

Minutes of meeting of Friday 13 March  
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\* Kip suggests that we merge with Sams group.

\* Agreement: I do minutes, Pat Brady does Web page.  
Tom Prince says does not have to be on the LIGO web site.

Pat + I commit to our respective tasks for 1 year.  
We contact Pat for stuff to put on the web pages.  
or links to link to.

LIGO guys says don't depend on LIGOs computers.  
Will be a tapir web page.

Bruce outlines plan of meeting:

1. Roster
2. Minutes
3. Web Page

ROSTER  
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Bruce says Rai says don't restrict our group to LSC members  
only???  
ie roster of working group, not LSC people only.

BRUCE:  
GOAL of LSC groups: determines priorities for LSC  
Establish roles and program for collaboration  
ie what are individual groups going to be doing,  
timetables, how fit together.

He wants each of us spend 5 minutes talking about work  
in each of our groups, and our view of priorities.  
Morning: work going on now

Afternoon: take first pass at establishing priorities.  
for what needs to be done.  
How will priorities be distributed to various groups.

Types of issues:

1. Broad structural issues.
2. Implementation specific things.

Bernie says 1 and 2 are coupled, eg cross correlation decision  
depends on practacilities.

He says define  
(i) science goals, then  
eg what sources

(ii) algorithms

(iii) implementation details.

Everything up to first science run.

Bruce has list of tasks for (ii) and (iii), but not (i).

Bruce: Third thing: Organize schedule for future meeting.

Suggests co-opting a monthly teleconference that has been going on with Kip, TOM Prince, Sam and Bruce.

Tom and Kip resist slightly, say they like to chew the fat on (i) and (ii), don't want to get bogged down in implementation.

Bernie: hard to link up with Potsdam, time difference.

People want to minimize travel.  
Regular phone meetings: consensus.

Horhaid says will be meetings anyway at bigger things.

Kip suggests something near LISA workshop this summer  
July 6 - 9. maybe we go 10 and 11 July ?

also  
GWDAAW

GWDAAW NOV 19-21

Pat suggests leaving this issue till later today.  
Next LSC meeting: AUG 13-15 in Boulder.

Bruce: purpose is to coordinate work to be ready for LIGO 1

Model from HEP. Coordinate all our proposals, be tightly coupled.

D Shoemaker said their goals to produce list of goals, branches points  
.. all be Sept 1?

Consensus: leave this issue till later.

ROSTER: of all people interested.  
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Kip raises the issue of division  
between source simulation community and data analysis community

\* Alan Wiseman  
Luc Blanchet  
Cliff Will  
B. Sathyaprakash  
Thibault Damour  
Bala Iyer

\* Kent Blackburn  
Matt Evans LIGO graduate students  
Don Hee  
Chip Sumner  
Albert Lazzarini  
Sam Finn

\* Tom Prince  
Stuart Anderson

\* Warren Anderson (Bruces grad student at UWM)  
Bruce Allen  
Balasubramanian  
Wensheng Hua (another grad student of Bruces)

Kip says Sams group includes  
Sumya Mohanty and Soma Mukherjee

\* Kip  
Pat Brady  
Jolien Creighton  
Teviet Creighton  
Scott Hughes  
Ben Owen  
Lee Lindblom  
T. Apostolator (hes just started a professorship in greece)

\*Bernard Schutz  
Ian Taylor  
Vlad Kondrashov  
Curt Cutler  
Alberto Vecchio  
Maria Alessandra Papa  
Alicia Sintes  
Andrzej Krolak  
Hernand Pastora  
Sanjeev Dhurandhar

He suggests draw in Bar Groups

Rome Group:  
Pia Astone  
Sergio Frasca

Virgo:  
CW source guy is Fulvio Ricci

\* Jorge Pullin

Richard Price  
Eric Poisson  
Serge Droz

Bernie suggests Nils Andersson  
Kostas Kokkotas in Greece.  
T. Nakamura

TAMA: Fujimoto is the project leader  
I. Kanda in charge of data analysis, he's here  
Seji Kawamura

\* Walid Majid  
Sarap Tilav  
Brent Ware

\* Eanna Flanagan

\* Pat Brady  
Lars Bildsten

Susan Scott  
Bernard Whiting.  
Adrian Ottiwell

I. Pinto for time frequency methods.  
B. Mours  
Michel Davier  
D. Verkindt

Purpose of roster  
Inform people of existence of group and meetings etc  
Also to identify people to solicit to join the group and do specific  
tasks.

PHASE TWO  
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Science Goals            Algorithms            Implementation  
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I. Alan Wiseman  
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Inspiralling Binaries

Mass range?

Kip says 0.05 solar masses???

We say this should be looked at or decided, to be done.

Matched filtering has been implemented.

Algorithms: Pade, Sathya.

Pat suggests adding Hierarchical searches into implementation

Kip: Equally important: multiple detector issue, says its  
an algorithm question.

Alan does source calcs, PN calculations etc.

Alan says still unresolved issues about how accurate these issues  
are.

Alan wants to work

Bruce says another issue is how is SNRs affected by how  
end of inspiral.

Only an issue for NSBH and BHBH cases.

Cutoff is 5 solar masses.

Major issue about 12 solar masses.

Kip: rule of thumb has been computations of waveforms NOT in LSC,

Barry Barish thinks NOT drag in theorists who work in this area.

Kip agrees.

Issue of boundary, lets return to this issue later.

We need to interface with them.

How does waveform end. Is this a science or an algorithm issue?

Tom had suggested Generating chirps in freq domain.

using stationary phase.

Ben Owen has a number for that.

We add this to Algorithms.

Bruces List  
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Science question: do we need Post 2.5 and post 3 stuff for

detection.

Then incorporation into algorithms

Prince:

This group needs to interface strongly with Grand Challenge and source theory groups.

They will welcome input about priorities etc.

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Prince suggests LSC form and maintain a user software archive on the web  
eg Grasp  
Kent says its a big job.

Bruce says its a good idea.

Stretches across all three categories.  
Formats and guidelines for users to write software??

Bernie would like to see from LSC a data analysis book for different subject with documentation of algorithms, the whys's etc, the references.

Come back to later

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\*\*\* Jorge Pullin

Has been looking colliding black holes in close approximation.  
Now has a catalog of waveforms

They plan to see if one takes these waveforms will be the useful for LIGO?

Issue: will these waveforms be useful? I say yes.

They are interested in pushing forward this stuff in the 3 stages. Detect their signals...

Creighton has been looking at ringdowns.

I say couples into searching for unknown sources, get useful info re bandwidth, and their waveforms are good testbeds.

Pat Brady  
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ringdowns

Jolien Creighton has worked on algorithms, matched filtering techniques.

Key issue: How to veto incorrect detections.  
Bruce's  $r^2$  method does not work well

Multidetector vetos.

Implementation issues.

### Inspiralling Binaries

Ben Owen: working on Hierarchical searches, and computational cost issues.

under algorithm section.

There are published papers by Mohanty and Dhurandhar  
Ben has looked at this with lower thresholds  
appropriate for multiple detectors,  
he is contemplating exploring hierarchical methods  
in multidetector systems.

Science Issues: how design to algorithm

Kip : desirable to go low masses, not crucial.

Desirable to have a working tested method by LIGO 1 timescale.

Kip: hierarchical, multidetector method for binaries is a very high priority issues.

beginning 2001: need algorithms  
So need a timescale.

Our goals: make recommendations what algorithms needed.  
decision point a year before software needed as to  
which algorithms will be used.

That;s about a year from now.

Bernie: go for efficient algorithm from start.

Prince: before LIGO1 science run, look for unexpected things  
Blind signal analysis.

Bernie says he disagrees with Kips assesment that  
theres no work so far on multidetector searches.  
Bernie: has done joint searches in 100 hour run.

back to Pat

#### Unknown Sources

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Blind signal analysis: looking for excess power in given freq bandwidth. Excess power algorithm.

Needs to be extended to multidetector coincidencing.

Also feeds into instrument diagnostics, characterization of instrument.

No exploration at Caltech of time frequency methods for unknown burst sources.

\*\*\* Albert Lazzarini joins us, and Sam Finn. \*\*\*

#### Periodic Sources

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Recent Science developments here

Lars Bildsten;

Kip

\* Lars Bildsten has argued cogently that QPOs like SCO X1 are strong sources in 500 -> 700 Hz  
Spin up limited by GW emission.  
Mechanism for asymmetry.

Could be a very major source.

\* Nils Anderson discovered R mode instability in neutron stars.  
Makes a bar mode in sense of internal circulation.  
Current quadrupolar  
Ben Owen, Sharon Morsink, Lee Lindblom.

Anything born faster than 200 Hz will spin down due to GW emission in some time maybe less than a year, could be seen by initial LIGO out to VIRGO.

GW dissipation beats viscosity in certain temp ranges.

Will change in a major way how we think about periodic sources.

Pat:

Algorithms --- Refers to his work with Bernie et al.  
Some work on all sky searches.  
No implementation yet.

Also need to make directed searches.  
New stuff make directed searches very important.

Prompt R mode searches with optical SN detections.  
But Bernie says most of them are not seen??

Computational costs have been estimated for  
both brute force and hierarchial  
Algorithms ready for implementaion.

Both Potsdam and Caltech has done a lot of work  
on stacked searches, not yet published.

Tom Prince  
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Looking for oppertunities in algorithms for improvements.  
tie in to hardware.

In between algorithm and implementaiton categories.

Implementation driven algorithms.  
This summer they are looking targeted search on  
40 meter data.  
Both coherent searches and stacked search.

Bruce: Joe Taylor has made code available for radio  
pulsars, only timing model, but not code for searches.

Tom Prince: they have a coherent code for searching for  
pulsars, with acceleration depdents

Giga point in length, thousand of acceleartion trials.  
supports also fdot (1000 trials) and fdoubledot.

1 weeks data searched at a time. \*  
A month at max.

Couple of kHz sample rate.

This summer will push to 100 GIga point coherent transform.

This summer stacked search of the 40 meter data.

Bernie: says question about moving around sky.  
Algorithm question.  
Detailed discussion of how this is done.

Pat, Bernie, with Tom Princes student.  
Stepping idea.

Bernie: He thinks there is an algorithm question, not settled.

Tom Prince: Also has worked on the stationary phase approx.

3rd issue: Hierarchical searches -- will work on in the future.

Bernie Schutz  
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Other Science Goals:

Developing lists of targets, eg possible accreting CW systems.  
for targeted searches. eg posn on the sky.

eg possible accreting systems.  
also raises issue of NS in common envelope objects.  
Stronger GWs  
But could be very short lived???

LMXBs

Raised issue of algorithms for such sources.

Posn known, but huge parameter space,

Says need to prioritize science goals, decide if  
should prioritize development of this type of algorithm

Targeted search: lots of different levels of complexity.  
Posn known, freq unknown, or both known  
or some orbital parameters known, or all unknown.

Implementation: Gareth Jones  
searched around SN1987a in 100 hours of Garching data.  
PhD thesis at Cardiff.

Some work on Tracking, which is an alternative to stacking  
for CW sources, work in Potsdam. Name of student is Papa

exploration of short period FFTs in Jones thesis  
eg 1/2 hour.

Sathya is working on implementing Pade stuff.

They working on implementations of removal of interference.

Algorithm: work by Krolak and others on CW source covariance  
ie accuracy of parameter extraction in CW case.

Me:

Emphasize blind searches, excess power methods.

Also ringdown searches for very heavy mass black holes.

Sam Finn

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1. "Statistical" detection of GWs  
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A way of ???

Suppose gamma ray bursts do come from inspiralling NSs  
Then For initial LIGO rate too low to expect definitive  
detections.

But we do have trigger, a gamma ray burst.  
Look at last 3 minutes of data  
for all the detectors.

Accumulate a set of statistic for all these guys.  
Now look at 24 hours before gamma ray bursts.

The two distribtutions could different.  
Detect GWs.

Under development, both science goals and algorithm.

Just cross correlate, the time delay is known.

2. Things that go bump in the night === blind signal analysis  
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Again, both Science goal and algorithm is under development

3. Stochastic Signals from Non Exotic Sources.  
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no cosmic strings, AVEC violations.

4. Testing Relativity  
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Verify that graviton is spin 2, if there is a spin 0 component, there is a different component.

Test the polarization.

Look at BH normal modes. measure mass and spin from both  $l=m=2$  and higher order modes, need to be consistent.

5. Test pulsar models  
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That was all science goals, now algorithms:  
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a. Multidetector receiver:

deterministic bursts  
and stochastic signals.

they have matlab implementations of  
searches for ringdowns and stochastic sources.

b. Bayesian analysis for confidence in detection and parameter extraction.

c. Likelihood methods for analyzing data.

d. Wavelet methods:

\ Implementations  
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*Note 1, Linda Turner, 04/21/98 09:44:28 AM*  
LIGO-G980049-35-M