photon radiance, $L_p$

Number of photons (quanta of radiation, $N_p$) per time interval (photon flux), $q_p$, leaving or passing through a small transparent element of surface in a given direction from the source about the solid angle $\Omega$, divided by the solid angle and by the orthogonally projected area of the element in a plane normal to the given beam direction, $dS_\perp = dS \cos \theta$, with $\theta$ the angle between the normal to the surface and the direction of the beam. Equivalent definition: Integral taken over the hemisphere visible from the given point, of the expression $L_p \cos \theta \ d\Omega$, with $L_p$ the photon radiance at the given point in the various directions of the incident beam of solid angle $\Omega$ and $\theta$ the angle between any of these beams and the normal to the surface at the given point.

Notes:
1. Mathematical definition:

   $$L_p = \frac{d^2 q_p}{d\Omega \ dS_\perp} = \frac{d^2 q_p}{d\Omega \ dS \cos \theta}$$

   for a divergent beam propagating in an elementary cone of the solid angle $\Omega$ containing the direction $\theta$. SI unit is $m^{-2} \ s^{-1} \ sr^{-1}$.

2. For a parallel beam it is the number of photons (quanta of radiation, $N_p$) per time interval (photon flux), $q_p$, leaving or passing through a small element of surface in a given direction from the source divided by the orthogonally projected area of the element in a plane normal to the given direction of the beam, $\theta$. Mathematical definition in this case: $L_p = dq_p / (dS \cos \theta)$ If $q_p$ is constant over the surface area considered, $L_p = q_p / (S \cos \theta)$, SI unit is $m^{-2} \ s^{-1}$.

3. This quantity can be used on a chemical amount basis by dividing $L_p$ by the Avogadro constant, the symbol then being $L_{n,p}$, the name 'photon radiance, amount basis'. For a divergent beam SI unit is $mol \ m^{-2} \ s^{-1} \ sr^{-1}$; common unit is einstein $m^{-2} \ s^{-1} \ sr^{-1}$. For a parallel beam SI unit is $mol \ m^{-2} \ s^{-1}$; common unit is einstein $m^{-2} \ s^{-1}$.

Source:
PAC, 2007, 79, 293 (Glossary of terms used in photochemistry, 3rd edition (IUPAC Recommendations 2006)) on page 396