
	2.4.10	Electric Field Vs Polarization Loop Tracer instrument	35
	2.4.11	G.M Counter Interface for Phoenix system	36
	2.4.12	1kW(10V/100A) power supply for super conducting Magnets	36
	2.4.13	Resonator Heater Power supply	37
	2.4.14	Servicing and maintenance support	37
2.5		z Electron Cyclotron Resonance (ECR) Ion Source based nergy Ion Beam Facility (LEIBF)	38
	2.5.1	Development Of <i>In-situ</i> Deep Level Transient Spectroscopy (DLTS) System At IUAC	40
	2.5.2	Surface Analysis System in LEIBF Room 107	42
2.6	High C	urrent Injector	44
	2.6.1	High Temperature Superconducting ECRIS -PKDELIS and Low Energy Beam Transport System (LEBT)	44
	2.6.2	Low Power RF Tests on the 1.17m Modulated Prototype RFQ Accelerator	47
	2.6.3	Status report on the fabrication and testing of the prototype IUAC DTL-IH tank	49

3.	RESI	EARCH	SUPPORT FACILITIES	51
	3.1	High V	Vacuum Laboratory	51
		3.1.1	Design of Diagnostic Box	51
		3.1.2	Modifications in Material Science-I Experimental Chamber	51
		3.1.3	Repairing and Periodic Maintenance Works	51
		3.1.4	Installation of Vacuum Interlocking System in High Current Injector Lab	52
		3.1.5	Other Beam line Related Work	52
		3.1.6	Repair of UHV Sample Manipulator (Goniometer)	52
		3.1.7	HTS-ECR Beam line and Soft Landing Setup Alignment	53
		3.1.8	Design and Fabrication of Detector Annealing System for GDA / INGA	53
		3.1.9	Installation of Compressed Air Sensor in Vault -I and Vault-II.	54
	3.2	Maint	enance of Magnets and Power Supplies	54
		3.2.1	Routine Maintenance	55
		3.2.2	Breakdown maintenance	55
		3.2.3	BTS Installation	55
	3.3	Detect	or Laboratory	55
		3.3.1	Large area Position Sensitive annular PPAC	56
		3.3.2	MWPC for Neutron Array	56
		3.3.3	Charge integration of MWPC anode pulse using QDC	57
		3.3.4	Fast timing MWPC as master trigger for NAND	58
		3.3.5	Detector Telescope for transfer reaction studies	58
		3.3.6	Neutron-gamma discrimination using QDC	59
	3.4	Target	Development Laboratory	59
	3.5	RF & l	Electronics Laboratory	62
		3.5.1	INGA Clover electronics module production [1]	62
		3.5.2	Pulse shape discrimination (PSD) electronics module for NAND array and Si-PAD [1]	63
		3.5.3	Quad Timing Filter Amplifier	63

	3.5.4	Fabrication & testing of harmonic feedback control modules	64
	3.5.5	Feasibility Study and Development of a piezo actuator based Control for Superconducting Resonators	64
	3.5.6	Design of a high-resolution programmable current source for coil magnet actuator	65
3.6	Electri	cal Group Activities	65
	3.6.1	Captive Power Installations	65
	3.6.2	Power Stabilisers	66
	3.6.3	UPS Instalations	66
	3.6.4	Power Factor compensation	66
	3.6.5	Communication Equipments	66
	3.6.6	Maintenance of substation, power and Lighting installations of Office complex and Residential colony	66
	3.6.7	Energy Saving	67
	3.6.8	Installation for beam hall-II	67
	3.6.9	UPS Systems	67
	3.6.10	LT Power Panels	67
	3.6.11	Phase-II Part-II Installations	67
3.7	Compu	ter and Communications	67
	3.7.1	Central servers and network infrastructure	68
	3.7.2	Data Acquisition System and Hardware development	68
	3.7.3	Software development	69
3.8	Air Co	nditioning, Water System And Cooling Equipments	69
3.9	Mecha	nical Workshop	70
3.10	Health	Physics	71
	3.10.1	Dosimetry for Neutrons from 0.25 to 15 MeV by the Measurement of LET	72
	3.10.2	Neutron dosimetry with LET concept for high energy particle accelerators	73
	3.10.3	Analysis and Evaluation of Gamma And Neutron Dosimetry From 48MeV 7Li On Natural Cu And Its Dose Simulation With MCNP	73

	3.10.4	Radiological Risk Assessment of use of phosphate fertilizers in soil	/4
	3.10.5	Natural Radioactivity and Radon Exhalation Rate in Rock Samples from Jaduguda Uranium mine Through Nuclear Track Detectors	74
	3.10.6	Natural radioactivity in common building construction and radiation shielding materials	75
	3.10.7	Effects of swift heavy ions irradiation on polypyrrole, Polyaniline and other non conducting polymers	76
	3.10.8	Nanocrystalline $\mathrm{MgB_4O_7}$:Dy for high dose measurement of gamma radiation	76
	3.10.9	Thermoluminescence and photoluminescence studies of nanocrystalline ${\rm Ba_{0.97}Ca_{0.03}SO_4}$: Eu	77
	3.10.10	Thermoluminescence of ${\rm Ba_{0.97}Ca_{0.03}SO_4}$:Eu irradiated with 48 MeV 7 Li ion beam	77
	3.10.11	K_3 Na(SO_4) ₂ :Eu nanoparticles for high dose of ionizing radiation	78
	3.10.12	Effect of swift heavy ion irradiation on nanocrystalline CaS:Bi phosphors: Structural, optical and Luminescence studies	78
	3.10.13	Swift heavy ion induced structural modification and photo- luminescence in CaS: Bi nanophosphors	79
	3.10.14	Effect of high-energy ⁷ Li ²⁺ ions on the TL behavior of LiF:Mg,Cu,P detectors	79
	3.10.15	Nanoparticles of $K_2Ca_2(SO_4)_3$: Eu as effective detectors for swift heavy ions	80
3.11	Civil W	orks	81
3.12	Compre	essed Air System and Material Handling Equipments	82
3.13	Data Su	pport Laboratory	83
	3.13.1	Octal Gate & Delay Generator	83
	3.13.2	Fabrication of FPGA based 8K ADC with Histogram	84
	3.13.3	Fabrication of FPGA based Histogram generator CAMAC module	84
	3.13.4	Fabrication of Current Integrators	84
	3.13.5	Drive-probe Controller for LINAC	85
	3.13.6	Servicing and Maintenance	85

4. EXPERIMENTAL FACILITIES IN BEAM HALL

	4.1	Genera	al Purpose Scattering Chamber (GPSC)	86
		4.1.1	National Array of Neutron Detectors (NAND) in beam hall II	86
		4.1.2	BaF ₂ for timing measurements	87
		4.1.3	Integrated electronics module for neutron array	88
		4.1.4	Project For A Large Neutron Array	89
	4.2	Gamm	a Detector Array (GDA)	91
		4.2.1	Indian National Gamma Array (INGA)	91
		4.2.2	Experiments Using GDA / INGA Related Facilities	99
		4.2.3	HPGe detector Service / Annealing	99
		4.2.4	NP - Beam Hall II 2007	100
	4.3	Recoil	Mass Spectrometers	
		4.3.1	Heavy Ion Reaction Analyzer (HIRA)	101
		4.3.2	HYbrid Recoil mass Analyzer (HYRA)	102
	4.4	Materi	als Science Facility	104
		4.4.1	Scanning Probe Microscope	105
		4.4.2	Micro-Raman set up	105
		4.4.3	D8 Advance XRD Diffractometer	106
		4.4.4	Testing of sample cooling unit with beam	106
		4.4.5	Development of a low cost Electric Field versus Polarization (E-P) Measurement Setup	108
	4.5	Radiat	ion Biology	110
		4.5.1	Status of the Radiation Biology Beam line	110
		4.5.2	Status of the Molecular Radiation Biology Laboratory	111
	4.6	ATOM	TIC PHYSICS	
		4.6.1	Status of Atomic Phyics Beam Line	111
5.	RESI	EARCH	ACTIVITIES	113
	5.1	Nuclea	r Physics	113
		5.1.1	Fission fragment angular and mass distribution measurements for the system $^{16}\mathrm{O} + ^{194}\mathrm{Pt}$ forming the compound nucleus $^{210}\mathrm{Rn}^*$ at energies above and below the Coulomb barrier.	113

	5.1.2	Effect of entrance channel mass asymmetry in fission of ²¹⁶ Ra	116
	5.1.3	Mass gated neutron multiplicity measurement to understand the fusion-fission dynamics for the system ¹⁶ O+ ¹⁹⁴ Pt	117
	5.1.4	Evaporation residue cross section and γ -multiplicity distribution measurement for $^{19}F+^{184}W$ reaction	120
	5.1.5	Study of complete and incomplete fusion dynamics in $^{16}O+^{124}Sn$ system at 6.3 MeV/nucleon energy by measurement of spin distributions	121
	5.1.6	Disentangling of complete and incomplete fusion: Spin-distribution measurement at \approx 4-7MeV/nucleon	124
	5.1.7	Spin Distribution studies of evaporation residues produced through complete and incomplete fusion in the collision of ¹⁶ O+ ¹⁶⁰ Gd @ 90 MeV	127
	5.1.8	Fusion and incomplete fusion studies with heavy targets using ¹⁶ O beams	130
5.2	Materi	als Science	132
	5.2.1	An Evidence of Strain Induced Increase in Electronic Sputtering Yield of LiF Thin Films	133
	5.2.2	Study of swift heavy ion induced mixing Ti/Si using X-ray standing waves	134
	5.2.3	Smoothening, Roughening and Sputtering: The Complex Evolution of Immiscible Fe/Bi Bilayer System	137
	5.2.4	Swift Heavy ion induced modifications in Metal/polymer system	139
	5.2.5	Au irradiation at Ni ₃ N/Si bilayers: Surface roughening and interface mixing	140
	5.2.6	Cross-sectional TEM study of ion beam synthesized SiC	141
	5.2.7	Elastic recoil detection analysis of as deposited and rapid thermal annealed ${\rm SiN_x:}{\rm HFilms}$	143
	5.2.8	High energy irradiation studies on II-VI nanocrystalline thin films and I-III-VI ₂ chalopyrites	145
	5.2.9	Ion beam induced phase separation and formation of silicon nanocrystals embedded in silicon oxide matrix	147
	5.2.10	Novel effect of $100\text{MeV}\text{Ni}^{+7}$ ion on Silica coated ZnS quantum dots	148
	5.2.11	HI-ERDA Studies of Ion-beam Synthesized Buried Silicon Oxynitride Layers	150

5.2.12	Fast ion irradiation of ultra thin bulk pellets of some electronically important oxide semiconductors	151
5.2.13	Structural and optical characterisation of Swift Heavy Ion Irradiated GaN Epitaxial Layers	153
5.2.14	RBS/Channeling, HRXRD and AFM studies on swift heavy ion irradiated AlGaN/GaN heterostructures	155
5.2.15	Structural studies of Ge nanocrystals embedded in SiO_2 matrix	157
5.2.16	Swift heavy ion induced modifications in AgInSe_2 films	158
5.2.17	Formation of nanostructures using swift heavy ion beam	159
5.2.18	Irradiation led nanoarray patterning for binary semiconductor nanoparticles	161
5.2.19	Nanotrack Formation on MOCVD Grown Gallium Nitride Epilayers using Ni Ions Irradiation	163
5.2.20	Swift heavy ion irradiation induced modification of semiconducting oxide nanostructures	164
5.2.21	Role of microstructure in determining the energy relaxation processes of swift heavy ions in semiconductors	165
5.2.22	Structural evolution of TiO ₂ thin film by Thermal Annealing and Swift Heavy Ion Irradiation	166
5.2.23	In-situ XRD studies on YBa $_2$ Cu $_3$ O $_{7-x}$ thin films with SHI irradiation at low temperature	167
5.2.24	Influence of 100 MeV oxygen ion irradiation on Ni/n-Si (100) Schottky barrier characteristics	168
5.2.25	Growth of nano-pillars and nano-dots on the surface of copper sulphide thin film using 100 MeV Au ion irradiation	170
5.2.26	Swift Heavy Ion Induced Recrystallization of SOI Structures	172
5.2.27	Defect Characterization and Its Correlation with the Transport and Magnetic Property of ZnO Based Dilute Magnetic Semiconductor	174
5.2.28	Formation of nanoscale magnetic domains in swift-heavy -ion irradiated GeO_{x} thin films	175
5.2.29	100 MeV Ag ⁺⁷ ion irradiation effects on electrical properties of Li doped NiO thin films	176
5.2.30	Observation grain growth in SHI irradiated NiO thin films	178

	5.2.31	Swift Heavy Ion Induced Modification in Zinc Ferrite Nanoparticles	179
	5.2.32	Swift heavy ion irradiation induced modified surface and optical properties of nanostructured titania thin films derived from TiCl ₄ solutions	181
	5.2.33	Effect of SHI irradiation on FeNiCr thin films	183
	5.2.34	Swift Heavy Ion Induced Thermoluminescence tudies in Pure and Lanthanum Doped Polycrystalline Aluminium Oxide	185
	5.2.35	$100\mathrm{MeV}\mathrm{Ni^{8+}}$ ion irradiation of $\mathrm{Mo_{0.98}Fe_{0.02}O_3}$ thin films grown by pulsed laser deposition	186
	5.2.36	TL Response of Swift Heavy Ion Irradiated Silica Glass	187
	5.2.37	$100\mathrm{MeV}\ \mathrm{O}^{\scriptscriptstyle{+7}}$ Ion Irradiation effects on Polypyrrole Thin Films	189
	5.2.38	Modification of metal dispersed polymer composites by SHI	191
	5.2.39	Production of pores by swift heavy ion induced dewetting of polymer thin film on GaAs	192
	5.2.40	Effect of high energy ion beam irradiation on polypropylene	193
	5.2.41	UV-Visible Analysis of Pristine and Ion Irradiated Polymers	194
	5.2.42	Optical band gap study of swift heavy ion irradiated polymers with UV-vis spectroscopy	195
	5.2.43	Positron lifetime studies of the dose dependence of nanohole free volumes in ion-irradiated conducting poly-(ethylene-oxide) salt polymers	196
	5.2.44	Systematic measurements of energy loss and straggling for MeV heavy ions in polymers	198
	5.2.45	Effect of Lithium Ion Irradiation on Electrical Characteristics of High Speed NPN Power Transistor	198
	5.2.46	Influence of Irradiation Temperature on the characteristics of Deep Level Defects in Ag^{15+} Ion Irradiated Bipolar Junction Transistor	201
	5.2.47	SEE Testing of PEMS and COTS Integrated Circuits	202
5.3	Radiati	on Biology research	206
	5.3.1	Modulation of Endogenous Glutathione level and its role in High LET Radiation induced cellular damage	206
	5.3.2	Studies on ionizing radiation irradiated metal induced radiation sensitization in Bacillus subtilis	207

	5.4	Atomic Physics Research		
		5.4.1	Atomic astrophysics experiments using highly charged MeV ions	210
		5.4.2	Atomic and Molecular Physics Experiments at LEIBF	211
	A (7.4.)		• 1	
6.	ACA	DEMIC.	ACTIVITIES	213
	6.1	Pelletr	on Beam Utilization By Users	213
		6.1.1	Pelletron Beam Time Utilization and Experiments performed (April 2007 - March 2008)	213
		6.1.2	List of Users Family	214
	6.2	M.Sc. (Orientation Programme	219
	6.3	Librar	y	220
	6.4	The Ph	D Teaching Programme	221
	6.5	Acade	mic Activities Held In 2007-08	221
	6.6	Forthc	oming Events: 2008	222
	6.7	List of	Seminars Conducted In The Year 2007-08	223
	6.8	List of	Publications (2007-2008)	225
	6.9		Technical Reports / Technical s (2007-08)	232
	6.10	Teachi	ng Lab. Activities	234
		6.10.1	Fabrication of Radiation Detection & Analysis systems	234
	Appe	ndix – I	— Committees	236
	Appendix – II — IUAC Personnel			243
	Appendix – III — List of Users			246