

# Modifier Sinological extensions to the IPA

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This proposal, officially supported by the International Phonetic Association after evaluation by the IPA Alphabets, Charts and Fonts Committee (Nicolaidis 2024), follows on [L2/20-252](#) and [L2/20-253](#), which requested modifier (superscript) variants of nearly all letters of the modern IPA alphabet that were as yet unsupported by Unicode. Those two proposals included a few para-IPA letters, but consideration of para-IPA modifiers was largely deferred until the IPA could more fully discuss the desired scope of such encoding through the newly established Alphabet, Charts and Fonts Committee. This proposal is a result of that consultation.

By ‘para-IPA,’ we mean letters that are commonly used within otherwise-IPA transcription, but which are not part of the official IPA alphabet. Examples of para-IPA in Sinological circles are the palatal/palatalized consonants *ɲ* and *ʃ* and the Karlgren vowel letters *ɿ* and *ʅ* (Figure 1).

Thanks to Denis Jacquerye for several of the illustrations and for the table of historical forms that is Figure 2.

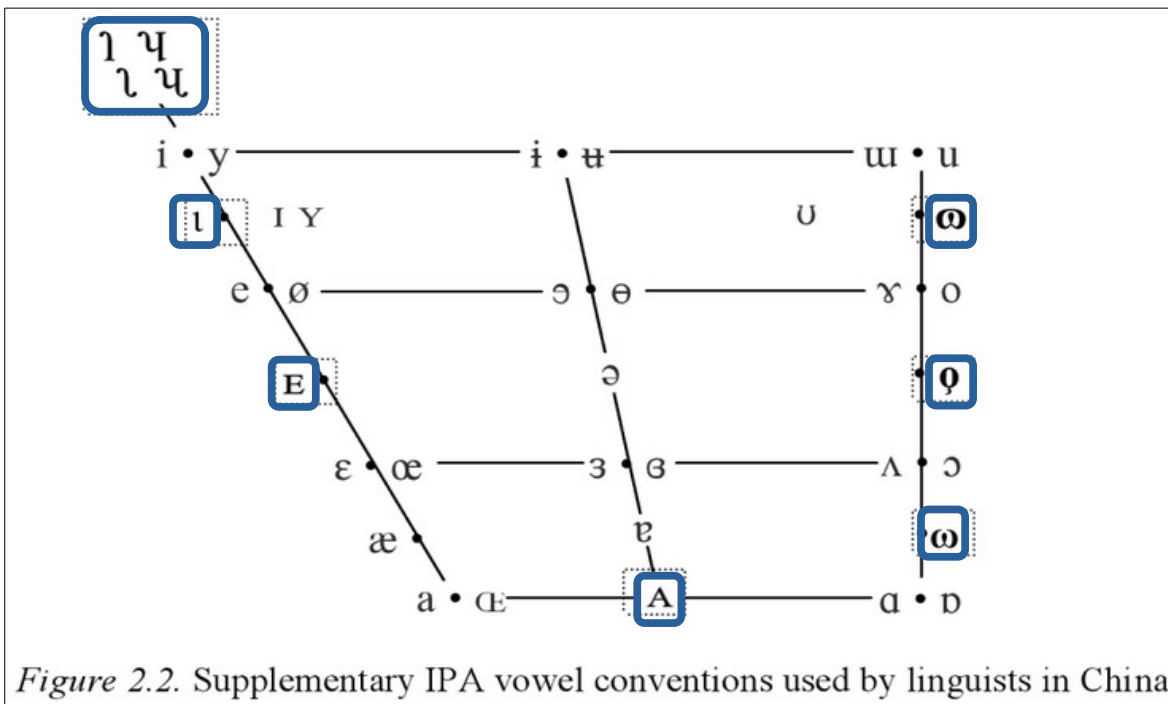


Figure 1. Pelkey (2011: 66). The Sinological para-IPA vowel letters (blue). Modifier *ɿ* and *ω* are supported at U+1DA5 <ɿ> and 107A4 <ω>. Modifier *φ* can be handled with U+1D52 <φ> and a combining diacritic. Modifier *ɿ ʅ ɿ ʅ* await encoding; modifier *ω* is proposed elsewhere.

The letters  $t̟$   $d̟$   $l̟$   $n̟$  are a Sinological extension for alveolo-palatal (or simply palatalized alveolar) consonants. I have found only  $n̟$  as a superscript, in the prenasalized stop [ $ʰd̟$ ] (Figure 3), but superscript  $t̟$   $d̟$   $l̟$  are to be expected. Some Sichuanese and Yunnanese dialects of Chinese and Miao, for example, are reported to have phonetically post-stopped nasals, which are often transcribed with superscripts. (See Chan 1987: 97 and Chan & Ren 1987, who list [ $m^b$ ], [ $n^d$ ], [ $ŋ^g$ ] but unfortunately not [ $n^d$ ].) The IPA requests all four modifier letters.

The ICPLA is considering adopting  $d̟$   $l̟$   $n̟$   $t̟$  into ExtIPA as alveolo-palatal consonants (Martin Ball, p.c. 2024), so modifier variants may prove useful there as well.

The Karlgren letters  $ɿ$   $ʅ$  are superscripted to mark transitional vowels under *erhua* in Chinese phonology (Figure 4). Their rounded analogs  $ɥ$   $ʉ$  are only found in a limited number of dialects and so modifier variants might be expected to be accidental gaps. Full Unicode coverage of this Sinological convention would include all four modifier letters. The Unicode names of these letters are unfortunate, and we propose more intuitive descriptions as annotations of the base and modifier letters.

Modifier  $^A$  and  $^E$  have not yet been found in Sinological works, but they occur in Americanist literature, where  $\langle A E \rangle$  may be either voiceless [ $ʌ̥ ɛ̥$ ] or obscure vowels with [ $a e$ ] coloring, and superscript  $\langle ^A ^E \rangle$  may be used to mark fleeting voiceless or obscure vowels. (The same holds for superscript  $\langle ^i ^u \rangle$ , which are already supported by Unicode.) Tokens of  $\langle ^A ^E \rangle$  may vary in size between texts and within a text. For example, in Frachtenberg's 1922 chapter on Siuslaw,  $\langle ^E \rangle$  is consistently a small capital (Figure 8), apart from one table where all superscripts are misaligned or oversized. However, in his chapter on Coos in the same volume,  $\langle ^E \rangle$  is raised above the baseline with little or no reduction in size; only in a few cases is it formatted correctly as  $\langle ^E \rangle$  (for example Figure 9). Semantically, these are all clearly small capitals as defined by the pronunciation key in the volume.

Similarly, modifier  $\langle ^\omega \rangle$  has not yet been found in Sinological works, but occurs in recent Americanist literature, where it indicates labialization. It is illustrated and requested in a separate proposal on Greek-derived modifier letters, due to a question over whether it should be encoded as a Latin or a Greek character.

### Shaping issues of the Karlgren letters

There are shaping issues with the four Karlgren letters  $ɿ$   $ʅ$   $ɥ$   $ʉ$ . Following the convention of the Swedish *Landsmålsalfabetet*, Karlgren (1926) usually set them in italic typeface. Chao (1931, 1934), writing in Chinese, set them in roman typeface, but retained the top flourishes of the italic letters:  $\langle ɿ ʅ ɥ ʉ \rangle$ . (In the few cases where Karlgren set them in roman typeface, he dropped the top terminals from  $ɥ$   $ʉ$  but retained them on  $ɿ$   $ʅ$ .) For Chao's publications in the IPA journal (IPA 1931), the glyphs were modified to fit to IPA style by replacing the *t*-like terminals with IPA hooks:  $\langle ɿ ʅ ɥ ʉ \rangle$

ɥ⟩. These are the glyphs in the current Unicode chart. There is evidently some concern in the Scandinavian community that encoding modifier variants of the Unicode characters U+027F, 0285 and 02AE–02AF will endanger future proposals to disunify them from the Karlgren glyphs found in non-IPA texts, separating non-IPA ⟨ɹɹ ɥ ɥ⟩ from the para-IPA characters ⟨ɹɹ ɥ ɥ⟩. (See Figure 2.) When this objection was raised at SEW, they stated that encoding modifier variants of existing characters will not impede possible future disunification of those characters.

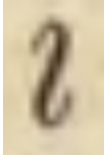

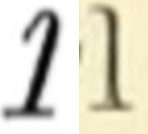



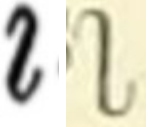
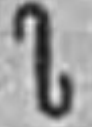


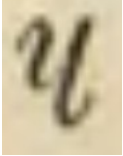
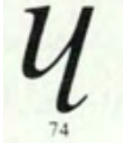
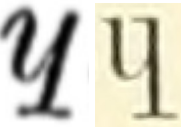



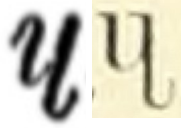
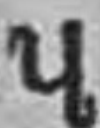
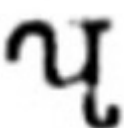

<i>Landsmålsalfabetet</i> (Lundell 1878)	<i>Landsmålsalfabetet</i> (Söderström 1989)	I. Sinological (Karlgren 1926)	II. para-IPA (Chao 1931, Chao 1934)	III. para-IPA (IPA 1931)	Unicode charts
					
					
					
					

Figure 2. The four Karlgren Sinological letters ɹɹ ɥ ɥ derive from a split of the two *Landsmålsalfabetet* letters ɹ ɥ. Columns I–III show three generations of the Karlgren letters: (I) Karlgren’s writings in French (and later texts in that tradition), (II) Chao’s writings in Mandarin (and later texts in that tradition), and (III) Chao’s writings in the IPA journal. Karlgren (col. I) splits serifs from hooked terminals, which in the *Landsmålsalfabetet* was merely a flourish of italic typeface. In rare cases of roman typeface (e.g. Karlgren 1926: 863, col. I right), Karlgren retains the top italic terminal in ɹ ɹ but not in ɥ ɥ. Chao (col. II) placed top terminals on all four letters; these designs are used in the Chinese translation of Karlgren (1926). They would be further modified to harmonize with the IPA alphabet in *Le Maître phonétique* (col. III); these are the Unicode forms (right).

# Characters

## Modifier small capitals (subheading continuing from 1DFE8)

- <sup>A</sup> 1DFE9 MODIFIER LETTER SMALL CAPITAL A. Figure 10.
- <sup>E</sup> 1DFEA MODIFIER LETTER SMALL CAPITAL E. Figures 4–5.

## Modifier Sinological letters

- <sup>1</sup> 1DFEB MODIFIER LETTER SMALL REVERSED R WITH FISHHOOK. Figure 4.
- <sup>ʌ</sup> 1DFEC MODIFIER LETTER SMALL SQUAT REVERSED ESH. Figure 4 *ff*.
- <sup>ʉ</sup> 1DFED MODIFIER LETTER SMALL TURNED H WITH FISHHOOK.
- <sup>ʊ</sup> 1DFEE MODIFIER LETTER SMALL TURNED H WITH FISHHOOK AND TAIL.
- <sup>ɔ</sup> 1DFEF MODIFIER LETTER SMALL D WITH CURL.
- <sup>ɹ</sup> 1DFF0 MODIFIER LETTER SMALL L WITH CURL.
- <sup>ʎ</sup> 1DFF1 MODIFIER LETTER SMALL N WITH CURL. Figure 3.
- <sup>ʟ</sup> 1DFF2 MODIFIER LETTER SMALL T WITH CURL.

# Properties

- 1DFE9;MODIFIER LETTER SMALL CAPITAL A;Lm;0;L;<super> 1D00;;;N;;;;;
- 1DFEA;MODIFIER LETTER SMALL CAPITAL E;Lm;0;L;<super> 1D07;;;N;;;;;
- 1DFEB;MODIFIER LETTER SMALL REVERSED R WITH FISHHOOK;Lm;0;L;<super> 027F;;;N;;;;;
- 1DFEC;MODIFIER LETTER SMALL SQUAT REVERSED ESH;Lm;0;L;<super> 0285;;;N;;;;;
- 1DFED;MODIFIER LETTER SMALL TURNED H WITH FISHHOOK;Lm;0;L;<super> 02AE;;;N;;;;;
- 1DFEE;MODIFIER LETTER SMALL TURNED H WITH FISHHOOK AND TAIL;Lm;0;L;<super> 02AF;;;N;;;;;
- 1DFEF;MODIFIER LETTER SMALL D WITH CURL;Lm;0;L;<super> 0221;;;N;;;;;
- 1DFF0;MODIFIER LETTER SMALL L WITH CURL;Lm;0;L;<super> 0234;;;N;;;;;
- 1DFF1;MODIFIER LETTER SMALL N WITH CURL;Lm;0;L;<super> 0235;;;N;;;;;
- 1DFF2;MODIFIER LETTER SMALL T WITH CURL;Lm;0;L;<super> 0236;;;N;;;;;

## Annotations

The Unicode characters for the four Karlgren vowel letters ɿ ʝ ȳ ȷ are poorly named. They originate in two letters of the Swedish *Landsmålsalfabetet*, specifically dotless *i* with a descender (long *i*) and *y* with a straight leg (turned *h*). We propose adding annotations for more intuitive names.

These annotations are proposed as additions to the existing annotations, not as replacements.

027F LATIN SMALL LETTER REVERSED R WITH FISHHOOK

\* long *i* with left hook

0285 LATIN SMALL LETTER SQUAT REVERSED ESH

\* long *i* with left hook and tail

02AE LATIN SMALL LETTER TURNED H WITH FISHHOOK

\* turned *h* with left hook

02AF LATIN SMALL LETTER TURNED H WITH FISHHOOK AND TAIL

\* turned *h* with left hook and tail

1DFEB MODIFIER LETTER SMALL REVERSED R WITH FISHHOOK

\* modifier letter long *i* with left hook

1DFEC MODIFIER LETTER SMALL SQUAT REVERSED ESH

\* modifier letter long *i* with left hook and tail

1DFED MODIFIER LETTER SMALL TURNED H WITH FISHHOOK

\* modifier letter turned *h* with left hook

1DFEE MODIFIER LETTER SMALL TURNED H WITH FISHHOOK AND TAIL

\* modifier letter turned *h* with left hook and tail

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# Chart

Greyed out cells are assigned (medium grey) or proposed elsewhere (light grey).

1DF00

Latin Extended-G

1DFFF

	1DF0	1DF1	1DF2	1DF3	1DF4	1DF5	1DF6	1DF7	1DF8	1DF9	1DFA	1DFB	1DFC	1DFD	1DFE	1DFF
0	ƒ̃	ɣ	ɔ̣	ɟ												ɮ
1	ɸ	ɮ	ɔ̣	ɟ												ɮ̃
2	ɔ̣	ɔ̣̃	ɮ	ɟ												ɮ̃
3	ɣ	ɮ̃	ɮ̃	ɟ̃												ɮ̃
4	ɮ̃	ɟ̃	ɮ̃	ɟ̃												ɮ̃
5	ɮ̃	ɟ̃	ɮ̃	ɟ̃												ɮ̃
6	ɮ̃	ɟ̃	ɮ̃	ɟ̃												ɮ̃
7	ɮ̃	ɟ̃	ɮ̃	ɟ̃												ɮ̃
8	ɮ̃	ɟ̃	ɮ̃	ɟ̃												ɮ̃
9	ɮ̃	ɟ̃	ɮ̃	ɟ̃											ɮ̃	ɮ̃
A	ɮ̃	ɟ̃	ɮ̃	ɟ̃											ɮ̃	ɮ̃
B	ɮ̃	ɟ̃	ɮ̃	ɟ̃											ɮ̃	ɮ̃
C	ɮ̃	ɟ̃	ɮ̃	ɟ̃											ɮ̃	ɮ̃
D	ɮ̃	ɟ̃	ɮ̃	ɟ̃											ɮ̃	ɮ̃
E	ɮ̃	ɟ̃	ɮ̃	ɟ̃											ɮ̃	ɮ̃
F	ɮ̃	ɟ̃	ɮ̃	ɟ̃											ɮ̃	ɮ̃

# Figures

One striking feature of Maonan is that pre-nasalized stops and pre-glottalized stops are found to be in complementary distribution in the tonal system, with pre-nasalized stops *<sup>m</sup>b-*, *<sup>m</sup>bj-*, *<sup>n</sup>d-*, *<sup>n</sup>dj-*, *<sup>n</sup>d̥-*, *<sup>ŋ</sup>g-* and *<sup>ŋ</sup>gw-* only occurring in high tones, while glottalized stops *<sup>ʔ</sup>b-*, *<sup>ʔ</sup>bj-*, *<sup>ʔ</sup>d-* and *<sup>ʔ</sup>dj-* only occurring in low tones, as shown

*<sup>ʔ</sup>na<sup>5</sup>mai<sup>4</sup>*    *nim<sup>1</sup>* *<sup>ʔ</sup>naŋ<sup>1</sup>* *wi<sup>1</sup>*.    *<sup>n</sup>dam<sup>5</sup>* *swa:ŋ<sup>3</sup>*    *<sup>n</sup>dam<sup>5</sup>* *t<sup>h</sup>ɔŋ<sup>1</sup>*    *ləm<sup>1</sup>*.  
 tree branch seek still easy. and cool and pass through wind.  
 tree. It's easier to look for the lice on the tree branches. It is cool and there

Figure 3. Lu (2008: 93, 370).

A comparison of Figure 14.5c and Figure 14.6c shows the F-pattern of [ɿ-ɿ̥] is similar to the F-patterns of [i-ɿ̥], [y-ɿ̥], and [a-ɿ̥], except for a much shorter duration of the formants for [ɿ] at the onset of [ɿ̥], suggesting [ɿ] suffixed with [ɿ̥] (Figure 14.5c) turns into [ɿ̥̥]. The superscript [̥] indicates that [ɿ] of [ɿ-ɿ̥] is transient. Similarly, [ɿ̥] suffixed with [ɿ̥] (Figure 14.5d) turns into [ɿ̥̥̥].

Figure 4. Lee & Zee (2014: 384). Though the vowels have ascenders in this font, they are clearly the Karlgren letters ɿ and ɿ̥, as demonstrated by context and by the Unicode encoding of the electronic version of the book. The ascenders are a not-uncommon graphic variant.

例詞	純粹老派	錢、張半老派
(八)成兒	[ɿ̥'əɿ] (歸「小人辰兒」)	≠ [ɿ̥'ə̥ɿ] (另立「小中東兒」)
(香)腸兒	[ɿ̥'a'ɿ] (歸「小言前兒」)	≠ [ɿ̥'ḁ'ɿ] (另立「小江陽兒」)
(出)錯兒	[ɿ̥'uəɿ] (歸「小人辰兒」)	≠ [ɿ̥'uə̥ɿ] (另立「小梭撥兒」)

Figure 5. Li (1994: 115). Contrast of [ɿ] and [ɿ̥].



morpheme” and transcribes *erhua* as /ɿ/. Later, [2] holds that *erhua* is actually ʮ/ (i.e. a retroflex apical vowel) and proposes that there are five exponents of it, namely, {aʮ, əʮ, aʮ̌, əʮ̌, uʮ̌}. [3] and [4] claim that the *er*-suffix in Standard Mandarin is a (subsyllabic) rhotic schwa [ə̌] and may be featurally

Figure 6. Huang et al. (2020: 661), citing Li (1994).

throughout the whole of the rime, e.g., [aʮ̌]. In the Chinese-language literature, Li (1986) claims that the *er*-suffix is a retroflex apical vowel (ʮ/) and proposes that the *er*-suffix may be attached to a stem, forming a diphthong, i.e., {aʮ, əʮ}, or merged into a stem, resulting in a rhotacized rime, i.e., {aʮ̌, əʮ̌, uʮ̌} Lin and Shen (1995), among others, hold that rhoticity is almost synchronous with the vowel across the board. However,

Figure 7. Huang et al. (2023: 44). <aʮ̌> is a diphthong, whereas <aʮ̌> is a rhoticized vowel approximately equal to [aʮ̌].

*kwī' n<sup>ɛ</sup>x yal·x kū' na'wūn* you almost  
 beat him

Figure 8. Frachtenberg (1922: 458) “Siuslawan (Lower Umpqua)”, in Boas (ed.) *Handbook of American Indian Languages*, part 2. <ɛ> (red) is the same size as lower-case <w> (yellow). Its sharp angles distinguish it from the <ɛ> used for glottal stop.

*ts<sup>ɛ</sup>xaw'tc îł dōwā'ya* to kill they want him  
*īn lɛ'γī xkwî' na<sup>u</sup>tc* it does not look good

Figure 9. Frachtenberg (1922: 340) “Coos”, in Boas (ed.) *Handbook of American Indian Languages*, part 2. <ɛ> (red) vs. baseline <ɛ> and a lower-case superscript u (yellow). <ɛ> is formatted correctly also on pages 317, 344, 359.

dispensed with and phonetically explained as a timbre-echo of -ōl-); **A** in qē'w<sup>A</sup>x “steel-head salmon” (that **A** is organic, despite its dull quality and extreme brevity, and reduced from a, is indicated by Nootka qē'waH “steel-head salmon,” with which Comox qē'w<sup>A</sup>x is evidently identical; borrowing has doubtless taken place); **A** and <sup>a</sup> in hēw<sup>A</sup>qen' “swan” and its diminutive hēw<sup>a</sup>qAōōl.

Figure 10. Sapir (1994: 4 [384]) “Noun Reduplication in Comox”, in Golla (ed., 1994) *The Collected Works of Edward Sapir VI: American Indian Languages 2*. Although the size is inconsistent between the letter in isolation and in a word, the intent is clearly a small-cap: brief/fleeting vowels are superscripted, and the corresponding full vowel in Comox can be seen to be a small-cap <A> (yellow).

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://std.dkuug.dk/JTC1/SC2/WG2/docs/principles.html> for guidelines and details before filling this form.

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

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

**A. Administrative**

1. **Title:** Modifier Sinological extensions to the IPA

2. Requester's name: Kirk Miller

3. Requester type (Member body/Liaison/Individual contribution): individual

4. Submission date: 2024 June 14

5. Requester's reference (if applicable): \_\_\_\_\_

6. Choose one of the following:  
 This is a complete proposal: \_\_\_\_\_  
 (or) More information will be provided later: \_\_\_\_\_

**B. Technical – General**

1. Choose one of the following:  
 a. This proposal is for a new script (set of characters): \_\_\_\_\_  
 Proposed name of script: \_\_\_\_\_  
 b. The proposal is for addition of character(s) to an existing block: x  
 Name of the existing block: Latin Extended-G

2. Number of characters in proposal: 10

3. Proposed category (select one from below - see section 2.2 of P&P document):  
 A-Contemporary x B.1-Specialized (small collection) \_\_\_\_\_ B.2-Specialized (large collection) \_\_\_\_\_  
 C-Major extinct \_\_\_\_\_ D-Attested extinct \_\_\_\_\_ E-Minor extinct \_\_\_\_\_  
 F-Archaic Hieroglyphic or Ideographic \_\_\_\_\_ G-Obscure or questionable usage symbols \_\_\_\_\_

4. Is a repertoire including character names provided? yes  
 a. If YES, are the names in accordance with the “character naming guidelines” in Annex L of P&P document? yes  
 b. Are the character shapes attached in a legible form suitable for review? yes

5. Fonts related:  
 a. Who will provide the appropriate computerized font to the Project Editor of 10646 for publishing the standard?  
Kirk Miller  
 b. Identify the party granting a license for use of the font by the editors (include address, e-mail, ftp-site, etc.):  
SIL (Gentium release)

6. References:  
 a. Are references (to other character sets, dictionaries, descriptive texts etc.) provided? yes  
 b. Are published examples of use (such as samples from newspapers, magazines, or other sources) of proposed characters attached? yes

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)? yes

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: N4502-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, 2012-01)

**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:	 yes <i>The International Phonetic Organization</i> <i>(see letter of support)</i>
3. Information on the user community for the proposed characters (for example: size, demographics, information technology use, or publishing use) is included? Reference:	
4. The context of use for the proposed characters (type of use; common or rare) Reference:	 phonetic
5. Are the proposed characters in current use by the user community? If YES, where? Reference:	 yes <i>see References section</i>
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)?	 no
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, or could be confused with, an existing character? If YES, is a rationale for its inclusion provided? If YES, reference:	 no
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)	 no
13. Does the proposal contain any Ideographic compatibility characters? If YES, are the equivalent corresponding unified ideographic characters identified? If YES, reference:	 no