

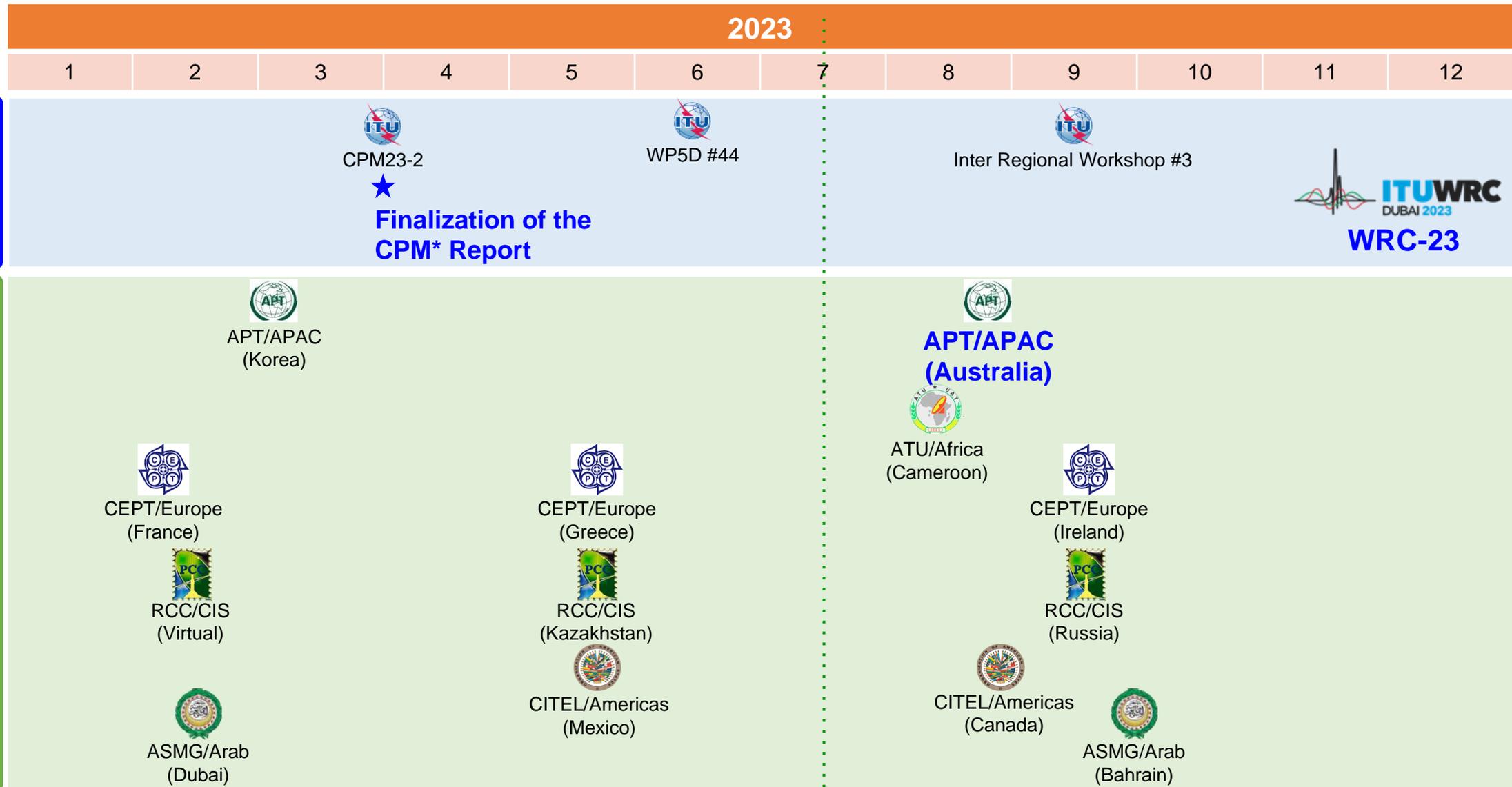
An aerial photograph of a mountain range, likely the Japanese Alps, with a vast sea of white clouds filling the valleys and lower slopes. The sky is a clear, deep blue. The text is overlaid on the upper portion of the image.

Updates on WRC-23 Agenda Item 1.4

July 14, 2023

Shiro Fukumoto
SoftBank Corp.

Overall schedule toward WRC-23



CPM: Conference Preparatory Meeting

Today

CPM Report on WRC-23 AI 1.4

- ✓ CPM Report on AI1.4 mainly includes the following contents:
 - Summary of ITU-R studies
 - Methods to satisfy WRC-23 AI1.4
 - Regulatory conditions for the protection of existing services
- ✓ The structure of Methods and Regulatory conditions for the protection of existing services as follows:

Methods

X1: NOC (No change, i.e. No spectrum identifications)

X2: Identification for HIBS globally

X3: Identification for HIBS with additional regulatory constraints

X4: Identification for HIBS per Region or country

Regulatory conditions

Same regulatory conditions apply to Methods X2, X3 and X4.

Methods to satisfy WRC-23 AI 1.4

Issue A (694-960 MHz)

- A1: NOC (No change)
- A2: Identification for HIBS globally
- A3: Identification for HIBS globally not claiming protection **and commitment to reduce unacceptable interference**
- A4: Identification for HIBS per Region or country

Issue B (1 710-1 885 MHz) Issue C (1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz)

- B1/C1: NOC (No change)
- B2: Identification for HIBS globally
- B3: Identification for HIBS globally not claiming protection **and commitment to reduce unacceptable interference**
- B4: Identification for HIBS per Region
- C2: Review existing conditions
- C3: Review existing conditions not claiming protection **and commitment to reduce unacceptable interference**

Issue D (2 500-2 690 MHz)

- D1: NOC (No change)
- D2: Identification for HIBS globally
- D3: Identification for HIBS globally not claiming protection **and commitment to reduce unacceptable interference**
- D4: Identification for HIBS per Region

Updates in CPM23-2

Methods to satisfy WRC-23 AI 1.4

| Issue A (694-960 MHz) | Issue B (1 710-1 885 MHz) Issue C (1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz) | Issue D (2 500-2 690 MHz) |
|--|--|---|
| A1: NOC (No change) | B1/C1: NOC (No change) | D1: NOC (No change) |
| A2: Identification for HIBS globally | B2: Identification for HIBS globally | D2: Identification for HIBS globally |
| A2: Identification for HIBS globally not or country | C2: Review existing conditions | D2: Identification for HIBS globally not |
| | C3: Review existing conditions not | |

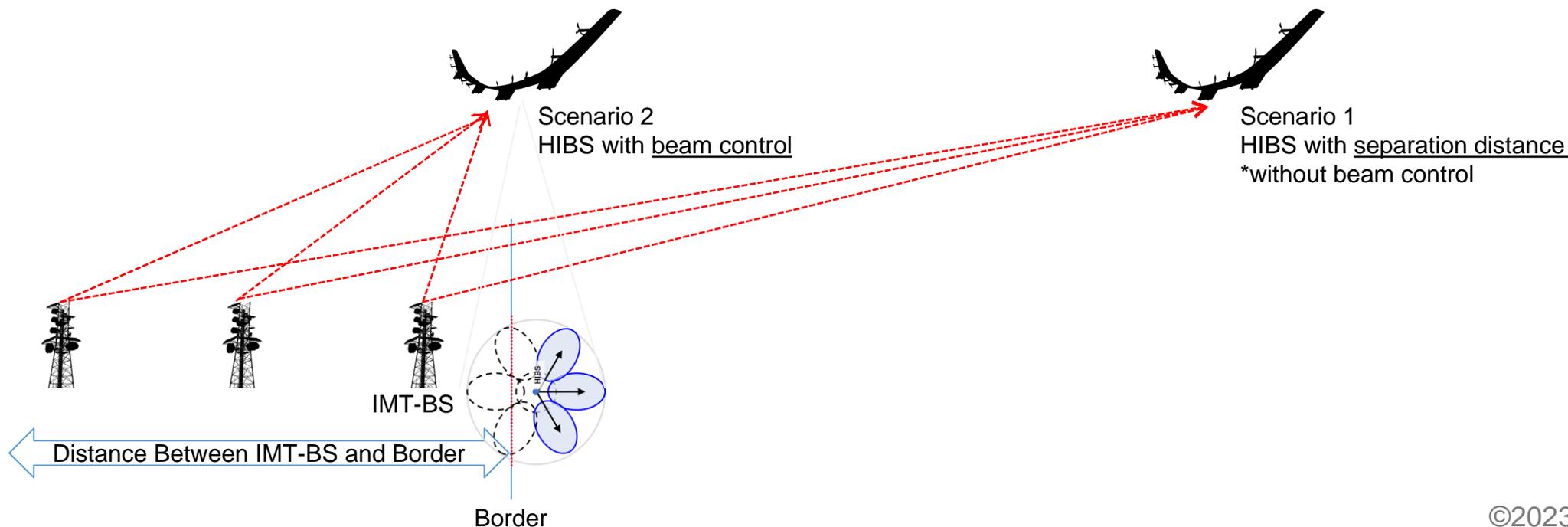
Encourage support for Methods X2 (A2, B2, C2 and D2)

- **Methods X1 (NOC) should not be considered in terms of the protection of existing services**, since the draft WRC Resolutions provide adequate technical and regulatory conditions to ensure protection of existing services.
- While Method X3 also provides for global identification of HIBS, **the condition of HIBS not claiming protection is not necessary**:
 - Method X3 does not provide additional protection for the existing Services.
 - Interference from existing services to HIBS would not be a problem as shown in the next slides.
 - Such a provision could be precedent setting for future IMT identifications and for other applications.

Interference analysis from IMT-BS to HIBS

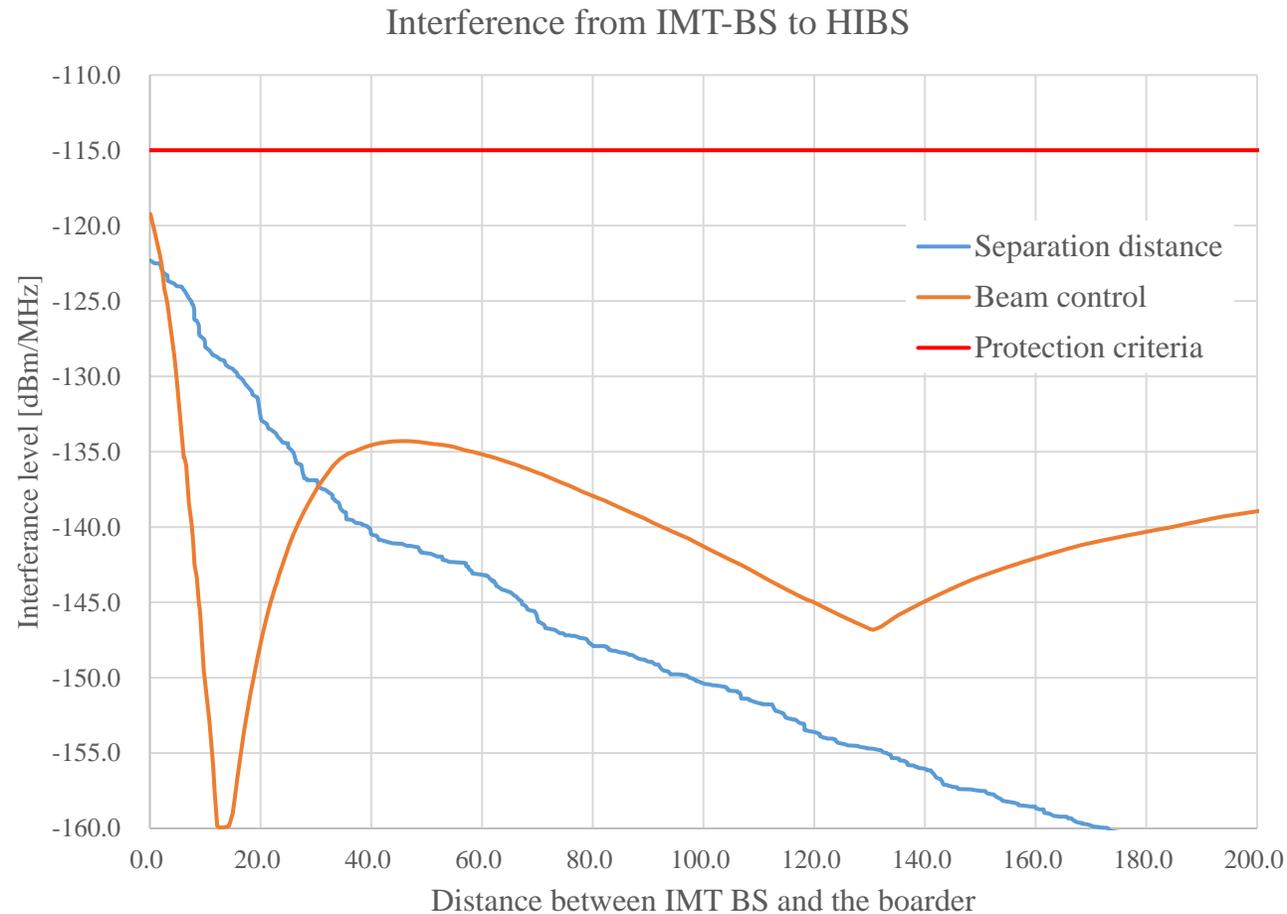
Evaluate interference to HIBS that complies with the PFD limit in the following scenarios

- Incompatible frequency arrangements between countries are considered
- The worst-case interference analysis from single IMT- BS to HIBS in 1.7 GHz bands
 - Scenario 1: HIBS complies with the PFD limit by separation distance
 - Scenario 2: HIBS complies with the PFD limit by beam control (footprint fixation and beam suppression)
- Calculating interference level at HIBS receiver while changing the IMT-BS position from the border
 - Uses the same parameters as ITU-R Study



Interference analysis from IMT-BS to HIBS cont'd

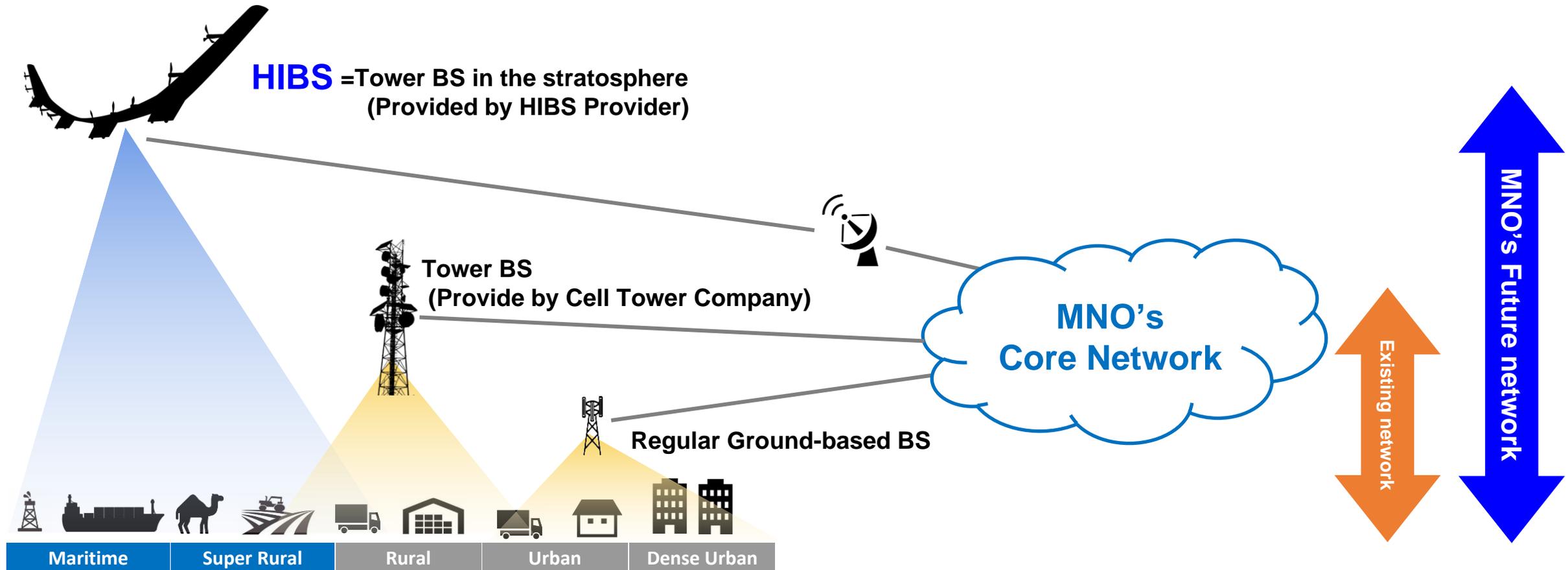
No interference from IMT-BS to HIBS is happened when HIBS complies with the PFD limit



MNOs' Future networks

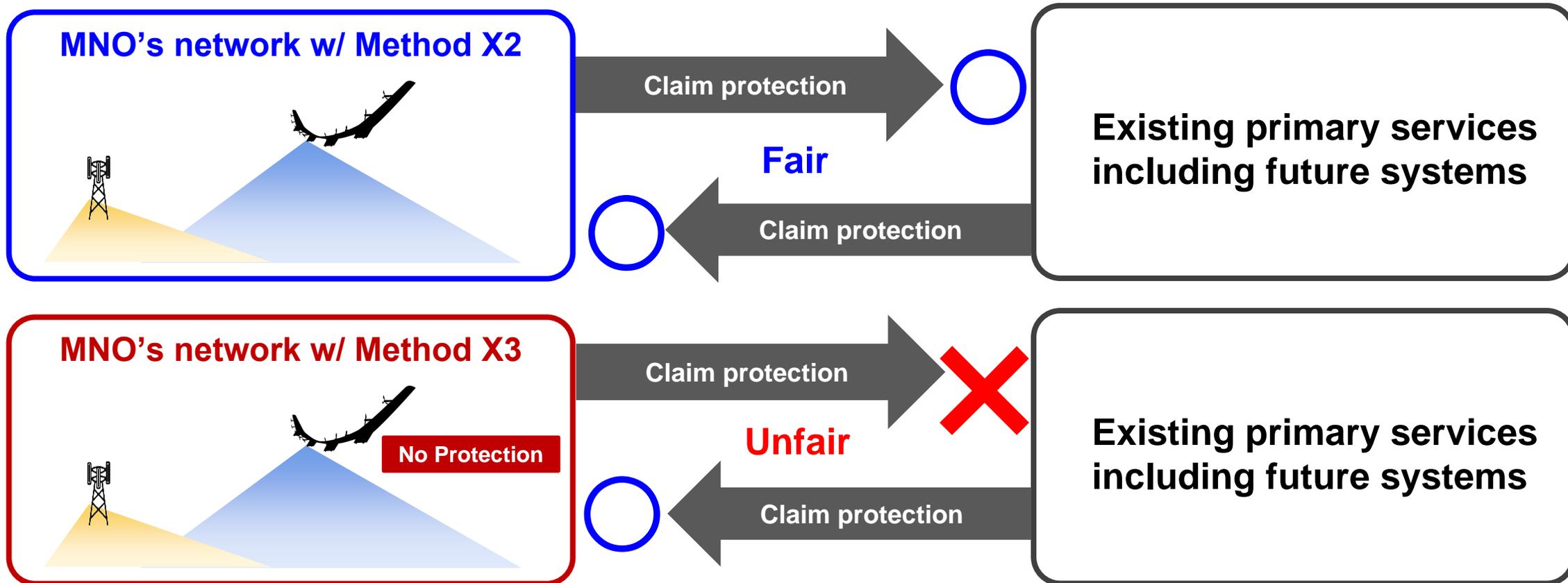
Interworking with NTN (HIBS) is key for next-gen communication

- ✓ “Connecting the Unconnected” and “Ubiquitous Connectivity” are important elements in 6G (IMT-2030) concept.
- ✓ HIBS would be used for MNOs as one of the cost-effective deployment methods to extend their service areas that were difficult to cover with conventional ground-based BS, like the current tower BS provided by Cell Tower Company.



Disadvantages of Method X3 for MNOs

- ✓ With Method X2, MNO's operation can maintain coordination fairness against other services, just as it does today.
- ✓ However, with Method X3, MNO's operation would have to accept unfair negotiations regarding HIBS issues from other services.



Method X2 is preferable to ensure fairness in MNO's operations against others

Regulatory conditions to protect other primary services

| Issue A (694-960 MHz) | |
|---------------------------------|---------------------|
| Land mobile | ✓ |
| IMT | PFD |
| ARNS | NO. 9.21 (DISTANCE) |
| Broadcasting | NO. 9.21 or PFD |
| ARNS adjacent | ✓ |
| AM(R)S adjacent | ✓ |
| [RAS 2 nd harmonics] | ✓ or PFD |

| Issue B (1 710-1 885 MHz) Issue C (1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz) | |
|--|---------------|
| Land mobile | ✓ |
| IMT | PFD |
| FS | PFD |
| SRS/SOS | DL ONLY |
| AMS | ✓ or DISTANCE |
| MetSat adjacent | UL ONLY |
| MSS adjacent | PFD |
| FS adjacent | ✓ or PFD |
| SRS/SOS/EESS adj. | DL ONLY |

| Issue D (2 500-2 690 MHz) | |
|----------------------------|-------------------|
| IMT | PFD |
| FS | PFD |
| BSS | PFD |
| MSS | ✓ |
| MSS adjacent | UNWANTED EMISSION |
| RDSS adjacent | UNWANTED EMISSION |
| ARNS adjacent | PFD |
| Meteorological radars adj. | PFD |
| RAS adjacent | PFD or DISTANCE |

- ✓ Technical and regulatory conditions are included in WRC Resolutions in the CPM Report to ensure the protection of these services without any change to the provisions of existing services in RR.

Regulatory conditions to protect other primary services

| Issue A (694-960 MHz) | |
|---------------------------------|---------------------|
| Land mobile | ✓ |
| IMT | PFD |
| ARNS | NO. 9.21 (DISTANCE) |
| Broadcasting | NO. 9.21 or PFD |
| ARNS adjacent | ✓ |
| AM(R)S adjacent | ✓ |
| [RAS 2 nd harmonics] | ✓ or PFD |

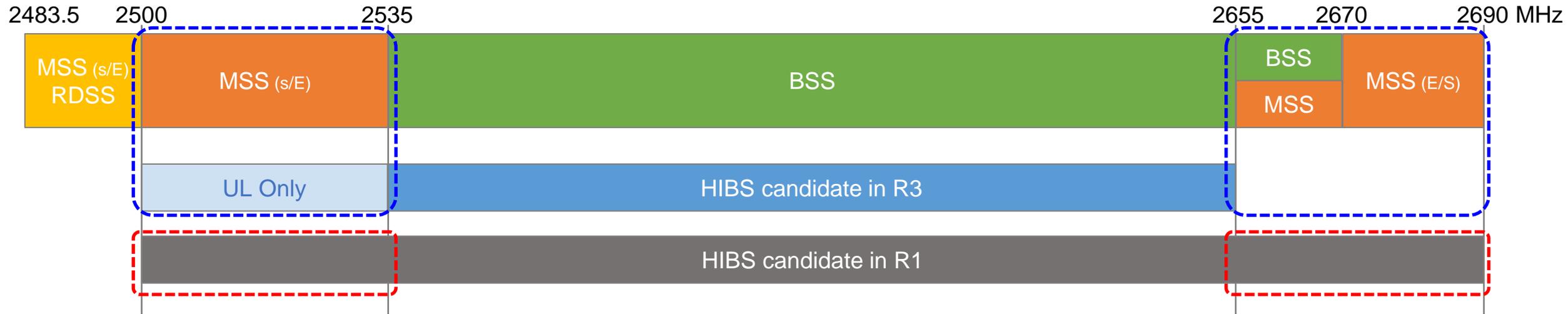
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| Land mobile | ✓ |
| IMT | PFD |
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| SRS/SOS/EESS adj. | DL ONLY |

| Issue D (2 500-2 690 MHz) | |
|----------------------------|-------------------|
| IMT | PFD |
| FS | PFD |
| BSS | PFD |
| MSS | ✓ |
| MSS adjacent | UNWANTED EMISSION |
| RDSS adjacent | UNWANTED EMISSION |
| ARNS adjacent | PFD |
| Meteorological radars adj. | PFD |
| RAS adjacent | PFD or DISTANCE |

- ✓ Technical and regulatory conditions are included in WRC Resolutions in the CPM Report to ensure the protection of these services without any change to the provisions of existing services in RR.

Sharing between MSS in R3 and HIBS in R1

Issued D (2500-2690 MHz): Spectrum allocation for Satellite Services in Region 3



- No interference from HIBS to MSS within R3.
- Interference from HIBS in R1 to Indian MSS is unlikely problem:
 - Distance between Region 1 countries boarder and India is more than 600 km (beyond radio horizon) that does not case harmful interference to MSS earth stations (2500-2535 MHz)
 - ITU-R Study showed that sharing between HIBS in R1 and MSS space station (83E) is feasible using the antenna contour provided by India.

Current regulatory conditions in CPM Report would be sufficient for the protection of MSS in R3

Summary

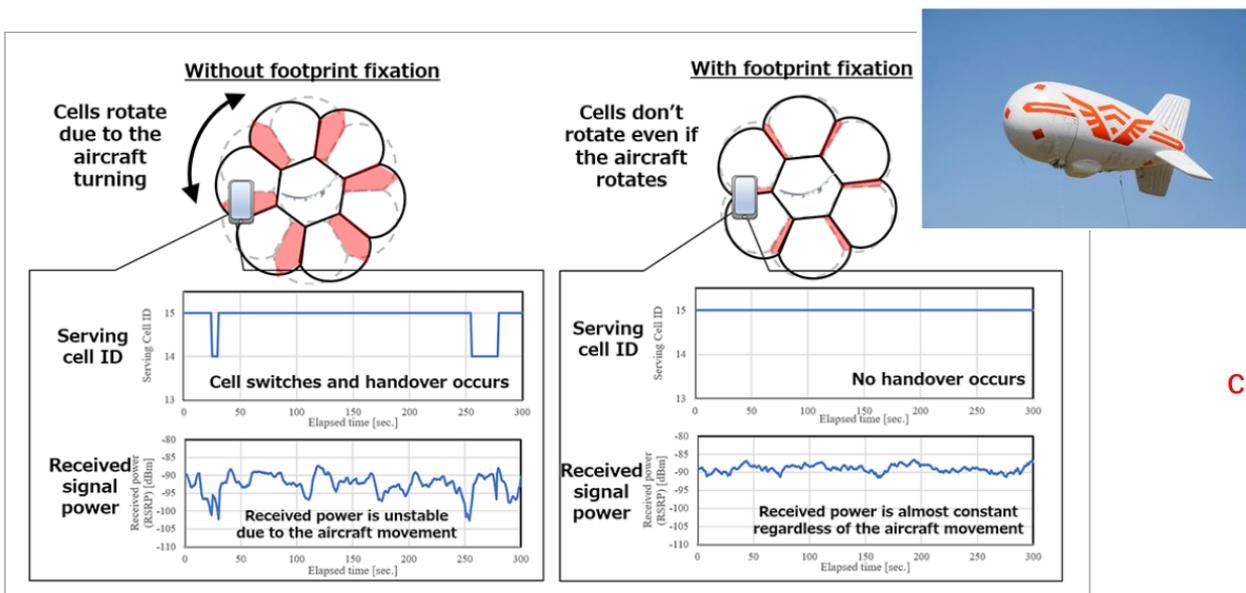
1. WRC-23 is timely opportunity to make enabling provisions for HIBS harmonized globally without negatively impacting existing services.
2. CPM report provides adequate technical and regulatory conditions to ensure protection of existing services, including MSS in R3, based on extensive technical studies.
3. Methods X1 (NOC) should not be considered in terms of the protection of existing services, since the draft WRC Resolutions provide adequate technical and regulatory conditions to ensure protection of existing services.
4. Method X3 (No claim protection by HIBS) is not needed, since interference from existing services to HIBS would not be a problem under the operation that HIBS will take measures to comply with the technical and regulatory conditions (e.g., PFD at the border). In addition, Method X3 implies lower status for HIBS which is an application to complement ground based IMT under primary allocation to Mobile service. Such a provision could be precedent setting for future IMT identifications and for other applications under primary allocations to a radio service in the Radio Regulations.
5. Therefore, Method X2 for all bands is most suitable to make enabling provisions for HIBS.

Appendix

Examples of flexible operations

- The following measures would ensure that HIBS does not simply maintain large separation distances, but provides connectivity near the border while protecting existing services. (See also [5D/1275](#)):

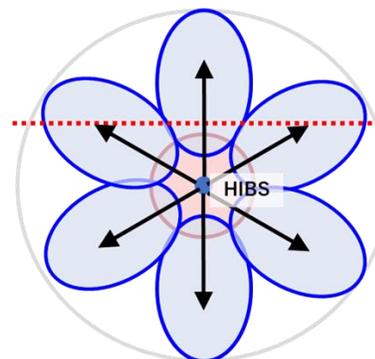
Footprint fixations



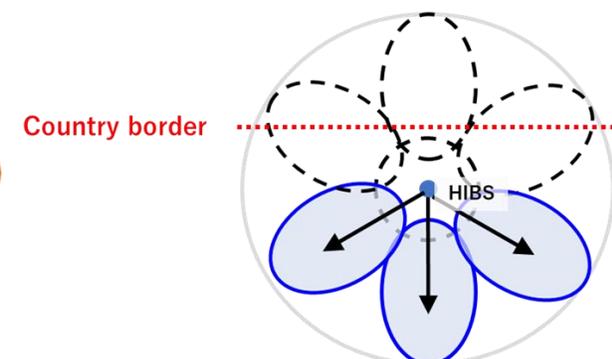
(e.g. Beamforming and mechanical adjustment of antenna direction)

Beam suppression

Transmission with all antennas



Transmission suspending for 4 antennas



- ✓ SoftBank successfully tested footprint fixation technology with high altitude tethered balloon system in June 2022. (URL: https://www.softbank.jp/en/corp/news/press/sbkk/2022/20220622_01/)

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