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# New computational treatment of optical wave propagation in lossy waveguides

**Key words:** Adjoint operator, Orthogonal, Chebyshev, Pseudospectral method, Dirichlet-to-Neumann map

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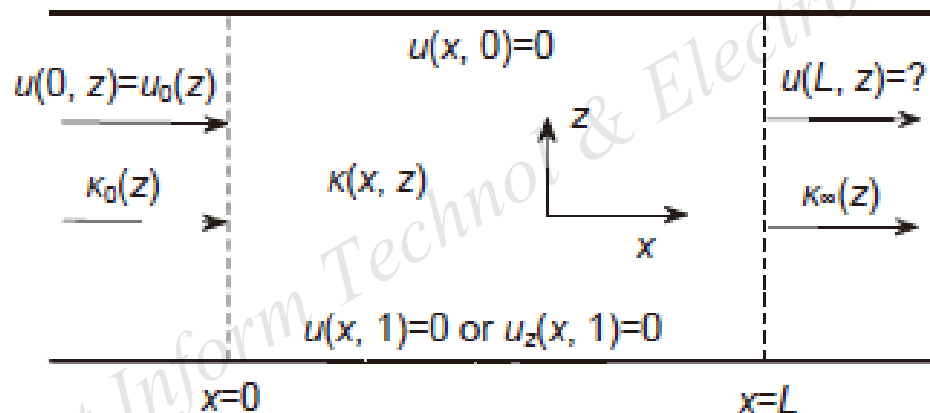
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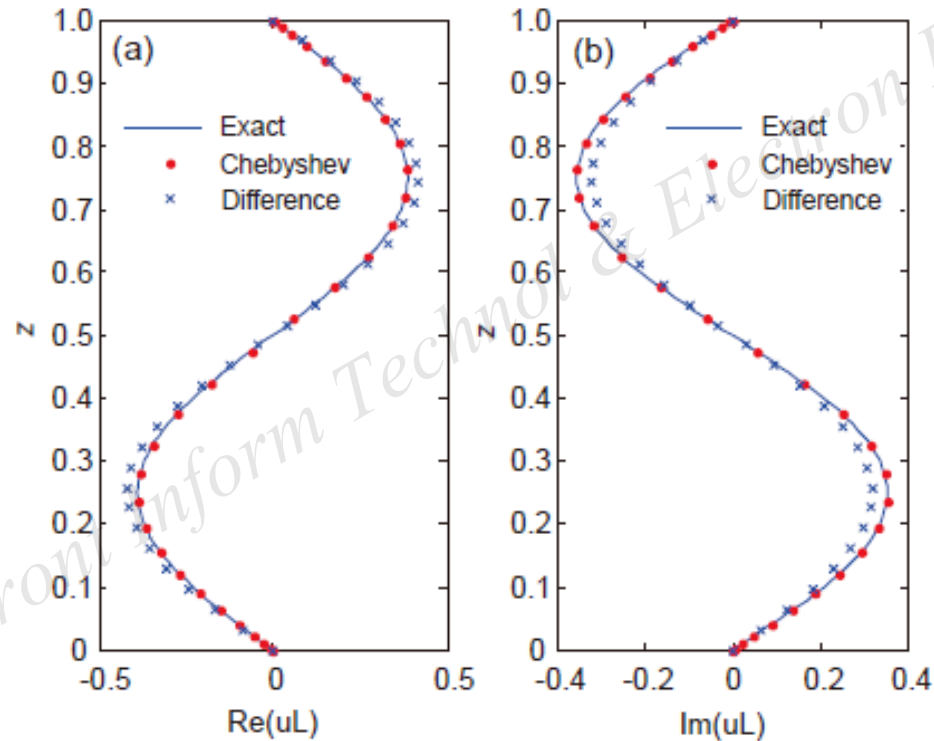
# Introduction

- Optical wave propagation in lossy waveguides is described by the Helmholtz equation with the complex refractive-index.
- The Chebyshev pseudospectral method is used to discretize the transverse operator of the equation.
- An operator marching method, a one-way re-formulation based on the Dirichlet-to-Neumann (DtN) map, is improved to solve the equation.

# Problem sketch

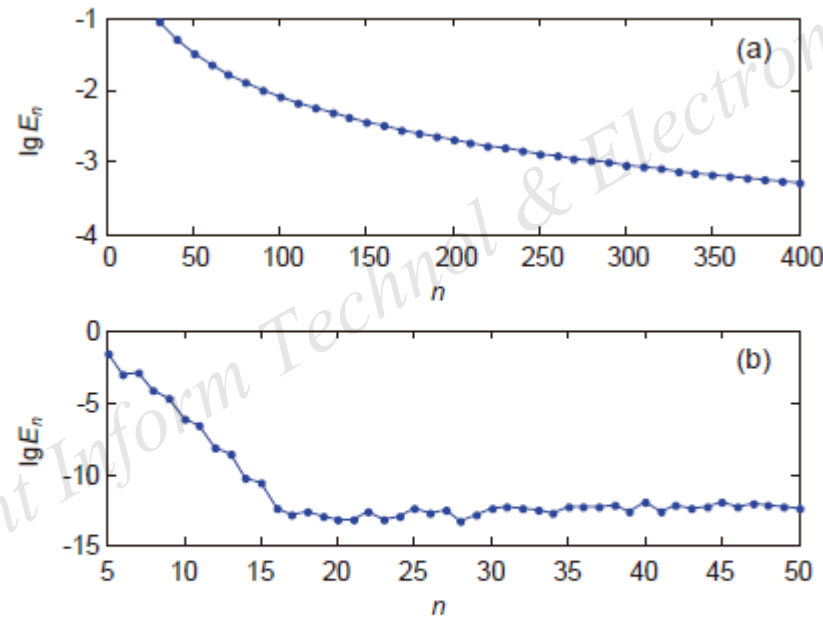


# Simulation results



**Fig. 2** Comparison of two methods for case 1: (a) real part of  $uL$ ; (b) imaginary part of  $uL$

# Simulation results (Con'd)



**Fig. 3** Relative errors for different  $n$ 's for case 1:  
(a) finite difference method; (b) Chebyshev pseudo-spectral method

# Conclusions

- We propose a new method for the computation of propagation in lossy waveguides.
- The method is also suitable for some complex problems.