Over the last years, Carbon Nanotubes (CNTs) drew interdisciplinary attention. Regarding space technologies, a variety of potential applications were proposed and pre-investigated, e.g. electro-static discharge (ESD) coatings, electromagnetic interference (EMI) shields or high-strength materials for structural applications. However, no complex data regarding the behaviour and degradation process of CNTs under space environment have been collected so far and only a limited number of real space experiments and applications of CNTs exists nowadays. Therefore, it is necessary to investigate the influence on these new materials in space environment and to revaluate the application potential of CNTs in space technologies.

To this end, the Carbon Nanotubes – Resistance Experiment (CiREX) was developed. CiREX is a small and compact experiment, which is designed for small satellites like Cubesats. These satellites are a class of nanosatellites with a standardised size and form.

CiREX was developed for SOMP2 (Student Oxygen Measurement Project 2) which is a double unit Cubesat. The design and construction was performed by master and PhD students at the Technische Universität Dresden.

CiREX is the first in-situ space material experiment for CNTs. Multi-walled carbon nanotubes (MWNTs) and single-walled carbon nanotubes (SWNTs) show extraordinarily properties. As a result of the nearly one-dimensional structure, the electrical transport is ballistic which only applies within the tubes. In CNT networks, the number of contacts between the tubes is higher and therefore the electrical resistance increases. Consequently, the ohmic behaviour of CNT networks is strongly influenced by adsorbed ions and molecules, the defect structure, the contact resistance of the network, and thermal modifications.

The influence of these effects were considered during the design process of CiREX. Accordingly, this experiment measures the electrical resistance of CNT networks under the harsh space environment. Its design, the electrical measurement, and the satellite’s interfaces will be discussed in detail.

To evaluate the data obtained from CiREX, ground validation tests are mandatory. As part of a test series the behaviour of CNTs under solar light was examined. SWNTs, MWNTs and multi-walled carbon nanotubes/resin composite (ME) were exposed to a solar simulator. Furthermore, we have measured the resistance of the samples during the irradiation. After the exposure, the defect density and surface structure of the tubes were investigated with Raman scattering and scanning electron microscope. The results show a clear indication that solar light can influence the electrical behaviour and the tube’s structure.