

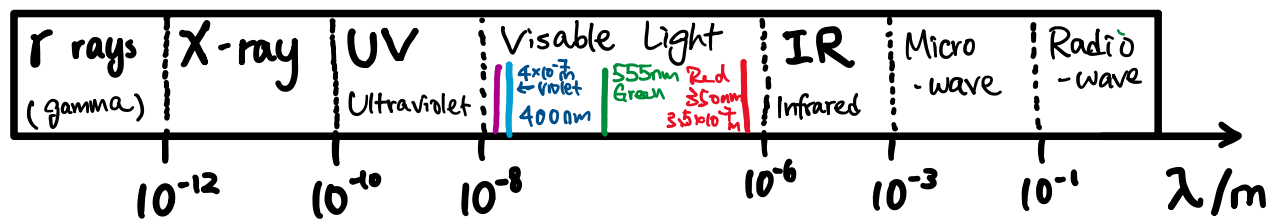
# Ch16 Concept

Sunday, 22 November 2020 14:43

## Light

### EM Spectrum (Colour Spectrum)

- Not in scale



### Young's Double Slit Experiment

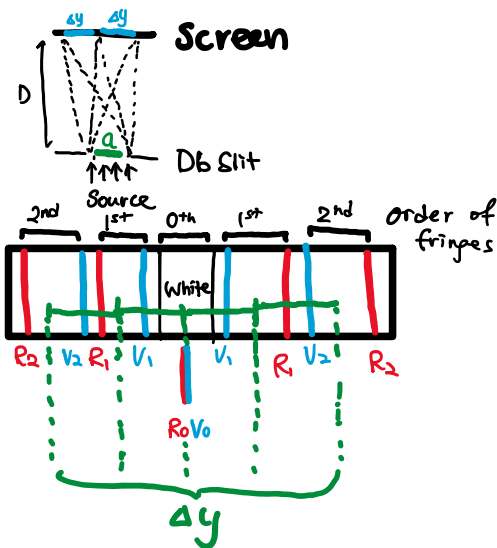
$$\Delta y = \frac{D\lambda}{a}$$

(s)

$(D \gg a)$  must be applied

$-(\Delta y = \frac{D\lambda}{a})$

$D$  = distance [m]  
 $\lambda$  = light ray [nm]  
 $a$  = slit separation  
 $\Delta y$  = Fringe Separation (s) - related to order

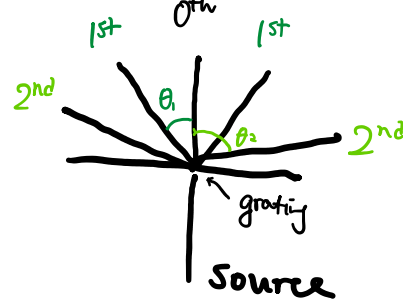


### Grating (Multiple Slits)

$$d \sin \theta_m = m\lambda$$

$\theta$  is NOT even spaced

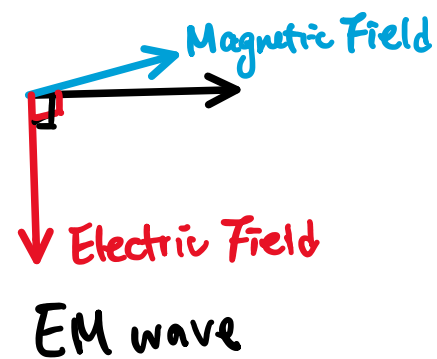
$d$  = slit width  
 $\sin \theta_m = \theta$  of order  
 $m$  = mth order  
 $\lambda$  = light ray



more about  $d$

- given at  $\frac{n \times 100 \text{ slit}}{\text{mm}} \Rightarrow \frac{1}{n} \times 10^{-7} \text{ m}$
- given  $x \mu\text{m} \Rightarrow x \cdot 10^{-6} \text{ m}$

Total ray can be produce  
 set  $\sin \theta \geq 1$   
 round down ↓



## Sound

Tuning Fork : constant  $f$   
 Longitudinal wave

Speed =  
 $V_{\text{solid}} > V_{\text{liquid}} > V_{\text{gas}}$   
 Water  $1497 \text{ m/s}$  Air  $343 \text{ m/s}$   
 $V \propto \text{Density} / \text{Temp}$

Measurement / Sound Intensity  
 C.R.O. (Cathode Ray Oscilloscope)  
 Sound Wave  $\rightarrow$  a.c. signal

Unit decibel [dB]  $\rightarrow$  Exponential

Audible Not hd Sound: 20 ~ 20 kHz  
 Ultra:  $\geq 20 \text{ kHz}$

Usage  
 Ultrasound detection  
 $d = \frac{vt}{2}$  sent / reflect  
 (from  $s = vt$  but half dist)

- examples usage
- Body & foetus scan
  - flaw detection (high density metal)
  - Glass / Jewellery cleaning (vibrating particles)

Pitch  $\propto$  Frequency  
 Loudness  $\propto$  Amplitude  
 Quality  $\rightarrow$  Wave form

Not Physics (Subjective)      Physics Terms

## Light vs Sound

Nature = EM wave	Mechanical
Transverse	Longitudinal
$V \propto \frac{1}{\text{density}}$	$V \propto \text{density}$
$V_{\text{in air}} = 3 \times 10^8 \text{ m/s}$	$3 \times 10^2 \text{ m/s}$
$f_{\text{vacuum}}: \Delta\lambda \rightarrow V_{\text{same}}$	Unable (w/o particle)
other (like water) $V \propto \lambda$	$\Delta\lambda \rightarrow V_{\text{same}}$
$\lambda$ = too small	about 1m
Diffraction Unnotice	Noticeable
$\lambda$ About Human	$400 \sim 750 \text{ nm}$ $(10^{-9} \text{ m})$
	0.02 ~ 20m

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 Yuhari ©  
 v2 Nov 20