



EUROPEAN UNION
European Structural and Investing Funds
Operational Programme Research,
Development and Education



PURCHASE CONTRACT

This purchase contract ("**Contract**") was concluded pursuant to Section 2079 *et seq.* of the act no. 89/2012 Coll., Civil Code ("**Civil Code**"), on the day, month and year stated below by and between:

- (1) **Institute of Physics of the Academy of Sciences of the Czech Republic, a public research institution,**
with its registered office at: Na Slovance 2, Praha 8, PSČ: 182 21,
registration no.: 68378271,
represented by: RNDr. Michael Prouza, Ph.D.. – director
(**"Buyer"**); and
- (2) **MIT, spol s r.o.,**
with its registered office at: Klánova 71/56, 147 00 Praha 4,
registration no.: 46348395,
represented by: Martin Moser – Managing director
(**"Seller"**).

(The Buyer and the Seller are hereinafter jointly referred to as "**Parties**" and individually as "**Party**".)

WHEREAS

- (A) The Buyer is a public contracting authority and the beneficiary of a grant of the Ministry of Education, Youth and Sports of the Czech Republic for projects realized within the Operational Programme Research, Development and Education ("**Projects**").
- (B) For the successful realization of the Projects it is necessary to purchase the Objects of Purchase (as defined below) in accordance with the Act no. 134/2016 Coll., on Public Procurement, and the Rules for the Selection of Suppliers within the Operational Programme Research, Development and Education.
- (C) The Seller wishes to provide the Objects of Purchase to the Buyer for consideration.
- (D) The Seller's bid for the public procurement entitled "*CIS Adaptive optics system*", whose purpose was to procure the Objects of Purchase ("**Public Procurement**"), was selected by the Buyer as the most suitable.

IT WAS AGREED AS FOLLOWS:



1. **BASIC PROVISIONS**

1.1 Under this Contract the Seller shall hand over to the Buyer products that are described in Annex 1 (*Technical Specification*) to this Contract in the quality and with the properties described therein (“**Objects of Purchase**”) and shall transfer to the Buyer ownership right to the Objects of Purchase, and the Buyer shall take over the Objects of Purchase and shall pay the Seller the Purchase Price (as defined below), all under the terms and conditions stipulated in this Contract.

1.2 The Objects of Purchase (all of its parts) shall be new (not remanufactured).

2. **MANUFACTURING OF THE OBJECTS OF PURCHASE**

2.1 Parties acknowledge that at the time of the conclusion of this Contract the Objects of Purchase do not exist and the Seller must prepare manufacturing drawings of the Objects of Purchase (“**Manufacturing Drawings**”), and subsequently manufacture the Objects of Purchase.

2.2 The Seller shall prepare Manufacturing drawings based on the requirements specified in this Contract.

2.3 The Manufacturing Drawings shall be approved by the Buyer prior to the manufacture of the Objects of Purchase.

2.4 The Seller must act in such a way that this Contract is performed in time and in due manner. If the Manufacturing Drawings are not approved by the Buyer within 15 working days, the Seller is entitled to proceed with the manufacturing process.

3. **THE PLACE OF DELIVERY**

The place of delivery is at the address: Fyzikální ústav AV ČR v.v.i/ELI beamlines, Průmyslová 836, 252 41 Dolní Břežany, Czech Republic or any other address in Dolní Břežany, Czech Republic, which the Buyer communicated to the Seller prior to the delivery of the Object of Purchase.

4. **THE TIME OF DELIVERY**

4.1 The Seller shall deliver the Objects of Purchase within 42 weeks from the effectiveness of this Contract. The Seller is entitled to deliver the Object of Purchase earlier, if the Buyer agrees to it. The Buyer is entitled to postpone the delivery time by up to another 6 months, if the premises at the place of delivery are not prepared for the takeover (acceptance) of the Objects of Purchase.

5. **THE OWNERSHIP RIGHT**

The ownership right to the Object of Purchase shall be transferred to the Buyer upon the signature of the acceptance protocol by both Parties.



6. PRICE AND PAYMENT TERMS

- 6.1 The purchase price for the Objects of Purchase is EUR **228.800,-** (“**Purchase Price**”) without value added tax (“**VAT**”). VAT will be paid in accordance with the applicable legal regulations.
- 6.2 The Purchase Price cannot be exceeded and include all costs and expenses of the Seller related to the performance of this Contract. The Purchase Prices include, among others, all expenses related to the handover of the Objects of Purchase, costs of copyright, insurance, customs, warranty service and any other costs and expenses connected with the performance of this Contract.
- 6.3 The Purchase Prices for the Object of Purchase shall be paid in EUR on the basis of a tax document – invoice, to the account of the Seller designated in the invoice. The Purchase Prices shall be paid in the following manner:
- a) 30% of the Purchase Price shall be paid after the Buyer approves Manufacturing Drawings; and
 - b) 70% of the Purchase Price shall be paid after the signature of the acceptance protocol. The copy of the acceptance protocol shall be attached to the invoice.
- 6.4 The Buyer shall realize payments on the basis of duly issued invoices within 30 days from their receipt. The invoice shall be considered to be paid for on the day when the invoiced amount is deducted from the Buyer’s account on behalf of the Seller’s account.
- 6.5 The invoice issued by the Seller as a tax document must contain all information required by the applicable laws of the Czech Republic. Invoices issued by the Seller in accordance with this Contract shall contain in particular following information:
- a) name and registered office of the Buyer,
 - b) tax identification number of the Buyer,
 - c) name and registered office of the Seller,
 - d) tax identification number of the Seller,
 - e) registration number of the tax document,
 - f) scope of the performance (including the reference to this Contract),
 - g) the date of the issue of the tax document,
 - h) the date of the fulfilment of the Contract,
 - i) Purchase Price,



- j) registration number of this Contract, which the Buyer shall communicate to the Seller based on Seller's request prior to the issue of the invoice,
- k) declaration that the performance of the Contract is for the purposes of a specific project; the Buyer shall provide the Seller with the information on the specific project at Seller's request prior to the issue of the invoice.

6.6 In case that the invoice shall not contain the above mentioned information, the Buyer is entitled to return it to the Seller during its maturity period and this shall not be considered as a default. The new maturity period shall begin from the receipt of the supplemented or corrected invoice to the Buyer.

6.7 The Buyer prefers electronic invoicing on the following email address: efaktury@fzu.cz.

7. **SELLER'S DUTIES**

7.1 The Seller shall ensure that the Object of Purchase are in compliance with this Contract including all its annexes and applicable legal (e.g. safety), technical and quality norms.

7.2 During the performance of this Contract the Seller proceeds independently. If the Seller receives instructions from the Buyer, the Seller shall follow such instructions unless these are against the law or in contradiction to this Contract. If the Seller finds out or should have found out if professional care was exercised that the instructions are for any reason inappropriate or illegal or in contradiction to this Contract, then the Seller must notify the Buyer.

7.3 All things necessary for the performance of this Contract shall procure the Seller, unless this Contract stipulates otherwise.

8. **HANDOVER AND TAKEOVER OF THE OBJECT OF PURCHASE**

8.1 Handover and takeover of the Objects of Purchase shall be realized on the basis of an acceptance protocol.

8.2 If any of the Object(s) of Purchase does not meet requirements stipulated in this Contract, the Buyer is entitled to refuse the takeover of such Object(s) of Purchase. In such a case the Seller shall remedy the deficiencies within ten (10) working days, unless Parties agree otherwise. The Buyer is entitled (but not obliged) to takeover the Object(s) of Purchase despite the above mentioned deficiencies, in particular if such deficiencies do not prevent the Buyer in the proper operation of the Object(s) of Purchase. In such a case the Seller and the Buyer shall list the deficiencies in the acceptance protocol, including the manner and the date of their removal (remedy). If the Parties do not reach agreement in the acceptance protocol regarding the date of the removal, the Seller shall remove the deficiencies within ten (10) working days.



9. **WARRANTY**

- 9.1 The Seller shall provide a warranty of quality of the Object of Purchase for the period of 1 year.
- 9.2 The warranty period shall begin on the day of the signature of the acceptance protocol by both Parties. If the acceptance protocol lists any deficiencies, the warranty period shall begin on the day, which follows the day, in which the last deficiency was removed.
- 9.3 If the Buyer ascertains a defect of the Object of Purchase during the warranty period, the Buyer shall notify such defect without undue delay to the Seller. Defects may be notified on the last day of warranty period, at the latest.
- 9.4 The Buyer notifies defects in writing via e-mail. The Seller shall accept notifications of defects on the following e-mail address: servis@mit-laser.cz. The Seller shall confirm within 24 hours from the receipt of the notification.
- 9.5 In the notification the Buyer shall describe the defect. The Buyer has the right to:
- a) ask for the removal of the defect by the delivery of new Object(s) of Purchase or its individual parts, or
 - b) ask for the removal of the defect by repair, or
 - c) ask for the reasonable reduction of the Purchase Price.

The choice among the above mentioned rights belongs to the Buyer, which will take into account reasonable suggestions from the Seller. The Buyer is also entitled to withdraw from this Contract, if by delivering the Objects of Purchase with such defects this Contract is substantially breached.

- 9.6 The Seller shall remove defects that occur during the warranty period free of charge within 2 months from their notification, unless Parties due to the nature of the defect agree on the longer period of time.
- 9.7 Parties shall execute a protocol on the removal of the defect, which shall contain the description of the defect and the confirmation that the defect was removed. The warranty period shall be extended by a period of time that elapses between the notification of the defect until its removal.
- 9.8 In case that the Seller does not remove the defect within stipulated time or if the Seller refuses to remove the defect, then the Buyer is entitled to remove the defect at his own costs and the Seller shall reimburse these costs within 10 days after the Buyer's request to do so.
- 9.9 The warranty does not cover defects caused by unprofessional manipulation or by the failure to follow Seller's instructions for the operation and maintenance of the Objects of Purchase.



10. **PENALTIES**

- 10.1 If the Seller is in delay with the removal of the defect, the Seller shall pay to the Buyer a contractual penalty in the amount of 0,05 % of the Purchase Price for every (even commenced) day of delay.
- 10.2 The Seller shall pay contractual penalties within fifteen (15) days from the day, on which the Buyer enumerated its claims. The payment of contractual penalties shall not affect the right of the Buyer to damages even to the extent to which such damages exceeds the contractual penalty.
- 10.3 Total amount of contractual penalties that the Buyer is entitled to claim shall not exceed 10 % of the Purchase Price.
- 10.4 The Buyer is entitled to unilaterally set off claims arising from the contractual penalties against the claim of the Seller for the payment of the Purchase Price.
- 10.5 The Parties exclude use of Sec. 2050 of the Civil Code. By the payment of contractual penalty in accordance with this Art 10 hereof, no claim of the Buyer to damage compensation shall be affected

11. **LIMITATION OF COMPENSATION**

If any of the Parties breaches any provision of this Contract and such breach shall result in the financial loss or other harm to the other Party, the breaching Party shall provide compensation for such financial loss or other harm. However, Parties agree that such compensation shall be limited to 100 % of the Purchase Price. Indirect and consequential financial losses or other harms shall not be compensated.

12. **RIGHT OF WITHDRAWAL**

- 12.1 The Buyer is entitled to withdraw from this Contract without any penalties, if any of the following circumstances occur:
- a) the Seller shall be in delay with the fulfilment of this Contract and such delay lasts more than 2 weeks;
 - b) The Object of Purchase during testing does not fulfil the requirements stipulated in this Contract, in particular in Annex 1 (*Technical Specification*) and the deficiencies cannot be remedied;
 - c) the insolvency proceeding is initiated against the Seller; or
 - d) the Buyer ascertains that the Seller provided in its bid for the Public Procurement information or documents that do not correspond to the reality and that had or could have had impact on the result of the tendering procedure, which preceded the conclusion of this Contract.



13. **SPECIAL PROVISIONS**

By signing this Contract, the Seller becomes a person that must cooperate during the finance control within the meaning of Section 2 letter e) of the act no. 320/2001 Coll., on finance control in the public administration, and shall provide to the Directing Body of the Operational Programme Research, Development and Education or other control bodies access to all parts of the bid, Contract or other documents that are related to the legal relationship formed by this Contract. This duty also covers documents that are subject to the protection in accordance with other acts (business secrets, secret information, etc.) provided that control bodies fulfil requirements stipulated by these acts. The Seller shall secure that all its subcontractors are also obliged to cooperate with control bodies in the above stipulated extent. The possibility of effective control must be preserved until the year 2028.

14. **PUBLICITY**

Parties are aware that this Contract shall be published in the register of contracts in accordance with the Act no. 340/2015 Coll., on the Register of Contracts.

15. **FINAL PROVISIONS**

- 15.1 In this Contract words used in singular include (depending on the circumstances) also the plural and vice versa.
- 15.2 The Seller bears the risk of changed circumstances within the meaning of Sec. 1765 of the Civil Code.
- 15.3 This Contract is governed by the laws of the Czech Republic, especially by the Civil Code.
- 15.4 All disputes arising out of this Contract or out of legal relations connected with this Contract shall be preferably settled by a mutual negotiation. In case that the dispute is not settled within sixty (60) days, such dispute shall be decided by courts of the Czech Republic in the procedure initiated by one of the Parties.
- 15.5 The Seller is not entitled to set off any of its claims or his debtor's claims against the Buyer's claims. The Seller is not entitled to transfer its claims against Buyer that arose on the basis or in connection with this Contract on third parties. The Seller is not entitled to transfer rights and duties from this Contract or its part on third parties.
- 15.6 All modifications and supplements of this Contract must be in writing.
- 15.7 If any of provisions of this Contract are invalid or ineffective, the Parties are bound to change this Contract in such a way that the invalid or ineffective provision is replaced by a new provision that is valid and effective and to the maximum possible extent correspond to the original invalid or ineffective provision.



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- 15.8 This Contract is executed in four (4) counterparts and every Party shall receive two (2) counterparts.
- 15.9 An integral part of this Contract is Annex 1 (*Technical Specification*). If Annex 1 (*Technical Specification*) uses the term “Contracting Authority” or “contracting authority” it means Buyer. If Annex 1 (*Technical Specification*) uses the term “Supplier” or “supplier” it means Seller.
- 15.10 This Contract shall be valid on the date of the signature of both Parties and effective on the day, on which it was published in the register of contracts within the meaning of the Act no. 340/2015 Coll., on the Register of Contracts.

IN WITNESS WHEREOF attach Parties their handwritten signatures:

Buyer

Signature: _____

Name: RNDr. Michael Prouza, Ph.D.

Position: director

Date:

Seller

Signature: _____

Name: Martin Moser

Position: Managing director

Date:



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ANNEX 1

TECHNICAL SPECIFICATION

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[RSD product category C]

CIS Adaptive optics system

TP16_179_C



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Approved by			
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3	D. Kramer, A. Kuzmenko	16.07.2018	RSD update, final version for approval	C

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1. Introduction

1.1. Purpose

This Requirements Specification Document (RSD) lists the technical requirements and constraints on products applying in RA1 program of ELI Beamlines project. This leads to the identification of interfaces with the ELI Beamlines science based technology. This RSD also acts as the parent document for the technical requirements that need to be addressed in lower level design description documents.

1.2. Scope

This RSD contains all of the top level technical requirements: functional, performance and design, packaging and delivery, safety, and quality requirements for the following products: CIS Adaptive optics system (*further "AL system"*).

The AL system is an integral part of the L4 Compressor Image System (CIS) and will be placed in the L4c laser halls at the ELI Beamlines facility. This product is registered in the PBS database under the following PBS code: *RA1.L4.CMP1.CIS.DFM*.

1.3. Terms, Definitions and Abbreviations

For the purpose of this document, the following abbreviated terms are applied:

Abbreviation	Meaning
A	Analysis (as a verification method)
AL	Adaptive Loop
AMU	Atomic Mass Unit
AOI	Angle Of Incidence
CA	Contracting Authority (Institute of Physics AV CR, v. v. i.)
CAp	Clear Aperture
CIS	Compressor Imaging System
DFM	Deformable Mirror
ELI	Extreme Light Infrastructure
EMP	Electromagnetic Pulse
GDD	Group Delay Dispersion
I	Inspection (as a verification method)
L4	Laser 4
LIDT	Laser Induced Damage Threshold
NCR	Nonconformity Report
OS	Operating System

Abbreviation	Meaning
QR	Quality Report
R	Review (as a verification method)
RA1	Research activity 1
RGA	Residual Gas Analysis
RH	Relative humidity
RMS	Root Mean Square
RSD	Requirements Specification Document
SDK	Software Development Kit
SW	Software
T	Test (as a verification method)
UHV	Ultra-High Vacuum
VCD	Verification Control Document

1.4. Reference documents

Number of document	Title of Document/ File
RD-01	00163567-B_1.2_Q_M_Guide_for_Instructions_for_Use_Ver-9_EN_fully_signed.pdf

1.5. References to standards

If this document includes references to standards or standardized/ standardizing technical documents the CA allows/permits also another equal solution to be offered. If a supplier offers another equal solution the CA shall not reject its bid, once the supplier by appropriate means in the bid proves that the offered supplies, services or works meet in an equivalent manner the requirements including references to standards or technical documents.

2. Functional, Performance and Design requirements

Functional, performance and design requirements for the **AL system** are summarized within the reference Tables below:

- **RT-01** – Deformable Mirror with control electronics;
- **RT-02** – Adaptive optics SW loop;
- **RT-03** – Wavefront sensor.

2.1. General requirements

REQ-023670/A

The Supplier shall provide the manufacturing drawings for the **DFM** in conformity with the Table **RT-01** for approval by the CA.

Verification method: A – analysis, R – review of design

REQ-023671/A

The parameters of the **DFM** shall correspond to the Table **RT-01** below.

Verification method: T – test (*in accordance with QRs I–VII, see REQ-023681*)

REQ-023672/A

The parameters of the Adaptive optics **SW** loop shall correspond to the requirements given in the reference Table **RT-02** below.

Verification method: R - review of documentation, I - inspection

REQ-023673/A

The parameters of the **Wavefront sensor** shall correspond to the requirements given in the reference Table **RT-03** below.

Verification method: R - review of documentation, I - inspection

Table RT-01: The parameters of the DFM

#	Parameter	Required value	Comment
1	Minimum Clear Aperture (CAp)	284 x 329 mm	RECTANGULAR
2	Beam size at 0.1 % intensity	273 x 313 mm	RECTANGULAR
3	Maximum physical dimensions [width x height x depth]	480 x 435 x 230 mm	Limited due to neighboring systems/beams
4	Position of the connectors	Back plane	
5	LIDT	$\geq 3.5 \text{ J/cm}^2$	1000-on-1 $t \leq 1 \text{ ns}^1$ in RH < 0.2 % or vacuum with 1050 nm < λ < 1070 nm
6	Central wavelength	1060 nm	
7	Minimum Bandwidth $\Delta\lambda$	$\pm 20 \text{ nm}$	
8	Angle of incidence AOI	$30^\circ \pm 3^\circ$	
9	GDD for s and p polarization	$< 140 \text{ fs}^2$	Over bandwidth $\Delta\lambda$ and AOI
10	Minimum reflectivity @ s-polarization	99.8 %	Over bandwidth $\Delta\lambda$ and AOI

¹ LIDT test can be performed with different pulse duration t_x up to 10ns, the corresponding threshold will be adjusted as $LIDT_x = LIDT \cdot \sqrt{t_x/t_0}$. With $t_0=1\text{ns}$.

#	Parameter	Required value	Comment
11	Minimum reflectivity @ p-polarization	99.6 %	Over bandwidth $\Delta\lambda$ and AOI
12	Operating environment	High vacuum $\leq 2e-6$ mbar	No crazing of optics
13	System chemical cleanliness	Very low outgassing equivalent to UHV applications	Water is not critical, hydrocarbons and silicone oils are critical
14	Vacuum compatibility – RGA scan result after 12h pumping at $< 5e-6$ mbar	Peaks with AMU above 44 $< 0.01 \times 44$ AMU peak	RGA scanned up to AMU 200 in compliant vessel
15	Acceptable grease for actuators	Braycote 601 Micronic EF	Any equivalent must be approved by the CA
16	Actuator technology	mechanical	
17	Power-off change	< 10 nm RMS over 1h	Surface shape to be identical to the powered state
18	EMP tolerance	Up to 1 kV/m	In the power off mode
19	Number of actuators	To be optimized for the specified beam footprint	must be larger than 49 pcs
20	Actuator pattern	Optimized for first 21 Legendre polynomials	simulation results using inputs of Figure 1 to be provided by the Supplier before manufacturing
21	Baseline surface sag (flattening)	Flat with RMS ≤ 35 nm	Over CAp
22	Correction range for 45 deg astigmatism	$\geq \pm 15$ μm	Relative residual to flat sag < 30 nm RMS
23	Correction range for horizontal and vertical defocus	$\geq \pm 15$ μm	Relative residual to flat sag < 30 nm RMS
24	Correction range for coma	≥ 5 μm	Relative residual to flat sag < 30 nm RMS
25	Length of vacuum cables	≥ 2 m	
26	Length of air side cables	≥ 5 m	
27	Vacuum feedthroughs	To be supplied by the CA	Connector types to be agreed with the Supplier
28	Mechanical mounting interface	On sides centered to horizontal axis of the mirror	Detailed drawing to be agreed with CA
29	Particulate cleanliness	All components to be cleaned and assembled in cleanroom of class 7 according to ČSN EN ISO 14644 or better	or equivalent, e.g. EN ISO 14644; including control rack
30	Surface roughness – metallic parts for vacuum installation	Must allow cleaning to class 5 clean room standard according to ČSN EN ISO 14644	or equivalent, e.g. EN ISO 14644

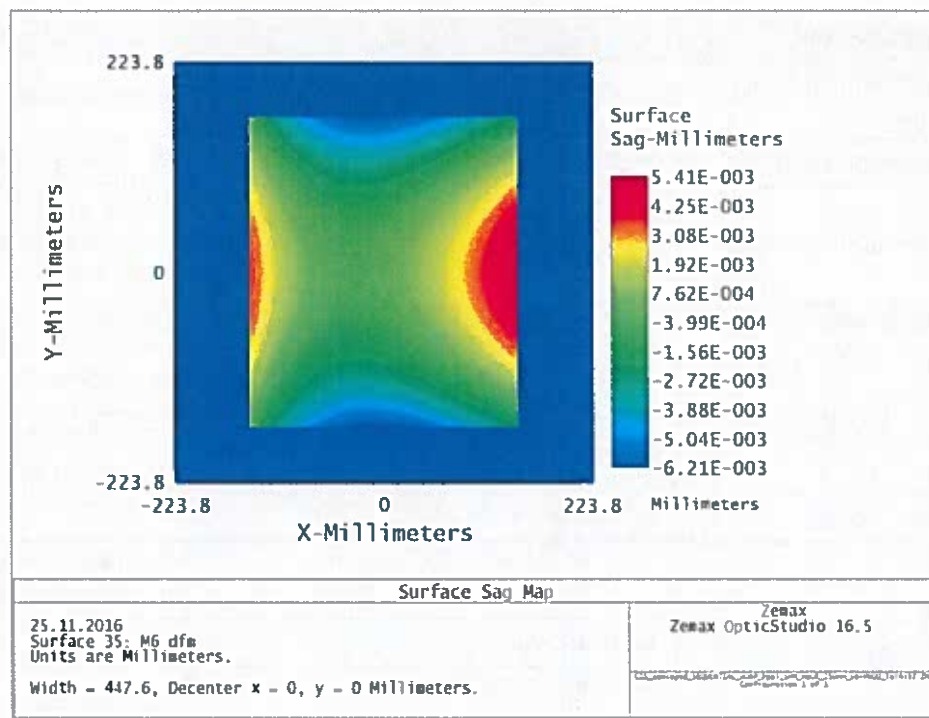


Figure 1: Main static deformation foreseen on the deformable mirror.

2.2. Adaptive loop software and Wavefront Sensor

Table RT-02: The parameters of the Adaptive Loop (AL) software

#	Parameter	Minimum required value	Comment
1	Operating system	Tested with Microsoft Windows 10	Additional support for NI Real Time OS (ETS Pharlap or NI Linux RT) should be provided if possible
2	NI LabVIEW SDK	SDK provided and tested with LabVIEW 2016	Provided in a form that is recompilable by the client on demand
3	Closed loop capability processing speed	≥ 1 Hz	With CPU performance LESS or equal 8000 points when using CPU Mark Test of the Passmark software
4	Fitting polynomials	Legendre, Zernike	
5	Full control of the mirror voltages	Yes	
6	Electrode pattern	Customizable	
7	Load/Save voltage configuration	Yes	

#	Parameter	Minimum required value	Comment
8	Transfer function measurement	Automatic and Manual	
9	Calibration verification	Yes	
10	AL Convergence wavefront	to a flat phase or an arbitrary phase profile, including phase profiles generated by Zernike/Legendre polynomials	
11	AL safety functions	tools to automatically remove inconsistent measurements and preventing incoherent voltage application	
12	AL wavefront averaging	customizable	
13	AL parameters customization	Number of modes/polynomials, gain, stop point, number of iterations	
14	AL display options	Measured phase, error signal, correction, applied voltages. Temporal evolutions. Mirror mode	
15	AL iteration rate	Arbitrary up to 1 Hz	
16	Number of AL iterations	Arbitrary including single iteration	
17	AL data saving	All settings, measurements and applied functions can be saved during the loop.	

Table RT-03: The parameters of the Wavefront sensor

#	Parameter	Required value	Comment
1	Operating system	Tested with Microsoft Windows 10	Additional support for NI Real Time OS (ETS Pharlap or NI Linux RT) should be provided if possible
2	Wavefront sampling resolution	≥ 18000 points	
3	Active area	$> 3 \times 4$ mm	
4	Connection	GigE	
5	NI LabVIEW SDK	SDK provided and tested with LabVIEW 2016	Provided in a form that is recompilable by the client on demand
6	Full resolution processing speed	≥ 5 Hz	With CPU performance LESS or equal 8000 points when using CPU Mark Test of the Passmark software
7	Wavelength range	$\geq 500 - 1100$ nm	
8	Wavefront processing – Far Field	Strehl ratio, focal spot, encircled energy	
9	Wavefront processing – fitting	Legendre, Zernike polynomials, Radii of curvature	

3. Environmental requirements

REQ-023674/A

The Supplier shall provide the cleaning method to clean the mirror surface if required without degrading its properties and to avoid contamination of clean space.

NOTE: The cleaning methods may use high gas flow (dry air) and specialized chemical cleaning liquids (i.e. methanol, isopropyl alcohol, deionized water).

Verification method: I - inspection

4. Packaging and Delivery requirements

4.1. General requirements

REQ-023675/A

All the components of the **AL system** shall be cleaned and packaged in a clean environment of class 7 according to ČSN EN ISO 14644 (or equivalent, e.g. EN ISO 14644) or cleaner.

NOTE: Regarding the referred to standard/s or technical documents the CA allows/permits also another equal solution to be offered.

Verification method: I - inspection

REQ-023676/A

The **DFM** and all its components shall be placed in an appropriate clean packaging with sufficient padding and placed in a box suitable for air transport. The innermost wrapping has to be compatible with class 7 clean room handling.

Verification method: I - inspection

REQ-023677/A

The **Wavefront sensor** can be shipped in standard packaging but it shall allow cleaning with Isopropyl Alcohol.

Verification method: R - review of documentation

REQ-023678/A

The transportation to the final destination of the **AL system** shall be conducted by the Supplier.

*NOTE: The Supplier is fully responsible for the delivery of undamaged **AL system**.*

Verification method: I - inspection

5. Safety Requirements

REQ-023680/A

The Supplier shall supply a Declaration of Conformity or any other equivalent document legally recognized and accepted in the Czech Republic for each product type if the appropriate legislation determines the Supplier's obligation to have a Declaration of Conformity (or the equivalent document) for the purposes of a Product sale in the Czech Republic to fulfil the requirements of 2001/95/EC directive or applicable Czech law.

Verification method: I - inspection

6. Quality control

6.1. Quality Reports (QRs)

REQ-023681/A

The Supplier shall perform tests of the **AL system** and provide corresponding specific quality reports (I - VII):

- I. Measured Reflectivity curve at s and p polarization on coated membrane or witness sample;
- II. LIDT test protocol of witness sample or LIDT test protocol of similar coating type;
NOTE: If the LIDT protocol refers only to similar coating type the Supplier shall provide witness sample from the actual coating run (possible with different substrate material).
- III. Interferometric or high resolution wavefront measurement of clear aperture after flattening. If stitching is needed, procedure must be approved by the CA. Minimum resolution is 250 x 250 points;
- IV. Table summarizing RMS residuals and RMS slope errors of first 15 Legendre polynomials;
- V. GDD curve at s and p polarization or 1 or 2" witness sample to be delivered for measurement by the CA;
- VI. Report listing materials used in the vacuum components (i.e. cable insulation, grease, glues, metals, plastics...);
- VII. RGA test protocol, if possible.
NOTE: The RGA test can be performed by the CA.

Verification method: R - review of reports, I - inspection

6.2. Documentation and data control

REQ-023682/A

The Supplier shall provide Instructions for use (Product User Manual) as part of the delivered Product. The Instructions for use shall be written in accordance with standard ČSN EN 82079-1 (or equivalent, e.g. EN 82079-1) and shall include the instructions and descriptions regarding the following:

- transport and storage;
- installation and cleaning;
- safe operation and maintenance procedures.

*NOTE: As an alternative to standard ČSN EN 82079-1 (or equivalent, e.g. EN 82079-1) an internal ELI "Instructions for use" methodology can be used (see **RD-01**; chapter 1.4) which will be provided to the Supplier upon request.*

Verification method: R - review, I - inspection

REQ-023683/A

The Supplier shall provide a Declaration of Conformity (or the equivalent document) with technical requirements defined by the product RSD and ensure completeness of the products.

Verification method: I - inspection

REQ-023684/A

The Supplier shall supply the following relevant manufacturing documents:

- all approved by the CA manufacturing drawings, 3D models and design supporting documentation;
- all approved by the CA "requests for deviation/waiver from requirements described herein";

NOTE: The manufacturing documents may be supplied in electronic form in relevant data formats described in the REQ-023685/A.

Verification method: I - inspection

REQ-023685/A

The Supplier shall use following data formats:

- *.dat (Zygo binary file format for interferograms)
- *.JPG, *.PDF/A, *.HTML, *.ppt, *.pptx
- CAD 2D: *.dwg
- CAD 3D: *.stp; *.ste; *.step or other 3D CAD formats agreed with the CA
- text processors *.doc, *.docx, OpenDocument Format
- spreadsheet processors *.xls, *.xlsx, OpenDocument Format

Verification method: Not To Be Tracked within VCD

REQ-023686/A

The Supplier shall establish and maintain a nonconformity control system compatible with ČSN EN ISO 9001 (or equivalent, e.g. EN ISO 9001).

Verification method: Not To Be Tracked within VCD

6.3. Specific Quality requirements

REQ-023687/A

In case of a warranty repair of the **AL system** by the Supplier, the Supplier shall redo necessary parts of the verification procedure (see chapter 8). The results of this process shall be provided to the CA.

Verification method: Not To Be Tracked within VCD

7. Verification requirements for the Supplier

7.1. Verification methods

REQ-023688/A

The verification shall be accomplished by the Supplier through one or more of the following verification methods:

1. **Review**; Verification via Review (**R**) shall consist of using approved records (examples of such approved records are design documents and reports, technical descriptions, and engineering drawings, manuals and accompanying operation documentation) or evidence that unambiguously shows that the requirement is met.
2. **Inspection**; Verification via Inspection (**I**) shall consist of visual determination of physical characteristics including photographs taken by the Supplier and sent to the CA proving that the specific requirements have been met.
3. **Test**; Verification via Test (**T**) shall consist of measuring product performance and functions under realistic operating conditions.
4. **Analysis**; Verification via Analysis (**A**) shall consist of performing theoretical or empirical evaluations (e.g. mathematical models, calculations and etc.).

Verification method: Not To Be Tracked within VCD

7.2. Verification Control Document (VCD)

Verification Control Document (**VCD**) is a living document which shall be used throughout the entire Contract delivery and its phases (see chapter 8.3 Phasing of the delivery). The **VCD** provides traceability during delivery phases (Qualification of Design, Manufacturing, Acceptance, etc.).

The **VCD** represents a formal tool of communication between the Supplier and the CA (formal record, reporting tool).

The **VCD** will be provided by the CA and it can be accommodated to the Supplier's needs.

REQ-023689/A

The Supplier shall provide a Verification Control Document (VCD) for the reviews as agreed with the CA.

NOTE 1: Guidelines for VCD preparation will be provided by the CA.

NOTE 2: The form of VCD will be agreed between the CA and the Supplier based on the best commercial praxis used by the Supplier.

NOTE 3: The form of VCD will be agreed before completion of Qualification of Design phase (see chapter 8.3.1).

*NOTE 4: The VCD specifies **HOW** and **WHEN** each requirement is planned to be verified by the Supplier, when it was actually verified.*

Verification method: R - review

7.3. Phasing of the delivery

This chapter is intended to briefly summarize basic milestones of the Contract delivery. These milestones represent gates (checkpoints) where the quality of the delivery is to be evaluated.

Delivery shall not proceed past these gates unless their satisfactory accomplishment is approved by the CA.

Delivery lifecycle shall contain at least the following phases (quality gates):

- **Qualification of Design;**
- **Manufacturing;**
- **Acceptance.**

7.3.1. Qualification of Design

Summary of what has to be provided by the Supplier in terms of documentation (QRs and manufacturing drawings) before starting the manufacturing. The goal is to verify the **manufacturing drawings and design supporting documentation**.

Output of this phase is **Qualified Design**.

REQ-023690/A

Before the ending of Qualified Design phase the Supplier shall provide following information that shall be approved by the CA:

- structure and content of quality reports (see REQ-023681/A);
- structure and content of the VCD ready to be implemented (see REQ-023689/A).

Verification method: R - review

REQ-023691/A

Before the ending of Qualified Design phase the Supplier and the CA shall agree on:

- final manufacturing drawings provided by the Supplier (see REQ-023684/A);
- exact layout of the actuators based on the Supplier's analysis (see Table **RT-01**, item 20);
- detailed procedures related to the testing during Manufacturing phase (see chapter 8.3.2);
- common nonconformity control system (see REQ-023686/A).

Verification method: R - review

7.3.2. Manufacturing

The goal is to demonstrate that the manufactured products meet the specified technical requirements (RSD) of the CA.

This quality gate concerns primarily:

- **Inspection of manufactured and assembled product;**
- **Testing at the Supplier's site (factory testing);**
- **Packaging and shipping;**

Output of this phase is the **Verified Final Product**.

REQ-023692/A

The results of the Manufacturing phase of verification shall be recorded by the Supplier in the corresponding **QRs** (or in other factory/quality reports, if not specified in the chapter 7.1) and provided to the CA for approval. The overall results (including review of design/documentation/reports and inspection of products) shall be recorded by the Supplier in the **VCD** (see chapters 8.2).

NOTE: The results of all the tests shall be given strictly in units which are used to define the requirements in the chapter 2.

Verification method: R - review

REQ-023693/A

The final issue of the VCD shall be submitted to the CA after the approval of the last report before delivery.

Verification method: R – review, I - inspection

7.3.3. Acceptance

The Acceptance phase shall demonstrate following:

- Final delivered **AL system** has been successfully verified and this process has been documented in an appropriate way through QRs (see REQ-023681/A) and VCD (see REQ-023689/A);
- All detected nonconformities have been solved in accordance with REQ-023686/A;
- Final **AL system** is free of fabrication errors.

In case of successful acceptance phase the CA shall provide to the Supplier signed acceptance protocol. In case of unsuccessful acceptance stage the CA shall provide to the Supplier the Nonconformity Report (NCR) and process in accordance with REQ-023686/A shall be applied.

REQ-023694/A

Verification process shall be carried out by the Supplier and it is successfully completed when the final **AL system** complies with all specifications and the results of this process is documented in an appropriate way through QRs (see REQ-023681/A) and VCD (see REQ-023689/A).

*NOTE: Acceptance will be carried out by the CA (or if required, representatives/contractors appointed by the CA) on the final delivered **AL system**.*

Verification method: Not To Be Tracked within VCD