5.3.3 Tonal system in connected speech

Regarding the number of tones, Chiangrai's Northern Thai dialect pronounced by ten Karen speakers have a 6 tone system. Its pattern of split and coalescence may be shown as follows:

Table 26 : ***Pattern of tones in connected speech of Chiangrai's Northern Thai dialect pronounced by Karen***

A	*B*	*C*	*DL*	*DS*
Tone 1	*Tone 3*	*Tone 5*	*Tone 3*	*Tone 2*
Tone 2	*Tone 4*	*Tone 6*	*Tone 4*	*Tone 5*

Following table 26, the tonal system, it is interesting to note that tone ***A*** reflects the glottalization split and the tones in other columns, ***B***, ***C***, ***DL***, and ***DS***, always reflect the voiced-voiceless split.

5.3.4 Tone features in connected speech

1) Tone 1 : Low-falling-rising tone [212]

The pitch pattern of this tone starts at 101.2 Hz and glides down to about 91.6 Hz, then rises quickly to about 106.7 Hz (see figures 83 and 91).

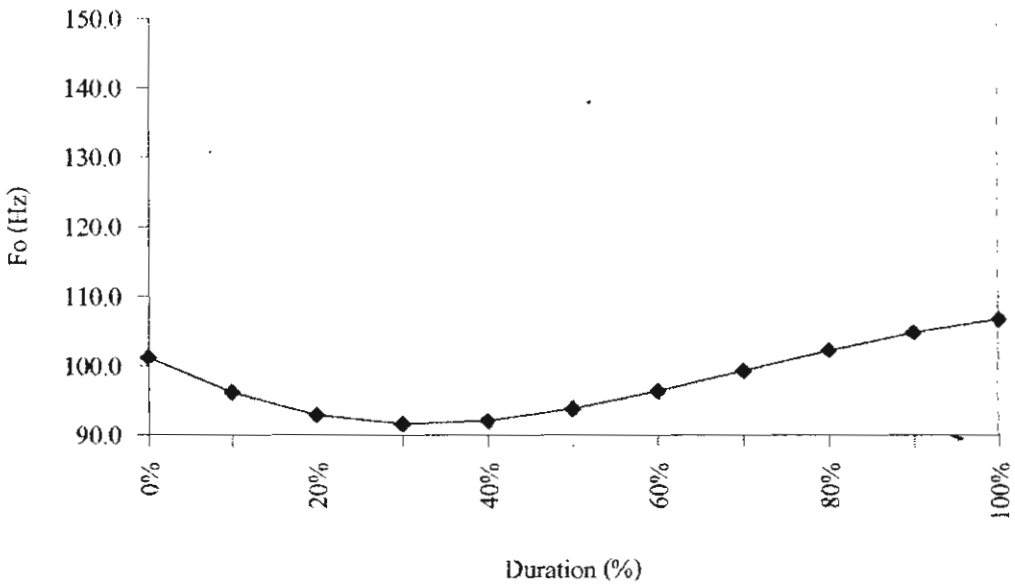


Figure 83 : ***Tone 1 in connected speech of Chiangrai's Northern Thai dialect pronounced by Karen***

Ex.	[hu:^{212}]	'ear'
	[k^{h}a:^{212}]	'leg'
	[pi:^{212}]	'year'
	[kin^{212}]	'to eat'

2.) Tone 2 has 2 allotones which are in complementary distribution as follows:

2.1) Mid - rising tone (occurs with smooth syllables) [34]

The pitch pattern of this tone starts at 114.9 and glides up to about 127.2 Hz (see figures 84 and 91).

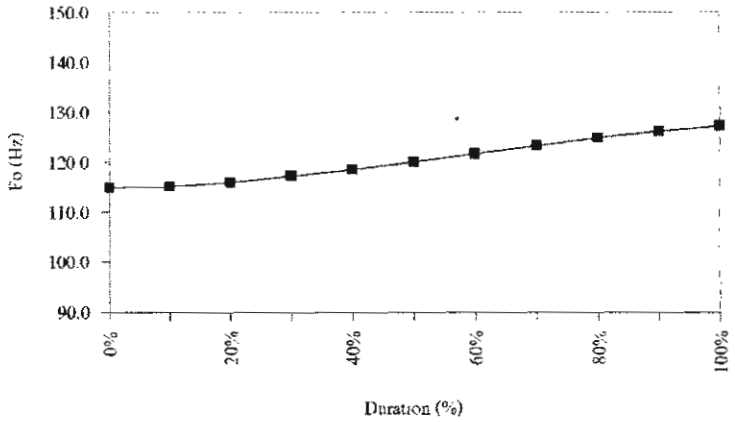


Figure 84 : ***Tone 2 on smooth syllables in connected speech of Chiangrai's Northern Thai dialect pronounced by Karen***

Ex.	[bin^{34}]	'to fly'
	[dæːŋ^{34}]	'red'
	[miː^{34}]	'hand'
	[nɔːn^{34}]	'to lie down'

2.2) High - rising tone (occurs with checked syllables) [45]

The pitch pattern of this tone starts at 126.4 Hz and glides up to about 139.4 Hz. The glottal stop is heard at the end of the tone (see figures 85 and 91).

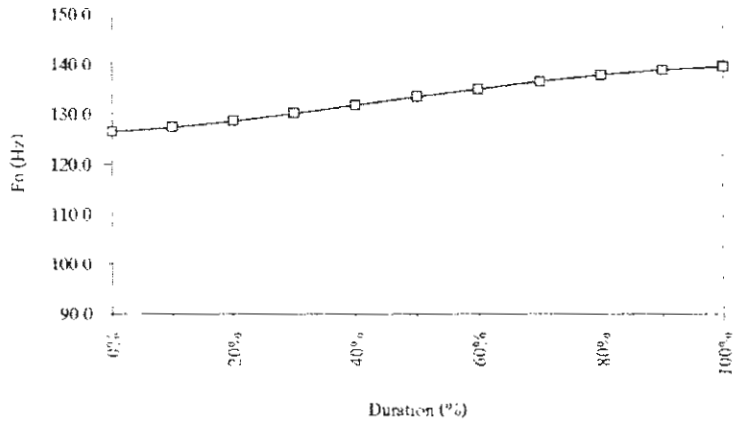


Figure 85 : ***Tone 2 on checked syllables in connected speech of Chiangrai's Northern Thai dialect pronounced by Karen***

Ex.	[$p^ha^{45ʔ}$]	'vegetable'
	[$si^{45ʔ}$]	'ten'
	[$to^{45ʔ}$]	'to fall'
	[$ʔo^{45ʔ}$]	'chest'

3.) Tone 3 : Low - falling tone [21]

The pitch pattern of this tone starts at 105.1 Hz on smooth syllables and 105.0 Hz on checked syllables, then glides down a little to about 93.1 Hz on smooth syllables and 93 Hz on checked syllables. The glottal stop is heard at the end of the tone on checked syllables (see figures 86 and 91).

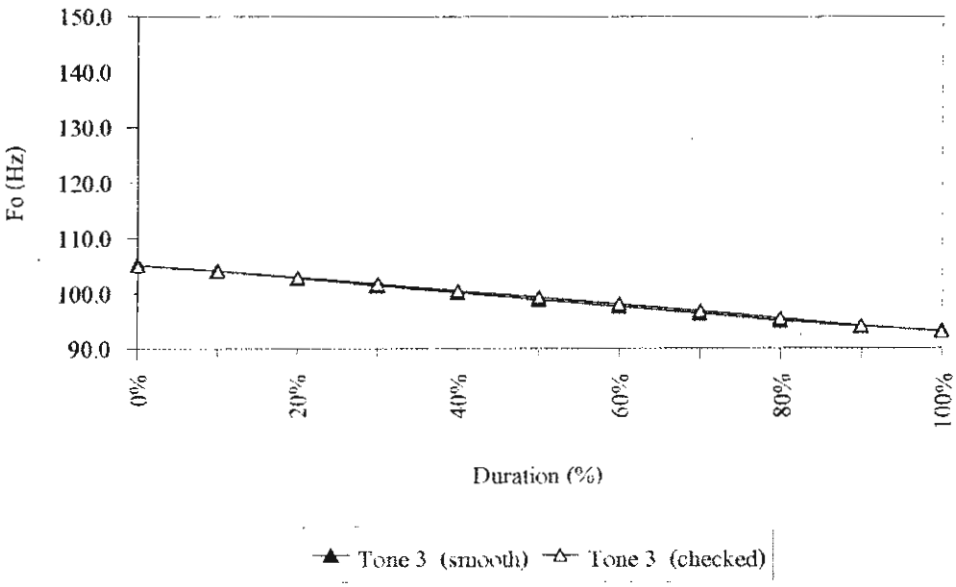


Figure 86 : ***Tone 3 on smooth and checked syllables in connected speech of Chiangrai's Northern Thai dialect pronounced by Karen***

Ex.	[$si:^{21}$]	'four'
	[taw^{21}]	'turtle'
	[$bæŋ^{21}$]	'to divide'
	[$k^ha^{21ʔ}$]	'to be torn'
	[$kɔ^{21ʔ}$]	'to embrace'
	[$bɔ^{21ʔ}$]	'blind'

4.) Tone 4 : Mid - falling tone [31]

The pitch pattern of this tone starts at 117.0 Hz on smooth syllables and 115.8 Hz on checked syllables, then falls to about 94.7 Hz on smooth syllables and 93.0 Hz on checked syllables. The glottal stop is heard at the end of the tone on checked syllables (see figures 87 and 91).

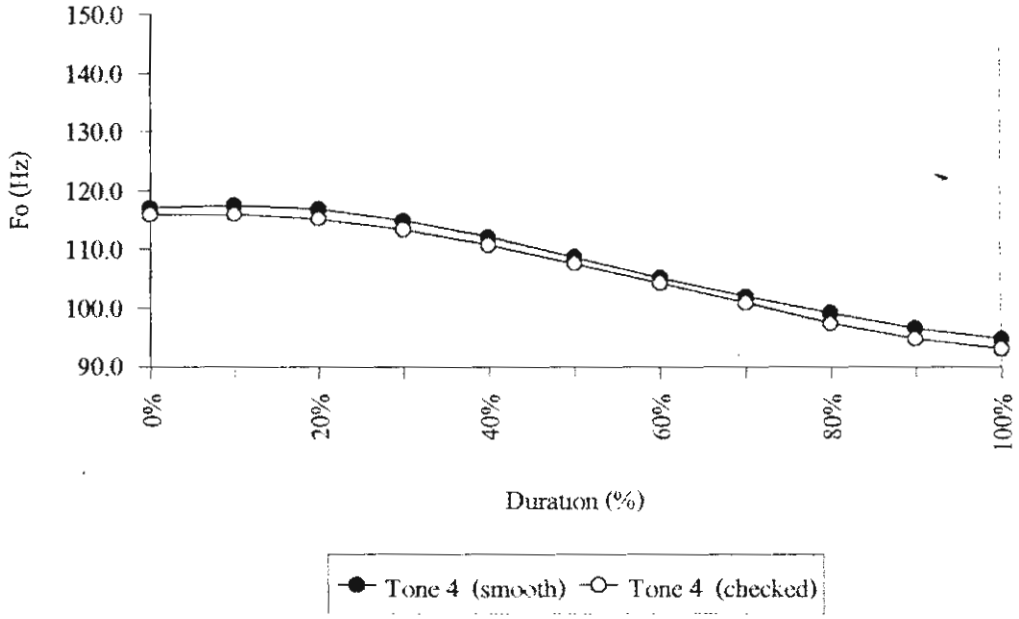


Figure 87 : ***Tone 4 on smooth and checked syllables in connected speech of Chiangrai's Northern Thai dialect pronounced by Karen***

Ex.	[pɔ:^{31}]	'father'
	[hay^{31}]	'plantation'
	[hɨə^{31ʔ}]	'blood'
	[ha^{31ʔ}]	'root'

5.) Tone 5 has 2 allotones which are in complementary distribution as follows:

5.1) High-mid-falling tone (occurs with smooth syllables) [43]

The pitch pattern of this tone starts at 127.8 Hz and glides down to about 115.0 Hz (see figures 88 and 91).

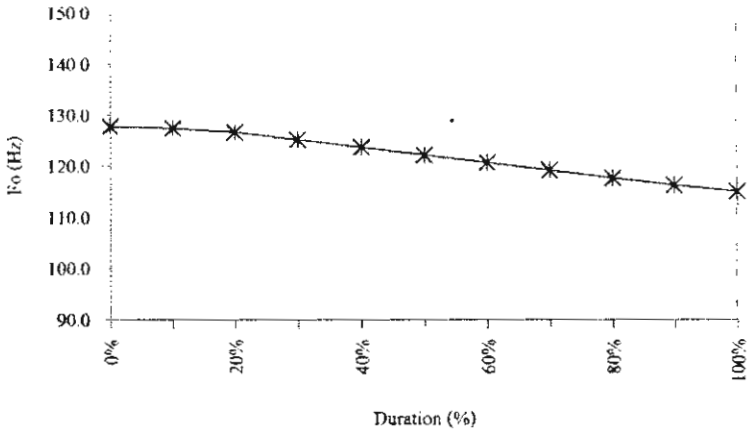


Figure 88 : ***Tone 5 on smooth syllables in connected speech of Chiangrai's Northern Thai dialect pronounced by Karen***

Ex.	[ya:^{43}]	'grass'
	[ka:w^{43}]	'nine'
	[tom^{43}]	'to boil'
	[da:y^{43}]	'cord'

5.2) High-high-falling tone (occurs with checked syllables) [54]

The pitch pattern of this tone starts at 141.5 Hz and glides down to about 131.0 Hz. The glottal stop is heard at the end of the tone (see figures 89 and 91).

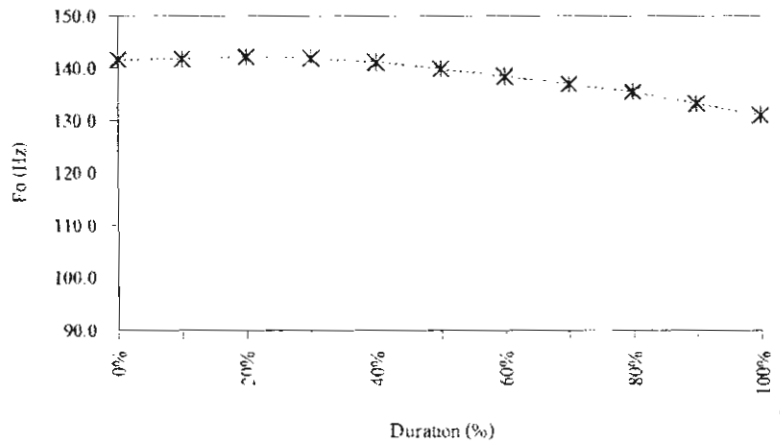


Figure 89 : ***Tone 5 on checked syllables in connected speech of Chiangrai's Northern Thai dialect pronounced by Karen***

Ex.	[ha^{542}]	'to love'
	[no^{542}]	'bird'
	[wa^{542}]	'temple'
	[k^{h}a^{542}]	'to select'
	[le^{542}]	'nail'
	[mo^{542}]	'ant'

6.) Tone 6 : High - low falling tone [51]

The pitch pattern of this tone starts at 138.0 Hz and falls quickly to about 94.8 Hz (see figures 90 and 91).

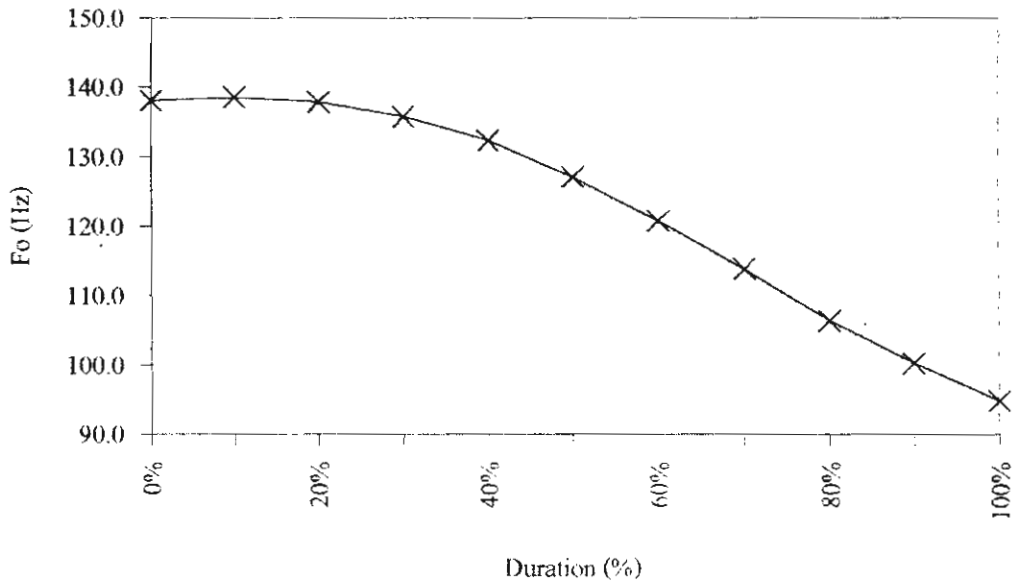


Figure 90 : ***Tone 6 in connected speech of Chiangrai's Northern Thai dialect pronounced by Karen***

Ex.	[kiw^{51}]	'eyebrows'
	[tɔ:ŋ^{51}]	'stomach'
	[na:m^{51}]	'water'
	[lin^{51}]	'tongue'
	[ma:^{51}]	'horse'

All the tones on smooth and checked syllables are put into the same diagram as follows:

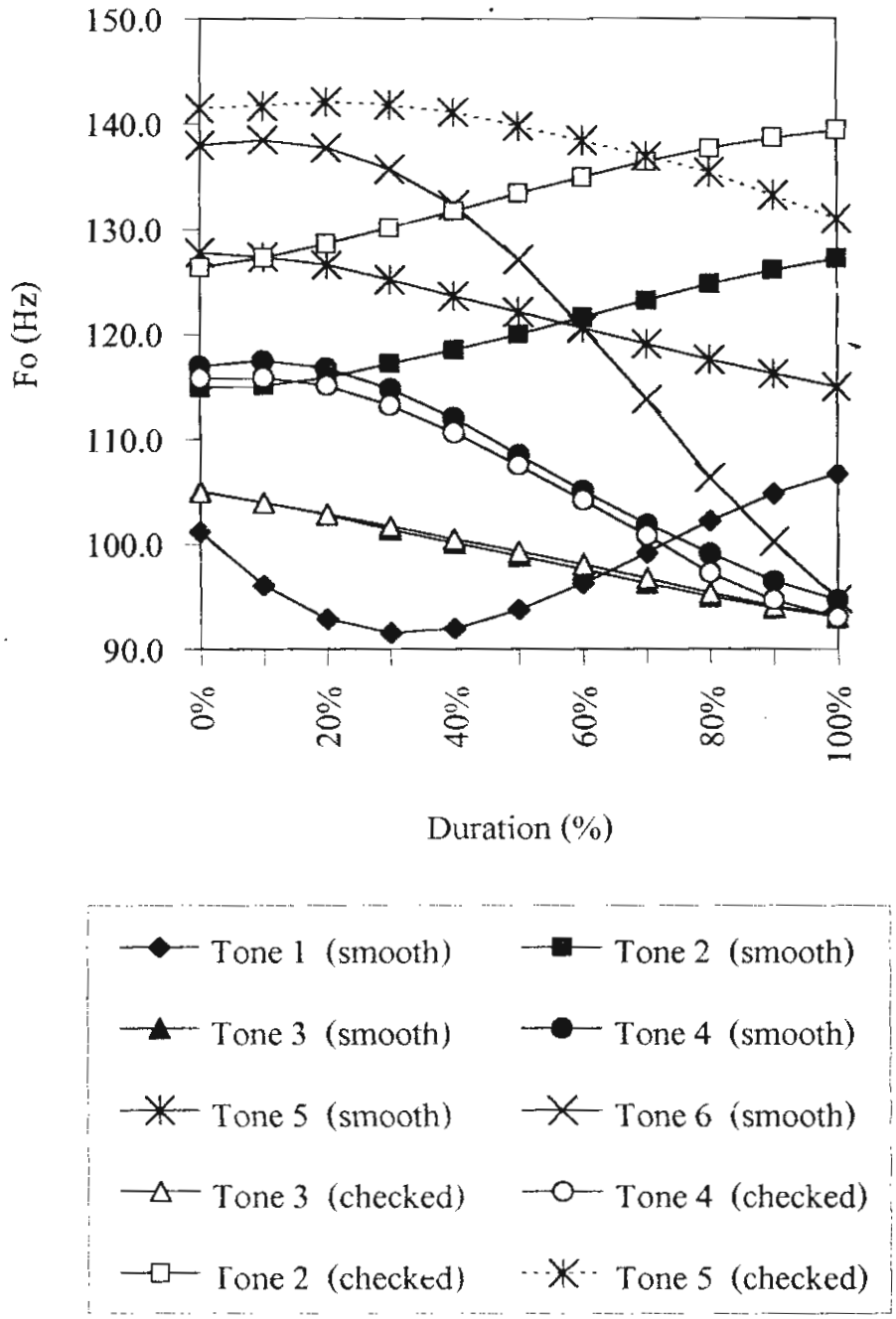


Figure 91 : ***Tone features in connected speech of Chiangrai's Northern Thai dialect pronounced by Karen***

5.3.5 Comparison of tonal systems and tone features between citation form and connected speech

1.) Tonal system

Table 27 : ***Comparison of tonal systems between citation form and connected speech of Chiangrai's Northern Thai dialect pronounced by Karen***

A	*B*	*C*	*DL*	*DS*
Tone 1	*Tone 3*	*Tone 5*	*Tone 3*	*Tone 2*
Tone 2	*Tone 4*	*Tone 6*	*Tone 4*	*Tone 5*

Citation form

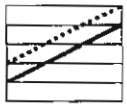
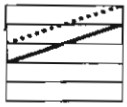
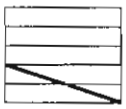
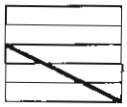
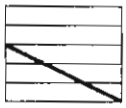
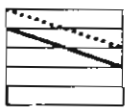
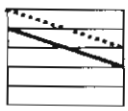
A	*B*	*C*	*DL*	*DS*
Tone 1	*Tone 3*	*Tone 5*	*Tone 3*	*Tone 2*
Tone 2	*Tone 4*	*Tone 6*	*Tone 4*	*Tone 5*

Connected speech

Table 27 indicates that the tonal systems in both citation form and connected speech are not different. That is, tone ***A*** reflects the glottalization split and the tones in other columns, ***B***, ***C***, ***DL***, and ***DS***, always reflect the voiced-voiceless split.

2.) Tone features

Table 28 : ***Comparison of tone features between citation form and connected speech of Chiangrai's Northern Thai dialect pronounced byKaren***

Form of Speech / Tone	**Citation form**	**Connected speech**
Tone 1	Low - falling - rising tone [212] 105.0 Hz - 92.2 Hz - 107.5 Hz 	Low - falling - rising tone [212] 101.2 Hz - 91.6 Hz - 106.7 Hz 
Tone 2	Low - rising tone [24] (smooth) 112.1 Hz - 124.8 Hz Mid - rising tone [35] (checked) 122.4 Hz - 135.4 Hz 	Mid - rising tone [34] (smooth) 114.9 Hz - 127.2 Hz High - rising tone [45] (checked) 126.4 Hz - 139.4 Hz 
Tone 3	Low - falling tone [21] 113.9 Hz - 101.4 Hz (smooth) 113.2 Hz - 101.5 Hz (checked) 	Low - falling tone [21] 105.1 Hz - 93.1 Hz (smooth) 105.0 Hz - 93.0 Hz (checked) 
Tone 4	Mid - falling tone [31] 123.5 Hz - 96.9 Hz (smooth) 124.0 Hz - 101.5 Hz (checked) 	Mid - falling tone [31] 117.0 Hz - 94.7 Hz (smooth) 115.8 Hz - 93.0 Hz (checked) 
Tone 5	High - mid - falling tone [43] 129.7 Hz - 116.2 Hz (smooth) High - high - falling tone [54] 141.7 Hz - 129.7 Hz (checked) 	High - mid - falling tone [43] 127.8 Hz - 115.0 Hz (smooth) High - high - falling tone [54] 141.5 Hz - 131.0 Hz (checked) 

(Table 28)

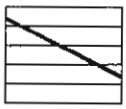
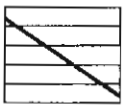
Form of speech / Tone	**Citation form**	**Connected speech**
Tone 6	High - low - falling tone [52] 146.3 Hz - 104.6 Hz 	High - low - falling tone [51] 138.0 Hz - 94.8 Hz 

Table 28 indicates that the tone features in citation form differ from connected speech in tones 2 and 6 as follows:

(i) The pitch pattern of tone 2, in citation form, starts at the second section of the voice range on smooth syllables and the third section on checked syllables but in connected speech, starts at the third section on smooth syllables and the fourth section on checked syllables.

(ii) The end of the point of tone 6, in citation form, is at the second section but in connected speech, is at the first section.

CHAPTER VI

TONAL COMPARISON

In this chapter, the tonal systems and tone features of Chiangrai's Northern Thai dialect pronounced by the Lahu, Akha, and Karen people will be compared in three ways as follows:

(i) To be compared with their native languages in only citation form.

(ii) To be compared with Chiangrai's Northern Thai dialect pronounced by native speakers.

(iii) To be compared with each other.

6.1 Tonal Comparison between Chiangrai's Northern Thai Dialect Pronounced by the Lahu, Akha, and Karen People and Their Native Languages

6.1.1 Comparison of Tonal System

Table 29 : ***Comparison of tonal system between Chiangrai's Northern Thai dialect pronounced by the Lahu, Akha, and Karen people and their native languages in citation form***

Language / Ethnic group	Chiangrai's Northern Thai dialect	Native languages
Lahu	4 tone system	7 tone system
Akha	4 tone system	5 tone system
Karen	6 tone system	6 tone system

Following table 29, the Lahu has a four tone system in Chiangrai's Northern Thai dialect and a seven tone system in his native language.

The Akha has a four tone system in Chiangrai's Northern Thai dialect and a five tone system in his native language.

The Karen has a six tone system in both Chiangrai's Northern Thai dialect and his native language.

6.1.2 Comparison of Tone Features

6.1.2.1 Lahu

Tone features of Chiangrai's Northern Thai dialect pronounced by the Lahu and the Lahu language pronounced by a native speaker in citation form may be shown as follows:

Chiangrai's Northern Thai dialect pronounced by the Lahu

Tone 1 -------- low - falling - rising tone [212]

Tone 2 -------- mid - rising tone / smooth syllables [34]

Tone 2 -------- high - rising tone / checked syllables [45]

Tone 3 -------- low - falling tone [21]

Tone 4 -------- high - falling tone [52,42]

The Lahu language pronounced by a native speaker

Tone 1 -------- low - level tone [22]

Tone 2 -------- low - level - glottalized tone [22?]

Tone 3 -------- mid - falling tone [31]

Tone 4 -------- high - falling tone [42]

Tone 5 -------- high - falling - glottalized tone [43?]

Tone 6 -------- high - level tone [55]

Tone 7 -------- high - level - glottalized tone [55?]

Table 30 : ***Comparison of tone features between Chiangrai's Northern Thai dialect pronounced by the Lahu and his native language***

Tone	Chiangrai's Northern Thai dialect	Tone	The Lahu language
1	Low – falling - rising tone [212]	-	-
2	2.1 Mid – rising tone (smooth) [34]	6	High - level tone [55]
	2.2 High – rising - glottalized tone (checked) [45?]	7	High - level - glottallized tone [55?]
3	Low – falling tone (smooth)[21]	1	Low - level tone [22]
	Low – falling - glottalized tone (checked) [21?]	2	Low - level - glottallized tone [22?]
4	High – falling tone (smooth) [52]	4	High - falling tone [42]
	High – falling - glottalized tone (checked) [42?]	5	High - falling - glottalized tone [43?]
-	-	3	Mid - falling tone [31]

Following table 30, it is interesting to note that some tones of Chiangrai's Northern Thai dialect pronounced by the Lahu should be interfered with by the native Lahu language, such as pronouncing with glottalized tone.

6.1.2.2 Akha

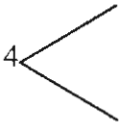
Tone features of Chiangrai's Northern Thai dialect pronounced by the Akha and the Akha language pronounced by a native speaker may be shown as follows:

Chiangrai's Northern Thai dialect pronounced by the Akha

Tone 1 -------- low - falling - rising tone [212]

Tone 2 -------- low - rising tone [23]

Tone 3 -------- low falling tone [21]

Tone 4  high - low - falling tone [52] / smooth and long - checked syllables

high - high - falling tone [54] / short - checked syllables

The Akha language pronounced by a native speaker

Tone 1 -------- low - falling tone [21]

Tone 2 -------- low - falling - glottalized tone [21?]

Tone 3 -------- mid - level tone [33]

Tone 4 -------- mid - rising tone [34]

Tone 5 -------- high - level tone [55]

Table 31 : ***Comparison of tone features between Chiangrai's Northern Thai dialect pronounced by the Akha and his native language***

Tone	Chiangrai's Northern Thai dialect	Tone	The Akha language
1	Low - falling - rising tone [212]	-	-
2	Low - rising tone [23]	4	Mid - rising tone [34]
3	Low - falling tone (smooth) [21]	1	Low - falling tone [21]
	Low - falling - glottalized tone (checked) [21?]	2	Low - falling - glottallized tone [21?]
4	4.1 High - low - falling tone (smooth) [52] High - low - falling - glottalized tone (long - checked) [51?] 4.2 High - high - falling - glottalized tone (short - checked) [54?]	-	-
-	-	3	Mid - level tone [33]
-	-	5	High - level tone [55]

Following table 31, it is interesting to note that some tones of Chiangrai's Northern Thai dialect pronounced by the Akha should be interfered with by the Akha language, such as pronouncing with glottalized tone.

6.1.2.3 Karen

Tone features of Chiangrai's Northern Thai dialect pronounced by the Karen and the Karen language pronounced by a native speaker in citation form may be shown as follows:

Chiangrai's Northern Thai dialect pronounced by the Karen

Tone 1 -------- low - falling - rising tone [212]

Tone 2 < low - rising tone [24]
mid - rising tone [35]

Tone 3 ---- --- low - falling tone [21]

Tone 4 -------- mid - falling tone [31]

Tone 5 < high - mid - falling tone [43]
high - high - falling tone [54]

Tone 6 -------- high - low - falling tone [52]

The Karen language pronounced by a native speaker

Tone 1 -------- low - level tone [22]

Tone 2 -------- mid - level tone [33]

Tone 3 -------- high - falling tone [41]

Tone 4 -------- high - falling - glottalized tone [52?]

Tone 5 -------- high - level tone [44]

Tone 6 -------- high - level - glottalized tone [55?]

Table 32 : *Comparison of tone features between Chiangrai's Northern Thai dialect pronounced by the Karen and his native language*

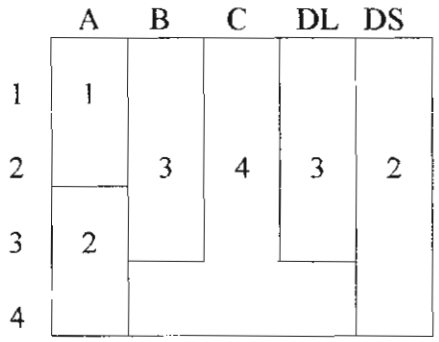
Tone	Chiangrai's Northern Thai dialect	Tone	The Karen language
1	Low - falling - rising tone [212]	-	-
2	2.1 Low – rising tone (smooth) [24]	5	High - level tone [44]
	2.2 Mid – rising - glottalized tone (checked) [35?]	6	High - level - glottallized tone [55?]
3	Low - falling tone (smooth) [21]	1	Low – level tone [22]
	Low - falling - glottalized tone (checked) [21?]		
4	Mid - falling tone (smooth) [31]	-	-
	Mid - falling - glottalized tone (checked) [31?]		
5	5.1 High – mid - falling tone (smooth) [43]	-	-
	5.2 High – nigh - falling – glottalized tone (checked) [54?]		
6	High - low - falling tone [52]	3	High - low - falling tone [41]
-	-	2	Mid – level tone [33]
-	-	4	High - low - falling - glottalized tone [52?]

Following table 32, it is interesting to note that some tones of Chiangrai's Northern Thai dialect pronounced by the Karen should be interfered with by the native Karen language, such as pronouncing with glottalized tone.

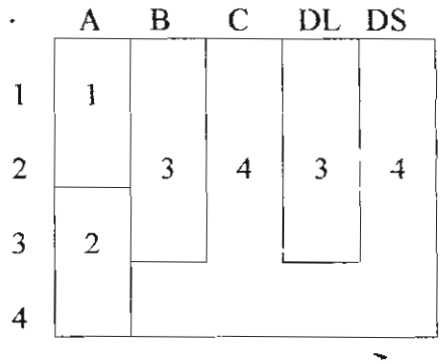
6.2 Tonal Comparison between Chiangrai's Northern Thai Dialect Pronounced by the Lahu, Akha, and Karen People and the Native Speakers

6.2.1 Comparison of Tonal System in Citation Form

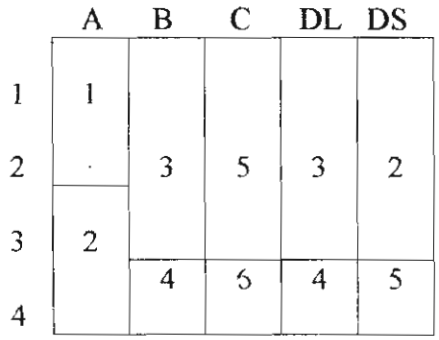
Table 33 : ***Comparison of tonal system in citation form between Chiangrai's Northern Thai dialect pronounced by the Lahu, Akha, and Karen people and native speakers***



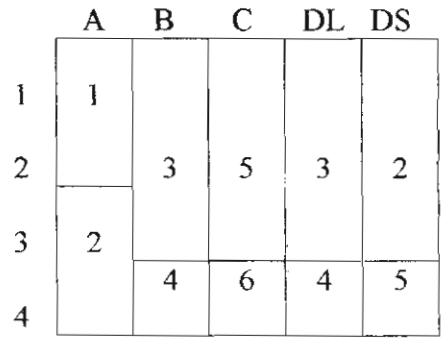
Lahu



Akha



Karen



Native Chiangrai's Northern Thai speakers

Following table 33, it is interesting to note that:

(i) Tone A in every group does not differ from native Chiangrai's Northern Thai speakers. That is, it reflects the glottalization split.

(ii) Tones B and DL in every group do not differ from native Chiangrai's Northern Thai speakers. That is, they reflect the voiced-voiceless split.

(iii) Tones C and DS in the Lahu and Akha groups have no split in their columns but they reflect the voiced-voiceless split in the Karen group in the same way as native Chiangrai's Northern Thai speakers.

(iv) Tone C in the Lahu and Akha groups differs from native Chiangrai's Northern Thai speakers in the pattern of tonal coalescence. That is, tone C in the Lahu merges with tones B4 and DL4, and tone C in the Akha merges with tones B4, DL4, and DS.

6.2.2 Comparison of Tonal System in Connected Speech

Table 34 : ***Comparison of tonal system in connected speech between Chiangrai's Northern Thai dialect pronounced by the Lahu, Akha, and Karen people and native speakers***

	A	B	C	DL	DS
1	1				
2		3	5	3	2
3	2				
4		4		4	5

Lahu

	A	B	C	DL	DS
1	1				
2		3	4	3	4
3	2				
4					

Akha

	A	B	C	DL	DS
1	1				
2		3	5	3	2
3	2				
4		4	6	4	5

Karen

	A	B	C	DL	DS
1	1				
2		3	5	3	2
3	2				
4		4	6	4	5

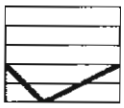
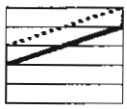
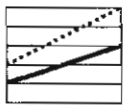
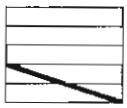
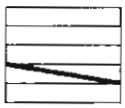
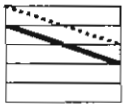
Native Chiangrai's Northern Thai speakers

Table 34 shows that the tonal systems of the Akha, Karen, and native Chiangrai's Northern Thai speakers in connected speech are the same as those in citation form except for the Lahu, in which tone C does not merge with tones B4 and DL4 and tone DS reflects the voiced-voiceless split.

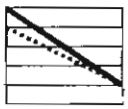
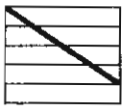
6.2.3 Comparison of Tone Features in Citation Form

6.2.3.1 Lahu

Table 35 : ***Comparison of tone features in citation form between Chiangrai's Northern Thai dialect pronounced by the Lahu and native speakers***

Tone	Chiangrai's Northern Thai dialect pronounced by the Lahu	Tone	Chiangrai's Northern Thai dialect pronounced by native speakers
1	Low - falling - rising tone [212] 107.6 Hz - 97.6 Hz - 115.1 Hz 	1	Low – falling - rising tone [212] 105.3 Hz – 98.3 Hz - 107.5 Hz 
2	Mid - rising tone [34] (smooth) 119.2 Hz - 129.9 Hz High - rising tone [45] (checked) 133.9 Hz - 146.2 Hz 	2	Low – rising tone [23] (smooth) 116.5 Hz - 126.6 Hz Mid – rising tone [35] (checked) 127.2 Hz - 146.4 Hz 
3	Low - falling tone [21] 114.6 Hz - 102.5 Hz (smooth) 116.8 Hz - 103.9 Hz (checked) 	3	Low – level tone [22] 120.7 Hz – 110.0 Hz (smooth) 120.3 Hz – 112.4 Hz (checked) 
-	-	4	Mid – falling tone [31] 124.1 Hz – 95.1 Hz (smooth) 125.4 Hz – 103.1 Hz (checked) 
-	-	5	High - mid - falling tone [43] 138.1 Hz –122.6 Hz (smooth) High - high - falling tone [54] 152.9 Hz – 140.2 Hz (checked) 

(Table 35)

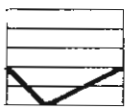
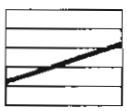
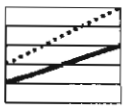
Tone	Chiangrai's Northern Thai dialect pronounced by the Lahu	Tone	Chiangrai's Northern Thai dialect pronounced by native speakers
4	High - low -falling tone [52] 144.3 Hz -114.8 Hz (smooth) High - low - falling tone [42] 131.3 Hz - 107.4 Hz (checked) 	6	High - low - falling tone [52] 154.0 Hz - 106.7 Hz 

Following table 35, it is interesting to note that, tones 2 and 3 of Chiangrai's Northern Thai dialect pronounced by the Lahu differ from native speakers in the pattern of tones. That is, tone 2 of the Lahu starts at the third section of the voice range on smooth syllables and the fourth section on checked syllables, whereas tone 2 of native speakers starts at the second section on smooth syllables and the third section on checked syllables.

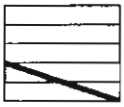
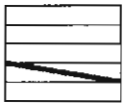
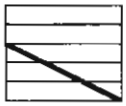
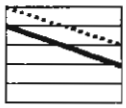
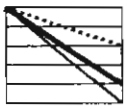
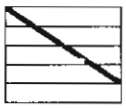
For tone 3, the Lahu pronounces it as a low falling tone but native speakers pronounces it as a low level.

6.2.3.2 Akha

Table 36 : *Comparison of tone features in citation form between Chiangrai's Northern Thai dialect pronounced by the Akha and native speakers*

Tone	Chiangrai's Northern Thai dialect pronounced by the Akha	Tone	Chiangrai's Northern Thai dialect pronounced by native speakers
1	Low - falling - rising tone [212] 125.9 Hz - 116.2 Hz - 130.5 Hz 	1	Low – falling - rising tone [212] 105.3 Hz – 98.3 Hz - 107.5 Hz 
2	Low - rising tone [23] 126.5 Hz -137.3 Hz 	2	Low – rising tone [23] (smooth) 116.5 Hz - 126.6 Hz Mid – rising tone [35] (checked) 127.2 Hz - 146.4 Hz 

(Table 36)

Tone	Chiangrai's Northern Thai dialect pronounced by the Akha	Tone	Chiangrai's Northern Thai dialect pronounced by native speakers
3	Low - falling tone [21] 130.5 Hz -115.9 Hz (smooth) 131.7 Hz - 117.5 Hz (checked) 	3	Low – level tone [22] 120.7 Hz – 110.0 Hz (smooth) 120.3 Hz – 112.4 Hz (checked) 
-	-	4	Mid – falling tone [31] 124.1 Hz – 95.1 Hz (smooth) 125.4 Hz – 103.1 Hz (checked) 
-	-	5	High - mid - falling tone [43] 138.1 Hz –122.6 Hz (smooth) High - high - falling tone [54] 152.9 Hz – 140.2 Hz (checked) 
4	High - low - falling tone [52] 154.4 Hz - 128.3 Hz (smooth) High - low - falling tone [51] 155.5 Hz - 121.3 Hz (L-checked) High - high - falling tone [54] 161.1 Hz - 142.1 Hz (S-checked) 	6	High - low - falling tone [52] 154.0 Hz - 106.7 Hz 

Following table 36, it is interesting to note that,

(i) Tone 2 of native speakers has two allotones, which are in complementary distribution, but tone 2 of the Akha has not.

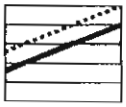
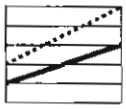
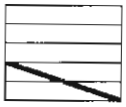
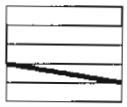
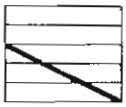
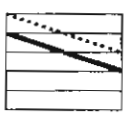
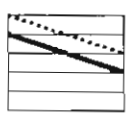
(ii) Tone 3 of the Akha is pronounced as a low falling tone, but native speakers pronounce this tone as a low level.

(iii) Tone 4 of the Akha has two allotones which are in complementary distribution but tone 6 of native speakers has not.

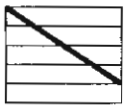
(iv) The beginning point of fundamental frequency curve in each tone of the Akha is higher than native speakers.

6.2.3.3 Karen

Table 37 : *Comparison of tone features in citation form between Chiangrai's Northern Thai dialect pronounced by the Karen and native speakers*

Tone	Chiangrai's Northern Thai dialect pronounced by the Karen	Tone	Chiangrai's Northern Thai dialect pronounced by native speakers
1	Low - falling - rising tone [212] 105.0 Hz - 92.2 Hz - 107.5 Hz 	1	Low – falling - rising tone [212] 105.3 Hz – 98.3 Hz - 107.5 Hz 
2	Low - rising tone [24] (smooth) 112.1 Hz - 124.8 Hz Mid - rising tone [35] (checked) 122.4 Hz - 135.4 Hz 	2	Low – rising tone [23] (smooth) 116.5 Hz - 126.6 Hz Mid – rising tone [35] (checked) 127.2 Hz - 146.4 Hz 
3	Low - falling tone [21] 113.9 Hz - 101.4 Hz (smooth) 113.2 Hz - 101.5 Hz (checked) 	3	Low – level tone [22] 120.7 Hz – 110.0 Hz (smooth) 120.3 Hz – 112.4 Hz (checked) 
4	Mid - falling tone [31] 123.5 Hz - 96.9 Hz (smooth) 124.0 Hz - 101.5 Hz (checked) 	4	Mid – falling tone [31] 124.1 Hz – 95.1 Hz (smooth) 125.4 Hz – 103.1 Hz (checked) 
5	High - mid - falling tone [43] 129.7 Hz - 116.2 Hz (smooth) High - high - falling tone [54] 141.7 Hz - 129.7 Hz (checked) 	5	High - mid - falling tone [43] 138.1 Hz –122.6 Hz (smooth) High – high - falling tone [54] 152.9 Hz – 140.2 Hz (checked) 

(Table 37)

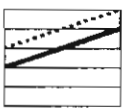
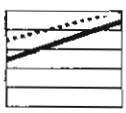
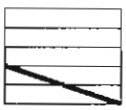
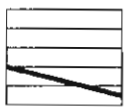
Tone	Chiangrai's Northern Thai dialect pronounced by the Karen	Tone	Chiangrai's Northern Thai dialect pronounced by native speakers
6	High - low - falling tone [52] 146.3 Hz - 104.6 Hz 	6	High – low - falling tone [52] 154.0 Hz - 106.7 Hz 

Following table 37, Tone 3 of the Karen is pronounced as a low falling tone but the native speakers pronounce this tone as a low level.

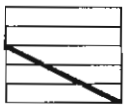
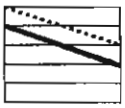
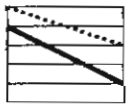
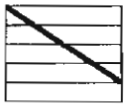
6.2.4 Comparison of Tone Features in Connected Speech

6.2.4.1 Lahu

Table 38 : ***Comparison of tone features in connected speech between Chiangrai's Northern Thai dialect pronounced by the Lahu and native speakers***

Tone	Chiangrai's Northern Thai dialect pronounced by the Lahu	Tone	Chiangrai's Northern Thai dialect pronounced by native speakers
1	Low - falling - rising tone [212] 116.7 Hz - 106.1 Hz - 124.8 Hz 	1	Low - falling - rising tone [212] 123.6 Hz – 112.6 Hz -126.9 Hz 
2	Mid - rising tone [34] (smooth) 132.7 Hz - 145.5 Hz High - rising tone [45] (checked) 149.7 Hz - 163.6 Hz 	2	Mid - rising tone [35] (smooth) 134.5 Hz - 158.7 Hz High - rising tone [45] (checked) 153.0 Hz - 169.5 Hz 
3	Low - falling tone [21] 122.0 Hz - 105.4 Hz (smooth) 125.2 Hz - 109.1 Hz (checked) 	3	Low – falling tone [21] 127.4 Hz – 114.2 Hz (smooth) 127.2 Hz – 114.2 Hz (checked) 

(Table 38)

Tone	Chiangrai's Northern Thai dialect pronounced by the Lahu	Tone	Chiangrai's Northern Thai dialect pronounced by native speakers
4	Mid - falling tone [31] 139.5 Hz - 115.3 Hz (smooth) 138.8 Hz - 111.1 Hz (checked) 	4	Mid – falling tone [31] 142.9 Hz – 105.3 Hz (smooth) 141.4 Hz – 103.4 Hz (checked) 
-	-	5	High - mid - falling tone [43] 151.5 Hz – 133.1 Hz (smooth) High - high - falling tone [54] 169.6 Hz – 151.7 Hz (checked) 
5	High - low - falling tone [42] 147.0 Hz - 128.5 Hz (smooth) High - high - falling tone [54] 157.4 Hz - 147.0 Hz (checked) 	6	High - low - falling tone [52] 166.4 Hz - 117.7 Hz 

Following table 38, it should be noted that:

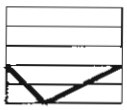
(i) Tone 5 of the Lahu has two allotones which are in complementary distribution but tone 6 of native speakers has not.

(ii) The high-low-falling tone of the lahu starts at the fourth section of the voice range but the tone of native speakers starts at the fifth section.

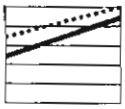
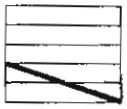
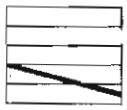
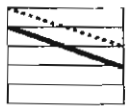
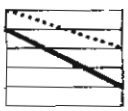
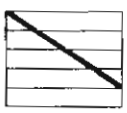
(iii) The ending point of mid-rising tone of the Lahu is at the fourth section of the voice range but the point of native speakers is at the fifth section.

6.2.4.2 Akha

Table 39 : ***Comparison of tone features in connected speech between Chiangrai's Northern Thai dialect pronounced by the Akha and native speakers***

Tone	Chiangrai's Northern Thai dialect pronounced by the Akha	Tone	Chiangrai's Northern Thai dialect pronounced by native speakers
1	Low - falling - rising tone [212] 120.0 Hz - 109.0 Hz - 130.3 Hz 	1	Low - falling - rising tone [212] 123.6 Hz – 112.6 Hz – 126.9 Hz 

(Table 39)

Tone	Chiangrai's Northern Thai dialect pronounced by the Akha	Tone	Chiangrai's Northern Thai dialect pronounced by native speakers
2	Mid - rising tone [34] 141.5 Hz - 156.1 Hz 	2	Mid - rising tone [35] (smooth) 134.5 Hz - 158.7 Hz High - rising tone [45] (checked) 153.0 Hz - 169.5 Hz 
3	Low - falling tone [21] 127.9 Hz - 114.1 Hz (smooth) 129.0 Hz - 114.2 Hz (checked) 	3	Low - falling tone [21] 127.4 Hz – 114.2 Hz (smooth) 127.2 Hz – 114.2 Hz (checked) 
-	-	4	Mid - falling tone [31] 142.9 Hz - 105.3 Hz (smooth) 141.4 Hz - 103.4 Hz (checked) 
-	-	5	High - mid - falling tone [43] 151.5 Hz - 133.1 Hz (smooth) High - high - falling tone [54] 169.6 Hz – 151.7 Hz (checked) 
4	High - low - falling tone [42] 147.7 Hz - 129.4 Hz (smooth) 144.1 Hz - 123.6 Hz (L-checked) High - high - falling tone [54] 170.3 Hz - 155.1 Hz (S-checked) 	6	High - low - falling tone [52] 166.4 Hz - 117.7 Hz 

Following table 39, it is noted that:

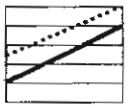
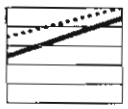
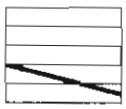
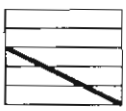
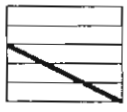
(i) Tone 2 of native speakers has two allotones, which are in complementary distribution, but tone 2 of the Akha has not.

(ii) Tone 4 of the Akha has two allotones, which are in complementary distribution, but tone 6 of native speakers has not.

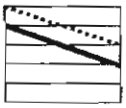
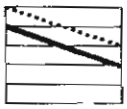
(iii) The ending point of mid-rising tone of the Akha is at the fourth section of the voice range, but the point of native speakers is at the fifth section.

6.2.4.3 Karen

Table 40 : ***Comparison of tone features in connected speech between Chiangrai's Northern Thai dialect pronounced by the Karen and native speakers***

Tone	Chiangrai's Northern Thai dialect pronounced by the Karen	Tone	Chiangrai's Northern Thai dialect pronounced by native speakers
1	Low - falling - rising tone [212] 101.2 Hz - 91.6 Hz - 106.7 Hz 	1	Low - falling - rising tone [212] 123.6 Hz - 112.6 Hz – 126.9 Hz 
2	Low - rising tone [24] (smooth) 112.1 Hz - 124.8 Hz Mid - rising tone [35] (checked) 122.4 Hz - 135.4 Hz 	2	Mid - rising tone [35] (smooth) 134.5 Hz - 158.7 Hz High - rising tone [45] (checked) 153.0 Hz - 169.5 Hz 
3	Low - falling tone [21] 113.9 Hz - 101.4 Hz (smooth) 113.2 Hz - 101.5 Hz (checked) 	3	Low - falling tone [21] 127.4 Hz – 114.2 Hz (smooth) 127.2 Hz – 114.2 Hz (checked) 
4	Mid - falling tone [31] 123.5 Hz - 96.9 Hz (smooth) 124.0 Hz - 101.5 Hz (checked) 	4	Mid - falling tone [31] 142.9 Hz - 105.3 Hz (smooth) 141.4 Hz - 103.4 Hz (checked) 

(Table 40)

Tone	Chiangrai's Northern Thai dialect pronounced by the Karen	Tone	Chiangrai's Northern Thai dialect pronounced by native speakers
5	High - mid - falling tone [43] 129.7 Hz - 116.2 Hz (smooth) High - high - falling tone [54] 141.7 Hz - 129.7 Hz (checked) 	5	High - mid - falling tone [43] 151.5 Hz - 133.1 Hz (smooth) High - high - falling tone [54] 169.6 Hz – 151.7 Hz (checked) 
6	High - low - falling tone [52] 146.3 Hz - 104.6 Hz 	6	High - low - falling tone [52] 166.4 Hz - 117.7 Hz 

Following table 40, the tone features of Chiangrai's Northern Thai dialect pronounced by the Karen differ from native speakers in tone 2.That is, the beginning point of tone 2 of the Karen is at the second section of the voice range on smooth syllables and the third section on checked syllables but tone 2 of native speakers starts at the third section on smooth syllables and the fourth section on checked syllables.

6.3 Tonal Comparison among the Ethnic Groups

6.3.1 Comparison of Tonal System in Citation Form

6.3.1.1 Lahu and Akha

Table 41 : ***Comparisons of tonal system in citation form between Chiangrai's Northern Thai dialect pronounced by the Lahu and Akha***

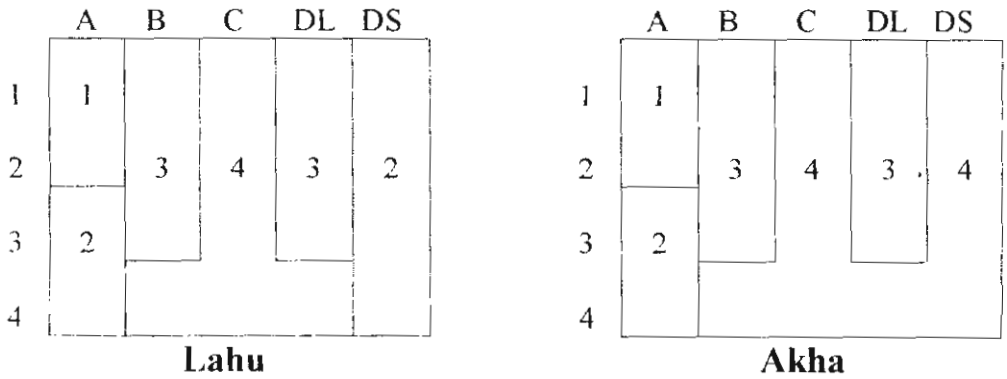


Table 41 shows that:

(i) Tone A in the Lahu group is not different from the Akha. That is, it reflects the glottalization split.

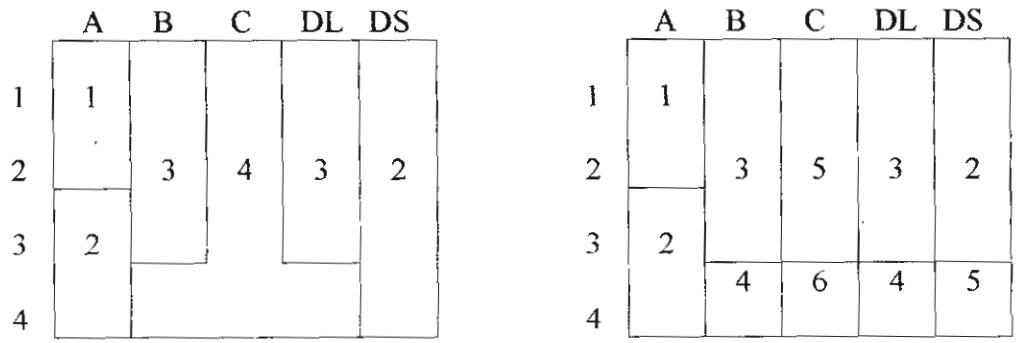
(ii) Tones B and DL in both groups are the same. That is, they reflect the voiced-voiceless split.

(iii) Tones C and DS in both groups have no split in their columns.

(iv) Tone C in the Lahu group differs from Akha in the pattern of tonal coalescence. That is, tone C in the Lahu merges with tones B4 and DL4 but tone C in the Akha merges with tones B4, DL4, and DS.

6.3.1.2 Lahu and Karen

Table 42 : ***Comparison of tonal system in citation form between Chiangrai's Northern Thai dialect pronounced by the Lahu and Karen***



Lahu **Karen**

Table 42 shows that:

(i) Tone A in the Lahu group is not different from the Karen. That is, it reflects the glottalization split.

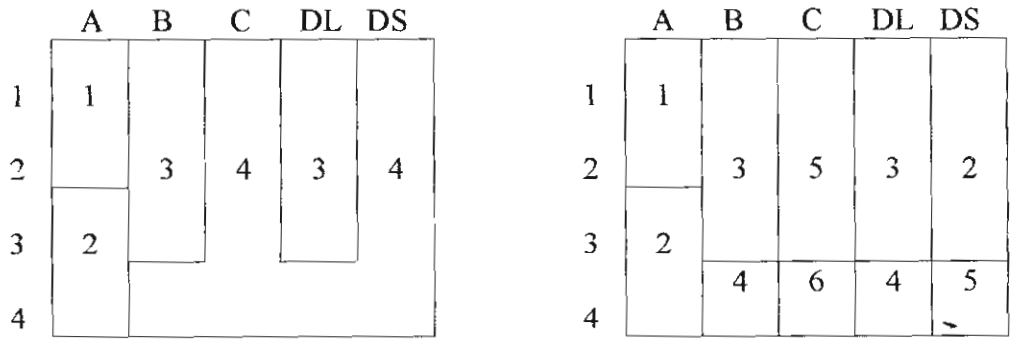
(ii) Tones B and DL in both groups are not different. That is, they reflect the voiced - voiceless split.

(iii) Tones C and DS in the Lahu group have no split in their columns but they reflect the voiced - voiceless split in the Karen group.

(iv) Tones B4 and DL4 in the Lahu group differ from the Karen in the pattern of tonal coalescence. That is, tones B4 and DL4 in the Lahu merge with tone C but tones B4 and DL4 in the Karen do not.

6.3.1.3 Akha and Karen

Table 43 : ***Comparison of tonal system in citation form between Chiangrai's Northern Thai dialect pronounced by the Akha and Karen***



Akha **Karen**

Table 43 shows that:

(i) Tone A in the Akha group is not different from the Karen. That is, it reflects the glottalization split.

(ii) Tones B and DL in both groups are not different. That is, they reflect the voiced-voiceless split

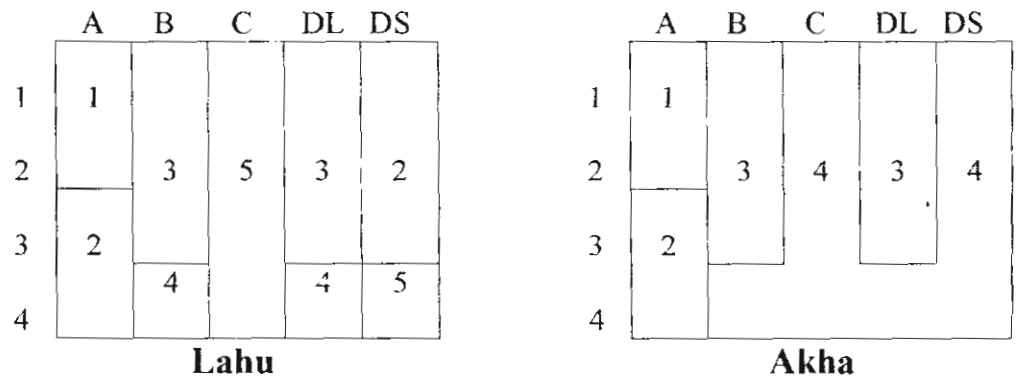
(iii) Tones C and DS in the Akha group have no split in their columns but they reflect the voiced-voiceless split in the Karen group.

(iv) Tones B4 and DL4 in the Akha group differ from the Karen in the pattern of tonal coalescence. That is, tones B4 and DL4 in the Akha merge with tones C and DS but tones B4 and DL4 in the Karen do not.

6.3.2 Comparison of Tonal System in Connected Speech

6.3.2.1 Lahu and Akha

Table 44 : ***Comparison of tonal system in connected speech between Chiangrai's Northern Thai dialect pronounced by the Lahu and Akha***



Lahu **Akha**

Following table 44, it is noted that:

(i) Tone A in the Lahu group is not different from the Akha. That is, it reflects the glottalization split.

(ii) Tones B and DL in both groups are the same. That is, they reflect the voiced and voiceless split.

(iii) Tone C in both groups has no split in its columns.

(iv) Tone DS in the Lahu group reflects the voiced and voiceless split, but tone DS in the Akha has no split in its column.

(v) Tone C in the Lahu group differs from the Akha in the pattern of tonal coalescence. That is, tone C in the Lahu merges with tones B4 and DL4, but tone C in the Akha merges with tones B4, DL4, and DS.

6.3.2.2 Lahu and Karen

Table 45 : ***Comparison of tonal system in connected speech between Chiangrai's Northern Thai dialect pronounced by the Lahu and Karen***

	A	B	C	DL	DS
1	1				
2		3	5	3	2
3	2				
		4		4	5
4					

Lahu

	A	B	C	DL	DS
1	1				
2		3	5	3	2
3	2				
		4	6	4	5
4					

Karen

Table 45 shows that:

(i) Tone A in the Lahu group is not different from the Karen. That is, it reflects the glottalization split.

(ii) Tones B, DL, and DS in both groups are not different. That is, they reflect the voiced - voiceless split.

(iii) Tone C in the Lahu group has no split in its column but it reflects the voiced - voiceless split in the Karen group.

6.3.2.3 Akha and Karen

Table 46 : *Comparison of tonal system in connected speech between Chiangrai's Northern Thai dialect pronounced by the Akha and Karen*

	A	B	C	DL	DS
1	1				
2		3	4	3	4
3	2				
4					

Akha

	A	B	C	DL	DS
1	1				
2		3	5	3	2
3	2				
4		4	6	4	5

Karen

Table 46 shows that:

(i) Tone A in the Akha group is not different from the Karen. That is, it reflects the glottalization split.

(ii) Tones B and DL in both groups are not different. That is, they reflect the voiced - voiceless split.

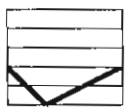
(iii) Tones C and DS in the Akha group have no split in their columns, but they reflect the voiced - voiceless split in the Karen group.

(iv) Tones B4 and DL4 in the Akha group differ from the Karen in the pattern of tonal coalescence. That is, tones B4 and DL4 in the Akha merge with tones C and DS, but tones B4 and DL4 in the Karen do not.

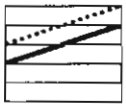
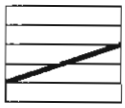
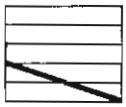
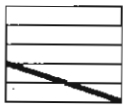
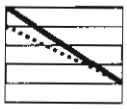
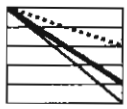
6.3.3 Comparison of Tone Features in Citation Form

6.3.3.1 Lahu and Akha

Table 47 : *Comparison of tone features in citation form between Chiangrai's Northern Thai dialect pronounced by the Lahu and Akha*

Tone	Chiangrai's Northern Thai dialect pronounced by Lahu	Tone	Chiangrai's Northern Thai dialect pronounced by Akha
1	Low - falling - rising tone [212] 107.6 Hz - 97.6 Hz - 115.1 Hz 	1	Low - falling - rising tone [212] 125.9 Hz - 116.2 Hz - 130.5 Hz 

(Table 47)

Tone	Chiangrai's Northern Thai dialect pronounced by the Lahu	Tone	Chiangrai's Northern Thai dialect pronounced by the Akha
2	Mid - rising tone [34] (smooth) 119.2 Hz - 129.9 Hz High - rising tone [45] (checked) 133.9 Hz - 146.2 Hz 	2	Low - rising tone [23] 126.5 Hz -137.3 Hz 
3	Low - falling tone [21] 114.6 Hz - 102.5 Hz (smooth) 116.8 Hz - 103.9 Hz (checked) 	3	Low - falling tone [21] 127.9 Hz - 114.1 Hz (smooth) 129.0 Hz - 114.2 Hz (checked) 
4	High - low -falling tone [52] 144.3 Hz -114.8 Hz (smooth) High - low - falling tone [42] 131.3 Hz - 107.4 Hz (checked) 	4	High - low - falling tone [52] 154.4 Hz - 128.3 Hz (smooth) High - low - falling tone [51] 155.5 Hz - 121.3 Hz (L-checked) High - high - falling tone [54] 161.1 Hz - 142.1 Hz (S-checked) 

Following table 47, it should be noted that:

(i) Tone 2 of the Lahu has two allotones which are in complementary distribution, but tone 2 of the Akha has not.

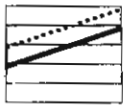
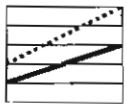
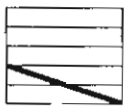
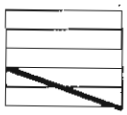
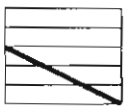
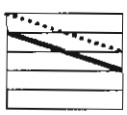
(ii) Tone 4 of the Akha has two allotones which are in complementary distribution, but tone 4 of the Lahu has not.

(iii) The beginning point of tone 2 of the Lahu is at the third section of the voice range, but the point of the Akha is at the second section.

(iv) The ending point of tone 2 of the Lahu is at the fourth section of the voice range, but the point of the Akha is at the third section.

6.3.3.2 Lahu and Karen

Table 48 : ***Comparison of tone features in citation form between Chiangrai's Northern Thai dialect pronounced by the Lahu and Karen***

Tone	Chiangrai's Northern Thai dialect pronounced by the Lahu	Tone	Chiangrai's Northern Thai dialect pronounced by the Karen
1	Low - falling - rising tone [212] 107.6 Hz - 97.6 Hz - 115.1 Hz 	1	Low - falling - rising tone [212] 105.0 Hz - 92.2 Hz - 107.5 Hz 
2	Mid - rising tone [34] (smooth) 119.2 Hz - 129.9 Hz High - rising tone [45] (checked) 133.9 Hz - 146.2 Hz 	2	Low - rising tone [24] (smooth) 112.1 Hz - 124.8 Hz Mid - rising tone [35] (checked) 122.4 Hz - 135.4 Hz 
3	Low - falling tone [21] 114.6 Hz - 102.5 Hz (smooth) 116.8 Hz - 103.9 Hz (checked) 	3	Low - falling tone [21] 113.9 Hz - 101.4 Hz (smooth) 113.2 Hz - 101.5 Hz (checked) 
-	-	4	Mid - falling tone [31] 123.5 Hz - 96.9 Hz (smooth) 124.0 Hz - 101.5 Hz (checked) 
-	-	5	High - mid - falling tone [43] 129.7 Hz - 116.2 Hz (smooth) High - high - falling tone [54] 141.7 Hz - 129.7 Hz (checked) 

(Table 48)

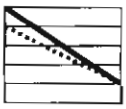
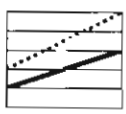
Tone	Chiangrai's Northern Thai dialect pronounced by the Lahu	Tone	Chiangrai's Northern Thai dialect pronounced by the Karen
4	High - low -falling tone [52] 144.3 Hz -114.8 Hz (smooth) High - low - falling tone [42] 131.3 Hz - 107.4 Hz (checked) 	6	High - low - falling tone [52] 146.3 Hz - 104.6 Hz 

Table 48 shows that the tone features of Chiangrai's Northern Thai dialect pronounced by the Lahu differ from the Karen in the beginning of tone. That is, tone 2 of the Lahu starts at the third section of the voice range on smooth syllables and the fourth section on checked syllables whereas tone 2 of the Karen starts at the second section on smooth syllables and the third section on checked syllables.

6.3.3.3 Akha and Karen

Table 49 : ***Comparison of tone features in citation form between Chiangrai's Northern Thai dialect pronounced by the Akha and Karen***

Tone	Chiangrai's Northern Thai dialect pronounced by the Akha	Tone	Chiangrai's Northern Thai dialect pronounced by the Karen
1	Low - falling - rising tone [212] 125.9 Hz - 116.2 Hz - 130.5 Hz 	1	Low - falling - rising tone [212] 105.0 Hz - 92.2 Hz - 107.5 Hz 
2	Low - rising tone [23] 126.5 Hz -137.3 Hz 	2	Low - rising tone [24] (smooth) 112.1 Hz - 124.8 Hz Mid - rising tone [35] (checked) 122.4 Hz - 135.4 Hz 

(Table 49)

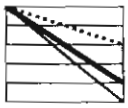
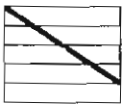
Tone	Chiangrai's Northern Thai dialect pronounced by the Akha	Tone	Chiangrai's Northern Thai dialect pronounced by the Karen
3	Low - falling tone [21] 127.9 Hz - 114.1 Hz (smooth) 129.0 Hz - 114.2 Hz (checked) 	3	Low - falling tone [21] 113.9 Hz - 101.4 Hz (smooth) 113.2 Hz - 101.5 Hz (checked) 
-	-	4	Mid - falling tone [31] 123.5 Hz - 96.9 Hz (smooth) 124.0 Hz - 101.5 Hz (checked) 
-	-	5	High - mid - falling tone [43] 129.7 Hz - 116.2 Hz (smooth) High - high - falling tone [54] 141.7 Hz - 129.7 Hz (checked) 
4	High - low - falling tone [52] 154.4 Hz - 128.3 Hz (smooth) High - low - falling tone [51] 155.5 Hz - 121.3 Hz (L-checked) High - high - falling tone [54] 161.1 Hz - 142.1 Hz (S-checked) 	6	High - low - falling tone [52] 146.3 Hz - 104.6 Hz 

Table 49 shows that:

(i) Tone 2 of the Karen has two allotones which are in complementary distribution, but tone 2 of the Akha has not.

(ii) Tone 4 of the Akha has two allotones which are in complementary distribution, but tone 6 of the Karen has not.

(iii)The beginning point of fundamental frequency curve in each tone of the Akha is higher than the Karen.

6.3.4 Comparison of Tone Features in Connected speech

6.3.4.1 Lahu and Akha

Table 50 : ***Comparison of tone features in connected speech between Chiangrai's Northern Thai dialect pronounced by the Lahu and Akha***

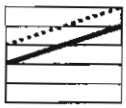
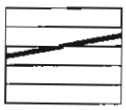
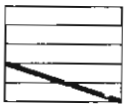
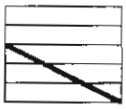
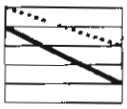
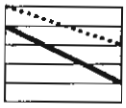
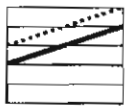
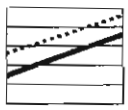
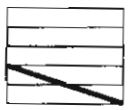
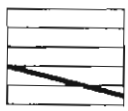
Tone	Chiangrai's Northern Thai dialect pronounced by the Lahu	Tone	Chiangrai's Northern Thai dialect pronounced by the Akha
1	Low - falling - rising tone [212] 116.7 Hz - 106.1 Hz - 124.8 Hz 	1	Low - falling - rising tone [212] 120.0 Hz - 109.0 Hz - 130.3 Hz 
2	Mid - rising tone [34] (smooth) 132.7 Hz - 145.5 Hz High - rising tone [45] (checked) 149.7 Hz - 163.6 Hz 	2	Mid - rising tone [34] 141.5 Hz - 156.1 Hz 
3	Low - falling tone [21] 122.0 Hz - 105.4 Hz (smooth) 125.2 Hz - 109.1 Hz (checked) 	3	Low - falling tone [21] 127.9 Hz - 114.1 Hz (smooth) 129.0 Hz - 114.2 Hz (checked) 
4	Mid - falling tone [31] 139.5 Hz - 115.3 Hz (smooth) 138.8 Hz - 111.1 Hz (checked) 	-	-
5	High - low - falling tone [42] 147.0 Hz - 128.5 Hz (smooth) High - high - falling tone [54] 157.4 Hz - 147.0 Hz (checked) 	4	High - low - falling tone [42] 147.7 Hz - 129.4 Hz (smooth) 144.1 Hz - 123.6 Hz (L-checked) High - high - falling tone [54] 170.3 Hz - 155.1 Hz (S-checked) 

Table 50 shows that tone 2 of the Lahu has two allotones which are in complementary distribution, but tone 2 of the Akha has not.

6.3.4.2 Lahu and Karen

Table 51 : ***Comparison of tone features in connected speech between Chiangrai's Northern Thai dialect pronounced by the Lahu and Karen***

Tone	Chiangrai's Northern Thai dialect pronounced by the Lahu	Tone	Chiangrai's Northern Thai dialect pronounced by the Karen
1	Low - falling - rising tone [212] 116.7 Hz - 106.1 Hz - 124.8 Hz 	1	Low - falling - rising tone [212] 101.2 Hz - 91.6 Hz - 106.7 Hz 
2	Mid - rising tone [34] (smooth) 132.7 Hz - 145.5 Hz High - rising tone [45] (checked) 149.7 Hz - 163.6 Hz 	2	Low - rising tone [24] (smooth) 112.1 Hz - 124.8 Hz Mid - rising tone [35] (checked) 122.4 Hz - 135.4 Hz 
3	Low - falling tone [21] 122.0 Hz - 105.4 Hz (smooth) 125.2 Hz - 109.1 Hz (checked) 	3	Low - falling tone [21] 113.9 Hz - 101.4 Hz (smooth) 113.2 Hz - 101.5 Hz (checked) 
4	Mid - falling tone [31] 139.5 Hz - 115.3 Hz (smooth) 138.8 Hz - 111.1 Hz (checked) 	4	Mid - falling tone [31] 123.5 Hz - 96.9 Hz (smooth) 124.0 Hz - 101.5 Hz (checked) 
-	-	5	High - mid - falling tone [43] 129.7 Hz - 116.2 Hz (smooth) High - high - falling tone [54] 141.7 Hz - 129.7 Hz (checked) 

(Table 51)

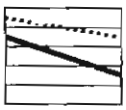
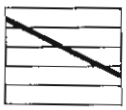
Tone	Chiangrai's Northern Thai dialect pronounced by the Lahu	Tone	Chiangrai's Northern Thai dialect pronounced by the Karen
5	High - low - falling tone [42] 147.0 Hz - 128.5 Hz (smooth) High - high - falling tone [54] 157.4 Hz - 147.0 Hz (checked) 	6	High - low - falling tone [52] 146.3 Hz - 104.6 Hz 

Table 51 shows that:

(i) Tone 5 of the Lahu has two allotones which are in complementary distribution, but tone 6 of the Karen has not.

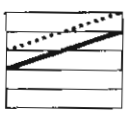
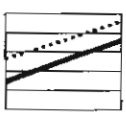
(ii) The high-low-falling tone of the lahu starts at the fourth section of the voice range, but the tone of the Karen starts at the fifth section.

(iii) The beginning point of tone 2 of the Lahu, on smooth syllables, is at the third section of the voice range, but the point of the Karen is at the second section.

(iv) The beginning point of tone 2 of the Lahu, on checked syllables, is at the fourth section of the voice range, but the point of the Karen is at the third section.

6.3.4.2 Akha and Karen

Table 52 : ***Comparison of tone features in connected speech between Chiangrai's Northern Thai dialect pronounced by the Akha and Karen***

Tone	Chiangrai's Northern Thai dialect pronounced by Akha	Tone	Chiangrai's Northern Thai dialect pronounced by Karen
1	Low - falling - rising tone [212] 120.0 Hz - 109.0 Hz - 130.3 Hz 	1	Low - falling - rising tone [212] 101.2 Hz - 91.6 Hz - 106.7 Hz 
2	Mid - rising tone [34] 141.5 Hz - 156.1 Hz 	2	Low - rising tone [24] (smooth) 112.1 Hz - 124.8 Hz Mid - rising tone [35] (checked) 122.4 Hz - 135.4 Hz 

(Table 52)

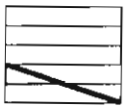
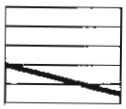
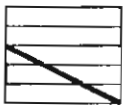
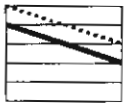
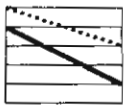
Tone	Chiangrai's Northern Thai dialect pronounced by the Akha	Tone	Chiangrai's Northern Thai dialect pronounced by the Karen
3	Low - falling tone [21] 127.9 Hz - 114.1 Hz (smooth) 129.0 Hz - 114.2 Hz (checked) 	3	Low - falling tone [21] 113.9 Hz - 101.4 Hz (smooth) 113.2 Hz - 101.5 Hz (checked) 
-	-	4	Mid - falling tone [31] 123.5 Hz - 96.9 Hz (smooth) 124.0 Hz - 101.5 Hz (checked) 
-	-	5	High - mid - falling tone [43] 129.7 Hz - 116.2 Hz (smooth) High - high - falling tone [54] 141.7 Hz - 129.7 Hz (checked) 
4	High - low - falling tone [42] 147.7 Hz - 129.4 Hz (smooth) 144.1 Hz - 123.6 Hz (L-checked) High - high - falling tone [54] 170.3 Hz - 155.1 Hz (S-checked) 	6	High - low - falling tone [52] 146.3 Hz - 104.6 Hz 

Table 52 shows that:

(i) Tone 2 of the Karen has two allotones which are in complementary distribution, but tone 2 of the Akha has not.

(ii) Tone 4 of the Akha has two allotones which are in complementary distribution, but tone 6 of the Karen has not.

(iii) The beginning point of tone 2 of the Akha, on smooth syllables, is at the third section of the voice range, but the point of the Karen is at the second section.

CHAPTER VII

CONCLUSION

7.1 Summary

The purpose of the study is, firstly, to analyze the tonal systems and tone features of Chiangrai's Northern Thai dialect and the Lahu, Akha, and Karen languages pronounced by native speakers. Secondly, it is to analyze the tonal systems and tone features of Chiangrai's Northern Thai dialect pronounced by the Lahu, Akha, and Karen people. Thirdly, it is to compare the tonal systems and tone features of Chiangrai's Northern Thai dialect pronounced by these minority groups with their native languages, and with those by native Chiangrai's Northern Thai speakers, and then to compare among their groups. Finally, it is to identify the Lahu, Akha, and Karen languages by using tones of Chiangrai's Northern Thai dialect as criteria.

The hypothesis is that the tonal systems and tone features of Chiangrai's Northern Thai dialect pronounced by the Lahu, Akha, and Karen would be different according to the tonal systems and tone features of each minority language due to the interference of their native languages. This enables us to identify which speaker is the Lahu, Akha, or Karen when these people speak Chiangrai's Northern Thai dialect.

For the method of gathering data, I selected the speech community of Mae-Yao sub-district, Mueng district, Chiangrai province, a highly cosmopolitan area composed of several ethnic groups, as the source for gathering the data. A total of forty informants were chosen for this study and divided into 4 groups; ten Lahu, ten Akha, ten Karen, and ten Northern Thai. The criteria for the selection of informants were to choose people (i) who were male, between 30-50 years old; (ii) who had lived in their villages more than 30 years; (iii) who used their own language natively in their daily life and used Chiangrai's Northern Thai dialect as a lingua franca for the informants who were not the Chiangrai's Northern Thai people; (iv) who had never been educated in Thai school, except the Chiangrai's Northern Thai people, because the Standard Thai language might have interfered with the Chiangrai's Northern Thai dialect spoken by the Lahu, Akha, and Karen. The materials used in this study are a checklist for determining tones in Northern Thai dialect, a word list of the Lahu, Akha, and Karen languages, pictures, and a cassette recorder. I collected the data by interviewing a total of forty informants and recorded their pronunciation, Chiangrai's Northern Thai dialect and their native languages in both citation form and connected speech, into the cassette recorder.

For data analysis, auditory judgement was used in analyzing the tonal system and a computer software program called "CECIL" was used to analyze the tone features by considering fundamental frequency of each tone.

The results of the analysis indicate that, there are 6 tones in Chiangrai's Northern Thai Dialect, 7 tones in Lahu, 5 tones in Akha, and 6 tones in Karen as follows:

(i) Chiangrai's Northern Thai dialect

	citation form	***connected speech***
Tone 1	low - falling - rising tone	low - falling - rising tone
Tone 2	low - rising tone / *smooth* mid - rising tone / *checked*	mid - rising tone / *smooth* high - rising tone / *checked*
Tone 3	low - level tone	low - falling tone
Tone 4	mid - falling tone	mid - falling tone
Tone 5	high - mid - falling tone / *smooth* high - high - falling tone / *checked*	high - mid - falling tone / *smooth* high - high - falling tone / *checked*
Tone 6	high - low - falling tone	high - low - falling tone

(ii) Lahu

Tone 1	low - level tone
Tone 2	low - level - glottalized tone
Tone 3	mid - falling tone
Tone 4	high - falling tone
Tone 5	high - falling - glottalized tone
Tone 6	high - level tone
Tone 7	high - level - glottalized tone

(iii) Akha

Tone 1	low - falling tone
Tone 2	low - falling - glottalized tone
Tone 3	mid - level tone
Tone 4	mid - rising tone
Tone 5	high - level tone

(iv) Karen

Tone 1	low - level tone
Tone 2	mid - level tone
Tone 3	high - falling tone
Tone 4	high - falling - glottalized tone
Tone 5	high - level tone
Tone 6	high - level - glottalized tone

For the tonal systems and tone features of Chiangrai's Northern Thai dialect pronounced by the minority groups, the results were found that, in citation form, Lahu and Akha have 4 tones, whereas Karen has 6 tones. In connected speech, Lahu has 5 tones, Akha has 4 tones, and Karen has 6 tones. The tone features of Akha and Karen in citation form are the same as in connected speech, but Lahu has an extra mid-falling tone in connected speech.

(i) Lahu

citation form	***connected speech***
Tone 1 low - falling - rising tone	Tone 1 low - falling - rising tone
Tone 2 mid - rising tone / *smooth*	Tone 2 mid - rising tone / *smooth*
high - rising tone / *checked*	high - rising tone / *checked*
Tone 3 low - falling tone	Tone 3 low - falling tone
	Tone 4 mid - falling tone
Tone 4 high - falling tone	Tone 5 high - low - falling tone / *smooth*
	high - high - falling tone / *checked*

(ii) Akha

citation form	***connected speech***
Tone 1 low - falling - rising tone	Tone 1 low - falling - rising tone
Tone 2 low - rising tone	Tone 2 mid - rising tone
Tone 3 low - falling tone	Tone 3 low - falling tone
Tone 4 high - low - falling tone / *smooth and long - checked*	Tone 4 high - low - falling tone / *smooth and long - checked*
high - high - falling tone / *short - checked*	high - high - falling tone / *short - checked*

(iii) Karen

	citation form	***connected speech***
Tone 1	low - falling - rising tone	low - falling - rising tone
Tone 2	low - rising tone / *smooth* mid - rising tone / *checked*	mid - rising tone / *smooth* high - rising tone / *checked*
Tone 3	low - falling tone	low - falling tone
Tone 4	mid - falling tone	mid - falling tone
Tone 5	high - mid - falling tone / *smooth* high - high - falling tone / *checked*	high - mid - falling tone / *smooth* high - high - falling tone / *checked*
Tone 6	high - low - falling tone	high - low - falling tone

For comparisons of the tonal systems and tone features, the results indicate that, in citation form,

(i) Tone A in every group does not differ from the native speakers. That is, it reflects the glottalization split.

(ii) Tones B and DL in every group do not differ from native speakers. That is, they reflect the voiced and voiceless split.

(iii) Tones C and DS in the Lahu and Akha groups have no split in their columns, but they reflect the voiced and voiceless split in the Karen group in the same way as native speakers.

(iv) Tone C in the Lahu and Akha groups differs from native speakers in the pattern of tonal coalescence. That is, tone C in Lahu merges with tones B4 and DL4, and tone C in Akha merges with tones B4, DL4, and DS.

(v) The minority groups pronounce Chiangrai's Northern Thai dialect with the glottalized tone on checked syllables, but native speakers do not.

And in connected speech,

(i) Tone A in every groups does not differ from native speakers. That is, it reflects the glottalization split.

(ii) Tones B and DL in every group do not differ from native speakers. That is, they reflect the voiced and voiceless split.

(iii) Tone C in the Lahu and Akha groups has no split in its column, but it reflects the voiced and voiceless split in the Karen group in the same way as native speakers.

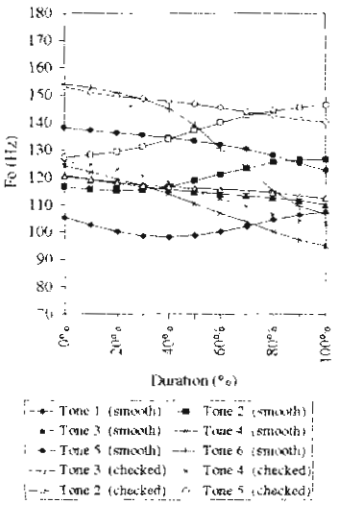
(iv) Tone C in the Akha group differs from native speakers in the pattern of tonal coalescence. That is, it merges with tones B4, DL4, and DS.

(v) Tone DS in the Akha group has no split in its column, but it reflects the voiced and voiceless split in the Lahu and Karen groups in the same way as native speakers.

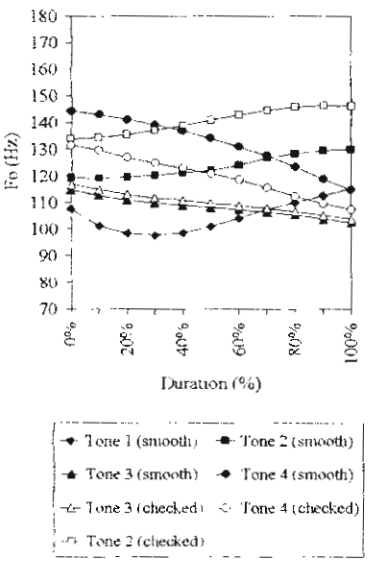
(vi) The minority groups pronounce Chiangrai's Northern Thai dialect with the glottalized tone on checked syllables, but native speakers do not.

All the tones in citation form of Chiangrai's Northern Thai dialect (CNTD) and the Lahu, Akha, and Karen languages pronounced by native speakers and CNTD pronounced by the Lahu, Akha, and Karen are put into the figure below to compare the tone features among the ethnic groups as follows:

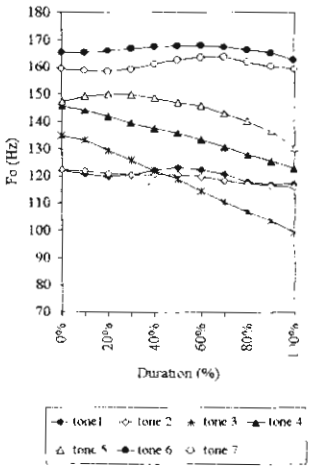
Chiangrai's Northern Thai dialect pronounced by native speakers



Chiangrai's Northern Thai dialect pronounced by the Lahu



The Lahu language pronounced by native speaker



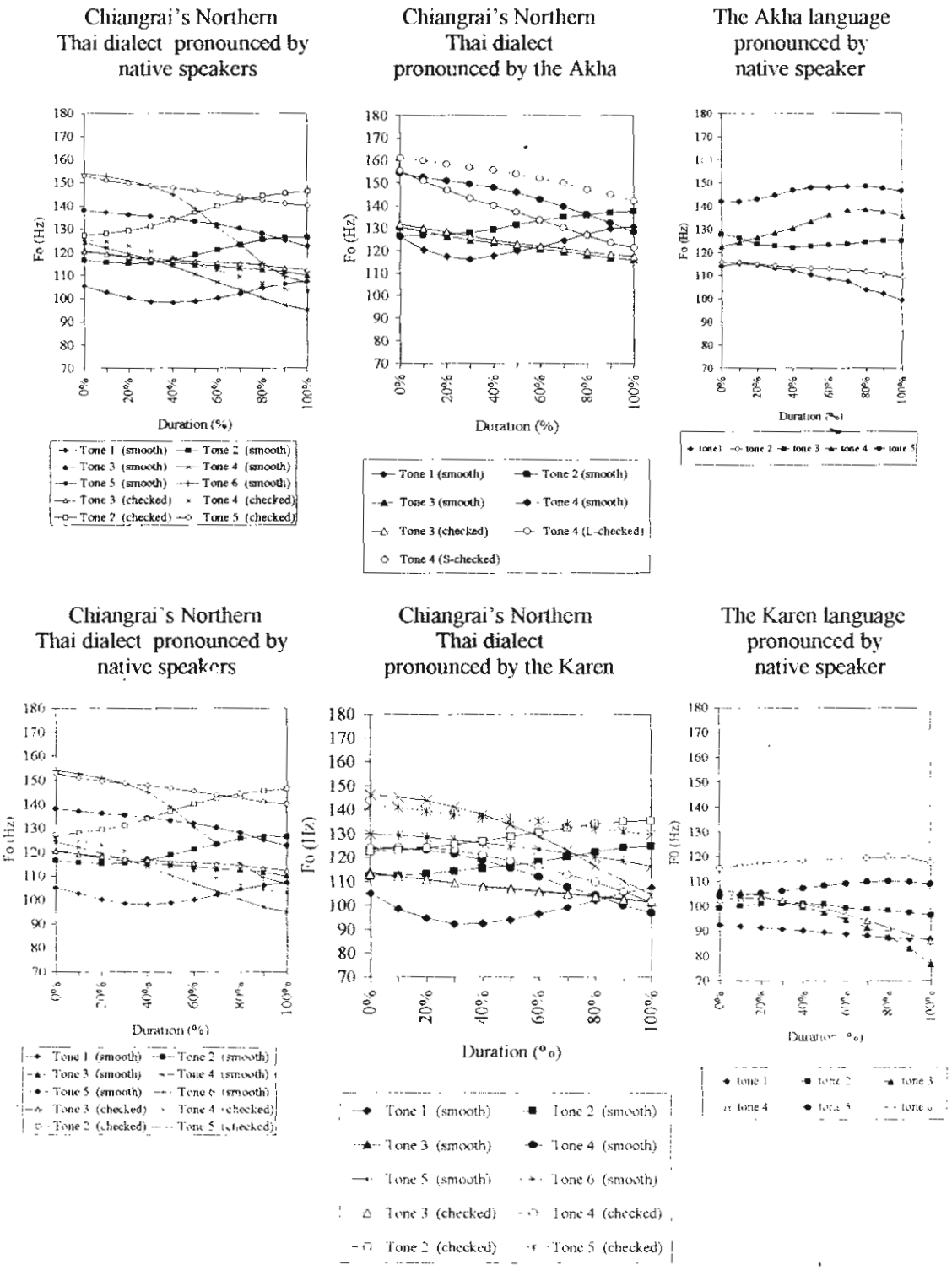


Figure 92 : ***Comparison of the tone features in citation form***

For connected speech, there is only Chiangrai's Northern Thai dialect pronounced by the lahu, Akha, Karen, and native speakers. All the tones of the dialect in each group are put into figure 93 as follows:

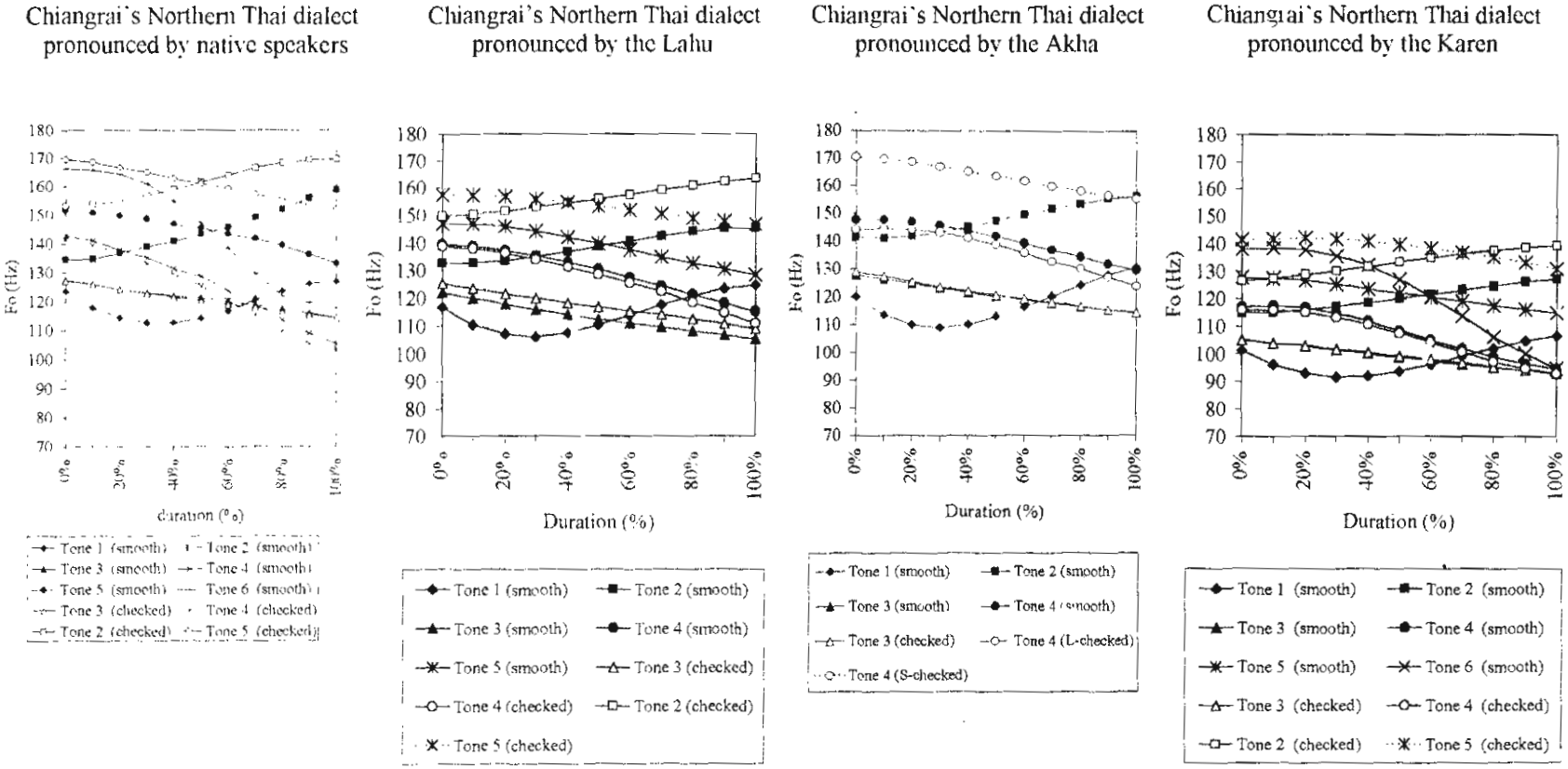


Figure 93 : ***Comparison of the tone features in connected speech***

Following figures 92 and 93, they should be noted that:

In citation form, CNT dialect pronounced by native speakers and Karen have 3 rising and falling tones and CNT dialect pronounced by the Lahu and Akha have 2 rising and falling tones.

In connected speech, CNT dialect pronounced by native speakers, Karen, and Akha are the same as those in citation form, whereas CNT dialect pronounced by the Lahu are not. The figure 93 shows that the Lahu has 2 rising and 3 falling tones.

Considering the phonetic realizations in each tone of CNT dialect, it can be conclude in the following table:

Table 53 : ***Comparison of the tone features among 4 ethnic groups****

Speech Form / Tone	Citation Form								Connected Speech							
	Smooth Syllable				Checked Syllable				Smooth Syllable				Checked Syllable			
	CNT	L	A	K	CNT	L	A	K	CNT	L	A	K	CNT	L	A	K
1	212	212	212	212	-	-	-	-	212	212	212	212	-	-	-	-
2	23	34	23	24	35	45	54	35	35	34	34	34	45	45	54	45
3	22	21	21	21	22	21	21	21	21	21	21	21	21	21	21	21
4	31	52	52	31	31	42	51	31	31	31	42	31	31	31	42	31
5	43	52	52	43	54	45	54	54	43	42	42	43	54	54	54	54
6	52	52	52	52	-	-	-	-	52	42	42	51	-	-	-	-

*CNT = Native Chiangrai's Northern Thai, L = Lahu, A = Akha, K = Karen

Following table 53, It can be explained as follows:

1. Citation form

Tone 1 Tone 1 in CNT dialect is realized as [212]. It is seen that the Lahu, Akha, and Karen speakers pronounce this tone just like the native Chiangrai's Northern Thai speakers do.

Tone 2 On smooth syllables, tone 2 in CNT dialect is realized as [23]. The difference in phonetic detail is found in the Lahu and Karen. In Lahu, this tone is realized as [34] and in Karen, this tone is realized as [24].

On checked syllables, this tone is realized as [35]. It is seen that the Karen speakers pronounce this tone just like the native Chiangrai's Northern Thai speakers do, while the Lahu speakers pronounce this tone as [45], and the Akha speakers pronounce this tone as [54].

Tone 3 Tone 3 in CNT dialect is realized as [22] on both smooth and checked syllables, but the Lahu, Akha, and Karen speakers pronounce this tone as [21].

Tone 4 Tone 4 in CNT dialect is realized as [31] on both smooth and checked syllables. It is seen that the Karen speakers pronounce this tone just like the native Chiangrai's Northern Thai speakers do, while the Lahu speakers pronounce this tone as [52] on smooth syllables and [42] on checked syllables, and the Akha speakers pronounce this tone as [52] on smooth syllables and [51] on checked syllables.

Tone 5 On smooth syllables, tone 5 in CNT dialect is realized as [43]. It is seen that the Karen speakers pronounce this tone just like the native Chiangrai's Northern Thai speakers do, while the Lahu and Akha speakers pronounce this tone as [52].

On checked syllables, this tone is realized as [54]. It is seen that the Akha and Karen speakers pronounce this tone just like the native Chiangrai's Northern Thai speakers do, while the Lahu speakers pronounce this tone as [45].

Tone 6 Tone 6 in CNT dialect is realized as [52]. It is seen that the Lahu, Akha, and Karen speakers pronounce this tone just like the native Chiangrai's Northern Thai speakers do.

2. Connected speech

Tone 1 Tone 1 in CNT dialect is realized as [212]. It is seen that the Lahu, Akha, and Karen speakers pronounce this tone just like the native Chiangrai's Northern Thai speakers do.

Tone 2 On smooth syllables, tone 2 in CNT dialect is realized as [35], but the Lahu, Akha, and Karen speakers pronounce this tone as [34].

On checked syllables, this tone is realized as [45]. It is seen that the Lahu and Karen speakers pronounce this tone just like the native Chiangrai's Northern Thai speakers do, while the Akha speakers pronounce this tone as [54].

Tone 3 Tone 3 in CNT dialect is realized as [21] on both smooth and checked syllables. It is seen that the Lahu, Akha, and Karen speakers pronounce this tone just like the native Chiangrai's Northern Thai speakers do.

Tone 4 Tone 4 in CNT dialect is realized as [31] on both smooth and checked syllables. It is seen that the Lahu and Karen speakers pronounce this tone just like the native Chiangrai's Northern Thai speakers do, while the Akha speakers pronounce this tone as [42] on smooth and checked syllables.

Tone 5 On smooth syllables, tone 5 in CNT dialect is realized as [43]. It is seen that the Karen speakers pronounce this tone just like the native Chiangrai's Northern Thai speakers do, while the Lahu and Akha speakers pronounce this tone as [42].

On checked syllables, this tone is realized as [54]. It is seen that the Lahu, Akha, and Karen speakers pronounce this tone just like the native Chiangrai's Northern Thai speakers do.

Tone 6 Tone 6 in CNT dialect is realized as [52], but the Lahu and Akha speakers pronounce this tone as [42], and the Karen speakers pronounce this tone as [51].

7.2 Discussion

The results of the study indicate that Chiangrai's Northern Thai dialect pronounced by the Karen group is most similar to native Chiangrai's Northern Thai speakers.

Results suggest that the Karen group speaks Chiangrai's Northern Thai dialect better than other groups. The main reason for this is because they have the most language contact with the Chiangrai's Northern Thai people. Lahu and Akha are isolated from the Chiangrai's Northern Thai people, and come into contact with the Chiangrai's Northern Thai people when they are hired by them. Therefore, they have less opportunity to use Chiangrai's Northern Thai dialect than the Karen group, which results in the observed differences between these two groups.

It is true that the pronunciation of the Karen and native speakers are the same, they are different in the way that Karen tend to pronounce the tones on checked syllables with the glottalized tones, whereas native Chiangrai's Northern Thai speakers do not. This enable us to identify which speakers is the Lahu, Akha, or Karen. Tonal systems and tone features of Chiangrai's Northern Thai dialect as pronounced by them are useful instruments for speaker identification according to the following criteria:

(i) On checked syllables

By using the tone features, we can identify which speaker is the minority group or native Chiangrai's Northern Thai speaker by considering his pronunciation on checked syllables. That is, the minority groups pronounce Chiangrai's Northern Thai dialect with the glottalized tone on checked syllables, but native speakers do not.

Besides, we can divide the minority groups into two groups as follows:
Tones DS1, DS2, and DS3 are rising tone : Lahu and Karen
Tones DS1, DS2, and DS3 are falling tone : Akha

(ii) On smooth syllables

By using the number of tones, we can divide the minority groups into two types of tonal system in citation form and three types in connected speech.

In citation form

1. 4-tone system : Lahu and Akha
2. 6-tone system : Karen

In connected speech

1. 4-tone system : Akha
2. 5-tone system : Lahu
3. 6-tone system : Karen

(iii) On smooth and checked syllables

By using the pattern of tonal split and coalescence in both citation form and connected speech, we can divide the minority groups into two groups.

In citation form

1. Tones C and DS reflect the voiced and voiceless split : Karen
2. Tones C and DS do not reflect the voiced and voiceless split : Lahu and Akha
3. Tone DL4 merges with DS4 : Akha
4. Tone DL4 does not merge with DS4 : Lahu and Karen

In connected speech

1. Tone C reflects the voiced - voiceless split : Karen
2. Tone C does not reflect the voiced - voiceless split : Lahu and Akha
3. Tone DS reflects the voiced - voiceless split : Lahu and Karen
4. Tone DS does not reflect the voiced - voiceless split : Akha
5. Tone DL4 merges with DS4 : Akha
6. Tone DL4 does not merge with DS4 : Lahu and Karen

7.3 Suggestions for Further Studies

1. The results of the analysis can be used as a guideline on the tonal analysis of other minority languages.

2. This research focuses on a small place, sub-district, therefore the results may be limited. A larger place, such as a district or province, should be studied for data collection.

3. This study can be used as a guideline for other studies of lingua franca in other minority groups.

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APPENDIX

Fundamental Frequency Values of Tones of Chiangrai's Northern Thai Dialect in Citation Form Pronounced by Lahu

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Tone 1 (smooth)	107.6	101.1	98.5	97.6	98.6	101.0	104.1	107.4	109.9	112.6	115.1
Tone 2 (smooth)	119.2	119.1	119.4	120.2	121.1	122.1	124.0	126.8	128.3	129.5	129.9
Tone 3 (smooth)	114.6	112.6	111.0	109.8	108.9	108.2	107.3	106.4	105.5	103.9	102.5
Tone 4 (smooth)	144.3	143.0	141.2	139.2	136.9	134.1	131.0	127.6	123.5	118.8	114.8
Tone 3 (checked)	116.8	114.8	113.1	111.7	110.8	109.8	108.9	107.8	106.6	105.3	103.9
Tone 4 (checked)	131.3	129.6	126.9	124.8	122.9	120.9	118.5	115.6	112.3	109.6	107.4
Tone 2 (checked)	133.9	134.3	135.4	137.0	139.0	141.0	142.9	144.6	146.0	146.5	146.2

Fundamental Frequency Values of Tones of Chiangrai's Northern Thai Dialect in Citation Form Pronounced by Akha

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Tone 1 (smooth)	125.9	120.4	117.3	116.2	117.7	119.8	122.6	124.4	127.3	129.6	130.5
Tone 2 (smooth)	126.5	127.0	127.1	128.0	129.3	131.5	133.3	134.8	135.8	137.0	137.3
Tone 3 (smooth)	130.5	128.5	126.4	124.7	123.4	122.0	120.8	119.5	118.2	116.9	115.9
Tone 4 (smooth)	154.4	152.5	151.0	149.5	147.9	145.8	142.8	139.6	136.0	132.4	128.3
Tone 3 (checked)	131.7	129.9	128.4	126.3	124.6	123.0	122.0	120.9	119.5	118.3	117.5
Tone 4 (L-checked)	155.5	150.9	146.9	143.2	140.2	137.1	133.5	130.1	126.7	123.4	121.3
Tone 4 (S-checked)	161.1	160.0	158.4	157.0	155.6	153.9	152.1	150.0	147.2	144.8	142.1

Fundamental Frequency Values of Tones of Chiangrai's Northern Thai Dialect in Citation Form Pronounced by Karen

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Tone 1 (smooth)	105.0	98.6	94.7	92.2	92.4	93.9	96.4	99.1	102.2	105.2	107.5
Tone 2 (smooth)	112.1	112.4	113.1	114.2	115.5	116.6	118.1	120.0	122.3	124.1	124.8
Tone 3 (smooth)	113.9	111.9	110.7	109.4	108.1	107.2	106.2	105.1	104.0	103.0	101.4
Tone 4 (smooth)	123.5	123.6	123.1	121.5	119.0	115.5	111.9	107.7	104.2	100.0	96.9
Tone 5 (smooth)	129.7	129.4	128.5	127.3	126.1	124.9	123.4	121.9	120.2	118.5	116.2
Tone 6 (smooth)	146.3	145.3	144.0	141.3	138.0	133.9	129.0	123.0	116.2	110.3	104.6
Tone 3 (checked)	113.2	111.9	110.8	109.4	108.0	106.8	105.7	104.8	103.7	102.6	101.5
Tone 4 (checked)	124.0	124.1	124.1	123.1	121.1	118.6	115.9	112.8	109.7	105.8	101.5
Tone 2 (checked)	122.4	123.1	124.0	125.5	126.9	128.8	130.7	132.5	134.1	135.1	135.4
Tone 5 (checked)	141.7	140.9	139.5	137.9	136.8	136.1	135.2	134.1	132.5	130.9	129.7

Fundamental Frequency Values of Tones of Chiangrai's Northern Thai Dialect in Citation Form Pronounced by Native Speakers

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Tone 1 (smooth)	105.3	102.7	100.3	98.6	98.3	98.9	100.3	102.2	104.6	106.4	107.5
Tone 2 (smooth)	116.5	115.6	115.1	115.4	116.4	118.9	121.1	123.3	125.6	126.6	126.6
Tone 3 (smooth)	120.7	119.0	117.6	116.5	115.6	114.6	113.9	113.1	112.4	111.7	110.0
Tone 4 (smooth)	124.1	121.9	119.4	117.0	114.0	110.4	106.9	103.7	100.2	97.2	95.1
Tone 5 (smooth)	138.1	137.0	136.2	135.4	134.4	133.3	132.0	130.3	128.1	125.1	122.6
Tone 6 (smooth)	154.0	152.7	150.8	148.5	145.0	139.1	130.7	123.4	115.2	109.5	106.7
Tone 3 (checked)	120.3	119.3	118.1	117.3	116.6	116.0	115.5	115.1	114.3	113.2	112.4
Tone 4 (checked)	125.4	124.6	122.9	120.5	118.1	114.8	112.2	109.3	106.6	104.2	103.1
Tone 2 (checked)	127.2	128.2	129.3	131.1	134.0	137.0	140.1	142.6	144.5	145.6	146.4
Tone 5 (checked)	152.9	150.9	149.6	148.7	147.8	146.7	145.4	143.9	142.6	141.1	140.2

Fundamental Frequency Values of Tones of Chiangrai's Northern Thai Dialect in Connected Speech Pronounced by Lahu

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Tone 1 (smooth)	116.7	116.3	107.0	106.1	107.4	110.3	113.9	117.6	120.8	123.4	124.8
Tone 2 (smooth)	132.7	132.7	133.5	135.2	136.9	138.8	140.7	142.6	144.3	145.4	145.5
Tone 3 (smooth)	122.0	119.9	117.7	115.8	114.0	112.4	111.0	109.6	108.1	106.7	105.4
Tone 4 (smooth)	139.5	138.8	137.4	135.4	133.2	130.6	127.4	124.4	121.2	118.3	115.3
Tone 5 (smooth)	147.0	146.9	146.0	144.3	142.2	140.0	137.6	135.0	132.6	130.4	128.5
Tone 3 (checked)	125.2	123.4	121.6	120.0	118.3	116.8	115.4	114.0	112.5	110.8	109.1
Tone 4 (checked)	138.8	138.1	136.5	134.0	131.4	128.6	125.6	122.3	118.4	114.8	111.1
Tone 2 (checked)	149.7	150.4	151.5	153.1	154.6	156.0	157.6	159.3	161.0	162.5	163.6
Tone 5 (checked)	157.4	157.3	156.9	156.0	154.8	153.4	152.0	150.6	149.1	147.9	147.0

Fundamental Frequency Values of Tones of Chiangrai's Northern Thai Dialect in Connected Speech Pronounced by Akha

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Tone 1 (smooth)	120.0	113.5	110.0	109.0	110.0	112.9	116.4	120.1	124.1	127.8	130.3
Tone 2 (smooth)	141.5	141.0	141.7	143.2	145.0	147.3	149.4	151.5	153.4	155.2	156.1
Tone 3 (smooth)	127.9	126.3	124.7	123.0	121.4	120.1	118.8	117.6	116.4	115.2	114.1
Tone 4 (smooth)	147.7	147.6	146.8	145.5	143.7	141.6	139.2	136.7	134.2	131.6	129.4
Tone 3 (checked)	129.0	127.3	125.4	123.5	122.0	120.5	119.2	117.9	116.5	115.2	114.2
Tone 4 (L-checked)	144.1	144.5	144.1	143.1	141.1	138.6	135.7	132.6	129.9	126.9	123.6
Tone 4 (S-checked)	170.3	169.6	168.6	166.9	165.2	163.5	161.7	159.8	158.0	156.4	155.1

Fundamental Frequency Values of Tones of Chiangrai's Northern Thai Dialect in Connected Speech Pronounced by Karen

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Tone 1 (smooth)	101.2	96.1	92.9	91.6	92.0	93.8	96.3	99.2	102.2	104.8	106.7
Tone 2 (smooth)	114.9	115.1	115.9	117.2	118.5	120.0	121.6	123.2	124.8	126.1	127.2
Tone 3 (smooth)	105.1	104.0	102.9	101.4	100.1	98.9	97.6	96.3	95.0	93.9	93.1
Tone 4 (smooth)	117.0	117.5	116.8	114.8	112.0	108.5	105.1	101.9	99.1	96.5	94.7
Tone 5 (smooth)	127.8	127.4	126.6	125.2	123.6	122.1	120.6	119.1	117.6	116.2	115.0
Tone 6 (smooth)	138.0	138.5	137.8	135.7	132.3	127.1	120.7	113.8	106.3	100.2	94.8
Tone 3 (checked)	105.0	104.0	102.9	101.7	100.5	99.3	98.1	96.8	95.4	94.1	93.0
Tone 4 (checked)	115.8	115.9	115.1	113.2	110.6	107.5	104.2	100.8	97.3	94.7	93.0
Tone 2 (checked)	126.4	127.3	128.6	130.1	131.7	133.4	134.9	136.4	137.7	138.7	139.4
Tone 5 (checked)	141.5	141.7	142.1	141.8	141.1	139.8	138.4	136.9	135.4	133.2	131.0

Fundamental Frequency Values of Tones of Chiangrai's Northern Thai Dialect in Connected Speech Pronounced by Native Speakers

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Tone 1 (smooth)	123.6	117.6	114.4	112.6	112.8	114.2	116.7	120.7	123.7	126.0	126.9
Tone 2 (smooth)	134.5	134.7	136.8	138.9	140.9	143.4	145.9	149.0	151.8	155.9	158.7
Tone 3 (smooth)	127.4	125.8	124.1	122.9	121.9	121.1	120.0	118.6	117.6	115.9	114.2
Tone 4 (smooth)	142.9	141.1	138.0	135.0	131.5	128.5	123.7	118.9	113.6	109.0	105.3
Tone 5 (smooth)	151.5	150.6	149.7	148.4	146.9	145.2	143.5	141.6	139.4	136.2	133.1
Tone 6 (smooth)	166.4	165.8	164.5	160.7	154.9	147.2	138.5	129.5	122.1	119.6	117.7
Tone 3 (checked)	127.2	125.7	124.2	122.6	121.5	120.2	119.0	117.8	116.6	115.3	114.2
Tone 4 (checked)	141.4	139.4	136.8	133.1	129.6	125.2	120.4	115.3	109.9	105.4	103.4
Tone 2 (checked)	153.0	153.7	154.8	156.6	158.9	161.4	164.0	166.5	168.3	169.2	169.5
Tone 5 (checked)	169.6	168.5	166.8	164.9	162.8	160.8	159.1	156.9	155.4	153.4	151.7

Fundamental Frequency Values of Tones of Lahu in Citation Form Pronounced by Native Speaker

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
tone1	122.1	120.7	119.7	120.4	122.1	123.1	122.4	120.7	117.9	116.9	117.1
tone 2	122.3	121.9	120.8	120.3	120.5	120.5	119.6	118.2	117.1	116.4	116.0
tone 3	134.7	133.1	129.2	125.8	121.8	118.7	114.4	110.4	106.7	103.6	99.3
tone 4	145.7	144.0	141.9	139.4	137.4	135.6	133.3	130.6	127.8	125.5	122.9
tone 5	147.3	149.2	149.9	149.8	148.5	146.9	145.7	142.9	140.1	136.3	130.3
tone 6	165.3	165.4	166.0	166.8	167.5	167.8	167.9	167.4	166.4	165.2	162.7
tone 7	159.3	158.5	158.2	159.1	161.1	162.6	163.6	163.8	161.9	160.2	159.2

Fundamental Frequency Values of Tones of Akha in Citation Form Pronounced by Native Speaker

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
tone1	114.1	115.1	114.7	113.2	112.1	110.4	108.5	107.4	103.7	102.2	99.3
tone 2	115.9	115.6	115.0	114.4	113.5	113.0	112.8	112.4	111.7	110.5	109.1
tone 3	128.0	126.3	123.7	122.8	122.2	122.8	123.3	123.7	124.5	125.1	125.1
tone 4	122.6	124.3	126.6	128.5	130.5	133.4	136.4	138.4	138.7	137.7	135.8
tone 5	142.3	141.9	143.1	144.7	146.8	148.0	148.1	148.4	148.6	147.9	146.7

Fundamental Frequency Values of Tones of Karen in Citation Form Pronounced by Native Speaker

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
tone 1	92.5	91.9	91.4	90.9	90.2	89.6	88.9	88.3	87.4	87.0	87.0
tone 2	99.3	100.2	101.0	101.1	101.1	100.9	99.6	98.9	98.5	97.6	96.5
tone 3	106.4	105.6	104.2	102.0	100.0	97.5	94.7	91.4	87.7	83.3	76.8
tone 4	102.8	103.3	103.4	102.6	101.1	99.4	96.7	94.4	91.4	88.7	86.1
tone 5	104.2	104.4	105.4	106.2	107.4	108.4	109.3	110.0	110.1	110.0	109.1
tone 6	115.1	116.3	117.3	118.0	118.4	118.9	119.0	119.4	119.9	119.2	117.4

Tonal System of CNTD Pronounced by Lahu in Citation Form

	A	B	C	DL	DS
1	1 [212]				
2		3 [21]	4 [52]	3 [21]	2 [45]
3	2 [34]				
4				4 [42]	

Tonal System of CNTD Pronounced by Lahu in Connected Speech

	A	B	C	DL	DS
1	1 [212]				
2		3 [21]	5 [42]	3 [21]	2 [45]
3	2 [34]				
4		4 [31]		4 [31]	5 [54]

Tonal System of CNTD Pronounced by Akha in Citation Form

	A	B	C	DL	DS
1	1 [212]				
2		3 [21]	4 [52]	3 [21]	4 [54]
3	2 [23]				
4				4 [51]	

Tonal System of CNTD Pronounced by Akha in Connected Speech

	A	B	C	DL	DS
1	1 [212]				
2		3 [21]	4 [42]	3 [21]	4 [54]
3	2 [34]				
4					

Tonal System of CNTD Pronounced by Karen in Citation Form

	A	B	C	DL	DS
1	1 [212]				
2		3 [21]	5 [43]	3 [21]	2 [35]
3	2 [24]				
4		4 [31]	6 [52]	4 [31]	5 [54]

Tonal System of CNTD Pronounced by Karen in Connected Speech

	A	B	C	DL	DS
1	1 [212]				
2		3 [21]	5 [43]	3 [21]	2 [45]
3	2 [34]				
4		4 [31]	6 [51]	4 [31]	5 [54]

Tonal System of CNTD Pronounced by Native Speakers in Citation Form

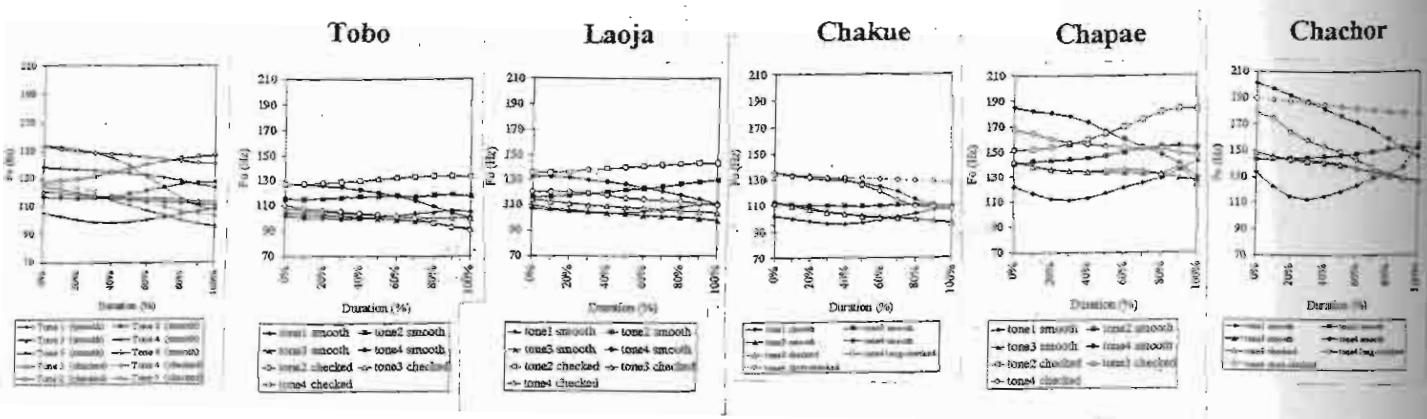
	A	B	C	DL	DS
1	1 [212]				
2		3 [22]	5 [43]	3 [22]	2 [35]
3	2 [23]				
4		4 [31]	6 [52]	4 [31]	5 [54]

Tonal System of CNTD Pronounced by Native Speakers in Connected Speech

	A	B	C	DL	DS
1	1 [212]				
2		3 [21]	5 [43]	3 [21]	2 [45]
3	2 [35]				
4		4 [31]	6 [52]	4 [31]	5 [54]

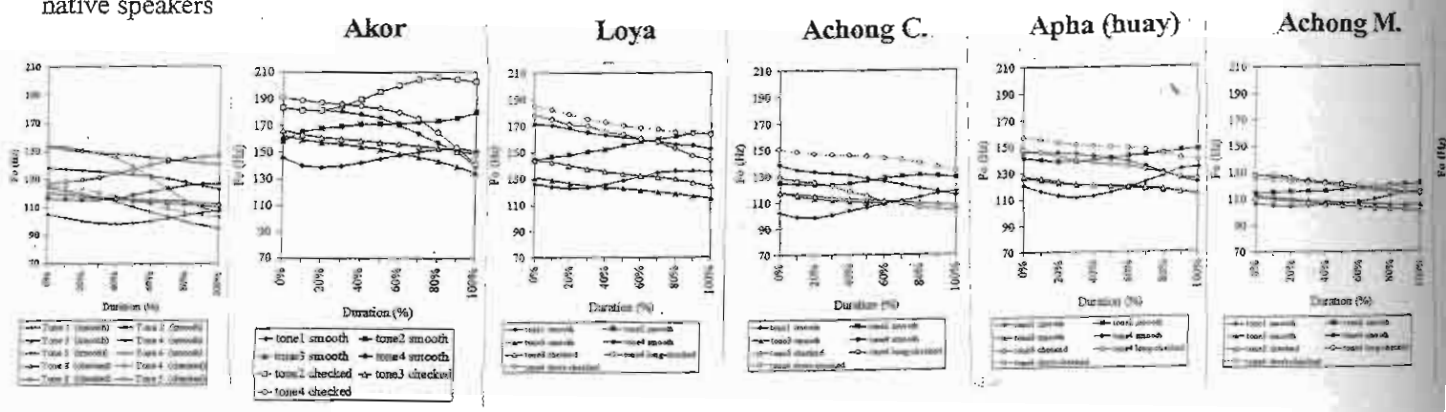
Chiangrai's Northern Thai dialect pronounced by native speakers

Chiangrai's Northern Thai dialect Pronounced by the Lahu



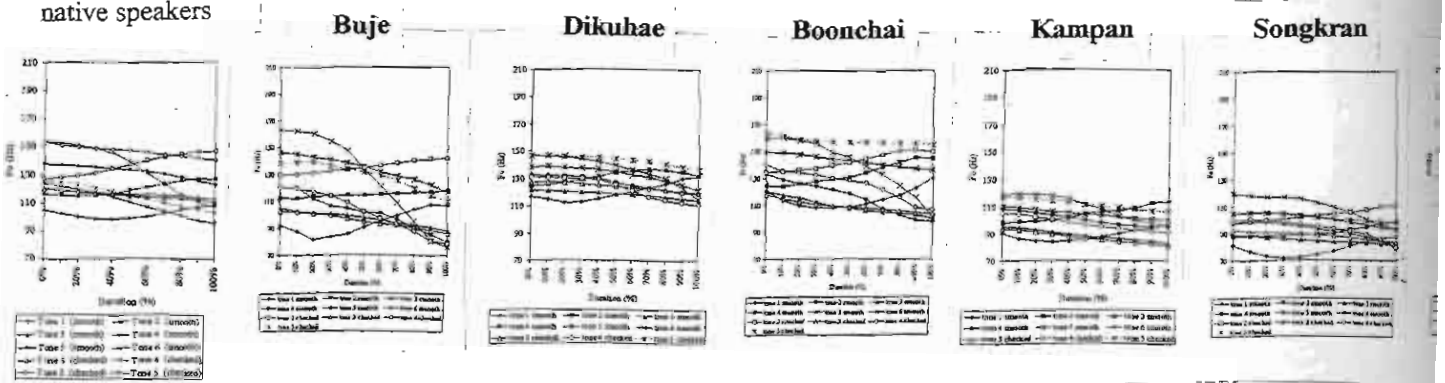
Chiangrai's Northern Thai dialect pronounced by native speakers

Chiangrai's Northern Thai dialect Pronounced by the Akha



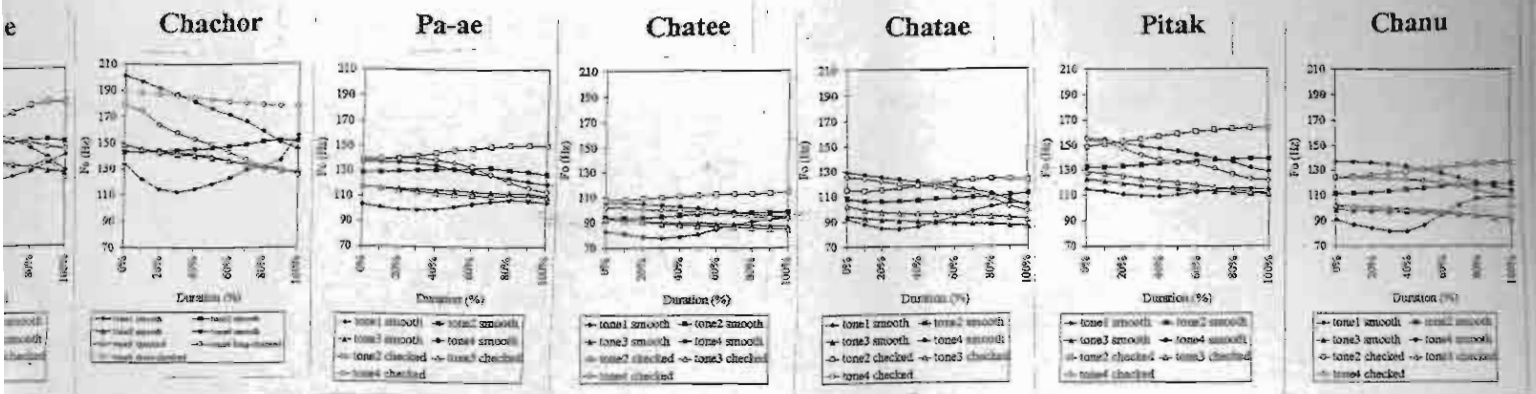
Chiangrai's Northern Thai dialect pronounced by native speakers

Chiangrai's Northern Thai dialect Pronounced by the Karen

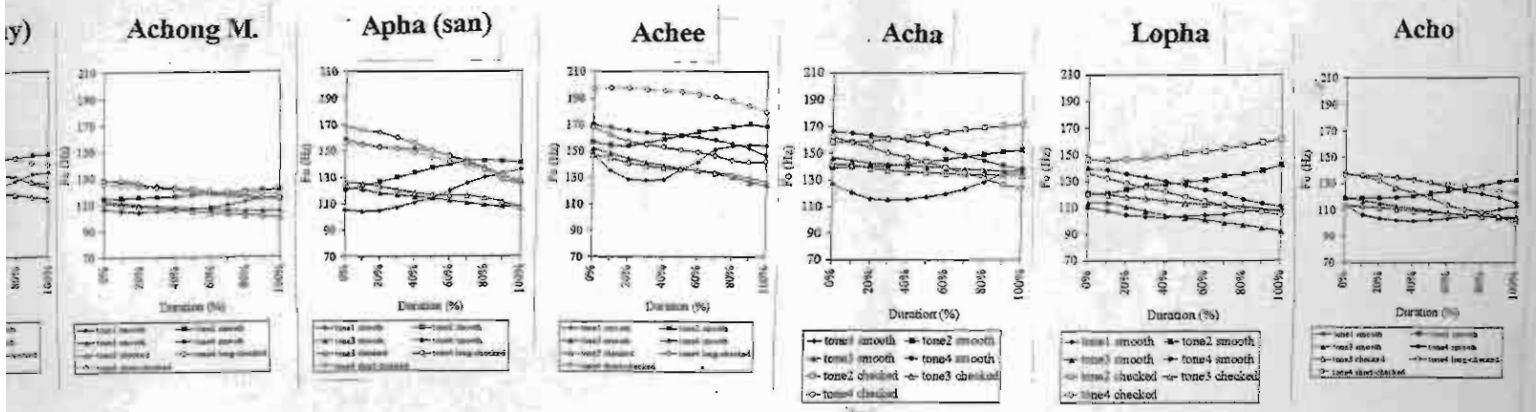


Tonal Characteristics of Chiangrai's Nort in Citation Form

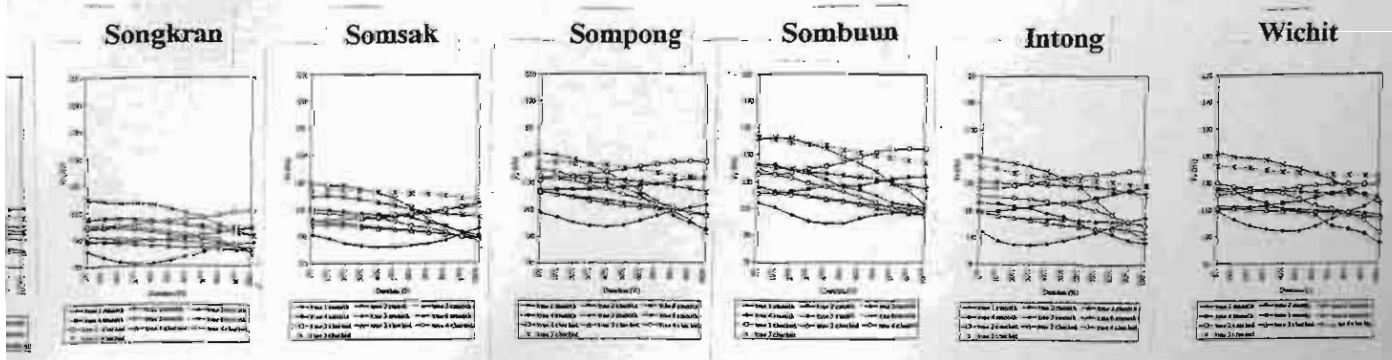
angrai's Northern Thai dialect
Pronounced by the Lahu



ıgrai's Northern Thai dialect
Pronounced by the Akha



ıgrai's Northern Thai dialect
ronounced by the Karen



s of Chiangrai's Northern Thai Dialect
n Citation Form

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