Trimble DIMENSIONS 2014

GEO-6805

Using imaging and laser scanning technologies to create high-precision geospatial models of archeological objects

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Master

Who we are

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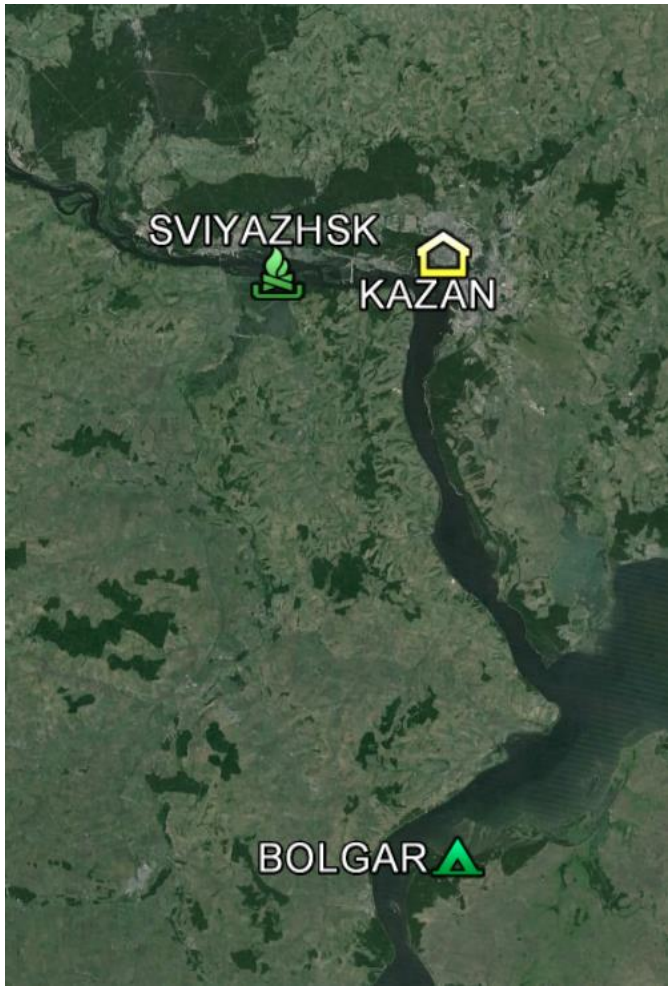
KAZAN FEDERAL UNIVERSITY

Where we are


KAZAN
Image IBCAO
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

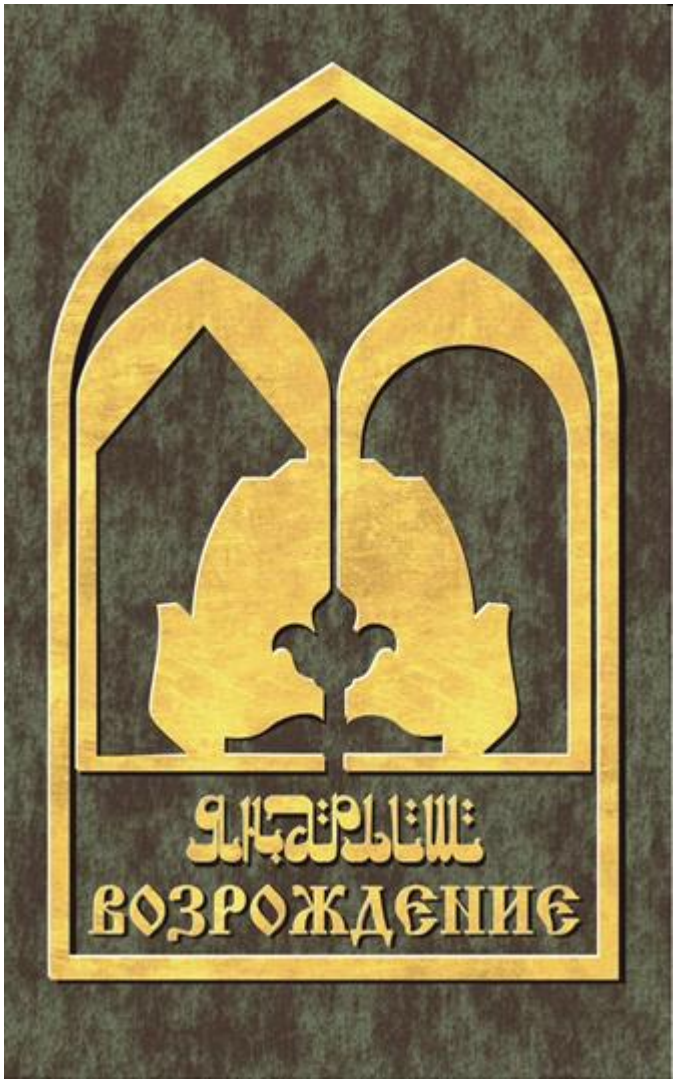

SVIYAZHSK
KAZAN
BOLGAR

Agenda of the presentation

- Project background
- First steps of project and used equipment and technologies
- GNSS and terrestrial networks, RTX-PP
- Using Trimble VX
- Using Trimble GX
- Comparison with terrestrial photogrammetry
- Perspectives

The «Renaissance» foundation

We have the historical mission to save what we have, to revive and pass it on to the future generations. Restoring the historical view of Bulgar and Sviyazhsk will become the largest joint project of the government, business, religious organizations and the public, whose name is the «Renaissance».



Bulgar and Sviyazhsk

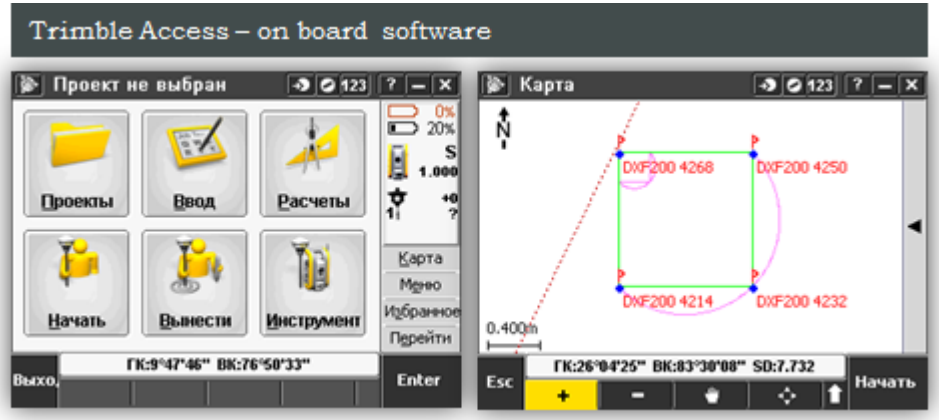
The confluence of two cultures and religions

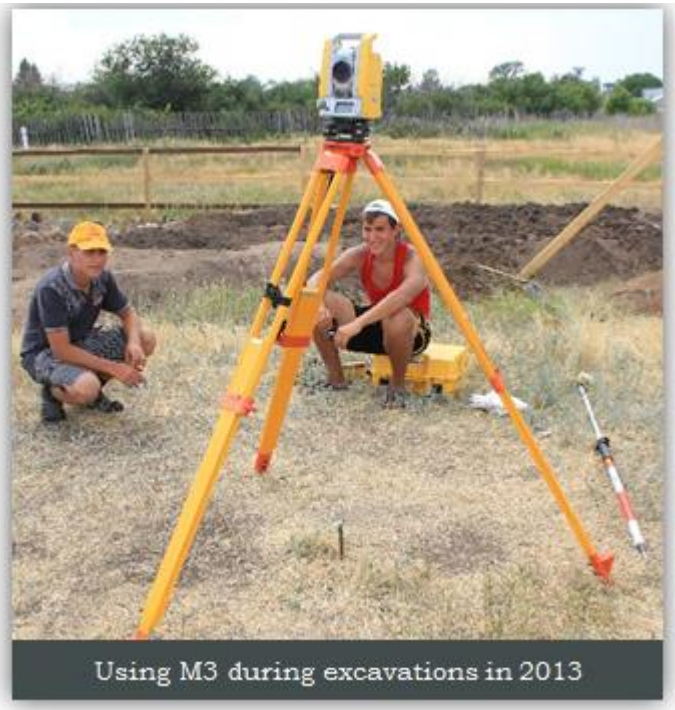
From 1974

to nowadays

Optical equipment

Trimble M3





Using M3 during excavations in 2013

GNSS equipment

Trimble R8
TSC3 Controller

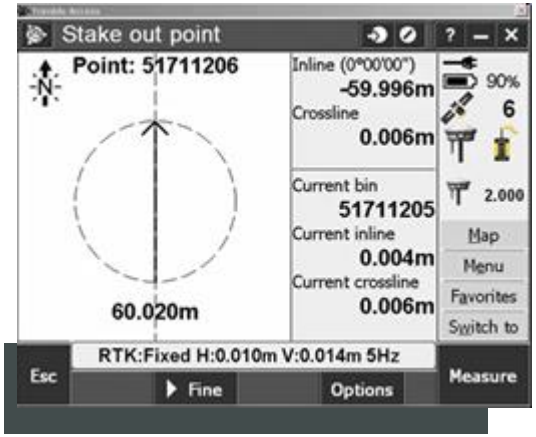
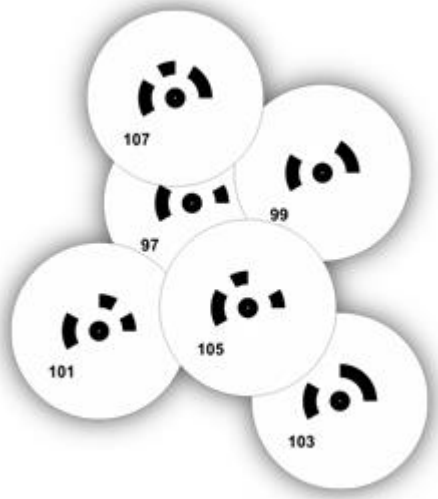


Photo equipment and data processing

Lens reflex camera with photosensitive lens



Set of printed markers for automatic creation of control points

Graphic station or a powerful laptop for data processing

Comparison of photogrammetry and laser scanning

3500 USD

Canon Mark II D5

59 500 USD

Trimble TX5 3D Scanner

Total station for precise local CS set up	✓		✓
GNSS for global CS set up	✓		✓
Graphic station or a powerful laptop for data processing	✓		✓

Accuracy within 10 m:
Sub-centimeter
Type: Calculated

Accuracy within 10 m:
Sub-millimeter
Type: Measured

Aerial photogrammetry of Bulgar

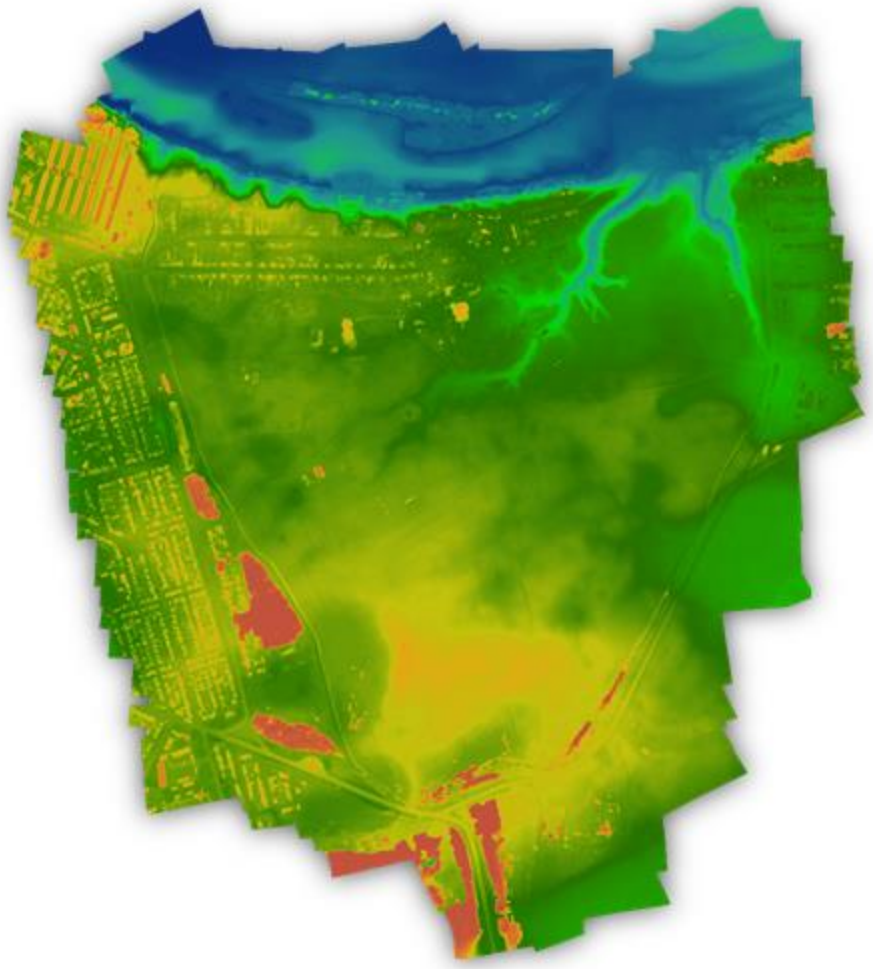
Event marker to syncronize camera shots with 0.001 sec

5 Hz data collection by Trimble R5

Examples

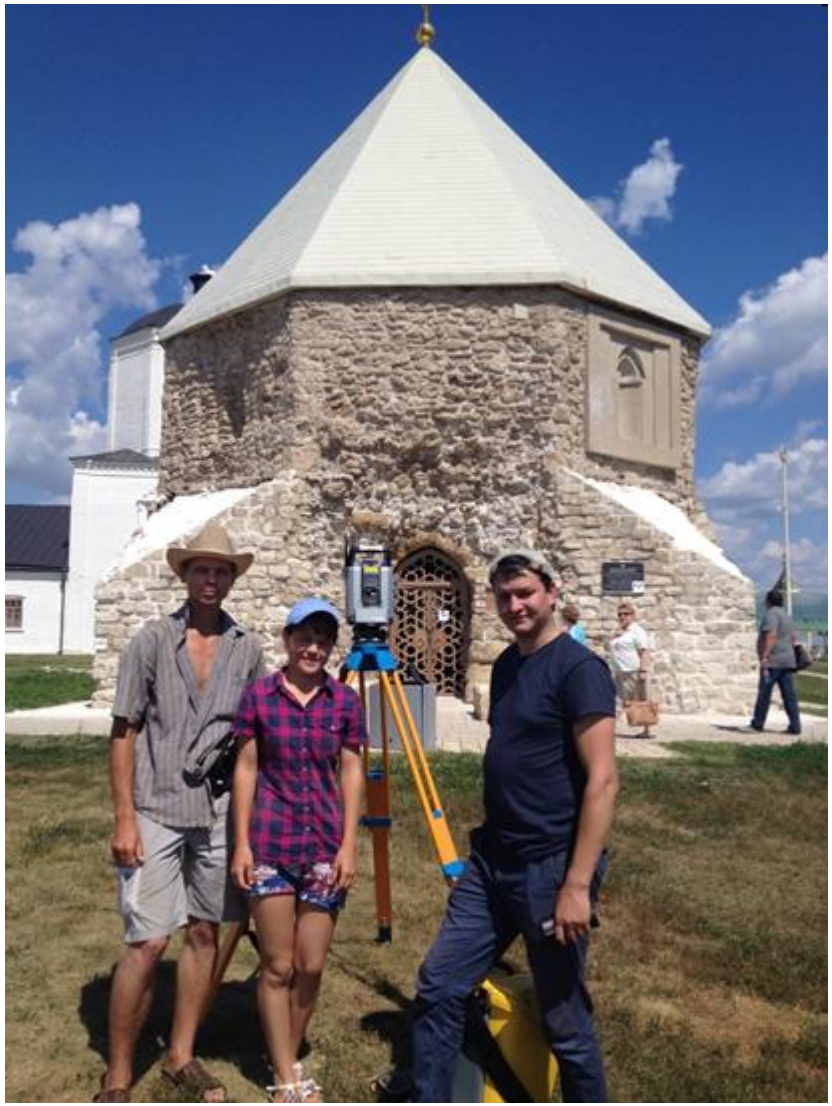
Ortho photo and DTM

Ortho photo with 0.075 m resolution



DTM with 0.35 m 3D resolution

GNSS and terrestrial networks



GNSS and terrestrial networks

Using RTX-PP solution

Свойства

Решение RTX
Report_3883488.xml

Решение RTX (1)

Информация о файле

Имя файла:	Report_3883488.xml
Путь к файлу:	C:\Users\Renat\Documents\Trimble Business Center\!B
Тип файла:	Решение RTX
Размер:	4 KB
Создано:	18.07.2014 9:31:04
Дата последнего изменения:	18.07.2014 9:30:00
Открывался:	18.07.2014 9:31:04
Файл существует:	Да
Только для чтения:	Нет

Связанная информация

Точка:	1
Защищено:	Нет

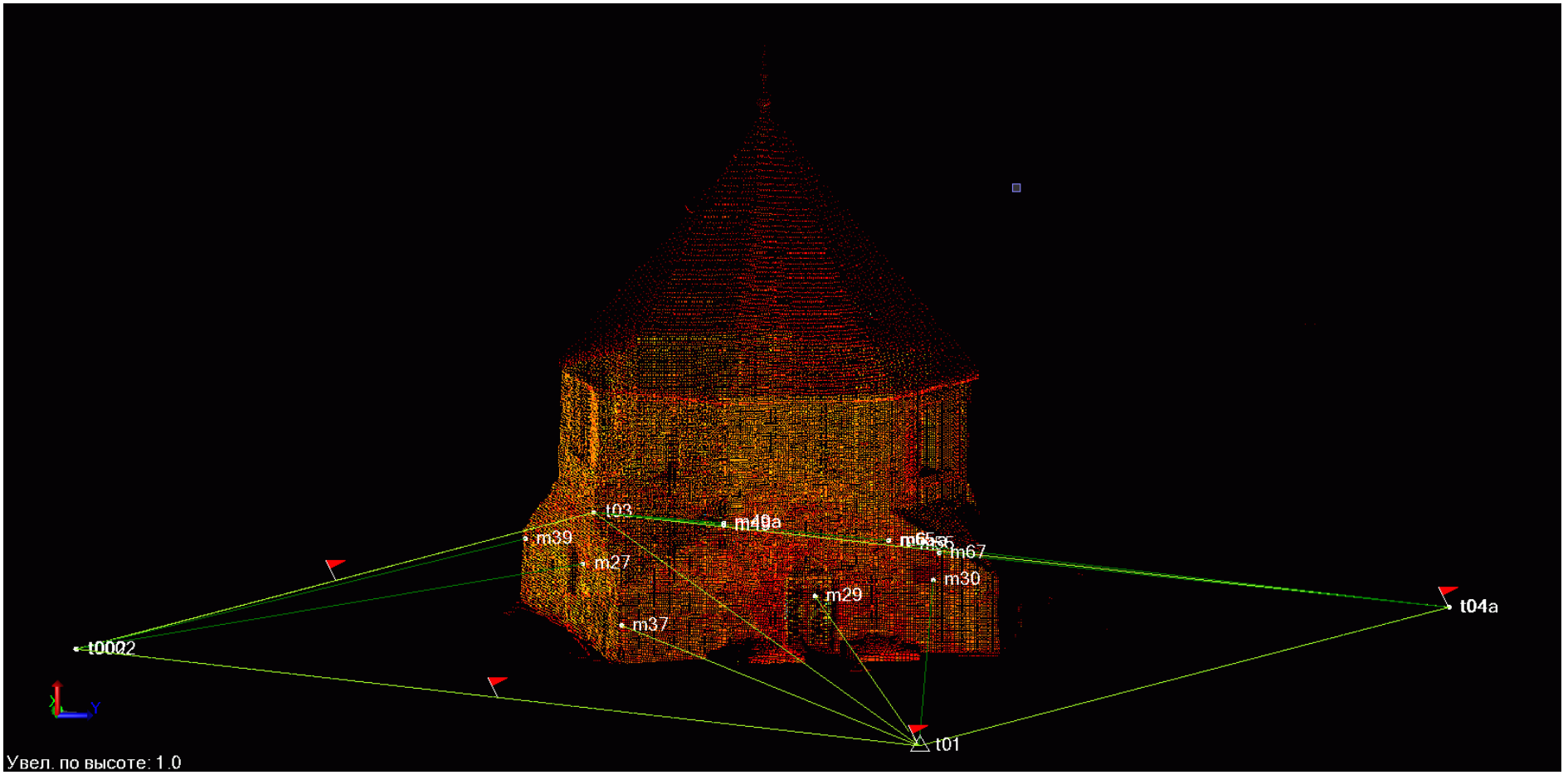
Решение координат

ПО:	RTX 3.3.0.14133
Время начала:	17.07.2014 12:06:50
Время окончания:	17.07.2014 18:37:25
Продолжительность:	06:30:35.0
Имя антенны:	TRM55971.00 NONE
Высота ARP:	1.666 м
Использованы измерения:	2333 / 2344 (=4688/10.0) : 99%
Общее СКО:	0.000 м
Гор. точность (95%):	0.014 м
Верт. точность (95%):	0.018 м
Тип координат	Местное

Информация по координате

Координаты:	1
Имя системы:	ITRF2008
Тектоническая плита:	Eurasia
Эпоха:	2005.0

Results of scanning with Trimble VX – 3D view



Results of scanning with Trimble VX – plan view

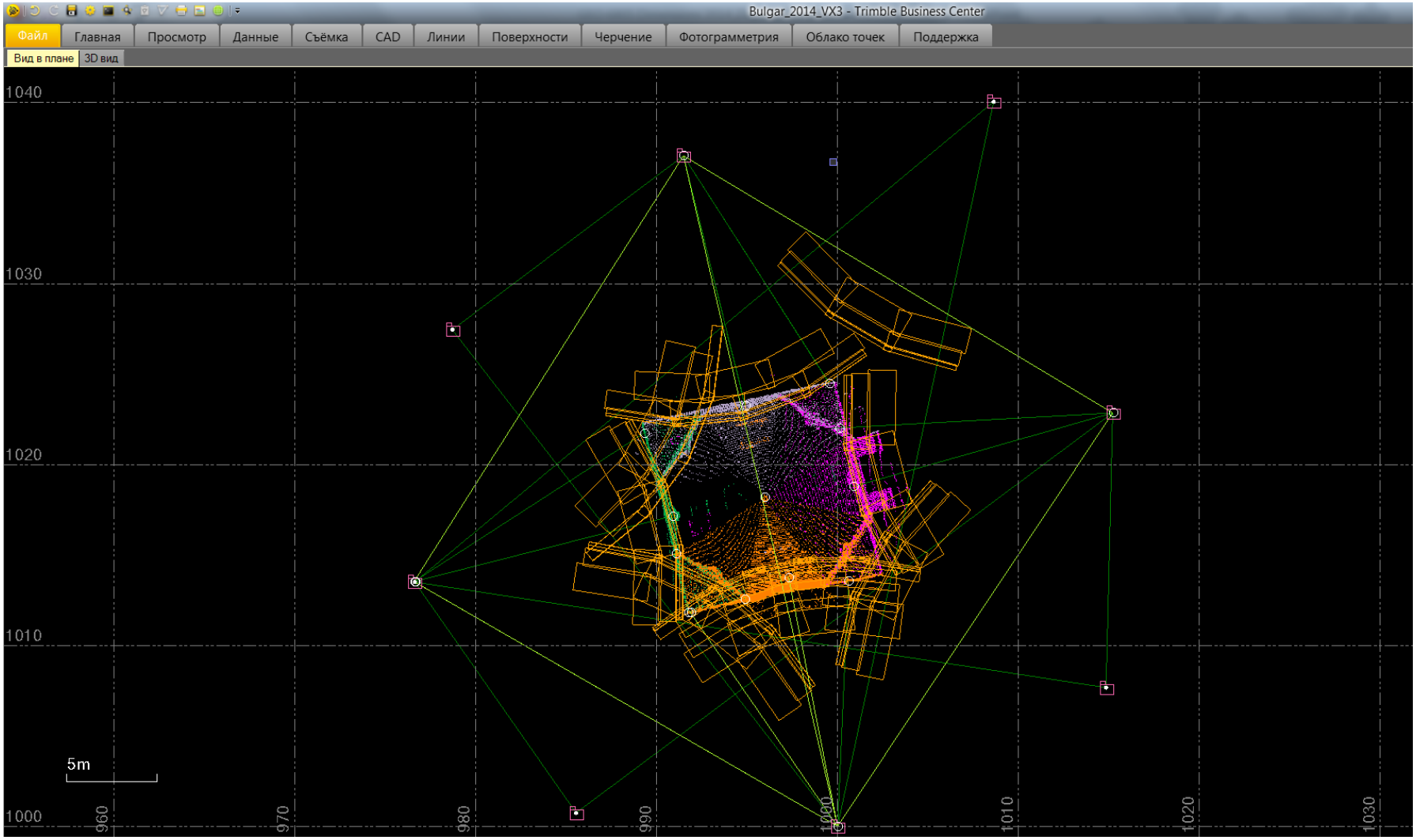


Photo points by TBC

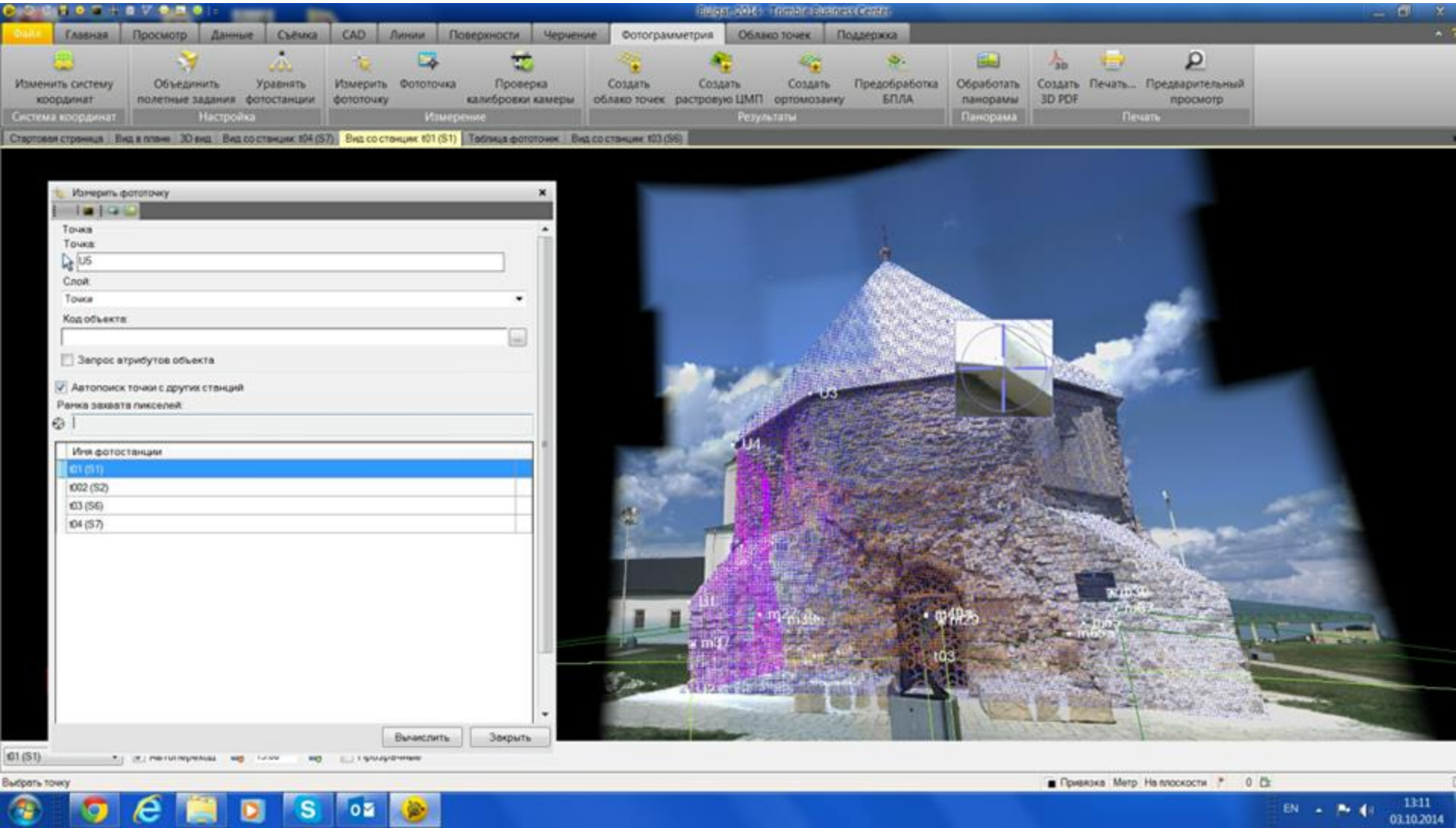


Photo points by TBC

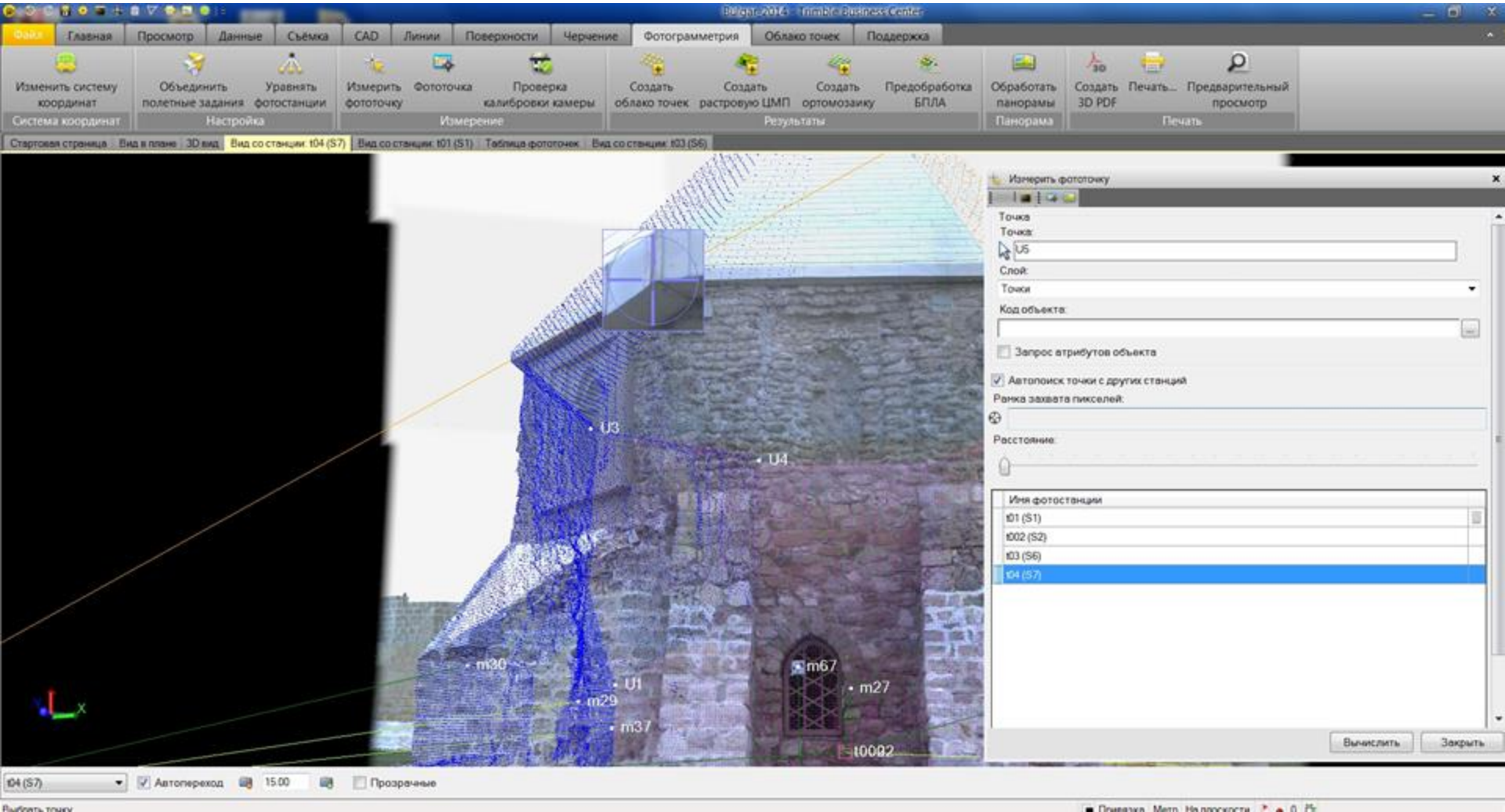


Photo points by TBC

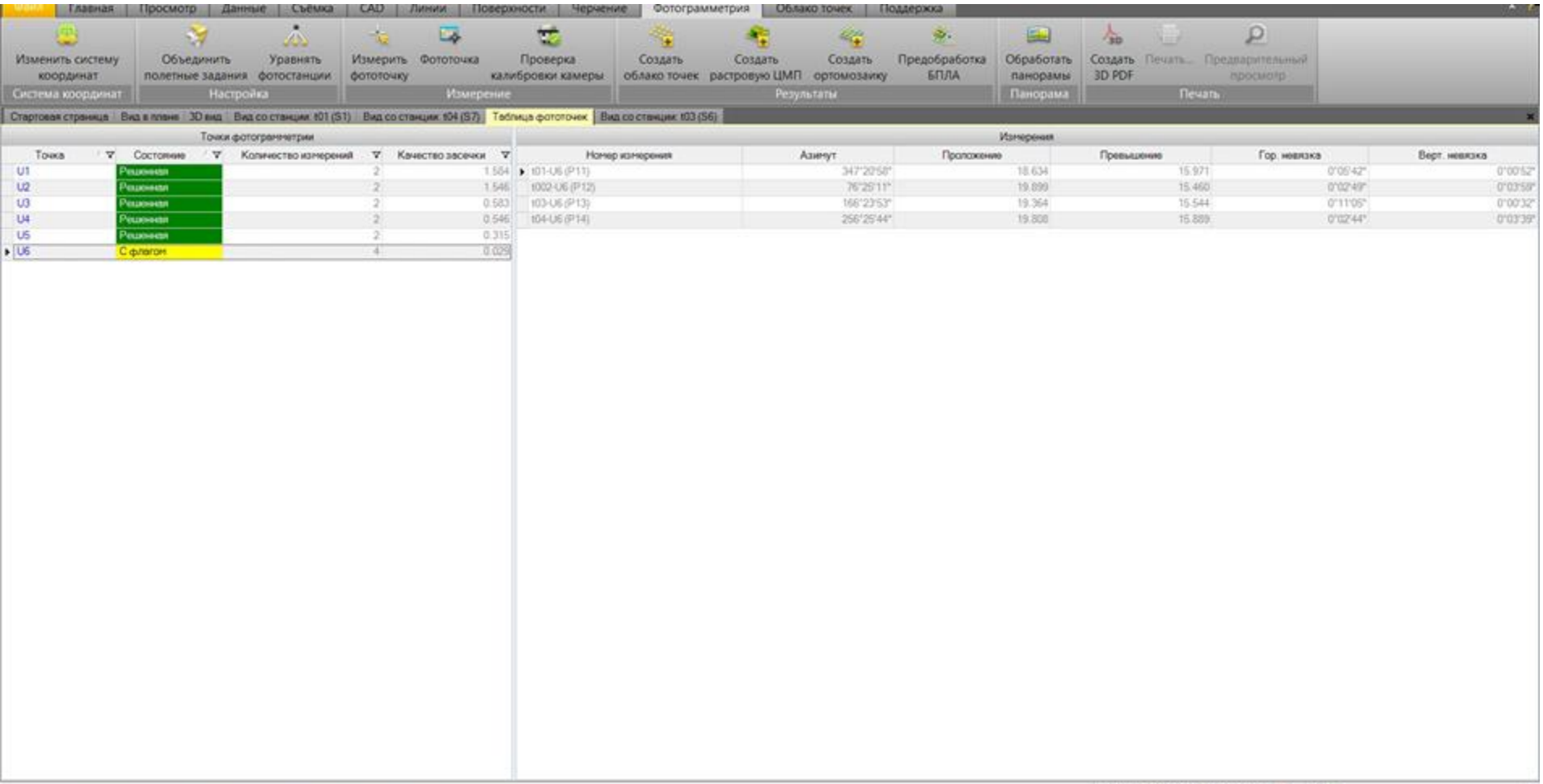


Photo points by TBC

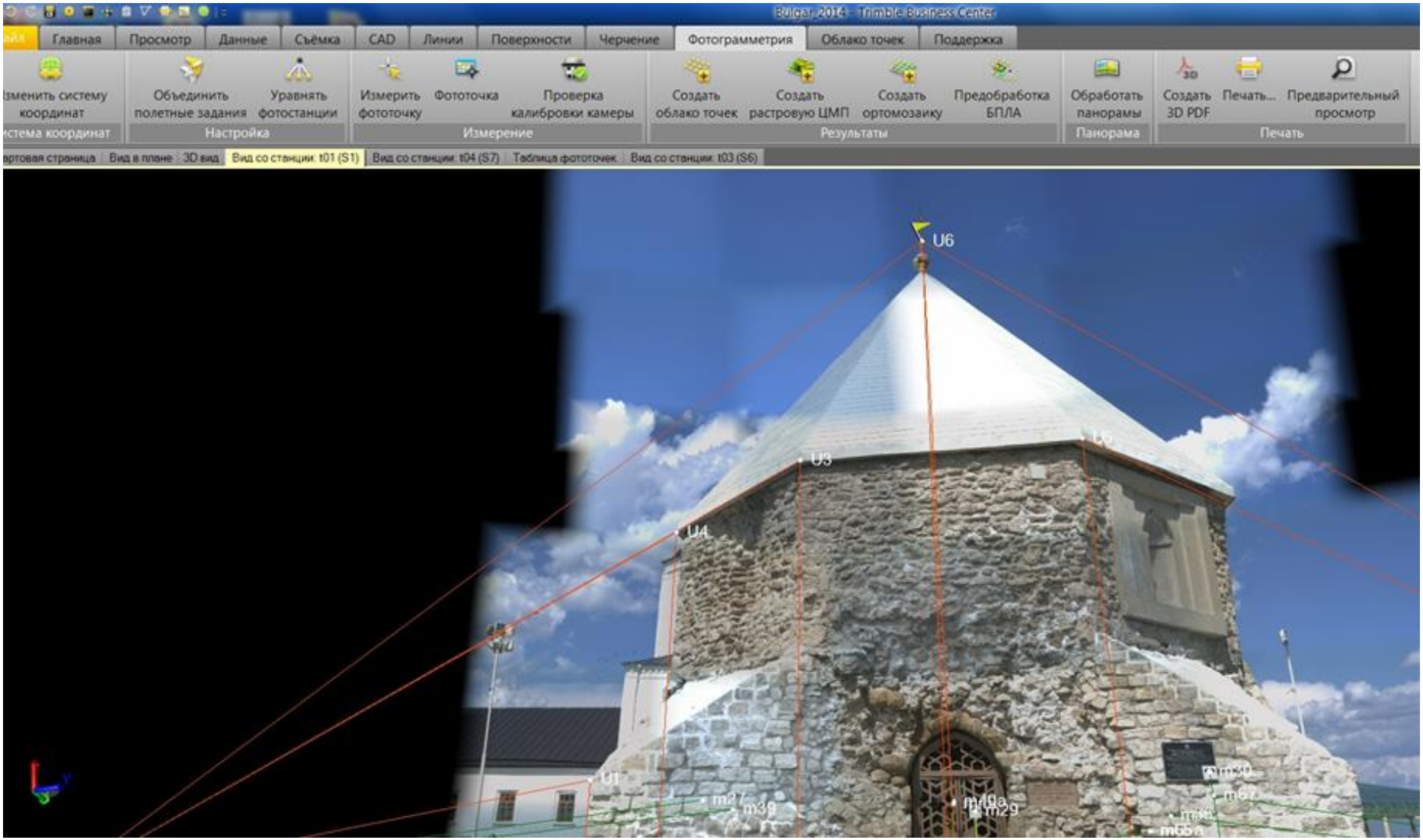
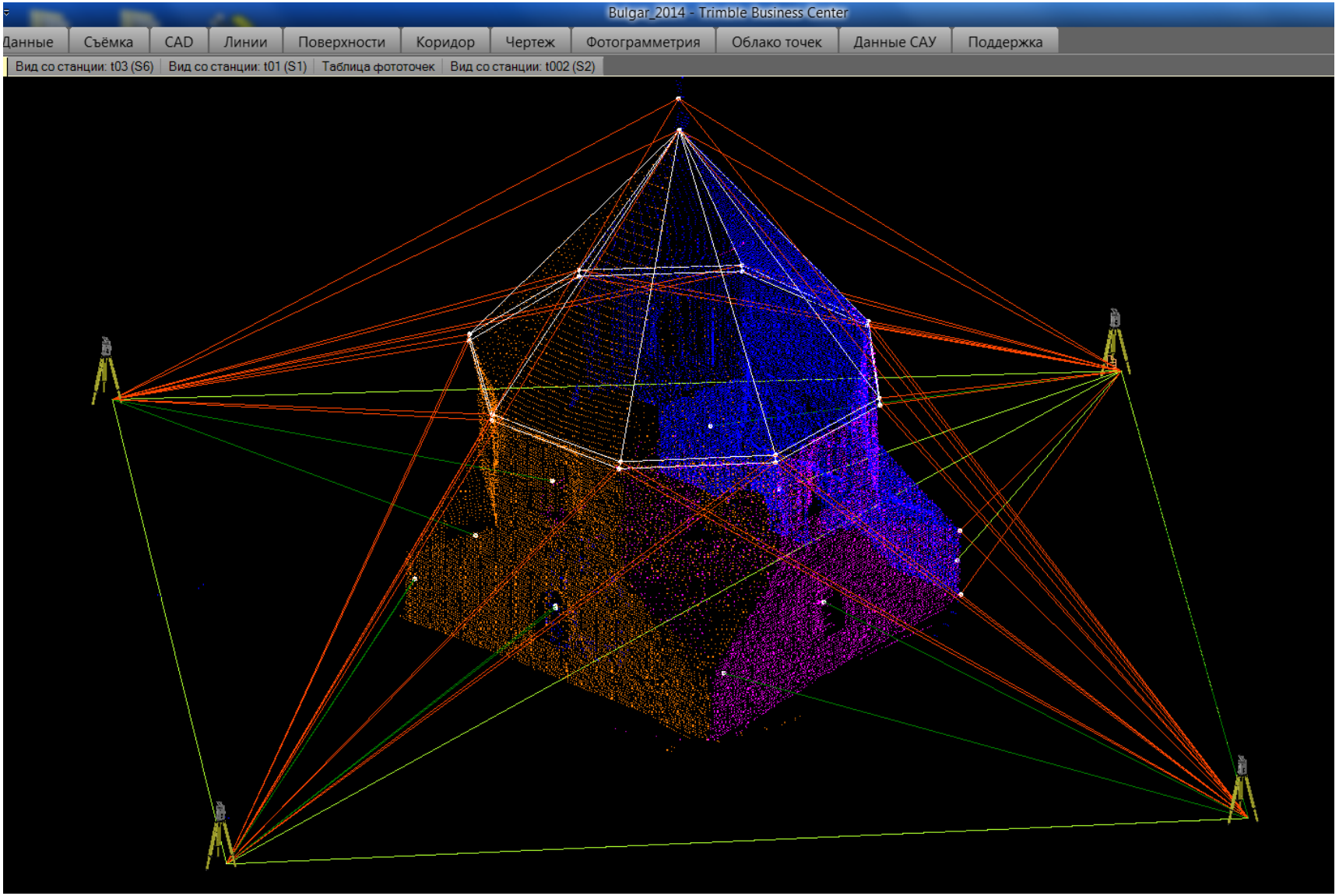


Photo points by TBC



Laser scanning by Trimble GX

Laser scanning by Trimble GX

Laser scanning by Trimble GX

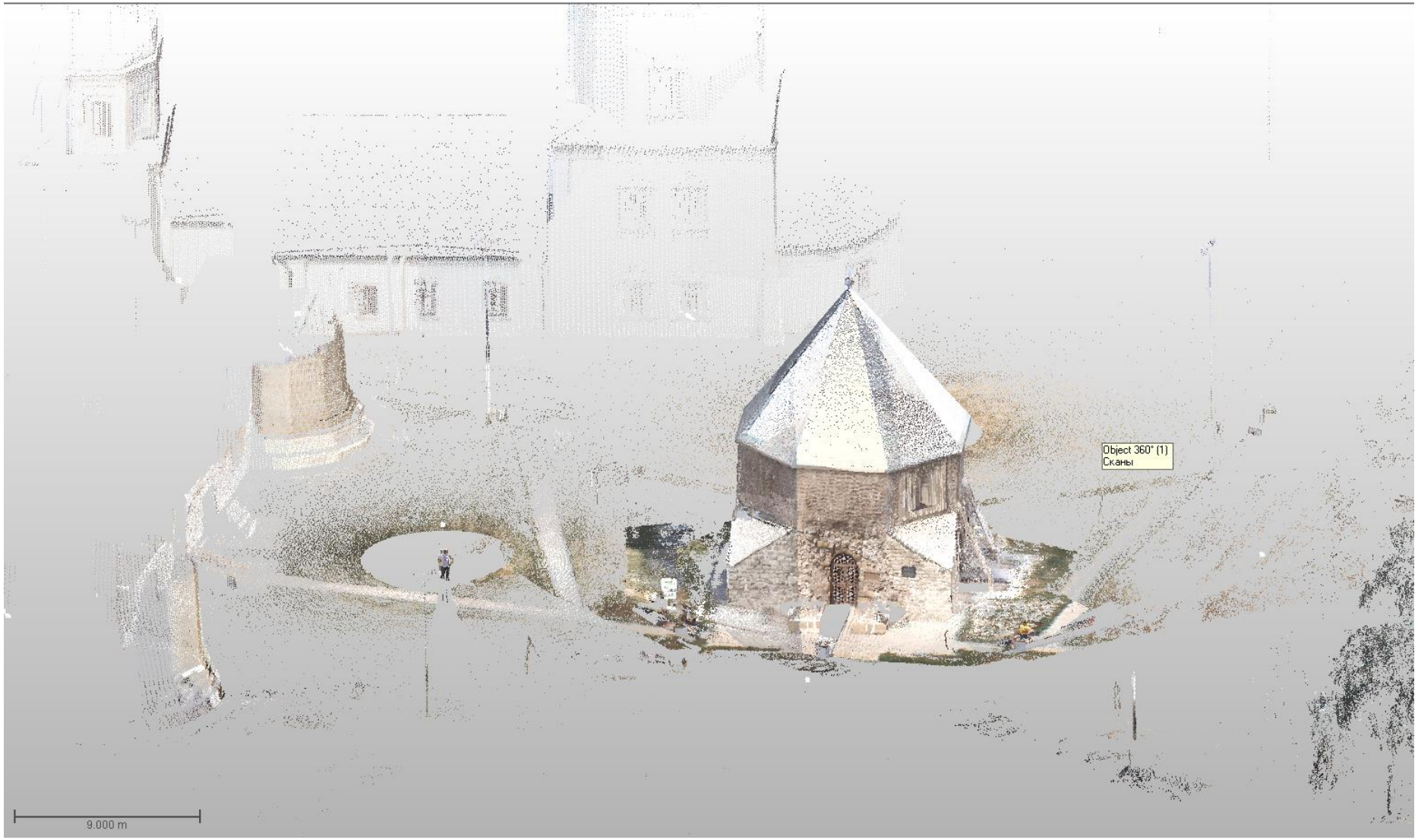
Registration Report (Target-Based)
Report by station

4 STATION(S) - Mean Distance: 0.007 **Max Distance:** 0.008
12 TARGET(S) - Mean Distance: 0.007 **Max Distance:** 0.009

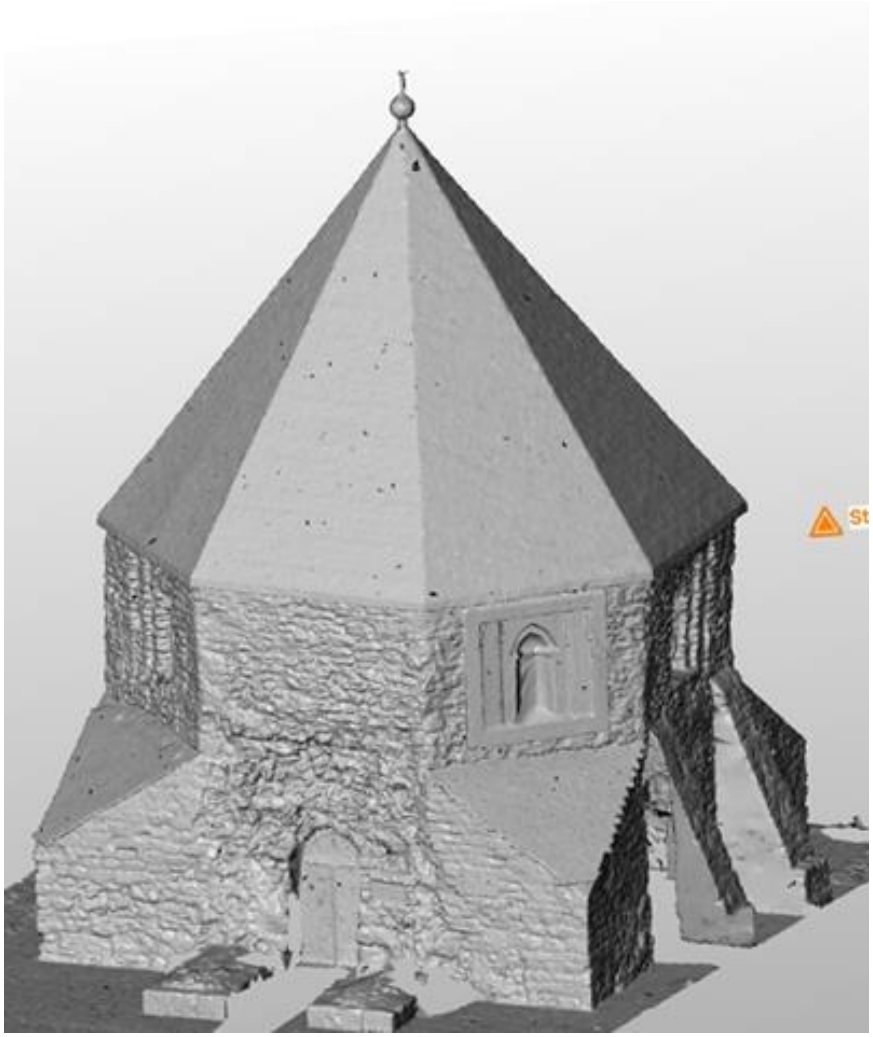
Station_1 - 8 **Scanned Objects - Mean Distance:** 0.007

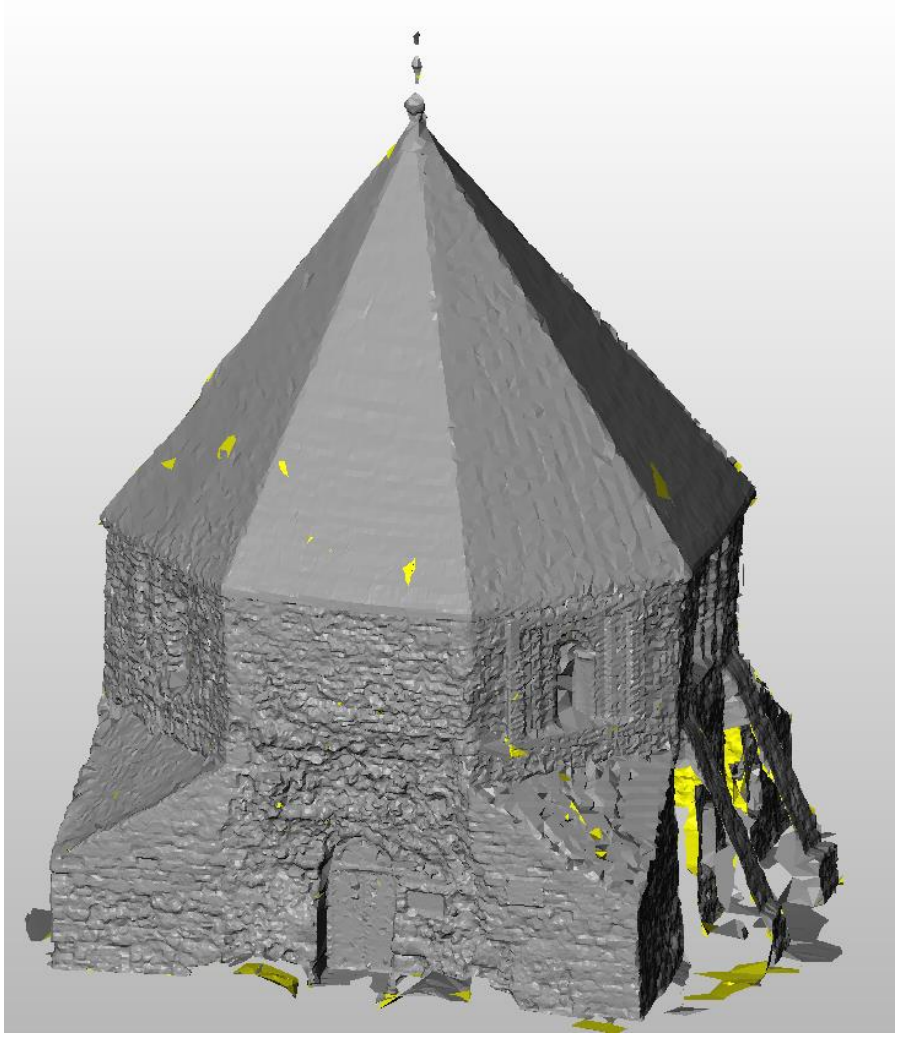
Object Name	Corresponding Target	Scan Per Target	Residual Error	Delta X	Delta Y	Delta Z	Fitting Error	Distance to Scanner
Sphere_1	002	4	0.006 m	-0.003 m	0.005 m	0.003 m	0.001 m	22.747 m
Sphere_2	004	3	0.004 m	0.002 m	-0.001 m	0.004 m	0.001 m	18.742 m
Sphere_3	005	3	0.007 m	0.006 m	-0.002 m	0.003 m	0.001 m	12.497 m
Sphere_4	006	4	0.006 m	0.005 m	-0.001 m	0.003 m	0.001 m	19.602 m
Sphere_5	009	3	0.006 m	0.001 m	-0.002 m	-0.005 m	0.001 m	31.444 m
Sphere_6	010	3	0.008 m	-0.004 m	-0.002 m	-0.006 m	0.001 m	35.235 m
Target_1	012	2	0.009 m	-0.004 m	0.008 m	-0.003 m	0.003 m	27.016 m
Target_2	011	2	0.008 m	-0.006 m	-0.004 m	-0.003 m	0.003 m	27.837 m

Laser scanning by Trimble GX

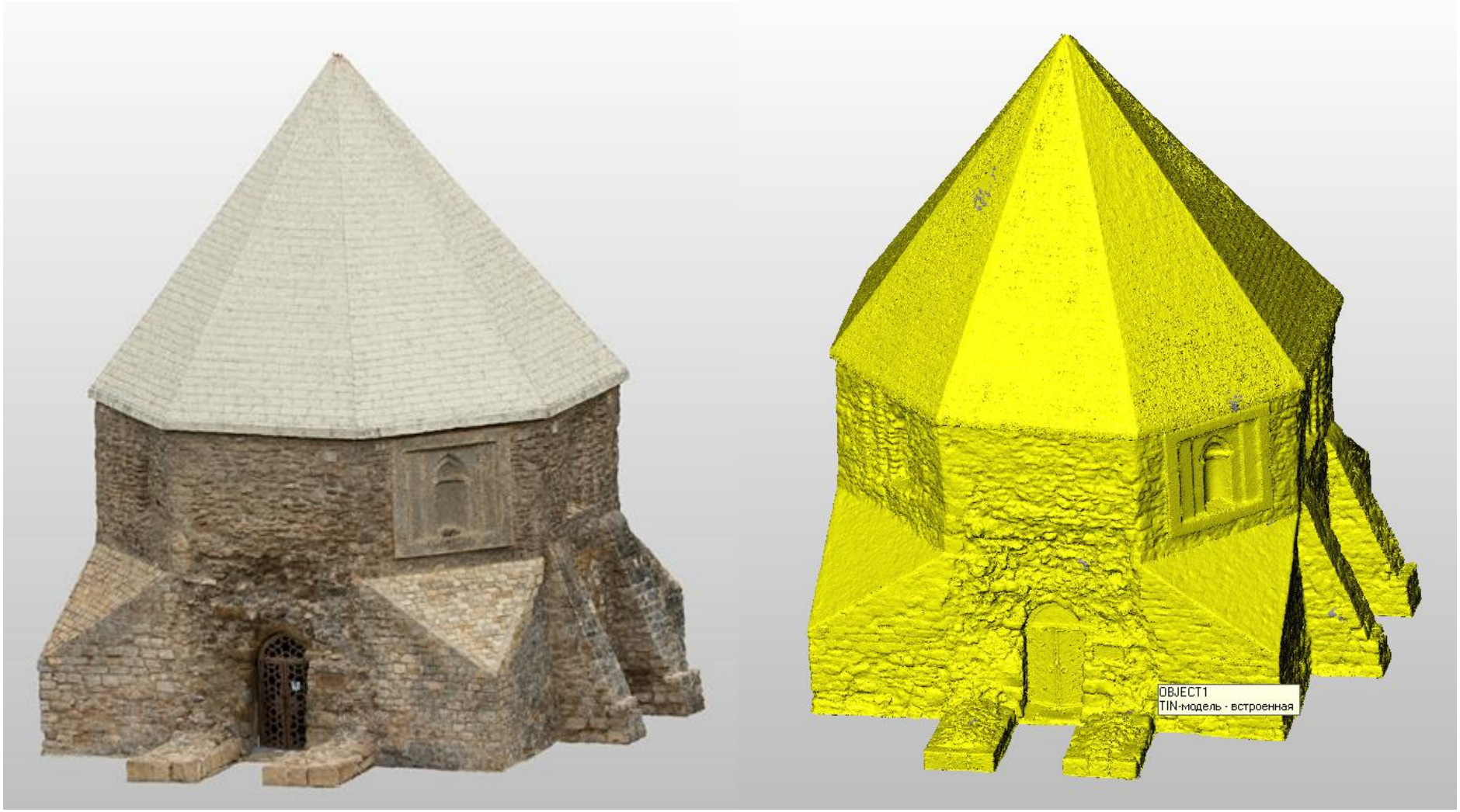


Results of laser scanning by Trimble GX and VX

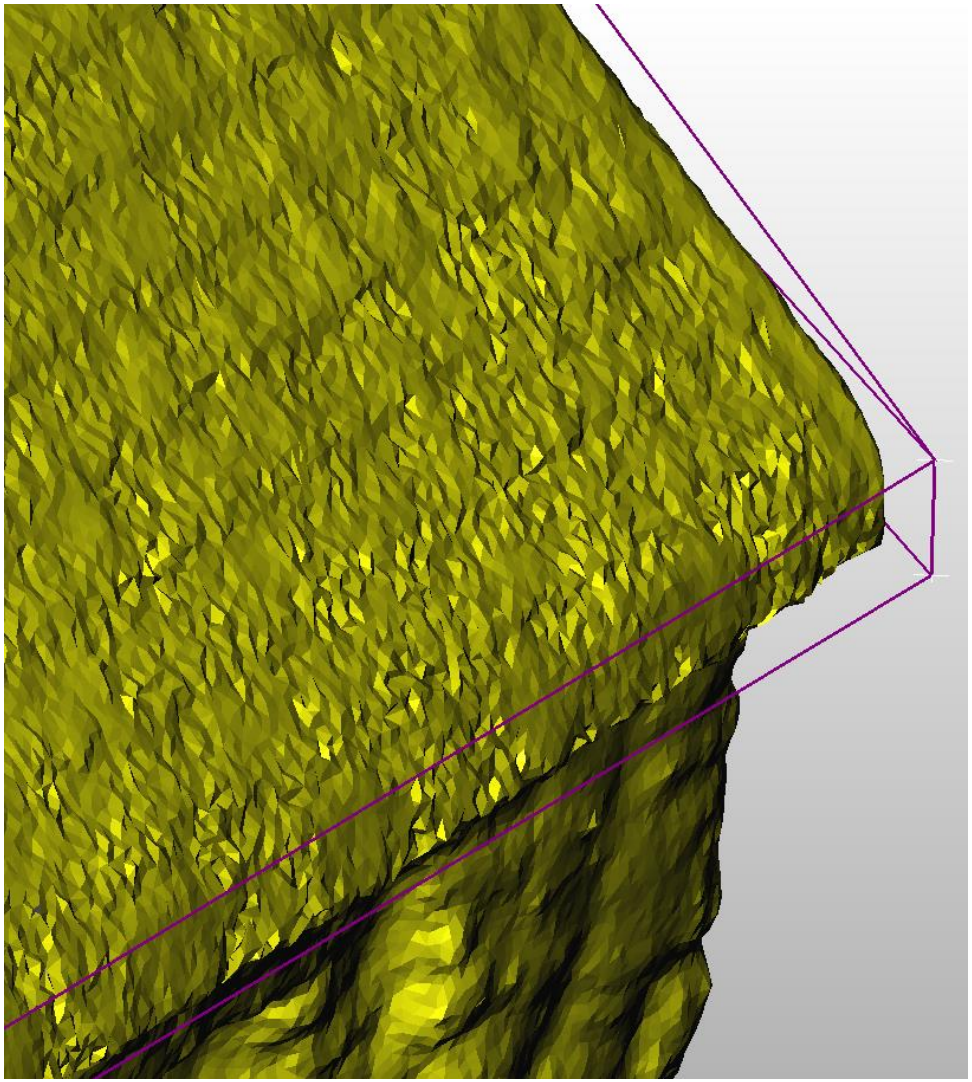


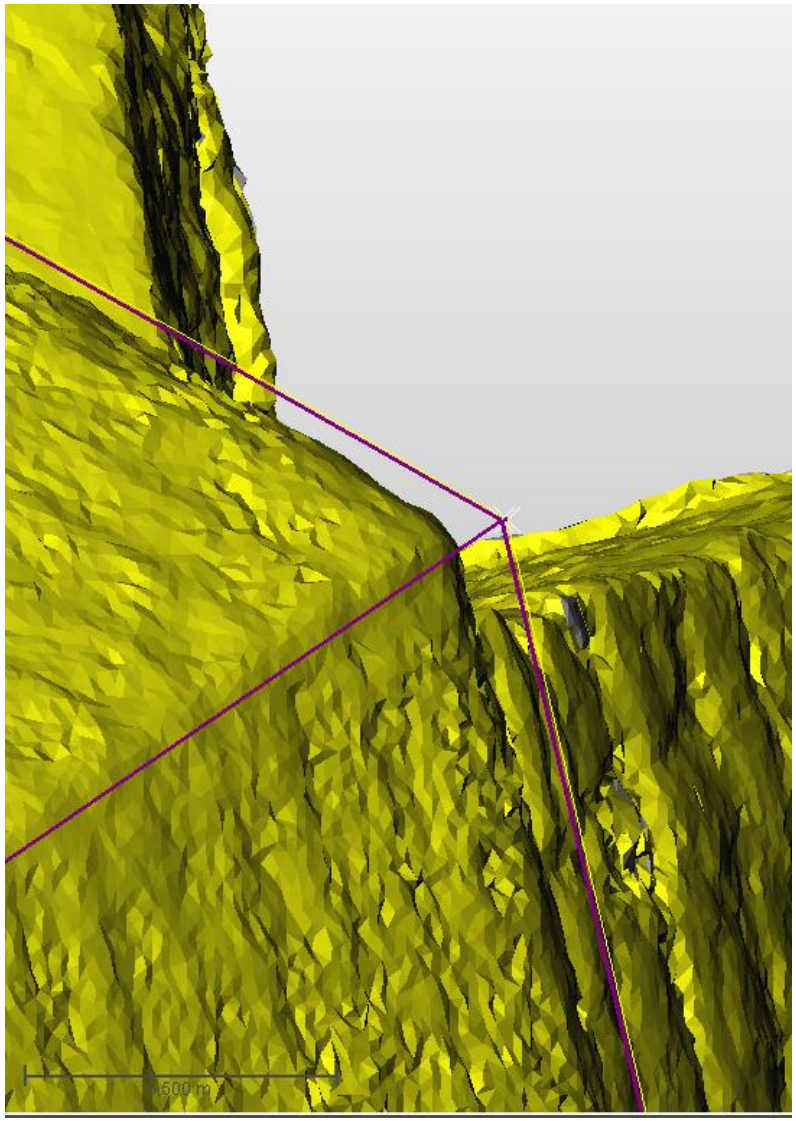


Results of terrestrial photogrammetry

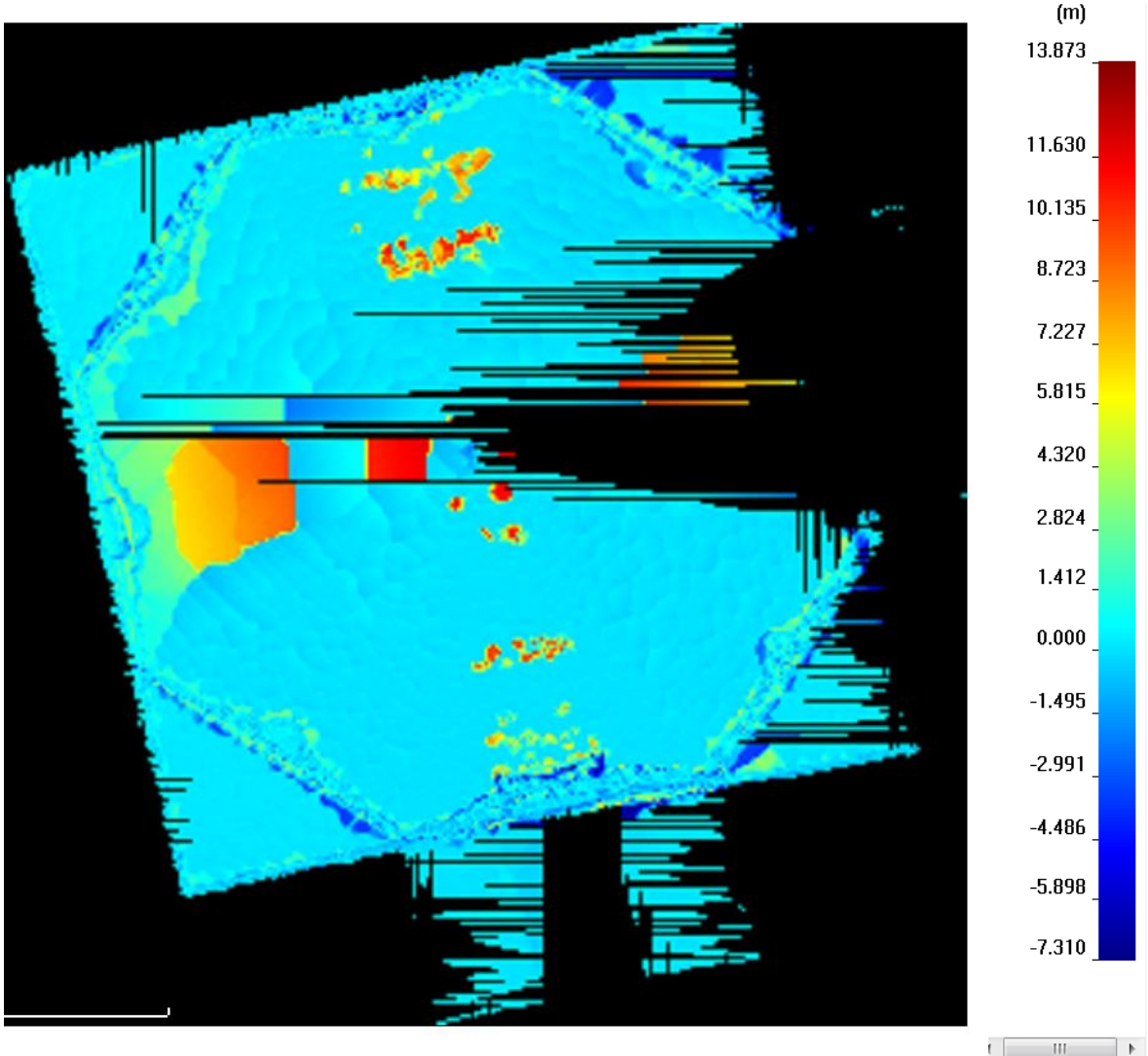


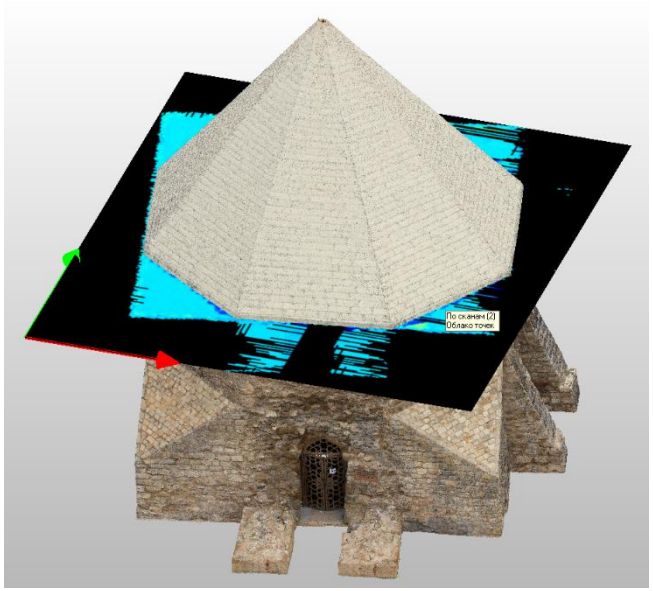
Comparison of different techniques





Comparison of different techniques





3D printing of spatial model

Conclusions

- Kazan university is responsible for scientific support of «Renaissance» foundation programs
- Modern geospatial and geophysics technologies are well accepted by archeological community in Tatarstan
- Trimble surveying, imaging and laser scanning technologies had been used intensively last years for creation high-precision geospatial models of archeological objects in Bolgar and Sviyazhsk

Links to video

- Terrestrial photogrammetry of Eastern mausoleum - https://www.facebook.com/video.php?v=444015975739893
- Laser scanning of Eastern mausoleum by Trimble GX. – http://vimeo.com/103555342

Acknowledgements

Trimble

KAZAN FEDERAL UNIVERSITY

Академия наук
Республики Татарстан

Возрождение

Thank you for your attention

Булгар