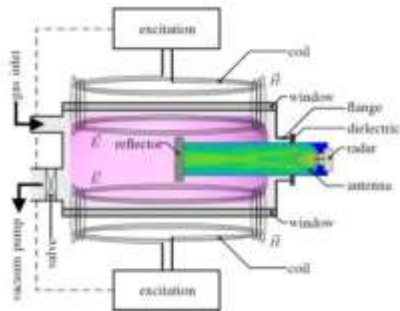


## On the trail of plasma

### Radar-based plasma characterization

#### Invention

Plasmas are used in a wide range of technical applications, including semiconductor technology. Plasma etching and plasma-induced material deposition are used to remove functional layers in a



Reflector freely positionable in the radar beam



Radar-based plasma characterization

structured manner or to selectively generate surface hardening, cleaning and activation on the target surface. In order to accurately control these processes and achieve reproducible production results, a multitude of plasma properties must be known. The new principle of the Ruhr-Universität Bochum uses a radar-based approach for the contactless monitoring and characterization of the plasma state in real time. The coupled power used for excitation is monitored, and with it the change in plasma density in a plasma reactor. The plasma density in turn is directly related to the so-called plasma electron frequency, which can be used to describe the dielectric properties. In addition to monitoring the density, it also provides information on whether plasma impurities are present and whether the transient addition of the plasma has been achieved. Furthermore, it enables conclusions about the homogeneity of the plasma.

#### Commercial Opportunities

Plasmas are an indispensable tool for the production of high-quality thin films, enabling the deposition of novel surfaces and multifunctional film systems, especially on silicon, glass and plastics. Radar-based plasma characterization allows these layers to be applied with optimized homogeneity and quality. Furthermore, an increasing use of plasma-supported sterilization processes for the effective inactivation of multi-resistant germs can be observed.

#### Current Status

A prototype was built to demonstrate the functionality. A German patent application was filed at the German Patent and Trade Mark Office. On behalf of the Ruhr-Universität Bochum, we offer interested companies the opportunity of licensing and in particular of jointly developing the technology.

#### Relevant Publications

C. Schulz, C. Baer and M. Fiebrandt, "Millimeter Wave Radar-based Plasma Measurements," 2019 IEEE Asia-Pacific Microwave Conference (APMC), Singapore, Singapore, 2019, pp. 756-758.

An invention of the Ruhr-Universität Bochum.

#### Competitive Advantages

- Contactless measurement
- Suitable for high temperatures
- Suitable for many types of gas
- Fast and dynamic measuring method
- Simple evaluation method

#### Technology Readiness Level

123456789

Technology validated in lab

#### Industries

- Semiconductor industry
- Medical technology
- Plasma technology

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