外部委託業者の募集

References: IO/26/OT/10035272/LLU

“Service Contract for Design and Prototyping of X-ray Optics assembly for ITER XRCS-Core "

（ITER XRCS-コアのための X 線光学組み立ての設計とプロトタイプ製作のサービス契約）

IO 締め切り 2026 年 7 月 31 (金)

〇はじめに

本事前情報通知（PIN）は、作業契約の入札授与および実行につながる公開入札調達プロセスの最初のステップです。

本文書の目的は作業範囲と入札プロセスに関する技術的な内容の基本的な要約を提供することです。

〇背景

ITER は平和利用の核融合発電の科学的および技術的な実現可能性の実証を目的とした、国際共同研究開発プロジェクトです。ITER 機構の 7 つのメンバーは、;欧州連合（EURATOM が代表）、日本、中華人民共和国、インド、大韓民国、ロシア連邦、および米国です。

ITER の敷地はフランス南東部のブーシュデュローヌ地区にあり、ITER 本社（HQ）もあるフランス CEA サン・ポール・レ・デュランス に近いところに位置しています。詳細については、ITER のウェブサイト http://www.iter.org を参照して下さい。

〇作業範囲

技術仕様書の付属書 1 GBYAK4_v1.3を参照下さい。

〇調達プロセスと目的

目的は、競争入札プロセスを通じて供給契約を落札することです。

この入札のために選択された調達手続きは公開入札手続きと呼ばれます。

オープン入札手順は、次の 4 つの主要なステップで構成されています。

- ステップ 1-事前情報通知（PIN）

  事前情報通知は公開入札プロセスの第一段階です。IO は、関心のある候補企業に対し、以下の概略日程に示された期日までに担当調達担当官に添付の関心表明フォームで以下の情報を提出し、競争プロセスへの関心を示すよう正式に要請します。

  特に注意:

  関心のある候補企業は、IO Ariba の電子調達ツール 「IPROC」 に登録してください（まだ登録していない場合）。手順については、

  https://www.iter.org/fr/proc/overview

  を参照してください。

Ariba (IPROC) に登録する際には、お取引先様に最低 1 名の担当者の登録をお願いします。**関心表明書において特定された担当者は、IPROC に登録されている必要があります。**

- ステップ 2-入札への招待

  PIN の発行から 10 作業日経過後、提案依頼書（RFP）を 「IPROC」 に掲載します。この段階では、担当の調達担当者に関心を示し、かつ IPROC に登録している関心のある候補企業は、RFP が公表された旨の通知を受けることができます。その後、RFP に詳述されている入札説明書に従って提案書を作成し、提出します。

  このツールに登録されている企業のみが入札に招待されます。

- ステップ 3-入札評価プロセス

  入札者の提案は、IO の公平な評価委員会によって評価されます。入札者は、技術的範囲に沿って、かつ、RFP に記載された特定の基準に従って作業を実施するために、技術的遵守を証明する詳細を提供しなければなりません。

- ステップ 4-落札

  認定は、公開されている RFP に記載されている、コストに見合った最適な価格または技術的に準拠した最低価格に基づいて行われます。

〇概略日程

概略日程は以下の通りです：

マイルストーン	暫定日程
事前指示書（PIN）の発行	2026 年 7 月 22 日
関心表明フォームの提出	2026 年 7 月 31 日
iPROC での入札への招待の発行	2026 年 8 月初旬
入札提出	2026 年入札発行後 4 週間後
契約評価と授与	2026 年 9 月初旬

〇契約期間と実行

ITER機構は206年のQ3ごろ供給契約を授与する予定です。予想される契約期間は14か月です。

〇経験

候補者は以下の経験と能力を有している必要があります。

- X 線結晶および光学機構の設計経験
- 高精度 X 線結晶の製作および光学機構システムの統合に関する経験
- X 線光学系の性能試験および真空性能試験に関する経験

〇候補

参加は、個人またはグループ/コンソーシアムに参加するすべての法人に開放されます。法人とは、法的権利及び義務を有し、ITER 加盟国内に設立された個人、企業又は機構をいいます。ITER 加盟国は欧州連合(EURATOM メンバー)、日本、中華人民共和国、インド共和国、大韓民国、ロシア連邦、アメリカ合衆国です。

法人は、単独で、またはコンソーシアムパートナーとして、同じ契約の複数の申請または入札に参加することはできません。共同事業体は、恒久的な、法的に確立されたグループ又は特定の入札手続のために非公式に構成されたグループとすることができます。

コンソーシアムのすべての構成員(すなわち、リーダーと他のすべてのメンバー)は、ITER 機構に対して連帯して責任を負います。

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【※　詳しくは添付の英語版技術仕様書「**Design and Prototyping of X-ray Optics assembly for ITER X-Ray Crystal Spectroscopy-Core**」をご参照ください。**】**

ITER 公式ウェブ　http://www.iter.org/org/team/adm/proc/overview からもアクセスが可能です。

「核融合エネルギー研究開発部門」の HP：　http://www.fusion.qst.go.jp/ITER/index.html
では ITER 機構からの各募集（IO 職員募集、IO 外部委託、IO エキスパート募集）を逐次更新しています。ぜひご確認ください。

イーター国際核融合エネルギー機構からの外部委託
に関心ある企業及び研究機関の募集について

＜ITER 機構から参加極へのレター＞

以下に、外部委託の概要と要求事項が示されています。参加極には、提案された業務に要求される能力を有し、入札すべきと考える企業及び研究機関の連絡先の情報を ITER 機構へ伝えることが求められています。このため、本研究・業務に関心を持たれる企業及び研究機関におかれましては、応募書類の提出要領にしたがって連絡先情報をご提出下さい。

Route de Vinon-sur-Verdon - CS 90 046 - 13067 St Paul Lez Durance Cedex - France

PRIOR INFORMATION NOTICE (PIN)

IO/26/OT/10035272/LLU

Design and Prototyping of X-ray Optics assembly for ITER X-Ray Crystal Spectroscopy-Core

Prior Indicative Notice annexes:

- Annex I: Technical Specification GBYAK4_v1.3
- Annex II: Expression of Interest

Abstract.

The purpose of this summary is to provide prior notification of the IO's intention to launch a competitive Open Tender process in the coming weeks. This summary provides some basic information about the ITER Organisation (the "IO"), the technical scope for this tender, and details of the tender process.

1 Introduction

This Prior Information Notice (PIN) is the first step of an Open Tender Procurement Process leading to the award and execution of a Service Contract.

The purpose of this document is to provide a basic summary of the technical content in terms of the scope of work, and the tendering process.

The Domestic Agencies are invited to publish this information in advance of the forthcoming tender giving companies, institutions or other entities that are capable of providing these services the prior notice of the tender details.

2 Background

The ITER project is an international research and development project jointly funded by its seven Members being, the European Union (represented by EURATOM), Japan, the People's Republic of China, India, the Republic of Korea, the Russian Federation and the USA. ITER is being constructed in Europe at St. Paul–Lez-Durance in southern France, which is also the location of the headquarters (HQ) of the ITER Organization (IO).

For a complete description of the ITER Project, covering both organizational and technical aspects of the Project, visit www.iter.org.

3 Scope of the Package

Please refer to Annex 1 of Technical Specification GBYAK4_v1.3

4 Procurement Objective & Process

The objective is to award a Supply Contract through a competitive bidding process.

The Procurement Procedure selected for this tender is called the **Open Tender** procedure.

The Open Tender procedure is comprised of the following four main steps:

- Step 1- Prior Information Notice (PIN) - publication on IO web procurement page

  The Prior Information Notice is the first stage of the process. The IO formally invites interested candidate companies to indicate their interest in the competitive process, within **10 calendar days**, by returning to the Procurement officer:
  - Name of candidate company
  - Country of registration
  - Point of contact name, email, title, and phone number.

  Interested tenderers are kindly requested to return the expression of interest form (Annex II) by e-mail by the date indicated in the procurement time table below.

  Special attention:

  Interested candidate companies are kindly requested to promptly register in the IO Ariba e-procurement tool called "IPROC", if not so done yet. The process on how to do is described at the following link: https://www.iter.org/fr/proc/overview.

  When registering in Ariba (IPROC), suppliers are kindly requested to register at least the contact person. This contact person will be receiving the notification of publication of the Request for Proposal and will then be able to forward the tender documents to colleagues if deemed necessary. **Therefore, the person identified in the Expression of Interest must be registered in IPROC.**

- Step 2 - Invitation to Tender

  After the full registration of interested candidate companies, the Request for Proposals (RFP) will be published in "IPROC". This stage allows interested candidate companies

who have indicated their interest to the Procurement Officer in charge AND who have registered in IPROC to receive the notification that the RFP is published. They will then prepare and submit their proposals in accordance with the tender instructions detailed in the RFP.
Only companies registered in this tool will be invited to the tender and registered company can only submit a proposal in their name.

- Step 3 – Tender Evaluation Process

  Tenderers proposals will be evaluated by an impartial evaluation committee of the IO. Tenderers must provide details demonstrating their technical compliance to perform the work in line with the technical scope and in accordance with the particular criteria listed in the RFP.

- Step 4 – Contract Award

  The award will be done on the basis of best value for money or lowest price technically compliant offer as described in the published RFP.

5 Procurement Timetable

The tentative timetable is as follows:

Milestone	Date
Publication of the Prior Information Notice (PIN)	22 of July 2026
Submission of expression of interest form	before end of July
Tender Launch	Beginning of August 2026
Tender Submission (Shortened tender submission time with special approval)	4 weeks after the Tender launching
Tender Evaluation & Contract Award	Beginning of September 2026

6 Experience Requirements

The candidates shall have the following experience and competences:

- Design Experience of X-ray crystal and optical mechanism.
- Experience of precision X-ray crystal manufacturing and optical mechanism system integration.
- Experience of X-ray optic performance testing and vacuum performance testing.

7 Quality Assurance Requirements

Prior to commencement of any work under this Contract, a “Quality Plan” shall be produced by the Contractor and submitted to the IO for approval, describing how they will implement the ITER Procurement Quality Requirements.

8 Contract Duration and Execution

The ITER Organization will award the Contract in Q3 2026. The estimated contract duration is with a period of 14 months.

9 Candidature

Participation is open to all legal entities participating either individually or in a grouping/consortium. A legal entity is an individual, company, or organization that has legal rights and obligations and is established within an ITER Member State.

Legal entities cannot participate individually or as a consortium partner in more than one application or tender of the same contract. A consortium may be a permanent, legally established grouping, or a grouping which has been constituted informally for a specific tender procedure. All members of a consortium (i.e. the leader and all other members) are jointly and severally liable to the ITER Organization.

In order for a consortium to be acceptable, the individual legal entities included therein shall have nominated a leader with authority to bind each member of the consortium, and this leader shall be authorised to incur liabilities and receive instructions for and on behalf of each member of the consortium.

It is expected that the designated consortium leader will explain the composition of the consortium members in a covering letter at the tendering stage (the Invitation to Tender). Following this, the Candidate's composition must not be modified without notifying the ITER Organization of any changes. Evidence of any such authorisation shall be submitted to the IO in due course in the form of a power of attorney signed by legally authorised signatories of all the consortium members.

10 Sub-contracting Rules

All sub-contractors who will be taken on by the Contractor shall be declared with the tender submission. Each sub-contractor will be required to complete and sign forms including technical and administrative information which shall be submitted to the IO by the tenderer as part of its tender.

The IO reserves the right to approve (or disapprove) any sub-contractor which was not notified in the tender and request a copy of the sub-contracting agreement between the tenderer and its subcontractor(s). Sub-contracting is allowed but is limited to 40% of the total Contract value. Rules on subcontracting in details will be indicated in the RFP itself.

IDM UID

GBYAK4

VERSION CREATED ON / VERSION / STATUS

08 Jul 2026 / 1.3 / Approved

EXTERNAL REFERENCE / VERSION

Technical Specifications (In-Cash Procurement)

Design and Prototyping of X-ray Optics assembly for ITER XRCS-Core

This document specifies the scope of design and prototyping of the x-ray spectrometer, including crystal assembly, crystal housing, and associated alignment components, for the ITER XRCS-Core diagnostic system.

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1 Preamble

This Technical Specification is to be read in combination with the General Management Specification for Service and Supply (GM3S) – [Ref 1] that constitutes a full part of the technical requirements.

In case of conflict, the content of the Technical Specification supersedes the content of Ref [1].

2 Purpose

This document specifies the scope of design and prototyping of the X-ray optics assembly for ITER XRCS-Core, including crystal assembly, calibration source and associated alignment components, for the ITER XRCS-Core diagnostic system, for which IO holds responsibility under a Service Provider Agreement (SPA), LGA-2025-A-051, with USDA.

3 Acronyms & Definitions

3.1 Acronyms

The following acronyms are the main one relevant to this document.

Abbreviation	Description
CRO	Contract Responsible Officer
DA	Domestic Agency
DSM	Diagnostic Shield Module
GM3S	General Management Specification for Service and Supply
HOPG	Highly Oriented Pyrolytic Graphite
IO	ITER Organization
IO-TRO	ITER Organization Technical Responsible Officer
ISS	Interspace Support Structure
PIA	Protection Important Activity
PIC	Protection Important Component (component critical for nuclear safety)
PRO	Procurement Responsible Officer
RH	Remote Handling
SIC	Safety Importance Component
SRD	System Requirement Document
SPA	Service Provider Agreement
XRCS	X-Ray Crystal Spectroscopy

3.2 Definitions

Contractor: shall mean an economic operator who has signed the Contract in which this document is referenced.

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4 Applicable Documents & Codes and standards

This is the responsibility of the Contractor to identify and request for any documents that would not have been transmitted by IO, including the below list of reference documents.

This Technical Specification takes precedence over the referenced documents. In case of conflicting information, this is the responsibility of the contractor to seek clarification from IO.

Upon notification of any revision of the applicable document transmitted officially to the contractor, the contractor shall advise within 4 weeks of any impact on the execution of the contract. Without any response after this period, no impact will be considered.

Ref	Title	IDM Doc ID	Version
[1]	General Management Specification for Service and Supply (GM3S)	82MXQK	1.4
[2]	Sub-System Requirement Document sSRD-55.E5: X-Ray Crystal Spectroscopy Core (XRCS Core)	WYX93Z	2.4
[3]	Defined requirements for PBS 55 - Diagnostics	NPEVB6	2.0
[4]	PRELIMINARY ANALYSIS OF THE IMPACT OF THE INB ORDER - 7TH FEBRUARY 2012	AW6JSB	1.0
[5]	Provisions for Implementation of the Generic Safety Requirements by the External Actors/Interveners	SBSTBM	2.2
[6]	ITER Procurement Quality Requirements	22MFG4	6.3
[7]	IS-31-55-027 Interface sheet between Diagnostic 55.E5 XRCS-Core and Vacuum System	8DE2FW	1.0
[8]	IS-55.E5-55.Q2-001 Physical & Functional Interfaces between XRCS-Core and Diagnostic Equatorial Port 02	6Q6B59	2.0
[9]	ITER Dimensional Metrology Handbook	VYJ7U2	2.1
[10]	Codes and Standards for ITER Mechanical Components	25EW4K	5.0
[11]	ITER Vacuum Handbook	2EZ9UM	2.5
[12]	System Design Description (DDD) 55.E5 X Ray Crystal Spec Core	E6CMJT	1.1
[13]	ITER CAD Manuals	29FVC2	Folder

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5 Scope of Work

This section defines the specific scope of work for the service, in addition to the contract execution requirement as defined in Ref [1].

5.1 General Introduction

The primary function of XRCS-Core diagnostic is to diagnose ion temperature and plasma rotation profiles in the ITER core plasma, which will be achieved by measuring the X-ray spectra emitted by the impurity ions. It is designed to collect X-ray light from the plasma through components located in equatorial port 2 using detectors at the back of ISS with multiple lines of sights, as shown in Figure 1. The system is housed in EQ#2 and features a novel dual-reflection configuration, optimized to fit the available space while reducing radiation exposure by positioning the detectors further back in the interspace. To enhance x-ray throughput and misalignment tolerance, Highly Oriented Pyrolytic Graphite (HOPG), which has a mosaic structure of microscopic crystallites, instead of a perfect crystal reflector, is applied as the pre-reflector. The diagnostic system includes Upper, Middle, and Lower pre-reflectors within the Diagnostic Shield Module #2 (DSM#2) to provide sufficient coverage of the ITER plasma. A vacuum environment extends through the front-end of the detector sensors. Figure 1 illustrates the x-ray pathway, from the vacuum extensions to the spectrometer box, located behind the Bioshield, which houses the crystal spectrometers and alignment subsystems.

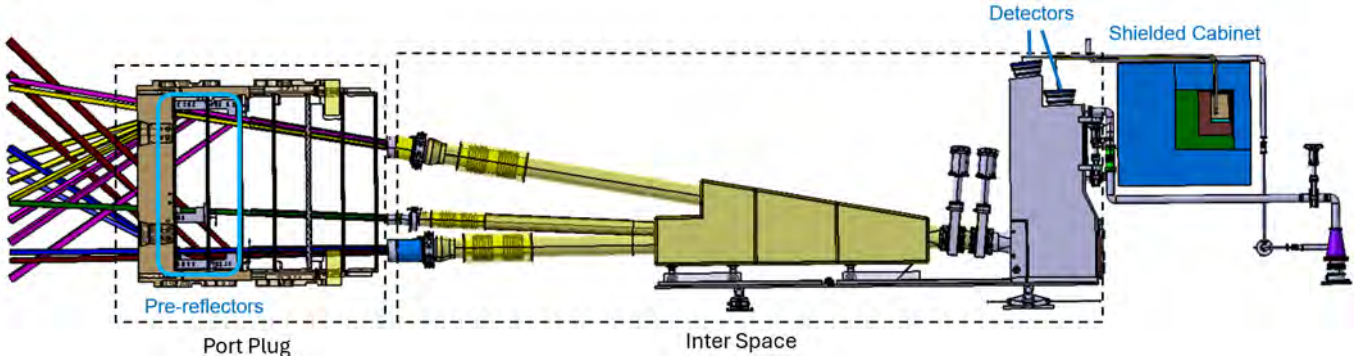

Figure 1. XRCS-Core System Overview

The scope of this contract includes addressing these challenges is broken down as below.

5.2 Scope of work #1: Design of Crystal Assembly and Tuning Mechanism

This task covers the complete mechanical design of the crystal assembly, including six spherically bent germanium crystals, crystal mounts, adjustable support with the integration of actuators that enable adjustment of both the orientation and position of the crystals. The actuators shall support remote operation, allowing precise and flexible alignment without requiring physical access. The mechanical interfaces of the assembly shall ensure sufficient stability and compatibility with the surrounding components, maintaining reliable performance throughout the system's operational lifetime. All selected components shall be suitable for the application in Ultra-High Vacuum (UHV) and environmental conditions in the ITER Port Cell, including radiation, magnetic fields, and other relevant operational constraints.

A PDR-level design concept of the crystal assembly is shown in Figure 2. IO will provide the 3D model including the designed lines of sight (LoSs), which are the interface to define the

position of the crystals. The support structure should have no interference to the LoSs. The assembly shall accommodate six crystals, each equipped with two-axis positioning adjustment driven by piezoelectric motors and one temperature monitor. In addition, an overall lifting mechanism shall be applied to the top support plate carrying all crystals, in order to compensate for the relative displacement between the port plug and the ISS. The contractor shall assess the feasibility of this concept and, if necessary, propose an alternative solution, subject to CRO approval.

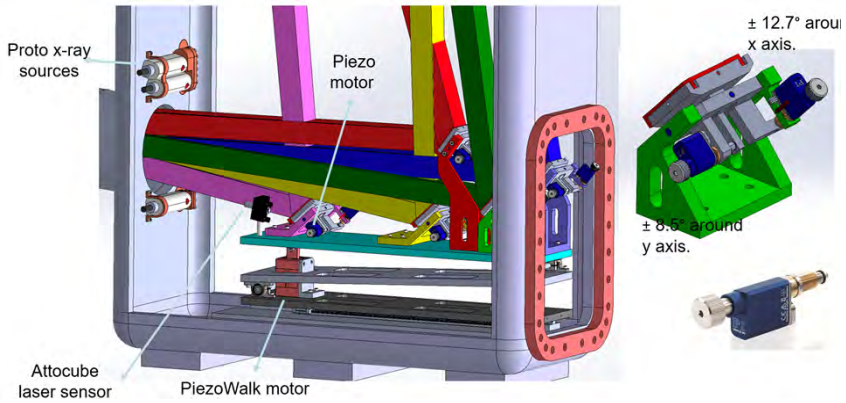

Figure 2: PDR design of crystal assembly

The design shall be based on commercially available off-the-shelf actuator components. The cable routing and electrical connections of all actuators shall be carefully evaluated to ensure compatibility with the local environmental conditions and assembly constraints.

The two-axis positioning adjustment shall meet the following performance requirements:

- **Pitch rotation:** adjustment range of at least ±10°, with positioning accuracy better than 0.01°
- **Radial linear translation:** adjustment range of at least ±5 mm, with positioning accuracy better than 0.1 mm

The overall lifting mechanism shall provide:

- **Vertical translation:** adjustment range of at least ±10 mm, with positioning accuracy better than 0.1 mm

The Contractor shall carry out the detailed design of the crystal assembly including the tuning mechanism and support IO in completing the integration of the design model into the ITER ENOVIA system.

Deliverables

- Technical report describing the mechanical design concept and evaluating the adjustment performance, including the components list and technical specification of commercial components
- 3D CAD models and manufacturing drawings of the crystal assembly and components

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5.3 Scope of work #2: Design of Crystal Alignment and Calibration System

A dedicated alignment and calibration system for the crystal assemblies shall be designed. The alignment system is used to detect the relative displacement between the crystal assembly (in the ISS) and the pre-reflectors (in the PP). The calibration system is used to assess the crystals' condition to ensure proper reflection of the selected X-ray signals.

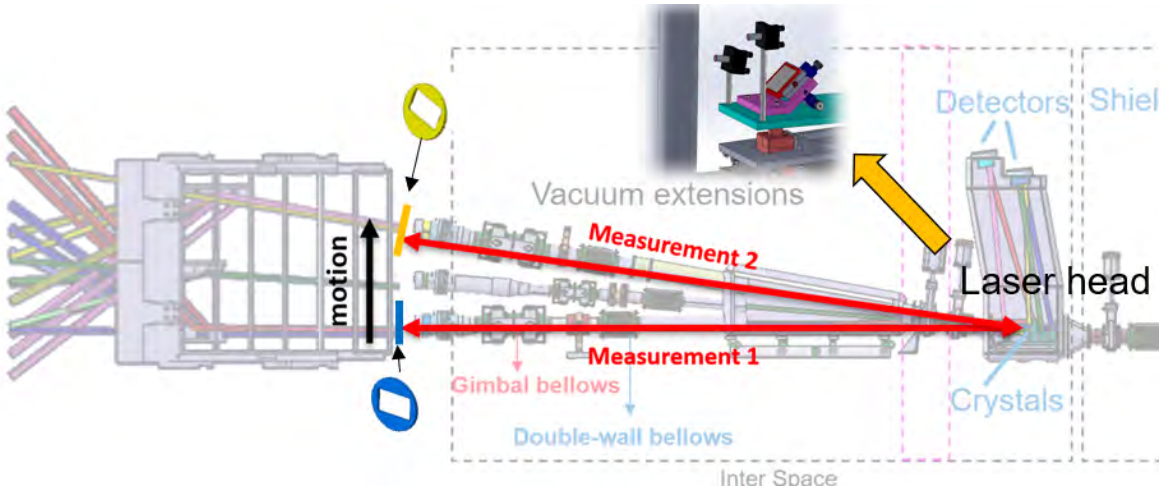

Figure 3: Conceptual design of crystal alignment System

A conceptual design of the alignment system is provided in Figure 3. The system comprises a relative displacement monitoring subsystem and a bellows adjustment mechanism. IO will provide the 3D model of the conceptual design, and the necessary models to define the interfaces.

The relative displacement monitoring subsystem shall provide measurement of the relative displacement between the port plug and the spectrometer housing during ITER operation. The measurable displacement range is ±20mm, with the precision better than 0.5mm. Sensor used in the subsystem shall be compatible with the local operating environment, including magnetic fields up to 200 mT and neutron fluxes up to 10^8 n/cm^2·s.

The bellows adjustment tool should adapt the DN150 bellows and DN100 bellows, and enable controlled adjustment of the relative position between the two ends of the bellows over a range of ±30 mm in both the axial and lateral directions.

The Contractor shall evaluate the feasibility of the proposed concept and, if deemed necessary, submit an alternative technical solution for CRO review and approval. Upon approval of the selected solution by CRO, the Contractor shall carry out the detailed design of the alignment system and support IO in completing the integration of the design model into the ITER ENOVIA system.

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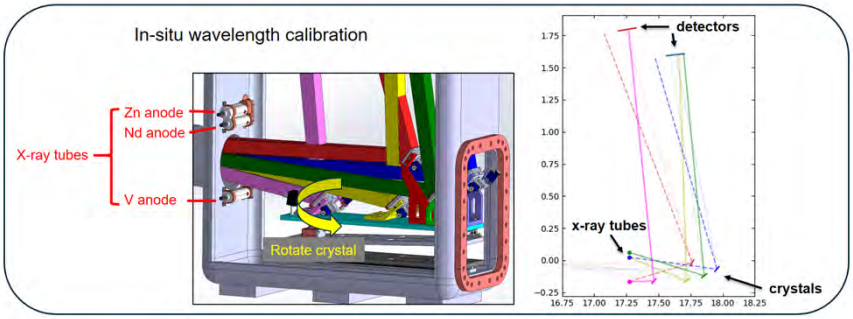

Figure 4: Conceptual design of crystal calibration System

A conceptual design of the wavelength calibration system is provided (see Figure 4), including three vacuum compatible X-ray tubes. The X-ray tubes should provide the characteristics X-ray lines at 5.414 keV (Cr Kα1), 6.49 keV (Mn Kβ1,3) and 9.89 keV (Ge Kα1). The in-vacuum components should meet the ITER VQC requirements as defined in [11] .

The contractor shall evaluate its feasibility and, if necessary, propose an alternative strategy, subject to CRO approval. Once the strategy is approved, the contractor shall proceed with the detailed design.

Deliverables

- Technical report describing alignment system and detailed configuration
- Technical report describing the X-ray tube design concept and detailed configuration.
- Operation instruction of the alignment system and the x-ray calibration system
- 3D CAD models and manufacturing drawings of alignment system and wavelength calibration components

5.4 Scope of work #3: Prototyping and Integration Testing

A complete prototype shall be fabricated, assembled, and tested. The prototype shall comprise:

- One (1) half-size HOPG pre-reflector assembly;
- Six (6) full-size germanium analyzing crystals;
- One (1) full-size crystal mounting assembly, including all adjustment and tuning mechanisms;
- One (1) alignment system;
- One (1) calibration system; and
- One (1) dummy crystal housing to support assembly, alignment, transportation, and testing activities.

The HOPG pre-reflector shall have an active area not smaller than 40 mm × 70 mm.

The germanium analyzing crystals shall be spherically bent to a nominal radius of curvature of approximately 2.0 m, with detailed configuration to be provided in the kick-off meeting. The actual radius of curvature of each crystal shall not deviate from the nominal value by more than ±0.2%. The crystal set shall consist of:

- Four (4) crystals of 50 mm × 50 mm; and

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- Two (2) crystals of 25 mm × 50 mm.

The crystal mounting assembly shall be fabricated at full scale in accordance with the design developed under Scope of Work #1. The assembly shall include full interfaces compatible with the Commercial off-the-shelf actuators, which will be provided by IO.

The alignment and calibration systems shall be fabricated in accordance with the design developed under Scope of Work #2. The calibration system shall incorporate an X-ray source capable of generating the 5.414 keV Cr $K\alpha_1$ emission line.

The objective of the prototype study is to validate the integration of all major subsystems, demonstrate the performance of the two-reflection crystal configuration and its agreement with theoretical and simulation predictions, verify the functionality and operability of the alignment and calibration systems, demonstrate the adjustment capability and repeatability of the crystal mounting assembly, and identify potential design improvements and operational considerations prior to final implementation.

Testing Requirements

A comprehensive testing program shall be conducted, including at minimum:

X-ray Performance Testing

Performance tests shall be carried out using the calibration X-ray source. The tests shall evaluate:

- Spectral response and effective bandwidth;
- Crystal alignment performance;
- Two-reflection optical performance;
- Comparison between measured results and simulation predictions; and
- Repeatability and stability of the system.

Alignment and Calibration System Demonstration

The alignment and calibration systems shall be fully demonstrated. Testing shall determine:

- Achievable displacement measurement accuracy;
- Measurement repeatability;
- Calibration procedure and reproducibility;
- Alignment sensitivity and adjustment resolution; and
- Operational procedures for routine use.

Magnetic Compatibility Testing

All actuators and other relevant components shall be tested to demonstrate compatibility with the expected installation environment, including operation in magnetic fields up to approximately 200 mT.

Vacuum Compatibility and Outgassing Testing

Outgassing testing shall be performed on materials and components intended for installation in the ITER vacuum environment. Testing shall provide evidence supporting compliance with applicable ITER vacuum compatibility requirements.

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A detailed prototyping and testing plan shall be submitted to IO for review and approval prior to the commencement of fabrication and testing activities. Fabrication and testing shall not begin until approval has been obtained.

Upon completion of all activities, a comprehensive test report shall be submitted documenting the test configurations, procedures, measurements, analyses, results, conclusions, and recommendations.

Deliverables

- **Prototype Fabrication and Test Plan**
  - Detailed fabrication approach;
  - Assembly procedures;
  - Test procedures;
  - Test equipment list;
  - Acceptance criteria;
  - Schedule and milestones.
- **Prototype Design Package**
  - Manufacturing drawings;
  - Assembly drawings;
  - Bill of Materials (BOM);
  - Alignment and calibration procedures.
- **Fabricated Prototype Assembly**
  - One complete integrated prototype including:
    - HOPG pre-reflector assembly;
    - Germanium crystal assemblies;
    - Crystal mounting assembly with actuators;
    - Alignment system;
    - Calibration system;
    - Dummy crystal housing.
- **X-ray Performance Test Report**
  - Test setup and methodology;
  - Measured spectral performance;
  - Effective bandwidth evaluation;
  - Comparison with simulation and theoretical predictions;
  - Uncertainty analysis.
- **Alignment and Calibration Validation Report**
  - Alignment accuracy measurements;
  - Calibration results;
  - Repeatability assessment;
  - Operational performance evaluation.
- **Magnetic Compatibility Test Report**
  - Test procedures;
  - Magnetic field conditions;
  - Functional performance under magnetic field exposure;
  - Compliance assessment.
- **Outgassing and Vacuum Compatibility Report**
  - Test methodology;
  - Material characterization;
  - Measured outgassing results;

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- Assessment of suitability for ITER vacuum service.

- **Final Prototype Demonstration Report**
  - Summary of all testing activities;
  - Integrated system performance assessment;
  - Design validation conclusions;
  - Identified risks and recommendations;
  - Proposed improvements for final design implementation.
  - Maintenance recommendations and troubleshooting guidance.

5.5 Scope of work #4: Structural Analysis and Verification

A dedicated structural analysis shall be performed for the crystal assembly, including the crystal mounts, alignment mechanisms, supporting structures. The analysis shall evaluate the effects of expected thermal loads, mechanical loads, transportation loads, and vibrational environments on the structural integrity, dimensional stability, and alignment of the X-ray optics.

The assessment shall include, as a minimum:

- Static structural analysis under operational and handling load conditions;
- Thermal analysis considering the anticipated operating environment and heat loads;
- Modal analysis to identify the natural frequencies of the assembly;
- Vibration response analysis for applicable operational and transportation conditions;
- Evaluation of crystal deformation, displacement, and alignment stability under the specified load cases; and
- Assessment of structural margins and compliance with the defined design requirements.

To validate the analytical results, representative thermal and vibration tests shall be performed on the prototype assembly or an equivalent test article. The test programme shall verify the predicted structural behaviour, alignment stability, and integrity of the optical assembly under the specified environmental conditions.

The objective of this task is to demonstrate that the optical assemblies maintain their structural integrity, alignment accuracy, and functional performance throughout the defined operational, maintenance, transportation, and installation conditions. The results of the analysis and validation activities shall provide evidence supporting the design qualification of the crystal assembly and shall serve as input to the XRCS-Core System Integrity Report and the overall system performance assessment.
Given the expectation that chits related to the contract scope may be raised during the FDR, a final conclusion report is required to address these comments and support the timely closure of the FDR.

Deliverables

- **Structural Analysis Report**
  - Finite element models and modelling assumptions;
  - Static, thermal, modal, and vibration analyses;
  - Predicted stresses, displacements, and alignment deviations;
  - Structural margins and compliance assessment;
  - Conclusions and recommendations.

- **Structural Qualification and Integrity Assessment Report**
  - Summary of analysis and test results;

SERVICE

- Demonstration of alignment stability and structural integrity;
- Assessment of compliance with project requirements;
- Inputs and recommendations for inclusion in the XRCS-Core System Integrity Report and the overall system performance assessment.

- **Conclusion report**
  - Design and analysis to respond FDR chits;
  - Report to summary the design and analysis for closing the involved chits.

5.6 Service duration

The maximum expected duration for this activity is **14 months**. The service duration is governed by deliverables associated to due dates which are referenced in Section 8.

6 Location for Scope of Work Execution

Contractor can perform the work at their own location, with visits on-site for meetings as and when necessary and requested by IO.

7 IO Documents

Under this scope of work, IO will deliver the input data listed below at the latest during the KOM.

Document Title	Doc ID	Expected date
3D Models of optical and alignment components of XRCS-Core	DET number to be defined	Kick-off
3D Models of surroundings systems	DET number to be defined	Kick-off
55.E5 - Ex-vessel System Load Specification (SLS)	ITER_D_7SZ74A	Kick-off
Specification of XRCS-Core crystals	N/A	Kick-off

SERVICE

8 List of deliverables and due dates

The Supplier shall provide IO with the documents and data required in the application of this technical specification, the GM3S Ref [1] and any other requirement derived from the application of the contract.

A minimum, but not limited to, list of documents is available hereafter with associated due dates:

#	Document Title	Further Description	Expected date (T0+x) *
D#01	Design description of crystal assembly	Technical report describing the mechanical design concept and evaluating the adjustment performance, including the components list and technical specification of commercial components.	T0 + 3 months
D#01-bis	Model and drawings of crystal assembly	3D CAD models and manufacturing drawings of the crystal assembly and components and support IO designer to introduce the model in IO ENVIA.	T0 + 3 months
D#02	Design description of alignment and calibration systems	Technical report describing alignment system and detailed configuration Technical report describing the X-ray tube design concept and detailed configuration. Operation instruction of the alignment system and the x-ray calibration system	T0 + 4 months
D#02-bis	Model and drawings of alignment and calibration systems	3D CAD models and manufacturing drawings of alignment system and wavelength calibration components and support IO designer to introduce the model in IO ENVIA.	T0 + 4 months
D#03	Prototype Fabrication and Test Plan	Report specifying: Detailed fabrication approach; Assembly procedures; Test procedures; Test equipment list; Acceptance criteria; Schedule and milestones; Manufacturing drawings; Assembly drawings; Bill of Materials (BOM); Alignment and calibration procedures.	T0 + 6 months
D#04	Fabricated Prototype Assembly	Below components at contractor site: HOPG pre-reflector assembly; Germanium crystal assemblies; Crystal mounting assembly; Alignment system; Calibration system; Dummy crystal housing.	T0 + 8 months
D#05	Prototype Demonstration Report	Summary of all testing activities defined in SoW #3; Integrated system performance assessment; Design validation conclusions; Identified risks and recommendations; Proposed improvements for final design implementation. Maintenance recommendations and troubleshooting guidance.	T0 + 10 months
D#06	Structural Qualification and Integrity Assessment Report	Summary of analysis and test results as defined in SoW #4; Demonstration of alignment stability and structural integrity; Assessment of compliance with project requirements;	T0 + 12 months

SERVICE

		Inputs and recommendations for inclusion in the XRCS-Core System Integrity Report and the overall system performance assessment.	
D#07	Conclusion report of XRCS-Core optical assembly design and prototyping demonstration	Conclusion report of XRCS-Core optical assembly design, including inputs for addressing the FDR chits involved this scope	T0 + 14 months

* T0 = Commencement Date of the contract.

Note:

Supplier is requested to prepare their document schedule based on the above and using the template available in the GM3S Ref [1] appendix II (click here to download).

These criteria shall be the basis of acceptance by IO following the successful completion of the works:

- The deliverables will be in the form of reports as indicated in “List of Deliverables”.
- The deliverables will be posted in the Contractor’s dedicated folder in IDM.
- The IO-TRO is the Approver of the delivered documents.
- The Approver can name one or more Reviewers(s) in the area of the report’s expertise.
- The Reviewer(s) can ask for modifications to the report, in which case the Contractor must submit a new version.
- The acceptance of the document by the Approver is the acceptance criterion.

9 Quality Assurance requirements

The Quality class under this contract is QC-2 for the tasks involved in the components to be installed in the ITER vacuum, and is QC-3 for the other tasks, [Ref 1] GM3S section 8 applies in line with the defined Quality Class.

10 Safety requirements

No specific safety requirement related to PIC and/or PIA and/or PE/NPE components apply.

11 Special Management requirements

Requirement for [Ref 1] GM3S section 6 applies in full.

11.1 Contract Gates

The contract gates are defined in [Ref 1] section 6.1.5, this scope of service calls for the following technical gates:

- KOM meeting
- Close-out

11.2 Work Monitoring

To review progress, technical issues, interfaces and schedules, the ITER Organization will hold Progress Meetings. In addition, formal exchange of documents transmitted by email will be used to provide detailed information on the progress of the work.

SERVICE

The main purpose of the Progress Meetings is to enable the ITER Organization, the Diagnostics Division and the Technical Responsible Officers to:

- Early detect and correct issues that may cause delays;
- Review completed and planned activities and assess progress;
- Enable rapid and consensual resolution of unexpected problems;
- Clarify doubts and prevent misinterpretations of the specifications.

In addition to the Progress Meetings, if necessary:

- Additional meetings to address specific issues to be resolved may be requested;

For all Progress Meetings, a document describing tasks done, results obtained, and blocking points must be submitted. Each report will be stored in the ITER IDM in order to ensure traceability of the work performed.

11.3 Meeting Schedule

The work will be managed by means of Progress Meetings and through the formal exchange of documents and transmitted by emails which provide detailed progress.

Progress meetings will be convened by either the IO CRO or the supplier CRO. They will be held as needed, and at a minimum, once per month via videoconference.

11.4 CAD design requirements

This contract requires for CAD activities, [Ref 1] GM3S section 6.2.2.2 applies

12 Appendices

None.

ANNEX II
EXPRESSION OF INTEREST

To be returned by e-mail to: Lijun.Liu@iter.org in copy to Chloe.Perret@iter.org

Tender Ref.: **IO/26/OT/10035272/LLU**

Description: Design and Prototyping of X-ray Optics assembly for ITER XRCS-Core

Procurement Officer**:** **Lijun LIU**

Company Name: .....

Country of Origin: .....

☐ WE ACKNOWLEDGE HAVING READ THE PIN NOTICE FOR THE ABOVE MENTIONED TENDER

☐ WE INTEND TO SUBMIT A TENDER

☐ WE ARE ALREADY REGISTERED IN IPROC

☐ WE INTEND TO REGISTER IN IPROC BEFORE THE TENDER LAUNCH DATE

Ariba Network (IPROC) ID if already registered in IPROC:

Please list the users of ARIBA/IPROC that you wish to add as response team for this tender:

Name	E-mail
…	…

Signature: COMPANY STAMP

Name: .....
Position: .....

Date: .....