

# Technicolor

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The latest unpublished results are described in “Dynamical Electroweak Symmetry Breaking” review.

### MASS LIMITS for Resonances in Models of Dynamical Electroweak Symmetry Breaking

VALUE (GeV)	CL%	DOCUMENT ID	TECN	COMMENT
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
> 703		<sup>1</sup> AAD	13AN ATLS	$pp \rightarrow a_T \rightarrow W\gamma$
> 494		<sup>2</sup> AAD	13AN ATLS	$pp \rightarrow \omega_T \rightarrow Z\gamma$
none 500–1740	95	<sup>3</sup> AAD	13AQ ATLS	top-color $Z'$
>1300	95	<sup>4</sup> CHATRCHYAN	13AP CMS	top-color $Z'$
>2100	95	<sup>3</sup> CHATRCHYAN	13BM CMS	top-color $Z'$
		<sup>5</sup> BAAK	12 RVUE	QCD-like technicolor
none 167–687	95	<sup>6</sup> CHATRCHYAN	12AF CMS	$\rho_T \rightarrow WZ$
> 805	95	<sup>3</sup> AALTONEN	11AD CDF	top-color $Z'$
> 805	95	<sup>3</sup> AALTONEN	11AE CDF	top-color $Z'$
		<sup>7</sup> CHIVUKULA	11 RVUE	top-Higgs
		<sup>8</sup> CHIVUKULA	11A RVUE	techni- $\pi$
		<sup>9</sup> AALTONEN	10I CDF	$\rho\bar{\rho} \rightarrow \rho_T/\omega_T \rightarrow W\pi_T$
none 208–408	95	<sup>10</sup> ABAZOV	10A D0	$\rho_T \rightarrow WZ$
		<sup>11</sup> ABAZOV	07I D0	$\rho\bar{\rho} \rightarrow \rho_T/\omega_T \rightarrow W\pi_T$
> 280	95	<sup>12</sup> ABULENCIA	05A CDF	$\rho_T \rightarrow e^+e^-, \mu^+\mu^-$
		<sup>13</sup> CHEKANOV	02B ZEUS	color octet techni- $\pi$
> 207	95	<sup>14</sup> ABAZOV	01B D0	$\rho_T \rightarrow e^+e^-$
none 90–206.7	95	<sup>15</sup> ABDALLAH	01 DLPH	$e^+e^- \rightarrow \rho_T$
		<sup>16</sup> AFFOLDER	00F CDF	color-singlet techni- $\rho$ , $\rho_T \rightarrow W\pi_T, 2\pi_T$
> 600	95	<sup>17</sup> AFFOLDER	00K CDF	color-octet techni- $\rho$ , $\rho_{T8} \rightarrow 2\pi_{LQ}$
none 350–440	95	<sup>18</sup> ABE	99F CDF	color-octet techni- $\rho$ , $\rho_{T8} \rightarrow \bar{b}b$
		<sup>19</sup> ABE	99N CDF	techni- $\omega, \omega_T \rightarrow \gamma\bar{b}b$
none 260–480	95	<sup>20</sup> ABE	97G CDF	color-octet techni- $\rho$ , $\rho_{T8} \rightarrow 2\text{jets}$

<sup>1</sup> AAD 13AN search for vector techni-resonance  $a_T$  decaying into  $W\gamma$ .

<sup>2</sup> AAD 13AN search for vector techni-resonance  $\omega_T$  decaying into  $Z\gamma$ .

<sup>3</sup> Search for top-color  $Z'$  decaying to  $t\bar{t}$ . The quoted limit is for  $\Gamma_{Z'}/m_{Z'} = 0.012$ .

<sup>4</sup> CHATRCHYAN 13AP search for top-color leptophobic  $Z'$  decaying to  $t\bar{t}$ . The quoted limit is for  $\Gamma_{Z'}/m_{Z'} = 0.012$ .

<sup>5</sup> BAAK 12 give electroweak oblique parameter constraints on the QCD-like technicolor models. See their Fig. 28.

- 6 CHATRCHYAN 12AF search for a vector techni-resonance decaying to  $WZ$ . The limit assumes  $M_{\pi_T} = (3/4) M_{\rho_T} - 25 \text{ GeV}$ . See their Fig. 3 for the limit in  $M_{\pi_T} - M_{\rho_T}$  plane of the low scale technicolor model.
- 7 Using the LHC limit on the Higgs boson production cross section, CHIVUKULA 11 obtain a limit on the top-Higgs mass  $> 300 \text{ GeV}$  at 95% CL assuming 150 GeV top-pion mass.
- 8 Using the LHC limit on the Higgs boson production cross section, CHIVUKULA 11A obtain a limit on the technipion mass ruling out the region  $110 \text{ GeV} < m_P < 2m_t$ . Existence of color techni-fermions, top-color mechanism, and  $N_{TC} \geq 3$  are assumed.
- 9 AALTONEN 10I search for the vector techni-resonances ( $\rho_T, \omega_T$ ) decaying into  $W\pi_T$  with  $W \rightarrow \ell\nu$  and  $\pi_T \rightarrow b\bar{b}, b\bar{c},$  or  $b\bar{u}$ . See their Fig. 3 for the exclusion plot in  $M_{\pi_T} - M_{\rho_T}$  plane.
- 10 ABAZOV 10A search for a vector techni-resonance decaying into  $WZ$ . The limit assumes  $M_{\rho_T} < M_{\pi_T} + M_W$ .
- 11 ABAZOV 07I search for the vector techni-resonances ( $\rho_T, \omega_T$ ) decaying into  $W\pi_T$  with  $W \rightarrow e\nu$  and  $\pi_T \rightarrow b\bar{b}$  or  $b\bar{c}$ . See their Fig. 2 for the exclusion plot in  $M_{\pi_T} - M_{\rho_T}$  plane.
- 12 ABULENCIA 05A search for resonances decaying to electron or muon pairs in  $p\bar{p}$  collisions. at  $\sqrt{s} = 1.96 \text{ TeV}$ . The limit assumes Technicolor-scale mass parameters  $M_V = M_A = 500 \text{ GeV}$ .
- 13 CHEKANOV 02B search for color octet techni- $\pi$   $P$  decaying into dijets in  $e p$  collisions. See their Fig. 5 for the limit on  $\sigma(ep \rightarrow ePX) \cdot B(P \rightarrow 2j)$ .
- 14 ABAZOV 01B searches for vector techni-resonances ( $\rho_T, \omega_T$ ) decaying to  $e^+e^-$ . The limit assumes  $M_{\rho_T} = M_{\omega_T} < M_{\pi_T} + M_W$ .
- 15 The limit is independent of the  $\pi_T$  mass. See their Fig. 9 and Fig. 10 for the exclusion plot in the  $M_{\rho_T} - M_{\pi_T}$  plane. ABDALLAH 01 limit on the techni-pion mass is  $M_{\pi_T} > 79.8 \text{ GeV}$  for  $N_D=2$ , assuming its point-like coupling to gauge bosons.
- 16 AFFOLDER 00F search for  $\rho_T$  decaying into  $W\pi_T$  or  $\pi_T\pi_T$  with  $W \rightarrow \ell\nu$  and  $\pi_T \rightarrow \bar{b}b, \bar{b}c$ . See Fig. 1 in the above Note on "Dynamical Electroweak Symmetry Breaking" for the exclusion plot in the  $M_{\rho_T} - M_{\pi_T}$  plane.
- 17 AFFOLDER 00K search for the  $\rho_{T8}$  decaying into  $\pi_{LQ}\pi_{LQ}$  with  $\pi_{LQ} \rightarrow b\nu$ . For  $\pi_{LQ} \rightarrow c\nu$ , the limit is  $M_{\rho_{T8}} > 510 \text{ GeV}$ . See their Fig. 2 and Fig. 3 for the exclusion plot in the  $M_{\rho_{T8}} - M_{\pi_{LQ}}$  plane.
- 18 ABE 99F search for a new particle  $X$  decaying into  $b\bar{b}$  in  $p\bar{p}$  collisions at  $E_{\text{cm}} = 1.8 \text{ TeV}$ . See Fig. 7 in the above Note on "Dynamical Electroweak Symmetry Breaking" for the upper limit on  $\sigma(p\bar{p} \rightarrow X) \times B(X \rightarrow b\bar{b})$ . ABE 99F also exclude top gluons of width  $\Gamma=0.3M$  in the mass interval  $280 < M < 670 \text{ GeV}$ , of width  $\Gamma=0.5M$  in the mass interval  $340 < M < 640 \text{ GeV}$ , and of width  $\Gamma=0.7M$  in the mass interval  $375 < M < 560 \text{ GeV}$ .
- 19 ABE 99N search for the techni- $\omega$  decaying into  $\gamma\pi_T$ . The technipion is assumed to decay  $\pi_T \rightarrow b\bar{b}$ . See Fig. 2 in the above Note on "Dynamical Electroweak Symmetry Breaking" for the exclusion plot in the  $M_{\omega_T} - M_{\pi_T}$  plane.
- 20 ABE 97G search for a new particle  $X$  decaying into dijets in  $p\bar{p}$  collisions at  $E_{\text{cm}} = 1.8 \text{ TeV}$ . See Fig. 5 in the above Note on "Dynamical Electroweak Symmetry Breaking" for the upper limit on  $\sigma(p\bar{p} \rightarrow X) \times B(X \rightarrow 2j)$ .

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