
Guitar multiphonics: notations for a formalized approach

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Abstract: When the execution of multiphonics takes place between frets, it might not be easy to find orientation references for the visual situation of some touch locations, as some of the reviewed pieces in this paper attest. Due to this situation it might be difficult to achieve the reproducibility of the sounds being this the criterion behind the authors' formalized approach to the technique. The suggested notations for this approach's touch locations pursue to suit all tastes. If a specific color is to be achieved, or if, at a certain location, the technique of harmonics is also possible, other descriptors need to be notated. Given that the technique of mutliphonics is not common vocabulary for the guitar, an explanation should always be included in the score, regardless of the chosen approach.

Keywords: Multiphonics. Guitar. Notation. Virtual frets.

Resumo: Quando a execução de multifônicos tem lugar entre trastos, pode não ser fácil encontrar pontos de referência ao tentar situar visualmente alguns locais de apoio, como é o caso em algumas das peças revistas neste artigo. Assim, poderá ser difícil atingir a reprodutibilidade dos sons, sendo este o critério subjacente à forma como a técnica foi abordada pelos autores. As notações sugeridas para os locais de apoio desta abordagem tentam agradar a todos os gostos. Se for desejado um determinado timbre, ou, em determinado local, a técnica de harmónicos também for possível, será necessário notar outros descritores. Visto a técnica de multifónicos não fazer parte do vocabulário guitarrístico, a partitura deve incluir uma explicação, independentemente da abordagem escolhida.

Palavras-chave: Multifónicos. Guitarra. Notação. Trastos virtuais.

1 Introduction

The technique of multiphonics consists, as in the case of harmonics, in damping out some of the string's vibrational modes by lightly touching the string at certain locations during or after its excitation (or both). The kind of vibrational-mode filtering which takes place in multiphonics produces sounds with a spectrum that facilitates the perception of multiple pitches, and which in some cases, due the inharmonicity of the higher partials, leads to the perception of bell-like sounds; at some locations it is possible, by applying different touch pressures, to execute either harmonics or multiphonics (TORRES; FERREIRA-LOPES, 2012a: 55-57).¹ A difference in the touch pressure is not only significant in the damping of the lower vibrational modes, but, realistically, also in the damping of the higher modes. This is because a higher touch pressure means a larger finger surface touching the string, covering then entire loops or a large percentage thereof; this and other kinds of filtering might also take place when exciting the string (TORRES; FERREIRA-LOPES, 2012b: 64-65).

The sounds arising from the technique of multiphonics suit both note-based and sound-based work, as existing compositions attest. This paper gives account of these compositions by focusing on the notations used. It also suggests notations for our formalized approach to multiphonics, which is intended to give rise to reproducible sounds. For the sake of simplicity, although sound perception is individual (SCHNEIDER; WENGENROTH, 2009) and not all listeners may perceive individual pitches in a multiphonics' sound, the spectral content of the sounds will be referred to as *resulting pitch(es)*.

2 Notation of multiphonics in guitar literature

To our knowledge, Schneider (1985: 135-138) is the first to have dealt with guitar multiphonics, and has also been the last until our first publications on the subject (TORRES; FERREIRA-LOPES, 2012a, 2012b).² Schneider (1985: 136) advises that “multiphonics should be notated by [...] (a tilted double-sharp sign), with the string number and fret placement; the note-head should lie on the staff where the note would sound if the finger were pressed to the fingerboard”. However, he does not depict an example and gives instead the verbal example “6 [encircled] $\frac{1}{4}$ XIX” which is supposed to mean (thus, has a typo): touch string 6 between frets VIII and IX at the point that is distanced from fret VIII one quarter of the length of the space between those frets (in the absence of a fraction the touching is at the fret). Schneider (1985: 137) supplies a “chart of multiphonics on the bass strings” – on the

¹ In case of extreme light pressure, this is possible at each location, since the lowest vibrational modes are not damped out and the fundamental is perceived.

² In a sub-section on harmonics at unusual nodes, Gimeno (2011, p. A78, translation by the authors) mentions the production of a “multiphonic sound” in which “two harmonics can be perceived.” Mas (1984), in what is possibly the first book on (twentieth-century) extended techniques on the guitar, does not mention multiphonics. However, he lists as harmonics locations (notating them symbolically, with microtonal accidentals when not at frets), locations at which the technique of multiphonics is also, or in fact, only possible (MAS, 1984: 28-30).

wound strings “the effect works much better” (SCHNEIDER, 1985: 136) –, in which he notates two, three, or four resulting pitches of multiphonics at certain locations of the depicted fretboard.

Fernando Sor (1832?: 8-9) was possibly the first composer to have asked for multiphonics on the guitar. This is however implicit, since he requests harmonics (at fret VI, which is notated with an Arabic number, on symbolically notated strings 5 and 6) without writing any resulting pitches (TORRES; FERREIRA-LOPES, 2012a: 58).³

Like Sor, Beat Furrer (1997: 3) does not write any resulting pitches but differentiates multiphonics from harmonics by using a different notation. However, the multiphonics requests (always at frets) only become explicit in the performance notes: a diamond-shaped note head means the numerically notated string is to be touched as in the technique of harmonics (which is notated with the resulting pitch). This gives rise to a “multiphonic, poignantly noisy sound” explains Furrer (1997: performance notes, translation by the authors).⁴

To our knowledge, Bruno Bartolozzi (1975a: 3) was, in 1972, the first after Sor to have requested multiphonics. He notates the string numerically, the fretboard location symbolically – with quarter-tone accidentals when between frets –, and the resulting pitches in parentheses. This notation, depicted in Figure 1, is also to be found in other pieces by Bartolozzi (1975b: 6; 1979: 2).⁵

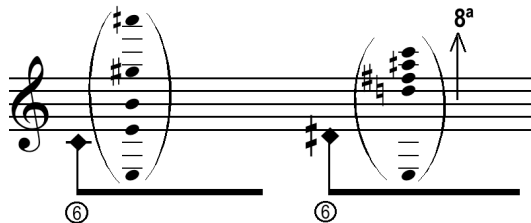


Figure 1: Notation of multiphonics by Bartolozzi (as in BARTOLOZZI, 1975a: 3; Note: in the score, the beams' thickness decreases, symbolizing the chords' decay).

Thierry Blondeau (2000: 7, 9) requests multiphonics at frets and at hypothetical frets between the last fret and the saddle. Both fret and string are notated symbolically and the same notation is used for harmonics. However, while for the latter the resulting pitch is notated in the chord of action-symbols, in multiphonics, only an encircled M is attached to it, as in example a of Figure 2. This can also be found twice in another piece by Blondeau (2005: 51, 54), in which he notates the string numerically, with the usual encircled number

³ Notating for harmonics not only string and fret but also the resulting pitch was not common in Sor but, as Gimeno (2011: A64) stresses, it is possible to find this in one of his Op. 60 pieces.

⁴ Original version: multiphoner, scharf geräuschhafter Klang.

⁵ According to guitarist Christoph Jäggin (2013a), Bartolozzi also requests multiphonics in, at least, *Memorie* for three guitars and orchestra.

superimposed on the stem of the notational chord. One of the two requests is to be executed between frets for which he uses a quarter-tone accidental. This notation is depicted in example b of Figure 2.6 In a pedagogical piece by Blondeau (1999: 1), which is mostly notated in tablature, it is also possible to find multiphonics, albeit implicitly.

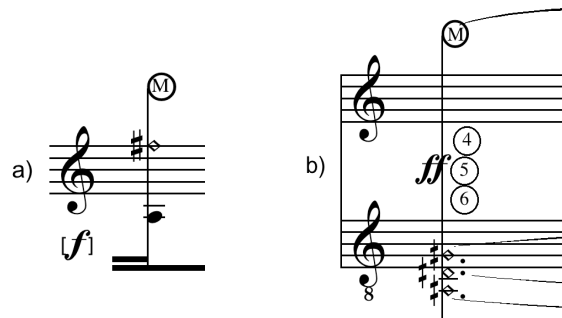


Figure 2: Notations of multiphonics by Blondeau (as in BLONDEAU, 2000: 7 [a], 2005: 51 [b]).

Rita Torres also has notated multiphonics in different ways. In her first use of multiphonics (TORRES, 2004: I, VI), she represented the string numerically and the fretboard location symbolically with a microtonal accidental, to which corresponds a graphic explanation, wrote an “M” above the staff, and notated four resulting pitches in parentheses, as depicted in Figure 3. Example a of Figure 4 depicts the other multiphonics request in this piece. More recently, Torres (2012: 3) represented the string symbolically and used a double notation for the fretboard location, as depicted in example b of Figure 4, explaining that the touching should take place halfway between frets IX and X.

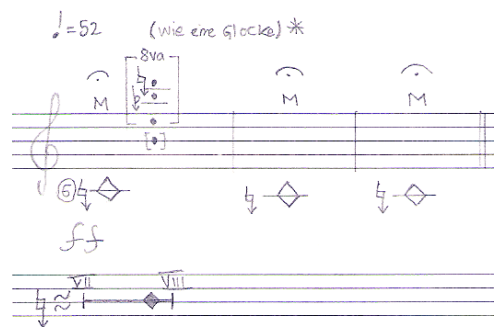


Figure 3: Excerpt of Torres' *Cyrano-Szenen* (TORRES, 2004: I). “Wie eine Glocke” means *like a bell*.

⁶ According to guitarist Christelle Séry (2011), Blondeau also requests multiphonics in *Lieu I* for ensemble.

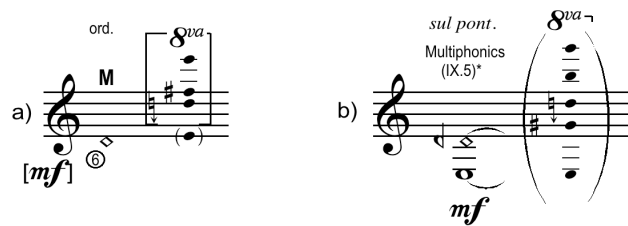


Figure 4: Notations of multiphonics by Torres (as in a) TORRES, 2004: VI; b) TORRES, 2012: 3).

An “M” above the staff is also used by Sam Hayden (1997: 25-27, 34). In his notation “fret position and string number are indicated – diamond note-head is position of touched note and small upper notes are the main sounding harmonics” (HAYDEN, 1997: Performance notes), as depicted in Figure 5. Microtonal pitches are used for the locations between frets, in the case of which “fret position” refers to the space between the frets.

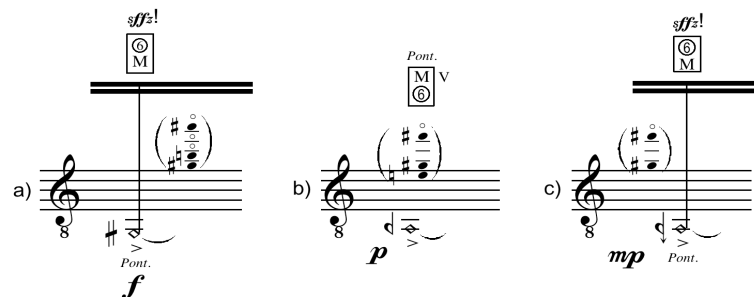


Figure 5: Notation of multiphonics by Hayden (as in HAYDEN, 1997: 25 [a, c], 34 [b]).

Guitarist Christoph Jäggin has collaborated with, and edited pieces by, Hans Ulrich Lehmann (1992), Christoph Neidhöfer (1997), and Fritz Voegelin (1987). Since Jäggin gave these composers the reference of Schneider's book, their choice of multiphonics' sounds (LEHMANN, 1992: 2-3; NEIDHÖFER, 1997: 3, 7; VOEGELIN, 1987: 3, 6, 7, 11) is almost exclusively limited to those notated in Schneider's chart. Jäggin mentions in the performance notes of the pieces by Lehmann (1992: 15) and Neidhöfer (1997: 8) that the notation of multiphonics is that of Schneider. However, this is only true for the resulting pitches and their diamond-shaped note heads. It is Jäggin's the “mph.” above the staff, and the notation of the fretboard location, which like the string is notated symbolically. When not at a fret, the fret number is either: 1. preceded by a minus sign, meaning to the left of the fret; 2. followed by a plus sign meaning to the right of the fret; 3. followed by an o (as superscript in Vögelin's piece), meaning at the middle of the space between that fret and the previous fret.⁷ Figure 6 exemplifies the notation used by Jäggin.⁸

⁷ These explanations are absent in Neidhöfer's piece. In Lehmann's piece there is a fourth possibility: a location between the 1st, or 2nd, and 3rd possibilities, for which both of these are separated by a slash.

⁸ According to guitarist Christoph Jäggin (2013b), Lehmann also requests multiphonics in *Um-Risse* for guitar and baritone saxophone.

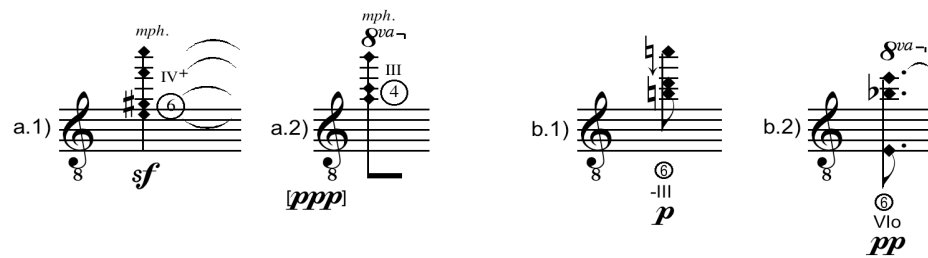


Figure 6: Notation of multiphonics by guitarist/editor Christoph Jäggin (as in a) VOEGELIN, 1987: 3, 11; b) LEHMANN, 1992: 2⁹).

Jäggin supplied Michael Reudenbach with Lehmann's performance instructions and Schneider's chart (REUDENBACH, 2013). For which, Reudenbach's multiphonics notation does not differ from Jäggin's, with the exception that the "mph." above the staff is absent (REUDENBACH, 2003: 1, 2, 5, 6). In the performance instructions he also mentions Schneider's notation but instead of explaining the fretboard location's numbers, he attaches a copy of Schneider's chart of multiphonics.

Both Rafael Nassif (2010) and Roman Pfeifer (2002) use a second (upper) staff to notate the resulting pitches. Pfeifer notates both string and fretboard location symbolically, the latter with microtonal accidentals when not at frets, as in example b of Figure 7. The performance instructions contain a list of the resulting pitches of all sounds resulting from harmonics and multiphonics occurring throughout the piece, and the notation of the fretboard locations where they are to be obtained (PFEIFER, 2002: Griff und Klang). However, while composing, Pfeifer used only one staff and notated both touch-location descriptors numerically, as depicted in example a of Figure 7. When the fretboard location is not at a fret, a superscript, consisting of a plus sign, a minus sign, or an arrow (the latter meaning even further away from the fret), is added to the fret number. Pfeifer changed this notation, because, for the guitarist with whom he worked with, it "ended up in being too complicated to learn although it looks visually simpler" (PFEIFER, 2011, translation by the authors).¹⁰ This could be related to the fact that, as in Schneider's (and Jäggin's) notation, the resulting sounds are notated with diamond-shaped note-heads, which usually indicate where to touch (Schneider's book was, however, not of Pfeifer's knowledge [PFEIFER, 2013]).

⁹ "mph." appears only for the first sound in the movement.

¹⁰ Original version: Die erste [Version] hat sich zum Lernen als umständlich erwiesen, obwohl sie visuell etwas einfacher aussieht.

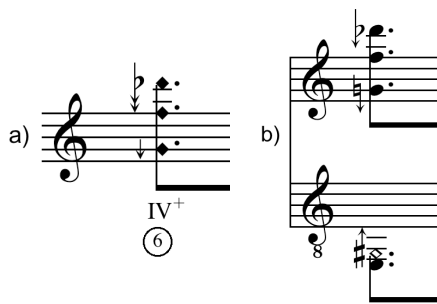


Figure 7: Notations of multiphonics by Pfeifer, both for the same sound (guitar with *scordatura*) a) while composing;¹¹ b) after working with a guitarist (as in PFEIFER, 2002: bar 4).

Nassif (2010: directions for study and performance: 2) advises the guitarists that they “should practice enough to produce in a balanced way the sound amalgam notated.” Throughout the piece, there are six different *sound amalgams* resulting from the execution of multiphonics on strings 4, 5, and 6 at the same two locations between fret XIX and the saddle, more precisely, “slightly below the node of the seventh partial (harmonic) and below the node of the fourth partial (harmonic)”. Although it is always these locations that are notated in the score, they “can be played at the fretboard as well, approximately at the middle of the seventh position and [at] the middle of the sixth position, respectively.” Nassif (2011) chose for the score the fretboard locations between fret XIX and the saddle because, when trying things out on the guitar, it became easy for him to produce the sounds that way. He notates the string numerically, the fretboard location symbolically, with microtonal accidentals when not at frets, and superimposes an “M” on the note stem, as depicted in Figure 8.

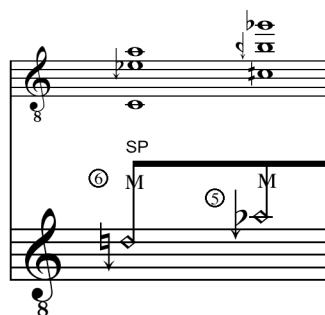


Figure 8: Notation of multiphonics by Nassif (as in NASSIF, 2010: 1 [guitar 4 (with *scordatura*)]).

In pieces by William Bland (as cited in SCHNEIDER, 1985: 136), Helmut Oehring (2000), Horațiu Rădulescu (1985), and Štěpán Rak (1985), in which, except for Rădulescu's piece, the multiphonics requests are all implicit, the player is free to choose the touch locations. The composers are then not interested in the specific content of the sounds. This is also the case of Uroš Rojko who, in a slow crochet-gliding of touching fingers along strings

¹¹ As in a copy of a manuscript page supplied by the composer.

5 and 6 which are to be plucked near the bridge (ROJKO, 1984: 1, 3) is interested in the (implicitly-requested) multiphonic's sounds as transitions between harmonics' sounds (ROJKO, 2011). This gesture puts in evidence the continuity of the multiphonics phenomenon between the string nodes of the lower vibrational modes.

Maurizio Pisati (1990: introduction) mentions “harmonics on ‘false’ positions” as a sort of sonority within his piece and stresses that “the fingerings ... are not only suggestions but should be considered essential to the faithful interpretation of the *Seven Studies*.” He notates the string numerically and the fretboard location symbolically, with microtonal accidentals when not at frets (PISATI, 1990: 5-6, 17-20). Pisati provides some of the resulting pitches and notates them with squared white note-heads, as in examples a, b, and c of Figure 9. Although referring to a different type of sound, he mentions, for quarter-tone accidentals, “distances corresponding the hypothetical quarter-tones” (PISATI, 1990: performance instructions, symbol 12). The multiphonics chord depicted in example d of Figure 9 is an implicit multiphonics request, as no resulting pitches are notated. This situation is also found in pieces by Lin-Ni Liao (2008a: 8, 2008b: III, 2010: 4), as depicted in examples a.1 and b.2 of Figure 10. Examples a.2, b.1 and c present other cases where she notated one or two resulting pitches. In example c the technique was also made explicit verbally. Liao uses a double notation for both touch location descriptors.

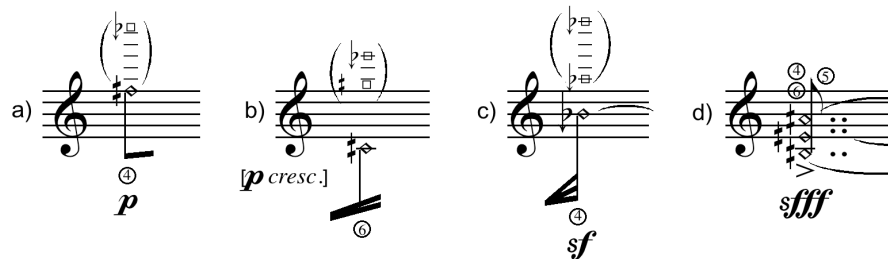


Figure 9: Notation of multiphonics by Pisati (as in PISATI, 1990: 5 [a, b, c], 17 [d]).¹²

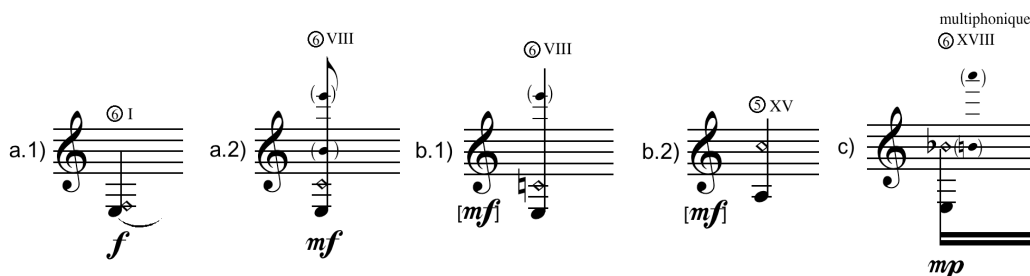


Figure 10: Notation of multiphonics by Liao (as in a) LIAO, 2008b: III; b) LIAO, 2008a: 8*; c) LIAO, 2010: 4*; *editing mistakes have been corrected).

¹² In example a, the resulting pitch is obtainable touching a half-tone lower than notated.

If, regardless of the touch location, composers always and exclusively notate one resulting pitch and do not make any reference to multiphonics, their intention is possibly harmonics. Some might not be aware that, at some locations, a one-pitched sound might not be possible, or might be optional.¹³ This is, however, not the case for Michael Pisaro (1996: 1) who advises the player: “It should be noted that, especially with the case of higher harmonics, more than one tone is likely to sound, due to the fact that these harmonics are rarely to be isolated. These other tones have not been notated.” Pisaro notates the string numerically and uses a form of graphic notation for the fretboard location, as in Figure 11.

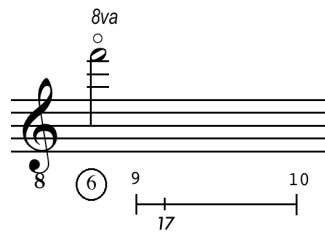


Figure 11: Notation of harmonics by Pisaro (as in PISARO, 1996: a/4). In the graphic notation “the upper numbers refer to frets, counting from the first fret above the nut. The [position of the] numbers below indicate the approximate (within a few millimetres) location of the harmonic [which has that number]” (PISARO, 1996: 1).

Table 1 sums up this review.

Table 1: Summary of the literature review. N: numeric; S: symbolic; G: graphic; PI: performance instructions.

Composer/Editor	Notation of touch location							Multiphonics explicitness (or not)		
	String			Fretboard location				In PI	In the score	
	N	S	G	N	S	G	Explained when not at frets		Verbal	Number of resulting pitches:
Bartolozzi (1975a, 1975b, 1979)	x				x					4 or 5
Bland (as cited in SCHNEIDER 1985: 136)							(both descriptors free)		Complex harmonic partial	
Blondeau (1999)			x			x				
Blondeau (2000)		x			x		(only frets)		M	
Blondeau (2005)	x				x				M	
Furrer (1997)	x				x		(only frets)	x		

¹³ Both situations are enhanced by amplification and are thus easily identifiable in recordings.

Hayden (1997)	x				x		x	x	M	1, 2, 3, or 4
Jäggin (LEHMANN, 1992, VOEGELIN, 1987)	x				x		x	x	mph.	3 or 4
Jäggin (NEIDHÖFER, 1997)	x				x			x	mph	3
Liao (2008a, 2008b)	x	x			x	x		(only frets)		0, 1, or 2
Liao (2010)	x	x			x	x			multiphonique	2
Nassif (2010)	x					x		x	M	3
Oehring (2000)								(only frets)	D.H. [dirty harmonics]	
Pfeifer (2002)		x				x		x		2 or 3
Pisaro (1996)	x						x	x		1 [desires harmonics]
Pisati (1990)	x					x				0, 1, or 2
Radulescu (1985)	x							(free)	x	Multiphonics/M
Rak (1985)	x							(only frets)		
Rojko (1984)	x					x		(glissando)		
Reudenbach (2003)	x				x				x	3
Sor (ca. 1832)		x			x			(only fret)	Har	
Torres (2004)	x					x	x	x	M	4
Torres (2012)		x			x	x		x	Multiphonics	5

3 A formalized approach to multiphonics

In most of the above-reviewed pieces, an explanation for the notation of locations between frets is either not provided or vague. Stopped microtonal pitches are only achievable by increasing the tension of the string at each space. Therefore, having in mind less-experienced performers, an explanation should also be provided when microtonal pitches are used to notate touch locations at which the string would be stopped were it not for the presence of (semitonic) frets.¹⁴ This is even more significant when these result from variations other than quarter-tones, as a generalized symbol-system exists mainly for the latter.

When the accidentals' system is not explained, or the explanation of the numerically notated location is not precise, the fretboard location is actually determined by the resulting pitch(es). If these are not notated, there is a greater degree of freedom in interpreting the location. If the higher pitches of the sound are also notated, there is a high precision as where to touch the string. Especially in the latter situation, it is not easy to come up with orientation references for the visual situation of some of the locations. The guitarist is thus compelled to memorize the location by instinct but, *microtonally* – a situation to which players of fretless instruments are more used. Such a situation may give rise to reproducibility problems. Thus, although other multiphonics locations exist apart from those suggested by Schneider (1985: 137), not all locations lend themselves to be used deterministically in a score that is to be performed. Therefore, achieving a high degree of reproducibility of the sounds was the criterion chosen for establishing locations for multiphonics. It is believed that (for the same touching and excitation conditions) that goal is achieved when the location is situated at the fretboard and there is easy orientation reference to both consecutive frets surrounding the location (TORRES; FERREIRA-LOPES, 2012a, p. 60). Thinking of the location as one of a group of equidistant *virtual frets* (v.fs., sg. v.f.) between the surrounding consecutive frets (or between the nut and fret I) allows for good orientation references to both of these, and this was our procedure in the testing of the hypothesis (TORRES; FERREIRA-LOPES, 2012b: 63). To the initially chosen nomenclature, we suggest adding a superscript reflecting the imagined subdivision between consecutive frets. The nomenclature scheme is then: $N^x y$, being N the nearest fret (or the lowest when halfway between frets), x the number of parts of the subdivision, and y the v.f., identified either by a “.5” when at the middle of the space, or one or two plus or minus signs depending on the distance to the nearest fret. This way each v.f. is unequivocally identified. This nomenclature is better clarified in the next section.

It must be stressed that the above-presented approach was devised having in mind

¹⁴ Microtonal guitars have been introduced as early as 1829 (SCHNEIDER, 1985, p. 82; WESTBROOK, 2012, pp. 48-50). In *Microtonal Guitar Gallery* (2013) it is possible to find an extensive list of this kind of guitars.

the live performance of deterministically requested multiphonics' sounds. In this situation, a continuous approach would be possible by using fixed media. Otherwise, it can be used for transition sounds between those deterministically requested, as in the piece by Rojko (1984).

4 Notation of touch locations

Figure 12 depicts, for the same touch location, our suggestions for the non-symbolic notation of v.fs. In example a, the above-suggested nomenclature is used, and in example b the v.f. is graphically notated. Both notations require an explanation and the former also requires the memorization of the nomenclature.¹⁵ Thus, example b is more straightforward.

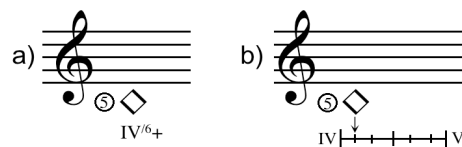


Figure 12: Examples, for the same touch location, of our suggestions for the notation of the lightly touching of an open string at *virtual frets* using non-symbolic notation for the latter. Both presuppose an explanation in the performance instructions.

There are guitarists who, however, prefer a symbolic notation for the frets. An unequivocal symbolic notation requires, for each v.f. within one space, different microtonal accidentals.

The location of the v.fs. for a certain subdivision of the spaces between consecutive frets does not differ much from the locations, when theoretically calculated in the equal temperament, where the string would be stopped if the same subdivision would be applied to the halftone, i.e., for example, a subdivision of a space in two would mean stopping quarter tones. We suggest using the microtonal accidentals from the *Extended Helmholtz-Ellis Just Intonation Pitch Notation* (SABAT; VON SCHWEINITZ, 2004) which alter the pitches of the nearest fret by amounts similar to those which would result from stopping the string at the v.fs. Figure 13 depicts our suggestions for a subdivision up to six parts. In Figure 14 it is possible to find, notated in four different ways, the same case as in Figure 12. In example b the string is notated symbolically – a notation that is then suitable for artificial harmonics/multiphonics. In fact, given that the string number is absent, example b could also be played *artificially* on string 6. It must be noted though that this is a less successful variant in the case of multiphonics. There is a much lesser degree of freedom of either the excitation location or the fretboard location, depending on with which hand the touching takes place. Examples c and d use a double notation for the v.f. This might be redundant in example c but it would suit all tastes. In example d it is actually not redundant, given that without the v.f.

¹⁵ Using the nomenclature N^{6++} and N^{6--} instead of the equivalents N^{3+} and N^{3-} respectively might be useful when the touching previously took place at N^{6+} or N^{6-} .

number it could be played in two strings.

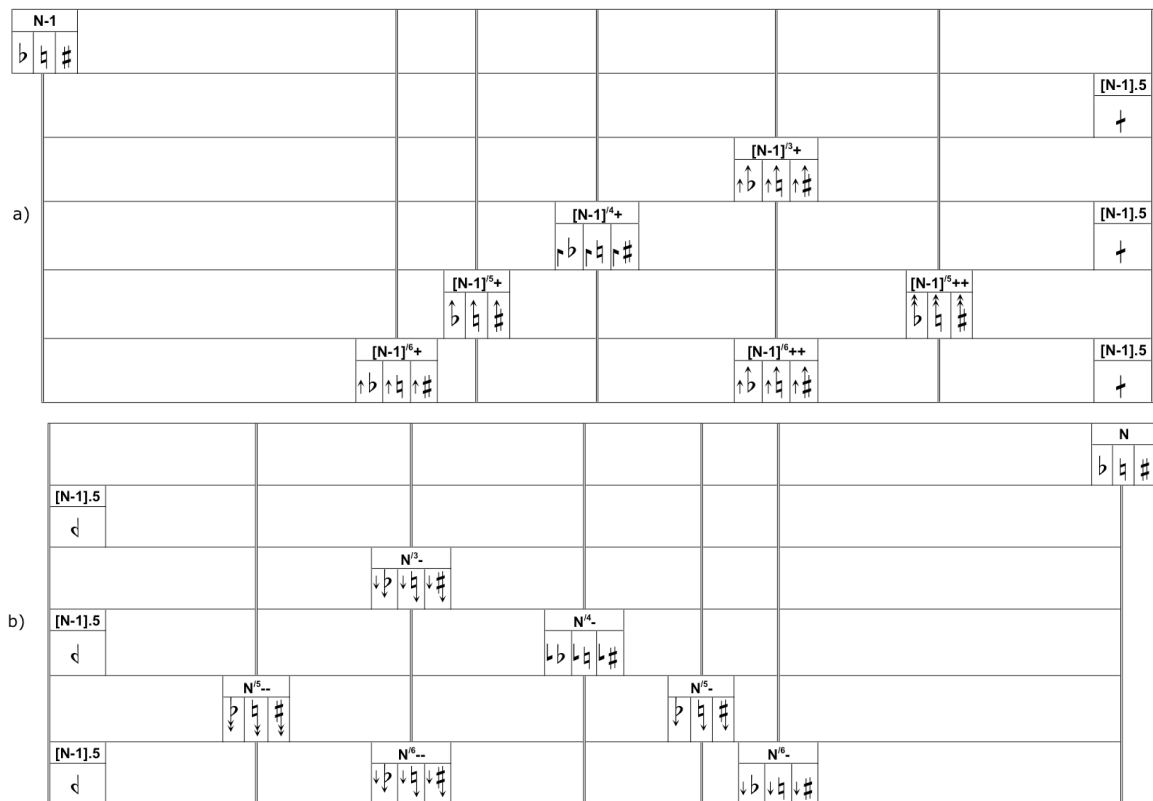


Figure 13: Suggested microtonal accidentals (from the *Extended Helmholtz-Ellis Just Intonation Pitch Notation* [SABAT; VON SCHWEINITZ, 2004]) for the symbolic notation of *virtual frets* (v.fs.). The figure represents the v.fs. which arise from the subdivision of the spaces between consecutive frets up to six equal parts. The accidentals in each line correspond to one subdivision. In the nomenclature of the v.fs. N is the upper-fret number. a) from the lower fret to the middle *virtual fret* (v.f.), accidentals apply to the pitch at the lower fret; b) from the middle v.f. to the upper fret, accidentals apply to the pitch at the upper fret.

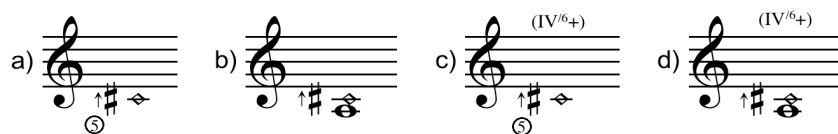


Figure 14: Examples, for the same touch location (the same as in Fig. 13), of our suggestions for the notation of the lightly touching of an open string (or stopped string, in examples b and d) at *virtual frets* using symbolic notation for the latter. All presuppose an explanation in the performance instructions.

5 Other descriptors for the notation of multiphonics

In the absence of resulting pitches, or if only one pitch is notated, we suggest making the **intended technique** explicit, especially when either one or the other is possible at the same location (e.g. with *M/H* or *Multiphonics/Harmonics* above the staff). However, when

multiphonics is intended, to notate only one resulting pitch, or none, gives the player a greater degree of freedom in the execution. If the goal is to have a color-rich sound, at least five **resulting pitches** should be notated. However, players sometimes ignore the notated result. Even if they do not, given the individuality of sound perception, not all might be able to perceive multiple pitches. Including the **touch pressure** when this is different from the usual harmonics pressure, the **kind of stroke**, and the **plucker** (when other than nail) would assure that the resulting sound approximates what the composer intends. Thus, for a partial-rich sound, the string should be touched with a lighter pressure and plucked with nail and an *apoyando* stroke near the bridge (*sul pont.*). A strong stroke helps enhancing the higher partials.

When only a few resulting pitches are notated, it should be because they are to be emphasized. For instance: in Figure 10, examples a.2 and b.1 regard the same touch location, but differ in the number of resulting pitches. In a.2, to emphasize the lower pitch, it is helpful to apply a lighter touch pressure, and to pluck with flesh (*polpastrella*) and an *apoyando* stroke at the *ordinario* zone. Here however, the other notated pitch (and also others not notated) might be damped, for which the right-hand placement would need to be more detailed. Using flesh instead of nail will filter out the higher partials, muffling thus the sound. Wanting to avoid this, then the nail should be used. Since this is the usual procedure, this instruction could be omitted. In b.1, trying to enhance the notated pitch will also enhance others, for which the solution is to filter these out, for example by plucking at the same location as in a.2 but with a higher pressure.

Finally, if the sound is intended to convey a meaning, alluding to this in the score, like in the example of Figure 3, might help in its conveying.

6 Conclusion

When the sounds resulting from the technique of harmonics are low pitched, the technique is often only notated with the resulting pitch, as guitarists can easily situate the locations from where to obtain them. When higher pitched, this might not be the case, and it is certainly not that of the sounds resulting from the technique of multiphonics, which sometimes are not avoidable when wanting to play high-pitched harmonics' sounds. It is then essential to notate the touch location. This consists of two descriptors: string and fretboard location (sometimes hypothetical). These can be identified in every above-reviewed piece, except when the player is free to choose them. However, when the fretboard location is between frets, the notation is not explained, or is vaguely explained. When in some cases it is the resulting pitches that determine the locations, for some of these locations it is not easy to find orientation reference. For which, it might be difficult to achieve reproducibility of the

sounds.

Notations have been suggested for the touch locations of a formalized approach to multiphonics (currently being tested) intended to give rise to reproducible sounds – some more straightforward than others.¹⁶ Given that the technique is not common vocabulary for the guitar, an explanation thereof and of its notation should always be included in the score, regardless of the chosen approach. As such, the composer is free to choose the notation. It could be argued that this may not help the assimilation of multiphonics into the vocabulary of the guitar but the case of harmonics goes against this. As Gimeno notes, along the guitar's history, "composers have used [harmonics] notations which lie far behind a desired normalization" (GIMENO, 2011: A58, translation by the authors).¹⁷ However, this has not prevented the assimilation of harmonics into the guitar's vocabulary. It is our view that, as the successful case of woodwind multiphonics shows, this resides in the availability of relevant information which lacks for guitar multiphonics and we intend to provide. This information will include that relative to the sonorities obtained when the technique is used on the amplified guitar, on which we believe it to be particularly suitable (TORRES; FERREIRA-LOPES, 2012a: 61-62). With this we aim to contribute to the promotion of color research on the guitar, and to the establishment of multiphonics in the sonic context of the instrument, especially of that of the amplified guitar.

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¹⁶ In an audience of 31 guitarists, before which this paper was presented, 15 elements preferred notation b of Figure 12, notations a and b of Figure 14 were each the choice of one element, and the rest of the audience did not reply.

¹⁷ Original version: Los guitarristas han utilizado notaciones que están muy lejos de una deseable normalización.

revision of the English.

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