Supporting Information for

Microwave spectra of four new perfluoromethyl polyyne chains: trifluoropentadiyne, $CF_3-C\equiv C-C\equiv C-H$, trifluoroheptatriyne, $CF_3-C\equiv C-C\equiv C-C\equiv C-H$, tetrafluoropentadiyne, $CF_3-C\equiv C-C\equiv C-F$, and trifluoromethylcyanoacetylene, $CF_3-C\equiv C-C\equiv N$.

Lu Kang and Stewart E. Novick*

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Table 1S Transition Frequencies of $CF_3-C\equiv C-C\equiv C-H$

Isotopomer	J'	J''	K	Observed MHz	Obs. - Calc. kHz
CF_3CCCCH	4	3	0	7100.590	-1
	5	4	0	8875.733	-2
	6	5	0	10650.875	-2
			1	10650.847	0
			2	10650.759	2
			3	10650.605	-2
			4	10650.400	3
	7	6	0	12426.015	-1
			1	12425.984	3
			2	12425.875	-1
			3	12425.702	0
			4	12425.459	2
	8	7	0	14201.153	0
			1	14201.115	2
			2	14200.992	-2
			3	14200.793	0
			4	14200.512	-1
			5	14200.153	0
	9	8	0	15976.287	0
			1	15976.241	0
			2	15976.106	-1
			3	15975.881	-1
			4	15975.568	2
			5	15975.161	-1
	10	9	0	17751.416	0
			1	17751.366	0
			2	17751.216	0
			3	17750.965	-1
			4	17750.615	-1
			5	17750.167	0
	11	10	0	19526.542	0
			1	19526.487	1
			2	19526.322	0

$CF_3CCC^{13}CH$	4	3	0	6901.556	0
	5	4	0	8626.942	-1
			1	8626.919	0
	6	5	0	10352.327	-1
			1	10352.298	-1
	7	6	0	12077.709	-1
			1	12077.677	1
	8	7	0	13803.089	1
			1	13803.052	2
	9	8	0	15528.465	1
			1	15528.420	-1
	10	9	0	17253.837	0
			1	17253.788	-1
$CF_3CC^{13}CCH$	4	3	0	7000.878	1
	5	4	0	8751.094	0
			1	8751.071	2
	6	5	0	10501.309	0
			1	10501.277	-2
	7	6	0	12251.519	-1
			1	12251.487	1
	8	7	0	14001.731	1
			1	14001.691	0
	9	8	0	15751.937	0
			1	15751.892	0
			2	15751.761	0
	10	9	0	17502.138	-1
			1	17502.090	0
	11	10	0	19252.338	1
$CF_3C^{13}CCCH$	4	3	0	7073.292	0
	5	4	0	8841.613	0
			1	8841.586	-1
	6	5	0	10609.931	1
	7	6	0	12378.247	0
			1	12378.210	0
	8	7	0	14146.561	1
			1	14146.516	-2
	9	8	0	15914.871	1
			1	15914.825	1
	10	9	0	17683.175	-2
			1	17683.126	1
	11	10	0	19451.478	-1
			1	19451.424	1
$CF_3{}^{13}CCCCH$	4	3	0	7099.679	-1
	5	4	0	8874.597	0
			1	8874.575	3
	6	5	0	10649.511	-1
			1	10649.483	0
	7	6	0	12424.424	-1
			1	12424.390	0
	8	7	0	14199.335	1
			1	14199.298	3

	9	8	0	15974.240	-2
			1	15974.194	-2
	10	9	0	17749.144	-1
			1	17749.093	-2
	11	10	0	19524.047	3
$^{13}CF_3CCCCH$	4	3	0	7083.514	1
	5	4	0	8854.390	1
	6	5	0	10625.261	-1
	7	6	0	12396.134	0
			1	12396.097	0
	8	7	0	14167.001	-1
			1	14166.961	1
	9	8	0	15937.867	-1
			1	15937.818	-3
	10	9	0	17708.729	-1
			1	17708.680	2
	11	10	0	19479.589	1
			1	19479.531	0
CF_3CCCCD	4	3	0	6788.874	0
	5	4	0	8486.090	0
			1	8486.065	-1
			2	8485.995	0
	6	5	0	10183.305	1
			1	10183.276	1
			2	10183.189	-1
	7	6	0	11880.517	1
			1	11880.481	-2
			2	11880.382	-1
	8	7	0	13577.726	1
			1	13577.687	-1
			2	13577.573	-1
	9	8	0	15274.932	0
			1	15274.889	0
			2	15274.763	2
	10	9	0	16972.135	-1
			1	16972.088	0
			2	16971.946	1
	11	10	0	18669.336	0
			1	18669.284	0
			2	18669.127	0

Table 2S Transition frequencies of $CF_3-C\equiv C-C\equiv C-C\equiv C-H$

J'	J''	K	Observed MHz	Obs. - Calc. kHz
8	7	0	6073.142	2
9	8	0	6832.281	-1
		1	6832.263	-4
10	9	0	7591.423	1
		1	7591.408	1
11	10	0	8350.563	0
		1	8350.547	2
12	11	0	9109.701	-1
		1	9109.684	0
13	12	0	9868.841	-1
		1	9868.823	2
14	13	0	10627.979	-1
		1	10627.960	2
15	14	0	11387.117	0
		1	11387.092	-2
16	15	0	12146.253	-1
		1	12146.228	-1
17	16	0	12905.390	0
		1	12905.363	0
18	17	0	13664.528	2
		1	13664.497	-1

Table 3S Transition frequencies of $CF_3-C{\equiv}C-C{\equiv}C-F$

J'	J''	K	Observed MHz	Obs. - Calc. kHz
7	6	0	6987.306	-2
8	7	0	7985.492	-1
		1	7985.478	3
9	8	0	8983.674	-3
		1	8983.659	2
10	9	0	9981.860	-1
		1	9981.837	0
		2	9981.771	3
		3	9981.658	4
11	10	0	10980.041	-2
		1	10980.017	0
		2	10979.942	0
		3	10979.813	-2
12	11	0	11978.222	-1
		1	11978.196	1
		2	11978.113	0
13	12	0	12976.401	-2
		1	12976.371	-1
		2	12976.282	-1
14	13	0	13974.580	-1
		1	13974.546	-2
		2	13974.450	-2
15	14	0	14972.757	-1
		1	14972.723	0
		2	14972.621	1
		3	14972.449	1
16	15	0	15970.936	4
		1	15970.896	1
17	16	0	16969.107	1
		1	16969.071	5
19	18	0	18965.445	-1
		1	18965.402	-1
		2	18965.271	-1
		3	18965.054	-1

Table 4S Transition frequencies of $CF_3-C{\equiv}C-C{\equiv}N$

J'	F'	J"	F"	K	Observed MHz	Obs. - Calc. kHz
4	3	3	2	0	7087.470	0
4	4	3	3	0	7087.564	0
4	5	3	4	0	7087.599	1
5	4	4	3	0	8859.400	1
5	5	4	4	0	8859.453	1
5	6	4	5	0	8859.475	0
6	5	5	4	0	10631.304	0
6	6	5	5	0	10631.337	-1
6	7	5	6	0	10631.352	0
7	6	6	5	0	12403.197	0
7	7	6	6	0	12403.221	0
7	8	6	7	0	12403.234	0
8	7	7	6	0	14175.084	1
8	8	7	7	0	14175.099	-1
8	9	7	8	0	14175.112	1
9	8	8	7	0	15446.961	-2
9	9	8	8	0	15946.975	-1
9	10	8	9	0	15946.987	2