Antenna and RF Glossary

A customer guide to the terms used across Bloomice antennas, RF connectivity products and design services.

Find plain-English explanations of wireless technologies, antenna specifications, design methods and test measurements. The guide includes abbreviations, units and technical terms used in product information and engineering discussions.

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Using the guide

Start with the relevant topic or use the alphabetical index. Definitions explain terminology in general. A product's datasheet provides its particular frequency coverage, electrical characteristics, mounting requirements and environmental ratings.

Comparing antenna specifications

Gain, efficiency, matching and radiation pattern describe different aspects of performance. Consider them together, along with the cable, mounting surface and test conditions. The surrounding enclosure and installation can affect the final result.

An antenna's frequency coverage is one part of compatibility. The radio, network, antenna arrangement and intended application also determine the required system configuration.

Wireless connectivity

Term	Meaning and relevance
RF	Radio frequency. The frequencies used for radio communication. An RF system includes the radio circuitry, transmission paths and antenna.
IoT / IIoT	Internet of Things / Industrial Internet of Things. Connected devices that exchange data, with IIoT focusing on industrial equipment and processes.
2G / 3G / 4G / 5G	Generations of cellular technology. The supported bands, radio technology and local network determine whether a device can connect.
GSM / GPRS	Global System for Mobile Communications / General Packet Radio Service. GSM is a 2G technology, with GPRS providing packet data services.
UMTS	Universal Mobile Telecommunications System. A 3G cellular technology.
LTE	Long Term Evolution. A cellular technology commonly described as 4G LTE.
5G NR	5G New Radio. The radio interface used by 5G networks. Band labels such as n78 identify specific frequency bands.
5G RedCap	5G Reduced Capability. A 5G NR device category designed to reduce device complexity for applications with moderate data requirements.
LTE-M / Cat-M1	LTE for machines / Category M1. LTE-M supports cellular IoT applications. Cat-M1 is a specific device category within LTE-M.
NB-IoT	Narrowband Internet of Things. Cellular technology designed for low-power devices exchanging relatively small amounts of data.
LPWAN	Low-power wide-area network. A broad category covering technologies designed for long-range communication with low device power consumption.
LoRa / LoRaWAN	LoRa is a radio modulation technology whose name derives from Long Range. LoRaWAN is a networking protocol that uses LoRa radio links.
Sigfox	A low-power wide-area technology and network service for devices sending small amounts of data.
ISM	Industrial, scientific and medical. Certain frequency bands designated for these uses also support radio applications under regional rules.
MIMO	Multiple input, multiple output. Multiple antenna and radio paths support wireless performance and capacity. A 2 × 2 MIMO system has two transmit and two receive paths.
Wi-Fi / WLAN	Wi-Fi is a wireless networking brand associated with IEEE 802.11 technologies. WLAN means wireless local area network.

Short range and positioning

Term	Meaning and relevance
Bluetooth / BLE	Bluetooth is a short-range wireless technology. BLE means Bluetooth Low Energy, also called Bluetooth LE, widely used in sensors and connected devices.
DECT	Digital Enhanced Cordless Telecommunications. A family of wireless standards used for cordless communications.
UWB	Ultra-wideband. Radio technology using a very wide bandwidth, used in applications including precise short-range ranging and positioning.
NFC	Near Field Communication. Very short-range wireless communication used for contactless interactions such as identification and device pairing.
RFID	Radio-frequency identification. Uses radio signals to identify tagged objects. Systems operate in different bands with different read ranges.
Zigbee / Z-Wave	Wireless technology names associated with low-power connected devices and mesh networks. Their frequency bands and technical requirements differ.
GNSS / GPS	Global Navigation Satellite System / Global Positioning System. GNSS is the umbrella term for satellite navigation systems. GPS is the United States' system.
Galileo / BeiDou / GLONASS	Global satellite navigation systems operated by the European Union, China and Russia respectively. GLONASS derives from the Russian name for Global Navigation Satellite System.
QZSS	Quasi-Zenith Satellite System. Japan's regional satellite positioning system, designed to complement GPS.
GPS L1 / L2 / L5	GPS signal bands centred on 1575.42, 1227.60 and 1176.45 MHz respectively. Multi-band operation requires compatible antennas and receivers.
Iridium	A satellite communications network used for services including voice and data.
ESN / TETRA	Emergency Services Network / Terrestrial Trunked Radio. ESN is the programme for the new emergency communications network in Great Britain. TETRA is a digital trunked-radio standard.
AM / FM	Amplitude modulation / Frequency modulation. In broadcast antenna specifications, these usually refer to analogue radio reception.
DAB / DAB+ / DVB-T	Digital Audio Broadcasting / Digital Audio Broadcasting Plus / Digital Video Broadcasting – Terrestrial. Standards used for digital radio or terrestrial television.
VHF / UHF	Very high frequency / Ultra high frequency. VHF covers 30–300 MHz and UHF covers 300 MHz–3 GHz.

Antenna performance

Term	Meaning and relevance
Frequency band / Bandwidth	A frequency band is a defined frequency range. Antenna bandwidth is the range over which specified performance criteria are met.
Wideband / Multiband	Wideband describes coverage across a broad frequency range. Multiband describes operation across multiple bands, which may be separated.
Impedance	The electrical relationship between voltage and current at an RF connection. Many antenna systems use a nominal impedance of 50 Ω.
VSWR	Voltage standing wave ratio. Indicates impedance mismatch and reflected power. Values closer to 1:1 indicate a better match at the measured frequency.
Return loss / S_{11}	Return loss expresses reflection as a positive value in dB, with larger values indicating less reflection. S_{11} is the input reflection coefficient. On a log-magnitude plot, more negative S_{11} values indicate less reflection.
Gain / Peak gain	Gain describes radiation in a direction relative to a reference antenna and includes radiation efficiency. Peak gain is the highest gain across the measured directions at a given frequency.
Realised gain	Antenna gain including the effect of impedance mismatch at the measurement reference plane. It can help relate radiation performance to power supplied by the RF system.
Average gain	Gain averaged over a stated set of directions, a plane or a solid angle. Meaningful comparisons depend on the same averaging method and test conditions.
Directivity / Beamwidth	Directivity describes concentration of radiation relative to an isotropic radiator. Beamwidth describes the angular width of a beam, commonly measured between points 3 dB below its peak.
Efficiency	Radiation efficiency is the fraction of power accepted by the antenna that is radiated. Total efficiency also accounts for impedance mismatch at the stated measurement reference plane.
Radiation pattern / Gain versus angle	Shows how radiation or reception varies with direction. Plots may show a two-dimensional cut or a three-dimensional pattern at a specified frequency.
Omnidirectional / Directional	An omnidirectional antenna provides broad coverage around an axis, usually in the horizontal plane. A directional antenna concentrates coverage towards particular directions.
Polarisation / RHCP / LHCP	Polarisation describes the electric field's orientation and behaviour. RHCP and LHCP mean right-hand and left-hand circular polarisation. Matching polarisation helps signal transfer.
Isolation	Describes how much unwanted coupling exists between antenna ports, commonly expressed in dB. Greater positive isolation means less coupling under the stated conditions.
Active / Passive antenna	An active antenna includes powered circuitry, such as an amplifier in a GNSS antenna. A passive antenna operates without a powered amplifier.
LNA / SAW	Low-noise amplifier / Surface acoustic wave. An LNA amplifies weak signals while adding limited noise. SAW filters help select wanted frequency bands and reject unwanted signals.

Design and integration

Term	Meaning and relevance
PCB / PCBA	Printed circuit board / Printed circuit board assembly. A PCBA is a PCB populated with components.
FPC / SMD	Flexible printed circuit / Surface-mount device. FPC antennas use a flexible circuit substrate. SMD components are mounted directly onto a PCB surface.
LDS	Laser Direct Structuring. A process that uses laser activation and metallisation to form conductive patterns on suitable moulded plastic surfaces.
CAD / Simulation	Computer-aided design creates digital drawings and models. Simulation predicts performance using a mathematical model of the antenna and its surroundings.
Embedded / External antenna	An embedded antenna is integrated within a device. An external antenna sits outside the main device enclosure and connects to the radio system.
Combination antenna	Several antenna elements or technologies housed in one assembly, for example cellular, Wi-Fi and GNSS. The supported functions depend on the product's elements and connections.
Dipole / Monopole / Patch	Common antenna forms. A dipole has two principal arms, a monopole works with a counterpoise or ground reference, and a patch uses a conducting surface over a ground plane.
GND / Ground plane	GND denotes electrical ground. A ground plane is a conductive area that provides a reference and may form part of the antenna system.
Counterpoise	A conductive structure that provides the complementary part of an antenna system. It may be formed by the PCB ground, chassis or another designed structure.
Ground-plane dependence	Describes how an antenna relies on a specified conductive mounting surface or ground structure. Ground-plane-independent designs still interact with nearby materials and objects.
Dielectric / Substrate	A dielectric is an electrically insulating material whose properties affect RF fields. A substrate is the supporting material on which an antenna or circuit is formed.
Tuning / Matching	Tuning adjusts antenna behaviour towards the required frequencies. Matching adjusts the impedance relationship between the antenna and the radio circuit.
Detuning / Keep-out area	Detuning is a shift in antenna behaviour caused by its surroundings. A keep-out area reserves space around an antenna to control nearby copper, components or other materials.
EMI / RFI	Electromagnetic interference / Radio-frequency interference. Unwanted electromagnetic energy can disturb circuitry or reception. RFI refers to interference at radio frequencies.
Enclosure / Radome	The enclosure houses a device. A radome is a protective antenna cover designed to allow radio signals to pass with controlled effect on performance.

Testing and measurement

Term	Meaning and relevance
Anechoic chamber	A test space lined with absorbing material to reduce unwanted reflections, allowing controlled antenna measurements.
Near field / Far field	Regions around an antenna with different field behaviour. In the far field, the angular radiation pattern is effectively independent of distance. The boundary depends on wavelength and antenna size.
2D / 3D	Two-dimensional / Three-dimensional. Antenna plots may show individual slices through a radiation pattern or its full spatial form.
FSM	Full Spherical Mount. In the Bloomice design brochure, this describes the positioning arrangement used to measure an antenna across directions around a sphere.
DAMS	An antenna measurement system family from Diamond Engineering. The DAMS 6000 named in the brochure combines antenna positioning with measurement software.
Passive / Active measurement	Passive measurements characterise the antenna using test equipment. Active measurements assess an operating radio device, including the effects of its transmitter or receiver.
VNA	Vector network analyser. Measures the magnitude and phase of RF reflection and transmission, helping characterise antenna matching and RF components.
Spectrum analyser	An instrument that displays signal level against frequency, used to investigate transmissions, interference and noise.
OTA	Over the air. Measurements made through radiated wireless signals, including antenna or complete-device measurements.
TRP / TIS	Total radiated power / Total isotropic sensitivity. TRP measures a device's transmitted power integrated over directions. TIS characterises its overall radiated receive sensitivity.
Noise / Noise figure	Noise is unwanted electrical energy that can obscure a signal. Noise figure describes how much a component or system degrades the signal-to-noise ratio, expressed in dB.
Attenuation / Cable loss	Reduction in signal power along a path, commonly expressed in dB. Cable loss depends on cable type, length, frequency and construction.
Test conditions	The mounting surface, ground plane, cable, connector, reference plane and measurement setup used to obtain results. These conditions help establish how results relate to a particular installation.
Pre-certification testing	Engineering checks carried out before formal certification to identify potential problems and guide design changes.

Connectors and protection

Term	Meaning and relevance
SMA / RP-SMA	SubMiniature version A / Reverse-polarity SMA. Related connector families with different centre-contact configurations. Mating requires the correct series and contact arrangement.
BNC / TNC	Bayonet Neill–Concelman / Threaded Neill–Concelman. Coaxial connector families using bayonet and threaded couplings respectively.
MCX / MMCX	Micro coaxial / Micro-miniature coaxial. Compact coaxial connector families with distinct mating interfaces.
U.FL / W.FL / I-PEX	U.FL and W.FL are Hirose miniature connector series. I-PEX is a connector manufacturer. Compatibility depends on the exact connector series and part number.
N-type / Connector gender	N-type is a threaded RF connector family. Plug, jack, male and female descriptions need to be read with the specific connector series and centre-contact arrangement.
RG174 / RG178 / LL100	Coaxial cable designations used in product specifications. Their dimensions, construction and losses vary. The full cable specification determines suitability.
FR-4 / ABS / PC/ABS	FR-4 is a glass-reinforced epoxy laminate grade. ABS is acrylonitrile butadiene styrene plastic. PC/ABS is a blend of polycarbonate and ABS used for housings.
UV	Ultraviolet. UV-stable materials are formulated to resist degradation from ultraviolet exposure, such as sunlight.
IP / IP65 / IP66	IP is the enclosure protection code under IEC 60529, commonly called ingress protection. IP65 and IP66 are dust-tight ratings with protection against water jets and powerful water jets respectively.
IP67 / IP68 / IP69	Dust-tight ratings with water protection for temporary immersion, continuous immersion under specified conditions, and high-pressure, high-temperature water jets respectively. Each rating has its own test conditions.
IK	An enclosure’s resistance to external mechanical impacts, classified under IEC 62262. Higher numbered ratings correspond to higher impact energies.
IEC / UL 94 V-0	IEC is the International Electrotechnical Commission. UL 94 V-0 is a material flammability classification whose scope includes the tested material and thickness.
RoHS / REACH	Restriction of Hazardous Substances / Registration, Evaluation, Authorisation and Restriction of Chemicals. These concern substances in products and materials. Applicable declarations describe the product’s compliance status.

Immersion and water-jet tests assess different conditions. The stated IP rating, installation requirements and product documentation together describe the intended protection.

Units and reading specifications

Term	Meaning and relevance
Hz / kHz / MHz / GHz	Hertz measures frequency. One kHz is 1,000 Hz, one MHz is 1,000,000 Hz, and one GHz is 1,000 MHz.
dB	Decibel. Expresses a ratio, such as gain or loss. A 3 dB power increase is approximately a doubling, and a 3 dB loss approximately halves the power.
dBi	Decibels relative to an isotropic radiator, a theoretical antenna radiating equally in all directions. Used to express antenna gain.
dBm	Decibels relative to one milliwatt. A measure of absolute power. For example, 0 dBm equals 1 mW and 30 dBm equals 1 W.
Ω / V / DC	Ohm / Volt / Direct current. Ω measures impedance or resistance, V measures voltage, and DC identifies a supply or signal with a constant direction of current.
W / mW / mA	Watt / Milliwatt / Milliampere. W and mW measure power. mA measures current. One watt equals 1,000 milliwatts.
mm / g / °C	Millimetre / Gram / Degree Celsius. Common units for dimensions, mass and temperature in antenna specifications.

Reading values and band labels

A value such as VSWR < 2.5:1 means the ratio is below 2.5 to 1 under the stated conditions. A dimension such as 40 × 15 mm gives the two stated measurements. LTE B20 and 5G NR n78 identify bands within different cellular technologies.

Discuss your application

For help relating these terms to your product or installation, contact Bloomice with your operating frequencies, available space, mounting arrangement and performance requirements.

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