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**Title: The design, construction and exploitation of the R&D Field Lab 'Einstein Telescope Pathfinder'**

The next (3<sup>rd</sup>) generation of gravitational wave detectors will make gravitational wave astronomy a fact. Indeed, with the current generation about one event a week is observed while with the 3<sup>rd</sup> generation this will be hundreds of events a day! The Einstein Telescope, currently being designed, will be Europe's 3<sup>rd</sup> generation facility. In order to observe the lower frequency range of the gravitational wave spectrum a radical departure from the traditional silicate-based room temperature optics has to be made and instead one has to use Silicon based optics at cryogenic temperatures. To this end *ETpathfinder* (<https://www.etpathfinder.eu/>), of which the VUB is a partner, is currently under construction: an R&D lab in Maastricht which will be fully dedicated to the development of cryogenic Si based optics. In close collaboration with the Photonics Innovation Center at the VUB (<https://www.b-phot.org/>) this project, based at ETpathfinder, aims at contributing to answering the question: "What are the fabrication requirements to meet the ultra-low roughness and extreme surface shape accuracy of Si-based resonator cavities for gravitational wave detectors?". A second project searches the answer to "Are free-form optical surfaces advantageous for the design, fabrication, assembly and alignment of gravitational wave interferometer injection optics?"

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