## **PSALTer results panel**

## Wave operator and propagator

| μ   |                |                     |   |   |   |                                    |             |  |   |  |          |  |        |     |                    |          |  | $^{2^{+}}\mathcal{T}^{\parallel}_{\alpha\beta}$ | 2 <sup>+</sup> W <sub>a</sub>  | $_{lphaeta}$ $^{2^{+}}\mathcal{W}_{s}$ | $\alpha \beta \stackrel{2^+}{\cdot} W_s$                      | $_{\alpha\beta}$ $^{2}W_{a}^{\parallel}{}_{\alpha\beta}$ | $^{2}W_{s}^{\parallel}_{\alpha\beta\chi}$    |   | 0+h <sup>1</sup>                      |   | _   | ${}^{0^+}\mathcal{F}_{a}{}^{\parallel}$ | <sup>0+</sup> ℋ <sub>s</sub> ⊥t | <sup>t 0+</sup> 𝚜₅ ∥ | <sup>0+</sup> ℋ <sub>s</sub> <sup>⊥h</sup>   | <sup>0</sup>                     |  |   |   |   |   |
|---|----------------|---------------------|---|---|---|------------------------------------|-------------|--|---|--|----------|--|--------|-----|--------------------|----------|--|---|--|--|---|--|--|---|---------------------------------------|---|---|---|---------------------------------|----------------------|--|----------------------------------|--|---|---|---|---|
| $^{1}\mathcal{H}_{\mathrm{s}}$                | 0              |                     | 0   | 0 0                                     |   | 0                                  | 0           | 8  |   | I  |          |  |        |     |                    |          | 2 <sup>+</sup> π"† <sup>αβ</sup>                 | $\frac{1}{2c}$                                  | 0  | 0                                      | 0   | 0  | 0  | 0+ h <sup>±</sup> 1                           | <i>C</i> . 2                          | -√3   | 3 c.  | 0                                       | <b>6</b> 0                      | 0                    |  | 0                                |  |   |   |   |   |
| γτh   | 0              | 0                   | 0   | 0 0                                     |   | 0                                  | 0           | J<br>R <sub>s</sub> ⊪  | 0   | 0  | 0        | 0 0  | 0      | 0 0 | 0                  | 0        | $^{2^{+}}W_{a}^{\parallel}\dagger^{lphaeta}$     | 2   | 0  | 0                                      | 0   | 0  | 0  | 0 <sup>+</sup> h <sup>  </sup> 1              | - √3 (                                | $c_{2} - c_{1} + 3$   | $c_1 k^4$   | $3i\sqrt{2}c_1k^2$                      | 0                               | 0                    | 0  | 0                                |  |   |   |   |   |
| 7 7   |                |                     |   |   |   |                                    |             | $\begin{bmatrix} 0 & & & & \\ & 1 \mathcal{A}_{S}^{lt} & 1 \mathcal{A}_{S}^{uh} & 1 \end{bmatrix}$ |   |  |          |  |        |     |                    |          | $^{2^{+}}W_{s}^{\parallel}$ † $^{\alpha\beta}$   |   | 0  | 0                                      | 0   | 0  | 0  | $0^+\mathcal{R}_a{}^\parallel$ 1              | 0                                     | -3 i √2   | $\frac{1}{2}c_1k^3$   | $6c_1k^2$                               | 0                               | 0                    | 0  | 0                                |  |   |   |   |   |
| <b>1</b>                                      | 0              | 0                   | 0   | 0 0                                     | 0   | 0                                  |             |  | 0   | 0  | 0        | 0 0  | 0      | 0 0 | 0                  | 0        | $^{2^{+}}W_{s}^{\perp}$ † $^{\alpha\beta}$       |   | 0  | 0                                      | 0   | 0  | 0  | 0 <sup>+</sup> ℋ <sub>s</sub> <sup>⊥t</sup> 1 | 0                                     | 0   | 0   |   | 0                               | 0                    | 0  | 0                                |  |   |   |   |   |
| τ 1,  |                |                     |   |   |   |                                    |             |  | δ 0   | 0 0  | 0        | 0  | 0      | 0 0 | 0                  | 0        |  |   |  | 0                                      | 0   |  | 0  | <sup>0+</sup> Æ <sub>s</sub> ∥ †              |                                       | 0   | 0   |   | 0                               | 0                    | 0  | 0                                |  |   |   |   |   |
| 1 1 × s                                       |                |                     |   |   |   |                                    |             |  |   |  |          | 0  | +      | +   |                    |          |  |   | 0  | 0                                      |   | 0  |  | $^{0^+}\mathcal{R}_{	extsf{s}}$               | 0                                     | 0   | 0   |   | 0                               | 0                    | 0  | 0                                |  |   |   |   |   |
|   | 0              | 0 0                 | 0   | 0 0                                     | 0   | 0                                  | 0 0         | 2 R  |   |  |          | 0  |        |     |                    |          | $^{2}W_{s}^{\parallel}\dagger^{\alpha\beta\chi}$ | 0   | 0  | 0                                      | 0   | 0  | 0  | <sup>0</sup> . Aa∥ †                          | 0                                     | 0   | 0   |   | 0                               | 0                    | 0  | 0                                |  |   |   |   |   |
| $^{1}\mathcal{W}_{a}$                         | 0 0            | 0                   | 0   | 0 0                                     | 0   | 0                                  | 0 0         | β <sub>¬</sub> β   | 0   | 0  | 0        | 0  | 0      | 0 0 | 0                  | 0        | S ==   | $\int (\mathcal{A}^{lphaeta\chi})$              | W abx  | $_{r}+\mathcal{T}^{lphaeta}$           | $h_{\alpha\beta}$ +   |  |  | $^{3}W_{s}^{\parallel}$                       | αβχ                                   |   | ${}^3\mathcal{A}_{s}{}^{\parallel}{}_{lphaeta_{\lambda}}$   | (                                       |                                 |                      |  |                                  |  |   |   |   |   |
| <del>β</del> = σ                              | 0              |                     | 0   | 0 0                                     |   | 0                                  | 0 0         | 7 1  |   | 0  | 0        | 0 0  | 0      | 0 0 | 0                  | 0        | 3333   |   |  |  | $^{3}-h^{\alpha}_{\alpha}h^{\beta}$                           | <sub>e</sub> )+  | $^{3}W_{s}^{\parallel}\dagger^{\alpha}$      | $\beta \chi$ 0                                | 3 <i>9</i>                            | $A_s^{\parallel} \uparrow^{\alpha\beta\chi}$  | 0   |   |                                 |                      |  |                                  |  |   |   |   |   |
| α 1,  |                |                     | 1 .: 8  |   |   |                                    |             | 1<br>= e   | 0   | 0  | 0        | 0 0  | 0      | 0 0 | 0                  | 0        |  |   | $c_{1}(\partial_{\beta}\partial_{\alpha}h^{\alpha\beta}\partial_{\delta}\partial_{\chi}h^{\chi\delta}$ - |  |   |  | $^{0^{+}}\!\mathcal{T}^{\perp}$              | $^{0^+}\!\mathcal{T}^\parallel$               | ${}^{0^+}\mathcal{W}_a{}^{\parallel}$ | $^{0^{+}}W_{a}^{\parallel}$ $^{0^{+}}W_{s}^{\perp t}$ $^{0^{+}}W_{s}^{\parallel}$ $^{0^{+}}W_{s}^{\perp h}$ $^{0^{+}}W_{s}^{\perp h}$ |   |   |                                 |                      |  |                                  |  |   |   |   |   |
| $^{3}$ $^{1}\mathcal{T}$                      | 0 0            | 0                   | $\frac{1}{2c.}$   | 2 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |   |                                    |             |  |   | $2\partial_{\beta}\partial^{\beta}h^{\alpha}_{\ \ \alpha}\partial_{\delta}\partial_{\chi}h^{\chi\delta}+\partial_{\beta}\mathcal{A}^{\alpha}_{\ \ \alpha}^{\ \beta}$ |          |  |        |     | <sup>0+</sup> T⁻ 1 | 1<br>4c. | $-\frac{\sqrt{3}}{4c}$                           | $\frac{i\sqrt{\frac{3}{2}}k}{4c.}$              | 0  | 0                                      | 0   | 0  |  |   |                                       |   |   |   |                                 |                      |  |                                  |  |   |   |   |   |
| $^{1+}\mathcal{W}_{\mathbf{S}}^{\perp}\alpha$ |                |                     | 0   |   |   |                                    |             | $\alpha\beta$  |   |  |          |  |        |     |                    |          |  |   |  |  | $i \frac{\alpha}{x}^{\delta} - 2(\partial_{\delta}$           |  | 17   | 2   | 4 <i>c</i> .                          | Z   |   |   | Ů                               |                      |  | $^{2^{+}}h^{\parallel}_{\alpha}$ | $\mathcal{A}_{\mathcal{B}} \stackrel{2^+}{\cdot} \mathcal{F}_{a}  _{\alpha \mathcal{B}}$ | $\mathcal{A}_{s}^{l} \mathcal{A}_{s}^{l}_{\alpha\beta}$ | $^{2^{+}}\mathcal{F}_{s}{}^{\perp}{}_{\alpha\beta}$ | $^{2}\mathcal{A}_{a}^{\parallel}_{\alpha\beta\gamma}$ | ${}^{2}\mathcal{A}_{s}^{\parallel}_{\alpha\beta\gamma}$ |
|   | 0 0            | 5 0                 |   | 0 0                                     | 5 0   | 0                                  | 0 0         | 1+<br>S <sub>2</sub> L   |   |  |          |  |        |     |                    |          |  |   |  |  | ' χ<br>h <sup>χδ</sup> - ∂ <sub>δ</sub> ∂ <sup>δ</sup> l      | ~  | <sup>0,+</sup> ∕T <sup>  </sup> 1            | $-\frac{\sqrt{3}}{4c}$                        | $-\frac{1}{4c}$                       | $\frac{i k}{4 \sqrt{2} c}$  | 0   | þ                                       | 0                               | 0                    | 2+h   +                                      |                                  |  | 0 0   | ,   | 0   | 0   |
| $W_{a}^{\perp}$                               |                |                     | 0   |   |   |                                    |             | αβ   |   | 0  | 0        | 0 0  | 0      | 0 0 | 0                  | 0        |  |   |  |  | , (д <sub>б</sub> АХ <sup>б</sup> х                           | ^  | 0+ "   | $i\sqrt{\frac{3}{2}}k$                        | i k                                   | 1 k   | 2   |   | _                               | _                    | <sup>2+</sup> <i>A</i> <sub>a</sub>    †     |                                  | 0  | 0   | 0   | 0   | 0   |
| $\alpha \beta$ 1+c                            | 0 0            | 0                   |   | 0 0                                     | 0   | 0                                  | 0 0         | ) 1+ Pa  | 0   | 0  | 0        | 0 0  | 0      | 0 0 | 0                  | 0        |  |   |  |  | α <sup>(5</sup> 00 · χ<br>η <sup>χδ</sup> -2 ∂ <sub>δ</sub> ∂ |  | <sup>0+</sup> W <sub>a</sub> <sup>  </sup> 1 | 4c.   | 4 √2 c.                               | $\frac{1}{6c_1k^2} - \frac{k^2}{8c_1}$  | 0   | 0                                       | 0                               | 0                    | 2 <sup>+</sup> <i>F</i> l <sub>s</sub>    1  |                                  | 0  | 0   | 0   | 0   | 0   |
| = -   | 0              | 0                   | 0   | 0 0                                     | 0   | 0                                  | 0 0         | $\mathcal{A}_{\mathbf{a}^{\parallel}\alpha\beta}$  | 0   | 0  | 0        | 0 0  | 0      | 0 0 | . 0                | 0        |  |   |  |  |   | **   | 0+ W <sub>s</sub> <sup>⊥t</sup> 1            | 0   | 0                                     | D   | 0   | þ                                       | 0                               | 0                    | 2 <sup>+</sup> A <sub>s</sub> <sup>⊥</sup> † |                                  | 0  | 9   | 0   | 0   | 0   |
| 1+0   | å å            | g                   | σ   | a <sup>T</sup> a <sup>†</sup>           | 8   | +1·                                |             |  |   |  |          | $\partial_{eta}\partial^{eta}h^{lpha}_{lpha}\partial_{\delta}\partial^{\delta}h^{\chi}_{\chi}))[$ $t,\chi,y,z]$ $dzdy$ |        |     |                    |          | 0,*W <sub>s</sub>    †                           |   | 0  | 0                                      | 0   | þ  | 0  | 0   |                                       |   |   |   |                                 |                      | 0  |                                  |  |   |   |   |   |
|   | α+"«×          | $^{+}W_{s}^{\perp}$ | $^{1}\mathcal{T}^{\scriptscriptstyle \perp}$ $^{\dagger}$ | $ \mathcal{M}_a  +^{\alpha}$            | $\frac{1}{2} \frac{W_{a}}{W_{s}} + \frac{1}{4}$ | 1-W <sub>s</sub> lt † <sup>α</sup> | γ th +α (γ) | $\begin{array}{cccccccccccccccccccccccccccccccccccc$   |   |  |          |  |        |     | d x                |          |  |   | <sup>0+</sup> W <sub>s</sub> <sup>⊥h</sup>   |  | 0   | D  | 0  |   | 0                                     | -   | <sup>2</sup> $\mathcal{A}_{a}{}^{\parallel}$ † <sup>c</sup> |   | 0                               | 0                    | 0  | 0                                | 0  |   |   |   |   |
|   | ; <del>z</del> | <b>5</b> 2          | -   | ר ר                                     | 7   | 1,7                                | 1 2         | <u>.</u>   | $\stackrel{^{+}}{\not \!$ | $\overset{\scriptscriptstyle{1}}{\mathcal{R}}$   | +1<br>P2 | $^{1}$   | $^{1}$ | g 1 | $\mathcal{R}^{-1}$ | <u>-</u> |  | d t   |  |  |   |  | <sup>0</sup> -W <sub>a</sub> <sup>  </sup> 1 | 0   | 0                                     | þ   | 0   | þ                                       | 0                               | 0                    | $^{2}\mathcal{A}_{s}^{\parallel}\dagger^{c}$ | 0                                | 0  | 0   | 0   | 0   | 0   |

## **Massive and massless spectra**

(No particles) (No particles)

## **Unitarity conditions**

True