

# Biphenyl

Leading Resolution in LC  
for Clinical and Forensic Applications



Includes  
synthetic  
cannabinoid  
applications!

**RESTEK**

**Chromatography Products**

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# Biphenyl Columns

## Greater Versatility—Increased Method Performance



BIPHENYL

- Optimized for a wider range of compound chemistries compared to a C18 or phenyl column.
- Perfect for drugs of abuse, pharmaceuticals, metabolites, and more.
- Ultra Biphenyl columns are lot tested with a comprehensive drug panel to ensure confidence in method reproducibility.

Biphenyl columns are unique as they combine the performance of a traditional alkyl phase (C8 or C18) with that of a phenyl phase, providing unmatched versatility for clinical and forensic applications. This new phase offers excellent retention for both polar and nonpolar compounds because of the innovative end-to-end bonding of phenyl groups using an aryl linker instead of a straight chain hexyl linker. The overall result is a phase that offers the highest degree of aromatic selectivity and hydrophobic retention of any phenyl phase. To ensure reproducibility for demanding LC/MS/MS methods, each bonded lot of Ultra Biphenyl phase is tested by LC/MS with a multiclass drug panel as part of our rigorous QA process. Get optimal performance for clinical and forensic applications with versatile Biphenyl columns—**no other phase can provide both C18- and phenyl-like performance in a single column.**

### Benzodiazepines in Hydrolyzed Urine on Ultra Biphenyl

Analyze 19 benzodiazepines  
in 4.5 minutes on a  
robust, cost-effective  
5  $\mu$ m column!

Peaks	RT (min.)	MRM1	MRM2	MRM3
1. 7-Aminoclonazepam	0.59	286.0/250.3	286.0/222.2	286.0/121.0
2. 7-Aminoflunitrazepam	0.77	284.2/135.2	284.2/240.2	284.2/226.1
3. Bromazepam	1.10	315.9/182.0	315.9/209.1	315.9/260.9
4. N-Desmethylflunitrazepam	1.71	300.0/254.1	300.0/225.2	300.0/198.0
5. Nitrazepam	1.69	282.1/236.1	282.1/207.2	282.1/180.0
6. Lorazepam	1.71	321.0/302.9	321.0/275.1	321.0/229.1
7. 2-Hydroxyethylflurazepam	1.79	333.1/246.1	333.1/166.0	333.1/109.1
8. Nordiazepam	1.78	271.0/140.0	271.0/208.0	271.0/225.9
9. Estazolam	1.88	294.9/267.1	294.9/241.0	294.9/138.0
10. Desalkylflurazepam	1.90	289.0/140.0	289.0/165.1	289.0/226.0
11. Clonazepam	1.92	315.9/270.2	315.9/214.1	315.9/207.1
12. Alprazolam	1.99	309.4/281.1	309.4/205.0	309.4/274.1
13. Midazolam	1.26	326.1/291.2	326.1/244.2	326.1/209.0
14. Triazolam	2.06	343.1/315.0	343.1/308.2	343.1/239.2
15. Temazepam	2.13	301.2/283.1	301.2/255.1	301.2/228.1
16. Flurazepam	1.34	388.1/315.1	388.1/288.2	388.1/317.1
17. Flunitrazepam	2.24	314.4/211.0	314.4/239.1	314.4/268.1
18. Clobazam	2.26	301.1/259.1	301.1/224.0	301.1/181.1
19. Diazepam-D5 (IS)	2.42	290.0/154.1	—	—
20. Diazepam	2.45	284.8/193.1	284.8/222.2	284.8/257.1

**Column:** Ultra Biphenyl (cat.# 9109552); Dimensions: 50 mm x 2.1 mm ID; Particle Size: 5  $\mu$ m; Pore Size: 100  $\text{\AA}$ ; Temp.: 40  $^{\circ}\text{C}$ ; **Sample:** Diluent: Starting mobile phase + 30 ng/mL IS; Conc.: 100 ng/mL sample was diluted 20x prior to injection; Inj. Vol.: 30  $\mu$ L

**Mobile Phase:** A: Water + 2 mM ammonium formate + 0.2% formic acid  
B: Acetonitrile + 10% water + 2 mM ammonium formate + 0.2% formic acid

Time (min.)	Flow (mL/min.)	%A	%B
0	0.6	70	30
3.0	0.6	40	60
3.1	0.6	5	95
3.5	0.6	5	95
3.6	0.6	70	30
4.5	stop		

**Detector:** AB SCIEX API 4000 MS/MS; Model #: API 4000; Ion Source: TurboIonSpray $^{\circ}$ ; Ion Mode: ESI+; Ion Spray Voltage: 2 kV; Curtain Gas: 40 psi (275.8 kPa); Gas 1: 40 psi (275.8 kPa); Gas 2: 40 psi (275.8 kPa); Source Temp.: 600  $^{\circ}\text{C}$ ; **Instrument:** Applied Biosystems/MDS Sciex LC/MS/MS System; **Notes:** MS/MS instrument was operated in scheduled MRM mode.

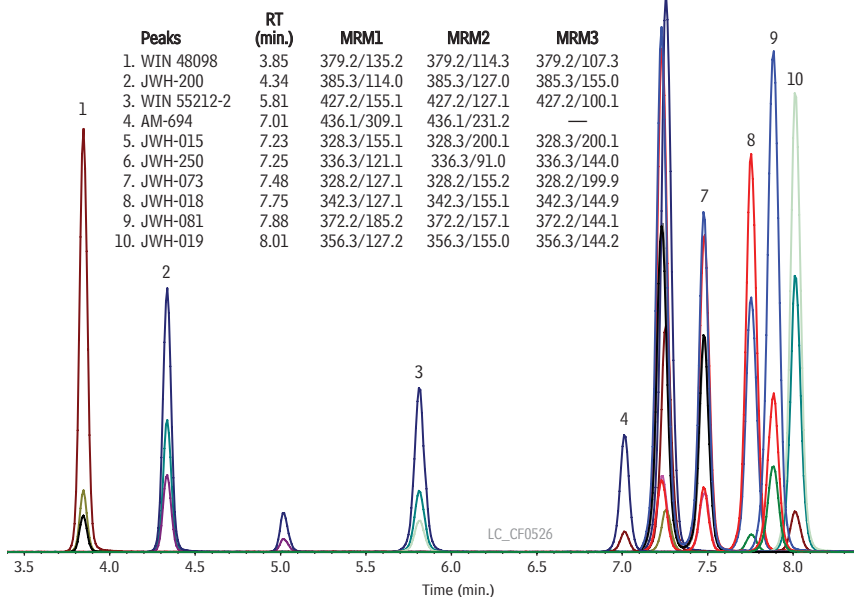


LC\_CF0525



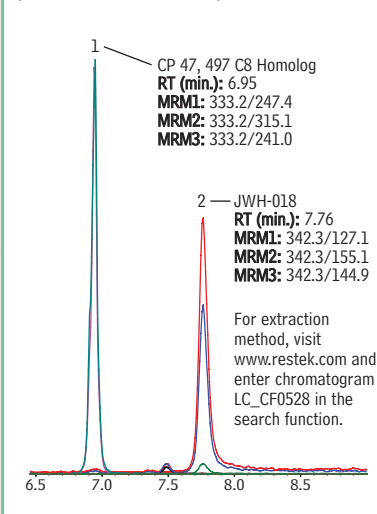
## Synthetic Cannabinoids on Ultra Biphenyl

### Standards



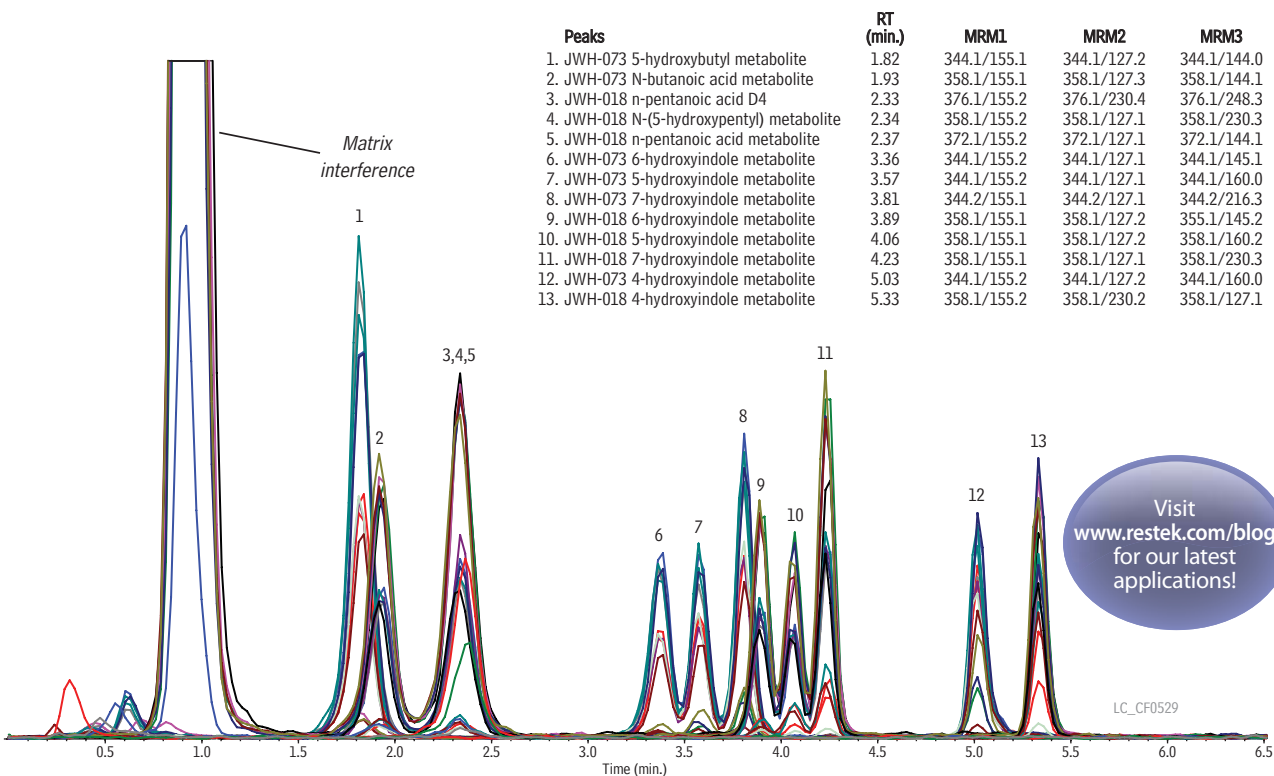
### Spice Gold Sample

(Methanol Extract)



**Column:** Ultra Biphenyl (cat.# 9109552); Dimensions: 50 mm x 2.1 mm ID; Particle Size: 5  $\mu$ m; Pore Size: 100  $\text{\AA}$ ; Temp.: 40  $^{\circ}$ C; **Sample:** Diluent: Methanol; Conc.: 50 ng/mL; Inj. Vol.: 5  $\mu$ L; **Detector:** AB SCIEX API 4000 MS/MS; Model #: API 4000; Ion Source: TurboIonSpray<sup>®</sup>; Ion Mode: ESI+; Ion Spray Voltage: 3000 kV; Curtain Gas: 40 psi (275.8 kPa); Gas 1: 40 psi (275.8 kPa); Gas 2: 40 psi (275.8 kPa); Interface Temp.: 600  $^{\circ}$ C; Mode: MRM; Dwell Time: 10 ms; **Instrument:** Applied Biosystems/MDS Sciex LC/MS/MS System

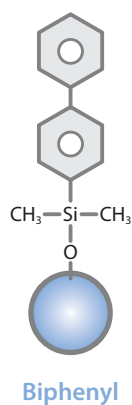
## Synthetic Cannabinoid Metabolites in Hydrolyzed Urine on Pinnacle<sup>®</sup> DB Biphenyl



**Column:** Pinnacle<sup>®</sup> DB Biphenyl (cat.# 9409552); Dimensions: 50 mm x 2.1 mm ID; Particle Size: 5  $\mu$ m; Pore Size: 140  $\text{\AA}$ ; Temp.: 25  $^{\circ}$ C  
For complete conditions, visit [www.restek.com](http://www.restek.com) and enter chromatogram LC\_CF0529 in the search function.

Visit [www.restek.com/blog](http://www.restek.com/blog) for our latest applications!





## Ultra Biphenyl Columns (USP L11)

### Physical Characteristics:

particle size: 3 $\mu$ m or 5 $\mu$ m, spherical  
pore size: 100Å

carbon load: 15%  
endcap: fully endcapped

pH range: 2.5 to 8  
temperature limit: 80°C

Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
<b>3<math>\mu</math>m Columns</b>				
30mm	9109331	9109332	9109333	9109335
50mm	9109351	9109352	9109353	9109355
100mm	9109311	9109312	9109313	9109315
150mm	9109361	9109362	9109363	9109365
<b>5<math>\mu</math>m Columns</b>				
30mm	9109531	9109532	9109533	9109535
50mm	9109551	9109552	9109553	9109555
100mm	9109511	9109512	9109513	9109515
150mm	9109561	9109562	9109563	9109565
200mm	9109521	9109522	9109523	9109525
250mm	9109571	9109572	9109573	9109575

## Ultra Biphenyl Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)
Ultra Biphenyl Guard Cartridge	910950212	910950210	910950222	910950220

## Pinnacle® DB Biphenyl Columns (USP L11)

### Physical Characteristics:

particle size: 1.9 $\mu$ m, 3 $\mu$ m, or 5 $\mu$ m, spherical  
pore size: 140Å

carbon load: 8%  
endcap: yes

pH range: 2.5 to 8  
temperature limit: 80°C

Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
<b>1.9<math>\mu</math>m Columns</b>				
30mm		9409232		
50mm		9409252		
100mm		9409212		
<b>3<math>\mu</math>m Columns</b>				
30mm	9409331	9409332	9409333	9409335
50mm	9409351	9409352	9409353	9409355
100mm	9409311	9409312	9409313	9409315
150mm	9409361	9409362	9409363	9409365
<b>5<math>\mu</math>m Columns</b>				
30mm	9409531	9409532	9409533	9409535
50mm	9409551	9409552	9409553	9409555
100mm	9409511	9409512	9409513	9409515
150mm	9409561	9409562	9409563	9409565
200mm	9409521	9409522	9409523	9409525
250mm	9409571	9409572	9409573	9409575

## Pinnacle® DB Biphenyl Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)
Pinnacle DB Biphenyl Guard Cartridge	940950212	940950210	940950222	940950220

### PATENTS & TRADEMARKS

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for more information visit [www.restek.com/biphenyl](http://www.restek.com/biphenyl)

# RESTEK

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