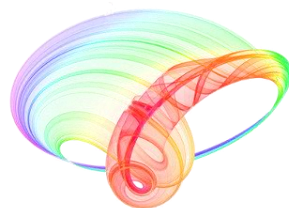


# Book of abstracts



## PHOTONICA2017

The Sixth International School and Conference on Photonics

& COST actions: MP1406 and MP1402



&H2020-MSCA-RISE-2015 CARDIALLY workshop



28 August – 1 September 2017

Belgrade, Serbia

*Editors*

Marina Lekić and Aleksandar Krmpot

Institute of Physics Belgrade, Serbia

Belgrade, 2017

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of

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## Application of multiparametric cardiac measurement system in ejection fraction calculation

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Ejection fraction (EF) is the most used parameter for characterisation of Heart Failure (HF) condition. EF is commonly calculated using echocardiography, which is an expensive non-invasive method and not used in primary healthcare. Systolic time intervals (STI) represent a non-invasive and inexpensive method for determination of EF [1, 2].

Heart failure (HF) is the single most expensive diagnosis in medicine. 2–3% of adult population in developed countries have HF diagnosis. It is not detectable by ECG test and it is commonly detected in a late stage, when the process is irreversible [2-5].

In this paper, a multiparametric cardiac measurement system for determination of STI is presented. Measurement system consists of sensors for simultaneous acquisition of electrocardiographic (ECG), phonocardiographic (PCG), photoplethysmographic (PPG) and cardiovascular (CV) pulsation signals. CV pulsation signals are measured by long period grating (LPG) fiber-optic sensors [6].

Two non-invasive methods for measuring systolic time intervals (STI) were applied on a set of 6 healthy volunteers, based on ECG, PCG and CV pulsation signals. CV pulsation signals were measured on carotide artery with PPG and LPG sensors.

In the first method, EF was calculated from the obtained STI signals, using CV carotide pulsations measured with the PPG sensor, giving EF values in the range from 0.60 to 0.68, with maximal standard deviation of 0.05. In the second method, EF was obtained using CV carotide pulsations measured with LPG sensor, giving EF values in the range from 0.60 to 0.66, with maximal standard deviation 0.06. Calculated values of EF with both methods were in the 0.55 to 0.75 range which corresponds to normal EF range in healthy individuals.

### REFERENCES

- [1] M. D. Ivanović, “An optical Fiber-Grating device for measuring cardiovascular and respiratory pulsations”, Ph.D. dissertation, University of Belgrade, Belgrade, Serbia, (2014).
- [2] L. N. Katz, H. S. Feil, I. Auricular fibrillation. *Arch Intern Med*, vol. 32, p. 672, (1923).
- Peacock WF et al. *Congest Heart Fail.* (2003).
- [3] Stewart S, et al. *Eur J Heart Fail.* (2001).
- [4] Lloyd-Jones D, et al. *Circulation.* (2010).
- [5] Mosterd A, et al. *Heart* (2007).
- [6] M. D. Petrović, A. Daničić, V. Atanasoski, S. Radosavljević, V. Prodanović, N. Miljković, J. Petrović, D. Petrović, B. Bojović, Lj. Hadžievski, T. Allsop, G. Lloyd and D. J. Webb, *Phys. Scr. T*, vol. T157, pp. 014022 (1-4) (2013).