

Speech Science

WiSe 2024/2025

Exercise 6: Acoustic Analyses II

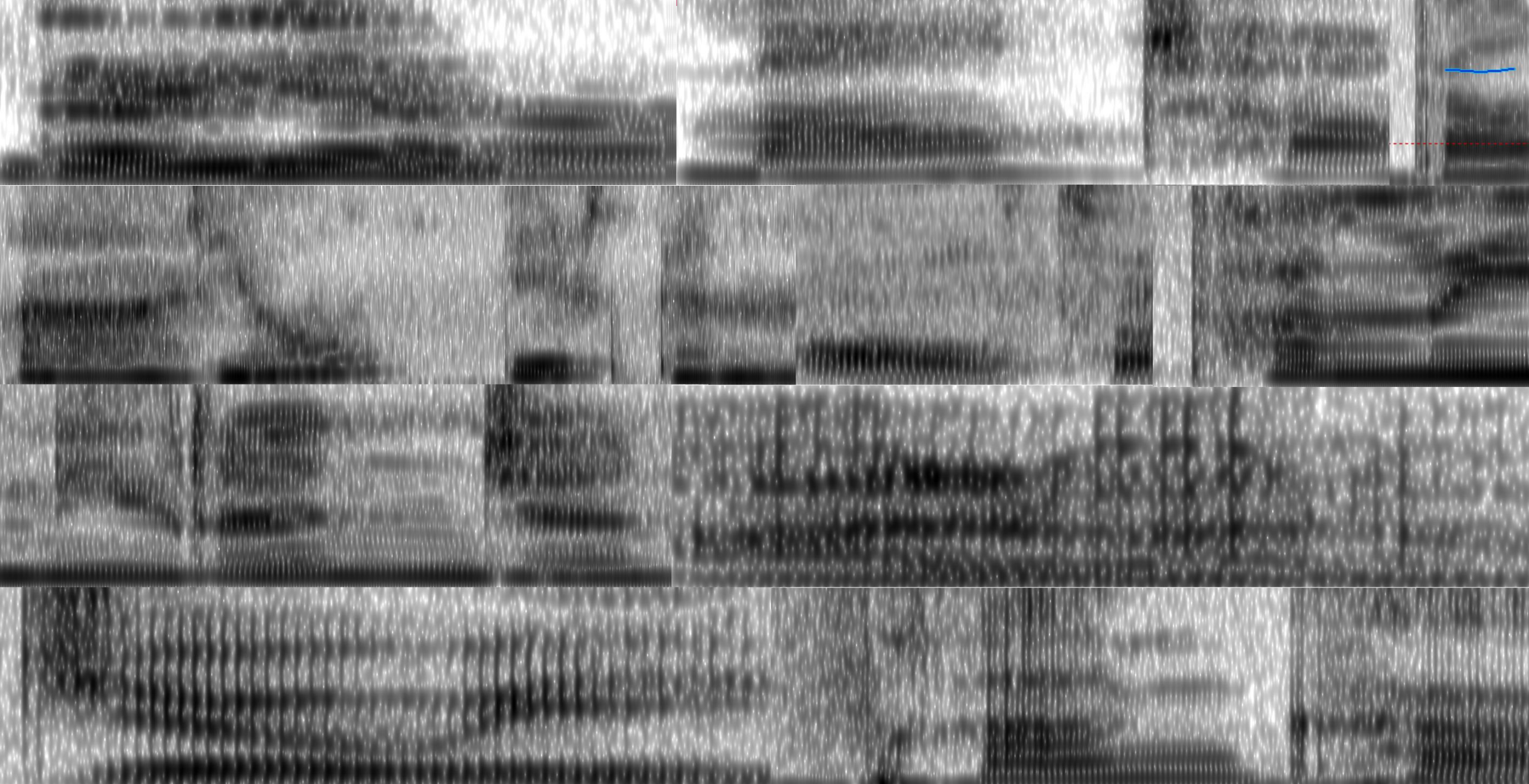
Dez 2, 2024

Bernd Möbius & Valentin Kany

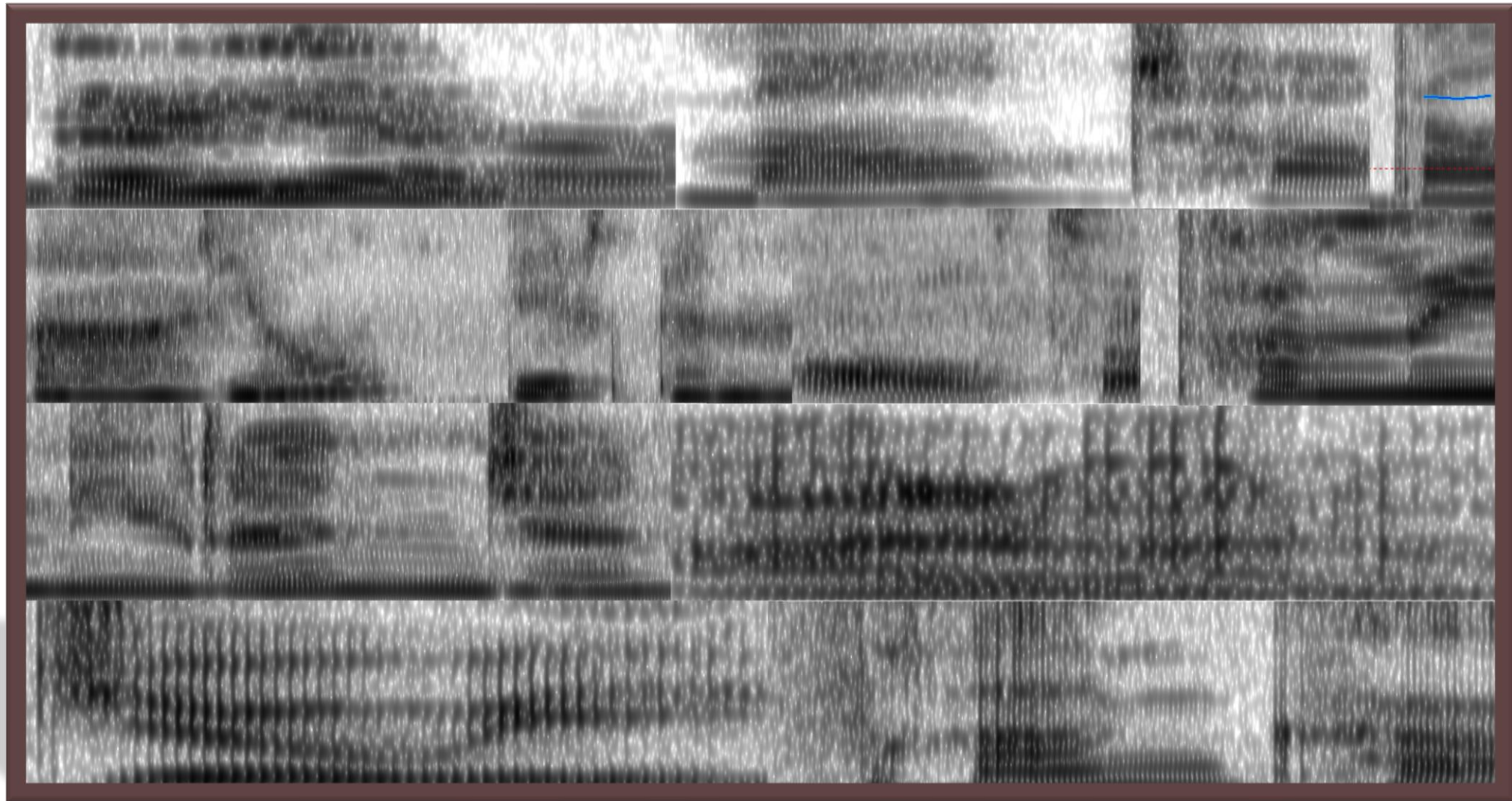
Language Science and Technology
Saarland University

Quick recap: Formants

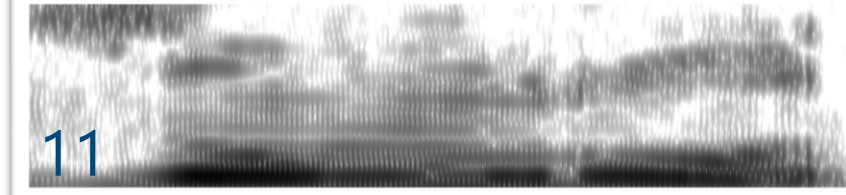
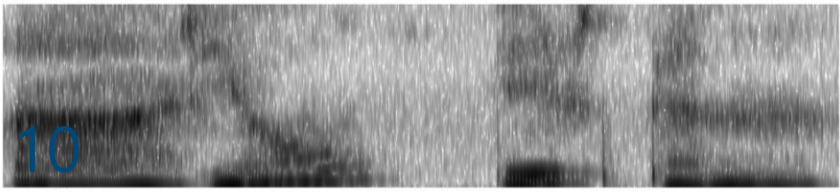
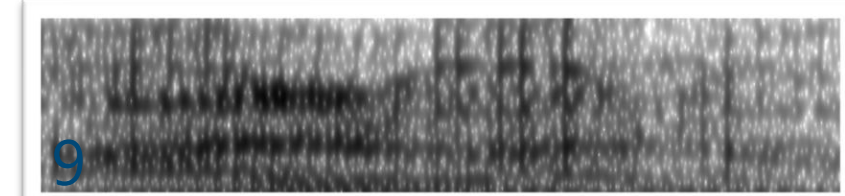
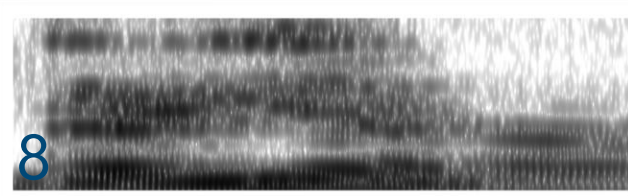
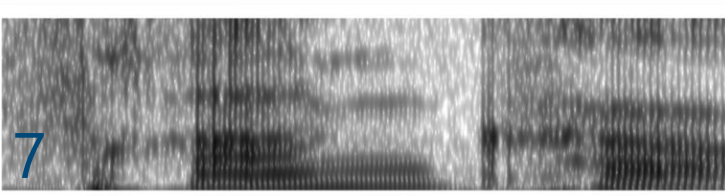
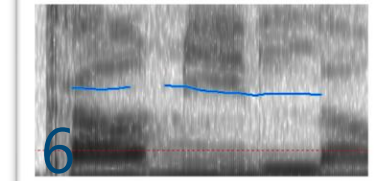
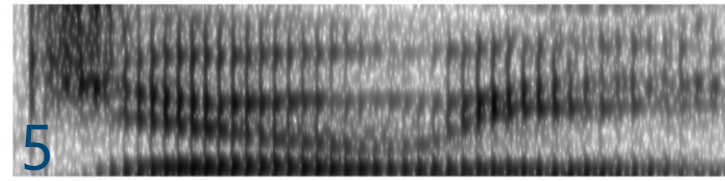
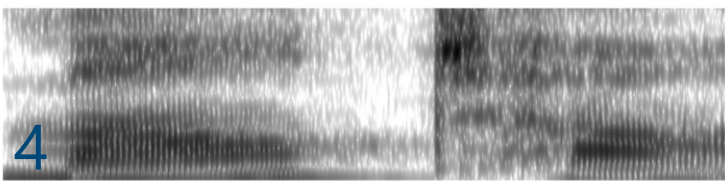
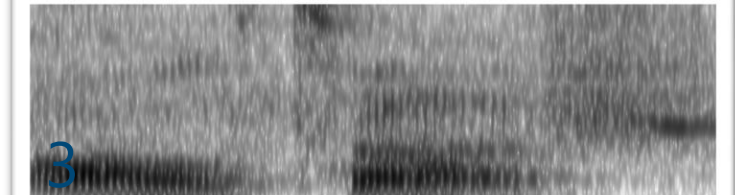
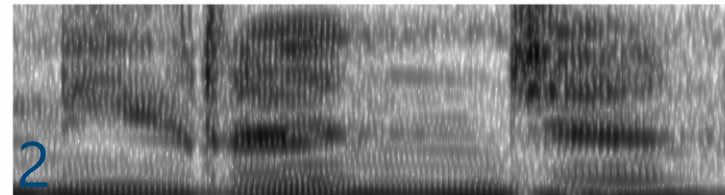
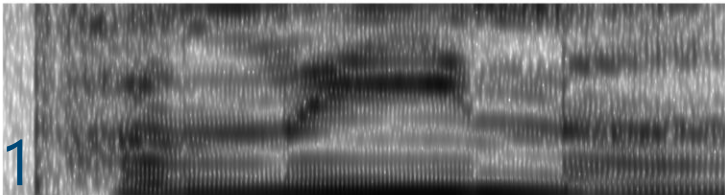
- Concentration of acoustic energy around a particular frequency
→ Local maxima in the spectrum
- Emerge as consequence of reinforcement of certain frequency ranges, corresponding to resonance characteristics of the vocal tract
- F1, F2 mainly define the quality of a vowel
→ Vowel chart



Recap: Reading spectrograms, Assignment 5

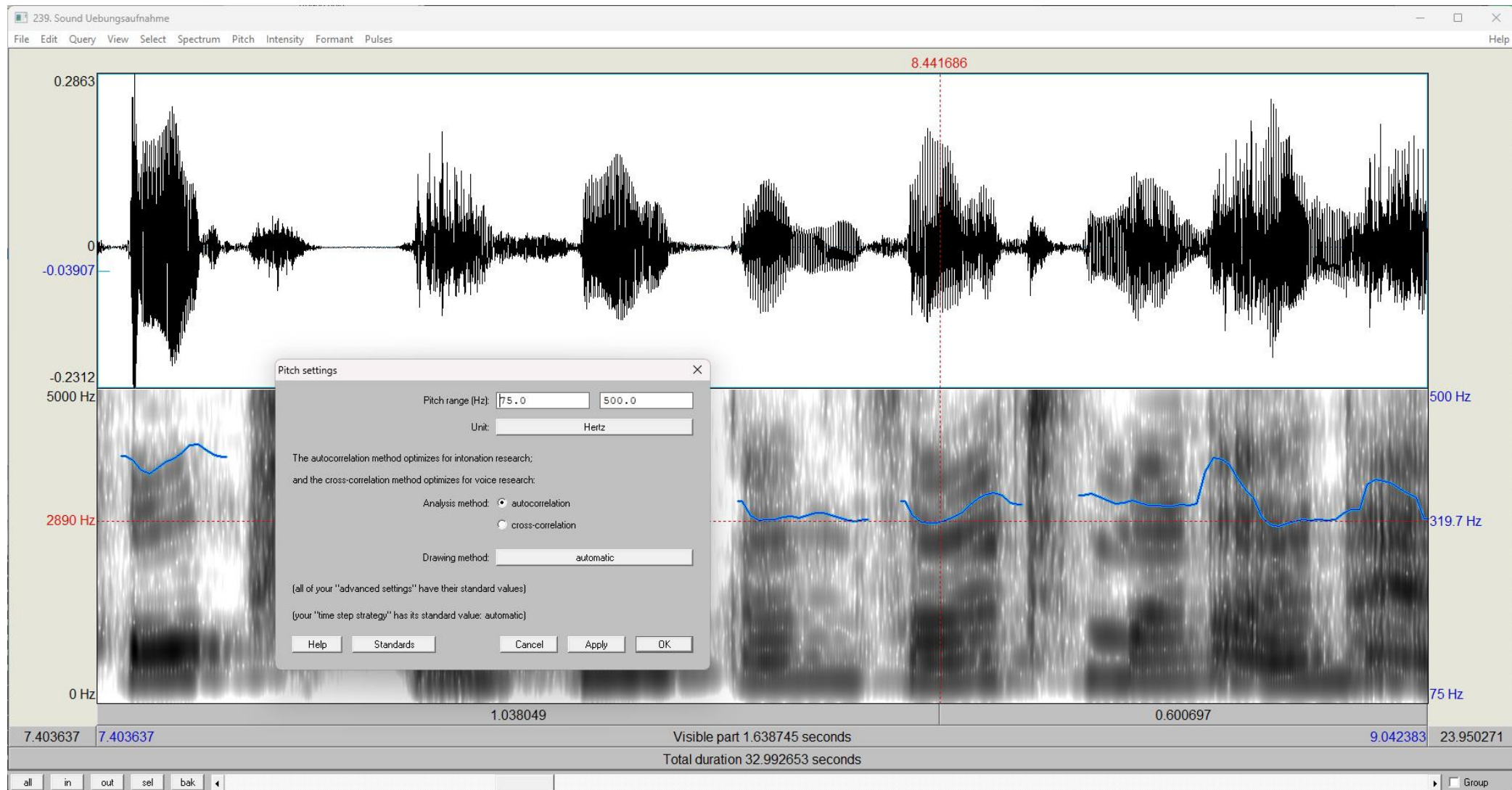


Challenge Time! Can we identify the names behind your spectrograms?



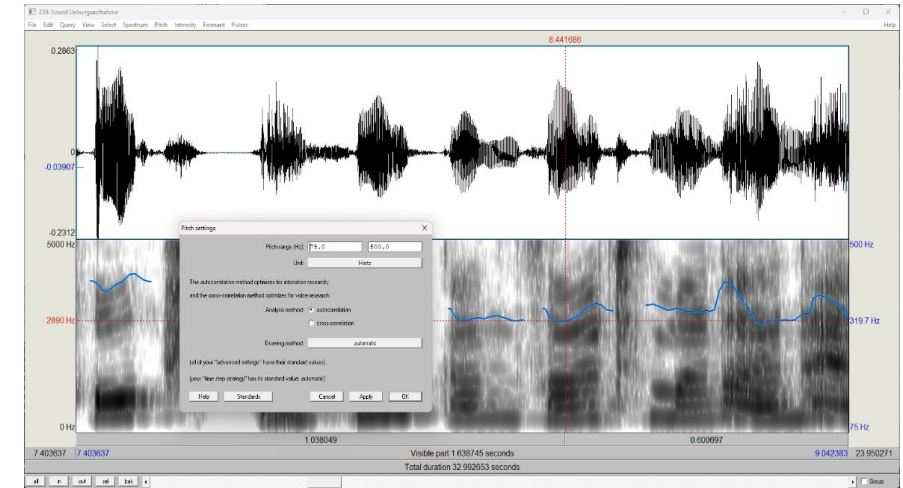
Acoustic Analyses II

Analysis: Fundamental frequency (f0)



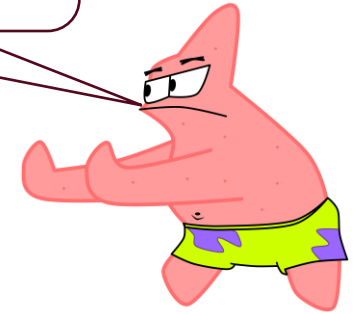
Analysis: Fundamental frequency (f0)

- 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



Is this today's exercise?

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: 0-9 **French:** 9-15 **Polish:** 15-21 **Russian:** 21-27 **Portuguese (Brazilian):** 27-33

Spanish (Latin): 33-39 **Mandarin:** 39-45 **Dutch:** 45-51 **Japanese:** 51-57 **Italian:** 57-1:03

Spanish (Spain): 1:03-1:09 **Portuguese (Portugal):** 1:09-1:15 **Hindi:** 1:15-1:21 **Arabic:** 1:21-1:27

Swedish: 1:27-1:33 **Turkish:** 1:33-1:39 **Greek:** 1:39-1:45 **Korean:** 1:45-1:51 **Thai:** 1:51-1:57

Hebrew: 1:57-2:03 **Czech:** 2:03-2:09 **Hungarian:** 2:09-2:15 **Indonesian:** 2:15-2:21 **German:** 2:21-

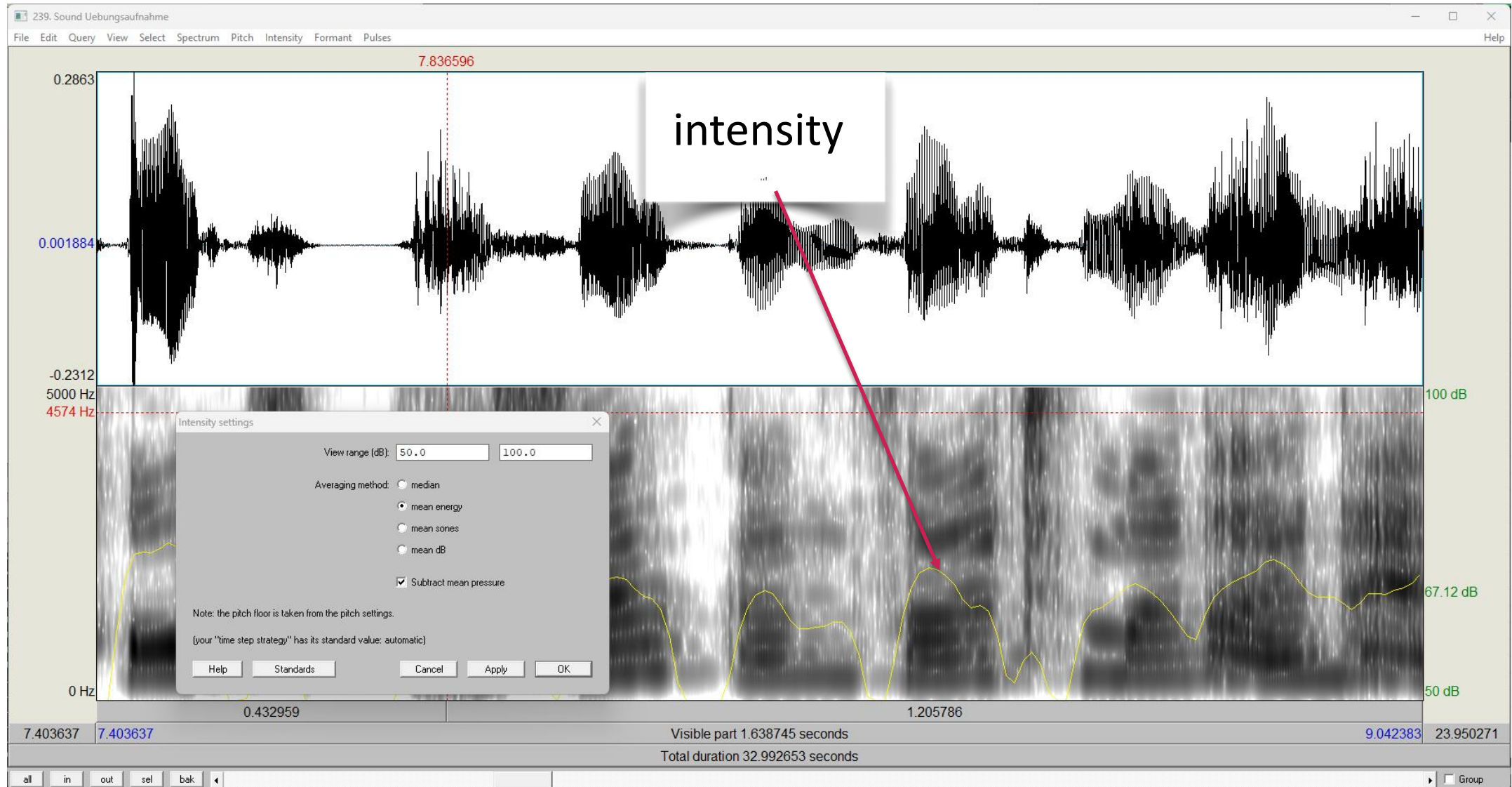
Exercise 1: Pitch analysis

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

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



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

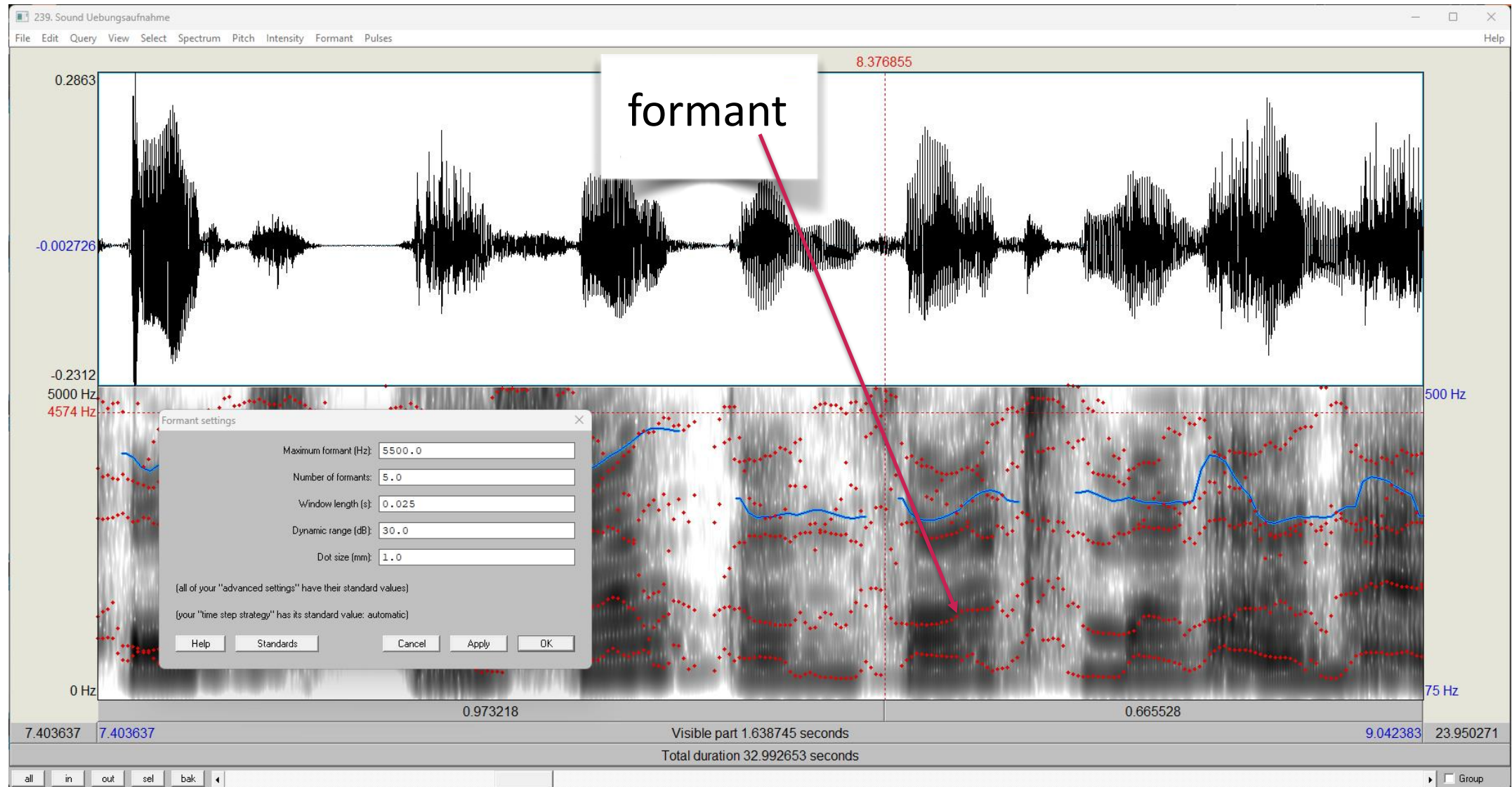
Exercise 2: Intensity analysis

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

Exercise 2: Intensity analysis

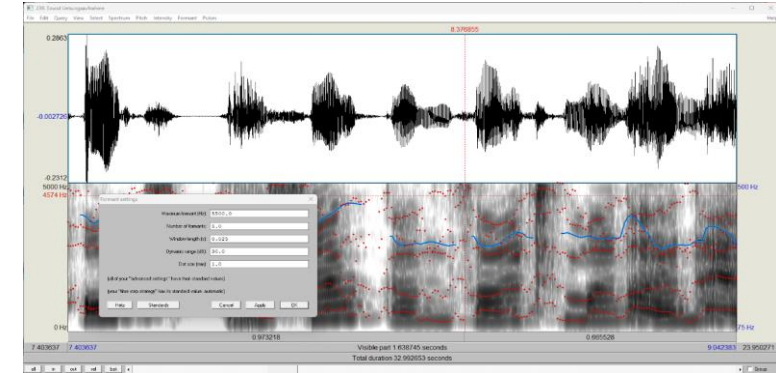
Language	Intensity (in dB)

Analysis: formants



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



Exercise 3: Formant analysis

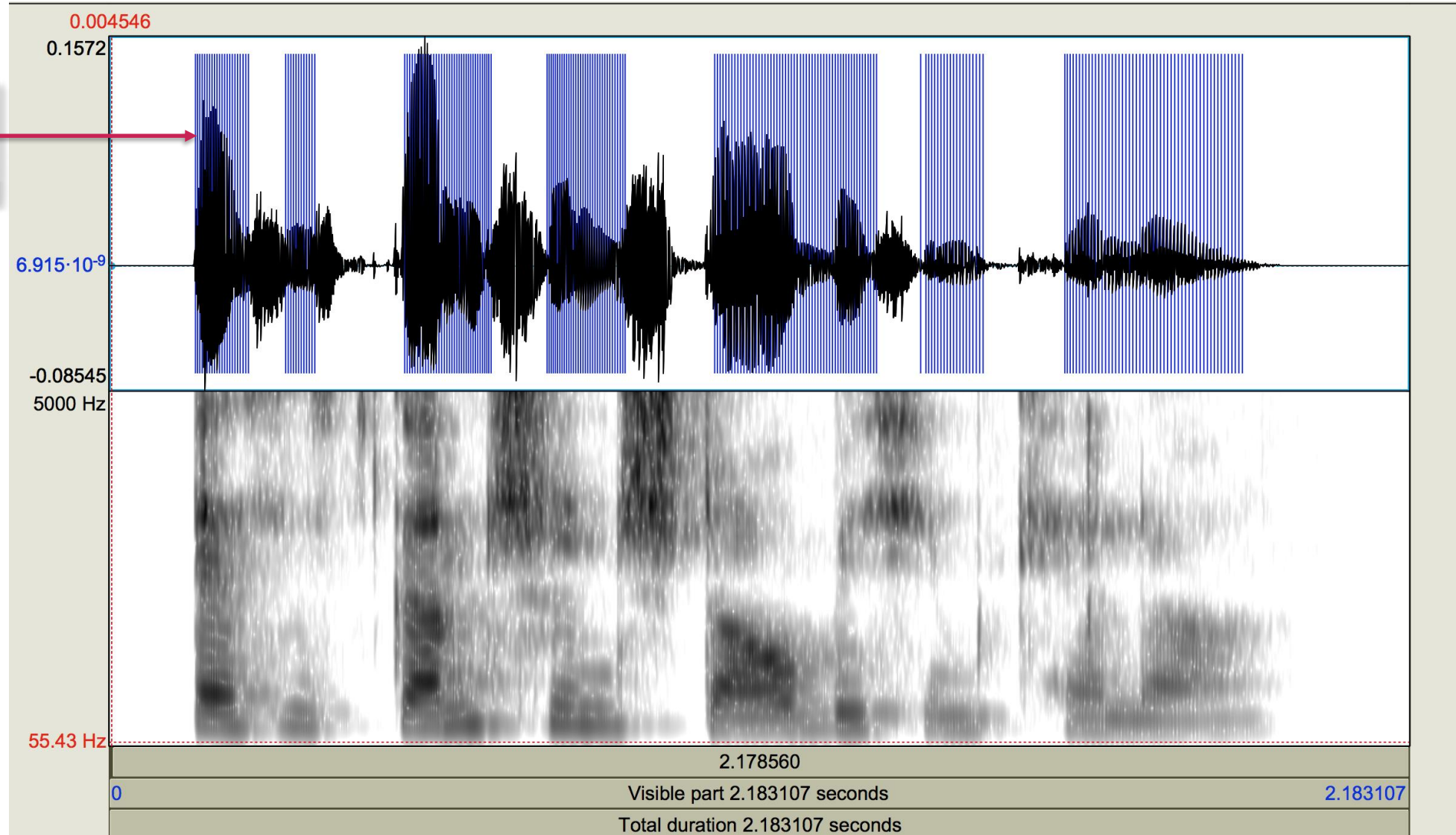
- Select the negation particle (e.g. "no", "niet", "nein") in the utterance
- Measure F1 and F2 of the first vowel
- Note down the Hz values

Exercise 3: Formant analysis

Language	F1 (in Hz)	F2 (in Hz

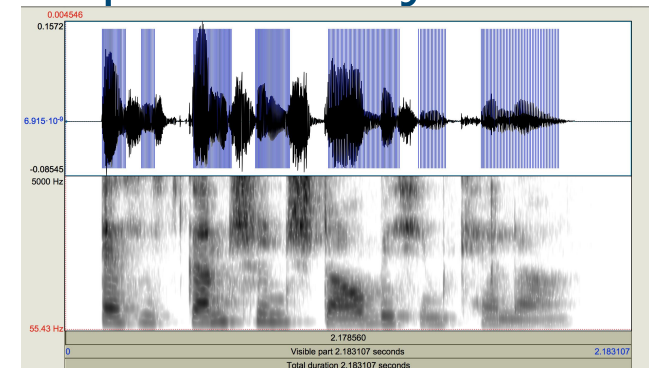
Analysis: glottal pulses

pulses



Analysis: glottal pulses

- pulse listing: time stamps of glottis pulses in selection
- voice report: information on voice quality (*pitch settings* → *analysis method* → *cross-correlation*)
- draw visible pulses: draws to Praat Picture Window
- extract visible pulses: creates points process object in Praat Object window



Thank you for your participation!



