The aim of Least Square Fitting is to find a set of parameters $\vec{P}$ which minimize the quantity

$$\chi^2 = \sum \omega_i [X_i - X(f_i;\vec{P})]^2$$

called the "'chi-square".

1. Selection of Data Sequence
   A. For "Z: Real & Imag" Data Sequence:
      X_i = { Zr[0], Zr[1], Zr[2], … Zr[Ns-1], Zi[0], Zi[1], … Zi[Ns-1] }

   B. For "Z: Real" Data Sequence:
      X_i = { Zr[0], Zr[1], Zr[2], … Zr[Ns-1] }

   C. For "Z: Mag & Phase" Data Sequence:
      X_i = { |Z[0]|, |Z[1]|, |Z[2]|, … |Z[Ns-1]|, φ[0], φ[1], … φ[Ns-1] }

   D. For "Y: Real & Imag" Data Sequence:
      X_i = { Yr[0], Yr[1], Yr[2], … Yr[Ns-1], Yi[0], Yi[1], … Yi[Ns-1] }

   E. and so on

2. Selection of Weighting Factor $\omega_i = 1/\sigma_i^2$ is calculated from the uncertainty (σ_i) of the i-th data point..
   A. "Unity" : no weighting.
      $\sigma_i = 1$

   B. "Proportional" : the uncertainty of the real component of the data is proportional to its magnitude, and the uncertainty of the imaginary component is proportional to its magnitude
      σ_i = { Zr[0], Zr[1], … Zr[Ns-1], Zi[0], Zi[1], … , Zi[Ns-1] } for "Z: Real & Imag"
      σ_i = { Zr[0], Zr[1], … Zr[Ns-1] } for "Z: Real"
      σ_i = { Zr[0], Zr[1], … Zr[Ns-1], Zi[0], Zi[1], … , Zi[Ns-1] } for "Z: Mag & Phase"
      σ_i = { Yr[0], Yr[1], … Yr[Ns-1], Yi[0], Yi[1], … , Yi[Ns-1] } for "Y: Real & Imag" *1
      and so on…
   C. "Modulus to Data" : the uncertainty of the each data is proportional to its modulus.
      σ_i = { |Z[0]|, |Z[1]|, … |Z[Ns-1]|, |Z[0]|, |Z[1]|, … , |Z[Ns-1]| } for "Z: Real & Imag"
      σ_i = { |Z[0]|, |Z[1]|, … |Z[Ns-1]| } for "Z: Real"
      σ_i = { |Z[0]|, |Z[1]|, … |Z[Ns-1]|, |Z[0]|, |Z[1]|, … , |Z[Ns-1]| } for "Z: Mag & Phase"
      σ_i = { |Y[0]|, |Y[1]|, … |Y[Ns-1]|, |Y[0]|, |Y[1]|, … , |Y[Ns-1]| } for "Y: Real & Imag" *1
      and so on…

**1 I have designed the ZMAN according to a rule that <u>bigger Z, bigger uncertainty.</u> However, please note that this is not valid for Y, E data sequence in current ZMAN version.*