RMS voltage calculations

For a periodic waveform, period T,

$$V_{RMS} = \left[\frac{1}{T}\int_0^T v(t)^2\,dt\right]^{\frac{1}{2}} \quad V$$

For $v(t) = A \sin 2\pi ft$ $\left(f = \frac{1}{T}\right)$,

$$V_{RMS} = \frac{A}{\sqrt{2}} \quad V$$

However, for $v(t) = A(1 + \sin 2\pi ft)$, i.e. an offset sinusoid with minimum value 0 and maximum value $2A$, the RMS value is significantly different.

$$V_{RMS} = \left[\frac{A^2}{T}\int_0^T \left(1 + \sin 2\pi t/T\right)^2 dt\right]^{\frac{1}{2}}$$

$$= \left[\frac{A^2}{T}\int_0^T \left(1 + 2\sin 2\pi t/T + \sin^2 2\pi t/T\right) dt\right]^{\frac{1}{2}}$$

$$= \left[\frac{A^2}{T}\int_0^T \left(1 + 2\sin 2\pi t/T + \tfrac{1}{2} + \tfrac{1}{2}\cos 4\pi t/T\right) dt\right]^{\frac{1}{2}}$$

$$= \left[\frac{A^2}{T}\left[t + t/2\right]_0^T\right]^{\frac{1}{2}}$$

$$= \frac{\sqrt{3}A}{\sqrt{2}} \quad V$$

What about V_{RMS} for an offset pulsed waveform?