The quest for physics at shortest scales

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Quantum Gravity group of Piero Nicolini / Marcus Bleicher
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A popular approach
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One of the planets visited, huge time dilation

Spinning astrophysical black hole „Gargantua“
Astrophysical black hole

- Mass: $10^{31}$ kilograms
- Radius: 20 kilometers
- Evaporation time: $10^{67}$ years

Companion star
Accretion disk
Black hole
Jet
In „Interstellar“, there is...

...bidirectional wormhole traveling

...A guy traveling to the origin of a BH for collecting Quantum Gravity measurement data...
A guy at the center in the black hole in „Interstellar“
The physicist's point of view: Schwarzschild's black hole

- Traveling inside the Black Hole
- for the math nerds

\[ T \sim r^{-1} \]

\[ r_H \sim M \]
Quantum Gravity?
Black Holes

Macroscopic

- Companion star
- Black hole
- Jet

Accretion disk

Mass: $10^{31}$ kilograms
Radius: 20 kilometers
Evaporation time: $10^{67}$ years

Microscopic

- Proton
- Black hole

Mass: $10^{-23}$ kilogram
Radius: $10^{-19}$ meter
Evaporation time: $10^{-26}$ second
The cube of physics

\[
c \approx 10^8 \text{m/s}
\]

\[
G \approx 10^{-11} \text{m}^3\text{kg}^{-1}\text{s}^{-2}
\]

\[
\hbar \approx 10^{-32} \text{J s}
\]
Approaches to Quantum Gravity

- String theory, Quantum Loop theory, ...

- What we do: Introducing concepts to General Relativity like further uncertainty principles, etc
Thank you for your attention