How Navimow EFLS works

NAVIMOW

CHOOSE LIFE
WITHOUT BOUNDARIES

What is GNSS satellite system?

The GNSS satellite system consists of the following satellite constellations: GPS/USA, BeiDou/China, GLONASS/Russia and Galileo/Europe.

The satellites of the GNSS satellite constellation communicate their exact position and time via radio codes. To determine the position, a receiver (e.g. robotic mower or reference antenna) must receive the signals from at least four satellites simultaneously. In the receiving device, the pseudo signal propagation times are measured (from the satellites to the receiving antenna, including the receiver's clock error) and the current position (including the altitude) and the clock error are thus determined.

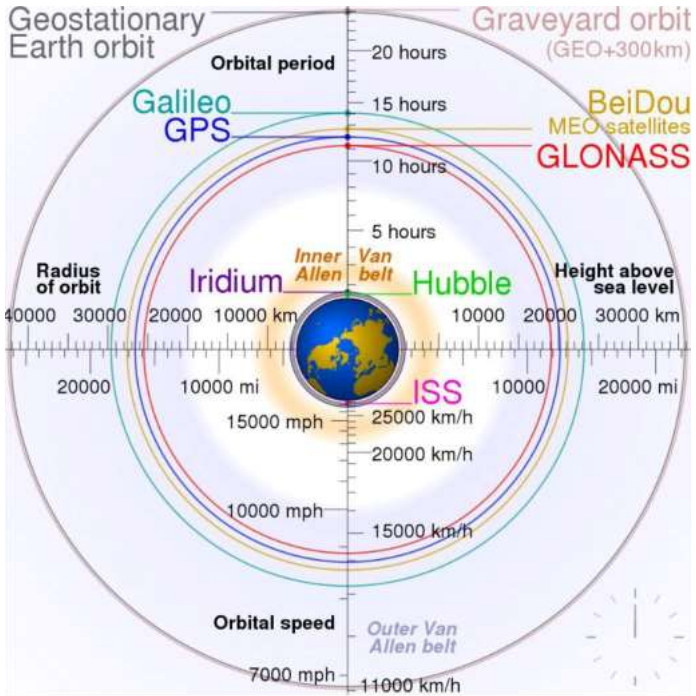
At a distance of about 25,000 km from the earth, a constellation of about 24 to 30 satellites is used. This ensures that the receiving devices - even if the view to the horizon is not completely clear - can always receive signals from at least four satellites simultaneously.

How Navimow uses GNSS

The robotic mower can locate itself through satellite signals. The same satellite signals can also be picked up by the antenna as correction signals (DGPS), improving satellite positioning accuracy to centimeter-level.
To achieve centimeter-level accuracy, the robot and the antenna must be able to receive signals from **at least 10 same satellites at the same time**.

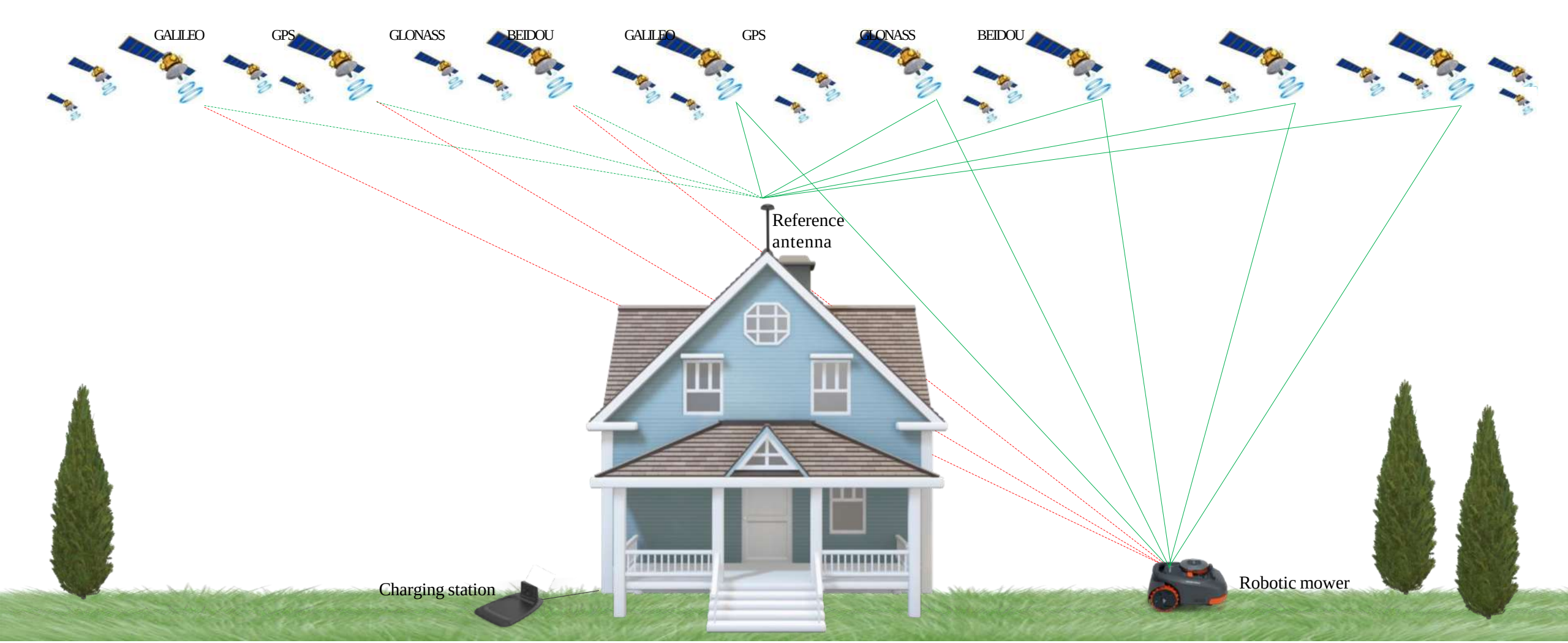
Functionality of EFLS

Nevertheless, the satellite signal may be lost occasionally. In this case, the Navimow system is designed to evaluate all the information from the gyroscope, accelerometer, magnetic compass and meter counter sensor in real time, and the mower continues its work temporarily even without a satellite.
Simply put, EFLS combines satellite positioning with data from multiple sensors to guarantee extremely precise positioning. The mower systematically mows within the virtual boundary mapped by EFLS, providing a revolutionary mowing result.



Satellite Constellations in orbit around the earth

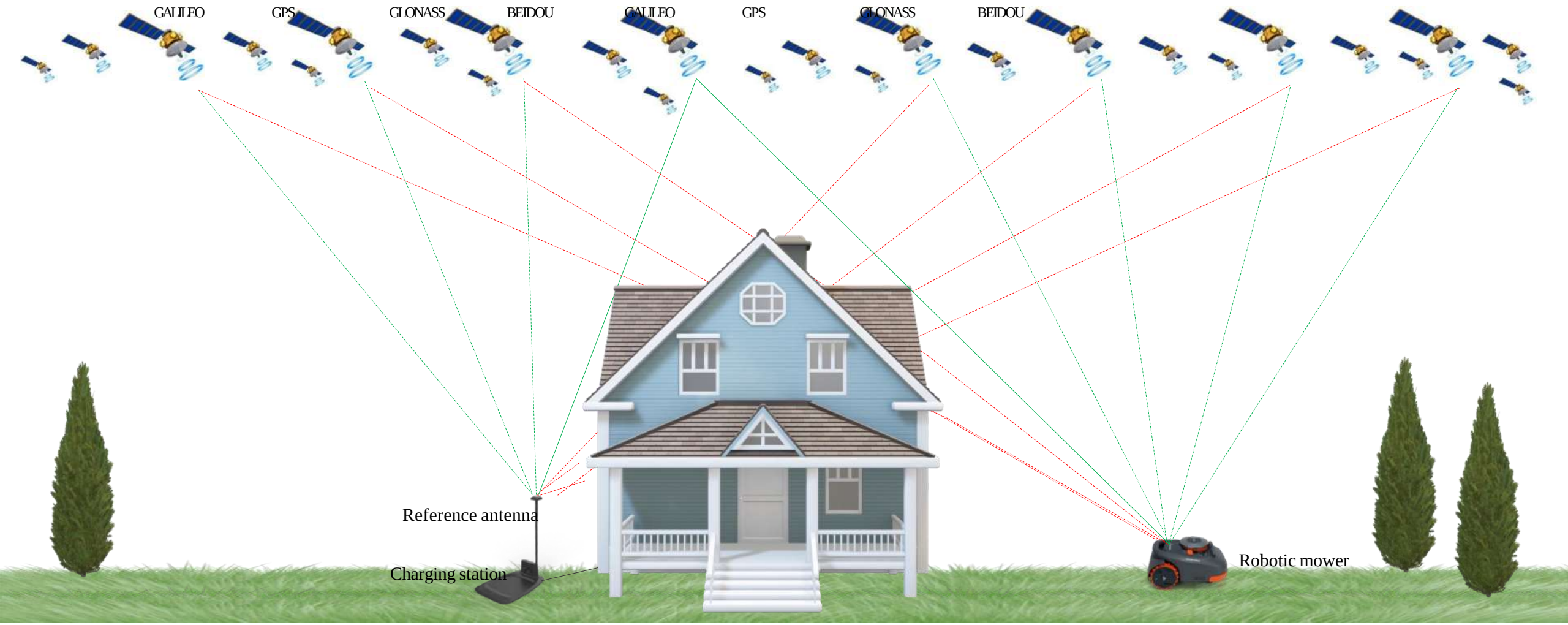
System	Country	Number of satellites
GPS	USA	31
BeiDou	PRC	35
GLONASS	RUS	24
Galileo	EU	24



Ideal installation of the reference antenna (lawn on all 4 sides of the property).

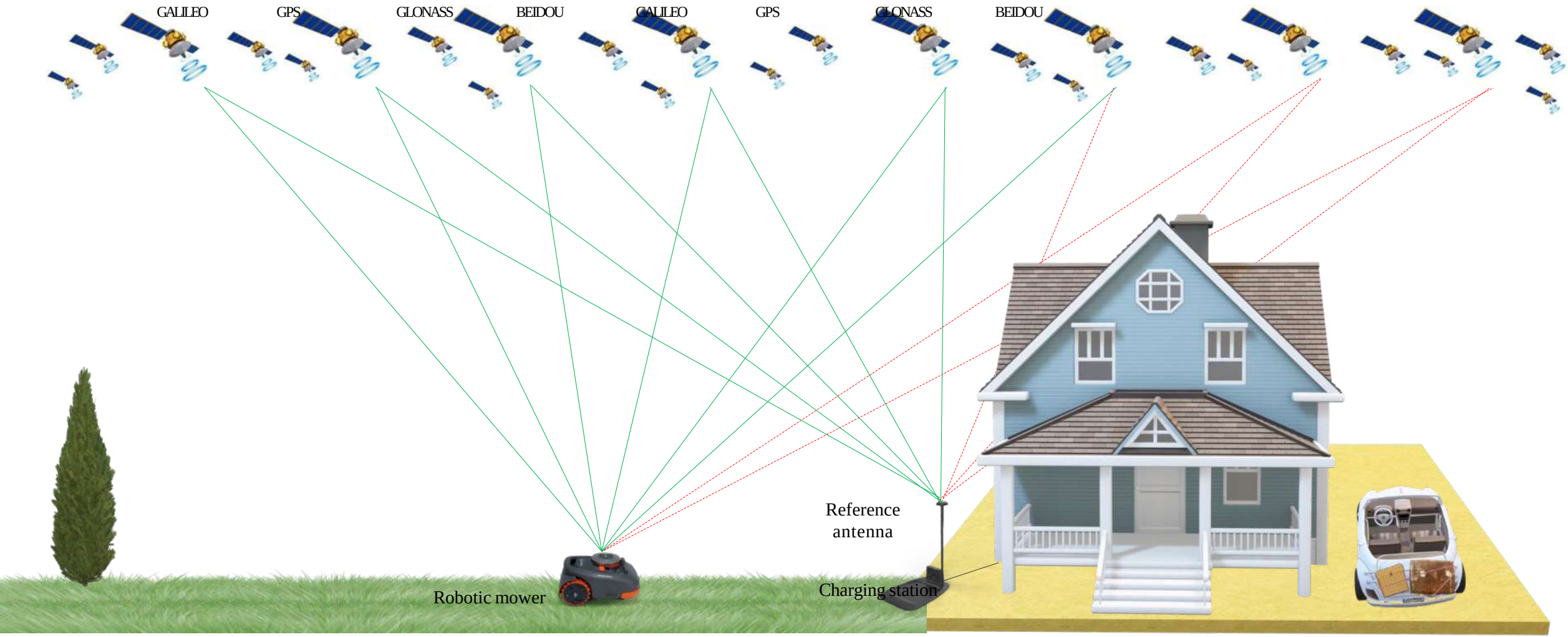
It is important that the robot and the antenna see the **"same sky"** and this **at least 10 same satellites** , so that an exact position determination is possible.
As shown in the illustration, the reference antenna is installed on the roof of the house. This gives the antenna an unrestricted 160° view of all directions to all satellites from GPS, GALILEO, GLONASS and BEIDOU. The reference antenna sees all satellites on the north, south, west and east side of the house, while the robot in this example only sees the satellites on the east side and uses them for navigation (antenna and robot both see at least 10 satellites together on the east side). If there is lawn on all four sides around the house and the robot is now mowing on one side, it would see at least 10 satellites together with the reference antenna and use them for navigation.
Note: The reference antenna is connected to the charging station. The charging station sends the data to the robot via radio signal. The reference antenna, the charging station and the robotic mower do **not** need to have direct visual contact with each other. The only **important** thing is that the robot and the reference antenna see the same section of the sky in the working area and thus at least 10 satellites.

Illustrations in this document is for reference purpose only



<u>Incorrect installation of the reference antenna</u> <u>(lawn on all 4 sides of the house).</u>

As shown in the illustration, the reference antenna is installed on the west side of the house. This means that the antenna does **not have an** unrestricted view of all directions. In this case, the antenna sees only the satellites on the west side of the house, while the robot in this example sees only the satellites on the east side. (Antenna and robot do **not** see enough satellites at the same time). Thus, no accurate or only very limited navigation of the robot on the east side of the property is possible. If the robotic mower were now on the west side of the property, i.e. on the same side as the reference antenna, the robotic mower and the reference antenna would see the "same sky" and therefore at least 10 satellites together and centimeter-level accuracy navigation would be possible.



Possible installation of the reference antenna (lawn on only one side of the house).

As shown in the illustration, the lawn and the reference antenna are located on the west side of the house. This means that the antenna does **not have an** unrestricted view of all 4 directions of the sky and satellites from GPS, GALILEO, GLONASS and BEIDOU, but it is important that the robot and the antenna see the "same sky" and thus at least 10 satellites together so that accurate positioning is possible. In this example, the reference antenna and the robotic mower see the "same sky" and thus at least 10 satellites together, so that navigation with centimeter accuracy is possible.

Note: Whenever possible, the reference antenna should be mounted on the highest point (house roof, etc.) with the greatest possible all-round visibility in order to be able to see as many satellites as possible. The reference antenna, the charging station and the robotic mower do **not** need direct visual contact with each other. The only **important** thing is that the robot and the reference antenna see the same section of the sky in one area and thus at least 10 satellites together.