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Project full title:	Remote Sensing Science Center for Cultural Heritage
Project acronym:	ATHENA
Work Package	WP4
Deliverable	D4.3 Report of the 3 rd Summer School



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Project acronym:	ATHENA	
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Nature	Name	Role	Partner	Date
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APPROVED	Diofantos G. Hadjimitsis	Project coordinator	CUT/CNR	30/09/2018

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Table of Contents

Summary.....	6
1. Introduction.....	7
2. Agenda of the summer school.....	9
3. List of Participants.....	11
4. Presentations during the summer school	16
5. Pictures take during the 3 rd Summer School.....	17
ANNEX.....	26

Summary

The specific deliverable summarizes the material related to the 3rd Summer School of the project entitled “Geophysics applied to Cultural heritage monitoring”. The deliverable contains actions completed prior the accomplishment of the Summer School acted during September 2018. The current report provides an overview of the event, such as the agenda, all material delivered during the Summer School (e.g. presentations, supportive documents etc.), the list of participants and pictures from the event. Also, some preliminary results and measurements are provided.

1. Introduction

The 3rd Summer School of ATHENA project has been successfully accomplished. The Summer School took place in Cyprus University of Technology premises in Limassol, Cyprus between the 4th and 5th of September 2018 with on-site visit to the UNESCO World Heritage Site of “Tombs of the Kings”. For this reason, a specific permission was asked and provided by the supporter of the project, Department of Antiquities of Cyprus, responsible for the management of all archaeological sites of the island (see Figure below).

The summer school was organized by the team of the National Research Centre of Italy (CNR) and was composed by Dr. Rosa Lasaponara, Dr. Nicola Masini, Dr. Francesco Soldovieri and Dr. Ilaria Catapano. The Italian team visited the members of the Remote Sensing and Geo-Environment Research Lab of the Department of Civil Engineering and Geomatics to introduce them the basic principles of geophysical prospection, as well as to train them in hands on via real measurements taken in the field.

The first day of the event, the team was met at the archaeological site of the “Tombs of the Kings” so as to take the necessary measurements. The campaign was focused in two important monuments of the site namely the “Tomb 3” and “Tomb 4”. The in situ campaign involved the acquisition of ground penetrating radar (GPR) measurements using the MALA equipment at the peristyle atrium of the tombs, while in parallel GPR investigations (equipped with 2GhZ frequency antenna) were performed to the columns of the tombs along vertical and transversal profiles.

After the end of these measurements, a fast 3-D documentation was carried out by the team of CUT so as to have a 3D photorealistic result of the case study.

The next day, the partners/ were met in the premises of CUT, so as to elaborate the measurements and further discuss on the geophysical prospection for archaeological sites and monuments. The day involved both theoretical part and hands-on on MATLAB environment.

It should be also noted that during the training Mr. Peter Folie from the German Aerospace Centre (DLR) was present, with his camera equipment, making shots and short interviews for the Video Promotion (see forthcoming deliverable) of the ATHENA project.

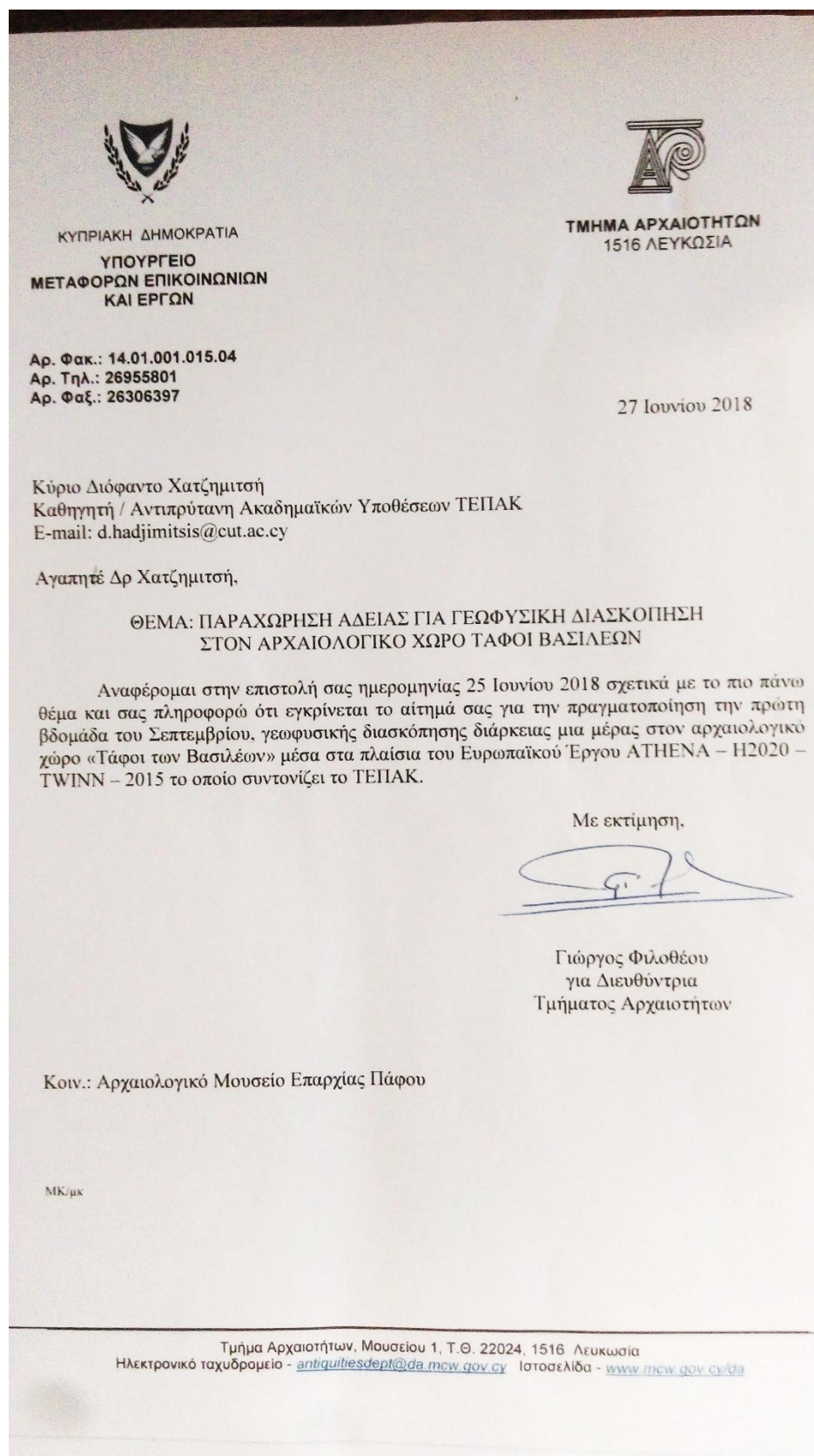


Figure: Permission licence from the Department of Antiquities (DoA) of Cyprus for the summer school needs at the Unesco World Heritage Site of ‘Tombs of the Kings’

2. Agenda of the summer school



ATHENA 3rd Summer School Agenda

ATHENA

Remote Sensing Science Center for Cultural Heritage

3rd Summer School Agenda

Topic: Geophysics

Date: 4-5 September, 2018

Hosted by: Cyprus University of Technology

Trainer: Dr. Ilaria Catapano (CNR/IREA), Rosa Lasaponara (CNR/IMAA), Nicola Masini (IBAM-CNR), Francesco Soldovieri (CNR/IREA)

Project Coordination Team



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 691936. Work programme **H2020** under "**Spreading Excellence and Widening Participation**", call: **H2020-TWINN-2015: Twinning** (Coordination and Support Action).

ATHENA 3rd Summer School AgendaTuesday 4th September

Full day field work (9:00 – 17:00)

“Tombs of the Kings” archaeological site, Paphos: data acquisition

Page | 2

Wednesday 5th September

09:20 – 09:30 **Registration**

09:30 – 11:30 **Data processing**

11:30 - 12:00 **Coffee break**

12:00 – 13:30 **Interpretation**

13:30 – 14:00 **Coffee break**

14:00 – 15:00 **Discussion**


-END OF MEETING-




3. List of Participants

Contracted Researchers as well as graduate and Master students of the Cyprus University of Technology attended the Summer School. The list of participants for each day is given below.


Tuesday 4th September 2018



Cyprus University of Technology





Consiglio Nazionale Ricerche











DLR

H2020-TWINN-2015 - Remote Sensing Science Center for Cultural Heritage - ATHENA
Topic: 3rd Summer School
Date: 4-5 September 2018
Hosted by: Cyprus University of Technology

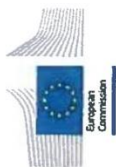







List of participants (4/9/2018)

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11				
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Wednesday, 5th September 2018


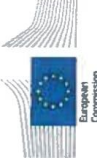













 Cyprus University of Technology	 DLR
 Consiglio Nazionale Ricerche	 ATHENA

H2020-TWINN-2015 - Remote Sensing Science Center for Cultural Heritage - ATHENA
 Topic: 3rd Summer School
 Date: 4-5 September 2018
 Hosted by: Cyprus University of Technology

List of participants (9/9/2018)

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16		FRANCUS DOVOVICI KRAJACI NEURISROCI INSTITUTU FOR CLASSICOMENTIC SURVIVIT 2017	SOLDOVICI F. @ IRE A. CNR. ST.	 	
17		KRAJACI NEURISROCI	INSTITUTU FOR CLASSICOMENTIC SURVIVIT 2017	SOLDOVICI F. @ IRE A. CNR. ST.	ZONE
18					
19					
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4. Presentations during the summer school

All presentations of the Summer School are given in the Annex of the present Deliverable, in the following order:

1. GPR Data processing from raw data to microwave tomography

- a. GPR data
- b. GPR system
- c. Practical principles
- d. Data processing steps
- e. Why radar tomography?
- f. GPR Imaging
- g. Integral scattering equations
- h. Direct scattering problem
- i. Inverse scattering problem
- j. Linear inverse scattering approaches
- k. Advanced GPR Imaging

2. GPR for archaeology and cultural heritage

- a. GPR archaeometry
- b. On field surveys: cultural heritage monitoring
- c. Conclusions
- d. Necessities

3. GPR processing on MATLAB

5. Pictures take during the 3rd Summer School







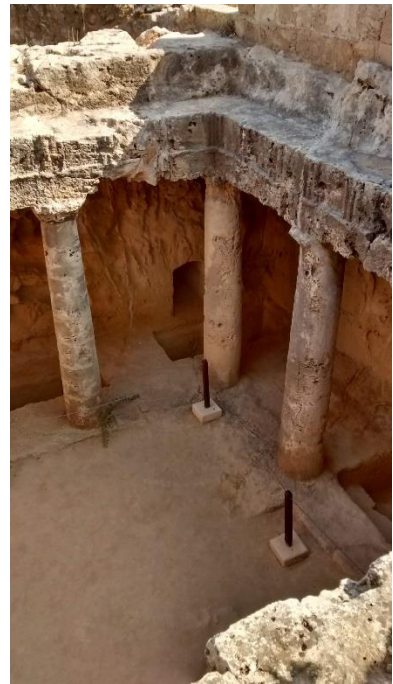
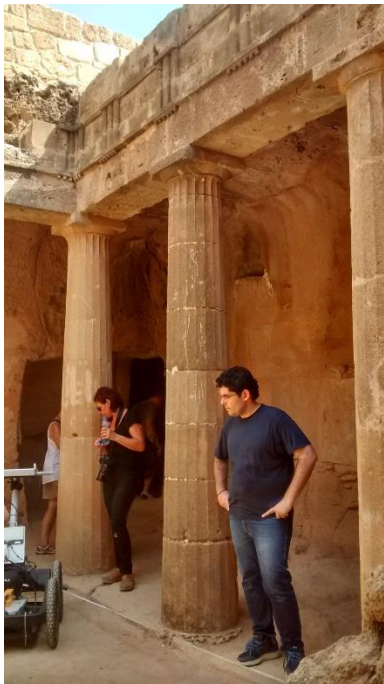
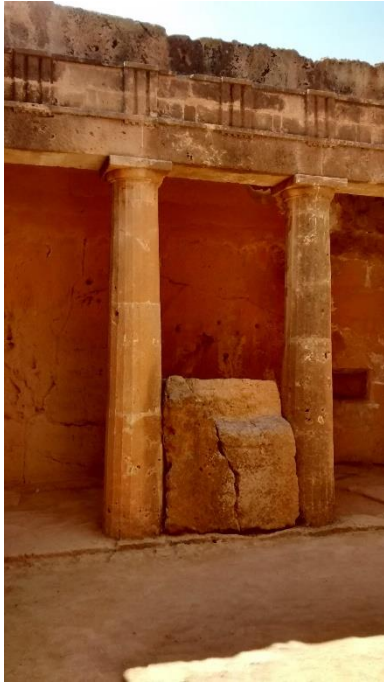
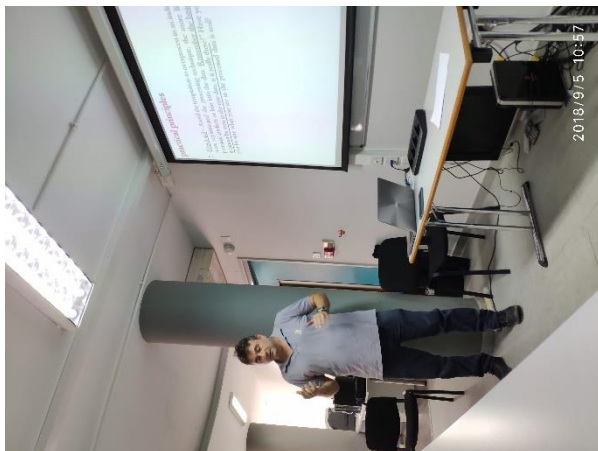
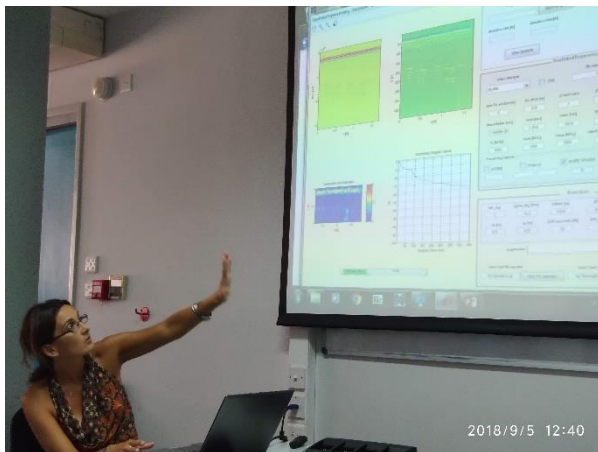




Figure: Photos during the field campaign at the Tombs of the Kings (4th of September 2018)





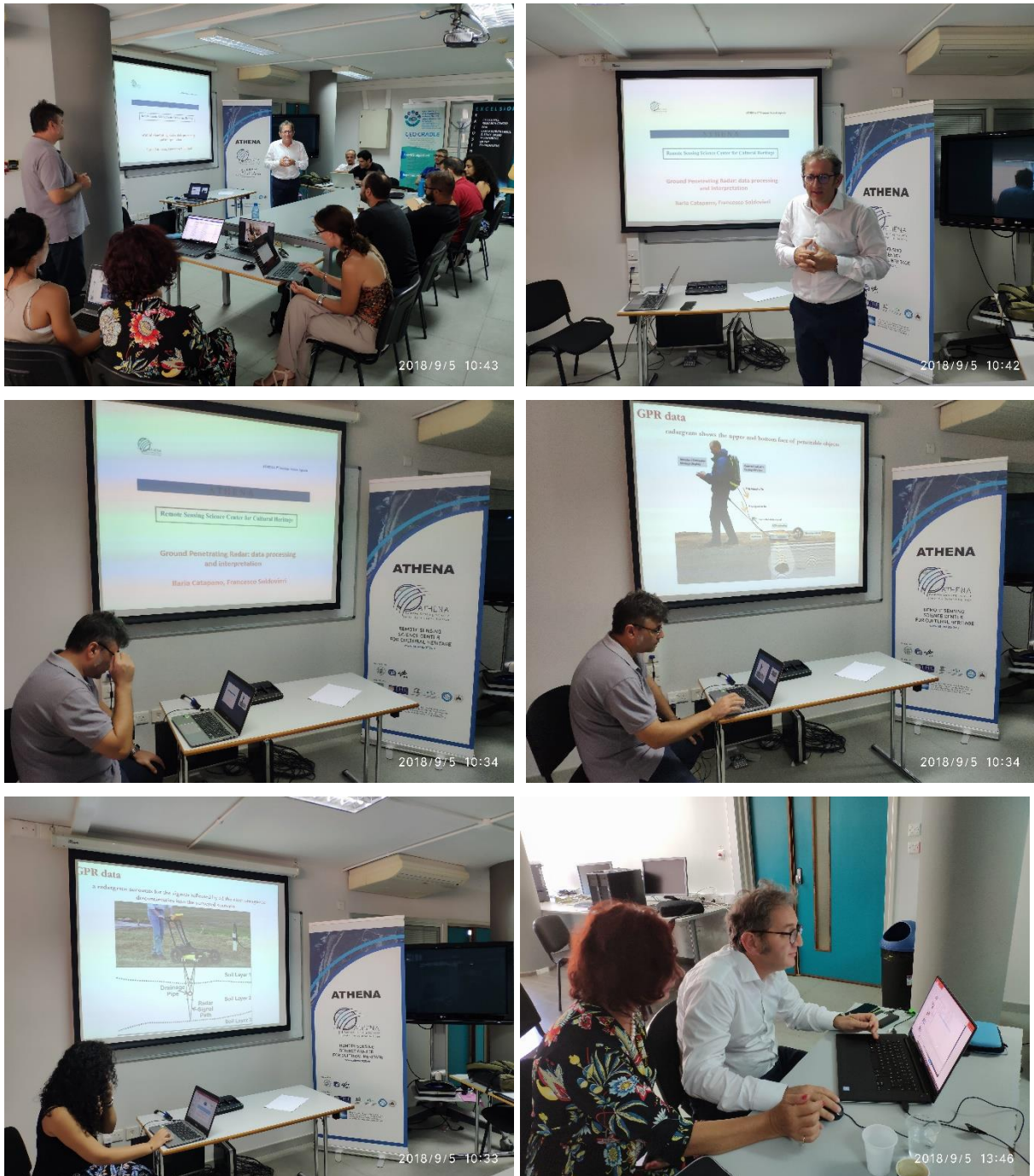
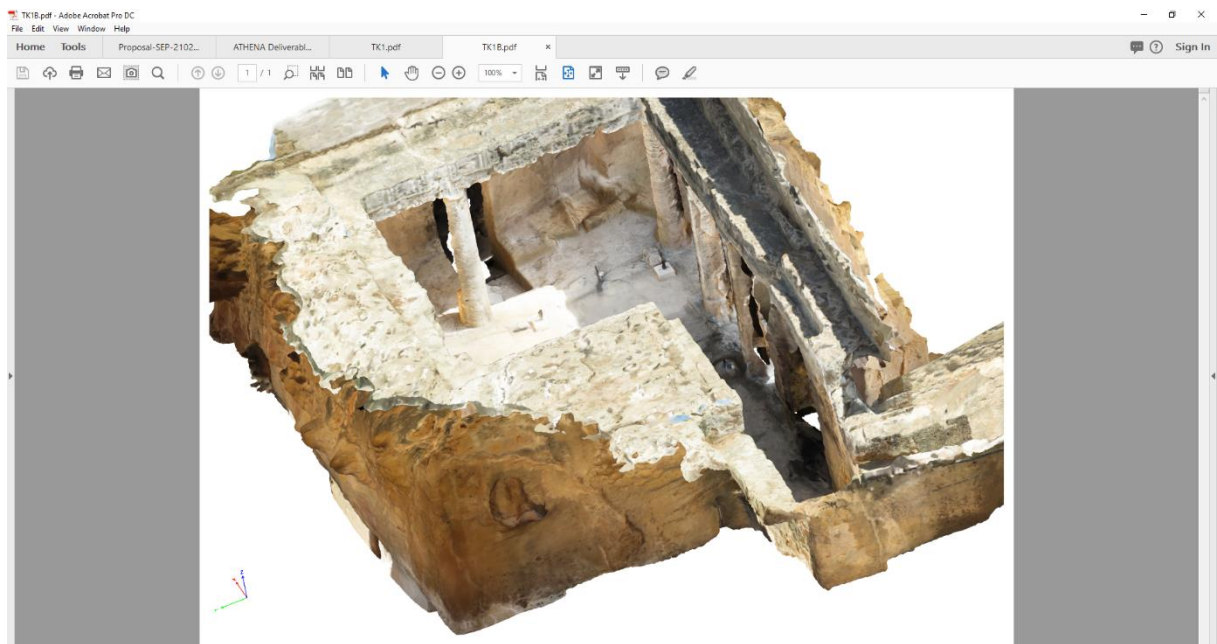
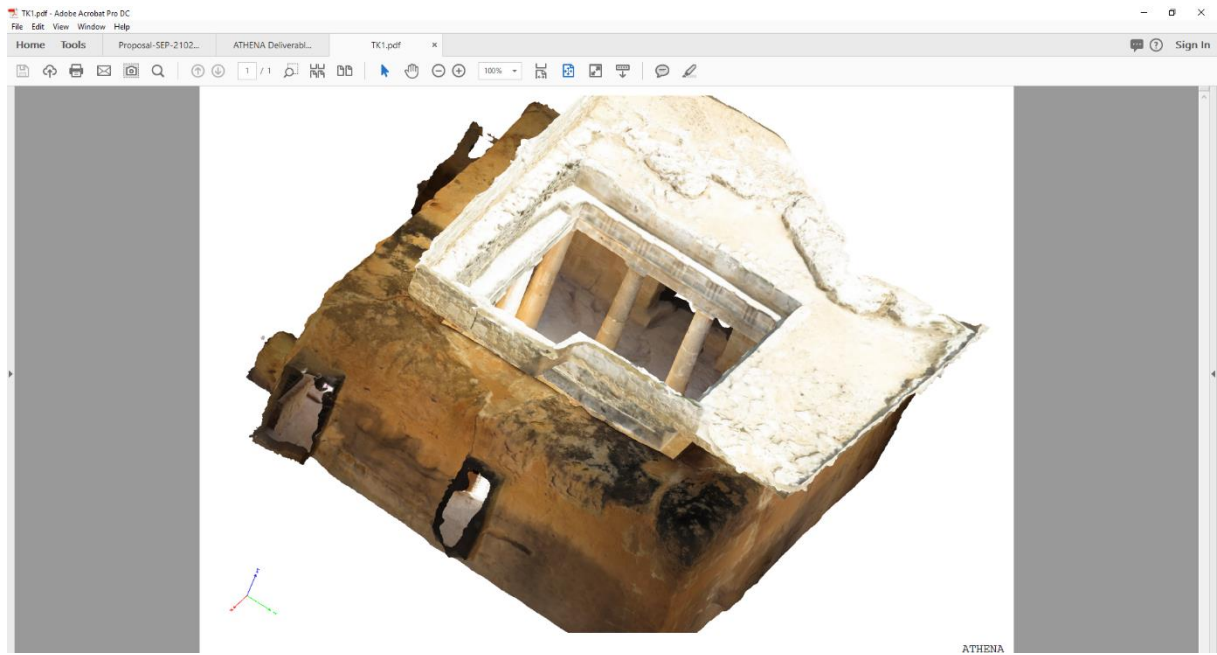


Figure: Photos taken during the hands on training on 05th of September 2018



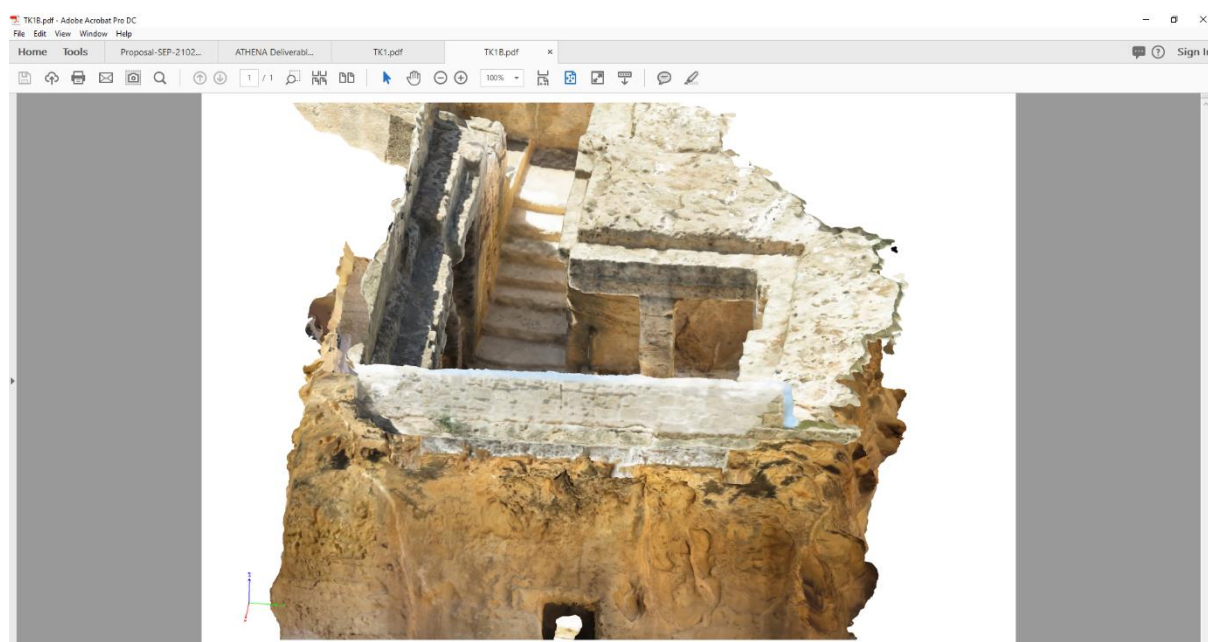


Figure: A 3D model of the Tombs of the Kings (Tomb 3 and Tomb 4), based on photos taken during the surveying of 4th of September 2018.

ANNEX

PRESENTATIONS OF THE SUMMER SCHOOL