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BETWEEN SPECTRAL DISPERSION AND GRAVITATION: *STRINGS 0.4* BY VLADIMIR KORAĆ

Abstract: Vladimir Korać's composition *Strings 0.4* (*Žice 0.4*) explores the spectral and multiphonic possibilities of the double bass through a systematic examination of the fundamental, overtone and inharmonic series, microtonal shifts, and bowing positions. Extended musical time and a reduced "harmonic" palette allow the transformation of the tones G, G#, and E, while multiphonics generate a complex acoustic polyphony. The result is a controlled, internally dynamic structure in which instrumental sound and timbre become the primary carriers of dramaturgy.
Keywords: *Strings 0.4* (*Žice 0.4*), Vladimir Korać, spectral music, double bass, multiphonics, timbre, time

The composition *Strings 0.4* (*Žice 0.4*, 2025) for double bass quartet by Vladimir Korać is founded upon a systematic investigation of the sonic possibilities of multiphonics and the spectral behavior of the double bass, wherein

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sound itself becomes the primary carrier of formal and perceptual development.[1] Rather than deriving from an extramusical narrative, the work emerges from an analytical and practical examination of the relationships between the fundamental tone, its harmonic and inharmonic projections, and the manner in which these relationships evolve within extended musical time – a duration that becomes "the very object of form".[2] The central technical and aesthetic foundation of the composition lies in the deployment of multiphonics as a type of non-harmonic spectrum;[3] these are not treated as extended techniques of a decorative nature, but rather as complex acoustic phenomena. Particular attention is devoted to the distinction between multiphonics produced on open strings – where partials radiate relatively freely above the fundamental – and those aimed at precisely defined sonorities (semitonic, quartertonic, and artificial multiphonics).[4] The latter necessitate a patient exploration of the individual instrument, precise control of bow positioning that transcends the *ordinario – sul ponticello* dichotomy, and a continuous balancing act between stability and the loss of control over the sound. Consequently, performance practice becomes inseparable from the very structure of the composition.

The treatment of time as an elastic category constitutes a distinctive compositional undertaking within the composer's serial output.[5] Musical

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[1] I owe special thanks to the composer Vladimir Korać for his generous assistance, for providing materials, and for his consultations during the preparation of this study.

[2] Gérard Grisey, "Did You Say Spectral?", *Contemporary Music Review*, 19(3), 2000, 2. The author says: "For me, spectral music has a temporal origin. It was necessary at a particular moment in our history to give form to the exploration of an extremely dilated time and to allow the finest degree of control for the transition from one sound to the next […] Strengthened by an ecology of sounds, spectral music no longer integrates time as an external element imposed upon a sonic material considered as being 'outside-time', but instead treats it as a constituent element of sound itself." Ibid., 1–2.

[3] Cf. Joshua Fineberg, "Appendix I. Guide to the Basic Concepts and Techniques of Spectral Music", *Contemporary Music Review*, 19(2), 2000, 91.

[4] Cf. Håkon Thelin, *Multiphonics on the double bass. An investigation on the development and use of multiphonics on the double bass in contemporary music*, Oslo, Norwegian Academy of Music, 2011. https://www.haakonthelin.com/multiphonics/multiphonics-on-the-double-bass/

[5] Vladimir Korać, email to the author, on 7 January 2026. The reference is to the cycle *Strings*: *No. 1* (for two violins and electronics), *No. 2* (for violin, viola, and electronics), *No. 3* (for violin, viola, cello, and electronics), and *No. 4* (for string quartet and electronics, on which the composer is currently working). The composition *Strings 0.4* does not

processes are radically decelerated; the prolonged dwelling within a singular frequency domain enables the listener to register subtle modulations in the spectrum and dynamics of partials, as well as microtonal pitch displacements. This temporal strategy may be characterized as a form of "zooming"[6] into the internal architecture of sound, probing the limits of musical time's prolongation by prioritizing immanent processes over external formal events. Such extended musical time pertains not only to the work's pitch-related trajectory but also to the melodic component, which is effectively annulled. The preponderance of sonic transformation occurs upon a single tone within individual parts, wherein said tone is transmuted through microtonal inflections (extending to quarter tones), modulations in vibrato extent, continuous bow-position transitions from *sul tasto* to *molto sul ponticello* (MSP), and the emergence of unisons on adjacent strings. Consequently, the listener's perceptual focus is redirected from melodic succession to the internal dynamics of sound itself.

The work's pitch material is radically reduced, organized around three primary anchor points – G, G#, and E – distributed across an approximate fourteen-minute duration. This progression eschews traditional harmonic functionality in favor of an extremely gradual process of transformation and perceptual refocusing. While E serves as the fundamental frequency and gravitational center of the work, its natural harmonic status is perpetually problematized. Moreover, its natural harmonic series constitutes merely one stratum within the composition's spectral architecture. The composer engages in the construction of inharmonic overtone series,[7] derived not from integer multiples of the fundamental frequency but through the application of a "distortion coefficient"[8] – for instance, 0.3 – thereby generating a distorted, unstable variant of the harmonic spectrum, or its "compressed version".[9] It is precisely this inharmonicity that furnishes an ideal substrate for prolonged musical time: the absence of a clear point of resolution permits

include electronics, hence its title, by the composer's own admission. It is part of the cycle, but with the character of a kind of "appendix".

6 Cf. Gérard Grisey, "*Tempus ex Machina*: A composer's reflections on musical time", *Contemporary Music Review*, 2, 1987, 259; Gérard Grisey, *Écrits: ou l'invention de la musique spectrale*, Paris, MF Editions, 2008, 31–32.

7 Cf. François Rose, "Introduction to the Pitch Organization of French Spectral Music", *Perspectives of New Music*, 34(2), 1996, 9.

8 Joshua Fineberg, op. cit., 94.

9 Ibid., 94.

sound to persist without stasis, undergoing continuous internal transformation. Such inharmonicity opens a sonic spectrum wherein non-integer ratios relative to the fundamental destabilize the pitch identity, creating space for spectral metamorphoses. The inharmonic vertical spectrum finds its horizontal temporal projections in glissandi, *ampio* vibrati,[10] and quarter-tones, wherein pitch is conceived as a continuum rather than a discrete entity.

The analysis of partials derived from a single sample of the E_1 (41.20 Hz) produced on the double bass served the composer as an additional source of material. He isolated the loudest, quietest, shortest, and longest partials, subsequently employing them as the foundation for so-called "minute notes" within the composition. However, even this system was treated with considerable flexibility. Although clearly present as an underlying structural framework, the composer does not apply it dogmatically; rather, he consciously negotiates a balance between adherence to and the free deconstruction of said system. The composer establishes a distinct intermedial connection with electroacoustic practice – albeit not consciously, as he himself acknowledges – by transposing its technological models into an instrumental context. Procedures inspired by echo effects, delays, and tape loops manifest through the successive transmission of identical musical material among the double bass parts, thereby generating forms of spectral polyphony. Such organization of material does not constitute a mere imitation of electronic procedures, but rather their conceptual mediation within an acoustic medium. Furthermore, the deployment of multiphonics and inharmonic spectral structures implies an experimentation with modes of thought inherent to the electroacoustic paradigm, wherein instrumental sound is treated as a complex spectral phenomenon rather than a traditionally pitch-defined entity. It is particularly indicative that the composition, despite the absence of electronics, functions as a structural and aesthetic "supplement" to the cycle containing an electronic component, thereby achieving continuity at the level of sonic conception and compositional thinking.

The analysis of the work is grounded primarily in the score as the principal source, as well as in conversations and correspondence with the composer, and in the composer's tables and sketches, which constitute relevant documentary material (Examples 1 and 2). Accordingly, it is not based on any known or available model of computer-assisted spectral analysis.

[10] Ampio – a wide vibrato whose intonational fluctuation approaches trilling (score, p. 2).

Example 1: V. Korać, *Strings 0.4*, table of multiphonics used in the composition

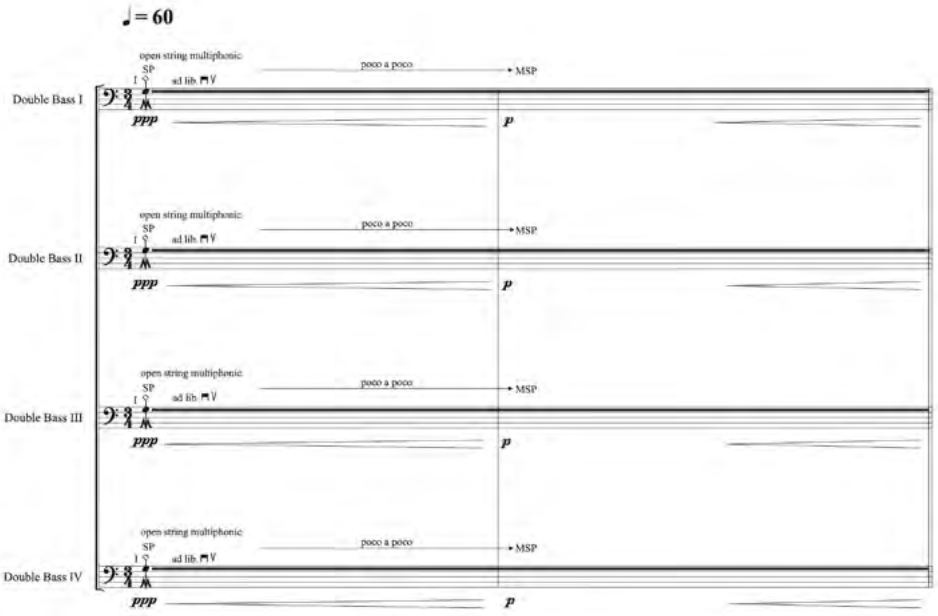
Example 2: V. Korać, *Strings 0.4*, sketch of the continuous spectral transformation and formal construction of the work

The composition can be understood as a process organized through several clearly delineated sections (the initial section mm. 1–29, followed by developmental units mm. 30–64, mm. 65–74, mm. 75–100, an extended zone of suspension in mm. 101–159, a phase of consolidation in mm. 160–176, and a final multi-phase process spanning mm. 177–236), in which the musical flow is not shaped through thematic development, but as a continuous transformation of spectral mass and relations between frequency layers. At the outset, G dominates as a provisional gravitational center, although already destabilized by microvariations, noise, and processes of spectral stratification. In the subsequent sections, G gradually loses its role as a stable anchor through the emergence of new pitches (F#, F, G#), which initially act as destabilizing elements but are later integrated into a broader sonic field. The decisive turning point occurs with the introduction of pitch E (m. 75), which redefines the entire system. Former centers become layers within its spectrum, while the gravitational focus is gradually shifted toward E as a deeper, fundamental frequency basis. However, this center is not established as stable immediately – the fifth section (mm. 101–159) functions as a zone of near-total suspension in which the sustainability of the system without a clearly

articulated axis is tested. Only in the final sections does gradual stabilization occur: through material reduction, temporal deceleration, and spectral "harmonization", E is affirmed as a stable, yet non-imposing center, capable of absorbing and integrating all preceding tensions. The final trajectory thus does not result in a dramatic resolution, but in a state of duration and equilibrium, in which E functions simultaneously as a physical fundamental, a spectral nucleus, and a perceptual gravitational axis of the entire work.

The introductory segment (mm. 1–5) of the first section (mm. 1–29) is founded upon reduced yet spectrally rich material: multiphonics produced on the open G string across all four instruments (Example 3).

Example 3: V. Korać, *Strings 0.4*, multiphonics on the open G string in four double basses, mm. 1–2



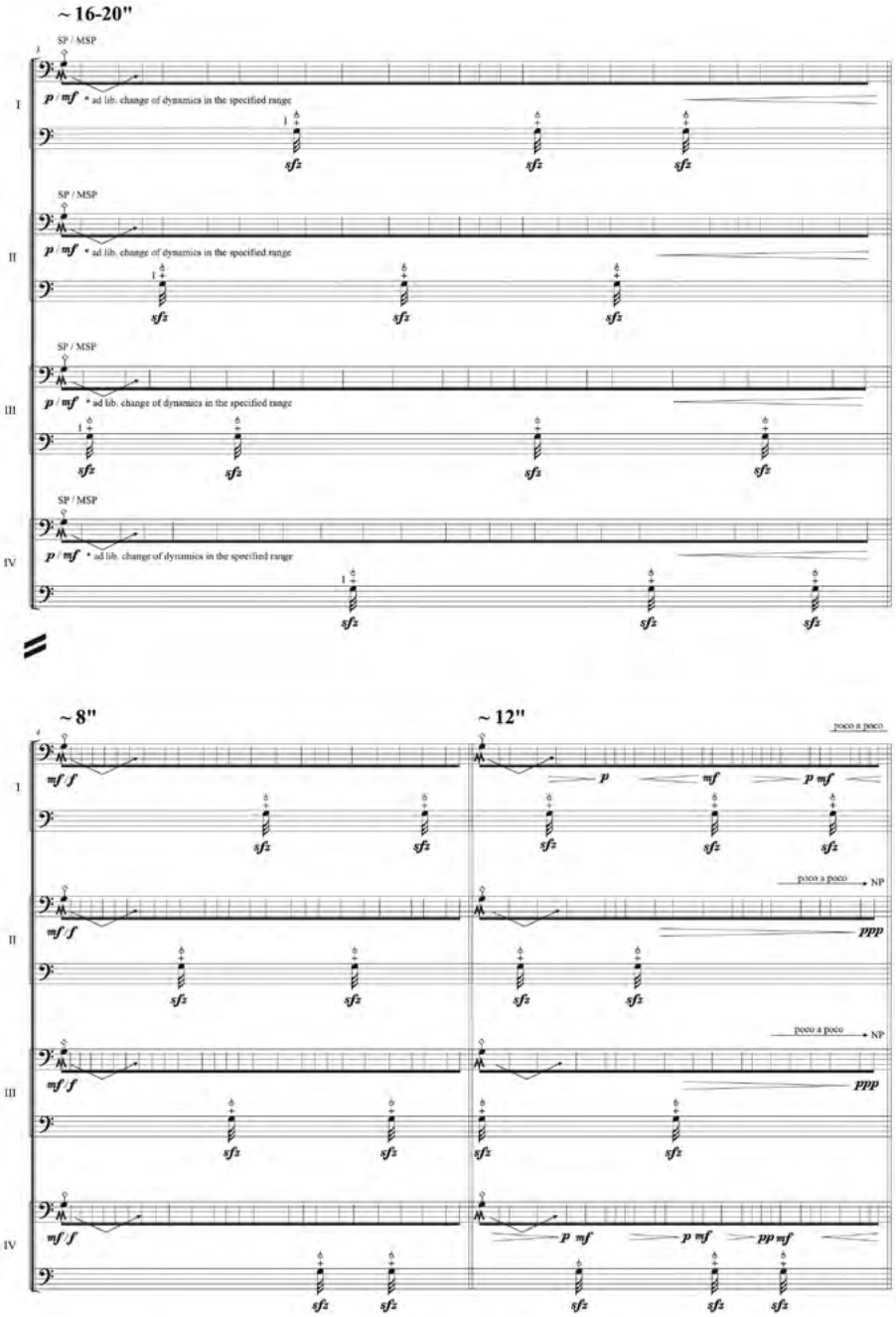
Parallel realizations of the same multiphonic preclude sonic identity; rather, disparities in instrument construction and material quality generate micro-variations (*beats*[11]), further amplified by individual bow strokes executed within the indicated *sul ponticello* (SP) position. In lieu of unison, a micro-heterogeneous sound mass emerges, wherein a single gesture stratifies into a

[11] Hermann von Helmholtz, *Sensations of Tone as a physiological basis for the Theory of Music*, London and New York, Aberdeen University Press, 1895, 160.

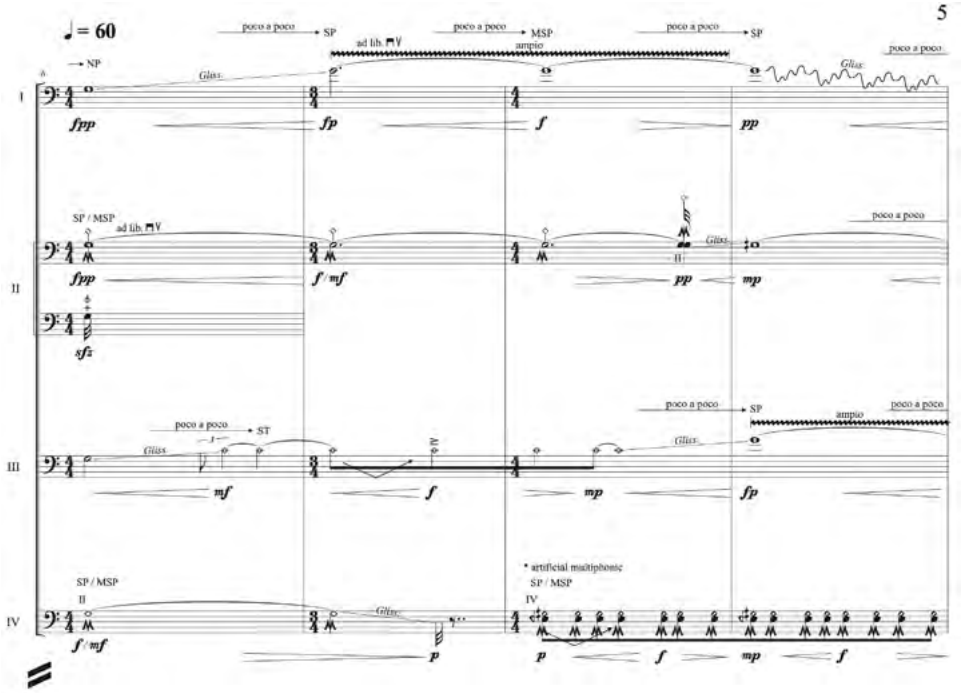
network of related yet non-identical spectral events. The initial *ppp* dynamic imbues the sound with fragility, while the multiphonic operates at the threshold between tone and noise – a liminal zone wherein the fundamental of the open string is barely perceptible, dominated instead by high-frequency harmonics. The SP bowing position critically shapes the spectrum by diminishing the fundamental's contribution and amplifying upper partials, thereby decomposing the G tone into its own spectral content. The transition to *molto sul ponticello* (MSP) in measure 2 shifts energy toward higher partials. Dynamic intensification renders the spectrum denser and more present, while the alternating deceleration and acceleration of bow strokes expand and compress the sonic mass. The alternation between SP and MSP modulates the relationship between fundamental and harmonics, generating a dissonant network possessing an internal "polyphony". This translucent mass is enriched by left-hand Bartók pizzicati, enhancing the voluminosity of the already sustained tone (Example 4). Within the *mf-f* dynamic range, a veritable "wall of sound" coalesces around an implicit center. Although the fundamental remains obscured, shared partials create the illusion of a collective sound, while inter-instrumental disparities enrich the sonority, producing an organic heterophony approaching orchestral effect. Thus, the opening measures establish the concept of process rather than stasis: from a minimal gesture emerges a complex sonic field wherein spectral, dynamic, and rhythmic transformations are inseparable, devoid of thematic articulation yet characterized by a clearly formed, transforming sound mass that lays the foundation for the work's trajectory.

In the subsequent passage (mm. 6–13), a subtle yet pivotal transformation occurs. Although G remains the spectral gravitational center, the sound ceases to function primarily as a vertically saturated mass and begins to coalesce as a temporal process. The focus shifts from collective texture to the internal instability of individual voices, thereby endowing the music with a more pronounced horizontal dimension – characterized by motion and oscillation. In the first double bass, a glissando toward the higher octave gradually transitions into *ampio vibrato*, generating microtonal oscillations that evade stable identification. This transition to horizontal oscillations produces the impression of the tone disintegrating from within; rather than progressing toward a goal, it loses coherence and metamorphoses into a micro-shifting field. The second and fourth double basses do not develop explicit motion but instead establish a stable spectral aura – a resonant field that sustains and reflects the transformations of the first voice, creating a vertical backdrop against which horizontal transformations become more salient (Example 5).

Example 4: V. Korać, *Strings 0.4*, multiphonics on the open G string with uneven slowing down and speeding up of the bow stroke, Bartók pizzicato, mm. 3–5



Example 5: V. Korać, *Strings 0.4*, building internal instability within individual parts, mm. 6–9



The third double bass glides from G_2 (97.99 Hz) toward a harmonic, whereby the sound loses mass and becomes nearly incorporeal, constructing a spectral arc from a solid fundamental to an ethereal high tone. The texture remains dense yet translucent, all voices remain connected to the G center, while their partials in the lower and middle registers occasionally converge, amplifying specific frequencies, only to diverge again, generating distinctive frictional effects wherein sound is increasingly perceived as color and resonant field rather than as a determinate pitch. The multiphonic in the fourth double bass (m. 8) further intensifies tension through micro-slides and intonational fluctuations, particularly during the alternation between SP and MSP. Acceleration of bow strokes renders the texture nervous and aggressive, whereas deceleration decomposes it into slower collisions of partials, evoking a sense of stagnation and dissolution. Sound thus alternately "opens" and "closes", transitioning from a translucent to a tense state. The segment unfolds without sharp boundaries, through the continuous development of sonic space. Horizontally, it is defined by perpetual motion and oscillation; vertically, by G_2, which remains the physical and spectral anchor. The overall

impression is that of a cold, fragile, and tense space situated at the threshold between tone and noise. As these motions transform the preceding trajectory, transitioning from a compact spectral mass to a field of internal tensions, the sensation of unstable equilibrium and constant sonic metamorphosis is deepened.

In the continuation of the same section (mm. 14–29), the first double bass introduces rapid, non-tempered pitch alterations through an alternation of harmonics. The tense timbre pulsates akin to the shimmering of a single hue refracted through different prisms, while tremolos intensify this effect, leading toward a denser, more potent multiphonic. From measure 23 onward, the oscillations between G and G# gradually decelerate. Nervous pulsations give way to a fine, organic vibration; harmonics recede, and spectral tension becomes controlled. The tone no longer destabilizes the space but rather sustains its vitality through *ampio vibrato* and discrete quarter-tone slides. The second, third, and fourth double basses initially maintain friction around G, employing slow pulsations[12] to prevent rapid spectral dissipation, thereby creating an impression of spatial and timbral motion. Following this destabilization, the three lower double basses progressively assume a stabilizing role, establishing a relatively calm G_2 as an acoustic anchor. Dynamics subside, and the tone becomes a referential field wherein preceding dissonances are deconstructed. Particularly notable is the relationship between the two G_2 in the second and fourth double basses (mm. 26–29). Although nominally identical, their timbral disparity generates a subtle internal pulse. In conjunction with multiphonics on the first strings, this forms a rich and balanced stratum that, combined with the micro-slides of the first double bass, constructs a homogeneous, calming sonic space. These doublings do not generate conflict but rather deepen the sensation of spectral "breathing", while dissonances and microtonal traces remain integrated as a memory of prior tension imprinted upon the partials of the G_2. The sonic wave initiated by the emergence of the G# here comes to a temporary halt: time decelerates, space expands, and the sound acquires a contemplative, almost meditative character. Following the profound disturbance provoked by the $G\#_2$ (103.82 Hz), the material coalesces around the fundamental, which is re-established as the gravitational center – now more stable, yet enriched by the experience of preceding spectral instability.

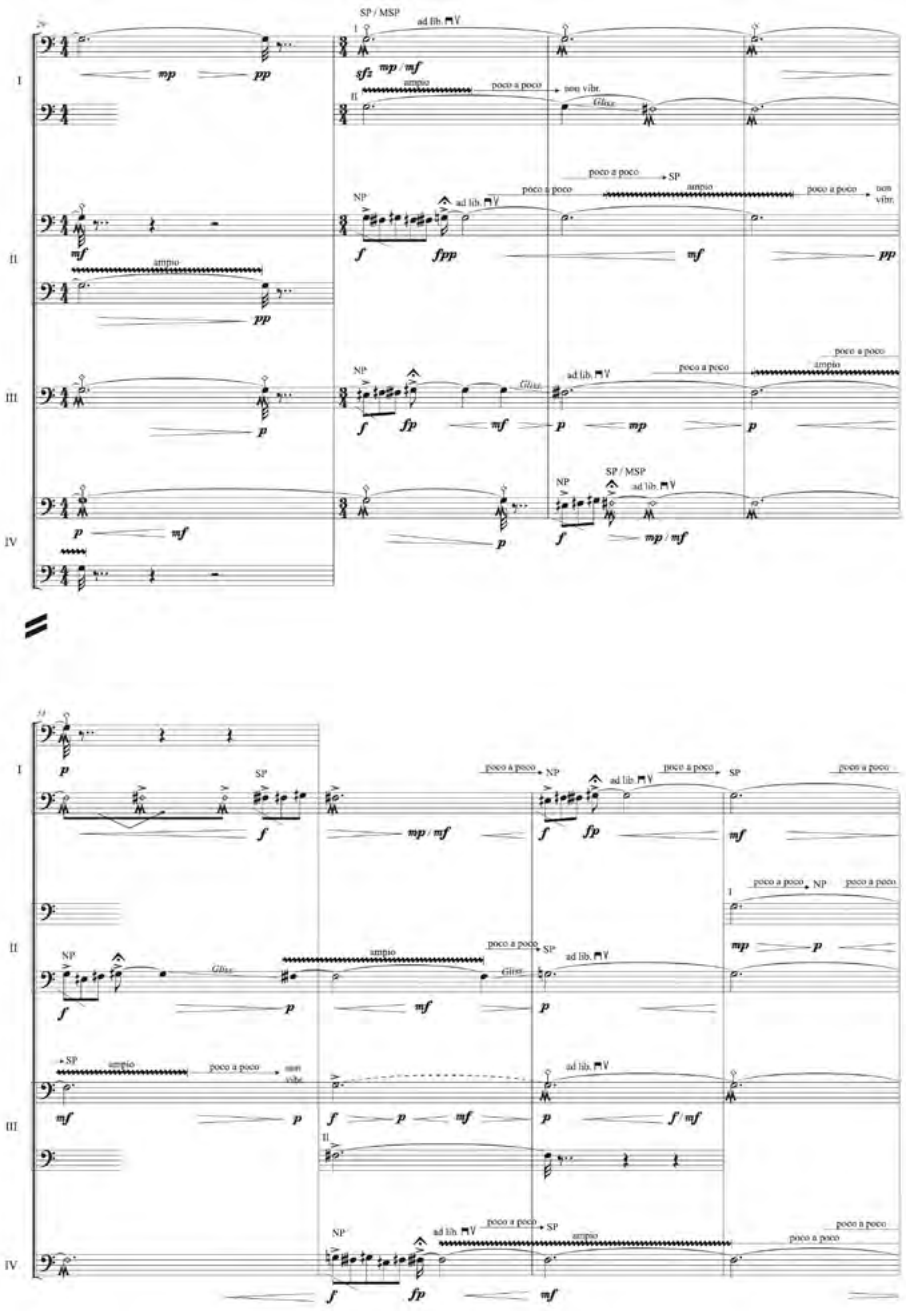
Following the introductory section (mm. 1–29), in which G_2 is established as the spectral center, the second section (mm. 30–64) unfolds as a

[12] Cf. Hermann von Helmholtz, op. cit., 160.

continuation of the process, deepening it without disrupting continuity. The sound continues to orbit around G_2, yet its status becomes unstable: it ceases to function as a solid anchor, transforming instead into a radiating center from which spectral events emanate, while itself remaining diffuse and perceptually elusive. In the first double bass, particularly within the MSP position, the G_2 fundamental nearly vanishes, dominated by upper partials. Dynamic fluctuations (*mp-mf*) modulate the spectral density, generating a sonic cloud lacking a clearly defined pitch. Simultaneously, G_2 on the second string of the same instrument establishes a latent unison relationship with the spectral trace of G from the first string. Two spectrally distinct G tones coexist, sustaining internal tension and continuity with the preceding process. A multiphonic emerges on the second string of the first double bass, radiating E_5 and a quarter-tone below B_5, constructing a spectrally stretched vertical structure. This is doubled in the fourth double bass, accompanied by an alternation between SP and MSP, thereby further destabilizing the sound. In the remaining double basses the reference point remains G, yet never as a "pure" tone, but rather as an idea of frequency. For the first time, quarter-tone arabesque figurations appear, creating a dense frequency mist (Example 6). These flow into G_2, into microintervals surrounding it, or into the multiphonic, with none of these outcomes yielding stabilization. Vibrato and spectral fluctuations erase the tone's fixed identity, undermining the authority of the fundamental. The spectrum expands downward for the first time with the introduction of $F\#_2$ (92.49 Hz, m. 34), followed by F_2 (87.30 Hz, m. 44); these new pitches emerge as realizations of potential inherent within the G spectrum. F#, too close to G to achieve autonomy yet too distant to merge completely, acts as a fissure in the spectrum: initially destabilizing, then temporarily stabilized (m. 40), but perpetually subverted by tremolo and vibrato. The process leads toward assimilation: F# merges into G (mm. 42–43), losing its independence yet leaving a trace in micro-oscillations. The doubling of G in the fourth double bass confirms its structural role, while the migration of F# to the third double bass part indicates that the conflict is systemic, now absorbed by the system itself. Tremolos and *ampio* oscillations[13] in the first two double bass parts prevent this conclusion from sounding serene, as constant micro-shifting keeps the spectrum open. The emergence of F_2 in measure 44 establishes a different relationship. Whereas F# initiated internal destabilization, resulting in an immanent conflict, F creates a permanent, static friction with G.

[13] Ampio oscillations – a wide vibrato (ampio) with continuous change of vibrato amplitude (score, p. 2).

Example 6: V. Korać, *Strings 0.4*, arabesque-like figurations, a semitonic multiphonic in the first double bass, and the appearance of F# in m. 34, mm. 30–36



Their relationship leads to coexistence: G remains the axis, now capable of bearing the weight of F. F_2 subsequently glides toward $F\#_2$ (m. 47), lingering in the zone between F# and G, where pitch transforms into spectral width, while harmonics maintain the connection to G_2 but without returning to a stable center. The pitch identity becomes increasingly dependent on its position within the sonic field, a fact corroborated by the exchange of material among parts in mm. 53–56/57. In the final phase (mm. 57–64), an apparent consolidation occurs: G is once again collectively focused, yet across multiple registers and with constant micro-pulsation. The multiphonic now surrounds G like an aura of preceding conflicts, while the center is reconstructed through timbral differentiation rather than pitch. The segment concludes with the compression of sound into a nucleus (mm. 63–64), wherein G_2 functions simultaneously as a resonant spectrum and as a pitch destabilized microintervallically. Thus, the conflict undergoes no resolution but is instead permanently embedded within the structure. G_2 becomes a spectral zone, a relationship, and the result of a process, thereby creating a multi-layered, perceptually and acoustically rich sonic space that integrates all preceding transformations.

In the third section (mm. 65–74), a decisive structural pivot occurs, marked by a conflict that ceases to be an internal destabilization of G and instead becomes a layered coloristic relationship in which the pitch space is decentralized. The emergence of $B\flat_2$ (116.54 Hz) does not function as a superficial novelty but signals a paradigmatic shift – the focus moves from spectral centrifugality to timbral nuancing. This turn is initially articulated through the affirmation of $G\#_2$ in the first (and subsequently the second) double bass, which, unlike earlier appearances of new pitches, now emerges as a pure, autonomous tone. The dark timbre of B♭2 (m. 68), which thickens the space upward through transitional zones (A_2 /110 Hz/ and microintervals), alters the timbral character of the G-field, displacing the conflict from the level of spectral destabilization to that of timbre. The first double bass establishes the vertical relationship G–B♭, the second remains in the G#/F# zone as a residual area of preceding conflicts, while the fourth, through multiphonics and the sonority G#–B, introduces the first tertial relationship outside the G-field, thereby opening a new spectral space. In this transitional section a "modulation" from the G-field to the G#-field is articulated. The cadence in measure 74 confirms a state of layered stability in which G is no longer a hierarchical anchor but merely one stratum within a complex sonic system. Concurrently, G# acquires its own spectral identity, confirmed by the

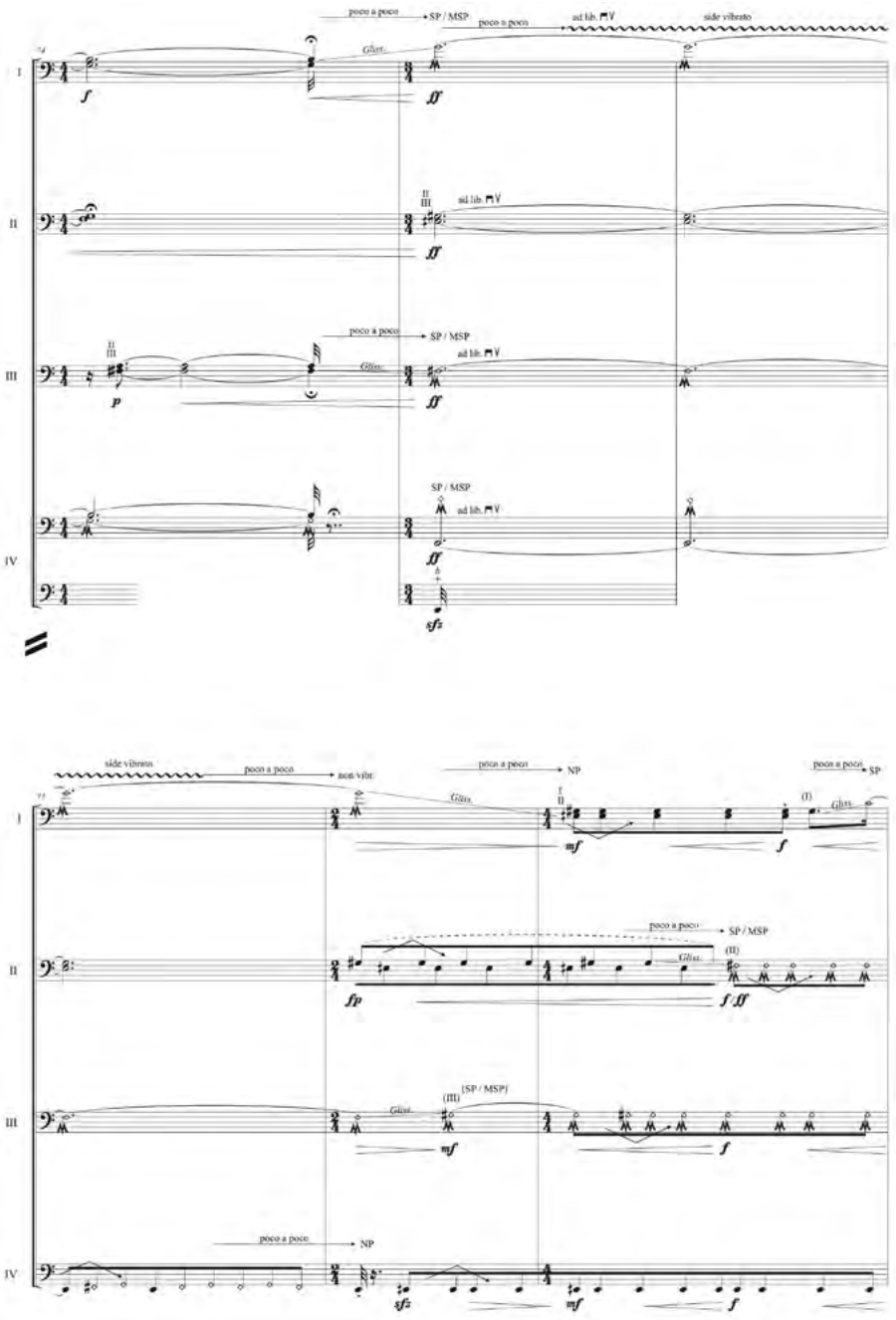
multiphonic in the fourth double bass, whose partials ($D\#_6$, F_6, and A_6, mm. 72–74) radiate as the imprint of a new system. Thus, two coexistent gravitational fields are formed: the historical G-field and the new, still unstable G#-field, with equilibrium arising from their simultaneous existence rather than from resolution.

The entrance of E_1 in measure 75, accompanied by the emergence of multiphonics on the open E string, inaugurates a new formal and acoustic phase (Example 7).

E is not merely a new pitch but a fundamental that transforms the preceding sonic order: G and G# lose their hierarchical status, and earlier conflicts are reconfigured as resonant layers integrated within a deeper foundational stratum. The sound becomes vertical, extending from E_1 toward middle partials and high multiphonics and harmonics. Although E_1 functions as a physical anchor, the multiphonic relativizes the stability of this foundation, rendering it acoustically ambivalent. The third double bass activates the E spectrum through a multiphonic (radiating B_4, $D\#_5$, and a quarter-tone below $A\flat_5$), generating friction above the fundamental and activating E as a resonant field. Within this context, F# – the pitch upon which the multiphonic rests and which previously functioned as a source of conflict – loses its destabilizing role, becoming instead a residual energy within the system oriented toward E. The second double bass retains G# as a coloristic element in relation to E, without reinstating hierarchical tension. One of the most sophisticated gestures in this segment occurs in the first double bass, where a multiphonic on the second string radiates the pitches G_5, a quarter-tone above G_5, a quarter-tone above B_5, and a quarter-tone above G_6. The zones surrounding previous centers now appear as integrated partials of a single tone. The multiphonic functions as a document of sonic history: traces of earlier conflicts no longer operate as opposition but as internal dynamics within the vertical field. For the first time, the use of *side vibrato*[14] further controls resonance, allowing higher components to remain active without compromising the fundamental. In measures 77–85, consolidation occurs: earlier centers are transformed into layers of partials within E. The multiphonic in the fourth double bass (from m. 75), accompanied by harmonics, provides a pulsating foundation oscillating between E_1 and higher spectral tones, while the third double bass mediates between upper strata and the

[14] Side vibrato – rapid changes of vibrato amplitude and pressure on the string, but applied laterally (without pressing the string to the fingerboard) (score, p. 2).

Example 7: V. Korać, *Strings 0.4*, appearance of the pitch E_1, m. 75



fundamental, integrating G# as color. The migration of multiphonics among parts (mm. 75–82) confirms a new hierarchy in which G is reactivated (via the multiphonic present since m. 31) solely as an integrated nuance of the vertical system. Preceding conflicts are now understood as preparation for the establishment of E as an all-encompassing foundation.

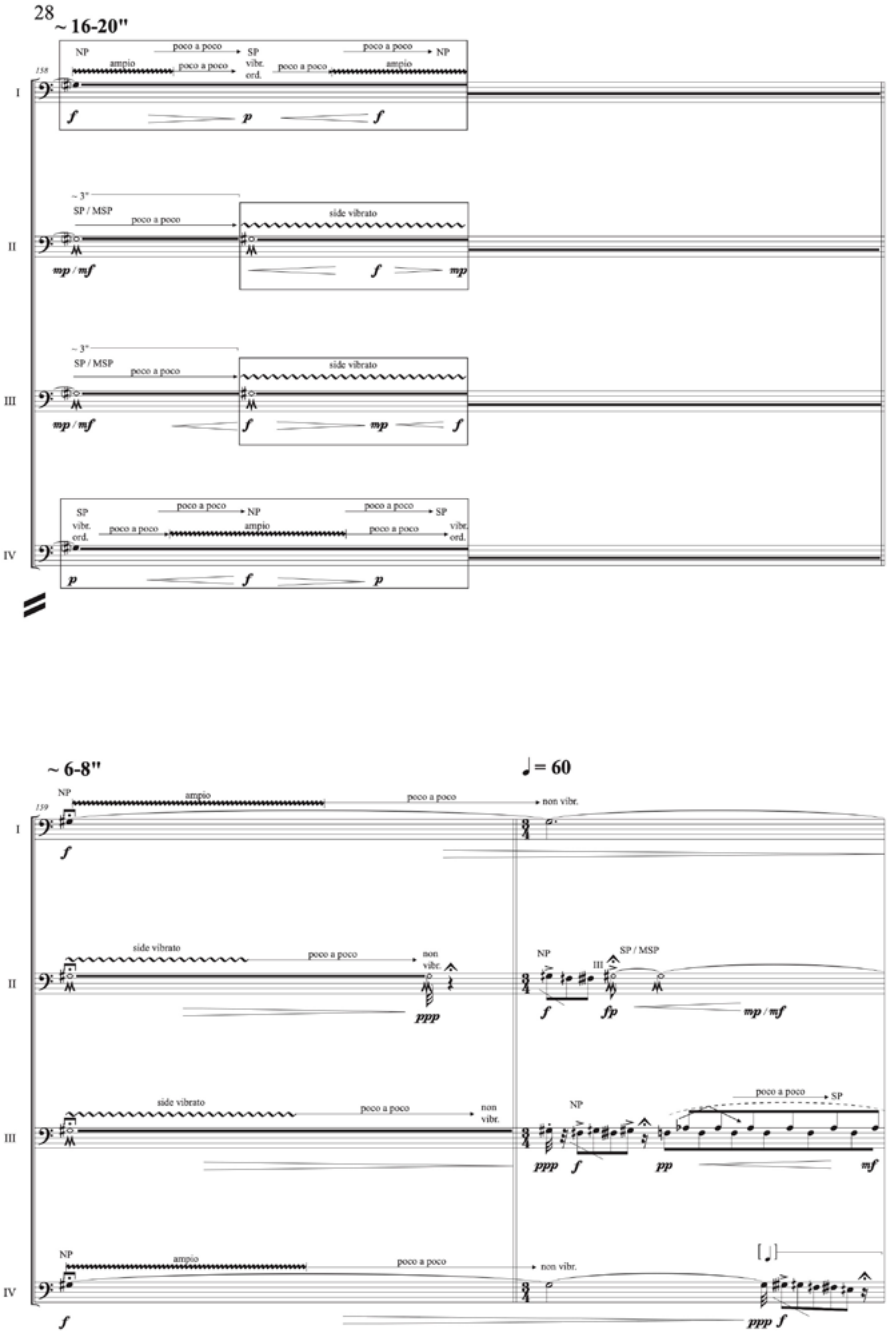
In mm. 82–88, earlier mechanisms (figurations) return, not to destabilize but to contribute to the stratification of the E-field. The partials of the first double bass (E_3, $C\#_4$, A_4, D_5) become shadows of past conflicts, while the quarter-tone above E_2 and $G\#_2$ in the fourth double bass function as a conceptual drone. From mm. 88–100, material circulates among the double basses: motives, partials, and multiphonics return without hierarchy; sound becomes a layered entity with its own internal life, wherein material is detached from its source. Formally, this signifies the material's maturity. It rotates without need for hierarchy or progression, testifying to a form that is stable yet not static. Linear time is transformed in this section into simultaneous acoustic duration, wherein each part carries an aspect of the same system. Particularly notable is the tone F_1 (43.65 Hz, mm. 98–100), which, in a low register with *ampio – non vibrato* and SP, acts as a shadow and pressure upon the E axis. It does not assume the role of center but partially undermines E, as demonstrated by the final verticality in measure 100, which summarizes the trajectory from the G-field, through F#, F, and G#, to E, without its ultimate affirmation. This verticality closes this developmental phase, yet without final resolution.

The section spanning mm. 101–159 represents a formally pivotal phase in the form of an extended zone of suspension, in which the sustainability of the system without its axis is examined. Although E had previously served as the structural center, it nearly completely withdraws here. Its place is temporarily occupied by G, G#, F, and F#, but without a new hierarchy, so the emergence of these pitches functions as an extension of the verticality from m. 100, lacking any stabilizing role. The section operates as a retrograde reflection, through which the form probes whether the system can persist without its own axis. Harmonics and multiphonics appear less frequently but more precisely, as carriers of latent tension, while E is no longer articulated as a height but persists in the form of a partial, an acoustic cause, or a shadow. In mm. 101–104, a secondary orbiting occurs without a clear axis. The first double bass evokes the earlier F/F# conflict, but now as an internal erosion rather than external destabilization. In the second double bass, G_2 – once the work's primary center – glides toward A_3 (220 Hz), but without a goal: no pitch becomes a center. The multiphonic containing the partial E_5 and a pitch

a quarter-tone below B_5 reflects the state of the system, confirming that E is present but without structural authority. The continuation of the F_1, gliding toward $F\#_2$, affirms that not even its closest "neighbor" can assume E's function. F does not orient toward E nor seek resolution, but instead glides into F# – the pitch that had previously functioned as a catalyst of conflict and a spectral destabilizer. The process of circumventing E concludes with a return to already exhausted material, confirming that only E possessed true structural weight. When F_1 appears, accented and rhythmically clearly profiled, it acts as an attempt to establish stability in the immediate proximity of the axis. Yet, the prolonged *molto vibrato* erodes this apparent solidity, and the glissando toward $F\#_2$ once again leads into a space devoid of developmental potential. Stability is revealed as illusion, and every attempt at consolidation ends in spectral instability.

In mm. 104–129, variants of figurations develop that "resolve" into prominent heights ($G\#_3$, A_3, $F\#_2$, $G\#_2$, and microtonal deviations). However, instability no longer drives development but becomes a permanent state. The process transforms from a functional impulse to a circulation of material: the field saturates around G# as a gravitational zone, rather than as a center. Grouped around it are G, A♭, A, F, and F#, while E appears indirectly, through multiphonics (m. 108, where a multiphonic emerges on the E string), as a spectral cause without clear articulation. The axis is present yet empty, with potential existing without realization. The E string, especially in the fourth double bass, serves almost exclusively for multiphonics and harmonics, while clearly articulated pitches in that register are $G\#_1$ and G_1. The insistence on G represents the last trace of the work's first center, but without stabilizing force. A rupture occurs in mm. 129–140, when E is articulated for the first time as an unambiguous real center. The vertical relations E–G# and G#–B form a precise pitch field within which G# is no longer an autonomous zone but a tertiary layer over E. Yet, the stability of the fundamental remains partial, as the space continues to be saturated with microtonal deviations. In the final segment (mm. 141–159), spectral contamination intensifies through more numerous, denser, and more closely related multiphonics, often distributed across the same strings in different double basses. The pitch inventory is relatively stable, but the hierarchy is suspended. E appears frequently – in tremolo with F# or in multiphonics as a partial – yet it rarely occurs as an isolated, clearly defined pitch. The concluding cadence (mm. 156–159) on G# with a multiphonic on G# condenses the entire preceding process (Example 8). A single tone exists simultaneously as a stable pitch and as a spectral cloud, articulating the work's fundamental conflict: pitch versus noise,

Example 8: V. Korać, *Strings 0.4*, cadence of the fifth section, mm. 158–159



center versus dispersion, identity versus contamination. The section spanning mm. 101–159 thus functions as an extended zone of examination in which the acoustic axis is suspended, former centers are reactivated without their power, development turns into circulation, and spectral pressure intensifies to the point of saturation. At the same time, it gradually reaffirms E_1 as the only pitch with true structural weight, while the final, self-referential gesture on G# remains a mirror of the entire dramaturgy – between the center and its shadow.

In mm. 160–176, the section grows organically out of the preceding phase and represents an internal transformation of an already established field. The pitch inventory, registers, and spectral relationships remain similar, but their internal organization changes.

Instead of spectral saturation and a conflict between a stable pitch and its stratification, a process of reorganizing the same material begins. A key sign of this change is the systematic alternation of two pitches in the double bass parts. A gesture that was previously fragmentary, microtonally blurred, and destabilized by tremolos and spectral "interferences"[15] now forms a network of tertian relations (Example 9). Instead of isolated impulses, a pattern is established, and instead of destabilization, a principle of structural organization emerges. This network can be understood as a processual spectral "harmonization": vertical organization exists, but without a closed chord and without resolution. The tertian relations arise from the earlier spectral densification. What had existed as a partial or a microtonal shadow now becomes a clear intervallic unit.

Full stabilization nevertheless fails to occur because of the role of G#. Although E appears with increasing frequency as the lower member of the third (E–G#), it is precisely G# that maintains the openness of the space, simultaneously confirming and postponing the consolidation of E. The conflict between pitch and noise is attenuated, multiphonics are rarer or function as a background timbre, yet hierarchy has still not been definitively established. This is why, in mm. 172–176, a brief but decisive phase of reduction occurs: the alternations in thirds narrow to the relations G#–B and G–B♭, and the multiphonic becomes a stabilized spectral frame. In this context, E_1 appears in its most stable form so far – as a quiet fundament (*ppp*, m. 173), with its stability arising from the calming of the system rather than from imposition. Previously, E had to "prove itself" – through conflict, through

[15] Hermann von Helmholtz, op. cit., 160.

absence, through spectral struggle with competing pitches. This is no longer necessary, so it does not suppress other pitches but instead integrates them. Stabilization is also accompanied by a slowing of musical time. Longer durations, slower changes, softer dynamics, and restrained articulation allow E to be perceived as a gravitational axis rather than as a momentary event. In this way, the process initiated by the suspension of the center in m. 101 is resolved: the testing of survival without a center ends with a quiet yet firm establishment of that center. The section spanning mm. 160–176 thus represents a final phase of consolidation, in which the material is reorganized and reduced to the point where E can function as a stable fundamental. Spectral harmonization through parallel thirds opens the space, reduction focuses it, and the slowing of time enables its final anchoring.

Example 9: V. Korać, *Strings 0.4*, a network of third-based relationships, mm. 161–162

From m. 177 onward, a final multi-phase process begins in which E_1 is constituted as the center in both a spectral and a perceptual sense. The very need for a temporally-extended stabilization already indicates a center that is not proclaimed but constructed through the integration of preceding tensions.

In the first phase, E and G# are the most prominent pitches, emphasized through duration and dynamics, with G# functioning as a resonant color and

an extension of the center. A special role in this legitimation is played by the multiphonic on the open E string, which for the first time clearly unifies the functions of cause and result: E functions simultaneously as the generator of its partials and their acoustic center, thereby granting the central pitch both physical and sonic validation. The appearance of F_1 (m. 184) does not open a new conflict but tests the boundary of stability. The semitone relation E–F, as well as the quarter-tone above E, no longer produces destructive tension. E remains present through a stable multiphonic and demonstrates the ability to absorb the closest possible pressure without loss of identity. Additional dramaturgical weight is provided by the fact that the anchoring occurs on the E string of all four double basses (mm. 184–194), so that the center is not only heard but also physically grounded in the performative gesture, with all instruments converging on the same sonic point. In the second phase (mm. 189–194), E remains the center, but in a complex, spectrally-enriched form. Its partials – E and B in different octaves, as well as G# – consolidate its identity, into which microtonal tensions are also integrated. E now possesses duration, dynamic presence, and physical authority, and the quarter-tone edge remains controlled, producing balance rather than a dramatic resolution. The third phase (mm. 195–201) introduces D_2 (73.41 Hz), which functions as a lower boundary and a sub-spectral shadow of E. The multiphonic on D (m. 196) does not construct its own spectrum, but rather opens a resonant space beneath the center E, recalling elements of earlier tensions. D thus deepens E's gravitational field, confirming its strength through the ability to bear instability from below.

In mm. 201–211, which mark the fourth phase of anchoring, the various processes converge as what previously approached "from above" (G#, F) and "from below" (D) flows into the spectrum of E. The transition of all instruments to the fourth (E) string is crucial, as it carries the idea of sonic homogenization by erasing the earlier registral differentiation. E becomes the sounding substance into which everything is drawn, whose stability arises from a shared performative gesture. This degree of homogeneity, however, cannot be sustained for long. The segment in mm. 209–217 brings a brief, controlled blurring: figurations, spectral fissures, and the return of F_2 (m. 214) function as a reminiscence of earlier conflicts. A quarter-tone above F_2 represents an unsuccessful attempt at resolution toward G, which has long since lost its structural significance. At this point, E is constantly present as a sonic gravitation, and this through multiphonics. This final blurring has a threefold role. First, it acts retrospectively, recalling and condensing the pre-

ceding phases of development. Second, on a psychological level, it mitigates the possibility of an overly clean and abrupt ending, preserving a trace of inner tension. Finally, on the formal level, it separates the act of anchoring from the act of calming, thereby granting the ending on E a convincing, organic character. In the final phase (mm. 218–236), E is confirmed in multiple ways: as a full pitch emphasized by duration, dynamics, and articulation, as a harmonic, as part of a multiphonic, and as a *side vibrato* (Example 10). The material is reduced, yet nuanced in timbre, dynamics, and microintervallic deviations. The rotation of material within a limited space constitutes a formal gesture of closure: no hierarchy among parts remains, the sound is collective and spatially distributed. The final stabilization produces a state of duration and equilibrium as the goal toward which the work has been striving. After a prolonged examination of the center's boundaries, the composition thus does not end in an explosion, but in a quiet yet unwavering remaining in E.

The composition *Strings 0.4* unfolds as a continuous process of transformation of the sonic field, with an initial, hierarchically-ambiguous center G as a spectral zone, timbrally destabilized and relativized through G#, and ultimately vertically integrated and reinterpreted within the deeper acoustic framework of E as the work's fundament. The first two centers function as provisional gravitational zones whose stability is under constant scrutiny, while E gradually assumes the role of the only truly viable structural axis. E appears as the result of a prolonged examination of stability, conflict, and the absorption of tension. The affirmation of the fundament arises from the integration of the preceding centers, which remain present as partial layers within its field.

The work deliberately remains below the threshold of complete harmonic coherence, in an intermediate space between pitch, spectrum, and noise. In this sense, the composition constitutes a consistent and systematic exploration of the sonic limits of the double bass, in which performance technique, the acoustic properties of the instrument, and formal dramaturgy are inextricably linked. Inharmonicity, microtonality, extended duration, and spectral instability do not function as effects or coloristic additions, but as fundamental bearers of musical thought and structure. The composition does not strive for traditional resolution, but for the maintenance of a tense yet stably controlled spectral state in which even the smallest change in sound production gains structural significance. Sound is thus not treated as a means, but as a process – as a space in which form and perception continually condi-

Example 10: V. Korać, *Strings 0.4*, final phase of anchoring in E, mm. 221–228

tion one another. This form is shaped as an evolution of the center. The key compositional procedure is the avoidance of abrupt cuts: each new center arises from the inner logic of the previous one. This creates an organic continuity in which development is not linear but spiral, with constant returns of the same material in a new acoustic context. This procedure is grounded in the transformation of internal relations within the same material, whereby development unfolds through spectral densification, destabilization, assimilation, and eventual anchoring. The work's underlying idea rests on the conception of tone as process and of center as an acoustic field that is constructed over time. The composition can thus be understood as a study of the perception of center – not as a pre-given point of support, but as an experience that is formed through time.

Works Cited

Fineberg, Joshua: "Appendix I. Guide to the Basic Concepts and Techniques of Spectral Music", *Contemporary Music Review*, 19(2), 2000, 81–113.

Grisey, Gérard: "Did You Say Spectral?", *Contemporary Music Review*, 19(3), 2000, 1–3.

Grisey, Gérard: "Tempus ex Machina: A composer's reflections on musical time", *Contemporary Music Review*, 2, 1987, 239–275.

Grisey, Gérard: *Écrits: ou l'invention de la musique spectrale*. Edited by Guy Lelong and Anne-Marie Réby. Paris: MF Editions, 2008.

Helmholtz, Hermann von: *Sensations of Tone as a physiological basis for the Theory of Music*. Third Edition. London and New York: Aberdeen University Press, 1895.

Rose, François: "Introduction to the Pitch Organization of French Spectral Music", *Perspectives of New Music*, 34(2), 1996, 6–39.

Thelin, Håkon: *Multiphonics on the double bass. An investigation on the development and use of multiphonics on the double bass in contemporary music*. Oslo: Norwegian Academy of Music, 2011. https://www.haakonthelin.com/multiphonics/multiphonics-on-the-double-bass/

Summary

The composition *Strings 0.4* (*Žice 0.4*) by Vladimir Korać for double bass quartet (2025) is based on a systematic exploration of the instrument's sonic possibilities, with particular emphasis on the phenomenon of multiphonics and the spectral organization of sound. Rather than relying on programmatic or narrative elements, the work focuses on the internal structure of sound and on the ways in which different acoustic parameters can be shaped and developed over time. In this sense, sound is not treated merely as a medium of musical expression but becomes the primary building block of

form and the central carrier of the entire musical process. The compositional approach begins with the consideration of tone as a complex acoustic phenomenon. Each pitch contains a fundamental frequency as well as a series of harmonic and inharmonic partials that determine its timbral character and spectral density. In this composition, these elements are treated as a malleable material that undergoes gradual transformation, with particular attention directed toward their interrelationships and the changes occurring within the sonic spectrum. Through slow and progressive developmental processes, the listener is able to perceive subtle shifts in timbre as well as the gradual emergence of new textural layers.

The double bass quartet functions as a space for acoustic exploration. Various performance techniques enable the isolation of specific partials and the highlighting of particular spectral characteristics of the instrument. Through the interaction of the four instruments, complex sonic structures emerge in which spectral layers may overlap, complement one another, or undergo gradual transformation. This organization of material results in a musical form that evolves directly from the internal processes of sound itself, rather than from traditional melodic or harmonic models. Extended sonic events and gradual transformations allow the listener to focus on subtle acoustic differences, thereby heightening the awareness of the internal dynamics of sound. In this context, the composition can be understood as a process of listening in which musical meaning unfolds through the gradual recognition of changes in spectrum and texture. Through this conceptual framework, *Strings 0.4* explores the potential of the double bass as a source of rich spectral structures. The work thus shifts the focus from traditional parameters such as melody and harmony toward the sonic material itself, emphasizing its complexity, fluidity, and perceptual potential. In this way, the composition constructs a musical space in which timbre, texture, and gradual acoustic transformations become the primary carriers of artistic meaning.