

[Journals ▼](#)[Books](#)[Publishing
Support](#)[Login ▼](#)

LETTER

Remnant loop quantum black holes

H A Borges, I P R Baranov, F C Sobrinho and S Carneiro⁵

Published 31 January 2024 • © 2024 IOP Publishing Ltd

Classical and Quantum Gravity, Volume 41, Number 5

Citation H A Borges *et al* 2024 *Class. Quantum Grav.* **41** 05LT01

DOI 10.1088/1361-6382/ad210c

-
1. Received 5 October 2023
 2. Accepted 22 January 2024
 3. Published 31 January 2024



Method: Single-anonymous

Revisions: 1

Screened for originality? Yes

[Buy this article in print](#)

 [Journal RSS](#)

Abstract

Polymer models inspired by Loop Quantum Gravity (LQG) have been used to describe non-singular quantum black holes with spherical symmetry, with the classical singularity replaced by a transition from a black hole to a white hole. A recent model, with a single polymerisation parameter, leads to a symmetric transition with same mass for the black and white phases, and to an asymptotically flat exterior metric. The radius of the transition surface is, however, not fixed, increasing with the mass. Following similar procedures, in a previous paper we have fixed that radius by identifying the minimal area on the transition surface with the area gap of LQG. This allowed to find a dependence of the polymerisation parameter on the black hole mass, with the former increasing as the latter decreases. It also permitted to extend the model to Planck scale black holes, with quantum fluctuations remaining small at the horizon. In the present letter we extend this analysis to charged black holes, showing that the Cauchy horizon lies beyond of the transition surface. We also show the existence of limiting states with zero surface gravity, the lightest one with $Q = 0$ and $\mu = 0$, and the heaviest with $\mu = 1$. Using our solutions to approximate quasi-steady

horizons, we show that Hawking evaporation leads asymptotically to these extremal states, leaving remnant black holes of Planck size.

Export citation and abstract

BibTeX

RIS

Next article in issue →

Access this article

The computer you are using is not registered by an institution with a subscription to this article. Please choose one of the options below.

Login

Access through your institution

IOPscience login

Find out more about journal subscriptions at your site.

Purchase from

Article Galaxy

CCC RightFind

Purchase this article from our trusted document delivery partners.

Rent from



This article is available from DeepDyve.

Make a recommendation

To gain access to this content, please complete the Recommendation Form and we will follow up with your librarian or Institution on your behalf.

For corporate researchers we can also follow up directly with your R&D manager, or the information management contact at your company. Institutional subscribers have access to the current volume, plus a 10-year back file (where available).

You may also like

JOURNAL ARTICLES

On the value of the Immirzi parameter and the horizon entropy

Effective quantum dust collapse via surface matching

Shadows of loop quantum black holes: semi-analytical simulations of loop quantum gravity effects on Sagittarius A* and M87*

Effective quantum extended spacetime of polymer Schwarzschild black hole

Improved effective dynamics of loop-quantum-gravity black hole and Nariai limit

Loop Quantum Gravity motivated multihorizon rotating black holes

IOPSCIENCE

Journals

Books

IOP Conference
Series

About IOPscience

Contact Us

Developing
countries access

IOP Publishing
open access policy

Accessibility

IOP PUBLISHING

Copyright 2024
IOP Publishing

Terms and
Conditions

Disclaimer

Privacy and
Cookie Policy

Text and Data
mining policy

PUBLISHING SUPPORT

Authors

Reviewers

Conference
Organisers



This site uses cookies. By continuing to use this site you agree to our use of cookies.



IOP