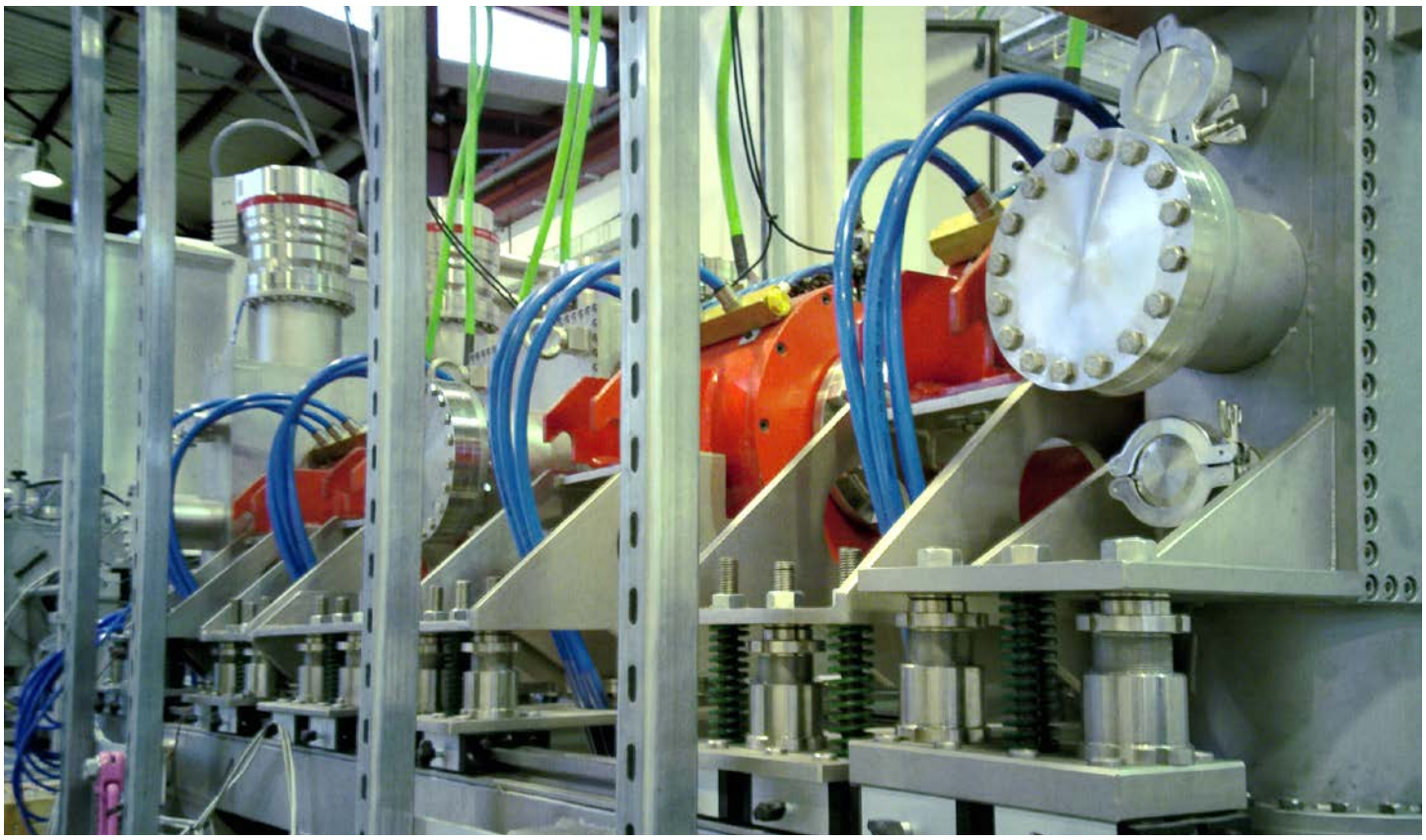
User Story
ESS-Bilbao



View of the ESS Bilbao particle accelerator

FARO Laser Tracker integrated into the ESS Bilbao particle accelerator

RESEARCH/ALIGNMENT *ESS Bilbao is a technical scientific facility facing the challenge of constructing the first high-intensity linear accelerator in Spain. This is currently the most important scientific project in the Basque Country, as well as being a prominent European model for particle accelerator technology. The FARO Laser Tracker ION is integrated into the entire accelerator system, has become a fundamental instrument in this ambitious project. It is currently the indispensable solution for providing measurements in the field of metrology and for the alignment of the accelerator with maximum precision in 3D.*

The FARO Laser Tracker ION is a portable measurement system that uses a laser beam to measure the coordinates of large components, equipment and machines in 3D using a spherical reflector. The ION has a measurement volume of 110m and uses aADM (Agile Absolute Distance Measurement) – the fastest system for calculating a position in 3D in real time.

In ESS Bilbao, this FARO product is integrated into the entire accelerator system to measure the components and mechanical parts of the accelerator and to align all of its sections. The FARO Laser Tracker ION not only enables rapid measurements, but can also scan surfaces. Maintaining precision at long distances from the target being measured is considered indispensable and is only possible with a device that has these characteristics.

Carlos Martínez de Marigorta explains: “The particle accelerator has different applications, for example in radiobiology (study of the effect of radiation on biological samples), materials (structural materials in fusion plants), electronic components (aerospace), etc. With regard >>

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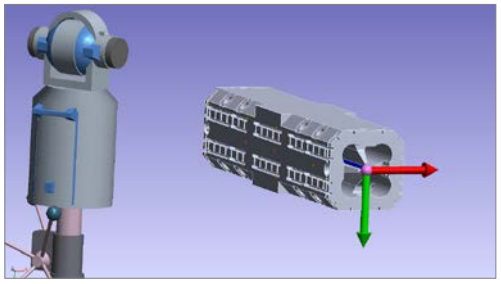

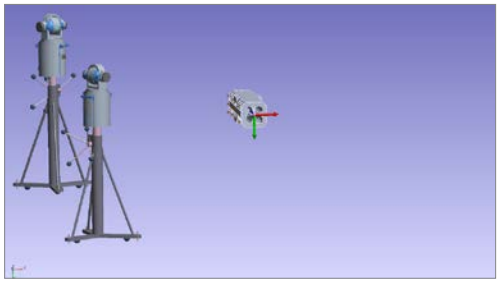

Figure 2. Images from the software

>> to applications in the area of generated neutrons, the ones that stand out are laboratories that work with neutron 'scattering' (which would be used by the scientific and industrial community) and neutron time of flight." He also maintains that the FARO Laser Tracker is an essential system in any accelerator in order to be able to align its components.

As can be seen in Figure 1, the FARO Laser Tracker ION and its powerful software are currently being used for the alignment of the different vanes (segments from which this particular component is formed) of the Radio-Frequency Quadrupole (RFQ) "cold model" or prototype. This component accelerates and focuses the "bunch" or group of protons due to the potential difference created between its vanes.

In this current application, the FARO Laser Tracker ION is used to take measurements at various points of the different vanes in the RFQ to check the difference in position between them (all of the vanes need to be aligned), as the difference between the vanes should not be more than a few microns.

One way of checking that this has been achieved is to move the Laser Tracker to another position and again take the measurements at the same points of each vane at which they were taken previously. The results should be the same. (Figure 2).

The steel component that can be seen in Figure 1 is the RFQ cold model, composed of four segments (upper, right, left, lower) called vanes. The Laser Tracker is used when trying to align them in such a way that none of the vanes is projecting compared to the others in any of their planes.

A Laser Tracker device takes a measurement by emitting a laser beam that is reflected in a reflector (SMR of 0.5' in this case), which means that the position is measured with great precision.

The image in Figure 2 is taken from the software used to carry out the relevant calculations, which graphically highlights the work done on the RFQ (in this case) and the position of the Laser Tracker in a real situation.

This advanced software displays icons that really look like the devices (Laser Tracker, measurement arms, etc.) to make it simpler to understand each device. The 3D representation of the parts can be imported in any type of design format.

Figure 1. Position of the reflector

ESS-BILBAO

ESS Bilbao is an independent multidisciplinary research centre which is well respected in Europe and which specialises in technologies for high-power accelerators. This technical scientific facility develops, builds and tests complex technical systems required for proton accelerators and/or for their applications.

The laboratory will be used for designing, developing and prototyping components and instruments in all of the scientific infrastructures in which it is involved. With 60 people on the workforce, ESS Bilbao is currently the most important scientific project in the Basque Country.

Backed by both public administration bodies, the Basque government and the central government, the project has an allocated budget of 180 million euros. ESS Bilbao is increasing the scientific/technological capacity of companies in the area, elevating them to a position of competitive advantage that they have never previously reached.

@ WWW.ESSBILBAO.ORG

– 4 GOOD REASONS –

Carlos Martínez de Marigorta, Accelerating Structures Group at ESS Bilbao

1 Technology: it locks onto the targets even if they are moving; there is no need to change between ADM and IFM (interferometer) systems.

2 Precision and range: cumulative errors are a risk when carrying out long-distance measurements. The FARO system allows these measurements to be made with complete confidence.

3 Smart warm-up: reduces the stabilisation time to minimise the impact of the initial changes in temperature on the measurements.

4 Instantaneous activation laser: the laser tube does not need to warm up.

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SUMMARY

FARO's entry was the winner in a public competition with other manufacturers. The FARO Laser Tracker ION fulfilled all advance expectations as regards maximum precision in 3D, rapid and easy measurement, scanning capability, cost-effectiveness, good quality/price relationship, compact size, light weight and other innumerable advantages.