

# Proposal to Encode Medieval East-Slavic Musical Notation in Unicode

Aleksandr Andreev

Yuri Shardt

Nikita Simmons

## PONOMAR PROJECT

### Abstract

A proposal to encode twelve additional characters in the Musical Symbols block of Unicode required for support of mediæval East-Slavic (Kievan) Music Notation.

## 1 Introduction

East Slavic musical notation, also known as Kievan, Synodal or “square” music notation is a form of linear musical notation found predominantly in religious chant books of the Russian Orthodox Church and the Carpatho-Russian jurisdictions of Orthodoxy and Eastern-Rite Catholicism. The notation originated in present-day Ukraine in the very late 1500’s (in the monumental *Irmologion* published by the Supraśl Monastery), and is derived from Renaissance-era musical forms used in Poland. Following the political union of Ukraine and Muscovite Russia in the 1660’s, this notational form became popular in Moscow and eventually replaced Znamenny neumatic notation in the chant books of the Russian Orthodox Church. The first published musical chant books using Kievan notation were issued in 1772, and though Western musical notation (what is referred to as Common Music Notation [CMN]) was introduced in Russia in the 1700’s, Kievan notation continued to be used. As late as the early 1900’s the publishing house of the Holy Synod released nearly the entire corpus of chant books in Kievan notation. The *Prazdniki* and *Obihod* chant books from this edition were reprinted in Russia in 2004, and may be found in the choir lofts of most monasteries and many parishes today. Therefore, the proper typesetting of Kievan notation is of interest not only to those in academic circles, but also to those who practice Russian Orthodox chant today.

Kievan notation is characterized by the distinct, square shape of its noteheads. The graphical form of some symbols of Kievan notation is similar to shape notes used in the United States or to some elements of mensural notation or notation used for Gregorian chant, all of which have already been encoded in Unicode. However, these elements of Kievan notation are functionally different from their shape notes, mensural or Gregorian analogs. In addition, they do not decompose into stems, heads and flags. Thus, the use of characters used for that repertoire to represent Kievan notation is not appropriate; Kievan notation characters should be encoded separately.

It is a goal of the Unicode standard to leave the rendering of pitch and other complexities associated with typesetting music to higher-level protocols. Musical layout, as well as the digital storage of musical compositions are therefore not addressed in this proposal. Rather,

the encoding of Kievan notation in Unicode is required for two reasons. First, to allow the handling of Kievan notational symbols in line (that is, within a body of text, such as academic literature, instructional manuals and guides to computer software); second, to identify the repertoire and provide a standard encoding method for use by musical typesetting software. In a related project, the authors propose a method for the handling of Kievan musical notation in the popular open-source music engraving package LilyPond.

## 2 Proposed Characters

Kievan notation and CMN share some elements of encoding; others may be considered as simple graphical variants. Table 1 presents the additional symbols proposed for inclusion required for full support of Kievan notation within Unicode. The subsequent section discusses the technical aspects of Kievan notation support. Figures 1 and 2 present examples of the use of Kievan musical symbols within a body of text. Figure 3 presents an example of a typical music score using Kievan notation; this proposal encodes all of the characters required to typeset the score, though the typesetting (engraving) process itself is left to musical software.

It has been noted that two of these characters are similar to Gregorian ligatures; however, these characters are not ligatures but single characters. The character Musical Symbol Kievan Whole Note (labeled 1 in Figure 1; proposed codepoint 1D1E2) consists of two attached diamonds; the nominal note is located between the two diamonds. The character Musical Symbol Kievan Eighth Note Stem Down (labeled 5 in Figure 1; proposed codepoint 1D1E7) consists again of two attached diamonds and a stem; the nominal note is located on the top diamond. The character Musical Symbol Kievan Final Note (labeled 1 in Figure 2; proposed codepoint 1D1E0) consists of two attached rectangles; the nominal note is located between the two rectangles. The character Musical Symbol Kievan Recitative Mark (labeled 1 in Figure 3; proposed codepoint 1D1E1) also consists of two attached rectangles; the nominal note is again located between the two rectangles. For more on the technical aspects of Kievan Notation, the reader is encouraged to consult [1].

## 3 Technical Comments

We have proposed for encoding the additional symbols required for Kievan musical notation. In some cases, symbols used in Kievan notation have a sufficiently close graphical representation and an identical function as CMN analogs; in these cases, the existing CMN symbol should be used. Thus, for example, we have not proposed the encoding of a Kievan Combining Augmentation Dot or a Kievan Sharp Sign; rather, the existing codepoints U+1D16D and U+266F, respectively, should be used.

In general, the following principles can be followed in typesetting Kievan notation in line. Kievan notes occur on a five-line staff; the existing five-line staff, U+1D11A, should be used. Musical phrases are separated by bar lines, and the existing codepoint, U+1D100 should be used for the bar line. We have proposed for encoding the Tsefaut clef<sup>1</sup> the only clef used in

---

<sup>1</sup>This clef is called Tsefaut because the note on the line where it appears would, in solfège nomenclature, be called *fa* or *ut*, which in the alternative terminology, is called C (Slavic pronunciation: *tse*). While functionally similar to the alto-clef, there is this subtle difference, *viz.* that in the Obihod scale, transposition by a fourth (from *ut* to *fa*) is musically invariant.

Figure 1: Kievan musical symbols used in-line. Note the characters used: 1. Musical Symbol Kievan Whole Note; 2. Musical Symbol Kievan Half Note on Line; 3. Musical Symbol Kievan Quarter Note Stem Down; 4. Musical Symbol Kievan Quarter Note Stem Up; 5. Musical Symbol Kievan Eighth Note Stem Down; 6. Musical Symbol Kievan Eighth Note Stem Up. Source: [2].








Богослужебныя пѣвческія книги печатаются <sup>1</sup>ва <sup>2</sup>ра <sup>3</sup>то <sup>4</sup>бо <sup>5</sup>то <sup>6</sup>то.  
 Квадратныя ноты имѣють слѣдующее начертаніе:   
 Различіе между изображенными здѣсь нотами заключается въ *долготѣ* или *длительности* соответствующихъ имъ звуковъ; такъ нота  означаетъ звукъ наибольшей длительности; звукъ ноты  равняется половинѣ долготы звука предыдущей ноты; нота  или  равняется по долготѣ четверти первой ноты; ноты  или  составляютъ вось-

Figure 2: Additional Kievan musical symbols used in-line: 1. Musical Symbol Kievan Final Note; 2. Musical Symbol Kievan End of Piece; 3. Musical Symbol Kievan Tsefaut Clef; 4. Musical Symbol Kievan Flat Sign. Source: [2].





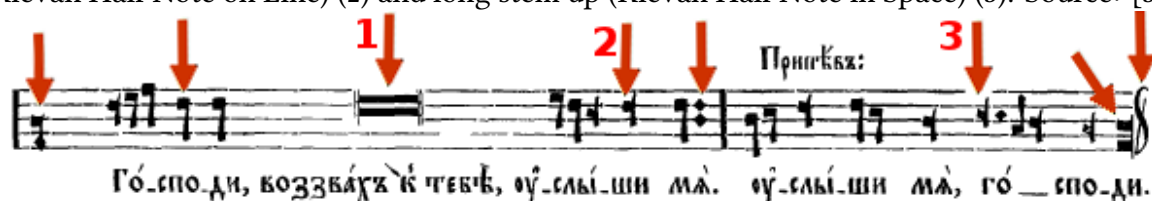












Въ концѣ пѣснопѣнія ставится обыкновенно нота <sup>1</sup>, означающая звукъ неопредѣленной длительности. Впрочемъ эта же нота *иногда*  
 Знакъ <sup>2</sup> употребляется для означенія конца пѣснопѣнія.  
 Для того, чтобы узнать, какъ называется нота, <sup>3</sup>входящаяся на известной линіи или промежуткѣ, употребляется знакъ , называемый *ключемъ*. Это ключъ *цѣфавтный* <sup>3</sup>). Въ богослужебныхъ пѣвческихъ третьяго тетра хорда, <sup>4</sup>т.е. между *ля* и *фа* на приписной линіи, всегда употребляется знакъ , соответствующій знаку пониженія — *бемоллю*.

Figure 3: A typical music score in Kievan notation. Note also the use of 1. Musical Symbol Kievan Recitative Mark and both variants of Musical Symbol Kievan Half Note, short stem up (Kievan Half Note on Line) (2) and long stem up (Kievan Half Note in Space) (3). Source: [3].



Гѡ-спѡ-ди, воззвахъ къ тебѣ, оу-слы-ши мѡ. оу-слы-ши мѡ, гѡ-спѡ-ди.

Table 1: Proposed Characters

Representation	Codepoint	Name	Comments
<b>Clefs</b>			
	U+1D1DE	MUSICAL SYMBOL KIEVAN TSEFAUT CLEF	C-clef with a unique graphical representation.
<b>Ornamentation</b>			
	U+1D1DF	MUSICAL SYMBOL KIEVAN END OF PIECE	Placed at the end of a piece
<b>Notes</b>			
	U+1D1E0	MUSICAL SYMBOL KIEVAN FINAL NOTE	Nominal note located between the two rectangles
	U+1D1E1	MUSICAL SYMBOL KIEVAN RECITATIVE MARK	Nominal note located between the two rectangles
	U+1D1E2	MUSICAL SYMBOL KIEVAN WHOLE NOTE	Whole note with a unique graphical representation.
			Nominal note located between the two diamonds.
	U+1D1E3	MUSICAL SYMBOL KIEVAN HALF NOTE IN SPACE	This variant of the half note is used between staff lines.
	U+1D1E4	MUSICAL SYMBOL KIEVAN HALF NOTE ON LINE	This variant of the half note is used on a line.
	U+1D1E5	MUSICAL SYMBOL KIEVAN QUARTER NOTE STEM DOWN	Quarter note with stem down.
	U+1D1E6	MUSICAL SYMBOL KIEVAN QUARTER NOTE STEM UP	Quarter note with stem up.
	U+1D1E7	MUSICAL SYMBOL KIEVAN EIGHTH NOTE STEM DOWN	Eighth note with unique representation. Nominal note located on the top diamond.
	U+1D1E8	MUSICAL SYMBOL KIEVAN EIGHTH NOTE STEM UP	Eighth note with stem up.
<b>Accidentals</b>			
	U+1D1E9	MUSICAL SYMBOL KIEVAN FLAT SIGN	Flat sign with unique representation.

Kievan notation. We have proposed for inclusion all required notes for the full repertoire of music. Graphical variations in the shape of the notes between the Synodal publishing house sources and the manuscript tradition should be handled at the font level.

The existing CMN support in Unicode offers a set of control characters that may be used for the repertoire of Kievan notation, if necessary. For example, on some occasions, notes may be beamed. For the purposes of beaming, the existing control characters U+1D173 (Musical Symbol Begin Beam) and U+1D174 (Musical Symbol End Beam) should be used. The correct beaming behavior may be implemented at the font level, *e.g.*, via a ligature substitution.

While slurs and ties do not exist in Kievan music notation, notes in single-syllabic melismatic structures are frequently grouped together; in the chantbooks, melismatic groups are separated from each other by whitespace. Existing control characters U+1D179 (Musical Symbol Begin Phrase) and U+1D17A (Musical Symbol End Phrase) should be used for the purposes of grouping.

## 4 Appendix: Character Properties

The following entries are proposed for addition to UnicodeData.txt:

```
1D1DE;MUSICAL SYMBOL KIEVAN TSEFAUT CLEF;So;0;L;;;;;N;;C or do
    clef in Kievan notation;;;
1D1DF;MUSICAL SYMBOL KIEVAN END OF PIECE;So;0;L;;;;;N;;;;;
1D1E0;MUSICAL SYMBOL KIEVAN FINAL NOTE;So;0;L;;;;;N;;;;;
1D1E1;MUSICAL SYMBOL KIEVAN RECITATIVE MARK;So;0;L;;;;;N;;;;;
1D1E2;MUSICAL SYMBOL KIEVAN WHOLE NOTE;So;0;L;;;;;N;;;;;
1D1E3;MUSICAL SYMBOL KIEVAN HALF NOTE IN SPACE;So;0;L;;;;;N;;
    See 1D1E4 for half note on line;;;
1D1E4;MUSICAL SYMBOL KIEVAN HALF NOTE ON LINE;So;0;L;;;;;N;;
    See 1D1E3 for half note in space;;;
1D1E5;MUSICAL SYMBOL KIEVAN QUARTER NOTE STEM DOWN;So;0;L;;;;;
    N;;See 1D1E6 for quarter note with stem up;;;
1D1E6;MUSICAL SYMBOL KIEVAN QUARTER NOTE STEM UP;So;0;L;;;;;N
    ;;See 1D1E5 for quarter note with stem down;;;
1D1E7;MUSICAL SYMBOL KIEVAN EIGHTH NOTE STEM DOWN;So;0;L;;;;;N
    ;;See 1D1E8 for eighth note with stem up;;;
1D1E8;MUSICAL SYMBOL KIEVAN EIGHTH NOTE STEM UP;So;0;L;;;;;N;;
    See 1D1E7 for eighth note with stem down;;;
1D1E9;MUSICAL SYMBOL KIEVAN FLAT SIGN;So;0;L;;;;;N;;;;;
```

## References

- [1] Simmons, Nikita. “A Primer of Kievan Square-note (Quadratic or Synodal) Musical Notation”. Online resource: [http://www.synaxis.info/psalom/research/simmons/Kievan\\_notation.pdf](http://www.synaxis.info/psalom/research/simmons/Kievan_notation.pdf)

- [2] Soloviev, D., *Краткое руководство к первоначальному изучению церковного пения по квадратной ноте. (A brief handbook for the study of church music written in square notation)*. St Petersburg, Russia, 1889.
- [3] *Обиход нотнаго пения употребительных церковных роспевов. (Obihod of scored music in common church chants)*. Moscow, Russia: Publishing Council of the Russian Orthodox Church, 2004.

**ISO/IEC JTC 1/SC 2/WG 2  
PROPOSAL SUMMARY FORM TO ACCOMPANY SUBMISSIONS  
FOR ADDITIONS TO THE REPERTOIRE OF ISO/IEC 10646<sup>1</sup>.**

**Please fill all the sections A, B and C below.**

Please read Principles and Procedures Document (P & P) from <http://www.dkuug.dk/JTC1/SC2/WG2/docs/principles.html> UT  
for guidelines and details before filling this form.

Please ensure you are using the latest Form from <http://www.dkuug.dk/JTC1/SC2/WG2/docs/summaryform.html>.

See also <http://www.dkuug.dk/JTC1/SC2/WG2/docs/roadmaps.html> for latest Roadmaps.

**A. Administrative**

1. Title:	<b>Proposal to Encode Medieval East-Slavic Musical Notation in Unicode</b>
2. Requester's name:	<i>Aleksandr Andreev, Yuri Shardt and Nikita Simmons</i>
3. Requester type (Member body/Liaison/Individual contribution):	<i>Individual contribution</i>
4. Submission date:	<i>September 29, 2011</i>
5. Requester's reference (if applicable):	
6. Choose one of the following:	
This is a complete proposal:	<input checked="" type="checkbox"/> <b>YES</b>
(or) More information will be provided later:	<input type="checkbox"/>

**B. Technical – General**

1. Choose one of the following:	
a. This proposal is for a new script (set of characters):	<input type="checkbox"/> <b>NO</b>
Proposed name of script:	
b. The proposal is for addition of character(s) to an existing block:	<input checked="" type="checkbox"/> <b>YES</b>
Name of the existing block:	<i>Musical Symbols</i>
2. Number of characters in proposal:	<input checked="" type="checkbox"/> <b>12</b>
3. Proposed category (select one from below - see section 2.2 of P&P document):	
A-Contemporary <input type="checkbox"/> B.1-Specialized (small collection) <input checked="" type="checkbox"/> B.2-Specialized (large collection) <input type="checkbox"/>	
C-Major extinct <input type="checkbox"/> D-Attested extinct <input type="checkbox"/> E-Minor extinct <input type="checkbox"/>	
F-Archaic Hieroglyphic or Ideographic <input type="checkbox"/> G-Obscure or questionable usage symbols <input type="checkbox"/>	
4. Is a repertoire including character names provided?	<input checked="" type="checkbox"/> <b>YES</b>
a. If YES, are the names in accordance with the "character naming guidelines" in Annex L of P&P document	<input checked="" type="checkbox"/> <b>YES</b>
b. Are the character shapes attached in a legible form suitable for review?	<input checked="" type="checkbox"/> <b>YES</b>
5. Fonts related:	
a. Who will provide the appropriate computerized font to the Project Editor of 10646 for publishing the standard?	<i>Aleksandr Andreev</i>
b. Identify the party granting a license for use of the font by the editors (include address, e-mail, ftp-site, etc.):	<i>Metasuprasl Regular licensed under GNU GPL, available from <a href="mailto:aleksandr.andreev@gmail.com">aleksandr.andreev@gmail.com</a>, or <a href="http://www.ponomar.net/cu_support.html">http://www.ponomar.net/cu_support.html</a></i>
6. References:	
a. Are references (to other character sets, dictionaries, descriptive texts etc.) provided?	<input checked="" type="checkbox"/> <b>YES</b>
b. Are published examples of use (such as samples from newspapers, magazines, or other sources) of proposed characters attached?	<input checked="" type="checkbox"/> <b>YES</b>
7. Special encoding issues:	
Does the proposal address other aspects of character data processing (if applicable) such as input, presentation, sorting, searching, indexing, transliteration etc. (if yes please enclose information)?	<input checked="" type="checkbox"/> <b>YES</b>
	<i>Technical comments addressing input and presentation have been provided.</i>

**8. Additional Information:**

Submitters are invited to provide any additional information about Properties of the proposed Character(s) or Script that will assist in correct understanding of and correct linguistic processing of the proposed character(s) or script. Examples of such properties are: Casing information, Numeric information, Currency information, Display behaviour information such as line breaks, widths etc., Combining behaviour, Spacing behaviour, Directional behaviour, Default Collation behaviour, relevance in Mark Up contexts, Compatibility equivalence and other Unicode normalization related information. See the Unicode standard at <http://www.unicode.org> for such information on other scripts. Also see Unicode Character Database ( <http://www.unicode.org/reports/tr44/> ) and associated Unicode Technical Reports for information needed for consideration by the Unicode Technical Committee for inclusion in the Unicode Standard.

<sup>1</sup> Form number: N3902-F (Original 1994-10-14; Revised 1995-01, 1995-04, 1996-04, 1996-08, 1999-03, 2001-05, 2001-09, 2003-11, 2005-01, 2005-09, 2005-10, 2007-03, 2008-05, 2009-11, 2011-03)

### C. Technical - Justification

1. Has this proposal for addition of character(s) been submitted before? If YES explain		NO
2. Has contact been made to members of the user community (for example: National Body, user groups of the script or characters, other experts, etc.)? If YES, with whom? If YES, available relevant documents:	<i>Academics, choir directors using Kievan notation</i> <i>Personal correspondence</i>	YES
3. Information on the user community for the proposed characters (for example: size, demographics, information technology use, or publishing use) is included? Reference:	<i>See Section 1 of Proposal</i>	YES
4. The context of use for the proposed characters (type of use; common or rare) Reference:	<i>See Section 1 of Proposal and Figures.</i>	common
5. Are the proposed characters in current use by the user community? If YES, where? Reference:	<i>Typesetting chant books and instructional material. See Proposal.</i>	YES
6. After giving due considerations to the principles in the P&P document must the proposed characters be entirely in the BMP? If YES, is a rationale provided? If YES, reference:		NO
7. Should the proposed characters be kept together in a contiguous range (rather than being scattered)?		YES
8. Can any of the proposed characters be considered a presentation form of an existing character or character sequence? If YES, is a rationale for its inclusion provided? If YES, reference:		NO
9. Can any of the proposed characters be encoded using a composed character sequence of either existing characters or other proposed characters? If YES, is a rationale for its inclusion provided? If YES, reference:		NO
10. Can any of the proposed character(s) be considered to be similar (in appearance or function) to an existing character? If YES, is a rationale for its inclusion provided? If YES, reference:	<i>Some characters look similar to Gregorian or Mensural notation, but should be encoded separately because they have a different function and are not decomposable. See Section 1 of Proposal.</i>	YES YES
11. Does the proposal include use of combining characters and/or use of composite sequences? If YES, is a rationale for such use provided? If YES, reference: Is a list of composite sequences and their corresponding glyph images (graphic symbols) provided? If YES, reference:		NO
12. Does the proposal contain characters with any special properties such as control function or similar semantics? If YES, describe in detail (include attachment if necessary)	<i>Existing control characters of the Musical Symbols block should be used for this Notation also.</i>	NO
13. Does the proposal contain any Ideographic compatibility characters? If YES, are the equivalent corresponding unified ideographic characters identified? If YES, reference:		NO