



# Knight Optical Enables SMi Systems to Unlock Ultra-Fast, High-Precision Molecular Testing

**25%**

Higher transmission with custom coatings

**100%**

In-house testing success rate

**20,000+**

Individual tests processed in under 10 minutes

## INDUSTRY

Medical

## APPLICATION

Imaging

## SOLUTIONS

- Custom lenses & prisms
- AR-coated
- LIDT tested



## ABOUT SMi SYSTEMS

Founded in 2018, SMi Systems was established to transform scientific research, disease diagnostics, and general health by harnessing super-resolution equipment.

Following funding from the UK Government and equity investment, the forward-thinking innovator developed a benchtop instrument that automates imaging and analysis using advanced optics, allowing users to view individual molecules within a sample.

Currently in use for cutting-edge research, including cancer and COVID-19 studies, and by a top-20 pharma company for quality control screening trials, SMi Systems' high-throughput, widefield, super-resolution imaging system can simultaneously detect over 200 different types of molecules within a sample at single-molecule resolution.

The pioneering technology helps reduce the long timelines and costly expense often associated with new drug development, meaning diseases are detected much earlier and with far greater certainty.

As a result of its precision and automation, the system can process up to 96 samples simultaneously in under 10 minutes – a potential equivalent to over 20,000 separate tests at a rate of under 30 milliseconds each. Achieving this level of speed and accuracy hinges on integrating high-spec optical components designed to meet the demands of a complex configuration.

*Right from the start of the project, Knight Optical have worked closely with us on the design and fulfilment of our custom optics. They are responsive and engaged, seeking to understand our technical and commercial objectives. They've proposed sensible alternatives to help us achieve our goals and delivered on time and with flawless quality.*

**Stephen Reeder,**  
COO, SMi Systems



## CHALLENGES

### PRECISION AND PERFORMANCE

Physical and optical properties were key. When looking at single molecules, the smallest flaw or artefact can become a significant obstacle. Coupled with a compact lens arrangement, made-to-order optics – fully tested and rigorously inspected for surface imperfections – became a defining consideration for SMi.

What's more, with high-powered lasers as the excitation source, damage threshold and antireflective (AR) coatings were vital parameters to ensure lenses could withstand laser intensity while enabling optimal transmission.

With such specific criteria, balancing cost with technical demands swiftly became an equally important element of the system's development.

#### Challenges:

- Customisation
- Compact design
- High damage thresholds
- AR coatings
- Cost

## SOLUTIONS

### CUSTOM-MADE OPTICAL COMPONENTS

When it became evident that fully tested and inspected custom-made optics were essential, SMi Systems turned to Knight Optical. Working closely with the experts at SMi, the global optical component supplier reviewed the designs and recommended materials and manufacturing methods to fulfil both volume and financial targets. The responsive relationship between the two companies meant any questions or obstacles were resolved quickly and effectively.

By engaging early and gaining a full understanding of Knight Optical's capabilities, SMi Systems was in a position to revisit and refine designs that were previously deemed out of reach, with some improvements already built into existing systems and others now shaping future iterations.

Upon receiving a sample production batch, the SMi team subjected each optic to its own extensive in-house testing to confirm that all met strict operational specifications.

#### Solutions:

- Custom optics
- Close collaboration
- Tailored substrates and processes
- Early engagement
- Rapid resolution of technical difficulties

## RESULTS

### ENHANCED PERFORMANCE AND RELIABILITY

By moving away from off-the-shelf optical components, SMi Systems has not only reduced transmission loss and virtually eliminated aberrations but also achieved the same transmission output with lower input laser power. This improves reliability and extends the lifespan of the laser head – a costly component – ultimately saving time and money.

Thanks to custom coatings, SMi Systems' high-throughput, widefield, super-resolution imaging system now delivers 25% higher transmission. Additionally, with optimised tolerances making assembly easier, SMi has created a more compact model through its partnership with Knight Optical.

#### Results:

- Near elimination of aberrations
- Reduced transmission loss
- Extended laser head lifetime
- 25% increase in transmission
- Improved ease of assembly
- More compact design
- Time and cost savings

*Stephen and the team at SMi are an absolute pleasure to work with. We've thoroughly enjoyed partnering with them throughout the whole process, from prototype to development. It's exciting to see our optics contribute to a groundbreaking diagnostic tool.*

**Connor Anderson,**  
UK Sales Supervisor, Knight Optical