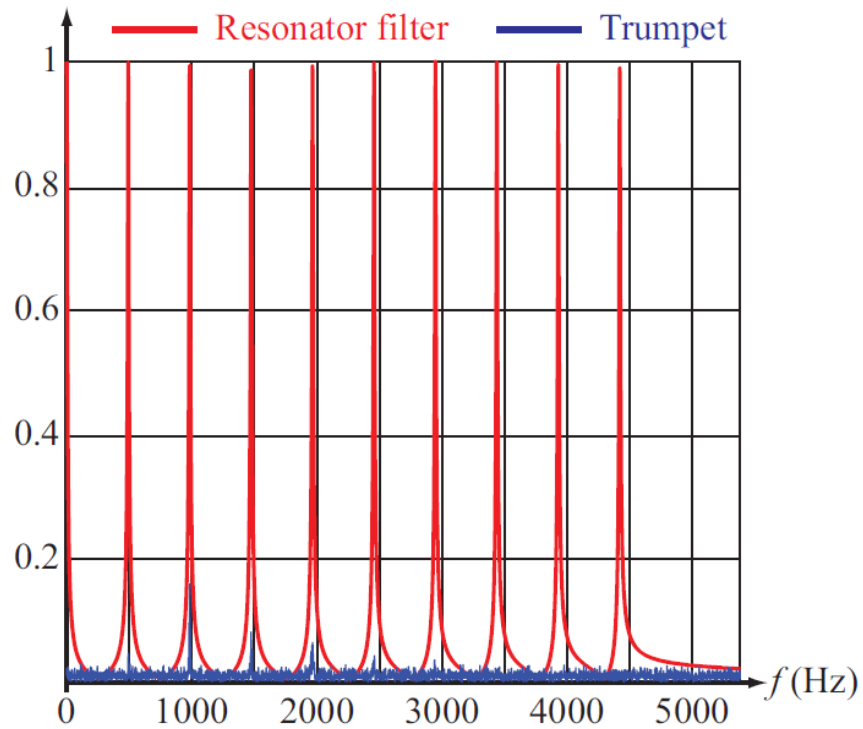**Concept Question 6-15:** Why did the resonator filter perform better than the lowpass filter in denoising the trumpet signal?

Because the resonator filter passes only the harmonics of the trumpet signal, and rejected all other frequencies. The Butterworth lowpass filter merely rejects all frequencies below the cutoff frequency, so it also passes frequencies between the harmonics, as shown in Fig. 6-48:

Figure 6-48: Magnitude spectra of resonator filter and noise-free trumpet signal.