ACOUSTIC ANALYSIS OF VOWELS

PRODUCED BY EFL STUDENTS IN UIN SUNAN AMPEL SURABAYA

THESIS

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THESIS EXAMINER'S APPROVAL

This is to certify that the Sarjana thesis of Dewi Setiorini, entitled "Acoustic Analysis Of Vowels Produced by EFL Students in UIN Sunan Ampel Surabaya" has been approved by the board of examiners as one of the requirements for the Sarjana Degree in English Department, Faculty of Letters and Humanities at the State Islamic University Sunan Ampel Surabaya on 30th June 2015.

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ABSTRACT

Setiorini, Dewi. 2015. Acoustic Analysis of Vowels Produced by EFL Students in UIN Sunan Ampel Surabaya.

Advisor: Endratno Pilih Swasono, M. Pd.

Key Words: Acoustic phonetics, Acoustic, EFL, ELF, Formant, Phoneme, Phonetics, Phonology, Praat Software, Spectrogram, and Vowel Quality.

This research focus on English vowel /æ/ and /e/ quality based on the acoustic characteristics through their formant frequencies and the correlation between the average formant frequency of native speakers and the articulation of English vowel sound to know their vowel quality. This research focuses on vowel /æ/ and /e/.

The research uses a tool to identify the formant frequency of data sources called Praat. It is computer software that used for analyzing speech. The praat program is designed by Paul Boersma and David Weenink.

The result shows that the timbre of EFL university students of UIN Sunan Ampel Surabaya vowel (vowel quality) /e/ is same as /æ/. Most of them make large jaw opening with F1 around 700 Hz like /æ/.

This research use descriptive qualitative method because analyzes the acoustic characteristics through participants own formant frequencies and the correlation between the average formant frequency of native speaker from Peter Ladefoged and the articulation of English vowel sound.

The writer hopes that this research will be useful and for further researchers it is important to be more careful in measuring sound to get accuracy and research not only on measuring vowel quality but also consonant quality.

CHAPTER I

INTRODUCTION

1.1 Background of the Study

English is known as world language. It is used by many people in this world. It is usually used as lingua franca. Lingua franca usually called a contact language, as firth (1996) has demonstrated:

> "ELF as a 'contact language' between persons who share neither a common native tongue nor a common (national) culture, and for whom English is the chosen foreign language of communication (firth 1996, quoted in Smit 2010, p. 23)

There are many groups of people who use English. It is used by native speakers versus non-native speakers or native speakers versus second language speakers and also foreign language speakers, as Smit (2010, p. 50) stated:

> "All of them use the much more established terminology of either native vs. non-native speaker (NS – NNS) and/or first language/mother tongue (L1) vs. second and foreign language (L2, FL)" (Smit, 2010).

In other Hand, Smit also said that English have unique status as world language, as Smit (2010, p. 45) stated:

> "English can justifiably be given a unique status amongst all languages used on our planet today. Similar to all other (socio) linguists, I also feel the need to relativize this statement by stressing that this uniqueness, which has widely been identified by the label 'global' or 'world' language" (Smit, 2010).

English as world language means that English is not only used by native speakers but also used by many people in this world. As the proof, it is known that 56 % of international news broadcasting and the internet web used English, as (Sigurbjörnsson, Kamps and de Rijke, 2005) stated:

> "English is still 'in the lead' in international news broadcasting and the internet, with an estimated 56% of web content in English in 2002 (Sigurbjörnsson, Kamps and de Rijke 2005, quoted in Smit 2010, p. 46).

In other hand, Smit (2010, p. 45) also said that English used as global communication systems included many aspects, such as communication for international business, trade and transport, international research, education and (mass) culture. So, to face this globalization, it is important to non native speaker of English to learn English as their second language or foreign language as good as possible.

It is not surprising to find an increase in English language use and learning (Smit: 2010, p. 46). Such as In Indonesia, English becomes foreign language that was learned by most of Indonesian. It becomes foreign language because their first language that is used is their own regional language and their second language is Indonesian. Even though, English became foreign language that learned in school. In this case, there are many aspects that must be considered in teaching English as foreign language. They are language skills and language component. Here, Language skills include listening, speaking, reading, and writing while language component include pronunciation (Rohmah: 2012, p. 4).

In this case, Goodwin (2001) said that the most important aspect of language that learned by second language (L2) learners is pronunciation. It becomes important because it is necessary to gain successful communication. In other hand, Harmer (2001, p. 183) said that awareness of pronunciation will give two advantages. The first is for speakers own production and the second are for speakers' understanding of spoken English. It means that the way to pronounce language is very important. So, it is important that foreign language speakers have to learn phonology to gain successful communication. Phonology is the study about language sound. According to Poole (1999, p. 55) phonology is studies sound in the context of language

One of phonology branch that have important role to get a better pronunciation are phonemics. It becomes important because phoneme is smallest units of speech in a language that distinguish one word from another (Oxford 7th Edition, 2010). It means that measurement of phoneme sound is very important to help us differentiate one word with the other word and gain successful communication.

Vowels have a big deal in foreign language acquisition because we know from O'connor that Native speakers of English accent were differentiated by the sound of vowel, as O'connor (1995, p. 2) stated:

> "Native speakers of English from different parts of the world have different accents, but the differences of accents are mainly the result of differences in the sound of vowels; the consonants are produced in very much the same way where English is spoken (O'connor, 1995)".

In this case, Harmer (2001, p.184) said that the particular problem in pronunciation teaching and learning is what students can hear. It means that students have difficulty to hear pronunciation feature which the teacher want them to reproduce. So, because of this reason the writer know that it is important to measure English vowel sound. It is known that measuring English vowel is not enough by using our hearing. It happens because we are not native speaker of English who know to pronounce correctly. For example, the writer is get difficulty to differentiate the vowel phoneme in cat and ten. This problem occurs because as foreign language speaker, we are not using English in daily life (Rohmah: 2012, p. 2).

Based on the explanations above, the writer wants to measure the EFL university student ability of pronounce English vowels using praat software. It is an instrument that is used for analyzing physical sound. It program is designed by Paul Boersma and David Weenink of the Institute of Phonetics Sciences of the University of Amsterdam. Its home page is www.praat.org or www.fon.hum.uva . The writer analyses the acoustic characteristic of English vowel produced by EFL university students called formant in the spectrogram. It is chosen because the writer considers that Vowel quality is based on the frequency of formant 1 and formant 2 based on the average formant frequency of American English vowel. The average formant was chosen because the writer considered that it is difficult compare acoustic data on the sounds of one individual with another. Even, it is known that Phoneticians do not really know how to compare acoustic data on the sounds of one individual with those of another (Ladefoged and Johnson, 2011). This research also was in accordance with article "How to Measure Vowel Formants Using praat" by Richard Wright and David Nichols University of Washington Phonetics Lab on 25 June 2009. They said that Vowel quality is based (largely) on our perception of the relationship between the first and second formants (F1 & F2). Ladefoged and Johnson (2011, p. 187) also said that quality of vowel was distinguished by the difference in formant.

This kind of research also has done previously by some researcher. One of them is Japanese, Kazuya Saito. He measure vowel æ and a in some words though formants using praat in his research.

1.2 Statement of the Problems

1. What are the formant values of English vowel produced by EFL university students of UIN Sunan Ampel Surabaya?
2. How does the English vowel quality of EFL university students of UIN Sunan Ampel Surabaya based on the acoustic characteristics through their formant frequencies?

1.3 Objective of Study

1. To know the formant value of English vowel produced by EFL university students of UIN Sunan Ampel Surabaya.
2. To know the English vowel quality of EFL university students of UIN Sunan Ampel Surabaya based on the acoustic characteristics through their formant frequencies.

1.4 Significance of the Study

The research is useful for many groups of people, such as students, further researchers who want to do the same kind of research, and other readers.

For students, the research enriches their knowledge about one of three points in phonetics called acoustic phonetics. Besides, it can also be used as an example of research on phonetic especially acoustic phonetics. It also gives them new information about one of software that can be used to analyze or measure sound (acoustics). So, they can learn something new through praat software. Besides, the research also became one of example how to measure vowel quality.

Principally, for further researchers who want to measure some phonological aspect using praat Software. Besides, the research also gives information about praat software. It is very important because praat is one of tool that can be used to get the measurements or to analyze physical properties of speech and phonetics that they need and desire for their research. Ultimately, the research became useful reference for further researchers who doing the same kind of study.

The last, the research also enrich knowledge about acoustic of vowels produced by EFL students in UIN Sunan Ampel Surabaya. It means that the research give us new information or knowledge about vowel quality of EFL students in UIN Sunan Ampel Surabaya.

1.5 Scope and Limitation

The research focuses on the English vowels /æ/ and /e/ from words that were derived by Indonesian EFL university students in English Letters, State Islamic University of Sunan Ampel Surabaya. The participants consisted of 16 students who were on the eight semester. It is chose because the writer considered that 16 students are enough to represent object of the research. It was in accordance to Mahsun (2013) in metode penelitian bahasa. He said that language research do not need a big sample but it needs sample that represent social group that was become data resource.

> "Dalam penelitian bahasa sampel yang besar tidak diperlukan,... Namun, yang paling penting diingat ialah bahwa setiap kategori kelompok social yang dijadikan variable independen harus terwakili didalam sampel yang dijadikan sumber data (Mahsun: 2013)"

> "Big sample in the linguistic research is not needed,... the most important to remember is we have to put every social group that was included in the independent variable in the data source (Mahsun: 2013)"

1.6 Definition of Key Terms

Acoustic phonetics: the study of the acoustic characteristics of speech, including an analysis and description of speech in terms of its physical properties. Sometimes restricted to instrumental analysis and measurement sound waves (Clark and Yallop, 1995)

Acoustic: the scientific study of sound and how we hear it (Clark and Yallop, 1995)

EFL: English as foreign language (Smit, 2010)

ELF: English as lingua franca (Smit, 2010)

Formant: the overtone pitches that give it its distinctive quality in sound (Ladefoged and Johnson, 2011)

Phoneme: smallest units of speech in a language that distinguish one word from another.

Phonetics: the scientific study of speech production that concerned with articulatory phonetics, acoustic phonetics, and auditory phonetics (Aarts, 2006)

Phonology: studies sound in the context of language (Poole, 1999)

Praat Software: computer software that used for analyzing speech (www.praat.org).

Spectrogram: The display produces of component of sound in computer program (Ladefoged and Johnson, 2011)

Vowel Quality: the timbre of a vowel (Ladefoged and Johnson, 2011)

CHAPTER II

LITERATURE REVIEW

2. 1 Theoretical Framework

2.1.1 Phonology

Phonology is one of the core fields that compose the discipline of linguistics (Odden, 2005). According to Poole (1999), Phonology is study sounds in the context of languages. It was in accordance with Clark and Yallop (1995), they said that phonology is concerned with speech with the ways in which human produce and hear speech. In other hand, phonology according to Ladefoged (1982, p. 23) is the description of the system and pattern of sounds that occurs in a language. In this case, Ladefoged said that it involves studying a language to determine its distinctive sound and to find out which sound convey a different in meaning. Based on the definitions above, it can be concluded that phonology is the study of the sound of a language.

In this case, there is one of important part of phonology like phonetics. Phonetics is the study of speech sound and their production. It was in accordance with MacMahon (2006, p. 360). He said that phonology focuses on the mechanics of sound production and transmission. In other hand, Aarts (2006, p. 359) Phonetics describes as the scientific study of speech production. It concerned with articulatory phonetics, acoustic phonetics, and auditory phonetics.

Aarts (2006, p. 359) explain that Articulatory phonetics is The processes that generate an air-stream which carries linguistic content, acoustic phonetics is the physical characteristics of the resulting sound waves that pass between the speaker's vocal tract and the listener's ears, and auditory phonetics is the processes whereby the mechanical movements of the ear-drum, created by the action of the sound waves, are transmitted into the middle and inner ear and perceived at a cortical level as sound.

In this research, the writer concern with the acoustic phonetic, especially acoustic of vowel sound. So, it means that this research concern with the physical characteristics of the resulting sound waves of vowel that through between the speaker's vocal tract and the listener's ears. Because of this reason, it is known that the research has relationship with the acoustic analysis of the vowel. So, it is better to know about speech production at first. It happened because it is known from the explanation above that acoustic phonetics have relation with speech production. In other hand, it is also important to know about vowel, the articulation of the vowel sound, the sounds of the vowel and vowel quality as additional explanation to make it clear.

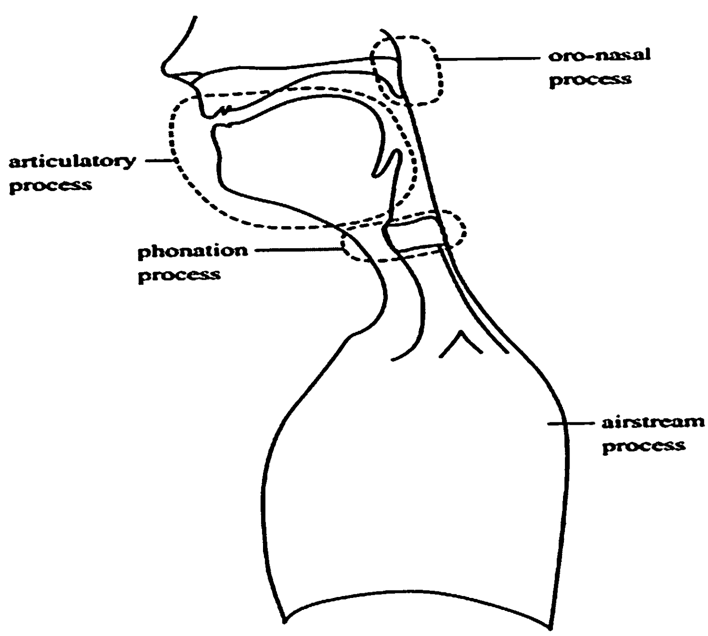
2.1.2 Speech Production

According to Ladefoged and Johnson (2011, p. 2), speech production is the result of the tongue and lips. He explains that the tongue and lips movements as gestures forming particular sound. It is possible to convey information by gestures of our hands that people can see, but in making speech that people can hear, humans have found a marvelously efficient way to give information. The gestures of the tongue and lips are made audible so that they can be heard and recognized.

Ladefoged and Johnson (2011, p. 2) also said that making speech gestures audible involves pushing air out of the lung while producing a noise in the throat or mouth. These basic noises are changed by the actions of the tongue and lips. So, it means that each sound is different because of the different of the tongue and lips' actions. Producing any sound requires energy. In nearly all speech sounds, the basic source of power is the respiratory system pushing air out of the lungs. It can be concluded that it is possible to produce sound or speak any language when we are breathing in.

In other hand, Ladefoged (2011, p. 5), explain that the speech production mechanism as a whole shows the four main component. They are the airstream process, the phonation process, the oro-nasal process, and the articulatory process. The airstream process includes all the ways of pushing air out that provide the power for speech. For the moment, we have considered just the respiratory system, the lungs pushing out air, as the prime mover in this process. The phonation process is the name given to the actions of the vocal folds. Only two possibilities have been mentioned: voiced sounds in which the vocal folds are vibrating and voiceless sounds in which they are apart. The possibility of the airstream going out through the mouth, as in (v) or (z), or the nose, as in (m) and (n), is determined by the oro-nasal process. The movements of the tongue and lips interacting with the roof of the mouth and the pharynx are part of the articulatory process.

Figure. 1 The four main components of the speech mechanism.



2.1.3 Vowels

The term vowel refers to sound, not to letter. It was in accordance with Clark and Yallop (1990, p. 3). So, it can be concluded that when we talk about vowel, it means that we does not talk about vowel letter but vowel sound.

There is much kind of English vowel sounds. They are short vowel, long vowel and diphthong (Baker, 2006). It also was in accordance with Roach (1983).

Short vowel means that we make short sounds. The symbol for these short vowel are /i/ as in list, /e/ as in less, / æ/ as in lass, / □/ as in cup, / □/ as in lost, and /u/ as in look.

Long vowels are the vowels which tend to be longer than the short vowels in similar context (Roach, 1983). The symbol for these long vowels are /i:/ as in least, / ə:/ as in learn, / □:/ as in last, / □:/ as in lord, and /u:/ as in Luke.

Diphthong is two vowel sounds. The symbols for these diphthongs are /iə/ as in dear, here, near, hear, gear, etc, /ei/ as in day, take, cake, case, /□ə/ as in care, there, where, /uə/ as in sure, tour, cure, /ou/ as in throw, grow, / □i/ as in toy, boy, joy, employ, noise, /ai/ as in tie, white, mind, time, find, right and /au/as in ground, town, snow, hound.

Although English has a large number of vowel sounds, the research focus on the short vowel especially /e/ and / æ/. Those vowels are chosen because the writer considers that most of Indonesian people pronounce it in the same way. So, because of the reason above the writer look for the formant value and its characteristics of vowel /e/ and / æ/.

Those vowels can be differentiated by the term of the position of the highest point of the tongue and the position of the lips. In this case, Ladefoged (2001, p. 12) states that there are three gestures that affect vowel sound. They are the height of the body tongue, the front and back position of the tongue, and the degree of the lip rounding. Johnson (2011, p. 211) called it as main aspects of vowel quality. Based on the previous explanation, it is important to know about the articulation of vowel sounds to know the gesture of vowel.

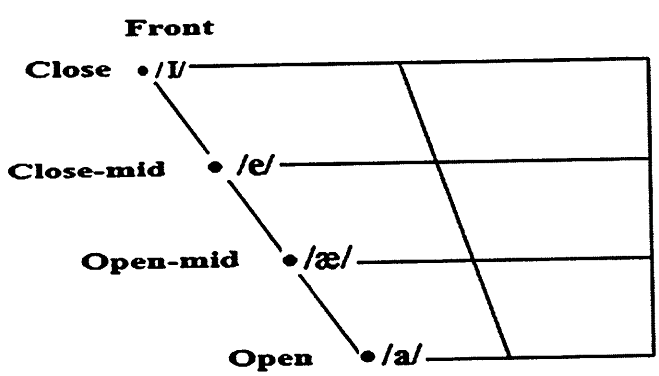
2.1.4 The Articulation of Vowel Sounds

It is known that the passage of the airstream of vowel sounds is relatively unobstructed. It differentiated by their gestures (articulation). They are the height of the body tongue, the front and back position of the tongue, and the degree of the lip rounding.

Johnson (2011, p. 19) also said that vowel sound in heed, hid, head, had, father, good, food gestures, the tongue tip is down behind the lower front teeth, and the body of the tongue is domed upward. In the first four vowels, the highest point of the tongue is in the front of the mouth. Accordingly, these vowels are called front vowels. The tongue is fairly close to the roof of the mouth for the vowel in heed, slightly less close for the vowel in hid, and lower still for the vowels in head and had. The vowel in heed is classified as a high front vowel, and the vowel in had as a low front vowel. The height of the tongue for the vowels in the other words is between these two extremes, and they are therefore called mid-front vowels. The vowel in hid is a mid-high vowel, and the vowel in head is a mid-low vowel.

Based on the explanation above, it can be concluded that /i/, /e/, /æ/, and /a/ are front vowels. /i/, is high front vowel or close front vowel, /e/ is mid-high vowel or close-mid vowel, /æ/ is mid-low vowel or open-mid vowel.

Figure. 2 The tongue shape of front vowel



In other hand, he also explains that the tongue position of vowel sounds in father, good, food is close to the back surface of the vocal tract.

These vowels are classified as back vowels. The body of the tongue is highest in the vowel in food and lowest in the first vowel in father. The vowel in good is a mid-high back vowel.

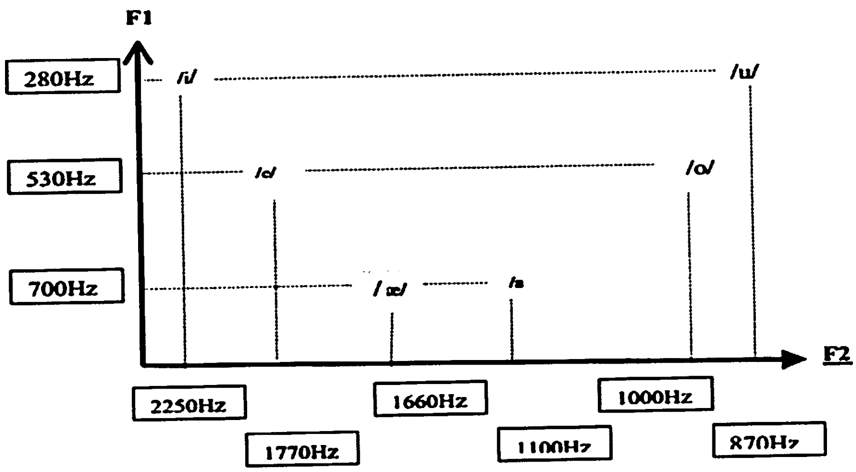
According to the explanation above, it can be concluded that /u:/ is called a high back vowel, /a:/ is called a low back vowel, and /u/ is mid-high back vowel.

In this case, it is also known that lip gesture also have affect in the different vowels. According to Johnson (2011, p. 20) there is a movement of the lips in addition to the movement that occurs because of the lowering and rising of the jaw. This movement is called lip rounding. It is usually most noticeable in the inward movement of the corners of the lips. Vowels may be described as being rounded (as in who'd) or unrounded (as in heed).

2.1.5 Acoustic Analyses

It is known from Johnson (2011, p. 193) that it is possible to analyze physical of vowel sound because phonetic scientists like to describe vowels in terms of number. He said that it is possible to analyze sounds so that the researcher can measure the actual frequencies of the formant. It can represent graphically, as in figure. In this case, a linguist named Ladefoged (1925–2006) has contribution in this figure. This figure is the average of a number of the frequencies of the first two formants in American English vowels.

Figure. 3 The frequencies of the first two formants in American English vowels.



Those values show the correlation between the first formant (F1) and second formant (F2) values and vowel height and frontness and backness. According to Kazuya Saito (2007, p. 24), the higher the F2 value is, the more front the tongue position, and the higher the F1 value is, the lower the tongue position.

Johnson (2011, p. 194) state that there are computer programs that can analyze sounds and show their components. The display produced is called a spectrogram. We have seen spectrograms in prior chapters without much discussion of how to interpret them. In spectrograms, time runs from left to right, the frequency of the components is shown on the vertical scale, and the intensity of each component is shown by the degree of darkness. It is thus a display that shows, roughly speaking, dark bands for concentrations of energy at particular frequencies showing the source and filter characteristics of speech. There are several free computer programs on the Web that can be used to make spectrograms, such as Praat.

The praat program is designed by Paul Boersma and David Weenink of the Institute of Phonetics Sciences of the University of Amsterdam. Its home page is http://www.praat.org or http://www.fon.hum.uva.nl/praat /. The praat is one of Computer software that used for analyzing physical properties of speech and phonetics (acoustic), such as loudness, pitch, and quality. It can be operated in UNIX, Linux, Mac and Microsoft Windows. It has some versions, it is 5.4.01 until 5.4.08. The update version is PRAAT 5.4.08. Praat is the dutch word for "talk" or "speak".

The first step to record sound using Praat software is click Objects, New, Record Mono and Press Record to record, and Stop to stop. After made a recording, the user has to name it and choose Save to list, and it will show up in the Praat objects window where it is ready for editing. In other hand, the user click Objects, Open, and Read from File if the user already have recording in their computer. The second step after the sound has been recorded or opened is select Objects, View & Edit to open a sound in the editor window. Finally, you will show the waveform of the sound that ready to analyze.

2.1.5.1 The Element of Acoustic

Sound consists of variation in air pressure due to small movements of the particles of air that differentiate each sound, such as loudness, pitch and quality in the wave. So, it can be concluded that those are element of acoustic that can differs sound.

In this case, Ladefoged (1996, p. 14) explained it clearly. He explained that If you listen to a number of musical notes, such as those made by tuning forks, pianos, or violins, you will find that they may differ from one another in three principal ways, firstly, one may be louder than another, if you strike two similar tuning forks, one gently and the other somewhat harder, almost the only difference between the two resulting sounds will be that one is soft and only just audible, whereas the other is loud and can be heard at a distance. The second possible difference between two musical sounds is that one may be higher in pitch than another. This is the main difference between two notes such as middle C and the C above it on a piano. It is possible to strike them so that they sound equally loud but differ as sounds because one is higher up the scale than the other. It is a number of vibrations per second of sound. Lastly, the third difference between musical sounds is that one may differ in quality from another. This is the difference between two notes that are equal in pitch and loudness but have been produced by different instruments, such as piano and a violin.

These three factors loudness, pitch and quality provide the most convenient method of differentiating between all sounds. They can be regarded as three ways in which sounds can differ. Whenever you hear two sounds it is possible to describe the differences between them by comparing them in these three ways. For example, a tuning fork and an organ will produce sounds they produce may have the same pitch, but one sound is almost certain to be louder than the other, and each sound definitely has its own quality.

2.1.6 Vowel Quality

It is known from Johnson (2011, p. 187) that the quality of a vowel depends on its overtone structure. When discussing differences in quality, we noted that the quality of a vowel depends on its overtone structure. Putting another way, we can say that a vowel sound contains a number of different pitches simultaneously. There is the pitch at which it is actually spoken, and there are the various overtone pitches that give it its distinctive quality. We distinguish one vowel from another by the differences in these overtones. The overtones are called formants.

Based on the explanation above, it can be concluded that quality of vowels usually based on the frequencies of the vowel. So, because of this reason it is important to know the relationship between articulatory of the vowels and the frequencies of those vowel. In following explanation, explain about those relationships from some linguist.

Lindblom and Sundberg's work as cited on Clark and Yallop (1995, p. 266) suggests the following general relationships between articulatory and acoustic factors:

1. Jaw opening cause F1 to rise quite markedly, usually in the context controlling vowel height. It will cause F2 to rise if the tongue is retracted up towards the soft palate: this effect is strongest when the lips are spread, but minimal in other articulatory position. F3 may rise sharply at moderate jaw apertures when the tongue is raised towards the palate region.
2. Tongue body movement in a general anterior to posterior direction causes a modest rise in fl if the jaw is kept at a fixed opening (but the jaw is not normally kept in one position). Movement from anterior to neutral position results in large drop in F2 in all cases. From neutral to posterior position, F2 will tend to rise with small jaw opening, but continue to fall with larger jaw openings.
3. Tongue body shape, which controls the degree of tract constriction (assuming a constant jaw position), has little effect on F1 except that it

results in a modest fall at maximum constriction if the tongue body is well forward. It has a strong effect on F2, causing it to fall substantially as constriction increases if the tongue body is in neutral or posterior position. An anterior tongue body position combined with maximum constriction results in a sharp rise in F2. F3 is little affected by tongue body shape except for a modest fall at neutral and maximum constriction with an anterior tongue position.

4. Lip rounding has the general effect of lowering all formant frequency, with the strongest effects observable on F2 and F3. The extent of the effect depends on what the tongue and jaw are doing at the same time.
5. Lowering of the larynx makes the vocal tract longer and tends to lower all formant frequency; the degree f lowering of each formant partly depends on the overall state of the vocal tract. In general, larynx height influences F2 and F4 more than F3.

In other hand, Ladefoged also said that there are two features of vowel quality. They are height and backness that are used to contrast one vowel with another in nearly every language, and there are other features that are used less frequently. In this case, the feature of vowel quality based on the explanation of Ladefoge can be concluded that formant frequency have some effect. Such as frequency of formant one affect height, frequency of formant two affect Backness, Frequency of formant three affect Rhotacization.

According to the explanation above, the writer can conclude that there are two features of vowel quality that are used to contrast one vowel with another in this research. They are height and backness. Both of them have relationship with the frequency of the first and second formant's frequencies. It was also in accordance with Kazuya Saito. He analyzed vowel æ and a based on the correlation between the first formant (F1) and second formant (F2) values and vowel height and frontness backness. He analyzed based on the first and second formant frequencies of æ and a.

2.2 Related Study

Studies on acoustic phonetics have been done previously. For first example, Dini Ratna Sari Putri (2007) analyzed the sounds of Fricatives and affricates pronunciation by Sudanese literature 2010 generation of Padjadjaran University. Her research focused on the ability of the sounds of Fricatives and affricates (V, F, S, Z, ʃ, θ, ð, □, t ʃ, and d□) pronunciation by Sudanese. She analyzed through praat Software and refers to the 7th Edition Oxford dictionary. The purpose of her research is to find out the accuracy of the sounds pronunciation of Sastra Sunda Students. She found that Sudanese are not pronouncing tʃ correctly. The results showed that the accuracy of the pronunciation of the respondents did not reach 70%.

Based on the explanation above, it is known that this research has similarity with previous study. Both of them measure quality of sound using praat. In other hand, they also have difference. This research refers to the average formant of native English while the previous refers to the pronunciation in 7th Edition Oxford dictionary. This research more accurately than previous research that refers to pronunciation in 7th Edition Oxford dictionary. This is more accurately because we know that this research uses the average formant of native English. The average formant is chosen because the writer considered that it is difficult to compare acoustic data on the sounds of one individual with another. Even, it is known that Phoneticians do not really know how to compare acoustic data on the sounds of one individual with those of another (Ladefoged and Johnson, 2011). So, because of this reason, it is better refer to average formant of English than pronunciation in dictionary.

The second is Kazuya Saito (2007) in the linguistics journal that was edited by Paul Robertson and John Adamson. He analyzed the ability of The Influence of Explicit Phonetic Instruction on Pronunciation in EFL Settings: The Case of English Vowels and Japanese Learners of English. The vowel that was analyzed by Kazuya Saito are æ and a. this research involved six Japanese learners of English. He found that using praat software is very effective to analyze the ability of The Influence of Explicit Phonetic Instruction on Pronunciation in The Case of English Vowels and Japanese Learners of English.

This research also has similarity with the second previous study. Both of them are measure vowel quality using praat and refer to the average formant of native English and EFL setting. EFL (English as foreign language) means that person who uses English after the first and second language. They usually do not use English in daily life of the society where they live (Rohmah, 2012). In other hand, it also has difference. The difference occurs because the previous study not only focuses on the vowel quality but also focus on the Influence of Explicit Phonetic Instruction on Pronunciation in EFL Settings.

CHAPTER III

RESEARCH METHOD

3.1 Research Approach

In this research, the writer chooses descriptive qualitative method. It is chosen by the writer because the writer concerned with the spectrogram or the pattern of the acoustic phonetics of the data and their frequency. The writer identifies the acoustic characteristics of the participants based on their own formant frequency through the correlation between the average formant frequency of native speaker and the articulation of English vowel sound to know their vowel quality.

3.2 Research Instrument

The writer is the main instrument of this research. She uses herself as the main research instrument through recording, collecting the data, and identifying. The secondary instrument is praat software. It is computer software that is used for analyzing physical properties of phonetics. It is used as a tool to identify the formant frequency of data sources in this research.

3.3 Data Sources

The primary data is recording of words that content vowel /æ/ and /e/. They are vowel /æ/ sound in word "cat" and /e/ in word "ten". The secondary is a list of average native English formant. Vowel /æ/ and /e/ is chosen because the writer considers that foreign speakers especially Indonesians are difficult to differentiate both of them. In other hand, it is also known that Indonesian language does not have kind of /e/ sound like English.

The data is a word cat and ten that were derived by 16 people of eighth semester of Indonesian EFL university students in English Letters, State Islamic University of Sunan Ampel Surabaya. It is chosen because the researcher wants to know and measure the vowel quality of /æ/ and /e/ of university students around her. /æ/ and /e/ is chosen because the writer considers that some people pronounce it in the same way. Besides, the writer also considers that 16 people already represent social group that was become data resource and students who were on the eighth semester are already learning about phonology.

3.4 Technique of Data Collection

The data collected through some steps:

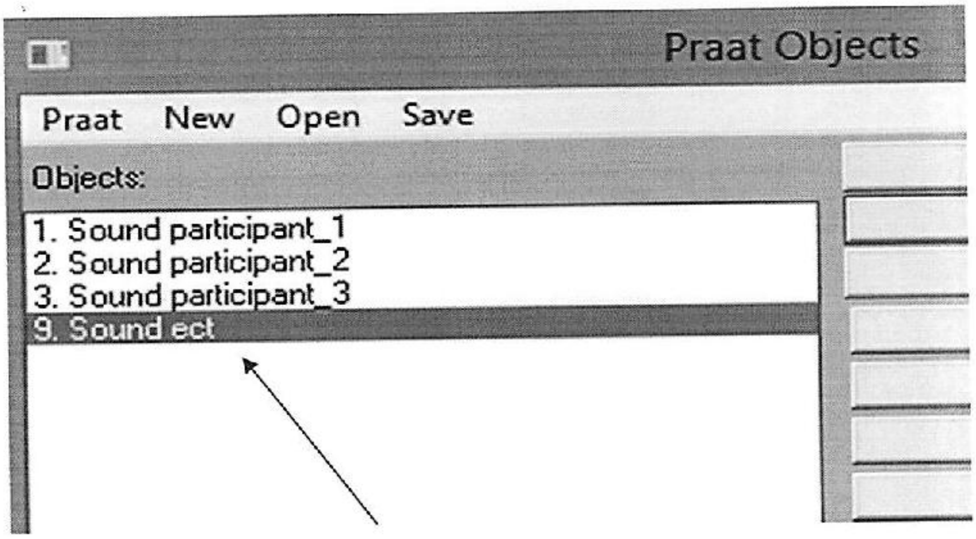
1. The writer made a list of words that were used in recording. They were cat and ten.
2. The writer asked the participants to mention two words "cat" and "ten" and record it.
3. The writer saved the recordings to the laptop and renamed it. Such as participant 1, 2, 3 and so on.
4. The writer measured that recording already saved in the laptop.

3.5 Technique of Data analysis

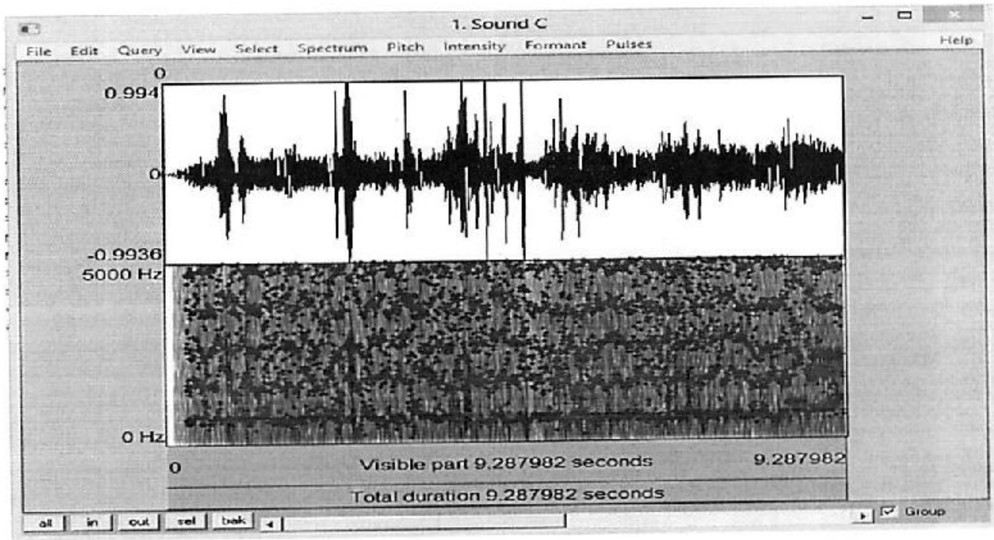
Some steps were taken in analyzing the acoustic characteristic of English vowel produced by EFL university students:

1. For a start, the writer downloaded software praat from www.praat.org and put the software in software in local disk D.

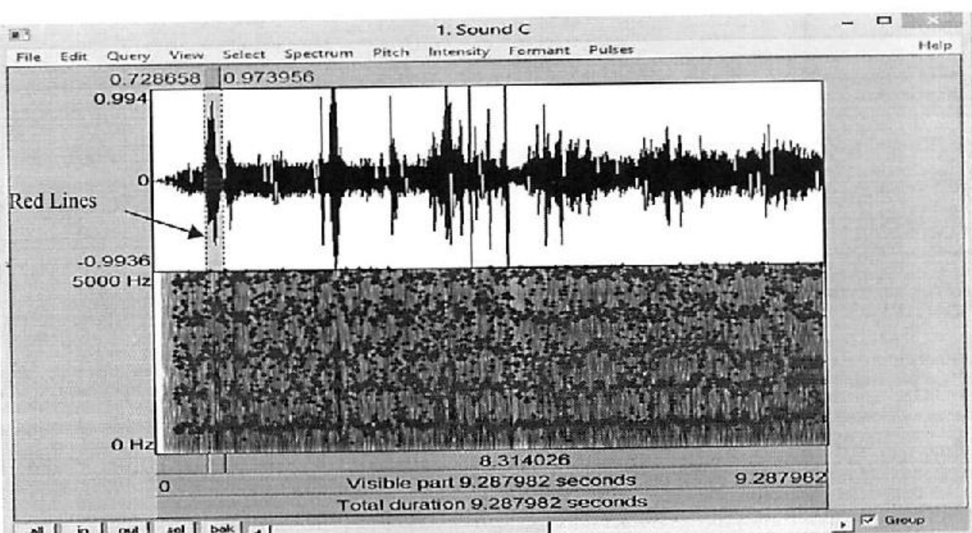
2. Put all the data (recording) into software.



3. Change the data (recording) to the form of spectrogram.

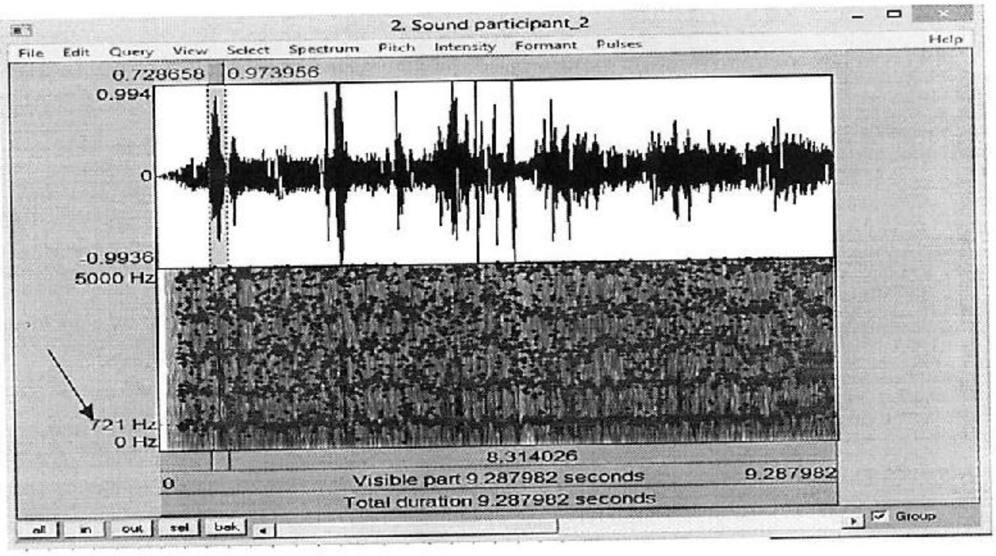


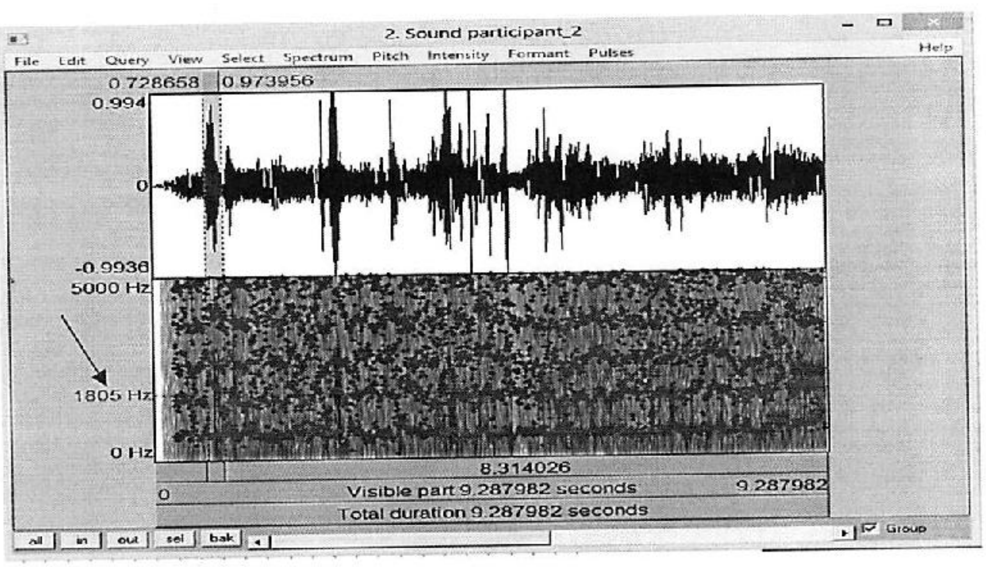
4. Cut and delete the unimportant sound before and after the word sound from environment with red line. It means that the writer just take the sound of the words. For example, the writer just takes spectrogram of word cat when the writer analyzes it.



5. Make sure that the red lines that limit the data sound and the unimportant sound before and after the data sound do not move and saved in the software.

6. Look for the frequency of formant 1 and formant 2 from the sound.





The frequency of the first formant is 721 Hz and the second formant is 1805 Hz.

7. Capture and put those spectrograms in the Microsoft word.

8. Do the 3rd – 7th step in each recording.

9. Look for the characteristic of English vowel produced by EFL university students based on their formant frequency through comparing each finding of frequency F1 and F2 from the recording with the average frequency of the native speaker to measure the EFL university students' ability to pronounce vowel /æ/ and /e/.
10. Look for the percentage of their vowel quality through this formula to know their vowel quality.

$$\frac{x}{amount\ of\ all\ participant} \times 100\ \%$$

11. Conclude based on those findings.
12. The last, the writer write the finding as the thesis.

CHAPTER IV

FINDING AND DISCUSSION

4.1 Discussion

The correlation between the first formant (F1) and second formant (F2) values is vowel height and frontness and backness. It means that F1 have effect on the opening of jaw, and F2 have effect on the tongue body shape.

In this research, the writer concern with the formant values in the front vowels /æ/ in word “cat” and /e/ in word “ten”. So, it has big deal with the formant values and the position of those vowels like in the following figure.

Figure. 4 Formant value

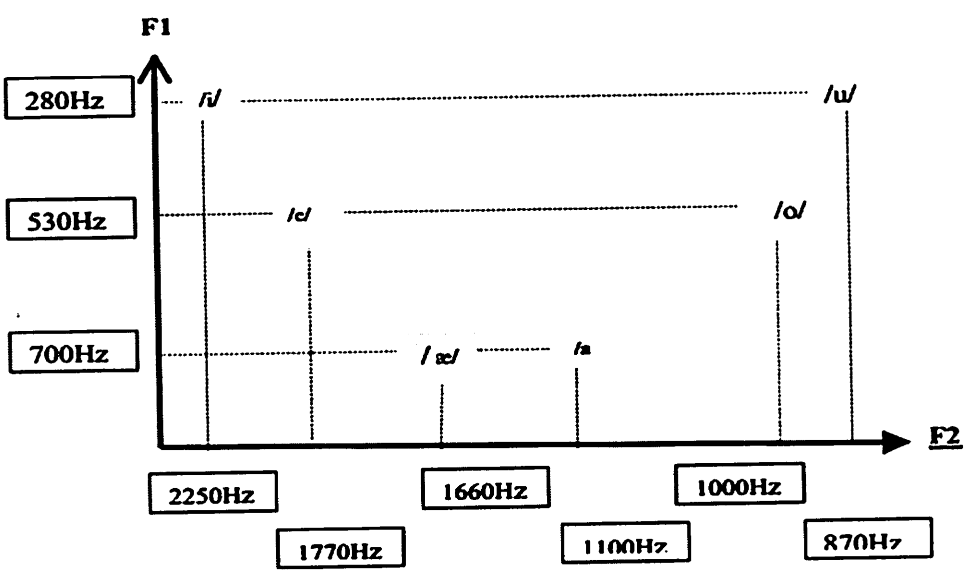
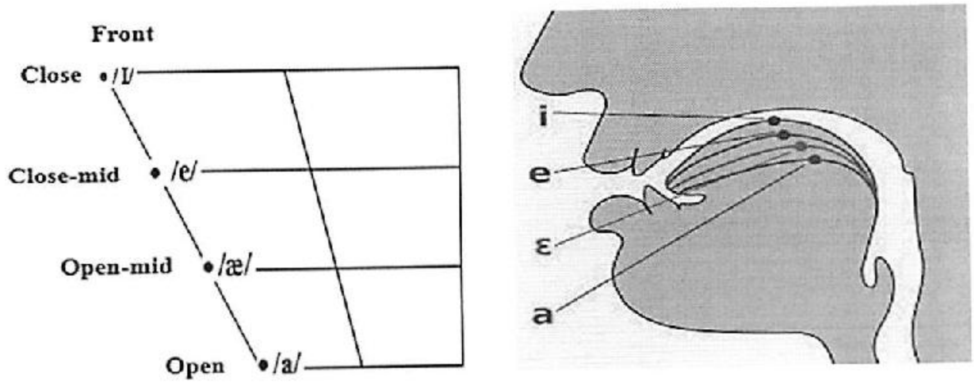
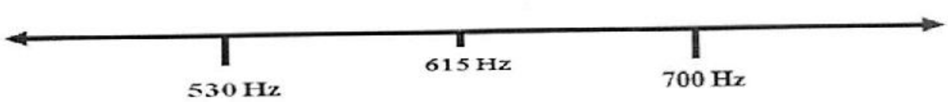


Figure. 5 The tongue shape of front vowel



Based on those figure, it is already known that the higher the F2 value is the more front the tongue position and F1 affects the jaw opening. Basically, /æ/ and /e/ can be differentiated based on the F1 value like in the following figure.

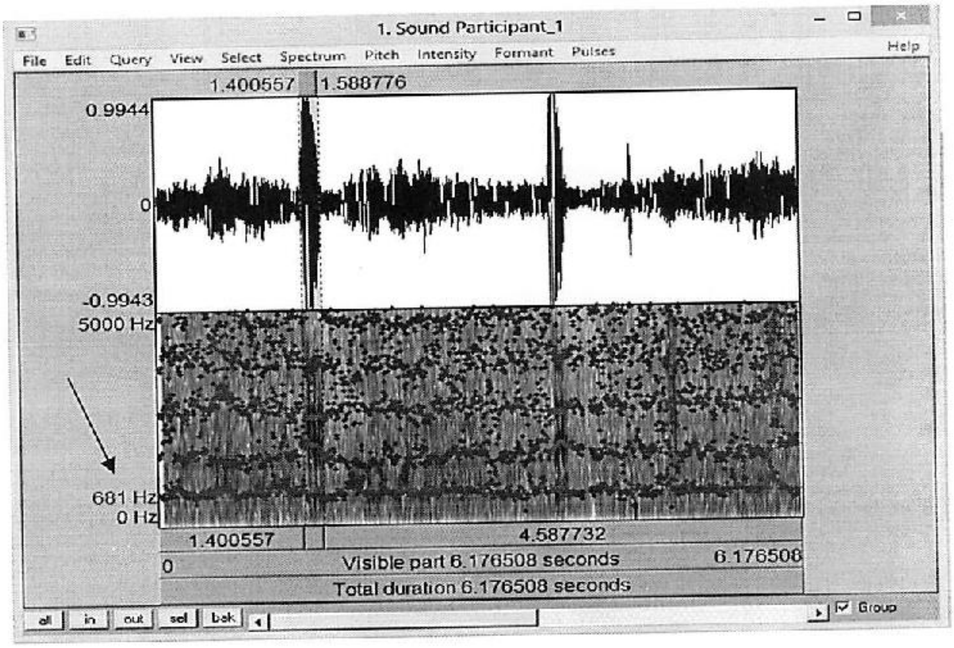
Figure 6. Measurement F1 of /æ/ and /e/

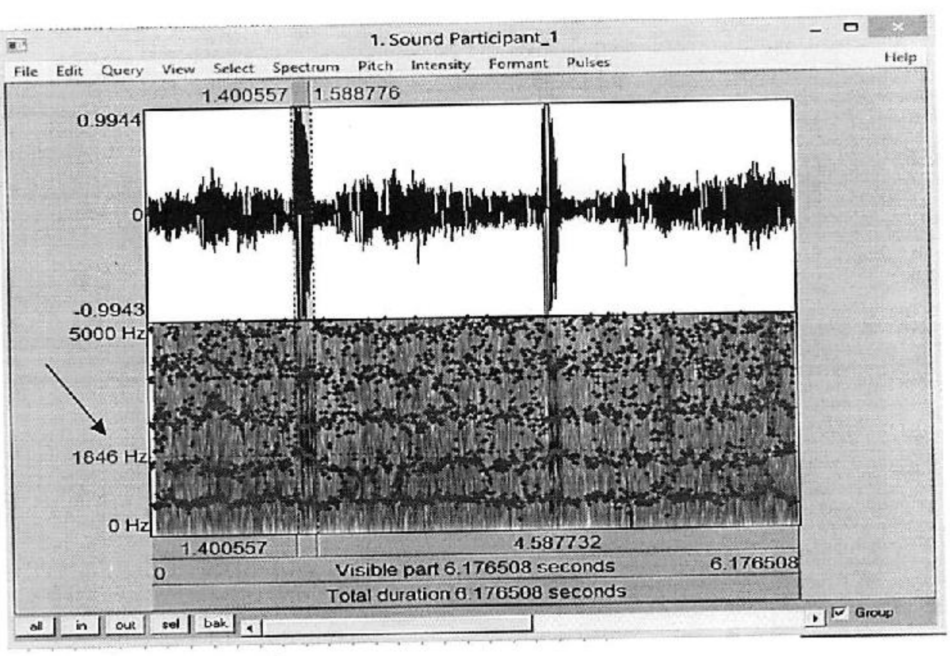


It happened because we know that F2 value of vowel /æ/ and /e/ is almost same. Both of them are mid front vowel. So, it means that the F2 value in this vowel is accepted as long as they have f2 value not too far from 1770 Hz and too less from 1660 Hz. It is a must because when it increase until around 2250 Hz , it will change its tongue body shape like /i/ and will change its body shape like /a/ when decrease until around 1660 Hz.

4.1.1 Participant 1

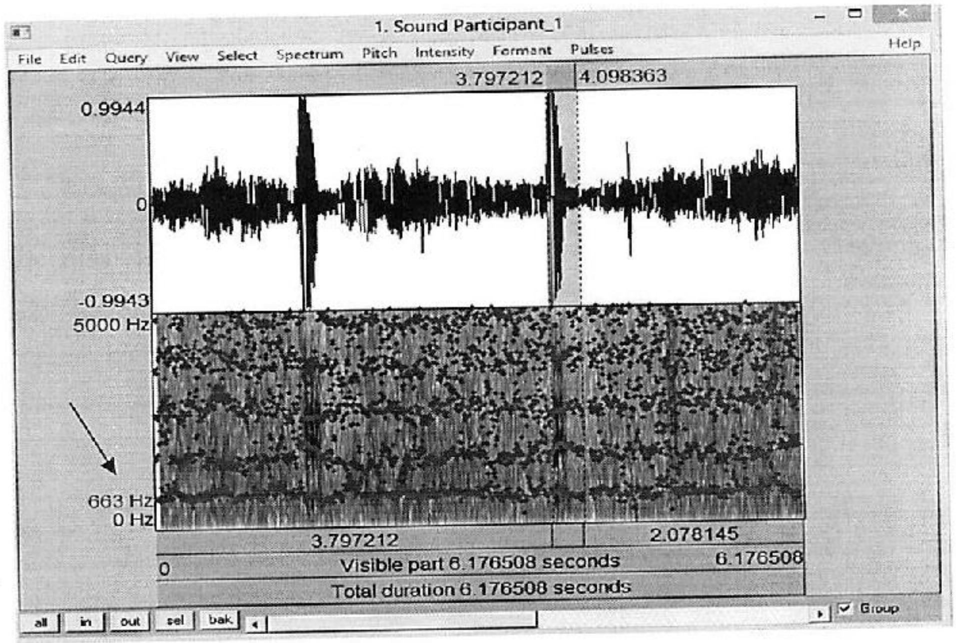
1. Cat (F1 and F2)

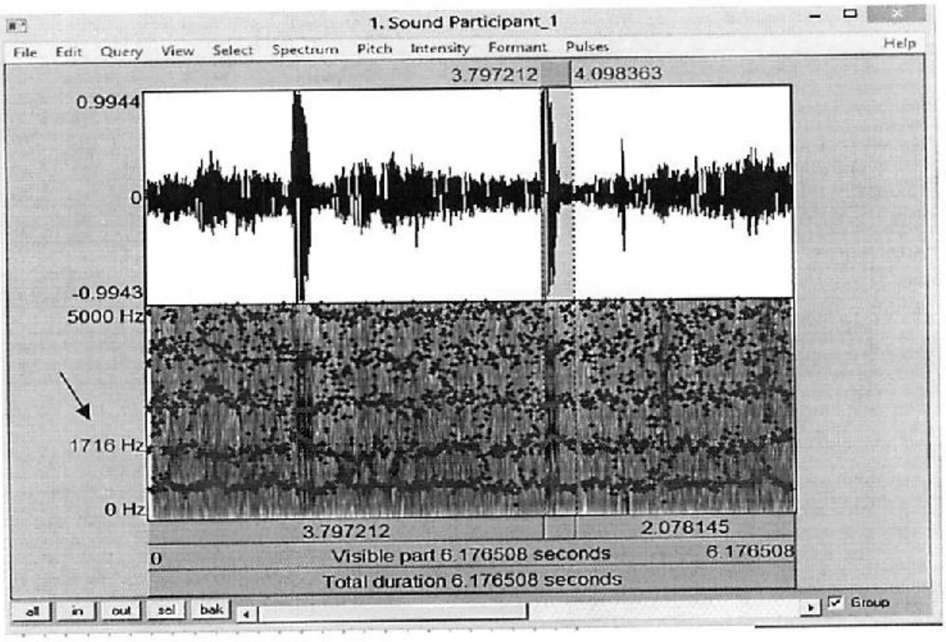




Based on the spectrograms above, it is known that the first participant produced 681 Hz for formant one and 1846 Hz for formant two in word Cat. Based on those frequencies, it can be concluded that the participant produced F1 close on 700 Hz. It means that the height of the participant is deservedly. The opening of jaw is enough. Next, F2 value of the participant is enough. It is around 1660-1770 Hz. It means that the position of this vowel already in the mid-front vowel. So, it can be concluded that the articulation of this vowel is good.

2. Ten (F1 and F2)

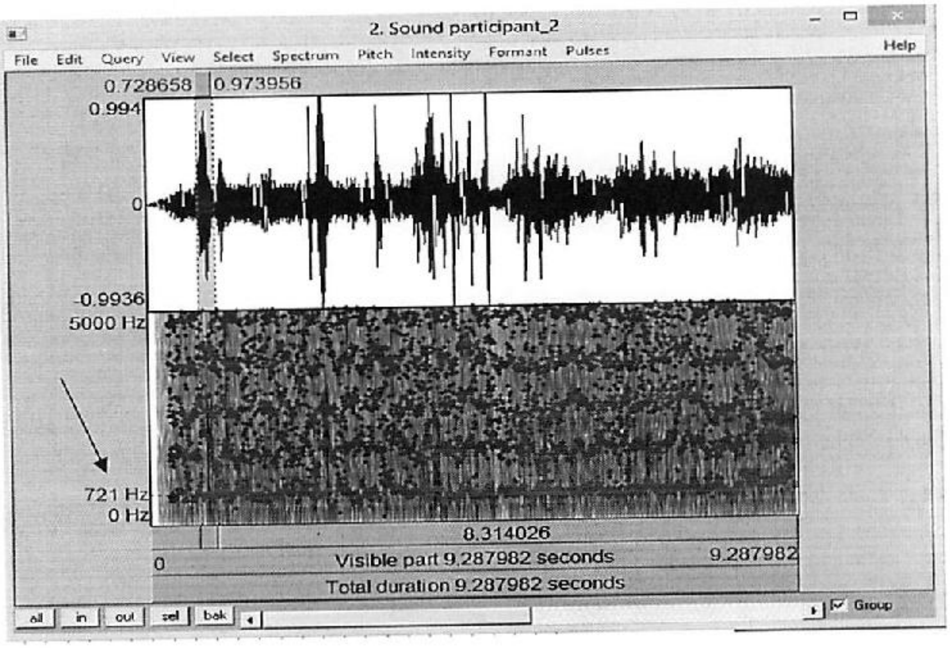


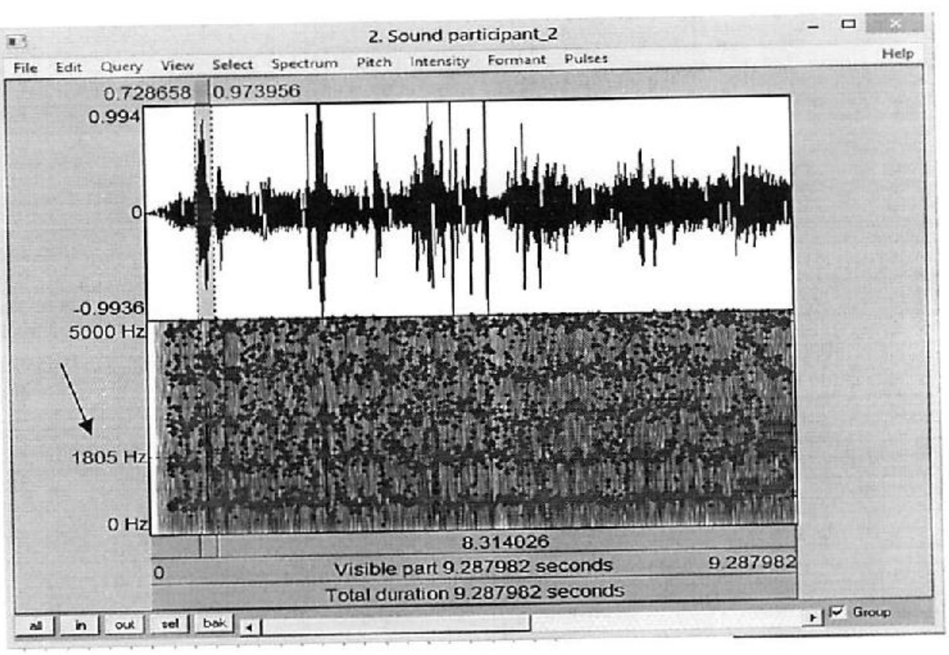


Based on the spectrograms above, it is known that the first participant produced 663 Hz for formant one and 1716 Hz for formant two in word ten. Based on those frequencies, it can be concluded that the participant produced F1 relatively high. It means that the opening of the jaw is too large. It is almost same with the height of vowel /æ/. Next, F2 value of the participant is deservedly. It is around 1660-1770 Hz. It means that this vowel already in the mid front position. So, based on the explanation above, it can be concluded that the articulation of this vowel is not good enough because the opening of the jaw is too large. It is like /æ/.

4.1.2 Participant 2

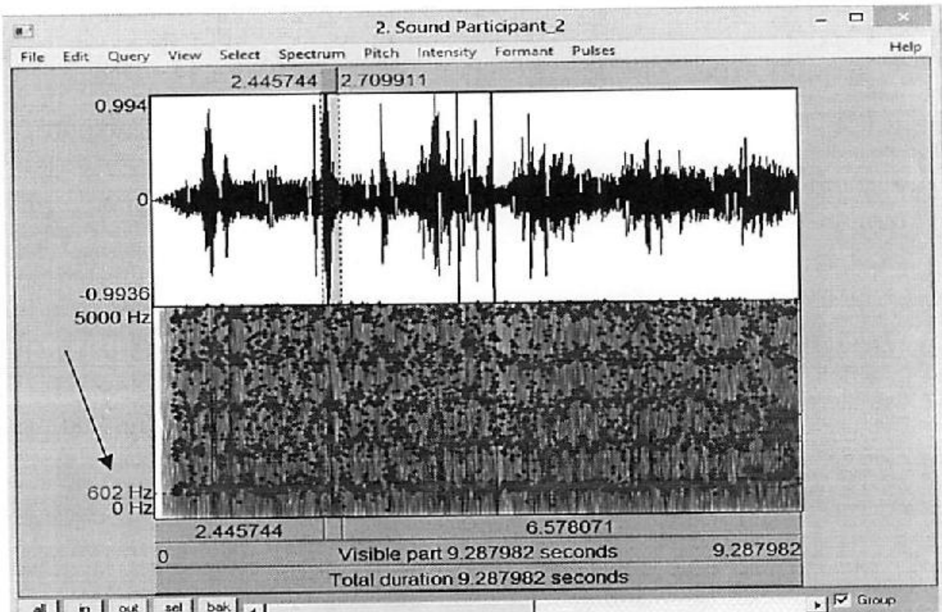
1. Cat (F1 and F2)

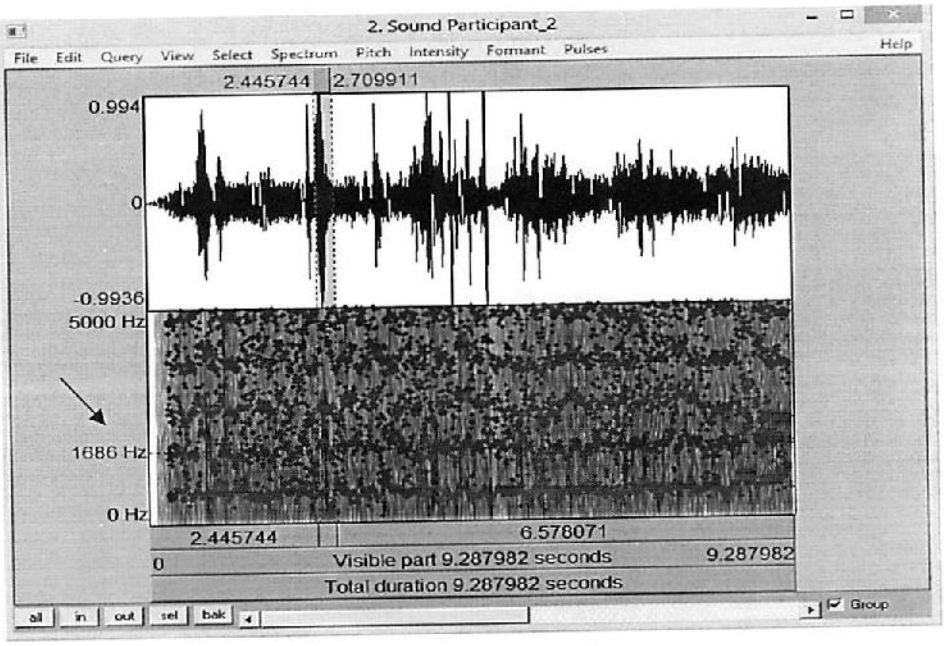




Based on the spectrograms above, it is known that the second participant produced 721 Hz for formant one and 1805 Hz for formant two in word Cat. Based on those frequencies, it can be concluded that the participant produced F1 close on 700 Hz. It means that the height of the participant is deservedly. The opening of jaw is enough. Next, F2 value of the participant is also enough. It is around 1660-1770 Hz. It means that the position of this vowel already in the mid-front vowel position. So, it can be concluded that the articulation of this vowel is good.

2. Ten (F1 and F2)

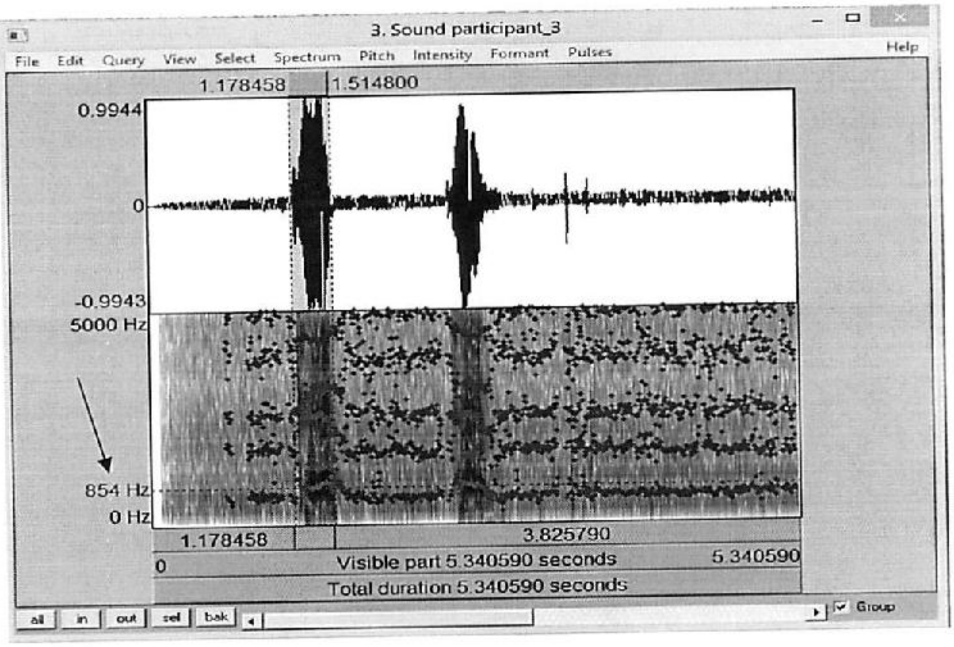


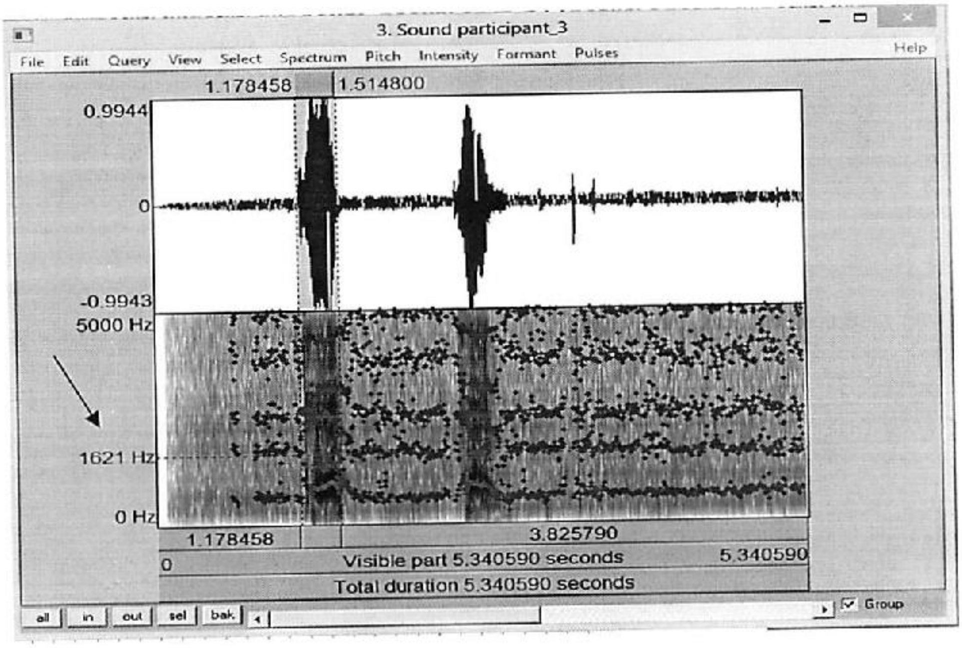


Based on the spectrograms above, it is known that the second participant produced 602 Hz for formant one and 1686 Hz for formant two in word ten. Based on those frequencies, it can be concluded that the participant produced F1 deservedly, it close to 530 Hz. It means that the opening of the jaw is enough although the jaw opening is somewhat large. Next, F2 value of the participant is also deservedly. It is around 1660-1770 Hz. It means that this vowel already in the mid frond position. So, it can be concluded that the articulation of this vowel is good enough.

4.1.3 Participant 3

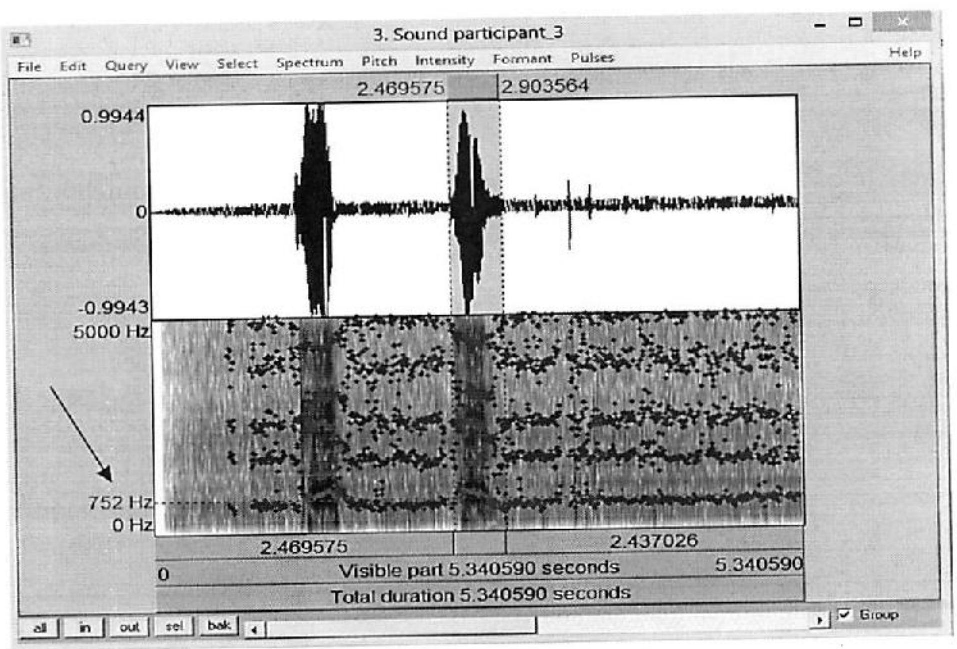
1. Cat (F1 and F2)

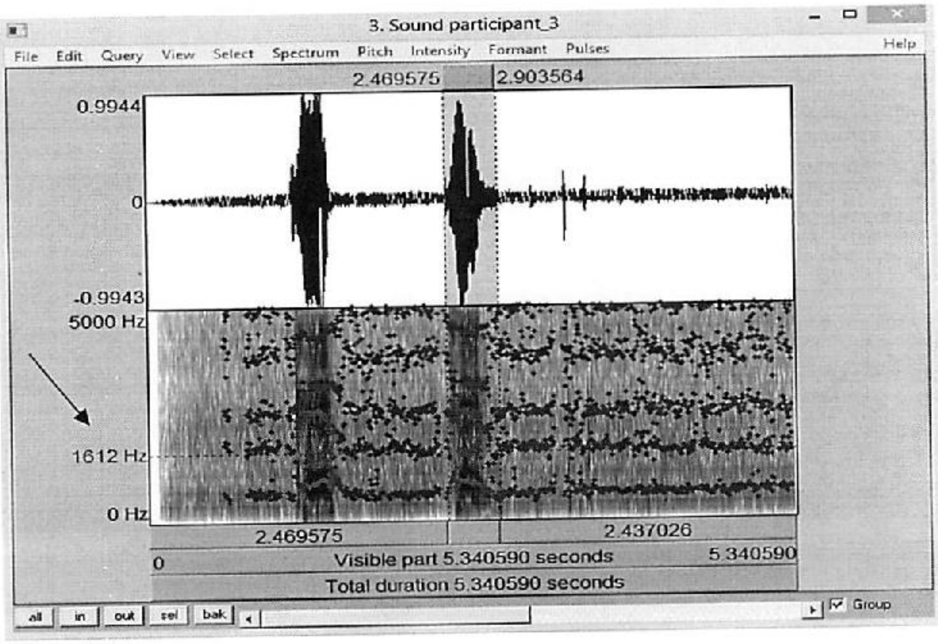




Based on the spectrograms above, it is known that the third participant produced 854 Hz for formant one and 1621 Hz for formant two in word Cat. Based on those frequencies, it can be concluded that the participant produced F1 close on 700 Hz. It means that the height of the participant is deservedly although the jaw opening is somewhat large. Next, F2 value of the participant is enough. It is around 1660-1770 Hz. It means that the position of this vowel is already in the mid-front vowel. So, it can be concluded that the articulation of this vowel is good enough.

2. Ten (F1 and F2)

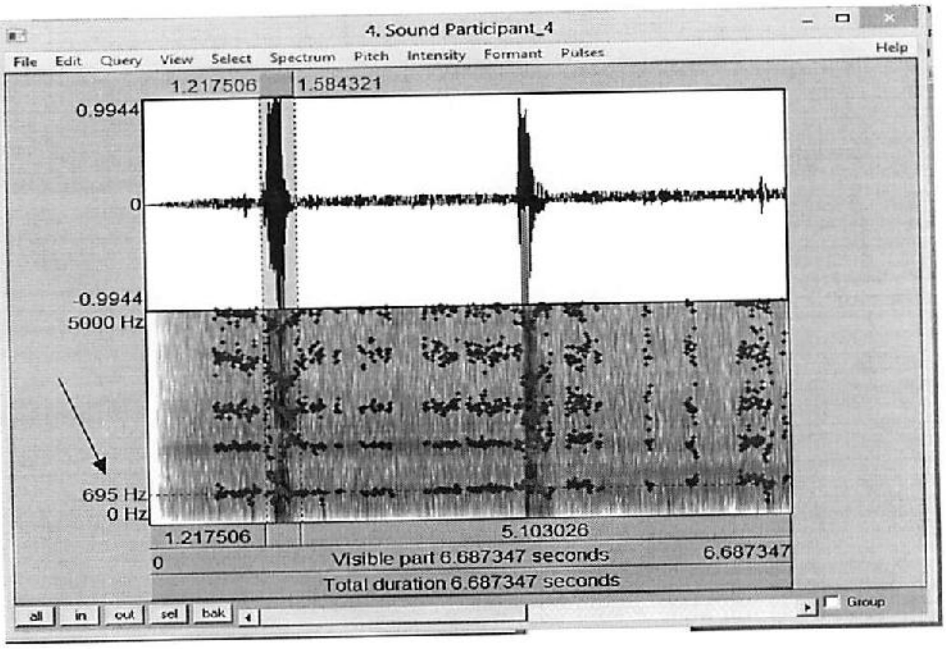


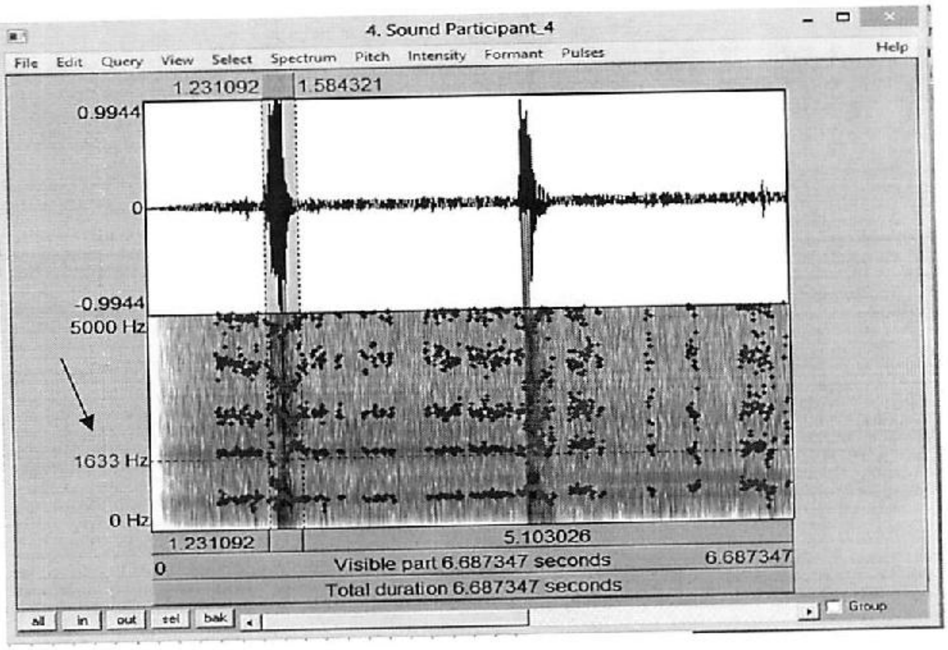


Based on the spectrograms above, it is known that the third participant produced 752 Hz for formant one and 1612 Hz for formant two in word ten. Based on those frequencies, it can be concluded that the participant produced F1 relatively high. It means that the opening of the jaw is too large. It is almost same with the height of vowel /æ/. Next, F2 value of the participant is deservedly. It is around 1660-1770 Hz. It means that the position of this vowel is already in the mid-front vowel. Based on the explanation above, it means that the articulation of this vowel is not good enough because the opening of the jaw is too large. It is like /æ/.

4.1.4 Participant 4

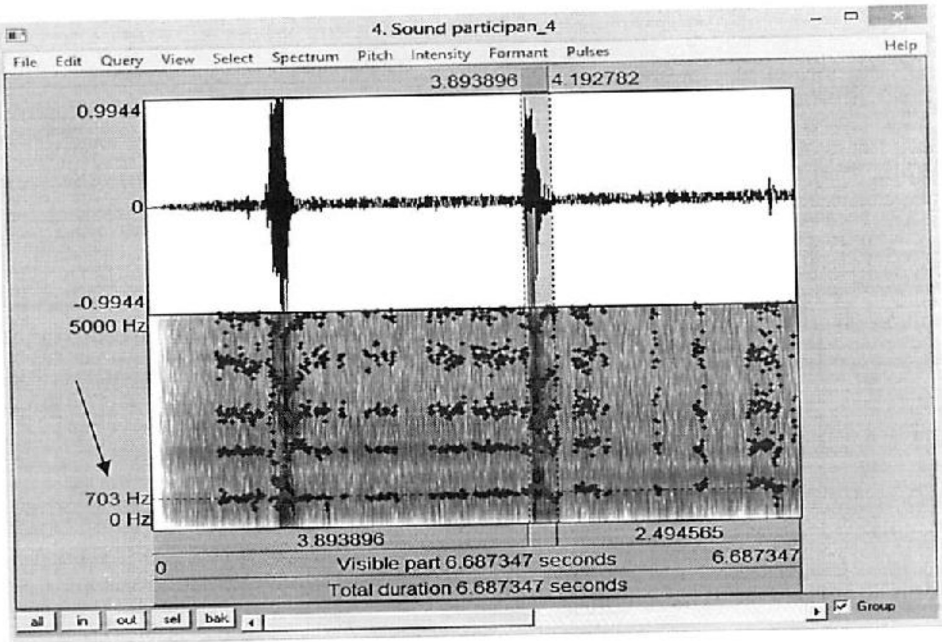
1. Cat (F1 and F2)

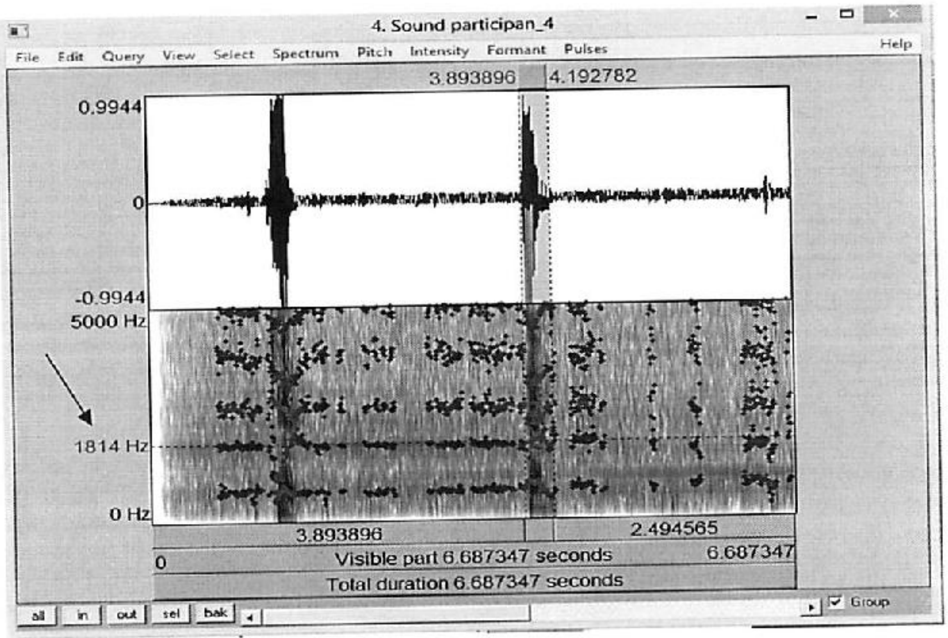




Based on the spectrograms above, it is known that the fourth participant produced 695 Hz for formant one and 1633 Hz for formant two in word Cat. Based on those frequencies, it can be concluded that the participant produced F1 close on 700 Hz. It means that the height of the participant is deservedly. The opening of jaw is enough. Next, F2 value of the participant is enough. It is around 1660-1770 Hz. It means that the position of this vowel already in the mid-front vowel. So, it can be concluded that the articulation of this vowel is good enough.

2. Ten (F1 and F2)

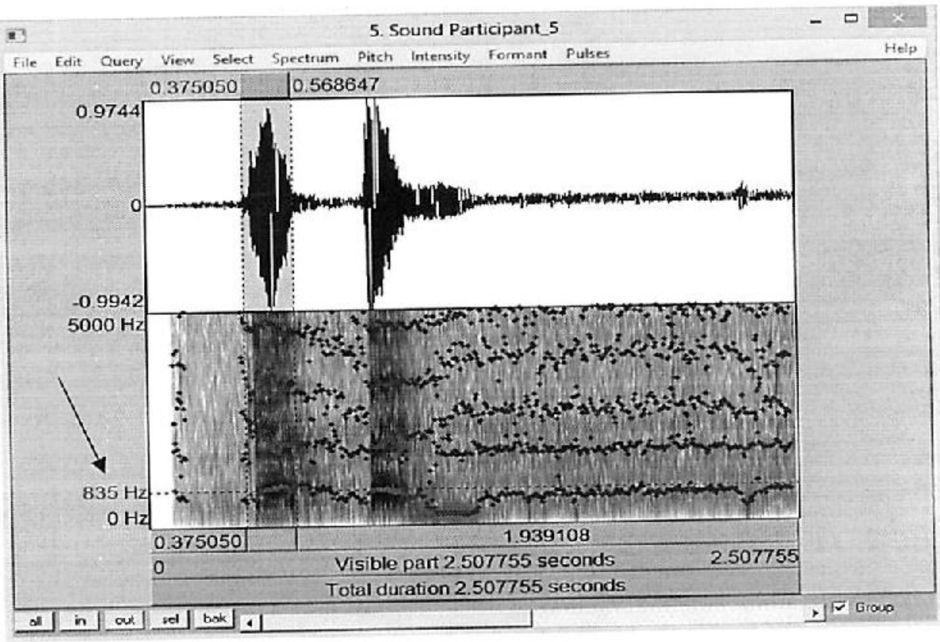


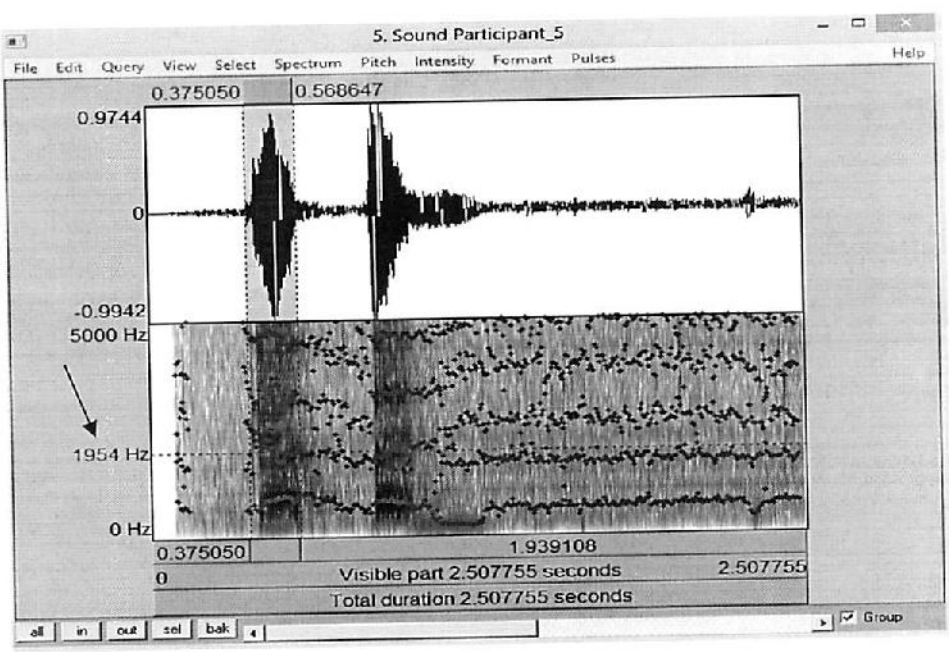


Based on the spectrograms above, it is known that the fourth participant produced 703 Hz for formant one and 1814 Hz for formant two in word ten. Based on those frequencies, it can be concluded that the participant produced F1 relatively high. It means that the opening of the jaw is too large. It is almost same with the height of vowel /æ/. Next, F2 value of the participant is deservedly. It is around 1660-1770 Hz. So, it was already in the mid front position. Based on the explanation above, it can be concluded that the articulation of this vowel is not good enough because the opening of the jaw is too large. It is like /æ/.

4.1.5 Participant 5

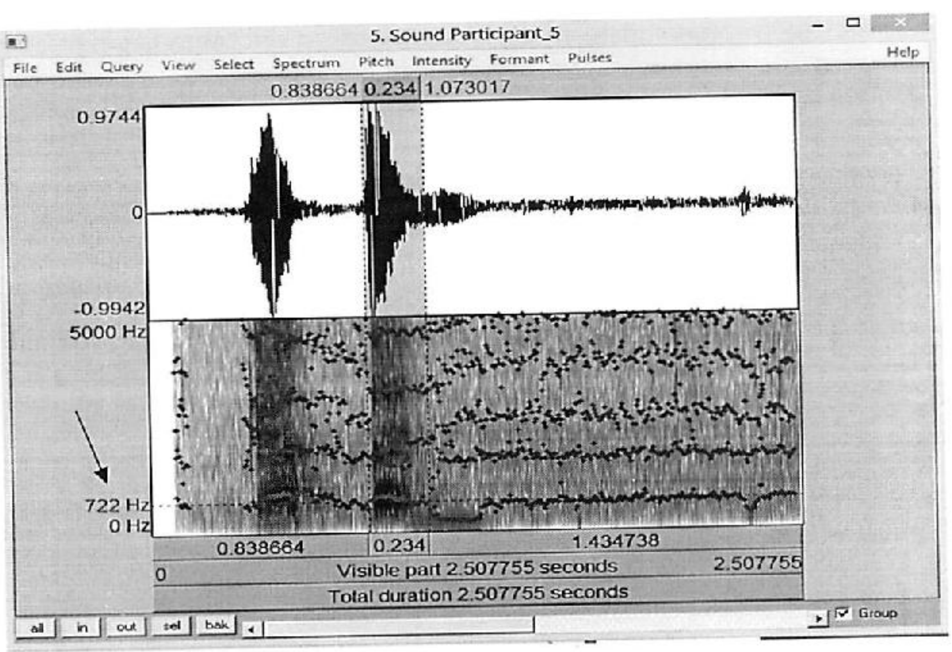
1. Cat (F1 and F2)

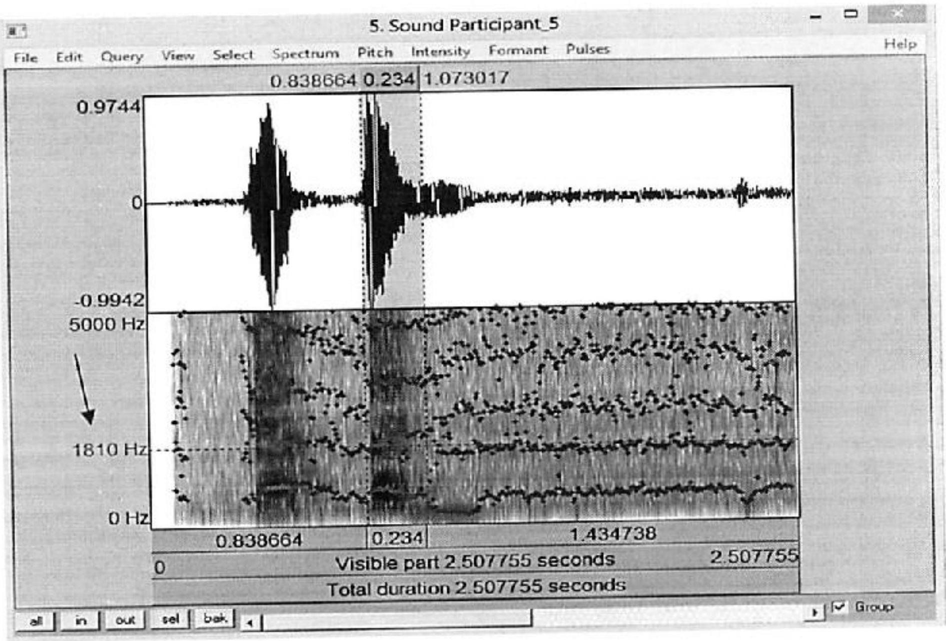




Based on the spectrograms above, it is known that the fifth participant produced 835 Hz for formant one and 1954 Hz for formant two in word Cat. Based on those frequencies, it can be concluded that the participant produced F1 close on 700 Hz. It means that the height of the participant is deservedly although the jaw opening is somewhat large. Next, F2 value of the participant is deservedly although this frequency is somewhat high. It is around 1660-1770 Hz. It means that the position of this vowel is still in the mid-front vowel position. So, it can be concluded that the articulation of this vowel is good enough.

2. Ten (F1 and F2)

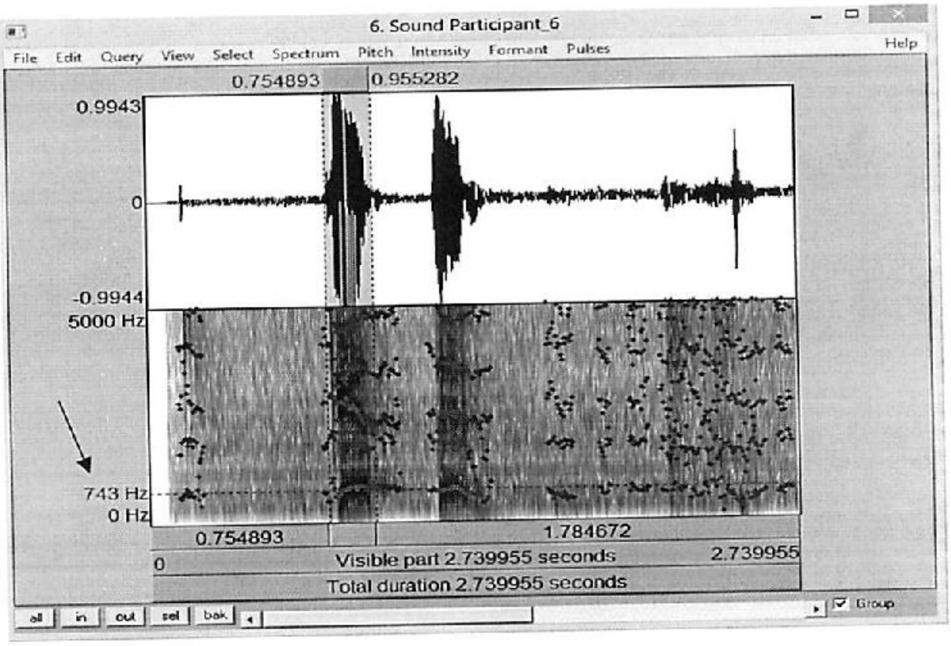


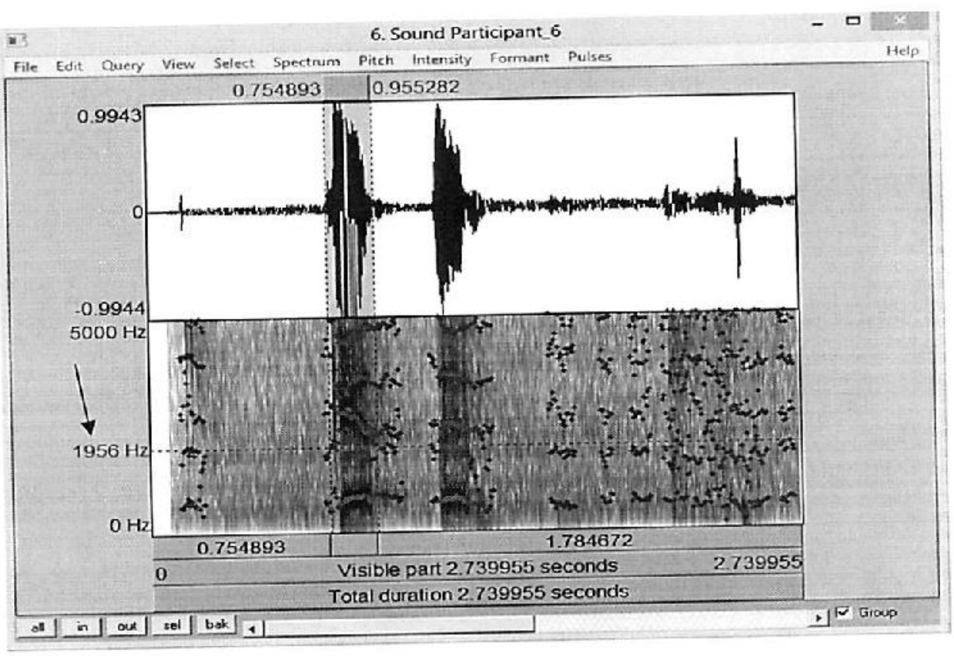


Based on the spectrograms above, it is known that the fifth participant produced 722 Hz for formant one and 1810 Hz for formant two in word ten. Based on those frequencies, it can be concluded that the participant produced F1 relatively high. It means that the opening of the jaw is too large. It is almost same with the height of vowel /æ/. Next, F2 value of the participant is deservedly. It is around 1660-1770 Hz. So, it was already in the mid low position. Based on the explanation above, it can be concluded that the articulation of this vowel is not good enough because the opening of the jaw is too large. It is like /æ/.

4.1.6 Participant 6

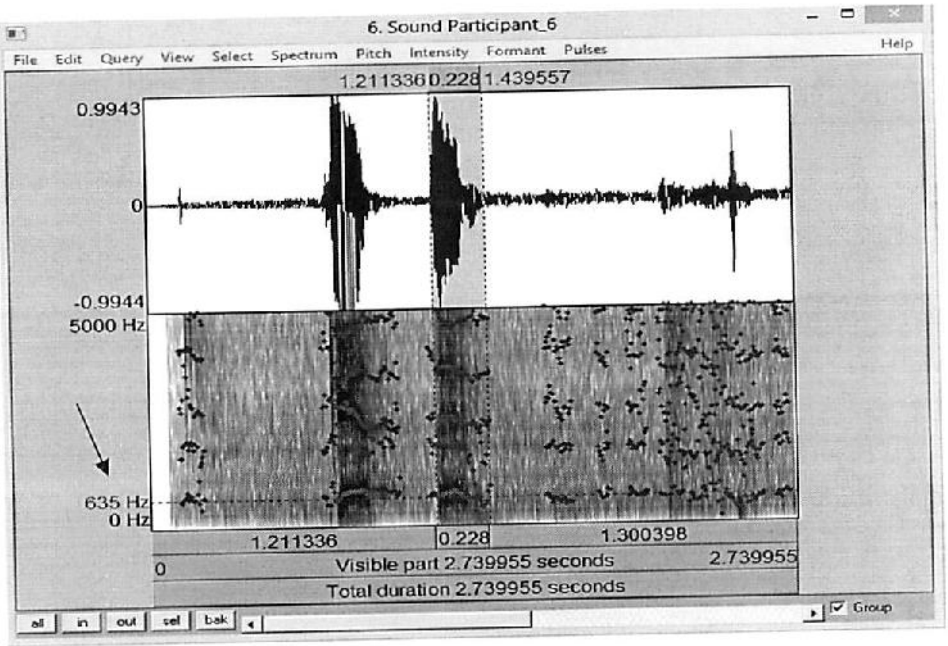
1. Cat (F1 and F2)

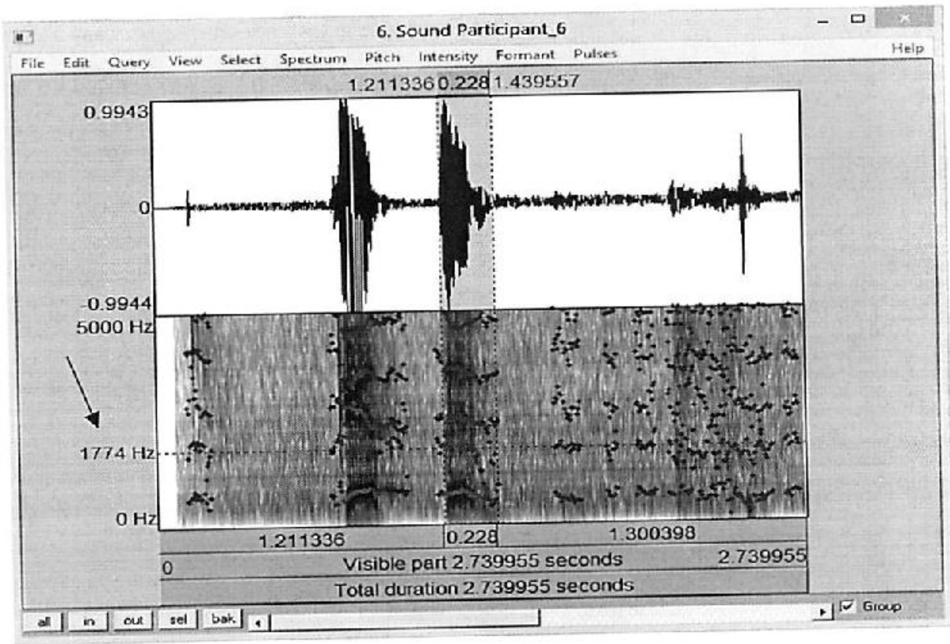




Based on the spectrograms above, it is known that the sixth participant produced 743 Hz for formant one and 1956 Hz for formant two in word Cat. Based on those frequencies, it can be concluded that the participant produced F1 close on 700 Hz. It means that the height of the participant is deservedly .The opening of jaw is enough. Next, F2 value of the participant is also deservedly although this frequency is somewhat high. It is around 1660-1770 Hz. It means that the position of this vowel is still in the mid-front vowel position. So, it can be concluded that the articulation of this vowel is good enough.

2. Ten (F1 and F2)

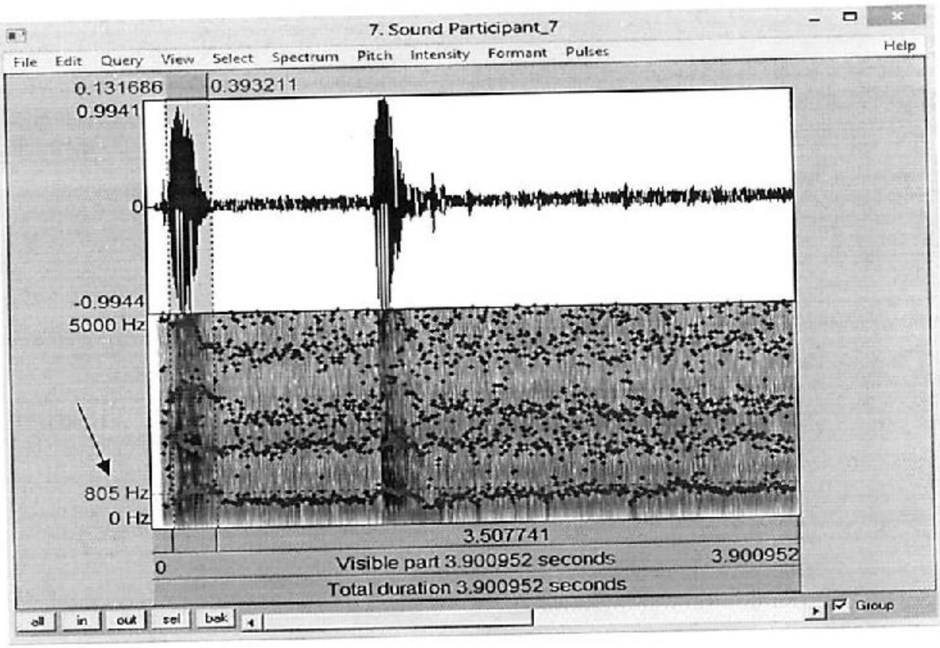


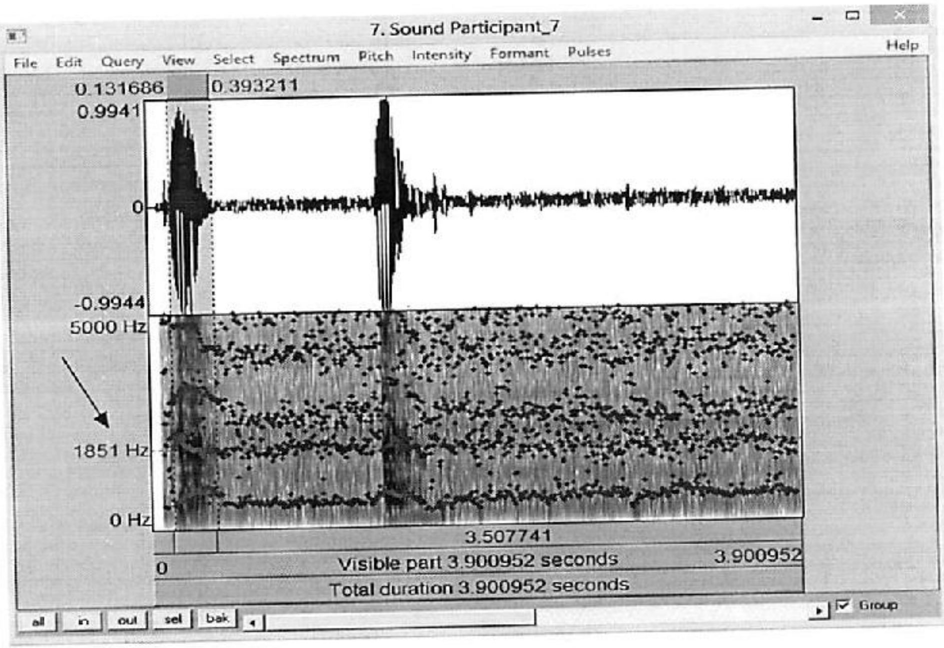


Based on the spectrograms above, it is known that the sixth participant produced 635 Hz for formant one and 1774 Hz for formant two in word ten. Based on those frequencies, it can be concluded that the participant produced F1 too high. It means that the opening of the jaw is large. Next, F2 value of the participant is deservedly. It is around 1660-1770 Hz. It means that this vowel already in the mid frond position. Based on the explanation above, it can be concluded that the articulation of this vowel is not good enough because the opening of the jaw is large. It is like /æ/.

4.1.7 Participant 7

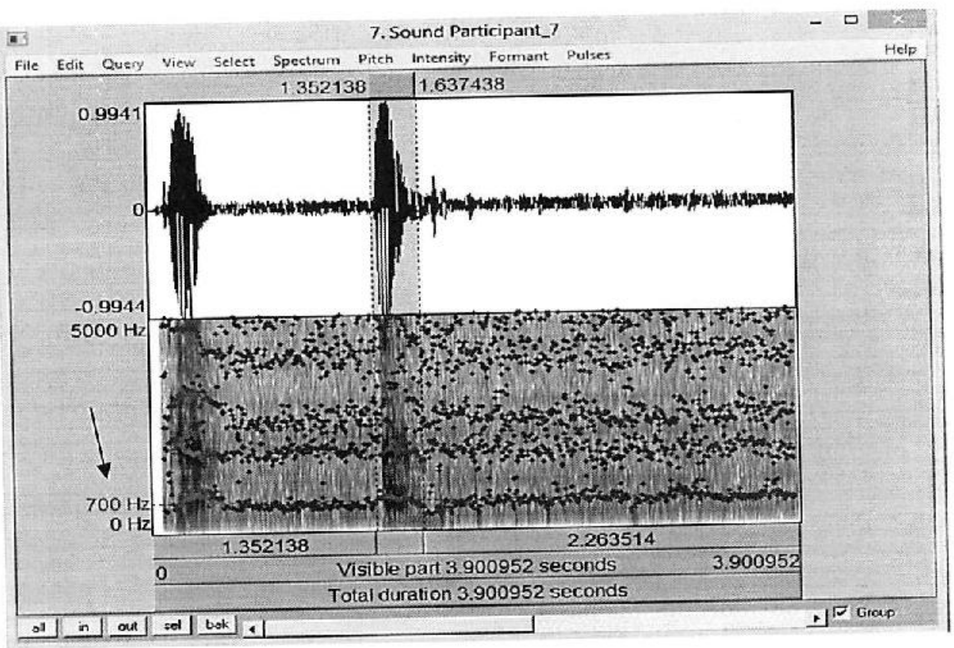
1. Cat (F1 and F2)

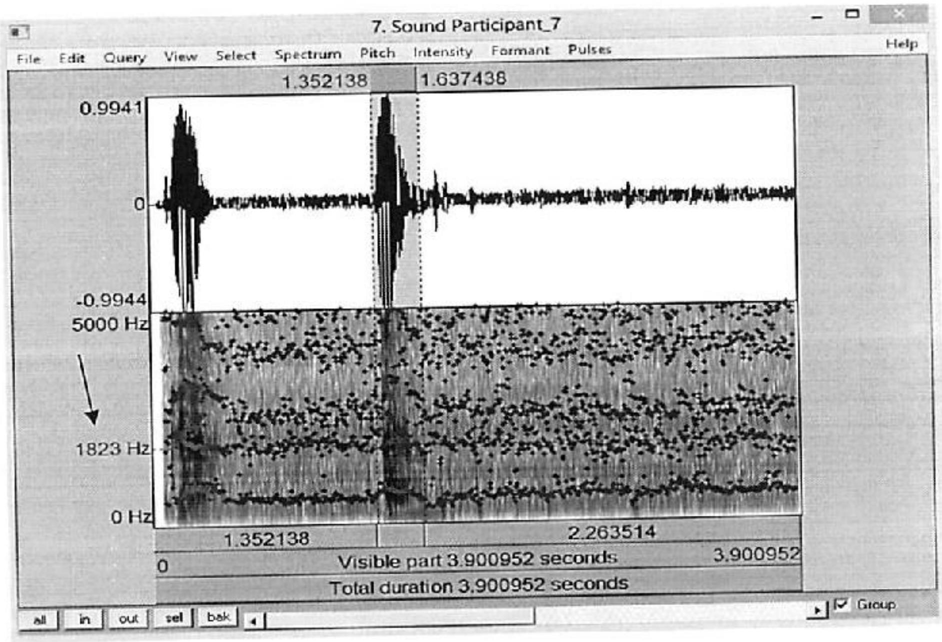




Based on the spectrograms above, it is known that the seventh participant produced 805 Hz for formant one and 1851 Hz for formant two in word Cat. Based on those frequencies, it can be concluded that the participant produced F1 close on 700 Hz. It means that the height of the participant is deservedly although the jaw opening is somewhat large. Next, F2 value of the participant is enough. It is around 1660-1770 Hz. It means that the position of this vowel already in the mid-front vowel position. So, it can be concluded that the articulation of this vowel is good enough.

2. Ten (F1 and F2)

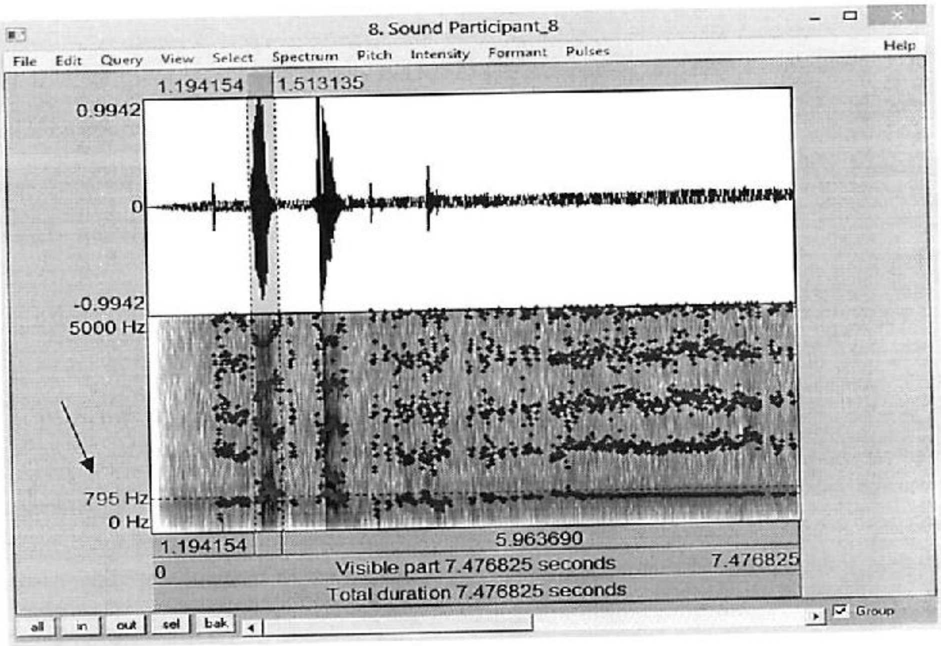


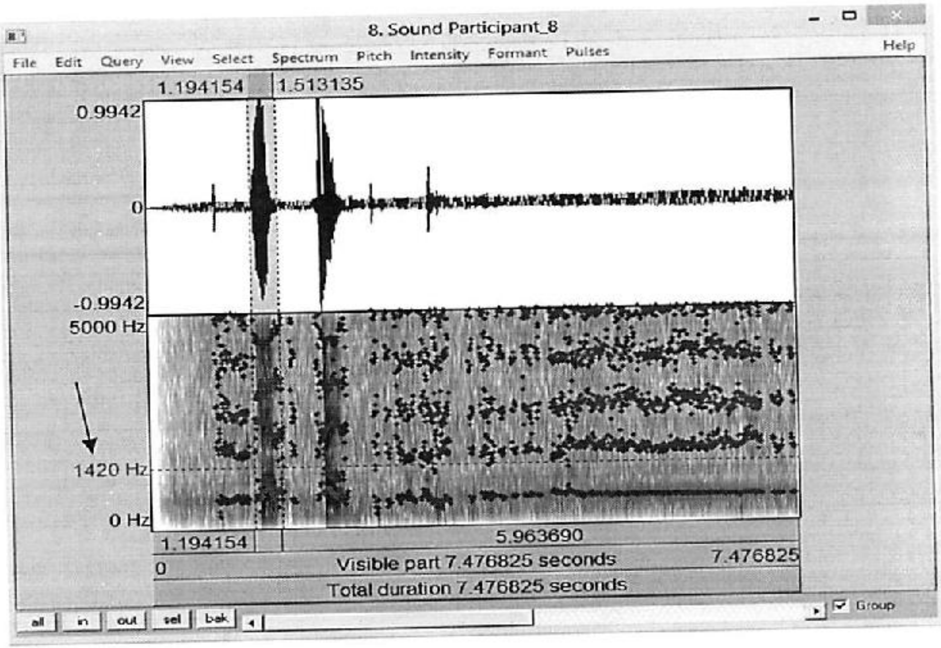


Based on the spectrograms above, it is known that the seventh participant produced 700 Hz for formant one and 1823 Hz for formant two in word ten. Based on those frequencies, it can be concluded that the participant produced F1 relatively high. It means that the opening of the jaw is too large. It is almost same with the height of vowel /æ/. Next, F2 value of the participant is deservedly. It is around 1660-1770 Hz. So, it is already in the mid front position. Based on the explanation above, it can be concluded that the articulation of this vowel is not good enough because the opening of the jaw is too large. It is like /æ/.

4.1.8 Participant 8

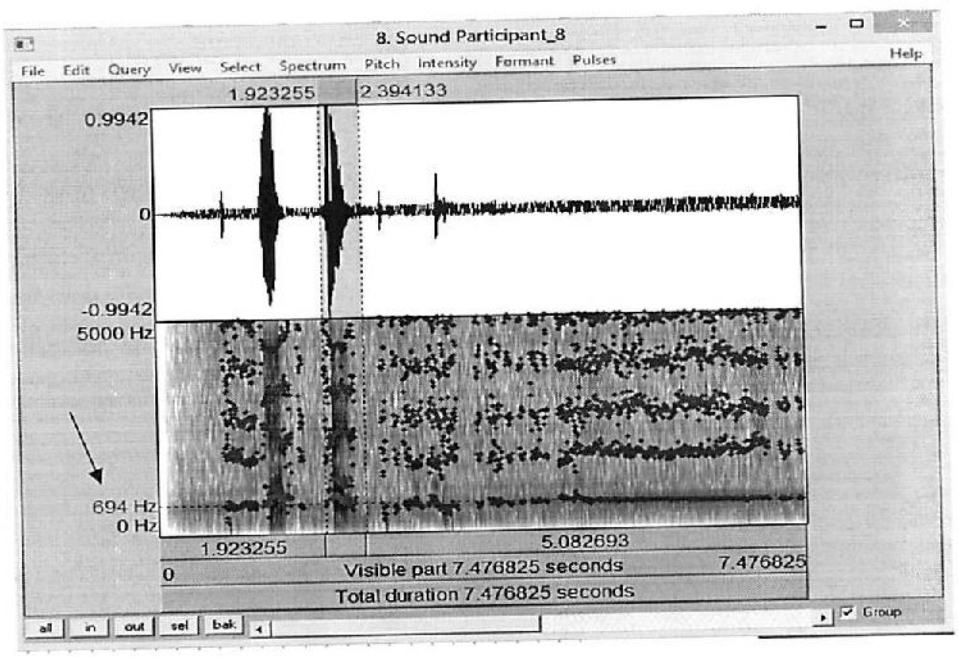
1. Cat (F1 and F2)

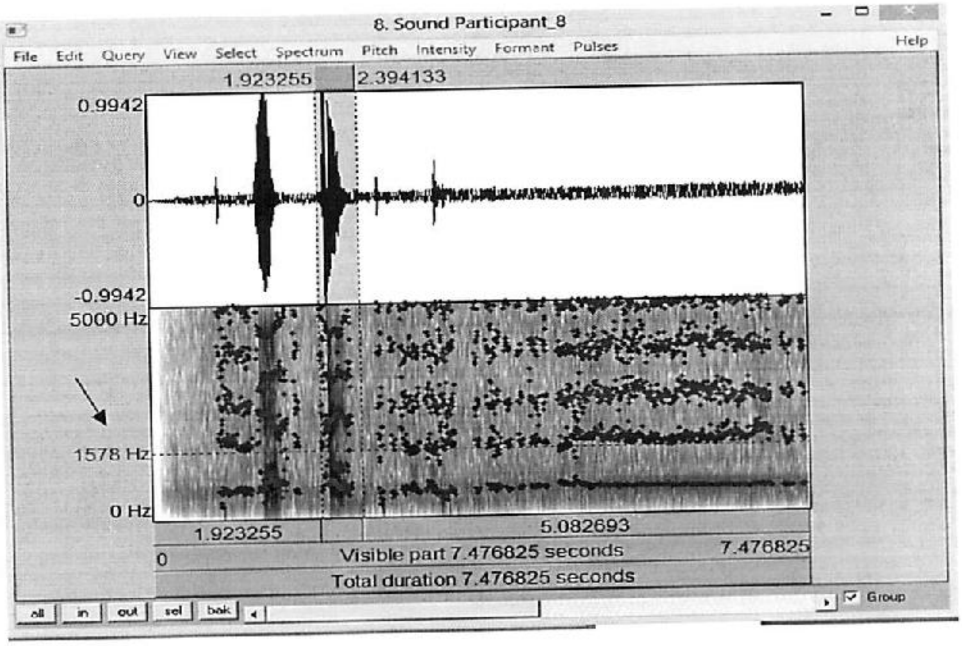




Based on the spectrograms above, it is known that the eight participant produced 795 Hz for formant one and 1420 Hz for formant two in word Cat. Based on those frequencies, it can be concluded that the participant produced F1 close on 700 Hz. It means that the height of the participant is deservedly although the jaw opening is somewhat large. Next, F2 value of the participant is enough. It means that the position of this vowel is still in the mid-front vowel position. So, it can be concluded that the articulation of this vowel is good enough.

2. Ten (F1 and F2)

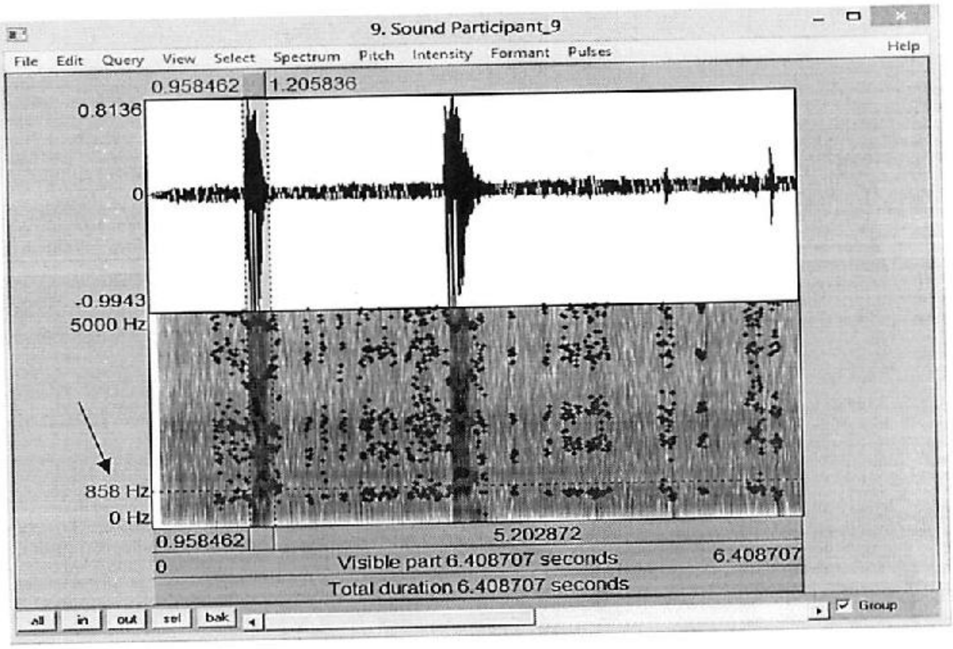


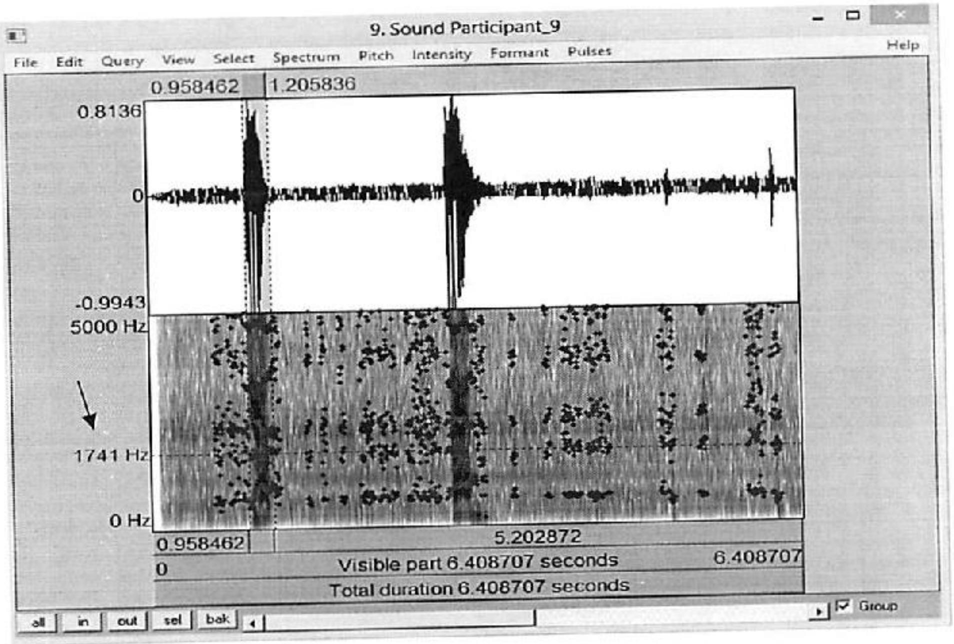


Based on the spectrograms above, it is known that the eight participant produced 694 Hz for formant one and 1578 Hz for formant two in word ten. Based on those frequencies, it can be concluded that the participant produced F1 relatively high. It means that the opening of the jaw is too large. It is almost same with the height of vowel /æ/. Next, F2 value of the participant is deservedly. It is around 1660-1770 Hz. It means that the position of this vowel is already in the mid-front vowel. Based on the explanation above, it means that the articulation of this vowel is not good enough because the opening of the jaw is too large. It is like /æ/.

4.1.9 Participant 9

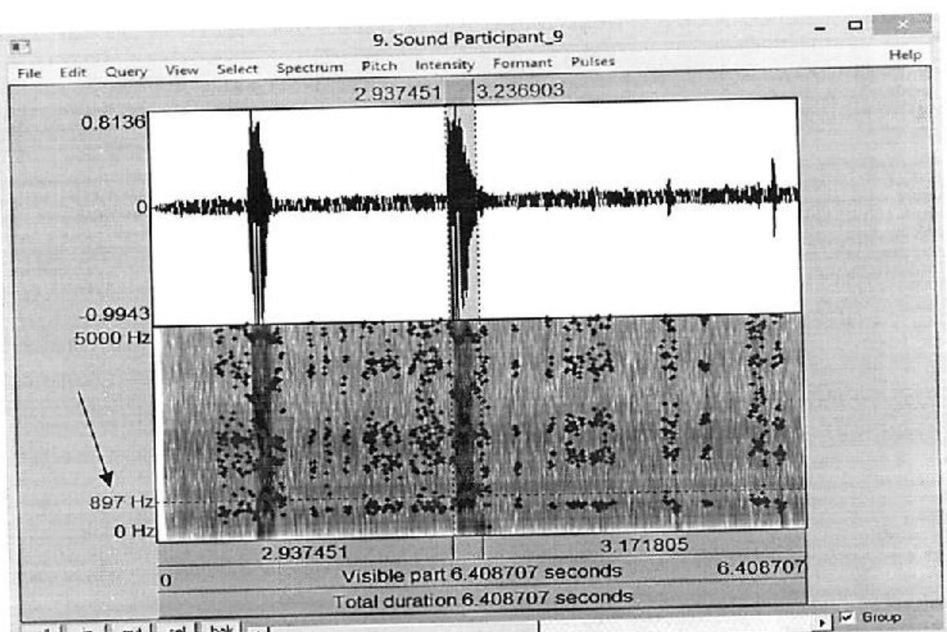
1. Cat (F1 and F2)

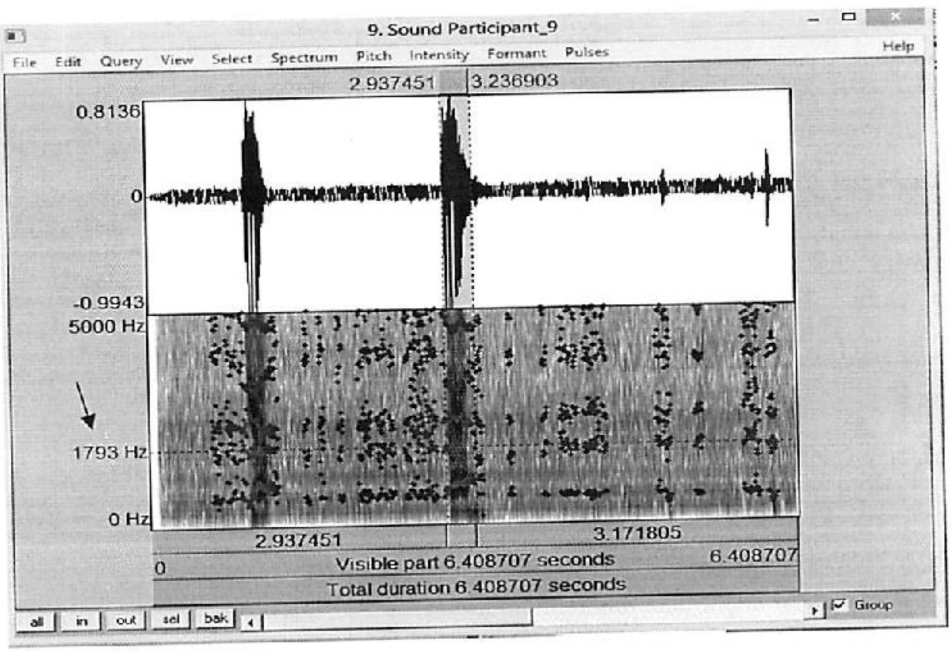




Based on the spectrograms above, it is known that the ninth participant produced 858 Hz for formant one and 1741 Hz for formant two in word Cat. Based on those frequencies, it can be concluded that the participant produced F1 close on 700 Hz. It means that the height of the participant is deservedly although the jaw opening is somewhat large. Next, F2 value of the participant is enough. It is around 1660-1770 Hz. It means that the position of this vowel is already in the mid-front vowel. So, it can be concluded that the articulation of this vowel is good enough.

2. Ten (F1 and F2)

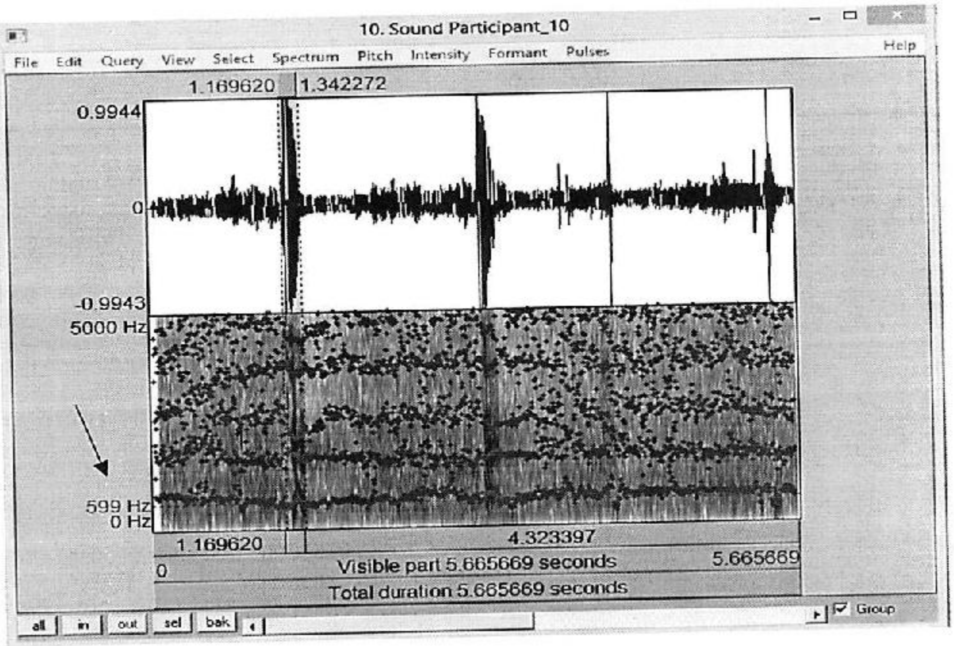


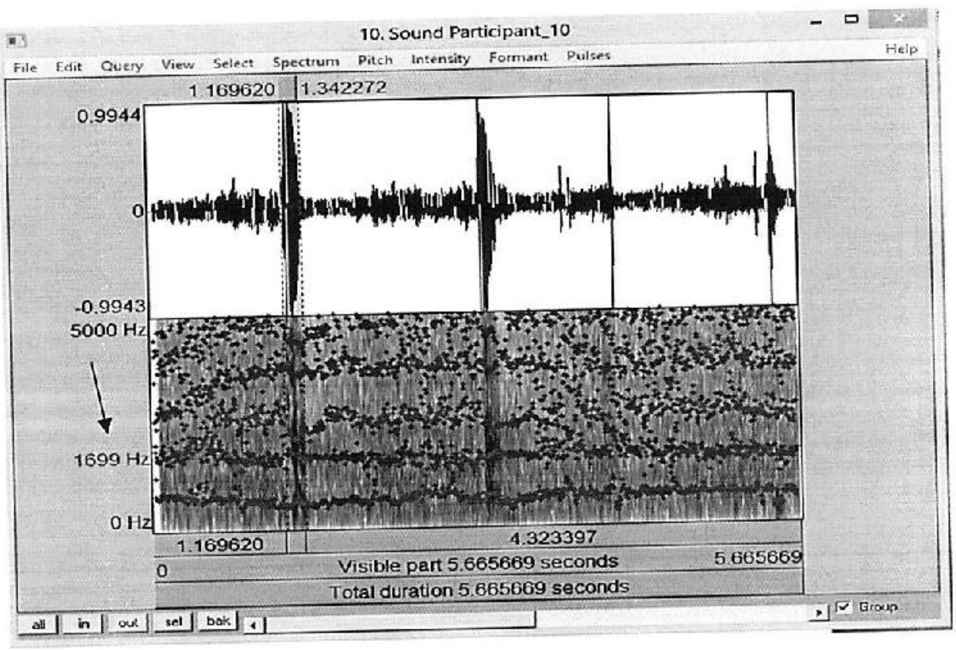


Based on the spectrograms above, it is known that the ninth participant produced 897 Hz for formant one and 1793 Hz for formant two in word ten. Based on those frequencies, it can be concluded that the participant produced F1 relatively high. It means that the opening of the jaw is too large. It is almost same with the height of vowel /æ/. Next, F2 value of the participant is deservedly. It is around 1660-1770 Hz. So, it was already in the mid front position. Based on the explanation above, it can be concluded that the articulation of this vowel is not good enough because the opening of the jaw is too large. It is like /æ/.

4.1.10 Participant 10

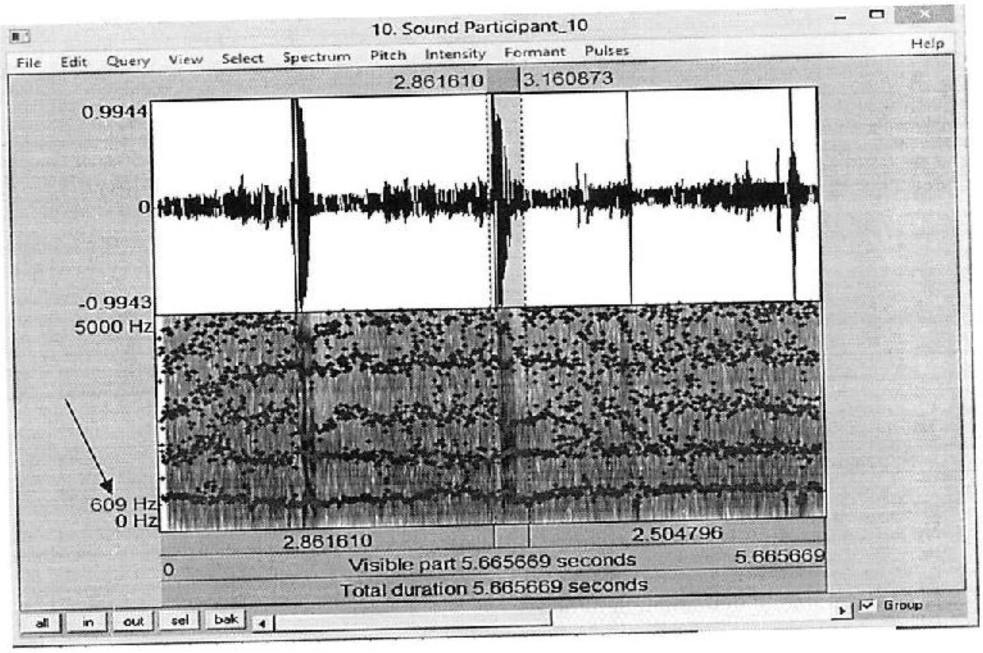
1. Cat (F1 and F2)

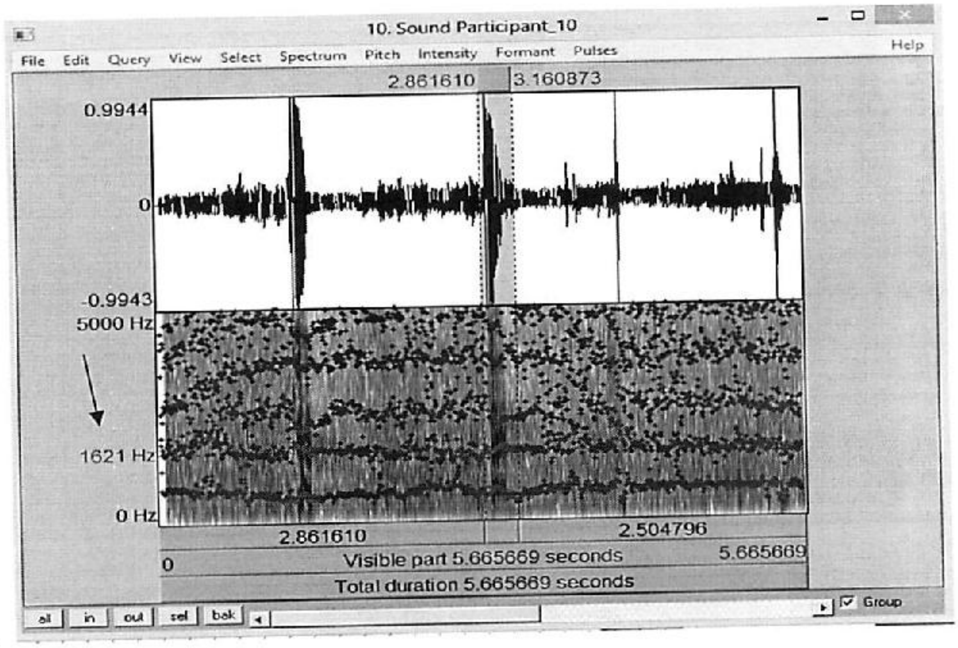




Based on the spectrograms above, it is known that the tenth participant produced 599 Hz for formant one and 1699 Hz for formant two in word Cat. Based on those frequencies, it can be concluded that the participant produced F1 relatively low. It means that the height of the participant is not deservedly. The jaw opening is not enough. Next, F2 value of the participant is enough. It is around 1660-1770 Hz. It means that the position of this vowel is already in the mid-front vowel. Based on the explanation above, it can be concluded that the articulation of this vowel is not good enough because the jaw opening is not enough. It is like vowel /e/.

2. Ten (F1 and F2)

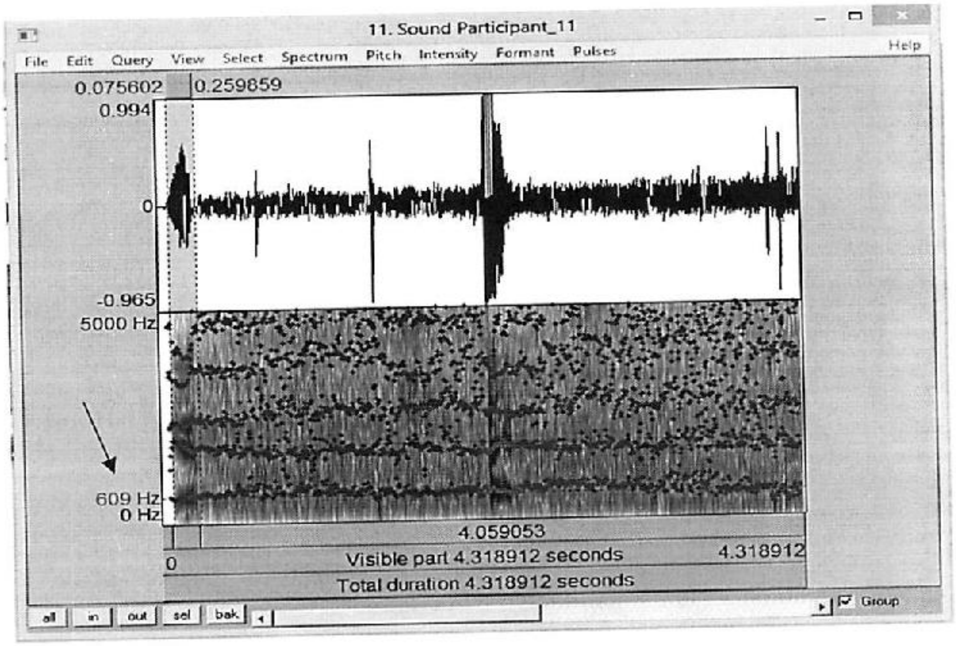


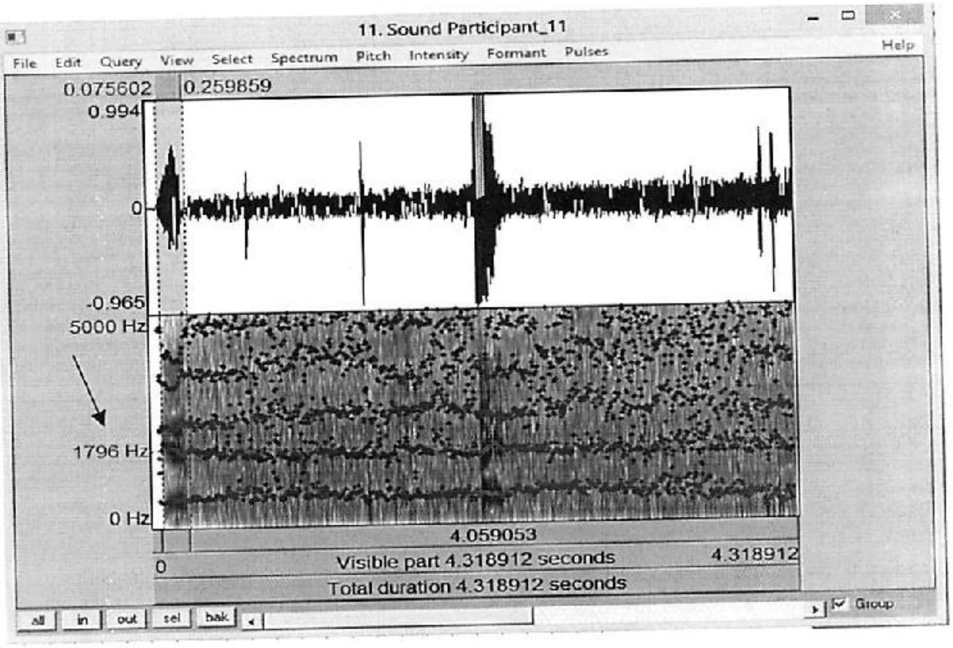


Based on the spectrograms above, it is known that the tenth participant produced 609 Hz for formant one and 1621 Hz for formant two in word ten. Based on those frequencies, it can be concluded that the F1 of the participant is deservedly, it close to 530 Hz. It means that the opening of the jaw is enough although the jaw opening is somewhat large. Next, F2 value of the participant is also deservedly. It is around 1660-1770 Hz. It means that this vowel already in the mid frond position. So, it can be concluded that the articulation of this vowel is good enough.

4.1.11 Participant 11

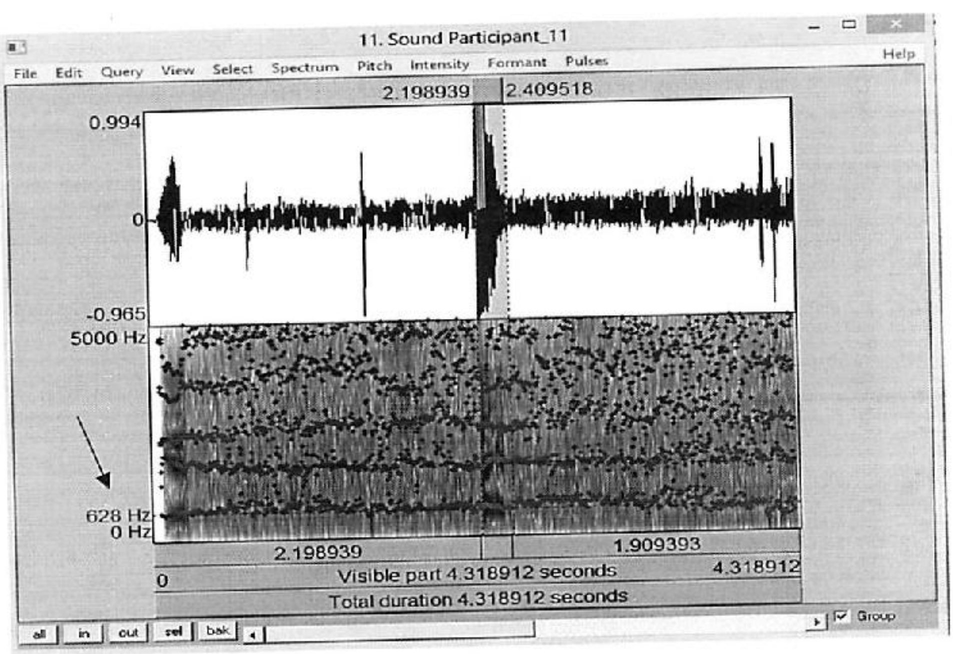
1. Cat (F1 and F2)

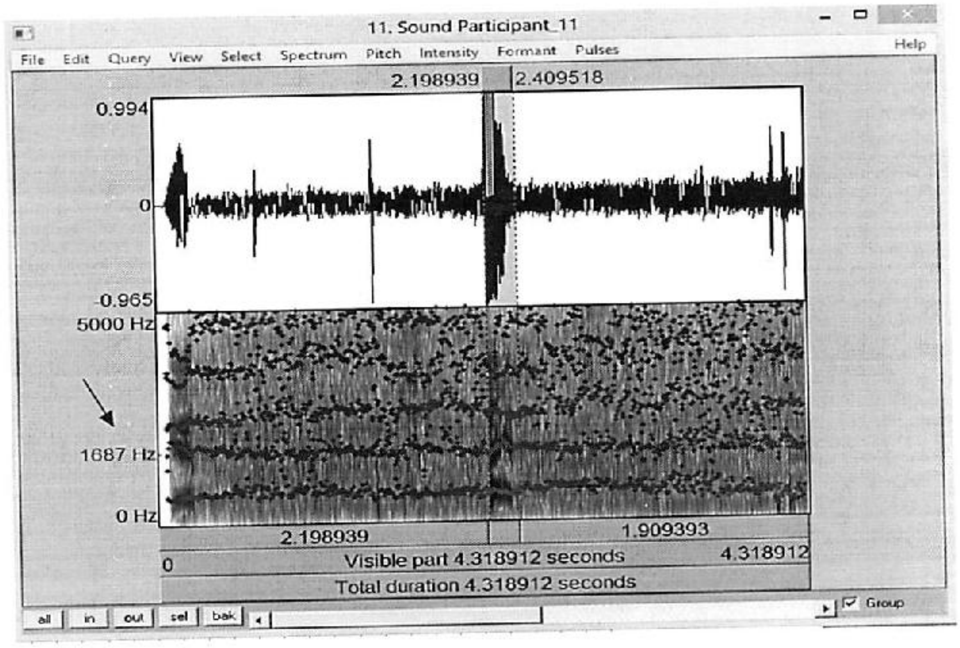




Based on the spectrograms above, it is known that the eleventh participant produced 609 Hz for formant one and 1796 Hz for formant two in word Cat. Based on those frequencies, it can be concluded that the participant produced F1 relatively low. It means that the height of the participant is not deservedly. The jaw opening is not enough. Next, F2 value of the participant is enough. It is around 1660-1770 Hz. It means that the position of this vowel is already in the mid-front vowel. Based on the explanation above, it can be concluded that the articulation of this vowel is not good enough because the jaw opening is not enough. It is like vowel /e/.

2. Ten (F1 and F2)

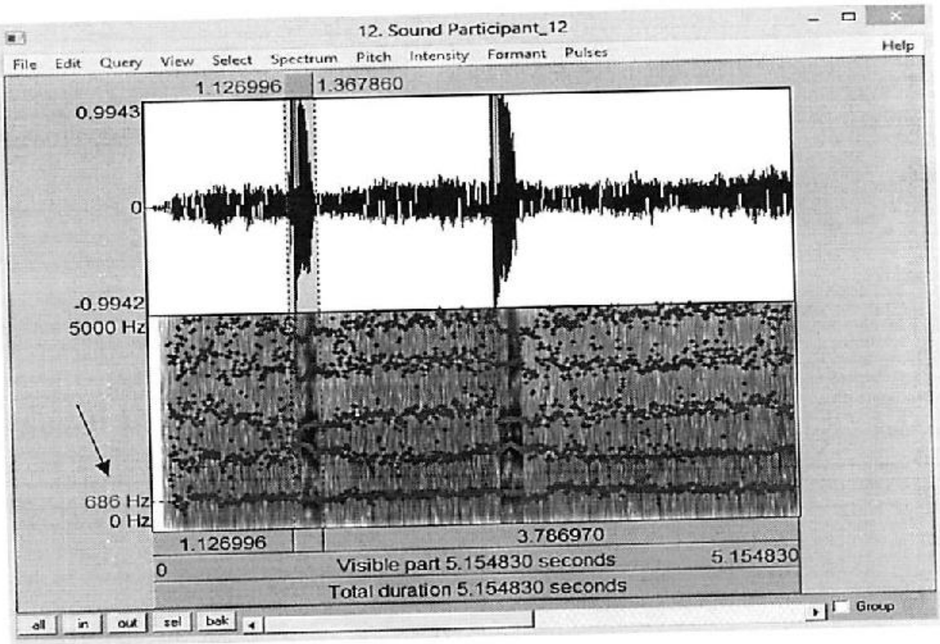


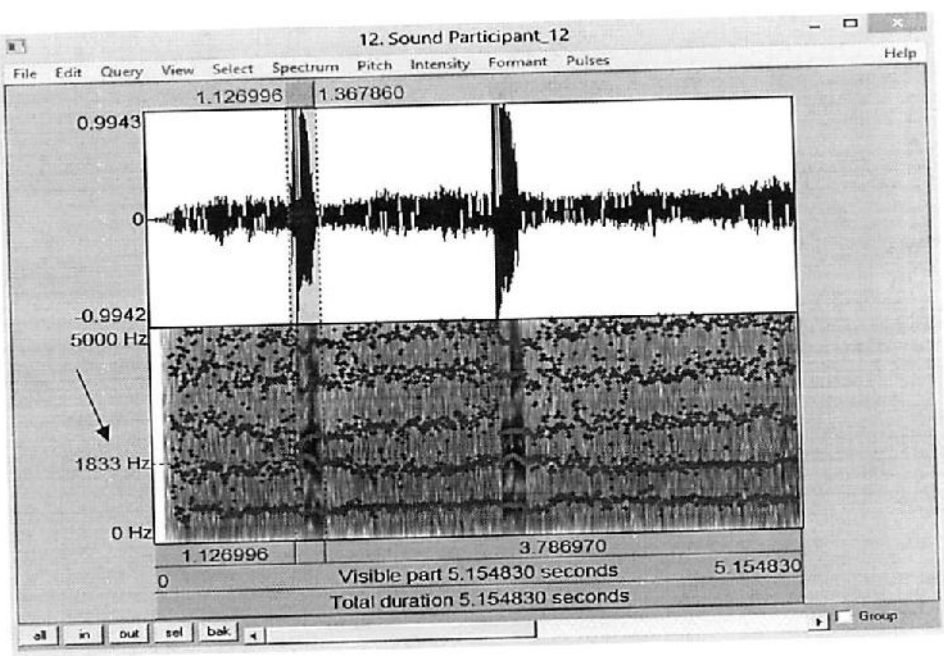


Based on the spectrograms above, it is known that the eleventh participant produced 628 Hz for formant one and 1687 Hz for formant two in word ten. Based on those frequencies, it can be concluded that the participant produced F1 too high, it close to /æ/ frequency. It means that the opening of the jaw is too large for /e/. Next, F2 value of the participant is deservedly. It is around 1660-1770 Hz. It means that this vowel already in the mid frond position. Based on the explanation above, it can be concluded that the articulation of this vowel is not good enough because the opening of the jaw is too large. It is like /æ/.

4.1.12 Participant 12

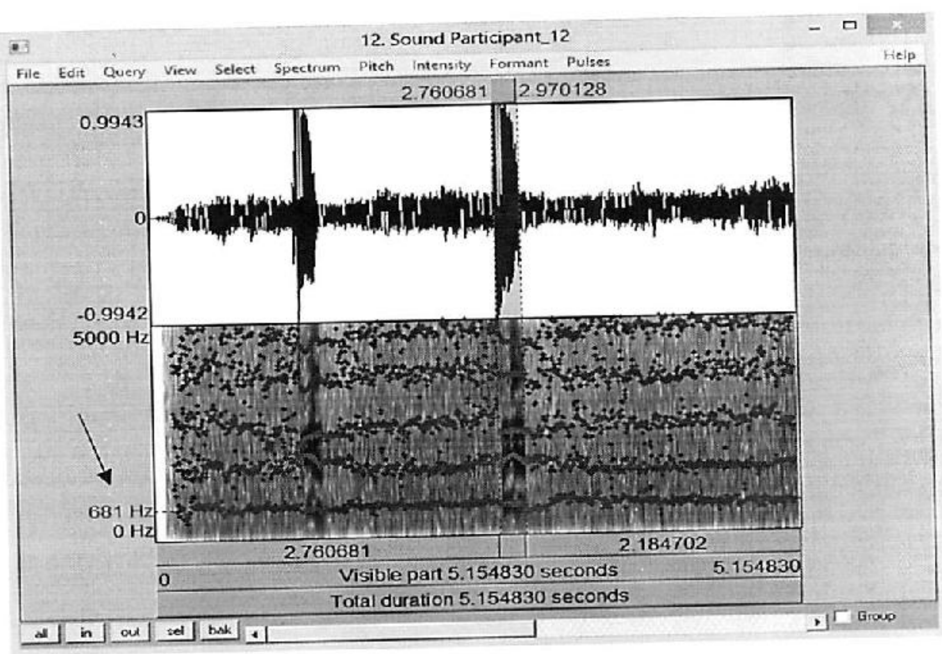
1. Cat (F1 and F2)

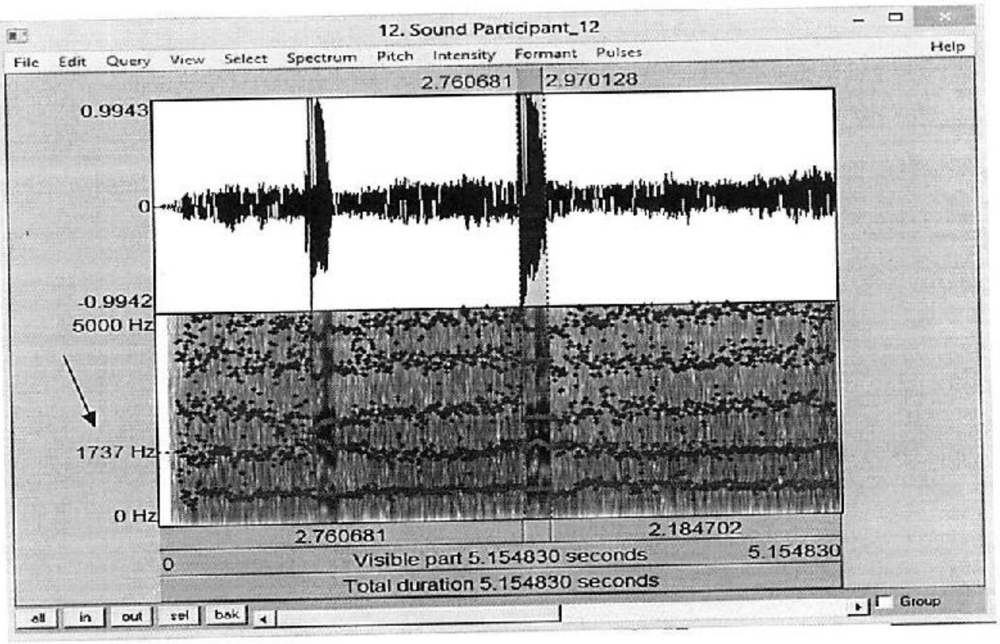




Based on the spectrograms above, it is known that the twelfth participant produced 686 Hz for formant one and 1833 Hz for formant two in word Cat. Based on those frequencies, it can be concluded that the participant produced F1 close on 700 Hz. It means that the height of the participant is deservedly. The jaw opening is enough .Next, F2 value of the participant is enough. It is around 1660-1770 Hz. It means that the position of this vowel already in the mid-front vowel. So, it can be concluded that the articulation of this vowel is good enough.

2. Ten (F1 and F2)

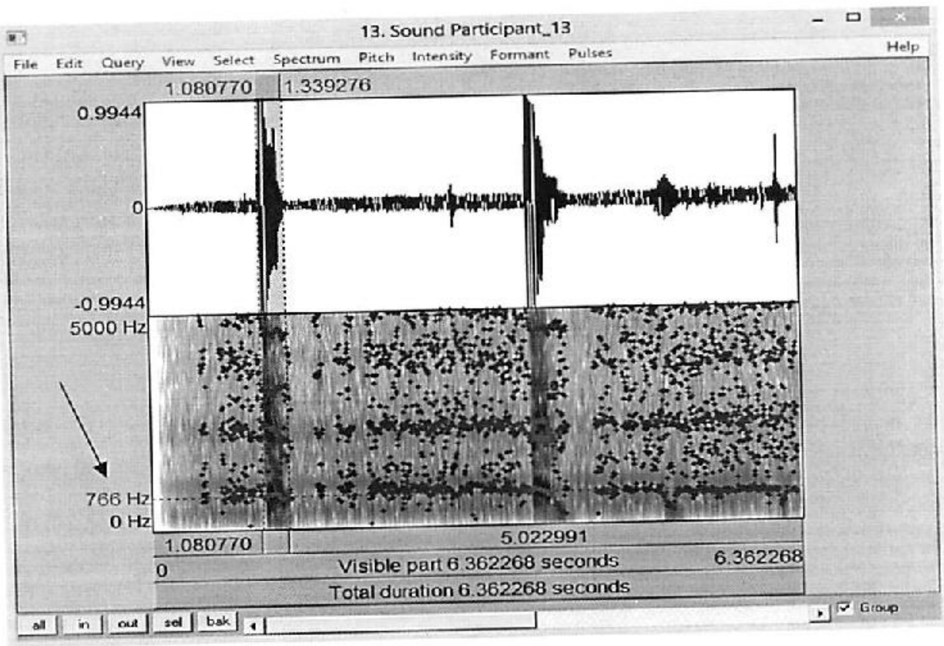


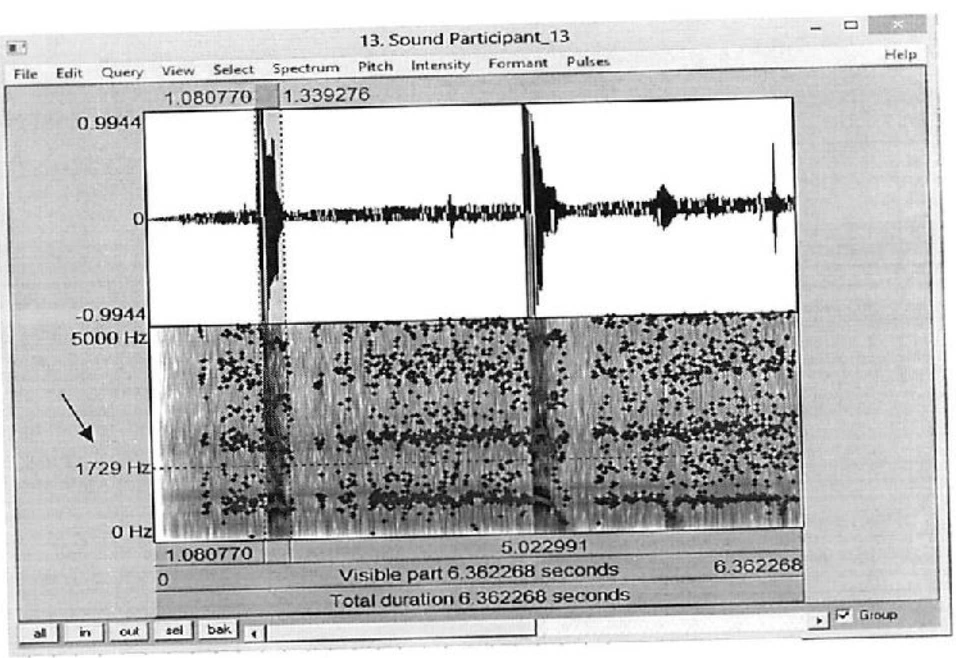


Based on the spectrograms above, it is known that the twelfth participant produced 681 Hz for formant one and 1737 Hz for formant two in word ten. Based on those frequencies, it can be concluded that the participant produced F1 relatively high. It means that the opening of the jaw is too large. It is almost same with the height of vowel /æ/. Next, F2 value of the participant is deservedly. It is around 1660-1770 Hz. So, it was already in the mid front position. Based on the explanation above, it can be concluded that the articulation of this vowel is not good enough because the opening of the jaw is too large. It is like /æ/.

4.1.13 Participant 13

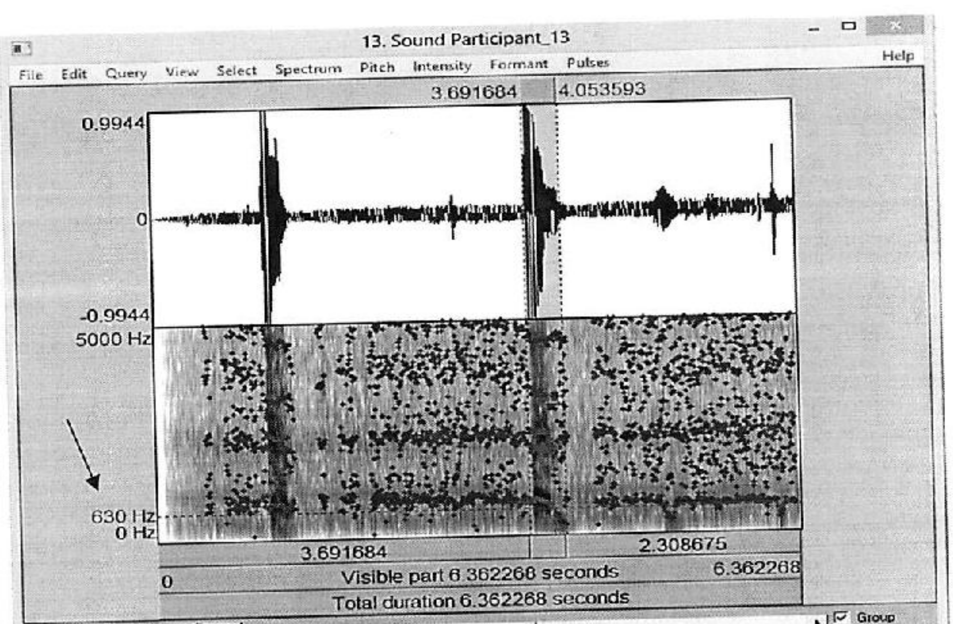
1. Cat (F1 and F2)

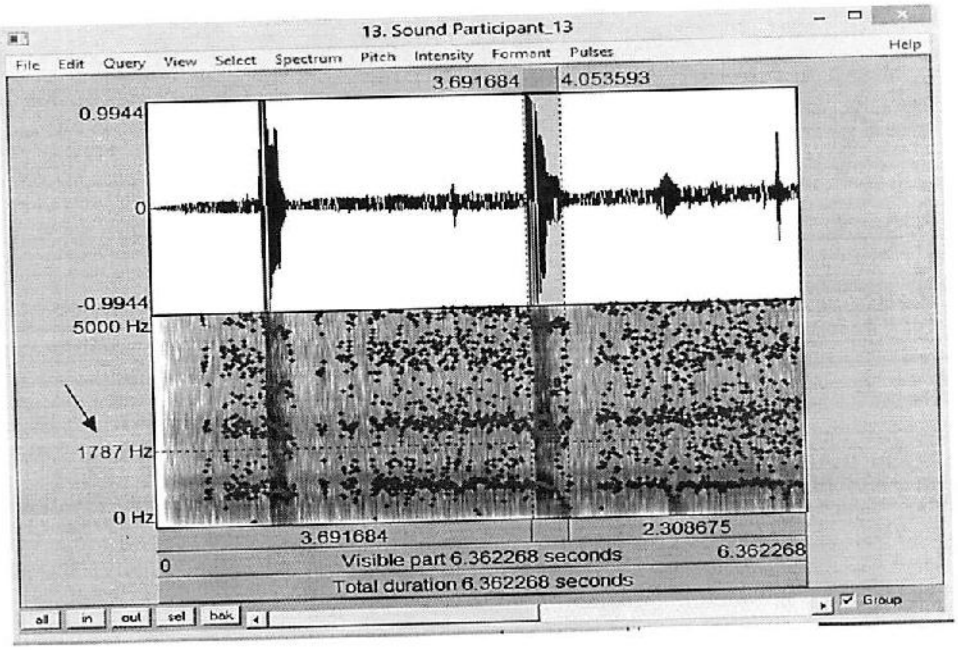




Based on the spectrograms above, it is known that the thirteenth participant produced 766 Hz for formant one and 1729 Hz for formant two in word Cat. Based on those frequencies, it can be concluded that the participant produced F1 close on 700 Hz. It means that the height of the participant is deservedly although the jaw opening is somewhat large. Next, F2 value of the participant is enough. It is around 1660-1770 Hz. It means that the position of this vowel is already in the mid-front vowel. So, it can be concluded that the articulation of this vowel is good enough.

2. Ten (F1 and F2)

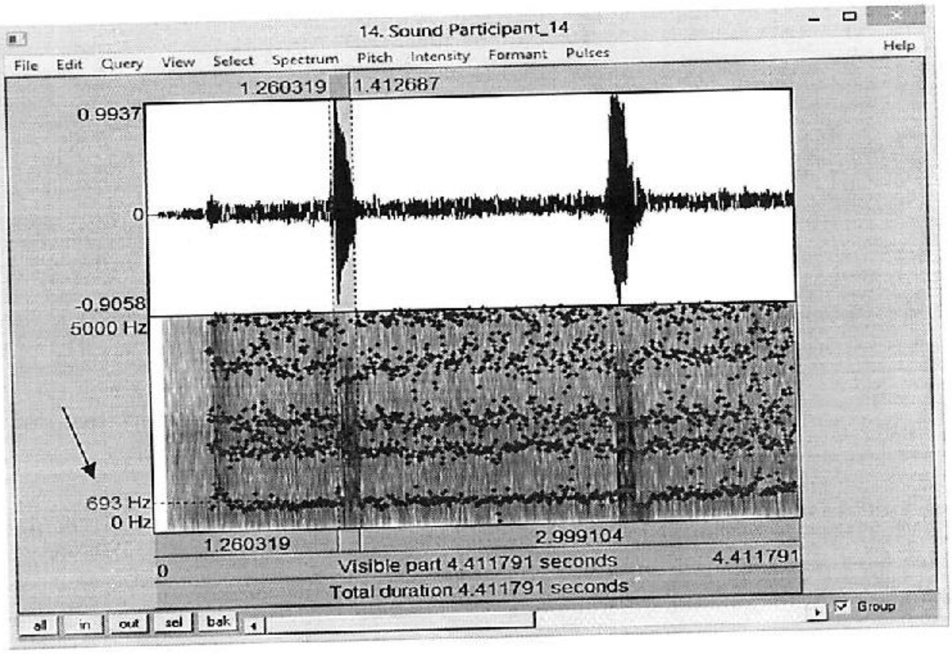


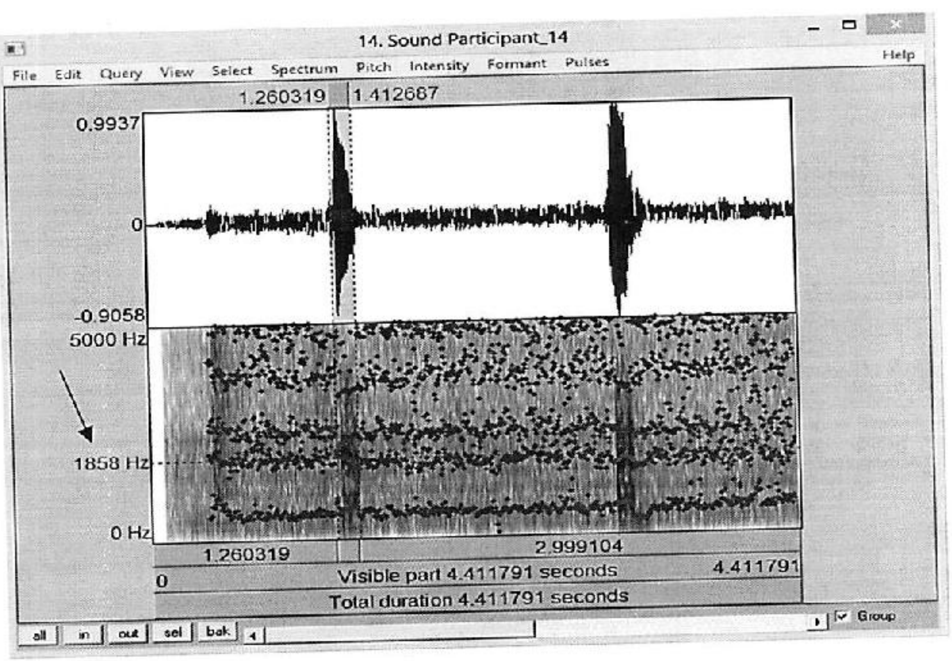


Based on the spectrograms above, it is known that the thirteenth participant produced 630 Hz for formant one and 1787 Hz for formant two in word ten. Based on those frequencies, it can be concluded that the participant produced F1 too high, it close to /æ/ frequency. It means that the opening of the jaw is too large for /e/. Next, F2 value of the participant is deservedly. It is around 1660-1770 Hz. It means that this vowel already in the mid frond position. Based on the explanation above, it can be concluded that the articulation of this vowel is not good enough because the opening of the jaw is too large. It is like /æ/.

4.1.14 Participant 14

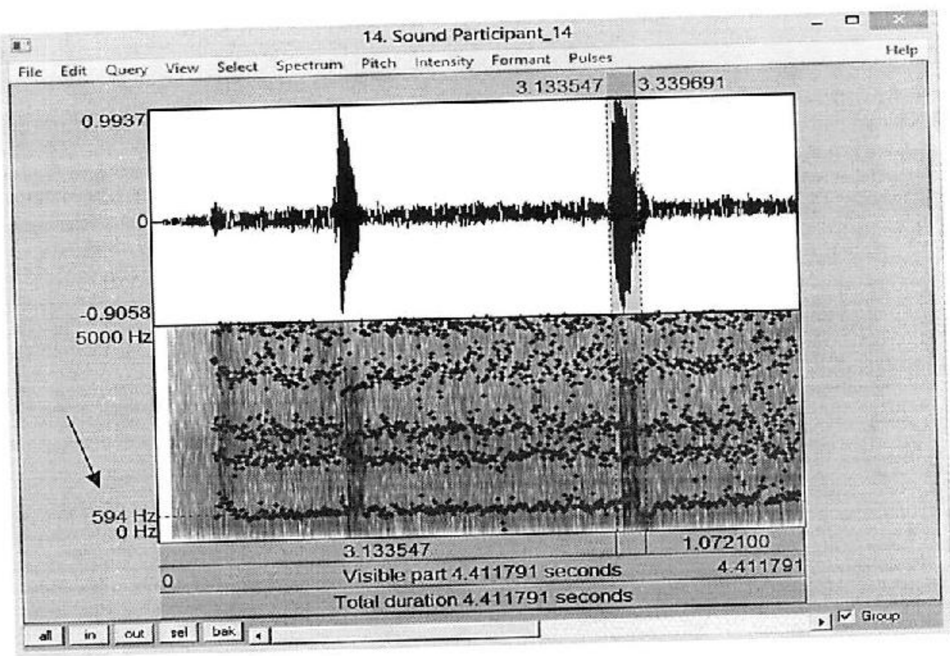
1. Cat (F1 and F2)

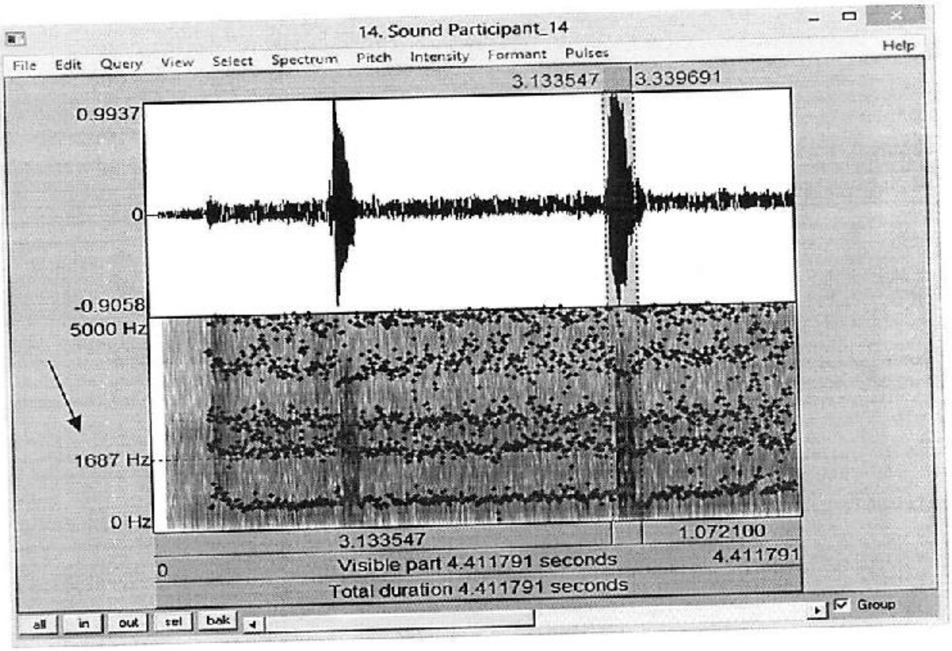




Based on the spectrograms above, it is known that the fourteenth participant produced 693 Hz for formant one and 1858 Hz for formant two in word Cat. Based on those frequencies, it can be concluded that the participant produced F1 close on 700 Hz. It means that the height of the participant is deservedly. The jaw opening is enough. Next, F2 value of the participant is enough. It is around 1660-1770 Hz. It means that the position of this vowel already in the mid-front vowel. So, it can be concluded that the articulation of this vowel is good enough.

2. Ten (F1 and F2)

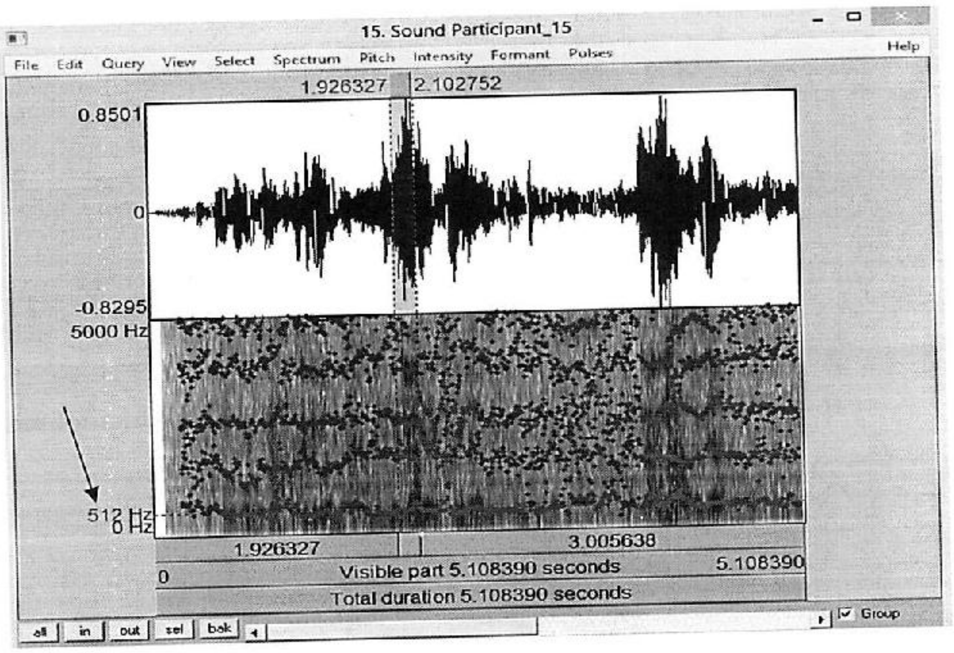


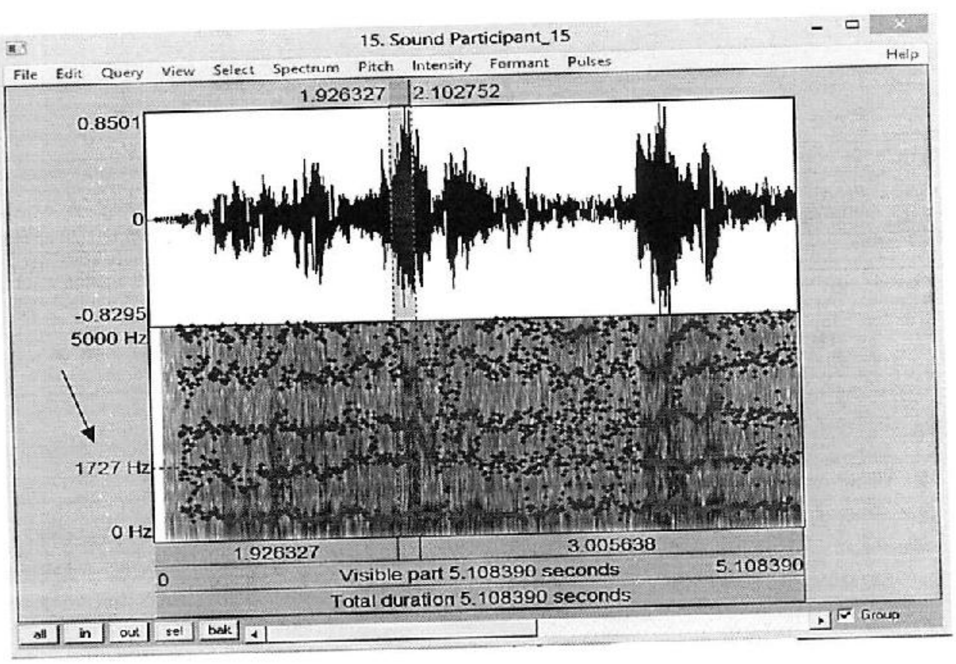


Based on the spectrograms above, it is known that the fourteenth participant produced 594 Hz for formant one and 1687 Hz for formant two in word ten. Based on those frequencies, it can be concluded that the participant produced F1 deservedly, it close to 530 Hz. It means that the opening of the jaw is enough. Next, F2 value of the participant is also deservedly. It is around 1660-1770 Hz. It means that this vowel already in the mid frond position. It can be concluded that the articulation of this vowel is good enough.

4.1.15 Participant 15

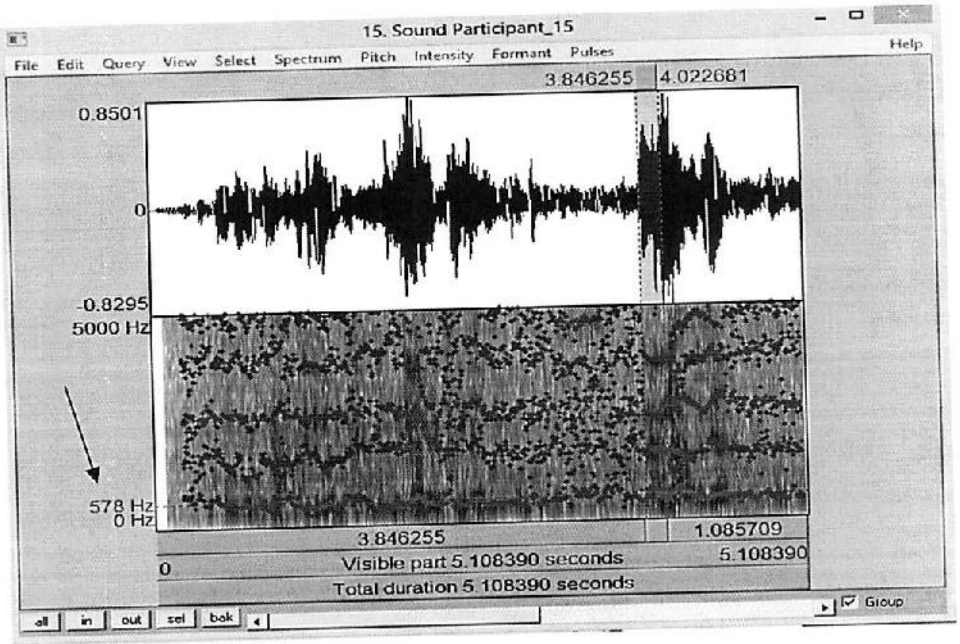
1. Cat (F1 and F2)

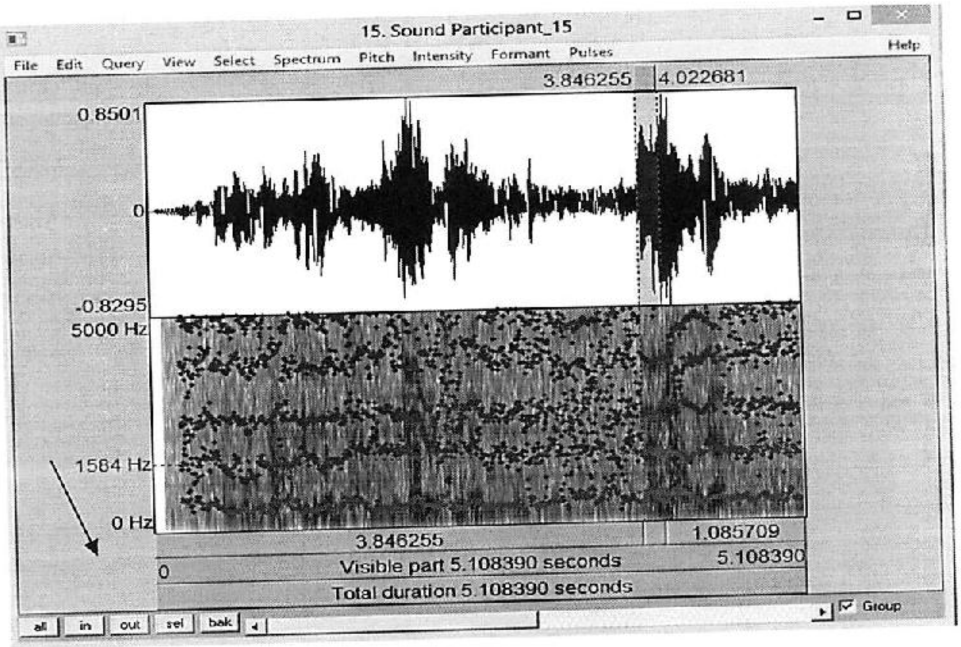




Based on the spectrograms above, it is known that the fifteenth participant produced 512 Hz for formant one and 1727 Hz for formant two in word Cat. Based on those frequencies, it can be concluded that the participant produced F1 relatively low. It means that the height of the participant is not deservedly. The jaw opening is not enough. Next, F2 value of the participant is enough. It is around 1660-1770 Hz. It means that the position of this vowel is already in the mid-front vowel. Based on the explanation above, it can be concluded that the articulation of this vowel is not good enough because the jaw opening is not enough. It is like vowel /e/.

2. Ten (F1 and F2)

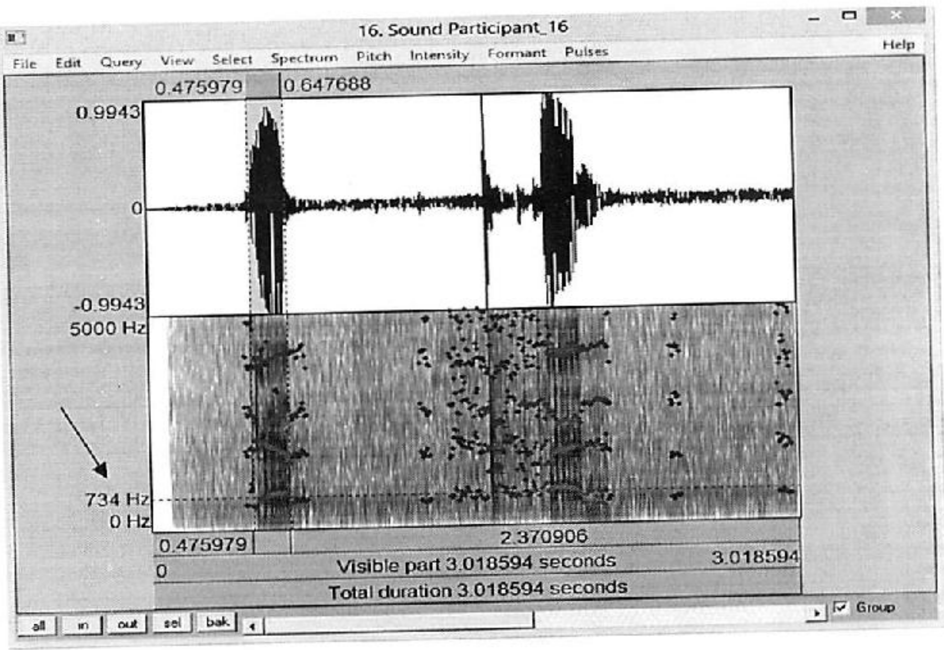


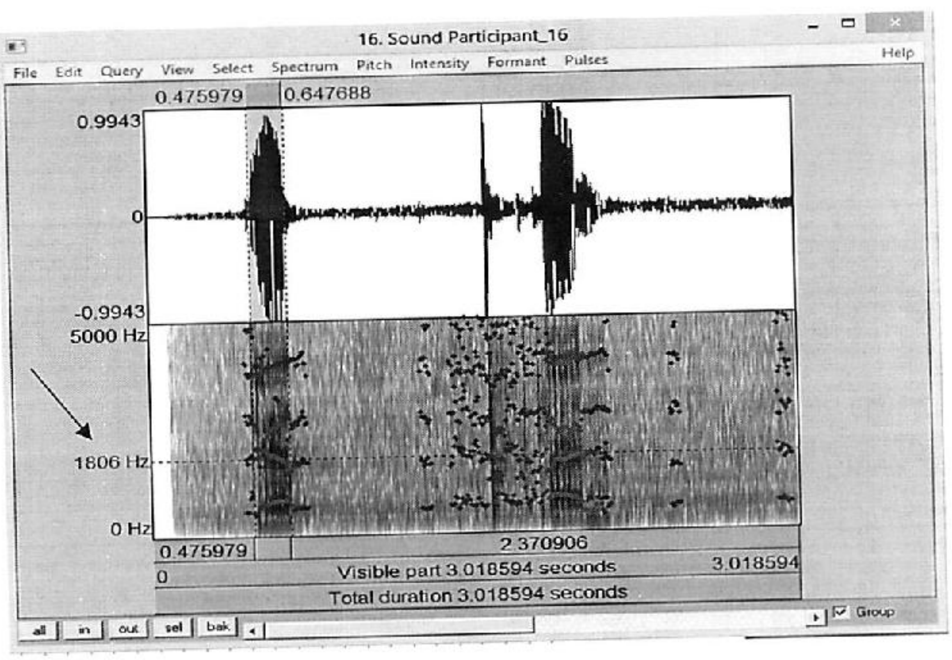


Based on the spectrograms above, it is known that the fifteenth participant produced 578 Hz for formant one and 1584 Hz for formant two in word ten. Based on those frequencies, it can be concluded that the participant produced F1 deservedly, it close to 530 Hz. It means that the opening of the jaw is enough. Next, F2 value of the participant is also deservedly. It is around 1660-1770 Hz. It means that this vowel already in the mid frond position. So, it can be concluded that the articulation of this vowel is good enough.

4.1.16 Participant 16

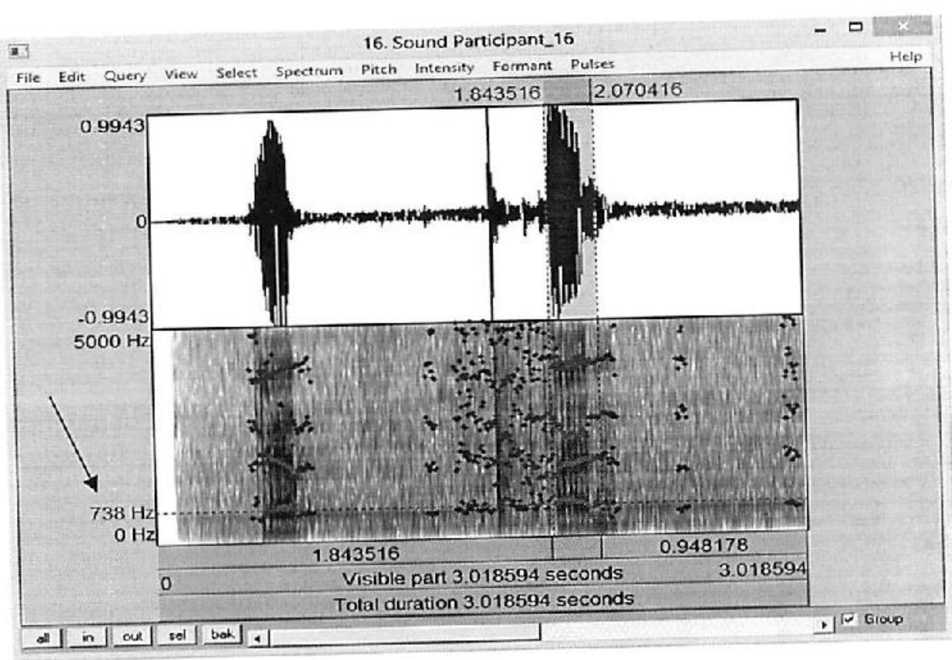
1. Cat (F1 and F2)

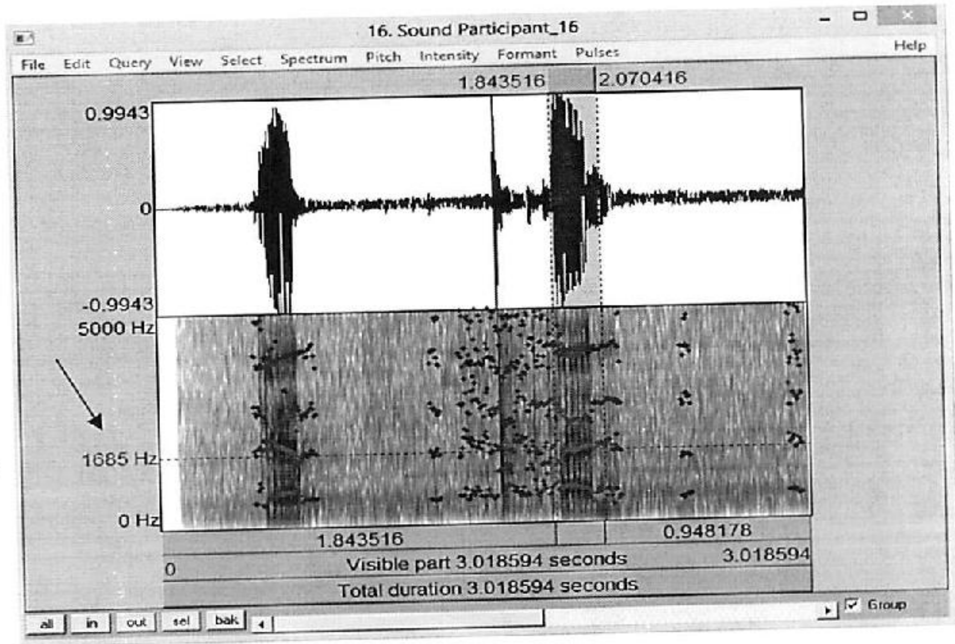




Based on the spectrograms above, it is known that the sixteenth participant produced 734 Hz for formant one and 1806 Hz for formant two in word Cat. Based on those frequencies, it can be concluded that the participant produced F1 close on 700 Hz. It means that the height of the participant is deservedly. The jaw opening is enough. Next, F2 value of the participant is also enough. It is around 1660-1770 Hz. It means that the position of this vowel already in the mid-front vowel. So, it can be concluded that the articulation of this vowel is good enough.

2. Ten (F1 and F2)





Based on the spectrograms above, it is known that the sixteenth participant produced 738 Hz for formant one and 1685 Hz for formant two in word ten. Based on those frequencies, it can be concluded that the participant produced F1 relatively high. It means that the opening of the jaw is too large. It is almost same with the height of vowel /æ/. Next, F2 value of the participant is deservedly. It is around 1660-1770 Hz. It means that the position of this vowel is already in the mid-front vowel. Based on the explanation above, it means that the articulation of this vowel is not good enough because the opening of the jaw is too large. It is like /æ/.

4.2 Finding

VOWEL	PARTICIPANTS	QUALITY		PERCENTAGE	
		Correct	Incorrect	Correct	Incorrect
Cat /æ/	Participant 1	✓		81,25 %	18,75 %
	Participant 2	✓			
	Participant 3	✓			
	Participant 4	✓			
	Participant 5	✓			
	Participant 6	✓			
	Participant 7	✓			
	Participant 8	✓			
	Participant 9	✓			
	Participant 10		✓		
	Participant 11		✓		
	Participant 12	✓			
	Participant 13	✓			
	Participant 14	✓			
	Participant 15		✓		
	Participant 16	✓			
				100%	

✓ : Correct

✓ : Like /e/

This figure shows sixteen participants who pronounce /æ/. There are thirteen participants who pronounce /æ/ correctly and there are three participants who pronounce it incorrectly. Four of them are pronounce it like /e/. It is incorrect because the height of those four participants is not enough. It means that the jaw opening is not enough.

VOWEL	PARTICIPANTS	QUALITY		PERCENTAGE	
		Correct	Incorrect	Correct	Incorrect
Ten /e/	Participant 1		✓	25 %	75%
	Participant 2	✓			
	Participant 3		✓		
	Participant 4		✓		
	Participant 5		✓		
	Participant 6		✓		
	Participant 7		✓		
	Participant 8		✓		
	Participant 9		✓		
	Participant 10	✓			
	Participant 11		✓		
	Participant 12		✓		
	Participant 13		✓		
	Participant 14	✓			
	Participant 15	✓			
	Participant 16		✓		
				100 %	

✓ : Correct

✓ : Like /æ/

This figure shows sixteen participants who pronounce /e/. There are four participants who pronounce /e/ correctly and there are 12 participants who pronounce it incorrectly. Twelve of them are pronounce it like /æ/. It is incorrect because the height of those twelve participants is high. The jaw opening is too large. It happens because their F1 is high like F1 of /æ/.

CHAPTER V

CONCLUSION AND SUGGESTION

5.1 Conclusion

The result shows that thirteen of all participants produced formant frequency of /æ/ deservedly. Their F1 frequency is 686 Hz - 858 Hz and 1621 Hz - 1956 Hz for F2. Next, three of all participants do not produced formant frequency of /æ/ deservedly because they produced F1 under 700 Hz. It is around 512 Hz - 609 Hz.

In other hand, it is also known that there are only four of all participants who produced formant frequency of /e/ deservedly. Their F1 is 594 Hz – 609 Hz. Next, sixteen of all participants do not produced formant frequency of /e/ deservedly because they produced high F1. It is around 628 Hz – 897 Hz.

Based on the explanation above, it is known that the accuracy of the pronunciation of the respondents in pronouncing /æ/ is about 81, 25%. It means that there are only 18, 75 % who does not pronounce accurately. 18, 75 % of all participants pronounce it like /e/. In other hand, it is also known that the accuracy of the pronunciation of the respondents in pronouncing /e/ is about only 25%. It means that there are 75 % of all participants do not pronounce accurately. Most of them pronounce it like /æ/. They pronounce it with large jaw opening like /æ/.

All of the participant's tongue position is deservedly but most of the mistakes happen because of their jaw opening. It means that all of their F2 values are good but not all their F1 value is deservedly.

Based on the findings above, it can be concluded that the participants pronounce /e/ same as /æ/. So, it means that the timbre of EFL university students of UIN Sunan Ampel Surabaya vowel (vowel quality) /e/ is same as /æ/.

5.2 Suggestion

This research is minor research but important to do. It called minor research because there are only a few people interest in this research. In other hand, it is better to know that this research have big deal when we talk about language, especially English. It is importance to know the accuracy of non native vowel quality.

In other hand, the writer considers that this research is also not perfect research. It may have many weaknesses. It may have less accuracy, especially when cut the sound and look for the formant frequency that has effect on the characteristic of the vowel and vowel quality. Besides, it also just researches vowels (/æ/ and /e/). Based on the statement above, it is better to further researcher to be more careful in measuring sound to get accuracy of the formant value. Next, the further researcher must also be more careful to the environment when recording the data sound to avoid disturbance. In other hand, it is also better to consider to the recorder. The last, it is also important to the further researchers to research not only on measuring vowel quality but also consonant quality.

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