
How will theory, observation and
instrument development interact within
the field?

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My charge

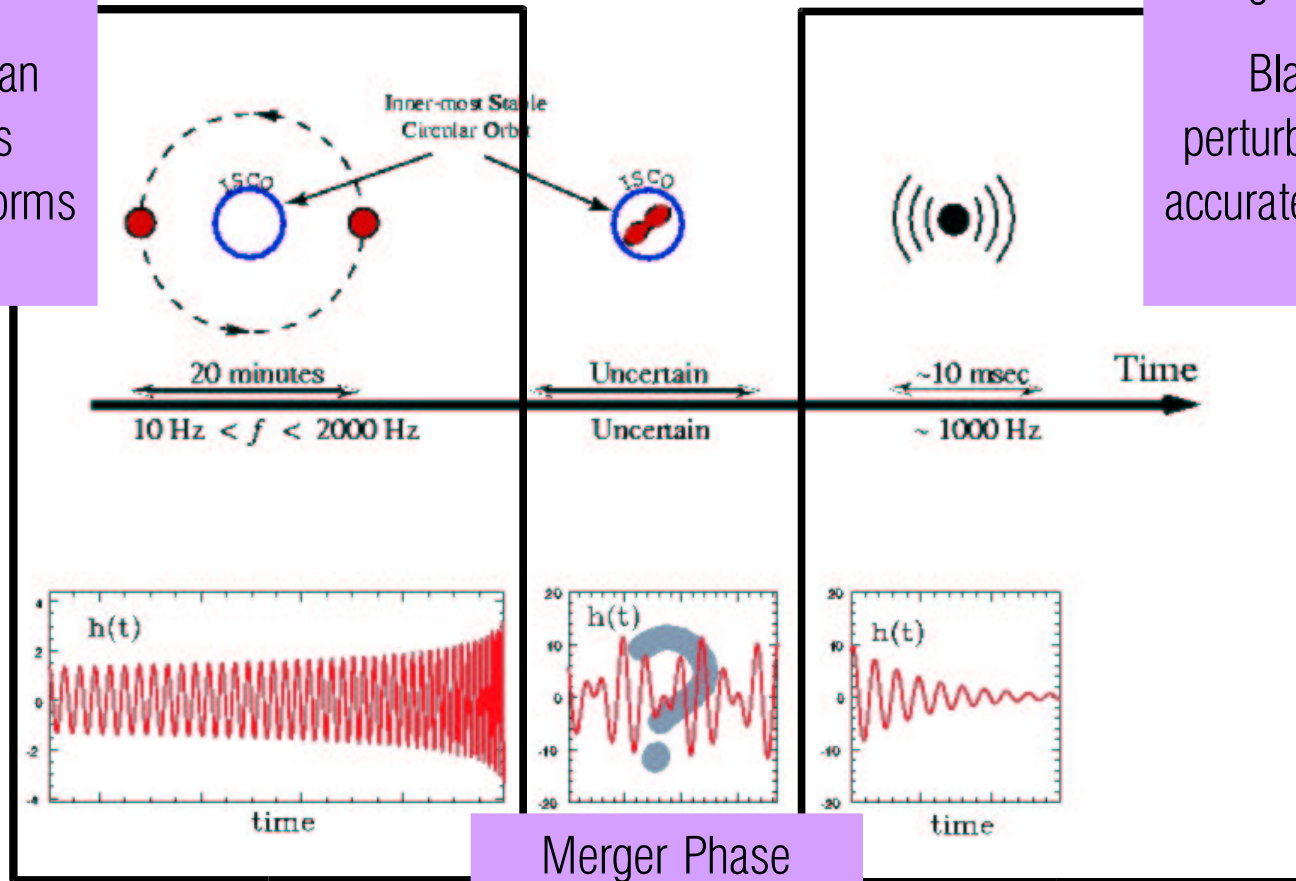
- Finn:
 - » “would you be willing to speak a session with Peter Saulson and you, as speakers to the question "How will theory, observation, and instrument development interact within the field?" would be a good line-up to spur thinking and discussion.”
- Brady:
 - » “Sure, I could give a talk on that subject. I haven't given it a lot of thought recently, but I generally have an opinion ;) and there's enough time to come up with something to say.”
- What I came up with
 - » “More of the same”

Observers

- Primary science objectives
 - » Identify (non-)interesting objects
 - » Classify these objects
 - » Publish spectra
 - » Publish waveforms
 - » Publish parameters <--> Theory
 - » Establish populations <--> Phenomenology
 - » What else?
- Other aspects
 - » Data reduction
 - » Data analysis methods & implementation
 - » Explore new observational regimes <--> Instrument Design
 - » Non-GW observers

Case Study: Compact Binary Systems

Inspiral Phase
Post-Newtonian
approx gives
accurate waveforms



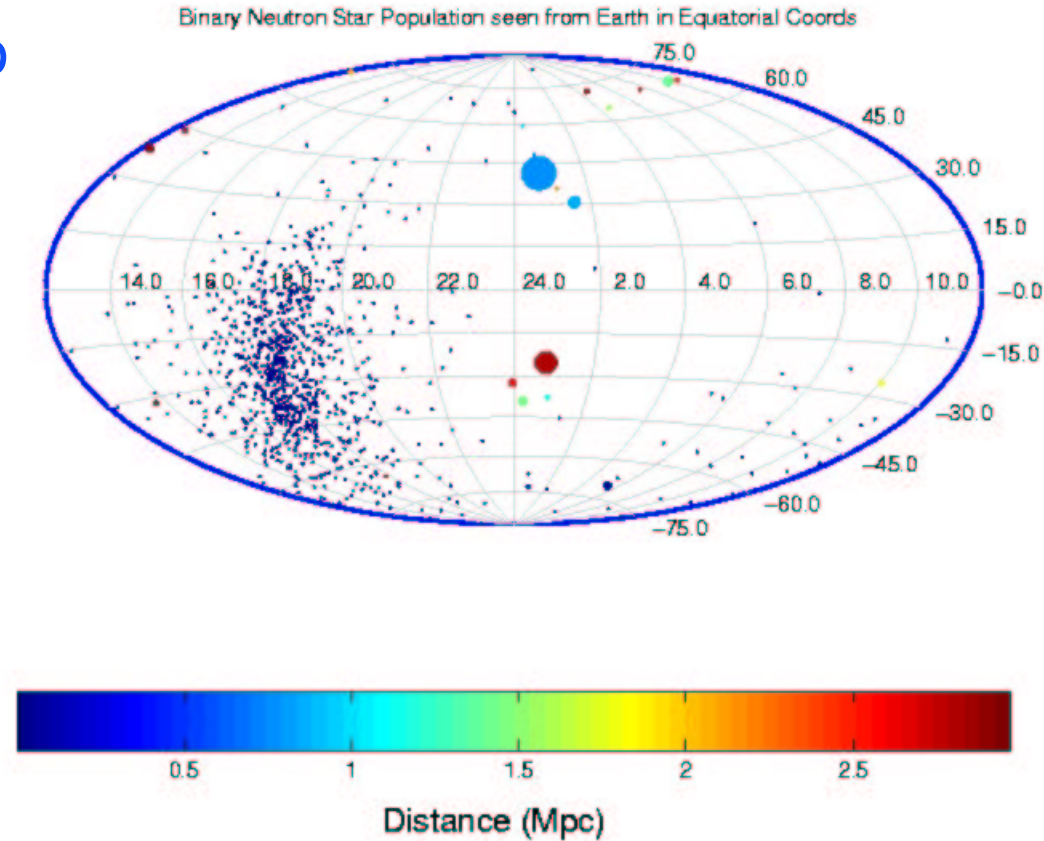
Ringdown Phase
Black hole
perturbation gives
accurate waveforms

Merger Phase
Need numerical
relativity

Sky maps

Spatial distribution of
Galaxies accessible to
LIGO S2 analysis for
binary neutron stars

Reminder of Peter's
talk about position
localization



Example of position information from LIGO

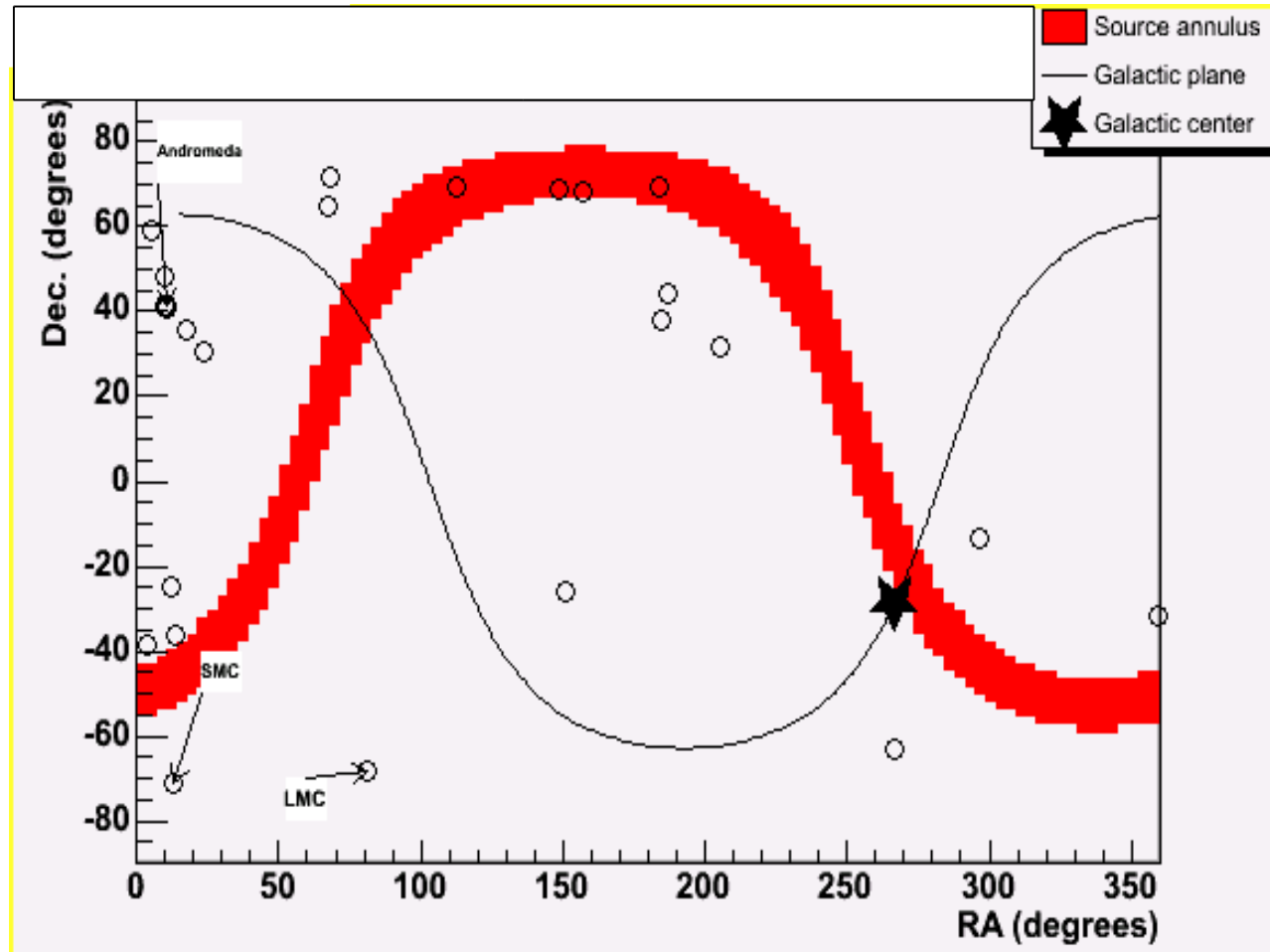
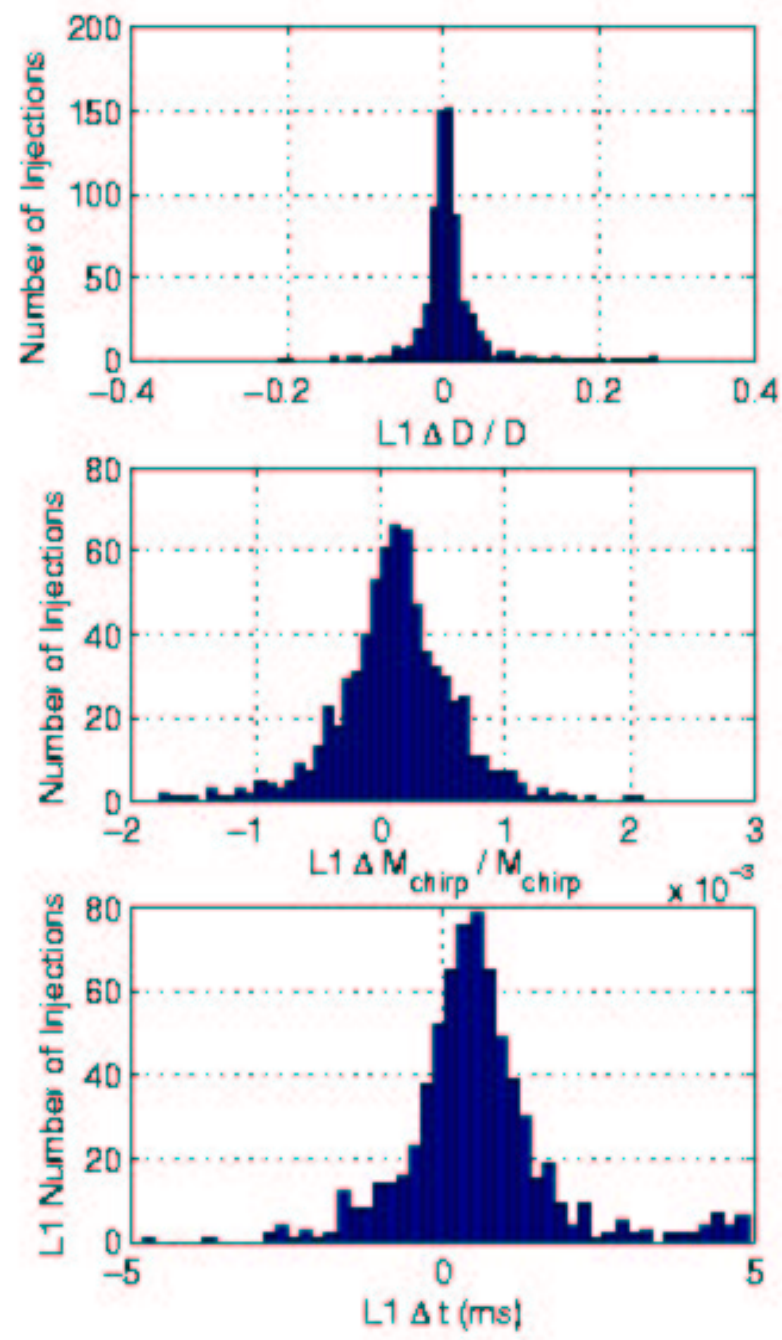
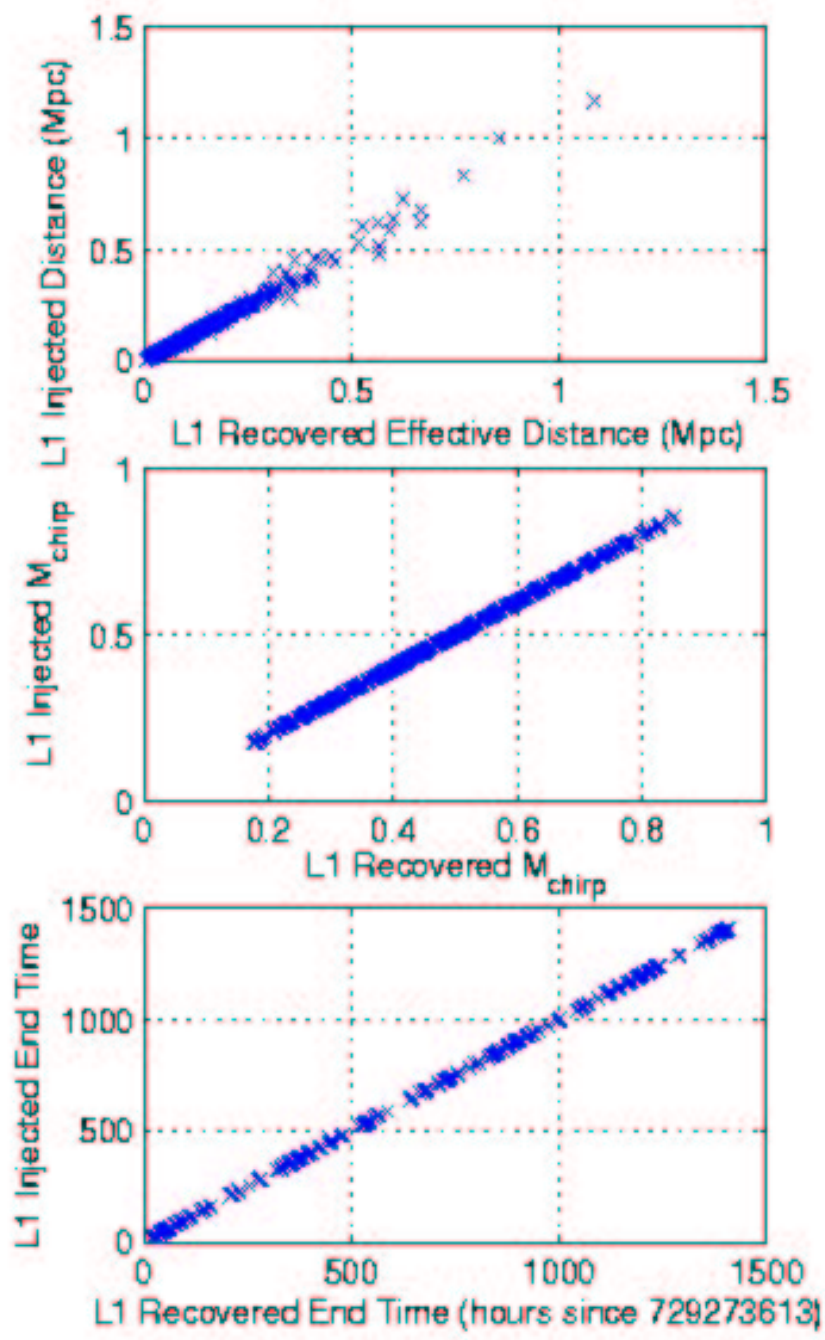


Figure:
K Rawlins

Theorists/Phenomenologists

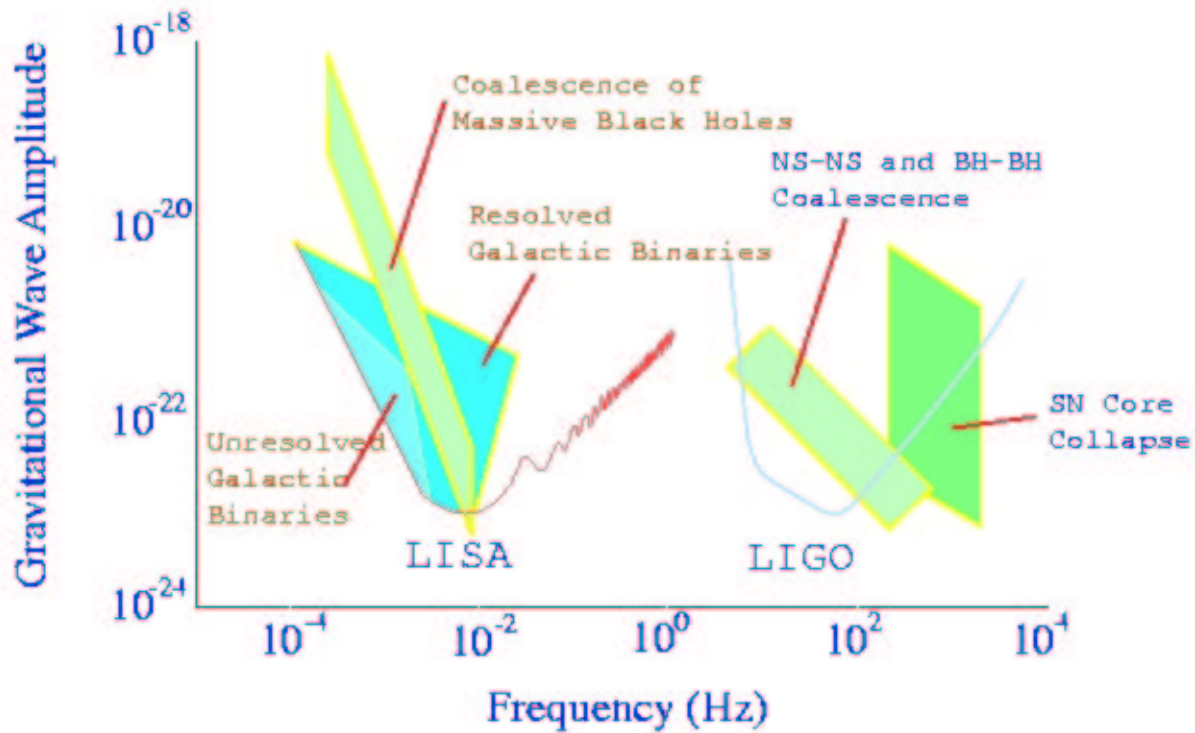
- Primary science objectives
 - » Model physical processes in the Universe
<--> Observation
 - » Develop methods to determine the gravitational signals
 - » Understand failures of current theories
<--> Observation
 - » Understand how sources imprint physics on signals
<--> Observation
 - » How do the populations arise/evolve?
<--> Observation
- Other aspects
 - » New instruments to answer new questions?
<--> Instruments Design
 - » Special observations to do the same?



Instrument Designers and Developers

- Primary science objectives
 - » Develop precision measurement
 - » Overcome fundamental science obstacles <--> Theory
 - » Many instrumentalists will also be observers
 - » Design to match science drivers, target sources
 - <--> Observation
 - <-- Theory
 - <-- Phenomenology
- Other aspects
 - » Instrument design pushes (and is pushed by) engineering
 - » Space-based instruments present unique challenges/opportunities

LISA and LIGO



How will we manage our science and data?

- Publish raw or processed GW channel(s)?
- Publish only highly processed data
 - » Triggers, etc?
- Global Network
 - » Database of objects. Do we vet them? How?
 - » How to prioritize modifications and observing targets?
 - » How to try new ideas?
 - » Global forum? Advocacy? Proposals?
- What do I think?
 - » Encourage global network collaboratory (in long term)
 - » Publish objects in catalog; publish processed data
 - » Design database tools to interact with object catalogs