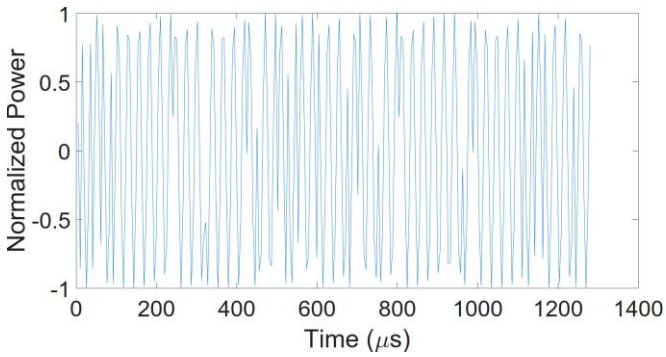
List of Errata

[1] Page 18, Figure 2.2 needs to be replaced by the figure below, because the current figure is not showing the actual signal transmitted by the satellites (as stated in the caption) but the demodulated signal in the baseband model.



[2] Page 23, further explanations about why "a third-party server knows the exact user location" during A-GNSS usage are needed. The sentence needs to be rephrased to "a third-party server may know the approximate user location by for example knowing which data has been retrieved from the server (e.g., from which country, city, area, etc.)".

[3] Page 31, the sentence stating that spoofer devices are "expensive and not easily portable" needs to be corrected, as nowadays it exists relatively cheap and non-bulky devices. For this reason, the lines "Such spoofing attacks may be quite expensive, due to the fact that it requires specific hardware (e.g., a GNSS signal generator, transmitter antenna, energy source), which can be expensive (e.g., up to hundreds of thousands of dollars) and it is not easily portable" needs to be replaced by "Typically, spoofing attacks were relatively expensive (specially compared to jammers), due to the fact that it requires specific hardware (e.g., a GNSS signal generator, transmitter antenna, energy source) to mimic GNSS transmissions, which resulted in expensive and bulky devices. Although this has changed nowadays, as now it can be found cheap spoofers in a contained size".

[4] Page 33, the sentence "The largest errors in the PVT solution are attributable to the atmosphere" needs correction, as errors due to multipath and NLOS reception can be even bigger. For this reason, the abovementioned sentence needs to be replaced by "One of the largest errors, along with multipath and NLOS, in the PVT solution are due to the atmosphere (which includes ionospheric, tropospheric and errors due to additional atmospheric-related phenomenon). Although these errors due to the atmosphere can be attenuated, at some extent, by using multi-frequency and differential receivers".

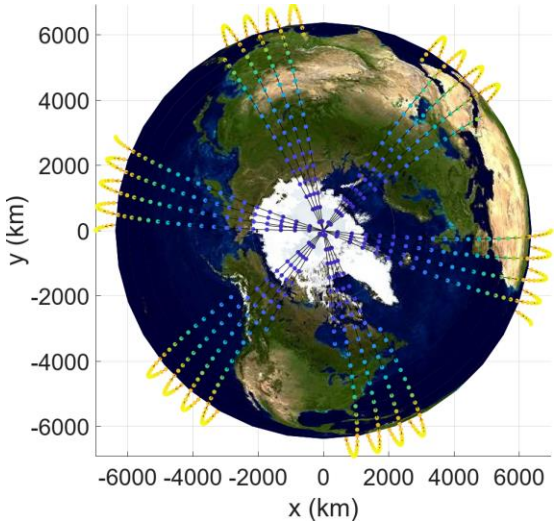
[5] Page 40, the expression $\begin{matrix} H_1 \\ > \\ < \\ H_0 \end{matrix} \gamma$ in Equation needs clarification. The sign stands for: if greater then we have H_1 (spoofer is present), if smaller then we have H_0 (jammer-free).

[6] Page 58, the figure reference ”Figure ??” needs to be replaced by ”Figure 3.8”.

[7] Page 58, Table 3.1 states that the “repetition frequency is ”0.1-1.9 THz”. This needs to be changed by ”0.1-1.9 MHz”.

[8] Page 82, the sentence “Elliptical orbits are also known as HEO” needs to be removed.

[9] Page 84, Figure 4.4d needs to be replaced by the figure below



[10] Page 91, Equation 4.7 needs further explanations. The following sentence needs to be included “By approximating the coverage needed by a circle, we can divide the total amount of angles to be covered (360°) by the angle a single satellite covers (2 times the cap angle θ)”.

[11] Page 96, the figure reference ”Figure ??” needs to be replaced by ”Figure 4.9”.

[12] Page 96, a clarification about the footprint size is needed, as satellite footprint and coverage is not the same. The following sentence needs to be added “In the presented simulations, no specific footprint size is considered as the analysis is done from the constellation geometry and hypothetical usage for positioning”.

[13] Pages 99-101, the following modifications needs to be done:

13.1. Matrix **Q** “measurement matrix” needs to be replaced by “covariance matrix”.

13.2. **H** matrix name is replaced by “geometry matrix”. And the following sentence is included “It contains the unit vectors components from receiver to satellite. ‘h’ needs to be corrected for not being negative by switching user and satellite xyz coordinates”.

13.3. R_i is the 3d-distance between satellite to receiver instead of the pseudorange. The word “pseudorange” is replaced by “3d-distance”

13.4. Equations 4.16 to 4.20 needs to be modified as follow to properly show the effect of the error covariance matrix (where σ_{UERE} is the pseudorange error factor and is defined as $\boldsymbol{\Sigma}_{all}=diag(\Sigma_1,...,\Sigma_K)=\text{diag}(\sigma^2_{UERE},.... \sigma^2_{UERE})$):

$$\text{GDOP}x\sigma_{UERE} = \sqrt{\sum_{i=1}^{K+3}\mathbf{Q}(i,i)} = \sqrt{PDOP^2+TDOP^2}, \quad (4.16)$$

$$\text{PDOP}x\sigma_{UERE} = \sqrt{\sum_{i=1}^{3}\mathbf{Q}(i,i)}, \quad (4.17)$$

$$\text{TDOP}x\sigma_{UERE} = \sqrt{\sum_{i=4}^{4}\mathbf{Q}(i,i)}, \quad (4.18)$$

$$\text{HDOP}x\sigma_{UERE} = \sqrt{\sum_{i=1}^{2}\mathbf{Q}(i,i)}, \quad (4.19)$$

$$\text{VDOP}x\sigma_{UERE} = \sqrt{\sum_{i=3}^{3}\mathbf{Q}(i,i)}, \quad (4.20)$$

[14] Pages 98-99 and Page 102, Figure 4.9, 4.10, and 4.12 needs to include the following sentence in the caption “For the simulations, a minimum elevation mask of 10° has been considered”.

[15] Page 103, Equation 4.22 needs to be replaced by the equation below and the following sentence needs to be replaced “where N_0 is the receiver noise density defined as N_0 = 10log10(kT), where k is the Boltzmann constant (1.38 · 10−21 J/Kelvin) and T is the receiver temperature in Kelvin. In GNSS applications, N_0 is typically considered to be −204 dBW/Hz (considering 290 Kelvin receiver temperature)” to “where N is the noise power in the receiver”.

$$SNR = P_{Rx} - N, \quad (4.22)$$

[16] Page 104, the sentence “the path loss and hence the measured C/N_0 in the receiver will be considerably higher” needs to be replaced by “the path loss decreases, and hence the measured C/N_0 in the receiver will be considerably higher”.