

## Accepted Manuscript

High-order functional derivatives of the scattered field according to the permittivity-contrast function

Slimane Arhab, Dimitrios Anagnostou, Maminirina Joelson



PII: S0165-2125(18)30116-1

DOI: <https://doi.org/10.1016/j.wavemoti.2018.07.008>

Reference: WAMOT 2261

To appear in: *Wave Motion*

Received date: 30 March 2018

Revised date: 17 June 2018

Accepted date: 30 July 2018

Please cite this article as: S. Arhab, D. Anagnostou, M. Joelson, High-order functional derivatives of the scattered field according to the permittivity-contrast function, *Wave Motion* (2018), <https://doi.org/10.1016/j.wavemoti.2018.07.008>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

# High-order functional derivatives of the scattered field according to the permittivity-contrast function

Slimane Arhab<sup>a,\*</sup>, Dimitrios Anagnostou<sup>a</sup>, Maminirina Joelson<sup>a</sup>

<sup>a</sup> *Université d'Avignon et des Pays de Vaucluse, UMR 1114 EMMAH, 84018 Avignon Cedex, France.*

---

## Abstract

In this work, we propose to extend an approach to calculate at any order ( $n$ ), the functional derivative of the scattered field with respect to the permittivity-contrast function of a three-dimensional object. These derivatives obtained for different orders are used to perform an expansion of the data according to the studied model parameter. Its validity and convergence are tested throughout some numerical results obtained for a scalar scattering problem. In particular, we show that taking into account higher order derivatives improve drastically, the fitting of benchmark data generated by a well-known forward model.

*Keywords:* functional derivatives, reciprocity theorem, scattered electric field, permittivity-contrast function

*2010 MSC:* 00-01, 99-00

---

## 1. Introduction

Reconstructing the permittivity-contrast function of an object from the scattered field is one of the most celebrated inverse problems. It is encountered in research areas such as optical digital tomographic microscopy [1, 2, 3] or the characterisation of buried objects in natural environments [4, 5]. To increase the resolution when reconstructing samples with high permittivity-contrast, data of the scattered field are processed by local optimisation iterative methods [6],

---

\*Corresponding author

*Email address:* [slimane.arhab@univ-avignon.fr](mailto:slimane.arhab@univ-avignon.fr) (Slimane Arhab)

Download English Version:

<https://daneshyari.com/en/article/9953984>

Download Persian Version:

<https://daneshyari.com/article/9953984>

[Daneshyari.com](https://daneshyari.com)