IIIT BANGALORE

No: MIIT/42/18 Date: 20th February 2018

Amendement-I

Subject: Supply, Installation, testing & commissioning and on-site support for setting up Communications Laboratory

IIIT Bangalore on be-half of Ministry of External Affairs (MEA) invited sealed tenders for Supply, installation, testing & commissioning and on-site support for setting up of Communications Laboratory for Myanmar Institute of Information and Technology (MIIT) at Mandalay in Myanmar on turnkey basis vide IIIT-B MIIT/44/18 dated 1st February 2018.

2. The following amendments are made in the above mentioned tender document

Name of Work	***EMD***	***Last date bid submission***	***Date opening of bids***
Supply, Installation, testing & commissioning and on-site support of Communications Laboratory.	**Rs 4.4 Lac**	**7th March 2018 at 1300 hours**	**7th March 2018 at 1400 hours**

3. The clarifications/responses to the queries listed in the pre-bid meeting are mentioned Annexure I of this amendment.

4. All other terms and conditions remain same.

Registrar IIIT-Bangalore

Annexure I

International Institute of Information Technology
(MIIT Mentoring Cell)

Tender Reference:- MIIT/44/18 for supply, installation, testing & commissioning and onsite support for installation and setting up of Communications Laboratory for Myanmar Institute of Information and Technology (MIIT) at Mandalay in Myanmar on turnkey basis.

Following clarifications are issued in response to the queries received from Prospective bidders:

Sl no	Tender Queries	Clause as published in the tender	Remarks/sub mission/Justifi cation	Clarifications/Corrigend a/Amendment
01	Section 1 Clause No 2.d	Self-Attested copy of VAT/ CST, Service Tax Number/ Registration certificate, GST as applicable.	Please delete VAT / CST No & Service Tax Number as GST is now in place	The terms and conditions are consistent with other tender issued for the same project. No change.
02	Section 1 Clause No 2.g	Relevant ISO certificate in Laboratory Infrastructure.	Please allow Relevant ISO Certificate in Laboratory / Communication / IT Infrastructure.	The change is accepted.
03	Section 1 Clause No 2.i	The copy of Supply Orders/ Contracts/ Agreements issued by/ signed with Government of India (Ministry/ Department/ Undertaking/ PSU/ Educational Institutions such as IIT's, NIT's, or other such Central Universities/Banking sector/IT-SEZs/Technology parks/ Stock/Commodity exchanges and reputed private organizations including educational institutions in India) for similar work, executed by the bidders in last five years ending December 31st 2017. The bidder should also enclose the completion certificate duly issued by the end user. The bidder should also enclose the completion certificate duly issued by the end user. The bidder should	Please allow – the similar work should mean setup of any Scientific / Forensic / Secured Messaging / Communication Lab / TV Studio Lab / IT lab instead of lab with similar items since the items desired are from IT field of communications. This will help in bringing more bidders participation	The tender conditions, ask for experience in similar work undertaken by the bidder. Hence scientific laboratories/communication's lab is also part of the similar work already outlined in the tender terms and conditions.

		have completed at least ONE similar work not less than Rs. 1.76 Crore OR TWO similar works not less than Rs. 1.10 Crore each OR THREE similar works not less than 88 Lac each. The similar work means supply & installation of all/ most of the items mentioned in this tender document in a single project on turn-key basis in India/abroad.		
04	Section 3 Clause No 7	IIIT Bangalore shall release 5% of the payment upon purchase order subject to receipt of the performance bank guarantee as outlined in clause 8 below. ii. IIIT Bangalore shall release 35% of the payment upon dispatch of the tendered items subject to submission of original shipping documents and BL. iii. IIIT Bangalore shall release 30% of the payment upon delivery of the tendered items at MIIT subject to satisfactory certificate of receipt by Embassy of India, Yangon and/or MIIT/IIITBangalore. iv. Payment of 30% of the purchase order value will be made after physical verification by a Project Monitoring Committee (PMC). v. In case of foreign bidders who quoted in US $, letter of credit(LC) will be opened and payment would be released as per 7(1), 7(2), 7(3) and 7(4).	Please allow 70% payment on dispatch against submission of Original Invoice, Packing List, Copy of Bill of Lading / AWB & Copy of Insurance & Balance 30% against Installation, testing, Commissioning duly signed by Embassy of India and /or MIIT/IIIT-Bangalore	The current payment terms are already in effect for the other tenders being administered for this project. **The change is not accepted.**
05	Section 3 Clause No 6	All the items covered in the schedule of requirements, shall carry minimum 2 (two) years on site comprehensive warranty from the date of its installation & commissioning. The bidder must undertake to provide the installation and warranty service in Myanmar. The repairing/ rectification/ replacement/ configuration required, if	Please clarify Warranty required is 2 year or 1 year as per MAF Format on page no 22	The warranty required is for 2 years as already outlined in the document

		any, must be done at site only. During the warranty, all Tender Document for Supply, Installation, Testing, Commissioning(SITC) and onsite support for Communications Laboratory of MllT Project, Mandalay, Myanmar 12 of 26 complaints should be rectified within 7 days from the time of complaint. In case the rectification of fault involves replacement of some hardware the same should be carried out within 21 days form the date of intimation. Failure to do so would result in the invoking of the PBG. The PBG will be released by IIIT Bangalore only after the submission of satisfactory performance certificate issued by MIIT / Indian Mission & end-user after the completion of warranty period. The Purchaser reserves the right to reject any set of equipment found defective within 30 days after the date of acceptance of equipment. The cost towards replacement will have to be borne by the supplier.		
06	Page No: 22	Manufacturer's Authorization Format	Please allow MAF as per Original Equipment Format.	The change is accepted, subject to the MAF including all aspects that are covered in the letter as outlined in Annexure in the tender document
07	Page 3, Clause 2d	Self attested copy of VAT/CST Service tax number and registration certificate	Please amend self attested GST/PAN and registration certificate to be enclosed.	The query is already answered in #1 above.

08	Page 4, clause 2g	Relevant ISO certificate in laboratory infrastructure	Kindly amend the relevant ISO certificate in laboratory infrastructure / IT infrastructure. Please note that the project is for setting up of communications laboratory which is part of IT and test and measurement equipment. Even Page 25, sl no 7, the tender asks for IT infrastructure.	The query is already answered in #2 above
09	Page no 4,6 Experience	The copy of Supply Orders/ Contracts/ Agreements issued by/ signed with Government of India (Ministry/ Department/ Undertaking/ PSU/ Educational Institutions such as IIT's, NIT's, or other such Central Universities/Banking sector/lT-SEZs/Technology parks/ Stock/Commodity exchanges and reputed private organizations including educational institutions in India) for similar work, executed by the bidders in last five years ending December 31st 2017. The bidder should also enclose the completion certificate duly issued by the end user. The bidder should also enclose the completion certificate duly issued by the end user. The bidder should have completed at least ONE similar work not less than Rs. 1.76 Crore OR TWO similar works not less than Rs. 1.10 Crore each OR THREE similar works not less than 88 Lac each. The similar Tender Document for Supply, Installation, Testing, Commissioning(SITC) and onsite support for Communications Laboratory of MllT Project, Mandalay, Myanmar 7 of 26 work means supply & installation of all/ most of the items mentioned in this	Similar work should mean setup of any IT / scientific lab instead of lab with similar items this will help in more bidders participating. This definition should be changed wherever its appearing in the tender document.	The query is already answered in #3 above

		tender document in a single project on turn-key basis in India/abroad.		
10	Page 7, clause 4.5	The bidders should have their own branch office/ service centre/ GST in Myanmar or arrangement to provide service through local dealer/ service provider.	Kindly delete GST, GST as a term applicable in India only.	The terms and conditions are consistent with other tender issued for the same project. No change.
11	Page 7, clause 4.6	Bidder should be registered with Sales Tax/ Income Tax Department of Government of India and should possess a valid VAT/ CST, Service Tax Number/ Registration as on date of bid submission.	Kindly amend bidder should be registered with sales tax, income tax, department of government of India and should possess a valid PAN,GST and registration certificate as on date of submission.	The terms and conditions are consistent with other tender issued for the same project. No change.
12	Page 6, Sl no 1	The delivery and installation at site(s) must be completed within 70 days from the date of placement of supply order by IIIT Bangalore. All the necessary spare parts and tools required for installation and commissioning of the tendered item will have to be supplied along with the tendered items. The custom clearance of the equipment would be facilitated by Indian Mission in Myanmar. The tendered equipment will be exempted from payment of Myanmar custom duties. It is mandatory for the bidders who respond to this bid to meet these expectations as time is the essence of this contract and is tightly linked to completing the project within the available time frame	Please extend the period of delivery and installation at site(s) from 70 days to 150 days from the date of placement of supply order by IIIT Bangalore as these products are not on the shelf available. Moreover this would require proper packing, custom clearance in dispatch country and dispatch clearance in host country. Time frame of 70 days is too less for delivery and installation at site.	The change is partially accepted. The revised delivery and installation is now 90 days.
13	Page 11,23 Sl no 6 Page11 and Page 22 MAF	All the items covered in the schedule of requirements shall carry minimum 2(two) years on site comprehensive warranty from the date of its installation and commissioning	Kindly confirm warranty required is 2(Two) years or 1 year as MAF format reads 1 year. Also please allow MAF as per OEM format.	The query is already answered #5 above.
14	Page 23 Clause 5	Undertaking of Authenticity	Requesting you to change the Tender Terms & Conditions for the Supply, Installation,	The change is accepted. The revised Undertaking format is provided in Annexure III

			Testing, Commissioning (SITC) and onsite support for Communications Laboratory of MIIT Project, Mandalay, Myanmar	
15	Page 6, clause 2.1	Delivery Period	We are requesting to extend the Delivery Period from 70days to 90days	The change is accepted.
16	Section II, Clause 4.2	The copy of Supply Orders for similar work, executed by the bidders in last five years ending December 31st 2017.	Order value for similar work is too high, as the same you need to ensure the credibility of a company. Anyway, if you would like to ensure this, you can evaluate the company and its work by turnover. We are requesting you to keep this value may be Rs. 50 Lakhs average for last three year, also accept order from overseas partners as well. There should be some relaxation to the companies who has an experience to execute the project at your MIIT, Mandalay, Myanmar	The terms and conditions are consistent with other tender issued for the same project. No change.
17	Section II, Clause 4.3	A certificate by the auditor/ CA/ CS indicating the turnover of the firm should be enclosed. The bidder should have minimum average turnover of Rs 66 Lac in last three financial years.	We are requesting you to evaluate worth and credibility of a company based on its average annual turnover at least for last three years	The terms and conditions are consistent with other tender issued for the same project. No change.
18	Section III, Instruction to Bidders	The delivery and installation at site(s) must be completed within 70 days from the date of placement of supply order by IIIT Bangalore. All the necessary spare parts and tools required for installation and commissioning of the tendered item will have to be supplied along with the tendered items. The custom clearance of the equipment would be facilitated by Indian Mission in Myanmar. The tendered equipment will be exempted from payment of Myanmar custom duties. It is mandatory for the bidders	As the site is in Mandalay, Myanmar delivery period should be minimum of 120 days from the date of receipt of order on us.	The query is already answered in #12 above

		who respond to this bid to meet these expectations as time is the essence of this contract and is tightly linked to completing the project within the available time frame.		
19	Page 15, Sl no 1, Universal Software Radio Peripheral Platform (USRP) Kit		Bidder should provide as SDR Training Platform.	Please see the revised specifications in Annexure II
		Frequency 70MHz to 6 GHz	As per Industry standards it should be 600MHz to 6GHz. Kindly remove USRP as it is not the common description	Please see the revised specifications in Annexure II
		PC Interface	USB Interface	Please see the revised specifications in Annexure II
		Software Interface	GNU Radio plus MATLAB (world leading software in communication)	Please see the revised specifications in Annexure II
		Real Time Bandwidth	Should have 40 MHz Real Time Bandwidth as per communication Industry standard	Please see the revised specifications in Annexure II
		Spartan 6 FPGA	Please delete - as different original equipment manufacturer's develop SDR with different approach and technology.	Please see the revised specifications in Annexure II
20	Page 15, Sl no 2 Spectrum Analyzer	With full-feature spectrum analysis with real time; and modulation, pulse, wireless standards analysis capabilities	Spectrum Analyzer should capable of testing frequency response of various communication system blocks like amplifier, modulator, mixer with built in tracking generator available.	Please see the revised specifications in Annexure II
		Spectrum Analyzer	Please mention stand alone spectrum analyzer with Display and size else PC Based Spectrum Analyzer is available.	Please see the revised specifications in Annexure II
		Some specifications have to be removed like Real Time Bandwidth , Minimum Signal duration,EVM on 802.11,EVM 1M Symbol	As these specs are Real Time Spectrum Analyzer which is Fast Fourier Principal Based. But commonly used spectrum analyzer in communication experiments is of swept tuned principal based and having more application in this particular lab.	Please see the revised specifications in Annexure II
		Frequency Range 9Khz to 6GHz	Your maximum range of frequency in this lab is of SDR and that is 6GHz.	Please see the revised specifications in Annexure II

			This is also frequency range of spectrum analyzer available in market.	
		There are many parameters like DANL,SFR etc are mentioned on specific frequencies like 1GHz , 3GHz.and are of not standard specifications.	As spectrum complete range is 6GHz so either frequency range wise or general (average value) to be mentioned in specifications.	Please see the revised specifications in Annexure II
21	Page 15, Sl no 3. Telecommunication Training Kit	A single board training platform is required.	Kindly change it to - Multiple Training Kits to address scope of experiment and learning in Communication Lab.	Please see the revised specifications in Annexure II
		Expansion sockets for additional modules and individual modules list mentioned like Adder (2 off), Multiplier (3 off), Twin Pulse Generator, Dual Analog Switch, Noise Generator, Buffer, Channel Module (band pass filter and low pass filter), Utilities (Comparator, Rectifier, Diode & RC LPF, RC LPF), Tune able Low Pass filter, etc.., bread board, QPSK etc to be removed	These specifications are to be deleted as they are based on Single board training platform while multiple training platform already has these building blocks which gives more value added package for performing various experiments and to study different communication techniques & technologies.	Please see the revised specifications in Annexure II
22	Page no 15, Sl no 1. Universal Software Radio Peripheral Platform (USRP) Kit	Universal Software Radio Peripheral Platform (USRP) Kit	Bidder should provide as software defined radio training platform since it has compatibility with various things MATLAB, GNU, radio lab view etc. whereas USRP kit has very limited compatibility in teaching environment.	Please see the revised specifications in Annexure II
		Frequency 70Mhz to 6Ghz	As per industry standard please change it to 600 Mhz to 6Ghz	Please see the revised specifications in Annexure II
		PC Interface	Should have PC/USB/LAN interface	Please see the revised specifications in Annexure II
		Software interface	Should have GNU/Radio/MATLAB/ lab view etc software interface.	Please see the revised specifications in Annexure II
		Real time bandwidth	Should have real time bandwidth of 40Mhz as per communication standards in industry.	Please see the revised specifications in Annexure II
		FPGA/Spartan6 FPGA	Kindly delete FPGA/Spartan6 FPGA terminology- as different manufacturers	Please see the revised specifications in Annexure II

			develop software radio's with different technology and software support.	
23	Page no 15, SL no 2 Spectrum Analyzer	With full-feature spectrum analysis with real time; and modulation, pulse, wireless standards analysis capabilities.	Please change it to – spectrum analyzer should be capable of testing frequency response of various communication system blocks of like amplifier, modulator, mixer with built-in tracking generator available.	Please see the revised specifications in Annexure II
		Spectrum Analyzer	Please change it to – Stand alone spectrum analyzer with display and size. Some specifications have to be removed like real time bandwidth, minimum signal duration EVM on 802.11 EVM 1m symbol.	Please see the revised specifications in Annexure II
			Please amend specs to the commonly used spectrum analyzer in communication experiments which is of swept tuned principal based and have more application for this particular lab.	Please see the revised specifications in Annexure II
		Frequency Range 9Khz to 7.5Ghz	We request you to change as per industry stand software defined radio frequency range ie., 9KHz to 6GHz	Please see the revised specifications in Annexure II
		There are many parameters like DANL, SFR, etc are mentioned on specific frequencies like 1GHz, 3GHz, and are not standard specifications	As per industry standard spectrum complete range is 6GHz, so either frequency range wise or general (average value) needs to be mentioned in specifications by IIIT-Bangalore. Kindly clarify.	Please see the revised specifications in Annexure II
24	Page 16,17 Sl no 3 Telecommunication training kit	A single board training platform is required.	Since the requirement is for an institute, we request you to kindly allow and change it to –Multiple training kits to address scope of experiment.	Please see the revised specifications in Annexure II
		Expansion sockets for additional modules and individual modules list mentioned like Adder (2off) Multiplier (3off) Twin pulse generator, dual analog switch noise generator, buffer, channel module, (band pass filter and low pass filter) utilities (comparator, rectifier diode & RC LPF, RC LPF) tuneable low pass filter etc. bread board, QPSK, etc.	We request you to kindly delete these specs as they signify single board training platform while multiple training platform already have these building blocks which gives more value added package for performing various experiments and allow students to study different communication techniques & technologies.	Please see the revised specifications in Annexure II
25	Page 15, Sl no 1	USRP Kit	we are suggesting the name should be more generic like	Please see the revised specifications in Annexure II

			Software Radio Peripheral development Kit.	
			Specification continuous frequency coverage from (50-70) MHz – 6 GHz.	Please see the revised specifications in Annexure II
			Options can be available to integrate Matlab, Labview	Please see the revised specifications in Annexure II
26	Page 15,18 , Sl no 2	Spectrum Analyzer	Kindly change the Concern Quantity is 4 no's on page 18	Please see the revised specifications in Annexure II
			we requesting you to kindly change The frequency range is up to 6.5GHz	Please see the revised specifications in Annexure II
			Hope we can supply the Analyzer with Display, USB, etc.	
27	Page 16, Sl no 3	Telecommunication trainer kit	we are requesting go either single or Multiple boards i.e. 5 board, it is acceptable in considering all Analogue, Digital, and Fibre optics modules.	Please see the revised specifications in Annexure II
			Hope that It should be functional circuit /modules based approach	Please see the revised specifications in Annexure II
			Hope that DSO and other measurement units will be arranged by end user	Please see the revised specifications in Annexure II
28	Page No 15, Sl no 1	Universal Software Radio Peripheral Platform (USRP) Kit	Modular Software USRP is one company specific product	Please see the revised specifications in Annexure II
		Platform (USRP) Kit	Defined Radio (SDR) and 2 x 2 MIMO Platform.	Please see the revised specifications in Annexure II
		A fully integrated, single-board, Universal Software Radio Peripheral (USRP™) platform with continuous frequency coverage from 70 MHz – 6 GHz.	Integrated Modular SDR Platform with frequency range from 400MHz to 6GHz with an option to upgrade. As SDR Platform this is the common RF Frequency used.	Please see the revised specifications in Annexure II
		A single chip direct-conversion transceiver providing up to 56MHz of real-time bandwidth, an open and reprogrammable Spartan6 FPGA, and fast SuperSpeed USB 3.0 connectivity with convenient bus-power.	Real Bandwidth : 40MHz , with USB Interface and fully programmable. 40MHz Real Time Bandwidth is a standard in communication,. It should have USB Interface. Spartan6 FPGA becomes the component and manufacturer specific and thus to be removed. All Phase sensitive wireless communication applications like MIMO, Radar, Smart Antennas and Digital Beam	Please see the revised specifications in Annexure II

		Forming should be completely Phase Coherent to achieve desired result. Platform should be Phase Coherent All Phase sensitive wireless communication applications like MIMO, Radar, Smart Antennas and Digital Beam Forming should be completely Phase Coherent to achieve desired result.	
	Full support for the USRP Hardware Driver software allowing developing with GNU Radio, prototype GSM base station with OpenBTS.	It should be compatible to MATLAB,GNU Radio,Labview, Python language, Direct FPGA, Custom Code Download using JTAG etc. Platform should come along with sample experiments using MATLAB. MATLAB is the most popular tool used in research and education. Student s always prefer to work on MATLAB .	Please see the revised specifications in Annexure II
	Full duplex, MIMO (2x2) operation with up to 56 MHz of real-time bandwidth (61.44MS/s quadrature)	The platform should have capability of performing SDR 2x2 MIMO Real Time Bandwidth 40MHz These specs are generalized one and of standard specifications not product specific.	Please see the revised specifications in Annexure II
	Fast and convenient bus-powered connectivity using SuperSpeed USB 3.0 GNURadio and OpenBTS support through the open-source USRP Hardware Driver™ (UHD)	PC Interface USB Software Compatibility with MATLAB GNU Radio Labview MATLAB as this is most popular software and most of the academic work is in MATLAB only. USRP Hardware Driver (UHD) is specific to one company,	Please see the revised specifications in Annexure II
	Open and reconfigurable Spartan 6 XC6SLX75 FPGA with free Xilinx tools Early access prototyping platform for the Analog Devices AD9361 RFIC, a fully integrated direct	Open and reconfigurable platform with it's capability to interface with MATLAB,GNU Radio, Labview to make it more versatile platform to test various communication related experiments.	Please see the revised specifications in Annexure II

		conversion transceiver with mixed signal baseband	These specs are more generic as it does not mention any Spartan IC Number etc.. The ultimate aim for SDR Platform is a black box having USB Interface and compatible with MATLAB, GNU Radio.	
29	Page no 15, SL no 2 Spectrum Analyzer	With full-feature spectrum analysis with real time; and modulation, pulse, wireless standards analysis capabilities	6GHz Bench top swept tuned spectrum Analyzer with TFT Display with built in tracking generator and with following measurement capabilities A swept tuned Spectrum Analyzer is better as it has Tracking Generator facility which is very important feature that allows user to test frequency response of amplifier, filters, cable etc.	Please see the revised specifications in Annexure II
		Power Source: 110/220 V ac, 50/60Hz	Power Source: 110/220 V ac, 50/60Hz Same	Please see the revised specifications in Annexure II
		Max Frequency Range: 9 kHz - 7.5 GHz	Max Frequency Range: 9 kHz - 6 GHz This is the common frequency range of Spectrum Analyzer.	Please see the revised specifications in Annexure II
		Max Acquisition Bandwidth (Real Time): 40 MHz	This is not required, as this specification belongs to Real Time Spectrum Analyzer (FFT Based) while in communication labs the widely used spectrum Analyzer which meets their experiment required is Swept Tuned based.	Please see the revised specifications in Annexure II
		Noise Floor (DANL at 1 GHz, Preamp On, dBm/Hz): -164	Displayed Average Noise Level(DANL): (1) Preamplifier Off a. 9 kHz to 100 kHz: <-120dBm (typical) b. 100 kHz to 5 MHz: <-135 dBm c. 5 MHz to 3.2 GHz: <-140 dBm d. 3.2 GHz to 6 GHz: <-136 dBm Noise Floor varies with frequency range of spectrum analyzer so it cannot be defined only for 1GHz.	Please see the revised specifications in Annexure II

		And will have to defined for PA Off and PA ON conditions.	
	Noise Floor (DANL at 1 GHz, Preamp On, dBm/Hz): -164	Preamplifier On a. 100 kHz to 1 MHz: <-152dBm (typical) b. 1 MHz to 5 MHz: <-152 dBm c. 5 MHz to 3.2 GHz: <-157 dBm d. 3.2 GHz to 6 GHz: <-153 dBm	Please see the revised specifications in Annexure II
	Reference Frequency accuracy, ppm: ± 1 (0.003 with GPS lock)	Reference Frequency Initial Calibration Accuracy < 1ppm Temperature Stability : <1 ppm Aging Rate : <2ppm/Year Besides Reference Level accuracy other two parameters to be also specified.	Please see the revised specifications in Annexure II
	Maximum Input: + 33 dBm (± 40 VDC)	Maximum Input : +30dBm (50VDC) Better	Please see the revised specifications in Annexure II
	Amplitude accuracy, 95% confidence to 3 GHz: ± 0.2 dB	Level Measurement Uncertainty or accuracy < 1dB This will make generalized standard specifications and not of specific model.	Please see the revised specifications in Annexure II
	3rd-Order Intercept at 2 GHz: 15 dBm Spurious-Free Dynamic Range(SFDR): <-70 dBc to 3 GHz	3rd-Order Intercept: 15 dBm Makes more generalized Specifications Spurious Response: <-90dBc Makes more generalized Specifications	Please see the revised specifications in Annexure II
	Minimum signal duration, 100% probability of intercept: 100 µs	These specs are of RSA	Please see the revised specifications in Annexure II
	EVM on 1 MSymbol/sec QPSK: 0.80%	This special feature is available in only one or two models worldwide to the best of our knowledge.	Please see the revised specifications in Annexure II
	EVM on 802.11n: -39 dB	This special feature is available in only one or two models worldwide to the best of our knowledge.	Please see the revised specifications in Annexure II
	Resolution Bandwidth	Resolution Bandwidth 10 Hz to 1 MHz, in 1-3-10 sequence	Please see the revised specifications in Annexure II

			This is one of the important specifications which signifies ability of spectrum to resolve two frequency components	
		Display Size : 8" TFT Colour	Display Size : 8" TFT Colour Very important specifications to discriminate different models	Please see the revised specifications in Annexure II
		PC Interface: USB Host & Device, Lxi (LAN)	PC Interface: usb Host & Device, Lxi (LAN) These are common interface available with these units to control the unit and save trace in external USB device.	Please see the revised specifications in Annexure II
		Measurement : T-Power, ACP, Channel Power, Occupied Bandwidth(OBW), Emission Bandwidth(EBW), C/N Ratio, Harmonic Distortion	Measurement : T-Power, ACP, Channel Power, Occupied Bandwidth(OBW), Emission Bandwidth(EBW), C/N Ratio, Harmonic Distortion This feature is very useful for performing various experiments in communication field.	Please see the revised specifications in Annexure II
30	Page no 16,18, SL no 3 Telecommunication Trainer Kit	A single board kit consisting of functional circuit blocks/modules that can be connected together to construct a wide variety of experiments, for thirty or more analog and digital modulation techniques; with the capability of expansion to include more advanced or specialized telecommunications experiments via a plug-in expansion interface. The expansion boards will implement additional functional circuit blocks.	Multiple Training Platforms and each platform should have functional blocks with test points and indication for signal flow. In order to perform the experiment each training platform should have detailed concept understanding and practical learning. All training platforms should be provided with separate power supply, learning material, operating manual with reference results wherever needed. Learning of respective topic with graphical interactive learning software will be an added advantage for students understanding. One board training platform is company specific however multiple platforms allows user to conduct experiments topic wise that helps him to understand subject in more detailed fashion.	Please see the revised specifications in Annexure II
		The range of analog and digital experiments covered should include:	The range of analog, digital and fiber optic experiments covered should include	Please see the revised specifications in Annexure II

		Same	
	Amplitude Modulation (AM), Double Sideband Modulation (DSBSC), Amplitude Demodulation, Double Sideband Demodulation, Single Sideband Modulation and Demodulation, FM Modulation, FM Demodulation, Sampling and Reconstruction, PCM Encoding and PCM Decoding, Bandwidth Limiting and restoring of digital Signals, Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Binary Phase Shift Keying (BPSK), Quadrature Phase Shift Keying (QPSK), Spread Spectrum – DSSS Modulation and Demodulation.	Amplitude Modulation (AM), Double Sideband Modulation (DSBSC), Amplitude Demodulation, Double Sideband Demodulation, Single Sideband Modulation and Demodulation, FM Modulation, FM Demodulation, Different type of sampling techniques like Natural, Flat top, Sampled and hold and its Reconstruction, PAM, PPM and PWM Techniques, PCM Encoding and PCM Decoding with and without transmission effect (attenuation, noise, filter), DPCM Encoding and PCM Decoding, Continuous Variable Slope Delta (CVSD) Modulator and Demodulator, Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Binary Phase Shift Keying (BPSK), Differential Binary Phase Shift Keying (DBPSK), Quadrature Phase Shift Keying (QPSK), Offset Quadrature Phase Shift Keying (OQPSK), Study of constellation patterns, Spread Spectrum – DSSS Modulation and Demodulation. Dual wavelength fiber optic transmit and receive with eye pattern observation and BER measurement experiments. Fiber optic couplers and WDM filter experiments. Digital communication experiments board should have on board DDS Generator with standard and arbitrary waveform and variable data pattern generator like 8bit, 16bit, 32 bit and 64bit. To perform above list of experiments, the lab setup should be covered in maximum 10 boards.	Please see the revised specifications in Annexure II

		We have suggested important left out topics of communication techniques which is been covered in curriculum.	
	Complete documentation including User Manuals and Student Manuals to be included for all the above experiments.	Detailed product tutorial and graphical interactive learning software covering many of above said communication techniques with animation and simulation software. Graphical interactive learning software allows better understanding of different topics.	Please see the revised specifications in Annexure II
	Expansion sockets to be provided for additional modulation of coding schemes, which may include:	Not required As it seems to be product specific and not the generalized specifications. As we have suggested separate modules to perform above mentioned various experiments.	Please see the revised specifications in Annexure II
	- QPSK experiments		Please see the revised specifications in Annexure II
	- Line-Code Decoding and PLL experiments		Please see the revised specifications in Annexure II
	- Dual wavelength fiber optic transmit and receive experiments		Please see the revised specifications in Annexure II
	- Fiber optic couplers and WDM filter experiments		Please see the revised specifications in Annexure II
	- Physics of Fibers accessory kit to allow student investigation of fiber optic cable and connect or performance, polarization and associated topics.	Demonstrator module to study of different types of cables, connectors and how to make mechanical splice and tools used in connectorization. Suggested specs are of generalized nature.	Please see the revised specifications in Annexure II
	- A breadboard plug-in which allows student to build circuits and connect them to the various functional blocks of the main unit.	Not required. As it is Product specific. Each training platform has different functional blocks and to be cascaded based on communication technique under study to perform experiments. So it is not required.	Please see the revised specifications in Annexure II

	Adder (2 off), Multiplier (3 off), Twin Pulse Generator, Dual Analog Switch, Noise Generator, Buffer, Channel Module (band pass filter and low pass filter), Utilities (Comparator, Rectifier, Diode & RC LPF, RC LPF), Tuneable Low Pass filter, Variable DCV, microphone, XOR gate, VCO, Sequence Generator, Divider, PCM Encoder, Master Signals module, Serial to Parallel converter, PCM Decoder and Expansion connector.	To be removed This is company specific. Each individual training platform has required functional blocks , signals to perform the experiments , so no need of going for individual modules. This is a standard and most common practice to perform experiments to understand various communication techniques with generalized specifications.	Please see the revised specifications in Annexure II
	Master Signals module: Synchronized 100kHz sine and cosine outputs for use as carrier signals of (approx.) 100kHz, 8kHz; and a 2kHz digital output and a 2kHz sine.	To be removed	Please see the revised specifications in Annexure II
	Channel module: o Band pass filter (BPF): 6th order Chebychev with 0.1dB ripple, with a passband from 88 kHz to 112 kHz. o Low pass filter (LPF): 4th order Butterworth with fcut-off = 1.6 kHz		Please see the revised specifications in Annexure II
	Line code Encoder module: fmax greater than 100KHz with line codes: NRZ-L, RZ-AMI, Bi-phase, NRZ-M		Please see the revised specifications in Annexure II
	Tunable LPF: Filter Range 600 Hz to 12 kHz, 8th order Elliptic, Stopband Attenuation > -50dB at 1.4 fc and Passband Ripple < 0.5dB, Gain Control 0 to 1.6	This is company specific. Each individual training platform has required functional blocks , signals to perform the experiments , so no need of going for individual modules. This is a standard and most common practice to perform experiments to understand various communication techniques with generalized specifications.	Please see the revised specifications in Annexure II
	Utilities module: COMPARATOR Operating Range > 100kHz, TTL Output Risetime 500nsec (typically) RECTIFIER: Bandwidth DC to 100kHz (approx) DIODE & LPF: LPF -3dB frequency: 2.6kHz (approx) RC LPF: LPF -3dB frequency: 2.6kHz (approx)		Please see the revised specifications in Annexure II

	VCO module: Frequency Ranges 1kHz < LO < 17kHz; sinewave and digital-level 60kHz < HI < 140kHz; sinewave and digital-level Input Voltage -3V < VCO INPUT < 3V		Please see the revised specifications in Annexure II
	• Sockets on the front panel for each module to facilitate patching.	Same as above	Please see the revised specifications in Annexure II
	• Facility to connect outputs from the kit to an oscilloscope	Same and block level approach allows user to observe various intermediate stages output on oscilloscope.	Please see the revised specifications in Annexure II
	• Sockets carrying digital and analog signals to be identified by different socket shapes.	To be removed Product/Company specific. various signals observed are mentioned on mimic.	Please see the revised specifications in Annexure II
	• All modules to be labeled so as to identify the basic electronic circuit function performed.	Each training platform to be labeled for the communication techniques covered and different functional blocks are marked on mimic. Better as not product specific	Please see the revised specifications in Annexure II
	• POWER SUPPLY to have reverse polarity protection and self-resetting circuit breaker protection above 16V input.	All modules comes with necessary Power Supply with protection Makes more general specifications	Please see the revised specifications in Annexure II

Annexure II

Revised Schedule of Requirements

Sr. No.	Item Details	Qty.
1	**Software Defined Radio (SDR) Platform Kit** A fully integrated, modular SDR platform with continuous frequency coverage from 400 MHz – 6 GHz. A single chip direct-conversion transceiver providing up to 40 MHz of real-time bandwidth, open and programmable, and USB with convenient bus-power. Full support for the hardware driver software allowing developing with GNU Radio, and MATLAB. Features: Full duplex, MIMO (2x2) operation with up to 40 MHz of real-time bandwidth Fast and convenient bus-powered connectivity using USB Open and reconfigurable hardware platform with capability to interface with GNU Radio, MATLAB, etc.	40
2	**Spectrum Analyzer** Stand alone swept tuned spectrum analyzer; with built-in tracking generator, and a TFT display. Specifications: Power Source: 110/220 V ac, 50/60Hz Max Frequency Range: 9 kHz - 6 GHz Displayed Average Noise Level (DANL): Preamplifier on: a. 100 kHz to 5 MHz: <-152dBm (typical) b. 5 MHz to 3.2 GHz: <-157 dBm c. 3.2 GHz to 6 GHz: <-153 dBm Preamplifier off: a. 100 kHz to 5 MHz: <-135dBm (typical) b. 5 MHz to 3.2 GHz: <-140 dBm c. 3.2 GHz to 6 GHz: <-136 dBm Reference Frequency accuracy, ppm: ± 1 Maximum Input: + 30 dBm (50 VDC) Amplitude accuracy, 95% confidence to 3 GHz: ± 0.2 dB 3rd-Order Intercept at 2 GHz: 15 dBm Spurious-Free Dynamic Range(SFDR): <-70 dBc to 3 GHz	4

	Resolution bandwidth: 10 Hz to 1 MHz in 1-3-10 sequence Display size: 8" TFT colour PC interface: USB host & device, Lxi (LAN)	
3	**Telecommunication Trainer Kit** <u>Specifications</u> A single or multiple platforms to construct a wide variety of experiments, for thirty or more analog and digital modulation techniques; with the capability of expansion to include more advanced or specialized telecommunications experiments . In case of multiple platforms, each platform must have its own power supply. The range of analog and digital experiments covered should include: Amplitude Modulation (AM), Double Sideband Modulation (DSBSC), Amplitude Demodulation, Double Sideband Demodulation, Single Sideband Modulation and Demodulation, FM Modulation, FM Demodulation, Sampling and Reconstruction, PCM Encoding and PCM Decoding, Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Binary Phase Shift Keying (BPSK), Quadrature Phase Shift Keying (QPSK), Spread Spectrum – DSSS Modulation and Demodulation. Complete documentation including User Manuals and Student Manuals to be included for all the above experiments. Additional modulation of coding schemes and plug-ins may include: - Delta Modulation and Demodulation - Adaptive Delta Modulation and Demodulation - Sigma Delta Modulation and Demodulation - Line-Code Decoding and PLL experiments - Dual wavelength fiber optic transmit and receive experiments - Fiber optic couplers and WDM filter experiments - Physics of Fibers accessory kit to allow student investigation of fiber optic cable and connect or performance, polarization and associate d topics. - A breadboard plug-in which allows student to build circuits and connect them to the various functional blocks of the main unit. Other specifications: • Sockets on the front panel for each module to facilitate patching. • Facility to connect outputs from the kit to an oscilloscope • Input and Output impedances intentionally mismatched, so that the signal connections may be made or broken without changing signal amplitudes at module outputs. • Inputs and outputs short-circuit protection.	40

	• Patching of modules to be possible at any time during an experiment without risk of causing damage to unit. • All modules to be labeled so as to identify the basic electronic circuit function performed. • Power supplies to have necessary protection circuitry.	

Annexure III

Undertaking of Authenticity

Sub: Supply of Communications Laboratory Laboratory Equipment's

Ref: 1. Your Purchase Order No. ----------dated-------.

2. Our invoice no/Quotation no. -------dated--------.

With reference to the Communications Laboratory Laboratory Equipment being supplied /quoted to you vide our invoice no/quotation no/order no. Cited above,----

We hereby undertake that all the components/parts/assembly/software used in the Communications Laboratory Equipment shall be original new components/parts/ assembly /software only, from respective OEMs of the products and that no refurbished/duplicate/ second hand components/parts/ assembly / software are being used or shall be used.

We also undertake that in respect of licensed operating system if asked for by you in the purchase order, the same shall be supplied along with the authorised license certificate (eg Product Keys on Certification of Authenticity in case of Microsoft Windows Operating System) and also that it shall be sourced from the authorised source (eg Authorised Microsoft Channel in case of Microsoft Operating System).

Should you require, we hereby undertake to produce the certificate from our OEM supplier in support of above undertaking at the time of delivery/installation. It will be our responsibility to produce such letters from our OEM supplier's at the time of delivery or within a reasonable time.

In case of default and we are unable to comply with above at the time of delivery or during installation, for the Communications Laboratory Equipment already billed, we agree to take back the equipment without demur, if already supplied and return the money if any paid to us by you in this regard.

We (system OEM name) also take full responsibility of both Parts & Service SLA as per the content even if there is any defect by our authorized Service Centre/ Reseller/SI etc.

Authorised Signatory

Name:

Designation

Place

Date