## 13.A. APPENDIX: DECOMPOSITION OF A SINGLE SIDEBAND

In Section 13.1 we saw how a pair of sidebands can be decomposed into equivalent modulation sidebands on a central carrier. Here we will see how the same basic results can be obtained by treating one sideband at a time.

The equivalence between a single sideband and two sideband pairs is illustrated in Fig. 13.A.1. A single-sideband is equivalent to four sidebands, an even pair and an odd pair of symmetrically placed sidebands, all with the same amplitude. If we have a pair of symmetrically placed sidebands with random phase, we can produce the eight sidebands obtained in Section 13.1 by following the procedure illustrated here for each of the original sidebands, or for their real and imaginary components.

Consideration of the equivalence shown here can also help us to understand how a single-sideband can have AM and PM aspects. For example, if a strong signal and a small single sideband pass through a hard limiter, the equivalent AM sidebands will be removed (since amplitude variation is suppressed), leaving the equivalent FM sidebands on both sides of the strong-signal carrier. Thus a frequency modulated signal, with power at a sideband where none had existed, emerges from the limiter.

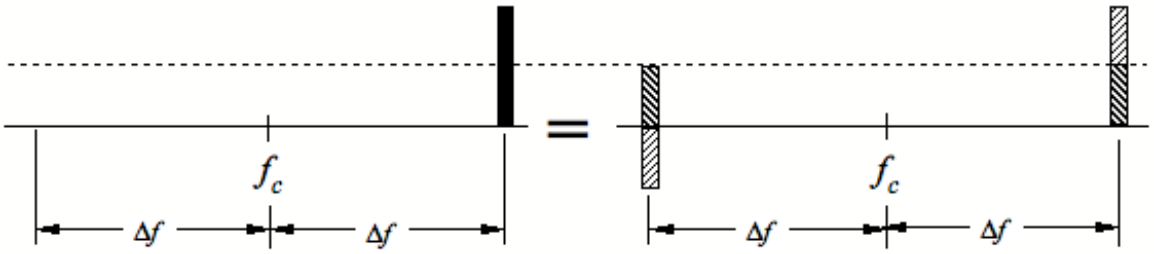


**Fig. 13.A.1** Decomposition of a single sideband into an even pair and an odd pair.