

# Moonlight communication workshop - Navigation service

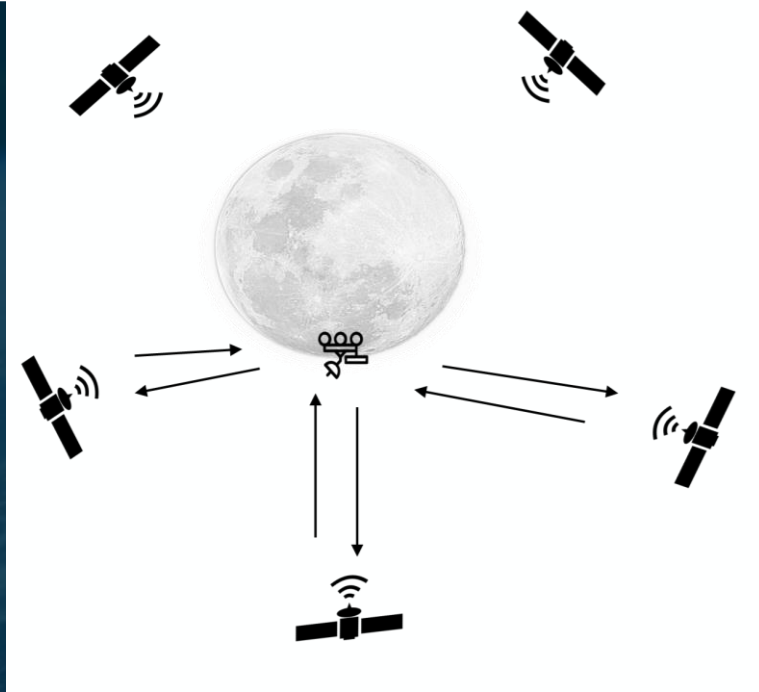


ESA Lunar PNT team

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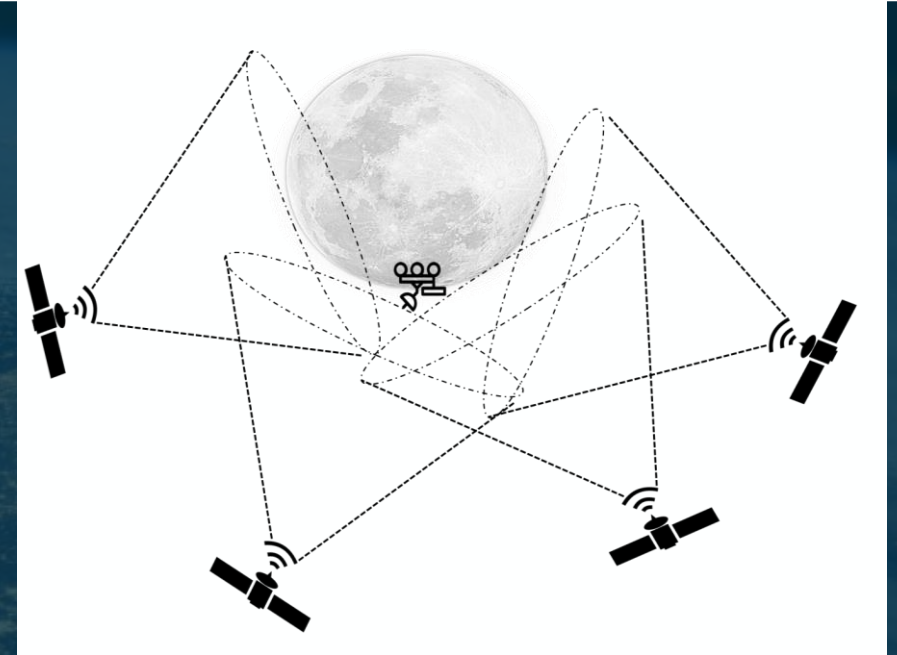
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# Moonlight Navigation services



## Two way service

Requires active transmission from user  
Similar to standard proximity link ranging



## One way service

User is only a receiver, no transmission is required  
Same concept as GNSS

# Moonlight navigation user terminal

The one-way user receiver will be very similar to a spaceborne GNSS receiver, in terms of concept of operations, SWaP and performances. One-way signal will be broadcasted in 2483.5-2500 MHz

The two-way user terminal will be similar to a TT&C transponder in terms of SWaP. Two-way service will be provided in 2025-2290 MHz (covering both forward and return links).

In both services, the user should fuse the Moonlight ranging data with the other sensors available on board such as IMU, Altimeters, visual odometer, etc.

# Moonlight navigation user cases

The Moonlight navigation service can support all lunar use cases

- 1) Orbital users: the moonlight receiver will be equipped with dynamic models to support navigation even during phases with limited or no moonlight satellites visible. This is similar to what is done in LEO orbit with GNSS
- 2) Landers: the moonlight receiver measurements can be fused with IMU and altimeter to provide very accurate absolute positioning, allowing to obtain below 50m 3-sigma horizontal accuracy
- 3) Surface users: the moonlight receiver can be fused with IMU and DEM to provide very accurate absolute positioning, allowing to obtain below 50m 3-sigma horizontal accuracy

The navigation service will be available at least for 5 consecutive hours during 24 hours and at least for 8 non-consecutive hours over 24hours.