



LIGO and the Gravitational Wave International Committee

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LIGO-G010054-00-Z

26-8 February 2001

L. S. Finn/Penn State/LIGO Ops Review



What is GWIC?

- Committee of project directors
 - » Parallel ICFA
- Formed Nov. 97
 - » Twice annual meetings through 1999, annually since
- Goals
 - » Promote international cooperation in construction, exploitation detectors;
 - » Coordinate long-range planning for new instrument proposals, upgrades;
 - » Promote development of grav.-wave detection as astronomical tool
 - » Organize regular, world-inclusive meetings and workshops ...
 - » Represent the grav.-wave detection community internationally...
 - » Provide for lab directors to meet, discuss & plan operation, direction of labs and exp. grav.-wave physics



Members

- Detector Project Directors
 - » ACIGA & NIOBE: McClelland & Blair
 - » ALLEGRO: Hamilton
 - » AURIGA: Cerdonio
 - » Explorer/Nautilus: Coccia
 - » GEO 600: Danzmann & Hough
 - » LIGO: **Barish** & Sanders
 - » LISA: Prince, Stebbins & Vitale
 - » TAMA 300: Kozai & Fujimoto
 - » VIRGO: Brillet & Giazotto
- Special members
 - » Theory Consultant: Will
 - » Executive Secretary: Finn



International and Promotional Activities

- International Presence
 - » Sub-panel of IUPAP Working Group 4: PaNAGIC
- Meeting Sponsorship
 - » Amaldi Meeting on Gravitational Waves Detection
 - Adopted “Home” of Gravitational Wave Detection community
 - Alternate years
 - 1999 Pasadena, 2001 in Perth, 2003 to be decided at Perth GWIC meeting
 - Follows IUPAP guidelines for international meeting
 - » Gravitational Wave Data Analysis Workshop
 - Yearly workshop on data analysis for grav.-wave data analysis issues
 - Meeting annually since Dec. 95 (Boston, Orsay, State College, Rome, Baton Rouge, Trento)
 - » Aspen Winter Meeting on Gravitational Waves and Their Detection
 - 2 years out of every three in Aspen, third year in Moriond.
 - Hardware/Experimental focus



LIGO Coordination/Sharing of Technical Research and Development

- Sapphire test mass collaboration
 - » ACIGA, LIGO, VIRGO
- Optical metrology collaboration
 - » LIGO, VIRGO
- Frame data format collaboration
 - » Data format standard adopted by all IFO projects, also AURIGA
- Cryogenic Mirrors
 - » TAMA/LCGT
- Suspension collaboration
 - » Cryogenic suspensions (LIGO, TAMA/LCGT)



Development of world-wide detector network

- July '99: technical committee appointed to investigate computational requirements of joint analysis
- Dec '99, Feb '00, Jul '00: committee meets, reports on technical requirements
 - » LIGO-M000040-01-E
- Feb '01: Committee meets, agrees to continuous exchange of PEM data starting 1 June 2001
 - » Seismometer, magnetometer, power-main monitors
 - » Exchange protocols, data formats established
 - » Goal: gain experience in data exchange, build trust, learn about intercontinental cross-correlations of environmental noises
- 8 Jun '01: Next meeting
 - » Assess success of exchange

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GWIC PEM Data Exchange

- What do we exchange?
 - » One seismometer, three axes, 256 Hz per axis
 - Each project is responsible for picking an appropriate seismometer
 - » One magnetometer, magnitude B, 2048 Hz
 - Each project is responsible for picking an appropriate magnetometer
 - » Power-line monitor, 2048 Hz
 - Each project picks a power-line monitor and a phase
 - » Exchanged PEM monitors will be documented on a web-page provided by each site
- Format
 - » Channel names
 - TBD by sub-committee (Daniel Sigg, Benoit Mours, Benno Willke), starting from Mours design
 - » Frame size/file length
 - 1 second long frames, 60 frames/file
 - Delay of first sample less than 1 microsecond from the frame start
 - Frames start on GPS second boundaries, files on GPS mod 60 = 0 boundaries
 - » Frame type
 - FRPROC DATA



GWIC PEM Data Exchange

- Exchange Protocol
 - » Medium: Internet
 - » Frame files will be placed in a directory accessible via an [S]FTP/SCP server at each project.
 - Projects pull data
 - » Latency
 - Frames will be available on the project server no later than 20m following acquisition
 - » Permanency
 - Each site maintains most recent 100 GB of data
- Availability
 - » Continuous save for instrument downtime
 - » Web page at each site will describe what segments are available.
 - » The page format will include one entry, with the start time of the first file and the start time of the last file, for each continuous segment
- Access control
 - » Existing MOUs will be extended to cover this new data set



Summary

- Meeting since 1997
- Membership by all large gravitational wave detection efforts
- International support, promotion of grav-wave detection activities
- Coordination & sharing of technical R&D
- Development of world-wide detector network
- Coordination of cooperative analysis with other astronomical observatories



International Collaboration and “First Science” Analyses

- GEO 600, ALLEGRO
 - » LIGO members
 - » Target simultaneous run and coordinated analysis with LIGO E6
- Participation
 - » Stochastic group
 - ALLEGRO/LLO very sensitive to stochastic signal near 900 Hz
 - GEO/LIGO investigations for correlated noises (not sensitive to stochastic signal background)
 - » Burst group
 - Generate events, search for coincidences
- IGEC
 - » International network of bar detectors for event list exchange
 - » Discussions underway on including event lists generated by IGEC in “first science” analyses



International Collaboration: LDAS datacondAPI

- datacondAPI provides data conditioning functionality for analysis
 - » Data conditioning? Preparing data stream for analysis
 - » Examples
 - Regression of instrumental, environmental artifacts
 - Drop-out/veto management
 - Band selection; doppler demodulation
 - Calibration; power spectrum estimation & other statistical characterization; etc.
 - » Programming environment: LIGO's custom matlab
- Analysis programs request data conditioned in problem-specific ways
 - » E.g., bandwidth about frequency, estimated power spectra to given accuracy, resolution, etc.
 - » datacondAPI processes data as requested, communicating with other APIs to acquire data and other necessary resources



datacondAPI Development Team

- **Australian National University**
 - » *Philip Charlton, Antony Searle*
- **LIGO/CIT**
 - » *Kent Blackburn, Philip Charlton, Phil Ehrens, Albert Lazzarini, Ed Maros, Isaac Salzman*
- **Penn State**
 - » *LSF, Eric Rotthoff, Charlie Shapiro, Natalie Hepler*
- **University of Texas, Brownsville**
 - » *Joe Romano, Warren Anderson, Art Gonzalez*
- **Project Start**
 - » 15 December 1999
- ***Modus Operandi***
 - » Weekly planning telecons
 - Review, reassess, refocus
 - » Web site
 - Minutes, resources
 - » Mailing list
 - Discussion between telecons
 - » “Weekly Report”
 - Saturday AM automated digest of accomplishments, open issues, schedule reassessment
- **First Mock Data Challenge**
 - » 31 July - 6 August 2000