2.7: Surfaces - Hemispherical Albedo

Also known as the *directional hemispherical reflectance*, the hemispherical albedo ρ refers to a point on a reflecting surface, and is defined as the ratio of the exitance *M* to the irradiance *E*, so that

$$\rho\left(\mu_0,\varphi_0\right)=\frac{M}{E\left(\mu_0,\varphi_0\right)}, \tag{2.7.1}$$

and in terms of the BRDF, we have

$$\rho\left(\mu_0,\varphi_0\right)=\int_0^{2\pi}\int_0^1 f_r\left(\mu,\varphi;\mu_0,\varphi_0\right)\mu d\mu d\varphi. \tag{2.7.2}$$

Unlike the single scattering albedo, ρ and the other albedos that we will encounter do not necessarily have in principle a maximum possible value of unity. (See *A Brief History of the Lommel-Seeliger Law*). The scattering properties of the surfaces that we have studied so far are summarised in Table I, from which, for the Lommel-Seeliger law, it can be seen that the maximum possible value for ρ is ½ and 0.125 for the normal albedo.

Table I. Properties of Surfaces

	Lambertian	Lommel-Seeliger
f_r	ϖ_0/π	$\frac{\varpi_0}{4\pi}\frac{1}{\mu_0+\mu}$
ρ	ϖ_0	$\frac{\varpi_0}{2}[1-\mu_0\ln(1+1/\mu_0)]$
p_n	ϖ_0	$\frac{\varpi_0}{8}$