

미시세계와 거시세계

7. CD, DVD, and PS2?

유재준

서울대 물리천문학부

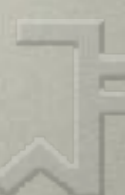
jyu@snu.ac.kr

2016/2학기

CD or DVD



정보를 어떤 형태로 CD에 저장하는가?



2-진수 (binary)

$$101_2 = 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 = 5_{10}$$

$$0.1_{10} = ???_2$$

$$0.156_{10} = 1 \times 10^{-1} + 5 \times 10^{-2} + 6 \times 10^{-3}$$

$$0.1_{10} = .00011001100110011\dots_2$$

$$10.101_2 = 1 \times 2^1 + 0 \times 2^0 + 1 \times 2^{-1} + 0 \times 2^{-2} -$$



N -진수

$$n_i < N$$

$$n_4n_3n_2n_1n_0 = n_4 \times N^4 + n_3 \times N^3 + n_2 \times N^2 + n_1 \times N + n_0$$

alphabet = 26-진수?



ASCII code - 128-진수=2⁸-진수

Dec	Hx	Oct	Char	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr
0	0	000	NUL (null)	32	20	040	 	Space	64	40	100	@	@	96	60	140	`	`
1	1	001	SOH (start of heading)	33	21	041	!	!	65	41	101	A	A	97	61	141	a	a
2	2	002	STX (start of text)	34	22	042	"	"	66	42	102	B	B	98	62	142	b	b
3	3	003	ETX (end of text)	35	23	043	#	#	67	43	103	C	C	99	63	143	c	c
4	4	004	EOT (end of transmission)	36	24	044	$	\$	68	44	104	D	D	100	64	144	d	d
5	5	005	ENQ (enquiry)	37	25	045	%	%	69	45	105	E	E	101	65	145	e	e
6	6	006	ACK (acknowledge)	38	26	046	&	&	70	46	106	F	F	102	66	146	f	f
7	7	007	BEL (bell)	39	27	047	'	'	71	47	107	G	G	103	67	147	g	g
8	8	010	BS (backspace)	40	28	050	((72	48	110	H	H	104	68	150	h	h
9	9	011	TAB (horizontal tab)	41	29	051))	73	49	111	I	I	105	69	151	i	i
10	A	012	LF (NL line feed, new line)	42	2A	052	*	*	74	4A	112	J	J	106	6A	152	j	j
11	B	013	VT (vertical tab)	43	2B	053	+	+	75	4B	113	K	K	107	6B	153	k	k
12	C	014	FF (NP form feed, new page)	44	2C	054	,	,	76	4C	114	L	L	108	6C	154	l	l
13	D	015	CR (carriage return)	45	2D	055	-	-	77	4D	115	M	M	109	6D	155	m	m
14	E	016	SO (shift out)	46	2E	056	.	.	78	4E	116	N	N	110	6E	156	n	n
15	F	017	SI (shift in)	47	2F	057	/	/	79	4F	117	O	O	111	6F	157	o	o
16	10	020	DLE (data link escape)	48	30	060	0	0	80	50	120	P	P	112	70	160	p	p
17	11	021	DC1 (device control 1)	49	31	061	1	1	81	51	121	Q	Q	113	71	161	q	q
18	12	022	DC2 (device control 2)	50	32	062	2	2	82	52	122	R	R	114	72	162	r	r
19	13	023	DC3 (device control 3)	51	33	063	3	3	83	53	123	S	S	115	73	163	s	s
20	14	024	DC4 (device control 4)	52	34	064	4	4	84	54	124	T	T	116	74	164	t	t
21	15	025	NAK (negative acknowledge)	53	35	065	5	5	85	55	125	U	U	117	75	165	u	u
22	16	026	SYN (synchronous idle)	54	36	066	6	6	86	56	126	V	V	118	76	166	v	v
23	17	027	ETB (end of trans. block)	55	37	067	7	7	87	57	127	W	W	119	77	167	w	w
24	18	030	CAN (cancel)	56	38	070	8	8	88	58	130	X	X	120	78	170	x	x
25	19	031	EM (end of medium)	57	39	071	9	9	89	59	131	Y	Y	121	79	171	y	y
26	1A	032	SUB (substitute)	58	3A	072	:	:	90	5A	132	Z	Z	122	7A	172	z	z
27	1B	033	ESC (escape)	59	3B	073	;	;	91	5B	133	[[123	7B	173	{	{
28	1C	034	FS (file separator)	60	3C	074	<	<	92	5C	134	\	\	124	7C	174	|	
29	1D	035	GS (group separator)	61	3D	075	=	=	93	5D	135]]	125	7D	175	}	}
30	1E	036	RS (record separator)	62	3E	076	>	>	94	5E	136	^	^	126	7E	176	~	~
31	1F	037	US (unit separator)	63	3F	077	?	?	95	5F	137	_	_	127	7F	177		DEL

Source: www.LookupTables.com

암호 - encryption

- **Prime numbers in encryption**

- **RSA algorithm**

- RSA stands for Ron Rivest, Adi Shamir and Leonard Adleman.

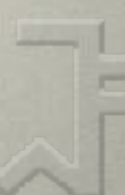
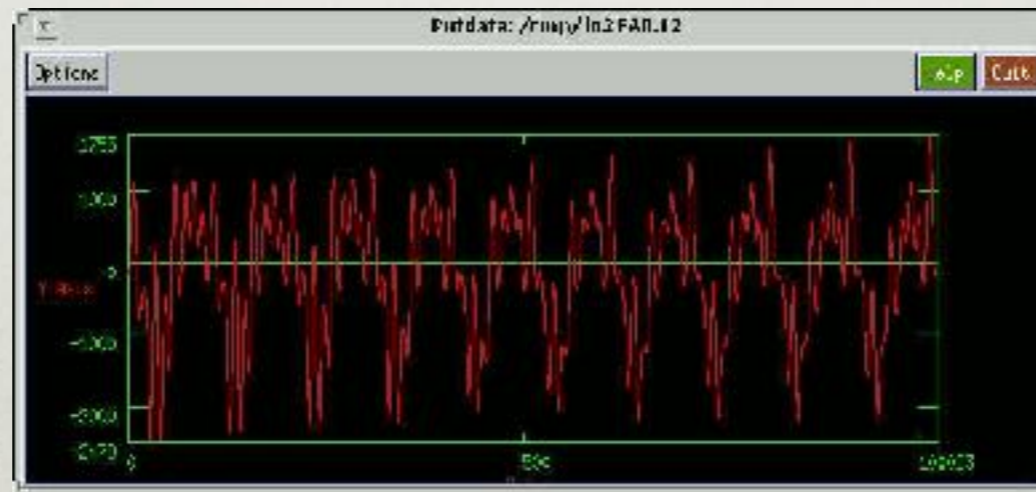
The system includes a communications channel coupled to at least one terminal having an encoding device and to at least one terminal having a decoding device. A message-to-be-transferred is enciphered to cipher text at the encoding terminal by encoding the message as a number M in a predetermined set. That number is then raised to a first predetermined power (associated with the intended receiver) and finally computed. The remainder or residue, C , is... computed when the exponentiated number is divided by the product of two predetermined prime numbers (associated with the intended receiver).



A-to-D / D-to-A Converter



※ 2진법 수 101001 신호의 크기도 기록할 수 있다.



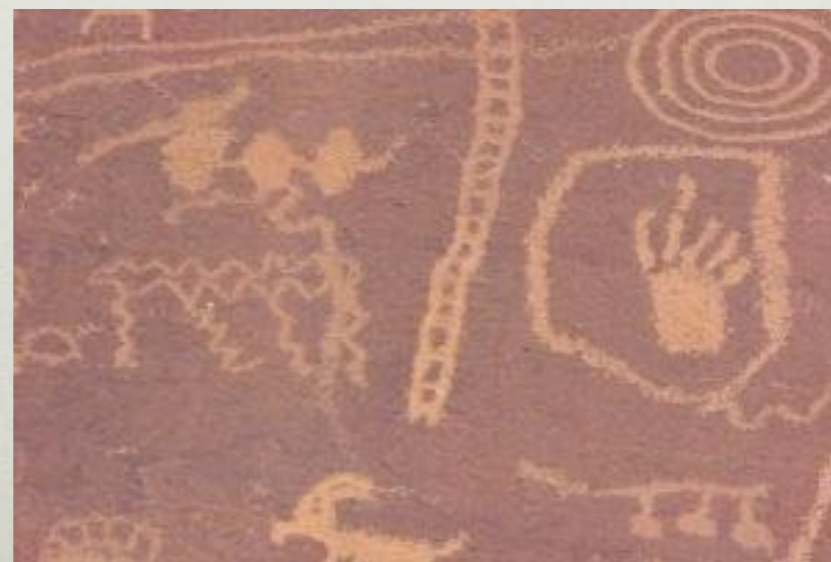
디지털 신호 기록하기?



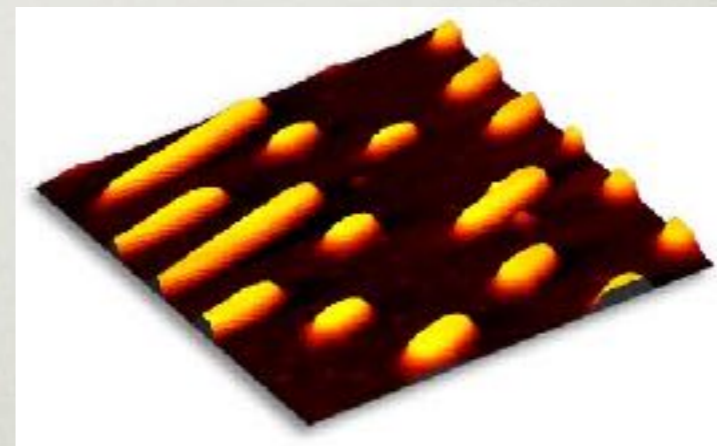
10101110001010:
001101110010100
1010001.....

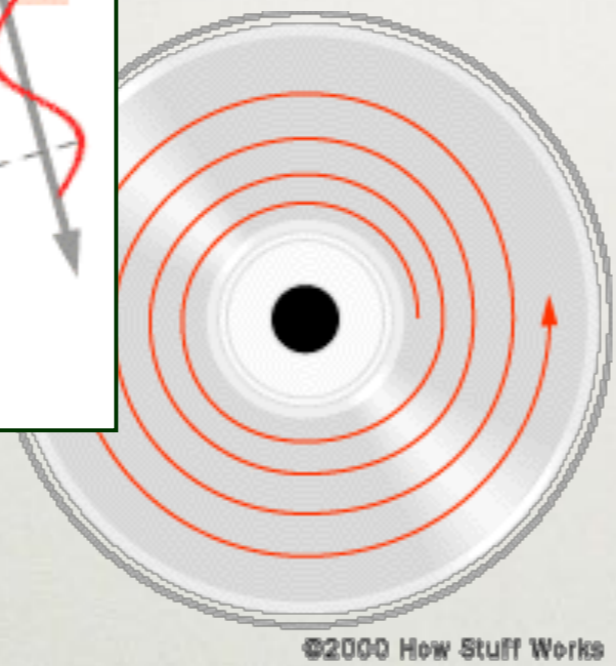
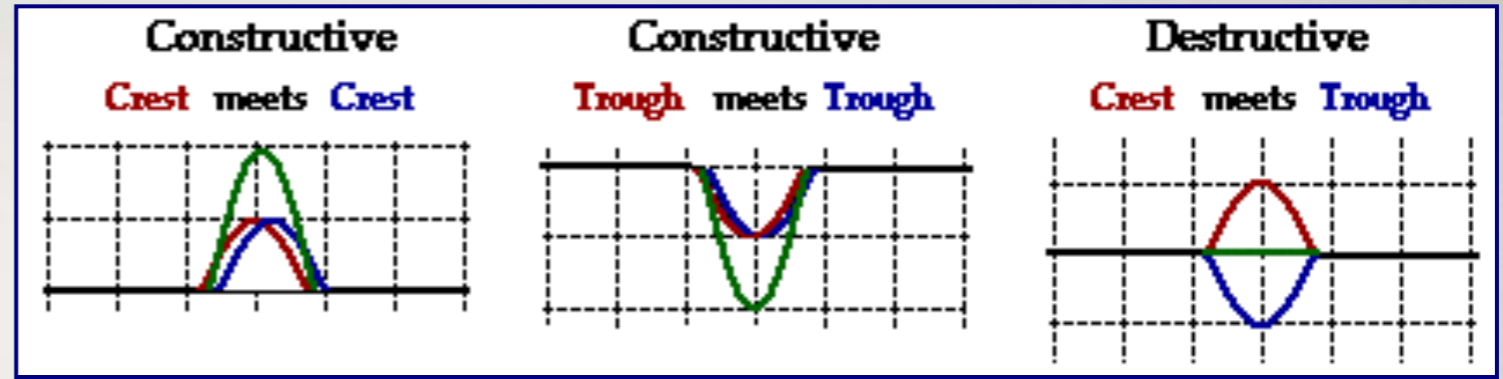
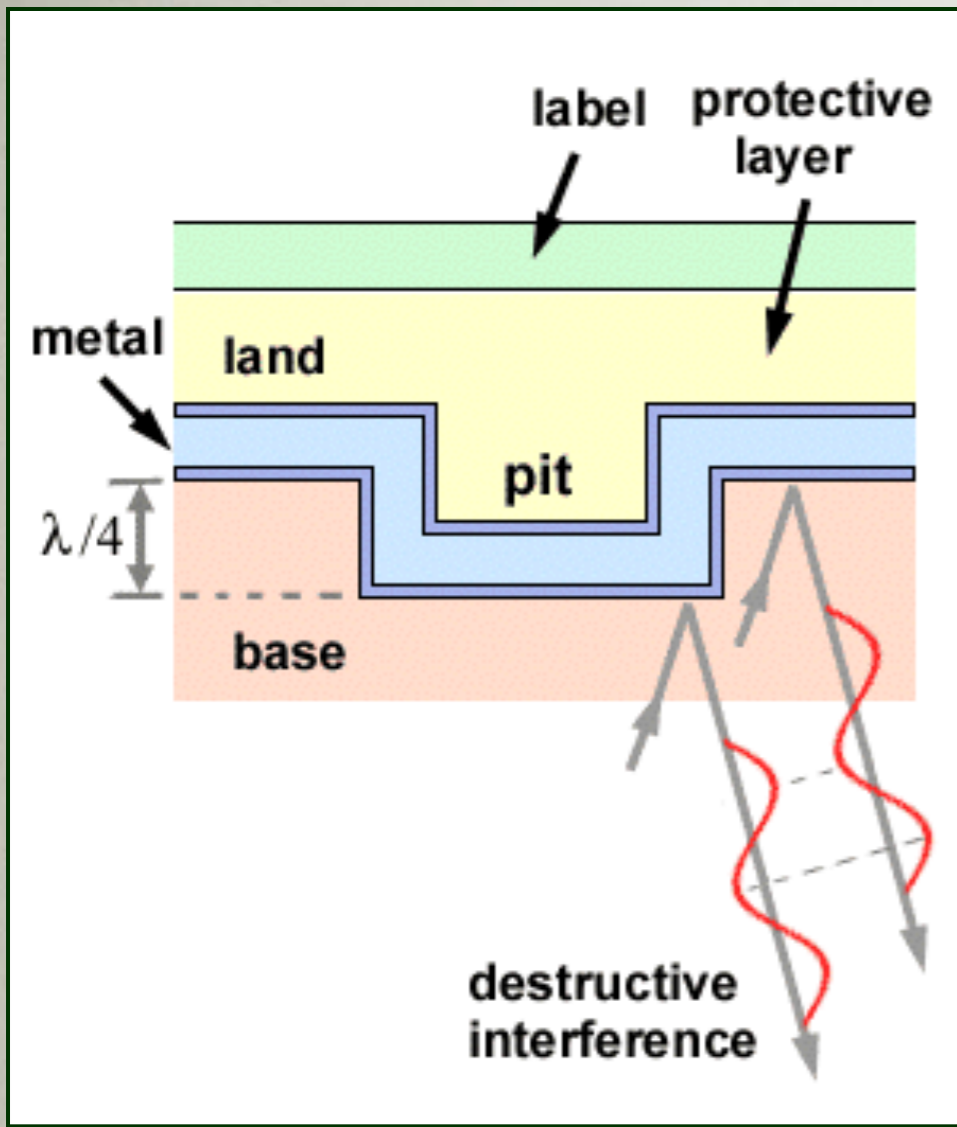
THE HIEROGLYPHIC ALPHABET

A	B	C-K	D	E
F-V	G	H	I	J
L	M	N	O	
P	Q	R	S	S
T	U-W	X	Y	Z
TH	SH	CH	e	KH



왜 CD를 굽는다고 하는 걸까?

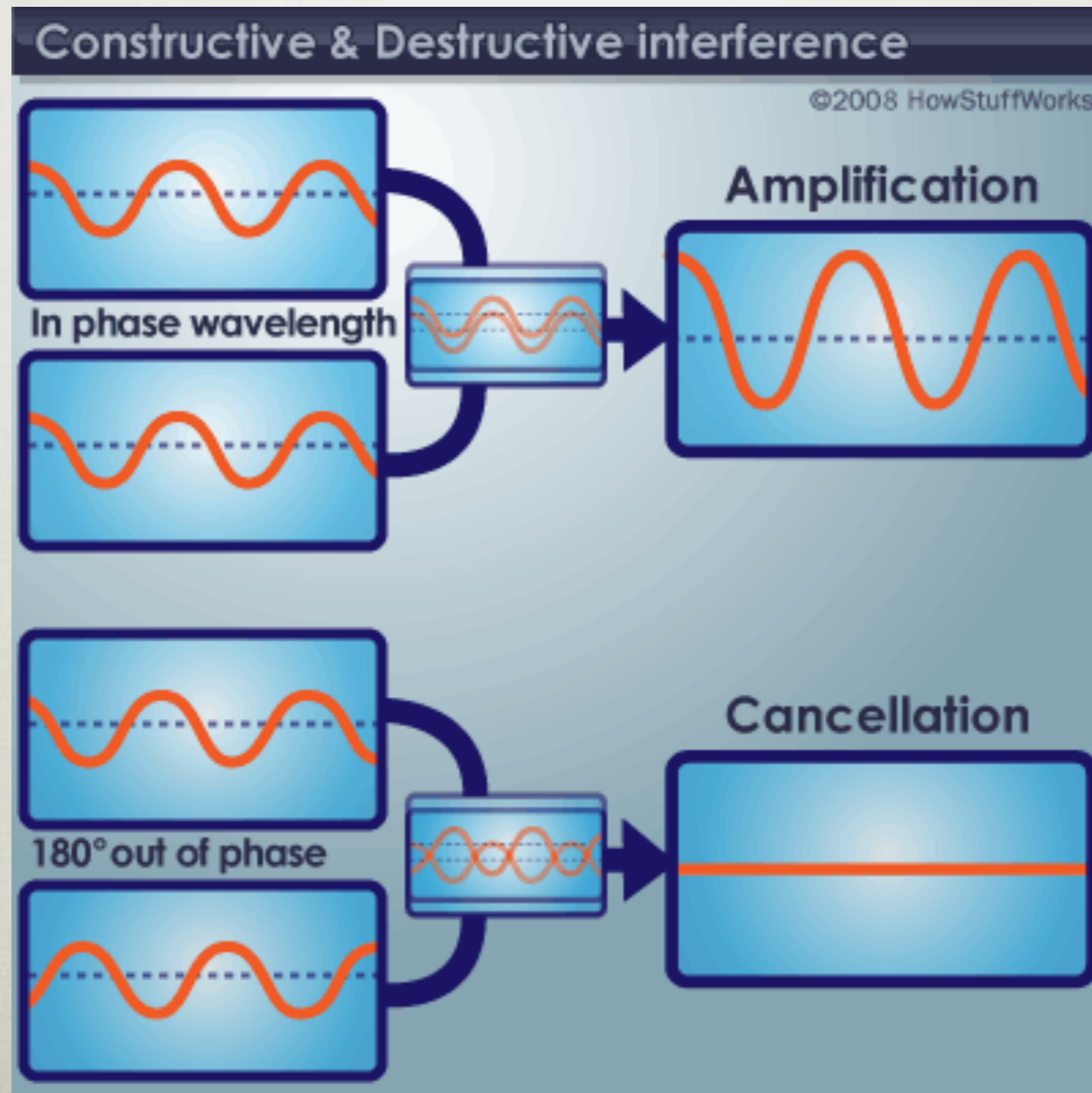




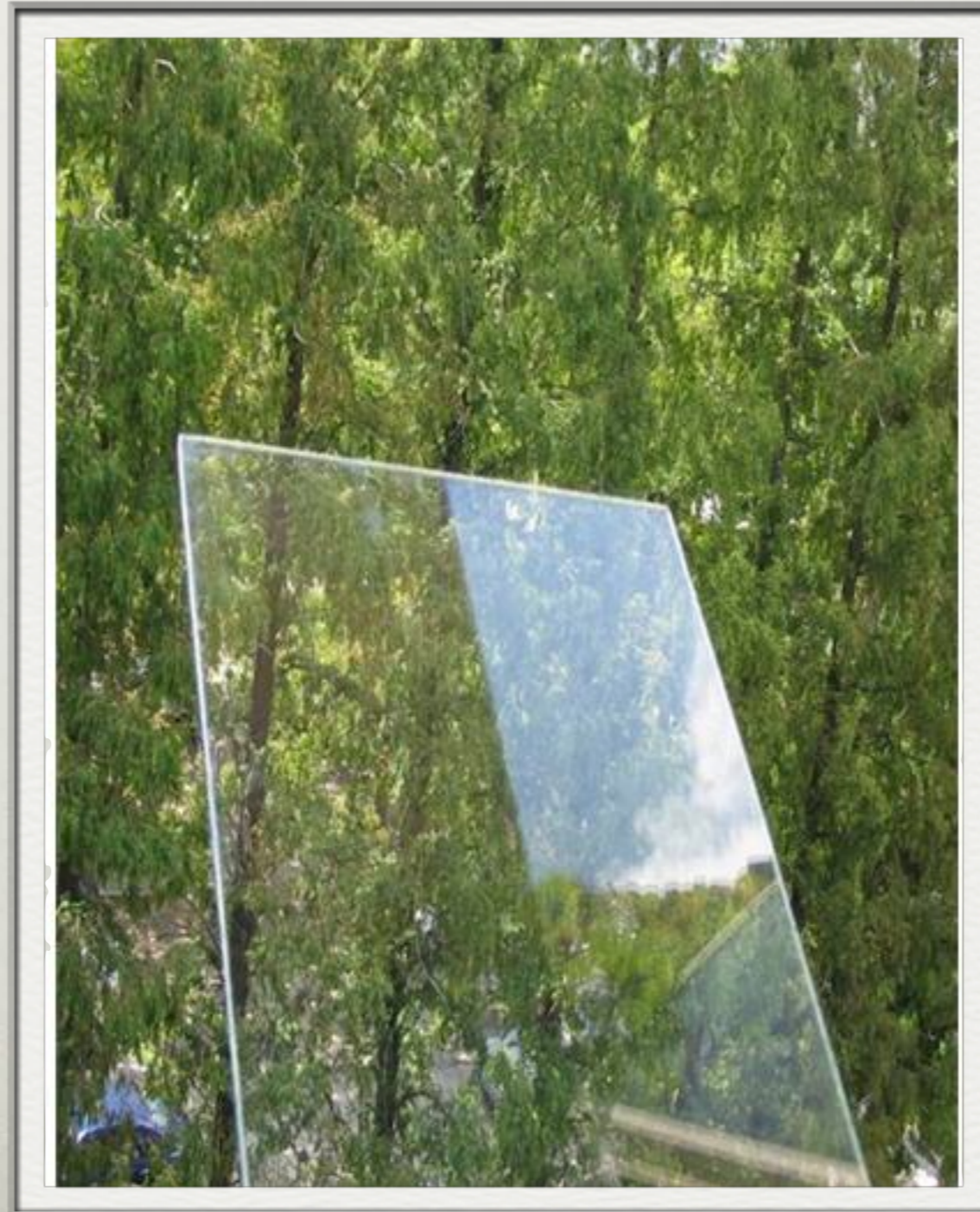
• 과동 간섭 효과



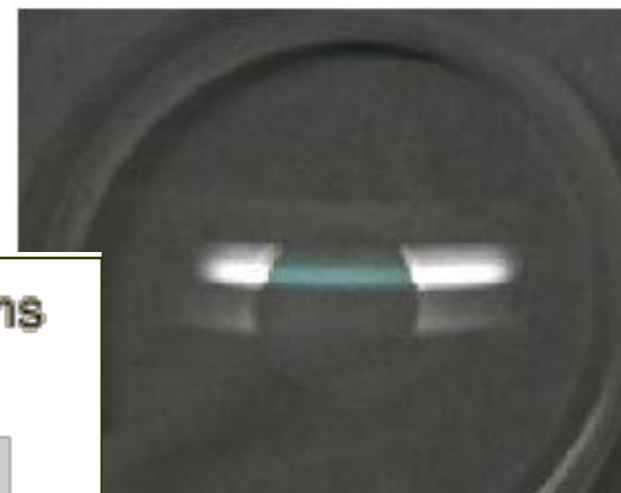
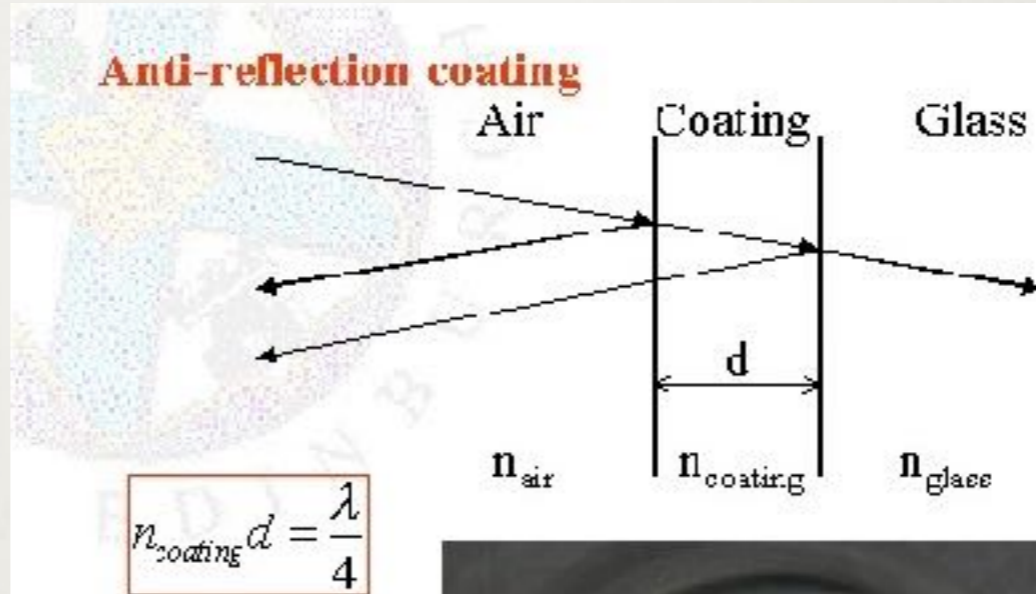
Interference



무반사 코팅 안경



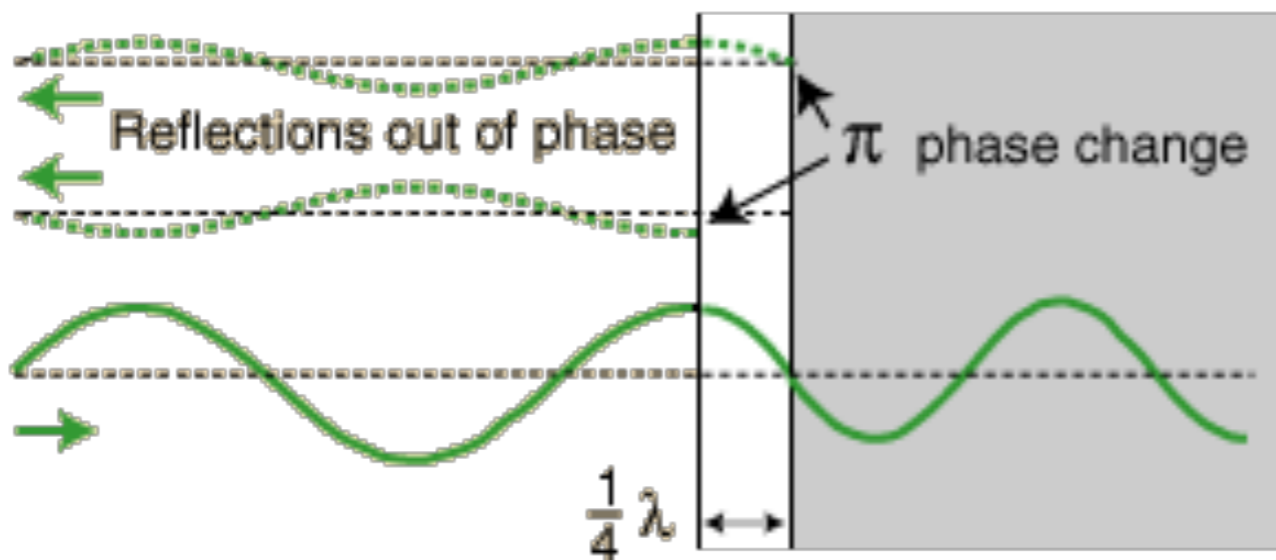
무반사 코팅 안경



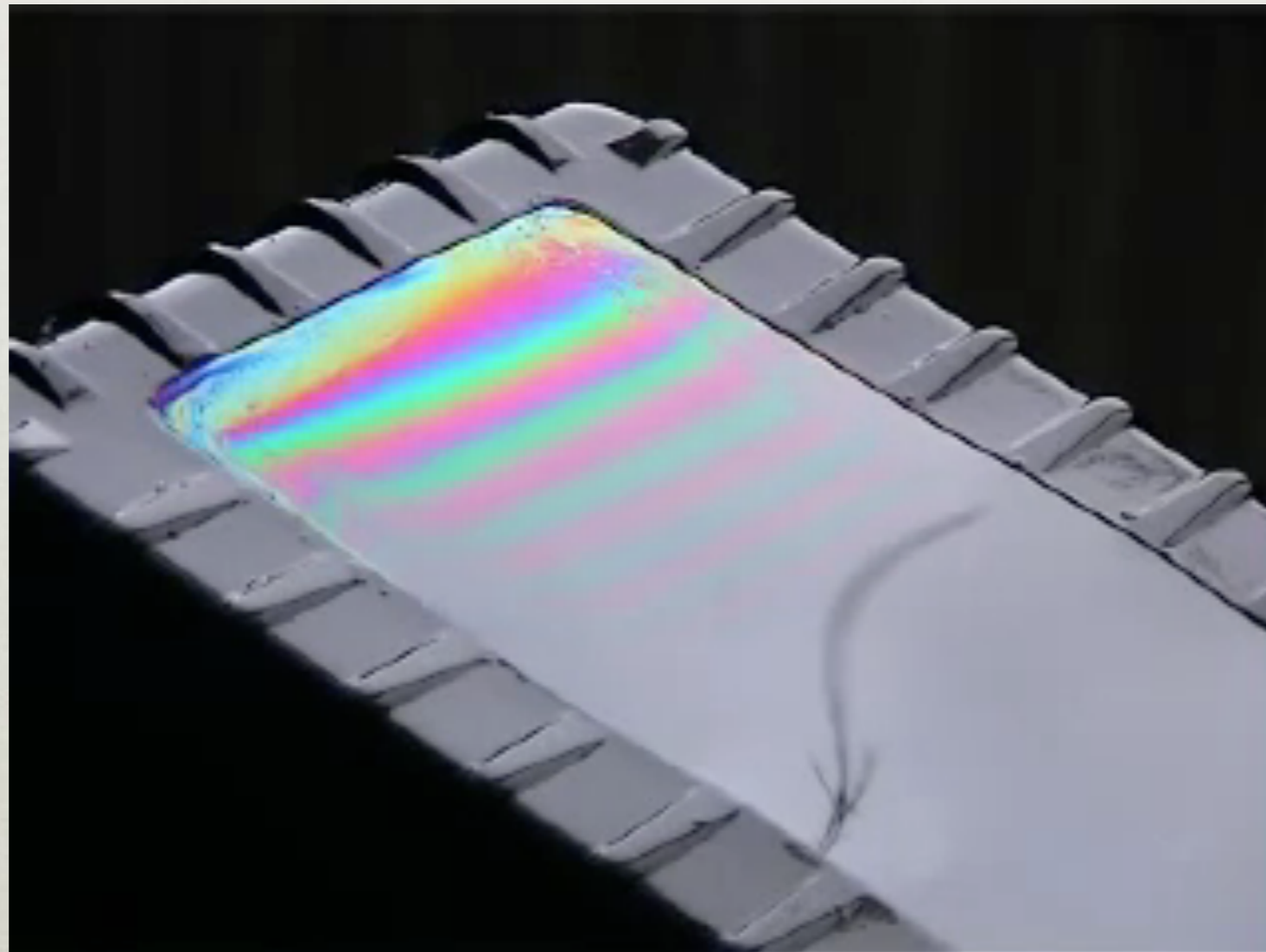
$$n_{coating} = \sqrt{n_{air} n_{glass}}$$

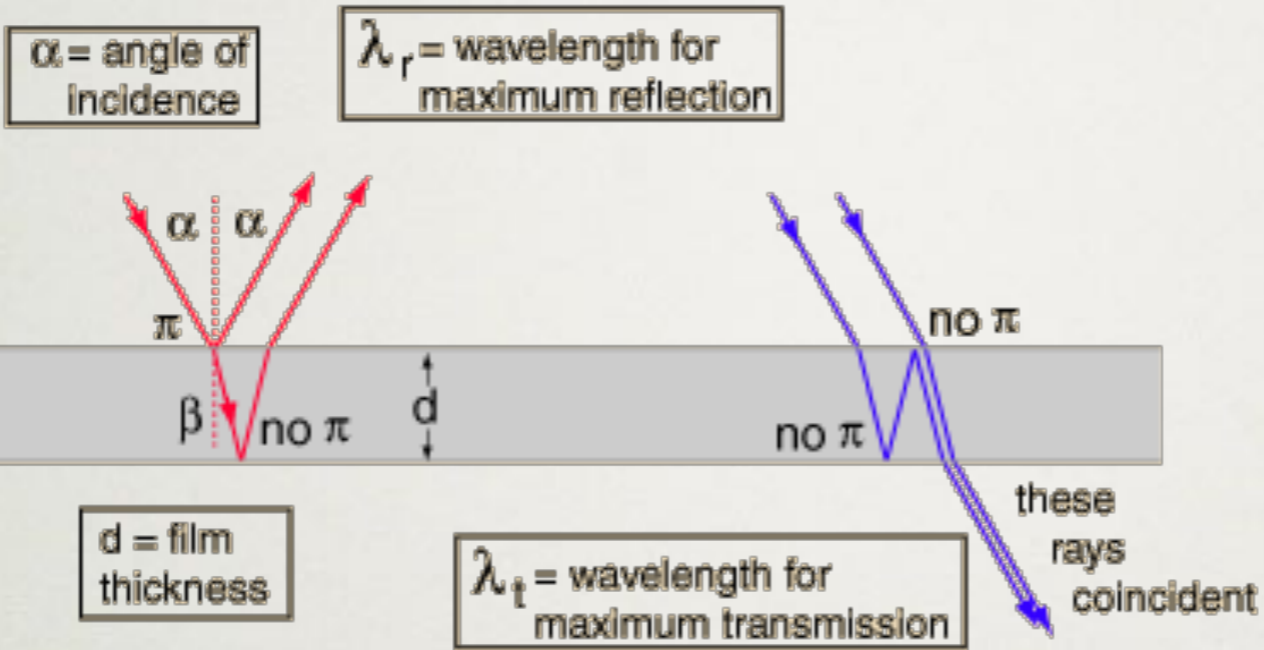
Higher still

Anti-reflection coatings work by producing two reflections which interfere destructively with each other.



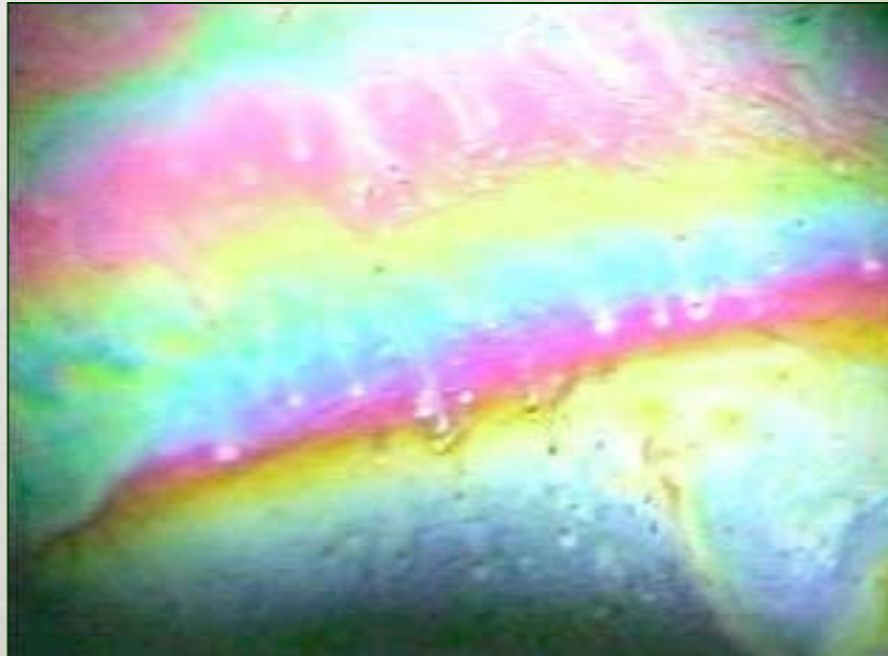
비누 방울/필름을 이용한 빛의 간섭



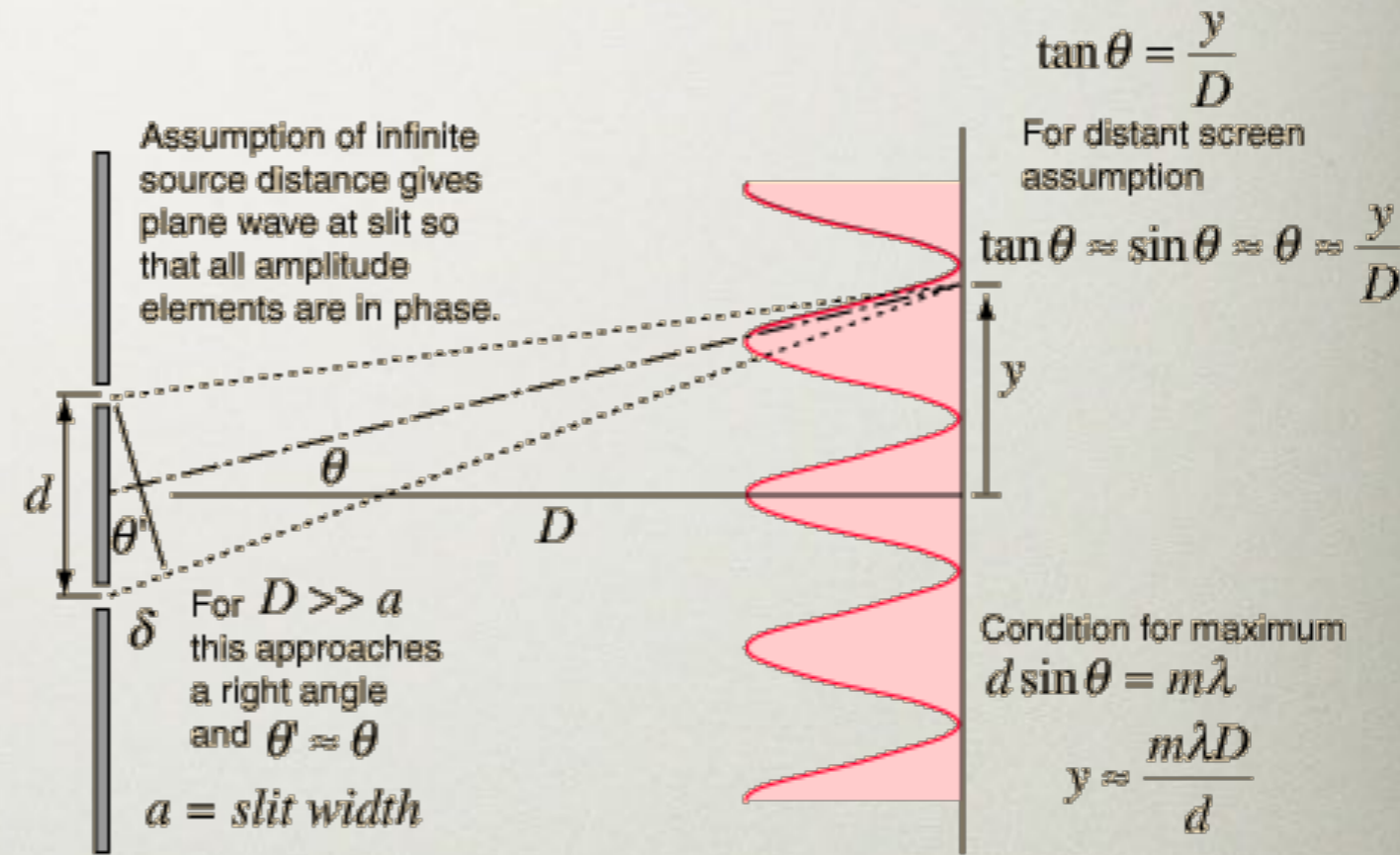
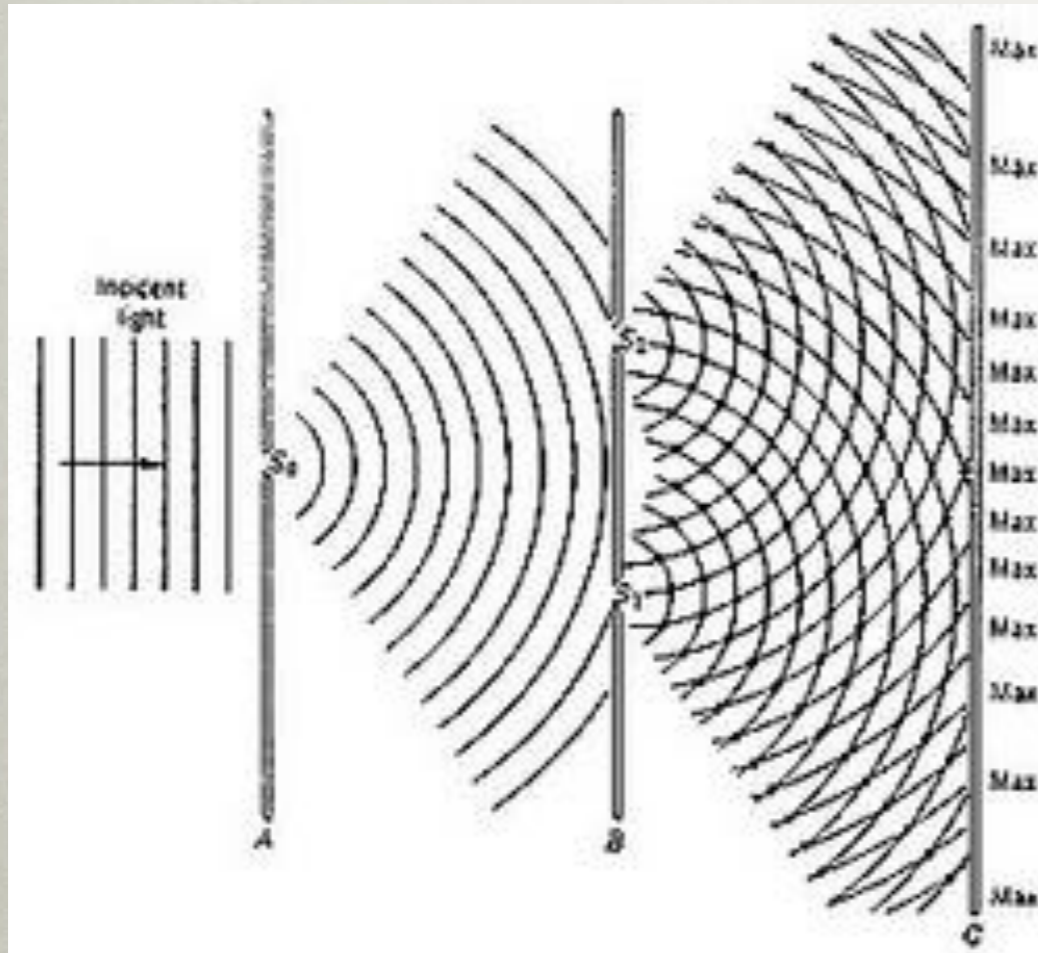


$2nd \cos \beta = (m - \frac{1}{2})\lambda_r$
Maximum reflection

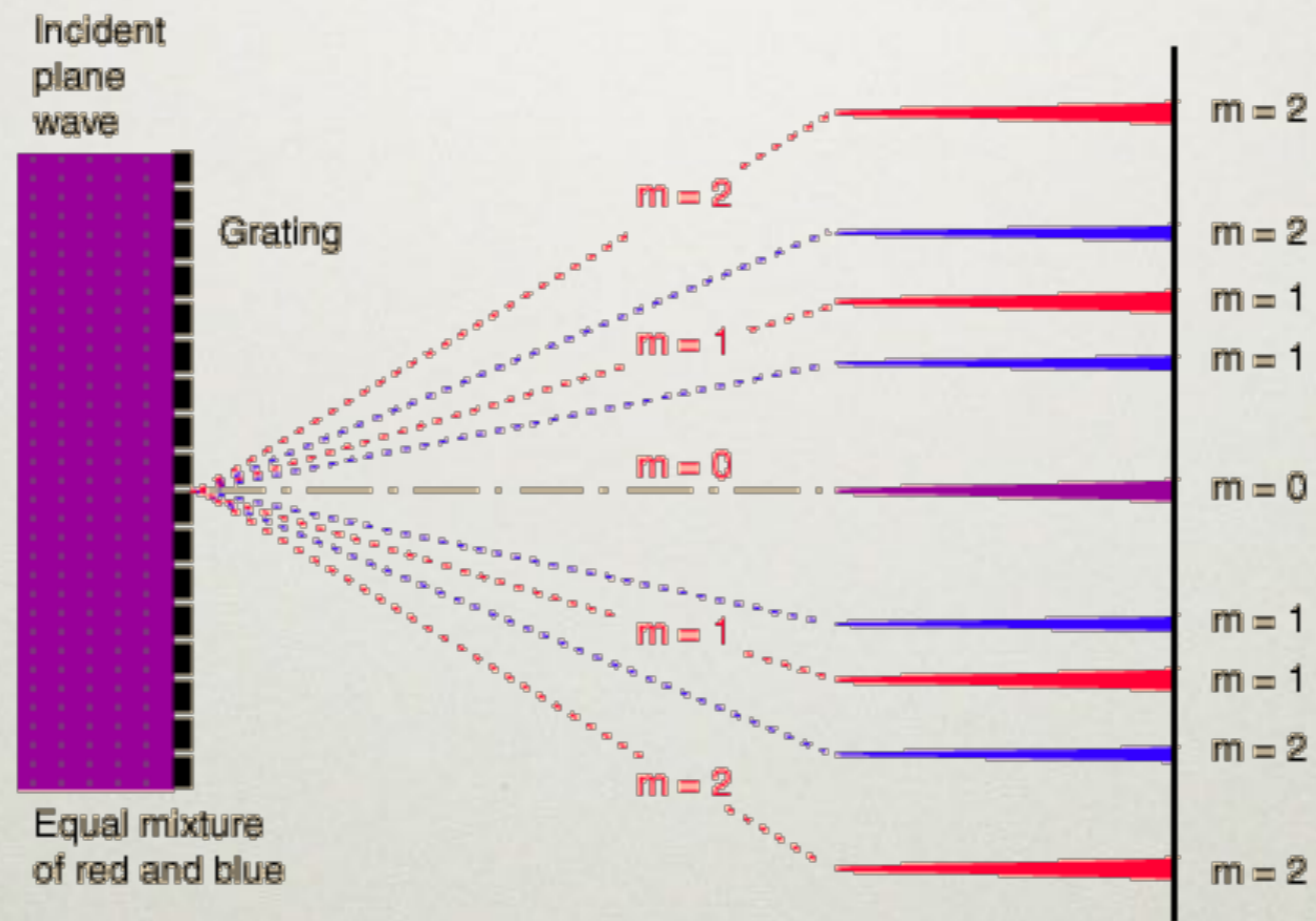
$2nd \cos \beta = m\lambda_t$
Maximum transmission



슬릿을 통한 간섭 현상

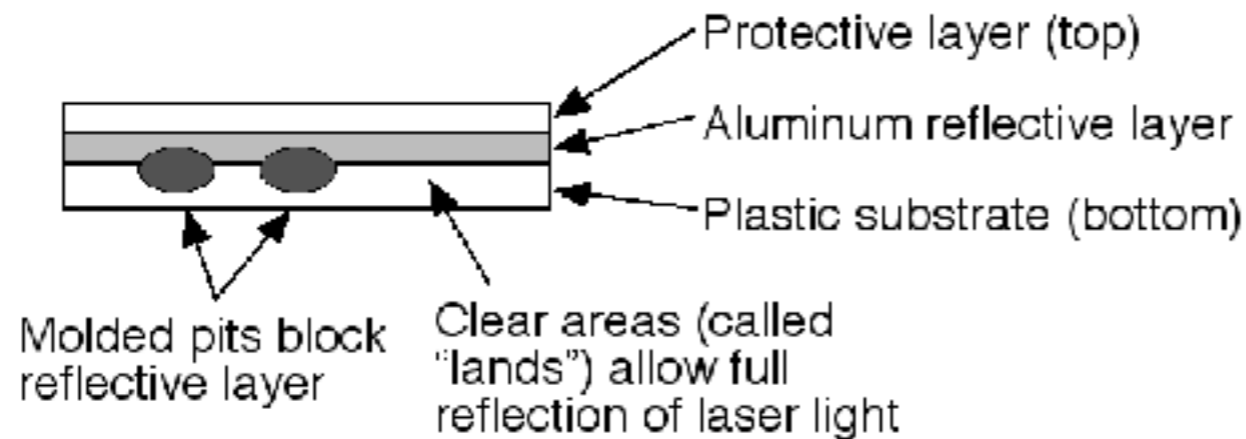


다중 슬릿 간섭

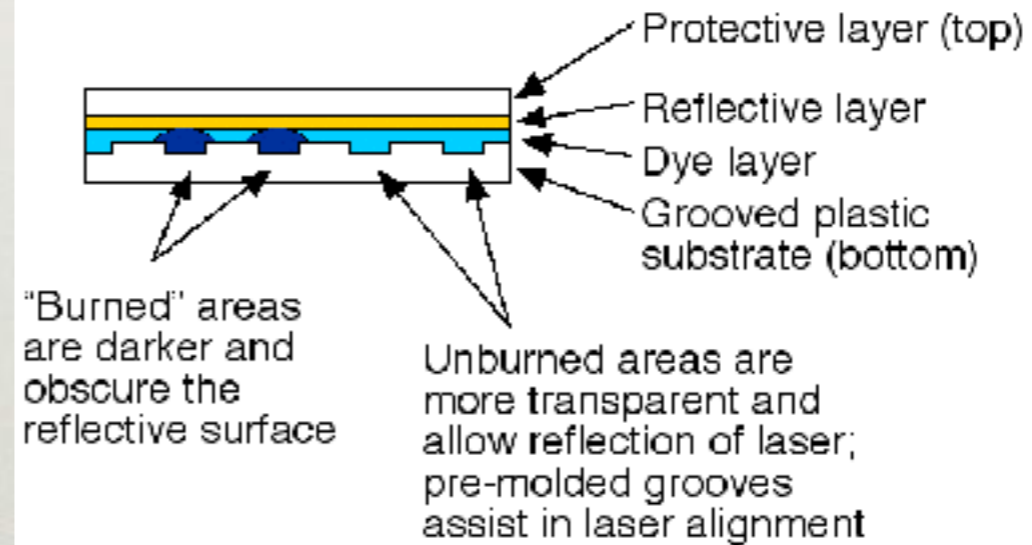


CD-ROM과 CD-R, CD-RW의 차이점은?

CD-ROM Construction

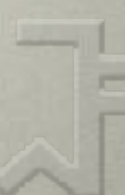


CD-Recordable Construction

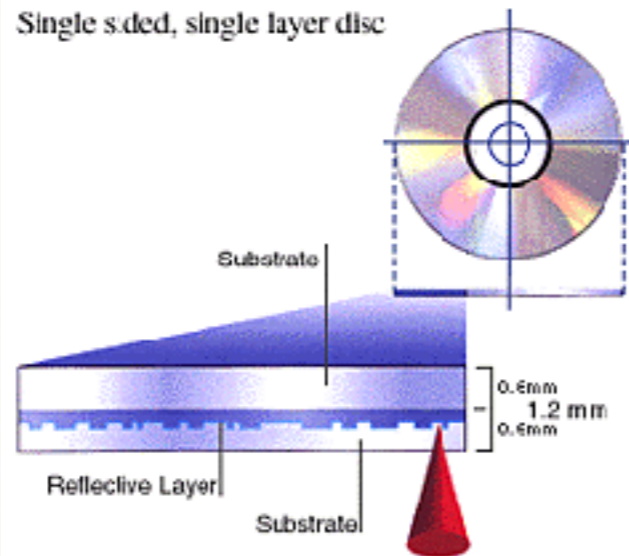


DVD Specifications

Name	Capacity (GB)	Layers	Sides	Comments
DVD-5	4.7	1	1	Read from one side only
DVD-9	8.54	2	1	Read from one side only
DVD-10	9.4	1	2	Read from both sides
DVD-18	17.08	2	2	4 layers, read from both sides
DVD-R	4.7/9.4	1	1 or 2	Recordable DVD
DVD-RAM	2.6/5.2	1	1 or 2	Rewritable DVD
DVD-RW	4.7	1	1 or 2	Re-Recordable DVD



Single sided, single layer disc



Single sided, dual layer disc

A semi-transmissive film and a dual-focus laser system enable two data layers to be read on a single side!

