Absolute analytical prediction of photonic crystal guided mode resonance wavelengths -
DTU Orbit (16/02/2019)

Absolute analytical prediction of photonic crystal guided mode resonance wavelengths
A class of photonic crystal resonant reflectors known as guided mode resonant filters are optical structures that are widely 
used in the field of refractive index sensing, particularly in biosensing. For the purposes of understanding and design, their 
behavior has traditionally been modeled numerically with methods such as rigorous coupled wave analysis. Here it is 
demonstrated how the absolute resonance wavelengths of such structures can be predicted by analytically modeling them 
as slab waveguides in which the propagation constant is determined by a phase matching condition. The model is 
experimentally verified to be capable of predicting the absolute resonance wavelengths to an accuracy of within 0.75 nm, 
as well as resonance wavelength shifts due to changes in cladding index within an accuracy of 0.45 nm across the visible 
wavelength regime in the case where material dispersion is taken into account. Furthermore, it is demonstrated that the 
model is valid beyond the limit of low grating modulation, for periodically discontinuous waveguide layers, high refractive 
index contrasts, and highly dispersive media.

General information
State: Published
Organisations: Department of Micro- and Nanotechnology, Optofluidics
Contributors: Hermansson, P. G., Vannahme, C., Smith, C., Kristensen, A.
Number of pages: 4
Pages: 071103
Publication date: 2014
Peer-reviewed: Yes

Publication information
Volume: 105
Issue number: 7
ISSN (Print): 0003-6951
Ratings:
BFI (2019): BFI-level 2
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 3.25 SJR 1.382 SNIP 1.167
Web of Science (2017): Impact factor 3.495
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 2.67 SJR 1.673 SNIP 1.249
Web of Science (2016): Impact factor 3.411
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 2.47 SJR 1.499 SNIP 1.226
Web of Science (2015): Impact factor 3.142
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 3.25 SJR 1.861 SNIP 1.492
Web of Science (2014): Impact factor 3.302
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 3.77 SJR 2.146 SNIP 1.633
Web of Science (2013): Impact factor 3.515
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 3.76 SJR 2.57 SNIP 1.739
Web of Science (2012): Impact factor 3.794
ISI indexed (2012): ISI indexed yes