

# OTHER MESONS

## $T_{c\bar{c}1}(3900)$

$$I^G(J^{PC}) = 1^+(1^{+-})$$

was  $Z_c(3900)$ ,  $X(3900)$

$$\text{Mass } m = 3887.1 \pm 2.6 \text{ MeV} \quad (S = 1.7)$$

$$\text{Full width } \Gamma = 28.4 \pm 2.6 \text{ MeV}$$

| $T_{c\bar{c}1}(3900)$ DECAY MODES | Fraction ( $\Gamma_i/\Gamma$ ) | $p$ (MeV/c) |
|-----------------------------------|--------------------------------|-------------|
| $J/\psi \pi$                      | seen                           | 699         |
| $h_c \pi^\pm$                     | not seen                       | 318         |
| $\eta_c \pi^+ \pi^-$              | not seen                       | 758         |
| $\eta_c(1S) \rho(770)^\pm$        | seen                           | —           |
| $(D \bar{D}^*)^\pm$               | seen                           | —           |
| $D^0 D^{*-} + \text{c.c.}$        | seen                           | 152         |
| $D^- D^{*0} + \text{c.c.}$        | seen                           | 143         |
| $\omega \pi^\pm$                  | not seen                       | 1862        |
| $J/\psi \eta$                     | not seen                       | 510         |
| $D^+ D^{*-} + \text{c.c.}$        | seen                           | —           |
| $D^0 \bar{D}^{*0} + \text{c.c.}$  | seen                           | —           |

## $T_{c\bar{c}}(4020)$

$$I^G(J^{PC}) = 1^+(?^{? -})$$

was  $X(4020)$

$$\text{Mass } m = 4024.1 \pm 1.9 \text{ MeV}$$

$$\text{Full width } \Gamma = 13 \pm 5 \text{ MeV} \quad (S = 1.7)$$

| $T_{c\bar{c}}(4020)$ DECAY MODES | Fraction ( $\Gamma_i/\Gamma$ ) | $p$ (MeV/c) |
|----------------------------------|--------------------------------|-------------|
| $h_c(1P) \pi$                    | seen                           | 450         |
| $D^* \bar{D}^*$                  | seen                           | 85          |
| $D \bar{D}^* + \text{c.c.}$      | not seen                       | 542         |
| $\eta_c \pi^+ \pi^-$             | not seen                       | 872         |
| $J/\psi(1S) \pi^\pm$             | not seen                       | 811         |

**$T_{c\bar{c}1}(4430)^+$** 

$$I^G(J^{PC}) = 1^+(1^{+-})$$

$G, C$  need confirmation.

was  $Z_c(4430), X(4430)^\pm$ 

Quantum numbers not established.

$$\text{Mass } m = 4478_{-18}^{+15} \text{ MeV}$$

$$\text{Full width } \Gamma = 181 \pm 31 \text{ MeV}$$

| <b><math>T_{c\bar{c}1}(4430)^+</math> DECAY MODES</b> | Fraction ( $\Gamma_i/\Gamma$ ) | $p$ (MeV/c) |
|---|--------------------------------|-------------|
| $\pi^+ \psi(2S)$                                      | seen                           | 711         |
| $\pi^+ J/\psi$  | seen                           | 1162        |

 **$T_{b\bar{b}1}(10610)$** 

$$I^G(J^{PC}) = 1^+(1^{+-})$$

was  $Z_b(10610), X(10610)$ 

$$\text{Mass } m = 10607.2 \pm 2.0 \text{ MeV}$$

$$\text{Mass } m = 10609 \pm 6 \text{ MeV}$$

$$\text{Full width } \Gamma = 18.4 \pm 2.4 \text{ MeV}$$

| <b><math>T_{b\bar{b}1}(10610)</math> DECAY MODES</b> | Fraction ( $\Gamma_i/\Gamma$ )       | $p$ (MeV/c) |
|--|--------------------------------------|-------------|
| $\Upsilon(1S)\pi^+$                                  | $(5.4_{-1.5}^{+1.9}) \times 10^{-3}$ | 1077        |
| $\Upsilon(1S)\pi^0$                                  | not seen                             | 1077        |
| $\Upsilon(2S)\pi^+$                                  | $(3.6_{-0.8}^{+1.1}) \%$             | 551         |
| $\Upsilon(2S)\pi^0$                                  | seen                                 | 552         |
| $\Upsilon(3S)\pi^+$                                  | $(2.1_{-0.6}^{+0.8}) \%$             | 207         |
| $\Upsilon(3S)\pi^0$                                  | seen                                 | 210         |
| $h_b(1P)\pi^+$                                       | $(3.5_{-0.9}^{+1.2}) \%$             | 671         |
| $h_b(2P)\pi^+$                                       | $(4.7_{-1.3}^{+1.7}) \%$             | 313         |
| $B^+ \bar{B}^0$                                      | not seen                             | 504         |
| $B^+ \bar{B}^{*0} + B^{*+} \bar{B}^0$                | $(85.6_{-2.9}^{+2.1}) \%$            | —           |

**$T_{b\bar{b}1}(10650)^+$** 

$$I^G(J^{PC}) = 1^+(1^+ -)$$

$I, G, C$  need confirmation.

was  $Z_b(10650), X(10650)^\pm$ 

Mass  $m = 10652.2 \pm 1.5$  MeV

Full width  $\Gamma = 11.5 \pm 2.2$  MeV

 $T_{b\bar{b}1}(10650)^-$  decay modes are charge conjugates of the modes below.

| <b><math>T_{b\bar{b}1}(10650)^+</math> DECAY MODES</b> | Fraction ( $\Gamma_i/\Gamma$ )       | $p$ (MeV/c) |
|--|--------------------------------------|-------------|
| $\Upsilon(1S)\pi^+$                                    | $(1.7_{-0.6}^{+0.8}) \times 10^{-3}$ | 1117        |
| $\Upsilon(2S)\pi^+$                                    | $(1.4_{-0.4}^{+0.6}) \%$             | 595         |
| $\Upsilon(3S)\pi^+$                                    | $(1.6_{-0.5}^{+0.7}) \%$             | 259         |
| $h_b(1P)\pi^+$   | $(8.4_{-2.4}^{+2.9}) \%$             | 714         |
| $h_b(2P)\pi^+$   | $(15 \pm 4) \%$                      | 360         |
| $B^+\bar{B}^0$   | not seen                             | 703         |
| $B^+\bar{B}^{*0} + B^{*+}\bar{B}^0$                    | not seen                             | —           |
| $B^{*+}\bar{B}^{*0}$                                   | $(74_{-6}^{+4}) \%$                  | 120         |