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Market Survey

MS–2611/EP/ATL

Supply and Coating of High Thermal Conductivity Pyrolitic Graphite Substrates for the ATLAS SCT

Original: English
TA1 Group

Contains:

General Description

Qualification Criteria

Questionnaire

Abstract

The purpose of this Market Survey is to establish a list of firms able to supply High Thermal Conductivity Pyrolitic Graphite substrates with thermal conductivity >1650 W/mK, at 20^{o}C, and a negative temperature gradient coefficient. The substrates are to be cut to shape and coated with polyimide, with the option of attached ceramic facing plates. Approximately 5500 substrates are required in total, consisting of two different shapes and thicknesses.

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General Description

1. Introduction

CERN is one of the world's largest scientific laboratories and an outstanding example of international collaboration of its many member states. The LHC project, a large proton-proton collider, was approved in 1994 by the 19 member states of CERN. The LHC will be the next major research tool for world particle physics and it is expected to be commissioned in 2005. ATLAS is one of the two main experiments which will be installed on this accelerator. Its inner detector is situated closest to the interaction point and one of the three components of this inner detector is the SemiConductor Tracker (SCT).

The SCT is a large silicon microstrip tracking detector which is made up from silicon detector modules. In each module, the silicon wafers are attached to a thin *baseboard* of high thermal conductivity pyrolitic graphite coated with 20 μm thick polyimide to which, optionally, ceramic facing plates or inserts will be attached. The high thermal conductivity pyrolitic graphite, hereafter referred to as HCPG, must have thermal conductivity >1650 W/mK, at 20°C, with a negative fractional in-plane temperature gradient coefficient of typically –0.4% /K. The supply of approximately 5,500 of these complete *baseboards* is the subject of this Market Survey.

2. Scope of the Market Survey

The purpose of this market survey is to identify companies specialised and experienced in the manufacture of HCPG substrates and able to supply such substrates cut and coated with polyimide to form *baseboards*. The coating can be to a technique successfully developed at CERN for the purpose. Beryllia facing plates, if required, can be supplied by ATLAS to the company, and can to be attached by a technique also developed at CERN. CERN, on behalf of several of the collaborating Institutes of ATLAS, intends to issue an Invitation to Tender for approximately 5,500 completed *baseboards*. .The forthcoming Invitation to Tender shall only be sent to companies which have thoroughly answered the Questionnaire and have fulfilled the Qualification Criteria of this Market Survey. CERN reserves the right to split the contract between different suppliers.

3. Technical Description of the Supply

3.1. The High Thermal Conductivity Pyrolytic Graphite (HCPG)

The HCPG must have in-plane thermal conductivity at 20°C between 1650 W/mK and 1750 W/mK, with a negative fractional in-plane temperature coefficient of typically –0.4% /K, and a transverse thermal conductivity of typically 25 W/mK. The substrate thickness will be either 380 μm or 500 μm , with a uniformity of thickness of ±5 μm over the baseboard area and comparable flatness. The surface should be smooth.

The substrates are to be profiled to the shapes shown schematically in figures 1 and 2 (all dimensions are still subject to modification). The baseboard of figure 1 is 380 μm thick and some holes and slots, of typical dimensions 500 μm to 2mm, will be required within it. The baseboard of figure 2 is 500 μm thick apart from the grey shaded areas which are thinned to 250 μm All internal and external edges must be smoothed for both baseboards.

Figure 1: Schematic profile of baseboard shape number 1. Dimensions are in mm. Two internal slots and two internal holes are indicated.

Figure 1 Schematic profile of baseboard shape number 2. Dimensions are in mm. The shaded grey areas are of half the thickness.

3.2. The Polyimide Baseboard Coating

The HCPG board is to be coated with polyimide on both planar surfaces to a thickness of 20 μm, with less than ±4 μm variation. All internal and external board edges are to be coated with polyimide of at least 20 μm in thickness. The detailed techniques for applying the coating and the specific coating material could be specified to qualified manufacturers at a technical meeting in CERN. Standard equipment and procedures for curing at a range of temperatures are required.

3.3 Attaching Ceramic Facings

For baseboard shape number 1, four pieces of beryllia, each 250 μm thick, provided by ATLAS, and with size typically 4mm×30mm and 15mm×60mm are to be attached to the coated surface, in a bubble-free process, with a few micron thick epoxy layer. The relative positions of the board and the facings will be determined by jigs to be provided by ATLAS. The details of epoxy and processing procedures could be provided to qualified companies at a technical meeting in CERN.

For baseboard shape number 2, three pieces of aluminium nitride of typical size 10mm×80mm may be attached to the thinned areas.

4. Quantity and Delivery

4.1. Quantity and Extent of the Supply

The supply consists of:

- The production of approximately 5,500 baseboards consisting of polyimide coated HCPG substrates to the dimensions and tolerances specified above..
- An additional and separate option of attaching beryllia facings to the coated baseboards of type 1 before delivery by the company.
- An additional and separate option of attaching aluminium nitride pieces to the coated baseboards of type 2 before delivery by the company.

4.2. Provisional Delivery Schedule

The year foreseen for tendering and adjudication is 1999. The delivery is anticipated through the years 2000-2001. It is expected that the contract and delivery will proceed in two distinct phases, with evaluation by ATLAS following the first phase. The proportion of the baseboards required in each of these phases will be about 5% and 95% of the total.

5. Persons in Charge for Technical Aspects

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Qualification Criteria

In order to be considered as a possible bidder for the forthcoming Invitation to Tender, the company shall satisfy the criteria specified below.

(a) The company should have proven experience in the production of HCPG substrate material, with thermal conductivity of typically 1700 W/mK at 20^{o}C.
(b) The company should be able to prove their experience in the field by providing samples of such HCPG within 3 weeks upon request from CERN.
(c) The company should be able to provide a profiled sample baseboard, coated with polyimide to the specification of this Market Survey, within 6 weeks of receiving a request from CERN.
(d) The company must ensure that the thermal conductivity of the HCPG remains within the specified range and provide relevant data sheets for each delivered batch.
(e) The company must have proven experience in providing HCPG encapsulated products.
(f) The company must demonstrate that it has capacity for delivery of HCPG coated baseboards that meet the requirements of 4.2.
(g) The annual turnover should be greater than 6 MCHF for both the years 1996 and 1997.
(h) The company must be registered in one of the CERN Member States or in one of the countries collaborating in ATLAS (see document DG/ATL/98-13).
(i) A registered Quality Assurance Plan meeting the requirements of ISO9000 or a national equivalent.

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Original: English
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Questionnaire

(To be returned in duplicate, by the companies interested in tendering)

Company .....

Company:

Name: .....

Address: .....

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Commercial Contact Person .....
Telephone Number .....
Fax Number .....
Electronic Mail .....

In case of absence:

Commercial Contact Person .....
Telephone Number .....
Fax Number .....
Electronic Mail .....

Technical Contact Person .....
Telephone Number .....
Fax Number .....
Electronic Mail .....

In case of absence:

Technical Contact Person .....
Telephone Number .....
Fax Number .....
Electronic Mail .....

1. General Information

1.1. Are you interested in receiving the Invitation to Tender ?

❑ Yes ❑ No

1.2. Financial information

When established: ……
Registered capital: ……
Turnover in 1996: ……
Number of employees in 1997: ……
Turnover in 1997:

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1.3. Would you sub-contract part of the work ?

❑ Yes ❑ No

If yes, please specify which part of the work that would be sub-contracted, and give the name, address, person in charge and the telephone number of the potential sub-contractors:

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1.4. Would you accept a contract for part of the supply?

❑ Yes ❑ No

1.5. Have you previously replied to a CERN call for tender?

❑ Yes ❑ No

If yes, specify for which product(s):

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2. Qualification Criteria

· Does your company comply with the qualification criteria stipulated in this market survey?

❑ Yes ❑ No

If not, indicate in what respects:

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3. Further Technical Information

i. Give details of your experience in manufacturing HCPG of thermal conductivity in the region of 1700 W/mK at 20^{o}C

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ii.Give details of your experience in delivering HCPG encapsulated products.

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iii. Are you interested in attaching beryllia facings to the coated baseboards?

❑ Yes ❑ No

iv. Are you aware of the hazards associated with handling beryllia products?

❑ Yes ❑ No

v.Are you interested in attaching aluminium nitride pieces to the coated baseboards?

❑ Yes ❑ No

vi. What is your monthly production capacity for producing coated baseboards of the type described above ?

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vii. Can you satisfy the Qualification Criterion item (c).

❑ Yes ❑ No

viii. Do you, or a sub-contractor, have the equipment used for standard polyimide coating processes?

❑ Yes ❑ No

ix. Do you, or a sub-contractor, have the equipment and experience necessary to measure the thermal conductivity of the produced baseboards?

❑ Yes ❑ No

x. Do you, or a sub-contractor, have the equipment and experience necessary to measure the dimensions and flatness of the produced baseboards?

❑ Yes ❑ No

xi. Can you provide samples of bare HCPG?

❑ Yes ❑ No

xii. Do you have a Quality Assurance Plan?

❑ Yes ❑ No

If yes, is it registered by an accredited body like ISO?

❑ Yes ❑ No

Indicate which one:

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4. Comments on the Product Requirements:

i. Are there points within the requirements that cause you particular concerns either technically or as cost-driving items?

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ii. General suggestions from the company:

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Questions from the company:

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Date *Company seal and signature*