

# 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The latest unpublished results are described in “Dynamical Electroweak Symmetry Breaking” review.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. ● ● ●				
>805	95	<sup>1</sup> BAAK 12	RVUE	QCD-like technicolor
>805	95	<sup>2</sup> AALTONEN 11AD	CDF	top-color $Z'$
		<sup>2</sup> AALTONEN 11AE	CDF	top-color $Z'$
		<sup>3</sup> CHIVUKULA 11	RVUE	top-Higgs
		<sup>4</sup> CHIVUKULA 11A	RVUE	techni- $\pi$
none 208–408	95	<sup>5</sup> AALTONEN 10I	CDF	$\rho_T \rightarrow W \pi_T$
		<sup>6</sup> ABAZOV 10A	D0	$\rho_T \rightarrow W Z$
		<sup>7</sup> ABAZOV 07I	D0	$\rho_T \rightarrow W \pi_T$
>280	95	<sup>8</sup> ABULENCIA 05A	CDF	$\rho_T \rightarrow e^+ e^-, \mu^+ \mu^-$
		<sup>9</sup> CHEKANOV 02B	ZEUS	color octet techni- $\pi$
>207	95	<sup>10</sup> ABAZOV 01B	D0	$\rho_T \rightarrow e^+ e^-$
none 90–206.7	95	<sup>11</sup> ABDALLAH 01	DLPH	$e^+ e^- \rightarrow \rho_T$
		<sup>12</sup> AFFOLDER 00F	CDF	color-singlet techni- $\rho$ , $\rho_T \rightarrow W \pi_T, 2\pi_T$
>600	95	<sup>13</sup> AFFOLDER 00K	CDF	color-octet techni- $\rho$ , $\rho_{T8} \rightarrow 2\pi_{LQ}$
none 350–440	95	<sup>14</sup> ABE 99F	CDF	color-octet techni- $\rho$ , $\rho_{T8} \rightarrow \bar{b}b$
		<sup>15</sup> ABE 99N	CDF	techni- $\omega, \omega_T \rightarrow \gamma \bar{b}b$
none 260–480	95	<sup>16</sup> ABE 97G	CDF	color-octet techni- $\rho$ , $\rho_{T8} \rightarrow 2\text{jets}$

<sup>1</sup> BAAK 12 give electroweak oblique parameter constraints on the QCD-like technicolor models. See their Fig. 28.

<sup>2</sup> AALTONEN 11AD and AALTONEN 11AE search for top-color  $Z'$  decaying to  $t\bar{t}$ . The quoted limit is for  $Z'_{\text{top}}$  with decay width  $\Gamma = 0.012 M_{Z'}$ .

<sup>3</sup> Using the LHC limit on the Higgs boson production cross section, CHIVUKULA 11 obtain a limit on the top-Higgs mass  $> 300$  GeV at 95% CL assuming 150 GeV top-pion mass.

<sup>4</sup> 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 technifermions, top-color mechanism, and  $N_{TC} \geq 3$  are assumed.

<sup>5</sup> 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.

<sup>6</sup> ABAZOV 10A search for a vector techni-resonance decaying into  $W Z$ . The limit assumes  $M_{\rho_T} < M_{\pi_T} + M_W$ .

- <sup>7</sup> 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.
- <sup>8</sup> ABULENCIA 05A search for resonances decaying to electron or muon pairs in  $p\bar{p}$  collisions. at  $\sqrt{s} = 1.96$  TeV. The limit assumes Technicolor-scale mass parameters  $M_V = M_A = 500$  GeV.
- <sup>9</sup> CHEKANOV 02B search for color octet techni- $\pi$   $P$  decaying into dijets in  $ep$  collisions. See their Fig. 5 for the limit on  $\sigma(ep \rightarrow ePX) \cdot B(P \rightarrow 2j)$ .
- <sup>10</sup> ABAZOV 01B searches for vector techni-resonances ( $\rho_T, \omega_T$ ) decaying to  $e^+e^-$ . The limit assumes  $M_{\rho_T} = M_{\omega_T} < M_{\pi_T} + M_W$ .
- <sup>11</sup> 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  $M_{\pi_T} > 79.8$  GeV for  $N_D=2$ , assuming its point-like coupling to gauge bosons.
- <sup>12</sup> 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.
- <sup>13</sup> 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  $M_{\rho_{T8}} > 510$  GeV. See their Fig. 2 and Fig. 3 for the exclusion plot in the  $M_{\rho_{T8}} - M_{\pi_{LQ}}$  plane.
- <sup>14</sup> ABE 99F search for a new particle  $X$  decaying into  $b\bar{b}$  in  $p\bar{p}$  collisions at  $E_{\text{cm}} = 1.8$  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  $280 < M < 670$  GeV, of width  $\Gamma=0.5M$  in the mass interval  $340 < M < 640$  GeV, and of width  $\Gamma=0.7M$  in the mass interval  $375 < M < 560$  GeV.
- <sup>15</sup> 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.
- <sup>16</sup> ABE 97G search for a new particle  $X$  decaying into dijets in  $p\bar{p}$  collisions at  $E_{\text{cm}} = 1.8$  TeV. See Fig. 5 in the above Note on "Dynamical Electroweak Symmetry Breaking" for the upper limit on  $\sigma(p\bar{p} \rightarrow X) \times B(X \rightarrow 2j)$ .

## REFERENCES FOR Technicolor

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CHIVUKULA	11A	PR D84 115025	R. S. Chivukula <i>et al.</i>	
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AFFOLDER	00F	PRL 84 1110	T. Affolder <i>et al.</i>	(CDF Collab.)
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ABE	99F	PRL 82 2038	F. Abe <i>et al.</i>	(CDF Collab.)
ABE	99N	PRL 83 3124	F. Abe <i>et al.</i>	(CDF Collab.)
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