

Light rings of black holes and black rings in 5D

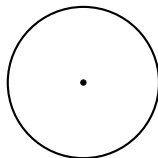
Tom Lemmens

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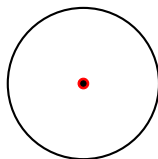
Athens 2019: Gravitational Waves, Black Holes and
Fundamental Physics

String theory corrections at the horizon?



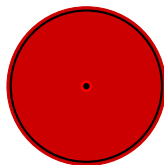
String theory corrections at the horizon?

- singularity resolution



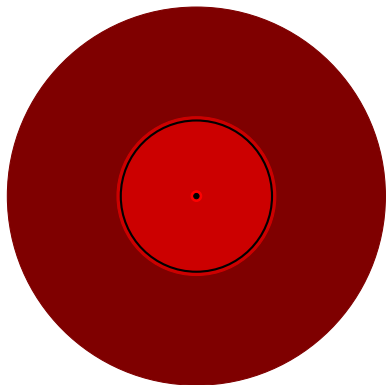
String theory corrections at the horizon?

- singularity resolution
- interior and/or close to the horizon



String theory corrections at the horizon?

- singularity resolution
- interior and/or close to the horizon
- replace the whole BH metric



multi center metrics in SUGRA

- same mass, spin and charge as BH

multi center metrics in SUGRA

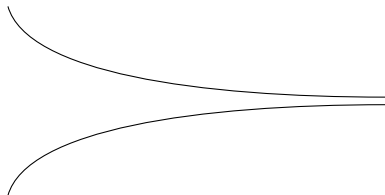
- same mass, spin and charge as BH
- can be smooth and horizon free

multi center metrics in SUGRA

- same mass, spin and charge as BH
- can be smooth and horizon free
- $D \geq 5$

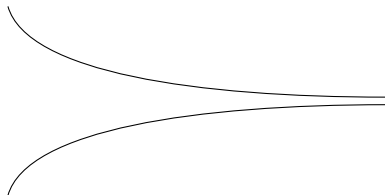
multi center metrics in SUGRA

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multi center metrics in SUGRA

- same mass, spin and charge as BH
- can be smooth and horizon free
- $D \geq 5$
- easiest examples: BH and black ring in 5D



A black hole and black ring in 5D

A black hole and black ring in 5D

$$\begin{array}{c|c} 4\text{D} & 5\text{D} \\ \hline \text{RN: } (M = Q, J = 0) & \end{array}$$

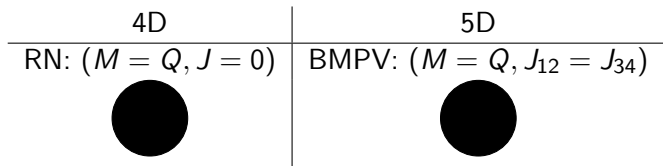
A black hole and black ring in 5D

$$\begin{array}{c|c} 4\text{D} & 5\text{D} \\ \hline \text{RN: } (M = Q, J = 0) & (M = Q,) \end{array}$$

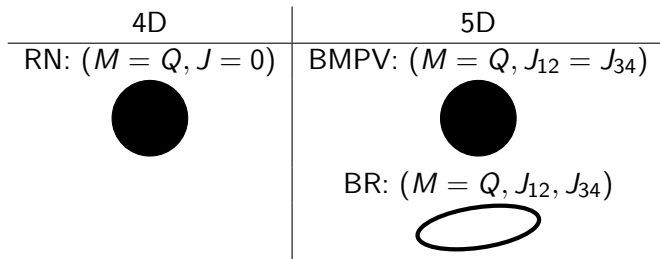
A black hole and black ring in 5D

$4D$ <hr style="border: 0; border-top: 1px solid black;"/> RN: $(M = Q, J = 0)$	$5D$ <hr style="border: 0; border-top: 1px solid black;"/> BMPV: $(M = Q, J_{12} = J_{34})$
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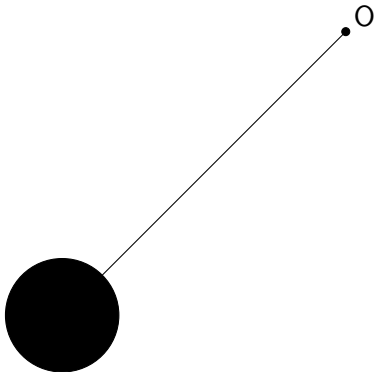
A black hole and black ring in 5D



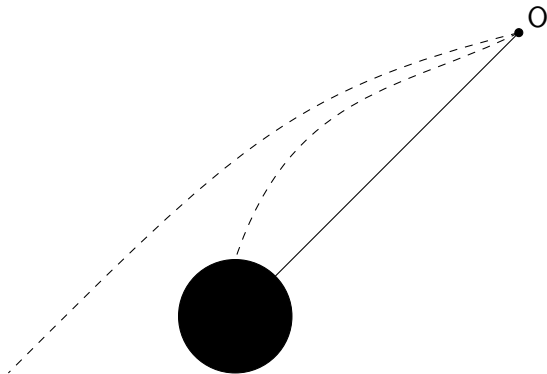
A black hole and black ring in 5D



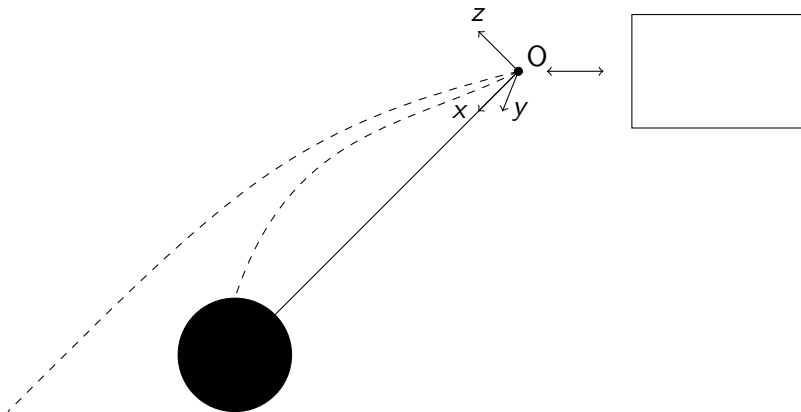
Raytracing in 4D



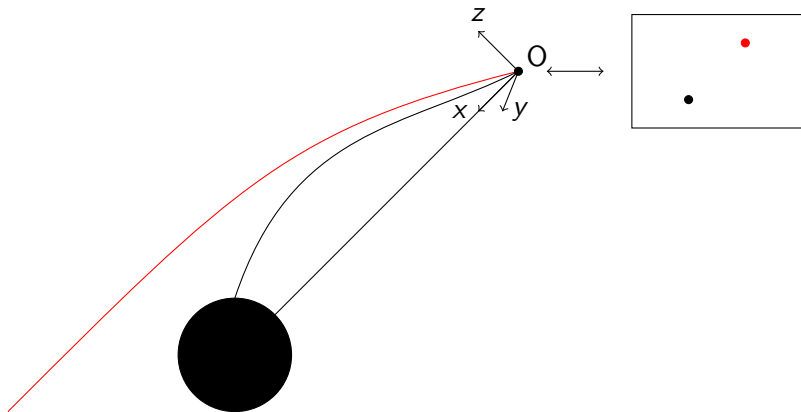
Raytracing in 4D



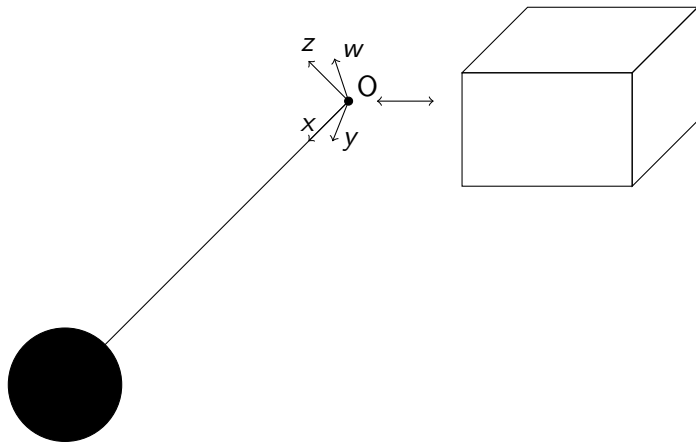
Raytracing in 4D



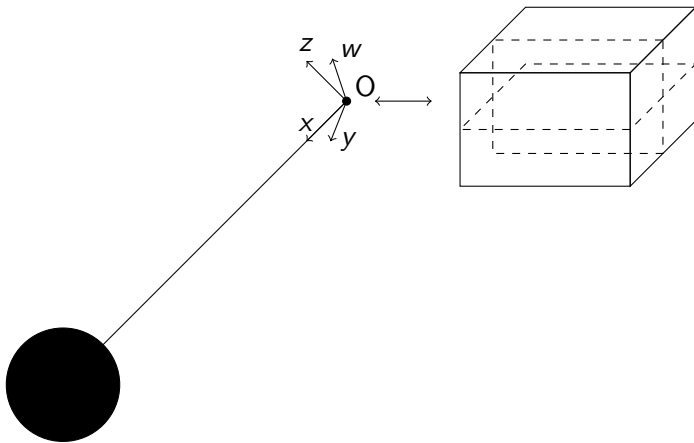
Raytracing in 4D



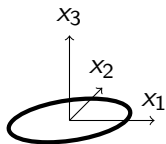
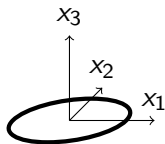
Raytracing in 5D



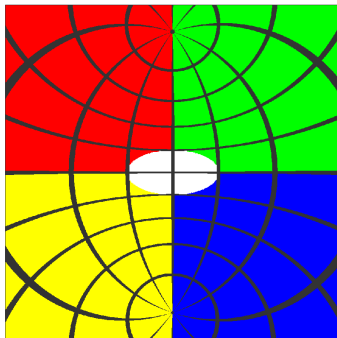
Raytracing in 5D



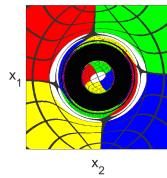
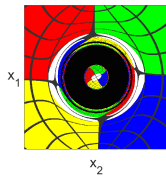
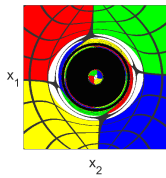
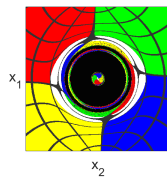
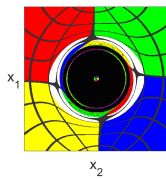
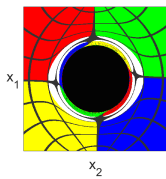
Observer placement



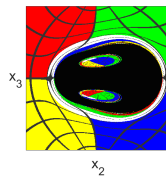
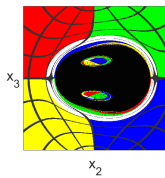
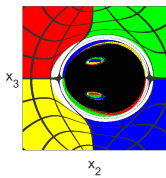
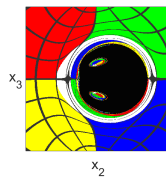
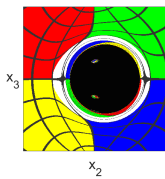
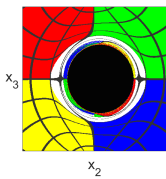
Reference



Face-on



Edge-on



Conclusion

Conclusion

- what we have now
 - code for axisymmetric multicenter solutions in 5D
 - light ring and lensing for black hole and black ring

Conclusion

- what we have now
 - code for axisymmetric multicenter solutions in 5D
 - light ring and lensing for black hole and black ring
- future
 - Meyers-Perry black hole and non SUSY black ring
 - more general multicenter solutions
 - waves in multicenter solutions