To search for deviations from the SM it is useful to compare measurements involving \( CP \)
violating loop diagrams, where imaginary parts of amplitudes come into play, with
measurements of the sides of triangle. The UT fit group shows in Figure 28 a comparison in
the \( \rho-\eta \) plane of angle measurements with those of the sides of the unitarity triangle. The
overlap regions in both cases are consistent.

![Figure 28](image)

Figure 28: Constraints at 68% confidence level in the \( \rho-\eta \) plane. On the left side are mea-
surements of the \( CP \) violating angles \( \alpha, \beta \) and \( \gamma \) and \( \epsilon_K \) in the neutral kaon system. On the
right side are measurements of \( |V_{ub}|/|V_{cb}| \) and the ratio of \( B_s \) to \( B_d \) mixing. (From the UT fit
group [233]).

It remains to set limits on New Physics. We allow for NP to contribute to the mixing
amplitude of either \( B_d \) or \( B_s \) mesons, which we consider separately. Then the amplitude of this
second order (\( \Delta F = 2 \)) flavor changing interaction can be expressed as

\[
\langle B_q | \mathcal{H}_{\Delta F=2}^{SM+NP} | B_q \rangle = [\text{Re}(\Delta_q) + i\text{Im}(\Delta_q)] \cdot |B_q \rangle | \mathcal{H}_{\Delta F=2}^{SM+NP} | B_q \rangle ,
\]

where \( q \) specifies the type of neutral \( B \) meson, and \( \Delta_q \) gives the relative size of NP to SM
physics. (The SM point has \( \text{Re}(\Delta_q)=1 \) and \( \text{Im}(\Delta_q)=0 \).)

To set limits it is necessary to make some simplifying, but very reasonable, assumptions [235].
We assume that there is no NP in the tree level observables starting with the magnitudes
\( |V_{ud}|, |V_{us},|, |V_{cb}|, \) and \( |V_{ub}| \). Since since \( \gamma \) is measured using tree level \( B^\pm \) decays we include it in this
category. Now we incorporate the measurement of \( \beta \) by noting that \( \alpha = \pi - \gamma - \beta_{\text{meas}} \), allowing