



National Radio Astronomy Observatory

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29 April 2015

Re: Iridium Constellation LLC Petition for Rulemaking **RM-11697**

To the Federal Communications Commission:

In its most recent filing, Iridium Constellation LLC (Iridium) said:

“And for its part, Iridium has mutual coordination agreements with radio astronomers in the US since beginning operations in 1998. Iridium also regularly engages with RAS operators in the U.S. and abroad to discuss Iridium NEXT-RAS interaction. Iridium is committed to continuing these efforts to coexist with RAS, and looks forward to addressing any concerns regarding the expanded spectrum sharing in the appropriate coordination contexts.”

Here, the National Radio Astronomy Observatory (NRAO) summarizes the state of this coordination effort between Iridium and the US radio astronomy (RAS) community.

Since the inception of its operation, harmful levels of unwanted emissions from the Iridium constellation operating in the MSS (space-earth) allocation above 1616 MHz have fallen into the band 1610.6 – 1613.8 MHz that is allocated to the radio astronomy service (RAS) on a primary basis and shared with MSS (earth-space). That interference gave rise to a mutual coordination agreement (MOU) between NRAO and Iridium specifying that there will be a 4 hour or longer contiguous period “between the late night and early morning hours (local time) for the Green Bank observatory site” during which the unwanted Iridium signal will be below the level -238 dB W/m²/Hz (the threshold specified in ITU-R Recommendation RA. 769). But also, “... NRAO agrees to avoid, to the greatest extent practicable, the taking of observations during peak traffic periods of the IRIDIUM system.”

The MOU is an altogether extraordinary spectrum regulatory document in that it so greatly encumbers NRAO’s use of the 1610.6 – 1613.8 MHz band in order to accommodate unwanted emissions of the first-generation Iridium system, operating entirely in a nearby band and sharing no allocated spectrum. The few daily hours of guaranteed interference-free observing in Green Bank are imprecisely specified and seemingly left to Iridium’s discretion, while NRAO is obliged to show deference throughout the entirety of its scheduling, and to refrain from observing in its own band when it is not specifically protected.

Much has changed since the MOU was originally signed circa 1998. The lower operating limit of the Iridium system, originally above 1621 MHz, is now near 1618 MHz. Iridium is preparing to launch a new generation of satellites while petitioning to be allowed to operate down to 1616 MHz, even though unwanted emissions into the radio astronomy band at 1610.6 – 1613.8 MHz are known to increase as Iridium’s operating bandwidth grows downward. The 100m Robert C. Byrd Green Bank Telescope (GBT) was brought online in Green Bank and the electronic backbone and receiving systems of the VLA in New Mexico (now the Jansky VLA or JVLA) have been entirely refurbished with wideband infrastructure. NRAO no longer schedules its telescopes more than one day in advance, to take advantage of weather conditions that are required to be better at some observing frequencies. The 1610.6 – 1613.8 MHz band is now

routinely observed whenever NRAO's L-band receivers are engaged, not just when receivers are specifically tuned to observe only that narrow band.

Sadly, Iridium's proposed remedy for the interference expected from its next-generation satellites does not reflect these changed conditions. In its discussions with the radio astronomy community in the US and Europe, Iridium has proposed to operate in a "radio astronomy protection mode" with 6 MHz bandwidth (ie operating down to ~1620 MHz) only during limited periods in off-peak hours, after advance notification that would require observatories to enter, in advance on a website, all the telescope pointings and tunings that would be used during periods of protected observing.

The protection mechanism proposed by Iridium is unfavorable to radio astronomy and generally unworkable given the way radio astronomy telescopes are currently operated. Positions of celestial objects are often fed to the telescope by a non-staff off-site astronomer in real time as her observations progress, perhaps with only a few hours advance notice of observing. Sky directions differ with the epoch of observation even if the same celestial object is being observed. Tunings vary with date and time of day and the 1610.6 – 1613.8 MHz band will often be observed opportunistically when the tuning center is hundreds of MHz away. The detailed information required to be entered on the coordination website proposed by Iridium is an unwarranted intrusion on RAS operations. The coordination proposed by Iridium with regard to its next generation satellites is predicated on the forbearance of astronomers and spectrum regulators in continuing to tolerate the harmful interference that Iridium causes.

Moreover, the current coordination process has occurred at much too slow a pace to reach any productive end before launch of the next generation of Iridium satellites. A request to Iridium to provide simulations of interference to the US RAS sites from next-generation satellites operating in the 6, 8 and 10 MHz bandwidth modes, akin to those already provided at CEPT for European RAS sites in the 6 and 8 MHz modes, has been pending since last autumn. The only face to face meeting between US RAS operators and Iridium in perhaps the last 5 years, at the NSF last November, was unproductive because Iridium had not provided the simulation results that RAS requested as a vital precondition for any progress. Partial results, for the 6 MHz Iridium operating mode, the so-called RAS protection mode, were eventually provided in March 2015.

NRAO believes that relatively straightforward adjustments to Iridium operations would suffice to eliminate interference to US radio astronomy operations quite generally without ongoing coordination. If Iridium could arrange its operations so that the few spot beams illuminating RAS sites operated in the 6 MHz RAS protection mode, interference issues between RAS and Iridium might well be mooted with very little cost to Iridium's operating capacity. This was suggested to Iridium last November.

NRAO respectfully suggests that progress in the consultations with Iridium would be materially aided if the FCC were to take a more direct and active role, as it has in the discussion between Globalstar and Iridium. The basic issues at stake are regulatory matters of clear concern to the Commission, and NRAO respectfully asks that they be clarified. NRAO especially wishes to know the extent to which it may expect relief from interference created by the next generation of Iridium satellites.

Respectfully noted

A handwritten signature in blue ink that reads "Harvey S. Liszt". The signature is written in a cursive style with a large, sweeping 'H' and a long, trailing 'z'.

Harvey S. Liszt (hlist@nrao.edu)
Scientist and Spectrum Manager
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