

## CHURCH OF SAN VITTORE, MURALTO (LOCARNO)

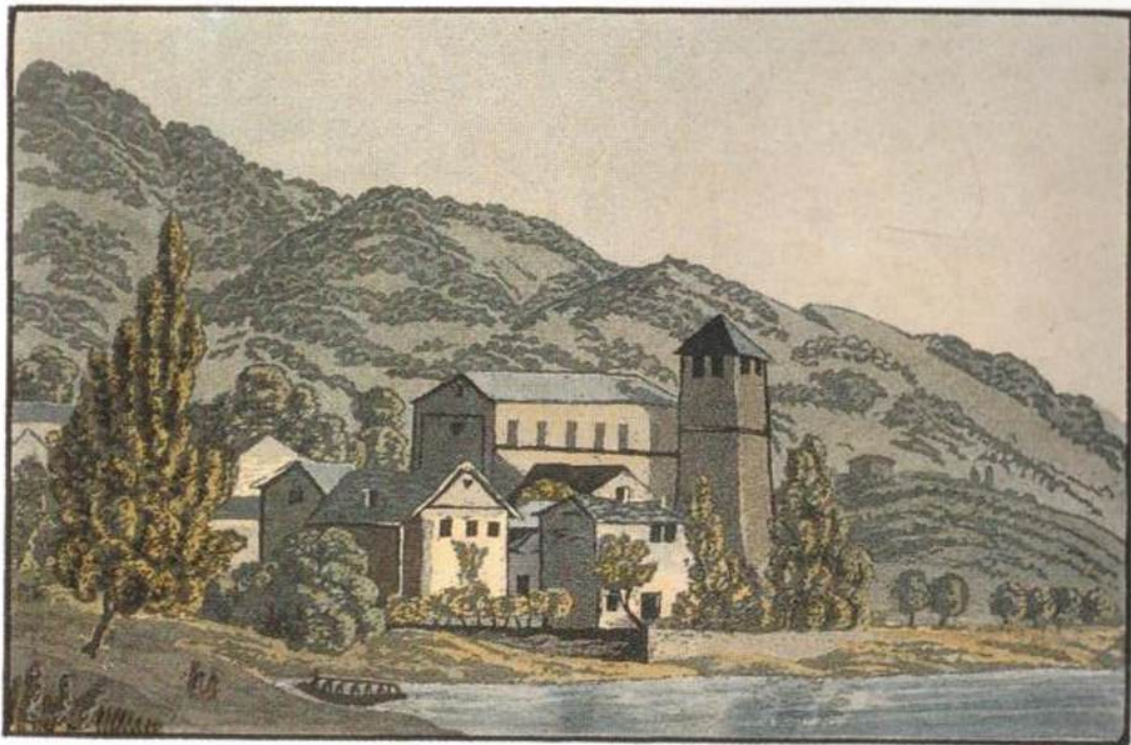
### THE CRUCIFIXION

#### Report on the Conservation Status of the Fresco Cantiere Studio – BWP 2.1

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**Date** : 2025



*Fig.1. Historical illustration of San Vittore di Muralto, from Elfi Rüschi, San Vittore di Muralto, Guide ai monumenti svizzeri SSAS, 2005.*

#### **About the Location**

Owner - Municipality of Muralto

Administrator - Parish Council

Supervisor Authority - Office for Cultural Heritage of Bellinzona

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## 1. Introduction

San Vittore di Muralto is one of the most significant Romanesque churches in Ticino. Its crypt, adorned with expressive and symbolic capitals, and its rich history of all the layers of changes makes it one of the intact examples of this style in the area. The Romanesque pictorial cycle of Genesis in the central nave, rediscovered through restoration efforts, is particularly rare and valuable. Despite their fragmentary state, the frescoes reveal refined iconographic choices, rich materials, and skillful execution techniques.

Over the centuries, San Vittore underwent significant architectural changes, particularly in 1857, when the construction of new vaults in the nave altered the church's interior volume and concealed original frescoes. Neo-Gothic decorations with Baroque influences further obscured its Romanesque character. However, 20th-century restoration efforts aimed to recover its medieval features, leading to the rediscovery and preservation of earlier frescoes.<sup>1</sup>

Ongoing research by SUPSI students continues to uncover San Vittore's artistic significance. Recent studies have revealed Romanesque fragments, such as the crucifixion fresco that we will be working on, as well as other Gothic frescoes emerging from beneath layers of whitewash. The Crucifixion fresco in particular demonstrates remarkable artistry and needs to be assessed accordingly.

The analysis involved various advanced imaging and spectroscopic techniques. A Dino-lite Premier AM4115T-FUW portable digital microscope, with switchable white and UV (375 nm) LEDs, was used for close examination. A Zeiss Axioskope 5 microscope, paired with an Axiocam 305 color camera and ZEN core v3.1 software, was employed to document micro-samples in reflective light. Multispectral images (VIS, IRr, VIL, UVI, UVr) were captured using a modified Canon 5D Mark II camera, illuminated by 500 W Lowel V tungsten lamps for VIS/IR and CR500 Madatec UV lamps for UV imaging. XRF analyses were conducted with a Niton™ XL3t 900 spectrometer (Thermo Scientific), equipped with a 50 kV Ag anode X-ray tube and Si-PIN detector, enabling detection of elements with atomic number  $\geq 16$  in 60-second scans. Non-invasive infrared analyses were performed using a Bruker ALPHA II portable FT-IR with a specular reflectance module ( $22^\circ/22^\circ$ ), collecting spectra in the  $8000\text{--}350\text{ cm}^{-1}$  range at  $4\text{ cm}^{-1}$  resolution over  $\sim 186$  scans. Laboratory FT-IR on samples used a Perkin Elmer Spectrum Two UATR spectrometer, with a diamond crystal and LiTaO<sub>3</sub> detector, collecting spectra from  $4000\text{--}600\text{ cm}^{-1}$  at  $4\text{ cm}^{-1}$  resolution with 8 scans.

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<sup>1</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, Ticino I* (1972): (page 349)

## 2. The Building

### 2.1 Environmental Context and Use

San Vittore is situated in an area of profound archaeological importance for Locarno's history. The site originally hosted a Roman *Vicus* (a village or settlement), which was a significant artisanal and commercial center between the 7th and 3rd centuries BC, complete with villas, necropolises, and a temple.<sup>2</sup> Excavations have confirmed this, uncovering remnants of this Roman settlement, including a 1st-century Roman villa over which the first sacred structure was eventually built.<sup>3</sup>

Known as San Vittore di Locarno until the early 19th century, it held the distinction of being one of Ticino's eight mother churches, playing a pivotal role in the dissemination of Christianity throughout the region. Its extensive parish district covered the upper Lake Maggiore area and the Locarno valleys.<sup>4</sup>

The ancient parish church (plebana) of San Vittore is located near the Locarno-Muralto railway station, positioned just above a large public car park, which makes it easily accessible. Today, the church finds itself somewhat isolated from its original historical context. To the east, it is bordered by a busy municipal road. To the west and south, a green area, reminiscent of the ancient churchyard (sagrato), surrounds the building. There is also visible evidence of a rise in the ground level around the church over the years.<sup>5</sup>

San Vittore remains a highly frequented church. It is open to the public daily from 07:00 in the morning until 18:00 in the evening, and Holy Mass is celebrated every day, though at varying times. The current study and conservation efforts aim to analyze its historical construction techniques and the transformations it has undergone. These efforts often rely on non-invasive imaging techniques to study materials, pigments, and structural composition, ensuring the church's long-term preservation and safeguarding its rich history.<sup>6</sup>

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<sup>2</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, Ticino I* (1972): pg.349

<sup>3</sup> Rüschi, Elfi. *San Vittore di Muralto*. Bern: Società di Storia dell'Arte in Svizzera SSAS, 2005 pg.5

<sup>4</sup> Rüschi, Elfi. *San Vittore di Muralto*. Bern: Società di Storia dell'Arte in Svizzera SSAS, 2005 pg.1-2

<sup>5</sup> Rüschi, Elfi. *San Vittore di Muralto*. Bern: Società di Storia dell'Arte in Svizzera SSAS, 2005 pg.1-2

<sup>6</sup> Rüschi, Elfi. *San Vittore di Muralto*. Bern: Società di Storia dell'Arte in Svizzera SSAS, 2005 pg.1-2

## 2.2.1 Exterior



Fig.2. Location of Chiesa San Vittore on Google Maps

The Collegiata di San Vittore is situated in Muralto, a municipality in the district of Locarno within the Swiss canton of Ticino. Muralto lies along the shores of Lake Maggiore, adjacent to the city of Locarno, forming part of a continuous urban area.

Historically, the area surrounding the church included the rectory, along with its outbuildings and vegetable gardens to the east, now bordered by a municipal road. To the west and south, where the parish house is also located, a newly created green space planted with olive trees recalls the ancient churchyard. In the Middle Ages, the settlement of San Vittore, with its cluster of homes, formed the center of the Mezzane Council, which also included the squadre, settlements surrounding the da Muralto castle, as well as the areas of Burbaglio and Orsarina, located closer to the lake.<sup>7</sup>

In more recent times, the civic center of the Municipality of Muralto was established nearby. Founded in 1861, it now houses the Town Hall and a large school complex with a conference hall, further underscoring the ongoing importance of this historically significant area.

The building is constructed using local granite and stone, meticulously squared and laid in horizontal courses. The stonework reveals alternating bands of small and large blocks, sometimes interspersed with thinner courses, giving the surface rhythm and texture. This type of stone apparatus is particularly well preserved on the south and east sides, where the apsidal sector still shows its original blind arcades and stone detailing.<sup>8</sup>

<sup>7</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, Ticino I* (1972): pg.349

<sup>8</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, Ticino I* (1972): pg.350

These stone blocks are meticulously fitted together with minimal mortar (fig.3). The Romanesque style is prominent, particularly evident in the Lombard arches which is a characteristic decorative feature used to adorn the apses and the central part of the church's facade (fig.4).



Fig.3. Exterior Mural Structure



Fig.4. Lombard Arches on the Facade

The main facade reflects the church's three-part internal structure. Pilasters frame the middle section, and a decorative frieze of hanging arches runs beneath the gabled roof. After 1597, during the Counter-Reformation period, the original medieval oculus (round window) was replaced by a new Serlian arch for facade changes with a Serlian window (fig.5). The granite entrance portal, dating to the 16th century, is flanked by ornate wooden doors carved with intricate floral patterns and symbolic designs, notably a depiction of the Tree of Life surrounded by lions (fig.6). The facade also incorporates 'bucce pontaiie,' small, partially filled rectangular apertures in the stonework, which are utilized by a protected species of swifts to build their nests.<sup>9</sup>



Fig.5. Serlian arched window replaced the original oculus



Fig.6. Wooden facade door - Tree of Life with Lions

<sup>9</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, Ticino I* (1972):pg.361-366

On the right-hand (southern) side of the church, an 18th-century portico leads to the Chapel of the Dead (Ossario) built in 1745 (fig.7). This chapel retains remnants of Baroque-style decorations and features a scagliola antependium representing Souls in Purgatory.<sup>10</sup> The northern side of the building, which faces the road, preserves some original Romanesque features, including a lancet window that was later filled in with bricks (fig.8). The eastern apse is characterized by a simple symmetrical design, though its visual impact is somewhat limited by the surrounding cobblestone streets and the 16th-century sacristy that partially covers the central and northern apses. During restoration, two original Romanesque windows on the apse that had been sealed were reopened, however, the crypt's original window in its apse also remains intact.<sup>11</sup>



Fig. 7. The Chapel of the dead - Ossario

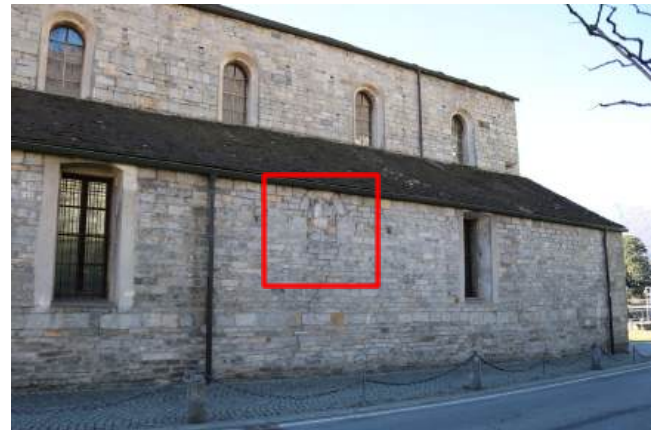


Fig.8. Northern side - Filled up lancet window

The bell tower, appended to the southern nave, clearly displays two phases of construction (Fig.9). The lower section, erected in 1524, is composed of yellowish stone blocks, some of which were repurposed from the Visconti Castle in Locarno.<sup>12</sup> A marble plaque dated 1527 on this lower part records grain prices during a period of famine. The upper portion, realized in granite and added in 1932, adheres to a neo-Romanesque style conceived to harmonize with the original stonework. A plaque featuring a bas-relief of San Vittore (Saint Victor) on horseback, holding a banner with a depiction of the Trinity (Fig.10), adorns the western side of the bell tower. Evidence suggests a doorway, possibly an earlier entrance, was filled in during the bell tower's second construction phase (Fig.11), and the entrance was relocated to the side, where a large arch was later created, subsequently filled, and fitted with a wooden

<sup>10</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, Ticino I* (1972):pg. 356

<sup>11</sup> Rüschi, Elfi. *San Vittore di Muralto*. Bern: Società di Storia dell'Arte in Svizzera SSAS, 2005 (pag 1-2)

<sup>12</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, Ticino I* (1972):pg.361

door. The southern flank of the church presents a combination of Romanesque features and later modifications, including enlarged and blocked windows.<sup>13</sup>



Fig.9. Evidence of different constructions on the bell tower



Fig.10. Saint Vittore on horseback, bas-relief



Fig.11. Closed door (possible old bell tower entrance)

## 2.2.2 Interior



Left Nave

Central Nave

Right Nave

San Vittore is designed as a three-nave church, oriented almost perfectly eastward, and culminating in three apses. The interior space is articulated by five pairs of pillars that support round arches which bear upon granite pulvini (rounded, cushion-like blocks), ensuring a stable foundation and enhancing the church's overall structural integrity. The central nave is covered by a flat wooden ceiling up to its junction with the apse. In contrast, the lateral naves are each segmented into six bays and are topped with cross vaults.

<sup>13</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, Ticino I* (1972):pg. 353

The entire apsidal dome is occupied by a large Pentecost scene, signed and dated 1583 and executed by Hanns Schmidt, a painter from Augsburg (fig.12). Meanwhile, in the conch (the semi-dome of the apse), after the removal of almost all the neo-Gothic decorative paintings, fragmentary layers of late medieval frescoes, dating from the 16th and 17th centuries, have reappeared (fig.13).<sup>14</sup> A large depiction of Saint Victor on horseback, painted in grey monochrome within a yellow-grounded frame, is figured high up, above the choir loft. The latter, built in 1619, features a supporting beam and a parapet structure that are carved and painted.<sup>15</sup>



Fig.12. *Miracle of Pentecost - Hans Schmidt (Augsburg 1583)*



Fig.13. *16th-17th century frescoes revealed*

A notable interior feature is the oratory-type crypt located beneath the central nave, specifically under the presbytery and choir area (fig.14) [Gilardoni, p. 364 describes it as an "oratorio" type under the presbytery and choir]. This subterranean space is arranged into three smaller naves supported by four pairs of decorative columns with distinctive, imaginatively carved capitals [Gilardoni, p. 364 details the "tre navatelle" and varied capitals]. The crypt features cross vaults and a single-lancet window on its eastern side. The original Romanesque windows of the church were distinguished by their double-splay construction and the primary source of natural light within the church is from the east. Many of the windows underwent modifications during 16th and 17th-century renovations. Subsequent restoration efforts led to the reopening of some of these original Romanesque windows.<sup>16</sup>

<sup>14</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, TicinoI* (1972):pg.353

<sup>15</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, TicinoI* (1972):pg.356

<sup>16</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, TicinoI* (1972):pg.364

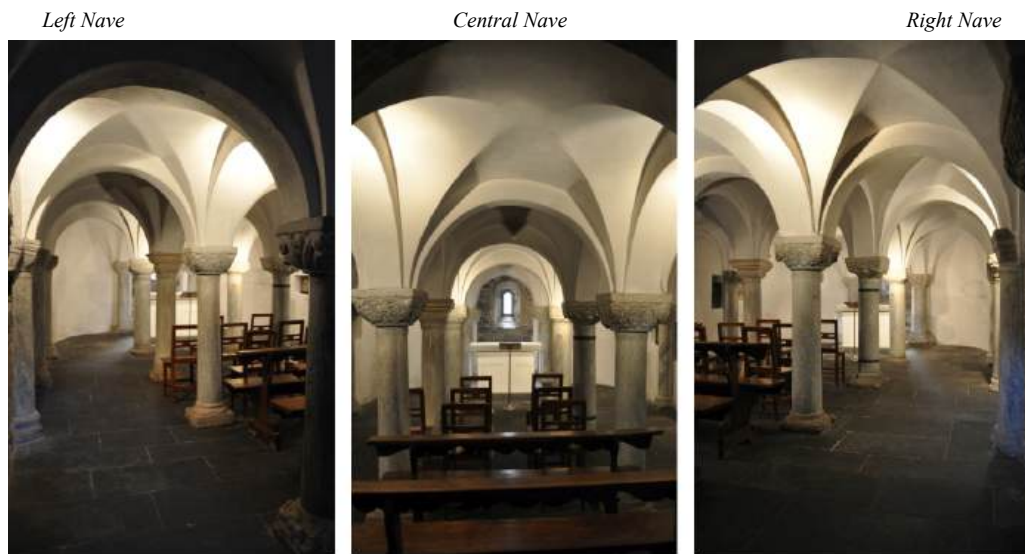


Fig.14. The Crypt

Artistically, the interior once boasted a Romanesque pictorial cycle in the central nave, notably depicting scenes from Genesis, which was recovered during restoration (fig.15). Sculptural elements from the Romanesque era were removed in the 17th century.<sup>17</sup> Gothic frescoes were introduced in the 14th and 15th centuries, fragments of which have been rediscovered. Among the most significant surviving Gothic artworks is the Crucifixion fresco (circa 1400-1420), situated in the first bay of the south aisle. Baroque stucco embellishments were applied to three chapels in the 17th century.<sup>18</sup> The Chapel of the Dead, dating to 1745, contains Baroque decorative features, and a marble high altar was installed in 1781.<sup>19</sup> A choir was added to the church in 1613.<sup>20</sup>



Fig.15. Stories from Genesis (Scene 1-5) by a Lombard master (First half of the 12th century)

<sup>17</sup> Rüschi, Elfi. *San Vittore di Muraltto*. Bern: Società di Storia dell'Arte in Svizzera SSAS, 2005 (pag 1-5)

<sup>18</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, TicinoI* (1972):pg. 372-378

<sup>19</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, TicinoI* (1972):pg.356

<sup>20</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, TicinoI* (1972):pg.353

## 2.3 History and Cultural Value

The historical narrative of San Vittore is deeply connected to the ancient settlements that once occupied its site. It is established over a 1st-century Roman Vicus, and its genesis as a sacred location is associated with a 5th–6th century necropolis discovered in the vicinity. The earliest iteration of the church structure likely belongs to the Lombard period (8th–9th century), as inferred from carved stone fragments.<sup>21</sup>

Archaeological investigations within the current edifice have yielded evidence of expansions undertaken during the 8th and 10th centuries. The Romanesque church was subsequently erected between 1090 and 1100, initially conceived without a crypt. The crypt was incorporated at a later stage, inserted into the existing church's framework, possibly built in two different phases.<sup>22</sup>

Early records indicate that the church might have originally been dedicated to the Virgin Mary, though it has long been identified with Saint Victor (Vittore Mauro), a Milanese martyr venerated in the Ambrosian tradition. Throughout its existence, San Vittore has borne the titles of arch presbyteral, collegiate, and plebeian church, attesting to its considerable religious and administrative stature. The earliest documented reference to the "Canons of Plebis S. Victoris de Locarno" is dated around 1152, affirming the church's established role following its Romanesque rebuilding.<sup>23</sup> The Romanesque epoch (11th–12th century) witnessed the church's reconstruction as a three-nave church, complete with its notable pictorial cycle like the Gothic frescoes which were introduced during the 14th and 15th centuries.<sup>24</sup>

Substantial modifications in the 16th century included the reconstruction of the rectory (1520–1525), the commencement of the bell tower (1524), the addition of the sacristy (1599), and a new portico. The 17th century ushered in the construction of the choir (1613), the enlargement of windows in the 1620s to accommodate Baroque frescoes, the removal of Romanesque sculptural elements, and the application of Baroque stucco work. The 18th century saw the addition of the Chapel of the Dead (1745) and a new marble high altar (1781).<sup>25</sup>

In 1857, significant neo-Gothic alterations were made, including the installation of vaults in the central nave, which obscured earlier frescoes.<sup>26</sup>

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<sup>21</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, TicinoI* (1972):pg.349-350

<sup>22</sup> Rüschi, Elfi. *San Vittore di Muraltto*. Bern: Società di Storia dell'Arte in Svizzera SSAS, 2005 pg.5

<sup>23</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, TicinoI* (1972):pg.352

<sup>24</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, TicinoI* (1972):pg.372

<sup>25</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, TicinoI* (1972):pg.372-373

<sup>26</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, TicinoI* (1972):pg.363

The 20th century was characterized by extensive restoration efforts aimed at recovering the church's medieval essence and artistic heritage. Crypt conservation was undertaken between 1960 and 1963, followed by a major restoration campaign from 1965 to 1984 (fig.16 & 17).<sup>27</sup> These initiatives led to the discovery of Gothic fresco fragments, the restoration of Baroque stucco, and the reopening of original Romanesque windows, as well as the removal of the neo-Gothic vaults which led to the rediscovery of the fresco of the Cycle of Genesis.<sup>28</sup> Additionally, archaeological openings were made in the walls to expose earlier structural elements, providing valuable insights into the church's history.



*Fig. 16 & 17. The crypt before and after conservation*

The cultural significance of San Vittore di Muralto is profound; it stands as a monument to centuries of faith, artistic endeavor, and architectural development, showcasing a range of styles from Roman to neo-Gothic. Its historical function as a mother church underscores its importance in the Christianization and religious fabric of Ticino. It is regarded as one of the most significant and frequently visited Romanesque churches in the region.<sup>29</sup>

<sup>27</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, Ticino I* (1972):pg.364

<sup>28</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, Ticino I* (1972):pg.363

<sup>29</sup> Rüschi, Elfi. *San Vittore di Muralto*. Bern: Società di Storia dell'Arte in Svizzera SSAS, 2005 pg.1

### 3. The Artwork

#### 3.1 Description



*Fig.18. The Crucifixion Fresco*

The Crucifixion fresco (fig.18) in San Vittore, dating to the early 15th century, stands as one of the church's most significant artistic expressions, though it has suffered considerable deterioration over time. Located in the right aisle, it portrays the classic composition of Christ's crucifixion in a Gothic style, with the cross in the centre, surrounded by angels, reminiscent of other regional frescoes, such as the one in Santa Maria in Selva, Locarno.<sup>30</sup>

The artist uses the most famous and common composition for any crucifixion depiction. Christ is positioned at the center on a cross, which is now obstructed because of the single lancet window(fig.19). A small part of Christ's face and arm can be seen but the rest is completely destroyed. The other prominent subjects in this fresco are the three Madonna figures whose halos, originally gilded, are rendered in relief, adding a sense of depth and radiance (fig.20). The third Madonna is hardly visible and can only be noticed due to a small fragment of her eye left behind. From all the different subjects painted in this fresco, there are Roman soldiers with horses positioned on either side of the cross(fig21 & fig.22). Incised

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<sup>30</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, Ticino I* (1972):pg376-377

details are used as preparatory drawings in different parts of the fresco, some are visible near the cuffs of their garments, on the spears they hold, as well as in the floral frame motifs(fig.23). One of the soldiers (San Longino) is notable for his distinctive headpiece(fig.24) and blue eyes, which sets him apart from the other figures while the other is seen in a metallic armour.<sup>31</sup>



Fig.19. Figure of Christ on the cross with the window obstructing



Fig.20. The Madonna's with relief halo's



Fig.21. Soldier no.1 (San Longino)



Fig.22. Soldier no.2



Fig.23. Incisions on Soldier's gloves and cuffs



Fig.24. Headpiece of the Soldier (San Longino)

<sup>31</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, Ticino I* (1972): 348-367

At the foot of the cross, possibly Mary Magdalene is depicted in a deeply emotional posture, lying down, gripping the base of the cross with a profound sense of anguish and devotion. Like the Madonna figures present in the scene, she is also adorned with a relief halo, which was previously gilded with metal leaf (fig.25). The artist also incorporated an angel in a reversed perspective with its back facing the viewer and head tilted back, with a stamped halo, which was very reminiscent of the Gothic period (fig.26). There are also fragments of what appears to be an ornate saddled horse next to San Longino (fig.27). The details not only highlight the intricate craftsmanship but also indicate the possibility of the artist to be a miniature painter.<sup>32</sup> The frame is composed of 'fiorami' or floral motifs like leaves, vines and flowers, similar to the one seen in Chiesa di Santa Maria in Selva in Locarno. The decorative elements like the floral frames and use of color draw a connection to the frescoes in the Church of Santa Maria di Selva, highlighting a regional artistic style prevalent in the 14th and 15th centuries.<sup>33</sup>

The artist's skill is evident in the expressive drapery and detailed figures, which capture movement and emotion, hallmarks of the Gothic style. There are also some remnants of what seems to be a painted marble altar at the foot of the fresco, where there is also the only clear evidence of sinopia (fig.28). Though parts of the fresco are now lost, traces of additional figures suggest a more complex composition that may have included other mourners or symbolic elements. There is evidence of secco or dry painting in the floral frame as mentioned before.

The fresco may be attributed to a Lombard painter associated with the Seregno workshop, possibly even Cristoforo da Seregno or an artist working within his stylistic circle. This hypothesis is supported by the notable similarity in the composition of the plaster layers when compared to those found in the frescoes of the southern absidiola, indicating a close chronological relationship and suggesting that the works may have originated from the same workshop or artistic environment.<sup>34</sup>

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<sup>32</sup> Rüschi, Elfi. *San Vittore di Muraltò*. Bern: Società di Storia dell'Arte in Svizzera SSAS, 2005 (pag 18-25)

<sup>33</sup> Rüschi, Elfi. *San Vittore di Muraltò*. Bern: Società di Storia dell'Arte in Svizzera SSAS, 2005 (pag 24)

<sup>34</sup> Gilardoni, Virgilio. Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno. *Monumenti d'arte LX, Ticino I* (1972): p.352



*Fig.25. Mary Magdalene*



*Fig.26. Angel in perspective*



*Fig.27. Ornate saddled horse*



*Fig.28. Marble altar fragments*

### 3.2 History and Cultural Value

A particularly interesting aspect of its history and current appearance involves a Romanesque-era single-lancet window (monofora). The pictorial decoration of the fresco is interrupted because this window, likely closed to create an uninterrupted surface for the original painting, was reopened in the 20th century during restoration efforts. This sequence of creating the fresco over a closed window, its subsequent concealment for centuries, its rediscovery, and the later reopening of the Romanesque window through the painted layer, all speak to the evolving life of the church, changing aesthetic preferences, and the complex processes of 20th-century restorations aimed at revealing multiple historical layers. The fresco's deteriorated condition, combined with such interventions, makes it a poignant testament to the layered history of San Vittore and the challenges of preserving medieval art.<sup>35</sup>

<sup>35</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, Ticino I* (1972): 363-364  
Rüsch, Elfi. *San Vittore di Muralto*. Bern: Società di Storia dell'Arte in Svizzera SSAS, 2005 (pag 6)

With the help of the archival documentation, there is evidence of the execution of a consolidation of the upper part of the Crucifixion, but the consolidant applied is not specified. Regarding the Romanesque paintings, the following are mentioned: “removal of the paint film by mechanical, manual or micro-erosion means, consolidation of the support plaster by injections of fluid lime loaded with calcium carbonate powder and Ecosal, consolidation of the paint film by impregnation with 2% Paraloid B72 in toluene, methylcellulose gel loaded with Paraloid (2%) and Dowicide (1%), limewater” and “pictorial integration in watercolor.”<sup>36</sup>

An estimated expenditure of approximately 27,000 Swiss francs was allocated for the meticulous work of liberating the remaining fresco fragments using micro-erosion techniques, followed by their necessary consolidation and aesthetic presentation.<sup>37</sup>

The later centuries saw dramatic shifts in San Vittore’s role. The church was partially stripped of its parochial functions in 1816, following the political reorganization of the canton, reducing it to a local religious site. Mid-19th-century renovations introduced vaulted ceilings and erased many of the medieval frescoes, further complicating the interpretive integrity of the building.<sup>38</sup> However, a growing interest in heritage during the early 20th century, driven by scholars like Giorgio Simona and architects like Rahn, helped recover dispersed Romanesque fragments and inspired new conservation frameworks.<sup>39</sup>

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<sup>36</sup> Archived document (X) Luigi Gianola, Conservatore, progettazione ed esecuzione restauri, Navatella sud: prospetto degli interventi di riordino delle campate terminali e preventivo. Tremona, 8.12.1985

<sup>37</sup> Archived document (X) Ente Restauri Chiesa Collegiata, Muralto, Relazione Gestione 1985. Muralto, 10.01.1986

<sup>38</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, Ticino I* (1972): 356-357

<sup>39</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, Ticino I* (1972): 357

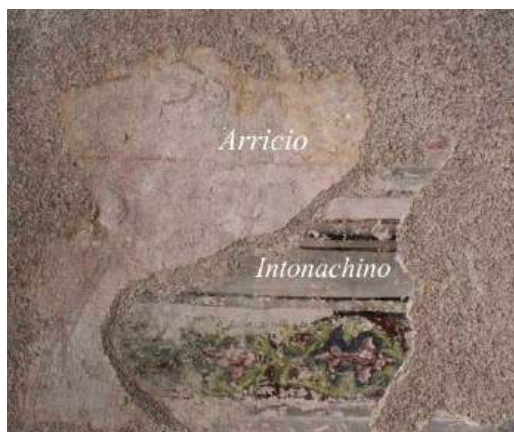
## 4. Condition Assessment

### 4.1 Materials and Execution Techniques

The Crucifixion fresco in San Vittore was created using both buon fresco, painting on wet plaster, and secco, painting on dry plaster, a combination that provided both lasting color and fine detail. The wall supporting the mural was constructed from roughly squared local stones of varying sizes, laid in regular courses and held together by mortar, which is visible around the single-light window (fig.25). The numerous pits caused by the hammering on the painted surface not only gives us evidence of past interventions but have also made it possible to observe the presence of a rough preparatory layer (rinzaffo) as well as the mortar used for the arriccio. Examination of the plaster stratigraphy (fig.26), reveals an overall absence of unreacted lime particles (calcinaroli), with only a few minor exceptions. This indicates that the lime employed as a binder had been thoroughly slaked and effectively combined with the aggregates during the preparation of the mortar.



*Fig.25. Mural support*



*Fig.26 Arriccio and Intonachino*

The Crucifixion is a mural painting primarily executed using the fresco technique. Despite the difficulty in immediately identifying the boundaries of the giornate (fig.30), due to numerous losses, some were recognized using raking light and further joined to reveal 7-8 possible giornate. Traces of a preliminary brush drawing, made with a black pigment which is visible in the outermost geometric frame and a yellow pigment which was used to outline the armor and spears of the soldiers on the right and Longinus on the left, are clearly distinguishable on the uppermost plaster layer. Direct incisions also appear to highlight the use of the fresco technique, particularly the deeper ones.

Two types of direct incision were identified: shallow incisions made with a fine tool on the semi dry plaster, and deeper incisions defining the compass-drawn motifs of the innermost frame, the armor and spears of the soldiers on the right and Longinus on the left, and the halos of the depicted saints (fig.31,32 & 33). There were incisions in one of Madonna's dresses, a common technique for transferring drawings and guiding the fresco execution.



*Fig.30. Giornata evidence*



*Fig.31. Light incision with a tool*



*Fig.32. Deep incisions on the soldier's helmet*



*Fig.33. Deep incisions with a compass*

Small traces of sinopia (fig.34), a preparatory drawing made with a red pigment likely red ochre, were found on the marble altar fragment. The intonachino is the fine preparatory plaster layer applied over the arriccio (the layer which bears the sinopia drawing) to create the final painting surface; it appears this intonachino was made with a mortar of a similar composition to the arriccio. Furthermore, small wood fragments likely incorporated during preparation of the mortar, were found within the intonachino mortar in some areas of the painting (fig.35 & 36).



*Fig.34. Evidence of Sinopia*



*Fig.35. Reference picture of the additive (wood)*

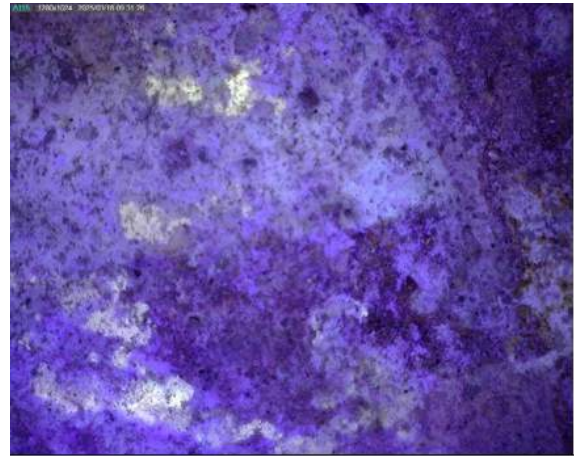


*Fig.36. Dino Lite (x50mag) picture of the additive (wood)*

Microscopic analysis using a portable Dino-Lite microscope, revealed traces of gilding on the spear near the helmet of the soldier Longinus within these deeper incisions, also visible under UV light, suggesting they were intended to hold gold or silver leaf (fig.37 & 38). The artist also made use of battitura di corda, a technique typically used for architectural elements or straight lines. Evidence of rope impression is visible in the lower part of the painting, in the imitation polychrome marble frame, and in the upper part, particularly on the spears of the soldiers on the right, where the rope was even pressed into the surface, leaving clear imprints of its weave. Punzonatura, or punching, was mainly used for the halos of the saints, exhibiting different execution styles. The halos of the angels at the top of the Crucifixion were created with simple direct incisions, likely with the back of a brush (fig.39). In contrast, the halos of Mary Magdalene and the three Madonna's are more refined and in relief, achieved through an additional application of plaster to the relevant painted areas (fig.40). In the upper part of the Crucifixion, near the arch, a very fine spolvero was used to outline small details of the floral motifs of the frame, likely applied a secco on top of the yellow and green base of the flowers (fig.41).



*Fig.37. Reference picture*



*Fig.38. Luminescence indicating metal leaf gilding ( Dino-Lite, x50uv)*



*Fig.39. Punzanatura using direct method on wet plaster*



*Fig.40. Punzanatura on a relief plaster layer*



*Fig.41. Spolvero*

Pictorial finishes executed as secco were identified, for example, in the entire background of the artwork, a black preparatory layer was applied to affresco and finished with a blue pigment(copper-based), which is incompatible with the fresco technique (fig.42,43,44).



Fig.41. Reference photo

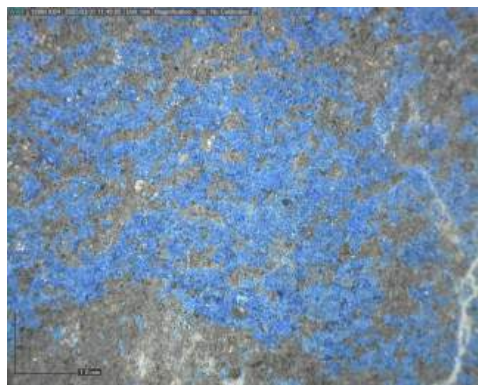


Fig.42. Dino-Lite image, x50 (incident light)



Fig.43. Dino-Lite image, x50 (raking light)

Regarding the portion of the fresco depicting San Longinus, technical photographs compared with visible light images revealed an anomaly in the pigment of the soldier's robe, which appears black in visible light but an intense pink in false-color infrared (fig.44,45,46). Many historical red lake pigments (organic dyes precipitated onto an inert base, like madder lake or cochineal) often appear bright pink or magenta in false-color infrared, even if they look dark red, brown, or even blackish in visible light due to degradation or the original depth of color. It's possible the robe was originally a deep red or purple (made with such a lake pigment) that has darkened considerably over time to appear black to the naked eye.



Fig.44. Reference photo



Fig.45. Close up of reference

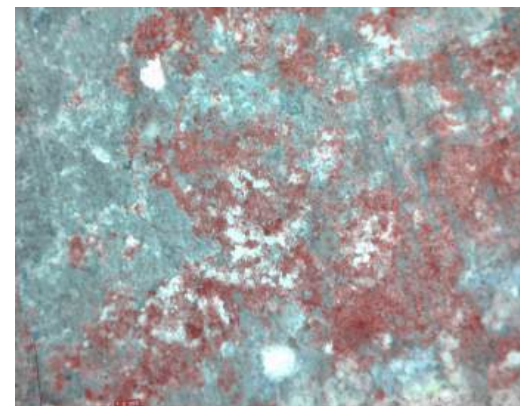


Fig.46. False Colour examination result

Subsequent analytical tests on the painting's pigments revealed the deliberate use of at least two distinct types of blue. Analysis with XRF analysis on the angels' garments indicated a blue pigment with no detectable copper, strongly suggesting the use of precious Lapis Lazuli (ultramarine) for these figures(fig.47). The evidence of presence of calcium, strontium and iron may be related to the support. In contrast, the blue embellishing the soldier's feathered hat was found to not contain copper (fig.48). The second part of the floral frame has a dark red pigment which under XRF turned out to be Terra Rossa

which showed traces of mercury, probably due to contamination from surrounding materials(fig.49). Historically, mercury was used in a gilding technique called fire-gilding (or mercury amalgamation). In this process, gold was dissolved in mercury to create an amalgam. This amalgam was applied to the surface to be gilded (often metal, but sometimes other materials on frames or decorative objects). The object was then heated, causing the mercury to vaporize, leaving a thin layer of gold adhered to the surface. This may possibly be one of the reasons behind the evidence of mercury.



*Fig.47. Blue pigment with copper (Lapiz Lazuli)*



*Fig.48 Blue pigment without copper*



*Fig.49. Terra Rossa*

The artist also used techniques like battita di cordo which can be seen due to the evidence of rope incision in some areas where it was used on a wet plaster (fig.50). In some areas, there are overlapping giornate where the artist layered fresh plastered on already existing, painted and dried plaster from the previous giornata resulting in layers of painted plaster (fig.51). Although it is very difficult to figure out all of them, hypothetically, there can be 7-8 giornate, after joining the fragmented pieces.



*Fig.50. Impression of Battuta di cordo in wet plaster*



*Fig.51. Overlapping giornate*

Plaster detachment in the upper right portion of the fresco, not only exposed the older artwork beneath but also subjected it to greater amounts of candle smoke than the rest of the wall (fig.51,52,53). This increased smoke exposure led to the development of concretions, which are responsible for the distinct color difference observed in that area today.



*Fig.51. Before conservation*



*Fig.52. During on-going conservation*



*Fig.53. After conservation*

It remained to be verified whether the work's surface showed signs of small holes, attributable to consolidation efforts via mortar injections, and to determine the originality (or lack thereof) of the nail positioned below the arch, which, however, seemed to be present in archival documentation photos from around the 1800s.<sup>40</sup>



<sup>40</sup> Archive Document: "Gianolo Luigi, ISTITUTO REGIONALE PER LA CONSERVAZIONE ED IL RESTAURO sa, 24.1.1982

## 4.2 Previous Interventions

The church of San Vittore has undergone numerous transformations throughout its history, reflecting evolving styles and needs. The earliest alterations occurred during the Renaissance, when the original Romanesque structure was adapted to contemporary tastes. A significant phase of work took place in the late 1500s under Bishop Bonomi, which included repainting damaged frescoes in the main apse according to the dictates of the Council of Trent, with the removal of certain decorations deemed unsuitable. In the 1800s, a Neo-Gothic restoration led to the Crucifixion fresco being covered with plaster and limewash, a process that involved systematically hammering the original surface to improve adhesion, resulting in the fresco's current fragmented state. The reopening of a long-sealed Romanesque window during this time likely contributed to the loss of the section depicting Christ's body.

The historical record of early conservation efforts or modifications specifically concerning the wall adorned with the Crucifixion fresco is notably sparse. Nevertheless, the fresco itself bears evident physical testimony to past interventions. Among the most striking of these are widespread indentations from hammering, a common albeit destructive method to create a rough key for a new layer of plaster, which served to create a keyed surface for a subsequent plaster layer designed to obscure the artwork.<sup>41</sup>

Information obtained from archival materials reveals specific details about how 19th-century interventions impacted earlier artworks within San Vittore. For instance, the plaster applied during that period to conceal older paintings is characterized as "a mixture with abundant lumps of calcium". Furthermore, letters attributed to the restorer Luigi Gianola shed light on the prevailing practices for treating these underlying frescoes: it's reported that artworks on compromised supports faced systematic destruction or extensive hammering to create a key for new plaster. Conversely, ancient frescoes deemed to be in good condition were treated more sympathetically, receiving only a minimal covering layer or sometimes just a whitewash, thereby avoiding the need for aggressive surface preparation like hammering. The general approach of Luigi Gianola, involving careful assessment and specific intervention plans for frescoes, is evident in his various proposals.<sup>42</sup>

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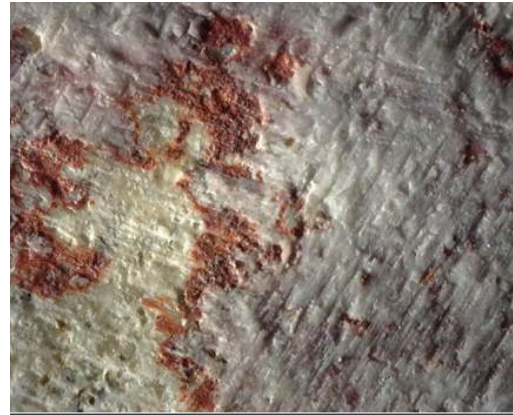
<sup>41</sup> Gilardoni, Virgilio. "Chiesa di San Vittore Già Collegiata Plebana di San Vittore di Locarno." *Monumenti d'arte LX, Ticino I* (1972): 363

<sup>42</sup> Archival Document: Luigi Gianola, *Conservatore, progettazione ed esecuzione restauri. Indicazioni inerenti lo stato di conservazione e modalità del recupero e della restituzione. Stima dei tempi e costi relativi. Tremona, 7 febbraio 1982*

The traces of whitewash are also evident, which, according to archival documents, were probably applied in the 1500s, but there are also signs of de-whitewashing carried out during previous restorations that are particularly visible where the outermost geometric frame is located (fig.54,55).



*Fig. 54. Reference image*



*Fig. 55. Detail of lime wash (Dino-Lite image, 50x zoom)*

On the wall, there are numerous and extensive lacunae (gaps/losses), which were probably reintegrated in the 1980s by Gianola. For this reintegration process, a distinct mortar was utilized, characterized by the inclusion of aggregate particles of varying dimensions. Detailed examination using a Dino-Lite portable digital microscope, and the subsequent analysis of the captured images, has revealed that these aggregate sizes range from extremely fine, near 0mm, to larger grains exceeding 1mm in diameter (fig.56,57,58).



*Fig. 56. Reference photo*



*Fig. 57. Details of the filling (Dino-Lite image, 50x zoom inc)*



*Fig. 58. Dino-Lite image, 50x zoom rad*

The same Type 1 stucco filling seems to have been used for the south apse (absidiola), the restoration of which is contemporary with that of the Crucifixion wall (fig.59,60). The choice to use the same type of mortar, only with the addition of more binder, to plaster both works may have been dictated by the surplus of material and/or the desire to finish the restoration site as soon as possible.



*Fig.59. Reference Image*



*Fig.60. Detail of the mortar used for the grouting of the apse (Dino-Lite image, 50xinc).*

Other such numerous lacunae were probably reintegrated in the 16th century (Cinquecento), likely with the intention of supporting the layer of whitewash (scialbo) subsequently applied during the same period. Although this is probably not an isolated case, it is difficult today to find similar traces in other areas of the wall. In contrast to other repairs, a Type 2 stucco can be identified in the vicinity of the arch. This particular filling is believed to be of an earlier origin, with current hypotheses suggesting it could date as far back as the 16th century. Interestingly, this older stucco was apparently not removed during later restoration campaigns undertaken by Gianola; the decision to preserve it was likely made because it was assessed as still being structurally sound and effective for its purpose. This 'type two' stucco is distinguishable not only by its different coloration when compared to the 'type one' fillings but also by the presence of specific surface marks. These marks are interpreted as having been inflicted during the process of 'descialbo,' which is the careful removal of overlying whitewash or limewash layers from the artwork (fig.61,62).



*Fig.61. Reference image*



*Fig.62. Detail of type two stucco (Dino-Lite image, 50x inc)*

Further investigation using ultraviolet (UV) light revealed additional insights into the history of interventions near the window. Specifically, an earlier type of filling material located beneath the window was observed to exhibit luminescence when exposed to UV radiation (fig.60,61). The phenomenon of luminescence under UV light is significant because different materials fluoresce in distinct ways; this particular response helps to distinguish this earlier repair from other materials and suggests it possesses a different chemical composition, possibly due to older types of binders, varnishes, or pigments used in that specific filling.

Beyond this specific finding, there is compelling evidence indicating that the entire zone around the window has undergone significant alterations at some point in its past. These modifications are suspected to have occurred during renovation campaigns in the 19th or early 20th centuries. Supporting this hypothesis are the discernibly jagged and uneven edges of the current window aperture. Such irregularities could indeed be the result of a forceful or less meticulously executed reopening or reshaping of the window during one of these historical renovation phases.

There is also the existence of colored fragments associated with the brickwork surrounding the window. The discovery of these 'colored fragments by bricklayers' is particularly intriguing and open to a couple of interpretations. One possibility is that these are, as previously considered, dislodged pieces of the original fresco or its painted plaster surround that became embedded in new mortar or disturbed during construction or repair activities around the window—perhaps during attempts to remove the fresco or when the window itself was altered. Alternatively, these colored fragments might indicate that the brickwork itself around the window was once decoratively painted, and what we are seeing are remnants of this applied paint layer on the bricks. If this is the case, it would point to an even more layered decorative history in this specific area, with subsequent building work partially obscuring or incorporating these painted brick surfaces.



*Fig.60,61. Luminescence detected in the fillings under the window*

### 4.3 Deterioration Phenomena: Description, Causes, Severity, and Risk Factors

The degradation of the mural paintings is characterized by several phenomena, including detachments, abrasion, fissures, deposits, involuntary deposits like paint drops. The crucifixion is mainly affected by detachments that have resulted in voids making the pictorial structure unstable. The detachments are more likely attributed to inadequate bonding between the arriccio (rough plaster coat) and the intonachino (fine plaster coat), maybe due to the artist's technique. It is possible that these detachments were caused due to the hammering, which might have hurt and affected the surrounding areas causing the plaster to lose its tenacity. These voids are dominant around the area of the frame as well near Christ's hand. They can also be seen prevalent close to the fillings and cracks.

There is a fissure (fig.64) in the adjacent west wall that runs from the top of the vault down which may be connected to the ossario, and its activity should be assessed by examining Gianola's photographs, which show a displaced crack meter; observations suggest this same wall might have been plastered in the 16th century or possibly by Gianola, as traces of limewash have been left behind in the upper right area as a testimony to the past(fig.63).



*Fig.62. Fissure in the adjacent west wall*



*Fig.63. Evidence of Lime wash left behind by Gianola*

This fissure can also be due to the pressure created while the construction of the ossario on the other side. There are cracks prevalent on the vault ceiling that start in the middle point and run down towards the wall of the painting displaying structural imbalance (fig.64). These cracks can also be caused by other factors like the vibration caused due to the constant vehicle traffic on the road as well as the train track located right next to the church. These cracks are dominantly visible around fillings that may be the cause behind the cracks (fig.65,66).



*Fig.64. Cracks in the ceiling*



*Fig.65,66. Cracks and fissures formed near existing fillings*

A significant degradation phenomenon observed is abrasion, which presents in several forms across the mural paintings. One potential cause of this abrasion is the descialbo process, the historical removal of limewash layers, which would have involved aggressive scraping or cleaning that could damage the delicate paint surface. This process is known to involve risks, particularly to the original surface of the artwork. A damaged or structurally unsound intonaco cannot provide a stable foundation for the paint layer, thus accelerating the decohesion and loss of pigments.

Furthermore, the loss of significant portions of the intonachino itself is a critical and related problem. The intonachino is the immediate support for the paint and also acts as a protective layer. When large areas of this essential plaster layer are missing, any remaining fragments of paint and intonachino often show widespread signs of abrasion. This is because their edges are exposed, and the overall structural integrity of the painted surface is diminished. In essence, when this protective plaster layer is no longer intact, the paint becomes highly vulnerable to all forms of mechanical damage and environmental stresses, leading to further deterioration.

Most of the fragments of the intonachino are lost and the ones that are left behind show signs of abrasions all over the painting (fig. 67). Furthermore, the application and subsequent removal of lime washes, a recurring practice in the history of the church, has resulted in the stripping away of much of the metal leaf gilding, another form of abrasion specific to the gilded areas. A layer of deposits like dust and grime are present on both the pictorial surface and within the fillings and hammered grooves of the artwork. These deposits primarily consist of accumulated dust, a common occurrence over time in untreated surfaces (fig.68).



*Fig.67. Abrasione of the pictorial layer*



*Fig.68. Deposition of dust, discoloration due to deposit*

However, this phenomenon is also identified as a form of deposit, and it requires further analysis to determine its nature, specifically whether it is coherent (firmly attached) or incoherent (loosely attached); initial observations suggest it is incoherent. Understanding the composition and adherence of these deposits is crucial for selecting appropriate cleaning methods. In addition to general dust accumulation, there are also instances of paint drips visible in certain areas of the mural paintings (fig.69). These drips are likely a consequence of Gianola's restoration project, indicating that some paint may have run or splattered during the application process. Such drips, while potentially minor, can affect the aesthetic appearance of the artwork and need to be considered in conservation planning. Previous documentation of the fresco clearly shows signs of degradation caused by water infiltration and humidity which was solved by Gianola. The fractures however were either left unsolved or appeared later.



*Fig.69. Paint splatter*

## **5. Conclusions and Recommendations**

Artistically, the church houses significant, albeit often fragmentary, evidence of its rich decorative past. The Romanesque Genesis cycle in the central nave stands as a paramount example of early medieval narrative painting in the region. The early 15th-century Gothic Crucifixion fresco, despite severe deterioration and losses—particularly the central figure of Christ due to the past reopening of a Romanesque monofora—remains a crucial artistic testament, with specific execution techniques like *spolvero* and *a secco* applications identified for its detailed elements. Technical analysis of various pictorial elements have further illuminated the artists' material choices, identifying pigments such as Lapis Lazuli, copper-based blues (possibly azurite or Egyptian blue), and Terra Rossa, alongside issues like mercury contamination in earth pigments, likely from vermilion. The study of fresco execution techniques has also clarified the use of distinct plaster layers, including *rinza*, *arriccio*, and *intonaco*.

The history of interventions is equally layered. Centuries of modifications, including the 19th-century practice of covering earlier frescoes with plaster (sometimes after aggressive surface preparation like hammering), have profoundly impacted the legibility of its historical phases. The extensive 20th-century scientific restoration campaigns, particularly the work from 1960-1984 and the subsequent detailed interventions led by Luigi Gianola, have been pivotal. These efforts have involved complex decision-making, leading to the recovery of significant artworks but also highlighting ongoing conservation challenges such as abrasion, the compromised state of the *intonaco* in various areas, and the irreversible losses caused by past destructive actions.

To ensure the continued understanding and preservation of San Vittore di Muralto's rich legacy, future actions should prioritize targeted research, including further non-invasive diagnostic investigations (e.g., portable XRF or FTIR) to definitively identify uncertain materials in artworks like the copper-based blue on the soldier's feathered hat or the luminescent filling beneath the window, and continued archival exploration to uncover more details about unrecorded past interventions, especially those impacting the Crucifixion fresco. Implementing a continuous monitoring program for the most fragile pictorial and stucco elements, particularly the Crucifixion fresco, areas exhibiting abrasion, and sections where the *intonaco* is known to be compromised or 'stanco'. This should include regular visual inspection and environmental monitoring (temperature, relative humidity).

This monitoring must also extend to structural concerns, specifically including a thorough assessment and appropriate remediation strategy for the noted crack on the west wall at the back of the ossuary, alongside checks for the cracks in the vault.

## 6. Bibliography

- Gilardoni V., *I monumenti d'arte e di storia del Canton Ticino, Volume I, Locarno e il suo circolo (Locarno, Solduno, Muralto e Orselina)*. Birkhauser Verlag Basel, 1972
- Rüschi E., *San Vittore di Muralto*, Berna 2005
- *Guida d'arte della Svizzera*. Berna Descrizione degli oggetti per la gentile concessione della Società di Storia dell'arte in Svizzera SSAS Vol 1 2005/ Vol. 2 2006 / Vol. 3 2006

## **Allegato A1**

## **Register for Archival Sources**

- Archived document (X) Ente Restauri Chiesa Collegiata Muralto, Relazione Gestione 1978. Muralto, 22.01.1079
- Archived document (X) Ente Restauri Chiesa Collegiata, Muralto, Relazione Gestione 1979. Muralto, 31.01.1980
- Archived document (X) Cantone Ticino, Dipartimento dell'ambiente, II° Rapporto intermedio, dati al 10.05.1980. Bellinzona, 23.05.1980
- Archived document (X) Ente Restauri Chiesa Collegiata, Muralto, Relazione Gestione 1981. Muralto, 26.01.1981; Luigi Gianola, Conservatore, progettazione ed esecuzione restauri. Tremona, gennaio 1982, Comunicazione. Bellinzona, 6.08.1981
- Archived document (X) Luigi Gianola, Conservatore, progettazione ed esecuzione restauri, Indicazioni operative e costi possibili per gli interventi previsti sulle pareti della nave centrale a complemento della proposta di un piano di lavoro. Tremona, gennaio 1982; Luigi Gianola, Conservatore, progettazione ed esecuzione restauri. Indicazioni inerenti lo stato di conservazione e modalità del recupero e della restituzione. Stima dei tempi e costi relativi. Tremona, 7 febbraio 1982; Luigi Gianola, Conservatore, progettazione ed esecuzione restauri, Comunicazione fine riporto degli affreschi strappati sulla volta. Locarno, 15 giugno 1982; Cantone Ticino, Dipartimento dell'ambiente. Pareti della navata centrale: situazione e proposta di un piano di lavoro. Bellinzona, dicembre 1982.
- Archived document (X) Ente Restauri Chiesa Collegiata, Muralto, Relazione Gestione 1982. Muralto, 1 febbraio 1983; Luigi Gianola, Conservatore, progettazione ed esecuzione restauri. Tabella riassuntiva delle prestazioni al cantiere di restauro. Tremona, 9.03.1983
- Archived document (X) Cantone Ticino, Dipartimento dell'ambiente, Comunicazione sulle travature della navata centrale. Bellinzona, 8.06.1983
- Archived document (X) Luigi Gianola, Conservatore, progettazione ed esecuzione restauri, Indicazioni operative e di spesa per interventi su alcuni dipinti murali dell'interno. Tremona, 1.07.1984
- Archived document (X) Luigi Gianola, Conservatore, progettazione ed esecuzione restauri, Ciclo pittorico della prima metà del secolo XV interessante l'absidiola e la prima campata della navatella sud. Stadio odierno, modalità per la conclusione dei lavori ed indicazione die costi possibili. Tremona, 2.07.1984
- Archived document (X) Ente Restauri Chiesa Collegiata, Muralto, Relazione Gestione 1984. Muralto, 19.02.1984

- Archived document (X) Luigi Gianola, Conservatore, progettazione ed esecuzione restauri, Navatella sud: prospetto degli interventi di riordino delle campate terminali e preventivo. Tremona, 8.12.1985
- Archived document (X) Luigi Gianola, Conservatore, progettazione ed esecuzione restauri, Preventivo absidiola sud. Tremona 5 giugno 1985
- Archived document (X) Ente Restauri Chiesa Collegiata, Muralto, Relazione Gestione 1985. Muralto, 10.01.1986
- Archived document (X) Luigi Gianola, Conservatore, progettazione ed esecuzione restauri, Comunicazione allo Studio di architettura Ervino Reichhardt. Tremona 22.07.1986
- Archived document (X) Cantone Ticino, Dipartimento dell'ambiente, Comunicazione al restauratore Gianola. 29.07.1986
- Archived document (X) Luigi Gianola, Conservatore, progettazione ed esecuzione restauri, Comunicazione. Tremona, 21.07.1986
- Archived document (X) Ente Restauri Chiesa Collegiata, Muralto, Relazione Gestione 1986. Muralto, 12.02.1987
- Archived document (X) Ente Restauri Chiesa Collegiata, Muralto, Relazione Gestione 1987. Muralto, 4.01.1988
- Archived document (X) Ente Restauri Chiesa Collegiata, Muralto, Relazione Gestione 1988. Muralto, 3.01.1989
- Archived document (X) Ente Restauri Chiesa Collegiata, Muralto, Relazione Gestione 1989. Muralto, 4.01.1990
- Archived document (X) Ente Restauri Chiesa Collegiata, Muralto, Relazione Gestione 1993. Muralto, 10.01.1994
- Archived document (X) Ente Restauri Chiesa Collegiata, Muralto, Relazione Gestione 1994. Muralto, 16.01.1995; Commissione Federale dei Monumenti Storici, Comunicazione. Freiburg, 24.07.1995
- Archived document (X) Istituto Regionale per la Conservazione ed il Restauro, Proposte di riordino e stime preventive. Tremona, 12.11.1996
- Archived document (X) Studio di Architettura Succ. Dr. Erh. Gull, Ascona, Comunicazione, conferma d'ordine. Ascona, 17.01.1997
- Archived document (X) Ente Restauri Chiesa Collegiata, Muralto, Comunicazione, proposte per ulteriori interventi di restauro: 6 tappa. Muralto, 24.01. 1997

- Archived document (X) Ente Restauri Chiesa Collegiata, Muralto, Scioglimento dell'Ente.  
Muralto, 11.03.2002
- Archived document (X) Raffaele Cavadini Architetto, Studio preliminare. Muralto, 2017
- Luce A., *Procedure disegnative delle pittura murale di primo Quattrocento*
- Gregori M., *Pittura a Como e nel Canton Ticino, dal Mille al Settecento*, ed. Amilcare Pizzi
- Quadri I., *La pittura murale tra XI e XIII secolo in Canton Ticino. Tra gli intonaci medievali di un'altra Lombardia*, Silvana Editoriale pag. 130-137
- Mora P., Mora L., Philippot P., *La conservazione delle pitture murali*, 1999
- S. Tassetto, *La miniatura tardogotica lombarda e i suoi rapporti con l'Europa, il Messale-Libro d'Ore Lat. 575*, Vita e Pensiero, Pubblicazione dell'Università Cattolica del Sacro Cuore, Arte Lombarda

## **Allegato A2**

### **Church of San Vittore, Muralto Crucifixion**

### **Illustrated Glossary**

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## 1. CONSTITUTIVE PROCEDURES

### 1.1 ORIGINAL MATERIALS

#### Wall Support

Load-bearing structure that provides the physical stability of the building, onto which the plaster layers are applied. It consists of a homogeneous composition of locally sourced stones, cut and roughly shaped. The various components of the wall are held together by a bedding mortar.



*Masonry visible in the splay of a window*



*External masonry with visible tooled (or pointed) joints*

#### Bending Mortar

Layer of mortar applied between one stone of the masonry and another, serving as a binder. In this case, the joints are tooled as a decorative element.



*External masonry with visible tooled joints*

## Arriccio (rough coat)

Application of an intermediate mortar layer between the masonry support and the finishing plaster (intonachino); the surface is relatively well-smoothed and contains aggregates ranging in size from 0 to 10 mm. Its function is to even out the surface and provide a suitable anchoring base for the intonachino.



*Base plaster (arriccio) with finishing plaster (intonachino), observed under raking light*

## Intonachino (fine coat)

Application of a surface mortar layer approximately 5 mm thick; the finish is well-worked and smoothed, with aggregates ranging from 0 to 5 mm in size. Its function is to decorate the walls, with or without painted decoration.



*Intonachino privo di pellicola pittorica, luce radente.*

## Intonaco (plaster)

A protective and/or decorative layer applied to architectural surfaces. It is also used for modelling and casting decorative elements. (Source: EWA, 2016: *Art and Craft Techniques, Construction*, p. 51)

The plaster in the area of interest is composed of two layers: arriccio and intonachino. It is pale in color and consists of air lime and white angular aggregate, with inclusions of mica and probable quartz.

The function of the plaster is to protect the masonry and to decorate it



*Losses that reveal the superimposition of different plaster layers*

## 1.2 EXECUTIVE TECHNIQUES

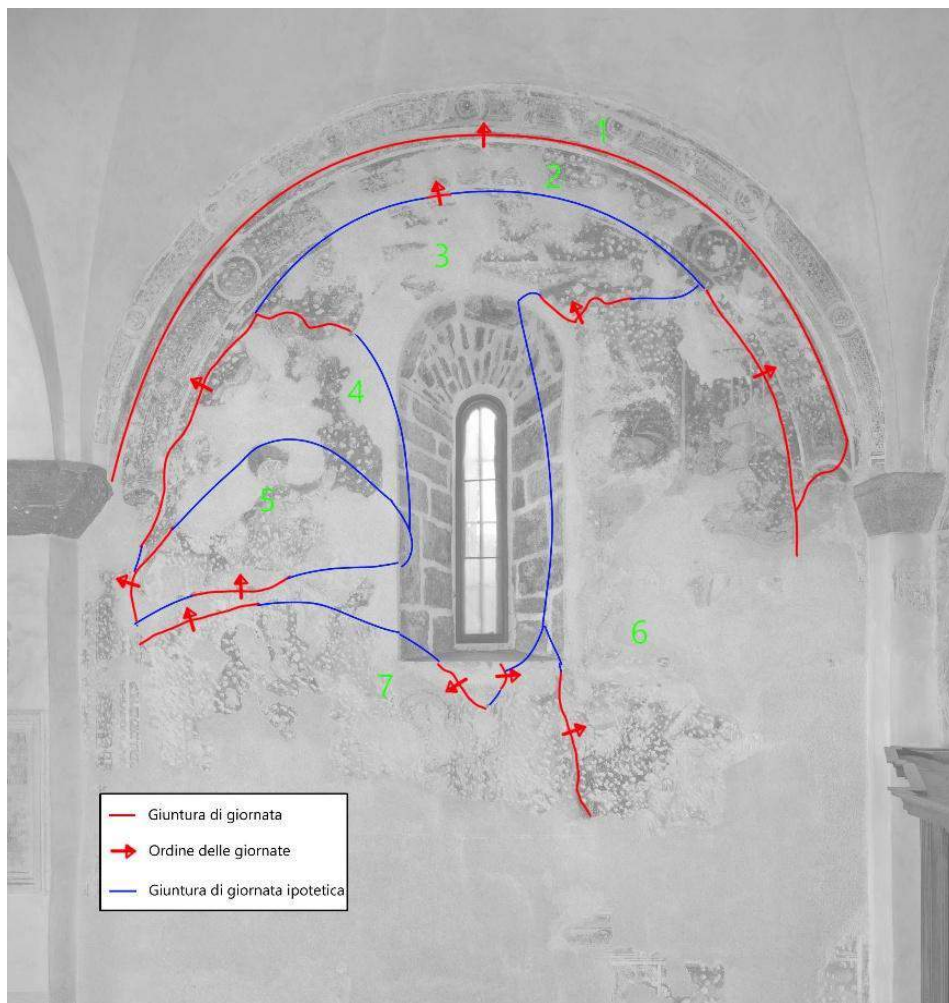
### 1.2.1 Application of Preparatory Layer

#### Giornate

Division of the areas where the finishing plaster (intonachino) is applied in preparation for fresco painting. Since fresco painting must be executed within a limited time frame, the plaster is applied in sections known as *giornate*. These are identifiable by the overlapping of the edges, which is sometimes concealed by careful surface finishing.



Joint between giornate with visible tool marks



Map of the giornate.

## Signs/Traces of workmanship

Marks left by tools used for surface smoothing, such as a trowel, or by a brush applied to the plaster while still fresh.



*Traces of brushstrokes applied to fresh plaster, visible under raking light.*

## 1.2.2 Preparatory Drawing

### Sinopia (underdrawing)

Preparatory drawing made on the arriccio layer, primarily used to organize the composition and serve as a draft for the final work, including the placement of figures and decorative frames.



*Arriccio layer with sinopia*

### Spolvero (pouncing)

Technique used to transfer a drawing, generally employed to reproduce the same design or decoration multiple times by dabbing a cloth pouch filled with pigment over a cartoon perforated along the outlines of the figures. It appears as rows of dots following the contours of the figures.



*Pouncing used for the highlighting of a leaf, observed under a digital microscope*

### Battitura di corda (chord paint splatter)

Definition of linear elements, such as frames and weapon shafts, created by striking a cord against the fresh plaster. This technique is identifiable by the imprint left in the plaster, which was sometimes reinforced with a brush-drawn line.



*Vertical imprints from cord beating used to draw a spear, visible under raking light.*

## Incisions

Marks made with various pointed tools, such as styluses, sticks, or compasses. These can be direct, when the marks are incised directly into the intonachino, or indirect, when a cartoon bearing the design is placed over the intonachino to transfer the drawing.



*Direct incisions made with a compass, visible under raking light.*

## Brush Drawings

Drawings made with yellow, black, or red pigment as preparatory sketches on the intonachino, visible where the dry applications have been lost.



*Brush-drawn sketch in yellow pigment for the preparation of the helmets.*

## 1.2.3 Painting Layer

### Preparatory paint layer

A layer of color usually applied to fresh plaster, intended to receive a subsequent dry application characterized by a brilliant, coarsely ground pigment, in order to achieve a particular chromatic effect.



*Black preparatory layer for the application of blue pigment.*

### Dry application/Finishing

Applications applied to dry plaster using a binder—such as egg yolk or lime putty—of pigments that may or may not be compatible with the fresco technique, or metal leaf.



*Dry finish for the vegetal motif.*

### **Punzonatura (pouncing)**

A technique that allows a decorative mark to be impressed into the plaster through applied pressure. This technique has been found exclusively in certain haloes.



*Raised crown of a Madonna decorated with punchwork.*

### **Pentimento**

Remnants of a line or figure that were covered over because they were executed incorrectly or altered during the course of the work.



*Area where a layer of pigment is visible beneath fallen plaster, possibly indicating a pentimento.*

## 2. CURRENT STATE

### 2.1 Previous Interventions

#### Hammering

Roughening of plaster carried out with a hammer to promote the adhesion of a subsequent layer.



*Signs of Hammering*

#### Fillings

Filling of a lacuna or the loss of one or more support layers using a mortar composed of lime and medium-fine sand. The aim is to restore the continuity of the layers that make up the artwork, both structurally and aesthetically. These fillings are very extensive across the entire decorated wall area.



*Old stucco filling, date unknown*



*Stucco filling dating to the restoration work by Luigi Gianola*

## White wash

Thin white layer of lime or limewash, used to cover the painting (sometimes applied to conceal decorations for religious, political, or aesthetic reasons, hiding imagery deemed no longer appropriate).



*White patches of limewash remaining from the removal intervention.*

## Mortar Injection points

Holes that indicate the use of syringes (for example, with mortar) to bond two layers of plaster by filling voids in cases of detachment or delamination. Sometimes, instead of creating holes, injections are performed through already accessible areas of detachment.



Possible injection mortar (yellow), either injected or leaked. (UV light)

## Nails

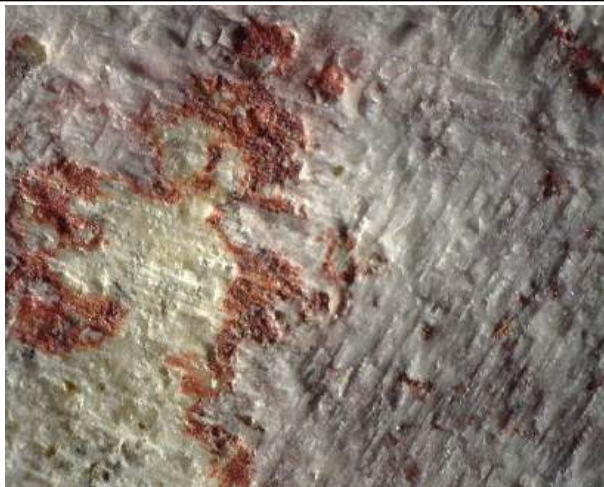
They can serve various functions, such as securing decorative elements; they may also be part of the execution technique (e.g., string beating).



*Large nail embedded in the plaster; its purpose is unknown.*

## Traces of whitewash removal

Marks on the surface left by the tools used for the removal of the limewash. They vary depending on the type of tool used.



*Limewash removal with signs of micro-erosion, digital microscope.*

## 2.2 FENOMENI DI DEGRADO

### Abrasion

Partial loss in the thickness of a layer of the work, which may involve the plaster or the paint layer.



*Abrasion of Intonaco*



*Abrasion of paint layer*

### Drippings

Drops of color that fell onto the surface during the execution technique.



*Dripping of pigment or binder*

## Loose surface deposits

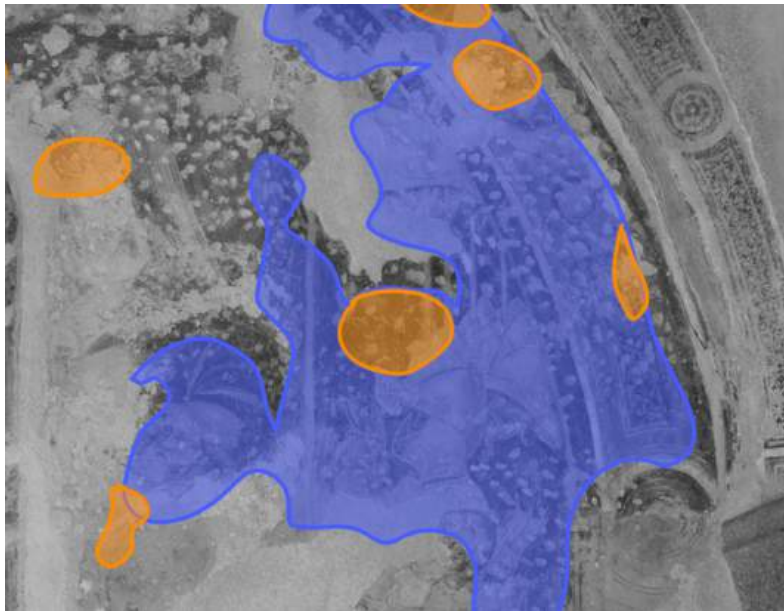
Material deposited on the surface of the artwork with low or no adhesion. It can be identified as dust, cobwebs, debris, etc.



*Cobwebs, dust, and debris at the base of the single-light window (monofora)*

## Detachments

Separation of two layers of plaster, classified into two categories based on severity using empirical methods.



*Mapping of a detachment that includes both categories.*

## Cracks

A crack that runs through the wall and affects the masonry support; it may be a sign of structural instability of the entire wall and requires particular attention.



*Through crack, exterior*



*Through crack, interior*

## Crack meter

Plate applied over a crack to determine whether the cause remains active over time.



*Activated Crack meter*

### Knock test

Test performed to detect hidden detachments without visible lacunae. By tapping the surface with the knuckles, a sound is produced whose intensity varies depending on the size of the void, which also forms the basis for classification.

### Lacuna (loss)

Partial loss of a layer of the artwork, which may involve either the plaster or the paint layer. Unlike abrasion, a lacuna includes a clearly defined area where the entire thickness of the layer is missing. It occurs when a detached surface completely separates from the artwork.



*Lacuna of the Intonaco*



*Lacuna of the paint layer*

### Mortar splashes

Droplets of mortar that fell onto the surface during the application of a fill (stuccatura).



*Splashes of mortar*

## **Allegato A3**



### **Church of San Vittore, Muralto (TI) Crucifixion**



#### **Non-invasive diagnostic tests: X-ray fluorescence (p-XRF)**



## Introduction



The following document reports the results of the analyses obtained from the p-XRF measurements carried out on 03.24.2025 by the teacher and diagnostician Patrizia Moretti at the Church of San Vittore in Muralto (TI). The analyses are contextualized to the SUPSI educational project for the Bachelor in Conservation degree course dedicated to the preliminary study on the state of conservation of the mural paintings of the Crucifixion in international Gothic style on the wall of the first span of the south nave. The analyses were carried out in order to identify the chemical elements that characterise the pigments used for the decoration.



X-ray fluorescence analyses were performed with a Niton™ XL3t 900 spectrometer manufactured by Thermo Scientific. The instrument consists of an RX tube that can reach a maximum voltage value of 50 kV, a silver anode (50 kV and 200  $\mu$ A) and a Si-PIN detector that allows reaching a resolution of 195 eV. The XRF spectra were acquired with measurement times of 30 seconds. With this instrumentation it is possible to discriminate the presence of chemical elements with atomic number ( $Z$ )  $\neq$  that of sulfur [ $Z(S)=16$ ]. For each measurement point, the data recorded in situ were reported in a table with the detected elements and the counts per second of the fluorescence X-rays related to the electronic transition (counts/ s) associated with them. The table is accompanied by a photo of the point and an interpretation of the results.



Blue		X01_A8					
							
<b>Location:</b> Area above the halos of the three Marys.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	32.59	4.40	-	-	5.70	12.91	-
<b>Interpretation:</b> The presence of calcium, strontium and iron may be related to the support. There are no identifying elements for the blue pigment which could, in this case, be identifiable as Lapis Lazuli.							



Green		X02_A8					
							
<b>Location:</b> Robe covering the head of Mary of Clopas (?).							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	6.47	25.16	1.86	-	170.63	2.75	12.14
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support. With the considerable presence of lead and tin it is assumed that Gallorino was used, probably applied in a mixture with green earth.							



Green		X03_A6					
							
<b>Location:</b> Robe of Saint Longinus							
<b>Chemical Elements (count/s)</b>							
<b>K (<math>K\alpha_1</math>)</b>	<b>Ca (<math>K\alpha_1</math>)</b>	<b>Fe (<math>K\alpha_1</math>)</b>	<b>Cu (<math>K\alpha_1</math>)</b>	<b>Hg (<math>L\alpha_1</math>)</b>	<b>Pb (<math>L\alpha_1</math>)</b>	<b>Sr (<math>K\alpha_1</math>)</b>	<b>Sn (<math>K\alpha_1</math>)</b>
-	30.35	36.24	20.11	-	34.63	6.73	-
<b>Interpretation:</b> The presence of calcium and iron could be related to the support. The presence of copper could indicate the use of Malachite even if the quantity of copper is very low; instead, lead could be traced back to the use of a pigment (such as Biacca) present in residues and/or in a mixture.							



Black		X04_A6					
							
<b>Location:</b> Robe of San Longinus.							
<b>Chemical Elements (count/s)</b>							
<b>K (<math>K\alpha_1</math>)</b>	<b>Ca (<math>K\alpha_1</math>)</b>	<b>Fe (<math>K\alpha_1</math>)</b>	<b>Cu (<math>K\alpha_1</math>)</b>	<b>Hg (<math>L\alpha_1</math>)</b>	<b>Pb (<math>L\alpha_1</math>)</b>	<b>Sr (<math>K\alpha_1</math>)</b>	<b>Sn (<math>K\alpha_1</math>)</b>
-	24.24	28.52	133.95	-	17.95	6.68	-
<b>Interpretation:</b> The presence of calcium, iron and strontium could be related to the support. Copper is much more consistent than the measurement point X03 and suggests the presence of a copper-based pigment. The presence of lead could indicate the use of a lead-based pigment (White lead?) used in a mixture or used for some finishes.							



Yellow		X05_A6					
							
<b>Location:</b> Saint Longinus's sleeve, part of the armour.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	35.36	11.09	1.59	-	14.13	6.88	-
<b>Interpretation:</b> The presence of calcium, iron and strontium could be related to the support or to the yellow ochre (ferrous pigment) used for the preparatory drawing; the Lead could be linked to the use of oily substances that were used to apply the metal sheets (see luminescence, in mur_crx_a6_soldato_uvl).							



Blue		X06_A8					
							
<b>Location:</b> Virgin Mary's robe. Preparatory layer.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	25.45	5.54	3.95	-	1.73	6.25	-
<b>Interpretation:</b> The presence of calcium, iron and strontium can be related to the support and/or black pigment. The presence of copper and lead is to be considered in traces.							

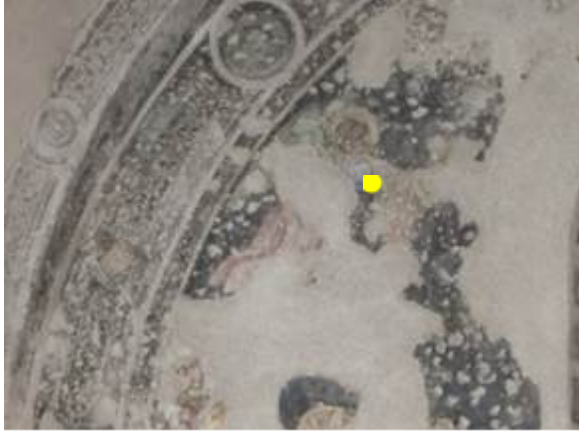

Dark Blue		X07_A8					
							
<b>Location:</b> Virgin Mary's robe. Darker finishing coat							
<b>Chemical Elements (count/s)</b>							
<b>K (Kα1)</b>	<b>Ca (Kα1)</b>	<b>Fe (Kα1)</b>	<b>Cu (Kα1)</b>	<b>Hg (Lα1)</b>	<b>Pb (Lα1)</b>	<b>Sr (Kα1)</b>	<b>Sn (Kα1)</b>
-	5.44	9.61	411.85	-	4.64	2.88	-
<b>Interpretation:</b> The presence of calcium, iron and strontium can be related to the support. Lead is present in traces while copper indicates the presence of a copper-based pigment. The IR False Color technical photography excludes the use of Azurite.							

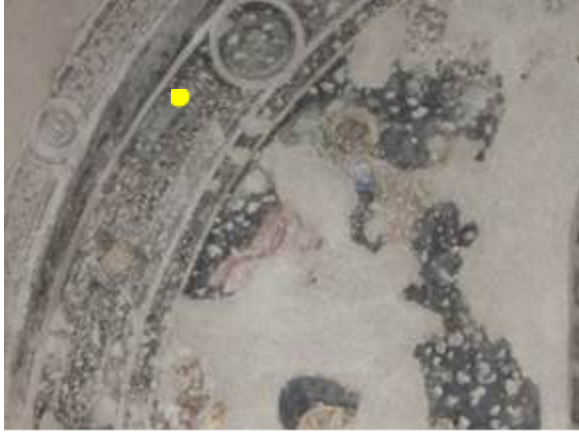

Blue		X08_A7					
							
<b>Location:</b> The soldier's headpiece.							
<b>Chemical Elements (count/s)</b>							
<b>K (Kα1)</b>	<b>Ca (Kα1)</b>	<b>Fe (Kα1)</b>	<b>Cu (Kα1)</b>	<b>Hg (Lα1)</b>	<b>Pb (Lα1)</b>	<b>Sr (Kα1)</b>	<b>Sn (Kα1)</b>
-	22.64	5.59	1.38	-	1.45	6.46	-
<b>Interpretation:</b> The presence of calcium, iron and strontium can be related to the support. There are no identifying elements for the blue pigment which could, in this case, be recognizable as Lapis Lazuli.							



Blue		X09_A7					
							
<b>Location:</b> Soldiers Cap							
<b>Chemical Elements (count/s)</b>							
<b>K (Ka1)</b>	<b>Ca (Ka1)</b>	<b>Fe (Ka1)</b>	<b>Cu (Ka1)</b>	<b>Hg (La1)</b>	<b>Pb (La1)</b>	<b>Sr (Ka1)</b>	<b>Sn (Ka1)</b>
-	22.46	5.07	1.45	-	2.54	6.74	-
<b>Interpretation:</b> The presence of calcium, iron and strontium can be related to the support. There are no identifying elements for the blue pigment which could, in this case, be recognizable as Lapis Lazuli.							



Blue		X10_A6					
							
<b>Location:</b> Background near the figure of Saint Longinus.							
<b>Chemical Elements (count/s)</b>							
<b>K (Ka1)</b>	<b>Ca (Ka1)</b>	<b>Fe (Ka1)</b>	<b>Cu (Ka1)</b>	<b>Hg (La1)</b>	<b>Pb (La1)</b>	<b>Sr (Ka1)</b>	<b>Sn (Ka1)</b>
-	30.04	7.38	91.74	-	5.12	6.58	-
<b>Interpretation:</b> The presence of calcium, iron and strontium can be related to the support. The presence of copper probably suggests the use of a copper pigment. Lead is present in traces.							



Blue		X11_A6					
							
<b>Location:</b> Angel's robe (dark section)							
<b>Chemical Elements (count/s)</b>							
K (K $\alpha$ 1)	Ca (K $\alpha$ 1)	Fe (K $\alpha$ 1)	Cu (K $\alpha$ 1)	Hg (L $\alpha$ 1)	Pb (L $\alpha$ 1)	Sr (K $\alpha$ 1)	Sn (K $\alpha$ 1)
-	17.32	6.28	8.01	1.44	3.46	7.29	-
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support. Lead and copper are present in trace amounts.							



Blue		X12_A6					
							
<b>Localizzazione:</b> Angel's robe (light section)							
<b>Chemical Elements (count/s)</b>							
K (K $\alpha$ 1)	Ca (K $\alpha$ 1)	Fe (K $\alpha$ 1)	Cu (K $\alpha$ 1)	Hg (L $\alpha$ 1)	Pb (L $\alpha$ 1)	Sr (K $\alpha$ 1)	Sn (K $\alpha$ 1)
-	27.14	2.29	-	-	2.43	5.57	-
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support. There are no identifying elements for the blue pigment (perhaps Lapis Lazuli), probably mixed with a lime white.							



Blue		X13_A3					
							
<b>Location:</b> Detail of internal figurative frame with vegetal scrolls.							
<b>Chemical Elements (count/s)</b>							
K (K $\alpha$ 1)	Ca (K $\alpha$ 1)	Fe (K $\alpha$ 1)	Cu (K $\alpha$ 1)	Hg (L $\alpha$ 1)	Pb (L $\alpha$ 1)	Sr (K $\alpha$ 1)	Sn (K $\alpha$ 1)
-	21.83	16.96	163.88	3.08	24.03	9.01	8.52
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support. The high presence of copper suggests the use of Azurite; the presence of lead and mercury could be traced back to the neighbouring yellow (see also X22) and red (see also X16) layers.							



Red		X14_A3					
							
<b>Location:</b> Detail of internal figurative frame with vegetal scrolls							
<b>Chemical Elements (count/s)</b>							
K (K $\alpha$ 1)	Ca (K $\alpha$ 1)	Fe (K $\alpha$ 1)	Cu (K $\alpha$ 1)	Hg (L $\alpha$ 1)	Pb (L $\alpha$ 1)	Sr (K $\alpha$ 1)	Sn (K $\alpha$ 1)
-	26.54	54.18	-	-	15.47	5.06	-
<b>Interpretation:</b> The presence of calcium, strontium and iron may be related to the substrate, but, in particular, the iron peak probably indicates the use of a red ochre.							



Red		X15_A3					
							
<b>Location:</b> Detail of internal figurative frame with vegetal scrolls							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	16.85	44.06	-	-	43.76	9.99	7.88
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support; since it is a red pigment, the iron peak could indicate a red ochre; on the contrary, the lead, present in equal quantities to the iron, could signal the presence of a lead based pigment (perhaps Giallorino?) or Minio used in a mixture.							


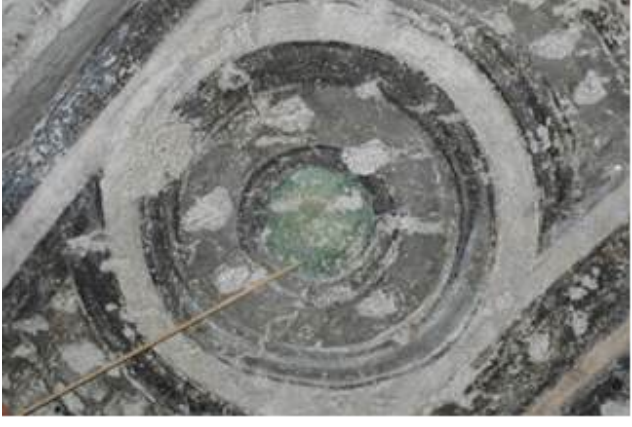
Red		X16_A4					
							
<b>Location:</b> Floral detail of the internal figurative frame with vegetal swirls.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	18.44	22.05	-	62.23	26.94	8.42	8.98
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support. The mercury peak indicates the presence of Cinnabar pigment. The presence of lead could be related to the use of a lead-based layer (perhaps Giallorino?).							



Red		X17_A7					
							
<b>Location:</b> Red feather sticking out of the soldier's blue headpiece							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	19.10	31.19	1.01	2.89	4.49	5.21	-
<b>Interpretation:</b> Calcium, strontium and iron may be related to the medium and/or the use of red ochre. Lead and mercury are present in trace amounts.							



Green		X18_A7					
							
<b>Location:</b> Green feather sticking out of the soldier's blue headpiece.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
1.37	17.93	14.25	1.73	3.02	12.10	5.47	-
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support and/or the use of green earth (also confirmed by the presence of potassium); the lead peak (slightly lower than the other two elements) does not allow to determine with certainty the presence of a lead-based pigment, therefore it could be present due to a possible contamination.							



Red		X19_A7					
							
<b>Location:</b> Angel wing from behind.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	25.78	19.16	-	-	2.62	6.12	-
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support and use of a red ochre.							



Green		X20_A3					
							
<b>Location:</b> Angel with chalice.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
1.63	15.62	39.86	3.88	-	70.09	10.10	9.56
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support and/or the use of green earth (presence of potassium). The presence of lead and tin could be attributable to the use of Giallorino for yellow finishes.							



Green		X21_A3					
							
<b>Location:</b> Circular decorative motif of the figurative frame with vegetal swirls.							
<b>Chemical Elements (count/s)</b>							
<b>K (Ka<sub>1</sub>)</b>	<b>Ca (Ka<sub>1</sub>)</b>	<b>Fe (Ka<sub>1</sub>)</b>	<b>Cu (Ka<sub>1</sub>)</b>	<b>Hg (La<sub>1</sub>)</b>	<b>Pb (La<sub>1</sub>)</b>	<b>Sr (Ka<sub>1</sub>)</b>	<b>Sn (Ka<sub>1</sub>)</b>
1.90	22.01	28.03	-	-	52.48	4.95	11.96
<b>Interpretazione:</b> The presence of calcium, strontium and iron can be related to the support and/or the use of green earth (presence of potassium). The presence of lead and tin could be attributable to the use of Giallorino for yellow finishes.							



Yellow		X22_A4					
							
<b>Location:</b> Floral detail of the figurative frame with vegetal swirls.							
<b>Chemical Elements (count/s)</b>							
<b>K (Ka<sub>1</sub>)</b>	<b>Ca (Ka<sub>1</sub>)</b>	<b>Fe (Ka<sub>1</sub>)</b>	<b>Cu (Ka<sub>1</sub>)</b>	<b>Hg (La<sub>1</sub>)</b>	<b>Pb (La<sub>1</sub>)</b>	<b>Sr (Ka<sub>1</sub>)</b>	<b>Sn (Ka<sub>1</sub>)</b>
-	7.04	8.92	-	-	210.31	3.27	13.91
<b>Interpretation:</b> The presence of calcium, strontium and iron may be related to the support. The presence of lead and tin could be related to the use of Giallorino.							



Yellow		X23_A4					
							
<b>Location:</b> Circular decorative motif of the figurative frame with vegetal swirls							
<b>Chemical Elements (count/s)</b>							
<b>K (Ka<sub>1</sub>)</b>	<b>Ca (Ka<sub>1</sub>)</b>	<b>Fe (Ka<sub>1</sub>)</b>	<b>Cu (Ka<sub>1</sub>)</b>	<b>Hg (La<sub>1</sub>)</b>	<b>Pb (La<sub>1</sub>)</b>	<b>Sr (Ka<sub>1</sub>)</b>	<b>Sn (Ka<sub>1</sub>)</b>
-	30.27	19.23	-	-	-	6.46	-
<b>Interpretation:</b> The presence of calcium, strontium and iron may be related to the support and/or the use of yellow ochre.							



Red		X24_A5					
							
<b>Location:</b> Crucifixion, blood stain on the arm.							
<b>Chemical Elements (count/s)</b>							
<b>K (Ka<sub>1</sub>)</b>	<b>Ca (Ka<sub>1</sub>)</b>	<b>Fe (Ka<sub>1</sub>)</b>	<b>Cu (Ka<sub>1</sub>)</b>	<b>Hg (La<sub>1</sub>)</b>	<b>Pb (La<sub>1</sub>)</b>	<b>Sr (Ka<sub>1</sub>)</b>	<b>Sn (Ka<sub>1</sub>)</b>
	33.72	12.63			1.58	5.45	
<b>Interpretation:</b> The presence of calcium, strontium and iron may be related to the support and/or the use of a red ochre							



Red		X025_A9					
							
<b>Location:</b> Red sleeve of one of the figures caring for a sick person at the foot of the cross.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	19.04	24.06	-	108.17	4.93	7.94	-
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support while mercury indicates the use of Cinnabar.							



Red		X026_A9					
							
<b>Location:</b> Red robe of one of the figures caring for a sick person at the foot of the cross.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	20.49	-	60.10	-	1.58	6.61	-
<b>Interpretation:</b> The presence of calcium, strontium and iron may be related to the support and/or the use of a red ochre.							



Yellow		X027_A9					
							
<b>Location:</b> Highlighting the robe of a figure caring for a sick person at the foot of the cross.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	6.16	11.75	-	32.85	155.96	4.00	7.27
<b>Interpretation:</b> The presence of calcium, strontium and iron may be related to the support. The presence of lead and tin may indicate the use of a Giallorino. Mercury could indicate the use of Cinnabar for finishes now lost.							



Yellow		X028_A8					
							
<b>Location:</b> Highlights of Mary Magdalene's hair.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	15.88	3.75	-	-	160.89	3.59	10.53
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support. The presence of lead and tin can indicate the use of Giallorino. The presence of Biacca or Bianco San Giovanni for highlights is not excluded.							



Yellow		X029_A8					
							
<b>Location:</b> Highlight on the robe of the figure next to the three Madonna's.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	13.67	2.50	1.08	-	215.92	2.33	12.75
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support. The presence of lead and tin can indicate the use of Giallorino. The presence of Biacca or Bianco San Giovanni for highlights is not excluded							



Yellow		X030_A8					
							
<b>Location:</b> Highlight on the robe of the figure next to the three Madonna's.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	16.45	4.49	1.52	-	162.92	4.33	11.96
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support. The presence of lead and tin can indicate the use of Giallorino. The presence of Biacca or Bianco San Giovanni for highlights is not excluded.							



Yellow		X031_A8					
							
<b>Location:</b> Highlight on the robe of the figure next to the three Madonna's.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	19.51	11.72	-	-	103.07	5.66	10.62
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support. The presence of lead and tin can indicate the use of Giallorino.							



Black		X032_A6					
							
<b>Location:</b> Horse harnesses near Saint Longinus.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	33.84	10.82	-	-	3.12	8.13	-
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support and/or the black pigment. Lead is present in traces.							



Intonaco		X033_A6					
							
<b>Location:</b> Lance/helmet of Saint Longinus (UV glowing area).							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	18.57	10.17	3.92	-	138.59	4.96	-
<b>Interpretation:</b> The presence of calcium, strontium and iron may be related to the support and/or the use of yellow ochre for the preparatory drawing. The presence of lead could indicate the use of an oily mission for the metal sheet.							



Green		X034_A8					
							
<b>Location:</b> Traces of decoration on the dress of Mary of Cleophas (?).							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	8.91	8.58	1.90	-	221.20	2.39	13.70
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support. The presence of lead and tin suggests the use of Giallorino used in a mixture probably with a green earth.							



Yellow		X035_A6					
							
<b>Location:</b> Halo of Mary of Cleophas (?)							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	35.91	7.81	-	-	4.52	6.23	-
<b>Interpretation:</b> The presence of calcium, strontium and iron may be related to the support and/or the use of yellow ochre.							



Black		X036_A7					
							
<b>Localizzazione:</b> Soldier's sword hilt.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	23.87	8.15	1.22	-	1.22	7.29	-
<b>Interpretazione:</b> The presence of calcium, strontium and iron may be related to the support and/or the use of a black pigment.							



Incarnato		X037_A8					
							
<b>Location:</b> Nose of Mary of Cleophas(?).							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	30.02	5.62	1.39	-	-	6.28	-
<b>Interpretation:</b> The presence of calcium, strontium and iron may be related to the support and/or the use of a red ochre mixed with lime or Bianco San Giovanni.							

Incarnato		X038_A8					
							
<b>Localizzazione:</b> Mary Magdalene's neck.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	30.09	6.69	1.39	-	1.67	6.03	-
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support and/or the use of a red ochre mixed with lime or Bianco San Giovanni and a green earth.							

<b>Red</b>		X039_A8					
							
<b>Location:</b> Edge of the veil of Mary of Magdala (?).							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	24.21	13.42	-	78.41	9.33	7.40	-
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support. The presence of mercury indicates the use of Cinnabar.							

White		X040_A8					
							
<b>Location:</b> Veil of Mary of Magdala (?).							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	44.13	2.90	-	-	3.39	4.53	-
<b>Interpretation:</b> The presence of calcium, strontium and iron may be related to the support and/or the Bianco San Giovanni/lime.							

Green		X041_A7					
							
<b>Location:</b> Soldier's sleeve.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	16.55	26.75	-	-	27.19	6.20	-
<b>Interpretation:</b> The presence of calcium, strontium and iron can be related to the support. The presence of lead indicates the presence of residues of the materials used for the metal leaf gilding.							

Intonaco		X042_A7					
							
<b>Location:</b> Sleeve of the Soldier's armour.							
<b>Chemical Elements (count/s)</b>							
<b>K (K<math>\alpha_1</math>)</b>	<b>Ca (K<math>\alpha_1</math>)</b>	<b>Fe (K<math>\alpha_1</math>)</b>	<b>Cu (K<math>\alpha_1</math>)</b>	<b>Hg (L<math>\alpha_1</math>)</b>	<b>Pb (L<math>\alpha_1</math>)</b>	<b>Sr (K<math>\alpha_1</math>)</b>	<b>Sn (K<math>\alpha_1</math>)</b>
-	22.53	4.97	1.08	-	-	6.48	-
<b>Interpretazione:</b> The presence of calcium, strontium and iron may be related to support.							

## **Allegato A4**

### **Church of San Vittore, Muralto (TI) Crucifixion**

### **Non-invasive diagnostic investigations: FT-IR spectroscopy**

## 1. Introduction

The investigations were carried out on site by Dr. Patrizia Moretti (SUPSI IMC, Institute of Materials and Construction) on March 24, 2025.

The instrument used is a portable FT-IR spectrophotometer ALPHA II (Bruker Optics) consisting of a CenterGlow™ infrared source, a RockSolid™ interferometer modified to work in any environmental condition and spatial orientation and a DTGS room temperature detector. A system of parabolic mirrors allows it to send and collect ( $22^\circ/22^\circ$ ) the infrared radiation reflected by a surface located about 1 cm away from the instrument. The spectra are acquired in a range that extends from 8000 to 350  $\text{cm}^{-1}$ , with a spectral resolution of 4  $\text{cm}^{-1}$ , and then displayed in pseudo-absorbance [ $\text{Log}(1/R)$ ]. A fully reflective gold plate is used for the background. The diameter of the survey area, visible thanks to an integrated camera, is approximately 3 mm (Figure 1). The data were recorded and processed using the OPUS 8.1 software.



Figure 1 – Images of the portable FT-IR spectrophotometer ALPHA II (Bruker Optics): setup and distance of the instrument from the investigated surface.

## 2. Results

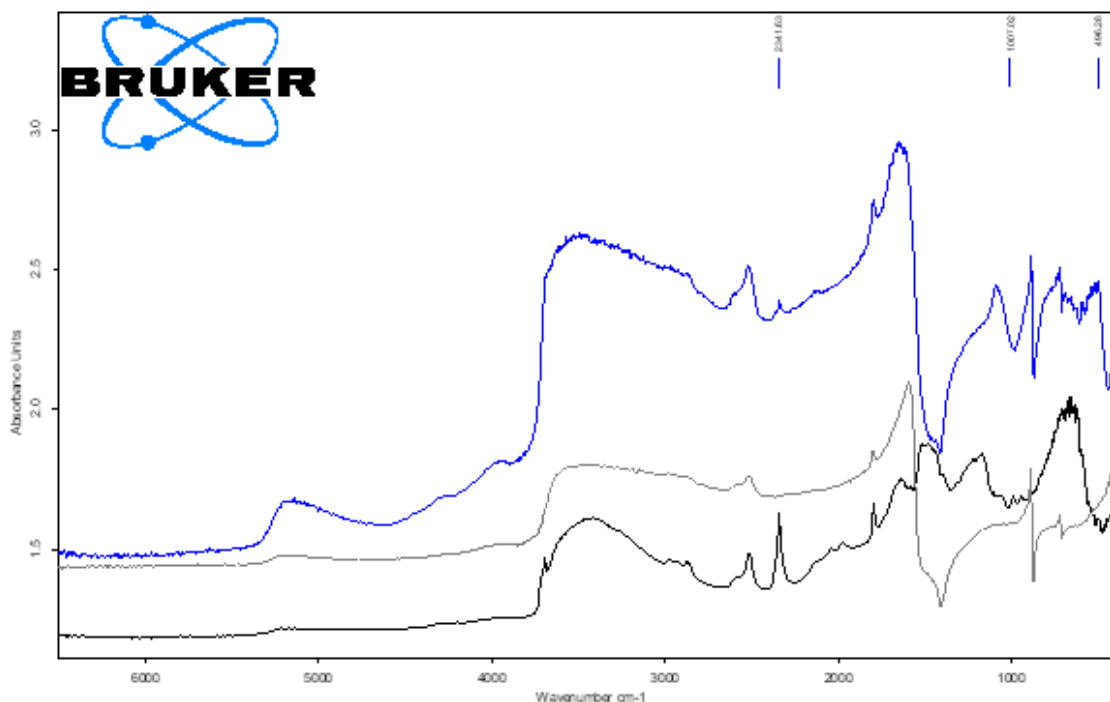
IR01\_A8



**Location:** Area above the halos of the three Marys.

**Interpretation:** Natural ultramarine blue (band at about 2342  $\text{cm}^{-1}$  of the carbon dioxide and bands at about 1007 and 496  $\text{cm}^{-1}$  of the silicate component, in blue reference spectrum of a fresh application of the pigment) and calcium carbonate (reference spectrum in grey).

Oltremare nat. a fresco rif.  
Carbonato di calcio rif.  
mur\_crx\_IR01



## IR02\_A8

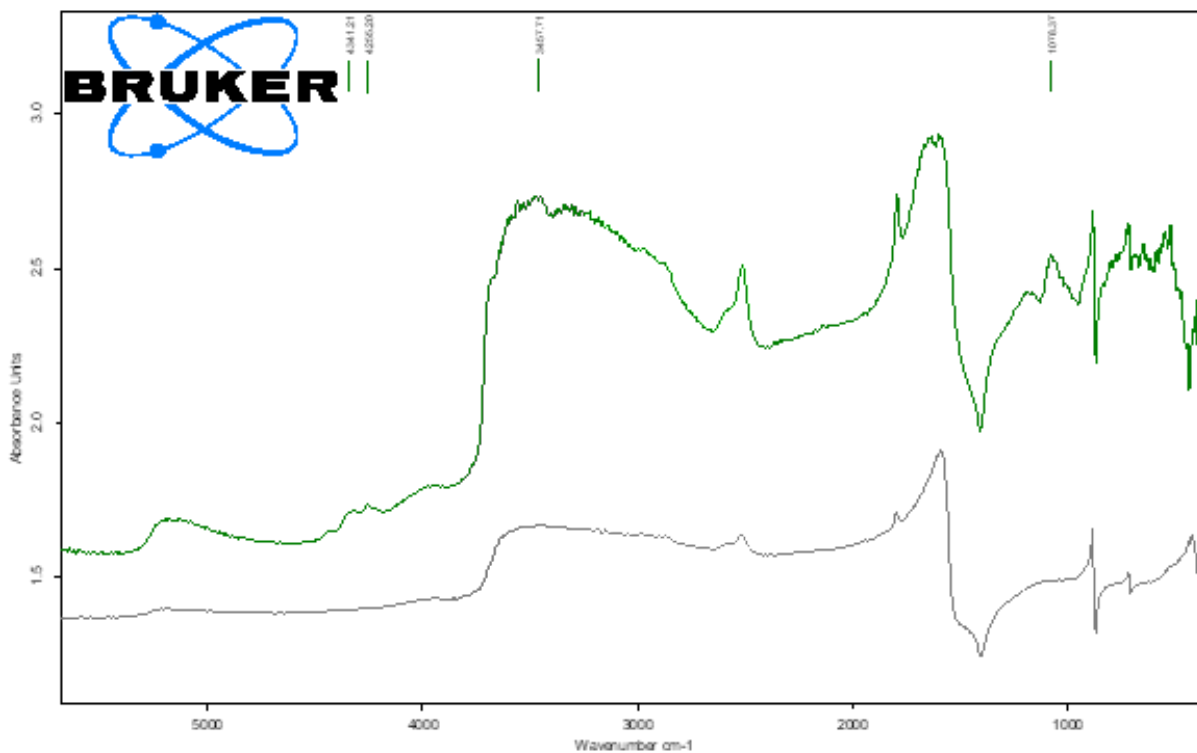


**Location:** Dress covering the head of Mary of Clopas (?).

**Interpretation:** Calcium carbonate (reference spectrum in grey) possible silicate component (bands at about 1078 cm<sup>-1</sup> and hydroxyl groups (-OH) at about 3458 cm<sup>-1</sup>). Doublet at about 4341 and 4255 cm<sup>-1</sup> of complex interpretation.

Carbonato di calcio rif.

mur\_crx\_IR02



IR03\_A6



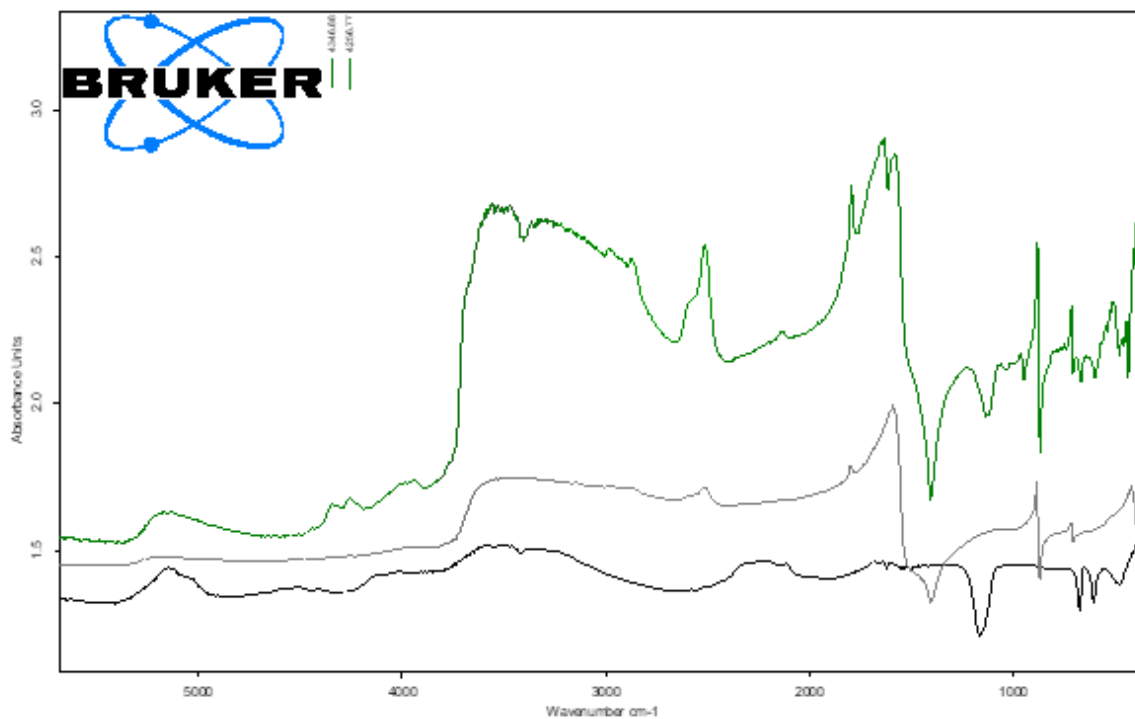
**Location:** Robe of Saint Longinus.

**Interpretation:** Calcium carbonate (reference spectrum in grey) and gypsum (reference spectrum in black). Doublet at about 4347 and 4257  $\text{cm}^{-1}$  of complex interpretation.

Carbonato di calcio rif.

Gesso rif.

mur\_crx\_IR03



IR04\_A6

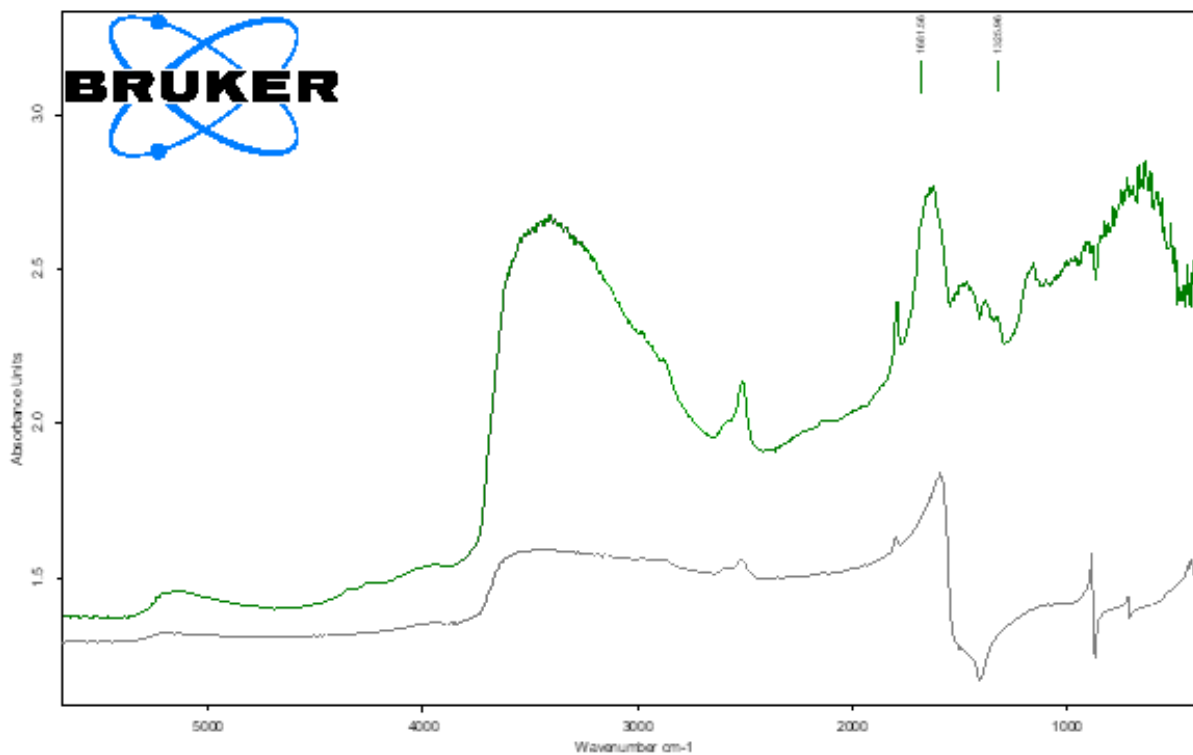


**Location:** Robe of Saint Longinus.

**Interpretation:** Calcium carbonate (reference spectrum in grey) and possible oxalates (bands at approximately 1326 and 1682 cm<sup>-1</sup>)

Carbonato di calcio rif.

mur\_crx\_IR04



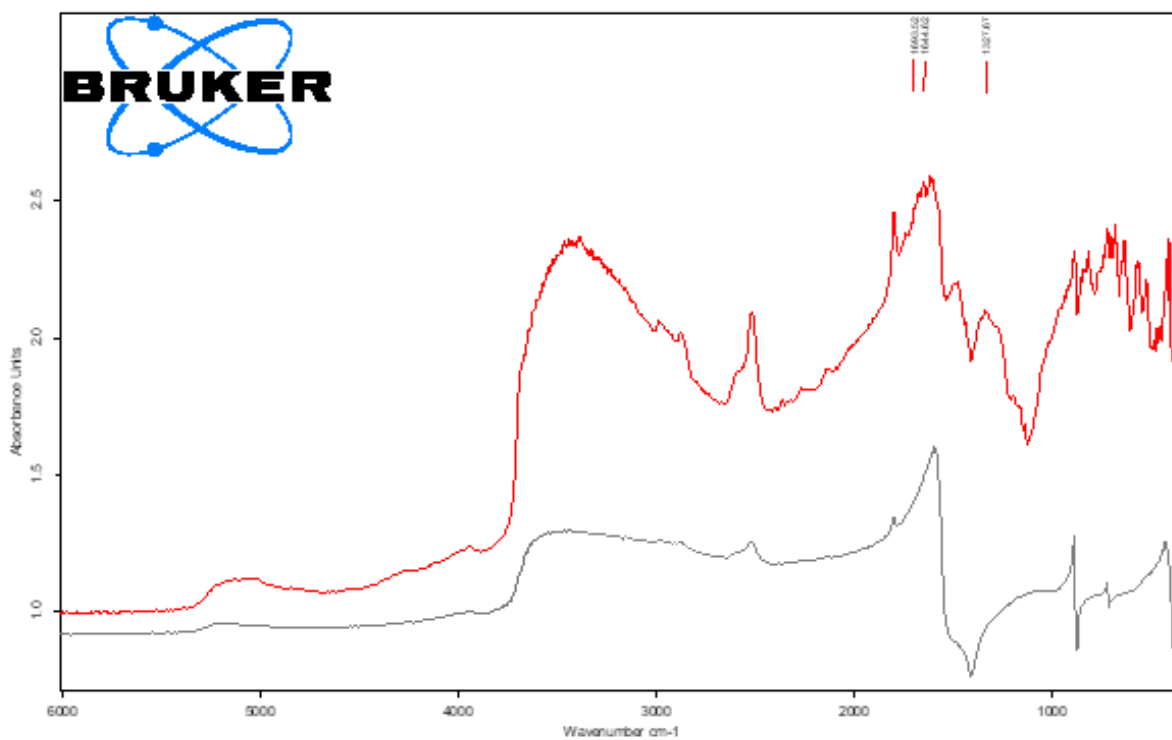
IR05\_A6



**Location:** Sleeve of St. Longinus (armor).

**Interpretation:** Calcium carbonate (reference spectrum in grey). Possible oxalates (bands at about 1328 and 1694/1644 cm<sup>-1</sup>)

Carbonato di calcio rif.  
mur\_crx\_IR05



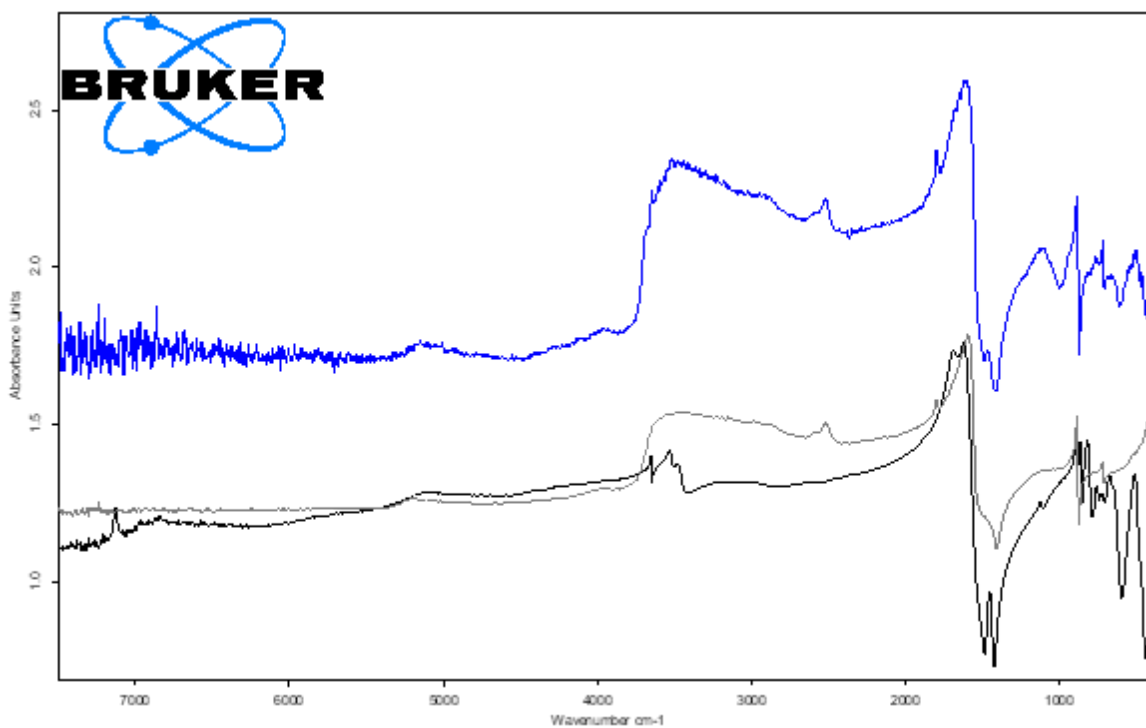
IR06\_A8



**Location:** Clothes of the Virgin Mary (preparatory layer).

**Interpretation:** Calcium carbonate (reference spectrum in grey) and magnesium carbonate (reference spectrum in black)

Carbonato di calcio rif.  
Carbonato di magnesio rif.  
mur\_crx\_IR06



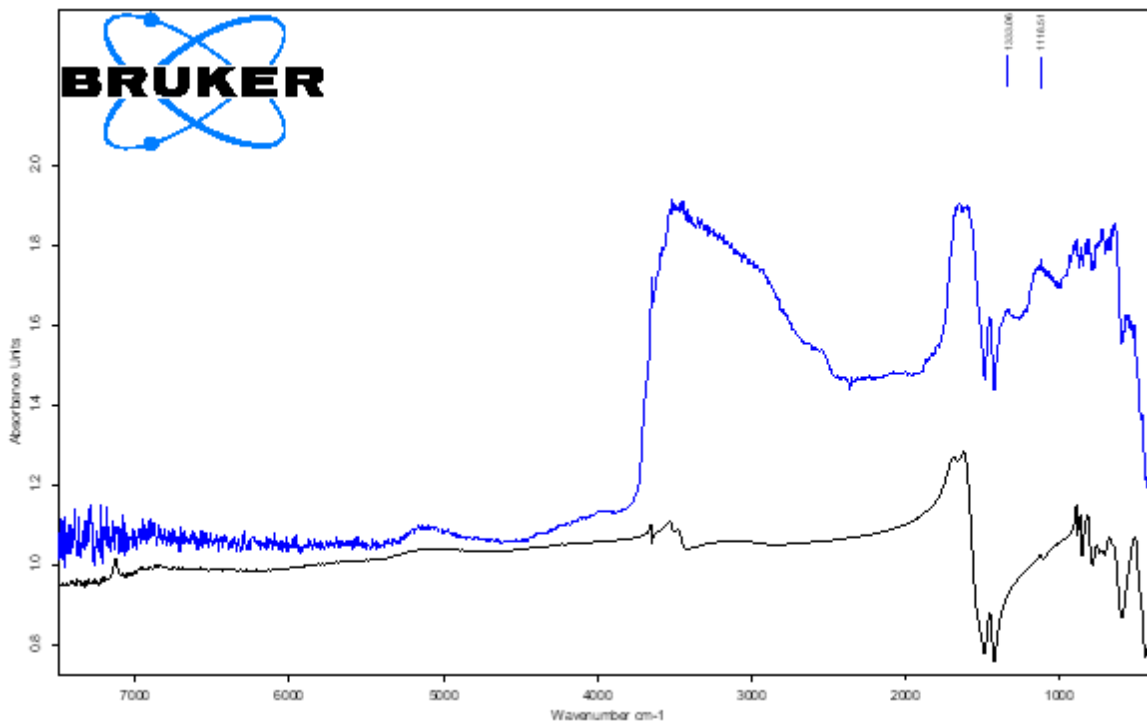
IR07\_A8



**Location:** Vestment of the Virgin Mary (finishing layer, darker).

**Interpretation:** Magnesium carbonate (reference spectrum in black), possible oxalates (band at about 1333  $\text{cm}^{-1}$ ) and possible sulfate (band at about 1119  $\text{cm}^{-1}$ )

Carbonato di magnesio rif.  
mur\_crx\_IR07



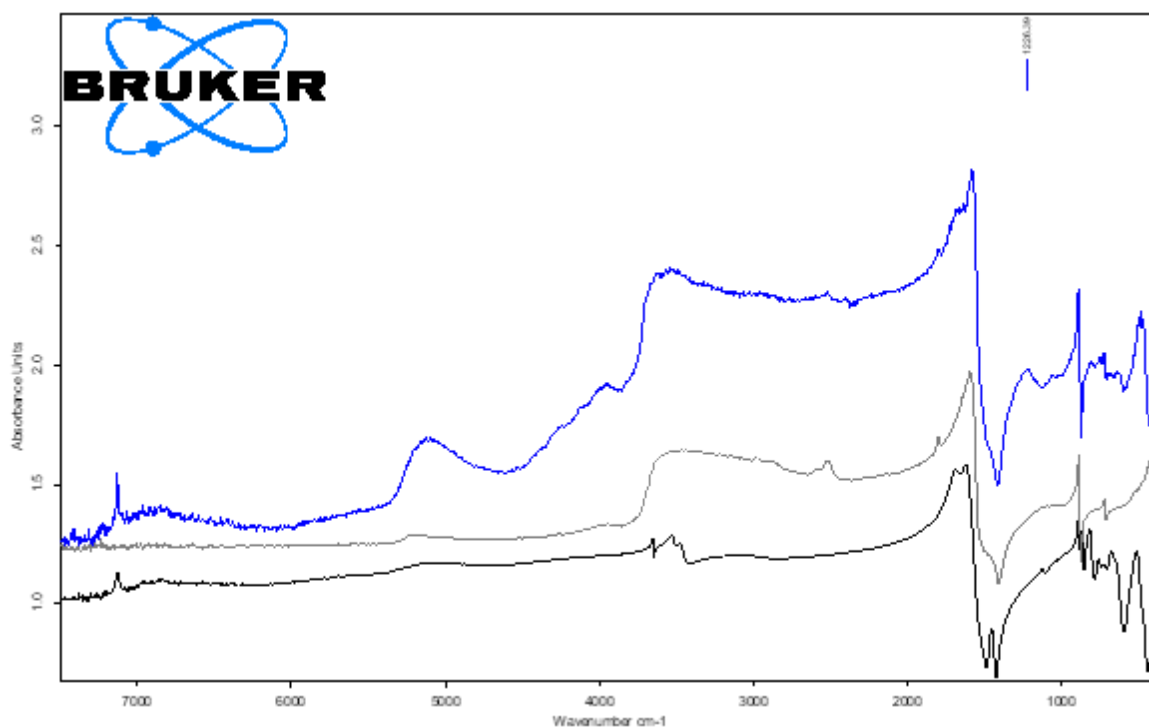
IR08\_A7



**Location:** Headpiece of one of the figures.

**Interpretation:** Calcium carbonate (reference spectrum in grey). Band at about 1226 cm<sup>-1</sup> of complex identification

Carbonato di calcio rif.  
Carbonato di magnesio rif  
mur\_crx\_IR08



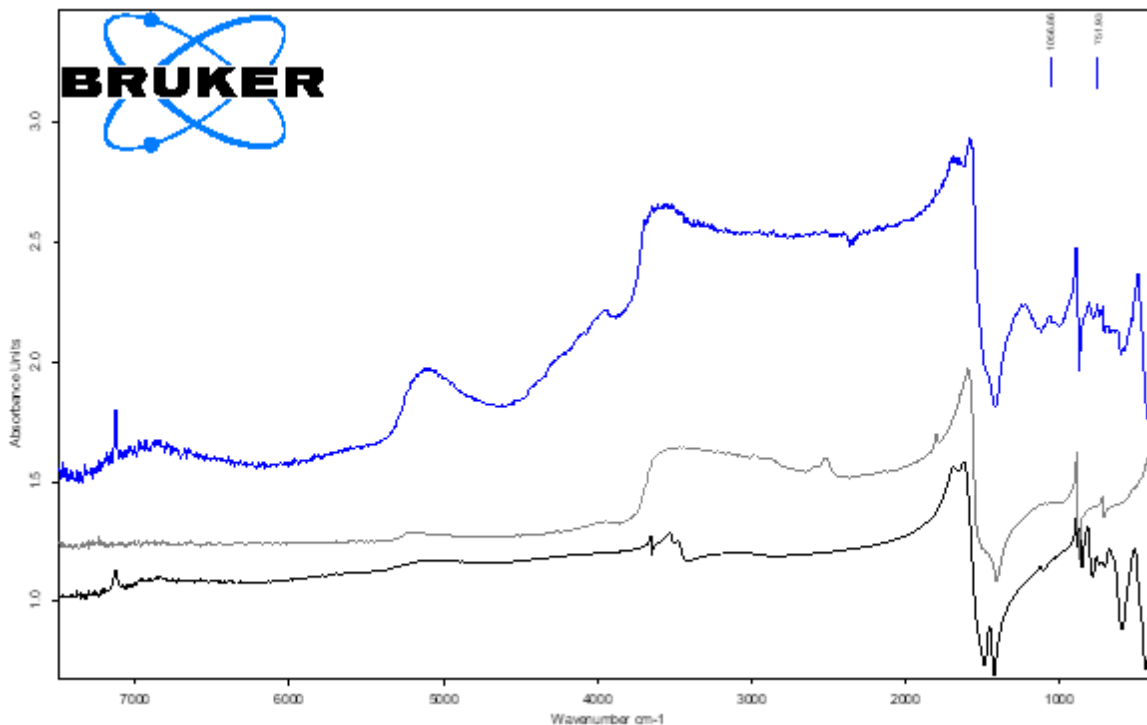
IR09\_A7



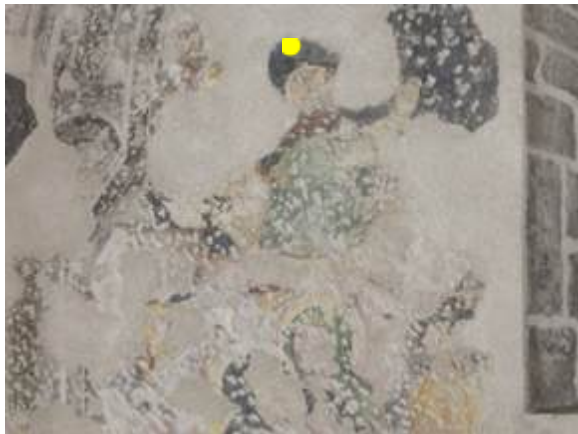
**Location:** Headpiece of one of the figures.

**Interpretation:** Calcium carbonate (reference spectrum in grey), magnesium carbonate (reference spectrum in black) and silicate component (bands at approximately 1057 and 752  $\text{cm}^{-1}$ ).

Carbonato di calcio rif.  
Carbonato di magnesio rif.  
mur\_crx\_IR09



## IR10\_A6



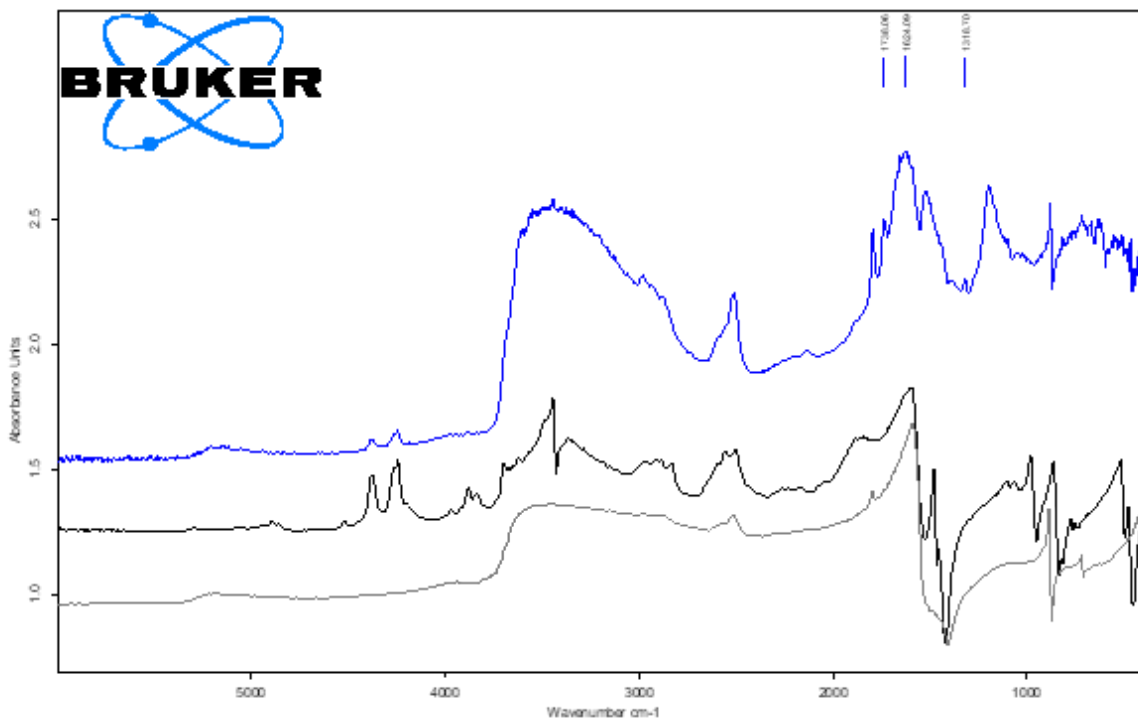
**Location:** Background near the figure of St. Longinus.

**Interpretation:** Azurite (reference spectrum in black) and calcium carbonate (reference spectrum in gray). The bands at about 1624 and 1319  $\text{cm}^{-1}$  could be related to the presence of oxalates. The band at about 1738  $\text{cm}^{-1}$  can be attributed to the carbonyl group ( $\text{C}=\text{O}$ ) of a possible organic material

Carbonato di calcio rif.

Azzurrite rif.

mur\_crx\_IR10

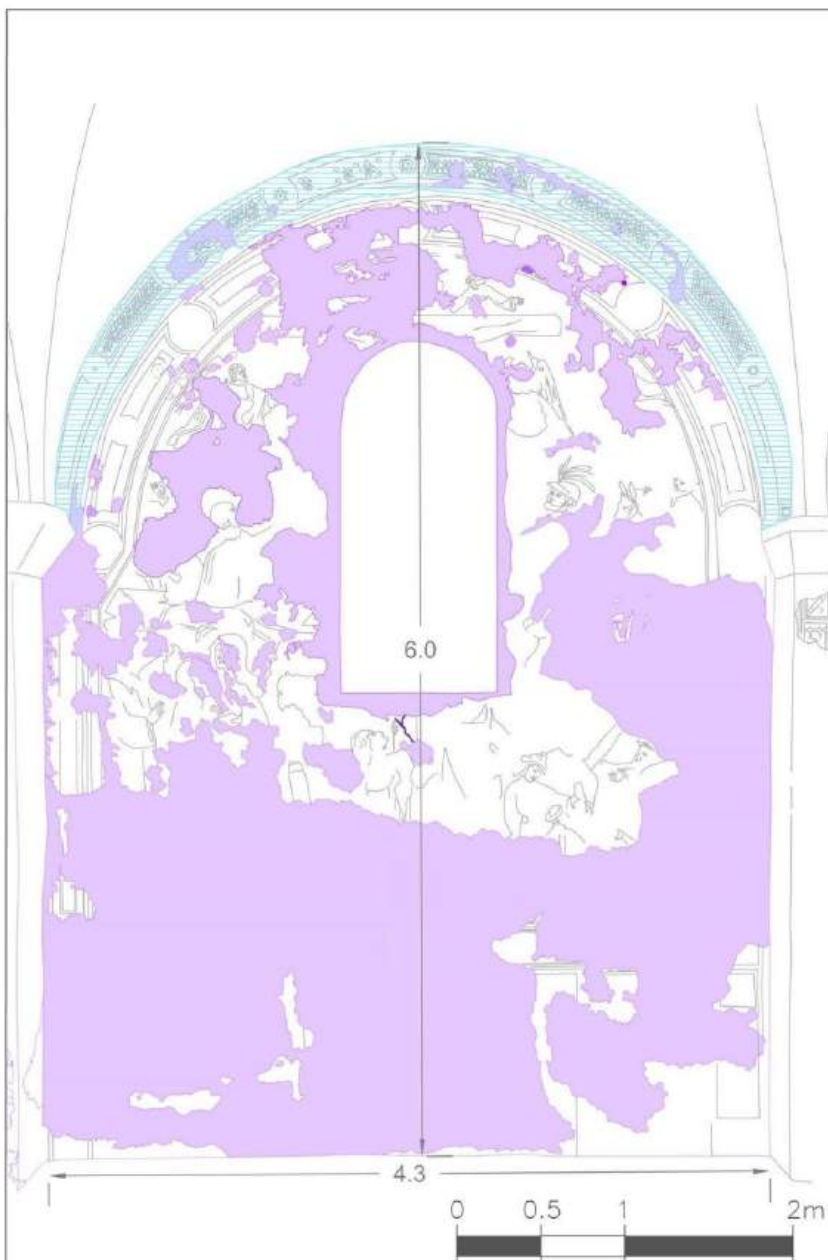


## **Allegato A5**

### **Church of San Vittore, Muralto (TI) Crucifixion**

#### **Graphic Documentation:**

#### **Execution Techniques, Previous Interventions, and Degradation Phenomena**



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Muraltò (Locarno)

**Oggetto**  
Chiesa di San Vittore

**Soggetto**  
Crocifissione

**Proprietario**  
Comune di Muraltò

**Ufficio di tutela**  
Ufficio dei Beni Culturali di Bellinzona






**Docente**  
Restauratrice Stefania Luppichini

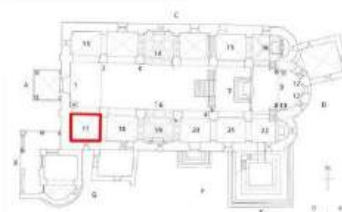
**Studenti**  
Cinzia Marchi, Lorena Macera, Marco Tosi,  
Mahek Pednekar

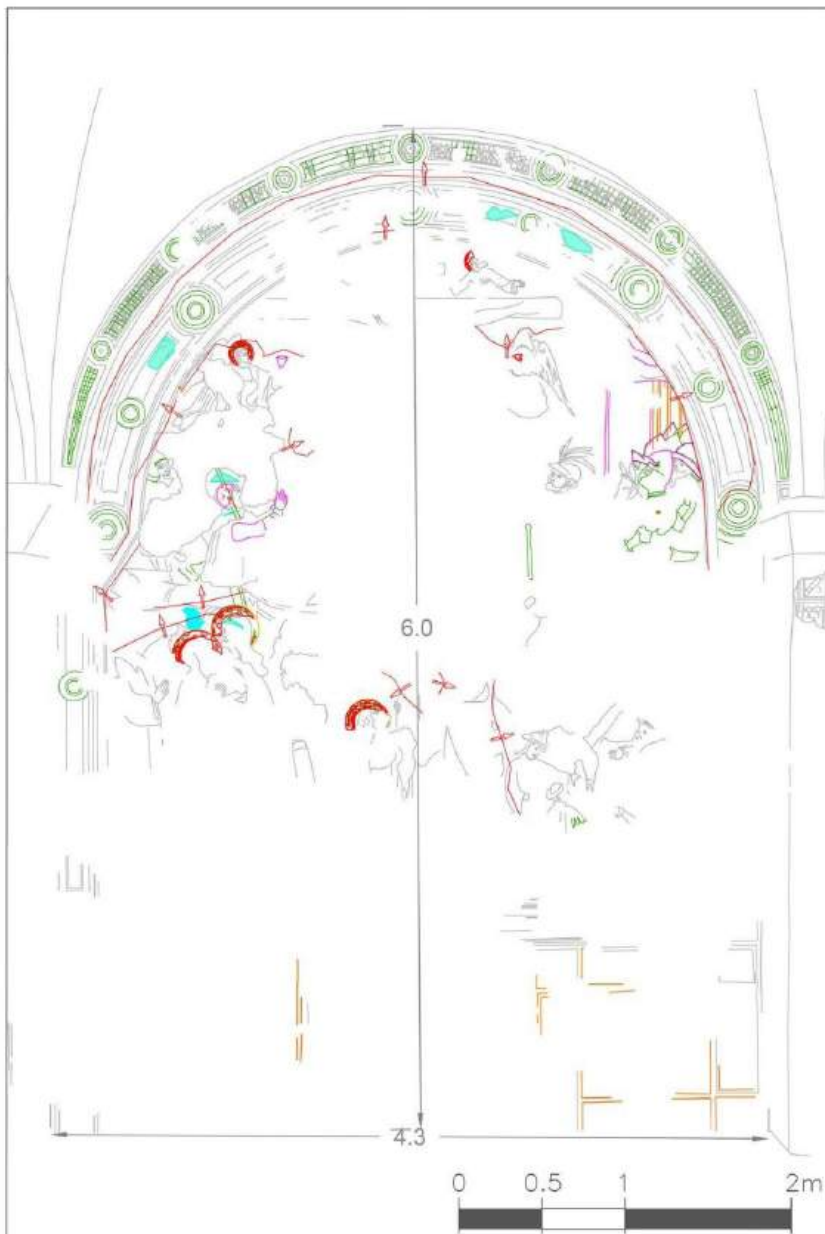
Tavola 1 - Interventi pregressi

Data  
19/06/2025

### LEGENDA - INTERVENTI PREGRESSI

 Stuccatura di tipo 1	 Stuccatura di tipo 2	 Stuccatura di tipo 3
 Residui di scialbo	 Foro chiodo	





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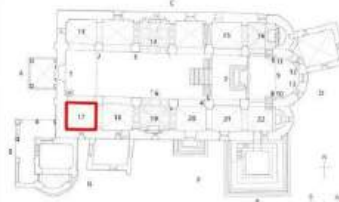
**Studenti**  
Cinzia Marchi, Lorena Macera, Marco Tosi,  
Mahek Pednekar

Tavola 2 - Tecniche esecutive

Data  
19/05/2025

### LEGENDA - TECNICHE ESECUTIVE

	Giornate		Spolvero		Sinopia
	Battitura di corda		Incisione diretta		Disegno a pennello
	Punzonatura		Pentimento		Lamine metalliche
	Pigmento con legante organico				





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Restauratrice Stefania Luppichini

**Studenti**  
Cinzia Marchi, Lorena Macera, Marco Tosi,  
Mahek Pednekar

Tavola 3 - Fenomeni di degrado

Data  
19/05/2025

### LEGENDA - FENOMENI DI DEGRADO

 Abrasione della pellicola pittorica	 Fessurazioni	 Distacco medio
 Deposito coerente	 Distacco grave	 Colature

