

Intel® Wi-Fi 6E AX411 and Intel® Killer™ AX1690

1st Generation Intel® Double Connect Technology with simultaneous Wi-Fi connections supporting Wi-Fi 6E

Intel® Wi-Fi 6E AX411/AX1690 (Gig+)

Intel® Double Connect Technology allows network connections in the 2.4GHz band and in the 5GHz or 6GHz band, enabling the ability to route Wi-Fi traffic over two bands concurrently



The Intel® AX411 and AX1690 CRF¹ (Companion RF) modules are the first products to support Intel® Double Connect Technology, enabling two simultaneous Wi-Fi connections. They are designed to support Wi-Fi 6 (and Wi-Fi 6E) technology in the 2.4GHz, 5GHz and 6GHz bands. They support improved TCP throughput and Wi-Fi 6 R2 features, including UL MU-MIMO², which improves UL network capacity in dense environments, as well as support for Bluetooth® 5.3. These new features maximize the benefits of Wi-Fi 6, including Gigabit speed, ultra-low latencies, and enhanced reliability benefits across new radio frequencies exclusive to Wi-Fi 6E devices, and deliver a significant improvement in user experience in dense deployments. Combined with Intel® Core™ processors and exceptional Intel wireless innovations, the Intel® Wi-Fi 6E AX411 module can dramatically improve your connected experience at home, work, or on the go.

2nd Generation Intel Wi-Fi 6 Wireless with Extended Wi-Fi 6E (6GHz Band) Support

Greater Network Flexibility Faster Speed Reduced Latency Wi-Fi 6E Tri Band 2x2 160MHz	<p>The Intel® Wi-Fi 6E AX411 module supports Wi-Fi 4, 5, 6, and Wi-Fi 6E technologies including Wi-Fi 6 R2 features. By implementing the new Wi-Fi 6E technology, supporting the new 6GHz band that includes up to 1200MHz of new contiguous spectrum (>2x compared to 5GHz) with more Gigabit Wi-Fi options and exclusivity to Wi-Fi 6 products, the Intel® Wi-Fi 6E AX411 module maximizes Wi-Fi 6 and Gigabit Wi-Fi benefits, enabling greater network flexibility, faster downloads, sharing, and backups, as well as reduced latency and improved reliability.</p> <p>When using Wi-Fi 6 technology with 1024QAM and 160MHz channels, the Intel® Wi-Fi 6E AX411 module can deliver nearly 3x higher peak data rates³ (up to 2.4Gbps), and up to 4x capacity improvement in dense or congested environments compared to Wi-Fi 5⁴.</p>
Bluetooth® 5.3	<p>On top of existing features, Bluetooth® 5.3 includes an Isochronous Channel feature, which lays the foundation for the implementation of next generation of Bluetooth Low Energy Audio. The Bluetooth® 5.3 Core specification also provides the capability to change the transmit power of devices (local and peer) to improve the link quality without consuming extra power.</p>
Microsoft* Windows*	<p>Full support for the latest Microsoft* Windows 11* OS required for Intel DCT support.</p>
Form Factors (M.2 2230 and 1625)	<p>M.2 2230 modules enable system configuration and platform usage flexibility with the use of a standard Key E socket for attaching the module.</p> <p>Intel® 1625 modules are design compatible with M.2 1216 CRF¹ modules. Intel CNVio interface allows for flexible motherboard routing of up to 10".</p>

Experience the Intel® Difference

Intel® Double Connect Technology	On Microsoft* Windows 11* systems, provides the capability of connecting to both 2.4GHz and 5GHz (or 6GHz) networks simultaneously. Combined with Intel® Killer™ or Intel® Connectivity Performance Suite software, Wi-Fi traffic can be routed over either Wi-Fi link, improving latency and throughput for critical applications.
Worldwide Regulatory Support Intel® Dynamic Regulatory Solution	Enables performance-optimized worldwide regulatory compliance SKU. The Intel® Wi-Fi 6E AX411 module detects its location and automatically optimizes the Wi-Fi settings to local regulatory requirements, maximizing performance in each geography, simplifying travel experience and global enterprise procurement. Future regulatory changes are easily managed during the product life cycle.
Wireless Functionality in Pre-boot Environment	Support for Wi-Fi network and Bluetooth® Low Energy HID connectivity in the platform's Unified Extensible Firmware Interface (UEFI) environment during its boot stage. This capability enables use cases like OS recovery over Wi-Fi and Bluetooth® Low Energy-based keyboard and mouse connectivity in this pre-boot environment.

Business-Class Wireless

Intel® vPro® Technology⁵	Supports Intel's hardware-based security and management features built into Intel® Core™ vPro® processors and chipsets that enable IT to manage PCs virtually anywhere, anytime, while reducing deployment costs, improving security and ROI.
Intel® Active Management Technology⁶	Using integrated platform capabilities and popular third-party management and security applications, Intel® AMT allows IT or managed service providers to better discover, repair, and help protect their networked computing assets. Intel® AMT is a feature of Intel® Core™ processors with Intel® vPro® technology.

Intel® Wi-Fi 6E AX411 Module Technical Specifications

GENERAL

Dimensions (H x W x D)	2230: 22mm x 30mm x 2.4mm [1.5mm Max (Top Side)/ 0.1mm Max (Bottom Side)] 1625: 16mm x 25mm x 2.0mm
Weight	2230: 2.83 +/- 0.3 g 1625: 0.90 +/- 0.1 g
Radio ON/OFF Control	Supported
Connector Interface	M.2: CNVio2 ⁷
Operating Temperature (Adapter Shield)	0°C to +80°C
Humidity Non-Operating	50% to 90% RH non-condensing (at temperatures of 25°C to 35°C)
Operating Systems	Microsoft* Windows 11*, Linux*
Wi-Fi Alliance ⁸	Wi-Fi CERTIFIED* 6, Wi-Fi CERTIFIED* a/b/g/n/ac, WMM*, WMM*-Power Save, WPA3*, PMF*, Wi-Fi Direct*, and Wi-Fi Agile Multiband*
IEEE WLAN Standard	IEEE 802.11-2016 and select amendments (selected feature coverage) IEEE 802.11a, b, d, e, g, h, i, k, n, r, u, v, w, ac, ax; Fine Timing Measurement based on 802.11-2016, Wi-Fi Location R2 (802.11az) HW readiness ⁹
Bluetooth®	Bluetooth® 5.3

SECURITY FEATURES¹⁰

Security Methods	WPA2*; WPA3*
Authentication Protocols	802.1X EAP-TLS, EAP-TTLS/MSCHAPv2, PEAPv0 -MSCHAPv2 (EAP-SIM, EAP-AKA, EAP-AKA')
Encryption	128-bit AES-CCMP, 256-bit AES-GCMP

COMPLIANCE

Regulatory	For a list of country approvals, please contact your local Intel representatives.
US Government	FIPS ¹¹ 140-2
Product Safety	UL, C-UL, CB (IEC 60950-1)

Product Name	Model Number	Version
Intel® Wi-Fi 6E AX411	AX411NGW AX411E2W	Wi-Fi 6E (6GHz), 2x2, Bluetooth® 5.3, M.2 2230 Wi-Fi 6E (6GHz), 2x2, Bluetooth® 5.3, M.2 1625

For more information on Intel® Wireless products, visit [intel.com/wireless](https://www.intel.com/wireless)



- ¹ CRF: Companion RF module in M.2 form factor.
- ² Wi-Fi 6 Uplink Multi-User MIMO (Multiple Input Multiple Output) supports up to 8 streams of UL data from multiple stations improving UL network capacity in dense environment.
- ³ "Nearly 3X higher peak data rates" Intel® Wi-Fi 6 AX claims are based on the comparison of the expected maximum theoretical data rates for similarly configured Wi-Fi 6 (802.11ax) and standard Wi-Fi 5 (802.11ac) Wi-Fi solutions as documented in IEEE 802.11ax D4.0 spec and IEEE 802.11 wireless standard specifications, and require the use of similarly configured 802.11ax wireless network routers.
- ⁴ Wi-Fi 5 = 802.11ac. In accordance with the IEEE 802.11ax PAR. For additional details visit: <https://mentor.ieee.org/802.11/dcn/14/11-14-0165-01-0hew-802-11-hew-sg-proposed-par.docx>.
- ⁵ Intel® vPro® Technology is sophisticated and requires setup and activation. Availability of features and results will depend upon the setup and configuration of your hardware, software and IT environment. To learn more visit: <http://www.intel.com/technology/vpro>.
- ⁶ Requires activation and a system with a corporate network connection, an Intel® AMT-enabled chipset, network hardware and software. For notebooks, Intel® AMT may be unavailable or limited over a host OS-based VPN, when connecting wirelessly, on battery power, sleeping, hibernating or powered off. Results dependent upon hardware, setup and configuration. For more information, visit <http://www.intel.com/technology/platform-technology/intel-amt>.
- ⁷ The CNVio signals connect the CRF module and the CNVi IP in the Intel SoC/PCH. The CNVio protocol is Intel proprietary.
- ⁸ Support of Wi-Fi Alliance certifications is OS-dependent.
- ⁹ IEEE 802.11az hardware readiness per expected Wi-Fi Location R2 feature support and based on draft 2.1 of the IEEE802.11az amendment and is subject to change.
- ¹⁰ Some security solutions may not be supported by your device operating system and/or by your device manufacturer or may require additional hardware (e.g., UICC – SIM card). Check with your device manufacturer for details on availability.
- ¹¹ On Microsoft* Windows*.

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Tests document performance of components on a particular test, in specific systems. Differences in hardware, software, or configuration will affect actual performance. Consult other sources of information to evaluate performance as you consider your purchase. For more complete information about performance and benchmark results, visit www.intel.com/benchmarks.

Estimated results were obtained prior to implementation of recent software patches and firmware updates intended to address exploits referred to as "Spectre" and "Meltdown". Implementation of these updates may make these results inapplicable to your device or system.

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