1. Scope of Work

1.1 PSeGS invites bids from interested bidders (Service Providers for providing RF connectivity) for supply, installation, commissioning and maintenance of RF based point to point and point to multi-point network in unlicensed multi-range band of 5 GHz (License exempted band as per WPC) at various locations across Punjab and Chandigarh with five years onsite comprehensive warranty and onsite comprehensive maintenance support of the complete RF network. No other type of alternative connectivity solution is allowed for any location.

1.2 The PTP radios should work over a distance of minimum 30 kms and BTS radios should work over a distance of minimum 5 kms. The minimum link speed with less than 10 ms latency should be 50 Mbps in either direction (50 Mbps uplink and 50 Mbps downlink).

1.3 Based on Expression of Interest (EoI) floated earlier, the tentative BoQ is being provided for 2500 locations approximately (Refer Annexures for BoQ). The proposed technology / solution shall be agile and scale-able to cater to 2,500 locations (tentative) with assurance of minimum speed requirement. The unit rates discovered in the bidding process would be fixed and valid for 2,500 locations (tentative) or a period of two years. In case the taxes are reduced, the benefit of reduced taxes shall be passed on to PSeGS. The purchase orders would be placed in phase wise manner as per the unit rates. The quantities of equipment in each phase would be decided by PSeGS. After expiry of two years, PSeGS may take appropriate decision regarding validity of rates for further requirements with the approval of competent authority.

1.4 The Points of Presence (PoPs) of Punjab Wide Area Network (PAWAN) in all districts in Punjab are mostly setup in the Deputy Commissioner’s office area and has the requisite infrastructure (e.g. power, security, etc.) thereby considerably reducing the infrastructure challenges for deployment of wireless links.

1.5 The bidder shall furnish interest free EMD of Rs. 15,00,000/- (Fifteen Lakhs only) via NEFT / RTGS / Demand Draft, as part of the Eligibility Criteria.

1.6 The bidders would be required to submit complete network diagram detailing how all the base locations will be inter-connected and all remote locations to the base

stations in a Point to Multi-point & Point to Point architecture in the best possible network topology.

1.7 The wireless solution being quoted should comply with all regulations and guidelines of Wireless Planning Commission (WPC). Offered equipment shall be compliant with GSR 38 (E) dated 19th January 2007 and GSR 1048 (E) dated 18th October 2018. (Document: letter from OEM).

1.8 The OEM of radio equipment must have RMA (Return Merchandise Authorization) facility in India. (Document: letter from OEM).

1.9 The OEM of radio equipment should be clear of any litigation globally w.r.t. hardware / software of productline being manufactured. (Document: letter from OEM).

1.10 The OEM of the radio equipment should be supplying 5 GHz radios since more than 5 years in India. (Document: any relevant proof from OEM).

1.11 The radio equipment should be ETA (Equipment Type Approval) certified by WPC (Wireless Planning and Coordination wing). (Document: letter from OEM).

1.12 The bidder should not been ever under a declaration of ineligibility for corrupt or fraudulent practices and should not be blacklisted by any State Govt. / Central Govt. / Board, Corporations and Government Societies / PSU for any reason. In case of any such information the concerned bid shall be summarily rejected. (Document: letter from bidder).

1.13 The bidder must have installed a minimum of 500 RF links (cumulative) out of which at least one work order should involve a minimum of 50 RF links spread across multiple locations. (Document: relevant proof of having executed projects as stated above).

1.14 The radio products being proposed must be current and based on latest technology. The bidder’s OEM must submit Product Life Cycle certificate for atleast 7 years. Further, the OEM shall ensure the availability of spares during this period. (Document: letter from OEM).

1.15 The bidder must submit data sheets of the proposed radio, antenna, surge protector, PoE injector, etc. Further, these data sheets must be available on website of the OEM.

1.16 The bidder must submit signed and stamped copy of this ATC document along with technical bid.

1.17 The bidder must submit a letter from OEM confirming that the radio equipment is not wifi based and further it meets all specifications mentioned in this RFQ.

1.18 802.11 radio with additional TDMA shall not be acceptable to ensure carrier grade equipment. Any radio operating (or having any option to operate / customization) in the 2.4 GHz band shall not be acceptable.

1.19 Radio having any wifi feature such as dual band (802.11 a/b/g/n/ac), WPA encryption, CSMA, WDS, etc shall be summarily rejected.

1.20 All documentation should be supported by Power of Attorney from the board of the respective organization.

1.21 Any bid found to have manipulated any bid related information shall be summarily rejected. Further, the EMD of such bidder shall also be forfeited.

1.22 **Bench test for RF link:** Bidder has to submit the complete kit of quoted radios with antenna and accessories at PSeGS office post submission of the bid. During the technical evaluation, the bench test will be executed by PSeGS in its premises to verify the specifications of quoted equipment, antenna and accessories. The bench test may include but not limited to all features asked in the bid document and ATC document. Demonstration of physical tower is exempted in the technical evaluation. However certified design and all other tower related documents shall be verified during the bench test.

1.23 **Proof of Concept (PoC) for RF Link:** All bidders would be required to provide PoC at a few locations which would be a subset of the actual project. Such locations would be identified by PSeGS within 2 weeks from date of opening of Technical Bid. The same would be evaluated by Technical Committee of PSeGS. This will be qualifying criteria for opening of Commercial Bid. The evaluation criteria of PoC will be shared with the bidders after opening of technical bid. It may

be noted that RF connectivity provided by the bidder at any other location other than those intimated by PSeGS would not be considered for the PoC.

1.24 The successful bidder would be required to conduct detailed survey of the locations where RF connectivity is to be provided and then submit detailed low level design and location of tower / mast along with height and load bearing capacity requirement. The successful bidder would be required to get the network diagram approved from PSeGS before initiating the supply / installation of the material.

1.25 The radio equipment's speed shall be configurable i.e. CIR/MIR (Committed Information Rate / Maximum Information Rate). Each site broadcast traffic should be segregated using VLAN or routing solution. Also the proposed network should understand the traffic prioritizing for uninterrupted video and voice applications over data network.

1.26 Before placing the purchase order, bidder will be required to submit a feasibility report for the approved locations provided by PSeGS.

1.27 The existing PAWAN infrastructure (UPS, Rack, Router, Switch, etc.) should be used wherever possible. If there is a possibility to use any nearby existing towers at any of the locations for which work order is placed, the successful bidder must intimate the same to PSeGS. In this case, amended PO will be issued.

1.28 No hopping / repeaters would be used for distances upto 30 kms. In case hopping is required due to line of sight / design issues, the same should be done with prior approval of PSeGS.

1.29 As per present availability on GeM, the bid has been created for "High Mast Pole For National Flags". However, in the project "self-supporting towers" are required instead of poles. The bidder must quote the prices of towers (including all accessories) considering below mentioned specs and quantity:

Self-supporting Tower details			
SN	**Height**	**Quantity**	**Specifications**
1.	48 m	100	Towers shall be made of GI pipe (all metal components shall be hot dip galvanized). The components of the tower

Self-supporting Tower details			
SN	**Height**	**Quantity**	**Specifications**
2.	36 m	75	shall further be treated suitably to protect from rusting. Further, towers shall be self-supported with minimum three legs (inclusive of design, fabrication, supply and erection) with foundation work, leveling, retaining walls, solid state aviation obstruction lights, cabling & earthing. The design of tower shall ensure stability and safety. Installation shall be done with due compliance to regulations. The towers shall be designed to withstand a minimum of wind load of 180 kmph. 5 years onsite comprehensive warranty and onsite support shall be inclusive. The overall responsibility for the safety of the tower shall lie with the successful bidder.
3.	30 m	375	

1.30 Structural design of the tower shall be certified & approved by appropriate approving authority. Approval documents are to be submitted before processing of payments.

1.31 The OEM must submit an undertaking that the supplied hardware / software including all accessories is under 5 year on-site comprehensive warranty and comprehensive maintenance and support. The warranty and support should be purchased from the OEM in the name of PSeGS and should be provided to PSeGS before final acceptance. This shall be pre-requisite for processing of payments.

1.32 All accessories (indoor & outdoor cables, surge protectors, lightning protection kit, roof top poles of upto 9 meters, conduits, weatherproofing kits, cable ties, etc.) related to this project must be provided by the bidder. The price of such accessories shall be included in the quoted rates.

1.33 Radio equipment, antenna and related accessories (except tower) should be from same OEM. Towers must be certified by OEM of radio equipment.

1.34 During the warranty period, service / maintenance of hardware, system software and its accessories, all software and firmware, bugs/patches and services shall be provided free of cost by the bidder & its OEM.

1.35 The delivery and installation of material shall be done by the successful bidder at the respective sites at no additional cost.

1.36 The successful bidder shall intimate in writing about completion of installation and commissioning of a RF link. PSeGS shall complete the SAT (Site Acceptance Test) within 10 working days after the written intimation is received. The tentative format to be used for SAT is available in Annexures.

1.37 The successful bidder will maintain minimum 5% spares in each district of Punjab so as to provide satisfactory on-site comprehensive maintenance services during the warranty period. Further, at least one PTP equipment and at least one PTMP equipment must be kept as spare in each district. The space for these spares will be provided by PSeGS or concerned office at district level.

1.38 In case of non performing radio, antenna, accessories or any related hardware / software, the bidder may be asked to provide the equipment with equivalent or better specifications at no additional cost.

1.39 If any system fails at the hardware level for more than two times in three months, displaying chronic system design or manufacturing defects or quality control problem, then the concerned equipment will be replaced by the vendor at its cost and risk within 15 days.

1.40 During the warranty period the bidder will carry out Preventive Maintenance (PM) of equipment at least once in six months or as and when required. Half yearly PM reports should be submitted to PSeGS in January and July of each year. This shall be a pre-requisite for processing of yearly payments.

1.41 PSeGS has deployed about 100 manpower in PAWAN project across the state. This manpower would be used by the successful bidder for operations and maintenance of the network (including RF equipment). Accordingly, the successful bidder would be required to impart appropriate training in RF hardware and software for smooth operations and onsite comprehensive maintenance of the radio and related equipment. The successful bidder must take a written test at the end of the training and award certificates after successful completion of training and test. Accordingly, no full time resources would be required to be deployed by the successful bidder. The successful bidder must get the software / configuration issues resolved promptly with the help of PSeGS field manpower. The successful

bidder in coordination with its OEM should ensure to meet SLA under all circumstances. The overall responsibility of O & M of the RF network shall lie with the bidder.

1.42 The bidder has to extend the electrical wiring / LAN (passive) / connections for RF Radio to establish point to point and point to multi-point links without any additional cost to PSeGS. The bidder will ensure that the related wiring required for the extension of the electrical power / LAN (passive) to their equipment is done in a proper manner through conduits / channels / guides following standard practice of safety.

1.43 Repairs required due to improper installation would have to be carried out by the successful bidder at its own cost.

1.44 The bidder shall ensure that the most suitable resources (Wireless OEM Certified Engineers) shall be deployed during installation and commissioning.

1.45 All engineers and technicians deployed for installation and commissioning shall be on the bidder's roles. Outsourcing of any work (part of scope of work) to third party organization shall not be allowed except civil and electrical work.

1.46 Resources like technicians / riggers at the sites for outdoor work shall follow the required safety guidelines. Adequate protection shall be included for ensuring safety of personnel from any possible hazards, including Electromagnetic (EM) radiation, high voltages, etc.

1.47 All transportation, accommodation and logistic support expenses for delivery (at various locations), installation, testing, onsite comprehensive maintenance and RMA (repair and replacement) shall be borne by bidder. During the period of contract, if shifting of links is required due to any reason, the same shall be done by the successful bidder at no additional cost, subject to maximum of 2% (per annum) of the total deployed links.

1.48 GPS synchronization shall be provided by the bidder as part of the solution at no extra cost. All proposed PTP / PTMP equipment must support GPS synchronization.

1.49 If required, PSeGS nominated officials may inspect the OEM factory for better evaluation.

1.50 Bidder would be required to provide a 24 * 7 * 365 help desk support services through telephone / e-mail / portal where users can lodge their complaint. Each user shall be assigned a unique ticket number through which he should be able to track the action taken on his complaint through a web portal. The successful bidder will also provide a status report every three months through e-mail to PSeGS about the support related complaints lodged by end users. Such reports should also be made available in real time on a web portal.

1.51 For monitoring the RF links, appropriate solution must be provided at no additional cost.

1.52 Separate PO shall be raised for towers.

1.53 **Payment terms:** Payments will be released as per unit rates discovered in the bid. 65% payment will be made after delivery and inspection of the complete material (radio, antenna, tower, accessories, etc.) as per the purchase order. Another 25% payment will be made after SAT (Site Acceptance Test). Remaining 10% payment will be made on annual basis spread equally over five years. Payments shall be subject to submission of all relevant documents as mentioned in this tender documents or as requested by PSeGS.

1.54 The invoices must be raised using GST number of Punjab only.

1.55 PSeGS reserves the right to terminate, by prior written 1 month notice, the whole or part of the contract, at any time for its convenience. The notice of termination shall specify that termination is for the convenience of PSeGS, the extent to which performance of work under the work order is terminated, and the date upon which such termination becomes effective.

1.56 L1 bidder would be decided based on grand total cost of the all the items. In case L1 bidder fails to accept the LoI or fails to initiate the project or abandons the project at any time during the period of contract:

- Security deposit and / or PBG of the L1 bidder will be forfeited.
- If the project is yet to be initiated or L1 fails to accept the LoI, L2 will be offered to implement the project on L1's unit rates and same terms and conditions. In case L2 refuses, L3, L4, etc will be given the offer at L1's unit

rates and same terms and conditions. In case of refusal by L2, L3, L4, etc, the security deposit shall not be forfeited.

- If the project is in execution or O & M phase, the next lowest bid having same OEM as L1's OEM, will be offered to implement the project on the L1's unit rates and same terms and conditions. It may be noted that the same OEM condition has been kept since radios from different OEMs may not be able to communicate with each other and also to maintain continuity and homogeneity of the network.

2. Service Level Agreement

2.1 The successful bidder shall deliver the items within 90 days to respective sites from the date of receipt of purchase order. Any unjustified and unacceptable delay beyond delivery schedule will render the bidder liable for liquidated damage at the rate of 0.2% of the cost of delayed items per day, which will increase to 0.5% of the cost of delayed items per day for delay beyond 120 days from the date of receipt of purchase order. After 45 days from due date of delivery, PSeGS reserves the right to stop all pending payments, forfeit PBG, cancel the order / contract or even blacklist the bidder.

2.2 The products should be installed within 120 days from the date of receipt of purchase order subject to the site readiness by PSeGS or its end user. Any unjustified and unacceptable delay beyond installation schedule will render the bidder liable for liquidated damage at the rate of 0.2% of the cost of delayed items / services per day, which will increase to 0.5% of the cost of delayed items / services per day for delay beyond 150 days from the date of receipt of purchase order. After 45 days from due date of delivery, PSeGS reserves the right to stop all pending payments, forfeit PBG, cancel the order / contract or even blacklist the bidder.

2.3 Bidder must ensure the following:

- Operation of network – 24 * 7 * 365 basis
- Latency (max.) - 10ms
- Average maintenance outage per month - Three hours (with prior notice and confirmation from PSeGS)

2.4 The SLAs and penalties for downtime due to hardware failure shall be as follows:

2.4.1 **Most Critical:** If any PTP equipment (including antenna) at the district HQ and SDM level is down for more than 8 working hours in one month, then a penalty at the rate of Rs. 2,000 per working day per PTP equipment shall be levied or part thereof. In this case, the penalty applicable on the connected PTMP / CPE equipment will not be considered.

2.4.2 **Critical:** If any PTP (those not covered in Most Critical) / BTS / PTMP equipment (including antenna) is down for more than 12 working hours in one month, then a penalty at the rate of Rs. 1,500 per working day per BTS / PTMP shall be levied or part thereof. In this case, the penalty applicable on connected CPE equipment will not be considered.

2.4.3 **Least Critical:** If the CPE equipment (including antenna) is down for more than 16 working hours in one month then a penalty at the rate of Rs. 1,000 per working day per CPE shall be levied or part thereof.

2.4.4 If any equipment (including radio, tower, pole and antenna) is down for more than 72 hours continuously, then a notice letter shall be issued to the successful bidder.

2.4.5 The penalties shall be charged or recovered from the bidder / pending payments / PBG amount.

2.4.6 In the event of unsatisfactory service / frequent downtime or any breakdown beyond tender terms, the up-time shall be calculated as per the prevalent industry standards.

2.4.7 Down time due to the following situations will not be considered for the purpose of penalty calculation for downtime:

- If the link is down due to power failure or the equipment being switched off at the respective locations.
- Scheduled maintenance by the vendor, with prior intimation to PSeGS, subject to allowed average maintenance outage per month mentioned above.
- Riots, natural calamities and other force majeure conditions.

2.4.8 The time of registering of support ticket shall be referred for response / resolution / replacement or penalty calculations.

Annexure - A (BoQ)

SN	Item Required	Corresponding item as per GeM	Quantity
1.	BTS (Base Tower Station) or PTMP (Point to Multi-point) Radio equipment (Throughput - 250 Mbps or higher; connectorized) Detailed specifications at Annexure - B	Outdoor Unlicensed Band RF Radio (Throughput - 250 Mbps)	350
2.	Sector Antenna (120 Degree; Gain – 14 dBi) Detailed specifications at Annexure - E	Outdoor RF Antenna (Gain – 14 dBi)	350
3.	CPE (Customer premises Equipment) with 24 dBi or higher Integrated Antenna (Throughput - 100 Mbps or higher) Detailed specifications at Annexure - C	Outdoor Unlicensed Band RF Radio (Throughput - 100 Mbps)	2000
4.	PTP (Point to Point) Radio equipment (Throughput - 450 Mbps or higher) Detailed specifications at Annexure - D	Outdoor Unlicensed Band RF Radio (Throughput - 400 Mbps)	1100
5.	Directional (Solid Parabolic) Antenna (Gain – 29 dBi or higher) Detailed specifications at Annexure - F	Outdoor RF Antenna (Gain – 29 dBi)	1100
6.	Self Supporting Tower (48 meters) (Detailed specs as per clause 1.29)	High Mast Pole For National Flags (40 meters)	100
7.	Self Supporting Tower (36 meters) (Detailed specs as per clause 1.29)	High Mast Pole For National Flags (32 meters)	75
8.	Self Supporting Tower (30 meters) (Detailed specs as per clause 1.29)	High Mast Pole For National Flags (30 meters)	375

Annexure – B (BTS / PTMP Specifications)

Note: In case of conflict with the specifications mentioned in the SoW, the specifications mentioned in the SoW shall take precedence.

SN	Specification Name	Bid Requirement (Allowed Values)
1.	GSR 38 (E) Unlicensed Frequency Band (GHz)	5825 – 5875 Note: GSR 1048 (E) compliance i.e. 5 GHz Unlicensed Frequency Band is required but the option is not available on GeM
2.	PSK Modulation Supported : 1) BPSK 2) QPSK	In compliance
3.	QAM Supported : 1) 16 QAM 2) 64 QAM	In compliance
4.	256 QAM Supported	Any value
5.	Available Channel Bandwidth 1) 5 MHz 2) 10 MHz 3) 20 MHz 4) 40 MHz	In compliance
6.	Integrated Antenna Gain (dBi)	Any value (since external Sector Antenna (120 Degree; Gain – 14 dBi is to be provided)
7.	Integrated Antenna Azimuth (degree)	As above
8.	Number of External Antenna Port	2 or higher
9.	MIMO Supported	2 x 2 (No other MIMO value will be accepted)
10.	TX Power (dB)	30
11.	Rx Receiver Sensitivity in (dB)	-89 or lower
12.	Automatic Transmit Power Control Available	Yes
13.	Maximum Supported Link Distance with 36 dBm EIRP (Km)	Any value
14.	TDD Supported	Any value
15.	TDMA Supported	Yes
16.	OFDMA Supported	No
17.	Throughput (Mbps)	250 or higher
18.	Configurable uplink throughput % of total product capacity	90
19.	Configurable downlink throughput % of total product capacity	90
20.	Spectral Efficiency (b/Hz)	6.25 or higher
21.	Quality of Service according to IEEE 802 point 1p, TOS/Diffserve	Yes
22.	GPS Synchronization Supported	Yes
23.	Forward Error Correction Feature	Yes
24.	LAN Interface 10/100/1000 Base T interface	Yes

SN	Specification Name	Bid Requirement (Allowed Values)
25.	MTU Size (Bytes)	2100 or higher
26.	Framing/Coding IEEE802 pointy 3/U standard Compliance	Yes
27.	SNMP Supported 1) v1 2) v2 3) v3	Yes
28.	Local and Remote Management Supported	Yes
29.	Management VLAN supported	Yes
30.	VLAN Supported : 1) Trunking 2) Passthrough 3) Transparent 4) Q in Q (Double Tagging)	Yes
31.	Encryption Method Supported	AES 128
32.	DC 20 to 60 VDC Power supported	Yes
33.	AC 110-240v AC Power supported	Yes
34.	Radius Client Supported	Yes
35.	NTP Client Supported	Yes
36.	Number of CPE Supported	100 or higher
37.	Built-in Spectrum analyzer tool	Yes
38.	Management by Telnet	Yes
39.	Management by Web Interface	Yes
40.	Radio is capable to support Dynamic Bandwidth Allocation/CIR	Yes
41.	Radio is capable to support NMS for Configuration and Monitoring	Yes
42.	IP v4 Compliant	Yes
43.	IP v6 Compliant	Yes
44.	Dual Stack IPv4 and IPv6 Compliant	Yes
45.	Power Consumption (Watt)	10 or lower
46.	Safety Standard IEC/UL-60950-1 Compliance	Yes
47.	Safety Standard IEC/UL-60950-22 Compliance	Yes
48.	Ingress Protection Rating (IP)	67 or higher
49.	Lightening Protection Class and Standard	IEC 61000-4-5
50.	Equipment Type Approval Certificate available from WPC (Certificate shall be furnished when demanded by buyer)	Yes
51.	Equipment Type Approval Certificate number and its validity	Any value
52.	Minimum Operating Temperature	-20 or lower

SN	Specification Name	Bid Requirement (Allowed Values)
	(Degree C)	
53.	Maximum Operating Temperature (Degree C)	60 or higher
54.	Minimum Operating Humidity (RH) (%)	90 or higher
55.	Dimensions (L x B x H) (mm x mm x mm)	Any value
56.	Weight (grams)	Any value
57.	Outdoor Twisted Pair Cable - 50 meter	Yes
58.	CAT 6 Cable shielding type UTP (Flame Retardant) - 50 meter	Yes
59.	CAT 6 Cable shielding type STP (Flame Retardant) - 50 meter	Any value
60.	LMR600 Cable Length - 1point 5 meter with connector both ends	Yes
61.	Surge Protection Unit	Yes
62.	Installation and Site Survey is included in the scope of supply	Yes
63.	On Site OEM Warranty (Year)	5

Annexure – C (CPE Specifications)

Note: In case of conflict with the specifications mentioned in the SoW, the specifications mentioned in the SoW shall take precedence.

SN	Specification Name	Bid Requirement (Allowed Values)
1.	GSR 38 (E) Unlicensed Frequency Band (GHz)	5825 – 5875 Note: GSR 1048 (E) compliance i.e. 5 GHz Unlicensed Frequency Band is required but the option is not available on GeM
2.	PSK Modulation Supported : 1) BPSK 2) QPSK	In compliance
3.	QAM Supported : 1) 16 QAM 2) 64 QAM	In compliance
4.	256 QAM Supported	Any value
5.	Available Channel Bandwidth 1) 5 MHz 2) 10 MHz 3) 20 MHz 4) 40 MHz	In compliance
6.	Integrated Antenna Gain (dBi)	24
7.	Integrated Antenna Azimuth (degree)	Any value
8.	Number of External Antenna Port	2 or higher
9.	MIMO Supported	2 x 2 (No other MIMO value will be accepted)
10.	TX Power (dB)	30
11.	Rx Receiver Sensitivity in (dB)	-89 or lower
12.	Automatic Transmit Power Control Available	Yes
13.	Maximum Supported Link Distance with 36 dBm EIRP (Km)	Any value
14.	TDD Supported	Any value
15.	TDMA Supported	Yes
16.	OFDMA Supported	No
17.	Throughput (Mbps)	100 or higher
18.	Configurable uplink throughput % of total product capacity	90
19.	Configurable downlink throughput % of total product capacity	90
20.	Spectral Efficiency (b/Hz)	6.25 or lower
21.	Quality of Service according to IEEE 802 point 1p, TOS/Diffserve	Yes
22.	GPS Synchronization Supported	Any value
23.	Forward Error Correction Feature	Yes
24.	LAN Interface 10/100/1000 Base T interface	Yes

SN	Specification Name	Bid Requirement (Allowed Values)
25.	MTU Size (Bytes)	2100 or higher
26.	Framing/Coding IEEE802 pointy 3/U standard Compliance	Yes
27.	SNMP Supported 1) v1 2) v2 3) v3	Yes
28.	Local and Remote Management Supported	Yes
29.	Management VLAN supported	Yes
30.	VLAN Supported : 1) Trunking 2) Passthrough 3) Transparent 4) Q in Q (Double Tagging)	Yes
31.	Encryption Method Supported	AES 128
32.	DC 20 to 60 VDC Power supported	Yes
33.	AC 110-240v AC Power supported	Yes
34.	Radius Client Supported	Yes
35.	NTP Client Supported	Yes
36.	Number of CPE Supported	Any value
37.	Built-in Spectrum analyzer tool	Yes
38.	Management by Telnet	Yes
39.	Management by Web Interface	Yes
40.	Radio is capable to support Dynamic Bandwidth Allocation/CIR	Yes
41.	Radio is capable to support NMS for Configuration and Monitoring	Yes
42.	IP v4 Compliant	Yes
43.	IP v6 Compliant	Yes
44.	Dual Stack IPv4 and IPv6 Compliant	Yes
45.	Power Consumption (Watt)	10 or lower
46.	Safety Standard IEC/UL-60950-1 Compliance	Yes
47.	Safety Standard IEC/UL-60950-22 Compliance	Yes
48.	Ingress Protection Rating (IP)	67 or higher
49.	Lightening Protection Class and Standard	IEC 61000-4-5
50.	Equipment Type Approval Certificate available from WPC (Certificate shall be furnished when demanded by buyer)	Yes
51.	Equipment Type Approval Certificate number and its validity	Any value
52.	Minimum Operating Temperature	-20 or lower

SN	Specification Name	Bid Requirement (Allowed Values)
	(Degree C)	
53.	Maximum Operating Temperature (Degree C)	60 or higher
54.	Minimum Operating Humidity (RH) (%)	90 or higher
55.	Dimensions (L x B x H) (mm x mm x mm)	Any value
56.	Weight (grams)	Any value
57.	Outdoor Twisted Pair Cable - 50 meter	Yes
58.	CAT 6 Cable shielding type UTP (Flame Retardant) - 50 meter	Yes
59.	CAT 6 Cable shielding type STP (Flame Retardant) - 50 meter	Any value
60.	LMR600 Cable Length - 1point 5 meter with connector both ends	Yes
61.	Surge Protection Unit	Yes
62.	Installation and Site Survey is included in the scope of supply	Yes
63.	On Site OEM Warranty (Year)	5

Annexure – D (PTP Specifications)

Note: In case of conflict with the specifications mentioned in the SoW, the specifications mentioned in the SoW shall take precedence.

SN	Specification Name	Bid Requirement (Allowed Values)
1.	GSR 38 (E) Unlicensed Frequency Band (GHz)	5825 – 5875 Note: GSR 1048 (E) compliance i.e. 5 GHz Unlicensed Frequency Band is required but the option is not available on GeM
2.	PSK Modulation Supported : 1) BPSK 2) QPSK	In compliance
3.	QAM Supported : 1) 16 QAM 2) 64 QAM	In compliance
4.	256 QAM Supported	Yes
5.	Available Channel Bandwidth 1) 5 MHz 2) 10 MHz 3) 20 MHz 4) 40 MHz	In compliance
6.	Integrated Antenna Gain (dBi)	Any value (since Directional [Solid Parabolic] Antenna with Gain – 29 dBi or higher is to be provided)
7.	Integrated Antenna Azimuth (degree)	As above
8.	Number of External Antenna Port	2 or higher
9.	MIMO Supported	2 x 2 (No other MIMO value will be accepted)
10.	TX Power (dB)	30
11.	Rx Receiver Sensitivity in (dB)	-89 or lower
12.	Automatic Transmit Power Control Available	Yes
13.	Maximum Supported Link Distance with 36 dBm EIRP (Km)	Any value
14.	TDD Supported	Yes
15.	TDMA Supported	Any value
16.	OFDMA Supported	No
17.	Throughput (Mbps)	450 or higher
18.	Configurable uplink throughput % of total product capacity	90
19.	Configurable downlink throughput % of total product capacity	90
20.	Spectral Efficiency (b/Hz)	7.5 or higher
21.	Quality of Service according to IEEE 802 point 1p, TOS/Diffserve	Yes
22.	GPS Synchronization Supported	Yes
23.	Forward Error Correction Feature	Yes
24.	LAN Interface 10/100/1000 Base T	Yes

SN	Specification Name	Bid Requirement (Allowed Values)
	interface	
25.	MTU Size (Bytes)	2100 or higher
26.	Framing/Coding IEEE802 pointy 3/U standard Compliance	Yes
27.	SNMP Supported 1) v1 2) v2 3) v3	Yes
28.	Local and Remote Management Supported	Yes
29.	Management VLAN supported	Yes
30.	VLAN Supported : 1) Trunking 2) Passthrough 3) Transparent 4) Q in Q (Double Tagging)	Yes
31.	Encryption Method Supported	AES 128
32.	DC 20 to 60 VDC Power supported	Yes
33.	AC 110-240v AC Power supported	Yes
34.	Radius Client Supported	Yes
35.	NTP Client Supported	Yes
36.	Number of CPE Supported	Any value
37.	Built-in Spectrum analyzer tool	Yes
38.	Management by Telnet	Yes
39.	Management by Web Interface	Yes
40.	Radio is capable to support Dynamic Bandwidth Allocation/CIR	Yes
41.	Radio is capable to support NMS for Configuration and Monitoring	Yes
42.	IP v4 Compliant	Yes
43.	IP v6 Compliant	Yes
44.	Dual Stack IPv4 and IPv6 Compliant	Yes
45.	Power Consumption (Watt)	10 or lower
46.	Safety Standard IEC/UL-60950-1 Compliance	Yes
47.	Safety Standard IEC/UL-60950-22 Compliance	Yes
48.	Ingress Protection Rating (IP)	67 or higher
49.	Lightening Protection Class and Standard	IEC 61000-4-5
50.	Equipment Type Approval Certificate available from WPC (Certificate shall be furnished when demanded by buyer)	Yes
51.	Equipment Type Approval Certificate number and its validity	Any value

SN	Specification Name	Bid Requirement (Allowed Values)
52.	Minimum Operating Temperature (Degree C)	-20 or lower
53.	Maximum Operating Temperature (Degree C)	60 or higher
54.	Minimum Operating Humidity (RH) (%)	90 or higher
55.	Dimensions (L x B x H) (mm x mm x mm)	Any value
56.	Weight (grams)	Any value
57.	Outdoor Twisted Pair Cable - 50 meter	Yes
58.	CAT 6 Cable shielding type UTP (Flame Retardant) - 50 meter	Yes
59.	CAT 6 Cable shielding type STP (Flame Retardant) - 50 meter	Any value
60.	LMR600 Cable Length - 1point 5 meter with connector both ends	Yes
61.	Surge Protection Unit	Yes
62.	Installation and Site Survey is included in the scope of supply	Yes
63.	On Site OEM Warranty (Year)	5

Annexure – E (BTS Antenna Specifications)

Note: In case of conflict with the specifications mentioned in the SoW, the specifications mentioned in the SoW shall take precedence.

SN	Specification Name	Bid Requirement (Allowed Values)
1.	Operating Frequency Range (MHz)	5825 – 5875 Note: GSR 1048 (E) compliance i.e. 5 GHz Unlicensed Frequency Band is required but the option is not available on GeM
2.	Type of Antenna	Sectorial
3.	RF Connector on Antenna	2
4.	Polarization	Dual
5.	Beamforming	Any value
6.	Antenna vertical azimuth (degree)	Any value
7.	Antenna horizontal azimuth (degree)	120
8.	Gain (dBi)	14 or higher
9.	VSWR (MAX)	Any value
10.	Input Power (Watts)	Any value
11.	Impedance (Ohm)	Any value
12.	Minimum Operating Temperature	-20 Degree C or lower
13.	Maximum Operating Temperature	60 Degree C or higher
14.	Minimum Operating Humidity (RH) (%)	90 or higher
15.	Dimensions (L x B x H) (mm x mm x mm)	Any value
16.	Weight (grams)	Any value
17.	On Site OEM Warranty (Years)	5

Annexure – F (PTP Antenna Specifications)

Note: In case of conflict with the specifications mentioned in the SoW, the specifications mentioned in the SoW shall take precedence.

SN	Specification Name	Bid Requirement (Allowed Values)
1.	Operating Frequency Range (MHz)	5825 – 5875 Note: GSR 1048 (E) compliance i.e. 5 GHz Unlicensed Frequency Band is required but the option is not available on GeM
2.	Type of Antenna	Solid Parabolic
3.	RF Connector on Antenna	2
4.	Polarization	Dual
5.	Beamforming	Any value
6.	Antenna vertical azimuth (degree)	Any value
7.	Antenna horizontal azimuth (degree)	Any value
8.	Gain (dBi)	29 or higher
9.	VSWR (MAX)	Any value
10.	Input Power (Watts)	Any value
11.	Impedance (Ohm)	Any value
12.	Minimum Operating Temperature	-20 Degree C or lower
13.	Maximum Operating Temperature	60 Degree C or higher
14.	Minimum Operating Humidity (RH) (%)	90 or higher
15.	Dimensions (L x B x H) (mm x mm x mm)	Any value
16.	Weight (grams)	Any value
17.	On Site OEM Warranty (Years)	5

Annexure – G (Tentative SAT format)

1. Location with coordinates: _____
2. Date on which SAT conducted: _____
3. Date of installation and completion of works: _____
4. Date of intimation by M/s _____ to PSeGS and local contact person about the site being ready for SAT:
5. Radio equipment type: PTP / BTS / CPE
6. Make, Model and Serial No of Radio: _____
7. Make, Model and Serial No of Antenna: _____
8. Make and model of Surge Protection kit: _____
9. Make and model of RF cable: _____

SN	Items	Requirement	Compliance (Yes / No)
1.	Radio and Antenna	The equipment is installed securely on pole / tower.	
2.	Cable Routing	Radio connected with shielded outdoor cable	
		Shielded outdoor cable must be used together with shielded RJ45 connector and shielded metal foil of cable must be full contact with shield RJ45 connector	
		Waterproof treatment on both ends of the RF cable	
3.	Tower	Installed tower design is Certified and approved by appropriate authority	
		Aviation lamp installed on tower	
		Lightning Protection Installed on tower	
4.	Power Supply	Power cables are neatly routed.	
		Power cables securely connected with AC Supply	
		Power on all devices and make sure all devices are running	
		Surge protection kit has been installed	
5.	Network	Link Speed from Base Station / PTP	
		Latency from Base Station / PTP	
		Device MAC Address	
		Device IP Address	
		VLAN ID	

SN	Items	Requirement	Compliance (Yes / No)
		Average link speed at end user level	

Signatures with date:

Representative of M/s _____ Representative of PSeGS