



## Frequently Asked Questions

# UV and IR Emission, Lamp Safety of WideTEK and Bookeye Scanners

### Abstract

There are concerns about the light sources of scanners harming precious, old and fragile documents. It is well known that excessive exposure to sunlight and other artificial lights can harm and potentially alter material to be scanned; such as paper documents, paintings and other objects.

Other concerns are about the safety of the operators. High levels of UV or IR radiation can cause harm to the human eye. Sudden exposure to high levels of visible light may not be harmful but can be extremely annoying thus reducing operator satisfaction and productivity.

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## 1. Confidentiality

Status	Interested Party	Source	PDF
Public Information	Image Access Support	Yes	Yes
	Authorized Service Providers	No	Yes
	Image Access Customers	No	Yes

## 2. Revision History

Date	Rev.	Name	Description of Change	Reason for Change
27.05.2018	1.0	AKE/TI	Initial Version	

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#### 4. Purpose

The purpose of this document is to explain the impact of UV and IR emission as well as excessive visible light caused by the lamps of scanners on sensitive objects and on operators' health.

#### 5. Scope

The scope of the document includes all Bookeye® and WideTEK® scanners including the WideTEK®-ART fine art scanner.

#### 6. Terms and Definitions

Term	Description, Meaning
UV	Ultraviolet light
IR	Infrared light
Emission	Light emission of the LEDs
RG1,2,3	Risk groups of lamps and LEDs

#### 7. Introduction

The target audience for this FAQ document are users of a Bookeye or a WideTEK scanner including preservationists, archivists, librarians, reprographers and any other scanner operators or administrators.

#### 8. What is Light?

The common understanding of light is the part of the spectrum of electromagnetic radiation which is visible to humans. This is very small part of the total spectrum as can be seen in this diagram.

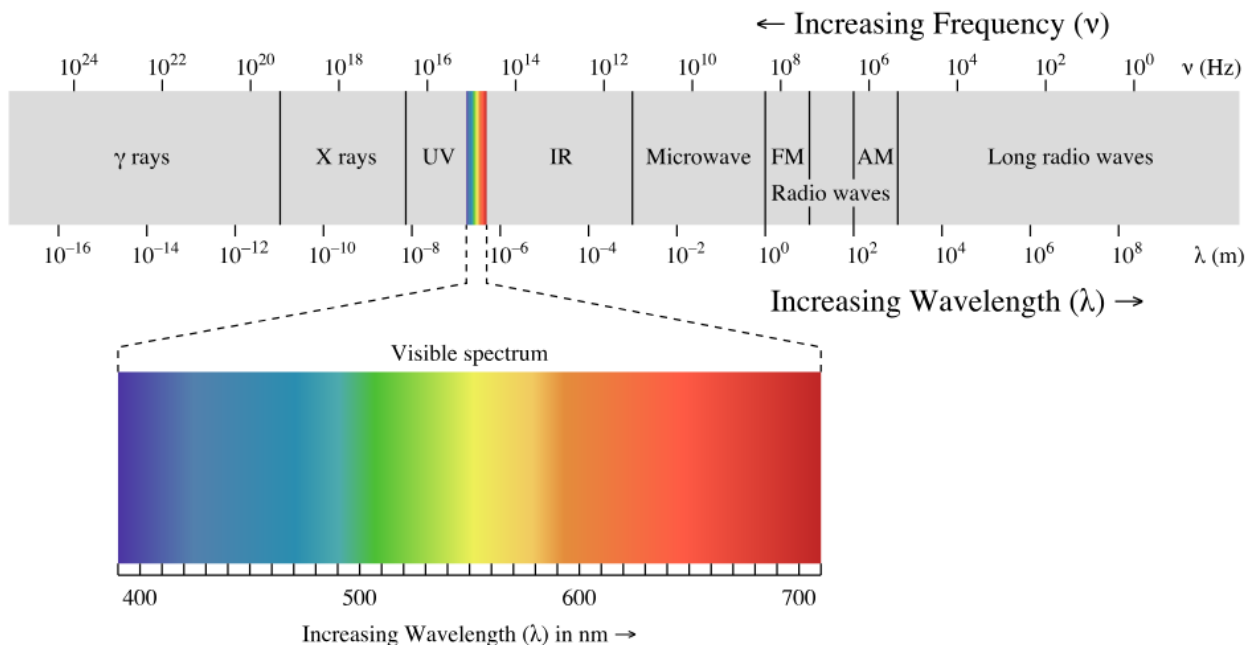


Fig. 1 Electromagnetic Spectrum

### 8.1. Ultraviolet Light (UV)

To the left of the visible part is the UV range, which consists of UVC, UVB and UVA. Ultraviolet radiation (UV) is an electromagnetic radiation with a wavelength between 10nm and 400nm, shorter wavelengths than those of visible light (see also <https://en.wikipedia.org/wiki/Ultraviolet>)

UVC is almost completely absorbed by the atmosphere and only reaches earth in small doses. It has the power to destroy all DNA and is therefore used for disinfection purposes. It is extremely harmful to the skin and eyes. UVB in part and UVA reach the earth in higher doses and the least harmful is UVA, which can go deep into the skin and trigger the production of melanin (skin gets tanned).

Unless needed for a specific purpose, a scanner lamp should not produce any UV radiation. It is not needed to capture the images and bears the risk that the objects are harmed (discoloring, fading) which is a major concern to preservationists and other people involved in scanning.

Fluorescent lamps are not 100% UV free. The reason is that they use excited mercury vapor which emits almost all its energy in the UVC and a lesser part in the UVA range. The inner surface treatment of the glass tubes converts the UV light into visible light but there is a small portion of UV light which is not blocked.

White LED light is different. The LED chip basically emits light in the blue range and cannot even generate UV light. This blue light is then converted to visible light using a highly complex mixture of chemicals commonly (but incorrectly) called phosphor.

### 8.2. Infrared Light (IR)

To the right of the visible part of the spectrum is the IR range, which consists of near IR and other components. Infrared radiation (IR) is an electromagnetic radiation with a longer wavelength than that of visible light, greater than 780 nm (see also <https://en.wikipedia.org/wiki/Infrared>).

Infrared radiation is not heavily absorbed by the atmosphere and reaches earth almost completely. This is commonly referred to as heat and is the reason why you as a reader are living at all. Without the IR dose (50% of all the energy) from the sun, the earth would be an ice ball with no life on it.

IR is less harmful than UV but since it is not visible, even high doses are not easy to recognize.

Unless needed for a specific purpose, a scanner lamp should not produce any IR radiation. It is not needed to capture the images and bears the risk, that the objects are harmed (discoloring, fading, paint melting, object becoming rippled) which is a major concern to preservationists and other people involved in scanning.

This should not be an issue today. Decades ago in the 90s, copiers and scanners used tungsten lamps which emitted less than 10% of their energy in the visible light range and more than 90% in the infrared spectrum. Fluorescent lamps emit some of their energy in the IR spectrum but this is rather harmless due to the low intensity.

### 8.3. Visible Light (VIS)

Visible light between 420 and 760 nm is visible to the human eye. Scanner illumination should be restricted to this range since all other radiation is a potential hazard to the scanned object.

## 9. Light and Lamp Safety

A good scientific explanation of lamp safety and labeling requirements can be found [here](#). In general, lamps are classified in risk groups RG0, RG1, RG2, RG3. The first two, RG0 and RG1, require no labeling because they only pose a low risk. Image Access lamps are RG1 or even RG0.

All scanners need light but it can be annoying to have to look into the emitted light, even if classified at low risk group RG1. The following videos show the difference in operation of a competitor's book scanner which scans (and illuminates) from the back to the front and our Bookeye scanner, which moves the light from left to right. Click on the picture to see the full video (links verified 05/2018).



Fig. 2 Operation of an OS16000



Fig. 3 Operation of a Bookeye V2 Professional

### 9.1. Light emission of the Bookeye or WideTEK scanners

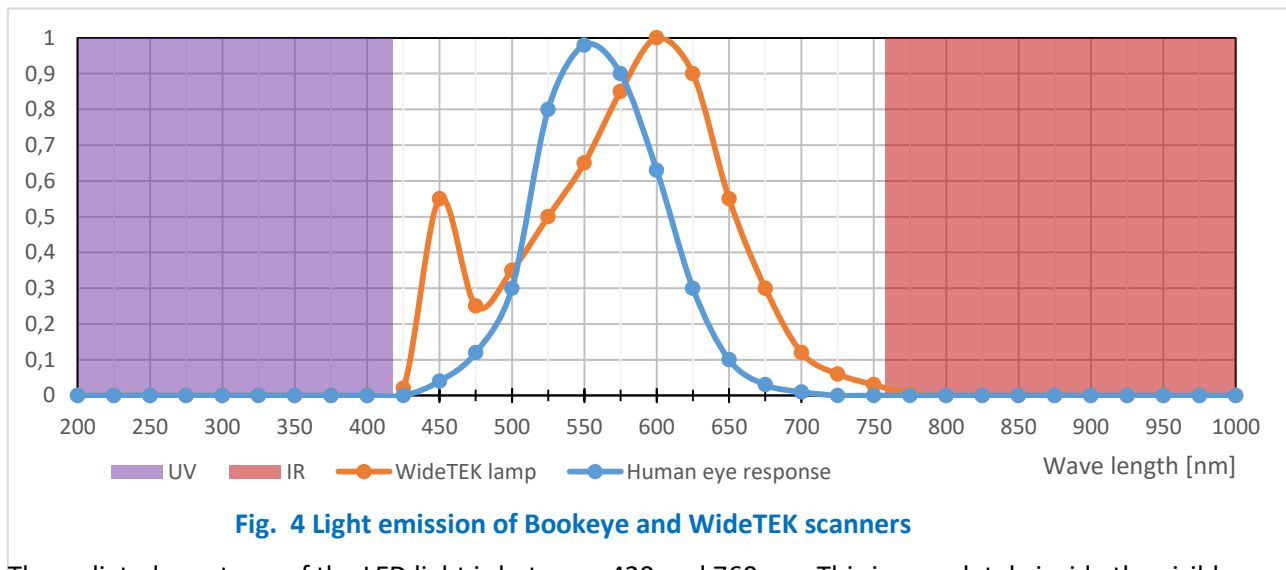


Fig. 4 Light emission of Bookeye and WideTEK scanners

The radiated spectrum of the LED light is between 420 and 760 nm. This is completely inside the visible spectrum of the human eye. There is no mission of UV light and no emission of IR, only useful light is emitted.

**Conclusion:** No UV or IR light is emitted by WideTEK and Bookeye Scanners.

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