





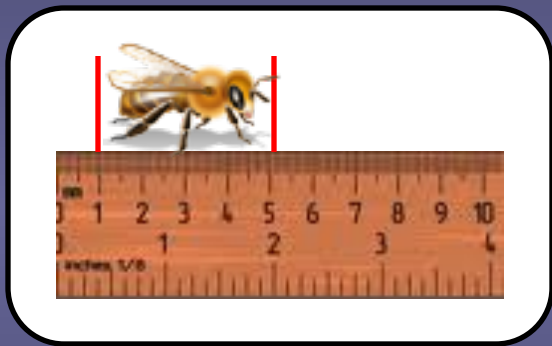




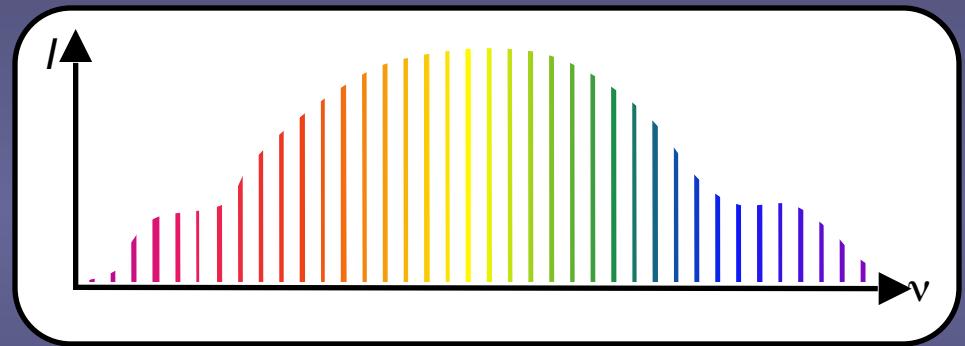
How do we measure frequencies of light?

- We make a “light ruler”

$$\text{Comb Equation: } \nu_n = n f_{\text{rep}} + f_0$$



Ruler: Number of ticks
Offset
Spacing between ticks



Optical Frequency Comb: Mode number
Offset frequency
Frequency spacing

- This structure is called an optical frequency comb – a set of equidistantly spaced spectral lines
- By interfering different colors in the comb, we can produce radio frequencies that we can control

Why lithium?

The Periodic Table of the Elements

1																	2
H Hydrogen 1.00794																	He Helium 4.0026
3	4																
Li Lithium 6.941	Be Beryllium 9.012182																
11	12																
Na Sodium 22.989769	Mg Magnesium 24.304																
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
K Potassium 39.0983	Ca Calcium 40.078	Sc Scandium 44.955912	Ti Titanium 47.88	V Vanadium 50.9415	Cr Chromium 51.9961	Mn Manganese 54.938044	Fe Iron 55.845	Co Cobalt 58.933195	Ni Nickel 58.6934	Cu Copper 63.546	Zn Zinc 65.38	Ga Gallium 69.723	Ge Germanium 72.64	As Arsenic 74.921595	Se Selenium 78.96	Br Bromine 79.904	Kr Krypton 83.80
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Rb Rubidium 85.4678	Sr Strontium 87.62	Y Yttrium 88.90584	Zr Zirconium 91.224	Nb Niobium 92.90638	Mo Molybdenum 95.94	Tc Technetium (98)	Ru Ruthenium 101.07	Rh Rhodium 101.0725	Pd Palladium 106.42	Ag Silver 107.8682	Cd Cadmium 112.411	In Indium 114.818	Sn Tin 118.710	Sb Antimony 121.757	Te Tellurium 127.60	I Iodine 126.90447	Xe Xenon 131.29
55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Cs Cesium 132.90545	Ba Barium 137.327	La Lanthanum 138.90547	Hf Hafnium 178.49	Ta Tantalum 180.94788	W Tungsten 183.84	Re Rhenium 186.207	Os Osmium 190.23	Ir Iridium 192.222	Pt Platinum 195.078	Au Gold 196.96657	Hg Mercury 200.59	Tl Thallium 204.3833	Pb Lead 207.2	Bi Bismuth 208.9804	Po Polonium (209)	At Astatine (210)	Rn Radon (222)
87	88	89	104	105	106	107	108	109	110	111	112	113	114				
Fr Francium (223)	Ra Radium (226)	Ac Actinium (227)	Rf Rutherfordium (261)	Db Dubnium (262)	Sg Seaborgium (263)	Bh Bohrium (264)	Hs Hassium (265)	Mt Meitnerium (266)									
58	59	60	61	62	63	64	65	66	67	68	69	70	71				
Ce Cerium 140.12	Pr Praseodymium 140.90768	Nd Neodymium 144.24	Pm Promethium (145)	Sm Samarium 150.35	Eu Europium 151.964	Gd Gadolinium 157.25	Tb Terbium 158.92534	Dy Dysprosium 162.50	Ho Holmium 164.93032	Er Erbium 167.26	Tm Thulium 168.93487	Yb Ytterbium 173.04	Lu Lutetium 174.967				
90	91	92	93	94	95	96	97	98	99	100	101	102	103				
Th Thorium 232.0377	Pa Protactinium 231.03688	U Uranium 238.02891	Np Neptunium (237)	Pu Plutonium (244)	Am Americium (243)	Cm Curium (247)	Bk Berkelium (247)	Cf Californium (251)	Es Einsteinium (252)	Fm Fermium (257)	Md Mendelevium (258)	No Nobelium (259)	Lr Lawrencium (260)				