PART B – Geometry-Free Ambiguity Resolution

Goals:

B1) Determine recursively the $\nabla\Delta N_1$ and $\nabla\Delta N_2$ ambiguities for all satellite-receiver pairs in a least-square manner over all epochs using double-differenced observations.

B2) Form the wide-lane $\nabla\Delta$ ambiguities as $\nabla\Delta N_{WL} = \nabla\Delta N_1 - \nabla\Delta N_2$ and plots their evolution.

B3) Determine ambiguity integer values $\hat{N}_1, \hat{N}_2$ by the method of Clyde Goad.

B4) Analyze the differential delay of the ionosphere using the phase measurement for all satellite-receiver pairs by plotting their evolution over all epochs.

Input: As in Part A + note that for E1 and E5a frequencies, F_1=154 and F_2=115 respectively.

Output:

4. Printed ambiguity values using observations from all epochs for each SV-Rx pair.
5. Plots of wide-line ambiguity determination per SV-Rx pairs.
6. **Your interpretation of the plots in B3 & B4 (explains the observed patterns)**.
7. Printed Matlab code.

Hints:

– *B1-2: Self-control (useful for debugging purposes) – with* ***base PRN 8***

Ambiguities: 1st epoch (cycle):

```
DD( 8-2): N1= -15.7 N2=  -49.7
```

Ambiguities all epochs (cycles):

```
DD( 8- 2): N1=     -16.4(      -16) N2=      -50.3(      -50) Nw=      33.9
DD( 8- 3): N1=     -18.9(      -18) N2=      -47.6(      -47) Nw=      28.7
DD( 8- 5): N1=     -12.5(      -11) N2=      -40.1(      -39) Nw=      27.6
DD( 8-11): N1=       8.0(        9) N2=        2.3(        3) Nw=       5.8
DD( 8-12): N1=     -17.8(      -17) N2=      -12.6(      -12) Nw=      -5.2
DD( 8-24): N1=     -33.4(      -33) N2=     -106.2(     -106) Nw=      72.9
DD( 8-25): N1=     -40.1(      -40) N2=      -49.0(      -49) Nw=       8.9
```

– *B3*: Follow the simple algorithm proposed by Clyde Goad in the Equation below:

$$K_1 = round(N_1 - N_2)$$
$$K_2 = round(F_2 N_1 - F_1 N_2)$$
$$\hat{N}_2 = round\left[(F_2 K_1 - K_2)/(F_1 - F_2)\right]$$
$$\hat{N}_1 = K_1 + \hat{N}_2$$

– *B4:* Express the differential ionospheric delay I_{ij}^{bk} as a solution of the following system:

$$\phi_{ij,1}^{bk} = \rho_{ij}^{*bk} - I_{ij}^{bk} + \lambda_1 N_{ij,1}^{bk}$$
$$\phi_{ij,2}^{bk} = \rho_{ij}^{*bk} - \left(f_1^2 / f_2^2\right) I_{ij}^{bk} + \lambda_2 N_{ij,2}^{bk}$$