Kochin function

In the far field, the velocity potential $\tilde{\phi}_{XX}(M)$ for the problem with number *XX* may be approximated :

$$\tilde{\phi}_{XX}(M) \cong f_0(z)\sqrt{\frac{k}{2\pi r}}e^{i\left(kr-\pi/4\right)}H_{XX}(\theta) \tag{1}$$

With :

- (r,θ,z) are the cylindrical coordinates of point M
- $f_0(z)$ is the depth dependence. $f_0(z)=e^{kz}$ in deep water whereas $f_0(z)=\dfrac{\cosh k(z+h)}{\cos kh}$ in finite water depth. h is the water depth.
- k is the wavenumber.
- $H_{XX}(\theta)$ is the Kochin function calculated by the program for problem with number *XX*. The Kochin functions are stored in files */Results/Kochin.XX.dat* (ASCII files). First column are the angles ϕ, second and third columns are the amplitude and phase of the Kochin function (it is a complex coefficient).

Let consider a floating body with one degree of freedom responding to a regular wave of amplitude A, circular frequency ω and propagating in direction β. Let number 1 be the diffraction problem and number 2 the radiation problem. Let $\tilde{X}(\omega)$ be the RAO of the floating body. Then, the total velocity potential in the far field is:

$$\tilde{\phi}(M) = Af_0(z)\left(\underbrace{-i\omega\tilde{X}(\omega)\sqrt{\frac{k}{2\pi r}}e^{i\left(kr+\pi/4\right)}H_2(\theta)}_{\text{Contribution from radiation}}+\underbrace{\sqrt{\frac{k}{2\pi r}}e^{i\left(kr+\pi/4\right)}H_1(\theta)}_{\text{Contribution from diffraction}}\underbrace{-i\frac{g}{\omega}e^{ik(x\cos\beta+y\sin\beta)}}_{\text{Incident wave potential}}\right) \tag{2}$$