C O N T R A C T

between:

INAF Istituto Nazionale Di Astrofisica with the seat at: Viale del Parco Mellini n°84 00136 Roma (Italy), represented by:
Prof. Nicolò D'Amico – President of the INAF Istituto Nazionale Di Astrofisica, hereinafter referred to as the **"Buyer" or "Purchaser**",

and

AstroTec Holding B.V. with the seat at Oude Hoogeveensedijk 4, 7991 PD Dwingeloo, The Netherlands, represented by:
Mr. Ronald G.B. Halfwerk – Director of AstroTec Holding B.V., who hereby declares that he is duly authorized to effectively conclude the Contract on behalf and for the abovementioned Company, as well as the conclusion of the Contract does not require to obtain any additional agreements, including the adoption of resolutions by any of the bodies of the Company or obtaining any other type of decision allowing its conclusion, hereinafter referred to as the **"Supplier",**

together called the "Parties" or individually "Party".

§ 1
SUBJECT OF THE CONTRACT/OBLIGATIONS

1. Considering that the LOFAR2.0 system is in an early phase of design, the intention of this contract is to allow Buyer to agree on the conditions to acquire an international station of the European radio interferometer LOFAR (LOw Frequency ARray) in a near future for a defined cost cap and within a defined time frame. The aim is to deliver to Buyer a LOFAR2.0 station (hereinafter referred to as "LOFAR station") in Italy, Medicina, by the end of 2021. Frequent consultation between Buyer and Supplier should assure that a final date of delivery is agreed in a timely manner. The Subject of the Contract includes an overview of the costs to produce and deliver the elements necessary for the construction of an international station of the European radio interferometer LOFAR (Low Frequency Array). The contract includes the cost for the assembly service, installation, integration and validation of the antenna elements.
2. The sum of the cost components given in this contract is a cap on total costs. Should it become clear to Supplier that it cannot contain the total station cost within the cap, this will be cause for renegotiation, in which unilaterally cancelling the sale of the station is an option. Conversely, Supplier will strive to push the final station price below the cap level if possible, and will engage with Buyer in discussion on any issues that may help to lower the costs (e.g. including delivery conditions).
3. Supplier aims to deliver to Buyer a LOFAR2.0 station by the end of 2021. However, uncertainties regarding the development of the LOFA2.0 system and opportunities for risk mitigation and cost optimisation may lead to final station installation occurring significantly later. Supplier will keep Buyer informed of significant developments in this respect. If Supplier is not able to confirm the delivery of a LOFAR2.0 station beyond one year from the agreed date, this will be cause for renegotiation, in which unilaterally cancelling the sale of the station is an option.
4. Parties together will perform consultations at least twice a year to keep each party informed about the progress on LOFAR2.0 development and the maturity of a solid timeframe. Supplier will update Buyer about the date at which Supplier will be incurring specific costs for the station to be delivered to Buyer.

5. At a certain moment in time, based upon consultations as mentioned in §1, point 4, a decision could be taken by either party, not to continue the Contract. That decision can only be based on the results of evaluation of the criteria as set in § 1, point 1 and in point 2 and in 3. However, in this case, the parties may enter renegotiations to settle a new agreement.
6. At a certain moment in time, Supplier will need to incur costs specifically for the station to be delivered to Buyer. As soon as this date is clear, and at least three months in advance, Supplier will notify Buyer of this impending moment, and of the final total cost and timeline to delivery. Passing of that point shall constitute a final "Go" moment. Buyer shall express at the latest at the "Go" moment which of the options as mentioned in § 3, point 1 it wishes to be included and excluded.
7. Warranty Conditions: The guarantee period for the Assignments implemented and materials used by Supplier shall be 24 months from the date of signing the Site Acceptance Test. During the guarantee period, Supplier upon receipt of written notification by Buyer, shall assist in diagnosing the defects. In case of defective components detected, Supplier shall ship replacement modules at their own expense within 40 (forty) days to Buyer. If necessary, the Buyer may renegotiate different warranty conditions. This, however, may cause recalculation of the contract value.
8. Documentation: the available documentation will be delivered, as an extensive data delivery package, during the acceptance phase of the station. This will allow for maintenance and operating the station by local resources.
9. LOFAR stations contain electronics connected to two types of antennas: Low Band Antennas (LBA's), performing observations between in a frequency band below the FM-radio band, and High Band Antennas (HBA's), performing observations in a frequency band above the FM-radio band. The antennas typically are installed in an area a.k.a. "the station site" of approximately 100x70m. The electronics are arranged in a screened compartment, which is a part of a modified container. The container has air conditioning, which ensures optimal operating temperature for the electronics. The contract includes the envisaged LOFAR2.0 components. The planned LOFAR2.0 HBA beamformer design will allow for generating dual simultaneous tile beams, but if the ongoing detailed LOFAR2.0 design should require any additional hardware, firmware, or software to process the second beam (e.g., for Space Weather applications), these additional items not part of the standard configuration for radio astronomy as offered here. Nevertheless, the equipment as offered will allow Buyer to perform the astronomical applications as currently available in the LOFAR1.0 system.
10. Connection to the network of the International LOFAR Telescope (ILT): the conditions for access to LOFAR data and other International LOFAR Telescope (ILT) related items are not in the scope of this contract. The connection of this LOFAR station to the network of ILT and the operation within the ILT must be arranged by the owner of the LOFAR station. Supplier has no jurisdiction regarding such agreements and therefore it should be covered separately between the Buyer and the ILT foundation. However, for concluding a successful commission of the station, it is required that a connection to the network of ILT already is operational before the start of the commissioning of the station.
11. The Buyer orders and the Supplier undertakes to carry out all indispensable activities for the completion of the Subject of the Contract, described above.
12. The Supplier declares that the Subject of the Contract shall be completed with the highest quality materials and highest standards of workmanship, within the specified deadlines and with due diligence in accordance with the required technical specifications.

§ 2
DECLARATION OF INTENT

The Parties understand that ongoing development and change in the radio technologies may create new situations not described nor expressly regulated in this Contract. The Parties will strive for mutual adjustment during the Contract period in order to meet the changes of needs and demands of the other Party. This Contract is founded on mutual trust between the Parties.

§ 3
CONTRACT VALUE

1. The final price for a LOFAR2.0 station currently is not known and is pending on completion of the design and subsequent industrial tendering. The table below is a price cap based on the best current estimate of Supplier. This price cap allows for risks and uncertainties as indicated in below and contingency as estimated by Supplier. Supplier will share further significant information on station price with Buyer as it becomes available.

   In the table below, therefore some risks are accounted for:
   a) Component obsolesces forcing re-design
   b) Development of LOFAR 2.0 by (multiple) external partners (Interfaces / Quality)
   c) Uncertainties / risks of the Development phase
   d) HBA moulds getting damaged / Limited life time
   e) Excessive increase of Component prices and lead times
   f) Bankruptcy of current supplier of HBA polystyrene parts or releases of current production machine(s)
   g) Variation on Batch size (number of stations, calculation is based on 38 NL stations)
   h) Minimum Order Quantity (MOQ)
   i) Regional price variation (local contractors, travel and subsistence expenses)
   j) Changes of USD/EU exchange rate (affecting BOM prices)
   k) Inflation

   Within the price cap is included a component that covers the development effort for LOFAR2.0 under a cost-sharing scheme for all ILT members. The scheme is set and monitored by the ILT board. Under this scheme, general contributions to ILT funding for LOFAR2.0 obtained externally or through other arrangements (such as new member entry fees to the ILT), are deducted from the total accrued development costs to be borne collectively by the ILT members; the remaining costs are then shared proportionally by all ILT members which purchase or upgrade their station hardware.

ILT Station2.0 hardware and rollout services	€ 1.600.021	
Options:		
A) Site survey and RFI measurements.	€ 7.434	
B) Transport of hardware components NL to IT	€ 44.027	
C) LBA groundplanes, galvanized and incl. transport NL to IT	€ 12.961	
Total cost including all options:		**€ 1.664.443**

Prices do not include VAT or applicable taxes unless mentioned.

2. VAT calculated as a result of the conclusion or the performance of the Contract shall be paid by the Buyer directly to the relevant tax office in Italy, according to the rate applicable of the date of rising the tax obligation.
3. The remuneration specified in sec. 1 above is the lump remuneration and includes all payments due to the Supplier, in particular all the license fees the Supplier will have to pay to the third parties, costs of design, packaging costs, safe transportation, assembly, configuration, insurances, documentation, Factory Acceptance Tests at the Supplier premise, warranties, customs duties and customs clearance cost, and other costs, including the final SAT tests (eng. *Site Acceptance Test),* that the Supplier shall bear or shall be obliged to bear in order to perform the Subject of the Contract.

§ 4
TERMS OF DELIVERY / SERVICES

1. Supplier will take care of the operations that are specific to the construction and rollout of a LOFAR station.
2. Buyer will take care of preparing the site to meet the LOFAR requirements, arranging infrastructure such as a connection to the power grid (240V mains), a fiber connection to the Italian academic data network and ultimately a connection with the Central LOFAR computer in the Netherlands.
3. Supplier will support Buyer by delivering appropriate specification documents (the so called Station Design Documents) in order to allow Buyer to contract out the work for preparing the site in Medicina, Italy. An overview of related activities in the scope of work for Buyer are addressed in the table mentioned at section 10 of this paragraph of this contract.
4. The assembly of the HBA tiles is done locally by adequate skilled people (professional workers). Additionally, Supplier offers an experienced professional during this assembly process.
5. Regarding the On-site installation and rollout supervision (Rollout project management and experienced rollout engineer), Supplier offers assistance in form of an experienced project manager to install (roll out) the delicate HBA tiles on-site. Additionally, Supplier supplies some special tooling needed during the rollout.
6. The hardware components for an International LOFAR station consist of:

Low Band Antennas (LBA)	96
Coaxial cables for LBA, outdoor	192
High Band Antenna tiles (HBA)	96
Coaxial cables for HBA, outdoor	192
High Band Antenna center tile	1
EMC Container	1
Receiver Unit boards	196*
Infra structure back-end (control racks) (Local control unit, GPS and Clock)	1*
Content Receiver Racks (Station processing board, backplanes)	6*
Power supply unit(s)	6*
Wide Area Network	1 (Network interface equipment)
Station software	1

*) Numbers are based on a LOFAR1.0 system. The number depends on the final system design but should be adequate to control and process the data from the antennas suitable for an ILT LOFAR2.0 operation mode.

7. Optional hardware: Ground planes for LBA. The LBA ground planes are 3x3 m (iron) meshes. The grid as required for LOFAR is non-standard and occasionally is difficult to get manufactured. In addition, given the oversized dimensions, the total cost of transport might become significant. Buyer may decide either to let these ground

planes manufactured by a national contractor. In that case, the manufacturing specifications for the LBA ground planes will be supplied to Buyer by the Supplier

8. Optional service: Site preparation verification including RFI advisory. Supplier offers support to Buyer in the preparation of the site(s) in general, effectively one day and additionally one day is reserved to perform an advisory for the local RFI conditions of the envisaged site(s). A report will be provided as a result. A site survey is highly advisable in order to benefit from our experiences on realizing new LOFAR stations.
9. Optional service: transport. For the transport of all goods, Supplier will supply Buyer with a list of applicable transport requirements to let Buyer decide to exercise this option. As an indication, the amount of curtain sided trailers will be in order of thirteen. Additionally, a truck mounted crane will be required for transporting the 20 foot ILT-station container and a (temporary) Tooling container.
10. Indication of services that are in scope of Supplier or Buyer:

		ATH	INAF
Part	**Description of product/service**		
B	**ON-SITE SERVICE (at the station in Medicina)**		
1	**Site survey**		
1a	RFI assesment including site survey report	ATH	
2	**Station Design**		
2a	Preliminary station design based on 1a	ATH	
2b	Final station design based on 3b providing PQR coordinates	ATH	
3	**Ground work**		
3a	Prepare field i.e. removing trees (stomps), increase ground level, create drainage etc.		INAF
3b	Measure terrain coordinates + height profile + position LBA/HBA antenna planes		INAF
3c	Define field normal vector for minimum ground work + reference stake positions	ATH	
3d	Equalizing (flattening) field to specifications *1), *3)	ATH	
3e	Mark LBA/HBA centre, measure height profile in 5m (LBA) and 3m (HBA) grid (report provided)		INAF
3f	Mark (stakes) ILT-Container position		INAF
3g	Mark (stakes) coax cable, LBA and HBA positions	ATH	
3h	LBA Routing groundcables incl digging/closing cable trenches	ATH	
3i	HBA Routing groundcables incl digging/closing cable trenches	ATH	
4	**ILT-Container**		
4a	ILT-Container concrete foundation according to specifications and local regulations		INAF
4b	Assembly of sub-racks in ILT-Container	ATH	
4c	Sub-rack validation	ATH	
4d	Placing the ILT-container on-site incl supervisory	ATH	
4e	Delivery and installation mains power to distribution board compliant with local regulations		INAF
4f	Delivery and installation ILT fibre connection		
4g	ILT-Container grounding according to local specifications		INAF
4h	Installation of antenna field cables to patch panel	ATH	
4i	Cable connections from patch panel to receivers	ATH	
5	**LBA installation**		
5a	LBA installation incl. installing foils and installing groundplanes	ATH	
6	**HBA installation**		
6a	Rental and installation of assembly tent	ATH	
6b	HBA assembly	ATH	
6c	HBA installation	ATH	
6d	Providing Crew wagon / Lavatory on-site		INAF
7	**Station validation**		
7a	Testing of ILT glass fiber connection, 2-way (report required)		INAF
7b	LBA validation	ATH	
7c	HBA validation	ATH	
7d	Network validation	ATH	
7e	System validation including all sky image	ATH	
7f	Validation report	ATH	
7g	Kickstart software configuration and installation	ATH	
7h	Configuration of station LCU	ATH	
7i	Creating calibration tables	ATH	
7j	Data Delivery Package (DDP)	ATH	
7k	Station acceptance report and handover	ATH	
8	**Miscellaneous**		
8a	Placing and maintenance of chemical toilet during construction period		INAF
8d	Inform KLIC (Notification to Cable and Pipeline Information Centre)		INAF
9	**Project management**		
9a	On Site Project management and Experienced workers assistance	ATH	
9b	Local project management		INAF

The services shall be delivered including:

- Cost of rental of the equipment for station rollout (fork lift truck, crane etc), but not for ground preparation i.e. 3a, 3b.
- Cost of rental of a Tent to allow for on-site assembly of the High Band Antennas.
- Cost of travel and stay.
- All cost of personnel is based upon applying professional workers, either from Supplier, ASTRON or Contractors having experiences with LOFAR rollout operations.
- On-site HBA tile Assembly.

11. All items related to local infrastructures and not mentioned in the table from section 10 are excluded in the pricing. They are considered to be responsibility of the Buyer. This list of items include but is not limited to:
    - Providing an area (site) which is suitable to encompass an ILT station.
    - Preparing the site (flattening), according to spec. This is the initial flattening of the field, in coarse grid 10x10m. (Specs to be supplied by Supplier).
    - Preparing the temporary access road.
    - Preparing temporary fencing (optional).
    - Preparing a place for unloading and on-site storage of the HBA components. (Approx. 800m3 for HBA-EPS materials).
    - Providing storage for electronics as needed during rollout.
    - Preparing the facilities for people working on assembly.
    - Providing Crew wagon / Lavatory on-site.
    - Marking reference points for land surveying.
    - Realizing a foundation for the ILT container (Specs to be supplied by Supplier).
    - Arranging and connecting a safety earthing (grounding) system to the ILT Container.
    - Power deployment and connection.
    - Fiber deployment and connection.

    Support activities and costs involved after acceptance of the station (SAT milestone) are to be discussed separately. In general, Supplier assumes that these activities are to be covered within the arrangement with a membership of the ILT organisation.
12. The Subject of the Contract shall be delivered in the proper packing, to properly secure the Subject of the Contract during the whole period of transportation until the hand-over of the Subject of the Contract to the Buyer or his representative and protecting it before the damage and before the interference of third parties. The Supplier shall ensure the packing along with the necessary handle grips that allow a safety transportation of the Subject of the Contract by forklift truck and crane. At the same time, the Supplier shall deliver along with the delivery of the Subject of the Contract the description of the safe unloading procedure. The delivery shall be made in INCOTERMS 2010 formula: DAP (eng. *Delivered at Place* – the exact place of the delivery).
13. Along with the delivery, the Supplier shall deliver to the Buyer the following documents:
    a) Quantitative and generic list of the delivered equipment, including in particular: the name of the device, manufacturer, year of production, serial number, specific functional parameters,
    b) Warranty cards of the equipment, manuals, operating instructions in English language version,
    c) Attestations, certificates, conformity declarations and all other adequate documents.
14. The details on packaging, safe transportation and safe unloading procedures, as indicated in sec. 12 above, shall be agreed by the Supplier and the Buyer in writing within 30 days before the date of the planned delivery.

15. The Parties allow for the possibility of early completion of delivery. Early completion date of delivery shall be confirmed by both Parties in the form of a written document and accepted by the Buyer.

§ 5
TERMS OF PAYMENT

1. The remuneration specified in § 3 sec. 1 shall be paid in six installments in following way:
    1. First installment of 0,4% of the total sum shall be paid upon completion of the Site Survey and RFI survey (if this option is requested).
    2. Second installment of 3,6% of the total sum shall be paid upon agreement on the final "Go" decision.
    3. Third installment of 50% of the total sum shall be paid upon Supplier placing orders for the production of components.
    4. Fourth instalment of 30% of the total sum shall be paid upon Supplier receiving all hardware components from its suppliers.
    5. Fifth installment of 10% of the total sum shall be paid upon the shipment of station components to Italy.
    6. Last installment of 6% of the total sum shall be paid upon successfully concluding the Site Acceptance Test of the entire Subject of the Contract.
2. A detailed project planning will be provided in order to timely allow Buyer to adjust its payment obligations.
3. The deliveries of the Subject of the Contract to the Buyer (including the documentation) and finishing of the FAT and SAT tests, shall be confirmed by the respective protocols of receipt prepared in a written form and signed by duly authorized representatives of the Parties.
4. The Buyer is obliged to pay the remuneration, specified in accordance with § 5 point 1 only if the Subject of the Contract is compliant with the technical specification specified § 4 point 6. In case the provisions mentioned above are fulfilled, the remuneration shall be paid within 30 days from the date of the delivery to the Buyer the properly issued invoice, to the bank account of the Supplier, in bank: Coöperatieve Rabobank U.A number: **NL 84 RABO 0122 4755 93**. The protocol of receipt without reservations signed by duly authorized representatives of the Parties is the basis for issuing the invoice.
5. The place of payment is the Buyer's bank.
6. Payment of invoices does not mean that the Buyer unconditionally approved the delivered Subject of the Contract. If, in connection with the performance of this Contract, it appears that the Subject of the Contract does not meet the requirements specified in the technical specifications, the Buyer has the right to withhold the entire payment or a part of the payment and demand a return of a part of the remuneration paid for the Subject of the Contract, despite its non-compliance with the specification.

§ 6
TERMS OF INVOICING

1. The Buyer is a value added tax (VAT) payer, and it's TIN (Tax Identification Number) timely will be provided to Supplier to allow proper invoicing.
2. The Supplier declares that he is not a value added tax (VAT) payer in the territory of Italy and he also does not have a permanent place of the business operation in the territory of Italy and that he has the Number of the VAT registry for the implementation of intra-community supplies: NL812375038B01.
3. On the invoice the Supplier shall also indicate the formula (INCOTERMS 2010 – DAP) and the place of the delivery as well as the payment due date, i.e. 30 days after the delivery of the invoice to the Buyer.
4. The invoices shall be submitted in relation to each of the instalments, in a written form as a hard copy, not earlier then after signing the respective acceptance protocol by duly authorized representatives of both Parties of the Contract, without

reservations, and not later than within 2 days from the date of its signing and deliver immediately to the address indicated in § 7 point 2 a) of the Contract.

§ 7
CORRESPONDENCE

1. It is recommended that any correspondence shall be made in writing.
2. All correspondence shall be made to the addresses of the Parties, which will be established at the start of the project.

§ 8
THE RELATIVE PRIORITY ORDER OF THE DOCUMENTS

The Contract and the documents related to it are intended to complement each other. Shall it be stated that the Contract and the documents related to it are contradictory to each other in any way, they shall be valid in the following order:

1) changes and supplements to this Contract approved and prepared by both Parties, in a form of annexes, prepared in writing, under the pain of nullity,
2) this Contract along with the attachments, constituting its integral part, with the reservation that in case of contradictory between any of the attachments and the content of the Contract, the content of the Contract shall prevail.

§ 9
INFRINGMENT OF COPYRIGHT AND PATENTS

1. The Supplier declares that according to his best knowledge, the fulfilment of his obligations resulting from the Contract does not infringe third parties' intellectual property rights (including industrial property). The Supplier is responsible for and shall bear all the costs arising from any infringements of copyrights, patent rights or other intellectual property rights which may result from the conclusion or the performance of this Contract, and which are not resulted by the Buyer's fault.
2. The Supplier, as the author, shall resign from any rights to the author's supervision of the created Works or its particular parts and agree for the free disposal of it by the Buyer. The Supplier undertakes in relation to the Buyer, to not perform, by indeterminate period of time, the copyrights to the Works that the Buyer is entitled to have. In particular, the Supplier undertakes in relation to the Buyer to not perform: the right to the authorship of the Works, the right to providing it anonymously, the right to the inviolability of the content and the form of the Works and its reliable use, the right to decide about the first time when the Works is made available to the public, the right to the supervision on the manner of using the Works.

§ 10
DISPUTES

1. Disputes that may arise from the execution of this Contract shall be solved by the Parties through mediation.
2. If an agreement cannot be established in a manner listed in point 1, within 60 days from the date of the notification of the dispute by one Party to the other Party, all disputes resulting from this Contract shall be subject exclusively to the Court competent for the Buyer's place of residence.
3. To matters not covered by this Contract, the Dutch law shall apply.

§ 11
CHANGES AND SUPPLEMENTS

Changes and supplements to the current Contract may only be made through a written document under the pain of nullity, and shall be signed by authorized representatives both of the Buyer and the Supplier.

§ 12
SIGNING OF THE CONTRACT

1. This Contract shall be valid from the date on which both Parties have signed the Contract.

On behalf of Buyer:

Prof. Nicolò D'Amico
INAF President

Date: .....

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On behalf of Supplier:

Mr. Ronald G.B. Halfwerk
Director of AstroTec Holding BV

Date: April, 5th, 2018

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Initialized by
Dr. Filippo Maria Zerbi
INAF Scientific Director

Date: April 6th, 2018

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