OPINION ITU-R 99-1[[1]](#footnote-1)\*

Time scale based on pulsar timing

(2003-2017)

ITU Radiocommunication Study Group 7,

considering

*a)* that observations of single and binary radio pulsars are important, both for astrophysics and also for precise timekeeping;

*b)* that among the more than 1 000 pulsars observed so far, there are some that have very stable spin and orbital rotation periods, particularly millisecond pulsars;

*c)* that the increase in the apparent spin rotation period with time of most pulsars is well known, and in some cases is as small as 10–21 s/s;

*d)* that the time of arrival (TOA) of pulsar pulses to the solar system barycenter is measured with an accuracy of about 100 ns or better by modern techniques;

*e)* that timing observations of several millisecond pulsars over extended periods showed quasi-white noise TOA with an RMS level below 2 μs as documented in Report ITU-R RA.2099-1;

*f)* that pulsar lifetimes are several million years and they offer a common time reference to all terrestrial observers;

*g)* that the radio frequency band 1 400-1 427 Hz is allocated for radio astronomy observations (No. **5.340** of the Radio Regulations) and this band provides the optimum
signal-to-noise ratio for pulsar timing measurements,

is of the opinion

1 that long-term timing monitoring of very stable reference pulsars, such as J1600-3053, J17130747, J1744-1134 and B1909-374, and potentially others listed in Report ITU-R RA.2099-1 by the largest radio telescopes in the world should be encouraged;

2 that the antenna and receive system documentation, including measurements of the relevant delays as well as the raw data, should be made available in a public manner so as to enable the creation, merging, and analysis of long-term datasets spanning multiple platforms and epochs;

3 that a time scale based upon reference pulsars should be established to provide a new astronomical time scale with high long-term stability.

1. \* This Opinion should be brought to the attention of the International Astronomical Union (IAU), the International Union of Radio Science (URSI) and the Consultative Committee for Time and Frequency (CCTF). [↑](#footnote-ref-1)