Equation of state of dense matter and rotation of neutron stars

J. L. Zdunik

Short review of the theory of stellar rotation and stability conditions in General Relativity applicable to Neutron Stars (NSs) is presented. The role of the equation of state (EOS) for the rotational properties of NSs is discussed with special emphasis on the softening of the EOS due to the appearance of new particles or phase transitions in the interiors of NSs. This softening could manifest itself as a back-bending phenomenon for a spinning-down solitary pulsar – the epoch of spinning-up by angular momentum loss. An isolated NS can lose a sizeable part of its initial angular momentum without significantly changing its rotation period. In some cases the softening of the EOS results in the existence of an instability region for rotating NSs. The discussion is based on the realistic equations of state with hyperon softening and polytropic models of a mixed phase in NS interiors.