LASER WAVELENGTH A-LEVEL PRACTI N lines per mm diffraction grating
A. French 7/10/2021

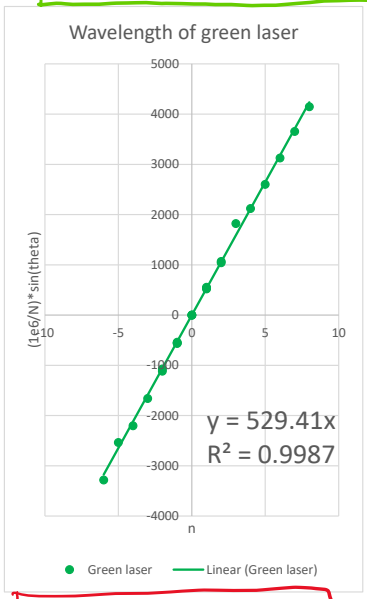
Height of diffraction grating from paper /mm
410

h

GREEN LASER

N	n	xn /mm	theta_n /rad	(1e6/N)*sin(theta)
100	-6	-142.5	-0.335	-3283
100	-5	-107.5	-0.256	-2536
100	-4	-92.5	-0.222	-2201
100	-3	-69	-0.167	-1660
100	-2	-46	-0.112	-1115
100	-1	-23	-0.056	-560
100	0	0	0.000	0
100	1	22	0.054	536
100	2	44	0.107	1067
100	3	76	0.183	1823
100	4	89	0.214	2121
100	5	110.5	0.263	2602
100	6	135	0.318	3128
100	7	161	0.374	3655
100	8	187	0.428	4150
300	-2	-139	-0.327	-1070
300	-1	-67	-0.162	-538
300	0	0	0.000	0
300	1	65	0.157	522
300	2	135	0.318	1043
600	-1	-145	-0.340	-556
600	0	0	0.000	0
600	1	145	0.340	556

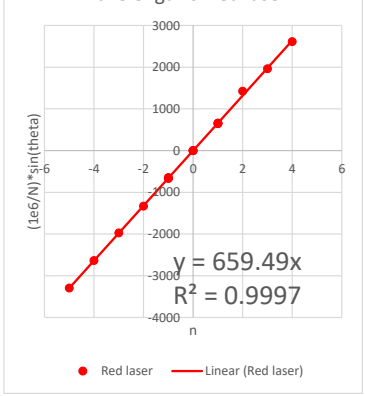
$\lambda = 529.4\text{nm}$

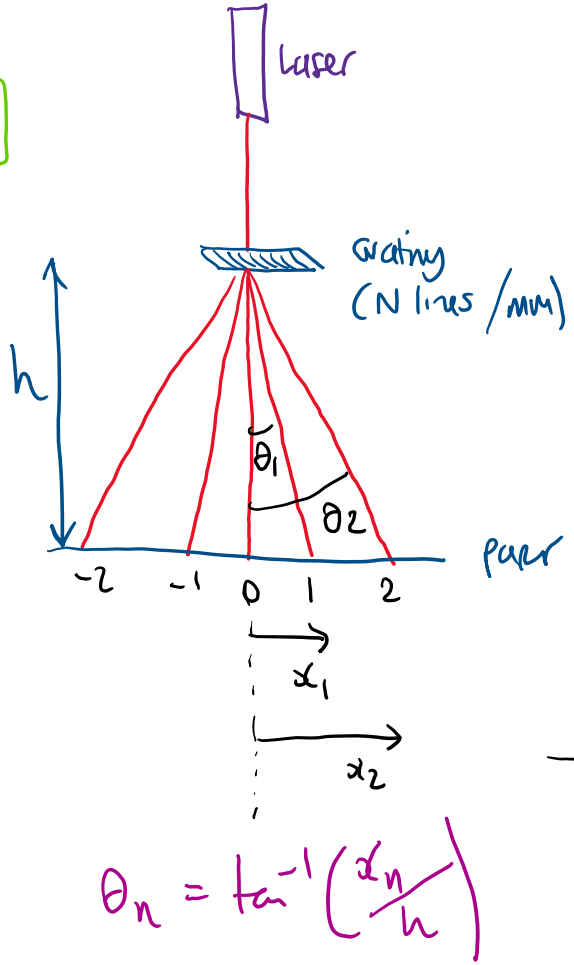


RED LASER

N	n	xn /mm	theta_n /rad	(1e6/N)*sin(theta)
100	-5	-143	-0.336	-3293
100	-4	-112	-0.267	-2635
100	-3	-82.5	-0.199	-1973
100	-2	-55	-0.133	-1330
100	-1	-27	-0.066	-657
100	0	0	0.000	0
100	1	27	0.066	657
100	2	59	0.143	1424
100	3	82	0.197	1961
100	4	111	0.264	2613
300	-1	-81	-0.195	-646
300	0	0	0.000	0
300	1	81	0.195	646
600	-1	-179	-0.412	-667
600	0	0	0.000	0
600	1	174.5	0.402	653

$\lambda = 659.5\text{nm}$





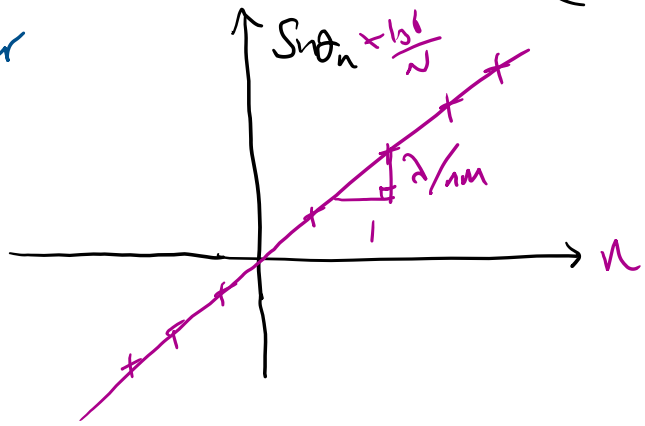
$\theta_n = \tan^{-1}\left(\frac{x_n}{h}\right)$

$S\sin\theta_n = n\lambda$

$S = \frac{1\,\text{mm}}{N} = \frac{10^6\,\text{nm}}{N}$

$\therefore \sin\theta_n = \frac{N}{10^6\,\text{nm}}\, n\lambda$

$\frac{10^6}{N}\sin\theta_n = n \times \left(\frac{\lambda}{\text{nm}}\right)$



Plot this graph for each laser.