

**Answer on Question #72316, Physics / Mechanics — Relativity**

**Question** A wire under tension vibrates with a frequency of 550Hz; what would be the fundamental frequency if the wire were half as long, twice as thick and under vibration in pipes.

**Solution** The formula for fundamental frequency is

$$f_1 = \frac{\sqrt{TL/m}}{2L} = \frac{1}{2}\sqrt{T/mL}$$

where  $L$  is length of string  $M$  is its mass and  $T$  is tension. With constant  $T$  we have 2 times smaller  $L$  and 2 times bigger mass, as it increases in 4 times with increasing thickness in 2 times and decreasing 2 times with decreasing length in 2 times. Hence, we have

$$f'_1 = \frac{1}{2}\sqrt{\frac{T}{2mL/2}} = f_1$$

As we can see, fundamental frequency will not change.