An analytical description of high $\beta_p$ equilibrium with Negative Triangularity in QUEST [Kishore Mishra]

- In QUEST spherical tokamak, negative triangular plasma equilibrium is self organized, naturally at high $\beta_p$ ($\varepsilon \beta_p \sim 1$) during ECRH injection in Ohmic plasma at fixed plasma current.
- As $\beta_p$ is increased, plasma shape becomes more negatively triangular with formation of a natural poloidal field null at the high field side (IPN plasma).
- No external shaping coils are used to enhance the negative triangularity ($\delta$).
- A simple analytical solution of Grad-Shafranov equation is used to investigate such equilibrium.
- The model is in agreement with the experimental results that
  - At a critical $\beta_p^*$ ($\beta_p + l/2$) ~ 3, IPN configuration is formed ($R_{in} > 0.22m$)
  - With decrease in $\delta$, $\beta_p^*$ increases.
  - Negative triangularity is a new feature of plasma self organization near equilibrium limit.

Variation of $\beta_p^*$ with $R_{in}$, triangularity ($\delta$) and triangularity parameter ($T$ in model) for EC heated Ohmic plasma in QUEST

Natural transition of equilibrium at high $\beta_p$ in EC heated Ohmic discharge