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Local tie accuracy on VLBI antennas

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We have applied a new mathematical model to compute the centering parameters of a VLBI antenna. These include the coordinates of the reference point, axis offset, orientation and non-perpendicularity of the axes. We have simulated the expected accuracy and robustness of the method. In our simulations we varied placements and number of targets in indirect observation method, number of VLBI antenna positions and the achievable accuracy of the coordinates of target points and accuracy of the angle readings of the VLBI antenna.

These simulations show that it is possible to achieve a sub-millimeter formal accuracy for the coordinates of the reference point and the antenna offset by increasing the number of VLBI antenna positions, even if the accuracy of target points is on the cm level. The systematic errors are neglected.

We tested the model on some different types of telescopes by simulating coordinate observations of the targets with normally distributed random errors. In simulations we choose the dimensions of antennas partly arbitrarily and partly to get a more realistic simulations from "a list of antenna construction elements and other necessary parameters" made by Axel Nothnagel and maintained under http://vlbi.geod.uni-bonn.de/IVS-AC/Conventions. We have also applied the model to the real data available and compared the results with the original determination.

Based on the simulation we can give some recommendations and practices to control the accuracy and reliability of the local ties on the VLBI sites.