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Ref.: BARC/BTDG/ASP/2021/54

Date: 24/12/2021

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Subject: Inviting quotations for fabrication of CCPS for X band Modulator

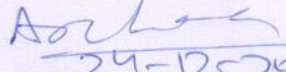
You are requested to quote for fabrication of CCPS as per details given in annexure I.

- 1) For any clarifications the supplier can contact, Sh. Ankur S Patel, SO/F, APPD on any working day (Monday to Friday) on telephone Nos. 25592644 or email: aspatel@barc.gov.in.
- 2) Since the goods to be supplied against this work order are meant for research purpose of a research institution under the department of Atomic Energy of Government of India, CGST and SGST at the rate of 2.5% each is payable as per notification number 47/2017 integrated Tax (Rate) dated 4.11.2017 issue by ministry of finance. The indenter shall make available the GST exemption certificate for it. Delivery schedule preferred within 4 months after issuing work order.
- 3) Payment for the above work will be made after satisfactory completion of job and on production of bill & advanced stamped receipt along with the copy of registration. No advance payment will be made for this work. Income-tax @2% & surcharge on Income-tax @15% will be deducted from the bill and a TDS (tax deducted at source) certificate will be issued as per Income-tax rules. Suppliers should submit their offers along with the following information.
(a) period of validity, terms & conditions of the offer, (b) Approximate period of completion of the task and (c) copy of the registration and income-tax clearance certificate.

Additional Information:

Your sealed quotation (in your letter head) including all details, like taxes to be paid, transport charges etc., duly indicating our reference number mentioned above, due date & time of opening of quotations on the envelop, may be sent to "Head, APPD, Engg. Hall No.4, Trombay, MUMBAI-400085", on or before, 7th January 2022. It is requested that the tender must be sent by Speed-post. The quotations received after the due date & by FAX/email will not be considered.

Yours faithfully,


24-12-2021
Dr. Archana Sharma
GD, BTDG, BARC

डॉ. (श्रीमती) अर्चना शर्मा / ARCHANA SHARMA
निदेशक / Director
किरणपुंज प्रौद्योगिकी विकास वर्ग
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भा.प.अ. केंद्र / B. A. R.C.
ट्रॉम्बे, मुंबई / Trombay, Mumbai - 400 085.

Copy to: A.P.O., GSS Section, Central Complex, BARC.

Annexure 1

Capacitor charging power supply is to be fabricated for the pulse Modulator. The capacitor charging power supply (CCPS) has the rating as below:

Capacitor to be charged: $1.2\mu\text{F} \times 70 \text{ capacitors} = 84 \mu\text{F}$

Average charging rate: 9kJ/s

Output maximum voltage: 1.2kV (in step of 100V)

Repetition rate: 5Hz to 200Hz

Polarity: positive

Output connection: 2kV dc insulation coaxial cable

Mains input: 430V-440V input, 50Hz three phase

Power factor: > 0.8

Pulse to pulse repeatability: $\pm 1\%$

Protection: open circuit, short circuit, over temp, Arc, output reverse pulse protection

Charge current maximum: 40A max.

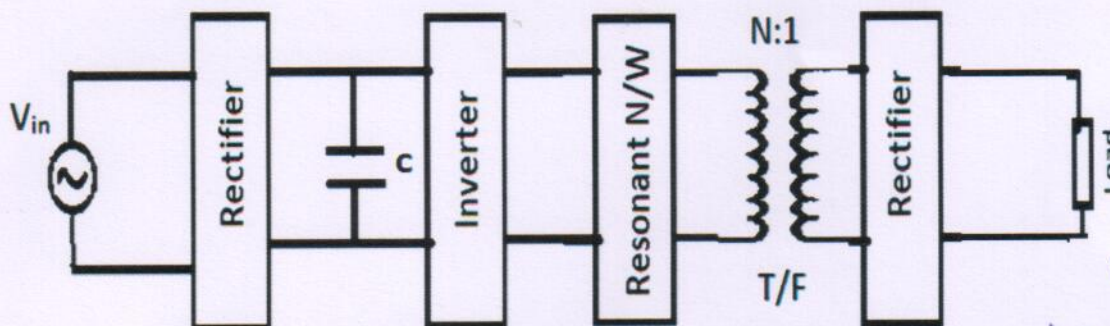
Efficiency: 90% at full load.

Remote operation: Possible through analog control

Front panel indicator: RYB phase, Voltage status, repetition rate,

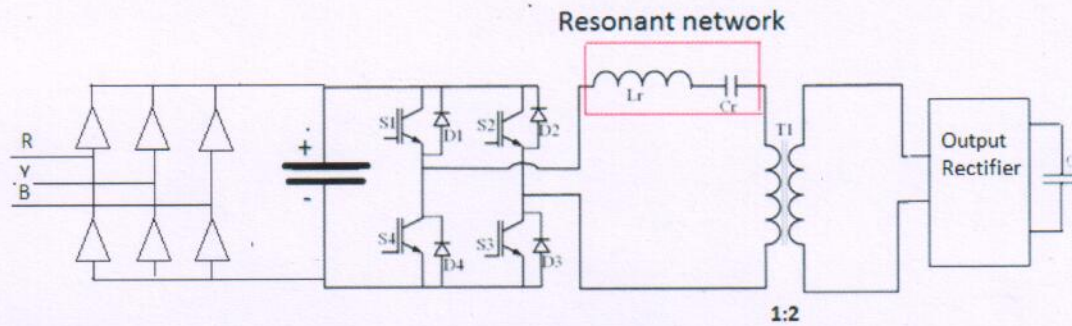
Front panel control: Voltage, repetition rate

Cooling: air cooling.



Basic block diagram of a capacitor charging power supply

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Schematic of Resonant converter based CCPS

- 1) The input of CCPS is three phase input supply through mains which goes inside through proper connection.
- 2) The fuses need to put to protect over current.
- 3) MCCB control to be provided at the front panel.
- 4) Two rectifiers can be used, one for low current and one for higher current for softstart to charge the DC link capacitor. The burden resistor has to be connected parallel to DC link capacitor to discharge it.
- 5) IGBT inverter should be used with series resonant circuit to provide constant current and ZCS. The circuit should be operated in discontinuous mode and switching frequency and resonant frequency should be 25 kHz and 55 kHz respectively.
- 6) High frequency transformer of 1:2 turns ratio should be used with rectifier circuit.
- 7) Reversal protection circuit has to be implemented for the protection.

PCBs

- 1) Feedback resistor PCB

This PCB converts the high voltage of 1kV to 10V corresponding voltage.

- 2) Low voltage supply for control circuit

SMPS of 15V, 12V 24V supply

- 3) Isolation PCB

This PCB converts the feedback voltages in the isolated voltage, which can be further used for the control.

- 4) Control PCB

This PCB compares the feedback voltage to the set voltage and shutdown signal will be generated for end of charge. The Inhibit signal should be generated from the control circuit to match the required pulse repetition rate.

Rack size should be (19 inch (width) * 10U height * 40 inch depth)

PCBs should be fabricated after the approval of circuit from the BARC official person.

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Bill of Material

Sr no.	Description	Quantity	Make & type
1	431.8mm×800mm×10U BIN	1	Aluminum Alloy + Zinc coated
2	5 pin circular Receptacle	1	AMPHENOL/MS-31102R-18-11P
3	5 pin Circular connector	1	AMPHENOL/MS-3106F-18-11
4	600VAC, 32A Fuse	3	Cooper BUSSMAN/FWC-32A10F
5	Fuse Holders	1	Cooper Bussmann/CHM3DNIU
6	32A EMI FILTER	1	ELCOM/EP355-30
7	1700V,110A Diodes	3	SEMIKRON/MD7LU7016
8	ALUMINIUM Heat sink Type-1	1	SEMIKRON/P16/200
9	0.47MFD, 2KV Snubber capacitors	6	ALCON/SIOU472000NKAXLMP4A
11	50E±1%, 15W Diode snubber Resistors		
12	1700V,100A IGBT	2	SKM100GB176D
13	ALUMINIUM Heat sink type-2	1	SEMIKRON/P16/200
14	SMPS	1 set	15V, 24V, 5V, ±15V
15	50E,20W soft Charging Resistor	3	VEPL/VPR20
17	4700UF, 450V DC link Capacitors	2	ALCON/PG-6D1
18	27K,20W Bleeder resistor	2	PEC/PYP10
20	0.1uF,1kV,IGBT Snubber capacitor	2	ALCON
21	IGBT gate driver with FRC connector	4	PCB to be made (Drawing provided by BARC)
22	PTC thermistor	1	Vishay/ PTCSGM3T081DBE
23	47nF,1.5kV,55kHz, resonant capacitor	3	ALCON/SIU0473000B1K_0
24	Resonant Inductor	1	Design provided by BARC
25	Transformer cores	3	UU12620
27	Primary winding (SWG27 bunched 40 nos.)	4 meters	Copper bunched wires (SWG27 bunched in 40 litz wires)
28	Secondary winding (SWG27 bunched	220meters	Copper bunched wires (SWG27 bunched

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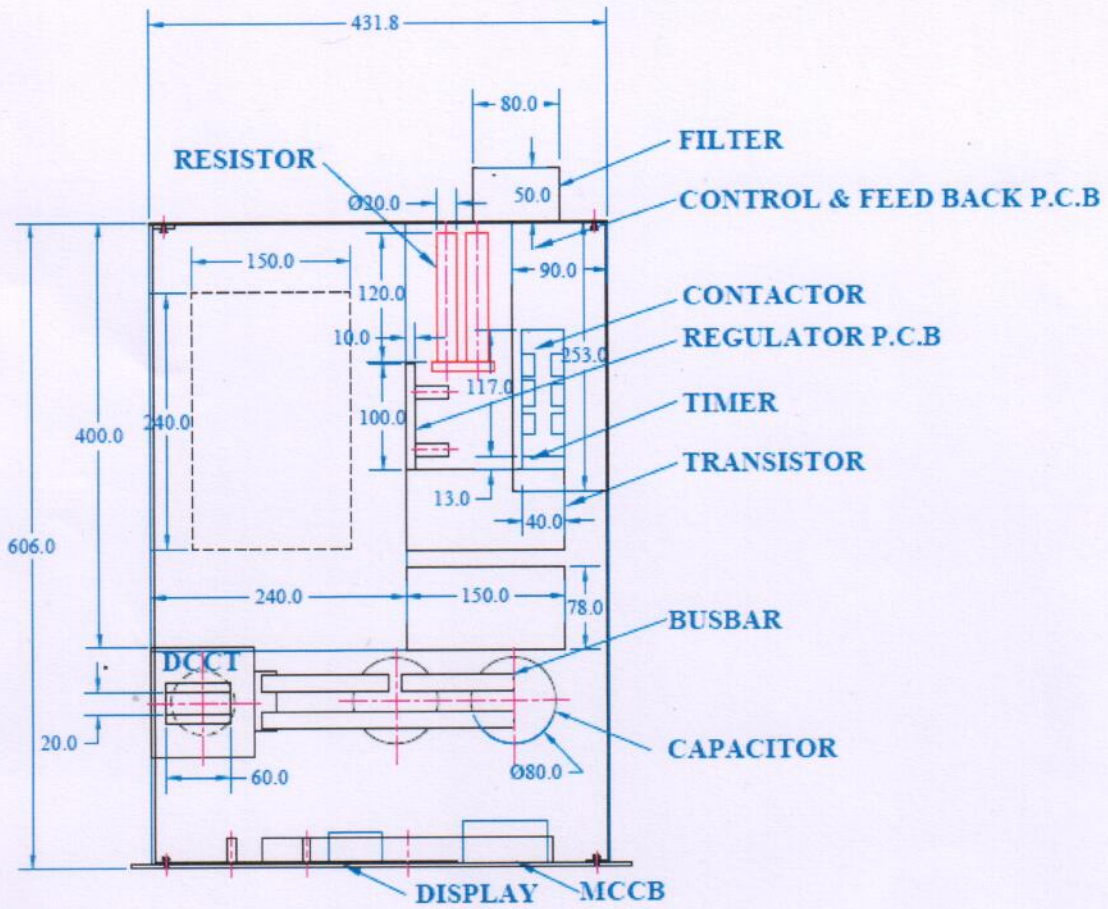
	in 8 litz wire)		in 8 litz wire)
30	45A open loop Hall Effect Current transformer	1	PANUCATT DEVICES/CS-45AL
31	10k Ω , 100W charging resistor	2	VEPL/VPR100
32	230V Red Led Indicator	1	MARL/514-105-76
33	230V Yellow Led indicator	1	MARL/514-111-76
34	230V Blue Led Indicator	1	MARL/514-114-76
35	415V, 3 Phase 32A MCCB	1	ABB/SH203M-C32
36	DIN RAIL-100mm Rail	1	ELMEX
37	220-240V,50Hz, 0.14/0.12A EXHAUST fan	1	SUNON/A2123-HBT
38	415V,3Phase, 40A contactor	1	L&T/MNX40
39	12V DC Push Button with indication Red color	1	EAO, HV ON
40	12V DC push button with Indication Green color	1	EAO,HV OFF
41	600ST timer	1	SELEC
42	HV charging cables suitable for 50kV insulation	5meter	NEXGEN/2297
43	Voltage display	1	
45	10 Turn, 10K Ohm Potentiometer	1	BOURNS/3500S-2-103L
46	22.2mm DIA fifteen Turn dial	2	BOURNS/H-23-6A
47	10 Turn, 50KOhm Potentiometer	1	Bourns/35000-2-503L
48	RG cable	10 meter	HELUKABLE/RG58
49	12 AWG TEFLON WIRE RED COLOUR	15 meters	
50	12 AWG TeFLON WIRE BLACK COLOUR	15 meters	
51	12 AWG TeFLON WIRE GREY COLOUR	15 meters	
52	22 AWG TeFLON WIRE RED COLOUR	15 meters	

Approved

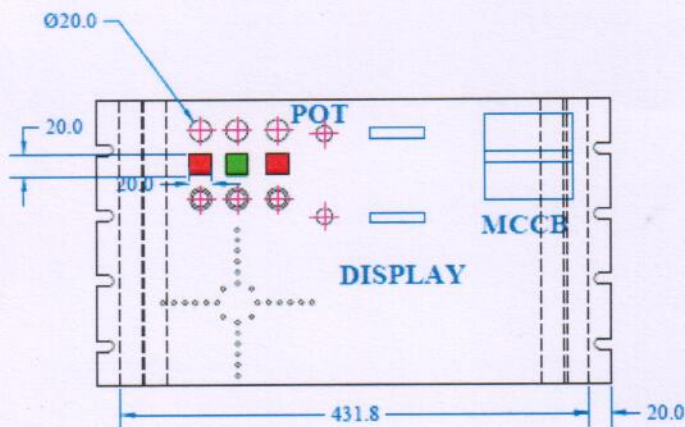
53	22 AWG TeFLON WIRE YELLOW COLOUR	15 meters	
54	22 AWG TeFLON WIRE BLUE COLOUR	15 meters	
55	22 AWG TeFLON WIRE GREY COLOUR	15 meters	
56	HV Flexible Cable ,2kV	1meter	
57	High voltage feed through		
58	5mm RED LED	3	OV,OC,OT
59	LED holder for 5mm LED	3	
60	Grounding STUD	1	
61	50 pin D SUB connector	1	
62	Cable Glad	2	
63	Transformer tank		
64	Amphenol connector	3 pin	MIL standard
65	Primary connection to tank	2 pin	

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Mounting Details



TOP VIEW



FRONT VIEW

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