

# World's first cross-border demonstration of 5G satellite communications toward the convergence of terrestrial and space communications

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## Case Overview

SKY Perfect JSAT successfully conducted the world's first cross-border demonstration using 5G NTN (Non-Terrestrial Network), leading the creation of a new market that combines terrestrial and space communications, with results showcased at Expo 2025 Osaka, Kansai. Originating in Japan, the initiative advances international standardization and ecosystem development, presenting a concrete model for addressing societal issues, including economic security, both domestically and globally. Furthermore, through industry-academia-government collaboration in human resource development and the "Universal NTN™" vision, the company promotes a future in which space is recognized as accessible infrastructure.

## Key points regarding receiving the award (Comments from the selection committee)

This cross-border demonstration between Japan and Singapore was the first in the world to show that 5G satellite communications using standardized technologies can operate at a practical level, demonstrating broad applicability across maritime transport, aviation, and disaster response, and is highly commendable.

The Universal NTN concept is outstanding, and the leadership in international standardization based on insights from the demonstration, together with the establishment of an open ecosystem to validate use cases, is also highly commendable.



Concept of Universal NTN™ and the Universal NTN innovation lab facilities

## Concrete Results

### 1. Contribution to creating new areas for space development and utilization

As a member of an international joint research team, SKY Perfect JSAT successfully conducted the world's first cross-border demonstration between Japan and Singapore using 5G NTN (Non-Terrestrial Network), with the results also showcased at Expo 2025 Osaka, Kansai. Communications based on 5G mobile standards were achieved via the commercial geostationary communications satellite JCSAT-1C (Ku-band). This is a pioneering achievement that precedes the Ku-band standardization discussions in 3GPP (Third Generation Partnership Project). Key technical challenges with low TRL, including time synchronization and frequency coordination, were resolved through proprietary expertise, enabling near-operational validation. Going forward, the company will utilize this to realize "Universal NTN™" and accelerate research and development and international collaboration with the aim of commercializing it in 2028. The initiative demonstrates broad applicability in maritime transport, aviation, and disaster response, opening new frontiers in space utilization.

### 2. Contribution to expanding the space development and utilization market

5G NTN is an emerging field that integrates terrestrial and space communications to create new markets, including in regions without established mobile networks. This demonstration showed that satellite-based mobile communications can operate at a practical level across borders and infrastructure constraints, opening the way to meet demand in vulnerable areas such as maritime, aviation, and border regions. Amid growing demand for complementing and expanding terrestrial networks in areas such as connected vehicles, international logistics, and security, this achievement serves as a foundation for commercial deployment and contract expansion. Through collaboration with overseas businesses, the foundation for the global expansion of Japan-origin technologies has also been formed. Positioning satellite communications as part of the mobile network, this initiative represents a key milestone driving the growth of the space utilization market.

### 3. Contribution to the advancement of the economy and society

This result is a concrete example of how space communications can be used to advance social infrastructure. It is expected to serve as foundational connectivity for autonomous and remotely controlled systems such as autonomous vessels, remote

navigation, and connected vehicles. For transport and logistics requiring resilient wide-area connectivity, 5G NTN integrating satellite and terrestrial networks improves efficiency, safety, and real-time performance. The demonstration, conducted in cooperation with the Maritime and Port Authority of Singapore (MPA), contributes to the advancement of port and traffic management while also promoting Japan-origin technologies internationally. Given the increasing geopolitical risks, space utilization led by Japan can be regarded as a strategic achievement that enhances infrastructure autonomy and strengthens international connectivity.

### 4. Contribution to technology

The knowledge gained from the demonstration directly contributes to international standardization and the formation of a technological ecosystem. Since 2022, the company has participated in ARIB (Association of Radio Industries and Businesses), TTC (Telecommunication Technology Committee), and 3GPP (3rd Generation Partnership Project), advancing use case proposals and Ku-band specification development for 5G NTN. It has played a leading role in addressing challenges related to increasing EIRP values for terminal transmission power, enabling more efficient bidirectional communication between satellites and mobile devices. These contributions were officially approved in 3GPP Release 19 in September 2025 and incorporated into global standards. Furthermore, the company is advancing multi-orbit demonstrations with domestic and international partners through the "Universal NTN Innovation Lab." By integrating standardization, demonstration, and collaboration, it continues to lead technological advancement.

### 5. Contribution to promoting public understanding and human resource development

This achievement was widely covered by domestic and international media, promoting understanding of the significance and future potential of space communications. By demonstrating that everyday 5G can connect across borders via space, it brought space closer as a practical and accessible domain. "Universal NTN™" was also presented as a vision of optimal connectivity for all, further deepening understanding. The demonstration also involved diverse participants from industry, academia, and government, with young professionals gaining experience in international joint research and standardization activities, contributing to human resource development.

