

# Science Community Focus

## Mayre Alvarez Sabater – Electrical Design Engineer talks about her career and her work at the UK's national synchrotron, Diamond Light Source

Mayre Alvarez Sabater

I've always been fascinated by engineering. It requires problem solving skills and provides a wide range of opportunities and ultimately led to my career working with the ever changing and challenging problems of engineering in science at facilities like Diamond.



Mayre in the Experimental Hall

The first step in my career was to opt for Automation and Control Engineering at the Technological University of Havana and after completing my degree I started working as an automation engineer. This was in my hometown in a thermo power station where I stayed for three years. I was principally working on controls there and didn't do much design. However, my next move took me back to Havana where I joined a naval company and became involved in the design, installation and commissioning of automatic fire detection and alarm systems for the industry. I was there for around two years and at the same time I was an Associate Researcher for the University of Havana working in the physics department. The sort of things I was involved in ranged from undertaking research, helping with university projects as well as post graduates. It was here that I got my first introduction to optical instruments.



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Fortunately, I had some friends working in synchrotron radiation facilities in Europe. Their work intrigued me and it inspired me to expand my knowledge of synchrotron radiation and its applications, and ultimately to apply to Diamond.

I joined as electrical designer and my first job was working in the machine for the accelerator. This meant I was involved from the very beginning in the Double-Double Bend Achromat (DDBA) project and I was part of the team that did the original designs for it. Later, I also worked on the design and installation of the normal conducting cavities as well as the digital low-level RF (radio frequency) for the cavities.

### Double-Double Bend Achromat (DDBA) Project

The DDBA project, saw the complete DBA (double bend achromat) cell of the storage ring replaced with a new DDBA structure. This converted a standard bending magnet beamline into a much more powerful insertion device beamline, with a full length in-vacuum insertion device as its source.

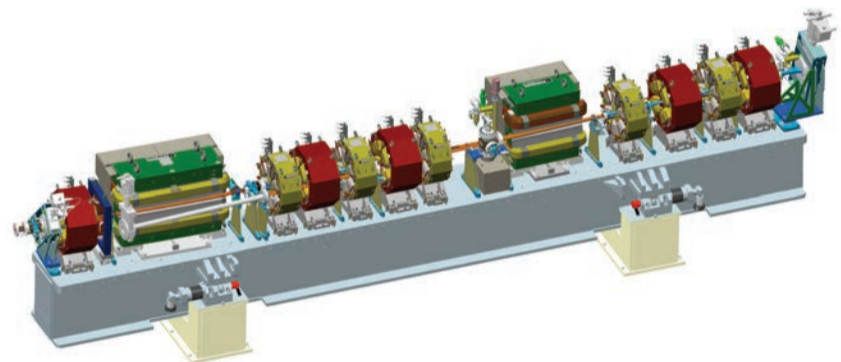


Figure 1: Model of one of the two girder assemblies that make up the new DDBA cell.

In order to accommodate the increased number and higher strength magnets into the ring, all of them had to be significantly reduced in size compared to the existing ring magnets, as shown in Figure 2.

My next position was outside the machine working for the beamlines at Diamond as an electrical design engineer. Working as part of a multi-disciplinary project team, I produce electrical detailed design drawings for electrical systems such as motion control, vacuum control, among others, with the purpose of either improving or expanding the beamline capabilities. A detailed design is the key phase in which a project's costs are defined and set. It also offers the guidelines for the installation by technicians.

Working in Industry, I have been generally involved in the development and maintenance of electrical control systems and components according to required specifications. Assisted by computer-aided design (CAD), in Electrical Design, we go from the concept and detail of the design, through to implementation, testing and handover of the system. One of the positive aspects about this career is that you feel great satisfaction when after working on a project, it is successful.

In fact, one of the good things about working in Diamond is that it always has something new to offer, there is always something new to learn about, which keeps me motivated and provides me with exciting challenges. Plus, it is a really friendly and professional environment to work in where people really do work as a team across disciplines.

I was very lucky when I moved into my current role, because I got the opportunity of being part of the team involved in the design and construction of a new soft X-ray spectro- and tomography beamline branch for an existing beamline. We have been through almost all the phases of the project now. The design is finished, installation is in process, and achieving what we call 'first light' in the new branch beamline is the next stage.

It is no exaggeration to say that this is really exciting work because once a beamline becomes operational, we are usually doing improvements or upgrades. It's not every day we get to design a brand new one.

So, it has been amazing to work as part of the team building a new branch beamline. Good teamwork and communication are critical because it requires a huge amount of co-ordination

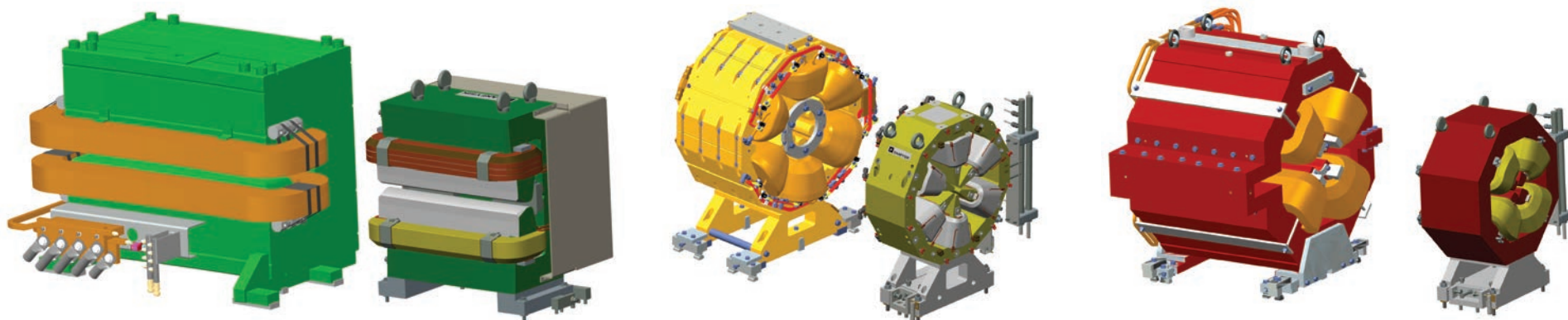


Figure 2: Comparison of the size of the existing ring magnets (left of each pair) with the new DDBA magnets (right of each pair); green - dipoles, red – quadrupoles, yellow – sextupoles.

between all the different people and suppliers involved. I have been involved in the design, commissioning of all the parts, communicating the concepts, designs and specifications for the electrical designs - in order to build the instrumentation racks. It is very challenging work and you encounter many different problems as you go along which you must find ways around. Diamond standardises the ways of working across all the beamline and it works in basic standards, both British and European, to ensure everything complies.

For example, our equipment needs to comply with the EMC (Electromagnetic Compatibility) directive. In our electromagnetic world, this means we need to make sure we don't radiate noise that could interfere with other equipment operation and on the other hand we need to make our equipment less susceptible to pick up noise and malfunction as a result.

The great thing about working here at Diamond is that one day to the next is always different. One day it's routine and the next you are thrown into a big exciting project. I really like when you have a problem and you need to get it solved. Diamond is multi-disciplinary so you can draw on lots of others to help you modify your solution and sometimes it's great to get everyone in a room to discuss the best approach to solve the problem. I love the fact that everyone can have input to ideas and problems. Coordinating and working with others really moves things forward

and means you are never left isolated with your idea or problem and the common goal is finding the solution.

So, going forward I'm looking forward to working on more exciting projects – nothing specific, as I must finish my current one, which is after all, the biggest challenge I've faced to date. I always want to stretch my boundaries as much as I can. When I feel comfortable, I want to push myself harder and try new things.

I believe electrical design engineering is a rewarding career choice – especially working in science and technology facilities. Depending on your stage and age, I would recommend that anyone considering coming into the profession consider getting enrolled in summer internships or work experience programmes as they will help you to get a clearer idea of what being an electrical design engineer means, and it gives you the opportunity of putting the theory into practice and shows you how and where team work is essential. Ultimately though, to be a design engineer you need to have an engineering background. So, it is essential to take a degree in engineering or do an apprenticeship and learn on the job. Both these routes will help you build the knowledge and base you need to work in a place like Diamond. However, you will never stop learning. Here we are learning all the time and not just new technologies or processes but standards and ways of working.

## A World-Changing Career at Diamond

Diamond Light Source is one of the most advanced scientific facilities in the world and is keen to attract scientists and engineers to be a part of the world-changing science that its users generate almost every day. Diamond houses the UK's synchrotron light source, a giant microscope that can produce beams of light 10 billion times brighter than the sun, to probe the structure and composition of matter.

From viruses and vaccines, to alternative energy solutions and nanotechnology, it underpins research and innovation for more than 8000 scientists, engineers, researchers, and more. A career at Diamond offers you the opportunity to help deliver impactful science that can change the world.

*Diamond endeavours to be a leading-edge facility for scientific research, supporting a wide range of users from both academia and industry, thereby delivering benefits to the UK society and economy. To achieve this, it is essential we attract people in STEM roles from the largest possible pool of talent and provide an environment that supports and stimulates staff and students to achieve their full potential.* **Professor Andrew Harrison, CEO of Diamond Light Source**

<https://www.diamond.ac.uk/Careers/>

**School Work Experience** – Diamond runs a work experience programme for school/college students offering a week of experience in the summer. For details of the next program and how to apply please click on weblink. <https://www.diamond.ac.uk/Careers/Students.html>

**Year in Industry Placement** – Usually offered to high calibre students studying a University degree or its equivalent from the UK or elsewhere and is offered for up to 12 months for 'Year in Industry' / 'sandwich year' type placements. With this type of placement, the trainee is paid directly by Diamond.

**Summer Placements** – Usually offered to high calibre students studying a University degree or its equivalent from the UK or elsewhere and is offered for 3 months for summer placements. With this type of placement, the trainee is paid directly by Diamond.



Andrew Harrison in Experimental Hall

**PhD Studentships** - Diamond partners with a wide range of Universities to offer PhD placements which include time at Diamond.

**Apprenticeships at Diamond** - an apprenticeship at Diamond allows students to earn while they learn, and to work at a cutting-edge science facility that challenges the boundaries of Engineering. Apprentices work alongside leading scientists and engineers from all over the world, delivering world-changing research.

<https://www.diamond.ac.uk/Careers/Apprenticeships/Advanced-engineering-apprenticeships.html>