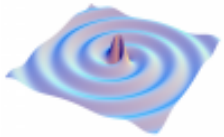
Inspiral Upper Limits: From data to science

Patrick R Brady
Department of Physics
University of Wisconsin-Milwaukee

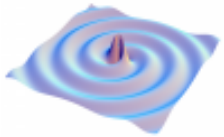
LIGO-G010356-00-Z

LSC Meeting, 15/08/2001



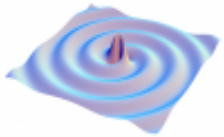
Binary neutron star science addressed

- Binary neutron stars
  - Determine an upper limit on event rate of inspirals
- Stage I: single interferometers
- Filter the GW signal & put events in database
  - LDAS/LAL/LALWrapper
- Filter auxilliary channels & inject triggers in database
  - DMT/LDAS/LAL/LALWrapper
- Select candidate events from "good" data
  - GUILD & "event analysis tools"
  - Vetoes based on auxilliary channel triggers
- Product: Lists of candidate events



Binary neutron star science addressed (cont'd)

- Stage II: multiple interferometers
  - Combine event lists looking for coincidences
  - Follow up survivors in coherent analysis
- Product: Lists of events by coherent SNR
  - Maybe no events!
- Stage III: statistical analysis of Poisson rate
  - $R_{90\%}$ with $P[R < R_{90\%}] = 0.9$
  - $R_{90\%} = \frac{2.3}{\varepsilon T_{\rm obs}}$
  - Need software injection of many signals to get ε
  - Fraction of events from target population detectable by pipeline I&II
    - inhomogeneous spatial distribution



Issues

- Astrophysical statement
  - requires accurate waveform for model population BBH debate!
  - ”correct” software injection process
  - ”correct” understanding of GW channel construction
- Poisson rate limit from
  - loudest event? What happens for no events?
  - Event counting? If we get thresholds wrong, too high a limit? Requires better noise statistics