

Universal Multiple-Octet Coded Character Set
 International Organization for Standardization
 Organisation internationale de normalisation
 Международная организация по стандартизации

Doc Type: Working Group Document

Title: Proposal to encode seven Cham characters in the BMP of the UCS
Source: UC Berkeley Script Encoding Initiative (Universal Scripts Project)
Author: Michael Everson and Andrew Cunningham
Status: Liaison Contribution
Action: For consideration by JTC1/SC2/WG2 and UTC
Date: 2016-04-25

1. Character additions. This document requests the addition of four new Cham characters to the UCS. Five of these letters represent final consonants, one represents a fossilized syllable, and one is a punctuation character. If this proposal is accepted, the following characters will be encoded:

AA3B	ꨀꨣ ꨀꨣ	CHAM LETTER FINAL PH
AA3C	ꨀꨣ ꨀꨣ	CHAM LETTER FINAL B
AA3D	ꨀꨣ ꨀꨣ	CHAM LETTER FINAL M
AA3E	ꨀꨣ ꨀꨣ	CHAM LETTER FINAL V
AA3F	ꨀꨣ ꨀꨣ	CHAM LETTER FINAL S
AA4F	ꨀꨣ ꨀꨣ	CHAM LETTER NUN
AA5B	ꨀꨣ ꨀꨣ	CHAM TANA PATOK SAP

• repetition sign

The original proposal for the Cham script relied heavily on available resources at the time. The Eastern Cham variety of the script and Eastern Cham language resources were more plentiful. As more resources become widely available for Western Cham, as used in Cambodia, examples of characters not covered by the original proposal are more accessible. In this document, the Eastern Cham glyphs are shown on the left (this is the code chart style) and the Western Cham glyphs to the right.

Western Cham has adopted loan words from Malay, Khmer, Arabic and other languages. Additional final consonants have been added to the Cham character repertoire to write these words.

The additional Cham characters covered by this proposal fall into two groups:

1. Pre-existing characters in use within Cambodia, and
2. Characters added to Western Cham by the Cham Language Advisory Committee (2011–2012) in Cambodia, and subsequently the characters have been in use in Cham literacy programs and are used in Cham literacy materials.

2. Final consonants. Five additional explicit final consonants are required by Western Cham, as used in Cambodia: PH, B, M, V, and S.

U+AA3B 𑜏𑜥 𑜓 CHAM LETTER FINAL PH is the final form of U+AA1C 𑜏𑜥 𑜓 CHAM LETTER PHA. This letter was added by the Cham Language Advisory Committee to represent a final “f” sound in loan words. See Figure 1.

U+AA3C 𑜏𑜥 𑜓 CHAM LETTER FINAL B is the final form of U+AA1D 𑜏𑜥 𑜓 CHAM LETTER BA. This letter was added to the Western Cham repertoire by the Cham Language Advisory Committee to distinguish and differentiate separate sounds that were originally represented by U+AA47 𑜏𑜥 𑜓 CHAM LETTER FINAL P. See Figure 2.

U+AA3D 𑜏𑜥 𑜓 CHAM LETTER FINAL M is the final form of U+AA1F 𑜏𑜥 𑜓 CHAM LETTER MUE. See Figure 3.

U+AA3E 𑜏𑜥 𑜓 CHAM LETTER FINAL V is the final form of U+AA25 𑜏𑜥 𑜓 CHAM LETTER VA. This letter has a long established use in Western Cham in Cambodia but has no corresponding character in Vietnam. See Figure 4.

U+AA3F 𑜏𑜥 𑜓 CHAM LETTER FINAL S is the final form of U+AA27 𑜏𑜥 𑜓 CHAM LETTER SA. Western Chaus uses FINAL S instead of using U+AA4B 𑜏𑜥 𑜓 CHAM LETTER FINAL SS, which fell out of traditional usage in Cambodia. In Cambodia, FINAL S is used in contexts that in Vietnam would see FINAL SS used. See Figure 5.

3. CHAM LETTER NUN. U+AA4F 𑜏𑜥 𑜓 CHAM LETTER NUN is used to represent a complete syllable. The glyph is based on what appears to be a ligature of U+AA17 𑜏𑜥 𑜓 CHAM LETTER NUE. and U+AA46 𑜏𑜥 𑜓 CHAM LETTER FINAL N. Ligation is not a productive feature of Cham, so this fossilized form should be encoded uniquely. This character was not one of the additions of the reform, but is a pre-existing character. It is treated as part of the Cham alphabet, placed in the same column as the independent vowels. In Cham language classes in Cambodia it is taught as a specific letter of the Cham alphabet. The age of this character is currently unknown; many books and manuscripts were destroyed during the Khmer Rouge Period and the community have been attempting to recover their literary past. It is currently used to represent the word *nun* ‘that’. See Figure 6.

4. Repetition sign. Western Cham documents in Cambodia use a repetition sign U+AA5B 𑜏𑜥 𑜓 TANA PATOK SAP. Its function in Cham is similar to the function of U+17D7 𑜏𑜥 𑜓 LEK TOO in Khmer. See Figure 7.

5. Unicode Character properties

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AA3B;CHAM LETTER FINAL PH;Lo;0;L;;;;N;;;;;
AA3C;CHAM LETTER FINAL B;Lo;0;L;;;;N;;;;;
AA3D;CHAM LETTER FINAL M;Lo;0;L;;;;N;;;;;
AA3E;CHAM LETTER FINAL V;Lo;0;L;;;;N;;;;;
AA3F;CHAM LETTER FINAL S;Lo;0;L;;;;N;;;;;
AA4F;CHAM LETTER NUN;Lo;0;L;;;;N;;;;;
AA5B;CHAM SIGN TANA PATOK SAP;Lm;0;L;;;;N;;;;;
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လစ်ဇာန့်လုပ်ကွက်

၈. နှစ်ပတ်လည်ပတ်လည်

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[illegible]

Handwritten text in a cursive script, likely a historical document. The text is written on lined paper and includes several red circles highlighting specific words or phrases, possibly indicating corrections or important terms. The script is dense and difficult to decipher without specialized knowledge of the language.

4

[illegible]

A. Administrative

- ## B. Technical – General

- 8

4a. Is a repertoire including character names provided?

Yes.

4b. If YES, are the names in accordance with the “character naming guidelines” in Annex L of P&P document?

Yes.

4c. Are the character shapes attached in a legible form suitable for review?

Yes.

5a. Who will provide the appropriate computerized font (ordered preference: True Type, or PostScript format) for publishing the standard?

Michael Everson.

5b. If available now, identify source(s) for the font (include address, e-mail, ftp-site, etc.) and indicate the tools used:

Michael Everson. Fontlab.

6a. Are references (to other character sets, dictionaries, descriptive texts etc.) provided?

No.

6b. Are published examples of use (such as samples from newspapers, magazines, or other sources) of proposed characters attached?

Yes.

7. 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. 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.

See above.

C. Technical – Justification

1. Has this proposal for addition of character(s) been submitted before? If YES, explain.

No.

2a. Has contact been made to members of the user community (for example: National Body, user groups of the script or characters, other experts, etc.)?

Yes.

2b. If YES, with whom?

Andrew Cunningham.

2c. If YES, available relevant documents

3. Information on the user community for the proposed characters (for example: size, demographics, information technology use, or publishing use) is included?

Users of Cham.

4a. The context of use for the proposed characters (type of use; common or rare)

Common.

4b. Reference

5a. Are the proposed characters in current use by the user community?

Yes.

5b. If YES, where?

In Cambodia.

6a. After giving due considerations to the principles in the P&P document must the proposed characters be entirely in the BMP?

Yes.

6b. If YES, is a rationale provided?

Yes.

6c. If YES, reference

Keep with other Cham characters.

7. Should the proposed characters be kept together in a contiguous range (rather than being scattered)?

No.

8a. Can any of the proposed characters be considered a presentation form of an existing character or character sequence?

No.

8b. If YES, is a rationale for its inclusion provided?

8c. If YES, reference

9a. Can any of the proposed characters be encoded using a composed character sequence of either existing characters or other proposed characters?

No.

10a. Can any of the proposed character(s) be considered to be similar (in appearance or function) to an existing character?

No.

11a. Does the proposal include use of combining characters and/or use of composite sequences?

Yes.

11b. If YES, is a rationale for such use provided?

Yes.

11c. If YES, reference

































































































One of the characters is a combining character.

11d. Is a list of composite sequences and their corresponding glyph images (graphic symbols) provided?

No.

12a. Does the proposal contain characters with any special properties such as control function or similar semantics?

No.

	AA0	AA1	AA2	AA3	AA4	AA5
0	 AA00	 AA10	 AA20	 AA30	 AA40	 AA50
1	 AA01	 AA11	 AA21	 AA31	 AA41	 AA51
2	 AA02	 AA12	 AA22	 AA32	 AA42	 AA52
3	 AA03	 AA13	 AA23	 AA33	 AA43	 AA53
4	 AA04	 AA14	 AA24	 AA34	 AA44	 AA54
5	 AA05	 AA15	 AA25	 AA35	 AA45	 AA55
6	 AA06	 AA16	 AA26	 AA36	 AA46	 AA56
7	 AA07	 AA17	 AA27		 AA47	 AA57
8	 AA08	 AA18	 AA28		 AA48	 AA58
9	 AA09	 AA19	 AA29		 AA49	 AA59
A	 AA0A	 AA1A	 AA2A		 AA4A	
B	 AA0B	 AA1B	 AA2B	 AA3B	 AA4B	 AA5B
C	 AA0C	 AA1C	 AA2C	 AA3C	 AA4C	 AA5C
D	 AA0D	 AA1D	 AA2D	 AA3D	 AA4D	 AA5D
E	 AA0E	 AA1E	 AA2E	 AA3E		 AA5E
F	 AA0F	 AA1F	 AA2F	 AA3F	 AA4F	 AA5F

Independent vowels

AA00	ꨀ	CHAM LETTER A
AA01	ꨁ	CHAM LETTER I
AA02	ꨂ	CHAM LETTER U
AA03	ꨃ	CHAM LETTER E
AA04	ꨄ	CHAM LETTER AI
AA05	ꨅ	CHAM LETTER O

Consonants

AA06	ꨆ	CHAM LETTER KA
AA07	ꨇ	CHAM LETTER KHA
AA08	ꨈ	CHAM LETTER GA
AA09	ꨉ	CHAM LETTER GHA
AA0A	ꨊ	CHAM LETTER NGUE
AA0B	ꨋ	CHAM LETTER NGA
AA0C	ꨌ	CHAM LETTER CHA
AA0D	ꨍ	CHAM LETTER CHHA
AA0E	ꨎ	CHAM LETTER JA
AA0F	ꨏ	CHAM LETTER JHA
AA10	ꨐ	CHAM LETTER NHUE
AA11	ꨑ	CHAM LETTER NHA
AA12	ꨒ	CHAM LETTER NHJA
AA13	ꨓ	CHAM LETTER TA
AA14	ꨔ	CHAM LETTER THA
AA15	ꨕ	CHAM LETTER DA
AA16	ꨖ	CHAM LETTER DHA
AA17	ꨗ	CHAM LETTER NUE
AA18	ꨘ	CHAM LETTER NA
AA19	ꨙ	CHAM LETTER DDA
AA1A	ꨚ	CHAM LETTER PA
AA1B	ꨛ	CHAM LETTER PPA
AA1C	ꨜ	CHAM LETTER PHA
AA1D	ꨝ	CHAM LETTER BA
AA1E	ꨞ	CHAM LETTER BHA
AA1F	ꨟ	CHAM LETTER MUE
AA20	ꨠ	CHAM LETTER MA
AA21	ꨡ	CHAM LETTER BBA
AA22	ꨢ	CHAM LETTER YA
AA23	ꨣ	CHAM LETTER RA
AA24	ꨤ	CHAM LETTER LA
AA25	ꨥ	CHAM LETTER VA
AA26	ꨦ	CHAM LETTER SSA
AA27	ꨧ	CHAM LETTER SA
AA28	ꨨ	CHAM LETTER HA

Dependent vowel signs

AA29	ꨩ	CHAM VOWEL SIGN AA
AA2A	ꨪ	CHAM VOWEL SIGN I
AA2B	ꨫ	CHAM VOWEL SIGN II
AA2C	ꨬ	CHAM VOWEL SIGN EI
AA2D	ꨭ	CHAM VOWEL SIGN U
AA2E	ꨮ	CHAM VOWEL SIGN OE
AA2F	ꨯ	CHAM VOWEL SIGN O
AA30	ꨰ	CHAM VOWEL SIGN AI
AA31	ꨱ	CHAM VOWEL SIGN AU
AA32	ꨲ	CHAM VOWEL SIGN UE

Consonant signs

AA33	ꨳ	CHAM CONSONANT SIGN YA
AA34	ꨴ	CHAM CONSONANT SIGN RA
AA35	ꨵ	CHAM CONSONANT SIGN LA
AA36	ꨶ	CHAM CONSONANT SIGN WA

Final letters

AA3B	꨷	CHAM LETTER FINAL PH
AA3C	꨸	CHAM LETTER FINAL B
AA3D	꨹	CHAM LETTER FINAL M

AA3E	꨺	CHAM LETTER FINAL V
AA3F	꨻	CHAM LETTER FINAL S
AA40	꨼	CHAM LETTER FINAL K
AA41	꨽	CHAM LETTER FINAL G
AA42	꨾	CHAM LETTER FINAL NG
AA43	꨿	CHAM CONSONANT SIGN FINAL NG
AA44	ꩀ	CHAM LETTER FINAL CH
AA45	ꩁ	CHAM LETTER FINAL T
AA46	ꩂ	CHAM LETTER FINAL N
AA47	ꩃ	CHAM LETTER FINAL P
AA48	ꩄ	CHAM LETTER FINAL Y
AA49	ꩅ	CHAM LETTER FINAL R
AA4A	ꩆ	CHAM LETTER FINAL L
AA4B	ꩇ	CHAM LETTER FINAL SS
AA4C	ꩈ	CHAM CONSONANT SIGN FINAL M
AA4D	ꩉ	CHAM CONSONANT SIGN FINAL H

Consonants

AA4F	ꩊ	CHAM LETTER NUN
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Digits

AA50	ꩋ	CHAM DIGIT ZERO
AA51	ꩌ	CHAM DIGIT ONE
AA52	ꩍ	CHAM DIGIT TWO
AA53	꩎	CHAM DIGIT THREE
AA54	꩏	CHAM DIGIT FOUR
AA55	꩐	CHAM DIGIT FIVE
AA56	꩑	CHAM DIGIT SIX
AA57	꩒	CHAM DIGIT SEVEN
AA58	꩓	CHAM DIGIT EIGHT
AA59	꩔	CHAM DIGIT NINE

Various signs

AA5B	꩕	CHAM SIGN TANA PATOK SAP
• repetition sign		
→ 0E46 ꪥ thai character maiyamok		

Punctuation

AA5C	꩖	CHAM PUNCTUATION SPIRAL
AA5D	꩗	CHAM PUNCTUATION DANDA
AA5E	꩘	CHAM PUNCTUATION DOUBLE DANDA
AA5F	꩙	CHAM PUNCTUATION TRIPLE DANDA

	AA0	AA1	AA2	AA3	AA4	AA5
0	ꨀ AA00	ꨁ AA10	ꨂ AA20	ꨃ AA30	ꨄ AA40	ꨅ AA50
1	ꨆ AA01	ꨇ AA11	ꨈ AA21	ꨉ AA31	ꨊ AA41	ꨋ AA51
2	ꨌ AA02	ꨍ AA12	ꨎ AA22	ꨏ AA32	ꨐ AA42	ꨑ AA52
3	ꨒ AA03	ꨓ AA13	ꨔ AA23	ꨕ AA33	ꨖ AA43	ꨗ AA53
4	ꨙ AA04	ꨚ AA14	ꨛ AA24	ꨜ AA34	ꨝ AA44	ꨞ AA54
5	ꨟ AA05	ꨠ AA15	ꨡ AA25	ꨢ AA35	ꨣ AA45	ꨤ AA55
6	ꨥ AA06	ꨦ AA16	ꨧ AA26	ꨨ AA36	ꨩ AA46	ꨪ AA56
7	ꨬ AA07	ꨭ AA17	ꨮ AA27		ꨯ AA47	ꨰ AA57
8	ꨲ AA08	ꨳ AA18	ꨴ AA28		ꨵ AA48	ꨶ AA58
9	꨷ AA09	꨸ AA19	꨹ AA29		꨺ AA49	꨻ AA59
A	꨼ AA0A	꨽ AA1A	꨾ AA2A		꨿ AA4A	
B	ꩀ AA0B	ꩁ AA1B	ꩂ AA2B	ꩃ AA3B	ꩄ AA4B	ꩅ AA5B
C	ꩆ AA0C	ꩇ AA1C	ꩈ AA2C	ꩉ AA3C	ꩊ AA4C	ꩋ AA5C
D	ꩌ AA0D	ꩍ AA1D	꩎ AA2D	꩏ AA3D	꩐ AA4D	꩑ AA5D
E	꩒ AA0E	꩓ AA1E	꩔ AA2E	꩕ AA3E		꩖ AA5E
F	꩘ AA0F	꩙ AA1F	꩚ AA2F	꩛ AA3F	꩜ AA4F	꩝ AA5F

Independent vowels

AA00	ꨀ	CHAM LETTER A
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AA03	ꨃ	CHAM LETTER E
AA04	ꨄ	CHAM LETTER AI
AA05	ꨅ	CHAM LETTER O

Consonants

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AA09	ꨉ	CHAM LETTER GHA
AA0A	ꨊ	CHAM LETTER NGUE
AA0B	ꨋ	CHAM LETTER NGA
AA0C	ꨌ	CHAM LETTER CHA
AA0D	ꨍ	CHAM LETTER CHHA
AA0E	ꨎ	CHAM LETTER JA
AA0F	ꨏ	CHAM LETTER JHA
AA10	ꨐ	CHAM LETTER NHUE
AA11	ꨑ	CHAM LETTER NHA
AA12	ꨒ	CHAM LETTER NHJA
AA13	ꨓ	CHAM LETTER TA
AA14	ꨔ	CHAM LETTER THA
AA15	ꨕ	CHAM LETTER DA
AA16	ꨖ	CHAM LETTER DHA
AA17	ꨗ	CHAM LETTER NUE
AA18	ꨘ	CHAM LETTER NA
AA19	ꨙ	CHAM LETTER DDA
AA1A	ꨚ	CHAM LETTER PA
AA1B	ꨛ	CHAM LETTER PPA
AA1C	ꨜ	CHAM LETTER PHA
AA1D	ꨝ	CHAM LETTER BA
AA1E	ꨞ	CHAM LETTER BHA
AA1F	ꨟ	CHAM LETTER MUE
AA20	ꨠ	CHAM LETTER MA
AA21	ꨡ	CHAM LETTER BBA
AA22	ꨢ	CHAM LETTER YA
AA23	ꨣ	CHAM LETTER RA
AA24	ꨤ	CHAM LETTER LA
AA25	ꨥ	CHAM LETTER VA
AA26	ꨦ	CHAM LETTER SSA
AA27	ꨧ	CHAM LETTER SA
AA28	ꨨ	CHAM LETTER HA

Dependent vowel signs

AA29	ꨩ	CHAM VOWEL SIGN AA
AA2A	ꨪ	CHAM VOWEL SIGN I
AA2B	ꨫ	CHAM VOWEL SIGN II
AA2C	ꨬ	CHAM VOWEL SIGN EI
AA2D	ꨭ	CHAM VOWEL SIGN U
AA2E	ꨮ	CHAM VOWEL SIGN OE
AA2F	ꨯ	CHAM VOWEL SIGN O
AA30	ꨰ	CHAM VOWEL SIGN AI
AA31	ꨱ	CHAM VOWEL SIGN AU
AA32	ꨲ	CHAM VOWEL SIGN UE

Consonant signs

AA33	ꨳ	CHAM CONSONANT SIGN YA
AA34	ꨴ	CHAM CONSONANT SIGN RA
AA35	ꨵ	CHAM CONSONANT SIGN LA
AA36	ꨶ	CHAM CONSONANT SIGN WA

Final letters

AA3B	꨷	CHAM LETTER FINAL PH
AA3C	꨸	CHAM LETTER FINAL B
AA3D	꨹	CHAM LETTER FINAL M

AA3E	꨺	CHAM LETTER FINAL V
AA3F	꨻	CHAM LETTER FINAL S
AA40	꨼	CHAM LETTER FINAL K
AA41	꨽	CHAM LETTER FINAL G
AA42	꨾	CHAM LETTER FINAL NG
AA43	꨿	CHAM CONSONANT SIGN FINAL NG
AA44	ꩀ	CHAM LETTER FINAL CH
AA45	ꩁ	CHAM LETTER FINAL T
AA46	ꩂ	CHAM LETTER FINAL N
AA47	ꩃ	CHAM LETTER FINAL P
AA48	ꩄ	CHAM LETTER FINAL Y
AA49	ꩅ	CHAM LETTER FINAL R
AA4A	ꩆ	CHAM LETTER FINAL L
AA4B	ꩇ	CHAM LETTER FINAL SS
AA4C	ꩈ	CHAM CONSONANT SIGN FINAL M
AA4D	ꩉ	CHAM CONSONANT SIGN FINAL H

Consonants

AA4F	ꩊ	CHAM LETTER NUN
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Digits

AA50	ꩋ	CHAM DIGIT ZERO
AA51	ꩌ	CHAM DIGIT ONE
AA52	ꩍ	CHAM DIGIT TWO
AA53	꩎	CHAM DIGIT THREE
AA54	꩏	CHAM DIGIT FOUR
AA55	꩐	CHAM DIGIT FIVE
AA56	꩑	CHAM DIGIT SIX
AA57	꩒	CHAM DIGIT SEVEN
AA58	꩓	CHAM DIGIT EIGHT
AA59	꩔	CHAM DIGIT NINE

Various signs

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• repetition sign		
→ 0E46 ꨶ thai character maiyamok		

Punctuation

AA5C	꩖	CHAM PUNCTUATION SPIRAL
AA5D	꩗	CHAM PUNCTUATION DANDA
AA5E	꩘	CHAM PUNCTUATION DOUBLE DANDA
AA5F	꩙	CHAM PUNCTUATION TRIPLE DANDA