

Overlap Operations of Old and New Radio Telescopes

Recommended Tie-in Observations for New Radio Telescopes at Existing VLBI Sites

Many geodetic/astrometric VLBI stations have accumulated a very long record of station positions in their observing history of 20–30 years or even longer. These long time series are invaluable information to reliably determine the kinematics of the stations. As the old radio telescopes reach the end of their expected life time, new radio telescopes are being constructed to continue the operational VLBI observations using either the current S/X system or the broadband delay system (VLBI2010). New telescopes, however, start a completely new history of station position determinations. These new time series by themselves would require a considerable time (3–5 years) in order to furnish first reliable velocity estimates and position differences in the Terrestrial Reference Frame (TRF). For that, it is essential that at existing VLBI sites an overlap period of common observations be implemented, which will allow the connection of the new time series with the existing one.

In order to have a quality connection, the old and new telescopes need to observe in parallel in geodetic VLBI sessions over a sufficiently long period of time. As a rule of thumb, the overlap period should at least be *18 months (1.5 years)* and consist of one high-quality geodetic session per month at a minimum (with both telescopes participating). In the southern hemisphere, where the geodetic VLBI network is rather sparse and the position determinations suffer from extremely long baselines, the period of common operations of the two telescopes should be *24 months (two years)*. Only if these periods are maintained throughout the IVS network is it guaranteed that the existing history of position results for velocity determinations will be carried forward to the new radio telescope and that the stability of the global VLBI network will be maintained.

In addition to the overlap operations within regular IVS sessions, it is recommended that the old and new telescopes also run local dedicated phase delay observing sessions every one to two months. Finally, local surveys should be performed as an independent method to determine the tie vectors between the reference points of the old and new radio telescopes as well as the other space geodetic instruments present at the site. All of the above observations are necessary to link the positions of the old and new radio telescopes with utmost reliability.