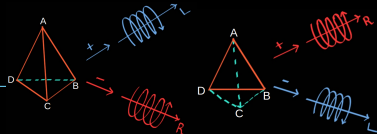


Chiral GW: four points to tell right from left



Scalar-induced tensor perturbations

$$h_{ij} \propto \mathcal{R}^2$$

$$h_{ij}h^{ij} \propto \mathcal{R}^4$$

$$\mathcal{P}_h^I \propto \mathcal{P}_s^2 + \mathcal{T}_{\text{even}}$$

$$\mathcal{P}_h^V \propto \mathcal{T}_{\text{odd}}$$

$$\Pi_k \equiv \frac{\mathcal{P}_h^V}{\mathcal{P}_h^I} \propto \frac{\mathcal{T}_{\text{odd}}}{\mathcal{P}_s^2 + \mathcal{T}_{\text{even}}}$$

Trispectrum:

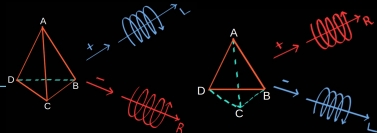
$$\mathcal{T}_{\text{odd}}(\mathbf{k}_1, \mathbf{k}_2, \mathbf{k}_3, \mathbf{k}_4) = i \tilde{g}_{\text{NL}} \beta(\widehat{\mathbf{k}_1 + \mathbf{k}_2}, \hat{\mathbf{k}}_1, \hat{\mathbf{k}}_3) P_{\mathcal{R}}(k_1) P_{\mathcal{R}}(k_3) P_{\mathcal{R}}(|\mathbf{k}_1 + \mathbf{k}_2|) + 23 \text{ permutations}$$

$$\mathcal{T}_{\text{even}}(\mathbf{k}_1, \mathbf{k}_2, \mathbf{k}_3, \mathbf{k}_4) = 2 g_{\text{NL}} P_{\mathcal{R}}(k_1) P_{\mathcal{R}}(k_3) P_{\mathcal{R}}(|\mathbf{k}_1 + \mathbf{k}_2|) + 11 \text{ permutations}$$

• Scale-invariant spectrum: $\mathcal{P}_s(k) = A_s \Rightarrow \boxed{\tilde{g}_{\text{NL}} \leq A_s^{-1}}$

Stokes inequality $\Rightarrow \Pi_k \in [-1, 1]$

Chiral GW: four points to tell right from left



Scalar-induced tensor perturbations

$$\begin{aligned} h_{ij} &\propto \mathcal{R}^2 \\ h_{ij}h^{ij} &\propto \mathcal{R}^4 \\ \mathcal{P}_h^I &\propto \mathcal{P}_s^2 + \mathcal{T}_{\text{even}} \\ \mathcal{P}_h^V &\propto \mathcal{T}_{\text{odd}} \\ \Pi_k \equiv \frac{\mathcal{P}_h^V}{\mathcal{P}_h^I} &\propto \frac{\mathcal{T}_{\text{odd}}}{\mathcal{P}_s^2 + \mathcal{T}_{\text{even}}} \end{aligned}$$

Stokes inequality $\Rightarrow \Pi_k \in [-1, 1]$

Trispectrum:

$$\mathcal{T}_{\text{odd}}(\mathbf{k}_1, \mathbf{k}_2, \mathbf{k}_3, \mathbf{k}_4) = i \tilde{g}_{\text{NL}} \beta(\widehat{\mathbf{k}_1 + \mathbf{k}_2}, \hat{\mathbf{k}}_1, \hat{\mathbf{k}}_3) P_{\mathcal{R}}(k_1) P_{\mathcal{R}}(k_3) P_{\mathcal{R}}(|\mathbf{k}_1 + \mathbf{k}_2|) + 23 \text{ permutations}$$

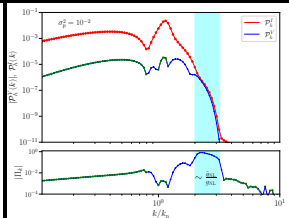
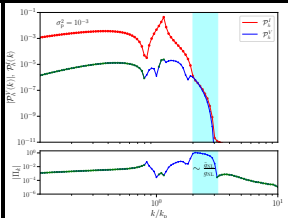
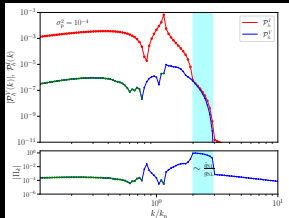
$$\mathcal{T}_{\text{even}}(\mathbf{k}_1, \mathbf{k}_2, \mathbf{k}_3, \mathbf{k}_4) = 2 g_{\text{NL}} P_{\mathcal{R}}(k_1) P_{\mathcal{R}}(k_3) P_{\mathcal{R}}(|\mathbf{k}_1 + \mathbf{k}_2|) + 11 \text{ permutations}$$

• Scale-invariant spectrum: $\mathcal{P}_s(k) = A_s \Rightarrow \tilde{g}_{\text{NL}} \leq A_s^{-1}$

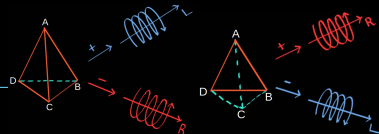
• Peaked spectrum: $\mathcal{P}_s(k) \sim$



$$g_{\text{NL}} = \tilde{g}_{\text{NL}} = 1 \Rightarrow$$



Chiral GW: four points to tell right from left



Scalar-induced tensor perturbations

$$\begin{aligned}
 h_{ij} &\propto \mathcal{R}^2 \\
 h_{ij}h^{ij} &\propto \mathcal{R}^4 \\
 \mathcal{P}_h^I &\propto \mathcal{P}_s^2 + \mathcal{T}_{\text{even}} \\
 \mathcal{P}_h^V &\propto \mathcal{T}_{\text{odd}} \\
 \Pi_k \equiv \frac{\mathcal{P}_h^V}{\mathcal{P}_h^I} &\propto \frac{\mathcal{T}_{\text{odd}}}{\mathcal{P}_s^2 + \mathcal{T}_{\text{even}}}
 \end{aligned}$$

Stokes inequality $\Rightarrow \Pi_k \in [-1, 1]$

Trispectrum:

$$\begin{aligned}
 \mathcal{T}_{\text{odd}}(\mathbf{k}_1, \mathbf{k}_2, \mathbf{k}_3, \mathbf{k}_4) &= i \tilde{g}_{\text{NL}} \left\{ 1 + \frac{\alpha}{\sqrt{2\pi\sigma_t^2}} \exp \left[\frac{-1}{2\sigma_t^2} \ln^2 \left(\frac{k_1 + k_2 + k_3 + k_4}{4k_t} \right) \right] \right\} \\
 &\quad \times \beta(\widehat{\mathbf{k}_1 + \mathbf{k}_2}, \hat{\mathbf{k}}_1, \hat{\mathbf{k}}_3) P(k_1)P(k_3)P(|\mathbf{k}_1 + \mathbf{k}_2|) + \dots \\
 \mathcal{T}_{\text{even}}(\mathbf{k}_1, \mathbf{k}_2, \mathbf{k}_3, \mathbf{k}_4) &= 2 g_{\text{NL}} \left\{ 1 + \frac{\alpha}{\sqrt{2\pi\sigma_t^2}} \exp \left[\frac{-1}{2\sigma_t^2} \ln^2 \left(\frac{k_1 + k_2 + k_3 + k_4}{4k_t} \right) \right] \right\} \\
 &\quad \times P(k_1)P(k_3)P(|\mathbf{k}_1 + \mathbf{k}_2|) + \dots
 \end{aligned}$$

⊙ Peaked spectrum: $\mathcal{P}_s(k) \sim$



$g_{\text{NL}} = \tilde{g}_{\text{NL}} = 1 \Rightarrow$

