Title: Preliminary Proposal to Encode the Tikamuli Script in ISO/IEC 10646
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Status: Individual Contribution
Action: For consideration by UTC and WG2
Date: 2011-01-25

1 Introduction

This is a preliminary proposal to encode the Tikamuli script in the Universal Character Set (ISO/IEC 10646). Tikamuli is used in Nepal for writing the Sunuwar (Kõits) language. This document provides a description of the writing system, implementation details, a code chart and names list, and a few specimens. Some questions regarding the encoding of characters are raised in Section 4.

There is another script used in Sikkim, India for writing Sunuwar, which is called 'Jenticha'. A preliminary proposal (N3962 L2/10-466R) to encode Jenticha in the UCS has been submitted by the present author to the Unicode Technical Committee (UTC) and ISO/IEC JTC1/SC2/WG2 for review.

2 Background

Tikamuli is a script used for writing Sunuwar (ISO 639-3: suz), a Tibeto-Burman language of the Kiranti family that is spoken in eastern Nepal and in the state of Sikkim, India. Sunuwar is spoken by forty thousand persons in Nepal and it is an official language of Sikkim.

Sunuwar (सुनुवार *sunuvāra*), alternately spelled 'Sunwar', is also known by the name 'Mukhiya' (मुखिया *mukhiyā*); both are Nepali exonyms. The autonym is कौँइच *kõica*, which is normalized as 'Kõits'. The language is called कौँइच लो *kõica lo* 'Kõits Lo' or किराँती-कौँइच *kirãtī-kõica* 'Kiranti-Kõits'. The name 'Kõits' is also romanized as 'Koinch', 'Koincha', 'Koints', etc.

Tikamuli was developed by Tikaram Mulicha. It is known as तिकामुली ब्रेःसे *tikāmulī brese*, 'Tikamuli Brese'. The name is an acronym derived from the first four letters of Mulicha's first (TIKA) and last (MULI) names. It has no genetic relationship to other writing systems, although it has similarities to the Limbu (Sirijonga) and Lepcha (Rong) scripts. A comparison of the three scripts is given in Table 1. Tikamuli was developed for the Sunuwar community as an alternative to the Jenticha script.

Additional research is required in order to determine the status and usage of Tikamuli. It appears that the Sunuwar Welfare Society in Kathmandu, Nepal is promoting the script. There are reports that the organization plans to produce books in the script for primary-level education.[1] The use of Tikamuli is limited to the Sunuwar community in Nepal; the preferred indigenous script for writing Sunuwar in Sikkim is Jenticha.

Tikamuli has been adapted for use in digital media. Two Tikamuli fonts, 'Lonkuch' and 'Prem', have been designed by Krishna B. Sunuwar (see figures 2 and 3). They are based upon the ISO-8891 encoding and characters are mapped to Latin code points (see Figure 4). The 'Lonkuch' font is used throughout this document and in the code chart.

[1] Krishna Sunuwar, personal correspondence, November 2010.

3 Implementation Details

3.1 Structure

Tikamuli is an alphasyllabic writing system based upon the Brahmi model. It is written from left to right. It should be implemented according to the *virāma* encoding model.

3.2 Vowels

There is one vowel letter: 𑋃 A /ə/. It functions as a vowel carrier. Other vowels are represented as dependent signs. Independent forms of other vowels are produced by writing dependent vowel signs with this letter:

◌̄	VOWEL SIGN AA	𑋃	A	+	◌̄	→	𑋃̄ /a/
◌̂	VOWEL SIGN I	𑋃	A	+	◌̂	→	𑋃̂ /i/
◌̱	VOWEL SIGN U	𑋃	A	+	◌̱	→	𑋃̱ /u/
◌ᵣ	VOWEL SIGN E	𑋃	A	+	◌ᵣ	→	𑋃ᵣ /e/
◌°	VOWEL SIGN O	𑋃	A	+	◌°	→	𑋃° /o/

3.3 Vowel Length

Vowel length is indicated using two marks: ◌ˑ DIRGHA (‘long’) and ◌ˑˑ ATI DIRGHA (‘extra long’). They are written in conjunction with dependent vowel signs (see Section 3.11 for details on ordering).

3.4 Consonants

There are 32 basic consonant letters:

𑋀	TIKAMULI LETTER KA	/k/	क
𑋁	TIKAMULI LETTER KHA	/kʰ/	ख
𑋂	TIKAMULI LETTER GA	/g/	ग
𑋃	TIKAMULI LETTER GHA	/gʱ/	घ
𑋄	TIKAMULI LETTER NGA	/ŋ/	ङ
𑋅	TIKAMULI LETTER CA	/tʃ/	च
𑋆	TIKAMULI LETTER CHA	/tʃʰ/	छ
𑋇	TIKAMULI LETTER JA	/dʒ/	ज
𑋈	TIKAMULI LETTER JHA	/dʒʱ/	झ
𑋉	TIKAMULI LETTER TTA	/ʈ/	ट
𑋊	TIKAMULI LETTER TTHA	/ʈʰ/	ठ
𑋋	TIKAMULI LETTER DDA	/ɖ/	ड
𑋌	TIKAMULI LETTER DDHA	/ɖʱ/	ढ
𑋍	TIKAMULI LETTER NNA	/ɳ/	ण
𑋎	TIKAMULI LETTER TA	/t/	त
𑋏	TIKAMULI LETTER THA	/tʰ/	थ

𑋐	TIKAMULI LETTER DA	/d/	द
𑋑	TIKAMULI LETTER DHA	/dʱ/	ध
𑋒	TIKAMULI LETTER NA	/n/	न
𑋓	TIKAMULI LETTER PA	/p/	प
𑋔	TIKAMULI LETTER PHA	/pʰ/	फ
𑋕	TIKAMULI LETTER BA	/b/	ब
𑋖	TIKAMULI LETTER BHA	/bʱ/	भ
𑋗	TIKAMULI LETTER MA	/m/	म
𑋘	TIKAMULI LETTER YA	/y/	य
𑋙	TIKAMULI LETTER RA	/r/	र
𑋚	TIKAMULI LETTER LA	/l/	ल
𑋛	TIKAMULI LETTER VA	/v/	व
𑋜	TIKAMULI LETTER SSA	/ʃ/	श, ष
𑋝	TIKAMULI LETTER SA	/s/	स
𑋞	TIKAMULI LETTER HA	/h/	ह
𑋟	TIKAMULI LETTER GLOTTAL	/ʔ/	ऄ, अ॒व

There is a pattern to the graphical structure of letters for aspirated consonant. These are produced by attaching the sign ◌𑊰 to the letter for the corresponding unaspirated consonant:

𑊅	KA	+	◌𑊰	→	𑊆	KHA		𑊏	DDA	+	◌𑊰	→	𑊐	DDHA
𑊇	GA	+	◌𑊰	→	𑊈	GHA		𑊑	TA	+	◌𑊰	→	𑊒	THA
𑊉	CA	+	◌𑊰	→	𑊊	CHA		𑊓	DA	+	◌𑊰	→	𑊔	DHA
𑊋	JA	+	◌𑊰	→	𑊌	JHA		𑊕	PA	+	◌𑊰	→	𑊖	PHA
𑊍	TTA	+	◌𑊰	→	𑊎	TTHA		𑊗	BA	+	◌𑊰	→	𑊘	BHA

Each consonant letter, except for 𑊀 GLOTTAL STOP, possesses the inherent vowel /ə/, which corresponds to the letter 𑊃 A. The inherent vowel is changed by writing a vowel sign with the letter. The inherent vowel is silenced by writing ◌𑑂 VIRAMA beneath a consonant.

3.5 'Trill'

When /l/ occurs as the second element of a consonant conjunct with a velar or labial consonant, it is realized as the allophone [ɭ]. This allophone is indicated using the combining sign ◌𑊰 TRILL:

𑊅	KA	+	◌𑊰	→	𑊍	/kɭ/	क्ड, क्ल, क्र		𑊕	PA	+	◌𑊰	→	𑊛	/pɭ/	प्ड, प्ल, प्र
𑊆	KHA	+	◌𑊰	→	𑊎	/kʰɭ/	ख्ड, ख्ल, ख्र		𑊖	PHA	+	◌𑊰	→	𑊜	/pʰɭ/	फ्ड, फ्ल, फ्र
𑊇	GA	+	◌𑊰	→	𑊏	/gɭ/	ग्ड, ग्ल, ग्र		𑊘	BA	+	◌𑊰	→	𑊝	/bɭ/	ब्ड, ब्ल, ब्र
𑊈	GHA	+	◌𑊰	→	𑊐	/gʱɭ/	घ्ड, घ्ल, घ्र		𑊙	BHA	+	◌𑊰	→	𑊞	/bʱɭ/	भ्ड, भ्ल, भ्र

These characters are not proposed for independent encoding. They are to be produced using the ◌𑊰 TRILL.

The ◌𑊰 TRILL sign is part of the graphical structure of 𑊟 NNA, which may be analyzed as <𑊞 NA + ◌𑊰>. This letter is an independent character in Tikamuli.

3.6 VIRAMA

The ◌𑑂 VIRAMA is identical in function to that of the VIRAMA of Devanagari. It is always rendered visibly.

3.7 Consonant Conjuncts

Consonant conjuncts are represented by writing ◌𑑂 VIRAMA with each vowel-less element of a conjunct.

3.8 Digits

Digits represent numbers of the decimal system: 𑑐 ZERO, 𑑑 ONE, 𑑒 TWO, 𑑓 THREE, 𑑔 FOUR, 𑑕 FIVE, 𑑖 SIX, 𑑗 SEVEN, 𑑘 EIGHT, 𑑙 NINE.

3.9 Punctuation

There are no script-specific punctuation marks. Latin marks, such as periods and commas, are used.

3.10 Collation

The sort order follows the general Brahmi pattern. The 𑐾 GLOTTAL STOP is sorted after 𑐲 HA.

3.11 Ordering

A letter may carry two combining marks, namely a vowel sign and a vowel length mark, eg. <◌̣̂>. In such cases, the vowel length mark is placed to the left of the vowel sign, but in the encoded sequence the latter is written first: <◌̂ VOWEL SIGN I + ◌̣ DIRGHATA> and <◌̂ VOWEL SIGN I + ◌̱ ATI DIRGHATA>. This rule applies to all vowel signs. Rendering engines should recognize such sequences as valid.

3.12 Line-Breaking

All characters have line-breaking rules similar to that of Devanagari.

3.13 Character Properties

```
11C00;TIKAMULI LETTER A;Lo;0;L;;;;;N;;;;;
11C01;TIKAMULI LETTER KA;Lo;0;L;;;;;N;;;;;
11C02;TIKAMULI LETTER KHA;Lo;0;L;;;;;N;;;;;
11C03;TIKAMULI LETTER GA;Lo;0;L;;;;;N;;;;;
11C04;TIKAMULI LETTER GHA;Lo;0;L;;;;;N;;;;;
11C05;TIKAMULI LETTER NGA;Lo;0;L;;;;;N;;;;;
11C06;TIKAMULI LETTER CA;Lo;0;L;;;;;N;;;;;
11C07;TIKAMULI LETTER CHA;Lo;0;L;;;;;N;;;;;
11C08;TIKAMULI LETTER JA;Lo;0;L;;;;;N;;;;;
11C09;TIKAMULI LETTER JHA;Lo;0;L;;;;;N;;;;;
11C0A;TIKAMULI LETTER TTA;Lo;0;L;;;;;N;;;;;
11C0B;TIKAMULI LETTER TTHA;Lo;0;L;;;;;N;;;;;
11C0C;TIKAMULI LETTER DDA;Lo;0;L;;;;;N;;;;;
11C0D;TIKAMULI LETTER DDHA;Lo;0;L;;;;;N;;;;;
11C0E;TIKAMULI LETTER NNA;Lo;0;L;;;;;N;;;;;
11C0F;TIKAMULI LETTER TA;Lo;0;L;;;;;N;;;;;
11C10;TIKAMULI LETTER THA;Lo;0;L;;;;;N;;;;;
11C11;TIKAMULI LETTER DA;Lo;0;L;;;;;N;;;;;
11C12;TIKAMULI LETTER DHA;Lo;0;L;;;;;N;;;;;
11C13;TIKAMULI LETTER NA;Lo;0;L;;;;;N;;;;;
11C14;TIKAMULI LETTER PA;Lo;0;L;;;;;N;;;;;
11C15;TIKAMULI LETTER PHA;Lo;0;L;;;;;N;;;;;
11C16;TIKAMULI LETTER BA;Lo;0;L;;;;;N;;;;;
11C17;TIKAMULI LETTER BHA;Lo;0;L;;;;;N;;;;;
11C18;TIKAMULI LETTER MA;Lo;0;L;;;;;N;;;;;
11C19;TIKAMULI LETTER YA;Lo;0;L;;;;;N;;;;;
11C1A;TIKAMULI LETTER RA;Lo;0;L;;;;;N;;;;;
11C1B;TIKAMULI LETTER LA;Lo;0;L;;;;;N;;;;;
11C1C;TIKAMULI LETTER VA;Lo;0;L;;;;;N;;;;;
11C1D;TIKAMULI LETTER SSA;Lo;0;L;;;;;N;;;;;
11C1E;TIKAMULI LETTER SA;Lo;0;L;;;;;N;;;;;
11C1F;TIKAMULI LETTER HA;Lo;0;L;;;;;N;;;;;
11C20;TIKAMULI LETTER GLOTTAL STOP;Lo;0;L;;;;;N;;;;;
11C21;TIKAMULI VOWEL SIGN AA;Mn;0;NSM;;;;;N;;;;;
11C22;TIKAMULI VOWEL SIGN I;Mn;0;NSM;;;;;N;;;;;
11C23;TIKAMULI VOWEL SIGN U;Mn;0;NSM;;;;;N;;;;;
11C24;TIKAMULI VOWEL SIGN E;Mn;0;NSM;;;;;N;;;;;
11C25;TIKAMULI VOWEL SIGN O;Mn;0;NSM;;;;;N;;;;;
11C26;TIKAMULI SIGN VIRAMA;Mn;0;NSM;;;;;N;;;;;
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11C27;TIKAMULI SIGN DIRGHA;Mn;0;NSM;;;;;N;;;;;
11C28;TIKAMULI SIGN ATI DIRGHA;Mn;0;NSM;;;;;N;;;;;
11C29;TIKAMULI SIGN TRILL;Mc;0;L;;;;;N;;;;;
11C30;TIKAMULI DIGIT ZERO;Nd;0;L;;0;0;0;N;;;;;
11C31;TIKAMULI DIGIT ONE;Nd;0;L;;1;1;1;N;;;;;
11C32;TIKAMULI DIGIT TWO;Nd;0;L;;2;2;2;N;;;;;
11C33;TIKAMULI DIGIT THREE;Nd;0;L;;3;3;3;N;;;;;
11C34;TIKAMULI DIGIT FOUR;Nd;0;L;;4;4;4;N;;;;;
11C35;TIKAMULI DIGIT FIVE;Nd;0;L;;5;5;5;N;;;;;
11C36;TIKAMULI DIGIT SIX;Nd;0;L;;6;6;6;N;;;;;
11C37;TIKAMULI DIGIT SEVEN;Nd;0;L;;7;7;7;N;;;;;
11C38;TIKAMULI DIGIT EIGHT;Nd;0;L;;8;8;8;N;;;;;
11C39;TIKAMULI DIGIT NINE;Nd;0;L;;9;9;9;N;;;;;
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3.14 'Confusable' Characters

Below is a list of Tikamuli characters that are 'confusable' with those encoded in other script blocks:

```
11C00 TIKAMULI LETTER A      ; 0909 DEVANAGARI LETTER U
11C1C TIKAMULI LETTER LA     ; 1C1C LEPCHA LETTER LA
11C1C TIKAMULI LETTER VA     ; 004F LATIN CAPITAL LETTER O
11C1F TIKAMULI LETTER HA     ; 091F DEVANAGARI LETTER TTA
11C21 TIKAMULI VOWEL SIGN AA ; 0304 COMBINING MACRON
11C22 TIKAMULI VOWEL SIGN I  ; 0302 COMBINING CIRCUMFLEX ACCENT
11C25 TIKAMULI VOWEL SIGN 0  ; 030A COMBINING RING ABOVE
11C26 TIKAMULI SIGN VIRAMA   ; 0332 COMBINING LOW LINE
11C31 TIKAMULI DIGIT ONE     ; 0964 DEVANAGARI DANDA
11C32 TIKAMULI DIGIT TWO     ; 004C LATIN CAPITAL LETTER L
11C33 TIKAMULI DIGIT THREE   ; 0394 GREEK CAPITAL LETTER DELTA
11C36 TIKAMULI DIGIT SIX     ; 29D6 WHITE HOURGLASS
```

4 Questions

1. *Aspirated Characters* Should aspirated consonants be encoded as independent letters or be composed using the aspiration mark ◌ʰ? It is necessary to learn if the mark ◌ʰ is used in other contexts.

2. *'Trilled' Characters* Should the 'trilled' consonants be composed using the ◌ʳ TRILL or be encoded as independent letters? It is necessary to learn if the mark ◌ʳ is used in other contexts.

5 References

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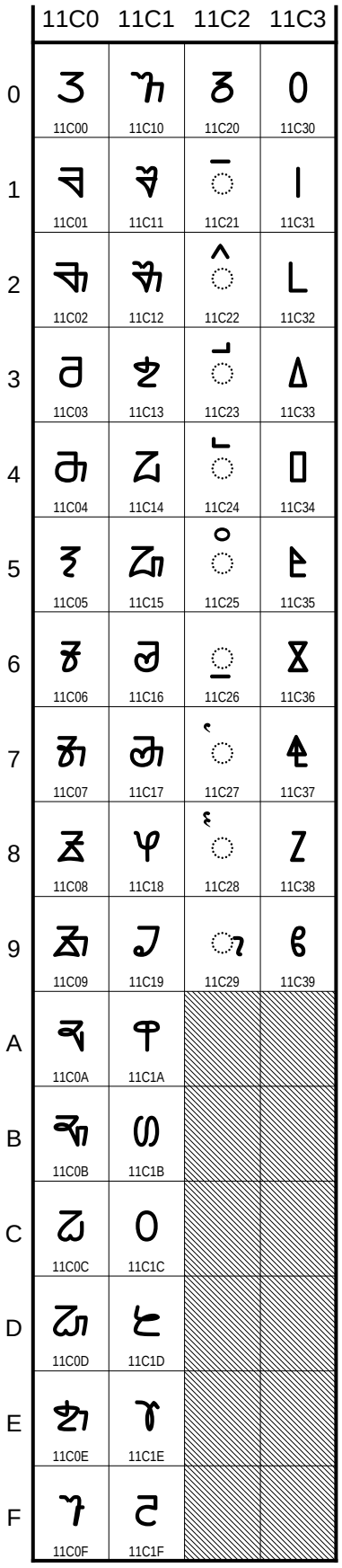
Pandey, Anshuman. 2011. "Preliminary Proposal to Encode the Jenticha Script in ISO/IEC 10646" (N3962 L2/10-466R). January 25, 2011. http://std.dkuug.dk/JTC1/SC2/WG2/docs/n3962.pdf

6 Acknowledgments

I would like to extend my gratitude to Krishna B. Sunuwar of Kathmandu for sharing his knowledge of the scripts used for writing Sunuwar.



Vowel

11C00 TIKAMULI LETTER A

Consonants

11C01 TIKAMULI LETTER KA
11C02 TIKAMULI LETTER KHA
11C03 TIKAMULI LETTER GA
11C04 TIKAMULI LETTER GHA
11C05 TIKAMULI LETTER NGA
11C06 TIKAMULI LETTER CA
11C07 TIKAMULI LETTER CHA
11C08 TIKAMULI LETTER JA
11C09 TIKAMULI LETTER JHA
11C0A TIKAMULI LETTER TTA
11C0B TIKAMULI LETTER TTHA
11C0C TIKAMULI LETTER DDA
11C0D TIKAMULI LETTER DDHA
11C0E TIKAMULI LETTER NNA
11C0F TIKAMULI LETTER TA
11C10 TIKAMULI LETTER THA
11C11 TIKAMULI LETTER DA
11C12 TIKAMULI LETTER DHA
11C13 TIKAMULI LETTER NA
11C14 TIKAMULI LETTER PA
11C15 TIKAMULI LETTER PHA
11C16 TIKAMULI LETTER BA
11C17 TIKAMULI LETTER BHA
11C18 TIKAMULI LETTER MA
11C19 TIKAMULI LETTER YA
11C1A TIKAMULI LETTER RA
11C1B TIKAMULI LETTER LA
11C1C TIKAMULI LETTER VA
11C1D TIKAMULI LETTER SSA
11C1E TIKAMULI LETTER SA
11C1F TIKAMULI LETTER HA
11C20 TIKAMULI LETTER GLOTTAL STOP

Dependent vowel signs

11C21 TIKAMULI VOWEL SIGN AA
11C22 TIKAMULI VOWEL SIGN I
11C23 TIKAMULI VOWEL SIGN U
11C24 TIKAMULI VOWEL SIGN E
11C25 TIKAMULI VOWEL SIGN O

Various signs

11C26 TIKAMULI SIGN VIRAMA
11C27 TIKAMULI SIGN DIRGHA
11C28 TIKAMULI SIGN ATI DIRGHA
11C29 TIKAMULI SIGN TRILL

Digits

11C30 TIKAMULI DIGIT ZERO
11C31 TIKAMULI DIGIT ONE
11C32 TIKAMULI DIGIT TWO
11C33 TIKAMULI DIGIT THREE
11C34 TIKAMULI DIGIT FOUR
11C35 TIKAMULI DIGIT FIVE
11C36 TIKAMULI DIGIT SIX
11C37 TIKAMULI DIGIT SEVEN
11C38 TIKAMULI DIGIT EIGHT
11C39 TIKAMULI DIGIT NINE

Figure 1: Tentative code chart and names list for Tikamuli.

Figure 2: Chart showing the Tikamuli script promoted by the Sunuwar Welfare Society of Kathmandu, Nepal (from kiratisaath.com 2007).

-[सुनुवार लिपी]-

NP	अ	आ	इ	ई	उ	ऊ	ए	ऐ	ओ	औ	अं	अः
TR	𑄃	𑄃𑄧	𑄃𑄨	-	𑄃𑄩	-	𑄃𑄪	-	𑄃𑄫	-	-	-
NP	क	ख	ग	घ	ङ	च	छ	ज	झ	ञ	ट	ठ
TR	𑄇	𑄇𑄧	𑄈	𑄈𑄧	𑄉	𑄊	𑄊𑄧	𑄋	𑄋𑄧	-	𑄌	𑄌𑄧
NP	ड	ढ	ण	त	थ	द	ध	न	प	फ	ब	भ
TR	𑄍	𑄍𑄧	𑄎	𑄏	𑄏𑄧	𑄐	𑄐𑄧	𑄑	𑄒	𑄒𑄧	𑄓	𑄓𑄧
NP	म	य	र	ल	व	श	ष	स	ह	क्ष	त्र	अ्व
TR	𑄔	𑄕	𑄖	𑄗	𑄘	-	𑄙	𑄚	𑄛	-	-	𑄃
NP	१	२	३	४	५	६	७	८	९	०		
TR	𑄁	𑄂	𑄃	𑄄	𑄅	𑄆	𑄇	𑄈	𑄉	𑄊		

मात्राहरु : ◌ आकार ◌ इकार ◌ उकार ◌ ओकार ◌ एकार ◌ हलन्त ◌ दिघ ◌ अति

Figure 3: Glyphs of the ‘Prem’ font (from kiratisaath.com 2007).

Figure 4: A keyboard map for the 'Lonkuch' and 'Prem' fonts (from kiratisaath.com 2007).

	TIKAMULI	LIMBU	LEPCHA		TIKAMULI	LIMBU	LEPCHA
A	ᱚ	(ᤀ)	ᰀ	DA	ᱡ	ᤖ	ᰪ
KA	ᱣ	ᤁ	ᰁ	DHA	ᱢ	ᤗ	—
KLA	(ᱣ᱅)	—	ᰯ	NA	ᱱ	ᤘ	ᰚ
KHA	ᱤ	ᤂ	ᰂ	PA	ᱦ	ᤙ	ᰛ
GA	ᱛ	ᤃ	ᰃ	PLA	(ᱦ᱅)	—	ᰵ
GLA	(ᱛ᱅)	—	ᰰ	PHA	ᱧ	ᤚ	ᰜ
GHA	ᱜ	ᤄ	—	BA	ᱨ	ᤛ	ᰝ
NGA	ᱝ	ᤅ	ᰄ	BLA	(ᱨ᱅)	—	ᰶ
CA	ᱞ	ᤆ	ᰅ	BHA	ᱩ	ᤜ	—
CHA	ᱟ	ᤇ	ᰆ	MA	ᱬ	ᤝ	ᰞ
JA	ᱠ	ᤈ	ᰇ	YA	ᱭ	ᤞ	ᰮ
JHA	ᱡ	ᤉ	—	RA	ᱮ	᤟	ᰬ
NYA	—	ᤊ	ᰈ	LA	ᱯ	ᤠ	ᰫ
TTA	ᱰ	—	—	VA	ᱳ	ᤡ	ᰭ
TTHA	ᱱ	—	—	SHA	(ᱴ)	ᤢ	ᰧ
DDA	ᱲ	—	—	SSA	ᱴ	ᤣ	—
DDHA	ᱳ	—	—	SA	ᱵ	ᤤ	ᰎ
NNA	ᱶ	—	—	HA	ᱷ	ᤥ	ᰤ
TA	ᱸ	ᤋ	ᰉ	GL. STOP	ᱹ	—	—
THA	ᱺ	ᤌ	ᰊ				

Table 1: Comparison of letters of Tikamuli, Limbu, and Lepcha.