



Determining Tahrim Prayer Times Based on Sky Brightness and Sun Altitude Parameters with a Sky Quality Meter

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Abstract: The aimed of this study is to examine the time for tahrim prayer with the parameters of sky height and sky brightness. Because the average limits of the sun's height and sky brightness during the time of tahrim prayer are unknown, this study uses both data to be used as parameters in determining the time for tahrim prayer. To obtain both data, the author also used a Sky Quality Meter (SQM). This study is researched by qualitative method using field research. Where the primary source is taken from data generated by direct observation using a Sky Quality Meter (SQM). The finding of this research is determined that the duration of the tahrim prayer time with the parameters of sky brightness and sun height which ranges from 5-8 minutes before the time of Maghrib prayer. In addition, it can also determine the average limits of sky brightness and sun height data during the time of tahrim prayer. It is important to know the time for tahrim prayer so that you can perform prayers according to the time, because not all prayer time schedules have an explanation regarding the time for tahrim prayer and when the prayer time ends, not all times mark the beginning of prayer time. And avoid times when it is forbidden to perform prayers.

Keywords: Tahrim Prayer Time, Prayer Time, Sky Quality Meter (SQM), Sky Brightness, Sun Altitude

Abstrak: Penelitian ini bertujuan untuk mengkaji waktu tahrim salat berdasarkan parameter ketinggian langit dan kecerahan langit. Dikarenakan belum diketahuinya batasan rata-rata ketinggian matahari dan kecerahan langit ketika waktu tahrim salat maka penelitian ini mengambil kedua data tersebut untuk dijadikan parameter dalam menentukan waktu tahrim salat. Data dalam penelitian ini diperoleh dari hasil pengamatan menggunakan alat Sky Quality Meter (SQM). Penelitian ini adalah penelitian kualitatif dengan pendekatan data diperoleh dari lapangan. Dimana sumber primer diambil dari data yang dihasilkan observasi secara langsung menggunakan Sky Quality Meter (SQM). Hasil dari studi ini mengetahui durasi waktu tahrim salat berdasarkan parameter kecerahan langit dan ketinggian matahari yang berkisar antara 5-8 menit sebelum masuk waktu salat maghrib. Selain itu juga dapat mengetahui batas rata-rata data kecerahan langit dan ketinggian matahari saat waktu tahrim salat. Pentingnya mengetahui waktu tahrim salat agar dapat melaksanakan salat sesuai dengan waktunya, dikarenakan tidak semua jadwal waktu salat terdapat penjelasan terkait waktu tahrim salat dan ketika waktu salat berakhir tidak setiap waktunya menjadi tanda awal waktu salat. Serta terhindar dari waktu yang dilarang menunaikan salat.

Kata kunci: Waktu Salat, Tahrim, Sky Quality Meter (SQM), Kecerahan Langit, Ketinggian Matahari

A. Introduction

The Qur'an has established prayer times in Islamic terms; however, a detailed explanation has not been provided.¹ Islamic jurisprudence scholars have set limits on prayer times using various methods or methods that they assume are used to determine these prayer times.² Not only knowing

¹ Ahmad Izzuddin, *Ilmu Falak Praktis Metode Hisab-Rukyat Praktis Dan Solusi Permasalahannya*, II (Semarang: Pustaka Rizki Putra, 2012).

² Nur Imani Surur and Ahmad Adib Rofiuddin, "Hisab Awal Waktu Salat Dalam Kitab Risalah Falak Al-Anwar," *Salimiya: Jurnal Studi Ilmu Keagamaan Islam* 6, no. 1 (2025): 7, <https://doi.org/10.58401/salimiya.v6i1.2070>.



the start of prayer times, but also knowing the times when it is forbidden to perform prayers, so that you can perform prayers according to what is recommended and according to the times.³ Each of the Maktubah prayers also has various time laws and of prayer times can be used as a sign of the start of the next prayer.⁴ Because there are specific times known as tahrir prayer times when praying is prohibited. The prayers that are forbidden to be performed at these times are voluntary prayers, voluntary prayers that are not tied to any reason, prayers that are simply performed without any specific reason.⁵ For example, when you have free time and want to fill it with worship of Allah, you can pray two or more rak'ahs.

Research studies discussing the tahrir prayer times have several different perspectives and analyses. First, the research journal by Istigfar Nuvegar, Rahmatiah HL, and Abdi Wijaya, entitled "Analysis of Astronomy on Prohibited Prayer Times," examines the several tahrir prayer times from the standpoint of astronomy and Islamic law. It also explains the astronomical formula for calculating the times when prayer is prohibited.⁶ Second, Ernawati Beru Ginting's research journal entitled "Contradictions of the Hadith Prohibiting Prayer After Subuh and Asr (*Mukhtalif Al-Hadist* Study), in the journal discusses the contradictions of several hadiths regarding the prohibition of prayer after Subuh and Asr prayers.⁷ Third, Hanik Wafirotn's research, in a thesis in 2017 entitled "Formulation of Times that Affect Prayer in an Astronomical Perspective (Study of *Al-Umm* by Imam Syafi'i)". The thesis provides an astronomical explanation of the idea of makruh prayer times as stated in Imam Syafi'i's Book of *Al Umm*.⁸ The author provides the findings of study using a Sky Quality Meter since, although several studies, none have clarified the requirements for tahrir prayer times with the limitations of the sun's height and sky brightness.

The parameters used in the research on the time of tahrir prayer are the hadith narrated by Imam Muslim from Uqbah bin Amir Al-Juhanniy ra. which explains the three times of tahrir prayer, namely when the sun rises until it rises, when the sun is mid-afternoon until it declines, when the sun is leaning to the west until it sets.⁹ This research focuses on the time for tahrir prayer,

³ Ahmad Ihsan and Muhammad Zakiyul, "Uji Akurasi Jam Bencet Dalam Menentukan Awal Waktu Salat Zuhur Di Masjid Al-Muttaqin Desa Tanjunganyar Kecamatan Gajah Kabupaten Demak," *AL - AFAQ: Jurnal Ilmu Falak Dan Astronomi* 5, no. 2 (2023): 39.

⁴ Ahmad Zukhruf Nafis Khurr, "Penggunaan Ihtiyath Waktu Salat Dengan Acuan Waktu Tahrir Perspektif Fiqh Syafi'i Dan Astronomi" (Fakultas Syariah dan Hukum UIN Walisongo Semarang, 2022):20.

⁵ Muhammad Danil, "HUKUM QADHA SHALAT SUNAH FAJAR SETELAH SHALAT SUBUH STUDI KOMPARATIF IBNU QUDAMAH DAN IBNU ABIDIN," *Moefty: Jurnal Perbandingan Mazhab Dan Hukum*, no. 725 (2023):11.

⁶ Istigfar Novegar, Rahmatiah,HL, and Abdi Wijaya, "Analisis Ilmu Falak Tentang Pelarangan Waktu Salat," *HISABUNA: Jurnal Ilmu Falak* 4, no. 2 (2023): 50, <https://doi.org/10.24252/hisabuna.v4i2.30052>.

⁷ Ernawati Beru Ginting, "Kontradiksi Hadis Larangan Salat Sesudah Subuh Dan Ashar (Kajian Mukhtalif Al-Hadīs)," *Al-Mabsut: Jurnal Studi Islam Dan Sosial* 18, no. 2 (2024): 61, <https://doi.org/10.56997/almabsut.v18i2.1612>.

⁸ Hanik Wafirotn, "Formulasi Waktu Yang Dimakruhkan Salat Dalam Perspektif Astronomi (Studi Kitab *Al-Umm Karya Imam Syafi'i*)," *Fakultas Syariah Dan Hukum, Universitas Islam Negeri Walisongo Semarang* (2017):22.

⁹ Al Imam Abi Al Husain Muslim Ibnu Al-Hajjaj Al-Qusyairy An Naisabury, *Shahih Muslim:Juz 1*, Beirut, Le (Dar al Fikr, 1983):861.



when the sun is leaning westward until it sets or the time for Maghrib prayer begins. In the explanation,¹⁰ When the sun completely sets, the Tahrim prayer period ends and the Maghrib prayer period begins. The data produced by the Sky Quality Meter (SQM) is the focus of this study. the values of the sun's height and the brightness of the sky, which are then expressed as time duration.

Knowing the timing of the tahrim prayer is crucial to avoid periods when it is forbidden to offer the prayer and to ensure that it is still valid to do so. This study uses data from the Sky Quality Meter (SQM) to calculate the average limit of the sun's height and sky brightness during the tahrim prayer period. The two problem formulations that constitute the basis of this work are as follows: first, how is the tahrim prayer time determined by the Sky Quality Meter (SQM) based on the parameters of the sun's height and sky brightness? Second, what are the outcomes of the data collected by the Sky Quality Meter (SQM) during the time of the Tahrim prayer? Therefore, the discussion of tahrim prayer time based on the sun's height and sky brightness criteria are the main emphasis of this work.

B. Research methods

This research employs a field research strategy combined with a qualitative method. The focused of this research mainly on gathering statistical data on a phenomenon, particularly data on the brightness of the sky and the sun's height during the tahrim prayer hour. This study was carried out in two locations: Moro Indah Kendal Beach and the UIN Walisongo Semarang Observatory. It took place between 16.30 and 18.15, which is the time for the tahrim prayer time, which is when the sun starts to lean toward setting or enters the Maghrib prayer time. The primary source of this research data is the Sky Quality Meter (SQM), while secondary sources include hadiths that serve as references for the tahrim time and journals that discuss the tahrim prayer time from various analyses that serve as supporting data in the form of astronomical calculations and criteria.

In this study, the data analysis used is by comparing the criteria explained in Islamic jurisprudence with the results of analysis based on field measurements made with the Sky Quality Meter (SQM). The Unihedron Device Manager (UDM) software was used for data processing to calculate the sun's altitude at the time of tahrim prayer time and the average sky brightness, expressed in magnitude units per arc² MPAS. From several literature reviews and studies, no one has stated the duration of tahrim prayer time, therefore the author describes the duration of tahrim prayer time obtained according to the criteria of tahrim prayer time. By Sky Quality Meter (SQM) data that complies with the requirements of tahrim prayer time that is, when the sun starts to lean towards setting until the sun sets completely or the entry of maghrib the duration is generated from the difference in the duration of tahrim time derived from the time of Maghrib prayer and the time of tahrim prayer.

¹⁰ Slamet Hambali, *Ilmu Falak 1: Penentuan Awal Waktu Shalat & Arah Kiblat Seluruh Dunia.*, I (Semarang: Program Pascasarjana IAIN Walisongo, 2011), 40.



C. Results and Discussion

1. Tahrim Prayer Time from Fiqh and Astronomy Perspectives

Each of the Maktubah prayers also has various time laws and of prayer times can be used as a sign of the start of the next prayer.¹¹ There are specific times, known as tahrim prayer times, when praying is prohibited. The prayers referred to in tahrim prayer times are absolutely voluntary prayers, voluntary prayers that have no preceding or accompanying cause.¹² The time for tahrim prayer is explained in the Hadith narrated by Imam Muslim, namely:

ثَلَاثُ سَاعَاتٍ كَانَ رَسُولُ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ يَنْهَانَا أَنْ نُصَلِّيَ فِيهِنَّ أَوْ أَنْ نَقْبَرَ فِيهِنَّ مَوْتَانَا: حِينَ تَطْلُعُ الشَّمْسُ بَارِغَةً حَتَّى تَرْتَفِعَ، وَحِينَ يَقُومُ قَائِمُ الظُّهَيْرَةِ حَتَّى تَمِيلَ الشَّمْسُ، وَحِينَ تَضَيِّفُ الشَّمْسُ لِلْعُرُوبِ حَتَّى تَغْرُبَ

Meaning: "The Messenger of Allah (peace and blessings of Allah be upon him) prohibited us from praying or burying our dead three times: while the sun is rising till it rises again, when it is midday until it sets, and when it is slanting westward until it sets."¹³

This hadith is reinforced by the opinion of Imam Syafi'i in the book *Al-Umm*, which explains the time of tahrim salat, namely:

قال الشافعي وليس بعد هذا اختلافا في الحديث بل بعض هذه الأحاديث يدل على بعض فجماع نهي رسول الله صلى الله عليه وسلم - والله اعلم - عن الصلاة بعد الصبح حتى تطلع الشمس وبعدها تبدو حتى تبرز وعن الصلاة بعد العصر حتى تغرب الشمس وبعد مغيب بعضها حتى يغيب كلها وعن الصلاة نصف النهار حتى تزول الشمس إلا يوم الجمعة ليس على كل صلاة لزمت المصلي بوجه من الوجوه أو تكون الصلاة مؤكدة فامر بما وان لم تكن فرضا أو صلاة كان الرجل يصليها فأغفلها فإذا كانت واحدة من هذه الصلوات صليت في هذه الأوقات بالدلالة عن رسول الله صلى الله عليه وسلم ثم إجماع الناس في الصلاة على الجنائز بعد الصبح والعصر

Meaning: Imam Syafi'i said "This is not considered a contradiction, but rather some hadiths reinforce other hadiths, so the collection of prohibitions from the Messenger of Allah refers to performing prayer after the dawn prayer until sunrise, When the sun begins to set partially until it sets completely, pray when the sun is in the middle of the sky until it slips, except on Fridays. Not every prayer is forbidden to be performed at those times except for certain reasons, such as if the prayer is strongly emphasized, it must not be a fard prayer or a prayer that is usually performed by a person and he does not have time to perform it. If one of these prayers is performed at these times,

¹¹ Khurr, "Penggunaan Ihtiyath Waktu Salat Dengan Acuan Waktu Tahrim Perspektif Foqoh Syafii Dan Astronomi. 29"

¹² Ahmad Sarwat, "Seri Fiqih Kehidupan : 3 Shalat," *Fikih Shalat*, no. 3 (2011): 32.

¹³ Naisabury, *Shahih Muslim: Juz I*.



then it is permissible based on the statement of the Messenger of Allah and the consensus that it is permissible to perform the funeral prayer after the dawn and afternoon prayers.”¹⁴

In the opinion explained by Imam Syafi'i in the book *Al-Umm*, the times when prayer is prohibited are divided into five periods, namely: from dawn prayer until sunrise, after the sun begins to rise until it is fully visible. Asr prayer until sunset when the sun begins to set partially until it sets completely. And pray when the sun is at its zenith or meridian until it begins to set. There are exceptions to performing prayers during the tahrir period, such as when performing Friday prayers, eclipse prayers, and funeral prayers. Performing these prayers is permissible based on the statements of the Prophet and *ijma'*.¹⁵

Similarly, Imam Shafi'i's opinion on the prohibition of prayer is also explained in the book Fathul Qarib by Sheikh Muhammad bin Qasim al-Ghazziy, but in his explanation, he summarizes the times into three periods, namely: first, the morning time after the dawn prayer until the sun rises. Second, during the day when the sun is at its zenith. And third, in the afternoon after the afternoon prayer until sunset.

The time of tahrir can be explained as follows based on the criteria of time according to the astronomical perspective, namely: First, after the dawn prayer until sunrise, when the observer's perspective places the sun's top edge precisely on the horizon circle or mar'i horizon on the eastern of the horizon.¹⁶ ends when the sun slightly rises and reaches a height of 4.5 degrees, marking the start of the Duha prayer.¹⁷ Second, during the istiwa time, the term istiwa' refers to the event of the sun's culmination, namely the event when the center point of the sun coincides with the observer's celestial meridian.¹⁸ Third, after the Asr prayer until sunset, and when the sun begins to lean towards setting until it sets completely.

Just like prayer times in general, the shift of the sun's position is another factor that determines the tahrir prayer timings. The first time of tahrir is when the sun rises at a height of about 1 degree, meaning that the sun has risen but has just appeared from behind the horizon to the height of one spear or two spears, approximately 2.5 meters 7 *džira'* or 12 spans.¹⁹ The second tahrir time is when the time of *istiwa'*, the term *istiwa'* refers to the event of the sun's culmination, namely the event when the center point of the sun coincides with the observer's celestial meridian.²⁰ The third Tahrir time is when the sun begins to lean towards setting until it sets completely. Currently, the sun's circular disc is visible to the naked eye, and the sky on the western horizon

¹⁴ Imam Abu Abdullah Muhammad bin Idris al- Syafi'i, *Al-Umm* (Beirut: Dār al-Kutubal-Ilmiyyah, n.d.).

¹⁵ Syafi'i.

¹⁶ Riza Afrian Mustaqim, “Relevansi Jadwal Waktu Salat Sepanjang Masa,” *Jurnal Alwatzikhoebillah : Kajian Islam, Pendidikan, Ekonomi, Humaniora* 6, no. 2 (2020): 27, <https://doi.org/10.37567/alwatzikhoebillah.v6i2.282>.

¹⁷ Izzuddin, *Ilmu Falak Praktis Metode Hisab-Rukyat Praktis Dan Solusi Permasalahannya*.

¹⁸ Abdulloh Hasan, “Implikasi Bayang Istiwa' Terhadap Penentuan Awal Waktu Sholat,” *Jurnal Penelitian Agama* 22, no. 1 (2021): 5, <https://doi.org/10.24090/jpa.v22i1.2021.pp1-19>.

¹⁹ Sarwat, “Seri Fiqih Kehidupan : 3 Shalat.”

²⁰ Hasan, “Implikasi Bayang Istiwa' Terhadap Penentuan Awal Waktu Sholat,” 5.



begins to turn yellow. At sunset, the sun is positioned so that its lower disc touches the western horizon.²¹

There are three times when prayer is prohibited, as explained in the hadith of the Prophet and fiqh, but the author only analyzes the time when prayer is prohibited in the afternoon. Data collection was conducted in the afternoon from 4:30 p.m. to 6:10 p.m. Western Indonesian Time. The time of data collection was adjusted to the criteria for the time of tahrim salat. Observation began when the sun was about to set, marked by the sun turning yellow and the sky on the western horizon also turning yellow. and then ends after the sun has completely set or when it is time for the evening prayer. The duration of data collection produced data ranging from before the start of the tahrim prayer time to after the tahrim prayer time, making it possible to clearly identify the beginning and end of the tahrim prayer time.

Essentially, the formula for prayer times involves calculating when the sun will be in a certain position, which indicates prayer times. The sun's position in the horizon coordinates is crucial, especially its altitude or distance from the zenith. There are various methods for determining prayer times, and in Indonesia, these methods continue to evolve in line with advances in science and technology. In addition to using hisab (calculations), direct observation can also be used to determine the time for tahrim prayers, the Sky Quality Meter (SQM) is one of them.

Sky Quality Meter (SQM) The brightness of the night sky is measured in magnitudes per square arc second (MPSAS), or mathematically, mag/arc sec². Sky brightness can be quantified using a Sky Quality Meter (SQM). By using a Sky Quality Meter (SQM), sky brightness can be measured objectively. Sky Quality Meter (SQM) has a comparatively low error rate of under 3% and the measurement angle to the sky is 20°. ²² In addition to data in the form of magnitude, the Sky Quality Meter (SQM) also produces data on the altitude of the sun and moon, based on the time and location of observation. ²³

The process of observing the tahrim prayer time using the Sky Quality Meter (SQM) was carried out in two places that have quite different sky criteria. The first location is Moro Indah Beach, Rowosari, Kendal Regency with coordinates 6° 54' 17.3" South Latitude 110° 01' 20.77" East Longitude and an altitude of 1 MDPL. There are several reasons for placing this location, namely having a sky category with minimal light pollution with a bortle scale included in the class 3 scale, ²⁴ including one of the lowlands with an altitude of 1 MDPL and a good and unobstructed western horizon, so that the movement of the sun at sunset is clear enough to be observed.

²¹ Anis Alfiani Atiqoh, "Analisis Implementasi Ilmu Falak Dalam Penentuan Waktu-Waktu Yang Diharamkan Untuk Melaksanakan Salat" (Fakultas Syariah dan Hukum UIN Walisongo Semarang, 2017).

²² Hendro Setyanto et al., "Zodiac Light Detection Based on Sky Quality Meter (Sqm) Data: Preliminary Study," *Al-Hilal: Journal of Islamic Astronomy* 3, no. 2 (2021): 29, <https://doi.org/10.21580/al-hilal.2021.3.2.8477>.

²³ "Sky Quality Meter - LU-DL," Unihedron, accessed October 3, 2025, <https://www.unihedron.com/projects/sqm-lu-dl/>.

²⁴ "Lightpollution Map," accessed December 23, 2025, <https://www.lightpollutionmap.info>.



The existence of a second location to compare the data generated with different location criteria. The second location is the UIN Walisongo Semarang Observatory, with coordinates $6^{\circ} 59' 29.18''$ South Latitude $110^{\circ} 20' 53.61''$ East Longitude and an altitude of 83 MSAL. The reason for choosing the UIN Walisongo Semarang Observatory is first, it is classified as a large light pollution category with a bortle scale, this area is included in the class 5 scale, especially around the UIN Walisongo Observatory, there are many light disturbances originating from residential areas, buildings, and factories. Second, it is located on the 3rd and 4th floors of the UIN Walisongo Planetarium & Observatory building with an altitude of 89 MSAL, but the western horizon is blocked by several buildings to the west. This is a comparison in making observations. From these reasons, it becomes a comparison of data against observations at the first location.

The two observation locations have several differences due to their geographical locations, so the results of the study also differ. The difference in the duration of the tahrim salat each day, even though it is only a matter of seconds, is influenced by the apparent daily movement of the sun, the height of the sun, and the value of the sun's angle. For both research locations, the distance between them is not too far, so there is only a difference of about 2-3 minutes. The appearance of the sun when the tahrim time ends at sunset is indeed different, due to the different altitudes of the two locations. The sun's disk has a diameter of 32 arcminutes, so its semi-diameter is 16 arcminutes, which is close to the horizon.²⁵ Refraction shows that the position of the sun is higher than it actually is for 34 arc minutes, so the low horizon of both locations also has a difference that is used as a comparison by the author.²⁶

From the results of direct observations of tahrim prayer times for one month and after data selection due to weather factors that affect observations. Then obtained 23 data at Moro Rowosari Beach Kendal and 11 Data at the UIN Walisongo Observatory Semarang. The data above is a comparison between data from SQM sky brightness data (MPAS) and sun height (Altitude). At the beginning of the tahrim time begins to adjust to the criteria when the sun begins to lean westward towards sunset and the sun's disk is yellowish & can be seen in its entirety with the naked eye. The end of the tahrim time is based on the sun having set completely or has entered the time for Maghrib prayer.

2. Determining Tahrim Prayer Times by Sky Quality Meter (SQM)

In islamic astronomy, the Qur'an and the Prophet SAW's Hadith serve as the basis for the specific prayer hours. This becomes a schedule text from the collaborative understanding of the perspectives of Islamic jurisprudence, astronomy, and geography, which is then defined as an exact

²⁵ Dini Rahmadani, "Telaah Rumus Perhitungan Waktu Salat : Tinjauan Parameter Dan Algoritma," *Al-Marshad: Jurnal Astronomi Islam Dan Ilmu-Ilmu Berkaitan* 5729, no. December (2018): 3.

²⁶ A. Zuhruhin Hadi Saputra and A. Mufti Khazin, "Perhitungan Koreksi Refraksi Dalam Penentuan Tinggi Matahari Pada Awal Waktu Salat Asar," *Azimuth: Jurnal of Islamic Astronomy* vol.5, No (2024): 9, <https://doi.org/https://doi.org/10.15642/azimuth.v5i2.2671>.



calculation as a benchmark for the time for Muslims to perform the obligatory 5 daily prayers.²⁷ Accuracy in determining prayer times, besides depending on the system or formula used, also depends greatly on the accuracy of data collection related to the sun and other information required in the calculation process. Just as determining the time for obligatory prayers, determining the time for tahrim prayers is also based on the sun's daily movement.

Among three requirements for the tahrim prayer period, the author conducted one study, namely the time of the tahrim prayer when the sun begins to tend to set until it sets completely. By adapting the hadith of the Prophet narrated by Imam Muslim.

وَحِينَ تَضَيَّفَ الشَّمْسُ لِلْغُرُوبِ حَتَّى تَغْرُبَ "when the sun leans to the west until it sets."²⁸ It can be interpreted as when the sun begins to lean towards setting when the lower disk of the sun begins to touch the western horizon and begins to turn yellowish, which can be seen as a round disk in its entirety with the naked eye and the condition of the sky on the western horizon begins to turn yellowish, which indicates that the sun will soon set completely.²⁹ And because of tiny particles in the atmosphere scattering and reflecting sunlight, the sky begins to become yellow, such as dust and water vapor.³⁰

From the data generated by the Sky Quality Meter (SQM), two data points are analyzed: solar altitude and sky brightness, measured in magnitude per arc2 MPAS. The following data was obtained by SQM during Tahrim prayer time:

Table 1. Results table at Moro Beach Kendal

| SQM Data Results at Moro Indah Beach, Rowosari, Kendal | | | | | | |
|--|---------------------|---------|------|--------------------------------|---------|------|
| Date | Beginning of Tahrim | | | End of Tahrim/ Maghrib time | | |
| | Time | Elv Sun | MSAS | Time | Elv Sun | MSAS |
| 06/09/2025 | 17:28:45 | 0.4128 | 6.15 | 17:35:00 | -1.132 | 7.1 |
| 07/09/2025 | 17:29:28 | 0.2106 | 5.94 | 17:35:00 | -1.1159 | 6.87 |
| 08/09/2025 | 17:28:11 | 0.5039 | 5.94 | 17:35:00 | -1.1781 | 7.01 |
| 09/09/2025 | 17:30:08 | 0.035 | 5.94 | 17:35:00 | -1.1984 | 6.61 |
| 10/09/2025 | 17:29:24 | 0.1625 | 5.94 | 17:35:00 | -1.2195 | 7.14 |
| 11/09/2025 | 17:28:00 | 0.1625 | 6.16 | 17:35:00 | -1.2195 | 7.04 |

²⁷ Muhammad Hadi Bashori, *Pengantar Ilmu Falak*. "Pustaka Al-Kautsar, ed. Achmad Zirzis (Jakarta: Pustaka Al-Kautsar, 2015);17.

²⁸ Naisabury, *Shahih Muslim: Juz I*.

²⁹ Atiqoh, "Analisis Implementasi Ilmu Falak Dalam Penentuan Waktu-Waktu Yang Diharamkan Untuk Melaksanakan Salat.";18.

³⁰ Zainul Arifin et al., "Tinjauan Astronomi Tentang Pembagian Waktu Asar Dalam Kitab Fath Al-Qarib," *Al-'Adalah: Jurnal Syariah Dan Hukum Islam* 9, no. 1 (2024): 51, <https://e-journal.uac.ac.id/index.php/adlh/article/view/5398>.



| | | | | | | |
|----------------|-----------------|-----------------|-----------------|-----------------|----------------|-----------------|
| 12/09/2025 | 17:28:00 | 0.4728 | 7.57 | 17:35:00 | -1.2487 | 8.94 |
| 13/09/2025 | 17:28:00 | 0.4584 | 7.54 | 17:35:00 | -1.2614 | 8.74 |
| 14/09/2025 | 17:28:00 | 0.4462 | 7.38 | 17:35:00 | -1.2723 | 8.47 |
| 15/09/2025 | 17:28:00 | 0.4356 | 6.42 | 17:35:00 | -1.2809 | 7.53 |
| 16/09/2025 | 17:27:23 | 0.5784 | 5.94 | 17:35:00 | -1.2875 | 6.97 |
| 17/09/2025 | 17:26:36 | 0.7639 | 5.94 | 17:35:00 | -1.2917 | 7.23 |
| 18/09/2025 | 17:28:47 | 0.2259 | 5.94 | 17:35:00 | -1.2937 | 6.86 |
| 19/09/2025 | 17:27:48 | 0.4648 | 5.94 | 17:35:00 | -1.2931 | 6.98 |
| 20/09/2025 | 17:27:17 | 0.5917 | 5.94 | 17:35:00 | -1.29 | 7.02 |
| 21/09/2025 | 17:29:24 | 0.07917 | 5.94 | 17:35:00 | -1.2845 | 7.14 |
| 22/09/2025 | 17:29:22 | 0.3814 | 5.94 | 17:35:00 | -1.2523 | 6.96 |
| 23/09/2025 | 17:28:16 | 0.3953 | 5.94 | 17:35:00 | -1.2362 | 6.94 |
| 26/09/2025 | 17:28:00 | 0.4764 | 6.98 | 17:35:00 | -1.2175 | 7.81 |
| 27/09/2025 | 17:28:00 | 0.4956 | 6.38 | 17:35:00 | -1.1959 | 7.25 |
| 28/09/2025 | 17:28:00 | 0.5175 | 7.28 | 17:35:00 | -1.1717 | 8.27 |
| 29/09/2025 | 17:28:00 | 0.5423 | 6.47 | 17:35:00 | -1.1448 | 7.52 |
| 30/09/2025 | 17:28:00 | 0.5698 | 7.24 | 17:36:00 | -1.1148 | 8.62 |
| Average | 17:28:15 | 0.449908 | 6.456667 | 17:35:07 | -1.2119 | 7.503333 |

Table 2. Results table at the UIN Walisongo Observatory

| SQM Data Results at the Walisongo State Islamic University Observatory | | | | | | |
|---|-----------------------------------|-----------------------|-----------------|---|-----------------------|-------------|
| Date | Beginning of <i>Tahrim</i> | | | End of <i>Tahrim</i>/ Maghrib time | | |
| | Time | <i>Elv Sun</i> | MSAS | Time | <i>Elv Sun</i> | MSAS |
| 07/10/2025 | 17:32:41 | 0.894 | 4.82 | 17:40:00 | -1.579 | 6.59 |
| 08/10/2025 | 17:31:30 | 0.855 | 6.17 | 17:40:00 | -1.615 | 8.13 |
| 09/10/2025 | 17:32:27 | 0.816 | 6.2 | 17:40:00 | -1.656 | 8.31 |
| 14/10/2025 | 17:32:09 | 0.613 | 5.79 | 17:40:00 | -1.618 | 8.12 |
| 15/10/2025 | 17:31:45 | 0.571 | 6.08 | 17:40:00 | -1.66 | 8.56 |
| 16/10/2025 | 17:33:03 | 0.529 | 7.12 | 17:40:00 | -1.455 | 9.24 |
| 17/10/2025 | 17:32:49 | 0.487 | 5.92 | 17:40:00 | -1.497 | 8.26 |
| 19/10/2025 | 17:31:56 | 0.404 | 6.7 | 17:40:00 | -1.581 | 7.99 |
| 07/10/2025 | 17:32:41 | 0.363 | 5.96 | 17:40:00 | -1.622 | 7.43 |
| Average | 17:32:17 | 0.614667 | 6.084444 | 17:40:00 | -1.587 | 8.07 |



Based on the observation table of the two places, there are several differences in tahrim prayer times. Differences in some of these data include: 1) the fastest time occurred at 17:26:36 WIB with a sky brightness of 5.94 MPAS and a sun altitude of 0.7639 2) the slowest time occurred at 17:30:08 WIB with a sky brightness of 5.94 MPAS and a sun altitude of 0.035. 3) The smallest sky brightness was 4.82 MPAS at 17:30:00 WIB and a sun altitude of 0.894. 4) the largest sky brightness was 7.57 MPAS at 17:28:00 WIB and a sun altitude of 0.4728. 5) The lowest sun altitude value was 0.07917. at 17:29:24 WIB and the sky brightness was 5.94 MPAS 6) The highest sun altitude value was 0.894 at 17:30:00 WIB and the sky brightness was 4.82 MPAS.

During the observation of the sun's altitude when the time for tahrim prayer begins is at a height of no more than 1 degree above the horizon. One indication of the onset of the tahrim period is when the lower edge of the sun begins to touch the horizon, assuming a horizon height of 0-1 degrees. To determine the position of the sun and its visibility when entering the time of tahrim salat, photos were taken directly in the field using a Sony ILCE-6000 camera with an ISO setting of 160 and a shutter speed of 1/200 sec, with photos taken every 5 seconds. The photos were processed using AstroImageJ software. Based on this analysis, when the sun appears to be approaching the horizon, the light intensity data is reduced at the time of tahrim prayer. The data values are then compared with the results obtained from the Sky Quality Meter (SQM) to determine the movement of the sun's position, the sun's altitude, changes in the color of the sun's disk, and the brightness of the sky.

As the sun approaches the horizon, Tahrim time starts, its light decreasing significantly. The previously bright sunlight begins to fade and appear weaker and dimmer. It happens when the sun becomes to the horizon, causing atmosphere to absorb and scatter lighter. The sky changes color from blue to orange, red, or even purple. The time for Tahrim ends when the sun completely sets, which is marked by the natural light almost completely disappearing but may still have a little twilight light. During the time for Tahrim prayer, the sky brightness is at its lowest at 4.82 MPAS at 17:30:00 WIB with a solar altitude of 0.894. The sky brightness is at its highest at 7.57 MPAS at 17:28:00 WIB with a solar altitude of 0.4728. The brightness value of the sky was taken from the change in value when the sun entered the tahrim prayer time criteria, which was obtained through the results of two analyses using data obtained from the Sky Quality Meter (SQM) and AstroImageJ software.

The average the sun altitude at a height of 0.449908 above the horizon, the tahrim prayer period starts, with the lowest value at a height of 0.035 and the highest value at a height of 0.7639 located at the location of Pantai Moro Indah, Rowosari, Kendal. Meanwhile, for the location of the UIN Walisongo Semarang Observatory, the average is at a height of 0.614667 above the horizon, the lowest value is at a height of 0.363 and the highest value is at a height of 0.894. The sky brightness used refers to changes in the sky and changes the sun's color before and after tahrim prayer time. When the sun reaches the horizon and its complete round disc is visible to the unaided



eye, as well as when the sky on the western horizon starts to become yellowish, that is when the Tahrim prayer begins.³¹ In accordance with the criteria mentioned in the hadith and fiqh.

3. Duration of Tahrim Prayer Time

The visibility of the sun's position is influenced by the height of an area, although the height of the place does not directly change the path of the sun, but it also has an influence in determining the prayer time schedule and especially for determining the tahrim prayer time. In every prayer time calculation, latitude and longitude of a place are very important because the calculation results will not match an area if the latitude and longitude do not match.³² In addition, in areas with higher ground, the sun appears to rise earlier and set later than in areas with lower ground around it. Furthermore, the condition of the western horizon is a factor in determining the time for tahrim prayer. Differences in altitude affect prayer times, especially the time for tahrim prayer. In determining the duration of tahrim prayer, the altitude of the area is still considered, such as at the location of Moro Indah Beach, Rowosari, which has an altitude of 1 masl and at the location of the Walisongo UIN Semarang Observatory, the altitude is 89 MDPL.

The data from this research is gotten from the Sky Quality Meter (SQM) is then correlated with the 2025 ephemeris technique used to construct the prayer time schedule. The use of prayer times here is intended to determine the arrival of Maghrib as a sign of the end of the tahrim prayer time. Because in various prayer time schedules that have been made by various parties, the tahrim prayer time has not been included, so it is highly expected that the party making the prayer schedule includes the tahrim prayer time or provides a little understanding of the tahrim prayer time. The following are the results of the tahrim prayer time duration based on Sky Quality Meter (SQM) data:

Table 3. Tahrim Prayer Time Data Table at Moro Indah Beach, Rowosari

| Date | Beginning of Tahrim | End of Tahrim | Duration |
|------------|---------------------|---------------|----------|
| 06/09/2025 | 17:28:45 | 17:35:00 | 00:06:15 |
| 07/09/2025 | 17:29:28 | 17:35:00 | 00:05:32 |
| 08/09/2025 | 17:28:11 | 17:35:00 | 00:06:49 |
| 09/09/2025 | 17:30:08 | 17:35:00 | 00:04:52 |
| 10/09/2025 | 17:29:24 | 17:35:00 | 00:05:36 |
| 11/09/2025 | 17:28:00 | 17:35:00 | 00:07:00 |

³¹ Novegar, Rahmatiah, HL, and Wijaya, "Analisis Ilmu Falak Tentang Pelarangan Waktu Salat," 6.

³² SRI RAHMADANI PULU PULU, "Analisis Posisi Astronomis (Lintang Dan Bujur) Terhadap Perbedaan Awal Waktu Shalat Di Provinsi Maluku.," *Jurnal Pendidikan Mipa* 12, no. 1 (2022): 53, <https://doi.org/10.37630/jpm.v12i1.540>.



| | | | |
|----------------|-----------------|-----------------|-----------------|
| 12/09/2025 | 17:28:00 | 17:35:00 | 00:07:00 |
| 13/09/2025 | 17:28:00 | 17:35:00 | 00:07:00 |
| 14/09/2025 | 17:28:00 | 17:35:00 | 00:07:00 |
| 15/09/2025 | 17:28:00 | 17:35:00 | 00:07:00 |
| 16/09/2025 | 17:27:23 | 17:35:00 | 00:07:37 |
| 17/09/2025 | 17:26:36 | 17:35:00 | 00:08:24 |
| 18/09/2025 | 17:28:47 | 17:35:00 | 00:06:13 |
| 19/09/2025 | 17:27:48 | 17:35:00 | 00:07:12 |
| 20/09/2025 | 17:27:17 | 17:35:00 | 00:07:43 |
| 21/09/2025 | 17:29:24 | 17:35:00 | 00:05:36 |
| 22/09/2025 | 17:29:22 | 17:35:00 | 00:05:38 |
| 23/09/2025 | 17:28:16 | 17:35:00 | 00:06:44 |
| 26/09/2025 | 17:28:00 | 17:35:00 | 00:07:00 |
| 27/09/2025 | 17:28:00 | 17:35:00 | 00:07:00 |
| 28/09/2025 | 17:28:00 | 17:35:00 | 00:07:00 |
| 29/09/2025 | 17:28:00 | 17:35:00 | 00:07:00 |
| 30/09/2025 | 17:28:00 | 17:36:00 | 00:08:00 |
| Average | 17:28:15 | 17:35:07 | 00:06:51 |

Table 4. Tahrim Prayer Time Data Table at the Walisongo State Islamic University Observatory

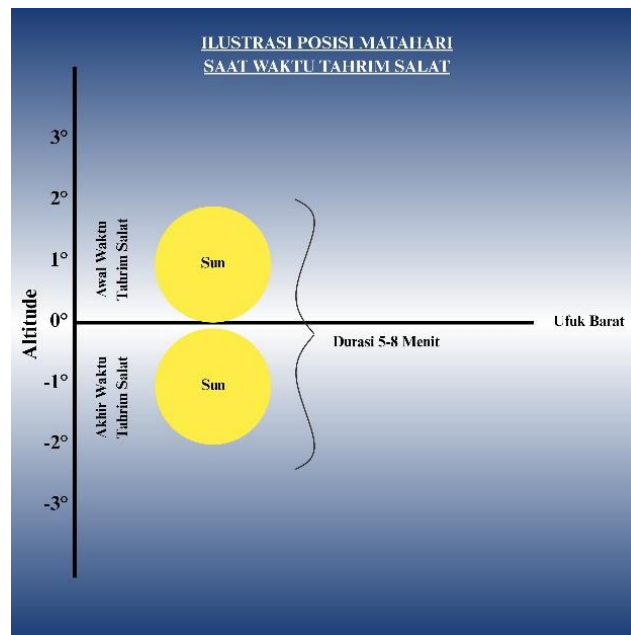
| Date | Beginning of Tahrim | End of Tahrim | Duration |
|----------------|----------------------------|----------------------|-----------------|
| 07/10/2025 | 17:32:41 | 17:40:00 | 00:07:19 |
| 08/10/2025 | 17:31:30 | 17:40:00 | 00:08:30 |
| 09/10/2025 | 17:32:27 | 17:40:00 | 00:07:33 |
| 14/10/2025 | 17:32:09 | 17:40:00 | 00:07:51 |
| 15/10/2025 | 17:31:45 | 17:40:00 | 00:08:15 |
| 16/10/2025 | 17:33:03 | 17:40:00 | 00:06:57 |
| 17/10/2025 | 17:32:49 | 17:40:00 | 00:07:11 |
| 19/10/2025 | 17:31:56 | 17:40:00 | 00:08:04 |
| Average | 17:32:17 | 17:40:00 | 00:07:42 |

The duration of tahrim time comes from the difference between the time of Maghrib prayer and the tahrim prayer time based on data. The end of the tahrim prayer time is when the sun has completely set or the beginning of the Maghrib prayer time. This can be interpreted as when the

sun has completely set.³³ The Maghrib prayer time listed is calculated by the coordinates of the research location and its altitude and does not use the ihtiyath time. At Moro Indah Beach, Rowosari, Kendal, the tahrim prayer time occurs five to eight minutes before the Maghrib prayer time, while at the Walisongo State Islamic University Observatory, Semarang, the tahrim prayer time occurs ten minutes before the Maghrib prayer time.

The shortest duration of the tahrim prayer time is 5 minutes at 17:30:08 WIB to 17:35:00 WIB and the longest duration with a duration of 8 minutes at 17:26:36 WIB to 17:35:00 WIB. The duration obtained is the result of the author's analysis by comparing Sky Quality Meter (SQM) data with light intensity reduction data generated using AstroImageJ software to determine the movement of the sun's position, the sun's altitude, changes in the color of the sun's disk, and the brightness of the sky. There is a difference in the duration of the tahrim prayer time every day which is not too significant, although it is still in the range of several seconds, it is impacted by the sun's height, apparent daily movement, and solar time angle value. Based on the results of observations at both locations after analysis, data was taken with conditions where the sun can be observed or is not blocked by clouds or overcast. When the weather conditions are cloudy, the duration of the tahrim prayer time is taken by the average duration of the tahrim prayer time during the observation. Then it is correlated with Sky Quality Meter (SQM) data by taking solar altitude data based on the Tahrim prayer time criteria.

Image 1. sun' position during the Tahrim prayer.



³³ Slamet Hambali, *Almanak Sepanjang Masa (Sejarah Sistem Penanggalan Masehi, Hijriyah, Dan Jawa)* (Semarang: Program Pascasarjana IAIN Walisongo Semarang, 2011); 26.



The computation of the beginning of the Maghrib, Isha, and Subuh prayer periods will be impacted by the altitude data, but not the start of the Dhuhr and Asr prayer times.³⁴ Considering that location data in the form of altitude is very necessary in the tahrim prayer times. One of the effects is the scattering of different refracted sunlight, which makes the sun appear to set in a *mar'i* manner. This is because the problem of sunrise and sunset is influenced by the position of the *mar'i* horizon (Visible Horizon) because the round shape of the sun, the *mar'i* horizon will appear lower. If the observer's position is in a higher area, the lower horizon will cause the sun to appear to rise earlier and set later.³⁵ Therefore, the time for Tahrim prayer is also affected by solar refraction, as the times for Tahrim prayer begins when the sun begins to lean towards setting, marked by its yellowish hue and the sun's disc being fully visible. It then ends when the sun sets completely. The elevations of the two observation locations differ, resulting in differences in the duration of Tahrim prayer time.

The Tahrim prayer period starts when the sun touches the horizon before sunset and finishes until the sun is entirely below the horizon, as seen in the above figure. When the sun is getting closer to the horizon, it is Tahrim time with a positive value marked with a plus sign (+) and ends when the sun has set completely from the horizon with a negative value marked with a minus sign (-) or the Maghrib prayer time with a sun height of -1 degree based on astronomical criteria³⁶ The results of observations of the sun's height when the tahrim prayer time begins is at a height of no more than 1 degree above the horizon.

Data generated by the Sky Quality Meter (SQM) can only be obtained when the weather is clear enough. Weather conditions that make direct observation impossible, such as cloudy or rainy weather, are one of the drawbacks of the Sky Quality Meter (SQM). From both observation locations, the data generated is still relatively weak, because the western horizon is blocked by hills or buildings. As a result, when the sun begins to set, the sun's condition at both locations is not clearly visible. Only when the sun is at the Tropic of Cancer does the Sky Quality Meter (SQM) produce data, which occurs from September 23 to December 22.³⁷ The appearance of the sun and astronomical data for the sun differ when the sun is at the Tropic of Capricorn and at the Tropic of Capricorn.

D. Conclusion

³⁴ Arief Taufikurrahman, "Simulasi Perhitungan Awal Waktu Salat Berdasarkan NOAA Solar Calculator Menggunakan Spreadsheet," *AL - AFAQ : Jurnal Ilmu Falak Dan Astronomi* 5, no. 1 (2023): 7.

³⁵ Unggul Suryo Ardi, "Problematika Awal Waktu Shubuh Antara Fiqih Dan Astronomi," *AL - AFAQ : Jurnal Ilmu Falak Dan Astronomi* 2, no. 2 (2020): 14.

³⁶ Nur Qomariyah, "Penentuan Awal Waktu Salat (Awal Waktu Salat Asar, Magrib, Dan Isya Berdasarkan Hadis Nabi)," *AL - AFAQ : Jurnal Ilmu Falak Dan Astronomi* 2, no. 2 (2020): 24.

³⁷ Hasanuddin Muhammad, "PERBEDAAN AWAL WAKTU SHALAT DUNIA: Analisis Aplikasi Athan Tinjauan Terhadap Posisi Matahari Dan Letak Geografis," *Al-Maslahah : Jurnal Ilmu Syariah* 16, no. 1 (2020): 34, <https://doi.org/10.24260/al-maslahah.v16i1.1130>.



Determining the time for tahrim prayer using the Sky Quality Meter (SQM) focuses on collecting data on sky brightness and the sun's altitude during tahrim prayer time. To ascertain the average value of the sky brightness and the limit of the sun's height from the beginning to the conclusion of the tahrim prayer period, the results of this data are then structured as a time duration. The maximum sky brightness is 7.57 MPAS and the minimum sky brightness is 4.82 MPAS. The brightness value of the sky was taken from the change in value when the sun entered the criteria for the time of tahrim prayer, which was obtained through the results of two analyses using data from the Sky Quality Meter (SQM) and AstroImageJ software. During observation, the height of the sun when the time for tahrim prayer begins is no more than 1 degree above the horizon. One indication of the onset of the tahrim period is when the lower edge of the sun begins to touch the horizon, assuming a horizon height of 0-1 degrees. The average sun altitude is 0.449908 above the horizon, with the lowest sun altitude being 0.07917 and the highest sun altitude being 0.894 above the horizon.

Knowing the time for prayer tahrim is certainly different for each region. From this data, we can see the criteria that have been formulated into a format of hours or duration of time when the tahrim prayer takes place. This duration occurred between 5 and 8 minutes before Maghrib prayer time at Moro Indah Beach, Rowosari, Kendal, and 10 minutes before Maghrib prayer time at the UIN Walisongo Observatory in Semarang. This duration is obtained from the difference between the start of the tahrim prayer time and the maghrib prayer time as the end of the tahrim prayer time, calculated without using the ikhtiyat time. It is important to know the time for tahrim prayer so that you can perform the prayer according to the time, because not all prayer time schedules have an explanation regarding the time for tahrim prayer.

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