



GNSS signal interference by radio amateurs

(based on information from APOS / E. Zahn)

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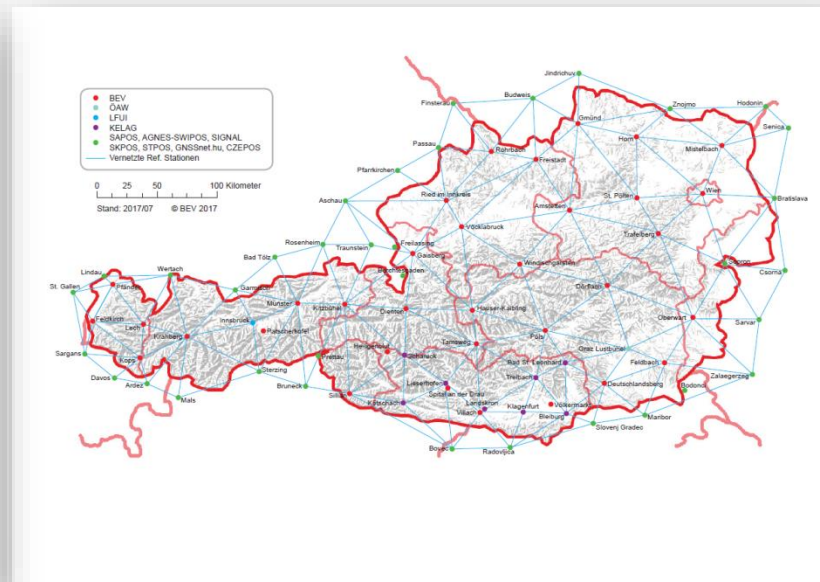
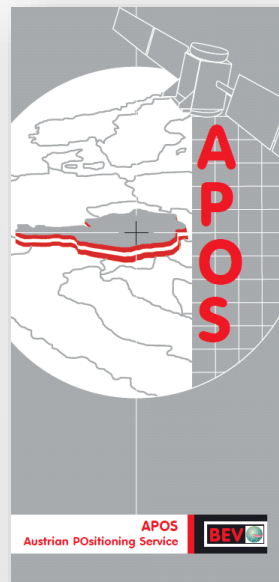
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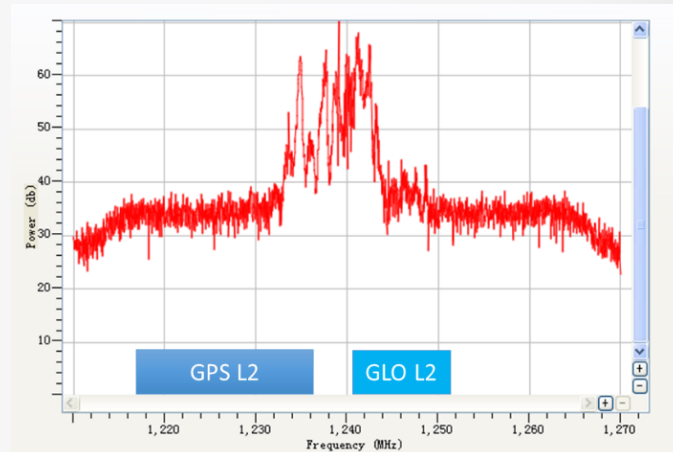
Motivation

- Mr. Zahn (APOS network Austria) orally presented on the 4th EUPOS technical meeting in Bratislava recognized GNSS signal interference on WIEN (Vienna) APOS station caused by radio amateurs

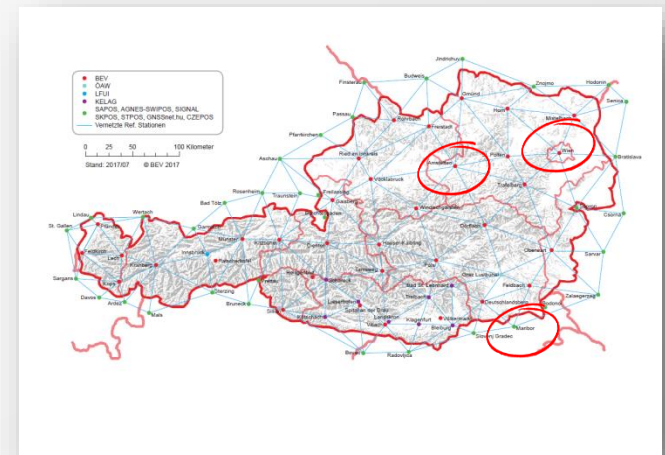


More information about the problem

- In 2017 APOS operators recognized on APOS WIEN station
 - completely interference of GLONASS L2 frequency
 - partly interference of GPS L2 frequency
- the same interference was recognized later on AMST (Amstetten) station and on Slovenian MARI (Maribor) station
- L2 frequency interference
 - it was only during working hours
 - affected WIEN permanent station as well as users rovers

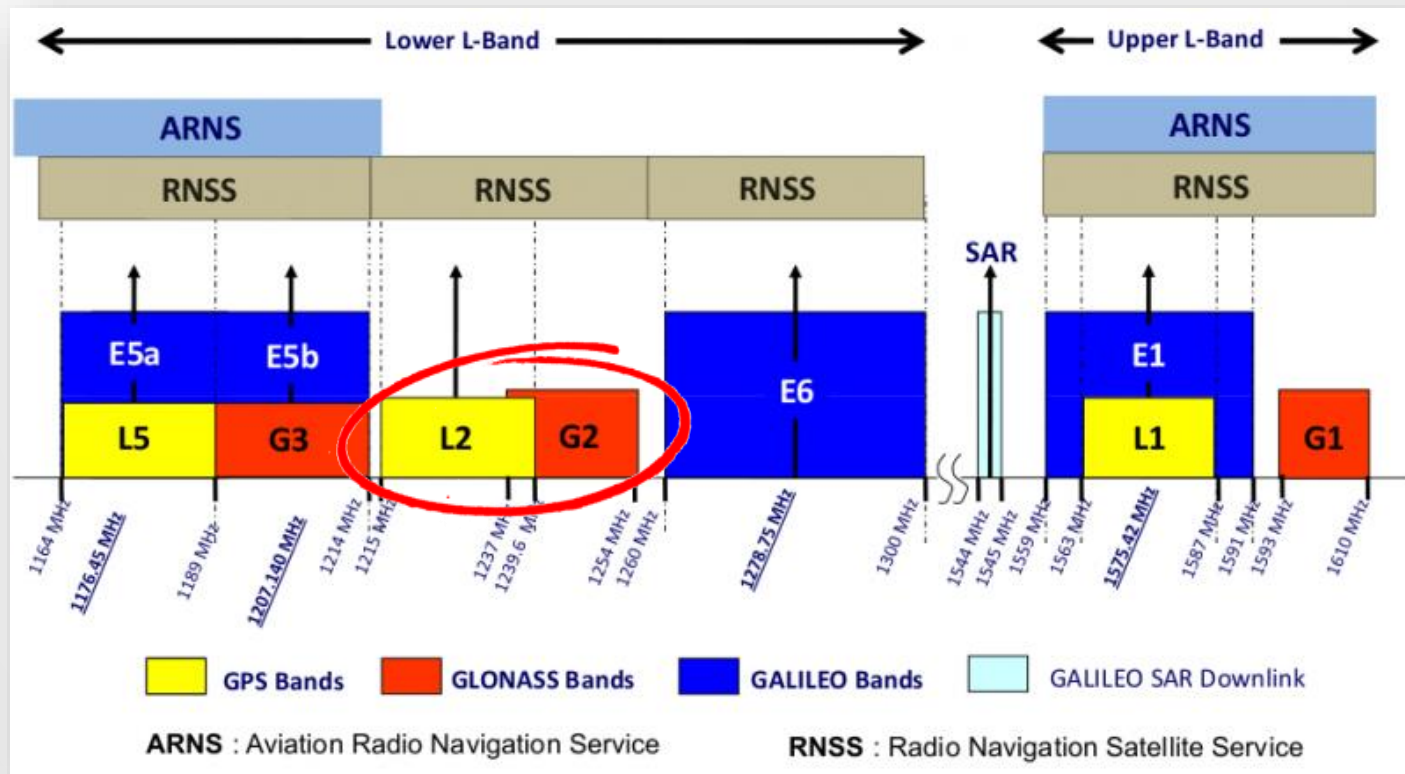


- Source: http://mensuro.cz/mac-pro/uploads/2018/01/Septentrio-AIM_GNSS_interference.pdf



GPS and GLONASS L2 frequency

- **GLO L2 Band:** 1242.9375 MHz to 1248.625 MHz
- **GPS L2 Band:** 1227.6 MHz with a bandwidth of 11 MHz

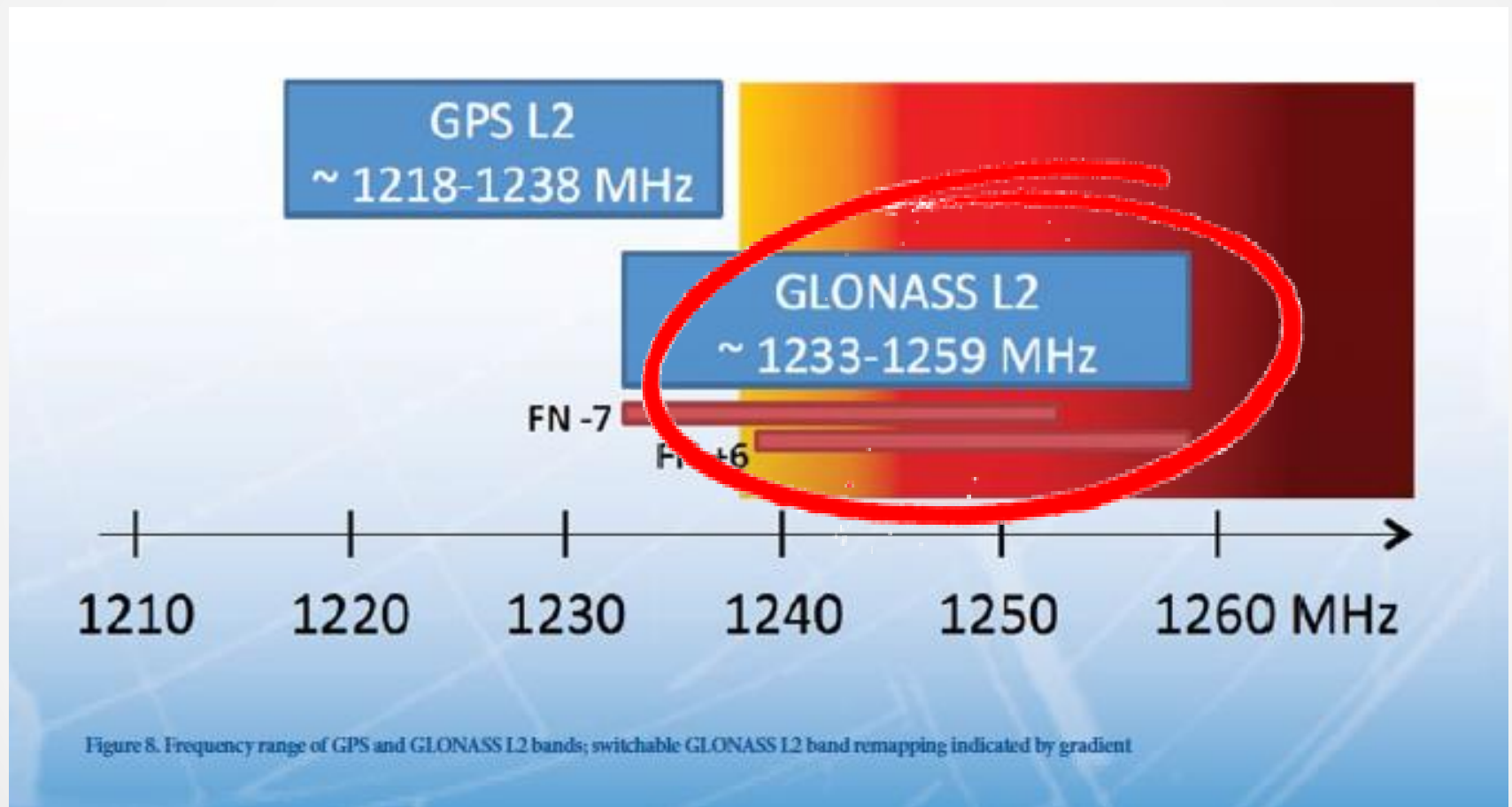


Radio amateur UHF (23cm) frequency



- The **23 centimeter, 1200 MHz or 1.2 GHz** band is a portion of the [UHF \(microwave\)](#) radio spectrum internationally allocated to [amateur radio](#) and [amateur satellite](#) use on a secondary basis. **The amateur radio band is between 1240 MHz and 1300 MHz.** The amateur satellite band is between 1260 MHz and 1270 MHz, and its use by satellite operations is only for up-links on a non-interference basis to other radio users

Collision GPS/GLONASS L2 frequency and UHF 23cm frequency



- Source: http://mensuro.cz/mac-pro/uploads/2018/01/Septentrio-AIM_GNSS_Interference.pdf

Interference caused by radio amateurs confirmed

- APOS colleagues contacted Trimble - the suspicion fell on radio amateurs
- Investigation confirmed assumption – unintentional L2 frequency interference caused by radio amateurs antenna directly oriented to WIEN station
- Solution – negotiation with radio amateurs
 - radio amateurs change used frequency and informed Slovenian (Maribor) colleagues as well to do it



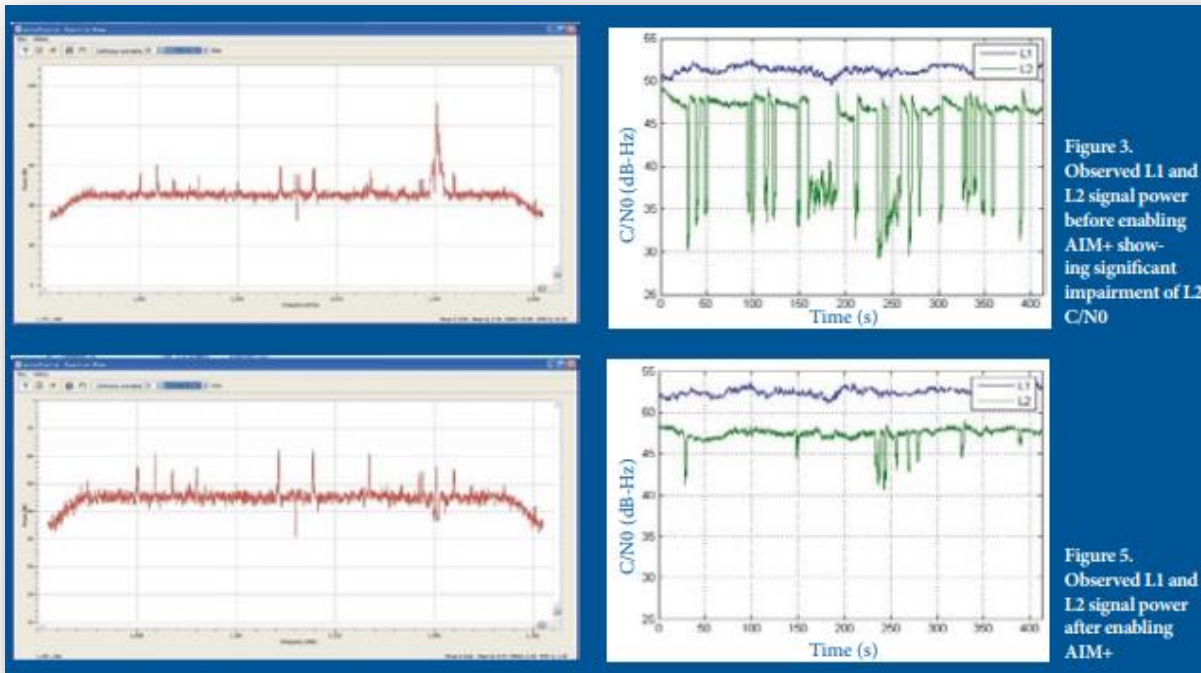
Symptoms of L2 frequency interference by radio amateurs

- according to ESA white paper (https://www.researchgate.net/...Invited_Lecture/.../An-introductio...)

Impact on GNSS receiver:	GNSS-user would notice:
<ul style="list-style-type: none">• Degradation of C/N0	<ul style="list-style-type: none">• Loss of tracking• Lower availability observables• Cycle Slips
<ul style="list-style-type: none">• Higher noise on code and phase observables	<ul style="list-style-type: none">• Degradation of accuracy
<ul style="list-style-type: none">• Longer Acquisition Time	<ul style="list-style-type: none">• Longer Time-To-First-Fix

Hint

- Septentrio receivers was not affected because they use special Adaptive Notch Filtering solution which helps to prevent interference or signal degradation



Summary

- In case of problem with L2 frequency (especially GLONASS) check possible interference by radio amateurs transmission
- contact radio amateurs society and ask them for used frequency change

Thank you for your attention

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