Comparison of spatial harmonics in infinite and finite Bragg stacks for metamaterial homogenization

Metamaterial homogenization may be based on the dominance of a single Floquet-Bloch spatial harmonic in an infinite periodic structure - with the dominance quantified in terms of the relative magnitude of the associated spatial harmonic Poynting vector. For the corresponding finite structure the field is not quasi-periodic and cannot be expanded in Floquet-Bloch spatial harmonics; however, a set of pseudo spatial harmonics can be defined and the dominance of a single such harmonic likewise be used to determine whether the structure can be homogenized. For three different lossless Bragg stack configurations (one of which is magneto-dielectric), we show, using spectral representation, that the field in the finite structure can be accurately expanded in terms of these pseudo spatial harmonics and that the distribution of these agrees very well with the distribution of Floquet-Bloch spatial harmonics of the corresponding infinite Bragg stack. This is even the case for finite Bragg stacks having only two unit cells; thus, the number of unit cells does not influence the homogenizability of this type of configuration.

General information
State: Published
Organisations: Department of Electrical Engineering, Electromagnetic Systems
Contributors: Clausen, N. C. J., Arslanagic, S., Breinbjerg, O.
Pages: 419-428
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Photonics and Nanostructures - Fundamentals and Applications
Volume: 12
ISSN (Print): 1569-4410
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 1.63 SJR 0.433 SNIP 0.762
Web of Science (2017): Impact factor 1.575
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.8 SJR 0.535 SNIP 0.823
Web of Science (2016): Impact factor 1.705
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 1.56 SJR 0.728 SNIP 0.668
Web of Science (2015): Impact factor 1.505
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 1.54 SJR 0.739 SNIP 0.772
Web of Science (2014): Impact factor 1.474
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 1.67 SJR 0.85 SNIP 0.743
Web of Science (2013): Impact factor 1.35
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 1.73 SJR 0.962 SNIP 1.094
Web of Science (2012): Impact factor 1.792
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.29 SJR 1.328 SNIP 1.183
Web of Science (2011): Impact factor 1.681
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.448 SNIP 1.184
Web of Science (2010): Impact factor 2.75
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.549 SNIP 1.079
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.212 SNIP 1.172
Scopus rating (2007): SJR 1.386 SNIP 1.121
Scopus rating (2006): SJR 1.416 SNIP 0.906
Scopus rating (2005): SJR 1.545 SNIP 1.258
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.381 SNIP 1.288
Web of Science (2003): Indexed yes
Original language: English
Keywords: Bragg stack, Floquet-Bloch, Homogenization, Metamaterials, Spatial harmonics, Truncation
DOIs:
10.1016/j.photonics.2014.06.006
Source: FindIt
Source-ID: 2201224338
Research output: Research - peer-review › Journal article – Annual report year: 2014