METER

Equivalent Isotropically Radiated Power (EIRP) Calculation

$P_{Tmax} = P_R + 20\log_{10}f + 20\log_{10}(30 + d) - 27.55$ (from NTIA 8.3.28)

For the proposed repeaters,

$P_R = P_{GPS} + G_{antenna} + G_{repeater,adjustable} + G_{repeater,antenna} - G_{dipole} - L_{cable} - L_{free\ space}$

Where: P_{GPS} is the average power received from GPS satellites in North America (-130 dBm)
$G_{antenna}$ is the gain of the GPS antenna (35 dB)
$G_{repeater,adjustable}$ is the adjustable gain in the repeater (30 dB)
$G_{repeater,antenna}$ is the gain from the repeater antenna (3 dB)
G_{dipole} is the gain dipole antenna and is subtracted to represent isotropic antenna (2.2 dB)
L_{cable} is the cable loss (-12.8 dB)
$L_{free\ space}$ is free space loss
d is the distance from the repeater
f is the frequency of the repeater (1575.42 MHz for L1)

$L_{free\ space} = 20\log_{10}d + 20\log_{10}f + 32.44$
$L_{free\ space} = 20\log_{10}(30) + 20\log_{10}(1575.42) + 32.44$
$L_{free\ space} =$ 66.1 dB

$P_R = -130 + 35 + 30 + 3 - 2.2 - 12.8 - 66.1$
$P_R = -143.1\ dBm = 0.000005\ pW$

Thus, we can determine P_{Tmax} at $d = 0\ meters$:

$P_{Tmax} = -143.1 + 20\log_{10}(1575.42) + 20\log_{10}(30 + 0) - 27.55$
$P_{Tmax} = -77.16\ dBm = 19.23\ pW$

Therefore, the proposed repeaters comply to NTIA 8.3.28 because:
$P_R < -140dBm$ and $P_{Tmax} < 39.3\ pW\ at\ d = 0\ meters$

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