PREPARED: Sean A. Marcus	Date: **9/9/2005**	DOC No: **05:2000-00**
Approved: Sean A. Marcus	Rev: **A**	File:

1. Purpose

The GPS re-radiation kit is designed to receive the terrestrial GPS signal from an external antenna and re-radiate it for reception by an indoor receiver. This document is to address the effect on a GPS receiver in close external proximity to the intended indoor radiation facility. This document assumes that the radiating antenna is 0ft from the external wall inside the room, and the receive antenna is 100ft from the external wall on the outside of the closed room. This is for a worst case calculation. It is not meant to represent the actual system layout. It also assumes there is a ceiling or roof on the room.

2. Feasibility

The total path loss of between a transmitter and receiver is defined by three additive effects: free space loss, reflection loss, and diffraction loss.
Free space loss is defined by the loss created by the open air dielectric, and distance between transmit and receive antennas.
Diffraction loss is created by a large isolation object. The radiated signal losses some of its power as it diffracts around the object.
This theory assumes that distance between transmit and receive antennas is much greater than the size of the transmitting antenna. This is called far field effect.

3. Kit Link Budget

The radiation amplitude of the GPS signal from the Reradiating Kit is based on the link of its system components.

- Satellite- GPS signal received from the GPS satellite castellation system assumed to be (-160dBW).
- Antenna- Active GPS antenna with a low noise amplifier.
- Cable- LMR400 coaxial low loss cable.
- Radiating Amp- radiating amplifier of the re-radiating kit.
- Antenna (2) - re-radiating passive antenna.
- Total interface- loss of the interfacing coaxial connections.

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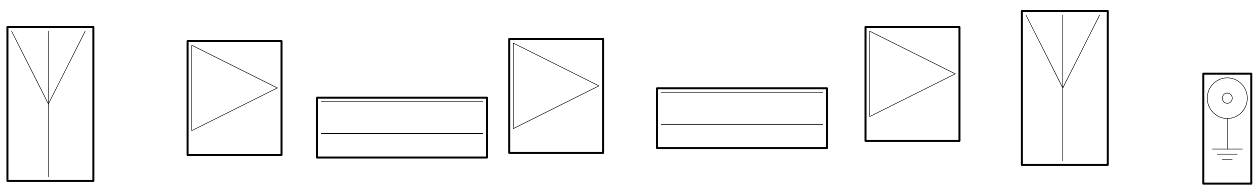

Satellite (dBm) {-160dBW}	**Antenna LNA (dB)**	**100' cable loss @.067db/ft (dB)**	**Radiating AMP gain(dB)**	**200' cable loss @.067db/ft (dB)**	**Radiating AMP gain(dB)**	**Antenna (2) Gain (dBic)**	**Total interfac e loss 0.1/int (dB)**	**Total Signal out (dBm)**	
-130	38	-6.7	23	-13.4	23	3	-0.3	**-63.4**	
								4.6E-10	**W**
								460pW	

1. Total Radiation loss

- ***Free Space Loss***

  Free space loss is defined by the following equation:

  $1/D^2$

  D = distance from the transmiter
  D(m) 30.48m

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- ***Diffraction Loss***

It is not likely for a GPS signal to enter or escape from a closed room creating a non-permeable interference. Therefore the loss due to diffraction is not applicable. The signal propagations will not go around or over this interference.

2. Final Re-radiated Signal

$Po/d^{2} =$ 460pW / 1.076E-3

= 0.495pW