EXPERIMENTAL LICENSE PROGRESS REPORT OF
THE ALFRED MANN FOUNDATION
May 16, 2013

As required under the experimental license renewal granted on November 16, 2009 (Call Sign WD2XLW; File No. 0228-EX-RR-2009), the Alfred Mann Foundation for Scientific Research ("AMF") submits this semi-annual progress report on the experimental operation of the medical micropower network ("MMN") system. AMF continues to make progress with its innovative system. AMF has implemented and continues to implement improvements that will enhance the radio communication performance and reliability of the MMN devices, including the following:

1. AMF has been focused on minimizing the system error rate induced by near-field inter-symbol interference. Although the implant and MCU are in close proximity, the system demonstrated inter-symbol interference similar to that demonstrated by cell phone systems. A study performed with independent antennas demonstrated that the faded direct beam (from antenna polarization disorientation) was being overlapped with the cross-polarized products from weak reflections in the nearby environment. A further experiment demonstrated a possible mitigation with longer bit intervals. In conjunction with the protocol modification described in paragraph (2) below, the average system error rate with longer bit intervals has been reduced dramatically from 0.175 to less than 0.007.
2. At the end application level, the transfer protocol was modified to accommodate very short signal losses, and re-acquire the MCU/implant link without user intervention and without deterioration of the end therapeutic scheme.
3. The improvements with antenna spatial diversity were investigated with small separation (2-10cm) and large (10-100cm). The investigation demonstrated that antenna spatial diversity with small separation resulted in insufficient improvements in link acquisition

and bit rate adjustment, and no further increase in the size of the hardware system is required.

Table 1 below specifies the four channels implemented in the MMN hardware.

Table 1 – Radio Channel Frequencies (MHz)

	Lower Edge	**Center**	**Upper Edge**
Band 1	413.919	416.405	418.891
Band 2	426.349	428.835	431.321
Band 3	438.779	441.265	443.751
Band 4	451.209	453.695	456.181
Guard bands 7.458 MHz		**Band Width 4.972 MHz**	