WHAT’S HAPPENING?
An untreated or not-correctly treated joint injury will most likely progress towards osteoarthritis.

WHAT’S BEING DONE?
The articular cartilage assessment during arthroscopic surgery is solely based on visual inspection (video) and manual probing of the stiffness hindering the intra-operative decision making.

WHAT’S THE SOLUTION?
MIRACLE will develop the first mid-infrared attenuated total reflection (MIR-ATR) probe capable of quantifying and real-time assessment of articular cartilage during arthroscopic surgery.

WHAT’S NEXT??
MIRACLE will enable accurate evaluation of the articular cartilage during arthroscopy, assisting the orthopaedic surgeon in more objective decision making and promoting patient well-being.

CONSORTIUM

COMBINING TECHNOLOGIES. CREATING SOLUTIONS.
MID-INFRARED ARTHROSCOPY IMAGING SYSTEM

www.miracleproject.eu

This project received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 738934.

The project is an initiative of the Phoebus Public-Private Partnership.
FACTS ON
OSTEOARTHRITIS

Affects 242 million people globally
50% of people over 65 affected worldwide
Estimated 8.9 years delay in diagnosis
€1130-€10,452/year per patient in EU

These facts clearly support efforts taking on the challenge of developing accurate
diagnostic tools for in-depth evaluation of the articular cartilage.

MIRACLE consortium members have promising results demonstrating the great
potential of using a MIR-based system as a diagnostic tool.

BACKGROUND
MIR spectra
The University of Oulu has demonstrated experimentally that the MIR spectra
extracted from the superficial layer of articular cartilage can be used to assess
the Osteoarthritis (OA) status of the joint and are correlated with the histopatho-
logical grading of OA (CHARIOT grade) providing proof of concept for the
diagnostics approach.

MIR based probe
art photonics has developed and demonstrated experimentally a MIR-based probe
capable of evaluating the biochemical composition of tissues, with potential use
for future in vivo diagnostic applications.

WORK IN PROGRESS
Tailored laser light source
Specific quantum cascade lasers (QCL) light source to examine articular cartilage,
with the potential of being used in other medical applications.

Beam combiners
An unique on-chip beam combiner (Beam) to act as the optical interface between
the QCL based light source and the waveguide.

Waveguides (for spatial resolution)
It will enable the probe to acquire resolved MIR spectra allowing for mapping (i.e.,
imaging) of the area under investigation.

THE FUTURE
MIR-ATR based probe
The prototype developed in MIRACLE will be validated and demonstrated during
arthroscopic surgery by highly competent human and equine orthopaedic surgeons,
paving the way for market entry.

By bringing this diagnostic tool to the market, MIRACLE will not only impact on
surgeons’ routines and patients’ lives but will also place Europe at the forefront of
photonic technologies and medical equipment industry.