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May 28, 1998

Via Hand Delivery

Magalie Roman-Salas, Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, D.C. 20554

Re: Ex Parte File Nos. 48-SAT-P/LA-97, 89-SAT-AMEND-97, RM No. 9147

Dear Ms. Salas:

On May 27, 1998, Jeffrey H. Olson and Diane C. Gaylor of Paul, Weiss, Rifkind, Wharton & Garrison, Guy Christiansen of SkyBridge L.L.C. and Jeffrey Krauss of Telecommunications and Technology Policy, met with David Wye and Thomas P. Stanley of the Wireless Telecommunications Bureau, and Julius P. Knapp of the Office of Engineering and Technology, for the purpose of discussing issues related to NGSO FSS/FS sharing. The attached handout was distributed at the meeting.

Please contact the undersigned if you have any questions.

Respectfully submitted,

Diane C. Gaylor

Diane C. Gaylor

Attachment

cc: Mr. David Wye
Mr. Thomas P. Stanley
Mr. Julius P. Knapp

SkyBridge

FREQUENCY RE-USE

With the Fixed Service

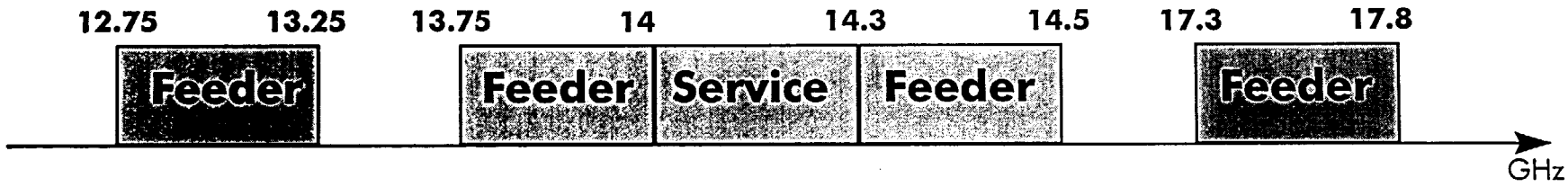
Table of Contents

- SkyBridge proposed frequency plan
- Frequency re-use with FS systems on the terrestrial path
- Frequency re-use with FS systems on the downlink (slant path)

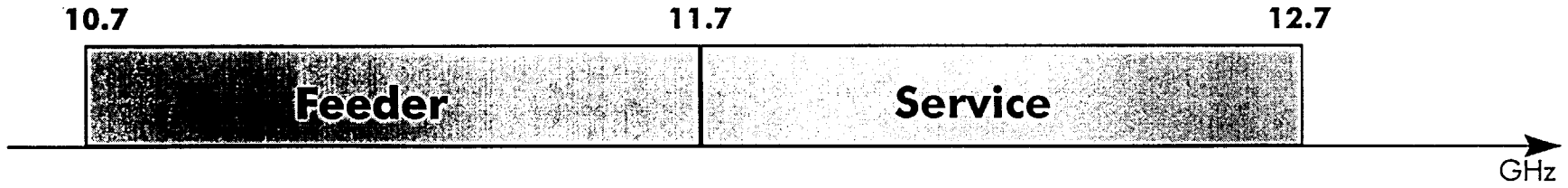
SkyBridge
Frequency Re-Use with the Fixed Service

Proposed frequency band

Uplink



Downlink

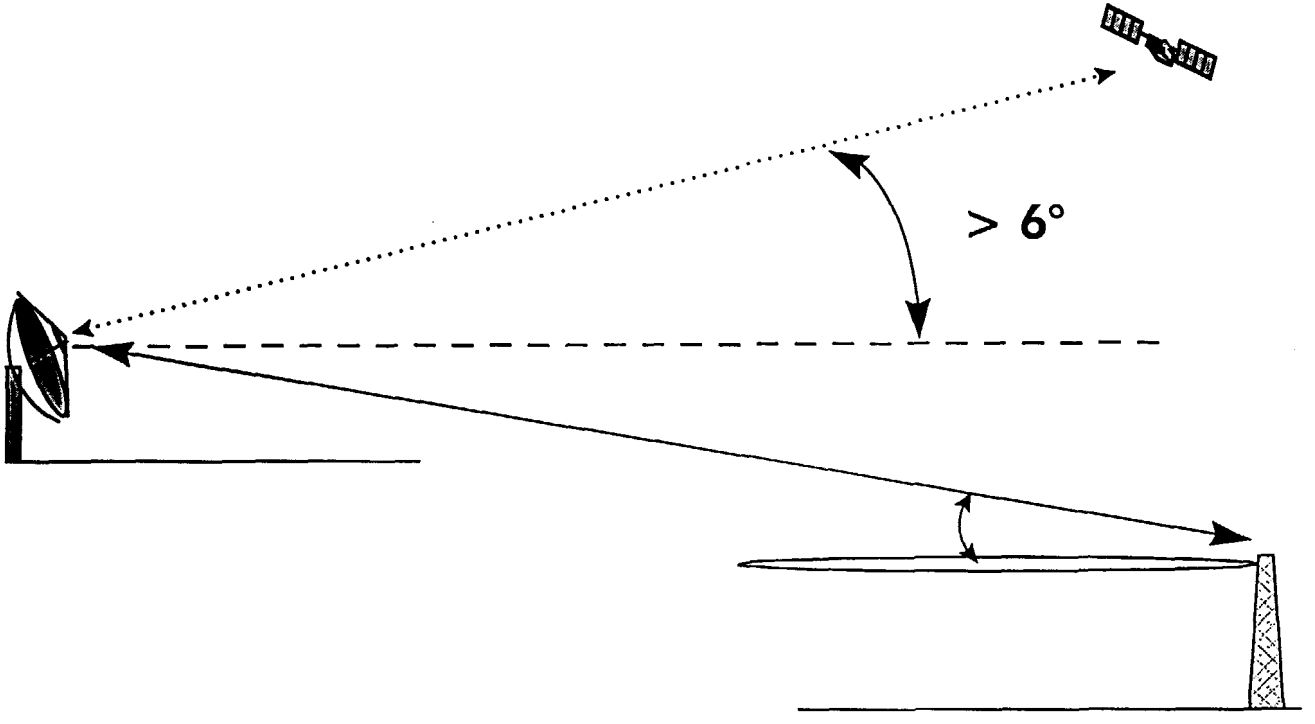


FREQUENCY RE-USE

With FS systems on the terrestrial path

Frequency re-use on the terrestrial path

Frequency re-use geometry



Frequency re-use on the terrestrial path

In bands used by FS systems in the US :

- **Only Gateways will be operated :**
  - ⇨ few in number (one per 350 km radius Cell) ; 30-40 throughout the US
  - ⇨ large antennas (2.5 m or 4.5 m)
  - ⇨ efficient antenna side-lobes

- **Coordination will be effected on a case-by-case basis**
  - ⇨ Gateways will be carefully sited in order to take into account the surrounding FS infrastructure

Frequency re-use on the terrestrial path

Proposed procedure for coordination of SkyBridge Gateways in the US :

Classical coordination procedures will apply, i.e. :

⇒ Determination of coordination contour around the Gateway site
- coordinates of the Gateway site
- horizon profile around the Gateway site,

⇒ Identification of the FS facilities inside the coordination area

⇒ Determination of the I/N ratio at the potentially interfered receiver (Gateway or FS) - calculation of separation distance
- terrain profile on the Gateway - FS path
- pointing azimuth of FS antenna
- statistics of Gateway antenna gain towards the horizon

Frequency re-use on the terrestrial path

Purpose of the calculation of separation distances

- I/N can be used in studies to determine separation distances
- Give an order of magnitude of the required separation between the Gateway and the FS system
- Worst-case analysis in terms of :
  - ⇒ Gateway antenna gain in the direction of the FS system
  - ⇒ propagation model (no terrain blockage)

Frequency re-use on the terrestrial path

Assumptions for evaluation of separation distances

- **Propagation model :**
  - ⇨ short distances : free space loss
  - ⇨ large distances : tropospheric scatter
  - ⇨ between : spherical diffraction
  - ⇨ terrain blockage : no

- **Antenna pointing assumptions :**
  - ⇨ Gateway antenna : 6° elevation; 0° azimuth
  - ⇨ FS antenna : all azimuths

Frequency re-use on the terrestrial path

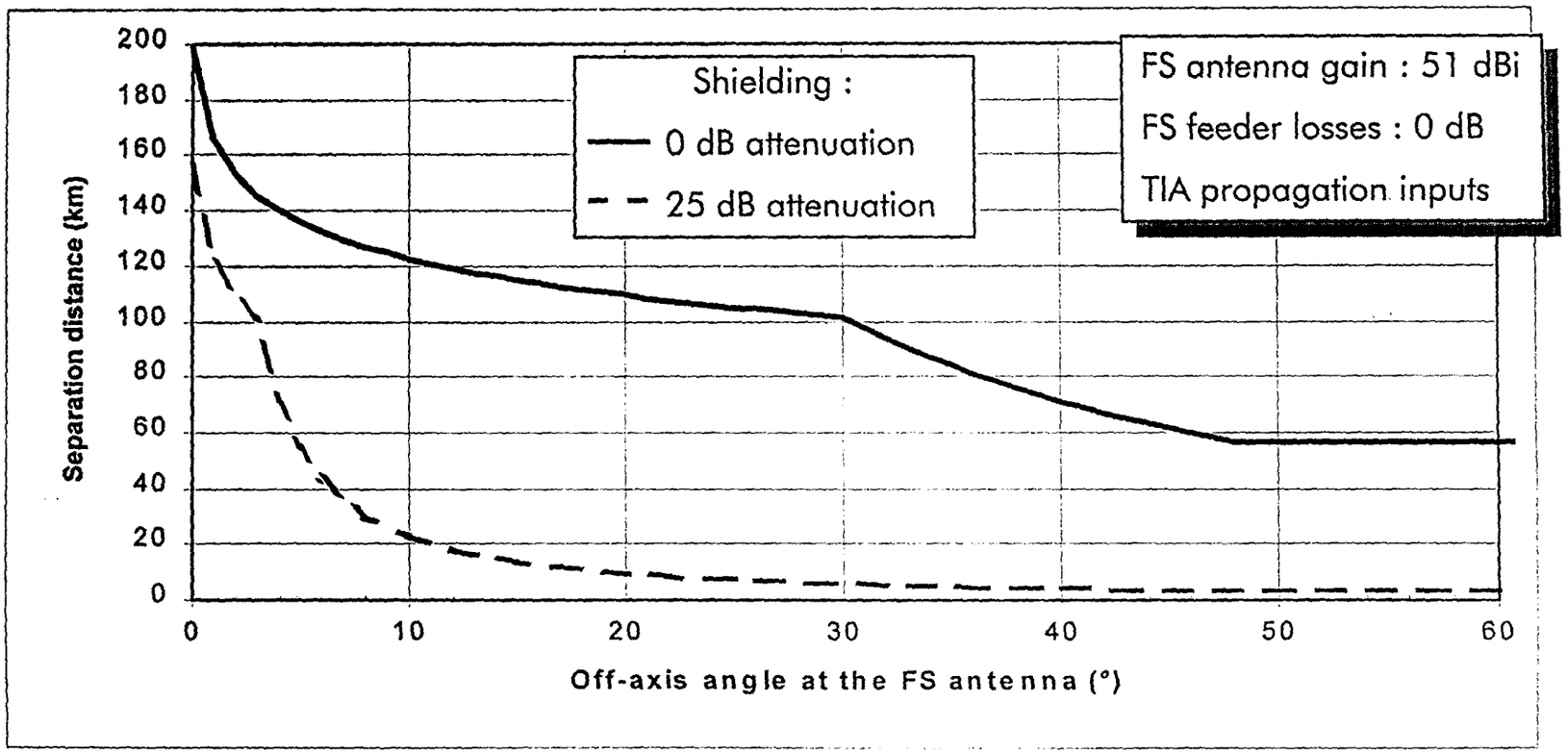
Reasons for differences between TIA and SkyBridge separation distances

- TIA calculates "worst-worst case" separation distances (i.e. FS antenna pointing in the direction of the Gateway), whereas SkyBridge calculates worst-case separation distances that will be required in most cases
- Propagation models assumptions

	TIA	SkyBridge
– FS antenna height :	50 m	20 m
– k factor	10	4/3

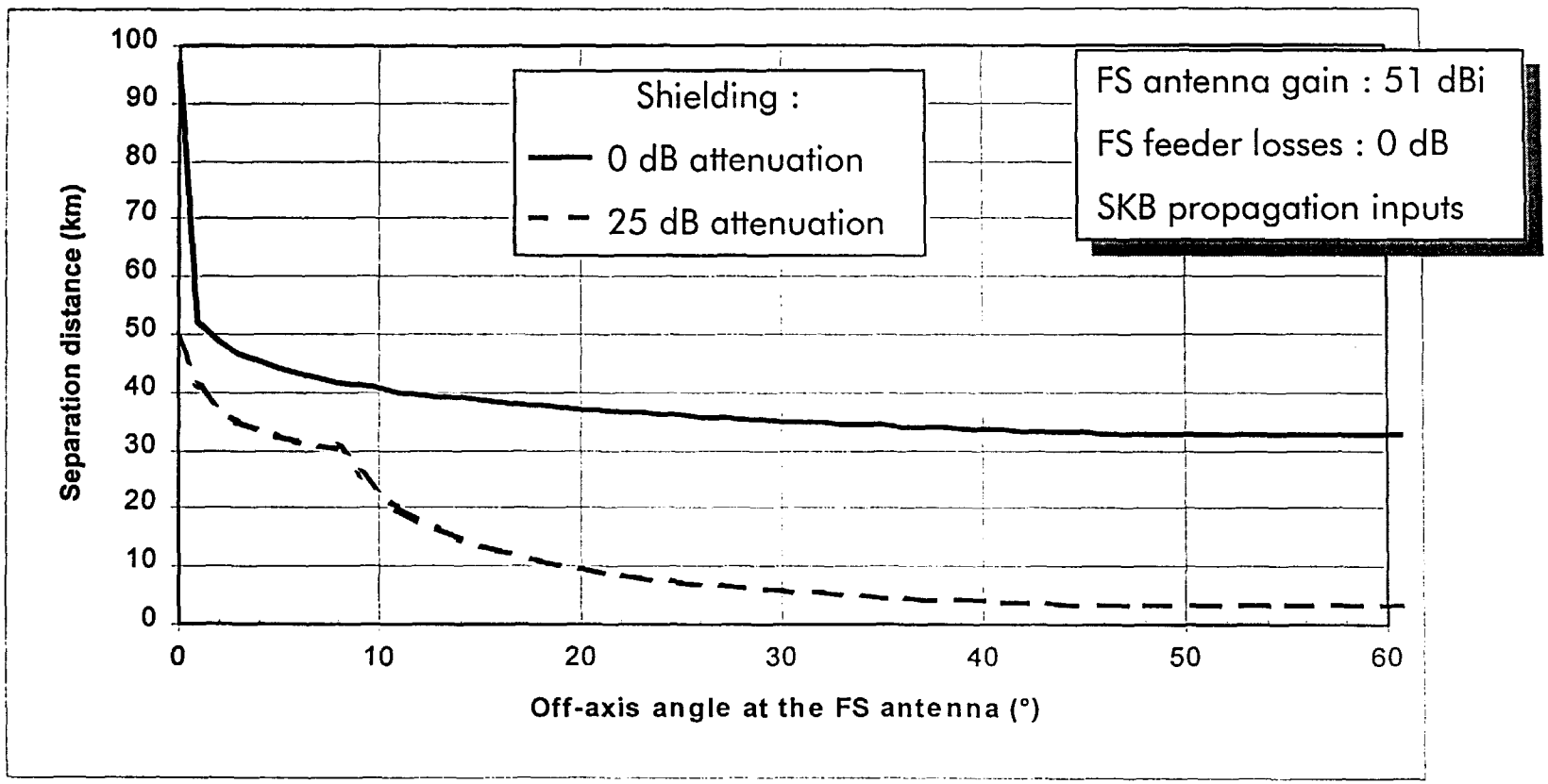
Frequency re-use on the terrestrial path

Worst-case separation distances
TIA propagation inputs



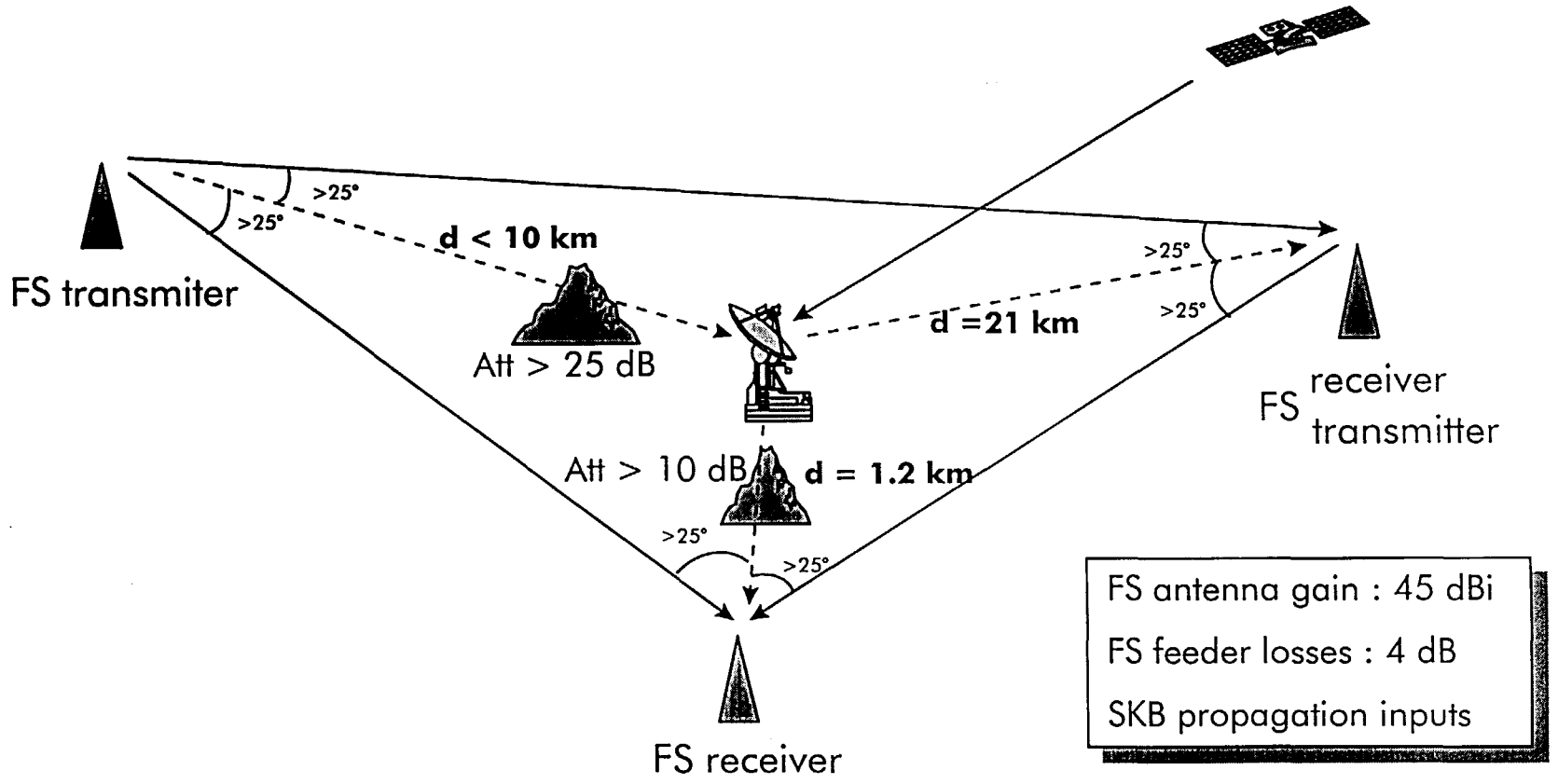
Frequency re-use on the terrestrial path

Examples of separation distances
SkyBridge propagation model



Frequency re-use on the terrestrial path

Example of implementation in a dense FS environment



FS antenna gain : 45 dBi

FS feeder losses : 4 dB

SKB propagation inputs

Frequency re-use on the terrestrial path

Conclusion

⇒ Siting of SkyBridge is feasible even in dense FS environment

⇒ Separation distances between SkyBridge gateways and FS systems is not burdensome

⇒ Siting of future FS systems is possible

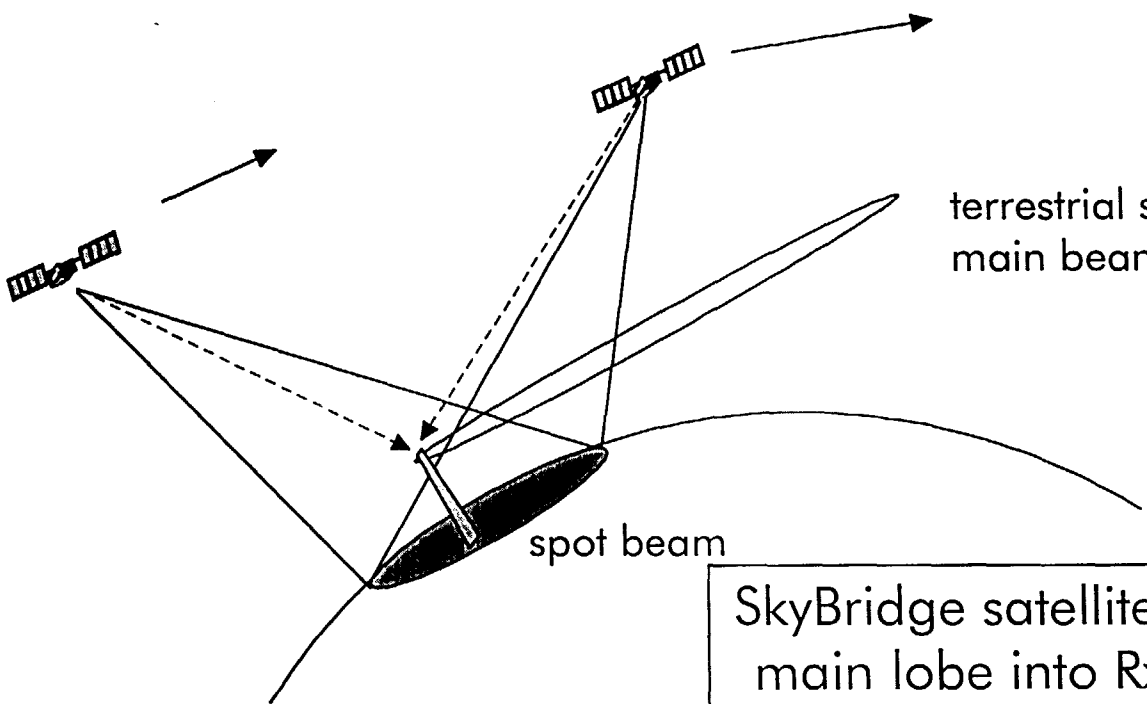
Future FS growth is feasible

FREQUENCY RE-USE

With FS systems on the downlink (slant path)

Downlink signals into FS systems

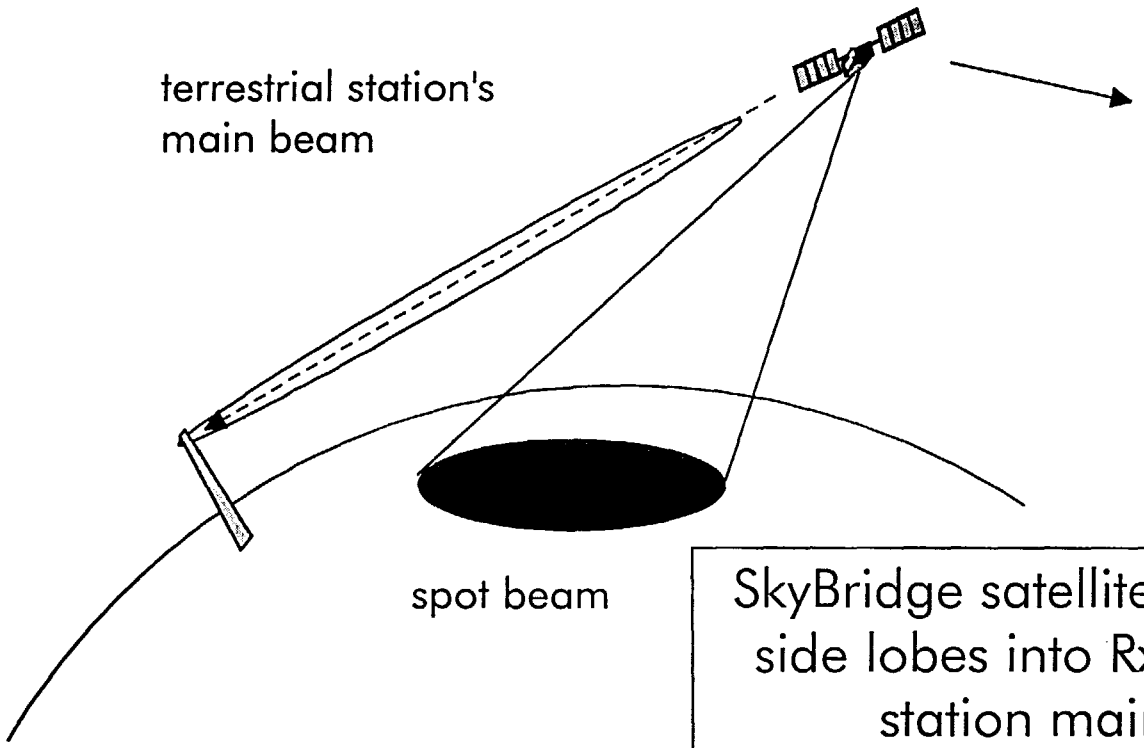
Long-term situation



SkyBridge satellite Tx antenna main lobe into Rx Terrestrial station side lobes

Downlink signals into FS systems

Short-term situation



SkyBridge satellite Tx antenna side lobes into Rx Terrestrial station main lobe

Downlink signals into FS systems

Protection of FS systems

Fixed Service systems are protected if :

- there is no degradation of service or availability of Fixed Service links
- the Fixed Service system operators have no additional regulatory and design constraints

Downlink signals into FS systems

Methods for determining statistics of interference levels at FS Rx input

- Specify location of FS Rx
- Determine the "worst-case" pointing azimuth of the FS receiver antenna
- For each time step of the simulation :

  Calculate the aggregate power at the Rx input produced by all the visible space stations of the non-GSO FSS
- Determine the cumulative distribution function of the power levels
- Compare with FS protection criteria

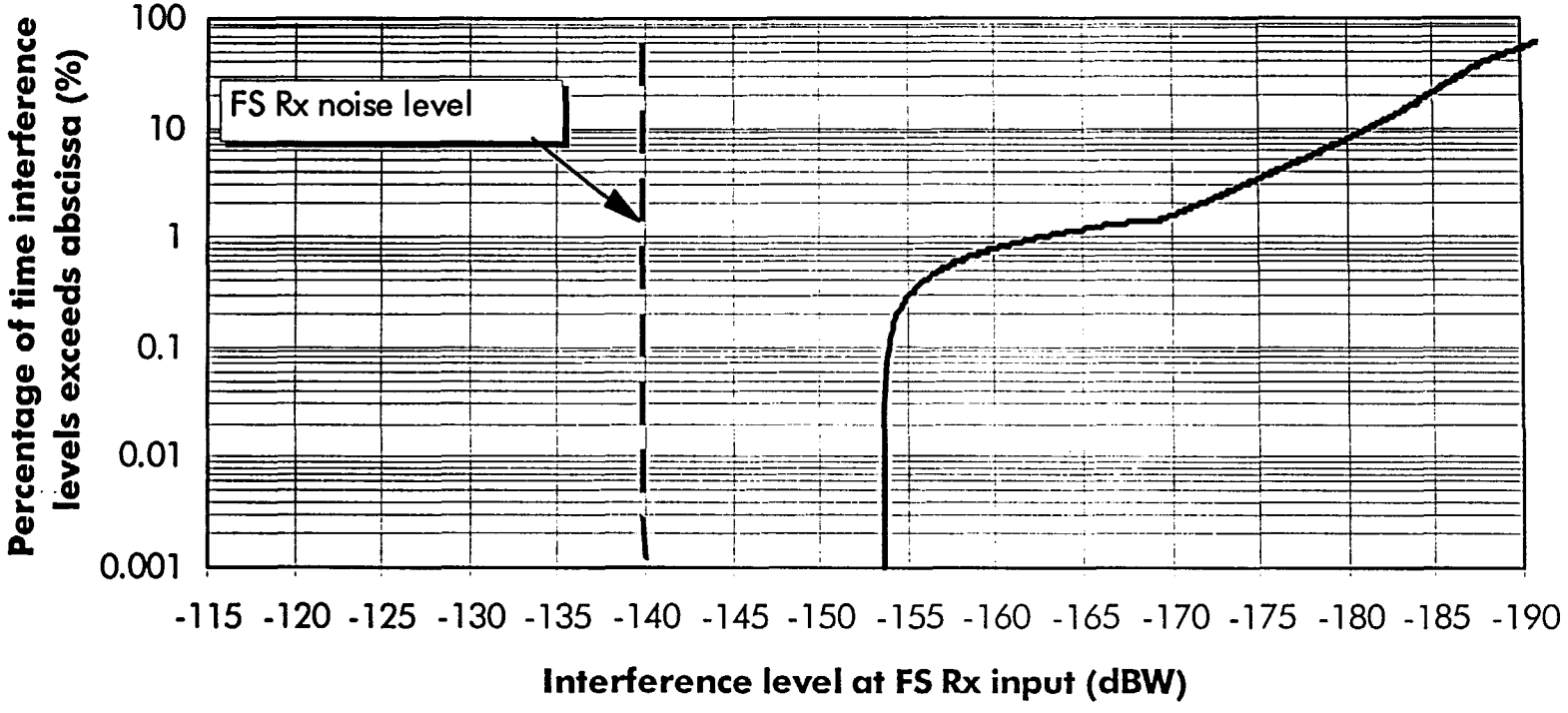
Downlink signals into FS systems

Characteristics of the FS systems in the 10.7-11.7 GHz band

	Typical design	Worst-case design
		ITU-R F.758-1
• Noise figure (dB)	4	4
• Receiver noise power density (dB(W/MHz))	-140	-140
• Feeder losses (dB)	4	0
• Max. antenna gain (dBi)	45	51
• Antenna pattern	Rec. ITU-R F.1245	

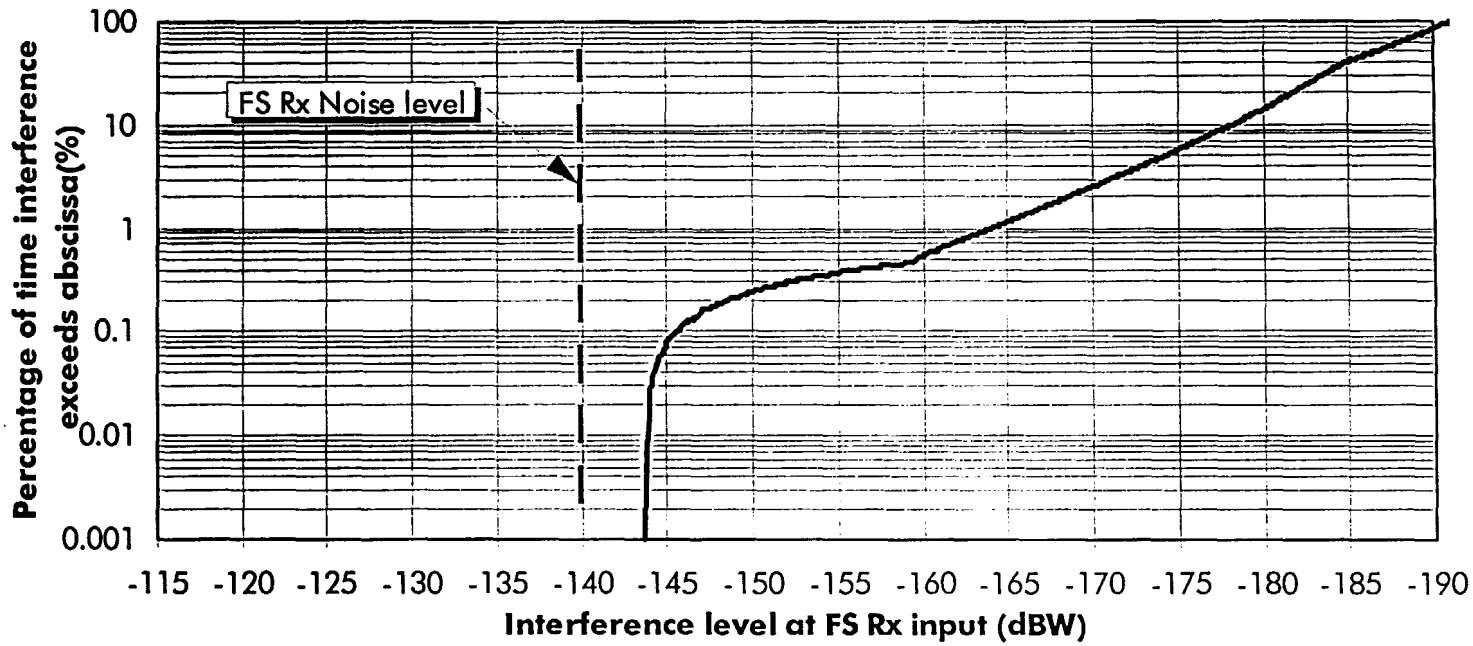
Downlink signals into FS systems

Worst-case results in the 10.7-11.7 GHz band
Typical case design



Downlink signals into FS systems

Worst-case results in the 10.7-11.7 GHz band
Worst-case design



Downlink signals into FS systems

Conclusion

SkyBridge
fully protects FS systems
in the 10.7-11.7 GHz band