DEUTERIUM ARRAY MEMO #061

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
HAYSTACK OBSERVATORY
WESTFORD, MASSACHUSETTS 01886

November 18, 2004

Telephone: 978-692-4764
Fax: 781-981-0590

To: Deuterium Array Group

From: Alan E.E. Rogers

Subject: Expected levels of RFI reflected from the moon, earth satellites and aircraft.

1] Moon reflections

If we assume an earth based transmitter with antenna gain of -7.5 dBi received by an individual D1 array dipole with +12 dBi gain the path loss is 243 dB assuming a 10% specific radar cross-section.

In long integrations the array is sensitive to 1 ppm or 100 μK in 244 Hz or -215 dBm so that transmitters above 1 watt could be a concern. [In memo I estimated that only transmitter stronger than 2 kw could pose a problem]. Part 15 limits the transmitted power to -49 dBm but if there are 100 million devices just meeting part 15 with the same spurious radiation the combined power is about 1 watt.

2] Synchronous satellites

The path loss for a reflection from a synchronous satellite at a distance of 35,790 km is about 331 dB for a $1m^2$ radar cross-section. This is very large so we would not expect any significant reflections from a synchronous satellite.

3] Lower orbit satellites

If the orbit is 1000 km above the surface the path loss drops to about 268 dB. This is still small and no significant reflections are likely.

4] Aircraft

If the distance is reduced to 10 km the path loss drops to 189 dB for a $1m^2$ cross-section and reflections from devices at the part 15 limit will be received at about -238 dBm. This should not be significant unless there are unwanted emissions from transmitters on the ground which are well above the part 15 limit.