LIGO LABORATORY
California Institute of Technology
1200 E. California Blvd.
Pasadena, CA 91125

Statement of Work
SI-134g In-vacuum cables
C1105931-v4

1.0 Scope
This SOW is for the fabrication of various individual parts detailed in the drawing included in this package. These parts will be assembled by the Supplier to create in-vacuum cables for use in several Advanced LIGO subsystems. These cables (and their individual parts) will be in contact with an Ultra High Vacuum (UHV) environment. Please note that some of the parts for the assembly of the cables will be supplied by LIGO.

2.0 Document Access
Many supplemental documents and specifications are incorporated into and made a part this Statement of Work. Click on the document links to access these documents from the LIGO Document Control Center (DCC) or go on line to the LIGO Public DCC at https://dcc.ligo.org/ to access the DCC#.

3.0 Commercial Terms and Applicable LIGO Specifications:

Note: The documents listed below are invoked for this Statement of Work and comprise additional requirements which are integral to this Statement of Work.

- LIGO-C080185-v1 LIGO Commercial Items or Services Contract General Provisions
- LIGO-Q0900001-v5 Advanced LIGO Supplier Quality Requirements

4.0 Quality System:
Referring to the above referenced LIGO Specification Q0900001, Suppliers should include a copy of their current ISO 9001, AS9100, or TS16949 certification in their bid package. Suppliers lacking current certification should send a copy of their Quality Manual with their bid package.

5.0 Parts/Assemblies to be manufactured, Quantity Required, and Inspection requirements:

Note: Quantities for D1100153, D1100154, and D1100155 have changed.
Note: refer to Section 8.0 for delivery schedule and location
All cable lengths are to be measured, and found to comply with drawing tolerances.
All other dimensions on the drawing should be checked on the first article.
All cables are to be electrically tested for continuity, shorting, cross-connection insulation resistance and HiPot withstand.

Drawing #	Part Description	Total Qty:
D1000225	25-pin-to-25-pin cable, **108”** long	75
D1000225	25-pin-to-25-pin cable, **180”** long	106
D1000225	25-pin-to-25-pin cable, **199”** long	12
D1000225	25-pin-to-25-pin cable, **209”** long	15
D1000225	25-pin-to-25-pin cable, **230”** long	10
D1100148	DB3 F to DB3 M Power **80”** long	160
D1100150	DB3 F to Pins Power **40”** long	80
D1100151	DB3 F to Pins Power **60”** long	80
D1100152	25-pin-to-25-pin cable, **110”** long	42
D1100153	25-pin-to-25-pin cable, **80”** long	75
D1100154	25-pin-to-two 9-pin cable, **48”** long	40
D1100155	25-pin-to-25-pin cable, **120”** long	40

Note: refer to LIGO-L1100003 (Sec 3.0) for the AQL table.

6.0 Manufacturing:

6.1 Requirements:
Suppliers must refer to the LIGO Specifications referenced in Section 3 for additional, and in some cases, non-industry standard requirements.

6.2 Sub-Contracted Work:
LIGO expects that at least 2/3 (by dollar value) of the contracted work be performed by the Supplier named on the Purchase Order. The Supplier shall be responsible for all sub-contracted work.

6.3 Precedence:
The drawings typically represent the finished part as needed for use in service. Suppliers should always contact a LIGO representative to resolve any discrepancies uncertainties in the documentation or instructions.

6.4 Special Instructions:

6.4.1 Restrictions:

Cleanliness Requirements for Cable Assembly/Manufacture:

- These cables will be used in an Ultra-High Vacuum (UHV) system. Care must be taken to maintain cleanliness while handling and machining these parts. All machines, tools, fixtures and storage containers which come into contact with the cable parts or cable assemblies should be clean, and kept clean from oxides, oils, etc. This is to avoid cross contamination before any winding/assembly takes place.
- All parts/components of the cable assembly must be as clean as possible before assembly.
- The backshells are machined parts. Water soluble (not just water miscible) cutting fluid (lubrication) is to be used for all machining operations. The use of cutting fluids or lubricants, which contain sulfur, chlorine or silicone compounds is prohibited. Machine all backshell surfaces to remove any oxides and mill finish. No grinding or lapping with abrasive wheels, cloth or stones is permitted. Abrasive removal techniques are not acceptable. All electrical pin connections on the cables must be crimped and not soldered.
- Any approved molded parts must use no kind of mold release agent, or other additives.

6.4.2 Materials:

The wire to be used to manufacture the cables, the copper braided shield and PEEK overbraid material will be supplied by LIGO. All other materials are specified on the drawings. All materials specified by drawings or SOW have been approved for use in the UHV environment in LIGO. No materials may be substituted or added without prior knowledge and testing by LIGO. Cast tooling plate is not permitted.

6.4.3 Finishing:

Any required surface finish is defined in the drawings. Localized scratches, digs and blemishes should be minimized.

6.4.4 Markings:

The drawing number, revision, length and a serialized, 8-digit serial number shall be etched or engraved on to each backshell of the cables. The particular serial numbers will be provided by the LIGO Lab when needed. The method used is unimportant except that it should leave no residue to contaminate the aLIGO ultra-high vacuum system, and should result in a legible set of numbers without using any dyes or inks.
As an example of the kind of writing requested, here is a fictitious number of the correct format:

D1000225-v2 108”
S1101234

6.5 Exclusions:

- Supplier is NOT responsible for the procurement of Kapton coated wire.
- Supplier is NOT responsible for the procurement of the PEEK over-braid.

7.0 End Item Data Package:

Before delivery of the parts, the Supplier shall 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
- Inspection reports of all dimensional features for the number of parts specified per the AQL number and referenced in the AQL table LIGO-L1100003 (Sec 3.0) and any other inspection requirements detailed in Section 5 of this SOW
- Certificate of compliance for each part number stating conformance to contract and drawing requirements

8.0 Delivery Requirements:

8.1 Shipping Containers and Packaging:

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

8.2 Shipping Destination(s):

The deliveries are FOB at these destinations, i.e. the Supplier has the 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.

These items will be shipped to:

California Institute of Technology (CIT)
LIGO Project MS 100-36
391 S. Holliston Ave.
Pasadena, CA 91125
Attn: Ben Abbott

8.3 Delivery Schedule:

Cables should be shipped within an 8 weeks after receipt of materials.