



Internal Technical Report

GMRT/RFI/3 – 12th January 2021

**Report on RFI measurement of Grandstream make VOIP to PSTN
adaptor with shielded enclosure**

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Revision	Date	Modification/ Change
Ver. 3	28 th December. 2020	Third Version

Objective:

To find out radio frequency interference coming from the **Grandstream make VOIP to PSTN adaptor with aluminum shielded enclosure.**

(Model No. HT801)

Specifications:

Interfaces	
Telephone Interfaces	One (1) FXS port
Network Interfaces	One (1) 10/100Mbps auto-sensing ethernet port (RJ45)
LED Indicators	POWER, INTERNET, PHONE
Factory Reset Button	Yes
Voice, Fax, Modem	
Telephony Features	Caller ID display or block, call waiting, flash, blind or attended transfer, forward, hold, do not disturb, 3-way conference
Voice Codecs	G.711 with Annex I (PLC) and Annex II (VAD/CNG), G.723.1, G.729A/B, G.726, iLBC, OPUS, dynamic jitter buffer, advanced line echo cancellation
Fax Over IP	T.38 compliant Group 3 Fax Relay up to 14.4kpbs and auto-switch to G.711 for Fax Pass-through
Short/Long Haul Ring Load	5 REN: Up to 1km on 24 AWG
Caller ID	Bellcore Type 1 & 2, ETSI, BT, NTT, and DTMF-based CID
Disconnect Methods	Busy Tone, Polarity Reversal/Wink, Loop Current
Signaling	
Network Protocols	TCP/IP/UDP, RTP/RTCP, HTTP/HTTPS, ARP/RARP, ICMP, DNS, DHCP, NTP, TFTP, SSH, STUN, SIP (RFC3261), SIP over TCP/TLS, SRTP, TR-069
QoS	Layer 2 (802.1Q VLAN, SIP/RTP 802.1p) and Layer 3 (ToS, DiffServ, MPLS)
DTMF Method	In-audio, RFC2833 and/or SIP INFO
Provisioning and Control	HTTP, HTTPS, SSH, TFTP, TR-069, secure and automated provisioning using AES encryption, syslog
Security	
Media Control	S RTP TLS/SIPS/HTTPS
Management	Syslog support, SSH, remote management using web browser
Physical	
Universal Power Supply	Input: 100-240VAC, 50-60Hz Output: 5.0VDC/1.0A
Environmental	Operational: 32° – 104°F or 0° – 40°C Storage: 14° – 140°F or -10° – 60°C Humidity: 10 – 90% Non-condensing
Dimension and Weight	Dimensions: 100mm x 100mm x 29.5mm Weight: 102 g
Compliance	
FCC: Part 15B	
CE: EN55032, EN55024, EN61000-3-2, EN61000-3-3, EN60950-1	
RCM: AS/NZS CISPR22, AS/NZS60950.1, S003	
K.21	

Test setup:

1. Measurement is done at 3 meter distance with LPDA antenna used as a receiving antenna inside the Multi-Purpose Building (MPB).
2. LPDA Antenna is connected with 20dB post-amplifier.
3. Measurement is done in the horizontal and vertical polarization mode with various test conditions as follows.
 - a) Adaptor ON without shielded enclosure.
 - b) Adaptor ON with shielded enclosure.
4. Shielded enclosure has been tested with **two different configurations by using shielded connectors D-Type and RJ45 (Chassis mount)** to ensure better attenuation or isolation from DUT.
5. Measurement frequency range: 30MHz to 2 GHz frequency range.
6. Basic Beetel make landline phone used as a receiver with this adaptor.

Measurement Results:

Shielded Enclosure using D-Type Shielded Connector

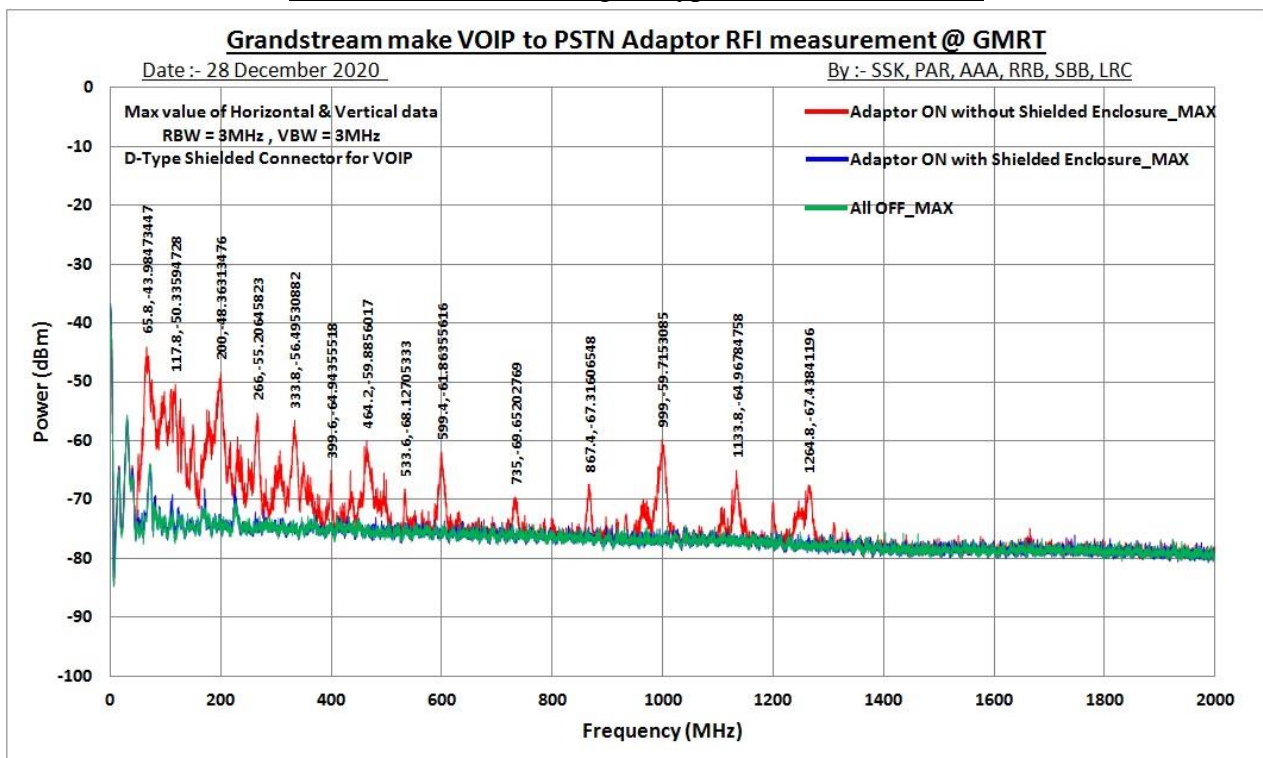


Fig.1:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 0-2000MHz.

1. **Red line** shows **broad band RF noise 1-30dB** above the noise floor level in 0-2000MHz frequency band when **Adaptor + Phone ON in Call mode without shielded enclosure** in trace Maxhold mode.
2. **Dark blue line** shows **no broad band RF noise** above the noise floor level when **Adaptor + Phone ON in Call mode with shielded enclosure** in trace Maxhold mode.
3. **Green line** shows the ambient noise floor level in the **All OFF** condition with trace in Maxhold mode.

Note: - The periodic lines have been observed at the interval of 133MHz in the frequency band from 0-2000MHz **when Phone ON without shielded enclosure.**

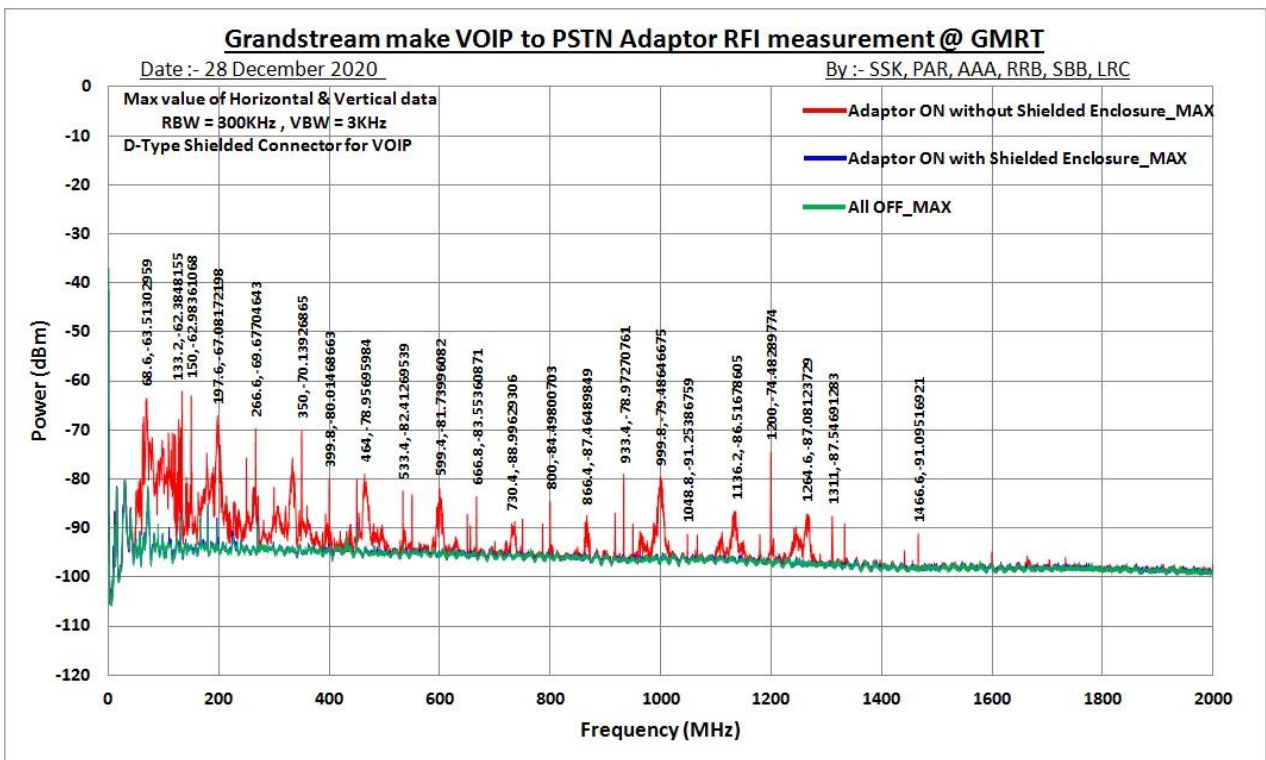


Fig.2:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 0-2000MHz.

1. **Red line** shows **broad band RF noise 1-30dB** above the noise floor level in 0-2000MHz frequency band when **Adaptor + Phone ON in Call mode without shielded enclosure** in trace Maxhold mode.
2. **Dark blue line** shows **no broad band RF noise** above the noise floor level when **Adaptor + Phone ON in Call mode with shielded enclosure** in trace Maxhold mode.
3. **Green line** shows the ambient noise floor level in the **All OFF** condition with trace in Maxhold mode.

Shielded Enclosure using RJ-45 Shielded Connector

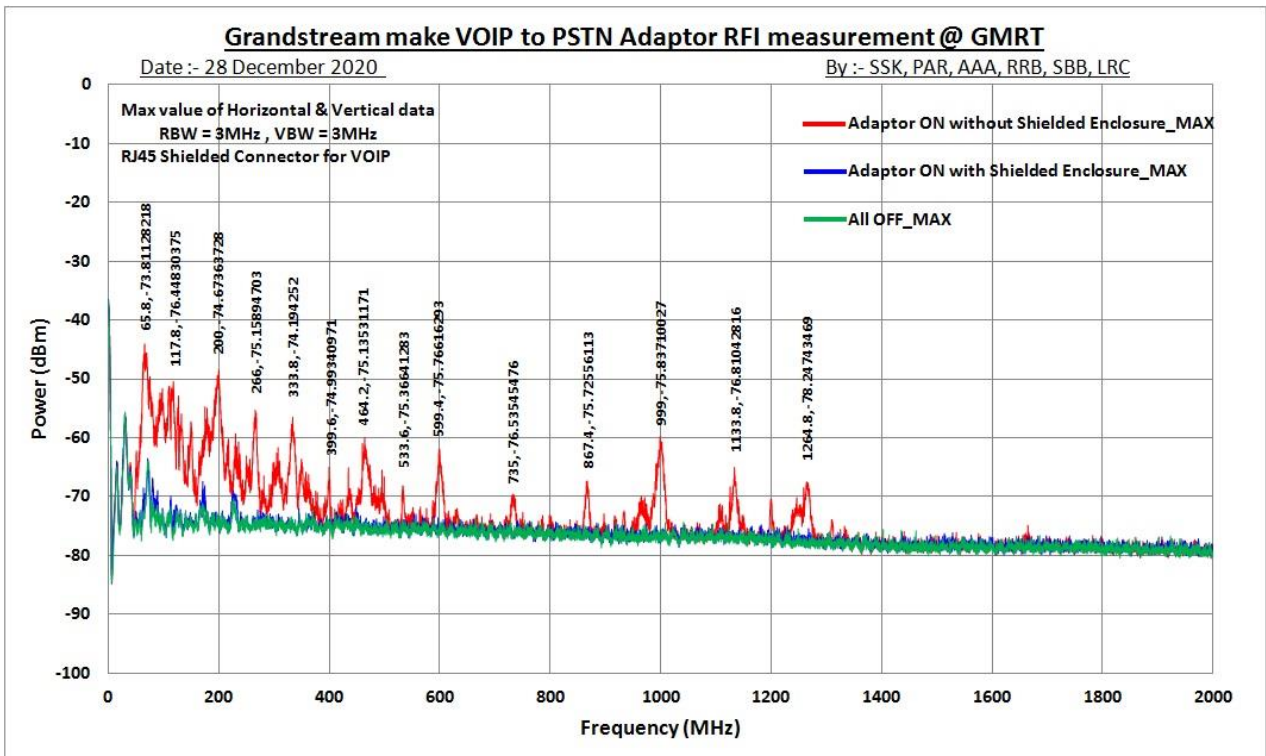


Fig.3:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 0-2000MHz.

1. **Red line** shows **broad band RF noise 1-30dB** above the noise floor level in 0-2000MHz frequency band when **Adaptor + Phone ON in Call mode without shielded enclosure** in trace Maxhold mode.
2. **Dark blue line** shows **no broad band RF noise** above the noise floor level when **Adaptor + Phone ON in Call mode with shielded enclosure** in trace Maxhold mode.
3. **Green line** shows the ambient noise floor level in the **All OFF** condition with trace in Maxhold mode.

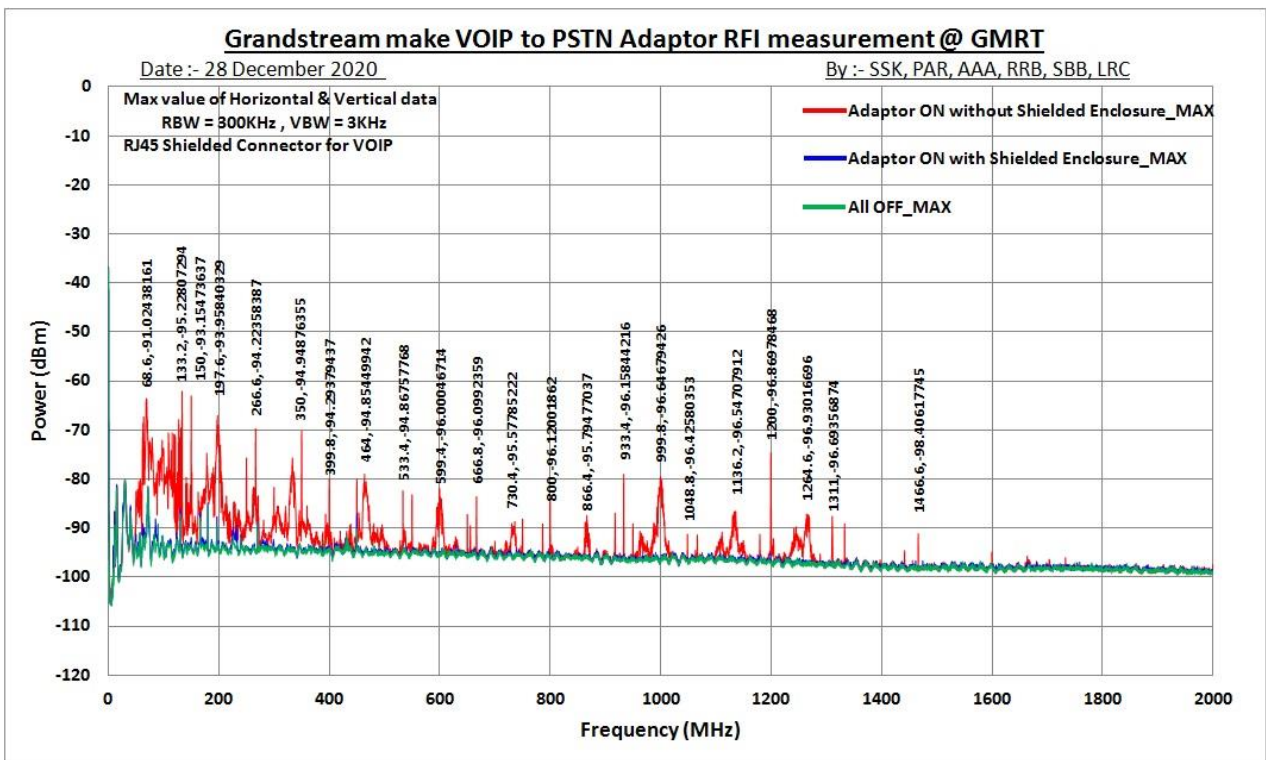


Fig.4:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 0-2000MHz.

- Red line** shows **broad band RF noise 1-30dB** above the noise floor level in 0-2000MHz frequency band when **Adaptor + Phone ON in Call mode without shielded enclosure** in trace Maxhold mode.
- Dark blue line** shows **no broad band RF noise** above the noise floor level when **Adaptor + Phone ON in Call mode with shielded enclosure** in trace Maxhold mode.
- Green line** shows the ambient noise floor level in the **All OFF** condition with trace in Maxhold mode.

Images:



Image1,2&3: Grandstream make VOIP to PSTN Adaptor Top and Rear view with Beitel Basic Phone

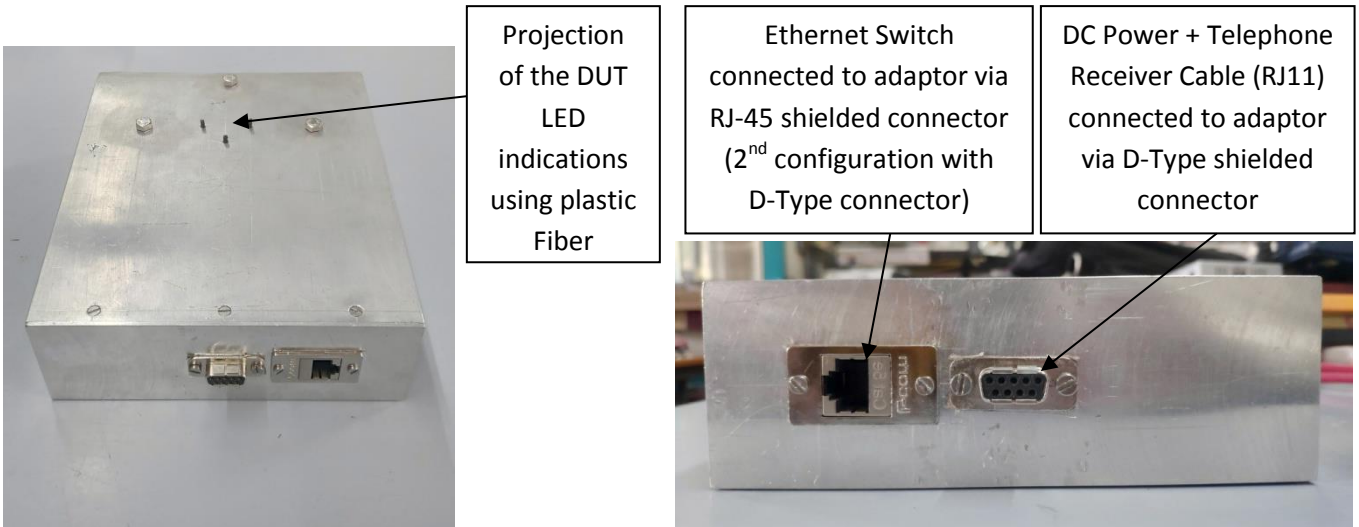


Image4&5: Grandstream make VOIP Adaptor + Phone with aluminium shielded enclosure



Image 6: Front and rear side view of external transformer based 5V DC power supply

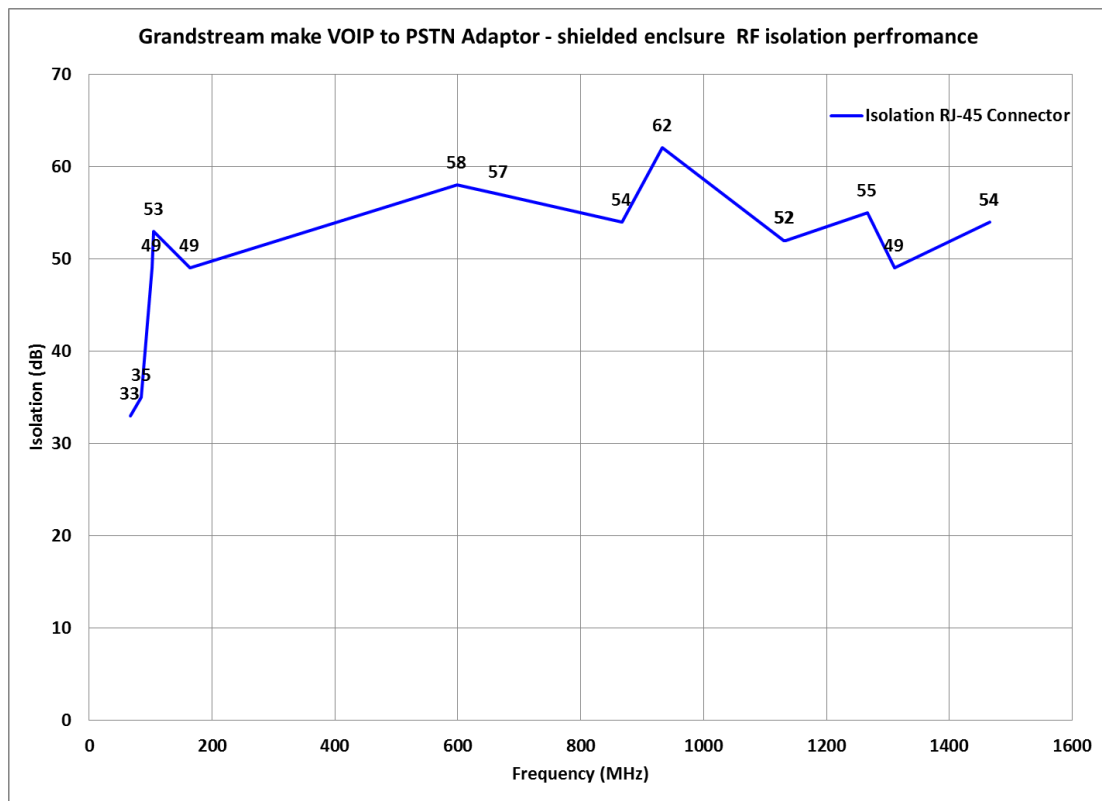


Image7: The RF isolation measurement for the lines produced by the VOIP adapter with and without shielded enclosure.

Conclusion:-

The new design of shielded enclosure for VOIP adapter to be used at the antenna base for telephone connectivity gives good minimum RF isolation from 33dB to 62dB in the 66MHz to 1600MHz band. The Ethernet enclosure also provides around 40dB isolation hence total isolation for VOIP adapter would be around 70dB.

Features of the shielded enclosure:

1. Shielded and filtered 9 pin D type connector for Telephone (RJ11) and for DC power supply.
2. Shielded and filtered RJ45 connector for LAN connectivity.
3. LED indication for DC power, phone and internet connectivity indication on the top unit provided with plastic fiber.
4. Use of existing AC adapter inside the shielded Ethernet enclosure prevented additional shielding for it.
5. Use of shielded and filtered 9 pin D type connector or 2 pin feed through on the front panel of the shielded Ethernet enclosure for telephone connectivity.
6. A separate transformer based +5 V DC power supply has been designed to provide power and could be used in the GMRT lab building.
7. The detailed mechanical drawing of the enclosure has been made with the help taken from Shri. Rajesh Lolap which will be helpful for mass production of the enclosures.
