IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

BUFFALO PATENTS, LLC, **Plaintiff,** **v.** **MOTOROLA MOBILITY LLC,** **Defendant.**	**Case No.: 1:22-cv-00621** **JURY TRIAL DEMANDED**

ORIGINAL COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Buffalo Patents, LLC ("Buffalo Patents" or "Plaintiff") files this original complaint against Defendant Motorola Mobility LLC ("Motorola" or "Defendant") alleging, based on its own knowledge as to itself and its own actions and based on information and belief as to all other matters, as follows:

PARTIES

1. Buffalo Patents is a limited liability company formed under the laws of the State of Texas, with its principal place of business at 1200 Silver Hill Dr., Austin, Texas, 78746.

2. Defendant Motorola Mobility LLC is a limited liability company organized and existing under the laws of the State of Delaware. Motorola may be served through its registered agent, The Corporation Trust Company at Corporation Trust Center, 1209 Orange St., Wilmington, Delaware, 19801.

3. Motorola, an indirect subsidiary of Lenovo Group Limited, is involved in the development and sale of hardware and software relating to mobile products, such as smartphones. Motorola has a place of business located at 222 W. Merchandise Mart Plaza, Suite 1800, Chicago, Illinois, 60654.

JURISDICTION AND VENUE

4. This is an action for infringement of United States patents arising under 35 U.S.C. §§ 271, 281, and 284–85, among others. This Court has subject matter jurisdiction of the action under 28 U.S.C. § 1331 and § 1338(a).

5. This Court has personal jurisdiction over Motorola pursuant to due process because, *inter alia*, (i) Motorola has done and continues to do business in Illinois; (ii) Motorola has committed and continues to commit acts of patent infringement in the State of Illinois, including making, using, offering to sell, and/or selling accused products in Illinois, and/or importing accused products into Illinois, including by Internet sales and/or sales via retail and wholesale stores, inducing others to commit acts of patent infringement in Illinois, and/or committing at least a portion of any other infringements alleged herein in Illinois; and (iii) Motorola regularly places its products within the stream of commerce—directly, through subsidiaries, or through third parties—with the expectation and knowledge that such products will be shipped to, sold, or used in Illinois and elsewhere in the United States. Thus, Motorola has established minimum contacts within Illinois and purposefully availed itself of the benefits of Illinois, and the exercise of personal jurisdiction over Motorola would not offend traditional notions of fair play and substantial justice. In addition, Motorola is amenable to service of process for this action.

6. Venue is proper in this district as to Motorola under 28 U.S.C. § 1400(b). Venue is further proper as to Motorola because it has committed and continues to commit acts of patent infringement in this district, including making, using, offering to sell, and/or selling accused products in this district, and/or importing accused products into this district, including by Internet sales and/or sales via retail and wholesale stores, inducing others to commit acts of patent

infringement in this district, and/or committing at least a portion of any other infringements alleged herein in this district.

7. Furthermore, Motorola has a regular and established place of business in this district, including at least at 222 W. Merchandise Mart Plaza, Suite 1800, Chicago, Illinois, 60654.

BACKGROUND

8. The patents-in-suit broadly cover technology used in electronic devices commonly used today, such as mobile phones, televisions, and other electronic devices. More particularly, the patents-in-suit describe key improvements to electronic devices in the areas of internet and wireless network telephony, and display technology.

9. U.S. Patent Nos. 7,187,670 ("the '670 Patent") (a true and correct copy is attached as Exhibit A), 7,408,915 ("the '915 Patent") (a true and correct copy is attached as Exhibit B), 8,611,328 ("the '328 Patent") (a true and correct copy is attached as Exhibit C), and 9,001,816 ("the '816 Patent") (a true and correct copy is attached as Exhibit D) generally relate to internet and wireless network telephony. They disclose methods and systems for transmitting voice information to an end user in a digital format based on a network protocol (such as Wi-Fi or IEEE 802.11). The patented technology is used in smartphones and other devices for Voice over Wi-Fi calling (VoWi-Fi). The technology allows a user to place a call over private networks, such as WLANs (IEEE 802.11 wireless local area networks), home Wi-Fi networks, and public Wi-Fi hotspots.

10. The technology disclosed by the '670 Patent, the '915 Patent, the '328 Patent, and the '816 Patent was developed by engineers at the Danish company Nextlink.to A/S in the late 1990s. Nextlink began operations in 1999 and its roots originate from "The Danish Sound," an international industry cluster with a long tradition of technological achievements in acoustics,

hearing, and mobile communication based on research and collaboration between businesses and universities.[1] In the early 2000s, Nextlink developed the smallest Bluetooth headset in the world, which was presented at the IBC Bluetooth Congress in Monte Carlo. In 2008, the company changed its name to Invisio Headsets AB and streamlined the business to focus on communication solutions for professional users.[2] The current company, INVISIO, develops advanced communication systems that help professionals in mission critical environments to communicate and work more effectively.[3]

11. The inventions disclosed in the '670 Patent, the '915 Patent, the '328 Patent, and the '816 Patent have been cited during patent prosecution multiple times by leading technology companies in the telecommunications industry, including ADC Telecom (now TE Connectivity), AT&T, Fujitsu, General Instrument Corp. (now Motorola Mobility), GN Group, Huawei, iGo, Koninklijke Philips, NVIDIA, Samsung, Sennheiser, Sony, and Sprint.

12. U.S. Patent No. 6,856,086 ("the '086 Patent") (a true and correct copy is attached as Exhibit E) generally relates to the field of optical display devices. It discloses, *inter alia*, hybrid display devices that include a front panel, a back panel, and a light control material and methods for making hybrid display devices. In particular, the '086 Patent describes hybrid display devices that include rigid and flexible substrates. The patented technology is used in smartphones and other display devices, such as devices with flexible OLED displays.

[1] *See* INVISIO Annual Report 2018, at 26, https://invisio.com/media/1358/invisio-communications-annual-report-2018.pdf; *see also* https://invisio.com/about/history ("Denmark has a long tradition of world-leading technology in hearing and acoustics with products from hearing aids to headsets and loudspeakers.")

[2] *Id.*

[3] *See* https://invisio.com.

13. The technology disclosed in the ’086 Patent was developed by engineers at Avery Dennison Corporation in the late 1990s and early 2000s. Avery Dennison, a global Fortune 500 company, began its operations in the 1930s as the first self-adhesive label company. In the early 2000s—when the patent application that led to the ’086 Patent was filed—Avery Dennison was involved, *inter alia*, in the development of specialty films and performance polymers. The company continues to be known today as a global materials science and manufacturing company, specializing in the design and manufacture of labeling and functional materials.

14. The invention disclosed in the ’086 Patent has been cited during patent prosecution multiple times by leading technology companies, including 3M, Apple, Applied Materials, Asahi Glass Co. (Japan), AU Optronics (Taiwan), BOE Technology Group (China), Eastman Kodak, General Electric, Hewlett Packard, Industrial Technology Research Institute (Taiwan), and Sharp Corporation.

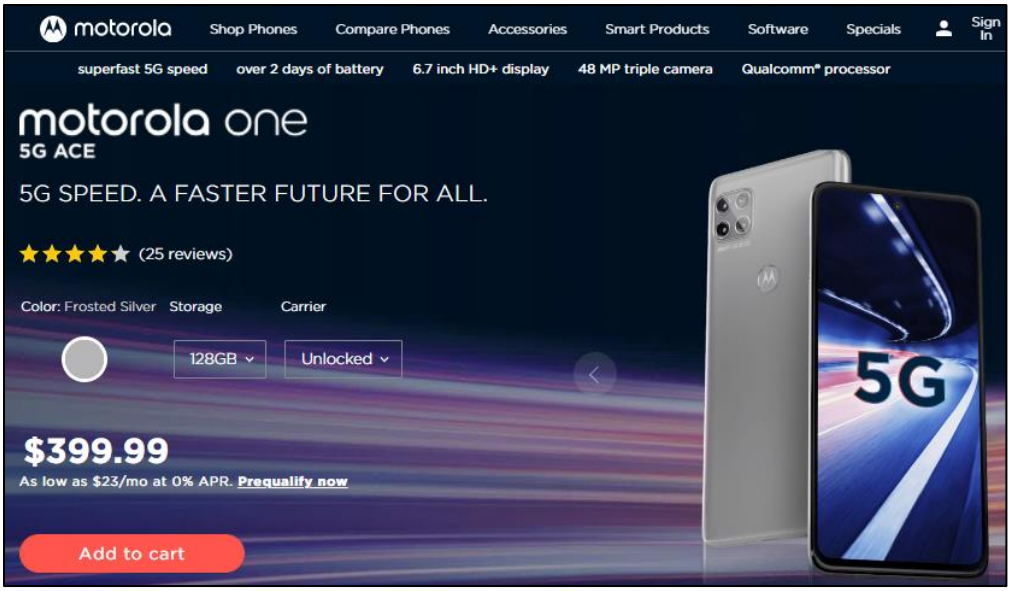
COUNT I

DIRECT INFRINGEMENT OF U.S. PATENT NO. 7,187,670

15. On March 6, 2007, the ’670 Patent was duly and legally issued by the United States Patent and Trademark Office for an invention entitled “Communications Terminal, a System and a Method for Internet/Network Telephony.”

16. Buffalo Patents is the owner of the ’670 Patent, with all substantive rights in and to that patent, including the sole and exclusive right to prosecute this action and enforce the ’670 Patent against infringers, and to collect damages for all relevant times.

17. Motorola made, had made, used, imported, provided, supplied, distributed, sold, and/or offered for sale products and/or systems including, for example, its Motorola One 5G Ace smartphone and other products that support Voice over Wi-Fi (VoWi-Fi) or Wi-Fi calling (“accused products”):



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537

18. By doing so, Motorola has directly infringed (literally and/or under the doctrine of equivalents) at least Claim 1 of the '670 Patent. Motorola's infringement in this regard is ongoing.

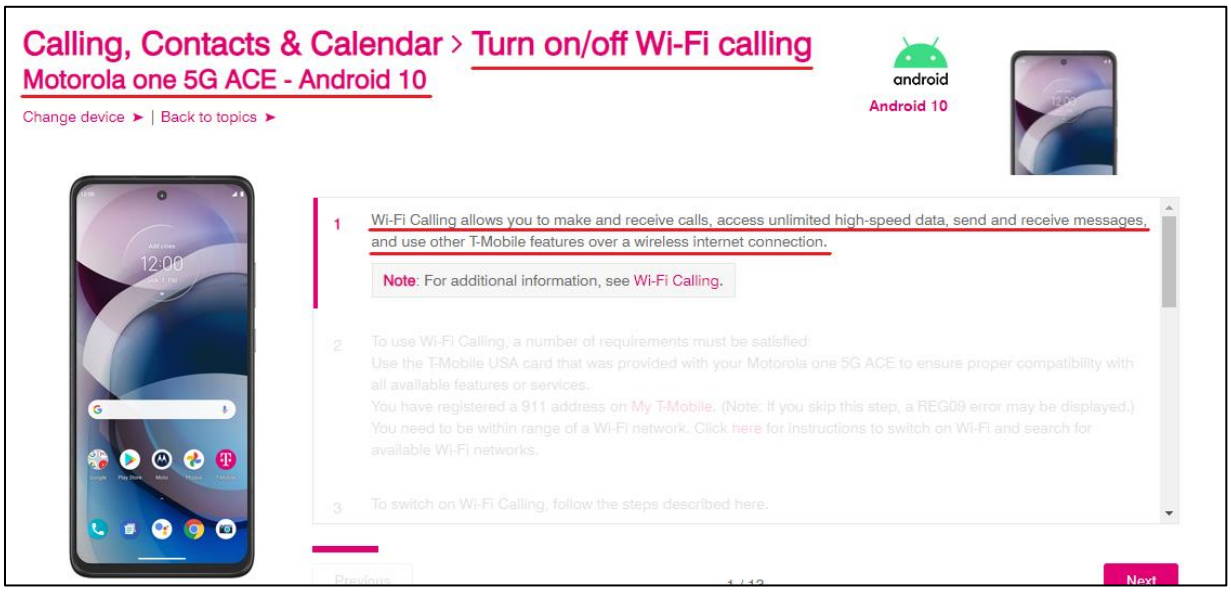
19. Motorola One 5G Ace smartphone is an exemplary accused product.

20. A Motorola One 5G Ace device is an electronic portable communications terminal for network telephony. It includes audio means for reproducing sound on the basis of a first electrical signal and to record sound resulting in a second electrical signal.

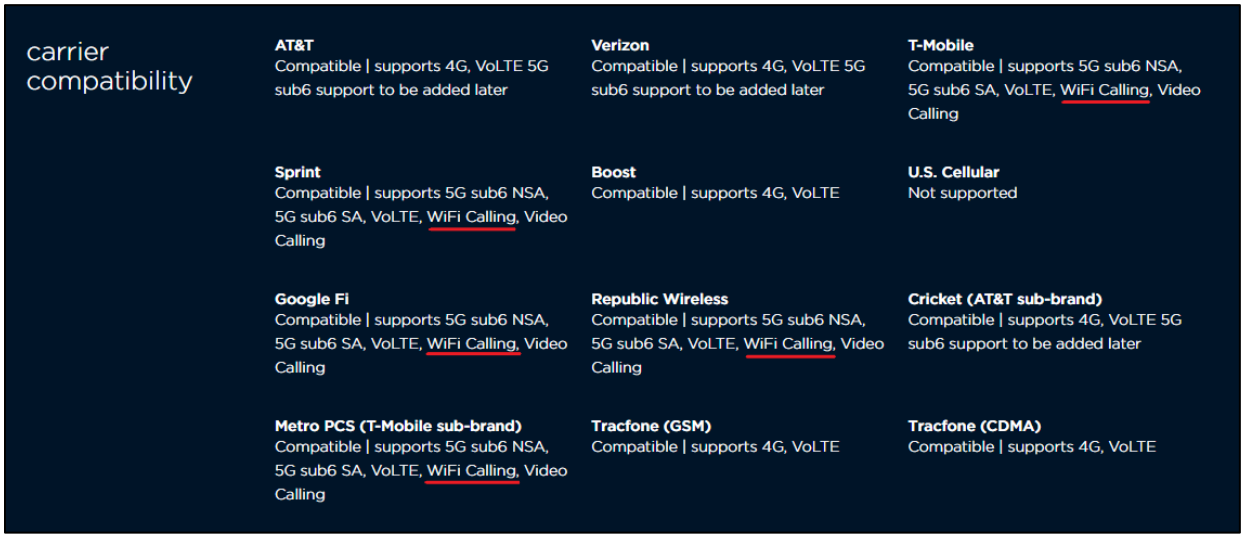
21. For example, a Motorola One 5G Ace device supports Wi-Fi calling/Voice over Wi-Fi (VoWi-Fi). VoWi-Fi enables a user to make and receive calls over the internet. A Motorola One 5G Ace device includes a microphone and a speaker ("audio means") to detect sounds generated by the user and to generate sounds based on voice data, respectively.

22. As one example, when a calling party establishes a call using the VoWi-Fi feature, the sound waves generated by the calling party are converted into analog electrical signals ("second electrical signal") by the microphone.

23. The voice data received at the calling party's device is processed to generate analog voice signals ("first electrical signal") which are fed to the speaker to generate or reproduce sound.



Source: https://www.t-mobile.com/support/tutorials/device/motorola/one-5g-ace/topic/calling-contacts-amp-calendar/turn-on-off-wi-fi-calling/1



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537

What is Voice over Wi-Fi?

Voice over Wi-Fi (VoWi-Fi) refers to the use of IEEE 802.11 wireless LANs (WLANs) to transport Voice over IP (VoIP) traffic. The technology has consumer, business and service provider applications. It is used over private WLANs, home Wi-Fi networks and public Wi-Fi hotspots.

Source: https://ribboncommunications.com/company/get-help/glossary/voice-over-wi-fi

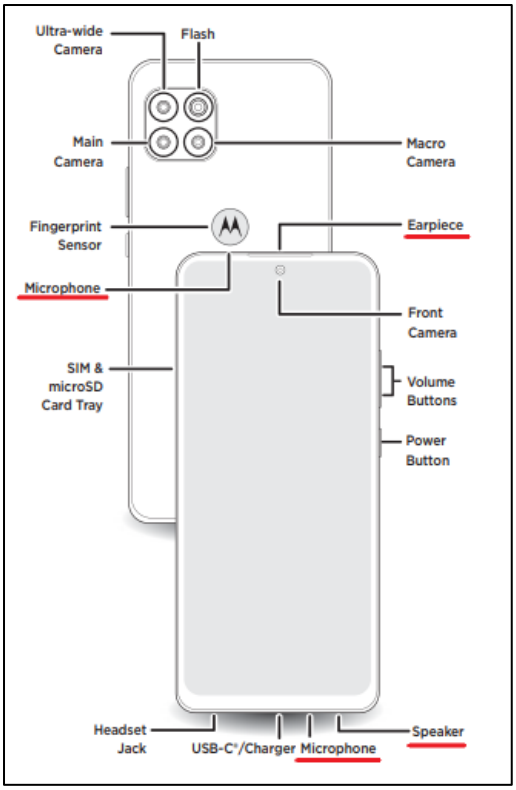
Microphone

The microphone changes the sound waves from your voice into electrical signals that are sent to the audio amplifier of the radio components. A microphone is essentially a speaker that works in reverse. When sound waves from your voice move the membrane, they make tiny electric currents either by moving a coil of wire within a magnet or by compressing the membrane against carbon dust (see How do microphones work? for details).

Source: https://electronics.howstuffworks.com/cordless-telephone4.htm

One common application for CODECs is with Digital Signal Processors (DSPs) in audio electronics devices. CODECs convert sound (using the ADC) to digital signals for a processor to compress and store and for playback, the stored digital data is decompressed and converted to analog signals via the DAC. The analog signal reaches the human ear by converting the analog signal into a transmissible sound via a pulse width modulator and a speaker, for example.

Source: https://www.analogictips.com/what-is-a-codec/



Source:

https://download.lenovo.com/Motorola/Manuals/156922/73228221/motorola%20one%205G%20ACE_UG_en-US_SSC8D10322A.pdf (Page 3)

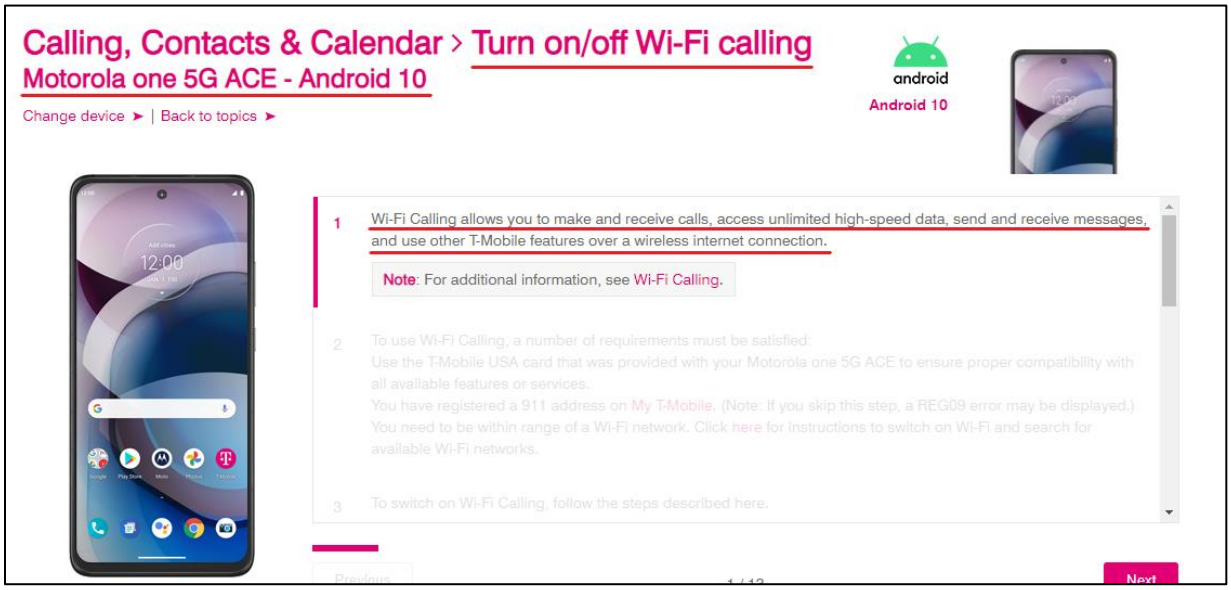
24. A Motorola One 5G Ace device includes a converting means converting said second electrical signal into transmission data, representing sound for transmission, in a suitable data format, and to convert received data, representing received sound, in said suitable data format into said first electrical signal.

25. For example, a Motorola One 5G Ace device supports Wi-Fi calling/Voice over Wi-Fi (VoWi-Fi). VoWi-Fi enables a user to make and receive calls over the internet. A Motorola One 5G Ace device includes a codec (coder/decoder) ("converting means") to convert analog voice input into digital data and vice versa.

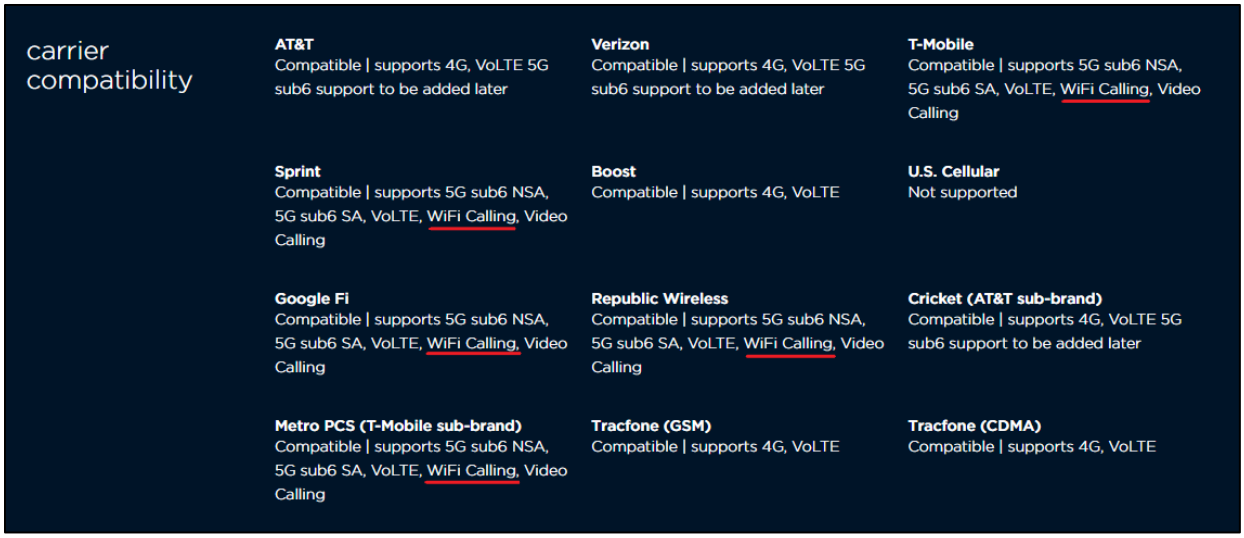
26. As one example, when a calling party establishes a call using the VoWi-Fi feature, the electrical signal generated by the microphone ("second electrical signal") is

converted into digital data ("transmission data, representing sound for transmission, in a suitable data format") with the help of a codec.

27. Further, packetized voice data received at the calling party's device is processed and converted into digital data. This digital data ("received data, representing received sound, in said suitable data format") is fed to the codec to generate an analog voice signal ("first electrical signal").



Source: https://www.t-mobile.com/support/tutorials/device/motorola/one-5g-ace/topic/calling-contacts-amp-calendar/turn-on-off-wi-fi-calling/1



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537

What is Voice over Wi-Fi?

Voice over Wi-Fi (VoWi-Fi) refers to the use of IEEE 802.11 wireless LANs (WLANs) to transport Voice over IP (VoIP) traffic. The technology has consumer, business and service provider applications. It is used over private WLANs, home Wi-Fi networks and public Wi-Fi hotspots.

Source: https://ribboncommunications.com/company/get-help/glossary/voice-over-wi-fi

3. Codecs

The quality of voice is a characteristic on digital telephony. Since VoIP and VoWiFi combine digital telephony and networking technologies they also have the quality of voice characteristic. An important element that controls the quality of voice is the compression, and conversion of analog to digital (codec) used on the voice traffic. There are numerous codecs defined for use with voice traffic. The following sections will introduce and give an overview of a few current codecs in use.

Source: https://www.cse.wustl.edu/~jain/cse574-06/ftp/wireless_voip/index.html

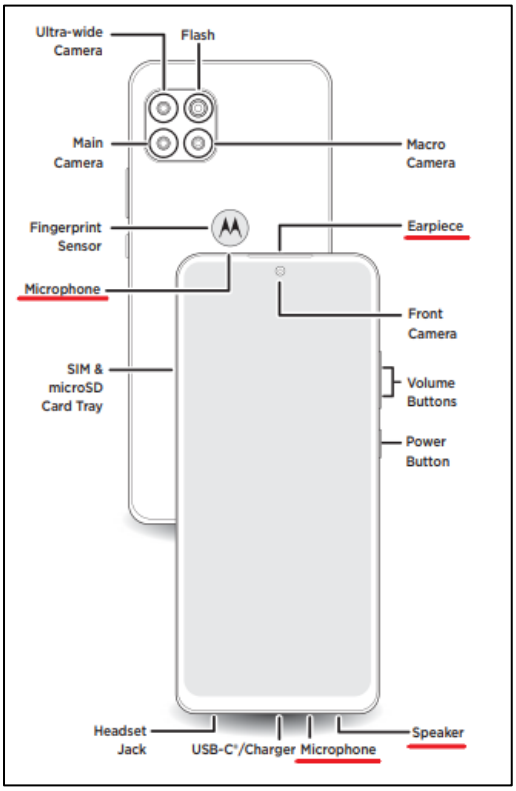
One common application for CODECs is with Digital Signal Processors (DSPs) in audio electronics devices. CODECs convert sound (using the ADC) to digital signals for a processor to compress and store and for playback, the stored digital data is decompressed and converted to analog signals via the DAC. The analog signal reaches the human ear by converting the analog signal into a transmissible sound via a pulse width modulator and a speaker, for example.

Source: https://www.analogictips.com/what-is-a-codec/

Baseband part in a mobile is comprised of a digital signal processor (DSP) to process forward voice/data signals for transmission and to process reverse voice/data signals received.

This is the core processing part which changes for various air interface standards like GSM, HSPA, LTE and more. It is often named as physical layer or Layer 1 or L1. For Speech/audio, codec is used to compress and decompress the signal to match the data rate to the frame it has to fit in. The baseband or physical layer will add redundant bits to enable error detection as well as error correction. Error detection is obtained with CRC and error correction with forward error correction techniques. Other than this interleaving is done for the data of one burst which helps in spreading the error over the time hence helps receiver de-interleave and decode the frame (consecutively data burst) correctly.

Source: https://www.techplayon.com/mobile-phone-architecture/#:~:text=Baseband%20part%20in%20a%20mobile,%2C%20HSPA%2C%20LTE%20and%20more



Source:

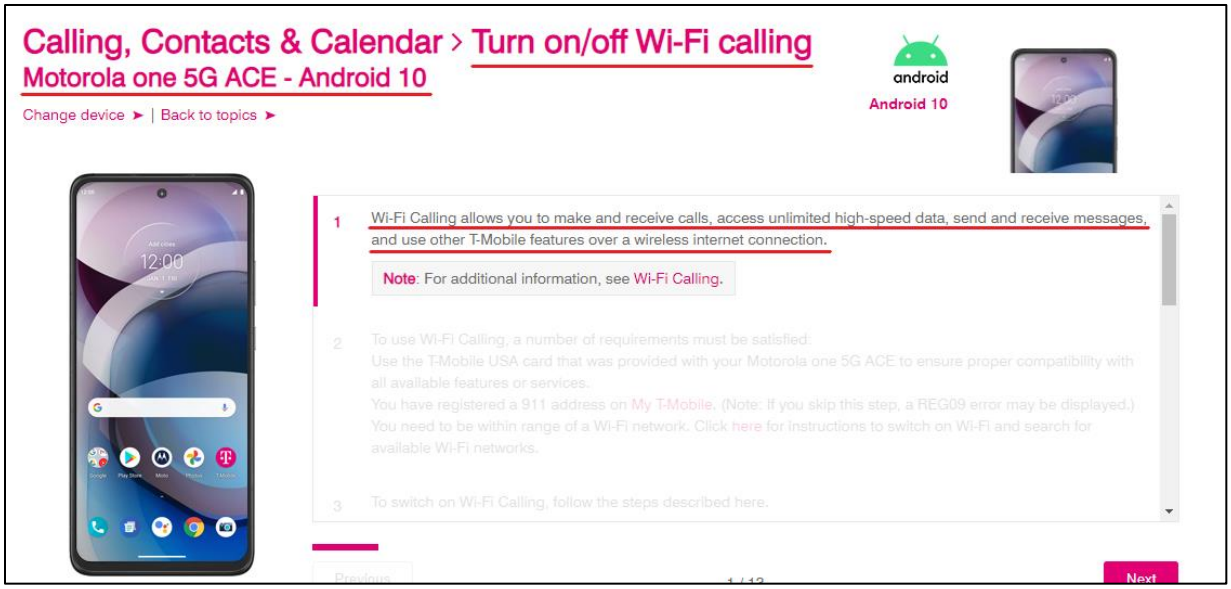
https://download.lenovo.com/Motorola/Manuals/156922/73228221/motorola%20one%205G%20ACE_UG_en-US_SSC8D10322A.pdf (Page 3)

28. A Motorola One 5G Ace device includes a protocol means connected to said converting means for handling and controlling communication of said received and transmission data in accordance with a standardized network protocol, thereby embedding and extracting said transmission and received data, respectively, in/from a data packet format according to said standardized network protocol.

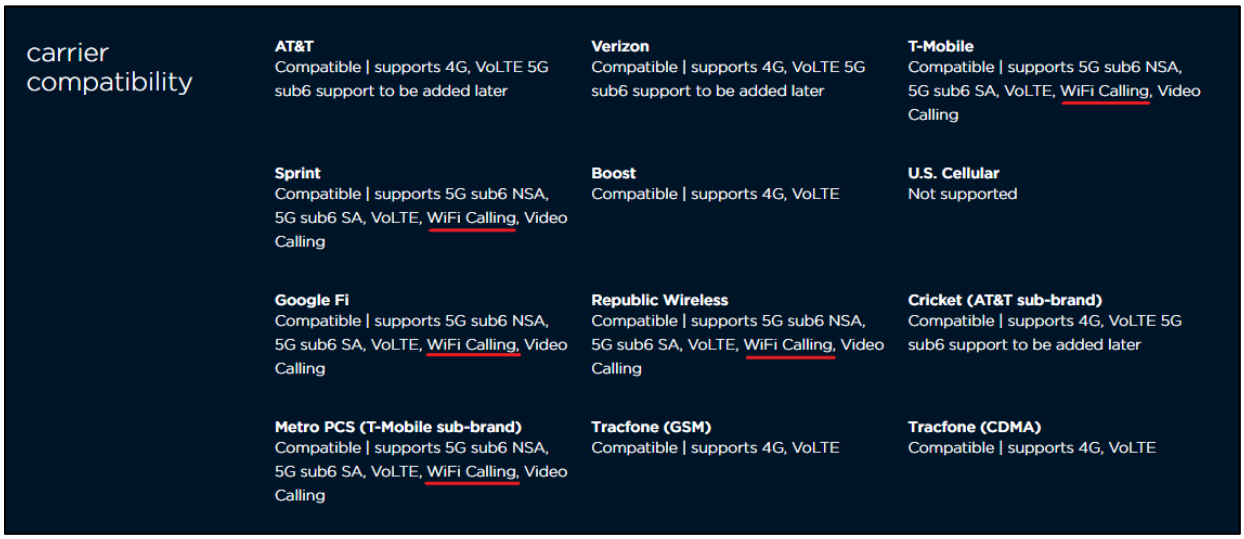
29. For example, a Motorola One 5G Ace device supports Wi-Fi calling/Voice over Wi-Fi (VoWi-Fi). VoWi-Fi enables a user to make and receive calls over the internet.

30. As one example, when a calling party establishes a call using the VoWi-Fi feature, the voice input is converted into digital voice data and the digital voice data is split and encapsulated ("thereby embedding") into IP (Internet Protocol) packets ("data packet format") by the device.

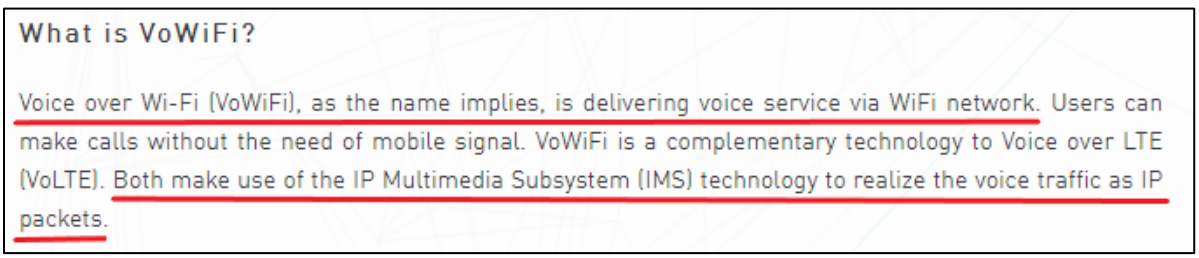
31. Further, when voice data is received at the calling party's device, the data is processed and the IP packets (encapsulated data), including the packetized voice data, are extracted. The IP packets correspond to the IP protocol ("standardized network protocol"). A Motorola One 5G Ace device includes a processor ("protocol means") for embedding and extracting the digital data into/from IP packets, respectively.



Source: https://www.t-mobile.com/support/tutorials/device/motorola/one-5g-ace/topic/calling-contacts-amp-calendar/turn-on-off-wi-fi-calling/1



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537



Source: https://insinuator.net/2016/10/a-journey-into-the-depths-of-vowifi-security/

Transport Layer (Layer 4)

Transport layer adds many information with original data as Transport layer header (Layer 4 header), which are relevant for data processing at the Transport layer.

The Application layer message is encapsulated at the Transport layer. If the protocol used at the Transport Layer is TCP (Transmission Control Protocol), the data packet is known as "TCP Segment". If the protocol used at the Transport layer is UDP (User Datagram Protocol), the data packet is known as "UDP Datagram".

Network Layer (Layer 3)

Network layer adds additional data as header, which are relevant for processing data at Network layer.

The data packet created at the Network layer by Internet Protocol (IPv4 or IPv6), which encapsulates its upper layer Transport layer segment/datagram, is known as "IP Datagram".

Source: https://www.omnisecu.com/tcpip/tcpip-encapsulation-decapsulation.php

Datalink Layer (Layer 2)

Receiver opens the Datalink layer header and trailer (Layer 2 header and trailer), uses the values at Datalink header and trailer for processing data at the Datalink layer.

Receiver then collects the Network layer packet (IPv4 or IPv6 Datagram), and it is transferred to Network layer for further processing.

Source: https://www.omnisecu.com/tcpip/tcpip-encapsulation-decapsulation.php

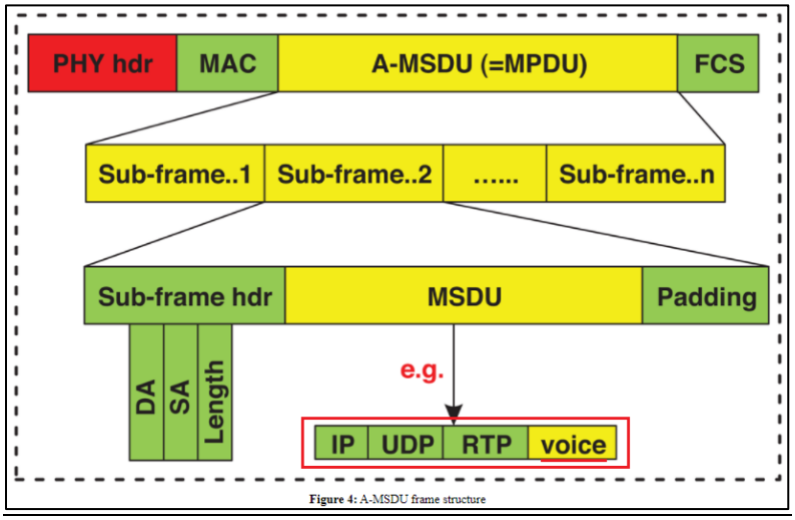


Figure 4: A-MSDU frame structure

Source: https://www.techscience.com/cmc/v66n2/40658/html

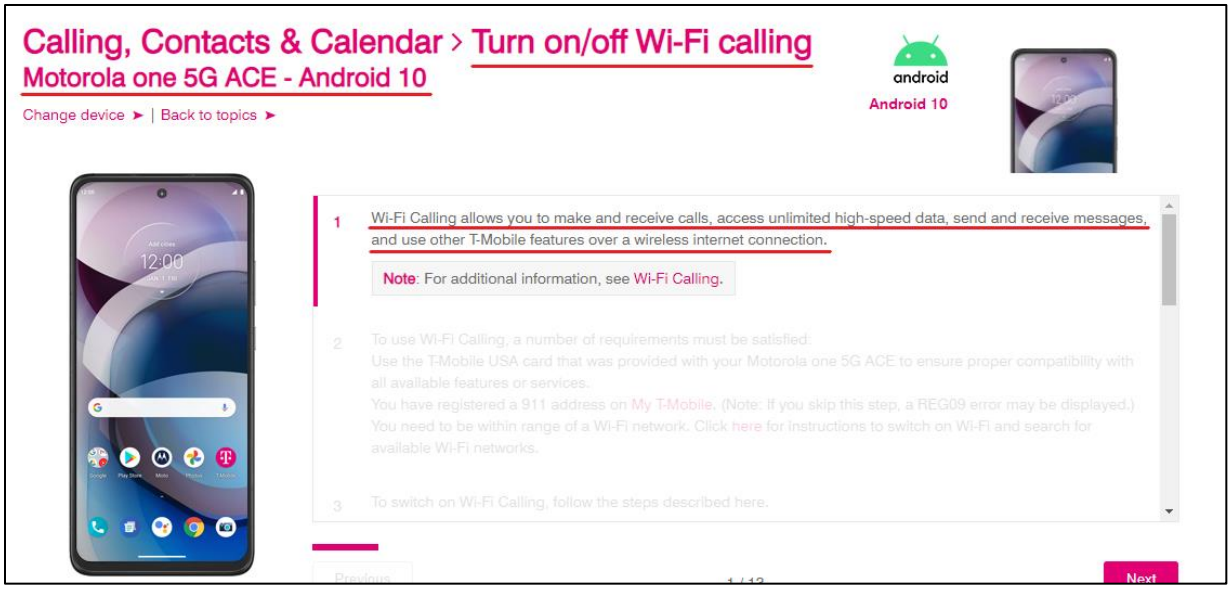
32. A Motorola One 5G Ace device includes a wireless near field communications means connected to said protocol means for receiving/sending said received and transmission data in said first data packet format from/to said protocol means. The near field communications means embeds said transmission data in said first data packet format received from said protocol

means in a wireless second data format and extracts said received data in said first data packet format from said wireless second data format.

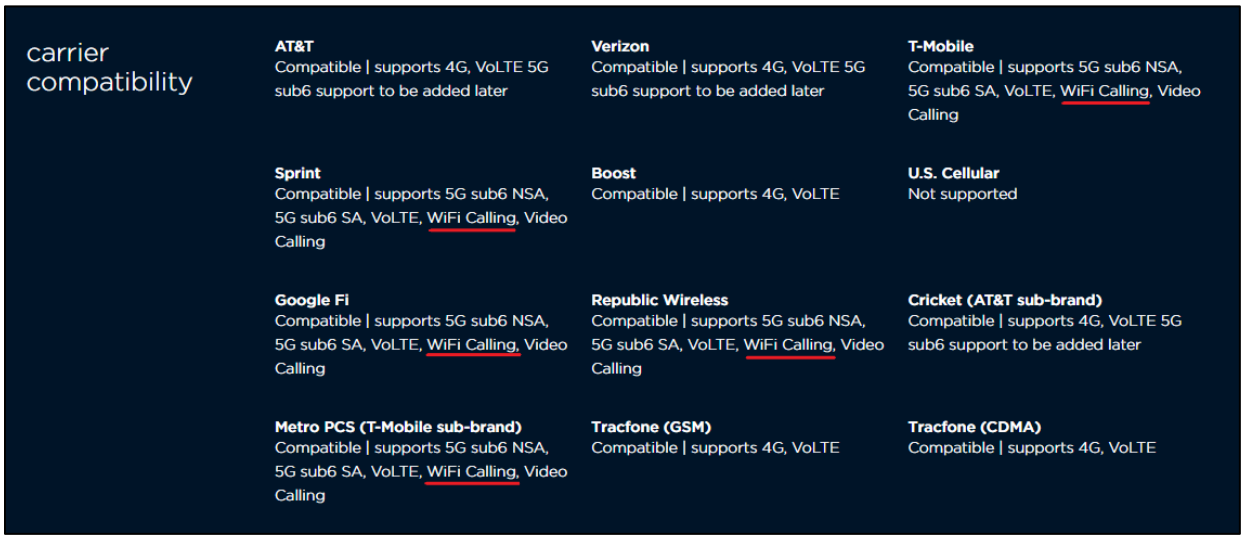
33. For example, a Motorola One 5G Ace device supports Wi-Fi calling/Voice over Wi-Fi (VoWi-Fi). VoWi-Fi enables a user to make and receive calls over the internet. As one example, when a calling party establishes a call using the VoWi-Fi feature, the voice input is processed and encapsulated into IP packets ("first data packet format") by the device. Further, when voice data is received at the calling party's device, the data is processed and the encapsulated IP packets, including the packetized voice data, are extracted. A Motorola One 5G Ace device includes a processor ("protocol means") for embedding and extracting the digital data into/from IP packets, respectively.

34. The IP packets ("in said first data packet format") received from the protocol means are then embedded into PPDU (PLCP (Physical Layer Convergence Protocol) Protocol Data Unit) frames by adding appropriate headers, such as Physical layer and MAC layer headers. The Motorola One 5G Ace includes a Wi-Fi chipset ("wireless near field communication means") for embedding the IP packets into the IEEE 802.11 frame format (PPDUs) ("wireless second data format").

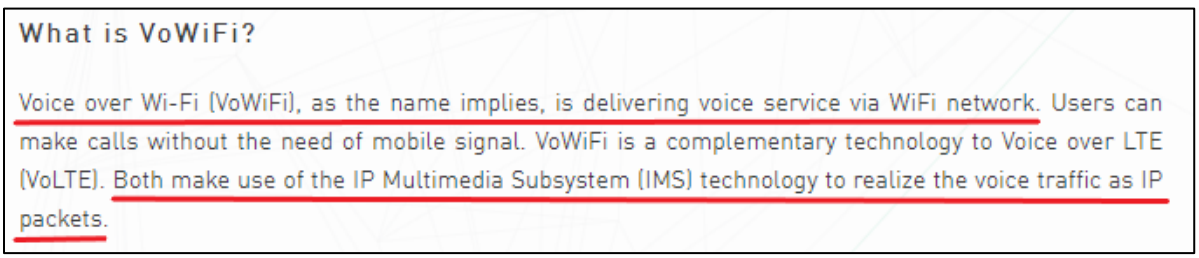
35. When the calling party receives the voice data (PPDUs) from the wireless network, the embedded IP packets are extracted from these PPDU frames by the removal of appropriate headers. The received PPDU frames correspond to the IEEE 802.11 protocol. The extracted IP packets including the packetized voice data are then sent to the protocol means for processing. The Wi-Fi chipset ("wireless near field communication means") extracts the IP packets from the received PPDUs and sends them to the protocol means.



Source: https://www.t-mobile.com/support/tutorials/device/motorola/one-5g-ace/topic/calling-contacts-amp-calendar/turn-on-off-wi-fi-calling/1



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537



Source: https://insinuator.net/2016/10/a-journey-into-the-depths-of-vowifi-security/

Datalink layer (Layer 2)

The data packet generated at Network layer is then placed inside Datalink layer header and trailer (Layer 2 header and trailer). Values inside Datalink layer header and trailer are relevant for processing data at Datalink layer.

The data packet at the Datalink layer, which encapsulates and may subdivide the IP Datagram, is known as a "Frame" (generally Ethernet Frame).

The most important values at Datalink layer header (Layer 2 header) are source and destination MAC addresses (Layer 2 addresses). Following image represents data packet generated at Datalink layer.

Source: https://www.omnisecu.com/tcpip/tcpip-encapsulation-decapsulation.php

Datalink Layer (Layer 2)

Receiver opens the Datalink layer header and trailer (Layer 2 header and trailer), uses the values at Datalink header and trailer for processing data at the Datalink layer.

Receiver then collects the Network layer packet (IPv4 or IPv6 Datagram), and it is transferred to Network layer for further processing.

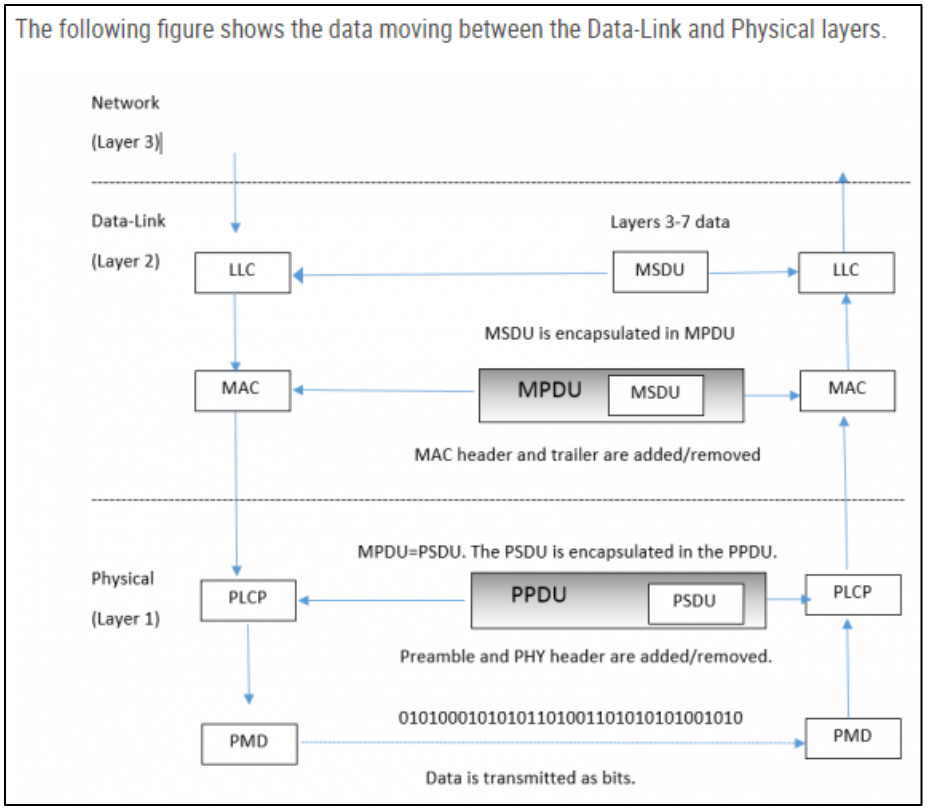
Source: https://www.omnisecu.com/tcpip/tcpip-encapsulation-decapsulation.php

physical layer (PHY) protocol data unit (PPDU): The unit of data exchanged between two peer PHY entities to provide the PHY data service.

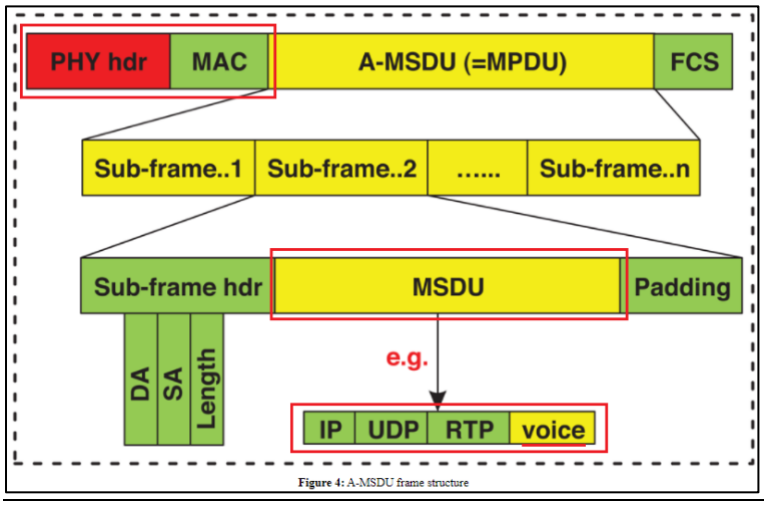
Source: https://ieeexplore.ieee.org/document/7786995 (Page 138)

- When the Network layer (layer 3) sends data to the Data-Link layer, that data is handed off to the LLC and becomes known as the MAC Service Data Unit (MSDU).
- The payload of a 802.11 data frame is the layer 3–7 information known as the MSDU.
- A simple definition of the MSDU is that it is the data payload that contains the IP packet plus some LLC data.

Source: https://dot11ap.wordpress.com/msdu-and-mpdu/



Source: https://www.cwnp.com/802.11-mac-series-ndash-basics-mac-architecture-ndash-part-1-3/



Source: https://www.techscience.com/cmc/v66n2/40658/html

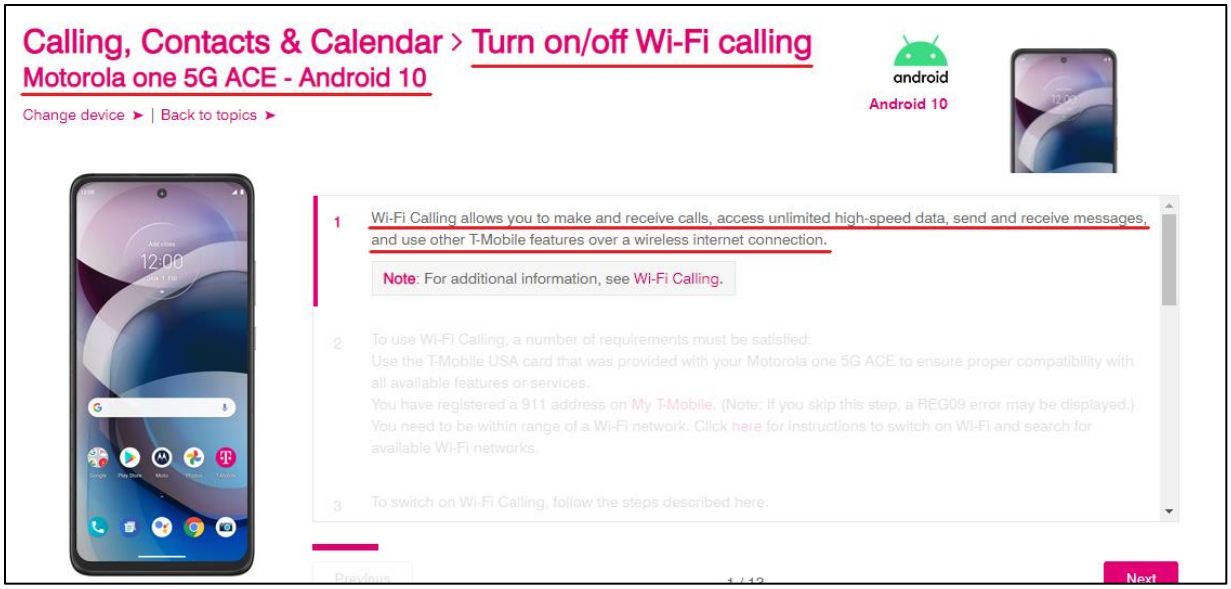
36. The wireless near field communications means performs wireless near field communication of said received data or said transmission data embedded in said wireless second

data format with a connecting unit communicating in said wireless second data format and to establish a connection to a network according to said standardized network protocol, whereby the resulting data exchanged between the wireless near field communication means and the connecting unit consist of packets in said first data packet format embedded in said wireless second data format.

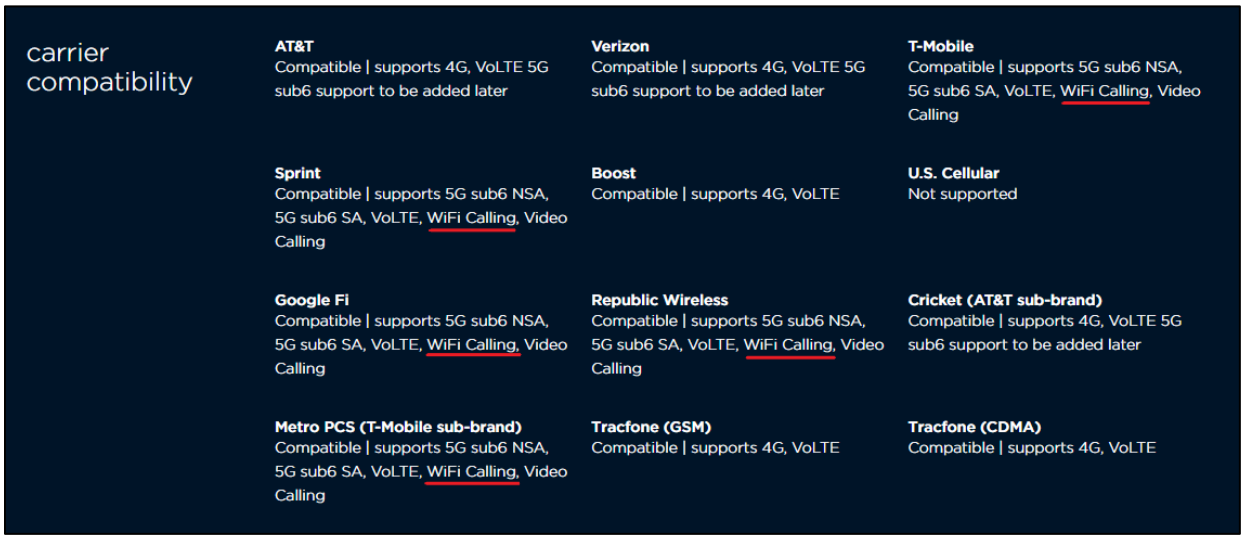
37. For example, a Motorola One 5G Ace device supports Wi-Fi calling/Voice over Wi-Fi (VoWi-Fi). VoWi-Fi enables a user to make and receive calls over the internet. As one example, when a calling party establishes a call using the VoWi-Fi feature, the calling party's device embeds the digital voice data into IP packets. These IP packets ("said first data packet format") are then embedded into PPDU frames by adding appropriate headers, such as Physical layer and MAC layer headers. The Motorola One 5G Ace device includes a Wi-Fi chipset ("wireless near field communication means") for embedding the IP packets into IEEE 802.11 frame format (*i.e.*, PPDUs) ("wireless second data format").

38. The Wi-Fi chipset ("wireless near field communication means") of the device transmits the PPDUs ("transmission data embedded in wireless second data format") to the 802.11 router/access point ("connecting unit") using corresponding wireless communication antennas. The Wi-Fi chipset ("wireless near field communication means") of the device also receives PPDUs ("received data") from the 802.11 router/access point ("connecting unit") using corresponding wireless communication antennas. These PPDUs correspond to IEEE 802.11 frame format ("wireless second data format") and include the embedded IP ("first data packet format") packets with packetized voice data.

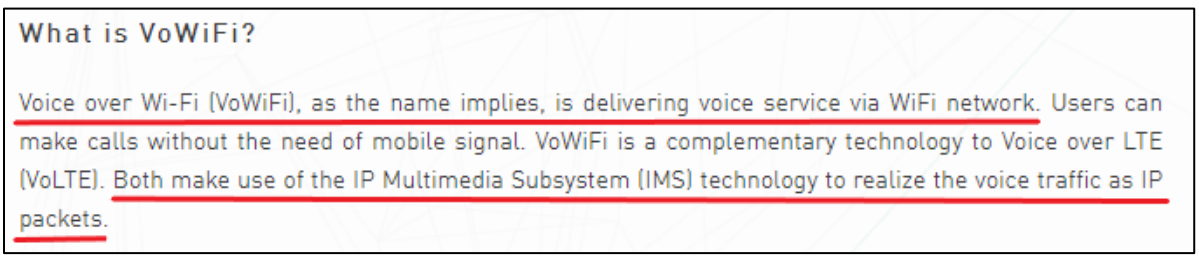
39. The 802.11 access points are connected to the internet according to the Internet Protocol ("standardized network protocol").



Source: https://www.t-mobile.com/support/tutorials/device/motorola/one-5g-ace/topic/calling-contacts-amp-calendar/turn-on-off-wi-fi-calling/1



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537



Source: https://insinuator.net/2016/10/a-journey-into-the-depths-of-vowifi-security/

> **Datalink layer (Layer 2)**
>
> The data packet generated at Network layer is then placed inside Datalink layer header and trailer (Layer 2 header and trailer). Values inside Datalink layer header and trailer are relevant for processing data at Datalink layer.
>
> The data packet at the Datalink layer, which encapsulates and may subdivide the IP Datagram, is known as a "Frame" (generally Ethernet Frame).
>
> The most important values at Datalink layer header (Layer 2 header) are source and destination MAC addresses (Layer 2 addresses). Following image represents data packet generated at Datalink layer.

Source: https://www.omnisecu.com/tcpip/tcpip-encapsulation-decapsulation.php

> **Datalink Layer (Layer 2)**
>
> Receiver opens the Datalink layer header and trailer (Layer 2 header and trailer), uses the values at Datalink header and trailer for processing data at the Datalink layer.
>
> Receiver then collects the Network layer packet (IPv4 or IPv6 Datagram), and it is transferred to Network layer for further processing.

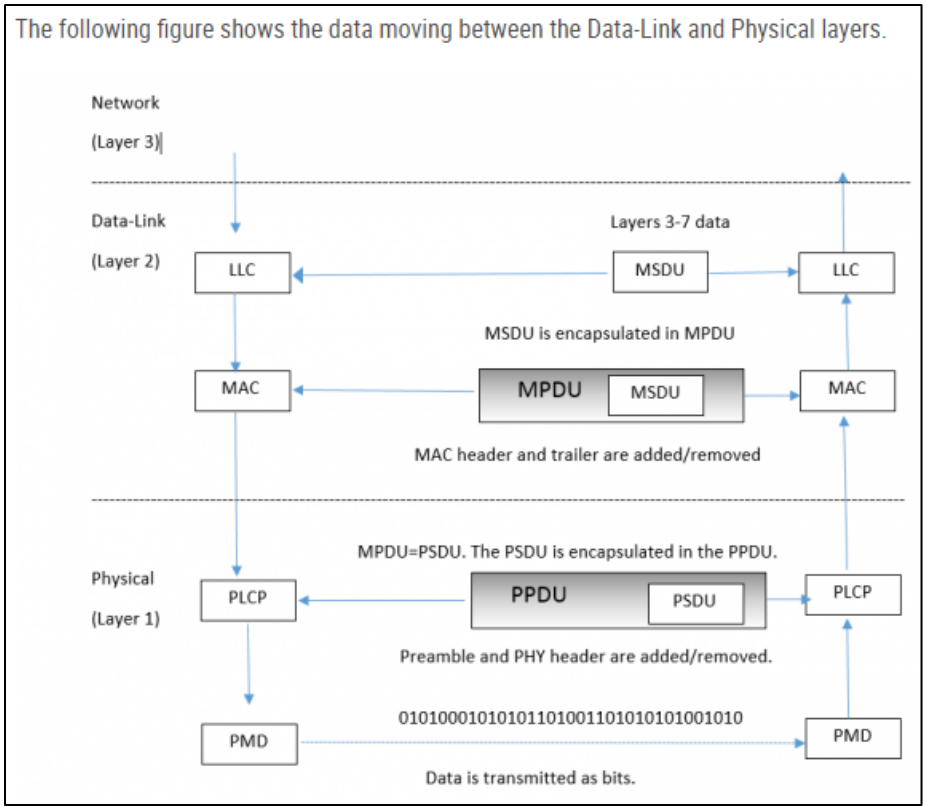
Source: https://www.omnisecu.com/tcpip/tcpip-encapsulation-decapsulation.php

> **physical layer (PHY) protocol data unit (PPDU):** The unit of data exchanged between two peer PHY entities to provide the PHY data service.

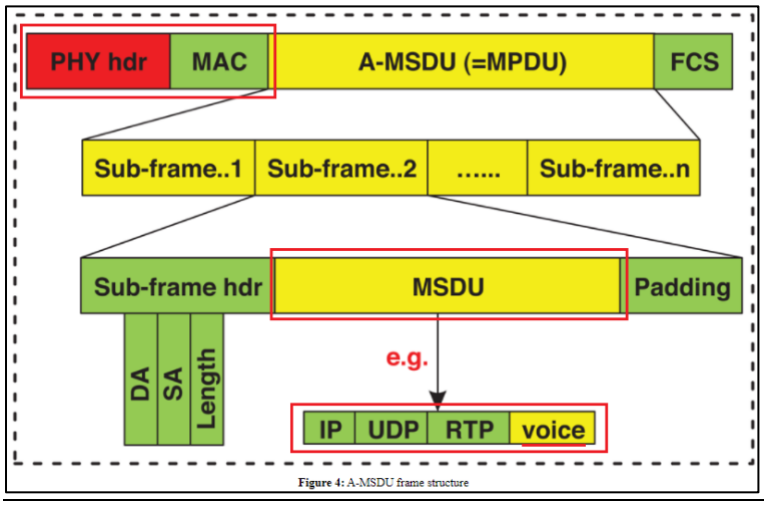
Source: https://ieeexplore.ieee.org/document/7786995 (Page 138)

> - When the Network layer (layer 3) sends data to the Data-Link layer, that data is handed off to the LLC and becomes known as the MAC Service Data Unit (MSDU).
> - The payload of a 802.11 data frame is the layer 3–7 information known as the MSDU.
> - A simple definition of the MSDU is that it is the data payload that contains the IP packet plus some LLC data.

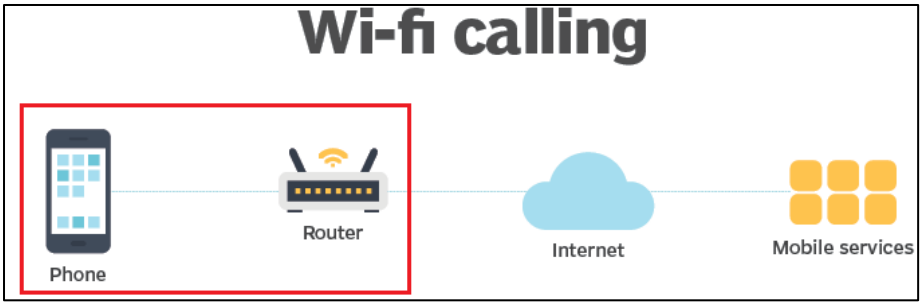
Source: https://dot11ap.wordpress.com/msdu-and-mpdu/



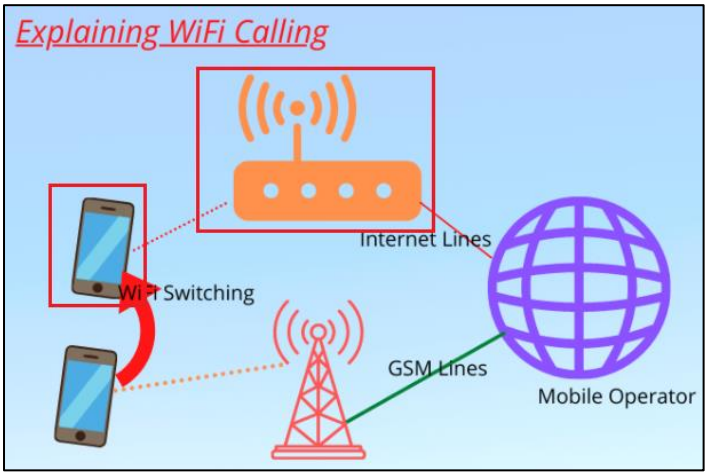
Source: https://www.cwnp.com/802.11-mac-series-ndash-basics-mac-architecture-ndash-part-1-3/



Source: https://www.techscience.com/cmc/v66n2/40658/html



Source: https://whatis.techtarget.com/definition/Wi-Fi-calling



Source: https://www.cspsprotocol.com/what-is-wifi-calling/

40. Motorola has had knowledge of the '670 Patent at least as of the date when it was notified of the filing of this action, and as early as November 2, 2021, when Motorola received a letter notifying it of the '670 Patent.

41. Buffalo Patents has been damaged as a result of the infringing conduct by Motorola alleged above. Thus, Motorola is liable to Buffalo Patents in an amount that adequately compensates it for such infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

42. Buffalo Patents has neither made nor sold unmarked articles that practice the '670 Patent, and is entitled to collect pre-filing damages for the full period allowed by law for infringement of the '670 Patent.

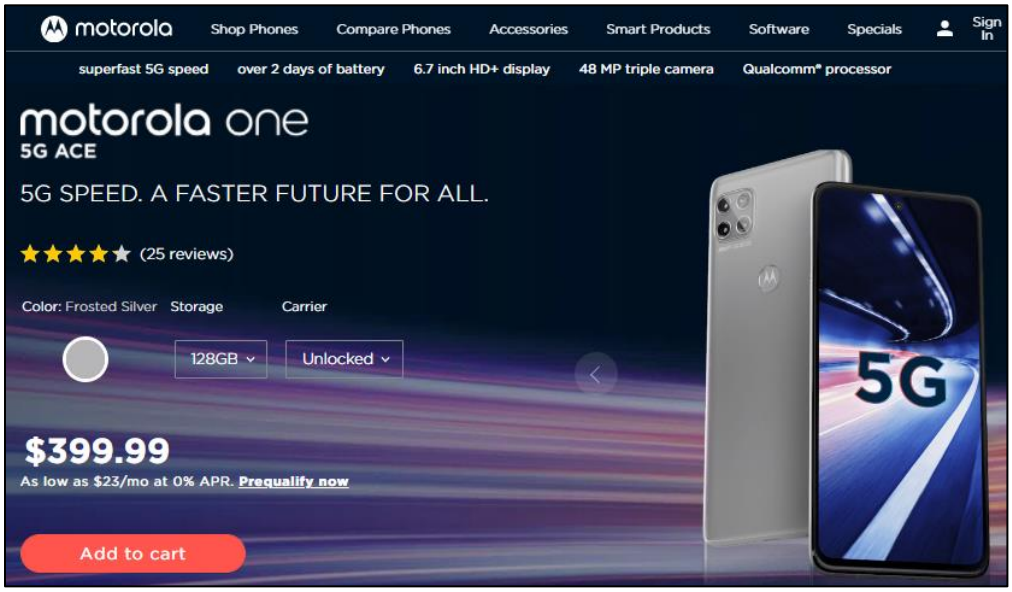
COUNT II

DIRECT INFRINGEMENT OF U.S. PATENT NO. 7,408,915

43. On August 5, 2008, the ’915 Patent was duly and legally issued by the United States Patent and Trademark Office for an invention entitled “Communications Terminal, a System and a Method for Internet/Network Telephony.”

44. Buffalo Patents is the owner of the ’915 Patent, with all substantive rights in and to that patent, including the sole and exclusive right to prosecute this action and enforce the ’915 Patent against infringers, and to collect damages for all relevant times.

45. Motorola made, had made, used, imported, provided, supplied, distributed, sold, and/or offered for sale products and/or systems including, for example, its Motorola One 5G Ace smartphone and other products that support Voice over Wi-Fi (VoWi-Fi) or Wi-Fi calling (“accused products”):



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537

46. By doing so, Motorola has directly infringed (literally and/or under the doctrine of equivalents) at least Claim 29 of the '915 Patent. Motorola's infringement in this regard is ongoing.

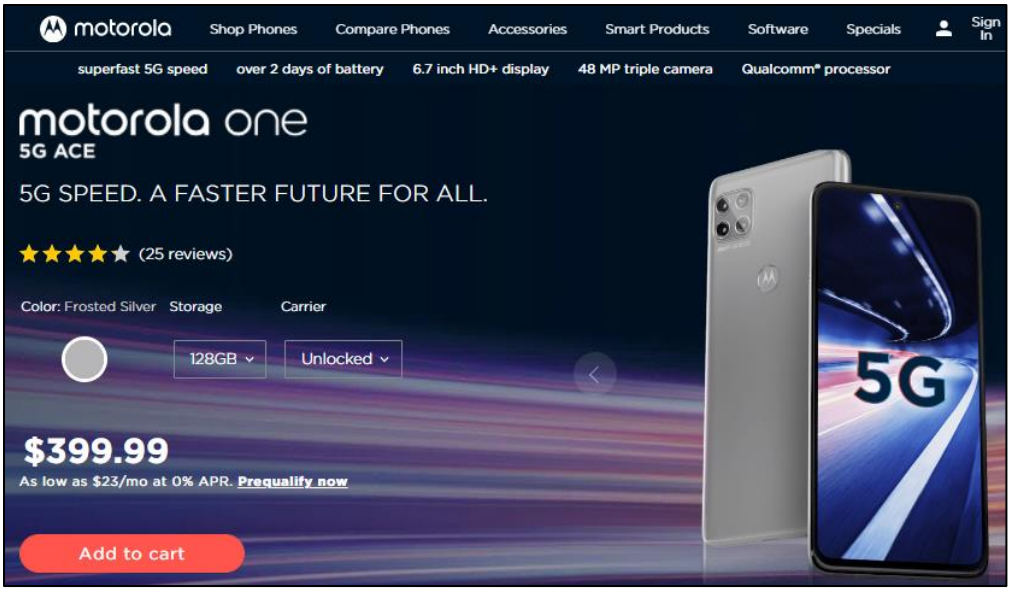
47. Motorola One 5G Ace smartphone is an exemplary accused product.

48. Motorola has infringed the '915 Patent by using the accused products and thereby practicing a method for network telephony comprising the step of reproducing sound on the basis of a first electrical signal and recording sound resulting in a second electrical signal, by audio means.

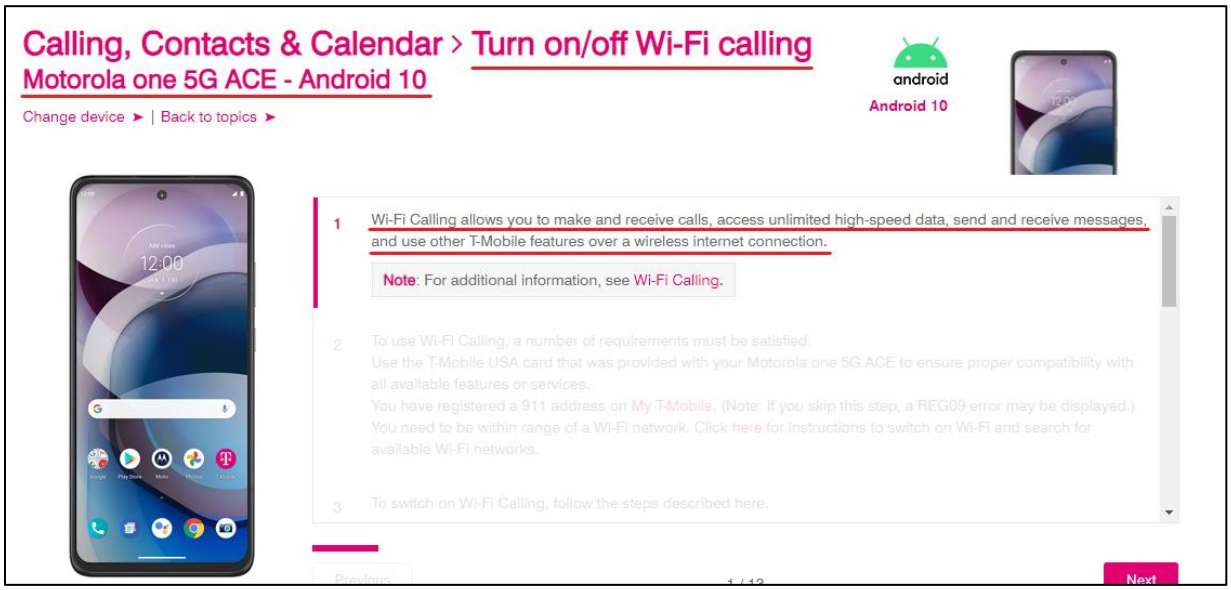
49. For example, a Motorola One 5G Ace device supports Wi-Fi calling/Voice over Wi-Fi (VoWi-Fi). VoWi-Fi enables a user to make and receive calls over the internet. A Motorola One 5G Ace device includes a microphone and a speaker ("audio means") to detect sounds generated by the user and to generate sounds based on voice data, respectively.

50. As one example, when a calling party establishes a call using the VoWi-Fi feature, the sound waves generated by the calling party are converted into analog electrical signals ("second electrical signal") by the microphone.

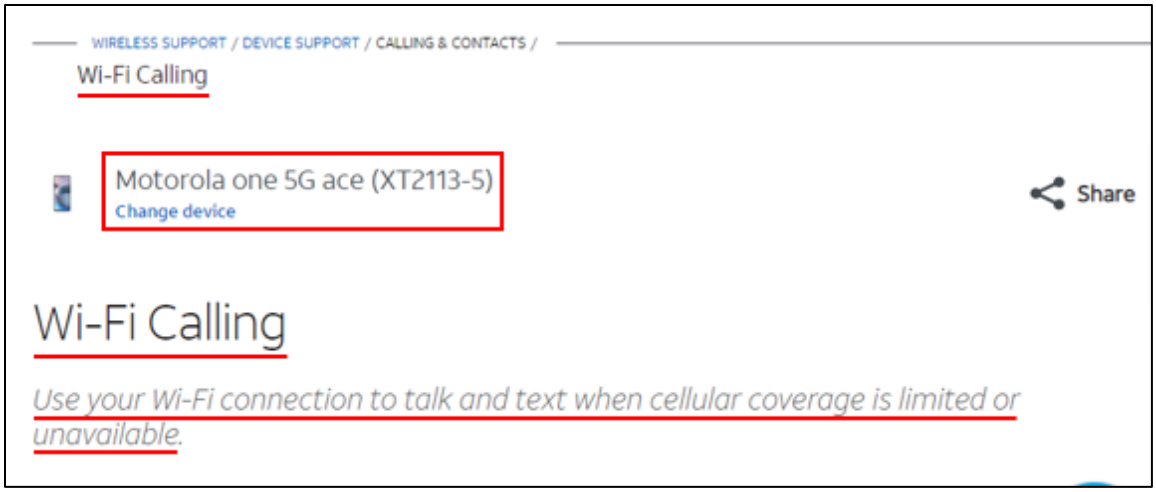
51. Further, voice data received at the calling party's device is processed to generate analog voice signals ("first electrical signal"), which are fed to the speaker to generate or reproduce sound.



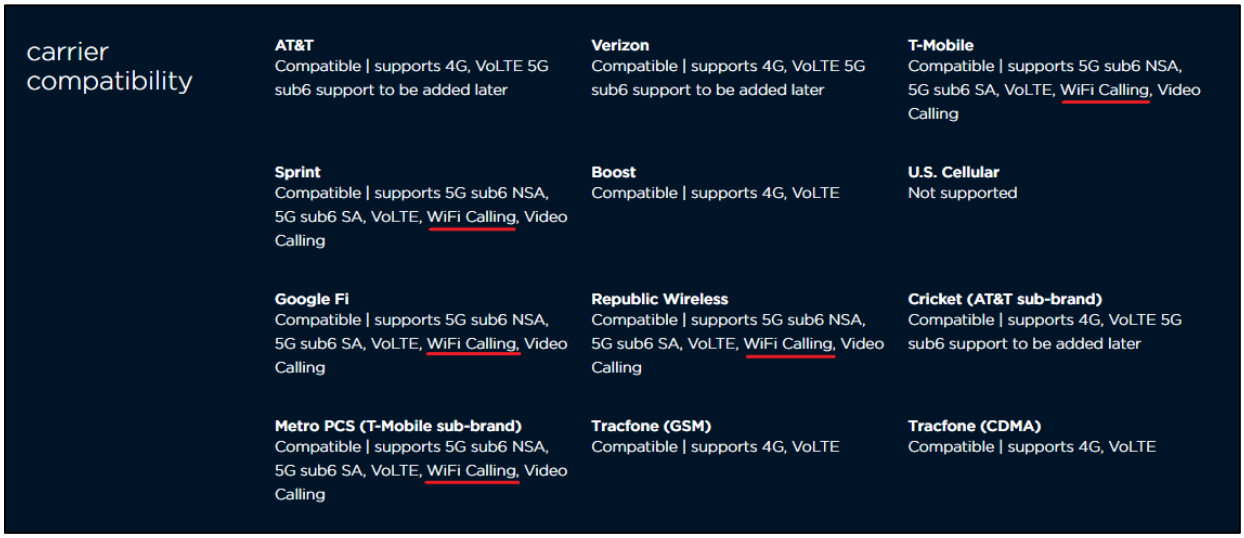
Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537



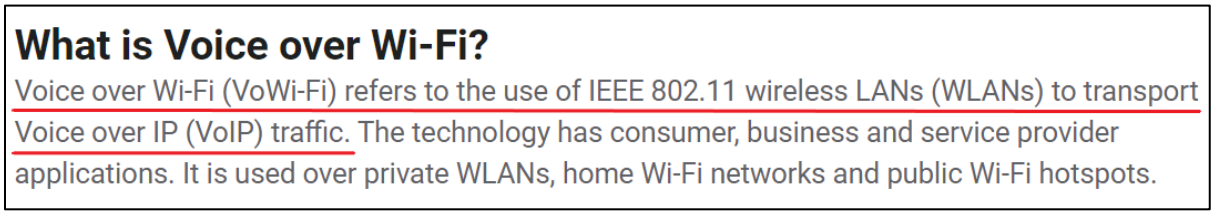
Source: https://www.t-mobile.com/support/tutorials/device/motorola/one-5g-ace/topic/calling-contacts-amp-calendar/turn-on-off-wi-fi-calling/1



Source: https://www.att.com/device-support/article/wireless/KM1428768/Motorola/MotorolaXT21135



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537



Source: https://ribboncommunications.com/company/get-help/glossary/voice-over-wi-fi

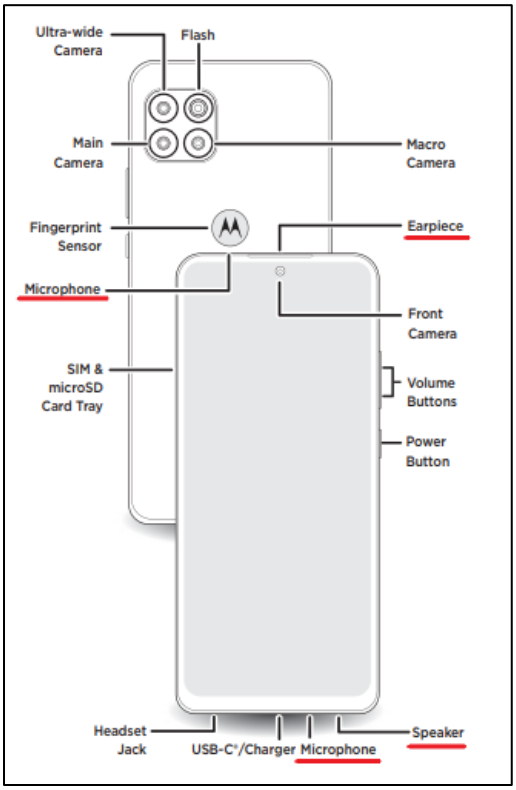
Microphone

The microphone changes the sound waves from your voice into electrical signals that are sent to the audio amplifier of the radio components. A microphone is essentially a speaker that works in reverse. When sound waves from your voice move the membrane, they make tiny electric currents either by moving a coil of wire within a magnet or by compressing the membrane against carbon dust (see How do microphones work? for details).

Source: https://electronics.howstuffworks.com/cordless-telephone4.htm

One common application for CODECs is with Digital Signal Processors (DSPs) in audio electronics devices. CODECs convert sound (using the ADC) to digital signals for a processor to compress and store and for playback, the stored digital data is decompressed and converted to analog signals via the DAC. The analog signal reaches the human ear by converting the analog signal into a transmissible sound via a pulse width modulator and a speaker, for example.

Source: https://www.analogictips.com/what-is-a-codec/



Source:

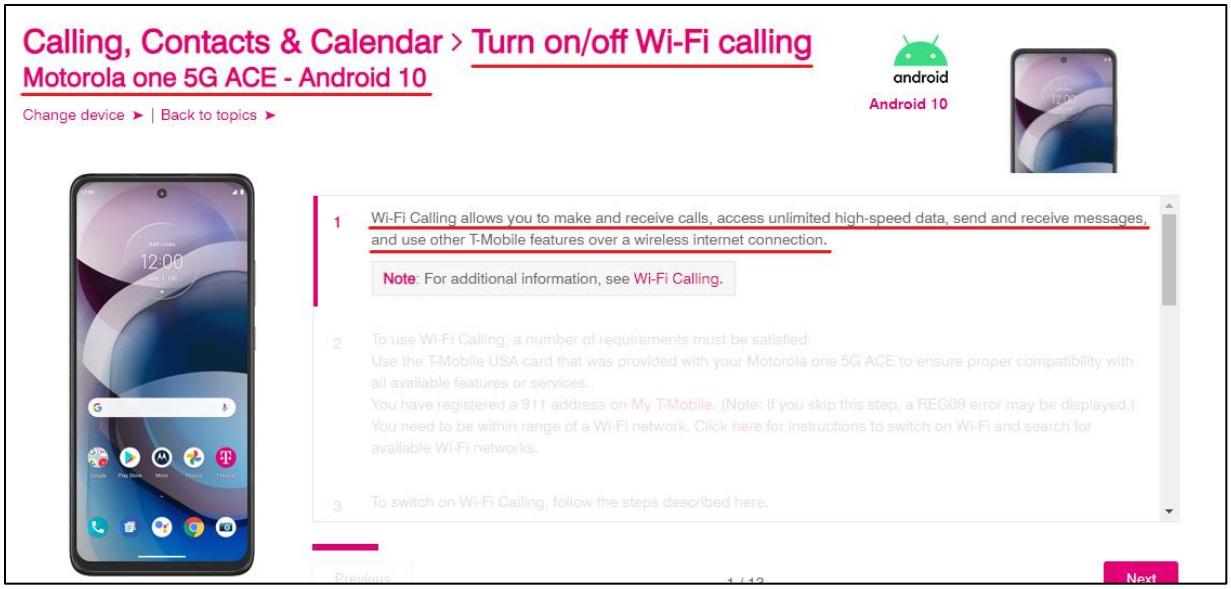
https://download.lenovo.com/Motorola/Manuals/156922/73228221/motorola%20one%205G%20ACE_UG_en-US_SSC8D10322A.pdf (Page 3)

52. The method practiced using the accused products further comprises the step of converting said second electrical signal into transmission data, representing sound for transmission, in a suitable data format, and converting received data, representing received sound, in said suitable data format into said first electrical signal, by converting means.

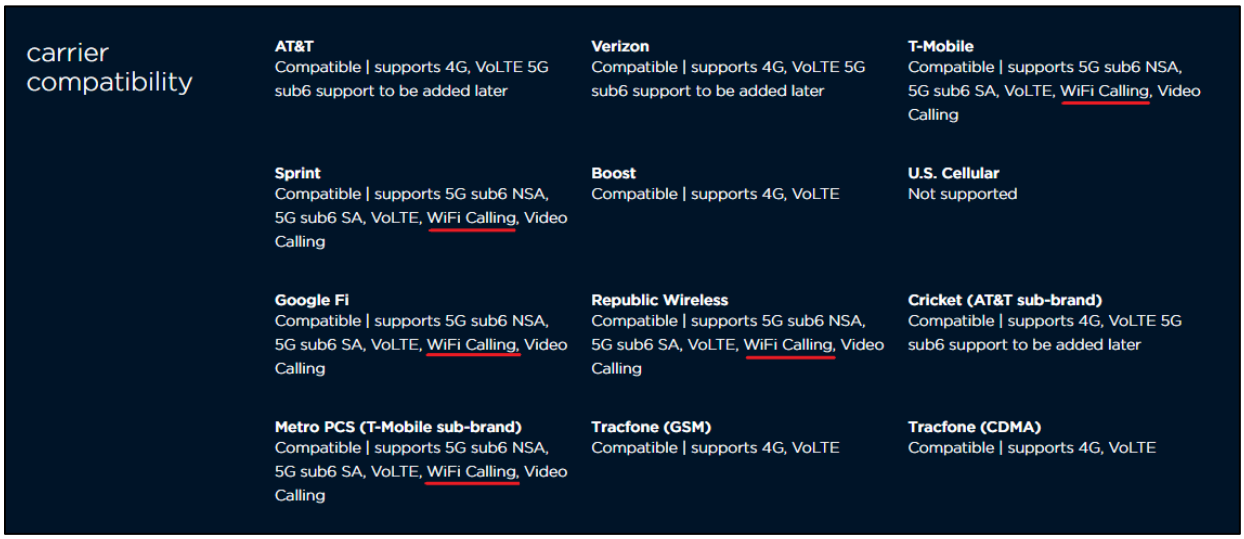
53. For example, a Motorola One 5G Ace device supports Wi-Fi calling/Voice over Wi-Fi (VoWi-Fi). VoWi-Fi enables a user to make and receive calls over the Internet. A Motorola One 5G Ace device includes a codec (coder/decoder) ("converting means") to convert analog voice input into digital data and vice versa.

54. As one example, when a calling party establishes a call using the VoWi-Fi feature, the electrical signal generated by the microphone ("second electrical signal") is converted into digital data ("transmission data, representing sound for transmission, in a suitable data format") with the help of the codec.

55. Further, packetized voice data received at the calling party's device is processed and converted to digital data. The digital data ("representing received sound, in said suitable data format") is further fed to the codec to generate an analog voice signal ("first electrical signal").



Source: https://www.t-mobile.com/support/tutorials/device/motorola/one-5g-ace/topic/calling-contacts-amp-calendar/turn-on-off-wi-fi-calling/1



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537

What is Voice over Wi-Fi?

Voice over Wi-Fi (VoWi-Fi) refers to the use of IEEE 802.11 wireless LANs (WLANs) to transport Voice over IP (VoIP) traffic. The technology has consumer, business and service provider applications. It is used over private WLANs, home Wi-Fi networks and public Wi-Fi hotspots.

Source: https://ribboncommunications.com/company/get-help/glossary/voice-over-wi-fi

3. Codecs

The quality of voice is a characteristic on digital telephony. Since VoIP and VoWiFi combine digital telephony and networking technologies they also have the quality of voice characteristic. An important element that controls the quality of voice is the compression, and conversion of analog to digital (codec) used on the voice traffic. There are numerous codecs defined for use with voice traffic. The following sections will introduce and give an overview of a few current codecs in use.

Source: https://www.cse.wustl.edu/~jain/cse574-06/ftp/wireless_voip/index.html

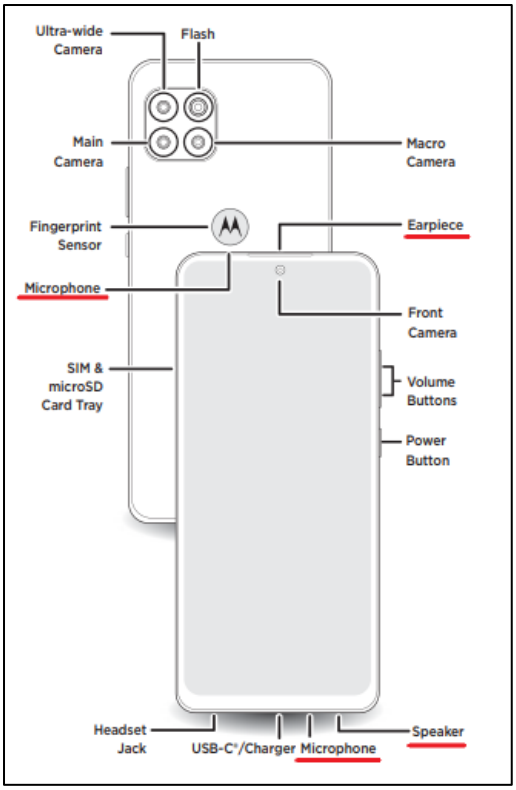
One common application for CODECs is with Digital Signal Processors (DSPs) in audio electronics devices. CODECs convert sound (using the ADC) to digital signals for a processor to compress and store and for playback, the stored digital data is decompressed and converted to analog signals via the DAC. The analog signal reaches the human ear by converting the analog signal into a transmissible sound via a pulse width modulator and a speaker, for example.

Source: https://www.analogictips.com/what-is-a-codec/

Baseband part in a mobile is comprised of a digital signal processor (DSP) to process forward voice/data signals for transmission and to process reverse voice/data signals received.

This is the core processing part which changes for various air interface standards like GSM, HSPA, LTE and more. It is often named as physical layer or Layer 1 or L1. For Speech/audio, codec is used to compress and decompress the signal to match the data rate to the frame it has to fit in. The baseband or physical layer will add redundant bits to enable error detection as well as error correction. Error detection is obtained with CRC and error correction with forward error correction techniques. Other than this interleaving is done for the data of one burst which helps in spreading the error over the time hence helps receiver de-interleave and decode the frame (consecutively data burst) correctly.

Source: https://www.techplayon.com/mobile-phone-architecture/#:~:text=Baseband%20part%20in%20a%20mobile,%2C%20HSPA%2C%20LTE%20and%20more



Source:

https://download.lenovo.com/Motorola/Manuals/156922/73228221/motorola%20one%205G%20ACE_UG_en-US_SSC8D10322A.pdf (Page 3)

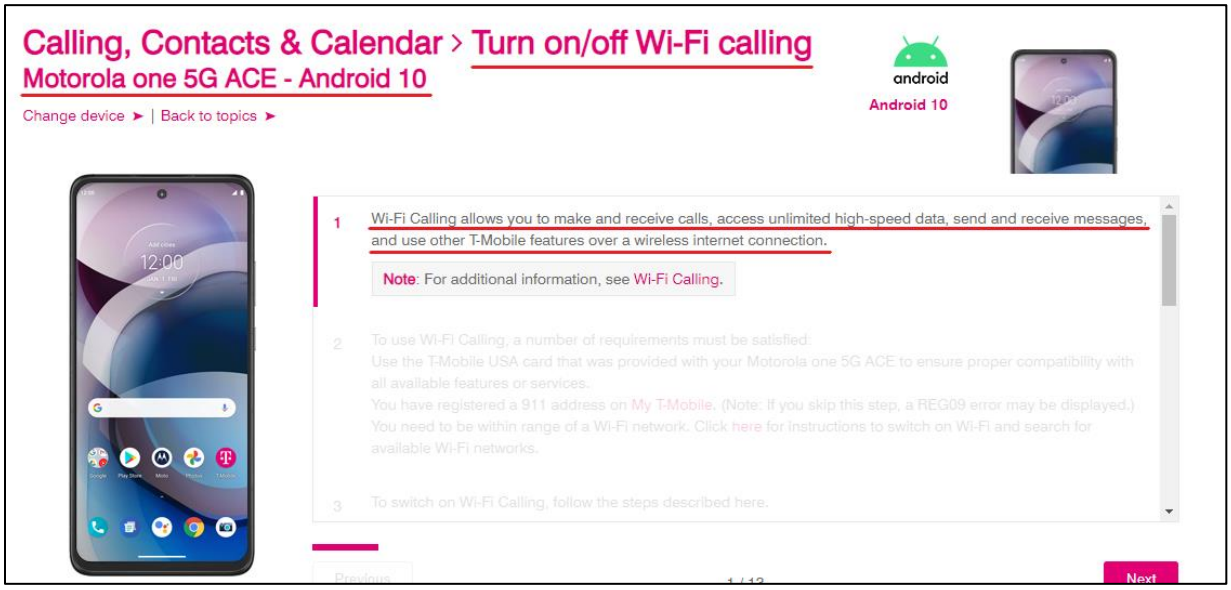
56. The method practiced using the accused products further comprises the step of handling/controlling communication of said received and transmission data in accordance with a standardized network protocol and embedding and extracting said transmission and received data, respectively, in/from a data packet format according to said standardized network protocol, by protocol means.

57. For example, Motorola One 5G Ace device supports Wi-Fi calling/Voice over Wi-Fi (VoWi-Fi). VoWi-Fi enables a user to make and receive calls over the internet.

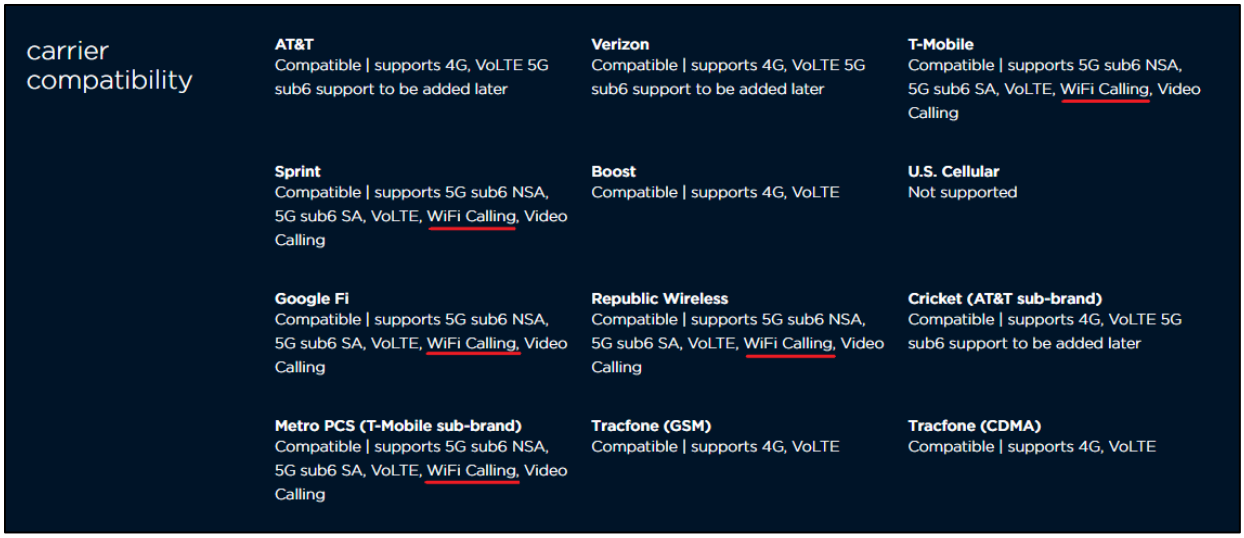
58. As one example, when a calling party establishes a call using the VoWi-Fi feature, the voice input is converted into digital voice data and the digital voice data is split and

encapsulated ("embedding") into IP (Internet Protocol) packets ("data packet format") by a device.

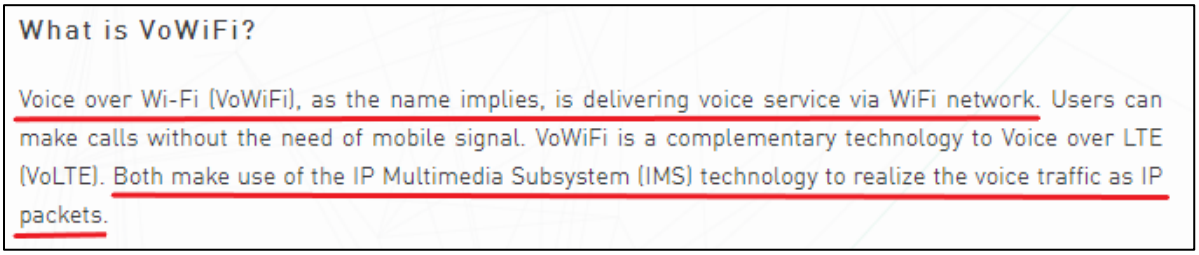
59. Further, when the digital voice data is received at the calling party's device, the digital voice data is processed and IP packets (encapsulated data) including the packetized voice data are extracted. The IP packets correspond to the IP protocol ("standardized network protocol"). The Motorola One 5G Ace device includes a processor ("protocol means") for embedding and extracting the digital voice data into/from the IP packets, respectively.



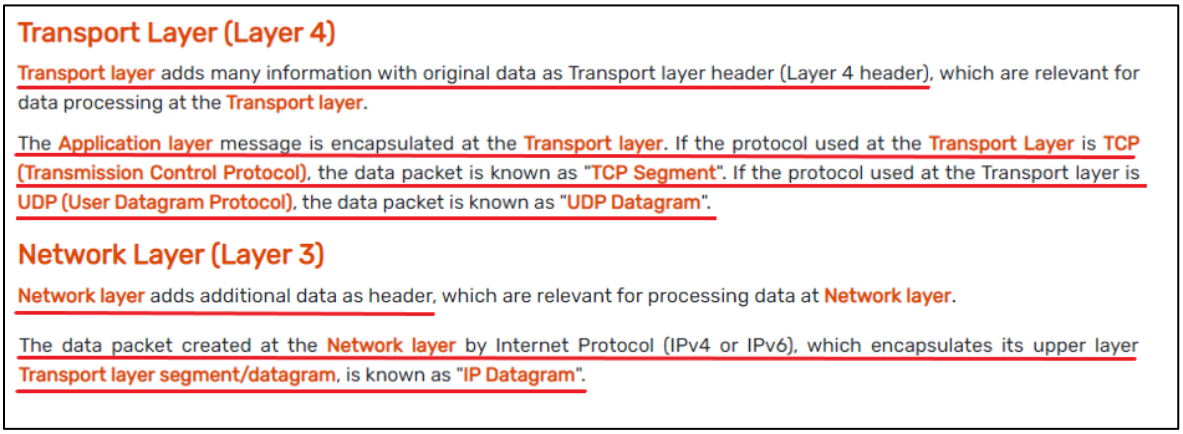
Source: https://www.t-mobile.com/support/tutorials/device/motorola/one-5g-ace/topic/calling-contacts-amp-calendar/turn-on-off-wi-fi-calling/1



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537



Source: https://insinuator.net/2016/10/a-journey-into-the-depths-of-vowifi-security/



Source: https://www.omnisecu.com/tcpip/tcpip-encapsulation-decapsulation.php

Datalink Layer (Layer 2)

Receiver opens the Datalink layer header and trailer (Layer 2 header and trailer), uses the values at Datalink header and trailer for processing data at the Datalink layer.

Receiver then collects the Network layer packet (IPv4 or IPv6 Datagram), and it is transferred to Network layer for further processing.

Source: https://www.omnisecu.com/tcpip/tcpip-encapsulation-decapsulation.php

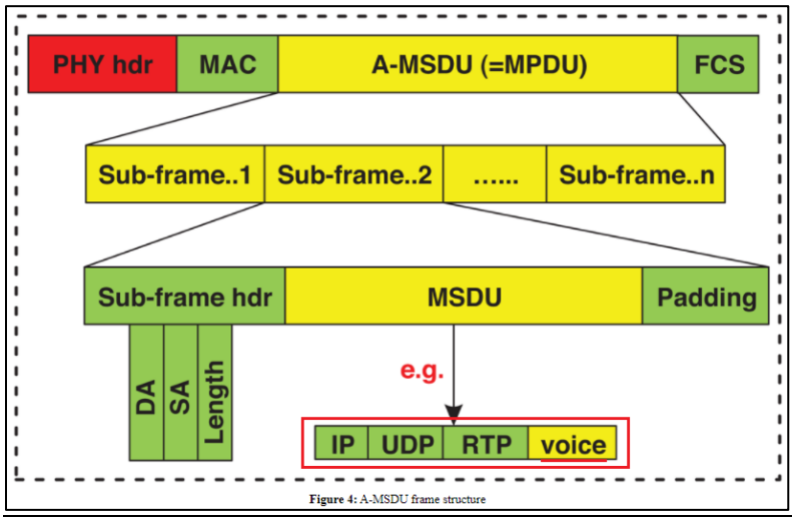


Figure 4: A-MSDU frame structure

Source: https://www.techscience.com/cmc/v66n2/40658/html

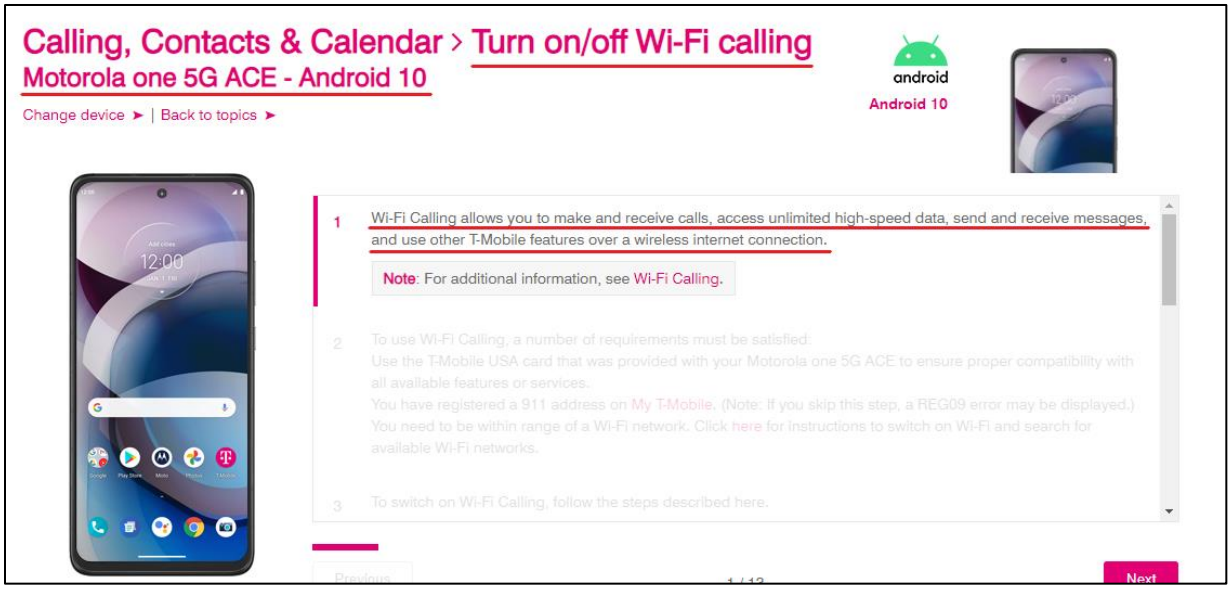
60. The method practiced using the accused products comprises the step of receiving/sending, by wireless near field communication means, of said received data or said transmission data in said data packet format from/to said protocol means, embedding said transmission data in said data packet format received from said protocol means in a WiFi or IEEE 802.11 format and extracting said received data in said data packet format from said WiFi or IEEE 802.11 format.

61. For example, a Motorola One 5G Ace device supports Wi-Fi calling/Voice over Wi-Fi (VoWi-Fi). VoWi-Fi enables a user to make and receive calls over the Internet. As one example, when a calling party establishes a call using the VoWi-Fi feature, the voice input is processed and encapsulated into IP packets ("data packet format") by the device. Further, when digital voice data is received at the calling party's device, the data is processed and the

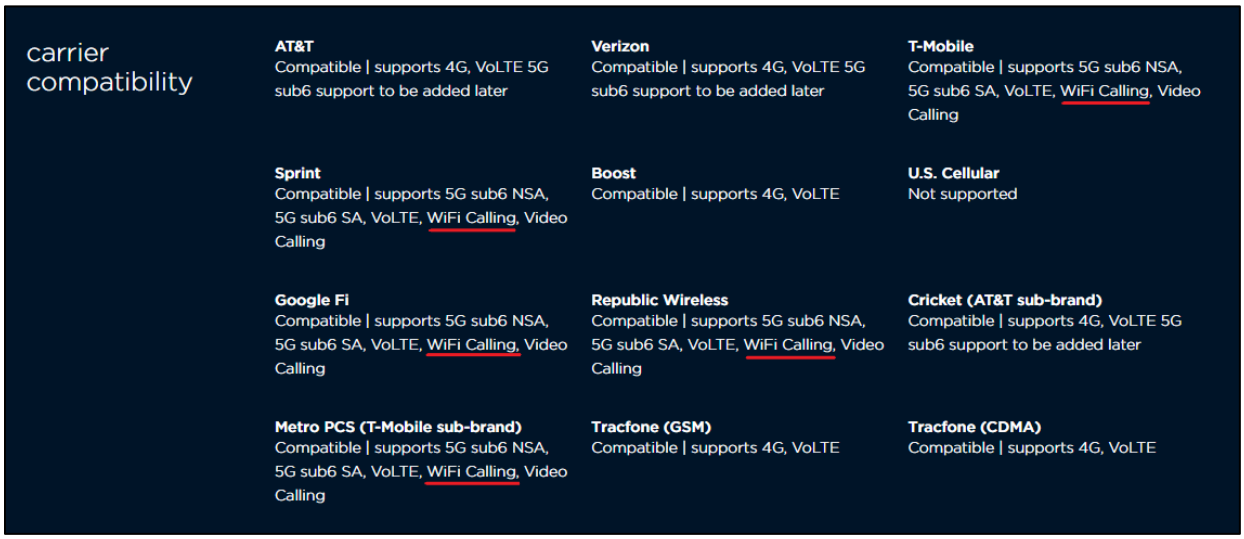
encapsulated IP packets including the packetized voice data are extracted. The Motorola One 5G Ace device includes a processor ("protocol means") for embedding and extracting the digital data into/from IP packets, respectively.

62. The IP packets ("data packet format") received from the protocol means are then embedded into PPDU (PLCP (Physical Layer Convergence Protocol) Protocol Data Unit) frames (WiFi or IEEE 802.11 format) by adding appropriate headers such as Physical layer and MAC layer headers. The Motorola One 5G Ace device includes a Wi-Fi chipset ("wireless near field communication means") for embedding the IP packets into the IEEE 802.11 frame format (PPDUs).

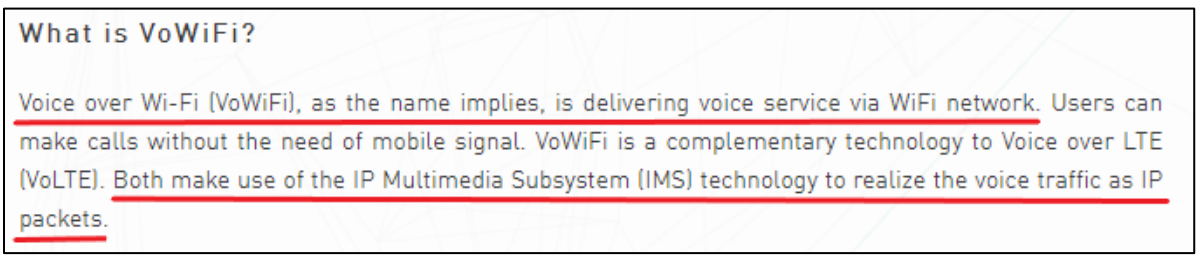
63. When the calling party receives the voice data (*i.e.*, PPDUs) from the wireless network, the embedded IP packets are extracted from these PPDU frames by the removal of the appropriate headers. The received PPDU frames ("WiFi or IEEE 802.11 format") correspond to the IEEE 802.11 protocol. The extracted IP packets including the packetized voice data are then sent to the protocol means for further processing. The Wi-Fi chipset ("wireless near field communication means") extracts the IP packets from the received PPDUs and sends them to the protocol means.



Source: https://www.t-mobile.com/support/tutorials/device/motorola/one-5g-ace/topic/calling-contacts-amp-calendar/turn-on-off-wi-fi-calling/1



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537



Source: https://insinuator.net/2016/10/a-journey-into-the-depths-of-vowifi-security/

Datalink layer (Layer 2)

The data packet generated at Network layer is then placed inside Datalink layer header and trailer (Layer 2 header and trailer). Values inside Datalink layer header and trailer are relevant for processing data at Datalink layer.

The data packet at the Datalink layer, which encapsulates and may subdivide the IP Datagram, is known as a "Frame" (generally Ethernet Frame).

The most important values at Datalink layer header (Layer 2 header) are source and destination MAC addresses (Layer 2 addresses). Following image represents data packet generated at Datalink layer.

Source: https://www.omnisecu.com/tcpip/tcpip-encapsulation-decapsulation.php

Datalink Layer (Layer 2)

Receiver opens the Datalink layer header and trailer (Layer 2 header and trailer), uses the values at Datalink header and trailer for processing data at the Datalink layer.

Receiver then collects the Network layer packet (IPv4 or IPv6 Datagram), and it is transferred to Network layer for further processing.

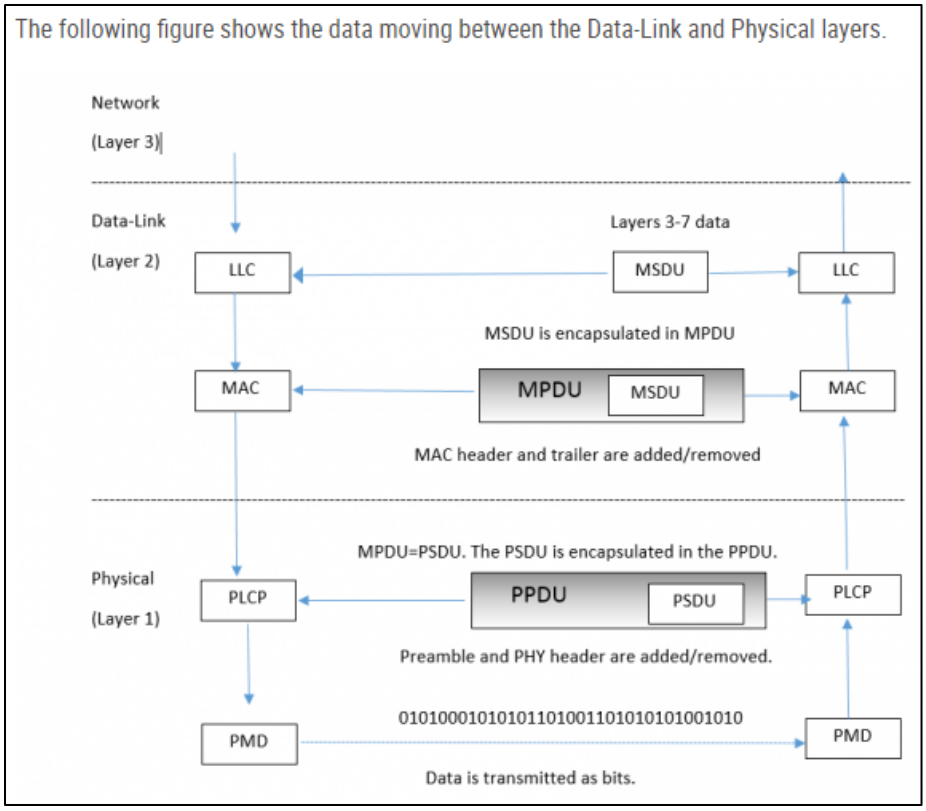
Source: https://www.omnisecu.com/tcpip/tcpip-encapsulation-decapsulation.php

physical layer (PHY) protocol data unit (PPDU): The unit of data exchanged between two peer PHY entities to provide the PHY data service.

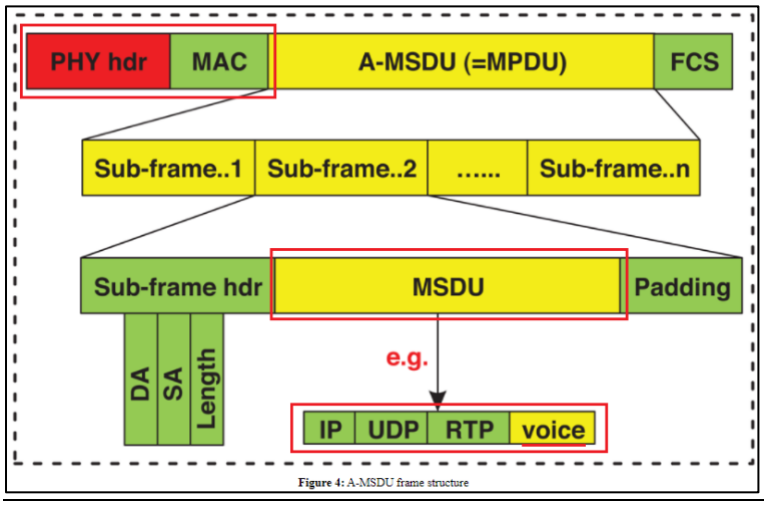
Source: https://ieeexplore.ieee.org/document/7786995 (Page 138)

- When the Network layer (layer 3) sends data to the Data-Link layer, that data is handed off to the LLC and becomes known as the MAC Service Data Unit (MSDU).
- The payload of a 802.11 data frame is the layer 3–7 information known as the MSDU.
- A simple definition of the MSDU is that it is the data payload that contains the IP packet plus some LLC data.

Source: https://dot11ap.wordpress.com/msdu-and-mpdu/



Source: https://www.cwnp.com/802.11-mac-series-ndash-basics-mac-architecture-ndash-part-1-3/



Source: https://www.techscience.com/cmc/v66n2/40658/html

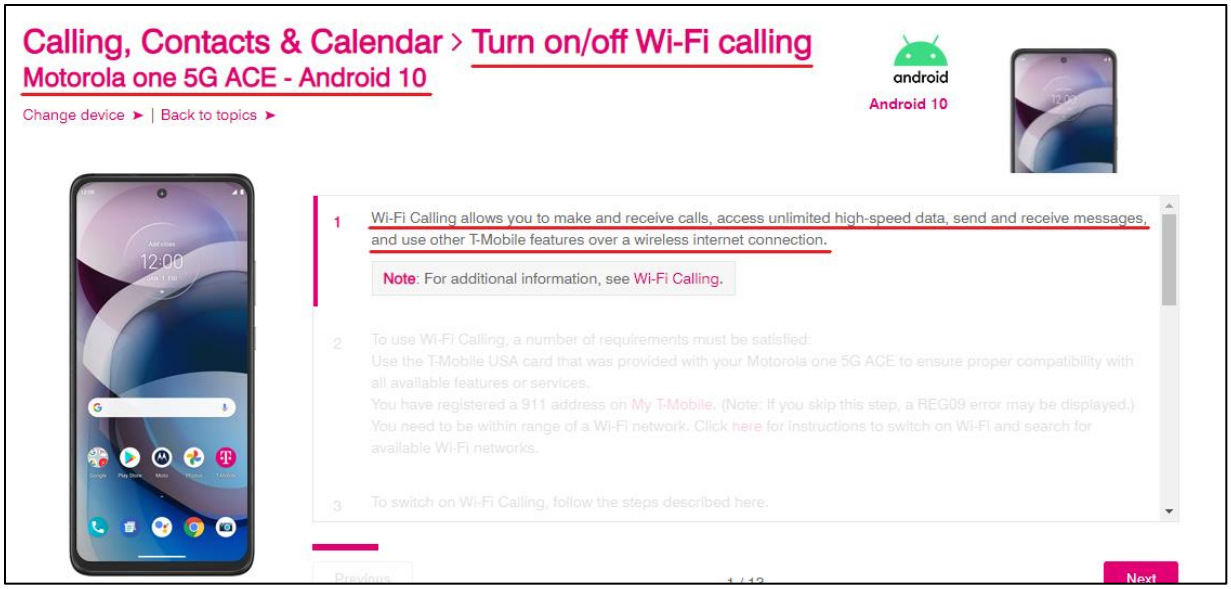
64. The method practiced using the accused products further comprises the step of communicating, by said wireless near field communication means, said received data or said

transmission data embedded in said WiFi or IEEE 802.11 format with a connecting unit communicating in said WiFi or IEEE 802.11 format to establish a connection to a network according to said standardized network protocol, whereby the resulting data exchanged between the wireless near field communication means and the connecting unit include packets in said data packet format embedded in said WiFi or 802.11 format.

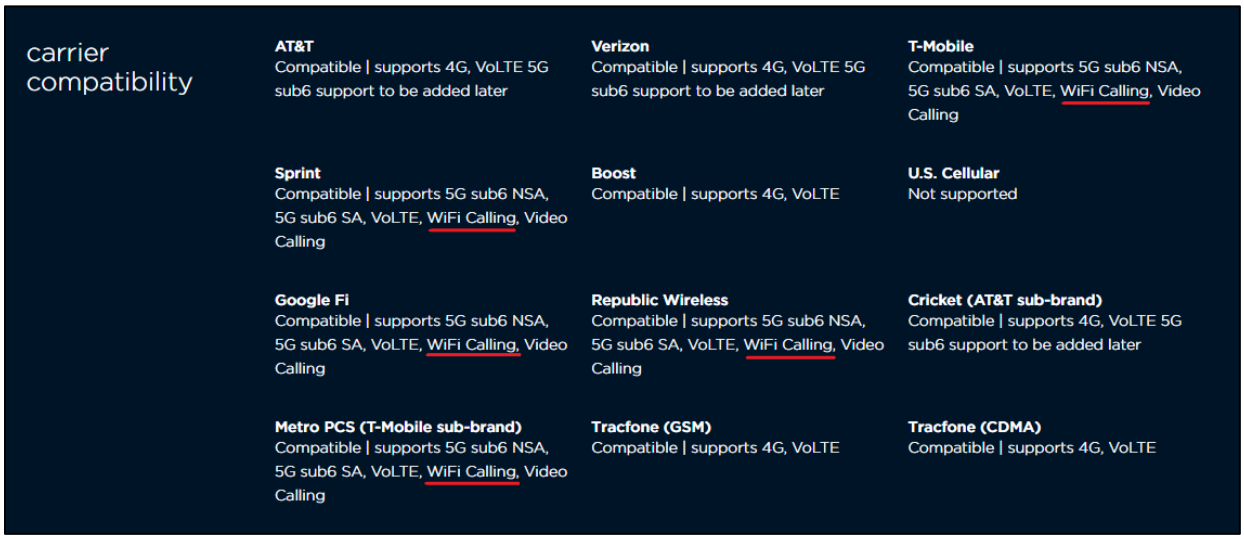
65. For example, a Motorola One 5G Ace device supports Wi-Fi calling/Voice over Wi-Fi (VoWi-Fi). VoWi-Fi enables a user to make and receive calls over the Internet. As one example, when a calling party establishes a call using the VoWi-Fi feature, the calling party's device embeds the digital voice data into IP packets. These IP packets ("data packet format") are then embedded into PPDU frames ("WiFi or IEEE 802.11 format") by adding appropriate headers such as Physical layer and MAC layer headers. The Motorola One 5G Ace device includes a Wi-Fi chipset ("wireless near field communication means") for embedding the IP packets into the IEEE 802.11 frame format (PPDUs).

66. The Wi-Fi chipset ("wireless near field communication means") of the device transmits the PPDUs ("transmission data embedded in said WiFi or IEEE 802.11 format") to 802.11 router/access point ("connecting unit") using corresponding wireless communication antennas. The Wi-Fi chipset of the device also receives PPDUs ("received data") from the 802.11 router/access point ("connecting unit") using corresponding wireless communication antennas. These PPDUs correspond to the IEEE 802.11 frame format ("WiFi or IEEE 802.11 format") and include the embedded IP ("data packet format") packets with packetized voice data.

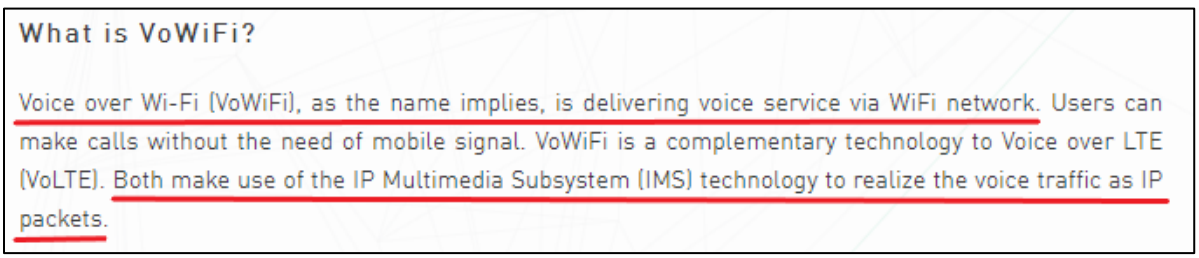
67. Further, the 802.11 access points are connected to the internet according to the Internet Protocol ("standardized network protocol").



Source: https://www.t-mobile.com/support/tutorials/device/motorola/one-5g-ace/topic/calling-contacts-amp-calendar/turn-on-off-wi-fi-calling/1



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537



Source: https://insinuator.net/2016/10/a-journey-into-the-depths-of-vowifi-security/

Datalink layer (Layer 2)

The data packet generated at Network layer is then placed inside Datalink layer header and trailer (Layer 2 header and trailer). Values inside Datalink layer header and trailer are relevant for processing data at Datalink layer.

The data packet at the Datalink layer, which encapsulates and may subdivide the IP Datagram, is known as a "Frame" (generally Ethernet Frame).

The most important values at Datalink layer header (Layer 2 header) are source and destination MAC addresses (Layer 2 addresses). Following image represents data packet generated at Datalink layer.

Source: https://www.omnisecu.com/tcpip/tcpip-encapsulation-decapsulation.php

Datalink Layer (Layer 2)

Receiver opens the Datalink layer header and trailer (Layer 2 header and trailer), uses the values at Datalink header and trailer for processing data at the Datalink layer.

Receiver then collects the Network layer packet (IPv4 or IPv6 Datagram), and it is transferred to Network layer for further processing.

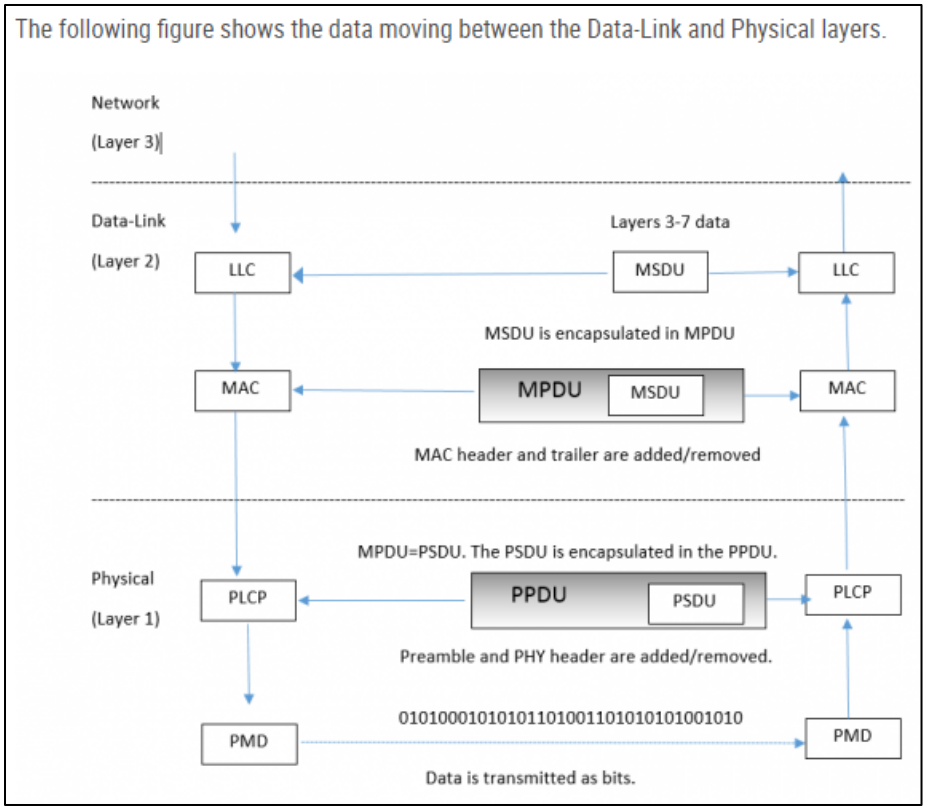
Source: https://www.omnisecu.com/tcpip/tcpip-encapsulation-decapsulation.php

physical layer (PHY) protocol data unit (PPDU): The unit of data exchanged between two peer PHY entities to provide the PHY data service.

Source: https://ieeexplore.ieee.org/document/7786995 (Page 138)

- When the Network layer (layer 3) sends data to the Data-Link layer, that data is handed off to the LLC and becomes known as the MAC Service Data Unit (MSDU).
- The payload of a 802.11 data frame is the layer 3–7 information known as the MSDU.
- A simple definition of the MSDU is that it is the data payload that contains the IP packet plus some LLC data.

Source: https://dot11ap.wordpress.com/msdu-and-mpdu/



Source: https://www.cwnp.com/802.11-mac-series-ndash-basics-mac-architecture-ndash-part-1-3/

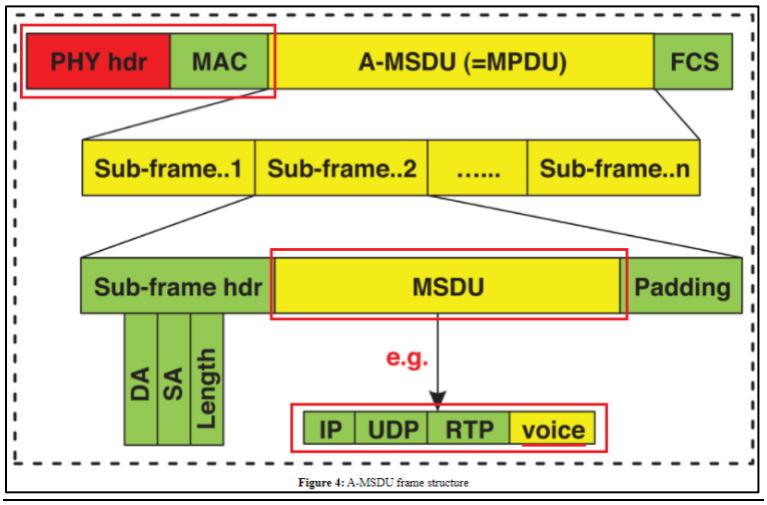
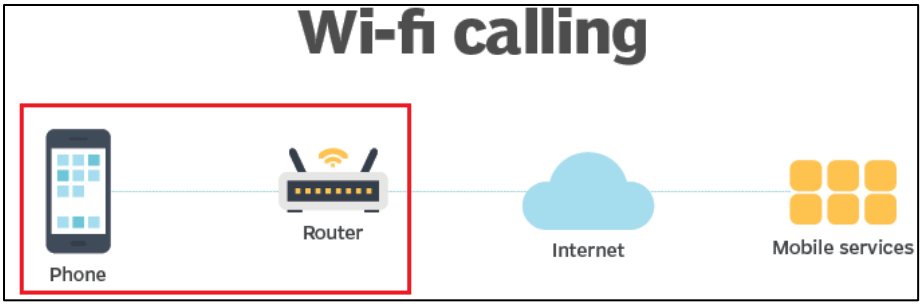
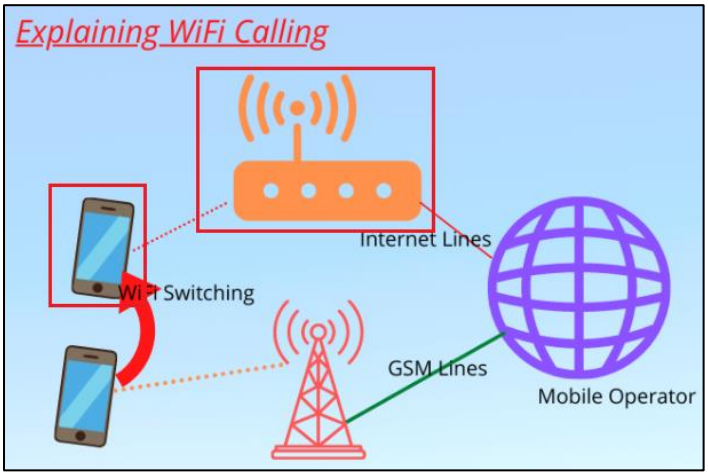


Figure 4: A-MSDU frame structure

Source: https://www.techscience.com/cmc/v66n2/40658/html



Source: https://whatis.techtarget.com/definition/Wi-Fi-calling



Source: https://www.cspsprotocol.com/what-is-wifi-calling/

68. Buffalo Patents has been damaged as a result of the infringing conduct by Motorola alleged above. Thus, Motorola is liable to Buffalo Patents in an amount that adequately compensates it for such infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

69. Buffalo Patents is only asserting method claims for the ’915 Patent, and therefore, 35 U.S.C § 287(a) does not apply.

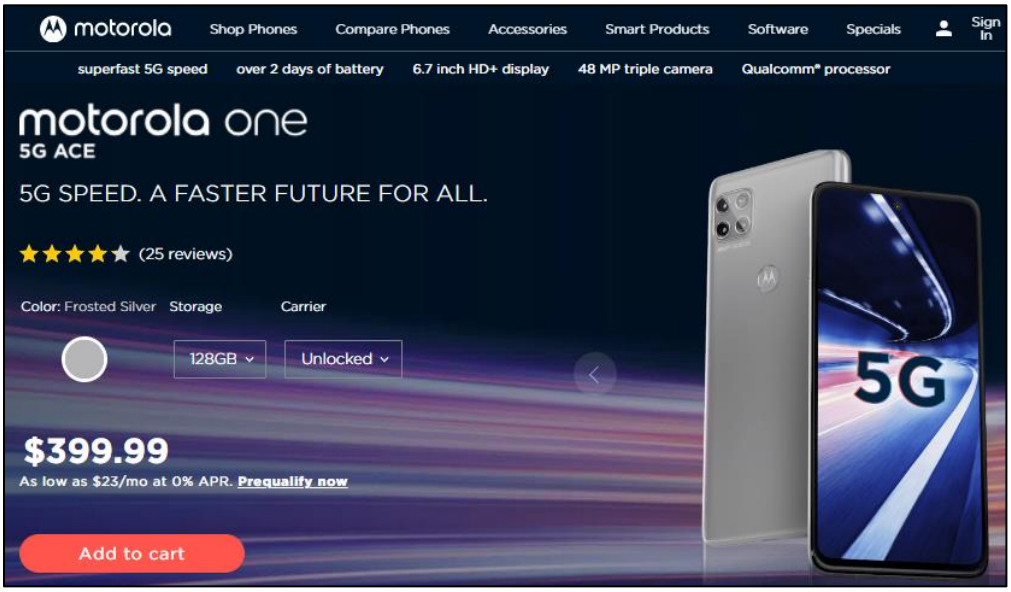
COUNT III

DIRECT INFRINGEMENT OF U.S. PATENT NO. 8,611,328

70. On December 17, 2013, the ’328 Patent was duly and legally issued by the United States Patent and Trademark Office for an invention entitled “Communications Terminal, a System and a Method for Internet/Network Telephony.”

71. Buffalo Patents is the owner of the ’328 Patent, with all substantive rights in and to that patent, including the sole and exclusive right to prosecute this action and enforce the ’328 Patent against infringers, and to collect damages for all relevant times.

72. Motorola made, had made, used, imported, provided, supplied, distributed, sold, and/or offered for sale products and/or systems including, for example, its Motorola One 5G Ace smartphone and other products that support Voice over Wi-Fi (VoWi-Fi) or Wi-Fi calling (“accused products”):



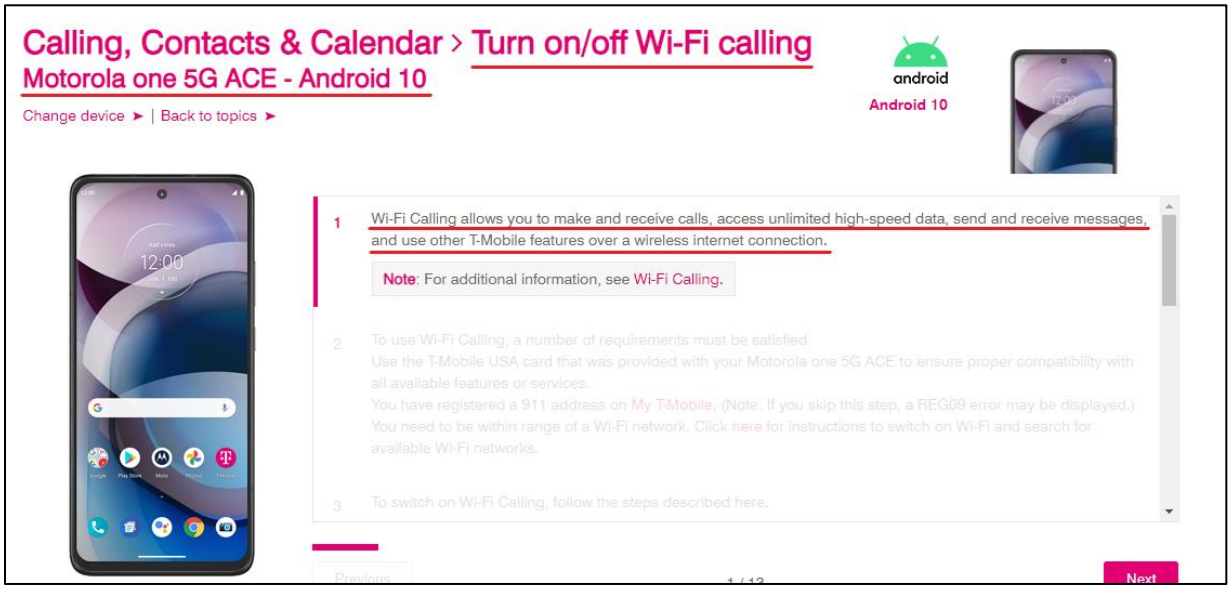
Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537

73. By doing so, Motorola has directly infringed (literally and/or under the doctrine of equivalents) at least Claim 8 of the ’328 Patent. Motorola’s infringement in this regard is ongoing.

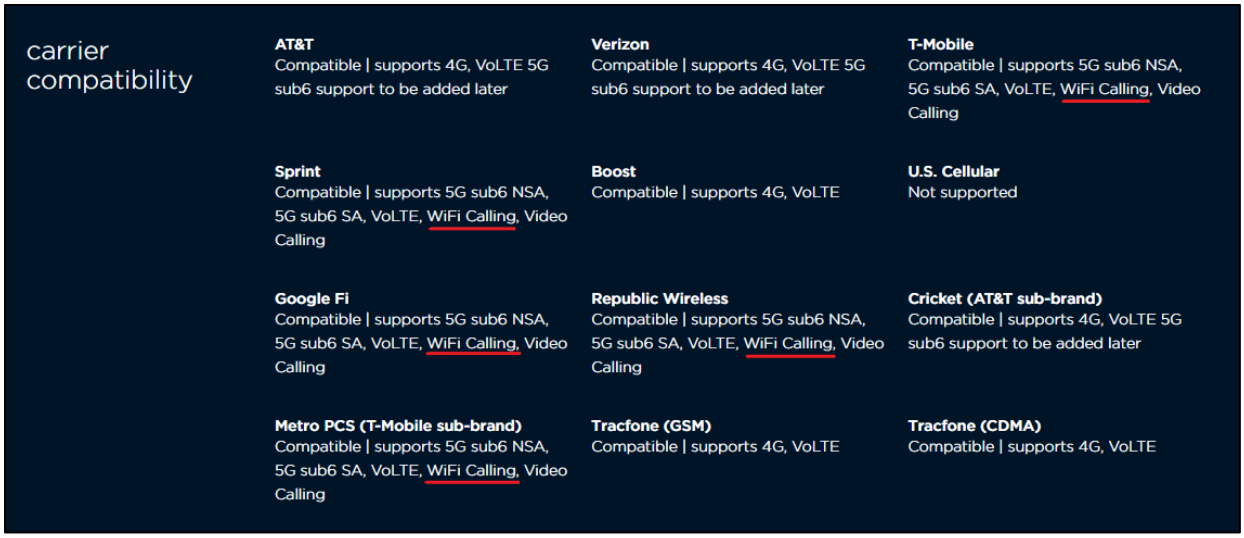
74. Motorola One 5G Ace smartphone is an exemplary accused product.

75. Motorola has infringed the ’328 Patent by using the accused products and thereby practicing a method comprising converting a first signal representing a detected sound to first digital data.

76. For example, Motorola One 5G Ace device supports Wi-Fi calling/Voice over Wi-Fi (VoWi-Fi). VoWi-Fi enables a user to make and receive calls over the internet. A Motorola One 5G Ace device includes a codec (coder/decoder) to convert the analog voice input to digital data. As one example, when a user establishes a call using the VoWi-Fi feature, the sound waves generated by the user are converted into analog electrical signals (“first signal”) by the microphone. The electrical signals contain the voice data which is compressed and converted into digital data (“first digital data”) with the help of a codec.



Source: https://www.t-mobile.com/support/tutorials/device/motorola/one-5g-ace/topic/calling-contacts-amp-calendar/turn-on-off-wi-fi-calling/1



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537

What is Voice over Wi-Fi?

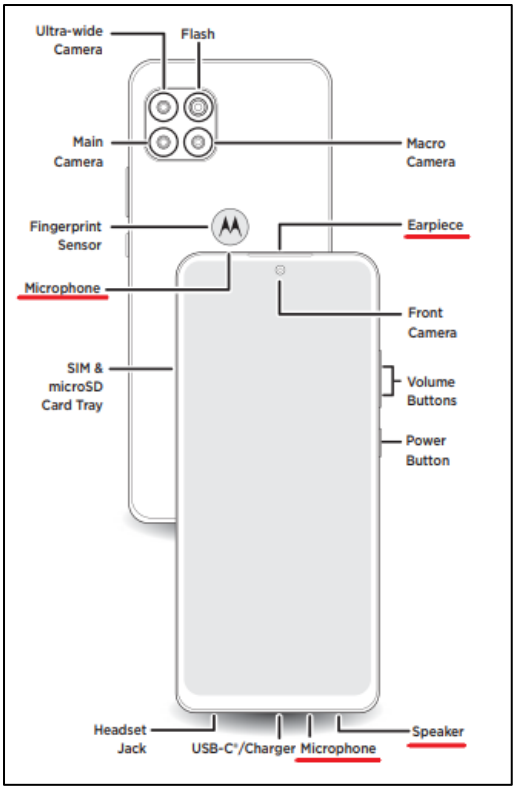
Voice over Wi-Fi (VoWi-Fi) refers to the use of IEEE 802.11 wireless LANs (WLANs) to transport Voice over IP (VoIP) traffic. The technology has consumer, business and service provider applications. It is used over private WLANs, home Wi-Fi networks and public Wi-Fi hotspots.

Source: https://ribboncommunications.com/company/get-help/glossary/voice-over-wi-fi

Microphone

The microphone changes the sound waves from your voice into electrical signals that are sent to the audio amplifier of the radio components. A microphone is essentially a speaker that works in reverse. When sound waves from your voice move the membrane, they make tiny electric currents either by moving a coil of wire within a magnet or by compressing the membrane against carbon dust (see How do microphones work? for details).

Source: https://electronics.howstuffworks.com/cordless-telephone4.htm



Source:

https://download.lenovo.com/Motorola/Manuals/156922/73228221/motorola%20one%205G%20ACE_UG_en-US_SSC8D10322A.pdf (Page 3)

3. Codecs

The quality of voice is a characteristic on digital telephony. Since VoIP and VoWiFi combine digital telephony and networking technologies they also have the quality of voice characteristic. An important element that controls the quality of voice is the compression, and conversion of analog to digital (codec) used on the voice traffic. There are numerous codecs defined for use with voice traffic. The following sections will introduce and give an overview of a few current codecs in use.

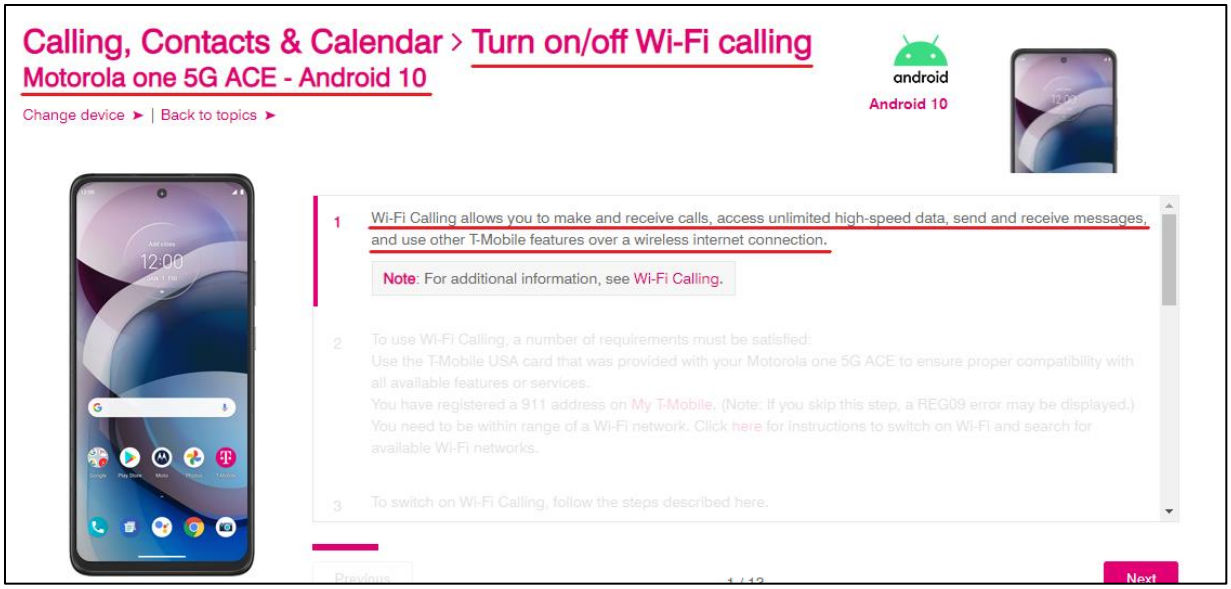
Source: https://www.cse.wustl.edu/~jain/cse574-06/ftp/wireless_voip/index.html

> Baseband part in a mobile is comprised of a digital signal processor (DSP) to process forward voice/data signals for transmission and to process reverse voice/data signals received.
>
> This is the core processing part which changes for various air interface standards like GSM, HSPA, LTE and more. It is often named as physical layer or Layer 1 or L1. For Speech/audio, codec is used to compress and decompress the signal to match the data rate to the frame it has to fit in. The baseband or physical layer will add redundant bits to enable error detection as well as error correction. Error detection is obtained with CRC and error correction with forward error correction techniques. Other than this interleaving is done for the data of one burst which helps in spreading the error over the time hence helps receiver de-interleave and decode the frame (consecutively data burst) correctly.

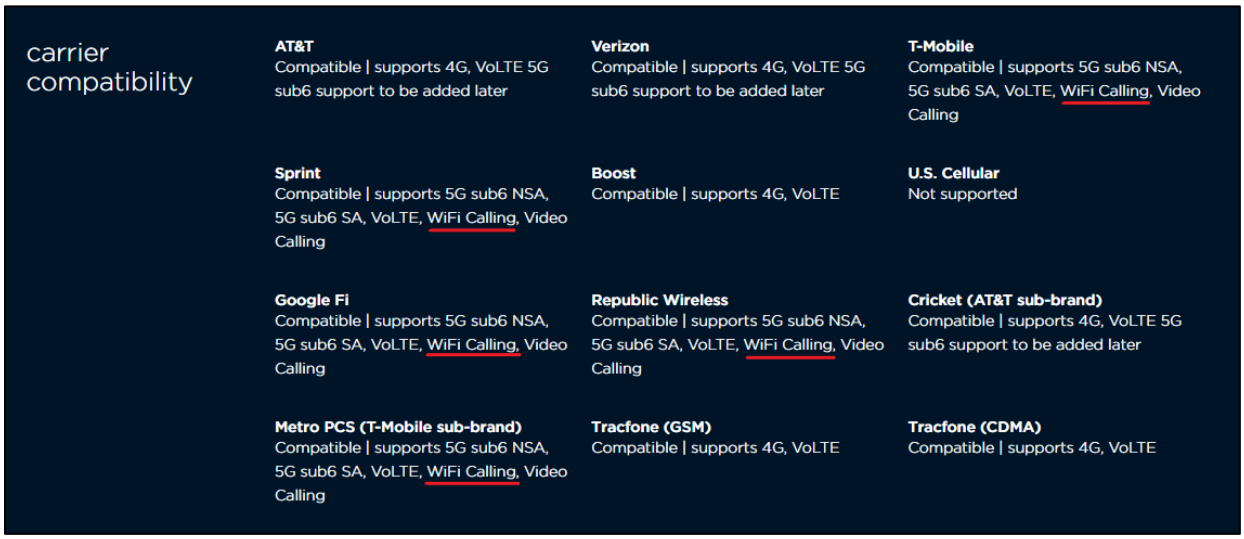
Source: https://www.techplayon.com/mobile-phone-architecture/#:~:text=Baseband%20part%20in%20a%20mobile,%2C%20HSPA%2C%20LTE%20and%20more

77. The method practiced using the accused products further comprises converting the first digital data into one or more first data packets that accord to a network protocol of a first network.

78. For example, a Motorola One 5G Ace device supports Wi-Fi calling/Voice over Wi-Fi (VoWi-Fi). VoWi-Fi enables a user to make and receive calls over the internet. As one example, when a user establishes a call using the VoWi-Fi feature, the voice data from the caller is compressed and converted into digital data. The digital data ("first digital data") is encapsulated into IP packets ("first data packets"). These IP packets correspond to the Internet protocol ("network protocol of a first network").



Source: https://www.t-mobile.com/support/tutorials/device/motorola/one-5g-ace/topic/calling-contacts-amp-calendar/turn-on-off-wi-fi-calling/1



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537

What is Voice over Wi-Fi?

Voice over Wi-Fi (VoWi-Fi) refers to the use of IEEE 802.11 wireless LANs (WLANs) to transport Voice over IP (VoIP) traffic. The technology has consumer, business and service provider applications. It is used over private WLANs, home Wi-Fi networks and public Wi-Fi hotspots.

Source: https://ribboncommunications.com/company/get-help/glossary/voice-over-wi-fi

> **What is VoWiFi?**
>
> Voice over Wi-Fi (VoWiFi), as the name implies, is delivering voice service via WiFi network. Users can make calls without the need of mobile signal. VoWiFi is a complementary technology to Voice over LTE (VoLTE). Both make use of the IP Multimedia Subsystem (IMS) technology to realize the voice traffic as IP packets.

Source: https://insinuator.net/2016/10/a-journey-into-the-depths-of-vowifi-security/

> **Transport Layer (Layer 4)**
>
> Transport layer adds many information with original data as Transport layer header (Layer 4 header), which are relevant for data processing at the Transport layer.
>
> The Application layer message is encapsulated at the Transport layer. If the protocol used at the Transport Layer is TCP (Transmission Control Protocol), the data packet is known as "TCP Segment". If the protocol used at the Transport layer is UDP (User Datagram Protocol), the data packet is known as "UDP Datagram".
>
> **Network Layer (Layer 3)**
>
> Network layer adds additional data as header, which are relevant for processing data at Network layer.
>
> The data packet created at the Network layer by Internet Protocol (IPv4 or IPv6), which encapsulates its upper layer Transport layer segment/datagram, is known as "IP Datagram".

Source: https://www.omnisecu.com/tcpip/tcpip-encapsulation-decapsulation.php

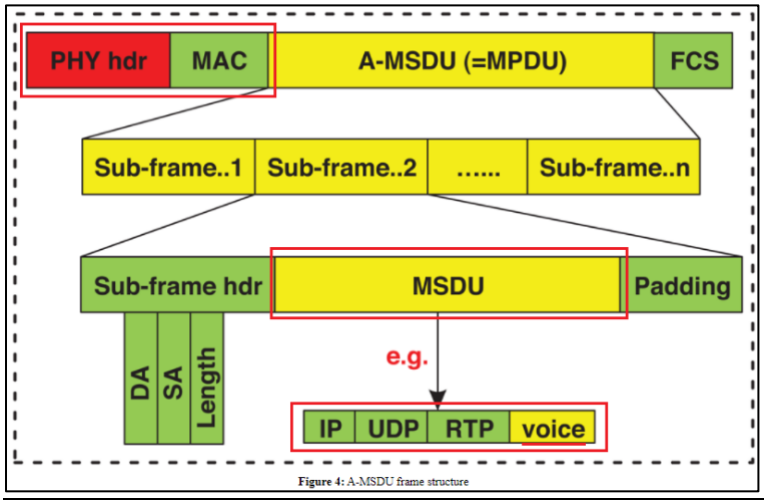
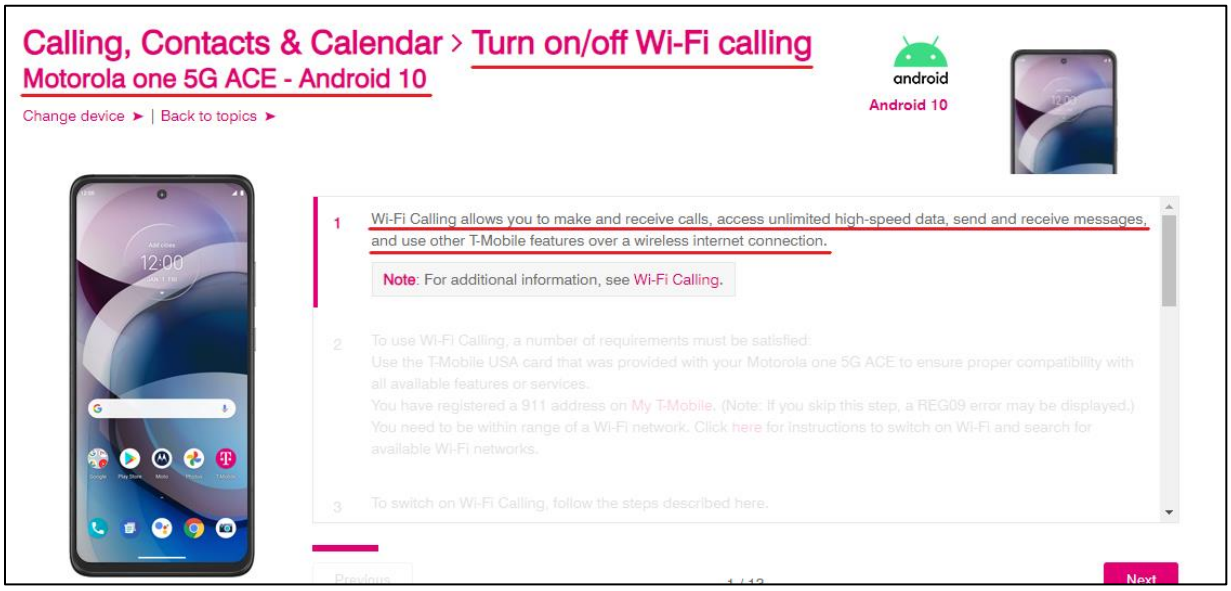


Figure 4: A-MSDU frame structure

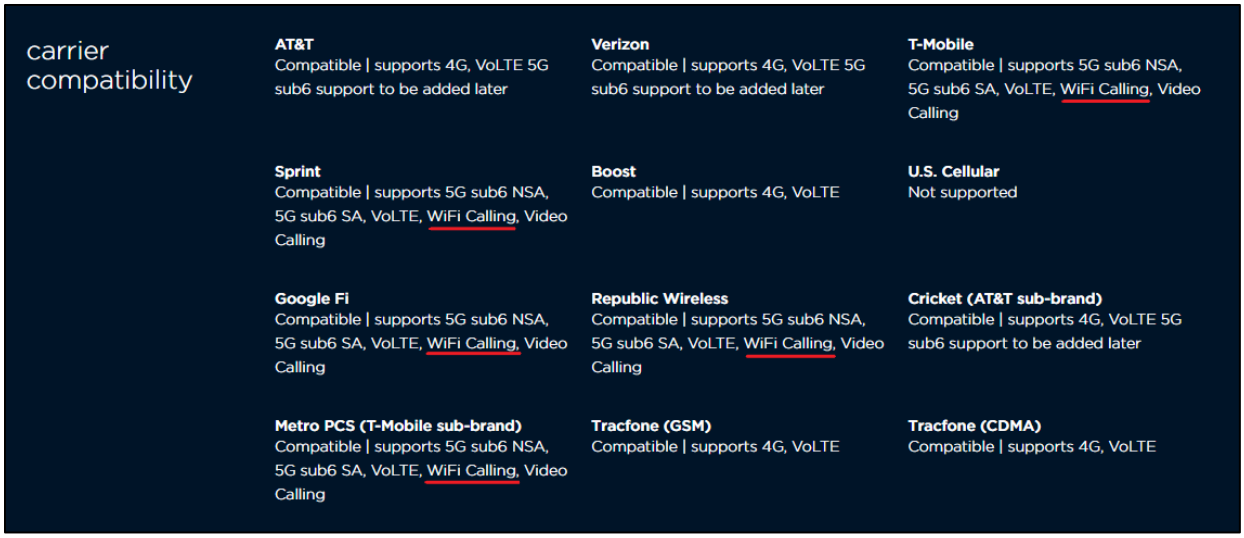
Source: https://www.techscience.com/cmc/v66n2/40658/html

79. The method practiced using the accused products further comprises embedding one or more first data packets into first wireless data that accords to a network protocol of a near field communication network.

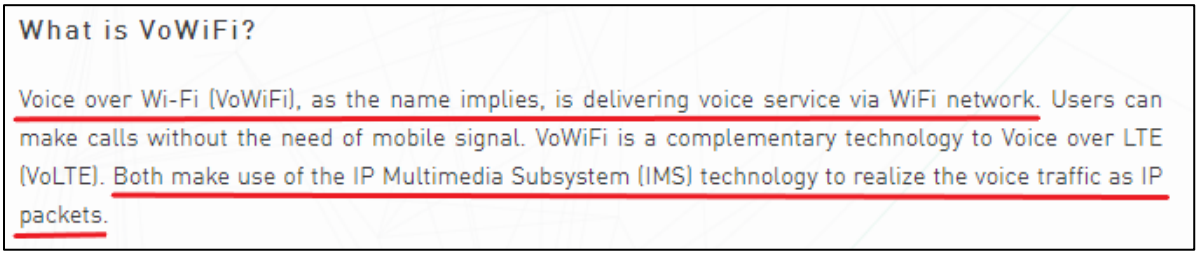
80. For example, a Motorola One 5G Ace device supports Wi-Fi calling/Voice over Wi-Fi (VoWi-Fi). VoWi-Fi enables a user to make and receive calls over the internet. As one example, when a user establishes a call using the VoWi-Fi feature, the voice data is compressed and encapsulated into IP packets. The IP packets ("first data packets") are embedded into PPDU (PLCP (Physical Layer Convergence Protocol) Protocol Data Unit) frames by adding appropriate headers such as Physical layer and MAC layer headers. The PPDUs ("first wireless data") are formatted according to the 802.11 protocol ("network protocol of a near field communication network") frame format.



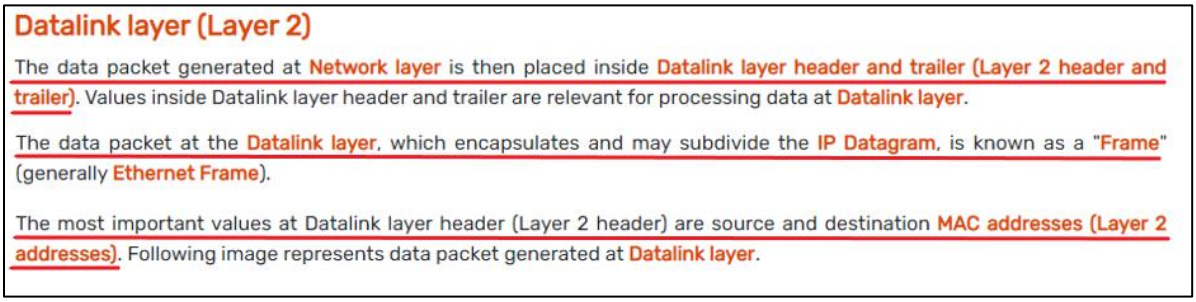
Source: https://www.t-mobile.com/support/tutorials/device/motorola/one-5g-ace/topic/calling-contacts-amp-calendar/turn-on-off-wi-fi-calling/1



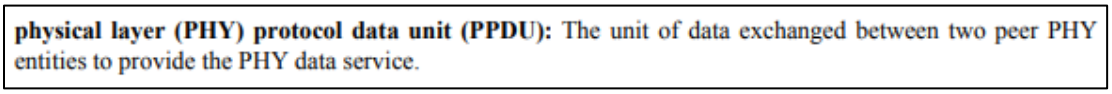
Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537



Source: https://insinuator.net/2016/10/a-journey-into-the-depths-of-vowifi-security/



Source: https://www.omnisecu.com/tcpip/tcpip-encapsulation-decapsulation.php



Source: https://ieeexplore.ieee.org/document/7786995 (Page 138)

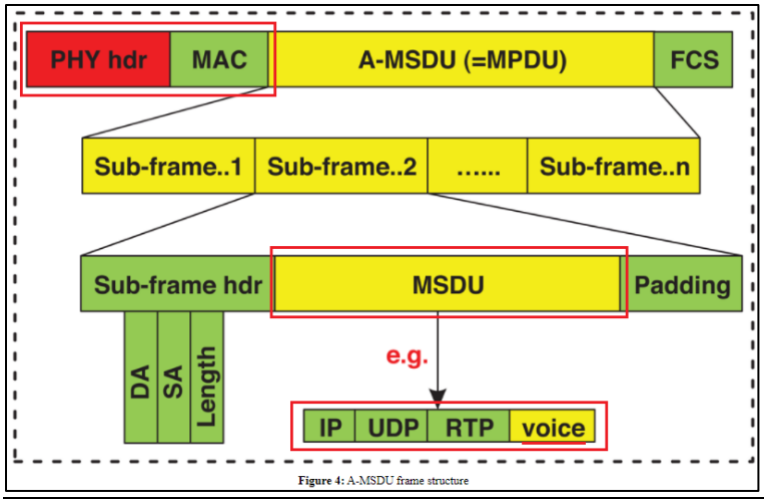
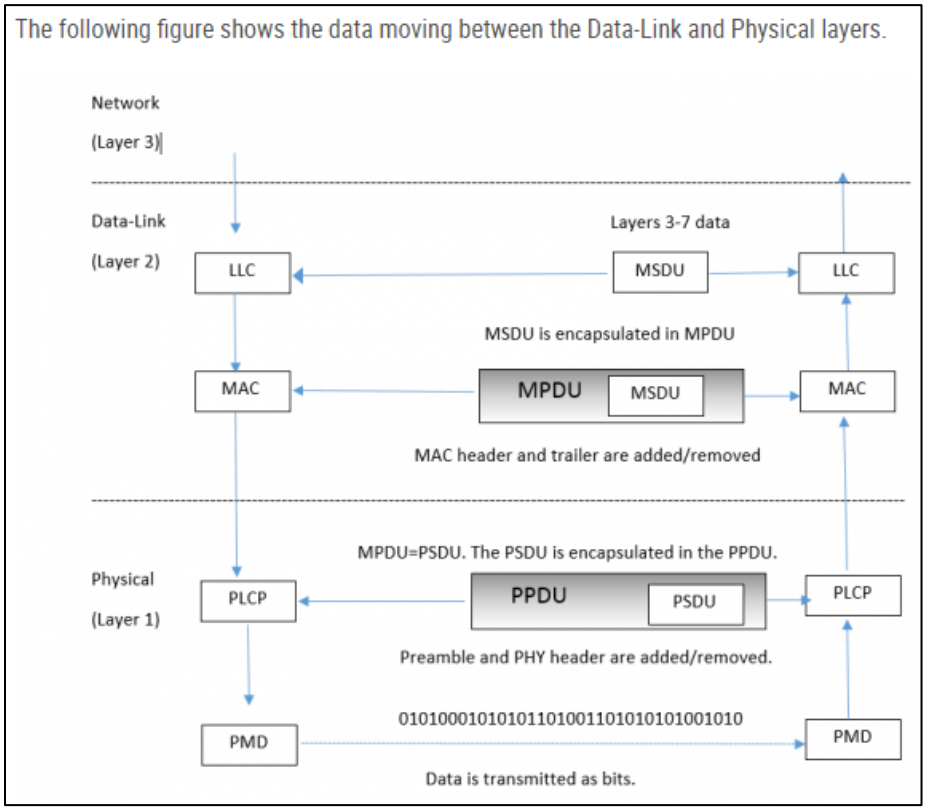


Figure 4: A-MSDU frame structure

Source: https://www.techscience.com/cmc/v66n2/40658/html



Source: https://www.cwnp.com/802.11-mac-series-ndash-basics-mac-architecture-ndash-part-1-3/

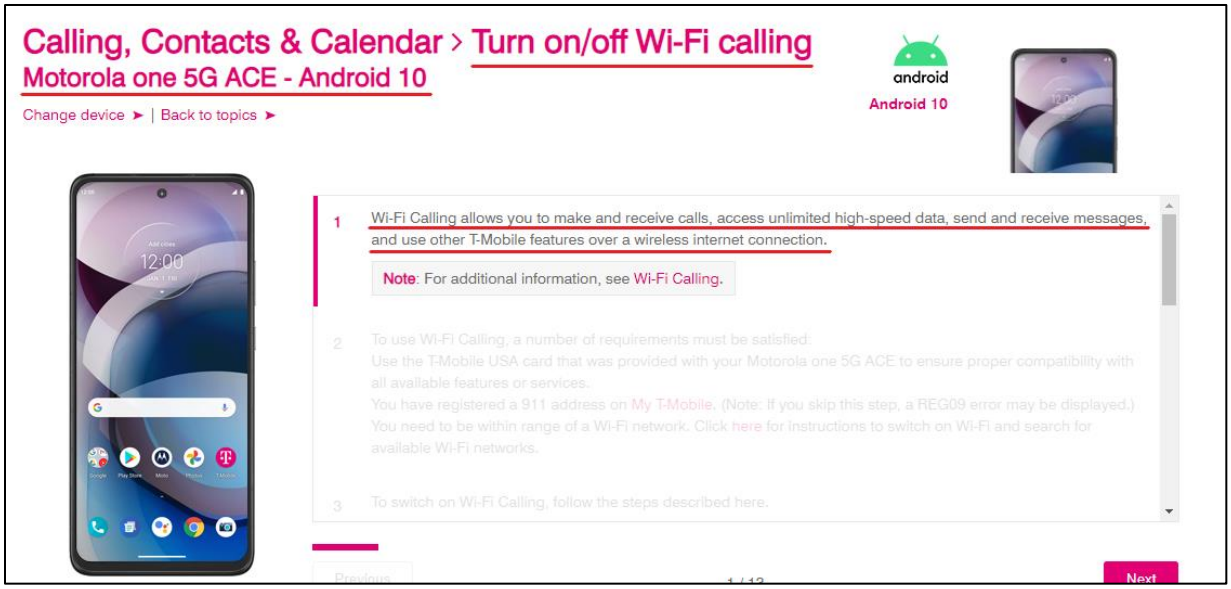
- When the Network layer (layer 3) sends data to the Data-Link layer, that data is handed off to the LLC and becomes known as the MAC Service Data Unit (MSDU).
- The payload of a 802.11 data frame is the layer 3–7 information known as the MSDU.
- A simple definition of the MSDU is that it is the data payload that contains the IP packet plus some LLC data.

Source: https://dot11ap.wordpress.com/msdu-and-mpdu/

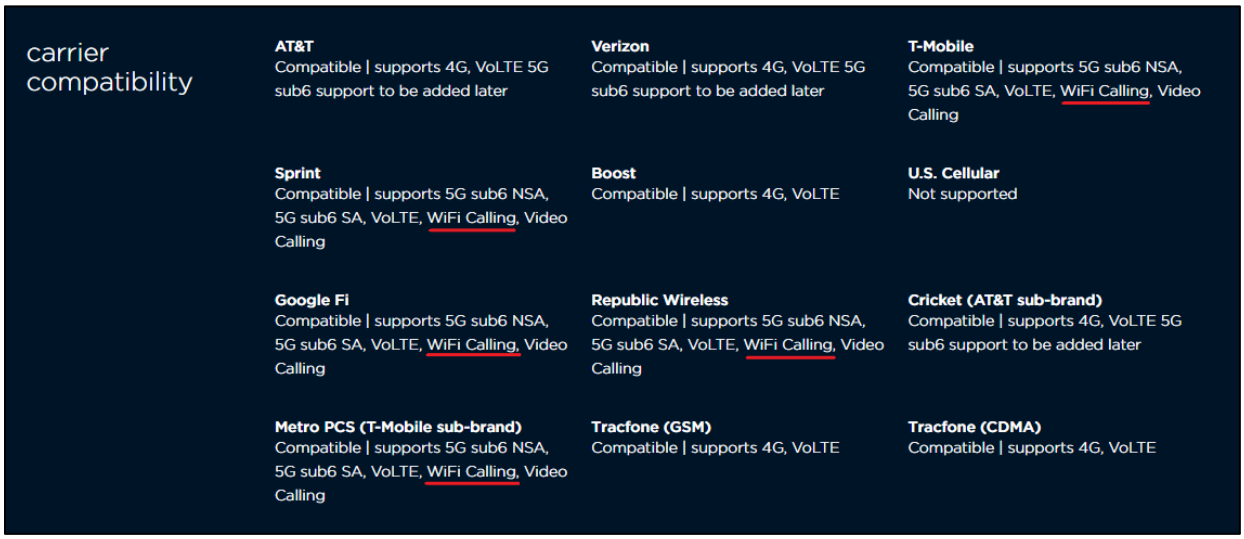
81. The method practiced using the accused products further comprises transmitting the first wireless data via the near field communication network in accordance with the network protocol of the second network.

82. For example, a Motorola One 5G Ace device supports Wi-Fi calling/Voice over Wi-Fi (VoWi-Fi). VoWi-Fi enables a user to make and receive calls over the internet using Wi-Fi access points. VoWi-Fi allows the delivery of voice traffic as IP packets via a Wi-Fi network.

83. As one example, when a user establishes a call using the VoWi-Fi feature, the voice data is compressed and encapsulated into IP packets and further embedded into PPDU frames. The PPDU data corresponds to the 802.11 protocol ("network protocol of the second network"). The PPDU frames are then transmitted using Wi-Fi access points ("near field communication network").



Source: https://www.t-mobile.com/support/tutorials/device/motorola/one-5g-ace/topic/calling-contacts-amp-calendar/turn-on-off-wi-fi-calling/1



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537

What is Voice over Wi-Fi?

Voice over Wi-Fi (VoWi-Fi) refers to the use of IEEE 802.11 wireless LANs (WLANs) to transport Voice over IP (VoIP) traffic. The technology has consumer, business and service provider applications. It is used over private WLANs, home Wi-Fi networks and public Wi-Fi hotspots.

Source: https://ribboncommunications.com/company/get-help/glossary/voice-over-wi-fi

> What is VoWiFi?
>
> Voice over Wi-Fi (VoWiFi), as the name implies, is delivering voice service via WiFi network. Users can make calls without the need of mobile signal. VoWiFi is a complementary technology to Voice over LTE (VoLTE). Both make use of the IP Multimedia Subsystem (IMS) technology to realize the voice traffic as IP packets.

Source: https://insinuator.net/2016/10/a-journey-into-the-depths-of-vowifi-security/

> **physical layer (PHY) protocol data unit (PPDU):** The unit of data exchanged between two peer PHY entities to provide the PHY data service.

Source: https://ieeexplore.ieee.org/document/7786995 (Page 138)

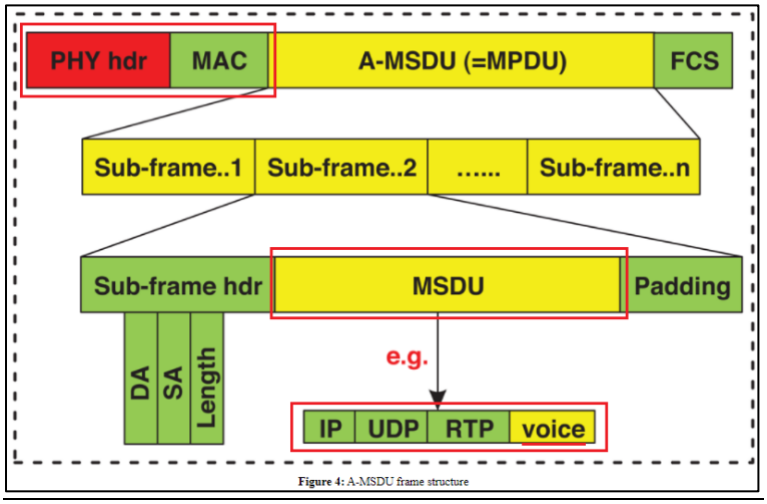
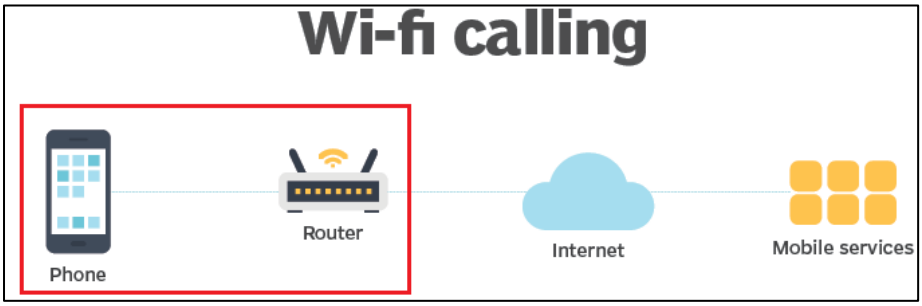
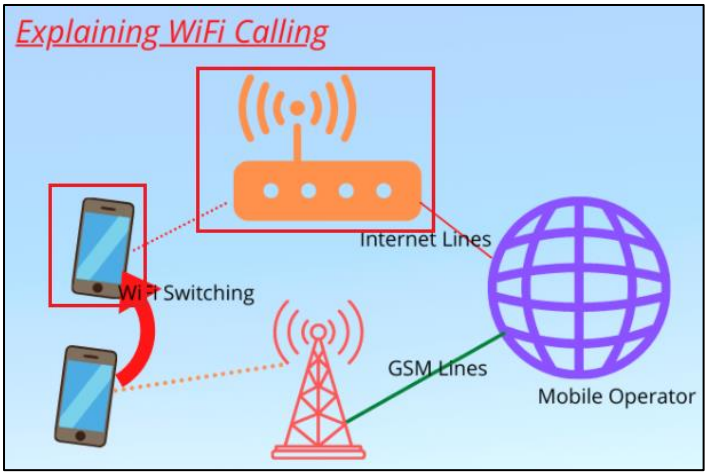


Figure 4: A-MSDU frame structure

Source: https://www.techscience.com/cmc/v66n2/40658/html



Source: https://whatis.techtarget.com/definition/Wi-Fi-calling



Source: https://www.cspsprotocol.com/what-is-wifi-calling/

84. Buffalo Patents has been damaged as a result of the infringing conduct by Motorola alleged above. Thus, Motorola is liable to Buffalo Patents in an amount that adequately compensates it for such infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

85. Buffalo Patents is only asserting method claims for the ’328 Patent, and therefore, 35 U.S.C § 287(a) does not apply.

COUNT IV

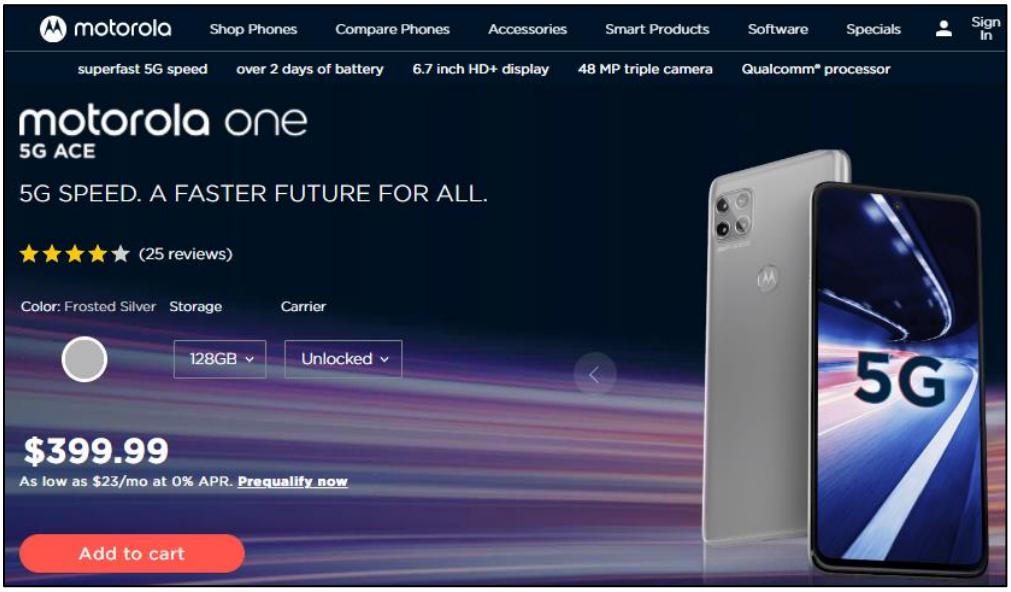
DIRECT INFRINGEMENT OF U.S. PATENT NO. 9,001,816

86. On April 7, 2015, the ’816 Patent was duly and legally issued by the United States Patent and Trademark Office for an invention entitled “Communications Terminal, a System and a Method for Internet/Network Telephony.”

87. Buffalo Patents is the owner of the ’816 Patent, with all substantive rights in and to that patent, including the sole and exclusive right to prosecute this action and enforce the ’816 Patent against infringers, and to collect damages for all relevant times.

88. Motorola made, had made, used, imported, provided, supplied, distributed, sold, and/or offered for sale products and/or systems including, for example, its Motorola One 5G Ace

smartphone and other products that support Voice over Wi-Fi (VoWi-Fi) or Wi-Fi calling ("accused products"):



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537

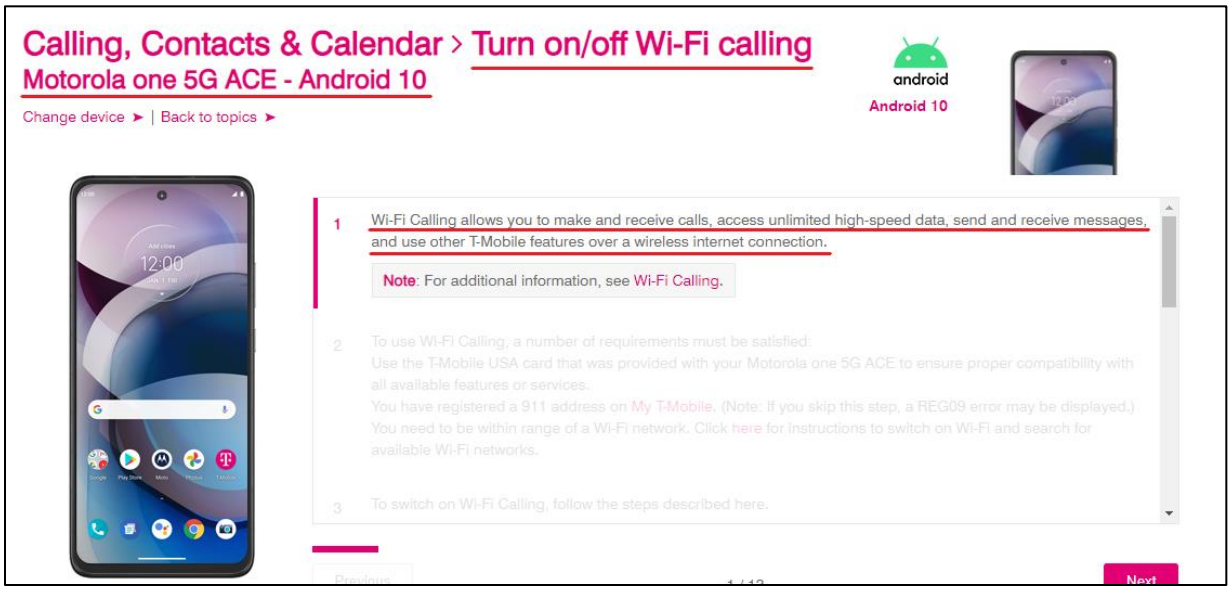
89. By doing so, Motorola has directly infringed (literally and/or under the doctrine of equivalents) at least Claim 10 of the '816 Patent. Motorola's infringement in this regard is ongoing.

90. Motorola One 5G Ace smartphone is an exemplary accused product.

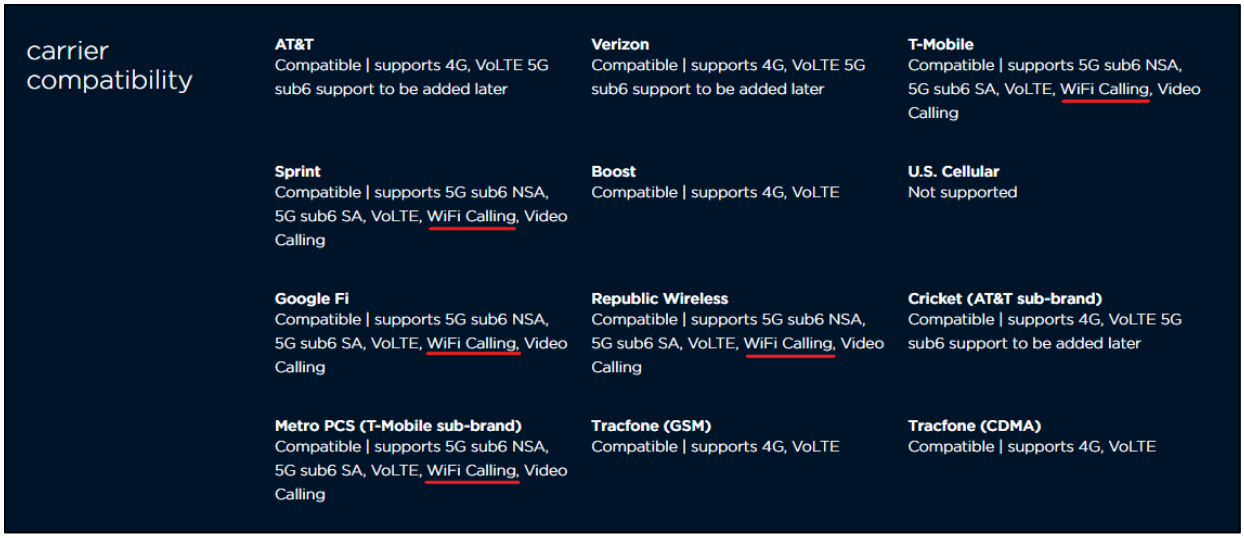
91. Motorola has infringed the '816 Patent by using the accused products and thereby practicing a method comprising receiving, via a near field network, wireless data that accords to a first network protocol, wherein the wireless data includes a data packet that accords to a second network protocol.

92. For example, a Motorola One 5G Ace device supports Wi-Fi calling/Voice over Wi-Fi (VoWi-Fi). VoWi-Fi enables a user to make and receive calls over the internet using Wi-Fi access points. VoWi-Fi allows the delivery of voice traffic as IP packets via a Wi-Fi network.

93. As one example, when a user (caller) establishes a call using the VoWi-Fi feature with another user (receiver), the voice data from the caller is compressed and encapsulated into IP packets, and then formatted according to the IEEE 802.11 protocol frame format for transmission using 802.11 WLAN (Wireless Local Area Network) access points. The formatted data is transmitted in the form of PPDUs (PLCP (Physical Layer Convergence Protocol) Protocol Data Unit). The receiver receives the transmitted PPDUs via a Wi-Fi network ("near field network"). The PPDUs ("wireless data") received by the receiver correspond to the 802.11 protocol ("first network protocol") and the IP packets ("data packet") embedded in the received PPDUs correspond to the Internet protocol ("second network protocol").



Source: https://www.t-mobile.com/support/tutorials/device/motorola/one-5g-ace/topic/calling-contacts-amp-calendar/turn-on-off-wi-fi-calling/1



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537

What is Voice over Wi-Fi?

Voice over Wi-Fi (VoWi-Fi) refers to the use of IEEE 802.11 wireless LANs (WLANs) to transport Voice over IP (VoIP) traffic. The technology has consumer, business and service provider applications. It is used over private WLANs, home Wi-Fi networks and public Wi-Fi hotspots.

Source: https://ribboncommunications.com/company/get-help/glossary/voice-over-wi-fi

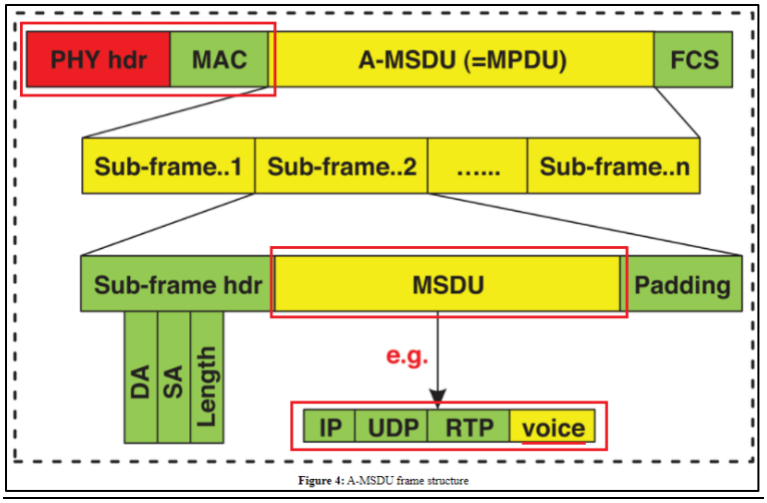
What is VoWiFi?

Voice over Wi-Fi (VoWiFi), as the name implies, is delivering voice service via WiFi network. Users can make calls without the need of mobile signal. VoWiFi is a complementary technology to Voice over LTE (VoLTE). Both make use of the IP Multimedia Subsystem (IMS) technology to realize the voice traffic as IP packets.

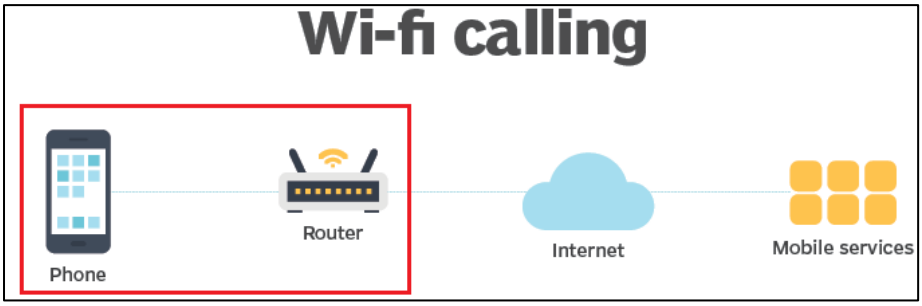
Source: https://insinuator.net/2016/10/a-journey-into-the-depths-of-vowifi-security/

physical layer (PHY) protocol data unit (PPDU): The unit of data exchanged between two peer PHY entities to provide the PHY data service.

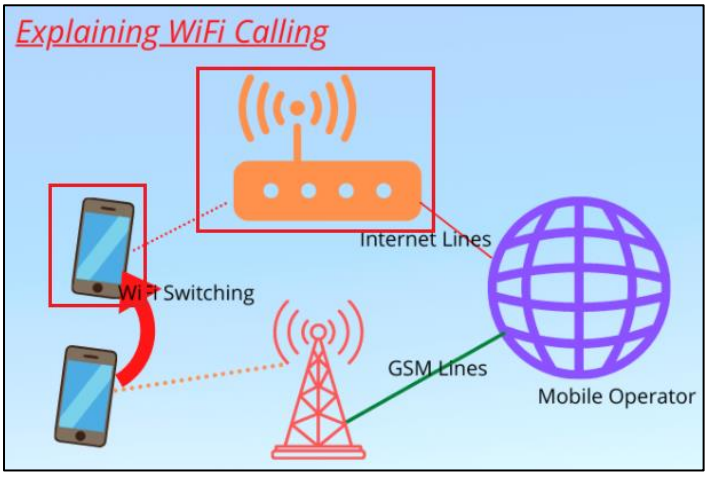
Source: https://ieeexplore.ieee.org/document/7786995 (Page 138)



Source: https://www.techscience.com/cmc/v66n2/40658/html



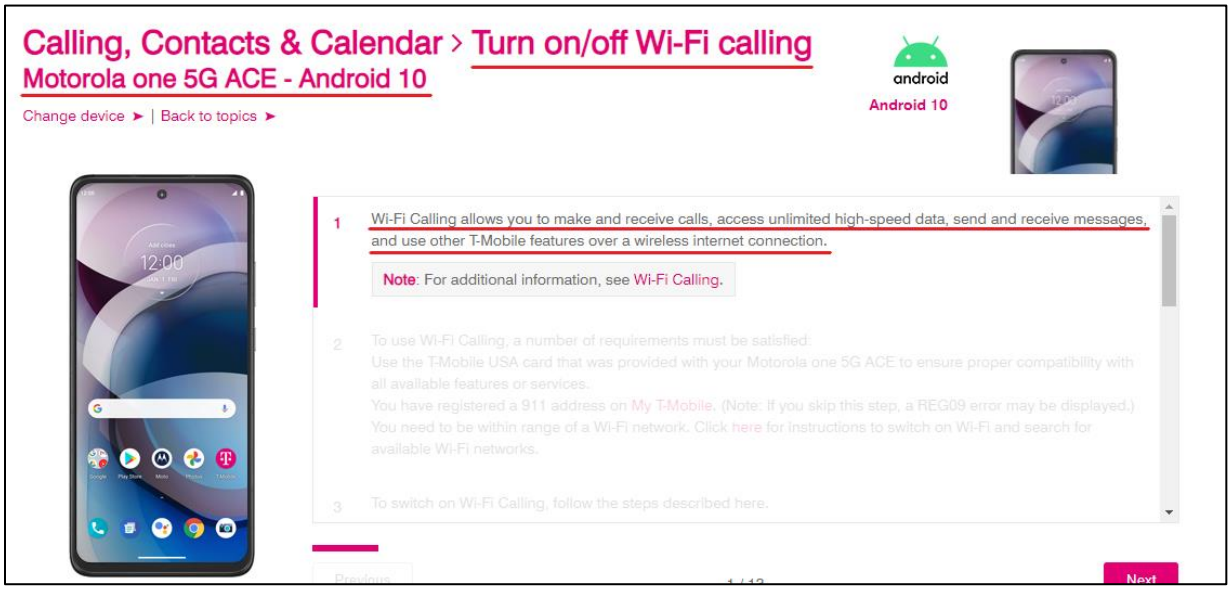
Source: https://whatis.techtarget.com/definition/Wi-Fi-calling



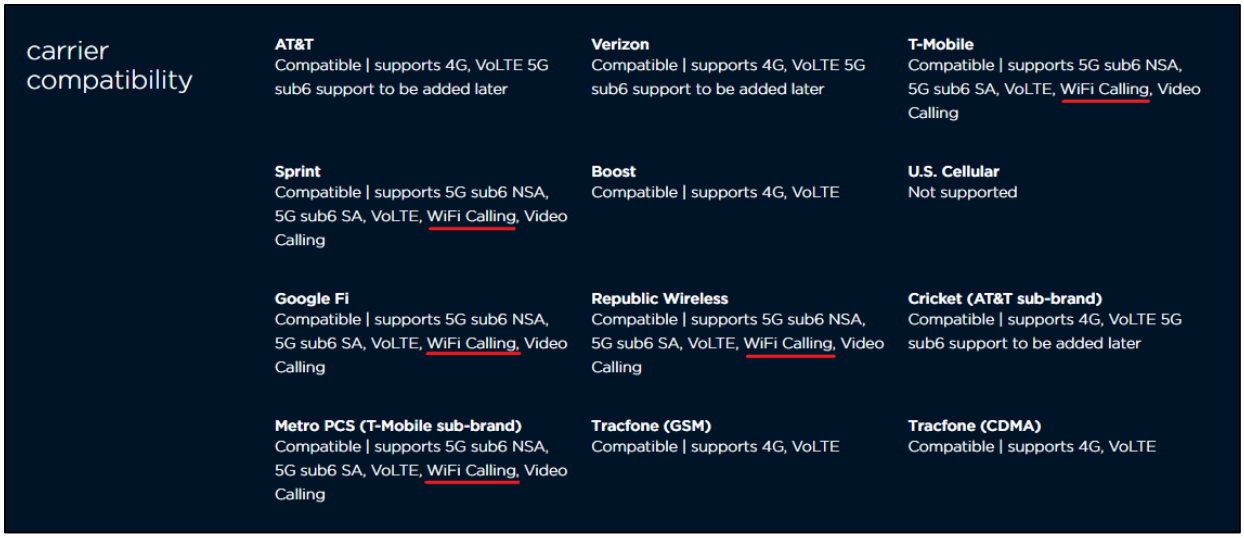
Source: https://www.cspsprotocol.com/what-is-wifi-calling/

94. The method practiced using the accused products further comprises extracting the data packet from the wireless data.

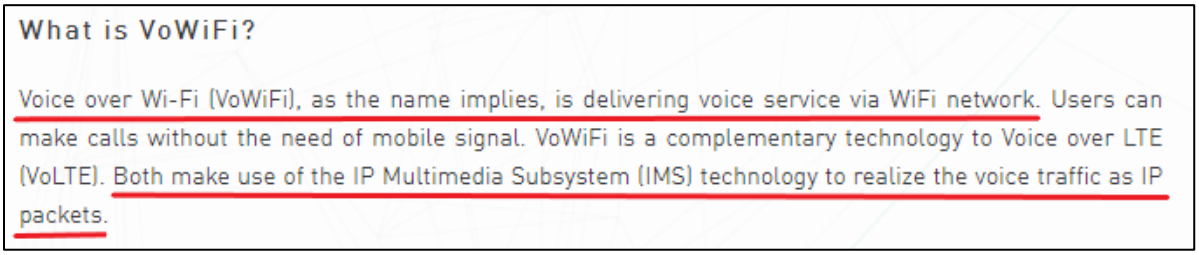
95. For example, a Motorola One 5G Ace device supports Wi-Fi calling/Voice over Wi-Fi (VoWi-Fi). As one example, when a user (caller) establishes a call using the VoWi-Fi feature with another user (the receiver), the receiver receives transmitted PPDUs from a caller via a Wi-Fi network. The received PPDUs include appropriate headers such as Physical layer and MAC layer headers. The headers are removed from the received PPDUs ("wireless data") in order to extract an IP packet ("data packet"), which includes the packetized voice data.



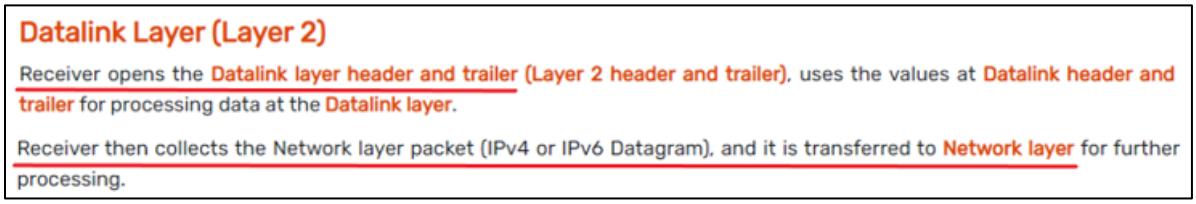
Source: https://www.t-mobile.com/support/tutorials/device/motorola/one-5g-ace/topic/calling-contacts-amp-calendar/turn-on-off-wi-fi-calling/1



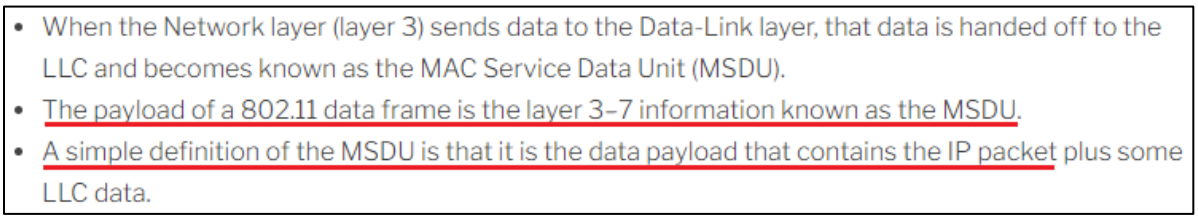
Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537



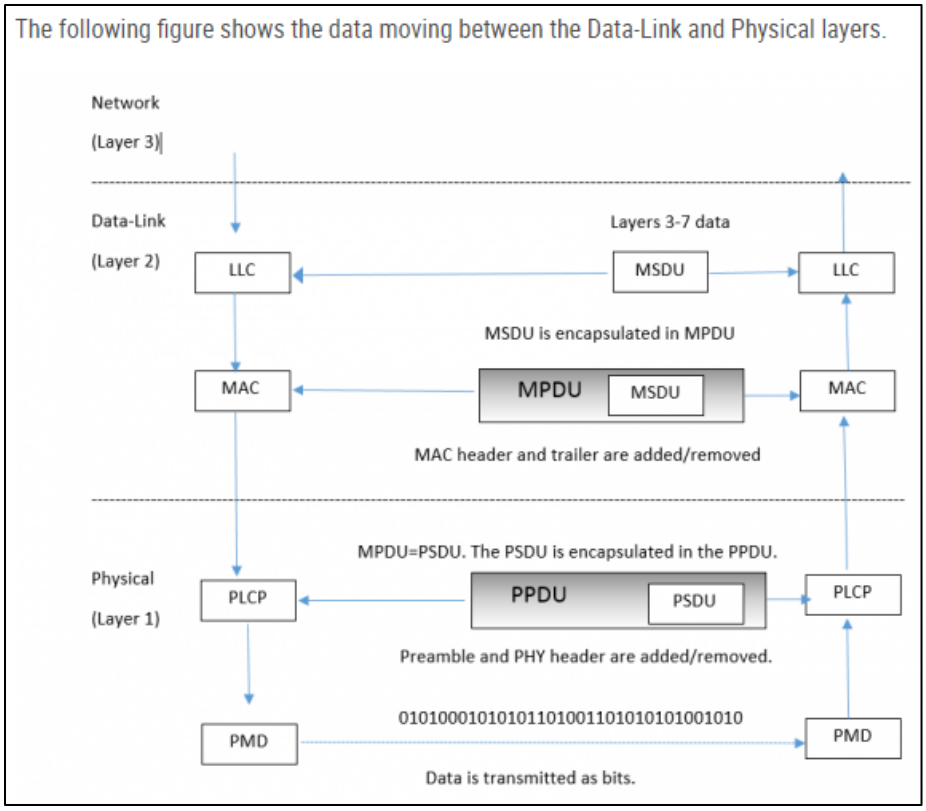
Source: https://insinuator.net/2016/10/a-journey-into-the-depths-of-vowifi-security/



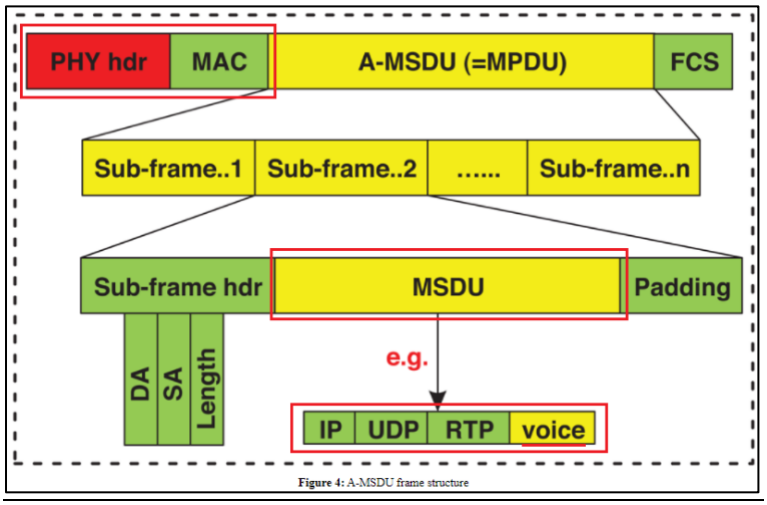
Source: https://www.omnisecu.com/tcpip/tcpip-encapsulation-decapsulation.php



Source: https://dot11ap.wordpress.com/msdu-and-mpdu/



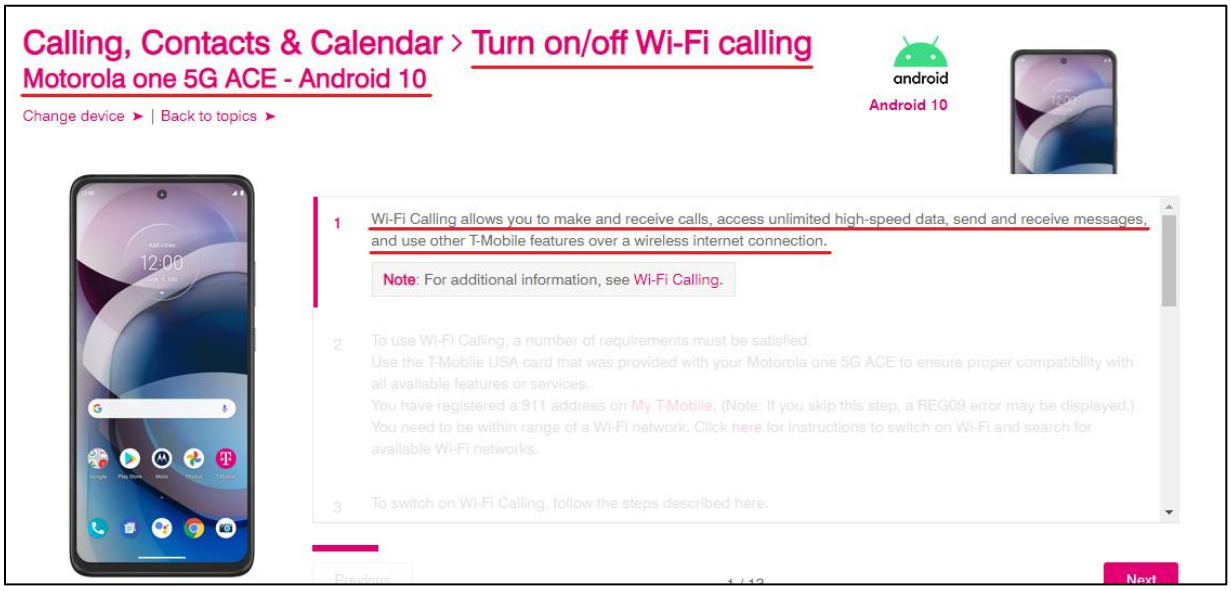
Source: https://www.cwnp.com/802.11-mac-series-ndash-basics-mac-architecture-ndash-part-1-3/



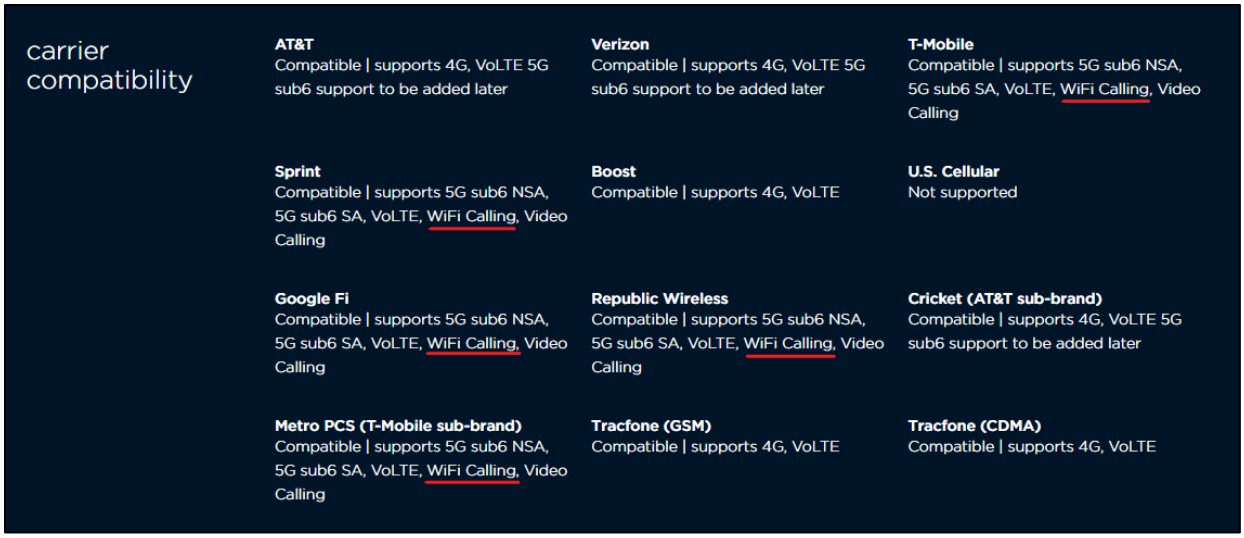
Source: https://www.techscience.com/cmc/v66n2/40658/html

96. The method practiced using the accused products further comprises generating a sound based on the data packet.

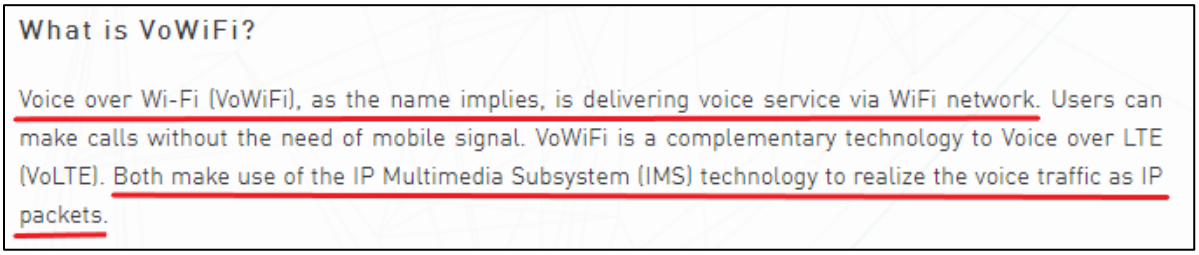
97. For example, a Motorola One 5G Ace device supports Wi-Fi calling/Voice over Wi-Fi (VoWi-Fi). As one example, when a user (caller) establishes a call using the VoWi-Fi feature with another user (the receiver), the receiver receives transmitted PPDUs from a caller via a Wi-Fi network. The PPDUs are then decapsulated to extract an IP packet ("data packet") which includes the packetized voice data from the caller. The extracted IP packet is processed to convert the digital voice data into an analog voice signal using a codec. The analog voice signal is then fed to a speaker of the receiver's device for generating sound corresponding to the voice data extracted from the IP packet.



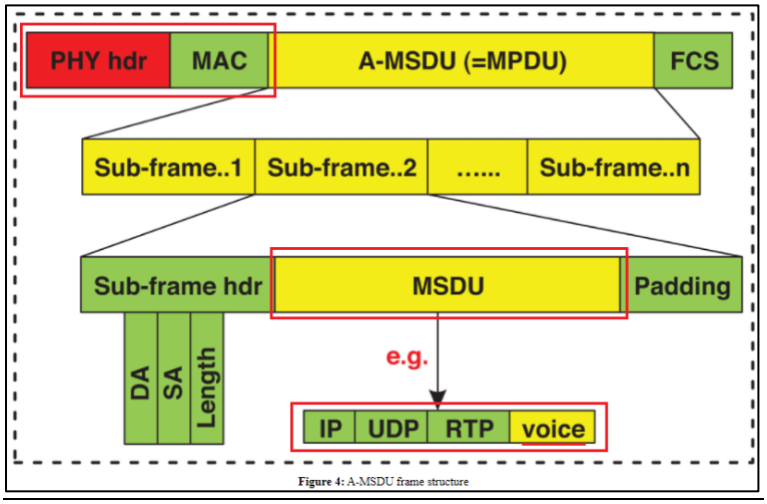
Source: https://www.t-mobile.com/support/tutorials/device/motorola/one-5g-ace/topic/calling-contacts-amp-calendar/turn-on-off-wi-fi-calling/1



Source: https://www.motorola.com/us/smartphones-motorola-one-5g-ace/p?skuId=537



Source: https://insinuator.net/2016/10/a-journey-into-the-depths-of-vowifi-security/



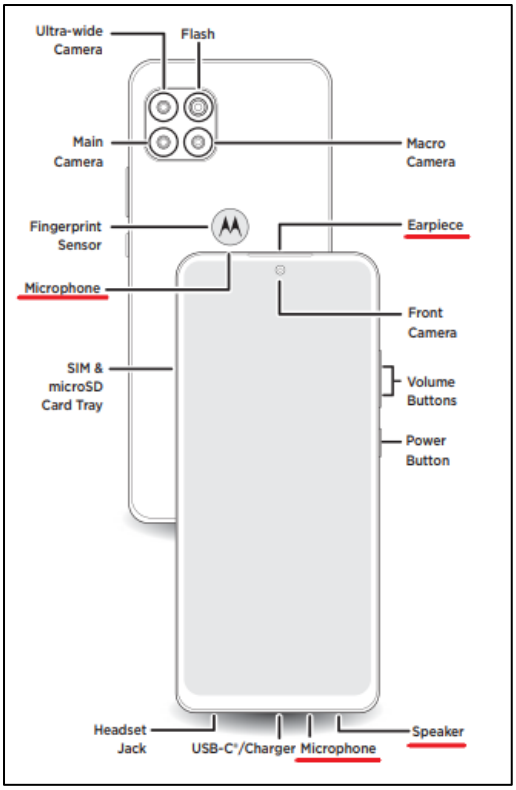
Source: https://www.techscience.com/cmc/v66n2/40658/html

> Baseband part in a mobile is comprised of a digital signal processor (DSP) to process forward voice/data signals for transmission and to process reverse voice/data signals received.
>
> This is the core processing part which changes for various air interface standards like GSM, HSPA, LTE and more. It is often named as physical layer or Layer 1 or L1. For Speech/audio, codec is used to compress and decompress the signal to match the data rate to the frame it has to fit in. The baseband or physical layer will add redundant bits to enable error detection as well as error correction. Error detection is obtained with CRC and error correction with forward error correction techniques. Other than this interleaving is done for the data of one burst which helps in spreading the error over the time hence helps receiver de-interleave and decode the frame (consecutively data burst) correctly.

Source: https://www.techplayon.com/mobile-phone-architecture/#:~:text=Baseband%20part%20in%20a%20mobile,%2C%20HSPA%2C%20LTE%20and%20more

> One common application for CODECs is with Digital Signal Processors (DSPs) in audio electronics devices. CODECs convert sound (using the ADC) to digital signals for a processor to compress and store and for playback, the stored digital data is decompressed and converted to analog signals via the DAC. The analog signal reaches the human ear by converting the analog signal into a transmissible sound via a pulse width modulator and a speaker, for example.

Source: https://www.analogictips.com/what-is-a-codec/



Source:

https://download.lenovo.com/Motorola/Manuals/156922/73228221/motorola%20one%205G%20ACE_UG_en-US_SSC8D10322A.pdf (Page 3)

98. Buffalo Patents has been damaged as a result of the infringing conduct by Motorola alleged above. Thus, Motorola is liable to Buffalo Patents in an amount that adequately compensates it for such infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

99. Buffalo Patents is only asserting method claims for the '816 Patent, and therefore, 35 U.S.C § 287(a) does not apply.

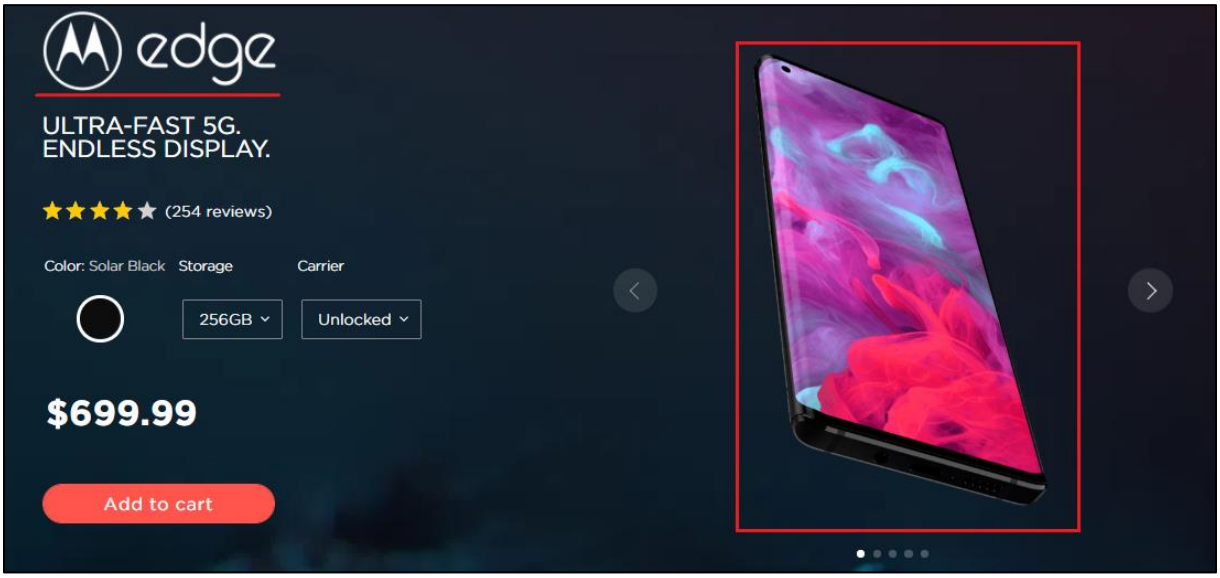
COUNT V

DIRECT INFRINGEMENT OF U.S. PATENT NO. 6,856,086

100. On February 15, 2005, the '086 Patent was duly and legally issued by the United States Patent and Trademark Office for an invention entitled "Hybrid Display Device."

101. Buffalo Patents is the owner of the ’086 Patent, with all substantive rights in and to that patent, including the sole and exclusive right to prosecute this action and enforce the ’086 Patent against infringers, and to collect damages for all relevant times.

102. Motorola made, had made, used, imported, provided, supplied, distributed, sold, and/or offered for sale products and/or systems including, for example, its Motorola Edge smartphone and other products that include curved displays or flexible OLED displays (“accused products”):



Source: https://www.motorola.com/us/smartphones-motorola-edge/p?skuId=352

Source: https://www.motorola.com/us/smartphones-motorola-edge/p?skuId=352

Specification	Motorola Edge
Model	XT2063-3
Display	6.67-inches curved "waterfall" display with left-sided single hole-punch 2340×1080 (19.5:9)

Source: https://www.xda-developers.com/motorola-edge-exclusive-leaked-photos/

103. By doing so, Motorola has directly infringed (literally and/or under the doctrine of equivalents) at least Claim 1 of the '086 Patent. Motorola's infringement in this regard is ongoing.

104. The Motorola Edge smartphone is an exemplary accused product.

105. The Motorola Edge smartphone is a display device comprising a front panel and a back panel with a light control material therebetween. One of the panels has a rigid substrate and the other of the panels has a flexible substrate.

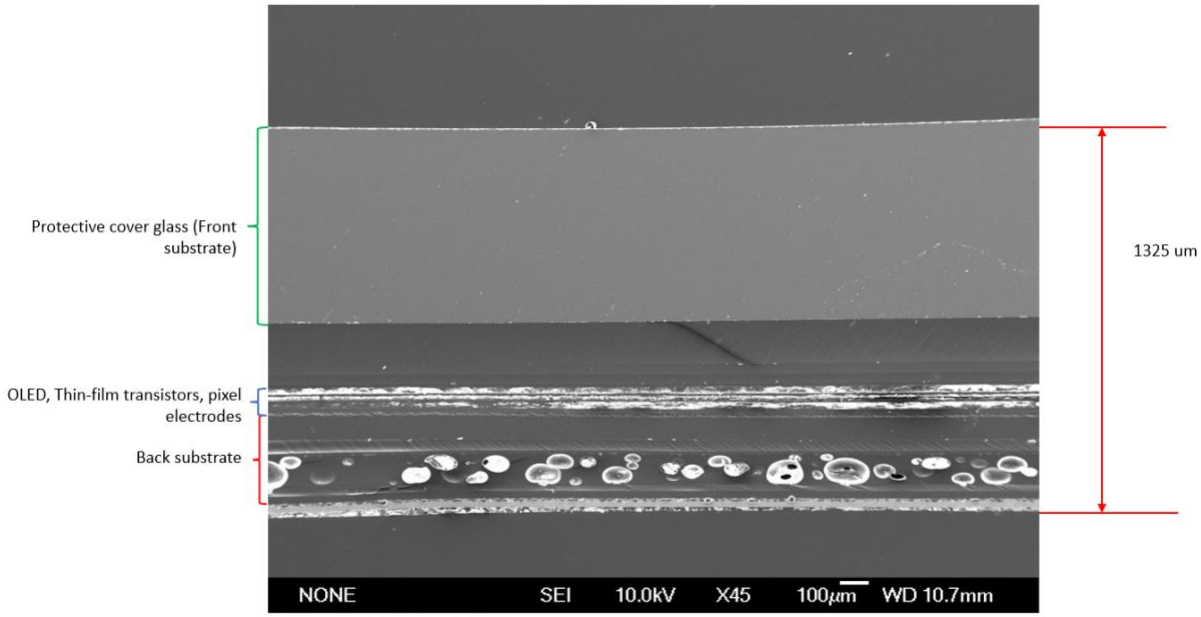
106. For example, the Motorola Edge smartphone includes a flexible OLED (Organic Light Emitting Diode) display, which includes a front panel and a back panel. The top layer ("front panel") of the display includes a rigid substrate: Corning Gorilla Glass 5 ("rigid substrate") as the cover glass. The cover glass is about 673 µm thick. Gorilla Glass is generally composed of alkali-aluminosilicates. A Reverse Engineering (RE) analysis of the Motorola Edge display also reveals the presence of alkali-aluminosilicates (*i.e.*, sodium (alkali metal), aluminum, silicon, and oxygen) in the front panel.

Source: https://www.motorola.com/us/smartphones-motorola-edge/p?skuId=352

Specification	Motorola Edge
Model	XT2063-3
Display	6.67-inches curved "waterfall" display with left-sided single hole-punch 2340×1080 (19.5:9)

Source: https://www.xda-developers.com/motorola-edge-exclusive-leaked-photos/

Source: https://www.motorola.com/us/smartphones-motorola-edge/p?skuId=352



Source: Scanning Electron Microscope (SEM) image for the Motorola Edge OLED Display

How Gorilla Glass Is Made

The glass consists of a thin sheet of alkali-aluminosilicate. Gorilla Glass is strengthened using an ion-exchange process which forces large ions into the spaces between molecules on the glass surface. Specifically, glass is placed in a 400°C molten potassium salt bath, which forces potassium ions to replace the sodium ions originally in the glass. The larger potassium ions take up more space between the other atoms in the glass. As the glass cools, the crunched-together atoms produce a high level of compressive stress in the glass that helps protect the surface from mechanical damage.

Source: https://www.thoughtco.com/what-is-gorilla-glass-607863

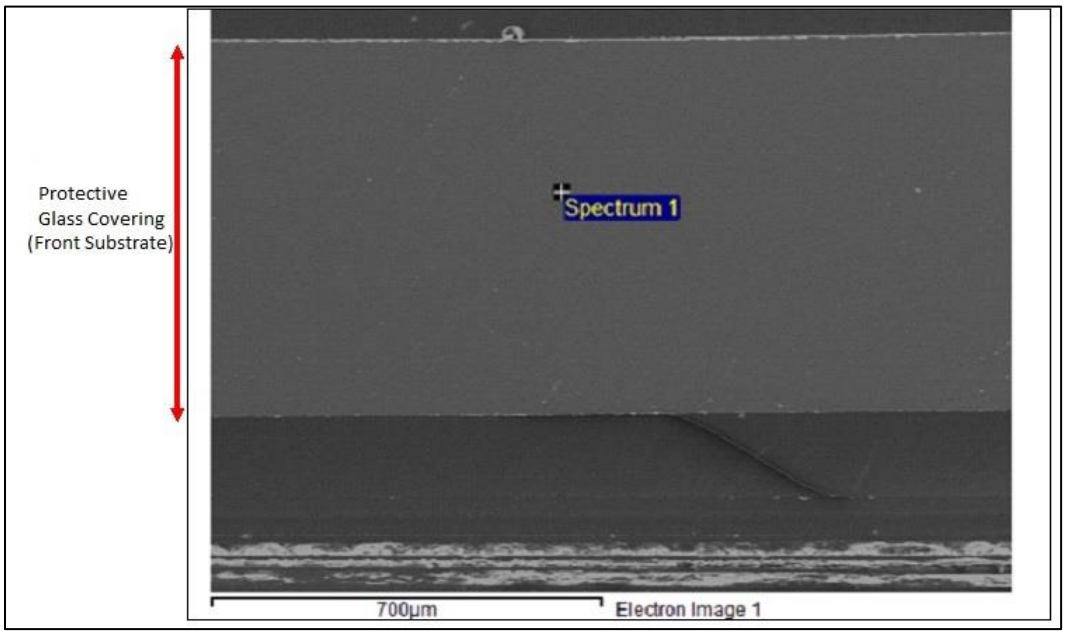
Glass has already established itself as the substrate of choice in mobile devices. The material plays a key role in the design and performance of current electronic and optoelectronic devices. This includes the use of glass as substrates, backlights, and protective covers for portable electronics, displays, and energy sources such as photovoltaics. Glass substrates are chosen for these applications because of the required attributes of thermal and dimensional stability, surface quality, hermeticity, chemical and process compatibility, and optical performance. Typical glass substrates used in these applications are rigid sheets >0.3 mm thick. These glass substrates have been optimized for hand-held electronics or discrete devices and modules.

Source: https://www.photonics.com/Articles/Flexible_Glass_Substrates_Enable_Large-Scale/a63967

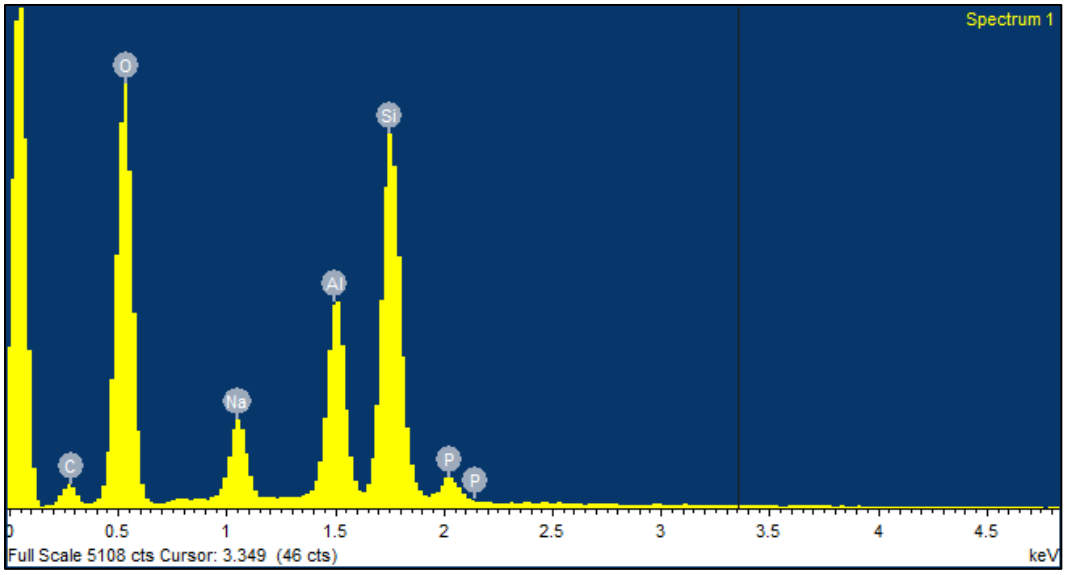
Thickness	
Standard	0.4 mm – 1.2 mm

Source:

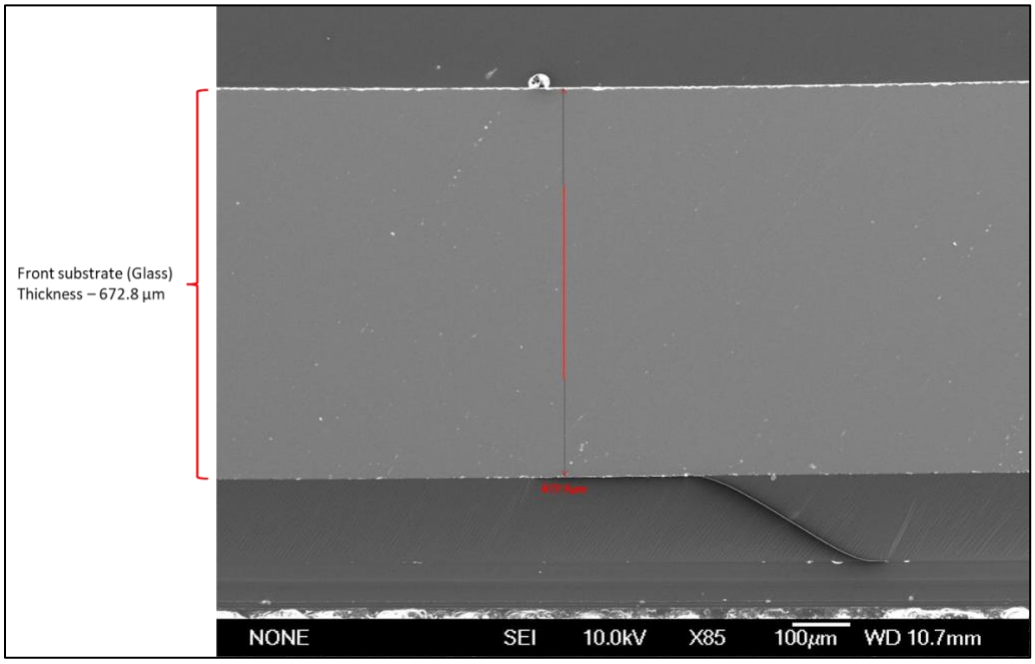
https://www.corning.com/microsites/csm/gorillaglass/PI_Sheets/2020/Corning%20Gorilla%20Glass%205_PI%20Sheet.pdf



Source: Scanning Electron Microscope (SEM) image for Protective Glass Covering of the Front Panel (Rigid Substrate) indicating the point of interest for Energy-Dispersive X-ray Spectroscopy (EDXS) analysis



Source: Energy-Dispersive X-ray Spectroscopy (EDXS) analysis for the Protective Glass Covering (indicated in above citation) of the Front Panel (Rigid Substrate)



Source: Scanning Electron Microscope (SEM) image for the front panel (along with thickness of glass substrate) of Motorola Edge OLED Display

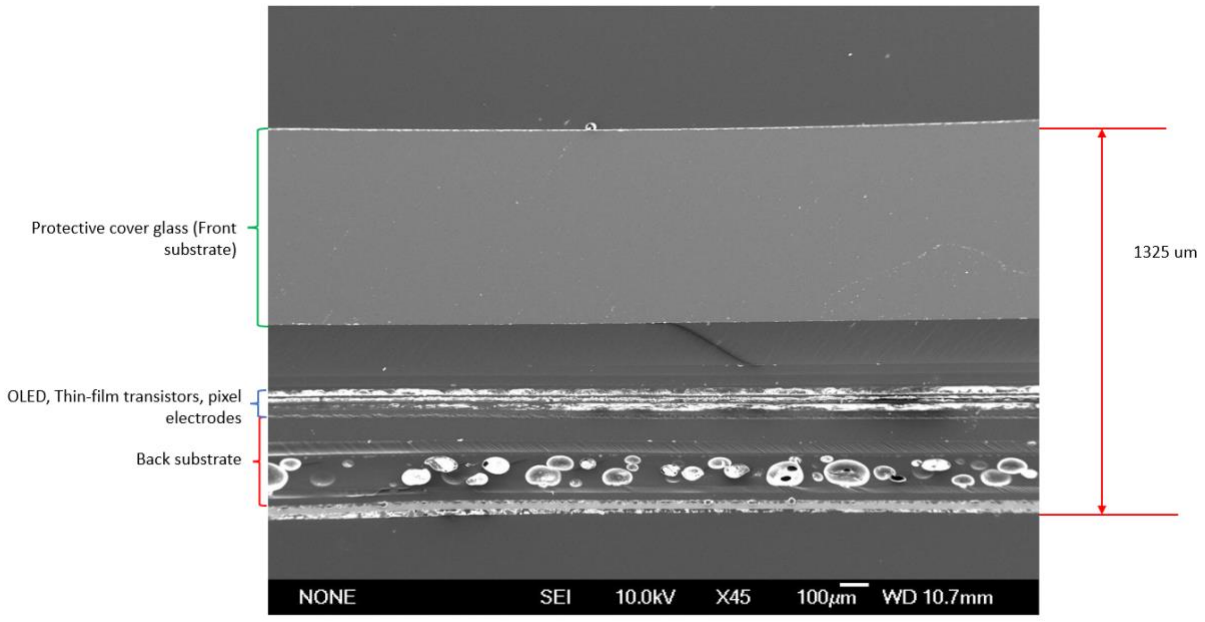
107. The display also includes an OLED material ("light control material") as the middle layer between the front panel and the back panel. The RE analysis of the OLED display

shows the presence of an OLED ("light control material") material as the middle layer between the top and bottom layers. This layer includes emissive and conductive layers. The emissive and conductive layers ("light control material") are responsible for emitting light and are made of organic molecules.

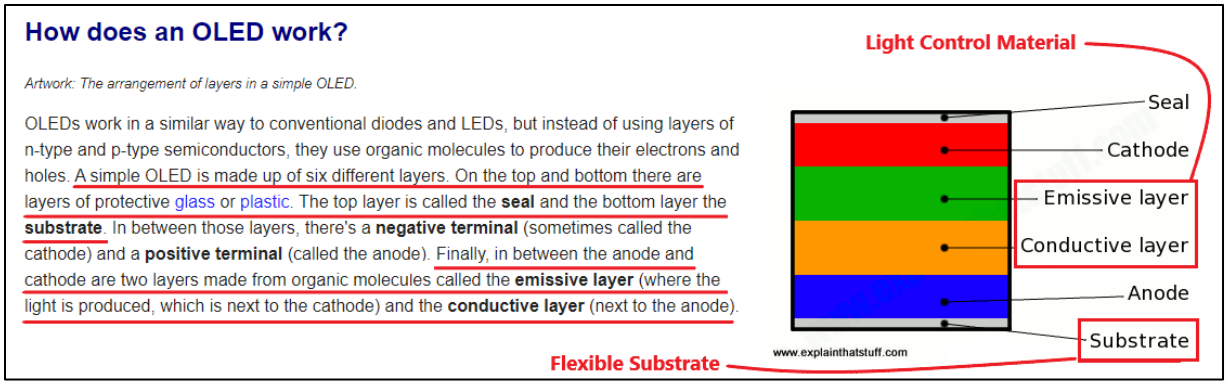
Source: https://www.motorola.com/us/smartphones-motorola-edge/p?skuId=352

Specification	Motorola Edge
Model	XT2063-3
Display	6.67-inches curved "waterfall" display with left-sided single hole-punch 2340×1080 (19.5:9)

Source: https://www.xda-developers.com/motorola-edge-exclusive-leaked-photos/



Source: Scanning Electron Microscope (SEM) image for the Motorola Edge OLED Display



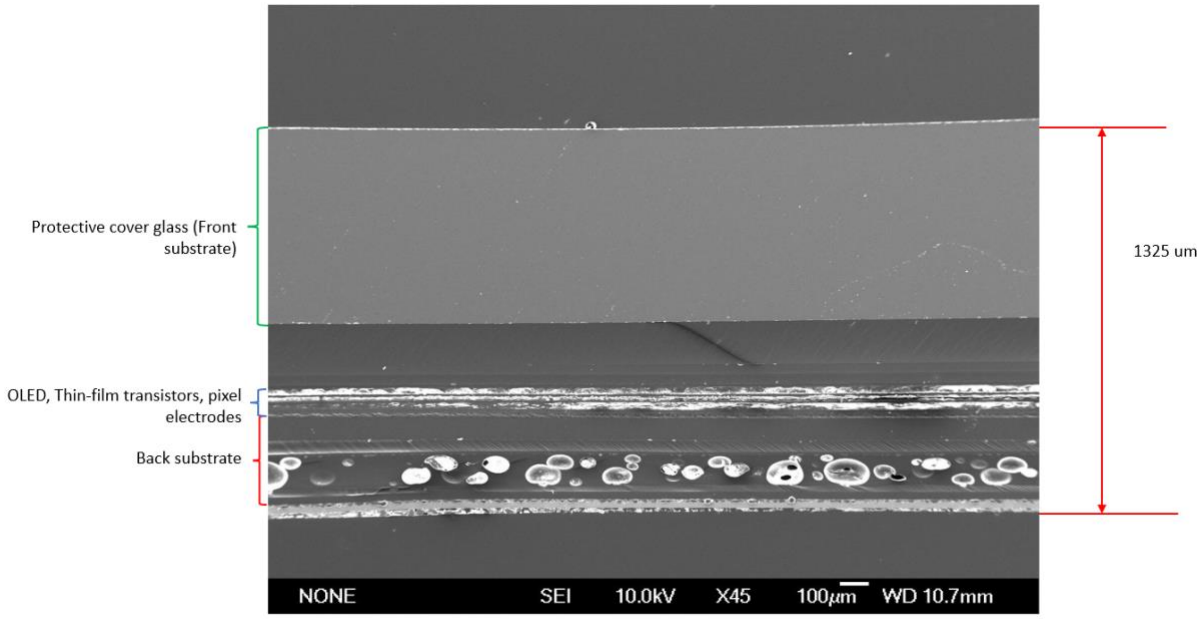
Source: https://www.explainthatstuff.com/how-oleds-and-leps-work.html

108. The bottom layer ("back panel") is a substrate layer and includes multiple organic polymer layers. These multiple organic polymer layers are flexible. In particular, the bottom layer includes multiple layers in which carbon and oxygen elements are the most predominant elements present, which indicates the presence of carbon-based organic materials, such as polymeric materials (*e.g.*, flexible plastic films). Polymers, such as polyimide (PI), polyethylene terephthalate (PET), polyester sulfone (PES), etc., are commonly used in the manufacture of flexible displays (and, in particular, flexible OLED displays). Additionally, flexible display materials are used to make curved displays, like the Motorola Edge display.

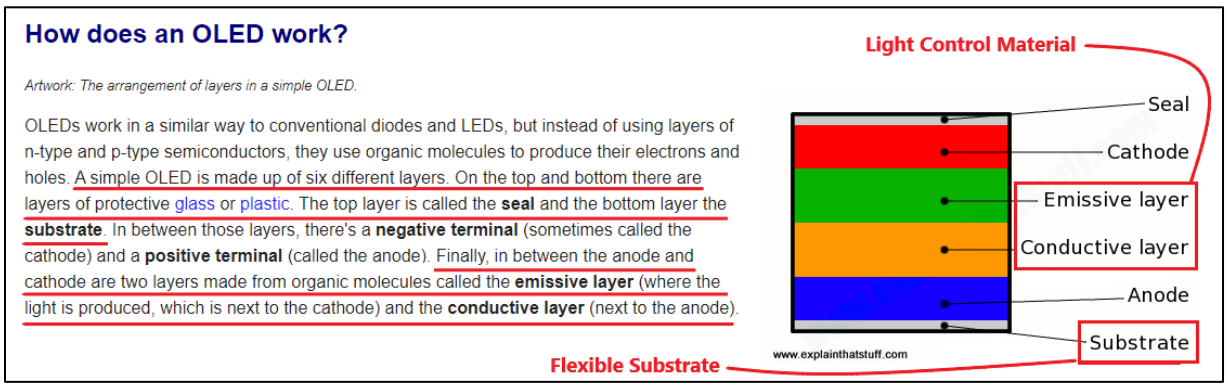
Source: https://www.motorola.com/us/smartphones-motorola-edge/p?skuId=352

Specification	Motorola Edge
Model	XT2063-3
Display	6.67-inches curved "waterfall" display with left-sided single hole-punch 2340×1080 (19.5:9)

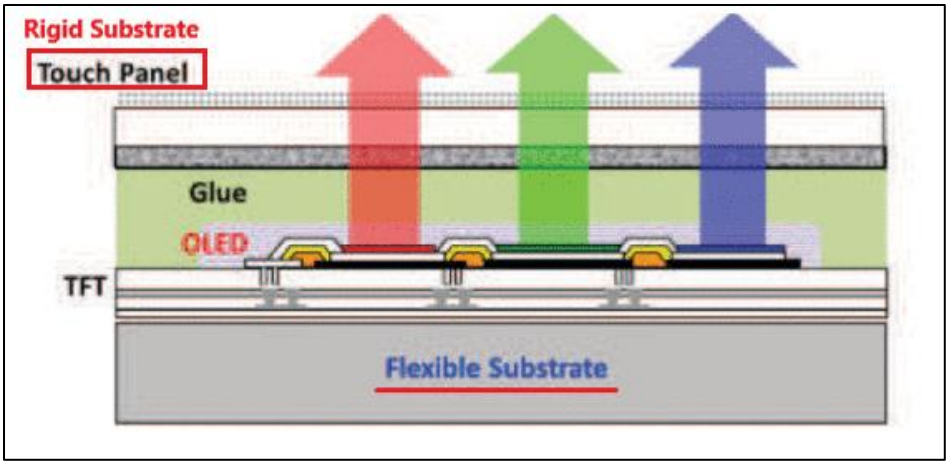
Source: https://www.xda-developers.com/motorola-edge-exclusive-leaked-photos/



Source: Scanning Electron Microscope (SEM) image for the Motorola Edge OLED Display



Source: https://www.explainthatstuff.com/how-oleds-and-leps-work.html



Source: https://ieeexplore.ieee.org/abstract/document/6514818

Unlike traditional flat panel displays OLEDs, one of the more popular types of flexible electronic displays are solid-state devices composed of thin films of organic molecules that create light with the application of electricity. OLEDs can provide brighter, crisper displays on electronic devices and use less power than conventional light-emitting diodes (LEDs) or liquid crystal displays (LCDs) used according to HowStuffWorks.com. Using glass substrates, flexible technology OLED's utilizes plastic substrates, which allow the display to bend and twist. Flexible OLED's only need one sheet of substrate while LCD's require two and a separate backlight. Because of this, OLED's are able to be paper thin and lightweight, a perfect candidate for mobile phones and wearable electronics. The challenge for manufacturers currently is allowing the device to be repeatedly deformed while keeping the internals intact. Currently, electronic flexible displays are being used to make curved phones and televisions. This is possible because while the display may be "flexible", the internal components remain fixed. Figure 1 shows a diagram of the layers in different types of displays. Samsung refers to their flexible OLED display as FAMOLED.

Source: https://www.patinformatics.com/blog-posts/are-flexible-electronic-displays-the-future-of-smartphone-display-technology-guest-post-by-riley-collins

When set makers request that a mobile device's display panel be molded, curved, or folded for its industrial design, panel makers add plastic – a polyimide layer, to be precise.

Source: https://www.corning.com/worldwide/en/products/display-glass/carrying-handheld-devices-into-the-flexible-oled-future.html

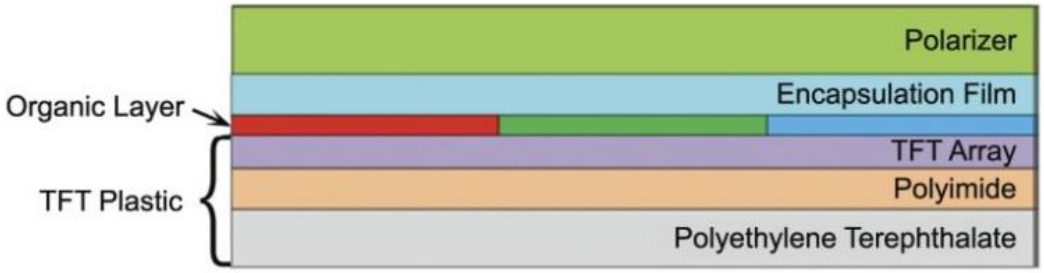
> Being in the midst of the shift with our OEM partners, Synaptics gets a front row seat to some pretty cool innovations enabled by OLED display technology. Flexible OLED displays not only provide an enhanced user experience, but also enable new form factors and features. These include borderless 'infinity' and waterfall displays, enhanced touch controls to replace physical buttons, face detection to automatically dim the screen when the handset is held to the ear, active pen based input, and foldable screens – all additional ways phone makers will differentiate their devices on top of traditional display performance features such as pixel count and refresh rates.

Source: https://www.synaptics.com/company/blog/flexible-oled-on-cell-key

> OLED is an emerging display technology that enables beautiful and efficient displays and lighting panels. Thin OLEDs are already being used in many mobile devices and TVs, and the next generation of these panels will be flexible and bendable. When we talk about flexible OLEDs, it's important to understand what that means exactly. A flexible OLED is based on a flexible substrate which can be plastic, metal or flexible glass. The plastic and metal panels will be light, thin and very durable - in fact they will be virtually shatter-proof.

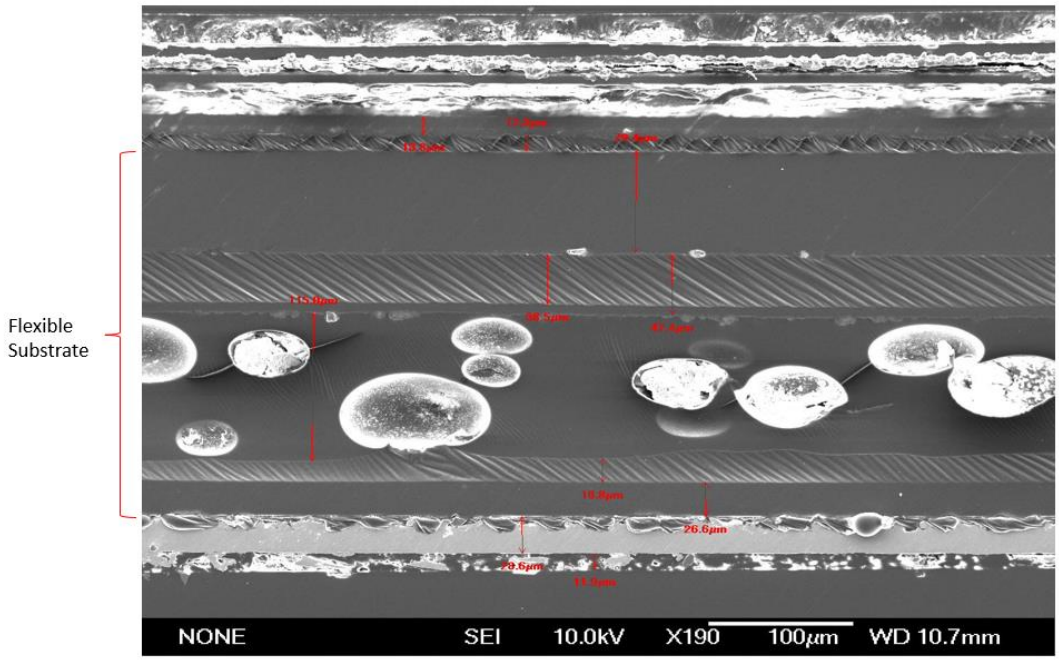
Source: https://zenodo.org/record/912230/files/779862429.pdf

> As the flat panel display market moves from liquid crystal displays (LCDs) to organic light emitting diode (OLED) display technology, laser patterning and cutting of heterogeneous materials (comprised of multiple organic material films) with high quality and accuracy is needed. Within OLED technology, substrate materials are moving from glass to flexible plastics to create lighter, thinner and more durable displays. Flexible OLED structures consist of a multilayer stack of functional materials deposited on heat sensitive plastic films such as PI and polyethylene terephthalate (PET) as shown in Figure 1. The sensitive thermal and optical properties of these films make these stacks difficult to machine using conventional laser sources.



Source: https://www.newport.com/n/flat-panel-display-manufacturing

109. The results below are SEM images and EDXS analyses of various layers of the back panel. The EDXS images of the Motorola Edge display are consistent with flexible plastic materials, such as polyimide and polyethylene terephthalate films.



Source: Scanning Electron Microscope (SEM) image for the back panel of Motorola Edge OLED Display

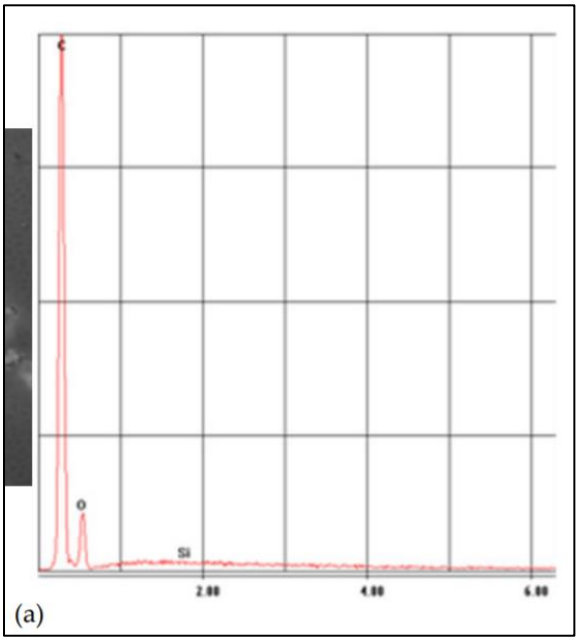


Figure 21. (a) Surface aspect of the polyimide film without microcapsules & EDX

Source: https://www.researchgate.net/publication/233967219_Auto-Reparation_of_Polyimide_Film_Coatings_for_Aerospace_Applications_Challenges_Perspectives (Page 229)

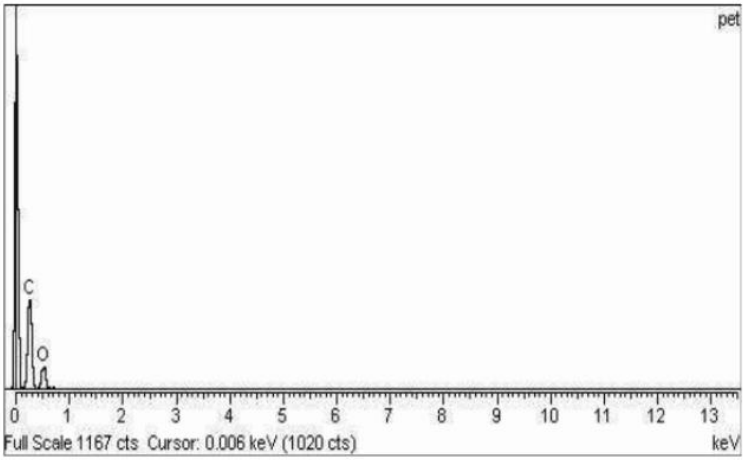
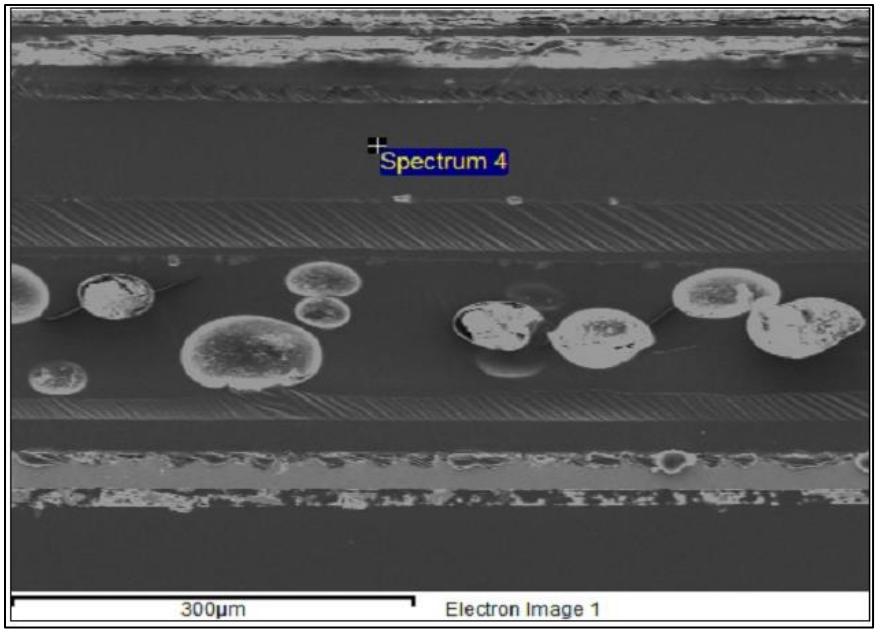


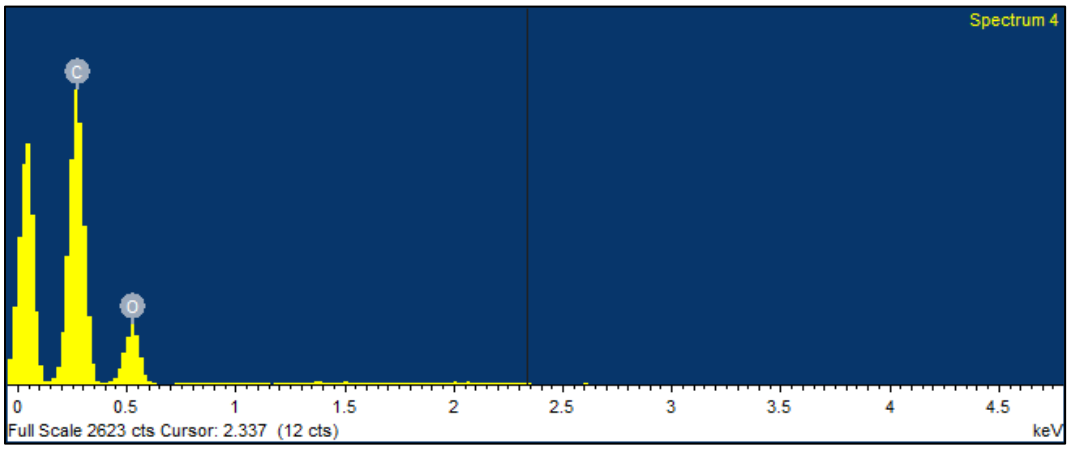
Figure 3. EDX spectrum of the PET.

Source:

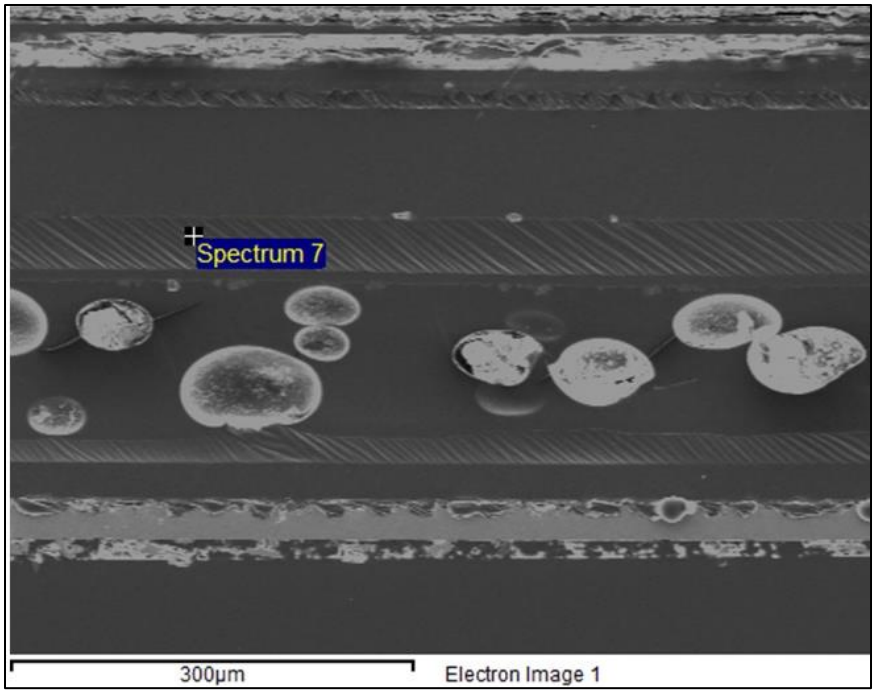
https://www.researchgate.net/publication/290429725_Crystallization_Behavior_of_PET_Materials (Page 31)



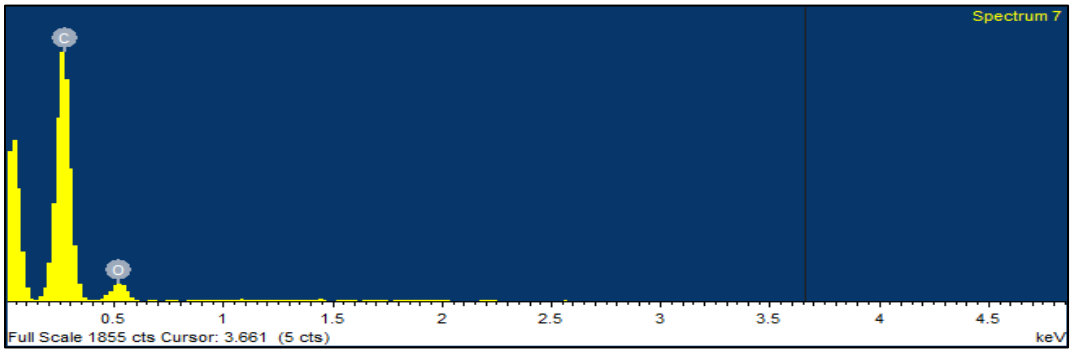
Source: Scanning Electron Microscope (SEM) image for a layer in the Back Panel (Flexible Substrate) indicating the point of interest for Energy-Dispersive X-ray Spectroscopy (EDXS) analysis



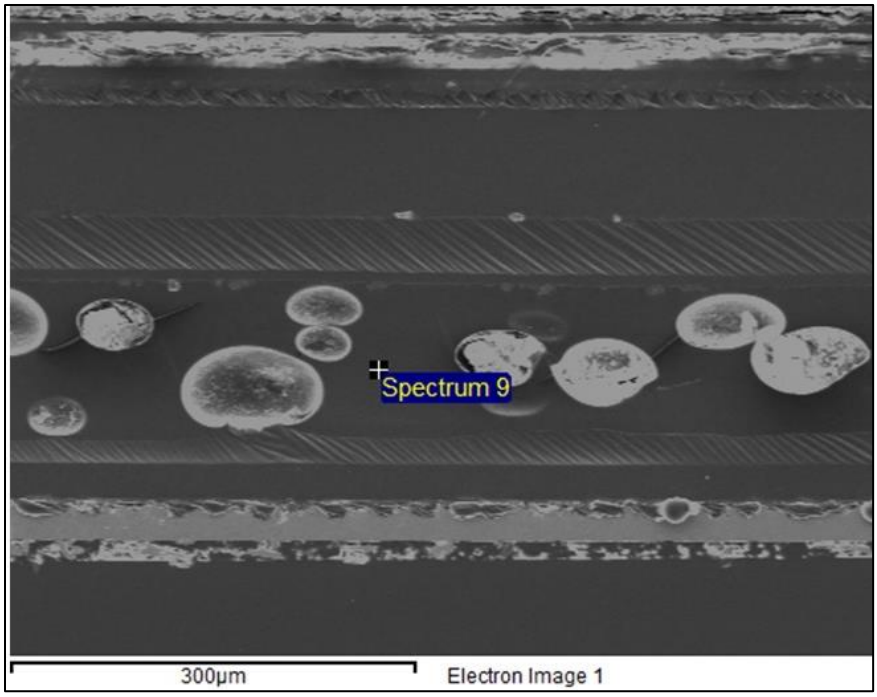
Source: Energy-Dispersive X-ray Spectroscopy (EDXS) analysis for a layer (indicated in above citation) in the Back Panel (Flexible Substrate)



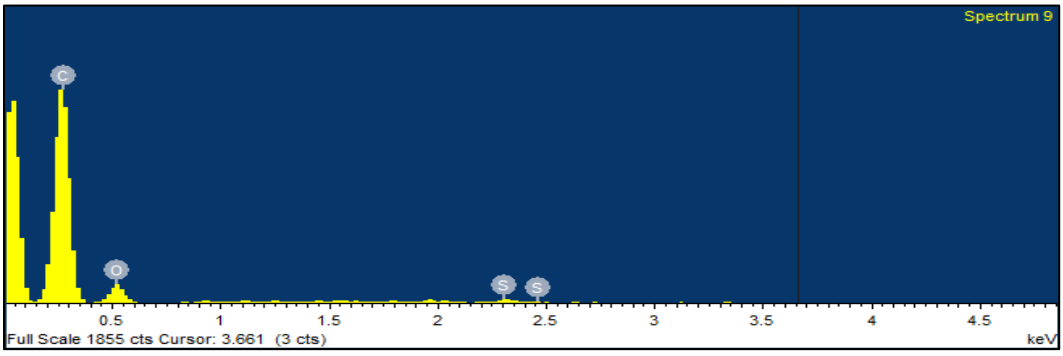
Source: Scanning Electron Microscope (SEM) image for a layer in the Back Panel (Flexible Substrate) indicating the point of interest for Energy-Dispersive X-ray Spectroscopy (EDXS) analysis



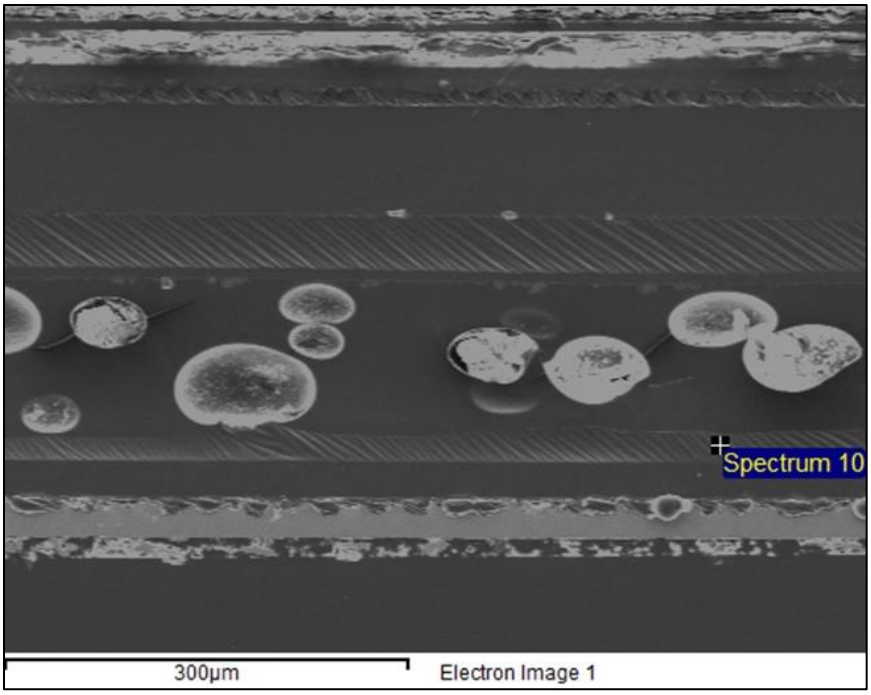
Source: Energy-Dispersive X-ray Spectroscopy (EDXS) analysis for a layer (indicated in above citation) in the Back Panel (Flexible Substrate)



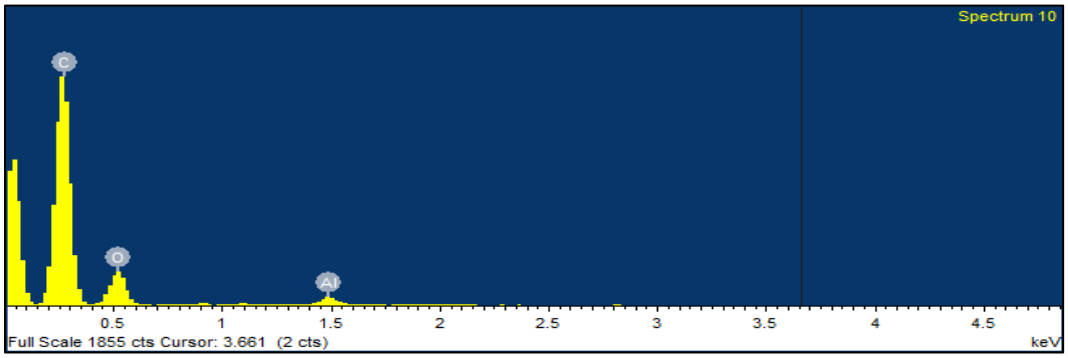
Source: Scanning Electron Microscope (SEM) image for a layer in the Back Panel (Flexible Substrate) indicating the point of interest for Energy-Dispersive X-ray Spectroscopy (EDXS) analysis



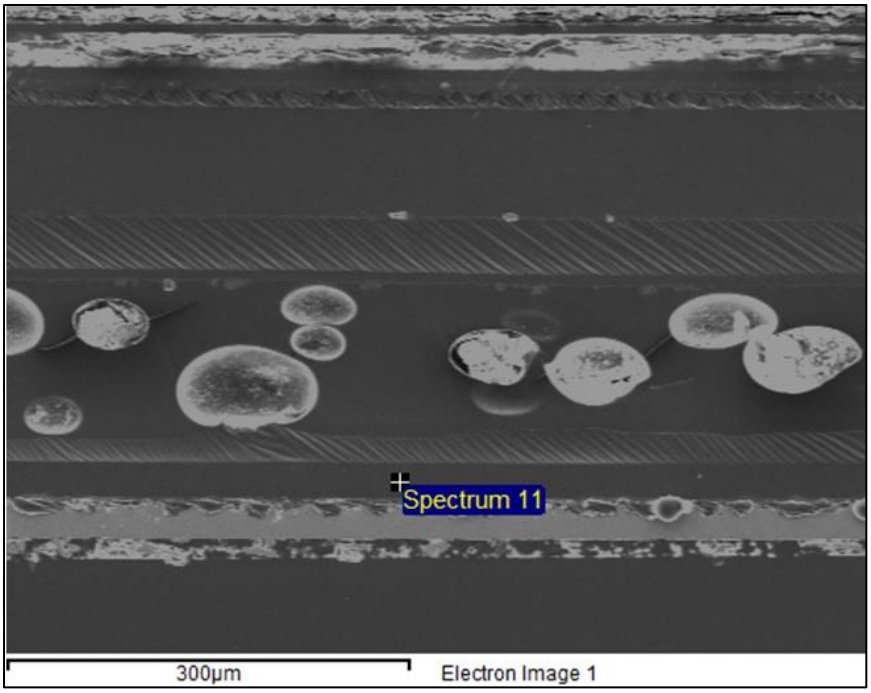
Source: Energy-Dispersive X-ray Spectroscopy (EDXS) analysis for a layer (indicated in above citation) in the Back Panel (Flexible Substrate)



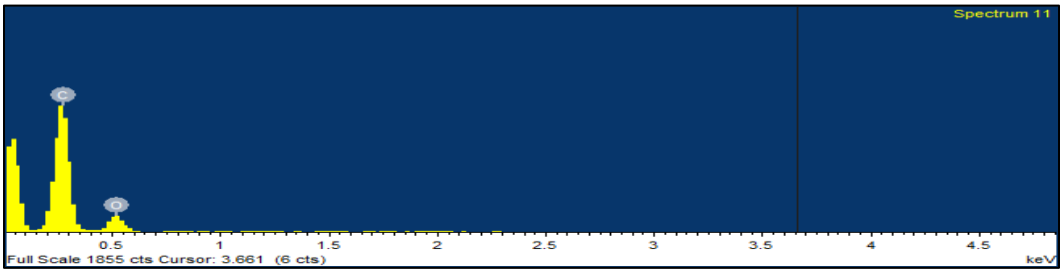
Source: Scanning Electron Microscope (SEM) image for a layer in the Back Panel (Flexible Substrate) indicating the point of interest for Energy-Dispersive X-ray Spectroscopy (EDXS) analysis



Source: Energy-Dispersive X-ray Spectroscopy (EDXS) analysis for a layer (indicated in above citation) in the Back Panel (Flexible Substrate)



Source: Scanning Electron Microscope (SEM) image for a layer in the Back Panel (Flexible Substrate) indicating the point of interest for Energy-Dispersive X-ray Spectroscopy (EDXS) analysis



Source: Energy-Dispersive X-ray Spectroscopy (EDXS) analysis for a layer (indicated in above citation) in the Back Panel (Flexible Substrate)

110. Accordingly, the front panel includes a rigid substrate, and the back panel includes a flexible substrate, with a light control material therebetween.

111. Motorola has had knowledge of the ’086 Patent at least as of the date when it was notified of the filing of this action, and as early as November 2, 2021, when Motorola received a letter notifying it of the ’086 Patent.

112. Buffalo Patents has been damaged as a result of the infringing conduct by Motorola alleged above. Thus, Motorola is liable to Buffalo Patents in an amount that adequately compensates it for such infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

113. Buffalo Patents has neither made nor sold unmarked articles that practice the ’086 Patent, and is entitled to collect pre-filing damages for the full period allowed by law for infringement of the ’086 Patent.

ADDITIONAL ALLEGATIONS REGARDING INFRINGEMENT AND PERSONAL JURISDICTION

114. Motorola has also indirectly infringed the ’670 Patent and the ’086 Patent by inducing others to directly infringe the ’670 Patent and the ’086 Patent.

115. Motorola has induced the end users and/or Motorola’s customers to directly infringe (literally and/or under the doctrine of equivalents) the ’670 Patent and the ’086 Patent by using the accused products.

116. Motorola took active steps, directly and/or through contractual relationships with others, with the specific intent to cause them to use the accused products in a manner that infringes one or more claims of the ’670 Patent and the ’086 Patent, including, for example, Claim 1 of the ’670 Patent and Claim 1 of the ’086 Patent.

117. Such steps by Motorola included, among other things, advising or directing customers, end users, and others (including third party testing and certification organizations) to use the accused products in an infringing manner; advertising and promoting the use of the accused products in an infringing manner; and/or distributing instructions that guide users to use the accused products in an infringing manner.

118. Motorola performed these steps, which constitute joint and/or induced infringement, with the knowledge of the ’670 Patent and the ’086 Patent, and with the knowledge that the induced acts constitute infringement.

119. Motorola was and is aware that the normal and customary use of the accused products by Motorola’s customers would infringe the ’670 Patent and the ’086 Patent. Motorola’s inducement is ongoing.

120. Motorola has also induced its affiliates, or third party manufacturers, shippers, distributors, retailers, or other persons acting on its or its affiliates’ behalf, to directly infringe (literally and/or under the doctrine of equivalents) the ’670 Patent and the ’086 Patent by importing, selling or offering to sell the accused products.

121. Motorola has a significant role in placing the accused products in the stream of commerce with the expectation and knowledge that they will be purchased by consumers in Illinois and elsewhere in the United States.

122. Motorola purposefully directs or controls the making of accused products and their shipment to the United States, using established distribution channels, for sale in Illinois and elsewhere within the United States.

123. Motorola purposefully directs or controls the sale of the accused products into established United States distribution channels, including sales to nationwide retailers. Motorola’s established United States distribution channels include one or more United States based affiliates.

124. Motorola purposefully directs or controls the sale of the accused products online and in nationwide retailers such as Walmart and Best Buy, including for sale in Illinois and elsewhere in the United States, and expects and intends that the accused products will be so sold.

125. Motorola purposefully places the accused products—whether by itself or through subsidiaries, affiliates, or third parties—into an international supply chain, knowing that the accused products will be sold in the United States, including Illinois. Therefore, Motorola also facilitates the sale of the accused products in Illinois.

126. Motorola took active steps, directly and/or through contractual relationships with others, with the specific intent to cause such persons to import, sell, or offer to sell the accused products in a manner that infringes one or more claims of the ’670 Patent and the ’086 Patent.

127. Such steps by Motorola included, among other things, making or selling the accused products outside of the United States for importation into or sale in the United States, or knowing that such importation or sale would occur; and directing, facilitating, or influencing its affiliates, or third party manufacturers, shippers, distributors, retailers, or other persons acting on its or its affiliates’ behalf, to import, sell, or offer to sell the accused products in an infringing manner.

128. Motorola performed these steps, which constitute induced infringement, with the knowledge of the ’670 Patent and the ’086 Patent, and with the knowledge that the induced acts would constitute infringement.

129. Motorola performed such steps in order to profit from the eventual sale of the accused products in the United States.

130. Motorola’s inducement is ongoing.

131. Motorola has also indirectly infringed by contributing to the infringement of the ’670 Patent and the ’086 Patent. Motorola has contributed to the direct infringement of the ’670 Patent and the ’086 Patent by the end user of the accused products.

132. The accused products have special features that are specially designed to be used in an infringing way and that have no substantial uses other than ones that infringe the ’670 Patent and the ’086 Patent, including, for example, Claim 1 of the ’670 Patent and Claim 1 of the ’086 Patent.

133. The special features include, for example, improved wireless communication capabilities, such as VoWi-Fi calling in which voice information is converted into IP packets and transmitted in digital format based on Wi-Fi or IEEE 802.11 network protocols, used in a manner that infringes the ’670 Patent; and display devices that have a front panel including a rigid substrate, a back panel including a flexible substrate, and a light control material in between the front and back panels, used in a manner that infringes the’086 Patent.

134. These special features constitute a material part of the invention of one or more of the claims of the ’670 Patent and the ’086 Patent, and are not staple articles of commerce suitable for substantial non-infringing use.

135. Motorola’s contributory infringement is ongoing.

136. Motorola has had actual knowledge of the ’670 Patent and the ’086 Patent at least as early as November 2, 2021, when Motorola received a letter notifying it of the ’670 Patent and the ’086 Patent, and/or as of the date when it was notified of the filing of this action. Since at least that time, Motorola has known the scope of the claims of the ’670 Patent and the ’086 Patent; the products that practice the ’670 Patent and the ’086 Patent; and that Buffalo Patents is the owner of the ’670 Patent and the ’086 Patent.

137. By the time of trial, Motorola will have known and intended (since receiving such notice) that its continued actions would infringe and actively induce and contribute to the infringement of one or more claims of the ’670 Patent and the ’086 Patent.

138. Furthermore, Motorola has a policy or practice of not reviewing the patents of others (including instructing its employees to not review the patents of others), and thus has been willfully blind of Buffalo Patents' patent rights. *See, e.g.*, M. Lemley, "Ignoring Patents," 2008 Mich. St. L. Rev. 19 (2008).

139. Motorola's actions are at least objectively reckless as to the risk of infringing valid patents, and this objective risk was either known or should have been known by Motorola. Motorola has knowledge of the '670 Patent and the '086 Patent.

140. Motorola's customers have infringed the '670 Patent and the '086 Patent. Motorola encouraged its customers' infringement.

141. Motorola's direct and indirect infringement of the '670 Patent and the '086 Patent, and its direct infringement of the '915 Patent, the '328 Patent, and the '816 Patent has been, and/or continues to be willful, intentional, deliberate, and/or in conscious disregard of Buffalo Patents' rights under the patents-in-suit.

142. Buffalo Patents has been damaged as a result of Motorola's infringing conduct alleged above. Thus, Motorola is liable to Buffalo Patents in an amount that adequately compensates it for such infringements, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court under 35 U.S.C. § 284.

JURY DEMAND

Buffalo Patents hereby requests a trial by jury on all issues so triable by right.

PRAYER FOR RELIEF

Buffalo Patents requests that the Court find in its favor and against Motorola, and that the Court grant Buffalo Patents the following relief:

a. Judgment that one or more claims of the '670 Patent, the '915 Patent, the '328 Patent, the '816 Patent, and the '086 Patent have been infringed, either literally and/or under the

doctrine of equivalents, by Motorola and/or all others acting in concert therewith;

b. A permanent injunction enjoining Motorola and its officers, directors, agents, servants, affiliates, employees, divisions, branches, subsidiaries, parents, and all others acting in concert therewith from infringement of the ’670 Patent and the ’086 Patent; or, in the alternative, an award of a reasonable ongoing royalty for future infringement of the ’670 Patent and the ’086 Patent by such entities;

c. Judgment that Motorola account for and pay to Buffalo Patents all damages to and costs incurred by Buffalo Patents because of Motorola’s infringing activities and other conduct complained of herein, including an award of all increased damages to which Buffalo Patents is entitled under 35 U.S.C. § 284;

d. That Buffalo Patents be granted pre-judgment and post-judgment interest on the damages caused by Motorola’s infringing activities and other conduct complained of herein;

e. That this Court declare this an exceptional case and award Buffalo Patents its reasonable attorney’s fees and costs in accordance with 35 U.S.C. § 285; and

f. That Buffalo Patents be granted such other and further relief as the Court may deem just and proper under the circumstances.

Dated: February 4, 2022

Respectfully submitted,

/s/ Timothy J. Haller

Timothy J. Haller (*Local Counsel*)
HALLER LAW PLLC
230 E Delaware Pl, Ste 5E
Chicago, IL 60611
Phone: (630) 336-4283
haller@haller-iplaw.com

Matthew J. Antonelli (*Pro Hac Vice Pending*)
Zachariah S. Harrington (*Pro Hac Vice Pending*)
Larry D. Thompson, Jr. (*Pro Hac Vice Pending*)
Rehan M. Safiullah (*Pro Hac Vice Pending*)
ANTONELLI, HARRINGTON & THOMPSON LLP
4306 Yoakum Blvd, Ste 450
Houston, TX 77006
Phone: (713) 581-3000
matt@ahtlawfirm.com
zac@ahtlawfirm.com
larry@ahtlawfirm.com
rehan@ahtlawfirm.com

Attorneys for Plaintiff,
Buffalo Patents, LLC