"Best Fit" Radius/Structure Predictions for Light Nuclei through F-19 based on Alternating Quark Model

ASSUMPTIONS:

- Protons have 2 up quarks and 1 down quark
- Neutrons have 2 down quarks and 1 up quark
- Individual quarks have a localizable average position
- Up and down quarks alternate in sequence
- The distance between sequential quarks is constant and equal to the radius of the proton (0.8414 fm)
- When sequences of quarks overlap, protons directly overlap neutrons
- Beginning with Be-9, nuclear structures build upon a Li-6 base (18 quarks arranged as a regular 18-gon)
- The distance between overlapping strands is 0.9616 fm, the distance between the two overlapping 18-gons of C-12
- Atomic nuclei are 3-dimentional, and thus have an average center of mass
- Center of nuclear mass is determined using current quark masses (Up Quark Mass = 2.16 MeV, Down Quark Mass = 4.67 MeV)
- Atomic nuclei rotation takes one of two forms: 1.) precessing about an axis, or 2.) tumbling end over end (double click images to the right)
  1.) Precessing Rotation: AQM predicted radius is calculated by dividing the distance between farthest quarks by two.
  2.) Tumbling Rotation: AQM predicted radius is distance from center of mass (COM) to farthest quark
- Both precessing and tumbling assumptions are calculated for each nucleus, and the "best fit" to experimental RMS charge radius is enclosed in a blue box
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Center of Mass Formula:

$$x_{cm}\ \frac{m_1x_1+m_2x_2+m_3x_3+....+m_nx_n}{m_1+m_2+m_3+.....+m_n}$$
$$y_{cm}\ \frac{m_1y_1+m_2y_2+m_3y_3+....+m_ny_n}{m_1+m_2+m_3+.....+m_n}$$
$$z_{cm}\ \frac{m_1z_1+m_2z_2+m_3z_3+....+m_nz_n}{m_1+m_2+m_3+.....+m_n}$$

Tumbling Rotation

Precessing Rotation

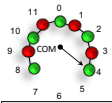
best fit =

COM = Center of Mass

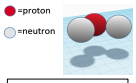
H-3

H-3 as a sequence of 9 quarks occupying 9 of 12 vertices of a dodecagon
(Axis of rotation passes through Center of Mass (COM) and comes directly out of the page)

dodecagon circumradius = 1.625 fm
dodecagon exterior angle = 30 degrees



Quark view from above



nucleon view from side

Up Quark
Down Quark

quark #	angle (deg)	angle (rad)	mass (MeV)	x-value (fm)	y-value (fm)	weight x	weight y
0	0	0	4.67	0	1.625	0	7.58875
1	30	0.52359878	2.16	0.8125	1.4072	1.755	3.039552
2	60	1.04719755	4.67	1.4072	0.8125	6.571624	3.794375
3	90	1.57079633	2.16	1.625	0	3.51	0
4	120	2.0943951	4.67	1.4072	-0.8125	6.571624	-3.794375
unoccupied vertices							
5	150	2.61799388	0	0.8125	-1.4072	0	0
6	180	3.14159265	0	0	-1.625	0	0
7	210	3.66519143	0	-0.8125	-1.4072	0	0
8	240	4.1887902	4.67	-1.4072	-0.8125	-6.571624	-3.794375
9	270	4.71238898	2.16	-1.625	0	-3.51	0
10	300	5.23598776	4.67	-1.4072	0.8125	-6.571624	3.794375
11	330	5.75958653	2.16	-0.8125	1.4072	-1.755	3.039552
		Total=	31.99			0	13.667854

Center of Mass: x = 0, y = 0.42725395

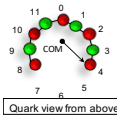
AQM predicted r (precessing)= 1.625
% agreement= 92.4%

AQM predicted r (tumbling) = 1.87542041 COM to quark 4
experimental (fm) = 1.7591
% agreement= 107.0%

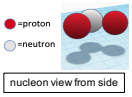
He-3

He-3 as a sequence of 9 quarks occupying 9 of 12 vertices of a dodecagon
(Axis of rotation passes through Center of Mass (COM) and comes directly out of the page)

dodecagon circumradius = 1.625 fm
dodecagon exterior angle = 30 degrees



Quark view from above



nucleon view from side

Up Quark
Down Quark

quark #	angle (deg)	angle (rad)	mass (MeV)	x-value (fm)	y-value (fm)	weight x	weight y
0	0	0	2.16	0	1.625	0	3.51
1	30	0.52359878	4.67	0.8125	1.4072	3.794375	6.571624
2	60	1.04719755	2.16	1.4072	0.8125	3.039552	1.755
3	90	1.57079633	4.67	1.625	0	7.58875	0
4	120	2.0943951	2.16	1.4072	-0.8125	3.039552	-1.755
unoccupied vertices							
5	150	2.61799388	0	0.8125	-1.4072	0	0
6	180	3.14159265	0	0	-1.625	0	0
7	210	3.66519143	0	-0.8125	-1.4072	0	0
8	240	4.1887902	2.16	-1.4072	-0.8125	-3.039552	-1.755
9	270	4.71238898	4.67	-1.625	0	-7.58875	0
10	300	5.23598776	2.16	-1.4072	0.8125	-3.039552	1.755
11	330	5.75958653	4.67	-0.8125	1.4072	-3.794375	6.571624
		Total =	29.48			0	16.653248

Center of Mass: x = 0, y = 0.56489986

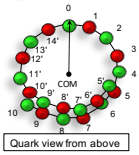
AQM predicted r (precessing)= 1.625
% agreement= 82.7%

AQM predicted r (tumbling) = 1.969 Center of Mass to quark 4
experimental (fm) = 1.9661
% agreement= 100%

Li-7

Li-7 as a split 15-gon
a=0.8414 fm (proton radius)
r=1.979 fm (assuming regular pentadecagon)
angle=24 degrees

Up Quark
Down Quark



Quark view from above

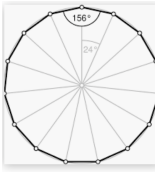
Quarks 5'-14' are 0.9616 fm above the plane of quarks 0-10, quarks 10'-14' gradually decline to the plane of quarks 0 - 10.

	degrees	radians	mass	x-value	y-value	z-value	x-coord	y-coord	z-coord
0	0	0	4.67	0	1.979	0	0	9.24193	0
1	24	0.41887902	2.16	0.8049	1.8079	0	1.738584	3.905064	0
2	48	0.83775804	4.67	1.4706	1.3242	0	6.867702	6.184014	0
3	72	1.25663706	2.16	1.8821	0.6115	0	4.065336	1.32084	0
4	96	1.67551608	4.67	1.9681	-0.2068	0	9.191027	-0.965756	0
5	120	2.0943951	2.16	1.7138	-0.9895	0	3.701808	-2.13732	0
6	144	2.51327412	4.67	1.1632	-1.601	0	5.432144	-7.47667	0
7	168	2.93215314	2.16	0.4114	-1.9357	0	0.888624	-4.181112	0
8	192	3.35103216	4.67	-0.4114	-1.9357	0	-1.921238	-9.039719	0
9	216	3.76991118	2.16	-1.1632	-1.601	0	-2.512512	-3.45816	0
10	240	4.1887902	4.67	-1.7138	-0.9895	0	-8.003446	-4.620965	0
5'	120	2.0943951	4.67	1.7519	-1.0115	**0.9616**	8.181373	-4.723705	4.490672
6'	144	2.51327412	2.16	1.189	-1.6366	**0.9616**	2.56824	-3.535056	2.077056
7'	168	2.93215314	4.67	0.4206	-1.9787	**0.9616**	1.964202	-9.240529	4.490672
8'	192	3.35103216	2.16	-0.4206	-1.9787	**0.9616**	-0.908496	-4.273992	2.077056
9'	216	3.76991118	4.67	-1.189	-1.6366	**0.9616**	-5.55263	-7.642922	4.490672
10'	240	4.1887902	2.16	-1.7519	-1.0115	**0.9616**	-3.784104	-2.18484	2.077056
11'	264	4.60766923	4.67	-2.0119	-0.2114	**0.76928**	-9.395573	-0.987238	3.5925376
12'	288	5.02654825	2.16	-1.9239	0.6251	**0.57696**	-4.155624	1.350216	1.2462336
13'	312	5.44542727	4.67	-1.5033	1.3536	**0.38464**	-7.020411	6.321312	1.7962688
14'	336	5.86430629	2.16	-0.8228	1.8481	**0.19232**	-1.777248	3.991896	0.4154112
			72.97				-0.432242	-32.152712	26.7536352

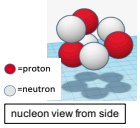
Center of Mass (COM): x= -0.005923558, y= -0.44062919, z= 0.366638827

AQM predicted r **(precessing)**= 2.04725232
% agreement= 83.7%

AQM predicted r (tumbling) = 2.4472 Center of Mass to quark 0
Experimental RMS charge radius (fm) = 2.444
% agreement = 100.1%



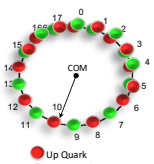
Pentadecagon - Wikipedia



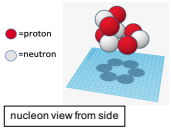
nucleon view from side

Be-9

Be-9 has 9 sequential quarks overlapping an 18-gon base
a=0.8414 fm (proton radius)
circumradius of 18-gon = 2.423 fm
angle=20 degrees



Quark view from above



nucleon view from side

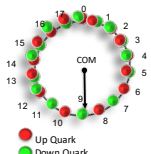
	angle (deg)	angle (rad)	mass	x-value	y-value	z-value	weight x	weight y	weight z
0	340	5.93411946	2.16	-0.8287	2.2768	0	-1.789992	4.917888	0
1	0	0	4.67	0	2.423	0	0	11.31541	0
2	20	0.34906585	2.16	0.8287	2.2768	0	1.789992	4.917888	0
3	40	0.6981317	4.67	1.5574	1.8561	0	7.273058	8.667987	0
4	60	1.04719755	2.16	2.0983	1.2115	0	4.532328	2.61684	0
5	80	1.3962634	4.67	2.3861	0.4207	0	11.143087	1.964669	0
6	100	1.74532925	2.16	2.3861	-0.4207	0	5.153976	-0.908712	0
7	120	2.0943951	4.67	2.0983	-1.2115	0	9.799061	-5.657705	0
8	140	2.44346095	2.16	1.5574	-1.8561	0	3.363984	-4.009176	0
9	160	2.7925268	4.67	0.8287	-2.2768	0	3.870029	-10.632656	0
10	180	3.14159265	2.16	0	-2.423	0	0	-5.23368	0
11	200	3.4906585	4.67	-0.8287	-2.2768	0	-3.870029	-10.632656	0
12	220	3.83972435	2.16	-1.5574	-1.8561	0	-3.363984	-4.009176	0
13	240	4.1887902	4.67	-2.0983	-1.2115	0	-9.799061	-5.657705	0
14	260	4.53785606	2.16	-2.3861	-0.4207	0	-5.153976	-0.908712	0
15	280	4.88692191	4.67	-2.3861	0.4207	0	-11.143087	1.964669	0
16	300	5.23598776	2.16	-2.0983	1.2115	0	-4.532328	2.61684	0
17	320	5.58505361	4.67	-1.5574	1.8561	0	-7.273058	8.667987	0
0'	340	5.93411946	4.67	-0.8287	2.2768	0.9616	-3.870029	10.632656	4.490672
1'	0	0	2.16	0	2.423	0.9616	0	5.23368	2.077056
2'	20	0.34906585	4.67	0.8287	2.2768	0.9616	3.870029	10.632656	4.490672
3'	40	0.6981317	2.16	1.5574	1.8561	0.9616	3.363984	4.009176	2.077056
4'	60	1.04719755	4.67	2.0983	1.2115	0.9616	9.799061	5.657705	4.490672
5'	80	1.3962634	2.16	2.3861	0.4207	0.9616	5.153976	0.908712	2.077056
15'	280	4.88692191	2.16	-2.3861	0.4207	0.9616	-5.153976	0.908712	2.077056
16'	300	5.23598776	4.67	-2.0983	1.2115	0.9616	-9.799061	5.657705	4.490672
17'	320	5.58505361	2.16	-1.5574	1.8561	0.9616	-3.363984	4.009176	2.077056
			90.95	0			0	47.650178	28.347968

AQM predicted r (precessing)= 2.47016813
% agreement= 98.1%

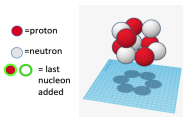
Coordinates
Center of Mass: x= 0; y= 0.523916196; z= 0.311687389
experimental r= 2.519
AQM predicted r (tumbling)= 2.475179427 Center of Mass to quark 5'
% agreement= 98.3%

B-10

B-10 as an 18-gon + sequence of 12 overlapping quarks
a=0.8414 fm (proton radius)
circumradius of 18-gon = 2.423 fm
angle=20 degrees



Quark view from above



nucleon view from side

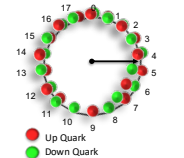
quark #	angle (deg)	angle (rad)	mass (MeV)	x-value (fm)	y-value (fm)	z-value (fm)	weight x	weight y	weight z
0	10	0.17453293	2.16	0.4207	2.3861	0	0.908712	5.153976	0
1	30	0.52359878	4.67	1.2115	2.0983	0	5.657705	9.799061	0
2	50	0.87266463	2.16	1.8561	1.5574	0	4.009176	3.363984	0
3	70	1.22173048	4.67	2.2768	0.8287	0	10.632656	3.870029	0
4	90	1.57079633	2.16	2.423	0	0	5.23368	0	0
5	110	1.91986218	4.67	2.2768	-0.8287	0	10.632656	-3.870029	0
6	130	2.26892803	2.16	1.8561	-1.5574	0	4.009176	-3.363984	0
7	150	2.61799388	4.67	1.2115	-2.0983	0	5.657705	-9.799061	0
8	170	2.96705973	2.16	0.4207	-2.3861	0	0.908712	-5.153976	0
9	190	3.31612558	4.67	-0.4207	-2.3861	0	-1.964669	-11.143087	0
10	210	3.66519143	2.16	-1.2115	-2.0983	0	-2.61684	-4.532328	0
11	230	4.01425728	4.67	-1.8561	-1.5574	0	-8.667987	-7.273058	0
12	250	4.36332313	2.16	-2.2768	-0.8287	0	-4.917888	-1.789992	0
13	270	4.71238898	4.67	-2.423	0	0	-11.31541	0	0
14	290	5.06145483	2.16	-2.2768	0.8287	0	-4.917888	1.789992	0
15	310	5.41052068	4.67	-1.8561	1.5574	0	-8.667987	7.273058	0
16	330	5.75958653	2.16	-1.2115	2.0983	0	-2.61684	4.532328	0
17	350	6.10865238	4.67	-0.4207	2.3861	0	-1.964669	11.143087	0
0'	10	0.17453293	4.67	0.4207	2.3861	0.9616	1.964669	11.143087	4.490672
1'	30	0.52359878	2.16	1.2115	2.0983	0.9616	2.61684	4.532328	2.077056
2'	50	0.87266463	4.67	1.8561	1.5574	0.9616	8.667987	7.273058	4.490672
3'	70	1.22173048	2.16	2.2768	0.8287	0.9616	4.917888	1.789992	2.077056
4'	90	1.57079633	4.67	2.423	0	0.9616	11.31541	0	4.490672
5'	110	1.91986218	2.16	2.2768	-0.8287	0.9616	4.917888	-1.789992	2.077056
12'	250	4.36332313	4.67	-2.2768	-0.8287	0.9616	-10.632656	-3.870029	4.490672
13'	270	4.71238898	2.16	-2.423	0	0.9616	-5.23368	0	2.077056
14'	290	5.06145483	4.67	-2.2768	0.8287	0.9616	-10.632656	3.870029	4.490672
15'	310	5.41052068	2.16	-1.8561	1.5574	0.9616	-4.009176	3.363984	2.077056
16'	330	5.75958653	4.67	-1.2115	2.0983	0.9616	-5.657705	9.799061	4.490672
17'	350	6.10865238	2.16	-0.4207	2.3861	0.9616	-0.908712	5.153976	2.077056
			102.45				-2.673903	41.265494	39.406368

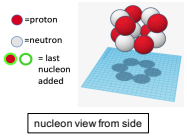
AQM predicted r (precessing)= 2.470147838
% agreement= 101.7%

Coordinates
Center of Mass: x= -0.02609959; y= 0.402786667; z= 0.38464
AQM predicted r (tumbling)= 2.511627725 COM to quark 9
experimental radius (fm)= 2.4277
% agreement 103.5%

B-11

B-11 as an 18-gon+2nd strand
a=0.8414 fm (proton radius)
circumradius of 18-gon = 2.423 fm
angle=20 degrees





quark #	angle (deg)	angle (rad)	mass (MeV)	x-value (fm)	y-value (fm)	z-value (fm)	weight x	weight y	weight z
0	0	0	4.67	0	2.423	0	0	11.31541	0
1	20	0.34906585	2.16	0.8287	2.2768	0	1.789992	4.917888	0
2	40	0.6981317	4.67	1.5574	1.8561	0	7.273058	8.667987	0
3	60	1.04719755	2.16	2.0983	1.2115	0	4.532328	2.61684	0
4	80	1.3962634	4.67	2.3861	0.4207	0	11.143087	1.964669	0
5	100	1.74532925	2.16	2.3861	-0.4207	0	5.153976	-0.908712	0
6	120	2.0943951	4.67	2.0983	-1.2115	0	9.799061	-5.657705	0
7	140	2.44346095	2.16	1.5574	-1.8561	0	3.363984	-4.009176	0
8	160	2.7925268	4.67	0.8287	-2.2768	0	3.870029	-10.632656	0
9	180	3.14159265	2.16	0	-2.423	0	0	-5.23368	0
10	200	3.4906585	4.67	-0.8287	-2.2768	0	-3.870029	-10.632656	0
11	220	3.83972435	2.16	-1.5574	-1.8561	0	-3.363984	-4.009176	0
12	240	4.1887902	4.67	-2.0983	-1.2115	0	-9.799061	-5.657705	0
13	260	4.53785606	2.16	-2.3861	-0.4207	0	-5.153976	-0.908712	0
14	280	4.88692191	4.67	-2.3861	0.4207	0	-11.143087	1.964669	0
15	300	5.23598776	2.16	-2.0983	1.2115	0	-4.532328	2.61684	0
16	320	5.58505361	4.67	-1.5574	1.8561	0	-7.273058	8.667987	0
17	340	5.93411946	2.16	-0.8287	2.2768	0	-1.789992	4.917888	0
0'	0	0	2.16	0	2.423	0.9616	0	5.23368	2.077056
1'	20	0.34906585	4.67	0.8287	2.2768	0.9616	3.870029	10.632656	4.490672
2'	40	0.6981317	2.16	1.5574	1.8561	0.9616	3.363984	4.009176	2.077056
3'	60	1.04719755	4.67	2.0983	1.2115	0.9616	9.799061	5.657705	4.490672
4'	80	1.3962634	2.16	2.3861	0.4207	0.9616	5.153976	0.908712	2.077056
5'	100	1.74532925	4.67	2.3861	-0.4207	0.9616	11.143087	-1.964669	4.490672
6'	120	2.0943951	2.16	2.0983	-1.2115	0.9616	4.532328	-2.61684	2.077056
7'	140	2.44346095	4.67	1.5574	-1.8561	0.9616	7.273058	-8.667987	4.490672
8'	220	3.83972435	4.67	-1.5574	-1.8561	0.9616	-7.273058	-8.667987	4.490672
12'	240	4.1887902	2.16	-2.0983	-1.2115	0.9616	-4.532328	-2.61684	2.077056
13'	260	4.53785606	4.67	-2.3861	-0.4207	0.9616	-11.143087	-1.964669	4.490672
14'	280	4.88692191	2.16	-2.3861	0.4207	0.9616	-5.153976	0.908712	2.077056
15'	300	5.23598776	4.67	-2.0983	1.2115	0.9616	-9.799061	5.657705	4.490672
16'	320	5.58505361	2.16	-1.5574	1.8561	0.9616	-3.363984	4.009176	2.077056
17'	340	5.93411946	4.67	-0.8287	2.2768	0.9616	-3.870029	10.632656	4.490672
			113.95				0	21.151186	50.464768

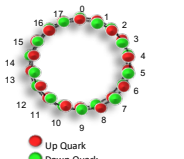
AQM predicted r (precessing about AOR)=	2.47024243	
% agreement=	102.7%	

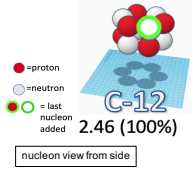
Coordinates

	x=	0	
COM-->	y=	0.185618131	
	z=	0.442867644	
experimental radius (fm)=		2.406	
AQM predicted r (tumbling)=		2.645944123	Center of Mass to quark 9
% agreement		110.0%	

C-12

C-12 as a double 18-gon, the distance between 18-gons was set at 0.9616 fm (In other words, carbon was used to determine distance between strands)
a=0.8414 fm (proton radius)
circumradius of 18-gon = 2.423 fm
angle=20 degrees





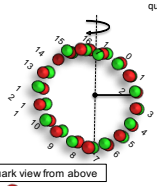
quark #	angle (deg)	angle (rad)	mass (MeV)	x-value (fm)	y-value (fm)	z-value (fm)	weight x	weight y	weight z
0	0	0	4.67	0	2.423	0	0	11.31541	0
1	20	0.34906585	2.16	0.8287	2.2768	0	1.789992	4.917888	0
2	40	0.6981317	4.67	1.5574	1.8561	0	7.273058	8.667987	0
3	60	1.04719755	2.16	2.0983	1.2115	0	4.532328	2.61684	0
4	80	1.3962634	4.67	2.3861	0.4207	0	11.143087	1.964669	0
5	100	1.74532925	2.16	2.3861	-0.4207	0	5.153976	-0.908712	0
6	120	2.0943951	4.67	2.0983	-1.2115	0	9.799061	-5.657705	0
7	140	2.44346095	2.16	1.5574	-1.8561	0	3.363984	-4.009176	0
8	160	2.7925268	4.67	0.8287	-2.2768	0	3.870029	-10.632656	0
9	180	3.14159265	2.16	0	-2.423	0	0	-5.23368	0
10	200	3.4906585	4.67	-0.8287	-2.2768	0	-3.870029	-10.632656	0
11	220	3.83972435	2.16	-1.5574	-1.8561	0	-3.363984	-4.009176	0
12	240	4.1887902	4.67	-2.0983	-1.2115	0	-9.799061	-5.657705	0
13	260	4.53785606	2.16	-2.3861	-0.4207	0	-5.153976	-0.908712	0
14	280	4.88692191	4.67	-2.3861	0.4207	0	-11.143087	1.964669	0
15	300	5.23598776	2.16	-2.0983	1.2115	0	-4.532328	2.61684	0
16	320	5.58505361	4.67	-1.5574	1.8561	0	-7.273058	8.667987	0
17	340	5.93411946	2.16	-0.8287	2.2768	0	-1.789992	4.917888	0
0'	0	0	2.16	0	2.423	0.9616	0	5.23368	2.077056
1'	20	0.34906585	4.67	0.8287	2.2768	0.9616	3.870029	10.632656	4.490672
2'	40	0.6981317	2.16	1.5574	1.8561	0.9616	3.363984	4.009176	2.077056
3'	60	1.04719755	4.67	2.0983	1.2115	0.9616	9.799061	5.657705	4.490672
4'	80	1.3962634	2.16	2.3861	0.4207	0.9616	5.153976	0.908712	2.077056
5'	100	1.74532925	4.67	2.3861	-0.4207	0.9616	11.143087	-1.964669	4.490672
6'	120	2.0943951	2.16	2.0983	-1.2115	0.9616	4.532328	-2.61684	2.077056
7'	140	2.44346095	4.67	1.5574	-1.8561	0.9616	7.273058	-8.667987	4.490672
8'	160	2.7925268	2.16	0.8287	-2.2768	0.9616	1.789992	-4.917888	2.077056
9'	180	3.14159265	4.67	0	-2.423	0.9616	0	-11.31541	4.490672
10'	200	3.4906585	2.16	-0.8287	-2.2768	0.9616	-1.789992	-4.917888	2.077056
11'	220	3.83972435	4.67	-1.5574	-1.8561	0.9616	-7.273058	-8.667987	4.490672
12'	240	4.1887902	2.16	-2.0983	-1.2115	0.9616	-4.532328	-2.61684	2.077056
13'	260	4.53785606	4.67	-2.3861	-0.4207	0.9616	-11.143087	-1.964669	4.490672
14'	280	4.88692191	2.16	-2.3861	0.4207	0.9616	-5.153976	0.908712	2.077056
15'	300	5.23598776	4.67	-2.0983	1.2115	0.9616	-9.799061	5.657705	4.490672
16'	320	5.58505361	2.16	-1.5574	1.8561	0.9616	-3.363984	4.009176	2.077056
17'	340	5.93411946	4.67	-0.8287	2.2768	0.9616	-3.870029	10.632656	4.490672
			122.94				0	0	59.109552

AQM predicted r (precessing)=	(same as tumbling)	
% agreement=	100%	

Center of Mass

	x=	0
	y=	0
	z=	0.4808
experimental RMS charge radius=		2.4702
AQM predicted r (tumbling)=		2.470147838
% agreement=		100.00%

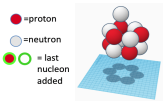
C-13



Quark view from above

Up Quark

Down Quark



nucleon view from side

quark #	angle (deg)	angle (rad)	mass (MeV)	x-value (fm)	y-value (fm)	z-value (fm)	weight x	weight y	weight z
0	40	0.6981317	2.16	1.5574	1.8561	0	3.363984	4.009176	0
1	60	1.04719755	4.67	2.0983	1.2115	0	9.799061	5.657705	0
2	80	1.3962634	2.16	2.3861	0.4207	0	5.153976	0.908712	0
3	100	1.74532925	4.67	2.3861	-0.4207	0	11.143087	-1.964669	0
4	120	2.0943951	2.16	2.0983	-1.2115	0	4.532328	-2.61684	0
5	140	2.44346095	4.67	1.5574	-1.8561	0	7.273058	-8.667987	0
6	160	2.7925268	2.16	0.8287	-2.2768	0	1.789992	-4.917888	0
7	180	3.14159265	4.67	0	-2.423	0	0	-11.31541	0
8	200	3.4906585	2.16	-0.8287	-2.2768	0	-1.789992	-4.917888	0
9	220	3.83972435	4.67	-1.5574	-1.8561	0	-7.273058	-8.667987	0
10	240	4.1887902	2.16	-2.0983	-1.2115	0	-4.532328	-2.61684	0
11	260	4.53785606	4.67	-2.3861	-0.4207	0	-11.143087	-1.964669	0
12	280	4.88692191	2.16	-2.3861	0.4207	0	-5.153976	0.908712	0
13	300	5.23598776	4.67	-2.0983	1.2115	0	-9.799061	5.657705	0
14	320	5.58505361	2.16	-1.5574	1.8561	0	-3.363984	4.009176	0
15	340	5.93411946	4.67	-0.8287	2.2768	0	-3.870029	10.632656	0
16	0	0	2.16	0	2.423	0	0	5.23368	0
17	20	0.34906585	4.67	0.8287	2.2768	0	3.870029	10.632656	0
0'	40	0.6981317	4.67	1.5574	1.8561	0.9616	7.273058	8.667987	4.490672
1'	60	1.04719755	2.16	2.0983	1.2115	0.9616	4.532328	2.61684	2.077056
2'	80	1.3962634	4.67	2.3861	0.4207	0.9616	11.143087	1.964669	4.490672
3'	100	1.74532925	2.16	2.3861	-0.4207	0.9616	5.153976	-0.908712	2.077056
4'	120	2.0943951	4.67	2.0983	-1.2115	0.9616	9.799061	-5.657705	4.490672
5'	140	2.44346095	2.16	1.5574	-1.8561	0.9616	3.363984	-4.009176	2.077056
6'	160	2.7925268	4.67	0.8287	-2.2768	0.9616	3.870029	-10.632656	4.490672
7'	180	3.14159265	2.16	0	-2.423	0.9616	0	-5.23368	2.077056
8'	200	3.4906585	4.67	-0.8287	-2.2768	0.9616	-3.870029	-10.632656	4.490672
9'	220	3.83972435	2.16	-1.5574	-1.8561	0.9616	-3.363984	-4.009176	2.077056
10'	240	4.1887902	4.67	-2.0983	-1.2115	0.9616	-9.799061	-5.657705	4.490672
11'	260	4.53785606	2.16	-2.3861	-0.4207	0.9616	-5.153976	-0.908712	2.077056
12'	280	4.88692191	4.67	-2.3861	0.4207	0.9616	-11.143087	1.964669	4.490672
13'	300	5.23598776	2.16	-2.0983	1.2115	0.9616	-4.532328	2.61684	2.077056
14'	320	5.58505361	4.67	-1.5574	1.8561	0.9616	-7.273058	8.667987	4.490672
15'	340	5.93411946	2.16	-0.8287	2.2768	0.9616	-1.789992	4.917888	2.077056
16'	0	0	4.67	0	2.423	0.9616	0	11.31541	4.490672
17'	20	0.34906585	2.16	0.8287	2.2768	0.9616	1.789992	4.917888	2.077056
15''	340	5.93411946	4.67	-0.8287	2.2768	1.9232	-3.870029	10.632656	8.981344
16''	0	0	2.16	0	2.423	1.9232	0	5.23368	4.154112
17''	20	0.34906585	4.67	0.8287	2.2768	1.9232	3.870029	10.632656	8.981344
			134.44				0	26.498992	81.226352

xy-plane bisector = y-axis

Slope = rise/run = 0.09921585

run from COM to quark 2= 0.22359354

intercept z-value= 0.62636694

	x	y	z
intercept	0	0.4207	0.62636694

Coordinates

Center of Mass coordinates: x= 0; y= 0.197106456; z= 0.604182922

experimental= 2.4614

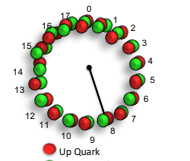
AQM predicted r (tumbling)= 2.688864974 COM to quark 7 (farthest)

% agreement= 109.2%

AQM predicted r (precessing) = 2.466943202 (distance from axis of rotation to quark 2)

% agreement= 100.2%

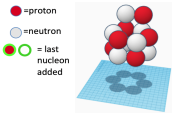
N-14



Up Quark

Down Quark

quark view from above



nucleon view from side

quark #	angle (deg)	angle (rad)	mass (MeV)	x-value (fm)	y-value (fm)	z-value (fm)	weight x	weight y	weight z
0	350	6.10865238	2.16	-0.4207	2.3861	0	-0.908712	5.153976	0
1	10	0.17453293	4.67	0.4207	2.3861	0	1.964669	11.143087	0
2	30	0.52359878	2.16	1.2115	2.0983	0	2.61684	4.532328	0
3	50	0.87266463	4.67	1.8561	1.5574	0	8.667987	7.273058	0
4	70	1.22173048	2.16	2.2768	0.8287	0	4.917888	1.789992	0
5	90	1.57079633	4.67	2.423	0	0	11.31541	0	0
6	110	1.91986218	2.16	2.2768	-0.8287	0	4.917888	-1.789992	0
7	130	2.26892803	4.67	1.8561	-1.5574	0	8.667987	-7.273058	0
8	150	2.61799388	2.16	1.2115	-2.0983	0	2.61684	-4.532328	0
9	170	2.96705973	4.67	0.4207	-2.3861	0	1.964669	-11.143087	0
10	190	3.31612558	2.16	-0.4207	-2.3861	0	-0.908712	-5.153976	0
11	210	3.66519143	4.67	-1.2115	-2.0983	0	-5.657705	-9.799061	0
12	230	4.01425728	2.16	-1.8561	-1.5574	0	-4.009176	-3.363984	0
13	250	4.36332313	4.67	-2.2768	-0.8287	0	-10.632656	-3.870029	0
14	270	4.71238898	2.16	-2.423	0	0	-5.23368	0	0
15	290	5.06145483	4.67	-2.2768	0.8287	0	-10.632656	3.870029	0
16	310	5.41052068	2.16	-1.8561	1.5574	0	-4.009176	3.363984	0
17	330	5.75958653	4.67	-1.2115	2.0983	0	-5.657705	9.799061	0
0'	350	6.10865238	4.67	-0.4207	2.3861	0.9616	-1.964669	11.143087	4.490672
1'	10	0.17453293	2.16	0.4207	2.3861	0.9616	0.908712	5.153976	2.077056
2'	30	0.52359878	4.67	1.2115	2.0983	0.9616	5.657705	9.799061	4.490672
3'	50	0.87266463	2.16	1.8561	1.5574	0.9616	4.009176	3.363984	2.077056
4'	70	1.22173048	4.67	2.2768	0.8287	0.9616	10.632656	3.870029	4.490672
5'	90	1.57079633	2.16	2.423	0	0.9616	5.23368	0	2.077056
6'	110	1.91986218	4.67	2.2768	-0.8287	0.9616	10.632656	-3.870029	4.490672
7'	130	2.26892803	2.16	1.8561	-1.5574	0.9616	4.009176	-3.363984	2.077056
8'	150	2.61799388	4.67	1.2115	-2.0983	0.9616	5.657705	-9.799061	4.490672
9'	170	2.96705973	2.16	0.4207	-2.3861	0.9616	0.908712	-5.153976	2.077056
10'	190	3.31612558	4.67	-0.4207	-2.3861	0.9616	-1.964669	-11.143087	4.490672
11'	210	3.66519143	2.16	-1.2115	-2.0983	0.9616	-2.61684	-4.532328	2.077056
12'	230	4.01425728	4.67	-1.8561	-1.5574	0.9616	-8.667987	-7.273058	4.490672
13'	250	4.36332313	2.16	-2.2768	-0.8287	0.9616	-4.917888	-1.789992	2.077056
14'	270	4.71238898	4.67	-2.423	0	0.9616	-11.31541	0	4.490672
15'	290	5.06145483	2.16	-2.2768	0.8287	0.9616	-4.917888	1.789992	2.077056
16'	310	5.41052068	4.67	-1.8561	1.5574	0.9616	-8.667987	7.273058	4.490672
17'	330	5.75958653	2.16	-1.2115	2.0983	0.9616	-2.61684	4.532328	2.077056
0''	350	6.10865238	2.16	-0.4207	2.3861	1.9232	-0.908712	5.153976	4.154112
1''	10	0.17453293	4.67	0.4207	2.3861	1.9232	1.964669	11.143087	8.981344
2''	30	0.52359878	2.16	1.2115	2.0983	1.9232	2.61684	4.532328	4.154112
15''	290	5.06145483	4.67	-2.2768	0.8287	1.9232	-10.632656	3.870029	8.981344
16''	310	5.41052068	2.16	-1.8561	1.5574	1.9232	-4.009176	3.363984	4.154112
17''	330	5.75958653	4.67	-1.2115	2.0983	1.9232	-5.657705	9.799061	8.981344
			143.43				-16.62674	37.862465	98.51592
			143.43						

AQM predicted r (precessing)= 2.60677381

% agreement= 101.9%

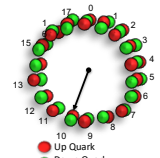
Coordinates

Center of Mass coordinates: x= -0.115922331; y= 0.2639787; z= 0.686857143

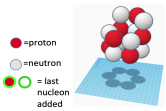
experimental RMS charge radius (fm)= 2.5582

AQM predicted r (tumbling)= 2.795386098 COM to quark 8 (farthest)

N-15



Quark view from above



nucleon view from side

quark #	angle (deg)	angle (rad)	mass (MeV)	x-value (fm)	y-value (fm)	z-value (fm)	weight x	weight y	weight z
0	0	0	2.16	0	2.423	0	0	5.23368	0
1	20	0.34906585	4.67	0.8287	2.2768	0	3.870029	10.632656	0
2	40	0.6981317	2.16	1.5574	1.8561	0	3.363984	4.009176	0
3	60	1.04719755	4.67	2.0983	1.2115	0	9.799061	5.657705	0
4	80	1.3962634	2.16	2.3861	0.4207	0	5.153976	0.908712	0
5	100	1.74532925	4.67	2.3861	-0.4207	0	11.143087	-1.964669	0
6	120	2.0943951	2.16	2.0983	-1.2115	0	4.532328	-2.61684	0
7	140	2.44346095	4.67	1.5574	-1.8561	0	7.273058	-8.667987	0
8	160	2.7925268	2.16	0.8287	-2.2768	0	1.789992	-4.917888	0
9	180	3.14159265	4.67	0	-2.423	0	0	-11.31541	0
10	200	3.4906585	2.16	-0.8287	-2.2768	0	-1.789992	-4.917888	0
11	220	3.83972435	4.67	-1.5574	-1.8561	0	-7.273058	-8.667987	0
12	240	4.1887902	2.16	-2.0983	-1.2115	0	-4.532328	-2.61684	0
13	260	4.53785606	4.67	-2.3861	-0.4207	0	-11.143087	-1.964669	0
14	280	4.88692191	2.16	-2.3861	0.4207	0	-5.153976	0.908712	0
15	300	5.23598776	4.67	-2.0983	1.2115	0	-9.799061	5.657705	0
16	320	5.58505361	2.16	-1.5574	1.8561	0	-3.363984	4.009176	0
17	340	5.93411946	4.67	-0.8287	2.2768	0	-3.870029	10.632656	0
0'	0	0	4.67	0	2.423	0.9616	0	11.31541	4.490672
1'	20	0.34906585	2.16	0.8287	2.2768	0.9616	1.789992	4.917888	2.077056
2'	40	0.6981317	4.67	1.5574	1.8561	0.9616	7.273058	8.667987	4.490672
3'	60	1.04719755	2.16	2.0983	1.2115	0.9616	4.532328	2.61684	2.077056
4'	80	1.3962634	4.67	2.3861	0.4207	0.9616	11.143087	1.964669	4.490672
5'	100	1.74532925	2.16	2.3861	-0.4207	0.9616	5.153976	-0.908712	2.077056
6'	120	2.0943951	4.67	2.0983	-1.2115	0.9616	9.799061	-5.657705	4.490672
7'	140	2.44346095	2.16	1.5574	-1.8561	0.9616	3.363984	-4.009176	2.077056
8'	160	2.7925268	4.67	0.8287	-2.2768	0.9616	3.870029	-10.632656	4.490672
9'	180	3.14159265	2.16	0	-2.423	0.9616	0	-5.23368	2.077056
10'	200	3.4906585	4.67	-0.8287	-2.2768	0.9616	-3.870029	-10.632656	4.490672
11'	220	3.83972435	2.16	-1.5574	-1.8561	0.9616	-3.363984	-4.009176	2.077056
12'	240	4.1887902	4.67	-2.0983	-1.2115	0.9616	-9.799061	-5.657705	4.490672
13'	260	4.53785606	2.16	-2.3861	-0.4207	0.9616	-5.153976	-0.908712	2.077056
14'	280	4.88692191	4.67	-2.3861	0.4207	0.9616	-11.143087	1.964669	4.490672
15'	300	5.23598776	2.16	-2.0983	1.2115	0.9616	-4.532328	2.61684	2.077056
16'	320	5.58505361	4.67	-1.5574	1.8561	0.9616	-7.273058	8.667987	4.490672
17'	340	5.93411946	2.16	-0.8287	2.2768	0.9616	-1.789992	4.917888	2.077056
0"	0	0	2.16	0	2.423	1.9232	0	5.23368	4.154112
1"	20	0.34906585	4.67	0.8287	2.2768	1.9232	3.870029	10.632656	8.981344
2"	40	0.6981317	2.16	1.5574	1.8561	1.9232	3.363984	4.009176	4.154112
3"	60	1.04719755	4.67	2.0983	1.2115	1.9232	9.799061	5.657705	8.981344
4"	80	1.3962634	2.16	2.3861	0.4207	1.9232	5.153976	0.908712	4.154112
5"	100	1.74532925	4.67	2.3861	-0.4207	1.9232	11.143087	-1.964669	8.981344
15"	300	5.23598776	4.67	-2.0983	1.2115	1.9232	-9.799061	5.657705	8.981344
16"	320	5.58505361	2.16	-1.5574	1.8561	1.9232	-3.363984	4.009176	4.154112
17"	340	5.93411946	4.67	-0.8287	2.2768	1.9232	-3.870029	10.632656	8.981344
			154.93				16.297063	44.776797	120.63272
			154.93						

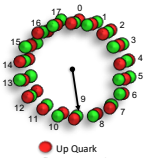
Coordinates

AQM predicted r (precessing)= 2.60676744
% agreement= 100.0%

Center of Mass coordinates: x= 0.105189847, y= 0.289013083, z= 0.778627251

experimental RMS charge radius= 2.6058
AQM predicted r (tumbling)= 2.839332214 COM to quark 10 (farthest)
% agreement= 108.90%

O-16



nucleon view from side

quark #	angle (deg)	angle (rad)	mass (MeV)	x-value (fm)	y-value (fm)	z-value (fm)	weight x	weight y	weight z
0	0	0	2.16	0	2.423	0	0	5.23368	0
1	20	0.34906585	4.67	0.8287	2.2768	0	3.870029	10.632656	0
2	40	0.6981317	2.16	1.5574	1.8561	0	3.363984	4.009176	0
3	60	1.04719755	4.67	2.0983	1.2115	0	9.799061	5.657705	0
4	80	1.3962634	2.16	2.3861	0.4207	0	5.153976	0.908712	0
5	100	1.74532925	4.67	2.3861	-0.4207	0	11.143087	-1.964669	0
6	120	2.0943951	2.16	2.0983	-1.2115	0	4.532328	-2.61684	0
7	140	2.44346095	4.67	1.5574	-1.8561	0	7.273058	-8.667987	0
8	160	2.7925268	2.16	0.8287	-2.2768	0	1.789992	-4.917888	0
9	180	3.14159265	4.67	0	-2.423	0	0	-11.31541	0
10	200	3.4906585	2.16	-0.8287	-2.2768	0	-1.789992	-4.917888	0
11	220	3.83972435	4.67	-1.5574	-1.8561	0	-7.273058	-8.667987	0
12	240	4.1887902	2.16	-2.0983	-1.2115	0	-4.532328	-2.61684	0
13	260	4.53785606	4.67	-2.3861	-0.4207	0	-11.143087	-1.964669	0
14	280	4.88692191	2.16	-2.3861	0.4207	0	-5.153976	0.908712	0
15	300	5.23598776	4.67	-2.0983	1.2115	0	-9.799061	5.657705	0
16	320	5.58505361	2.16	-1.5574	1.8561	0	-3.363984	4.009176	0
17	340	5.93411946	4.67	-0.8287	2.2768	0	-3.870029	10.632656	0
0'	0	0	4.67	0	2.423	0.9616	0	11.31541	4.490672
1'	20	0.34906585	2.16	0.8287	2.2768	0.9616	1.789992	4.917888	2.077056
2'	40	0.6981317	4.67	1.5574	1.8561	0.9616	7.273058	8.667987	4.490672
3'	60	1.04719755	2.16	2.0983	1.2115	0.9616	4.532328	2.61684	2.077056
4'	80	1.3962634	4.67	2.3861	0.4207	0.9616	11.143087	1.964669	4.490672
5'	100	1.74532925	2.16	2.3861	-0.4207	0.9616	5.153976	-0.908712	2.077056
6'	120	2.0943951	4.67	2.0983	-1.2115	0.9616	9.799061	-5.657705	4.490672
7'	140	2.44346095	2.16	1.5574	-1.8561	0.9616	3.363984	-4.009176	2.077056
8'	160	2.7925268	4.67	0.8287	-2.2768	0.9616	3.870029	-10.632656	4.490672
9'	180	3.14159265	2.16	0	-2.423	0.9616	0	-5.23368	2.077056
10'	200	3.4906585	4.67	-0.8287	-2.2768	0.9616	-3.870029	-10.632656	4.490672
11'	220	3.83972435	2.16	-1.5574	-1.8561	0.9616	-3.363984	-4.009176	2.077056
12'	240	4.1887902	4.67	-2.0983	-1.2115	0.9616	-9.799061	-5.657705	4.490672
13'	260	4.53785606	2.16	-2.3861	-0.4207	0.9616	-5.153976	-0.908712	2.077056
14'	280	4.88692191	4.67	-2.3861	0.4207	0.9616	-11.143087	1.964669	4.490672
15'	300	5.23598776	2.16	-2.0983	1.2115	0.9616	-4.532328	2.61684	2.077056
16'	320	5.58505361	4.67	-1.5574	1.8561	0.9616	-7.273058	8.667987	4.490672
17'	340	5.93411946	2.16	-0.8287	2.2768	0.9616	-1.789992	4.917888	2.077056
0"	0	0	2.16	0	2.423	1.9232	0	5.23368	4.154112
1"	20	0.34906585	4.67	0.8287	2.2768	1.9232	3.870029	10.632656	8.981344
2"	40	0.6981317	2.16	1.5574	1.8561	1.9232	3.363984	4.009176	4.154112
3"	60	1.04719755	4.67	2.0983	1.2115	1.9232	9.799061	5.657705	8.981344
4"	80	1.3962634	2.16	2.3861	0.4207	1.9232	5.153976	0.908712	4.154112
5"	100	1.74532925	4.67	2.3861	-0.4207	1.9232	11.143087	-1.964669	8.981344
12"	240	4.1887902	2.16	-2.0983	-1.2115	1.9232	-4.532328	-2.61684	4.154112
13"	260	4.53785606	4.67	-2.3861	-0.4207	1.9232	-11.143087	-1.964669	8.981344
14"	280	4.88692191	2.16	-2.3861	0.4207	1.9232	-5.153976	0.908712	4.154112
15"	300	5.23598776	4.67	-2.0983	1.2115	1.9232	-9.799061	5.657705	8.981344
16"	320	5.58505361	2.16	-1.5574	1.8561	1.9232	-3.363984	4.009176	4.154112
17"	340	5.93411946	4.67	-0.8287	2.2768	1.9232	-3.870029	10.632656	8.981344
			163.92				-4.532328	41.104	137.922288
			163.92						

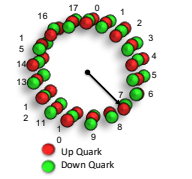
Coordinates

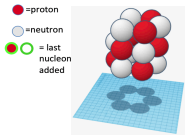
AQM predicted r (precessing)= 2.60674822
% agreement= 96.6%

COM--> x= -0.027649634, y= 0.250756467, z= 0.8414

experimental radius (fm)= 2.6991
AQM predicted r (tumbling)= 2.803157524 (COM to quark 1")
% agreement= 103.86%

O-17





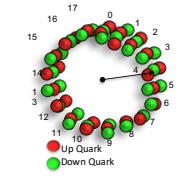
nucleon view from side

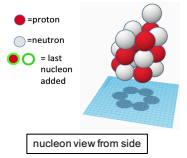
quark #	angle (deg)	angle (rad)	mass (MeV)	x-value (fm)	y-value (fm)	z-value (fm)	weight x	weight y	weight z
0	0	0	2.16	0	2.423	0	0	5.23368	0
1	20	0.34906585	4.67	0.8287	2.2768	0	3.870029	10.632656	0
2	40	0.6981317	2.16	1.5574	1.8561	0	3.363984	4.009176	0
3	60	1.04719755	4.67	2.0983	1.2115	0	9.799061	5.657705	0
4	80	1.3962634	2.16	2.3861	0.4207	0	5.153976	0.908712	0
5	100	1.74532925	4.67	2.3861	-0.4207	0	11.143087	-1.964669	0
6	120	2.0943951	2.16	2.0983	-1.2115	0	4.532328	-2.61684	0
7	140	2.44346095	4.67	1.5574	-1.8561	0	7.273058	-8.667987	0
8	160	2.7925268	2.16	0.8287	-2.2768	0	1.789992	-4.917888	0
9	180	3.14159265	4.67	0	-2.423	0	0	-11.31541	0
10	200	3.4906585	2.16	-0.8287	-2.2768	0	-1.789992	-4.917888	0
11	220	3.83972435	4.67	-1.5574	-1.8561	0	-7.273058	-8.667987	0
12	240	4.1887902	2.16	-2.0983	-1.2115	0	-4.532328	-2.61684	0
13	260	4.53785606	4.67	-2.3861	-0.4207	0	-11.143087	-1.964669	0
14	280	4.88692191	2.16	-2.3861	0.4207	0	-5.153976	0.908712	0
15	300	5.23598776	4.67	-2.0983	1.2115	0	-9.799061	5.657705	0
16	320	5.58505361	2.16	-1.5574	1.8561	0	-3.363984	4.009176	0
17	340	5.93411946	4.67	-0.8287	2.2768	0	-3.870029	10.632656	0
0'	0	0	4.67	0	2.423	0.9616	0	11.31541	4.490672
1'	20	0.34906585	2.16	0.8287	2.2768	0.9616	1.789992	4.917888	2.077056
2'	40	0.6981317	4.67	1.5574	1.8561	0.9616	7.273058	8.667987	4.490672
3'	60	1.04719755	2.16	2.0983	1.2115	0.9616	4.532328	2.61684	2.077056
4'	80	1.3962634	4.67	2.3861	0.4207	0.9616	11.143087	1.964669	4.490672
5'	100	1.74532925	2.16	2.3861	-0.4207	0.9616	5.153976	-0.908712	2.077056
6'	120	2.0943951	4.67	2.0983	-1.2115	0.9616	9.799061	-5.657705	4.490672
7'	140	2.44346095	2.16	1.5574	-1.8561	0.9616	3.363984	-4.009176	2.077056
8'	160	2.7925268	4.67	0.8287	-2.2768	0.9616	3.870029	-10.632656	4.490672
9'	180	3.14159265	2.16	0	-2.423	0.9616	0	-5.23368	2.077056
10'	200	3.4906585	4.67	-0.8287	-2.2768	0.9616	-3.870029	-10.632656	4.490672
11'	220	3.83972435	2.16	-1.5574	-1.8561	0.9616	-3.363984	-4.009176	2.077056
12'	240	4.1887902	4.67	-2.0983	-1.2115	0.9616	-9.799061	-5.657705	4.490672
13'	260	4.53785606	2.16	-2.3861	-0.4207	0.9616	-5.153976	-0.908712	2.077056
14'	280	4.88692191	4.67	-2.3861	0.4207	0.9616	-11.143087	1.964669	4.490672
15'	300	5.23598776	2.16	-2.0983	1.2115	0.9616	-4.532328	2.61684	2.077056
16'	320	5.58505361	4.67	-1.5574	1.8561	0.9616	-7.273058	8.667987	4.490672
17'	340	5.93411946	2.16	-0.8287	2.2768	0.9616	-3.870029	10.632656	2.077056
0"	0	0	2.16	0	2.423	1.9232	0	5.23368	4.154112
1"	20	0.34906585	4.67	0.8287	2.2768	1.9232	3.870029	10.632656	8.981344
2"	40	0.6981317	2.16	1.5574	1.8561	1.9232	3.363984	4.009176	4.154112
3"	60	1.04719755	4.67	2.0983	1.2115	1.9232	9.799061	5.657705	8.981344
4"	80	1.3962634	2.16	2.3861	0.4207	1.9232	5.153976	0.908712	4.154112
5"	100	1.74532925	4.67	2.3861	-0.4207	1.9232	11.143087	-1.964669	8.981344
9"	180	3.14159265	4.67	0	-2.423	1.9232	0	-11.31541	8.981344
10"	200	3.4906585	2.16	-0.8287	-2.2768	1.9232	-1.789992	-4.917888	4.154112
11"	220	3.83972435	4.67	-1.5574	-1.8561	1.9232	-7.273058	-8.667987	8.981344
12"	240	4.1887902	2.16	-2.0983	-1.2115	1.9232	-4.532328	-2.61684	4.154112
13"	260	4.53785606	4.67	-2.3861	-0.4207	1.9232	-11.143087	-1.964669	8.981344
14"	280	4.88692191	2.16	-2.3861	0.4207	1.9232	-5.153976	0.908712	4.154112
15"	300	5.23598776	4.67	-2.0983	1.2115	1.9232	-9.799061	5.657705	8.981344
16"	320	5.58505361	2.16	-1.5574	1.8561	1.9232	-3.363984	4.009176	4.154112
17"	340	5.93411946	4.67	-0.8287	2.2768	1.9232	-3.870029	10.632656	8.981344
			175.42				-13.595378	16.202715	160.039088
			175.42			Coordinates			
						x=	-0.07750187		
						y=	0.092365266		
						z=	0.912319507		

AQM predicted r (precessing)= 2.60683785
% agreement= 96.8%

experimental radius= 2.6932
AQM predicted r (tumbling)= 2.702174661 COM to quark 7 (farthest)
% agreement= 100.33%

O-18





nucleon view from side

quark #	angle (deg)	angle (rad)	mass (MeV)	x-value (fm)	y-value (fm)	z-value (fm)	weight x	weight y	weight z
0	0	0	2.16	0	2.423	0	0	5.23368	0
1	20	0.34906585	4.67	0.8287	2.2768	0	3.870029	10.632656	0
2	40	0.6981317	2.16	1.5574	1.8561	0	3.363984	4.009176	0
3	60	1.04719755	4.67	2.0983	1.2115	0	9.799061	5.657705	0
4	80	1.3962634	2.16	2.3861	0.4207	0	5.153976	0.908712	0
5	100	1.74532925	4.67	2.3861	-0.4207	0	11.143087	-1.964669	0
6	120	2.0943951	2.16	2.0983	-1.2115	0	4.532328	-2.61684	0
7	140	2.44346095	4.67	1.5574	-1.8561	0	7.273058	-8.667987	0
8	160	2.7925268	2.16	0.8287	-2.2768	0	1.789992	-4.917888	0
9	180	3.14159265	4.67	0	-2.423	0	0	-11.31541	0
10	200	3.4906585	2.16	-0.8287	-2.2768	0	-1.789992	-4.917888	0
11	220	3.83972435	4.67	-1.5574	-1.8561	0	-7.273058	-8.667987	0
12	240	4.1887902	2.16	-2.0983	-1.2115	0	-4.532328	-2.61684	0
13	260	4.53785606	4.67	-2.3861	-0.4207	0	-11.143087	-1.964669	0
14	280	4.88692191	2.16	-2.3861	0.4207	0	-5.153976	0.908712	0
15	300	5.23598776	4.67	-2.0983	1.2115	0	-9.799061	5.657705	0
16	320	5.58505361	2.16	-1.5574	1.8561	0	-3.363984	4.009176	0
17	340	5.93411946	4.67	-0.8287	2.2768	0	-3.870029	10.632656	0
0'	0	0	4.67	0	2.423	0.9616	0	11.31541	4.490672
1'	20	0.34906585	2.16	0.8287	2.2768	0.9616	1.789992	4.917888	2.077056
2'	40	0.6981317	4.67	1.5574	1.8561	0.9616	7.273058	8.667987	4.490672
3'	60	1.04719755	2.16	2.0983	1.2115	0.9616	4.532328	2.61684	2.077056
4'	80	1.3962634	4.67	2.3861	0.4207	0.9616	11.143087	1.964669	4.490672
5'	100	1.74532925	2.16	2.3861	-0.4207	0.9616	5.153976	-0.908712	2.077056
6'	120	2.0943951	4.67	2.0983	-1.2115	0.9616	9.799061	-5.657705	4.490672
7'	140	2.44346095	2.16	1.5574	-1.8561	0.9616	3.363984	-4.009176	2.077056
8'	160	2.7925268	4.67	0.8287	-2.2768	0.9616	3.870029	-10.632656	4.490672
9'	180	3.14159265	2.16	0	-2.423	0.9616	0	-5.23368	2.077056
10'	200	3.4906585	4.67	-0.8287	-2.2768	0.9616	-3.870029	-10.632656	4.490672
11'	220	3.83972435	2.16	-1.5574	-1.8561	0.9616	-3.363984	-4.009176	2.077056
12'	240	4.1887902	4.67	-2.0983	-1.2115	0.9616	-9.799061	-5.657705	4.490672
13'	260	4.53785606	2.16	-2.3861	-0.4207	0.9616	-5.153976	-0.908712	2.077056
14'	280	4.88692191	4.67	-2.3861	0.4207	0.9616	-11.143087	1.964669	4.490672
15'	300	5.23598776	2.16	-2.0983	1.2115	0.9616	-4.532328	2.61684	2.077056
16'	320	5.58505361	4.67	-1.5574	1.8561	0.9616	-7.273058	8.667987	4.490672
17'	340	5.93411946	2.16	-0.8287	2.2768	0.9616	-1.789992	4.917888	2.077056
0"	0	0	2.16	0	2.423	1.9232	0	5.23368	4.154112
1"	20	0.34906585	4.67	0.8287	2.2768	1.9232	3.870029	10.632656	8.981344
2"	40	0.6981317	2.16	1.5574	1.8561	1.9232	3.363984	4.009176	4.154112
3"	60	1.04719755	4.67	2.0983	1.2115	1.9232	9.799061	5.657705	8.981344
4"	80	1.3962634	2.16	2.3861	0.4207	1.9232	5.153976	0.908712	4.154112
5"	100	1.74532925	4.67	2.3861	-0.4207	1.9232	11.143087	-1.964669	8.981344
9"	180	3.14159265	4.67	0	-2.423	1.9232	0	-11.31541	8.981344
10"	200	3.4906585	2.16	-0.8287	-2.2768	1.9232	-1.789992	-4.917888	4.154112
11"	220	3.83972435	4.67	-1.5574	-1.8561	1.9232	-7.273058	-8.667987	8.981344
12"	240	4.1887902	2.16	-2.0983	-1.2115	1.9232	-4.532328	-2.61684	4.154112
13"	260	4.53785606	4.67	-2.3861	-0.4207	1.9232	-11.143087	-1.964669	8.981344
14"	280	4.88692191	2.16	-2.3861	0.4207	1.9232	-5.153976	0.908712	4.154112
15"	300	5.23598776	4.67	-2.0983	1.2115	1.9232	-9.799061	5.657705	8.981344
16"	320	5.58505361	2.16	-1.5574	1.8561	1.9232	-3.363984	4.009176	4.154112
17"	340	5.93411946	4.67	-0.8287	2.2768	1.9232	-3.870029	10.632656	8.981344
0"'	0	0	4.67	0	2.423	2.8848	0	11.31541	13.472016
1"'	20	0.34906585	2.16	0.8287	2.2768	2.8848	1.789992	4.917888	6.231168
2"'	40	0.6981317	4.67	1.5574	1.8561	2.8848	7.273058	8.667987	13.472016
			186.92				-4.532328	41.104	193.214288
						Coordinates			
						x=	-0.024247421		
						y=	0.219901562		
						z=	1.0336737		

AQM predicted r (precessing)= 2.81983098
% agreement= 101.7%

experimental radius= 2.7726
QM predicted r (tumbling)= 2.630318616 COM to quark 4 (farthest)
% agreement= 94.87%

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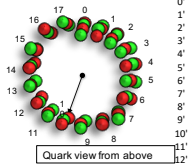
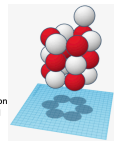
quark #	angle (deg)	angle (rad)	mass (MeV)	x-value (fm)	y-value (fm)	z-value (fm)	weight x	weight y	weight z
0	0	0	2.16	0	2.423	0	0	5.23368	0
1	20	0.34906585	4.67	0.8287	2.2768	0	3.870029	10.632656	0
2	40	0.6981317	2.16	1.5574	1.8561	0	3.363984	4.009176	0
3	60	1.04719755	4.67	2.0983	1.2115	0	9.799061	5.657705	0
4	80	1.3962634	2.16	2.3861	0.4207	0	5.153976	0.908712	0
5	100	1.74532925	4.67	2.3861	-0.4207	0	11.143087	-1.964669	0
6	120	2.0943951	2.16	2.0983	-1.2115	0	4.532328	-2.61684	0
7	140	2.44346095	4.67	1.5574	-1.8561	0	7.273058	-8.667987	0
8	160	2.7925268	2.16	0.8287	-2.2768	0	1.789992	-4.917888	0
9	180	3.14159265	4.67	0	-2.423	0	0	-11.31541	0
10	200	3.4906585	2.16	-0.8287	-2.2768	0	-1.789992	-4.917888	0
11	220	3.83972435	4.67	-1.5574	-1.8561	0	-7.273058	-8.667987	0
12	240	4.1887902	2.16	-2.0983	-1.2115	0	-4.532328	-2.61684	0
13	260	4.53785606	4.67	-2.3861	-0.4207	0	-11.143087	-1.964669	0
14	280	4.88692191	2.16	-2.3861	0.4207	0	-5.153976	0.908712	0
15	300	5.23598776	4.67	-2.0983	1.2115	0	-9.799061	5.657705	0
16	320	5.58505361	2.16	-1.5574	1.8561	0	-3.363984	4.009176	0
17	340	5.93411946	4.67	-0.8287	2.2768	0	-3.870029	10.632656	0
0'	0	0	4.67	0	2.423	0.96	0	11.31541	4.4832
1'	20	0.34906585	2.16	0.8287	2.2768	0.96	1.789992	4.917888	2.0736
2'	40	0.6981317	4.67	1.5574	1.8561	0.96	7.273058	8.667987	4.4832
3'	60	1.04719755	2.16	2.0983	1.2115	0.96	4.532328	2.61684	2.0736
4'	80	1.3962634	4.67	2.3861	0.4207	0.96	11.143087	1.964669	4.4832
5'	100	1.74532925	2.16	2.3861	-0.4207	0.96	5.153976	-0.908712	2.0736
6'	120	2.0943951	4.67	2.0983	-1.2115	0.96	9.799061	-5.657705	4.4832
7'	140	2.44346095	2.16	1.5574	-1.8561	0.96	3.363984	-4.009176	2.0736
8'	160	2.7925268	4.67	0.8287	-2.2768	0.96	3.870029	-10.632656	4.4832
9'	180	3.14159265	2.16	0	-2.423	0.96	0	-5.23368	2.0736
10'	200	3.4906585	4.67	-0.8287	-2.2768	0.96	-3.870029	-10.632656	4.4832
11'	220	3.83972435	2.16	-1.5574	-1.8561	0.96	-3.363984	-4.009176	2.0736
12'	240	4.1887902	4.67	-2.0983	-1.2115	0.96	-9.799061	-5.657705	4.4832
13'	260	4.53785606	2.16	-2.3861	-0.4207	0.96	-5.153976	-0.908712	2.0736
14'	280	4.88692191	4.67	-2.3861	0.4207	0.96	-11.143087	1.964669	4.4832
15'	300	5.23598776	2.16	-2.0983	1.2115	0.96	-4.532328	2.61684	2.0736
16'	320	5.58505361	4.67	-1.5574	1.8561	0.96	-7.273058	8.667987	4.4832
17'	340	5.93411946	2.16	-0.8287	2.2768	0.96	-1.789992	4.917888	2.0736
0''	0	0	2.16	0	2.423	1.92	0	5.23368	4.1472
1''	20	0.34906585	4.67	0.8287	2.2768	1.92	3.870029	10.632656	8.9664
2''	40	0.6981317	2.16	1.5574	1.8561	1.92	3.363984	4.009176	4.1472
3''	60	1.04719755	4.67	2.0983	1.2115	1.92	9.799061	5.657705	8.9664
4''	80	1.3962634	2.16	2.3861	0.4207	1.92	5.153976	0.908712	4.1472
5''	100	1.74532925	4.67	2.3861	-0.4207	1.92	11.143087	-1.964669	8.9664
6	120	2.0943951	2.16	2.0983	-1.2115	1.92	4.532328	-2.61684	4.1472
7	140	2.44346095	4.67	1.5574	-1.8561	1.92	7.273058	-8.667987	8.9664
8	160	2.7925268	2.16	0.8287	-2.2768	1.92	1.789992	-4.917888	4.1472
9''	120	2.0943951	4.67	2.0983	-1.2115	1.92	9.799061	-5.657705	8.9664
10''	140	2.44346095	2.16	1.5574	-1.8561	1.92	3.363984	-4.009176	4.1472
11''	160	2.7925268	4.67	0.8287	-2.2768	1.92	3.870029	-10.632656	8.9664
12''	180	3.14159265	2.16	0	-2.423	1.92	0	-5.23368	4.1472
13''	260	4.53785606	4.67	-2.3861	-0.4207	1.92	-11.143087	-1.964669	8.9664
14''	280	4.88692191	2.16	-2.3861	0.4207	1.92	-5.153976	0.908712	4.1472
15''	300	5.23598776	4.67	-2.0983	1.2115	1.92	-9.799061	5.657705	8.9664
16''	320	5.58505361	2.16	-1.5574	1.8561	1.92	-3.363984	4.009176	4.1472
17''	340	5.93411946	4.67	-0.8287	2.2768	1.92	-3.870029	10.632656	8.9664
0'''	0	0	4.67	0	3.383	2.88	0	15.79861	13.4496
1'''	20	0.34906585	2.16	1.157	3.1789	2.88	2.49912	6.866424	6.2208
2'''	40	0.6981317	4.67	2.1745	2.5915	2.88	10.154915	12.102305	13.4496
			195.91				43.282487	36.752247	210.1536



Quark view from above

Up Quark
Down Quark


=proton
=neutron
= last nucleon added

nucleon view from side

Coordinates

x=	0.220930463
y=	0.187597606
z=	1.072704813
experimental radius=	2.8976

AQM predicted r (precessing)=	3.24045008	AQM predicted r (tumbling)=	2.885424628	COM to quark 10 (farthest)
% agreement=	111.8%	% agreement=	99.6%	