

# Low frequencies, long observing runs and young unknown neutron stars: challenges for future continuous gravitational wave searches.

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Wide-band searches for continuous gravitational waves are essential to reveal unknown neutron stars that may be close enough to us to be detectable. Currently, analyses performed on data from 2G detectors for unknown sources cover all possible sky directions, but are restricted in the rotational parameters by their computational cost and by the limited bandwidth of the detectors at low frequencies. The simplest possible model describes neutron stars slowing down at a constant rate by a first-order spin-down parameter that, for one-year long observing runs, is expected by neutron stars that are about thousands of years old, or even older. However, with ET the perspective of several-years long observing runs suggests to enlarge the parameter space to search for signals with an higher-order spin-down. This enlargement, together with the expected widening of the detector bandwidth down to few-Hertz frequencies, will allow to search for younger neutron stars, up to hundreds or even tens of years old. In this talk, I will present the opportunities opened by 3G detectors to neutron-star science, together with the practical complications connected.

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