and $\hat{\omega}_{ES} \approx \frac{1}{|\vec{\omega}_{sun}|}(\vec{\omega}_{sun} - \vec{n}_E)$.

$\hat{\omega}_{PE}$ is similarly $\vec{\omega}_{PE} = \vec{\omega}_{Platform} - \vec{n}_P$ and $\hat{\omega}_{PE} \approx \frac{1}{|\vec{\omega}_{Platform}|}(\vec{\omega}_{Platform} - \vec{n}_P)$

Later, we will integrate over the satellite-centered coordinate system, so we can define $\vec{n}_P$ in terms of (R_P, θ_P, ϕ_P), where these parameters define spherical coordinates around the satellite.

We can evaluate $\langle \hat{n}_P, \hat{\omega}_{PE} \rangle = \langle \hat{n}_P, \hat{\omega}_{Platform} \rangle - \langle \hat{n}_P, \frac{\vec{n}_P}{|\vec{\omega}_{platform}|} \rangle$

$$= \langle \hat{n}_P, \hat{\omega}_{platform} \rangle - \langle \hat{n}_P, \hat{n}_P \left(\frac{R_P}{|\vec{\omega}_{platform}|}\right) \rangle \approx \langle \hat{n}_P, \hat{\omega}_{platform} \rangle \text{ for } \frac{R_P}{|\vec{\omega}_{platform}|} \to 0$$

and $\langle \hat{n}_E, \hat{\omega}_{ES} \rangle = \langle \hat{n}_E, \hat{\omega}_{sun} \rangle - \langle \hat{n}_E, \frac{\vec{n}_E}{|\vec{\omega}_{sun}|} \rangle = \langle \hat{n}_E, \hat{\omega}_{sun} \rangle - \langle \hat{n}_E, \frac{R_E}{|\vec{\omega}_{sun}|} \hat{n}_E \rangle$

$\approx \langle \hat{n}_E, \hat{\omega}_{sun} \rangle$ for $\frac{R_E}{|\vec{\omega}_{sun}|} \to 0$.

Thus,

$$= \int_\Omega \frac{\rho_P \rho_E \varepsilon_s}{\pi^2} \langle \hat{n}_P, \hat{\omega}_{platform} \rangle \langle \hat{n}_E, \hat{\omega}_{sun} \rangle \frac{\langle \hat{n}_E, -\hat{\omega}_{PE} \rangle}{|\vec{\omega}_{PE}|^2} \, dA_E$$

$\vec{\omega}_{PE}$ is more difficult. $\vec{\omega}_{platform}$ is the ~~distance between~~ vector from ~~Earth~~ platform to Earth. so $-\vec{\omega}_{platform}$ is from Earth to platform in Earth coordinates.