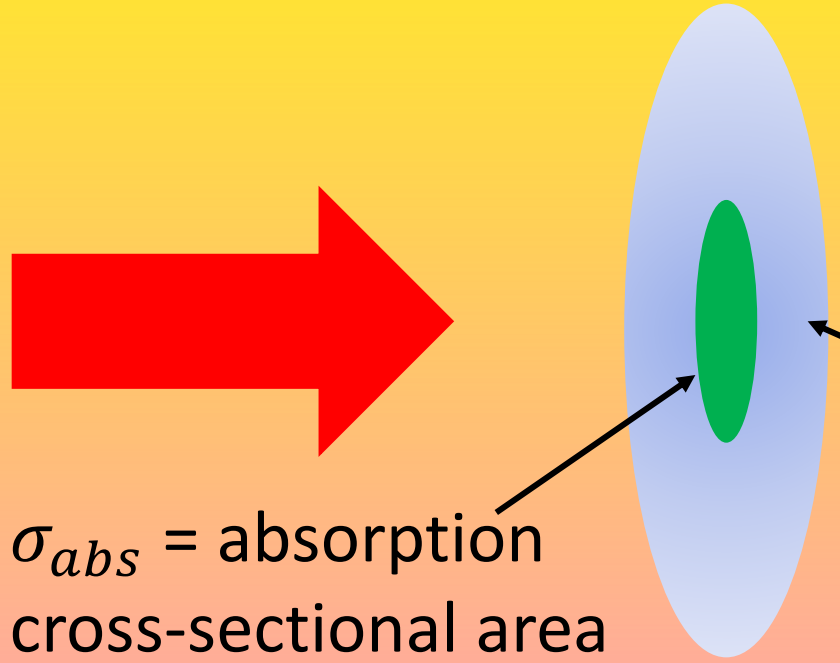
Colour – what is it?

Colour

- White light is ‘all’ colours mixed together
- Individual colours are simply white light with various wavelengths ‘subtracted out’

Colour

What is the probability of absorption?



σ_{abs} = absorption cross-sectional area

A = cross-sectional area of whole atom

Probability of absorption of photon = σ_{abs} / A

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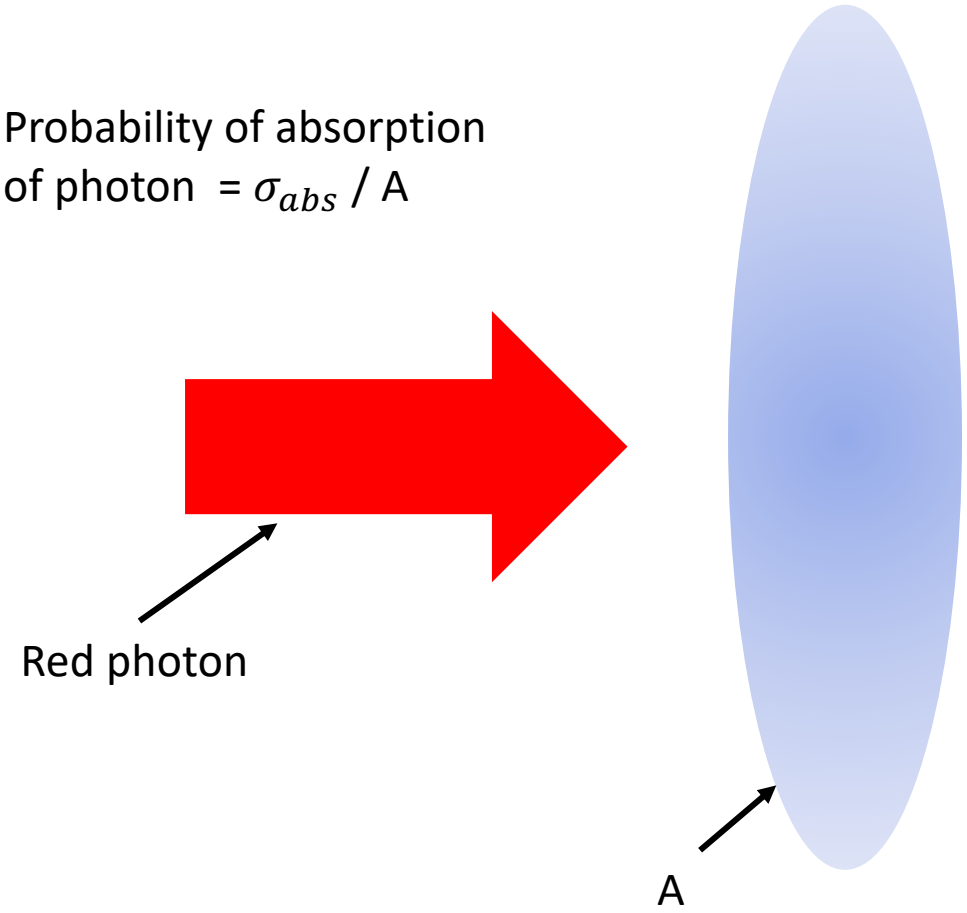
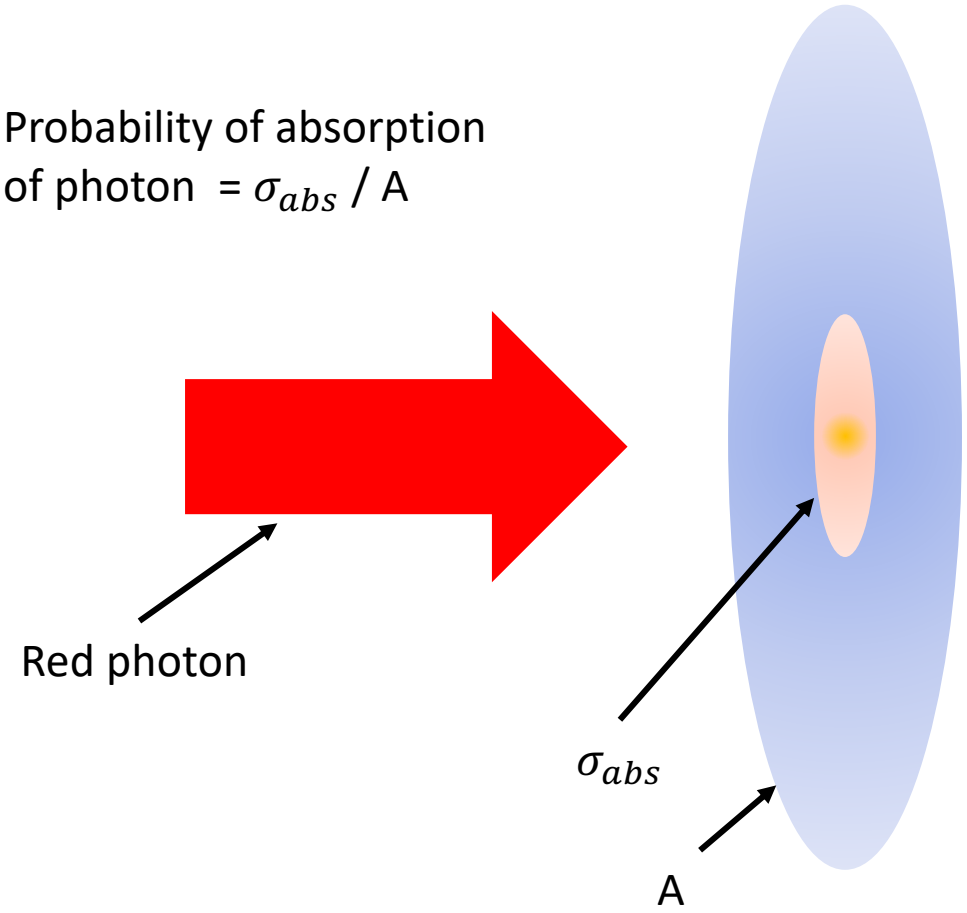
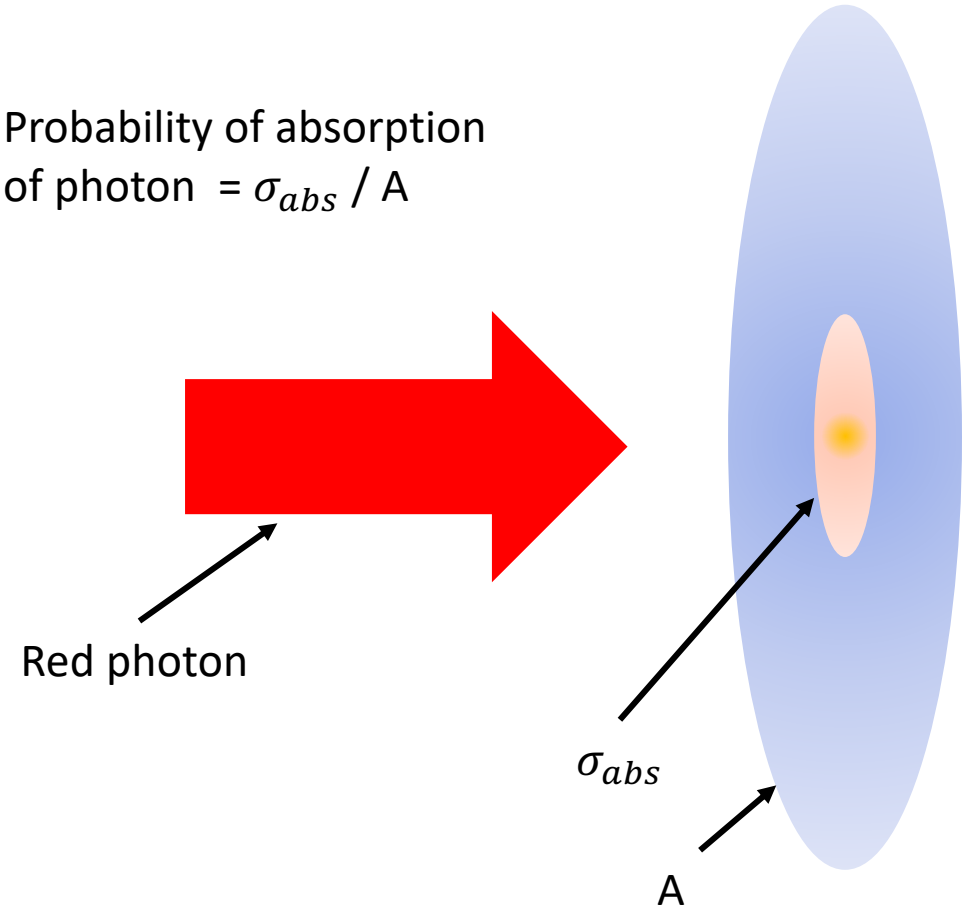


Probability of absorption of photon = σ_{abs} / A

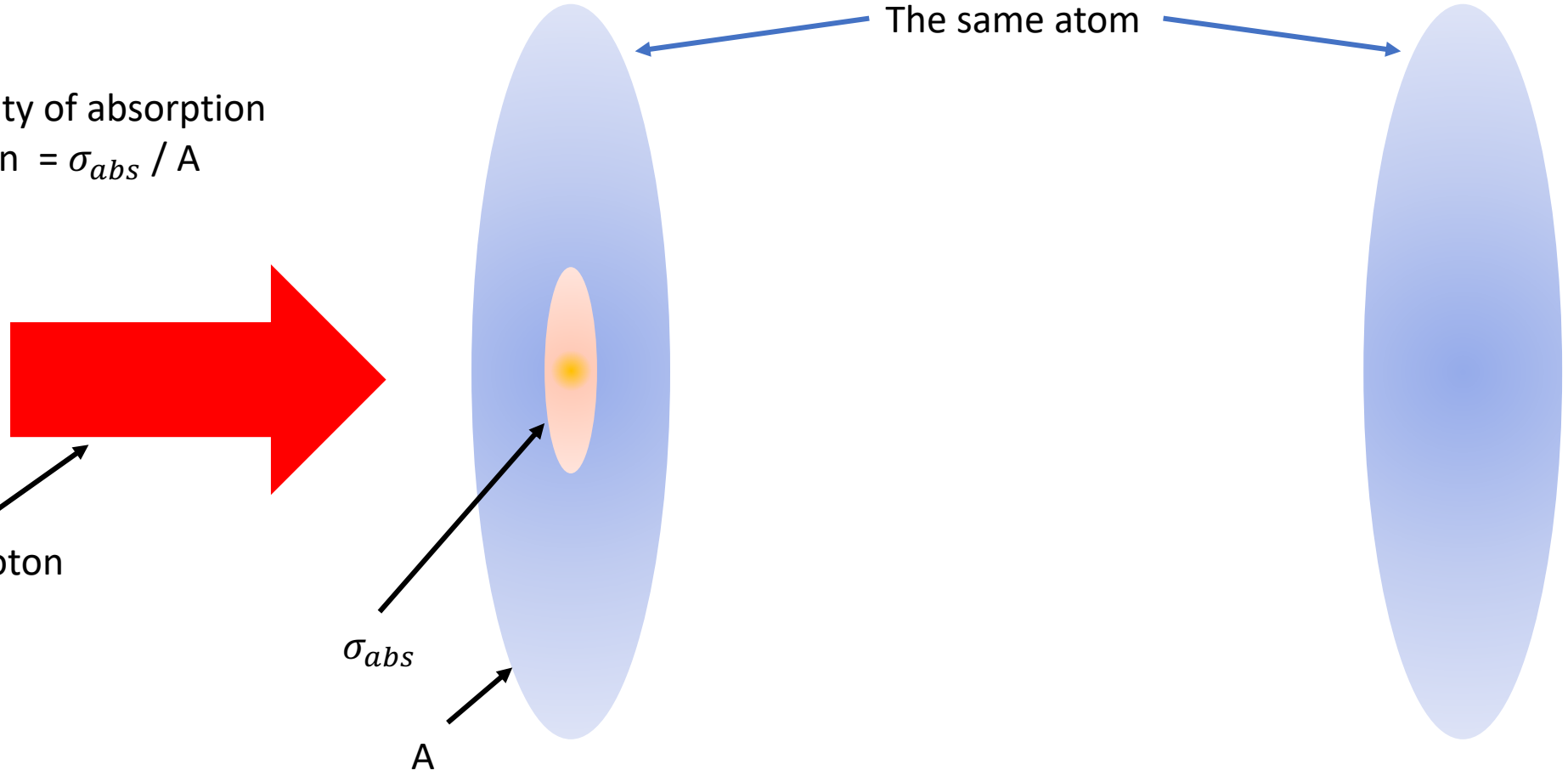


Probability of absorption of photon = σ_{abs} / A

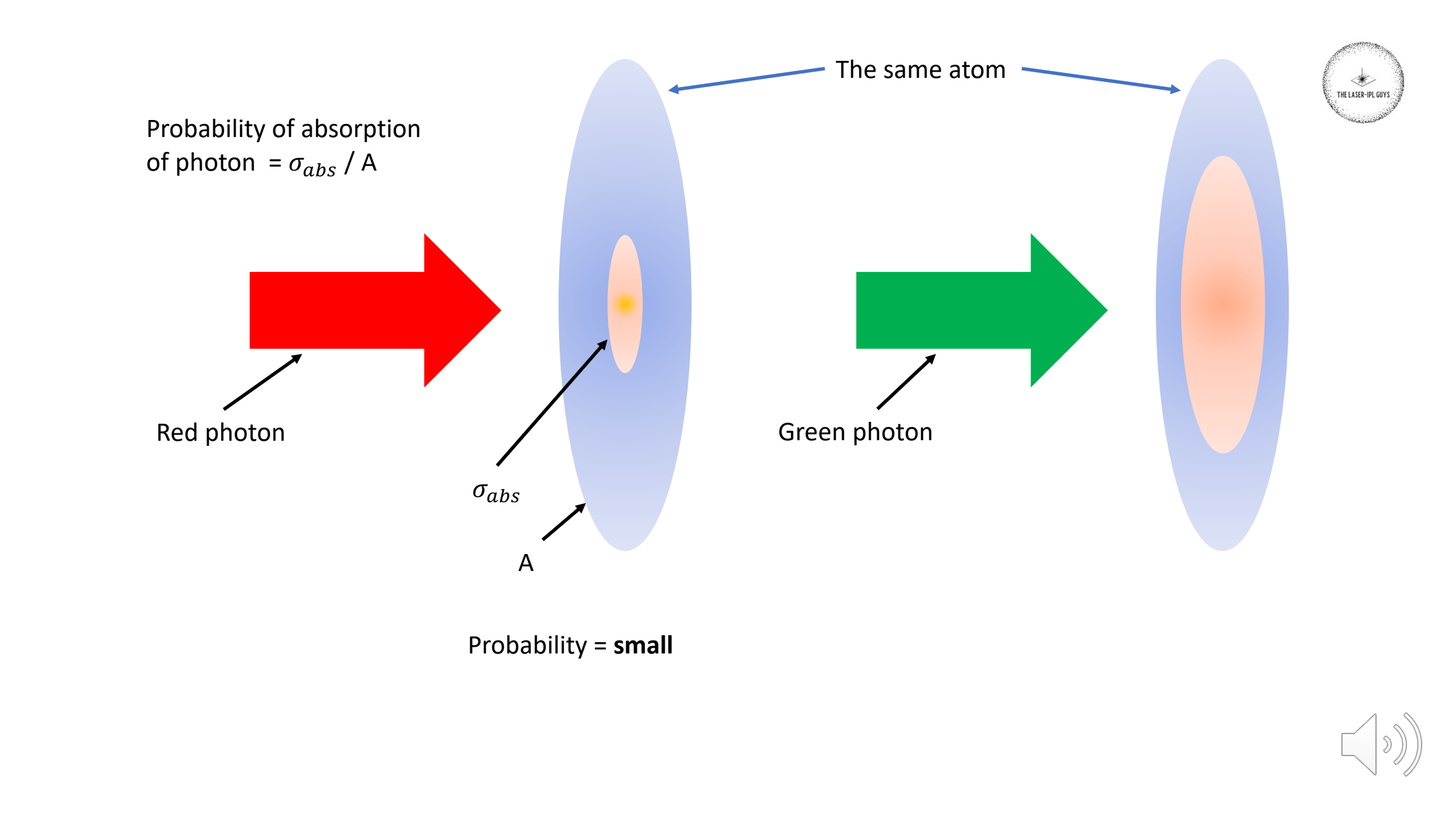


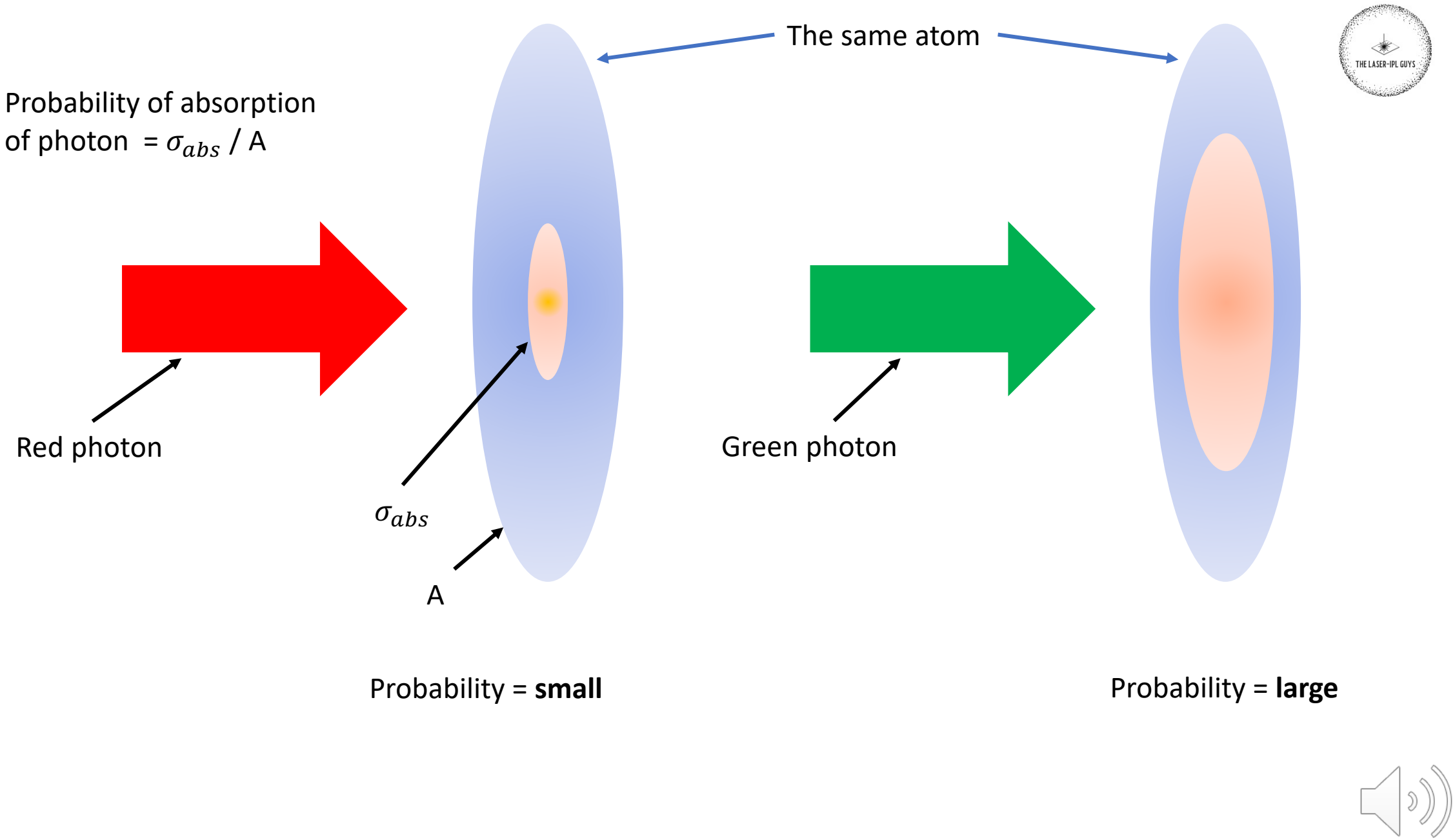
Probability = **small**

Probability of absorption of photon = σ_{abs} / A

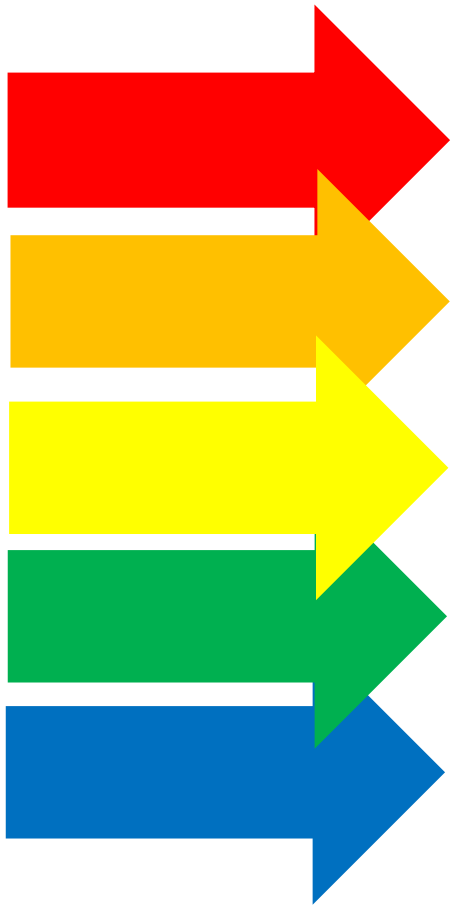


Probability = **small**

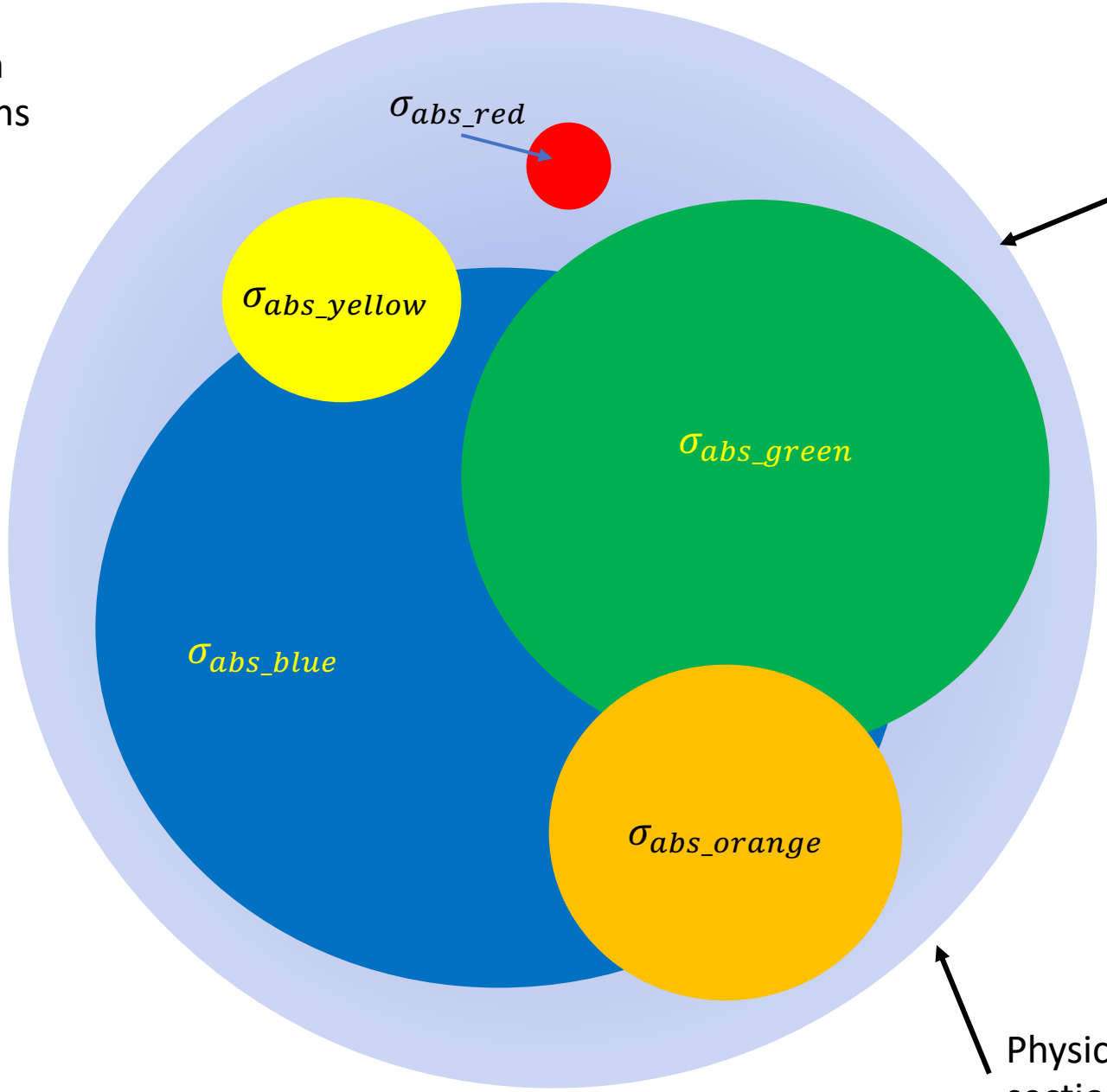

Probability of absorption of photon = σ_{abs} / A
The same atom
Red photon
σ_{abs}
A
Green photon
Probability = **small**


The same atom
Probability of absorption of photon = σ_{abs} / A
Red photon
σ_{abs}
A
Green photon
Probability = **small**
Probability = **large**

Probability of absorption depends on cross-sections



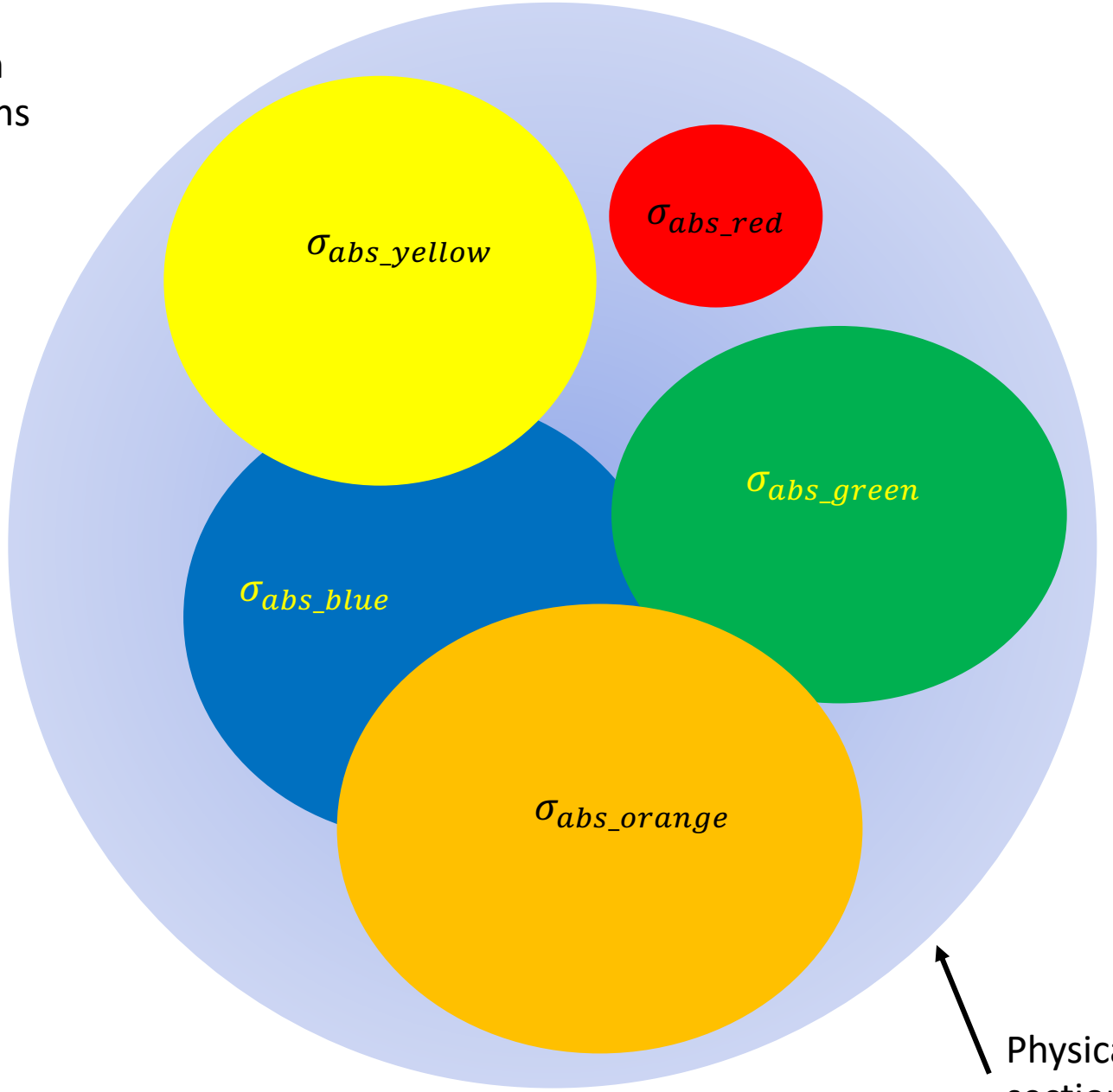
White light



'Reddish' object

Physical (geometrical) cross-sectional area

Probability of absorption depends on cross-sections

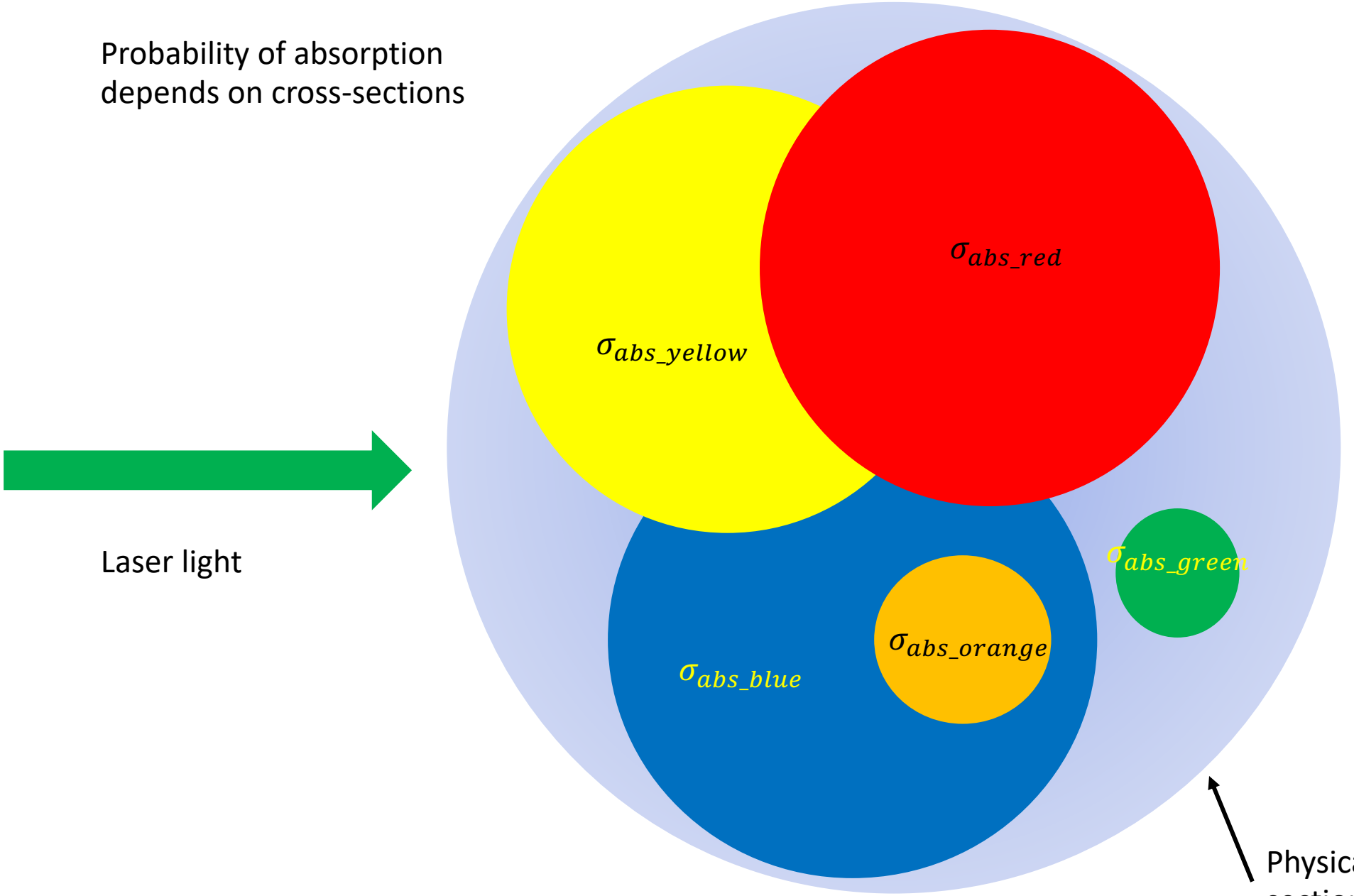


Laser light

?

Physical (geometrical) cross-sectional area

Probability of absorption
depends on cross-sections

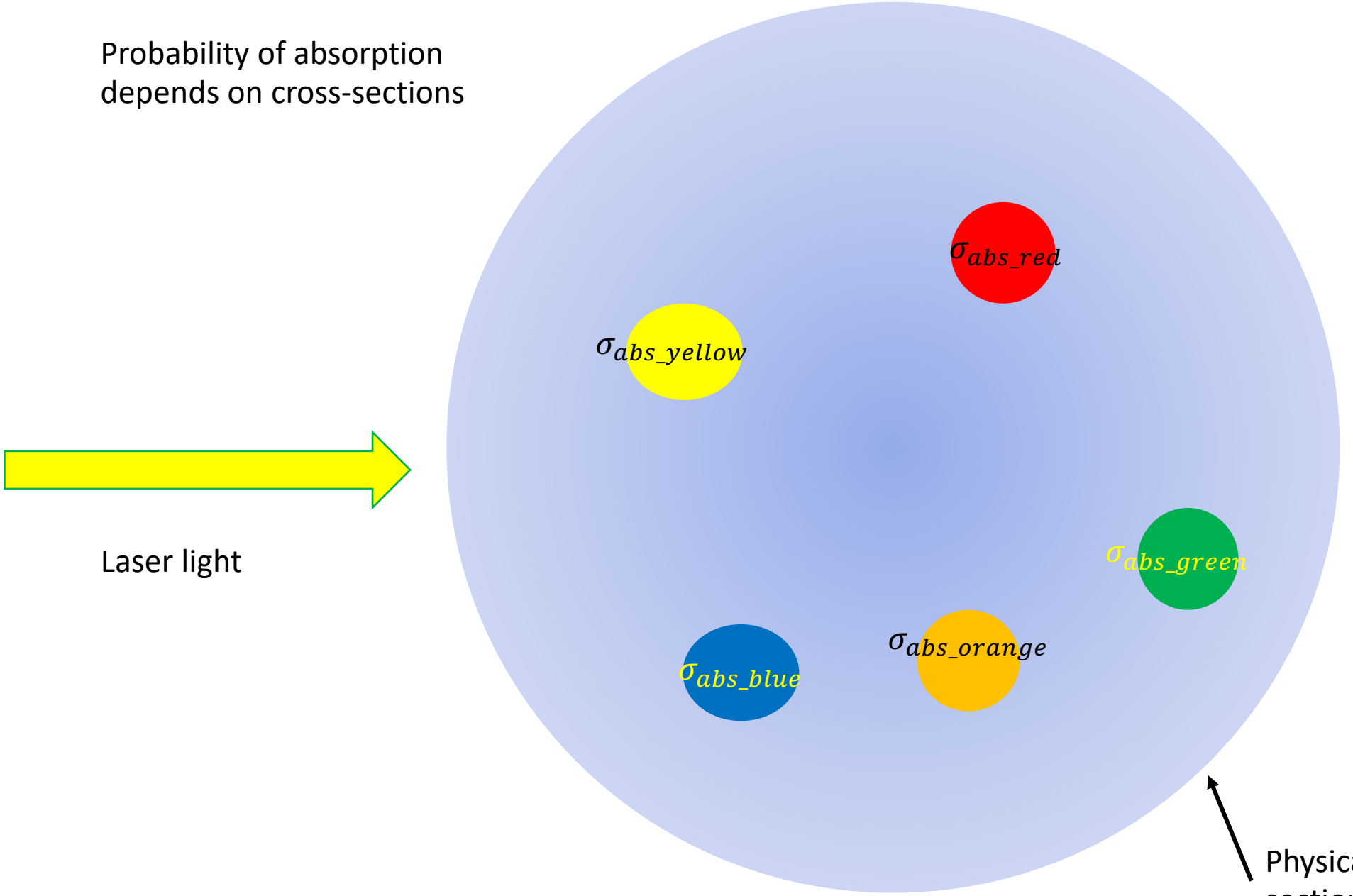


Laser light

?

Physical (geometrical) cross-sectional area

Probability of absorption depends on cross-sections

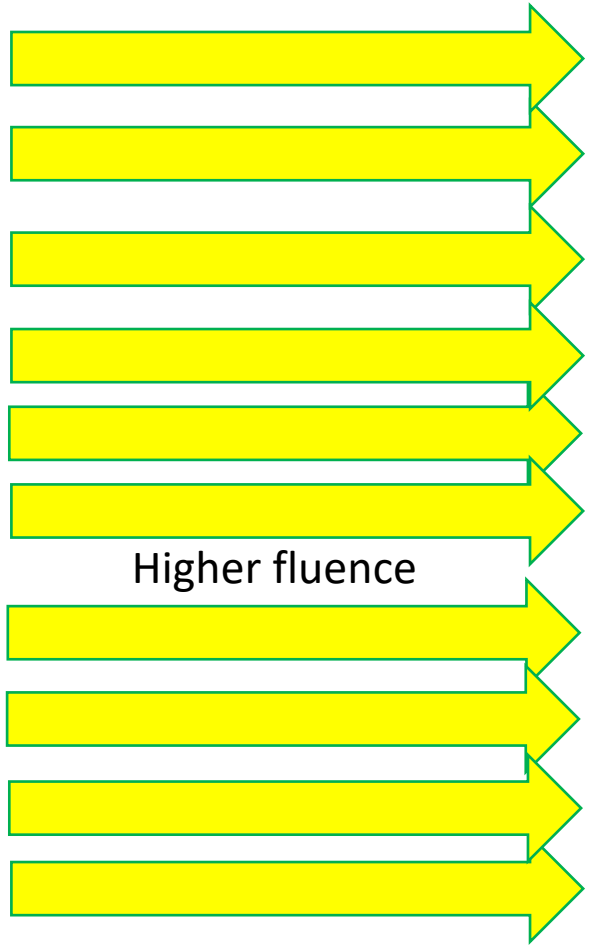


Laser light

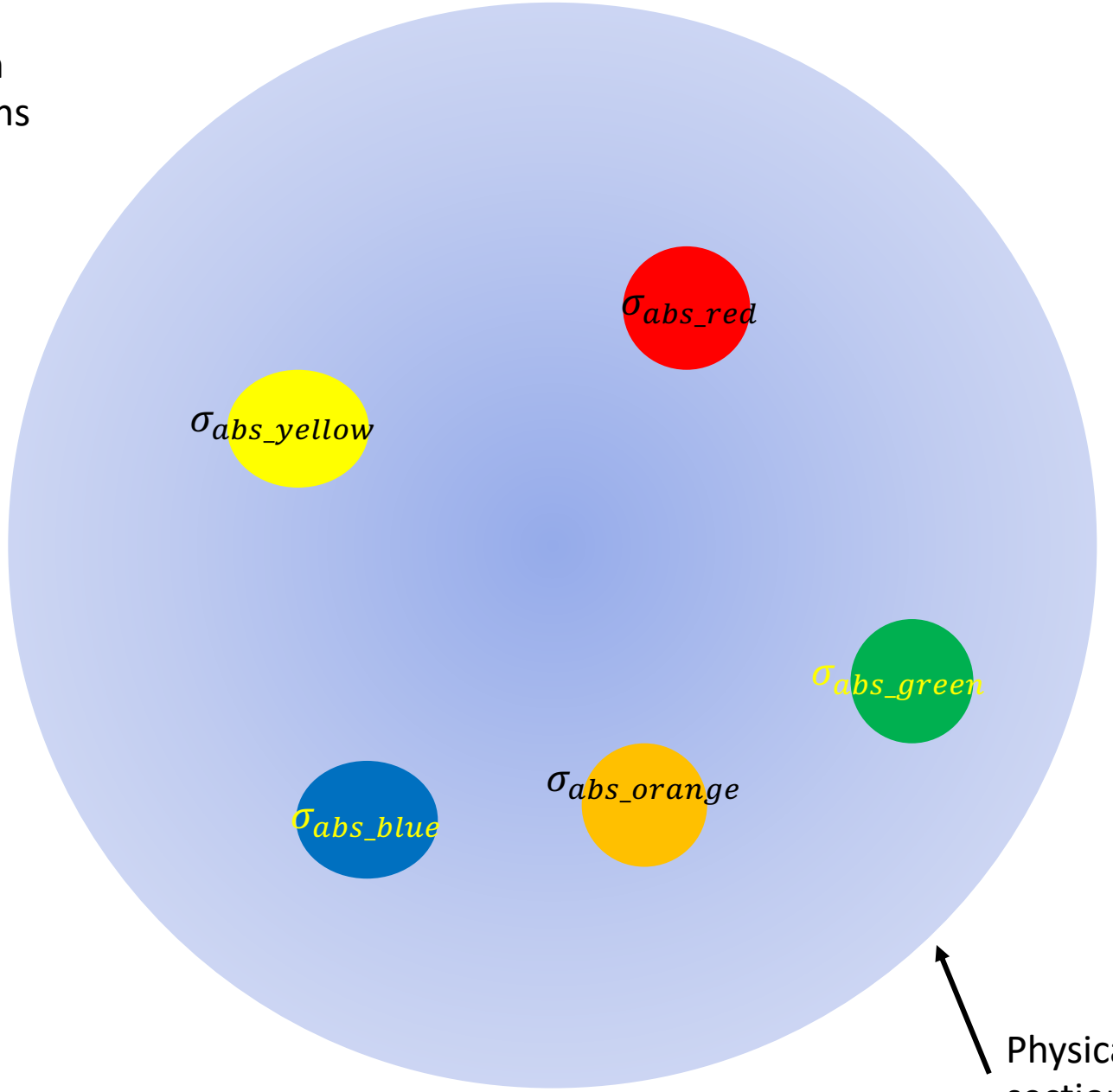
Very little reaction to laser energy

Physical (geometrical) cross-sectional area

Probability of absorption depends on cross-sections



Higher fluence



More reaction to laser energy…

Physical (geometrical) cross-sectional area

Tattoo ink colours

- A ‘red’ ink is red because it absorbs most of the coloured light except red
- So, it absorbs blue, yellow, orange and green – to some extent
- Red ink will absorb some red photons
- It depends entirely on the absorption cross-sectional area and the geometrical (physical) area of the atoms – at that wavelength
- Cross-sectional areas are different for different wavelengths!

Thanks for listening

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