

$$u_{ring}(N) = \frac{-\sin^3\left(\frac{\pi}{N}\right)}{d(N)^3} \left[\sum_{k=1}^{\left[\frac{N-1}{2}\right]} \frac{\cos^2\left(\frac{\pi k}{N}\right) + 1}{\sin^3\left(\frac{\pi k}{N}\right)} + \frac{\text{mod}(N+1, 2)}{2} \right]$$