A REFERENCE CARD · CWNE-CHECKED

Generations of 802.11

From **2 Mb** in 1997 to **23 Gb** on paper.
About **1.4 Gb** in the real world.

Swipe through every generation. Corrected figures, CWNE-checked.

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1997 / 802.11 / DSSS

MAX PHY RATE

2 Mb/s

CHANNEL WIDTH
22 MHz

MODULATION
DSSS

SPATIAL STREAMS
1

BAND
2.4 GHz

IN REALITY
1 stream, 22 MHz

2 Mb/s

Where it started. No QAM yet, DSSS only.

1999 / 802.11a / OFDM

MAX PHY RATE

54 Mb/s

CHANNEL WIDTH	MODULATION
20 MHz	64-QAM
SPATIAL STREAMS	BAND
1	5 GHz

IN REALITY

1 stream, 20 MHz — **54 Mb/s**

OFDM arrives, and so does 5 GHz.

1999 / 802.11b / HR/DSSS

MAX PHY RATE

11 Mb/s

CHANNEL WIDTH	MODULATION
22 MHz	CCK
SPATIAL STREAMS	BAND
1	2.4 GHz

IN REALITY

1 stream, 22 MHz — 11 Mb/s

Slower than 11a, but 2.4 GHz reach made it the one everyone bought.

2003 / 802.11g / ERP

MAX PHY RATE

54 Mb/s

CHANNEL WIDTH	MODULATION
20 MHz	64-QAM
SPATIAL STREAMS	BAND
1	2.4 GHz

IN REALITY

1 stream, 20 MHz — 54 Mb/s

11a speed brought back to 2.4 GHz.

2009 / 802.11n (Wi-Fi 4) / HT

MAX PHY RATE

600 Mb/s

CHANNEL WIDTH
40 MHz

MODULATION
64-QAM

SPATIAL STREAMS
4

BAND
2.4 + 5 GHz

IN REALITY
2 streams, 40 MHz

300 Mb/s

MIMO. Four streams put the gigabit barrier in sight.

2013 / 802.11ac (Wi-Fi 5) / VHT

MAX PHY RATE

3.47 Gb/s

CHANNEL WIDTH
160 MHz

MODULATION
256-QAM

SPATIAL STREAMS
8

BAND
5 GHz

IN REALITY
2 streams, 80 MHz
867 Mb/s

8 streams, 160 MHz, 256-QAM. 3,466.7 Mb/s at the ceiling, not 1.73 Gb.

2019 / 802.11ax (Wi-Fi 6) / HE

MAX PHY RATE

9.6 Gb/s

CHANNEL WIDTH
160 MHz

MODULATION
1024-QAM

SPATIAL STREAMS
8

BAND
2.4 + 5 GHz

IN REALITY
2 streams, 80 MHz

1.2 Gb/s

OFDMA and 1024-QAM. Efficiency, not just speed.

2021 / 802.11ax (Wi-Fi 6E) / HE

MAX PHY RATE

9.6 Gb/s

CHANNEL WIDTH
160 MHz

MODULATION
1024-QAM

SPATIAL STREAMS
8

BAND
2.4 + 5 + 6 GHz

IN REALITY
2 streams, 80 MHz

1.2 Gb/s

Same PHY as Wi-Fi 6. The story is 6 GHz: clean spectrum, 59 new 20 MHz channels.

2024 / 802.11be (Wi-Fi 7) / EHT

MAX PHY RATE

23 Gb/s *

CHANNEL WIDTH
320 MHz

MODULATION
4096-QAM

SPATIAL STREAMS
8

BAND
2.4 + 5 + 6 GHz

IN REALITY
2 streams, 80 MHz

1.44 Gb/s

320 MHz, 4096-QAM, 8 streams on paper.

** 23 Gb assumes 8 streams at 320 MHz. Early drafts had 16 streams and 46 Gb; the ratified standard stops at 8.*

FOUR LEVERS, EVERY GENERATION

- Wider channels
- Denser QAM
- More spatial streams
- More spectrum

Most of the paper growth is wider channels and more streams. Real devices run 2 streams at 80 MHz.

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CWNE #3

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