National Centre for Radio Astrophysics

Internal Technical Report

GMRT/RFI/2 – 07th December 2020

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

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Revision	Date	Modification/ Change
Ver. 2	07th December. 2020	Second 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	SRTP
Control	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: 32º – 104ºF or 0º – 40ºC Storage: 14º – 140ºF or -10º – 60ºC Humidity: 10 – 90% Non-condensing
Dimension and Weight	Dimensions: 100mm x 100mm x 29.5mm Weight: 102 g
Compliance	
FCC: Part15B	
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 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) **Adaptor + Phone ON in calling mode without shielded enclosure.**
    b) **Adaptor + Phone ON in calling mode with shielded enclosure.**
4. Measurement frequency range: 30MHz to 2 GHz frequency range.
5. Basic Beetel make landline phone used as a receiver with this adaptor.

Measurement Results:

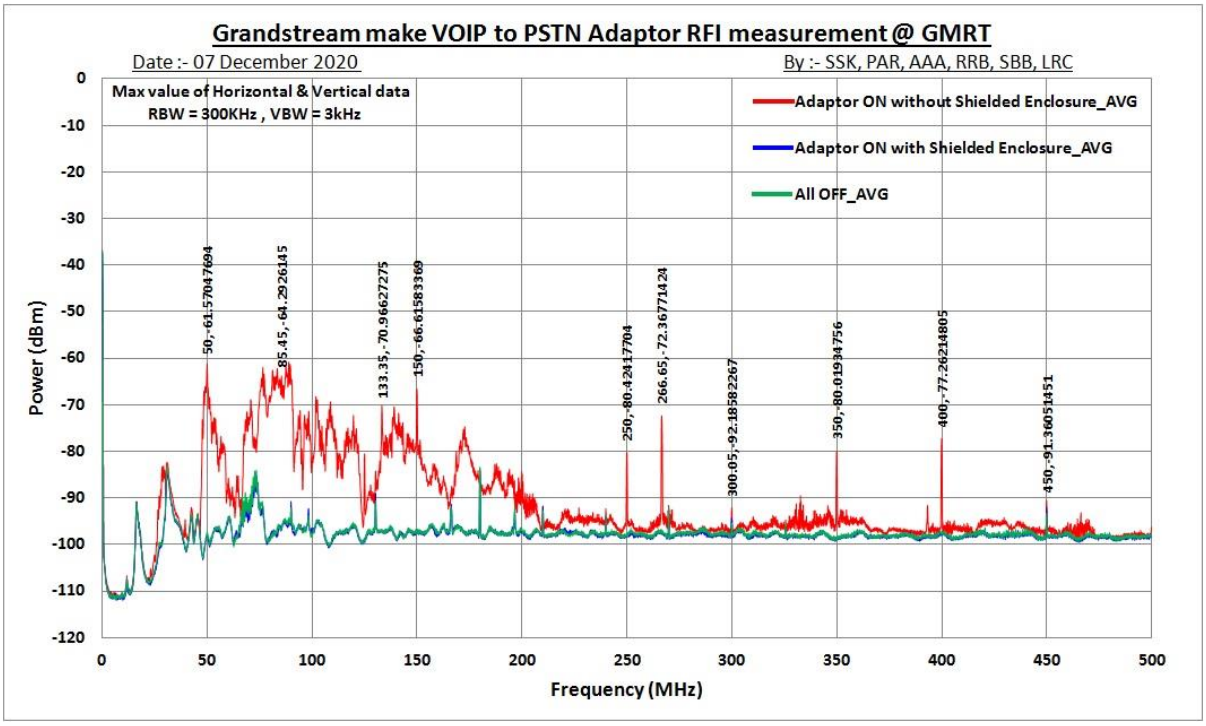
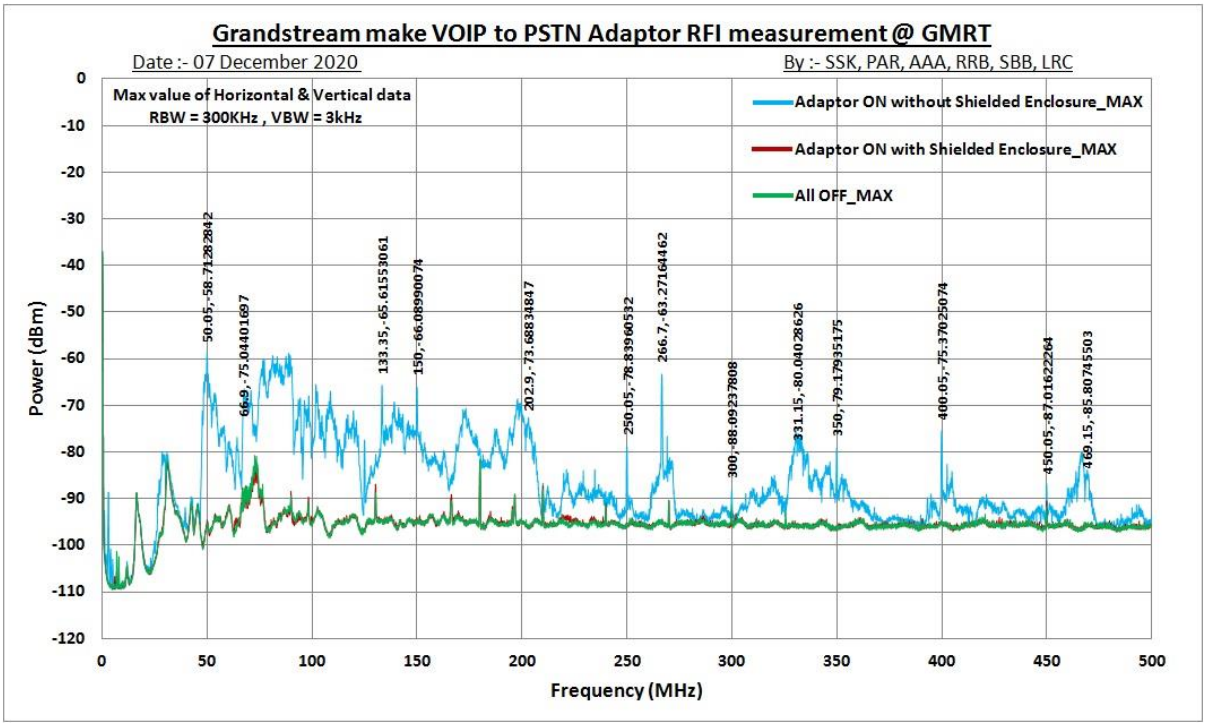


Fig.1:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 0-500MHz.

1. **Red line** shows broad band RF noise 1-32dB above the noise floor level when **Adaptor + Phone ON in Call mode without shielded enclosure** in trace Average 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 Average mode.
3. **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 133.35MHz and 50MHz in the frequency band from 0-2000MHz **when Adaptor + Phone ON without shielded enclosure**.



1. **Sky Blue line** shows broad band RF noise 1-35dB above the noise floor level when **Adaptor + Phone ON in Call mode without shielded enclosure** in trace Maxhold mode.
2. **Brown 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 **All OFF** with trace Maxhold mode.

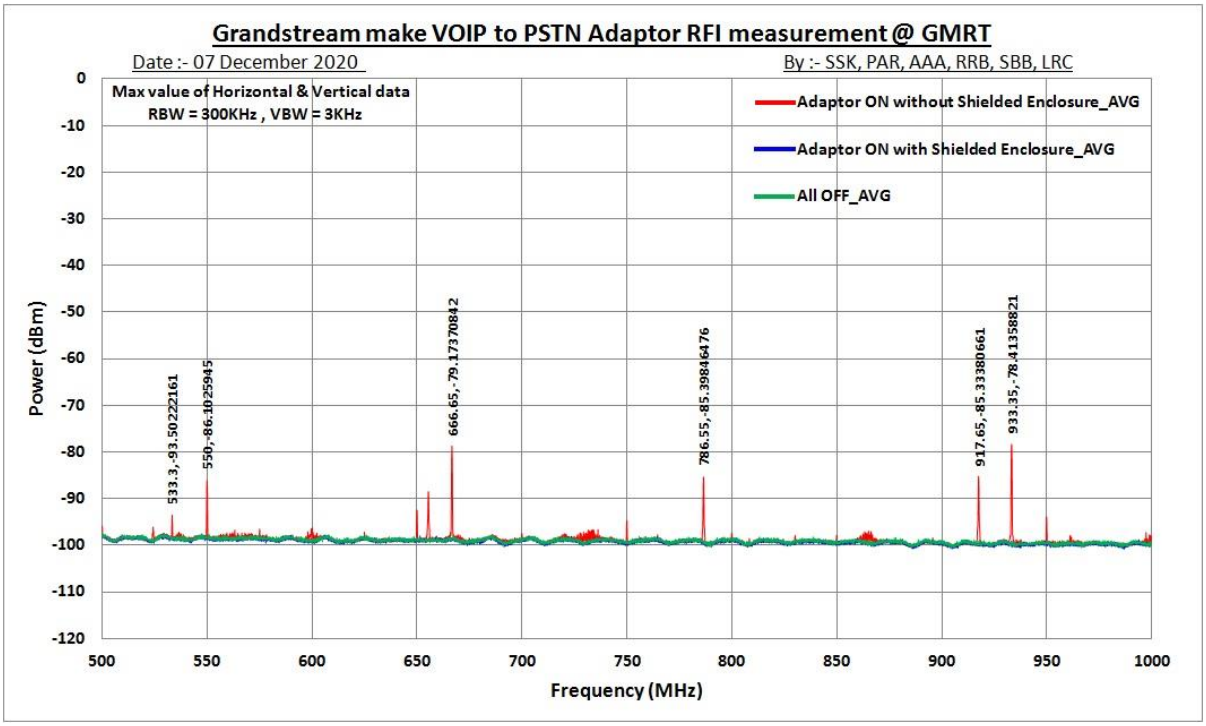


Fig.3:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 500-1000MHz.

1. **Red line** shows broad band RF noise 1-2dB above the noise floor level when **Adaptor + Phone ON in Call mode without shielded enclosure** in trace Average 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 Average mode.
3. **Green line** shows the ambient noise floor level in **All OFF** with trace Average mode.

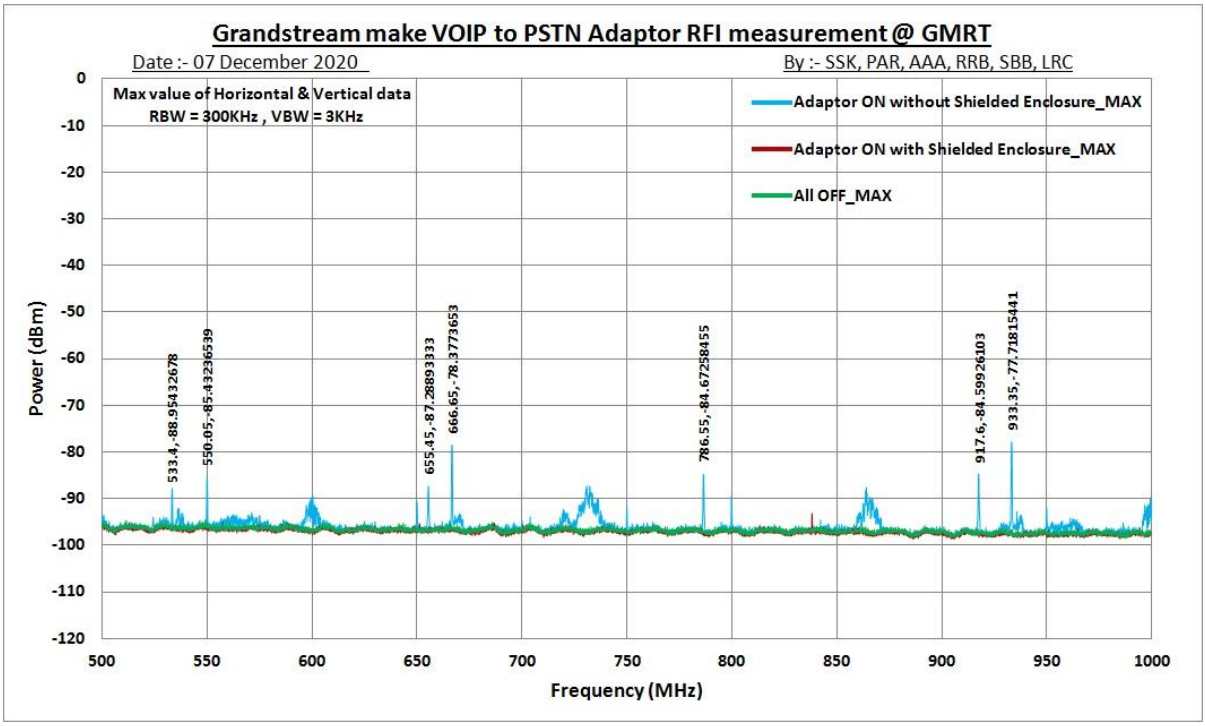


Fig.4:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 500-1000MHz.

1. **Sky Blue line** shows broad band RF noise 1-5dB above the noise floor level when **Adaptor + Phone ON in Call mode without shielded enclosure** in trace Maxhold mode.
2. **Brown 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 **All OFF** with trace Maxhold mode.

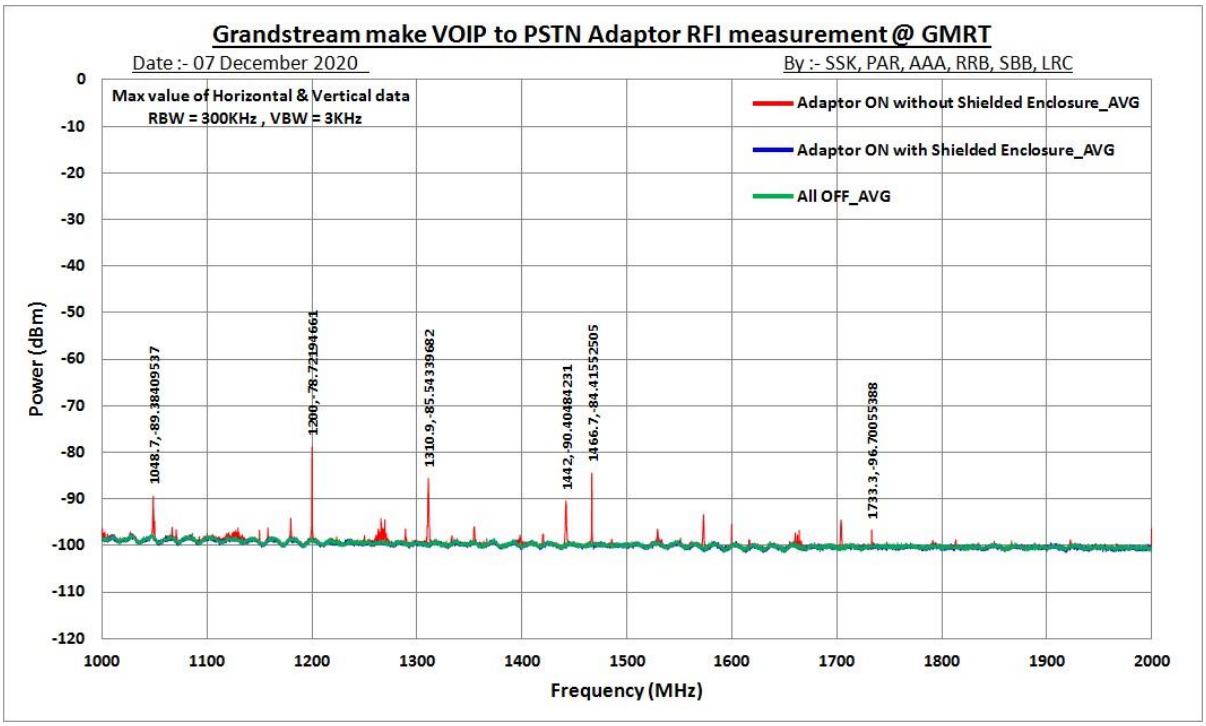


Fig.5:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 1000-2000MHz.

1. **Red line** shows broad band RF noise 1-4dB above the noise floor level when **Adaptor + Phone ON in Call mode without shielded enclosure** in trace Average 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 Average mode.
3. **Green line** shows the ambient noise floor level in **All OFF** with trace Average mode.

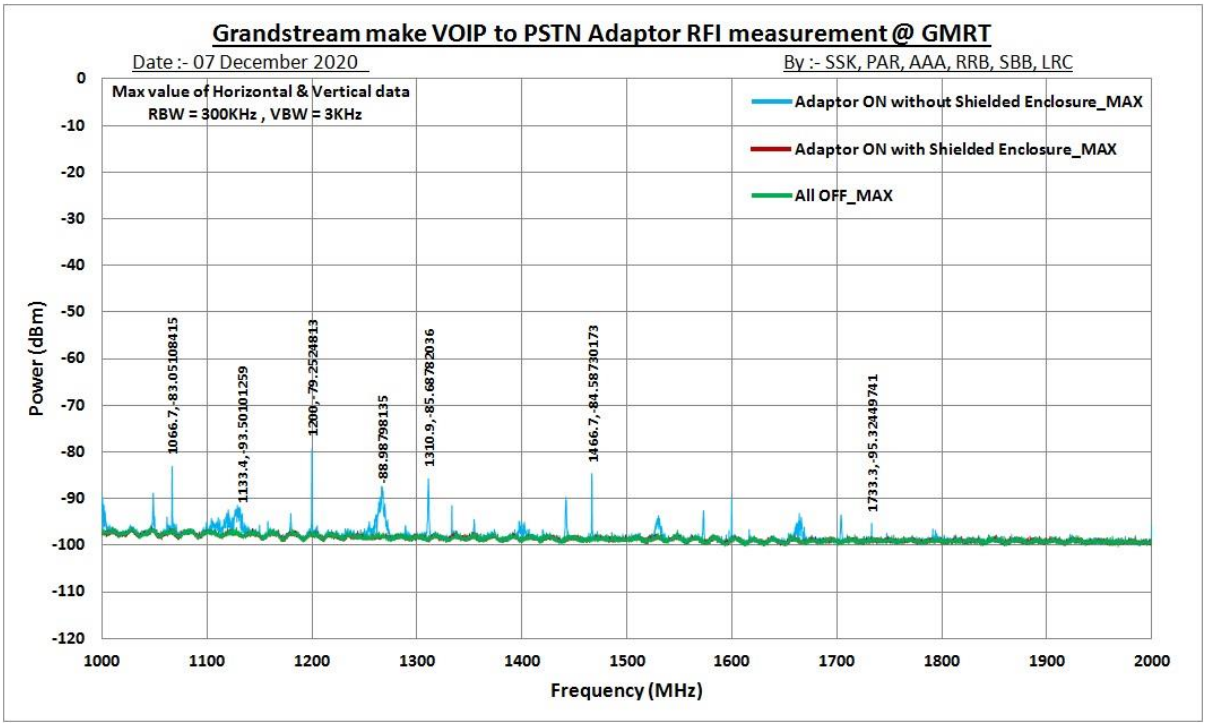


Fig.6:- Max Value of all data for Horizontal & Vertical polarization in the Frequency band 1000-2000MHz.

1. **Sky Blue line** shows broad band RF noise 1-10dB above the noise floor level when **Adaptor + Phone ON in Call mode without shielded enclosure** in trace Maxhold mode.
2. **Brown 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 **All OFF** with trace Maxhold mode.

Images:

Image1&2: Grandstream make VOIP to PSTN Adaptor Top and Rear view (without shielded enclosure)

Telephone Receiver Cable RJ11 connected to adaptor via Feed thru inside aluminium Shielded enclosure

Image3&4: Grandstream make VOIP Adaptor + Phone with aluminium shielded enclosure

Conclusion:-

Maximum Broad band and Periodic Radio frequency emission generated by the VOIP to PSTN

Frequency (MHz)	Without Shielded Enclosure		With Shielded Enclosure	
	Max Broad Band RF Noise Level (dB)	Periodic Lines level spaced at 25MHz (dB)	Max Broad Band RF Noise Level (dB)	Periodic Lines level spaced at 25MHz (dB)
0-500 MHz	1-30	1-40	No RFI seen	No RFI seen
500-1000 MHz	1-5	1-18	No RFI seen	No RFI seen
1000-2000 MHz	1-10	1-20	No RFI seen	No RFI seen

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

The **Grandstream make VOIP to PSTN Adaptor + Phone with shielded enclosure (Model No. HT801)** has not shown any radiation above the spectrum analyser noise floor level as well as at lowest noise floor level.

Following are the two configurations to be used on the front panel to connect a standard Beetel make a telephone unit.

1. Two number of the feedthrough with two-pin terminal strip
   or
2. One nine pin d type shielded and filtered connector.

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