

## CONTENTS

### CHAPTER I : PRESENT STATUS OF COSMIC RAY EXTENSIVE AIR SHOWER WORK

	Page
1. Introduction	... 01
2. The extensive air shower (EAS) phenomenon	... 01
3. Mass composition and energy spectrum of the primary cosmic rays	... 03
4. Present experiment	... 04
Figure caption	... 10

### CHAPTER II : REVIEW OF HIGH ENERGY INTERACTION MODELS

1. Introduction	... 11
2. Fermi's statistical model and thermodynamic model	... 14
3. The hydrodynamic model	... 15
4. The fireball model	... 16
5. Feynman scaling	... 17
6. The fragmentation model	... 20
7. Analysis of the accelerator data showing the status of the scaling model	... 22
8. KNO scaling	... 25
9. Simulation of air showers	... 27
Figure captions	... 33

### CHAPTER III : THE AIR SHOWER EXPERIMENT AND DATA ANALYSIS

1. Introduction	... 35
2. The EAS array	... 35
2.1. Detectors for electron density and timing measurement	... 36

	Page
2.2. The magnet spectrograph	... 37
2.3. Operation of the overall system	... 40
3. Estimation of EAS parameters and arrival angle	... 42
3.1. Calculation of arrival direction in equatorial coordinates	... 46
3.2. Determination of time offsets	... 47
3.3. Measurement of instrumental uncertainty in timing measurement	... 49
3.4. Uncertainty in timing measurement due to finite thickness of EAS disk	... 50
3.5. Determination of errors in the measurement of zenith, azimuth, declination and right ascension	... 51
3.6. Projected angle distribution	... 52
3.7. Estimation of errors in shower parameters	... 53
4. Measurement of muon momentum	... 54
Figure captions	... 56

#### CHAPTER IV : EXPERIMENTAL RESULTS

1. Introduction	... 57
2. Analysis of EAS parameters	... 57
2.1. The lateral distribution of EAS electrons	... 58
3. A critical experimental examination on shower age	... 59
3.1. Determination of radial age parameter	... 60
3.2. Determination of average age parameter	... 62
3.3. Variation of shower age with shower size	... 63
4. Muon data analysis	... 65
4.1. Lateral distribution of muons	... 65
4.2. The energy spectra of muons	... 67

	Page
4.3. Variation of total number of muons with shower size	... 69
4.4. Discussion	... 71
5. The zenith angle and azimuth distribution of EAS	... 73
6. The distribution of EAS in declination and in right ascension	... 75
Figure captions	... 76
<b>CHAPTER V : SUMMARY WITH CONCLUSIONS</b>	... 79
<b>REFERENCES</b>	... 84