NATIONAL RESEARCH COUNCIL
COMMISSION ON PHYSICAL SCIENCES, MATHEMATICS, AND APPLICATIONS
Board on Physics and Astronomy
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August 19, 1996

Mr. Alexander P. Haig, Jr.
President
Sky Station International, Inc.
3810 Concorde Parkway
Suite 1600
Chantilly, VA 22021

Dear Mr. Haig:

I am writing on behalf of the National Research Council's Committee on Radio Frequencies (hereinafter, "CORF"), which represents the interests of researchers who use the Radio Astronomy Service ("RAS"), the Earth Exploration-Satellite Service, the Space Research Service, and other users of the radio spectrum engaged in scientific research. CORF has reviewed the Sky Station International, Inc. petition to establish a new Global Stratospheric Telecommunications Service.

CORF is concerned about the potential for out-of-band emissions on the 48.94-49.04 GHz band allocated to the RAS on a primary basis under International Footnote 904. As a passive user of the spectrum the RAS uses extremely sensitive receivers directed toward the sky, with the result (as set forth in Footnote 904) that "[e]missions from space or airborne stations can be particularly serious sources of interference . . . ."

From the proposal sections I.A. (System Geometry) and I.B.4.a (Communications Systems-Stratospheric Payload), an initial analysis by CORF for the 47.9-48.2 GHz downlinks is as follows:

We consider a radio astronomy observatory located in a rural area cell which sees a Sky Station 30 degrees above the horizon (50 km from the nadir). This rural cell has a 6520 m (4.05 mile) radius, a surface area of $1.34\ 10^8\ m^2$, and a normal area of (surface area) sin (30 deg) = $6.68\ 10^7\ m^2$.

Maximum transmitter output power illuminating this cell is 76 W across 1.4 MHz of bandwidth.

Power flux density illuminating the cell is $76\ W / 6.65\ 10^7\ m^2 = 1.143\ 10^{-6}\ W/m^2 = -59.4\ dB\ (W/m^2)$.

Spectral power flux density (SPFD) illuminating the cell is $1.143\ 10^{-6}\ W/m^2 / 1.4\ MHz = 1.143\ 10^{-6}\ W/m^2 / 1.4\ 10^6\ Hz = 8.16\ 10^{-13}\ W/m^2 = -121\ dB\ (W/m^2/Hz)$.

Compare this SPFD to the harmful spectral power flux density (HSPFD) in the 48.94-49.04 GHz radio astronomy band (column 9 of Table 2 of recommendation ITU-R RA.769, 1992), which is -209 dB ($W/m^2/Hz$).

To avoid interference harmful to the RAS, Sky Station's downlink modulation and transmitter filtering will need to guarantee a ratio of 88 dB (nearly nine orders of magnitude) between the wanted transmissions in the downlink band and the unwanted transmissions only 0.74 GHz away in the RAS band.

Filtering will be a substantial technical challenge and accordingly should be addressed as soon as possible. There is some potential for interference to the RAS primary allocation in the 42.5-43.5 GHz band, and in the harmonically related RAS primary bands 97.88-98.08 GHz, 144.68-144.98 GHz, 145.45-145.75 GHz, and 146.82-147.12 GHz.

CORF hopes that SSI is committed to minimizing the impact of out-of-band emissions on other users of the spectrum. If you have technical questions related to the RAS bands, please contact CORF member William Brundage of the National Radio Astronomy Observatory, at 505-835-7120 (wbrundag@zia.nrao.edu).

Sincerely,

Michael Davis
Chairman
Committee on Radio Frequencies

cc: Jonathan D. Blake, Esq.
William Brundage, CORF
William Caton, Secretary, FCC, in ET Docket No. 94-124
Paul J. Feldman, Esq.
