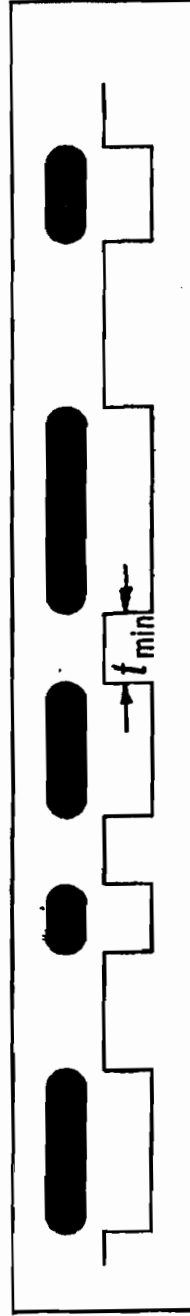
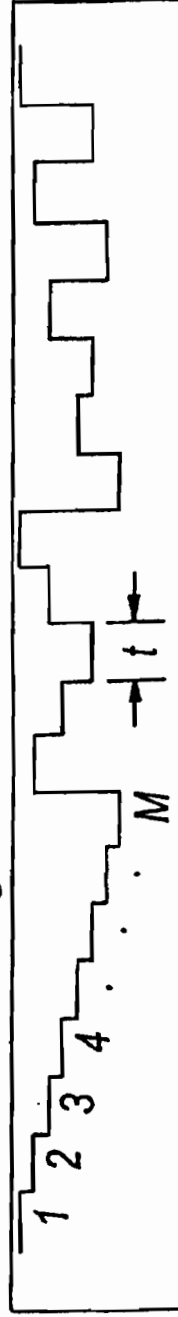


FIG. 1
Multi-States Encoding

Conventional Encoding

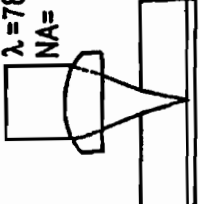
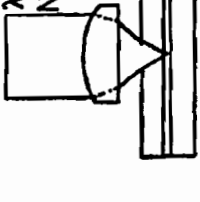
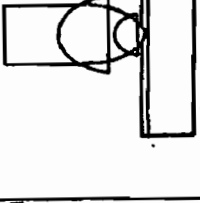
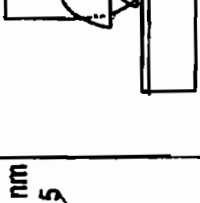
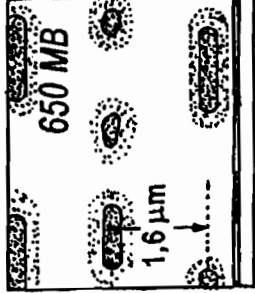
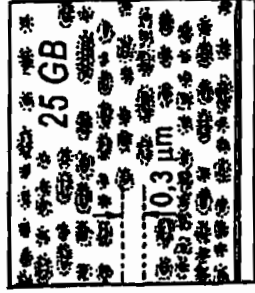
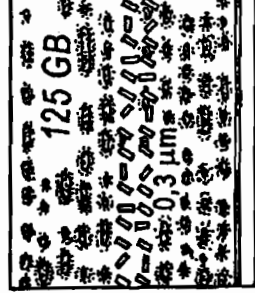


Multi-States Encoding



Areal density and data rate goes up by packing more information (M states) into one recording cell.

Oriented Nano-Structure (ONS) Technology

CD	DVD	Blu-ray Disc	ONS Disc
$\lambda = 780 \text{ nm}$ $NA = 0.45$  1.2 mm substrate	$\lambda = 650 \text{ nm}$ $NA = 0.60$  0.6 mm substrate	$\lambda = 400 \text{ nm}$ $NA = 0.85$  0.1 mm cover layer	$\lambda = 400 \text{ nm}$ $NA = 0.85$  0.1 mm cover layer
 650 MB $1.6 \mu\text{m}$	 4.7 GB $0.74 \mu\text{m}$	 25 GB $0.3 \mu\text{m}$	 125 GB $0.3 \mu\text{m}$
1st generation Audio 0.7 GB 1x: 1.2 Mb/s $\lambda = 780 \text{ nm}$ $NA = 0.45$ 1.2 mm cover	2nd generation SD Video 4.7/8.5 GB 1x: 11 Mb/s $\lambda = 650 \text{ nm}$ $NA = 0.60$ 0.6 mm cover	3rd generation HD Video 25/50 GB 1x: 36 Mb/s $\lambda = 405 \text{ nm}$ $NA = 0.85$ 0.1 mm cover	4th generation HD Compact Video 125 GB 1x: 180 Mb/s $L = 405 \text{ nm}$ $NA = 0.85$

Enable 5x or more in storage capacity and data rate of optical discs with similar far-field optics of convention optical drive.

FIG. 2



FIG. 3(A)

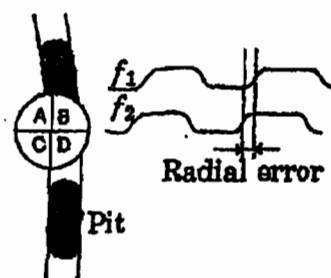


FIG. 3(B)

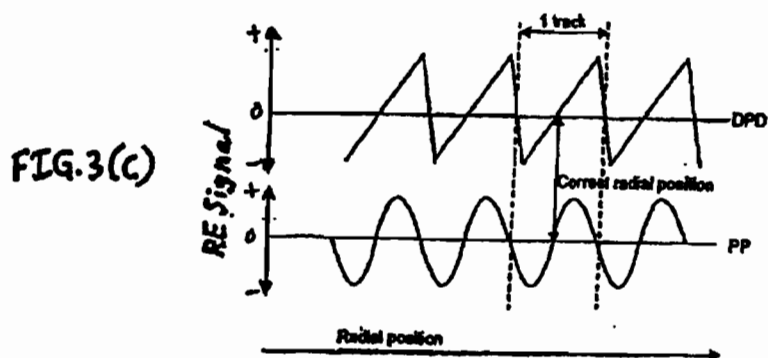


FIG. 3(C)



FIG. 4



FIG. 5(A)

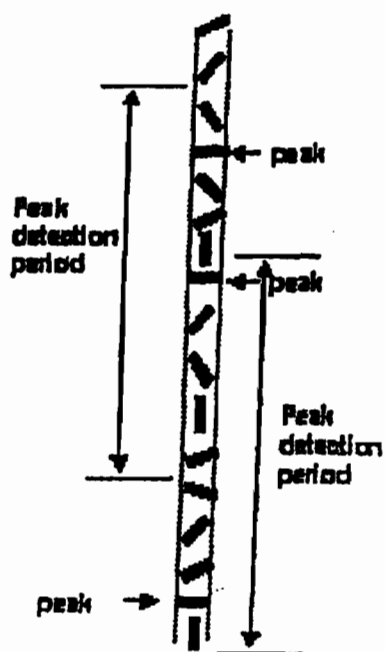


FIG. 5(B)