P R E F A C E

The present thesis describes the work done by the author, whilst he has been a recipient of a Teacher Fellowship of the University Grants Commission (UGC), in developing and installing an apparatus for studies on Extensive Air Showers (EAS) in the Cosmic Radiation Laboratory, North Bengal University. The development made so far in this project will take some more time to reach full fruition. The other operating air shower installation in this country is at Kolar Gold Field (KGF) Laboratory of the Tata Institute of Fundamental Research (TIFR). They have studied muons of energy above 220 GeV using underground muon detectors. The objective of the group at North Bengal University is to carry out studies on smaller air showers ($10^5 - 10^6$) at sea level (1030 gm/cm^2) in more detail in respect of electrons and muons. The work on electronics for the set up was done by the author with others who are collaborating in this project at North Bengal University.

The author's contribution to the Project during the tenure (1978-82) of Teacher Fellowship is stated below:

Development of Instrumentation work and design and construction of Air Shower recording system including

1. The Sample-Hold, Monitoring and analog multiplexer of the whole analog system.

2. The digital system consisting of the analog-to-digital converter (ADC), ADC programmer and the demultiplexer unit.

3. Memory system with programmer for storage of individual air shower density information and then printing by means of a line printer.

4. A master control unit for the operation of the air Shower array consisting of sixteen density detectors, neon flash tube chamber, magnetic spectrograph, cloud chamber unit.

5. A selection system for the triggering of the circuit with the arrival of air shower event.

The author has operated the system and made new measurements of lateral distribution of electrons in air showers of the size in the range 10^5 to 10^6 particles. The analysis of the data was made by the author.

A list of his publications in collaboration with others is given below in additional support of the candidature.

1. A Simple ADC unit for cosmic ray air shower experiments, G.C.Goswami, B.Ghosh, H.R.Ghoshdastidar, S.K.Sen Gupta and N.Chaudhuri, Nucl. Inst. and Method, 192 (1982) 375.

2. A Sample-Hold and analog multiplexer for multidetector systems, G.C.Goswami, H.R.Ghoshdastidar, B.Ghosh and N.Chaudhuri, Nucl. Inst. and Method, 199 (1982) 506.

3. A pulse height recording system for small air shower arrays, Goswami, G.C., Ghosh, B., Ghoshdastidar H.R., Basak D.K., Chaudhuri N, 17th Int. Cosmic Ray Conf., Paris, France, Vol. 8, T 4-20, p. 165.

4. Hadron production in inelastic muon-nuclear interaction, G.C.Goswami, G.R. Paul, N.L.Karmakar, A. Paul and N. Chaudhuri, 16th Int. Cosmic Ray Conf, Kyoto, Japan, Vol. 10, MM 4-15, p. 256.

5. Studies on direct production of electron-positron pairs by muons, A. Paul, N.L.Karmakar, B.Ghosh, H.R. Ghoshdastidar, G.C.Goswami and N.Chaudhuri, 16th Int. Cosmic ray Conf., Kyoto, Japan, Vol. 10, MM 4-16, p. 261.

6. A New air shower project for studies of muons and hadrons, N.Chaudhuri, B.Ghosh, H.R.Ghoshdastidar and

G.C.Goswami, 16th Int. Cosmic ray Conf. Kyoto, Japan, Vol. 8, HA 2.2 - 62, p. 362.

7. A critical evaluation of the single particle inclusive cross-sections used for describing particle production in high energy cosmic ray interactions, Ghoshdastidar M.R., Goswami G.C., Ghosh B, Basak D.K. and Chaudhuri N., 17th Int. Cosmic Ray Conf. Paris, France, Vol. 5, HE - 1.1, p. 1.

8. Nuclear shadowing in leptoproduction and photoproduction of hadrons, Ghosh B, Ghoshdastidar M.R., Basak D.K., Goswami G.C. and Chaudhuri N., 17th Int. Cosmic Ray Conf. Paris, France, Vol. 7, HE 4-11, p. 82(1981).

9. Direct electron-pair production by muons in the energy-transfer range 3 MeV - 10 GeV, M.R.Ghoshdastidar, G.C.Goswami, B.Ghosh, A.Paul, B.C. Karmakar and N. Chaudhuri, J. Phys. G. Nucl. Phys 7 (1981)687.

10. Atomic Rayleigh Scattering of photons in the vicinity of K-absorption edges, Swapan K. Sen Gupta, Niranjan C. Paul, Jahnabi Bose, Gopal C. Goswami, Satyendra C Das and Nirmalendu Chaudhuri, J. Physics B : At. Mol. Phys. 15 (1982)595.

11. A Simple method of studying atomic screening effect in pair production, J.Basu, S.K.Sengupta, N.C.Paul, G.C.Goswami, S.C.Das and N.Chaudhuri, Nucl. Inst. and method 200 (1982) 265.

12. Mössbauer spectroscopic analysis of iron in soils and rocks in the eastern Himalayan foot-hill Region, S.C.Das, S.K. Sengupta, G.C.Goswami, N.C.Paul, J. Basu and N.Chaudhuri, Indian Journal of Pure and Applied Physics, 1983 (in press).

13. Observations on air showers in the size range $10^5 - 10^6$ particles, D.K.Basak, N. Chakraborty, D. Ghosh, G.C. Goswami and N.Chaudhuri, 18th ICRC proceedings to be published in July-Aug, 1983.

Copies of some of the publications are attached.

The design and construction of a new air shower data handling system having novelty and simplicity and the original results of some studies on EAS at a new site serve to contribute to the advance in the subject area.