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A STUDY FOR QUALITY FACTORS OF MULTI-SPACECRAFT FORMATION DETECTION  
EFFICIENCY

**Abstract**

Space physics field detection has come into an age of multi-point cooperative detection. To collect three-dimensional data, recent space physics field detection missions implemented or planned prefer multi-spacecraft formation. In order to choose the best detection efficiency of different formations, quantitative evaluation shall be employed. In this paper, we analyze and summarize the existing quality factors of four-point cooperative detection based on the definition of volumetric tensor and further more we add another spacecraft to form a five-point formation. To study the fifth spacecraft's effect on the four-point tetrahedron formation, we divide the five-point formation into five tetrahedrons and one main tetrahedron cooperating with a fifth point to evaluate the five-point formation detection efficiency. We will use the simulated orbit data of five-spacecraft in one orbit period to simulate and analyze the two methods. Finally, we will discuss the effect of six orbit parameters on the evaluation of the formation, which is more significant to the design of distributed satellite system.