

LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY  
- LIGO -  
CALIFORNIA INSTITUTE OF TECHNOLOGY  
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

<b>Document Type</b> <b>LIGO-T970199-00 - P</b> 11/25/97
<b>LIGO WWW On-line Documents</b>
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# LIGO WWW On-line Documents

last updated 11/25/97

The following list of LIGO document numbers and titles includes the latest versions available for each document. Since not all LIGO documents are available in electronic form, documents in this list may not reflect the latest information available on a given subject. To use this list, click on the document number or title to retrieve the listed document.

## 1 LIGO TOP-LEVEL DOCUMENTS

### 1.1. Management Documentation

#### 1.1.1. Project Plans and Policies

[M950046-A](#) LIGO PROJECT SYSTEM SAFETY PLAN (900 kbyte)  
[M960076-A](#) LIGO PROJECT QUALITY ASSURANCE PLAN  
[E960099-B](#) LIGO RELIABILITY PROGRAM PLAN

#### 1.1.2. Annual Reports

[M970007-01](#) Annual Report (December 1995 through November 1996) (900 kbyte)

#### 1.1.3. Quarterly Reports

[M960024-00](#) Quarterly Progress Report (December 1995 through February 1996)  
[M960055-00](#) Quarterly Progress Report (March 1996 through May 1996) (600 kbyte)  
[M970034-00](#) Quarterly Report (December 1996 through February 1997) (500 kbyte)  
[M970080-00](#) Quarterly Report (March 1997 through May 1997) (700 kbyte)  
[M970138-00](#) Quarterly Report (June 1997 through August 1997) (700 kbyte)

#### 1.1.4. Monthly Reports

[M970017-01](#) Monthly Progress Report (End of December 1996)  
[M970033-00](#) Monthly Progress Report (End of January 1997)  
[M970042-00](#) Monthly Progress Report (End of March 1997)

#### 1.1.5. Proposals

[M950020-01](#) LIGO Operations, 1997-2001  
[M960051-A](#) LETTER OF INTENT FOR A RESEARCH AND DEVELOPMENT PROGRAM FOR ADVANCED LIGO DETECTORS BY THE LIGO MIT/CALTECH GROUPS  
[M970001-01](#) Revised Proposal for a Research and Development Program For Advanced Detectors by the LIGO MIT/Caltech Groups - FY 1997 Proposal Budget

## **1.1.6. Review Presentation Materials**

### **1.1.6.1 NSF Review April 13-17, 1997**

- G970068-00 LIGO DATA PROCESSING (700 kbyte)
- G970071-01 BEAM TUBE BAKEOUT
- G970075-01 LIGO Project Cost/Schedule Status
- G970091-00 LIGO Control and Data System Control and Monitoring

## **1.2. Publications**

- P940008-00 Measurement of Optical Path Fluctuations due to Residual Gas in the LIGO 40 Meter Interferometer
- P950017-02 The Laser Interferometer Gravitational-Wave Observatory (LIGO) Project (800 kbyte)
- P960024-A PRINCIPLES OF CALCULATING ALIGNMENT SIGNALS IN COMPLEX RESONANT OPTICAL INTERFEROMETERS
- P960031-C The Laser Interferometer Gravitational Wave Observatory Project (1 Mbyte)
- P960041-02 Recent Research on the LIGO 40 m Interferometer
- P960042-00 Development of Laser Interferometers for Gravitational Wave Detection: Abstract and Summary
- P970002-00 Modeling LIGO Data Analysis

## **1.3. System Engineering Documentation**

### **1.3.1. System Requirements**

- D970307-00 LIGO SYSTEMS FUNCTIONAL BLOCK DIAGRAM
- E950018-02 LIGO Science Requirements Document (SRD)
- E950111-A LIGO Naming Conventions
- E960036-A LIGO EMI CONTROL PLAN AND PROCEDURES
- E960099-B LIGO RELIABILITY PROGRAM PLAN
- E960010-A LIGO Sites Alignment Requirements
- E950083-B Science Requirements for the LIGO Beam Tube Baffles
- T970130-B Specification of a Common Data Frame Format for Interferometric Gravitational Wave Detectors (IGWD)

### **1.3.2. Modeling and Data Analysis**

- T970159-02 LIGO Data Analysis System Design Requirements
- T970160-04 LIGO Data Analysis System Conceptual Design (700 kbyte)
- G970064-00 Modeling LIGO Data Analysis (900 kbyte)
- G970135-00 What We've Learned About What We've Learned About "FRAMES"
- G970156-00 Computer Languages Computer Languages why all the fuss about why all the fuss about C++
- T970100-A LIGO Data Analysis Software Specification Issues
- T970101-A Strain Calibration in LIGO
- M970013-02 A Proposal for the First Experiment for Validation of the 40m End-to-End Model

- M970065-B White Paper Outlining the Data Analysis System (DAS) for LIGO I (800 kbyte)
- T970128-02 Quantization Noise in Ligo Interferometers
- T970167-00 LIGO Science Benchmarks
- T970166-01 Benchmark tests for inspiraling binary searches for LDAS

### **1.3.3. Alignment**

- E960010-A LIGO Sites Alignment Requirements
- T950004-B Derivation of Global and Local Coordinate Axes for the LIGO Sites
- T950107-A Orientation of the LIGO Beam Center Lines with respect to foundation slabs
- T960176-C Determination of the as-built LIGO Global Coordinate Axes for Hanford, WA
- T960042-A Alignment Tolerances and Re-Alignment Criteria for the LIGO Beam Tubes (600 kbyte)
- T970117-A LIGO Site-to-Site Separation

### **1.3.4. Testing, Measurements and Analysis**

- T960128-00 Radiation Pressure Noise in LIGO
- T970054-00 Beam Tube Dynamics

### **1.3.5. Layout Drawings**

- T960051-02 INTEGRATED LAYOUT DRAWINGS: USAGE & MAINTENANCE
- D970008-A Chamber & Rack Designations - WA (Corner Station)
- D970009-A Chamber & Rack Designations - WA (Mid Station)
- D970010-A Chamber & Rack Designations - WA (End Station)

## **2 FACILITIES DOCUMENTATION**

### **2.1. Beam Tube**

#### **2.1.1. Design Requirements and Qualification**

T960042-A Alignment Tolerances and Re-Alignment Criteria for the LIGO Beam Tubes  
T960125-00 Beam Tube Qualification Test

#### **2.1.2. Baffles**

E950083-B Science Requirements for the LIGO Beam Tube Baffles  
E960037-A COMPONENT SPECIFICATION: MECHANICAL FABRICATION OF BEAM  
TUBE BAFFLES  
T970053-00 Baffle Glaze Shedding

#### **2.1.3. Bakeout**

E960123-03 Beam Tube Bakeout Design Requirements Document  
E970125-A COMPONENT SPECIFICATION: BEAM TUBE MODULE INSULATION  
T960124-00 ISSUES AND CONSIDERATIONS ON THE BEAM TUBE BAKE  
T960178-01 Beam Tube Bakeout Conceptual Design  
T970148-00 Beam Tube Bakeout Preliminary Design  
G960181-00 BEAM TUBE BAKEOUT  
G960241-00 BEAM TUBE BAKEOUT DESIGN REQUIREMENTS REVIEW (600 kbyte)  
G970217-00 BEAM TUBE BAKEOUT PRELIMINARY DESIGN REVIEW

#### **2.1.4. Testing, Measurements and Analysis**

T970054-00 Beam Tube Dynamics  
T970110-00 Information for the Beam Tube Pumpdown  
T970111-00 Data from Beam Tube Pump Down II  
L970429-00 Technical Board Meeting to Review Beam Tube HX2 Vacuum Test Results

### **2.2. Civil Construction**

#### **2.2.1. Design Requirements**

E950101-00 Telecommunications requirements for Hanford, WA Site.  
E950106-00 LIGO Requirements and Options for Facilities Monitoring and Control System  
(FMCS)

## 3 DETECTOR DOCUMENTATION

### 3.1. Detector System Documentation

E960112-05	Detector Subsystems Requirements (600 kbyte)
E960022-03	LIGO Vacuum Compatibility, Cleaning Methods and Qualification Procedures
E960050-A	LIGO Vacuum Compatible Materials List
T950065-A	Guidelines for Design Requirement Documents
T960083-A	Derivation of CDS Rack Acoustic Noise Specifications
E960108-A	Recommendation of parameter choices in 2 km interferometer design (600 kbyte)
T960019-00	Frequency, Intensity and Oscillator Noise in the LIGO
T960120-00	Misalignment-Beam Jitter Coupling in LIGO
T960122-00	Proposed initial detector MC and RC baseline lengths
T970068-00	Recycling Cavity and Mode Cleaner Cavity Baseline Dimensions
D970002-00	Recycling Cavity Dimensional Range
D970003-00	Recycling Cavity Layout
T960128-00	Radiation Pressure Noise in LIGO
T960136-00	Estimates for Motions due to Sound Fields
T960140-00	Fast Estimation of Transverse Fields in High Finesse Optical Cavities
T960189-00	LIGO calibration accuracy
T970007-00	Modelling the Performance of an Initial-LIGO Detector with Realistically Imperfect Optics
G960250-00	Modelling the Performance of an Initial-LIGO Interferometer with Realistically-Deformed Optics (500 kbyte)
L970042-00	Internal Modes of Testmasses
T970077-00	Gravitational Deflection of LIGO Optics in a 9-Point Hindle Mount (1.5 Mbyte)
T970091-00	Determination of the Wedge Angles for the Core Optics Components
T952008-00	A Tutorial For the Fast Fourier Transform Interferometer Simulator
G950061-02	A Summary and Future Preview of the FFT Simulation Initiative in LIGO
T960187-01	Effect of Microseismic Noise on a LIGO Interferometer
T970059-01	The Effect of Earth Tides on LIGO Interferometers
T970101-A	Strain Calibration in LIGO
T970128-02	Quantization Noise in Ligo Interferometers
T970167-00	LIGO Science Benchmarks
T970166-01	Benchmark tests for inspiraling binary searches for LDAS
T970149-00	Influence of the stray magnetic field generated by the Faraday isolator on SOS mirror actuators

## 3.2. Suspensions and Seismic Isolation

### 3.2.1. Suspensions

T950011-19	Suspension Design Requirements
E970037-00	SMALL OPTICS SUSPENSION ASSEMBLY SPECIFICATION
E970038-00	LARGE OPTICS SUSPENSION SPECIFICATION
E970080-00	SMALL OPTICS SUSPENSION ASSEMBLY QUALITY CONFORMANCE WORKSHEET
E970132-00	LARGE OPTICS SUSPENSION ASSEMBLY QUALITY CONFORMANCE WORKSHEET
T960074-07	Suspension Preliminary Design
T970135-02	Small Optics Suspension Final Design (Mechanical System)
T970158-06	Large Optics Suspension Final Design (Mechanical System)
T960179-00	Small Optics Suspension Prototype Test Results
T960151-01	Large and Small Optics Suspension Electronics Design Requirements
T970113-00	Large and Small Optics Suspension Electronics Preliminary Design
G970219-00	LIGO LOS and SOS Electronics PDR
E970123-A	LIGO SUSPENSION SYSTEM RELIABILITY PREDICTION REPORT
L960596-00	Cross-coupling in the suspension controllers
T960040-00	RESPONSE OF PENDULUM TO MOTION OF SUSPENSION POINT
T960126-01	Magnet size considerations; interference and coil power dissipation
T960137-00	Note on Electrostatics in the LIGO suspensions
T970149-00	Influence of the stray magnetic field generated by the Faraday isolator on SOS mirror actuators

### 3.2.2. Seismic Isolation

T960065-03	Seismic Isolation Design Requirements Document
T960066-00	Seismic Isolation Conceptual Design (700 kbyte)
L970061-01	Specification Guidance for Seismic Component Cleaning, Baking and Shipping Preparation
E970063-01	LIGO Seismic Isolation System: Fabrication Process Specification
E970130-00	Material, Process, Handling, and Shipping Specification for Fluorel Parts
T970069-01	Requirements for Creep Testing of SEI Spring Elements
T970168-00	Viton Spring Seat Vacuum Bake Qualification

### **3.3. Lasers and Optics**

#### **3.3.1. General Documentation**

- L970042-00 Internal Modes of Testmasses
- T970077-00 Gravitational Deflection of LIGO Optics in a 9-Point Hindle Mount (1.5 Mbyte)
- T970091-00 Determination of the Wedge Angles for the Core Optics Components
- G950061-02 A Summary and Future Preview of the FFT Simulation Initiative in LIGO

#### **3.3.2. Prestabilized Laser**

- E950081-06 Nd 3+ Laser Target Specifications
- T970080-09 (Infrared) Pre-stabilized Laser (PSL) Design Requirements
- T970087-04 (Infrared) Pre-stabilized Laser (PSL) Conceptual Design
- T970145-00 Performance of VCO/AOM frequency shifter
  
- T970115-00 (Infrared) Pre-stabilized Laser (PSL) Electronics Design Requirements
- T970114-00 IR PSL CDS CONCEPTUAL DESIGN DOCUMENT

#### **3.3.3. Input Output Optics**

- T960093-02 Input Output Optics Design Requirements Document
- T970143-00 Design Considerations for LIGO Mode-Matching Telescopes
- T970144-00 Input Optics Preliminary Design (800 kbyte)
- T970149-00 Influence of the stray magnetic field generated by the Faraday isolator on SOS mirror actuators

#### **3.3.4. Core Optics**

- E950099-04 Core Optics Components Requirements (1064 nm)
- T970071-01 Core Optics Support Design Requirements Document
- T970072-01 Core Optics Support Conceptual Design
- G970067-00 Core Optics Support Design Requirements Review (900 kbyte)
- T970109-00 Spectral Analysis of Coated Optic Phase Maps

## 3.4. Alignment and Length Sensing

### 3.4.1. Alignment Sensing/Control

[T952007-04 Alignment Sensing/Control Design Requirements Document](#)  
[T960134-00 Alignment Sensing/Control Conceptual Design](#)  
[T970060-00 Alignment Sensing/Control Preliminary Design](#)  
[T952013-00 Alignment Design Interfaces](#)  
[T960103-00 ASC: Environmental Input to Alignment noise \(2 Mbyte\)](#)  
[T950049-00 ASC Centering Subsystem Description](#)  
[T950069-00 Naming and Interface Definition for ASC Wavefront/Centering](#)  
[T950073-00 Interferometer Requirement Flowdown To ASC](#)  
[T950074-00 Naming and Interface Definition for ASC Initial Alignment](#)  
[T970061-00 ASC CDS Design Requirements Document](#)  
[T970062-00 ASC CDS Conceptual Design](#)  
[T960138-00 ASC Channel Count](#)

#### 3.4.1.1 Optical Lever

[T950106-01 ASC Optical Lever Design Requirement Document](#)  
[T950112-00 ASC Optical Lever Specification and Design Document](#)  
[T950070-00 Naming Convention and Interface Definition for Optical Lever](#)

#### 3.4.1.2 Wavefront Sensing

[T960111-A WAVEFRONT SENSOR \(1.1 Mbyte\)](#)  
[T960113-00 Modal Model Update 1: Interferometer Operators](#)  
[T960114-B Modal Model Update 2: GW-Sensitivity to Angular Misalignments](#)  
[T960115-A Modal Model Update 3: Small Angle Regime](#)  
[T960116-00 Modal Model Update 4: Mode Mismatch](#)  
[T960191-00 Modal Model Update 5 Large Angle Regime](#)  
[T960118-00 Modal Model Update 6: Mode Cleaner](#)  
[T970058-00 Modal Model Update 7 Angular Transfer Functions](#)

### 3.4.2. Length Sensing/Control

[T960058-03 Length Sensing and Control Design Requirements Document](#)  
[T970138-00 LSC CDS Design Requirements](#)  
[T970139-00 LSC CDS Conceptual Design \(800 kbyte\)](#)  
[T970122-00 Length Sensing and Control Subsystem Preliminary Design \(1.4 Mbyte\)](#)  
[T952109-01 LIGO Length Sensing System: Design considerations for a tabletop prototype interferometer](#)  
[T960067-00 Length Control RMS Deviations from Resonance](#)  
[T960139-00 Shot noise sensitivity of the length control error signals](#)  
[T970084-00 Frequency Response of the LIGO Interferometer](#)  
[T970101-A Strain Calibration in LIGO](#)  
[G970192-00 Length Sensing and Control Subsystem Preliminary Design Review \(1.5 Mbyte\)](#)

### 3.5. Control and Data System

T950054-02	CDS Control and Monitoring Design Requirements Document
T950120-01	CDS Control and Monitoring Conceptual Design (1.1 Mbyte)
T960009-00	LIGO Data Acquisition System Design Requirements
T960010-00	CDS Data Acquisition System Conceptual Design
T970136-00	CDS Data Acquisition Preliminary Design
T970115-00	(Infrared) Pre-stabilized Laser (PSL) Electronics Design Requirements
T970114-00	IR PSL CDS CONCEPTUAL DESIGN DOCUMENT
T960151-01	Large and Small Optics Suspension Electronics Design Requirements
T970113-00	Large and Small Optics Suspension Electronics Preliminary Design
G970219-00	LIGO LOS and SOS Electronics PDR
T970061-00	ASC CDS Design Requirements Document
T970062-00	ASC CDS Conceptual Design
T970138-00	LSC CDS Design Requirements
T970139-00	LSC CDS Conceptual Design
T970165-00	PEM Data Acquisition Preliminary Design
D970532-00	Hanford PEM Data Acquisition System Preliminary System Layout
T960107-00	LIGO Interferometer Diagnostics System Design Requirements
T960108-00	Interferometer Diagnostics Conceptual Design
T960024-A	Vacuum Control and Monitoring System (VCMS) Design Requirements
T960037-00	Vacuum Control and Monitoring System (VCMS) Design
T970001-00	Vacuum Control and Monitoring System (VCMS) Final Design
T960014-00	Vacuum Feedthrough and Cabling Conceptual Design
T960177-00	LIGO Cable Numbering and Marking Standard
T970076-00	LIGO CDS VME Mainframe Specification
T960083-A	Derivation of CDS Rack Acoustic Noise Specifications

### 3.6. Physical Environment Monitor

T960127-02	Physical Environmental Monitor Design Requirements Document (600 kbyte)
T960145-00	Physical Environmental Monitor Conceptual Design
T970086-00	Physical Environmental Monitor Preliminary Design Document
G970026-00	Physics Environment Monitoring Preliminary Design Review
D970532-00	Hanford PEM Data Acquisition System Preliminary System Layout
T970165-00	PEM Data Acquisition Preliminary Design

## 4 R&D DOCUMENTATION

D961304-06	OPTICAL LAYOUT - 40m RECYCLING (1.8 Mbyte)
G960172-00	THE FMI ALIGNMENT EFFORT
G970152-01	LIGO@ MIT: Transition to Operations and Advanced Detector R& D
M970013-02	A Proposal for the First Experiment for Validation of the 40m End-to-End Model
T950035-01	Measurement of the Ground Drift at the 40-m Lab
T950137-00	Description of the Electronics for the FMI Wavefront Experiment (1.4 Mbyte)
T960013-02	Calculation of the Modulation Frequency for the 40m Power Recycling Interferometer
T960015-03	Calculation of Optical Parameters for the 40m Power Recycling Interferometer
T960072-00	Beam Splitter and Recycling Mirror Suspension Controller Design Requirements
T960073-00	40 Meter Recycling Electronics Design Requirements
T960162-02	Specifications of the 40m Test Mass Suspension Prototype
T960186-00	Procedure for Attaching the Fins and Hanging the PNI Mirrors
T970085-02	Correlation Function and Power Spectrum of Non-Stationary Shot Noise
T970090-00	Proposal for a table-top prototype resonant sideband extraction interferometer
T970102-00	40 Meter BS and RCM Suspension Controller Test Plan
T970103-00	BS and RCM Suspension Electronics Operator's Manual