Particle spectrograph

Wave operator and propagator

```
xAct`PSALTer`Private`GraphicsCollage[
```

$$\left\{\begin{array}{c|cccc} & \omega_{0^+}^{\#1} & f_{0^+}^{\#1} & f_{0^+}^{\#2} & \omega_{0^-}^{\#1} \\ \omega_{0^+}^{\#1}\dagger & 6k^2 r_3 & 0 & 0 & 0 \\ f_{0^+}^{\#1}\dagger & 0 & 0 & 0 & 0 \\ f_{0^+}^{\#2}\dagger & 0 & 0 & 0 & 0 \\ \omega_{0^-}^{\#1}\dagger & 0 & 0 & 0 & k^2 r_2 + t_2 \end{array}\right.,$$

```
Join[
```

$$\begin{array}{c|ccccccc} & \omega_{1^+}^{\#1}{}_{\alpha\beta} & \omega_{1^+}^{\#2}{}_{\alpha\beta} & f_{1^+}^{\#1}{}_{\alpha\beta} & \omega_{1^-}^{\#1}{}_{\alpha} & \omega_{1^-}^{\#2}{}_{\alpha} & f_{1^-}^{\#1}{}_{\alpha} & f_{1^-}^{\#2}{}_{\alpha} \\ \omega_{1^+}^{\#1}\dagger^{\alpha\beta} & \frac{2t_2}{3} & \frac{\sqrt{2}\,t_2}{3} & \frac{1}{3}i\sqrt{2}\,k t_2 & 0 & 0 & 0 & 0 \\ \omega_{1^+}^{\#2}\dagger^{\alpha\beta} & \frac{\sqrt{2}\,t_2}{3} & \frac{t_2}{3} & \frac{ik t_2}{3} & 0 & 0 & 0 & 0 \\ f_{1^+}^{\#1}\dagger^{\alpha\beta} & -\frac{1}{3}i\sqrt{2}\,k t_2 & -\frac{1}{3}ik t_2 & \frac{k^2 t_2}{3} & 0 & 0 & 0 & 0 \\ \omega_{1^-}^{\#1}\dagger^{\alpha} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \omega_{1^-}^{\#2}\dagger^{\alpha} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ f_{1^-}^{\#1}\dagger^{\alpha} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ f_{1^-}^{\#2}\dagger^{\alpha} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{array},$$

$$\left\{\begin{array}{c|ccc} & \omega_{2^+}^{\#1}{}_{\alpha\beta} & f_{2^+}^{\#1}{}_{\alpha\beta} & \omega_{2^-}^{\#1}{}_{\alpha\beta\chi} \\ \omega_{2^+}^{\#1}\dagger^{\alpha\beta} & 0 & 0 & 0 \\ f_{2^+}^{\#1}\dagger^{\alpha\beta} & 0 & 0 & 0 \\ \omega_{2^-}^{\#1}\dagger^{\alpha\beta\chi} & 0 & 0 & 0 \end{array}\right\}$$

```
  {AspectRatio → Automatic}],
 Join[548, {AspectRatio → Automatic}, {Null, Null}, {500}]]
```

Massive and massless spectra

```
xAct`PSALTer`Private`GraphicsCollage[{Null, Null},
 Join[548, {AspectRatio → Automatic}, {Null, Null}, {500}]]
```

Unitarity conditions