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November 26, 2002

Mr. Edmond J. Thomas, Chief
Office of Engineering and Technology
Federal Communications Commission
The Portals
445 Twelfth Street, S.W.
Washington, DC 20554

Re: ***Ex Parte Presentation***:
Terrestrial Use of the L-Band
IB Docket No. 01-185

Dear Mr. Thomas:

I am writing to follow-up on an issue that was raised at a meeting you had last week with representatives of Inmarsat. Specifically, I am addressing the infeasibility of incorporating new terrestrial interference monitoring capabilities on the Inmarsat 4 spacecrafts that are currently under construction.

As the Manager of Systems Engineering in the Advanced Systems Division at Inmarsat, I was responsible for designing and specifying the communications subsystem for the Inmarsat 4 satellite. I was also responsible for defining the basic characteristics of the new services to be introduced on the Inmarsat 4 satellites. I was in charge of evaluating the various bids we received for the Inmarsat 4 programme, concentrating on the payload, and have continuously monitored the programme through all its phases since the contract was awarded in May 2000. I have over twenty years of experience in the field of satellite communication systems, having designed and participated in the implementation of systems at L band, C band and Ku band, involving a total of 16 spacecrafts.

Utilising the L band MSS allocations for the provision of a land-based mobile cellular system in the US would likely result in a very large number of users---millions, if not tens of millions. A small portion of those users, possibly a few hundred thousand could be simultaneously active at any given time. The small omni directional antennas employed in cellular handsets mean that even when communicating with a ground base station, power would be transmitted with equal level towards the geostationary orbit, interfering with any MSS spacecraft within the field of view, including any Inmarsat spacecraft with service areas, or antenna sidelobes, that cover part of the U.S.

Those interfering signals could degrade the affected MSS link in a number of ways, from direct co-frequency interference, to a general rise in the system noise floor, and also by saturating the analog/digital converters used in modern geo-mobile satellites, like Inmarsat 4 and Thuraya. Modern MSS user terminals are very small, with transmit power not much higher than that of cellular phones, requiring very sensitive receive systems in the satellite. Hence the susceptibility of MSS satellite receivers to interference even from signals at very low levels.

Implementing a satellite based interference sensing system, sensitive enough to detect the harmful low levels of interference, and the small increases in system noise temperature, would be a significant technical challenge. The first problem is that, due to their low levels, the interfering signals could not be sensed by the addition of a small extra antenna providing a wide-area coverage beam. It would be necessary to ensure that the sensing system would be done through the satellite's primary L band communications antenna, which in the case of the Inmarsat 4 satellite has a 9 m aperture and can deliver some 40 dBi of gain. The designer would then face a couple of options, including sampling the signal after the 120 L band low noise amplifiers (LNA's), which would require designing and building a complicated sensing network, and would require the addition of couplers not currently present in the design. Alternatively, the sampling could be done after the analog/digital converters, but that would require major changes in the satellite Digital Signal Processor (DSP). Considering that the Inmarsat 4 payload is well past the design stage and is presently in final stages of integration, with all the LNA's in place, the DSP has already been qualified and the protoflight unit is in the final stages of test, any changes would be prohibitively expensive, with a huge impact on program schedule.

Even if those problems could be overcome, the designer would be left with the problem of implementing the required system to sense and identify a multitude of interfering signals and the geographic areas from which they arise, accurately assess their level, and transmit the information to the ground to a point where the terrestrial network could be controlled. That would have to be done whilst coping with a very dynamic environment, where the pattern of active users would be continuously moving, not to forget the changing signal propagation and fading conditions due to user mobility.

In essence, it is believed that even if a spacecraft could be designed with the specific purpose of identifying and assessing the interference levels produced by a land based cellular system, it would be technically challenging and very expensive. Trying to implement such a system on a satellite that has already been through, preliminary design review, critical design review, and final design review, whose payload in its final integration stages, and that has negligible mass and power margins remaining, is essentially, impossible. It goes without saying that nothing could be done for sensing interference levels on any of the 9 operational Inmarsat 2 and Inmarsat 3 satellites.

Sincerely yours,

/s/

Marcus Vilaca
Manager, Systems Engineering
Advanced Systems Division