1.3.2.10 Hardware/Component/Subsystem-Level Image Quality (IQ) Requirements

Specific aspects of the camera systems architecture and of hardware components are described in the following sections. Furthermore, requirements of other sections/modules may strongly influence these hardware components too.

1.3.2.10.1 Illumination (TX)

This section purely covers basic requirements towards the active illuminators, for full scope and detail of illuminator requirements please see dedicated module.

The Tier1 shall ensure that the illumination irradiance on system level complies with eye safety for each position in world coordinates (i.e., including the fact that multiple illuminators might be active intentionally or accidentally at the same time).

Each IR-contributing camera shall provide active IR illumination.

Information: This includes all cameras \in Cameras.

The peak wavelength of the IR illumination shall be 940 ± 5nm.

The IR illumination shall be invisible for the driver or any occupant.

Each IR illumination shall be synchronized with all cameras to enable a scheduling Scheme.

The beam profile of the IR illumination shall be measured and reported.

Each IR illumination shall be optimized with a custom diffusor and the characteristics shall be provided to MB experts for review.

The contractor must implement a hysteresis function between every illumination power lever to avoid illumination jitter.

Suitable hysteresis parameter for the hysteresis function must be proposed by the contractor and discussed and agreed on with the client.

1.3.2.10.2 Cover glass

component outside project, yet within optical path

<<TODO VolkerD>> please add cover glass spec.

Requirements in the subsection "cover glass specification" below summarizes a cover glass component. This component is outside of the camera system, yet its information shall be taken into account within the design, application and testing of

the camera system, especially w.r.t. IQ (image quality).

The IQ application to any camera configuration variant with a cover glass (any variant thereof of max. 3 different cover glass variants) shall be provided without a need for a CR, i.e., at no extra cost.

1.3.2.10.3 Camera Lens (RX)

The lens shall be designed in a way, that it is no limiting factor wrt. the specified imager. This includes all relevant IQ KPIs such as (but not limiting to) sharpness/resolution and dynamic range.

The supplier shall provide a lens design concept that proofs above requirement incl a relevant design report before serial tooling kickoff for the lens.

The supplier shall provide a the lens design model in Zemax or similar quasistandard format.

1.3.2.10.3.1 Lens Map / Transformation

Definition: The Lens mapping function shall define the mapping between angles to pixels. The distance of a point from the image center 'r' is dependent on the focal length of the optical system 'f', and the angle from the optical axis \theta.

The lens mapping function shall be radial symmetric.

The lens mapping function shall be derived from the functions/sub functions and packaging and shall be provided to MB experts for review.

1.3.2.10.3.2 Lens driven Image Circle

Definition (Wikipedia): The image circle is the cross section of the cone of light transmitted by a lens or series of lenses. When this light strikes a perpendicular target such as a digital camera sensor, it forms a circle of light, the image circle.

Definition: <PARA.IQ.ImageCircle> shall denote the diameter of the image circle.

Definition: Full frame image circle :<=> <PARA.IQ.ImageCircle> >= <IQ.Imager.Diagonal>.
Definition: Circucised frame image circle :<=> <IQ.Imager.Width> <= <PARA.IQ.ImageCircle> < <IQ.Imager.Diagonal>

The lens shall be designed in a way, that the resulting image circle forms a circucised image circle. The resulting tradeoff between resulting lowlight performance and dark corners shall be provided to MB experts for review.

The supplier shall present a circumcised frame image circle that is large enough to fulfill all camera system requirements, including off-center horizontal FoV requirements (from the function specification).

Info: a circumcised frame image circle might improve low light performance, as more light of the lens is collected on the imager