OBSERVATIONS ON TeV GAMMA RAYS FROM GEMINGA AND PSR 0950 + 08

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Recently there is a revival of interest in Geminga (2 CG 195+04) which was seen to exhibit a periodicity with a period of 59 to 60 s in its emission of X-rays, GeV gamma rays and TeV gamma rays; see Bignami et al[1] for a review. During the winter of 1984-85, we observed this object to see if it emits TeV gamma rays with a periodicity $\sim$ 60 s. The observations were carried out at two different sites separated by 11 Km with the Ooty Atmospheric Cerenkov Array split into two parts; see Bhat et al[2] for a description of the array. Data were collected during clear moonless nights for a total duration of 15.3 hours spread over 2 months, at each site - of this, 5.3 hours' data were simultaneous. Since the first time derivative of period is believed[1] to be large ($\dot{P} \sim 3.5 \cdot 10^{-9}$ s s^{-1}) and uncertain ($|\Delta \dot{P}| \sim 1.5 \cdot 10^{-9}$ s s^{-1}) we sub-divided our total data into segments of duration not more than 3 days each to steer clear of the effects of $\dot{P}$ in our phase analysis. If TeV gamma ray signals are seen in each of these segments, it is possible to derive $\dot{P}$ from our own data. The analysis is in progress and the results will be presented.

According to certain pulsar models, γ-rays are produced in the vicinity of the polar caps of a neutron star . These γ-rays subsequently initiate $e^+ - e^-$ pairs which may finally lead to the emission of radio waves by coherent curvature radiation. As a result one would expect a correlation between radio and γ-ray emission from at least a class of pulsars. With this scenario in mind we planned to search for any possible correlations between radio emission at 327 MHz and the TeV energy γ-rays from the nearest pulsar viz: PSR 0950 + 08.

This strong radio pulsar was observed with the Ooty radio telescope operating at 327 MHz . The individual radio pulses which were detected were converted into logical pulses and transmitted over

the telephone lines to the Cosmic Ray Laboratory where the same source was being observed in the TeV energy gamma ray range using the atmospheric Cerenkov technique. See Bhat et al.[2] for a description of the array. Both the atmospheric Cerenkov and the radio event times suitably tagged were recorded. At the radio telescope site the radio pulse heights at 6 different bands (each of band width 300 KHz) were recorded. The sampling time used for acquisition was 10 msec. and the time constant used for pulse integration was 5 msec. At the Cosmic Ray Laboratory, we have also recorded the Cerenkov light pulse heights.

We have recorded 15 hours of simultaneous observations out of a total of about 36 hours of gamma ray observations. The radio pulse arrival times were used to obtain the pulsar elements which in turn were used to obtain the pulsar phasograms of the gamma ray data. Also phasograms in association with the radio events as a function of various radio pulse heights were obtained.

The results of the above analyses will be presented.

References

1. G. F. Bignami et al. Nature 310, 464 (1984).
2. P. N. Bhat et al., see paper OG 2.3-10, this volume.