

Contents	1
I. Introduction	
A. Symmetric waveguide with gain	2
B. Effect of magnetic layer	2
C. Modal cut-off	2
D. Use in optical telecommunications	2
E. History of nonreciprocal propagation	3
F. Phase shift at transverse magnetization	3
G. Plan	4
II. Principle of dielectric waveguides	5
A. Reflection at a planar interface between two dielectrics	5
B. Film substrate system	13
C. Characteristic equation	15
III. Metal-clad waveguides	18
IV. Yehs' 4x4 matrix formalism	21
A. Wave equation	21
B. Eigen - values and eigen - polarisations	22
C. Boundary conditions	23
D. Matrix representation of the multilayer structure	25
E. Reflection and transmission coefficients	25
F. Isotropic multilayers	26
G. Reflection at a single interface of isotropic media	28
H. A single layer dielectric waveguide	29
I. Two layer dielectric waveguide	32
V. Magneto-optics at transverse magnetization	34
A. Material tensors	35
B. Eigen polarizations	36
C. Dynamic matrix	37
D. TM reflection of the radiation modes at transverse magnetization	38
E. Waveguide with an interface at transverse magnetization	43
F. Non-reciprocal propagation in a dielectric film sandwiched between two half spaces at transverse magnetization	47
G. A two layer waveguide with non reciprocal propagation	49
H. TM reflection on a magnetic film at transverse magnetization sandwiched between a non magnetic cover and a non magnetic substrate	54
VI. Maxwell equations	59
A. Systems with cylindrical symmetry	60
B. Planar structures	61
C. Reflection at an interface between an isotropic medium and a medium at transverse magnetization	64
D. TM modes in an isotropic waveguide	66
E. TM modes in a two layer nonreciprocal waveguide	69
Conclusions	73
References	75