

VLBI observation of Spacecraft-Differential VLBI and Phase Ambiguity Solution-

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Range and Range rate (R&RR) measurement, which has been used for spacecraft navigation in deep space, is sensitive in the direction of the line of sight (LoS) but it does not have high sensitivity in the plane perpendicular to the LoS. Very long baseline interferometry (VLBI) has complementarily high sensitivity on radio source position in the celestial sphere. Thus joint use of these two technologies can enhance the precision of orbit determination in the deep space. JPL/NASA has been using these techniques for spacecraft navigation as DDOR(Delta Differential One-way Range). Although, since the DDOR is group delay measurement, its delay resolution is limited by the bandwidth of the radio signal from the spacecraft.

We are investigating use of phase delay observable for spacecraft navigation, since phase delay has potential to achieve about two order higher delay resolution than group delay. The key to use phase delay is removal of integer ambiguity of the carrier phase.

We have developed an algorithm to solve the integer ambiguity by using LAMBDA algorithm and characteristic of spline function, which have minimum bending energy for interpolation. We introduce this algorithm and discuss on limitation of switching cycle interval of differential VLBI.