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Abstract

The work aims to present extensions of the developed methods used in electrostatic analysis of planar periodic and finite systems for efficient solving of variety of the acoustic and electromagnetic wave generation and scattering problems. Specifically, their generalization for application in the acoustic beamforming analysis is reported. Moreover, certain electromagnetic wave scattering problems by periodic waveguiding structures which can be efficiently approached by these methods are also considered.

(no more than one page)

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Streszczenie

Podstawowym celem pracy jest przedstawienie opracowanych uogólnionych metod analizy zagadnień elektrostatyki układów planarnych zarówno periodycznych jak i nieperiodycznych, zawierających skończoną ilość elementów, do celów efektywnego rozwiązywania zagadnień brzegowych w teorii generacji i detekcji fal akustycznych oraz analizy zagadnień brzegowych w teorii fal elektromagnetycznych dla przypadku struktur falowodowych.

(no more than one page)

Symbols and abbreviations **(OPTIONAL)**

The short list of most frequently used symbols and abbreviations is provided below:

ω, Ω	–	angular frequency
f	–	temporal frequency
f_0	–	central frequency (of a transducer)
λ	–	wave-length
k	–	wave-number
Λ	–	period of strips (group of strips) or baffles (group of baffles)
K	–	spatial spectrum wave-number of periodic array of strips (baffles)
P_k	–	Legendre polynomials of the first kind
J_k	–	Bessel function of the first kind of order k
Γ	–	gamma function
ϕ	–	electrostatic or acoustic potential
Q	–	electrostatic charge
V	–	potential difference (voltage between strips)
σ	–	surface charge distribution
x, y, z	–	Cartesian space variables
ϵ_0	–	dielectric permittivity of vacuum
ϵ	–	effective surface dielectric permittivity
μ_0	–	magnetic permeability of vacuum
$\mathbf{E}$	–	electric field vector
$\mathbf{H}$	–	magnetic field vector
$\mathbf{D}$	–	electric induction vector
E_i	–	components of electric field, $i = x, y, z$

H_i	–	components of magnetic field, $i = x, y, z$
D_i	–	components of electric induction, $i = x, y, z$
$G(\xi)$	–	planar harmonic Green's function
$\Phi(\xi)$	–	spectrum representation of the complex (electrostatic) field function
$\Phi(x)$	–	spatial representation of the complex (electrostatic) field function
d	–	strip half-width
r, s	–	spectral variables related to the x, y spatial coordinates constrained to one Brillouin zone
$\mathcal{F}$	–	Fourier transform
p	–	acoustic pressure
ρ_a	–	mass density of the acoustic media
v_z	–	z-component (normal component) of the particle velocity
Π	–	acoustic power
Π_z	–	normal component of the acoustic Poynting vector
SAW	–	surface acoustic wave
IDT	–	interdigital transducer
BIS	–	Blotekjœr, Ingebrigtsen, and Skeie expansion method
FFT	–	fast (finite) Fourier transform
SNR	–	signal-to-noise ratio
SA	–	synthetic aperture
SAFT	–	synthetic aperture focusing technique
M-SAFT	–	multi-element synthetic aperture focusing technique
STA	–	synthetic transmit aperture
MSTA	–	multi-element synthetic transmit aperture
TM	–	transverse magnetic wave polarization
TE	–	transverse electric wave polarization

Contents

1

Introduction

1.1 Title of the Section 1.1

A manuscript submitted for publication to IPPT Reports on Fundamental Technological Research should be original work which have not been previously published and should not be under consideration for publication elsewhere. Submitted materials should be written in good English. Exceptionally, submissions of the PhD and Habilitation theses written in the language other than English are also possible, provided that they are accompanied by parallel submissions of their summaries written in good English.

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2

Title of the Chapter 2

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Equations should be referenced either as Eq. (2.1) or simply as (2.1). Once chosen the reference style should be followed throughout the manuscript.

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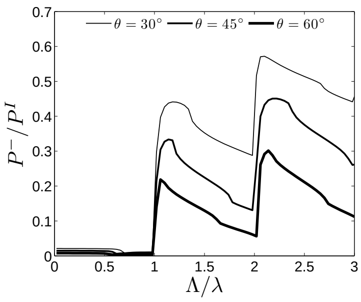
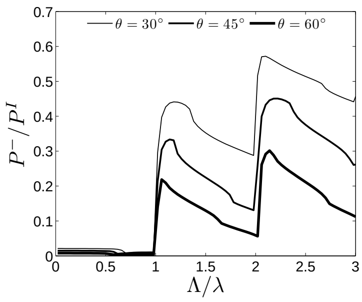


(a)



(b)

Figure 2.1. Example of the figure caption (a) subfigure 1 and (b) subfigure 2.

Table 2.1. Table in tabularx environment (tabularx package)

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