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LIGHT AS A BUILDING MATERIAL – SUPERIMPOSED VISUALIZATION

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ABSTRACT

This paper aims to investigate and confirm the inseparable connection between: interior architecture, iconographic topography, inverse perspective as a system for representing space on a surface, light and liturgy in Byzantine churches on the territory of medieval Macedonia.

The interior architecture in these sacral objects is methodically based on the superposition of all the aforementioned aspects. Any change in one of them can cause a disturbance in a series of others and disrupt the entire system. All these elements are in a methodically created superposition in order to be a visual support for the words of the liturgists and to convey a certain theological thought or concept in the church perceived as a model of the cosmos according to the Orthodox worldview.

Key words: Light, Byzantine architecture, Inverse perspective, Sacral architecture, Superimposed Visualization.

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1. INTRODUCTION

This paper aims to investigate and confirm the inseparable connection between: interior architecture, iconographic topography, inverse perspective (as a system for representing space on a surface), light and liturgy in Byzantine churches on the territory of medieval Macedonia.

Throughout the entire history of mankind, religion has been one of the most significant elements of social culture. Hence, it is logical that there is a strong and unbreakable relation between religion and architecture, which, on the other hand, represents a way in which humanity spatially expresses its understanding of the world, religion and the cosmos. The sacral architecture is a symbiotic assemblage of meanings and represents an endless field for exploration and research.

Nowadays, in time of globalization, the fast pace of living imposes a different everyday life to which architecture, perspective and symbolism react. The monuments of sacral architecture and painting stand as silent witnesses of another time in which the worldview of the master builders and painters is mystically petrified.

In order to be able to thoroughly analyse the superposition of different aspects of sacral architecture and painting, considering their complexity (a consequence of its evolutionary process that spans a vast period of time covering several millennia, during which it has laid a huge number of layers of meanings) it is necessary to do such an analysis by trying to understand the world view of the people at the time when those buildings were built.

2. MATERIAL AND METHODS

2.1.Subject of research

The subject of research in this paper are the superpositions of light, interior architecture, mathematical-proportional constructions, inverse perspective and liturgy in the Byzantine sacral architecture on the territory of medieval Macedonia.

Only through the analysis of such superpositions can one comprehend the big picture of relations between different aspects of the design program of the Byzantine builders which resulted in architectural examples that contain an extremely specific, unique space, and offer a unique experience to the visitors. Through the discovery of these superpositions, it is possible to recognize the methods used in the creation of such a space with an extremely suggestive and evocative visual communication capacity.

2.2. Identification of the problem

Over time, the conditions in which believers practiced their religious needs changed. The architectural space intended for those needs changed, but so did the time and the way in which these rites took place. As a consequence of this fact, some of the spatial effects related to a specific location, architectural form, liturgy or the exact moment of their appearance became invisible to the congregation, so over time they faded and were eventually forgotten in the modern context of sacral architecture.

2.3. Objectives of the research

The analysis presented in this paper aim to establish and recognize the spatial relations of architectural form and elements, iconographic topography, inverse perspective and light; and their manipulation in order to fully exploit their capacity and potential to create an exceptional spatial experience according to Byzantine Christian concepts. Through their superposition and integration into a complete system, they are transformed into planning tools that, in the hands of real masters, become a symbolic form by itself, which, as such, is the basis on which Byzantine sacral architecture is built. Taking into account the complexity of the problem, the thesis is not that these are the only methodological means for the creation of sacral architecture in Byzantium; rather, they are only part of them, which influenced the design of churches, and which over time lost their significance, as knowledge that has faded over time, and these aspects of the church space have ceased to be part of the design program for sacral objects in the modern context. The purpose of the analysis is not to delve into any stylistic analysis of Byzantine sacral architecture and painting, but to rediscover and recognize these superpositions and, through the valorisation of the potential they carry, to open the possibility that they become usable design tools in the contemporary context of architecture and painting and that it happens on several levels; during conservation, restoration and reconstruction interventions on buildings, during scientific research of individual architectural objects, but also in the design of modern objects, not only of a sacral nature.

2.4. Research methods

In order to analyse the superposition of the geometry and symbolism of the built and painted sacral space with the light (if the method of direct observation and documentation were to be used), a physical presence on site, in the objects that are the subject of analysis was necessary, objects dispersed across the geographical map in many different locations, coupled with the fact that due to the specificity of the problem being analysed, the very presence on site would have to cover a huge time interval, the analysis becomes irrational, if not impossible. Hence, as a method of work, it was chosen to create computer generated 3D models, and after they were georeferenced to the actual geographical location in the virtual space and oriented to the sides of the world as they are oriented in reality, they simulated the hypothetical situations in different periods of history, year or day in different geographical locations around the world, needed for the analyses. This approach is further

justified by the fact that some of the analyses were carried out on buildings that are currently demolished or have been changed to an extent that makes it impossible to draw relevant conclusions based on the analysis of the existing situation. To determine the angle of the light rays for different geographical locations and different periods of the day and year, apart from the simulation in Google SketchUp Pro, the software package Ecotect by AutoDesk was used, in which several analyses related to the reflected light were carried out, and Adobe Photoshop was used for graphic processing of the maps.

During the reconstruction of the churches and the creation of the computer 3D models, the following references were used: the reconstruction of St. Achilles in Mala Prespa according to Prof. Nikos Moutsopoulos, the reconstruction of St. Sophia in Ohrid according to Prof. Boris Chipan, the recordings and the reconstruction of St. Dimitria in Mark's Monastery according to Prof. Elizabeta Kasapova and the recordings of Saint Savior in Chora, Constantinople according to Van Millingen.

The direct measurement method was used only for the fine calibration of the computer-generated models on site where it was possible (St. Dimitria Markov Monastery, St. Sophia - Ohrid).

During preparation of the paper, the polychronic comparative analysis as well as the historical method were used in order to establish cause-and-effect relationships between the different analysed areas, times and problems.

With the method of cross-analysis, several aspects important for this paper were analysed on selected examples of sacral architecture from Constantinople, Mount Athos and from the territory of medieval Macedonia, as particularly important centres of Byzantium, in order to draw conclusions about their specifics.

3. RESULTS AND DISCUSSION

3.1. Case study St. Dimitria at Mark's Monastery near Skopje

The Church of St. Dimitria is a monastery church of the Markov Monastery, located about 20 kilometers from Skopje on the left bank of the Markova Reka, in close proximity to the village of Markova Sushica. The monastery and the church are located on the southern slope of Vodno mountain. The monastery complex was built in the second half of the 14th century and is among the last great artistic achievements of Byzantine architecture before the final establishment of Ottoman rule in this part of the Balkans. According to the founder's inscription inside the church, we know for sure that the reconstruction of the monastery initiated by King Volkashin ended in 1376/77. The significance of the monastery and its Catholicon is even greater if we consider that they represent the last great royal endowment on the territory of Macedonia of the dominant Serbian kingdom at that time.

3.2. Numerical, geometric and proportional systems for superimposed visualization

Numerical, geometric and proportional systems with emanated Christian symbolism were used during creation of the architectural assembly of the churches of medieval Macedonia. The architectural composition was formed in horizontal and vertical design by these systems. The circle, the square, the triangle used in the system of proportioning and dimensioning, through their symbolic meaning in Christian thought, were the basis for the creation of the sacral building and its transformation into logos constructed through symbols. Such systems of mathematical-symbolic dimensioning and proportioning have been perfected over time, but at the same time they are adapted to the specific conditions in which sacral objects were built - Figure [2].

Fresco painting, as the final stage in construction of churches, allowed the painters to see in front of them the already existing superposition of the architectural assembly and the light inside the churches, and to emphasize it with another layer of superimposed visualization - the iconographic topography. It represents one of the key means for shaping the entire system and overlaps with the mathematically-symbolically constructed architectural assembly, creating a visual analogy of meanings between them. Architectural logos and iconographic topography are in a symbiotic assemblage where painting has the primacy and bears one of the primary tasks of visual transfiguration of real interior architecture into an unreal, transcendentally promising reality.

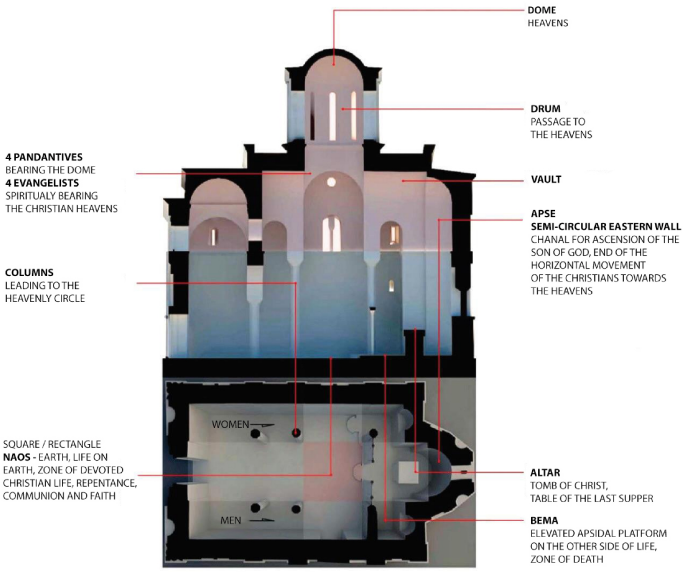

Figure 1. *Symbolism of architectural elements in a church, displayed as an inscribed cross and their symbolic meaning (Church of St. Dimitria)*

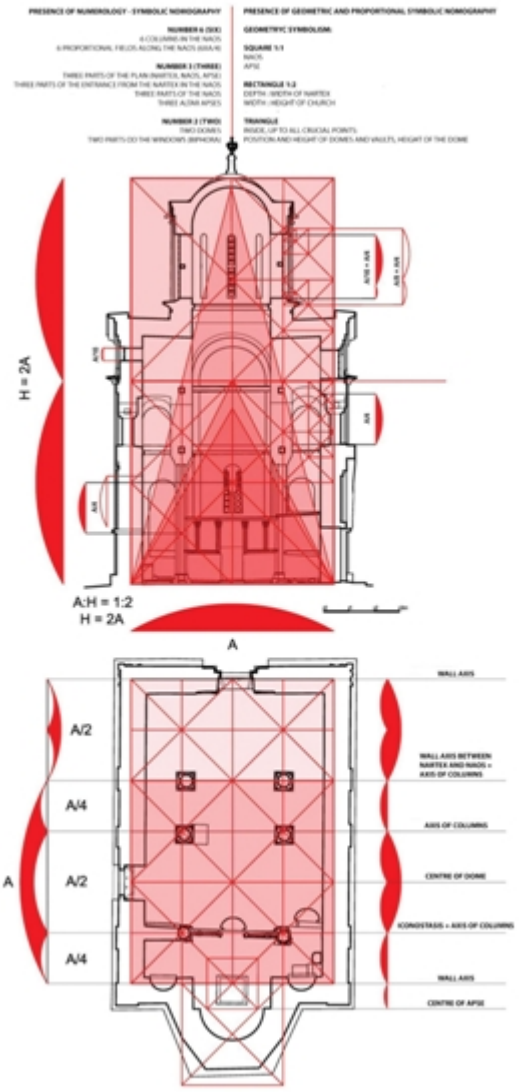

Figure 2. *Representation of the numerological symbolic nomography and the geometrical and proportional symbolic nomography in the church of St. Dimitria in Mark's Monastery*

The canonically controlled placement of painting cycles and certain painting compositions in the interior architecture represents a method through which its superposition with other elements in the superimposed visualization system is made possible - Figure [3].

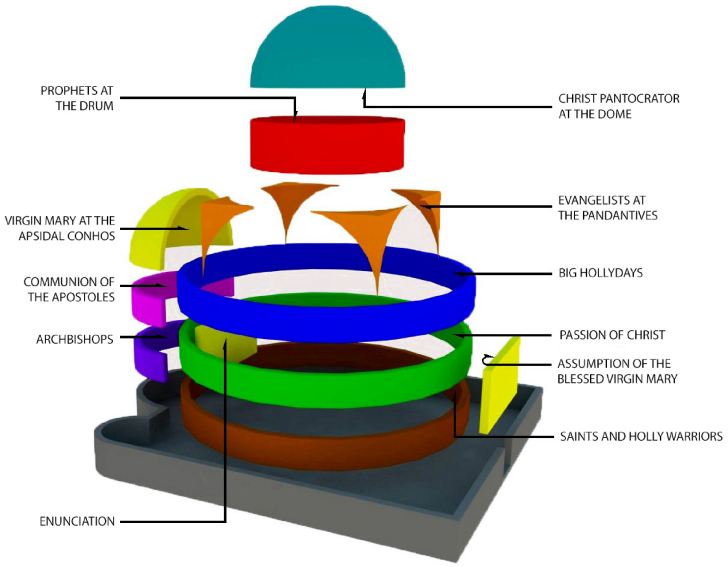

Figure 3. *Iconographic compositions and their location in the church*

In superposition with the light and the architectural logos, it has an irreplaceable role as a visual support for the words of the liturgists, for example:

• The iconographic topography is complemented by the light that moves along the painting along a precisely defined path, illuminating its parts in an accurately defined part of the day when, according to the liturgical hours, the theme is commemorated, which is presented at the illuminated position - Figure [4].

Figure 4. *Direction of movement of light landing onto the northern wall of the Church of St. Dimitria in Mark's Monastery through the monophora and the biphora illuminating the composition dedicated to the Crucifixion and the standing representations of the Saints of the southern wall, at about midday*

• In a certain period of the year, when important Christian holidays are celebrated, inside the churches, a certain fresco painting composition related to that celebration is illuminated - Figure [9].

• The type of light that lands on certain painting compositions from the painting is strictly controlled and depends on the position of the hierarchical ladder of sanctity

• The dimensions of the painting zones vertically, the painting compositions horizontally, as well as the content episodes and characters in the compositions are in direct relation with the shape, geometry and dimension of the window openings and the light that penetrates through them and directly illuminates them in a definite part of the day or time of year.

Figure 5.*Rays of light landing on Holy Communion during the Liturgy*

The strict canonization still leaves space in which the painters can intervene in the painting cycles by their exact positioning and dimensioning, but also in the compositional organization of the scenes as a consequence of which, despite the strict canonization, all the painting programs of the churches contain numerous variations and specifics.

All these overlays of iconographic topography with light and architectural form were intended to create the desired visual experience in the context of the general thesis of superimposed visualization. Their capacity for suggestive influence on people has been fully recognized and it has been used in order to convey numerous theological concepts.

Natural light is the key tool used to achieve the desired evocative aspects of the architectural assemblage. Through manipulation with natural light all the aforementioned aspects of medieval interior sacral architecture and painting are united into a system of superimposed visualization. As a dynamic phenomenological (natural) category, through its canonically controlled movement through the interior space, it dynamizes and transfigures the interior architecture and painting. In that process, as a result of architectural details conceived and realized by the designer, the sunlight manifests itself in two types (direct and diffuse) light with strictly canonized paths and topos of movement – on the interior architecture, painting, interior liturgical mobiliar and "choreography", finally on the liturgical action itself. This appearance of light inside the churches of medieval Macedonia is a direct result of several carefully designed factors:

• The positioning and orientation of the church itself and the deviation of its main axis in relation to the east-west axis - Figure [6]

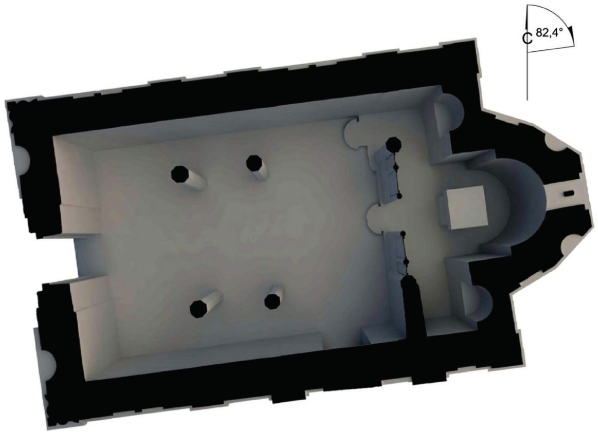

Figure 6. *Displacement of the main horizontal axis of the Church of St. Dimitria, Markov Monastery in relation to the geographical North*

• The mathematical model (geometry and proportions) of the architectural assembly in which the whole and its parts are mutually inextricably linked

• The geometry, dimensions and position of the window openings

In superposition with the iconographic topography and the liturgy, all these constituent elements of the architectural assembly fully gain their meaning in the context of sacral Christian architecture.

The light in the upper zones of the interior architecture, where the representations of the most important characters (according to the hierarchical scale of sanctity) are located, reaches only diffusely. Diffused light is methodologically and conceptually directed to certain positions in the interior architecture where pictorial representations of particular importance are presented by directing the reflections from specifically designed and materialized window banks, thus creating a visual impression that the light emanates from them, i.e., in an architectural sense, the effects of "luminous dome and apse" are realized - Figure [7].

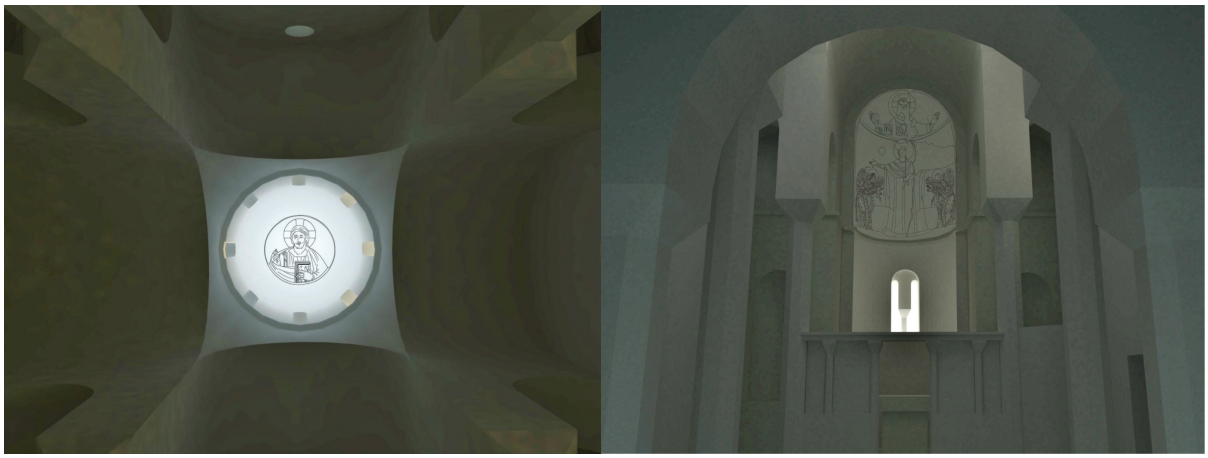

Figure 7. *Effect of luminous dome and luminous apse*

Direct beams of sunlight illuminate the holy table in the third liturgical hour through the apsidal windows (at the time when the Holy Communion is being prepared). This is a direct result of the orientation of the main horizontal axis of the church in relation to the east, as well as to the shape, position and dimensions of the apsidal windows.

The movement of direct sunlight that enters through the window openings creates light paths that illuminate certain continuous compositions from the fresco painting program. This is of crucial importance for the visual-verbal (liturgical) monitoring of the separate content episodes that are part of it. The unfolding of the presented action of the iconographic scenes in the churches is always followed

clockwise, which corresponds to the direction of the movement of the direct sunlight over them - Figure [8].

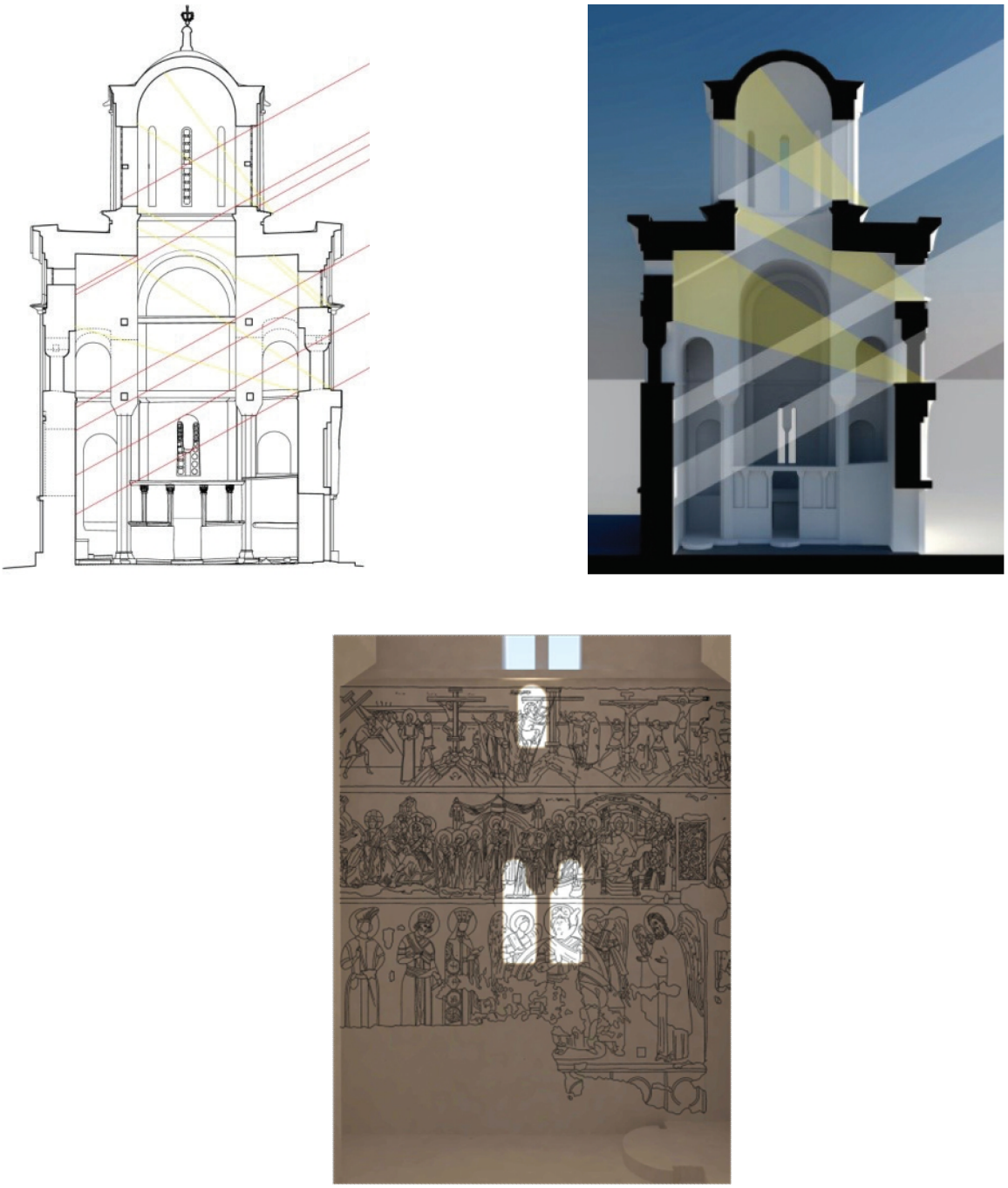

Figure 8. *Direct light on the north wall of the Church of Saint Demetrius in Mark's Monastery on the date of winter solstice, cross-section, spatial view and montage of illuminated frescoes at noon*

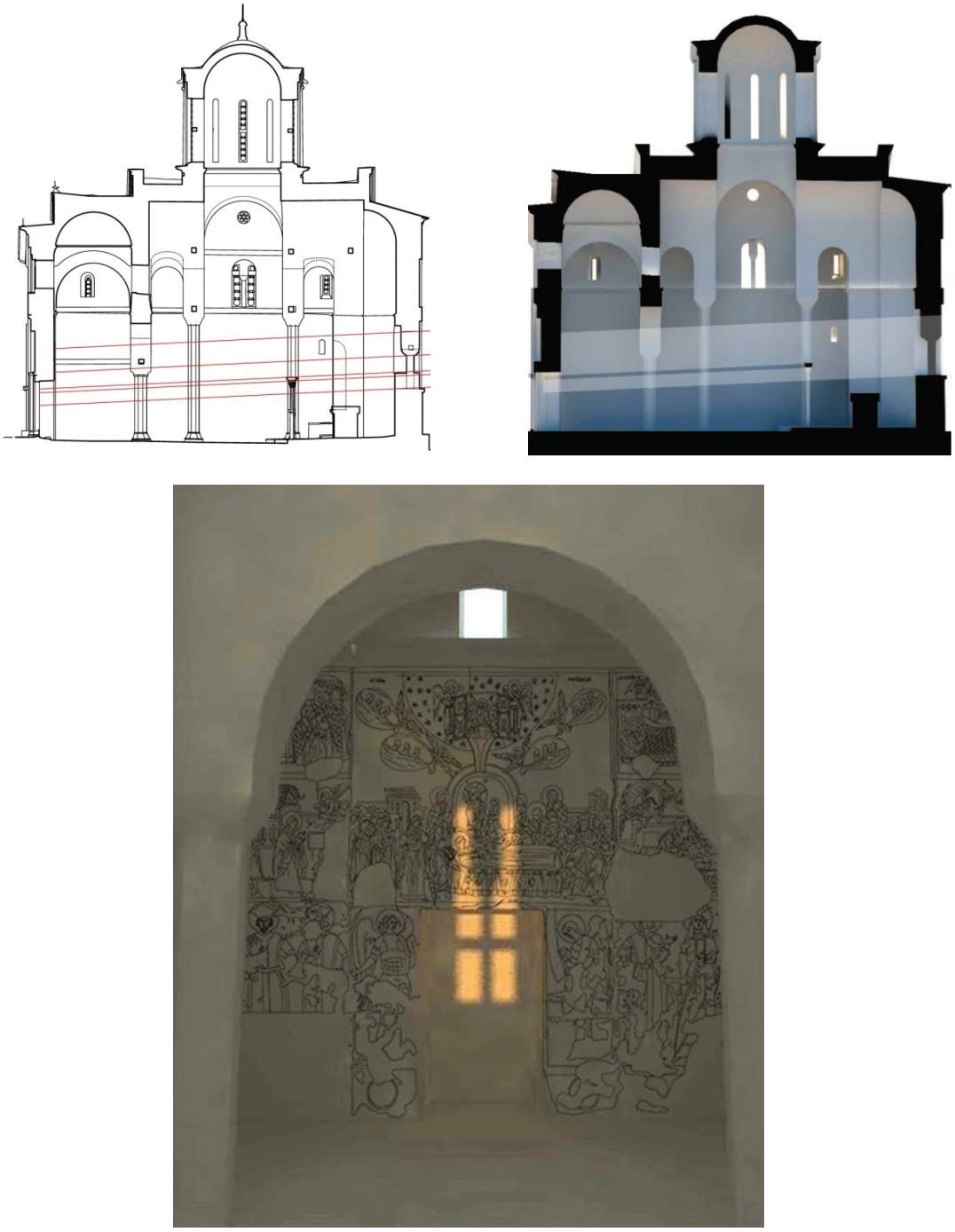

Figure 9. *Direct light on the western wall of the Church of St. Dimitria in Mark's Monastery in longitudinal section, spatial display and installation of illuminated frescoes at sunrise on the Assumption of the Blessed Virgin Mary*

4. CONCLUSIONS

In the analyzed churches of medieval Macedonia as a result of the superimposed visualization, the mystical and the miraculous become direct experiences of the believer. The space created using these tools and methods is sacred. In such space the supernatural events are manifested in a way that allows the believer a first-hand experience of the supernatural.

Therefore, it can be concluded that in the period of history that bears the epithet dark, the sacral architecture was built with light as building material.

In modern context, the problem of light in architecture is reduced to its capacity to create a comfortable environment appropriate to the action taking place in the space it illuminates (light intensity and color). It is as if the knowledge of the Byzantine master builders and painters was lost through time and disappeared from the design program. Therefore, this text should not be perceived as a conclusion of past conditions of the sacral architecture in medieval Macedonia, but it should be recognized as a motive for creating space in superposition with several other elements of the architectural assembly, a space with a deep meaning, and not merely a shelter that only satisfies human physiological needs and offers physical pleasures and sensations.

Figure 10. *Photography of the Interior of the church St. Dimitria at Mark's Monastery*

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