Tender Number: STF/TD/002/2025
Re:01 dt. 27/11/2025

IITM CDoT Samgnya Technologies Foundation
IITM Research Park, Tharamani, Chennai – 600113
Contact Number: +91 96001 79773
Email id: tender@samgnya.in

Date: 10-11-2025

Dear Sir/Madam,

On behalf of the IITM CDoT Samgnya Technologies Foundation, offers are invited for the supply of **"Quantum key distribution Nodes"** conforming to the specifications given in **Technical specification document.**

We are only inviting "Class - I Local Suppliers" and "Class - II Local Suppliers" to participate in this tender.

Instructions to the Bidder

I. **Prices:** - The offer/bid should be exclusive of taxes and duties. The percentage of tax & duties should be clearly indicated separately.

II. **Terms of Delivery**: -
Supplier will be fully responsible for the safe carriage of goods up to the delivery of the nodes as give in the Delivery document - Annexure VII or named place as per PO, Insurance coverage will be in the scope of the supplier.
The Installation/Commissioning should be completed as specified in our important conditions.
IITM CDoT Samgnya Technologies Foundation reserves the full right to accept / reject any tender at any stage without assigning any reason.

III. This tender will be a two part bid the bidders are required to submit an Technical bid with each annexures and Price Bid is to be uploaded separate.

For IITM CDoT Samgnya Technologies Foundation,

Ravindra Barlingay

Ravindra Barlingay
CEO

SCHEDULE

Important Conditions of the tender

1. The offers / bids should be submitted under two bid system (i.e.) Technical bid and financial bid. The Technical bid should consist of all technical details / specifications only. The Financial bid should indicate an item-wise price for each item and it should contain all Commercial Terms and Conditions including Taxes, transportation, packing & forwarding, installation, guarantee, payment terms, pricing terms etc.

2. The QKD nodes being provided shall comply with the interoperability requirements set forth by the QuILA consortia. (Specifications shall be shared on request.) There shall be provision to upgrade the same to comply with the upcoming national/international standards in this regard.

3. For the same tender, either the OEM or the authorized dealer/service provider can only quote. But both of them cannot quote separately for the same tender.

4. The offers/bids should be sent only for a machine that is available in the market and supplied to a one or more customers. A list of customers in India with details must accompany the quotations. Quotations for a prototype machine will only be accepted pursuant to further qualifications.

5. Original catalogue (not any photocopy) of the quoted model duly signed by the principals must accompany the quotation in the technical bid.

6. Compliance or Confirmation report with reference to the specifications and other terms & conditions should also be obtained from the principal.

7. **Validity:** The validity of Quotation should not be less than 120 days from the due date of tender.

8. **EMD: N.A**

9. **Performance Security: -** The successful bidder should remit Performance Security **for an amount of 5% of the value of the contract/supply**. The Performance Security may be furnished in the form of an Account Payee DD, FD Receipt in the name of "IITM CDoT Samgnya Technologies Foundation" from any scheduled commercial bank or Bank Guarantee from any scheduled commercial bank in India. **The performance security should be furnished within 14 days from the date of the purchase order.**

10. **Performance Security in the form of Bank Guarantee: -** In case the successful bidder wishes to submit Performance Security in the form of Bank Guarantee, the Bank Guarantee should be routed directly to Samgnya from the Bank. The Bank Guarantee should remain valid for a period of 60 days beyond the date of completion of all contractual obligations of the supplier including the warranty obligations.

11. **Delivery Schedule**: - The technical tenderer must clearly specify the time required for the delivery of the item, which shall be subject to approval by the Executive Committee – Samgnya. Any deviation from the approved delivery schedule will attract a liquidated damages clause or penalty for the delayed period.In the event of delay or non-supply of materials/execution of the contract beyond the stipulated delivery/completion date, a penalty of 1% of the purchase order value per week of delay, subject to a maximum of 10%, will be imposed. If the delay exceeds the timeframe accepted by Samgnya, the purchase order shall be liable for cancellation, and liquidated damages will be enforced accordingly.

12. **Risk Purchase Clause**: - In the event of failure of supply of the item/equipment within the stipulated delivery schedule, the purchaser has all the right to purchase the item/equipment from other sources on the total risk of the supplier under risk purchase clause.

13. **On-site Installation**: - The equipment or machinery has to be installed or commissioned by the successful bidder within the number of days (as prescribed by PI) from the date of receipt of the item at the site of Samgnya.

14. **Warranty/Guarantee**: - The Original Equipment Manufacturer (OEM) shall provide a minimum warranty/guarantee period of 1 (one) year for the supplied machinery/equipment from the date of delivery. Further, the OEM shall commit to provide an Annual Maintenance Contract (AMC) for an additional 2 (two) years after expiry of the warranty period. Thus, the OEM must ensure a total coverage period of 3 (three) years (1 year warranty + 2 years AMC) for the supplied equipment.

15. **Acceptance and Rejection**: - Samgnya has the right to accept the whole or any part of the Tender or portion of the quantity offered or reject it in full without assigning any reason.

16. Do not quote optional items or additional items unless and otherwise mentioned in the Tender documents / Specifications.

17. **Debarment from Bidding**: In case of breach of Terms & Conditions, Bidder may be suspended from being eligible for bidding in any contract with IIT PTF up to 2 Years [as per Rule 151(iii) of GFR] from the date of Tender.

18. **No price disclosure in technical documents:** Bidders shall not indicate or mention any price/cost details anywhere except in the designated Price Bid. Any bidder found indicating price(s) in any other document or section of the bid shall be **liable for disqualification**.

19. Disputes and Jurisdiction:

- **Settlement of Disputes:** Any dispute, controversy or claim arising out of or in connection with this PO including any question regarding its existence, validity, breach or termination, shall in the first instance be attempted to be resolved amicably by both the Parties. If attempts for such amicable resolution fails or no decision is reached within 30 days whichever is earlier, then such disputes shall be settled by arbitration in accordance with the Arbitration and Conciliation Act, 1996. Unless the Parties agree on a sole arbitrator, within 30 days from the receipt of a written request by one Party from the other Party to so agree, the arbitral panel shall comprise of two arbitrators. In that event, the supplier will nominate one arbitrator and Samgnya shall nominate one arbitrator. The arbitration proceeding shall be carried out in English language. The cost of arbitration and fees of the arbitrator(s) shall be shared equally by the Parties. The seat of arbitration shall be at the registered office of IITM CDOT Samgnya Technologies Foundation, Chennai.

- **The Applicable Law:** The Purchase Order shall be construed, interpreted and governed by the Laws of India. The court at Chennai shall have exclusive jurisdiction subject to the arbitration clause.

- Any legal disputes arising out of any breach of contact pertaining to this tender shall be settled in the court of competent jurisdiction located within the city of Chennai in Tamil Nadu.

20. All Amendments, time extension, clarifications etc., will be uploaded on the website only and will not be published in newspapers. Bidders should regularly visit the above website https://www.samgnya.in/ to keep themselves updated. No extension of the bid due date/ time shall be considered on account of delay in receipt of any document by mail.

21. Eligibility Criteria: Only “Class - I Local Suppliers” and “Class - II Local Suppliers” can participate in this bidding.

22. Preference to “class I Local Suppliers”: preference will be given to “class 1 local suppliers” (subject to class -I local supplier’s quoted price falling within the margin of purchase preference) as per public procurement (preference to make in India) order 2017 .O.M No P-45021/2/2017 – pp(BE - 11) dt 04/06/2020 subject to the conditions that the “class 1 Local Supplier” should agree to supply goods / provide service at L1 rate and furnish a certificate with the technical bid document that the goods/service provided by them consists local content equal to or more than 50%.(certificate from Chartered Accountant in case value of contract exceeds Rs 10 crore).

- ‘Class - I local supplier’ means a supplier or service provider whose goods, services or works offered for procurement consists of local content equal to or more than 50% as defined under the above said order. Declaration to be provided as per Annexure-I per item/service/work.

- 'Class - II local supplier' means a supplier or service provider whose goods, services or works offered for procurement consists of local content equal to 20% but less than 50% as defined under the above said order. Declaration to be provided as per Annexure-I per item/service/work. Imported and repackaged goods will not qualify as a Class - II local supplier.

- 'Margin of purchase preference': - The margin of purchase preference shall be 20%. The Definition of the margin of purchase preference is defined in the Govt. of India Order No: P-45021/12/2017-PP (BE-II) Dt.4th June, 2020) Order 2017. As per the Government of India Order – "Margin of Purchase Preference" means the maximum extent to which the price quoted by a "Class-I local supplier" may be above the L1 for the purpose of purchase preference.

  **Note: Local content percentage to be calculated in accordance with the definition provided at clause 2 of revised public procurement preference to Make in India Policy vide GoI Order no. P-45021/2/2017-PP (B.E.-II) dated 15.06.2017 (subsequently revised vide orders dated 28.05.2018, 29.05.2019and 04.06.2020)MOCI order No. 45021/2/2017-PP (BE II) Dt.16th September 2020 & P- 45021/102/2019-BE-II-Part(1) (E-50310) Dt.4th March 2021

Acknowledgement: - It is hereby acknowledged that the tenderer has gone through all the conditions mentioned above and agrees to abide by them.

Signature of the Bidder
with Name & Address

Date:

Technical Specification: MAQAN Node

Total number of nodes: 11 (3 each at Bengaluru, Hyderabad, Indore and 2 at Chennai)

The QuILA (Quantum Internet with Local Access) consortium aims to set up MAQAN (Metro Area Quantum Access Network) networks at Bengaluru, Indore, Hyderabad and Chennai.

Bengaluru, Indore and Hyderabad:

Interested vendors shall provide network rack-mountable chassis adhering to the essential specifications mentioned in Table 1 in a 3-node topology. The supported network topologies shall be decided by the vendor for a 3-node configuration, ensuring cost-effective all-to-all connectivity. The 3-node topology, common to all three cities, is shown in Fig. 1a. Each node shall support the layers as mentioned in Fig. 2. The vendor shall provide brief details of all these layers as requested in Table 2.

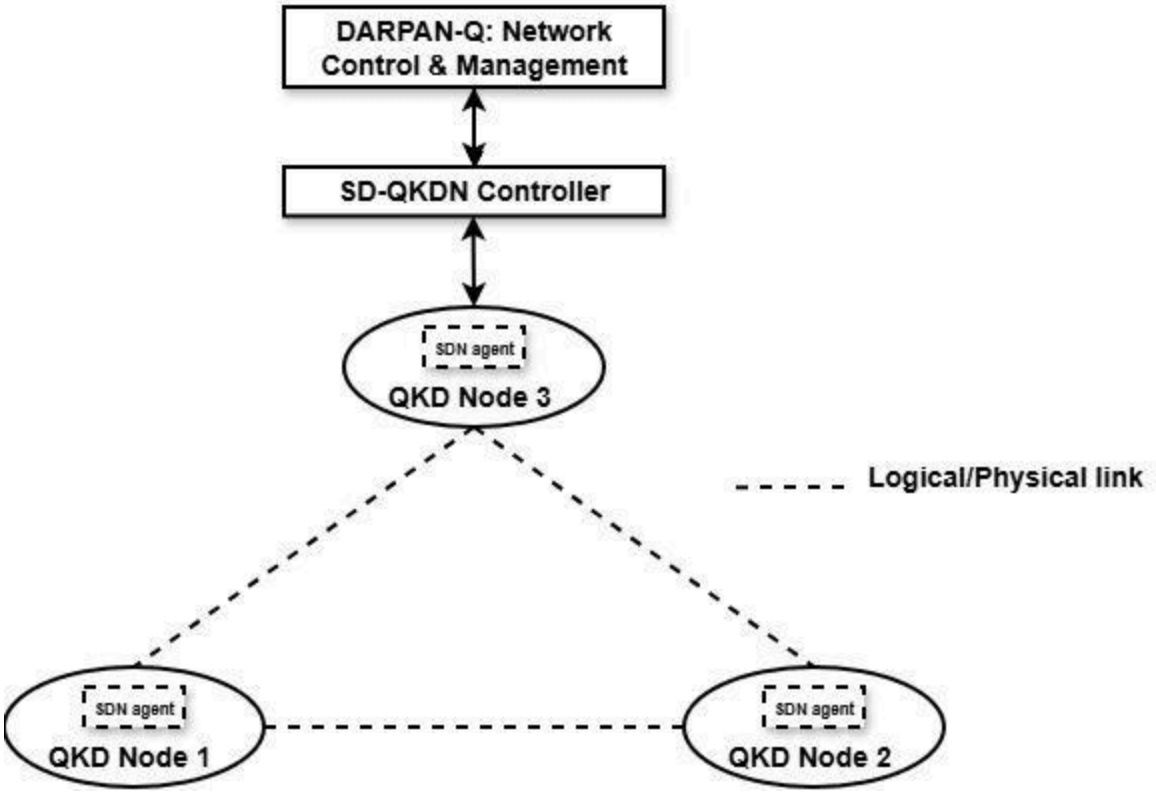

Fig. 1a. MAQAN Outline (Bengaluru, Hyderabad and Indore)

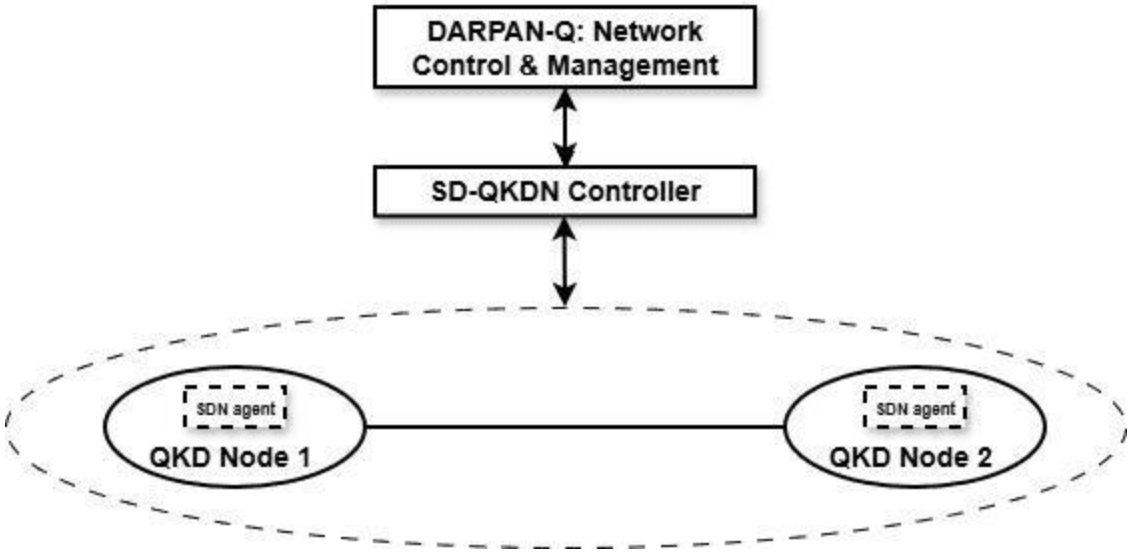

Fig. 1b. MAQAN Outline (Chennai)

Chennai:

Interested vendors shall provide network rack-mountable chassis adhering to the essential specifications mentioned in Table 1 in a 2-node point-to-point link. The 2-node layout is shown in Fig. 1b. Each node shall support the layers as mentioned in Fig. 2. The vendor shall provide brief details of all these layers as requested in Table 2.

Table 1: Essential specifications for a QKD node pair (Tx and Rx)

S.No	Specification Description	Value
1.	Finite-size secure key rate	$\geq$ 3 kbps
1a	Max. mean photon number	0.25
1b	QBER	<25%
1c	Raw key block size for post-processing	Minimum 5 Mbits
1d	Stability parameters	QBER, secure key rate, key access attempts, with 1% failure to comply with the defined parameters, calculated each month.

2.	QKD protocol	DPS, CoW, TF, MDI or any other protocol with security proofs
3.	Quantum Operational Distance	100 km over SMF-28
4.	Classical Operational Distance	100 km over SMF-28
5.	Channel loss tolerance	~20 dB
6.	Operational mode	Continuous and single instance-based provisioning
7.	System interface	USB and Ethernet (1 Gbps) Debug terminal HDMI (optional)
8.	Optics Interface	SC panel
9.	Quantum Wavelength	ITU grid
10.	Fiber type	SMF-28
11.	Fiber Interface for Quantum channel	SC/APC
12.	Fiber interface with Classical channel	SC/APC
13.	Detector type	SPAD in gated mode
14.	Power requirements	230 V, 50 Hz and -48 V DC operation
15.	Mechanical Dimension Optical Unit	19-inch rack mountable chassis Maximum 4U, Complaint to TEC/SD/DD/EMC-221/05/OCT-16
16.	Wavelength division multiplexing	4 adjacent DWDM channels to carry all quantum, classical post-processing traffic, clock sync, OTDR channel, and bidirectional data traffic at 10 Gbps.
17.	Key pool	On node/on-premise softcore TPM TPM-based, or better
18.	Key manager and key access	QKD node shall support node based Key Manager that shall comply with ETSI GS QKD 014 and QuILA specification in this regard. The

		QuILA specification shall be shared on request. Key access shall be request-response-based.
19.	SDN requirement	The SDN agent in the QKD Node shall comply with QuILA controller specification. The QuILA specification shall be shared on request. (operable as shown in Fig. 1)
20.	Communication: SDN controller to SDN agent Key manager and user application	REST services and JSON data over as data. Encrypted and authenticated using Chacha20Poly1305 algorithm.
21.	Vendor interoperability	All vendor nodes shall comply with the interoperability requirements set forth by the QuILA consortia. (Specifications shall be shared on request).
22.	PQC failsafe mechanism between each QKD pair	Yes
23.	On node VPN access/remote access	Yes
24.	Warranty and AMC	1 year followed by 2 years AMC.
25.	Support in feature enhancement in QuILA network with respect to point 16-23	3 years with a dedicated SPOC.
26.	Network availability	At least 99% uptime per node, measured monthly. The network will operate using a request-response mechanism. 99% of key requests measured monthly, raised for a given pair of nodes, shall result in a successful key

		generation response at a finite-size secure key rate of at least 3 kbps.
27.	System and solution deployment and acceptance	At defined field locations, integrated with defined SDN framework and DARPAN-Q. Demonstration of all features listed in Table 1 with control and management through DARPAN-Q.

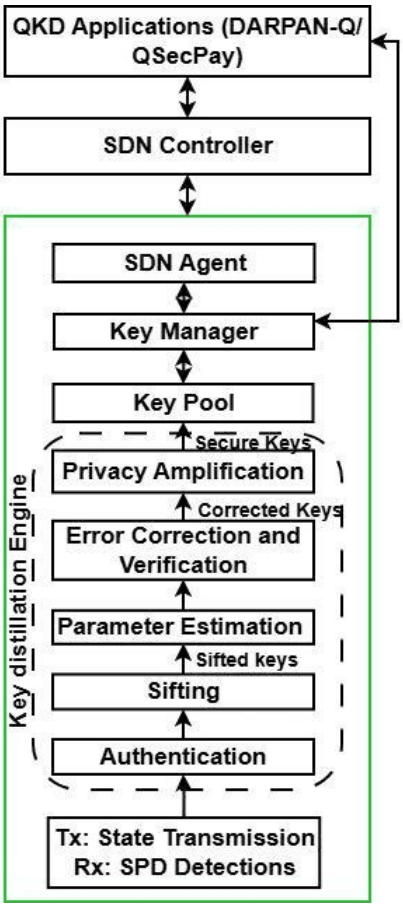

Fig. 2 Layered Architecture of a typical QKD node

All three MAQAN networks shall be managed through an SDN-enabled network control, management, and user application called DARPAN-Q. DARPAN-Q, manages the network topology, link provisioning, key management, OTDR monitoring, use case implementation, stability and performance monitoring, inventory management, event logging, etc. The SD-

QKDN controller layer runs as a centralised application in the MAQAN network, whereas the SDN agent runs on each of the QKD nodes. SDN controller implementation adheres to the

ITU-T Y.3805 recommendations. SDN Agent to SDN controller interface is defined in accordance with ETSI GS QKD 015 specifications. DARPAN-Q interacts with the SD-QKDN controller over the northbound interface implemented as REST APIs. The southbound interface between the SDN controller and SDN agent is also implemented as REST APIs. All communication between the DARPAN-Q, SD-QKDN controller, and SDN Agent is through the REST services and JSON data. It is all encrypted and authenticated using the Chacha20Poly1305 algorithm.
QKD application/use case to key manager interface is defined in accordance with ETSI GS QKD 004 and ETSI GS QKD 014 specifications. SDN controller implementation adheres to the ITU-T Y. 3805 recommendations. MAQAN's SDN framework also supports the classical key relay feature in accordance with the ITU-T Y.3804 recommendations.

Documentation and training:

- Comprehensive technical manuals, data sheets, API specifications, and deployment guides.
- Sub-component characterisation report and data sheets as applicable.
- Integrated chassis characterisation and report.

On-site training for the maintenance team.Support & Warranty

- One warranty covering supplied hardware and software, followed by two years AMC.
- Provide 24/7 technical support in alignment with SLA commitments.
- Escalation process covering L1, L2, and L3 levels of support.
- Fault resolution: within 24 hours of the first report.

Resources to be provided by the QuILA consortia:

- The QuILA consortia shall provide a single dark fiber core on a rental basis for the chassis deployment. Latest OTDR traces shall be provided for all the links.
- A network maintenance team with a single point of contact (SPOC) shall be available for the parties for 3 years, covering deployment, testing, warranty and AMC duration.
- Support during implementation and demonstration of vendor interoperability.

Table 2: Template for QKD chassis implementation fundamentals

QKD layer	Method	Hardware platform of implementation	Critical parameters (block sizes, Protocol Threshold, Protocol Efficiency, Frame Error Rate, Synchronisation Jitter, Remarks, etc.)
Interface between the quantum layer and the key distillation engine			
KDE stack authentication mechanism			
Sifting			
Parameter estimation			
Error correction			
Error verification			
Privacy authentication			
Key pool			
Key manager			
Clock synchronization			

Table 3: KDE Specifications

Authentication	
1	Mutual 2-way Authentication between each node before key generation.
2	Provision for a Data integrity check on data sent over the classical channel.
Sifting	
1	DPS, CoW, TF, MDI - multi QKD protocol sifting support

2	Estimates for Parameters like Visibility, Sifting efficiency, and Sifted key rate.
Error Correction	
1	The error correction algorithm used should be standard and well-proven.
2	Configurable code rate to adapt to various QBER and maximise the secure key rate.
3	Estimates of Error Correction Threshold, Error Correction Efficiency, and Frame (or Block) Error Rate with varying QBER to be provided.
4	Provision for Error verification after error correction, using a hash-based checksum (e.g., universal hash or CRC) with a failure probability ≤ 10^{-10}.
Privacy Amplification	
1	Privacy amplification should be universal hash function-based.
2	The privacy amplification compression ratio should be configurable.
3	The minimum input block Size should be 10^6.
The system should support security parameters, finite-size effects, Holevo bound, and security against common attacks demonstrated in literature.	

Table 4: Participation indication table

Locations	**Yes/No**
Network in a 3-node topology at Bengaluru	
Network in a 3-node topology at Hyderabad	
Network in a 3-node topology at Indore	
Network in a 2-node topology at Chennai	

Signature of the Bidder
with Name & Address

Date:

ANNEXURE – I

FORMAT FOR AFFIDAVIT OF SELF-CERTIFICATION UNDER PREFERENCE TO MAKE IN INDIA – PER ITEM

Tender bidding Number:

Name of the item / Service:

Date:
I/We S/o, D/o, W/o, _
Resident of

Hereby solemnly affirm and declare as under:
That I will agree to abide by the terms and conditions of the Public Procurement (Preference to Make in India) Policy vide GoI Order no. P-45021/2/2017-PP (B.E.-II) dated 15.06.2017 (subsequently revised vide orders dated 28.05.2018, 29.05.2019and 04.06.2020)MOCI order No. 45021/2/2017-PP (BE II) Dt.16th September 2020 & P-45021/102/2019-BE-II-Part(1) (E-50310) Dt.4th March 2021 and any subsequent modifications/Amendments, if any and

That the local content for all inputs which constitute the said item/service/work has been verified by me and I am responsible for the correctness of the claims made therein.

Tick ( ) and Fill the Appropriate Category	
☐	I/We [name of the supplier] hereby confirm in respect of quoted items thatLocal Content is equal to or more than 50% and come under **"Class-I Local Supplier"** category.
☐	I/We [name of the supplier] hereby confirm in respect of quoted items that Local Content is equal to 20% but less than 50% and come under **"Class-II Local Supplier"** category.

- The details of the location (s) at which the local value addition is made and the proportionate value of local content in percentage

Address _____ _____ __ Percentage of Local content: _____%
_____

For and on behalf of.....(Name of firm/entity)

Authorized signatory (To be duly authorized by the Board of Directors)
<Insert Name, Designation and Contact No.>

[Note: In case of procurement for a value in excess of Rs. 10 Crores, the bidders shall provide this certificate from statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content.]

This letter should be on the letterhead of the quoting firm and should be signed by a competent authority. Non-submission of this will lead to Disqualification of bids

ANNEXURE – II

(To be given on the letter head of the bidder)

No._____ Dated: _____

CERTIFICATE

(Bidders from India)

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and hereby certify that I am not from such a country.

OR *(whichever is applicable)*

(Bidders from Country which shares a land border with India)

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and hereby certify that I from _____ (Name of Country) and has been registered with the Competent Authority. I also certify that I fulfil all the requirements in this regard and is eligible to be considered. *(Copy/ evidence of valid registration by the Competent Authority is to be attached)*

Signature of the Bidder

ANNEXURE-III

Pre-Qualification Criteria: I				
S.NO	**PRE-QUALIFICATION CRITERIA - I**	**Compliance (Yes/No)**	**Reference Page No.**	**Remarks, If any**
1	The bidder shall not be from a country sharing land border with India and if the bidder is from a country sharing land border with India the bidder should have been registered with the competent authority as per orders of DIPP OM No. F. No. 6/18/2019-PPD dated 23rd July 2020, and MoCI Order No. P-45021/112/2020-PP (BE II) (E-43780) dated 24th August 2020. Declaration of Land border to be submitted as per Annexure II			
2	Only 'Class-I local suppliers' and 'Class-II local suppliers', as defined under DIPP, MoCI Order No. P45021/2/2017-PP (BE II) dated 16th September 2020 and other subsequent orders issued therein, shall be eligible to bid in this tender. Declaration for Class-I / Class-II local suppliers should be submitted in the prescribed proforma format as per Annexure I			
3	The bidder nor any of its partners has been blacklisted / debarred by any central or state government agencies in last 3 years. A self-declaration format given in Annexure V to be submitted along with Technical Bid.			
4	The Bidder, in case of authorized agent should submit the OEM authorization certification with reference to this tender as per Annexure IV			
Pre-Qualification Criteria: II				
S.NO	**PRE-QUALIFICATION CRITERIA - II**		**Reference Page No.**	**Remarks, If any**
1	The bidder who have supplied minimum 1 similar systems to State or Central Govt. recognised organisation / Institute in last 3 years. P.O/ W.O or Invoice copies to be submitted along with the technical bid for qualifying will be given preferance.	Optional		

Signature of the Bidder

ANNEXURE-IV

OEM CERTIFICATION FORM
(In Original Letter Head of OEM)

Tender No: ..... Dated: .....

We are Original Equipment Manufacturers (OEM) of..... (Name of the company) Ms..... (Name of the vendor) is one of our Distributors/Dealers/Resellers/Partners (tick one) for the ..... and is participating in the above-mentioned tender by offering our product model.....(Name of the product with model number).

..... is authorized to bid, sell and provide service support warranty for our product
as mentioned above.

Signature of the Bidder

Annexure V

NON-BLACKLISTING DECLARATION

Date: XXXX

Subject: Non-Blacklisting declaration in connection with tender RFF No: XXXXXX for procurement of "XXXXXXXXXXXXXXXXXXXXXXXXXXX"

This is to notify you that our Firm/Company/Organization <*provide Name of the Firm/Company/Organization*> intends to submit a proposal in response to the invitation for procurement of "XXXXXXXXXXXXXXXXXXXXXXXXXXX" In accordance with the above we declare that:

a. We are not involved in any major litigation that may have an impact of affecting or Letter compromising the delivery of services as required under this assignment.

b. We are not blacklisted by any Central/ State Government/ agency of Central/ State Government of India or any other country in the world/ Public Sector Undertaking/ any Regulatory Authorities in India or any other country in the world for any kind of fraudulent activities in last 3 years.

Signature of the Bidder

Annexure - VI

TENDER CHECKLIST – Mandatory to be filled in along with specification Document.

Sl. No.	Check List Details - Technical Bid	Uploaded (Yes / No)
01	Acceptance of Condition by signing on all pager of the Tender document (Page 1 - 5). The Tender document shall be signed by a person legally authorized.	
02	Acceptance of Technical specification by signign on all pages (Page 6 - 13).	
03	Certification of Class I / Class II Local supplier to be submitted (as a Part of technical bid) per item / service / work as per **Annexure I**	
04	Land border certification - **Annexure II**	
05	Pre Qualification criteria - **Annexure III**	
06	OEM Certification Form - **Annexure IV**	
07	Non-blacklisting Declaration Letter - **Annexure V**	
08	Delivery Schedule & Supply Indication Table - **Annexure VII**	
09	QKD chassis implementation fundamentals Table - **Annexure VIII**	
Sl. No.	**Check List Details - Price Bid**	**Uploaded (Yes / No)**
01	The Price Bid shall be submitted **in the prescribed format only**, and to be **uploaded separate**	

The above documents should be provided for a contractor's bid to be valid. Bidders are asked to supply and tick off the required information. Failure to provide any of the stated documents may result in the bid being considered non-compliant and rejected.

Signature of the Bidder

Annexure VII

Delivery Schedule & Supply Indication Table

Locations	**Yes/No**	**Delivery timeline (in number of weeks from the date of Purchase Order).**
Network in a 3-node topology at Bengaluru		
Network in a 3-node topology at Hyderabad		
Network in a 3-node topology at Indore		
Network in a 2-node topology at Chennai		

I confirm that I will deliver the Nodes in the city I have agreed to supply as per the tender technical specification.

Signature of the Bidder

Annexure VIII

Essential specifications for a QKD node

S.No	Specification Description	Value	Compliance (Yes/No)
1.	Finite-size secure key rate	≥ 3 kbps	
1a	Max. mean photon number	0.25	
1b	QBER	<25%	
1c	Raw key block size for post-processing	Minimum 5 Mbits	
1d	Stability parameters	QBER, secure key rate, key access attempts, with 1% failure to comply with the defined parameters, calculated each month.	
2.	QKD protocol	DPS, CoW, TF, MDI or any other protocol with security proofs	
3.	Quantum Operational Distance	100 km over SMF-28	
4.	Classical Operational Distance	100 km over SMF-28	
5.	Channel loss tolerance	~20 dB	
6.	Operational mode	Continuous and single instance-based provisioning	
7.	System interface	USB and Ethernet (1 Gbps) Debug terminal HDMI (optional)	
8.	Optics Interface	SC panel	
9.	Quantum Wavelength	ITU grid	
10.	Fiber type	SMF-28	
11.	Fiber Interface for Quantum channel	SC/APC	

12.	Fiber interface with Classical channel	SC/APC	
13.	Detector type	SPAD in gated mode	
14.	Power requirements	230 V, 50 Hz and -48 V DC operation	
15.	Mechanical Dimension Optical Unit	19-inch rack mountable chassis Maximum 4U, Complaint to TEC/SD/DD/EMC-221/05/OCT-16	
16.	Wavelength division multiplexing	4 adjacent DWDM channels to carry all quantum, classical post-processing traffic, clock sync, OTDR channel, and bidirectional data traffic at 10 Gbps.	
17.	Key pool	On node/on-premise softcore TPM TPM-based, or better	
18.	Key manager and key access	QKD node shall support node based Key Manager that shall comply with ETSI GS QKD 014 and QuILA specification in this regard. The QuILA specification shall be shared on request. Key access shall be request-response-based.	
19.	SDN requirement	The SDN agent in the QKD Node shall comply with QuILA controller specification. The QuILA specification shall be shared on request. (operable as shown in Fig. 1)	
20.	Communication: SDN controller to SDN agent Key manager and user application	REST services and JSON data over as data. Encrypted and authenticated using Chacha20Poly1305 algorithm.	
21.	Vendor interoperability	All vendor nodes shall comply with the interoperability requirements set forth by the QuILA consortia. (Specifications shall be shared on request).	
22.	PQC failsafe mechanism between	Yes	

	each QKD pair		
23.	On node VPN access/remote access	Yes	
24.	Warranty and AMC	1 year followed by 2 years AMC.	
25.	Support in feature enhancement in QuILA network with respect to point 16-23	3 years with a dedicated SPOC.	
26.	Network availability	At least 99% uptime per node, measured monthly. The network will operate using a request-response mechanism. 99% of key requests measured monthly, raised for a given pair of nodes, shall result in a successful key generation response at a finite-size secure key rate of at least 3 kbps.	
27.	System and solution deployment and acceptance	At defined field locations, integrated with defined SDN framework and DARPAN-Q. Demonstration of all features listed in Table 1 with control and management through DARPAN-Q.	

Annexure VIII

KDE Specifications

Authentication		**Compliance (Yes/No)**
1	Mutual 2-way Authentication between each node before key generation.	
2	Provision for a Data integrity check on data sent over the classical channel.	
Sifting		**Compliance (Yes/No)**
1	DPS, CoW, TF, MDI - multi QKD protocol sifting support	
2	Estimates for Parameters like Visibility, Sifting	

	efficiency, and Sifted key rate.	
Error Correction		**Compliance (Yes/No)**
1	The error correction algorithm used should be standard and well-proven.	
2	Configurable code rate to adapt to various QBER and maximise the secure key rate.	
3	Estimates of Error Correction Threshold, Error Correction Efficiency, and Frame (or Block) Error Rate with varying QBER to be provided.	
4	Provision for Error verification after error correction, using a hash-based checksum (e.g., universal hash or CRC) with a failure probability ≤ 10^{-10}.	
Privacy Amplification		**Compliance (Yes/No)**
1	Privacy amplification should be universal hash function-based.	
2	The privacy amplification compression ratio should be configurable.	
3	The minimum input block Size should be 10^6.	
The system should support security parameters, finite-size effects, Holevo bound, and security against common attacks demonstrated in literature.		

Annexure VIII

QKD chassis implementation fundamentals

QKD layer	**Method**	**Hardware platform of implementation**	**Critical parameters (block sizes, Protocol Threshold, Protocol Efficiency, Frame Error Rate, Synchronisation Jitter, Remarks, etc.)**
Interface between the quantum layer and the key distillation engine			
KDE stack authentication mechanism			

Sifting			
Parameter estimation			
Error correction			
Error verification			
Privacy authentication			
Key pool			
Key manager			
Clock synchronization			

Annexure VIII

System Specific Technical Specification

S. No.	Specification Description	Value / Specification
1	Secure key rate when QKD is working.	
2	Mean photon number, raw key size generated before post processing, and post processing algorithms used.	
3	Uptime of QKD versus PQC.	
4	Protocol used, and its security proofs against individual and collective attacks, finite vs asymptotically infinite keys	

To be filled as part of Technical Bid Qualification.

Signature of the Bidder

Bidders must submit a completed and signed Price Bid form in there respective companies letter head, **in a separate, sealed envelope**.

Price Bid

Sl. No.	Locations	Price Per location without GST in INR (1)	Cost of the GST in INR (2)	Total Price Including GST in INR (1+2)
1	Network in a 3-node topology at Bengaluru			
2	Network in a 3-node topology at Hyderabad			
3	Network in a 3-node topology at Indore			
5	Network in a 2-node topology at Chennai			

Note:

- Bidders should only quote the price for the locations chosen by them, Other locations can be left blank.
- Price coated per location should include Design, Supply of equipment, delivery, warranty (1 year) and AMC (2 years).
- Bidders shall not indicate or mention any price/cost details anywhere except in the designated Price Bid.

Signature of the Bidder