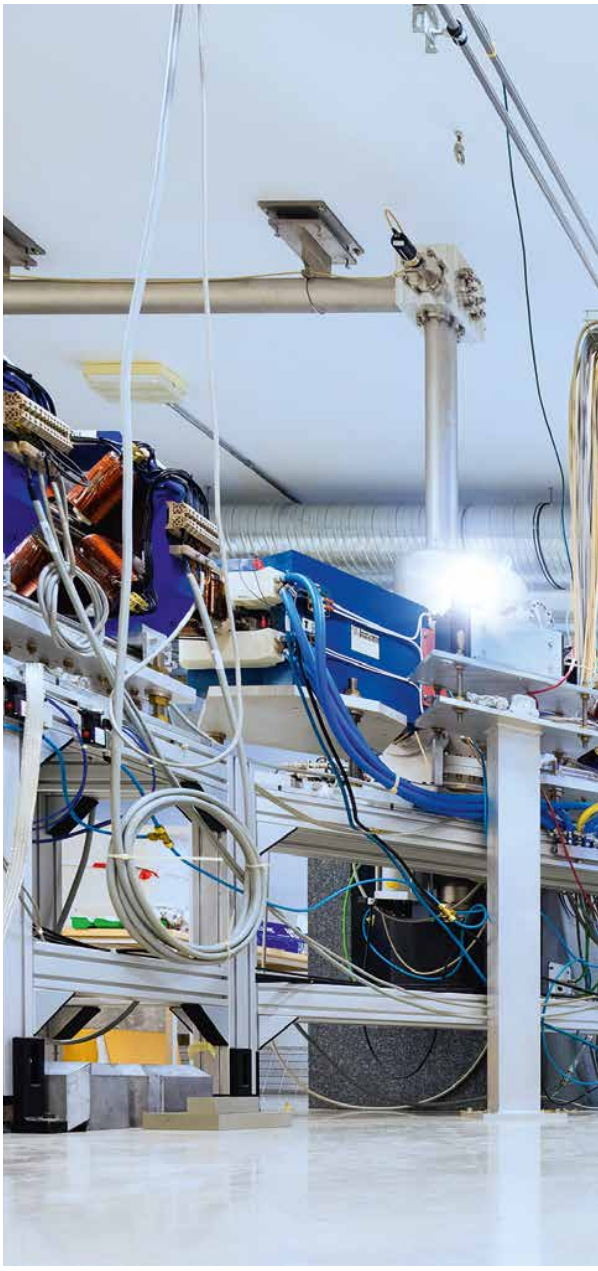
ELECTRONS IN WAVE FLIGHT



The question of "what holds the world together in its inmost folds" was already on the mind of Goethe's Faust all those years ago. Some considerable time has passed since then, nevertheless, the forces that hold the world together at the molecular level are still the subject of research today. Scientists at the Fritz Haber Institute (FHI) in Berlin, for example, are interested in the forces that act between atoms in molecules.

Each molecule has its own typical vibration spectrum – a fingerprint, as it were, that can be determined with the help of laser-like infrared radiation. The method of choice for generating such intense infrared radiation with adjustable wavelengths is a free-electron laser (FEL): in a vacuum, electrons are first accelerated to nearly the speed of light. These high-energy electrons then pass through very strong magnetic fields in what is known as an undulator. These undulators set the electrons in wave-like motion. This causes the electrons to emit photons – in a concentrated, intense beam. In principle, free-electron lasers can generate electromagnetic radiation of almost any wavelength, although this often involves radiation in the X-ray range, which has the shortest possible wavelength. For the experiments at FHI, meanwhile, long-wave radiation in the infrared range is required and generated.

Here, electronics engineer Marco De Pas checks the connections of the electromagnets used to deflect the electron beam on its way between the accelerator and the undulator. The scene is reminiscent of a stage on which a percussionist stands behind their instruments. There, as here, everything has to be coordinated very precisely to achieve the right outcome.

ON LOCATION

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