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EU Donation to Upgrade the ASF056 Auxiliary Station Borehole Seismometer

Mr. ALZOUBI, Shadi

Jordan Seismological Observatory (JSO)

Ministry of Energy and Mineral Resources
The Hashemite Kingdom Of Jordan

INTRODUCTION AND MAIN RESULTS

The ASF056 auxiliary station in (Tall Alasfar, Jordan), has received a vital upgrade to its borehole seismometer following a malfunction of its previous equipment, thanks to support from the European Union (EU) facilitated by the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) and the Permanent Mission of Jordan, this contribution enhances both local seismic monitoring and the International Monitoring System.

This cooperation reflects the shared commitment of the international community to advancing global verification efforts and supporting Member States in fulfilling their treaty obligations.

SnT 2025 CTBT: SCIENCE AND TECHNOLOGY CONFERENCE
8 SEPTEMBER ONLINE DAY
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ASF056 auxiliary

The ASF056 Auxiliary Station, located in Tal Al-Assfar, Jordan, plays a vital role in the national seismic monitoring network, while also contributing significantly to the International Monitoring System (IMS) due to its strategic location.

The station's borehole seismometer malfunctioned, affecting the integrity of the collected data and its contribution to the IMS. Despite multiple attempts to repair the sensor, the issue could not be resolved, and the manufacturer has since recommended a full replacement, the local station operator began planning to replace the sensor using limited local financial resources. However, given the budget constraints, the operator is now seeking support from the CTBTO or other organizations to secure the replacement and restore the station's essential operations.

European Union (EU) donation

Thanks to support from the European Union (EU) facilitated by the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) and the Permanent Mission of Jordan, the ASF056 auxiliary station in has received a vital upgrade to its borehole seismometer and to support the full replacement job done by CTBTO technical team and local station operator.

The donation cover the borehole sensor, shipment of the sensor and technical expert team mission to Jordan.

Dear Rana

Following our previous exchanges, let me bring to your kind attention that we have done extensive work on exploring various options for funding of the repair of the IMS auxiliary Station in Jordan through voluntary contribution. Finally, we could find a solution after we received the green light from Germany to cover the cost of the repair of the AS stations including one in Jordan from their voluntary contribution.

The PTS is therefore now able to cover all the costs related to the repair of the station including the shipment of the sensor.

The IMS colleagues will be in touch with your technical body to do that at an appropriate time.

Best regards

Mohammad

Dear Ali,

My name is José Pereira and I work for the maintenance section at the IMS .

I will be taking part in this field trip . I should like to discuss some details concerning the visit and the work itself:

1. We are planning to arrive in Amman on 9 October. This will be myself and Tarun Philip (Nanometrics). Another IMS colleague will join us, Sergelen Bazarragchaa. It is not certain whether he will arrive on the 9th October or a day or two later. We will be able to confirm his arrival soon.
2. Regarding the schedule. We are planning to travel to the station on the 10 th and initiate the work soon after that. Then work all the way to Saturday 14 th and return to Amman on Sunday 15 th. (Note that Tarun's schedule may be slightly shorter than this). Please let us know if you have any issue working/traveling on the weekend and we will adapt.
3. Related with point 1. : the commute from Amman to Azraq and back. It is not clear to me how we can go there and come back. Please advise on this. Note that we may need some level of autonomy between ourselves in terms of transport, as Tarun may return before the rest of us and Sergelen may arrive later.
4. Lodging at Azraq. You have sent us a hotel link, so we will try to book and will let you know.
5. Work task: I have a request. I understand that the faulty sensor is still in the borehole. It may save us some time during the visit if this is removed before we arrive. Can you organise this with your team? If so, please let's coordinate beforehand.

I believe this is all for now.

I await your feedback.

Thank you and have a good weekend.

The Replacement and upgrade of the ASF056 mission

The mission was carried out jointly by the ASF station operators(JSO), the CTBTO team and technicians from the seismometer manufacturing company.

The objectives of the mission were:

a. Recover and decommission the existing equipment (borehole seismometer and digitizer), completed by the (JSO) staff.

b. Deploy a new borehole sensor along with all necessary equipment, including the digital recorder, GPS antenna, and vault tamper switch.

c. Conduct borehole sensor orientation analysis using a reference sensor.

d. Reintegrate the station into the IMS to restore its contribution.

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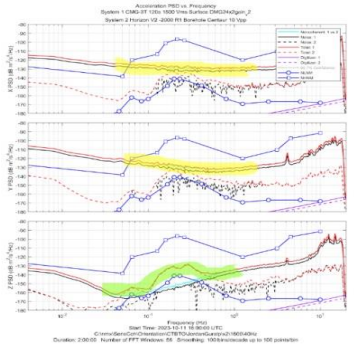
Borehole Sensor Orientation Deployment 1 (2023-10-11)

Station Code	Guralp S/N	Y Angle	X Angle	Notes
ASF	A2126, T36166	352°	82°	Using a CMG-3T Surface Sensor and DM-24 Digitizer. Station failed all quality checks. Had issues with the data format and noise. Vault installation

Acceleration Power Spectral Density Versus Frequency

Poor coherence on both horizontal components. Some coherence on vertical components. The solid PSD lines (red and black) represent the reference sensor and the dotted lines represent the borehole sensor. We would expect the same microseismic peak pattern forming for both sensors under ideal conditions.

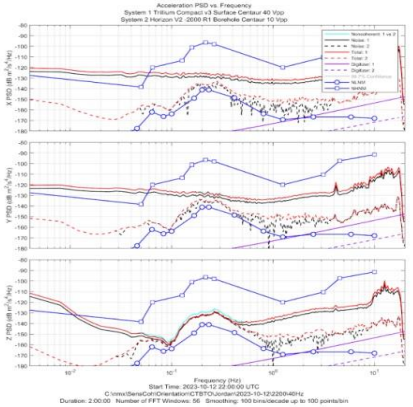


Borehole Sensor Orientation Deployment 2 (2023-10-12)

Station Code	T120BH S/N	Y Angle	X Angle	Notes
A4	7748	218°	225°	Using a Trillium Compact Surface Sensor and Centaur Digitizer. Station failed all quality checks and results were very incoherent due to noise. Vault installation.

Acceleration Power Spectral Density Versus Frequency

Poor coherence on both horizontal components. Some coherence on vertical components. The solid PSD lines (red and black) represent the reference sensor and the dotted lines represent the borehole sensor. We would expect the same microseismic peak pattern forming for both sensors under ideal conditions.

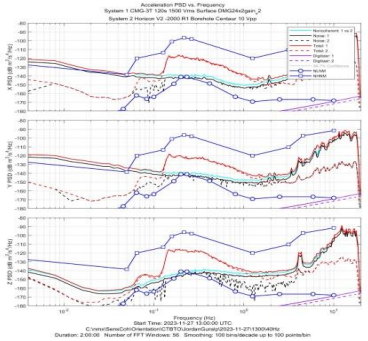


Borehole Sensor Orientation Deployment 3 (2023-11-27)

Station Code	Guralp S/N	Y Angle	X Angle	Notes
ASF	A2126, T36166	350°	80°	Using CMG-3T Surface Sensor. There was good coherence between the reference and borehole sensors. All sample rates, in all time periods, met all of the quality checks for this analysis. Direct burial installation.

Acceleration Power Spectral Density Versus Frequency

Good coherence can be observed on all channels. The PSD plots from both the reference sensor and borehole sensor follow a similar seismic noise pattern across most frequency ranges. The solid PSD lines (red and black) represent the reference sensor and the dotted lines represent the borehole sensor.

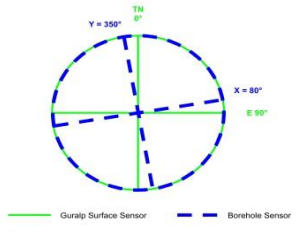


Quality Check Criteria

Each row of the following table shows the analysis results for a given sample rate during a specific time window. Four ~2 hour time windows were analyzed to obtain the results. **The quality checks were met for the analyzed frequency ranges.**

Orientation Axis Diagram

The diagram below shows the orientation of the borehole sensor (blue) with respect to the reference sensor deployed True North (TN).



Technical Dimension	Down Hole Camera Inspection Report
MEMER	BH ASF056
	Tal Asfar

Fig-7: 69.27 m BGL

Fig-8: 69.88 m BGL