Estimating the noise floor of an API baseline phase measurement given the signal to noise ratio of the received satellite signal with receivers of equal antenna gain and receiver conversion gain and noise.

Let :

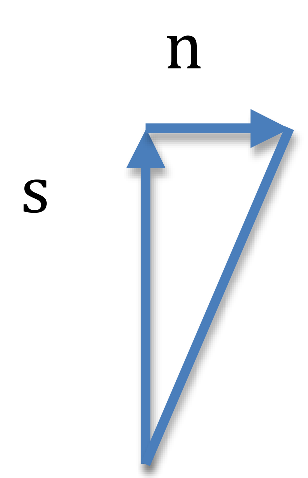
s = the rms signal amplitude (voltage)

n = the rms noise amplitude (voltage)

s^2/n^2 = rms power signal to noise ratio

s/n = rms amplitude signal to noise ratio

n/s = small angle approximation to rms phase noise in radians



n/s is the small angle approximation to single dish rms phase noise produced by the vector sum of noise voltage n to signal voltage s

Angle n/s radians

Let:

B = signal bandwidth

t = integration time

Bt = number of independent samples of a signal with bandwidth B in t time

$(1.414\ n/s)/(Bt)^{1/2}$ = standard error of phase measurement based on B*t independent samples and two dishes with independent noise (their noise adds root sum squared , thus the square root 2 factor).

The standard error is a standard deviation (equal to rms if signal is zero mean) of repeated measures of a statistical parameter where each measure is the average of a finite number of samples. In our case it is the standard deviation of many measures of baseline phase. This standard error is the rms noise floor of the API. See the Wikipedia article "Standard Error".

Example:

Given a power signal to noise of 8 dB = 6.3, bandwidth of 60 MHz and an integration time of 0.1s

$s/n = 6.3^{1/2} = 2.50$

$n/s = 0.40$

B = 60 MHz

t = 0.1s

$Bt = 6 * 10^6$

$(Bt)^{1/2} = 2.45 * 10^3$

$(1.414\ n/s)/(Bt)^{1/2} = (1.414 * 0.4)/(2.45 * 10^3) =$

$2.31 * 10^{-4}$ rad $= 1.32 * 10^{-2}$ degrees