Mobile telephones ring out changes for radioastronomy frequencies

Munich. European radioastronomers agreed last week to discuss a proposal that transmitting beacons should be set up next to their receivers to instruct mobile telephone users in their vicinity to switch from radioastronomy frequencies. The proposal had been made by the satellite company Iridium, a subsidiary of Motorola, to allow protected radiofrequencies to be shared by astronomers and mobile telephone users.

Meeting at the Nuffield Radioastronomy Laboratory at Jodrell Bank in Cheshire, England, the Committee on Radioastronomy Frequencies (CRAF), an *ad hoc* committee of the European Science Foundation, said it would be prepared to consider the 'beacon option' when it received from Iridium a more detailed technical specification.

But Jim Cohen, the chairman of CRAF, and a reader in radioastronomy at the University of Manchester, warned that European radioastronomers would wish to see a beacon functioning properly before making a firm agreement, and that it might be necessary to modify receivers to reduce sensitivity. For this reason, he says, CRAF will insist on similar compromises from Iridium to avoid interference from satellite signals returning to Earth, which at peak times spill over into radioastronomical frequencies.

Iridium is one of several companies planning to launch satellites for the global mobile communications market, but its unique design — using the same frequency band (1610.0–1626.5 MHz) for both uplinks and downlinks — threatens much more interference.

Satellite companies were allocated this frequency range by the International Telecommunication Union (ITU) at its World Radio Conference in 1992. Because it overlaps with the 1610.0–1613.8 MHz frequency range, which is protected for radioastronomy observations of the hydroxyl radical, a footnote to the allocation states that "harmful interference should not be caused to radioastronomy".

Mobile satellite companies will use the 1610.6–1626.5 MHz frequency band for sending signals from handsets to the satellite (the uplink) and accept that they must provide exclusion zones around radiotelescopes. It is only the mechanism for establishing such an exclusion zone that remains controversial.

Radioastronomers have up to now been reluctant to accept Iridium's beacon option. But they now agree that having a transmitter beacon close to receivers may not cause the technical problems they had initially feared. Nevertheless, Cohen says, it may cause other problems. In the Netherlands, for example, radio-observatories are placed in areas where no form of transmission is allowed. Radioastronomers would prefer mobile satellite companies to build a system into handsets that would allow their position to be located by satellite, an option that some companies, such as Global Star, have already accepted.

But Peter Fischer, a representative of Iridium based in Bonn, says that the beacon option is technically superior. "Relying on the less precise satellite location of handsets would render the exclusion zone unnecessarily large," he says. It is also rather late in the day for a system redesign. The company is planning to start launching its battery of 66 satellites by the end of the year, and already has an experimental licence to test the system in the United States.

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Rex Features

Crossed lines? The radio frequencies used by mobile phones and radioastronomers overlap.

The biggest potential for interference comes from the downlink, the connection between the satellite and the handset. This problem that applies only to Iridium, as other companies plan to use frequencies distant from radioastronomy frequencies. "The satellite will emit a lot of unwanted, polluting, signals, particularly at times of heavy load," says Cohen. This is where he and his colleagues believe that Iridium should compromise, by capping the number of subscribers using telephones at peak time to reduce interference. But such a solution is clearly not compatible with a commercial aim of maximizing revenue.

Radioastronomers are not prepared to accept Iridium's idea of time-sharing of frequencies, whereby they would be able to use only the gaps in the signal pulses left over by mobile telephone users. According to Cohen, this would effectively halve the time available for observations, already too limited for the liking of scientists, and would make certain observations technically impossible. Particularly affected would be the Nançay Radioastronomy Observatory south of Paris, which uses this frequency for a large fraction of its observations.

Fischer says Iridium is ready and willing to try to understand the needs of the radioastronomers. Indeed, the company will meet scientists, as well as British radiofrequency licensing authorities, in London next week to take negotiations further forward.

In particular, he would like to understand why European radioastronomers would not be happy with an agreement similar to the memorandum of understanding signed with the US National Radioastronomy Observatory in 1994. This guarantees four hours of zero radiointerference per day, during times of low user demand. It also provides equipment to the observatory to allow scientists to use the pulse gaps.

Martin Bond/SPL

Both Fischer and Cohen are members of a CEPT (European Conference of Post and Telecommunications) project team which must complete a report on the problem by October. Fischer says that a solution acceptable to both sides is certain to be found "because we all have to share the wavelengths". But the process will not be bloodless. CRAF intends to negotiate as determinedly as possible for its preferred option: no interference at all with radioastronomy frequencies.

Scientists fear that with the global mobile telephone system gaining momentum, the problem with interference will become increasingly worse. "The companies will just expand and expand," says Klaus Ruf of the Max Planck Institute for Radioastronomy in Bonn, who sees grave danger in giving in now to market pressures. Cohen points out that radioastronomers have only just solved a similar problem with the Russian Global Navigation Satellite System, GLONASS, which was launched in 1982. Three years ago, Russia agreed to make changes to the system to curb its massive interference with radioastronomy. But the changes will take ten years to complete. Cohen is committed to trying to avoid similar problems in the future.

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