



# IV Amazonian Workshop on Black Holes and Analogue Models of Gravity

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## The Aharonov-Bohm effect around a rotating black hole analogue

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In 1959, Y. Aharonov and D. Bohm proposed some experiments to understand the concept of electromagnetic potentials in Quantum Mechanics. They showed that these potentials are not just mathematical artifacts used to obtain electromagnetic fields, but they have physical significance. One of the manifestations of the Aharonov-Bohm effect, as it became known, is the appearance of a characteristic scattering pattern when electron beams pass through the opposite sides of a solenoid. A scattering pattern similar to this can be achieved in a totally different way: by using surface waves in a fluid with draining and vortex produced by its flow in a bathtub (Draining Bathtub Vortex). This is an analogue model of gravity in (2+1) dimensions, where the potential velocity perturbation in the fluid obeys the Klein-Fock-Gordon equation, whose effective acoustic metric is similar to the spacetime around a Kerr – rotating – black hole. In this presentation the scattering cross section is determined by the partial-wave method and low-frequency phase shifts are obtained analytically via the Born approximation. The analytic expression of the scattering cross-section has contributions of the event horizon and of the circulation of the effective spacetime, the last being the responsible by the analogue Aharonov-Bohm effect. Aharonov-Bohm effect. Aharonov-Bohm effect.