Infra Red (IR) Photography

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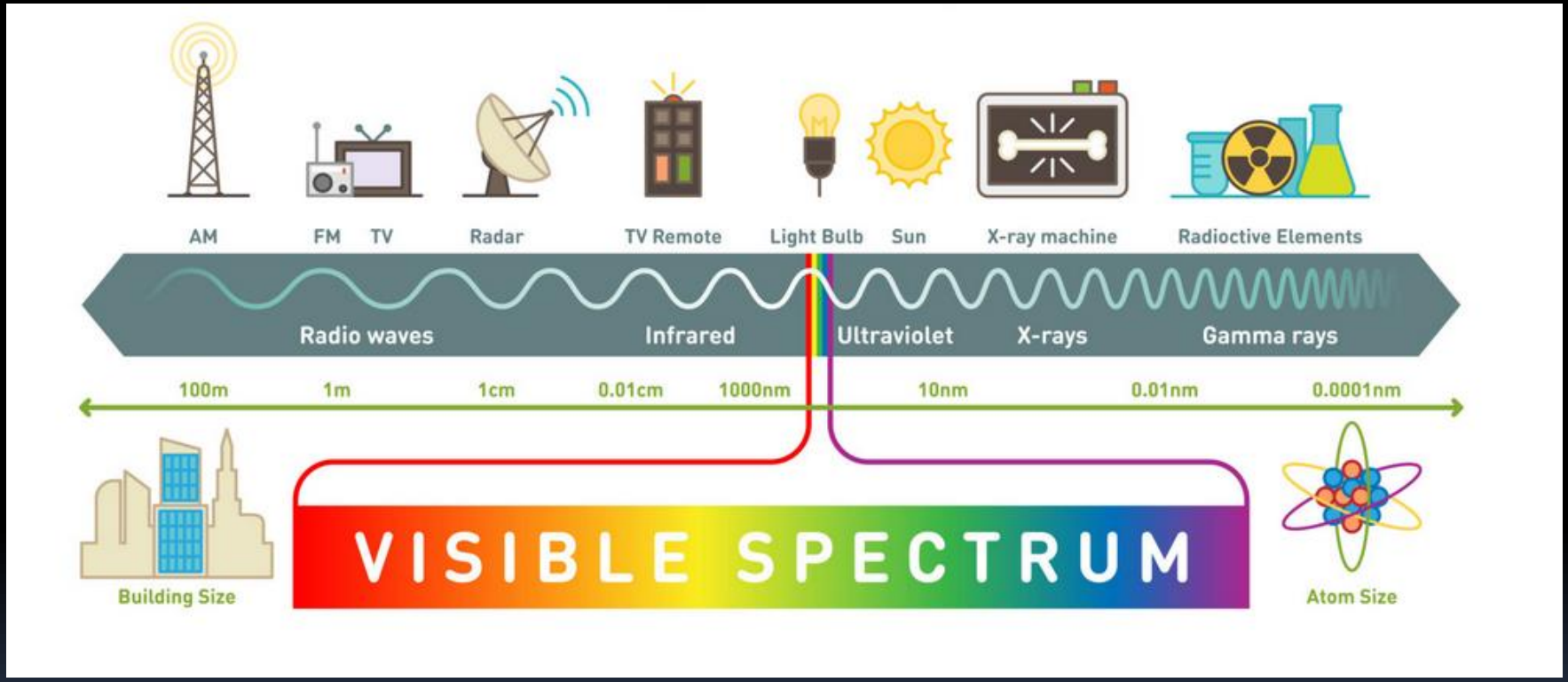
What I’m going to cover

- What is infra red (IR)
- What do IR photos look like relative to ‘visible’ light photos
- What are the barriers to taking IR photos
- What kit do you need
- What processing do you need to do
- Is it all worth it?

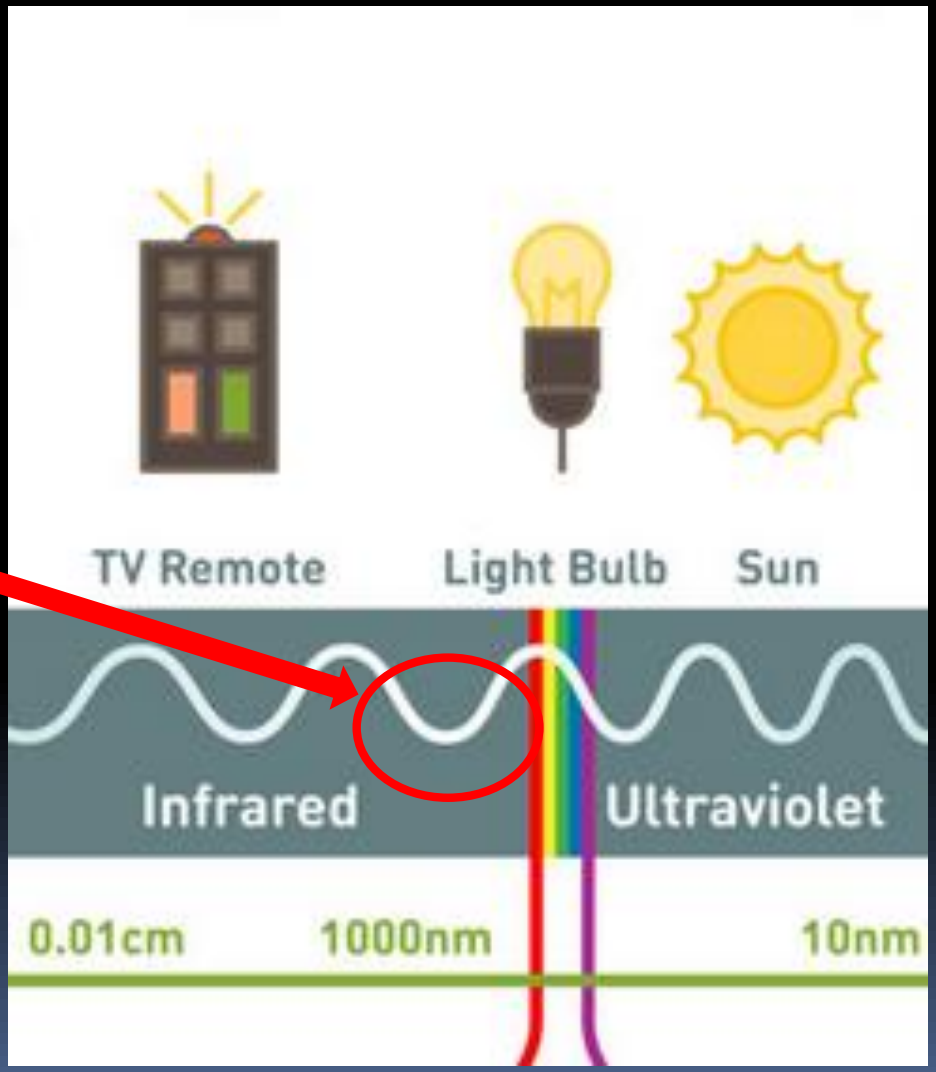
What is IR?

The Electromagnetic Spectrum



The Electromagnetic Spectrum

- Near IR
- 700-1200nm
- Just outside human visibility
- Used in IR photography



What do IR photos look like relative to visible light photos?

IR images can be processed as ‘colour’ or B&W

- By definition, colour is a property of visible light as interpreted by humans
- Because humans cannot perceive IR, ‘coloured’ IR images are an artificial construct derived via post-production (e.g. colour channel swapping)
- Such images look striking (not necessarily in a good way) and very unnatural

Examples of IR images processed for colour

Will not discuss colour IR further

- will focus on mono

Properties of IR photos processed in mono

- Blue skies are rendered as dark grey – black (with white clouds)
- Green foliage is rendered as light grey – white (most characteristic)
- Water is rendered as dark grey – black
- Buildings tend to be rendered naturally (shades of grey)
- Skin tones are rendered milky, washed out and lacking detail

Examples of some IR images processed for mono


tangents photography


Chris Collins
shutterstock

Aesthetic & practical limitations of IR photography

- Some landscapes can look striking and other-worldly (in a good way)
- Best landscape results are obtained with blue skies / white clouds with trees in full summer foliage, in full overhead sunlight at around 10am – 2pm (probably the worse time for visible light photos)
- Cloudy / overcast / misty days do not give good enough sky / foliage contrast
- Architecture & urban photos can look striking with black (e.g. blue) skies / white clouds but this effect can be emulated with a normal photo converted to mono with the blues dialled down when processing
- Macro, nature, street, portraiture and reportage images are not suited to an IR approach because of no aesthetic benefit or technical difficulty (see later)

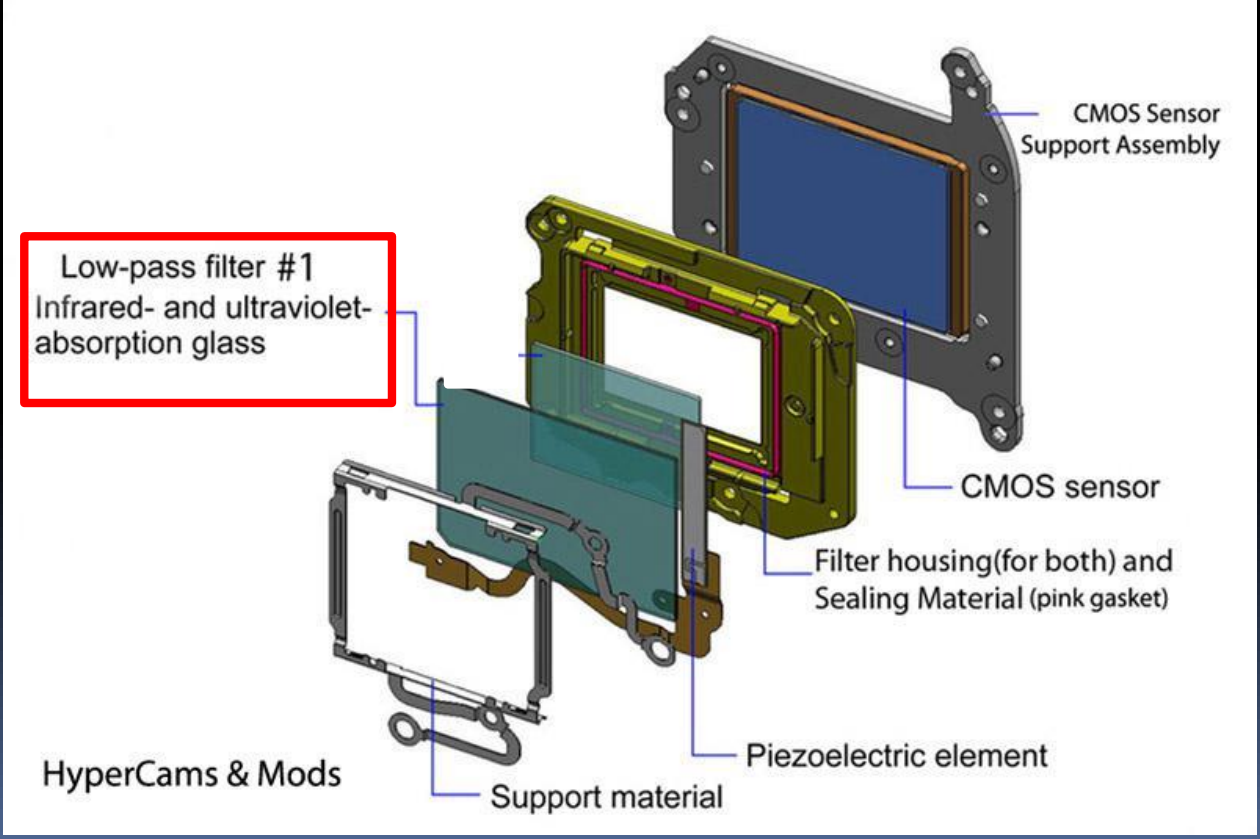
Barriers to taking IR Photographs

Barriers to IR Photography

- Modern digital camera sensors are very sensitive to IR (similar to visible light)
- Because of this, IR interferes with the accurate rendition of visible light photos
- Consequently, most digital cameras have an IR blocking filter in front of the sensor

Barriers to IR Photography

Most digital cameras are designed to block IR as effectively as possible



Overcoming the inbuilt filter barrier

1. Convert a regular camera to an IR camera by removing this filter

OR

2. Use a regular camera with an IR lens filter and deal with the dire exposure consequences

Converting a regular camera to IR only

Converting a camera to an IR camera

- IR blocking / Visible pass filter is removed by a specialist
- An IR pass / Visible blocking filter is put in its place
- Advantage - the camera will take IR photos (only) with exposures similar to visible light
- Disadvantage – cost of conversion / purchase and another camera for your kitbag

Best cameras for conversion

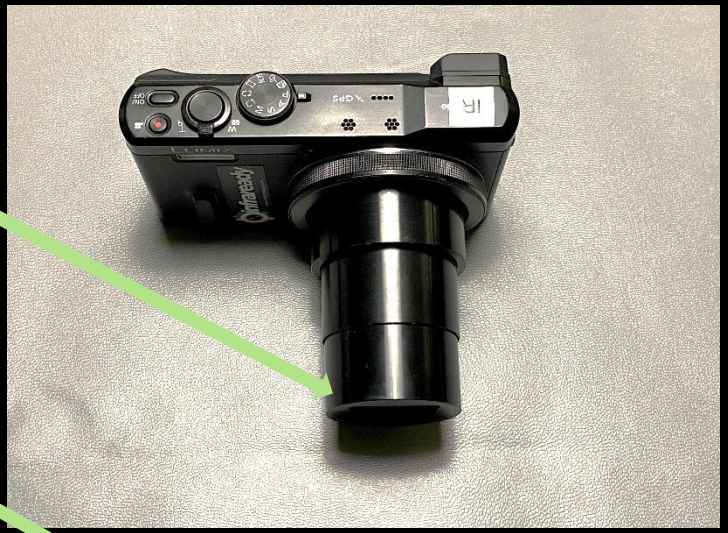
- Any converted DSLR (bulky / heavy) will send a visible light (only) image to the viewfinder via the mirror
- Live view (backscreen) needs to be used to see the IR image
- Do you really want another bulky, heavy, converted DSLR camera in your bag just for the occasional shot?
- Any converted mirrorless camera will show the true IR image via electronic viewfinder (EV) and / or backscreen
- Ideal camera is a small compact mirrorless camera with EV and decent wide – mid range zoom lens

Converted my old Lumix DMC-TZ60

- Lumix DMC-TZ60 a compact travel-zoom camera
- Was my ‘spare’ back-up camera when I wanted to travel light
- Upgraded spare camera to a Sony RX100 MK 6
- DMC-TZ60 became redundant
- Infraready converted it to IR with internal 720nm filter for £65

Lumix DMC-TZ60 (£50-90 used)

- 30x 24-720mm (equiv) lens
- 18.1 megapixel sensor
- Electronic viewfinder
- 3-inch 920K dot LCD
- 5-axis image stabiliser
- Built-in Wi-Fi, NFC, GPS connectivity



IR Photos taken with converted camera

(note ‘normal’ exposure data)

1/400s / f3.9 / iso 200

1/400s / f3.3 / iso 100

Stitched panorama 1/1000s / f3.3 / iso 100

1/320s / f3.3 / iso 100

1/50s / f3.3 / iso 400

1/400s / f3.6 / iso 400

1/250s / f3.3 / iso 100

1/250s / f3.3 / iso 100

Alternative

Use an IR pass lens filter on your current camera

(and manage the dire exposure consequences)

Hoya R72, 720nm IR pass filter

- Amazon: 52mm, £44 72mm, £55
- Always buy ‘specialist’ filters to fit your lens with the largest filter thread and then use cheap step-up rings to use same filter on smaller lens
- Individual step-up rings are around £10 each or £15 for a set of 8

Managing the dire exposure consequences

- Using an IR filter used to be fraught with difficulty
- An IR pass (light block) lens filter reduces exposure by about 12 stops (= 2^{12} = 4000 x less exposure)
- Can compensate by using longer shutter speed (with tripod) – but any slight movement in foliage will blur image
- Can use widest apertures – but could compromise depth of field
- Or can keep shutter speed fast enough to freeze foliage movement at wider aperture and use heroically high iso level (with risk of noise / poor image quality)

What's Changed?

Before

- Older DSLR / mirrorless / compact cameras had very poor high iso performance and noise could be a real issue above iso 800

- Noise reducing software was adequate at best and tended to soften detail

Now

- New generation of cameras, especially full-frame mirrorless, have exceptional high iso performance and can shoot at iso 204,000 with noise becoming problematic only at iso >102,000

- Latest AI-based de-noise software (Topaz De-Noise AI) is exceptional and only treats noise where noticeable leaving detail intact

Comparing exposures & high iso noise performance

Canon R6 (full-frame mirrorless) - 1/250s / f8 / iso 200

Same shot / camera / light with IR pass lens filter

Original exposure - 1/250s / f8 / iso 200

With IR filter (handheld) – 1/15s (+4) / f4 (+2) / iso 102,400 (+6) = +12 stops

+12 stops = 10^{12} = 4000x more exposure needed with IR filter in place

Crop shows degree of noise present at iso 102,400

Same Crop after Topaz De-Noise AI

Noise in sky controlled, leaf detail retained

Capturing IR – In camera white balance options

1. Leave white balance on auto

- The image will be shades of red in camera before it is converted to B&W in post

2. Create a custom white balance

- Position a piece of white A4 paper in full sunlight
- Create a new custom white balance setting by focussing on the paper with the IR pass filter on the lens – save as a new IR preset
- The images will be almost monochrome in camera before being converted to B&W in post

- Both methods give the same result in post
- The second method gives a better feel for how the image will look
- But don’t forget to switch back to AWB!

White Balance Auto

Convert to B&W

Same

White Balance Custom

Convert to B&W

Post Processing IR images

Post Processing IR Images

- Regardless of the capture method, once converted to B&W, all IR images are flat, low contrast and usually noisy
- Mid-tone contrast is particularly low and ‘muddy’

A good post processing sequence in the LR develop module (or PS Camera Raw filter) is as follows:

- Convert to B&W
- De-noise the image with Topaz De-Noise AI (in PS or standalone prog) ALWAYS DO FIRST
- Take the image into the LR develop mode or PS Camera Raw filter
- Increase the clarity (midtone contrast) slider to +50-100%
- Increase the texture slider to around +25%
- Adjust the shadows slider to around +20%
- Adjust the highlights, exposure, contrast, blacks & whites sliders accordingly while avoiding clipping of the whites and blacks

As taken (Auto white balance)

Converted to B&W

Denoise, clarity, texture, shadows, highlights, contrast, exposure

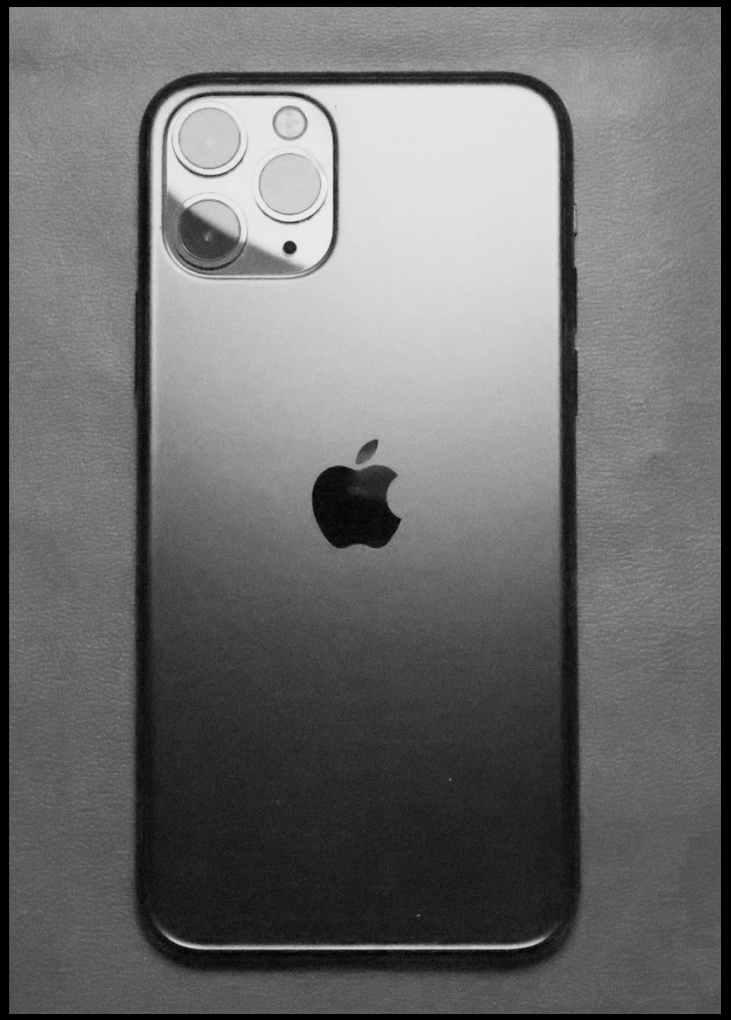
Final Option –

Use an IR pass lens filter on your other current camera

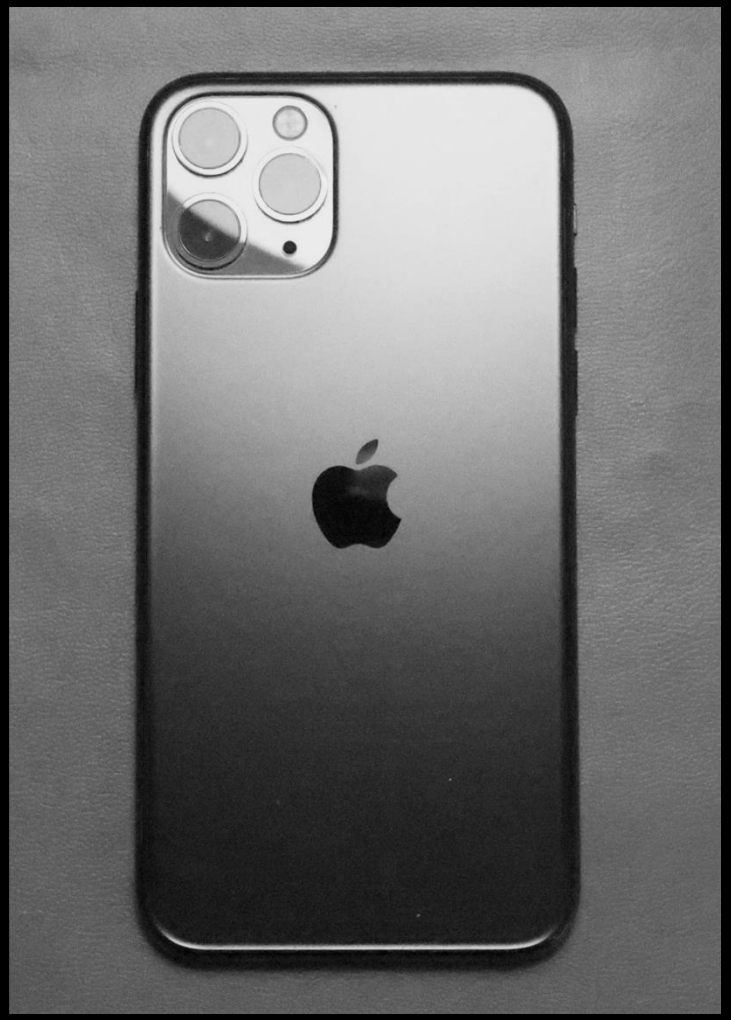
(and manage the dire exposure consequences)

Your other current camera!

- Your smartphone (Apple or Android) is the ‘other camera’ we often ignore as photo enthusiasts
- It is the best camera in the world because……



- Your smartphone (Apple or Android) is our ‘other camera’ we often ignore as photo enthusiasts
- It is the most useful camera in the world because…… you always have it with you!
- Don’t under-estimate these cameras, they are now as good as most pre-2018 compact cameras
- Apps (e.g. Halide) can give you manual control of shutter, iso and focus



Can a smartphone come anywhere close to taking IR photos that are ‘good enough’

How do you attach filters to a smartphone?

UKCOCO 37mm clip-on circular polarizer filter compatible with all smartphones

£13.50 Amazon

Apexel Phone Camera Lens Filter Kits - 52mm Graduated Colour Filter (Blue, Yellow, Orange, Red) CPL, ND32 and Star filters for all phones

£34 Amazon

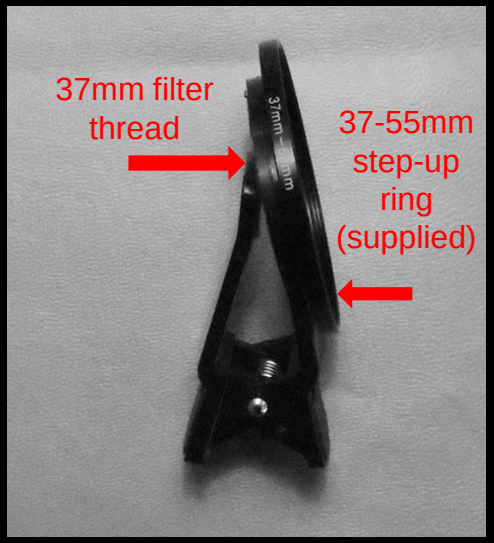
(this size filter also fits my Sony RX100 M6)

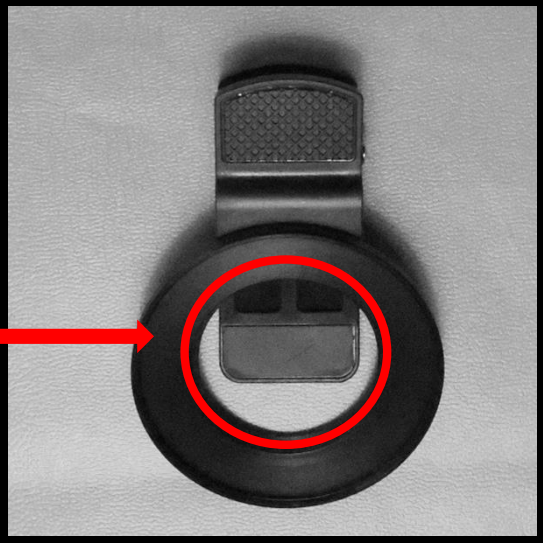
Urth 37mm IR R72 Filter

£34 Amazon

Hoya 52mm IR R72 Filter

£44 Amazon





Use a Stanley knife to cut out any baffle shaping inside ring

Make sure all camera lenses and sensors are exposed

With 37mm - 52mm step-up ring screwed in (unnecessary if you use 37mm filters)

With 52mm IR filter screwed in

Exposure and noise?

Comparing exposures & high iso noise performance

iPhone 11 pro, auto exposure, JPEG - 1/2400s / f1.8 / iso 32

Comparing exposures & high iso noise performance

iPhone 11 pro, auto exposure - 1/2400s / f1.8 / iso 32

With IR filter (handheld) – 1/35s (+6) / f1.8 / iso 640 (+4) = +10 stops

+10 stops = 2^{10} = 1000x more exposure needed with IR filter in place

Comparing exposures & high iso noise performance

B&W conversion – typically very flat and muddy but whites & blacks not clipped

Comparing exposures & high iso noise performance

Noise detail at iPhone iso 640

Comparing exposures & high iso noise performance

After Topaz Denoise AI treatment

Comparing exposures & high iso noise performance

Post processing:

Clarity +50, Texture +25, Contrast +20, Exposure +1, Highlights -50, Shadows -20

Audley End, Oct 2022

iPhone 11 pro, auto exposure, with IR filter (handheld), JPEG: 1/40s / f1.8 / iso 640

Audley End, Oct 2022

B&W conversion, de-noise, clarity, texture, contrast, exposure, highlights, shadows

Good enough quality for PDI or print competition?

Audley End, Oct 2022

Detail – some JPEG compression artifacts in clouds and foliage, no halos

Conclusions

- IR photography will always be a niche activity
- IR image conversion looks better in mono than in colour
- Best subjects are landscapes with blue, cloudy skies and trees in full summer foliage lit by full midday sun
- IR offers no benefit for macro, nature, (architecture), portraiture, street, or reportage photography
- All native IR images lack contrast and punch and need aggressive editing to give a good tonal range in monochrome

Conclusions

- All digital cameras have an inbuilt IR blocking filter
- This can be overcome by converting a (spare) mirrorless camera to IR
- Alternatively, an IR pass lens filter can be used on any camera but exposures need to be increased 1000-4000 fold (10-12 stops) via very high iso setting
- Modern mirrorless / full-frame cameras now have outstanding high-iso capabilities that make handheld exposures using an IR filter viable
- Surprisingly, modern phone cameras can take IR lens filter images to a good standard

Is it all worth it?

If you think IR photographs could feature as a serious / persistent addition to your portfolio

- Get a compact mirrorless camera with an electronic viewfinder, large sensor and a fixed wide - mid zoom lens
- Get it converted to IR and always carry it in your kit bag
- Cost will be the price of the camera plus around £100 for the conversion

Is it all worth it?

If you might take the odd IR image when the opportunity arises while on a landscape photoshoot

- Buy a 720nm IR lens filter for your largest lens and step-up filter(s) for your other lenses
- Carry these small items in your kit bag and use when the right landscape presents itself
- Be prepared to use very high iso settings and noise reduction software, your camera must not produce too much noise > iso 102,000
- Cost will be the price of the filter plus any step-up rings – around £65

Is it all worth it?

If you're not that convinced but maybe would like to dabble with the odd IR photo

- Buy and adapt a clip-on phone filter holder and IR filter and use it now and then
- You may be pleasantly surprised that you have an image good enough for a competition!
- Cost would be for the holder and filter – around £50

Is it all worth it?

If you’re not convinced at all and are mainly into macro / portraiture / street / architecture

- Do nothing
- You’ve saved yourself some money!

Any Questions?