

TABLE 2 MAJOR 802.11N DRAFT 2.0 MANDATORY AND OPTIONAL FEATURES

802.11n Draft 2.0 specification feature type	802.11n Draft 2.0 specification feature	Tested by Wi-Fi Alliance Certified for 802.11n Draft 2.0 program	Explanation	Comments
Mandatory	MIMO spatial multiplexing	Support for two spatial streams in transmitting mode, two spatial streams in receiving mode (2×2); mandatory for Wi-Fi Alliance certification.	Transmitting mode required for access-point device, receiving mode required for access-point and client device, except for handheld devices	Simultaneously transmits multiple bits from different antennas, increases throughput
Optional	MIMO space-time block coding	Not tested	IEEE still finalizing details; candidate for future certification program	Uses different antennas for redundancy and increases robustness; targets handheld devices
Optional	MIMO beam forming	Not tested	IEEE still finalizing details; candidate for future certification program	Uses multiple antennas as an array to form a directional beam, increases range
Mandatory	Aggregated MAC Service/Protocol Data Units	Support for both; mandatory for Wi-Fi Alliance certification	Required for all devices	Improves MAC-layer efficiency by increasing maximum frame size (frame aggregation)
Mandatory	Block ACK	Support for block ACK; mandatory for Wi-Fi Alliance certification	Required for all devices	Improves protocol efficiency and throughput by reducing size of block-ACK frame and enabling back-to-back frame transmissions
Optional	2.4-GHz operation	Single-band device in 2.4-GHz band; tested if implemented	Devices must operate in one of three modes: single-band, 2.4-GHz; single-band, 5-GHz; or dual-band, 2.4- and 5-GHz.	802.11n devices can be either single- or dual-band (2.4/5-GHz)-capable. Most current 802.11n devices use 2.4-GHz band.
Optional	5-GHz operation	Single-band device in 5-GHz band; tested if implemented	Devices must operate in one of three modes: single-band, 2.4-GHz; single-band, 5-GHz; or dual-band, 2.4- and 5-GHz.	NA
Optional	Dual-band 2.4- and 5-GHz operation	Access-point or client-device capable of supporting both 2.4- and 5-GHz bands; tested if implemented	Devices must operate in one of three modes: single-band, 2.4-GHz; single-band, 5-GHz; or dual-band, 2.4- and 5-GHz.	NA
Mandatory	20-MHz channel width	Tested at 2.4 or 5 GHz for both one and two spatial streams	NA	802.11n accommodates 20 MHz, 40 MHz, or both 20 and 40 MHz.
Optional	40-MHz channel width	Tested only in 5-GHz band, if implemented, for one and two spatial streams; 40-MHz operation poses interference risks in crowded 2.4-GHz band.	IEEE has not yet decided protocol for allowing 40-MHz operation in the 2.4-GHz band.	Doubling legacy 20-MHz channel width can double throughput.
Mandatory	Mixed-mode operation: 802.11n with a, and 802.11n with b/g	Tested in both access-point and client devices	Mixed mode with b/g is mandatory for all 802.11n devices operating in the 2.4-GHz band; mixed mode with 802.11a is mandatory for all 802.11n devices operating in the 5-GHz band.	NA
Optional	Greenfield-mode operation: 802.11n only	Tested in both access-point and client devices if implemented	NA	Improves efficiency by eliminating support of legacy devices in an all-802.11n network
Mandatory	Protection protocols	Tested in both access-point and client devices	Mandatory when legacy networks and devices are within range. IEEE is discussing other optional methods.	Prevent negative impact on legacy-device traffic by 802.11n transmissions
Optional	Power-save multipoll	Not tested	NA	Saves handset power consumption in time-slotted network when 20 or more VOIP handsets connect to a single access point
Not in spec	NA	Optional untested features must not disrupt Wi-Fi Alliance-certified features and expected functions.	Required for all devices	NA

Sources: Atheros, Broadcom, iSuppli, and Wi-Fi Alliance.

Notes: ACK=acknowledgment. MAC=media-access control. MIMO=multiple input/multiple output. VOIP=voice over Internet Protocol.