Archimedes Spiral

starting 1 cm from the center and 1cm spacing for 15 turns

$\Delta := 1.17$ gap between turns

$Ro := 16$ Outer radius, cm

$Ri := 1$ Inner Radius, cm

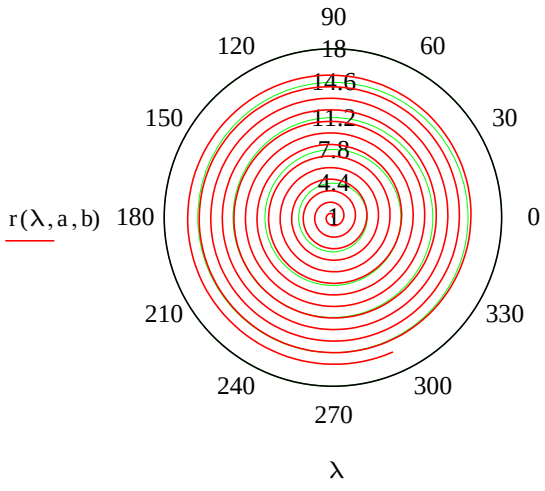
$N := \frac{Ro - Ri}{\Delta}$ number of turns $N = 12.821$

$r(\theta, a, b) := a + b \cdot \theta$ Archimedes Spiral

$a := Ri$ Start radius

$b := \frac{\Delta}{2 \cdot \pi}$ $b = 0.186$

$\lambda := 0, \frac{\pi}{60} .. N \cdot 2 \cdot \pi$



Length

$$L := \int_0^{N\cdot 2\cdot\pi} \sqrt{(a+b\cdot\theta)^2 + \left[\frac{d}{d\theta}(a+b\cdot\theta)\right]^2}\, d\theta$$

$L = 684.964$ cm

$Rs := 2.1$

$Ni := 1\cdot 10^{-6}$ Ohm – meters

$$A := \frac{Ni\cdot\frac{L}{1000}}{Rs}$$

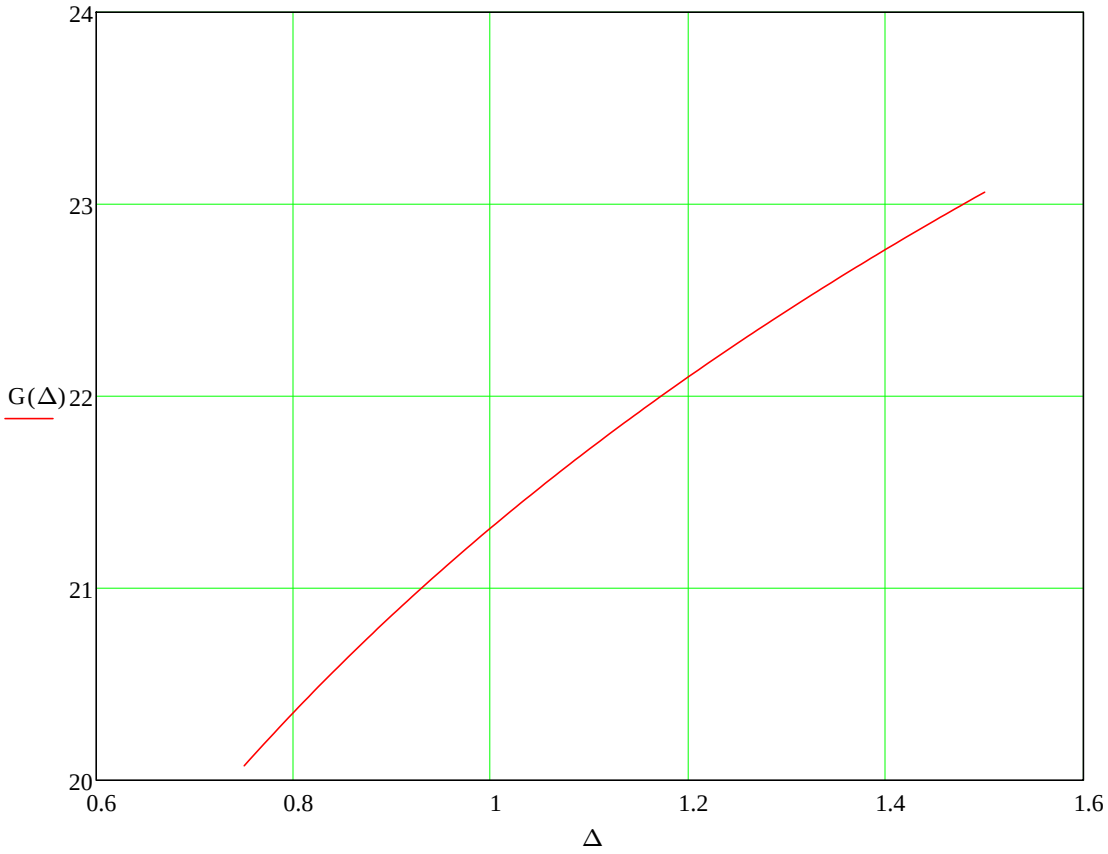
$$D := \sqrt{\frac{A\cdot 4}{\pi}}\cdot 39.37$$ Inches

$D = 0.025$

$$G := \frac{\ln(D) + 1.12436}{-.11594}$$ $G = 21.992$ wire gage eguation, in inches

$$G(\Delta) := \frac{\ln\left[\sqrt{\frac{\int_0^{\frac{Ro-Ri}{\Delta}\cdot 2\cdot\pi} \sqrt{\left(a+\frac{\Delta}{2\cdot\pi}\cdot\theta\right)^2 + \left[\frac{d}{d\theta}\left(a+\frac{\Delta}{2\cdot\pi}\cdot\theta\right)\right]^2}\, d\theta}{\frac{Ni\cdot\frac{1}{1000}}{Rs}\cdot 4}}\cdot\frac{39.37}{\pi}\right] + 1.12436}{-.11594}$$

$\Delta := 0.75, 0.755 .. 1.5$



A gap between turns of 1.17 cm, starting at 1cm and ending at 16cm will have a length of 685 cm
Using 22 ga Nichrome wire with a resistivity of 10-6 Ohm-meters will result in a 2.1 Ohm resistance

1.