

VRC6 - January 12, 2017

Item # VRC6 was discontinued on January 12, 2017. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

LASER VIEWING CARDS

- ▶ Detect Wavelengths from UV to MIR
- ▶ Handheld Photosensitive and Liquid Crystal Cards



[Hide Overview](#)

OVERVIEW

Features

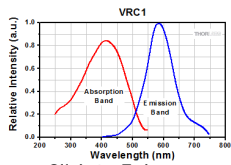
- Detector Cards for UV, Visible, NIR, or MIR Wavelength Ranges
- Detect Radiation as Low as 1 nW/cm²
- Absorption Wavelength Range(s) or Sensitivity Curve Printed on Card

Thorlabs offers a selection of detector cards for use with UV, Visible, Near IR (NIR), or Mid IR (MIR) radiation. These cards are fabricated from either plastic with a photosensitive region or metal with a liquid-crystal film. The card's light-sensitive detector area allows for the easy location of a UV, Visible, NIR, or MIR laser beam and its focal point. To facilitate their use during alignment procedures, the detection region of every card on this page except the VRC5 extends all the way to the edge of the card, all but the VRC5 feature two engraved reticles for use in laser beam collimation.

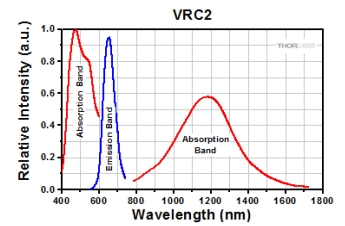
Please note that these detector cards are not intended to be used as laser beam blocks, and appropriate safety measures should be taken when working with laser beams. See the *Laser Safety* tab for details.

[Hide Graphs](#)

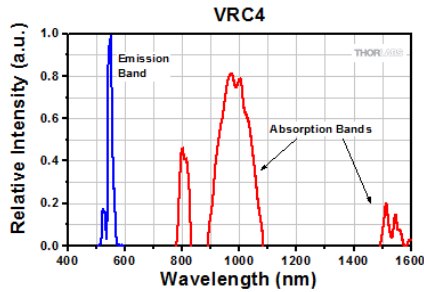
GRAPHS



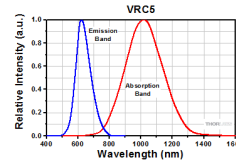
Click to Enlarge
 Wavelength Absorption from
 250 - 540 nm
 Wavelength Emission from 450
 - 750 nm



Click to Enlarge
 Wavelength Absorption from 400 - 640 nm &
 800 - 1700 nm
 Wavelength Emission from ~580 - 750 nm



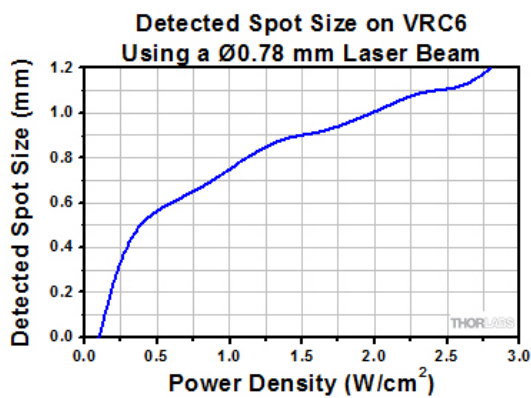
Click to Enlarge
 Wavelength Absorption from 790 - 840 nm & 870 - 1070
 nm & 1500 - 1590 nm
 Wavelength Emission from ~520 - 580 nm



Click to Enlarge
 Wavelength Absorption from 700
 - 1400 nm
 Visible Wavelength Emission

VRC6 Spot Images ^a					
Power Density	Detected Spot Size	Spot Image on Card	Power Density	Detected Spot Size	Spot Image on Card
0.3 W/cm ²	Ø0.5 mm		1.6 W/cm ²	Ø0.9 mm	
0.6 W/cm ²	Ø0.6 mm		2.0 W/cm ²	Ø1.0 mm	
0.9 W/cm ²	Ø0.7 mm		2.3 W/cm ²	Ø1.1 mm	
1.1 W/cm ²	Ø0.8 mm		2.6 W/cm ²	Ø1.1 mm	
1.4 W/cm ²	Ø0.9 mm		2.8 W/cm ²	Ø1.2 mm	

- The actual size of the spot on the VRC6 MIR detector card under varying power densities can be seen in the table above. Please note no spot was detected when the power density was below 0.3 W/cm². The ambient temperature of the lab was 23 °C.



The spot size on the VRC6 MIR detector card will vary depending on beam power. The graph above displays the results of a test done using a diode with a Ø0.78 mm spot size. The ambient temperature of the lab was 23 °C.

[Hide Laser Safety](#)

LASER SAFETY

Laser Safety and Classification

Safe practices and proper usage of safety equipment should be taken into consideration when operating lasers. The eye is susceptible to injury, even from very low levels of laser light. Thorlabs offers a range of laser safety accessories that can be used to reduce the risk of accidents or injuries. Laser emission in the visible and near infrared spectral ranges has the greatest potential for retinal injury, as the cornea and lens are transparent to those wavelengths, and the lens can focus the laser energy onto the retina.

Safe Practices and Light Safety Accessories









- Thorlabs recommends the use of safety eyewear whenever working with laser beams with non-negligible powers (i.e., > Class 1) since metallic tools such as screwdrivers can accidentally redirect a beam.
- Laser goggles designed for specific wavelengths should be clearly available near laser setups to protect the wearer from unintentional laser reflections.
- Goggles are marked with the wavelength range over which protection is afforded and the minimum optical density within that range.
- Laser Safety Curtains, Laser Barriers and Blackout Materials can prevent direct or reflected light from leaving the experimental setup area.
- Thorlabs' Enclosure Systems can be used to contain optical setups to isolate or minimize laser hazards.
- A fiber-pigtailed laser should always be turned off before connecting it to or disconnecting it from another fiber, especially when the laser is at power levels above 10 mW.
- All beams should be terminated at the edge of the table, and laboratory doors should be closed whenever a laser is in use.
- Do not place laser beams at eye level.
- Carry out experiments on an optical table such that all laser beams travel horizontally.
- Remove unnecessary reflective items such as reflective jewelry (e.g., rings, watches, etc.) while working near the beam path.
- Be aware that lenses and other optical devices may reflect a portion of the incident beam from the front or rear surface.
- Operate a laser at the minimum power necessary for any operation.



- If possible, reduce the output power of a laser during alignment procedures.
- Use beam shutters and filters to reduce the beam power.
- Post appropriate warning signs or labels near laser setups or rooms.
- Use laser sign lightboxes if operating Class 3R or 4 lasers (i.e., lasers requiring the use of a safety interlock).
- Do not use Laser Viewing Cards in place of a proper Laser Barrier or Beam Trap.

Laser Classification

Lasers are categorized into different classes according to their ability to cause eye and other damage. The International Electrotechnical Commission (IEC) is a global organization that prepares and publishes international standards for all electrical, electronic, and related technologies. The IEC document 60825-1 outlines the safety of laser products. A description of each class of laser is given below:



Class	Description	Warning Label
1	This class of laser is safe under all conditions of normal use, including use with optical instruments for intrabeam viewing. Lasers in this class do not emit radiation at levels that may cause injury during normal operation, and therefore the maximum permissible exposure (MPE) cannot be exceeded. Class 1 lasers can also include enclosed, high-power lasers where exposure to the radiation is not possible without opening or shutting down the laser.	
1M	Class 1M lasers are safe except when used in conjunction with optical components such as telescopes and microscopes. Lasers belonging to this class emit large-diameter or divergent beams, and the MPE cannot normally be exceeded unless focusing or imaging optics are used to narrow the beam. However, if the beam is refocused, the hazard may be increased and the class may be changed accordingly.	
2	Class 2 lasers, which are limited to 1 mW of visible continuous-wave radiation, are safe because the blink reflex will limit the exposure in the eye to 0.25 seconds. This category only applies to visible radiation (400 - 700 nm).	
2M	Because of the blink reflex, this class of laser is classified as safe as long as the beam is not viewed through optical instruments. This laser class also applies to larger-diameter or diverging laser beams.	
3R	Lasers in this class are considered safe as long as they are handled with restricted beam viewing. The MPE can be exceeded with this class of laser, however, this presents a low risk level to injury. Visible, continuous-wave lasers are limited to 5 mW of output power in this class.	
3B	Class 3B lasers are hazardous to the eye if exposed directly. However, diffuse reflections are not harmful. Safe handling of devices in this class includes wearing protective eyewear where direct viewing of the laser beam may occur. In addition, laser safety signs lightboxes should be used with lasers that require a safety interlock so that the laser cannot be used without the safety light turning on. Class-3B lasers must be equipped with a key switch and a safety interlock.	
4	This class of laser may cause damage to the skin, and also to the eye, even from the viewing of diffuse reflections. These hazards may also apply to indirect or non-specular reflections of the beam, even from apparently matte surfaces. Great care must be taken when handling these lasers. They also represent a fire risk, because they may ignite combustible material. Class 4 lasers must be equipped with a key switch and a safety interlock.	
All class 2 lasers (and higher) must display, in addition to the corresponding sign above, this triangular warning sign		

[Hide UV/VIS Detector Card: 250 to 540 nm](#)

UV/VIS Detector Card: 250 to 540 nm

- ▶ Does Not Require Charging
- ▶ Two Engraved Reticles for Use in Beam Collimation
- ▶ Absorption Wavelength Range Printed on Card
- ▶ Overall Dimensions (W x H): 2.10" x 3.40"

The VRC1 is a credit-card-sized detector card for viewing light in the 250 to 540 nm wavelength range. The lower front surface of this durable plastic card is photosensitive and enables the easy location of ultra-violet (UV) and visible (through 540 nm) light beams and focal points. As it is not necessary to charge the active region of the card

VRC1 Specifications	
Spectral	
Absorption Wavelength Range	250 - 540 nm
Emission Wavelength Range	450 - 750 nm
Emission Center Wavelength	580 nm
Sensitivity Graph	
Dimensional	
Active Region	2.10" x 1.20" (53.3 mm x 30.5 mm)
Overall	2.10" x 3.40" (53.3 mm x 86.4 mm)
Complete	

before use, either CW or pulsed incident light will generate emission, even when the card is used in a darkened room.

To facilitate the use of the card during alignment procedures, the detection region extends all the way to the edge of the card and includes two engraved reticles for use in laser beam collimation. These reticles, formed from lines that are about 0.004" wide, feature two concentric circles that have diameters of approximately 0.063" and 0.288" with horizontal and vertical lines that are approximately 0.512" long. When the card is used in a darkened room with a sufficiently bright source, the fluorescence from the activated photosensitive region can be seen through the back of the card. The photosensitive region can also be activated by illuminating the back of the card, which is useful when aligning two beams to overlap.

Visible Emission Performance	
Charging Required for Emission	No
Minimum Pulsed Stimulation for Emission ^a	<8 W/cm ² at 337 nm, 4 ns Pulses, 20 Hz <40 W/cm ² at 337 nm, 4 ns Pulses, 1 Hz
Minimum CW Stimulation for Emission ^a	<1 nW/cm ² at 450 nm <1 nW/cm ² at 365 nm
Persistence of Emission ^b	6 s to 4 min
Minimum Stimulation to Quench Emission ^a	2 MW/cm ² at 1064 nm, Ten 7 ns Pulses
Damage Threshold, Single 7 ns Pulse	
1064 nm	60 MW/cm ²
337 nm	130 MW/cm ²

- Darkened Conditions
- With stimulus removed. Persistence length depends on ambient light conditions.

Part Number	Description	Price	Availability
VRC1	UV/VIS Detector Card, 250 - 540 nm	\$79.00	Today



[Hide VIS/NIR Detector Card: 400 to 640 nm and 800 to 1700 nm](#)

VIS/NIR Detector Card: 400 to 640 nm and 800 to 1700 nm

- ▶ Requires Charging by Visible Light
- ▶ Two Engraved Reticles for Use in Beam Collimation
- ▶ Absorption Wavelength Ranges Printed on Card
- ▶ Overall Dimensions (W x H): 2.10" x 3.40"

The VRC2 is a credit-card-sized detector card for viewing light in the 400 to 640 nm or the 800 to 1700 nm wavelength range. The lower front surface of this durable plastic card is photosensitive and enables the easy location of visible or near-infrared (NIR) light beams and focal points. Before using the card, it is necessary to charge the active region with visible light. As a consequence of the card needing to be charged to generate emission, during operation the user must move the position of the incident light spot around the active region to maintain the intensity of the excited emission.

To facilitate the use of the card during alignment procedures, the detection region extends all the way to the edge of the card and includes two engraved reticles for use in laser beam collimation. These reticles, formed from lines that are about 0.004" wide, feature two concentric circles that have diameters of approximately 0.063" and 0.288" with horizontal and vertical lines that are approximately 0.512" long.

VRC2 Specifications	
Spectral	
Absorption Wavelength Ranges	400 - 640 nm 800 - 1700 nm
Emission Wavelength Range	~580 to 750 nm
Sensitivity Graph	
Dimensional	
Active Region	2.10" x 1.20" (53.3 mm x 30.5 mm)
Overall	2.10" x 3.40" (53.3 mm x 86.4 mm)
Complete	
Visible Emission Performance	
Charging Required for Emission	Yes
Minimum Pulsed Stimulation for Emission ^a	250 kW/cm ² at 1064 nm, 7 ns Pulses, 10 Hz
Minimum CW Stimulation for Emission ^a	<2 μW/cm ² at 808 nm <175 nW/cm ² at 960 nm <100 μW/cm ² at 1550 nm
Damage Threshold, Single 7 ns Pulse	
1064 nm	35 MW/cm ²



- Darkened Conditions

Part Number	Description	Price	Availability
VRC2	VIS/IR Detector Card, 400 - 640 nm, 800 - 1700 nm	\$79.00	Today

[Hide NIR Detector Card: 700 to 1400 nm](#)**NIR Detector Card: 700 to 1400 nm**

- ▶ Requires Charging by Visible Light
- ▶ Sensitivity Curve Printed on Card
- ▶ Overall Dimensions (W x H): 1.75" x 2.50"

The VRC5 laser viewing card is designed for operation in the 700 to 1400 nm wavelength range. The photosensitive area at the top of the card measures 1.50" x 0.75" and is laminated between sheets of durable clear plastic. Before the card is used, the active region must be charged with visible light. As a consequence of the card needing to be charged to generate emission, during operation the user must move the position of the incident light spot around the active region to maintain the intensity of the excited emission.

VRC5 Specifications	
Spectral	
Absorption Wavelength Range	700 - 1400 nm
Emission Wavelength Range	Visible
Sensitivity Graph	
Dimensional	
Active Region	1.50" x 0.75" (38.1 mm x 19.1 mm)
Overall	1.75" x 2.50" (44.5 mm x 63.5 mm)
Complete	
Visible Emission Performance	
Charging Required for Emission	Yes



Part Number	Description	Price	Availability
VRC5	IR Detector Card, 700 - 1400 nm	\$123.00	Today

[Hide NIR Detector Card: 790 to 840 nm, 870 to 1070 nm, and 1500 to 1590 nm](#)**NIR Detector Card: 790 to 840 nm, 870 to 1070 nm, and 1500 to 1590 nm**

- ▶ Does Not Require Charging by Visible Light
- ▶ Two Engraved Reticles for Use in Beam Collimation
- ▶ Absorption Wavelength Ranges Printed on Card
- ▶ Overall Dimensions (W x H): 2.10" x 3.40"

The VRC4 is a credit-card-sized detector card for viewing light in the 790 to 840 nm, 870 to 1070 nm, and 1500 to 1590 nm wavelength ranges. The lower front surface of this durable plastic card is photosensitive and enables the easy location of near-infrared (NIR) light beams and focal points. As it is not necessary to charge the active region of the card before use, either CW or pulsed incident light will generate emission, even when the card is used in a darkened room.

To facilitate the use of the card during alignment procedures, the detection region extends all the way to the edge of the card and includes two engraved reticles for use in laser beam collimation. These reticles, formed from lines that are about 0.004" wide, feature two concentric circles that have diameters of approximately 0.063" and 0.288" with horizontal and vertical lines that are approximately 0.512" long. When the card is used in a darkened room with a sufficiently bright source, the fluorescence from the activated photosensitive region can be seen through the back of the card. The photosensitive region can also be activated by illuminating the back of the card, which is useful when aligning two beams to overlap.

VRC4 Specifications	
Spectral	
Absorption Wavelength Ranges	790 - 840 nm 870 - 1070 nm 1500 - 1590 nm
Emission Wavelength Range	~520 - 580 nm
Sensitivity Graph	
Dimensional	
Active Region	2.10" x 1.20" (53.3 mm x 30.5 mm)
Overall	2.10" x 3.40" (53.3 mm x 86.4 mm)
Complete	
Visible Emission Performance	
Charging Required for Emission	No
Visible Emission, Minimum Stimulation(Pulsed) ^a	250 kW/cm ² at 1064 nm, 7 ns Pulses, 10 Hz
Visible Emission, Minimum Stimulation (CW) ^a	<2 μW/cm ² at 808 nm <175 nW/cm ² at 960 nm <100 μW/cm ² at 1550 nm
Damage Threshold, Single 7 ns Pulse	
1064 nm	35 MW/cm ²

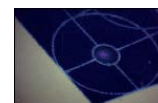
- Darkened Conditions

Part Number	Description	Price	Availability
VRC4	IR Detector Card, 790 - 840 nm, 870 - 1070 nm, 1500 - 1590 nm	\$79.00	Today

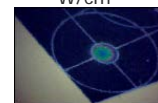
[Hide MIR Detector Card: 1500 to >13.200 nm](#)

MIR Detector Card: 1500 to >13,200 nm

- ▶ Liquid Crystal Film Changes Color When Exposed to Mid-IR (MIR) Light
- ▶ Active Area: 2.13" x 1.20"
- ▶ Minimum Detectable Power Density: 0.3 W/cm² @ 1550 nm
- ▶ Recovery Time: <1 Second
- ▶ Overall Dimensions (W x H): 2.13" x 3.37"



Ø0.5 mm Spot at 0.3 W/cm²



Ø1.0 mm Spot at 2.0 W/cm²

Click to Enlarge

The VRC6 detector area is green between 25 and 30 °C and is black or brown at other temperatures.

The VRC6 MIR laser viewing card has been tested to work with wavelengths from 1.5 μm to at least 13.2 μm. The detector area on this card is a thin layer of liquid crystal that has been printed onto the black metal card. Thermochromic liquid crystals are temperature-sensitive organic chemicals with twisted helical molecular structures. MIR light changes the temperature of the detector area, resulting in a color change. The detector area is green between 25 and 30 °C, and it is black or brown otherwise. Simply tap the card on a tabletop to return the color to the resting state.

The detection region extends all the way to the edge of the card in order to facilitate the use of the card during alignment procedures, and each card features two engraved reticles for use in laser beam collimation.

Please Note: The spot size on the card will vary depending on beam power. The photos to the right demonstrate the spot size on the card at the minimum detected power density, 0.3 W/cm², and at 2.0 W/cm². The engraved reticles are also visible in these photos. Please see the *Graphs* tab for more photos and details on the spot size variation.

Part Number	Description	Price	Availability
VRC6	MIR Liquid Crystal Detector Card	\$25.80	Today