To be prepared for the exercise on Dec 04, 2019
(10 points total)

Signals

Task 1 (4 points)

As described in the Interface Control Document of **GLONASS** (see 3.3.2.1 Ranging code generation, https://www.unavco.org/help/glossary/docs/ICD_GLONASS_4.0_(1998)_en.pdf) is the PRN ranging sequence obtained as the output 7st stage of a 9-stage shift register, which is initialized with a series of ones, i.e. (1 1 1 1 1 1 1 1 1).

The generating polynomial can be written as

$$G(X) = 1 + X^5 + X^9$$

a) Look inside the ICD and explain the process of code generation. Compare it with the GPS C/A-code.

b) Compute the first 20 and last 20 bits of the 511-bit long GLONASS PRN code.

Task 2 (6 points)

As described in the **BeiDou** Interface Control Document – Open Service Signal B1I (see 4.3 Ranging Code Characteristics, http://en.beidou.gov.cn/SYSTEMS/ICD/201902/P020190227702348791891.pdf) the 2046-bit-long PRN sequences are generated from the combined (XOR) output of two 11-bit shift-registers G_1 and G_2 with the characteristic polynomials

$G_1(X) = 1 + X + X^7 + X^8 + X^9 + X^{10} + X^{11}$ and $G_2(X) = 1 + X + X^2 + X^3 + X^4 + X^5 + X^8 + X^9 + X^{11}$

Please, look up in the ICD, the start sequence for the two register, the code generation process (see figure 4-1) and the phase assignment of the G_2 register (see table 4-1) in order to accomplish the following tasks:

a) Explain the process of code generation and compare it with the GPS C/A-code.

b) Compute the 2046 bit long sequences for satellites 1-15 based on the phase assignment of the G_2 register and print out the first 10 and last 10 bits of the codes for control purposes.

c) Find out which PRN signals are hidden in the signal sequence stored in the ASCII file **bds.txt**, which you find on ILIAS. By means of auto-correlation technique, take the PRN sequences from b) to test with the recorded data and output a plot which shows the correlations.

   If a certain PRN sequence is inside the recorded data, there should be a clear peak. Also note down the lag (i.e. the index) at which this correlation peak happens to be located.