

# Design of Low-Interception Short-Range Detection Signal for Co-Address MIMO-OCDM

Chao Ma\*, ZhangLong Li\*\*, YueHong Ma\*\*, GuiJing Li\*\*\*

*\*Sinounited Investment Group Corporation Limited Postdoctoral Programme, Phase II, Oak Bay, Qinghe, Haidian District, Beijing 100000, China*

*\*\*Hebei Provincial Collaborative Innovation Center of Transportation Power Grid Intelligent Integration Technology and Equipment, School of Electrical and Electronic Engineering, Shijiazhuang Tiedao University, 17 North Second Ring Road East, Shijiazhuang 050000, China*

*\*\*\*Engineering Mechanics, Shijiazhuang Tiedao University, 17 North Second Ring Road East, Shijiazhuang 050000, China*

[mc@zaninvest.com](mailto:mc@zaninvest.com), [Lee19711936516@163.com](mailto:Lee19711936516@163.com), [sunmyh@163.com](mailto:sunmyh@163.com), [guijingli@163.com](mailto:guijingli@163.com)

**Abstract**—The rapid development of electronic reconnaissance system has seriously threatened the survivability of fuse. To improve the survivability of fuse, a co-address Multiple Input Multiple Output-Orthogonal Chirp Division Multiplexing (MIMO-OCDM) signal is designed, and a signal processing method of two-phase parametric accumulation is adopted to improve the signal-to-noise ratio of the echo signal. Firstly, the transmission power of a single signal is evenly distributed to each sub-chirp signal of the OCDM signal, and the sub-chirp signals are transmitted by the co-address MIMO radar to reduce the signal transmission power. Subsequently, the first coherent accumulation is carried out on multiple sub-chirp signals received by a single antenna, and the second coherent accumulation is performed on the echo signals received by multiple antennas to significantly enhance the signal-to-noise ratio of the echo signals. The simulation results show that, compared with the traditional single signal, under the condition of ensuring that the echo signal-to-noise ratio is not lost, the co-address MIMO-OCDM signal can significantly reduce the transmission power of the signal, thereby resulting in a significant decrease in the interception distance of the electronic reconnaissance system and enabling the fuse to have excellent low interception performance.

**Keyword**—A Low Probability of Intercept, Signal Design, MIMO Radar, OCDM Signal, Signal Processing



**First A. Chao Ma** is currently a postdoctoral researcher at Sinounited Investment Group Corporation Limited Postdoctoral Programme, Beijing, China.  
Her main research directions are management and information processing.



**Second B. ZhangLong Li** is currently working toward the master's degree in Electrical Engineering from the School of Electrical and Electronic Engineering of Shijiazhuang Tiedao University, Shijiazhuang, China.  
His research interests include low interception probability radar signals, radar signal processing, etc.



**Third C. Yuehong Ma** received the M.S. degree in Signal and Information Processing from Yanshan University, Qinhuangdao, China, in 2007, and the Ph.D. degree in Communications and Information Systems from Beihang University, Beijing, China, in 2017. She is currently an associate professor at the School of Electrical and Electronic Engineering, Shijiazhuang Tiedao University, Shijiazhuang, China. She has published more than 20 academic papers, 1 monograph, and 15 authorized patents. Her research interests mainly include radar signal and information processing technology and modern communication technology.



**Fourth D. GuiJing Li** is currently an associate professor at the Engineering Mechanics, Shijiazhuang Tiedao University, Shijiazhuang, China.

His main research direction is the interface damage and fracture behavior of intelligent structural materials.