

Speech Science

WiSe 2024/2025

Exercise 7: Acoustic Analyses III

Dez 9, 2024

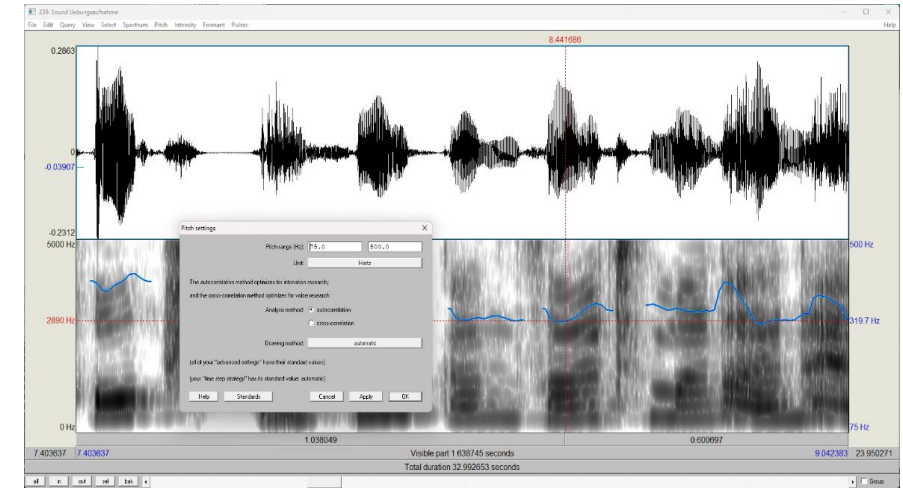
Bernd Möbius & Valentin Kany

Language Science and Technology
Saarland University

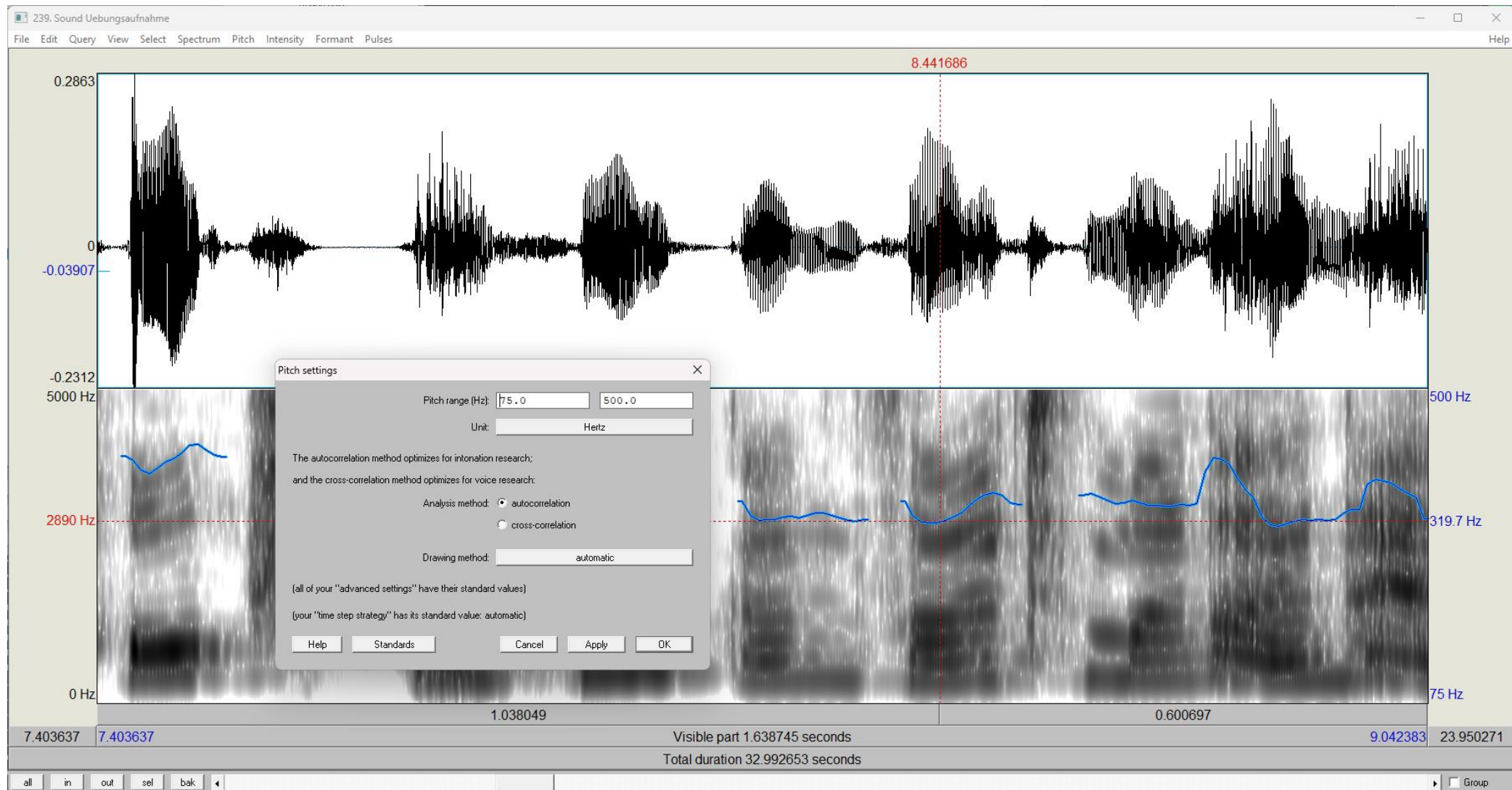
Acoustic Analyses III

Recap: Fundamental frequency (f0)

- Calculated for voiced sounds only
- *Pitch range* depends on speaker:
 - ♂ 75-300 Hz
 - ♀ 100-500 Hz
- `pitch listing`: f0 for all time stamps in selection
- `get pitch`: mean f0 in selection
- `get minimum / maximum pitch`
- `draw visible pitch contour`: draws to Praat Picture Window
- `extract visible pitch contour`: creates pitch object in Praat Object window

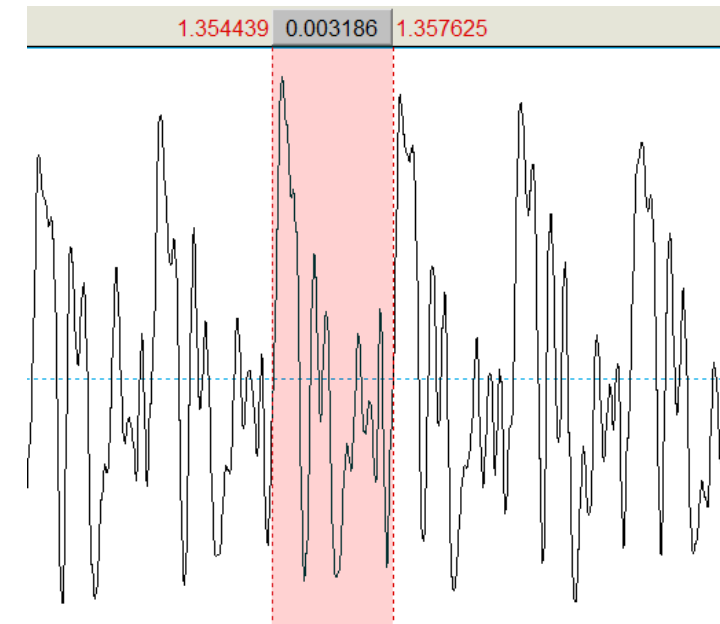
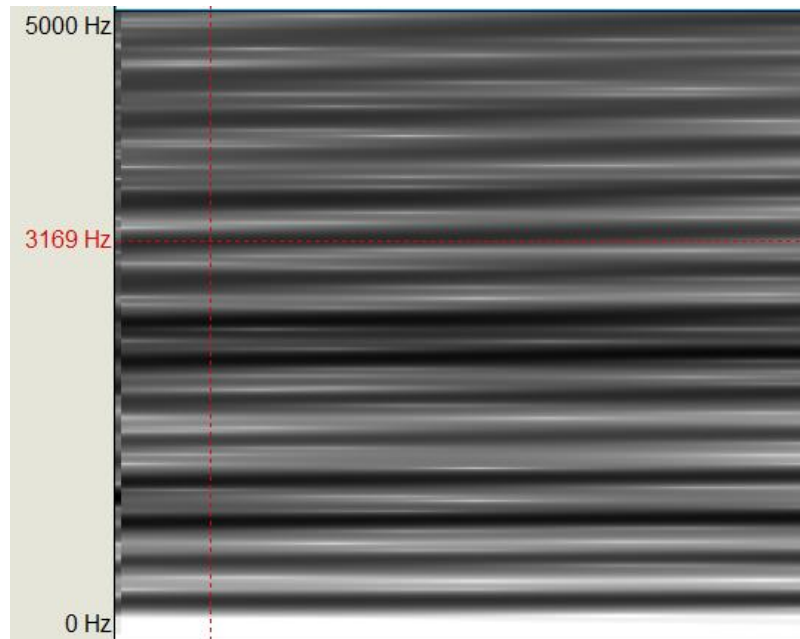


Analysis: Fundamental frequency (f0)



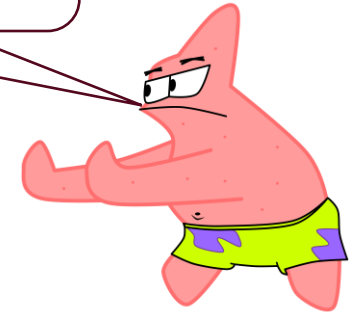
Other ways of measuring f_0

- Narrow-band spectrogram \rightarrow harmonics $\rightarrow f_0$
Alternatively: 10th harmonic, divide by 10 $\rightarrow f_0$
- Measuring duration of 1 period in the oscillogram



Is this today's exercise again?

No, this is Patrick!



- Analyses on Patrick's voice actors in different languages
- Find the wav-file in our teams folder
- Choose 5 languages to analyze:

English: 0-3 **French:** 3-9 **Polish:** 9-14 **Russian:** 14-22 **Portuguese (Brazilian):** 22-27

Spanish (Latin): 27-34 **Mandarin:** 34-39 **Dutch:** 39-45 **Japanese:** 45-51 **Italian:** 51-57

Spanish (Spain): 57-1:04 **Portuguese (Portugal):** 57-1:09 **Hindi:** 1:09-1:15 **Arabic:** 1:15-1:21

Swedish: 1:21-1:27 **Turkish:** 1:27-1:33 **Greek:** 1:33-1:39 **Korean:** 1:39-1:45 **Thai:** 1:45-1:51

Hebrew: 1:51-1:57 **Czech:** 1:57-2:03 **Hungarian:** 2:03-2:09 **Indonesian:** 2:09-2:15 **German:** 2:15-

Exercise 1: Pitch analysis

- Select the negation particle (e.g. "no", "niet", "nein") in the utterance
- Measure the pitch in the middle of the first vowel with both alternative methods
- Note down the Hz values

Exercise 1: Pitch analysis

Language	F0 (in Hz)
English	171
Czech	186
French	192
Russian	218
Spanish (Spain)	226
Japanese	293
German	360

Analysis: intensity

- `intensity listing`: intensity for all time stamps in selection
- `Get intensity`: mean intensity in selection
- `get minimum / maximum intensity`
- `draw visible intensity contour`: draws to Praat Picture Window
- `extract visible intensity contour`: creates pitch object in Praat Object window

Some Common Decibel Levels	
140 dB	airplane takeoff (30m)
130 dB	hearing threshold of pain
120 dB	jackhammer, car horn (1m)
115 dB	iPod at peak volume, crying baby
110 dB	chainsaw (1m), airport
100 dB	rock concert, helicopter
90 dB	hair dryer, lawnmower
70 dB	vacuum cleaner (1m)
60 dB	normal conversation (1m)
40 dB	quiet room

Exercise 2: Intensity analysis

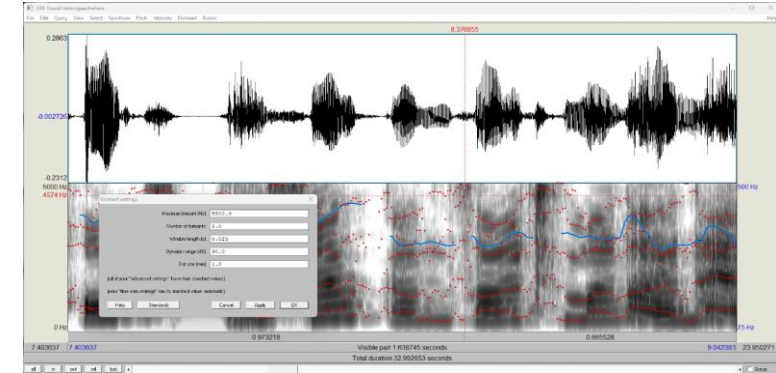
- Select the whole "No, this is Patrick" segment
- Note down the mean intensity of this segment

Exercise 2: Intensity analysis

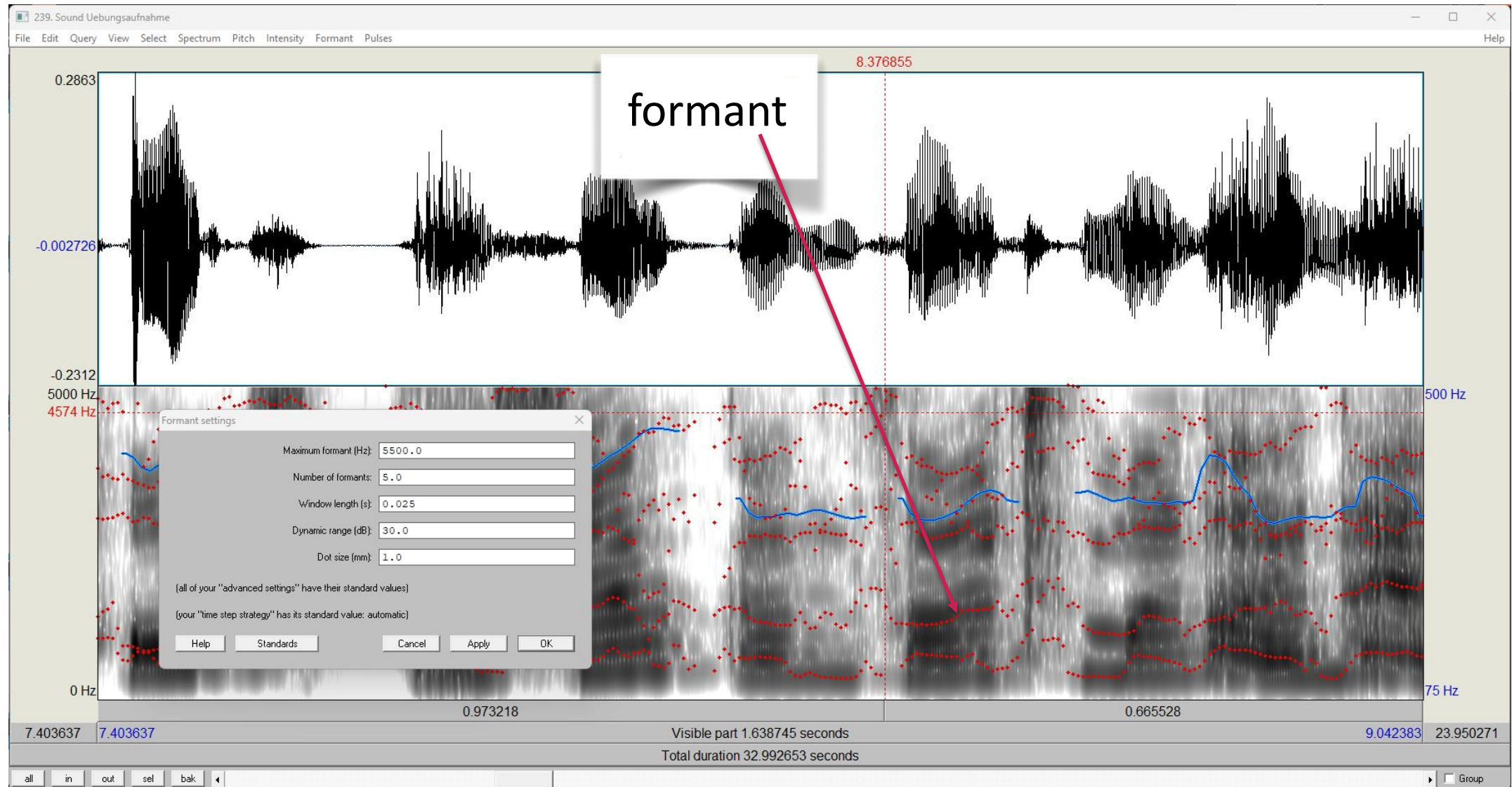
Language	Intensity (in dB)

Analysis: formants

- maximum formant depends on speaker:
 - ♂ 5,000 Hz
 - ♀ 5,500 Hz
- number of formants: 5
- formant listing: F1-F4 for all time stamps in selection
- get first/second/third/fourth formant
- draw visible formant contour: draws to Praat Picture Window
- extract visible formant contour: creates formant object in Praat Object window

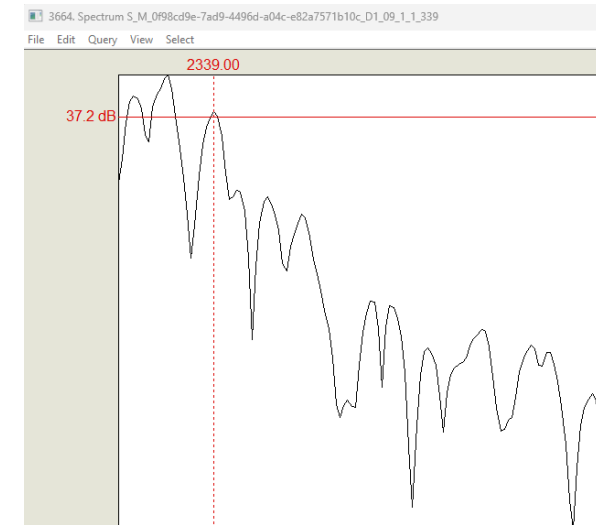
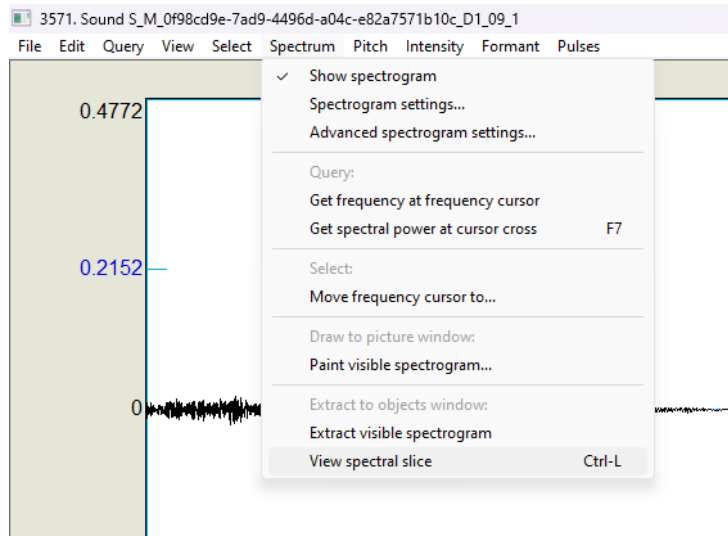


Analysis: formants



Other ways of measuring formants

- Use a spectrum:
 - Move cursor to the point you wish to measure formants from
 - Spectrogram → View spectral slice
- Read the frequency values from the peaks of the spectrum manually



Exercise 3: Formant analysis

- Select the negation particle (e.g. "no", "niet", "nein") in the utterance
- Measure F1 and F2 of the first vowel
- Use the "manual" method at least once and compare values
- Note down the Hz values

Exercise 3: Formant analysis

Language	F1 (in Hz)	F2 (in Hz)

Assignment 6: Create your own speech profile

- Create your own speech profile:
- Use your old recordings from Assignment 4
- Measure average pitch
- Measure average intensity
- Create your own formant map for all target vowels:
<https://adamb924.github.io/formant-plot/>
- Please send me the results

Thank you for your participation!

