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## **Periodic quantum graphs and the Bethe-Sommerfeld conjecture**

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14:00–15:00

in T115/C

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Trojanova 13, 12000 Praha

**Abstract:** The Bethe-Sommerfeld conjecture (1933) says that the number of spectral gaps for a system periodic in more than one direction is finite. The conjecture was proved for numerous systems; however, quantum graphs represent an exception from this law, as their spectra seem to have typically infinitely many gaps (or no gaps at all). Actually, for decades, no example of a quantum graph featuring a nonzero finite number of gaps in the spectrum was known. In the talk, we present two results: (i) We derive conditions under which the number of gaps cannot be nonzero finite. They allow one to understand why it became a longstanding open problem to find a counterexample. (ii) We construct a periodic quantum graph with a nonzero finite number of spectral gaps. In particular, we are able to tune the parameters of the graph to achieve any prescribed exact number of gaps, which is the first such example to the date.