Variable Energy Cyclotron Centre
Kolkata

Procurement Plan for next 5 year

List of items likely to be procured

Item	Brief Specification / comments
Power Electronic Devices & Components	Single & Dual Diodes(1200 V,upto 1000A),Thyristor modules , MOSFET's , IGBT modules(1200 V,upto 900 A),Power Transistors(240V,15A, 240W) DC link power capacitors(MKP type, upto 900 V 100-1000 uF),Electrolytic Capacitor(1000-10,000 uF upto 500V), Snubber capacitors (~ 2uF upto 500 V), Power Resistors and Ultra high power resistors, EMI filters (1 & 3-phase, upto 50 KVA).
High Power Single & Dual IGBT Drivers	Vsupply=15V,Peak Output current~8A,Galvanic Isolation ≥ 4KV & above,Vce Monitoring(1200V) & Short Circuit Protection
Low Power Electronic IC's	Presicion 3rd generation Opamps(Single Dual,Quad) & Diffrential Amplifiers,Refrence IC's 10V (less than 1 ppm/˚C),Regulator IC's(±5V to ±24V,TO-220 & TO-3 package),PWM driver IC's, High end & Low end MOSFET drivers, PCB mounted Precision 4 wire resistors (Temp. stability less than 1 ppm/˚C), Waveform generator IC's, TTL/CMOS based Digital IC's etc.
High Power water-cooled Triode.	Water cooled Ceramic metal Triode with Coaxial structure, Output Power ~ 400KW, Frequency = upto 30 MHz, Anode Voltage ~ 23 KV (DC operation), Anode power Dissipation
Fast Recovery High Voltage Diode Assemblies	Voltage=30KV & above, Peak current=250A & above
Fast Disconnect High Voltage Solid-State Switch	Operating Voltage = 24 KV (DC), Opearting Current = 20 Amps (DC),Turn off time ~ 5usec(Max.),Peak Current = 150 Amps (Max.),Optical Fibre based Gate Drive, Galvanic Isolation~50
Network Switch/Distribution switch	Distribution switch with 24nos of 10G SFP+ ports and 2 X QSFP+ 40GbE, dual power supply along with 1440 Gbps switching capacity
Firewalls	Hardware based Firewall/UTM with interfaces 6 X 10G SFP+, 4 X1G SFP, 8 copper 1G ports, Firewall throughput -30 Gbps, IPS throughput - 10Gbps, Threat prevention throughput - 7 Gbps, VPN throughput - 8 Gbps
Network Security Device	High end servers are required to procure for Packet-fence, NMS and IPS and IDS implementation with specification: 2nos Intel Xeon processors 16 cores per processor, RAM-256GB, with 4 X 1G Ethernet ports, 4 nos 10G Ethernet port, storage 5TB

Petabyte Storage with Disaster Recovery facility	Total two redundant storage facilities with capacity 1 petabyte each and IOP-20719 MB/sec, with disks SSD/SAS/NLSAS-10%,40% and 50% splits. The storage will be in active-active configuration for redundancy. It will be located in different location as disaster recovery facility. The storage facilities are synced with high speed redundant fiber connectivity.
Mobile Robot & Unmanned Aerial Vehicle (UAV)	Wheeled Mobile Robot with onboard embedded system and sensor suite . Unmanned Aerial Vehicles like Multicopter with onboard camera and programmable embedded system.
Digital Storage Oscilloscope:	Frequency range up-to 500 MHz, Minimum 4 no of channels, Minimum 2Gsps Sample rate, USB 2.0 host port on the front panel for quick and easy data storage.
Vector Network Analyzer:	Frequency range 100 kHz to 6 GHz, Two-port full S-parameter bidirectional measurements on passive components, 1Hz Resolution, Directivity≥ 38 dB, Source match ≥ 31 dB, Load match ≥ 35 dB
Spectrum Analyzer:	Frequency Range 9kHz to 3.0 GHz or Better, Resolution 1Hz, Resolution Band Width 1 Hz to 3MHz or Better, Phase Noise < –103 dBc/Hz (f=500 MHz, @100 kHz +30 dBm (1 W)offset) Max Input Power
Power Supply:	Linear DC Power Supply with digital display, No of channels: 4 (CH 1/2: 0-30V/3A, CH 3:2.2-5.2v/1A, CH 4:8-15V/1A), Series Voltage functionality: 0-60V, Parallel current functionality: 0-6A
GPU Server:	Minumum 12 core CPU; Per GPU Accelerator Minimum 32 GB GPU Memory, 7 TFLOPS DPP, TFLOPS SPP, 112 TFLOPS Tensor Performance; 900 GB/sec GPU Memory bandwidth:, 300 Compute GB/sec Interconnect Bandwidth
Web & NW Vulnerability Scanner:	Enterprise level remote port scanning tool for vulnerability assessment of hosts on a computer network along with report generation. Web application security testing tool that audits web applications by checking for vulnerabilities like SQL Injection, Cross site scripting and other exploitable vulnerabilities.
Computing Servers:	1U/2U Rack Server with Dual Processor, minimum 12 Core, minimum 16 MB Cache Memory, minimum 64 GB RAM, minimum 10 x 1.8TB SAS HDD, HBA Card, 5 Years On-site Warranty
Video conference system	Minimum 5x digital zoom 4K camera sensor Full HD Video 1080p all-in-one video conference system with at least (1+5) simultaneous connectivity
Fire detection System (FDS):	Approx. 2200 fire detectors with multi-criterion and inbuilt isolators. operating panel having 100% hot redundancy. Hotter and manual calling point for 200 devices and interconnectivity with 20 Km FRLS 2-core cable.
CCTV Surveillance System	Approx 100 numbers of 2MP digital CCTV cameras (external and internal) surveillance system with back up of 90 days.
Campus Security Systems	Flap barrier, Boom barrier, multi-zone Door Fame Metal Detector(DFMD) and portable DFMD, RFID based access control system
X-ray Machine	Single view security X-ray baggage inspection system with tunnel window size 620x420 mm

EPABX system	IP based EPABX system having 1000 extensions with 30+30 PRI channels
High voltage power supply	10kVdc, 7A, with 0.5% ripple with protections, unregulated
High Voltage DC regulated Power Supplies	various ratings from 5kV to 40kV range.
High current DC regulated Power Supplies	various ratings upto 500A.
Fabrication of Double pancake Coil winding Setup with water cooled copper conductor	Pancake Coil of size OD=2m, ID=1.4m fabrication setup contains maindrail with fixing arrangement on trun table, straightening unit, tensin device, deereller etc.
Fabrication of Die for casting a coil of size OD= 2m, ID=1.4m, H=300mm.	The coil of size 2mx1.4mx0.3m, wt=2Ton shall be epoxy casted and for this, required Die to be fabricated with lifting arrangement.
Vacuum impregnated epoxy	Plant of size 3mx3m, H=1m.
Super anamelled copper conductor, winding Tapes, epoxy cast materials etc.	Different sizes from .5sq.mm to 25sq.mm of copper conductors. Tapes:- cotton, Glass fibre, Kapton etc., Resin:- Dobeckot520, hardener:- WH7015.
High voltage Deck	Isolation voltage 60kV
3-phase with Neutral Isolation Transformer,	415VL-L, 30kVA, 60kv Isolation
High voltage components ie, Resistance, Cables, connectors etc.	HV non-inductive resitances suitable for 100kV as well as 300kV applications. 300kV Receptacle and connectors.
Low Level RF control system of Cyclotron	Low level RF control system for amplitude, phase and frequency control for particle accelerator
vacuum Tube for RF amplifier	Tetrode for 150kWatt , 1Mhz to 100MHz RF amplifier
Triode	40kWatt , 1Mhz to 100MHz RF amplifier
RF combiner	RF combiner at 3 to 100Mhz for power 1kWatt, 5kWatt, 20kWatt
RF Circulator	at 75MHz, 54MHz, 65MHz for 1kWatt or more
Programmable logic controller	Programmable logic controller with bit processing speed 1ns, and high speed ADC and DAC
FPGA based closed loop RF control system	FPGA with ADC DAC control card with DSP for application for 50MHz low level control sugnal processing
Desktop computer	Desktop computer
Server computer	High performance comoputer, 2 CPU with 500GB Ram
Rigid Transmission line	1 5/8, 3 1/8 and 6 1/8 Rigid transmissionline components
RF amplifier	5 to 100 MHz 1kwatt, 5 kwatt, 10kwatt, 20kwatt
rf cable	1GHz low loss rf cable for handing 250 Watt to 1kWatt
coaxial Connector	50 ohm RF connectors, 7-16, N-type, BNC type, SMA
oscilloscope	500MHz, 1GHz
signal generator	Frequency upto 3 GHz, maximum power level 13 dBm or more
network analyzer	Frequency upto 8 GHz, 2 port
impedance analyzer	0.1 to 120MHz
Cermaic insulator	Low RF Loss insulator for application in particle accelerators
RF coupler	Vacuum feed through RF coupler for cyclotron for power 10kwatt, 50kwatt, 100kwatt
Kapton film	Kapton polymide film
RF capacitor, industor and resistor	Capacitor, inductor, resistor for RF dissipation
High frequecy PCB lamilates	High frequecy PCB lamilates

DC servo motor, stepper motor	DC servo motor, high precision stepper motor
RF mosfet	2000 Watt , 1Mhz to 250MHz
Power combiner	2 port,4-port power combiner,of different power level and frequency range , power level-, frequency range-
Directional coupler	directional coupler for 1 to 100MHz, for 2kwatt, 10kwatt, 50kwatt
RF amplifier	RF power amplifier of different power level and frequency range, solid state / vaccum tube based , from 500W to 100kW power and frequency range of 5 MHz- 1.5 GHz
RF load	50 ohm RF load of different power level and frequency range , for 1 kW to 100kW power and frequency range of 5 MHz-1GHz
Niobium sheet for Superconducting RF Cavity	niobium sheet with 2.5 mm to 4.5 mm thickness and high value of Residual Resistivity Ratio RRR>300
Nb-Ti disc for Superconducting RF Cavity	Niobium-Titanium (Nb-55Ti) Alloy Disc and plates of different sizes
Titanium Helium Vessel and Titanium bellow for SCRF cavity	Cylindrical vessel , dome like structure and bellow made of 5mm to 8mm thick Grade 2 titanium.
Stepper motor	Hybrid stepper motor of different sizes with drive system , with microstepping, Torque upto 10 N-m torque
Camera with accessories for optical inspection of SCRF cavity	Camera for inspection of internal surface of a SCRF cavity (closed volume with port), smallest measureable feature size 50 micron or less
Electrical power distribution panels,	415V 3-Ph 50Hz 630A/1000A/1250A.
MCB (SP, DP, TP, TPN & FP)	with suitable Distribution board suitable for 2-63A.
LED street lights (30W, 45W), LED flood lights (60W, 100W), LED tube lights (20W), LED ceiling lights (12W, 18W)	suitable for 230V 1-Ph 50Hz.
Air circuit breakers, EDO type	suitable for 415V 3-Ph 50Hz (1000A, 1250A, 2000A, 3200A)
Electrical LT switch gears,	power contactors (16-110A), over load relay, MCCB (63-1600A), SDFU (32-800A), change over switch (32-630A), fuse (2-630A)
Electrical hardwares	Aluminum & copper bus bar (100-1250A), bus bar support insulator, heat shrinkable sleeves, bus bar clamps.
Power cables	3.5C 1100V XLPE insulated FRLS Aluminum armoured cable (16-300Sq.mm), 3.5C 1100V XLPE insulated FRLS copper armoured cable (1.5-25Sq.mm),
Control cables	single/multi core 1100V XLPE insulated FRLS copper (1.0-120Sq.mm),
Transformer	2MVA, 3-Ph 33/0.433KV 50HZ ONAN type transformer with On load tap changer.
Bus duct	415V 3-Ph 50Hz ,Sandwitch type aluminum bus duct suitable for out door use (3200A)
High Speed Diesel	suitable for Diesel Generators
D G Spares	for 250/500/750KVA D G sets

Power Capacitors,	415V 3-Ph, 50Hz (7.5-50KVAR)
Lift (8 passenger suitable for G+4 building), Cargo lift (3000Kg. Suitable for G+4 building)	
HT CT	33KV 40/1+1A, 200/5A
HT LA	suitable for 33KV system,10 KA Rating.Station type
Instant water heater(Geyser),	3KW 230V 1-Ph 50Hz.
Ceiling Fan,	230V 1-Ph 50Hz 1200mm sweep.
Solar PV Grid type Power Plant	4x20KW,3 ph 50 Hz
Diesel Generator set	500KVA,3Ph,N 50Hz,+/- 1.0% regulation.
UPS Battery Bank	(26AH, 75AH)12 volt,Sealed Maintenance Free
UPS, 3 ph input, 3 ph,N output, 50 Hz	20-100KVA. Maximum THD 3%, Voltage Reg +/- 1.0%
Chiller unit of capacity 230TR	at ambient temperature 40˚C, having In/Out water temperature 7˚C/12˚C.
Demestic Split Air Conditioner	of capacity 2TR with min. 7000W cooling capacity.
Air Handling Units(AHU)	having capacity 7.5TR,15TR,45TR,65 TR,130TR, at SP 40-65 mm of w.g.
Refrigerents (R410A, 134A, R404A, R23, R22) and Oil (Freezol68 & 160Z)	
Chilled water pumps	of capacity 7.5 HP,20HP, 40 HP, 60HP
SS ball valves	as per BS5351 (10 mm, 25mm, 40mm, 50mm, 65mm, 80mm, 100 mm)
Bearings With Plummer block .	
Precision V-Belt	
HEPA filters	of capacity 1700 CMH,min. efficiency 99.97 % @ 0.3 micron,
Mini Pleat HEPA Filter	of capacity 1000 CMH, Min. Efficiency 99.999% @ 0.3 micron,
Hi-Flow HEPA Filters	of capacity 2000, 1500 & 1000 CFM for min. efficiency 99.97% @ 0.3 micron
Pre Filters	90% down to 20 micron particle size
Micro Filters	99% down to 5 micron particle size
Bag Filters	99% down to 3 micron particle size
Hot Water Generator 130-180 KW their Heaters and air heaters	
Reverse Osmosys water Purifier and its spare items.	
Various plumbing fittings and accessories	
Tools & tackles	Blade set, Air filter Snorkel, Cylinder Kit, Carburetor 4 stroke, Gear box 28mm, Spark Plug 4 etc.consisting of Cylinder Kit, 4 stroke Carburetor, clutch drum assembly, Clutch assembly HBC, air filter (Sponge) HBC, Spark Plug 4 stroke, Petrol Filter.

Brush Cutter	Air cooled 4-stroke petrol engine, 1.3HP, dry weight-8.3 kg, recoil starter
Lawn Mower	Push mower 196cc petrol engine, deck width 20 inch,
Carbide tipped blade Chain Saw	Type of Engine-2- Stroke Petrol Driven, Air Cooled Displacement in CC-75 Output Power-5.5 Hp
High current power supplies	1250A / 60V, 100 ppm
	200A/50V, 50 ppm
High voltage power supplies	20kV/20mA
	(-2kV /100 mA)
	(-8kV/1A)
Permanent magnets (NdFeB)	sector magnets N52 and N46U
Turbomolecular pumps with rotary pumps	550 l/s
	100 l/s
Data acquitions systems	Ethernet modules
	Digital i/o modules
	Analog I/O modules
Multilayer insulation for cryogenic applications	100 m rolls of standard width
Cryogenic temperature sensors	4k thin film resistors
DC cables	250A
Microwave generator	14 GHz 1kW - 2kW CW
solid state amplifiers	14GHz 10W
Microwave diode detectors	Ku band
flexible waveguides	Ku band 2kW 1m / 2m long
DRO	Ku band 100 - 200mW
Klystron / TWT tubes	3kW / 750W Ku band
vacuum guages	Full range combined guages from atmosphere to 10^{-9} Torr
High purity gases	O, N, Ar, Ne 99.9% pure
Surviellance cameras and accessories for security	
high voltage feedthroughs with ceramic insulators	20kV / 1A
Relays (AC/DC)	1A/24Vdc
Power transistors	10-20A / 100-200W/100-300V
Desktop computers	latest
LCD / LED monotirs	42 inch
RF amplifier	1-50MHz / 200-500W
Liquid scintillator based neutron detectors having pulse shape discriminator property	Size 5inch x 5inch and 3inch x 3inch
Photo Multiplier Tube	5 inch with suitable voltage divided and mu-metal shield. Photocathode sensitivity: visible range
High voltage cable with SHV connector	8KV rating, 15mts long
50 Ohm coaxial signal cable with BNC connector with two screening shield, 15mts long	

Digitizer Board	1G Samples/sec, 14 bit resolution, four channel or more
Power supply	3KV, 3mA dual channel, NIM module
Teflon capillary tube	Inner dia 2.2 outer dia 3.0
Optical grease for scintillator detector in the visible region	
Liquid Organic Scintillator having pulse shape discrimination property	
Aluminium extruder profile structure	length 3.6mts (typical cross section 40 mm x 40 mm) and fittings
Quartz glass window	(diameter 5 inch and 8 inch, thickness 8mm)
Constant Fraction Discriminator (CFD) module: .	CAMAC or VME standard, High density (16 channels or more) , compatible for negative input, threshold range~ 0 -255mV (programmable with resolution 1mV), remotely controllable, internal delay~2ns, constant fraction~20%, ECL output, intrinsic delay of the complete module must be less than 15ns
Leading Edge Discriminator (LED) module:	CAMAC or VME standard, High density (16 channels or more) , compatible for negative input, threshold programmable, remotely controllable, ECL output, intrinsic delay of the complete module must be less than 15ns.
Fast Amplifiers	NIM standard, High density (8 channels or more), must accept negative input, Fixed amplification factor=10, large bandwidth
Gate and delay Generators:	CAMAC or VME standard, High density (16 channels or more), inputs and outputs must be ECL type, delay and gate widths must be programmable. Delay range~0-400ns, width range~20-500ns.
High Voltage supply for Scitillation detectors:	Multi-channels (8 or more) 3 KV, 3 mA, equipped with both types of polarities, Voltage set resolution~100mV or less, Voltage ripple ~ 20mVpp or less etc, connectivity- Ethernet / USB
Photo Multiplier tubes for BaF2 detectors	Head on, 29mm dia, quartz window, 10 stage dynode structures, typical gain~106, rise time - less than 2ns, transit time – less than 20ns along with suitable voltage divider base and magnetic shield.
Photo Multiplier tubes for LaBr3 + NaI phoswich detectors	Head on, 51mm dia, 8 stage dynode structures, typical gain~10^6, rise time - less than 2ns, transit time – less than 25ns along with suitable voltage divider base and magnetic shield.
Analog delay chip:	Chip of 100ns delay, PCM mountable, compatible for signals with fast rise time.
NIM standard high density Gate and Delay Generator	
NIM standard FAN-IN FAN-OUT modules for analog and logic signals.	
NIM to ECL translator	
NIM standard Octal CFD	

Digital oscilloscope	Bandwidth 70 MHz - 200 MHz Sample Rate 1 GS/s to 2 GS/s Analog Channels 2 to 4
NIM standard Delay amplifier.	
VME 32 channel ADC/QDC/TD	Full 12 bit resolution
VME and NIM Crate	VME: 21 Slot, 470 - 1200 W NIM: 12 Slot, 300 - 1100 W
Vacuum pumps:	Turbo pump (10-6 mbar), Scroll pump (10-2 mbar), Diffusion pumps (10-5 mbar), Rotary pump (10-2 mbar).
Electrically segmented LEPS detector:	2800 mm² planar crystal with 4 electrical segments within a single cryostat. The mechanical dimensions should fit into the standard Anti Compton shield with provision to mount inside the shield with a latch.
Cooled Si(Li) detector:	300mm^2 and 4-5mm thickness, with thin Beryllium window of about 200-300 micrometer, integrated with a cryostat to fill liquid nitrogen for cooling of the detector.
Digital Data Acquisition System	a) A whole system for processing the signals of a dedicated setup of array of detectors comprising of Clover HPGe detectors with BGO shields, segmented LEPS Planer HPGe detectors, CeBr3 fast scintillators. The measurements will involve time and energy information from all these detectors. b) A whole system for processing CsI(Tl) detector signal
High Voltage supply for HPGe detectors:	Dual or more channel per module, low noise, 5 KV, 2 mA supply, typical peak to peak noise < 5mV. It should have external inhibit signal connector option, so that high voltage should shut down depending on detector kill signal.
High voltage supply for scintillators:	3 KV, 10 mA supply with more than one channel per module.
NIM standard Time to Amplitude Converter (TAC):	Lowest range: 10ns or less, highest range: 1 ms or more, with SCA option.
NIM standard spectroscopy amplifiers:	Should accept both positive and negative input signal with unipolar or bipolar output. Should have pole-zero, BLR control, various shaping time and course gain and fine gain control.
Nanosecond Delay module:	Delay of linear or logic signals at least upto 64ns.
Hybrid gas detector	Consisting of 300-micron thick silicon detector (energy resolution about 1% for alpha) and gas electron multiplier foil etc.
CeBr3 detector	2" diameter and 2" length (crystal), 1" diameter and 1" length (crystal) coupled to a suitable PMT, must be optimized for both good energy as well as time resolution.
LaBr3 detector	2" diameter and 2" length (crystal) coupled to a suitable PMT, must be optimized for both good energy as well as time resolution.

Silicon Strip Detector	Single sided silicon strip detector (front side of detector must be divided into 16 strips for 50 mm by 50 mm area detector and 32 strips for 64 mm by 64 mm detectors and 20, 50, 100,500 and 2000 µm thicknesses). Double sided silicon strip detector (16 by 16 strips, i.e., front side of detector divided into 16 strips and back side also divided into 16 strips, mutually perpendicular to each other, for 50 mm by 50 mm area detector and similarly 32 by 32 strips for 64 mm by 64 mm detector0, 50, 100,500 and 2000 µm thicknesses). The dead area between the strips must be minimized to restrict the leakage of signals from one strip to other.
Charged Particle Detector bias module:	NIM standard four channels power supply with dual range (100V or 1kV) with independently selectable polarity. Output voltage should be continuously adjustable over the range from 0 to ±100 V or from 0 to ±1 kV, with a maximum output current of 20 µA, voltage accuracy: ±0.25% of full scale. Output Voltage Long Term Instability :<0.001%/24 hours.
NIM standard Spectroscopy Amplifiers:	Should accept both positive and negative input signal with unipolar or bipolar output. Should have pole-zero, BLR control, various
Charge sensitive preamplifier (single channel and multichannel) for silicon detector.	Bias +/- 800V
CsI(Tl) detectors:	Front face: 2.5cm x 2.5cm, back face: 3.5cm x 3.5cm, length: 6 cm with photo diode and charge sensitive preamplifier.
Servers & Computer & Workstation:	Server based on XEON processor, 16 cores, 256 GB RAM, 10TB storage. Workstations with XEON processor 8 cores, 32GB RAM and 2TB storage
Machinery for PCB soldering, lab instruments:	Semi-automatic soldering machine for BGA package soldering, soldering oven and accessories.
DAQ Facility upgradation:	Xilinx Kintex7 series FPGA based boards, ADC modules 14bit 125MSPS, Altium PCB design software, XILINX VIVADO FPGA programming software, ModelSIM simulators.
Cryogenic Liquid:	Liquid Helium (Total: ~3000 liters)
Helium Gas:	purity 99.995% (Quantity: ~ 1000Nm3)
Vacuum Pump:	a)Turbo-molecular Pump (DN160 Port , Pumping speed~700 litre/s, Ultimate vacuum~1x10-10 mbar), b) Ion sublimation Pump (DN160 port, Pumping speed~600 L/s, Ultimate vacuum <1x10-11 mbar)
Low Noise Cryogenic Amplifier:	(operating upto 4K), Bandwidth ~ 55 MHz, Input voltage noise density < 2 nV/sqrt(Hz)

Alpha Detector:	Transmission type Alpha PIPS detector with active area 150 & 300 mm2
Rotating wall drive:	Frequency range: 80 kHz - 10 MHz, Voltage range : 0-10Vp-p
Liquid helium transfer line with valve	
OFHC copper, Stycast 2850FT, Catalyst 23 LV, PEEK, Macor, Metal foils (Tungsten, Iron, Terbium, Silicon etc.)	
Pulse tube coldhead cryocooler with Cooling capacity at 2nd stage 1.5 W @4.2K and associated water-cooled compressor	
Non-magnetic Cernox temperature sensor and diode sensor	Ranging from 1.4 K to 300 K and associated temperature controller with eight input channel
Ultra-high vacuum compatible SS304 vacuum chamber to house cryocooler	
Vacuum components:	Suitable bellows (DN160 CF) and adapters (DN160 CF - DN100 CF, DN100 CF- DN63 CF, DN160 CF-DN40 CF), multipin, cryogenic electrical feedthrough, needle valve, DN160 CF blank flange, OFHC copper gaskets
Chiller	flow rate > 25 LPM, temperature condition -7°C - 35°C
Connectors	SMA male to BNC male, SMA female to BNC male, SMA I connector, SMA panel mount connector
SMD resistors), SMD NP0 Capacitors (1 pF - 100 µF), Coil inductors , RF choke, Ferrite core	10Ω - 100 MΩ 1 pF - 100 µF 1µH -100 mH
Segmented, Thin Be window LEPS Detector	
Cooled Si-Li Detector:	Detection limit <50 keV electrons
High temperature vacuum furnace:	Box type; Maximum working temperature: 1200 deg C; vacuum : better than 5e-5 mbar, constant zone volume : 10cm x10cm x10cm
In-situ high temperature tensile stage for Carl-Zeiss make SUPRA-55	Field Emission Scanning Electron Microscope. Load range: 10 N to 10 KN with a resolution <= 0.01N; Sample temperature: Room temp to >= 800 deg C with accuracy of 1% of desired temperature;
Automated Test Equipment for mixed-signal ASIC with multiple dc supplies, analog source and captures and hi-speed digital channels	

Precision Programmable 50V Step Generator	
Precision Programmable pico-second current Pulsar	
Nanosecond Delay units	multi-channel, passive module, range 0.5ns - 100 ns
Coincidence Logic units	OR, AND, XOR, NOT logics, low noise, Boolean logic based
Microsecond delay units	
Computing resources are Rack Severs with optimal number of compute cores with all supporting accessories. (GPU based Few servers will also be procured.)	Rack servers with 2* multi core processors, 2.5GB/core RAM, 5GB/core SSD, 2*10/40/100Gb network card and associated accessories.
Storage resources are Rack Severs with optimal number of storage media with all supporting accessories	Rack servers with 18 or more NLSAS 12 TB or more disks with 2 * multi core processors and associated accessories.
Network components are 40G-100G based routers, switches, firewalls and related accessories	Network switches for 40G-100G network and related accessories
Cooling and Infrastructure will be data centre cooling and required UPS power supply	Computing Data Centre Cooling Solution and Associated UPS for approx 100KW load.
Si-pad detectors on a 6" wafer, design and fabrication	p and n-type, low leakage current, pad size 1cm x 1cm
FPGA boards	Xlinx equivalent
Gas electron multiplier (GEM) detector foil	polyimide foil, 50 micron thick, 5micron cu coating on bth sides, perforated holes with 5omicron dia, 140 micron pitch
8-layer large size PCBs for detectors	8 layer, 1.2m x 0.5m
Front end readout Board	2-layer with components, with or without ground planes
LV (upto 5V) power supply	12V, 10 Amp
HV power supply	10 W, 2mA, upto +-5KV
Aluminium cooling plates	10m thick, Al pipes inserted side
Bakelite electrodes	2 mm thick, 10^9-10^10 ohm-cm resistivity, 2m x 1m size
Nylon washers	ID 2.5mm, od 5mm, thick 0.5mm
SS316 screws	M2 x 8mm CSK, M2.5 x 8 mm, M2.5 x 1.6 mm, M2.5 x 6mm
flexon/nylon materials tubes	od-3mm, id-1.8mm
compact portable chiller	less than 25 kG
Clean room equipment	lab tables, lab chair, SS tables with castor wheels, lockers, cabinet, ventillated type garment cubicle
Water flow meter	20-200 cc/min
Gas mixing unit	P30, freon-isobutane, 4 components
Gas regulators	Ar, Co2, N2, CF4, Neon, P10, freon, isobutane
DLC	diamond layered carbon films
single sided copper	50 microns, 60cm x 100 m
tapes	kapton
copper tapes	1000 m, 2 inch, 1 inch
BNC connectors	equivalent
cables	Lemo equiv, 0.5mm, 0.25mm, 1m, 3m , 6m, 10m, 30m
SHV connectors	CAEN equivalent

HV + signal connectors	Lemo equivalent
Photomultiplier	Philips equivalent
Coincidence unit	CAEN N455 equivalent
Quad discriminator	CAEN equivalent
FR4 sheet	0.5 mm thick, 1200 mm x 1000mm
gate valve for controlling water flow	1/4 inch, 1/2 inch
picoammeter	Keitheley 6517B equivalent
Oscillaoscope	Tek TBS1000C series equivalent
NIM crate	CAEN SY4500 series equivalent
Portable X-ray generator	8.9kV
Drift PCB	3 layer
Ultrasonic bath	1200 x 600 x 400 mm
Gas leak detector	Ar, Co2, N2, freon, isobutane
CNC lathe machine	tabletop, for handling jobs of max 300 mm
Gas nozzles	teflon
O-ring	radiation hard 10 Mrad
LV & HV cables	
Laser source with driver electronics and temperature control	760 nm DFB laser, 5-10 mW, fiber output
Digital signal processing electronics	24bit ADC, DAC, balancing circuit, image processing
Optical power meter	measurement of optical power range 0.1-50 W
Optical wavelength spectrum analyser	100nm to 2500 nm
Photodetector and preamplifier	InGaAs Pin diode, sensitivity 1A/W , detecttivity 10^11
Optical fiber and fiber splitter	for transmitting light and splitting light
Optical AR coated collimated Lens	AR coated collimated lens used fr collimating light
Various Electronic/electrical/ mechanical /cryogenic equipments and machineries	Filter, butterfly valves, ball valves, pressure safety valves, check valves etc. Molecular Sieve, desicant adsorber, activated charcoal for impurity removal
Electron Beam Welding Machine	EBW machine chamber size (3700mm X 1200mm X 1800mm), Beam power 15 kW (maximum), Gun Voltage range 20-60 kV, Beam current range 0 – 250, mA, Beam current setting resolution 0.1 mA or better, Beam oscillations 1 – 2000 Hz or more, Beam deflection ± 5o minimum, Focus Range 50 mm to 500 mm or more, Beam focus diameter 0.4 mm or less
Vacuum Furnace	1300 Deg. C, vacuum 1e-5 mbar
Horizontal Test Cryostat	Mechanical fabrication as per drawing
Liquid Helium Plant	50 litres/hr or 250 W at 4 K
Procurement of design software and workstations	3D modelling, FEM analysis
Procurement of hall probe and optical encoders, data acquisition system etc for field mapping system	Hall probe for measurement of magnetic field upto 3 Tesla, Optical encoders, Radial and Angular drive system,Guide rails: radial and cicumferencial, Stepper Motors and their drives, Cables, Hall Probe and Monitor, Accuracy ~1X10-4

Procurement of vacuum system (pumps, valves, gauges, accessories)	20K Cryopump, Size DN320, Pumping speed >=3000 lit/s, capacity>=1800 std lit, Should be suitable for use in high neutron radiation, Ultimate pressure : <-5X10-8 mbar, Maximum allowable leak <-1X10-9 mbar.lit/s, Different size pumps are required. Pumping speed varies with size, Insertable type, Aluminium body, Leak tightness better than 1X10-9 mbar.lit/s
	Turbo Molecular Pump (DN 100 CF-F/ISO-F)
	Turbo Molecular Pump(DN 160 CF-F/ISO-F)
	Diffusion Pump (4” NB)
	Diffusion Pump (6” NB)
	Diffusion Pump (10” NB)
	High Vacuum valve ((DN 100 CF-F/ISO-F)
	High Vacuum valve (DN 160 CF-F/ISO-F)
	High Vacuum valve (DN 250 CF-F/ISO-F)
	High Vacuum valve (DN 320 CF-F/ISO-F)
	High Vacuum valve (DN 80 CF-F/ISO-F)
	High Vacuum valve (DN 50 CF-F/ISO-F)
	High Vacuum valve (DN 25 CF-F/ISO-F)
	High Vacuum valve (DN 900 CF-F/ISO-F)
	Roots Pump (1000 lit/s)
	Rotary Pump (4000 l/m)
	Rotary Pump (200 l/m)
	Rotary Pump (80 m^3/h)
	Cryo Pump (DN 320)
	Helium Leak Detector (MDL < 10^{-11} mbar.l/s)
	Gauge head and Controller for vacuum measurement up to 10^{-9} mbar
	Scroll Pump(15 m^3/h)
	Scroll Pump(40 m^3/h)
	Diffusion Pump Fluid
	Vacuum components (Bellows, elbow, reducer and other fittings)
	4 inch Diffusion pump, Ultimater pressure : 5x10-8 mbar, DN25 Rotary Pump, ultimate pressure: 5x10-3 mbar
Manufacturing Switching Magnet	Switching dipole magnet : weight ~200 kg, Pole dia~200 mm
Procurement of power supplies	
High current power supplies	
Ion Source Power Supplies (Floating at 40kV)	165A, 12V DC 0.05% (500 ppm)
	120V, 40A DC 500 ppm stability
	10V, 10 A DC, 100ppm
Glaser Lens P/S	400A, 20V DC, 100 ppm
Main Coil P/S	150A, 100V DC, 10 ppm

Switching Magnet P/S	2 x ±200A, 60 dc 100 ppm
Beam Line Power Supplies	4 x 90A, 30 V DC 100 ppm
	4 x ±5A, 30V DC, 100ppm
High voltage power supplies	
Ion Source Bias for MC-18	- 40kV, 15mA
Ion Source Bias for VECC Ion S	- 40kV, 30mA
Einzel Lens for MC-18	- 30kV, 5mA
Einzel Lens for VECC Ion Sour	- 30kV , 40mA
Inflector for MC-18	- 15kV , 10mA
Inflector for MC-18	+ 15kV , 10mA
Ion Source Puller for MC-18	+ 6kV , 100mA
Ion Source Puller for VECC Ion	+ 10kV , 300mA
Mechanical and electrical machineries & equipment for the workshop	Portable pulsed TIG cum MMA welding machine, 5-200A
Development of ion-source and Injection beam line	SmCo and NDFeB Permanent magnets, Filament, Aluminium chamber, Feedthrough
RF test stand	Mechanical fabrication as per drawing
Fabrication of Vacuum Chamber assembly	Aluminium chamber,Outer Dia approx 1500 mm, Inner dia Approx 1350 mm, Height approx: 900 mm, 6 penetrations in the median plane, Inside surface roughness <=0.8 micron, Leak tightness better than 1x10-9 mbar.lit/s, suitable for use under vacuum 1x10-7 mbar.
Mechanical and electrical machineries, equipment for the test workshop	Crane, 500 kN, EOT
LCW pump and Heat Exchangers	LCW system, Flow: 20 m^3/hr (333 lpm) Temperature range: 15°C to 20 °C Supply pressure: 8 bar Power to be removed: less than 110 KW (Single beam) Conductivity: less than 1 µS/cm
Beam line components	Aluminium diagnostic chamber with six ports, Faraday cup, Beam viewer, Quadrupole magnet
Chiller System	Chiller 210 TR / 250 TR
Recondensation system components	4.2 K PT Cryocoolers with remote motor assembly, Cooling capacity at the 2nd stage @ 50Hz → 1.3 W @ Temperature 4.2 K, Cooling capacity at the 1st stage at 50Hz → 35 W @ Temperature 48 K or at lower Temperature, Lowest temperature with no load → 3.0 K
	Stainless Steel braided metal hose 1" ID, 792" long.
Insulated Multifilament NbTi Superconducting Wire,	No of filament: 54±5, Cu to Sc ratio: 1.3, Critical current (Amps @ 4.2K): ~ 780 @ 5T, ~ 480 @ 7T, ~165@9T, Continuous length (without joint): ≥ 3 Km
DM water & pneumatic system	Chilled water system, 210 TR, Delta T = 12 Deg. C
Vacuum, Beam line and	Aluminium beam pipe
RF electrical equipment & instruments	Tetrode tube, contact fingers, contact springs, signal generators, oscilloscopes, X-ray detectors, ceramic insulators

Radiation monitoring instruments	
Hot cells etc.	
RF mechanical system components	Fabrication, supply, testing of K130 RF cavity components:Dee, Dee Stem, Trimmer Capacitor, Beam Probe track, Puller track
	Manufacturing and supply of DEE Shells and DEE shell Ribs for DEE assembly of Superconducting Cyclotron
Central region components	Mechanical fabrication as per drawing
Magnetic field measurement device	Mechanical fabrication as per drawing
Components for beam chopper and interlocks	Components for beam chopper and interlocks(1kV-100 ohm RF-vacuum feedthrough, 0.05dB loss 100 ohm meander transmission line on alumina substrate,0.2nV noise-60 dB gain-LNA, 0.5 ns response time Fast current beam Transformer, 1ns pulse , 5kV nanosecond pulser)
Beam diagnostics components	Collimator, Faraday cup for beam power of 1.5 kW and 15 kW, Beam viewer
LCW system components	SS 316 make horizontal split casing centrifugal LCW pump-motor set for DM water applications, Capacity: 275 m3/hr with 125m head.
	SS Multistage vertical Inline centrifugal pump-motor set, Capacity: 25 m3/hr to 60 m3/hr range with 125 m head.
	Liquid/Liquid Gasketed plate and frame Heat Exchanger, Capacity: 105 m3/hr with temperature difference 10 deg C.
	FRP Induced draft cross flow cooling tower, Capcity: 450 TR
	Ultrapure water production system consisting of EDI for production of 900 LPH ultrapure water from the available low TDS water.
	Non magnetic water flow indicating switches, flow range: 0 to 2 lpm, set point: 0.6 lpm
	Water treatment and polishing unit for production of demineralised water having conductivity less than 1 µs/cm.
	CPA Reverse Osmosis membrane having salt rejection rates 99% or higher,Size: 4 to 8 "
	Screw type air cooled Air compressor with air treatment system, capacity: 120 cfm with 7 bar discharge pressure.
	SS 316 L Seamless pipe & fittings, SS ball valves, glove valves, flow control valves etc.
	Push-on hose and polyamide tube for DM water applications, working pr: 15 bar, temp: 80 °C (max)
Cryogenic system components	helium gas purifier capacity 20 m3/hr., Filter, butterfly valves, ball valves, pressure safety valves, check valves etc., Molecular Sieve, desicant adsorber, activated charcoal for impurity removal, helium gas cylinder quads 4 x 50 cylinders purity grade A helium
Instrumentation and control system components	Stripper movement drive system consisting of Linear guides, Stepper motors and drivers, linear potentiometers, supports, valves, bellow, feedthrough, Insulator, Indexing motor and plate etc.

Compressed air system components	Air Cooled Oil Lubricated Reciprocating Type Air Compressor, Free air delivery in CFM @ 10.0 kgf/cm2 → 15-21 CFM
Miscellaneous components, including spares and accessories	Procurement of Cu, Bellows, fasteners for K-130, Silver plating of Trimmer capacitor, Foil contact bar Dee-Stem contact bar fastners etc.-K130 cyclotron, standard nut, bolts, lubricating oils, etc.
Vacuum tubes	Aluminium tube (Rectangle and round)

Microwave generator	2.45 GHz, 500 watt
Thin film deposition unit	10-7 mbar vacuum, thin film of 0.1- 0.5 micron thickness
Recovery SS helium pipeline	as per drawings to be provided by VECC
High voltage power supply	20 kV, 10 mA
XY manipulator and controller	UHV compatible, XY range of ± 100 mm
UPS	20 kVA
ARM Microcontroller	32 bit, 72 MHz, 512 KB
12-bit Digital to analog converter	Sampling rate 125 ksps
RF Switch	Frequency Range: 10 to 2500 MHz
Amplifier	DC to 6000 MHz, Gain: ≥ 13 dB @ 100 MHz, VSWR: 1.10:1
Power Detector	up to 8000 MHz, Dynamic Range: -60 to +5dB
CCD camera	Resolution 780 x 580 pixels, Pixel Size 8.5 µm ; 70 fps
Faraday cup and diagnostic components	HV compatible, 1 kW, water cooled
HPR system	as per drawings to be provided by VECC
Vacuum pumps	350 - 600 lps; up to 10^{-9} mbar
Waveguide and high power load	1300 MHz, 30 kW
Cryomodule mechanical assy	as per drawings to be provided by VECC
Niobium	2.8 mm thick, RRR 100-300
Nb-Ti sheet	various thickness
OFHC components	as per drawings to be provided by VECC
RF modules	55-88MHz, 1000W, RF Pallet
UHV beam-line	as per drawings to be provided by VECC
RF components (Socket base for RF Tube, tetrode/triode, up to 100 kW)	
Cathode (Thermionic Gridded Cathode, dispenser type)	
Vacuum gate valve	DN100 CF and DN160 CF, 10-8 mbar, pneumatic
Air compressor	Single Stage, 100 ± 10 CFM, 10 kg/cm^2
High purity N2/SF6 gas system	
RF tubes	5 kW Triode, 50 kW Tetrode, up to 110 MHz
Silicon detector	500 µm , active area 50 mm^2
Receptacles and connectors	3-core, 350kV
Ion pumps	140 lps and 270 lps, Ultimate pressure : 5 x 10-10 mbar
Helium Cryoadsorber	Flow rate 60 SCFM at 17 bar, output purity < 5 ppm
Helium recovery compressor	120 bar, 20 nm^3/hr
Helium Purifier	as per drawings to be provided by VECC

Cryogenic Transfer Line	vacuum jacketed, LN2 cooled
High current power supply	800 A, 80V
Sub-atmospheric line	vacuum jacketed
Preamplifie	± 1 kV, bias resistance ≥ 100 MΩ, charge sensitivity ≥ 20 mV/MeV
SS diagnostic chamber	as per drawings to be provided by VECC
Scintillation screen	CeYAl Garnet, yield ≥15000 Photons / MeV, peak Emissions wavelength 520 nm
Cooling tower spares	
Iodine-123 Production System (from enriched Xe-124 gas) along with an Automated Chemistry Module	For Synthesis Of [123I]NaI Radiopharmaceutical for the IBA Cyclone-30 Cyclotron installed at Kolkata.
High precision high voltage power supply (Spellman, CAEN)	High voltage power cupply for GEM chambers at CBM-FAIR
High precision low voltage power supply (CAEN/Agilent)	LV supply for GEM and RPC chambers in CBM at FAIR
Water flow controllers	For cooling of CBM detectors
Multilayer varying size PCBs (largest: 1m x 1m)	GEM chamber readout and drift PCBs
Polycarbonate edge frames and spacers	For assembly of GEM and RPC detectors
Optocouplers	For HV supply of GEM chambers
SMDs	For detectors in CBM
SHV connectors	For HV in detectors
Ceramic divider	GEM chamber HV distribution
PU insulation spray (cans of large quantities)	GEM chambers and RPC insulation spray
Spartan-7 series (altera and Xilinx) FPGA	Detector (GEM, RPC, FOCAL) readout system
FPGA-based custom built CRI boards	Required for DAQ of GEM and RPC detectors in CBM at FAIR
Specialized miniaturised heavy duty connectors for LH and HV	For detectors in CBM
Specialised IC	CBM detectors
Large size GEM foils (1.5 m x 40 cm) of large numbers	GEM chambers of CBM
HGROC ASIC and boards (large numbers)	For reading Si-detectors in ALICE-FOCAL
Residual Gas Analyser	up to Mass number 100
Combined Roots-Rotary pump	Roots capacity 2600 cu. m. / h
2-dim Delay-Line-Detector incl. microchannel plates(L/D 60:1, 1.5 mm thick, 50 mm outer diameter), active diameter > 45 mm & compatible electronics	For phase detection of trapped ion signal.
Diamond Anvil Cell	For studying samples under high pressure
Linear Actuator : Operational in vacuum and cryogenic condition	Required for pre-cooling arrangement in Penning Trap setup
Liquid Helium Dewar	Storage of liquid helium for trapping experiment

Microwave Circulators / Isolators	for different frequency and power levels
Rolling machine	Rolling machine capable of reducing the thickness of metals plates for introduction of heavy deformation. It should be capable of deforming ferrous and non-ferrous alloys including Niobium-based, Ta-based, W-based, Mo-based alloys etc. It should be capable of handling initial sample thickness of 5-6 mm.
High resolution X-ray diffractometer	X-ray diffractometer with microfocus beam, 2D detector (high-end detector) and high temperature sample stage (up to 1200 deg C) capable of working in both Grazing Incidence XRD (parallel beam optics) and Wide-angle XRD (BB-geometry) modes.