**For SQUIDS, see:**

<https://en.wikipedia.org/wiki/SQUID>

[https://static1.squarespace.com/static/613641714f878116b516160b/t/61a77a0464caf53699caf4d7/1638365706759/3-fagaly2006\_REVIEW\_SQUID+intruments+and+applications.pdf](https://static1.squarespace.com/static/613641714f878116b516160b/t/61a77a0464caf53699caf4d7/1638365706759/3-fagaly2006_REVIEW_SQUID%2Bintruments%2Band%2Bapplications.pdf)

<https://www.nature.com/articles/nnano.2013.169>

**The Josephson junction array voltage standard:** <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4959396/>

See references in this paper regarding the wonderful Josephson-array voltage standard that was developed in the 1980’s at NIST, mainly in Boulder, CO

**For SIS Quasiparticle mixers, see, for example:**

<https://ieeexplore.ieee.org/abstract/document/4131776/references#references>

<https://www.nrao.edu/meetings/isstt/papers/1994/1994073083.pdf>

or just google-search this topic.

**It is important to understand, at least conceptually, these aspects of electrical engineering: regenerative amplification, heterodyne, super-heterodyne, homodyne, phase-locked loops, demodulation, and lock-in amplification. Start here:** <https://en.wikipedia.org/wiki/Edwin_Howard_Armstrong#Superheterodyne_circuit> E. H. Armstrong was the mega-genius of modern radio and signal processing. He won the first-ever IEEE Medal of Honor in 1917 (they created this honor just for him!), and many other top prizes throughout his career, including the Edison Medal in 1942.

**For lock-in amplification, see:**

<https://en.wikipedia.org/wiki/Lock-in_amplifier>

An example of a modern instrument from Stanford Research Systems: <https://www.thinksrs.com/products/sr865a.html?utm_source=Google&utm_medium=cpc&utm_content=432522399960&utm_term=lock-in%20amplifier&utm_campaign=Google:%2018557306696:&wv_initiative=Google:%2018557306696&wv_audience=18557306696&gclid=EAIaIQobChMI8uK6x9TO-wIVgyc4Ch2xuQ68EAAYAiAAEgKcP_D_BwE>

**For the operation and design of phase-locked loops, see:** <https://en.wikipedia.org/wiki/Phase-locked_loop>

**In the frequency domain, discrete FFTs may be rapidly calculated, which gives the frequency spectral information within the time variation of the signal:** <https://en.wikipedia.org/wiki/Fast_Fourier_transform> Among many applications, this is the core element in Shor’s Algorithm, which is a method of factoring huge numbers back their primes. This, if ever made practical by a large gate-based quantum computer, could break RSA encryption, which would change everything. This threat has been the primary motivation for the establishment of the National Quantum Initiative (NQI).