



## **Report on RFI measurement of Polycom make IP phone**

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

**Objective:**

To find out radio frequency interference coming from a **Polycom make IP phone**.

(Model No. IP331)

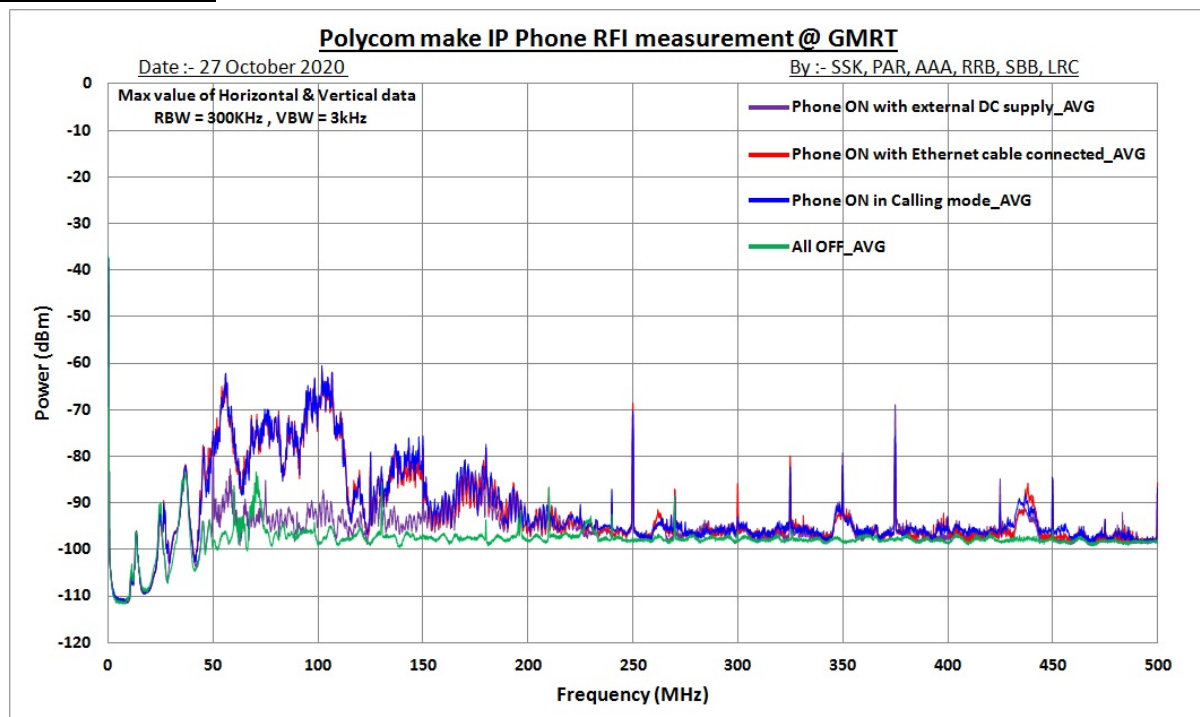
**Specifications:**

<b>Display</b>	
102 x 33 pixel-graphical LCD	Message Waiting Indicator (MWI) LED
<b>Feature Keys</b>	
3 context-sensitive “soft” keys	2 line keys with bi-color (red/green) LED
2 feature keys (“Menu” and “Dial”)	4-way navigation key cluster with center “Select” key
2 volume control keys	Dedicated hold key
Dedicated headset key	Dedicated hands-free speakerphone key
Dedicated microphone mute key	Dedicated 2.5-mm headset port
<b>Headset and Hearing Aid Compatibility</b>	
Compliant with ADA Section 508	Headset Compatibility
Hearing Aid Compatible (HAC) handset for magnetic coupling to approved HAC hearing aids	Compatible with commercially-available TTY adapter equipment
<b>Audio Features</b>	
Frequency response - 300Hz - 3300Hz for handset, headset and hands-free speakerphone modes	Acoustic Clarity Technology -- Type 1 compliant with IEEE 1329 full duplex standards
Full-duplex hands-free speakerphone with Polycom	Codecs: G.711 $\mu$ /A, G.729A (Annex B), and iLBC
Individual volume settings with visual feedback for each audio path	DTMF tone generation / DTMF event RTP payload
Voice activity detection	Comfort noise fill
Low-delay audio packet transmission	Background noise suppression
Packet loss concealment	Acoustic echo cancellation
<b>Power</b>	
Built-in, auto-sensing IEEE 802.3af Power over Ethernet (Class 1)	External universal input AC adapter (optional 24V DC @ 500mA)
<b>Call Handling Features</b>	
Shared call / bridged line appearance	Distinctive incoming call treatment / call waiting
Call timer	Call waiting
Call transfer, hold, divert (forward), pickup	Remote missed call notification
<b>Security</b>	
Transport Layer Security (TLS)	Secure Real-time Transport Protocol (SRTP)
Shipped with X.509 certificate installed	Encrypted configuration files
Digest authentication	Password login
Support for URL syntax with password for boot server	HTTPS secure provisioning
<b>Operating Conditions</b>	
Temperature: 0 to 40°C (+32 to 104°F)	Relative Humidity: 5% to 95%, non-condensing
<b>Network and Provisioning</b>	
SoundPoint IP 331 – two-port 10/100 Mbps Ethernet switch	SoundPoint IP 321 – single 10/100 Mbps Ethernet port
Manual or dynamic host configuration protocol (DHCP) network setup	FTP / TFTP / HTTP / HTTPS server-based central provisioning for mass deployments
Time and date synchronization using SNTP	Provisioning and call server redundancy supported
Web portal for individual unit configuration	QoS Support – IEEE 802.1p/Q tagging (VLAN), Layer 3
TOS, and DSCP	RTCP support (RFC 1889)
Event logging	Syslog
Local digit map	Hardware diagnostics
Status and statistics reporting	Network Address Translation (NAT) support for static configuration and “Keep-Alive” SIP signalling

## 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 (+24V) 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.

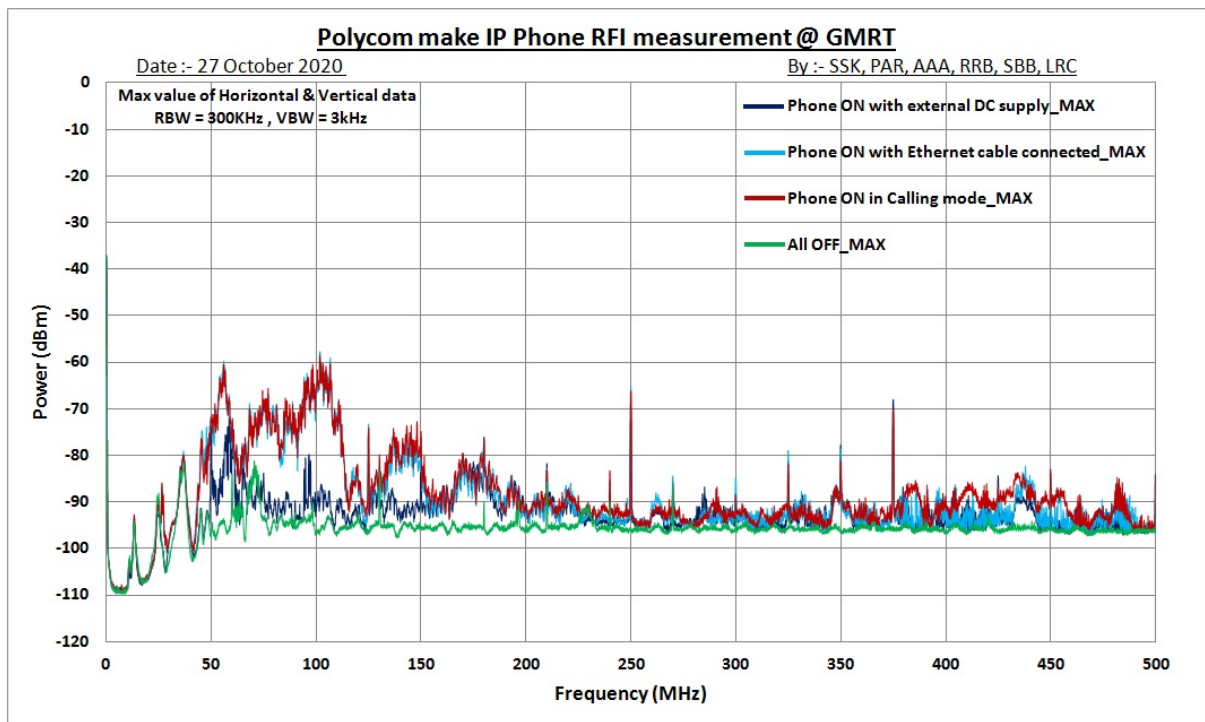
## Measurement Results:



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

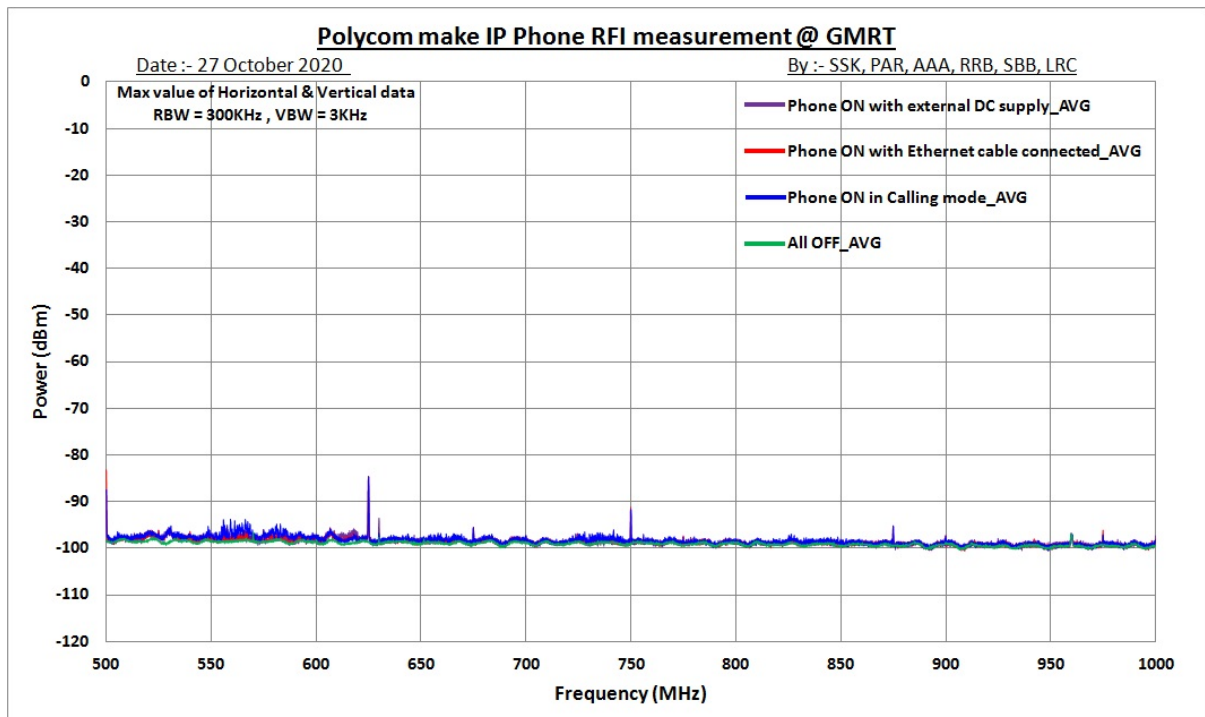
1. **Violet line** shows **broad band RF noise 1-17dB** above the noise floor level when Phone powered (ON) with external DC (+24V) power supply in trace Average mode.
2. **Red line** shows **broad band RF noise 1-38dB** above the noise floor level when Phone ON with Ethernet cable connected to device 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 1-38dB** 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 125MHz in the frequency band from 0-2000MHz for all test conditions.



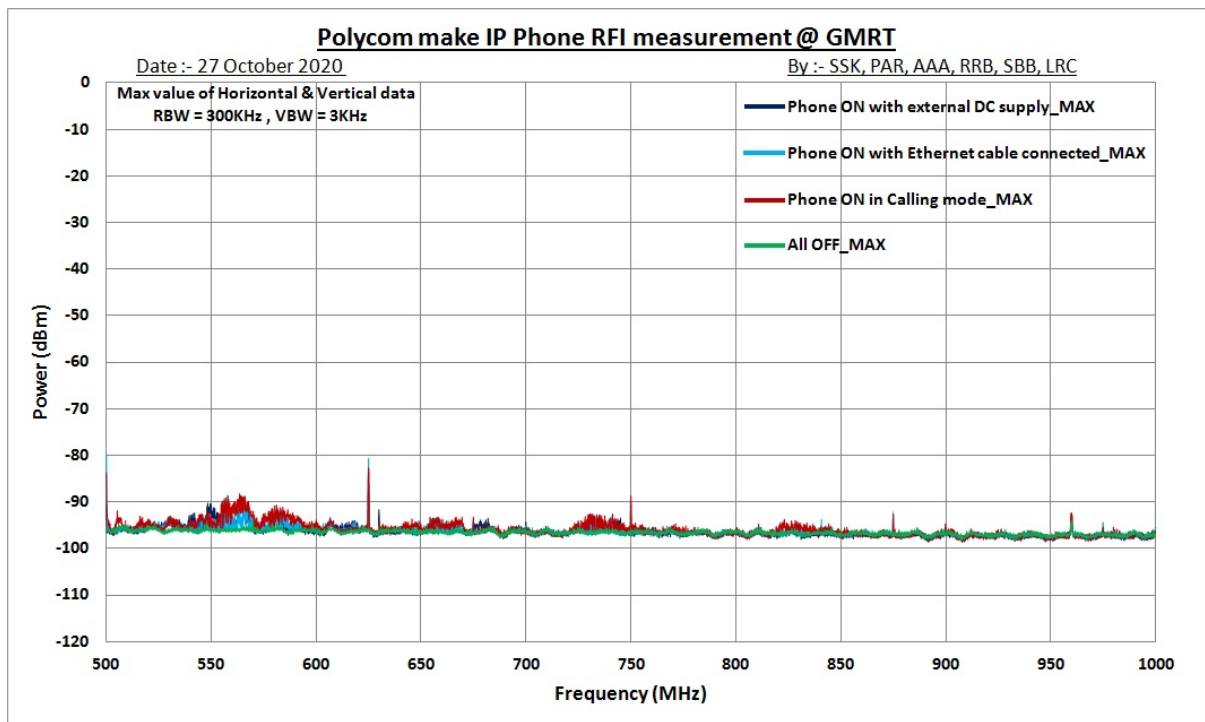
**Fig.2:-** Max Value of all data for Horizontal & Vertical polarization in the Frequency band 0-500MHz.

1. **Navy blue line** shows **broad band RF noise 1-20dB** above the noise floor level when Phone powered (ON) with external DC (+24V) power supply in trace Maxhold mode.
2. **Sky Blue line** shows **broad band RF noise 1-40dB** 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 1-40dB** 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.



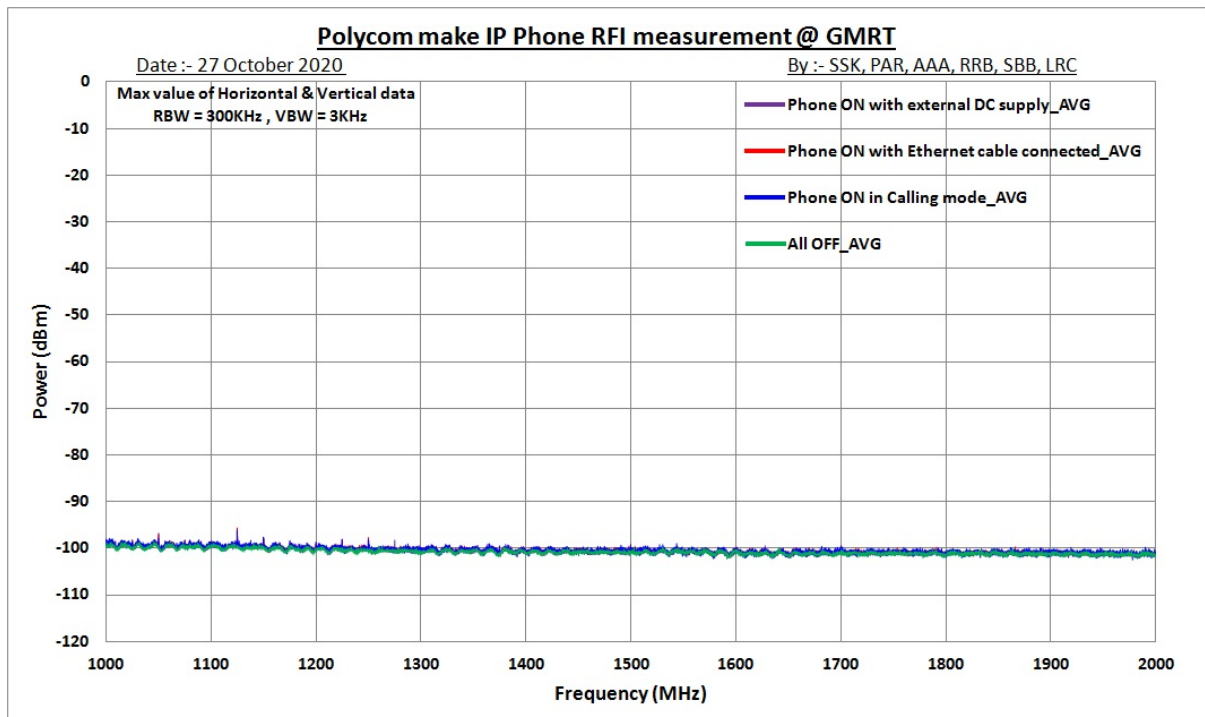
**Fig.3:-** Max Value of all data for Horizontal & Vertical polarization in the Frequency band 500-1000MHz.

1. **Violet line** shows **broad band RF noise 1-3dB** above the noise floor level when Phone powered (ON) with external DC (+24V) power supply in trace Average mode.
2. **Red line** shows **broad band RF noise 1-3dB** 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 1-4dB** 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.



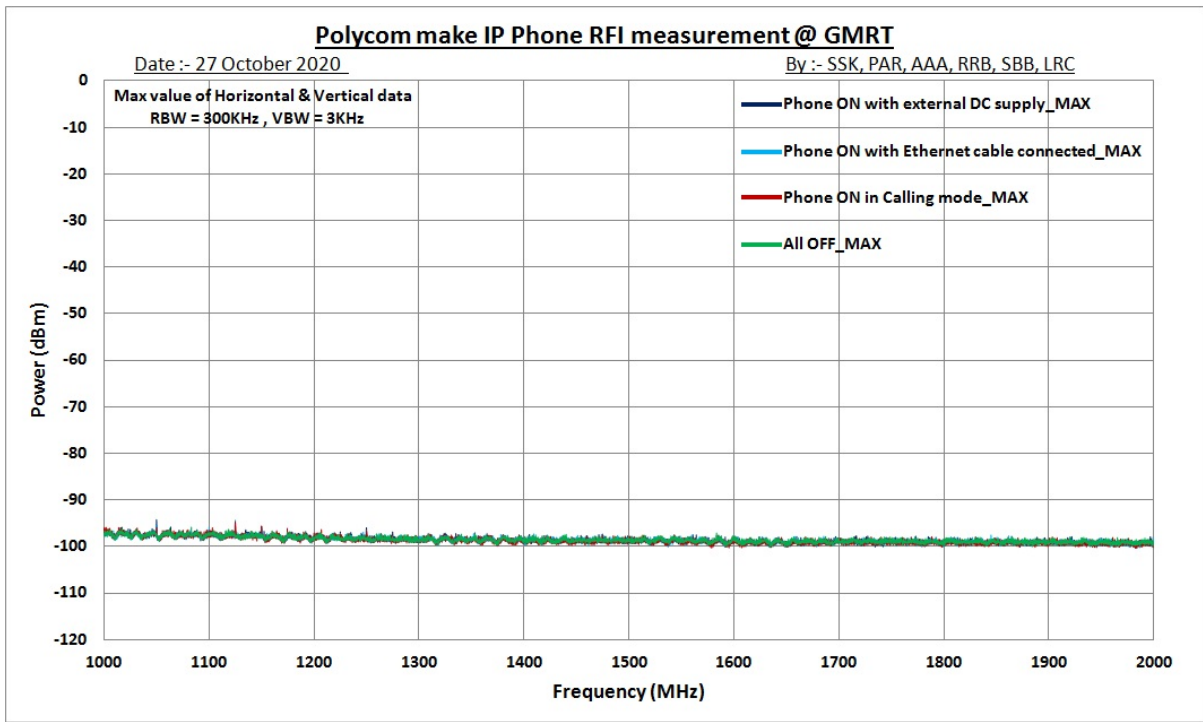
**Fig.4:-** Max Value of all data for Horizontal & Vertical polarization in the Frequency band 500-1000MHz.

1. **Navy blue line** shows **broad band RF noise 1-5dB** above the noise floor level when Phone powered (ON) with external DC (+24V) power supply in trace Maxhold mode.
2. **Sky Blue line** shows **broad band RF noise 1-5dB** 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 1-7dB** 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.



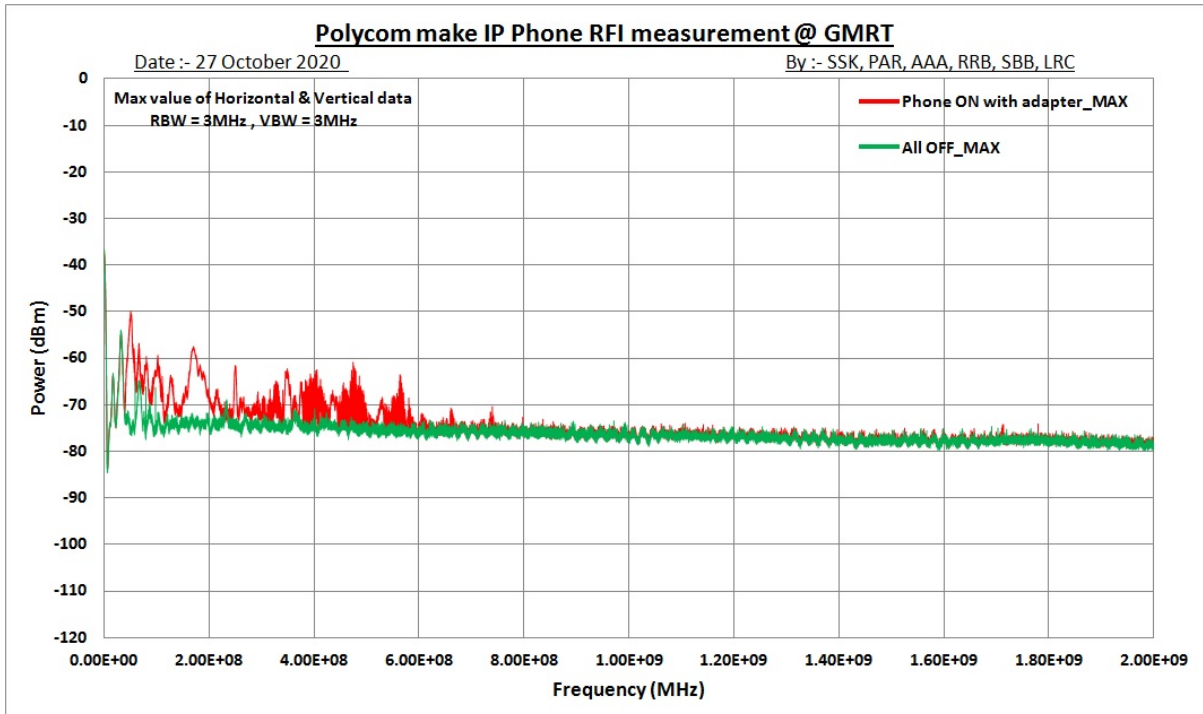
**Fig.5:-** Max Value of all data for Horizontal & Vertical polarization in the Frequency band 1000-2000MHz.

1. **Violet line** shows **few discrete lines 1-2dB** above the noise floor level when Phone powered (ON) with external DC (+24V) power supply in trace Average mode.
2. **Red line** shows **few discrete lines 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 **few discrete lines 1-3dB** 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 **few discrete lines 1-2dB** above the noise floor level when Phone powered (ON) with external DC (+24V) power supply in trace Maxhold mode.
2. **Sky Blue line** shows **few discrete lines 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 **few discrete lines 1-3dB** 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 1-28dB** above the noise floor level in 0-2000MHz frequency band when Phone ON with DC adapter (+24V) 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: Polycom make IP phone Model No. IP331 (Front & 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 125MHz (dB)
	AVG	MAX	
0-500 MHz	1-38	1-40	1-30
500-1000 MHz	1-4	1-7	1-13
1000-2000 MHz	-	-	1-3

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

The **Polycom make IP phone (Model No. IP331)** 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.