Full Rendering Equation

In our project we used `THREE.MeshStandardMaterial`, looking at `bsdfs.glsl.js` the rendering equation used for this material is:

$$L(l, geometry, material) =$$

$$\pi(irradiance * BRDF_{specularGGX}(roughness, c_{spec}, l, v, n) + irradiance * BRDF_{lambert}(c_{diff}))$$

BRDF lambert

This is the diffuse component of the BRDF:

$$BRDF_{lambert}(c_{diff}) = c_{diff}/\pi$$

BRDF specular GGX

This is the specular component of the BRDF:

$$BRDF_{specularGGX} = F_{Schlick}(c_{spec}, l * h) * G_{GGX}(\alpha, n * l, n * v) * D_{GGX}(\alpha, n * h)$$

$$h = l * v$$

Fresnel term (Schhlick approximation)

$$F_{Schlick}(c_{spec}, l * h) = (1 - c_{spec})(2^{(l*h)(-5.55(l*h)-6.98)}) + c_{spec}$$

Geometry function (Smith)

$$G_{GGX}(\alpha, n * l, n * v) = \frac{1}{2 * max(gv + gl, \epsilon)}$$

$$gv = (n * l)\sqrt{2^{\alpha+(1-2^{\alpha})*(n*v)}}$$

$$gl = (n * v)\sqrt{2^{\alpha+(1-2^{\alpha})*(n*l)}}$$

$$\alpha = roughness^2$$

Normal distribution function

$$D_{GGX}(\alpha, n * h) = \frac{2^{\alpha}}{\pi 2^{2^{(n*h)}2^{\alpha}+1}}$$