National Centre for Radio Astrophysics

Internal Technical Report

GMRT/RFI/1 – 27th October 2020

Report on RFI measurement of Coral 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 **Coral make IP phone**.

(Model No. IP2LP)

Key Features:

- HD Voice
- Support PoE
- Supports Two SIP Accounts
- Support 3 way Conference
- 132 × 64 pixel 2.3 inch Graphical LCD
- Fully Compatible with Asterisk, BroadSoft Platform

Specifications:

Phone Features	
2 Lines (Support 2 SIP account)	Support Call Waiting, Call Forward, Call Transfer
Call on Hold, Mute, Auto-answer, Redial, DND	Local 3-Way Conference
XML Browser	Direct IP call
Phonebook (500 entries), Call logs (100 entries)	Volume Adjustable, Ring tones Selectable
Physical Features	
DSPG Chipset	8M Bytes Flash Memory
31 Keys (with 4 Soft Keys, 10 Programmable keys)	AC Power Adapter: Input: AC 100-240V; Output: DC 5V/1A
1 Voice Mail Light	2 RJ45 10/100 Ethernet Ports
PoE: IEEE 802.3a	1*RJ9(4P4C) Handset Port and 1*1*RJ9(4P4C) Headset Port
Audio Features	
HD Voice: HD Handset, HD Speaker	Wideband Codec: G.722
Narrowband Codec: PCMA, PCMU, G.729, G723_53, G723_63,G726_32	VAD, CNG , Echo Canceller
PLC, AJB, AGC	Full-Duplex Hands-free Speakerphone with AEC
IP-PBX Features	
SMS, MWI	Music on hold, Intercom
BLF(Busy Lamp Field)	Call Pickup, Group Call Pickup
Hot Desking	Call Recording
Call Completion	Anonymous Call, Anonymous Call Rejection
Administration Features	
Auto provisioning using FTP/TFTP/HTTP/HTTPS/PnP	Dial through IP PBX Using Phone Number
Dial through IP PBX Using URL Address	Configuration Managements with Web, Keypad on the phone, and Auto Provisioning
SNMP	TR069
Network Features	
SIP V1(RFC2543), V2(RFC3261)	Fully Compatible with Asterisk, BroadSoft Platform
QOS	LLDP
NAT Transverse: STUN Mode	Static IP/DHCP for IP configuration, pppoe
3 DTMF modes: In-Band, RFC2833, SIP INFO	HTTP/HTTPS Web Server for Management
Proxy Mode and Peer-to-peer SIP Link Mode	NTP for Auto Time Setting
UDP/TCP/DNS-SRV(RFC 3263)	TFTP/FTP/HTTP/HTTPS Protocols
Security Features	
Support HTTPS (SSL)	Support SRTP for Voice Data Encryption
Support Login for Administration	OpenVPN, IEEE802.1X
Keypad Lock	Prevent SIP Hacking

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:

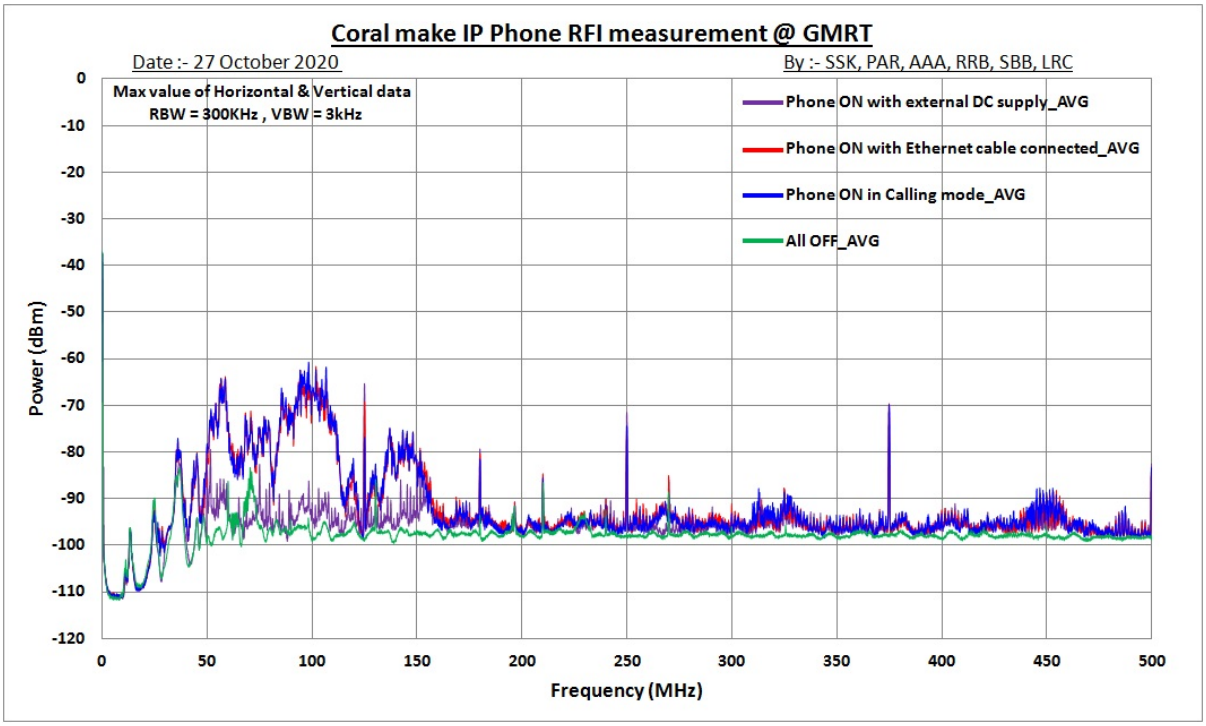

Fig.1:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 0-500MHz.

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 1-38dB 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.

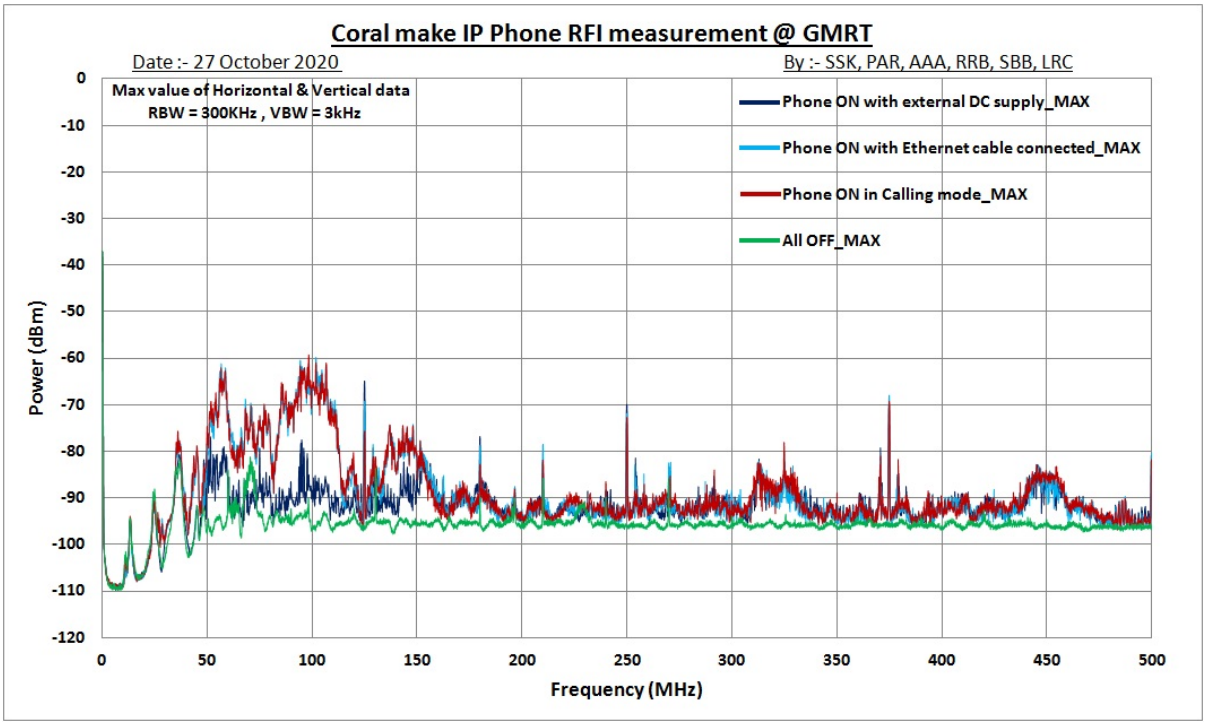

Fig.2:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 0-500MHz.

1. **Navy blue line** shows broad band RF noise 1-20dB above the noise floor level when Phone powered (ON) with external DC (+5V) 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.

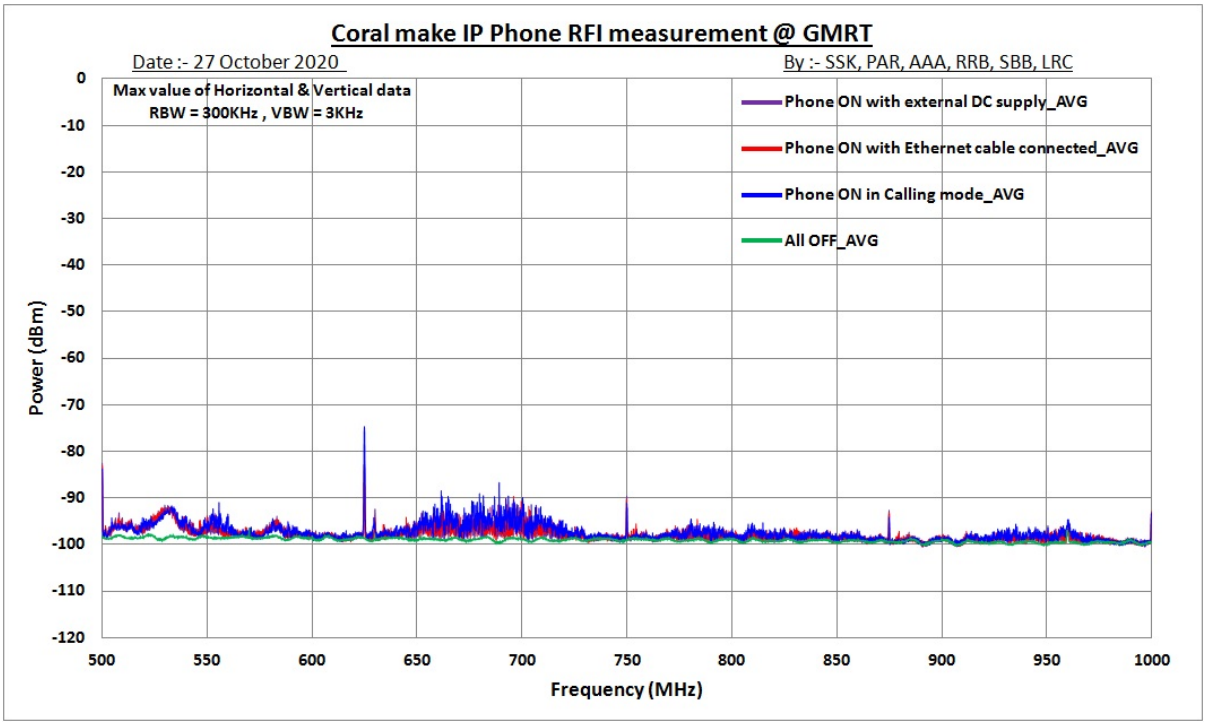

Fig.3:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 500-1000MHz.

1. **Violet line** shows broad band RF noise 1-8dB 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 1-8dB 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 1-10dB 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.

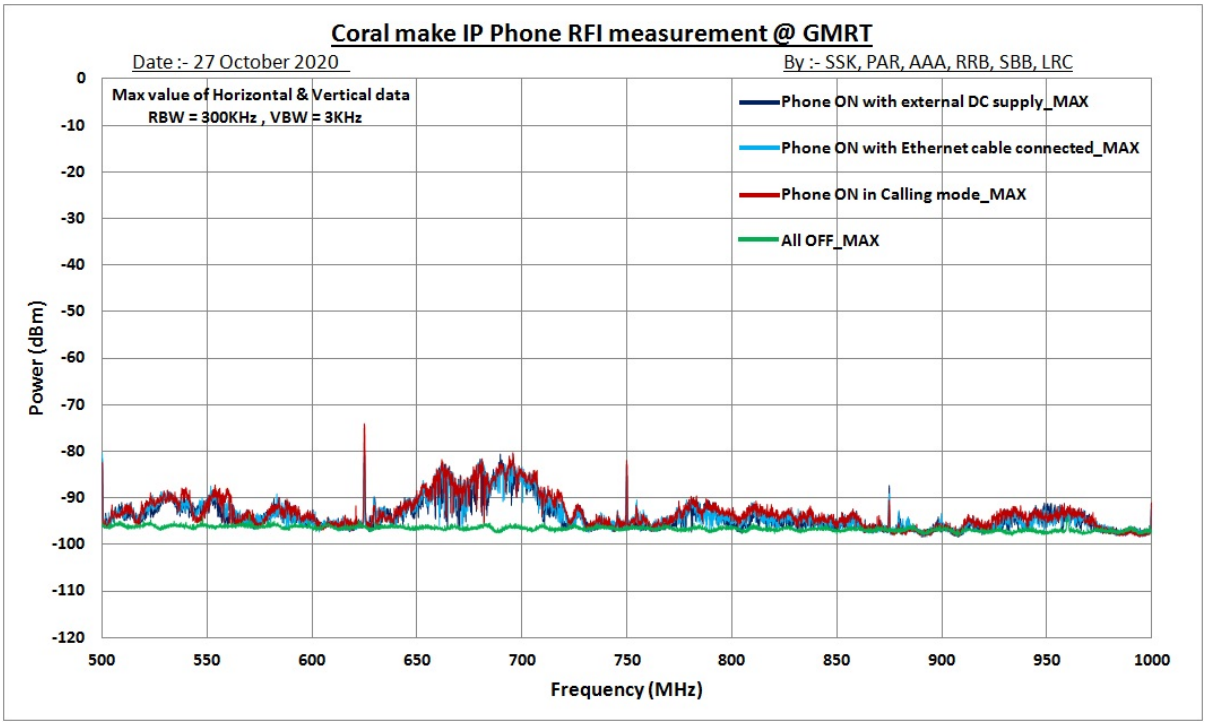

Fig.4:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 500-1000MHz.

1. **Navy blue line** shows broad band RF noise 1-12dB 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 1-12dB 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 1-15dB 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.

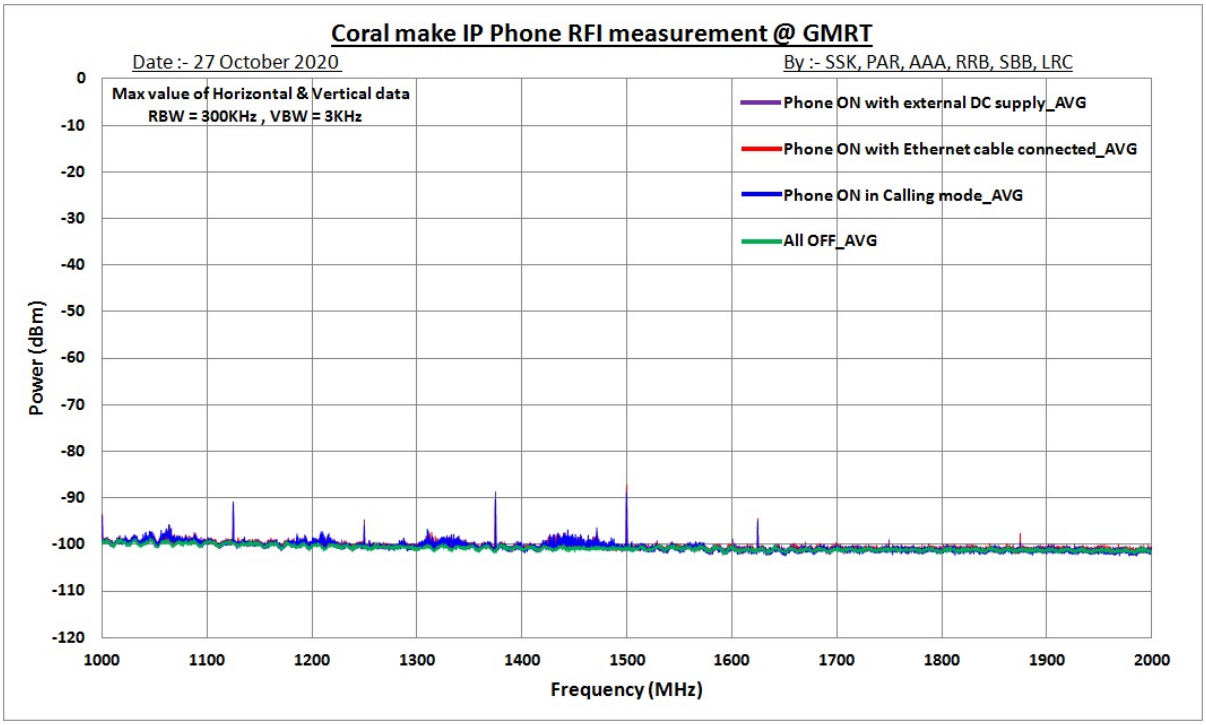

Fig.5:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 1000-2000MHz.

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 1-3dB 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.

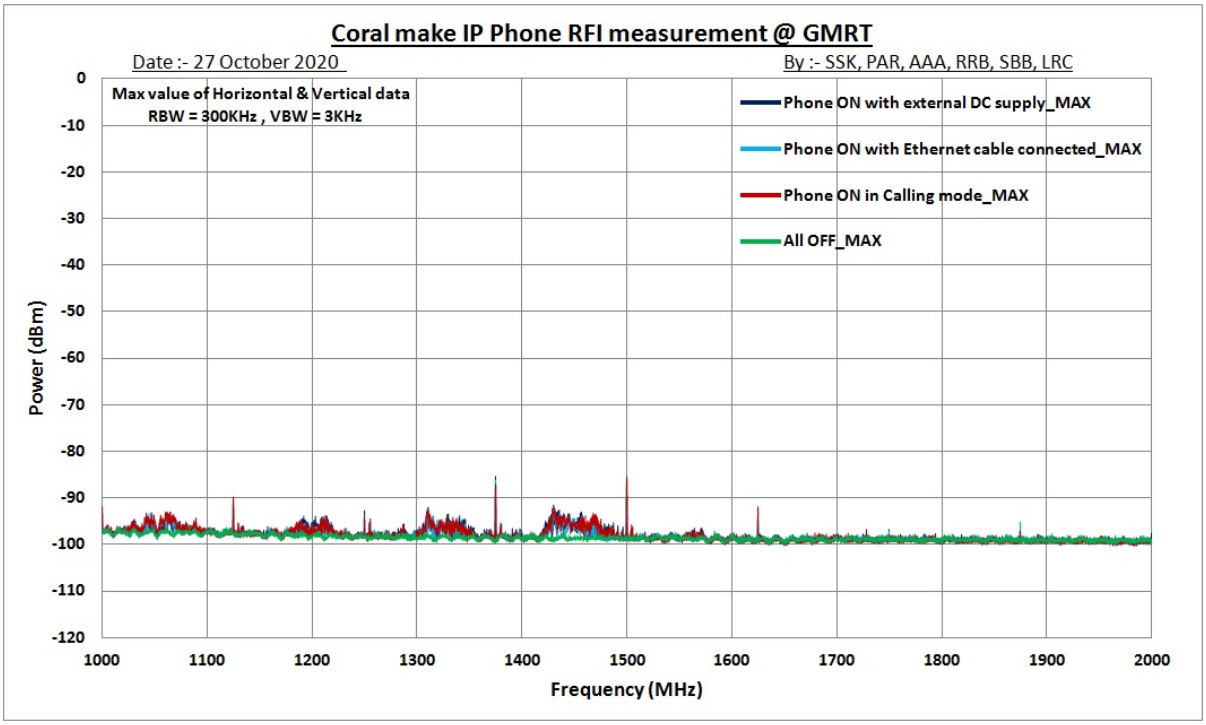

Fig.6:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 1000-2000MHz.

1. **Navy blue line** shows broad band RF noise 1-3dB 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 1-3dB 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 Maxhold mode.
3. **Brown line** shows broad band RF noise 1-5dB 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.

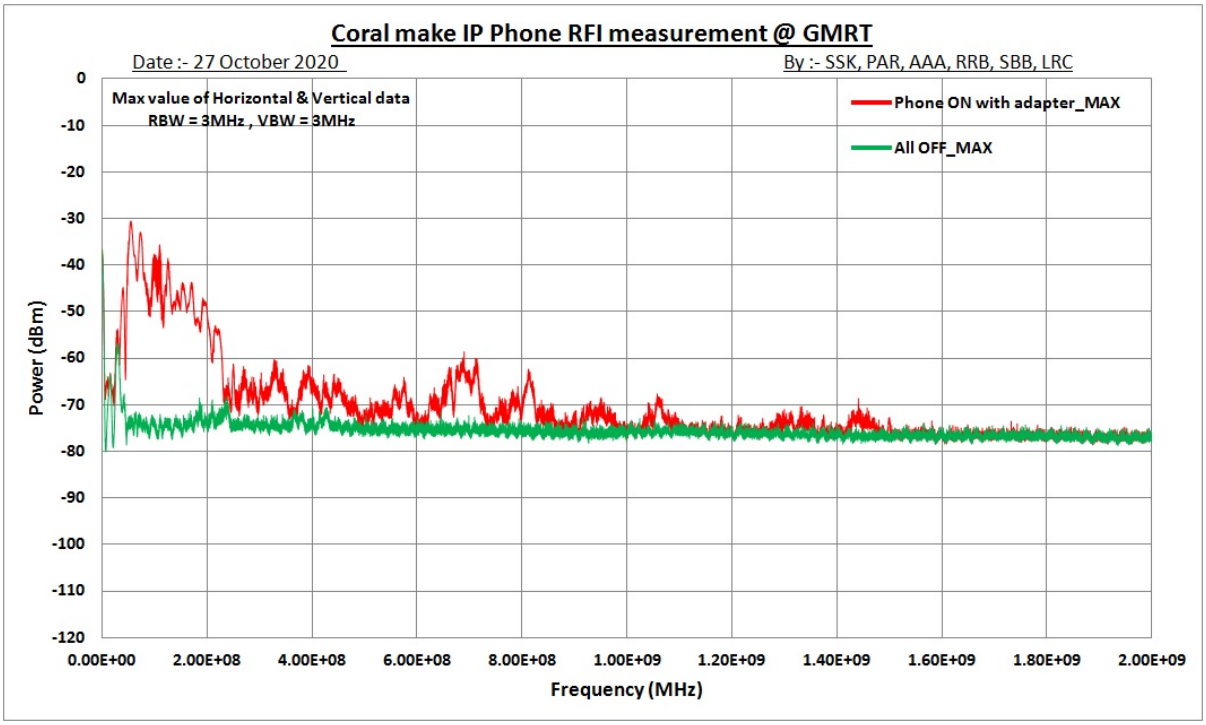

Fig.7:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 0-2000MHz.

1. **Red line** shows broad band RF noise 1-42dB 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: Coral make IP Phone Model No. IP2LP (Front 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	1-32
500-1000 MHz	1-10	1-15	1-23
1000-2000 MHz	1-3	1-5	1-13

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

The **Coral make IP phone (Model No. IP2LP)** 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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