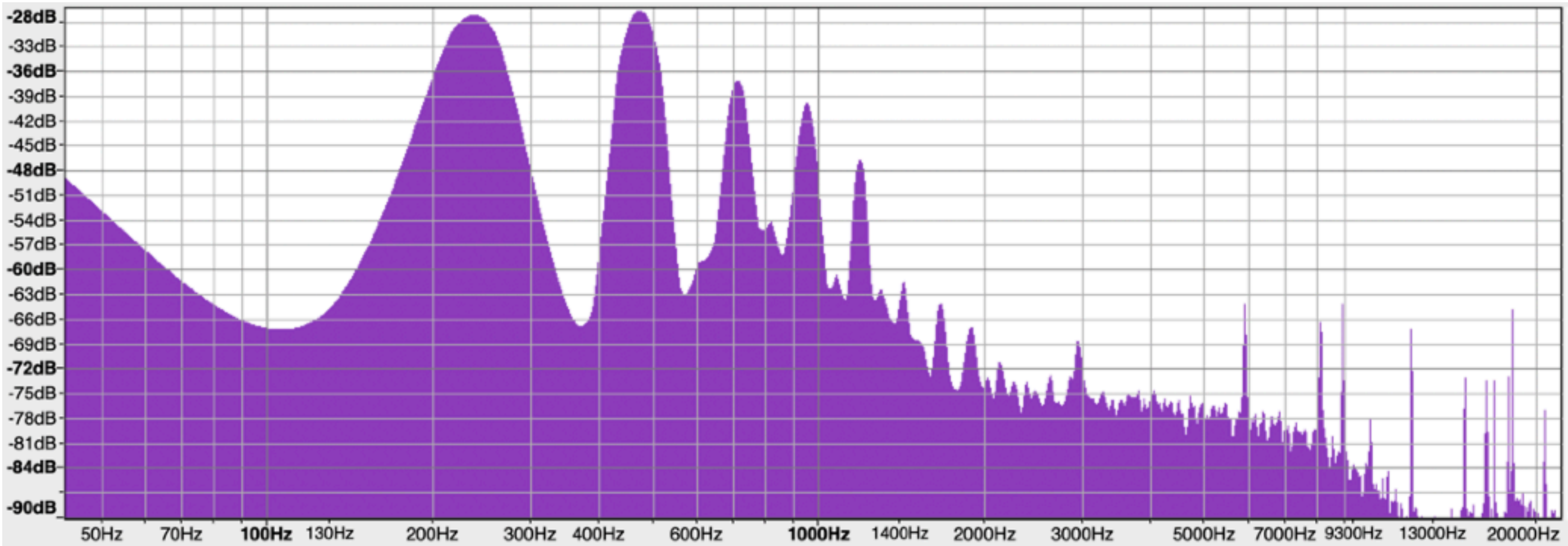


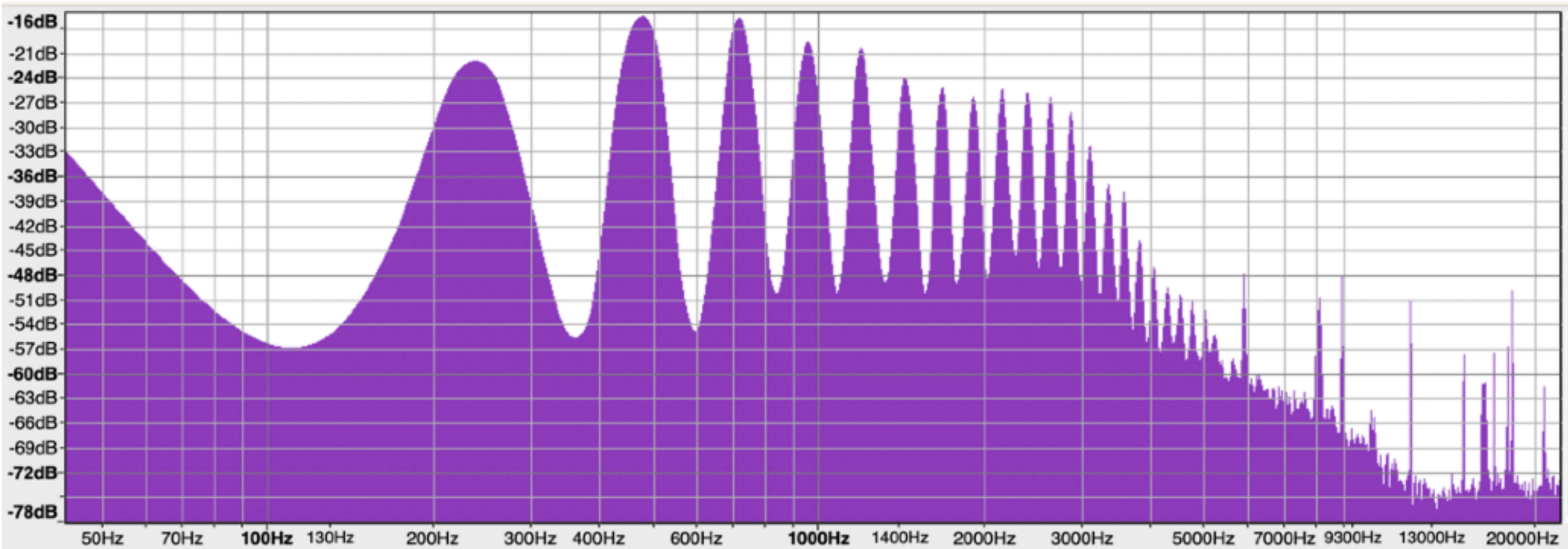
Loudness and spectra

- ▶ Upper spectrum: Spectrum of the *first* 0.3 seconds
- ▶ Lower spectrum: Spectrum of the *last* 0.3 seconds
- ▶ Observations
 - Fundamental frequency is hardly changed
 - Higher harmonics make the note sound louder

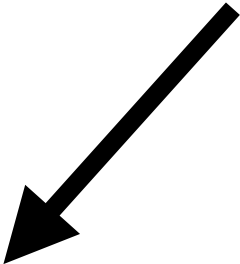
2

8





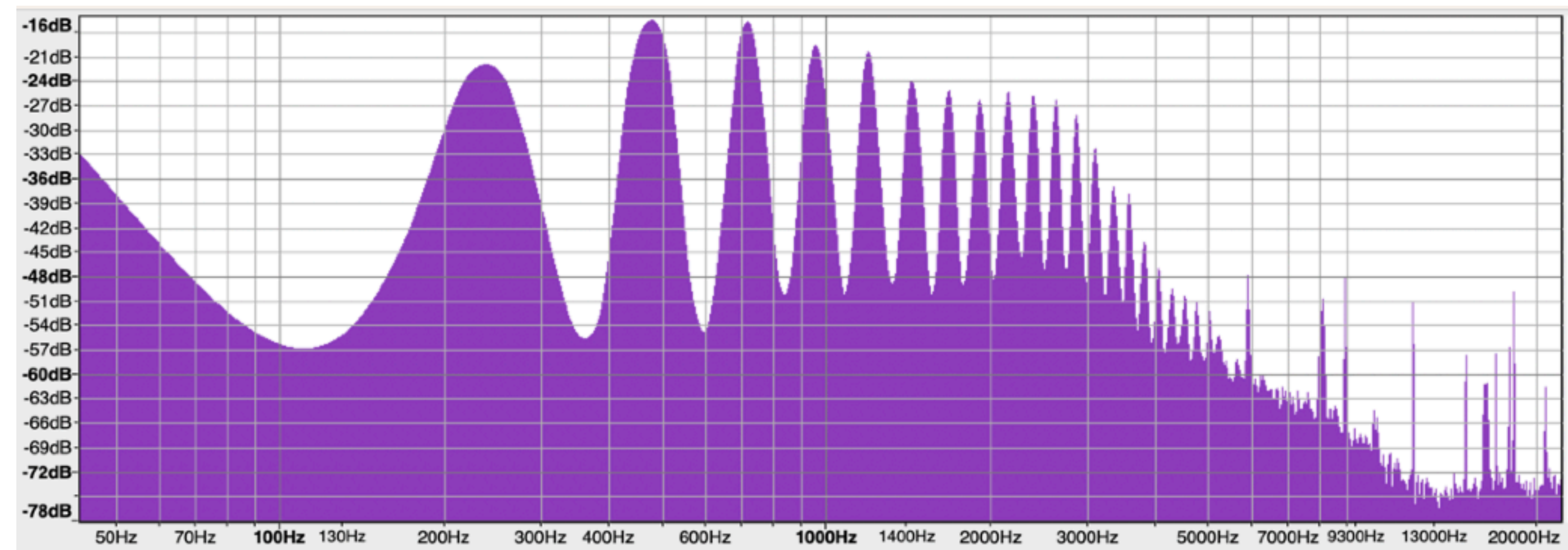
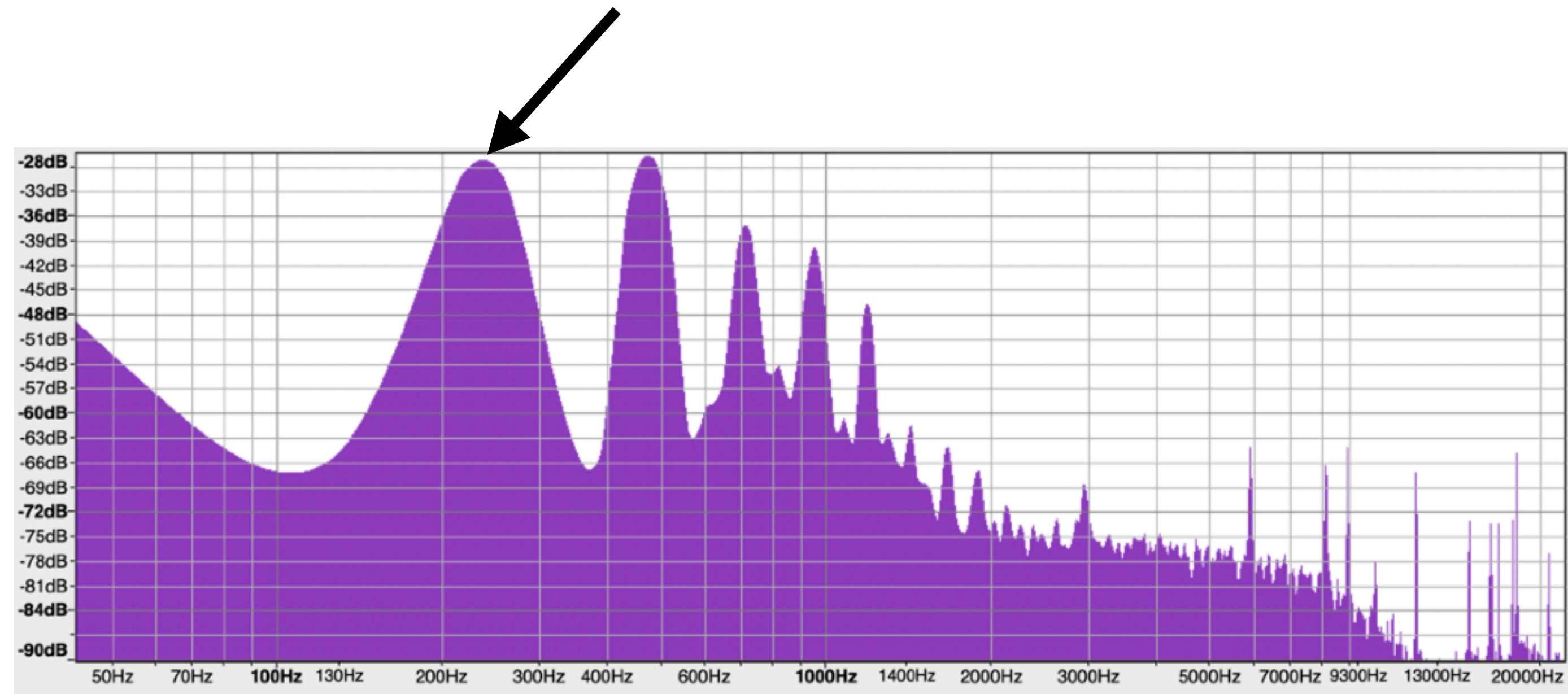
Fundamental frequency



Loudness and spectra

Fundamental frequency

- ▶ Upper spectrum: Spectrum of the *first* 0.3 seconds
- ▶ Lower spectrum: Spectrum of the *last* 0.3 seconds
- ▶ Observations
 - Fundamental frequency is hardly changed
 - Higher harmonics make the note sound louder



Timbre (also known as tone color/quality)

- Depends strongly on *envelope (time variation)* and also depends on *spectrum*

