



**Statement of Work  
 Fabrication of HAM Prisms  
 for Advanced LIGO  
 C1000894-v9**

The following documents are incorporated into and made a part this purchase order. Click on the following LIGO Document Control Center (DCC) links to access these documents or go on line to the LIGO Public DCC at <https://dcc.ligo.org/> to access the DCC#.

**1 Scope**

This Request for Quote (RFQ) is for the fabrication of sapphire prisms per the unique drawings included in this package. This RFQ does not include the laser ablation of the v-grooves in both drawings. It is for the fabrication of the sapphire prisms themselves, less the v-grooves. If your company can carry out the laser ablation work to produce v-grooves, please include a quote for that work as a separate line item.

**2 Terms**

<u>DCC #</u>	<u>Description</u>
<a href="#">C080185-v1</a>	Laser Interferometer Gravitational Wave Observatory (LIGO) Commercial Items or Services Contract General Provisions California Institute of Technology “Institute”, LIGO Rev 11/12/08
<a href="#">F0810001-v4</a>	Technical Direction Memorandum.

**3 Quality Control**

<u>DCC #</u>	<u>Description</u>
<a href="#">Q0900001-v4</a>	Advanced LIGO Supplier Quality Requirements, dated 2/10/10, describes following contractor/supplier QA/QC actions for this procurement:

<input checked="" type="checkbox"/> 3.1 Pre-Award Inspection	<input checked="" type="checkbox"/> 3.9 Discrepant Material Storage	<input checked="" type="checkbox"/> 4.4 Calibration Program
<input checked="" type="checkbox"/> 3.2 Supplier In Process Quality Control	<input checked="" type="checkbox"/> 3.10 Quality Records	<input type="checkbox"/> 4.5 Critical Interface
<input checked="" type="checkbox"/> 3.3 In Process Inspection	<input checked="" type="checkbox"/> 3.11 Drawing and Specification Change Control	<input checked="" type="checkbox"/> 4.6 Cleanliness
<input checked="" type="checkbox"/> 3.4 Pre-Ship Inspection	<input type="checkbox"/> 3.12 Welding Certification	<input checked="" type="checkbox"/> 4.7 Packaging
<input checked="" type="checkbox"/> 3.5 Receiving Inspection	<input checked="" type="checkbox"/> 3.13 End Item Data Package (including Certifications of Compliance)	<input checked="" type="checkbox"/> 4.8 Storage
<input checked="" type="checkbox"/> 3.6 Discrepant Material	<input type="checkbox"/> 4.1 Design Verification	<input checked="" type="checkbox"/> 4.9 Transport
<input type="checkbox"/> 3.7 Material Review Action	<input checked="" type="checkbox"/> 4.2 Raw Material Procurement	<input type="checkbox"/> 4.10 Customs
<input checked="" type="checkbox"/> 3.8 Material Review Actions at Contractor	<input checked="" type="checkbox"/> 4.3 Traceability of Materials	

For the above list the Supplier shall: 1) Identify the corresponding sections/paragraphs in their existing QA/QC system 2) meet or exceed the design requirements contained in the attached engineering documents for each area called out.

## 4 End Item Data Package

At the time of delivery of the parts, the Supplier shall also provide the following data, as a minimum:

- Any as-built modifications (with approval of the LIGO Contracting Officer) as mark-ups to the drawings
- Material certifications
- Certificate or statement of compliance with all contract and drawing process restrictions.
- Dimensional & QC inspection reports—this shall include a report showing that parts have been inspected and fall within specified tolerances, see Section 4.1

### 4.1 Dimensional & QC Inspections

Inspect all prisms. Full dimensional inspections, with inspection reports, are part of the end item data package for the first, last and 10% of each of the two types of prisms. A dimensional inspection of the width of the flat, shown in “Detail B” on the drawings, is required for all of the parts. Please provide this information by serial number, in an inspection report. Provide certificate of conformance for all prisms with End Item Data Package. The prisms shall be bagged separately and each bag marked with a serial number, with care taken in packing for shipment to avoid damage.

## 5 Included Documents

A set of drawings is included in this SOW. The list of Drawings (by part number, revision and name) is included in section 6.

3D CAD files are available upon request and are provided as reference only. All parts are to be manufactured to the attached 2D drawings. If there are any discrepancies between the drawings and the CAD files, the drawings take precedence.

## 6 Quantity Required

The total quantity required for each part by drawing number, and (if appropriate) type number, is indicated below:

[D070441-v4, HLTS Prism, Quantity 26](#)

[D0810033-v4, HSTS Prism, Quantity 68](#)

## 7 Delivery Requirements:

The deliveries are FOB at these destinations, i.e. the contractor has responsibility for shipping title and control of goods until they are delivered and the transportation has been completed. The contractor selects the carrier and is responsible for the risk of transportation and for filing claims for loss or damage.

Shipping Location:

LIGO Livingston Observatory (LLO)  
Attn: Janeen Romie  
19100 LIGO Lane  
Livingston, LA 70754

Shipping Containers:

The contractor is responsible for providing shipping containers and transportation which protects these parts from damage from the transportation environment (weather, handling, accidents, etc.). Edges of prisms should be especially protected from damage during shipping.

## 7.1 Delivery Schedule

While complete delivery to the site is specified in this SOW, it is also acceptable for LIGO to accept partial shipments.

All deliveries to be complete by **6 weeks ARO**. If this cannot be accommodated, please provide an alternative delivery schedule with your bid package. Likewise, an earlier delivery is welcome. Lead time is important. LIGO offers to provide the material. Please clarify in the quote whether you plan to use the LIGO material described in Section 8.3, or use material that your company supplies.

## 8 Manufacturing

### 8.1 Precedence

The Statement of Work (SOW) sections below regarding processing or fabrication of the parts are meant to convey the scope and nature of the requested work. If there is a conflict between the SOW and the drawing, the drawing has precedence. This RFQ does not include the laser ablation of the v-grooves in both drawings. It is for the fabrication of the sapphire prisms themselves, less the v-grooves.

### 8.3 Materials

Prisms are made from sapphire. LIGO can provide the material. The LIGO material is HEM sapphire, CSI white high purity, from Crystal Systems, [http://www.crystalsystems.com/sapphire\\_grading\\_system.pdf](http://www.crystalsystems.com/sapphire_grading_system.pdf). It is 25cm in diameter and 10 cm thick. Inspection polish on both faces. There is a 1 degree wedge between surfaces. The O.D. and bevels have been polished. LIGO material left over from the fabrication effort must be returned to LIGO. If you choose to quote using LIGO-supplied material, indicate this on the quote.

### 8.4 Machining for Use in Ultra High Vacuum (Clean)

- All machining fluids must be fully synthetic, water soluble (not simply water miscible) and free of sulfur, chlorine, and silicone.

### 8.5 Finishing

- Inspection polish on all surfaces.