

Engaging the World - The ATLAS Detector Visit and Virtual Visit Programmes

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High Energy Physics has a special appeal for students, educators, and science enthusiasts, making public engagement a key focus for the scientific community. The ATLAS collaboration at CERN has been proactive in providing opportunities for the public to explore cutting-edge particle physics research. With over 5500 members worldwide, the collaboration is committed to bridging the gap between science and society, recognising the importance of this connection. The ATLAS collaboration offers many outreach programmes, including two that are described here, the in-person ATLAS Visits and the remotely accessible Virtual Visits [1]. These initiatives allow visitors to interact with researchers. ATLAS Visits offer firsthand experiences, guiding guests through the experiment and its control room, while Virtual Visits leverage video conferencing technology to reach global audiences who cannot visit in person.

In these proceedings, we outline how both programmes work to broaden public access to the ATLAS experiment [2] at the LHC and showcase their scope and impact.

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1. ATLAS In-Person Visits

Located at LHC Point 1, near the CERN Science Gateway (SG), the ATLAS experiment [2] is one of the most visited sites at CERN. Visits to the ATLAS experiment are primarily organised by the CERN Visits Service or directly by ATLAS personnel. These group visits are typically booked several months in advance. Visits can also be tailored to groups of individuals with a keen interest in science and CERN activities. These visits can range from short sessions to an hour and may focus on ATLAS or be combined with tours of other CERN sites and activities.

ATLAS Visits typically start at the SG, where visitors, guided by their host, walk through the park near the Globe and ATLAS sites. They observe the ATLAS building with its mural and receive a brief introduction before proceeding to the ATLAS Visitor Centre (AVC), adjacent to the ATLAS Control Room (ACR). The two spaces are divided by "switchable glass" that alternates between transparent and opaque, allowing guides to discuss control room shifts, a topic of particular interest to visitors. Inside the AVC, exhibits showcase key detector components, including a LEGO model of the ATLAS detector. Large TV screens can play a short video about the experiment and present slides. For longer, hour-long visits, guides may take visitors to the first floor of the AVC building to watch a 10-minute 3D film that details the construction and goals of the ATLAS detector.

During the annual LHC technical shutdown, e.g. winter shutdown, visits to the ATLAS Cavern are possible. These visits are organised by CERN personnel in coordination with the ATLAS Secretariat. They begin at the SG or directly from the AVC. After a brief introduction, the hosts guide their visitors underground, explaining access protocols before descending via the lift. Hosts can discuss the machinery and its functions upon reaching the service room. From there, they proceed through the tunnel to the ATLAS detector. The sight of the detector often leaves visitors in awe as they are introduced to the visible components, giving them time to take photos.

The ATLAS experiment is one of the most popular sites at CERN, largely due to its location near the main CERN campus, the Visit Service, and the Science Gateway. Its excellent accessibility, being less than 100 m from a nearby tram stop, makes it convenient for visitors to reach. In 2023, the AVC hosted around 2900 visits, with the total number of people engaged exceeding 60000. Additionally, there were approximately 500 underground visits, with over 5200 visitors. Overall, the total number of registered visitors amounted to 65000, making the ATLAS experiment the most visited site at CERN.

2. ATLAS Virtual Visits

ATLAS Virtual Visits [3] have been offered since 2010, allowing groups and individuals worldwide to access the ATLAS experiment remotely. The programme uses video conferencing systems, primarily through the ZOOM application [4], but also leverages social media platforms like YouTube [5] and TikTok [6] to reach broader audiences. The programme brings particle physics into classrooms and public spaces, enabling participants to engage with scientists and learn about the ATLAS detector and the research conducted by the collaboration. Thousands of participants from six populated continents and in multiple languages have participated in the programme. ATLAS Virtual Visits, which last an hour, are designed to be interactive. They consist of two parts: an introduction from the hosts, who share their background and involvement in ATLAS, and an

explanation of the ATLAS detectors and subdetectors. This is followed by a longer, more engaging discussion with the audience on various aspects of the experiment, fostering a dynamic learning environment. Although most virtual visits focus on ATLAS, they can also be joint visits with other experiments, enhancing the experience and broadening the scope of discussion.

The programme is accessible through a simple online booking system [7], allowing schools, universities, and other interested groups to request visits based on their needs. Hosts are matched with groups based on language and audience background to ensure a pleasant experience. Additionally, Open Virtual Visits are organised a few times each year, particularly during the LHC technical shutdowns, offering individuals the opportunity to participate without the need for group bookings.

The ATLAS Cavern is the primary location for Virtual Visits, offering a unique opportunity for hosts to showcase the ATLAS detector. Hosts can begin the tour from the surface, providing an introduction and demonstrating how to access the cavern. They can then lead a virtual tour around the detector, showing it and highlighting the magnets and subdetectors. They use smartphones and tripods, and can use laptops to share additional media content with the audience for a more enriching experience. When the cavern is not accessible, particularly during LHC runs, Virtual Visits are conducted from the AVC, which is equipped with pre-installed HD cameras offering high-quality views of the hosts and the ACR. The AVC provides several advantages and was introduced in the previous section. Furthermore, the AVC is available at all times, not limited to the usual working hours of 7 AM to 7:30 PM, providing greater flexibility in scheduling Virtual Visits.

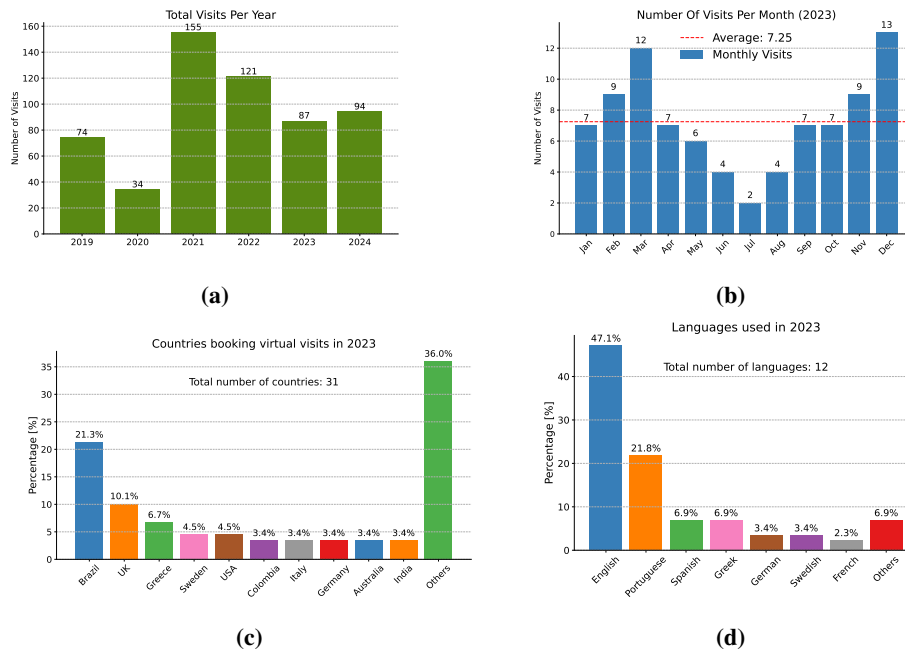


Figure 1: (a) The number of visits conducted annually in the past six years, with 2024 data reflecting visits booked up to September. (b) Monthly distribution of visits in 2023. (c) Countries of origin for bookings in 2023. (d) Languages used during visits in 2023.

ATLAS Virtual Visits have gained significant popularity, with approximately 100 visits conducted annually, as illustrated in Figure 1a. The data reveals a decline in 2020, attributed to the

COVID-19 pandemic, followed by a notable surge in 2021, likely driven by a global shift to remote engagement during the pandemic. The distribution of Virtual Visit dates spans the entire year, as presented in Figure 1b, with noticeable trends. A peak in visits occurs in March, coinciding with the International Masterclass programme organised by IPPOG [8] and just before the ATLAS Cavern becomes inaccessible. A noticeable decline in visits during the summer reflects the seasonal break. A sharp rise is observed in December as the annual LHC shutdown begins, allowing greater access to the cavern. In 2023 alone, 87 visits were made in 12 languages, including English, Portuguese, Spanish, Greek, and German, with 47% of those visits delivered in English, and were from 31 countries, as shown in Figure 1c and Figure 1d. Brazil emerged as the leading country in visit bookings, attributed to an ATLAS member, who was crucial in promoting the programme. In 2023, 33 guides participated in these visits, with an average (median) of 3.4 (2) visits per guide, ensuring a broad range of expertise and engagement throughout the programme.

References

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- [4] *ZOOM IP-based video conferencing software*: <https://www.zoom.us/>
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- [6] *TikTok*: <https://www.tiktok.com/>
- [7] *Virtual Visits booking form*: <https://atlas.cern/discover/visit/virtual-visit/request>
- [8] *International Particle Physics Outreach Group*: <https://ippog.org/>