



A JOURNAL OF THE SOCIETY FOR MUSIC THEORY

### **MTO 31.4 Examples: Moreira, Weird, Menacing, and Colorful**

(Note: audio, video, and other interactive examples are only available online)

<https://www.mtosmt.org/issues/mto.25.31.4/mto.25.31.4.moreira.html>

**Example 1.** Polytonal harmonies in selected Hollywood movies: (a) Bernard Herrmann: “Roof-top” (*Vertigo*, 1958); (b) Max Steiner: “Knives” (*Arsenic and Old Lace*, 1944); (c) John Williams: “The Reunion” (*The War of the Worlds*, 2005); (d) Max Steiner: “Mrs. Hammond” (*The Letter*, 1940); (e) John Williams: “Far From Home” (*E. T.*, 1982)



(a)



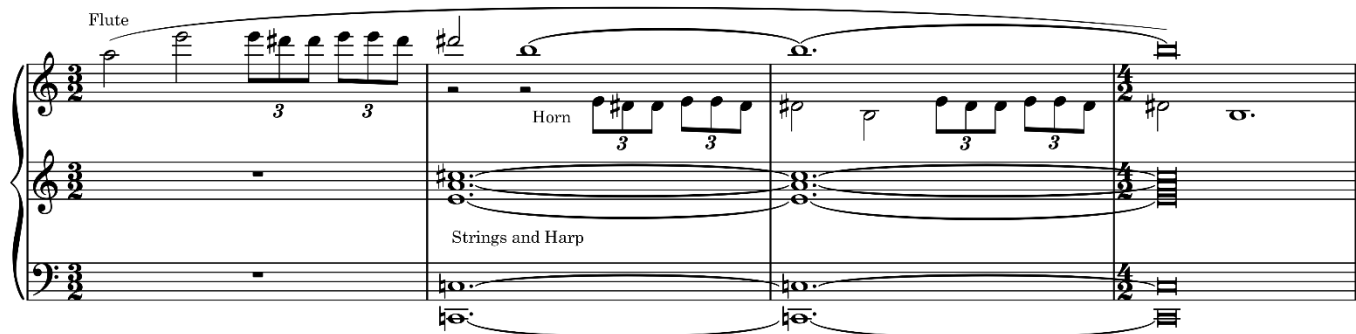
(b)



(c)



(d)



(e)

**Example 2.** Bernard Herrmann, “The Delivery” (*It’s Alive*, [00:13:26–00:14:07])

The image displays a musical score for the song "The Sound of Silence" by Simon & Garfunkel. The score is written for a piano, organ, and a large brass section. The piano part is in the treble clef, and the organ part is in the bass clef. The brass section includes tubas, trombones, and clarinets. The score is in 4/4 time and features a key signature of one sharp (F#). The tempo is marked "Andante". The score includes various musical notations such as notes, rests, and dynamic markings like "ff" (fortissimo) and "sf" (sforzando). The organ part is marked "Organ" and the piano part is marked "Piano". The brass section is marked "Tubas", "Trombones", and "Clarinets". The score is divided into two systems, with the first system starting at measure 1 and the second system starting at measure 11. The first system ends at measure 10, and the second system ends at measure 14. The score is a full orchestration of the song, capturing the iconic sound of the original recording.

**Example 3.** Bernard Herrmann, “The Scar” (*Sisters*, [00:15:48–00:16:53])

Example 3 is a musical score for Bernard Herrmann's "The Scar" from the film *Sisters*. The score is in 4/4 time and consists of two systems. The first system (measures 1-8) features a piano (*p*) texture. The top staff has a treble clef and a key signature of two flats (Bb, Eb). The bottom staff has a bass clef and a key signature of two flats (Bb, Eb). The instrumentation includes 3 Eng. Hns., 3 Cls., 2 Bass Cls. Contr. Cl., Vlns., and Vib. The second system (measures 9-16) features a very soft (*pp*) texture. The top staff has a treble clef and a key signature of two flats (Bb, Eb). The bottom staff has a bass clef and a key signature of two flats (Bb, Eb). The instrumentation includes 3 Eng. Hns., 3 Cls., 2 Bass Cls. Contr. Cl., Vlns., and Vib.

**Example 4.** Bernard Herrmann, “The Giant Crab” (*Mysterious Island*, [00:29:17–00:29:32])

Example 4 is a musical score for Bernard Herrmann's "The Giant Crab" from the film *Mysterious Island*. The score is in 4/4 time and consists of two systems. The first system (measures 1-3) features a fortissimo (*ff*) texture. The top staff has a treble clef and a key signature of one flat (Bb). The bottom staff has a bass clef and a key signature of one flat (Bb). The instrumentation includes Cls., Bass Cls., Cls. + Bsns., Bass Cls. + Bsns., Cls. + Bsns. + Vlas., Bass Cls. + Bsns. + Vlcs. & DBs., Hns., Upper triad: 3 Tpts. (+ 3 Cls.), Lower triad: 3 Tbns. (+ 3 Eng. Hns.), and Tubas + Vlcs. & DBs. The second system (measures 4-6) features a fortissimo (*ff*) texture. The top staff has a treble clef and a key signature of one flat (Bb). The bottom staff has a bass clef and a key signature of one flat (Bb). The instrumentation includes Cls., Bass Cls., Cls. + Bsns., Bass Cls. + Bsns., Cls. + Bsns. + Vlas., Bass Cls. + Bsns. + Vlcs. & DBs., Hns., Upper triad: 3 Tpts. (+ 3 Cls.), Lower triad: 3 Tbns. (+ 3 Eng. Hns.), and Tubas + Vlcs. & DBs.

**Example 5.** Bernard Herrmann, “The Grenades” (*The Naked and the Dead*, [01:26:20–01:26:38])

Abm\Dm -----

All notes with pattern: *sf*  $\longrightarrow$  *sf*

Tpts.  
Hns.  
Tbn.  
Tubas

**Example 6.** Bernard Herrmann, “The Pass” (*The Naked and the Dead*, [01:28:54–01:29:17])

Abm\Gm F#m\Gm

Tpts.  
Tbn.

*mp*  $\longrightarrow$  *sim.* *mp*  $\longrightarrow$  *sim.*

cup mutes  
harmon mutes

**Example 7.** Some polychords suggesting varying degrees of harmonic tension

(a) (b) (c) (d)

**Example 8.** The 48 bichordal classes under K-equivalence

Bichordal class (Murphy)	Bichordal class (Milhaud)	Example	Obs.	Bichordal class (Murphy)	Bichordal class (Milhaud)	Example	Obs.
M0M <sub>K</sub>	————	CM\CM	Trivial	m0m <sub>K</sub>	————	Cm\Cm	Trivial
M1M <sub>K</sub>	I-A	CM\DbM		m1m <sub>K</sub>	I-B	Cm\Dbm	
M2M <sub>K</sub>	II-A	CM\DM		m2m <sub>K</sub>	II-B	Cm\Dm	
M3M <sub>K</sub>	III-A	CM\EbM		m3m <sub>K</sub>	III-B	Cm\Ebm	
M4M <sub>K</sub>	IV-A	CM\EM		m4m <sub>K</sub>	IV-B	Cm\Em	
M5M <sub>K</sub>	V-A	CM\FM		m5m <sub>K</sub>	V-B	Cm\Fm	
M6M <sub>K</sub>	VI-A	CM\F#M		m6m <sub>K</sub>	VI-B	Cm\F#m	
M7M <sub>K</sub>	VII-A	CM\GM		m7m <sub>K</sub>	VII-B	Cm\Gm	
M8M <sub>K</sub>	VIII-A	CM\AbM		m8m <sub>K</sub>	VIII-B	Cm\Abm	
M9M <sub>K</sub>	IX-A	CM\AM		m9m <sub>K</sub>	IX-B	Cm\Am	
M10M <sub>K</sub>	X-A	CM\BbM		m10m <sub>K</sub>	X-B	Cm\Bbm	
M11M <sub>K</sub>	XI-A	CM\BM		m11m <sub>K</sub>	XI-B	Cm\Bm	
M0m <sub>K</sub>	————	CM\Cm		m0M <sub>K</sub>	————	Cm\CM	
M1m <sub>K</sub>	I-C	CM\Dbm		m1M <sub>K</sub>	I-D	Cm\DbM	
M2m <sub>K</sub>	II-C	CM\Dm		m2M <sub>K</sub>	II-D	Cm\DM	
M3m <sub>K</sub>	III-C	CM\Ebm		m3M <sub>K</sub>	III-D	Cm\EbM	
M4m <sub>K</sub>	IV-C	CM\Em		m4M <sub>K</sub>	IV-D	Cm\EM	
M5m <sub>K</sub>	V-C	CM\Fm		m5M <sub>K</sub>	V-D	Cm\FM	
M6m <sub>K</sub>	VI-C	CM\F#m		m6M <sub>K</sub>	VI-D	Cm\F#M	
M7m <sub>K</sub>	VII-C	CM\Gm		m7M <sub>K</sub>	VII-D	Cm\GM	
M8m <sub>K</sub>	VIII-C	CM\Abm		m8M <sub>K</sub>	VIII-D	Cm\AbM	
M9m <sub>K</sub>	IX-C	CM\Am		m9M <sub>K</sub>	IX-D	Cm\AM	
M10m <sub>K</sub>	X-C	CM\Bbm		m10M <sub>K</sub>	X-D	Cm\BbM	
M11m <sub>K</sub>	XI-C	CM\Bm		m11M <sub>K</sub>	XI-D	Cm\BM	

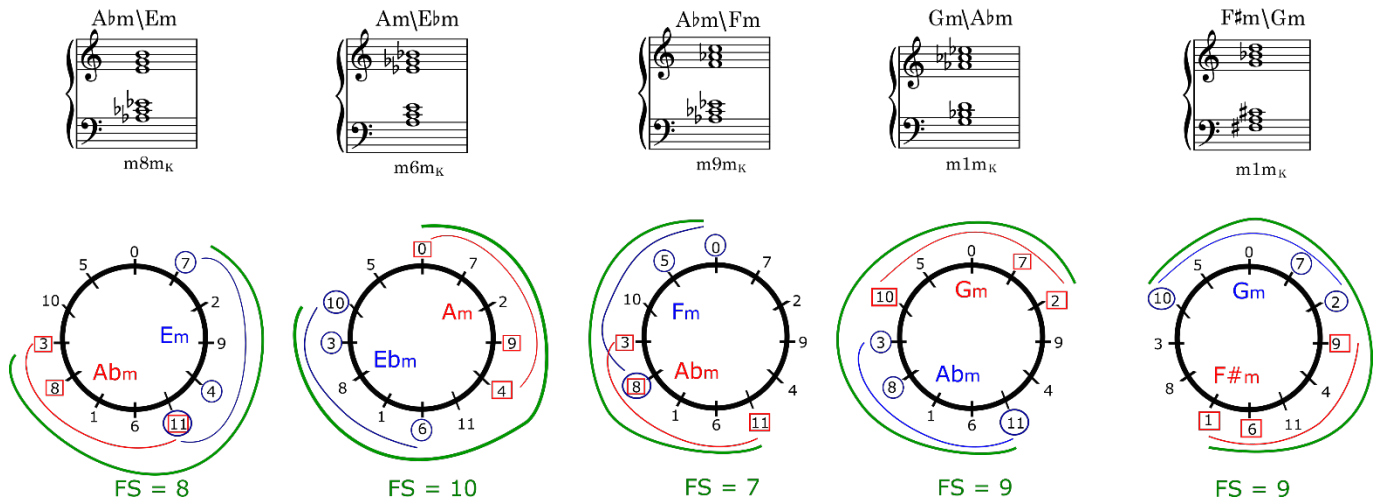
**Example 9.** The bichordal classes according to IRK, RK, and K equivalence

M1M <sub>IRK</sub>	M1M <sub>RK</sub> m1m <sub>RK</sub>	M1M <sub>K</sub> M11M <sub>K</sub> m1m <sub>K</sub> m11m <sub>K</sub>	M0m <sub>IRK</sub>	M0m <sub>RK</sub>	M0m <sub>K</sub> m0M <sub>K</sub>
M2M <sub>IRK</sub>	M2M <sub>RK</sub> m2m <sub>RK</sub>	M2M <sub>K</sub> M10M <sub>K</sub> m2m <sub>K</sub> m10m <sub>K</sub>	M1m <sub>IRK</sub>	M1m <sub>RK</sub>	M1m <sub>K</sub> m11M <sub>K</sub>
M3M <sub>IRK</sub>	M3M <sub>RK</sub> m3m <sub>RK</sub>	M3M <sub>K</sub> M9M <sub>K</sub> m3m <sub>K</sub> m9m <sub>K</sub>	M2m <sub>IRK</sub>	M2m <sub>RK</sub>	M2m <sub>K</sub> m10M <sub>K</sub>
M4M <sub>IRK</sub>	M4M <sub>RK</sub> m4m <sub>RK</sub>	M4M <sub>K</sub> M8M <sub>K</sub> m4m <sub>K</sub> m8m <sub>K</sub>	M3m <sub>IRK</sub>	M3m <sub>RK</sub>	M3m <sub>K</sub> m9M <sub>K</sub>
M5M <sub>IRK</sub>	M5M <sub>RK</sub> m5m <sub>RK</sub>	M5M <sub>K</sub> M7M <sub>K</sub> m5m <sub>K</sub> m7m <sub>K</sub>	M4m <sub>IRK</sub>	M4m <sub>RK</sub>	M4m <sub>K</sub> m8M <sub>K</sub>
M6M <sub>IRK</sub>	M6M <sub>RK</sub> m6m <sub>RK</sub>	M6M <sub>K</sub> m6m <sub>K</sub>	M5m <sub>IRK</sub>	M5m <sub>RK</sub>	M5m <sub>K</sub> m7M <sub>K</sub>
			M6m <sub>IRK</sub>	M6m <sub>RK</sub>	M6m <sub>K</sub> m6M <sub>K</sub>
			M7m <sub>IRK</sub>	M7m <sub>RK</sub>	M7m <sub>K</sub> m5M <sub>K</sub>
			M8m <sub>IRK</sub>	M8m <sub>RK</sub>	M8m <sub>K</sub> m4M <sub>K</sub>
			M9m <sub>IRK</sub>	M9m <sub>RK</sub>	M9m <sub>K</sub> m3M <sub>K</sub>
			M10m <sub>IRK</sub>	M10m <sub>RK</sub>	M10m <sub>K</sub> m2M <sub>K</sub>
			M11m <sub>IRK</sub>	M11m <sub>RK</sub>	M11m <sub>K</sub> m1M <sub>K</sub>

**Example 10.** Bernard Herrmann, “The Window” (*Sisters*, [00:28:25–00:29:11])

The musical score for "The Window" from Bernard Herrmann's *Sisters* features a piano accompaniment and a violin part. The piano part consists of three staves: 3 Cls. (Clarinets), 3 Hns. (Horns), and a Bass line. The violin part is marked with *Vib.* (Vibrato). The score is in 4/4 time and features a series of bichordal classes labeled above the piano staves: m8m<sub>K</sub>, m6m<sub>K</sub>, m9m<sub>K</sub>, m1m<sub>K</sub>, and m1m<sub>K</sub>. The piano part is marked with *pp* (pianissimo) and includes dynamic markings like *pp* and *pp*. The violin part includes a *f* (forte) marking. The score is divided into measures by vertical bar lines, with some measures containing rests.

**Example 11.** Herrmann's polychords (from "The Window," *Sisters*) in the circle of fifths



**Example 12.** The fifth span of all bichords as a measure of harmonic dissonance

RK class	K classes	FS	RK class	K classes	FS
$M1M_{RK}$	$M1M_K, M11M_K$	9	$M0m_{RK}$	$M0m_K, m0M_K$	7
$M2M_{RK}$	$M2M_K, M10M_K$	6	$M1m_{RK}$	$M1m_K, m11M_K$	8
$M3M_{RK}$	$M3M_K, M9M_K$	7	$M2m_{RK}$	$M2m_K, m10M_K$	5
$M4M_{RK}$	$M4M_K, M8M_K$	8	$M3m_{RK}$	$M3m_K, m9M_K$	10
$M5M_{RK}$	$M5M_K, M7M_K$	5	$M4m_{RK}$	$M4m_K, m8M_K$	5
$M6M_{RK}$	$M6M_K$	10	$M5m_{RK}$	$M5m_K, m7M_K$	8
$m1m_{RK}$	$m1m_K, m11m_K$	9	$M6m_{RK}$	$M6m_K, m6M_K$	7
$m2m_{RK}$	$m2m_K, m10m_K$	6	$M7m_{RK}$	$M7m_K, m5M_K$	6
$m3m_{RK}$	$m3m_K, m9m_K$	7	$M8m_{RK}$	$M8m_K, m4M_K$	9
$m4m_{RK}$	$m4m_K, m8m_K$	8	$M9m_{RK}$	$M9m_K, m3M_K$	4
$m5m_{RK}$	$m5m_K, m7m_K$	5	$M10m_{RK}$	$M10m_K, m2M_K$	9
$m6m_{RK}$	$m6m_K$	10	$M11m_{RK}$	$M11m_K, m11M_K$	6



**Example 13.** Bernard Herrmann, “The Bedroom” (*Cape Fear*, [00:33:33–00:34:05])

B $\circ$ \A $\flat$ m      F $\sharp$ M\Am      GM\G $\flat$ M      A $\flat$ M\GM      F $\sharp$ M\Em      Em\E $\flat$ m

6 solo Doublebasses (all with vibrato)

M3m<sub>K</sub>      M11M<sub>K</sub>      M11M<sub>K</sub>      M10m<sub>K</sub>      m11m<sub>K</sub>

B $\circ$ \A $\flat$ m      F $\sharp$ M\Am      GM\G $\flat$ M      A $\flat$ M\GM      F $\sharp$ M\Em      Em\E $\flat$ m

FS = 10      FS = 10      FS = 9      FS = 9      FS = 9      FS = 9

**Example 14.** Instances of ro1 and ro11 in selected bichords from *Sisters* (on the left) and *Cape Fear* (on the right)

A $\flat$ m\Em      F $\sharp$ m\Gm      F $\sharp$ M\Am      Em\E $\flat$ m

ro11      ro1      ro1      ro1      ro11      ro11      ro11      ro11      ro11

**Example 15.** Bernard Herrmann, “The Snake” (*The Naked and the Dead*, [01:20:00–01:20:18])

Gm\Abm  
3 Tpts. (cup mutes)  
3 Tpts. (hard mutes)  
3 Tbns. (cup mutes)  
8 Horns  
3 Tbns. (hard mutes)  
Bsn. and Ctrbsn.  
Hrps. (with pedal glissando)  
f  
ff  
ff  
ff

6  
Abm\Gm  
Am\Abm  
Bbm\Am  
Bm\Bbm  
6 Tbns.  
Hrps. and Tubas  
ff  
ff  
ff  
ff

**Example 16.** Beating between ic1-related harmonic spectra (with 8 partials each in this abstract example)

(a) Beating between the partials of two harmonic spectra separated by i1, the pitch interval of 1 semitone.

(b) Beating between the partials of two harmonic spectra separated by i11, the pitch interval of 11 semitones.

(c) Beating between the partials of two harmonic spectra separated by i13, the pitch interval of 13 semitones.

(d) Beating between the partials of two harmonic spectra separated by i25, the pitch interval of 25 semitones.

**Example 17.** Igor Stravinsky, “The Shrovetide Fair,” mm. 41–53 (*Petrouchka*)

Vivace

**Example 18.** William Schuman, *Three-Score Set* for piano solo, II, mm. 1–4

**Example 19.** Igor Stravinsky, “Dances des Adolescentes,” mm. 1–8 (*The Rite of Spring*)

**Example 20.** Bernard Herrmann, “The House” (*North by Northwest*, [01:50:44–01:50:57])

Example 21. Bernard Herrmann, “The Cliff” (*North by Northwest*, [02:08:58–02:09:14])

Woodwinds & Tuba Cm\Bm Em\ Ebm

ff

Tpts. Hns. Tbns.

Timp.

3

m11m<sub>K</sub>

3

m11m<sub>K</sub>

4

Abm\Gm Ebm\DM

Tpts. Hns. Tbns.

Timp.

3

m11m<sub>K</sub>

3

m11m<sub>K</sub>

m11M<sub>K</sub>

**Example 22.** Bernard Herrmann, “The Couch” (*Sisters*, [00:55:12–00:55:19]): (a) Herrmann’s polyharmony as the superimposition of four instrumental groups (b) Herrmann’s polyharmony as the superimposition of two half-diminished chords (c) The half-diminished motive in the “Prelude” [00:00:00–00:00:04]

3 Clarinets

3 English Horns

4 Horns

2 Bass Clarinets

*pp*

(a)

B $\emptyset$ 7 \ C $\emptyset$ 7

Clarinet  
English Horns  
Horns  
Bass Clarinets

(b)

C $\emptyset$ 7 B $\emptyset$ 7 C $\emptyset$ 7 B $\emptyset$ 7

2 Horns & 3 English Horns

*sf sf sim.*

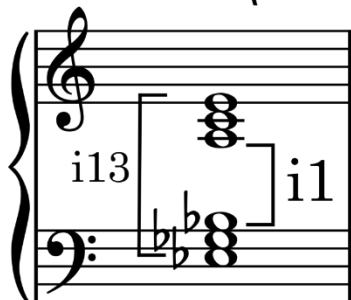
2 Horns & 3 Clarinets

(c)

Example 23. Sharp-dissonance vector (SDV) and fifth span (FS) for: (a) the first polychord from “Scar” (b) the polychord from “The Couch”

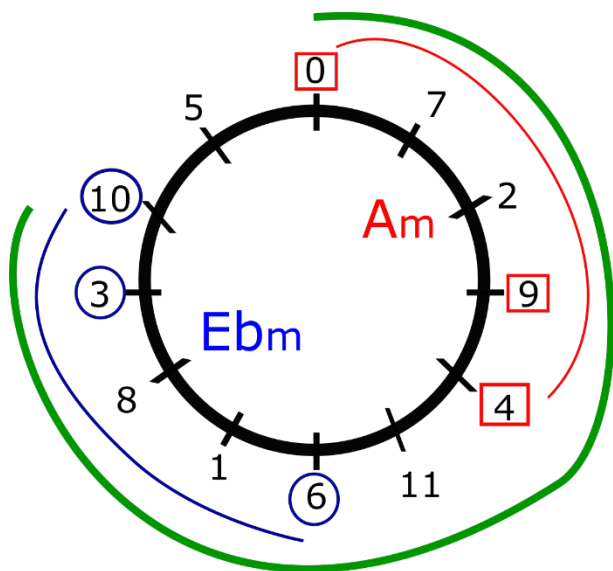
(a)

$E\flat m \backslash A m$



$m6m_K$

SDV:  $\begin{pmatrix} 110 \\ 00 \end{pmatrix}$



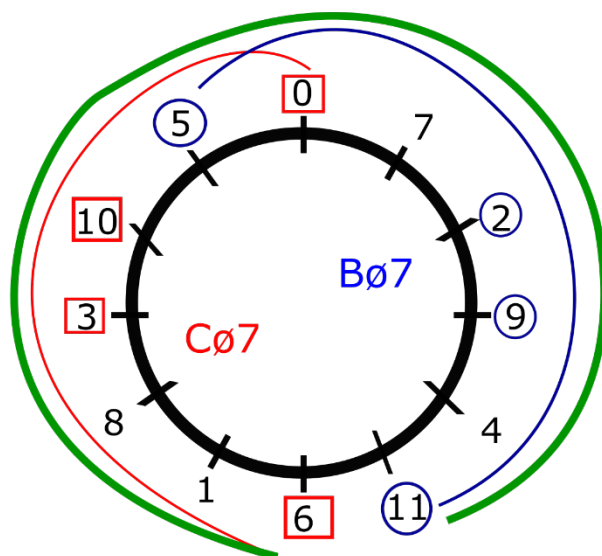
FS = 10

(b)

$B\emptyset 7 \backslash C\emptyset 7$

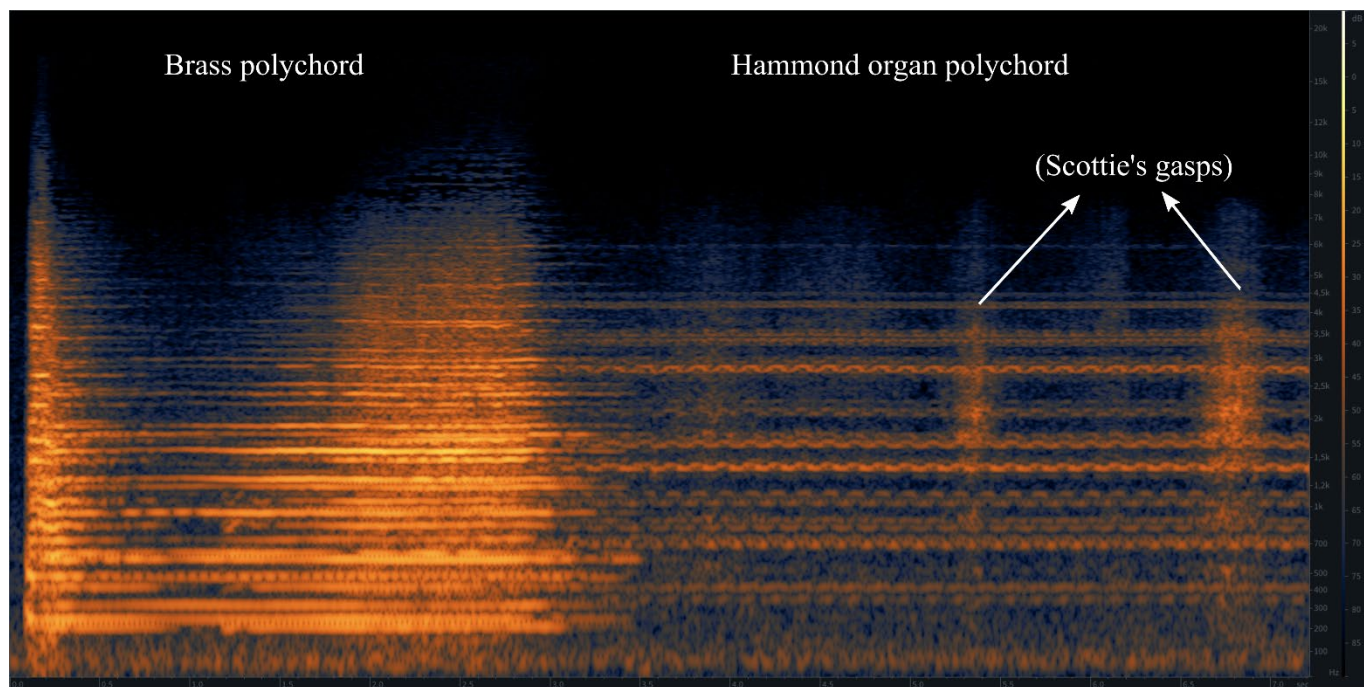


SDV:  $\begin{pmatrix} 400 \\ 00 \end{pmatrix}$



FS = 11

**Example 24.** Bernard Herrmann: “The Window” (*Vertigo*, [00:11:05–00:11:13])



Abm\Gm      Fm\F#m

Hammond organ

*pp*

Trumpets

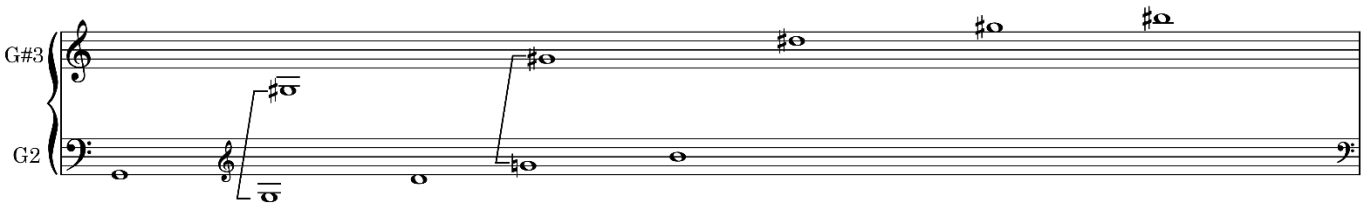
*sfp* *sff*

Trombones

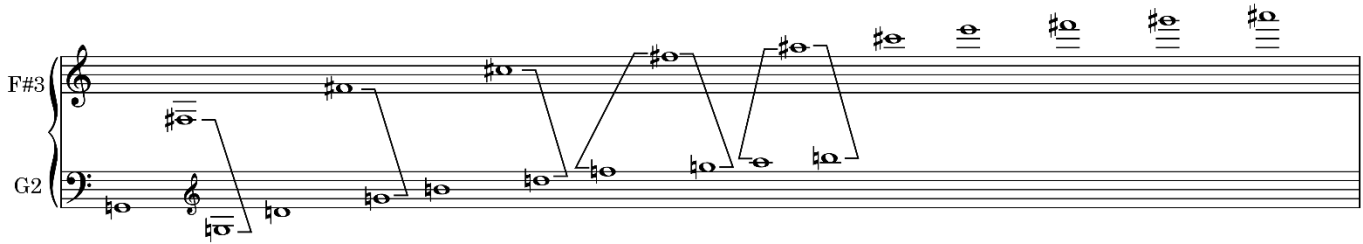
A musical score for the "The Window" scene from *Vertigo*. The score is in 3/2 time and consists of three staves. The top staff is for the Hammond organ, with a key signature change from Abm to Gm and then to Fm/F#m. The middle staff is for the Trumpets, and the bottom staff is for the Trombones. The Trumpets and Trombones parts are marked with *sfp* (sforzando piano) and *sff* (sforzando forte). The Hammond organ part is marked with *pp* (pianissimo).



**Example 25.** Abstract illustration of how a richer acoustic spectrum tends to imply more auditory roughness

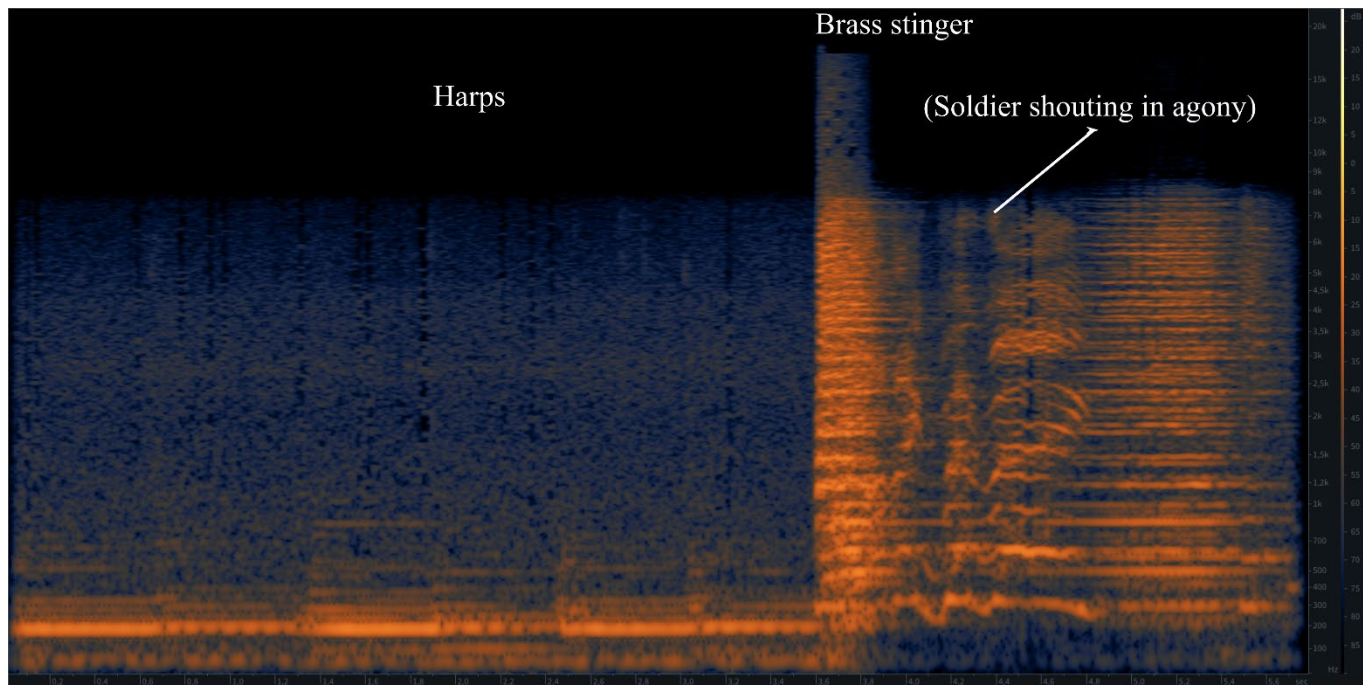


(a) Beating between the partials of two i13-related harmonic spectra with only 5 overtones each.



(b) Beating between the partials of two i11-related harmonic spectra with 10 overtones each.

**Example 26.** Bernard Herrmann: “The Snake” (*The Naked and the Dead*, [01:20:04–01:20:09])



Gm\Abm

6 trumpets

*f*

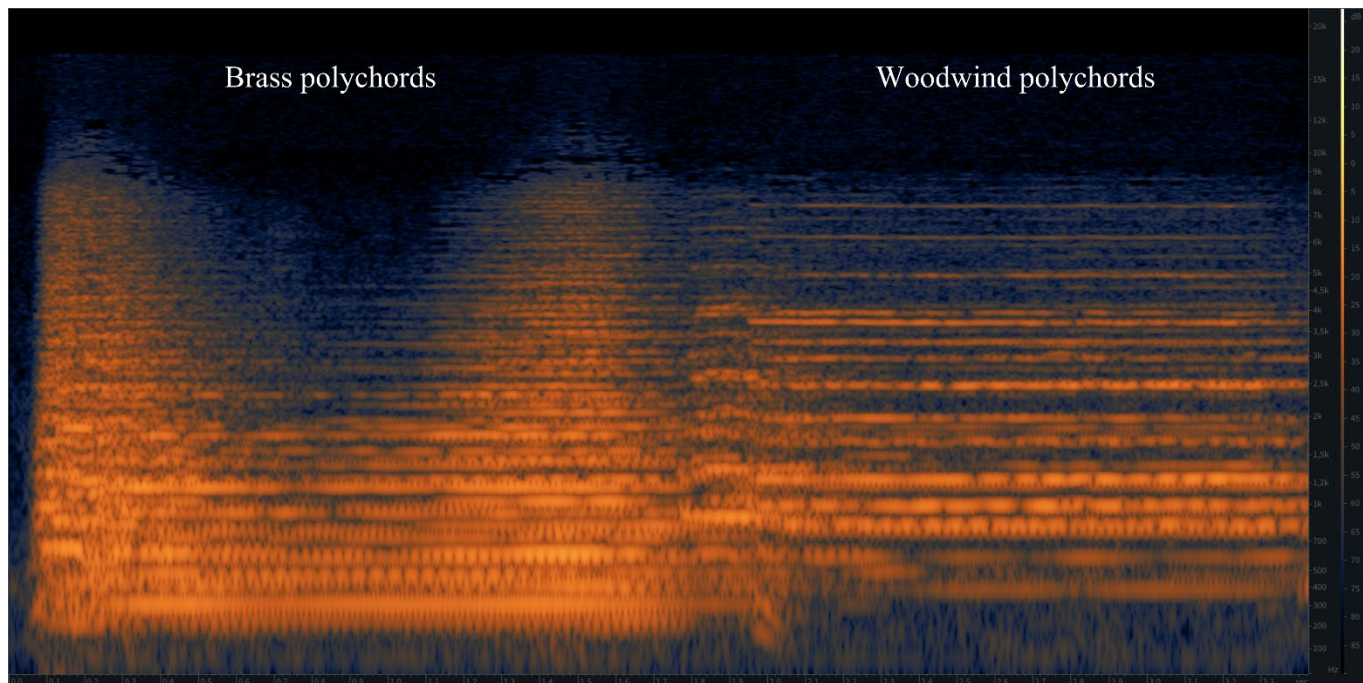
Harps (with pedal glissando)

*sfp*

6 trombones

A musical score for 6 trumpets and 6 trombones. The score is in 4/4 time and G major/Ab minor. The trumpets part is in the upper staff, and the trombones part is in the lower staff. The harps part is indicated by a glissando line. The score includes dynamic markings *f* and *sfp*.

**Example 27.** Bernard Herrmann: “The Knife” (*North by Northwest*, [00:36:20–00:36:28])



Woodwinds

Tpts.

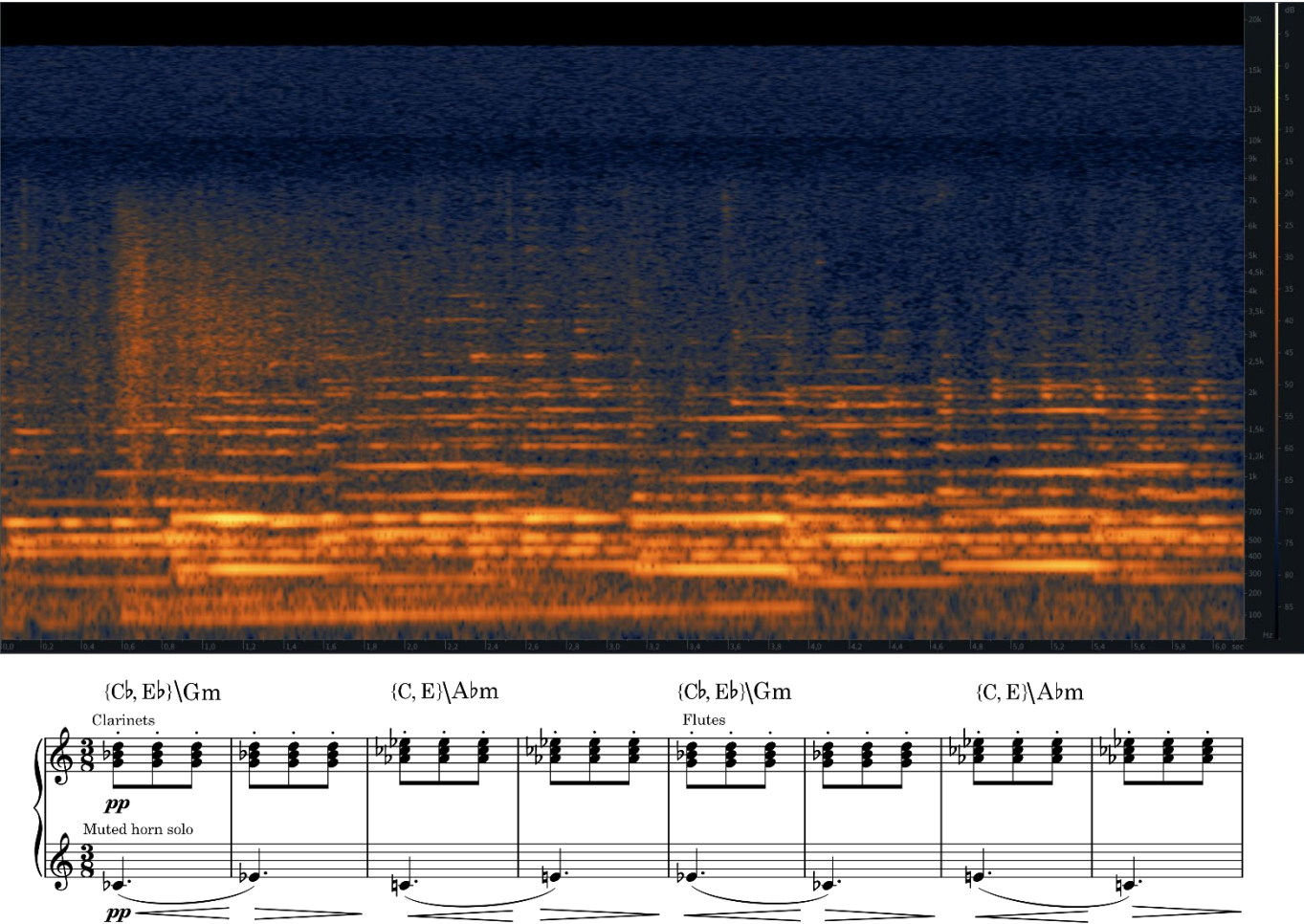
Trbs.

Woodwinds

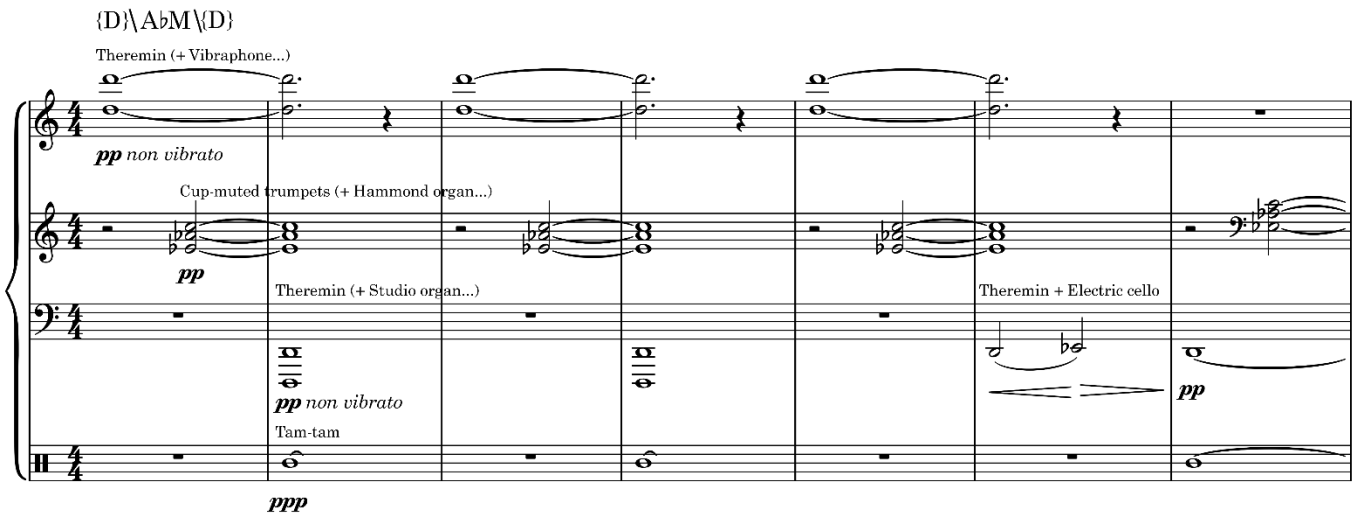
*sf* *sf* *ff* *sf* *sf* *ff*

A musical score for the "The Knife" scene, showing the first two measures. The score is in 2/4 time and features a key signature of one flat (B-flat). The top staff is for Trumpets (Tpts.) and the bottom staff is for Trombones (Trbs.). The woodwind parts are indicated by the labels "Woodwinds" above and below the staves. The score includes dynamic markings: *sf* (sforzando), *sf* (sforzando), and *ff* (fortissimo). The woodwind parts are marked with accents (>).

Example 28. Bernard Herrmann: “The House” (*North by Northwest*, [01:50:44–01:50:51])



Example 29. Bernard Herrmann: “Klaatu” (*The Day the Earth Stood Still*, [00:07:57–00:08:38])



**Example 30.** Bernard Herrmann: “The Ray” (*The Day the Earth Stood Still*, [00:11:12–00:11:54])

**A♭m \ Dm**

Trumpets  
Hammond organ

**ff**

Trombones  
Hammond organ

**fp** **ff**

**ff** **ff**

**ff** **ff**

Piano

**ff** **ff**

Chimes

**ff** **ff**

Cymbals

Cymbals + Tam-tam + Bass drum

**fff** **ff** **ff** **ff**

NOTE: Each of the four bars is heard in the movie as the combination of two superimposed tracks, one with the natural performance, the other one in reverse (as a result of electronic processing). The whole texture is superimposed on top of another cue, labeled "The Visor" in the score. The latter cue is much softer, so that it is completely covered when the sudden stingers of "The Ray" are heard.



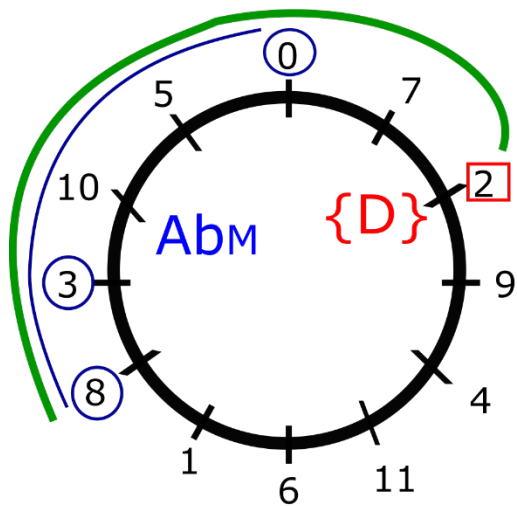
**Example 31.** Sharp-dissonance vector (SDV) and fifth span (FS) for: (a) “Klaatu” (b) “The Ray”

(a)

$\{D\} \backslash A^b M \backslash \{D\}$



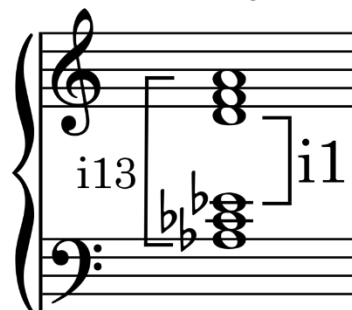
SDV:  $\begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 \end{pmatrix}$



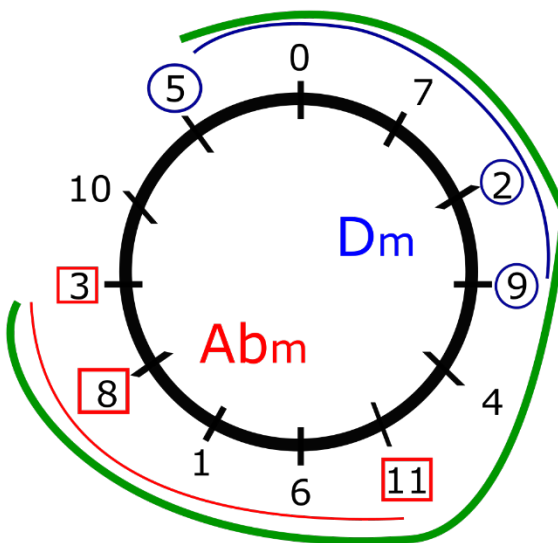
FS = 6

(b)

$A^b m \backslash D m$

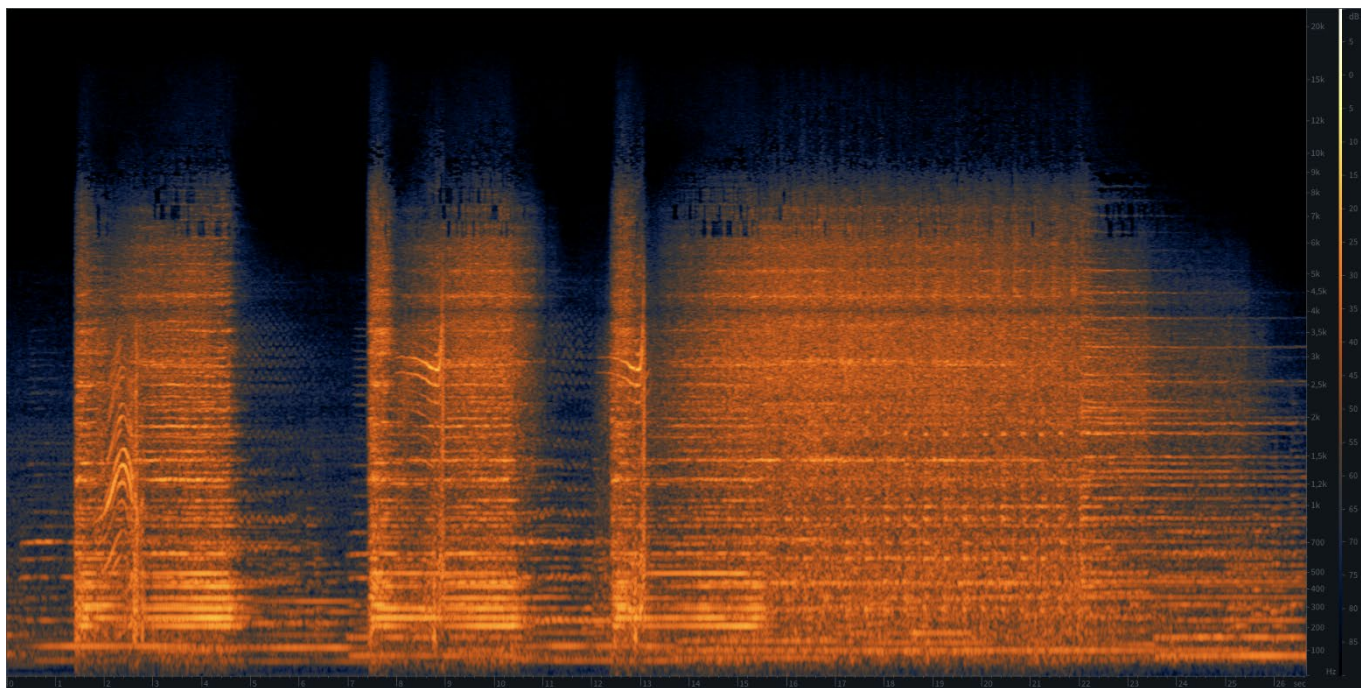


SDV:  $\begin{pmatrix} 1 & 1 & 0 \\ 0 & 0 \end{pmatrix}$

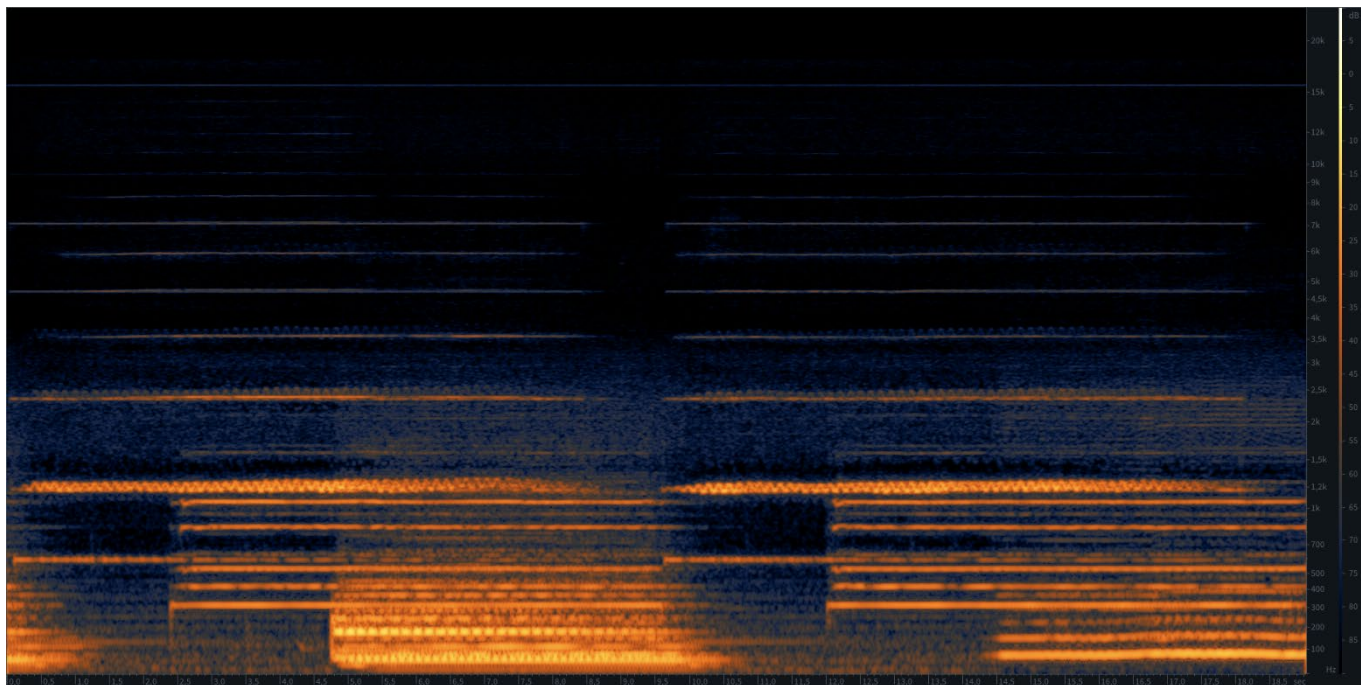


FS = 10

**Example 32.** Spectrogram for “The Ray” (corresponding to mm. 1–5 in Example 30)



**Example 33.** Spectrogram for “Klaatu” (corresponding to mm. 3–7 in Example 29)



**Example 34.** A summary of the comparative analysis of “Klaatu” and “The Ray”

	Klaatu’s polyharmony (“Klaatu”)	Gort’s polyharmony (“The Ray”)
Degree of chromaticism (fifth span)	-	+
Pitch dissonance (sharp-dissonance vector)	-	+
Fusion of the perceived texture	-	+
Timbral harshness	-	+