PROCEEDINGS OF SCIENCE

ATLAS On the Air!
Measuring the Success of the ATLAS Virtual Visit Programme

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Since 2010, the ATLAS experiment at CERN's Large Hadron Collider has revolutionised High Energy Physics outreach through its Virtual Visits, connecting collaboration members with audiences worldwide. The Virtual Visit model brings inspiring scientific outreach events to visitors who would otherwise not have such an opportunity. Over the years, by offering visits in many languages and utilising multiple online platforms, we have expanded our reach, engaging a broad and diverse audience, including parliaments, businesses, festivals, retirement homes, educational institutions, and even prisons. The visits, streamed from the detector cavern or the control room, stimulate audience engagement and offer excellent communication training to members of the collaboration. We present newly compiled statistics describing the growth, geographical, and demographic reach of the programme.

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1. Motivation

Public engagement is a key priority for the scientific community. The Virtual Visit programme of the ATLAS experiment [1] at the Large Hadron Collider (LHC) at CERN uses video conferencing systems to reach global audiences who cannot visit in person. It provides the public with opportunities to explore the frontier of particle physics research and allows physicists to deepen their connection with society. Virtual resources and experiences bring the excitement of discovery directly into classrooms and other places worldwide, making particle physics accessible to people of all ages and backgrounds [2–6].

2. Introduction

Launched in 2010, the ATLAS experiment's Virtual Visit programme has been running successfully for 15 years. Designed to be interactive and engaging [4], these visits are conducted via video conferencing platforms such as Zoom for group sessions and through social media channels including YouTube and TikTok Live for open events, with advertisements beforehand on Facebook and Instagram [8–10, 13]. Each visit typically lasts about an hour and begins with an introduction from the hosts, who present their roles within the ATLAS Collaboration, followed by an overview of the experiment, its subdetectors, and its physics programme [2]. Requests are handled through a dedicated booking system that matches hosts with groups based on language and audience background [14]. In addition to private, ATLAS regularly organises open Virtual Visits, which are public, scheduled events held several times a year, often during the LHC's technical shutdowns. A few joint virtual sessions with other LHC experiments have also taken place.

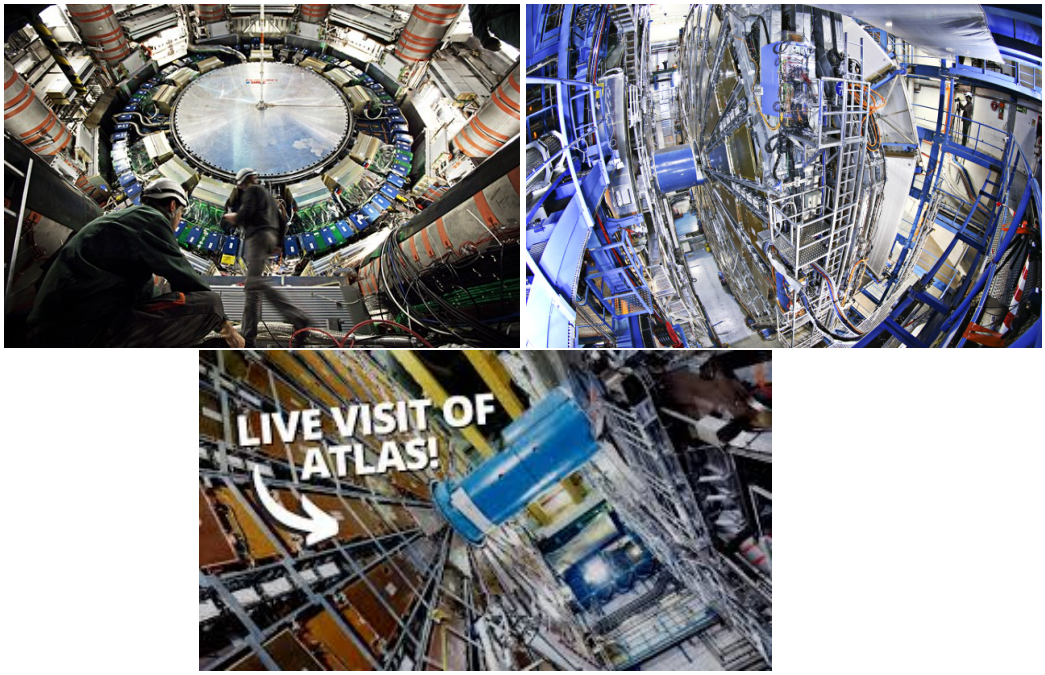

Figure 1: ATLAS experimental cavern sights, taken from open Virtual Visits on YouTube and official images [7, 11].

3. ATLAS Cavern

The primary location for these Virtual Visits is the ATLAS detector cavern, one of the most iconic and technically complex areas at CERN, as presented in Figure 1. Virtual cavern tours are typically offered during the LHC's year-end technical shutdown, when maintenance activities allow for safe access, or occasionally during operational periods when special permissions are granted. These tours give participants an exceptional opportunity to explore the underground infrastructure that houses the ATLAS detector, offering a unique perspective on the technology and engineering that drive particle physics research at CERN. Through these virtual experiences, visitors can observe authorised and restricted areas, thereby deepening public engagement and appreciation of the experiment's scientific and technical achievements.

The required equipment for Virtual Visits consists of a smartphone and noise-cancelling earphones. A tripod and extra microphones are included to enhance video quality. The ATLAS guide typically begins the virtual tour at the surface and descends into the cavern on camera, while explaining the process. They then lead the audience on a tour of the detector.

4. ATLAS Visitor Centre

The ATLAS Visitor Centre (AVC), shown in Figure 2, serves as a versatile and accessible space for both in-person and virtual outreach activities, offering a flexible schedule that extends beyond standard working hours.

Figure 2: ATLAS Visitor Centre [12], with the Virtual Visit area highlighted in red. The wall, partially covered with an ATLAS detector image, acts as a movable panel which can be closed to create a dedicated space for Virtual Visits.

Situated adjacent to the ATLAS Control Room (ACR), the AVC provides visitors with a unique vantage point into the daily operations of the experiment. One of its features is a set of switchable opaque windows that can be made transparent with the touch of a button, allowing guests to observe the control room. Inside the centre, a variety of interactive screens, physical models, and multimedia exhibits provide detailed explanations of the ATLAS subdetectors and the experiment's physics goals.

To further enhance the Virtual Visit experience, an audiovisual system is in place that includes two high-definition cameras, positioned in both the AVC and the ACR, which can be remotely operated via a tablet to adjust angles, zoom, and focus as needed. This configuration integrates seamlessly with videoconferencing platforms such as Zoom, enabling hosts to interact dynamically with audiences while displaying live or pre-recorded visuals. This setup enhances the immersive and interactive aspects of ATLAS Virtual Visits, bridging the gap between on-site experiences and remote engagement.

5. Statistics

In the past 15 years, the ATLAS Virtual Visit programme has engaged thousands of participants from all continents, in multiple languages. Each session typically hosts between 10 and 600 participants, with open visits for individuals offered regularly [2].

We focus on the last six years, during which nearly 700 visits were hosted, with 2021 and 2024 the most active, each with more than 100 visits, as shown in Figure 3. Early indications for 2025 suggest similarly high engagement, reflecting the programme's sustained growth and global reach.

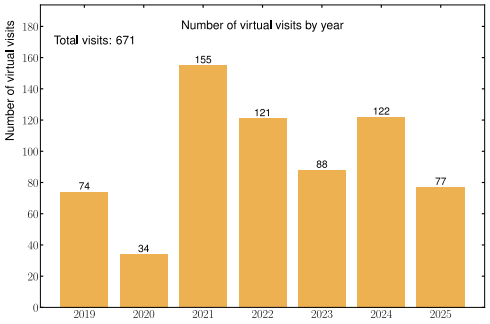

Figure 3: Annual number of Virtual Visits between 2019 and July 2025.

5.1 Visits by country

In 2024, Virtual Visits were offered to groups from 32 countries. Greece, Brazil, and the UK had the highest participation, reflecting the continued international interest in ATLAS outreach, as shown in Figure 4, which covers the six populated continents and is illustrated in 5.

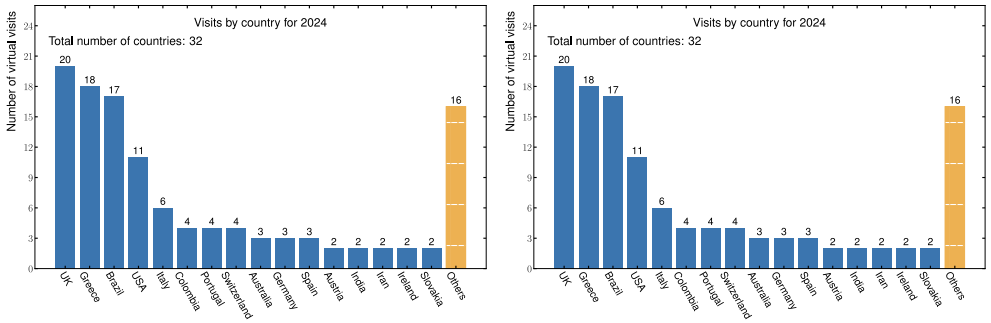

Figure 4: Visits by country in 2024 and in 2025 up to July.

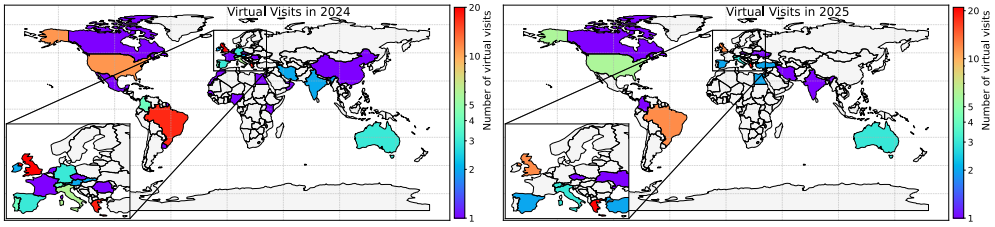

Figure 5: Global participation in ATLAS Virtual Visits in 2024 (left) and in 2025 (right).

5.2 Visits by language

English is the most commonly requested language for Virtual Visits, followed by Greek and Portuguese. In recent years, guides have provided visits in 10 different languages, making the programme accessible to a global audience, as illustrated in Figure 6.

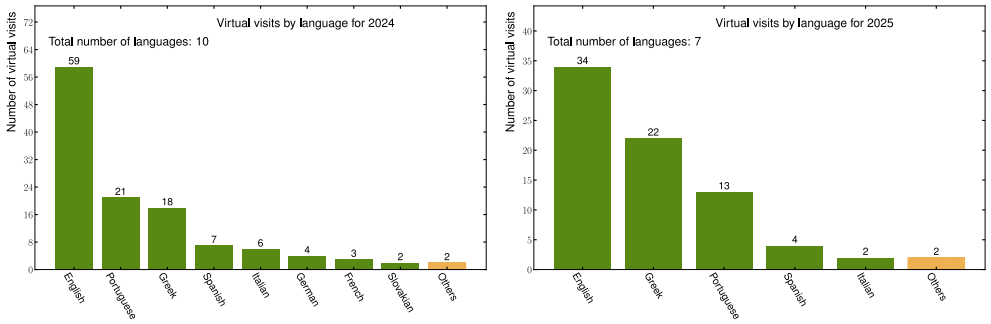

Figure 6: Distribution of Virtual Visits by language in 2024 and in 2025 up to July.

6. The Greek Wave of Interest

The ATLAS Virtual Visit Programme saw a surge in interest from Greek schools during the LHC shutdown of 2023 to 2024. Requested by teachers, the programme engaged 430 schools and 13,000 participants, with strong feedback expressing interest in making it an annual event.

Building on this success, the initiative has continued annually, reaching diverse audiences, including kindergartens, primary schools, special education institutions, retired educators, and Schools of Second Chance in Detention Centres. In the most recent year, it reached 640 schools and 25,000 participants, with the programme adapted to accommodate varied audiences and provide equal opportunities for all.

7. Conclusion

The ATLAS Collaboration continues to actively engage the public through a structured programme of Virtual Visits, offered both as private group sessions and open-access events. Leveraging modern video conferencing and social media platforms, the programme reaches a truly global audience, accommodating participants from diverse countries and in multiple languages. Its flexible setup allows students, educators, and the general public, including those in remote or underserved areas, to explore the ATLAS experiment, learn about particle physics, and experience the excitement of scientific discovery first-hand. The programme's success is reflected in its sustained growth, high

participation rates, and initiatives such as the Greek wave, which demonstrate its adaptability to diverse audiences. Overall, the Virtual Visit programme significantly enhances public access to ATLAS, fostering a broader understanding of its research and reinforcing its worldwide scientific impact.

Looking ahead, the programme aims to expand further by incorporating new digital media formats, increasing multilingual accessibility, and strengthening collaborations with other experiments, ensuring that ATLAS outreach continues to inspire and educate audiences worldwide.

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