

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)  
Safe Transportation Systems for Sustainable Commercial Human Spaceflight / Small Launchers: Concepts  
and Operations (Part II) (9-D6.2)

Author: Ms. Dandan Ding  
China, dingdandan211@163.com

Prof. Xiang Lv  
China, ks2851x@sohu.com  
Mr. Xiaoqiang Li  
China, yangtang6711@sina.com  
Mr. Wei Tong  
China, Tongwei\_622@163.com

INTERNAL NOISE SOURCE LOCATION OF MANNED SPACECRAFT CAPSULE BASED ON  
SPHERICAL MICROPHONE ARRAY

**Abstract**

Manned spacecraft capsule is the work and life place for astronauts, and it must provide astronaut with healthy environment. If the noise in the closed capsule is too large, it will make the astronauts' health in danger. Therefore, it is very important for us to control the capsule noise source effectively, and the control of the noise source is based on the accurate location and identification of noise source in the closed capsule.

In the field of noise source localization, the noise source localization method of the base microphone array is generally used. The most commonly used techniques for noise source location are near-field acoustic holography (NAH) and beamforming. In this paper, a 64-element spherical microphone array is used to pick up the steady-state noise source signals in a closed spacecraft cabin. Near-field spherical acoustic holography and spherical harmonic functional beamforming are combined to locate and identify noise sources in a closed cabin.

The research result shows that the spherical array with uniformly and randomly distributed spherical arrays has the full-space target localization characteristics. The spherical near-field acoustic holography has higher localization accuracy for the low-frequency short-distance acoustic source in the closed space, and focused beamforming based on spherical harmonics expansion high positioning accuracy for the High-frequency long-distance sound source in the closed space. The two methods are combined to achieve the sound source location and identification can broaden location and identification frequency range for the noise source and make better location performance.