L band solar radio bursts on September 6, 2017 and its impact on GNSS signals

H.Sato[1], N.Jakowski[1], J.Berdermann[1], K Jiricka[2], A. Heßelbarth[1]

[1]German Aerospace Center, Neustrelitz, 17235, Germany

[2]Astronomical Institute of the Academy of Sciences of the Czech Republic, Ondrejov, 25165, Czech Republic

Strong solar radio bursts are known to cause radio interference and have the potential to affect satellite radio systems such as Global Navigation Satellite System (GNSS). On September 6, 2017, GNSS signal interferences were observed at ground stations in the European sector from the low to high latitudes for all GNSS satellites in view including GPS, GLONASS and Galileo. This paper studies the GNSS signal response to the solar radio burst events. The impact of the radio burst has been found at GNSS L2/L5 (1.2 GHz) frequencies, but not at L1 frequency (1.4 GHz). The ground observation of the solar radio spectrum corresponds well to such frequency dependence. The signal interference reduces the signal to noise ratio and it is characterized by the amplitude scintillation index, showing clear difference between the signal interference patterns and other background noises. We examine the receiver performance for this event and the result show a clear indication of frequency-dependent GNSS performance degradation during strong space weather..