Luc Döbereiner

# **Spur** (2019)

for cello, double bass and live electronics

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for cello, double bass and live electronics

dedicated to *Ensemble Schallfeld*

## General

The piece consists of two gradually changing sounds that interact with each other. This interaction takes place acoustically in space, through the live electronics and by means of a form of “digitally augmented” listening. The live electronics analyze the sounds of the cello and the double bass and generate sets of frequencies that control oscillators whose sounds are played back over bone conducting headphones worn by the musicians. The electronic sounds mostly consist of harmonic content present in the other musician’s sound and not in the what is played by the musician listening to the electronics. In some sections of the piece, these frequencies are used to generate sum and difference frequencies that are not themselves present in what the cello or the double bass play at the moment of the analysis. The electronics, which function as a form of harmonic target sound, often maintain harmonic content that is only transiently prominent in the sound of the instruments. The musicians thus create possibilities for each other, although the precise results are a product of the contingent concurrence of both instruments’ sounds, the state of the sound analysis system, the acoustics and the involved technology.

## Playing Techniques and Notation

There should never be complete silence. All changes should be executed as gradually as possible. Transitions in the written-out and in the improvised sections are to be executed by adding a new sound to the currently sounding one and then by removing the first of these two. Subsequent sounds will thus always overlap.

There are three general types of sounds to be played: harmonics, harmonic mulitphonics and half-harmonic multiphonics to be played on a “normal” harmonic node with a somewhat stronger left hand finger pressure that makes the harmonic and the fingered pitch sound simultaneously. The latter type of sounds are denoted by a filled diamond shaped note head. There are no conventional fully depressed sounds to be played.

The piece is notated in two staves for each instrument. The lower staff shows the pitches to be played and the upper staff shows the – theoretically – resulting harmonics. The lower staff is notated in scordatura, i.e. it shows where to place the fingers of the left had as though the instruments were tuned according to the standard tuning.

The dynamics are notated in shapes below each staff. Wider and darker shapes denote louder dynamics. The dynamics are always relative to the current instrumental possibilities. Dynamics are always in transition and should also result in timbral transitions.

Bow placement, bow speed and bow pressure are not explicitly written, but should be established on the basis of the currently played harmonic or mulitphonic sounds, the dynamics and other technical restrictions and musical decisions taken by the musicians. The multiphonics do not always need to sound fully, but certain partials may be selected and the musicians are free to explore the possibilities of each multiphonic by, for example, beginning with a certain partial and broadening the spectrum of the mulitphonic. While the goal is a continuously changing sound, certain actions, such as changes of finger pressure when playing half-harmonic sounds, and changes in bow position or bowing speed will result in rather abrupt changes. The unpredictability of these changes should be

embraced rather than eliminated. Control gained though practicing should serve to extend the space of possibilities and to find new unpredictable behavior, not to eliminate unpredictability. In general, the score should not be regarded as the representation of an ideal sound result but as the description of potentials to be explored.

The absolute time in seconds, relative to each section, is indicated above the staves and time intervals between new fingerings are indicated above each staff.

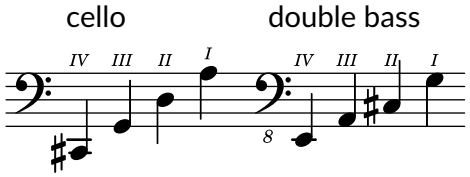
## Improvisational Sections

Improvised sections are indicated with an arrow (→). Their absolute duration in seconds is show above both staves. As in the rest of the piece, the players are to play gradual transitions of harmonics, half-harmonics and mulitphonics and should try to overlap subsequent sounds. The ending of the previous section and the beginning of the following section act as orientation guides. Each improvised section is a transition from the former to the latter.

The players hear pitches generated by the electronics on the basis of analyses. The performers should try to reproduce these pitches. However, this should be done while retaining the continuous character of the timbral transitions and without introducing rests or jumps. This means that it will not be possible to reproduce all of the heard pitches and the performers need to select pitches. The performers may freely transpose these pitches. Dynamics are to be chosen freely but should change continuously. The overall rate of change should be adapted from the rate of change heard in the electronic sounds.

At times, the electronics will not produce any sounds. That may happen when the performers hit the target pitches, or when the parameter settings don't allow for more pitches. When there is no sound, the players should not change fingerings but only change bow position, bowing pressure and bowing speed. They should first slowly become quieter and then move the bow gradually to the bridge and increase pressure and become louder in order to increase the amount of spectral possibilities. Only upon hearing a pitch generated by the electronics should they change fingerings and seek new harmonics, multiphonics etc.

## Tunings




## Electronics

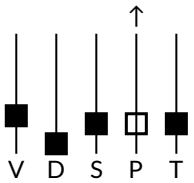
### Setup

The sound of both instruments is to be amplified. The electronics receive two channels (each instrument's microphone signal). The electronics generate four channels. The first two channels are the signals to be heard by the performers on stage via bone conducting headphones. The latter two channels are to be played back over loudspeakers in the room, mixed with the amplified microphone signals.

The C++ and SuperCollider source code can be downloaded from: https://github.com/lucdoebereiner/spur-electronics

### Parameters

The parameter settings are displayed by means of diagrams.




The arrows denote the direction of parameter transitions. Squares that are not filled show which parameter is to changed.

**Amplitude**
Controls the amplitude of the live electronics played back over the loudspeakers. It does not control the level of the electronics listened to by the musicians. This parameter is not explicitly notated in the score. The level should be kept low enough to blend with the sound of the amplified instruments.

**Number of voices** (V)
The maximum number of simultaneously sounding oscillators per instrument. *Min* = 1 voice, *Max* = 8 voices.

**Difference frequencies** (D)
The likelihood that either a partial from the analysis is chosen or a sum or difference frequency is calculated. *Min* = no difference frequencies, *Max* = only difference frequencies.

**Speed factor** (S)
A general time factor that speeds up the process of selecting a partial and controls the duration of maintaining a selected partial. *Min* = faster, *Max* = slower.

**Pauses factor** (P)
*Min* = shorter pauses between playing selected partials, *Max* = longer pauses.

**Peakedness threshold** (T)
Only spectral peaks are selected for

# Spur

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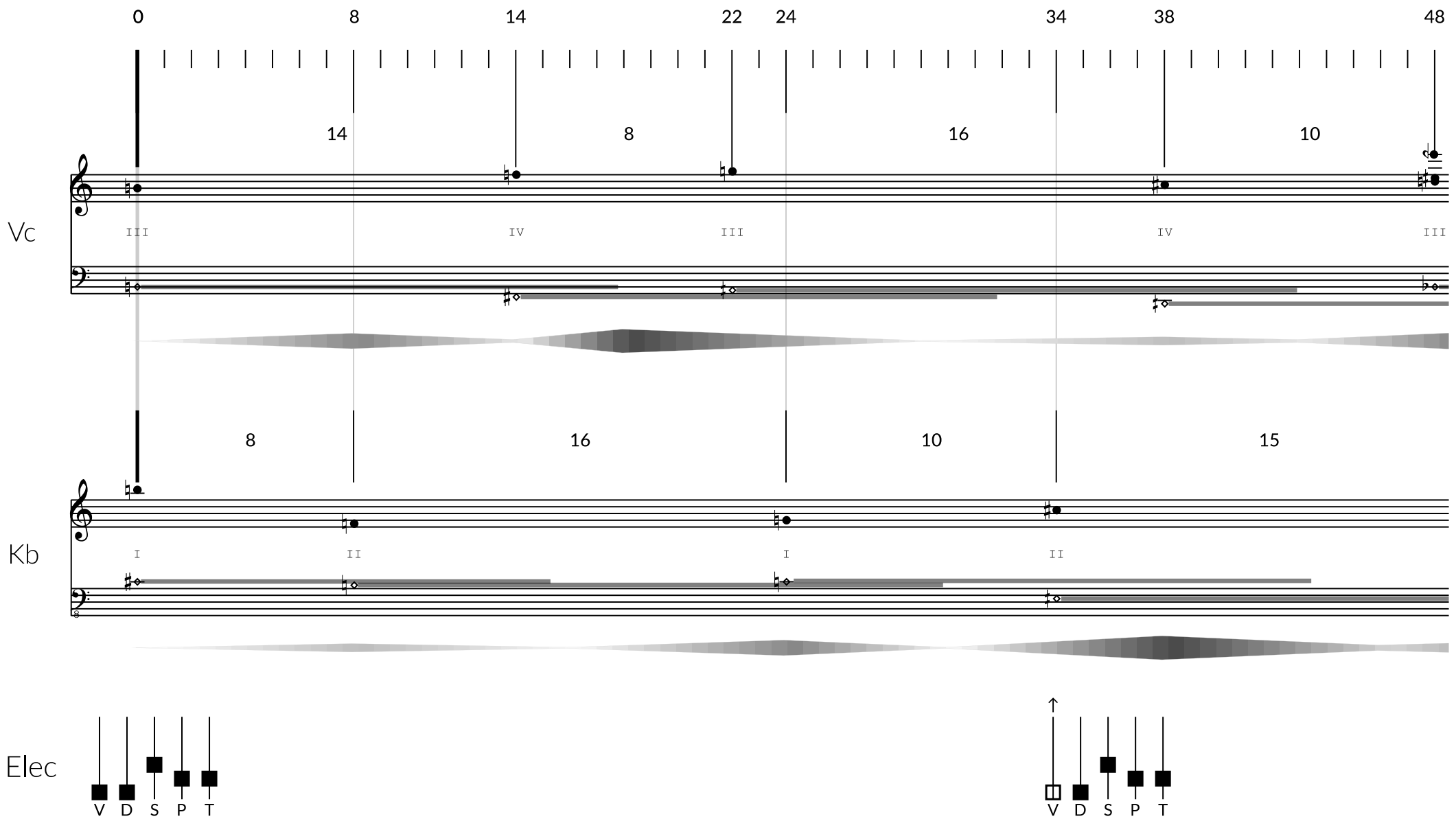

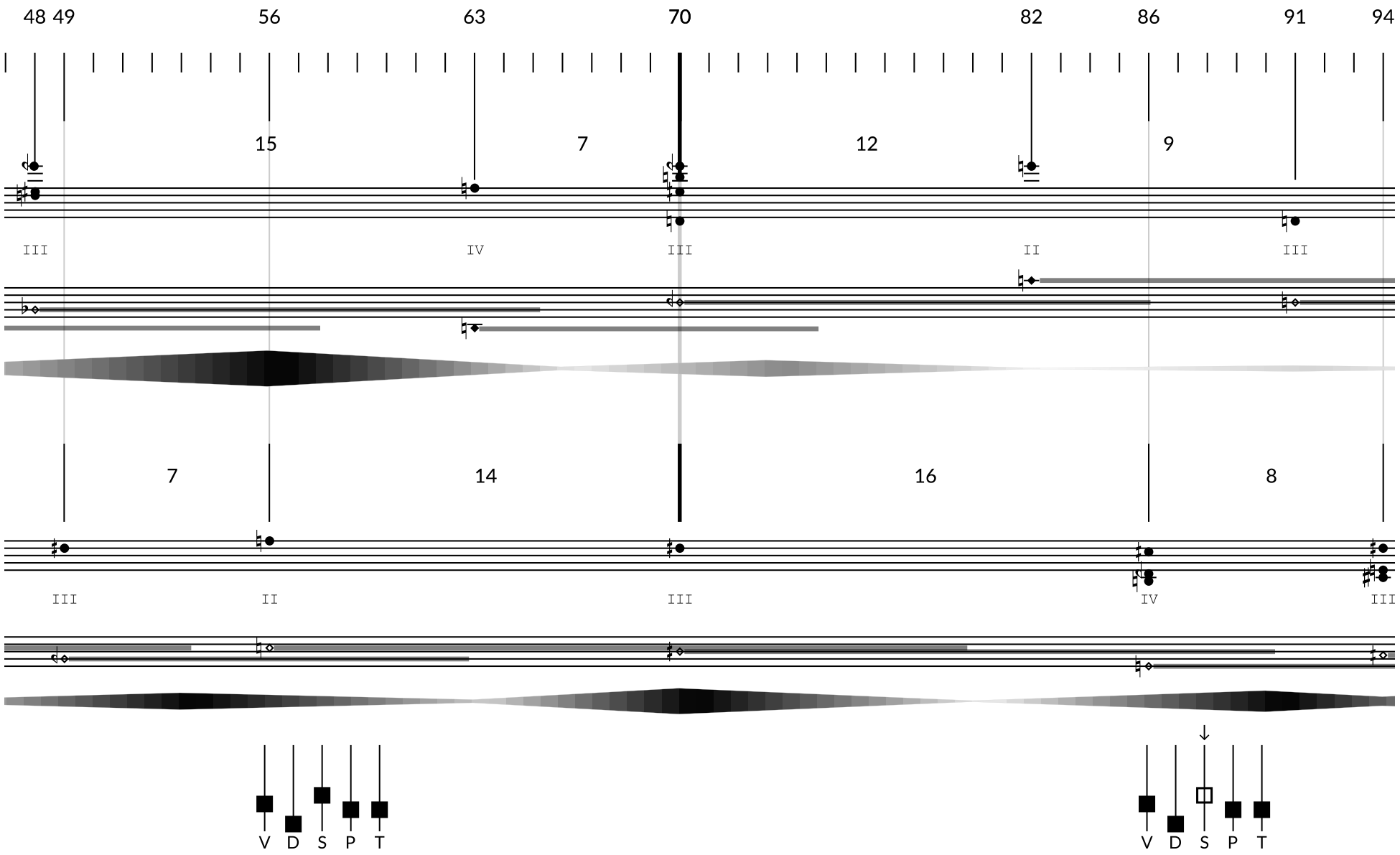
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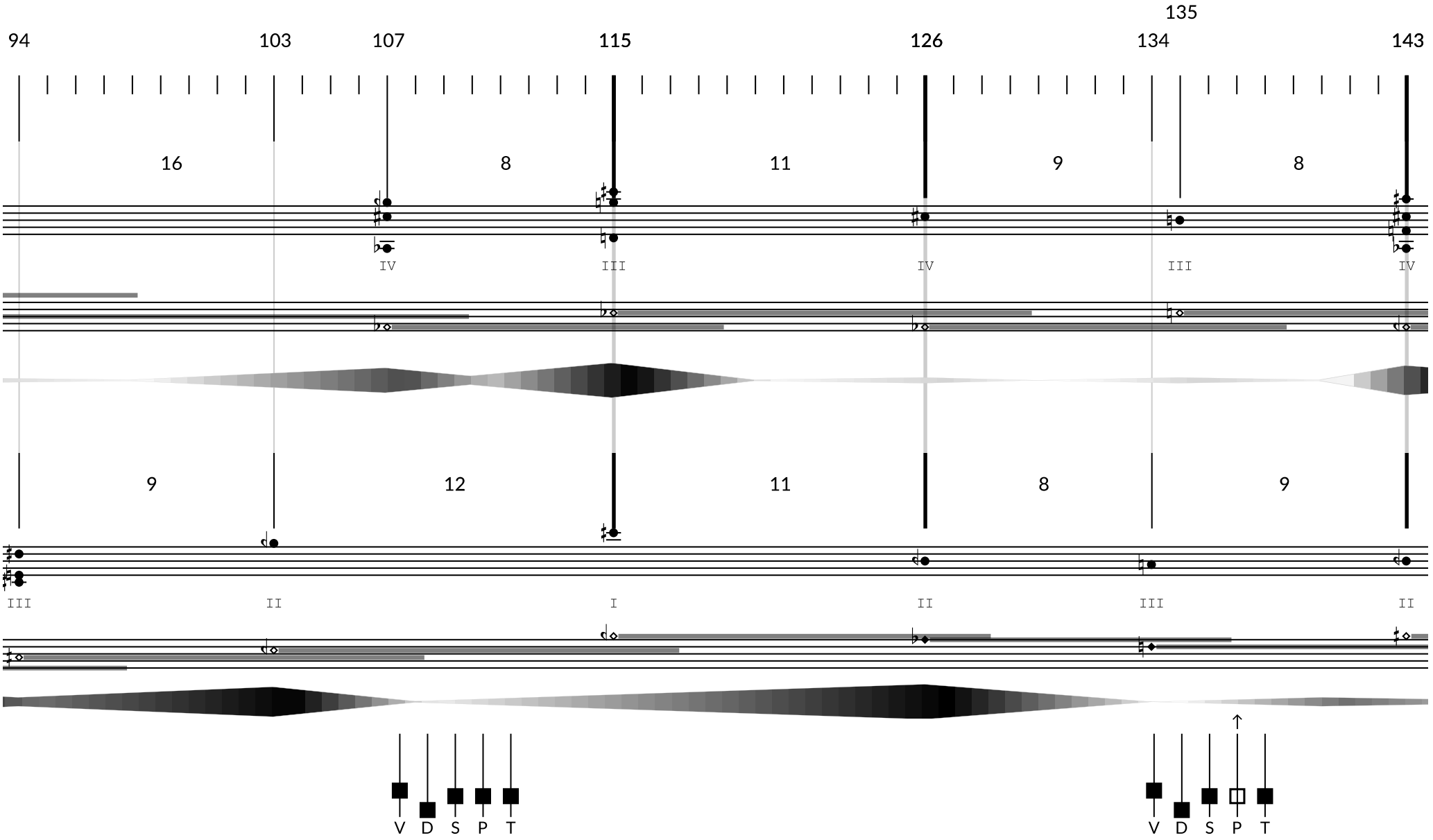
V D S P T
V D S P T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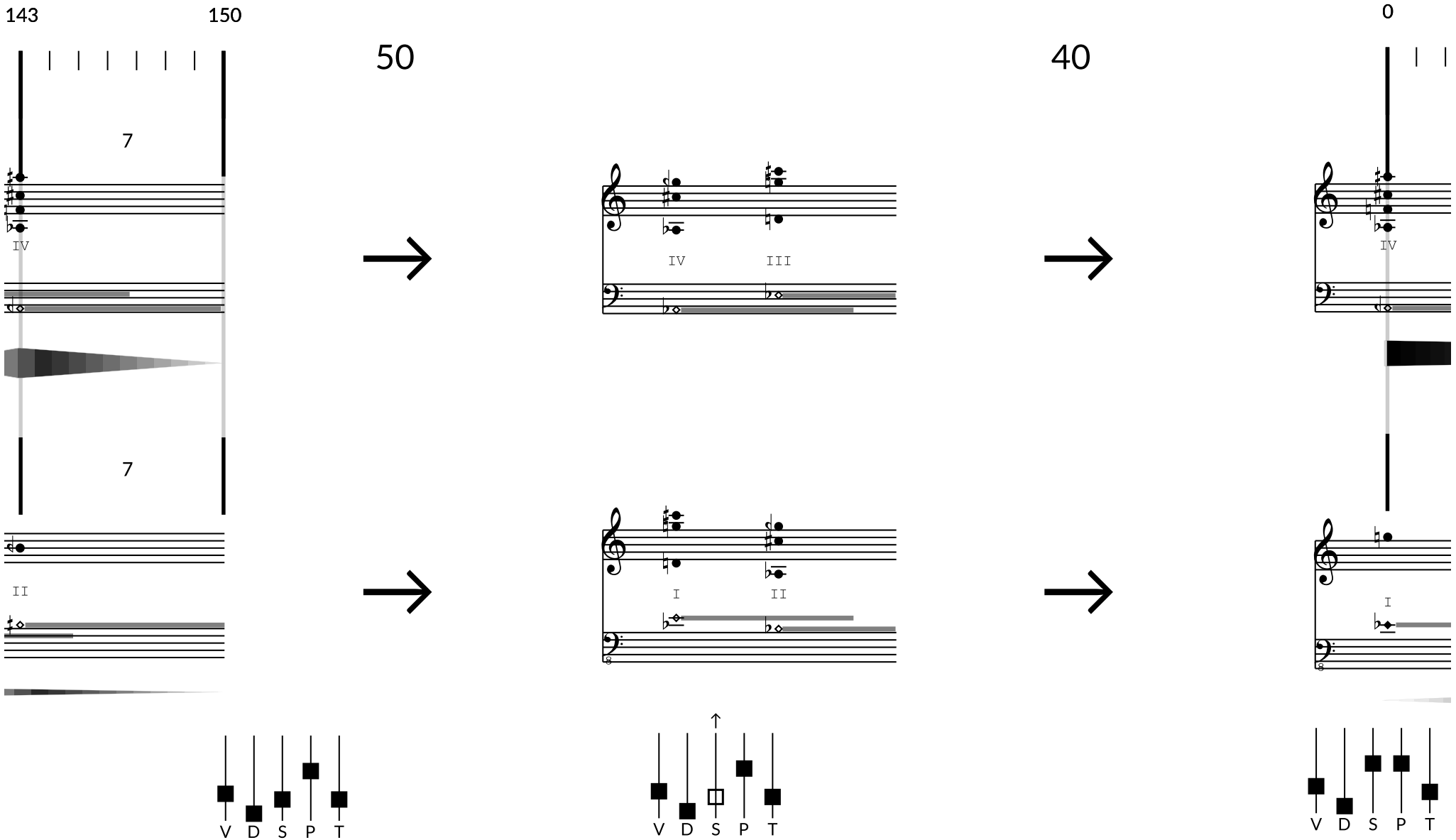
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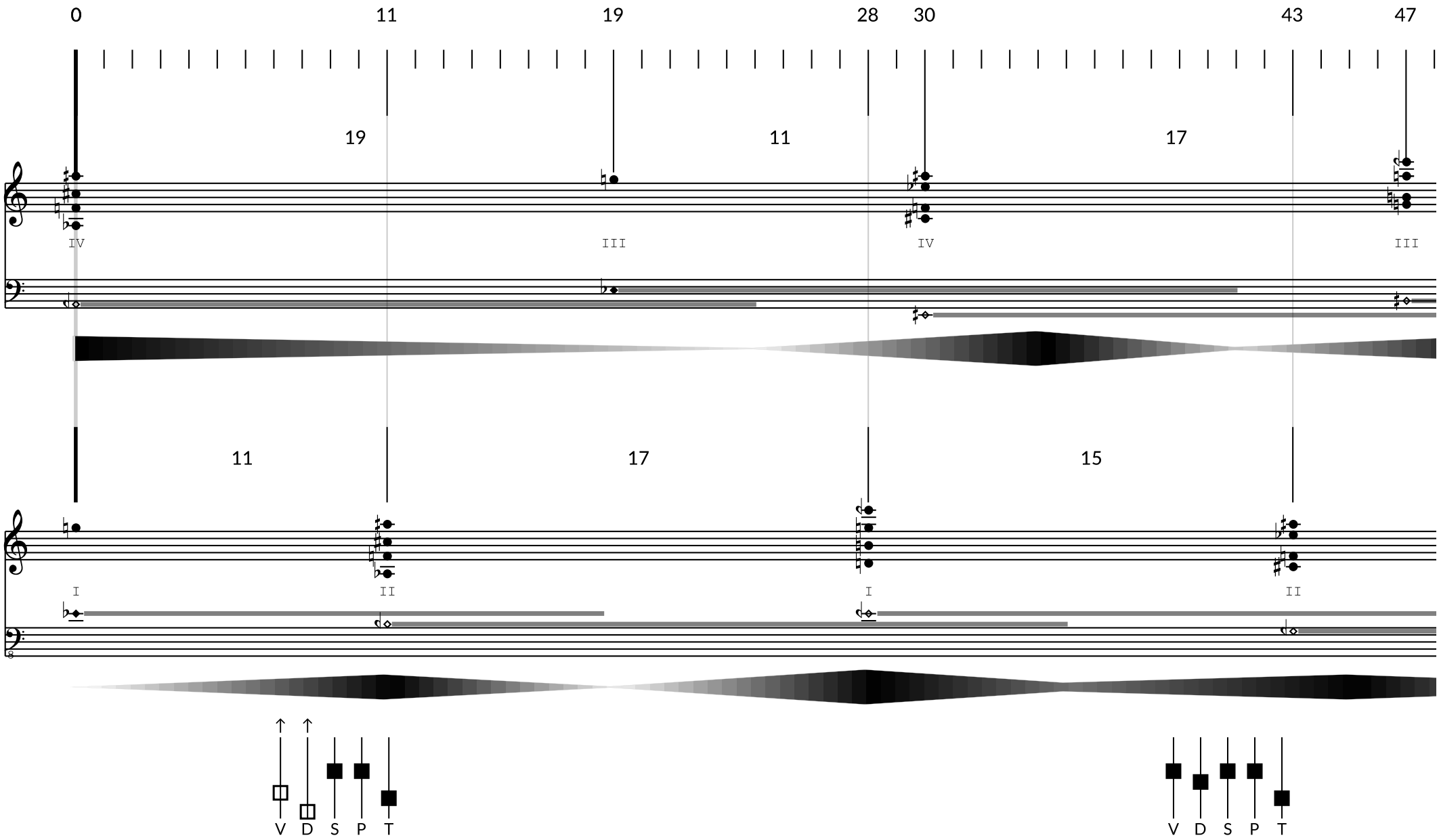
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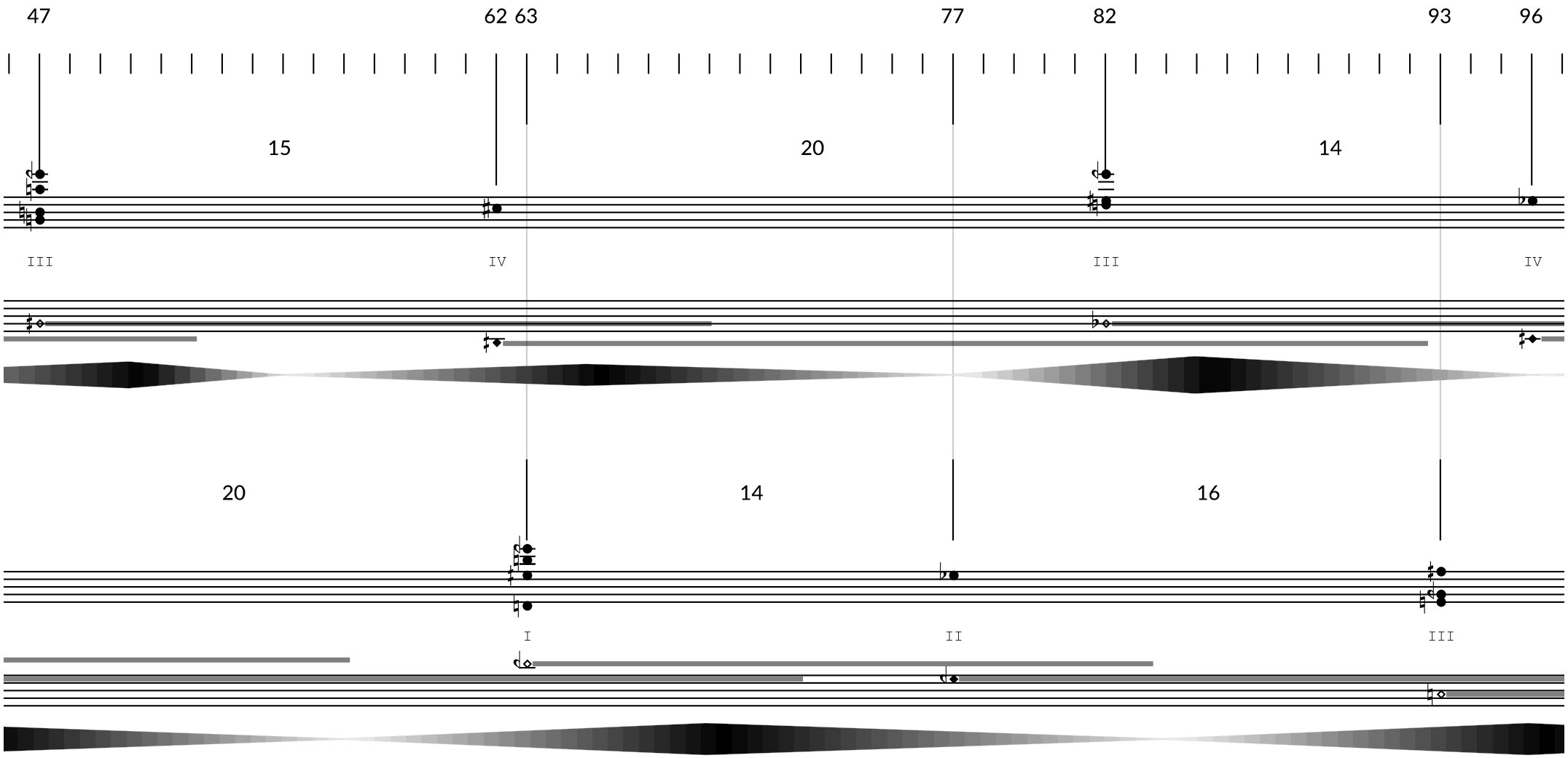
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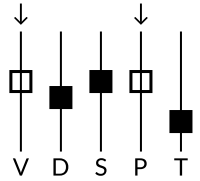
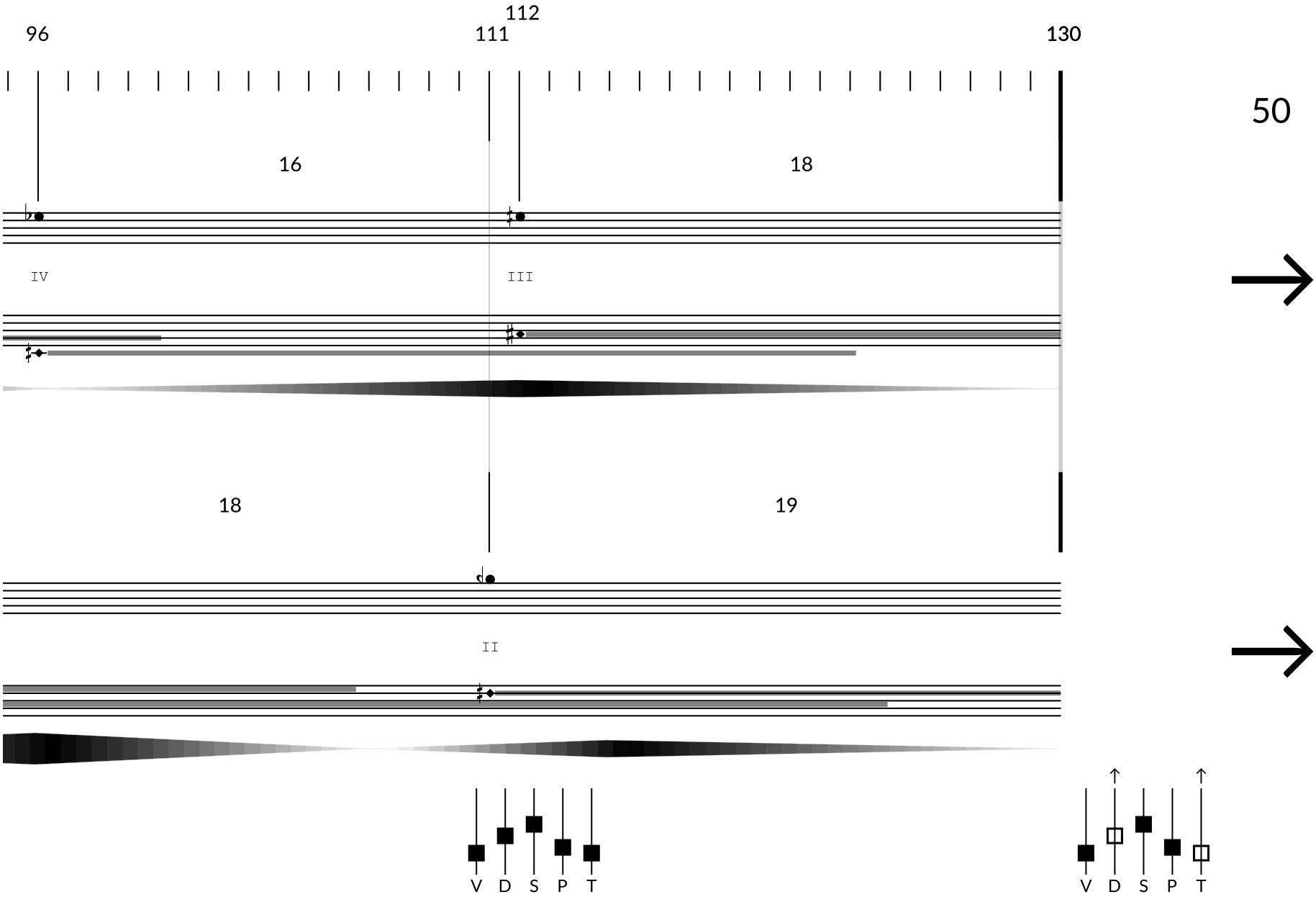

V D S P T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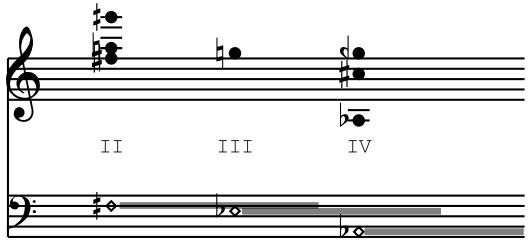
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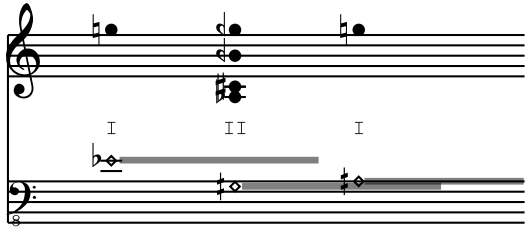
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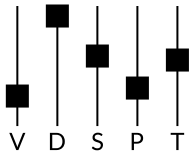
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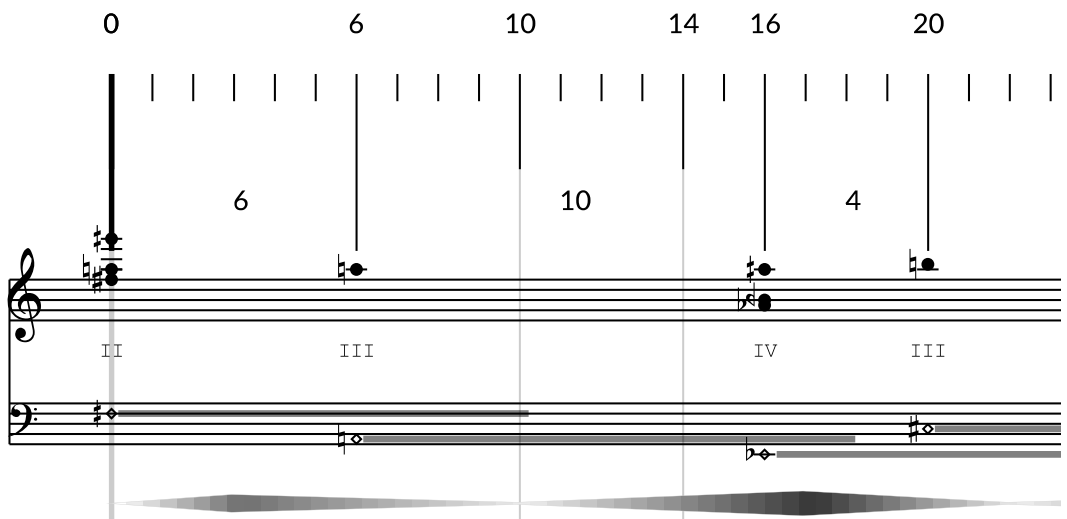
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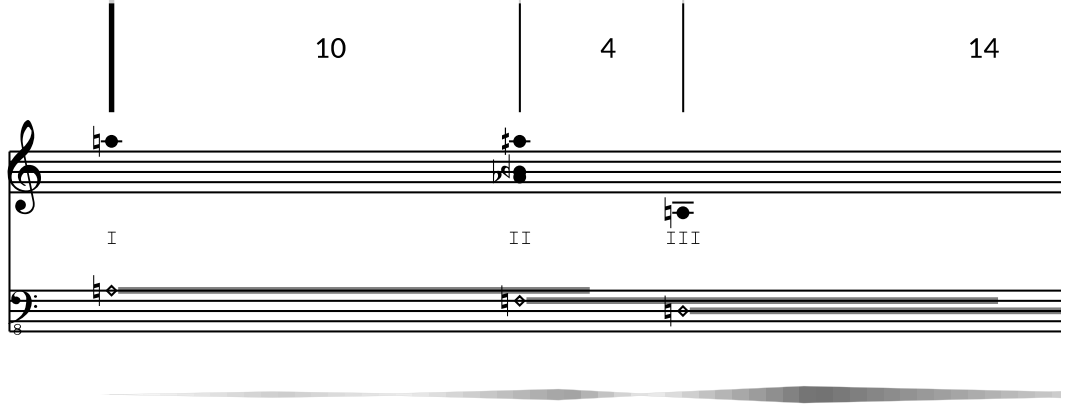
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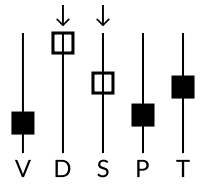
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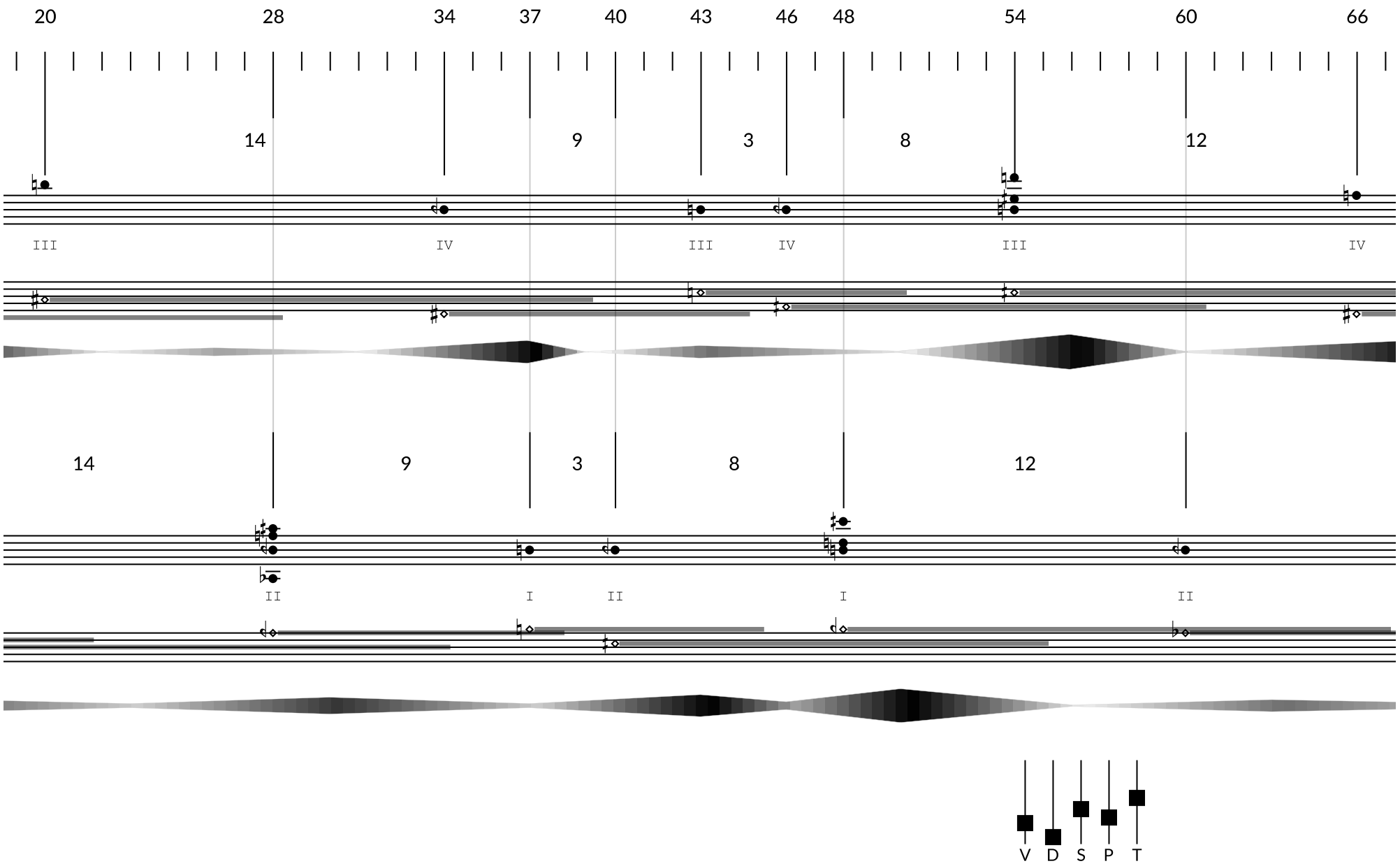
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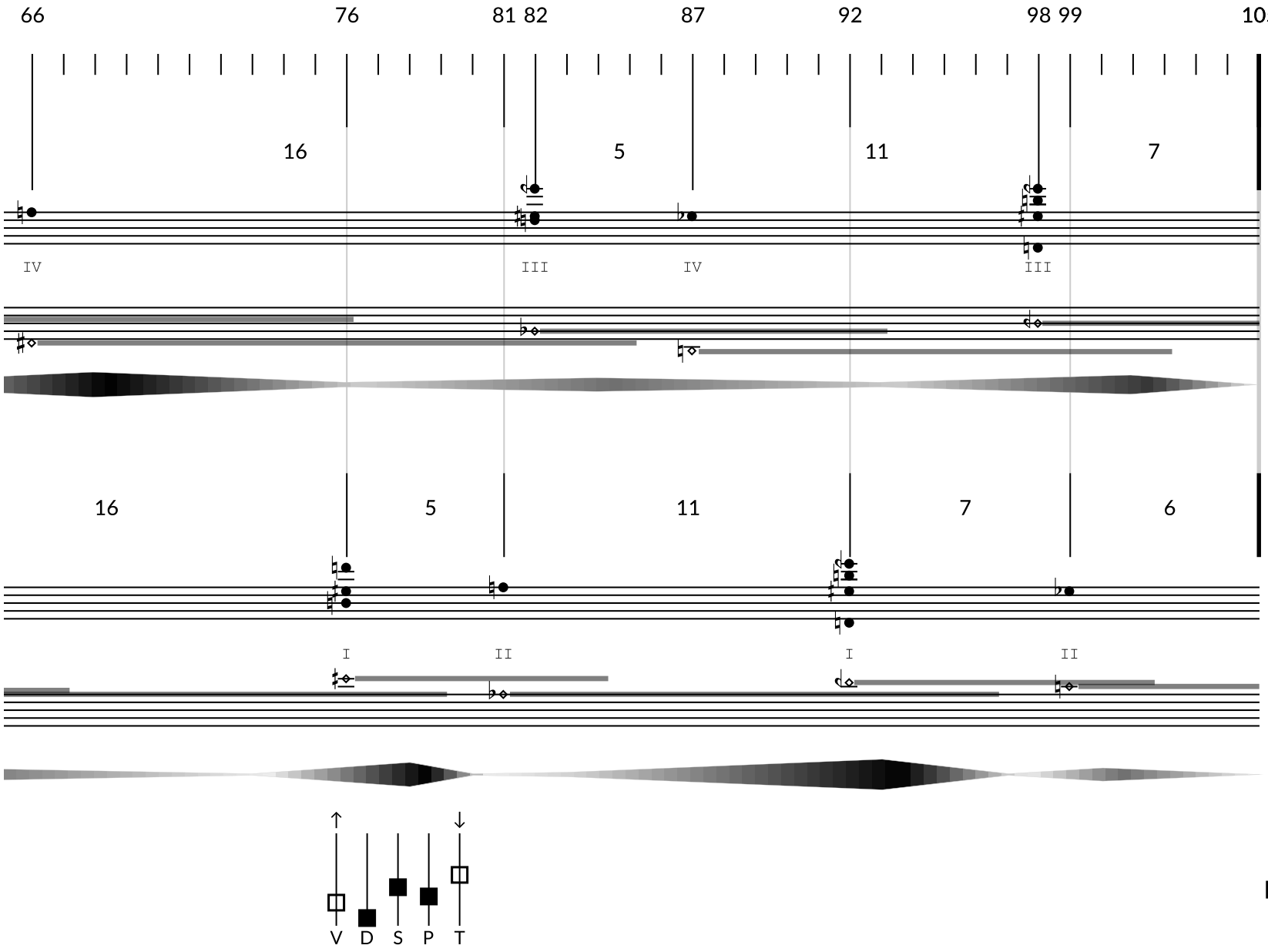
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left hand between bow and bridge
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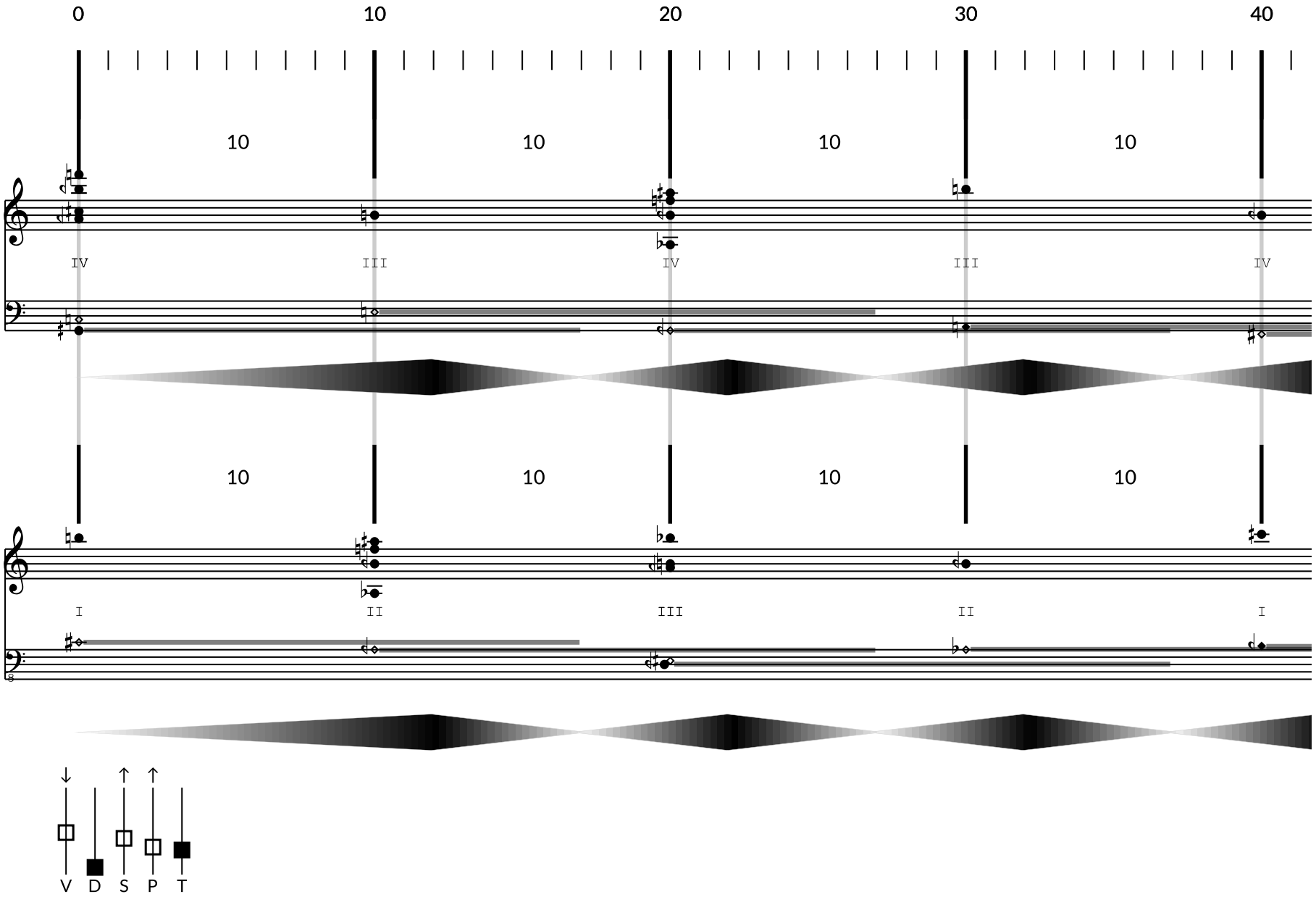
left hand between bow and bridge
V D S P T
V D S P T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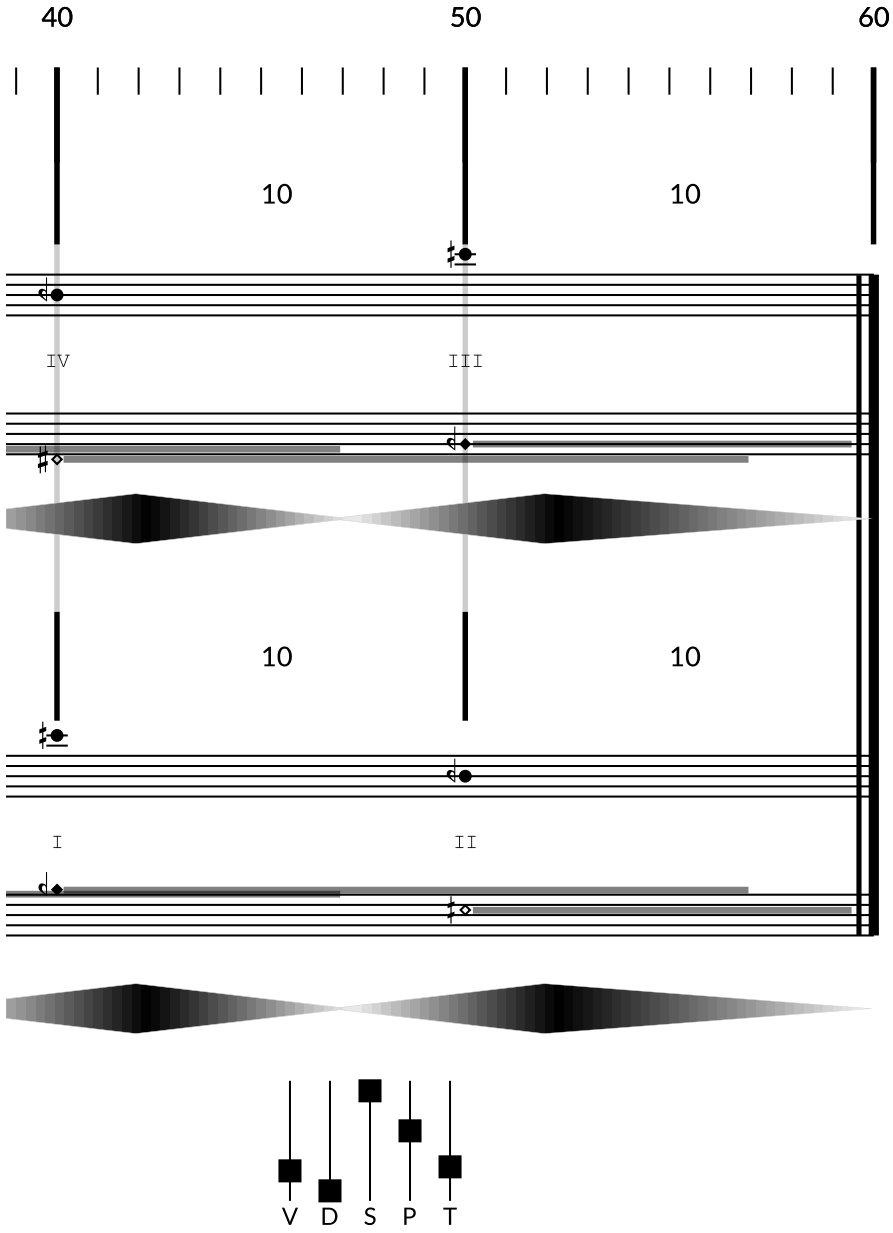


Berlin/Graz, Mai 2019