7th April 2025

2nd Preparatory Workshop for WRC-27

WRC-27

Agenda Item 1.2

Study to use smaller size of antenna for FSS uplink in frequency band 13.75-14 GHz

Agenda Item 1.4

Study for new primary allocation to FSS(sE) and BSS(sE) in 17.3-17.7/17.8 GHz

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1.2 to consider possible revisions of sharing conditions in the frequency band 13.75-14 GHz to allow the use of uplink fixed-satellite service earth stations with smaller antenna sizes, in accordance with Resolution 129 (WRC-23);

5.502: In the band 13.75-14 GHz, an earth station of a geostationary fixed-satellite service network shall have a minimum antenna diameter of 1.2 m and an earth station of a non-geostationary fixed-satellite service system shall have a minimum antenna diameter of 4.5 m. In addition, the e.i.r.p., averaged over one second, radiated by a station in the radiolocation or radionavigation services shall not exceed 59 dBW for elevation angles above 2° and 65 dBW at lower angles. Before an administration brings into use an earth station in a geostationary-satellite network in the fixed-satellite service in this band with an antenna diameter smaller than 4.5 m, it shall ensure that the power flux-density produced by this earth station does not exceed:

- −115 dB(W/(m^2 · 10 MHz)) for more than 1% of the time produced at 36 m above sea level at the low water mark, as officially recognized by the coastal State;
- −115 dB(W/(m^2 · 10 MHz)) for more than 1% of the time produced 3m above ground at the border of the territory of an administration deploying or planning to deploy land mobile radars in this band, unless prior agreement has been obtained.

For earth stations within the fixed-satellite service having an antenna diameter greater than or equal to 4.5 m, the e.i.r.p. of any emission should be at least 68 dBW and should not exceed 85 dBW.

Earth Station radiation pattern (Uplink):

The Recommendation ITU-R S.465-6 provides reference radiation patterns for angles between the direction considered and the axis of the main beam for frequencies in the range 2-30 GHz:

$G = 32 - 25 \log \phi$ dBi for $\phi_{min} \leq \phi < 48°$

$G = -10$ dBi for $48° \leq \phi \leq 180°$

where:

$\phi_{min} = 1°$ or $100\ \lambda/D$ degrees, whichever is the greater, for $D/\lambda \geq 50$.

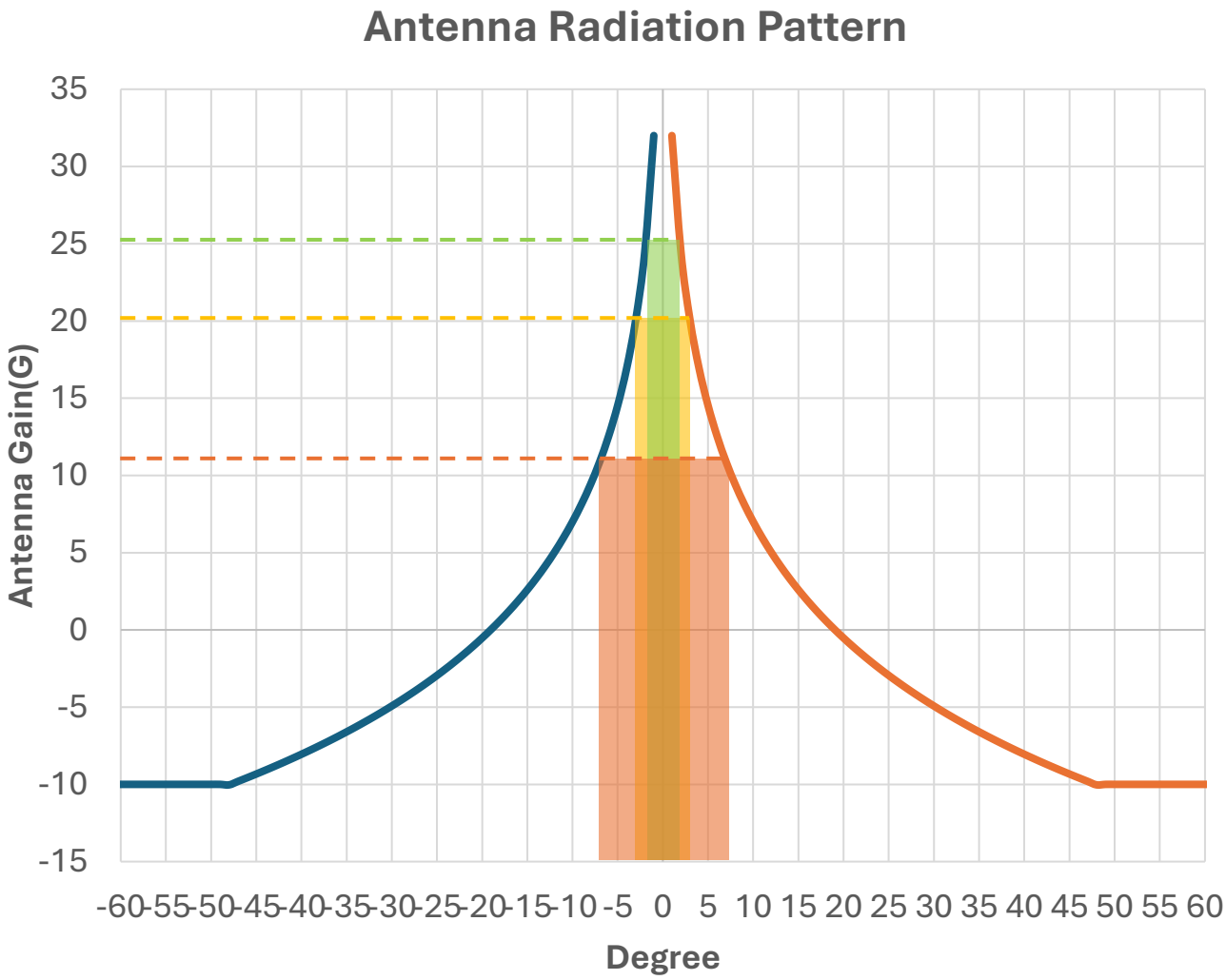
$\phi_{min} = 2°$ or $114\ (D/\lambda)^{-1.09}$ degrees, whichever is the greater, for $D/\lambda < 50$

ϕ_{min} at 13.85 GHz for 0.3, 0.6, 1.2, 4.5-meter antenna diameters(D).

Diameter	Deg
0.3	6.5
0.6	3.05
1.2	1.80
4.5	0.48

The minimum angle of antenna radiation pattern widens as the diameter of the antenna gets smaller increasing the interference probability to RLS.

Diameter	Deg
0.3	6.5
0.6	3.05
1.2	1.80
4.5	0.48



Regulation on off-axis e.i.r.p in the band 13.75-14 GHz for antenna diameter smaller than 4.5 m

According to RR Article **21.13A**, in the band 13.75-14 GHz, the level of off-axis e.i.r.p. emitted by an earth station of a geostationary fixed-satellite service network with an antenna diameter smaller than 4.5 m shall not exceed the following values:

Angle off-axis (degrees)	Maximum e.i.r.p. in any 1 MHz band(dBW)
$2 \leq \varphi \leq 7$	$43 - 25 \log \varphi$
$7 < \varphi \leq 9.2$	22
$9.2 < \varphi \leq 48$	$46 - 25 \log \varphi$
$\varphi > 48$	4 (WRC-03)

Scenario:

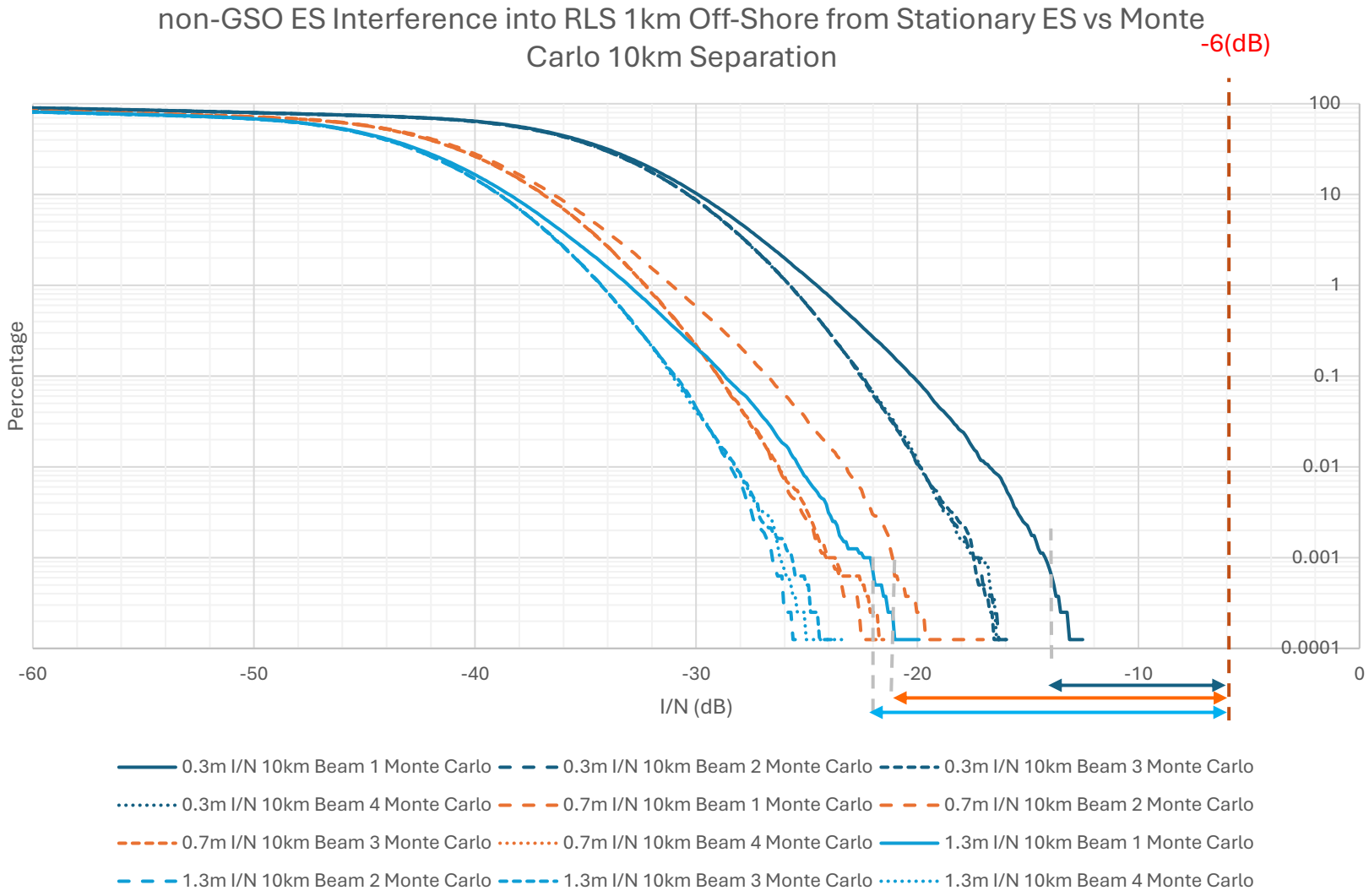
Fixed position of “Ship RLS” 1km off-shore.

Fixed path of NGSO

Random position of Earth Station transmitter, but maintain 10 km distance from RLS.

Result: At 0.001%, 8,15,16 dB positive margin for 0.3, 0.7 and 1.3 meter, respectively

Sharing study



Sharing study

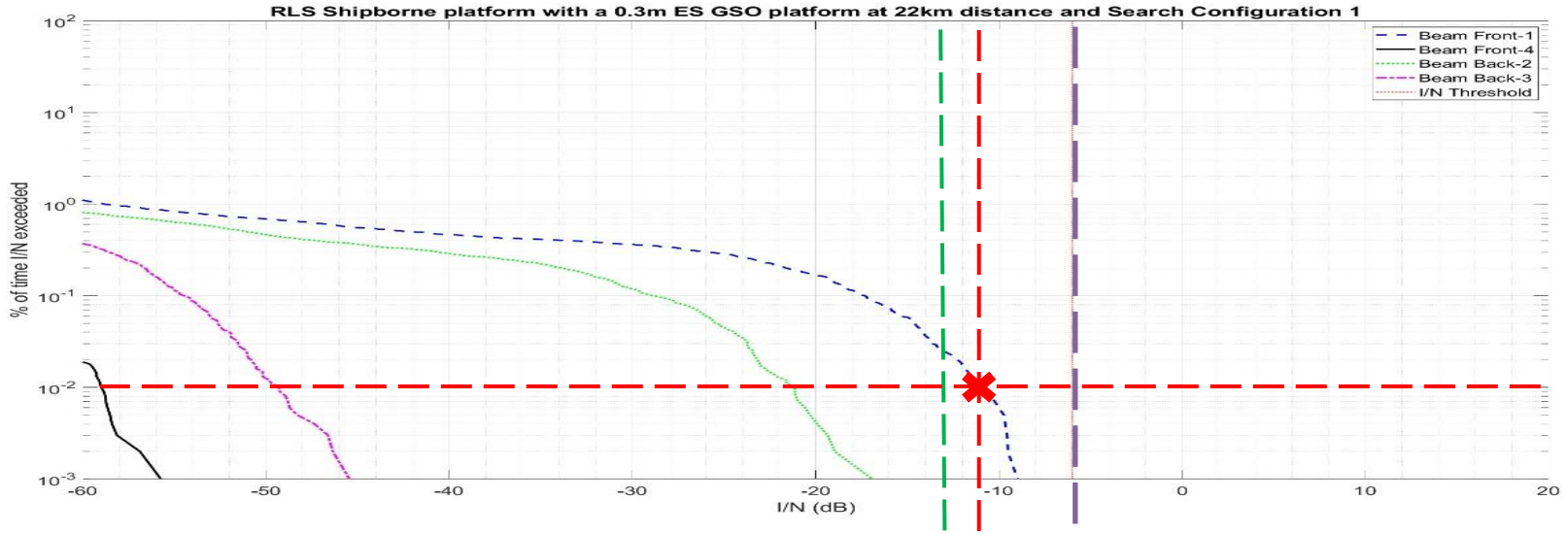
Scenario:

- Random position of “Shipborne Radar” at 22 km, randomized azimuth of search antenna, and target antenna pointing to the Red missile position which is randomized.
- Multiple path of NGSO.
- Fixed position of Earth Station transmitter and will transmit to a satellite which is at highest elevation.

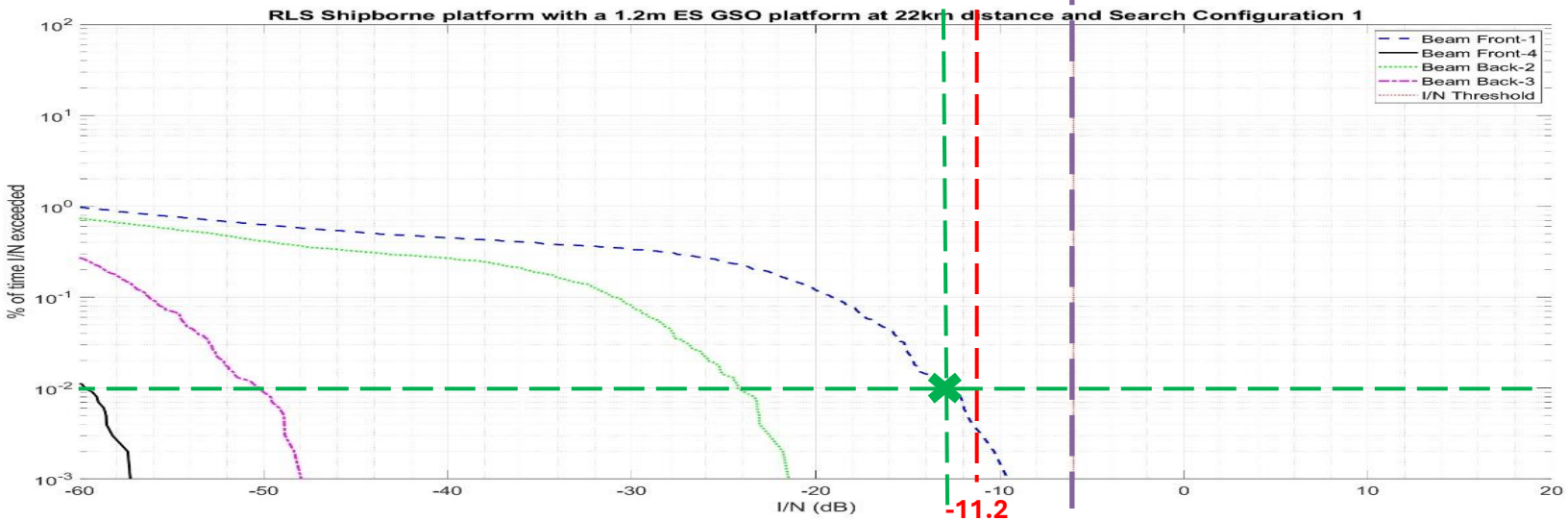
Result: At 0.001% 5,5,7 dB positive margin for 0.3, 0.6 and 1.2 meter, respectively

Sharing study

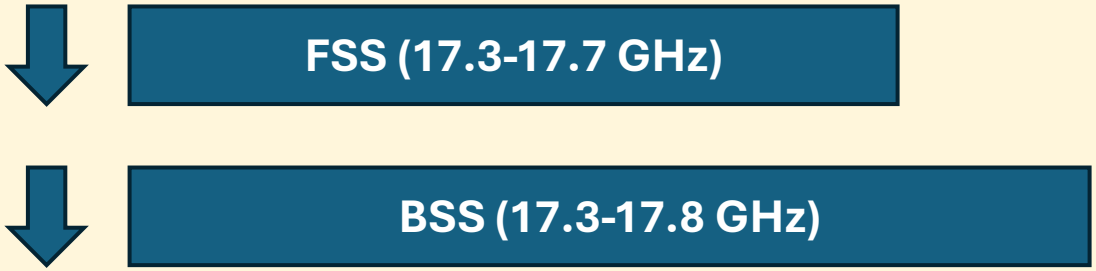
CDF 1 (0.3 m)



CDF 2 (1.2 m)



Agenda Items 1.4 New primary allocation to FSS(↓) and BSS(↓) in Region3

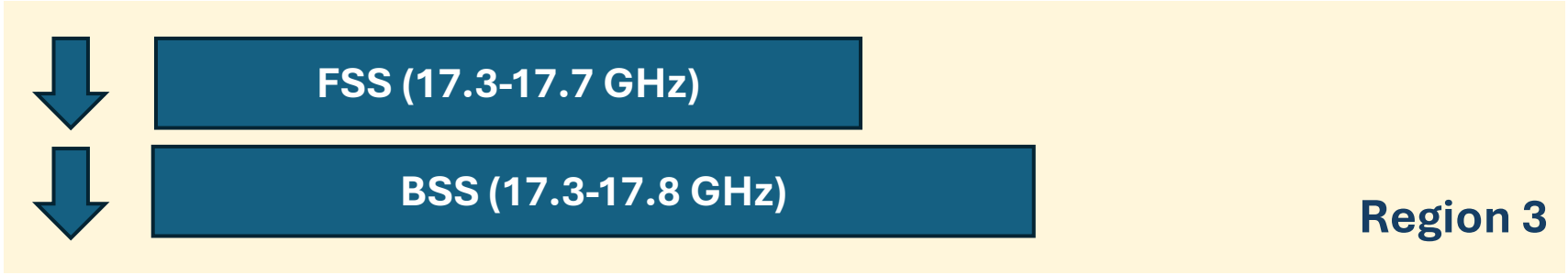


Region 3

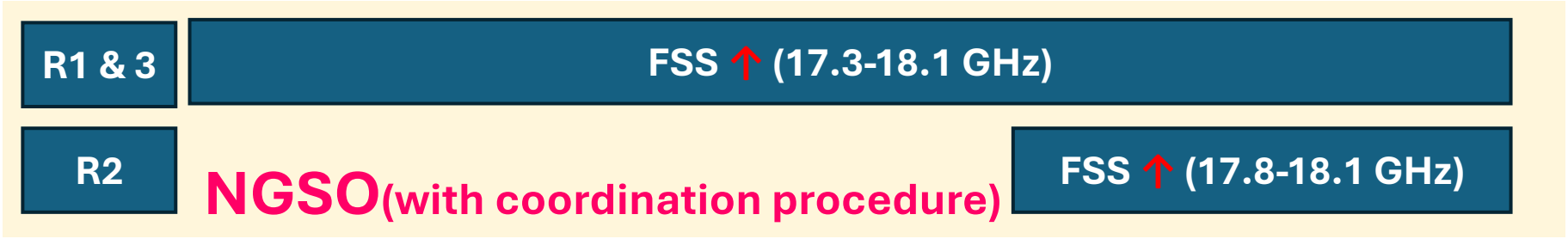
Sharing Studies:

- Determine epfd limits on ground due to NGSO in Region 1 & 3
- Sharing and compatibility studies (in & Adjacent Band) between
  - FSS(↓), BSS(↓) and RR footnote 5.516

Agenda Items 1.4 New primary allocation to FSS(↓) and BSS(↓) in Region3



RR Footnote 5.516



Agenda Items 1.4 New primary allocation to FSS(↓) and BSS(↓) in Region3

Sharing Studies

BSS (Rx- spaceborne) Victim (GSO)	←	BSS (Tx- spaceborne) Interferer (GSO)
Margin: 1.6 dB(Case1) and 7.6 dB (Case2) approx		

RLS (15.4-17.3 GHz) Victim	←	FSS (Tx- spaceborne) Interferer (GSO)
Margin: 15-30 dB approx		

RLS (15.4-17.3 GHz) Victim	←	FSS (Tx- spaceborne) Interferer (NGSO)
Margin: 1.6-17 dB approx		

Thanks

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