



Contribution ID: 996

Type: **Talk in the parallel session**

## **Black holes, stationary clouds and magnetic fields**

*Tuesday, 6 July 2021 10:40 (20 minutes)*

As the electron in the hydrogen atom, a bosonic field can bind itself to a black hole occupying a discrete infinite set of states. When (i) the spacetime is prone to superradiance and (ii) a confinement mechanism is present, some of such states are infinitely long-lived. These equilibrium configurations, known as stationary clouds, are states “synchronized” with a rotating black hole’s event horizon. For most, if not all, stationary clouds studied in the literature so far, the requirements (i)–(ii) are independent of each other. However, this is not always the case. In fact, massless neutral scalar fields can form stationary clouds around a Reissner–Nordström black hole when both are subject to a uniform magnetic field. The latter simultaneously enacts both requirements by creating an ergoregion (thereby opening up the possibility of superradiance) and trapping the scalar field in the black hole’s vicinity. This leads to some novel features, in particular, that only black holes with a subset of the possible charge to mass ratios can support stationary clouds.

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**Session Classification:** Black Holes in Alternative Theories of Gravity

**Track Classification:** Black Holes: Theory and Observations/Experiments: Black Holes in alternative theories of gravity