

NECESSARY BANDWIDTH DESCRIPTION

Equations and Info

Doppler: $V_{obs}/V_{source} = \sqrt{(1+V_s/c)/(1-V_s/c)}$

Necessary bandwidth for FSK: $B_n = R/\log_2(S) + 2 \cdot D \cdot K$

$D = 0.35 \cdot R$, $S = 2$, $K = 0.89$

(Equation taken from NTIA Annex J document.)

Velocity at 400km orbit, $V_s = 7672 \text{ m/s}$

Calculations for the 437.505 MHz frequency (GSMK):

$B_n = R/\log_2(S) + 2 \cdot 0.35 \cdot R \cdot 0.89$

$R = 9600 \text{ bps}$

$B_n = 9600 + 5980.8 = 15.5808 \text{ kHz}$

Calculations for the 460 to 470 MHz frequency:

Occupied BW = 2.34 MHz (from datasheet)

$V_s = 7672 \text{ m/s}$

$V_{obs}/V_{source} = \sqrt{(1+V_s/c)/(1-V_s/c)} = 1.00003$

Doppler shift amount = $0.00003 \cdot F_{source} = 0.00003 \cdot 470 \text{ MHz} = \pm 0.014 \text{ MHz}$

Necessary BW = occupied BW + 2(Doppler shift amount) = $2.34 \text{ MHz} + 2(0.014) \text{ MHz}$
= 2.37 MHz