PROCEEDINGS OF SCIENCE

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

Silke Möbius, on behalf of the ATLAS Collaboration.*

University of Bern,
Laboratory for High Energy Physics (LHEP),
Albert Einstein Center for Fundamental Physics,
Sidlerstrasse 5, 3012 Bern, Switzerland

E-mail: silke.mobius@cern.ch

The ATLAS Collaboration offers a wide range of popular outreach programmes, enabling the public to explore the ATLAS detector at CERN in-person or through virtual visits. These initiatives make full use of the annual technical stops and long shutdowns of the Large Hadron Collider to provide guided tours to local audiences. At the same time, remote visitors can participate via video conferencing. Throughout the year, the ATLAS Visitor Centre remains the most visited experimental site at CERN, where guides introduce thousands of local visitors to high-energy physics research. The virtual visit system extends this engagement to a global audience, providing an interactive view of the ATLAS Control Room and the experiment. These programmes are popular not only for classrooms and groups around the world, reaching tens of thousands of visitors, but also for the guides, who have a chance to hone their skills at describing the detector, our research, and the value of international collaboration. We present these programmes, recent developments, and current efforts to make them available to a broader and more diverse audience around the world.

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*Speaker

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1. Introduction

"You work at CERN???" - That's so cool!!! – many of us have experienced this reaction when sharing our workplace. However, explaining what we do at CERN is often challenging. To bridge this gap, the ATLAS collaboration offers various outreach activities that make the ATLAS detector[1] and the work of its scientists more accessible to the public. These activities aim to spark curiosity and provide insights into the cutting-edge research at CERN, particularly for those who may not have a scientific background.

2. ATLAS Underground Visits

One of the most impactful ways to showcase the work of physicists, engineers, and computer scientists at CERN is through the ATLAS underground experiment visits. Located about 100 meters below ground, visitors are given a firsthand look at the ATLAS detector, one of the largest and most complex scientific instruments ever built.

The ATLAS mural, prominently displayed on the walls of the ATLAS building, is visible to everybody who uses the tram, is on their way to France, or is entering Switzerland. This sparks interest in CERN's work, and hence, ATLAS cavern visits are offered as soon as the LHC is turned off during winter shutdowns and during long shutdowns that can last 2 to 3 years, during which major upgrades to detectors and accelerators are performed. The next such long shutdown will start in the summer of 2026 and span three years, giving CERN a chance to host cavern tours while the detector undergoes critical upgrades.

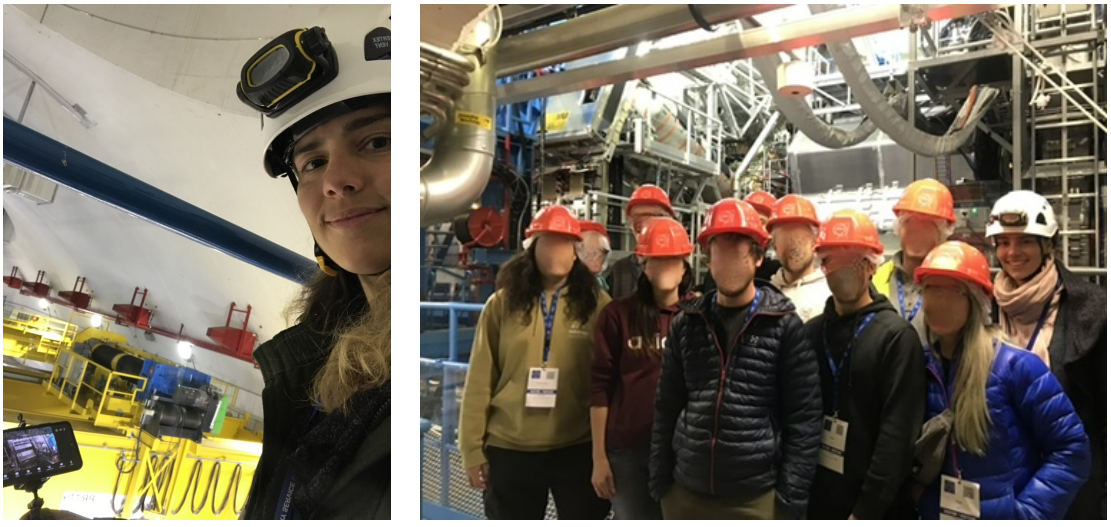

Figure 1: Left: A vantage point above the detector where a virtual-visit guide offers a view of the detector. Right: A view of ATLAS from the visitor platform.

In-person tours ignite enthusiasm and excitement for science as visitors descend into the cavern and gain an appreciation of the scale and complexity of the ATLAS experiment and High Energy Physics as a whole. A guide can bring up to 12 visitors underground and explain the significance and intricacies of the experiment while showcasing the ATLAS detector from a dedicated space in

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the ATLAS cavern, the visitor platform, as seen on the right in Figure 1. In 2023, there were 484 in-person visits to the underground cavern, engaging over 5200 visitors.

Recognising the logistical challenges of bringing large numbers of visitors underground, the ATLAS collaboration launched virtual visits in 2010. These visits allow a larger global audience to engage with the ATLAS experiment without travelling. A specially trained virtual guide uses videoconferencing technology to lead the tour. Unlike physical visitors, the virtual guide is not confined to a platform; the detector can be presented from various angles. A view from the top is shown on the left in Figure 1. This allows for a more comprehensive presentation of the detector, including areas not accessible in-person.

Virtual visits have become an effective way to bring the excitement of scientific exploration and discovery to the public. These visits are easily accessible through open visits where individuals can sign up without being part of a group. A smartphone connection via Zoom, YouTube, Instagram, or other streaming platforms is used to connect with participants. In these interactive sessions that present the detector and particle physics, audiences, ranging from schools to science festivals and VIPs, are encouraged to engage with the guide and ask questions. The popularity of virtual visits has grown steadily over the years. In 2023, 40 virtual visits were conducted directly from the ATLAS cavern, with some sessions hosting up to 1,000 participants. Figure 2 shows the distribution of languages and countries booking virtual visits in 2023. 12 different languages were offered for 31 countries booking visits.

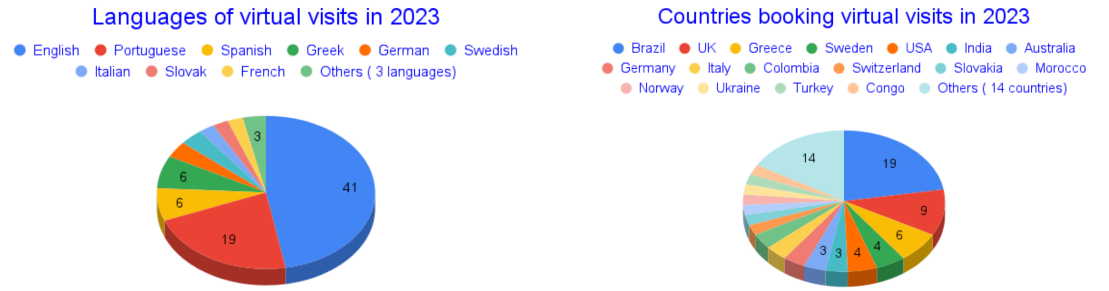

Figure 2: ATLAS virtual visits are given in many languages and countries. The pie charts show the distributions for the year 2023.

3. ATLAS Visitor Centre Visits

During LHC run periods, when the underground cavern is inaccessible, visitors are welcomed to the ATLAS Visitor Centre (AVC), located next to the ATLAS Control Room (ACR). The AVC offers an immersive experience through displays of actual detector components, informative films about the building of ATLAS, and a glimpse into the daily operations of the ATLAS shifters who monitor the experiment. In addition, a film presents the Higgs boson discovery, which is the most important achievement in ATLAS history.

Virtual visits can be simultaneous with in-person visits in the virtual visits area, which can be closed off from the rest by rotating out a panel on the wall with the ATLAS image on it, as shown in Figure 3. In 2023, there were 47 virtual and 2887 in-person visits from the AVC, with over 60000 visitors in-person at the AVC, as shown in Table 1.

Figure 3: The ATLAS Visitor Centre with the virtual visit (VV) area pointed out. The ATLAS image on the wall is a panel that can be rotated to create a separate space for the virtual visit behind it.

Table 1: The numbers of visits and visitors for virtual and in-person visits of the year 2023 are given.

	virtual visit		in-person visit	
	ATLAS cavern	ATLAS AVC	ATLAS cavern	ATLAS AVC
Number of visits	40	47	484	2887
Number of visitors	10-1000 per visit		> 5200	> 60000

4. How to...

4.1 ... become a guide?

ATLAS guides are volunteers from CERN who can get qualified through regular training. The virtual visits, in-person visits, and underground and AVC visits require different training. The virtual-visits underground guides have shorter training but access to the whole ATLAS cavern. In-person underground guides need longer training, safety courses, and emergency evaluation training. The underground briefing is used to familiarise with the path, the visitor platform and special points of interest.

On a dedicated web page, guides can check the *agenda* for training and in the *guides tools* also book visits themselves and check which guides there exist for a desired language, as shown in Figure 4. The guide program is critical for ensuring high-quality tours and maintaining the safety of both visitors and staff.

4.2 ... book a (virtual) visit?

Booking a virtual visit is straightforward. Virtual visits to the ATLAS cavern and/or the visitor centre can be booked with an online form at the visitor website[2], where information about the group and the context of the visit needs to be given, as it is useful for guides and statistics. The flexible system accommodates groups as small as 10 people or as large as 1,000. There is also the possibility to request a specific guide. Additionally, with prior authorisation, virtual visits can be recorded and shared publicly, expanding the programme's reach. The in-person visit to the AVC can be booked online at the Science Gateway, the large visitor centre at CERN.

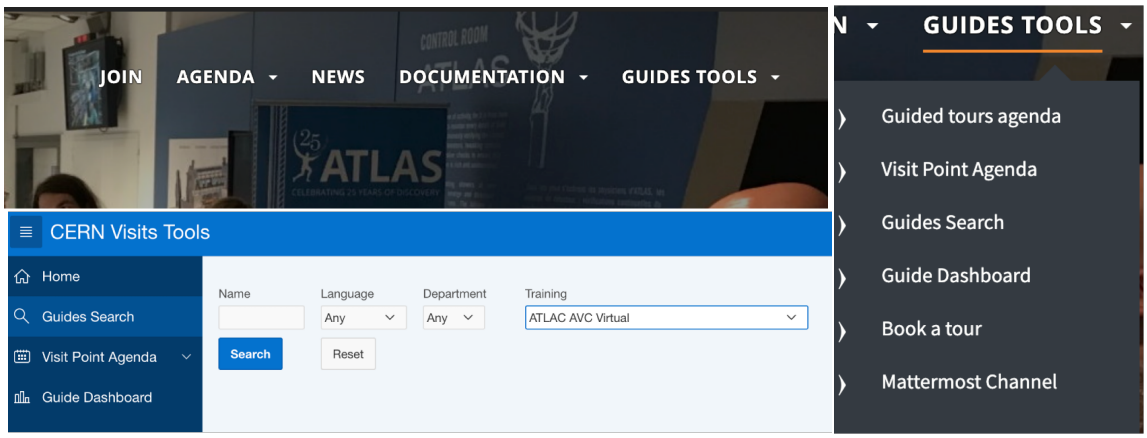

Figure 4: CERN personnel have access to the guides webpage where they can request visits themselves, sign up for training and find a suitable guide for a planned visit:

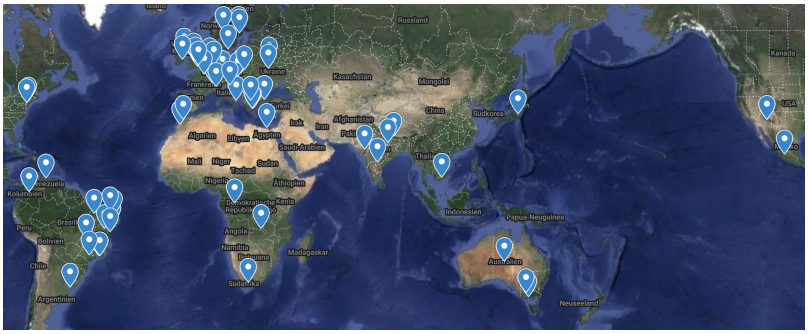

Figure 5: This map shows the origin of the people requesting virtual visits in 2023.

5. Conclusions, Outlook and Feedback

The ATLAS cavern visits, both virtual and in-person visits, receive excellent feedback. They are scheduled whenever the cavern is accessible, and new guides are trained regularly. The ATLAS visitor centre in-person visit is the most popular visit at CERN. Virtual visits from the AVC are still exciting and can be combined with a tour outside of the AVC. An advantage of virtual visits is that they allow us to connect with large numbers of people simultaneously to the detector and what we do at CERN. People worldwide can be reached thanks to our multilingual guides, as shown in Figure 5. We are constantly expanding our network to bring attention to our visit programmes. Also, there are continuing efforts to improve the programme for a better experience for guides and visitors.

References

[1] ATLAS Collaboration, *The ATLAS Experiment at the CERN Large Hadron Collider*, *JINST* **3** (2008) S08003

[2] ATLAS Virtual Visit contact form, https://visit.cern/form/contact