

The background of the slide is a 3D visualization of a gravitational well, represented by a grid of blue lines that curves inward towards a central point. In the center of this well, two black spheres represent black holes, with white arrows indicating they are in a circular orbit around each other.

Astrophysical Black Holes

Alberto Sesana

Albert Einstein Institute, Golm

Paris 23/10/2012

OUTLINE

1- What we have done

2- What we should do

3- Who is “we”?

4- Getting support from the astrophysical community

Results of the eLISA science case:

Results of the eLISA science case:

>Individual sources:

- Individual (redshifted) masses to $<1\%$ relative accuracy
- spin of the primary hole to <0.1 (in many cases to <0.01)
- sky location to 10-1000 deg
- luminosity distance to $<10\%$ in most cases
- no emphasis on multimessenger astronomy

Results of the eLISA science case:

>Individual sources:

- Individual (redshifted) masses to $<1\%$ relative accuracy
- spin of the primary hole to <0.1 (in many cases to <0.01)
- sky location to 10-1000 deg
- luminosity distance to $<10\%$ in most cases
- no emphasis on multimessenger astronomy

>Population studies:

- few detection will enable sensible astrophysical statements about MBH seeds and cosmic growth
- test made mainly on a discrete set of models

Individual sources:

Individual sources:

- Numbers can be easily recomputed for any design**

Individual sources:

- Numbers can be easily recomputed for any design
- Push on the parameter estimation side (DA group)
 - >Fully informative waveforms
 - >6 links?

Individual sources:

- Numbers can be easily recomputed for any design
- Push on the parameter estimation side (DA group)
 - >Fully informative waveforms
 - >6 links?
- Try to 'restore' the link to the astrophysical community by putting some more effort in multimessenger astronomy (e.g. spin-gas connection with ALMA)

Individual sources:

- Numbers can be easily recomputed for any design
- Push on the parameter estimation side (DA group)
 - >Fully informative waveforms
 - >6 links?
- Try to 'restore' the link to the astrophysical community by putting some more effort in multimessenger astronomy (e.g. spin-gas connection with ALMA)
- Put everything in prospective! Where will we be in 10 years from now? (eROSITA, LOFT, EUCLID, JWST, SKA)

Population studies:

Population studies:

-Models used so far were highly idealized and quite distinct one from each other:

try a more realistic, parametric approach!

(that might be an hard challenge)

Population studies:

-Models used so far were highly idealized and quite distinct one from each other:

**try a more realistic, parametric approach!
(that might be an hard challenge)**

-Investigate astrophysical populations of different origins (e.g. IMBHs in GCs)

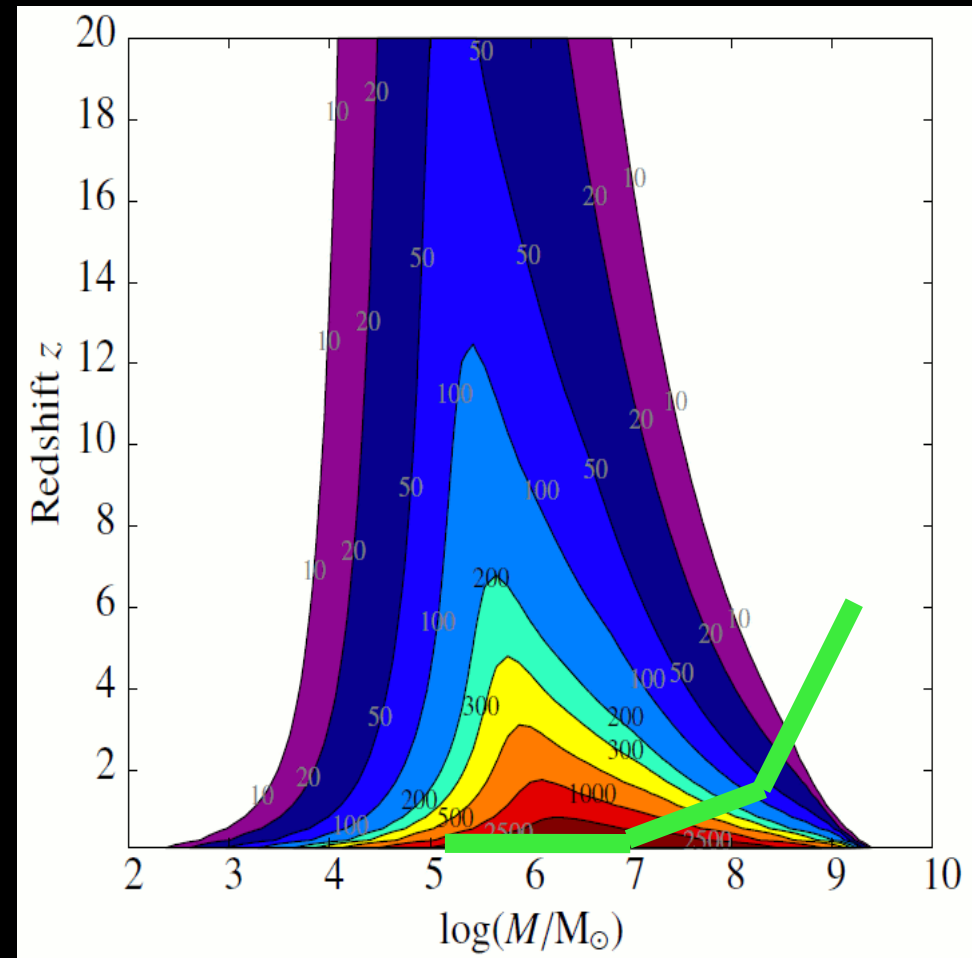
Population studies:

-Models used so far were highly idealized and quite distinct one from each other:

try a more realistic, parametric approach!
(that might be an hard challenge)

-Investigate astrophysical populations of different origins (e.g. IMBHs in GCs)

-Put everything in prospective!
Where will we be in 10 years from now? (eROSITA, LOFT, EUCLID, JWST, SKA)



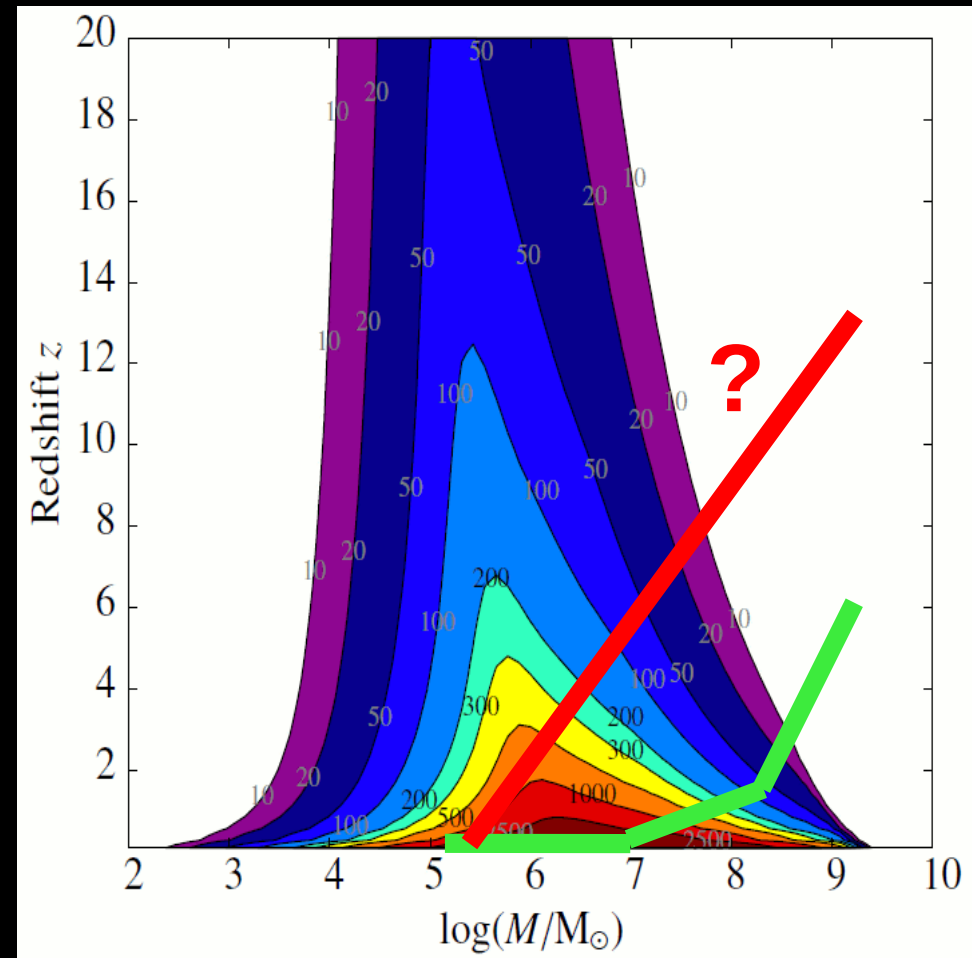
Population studies:

-Models used so far were highly idealized and quite distinct one from each other:

try a more realistic, parametric approach!
(that might be an hard challenge)

-Investigate astrophysical populations of different origins (e.g. IMBHs in GCs)

-Put everything in prospective!
Where will we be in 10 years from now? (eROSITA, LOFT, EUCLID, JWST, SKA)



Who is 'we'?

Who is 'we'?

Amaro-Seoane, Berti, Babak, Cornish, Colpi, Gair, Petiteau, Porter,
Sesana, Volonteri...

Who is 'we'?

Amaro-Seoane, Berti, Babak, Cornish, Colpi, Gair, Petiteau, Porter, Sesana, Volonteri...

-How many ***astro*physicists** are in this room?

-Technological developments are funded, but what about the science?

Who is 'we'?

Amaro-Seoane, Berti, Babak, Cornish, Colpi, Gair, Petiteau, Porter, Sesana, Volonteri...

- How many ***astro*physicists** are in this room?
- Technological developments are funded, but what about the science?
- Need financial support and a clear plan for eLISA related activity:
 - >Partially support activity of students/postdoc
 - >Travels and meetings

Who is 'we'?

Amaro-Seoane, Berti, Babak, Cornish, Colpi, Gair, Petiteau, Porter, Sesana, Volonteri...

-How many ***astro*physicists** are in this room?

-Technological developments are funded, but what about the science?

-Need financial support and a clear plan for eLISA related activity:

--->Partially support activity of students/postdoc

--->Travels and meetings

-Without money/programmatic it is hard to ask people to work on related topics

--->Example 1: good students in Milan Paris absorbed by Euclid

--->Example 2: European proposal mentioning eLISA killed

Who is 'we'?

Amaro-Seoane, Berti, Babak, Cornish, Colpi, Gair, Petiteau, Porter, Sesana, Volonteri...

- How many ***astro*physicists** are in this room?
- Technological developments are funded, but what about the science?
- Need financial support and a clear plan for eLISA related activity:
 - >Partially support activity of students/postdoc
 - >Travels and meetings
- Without money/programmatic it is hard to ask people to work on related topics
 - >Example 1: good students in Milan Paris absorbed by Euclid
 - >Example 2: European proposal mentioning eLISA killed
- Hard to identify a core group that can take the burden of this commitment

Topics which are not directly dependent on eLISA:

-Observational searches of MBH binaries

(Dotti, Colpi, Montuori, Decarli, Tsalmantza, Eracleous)

-Modelling of MBH binary dynamics in stellar and gas environments

(Spurzem, Preto, Amaro-Seoane, Merritt, Gualandris, Cuadra, Roedig, Dotti, King, Krolik, Mayer etc...)

-Modelling of the EM signatures related to such MBH binaries

(See above, plus Haiman, Kocsis...)

-Cosmological models of MBH formation (seeds) and growth

(Volonteri, Rossi, Barausse, White group at MPA, Durham group)

Topics which are not directly dependent on eLISA:

-Observational searches of MBH binaries

(Dotti, Colpi, Montuori, Decarli, Tsalmantza, Eracleous)

-Modelling of MBH binary dynamics in stellar and gas environments

(Spurzem, Preto, Amaro-Seoane, Merritt, Gualandris, Cuadra, Roedig, Dotti, King, Krolik, Mayer etc...)

-Modelling of the EM signatures related to such MBH binaries

(See above, plus Haiman, Kocsis...)

-Cosmological models of MBH formation (seeds) and growth

(Volonteri, Rossi, Barausse, White group at MPA, Durham group)

Can we get a larger reach among them?

-*Support* these activities---> e.g. collaboration meetings (but money)

-*Get in touch* with the community making clear what is going on within ESA, and what is a 'realistic' timeline for eLISA

-*Advocate* eLISA/GWs at meetings and conferences

-*Ask* to mention in their paper the potential impact for eLISA/GW science of their studies

