the values[8] at night due to the lower conductivity and high value of collision frequency.

Table I shows the comparison of E–W to W–E ratio of attenuation rates obtained by authors and Taylor in the frequency range 6–11 kHz along with the theoretical values at Waltair. From the field strength measurements[10], the values of attenuation ratios of $\frac{\text{E–W}}{\text{W–E}}$ and $\frac{\text{S–N}}{\text{N–S}}$ at 10·2 kHz, the values reported by Wait and Spies and those obtained in the present study at 10·2 kHz are given in Table II. These values compare adequately. From the above experimental results, reciprocity along N–S and S–N directions and non-reciprocity along E–W and W–E directions have been proved in the daytime also. Lastly it is concluded that the earth's magnetic field plays a major role in the propagation of VLF waves and the propagation from west to east is better than from east to west.

TABLE I

Attenuation factor at E–W / *Attenuation factor at W–E*

Frequency in kHz	Theoretical	Experimental	(Experimental) (Taylor 1960)
6	2·2	2·1	1·5
7	2·1	1·7	1·7
8		1·9	1·8
9	1·99	1·96	1·75
10		1·9	1·6
11	1·8	2·1	1·5

TABLE II

	Present work (10 kHz)	From ref. 10 at 10·2 kHz	From ref. 2 at 10 kHz (Theoretical)
$\frac{\text{E–W}}{\text{W–E}}$	1·95	2·1	1·75
$\frac{\text{S–N}}{\text{N–S}}$	1·034	1·03	1·0

October 16, 1980.

1. Barber, N. F. and Crombie, D. D., *J. Atmos. Terr. Phys.*, 1959, **16**, 37.
2. Wait, J. R. and Spies, K., *J. Geophys. Res.*, 1960, **65**, 2325.
3. Harth, W., *N R L Rep. No.* 7763, 1974, p. 147.
4. Taylor, W. L., *J. Res. Bur. Stand. Wash.*, 1960, **64D**, 349.
5. Wait J. R. and Spies, K. P., *N.B.S. Tech. Note* No. 300, 1964.
6. Gopalakrishna, S. and Sitaramaswamy, P., *Curr. Sci.*, 1979, **48**, 676.
7. — and —, *Ibid.*, 1980, **49**, 380.
8. — and —, *Indian J. Radio Space Phys.*, 1980, **9**, 112.
9. Wait, J. R., *Proc. Inst. Radio Engrs. N.Y.*, 1957, **45**, 760 and 768.
10. Hanselman, J. C., Casselman, C. J., Tibbals, N. L. and Bickel, J. E., *J. Res. Bur. Stand.*, 1960, **68D**, 11.

DETECTION OF IONOSPHERIC POLARIZATION SCINTILLATIONS

M. R. DESHPANDE, H. O. VATS, G. SETHIA, H. CHANDRA AND G. D. VYAS
Physical Research Laboratory
Ahmedabad 380 009, India

AND

K. N. IYER AND A. V. JANVE
Department of Physics, Saurashtra University,
Rajkot 360 005, India

THE present article reports an interesting and a new phenomenon of ionospheric polarization scintillations (PS) of satellite radio beacon signals at 136 MHz. A chain of polarization equipment was set up at Rangapur (17° 6′ N, 78° 43′ E), Pune (18° 31′ N, 73° 53′ E), Rajkot (22° 19′ N, 70° 44′ E) and Ahmedabad (23° 02′ N, 72° 36′ E) to investigate the effect of the solar eclipse of 16th February 1980 on the ionosphere and to detect eclipse-induced gravity waves. Rangapur experienced total solar eclipse (duration 2 min and 9 seconds), Pune experienced 90% eclipse, Rajkot and Ahmedabad 75% each. The observations were made for two weeks beginning a week before the eclipse. The details of the polarimeter are given elsewhere[1]. The observations of Faraday rotation angle (polarization) were carried out continuously round the clock using a Japanese geostationary satellite ETS–2. During the two-week observation period, PS were observed on all the nights except the eclipse night at all stations. Fig. 1 shows typical records for Rajkot and one can see the absence of PS on the eclipse night. Usually PS begin after sunset and continue upto midnight. There are occasions when it is observed during post-midnight hours also. Duration of PS at different stations varies. As one progresses towards higher latitudes, the duration drops down (Fig. 2). This indicates that the irregularities causing PS are observed for a longer duration near the equator. Similar observations were carried out at a chain of five stations during 1975–76 and no such PS were observed except on 10–11 January 1976 which was found to be a magnetic storm day[2]. But during the current eclipse observations the PS were seen on every night except the eclipse night. A moderate magnetic storm with sudden commencement began at 0810 75°EMT on 14th February 1980 with magnetic field recovery near 0000 hr on 15th February 1980. A major magnetic storm on 16th February began after 0000 hr with field recovery near 2100 hr on the same day. So the absence of scintillations on the eclipse night (16th February, 1980) is probably due to magnetic storm. The night-time scintillations are present whenever there is spread-*F*. A study of the magnetic activity dependence of spread-*F* occurrence at Kodaikanal (Chandra and Vyas[3]) has shown that the magnetic activity inhibits spread-*F* during D and E months of high sunspot years but during low sunspot years there could be increase in spread-*F* occurrence. This may be the reason that while during 1976 there was PS following a magnetic storm it was inhibited during 1980. However, it is important that during the entire two weeks of observations PS were observed which gives a clear indication that PS are observed during high sunspot years.

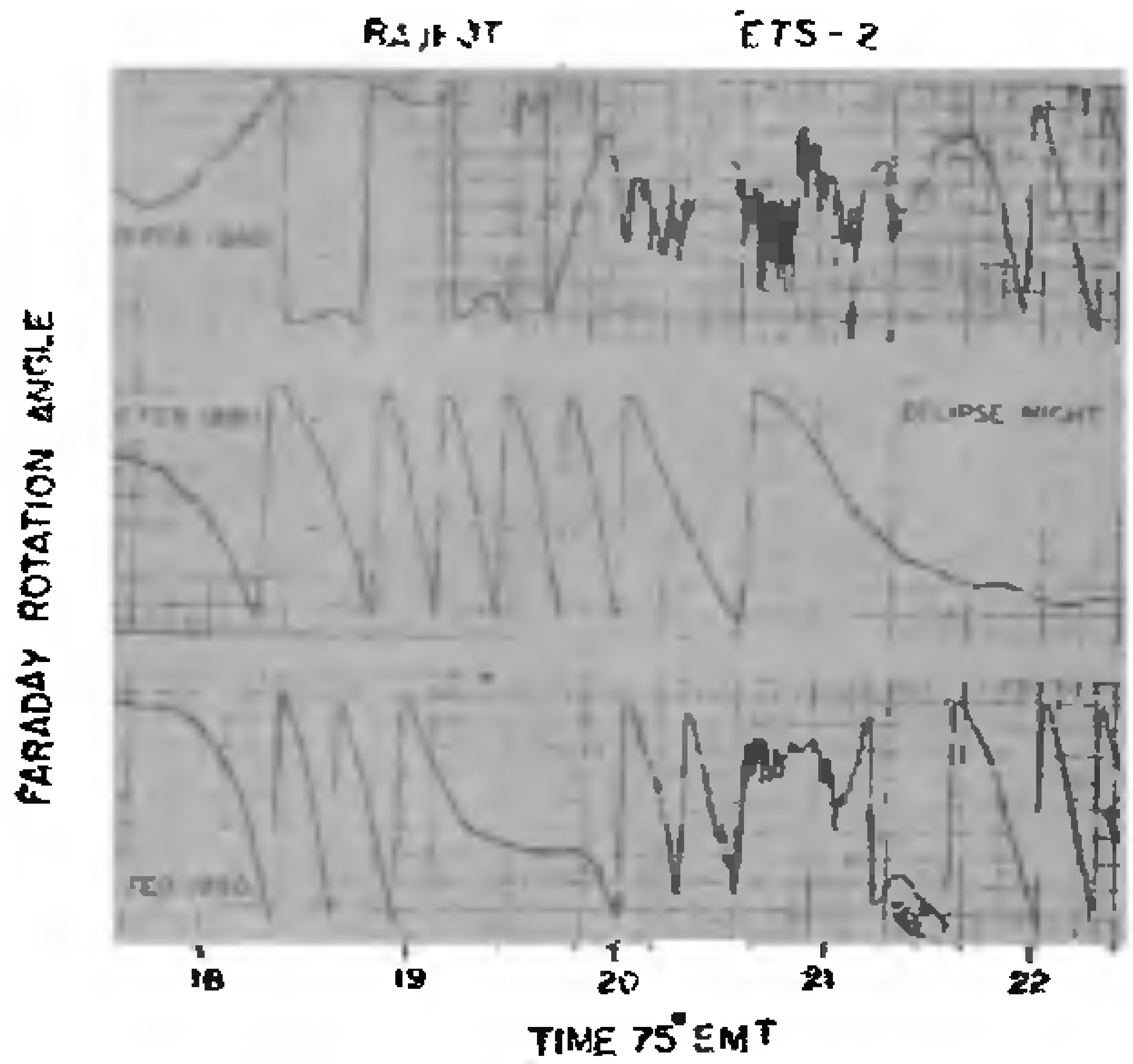

FIG. 1. Records of Faraday rotation at 136 MHz radio beacon from satellite ETS-2 at Rajkot on nights of 15 February, 16 February (eclipse day) and 17 February 1980. No polarization scintillations were observed on the night of 16 February.

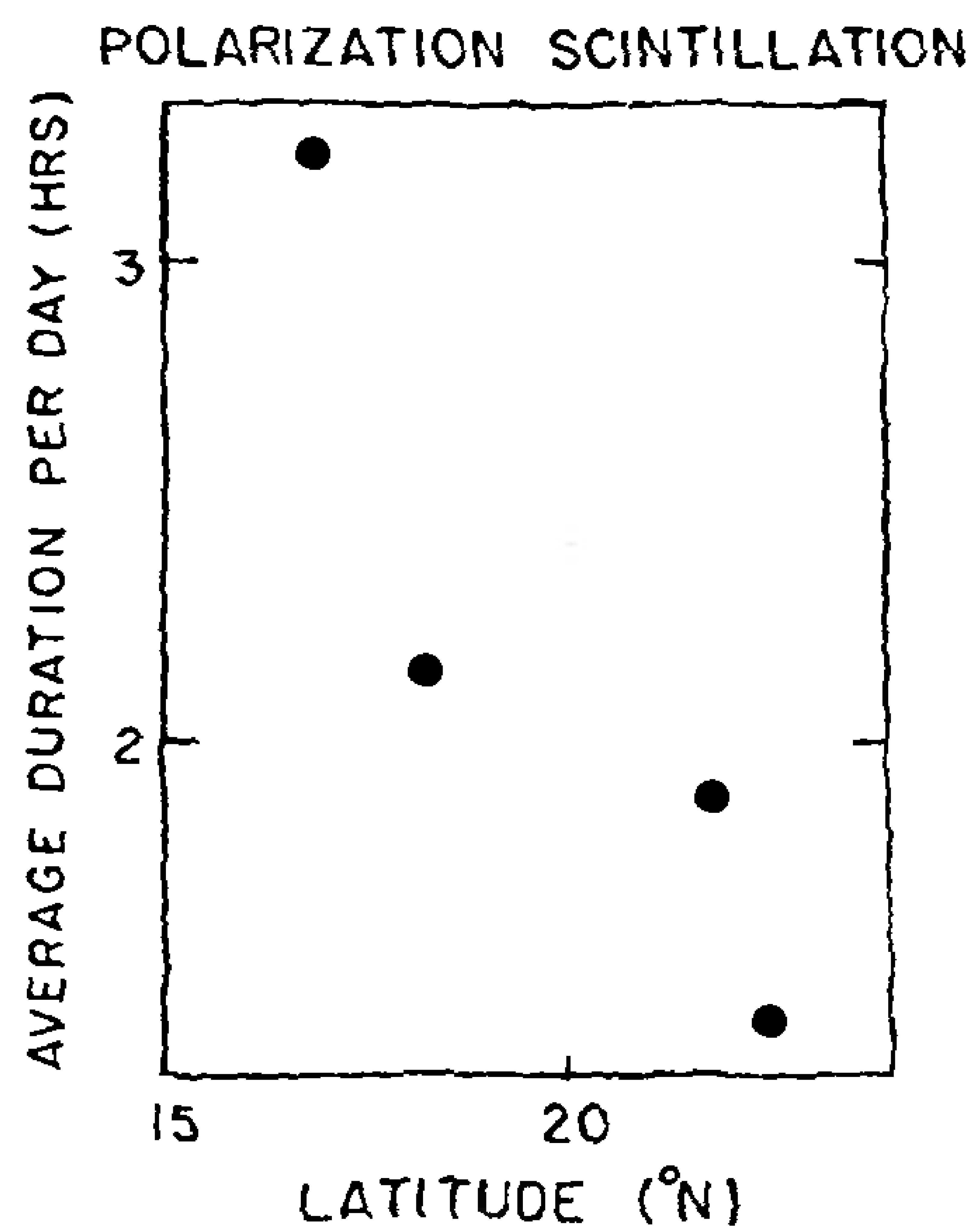

FIG. 2. Latitudinal variation of the average duration of polarization scintillation based on records from a chain of stations operated during the eclipse campaign.

The authors thank their colleagues for discussions and authorities who gave them facility to run the experiments. The experimental programs were carried out by Messrs. Banshidhar, N. M. Vadher, M. B. Dadhania, H. D. Parikh and V. D. Patel.

October 17, 1980.

1. Banshidhar *et al.*, *J. Inst. Telcom. Engrs.*, 1977, **23**, 708.
2. Vats, H. O. *et al.*, *Nature* (*London*), 1978, **272** (5651), 345.
3. Chandra, H. and Vyas, G. D., *Indian J. Rad. Space Phys.*, 1978, **7**, 163.

LOW ENERGY AUGER ELECTRON SPECTRA FROM Mg AND MgO WITH A RETARDING FIELD ANALYSER

P. S. MURTHY*, A. V. KORGAONKAR AND C. P. GOPALARAMAN

Technical Physics Division
Bhabha Atomic Research Centre, Trombay
Bombay 400 085, India

AUGER electrons are ejected out of an atom by a non-radiative process which occurs when the atom is ionized by a primary electron beam. The Auger electrons, which can also be referred as the secondary electrons, are separated according to their energy by different methods. One of the methods applied in the Auger electron analysis is by means of a retarding field ana-

* Spectroscopy Division.