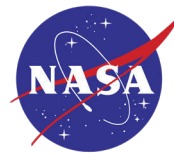




SVANTEK



esa



Noise Measurement at the International Space Station (ISS)

CASE STUDY: Ensuring Hearing Safety and Communication Clarity in Space using the SV 971A, and SV 104A Devices.

Measurement Operator:

Axiom Mission 4 Crew supported by ESA/NASA collaboration and SVANTEK's Applications Team

Measurement Equipment:

- SV 104A - Personal Noise Dosimeter
- SV 971A - Class 1 Sound Level Meter
- SV 36 - Class 1 Sound Calibrator

Challenge:

Balancing Astronaut Health, Communication, and Hardware Constraints. Continuous background noise on the ISS can mask alarms and increase cognitive load. The challenge was to continuously monitor near-ear exposure and localized ambient levels without adding mass, cabling, or electromagnetic risk—while delivering near-real-time data access for both medical and engineering teams on Earth.

Human spaceflight missions expose astronauts to a range of stressors, including elevated noise levels that can affect crew safety, communication, and long-term hearing health. Continuous acoustic monitoring is therefore a crucial part of Crew Health and Performance (CHP) systems on the International Space Station (ISS).

NASA has long relied on the SVANTEK **SV 102A+** dual-channel noise dosimeter for this purpose. However, the European Space Agency (ESA) required a next-generation system to support its upcoming Gateway missions. The goal was to evaluate smaller, lighter, and more flexible devices that could provide accurate data, integrate with ESA's **EveryWear** software, and minimize astronaut workload during on-board operation.

SV 102A+
Class 1 Dual-Channel
Noise Dosimeter



The Wireless Acoustics Technology Demonstration was designed to verify the performance of two off-the-shelf SVANTEK instruments - the **SV 971A** Class 1 Sound Level Meter and the **SV 104A** Personal Noise Dosimeter - in the spaceflight environment. The mission aimed to confirm device reliability, Bluetooth data transfer capability, and user experience during normal ISS operations.



Stawosz Uznański-Wiśniewski calibrates the SV 971A Sound Level Meter using the SV 36 Acoustic Calibrator in Earth orbit.

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SV 104A
Personal Noise
Dosimeter



SV 971A
Class 1 Sound
Level Meter

Implementation

The experiment involved two astronauts performing independent measurement sessions inside the Columbus module on board the ISS.

During Run 1, each astronaut used:

SV 104A as a body-worn personal dosimeter,

SV 971A as a fixed-position area monitor.



Sławosz Uznański-Wiśniewski installs the SV 971A Sound Level Meter aboard the ISS.

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Both devices operated continuously for 24 hours, collecting acoustic data at one-minute intervals. Upon completion, measurement files were wirelessly transferred to the **EveryWear** software running on an ISS iPad.



Sławosz Uznański-Wiśniewski, wearing a SV 104A Personal Noise Dosimeter on his arm, is the first Pole in history to reach the International Space Station.

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Questionnaire results confirmed a low mental and physical workload and high user satisfaction. Astronauts rated the **SV 104A** as easy to mount, comfortable to wear, and unobtrusive during routine operations - including sleep. The **SV 971A** area monitor also received top scores for stability and reliability in its fixed position.

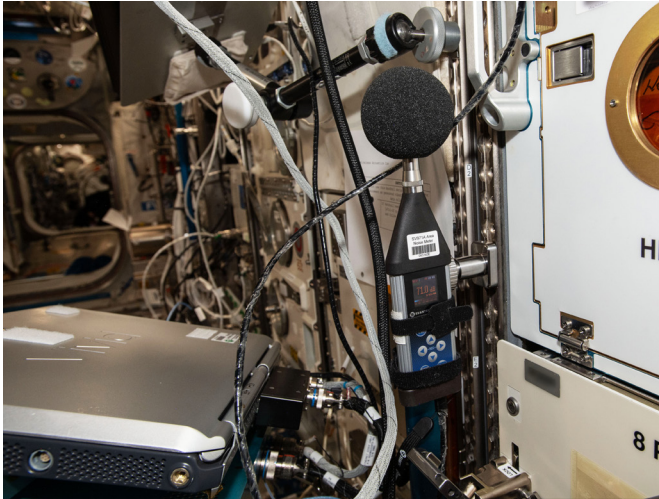
During Run 2, the same astronaut repeated the procedure using the legacy **SV 102A+** dosimeter to enable direct comparison of user experience and data quality.

Each participant completed detailed NASA-TLX questionnaires assessing mental, physical, and temporal workload, as well as comfort, ease of use, and data handling. Post-flight, all devices underwent full calibration and inspection at the Svantek Accredited Calibration Laboratory (PN-EN ISO/IEC 17025) to evaluate any potential metrological drift caused by spaceflight conditions.

Both the **SV 104A** and **SV 971A** performed flawlessly on board the ISS, demonstrating full functional and metrological compliance.

“Accurate evaluation of the ISS acoustic environment relied on combining personal exposure data, fixed-point ambient noise history, and crew activity records. The ability to insert event markers during high-vibration shocks was crucial to exclude artifacts and ensure reliable datasets.”

Karol Sazanov, Noise & Vibration Expert



The SV 971A Sound Level Meter continuously measured noise levels on the International Space Station during the Wireless Acoustics experiment.

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Data transfer via Bluetooth to the **EveryWear** system was successful, confirming compatibility with ESA's medical data architecture. Calibration tests performed before and after the mission showed that all deviations remained within standard tolerances defined by EN 61672-3 and EN 61252. No evidence of systematic drift or degradation was found.

Recorded sound pressure levels and time-weighted averages provided consistent, high-quality datasets suitable for operational analysis, future reference, and compliance with ISS acoustic safety criteria.



Conclusion

The Wireless Acoustics mission confirmed that commercial SVANTEK instruments - the **SV 971A** Class 1 Sound Level Meter and **SV 104A** Personal Noise Dosimeter - are fully suitable for use in the space environment.

The instruments maintained measurement stability, low self-noise, and accurate frequency response under ISS conditions. Their Bluetooth connectivity and seamless integration with ESA's EveryWear software significantly simplified on-board procedures, reducing astronaut time requirements.

The study validates the SVANTEK system as a viable successor to the legacy ISS acoustic monitoring solution, paving the way for its implementation in the ESA Gateway program. The results underline the robustness of SVANTEK's design and its readiness for the next era of human space exploration.



Axiom Mission 4 patch



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Noise Monitoring Case Study

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