RIGA TECHNICAL UNIVERSITY

# The Contribution of Galileo to GNSS

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# Aim and tasks of the Thesis

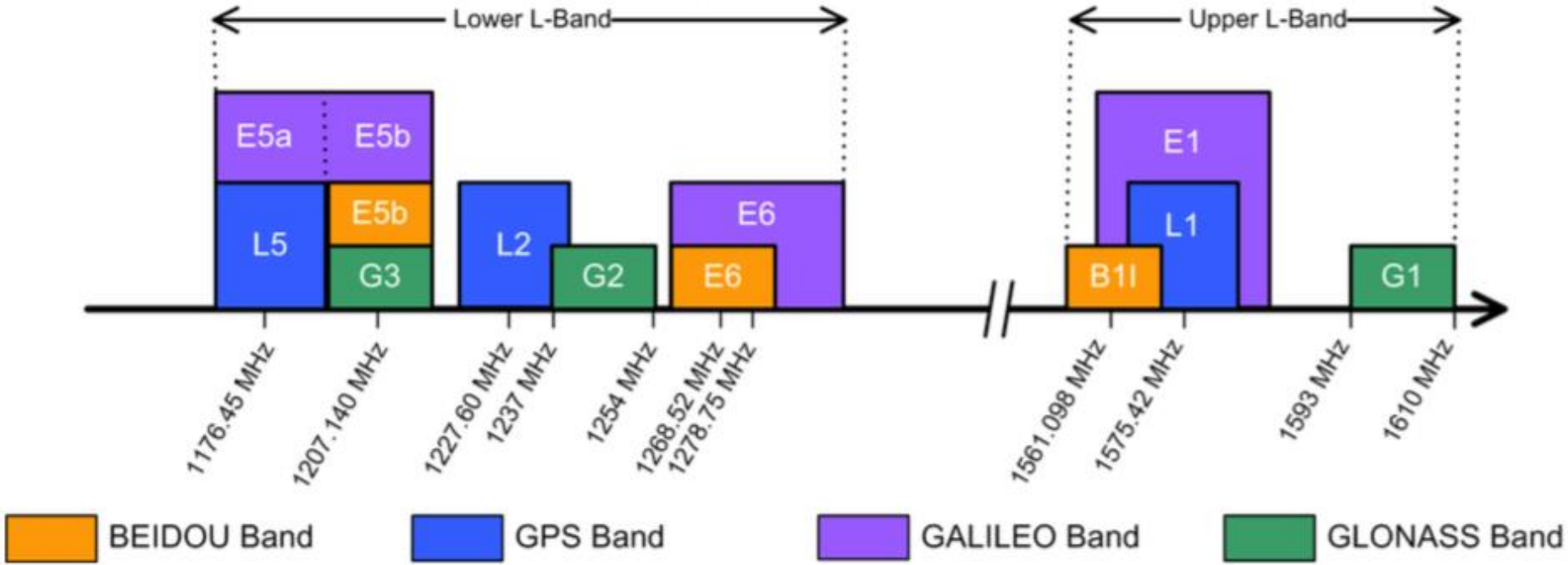
The aim of these theses is to determine the user benefits of Galileo global positioning systems. To achieve the goal, the following tasks were set:

1. Analyze available information about Galileo;
2. Analyze and compare GNSS performance with and without use of Galileo signals;
3. Make conclusions.

# What is Galielo


- Civil based European
- Global coverage
- Fully operational at year 2020 (30 satellites)
- 22 usable satellites, 2 testing satellites, 1 not available satellite and 1 not usable satellite (Constellation Status on 26.04.2019.)
- Orbital height 23,222 km
- 3 orbital planes,  56° inclination
- Transmitting three signal bands – E1 (1575.42 MHz), E5 (1191.795 MHz) and E6 (1278.75 MHz)

# Frequency bands



# E5 frequency band

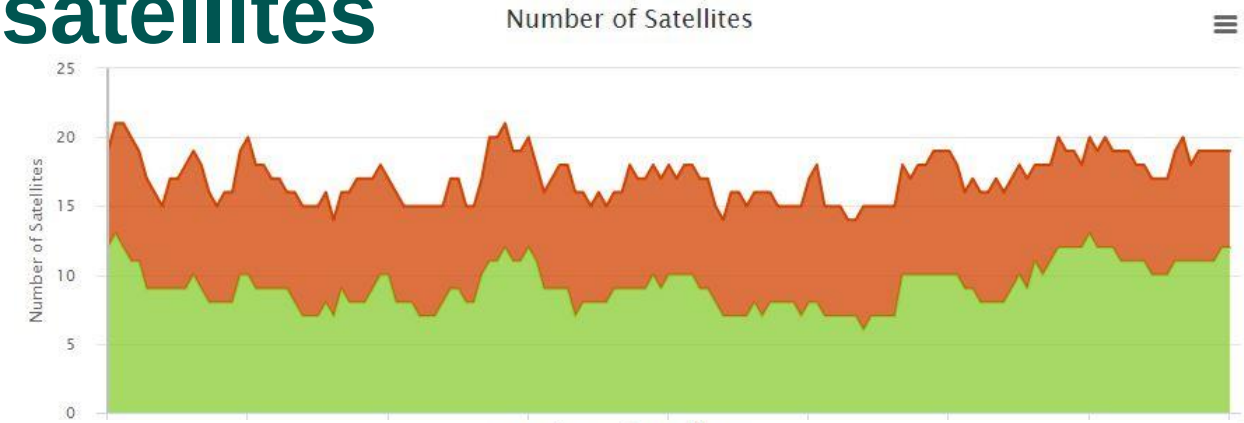
**Lower L-Band**

- E5 – 1191.795 (bandwith 51.15 MHz)
- E5a – 1176.45 (bandwith 20.46 MHz)
- E5b – 1207.14 (bandwith 20.46 MHz)

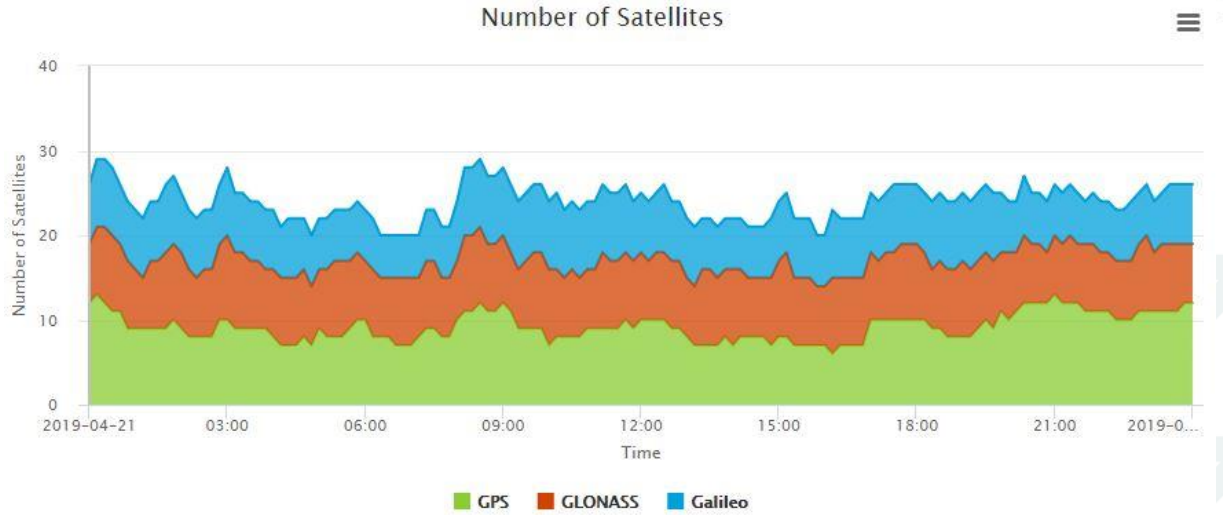
**Combined bandwith of 92.07 MHz**

# Number of satellites

**GPS + GLONASS**



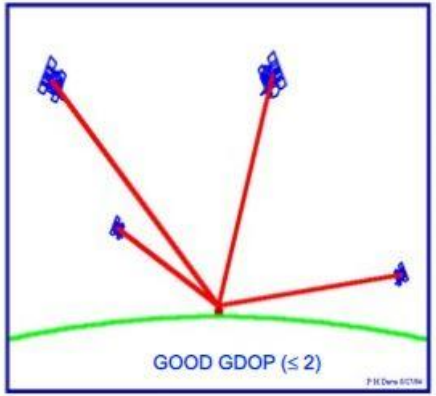

**GPS + GLONASS + Galileo**

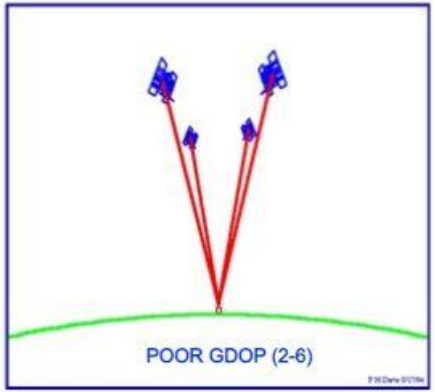


# Benefits of more satellites in the view

GNSS require dual-frequency receivers to eliminate the ionospheres delay

More satellites means better geometrical placement in the sky



# Results

1. Band E5 features low noise impact, which means it is more accurate in urban environment.
2. Galileo system gives addition of at least 6 visible satellites at any given moment, which improves geometrical placement of satellites.
3. More available satellites gives more band frequencies which helps to assess the error of ionosphere effect.