

## RTL Daily Check Source Strip

### *Datasheet*

Source standard is a 10cm x 2cm laminated strip of printer paper. Laminate thickness and composition ensure that  $\beta$  particles are emitted. The  $^{137}\text{Cs}$  spots are placed on the strip at 1cm, 5cm, and 7cm distance from one side of the strip (see Figure 1). The spots of radioactivity are within the red dots at the centers of the three trefoil icons shown in the picture.



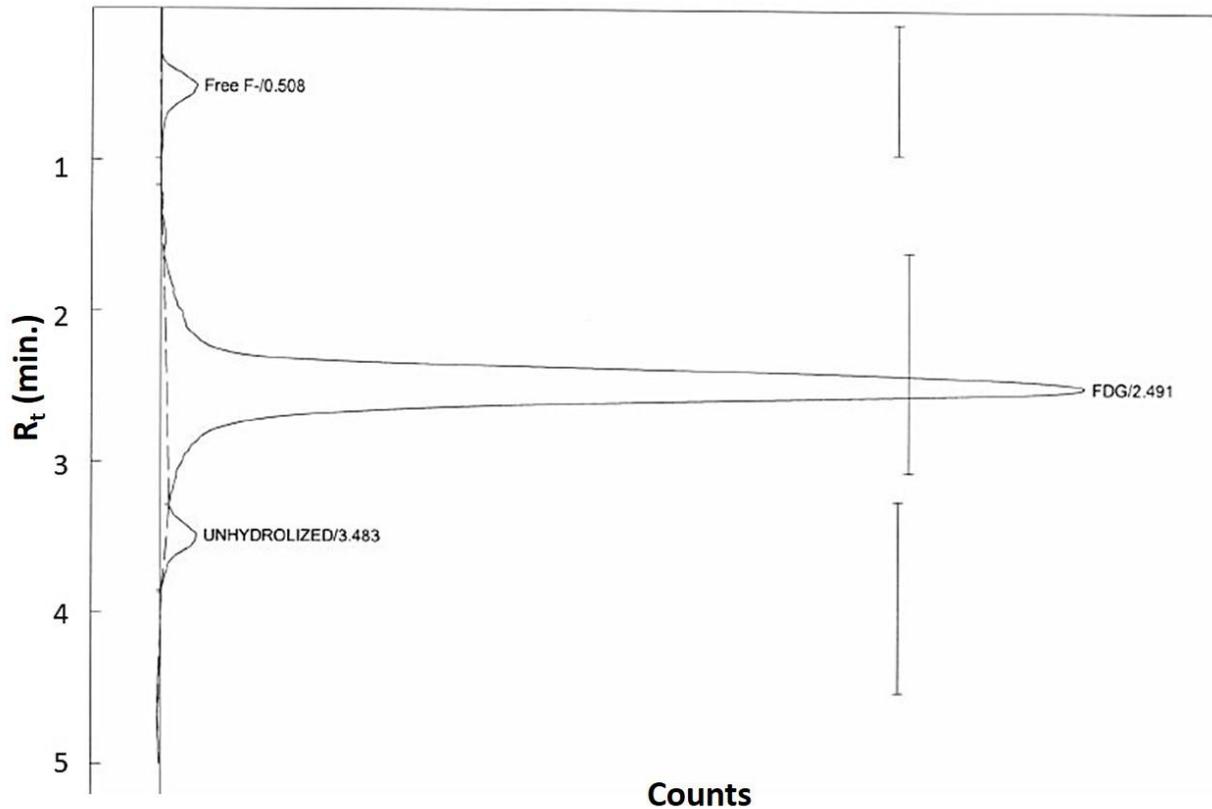
**Figure 1. Picture of RTL Daily Check Source Strip. Distances of red dots (point sources of activity) are 1cm, 5cm, and 7cm (+/- 0.05cm) from the right side of the strip of paper.**

Activity amounts of spots are in ratios of 2.5:95.0:2.5 in order to mimic FDG quality control tests for production purposes.  $^{137}\text{Cs}$   $\beta$ - and  $\gamma$ -emissions allow for convenient, efficient, and accurate verification of any RTL instrument for spatial, constancy, and accuracy parameters. Total activity of the strips ranges from  $\sim 0.247 \mu\text{Ci}$  (9kBq) to  $\sim 10 \mu\text{Ci}$  (370 kBq). These activities are chosen to provide good statistical analytics in short instrument operation intervals, but also remain as low as possible to facilitate shipping of item.

**Note: Activity of strip is highly dependent on instrument on which it will be used and shipping destination. If you are interested in purchasing a strip and or possible activities available, please contact Cyclomedical International Inc. at [RTLcorder@cyclomedical.com](mailto:RTLcorder@cyclomedical.com).**

## Sample data and analytics:

Sample data and analytics for a prototype RTLC Daily Check Source Strip were taken on a Carroll & Ramsey EZScan at Wisconsin Medical Cyclotron in West Allis, Wi. A sample chromatogram of the source strip can be seen in Figure 2.



**Figure 2. RTLC chromatogram of RTLC Daily Check Source Strip. The chromatogram was taken on a Carroll & Ramsey EZScan chromatograph. The bed speed of the device is  $\sim 2\text{cm}/\text{min}$ . The resultant location of the peaks are 1.016 cm, 4.982 cm, and 6.966 cm.**

The instrument was checked for precision by running the strip ten times and constancy by running the strip 3 times each on three consecutive days. The resulting data showed that the EZScan had relative standard deviations for retention time, area, and % area of 0.4% - 2.8%, 1.7% - 6.5%, and 0.2% - 6.1%, respectively. Also, the percent activity of total activity for each of the three peaks were measured as 3.5%, 93.9%, and 2.6%, respectively. See Figure 3 for a spreadsheet of RTLC precision data. Constancy result indicated that the EZScan ranged from 1.6% - 4.5% based on the expected value peak areas on a daily basis. See Figure 4 for a spreadsheet of RTLC constancy data.

## Cyclomedical International, Inc.

### Cesium-137 RTLC Strip Source Prototype

2 May, 2016 Wisconsin Medical Cyclotron

Component	Retention Time (min)	Retention Distance (cm)	Area	Area %	Dev. From Desired (cm)	
Free Fluoride	0.5080	1.02616	53.4125	3.4814	0.02616	
	0.5410	1.09282	61.0130	3.8519	0.09282	
	0.5500	1.11100	51.8965	3.3200	0.11100	
	0.5410	1.09282	54.5895	3.4998	0.09282	
	0.5500	1.11100	55.2775	3.5501	0.11100	
	0.5410	1.09282	57.4450	3.6732	0.09282	
	0.5330	1.07666	60.6065	3.8384	0.07666	
	0.5410	1.09282	50.8600	3.2481	0.09282	
	0.5410	1.09282	55.1330	3.3727	0.09282	
	0.5080	1.02616	51.2497	3.3203	0.02616	
<b>Ave.</b>	<b>0.5354</b>	<b>1.08151</b>	<b>55.1483</b>	<b>3.5156</b>	<b>0.08151</b>	
<b>Stand. Dev.</b>	<b>0.0152</b>	<b>0.0308</b>	<b>3.6050</b>	<b>0.2142</b>	<b>0.03079</b>	
<b>Rel. Stan.Dev</b>	<b>2.847</b>	<b>2.847</b>	<b>6.5370</b>	<b>6.094</b>		
Component	Retention Time (min)	Retention Distance (cm)	Area	Area %	Dev. From Desired (cm)	
FDG	2.4830	5.01566	1442.8190	94.0417	0.01566	
	2.4910	5.03182	1483.0450	93.6273	0.03182	
	2.4910	5.03182	1469.4775	94.0063	0.03182	
	2.5000	5.05000	1463.8715	93.8516	0.05000	
	2.4910	5.03182	1459.9510	93.7631	0.03182	
	2.4910	5.03182	1463.1530	93.5587	0.03182	
	2.4910	5.03182	1479.6820	93.7131	0.03182	
	2.5000	5.05000	1473.2400	94.0863	0.05000	
	2.5080	5.06616	1533.2162	93.7923	0.06616	
	2.4910	5.03182	1451.8260	94.0579	0.03182	
	<b>Ave.</b>	<b>2.4937</b>	<b>5.03727</b>	<b>1472.0281</b>	<b>93.8498</b>	<b>0.03727</b>
	<b>Stand. Dev.</b>	<b>0.0070</b>	<b>0.0142</b>	<b>24.6855</b>	<b>0.1898</b>	<b>0.01416</b>
<b>Rel. Stan.Dev</b>	<b>0.281</b>	<b>0.281</b>	<b>1.6770</b>	<b>0.202</b>		
Component	Retention Time (min)	Retention Distance (cm)	Area	Area %	Dev. From Desired (cm)	
Unhydrolyzed	3.5160	7.10232	38.0015	2.4769	0.10232	
	3.5080	7.08616	39.9297	2.5208	0.08616	
	3.4830	7.03566	41.7960	2.6738	0.03566	
	3.4910	7.05182	41.3120	2.6486	0.05182	
	3.5250	7.12050	41.8357	2.6868	0.12050	
	3.4830	7.03566	43.2895	2.7681	0.03566	
	3.4910	7.05182	38.6605	2.4485	0.05182	
	3.4830	7.03566	41.7390	2.6656	0.03566	
	3.5000	7.07000	46.3440	2.8350	0.07000	
	3.4830	7.03566	40.4695	2.6219	0.03566	
	<b>Ave.</b>	<b>3.4963</b>	<b>7.06253</b>	<b>41.3377</b>	<b>2.6346</b>	<b>0.06253</b>
	<b>Stand. Dev.</b>	<b>0.0154</b>	<b>0.0310</b>	<b>2.3694</b>	<b>0.1229</b>	<b>0.03105</b>
<b>Rel. Stan.Dev</b>	<b>0.440</b>	<b>0.440</b>	<b>5.7318</b>	<b>4.666</b>		

Figure 3. EZScan Precision data using RTLC Daily Check Source Strip.

**Cyclomedical International, Inc.**

**Cesium-137 RTLC Strip Source Prototype**

2 May, 2016 Wisconsin Medical Cyclotron

Component	Retention Time (min)	Retention Distance (cm)	Area	Area %	Date			
Free Fluoride	0.533	1.077	59.451	3.475	2-May-16			
	0.541	1.093	59.135	3.419	2-May-16			
	0.525	1.061	59.421	3.438	2-May-16	Ave. Area	Expected	Deviation
						59.335	----	----
	0.525	1.061	58.957	3.556	3-May-16			
	0.500	1.010	52.474	3.207	3-May-16			
	0.533	1.077	58.596	3.518	3-May-16	Ave. Area	Expected	Deviation
						56.675	59.33172	4.48%
	0.516	1.042	60.972	3.603	4-May-16			
	0.541	1.093	58.635	3.447	4-May-16			
FDG	0.525	1.061	58.924	3.493	4-May-16	Ave. Area	Expected	Deviation
						59.510	59.32797	-0.31%
	2.508	5.066	1603.391	93.721	2-May-16			
	2.500	5.050	1620.705	93.712	2-May-16			
	2.483	5.016	1620.445	93.763	2-May-16	Ave. Area	Expected	Deviation
						1614.847	----	----
	2.483	5.016	1549.961	93.484	3-May-16			
	2.483	5.016	1539.959	94.108	3-May-16			
	2.483	5.016	1556.374	93.442	3-May-16	Ave. Area	Expected	Deviation
						1548.765	1614.74458	4.09%
Unhydrolized	2.475	5.000	1583.784	93.589	4-May-16			
	2.491	5.032	1594.586	93.751	4-May-16			
	2.483	5.016	1578.626	93.572	4-May-16	Ave. Area	Expected	Deviation
						1585.665	1614.64251	1.79%
	3.525	7.121	47.972	2.804	2-May-16			
	3.533	7.137	49.623	2.869	2-May-16			
	3.483	7.036	48.375	2.799	2-May-16	Ave. Area	Expected	Deviation
						48.657	----	----
	3.491	7.052	49.080	2.960	3-May-16			
	3.466	7.001	43.945	2.686	3-May-16			
Unhydrolized	3.475	7.020	50.627	3.040	3-May-16	Ave. Area	Expected	Deviation
						47.884	48.65352	1.58%
	3.500	7.070	47.521	2.808	4-May-16			
	3.508	7.086	47.655	2.802	4-May-16			
	3.508	7.086	49.531	2.936	4-May-16	Ave. Area	Expected	Deviation
						48.235	48.65045	0.85%

**Figure 4. EZScan constancy results using RTLC Daily Check Source Strip.**

The results from the EZScan indicate that the instrument is functioning well and well within acceptable limits for daily FDG quality control testing. However, the strip does inform us that retention times of greater than 2.4 min (distance > 0.5 cm) are more reliable than retention times less than 2.4 min (distance < 0.5 cm) due to better relative standard deviations. Also, the instrument is more accurate for measurements activities above 1 μCi (37 kBq) as compare to those below 1 μCi (37 kBq).

Of note, by using the method dictated by the local SOPs, the instrument was shown to have an offset of approximately 1mm (Figure 5). The figure shows that all calculated distances are short of the expected/desired distances by approximately 1mm. Although 1mm is not large enough to fail instrument qualification or process validation, in this case, the strip could be used to minimize this systematic error and thereby optimize the use of this instrument.

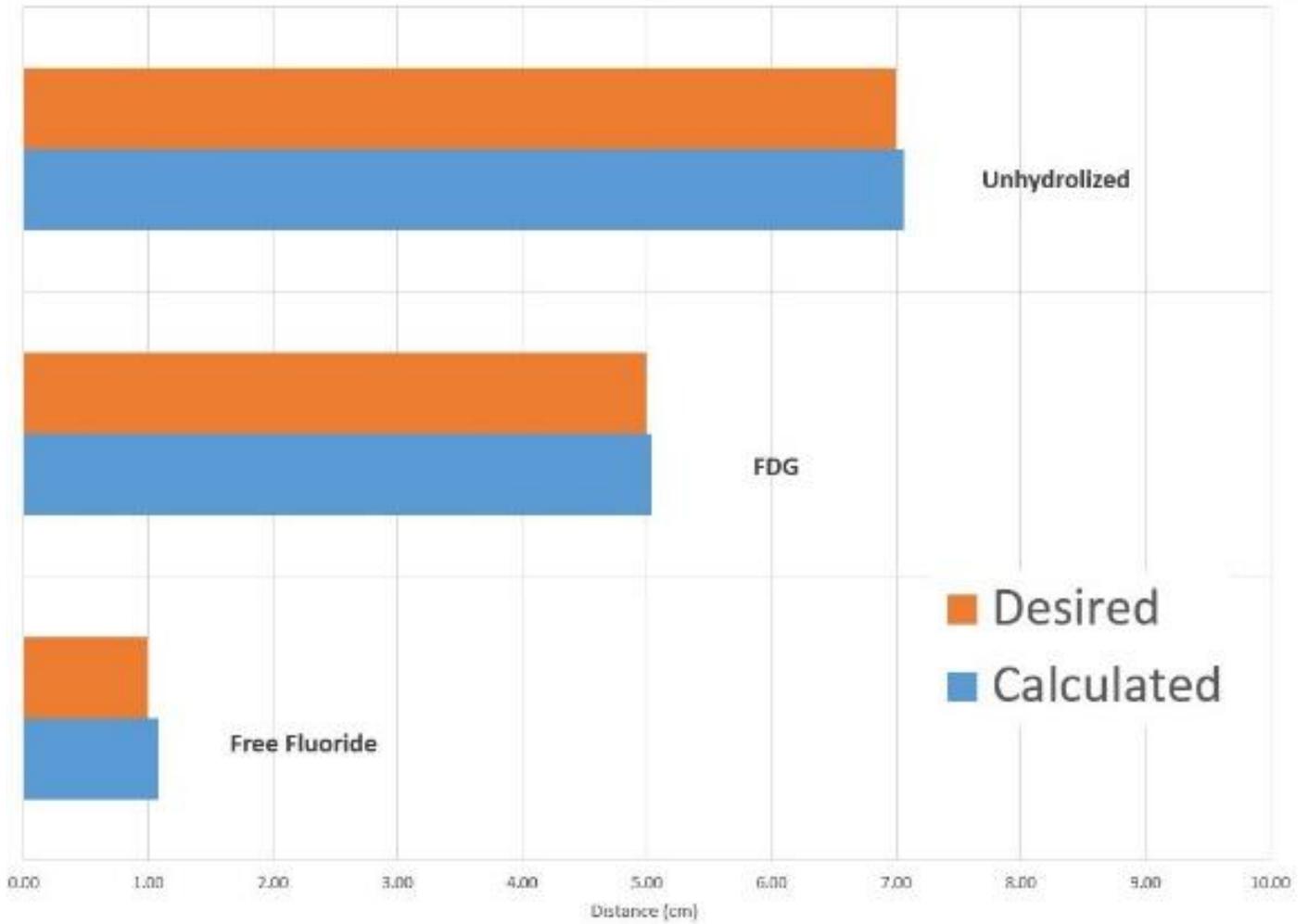


Figure 5. Chart of EZScan Desired vs. Calculated spot distances