
Inspiral Analysis Group Results and Plans

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for the Inspiral Group

Science goals

- Estimate the rate of compact binary inspiral by direct observation of gravitational waves
- Measure masses & spins of binaries & develop catalog of binaries for population studies
- Search for the inspiral, the merger-burst and/or ringdown waves
- Probe the disruption of neutron stars during binary merger.
- Test alternative theories of gravity & bound the mass of the graviton.

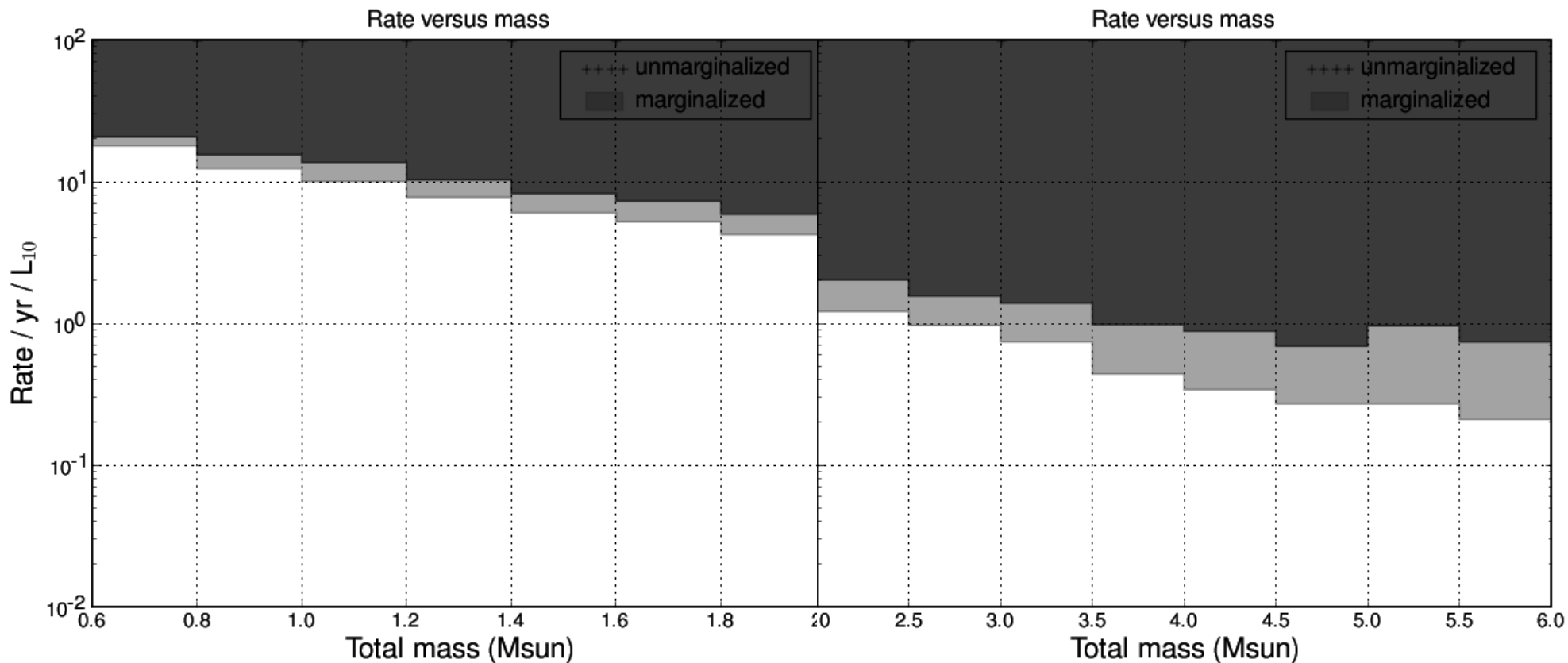
- see white paper for complete list!.

S3/S4 Joint Analysis Paper

- Includes S3/S4 results and
- S4 PBH upper limit 10 / yr / L10
- S4 BNS upper limit 1/ yr / L10
- S4 BBH upper limit coming soon
- **Paper** draft exists, Thomas Cokelaer corresponding author, available to LSC & review committee very soon, seek approval for submission in November
- Backed up by several **technical papers**: galaxy pop., systematics, pipeline, tuning. Drafts for November

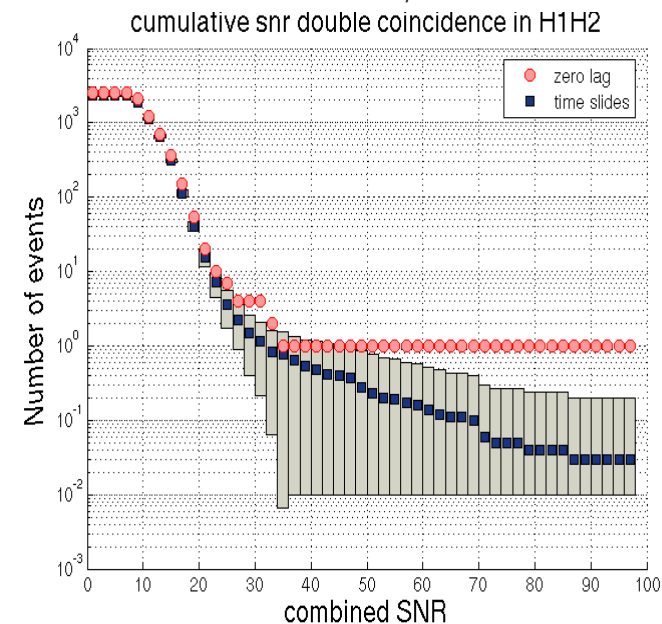
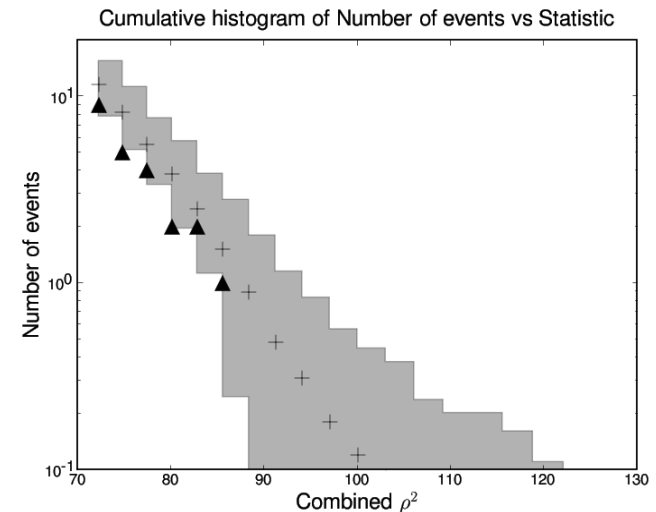
S4 upper limits

Upper limits versus mass



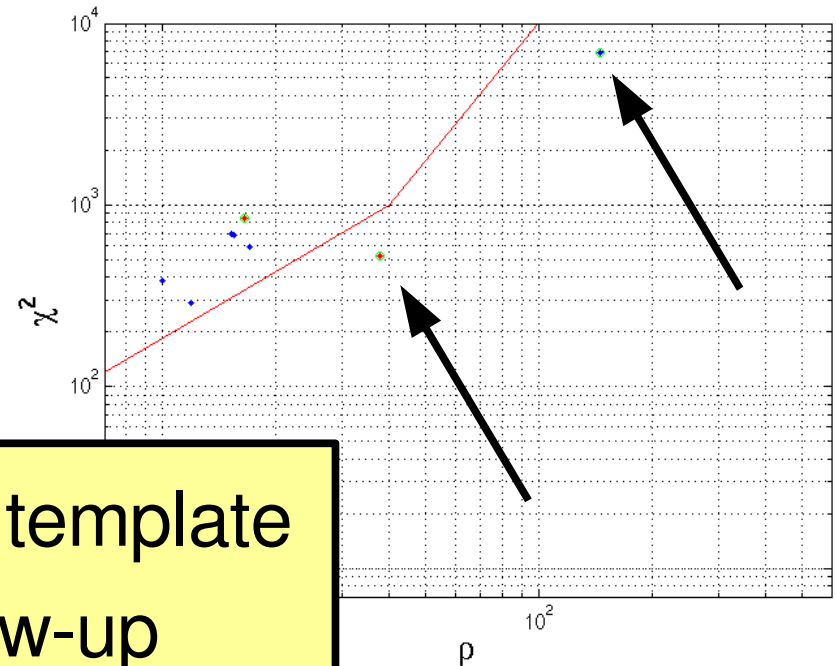
S3/S4 Searches

- Loudest events in each search followed up in detection exercise
- Detection checklist was updated in February 2006 and linked from inspiral group web site

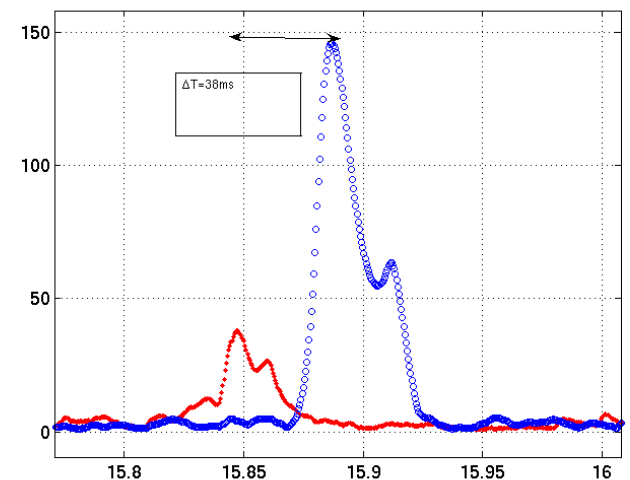


Follow-ups

- BBH search (S3)
 - H1 SNR=156, H2 SNR = 36
 - ~10% false alarm
- Pulled out detection checklist
- No smoking gun in aux / pem channels
- Continuing investigations



Physical template
follow-up



List of projects - Urgent

- S5 BNS/BBH; **paper** by Feb '07; see later
- S3 Spinning BBH (new analysis); **paper** in prep
- S4 Ringdown (new analysis); **paper** in Mar '07
- Follow-ups/detection checklist
 - Most urgent project being addressed by group,
 - Automation of follow-ups,
 - Improving vetoes, signal-based vetoes,

List of projects – cont'd

- Signal based vetoes
- S5 GRB triggered search
- S4/S5 Spinning BBH
- S5 time-domain
- Time-domain follow up
- S5 PBH
- Hierarchical pipeline

Publication plan for S5 data

- Binaries with $1.0 < m_1, m_2 < \sim 15.0$ Msun
- One calendar year analysis
 - Blind analysis of each epoch; combine upper limits using Bayesian methods
 - Epoch #1 open box & technical report for Nov LSC; can be presented during Dec '07 conferences assuming reviewed
 - Epoch #2 available in Nov '06
 - Complete result including **paper** Feb '07.

S5 analysis

- Better cover mass range: eliminate squares
- Bring in chisq for higher masses
- Bring in coherent H1/H2 statistic
- Improve mapping between SNR and false alarm
- Improve coincidence methods

S5 Epoch 1 BNS Plans

- Total time in triple coincident data ~ 0.1 years
- The total luminosity $\sim 300 L_{10} = 190$ MWEG
- $R_{90\%} \sim 0.08 \text{ yr}^{-1} L_{10}^{-1} = 0.13 \text{ yr}^{-1} \text{ MWEG}^{-1}$
- But don't quote this number outside this room...
 - Efficiency computed at threshold (limit will go up)
 - Error estimates not included (limit will go up)
 - No consideration of background, etc.
 - Not reviewed!
- Rate estimate from known NS binaries:

08/15/2006 $\sim 10^{-6} - 10^{-4} / \text{yr}$ in the Milky Way

Preparing for detection

- Group continues to gear its detection checklist
 - <http://www.lsc-group.phys.uwm.edu/iulgroup/papers/policy/detection.pdf>
- Prepare proposal for full scale mock detection challenge; ideas right now.
- Discussion of blind analysis procedures to avoid bias at detection stage; recent dry run reminded people that this goes both ways.

List of papers

Salmon: draft

Green: final draft

- S3/S4 joint (Nov 06)
- S3 SBBH (Mar '07)
- S4 Ringdown (Mar '07)
- S5 BNS [BBH] (Feb '07)
- S5 GRBs (Jun '07)
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- Galaxy pop (Nov 06)
- Pipeline (Nov 06)
- Tuning (Nov 06)
- Systematics (Nov 06)
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