# FSK-PSK data processing based on direct approximation of the Hilbert transform

**Maria Rosaria Capobianco**[a], Giuliana Criscuolo[b], Mario Medugno[c]

[a] CNR-National Research Council of Italy, IAC-Institute for Computational Application "Mauro Picone", Naples, Italy (Italy)

[b] Department of Mathematics and Applications "Renato Caccioppoli", University of Naples Federico II, Naples (Italy)

[c] CNR-National Research Council of Italy, ISASI-Institute for Advanced Systems and Intelligent Systems, Naples (Italy)

mariarosaria.capobianco@cnr.it, giuliana.criscuolo@unina.it, mario.medugno@cnr.it

We describe a signal processing method for demodulation of digital signals based on Hilbert transform (HT).

We review the signal processing theory and the method of Analytic Signal transformation (AS) and their algorithms which are implemented by FFT, then we propose a direct method for the numerical approximation of the Hilbert transform that is a generalization of the algorithm presented in [1].

The proposed algorithm provides the estimate of instantaneous frequency and phase of the received signals, and can be used for both binary communication based on phased-shifting keying (PSK) and frequency-shifting keying (BFSK) [2].

Typical applications include data analysis as a bank of matched filters [3], data communication of electric and acoustic soil response and sea autonomous platforms.

# References

[1] M.R. Capobianco, G. Criscuolo, Some Remarks about the Hilbert Transform, Journal of Research in Applied Mathematics, 5 (2019) pp.16-24

[2] J.C. Goswami, A.E. Hoefel, Algorithms for estimating instantaneous frequency, Signal Processing 84 (2004) pp.1423-1427

[3] S. Marano, M. Medugno, M. Longo, A real-time parallel application: the detection of gravitational waves by a network of heterogeneous workstations, Journal of Computational Physics, Vol. 139, No. 1, January 1 1998, pp.15-34, doi.org/10.1006/jcph.1997.5857