Shadows of Kerr black holes with Proca hair

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Gr@v

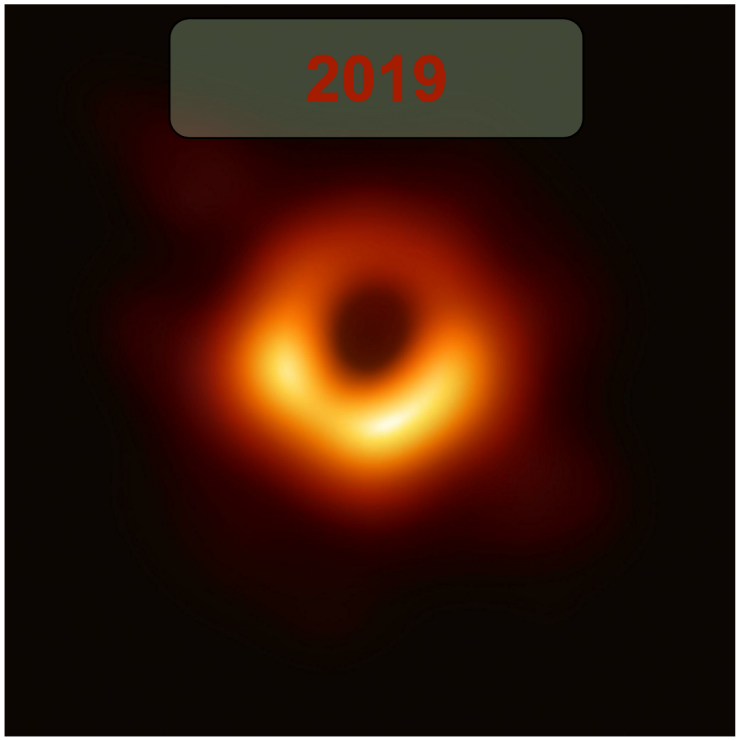
FCT Fundação para a Ciência e a Tecnologia

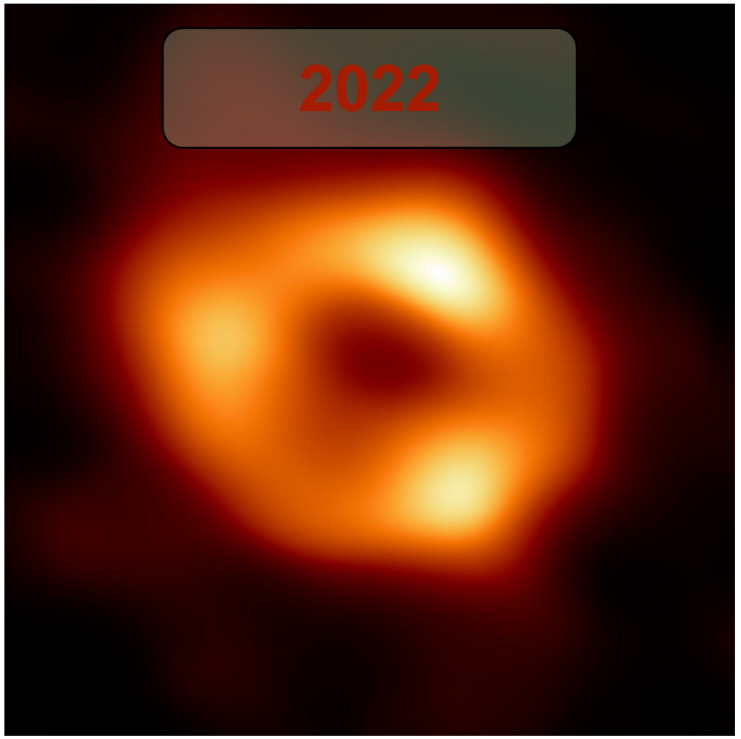
universidade de aveiro

The beginning of a new era

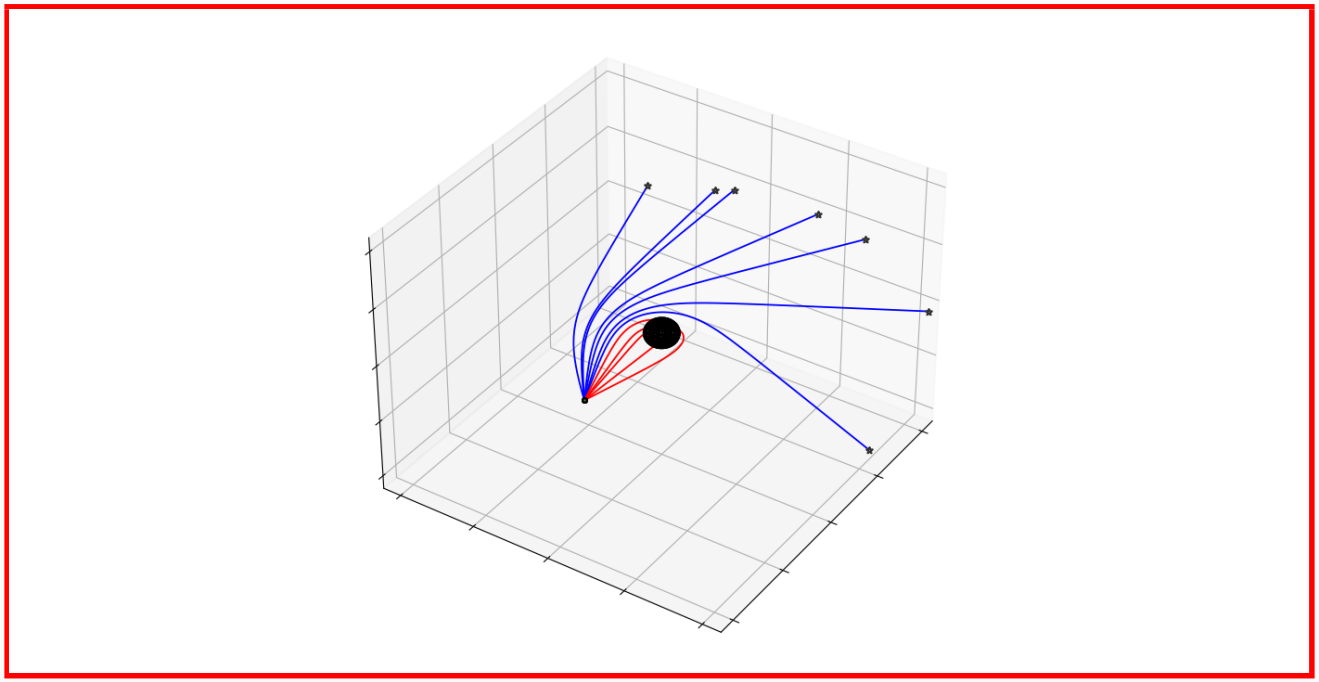
Source: Afonso Marques

The EHT observations

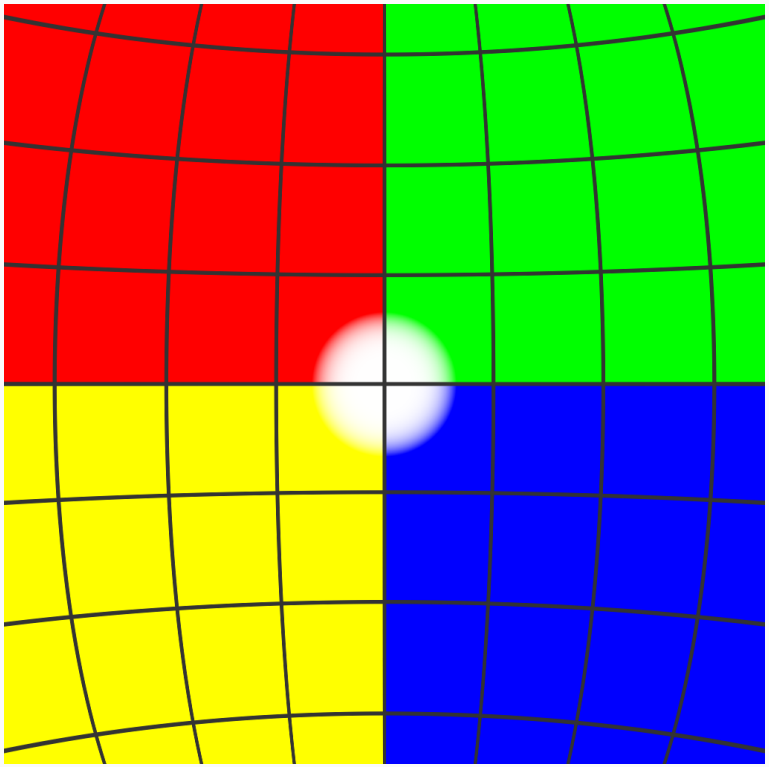




How to draw black holes on a computer

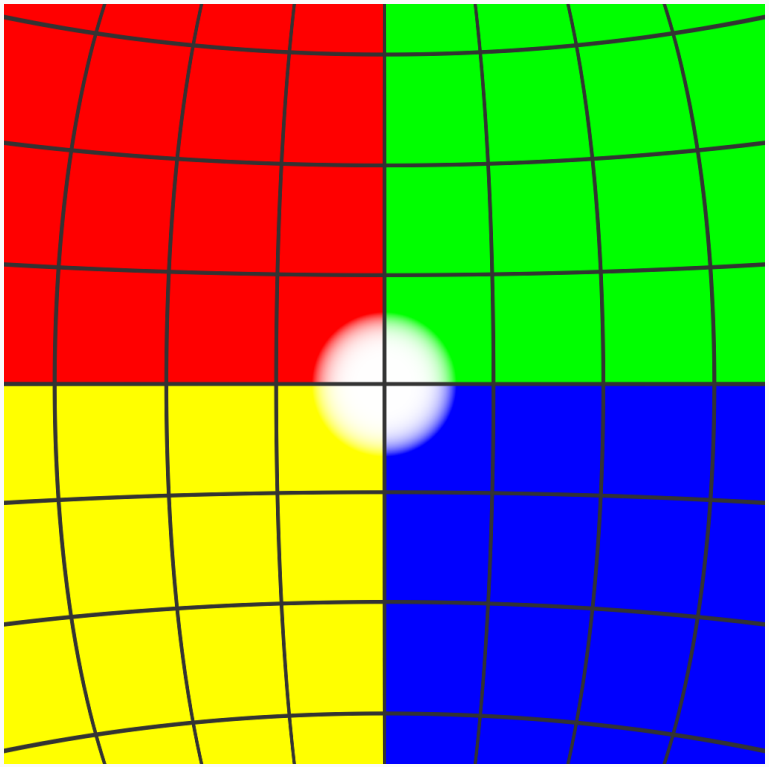


Black hole images



(a) without black hole

Black hole images



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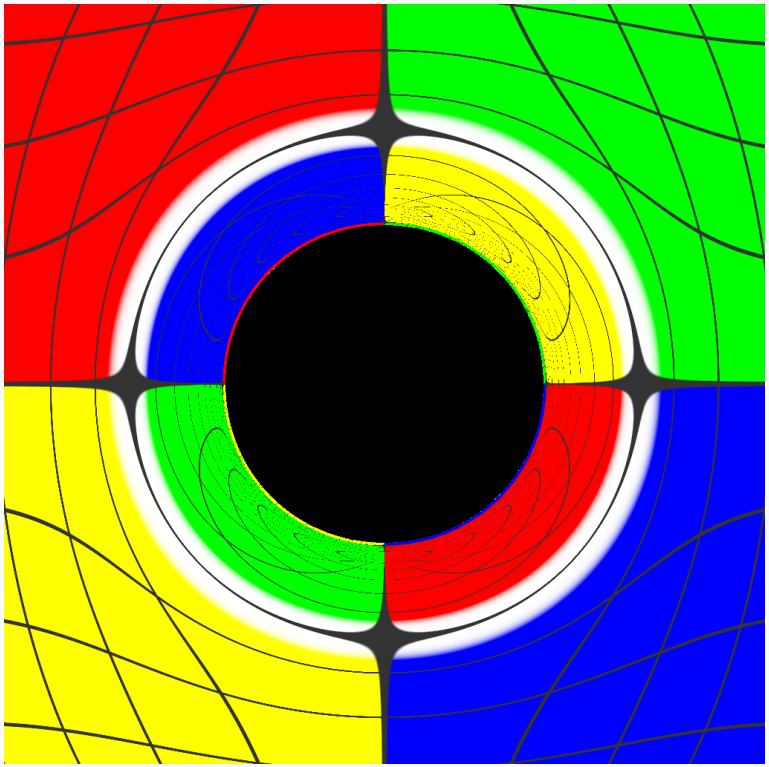
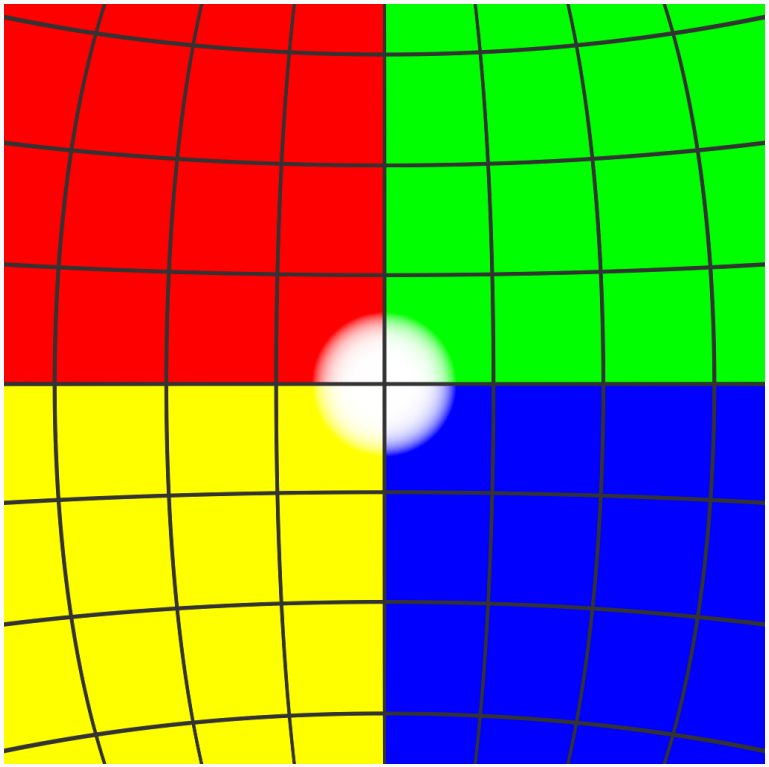
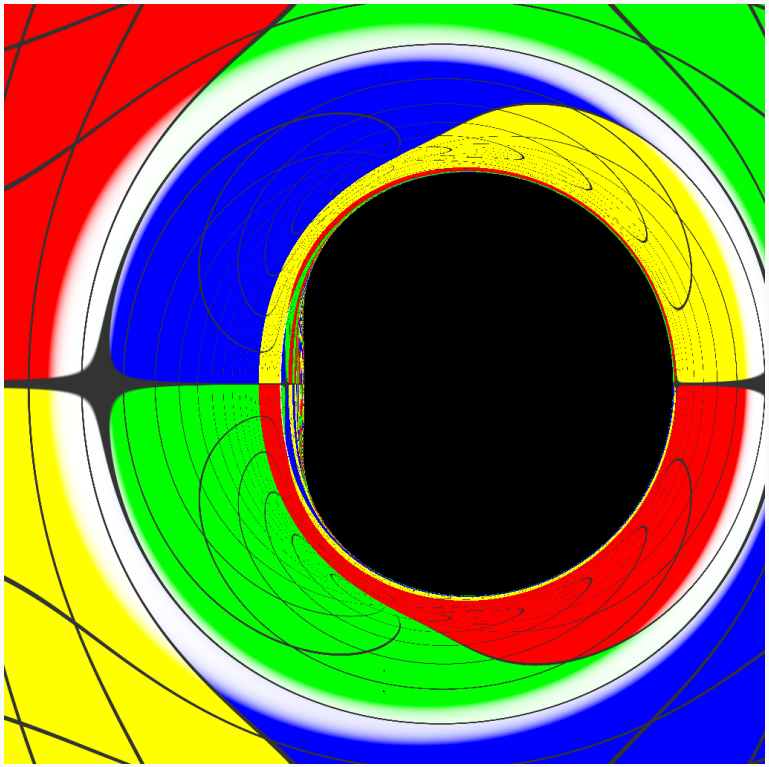


(b) with black hole (non-rotating)

Black hole images

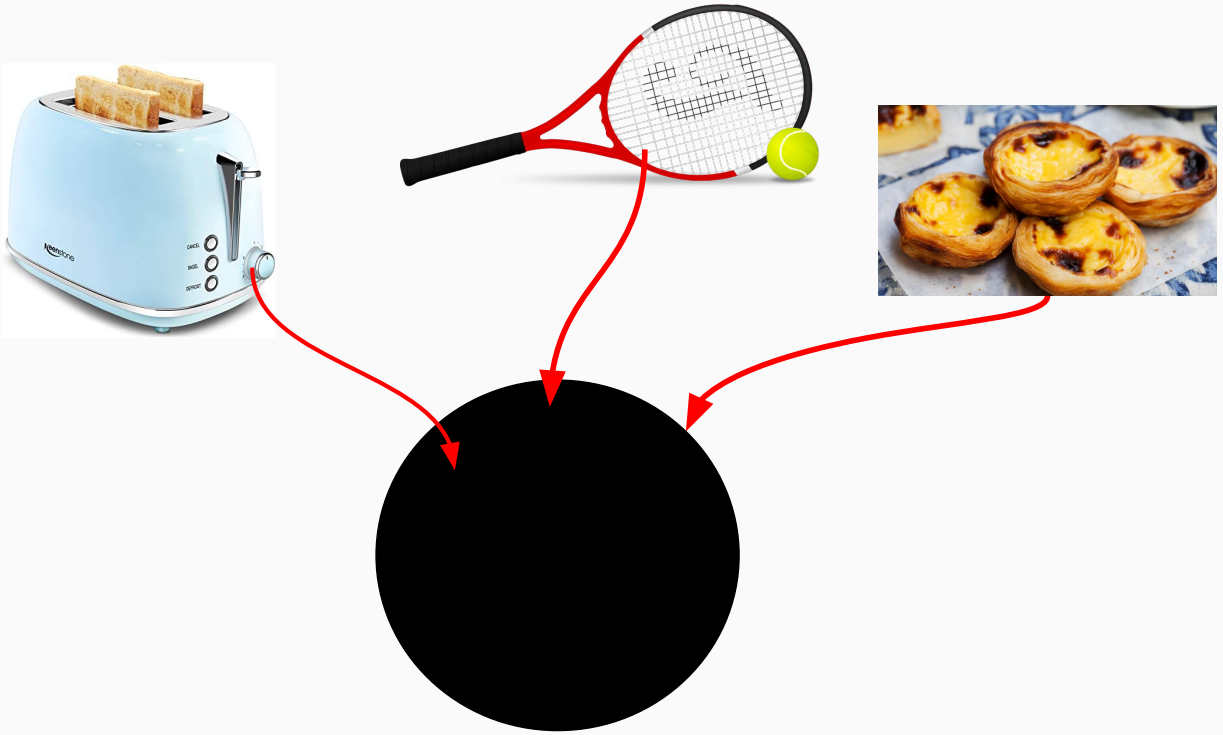


(a) without black hole



(b) with black hole (rotating)

The Kerr hypothesis



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Mass + Angular momentum

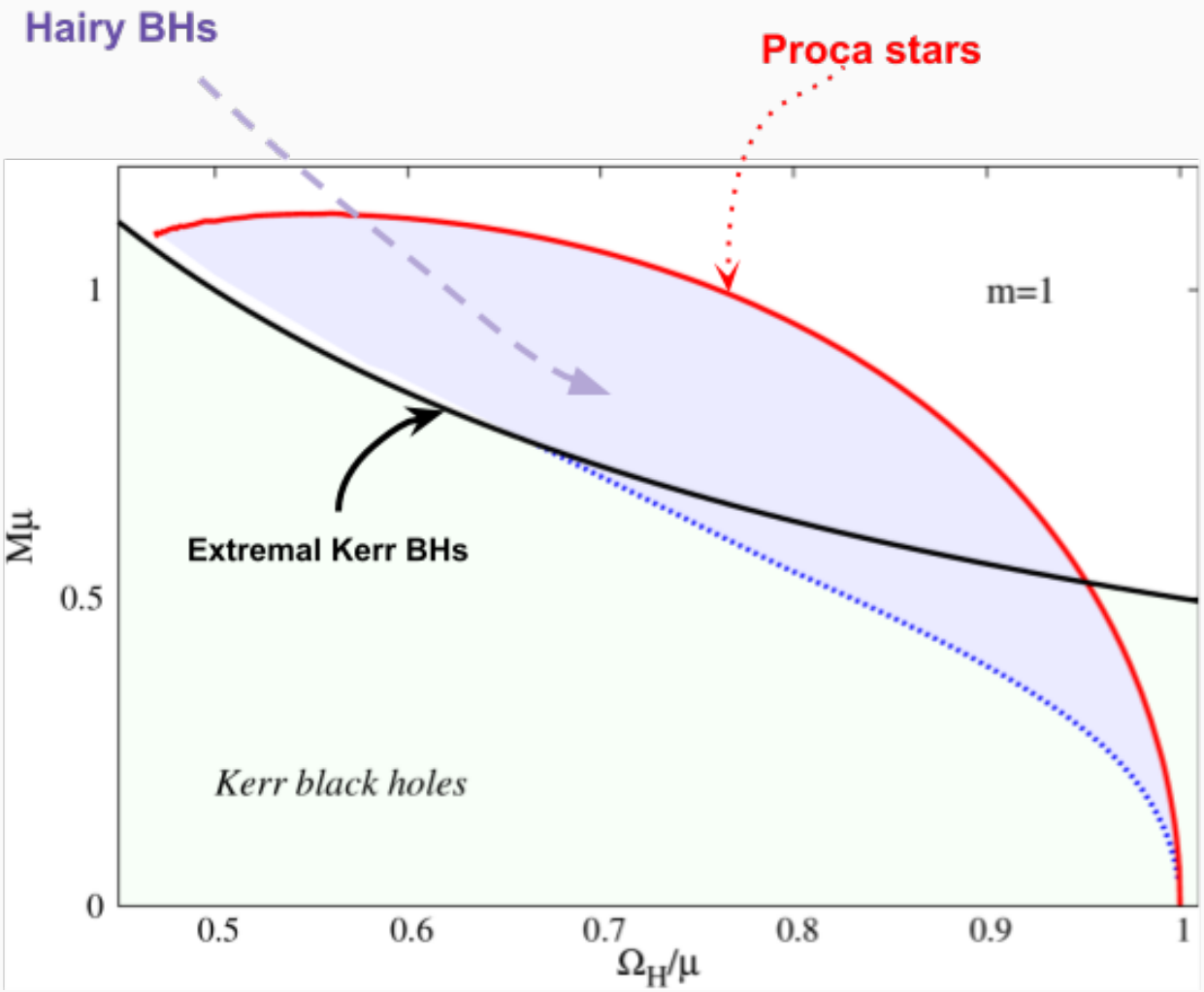
Proca hair – a viable alternative

Mass + Angular momentum +  ???

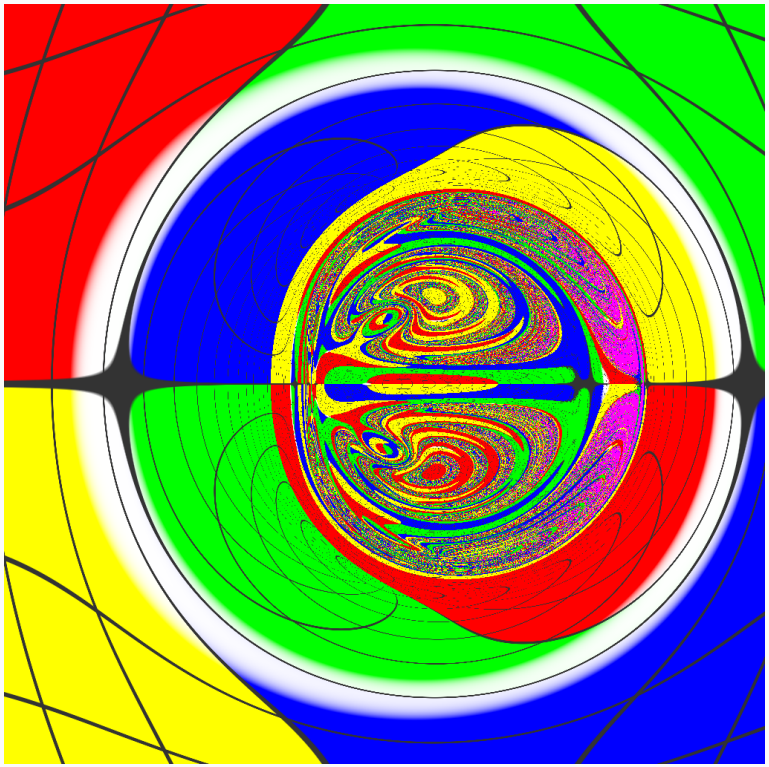
Hairy black hole solutions can be obtained by coupling gravity to a bosonic field. Like, for instance, Proca:

$$S = \int d^4x\sqrt{-g}\left(\frac{R}{16\pi} - \frac{1}{4}F_{\alpha\beta}\bar{F}^{\alpha\beta} - \frac{1}{2}\mu^2 A_\alpha \bar{A}^\alpha\right) \qquad (1)$$

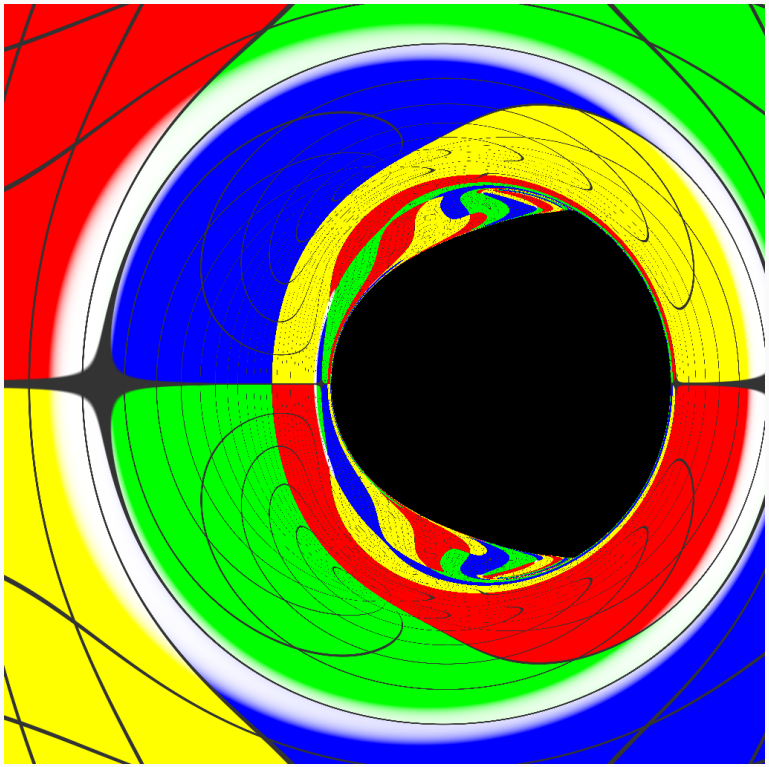
KBHsPH domain of existence



Kerr BHs with Proca hair (KBHsPH)

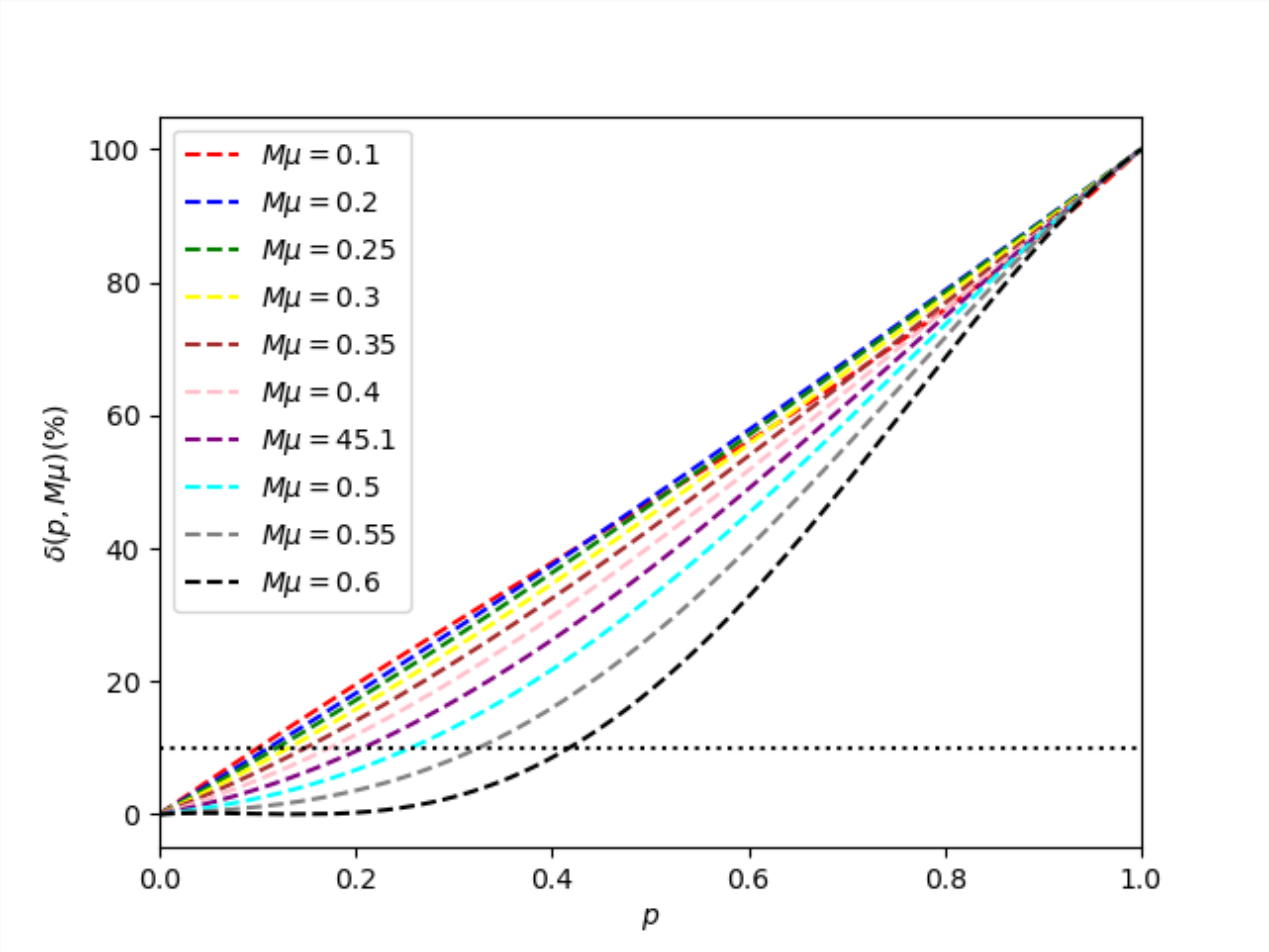


(a) Proca star



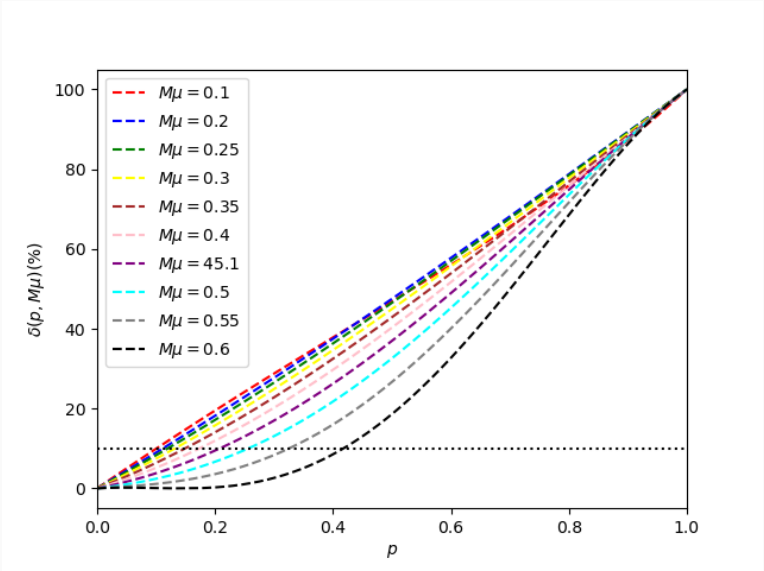
(b) Black hole with Proca hair

What can we learn from EHT

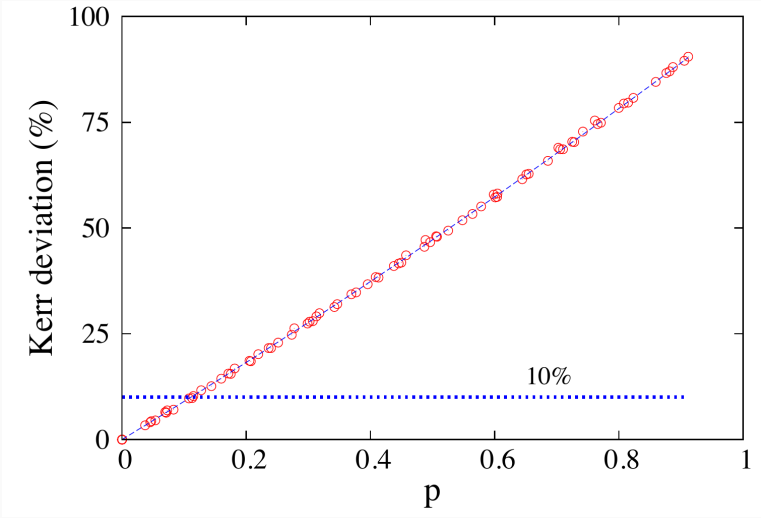


(Work in progress)

What can we learn from EHT

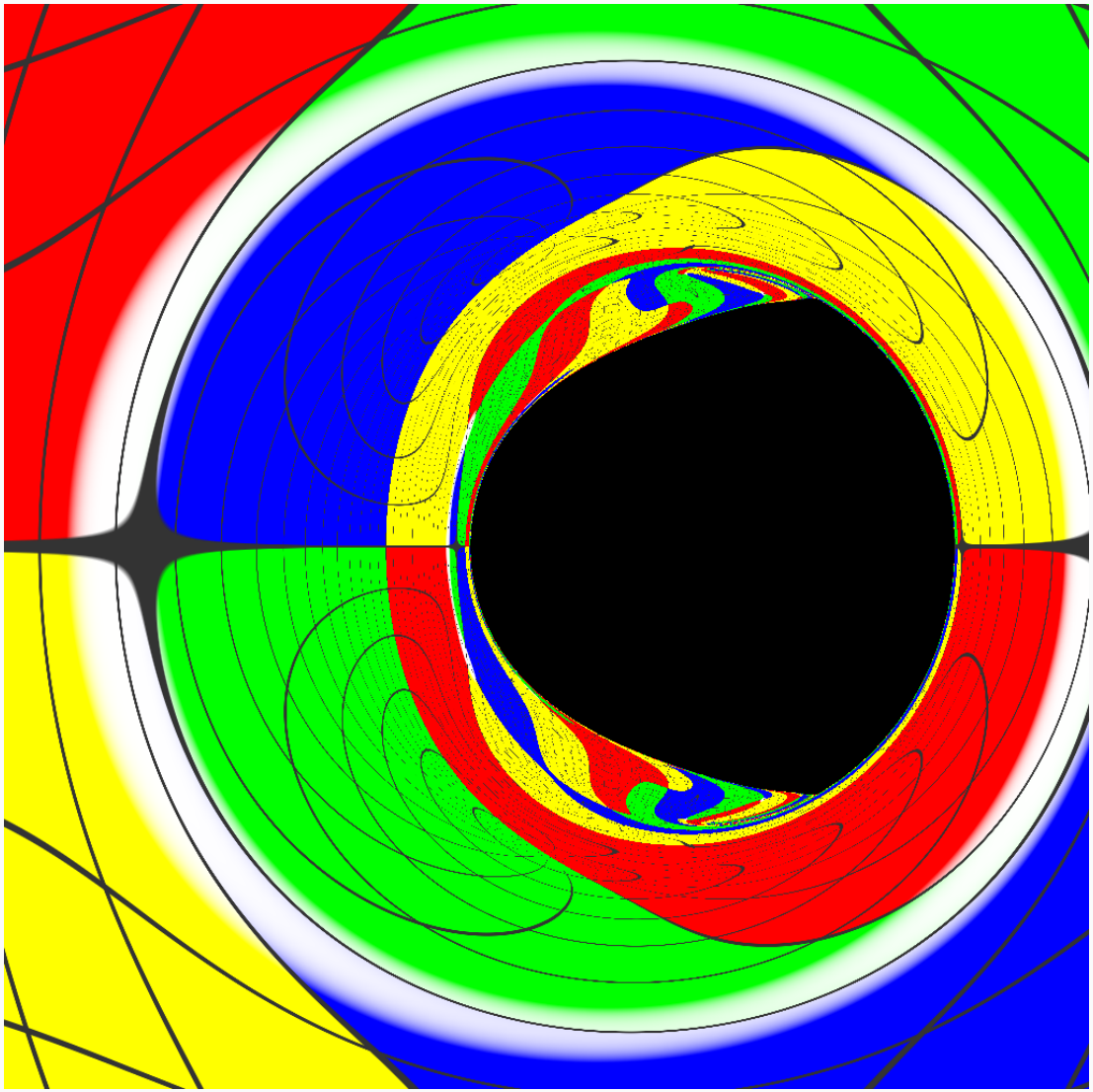


(a) Proca case (Work in progress)



(b) Scalar case (arXiv:93080.9091)

Thank you!



EXTRA