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TIME VARIATIONS IN COSMIC RAY EXTENSIVE AIR SHOWERS.

A thesis submitted to the University of New Zealand for the degree of Doctor of Philosophy.

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PREFACE.

References to the literature are made in the text by giving the names of the author or authors with the year of publication in brackets. The full reference can be obtained from the alphabetical list at the end of the thesis. Names of authors, year of publication, journal, volume and page are given in that order.

In the figures showing electronic circuits, units for the circuit constants are normally omitted owing to shortage of space. The rules to be followed are: resistances in kiloohms unless otherwise stated, capacities in picofarads if the number is greater than unity and microfarads if less than unity.

Symbols used are defined when first introduced in the text. However, to avoid repetition a list is compiled at the beginning of the thesis. Where a symbol has more than one definition it is hoped that the context will make it clear which is to be used.

The experiments to be described were made possible by financial help from the University Grants Committee. The author also wishes to thank the Weather Bureau for meteorological information supplied, Professor P.W. Burbidge for constant interest and encouragement and Mr. W.E.Armstrong for assistance with the 1955 experiment. Special thanks are due to Dr. F.J.M.Farley who originated the work and contributed to every phase of its history.

C O N T E N T S.

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LIST OF SYMBOLS.

A	type A coincidence
A	sensitive area of tray
A	solar vector
B	type B coincidence
B	Modulation amplitude of solar vector
C	type C coincidence
C	true sidereal vector
C	coincidence rate
D	type D coincidence
D	apparent sidereal vector
E	energy
E_o	energy of a primary cosmic ray
g	mutual conductance of a valve
I	cosmic ray intensity
I_o	mean cosmic ray intensity
K	constant term in shower spectrum
r_p	plate resistance of valve
S.E.	standard error
V	variance
X_1	coefficient of sine term in first harmonic
Y_1	coefficient of cosine term in first harmonic
Z_1	amplitude of first harmonic
α	effective area of tray
α	right ascension
β	exponent in decoherence equation
γ	exponent in differential shower spectrum
δ	exponent in integral primary spectrum
δ	declination
η	defined by $\prod \propto E_o^{\eta}$
θ	defined by: Tray rate $\propto A^{\theta}$
θ_1	phase angle of first harmonic
λ	scattering m.f.p. for primary particles
$\prod$	number of particles in shower at given depth
ρ	particle density in number per square metre

LIST OF SYMBOLS (cont)

τ	resolving time
123)	
1234)	coincidence types
12345)	