



## Access to the Central Laser Facility - Artemis

*Beamtime application for the period January - June 2020*

Applications are now invited for partial access to the Artemis laser facility at the Central Laser Facility (CLF), Science and Technology Facilities Council (STFC) Rutherford Appleton Laboratory, during the period January - June 2020. A total of ten weeks' access is available on the 1-kHz laser source only, and an additional 2-3 weeks may be scheduled in reserve.

Access in this call is funded by STFC, so proposals must have at least one co-investigator who is a permanent member of staff at a UK academic institution. Applications will be reviewed and prioritised by the Artemis Facility Access Panel. **The deadline for applications is Monday 16<sup>th</sup> September 2019.**

Please read the information and instructions in the following document before applying.

Dr Emma Springate  
Artemis Group Leader  
emma.springate@stfc.ac.uk

---

### Facilities available

This period will comprise the first user beamtime in Artemis's new laboratory. Our 100-kHz laser system will **not** be available until 2020; however, we are able in the meantime to offer beamtime for gas phase spectroscopy, imaging experiments, and material science on our 1-kHz Red Dragon laser system. As part of our facility upgrades, the laser has been fully refurbished and upgraded with an additional power amplifier.

This call period will offer ultrashort laser and extreme ultraviolet (XUV) pulses, with end-stations for any of the following:

- time-resolved spectroscopy in gases, using an electron time-of-flight spectrometer or velocity-map imaging detector;
- coherent XUV imaging;
- angle-resolved photoemission spectroscopy (ARPES) using a SPECS Phoibos 100 hemispherical analyser.

The laser and XUV pulses are generated from a Ti:sapphire laser system producing twin 8-mJ, 30-fs, 780-nm pulses at a 1-kHz repetition rate. 8 mJ can be used to pump an OPA system providing tuneable pulses in the spectral range of 235 nm – 15  $\mu$ m, with an output of up to 1 mJ per pulse at 1300 nm in a 40-fs pulse. The remaining energy can be used as synchronized pump/probe pulses.

Any of the Artemis laser outputs can be used to generate XUV pulses through high harmonic generation (HHG). Two XUV beamlines are available: one with a monochromator for photoelectron spectroscopy and photoemission, and the other a high-flux XUV beamline for HHG spectroscopy and imaging.

#### Photoelectron spectroscopy and photoemission

The monochromatised XUV beamline contains:

- HHG chamber with kHz gas jet or continuous nozzle;
- monochromator to select a single XUV harmonic in the spectral range 12 eV – 80 eV while preserving the pulse length (photon flux is  $1.8 \times 10^9$  photons/s at 30 eV and  $6 \times 10^7$  photons/s at 60 eV, and best energy resolution is 120 meV);
- absolutely calibrated channel electron multiplier to measure XUV flux; and
- relay imaging chamber with toroidal mirror and optics to enable laser and XUV pulses to be recombined for pump-probe experiments.

The end-stations available on this beamline for time-resolved spectroscopy are:

- atomic and molecular physics end-station with velocity-map imaging detector or time-of-flight electron spectrometer, a pulsed gas source, and differential pumping. The chamber can be reconfigured with different gas sources.
- UHV end-station for time- and angle-resolved photoemission spectroscopy (tr-ARPES) equipped with a SPECS Phoibos 100 hemispherical analyser, a five-axis cryo-manipulator, a preparation chamber and a fast load lock for sample transfer.

#### Spectroscopy and imaging

The high-flux XUV beamline contains:

- HHG chamber with differentially pumped continuous nozzle;
- XUV flat-field spectrometer, which can be used for HHG spectroscopy or HHG optimisation experiments; and
- coherent XUV imaging chamber with multilayer focusing mirrors and sample positioning (filters and XUV multilayer mirrors are available for 29 nm, 17.5 nm and 13 nm).

We have very limited space for users to bring their own end-stations and breadboards. Any equipment brought to Artemis must conform to CLF safety standards.

#### **Further details and contacts**

More technical specifications can be found at [www.clf.stfc.ac.uk/Pages/Artemis.aspx](http://www.clf.stfc.ac.uk/Pages/Artemis.aspx). We urge you to contact an appropriate Artemis staff member to discuss the requirements for your experiment prior to submission. Artemis staff will make a technical assessment of the feasibility of your proposal and identify any potential safety issues arising from your proposed experiment. This report is passed to the access panel. Please make sure there are enough experimental details in your proposal to enable us to do this. In particular, please provide details of any samples and gases to be used. We will contact you before the panel meets if we identify any serious problems.

During experiments, we recommend that four people are present each day (two of whom are experienced enough to lead the work), to enable you to make the most of your time. The facility is fully supported in core hours. At evenings and weekends, the facility is operated in data collection mode with limited support.

For more detailed information please contact:

- Emma Springate, Artemis group leader ([emma.springate@stfc.ac.uk](mailto:emma.springate@stfc.ac.uk)).
- Charlotte Sanders, Senior Experimental Scientist ([charlotte.sanders@stfc.ac.uk](mailto:charlotte.sanders@stfc.ac.uk)). Condensed matter physics experiments, monochromatised XUV beamline.
- Richard Chapman, Senior Experimental Scientist ([richard.chapman@stfc.ac.uk](mailto:richard.chapman@stfc.ac.uk)). HHG spectroscopy, XUV imaging, monochromatised XUV beamline, high flux XUV beamline, gas-phase experiments.
- Adam Wyatt, Senior Ultrafast Laser Scientist ([adam.wyatt@stfc.ac.uk](mailto:adam.wyatt@stfc.ac.uk)). Laser diagnostics, HHG spectroscopy, XUV imaging.

### Writing your proposal

A science case of up to three pages must be included in your proposal. You should give a clear account of the aims of the experiment and set it within the broader scientific context. Keep in mind that not all review panel members will be experts in your field. If you are using samples that are not commercially available, you should indicate their source.

In your proposal, you should justify the amount of beamtime you have requested, explaining what you aim to achieve on each week of your run and estimating the data collection time. Experiments are typically allocated 2 – 4 weeks of beamtime.

### Submitting a proposal

Use the CLF online proposal system (<https://users.facilities.rl.ac.uk>) to submit an electronic application. To do this:

- If this is your first proposal, register with the online proposal system by clicking on “Create a new facility user account with us”. Please provide accurate contact details so that we can communicate with you.
- Ask your co-investigators to register with the proposal system and check their contact details too. All co-investigators now have to be registered before their names can be added to proposals.
- On the home page, choose “Artemis” and then create your new proposal following the online instructions. For enquiries with regard to proposal submission please contact the CLF user office: [clf@stfc.ac.uk](mailto:clf@stfc.ac.uk).
- Step 3 of the form asks for information on your research grants and links to industry. Please list the sources of funding for the people and equipment on this project, including UKRI and EU grants, other national funders, and industry funding. If you have funding support from UKRI, you should also describe how the proposal connects with this research.
- Upload your science case of up to three pages.

Please make sure you read the [terms and conditions of access](#) before you submit. These have been recently updated to confirm the requirements for open-access publication and open data. Note also that the title and abstract of each accepted proposal will now be published online.

### Global Challenge Research Fund (GCRF)

The UK Government has established the Global Challenge Research Fund (GCRF) (<https://www.ukri.org/research/global-challenges-research-fund/>), to support research that addresses challenges faced by developing countries. This extends to facility access. Therefore, if your proposal is compliant with Official Development Assistance (ODA) guidelines, this fund may be used to support facility access—including travel to/from the partner country and subsistence during

beamtime—for investigators and their collaborators. The CLF encourages such proposals. If the research in your proposal is relevant to developing countries and if it will, or could be, conducted in collaboration with a developing country on the Development Assistance Committee (DAC) list (see link above), please provide us with additional information, by appending to your science case (maximum one additional page) explicit answers to the following questions:

- Which country/countries on the DAC list will directly benefit from this proposal?
- What development challenge in these countries is the proposal designed to address, and what evidence demonstrates a credible need for this specific proposal?
- How will the outcome of the proposed activities promote the economic development and/or welfare of a country or countries (not the individuals involved) on the DAC list?

The CLF can provide additional guidance prior to proposal submission if required.

### **Review criteria**

Applications for time on Artemis are reviewed and prioritised by the Facility Access Panel. Your proposal will be assessed with the following criteria:

- Absolute prerequisites, without which an application will not be recommended for funding:
  - scientific excellence in the specific objectives of the project;
  - international competitiveness; and
  - strategic value within the Artemis programme.
- Supporting evidence which increases the likelihood a successful outcome:
  - productivity of investigators;
  - quality of leadership and management; and
  - suitability of institution and group.

Additional criteria include strategic alignment to UKRI areas (*e.g.* grant supported), GCRF potential/compliance, potential for economic impact, training, facility development, and impact plan.

Please note that in making its assessment, the panel will refer to your previous track record of access to Artemis. The panel will have access to the experimental reports from your previous access periods at Artemis. Please contact [emma.springate@stfc.ac.uk](mailto:emma.springate@stfc.ac.uk) if you would like to update your report forms.