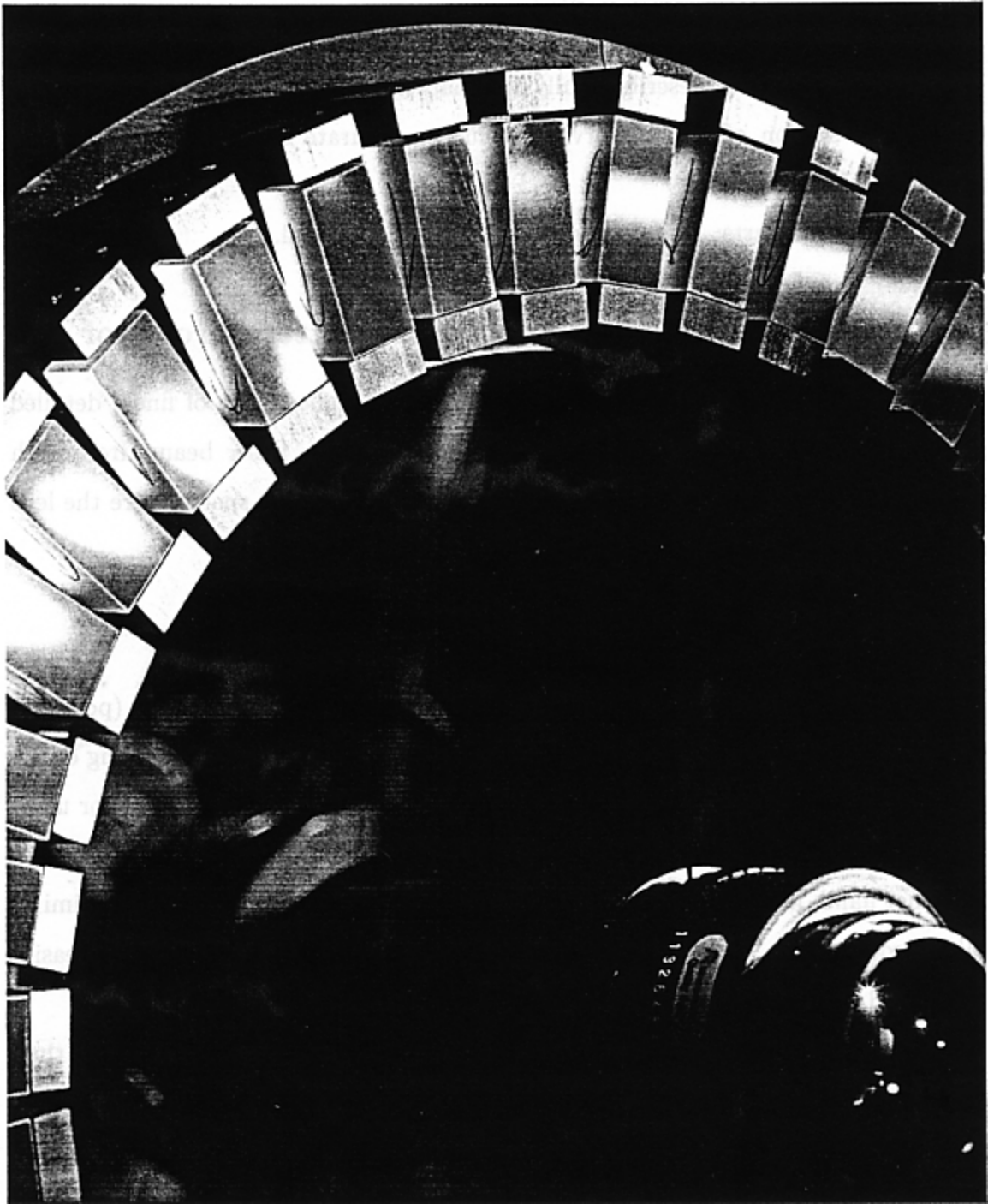
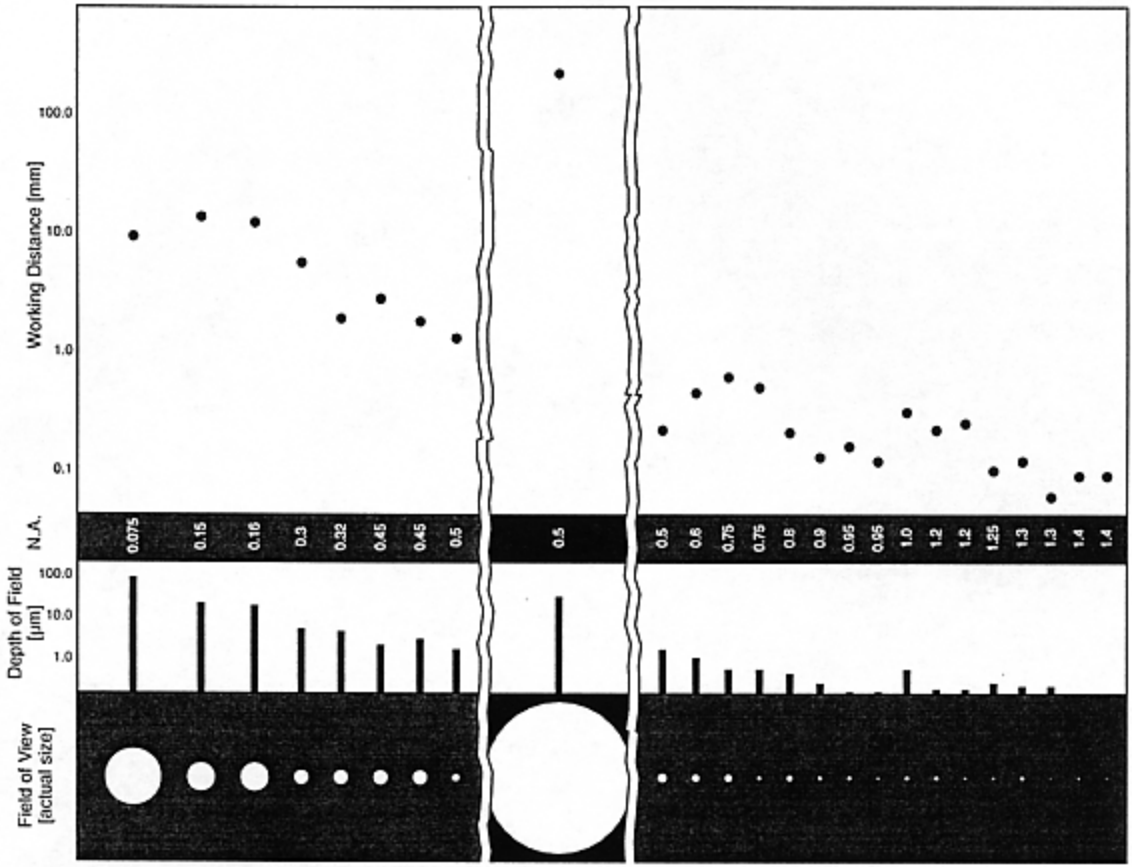
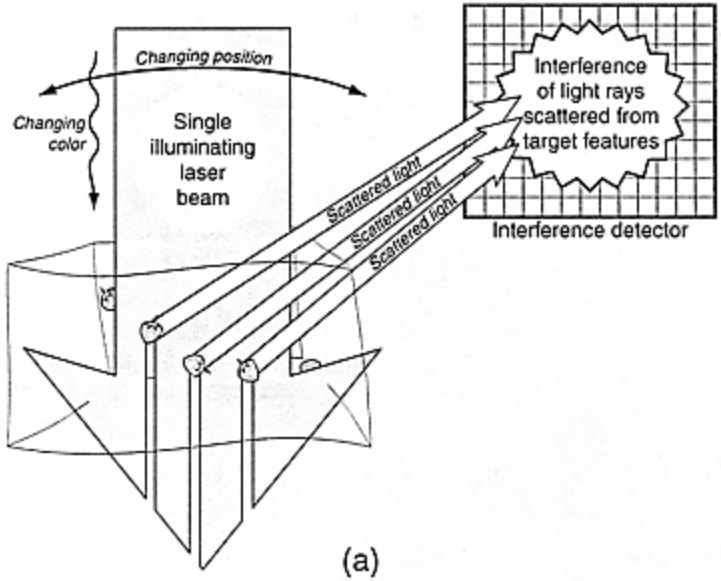


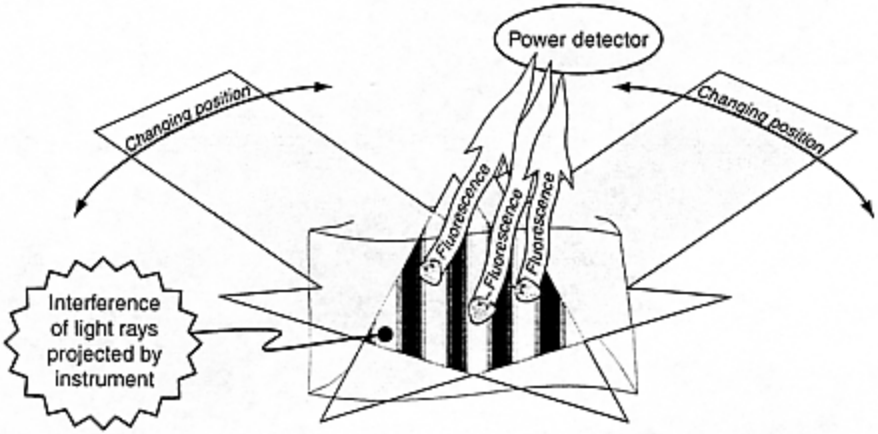

Working Distance [mm]
100.0
10.0
1.0
0.1
N.A.
0.075
0.15
0.16
0.3
0.32
0.45
0.45
0.5
0.5
0.5
0.6
0.75
0.75
0.8
0.9
0.95
0.95
1.0
1.2
1.2
1.25
1.3
1.3
1.4
1.4
Depth of Field [µm]
100.0
10.0
1.0
Field of View [actual size]
SAM

One-beam SAM measures complicated interference effect



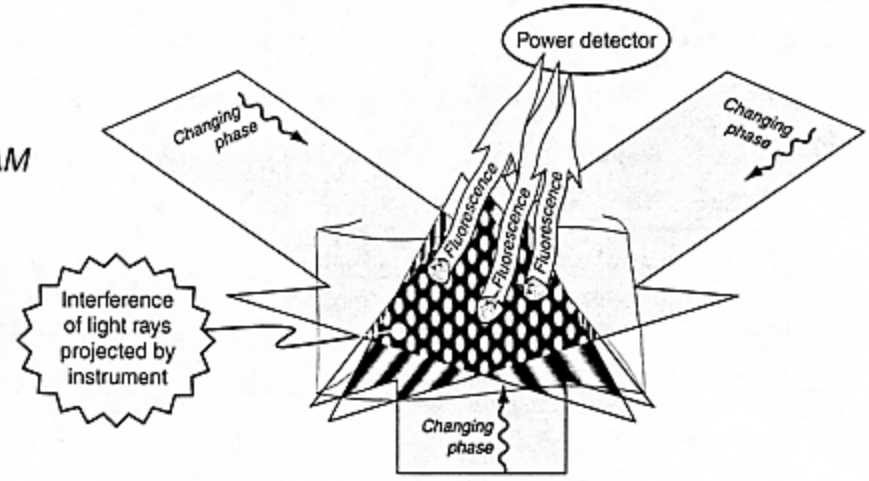
(a)

*Two-beam SAM measures **simple** effect with changing geometry*

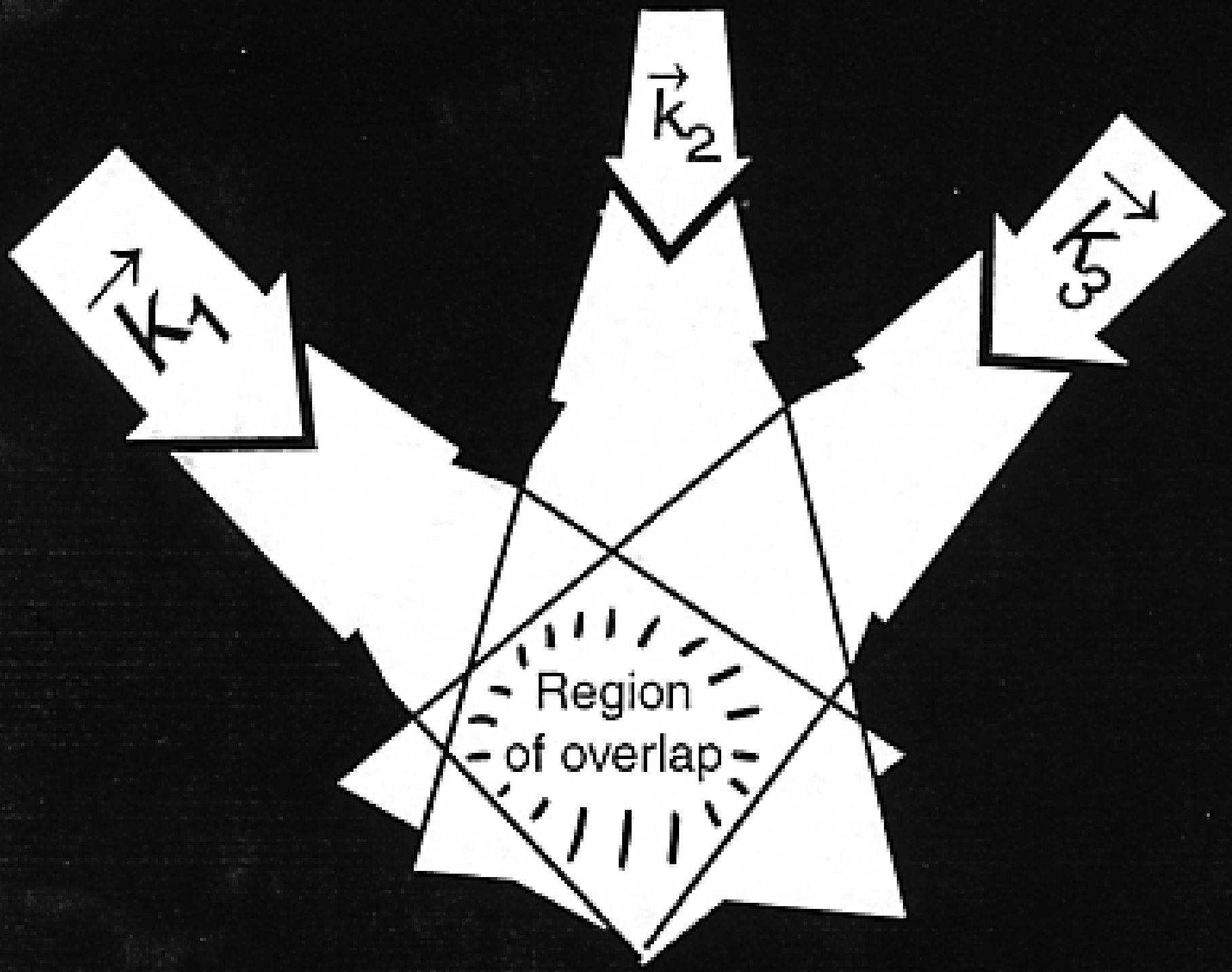


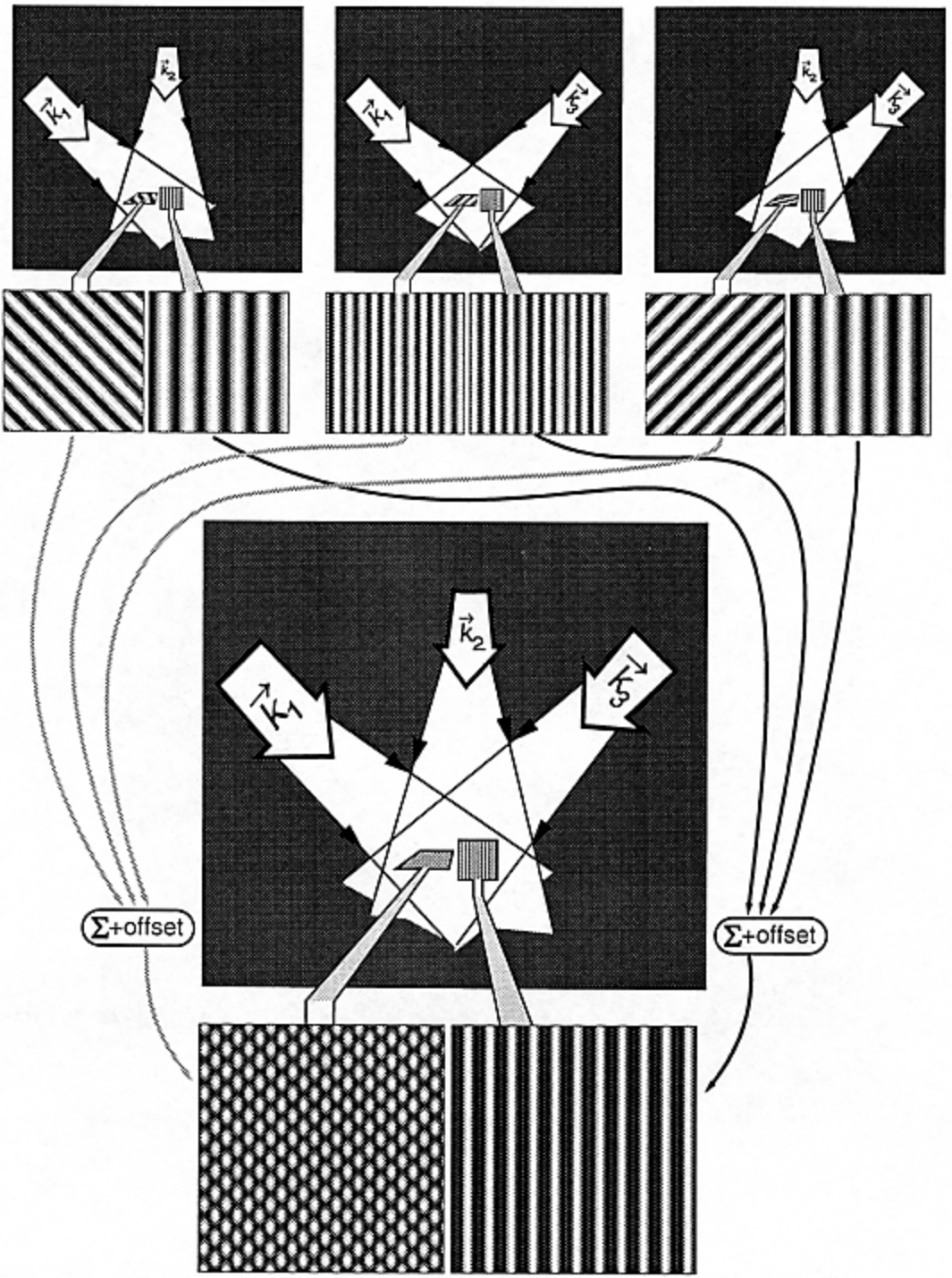
(b)

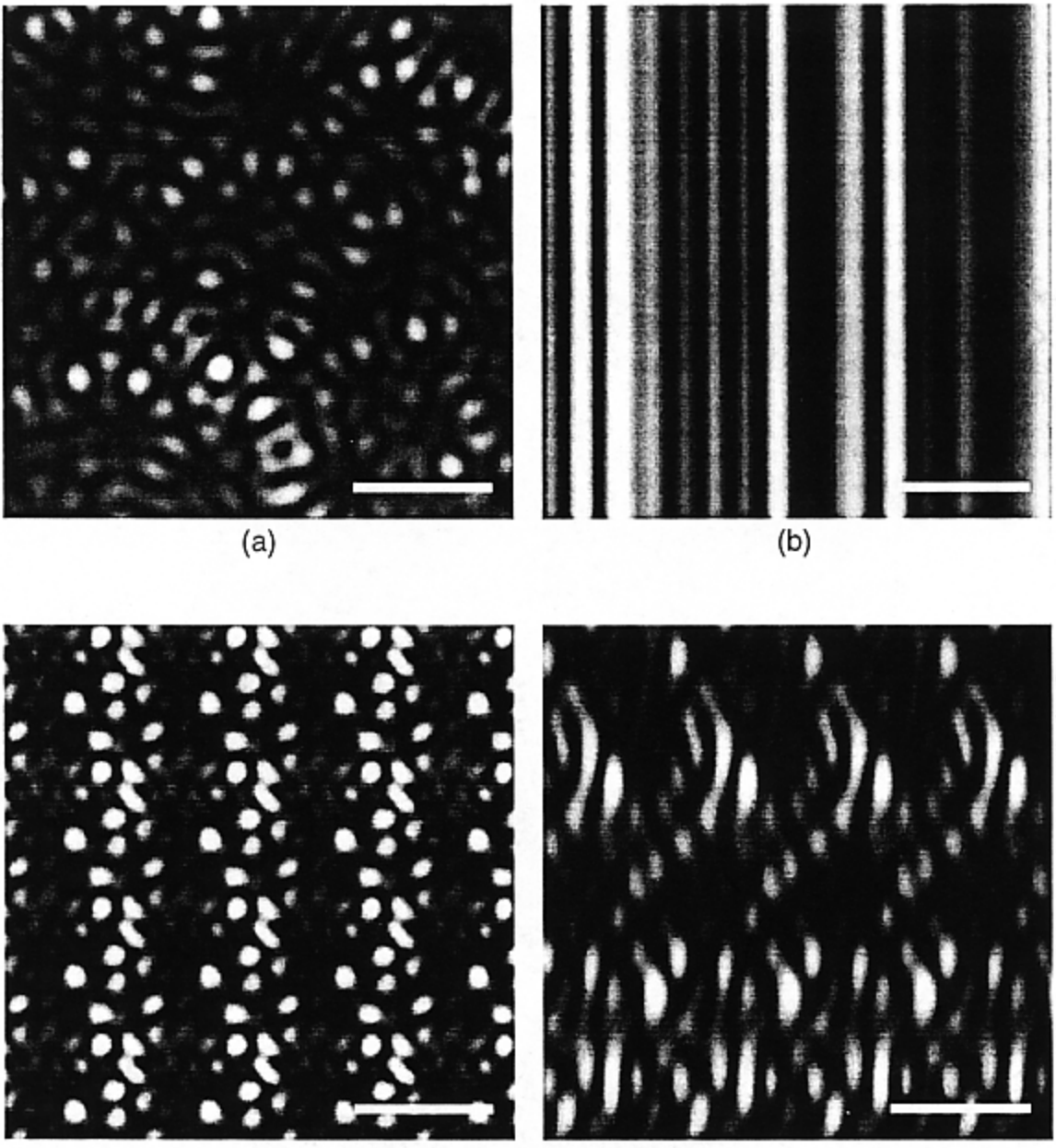
*Many-beam SAM measures simple effect with **fixed** geometry*

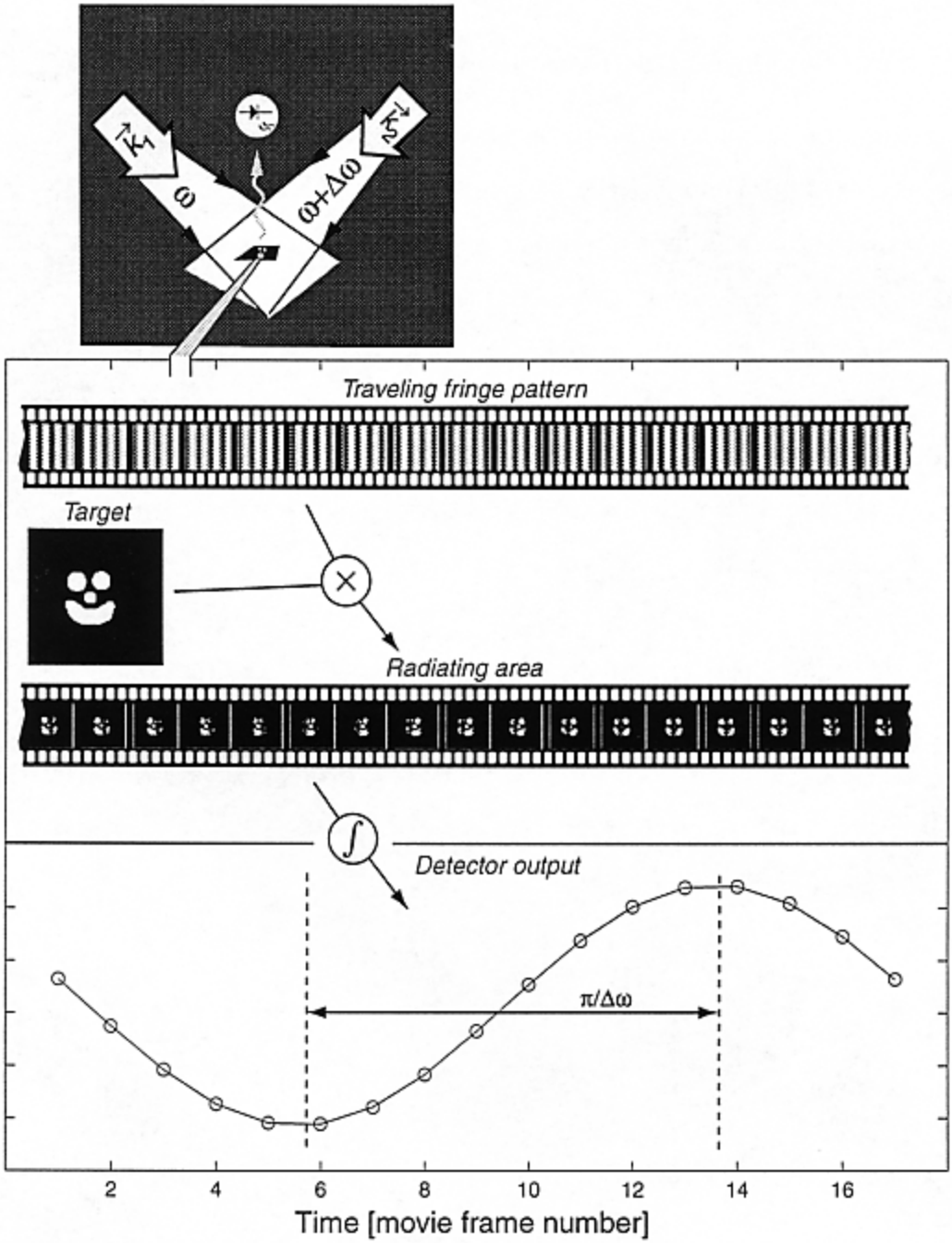


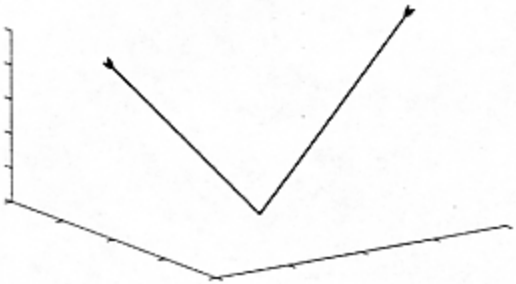
(c)


$\vec{k}_1$
$\vec{k}_2$
$\vec{k}_3$
Region
of overlap

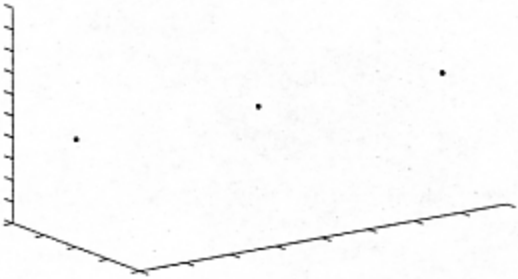

$\vec{k}_1$
$\vec{k}_2$
$\vec{k}_3$
Σ+offset
Σ+offset


(a)
(b)
(c)
(d)

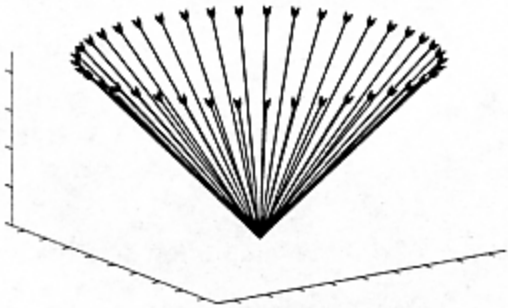

ω
ω+Δω
Traveling fringe pattern
Target
Radiating area
Detector output
π/Δω
2
4
6
8
10
12
14
16
Time [movie frame number]



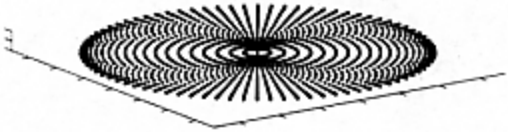
(a)



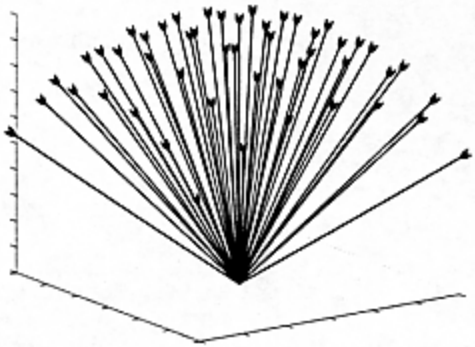
(b)



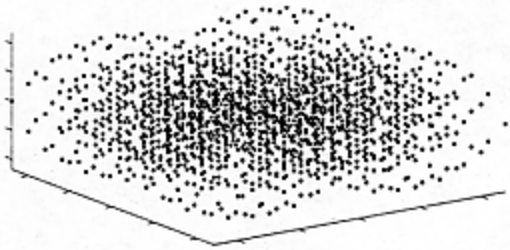
(c)



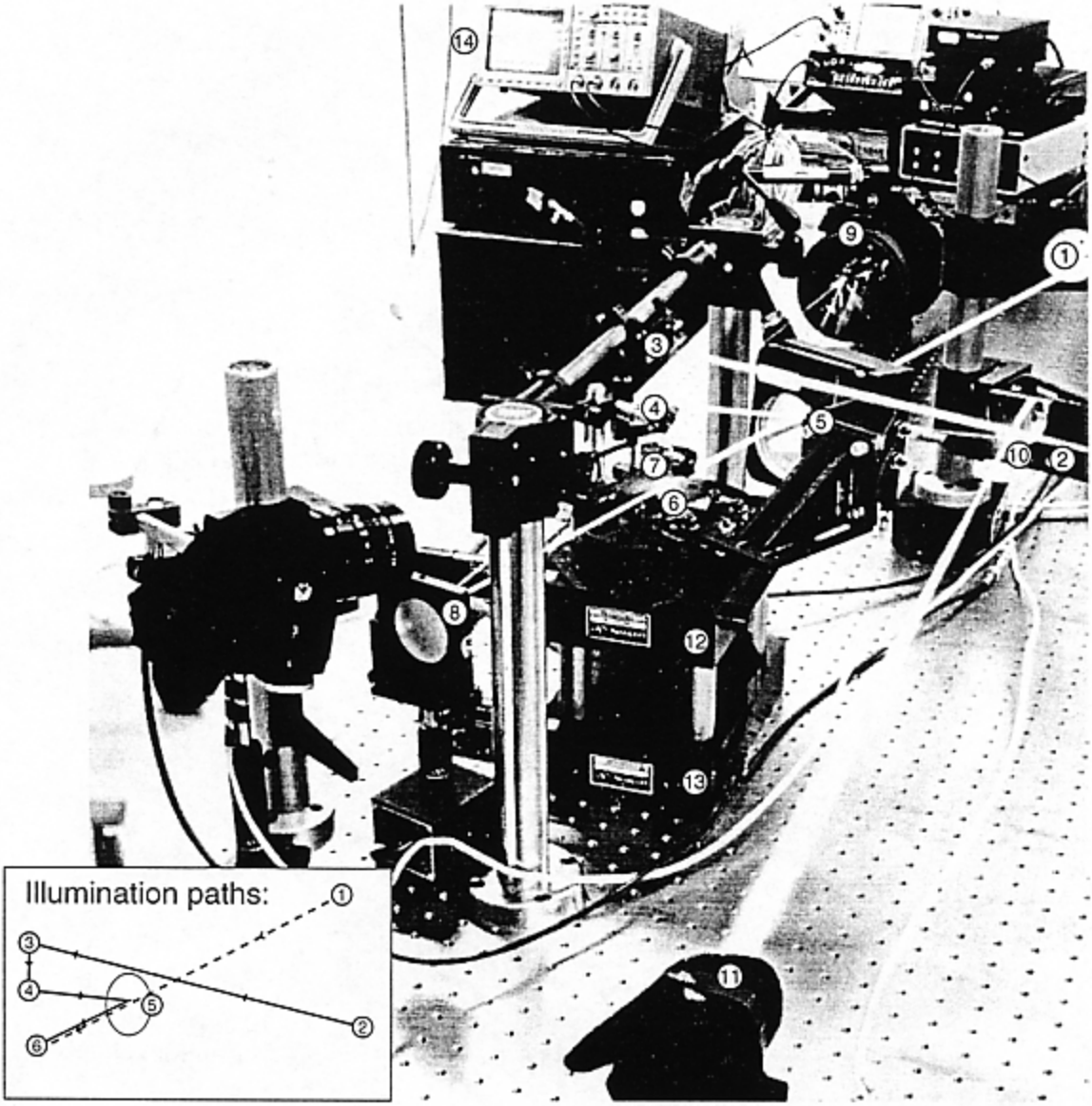
(d)

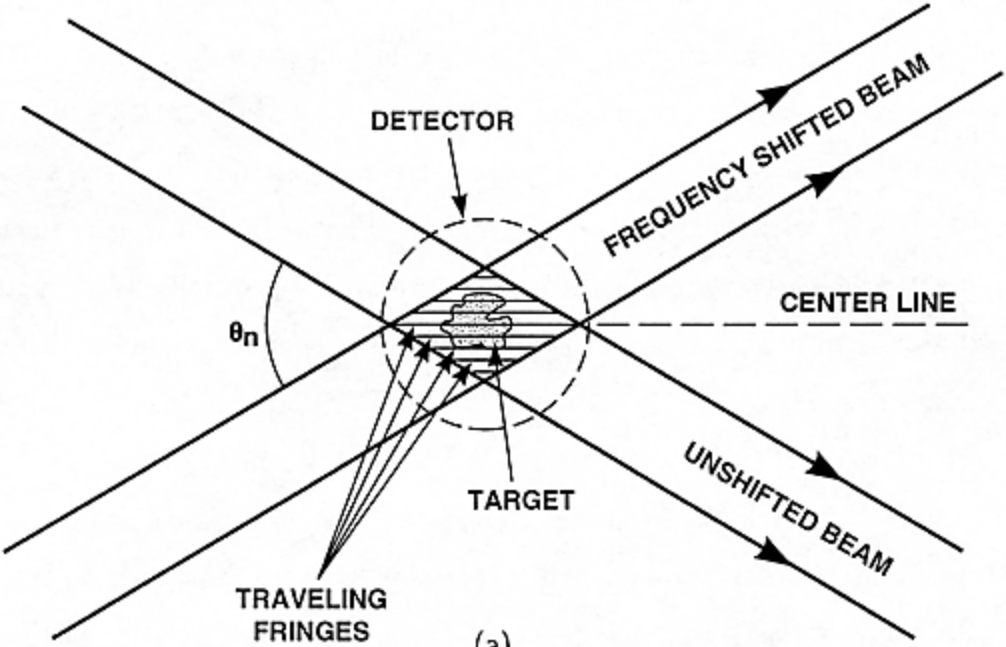


(e)

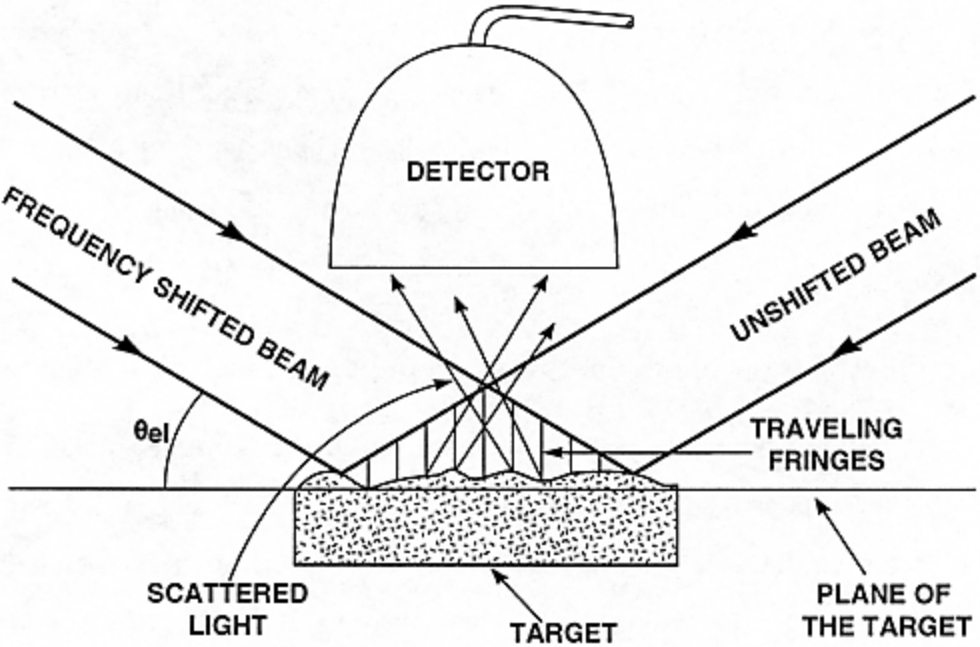


(f)

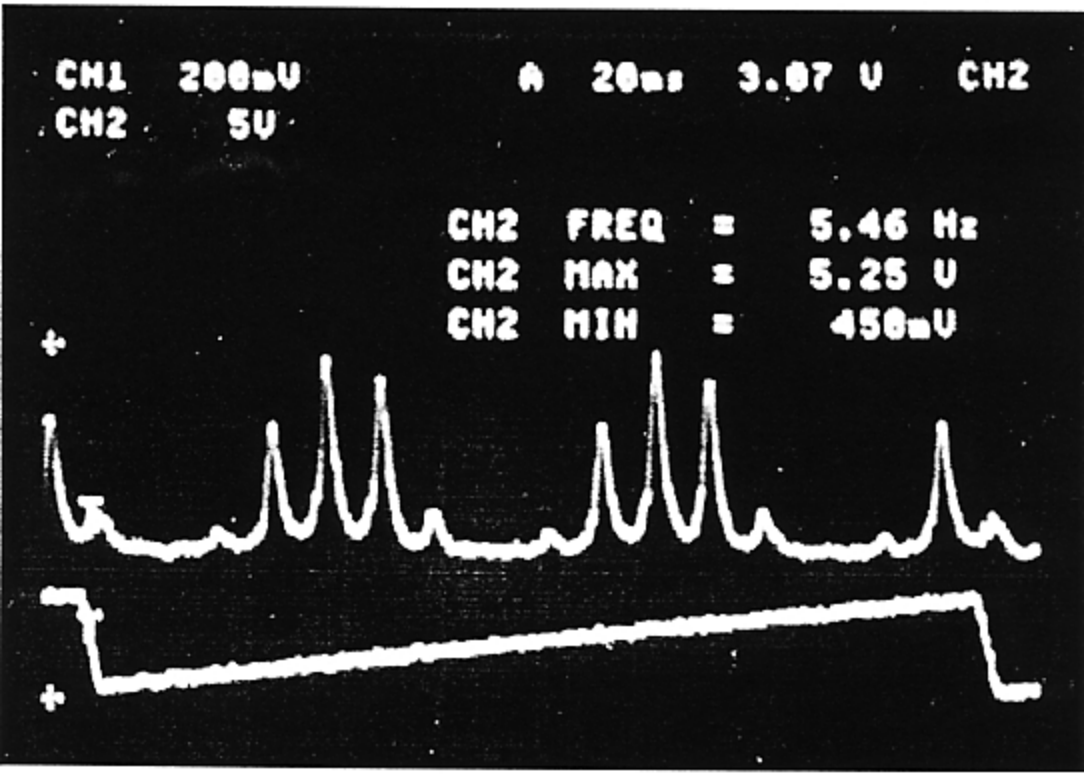

Illumination paths:
1
2
3
4
5
6
7
8
9
10
11
12
13
14

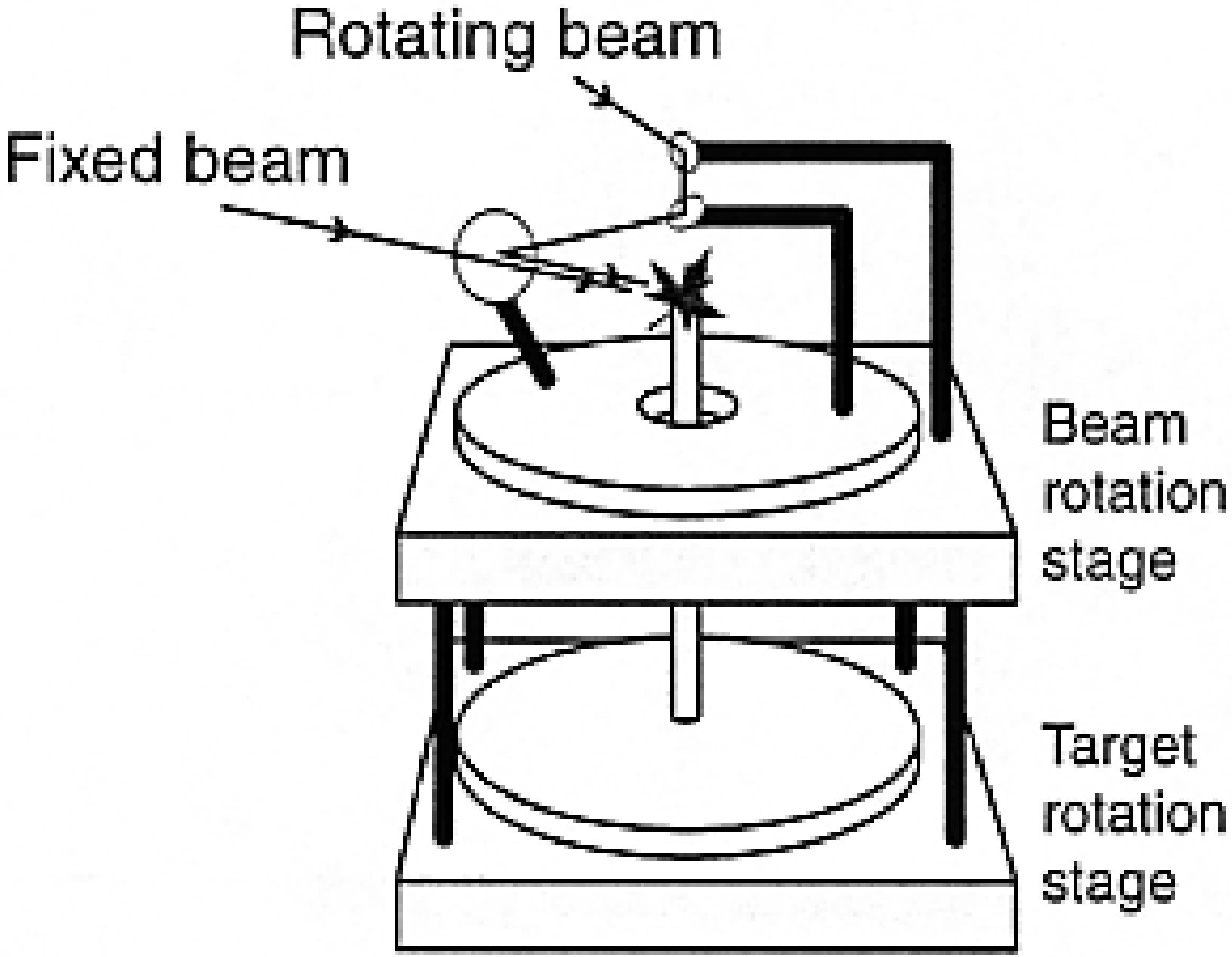

DETECTOR
FREQUENCY SHIFTED BEAM
CENTER LINE
θn
UNSHIFTED BEAM
TARGET
TRAVELING
FRINGES

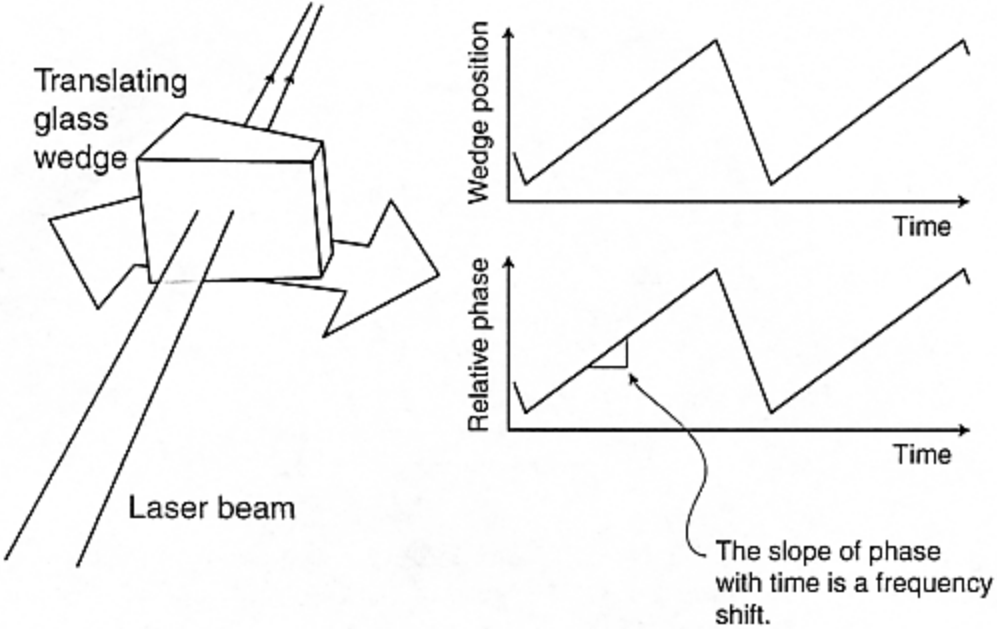
(a)

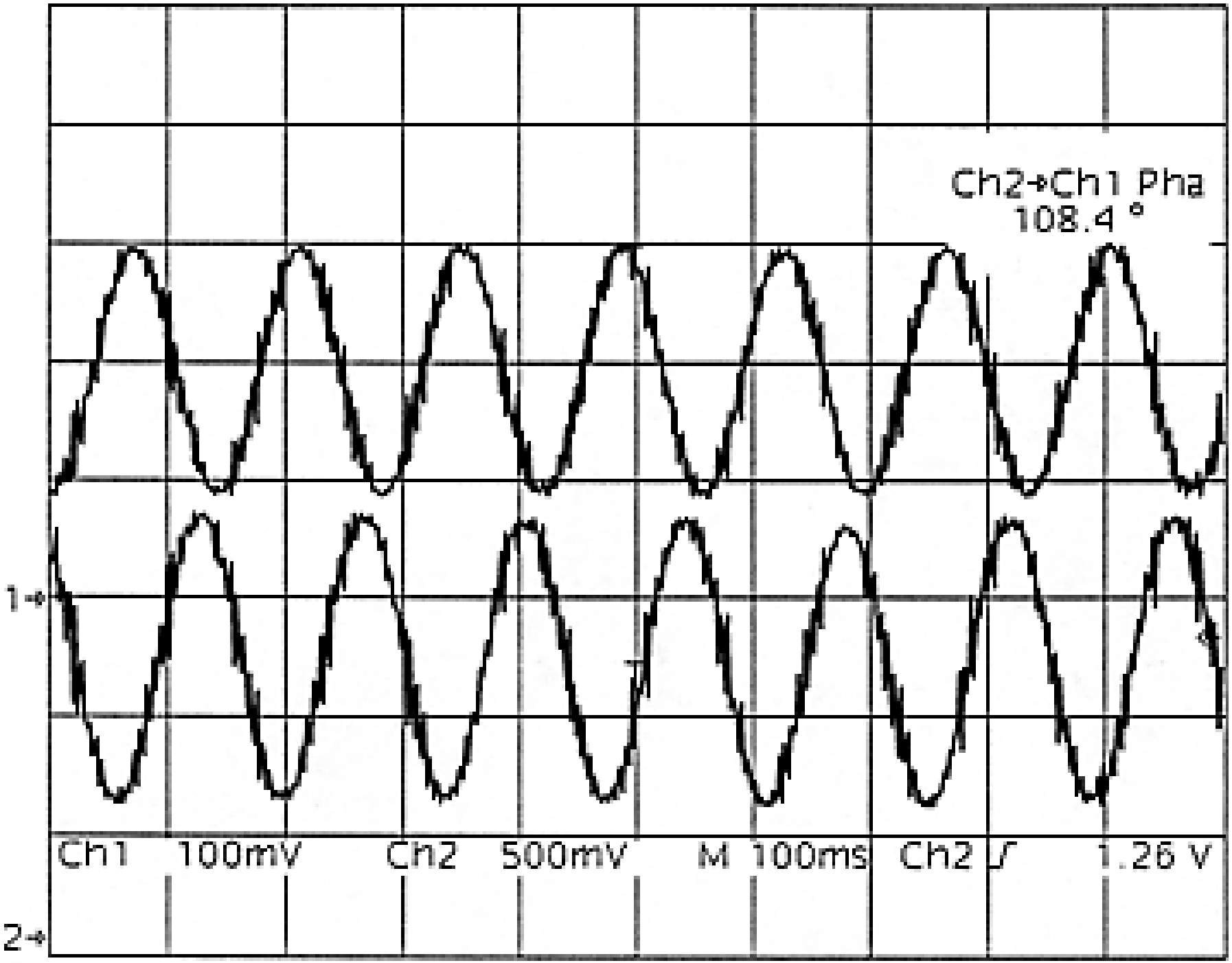

DETECTOR
FREQUENCY SHIFTED BEAM
UNSHIFTED BEAM
θel
TRAVELING
FRINGES
SCATTERED
LIGHT
TARGET
PLANE OF
THE TARGET

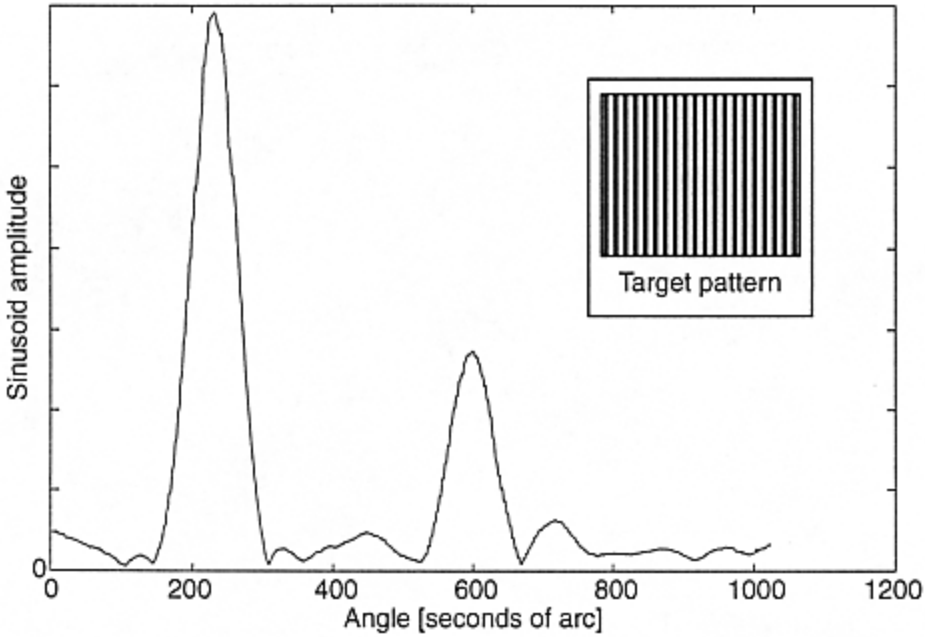
(b)


CH1 200mV
CH2 5V
A 20ms 3.07 V CH2
CH2 FREQ = 5.46 Hz
CH2 MAX = 5.25 V
CH2 MIN = 450mV

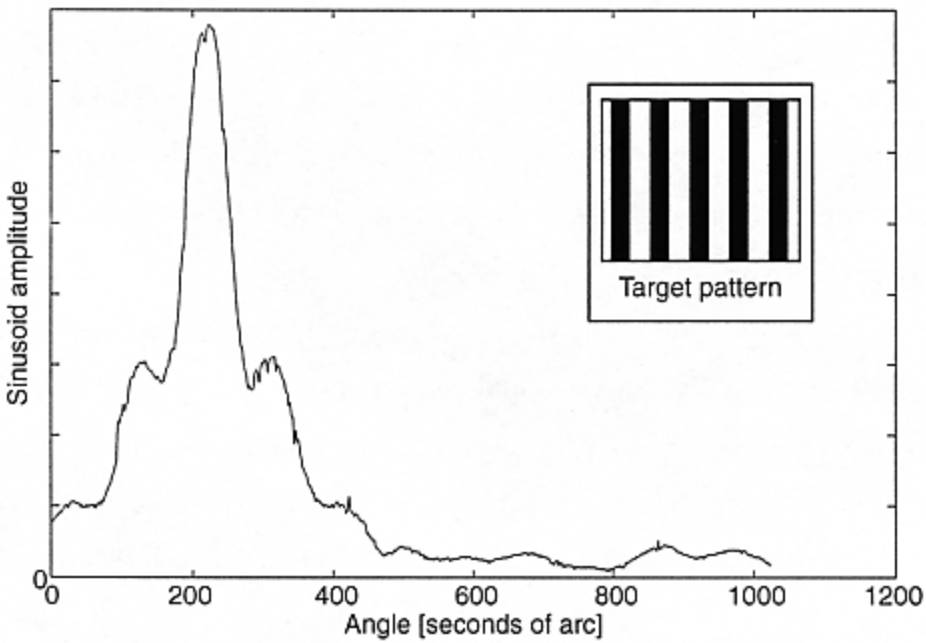

Rotating beam
Fixed beam
Beam rotation stage
Target rotation stage


Translating glass wedge
Laser beam
Wedge position
Time
Relative phase
Time
The slope of phase with time is a frequency shift.

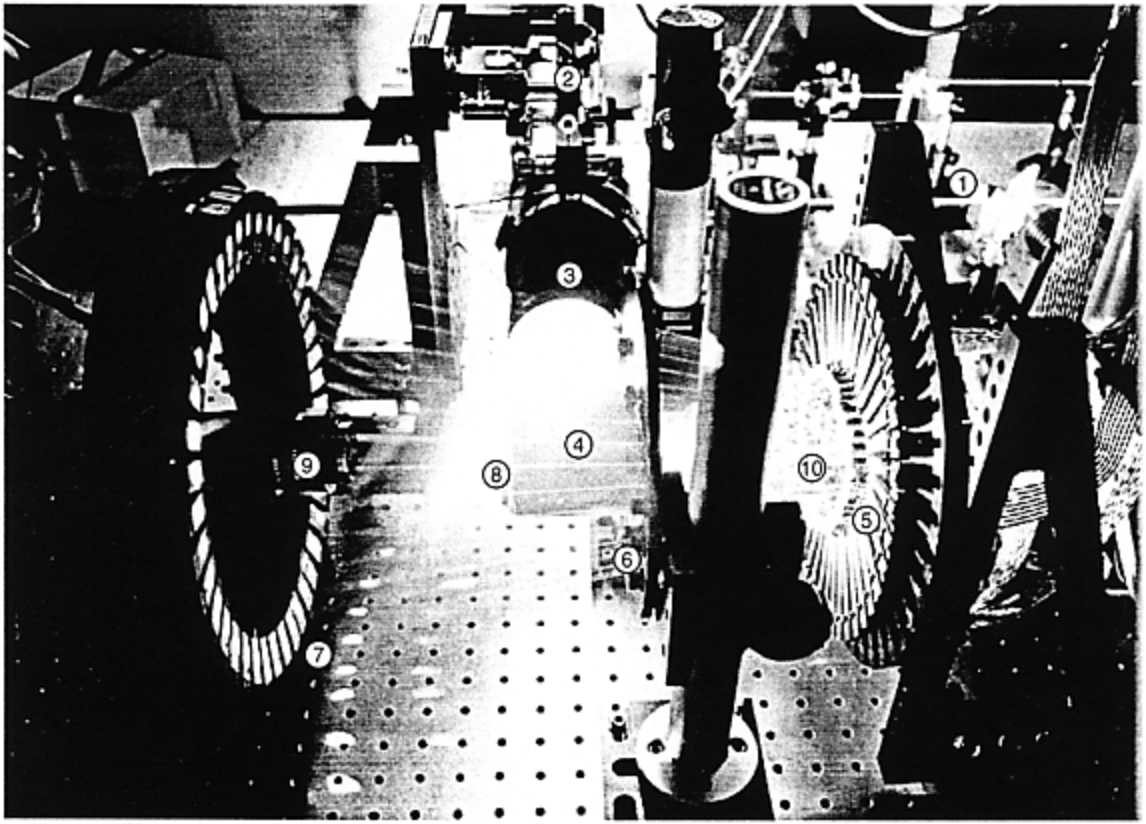

Ch2→Ch1 Pha
108.4 °
1→
Ch1 100mV
Ch2 500mV
M 100ms
Ch2 ∫ 1.26 V
2→

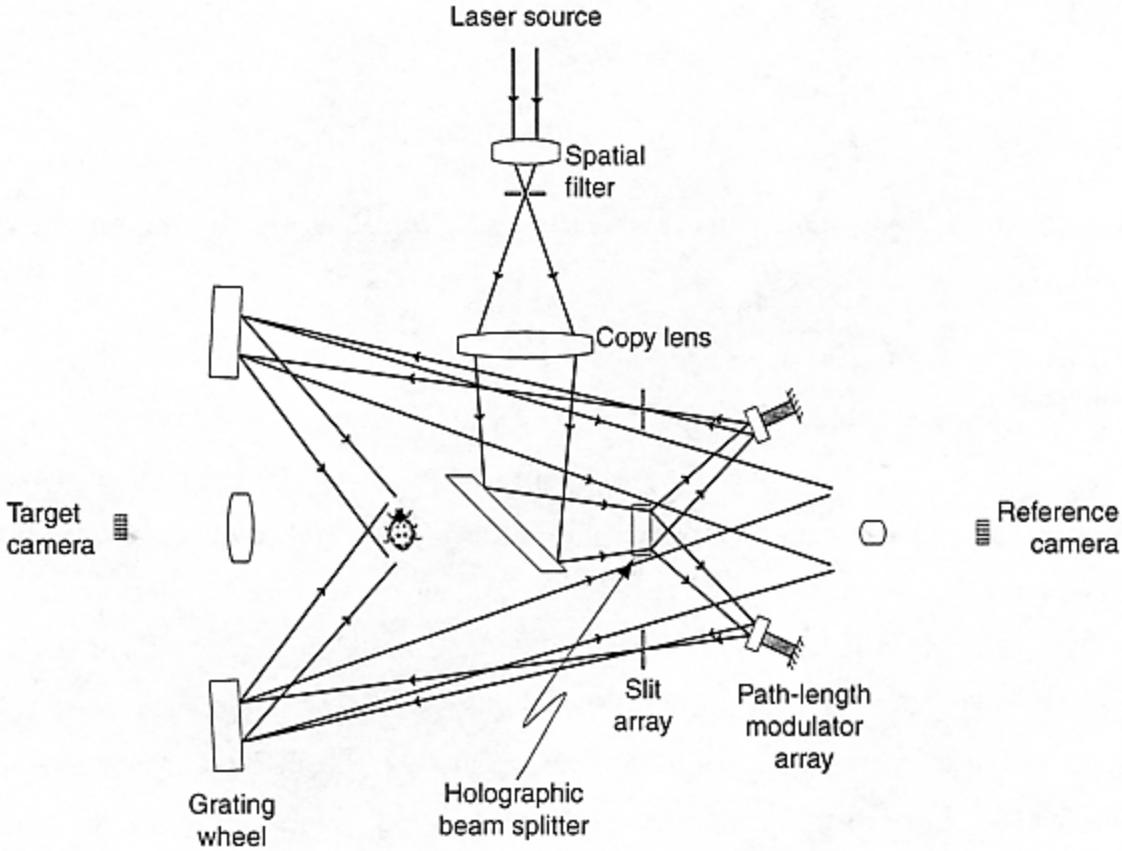

Sinusoid amplitude
0
0
200
400
600
800
1000
1200
Angle [seconds of arc]
Target pattern

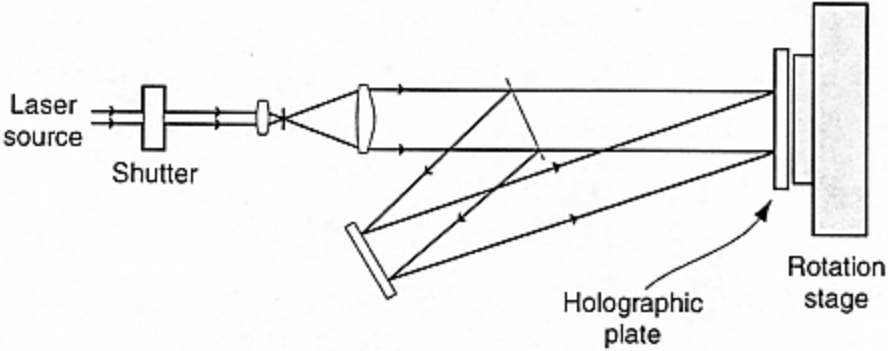
(a)

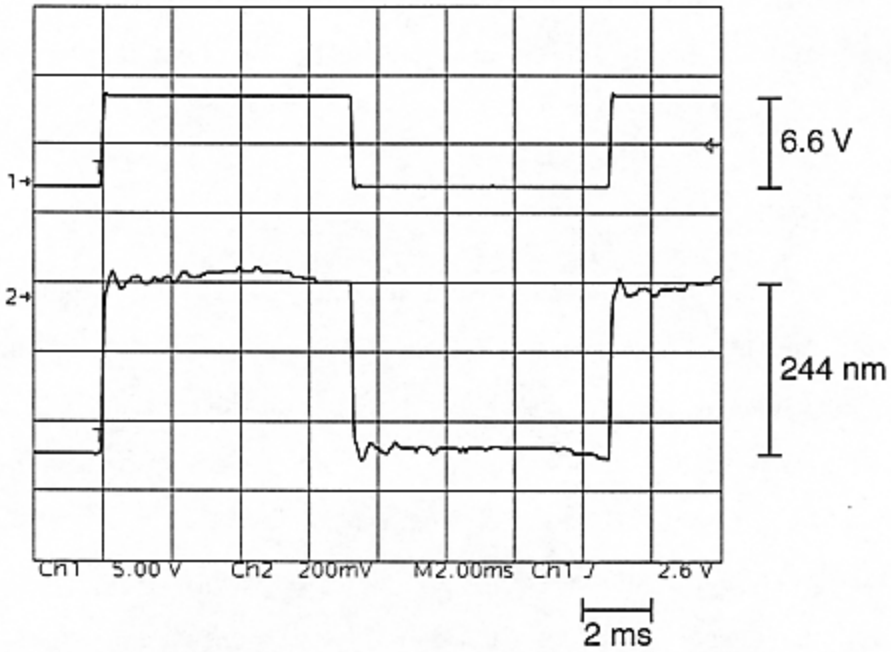

Sinusoid amplitude
0
0
200
400
600
800
1000
1200
Angle [seconds of arc]
Target pattern

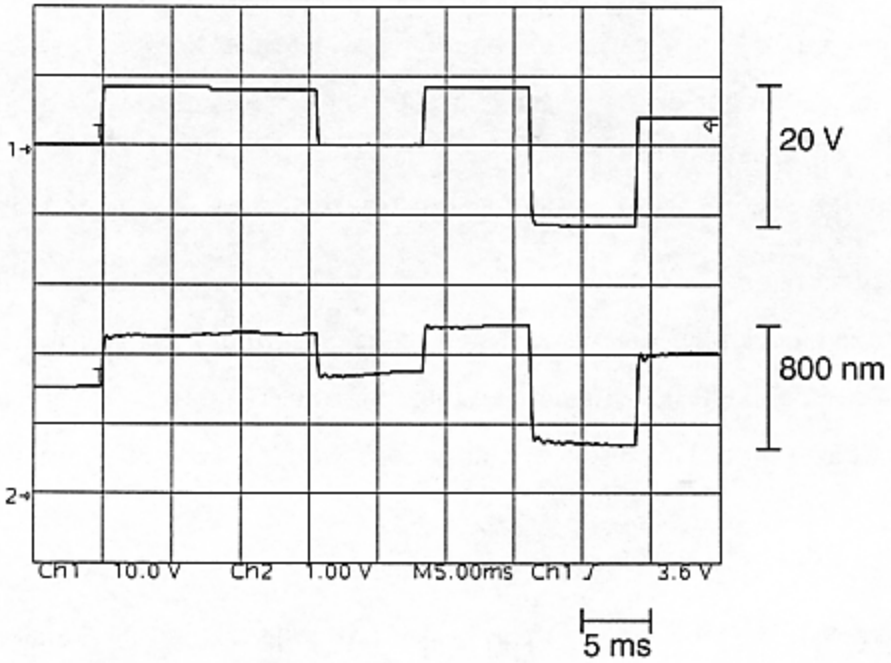
(b)

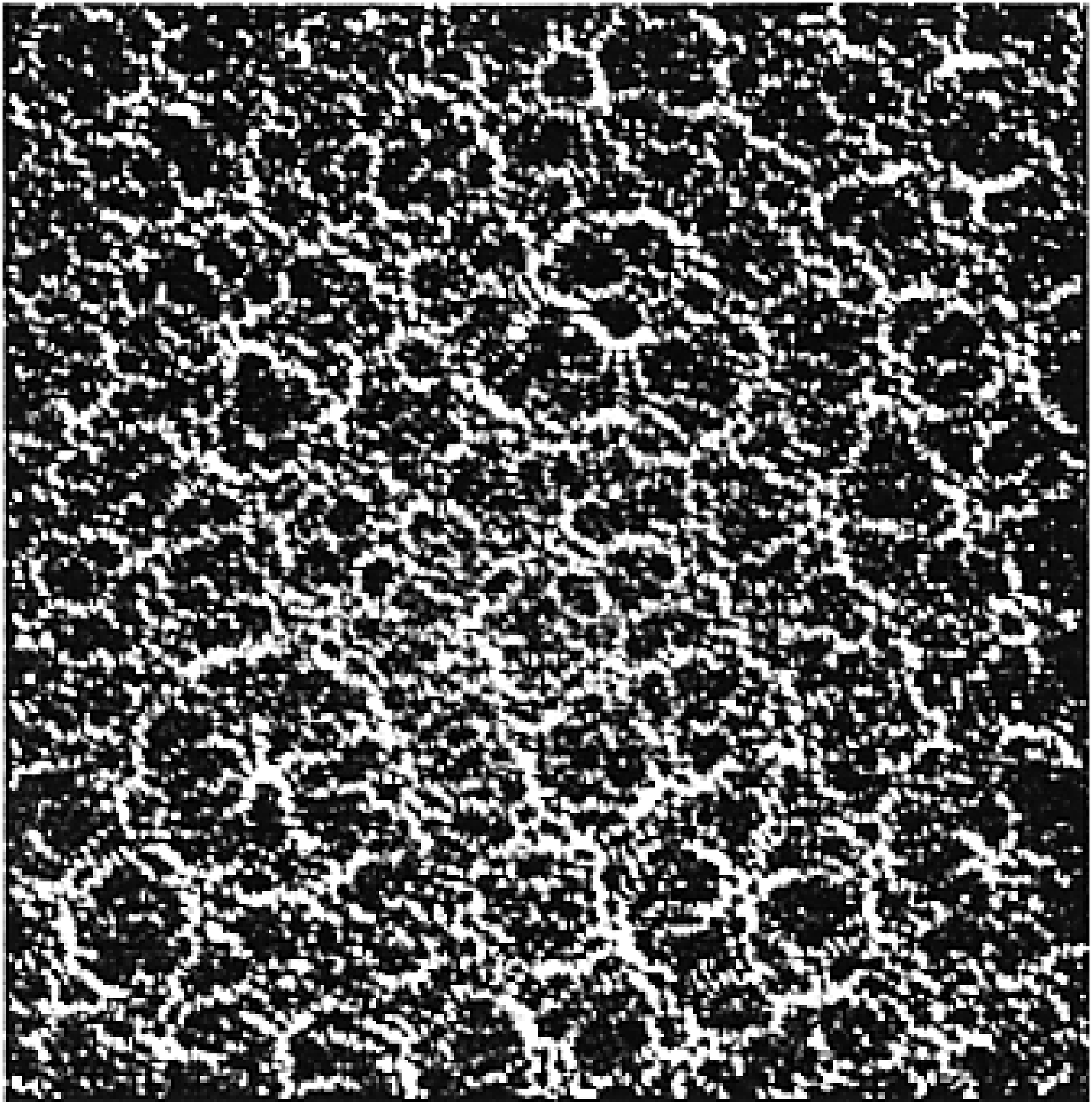

1
2
3
4
5
6
7
8
9
10

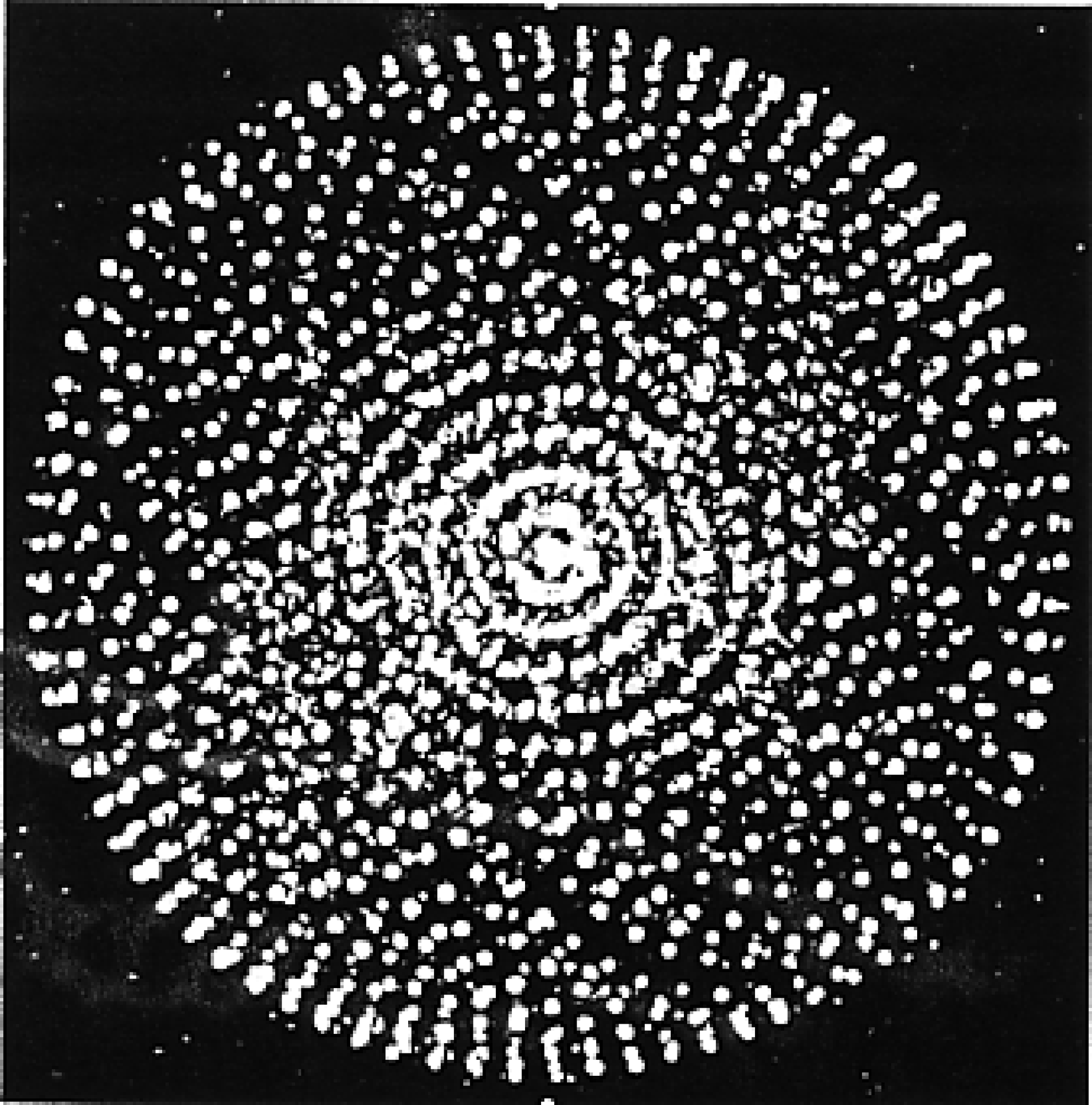

Laser source
Spatial filter
Copy lens
Target camera
Reference camera
Slit array
Path-length modulator array
Grating wheel
Holographic beam splitter

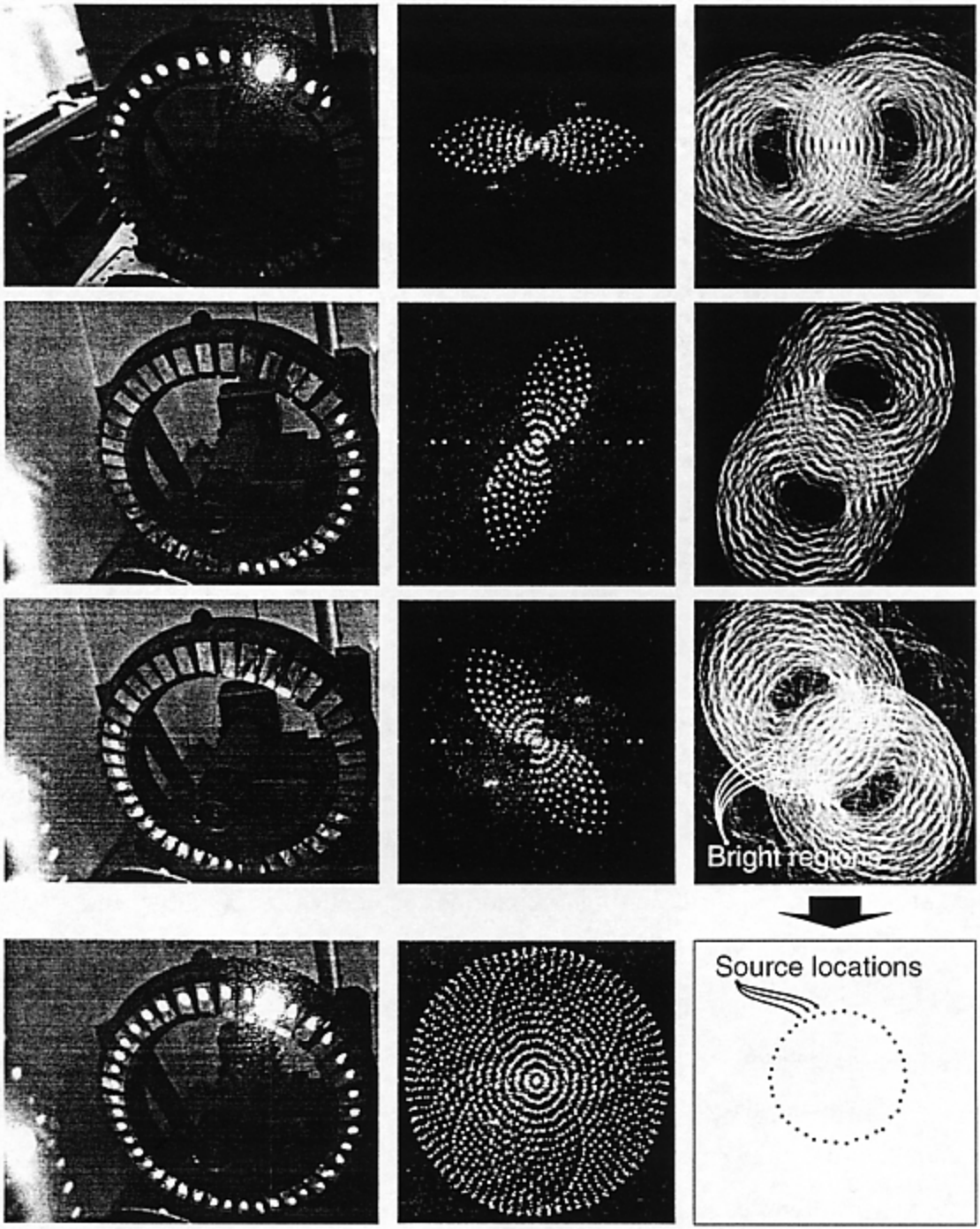

Laser
source
Shutter
Holographic
plate
Rotation
stage


1
2
6.6 V
244 nm
Ch1 5.00 V Ch2 200mV M2.00ms Ch1 ƒ 2.6 V
2 ms


1
2
20 V
800 nm
Ch1 10.0 V Ch2 1.00 V M5.00ms Ch1 ƒ 3.6 V
5 ms






Bright regions
Source locations