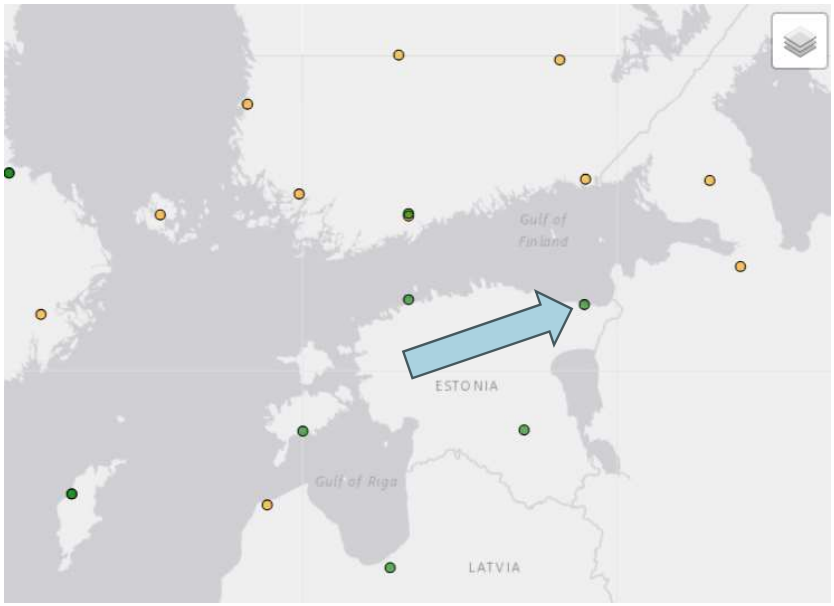
NLS
NATIONAL
LAND SURVEY
OF FINLAND

“Jammertest” 2024 Estonia

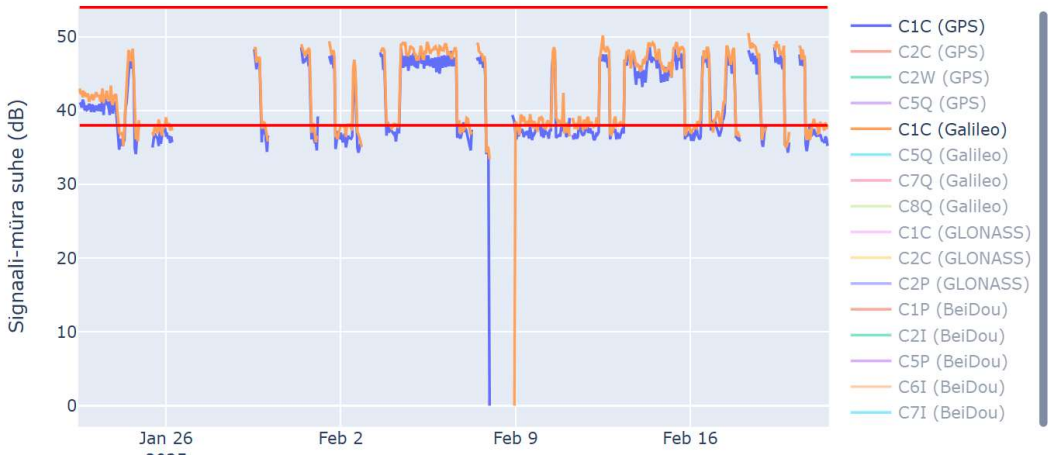
Dec 2-4 2024, Toila

Topi Rikkinen & Simo Marila
+ Jaanus Metsar & Karin Kollo

Toila Maa-amet EPN station



Signaali-müra suhe



https://geoportaal.maaamet.ee/est/ruumiandmed/estpos/gnss-tugijaamade-kvaliteedi-graafikud-p949.html

Antenna comparison

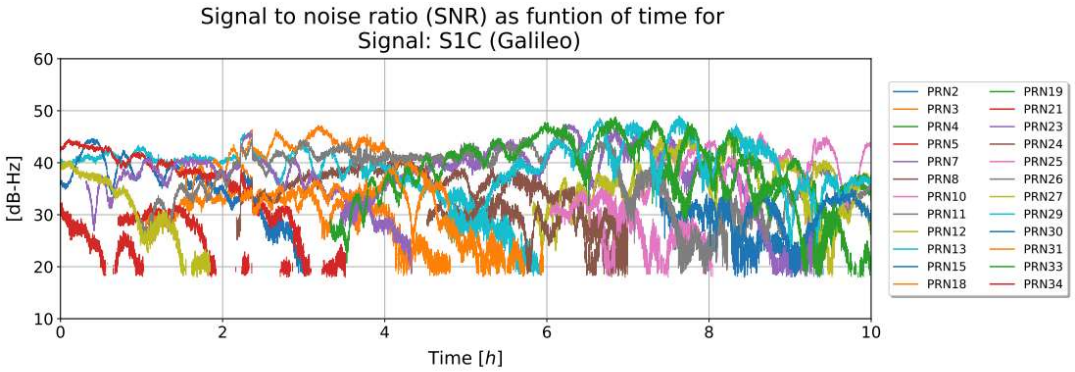
Anti-jam vs. VeraPhase

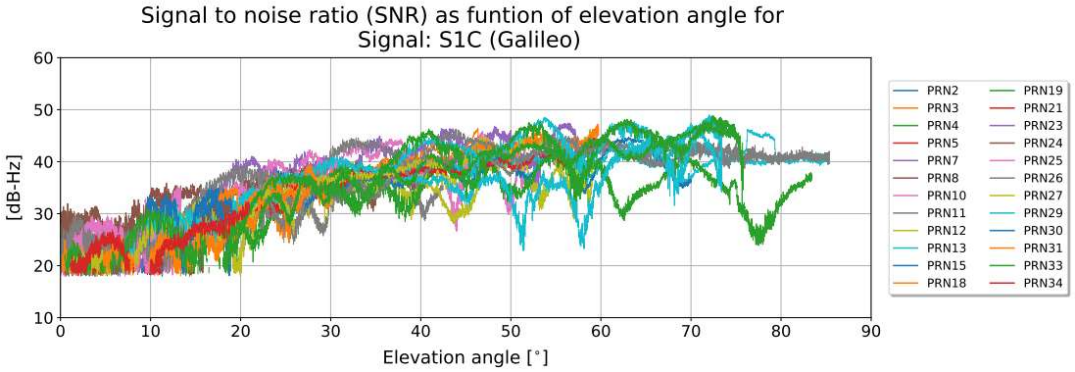
CNR – E1

Plots done with:
https://github.com/paarnes/GNSS_Multipath_Analysis_Software

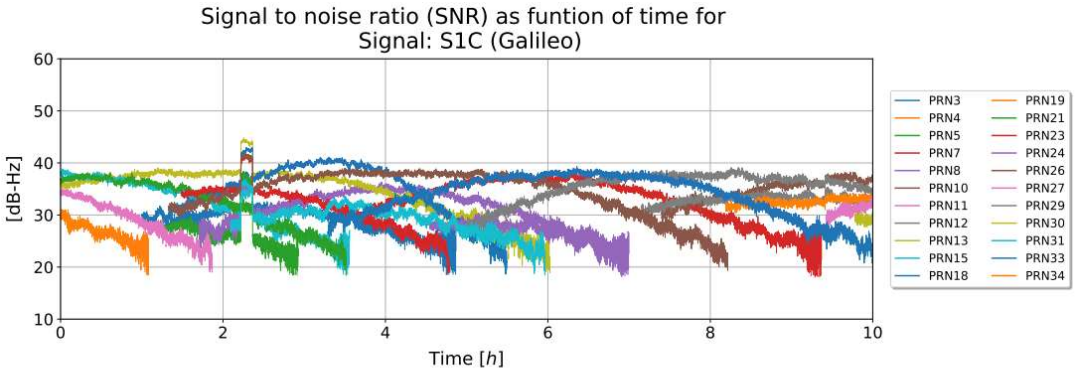
10 hours of data with medium jamming – night 1

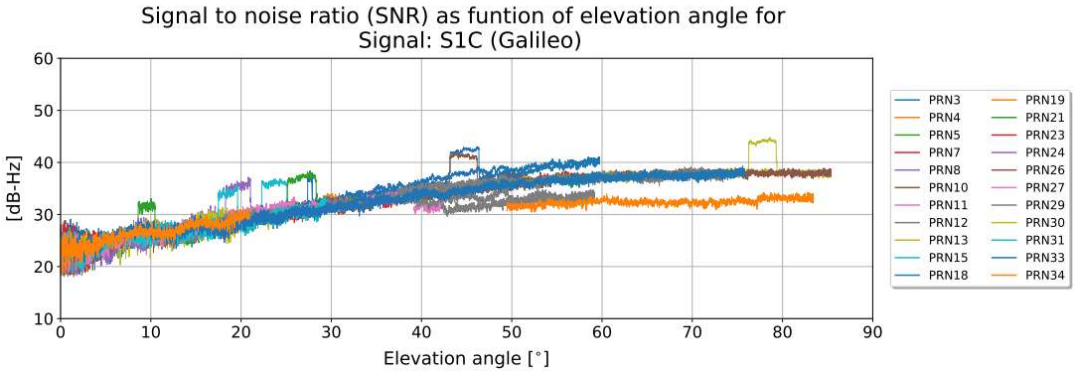
Anti-jam





VeraPhase

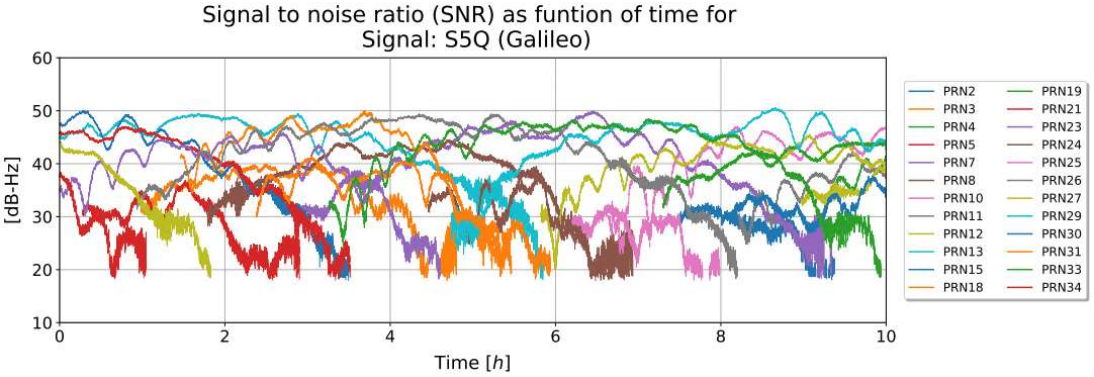


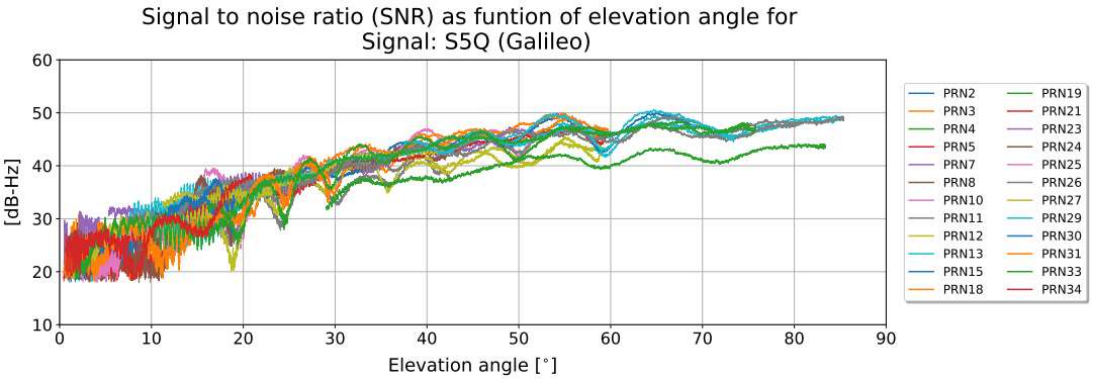


CNR – E5a

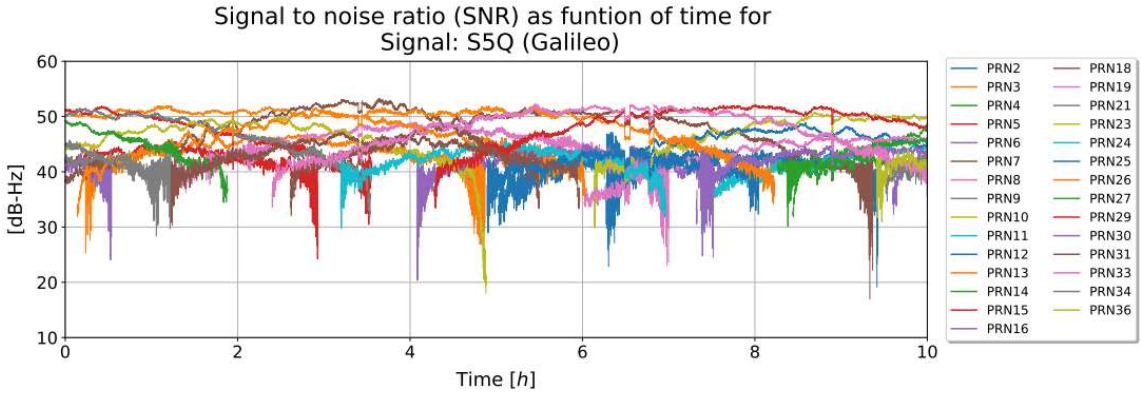
10 hours of data with medium jamming – night 1

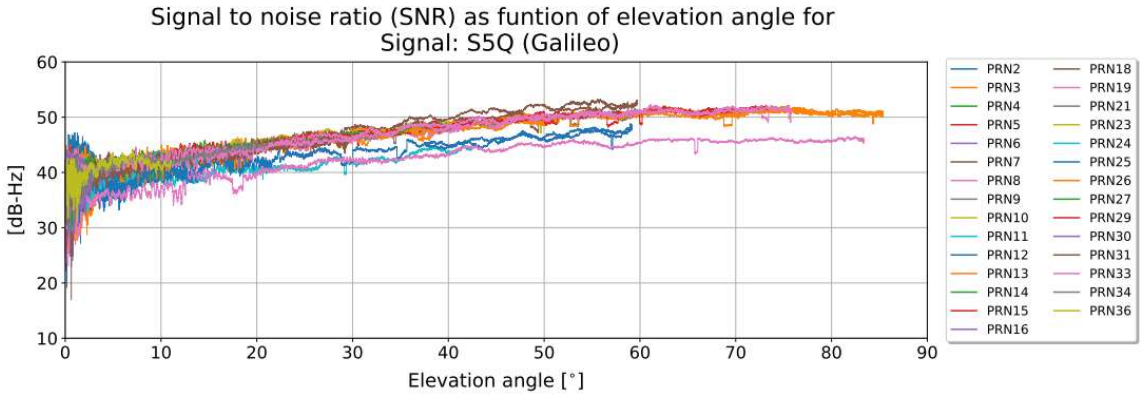
Anti-jam





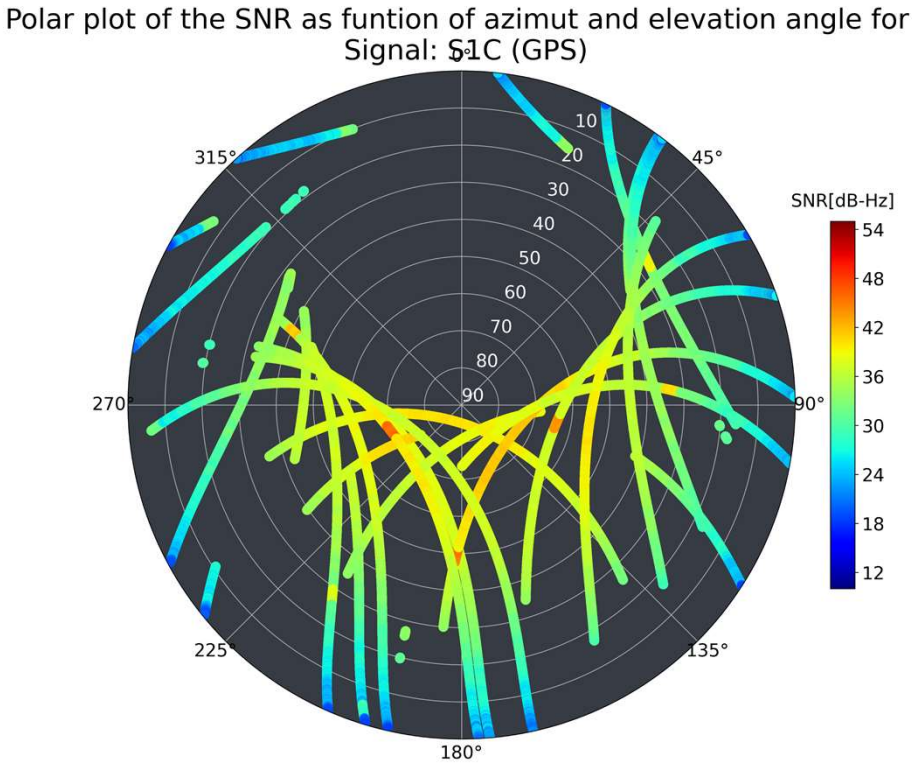
VeraPhase



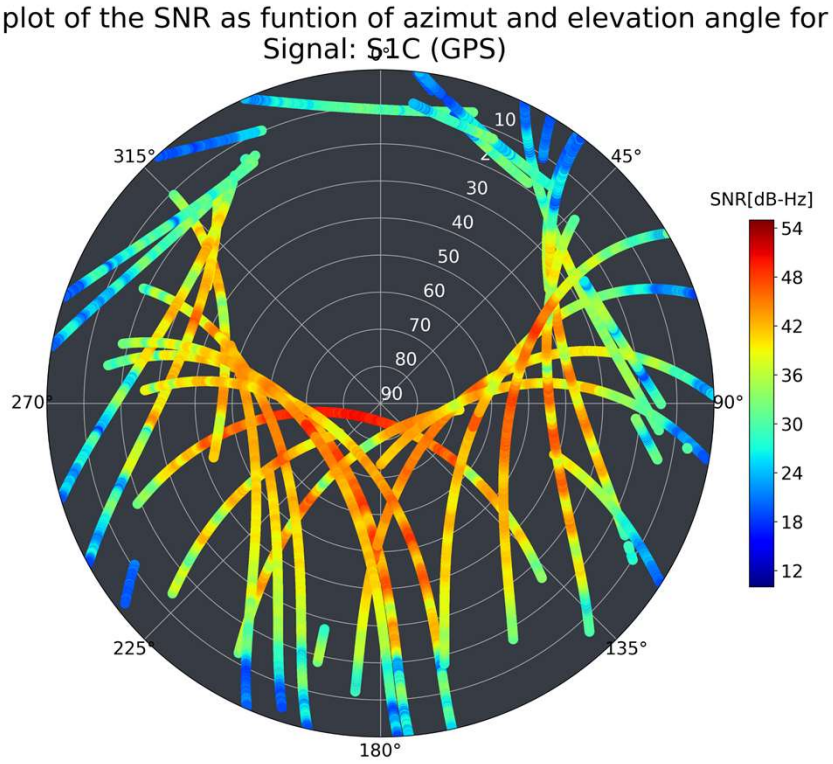


Skyplot night 1

VERA



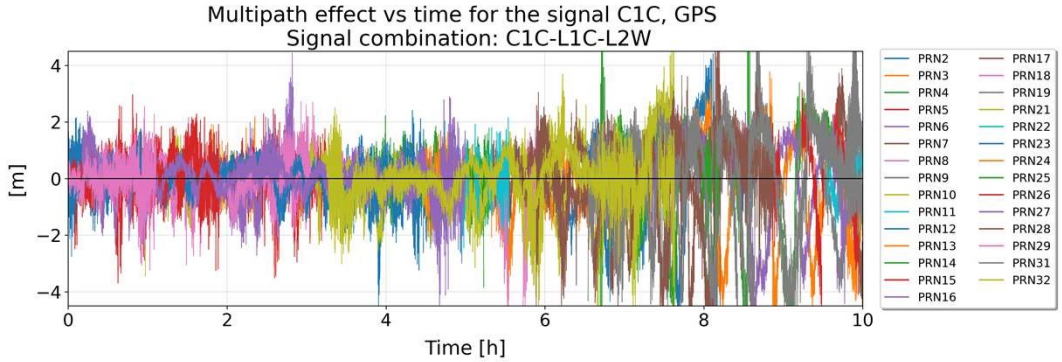
AJ00

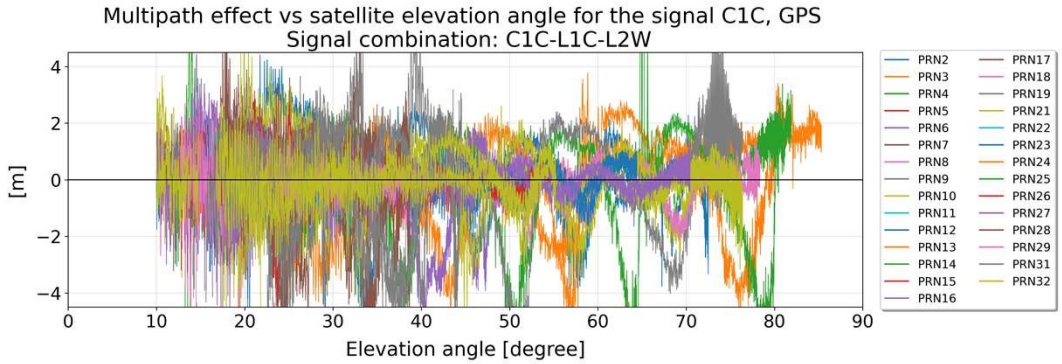


Multipath – L1

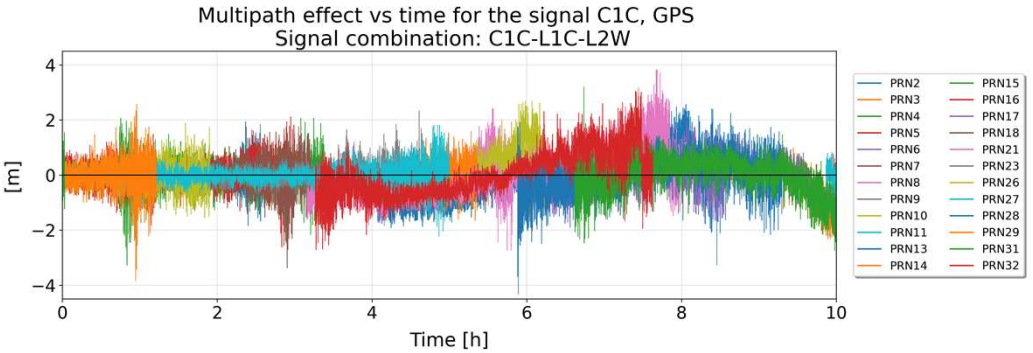
10 hours of data with medium jamming – night 1

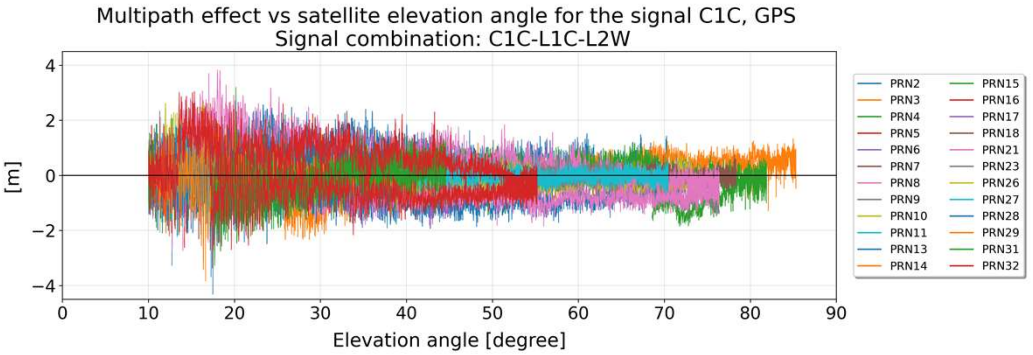
Anti-jam





VeraPhase

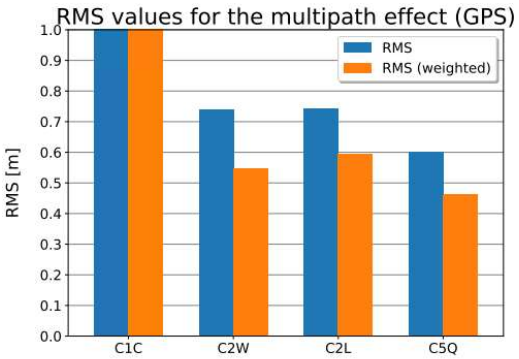


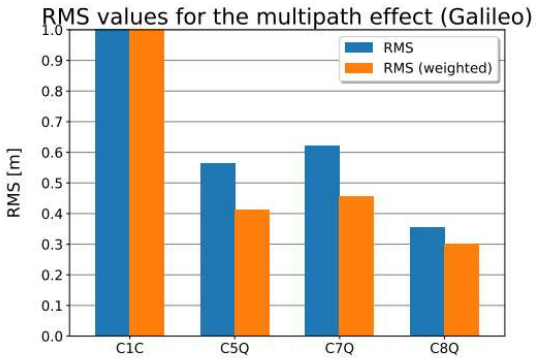


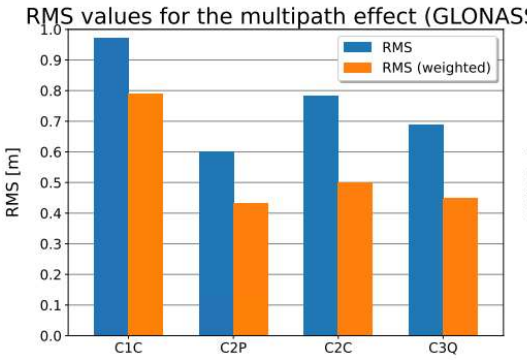
Multipath – summary

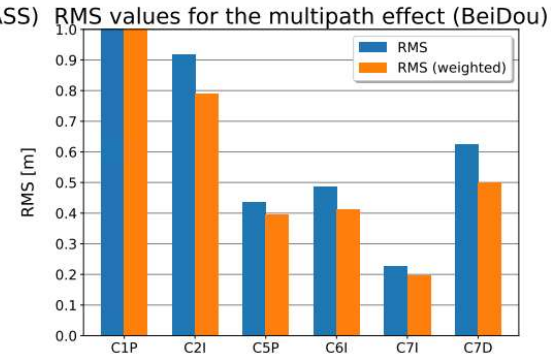
10 hours of data with medium jamming – night 1

Anti-jam

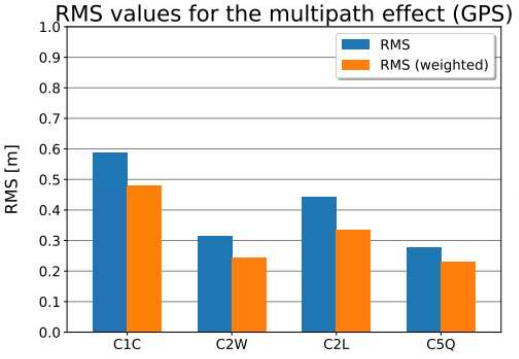


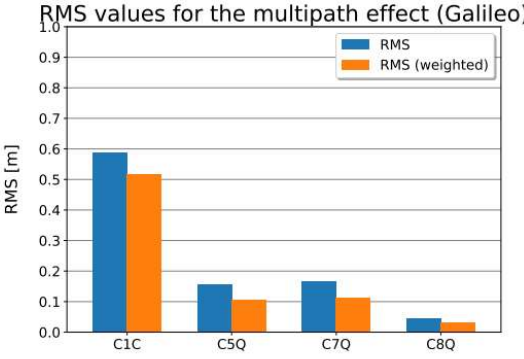


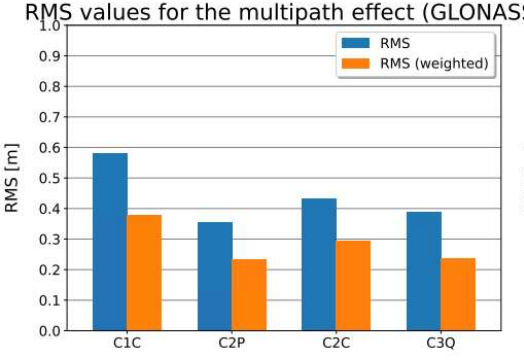


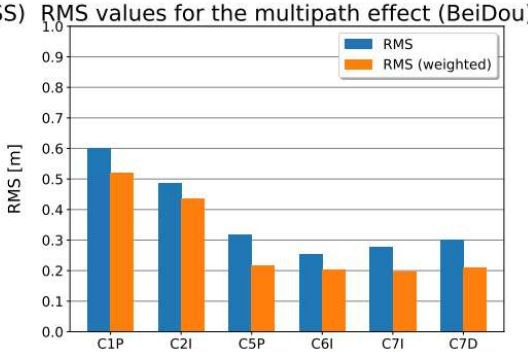


VeraPhase









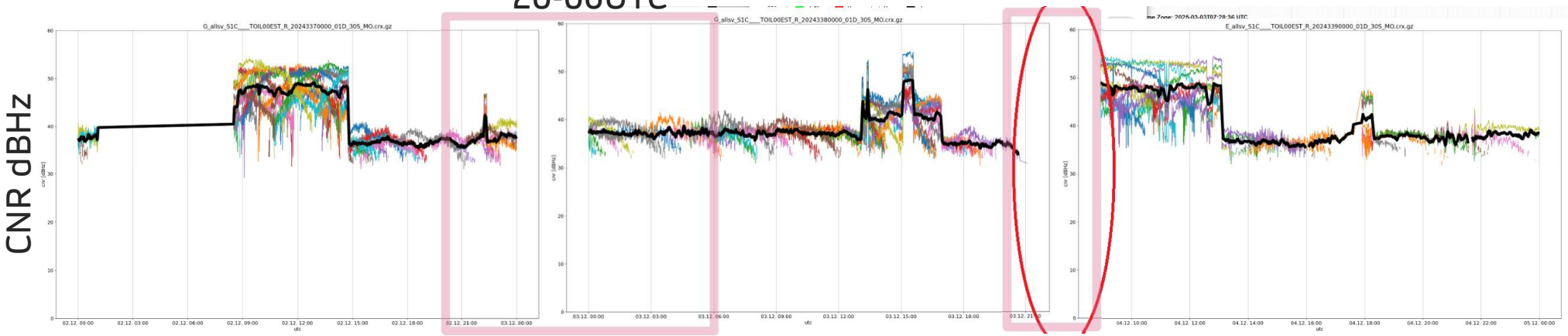
2 nights in Toila

- Number of satellites
- Gain
- DOPs
- Coordinate solution (autonomous)

TOIL CNR values for 2.-4.12.2024:

20-06UTC

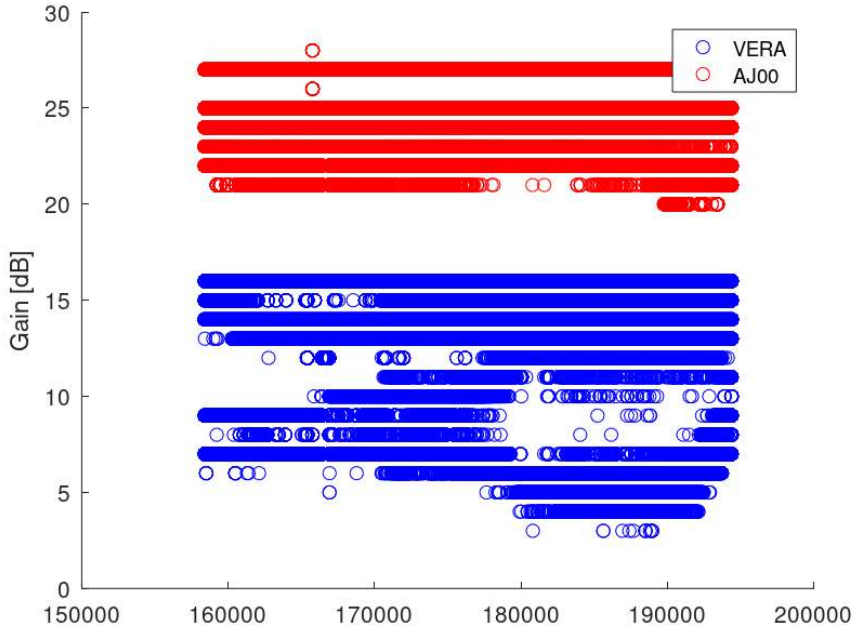
20-06UTC



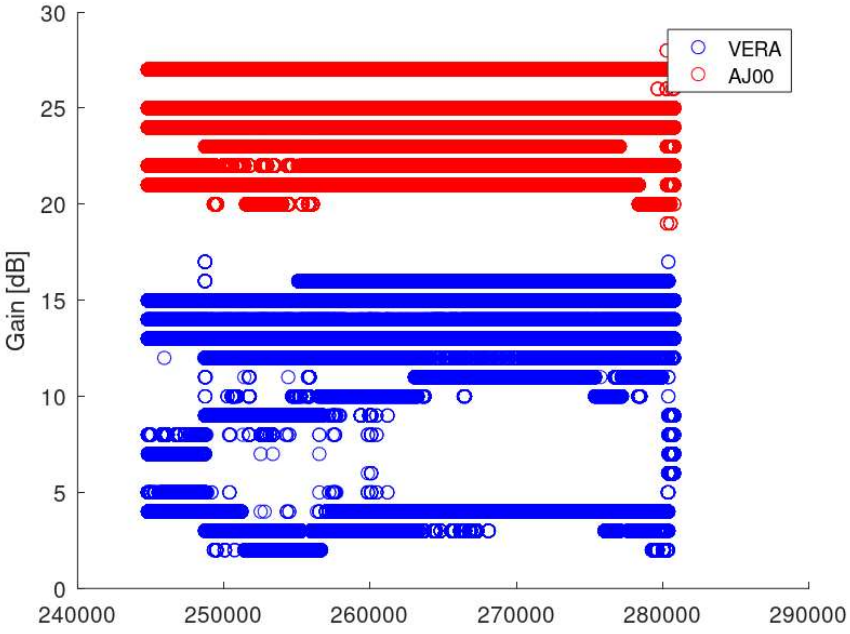
TOIL missing all the data due to interference:
~20:30 - ~8:00UTC

Gain

Night 1



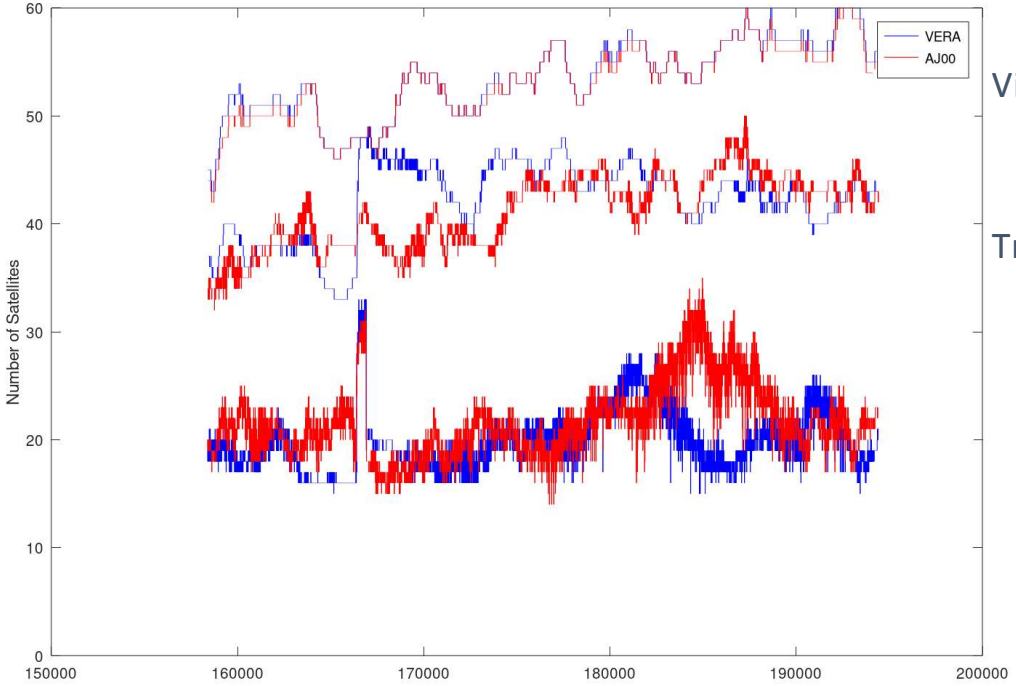
Night 2



Number of SV

- Both recover quickly when interference is on ”pause”
- Second night AJ more satellites

Night 1 20-06UTC

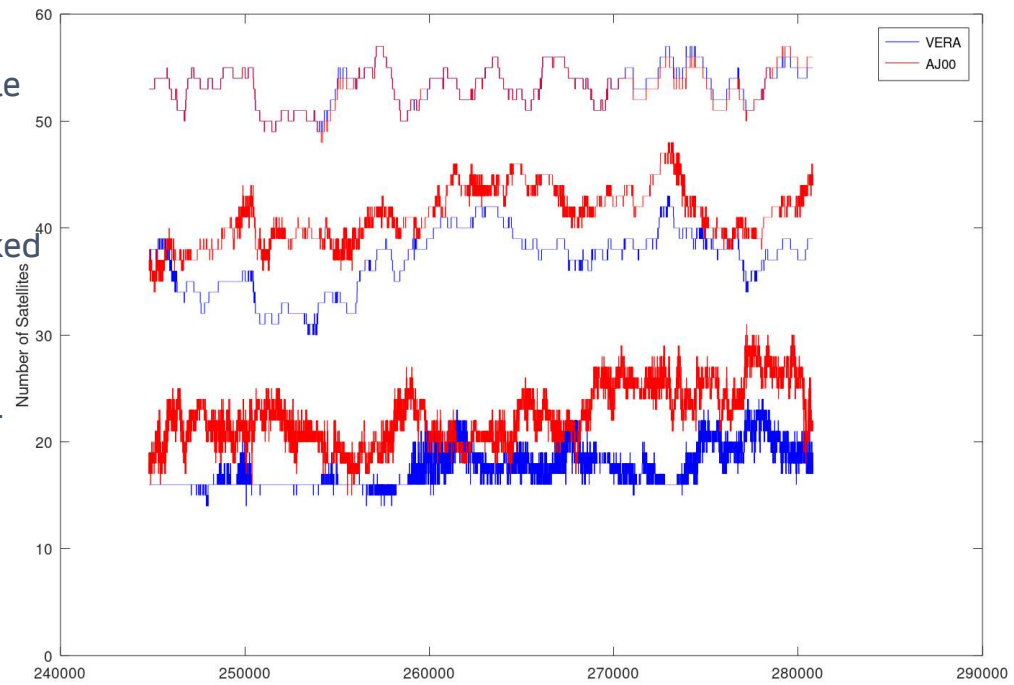


Visible

Tracked

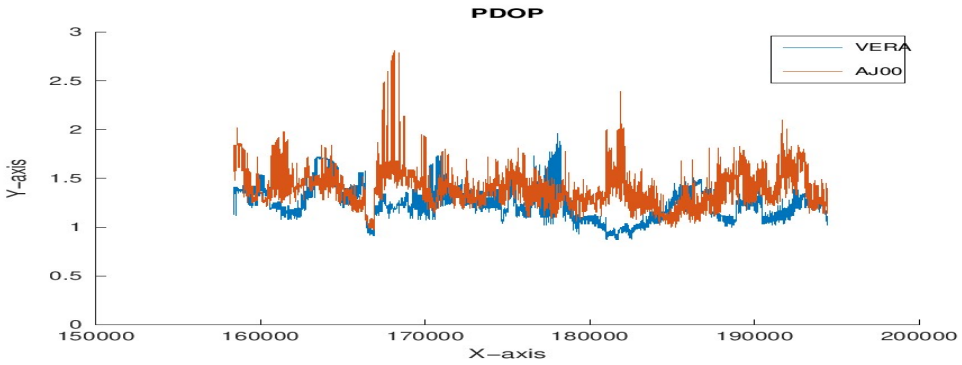
PVT

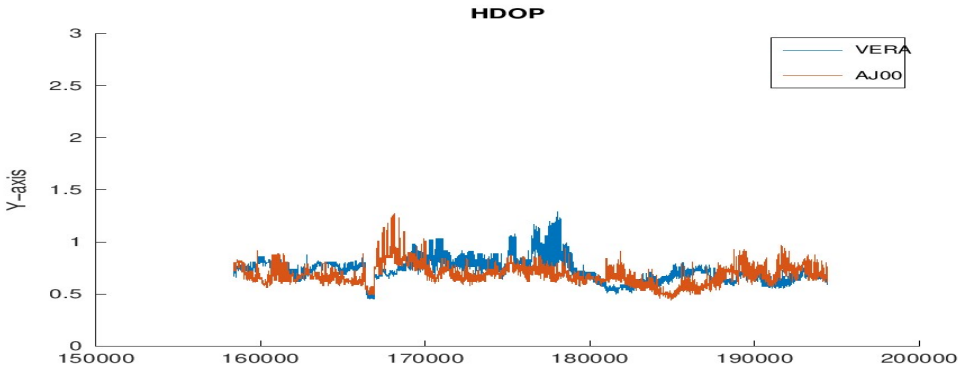
Night 2 20-06UTC

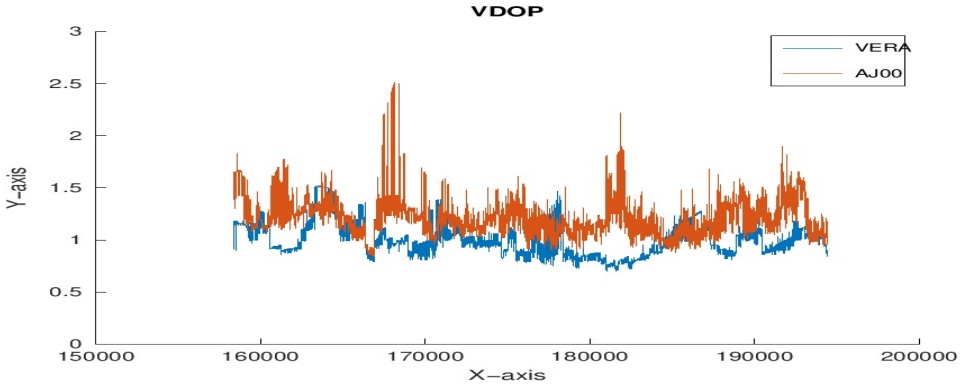


DOPs

Night 1 20-06UTC

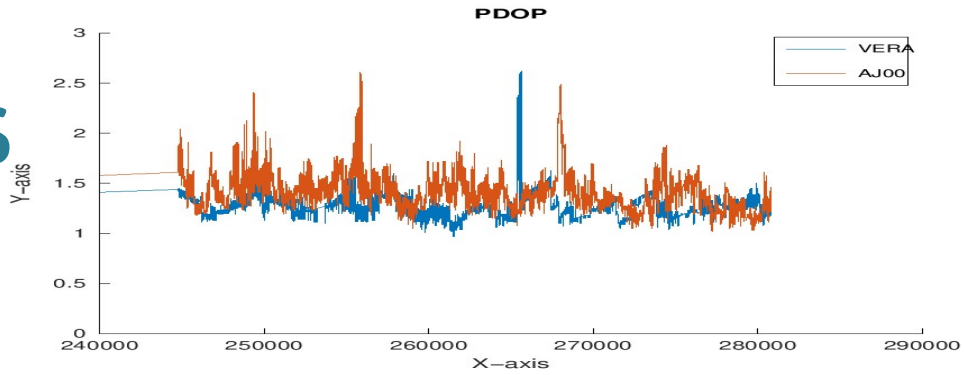


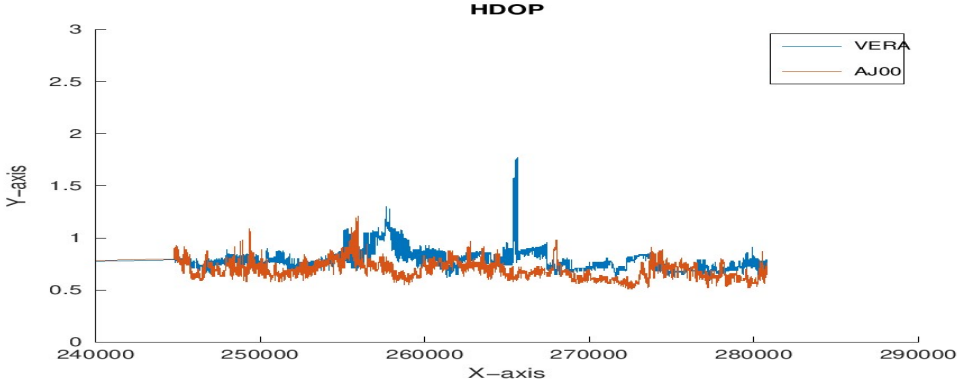


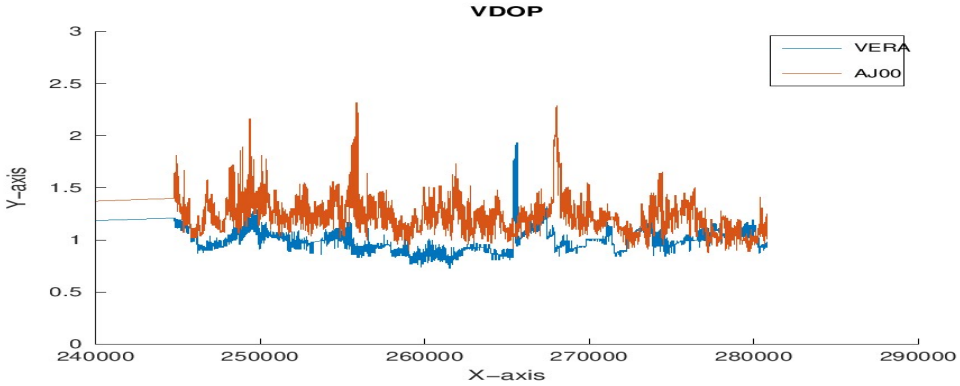


- PDOP/ VDOP lower with VERA

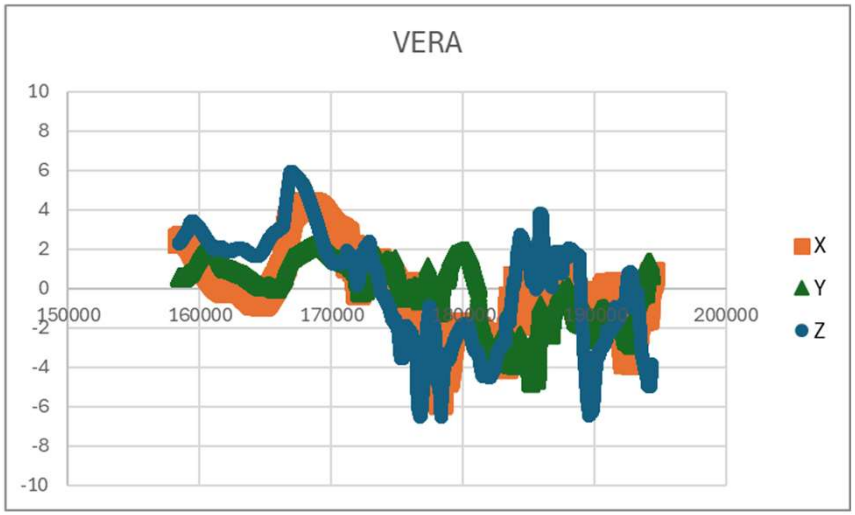
Night 2 20-06UTC

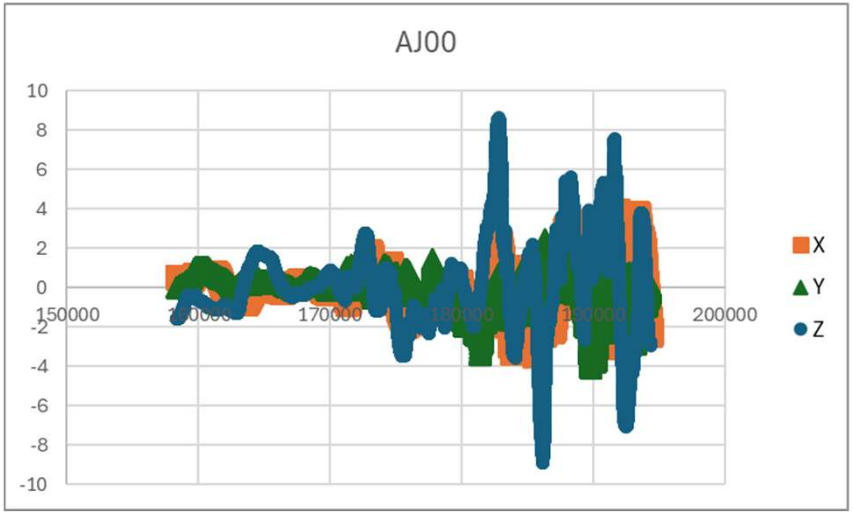






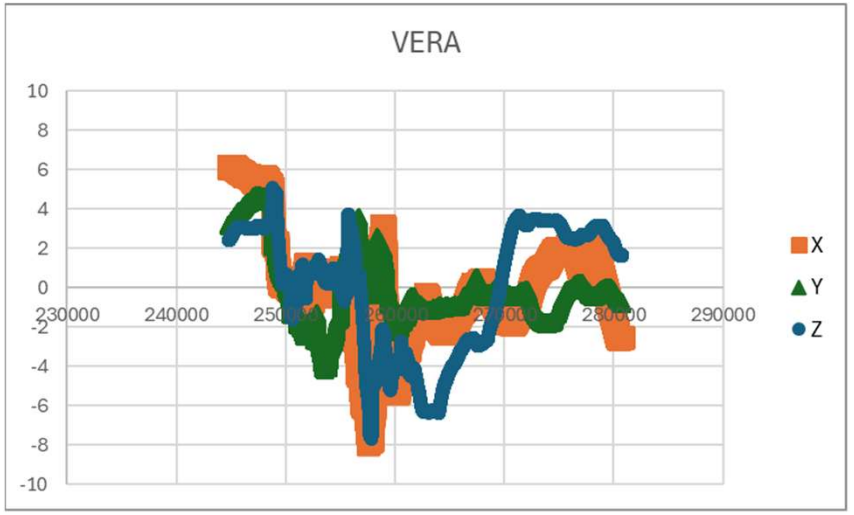
Night 1 20-06UTC

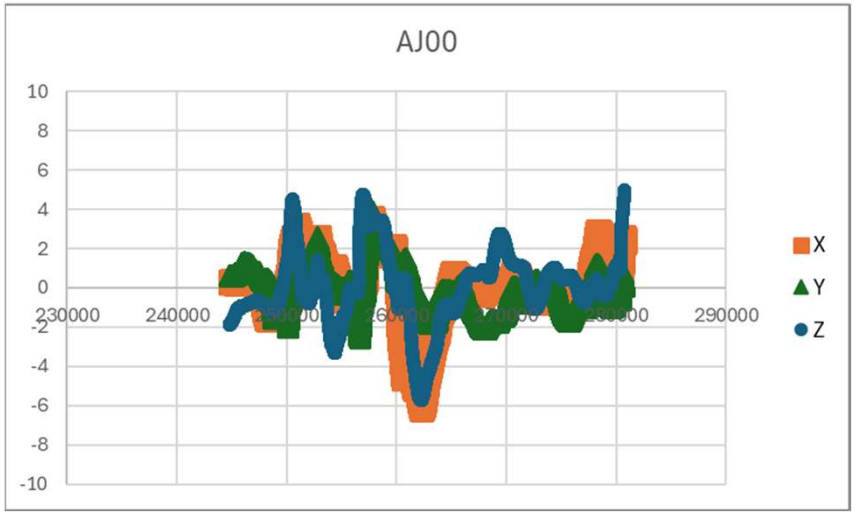




XYZ

Night 2 20-06UTC





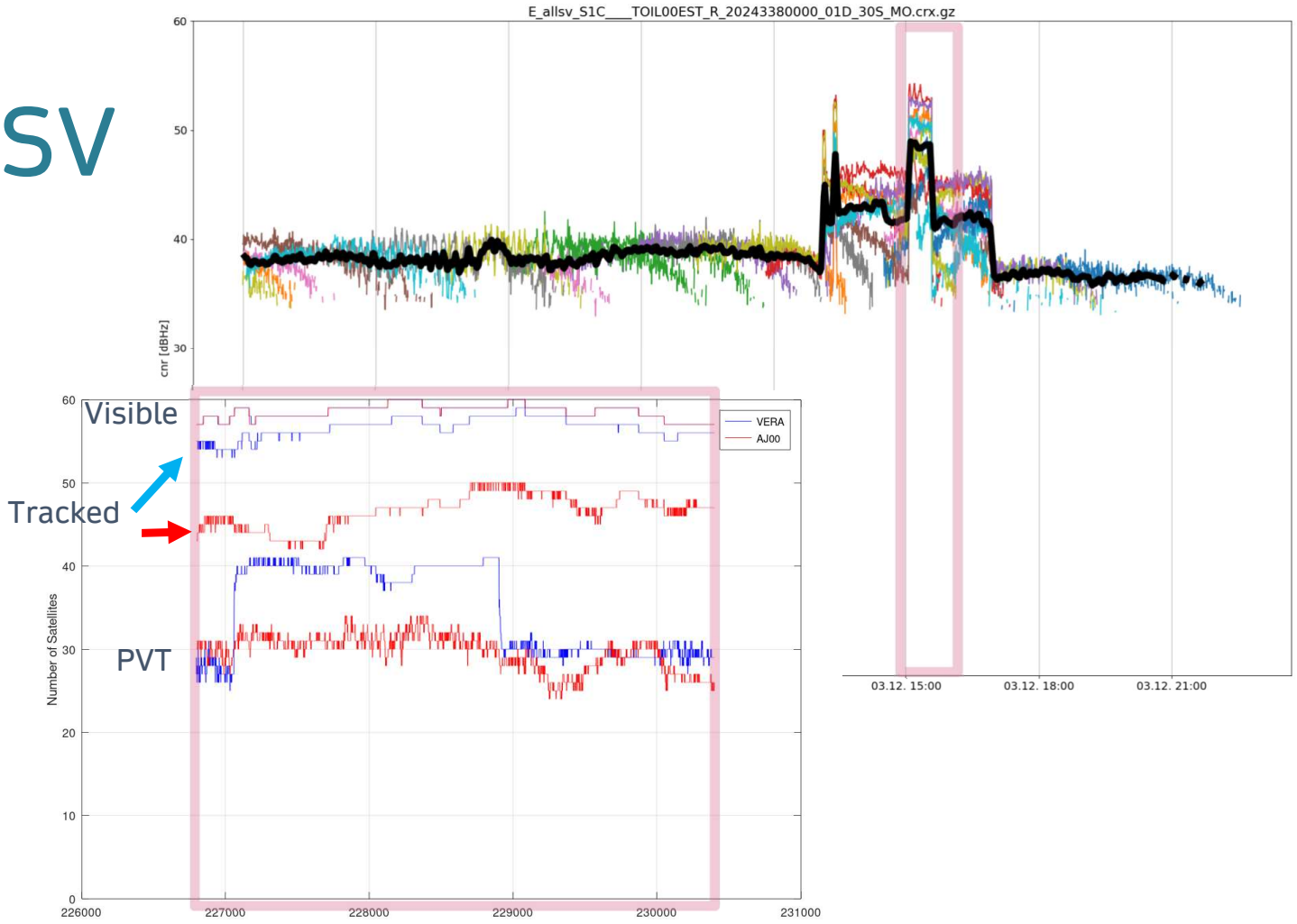
1 hour dataset

Doy 338, 3.12.2024

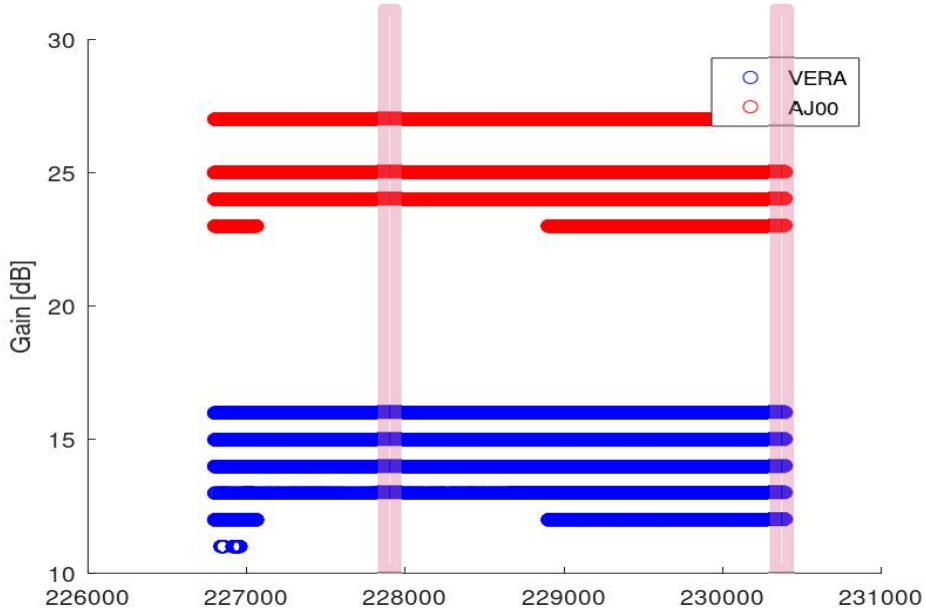
15-16 UTC

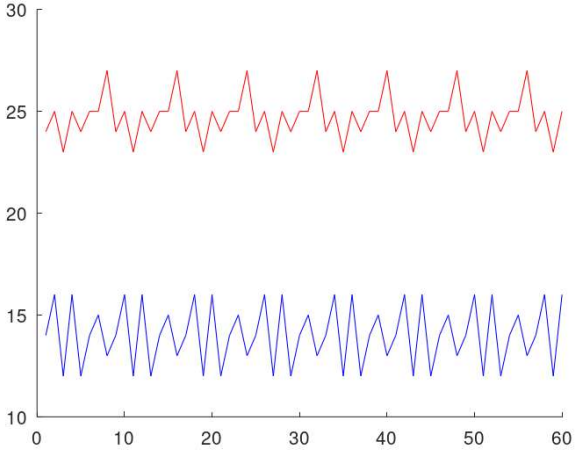
Number of SV

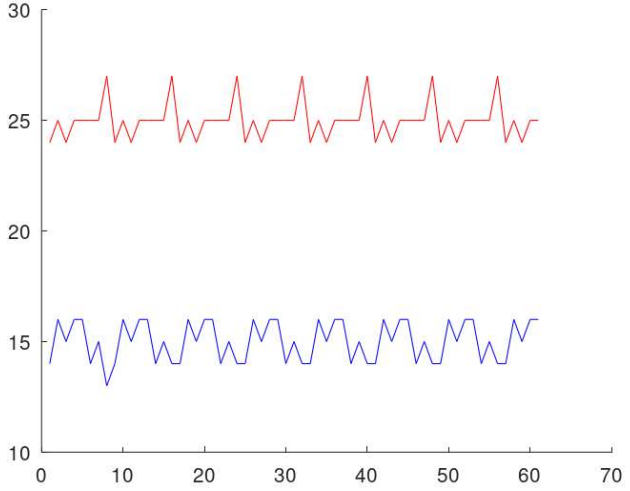
- VERA recovers quickly when interference is on ”pause”
- VERA tracks more satellites



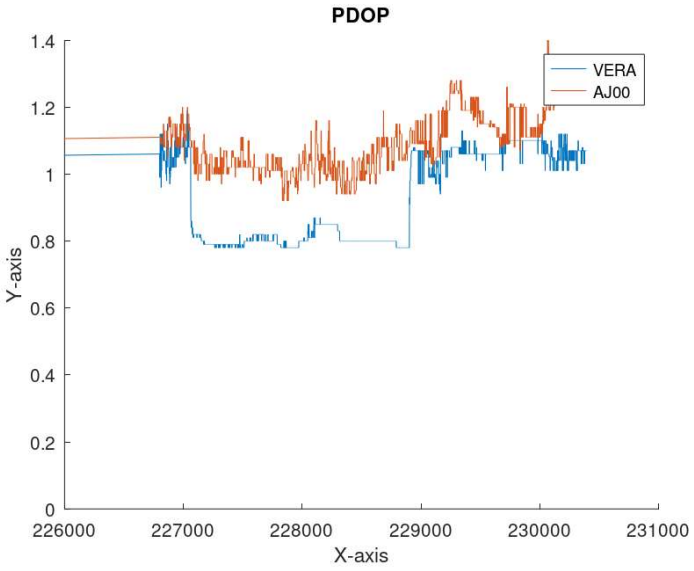
Gain (dB)


VERA
AJ00
Gain [dB]
30
25
20
15
10
226000
227000
228000
229000
230000
231000


30
25
20
15
10
0
10
20
30
40
50
60


30
25
20
15
10
0
10
20
30
40
50
60
70

DOPs


PDOP
VERA
AJ00
Y-axis
X-axis
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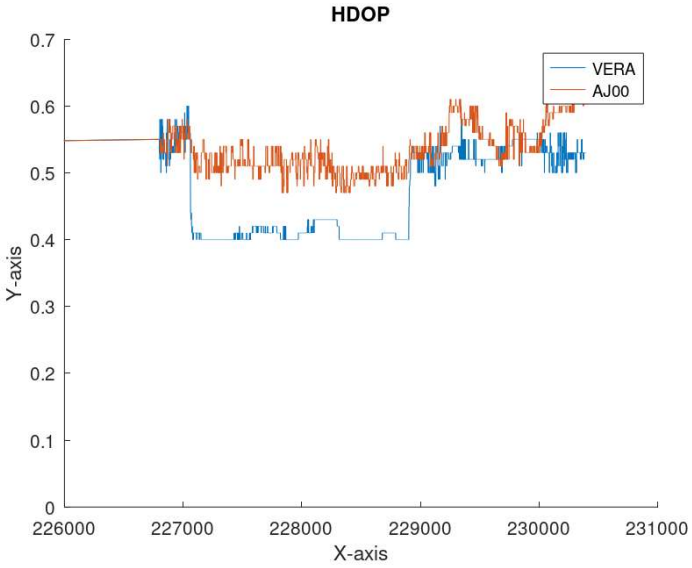
0.4
0.6
0.8
1
1.2
1.4
226000
227000
228000
229000
230000
231000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VERA
AJ00
Y-axis
X-axis
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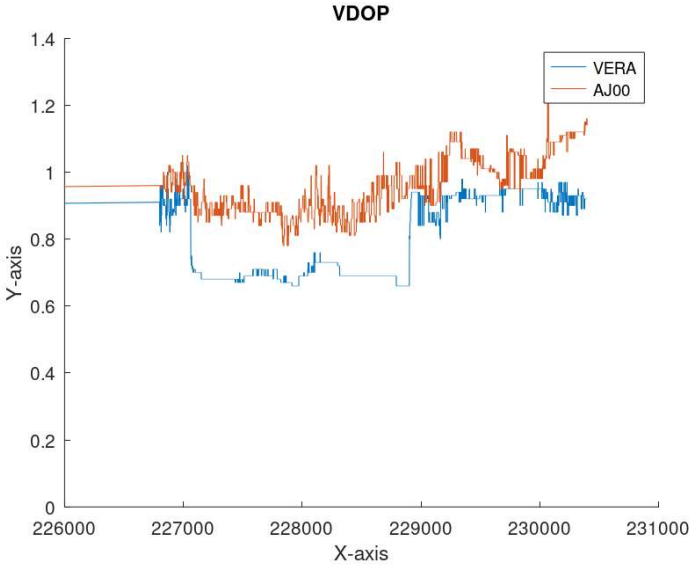
VDOP
VERA
AJ00
Y-axis
X-axis
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0.2
0.4
0.6
0.8
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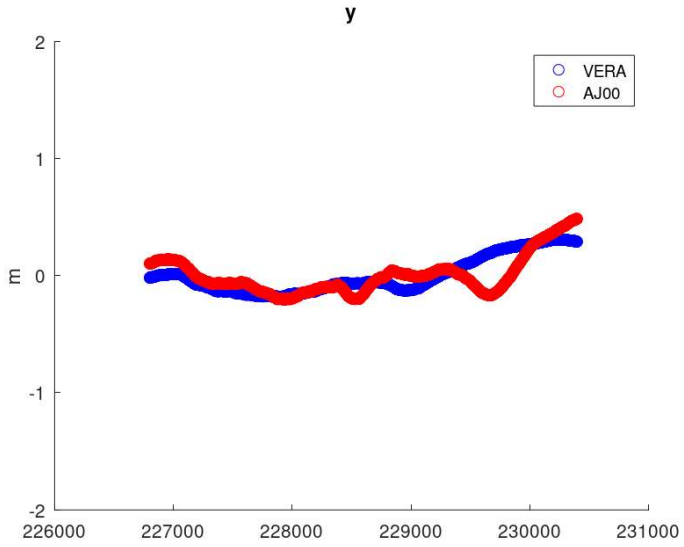
1.2
1.4
226000
227000
228000
229000
230000
231000

XYZ


y
VERA
AJ00
m
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0
-1
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226000
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230000
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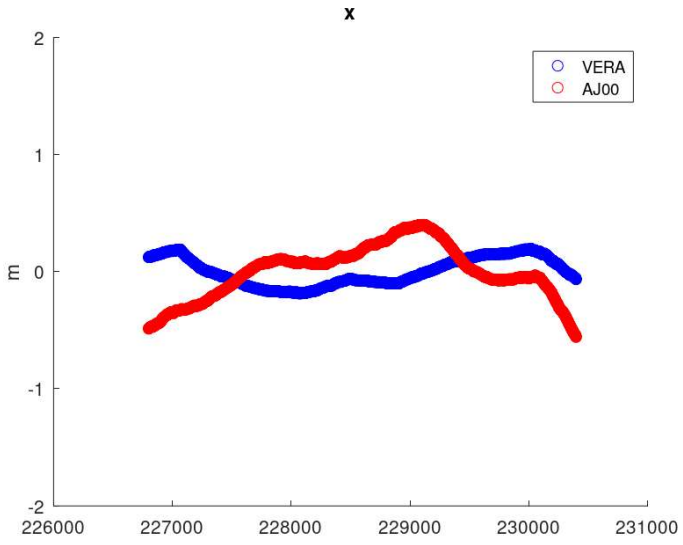
x
VERA
AJ00
m
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1
0
-1
-2
226000
227000
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229000
230000
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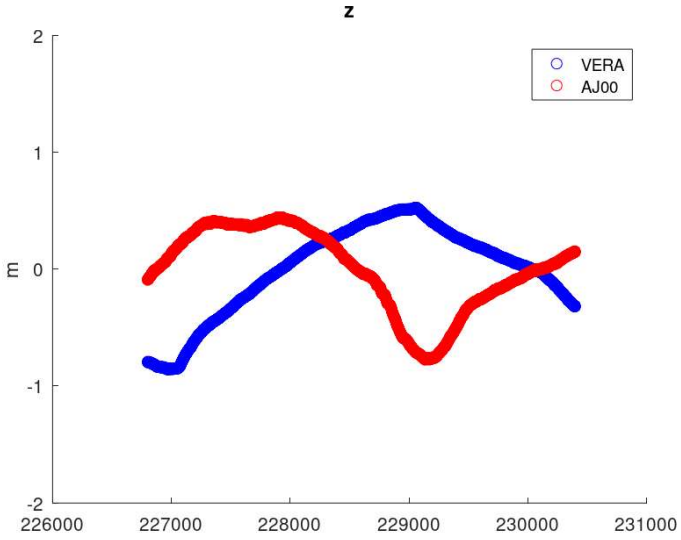
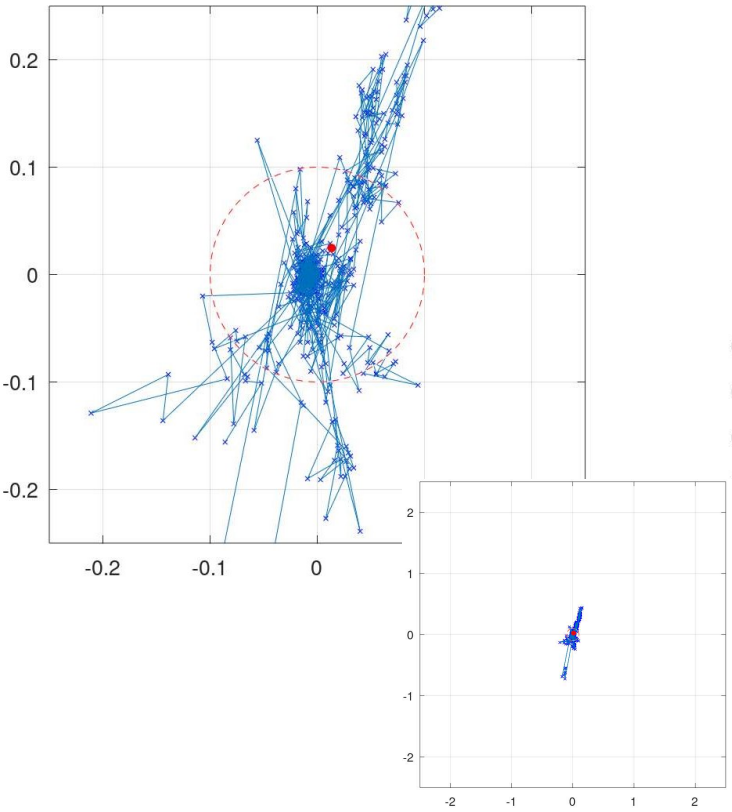
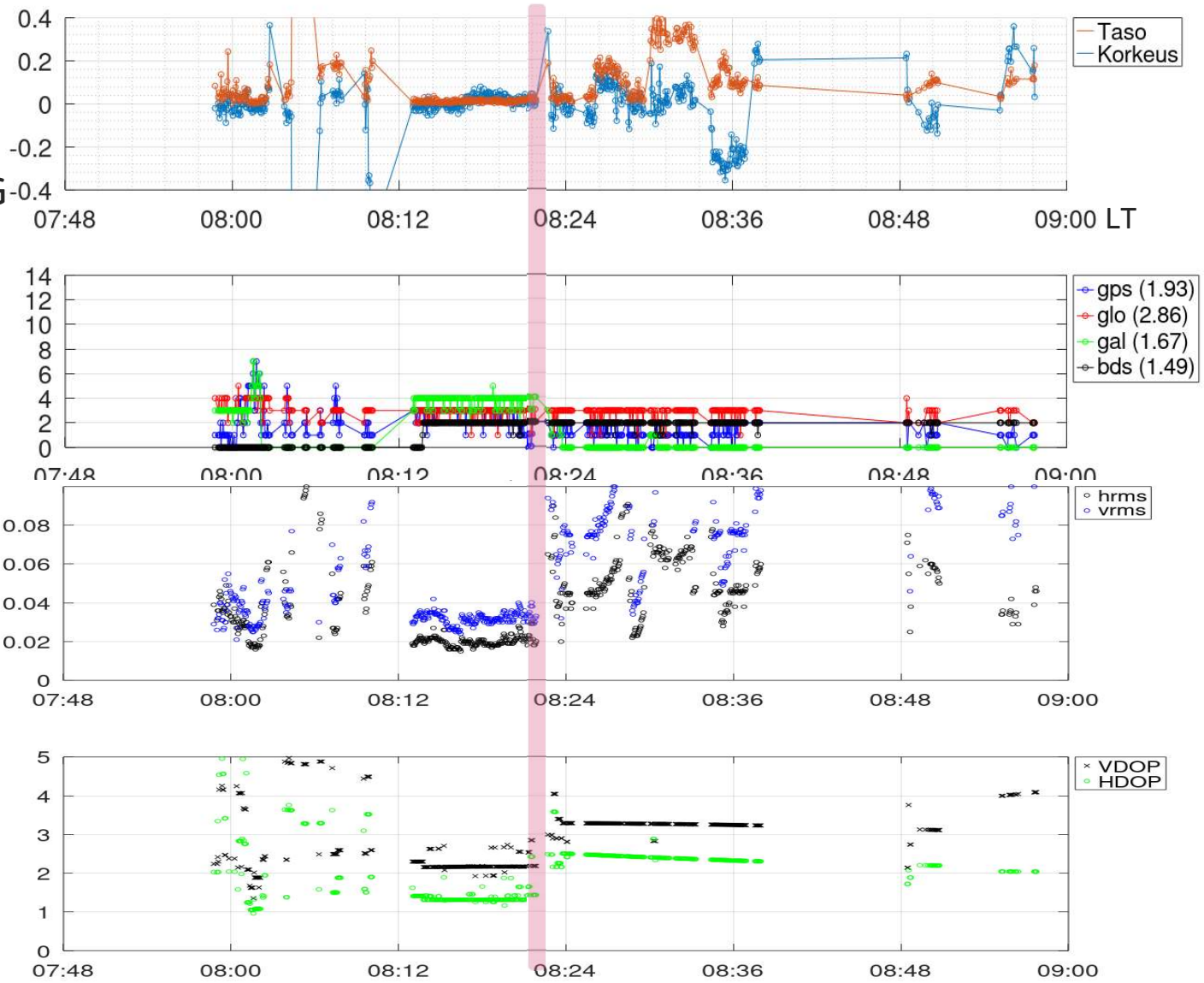

z
VERA
AJ00
m
2
1
0
-1
-2
226000
227000
228000
229000
230000
231000

RTK rover anti-jam option test

- 4.12.2024 morning
- Mountpoint SINGLE: Ref. station NJOE (~30 km)
- Ref. Clean
- FIXED ONLY Solutions in FIG

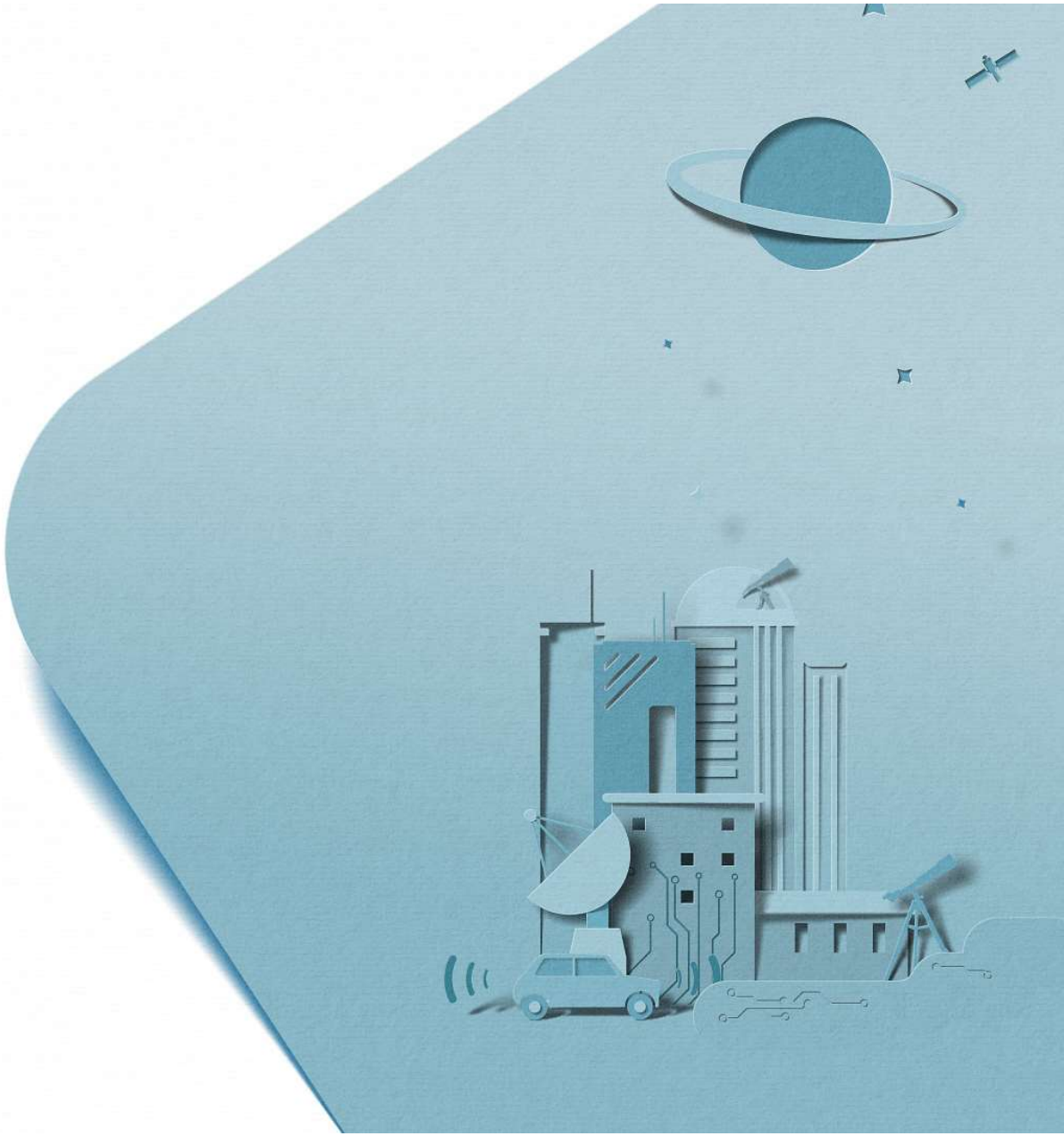


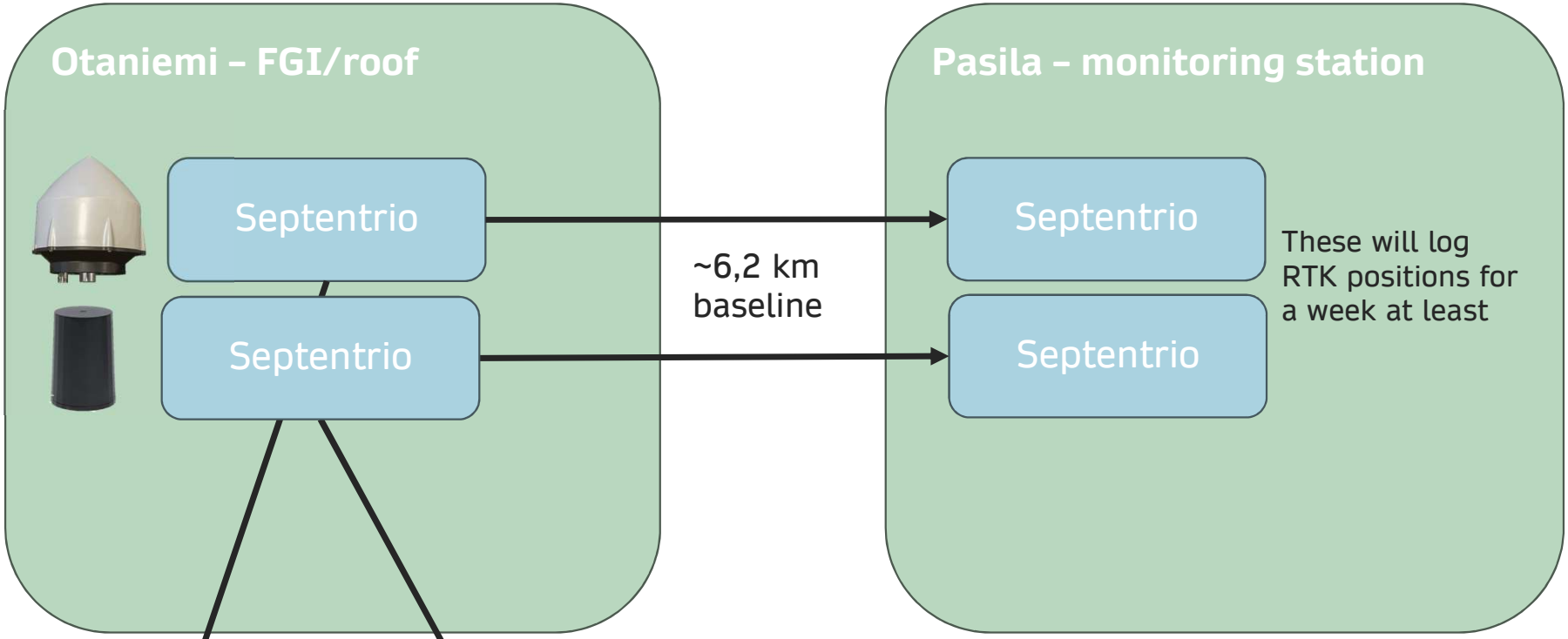
Anti-Jam turned ON



Anti-jam for RTK

Tests with monitoring station





Results will follow later!!!

We know the Earth
– we secure the future

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