



Welcome to the Autumn 2025 edition of 'Lens Innovation' – a twice yearly eNewsletter from **Resolve Optics Ltd.** Each issue of Lens Innovation contains features written to keep you informed about the latest technological developments, applications advances and breaking news in the optical design and manufacture industry.

Please do not hesitate to [contact us](#) if you would like to comment on a particular feature or ask further questions. We welcome your feedback.



Mark Pontin – *Managing Director*

INFORMATION GUIDELINES:

Comparing different design approaches to zoom lenses

Notable benefits of zoom lenses include versatility, offering a range of focal lengths in a single lens, and the convenience of portability and the ability to capture images without changing lenses. The most popular approaches to designing a zoom lens include manual focus, motorised / focus, tracking and more recently optically compensated. While all these design approaches provide the ability to change the focal length within a range, each type of zoom lens has its place for different applications.



Manual Zoom

A manual zoom design allows the magnification / focal length to be changed manually and then the image can also be focused manually. This is an inherently simple approach to creating a zoom lens. An example of this type of zoom lens is the manual SLR zoom as used by many photographers. Such a design provides user with the control to quickly frame the shot and achieve a sharp focused image.

Motorised Zoom / Focus

The key advantage of this design approach is that when designed in conjunction with the camera the lens can be kept very compact. Typically, the optical cells will be mounted on rails and stepper motors are used to accurately position the cells according to a look up table and feedback from the camera. An example of this design type is the Sony Block camera. The motorised zoom / focus approach achieves large zoom ranges (typically X40) and can utilise digital and optical zoom together to further increase the zoom range. A shortfall of this zoom lens design approach is that it is very difficult to ruggedise.

Tracking Zoom

The key benefit of a tracking zoom lens is that it holds focus throughout the zoom range. This approach is useful if the subject needs to be

kept in focus when zooming. A tracking zoom is designed independently of a camera and uses linked cam tubes to drive the zoom and focus cells precisely to maintain the image quality. This type of zoom lens does need to be set up on the camera to achieve the accurate tracking. Tracking zoom lenses are typically used in industrial applications where the object distance may change but focus must be maintained. Tracking zoom lenses are also popular in CCTV applications. Resolve Optic's largest market for tracking zooms is the nuclear industry where these versatile lenses are used for CCTV monitoring and inspection in areas where access is restricted and the zoom can be used to view objects further away. Beneficially tracking zooms designs are also relatively easy to ruggedise due to their construction.

Optically Compensated Zoom

The above zoom lens designs rely on a cam mechanism to control the individual movement of the different optical cells within the lens to maintain focus throughout the zoom range. To ensure smooth zoom movement these moving parts greased and this can be a problem in harsh environments or in space applications. By comparison, optically corrected zoom lenses, also known as optically compensated zoom lenses) are simpler in design relying on two optical cells moving together each side of a fixed cell. Advantageously this movement is linear so there is no need for complex cam mechanisms. The movement in an optically corrected zoom lens is effectively a push-pull movement. The benefits of an optically corrected zoom lens design include simplified construction. They are more rugged than traditional zoom lenses and no greases are required for smooth zoom operation making them ideal for space applications or harsh environments. However, optically corrected zoom lenses do have limitations – they are not suited for applications requiring a large field-of view or where a zoom range greater than x4 is required.

To learn more about application optimised zoom lenses please visit <https://www.resolveoptics.com/application-optimised-zoom-lenses/>

VIEWPOINT:

Getting from prototype quantities to batch production in a cost-effective way



A major factor that makes customers think twice about going down the custom design route when looking for a new lens, is the expected high cost of design and prototyping. Although this is an understandable concern, these costs are not always as high as people assume.

Where possible – Resolve Optics philosophy is not to charge customers Non-Reoccurring Engineering (NRE) costs. Our aim is to get through the design/prototyping phase at the minimum cost to allow customers to test and see the benefits of their custom lens before committing to move onto ordering batch quantities. For particularly complex lenses, this is not always possible, but the NRE

will always be kept to a minimum.

Although we typically refer to the first batch order of lenses as prototypes, this is not really the case. These lenses are built and tested to the same standards as a production batch. They are 'production quality' lenses that are suitable for use in your optical instrument, camera or sensor system. We have adopted this approach to custom optical design and manufacture to avoid the need for any redesigns.

Changes in a lens design typically necessitate further prototyping which can very quickly cause costs to spiral. Consequently, we work closely with our customers to ensure that all lens specifications are clearly defined during the design stage. This simple philosophy helps ensure that customer needs are met and costs are minimised. Once a lens design specification has been agreed and signed off, the responsibility of supplying that specification falls to Resolve Optics. The lenses we supply are guaranteed to meet this specification.

To learn more about our custom design and manufacture service or to tell us about your optical product development project please visit <https://www.resolveoptics.com/oem-design-manufacture/>

TECHNOLOGY FORUM

Custom IR lenses for more challenging applications

The Infrared spectral region ranges from 0.75 to 3 μm (near-IR), through the mid-infrared (3 to 5 μm) range to the longwave-IR, or LWIR waveband (5 to 14 μm). Infrared (IR) lenses for the mid infrared waveband are well catered for by the "off the shelf" market. However, these IR lenses tend to be designed for routine applications and are not intended for use in more extreme environments.

When faced with a challenging application such as when the lens may be exposed to vibration/shock, airborne particulates or large temperature swings, it is often necessary to turn to a custom solution. For over 25 years, Resolve Optics has supplied custom Infrared (IR) lens assemblies for sensor and instrument manufacturers that seek to push the boundaries in spectroscopy, thermal imaging and materials sorting as well as pivotal applications in defence and aerospace.

To develop IR lenses for more challenging applications you are faced with



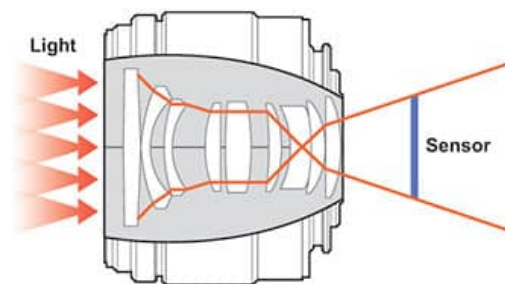
choices. There is only a limited number of glass types available in that transmit well in the MWIR and LWIR wavebands. Historically the most common of these was Germanium. Aside from being expensive and increasingly difficult to source, Germanium presents a significant problem for applications subject to large temperature changes as it is particularly non thermally stable. This means that as the ambient temperature changes the glass will expand and contract forcing the lens out of focus. To enable development of athermalized IR lenses you can use selected Chalcogenide glasses which transmit well in the 8-24um range and are much more thermally stable than Germanium. Unfortunately, both chalcogenide glasses and Germanium are relatively soft and scratch easily. For applications (such as in the defence and aerospace industries) where a lens may be exposed to airborne particulates, it is important that any exposed elements should be protected with a Diamond like Carbon (DLC) coating. Although this will greatly increase the scratch resistance of the lens, in some extreme cases, it is worth considering a DLC coated window also at the front of the lens. This sacrificial front element can then be easily replaced by the end user as and when required.

Using substrates including Germanium, Sapphire, Silicon, Chalcogenide glasses and Zinc Selenide, Resolve Optics is experienced in developing and supplying IR lens assemblies with anti-reflection coatings to optimise performance in the infrared waveband to best suit your application.

To discuss development of a bespoke IR lens or optical system for a challenging application please [contact Resolve Optics](#) or visit <https://www.resolveoptics.com/uv-ir-and-swir-lenses/>

DESIGN FOCUS:

How different glass types can affect lens performance and design



There is a vast array of glass types for an optical designer to choose from to achieve the best possible performance in a new lens design. Different glass types affect lens performance and design by influencing factors like optical clarity, refractive index, and dispersion.

Selecting high-refractive-index glasses, such as flint glass, allows you to create thinner, lighter lenses for a given power. The downside of flint glass lenses is that they have higher dispersion leading to chromatic aberration. By comparison, lower-dispersion glasses such as crown glass minimize chromatic aberration but typically crown glass lenses are thicker for the same refractive power.

Despite the availability of many different low / high dispersion glasses and crystalline materials such as germanium and calcium fluoride, the growing demand for higher resolution lenses has made it harder to find the correct material with the right refractive index to achieve the best result. As lens resolution increases the higher order aberrations increase and more elements with more extreme properties are required to correct these aberrations.

Lens designers use specific glass types and multiple elements to correct aberrations and meet performance goals. For instance, combining a positive lens made of flint glass with a negative lens made of crown glass forms an achromatic doublet able to correct chromatic aberration. The demand for higher lens performance is also driving increasing use of aspherical elements as another way to correct aberrations.

So, when you next look at an optical lens consider the way, each element has been designed to bend and refract the light to produce a high-resolution image onto your sensor. These lens elements are much more than lumps of polished glass.

Read Technical Note: <https://www.resolveoptics.com/design-and-performance-of-fixed-focus-lenses/>

PROJECT REPORT:

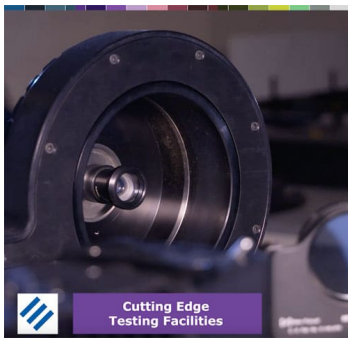
Optimised non browning lens for 2/3-inch format radiation tolerant camera

A nuclear systems integrator approached Resolve Optics to produce a compact, 16mm focal length fixed focus non-browning lens optimised for their 2/3-inch format radiation tolerant camera. The customer also required the lens to fit within a small area so they could use it without any modifications, in their existing camera housing. Leveraging existing fixed focus non browning lens designs – Resolve Optics was able to create and deliver the desired non-standard 16mm focal length lens in a fraction of the time of normal custom optics. This new f/2.8 fixed focus non browning lens has been reported by the customer to deliver high image resolution and minimal geometric distortion from 400 – 750 nm. Manufactured to the highest quality standards from cerium doped glass, the lens can withstand accumulated radiation exposure of up to 100,000,000 rad and temperatures of up to 55°C all while maintaining good transmission.



Learn more: <https://www.resolveoptics.com/2025/03/non-browning-lens-for-2-3-inch-format-sensors/>

BREAKING NEWS



Automated MTF testing – how it benefits our customers

Our MTF (Modular Transfer Function) test facility is automated to ensure that each lens is tested in the same way and results do not rely on individual set up by an operator. Each lens type we produce has a dedicated test program to ensure accurate and repeatable testing. This automated MTF testing provides peace of mind for customers as they can see (on request) the test report for any individual lens they have ordered. Apart from MTF (resolution) we can also provide reports detailing distortion, field-of-view and register. Quality assurance test programs can also be set-up to accommodate a customers' specific requirements.

To watch video clip [click here](#).

Satellite developer qualifies payload

Recently our vibration test centre was used by Sen Corporation Limited to conduct sine sweeps and random vibration testing on their latest satellite payload. For a satellite developer to be able to carry out vibration testing is invaluable as it provides a level of confidence that their payload will survive the rigors of launch and that the payload will not fail the launch operator's qualification vibration testing.

To learn more [click here](#).



Resolve Optics record year facilitates continued investment.



Many thanks to our customers – new and old. During the last year we secured new contracts to supply custom lenses and optical assemblies to several high technology businesses. This together with a strong repeat order book has enabled us to achieve an 11% increase in sales and record turnover for the year ending 30th June 2025. Our continuous program of investment in state-of-the-art optical assembly and testing equipment as well as skilled staff has allowed us to reduce costs and deliver consistently high quality, top performance lenses.

To learn more [click here](#).

THE LAST WORD:

Specialized vision systems help monitor nuclear hot zones

In an active nuclear power plant or a nuclear fuel recycling facility, areas subject to radiation must be remotely inspected for employee safety and to ensure the proper operation of the equipment. For this purpose, closed-circuit television cameras with radiation-tolerant lenses are used to inspect these sensitive areas to determine if contamination leaks have occurred. Monitoring points within a nuclear facility can range from control panels to valves and pipes in and around the reactor itself, wherein anomalous readings can provide a warning of an existing or potential problem. But therein lies the rub from a machine vision standpoint: High levels of radiation degrade typical lenses.

Read article in full: https://www.visionspectra-digital.com/visionspectra/summer_2025/MobilePagedArticle.action?articleId=2067906#articleId2067906



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