

### CW Bandwidth

The CW is a form of double sideband amplitude modulation, the modulating frequency depends on the keying speed, and this will affect its sidebands.

The word PARIS is the standard for determining the speed of the CW. Each point is an element, each line are three elements, the character spacing are three elements and the spacing between words are seven elements. The word PARIS has exactly 50 elements:

P

di di da da

1 1 3 1 3 1 1 (3) = 14 elements

A

di da

1 1 3 (3) = 8 elements

R

di da di

1 1 3 1 1 (3) = 10 items

I

di di

1 1 1 (3) = 6 elements

S

di di di

1 1 1 1 1 [7] = 12 items

Total = 50 items

() = Between characters

[] = Between words

If the word PARIS is transmitted 5 times in one minute (5 wpm) it have been sent (using the correct spacing) 250 elements. 250 items in 60 seconds = 240 milliseconds per item. 25 wpm is an item every 48 milliseconds.

While this is equivalent to a rate of just over 10 Hz, the

modulating signal is not a sine wave but a nearly square waveform, with a high content of odd harmonics.

In other words, a CW signal of 25 wpm has sidebands separated 10Hz, 30Hz, 50Hz, ... etc, at each side of the carrier, the amount of harmonics depend on the keying, and if this has clicks, it can be very high, significantly increasing the bandwidth of the signal.

According to the ARRL license manual from 1976:

**"With proper shaping, the necessary keying bandwidth is equal to 4 times the speed in words per minute for International Morse Code; e.g. at 25 words per minute, the bandwidth is approximately 100 cycles."**

I think this is an interesting issue, because suggested IARU bandplans show for CW a maximum bandwidth of 100 Hz. Does this mean that we can not transmit CW at over 25 wpm?

Sincerely,  
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Source: ITU – ARRL, and several notes on the web.

