The noise power spectrum (NPS) of an image sensor provides the spectral noise properties needed to evaluate sensor performance. Hence, measuring an accurate NPS is important. However, the fixed pattern noise from the sensor's nonuniform gain inflates the NPS, which is measured from images acquired by the sensor. Detrending the low-frequency fixed pattern is traditionally used to accurately measure NPS. However, detrending methods cannot remove high-frequency fixed patterns. In order to efficiently correct the fixed pattern noise, a gain-correction technique based on the gain map can be used. The gain map is generated using the average of uniformly illuminated images without any objects. Increasing the number of images n for averaging can reduce the remaining photon noise in the gain map and yield accurate NPS values. However, for practical finite n, the photon noise also significantly inflates NPS. In this paper, a nonuniform-gain image formation model is proposed and the performance of the gain correction is theoretically analyzed in terms of the signal-to-noise ratio (SNR). It is shown that the SNR is $O(\sqrt{n})$. An NPS measurement algorithm based on the gain map is then proposed for any given n. Under a weak nonuniform gain assumption, another measurement algorithm based on the image difference is also proposed. For real radiography image detectors, the proposed algorithms are compared with traditional detrending and subtraction methods, and it is shown that as few as two images ($n = 1$) can provide an accurate NPS because of the compensation constant $(1 + 1/n)$.