

This Exhibit is the Necessary Bandwidth Calculation for STA File number 0161-EX-ST-2003. Confirmation Number EL13222. Dated 4-28-2003.

This STA request is to allow for the development and testing of a device that will be Part 15 compliant. We are currently testing at two frequencies, 315MHz and 902-928MHz.

The 315MHz devices are On-Off Keyed and operate with a maximum emitted power of 1.5uW. The modulation circuit is designed to approximate a sinusoidal rising and falling edges to reduce unwanted emissions. To approximate the necessary bandwidth for the 315MHz devices, I have used the following:

$$\begin{aligned} BW &= (WC + Wa) - (WC - Wa) \text{ , which reduces to:} \\ BW &= 2Wa + Wc - Wc \text{ , which reduces to:} \\ BW &= 2Wa \end{aligned}$$

In this case, the maximum bit frequency is 2.5KHz, so the theoretical necessary bandwidth for the 315MHz devices is:

$$BW = 2 * 2.5\text{kHz} = 5\text{kHz}.$$

Recognizing that this is an approximation, the author arbitrarily bumped this up to 6kHz on the application for the STA.

The 902-928MHz devices are Frequency-Shift Keyed with a static carrier frequency within the specified range and an available data bit rate of 56Kbit/s. The frequency deviation to support this bitrate is ~110kHz. This is the necessary bandwidth for the 902-928MHz devices.