$P_{ms} = 1.04$ ms. If their mass is $1.4\,M_{\odot}$, then faster pulsars, with periods as short as 1 ms, should also be seen.

The general relativistic effects are expected to be important for the millisecond pulsar. If one retains terms of order c^2, one can write the post-newtonian corrections[8]:

$$\frac{\Omega^2}{\pi G\rho} = \frac{\Omega_N^2}{\pi G\rho} + \frac{R_s}{a_1} f(e).$$

Here Ω_N is the newtonian angular velocity, $R_s = 2GM/c^2$ is the Schwarzschild radius of the neutron star and $a_1 = a_2$ the longer axis. $f(e)$ is an involved function of the eccentricity and is tabulated by Chandrasekhar[8].

Thus if the post-newtonian effects are included, then for a given $\Omega^2/\pi G\rho$ the eccentricity is lower than the classical value (figure 1). The point of bifurcation and the point of maximum Ω^2 still occur at the same value of e, but now correspond to a higher Ω.

For a $0.7\,M_{\odot}$ neutron star, the point of bifurcation occurs at $\Omega^2/\pi G\rho = 0.4$, whereas for a $1.4\,M_{\odot}$ neutron star the corresponding value is 0.43. Thus the post-newtonian effects are about 10% of the classical values.

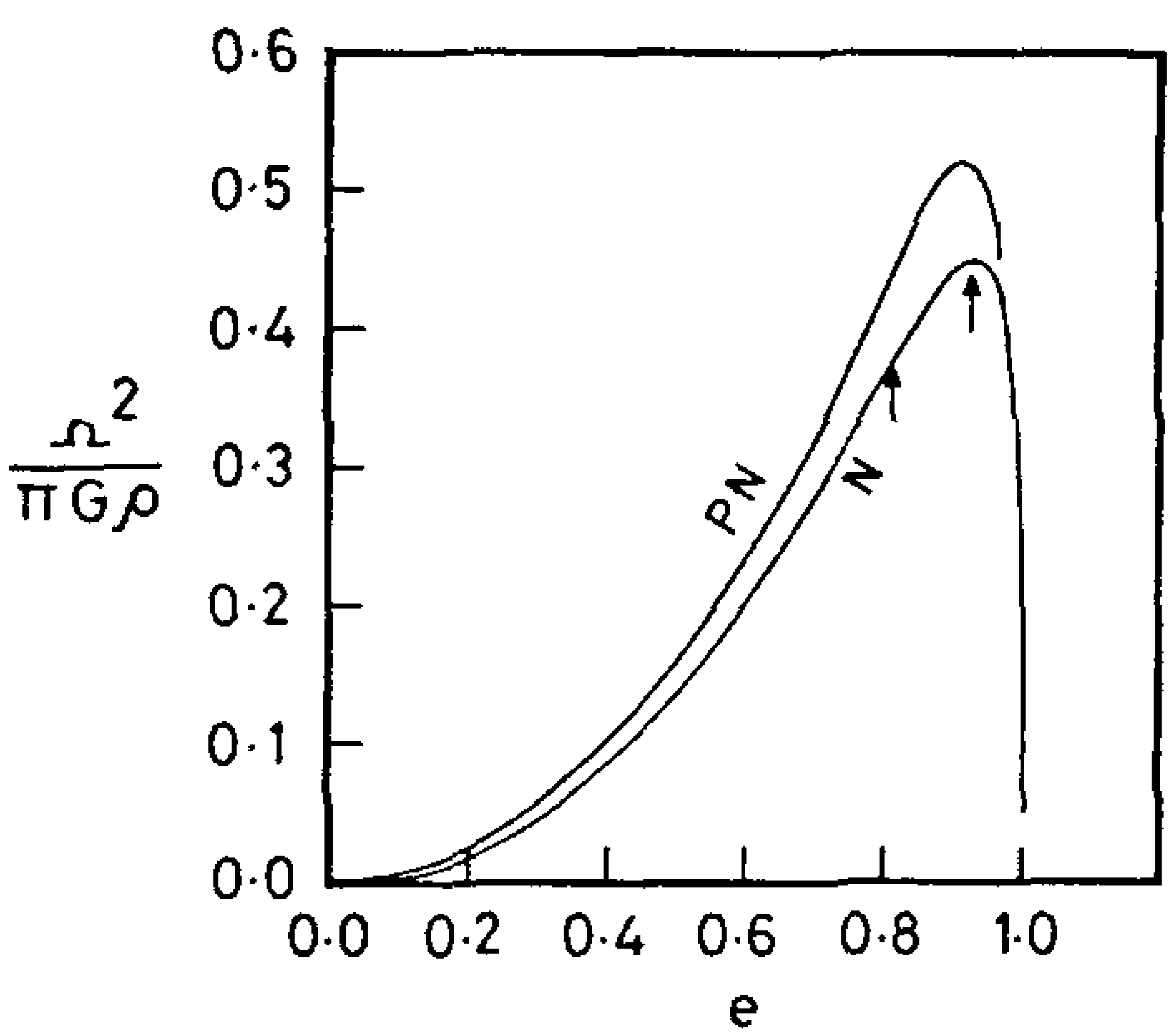

Figure 1. The square of the angular velocity (in the unit $\pi G\rho$) along the Maclaurin sequence as a function of the eccentricity. The classical (N) curve and the post-newtonian curve for mass = $1.4\,M_{\odot}$ (PN) are shown; for the latter only values upto $e = 0.98$ are plotted. Curve for $M = 0.7\,M_{\odot}$ is very close to the $1.4\,M_{\odot}$ curve and is omitted. The point of bifurcation ($e = 0.81267$) and the point of maximum Ω ($e = 0.93$) are the same for the newtonian as well as the post-newtonian case and are marked.

In the post-newtonian approximation, the 1.56 ms pulsar has an eccentricity $e = 0.73$ ($M = 0.7\,M_{\odot}$) or $e = 0.5$ ($M = 1.4\,M_{\odot}$). The point of bifurcation now corresponds to $P_{ms} = 1.5$ for a $0.7\,M_{\odot}$ neutron star. With post-newtonian effects included, a $1.4\,M_{\odot}$ neutron star will have a period of 0.98 ms at the point of bifurcation, which is the shortest it can have.

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PRODUCTION OF H⁻ ION BEAM USING DUOPLASMATRON SOURCE

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THE efficiency of direct extraction of H^- ion from a duoplasmatron ion source by on-axis and off-axis extraction technique has been found to be very small[1,2]. Recently a concept of ion source, in which negative surface ionization (NSI) of hydrogen can be used as a tool to produce H^- ion beam, has been proposed by several authors[3]. Measurement[4] of large conversion efficiency (up to 40%) of H^+ into H^- by NSI technique has given the prospect of utilising the duoplasmatron as an efficient negative ion source. We have started an experiment, the aim of which is to use a duoplasmatron to produce H^- ion beam efficiently, by the NSI technique. Since the NSI technique would need to impinging H^+ ion to be of lower energy, the duoplasmatron should be operated at its low-extraction voltage mode. But it is known that the usual