



Center for Gravitational Wave Physics

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LIGO-G010295-00-Z

8/14/2001

LSF/Penn State



Proposal Team

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 - » Penn State
- W. Anderson, M. Diaz, J. Romano
 - » University of Texas, Brownsville
- P. Brady
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- E. Flanagan
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- J. Tohline, G. Gonzalez, J. Pullin
 - » Louisiana State University
- M. Choptuik
 - » University of British Columbia
- K. Strain
 - » University of Glasgow

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Proposal: *A National Center* for Gravitational Wave Physics

- Frontier: the physics and astrophysics that can be explored by gravitational wave observations
 - » All wavebands & detector non-specific (pulsar timing, doppler tracking, bars ground and space-based IFOs)
- Why now?
 - » Confrontation of theory, observation rapidly approaching
 - » Design of new and advanced instruments underway
- Focus: *Phenomenology*
 - » How to use experiment to answer open science questions
 - » How to maximize the knowledge gained from observation
 - » How to design better experiments to attack open questions
- Problems live at interface of still separate communities
 - » Instrument/experiment, gravity theory, astronomy/astrophysics

Our phenomenology community does not yet exist



Center Vision: Building a Phenomenology Community

- Why a Center?
 - » Phenomenology requires synergy between presently disjoint disciplines of astrophysics, relativity theory and experiment
 - » Center provides focus and resources to combine existing expertise, train students & post-docs, launch new field
- Three tightly-coupled “Major Research Components”
 - » Gravitational Waves and Astrophysics
 - Sources, modeling and interpretation
 - » Gravitational Waves and Relativity
 - Testing gravity, developing technical infrastructure
 - » Target Science and Detector Design
 - Observational drivers for advanced detectors



How it works

- National Center nucleates community
 - » Workshops, conferences
 - Focus attention on critical, inter-disciplinary research areas
 - » Visitor program
 - Builds collaborations among scientists from different disciplines
 - » Cyber center
 - Interactive interface facilitating off-site participation
- Proposal team as intellectual anchor
 - » Community-based team spans critical disciplines
 - » Provides continuity, nucleates collaborations
- Advisory board provides perspective, community input
 - » *Narayan, Barish, Danzmann, Rees, Teukolsky*



The Opportunity

- Community driven science program
 - » Focus on developing collaborations, expertise, opportunities in cross-disciplinary phenomenology science
- Focused workshops on cross-disciplinary problems
 - » E.g., Numerical relativity contributions to source/signal modeling, observational GW-based tests of relativity, astrophysical source/signal/population modeling, etc.
- Broader meetings, conferences, summer institutes
 - » Outreach to broader communities, training of students
- Individual visits
 - » ~30-40 visitors/year for week to several week visits to work together, with other visitors, proposers on phenomenology problems
 - » Some sabbatic opportunities



Research, Teaching, Education and Outreach

- Goal: Educate a new *breed* of researchers
 - » Post-docs, graduate students immersed in interdisciplinary environment, trained in problems of phenomenology
 - » Undergraduate research opportunities in simulations, data analysis, modeling
- Outreach leverages existing, successful programs
 - » Diversity
 - Strong collaboration with UT Brownsville
 - WISER: Women In Science and Engineering Research mentoring program
 - » K-12
 - Emmy Award-Winning educational TV: “What’s In The News”
 - WISE Institute “Expanding Your Horizons” workshops



Status

- Pre-proposal submitted (1 of 60): September 2000
- Full proposal invited (1 of 16): November 2000
- Full proposal submitted: January 2001
- Mail reviews: February - March 2001
- Panel review: April 2001
- Presentation to NSF (1 of 8): May 2001
- Revised budget requested: June 2001
 - » 1M\$/y times 5y
- Cooperative agreement negotiated: June/July 2001
- Recommended for funding (1 of 4): 25 July
- Final co-op agreement approved by PSU, NSF: Today(!)
- Recommended start date: 15 August



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Summary

- *National Center* devoted to building phenomenology *tools, insights and community* to exploit observations
- Tightly coupled MRCs draw astrophysics, relativity, experimental communities together to focus on problems at the phenomenology interface
- *Workshops* provide focus on critical problems
- *Visitor program* forges interdisciplinary collaborations
- Educating a new and diverse generation of students, post-docs trained at the interface of astronomy, gravity and experiment

Creating a new discipline - Gravitational Wave Phenomenology