Annex C: Uncertainty budget terms

1 Statistical uncertainty

The statistical uncertainty u_a(A-B) for the comparison between two receivers A and B is evaluated by taking the upper limit of the error bar of the TDEV at 61 440 s (close to 1 d) when available, or otherwise the upper limit of the last error bar available. When two traveling receivers are used for the campaign the retained value is the average of the two statistical uncertainties evaluated as above. The statistical uncertainty of the calibration is obtained by the quadratic sum of the uncertainty at reference site and the one at visited site.

$u^2{}_a = u^2{}_a$(T-R) - $u^2{}_a$(T-V)

2 Type B uncertainties

- $u_{b,1}$ observed maximum misclosure. This uncertainty component is an estimation of the stability of equipment during the campaign. When a single receiver is traveling the only possible estimation is the classical misclosure. With two traveling receivers it is also possible to estimate the stability of the ensemble during the trip by computing the offset between these receivers when implemented in all sites. The misclosure $u_{b,1}$ we use is the maximum value between the actual misclosure between the start and the end of the campaign and the offset between both traveling equipment.
- $u_{b,11}$ position error at reference site. The position of the center of phase of traveling antenna is estimated at opening and closure by using the NRCAN PPP software, while for the reference antenna the coordinates of the last G1 calibration are used. We safely choose a conventional value of 200 ps for the position error at the reference site.
- $u_{b,12}$ position error at visited site. At visited sites the position of the center of phase of all antennas is estimated by using the NRCAN PPP software. We safely choose a conventional value of 200 ps for the position error at visited sites.
- $u_{b,13}$ multipath at reference site. We assume in all cases a conventional value of 200 ps. Work is in progress for a better determination of this component It is sligtly smaller than the value proposed by the CCTF WG on GNSS, but this conventional value is in line with some preliminary experiment at OP and ORB.
- $u_{b,14}$ multipath at visited site. Same as above.
- $u_{b,21}$ REFDLY (traveling receiver at reference lab). Uncertainty of the measure of the time difference between the reference point of the traveling receiver and the local UTC(k). The used value is the quadratic sum of a conventional value (200 ps) with the standard deviation of the actual measurement. When the REFDLY is obtained by summing several individual measurement the uncertainty is increased by quadratic sum as required.
- $u_{b,22}$ REFDLY (traveling receiver at visited lab). Same as above.
- $u_{b,TOT}$: Quadratic sum of all previous u_b.
- $u_{b,31}$ REFDLY uncertainty of the reference system to its local UTC(k). Computed as $u_{b,21}$. This term can be set to 0 when the reference has been recently calibrated, the uncertainty of REFDLY being already included in the calibration of the reference receiver.
- $u_{b,32}$ REFDLY uncertainty (at visited lab) of the link of the visited system to its local UTC(k). Computed as $u_{b,21}$. When this delay is measured and the $u_{b,32}$ is taken into account, the local distribution system can be modified afterwards without loosing the calibration.
- $u_{b,41}$ uncertainty of Antenna Cable delay at reference station. Same consideration as for REFDLY above.
- $u_{b,42}$ uncertainty of Antenna Cable delay at visited station. Same consideration as for REFDLY above. When for some reason the Antenna Cable of the traveling system is changed during the campaign $u_{b,42}$ is obtained by the quadratic sum of the uncertainty of the Antenna Cable of the visited station and of the traveling equipment.

- $u_{b,SYS}$: Quadratic sum of all type B uncertainty.
- u_{CAL0}: Quadratic sum of u_a and $u_{b,SYS}$. This uncertainty is for the link between the calibrated receiver and the reference receiver, without taking into account the uncertainty of this reference receiver.

P3 uncertainty values are not based on linear combination of P1 and P2 but estimated in a similar way as for P1 and P2.