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THE CASE OF THE TWO CHURCHES OF SANT'APOLLINARE IN PIEDMONT (ITALY): CAN ARCHAEOASTRONOMY HELP TO IDENTIFY WHICH OF THEM IS THE TEMPLAR ONE?

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ABSTRACT

In this paper we analyze the strange case of two churches located not far from each other, identified with the same name, Sant'Apollinare, situated one in Carpignano Sesia (No) and the other in Fisrengo-Casalbeltrame (No), at about ten kilometers each other, in the region of Piedmont, Italy. In a deed dated 1174 A.D it is mentioned the Templar Mansione Sanctum Apollinarem, in the area of Novara, where the Count Guido of Biandrate donates to the Templars everything he owned in the region Ruspalia, but there is not any indication or land registry map to identify the exact position of the mansio. In these two places the Order's presence is indicated by the archive historical documents, mostly, related to acts of buying and selling, but despite this there is a diatribe for the identification of the "Templar Church". Additional means of identification can be offered by an archaeoastronomical analysis of the temples within the context of their surrounding landscape and skyscape. A twofold approach was chosen, consisting of an archaeoastronomical examination of the temple's orientations, and an analysis of placenames and documents which. The two churches have been measured "in situ. Subsequently an appropriate statistical study was carried out in order to infer the distribution function of the astronomical orientations with the aim to perform an appropriate archaeoastronomical analysis. A set of appropriate statistical tests, based on artificial Neural Network, were designed and applied in order to check the possible solutions. The result is that the church that best meets the features of the Templar churches built in Piedmont is the church Sant'Apollinare in Carpignano Sesia.

KEYWORDS: Archaeoastronomy, Templar Knights, Templar church, Astronomy

1. INTRODUCTION

1.1. *A brief history of the Templar Order*

The Poor Knights of Christ and of the Temple of Solomon, (*Pauperes commilitones Christi templique Salomonis*) a religious military order of knighthood was originally founded to protect Christian pilgrims to the Holy Land and subsequently the order assumed greater military duties during the 12th century.

In 1119, the French knight Hugues de Payens approached King Baldwin II of Jerusalem and Warmund, Patriarch of Jerusalem, and proposed creating a monastic order for the protection of these pilgrims. Thanks to the significant contribution of Bernard of Clairvaux, at the Council of Troyes, 1129, the Templars were given a proper Rule, which was followed by the issue of three key bulls establishing the Templar as a privileged Order under Rome. In 1139, Pope Innocent II papal bull *Omne Datum Optimum* exempted the Order from obedience to local laws. Templars began to accumulate a substantial landed base in the West, not only in France, Provence, Iberia and England, where they were first known, but also in Italy, Germany, Dalmatia and Cyprus. By the late 13th century they may have had as many as 870 castles, preceptories and subsidiary houses spread across Latin Christendom. During the 12th and 13th centuries these properties were built into a network of support which provided men, horses, money and supplies for the Templars in the East.

On Friday, 13 October 1307 King Philip IV ordered de Molay and scores of other French Templars to be simultaneously arrested. At the Council of Vienne in 1312, Pope Clement issued a series of papal bulls, including *Vox in excelso*, which officially suppressed the Order, and *Ad providam*, which turned over most Templar assets to the Hospitallers. As for the leaders of the Order, the elderly Grand Master Jacques de Molay and Geoffroi de Charney, Preceptor of Normandy, were declared guilty of being relapsed heretics, and they were sentenced to burn alive at the stake in Paris on 18 March 1314.

1.2. *Templar Mansio in Piedmont*

A strange destiny occurred to all the Templar mansions, churches and properties formerly existing in the bishopric of Novara, Piedmont, Italy, condemned by time and unlucky events to undergo the uncertainty of the identification of the location site. The limited number of documents that cite the places is often characterized by nebulous and inaccurate references. Moreover, the buildings have been systematically destroyed and the residual traces, due to the anthropization, have been hidden. The scarce

presence of the Templars in this area had to deal with political problems due to their evident support to the imperial cause and culminated with the close relationship with the Biandrate family, enemy of Novara. That's why following the annihilation of the political power of this family the domus were abandoned. A serious problem of identification has arisen for the Templar Mansio of Sant'Apollinare. It is mentioned in a Templar notary deed of 1164, a document that has generated many misunderstandings.

In the Templar Mansio of Sant'Apollinare was drawn up the famous donation of the real estate of Santa Maria di Ruspaglia, in San Giorgio Canavese, to the Templar Knights Order.

In this act, dated September 25, 1164, we read that "the Count "Guido il Grande" of Biandrate in the presence of his sons and friars Alchenius and Portonarius, at the mansio, donates to the Templar Knights Order everything he owned in San Giorgio Canavese, Ruspalia". The question is that there is no geographical indication of the location of the Mansio of Sant'Apollinare.

Two academic scholars who are experts in local history have provided two different locations for the Mansio. The Vercelli historian Avonto, in a work of 1982, identifies the Templar Mansio with the Church of Sant'Apollinare in Fisrengo, citing the following reasons: the observation of what is still visible today, the strategic location of the alleged mansio in relation to the road network of the time, the surrounding territory rich in fountains and springs and the dedicatory title of the church of Fisrengo which would remind the Biandrate family (Avonto, *L. I Templari a Vercelli*, Vercelli 1977)

Some buildings of the farmhouse that incorporate the church, however, although they are ancient, are placed at most to date back to the sixteenth century. Regarding the strategic location, close to the major roads of communication, it has ensured that the distance of Fisrengo from the Via Francisca was 10km, from the Via Blandrena 5 km, 6 km from the Via Novarese, and at the time it was not right next to each. Regarding the dedication "Sant'Apollinare", it is possible to connect with the election to Bishop of Ravenna, in 1159, of Guido son of "Guido il Grande" of Biandrate. Analyzing the documents, however, it does not appear that Fisrengo ever belonged to the counts of Biandrate, but it turns out to have always belonged to the counts De Fisrenghi. The Novara historian Fiori, after having carefully studied the documents, identifies the church of Sant'Apollinare in the locality of Carpignano Sesia as the one mentioned in the deed. It is documented that Carpignano was a possession of the counts as early as 1070 A.D. East of Carpi runs the via Blandrena, a fundamental axis for power, economy and commerce. This ancient

road from Biandrate went up the Valsesia, on the left bank of the river, up to the slopes of Monte Rosa. The village is at the crossroads of this street and another very important route that came from Ticino and flows from east to west, it passed through Carpignano and crossed the Sesia. The Knights Templar built their suburban mansio on the streets of great commercial communication and pilgrimage, so to be closer to their land properties and better serve the pilgrims on their journey with hospital and refreshment facilities.

2. MATERIALS AND METHODS

Here we present the results of our analysis of the architectural alignments of the two Churches, whose data are based on measurements made by us in the field in different stages, from spring 2016 until March 2017. The complete mapping of the area was carried out using the GPS satellite tracking system with a portable Garmin Etrex set to the WGS84 coordinate system; the azimuth of orientation were measured with two compasses, a Sunto and a Silva; we also quite had a clinometer for detecting directly the heights of the mountains located on the opposite site. The error of a single measurement, detected by the profile of the scale of the instrument, is about $\frac{1}{2}^\circ$ for the azimuth and $\frac{1}{2}^\circ$ for the local horizon height.

The azimuth measured evaluated, being detected with a magnetic compass, were corrected by the magnetic declination obtained from the website <http://www.ngdc.noaa.gov> and mathematical calculations.

2.1. *Sant'Apollinare in Fisrengo* ($45^\circ 25' 00''$ N; $8^\circ 29' 35''$ E)

The farmhouse of Sant'Apollinare in Fisrengo rises about 1 km east of the municipality of Fisrengo, a hamlet of Casalbeltrame, province of Novara. The complex consists of four main parts dating back to different periods: the ancient church; an eighteenth-century building leaning against the left side of the church looking at the façade; an ancient building leaning against the church, but hidden from view from the outside and various successive rural buildings. The church has clear signs of restoration work, mostly from the 17th century, but also later. The most interesting part is the construction, hidden from the outside, which bears traces of ancient origin. The historian Avonto proposes that this building rises on the foundations of the ancient Templar domus annexed to the church of Sant'Apollinare, mentioned in the document of 1164 (Figure.1).



Figure 1: *Sant'Apollinare in Fisrengo*.

The church is composed of a main nave flanked by two altars housed in a sort of side aisle separated by a pillar with two round arches. All the walls and the ceiling are painted with architectural and floral motifs in shades of yellow ocher and with various

figures in the panels. I found no trace of the sixteenth-century fresco with the Madonna delle Grazie. To the left of the entrance there is what remains of the marble high altar, while the barrel vault overhangs with the adoration of the monstrance. At the

center of the nave there is an amazing sarcophagus of gilded wood placed on a wooden base surrounded by statues also wooden. These are the relics of a saint: Santa Esuberanza, whose body simulacrum, covered, is located inside with the vase containing the true relics. Next to the second altar, on the wall to the right of the presbytery, there is a large, rather battered canvas representing the Virgin with Child surrounded by various figures of saints: St. Joseph, St. Anthony of Padua, St. Charles Borromeo and at the foot two holy bishops. On the back wall of the church, what had to have the now walled entrance door, there is a large crucifix. On the side we see an old door that allowed a time to probably access a choir, a sort of wooden balcony whose signs can still be seen in the walls. Behind the high altar a small door leads into the bell tower.

The measurements were carried out on 5/10/2016 and 15/03/2017. The main side of the church is 19 meters, while the smaller side is 5.50 meters. The perimeter walls of the church, dating to the first building, are oriented with a measured azimuth of $(93.9^\circ \pm$

$0.5^\circ)$ and $(273.9^\circ \pm 0.5^\circ)$, the same orientation of the axis of the nave was detected. The churches were often oriented to the rising sun at the equinox, they were mostly equinoctial, that is, with an azimuth of orientation of the nave of 90° . When the sky was observed the day of the September 23, 1164, the Autumn Equinox, the sun arose at the local horizon with an azimuth of orientation which value was $(93.9^\circ \pm 0.5^\circ)$. We have calculated the real date of the Autumn equinox in the year 1164 A.D. and it was September 16th. and for about a century it did not change. The solar year related to the astronomical year, over the centuries had accumulated a small delay each year until you get to about 7 days in the twelfth century, because of the error in the Julian calendar. In this way, the azimuth of the rising sun measured to plan the construction of the church is different from the correct one, because the equinox day was September 16, 1164, that is seven days before and in this date the true value of the astronomical azimuth of the rising sun on the local horizon was 90.0° degrees. Figure 2

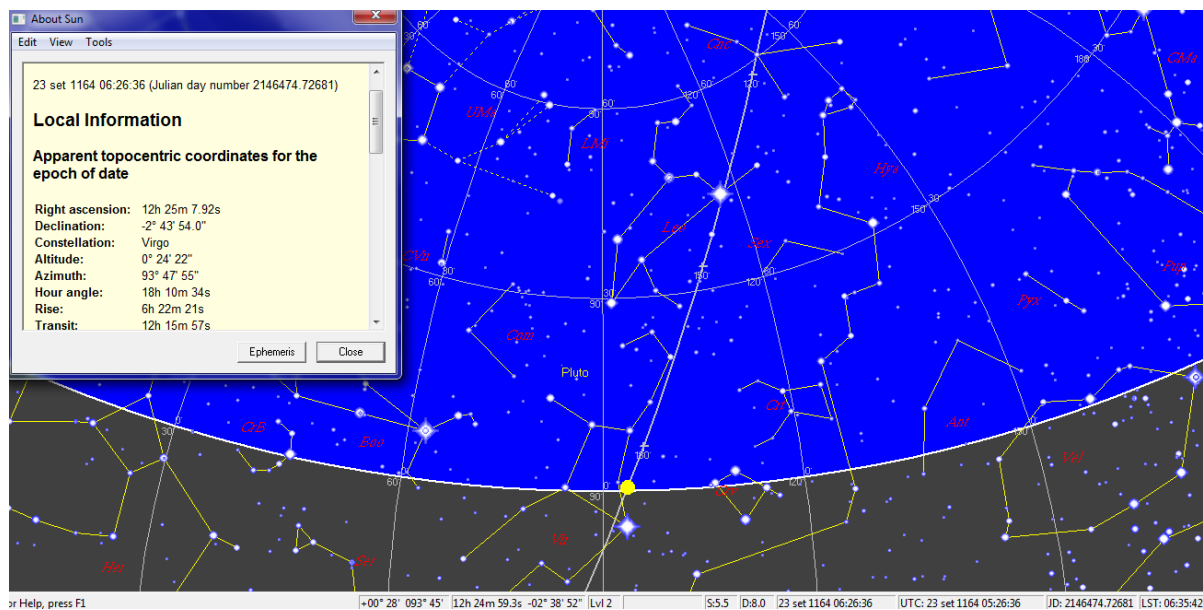


Figure 2: Sun rising on the Day of Equinox, 23th September 1164.

2.2 Sant'Apollinare in Carpignano Sesia ($45^\circ 31' 44''$ N ; $8^\circ 25' 48''$ E)

The chapel is located south of the town in the direction of Sillavengo, close to the route of the ancient via Blandratina (or Biandrina), a strategic and economic pillar of the road network of the possessions of the counts and secondary branch of the "via pellegrinale alta" of the Francigena "for the steps towards France and Santiago (Fiori, S., 2015). The large part of the building, rebuilt at the beginning of the 16th century, is rebuilt on ancient walls, proof of which are the fragments of foundations that emerge from the inner corners of the south-east and south-

west. It is formed by a single nave and an apse with an irregularity of curvature. The church consists of a single-apse inside a single-chamber chapel, probably built between 1159 (date of election of Guido di Biandrate, son of Guido il Grande, as a bishop of Ravenna) and 1164 (date of the donation of Ruspalia to the Templars, drawn up to his interior). The original apse presents a construction technique typical of the second half of the 12th century (Figure 3). It is located in the territory of Carpignano (Calpinianum), belonging, since 1070, to the ancestral nucleus of the feudal possessions of the de Blanderate family, called "Comitato della Biandrina".



Figure 2: Carpignano Sesia: S. Apollinare, details of the apse.

The two measurement fields were carried out on 25/10/2016 and 25/03/2017. The main side of the church is 12.35 meters, while the smaller side is 6.8 meters. The value of the astronomical azimuth of orientation of the axis of the nave, corrected by the magnetic declination, is $(68.8^\circ \pm 0.5^\circ)$. The axis of the apse is misaligned with respect to the nave and the azimuth measures $74.8^\circ \pm 0.5$. The rosette window on the upper part of the west facade above the entrance has an orientation with an azimuth of $(248.8^\circ \pm 0.5^\circ)$. The apse has an irregularity of curvature and an un-

usual and considerable depth; moreover, the curvature on the right side is more pronounced. The particular orientation of the apse led us to consider the particular date of the Julian calendar in which the sun could rise with an azimuth of that value. At first, we considered the possibility of dates related to the Easter day in the period between 1159 and 1164, dates deduced from the documents. The two possible dates were 12 April 1159 or 12 April 1164. In this two dates the sun raised at the local horizon with an azimuth of $(74.6^\circ \pm 0.5^\circ)$ (Figure 4).

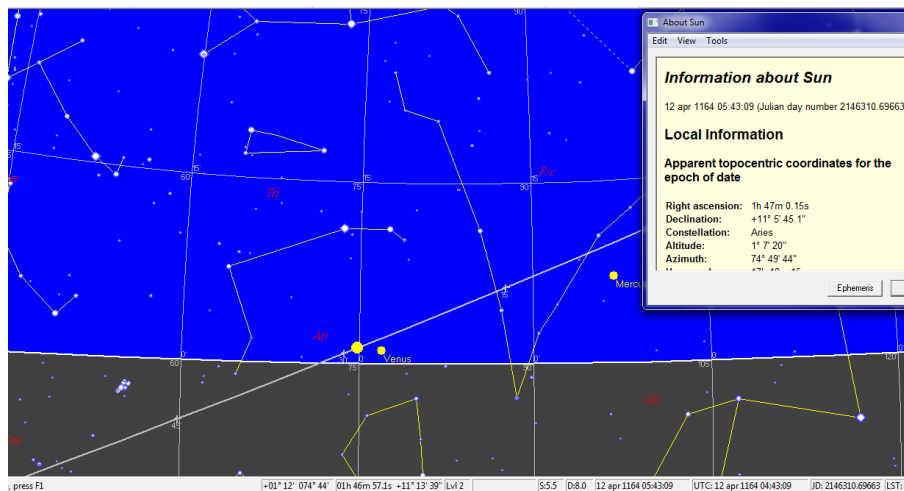


Figure 3: Sun rising on Easter Sunday April 12, 1164.

3. ORIENTATIONS OF TEMPLAR CHURCHES

We must bear in mind that in the Late Middle Ages, despite the indications and the Papal Bull of Nicea Council in 323 A.D. issued by the Church that prohibited their use, the astrological rules were

widely used in building construction as churches and castles. The Council Fathers affirmed in AD 325: "ecclesiarum situs plerimque talis erat, ut fideles facie altar versa orantes orientem solem, symbolum Christi qui est sol iustitia et lux mundi interentur" (Carolus Kozma "De Papi", 1861). During the Middle Ages the construction of a church had to undergo

very precise rules of orientation of its entrance-apse axis, but also in establishing the period in which the foundation rite was to be celebrated. Guido Bonatti da Forlì, mathematician, astronomer and astrologer active in Paris during the thirteenth century, in his "Decem continens tractatus astronomiae", of which there is an edition published in Venice in 1506, highlights that the churches, being centers of divine power, they had to be raised according to scrupulous ritual rules following the course of the heavens and which had to be built up when certain favorable astral conjunctions occur. In particular, the era of foundation of the churches was chosen in accordance with the rising on the horizon, for the first time during the year, of the stars of the constellation of Aries, so the period chosen was shortly after the spring equinox and it was in accord with the astronomical rules of the celebration of the Christian Easter. The reason was not only mystical, but also corresponded to two very specific practical needs: first, this was the period when the frost and winter rains ceased and the ground became softer allowing the workers to work; second, there was sufficient time, until the following winter, to complete the construction work.

In 1406, Jean Ganivet wrote: "Si velis aedificare aedificium duraturum, considers fundas in primal et conferas eis planetas benevolos (Jean Ganivet, "Coeli enarrant", Lyon 1406)" If you want to build a durable building, in the foundation observes primarily the fixed stars and compare them with the benevolent planets ". Therefore not only the rising heliacal rising of the stars of Aries defined the most favorable seasonal period, but the planetary positions, especially those of Mars and Jupiter, in the zodiacal constellations established the most suitable years for the building of sacred buildings, especially those of relevant importance. The position of the moon with its phases within a certain constellation was held in

high esteem; it was not to be found absolutely in Pisces, Capricorn, Scorpio and never in conjunction with Saturn. This direction could be correlated with the date of Easter which, as is known, is celebrated on the Sunday closest to the first full moon after the spring equinox. Being, however, the date of the Passover Easter with respect to the date of the equinox because of the lunar constraints, the orientation according to the position of the rising sun at Easter could not be codified in a fixed way. Since the date of Easter can oscillate roughly 30 days past the spring equinox, i.e. 1 lunar synodic month (29.5306 days), the difference in orientation with respect to the equinoctial line can reach up to about 18° north of the East. This means that orientations between 72° and 90° could be correlated with the position of the sunrise on Easter Sunday of the church's foundation year. Taking into account these considerations, given that on 12 April 1159 the moon was passing through Pisces, an unfavorable constellation, while on 12 April 1164 it was in Aquarius, a not unfavorable constellation, it is more probable that the year of construction was 1164.

The Templar churches considered can be divided into two main groups, those acquired as a result of donations and that preserve the original geometry and orientation, and those built ex-novo by the Templars, thus with geometric Templar criteria and Templar orientations. The astronomical orientation of the churches built by the Templar Order (Figure 5), in a sample of about 50 Templar churches built in Europe, provided that the axis alignment of the aisle on sight was aligned towards one of these targets: the point of the sunrise on calendar day of 21th March (Equinox); the point of the sunrise on calendar day of 25th March (Annunciation); the point of the sunrise on the calendar day of Easter; along the equinoctial line obtained by gnomonic methods.

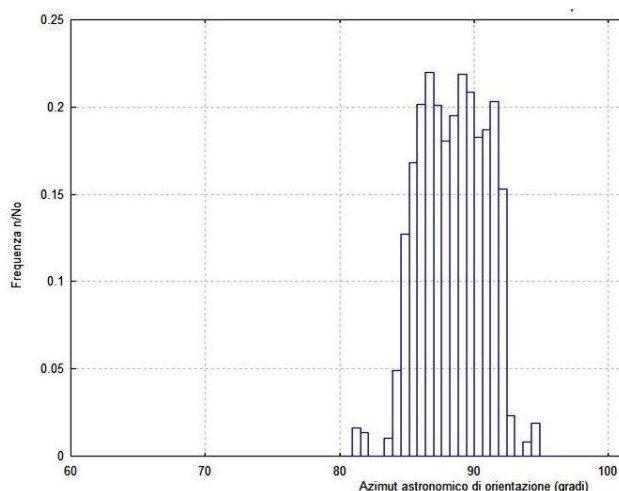


Figure 4: Astronomical azimuths of the Templar churches.

4. RESULTS

We processed the data making use of the statistics for circular and axial data. In order to estimate the cross correlation between the orientation of the axis of the nave of the church and the astronomical target, we applied some techniques (Fisher 1995), by the relation (Proakis 1989):

$$R = \cos(\theta), R = |1|$$

For $\theta = 0^\circ$ is the case of perfect correlation and $R = 1$; if $\theta = \pm 90^\circ$ there isn't any correlation between the processed directions; if $\theta = \pm 180^\circ$ we have $R = -1$ and the vectors are unrelated. P is the probability of randomness that the two vectors are randomly correlated with each other having that particular correlation R value.

To estimate the cross correlation between the orientation of the axis of the nave of the church and the astronomical target, we have calculated the value for R in Sant'Apollinare in Carpignano Sesia and we obtained a minimum value $R = 0.9999$. This is the correlation between the two vectors within the range of an angle 0.013° . That means that the two orientations are well correlated. Taking into account the correlation coefficient R obtained, we have estimated a probability $P(R) = 0.000228$ to obtain a correlation coefficient $R = 0.9999$ only by chance, so in this case there is a good correlation between the direction of the axis of the nave of the church and the astronomical target.

We operated in the same way with the data of Sant'Apollinare in Fisrenzo and we obtained a minimum value $R = 0.9999$. This is the correlation between the two vectors within the range of an angle 0.1353° and with a probability $P(R) = 0.0002361$ that they are randomly correlated. Now using the calculation of the probability and statistical test we want to establish which of the two churches Sant'Apollinare is more likely to be the Templar one mentioned in the document of 1164 A.D. The probability density function is:

$$P(x) = e^{-0.5\left(\frac{x-xm}{s}\right)^2}$$

where x is our value, xm the average and s is the standard deviation, all obtained using the t -Student distribution.

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The probability density function related to the length (a) for the Templar churches located in the Piedmont area is:

$$P(a) = e^{-0.5\left(\frac{a-11.6}{1.6}\right)^2}$$

The probability density function related to the ratio $r = a/b$, where b is the short side of the church

$$P(r) = e^{-0.5\left(\frac{r-1.75}{0.09}\right)^2}$$

The probability density function related to the azimuth

$$P(Az) = e^{-0.5\left(\frac{Az-84.53}{11}\right)^2}$$

When a deliberate astronomical alignment is proposed, it is of course fundamental to investigate on the possibility of a mere coincidence.

We assumed that the "null hypothesis" H_0 is the random orientation, that is the church is not a templar church and the alternative hypothesis H_1 is the deliberate orientation along the inferred directions, in this case it is a templar church. The decision criterion H_0 has to be rejected if

$$P_n(\text{random}) < P(\sigma)$$

where $P_n(\text{random})$ is the probability that the direction of the orientation is chance, $P(\sigma)$ is the tabulated integral of the Gaussian function.

Adopting a 97.0% confidence level the value is $P(\sigma) = 0.03$, the probability that a church had been built by the Templar Knight Order is:

$$P(Az, r, a) = 1 - [(1-P(Az))(1-P(r))(1-P(a))]$$

For the church Sant'Apollinare in Carpignano Sesia:

$$a = 15.35 \text{ m } b = 6.80 \text{ m } r = a/b = 2.5$$

and a value of the probability to be Templar is:

$$P(Az, r, a) = 98.7\%$$

For the church Sant'Apollinare in Fisrenzo:

$$a = 24.50 \text{ m } b = 5.50 \text{ m } r = a/b = 4.45$$

the value of the probability to be Templar is

$$P(Az, r, a) = 69.4\%$$

5. CONCLUSION

Following the archaeoastronomical analysis, we can suggest that the church that best meets the average features such as size, geometry and astronomical orientation typical of the Templar churches built in Piedmont is the church Sant'Apollinare in Carpignano Sesia.

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