On computer modeling of real submillisecond gamma-ray pulsations from rotating neutron stars

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Submillisecond gamma-ray pulsations were discovered by us for the Vela and Geminga pulsars (in 1996 and 2001, respectively) from a database of their observations performed in 1990–1991 with the GAMMA-1 telescope. We have already carried out (in 2002–2003) some modeling of such pulsations of radiation from rotating neutron stars, to prove the possibility to discern short-periodic processes, with periods less than discretization time. The essence of our modeling consists in an alternate imposing of submillisecond pulsations with different periods T on a detection time scale with the discretization T_0 of 1 ms. A sequence of the number of events detected per millisecond was determined for every T. These sequences turned out to be: 1) periodic with repetition characteristic T' for every T; 2) with intrinsic patterns. The phasogram of initial pulsations T was obtained then with the "Superposition of epoch method" just as a resonance frequency is selected by a tuned receiver. However, that first modeling was a somewhat imaginary, numerical experiment, although precise and strict. Now we present results of real computer modeling with variations of input T data and corresponding output results. Together with studies of pulsations by the "Superposition of epoch method", by the "Discrete temporal Fourier series method", and with a number of statistical criteria, our modeling proves the reality of pulsations and the possibility to distinguish even those of them which are significantly shorter than the discretization time. In order to reveal pulsations one should establish synchronous links between investigated pulsations and any parallel periodic process. In our case, such process is the pulsar rotation, specifically, the synchronous emission of low- and high- latitude electrons which generate curvature radiation. Some applications of our results are outlined.