



wwPDB EM Validation Summary Report ⓘ

Dec 13, 2022 – 01:02 AM EST

PDB ID : 3J2Q
Title : Model of membrane-bound factor VIII organized in 2D crystals
Authors : Stoilova-Mcphie, S.; Lynch, G.C.; Ludtke, S.; Pettitt, B.M.
Deposited on : 2012-12-11
Resolution : 15.00 Å(reported)

This is a wwPDB EM Validation Summary Report for a publicly released PDB/EMDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.31.2

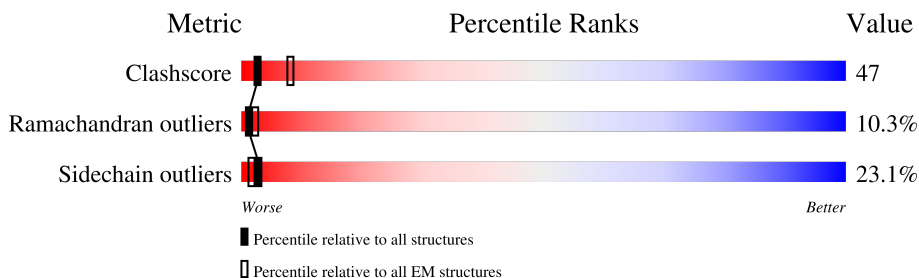
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

ELECTRON CRYSTALLOGRAPHY

The reported resolution of this entry is 15.00 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$.

Mol	Chain	Length	Quality of chain
1	A	754	15% (green), 47% (yellow), 19% (orange), 16% (grey), 1% (red)
2	B	684	21% (green), 51% (yellow), 17% (orange), 8% (grey), 3% (red)
3	C	2	50% (yellow), 50% (orange)
4	D	4	100% (orange)

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	BMA	D	2	-	-	X	-
4	BMA	D	4	-	-	X	-

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Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
7	NAG	B	2401	X	-	-	-
7	NAG	B	2402	X	-	-	-

2 Entry composition i

There are 7 unique types of molecules in this entry. The entry contains 10317 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Coagulation factor VIII heavy chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	630	5086	3278	855	928	25	0	0

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	746	PRO	-	expression tag	UNP P00451
A	747	PRO	-	expression tag	UNP P00451
A	748	VAL	-	expression tag	UNP P00451
A	749	LEU	-	expression tag	UNP P00451
A	750	LYS	-	expression tag	UNP P00451
A	751	ARG	-	expression tag	UNP P00451
A	752	HIS	-	expression tag	UNP P00451
A	753	GLN	-	expression tag	UNP P00451
A	754	ARG	-	expression tag	UNP P00451

- Molecule 2 is a protein called Coagulation factor VIII light chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	631	5125	3288	881	924	32	0	0

There is a discrepancy between the modelled and reference sequences:

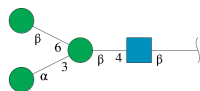
Chain	Residue	Modelled	Actual	Comment	Reference
B	1880	LEU	PHE	SEE REMARK 999	UNP P00451

- Molecule 3 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
3	C	2	28	16	2	10	0	0

- Molecule 4 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-[beta-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
4	D	4	47	26	1	20	0	0

- Molecule 5 is COPPER (II) ION (three-letter code: CU) (formula: Cu).

Mol	Chain	Residues	Atoms		AltConf
			Total	Cu	
5	A	1	1	1	0
5	B	1	1	1	0

- Molecule 6 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		AltConf
			Total	Ca	
6	A	1	1	1	0

- Molecule 7 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: C₈H₁₅NO₆).



Mol	Chain	Residues	Atoms			AltConf	
			Total	C	N		O
7	B	1	28	16	2	10	0
7	B	1	28	16	2	10	0

VAL
LEU
LYS
ARG
HIS
GLN
ARG

• Molecule 2: Coagulation factor VIII light chain

Chain B: 21% 51% 17% 8%

GLU	S1780	S1781	S1782	S1783	S1784	S1785	S1786	S1787	S1788	S1789	S1790	S1791	S1792	S1793	S1794	S1795	S1796	S1797	S1798	S1799	S1800	S1801	S1802	S1803	S1804	S1805	S1806	S1807	S1808	S1809	S1810	S1811	S1812	S1813	S1814	S1815	S1816	S1817	S1818	S1819	S1820	S1821	S1822	S1823	S1824	S1825	S1826	S1827	S1828	S1829	S1830	S1831	S1832	S1833	S1834	S1835	S1836	S1837	S1838	S1839	S1840	S1841	S1842	S1843	S1844	S1845	S1846	S1847	S1848	S1849	S1850				
ILE	S1760	PRO	HIS	VAL	LEU	ARG	ASN	ARG	ALA	ALA	SER	S1725	S1726	S1727	S1728	S1729	S1730	S1731	S1732	S1733	S1734	S1735	S1736	S1737	S1738	S1739	S1740	S1741	S1742	S1743	S1744	S1745	S1746	S1747	S1748	S1749	S1750	S1751	S1752	S1753	S1754	S1755	S1756	S1757	S1758	S1759	S1760	S1761	S1762	S1763	S1764	S1765	S1766	S1767	S1768	S1769	S1770	S1771	S1772	S1773	S1774	S1775	S1776	S1777	S1778	S1779	S1780								
THR	S1851	S1852	S1853	S1854	S1855	S1856	S1857	S1858	S1859	S1860	S1861	S1862	S1863	S1864	S1865	S1866	S1867	S1868	S1869	S1870	S1871	S1872	S1873	S1874	S1875	S1876	S1877	S1878	S1879	S1880	S1881	S1882	S1883	S1884	S1885	S1886	S1887	S1888	S1889	S1890	S1891	S1892	S1893	S1894	S1895	S1896	S1897	S1898	S1899	S1900	S1901	S1902	S1903	S1904	S1905	S1906	S1907	S1908	S1909	S1910	S1911	S1912	S1913	S1914	S1915										
THR	S1916	S1917	S1918	S1919	S1920	S1921	S1922	S1923	S1924	S1925	S1926	S1927	S1928	S1929	S1930	S1931	S1932	S1933	S1934	S1935	S1936	S1937	S1938	S1939	S1940	S1941	S1942	S1943	S1944	S1945	S1946	S1947	S1948	S1949	S1950	S1951	S1952	S1953	S1954	S1955	S1956	S1957	S1958	S1959	S1960	S1961	S1962	S1963	S1964	S1965	S1966	S1967	S1968	S1969	S1970	S1971	S1972	S1973	S1974	S1975	S1976	S1977	S1978	S1979											
THR	S1983	S1984	S1985	S1986	S1987	S1988	S1989	S1990	S1991	S1992	S1993	S1994	S1995	S1996	S1997	S1998	S1999	S2000	S2001	S2002	S2003	S2004	S2005	S2006	S2007	S2008	S2009	S2010	S2011	S2012	S2013	S2014	S2015	S2016	S2017	S2018	S2019	S2020	S2021	S2022	S2023	S2024	S2025	S2026	S2027	S2028	S2029	S2030	S2031	S2032	S2033	S2034	S2035	S2036	S2037	S2038	S2039	S2040	S2041	S2042	S2043	S2044	S2045	S2046	S2047	S2048									
THR	S2049	S2050	S2051	S2052	S2053	S2054	S2055	S2056	S2057	S2058	S2059	S2060	S2061	S2062	S2063	S2064	S2065	S2066	S2067	S2068	S2069	S2070	S2071	S2072	S2073	S2074	S2075	S2076	S2077	S2078	S2079	S2080	S2081	S2082	S2083	S2084	S2085	S2086	S2087	S2088	S2089	S2090	S2091	S2092	S2093	S2094	S2095	S2096	S2097	S2098	S2099	S2100	S2101	S2102	S2103	S2104	S2105	S2106	S2107	S2108	S2109														
THR	S2110	S2111	S2112	S2113	S2114	S2115	S2116	S2117	S2118	S2119	S2120	S2121	S2122	S2123	S2124	S2125	S2126	S2127	S2128	S2129	S2130	S2131	S2132	S2133	S2134	S2135	S2136	S2137	S2138	S2139	S2140	S2141	S2142	S2143	S2144	S2145	S2146	S2147	S2148	S2149	S2150	S2151	S2152	S2153	S2154	S2155	S2156	S2157	S2158	S2159	S2160	S2161	S2162	S2163	S2164	S2165	S2166	S2167	S2168	S2169	S2170	S2171													
THR	S2172	S2173	S2174	S2175	S2176	S2177	S2178	S2179	S2180	S2181	S2182	S2183	S2184	S2185	S2186	S2187	S2188	S2189	S2190	S2191	S2192	S2193	S2194	S2195	S2196	S2197	S2198	S2199	S2200	S2201	S2202	S2203	S2204	S2205	S2206	S2207	S2208	S2209	S2210	S2211	S2212	S2213	S2214	S2215	S2216	S2217	S2218	S2219	S2220	S2221	S2222	S2223	S2224	S2225	S2226	S2227	S2228	S2229	S2230	S2231	S2232	S2233	S2234	S2235	S2236	S2237	S2238	S2239	S2240	S2241	S2242	S2243	S2244	S2245	S2246
THR	S2247	S2248	S2249	S2250	S2251	S2252	S2253	S2254	S2255	S2256	S2257	S2258	S2259	S2260	S2261	S2262	S2263	S2264	S2265	S2266	S2267	S2268	S2269	S2270	S2271	S2272	S2273	S2274	S2275	S2276	S2277	S2278	S2279	S2280	S2281	S2282	S2283	S2284	S2285	S2286	S2287	S2288	S2289	S2290	S2291	S2292	S2293	S2294	S2295	S2296	S2297	S2298	S2299	S2300	S2301	S2302	S2303	S2304	S2305	S2306	S2307	S2308	S2309												
THR	S2310	S2311	S2312	S2313	S2314	S2315	S2316	S2317	S2318	S2319	S2320	S2321	S2322	S2323	S2324	S2325	S2326	S2327	S2328	S2329	S2330	S2331	S2332	S2333	S2334	S2335	S2336	S2337	S2338	S2339	S2340	S2341	S2342	S2343	S2344	S2345	S2346	S2347	S2348	S2349	S2350	S2351	S2352	S2353	S2354	S2355	S2356	S2357	S2358	S2359	S2360	S2361	S2362	S2363	S2364	S2365	S2366	S2367	S2368	S2369	S2370														

• Molecule 3: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain C: 50% 50%

MAG1
MAG2

- Molecule 4: alpha-D-mannopyranose-(1-3)-[beta-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain D:

100%

MAG1
BMA2
MAN3
BMA4

4 Data and refinement statistics i

EDS failed to run properly - this section is therefore incomplete.

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	81.00Å 71.00Å 100.00Å 67.00° 60.00° 65.00°	Depositor
Resolution (Å)	(Not available) – 15.00	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-15.00)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$	-	Xtrriage
Refinement program	unknown	Depositor
R, R_{free}	(Not available) , (Not available)	Depositor
Wilson B-factor (Å ²)	(Not available)	Xtrriage
Anisotropy	(Not available)	Xtrriage
L-test for twinning ¹	$\langle L \rangle =$ (Not available), $\langle L^2 \rangle =$ (Not available)	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	10317	wwPDB-VP
Average B, all atoms (Å ²)	2.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *(Not available)*

¹Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality i

5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: NAG, CU, BMA, CA, MAN

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	0.81	12/5230 (0.2%)	0.95	11/7098 (0.2%)
2	B	0.93	20/5270 (0.4%)	1.31	39/7136 (0.5%)
All	All	0.87	32/10500 (0.3%)	1.15	50/14234 (0.4%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	7
2	B	2	7
All	All	2	14

The worst 5 of 32 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	2132	SER	CA-CB	20.34	1.83	1.52
2	B	2020	LYS	CA-C	14.78	1.91	1.52
2	B	2018	SER	CA-C	14.67	1.91	1.52
2	B	2018	SER	N-CA	13.70	1.73	1.46
1	A	121	ARG	CZ-NH1	13.13	1.50	1.33

The worst 5 of 50 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	2020	LYS	O-C-N	35.80	179.97	122.70
2	B	2020	LYS	CA-C-O	-33.53	49.68	120.10
2	B	2017	TYR	O-C-N	-30.67	73.63	122.70
2	B	2018	SER	N-CA-CB	-26.55	70.67	110.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	121	ARG	NE-CZ-NH2	-24.06	108.27	120.30

All (2) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	B	2018	SER	CA
2	B	2135	ILE	CB

5 of 14 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	237	TYR	Peptide
1	A	278	VAL	Peptide
1	A	281	HIS	Peptide
1	A	282	ARG	Peptide
1	A	56	ASP	Peptide

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	5086	0	4971	442	3289
2	B	5125	0	4992	575	3230
3	C	28	0	25	1	0
4	D	47	0	40	2	54
5	A	1	0	0	1	0
5	B	1	0	0	0	0
6	A	1	0	0	0	0
7	B	28	0	26	1	0
All	All	10317	0	10054	948	3311

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 47.

The worst 5 of 948 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:107:LYS:CG	1:A:107:LYS:CD	1.74	1.61
2:B:1710:GLY:CA	2:B:2090:ARG:HH11	1.19	1.56
1:A:119:SER:CB	2:B:2139:ILE:HG12	1.32	1.53
2:B:2132:SER:CB	2:B:2132:SER:CA	1.83	1.52
2:B:2019:ASN:CB	2:B:2019:ASN:CG	1.78	1.50

The worst 5 of 3311 symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:437:LYS:O	4:D:4:BMA:C5[1_565]	0.18	2.02
1:A:579:PHE:N	2:B:2146:ALA:C[1_565]	0.19	2.01
1:A:572:ASN:ND2	2:B:2243:VAL:O[1_565]	0.22	1.98
1:A:604:GLU:CB	2:B:2126:PHE:N[1_565]	0.25	1.95
1:A:630:CYS:C	2:B:2257:VAL:CG1[1_565]	0.28	1.92

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	622/754 (82%)	430 (69%)	131 (21%)	61 (10%)	0	10
2	B	627/684 (92%)	434 (69%)	125 (20%)	68 (11%)	0	8
All	All	1249/1438 (87%)	864 (69%)	256 (20%)	129 (10%)	1	8

5 of 129 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	118	THR
1	A	133	SER
1	A	181	GLU
1	A	227	ALA
1	A	232	HIS

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	559/674 (83%)	414 (74%)	145 (26%)	0	3
2	B	560/612 (92%)	446 (80%)	114 (20%)	1	7
All	All	1119/1286 (87%)	860 (77%)	259 (23%)	3	4

5 of 259 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	2122	THR
2	B	2156	TYR
1	A	497	HIS
1	A	484	ARG
2	B	2178	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 32 such sidechains are listed below:

Mol	Chain	Res	Type
2	B	2129	ASN
2	B	2266	GLN
2	B	1736	GLN
1	A	694	ASN
2	B	2311	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates i

6 monosaccharides are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	NAG	C	1	3,1	14,14,15	0.87	0	17,19,21	1.08	1 (5%)
3	NAG	C	2	3	14,14,15	2.88	3 (21%)	17,19,21	1.74	2 (11%)
4	NAG	D	1	4	14,14,15	0.95	0	17,19,21	1.63	6 (35%)
4	BMA	D	2	4	11,11,12	0.65	0	15,15,17	1.64	2 (13%)
4	MAN	D	3	4	11,11,12	0.70	0	15,15,17	1.99	2 (13%)
4	BMA	D	4	4	11,11,12	0.80	0	15,15,17	1.70	3 (20%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAG	C	1	3,1	-	3/6/23/26	0/1/1/1
3	NAG	C	2	3	-	4/6/23/26	0/1/1/1
4	NAG	D	1	4	-	5/6/23/26	0/1/1/1
4	BMA	D	2	4	-	2/2/19/22	0/1/1/1
4	MAN	D	3	4	-	2/2/19/22	0/1/1/1
4	BMA	D	4	4	-	2/2/19/22	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	2	NAG	O7-C7	8.01	1.41	1.23
3	C	2	NAG	C8-C7	-6.02	1.38	1.50
3	C	2	NAG	C1-C2	2.72	1.56	1.52

The worst 5 of 16 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	3	MAN	C1-O5-C5	6.48	120.98	112.19
3	C	2	NAG	C4-C3-C2	5.16	118.58	111.02
4	D	2	BMA	C1-O5-C5	4.50	118.29	112.19
4	D	4	BMA	C1-C2-C3	3.87	114.42	109.67
4	D	4	BMA	C2-C3-C4	3.78	117.43	110.89

There are no chirality outliers.

5 of 18 torsion outliers are listed below:

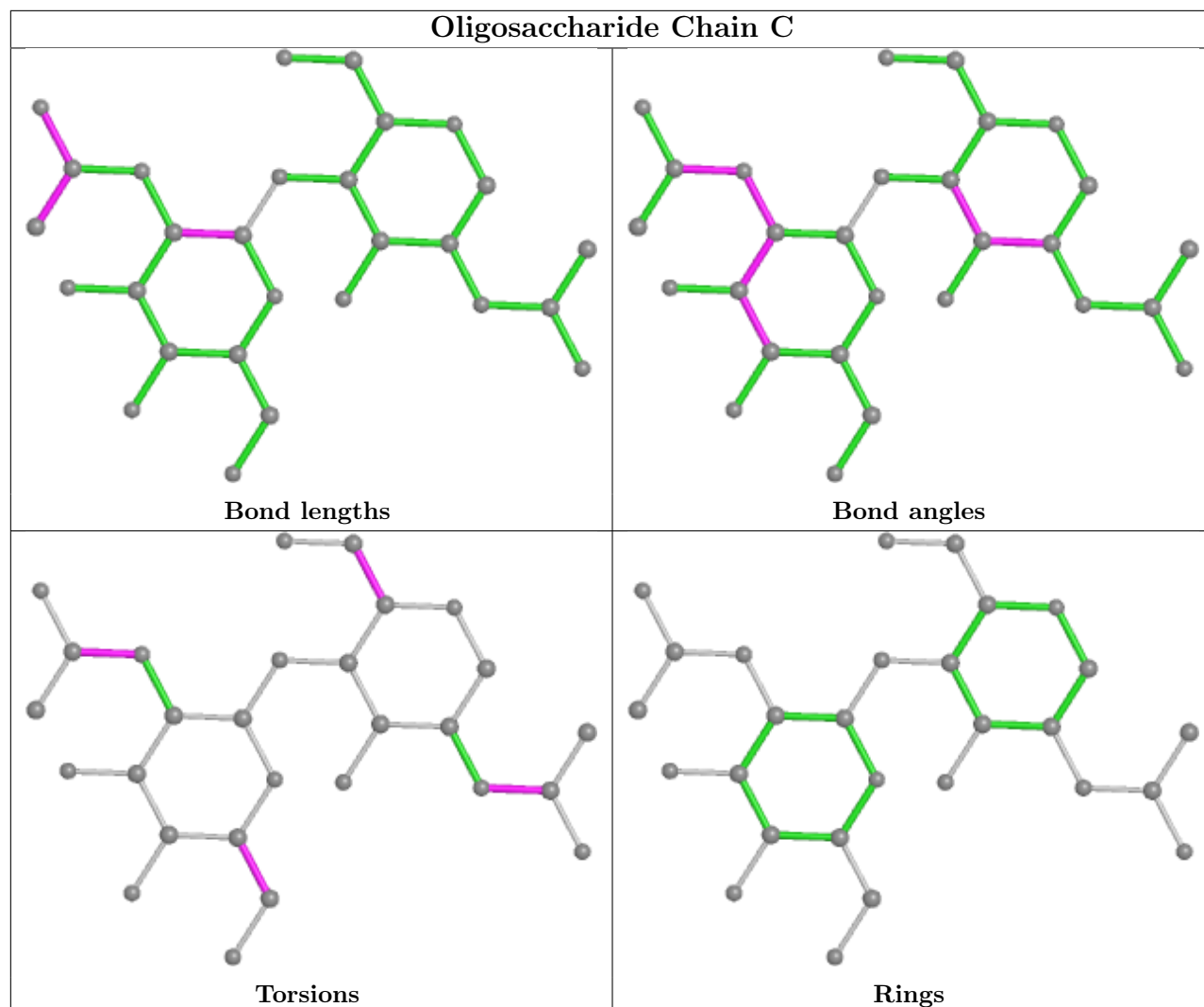
Mol	Chain	Res	Type	Atoms
3	C	1	NAG	C8-C7-N2-C2
3	C	1	NAG	O7-C7-N2-C2
4	D	1	NAG	C3-C2-N2-C7
4	D	1	NAG	C8-C7-N2-C2
4	D	1	NAG	O7-C7-N2-C2

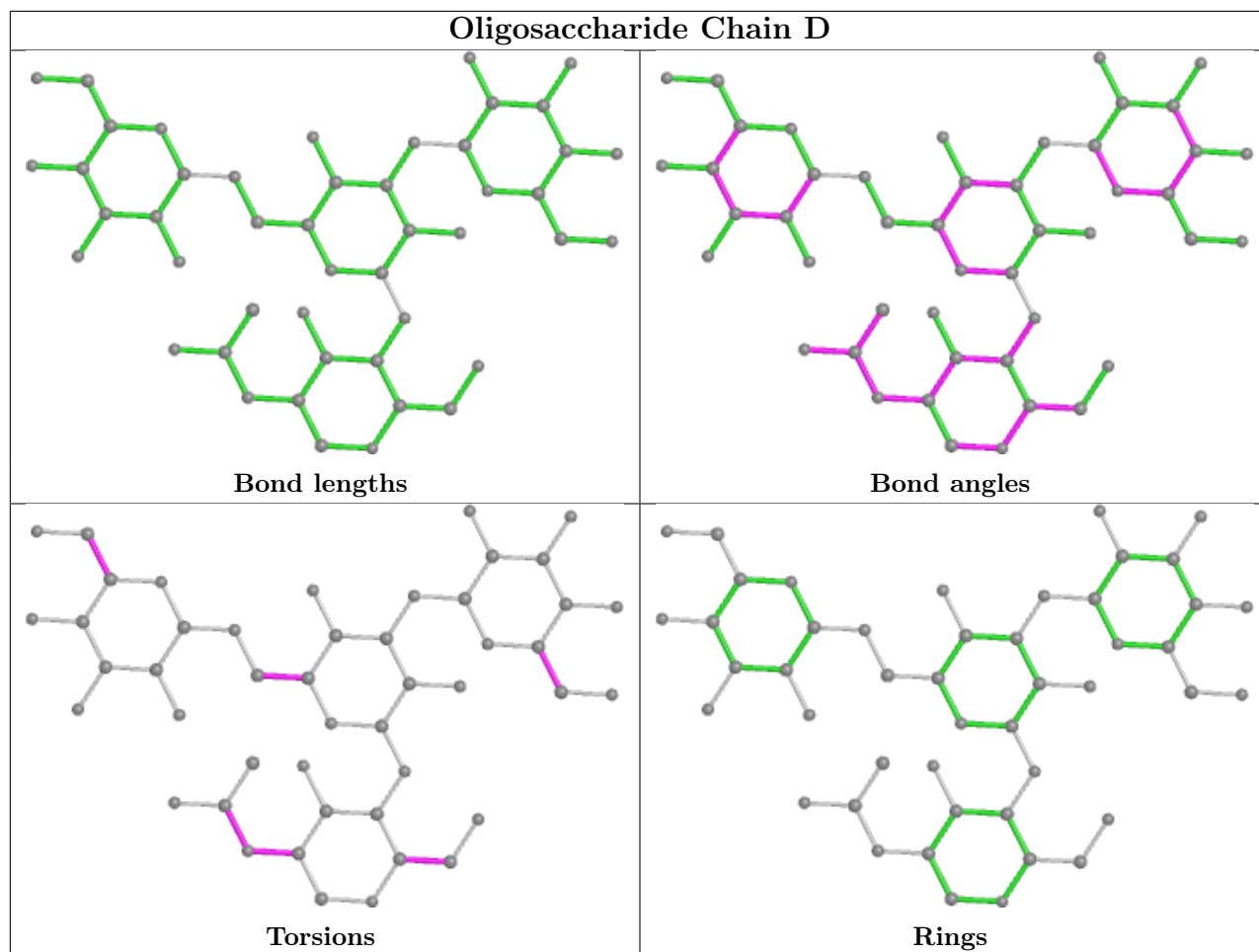
There are no ring outliers.

5 monomers are involved in 57 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	D	2	BMA	0	19
4	D	4	BMA	0	31
3	C	1	NAG	1	0
4	D	1	NAG	2	3
4	D	3	MAN	0	1

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.





5.6 Ligand geometry [i](#)

Of 5 ligands modelled in this entry, 3 are monoatomic - leaving 2 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
7	NAG	B	2401	2	14,14,15	0.76	0	17,19,21	2.03	5 (29%)
7	NAG	B	2402	2	14,14,15	0.85	0	17,19,21	1.25	2 (11%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns.

'-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	NAG	B	2401	2	1/1/5/7	3/6/23/26	0/1/1/1
7	NAG	B	2402	2	1/1/5/7	4/6/23/26	0/1/1/1

There are no bond length outliers.

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	B	2401	NAG	C1-O5-C5	5.03	119.00	112.19
7	B	2401	NAG	C3-C4-C5	4.41	118.11	110.24
7	B	2402	NAG	C1-O5-C5	2.97	116.22	112.19
7	B	2401	NAG	C2-N2-C7	2.51	126.47	122.90
7	B	2402	NAG	C2-N2-C7	2.49	126.45	122.90

All (2) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
7	B	2401	NAG	C1
7	B	2402	NAG	C1

5 of 7 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	B	2401	NAG	C8-C7-N2-C2
7	B	2401	NAG	O7-C7-N2-C2
7	B	2402	NAG	C8-C7-N2-C2
7	B	2402	NAG	O7-C7-N2-C2
7	B	2402	NAG	O5-C5-C6-O6

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	B	2402	NAG	1	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues

The following chains have linkage breaks:

Mol	Chain	Number of breaks
2	B	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	B	2017:TYR	C	2018:SER	N	1.62