# The planar topologies in QCD corrections to Z boson pair production

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# Outline

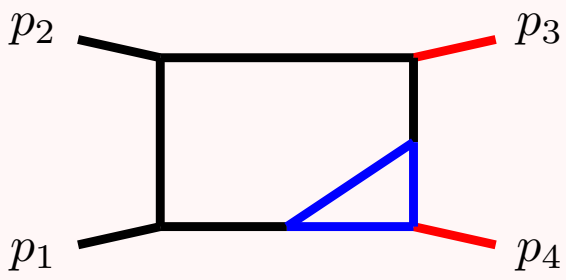
1. The planar topologies in QCD corrections to Z boson pair production

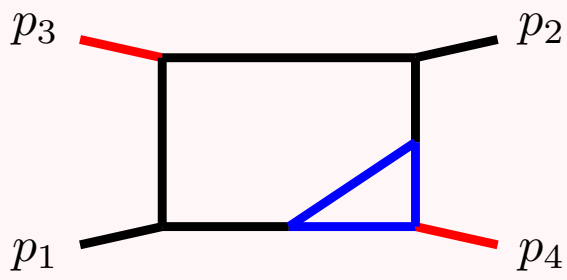
2. Two topologies

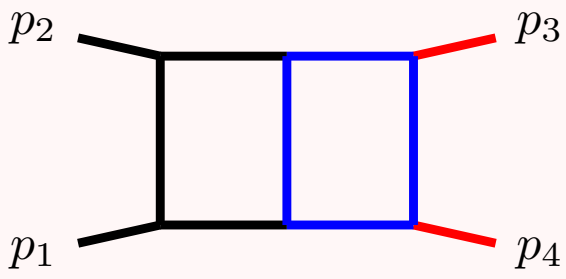
1. The planar topologies in QCD corrections to Z boson pair production

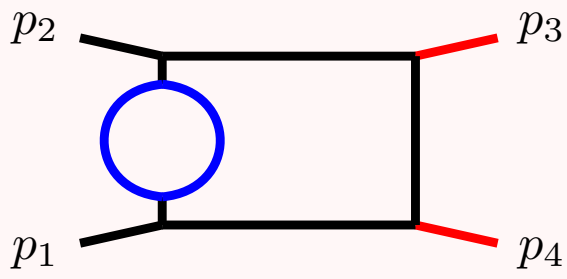
2. Two topologies
   - Roots involved the root

# **Planar** topologies in quark channel

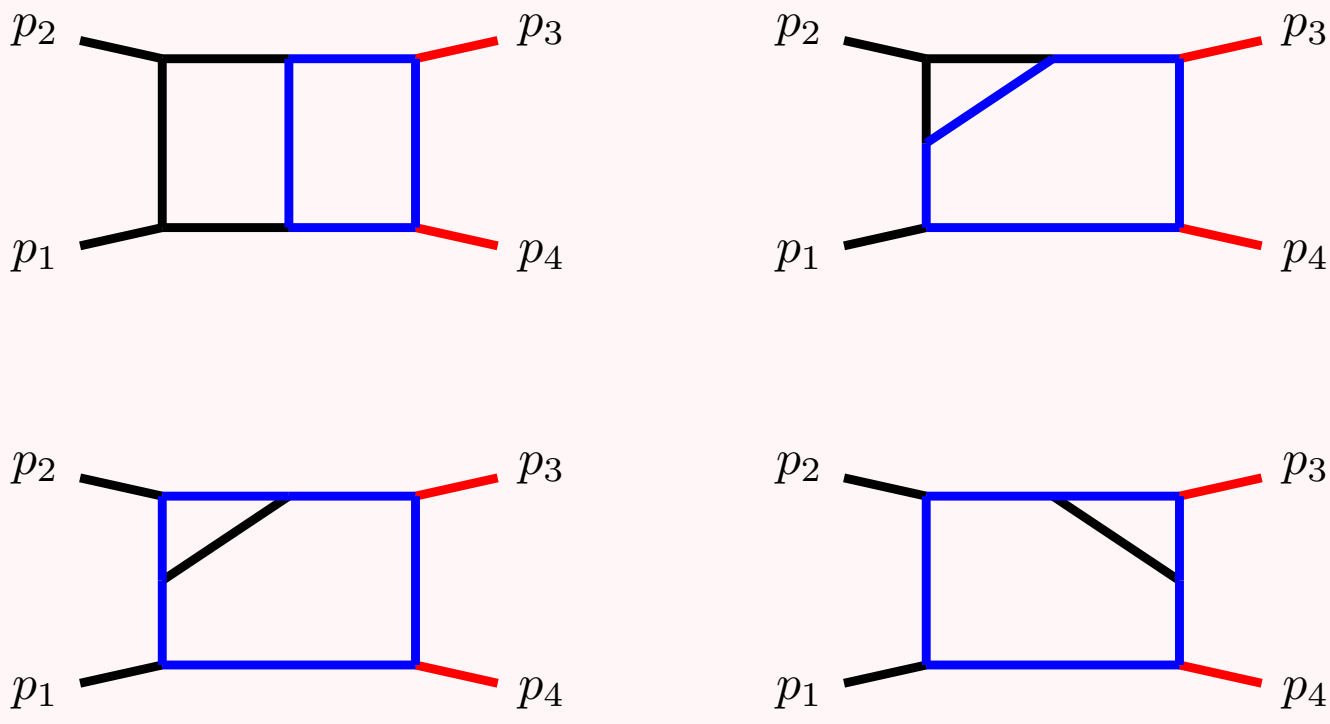


# **Planar** topologies in gluon channel



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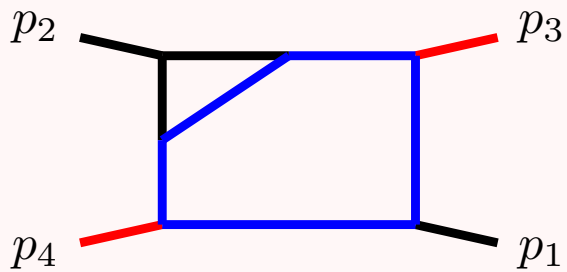


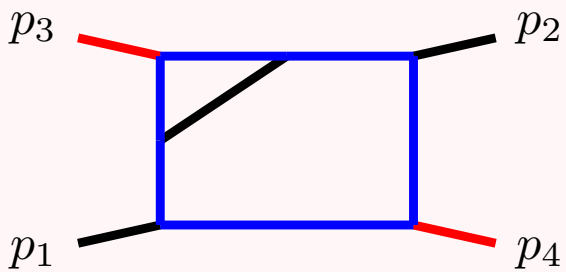


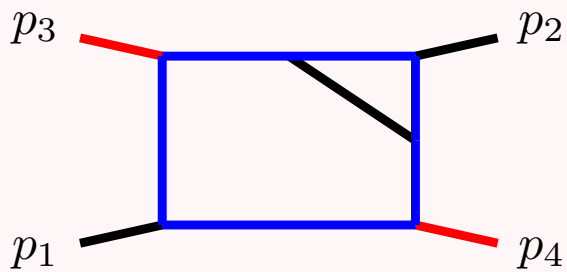

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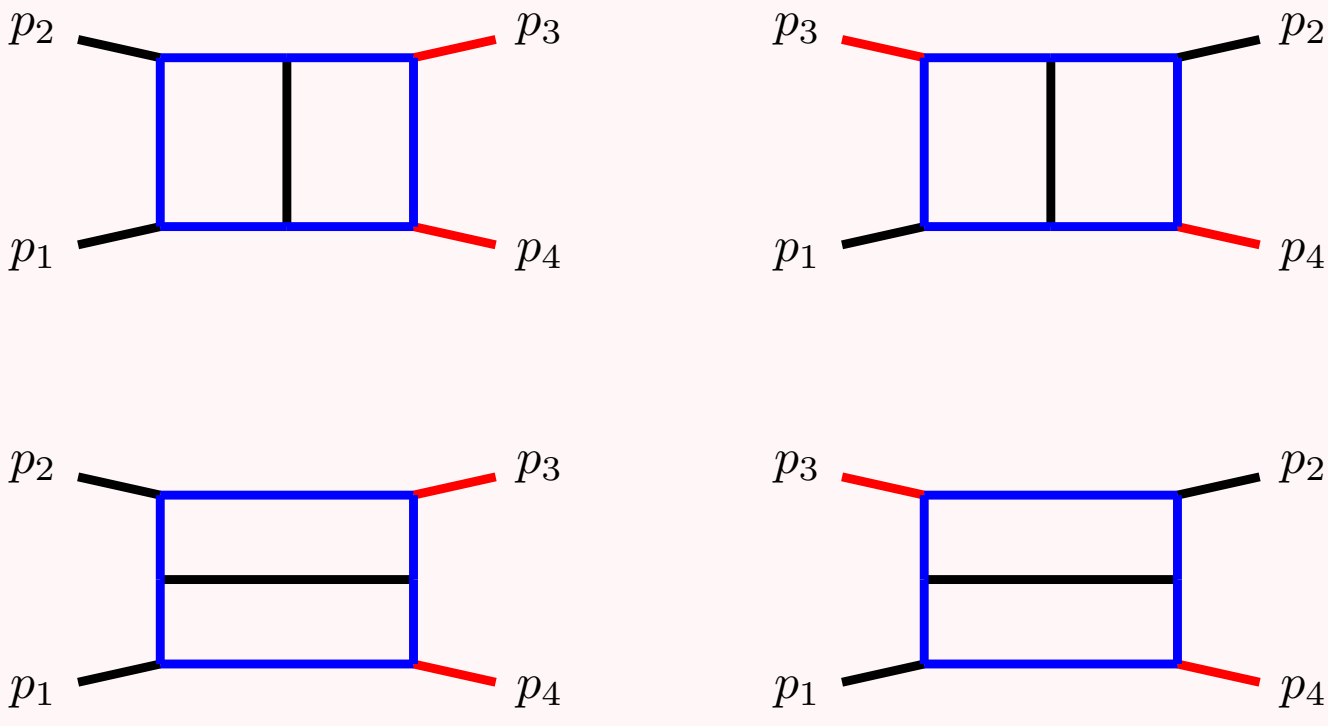

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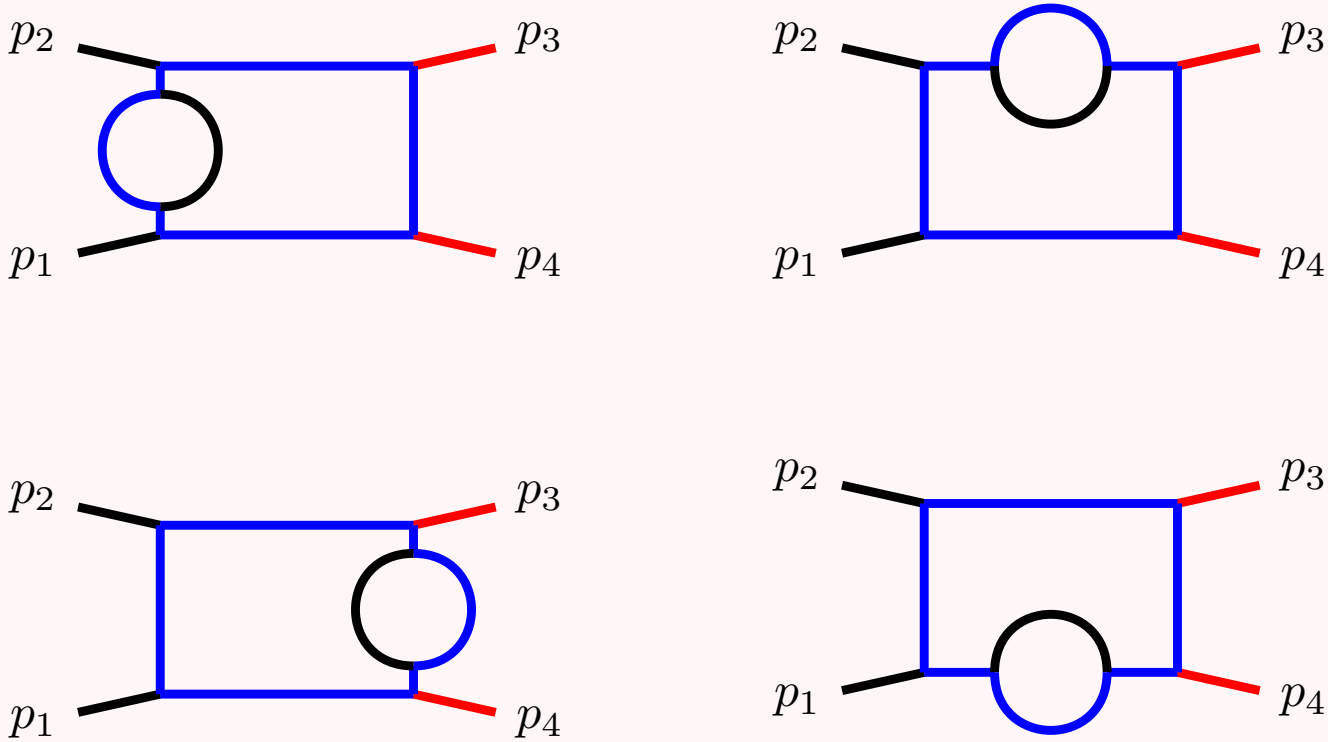

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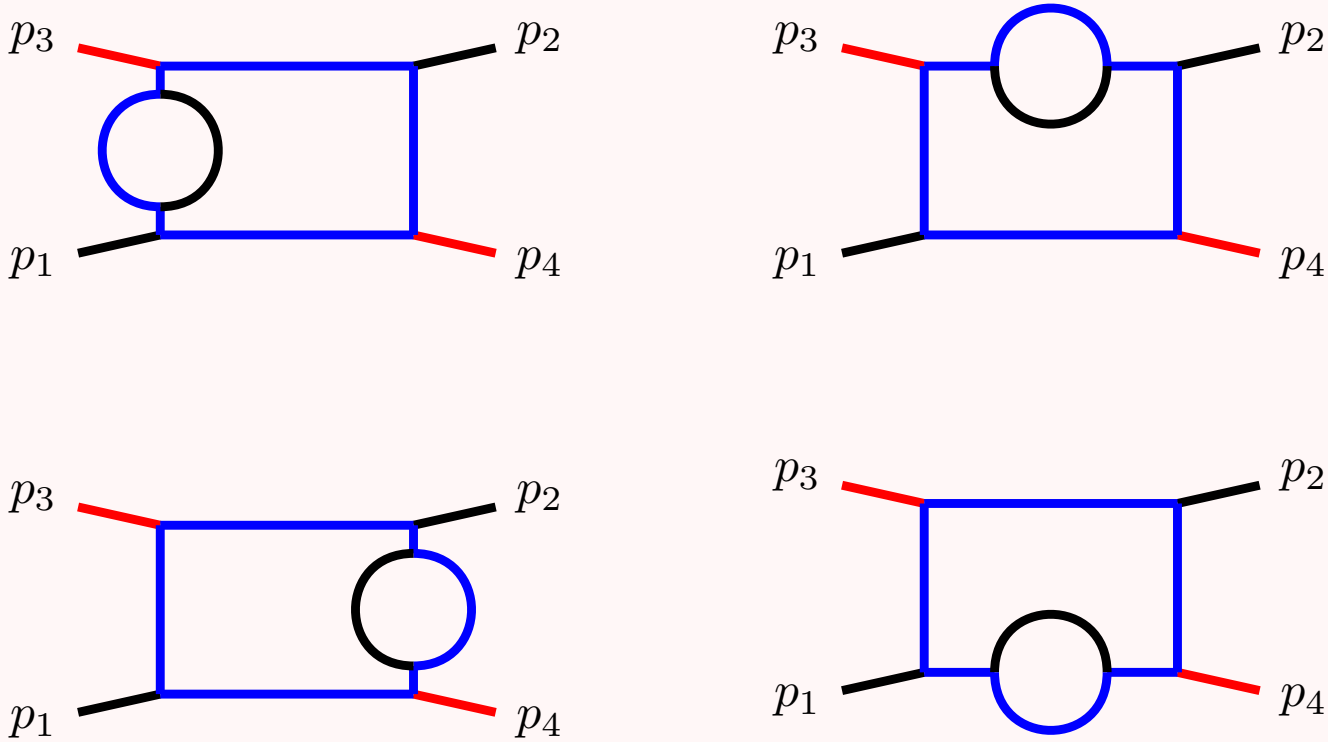

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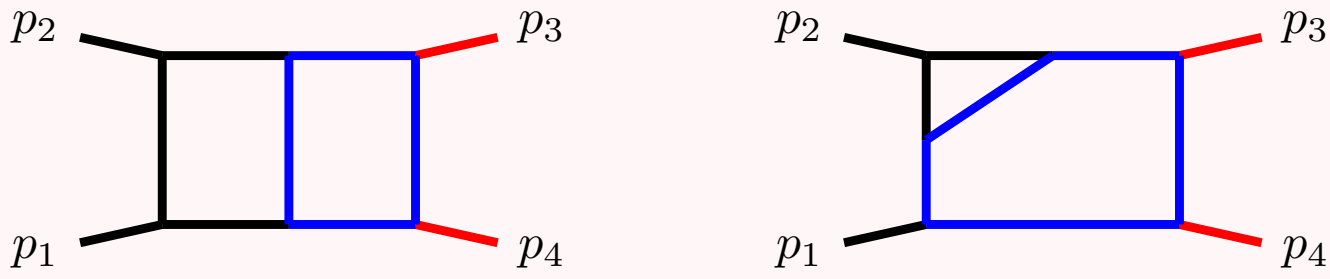



$$D_1 = l_1^2 \qquad D_2 = (l_1 + p_1)^2 \qquad D_3 = (l_1 + p_1 + p_2)^2$$

$$D_4 = (l_2 + p_1 + p_2)^2 - m_t^2 \qquad D_5 = (l_2 - p_4)^2 - m_t^2 \qquad D_6 = l_2^2 - m_t^2$$

$$D_7 = (l_1 - l_2)^2 - m_t^2 \qquad D_8 = (l_2 + p_1)^2 - m_t^2 \qquad D_9 = (l_1 - p_4)^2 - m_t^2$$

# The special sector

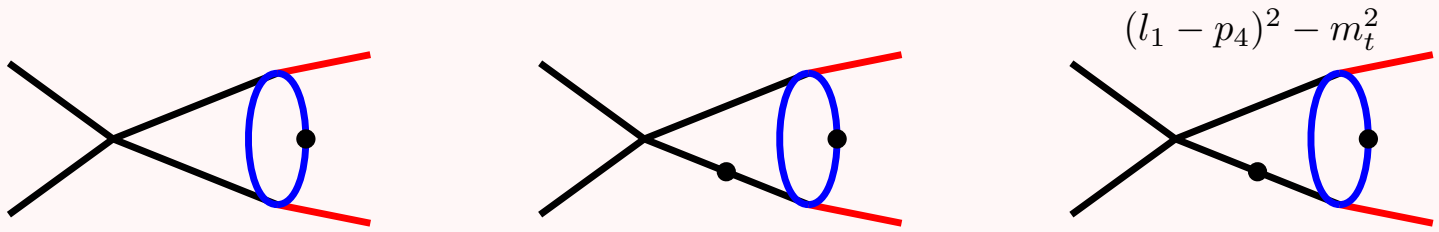
- 56 MIs
- Roots involved the root:

$$\Lambda_1 = \sqrt{(-4m_t^2 + m_Z^2 - \rho)} \quad \Lambda_2 = \sqrt{(4m_t^2 + m_Z^2 - \rho)}$$

$$\Lambda_3 = \sqrt{(-4m_t^2 + m_Z^2 + \rho)} \quad \Lambda_4 = \sqrt{(4m_t^2 + m_Z^2 + \rho)}$$

$$\rho = \sqrt{(4sm_t^2 + (m_Z^2 - 4m_t^2)^2)}$$

# The special sector




$$\mathbb{T}_{19,20,21;19,20,21} = \begin{pmatrix} \lambda_3\epsilon^3 & 0 & 0 \\ -\frac{\Lambda_1\Lambda_2\Lambda_3^2\epsilon^3}{4m_t^2} & \frac{\Lambda_1\Lambda_2\Lambda_3^2\epsilon^2(2\epsilon-1)}{4m_t^2} & -\frac{\Lambda_1\Lambda_2\Lambda_3^2\rho\epsilon^2}{4m_t^2} \\ \frac{\Lambda_3\Lambda_4\epsilon^3\Lambda_1^2}{4m_t^2} & -\frac{\Lambda_3\Lambda_4\epsilon^2(2\epsilon-1)\Lambda_1^2}{4m_t^2} & -\frac{\Lambda_3\Lambda_4\rho\epsilon^2\Lambda_1^2}{4m_t^2} \end{pmatrix}$$

$$\lambda_3 = \sqrt{s(-4m_Z^2 + s)}$$

# Why only these two sectors?

I was young.

# Thanks!