

Glossary of Antenna and Quasioptical Terminology

antenna – A means for radiating or receiving radio waves.

antenna efficiency of an aperture-type antenna – For an antenna with a specified planar aperture, the ratio of the maximum effective area of the antenna to the aperture area.

aperture of an antenna – A surface, near or on an antenna, on which it is convenient to make assumptions regarding the field values for the purpose of computing fields at external points.

NOTE: The aperture is often taken as the portion of a plane surface near the antenna, perpendicular to the direction of maximum radiation, through which the major part of the radiation passes.

aperture blockage – A blocking of or interfering with the radiation from the feed of secondary radiator by obstacles such as the feed itself or support struts.

aperture illumination – The field over the aperture as described by amplitude, phase and polarization distributions.

axial ratio – The ratio of the axes of the polarization ellipse.

bandwidth of an antenna – The range of frequencies within which the performance of the antenna, with respect to some characteristics, conforms to a specified standard.

beam of an antenna – The major lobe of the radiation pattern of an antenna.

boresight – See **electrical boresight**; reference boresight.

boresight error – The angular deviation of the electrical boresight of an antenna from its reference boresight.

Cassegrain reflector antenna – A double-reflector antenna with a subreflector (usually hyperboloidal) located between the focal point and the vertex of the main reflector.

conical scanning – A form of sequential lobing in which the direction of maximum radiation generates a cone whose vertex angle is of the order of the antenna half-power beamwidth.

NOTE: Such scanning may be either rotating or nutating according to whether the direction of polarization rotates or remains unchanged, respectively.

cross polarization – The polarization orthogonal to a reference polarization.

NOTE: Two fields have orthogonal polarizations if their polarization ellipses have the same axial ratio, major axes at right angles, and opposite sense of rotation.

directive gain - In a given direction, 4π times the ratio of the radiation intensity in that direction to the total power radiated by the antenna.

NOTE: The directive gain is fully realized on reception only when the incident polarization is the same as the polarization of the antenna on transmission.

directivity – The value of the directive gain in the direction of its maximum value.

effective area of an antenna – In a given direction, the ratio of the power available at the terminals of a receiving antenna to the power per unit area of a plane wave incident the antenna from that direction, polarized coincident with the polarization that the antenna would radiate.

efficiency – See **antenna efficiency**; **aperture illumination efficiency**; **radiation efficiency**.

electrical boresight – The tracking axis as determined by an electrical indication, such as the null direction of a conical scanning or monopulse antenna system, or the beam maximum direction of a highly directive antenna.

E-plane, principal – For a linearly polarized antenna, the plane containing the electric field vector and the direction of maximum radiation.

far-field region – That region of the field of an antenna where the angular field distribution is essentially independent of the distance of the antenna.

NOTE: 1.) If the antenna has a maximum overall dimension D which is large compared to the wavelength, the far-field region is commonly taken to exist at

Glossary of Antenna and Quasioptical Terminology

distances greater than $2D^2/\lambda$ from the antenna, λ being the wavelength.

2.) For an antenna focused at infinity, the far-field region is sometimes referred to as the Fraunhofer region on the basis of analogy to optical terminology.

feed of an antenna – That portion of an antenna coupled to the terminals which functions to produce the aperture illumination.

NOTE: A feed may consist of a distribution network and a primary radiator.

front-to-back ratio – The ratio of the directivity of an antenna to its directive gain in a specified direction toward the back.

gain – See **directive gain**.

ground plan (imaging plane) – A conducting or reflecting plane functioning to image a radiating structure.

half-power beamwidth – In a plane containing the direction of the maximum of a beam, the angle between the two directions in which the radiation intensity is one half the maximum value of the beam.

horn antenna – A radiating element having the shape of a horn.

isolation between antennas – A measure of power transfer from one antenna to another.

NOTE: The isolation between antennas is the ratio of power input to one antenna to the power received by the other, usually expressed in decibels.

lens antenna – An antenna consisting of an electromagnetic lens and a radiating feed.

lens, electromagnetic – A three-dimensional structure propagating electromagnetic waves, with an effective index of refraction differing from unity, employed to control the aperture illumination.

main lobe – See **major load**.

major lobe (main lobe) – The radiation lobe containing the direction of maximum radiation.

monopulse – In radar, simultaneous lobing whereby direction-finding information is obtainable from a single pulse

near-field region, radiating – That region of the field of an antenna between the reactive near-field region and the far-field region wherein radiation fields predominate and wherein the angular field distribution is dependent upon distance from the antenna

NOTE: 1.) If the antenna has a maximum overall dimension which is not large compared to the wavelength, this field region may not exist.

2.) For an antenna focused at infinity, the radiating near-field region is sometimes referred to as the Fresnel region on the basis of analogy to optical terminology.

noise temperature of an antenna – The temperature of a resistor having an available thermal noise power per unit bandwidth equal to that at the antenna output at a specified frequency.

NOTE: Noise temperature of an antenna depends on its coupling to all noise sources in its environment as well as noise generated within the antenna.

paraboloidal reflector – A reflector which is a portion of a paraboloid of revolution.

pattern – See **radiation pattern**.

pencil beam antenna – A unidirectional antenna having a narrow major lobe with approximately circular contours of equal radiation intensity in the region of the major lobe.

phase center – In a given direction and for a specified polarization, the center of curvature of the wavefront of the radiation from an antenna in a given plane.

plane of polarization – A plane containing the polarization ellipse.

NOTE: 1.) When the ellipse degenerates into a line segment, the plane of polarization is not uniquely defined. In general, any plane containing the segment is acceptable; however, for a plane wave in an isotropic medium, the plane of polarization is taken to be normal to the direction of propagation.

Glossary of Antenna and Quasioptical Terminology

2.) In optics, the expression **plane of polarization** is associated with a linearly polarized plane wave (sometimes called a plane polarized wave) and is defined as a plane containing the field vector of interest and the direction of propagation. This usage would contradict the above one and is deprecated.

polarization of an antenna – In a given direction the polarization of the wave radiated by the antenna. Alternatively, the polarization of a plane wave incident from the given direction which results in maximum available power at the antenna terminals.

NOTE: 1.) The polarization of these two waves is the same in the following sense. In the plane perpendicular to the direction considered, their electric fields describe similar ellipses. The sense of rotation of these ellipses is the same if each one is referred to the corresponding direction of propagation, outgoing for the radiated field, incoming for the incident plane wave.

polarization of a plane wave – The polarization of a specified field vector in the plane wave.

NOTE: 1.) It is the convention in electrical engineering to specify the polarization of the plane wave by that of the electrical field vector.
2.) In an isotropic medium, the plane of polarization is the plane perpendicular to the direction of propagation. It is the convention in electrical engineering to describe the sense of polarization at a fixed point in space as righthand (clockwise) or lefthand (counterclockwise) by choosing the direction of propagation as the reference direction.
3.) The polarization of a plane wave is the same at every point in space.

power gain – In a given direction, 4π times the ratio of the radiation intensity in that direction of the net power accepted by the antenna from the connected transmitter.

NOTE: 1.) When the direction is not stated, the power gain is usually taken to be the power gain in the direction of its maximum value.
2.) Power gain does not include reflection losses arising from mismatch of impedance.

power gain referred to a specified polarization – The power gain of an antenna, reduced by the ratio of that portion of the radiation intensity corresponding to the specified polarization to the radiation intensity.

primary radiator – A feed which illuminated a secondary radiator.

pyramidal horn antenna – A horn antenna the sides of which form a pyramid.

radiating element – A basic subdivision of an antenna which in itself is capable of effectively radiating or receiving radio waves.

NOTE: Typical examples of a radiating element are a slot, horn or dipole antenna.

radiation efficiency – The ratio of the total power radiated by an antenna to the net power accepted by the antenna from the connected transmitter.

radiation pattern (antenna pattern) – A graphical representation of the radiation properties of the antenna as a function of space coordinates.

NOTE: 1.) In the usual case, the radiation pattern is determined in the far-field region and is represented as a function of directional coordinates.

2.) Radiation properties include power flux density, field strength, phase and polarization.

radome – An enclosure for protecting an antenna from the harmful effects of its physical environment, generally intended to leave the electrical performance of the antenna unaffected.

reference boresight – A direction defined by an optical, mechanical, or electrical axis of an antenna established as a reference for the alignment. See also **electrical boresight**.

reflector antenna – An antenna consisting of a reflector and a radiating feed.

scan angle (beam angle) The angle between the maximum of the major lobe of an antenna.

NOTE: Reference boresight is usually chosen as the reference direction.

scanning, of a beam antenna A repetitive motion given to the major lobe of an antenna.

shaped beam antenna – An antenna which is designed to have a prescribed pattern shape differing substantially from that obtained from a uniform-phase aperture of the same size.

Glossary of Antenna and Quasioptical Terminology

sidelobe – A radiation lobe in any direction other than that of the intended lobe.

NOTE: When the intended lobe is not specified, it shall be taken to be the major lobe.

sidelobe level, maximum relative – The relative level of the highest sidelobe.

spillover – That part of the power radiated by a feed not intercepted by the secondary radiator.

squint angle – A small difference in pointing angle between a reference beam direction and the direction of maximum radiation.

subreflector – A reflector which redirects the power radiated from the feed to the main reflector.

tracking (angle tracking) – A motion given to the major lobe of an antenna such that a

selected moving target is contained within the major lobe.

vertically polarized plane wave – A plane wave in which the electric vector is in the vertical plane containing the direction of propagation.