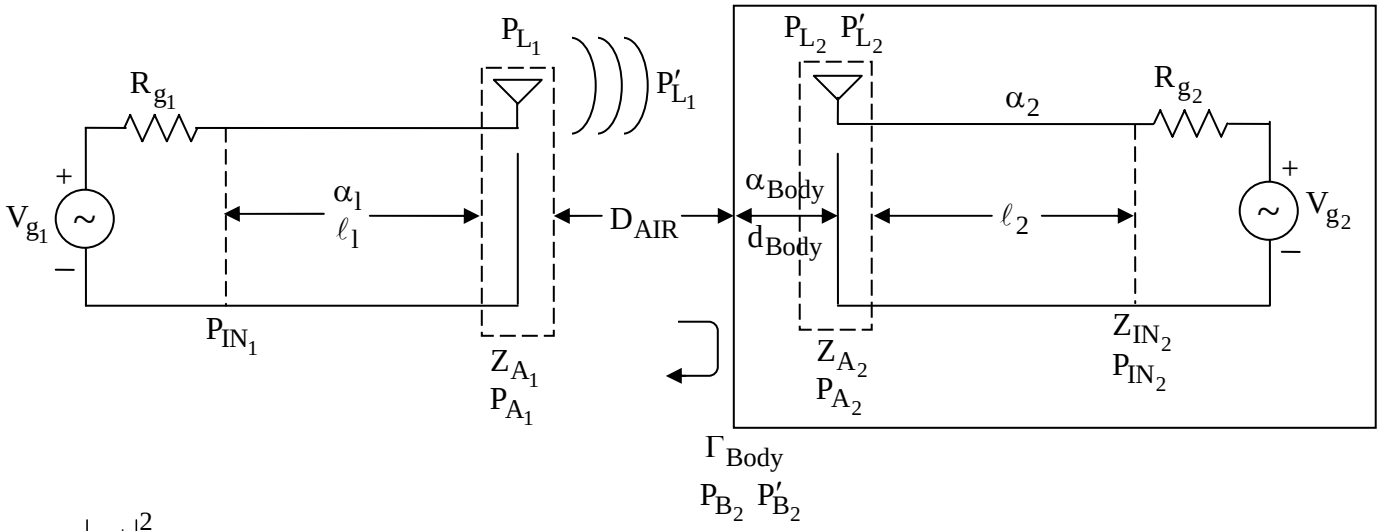
Power Link Budget: How much power reaches the receiver?



Examples of other possible losses:
Connectors, polarization, environment, "multipath fading", reflection @ receiver, etc.

Other possible gains:
Multiple antennas, amplifier, processing, etc.

$$P_{IN_1} = \frac{\left|V_o^+\right|^2}{2Z_o}$$ Incident power (given)

$$P_{A_1} = P_{IN_1}\left(e^{-\alpha_1 \ell_1}\right)^2$$ Power reaching antenna, (attenuation in T_{L_1})

$$P_{L_1} = P_{A_1}\left(1-\left|\Gamma_{L_1}\right|^2\right)$$ Power TX from antenna_1, (reflection @ antenna_1)

$$P'_{L_1} = G_{A_1} P_{L_1}$$ Power TX from ant_1 in direction of ant_2 (gain of antenna_1)

$$P_{B_2} = P'_{L_1}\left(\frac{\lambda_o}{4\pi D_{AIR}}\right)^2$$ Power reaching body surface (spreading in space) See Eq. 9.75

$$P'_{B_2} = P_{B_2}\left(1-\left|\Gamma_{Body}\right|^2\right)$$ Power reaching inner body surface (reflection @ surface)

$$P_{L_2} = P'_{B_2}\left(e^{-\alpha_{Body} D_{Body}}\right)^2$$ Power reaching antenna_2 (loss in body, approximately)

$$P'_{L_2} = G_{A_2} P_{L_2}$$ Power available for antenna_2 (gain of antenna_2)

$$P_{A_2} = P'_{L_2}\left(1-\left|\Gamma_{L_2}\right|^2\right)$$ Power RX by antenna_2, (reflection @ antenna_2)

$$P_{IN_2} = P_{A_2}\left(e^{-\alpha_2 \ell_2}\right)^2$$ Power @ receiver (attenuation @ TL_2) (min – 115 dB)

In dB:

$$P_{IN_1} = 10\log_{10}(\text{x watts})\ \text{dBW}$$

Given

$$L_1 = \text{Loss}_{A_1} = 10\log_{10}\left[\left(e^{-\alpha_1 \ell_1}\right)^2\right]\text{dB}$$

$$L_2 = \text{Loss}_{L_1} = 10\log_{10}\left[1-\left|\Gamma_{L_1}\right|^2\right]\text{dB}$$

etc.

$$P_{IN_2} = P_{IN_1} + L_1 + L_2 + \cdots\ \text{dBW}$$

This unit is same as P_{IN_1}

In linear:

$$P_{IN_2} = P_{IN_1}\left(e^{-\alpha_1 \ell_1}\right)^2\left(1-\left|\Gamma_L\right|^2\right)\cdot G_{A_1}\left(\frac{\lambda_o}{4\pi D}\right)^2 \text{ etc.}$$