STUDY OF DETERMINING PRAYER MAGHRIB TIME IN THE *AL-FALAQIYYAH* MANUSCRIPT

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Abstract

The five daily prayer times in the *al-Falaqiyah* text are determined using *rubū' mujayyab*, except for the Maghrib prayer time. It is stated in the text that the time for Maghrib is six o'clock without further information being given. This method contradicts the current method of determining the beginning of prayer times. By using qualitative research with literature study, this paper explores further the basis for calculations and implementation of the methods used in the *al-Falaqiyyah* text. By using descriptive analysis, it was found that the six o'clock provisions for Maghrib prayers in the text are approximate. After comparisons were made, there was also a difference of 3 to 7 minutes in the Maghrib time in the manuscript with the Maghrib time calculation using *rubū' mujayyab*.

Keywords: *al-Falaqiyyah Manuscript; Prayer Time; Rubū' mujayyab.*

Abstrak

Secara umum, waktu salat lima waktu dalam naskah *al-Falaqiyah* ditentukan menggunakan *rubū' mujayyab*, kecuali waktu salat Maghrib. Dikatakan dalam naskah bahwa masuknya waktu Maghrib adalah pukul enam tanpa diberikan keterangan lebih lanjut. Metode ini tentu bertentangan dengan metode penentuan awal waktu salat terkini. Dengan menggunakan penelitian kualitatif dengan studi kepustakaan, artikel ini menganalisis landasan perhitungan dan implementasi dari metode yang dipakai dalam naskah *al-Falaqiyyah*. Artikel ini menemukan bahwa ketentuan pukul enam untuk salat Maghrib dalam naskah adalah bersifat perkiraan. Setelah dilakukan komparasi, terdapat selisih 3 sampai 7 menit waktu

Maghrib dalam naskah dengan perhitungan waktu Maghrib menggunakan *rubū' mujayyab*.

Kata kunci: *Naskah Falaqiyyah; Waktu Salat; Rubū' mujayyab*

A. Introduction

Al-Falaqiyyah manuscript by K.H Muhammad Burkan Saleh, found in Jambi, is one of the classic manuscripts that discuss various astronomy issues, including determining prayer times. This calculation can be seen in the manuscript, which explains prayer times using a traditional tool called *rubū' mujayyab.* Based on the information on the Ministry of Religion website, the principles of calculation in *al-Falaqiyyah* manuscript are still used by the local community.[1] In general, the prayer time in this text is determined through *rubū'mujayyab*, but another case with the determination of the Maghrib prayer time is said to be 6 o'clock. This 6 o'clock designation is likely just an estimate. According to Muhyidin Khazin, scholars agree that it is not permissible to use forecasts in terms of worship.[2]

The study of the timing of prayers in the classical method has long attracted the attention of previous researchers. However, previous studies tend to the work of classical scholars who have been published or books that are widely circulated. The research usually attempts to test the accuracy of the methods used in the book by comparing them with contemporary approaches.

Fathul Ulum (2020) compares the prayer times calculation in the *al-Durūs al-Falaqiyyah* Book and Ephemeris. The results showed that there was a time difference of 10 minutes. It is said that the Ephemeris method is more accurate because the data used is constantly updated every day and uses modern calculations. While the calculation of prayer time in the Book of *al-Durūs al-Falakiyyah* still uses the time of events 'and counting tools *Rubū' mujayyab.*[3] Then Siti Nur Rohmah (2021). In her master thesis, she tried to compare the methods in the book *of Taqrīb al-Maqsūd fī `Amal bi al-Rubū' al-Mujayyab* and

[1] See: https://lektur.kemenag.go.id/manuskrip/web/koleksi-detail/lkk-jambi2015-bs003.html#ad-image-

[2] Muhyiddin Khazin, *Ilmu Falak dalam Teori dan Praktek*, 1st ed. (Yogyakarta: Buana Pustaka, 2004), 118.

[3] Fathul Ulum, "Studi Komparatif Hisab Penentuan Awal Waktu Shalat dalam Kitab *al-Durusul al-Falaqiyah* dan Ephemeris" (Universitas Islam Negeri Syarif Hidayatullah, 2020).

Ephemeris. The results showed that calculating the praying time in the Book of *Taqrīb al-Maqsūd* uses *rubū' mujayyab* and has a difference of 10 to 14 minutes compared with contemporary calculation.[4]

Some researchers concentrate on digging methods of calculation in a book. Rizal Mubit (2016) discusses the calculation of prayer times in the book *al-Khulāṣah fī al-Aqwāt al-Shar'iyyah bi al-Lugharitmiyyah* by Muhammad Khumaidi Jazry. From the research, it is known that the measure of prayer time in the book is to use logarithmic tables and eliminate negative values. So, to get a more precise time, other data and conversion to the calculated time area.[5] Alfan Maghfuri (2018), in his article, focuses on the calculation method in the book. It was found that the measure of prayer time in the book uses a list of logarithms with five decimals. When compared with the four decimal logarithms, the result of calculating the five decimal logarithms is still safe and has no significant difference.[6]

There is no writing that seeks to explore the method of determining the time of prayer in the classical texts and then seeks to complement and clarify the rules in the text so that the intent of the text is more easily conveyed considering the principles in the text is still used as a guide by the surrounding community. Considering that the method in this text is related to obligatory worship, research on determining the time of prayer in the reader needs to be done.

This paper aims to add to the knowledge of writers and readers about the scientific treasures of classical calculation. Specifically, this paper seeks to analyze the method of determining the Maghrib prayer time in *al-Falaqiyah* manuscript. In addition, the manuscript also explains the parts of *rubū' mujayyab* and the rules for determining prayer times with *rubū'*. However, the manuscript uses Malay Arabic and is difficult for some people to understand. In this case, I also intend to clarify these rules and re-narrate and complete the parts of *rubū' mujayyab* that are not mentioned in the manuscript. To complete the explanation in the manuscript, I refer to Siti Tatmainul Qulub's book

[4] Siti Nur Rohmah, "Perhitungan Awal Waktu Shalat Menggunakan Metode *Rubū' Mujayyab* (Di Pondok Pesantren Annida Al Islamy Bekasi)" (Universitas Islam Negeri Syarif Hidayatullah, 2021).

[5] Rizal Mubit, "Hisab Awal Waktu Salat dalam Kitab *Al-Khulasah fi al-Aqwat al-Syar'iyyah bi al-Lugharitmiyyah* Karya Muhammad Khumaidi Jazry," *Ahkam: Jurnal Ilmu Syariah* 4, no. 1 (2016).

[6] Alfan Maghfuri, "Hisab Waktu Shalat dalam Kitab *al-Durus al-Falakiyyah*," *Al-Mizan* 14, no. 1 (2018): 122–34, https://doi.org/10.30603/am.v14i1.739.

entitled *Ilmu Falak: Dari Sejarah ke Teori dan Aplikasi* and several articles discussing *rubū' mujayyab.*

B. Method

This research is a type *of* library research with a descriptive qualitative analysis method. The primary data sources in this study are *al-Falaqiyyah* manuscripts and *rubū' mujayyab* itself. In contrast, the secondary data sources are Siti Tatmainul Qulub's book entitled *Ilmu Falak: Dari Sejarah ke Teori dan Aplikasi* and books or articles related to the early calculation of prayer time and *rubū' mujayyab.* Data collection in this research uses the literature study method on *al-Falaqiyyah* manuscripts accessed from the Ministry of Religious Affairs website. After the data is collected, the provisions of the Maghrib prayer time and the *rubū' mujayyab* rule in *al-Falaqiyyah* manuscript are analyzed descriptively. Maghrib prayer time is set at six o'clock in the manuscript; I recalculate by using the *rubū' Mujayyab*'s rule to find out whether the provisions of six o'clock can be used or not. The explanation of the parts and controls of *rubū' mujayyab* is added from books and some related articles.

C. Result and Discussion

1. Biography of K.H. M. Burkan Saleh

Muhammad Burkan Saleh was born in the village of Tanjung Pauh Mudik, Kerinci, Jambi, in 1912 and died on July 21, 2010, in the same town. He is the son of H. Saleh Hj. Fatimah is an ordinary society and not a descendant of the great scholars. During his lifetime, he was married three times and had 12 children. He started his education at a Folk School in the village of Tanjung Pauh Home, coming and finishing in 1930. After graduating there, Burkan Saleh and his parents moved to Jambi and continued his education at the Jauhar Islamic Madrasah School in Jambi until he finally graduated in 1940. Not fasting until there, he studied again at the Islamic boarding school Tarbiyah Padang until graduating in 1945. After graduating from Padang, he continued to study at Pondok Pesantren Candung Bukittinggi and graduated in 1950.[7]

[7] Muhammad Rasidin and Oga Satria, "Manuskrip Islam Peninggalan K.H Muhammad Burkan Saleh (1912-2010)," *Jurnal Lektur Keagamaan, Vol. 18* (2020), 468 – 470.

With the provision of knowledge from the three Islamic boarding schools, Burkan Saleh returned to Jambi as a scholar and religious teacher. In addition to teaching, like the scholars generally, Burkan Saleh also poured his knowledge through writing. Among his writings are the following.[8]

Table 1 Some Works of Burkan Saleh

Al Falaqiyyah	It was written in 1973 and contains various astronomy discussions, namely about the direction of the Qibla, the determination of the month and the beginning of the year, and prayer times.
Amulets	These were written in 1948 and give a wide variety of amulets and how to use them.
Mustalah Alhadīs	This book, written in 1950, is a book that contains a discussion about the science of Hadith and various talks about the science.
Al-tarikh Qur'an al-Karīm	This book is not known when it was written; for sure, it contains a discussion about the science of the descent of the Qur'an and the history of the Qur'an. In general, this book includes religious issues.

2. An overview of *al-Falaqiyah* Manuscript

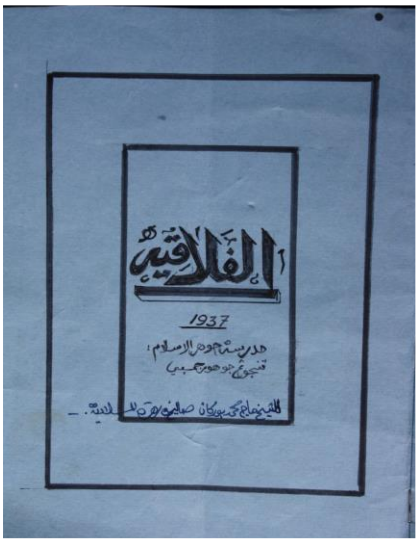

Figure 1 Cover of *Falaqiyah* Manuscript

Based on data on the manuscript page of the Ministry of Religion, *al-Falaqiyyah* manuscript by K.H. M. Burkan Shakeh consists of 24 sheets in Malay Arabic using *riqah khat*. This text discusses three things, as follows.

[8] Mayang Sari, "Naskah Kitab Al-Falaqiyah (Ilmu Perbintangan) Kajian Filologi" (Universitas Islam Negeri Jambi, 2021).

a. Qibla direction and Qibla azimuth

At the beginning of the text, he presented a table of several regions complete with the azimuth of the Qibla and the degree of Qibla. For its calculation, K.H. M. Burkan Saleh did not explain the methods used. It's just that at the end of the table, he stated that the tables of degrees of Qibla and azimuth (direction) are quoted from the book *of Riyāḍ al-Badī'ah fī Tārikh*. It can be said that he copied the degrees of Qibla and Qibla azimut in the book.

b. The beginning of the year and the beginning of Ramadan

In this section K.H. M. Burkan quotes the Hadith of the Prophet which reads:

صُوْمُا لِرُؤْيَتِهِ وَ أَفطِرُوْا لِرُؤْيَتِهِ, فَإِنْ غُمَّ عَلَيْكُمْ فَأَكْمِلُوْا شَّعْبَانَ ثَلَاثِيْنَ

> *"Fast by looking at the new Moon, and break your fast by looking at the new Moon. If he does not appear to you, then complete the count of Sha'ban to 30 days."*

It indicates that in determining the beginning of Ramadhan, he used the observation method. Then, for the year in this manuscript, he used the Year of Islamic Java. This is proven by the *windu* (8 years), which are named with the letter *Jumali* with the provisions that the first year and so on are named *Alip* (ا), *Ehe* (ه), *First Jim* (ج), *Ze* (ز), *Dal* (د), *Be* (ب), *Wawu* (و), and *Jim* (ج).[9]

Then, there is a table of the number of days in the Arabic month starting from Muharram. In the table, he wrote down the estimates that each odd month has an even number of days; for example, Muharram as the first month of 30 days, followed by Safar in the second month with the number of days as many as 29. And so it was with Zulhijjah. The rule of regular lunar ages with odd-even patterns in this text indicates that K.H. M. Burkan Saleh used Ḥisāb *'urfi* in determining the beginning of the month.

Ḥisāb 'urfi is a calendar calculation system based on the average time the Moongoes around the Earth. This calculation is only an approximation and does

[9] Burkan Saleh, *Al-Falaqiyah* (Tanjung Pauh, 1937).

not describe the actual phase of the Moon. A cycle of phases of the Moon, whose duration is about 29.53 days, is approximated by 29 or 30 days. Because it can not describe the actual position month, for worship, *Ḥisāb 'urfi* can not be used, so *rukyat hilāl* must still be done.[10]

In this text, he also explained how to determine the first day of Ramadan according to the opinion of the companions and imāms of the school he quoted from the book *Adah al-Ṭullāb.* He also introduced the science of calculation *aywayantajaqoh,* namely the science of calculation, to know the first day of each month in the Hijri year.

c. Prayer time with *rubū' mujayyab*

Before mentioning the time of prayer, the text said the rules for determining the time of prayer, starting from defining *the constellation* (zodiac), calculating the longitude of the solar ecliptic, calculating declination, *bu'd al-qutur, niṣful fuḍlah*, and ending with the rule of finding the time of prayer five times, as follows.

Table 2 Prayer times in *al-Falaqiyyah* manuscript[11]

Prayer	How to determine
Maghrib	Maghrib time in the script is six o'clock.
Isha	The time of Isha in the text is determined by putting *qaws irtifā'* in degree 17 calculated from the beginning of *qaws* and taking his *jayyib*, then adding *bu'd al-khutur* to the end of *qaws* then subtracting *niṣf al-fuḍlah* to the front of *qaws.*
Fajr	The time of Fajr in the script is determined by putting the *qaws irtifā'* in degrees 19 counted from the beginning of *qaws* and taking his *jayyib* plus *bu'd al-qutur* to the end of *qaws* then adding *niṣf al-fuḍlah* to the front of *qaws.*
Zuhr	The time of Zuhr in the script is determined by putting a rope at 90 degrees and then subtracting *niṣf al-fuḍlah* from the beginning of *qaws.*
Asar	Asar's time in the script is determined by: Take the constellation, then take the *mail,* and then move the rope to the *mail.* Then subtract the latitude of the place from the beginning of *qaws* by 4.5 degrees and then calculate from the beginning of the remaining *qaws*. This *is tamām ghayah*. Then, what is left is reduced by 90 degrees, and how much is left is the *ghāyah*. Then take *qamah aṣābah* as much as 12 degrees and then take his *jayyib* reduced with *bu'd al-khutur* and *niṣf al-fuḍlah,* and if ikhtilaf add *bu'd al-khutur* and *niṣf al-fuḍlah* reduced.

[10] Watni Marpaung, *Pengantar Ilmu Falak*, 1st ed. (Jakarta: Prenadamedia Group, 2015), 37-38.
[11] Burkhan Saleh, *Al-Falaqiyah.*

3. Analysis of the parts of *Rubū'* in *al-Falaqiyyah* Manuscript

In the manuscript, the parts of *rubū'* are described before calculating the prayer time. However, the *rubū' mujayyab* section in the manuscript is only mentioned briefly and, according to the Author, should be explained in more detail to make it easier to understand. Here, I will clarify the parts of *rubū'* in the manuscript by referring to several relevant sources, as follows.

Table 3 The parts of *Rubū'* in *al-Falaqiyah* manuscript[12]

Part of *Rubū'*	Description
Markaz **(ألمركز)**	The central point *of rubū' mujayyab* is that it has a hole where to install *khāyṭ* (thread).[13] At this *markaz*, the value of 0 from *jayb tamām* dan *sittīnī* located (beginning of *jayb tamām* and *sittīnī*).
Qaws al-Irtifā' **(قوس الإرتفاع)**	Arc (curved stroke) that surrounds the *rubū' mujayyab. qaws al-irtifā'*s values between 0 and 90 are calculated from the right direction of the person looking. In the *qaws al-irtifā'*, there are the names of 12 constellations located on each of the 30 scales.[14]
Jayb at-tamām **(جيب التمام)**	A straight line goes down from the *Markaz* to the beginning of *qaws al-irtifā'*, divided into 60° *jayb*. This base 60 (sexagesimal) *numbering* is a derivative of the Babylonian number system**.** It is used to calculate the cosine of an angle.[15]
Jayb sittin/ al-Sittīnī **(السـتيني)**	A straight line that descends from the base point to the end of *qaws al-irtifā'*, which is divided into 60° *jayb.* It is used to calculate the sine of an angle.[16]
Two *tajyīb* area (التجييب دائرتا)	Two semicircular lines with a radius of 30 grid scale units were drawn on the horizontal axis (*jayb at-tamām)* and vertical axis (*sittīnī).*[17] The line from *Markaz* to the end of *qaws* is named *tajyib al-awwal.* In comparison, the line from *Markaz* to the beginning of *qaws is* called *tajyib tsānī.*
Juyūb al-mabsūthoh **(الجيوب المبسوطة)**	Line connecting the value of *jayb al-Sittīnī* and value of *qaws al-irtifā'.*
Juyūb al-ma'kūsah **(المعكوسة الجيوب)**	Line connecting the value of *jayb at-tamām* and value of *qaws al-irtifā'.*
The Dairot Al-mail ad'dhom	A curved line similar in shape to the *qaws al-irtifā'* but more minor, which starts from *jayb at-tamām* at a position twenty-four degrees *jayb* from the *markaz* point.
Two *qāimatu ẓilli*	Two lines that go down to *qaws al-irtifā'.* It consists of *qā'imatu ẓill al-mabsūth*, which is a line accompanied by points that descend from *sittin*

[12] Burkhan Saleh.

[13] Siti Tatmainul Qulub, *Ilmu Falak: Dari Sejarah ke Teori dan Aplikasi* (Depok: Rajawali, 2017), 71.

[14] Qulub.

[15] Master Richard Wymarc and M K A Timothy J Mitchell, "Kuadran Sinus dalam Teori dan Praktik," n.d.

[16] Wymarc and Mitchell.

[17] Baharrudin Zainal and Mat Rofa Ismail, "Trigonometric Solutions Using Sine Quadrant," *Procedia - Social and Behavioral Sciences* 8, no. 5 (2010), 724.

قائمتا الظل)	to *qaws al irtifā'*, which differs by seven degrees from the *markaz point*, and *qāimatu ẓill al-manqūs*, which is a line accompanied by points that descend from *jayb at-tamām* to *qaws al-irtifā'* which differs at a position of seven degrees from the point of *markaz.*[18]
Two *hadaf*	Two additional pieces of wood on the *rubū' mujayyab* are on the right and left.[19]
***Khāyṭ* (الخيط)**	Thread with a length exceeding the size *of rubū' mujayyab* mounted on *the markaz* and used as a means of counting.
The Muri	A thread that is tied to the *chai*r and serves as a marker in the operation of *rubū'*. For easy viewing, this yarn has a different colour with *khāyṭ* and is fitted loosely so that it can be shifted.[20]
Shaqul	Weights are attached to the ends of the *khāyṭ* to ensure the flexibility of the thread when marking, moving the rope, and reading.[21]

The picture of *rubū' mujayyab* in *al-Falaqiyyah* text does not contain the *two qaws Aṣar* as we know in *rubū'* in general, so even in his explanation, Burkan Saleh did not mention this part. The ***two qaws `Aṣar*** (الصريين قوس) consist of two areas that are based on the concept of shadow Asar. The first area is Aṣar Shafi'ī Mazhab, named *qaws 'aṣr al-awwal.* The value of *qaws 'aṣr al-awwal* counted from the beginning of *qaws al-irtifā'* to 42,33° from *sittīnī.* The second area is the origin of the Hanafi Mazhab named *Qaws 'aṣr al-thānī.* The value of *qaws 'aṣr al-thānī* is calculated from the beginning of *qaws al-irtifā'* to 26.5 from *sittīnī.*[22]

[18] Muhammad Muhtar, *Taqribul Maqsod Fi Al-Amali Bi Al-Rubu' Al-Mujayyab* (Surabaya: Toko Kitab Utama, n.d.), 16.

[19] Muhtar, 16.

[20] Qulub, *Ilmu Falak: Dari Sejarah Ke Teori Dan Aplikasi,* 73.

[21] Zainal and Ismail, "Trigonometric Solutions Using Sine Quadrant."

[22] Qulub, *Ilmu Falak: Dari Sejarah Ke Teori Dan Aplikasi,* 72.

Figure 2
Rubū' mujayyab in *al-Falaqiyyah* Manuscript

4. Analysis of the Determining Maghrib Prayer Time in *al-Falaqiyyah* Manuscript

In the text, it is stated that Maghrib is six o'clock, and there is no mention of formulation or the reason. The author suspects that the determination of this six o'clock, as also found in the Book of *Shams al-Ḥilāl*, is calculated from the hour of culmination or *istiwā'*.[23] It is also possible that the stipulation of six o'clock is based on estimates only, considering that Indonesia and other areas around the equator have relatively the same duration of day and night. This is reinforced by making Jambi a calculation markaz, where the average Maghrib time in Indonesia is around six o'clock in the afternoon. So, for worship, this calculation cannot be used. However, considering that the time of Maghrib prayer is related to obligatory worship, it should not be used to determine the approximate time. Therefore, the determination of Maghrib's time in this text should be reviewed.

Because all prayer times (except Maghrib) in this text are determined through *rubū' mujayyab,* the following authors present steps and examples of determining the timing of Maghrib prayers with *rubū' mujayyab*. Previously, determining the prayer time required data and a precise calculation method. However, in the manuscript, the data needed and how to calculate it should be described in detail. Therefore, to facilitate understanding, the Author tries to complete the data in the manuscript through some literature. Here,

[23] Noor Ahmad, *Syamsul Hilal* (Kudus: Madrasah Tashwiq al-Tzullab Salafiyah, n.d.).

the Author gives an example of calculating the Maghrib prayer time with *Markaz* Jambi (where the manuscript was found) on November 22, 2022. Data and calculation steps are as follows.

a. Latitude and longitude of the place

Geographic Data of an area can be obtained from tables of Earth coordinates or GPS and Google Earth. In the manuscript, the latitude of the place is 130'. The geographical latitude of Jambi, as contained in the appendix to the book *Ilmu Falak Praktis*, is 1˚36' South Latitude and longitude 101˚38' East Longitude.[24]

b. Determining *burūj*/ constellations

Burūj is an approximation of the position of the sun on the ecliptic. In the text, it says, *"First, take the burūj first and then transfer the rope to the burūj."* Because the manuscript does not mention how to determine *the burūj*, therefore Author describes how to define it by adding the date of the month and is sought with a difference/ *tafāwut*. The sum of one constellation is 30 degrees, so when the sum is more than 30, it is reduced by 30. The rest goes into the next constellation. The northern *buruj* is positive (+) and negative (–) if Southern. For more details, see the following.[25]

Table 4 List *of Buruj*/ Constellation

Month	*Tafawut* (Difference)	Name of *Burūj*	*Buruj* Position
January	09	Jaydu	South
February	01	Dalwu	South
March	08	Ḥut	South
April	10	Ḥaml	North
May	09	Tsaur	North
June	09	Jauzā'	North
July	07	Saroton	North
August	07	Asad	North
September	07	Sumbulah	North
October	06	Mīzān	South
November	07	*Aqrab*	South
December	07	*Qaws*	South

[24] Ahmad Izzuddin, *Ilmu Falak Praktis* (Semarang: PT. Pustaka Rizk Putra, 2017), 237.
[25] Siti Tatmainul Qulub, *Ilmu Falak: Dari Sejarah Ke Teori Dan Aplikasi* (Depok: Rajawali, 2017), 89.

Based on the table above, the astronomical ecliptic constellation on November 22, 2022, is 22 + 07 = 29. So, the ecliptic longitude on November 22, 2022, is 29 degrees from *aqrab burūj*.

c. *Darajah al-syams/* astronomical longitude of the sun

Its meaning is that the distance of the sun from the point Aries (the constellation ḥaml or the constellation zero) is measured along the ecliptic circle. The steps for calculating the astronomical longitude of the sun in *rubū' mujayyab* are as follows.

- Position *khāyṭ* above the *qaws*
- Slide the *khāyṭ* until it is at the beginning of the constellation
- Slide the *khāyṭ* by the number of *tafāwut* numbers *tafāwut* with the date you are looking for (in the example: Slide 29 degrees)
- The position of the *khāyṭ* from the beginning of *qaws* indicates the longitude value of the solar ecliptic.

So, the astronomical longitude of the sun on November 22, 2022, is 59 degrees south.

d. Solar declination (*mail*)

I suspect that the value of solar declination in this manuscript is determined using the method *of Ḥisāb Taqrībī* because the manuscript does not provide a solar declination table. In essence, the declination value changes every hour, but in the script and calculation *of rubū' mujayyab*, the declination value constantly changes and is considered constant. The steps to know the declination of the sun using *Rubū' mujayyab* are:

- Put *khāyṭ* on *sittīnī* then mark with *muri* on 23°27' (maximal declination/ *dā'irat mayl a'ẓam)*
- Then move *khāyṭ* towards *darajah al-Shams* (59 degrees)
- Then, draw a straight line from *muri* to *sittīnī* and value from the beginning of markaz to *sittīnī*. That is the declination value.[26]

[26] Qulub, 90.

So the declination of the sun on November 22, 2022, is 20˚06'. Since the longitude of the solar ecliptic in *the burūj aqrab* is in the south, the value of the sun's declination is negative (–).

e. *Bu'dul quthur*

Scientifically, *bu'd al-qutur* is the value of the ratio of the diameter of the horizon to the latitude of the place calculated with the semidiameter of the horizon to the equator.[27] In the manuscript, how to find out is also not mentioned. To find out the declination by *rubū' mujayyab,* I refer to the writing of Moelki Fahmi Ardliansyah as follows.

- Place *the khāyṭ* at *qaws* latitude place (1˚36'), then draw a straight line from *qaws al-irtifā'* to *sittīnī.* See the values from the beginning *of markaz* to *sittīnī* (1˚40')
- Put *khāyṭ* on *sittīnī* and position *muri* at 1˚40'
- Shear *khāyṭ* at *qaws* solar declination (20˚06')
- Draw a straight line from *muri* to *sittīnī.* See its value from the beginning *of markaz* to *sittīnī.* That is the value of *bu'd al-qutur* sought.[28]

So the value of *bu'd al-qutur* in this example is 00˚34'.

f. *Aṣl al-Muṭlaq*

The scientific term for *aṣl al-muṭlaq* is altitude. In science *al-miqat*, *al-miqat* refers to the high value of the sun calculated from the sun's position in the sky to the Earth's horizon. The greater the value of solar declination, the smaller the value *of aṣl al-muṭlaq*, and vice versa.[29] How to know *aṣl al-muṭlaq* is as follows.

- Find *tamām* latitude place / *co*-latitude (90 – latitude place / 90 – 1˚36 ' = 88˚24'), then put *khāyṭ* on *qaws co*-latitude (88˚23')

[27] Nurul Huda Ahmad Zaki, Abdul Karim Mohd Ali, and Mohd Zambri Zainuddin, "Struktur Dan Istilah Dalam Alat *Rubū' mujayyab* Serta Kaedah Kiraannya Untuk Penentuan Waktu Sholat," in *Tradisi Kecemerlangan Astronomi Islam*, ed. Saadan Man et al., 1st ed. (Kuala Lumpur: Universiti Malaya, 2013), 26.

[28] Moelki Fahmi Ardliansyah, "Assessment Tool of Hisab Rukyat Archipelago (Rubu ' Mujayyab and Astrolabe in Calculating the Start Time of Prayer)," *Jurnal Bimas Islam* 8 (2015), 10.

[29] Ahmad Zaki, Ali, and Zainuddin, "Struktur Dan Istilah Dalam Alat *Rubū' mujayyab* Serta Kaedah Kiraannya Untuk Penentuan Waktu Sholat.", 27.

- Draw a straight line from *qaws al-irtifā'* to *sittīnī*, then see the value from the beginning *of markaz* to *sittīnī* (59˚58')
- Put *khāyṭ* on *sittīnī* and position *muri* on the number 59˚58.'
- Find *co*-latitude declination (90˚ – declination / 90˚– 20˚17' = 69˚43')) and then put *the khāyṭ* on the *qaws tamām* initial *mail* (69˚43')
- Then draw a straight line from *muri* to *sittīnī* and see the value from the beginning *of markaz* to *sittīnī* that is, the value *of aṣl al-muṭlaq*.[30]

So the value *of aṣl al-muṭlaq* in this example is 56˚16'.

g. *Niṣf al-fuḍlah*

That is, the arc along the pseudo-circular line of the celestial body is calculated from the horizon to the celestial body. It refers to the value of the duration of the day in excess of the night or vice versa.[31] The way to find out is:

- Place *khāyṭ* on *sittīnī* and position *muri* on *aṣl al-muṭlaq* (56˚16')
- Move *muri* until it attaches to *jayb al-mabsūṭah* of *bu'd al-qutur.*
- The angle formed between *the khāyṭh* and the beginning of the *cause* of the process is called *niṣf al-fuḍlah.*

The value of *niṣf al-fuḍlah* in this example is 00˚30'.

h. *Daqāiq tamkiniyah*

It is the correction of the angle of solar time and the angle of lunar time. There is no mention of this correction in the text. But because I try to complete the calculations in the book by referring to the writings of Siti Tatmainul Qulub, *daqā'iq tamkīniyah* needs me to mention. It is stated that the value of this correction is taken from the sum of refraction taken from the schedule by looking at the declination data of the Moon and the latitude of the place.

i. *Iḥtiyāṭ*

That is, the extra time to be careful so that the prayer time enters. There is no mention of how many minutes *iḥtiyāṭ* was used. But the value of *iḥtiyāṭ* in some books is different. For example, in the book of *ad–Durūs al-Falakiyyah*, using *iḥtiyāṭ*

[30] Qulub, *Ilmu Falak: dari Sejarah ke Teori dan Aplikasi, 93*.
[31] Ahmad Zaki, Ali, and Zainuddin, 27.

4 to 5 minutes.[32], while in the book *of Taqrīb al-Maqṣūd fī al-`Amal bi al-Rubū' al-Mujayyab* using *iḥtiyāṭ* 2 minutes.[33]

j. Maghrib time

To find the Maghrib time with *rubū' mujayyab* is to multiply the value of *niṣf al-fuḍlah* (NF) with 04' to get *sā'at niṣf al-fuḍlah* (SNF). When the declination is positive, increase the SNF by 06 hours and decrease the SNF by 06 hours when the declination is negative. The result is added with *daqāiq tamkīn* and *iḥtiyāṭ*. The value *of daqāiq tamkīn* used here is 03'30".[34] Meanwhile, for *iḥtiyāṭ*, I refer to the book *of Taqrīb al-Maqṣūd fī al-`Amal bi al-Rubū' al-Mujayyab*, which is 2 minutes. Then, the Maghrib time of the example is as follows:

SNF = NF x 0˚4'
= 00˚30' x 04'
= 00˚02'00"
Due to the negative declination, the SNF –06^{h}
= 00˚02'00" – 06^{H} 00^{m}
sum = 05˚58'00"
Maghrib = sum + *daqāiq tamkīn* + *iḥtiyāṭ*
= 05˚58'00" + 03'30" + 02'00"
= 06^{h} 03^{m} 30^{s}

From the example, it can be seen that there is a difference of 3.5 minutes between the time of Maghrib mentioned in the text and the actual Maghrib and *Rubū' mujayyab*. Due to the example using negative declination, I will give a model again for calculations with positive declination with the same Markaz. In the same way as above, the Maghrib prayer time on April 17, 2022, is:

Latitude of place	= 1˚36' South Latitude
Longitude of place	= 101˚38' East Longitude
Constellation	= 27 degrees from Haml
Solar declination	= 10˚38'
Bu'dul author	= 00˚18'
Aṣl al-muṭlaq	= 58˚56'
niṣf al-fuḍlah (NF)	= 00˚18'
Daqāiq tamkīn	= 03'30"
Iḥtiyāṭ	= 02'00"

[32] Muhammad Ma'shum, *Ad-Durus Al-Falakiyyah* (Jombang: Maktabah Sa'ad bin nashir nabhan, 1992).

[33]Muhtar, *Taqribul Maqsod Fi Al-Amali Bi Al-Rubu' Al-Mujayyab*.

[34]Qulub, *Ilmu Falak: Dari Sejarah Ke Teori Dan Aplikasi,* 111.

SNF = NF x 0°4'
= 00°18 ' x 04'
= 00°01'12"
Because of positive declination, then
SNF + 06 = 00°01'12" + 06°00'00"
sum = 06°01'12"
Maghrib = sum + *daqāiq tamkīn* + *iḥtiyāṭ*
= 06°01'12" + 03'30'' + 02'0"'
= $06^{h}\,06^{m}\,12^{s}$

From the second example, it can be seen that there is a difference of 6 minutes and 12 seconds between the Maghrib time in the book and the one sought using the *rubū' mujayyab* calculation. To know the accuracy of a measure of prayer time is not enough to use two examples given the declination of the sun that continues to change every day, even every hour. However, the two examples above provide an idea that the determination of the Maghrib prayer time in the manuscript has a difference of about 3 to 7 minutes from the actual calculation with *rubū'*.

Remember that prayer is an obligation determined in time as in Sūrah Al-Nisā' verse 103.

اِنَّ الصَّلٰوةَ كَانَتْ عَلَى الْمُؤْمِنِيْنَ كِتٰبًا مَّوْقُوْتًا

"Indeed, prayer is a prescribed duty for those who believe."

The time of the prayer should be determined carefully and carefully. However, the timing of prayers in the text cannot be completely wrong. This is considering that the manuscript has been around since 1937, and at that time, the science of calculation or analysis tools was less sophisticated than now. At that time, the provisions of the prayer time, mainly Maghrib contained in the manuscript, could be practised. But considering that at this time, the science of calculation or its tools have reached a very advanced development, then, of course, for caution, we are more advised to use prayer times calculated by contemporary methods.

D. Conclusion

Prayer times in *al-Falaqiyyah* manuscript are determined using *rubū' al-mujayyab*. The parts of *rubū'* mentioned in the manuscript are *markaz, qaws al-irtifā', jayb al-tamām, jayb*

sittīn, tajyib, juyūb al-mabsūṭah, juyūb, al-ma'kusah, dā'irat al-mayl al-a'ẓam, qaymah al-ẓilli, hadaq, khāyṭ, muri, and *Syaqul*. The Two *qaws* asar is not mentioned in this manuscript. Calculation with *rubū' mujayyab* can be categorized as the *ḥisāb ḥaqīqī taqrībī*; that is, the calculation system is still simple with a simple tool as well. As for the determination of the time of Maghrib that is mentioned only at 6 o'clock, it is only an estimate. Meanwhile, to determine the time of Maghrib prayer using *rubū' mujayyab*, the actual prayer time must go through several stages. The stages start from defining the latitude and longitude of the place, determining the *burūj*, calculating the astronomical longitude of the sun, solar declination, *bu'd al-quṭur* (semidiameter ratio), *aṣl al-muṭlaq* (altitude), *niṣf al-fuḍlah*, *daqāiq tamkiniyah* (correction of the angle of solar time), and *iḥtiyāṭ*. After calculating the Maghrib time using the *rubū'* rule and with the same markaz (i.e. Jambi), it was found that there was a difference of 3 to 7 minutes with the Maghrib time mentioned in the manuscript. Therefore, the provision of six o'clock Maghrib time in the manuscript is irrelevant today.

E. Bibliography

Ahmad Zaki, Nurul Huda, Abdul Karim Mohd Ali, and Mohd Zambri Zainuddin. "Struktur Dan Istilah Dalam Alat *Rubū' mujayyab* Serta Kaedah Kiraannya Untuk Penentuan Waktu Sholat." In *Tradisi Kecemerlangan Astronomi Islam*, edited by Saadan Man, Mohammaddin Abdul Niri, Khadijah Ismail, and Abdul Karim Ali, 1st ed., 24. Kuala Lumpur: Universiti Malaya, 2013.

Ahmad, Noor. *Syamsul Hilal*. Kudus: Madrasah Tashwiq al-Tzullab Salafiyah, n.d.

Ardliansyah, Moelki Fahmi. "Assessment Tool of Ḥisāb Rukyat Archipelago (Rubu ' Mujayyab and Astrolabe in Calculating the Start Time of Prayer)." *Jurnal Bimas Islam* 8 (2015).

Burkhan Saleh. *Al-Falaqiyah*. Tanjung Pauh, 1937.

Izzuddin, Ahmad. *Ilmu Falak Praktis*. Semarang: PT. Pustaka Rizk Putra, 2017.

Khazin, Muhyiddin. *Ilmu Falak Dalam Teori Dan Praktek*. 1st ed. Yogyakarta: Buana Pustaka, 2004.

Ma'shum, Muhammad. *Ad-Durus Al-Falakiyyah*. Jombang: Maktabah Sa'ad bin nashir nabhan, 1992.

Maghfuri, Alfan. "Ḥisāb Waktu Shalat Dalam Kitab Al-Durus Al-Falakiyyah." *Al-Mizan*

14, no. 1 (2018): 122–34. https://doi.org/10.30603/am.v14i1.739.

Marpaung, Watni. *Pengantar Ilmu Falak*. 1st ed. Jakarta: Prenadamedia Group, 2015.

Mubit, Rizal. "Ḥisāb Awal Waktu Salat Dalam Kitab Al-Khulasah Fi Al-Aqwat Al-Syar'iyyah Bi Al-Lugharitmiyyah Karya Muhammad Khumaidi Jazry." *AHKAM : Jurnal Ilmu Syariah* 4, no. 1 (2016).

Muhtar, Muhammad. *Taqribul Maqsod Fi Al-Amali Bi Al-Rubū' Al-Mujayyab*. Surabaya: Toko Kitab Utama, n.d.

Qulub, Siti Tatmainul. *Ilmu Falak: Dari Sejarah Ke Teori Dan Aplikasi*. Depok: Rajawali, 2017.

Rasidin, Muhammad, and Oga Satria. "Manuskrip Islam Peninggalan K . H Muhammad Burkan Saleh (1912-2010)." *Jurnal Lektur Keagamaan, Vol. 18* 18 (2020): 463–88.

Rohmah, Siti Nur. "Perhitungan Awal Waktu Shalat Menggunakan Metode *Rubū' mujayyab* (Di Pondok Pesantren Annida Al Islamy Bekasi)." Universitas Islam Negeri Syarif Hidayatullah, 2021.

Sari, Mayang. "Naskah Kitab Al-Falaqiyah (Ilmu Perbintangan) Kajian Filologi." Universitas Islam Negeri Jambi, 2021.

Ulum, Fathul. "Studi Komparatif Ḥisāb Penentuan Awal Waktu Shalat Dalam Kitab Al-Durusul Al-Falakiyah Dan Ephemeris." Universitas Islam Negeri Syarif Hidayatullah, 2020.

Wymarc, Master Richard, and M K A Timothy J Mitchell. "Kuadran Sinus Dalam Teori Dan Praktik," n.d.

Zainal, Baharrudin, and Mat Rofa Ismail. "Trigonometric Solutions Using Sine Quadrant." *Procedia - Social and Behavioral Sciences* 8, no. 5 (2010). https://doi.org/10.1016/j.sbspro.2010.12.100.