National Centre for Radio Astrophysics

Report on RFI measurement of Grandstream make IP phone

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Revision	Date	Modification/ Change
Ver. 1	27th October. 2020	First Version

Objective:

    To find out radio frequency interference coming from the **Grandstream make IP phone**.

<div align="center">

(Model No. GXP1625)

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Specifications:

Protocols/Standards	SIP RFC3261, TCP/IP/UDP, RTP/RTCP, HTTP/HTTPS, ARP/RARP, ICMP, DNS (A record, SRV, NAPTR), DHCP, PPPoE, SSH, TFTP, NTP, STUN, SIMPLE, LLDP-MED, LDAP, TR-069, 802.1x, TLS, SRTP
Network Interfaces	Dual switched auto-sensing 10/100 Mbps Ethernet ports, integrated PoE (GXP1625 only)
Graphic Display	132 x 48 backlit graphical LCD display
Feature Keys	2 line keys with dual-color LED and 2 SIP accounts, 3 XML programmable context sensitive soft keys, 5 (navigation, menu) keys. 13 dedicated function keys for MUTE, HEADSET, TRANSFER, CONFERENCE, SEND and REDIAL, SPEAKERPHONE, VOLUME, PHONEBOOK, MESSAGE, HOLD, PAGE/INTERCOM, RECORD, HOME
Voice Codecs	Support for G.711μ/a, G.722 (wide-band), G.723, G.726-32, G.729 A/B, in-band and out-of-band DTMF (In audio, RFC2833, SIP INFO), VAD, CNG, AEC, PLC, AJB, AGC
Telephony Features	Hold, transfer, forward (unconditional/no-answer/busy), 3-way conferencing, call park/pickup, shared-call appearance (SCA) / bridged-line-appearance (BLA), Downloadable phone book (XML, LDAP, up to 500 items), call waiting, call history (up to 200 records), off-hook auto dial, auto answer, click-to-dial, flexible dial plan, hot desking, personalized music ringtones, server redundancy & fail-over
Headset Jack	RJ9 headset jack (allowing EHS with Plantronics headsets)
HD Audio	Yes, HD handset and speakerphone with support for wideband audio
Base Stand	Yes, 2 angled positions available, wall mountable
Wall Mountable	Yes
QoS	Layer 2 QoS (802.1Q, 802.1P) and Layer 3 (ToS, DiffServ, MPLS) QoS
Security	User and administrator level access control, MD5 and MD5-sess based authentication, 256-bit AES encrypted configuration file, TLS, SRTP, HTTPS, 802.1x media access control
Multi-language	English, German, Italian, French, Spanish, Portuguese, Russian, Croatian, simplified and traditional Chinese, Korean, Japanese and more
Upgrade/Provisioning	Firmware upgrade via TFTP / HTTP / HTTPS, mass provisioning using TR-069 or AES encrypted XML configuration file
Power & Green Energy Efficiency	Universal Power Supply Input 100-240VAC 50-60Hz; Output +5VDC, 600mA PoE: ieee802.3af Class 2, 3.84W-6.49W (GXP1625 only)
Physical	Dimension: 209mm (L) x 184.5mm (W) x 76.2mm (H) (with handset) Unit weight: 0.73kg; Package weight: 1.1kg
Temperature and Humidity	Operation: 0°C to 40°C, Storage: -10°C to 60°C , Humidity: 10% to 90% Non-condensing
Package Content	GXP1620/1625 phone, handset with cord, base stand, universal power supply, network cable, Quick Installation Guide, brochure, GPL License
Compliance	FCC: Part 15 (CFR 47) Class B CE : EN55022 Class B, EN55024, EN61000-3-2, EN61000-3-3, EN60950-1 RCM: AS/ACIF S004; AS/NZS CISPR22/24; AS/NZS 60950; AS/NZS 60950.1

Test setup:

1. Measurement is done at 3 meter distance with LPDA antenna used as a receiving antenna at Multi-Purpose Building location (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) Phone powered (ON) with external DC (+5V) power supply.
   b) Phone ON with Ethernet cable connected to device at one end and other end connected to Ethernet switch outside the shielded lab.
   c) Phone ON in calling mode (Another phone kept outside the shielded lab connected via Ethernet cable thru network switch)
4. Measurement frequency range: 30MHz to 2 GHz frequency range.
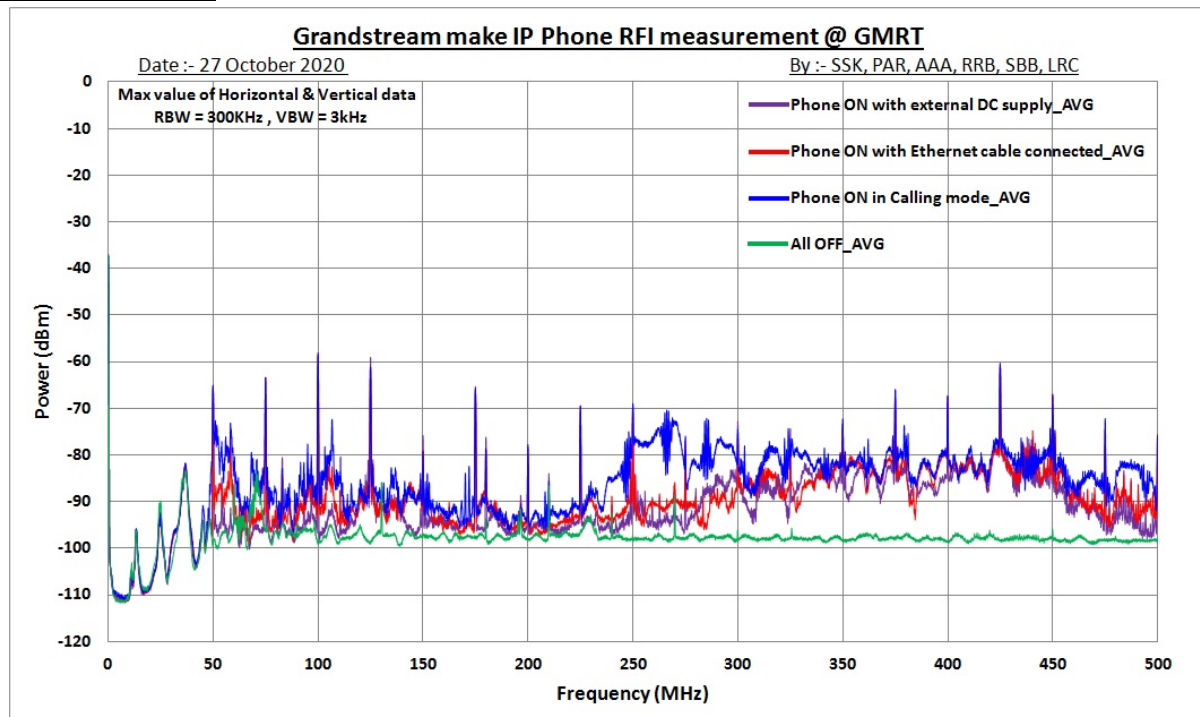
Measurement Results:

Fig.1:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 0-500MHz.

1. **Violet line** shows broad band RF noise 1-20dB above the noise floor level when Phone powered (ON) with external DC (+5V) power supply in trace Average mode.
2. **Red line** shows broad band RF noise 1-20dB above the noise floor level when Phone ON with Ethernet cable connected to device at one end and other end connected to Ethernet switch outside the shielded lab in trace Average mode.
3. **Dark blue line** shows broad band RF noise 1-28dB above the noise floor level when Phone ON in calling mode (Another phone kept outside the shielded lab) in trace Average mode.
4. **Green line** shows the ambient noise floor level in All OFF with trace Average mode.

Note: - The periodic lines have been observed at the interval of 25MHz in the frequency band from 0-2000MHz for all test conditions.
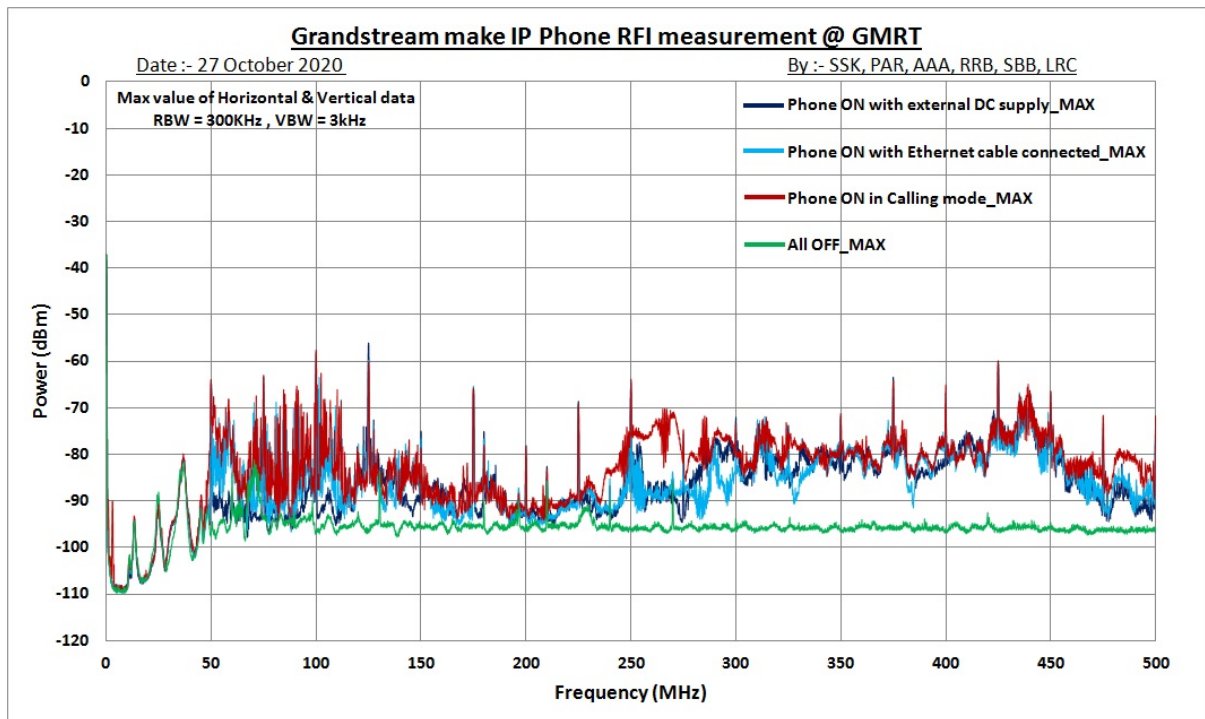
Fig.2:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 0-500MHz.

1. **Navy blue line** shows broad band RF noise 1-27dB above the noise floor level when Phone powered (ON) with external DC (+5V) power supply in trace Maxhold mode.
2. **Sky Blue line** shows broad band RF noise 1-27dB above the noise floor level when Phone ON with Ethernet cable connected to device at one end and other end connected to Ethernet switch outside the shielded lab in trace Maxhold mode.
3. **Brown line** shows broad band RF noise 1-30dB above the noise floor level when Phone ON in calling mode (Another phone kept outside the shielded lab) in trace Maxhold mode.
4. **Green line** shows the ambient noise floor level in All OFF with trace Maxhold mode.
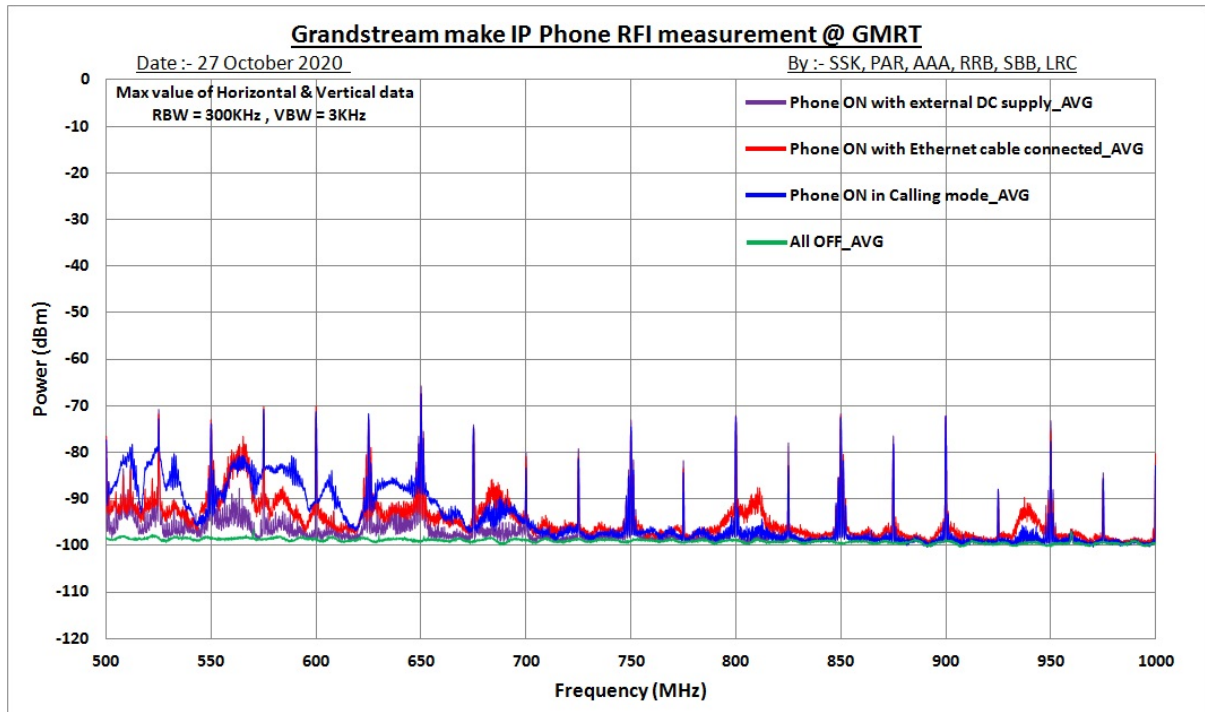

Fig.3:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 500-1000MHz.

1. **Violet line** shows broad band RF noise 1-10dB above the noise floor level when Phone powered (ON) with external DC (+5V) power supply in trace Average mode.
2. **Red line** shows broad band RF noise 1-20dB above the noise floor level when Phone ON with Ethernet cable connected to device at one end and other end connected to Ethernet switch outside the shielded lab in trace Average mode.
3. **Dark blue line** shows broad band RF noise 1-20dB above the noise floor level when Phone ON in calling mode (Another phone kept outside the shielded lab) in trace Average mode.
4. **Green line** shows the ambient noise floor level in All OFF with trace Average mode.
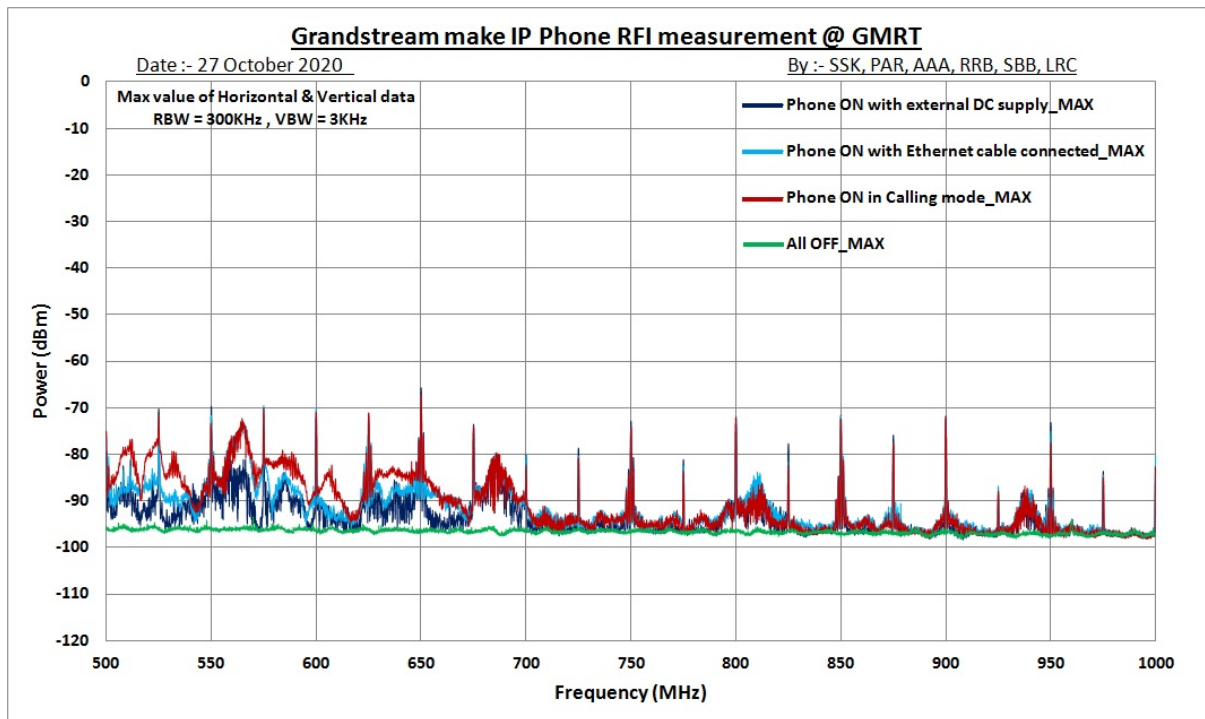
Fig.4:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 500-1000MHz.

1. **Navy blue line** shows broad band RF noise 1-10dB above the noise floor level when Phone powered (ON) with external DC (+5V) power supply in trace Maxhold mode.
2. **Sky Blue line** shows broad band RF noise 1-20dB above the noise floor level when Phone ON with Ethernet cable connected to device at one end and other end connected to Ethernet switch outside the shielded lab in trace Maxhold mode.
3. **Brown line** shows broad band RF noise 1-20dB above the noise floor level when Phone ON in calling mode (Another phone kept outside the shielded lab) in trace Maxhold mode.
4. **Green line** shows the ambient noise floor level in All OFF with trace Maxhold mode.
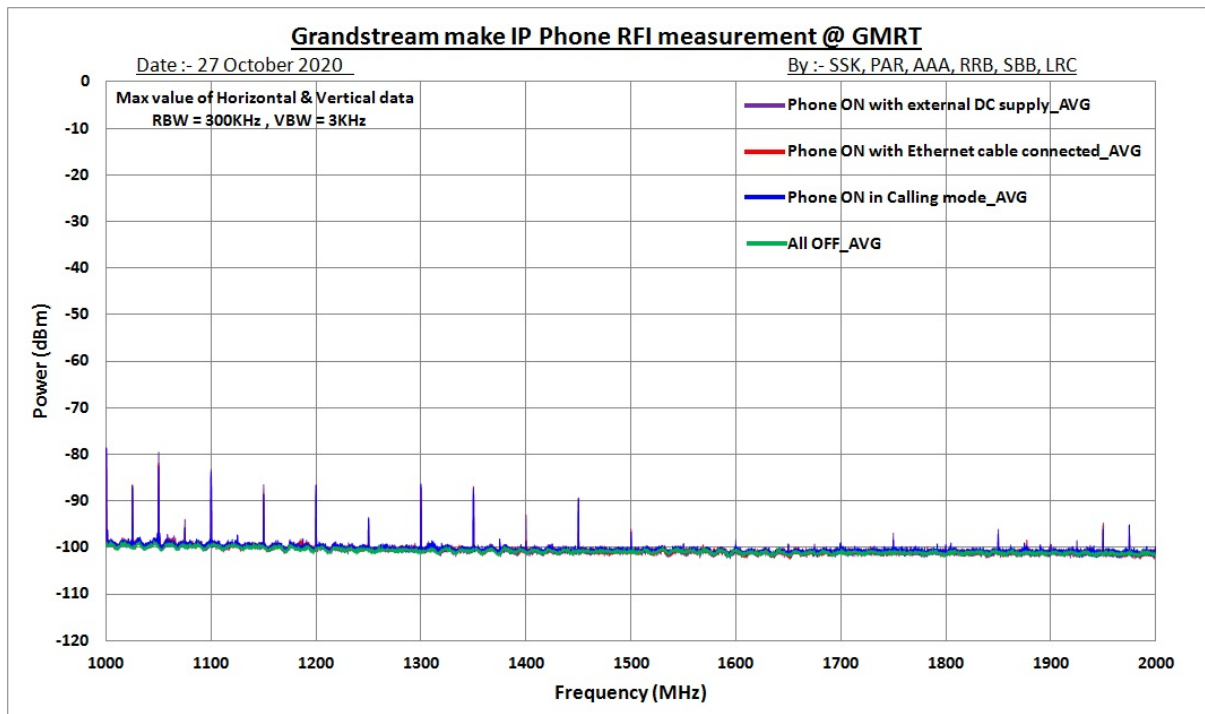

Fig.5:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 1000-2000MHz.

1. **Violet line** shows broad band RF noise 1-2dB above the noise floor level when Phone powered (ON) with external DC (+5V) power supply in trace Average mode.
2. **Red line** shows broad band RF noise 1-2dB above the noise floor level when Phone ON with Ethernet cable connected to device at one end and other end connected to Ethernet switch outside the shielded lab in trace Average mode.
3. **Dark blue line** shows broad band RF noise 1-2dB above the noise floor level when Phone ON in calling mode (Another phone kept outside the shielded lab) in trace Average mode.
4. **Green line** shows the ambient noise floor level in All OFF with trace Average mode.
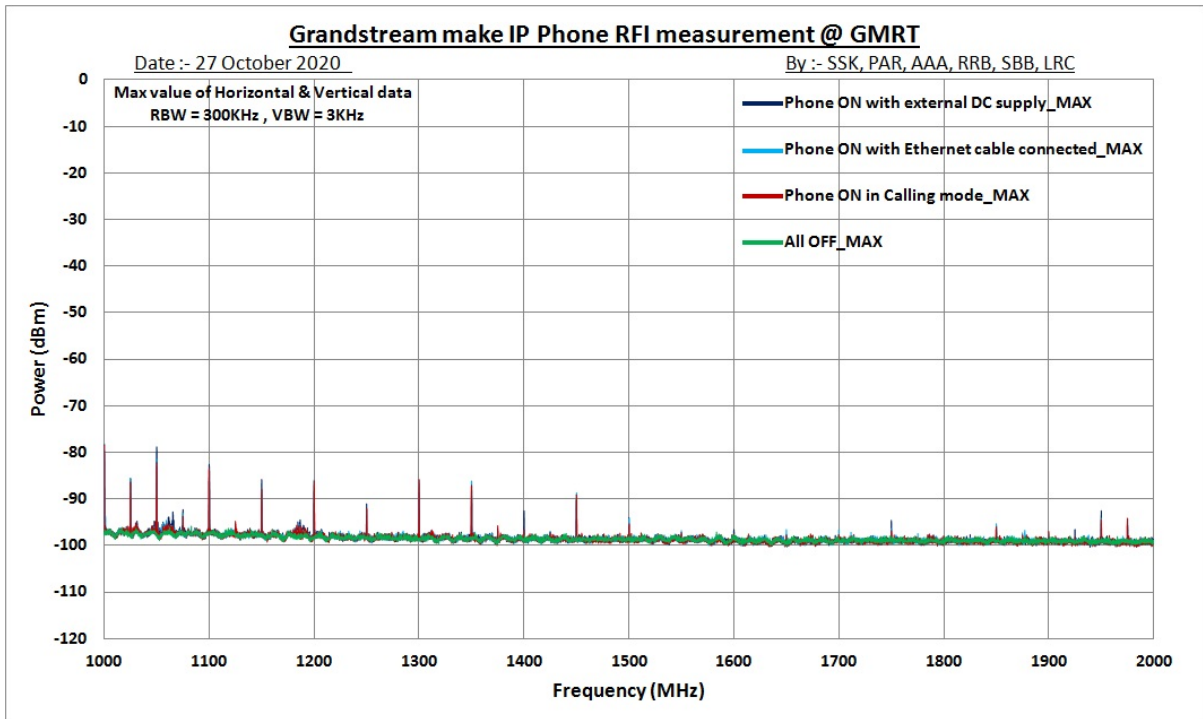
Fig.6:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 1000-2000MHz.

1. **Navy blue line** shows broad band RF noise 1-2dB above the noise floor level when Phone powered (ON) with external DC (+5V) power supply in trace Maxhold mode.
2. **Sky Blue line** shows broad band RF noise 1-2dB above the noise floor level when Phone ON with Ethernet cable connected to device at one end and other end connected to Ethernet switch outside the shielded lab in trace Maxhold mode.
3. **Brown line** shows broad band RF noise 1-2dB above the noise floor level when Phone ON in calling mode (Another phone kept outside the shielded lab) in trace Maxhold mode.
4. **Green line** shows the ambient noise floor level in All OFF with trace Maxhold mode.
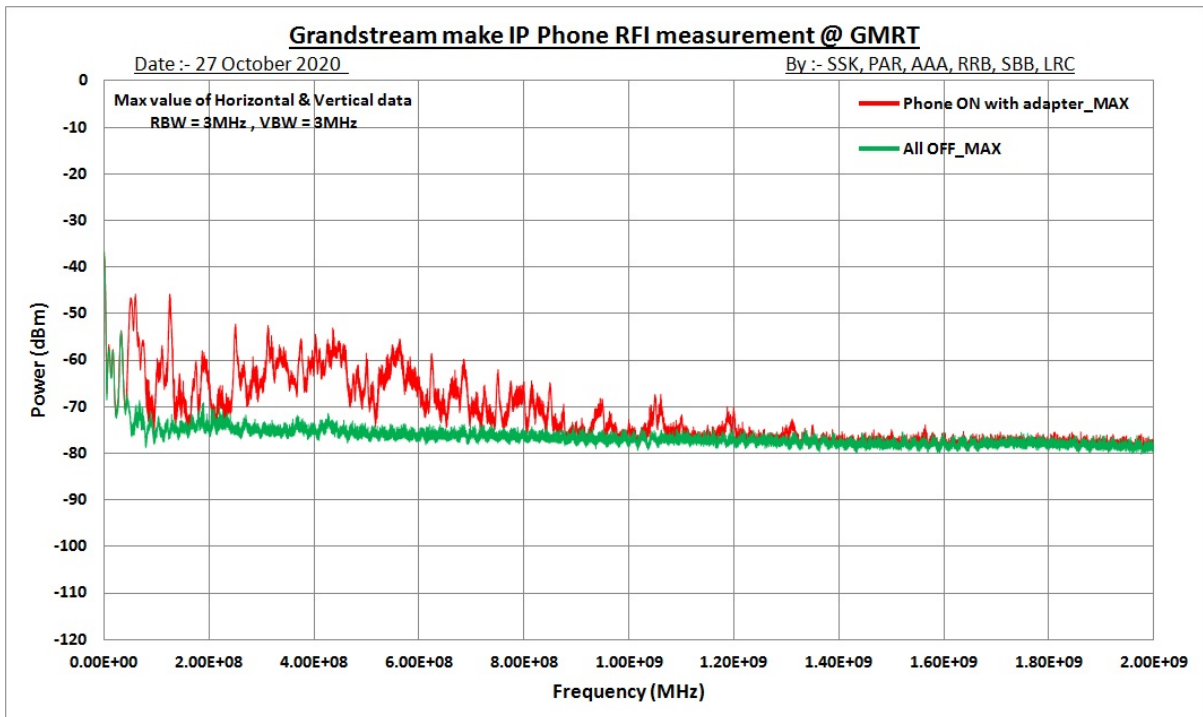

Fig.7:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 0-2000MHz.

1. **Red line** shows broad band RF noise 1-30dB above the noise floor level in 0-2000MHz frequency band when Phone ON with DC adapter (+5V) in trace Maxhold mode.
2. **Green line** shows the ambient noise floor level in the all OFF condition with trace in Maxhold mode.

Images:

Image1&2: Grandstream make IP Phone Model No. GXP1625 (Front and Rear View)

Conclusion:-

Maximum Broad band and Periodic Radio frequency emission generated by the IP Phone above ambient noise floor level (All OFF condition) is tabulated as follows.

Frequency (MHz)	Broad Band RF Noise Level (dB)		Periodic Lines level spaced at 25MHz (dB)
	AVG	MAX	
0-500 MHz	1-28	1-30	1-40
500-1000 MHz	1-20	1-20	1-33
1000-2000 MHz	1-2	1-2	1-20

Table1: Maximum values of all Average and Maxhold data (LPDA Horizontal & Vertical polarization).

The **Grandstream make IP phone (Model No. GXP1625)** produces broad band radio frequency emission (RFI) 1-40dB above the ambient noise floor level (all OFF mode) in the frequency band from 30-2000MHz for all test conditions and hence may not be a suitable option to be used inside the GMRT premises without shielding solution.

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