GNSS Meta Signals: Coherently Composite Processing of Multiple GNSS Signals

Abstract:
Today all four global navigation satellite systems broadcast on multiple frequencies, using a variety of modulation schemes. Each broadcast signal offers its own particular benefits and requires of a receiver with a particular processing strategy. In general, a receiver will opt to process more than one signal from each satellite on the basis that it either: reduces atmospheric errors, or improves carrier ambiguity fixing, in the case that the second signal bears a different center frequency; or improves tracking sensitivity, in the case that it is a pilot signal. Rarely, however, does the addition of a second signal significantly improve the single-point ranging accuracy over what is already afforded by the better of the two signals by itself. The stark exception to this rule, of course, is the processing of the Galileo E5 AltBOC signal. When processed as a single signal, it can offer drastically higher ranging accuracy and reduced sensitivity to multipath propagation than either of the two E5a or E5b signal components. The concept of composite processing of two signals need not be restricted to this case alone, indeed, with the appropriate techniques, it can be applied to any pair of signals.

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