



# Multifractal analysis of central (electrocardiography) and peripheral (laser Doppler flowmetry) cardiovascular time series from healthy human subjects

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**Résumé en anglais**

Analysis of the cardiovascular system (CVS) activity is important for several purposes, including better understanding of heart physiology, diagnosis and forecast of cardiac events. The central CVS, through the study of heart rate variability (HRV), has been shown to exhibit multifractal properties, possibly evolving with physiologic or pathologic states of the organism. An additional viewpoint on the CVS is provided at the peripheral level by laser Doppler flowmetry (LDF), which enables local blood perfusion monitoring. We report here for the first time a multifractal analysis of LDF signals through the computation of their multifractal spectra. The method for estimation of the multifractal spectra, based on the box method, is first described and tested on a priori known synthetic multifractal signals, before application to LDF data. Moreover, simultaneous recordings of both central HRV and peripheral LDF signals, and corresponding multifractal analyses, are performed to confront their properties. With the scales chosen on the partition functions to compute Renyi exponents, LDF signals appear to have broader multifractal spectra compared to HRV. Various conditions for LDF acquisitions are tested showing larger multifractal spectra for signals recorded on fingers than on forearms. The results uncover complex interactions at central and peripheral CVS levels.

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## Liens

- [1] <http://okina.univ-angers.fr/a.hum/publications>
- [2] [http://okina.univ-angers.fr/publications?f\[author\]=1950](http://okina.univ-angers.fr/publications?f[author]=1950)
- [3] <http://okina.univ-angers.fr/f.chapeau/publications>
- [4] [http://okina.univ-angers.fr/publications?f\[author\]=1901](http://okina.univ-angers.fr/publications?f[author]=1901)
- [5] [http://okina.univ-angers.fr/publications?f\[author\]=1153](http://okina.univ-angers.fr/publications?f[author]=1153)
- [6] <http://okina.univ-angers.fr/pierre.abraham/publications>
- [7] <http://okina.univ-angers.fr/publications/ua1462>
- [8] <http://dx.doi.org/10.1088/0967-3334/30/7/007>

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