



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 03:54 AM UTC

PDB ID : 4HF5 / pdb_00004hf5
Title : Crystal structure of Fab 8F8 in complex a H2N2 influenza virus hemagglutinin
Authors : Xu, R.; Wilson, I.A.
Deposited on : 2012-10-04
Resolution : 3.00 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

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

A user guide is available at

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

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:

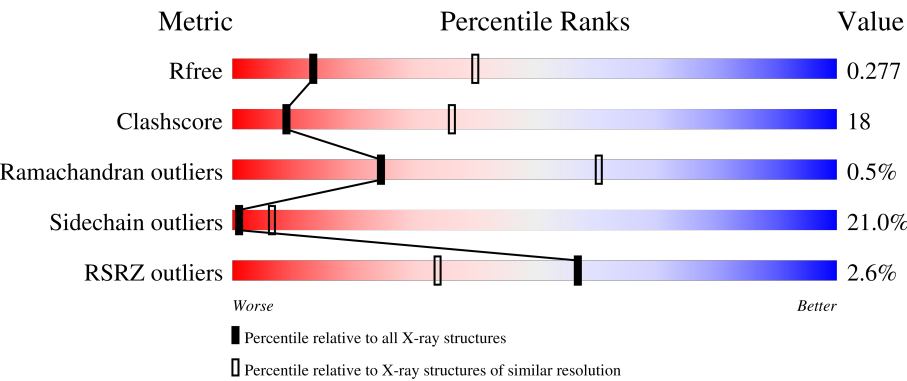
MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	2672 (3.00-3.00)
Clashscore	190562	2977 (3.00-3.00)
Ramachandran outliers	187476	2877 (3.00-3.00)
Sidechain outliers	187428	2880 (3.00-3.00)
RSRZ outliers	180081	2671 (3.00-3.00)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower 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 $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	327	% 59% 34% 6% .
2	B	174	2% 52% 35% 10% ..
3	H	233	3% 36% 24% 6% 34%
4	L	218	3% 38% 40% 11% . 10%
5	C	4	25% 75%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
6	D	2	 100%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 6639 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, 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 Hemagglutinin HA1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	324	Total	C	N	O	S	0	0	0
			2534	1593	440	486	15			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	9	PRO	-	expression tag	UNP C7S226

- Molecule 2 is a protein called Hemagglutinin HA2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	172	Total	C	N	O	S	0	0	0
			1396	871	237	279	9			

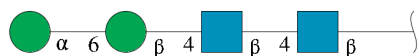
- Molecule 3 is a protein called Fab 8F8 heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	H	153	Total	C	N	O	S	0	0	0
			1195	756	203	228	8			

- Molecule 4 is a protein called Fab 8F8 light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	L	196	Total	C	N	O	S	0	0	0
			1436	897	237	298	4			

- Molecule 5 is an oligosaccharide called alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	C	4	Total	C	N	O	0	0	0
			50	28	2	20			

- Molecule 6 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.

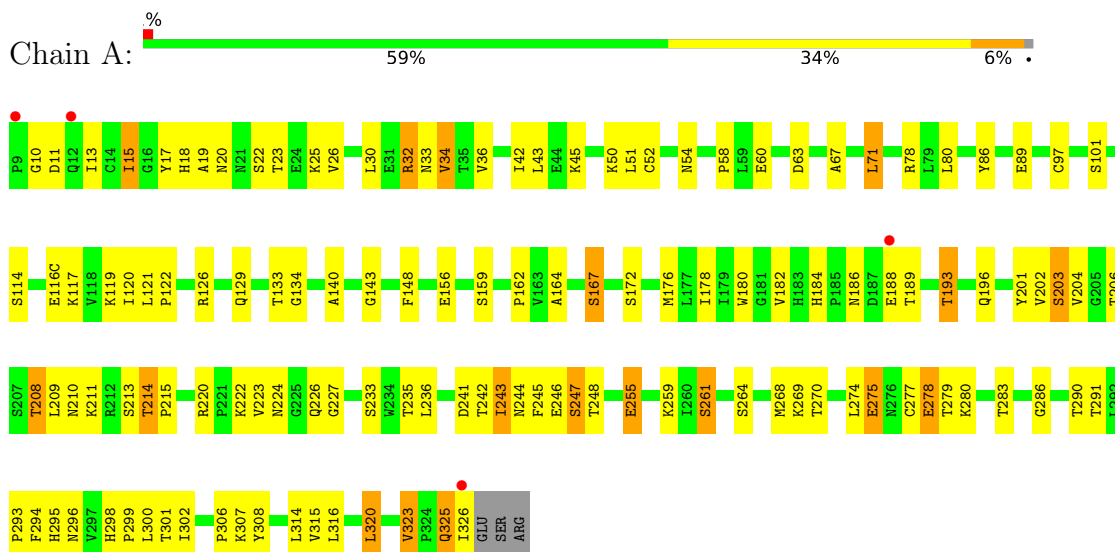


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
6	D	2	Total	C	N	O	0	0	0
			28	16	2	10			

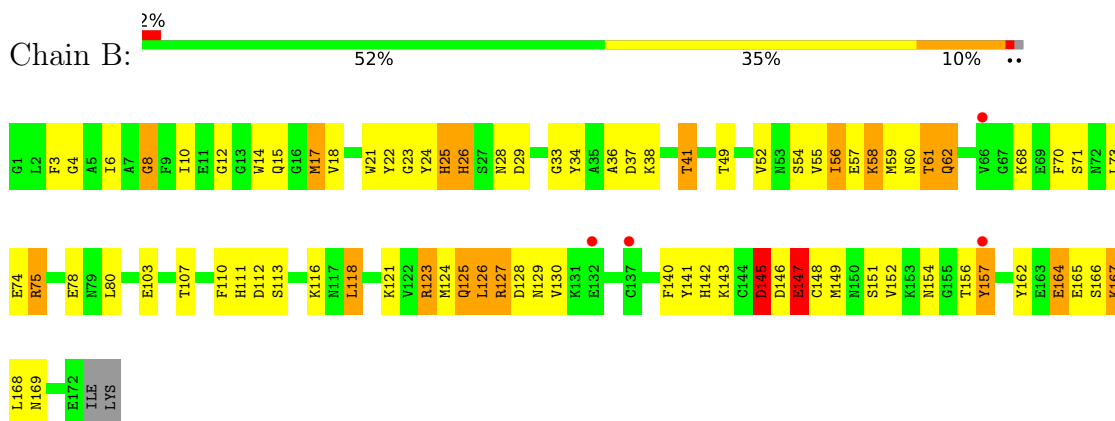
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

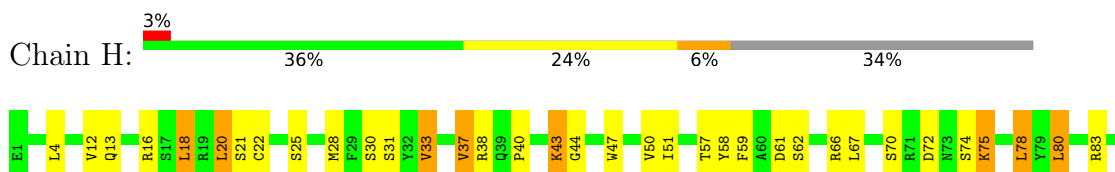
• Molecule 1: Hemagglutinin HA1

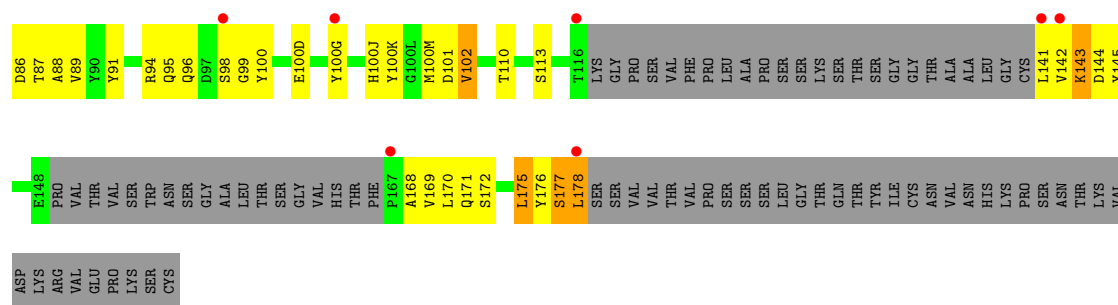


• Molecule 2: Hemagglutinin HA2

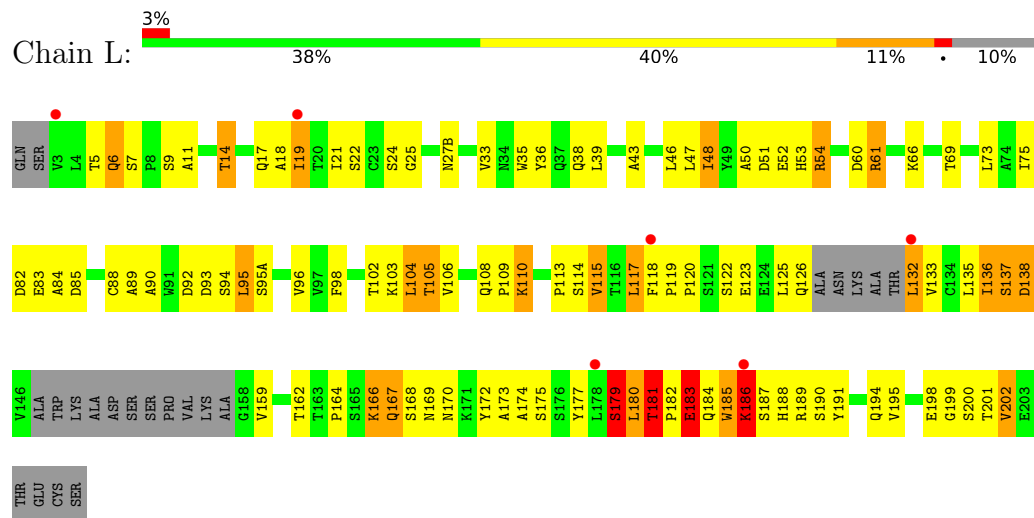


• Molecule 3: Fab 8F8 heavy chain





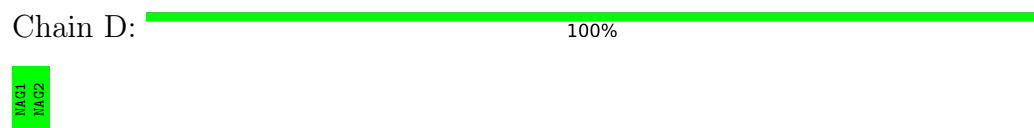
• Molecule 4: Fab 8F8 light chain



• Molecule 5: alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



• Molecule 6: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



4 Data and refinement statistics

Property	Value	Source
Space group	P 3 2 1	Depositor
Cell constants a, b, c, α , β , γ	136.62Å 136.62Å 142.13Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	44.72 – 3.00 44.72 – 3.00	Depositor EDS
% Data completeness (in resolution range)	87.8 (44.72-3.00) 94.3 (44.72-3.00)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.86 (at 3.01Å)	Xtriage
Refinement program	PHENIX 1.7 _650	Depositor
R, R_{free}	0.229 , 0.282 0.226 , 0.277	Depositor DCC
R_{free} test set	1499 reflections (4.82%)	wwPDB-VP
Wilson B-factor (Å ²)	76.8	Xtriage
Anisotropy	0.349	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 67.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.023 for -h,-k,l	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	6639	wwPDB-VP
Average B, all atoms (Å ²)	98.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.14% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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

5.1 Standard geometry

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

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	0.38	0/2594	0.86	4/3521 (0.1%)
2	B	0.42	0/1424	1.05	7/1912 (0.4%)
3	H	0.38	0/1224	0.82	0/1656
4	L	0.45	0/1470	1.14	11/2008 (0.5%)
All	All	0.40	0/6712	0.96	22/9097 (0.2%)

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
2	B	0	1
4	L	0	5
All	All	0	6

There are no bond length outliers.

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	147	GLU	N-CA-C	-17.40	88.80	112.12
4	L	186	LYS	N-CA-C	-14.65	93.77	110.91
4	L	199	GLY	N-CA-C	-12.78	95.34	111.70
4	L	181	THR	N-CA-C	-9.29	91.37	109.10
4	L	95	LEU	N-CA-C	-8.91	95.46	109.72
1	A	10	GLY	N-CA-C	7.65	123.89	112.41
2	B	8	GLY	N-CA-C	-7.61	101.60	112.55
2	B	145	ASP	CA-C-N	-7.50	111.67	122.77
2	B	145	ASP	C-N-CA	-7.50	111.67	122.77
4	L	200	SER	N-CA-C	7.25	120.90	110.10

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	L	183	GLU	N-CA-C	6.83	119.61	107.80
2	B	29	ASP	N-CA-C	-6.55	104.18	111.71
4	L	43	ALA	CA-C-N	5.88	125.84	119.78
4	L	43	ALA	C-N-CA	5.88	125.84	119.78
1	A	184	HIS	CA-C-N	5.84	126.17	119.92
1	A	184	HIS	C-N-CA	5.84	126.17	119.92
1	A	255	GLU	N-CA-C	-5.79	106.22	113.28
2	B	21	TRP	N-CA-C	5.53	117.12	111.14
4	L	53	HIS	N-CA-C	5.30	117.91	109.96
4	L	123	GLU	N-CA-C	-5.21	104.67	111.02
4	L	51	ASP	CB-CA-C	-5.19	110.17	117.23
2	B	33	GLY	N-CA-C	5.07	117.98	110.63

There are no chirality outliers.

All (6) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	B	146	ASP	Peptide
4	L	179	SER	Peptide
4	L	181	THR	Peptide
4	L	183	GLU	Peptide
4	L	185	TRP	Peptide
4	L	198	GLU	Peptide

5.2 Too-close contacts

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	2534	0	2486	80	0
2	B	1396	0	1299	59	0
3	H	1195	0	1142	45	0
4	L	1436	0	1377	71	0
5	C	50	0	43	1	0
6	D	28	0	25	0	0
All	All	6639	0	6372	240	0

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 18.

All (240) 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)
2:B:165:GLU:O	2:B:169:ASN:HB2	1.55	1.05
2:B:127:ARG:HD2	2:B:128:ASP:H	1.30	0.96
4:L:187:SER:HA	4:L:190:SER:H	1.33	0.93
4:L:113:PRO:HB2	4:L:136:ILE:HG22	1.56	0.87
3:H:40:PRO:HB2	3:H:43:LYS:HG2	1.57	0.86
1:A:122:PRO:O	1:A:126:ARG:HG2	1.77	0.85
4:L:14:THR:HG22	4:L:17:GLN:HB2	1.61	0.83
2:B:130:VAL:HG12	2:B:140:PHE:HA	1.58	0.82
4:L:187:SER:CB	4:L:188:HIS:HA	2.10	0.82
2:B:143:LYS:HE3	2:B:145:ASP:HA	1.61	0.81
3:H:28:MET:HE2	3:H:31:SER:HB3	1.64	0.80
4:L:194:GLN:HA	4:L:202:VAL:O	1.82	0.80
3:H:18:LEU:HD11	3:H:20:LEU:HD13	1.66	0.77
4:L:187:SER:HB3	4:L:188:HIS:HA	1.68	0.76
2:B:26:HIS:HD2	2:B:149:MET:HG2	1.52	0.74
3:H:37:VAL:O	3:H:91:TYR:HB2	1.87	0.74
4:L:92:ASP:OD2	4:L:94:SER:HB3	1.88	0.73
4:L:179:SER:O	4:L:180:LEU:HD23	1.88	0.73
3:H:96:GLN:HG3	3:H:100(K):TYR:HB3	1.71	0.73
1:A:122:PRO:HD2	1:A:126:ARG:HD2	1.73	0.70
4:L:186:LYS:N	4:L:187:SER:O	2.23	0.69
1:A:211:LYS:HE3	1:A:213:SER:HB2	1.74	0.69
1:A:323:VAL:HB	2:B:12:GLY:HA2	1.73	0.69
1:A:201:TYR:HE2	1:A:248:THR:HG23	1.58	0.68
1:A:164:ALA:O	1:A:246:GLU:HA	1.94	0.67
2:B:127:ARG:HD2	2:B:128:ASP:N	2.08	0.67
2:B:147:GLU:CD	2:B:147:GLU:C	2.62	0.67
4:L:105:THR:HG21	4:L:141:PRO:HB3	1.76	0.67
3:H:13:GLN:O	3:H:16:ARG:HB2	1.96	0.65
1:A:172:SER:HB2	1:A:259:LYS:HD2	1.77	0.65
4:L:138:ASP:HA	4:L:172:TYR:O	1.98	0.64
2:B:147:GLU:C	2:B:147:GLU:OE1	2.42	0.63
3:H:94:ARG:HB3	3:H:102:VAL:HG13	1.80	0.63
1:A:120:ILE:HG13	1:A:121:LEU:H	1.64	0.63
1:A:143:GLY:O	3:H:28:MET:HE3	1.98	0.62
1:A:23:THR:O	1:A:25:LYS:HG3	1.99	0.62
1:A:20:ASN:OD1	1:A:22:SER:HB3	2.00	0.61
4:L:185:TRP:O	4:L:186:LYS:HB2	2.00	0.61

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:L:179:SER:C	4:L:180:LEU:HD23	2.25	0.61
2:B:164:GLU:CD	2:B:164:GLU:H	2.09	0.61
2:B:140:PHE:HB3	2:B:142:HIS:O	2.02	0.60
4:L:119:PRO:HB2	4:L:120:PRO:HD2	1.84	0.60
1:A:32:ARG:O	1:A:34:VAL:HG23	2.03	0.59
4:L:95:LEU:HA	4:L:95(A):SER:C	2.27	0.59
1:A:278:GLU:HG3	1:A:279:THR:N	2.17	0.59
1:A:208:THR:O	1:A:209:LEU:HB2	2.03	0.59
1:A:209:LEU:HD12	1:A:210:ASN:H	1.68	0.59
2:B:4:GLY:O	2:B:8:GLY:HA3	2.02	0.59
1:A:167:SER:HA	1:A:243:ILE:O	2.03	0.58
2:B:143:LYS:HE3	2:B:145:ASP:CA	2.30	0.58
2:B:61:THR:O	2:B:62:GLN:HB3	2.04	0.58
2:B:70:PHE:HB3	2:B:74:GLU:HB2	1.85	0.58
3:H:28:MET:HE2	3:H:31:SER:CB	2.34	0.57
4:L:108:GLN:HB2	4:L:109:PRO:HD2	1.86	0.57
1:A:283:THR:HG22	1:A:301:THR:HG22	1.87	0.57
2:B:25:HIS:HB3	2:B:34:TYR:CD1	2.39	0.57
4:L:187:SER:HA	4:L:190:SER:N	2.13	0.57
2:B:107:THR:O	2:B:110:PHE:HB3	2.05	0.57
3:H:59:PHE:CD1	3:H:67:LEU:HD23	2.40	0.57
4:L:114:SER:HB3	4:L:137:SER:HB2	1.85	0.57
4:L:187:SER:CB	4:L:188:HIS:CA	2.83	0.57
3:H:67:LEU:HD11	3:H:80:LEU:HD11	1.85	0.57
4:L:6:GLN:NE2	4:L:88:CYS:SG	2.78	0.56
4:L:47:LEU:O	4:L:48:ILE:HD12	2.04	0.56
4:L:167:GLN:HE22	4:L:169:ASN:HB2	1.70	0.56
1:A:25:LYS:HB3	1:A:33:ASN:ND2	2.20	0.56
3:H:144:ASP:HA	3:H:175:LEU:HG	1.86	0.56
3:H:94:ARG:O	3:H:100(M):MET:HA	2.06	0.56
4:L:18:ALA:HA	4:L:75:ILE:O	2.06	0.56
1:A:15:ILE:HG12	2:B:118:LEU:HD21	1.88	0.55
1:A:71:LEU:O	1:A:148:PHE:HB3	2.06	0.55
1:A:11:ASP:OD2	2:B:143:LYS:HD2	2.06	0.55
4:L:117:LEU:O	4:L:133:VAL:O	2.25	0.55
2:B:151:SER:OG	2:B:157:TYR:HA	2.07	0.55
4:L:191:TYR:HD2	4:L:207:ALA:HB3	1.72	0.55
4:L:204:LYS:O	4:L:206:VAL:HG13	2.07	0.55
1:A:298:HIS:HE1	1:A:300:LEU:HD12	1.71	0.54
2:B:28:ASN:HD21	2:B:145:ASP:C	2.15	0.54
3:H:40:PRO:CB	3:H:43:LYS:HG2	2.33	0.54

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:23:GLY:HA3	2:B:36:ALA:HA	1.90	0.54
3:H:33:VAL:HG22	3:H:95:GLN:HB3	1.89	0.54
1:A:209:LEU:HD12	1:A:210:ASN:N	2.23	0.53
2:B:26:HIS:CD2	2:B:149:MET:HG2	2.38	0.53
3:H:38:ARG:NH1	3:H:86:ASP:HA	2.23	0.53
3:H:143:LYS:HG3	3:H:144:ASP:N	2.20	0.53
4:L:78:LEU:HD23	4:L:106:VAL:HG12	1.91	0.53
1:A:189:THR:O	1:A:193:THR:HG23	2.09	0.53
3:H:50:VAL:CG1	3:H:58:TYR:HB2	2.39	0.53
1:A:188:GLU:CD	1:A:188:GLU:H	2.16	0.52
4:L:187:SER:HB3	4:L:188:HIS:CA	2.33	0.52
1:A:45:LYS:HG2	1:A:296:ASN:HD21	1.75	0.52
1:A:134:GLY:HA3	3:H:100:TYR:OH	2.08	0.52
1:A:120:ILE:HG13	1:A:121:LEU:N	2.25	0.52
3:H:144:ASP:H	3:H:177:SER:HB3	1.74	0.52
3:H:47:TRP:CG	4:L:96:VAL:HB	2.45	0.52
3:H:50:VAL:HG12	3:H:58:TYR:HB2	1.91	0.52
4:L:11:ALA:O	4:L:104:LEU:HA	2.10	0.52
1:A:50:LYS:HB3	1:A:275:GLU:HG3	1.93	0.51
3:H:66:ARG:HH22	3:H:86:ASP:CG	2.18	0.51
4:L:6:GLN:HE22	4:L:88:CYS:H	1.56	0.51
1:A:17:TYR:CE2	2:B:6:ILE:HG12	2.46	0.51
1:A:206:THR:HG22	1:A:243:ILE:HA	1.92	0.51
3:H:100(J):HIS:O	4:L:50:ALA:HB2	2.11	0.51
4:L:108:GLN:HB2	4:L:109:PRO:CD	2.40	0.51
3:H:141:LEU:HG	3:H:142:VAL:N	2.26	0.51
1:A:42:ILE:HG13	1:A:314:LEU:HB3	1.93	0.51
4:L:185:TRP:CD1	4:L:185:TRP:N	2.79	0.50
1:A:226:GLN:OE1	3:H:99:GLY:HA3	2.11	0.50
1:A:307:LYS:HG3	2:B:62:GLN:HG2	1.93	0.50
3:H:96:GLN:HB3	3:H:101:ASP:OD2	2.12	0.50
1:A:224:ASN:O	1:A:226:GLN:HG2	2.11	0.50
4:L:115:VAL:HB	4:L:136:ILE:HG23	1.94	0.49
1:A:220:ARG:HD2	1:A:227:GLY:O	2.12	0.49
4:L:132:LEU:HD11	4:L:179:SER:O	2.12	0.49
2:B:17:MET:HE2	2:B:36:ALA:HB2	1.94	0.49
3:H:43:LYS:HG3	3:H:44:GLY:N	2.26	0.49
4:L:166:LYS:NZ	4:L:170:ASN:HA	2.27	0.49
2:B:55:VAL:HG23	2:B:56:ILE:N	2.28	0.49
4:L:166:LYS:NZ	4:L:167:GLN:H	2.11	0.48
4:L:181:THR:O	4:L:183:GLU:N	2.43	0.48

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:25:LYS:HD2	1:A:33:ASN:OD1	2.13	0.48
1:A:45:LYS:HA	1:A:296:ASN:OD1	2.13	0.48
3:H:143:LYS:HA	3:H:177:SER:HB3	1.95	0.48
4:L:95:LEU:HG	4:L:95(A):SER:HA	1.95	0.48
4:L:114:SER:HB3	4:L:137:SER:CB	2.42	0.48
2:B:71:SER:OG	2:B:74:GLU:HG3	2.13	0.48
2:B:129:ASN:O	2:B:141:TYR:HB2	2.14	0.48
1:A:43:LEU:HB2	1:A:314:LEU:HB2	1.96	0.48
1:A:316:LEU:HD11	2:B:55:VAL:HG21	1.94	0.48
4:L:82:ASP:O	4:L:104:LEU:HD21	2.14	0.48
1:A:89:GLU:OE1	1:A:269:LYS:HE2	2.14	0.48
3:H:28:MET:CE	3:H:31:SER:HB3	2.38	0.48
4:L:180:LEU:HB3	4:L:182:PRO:HA	1.95	0.48
2:B:151:SER:HA	2:B:154:ASN:ND2	2.29	0.47
1:A:186:ASN:OD1	1:A:227:GLY:HA3	2.14	0.47
1:A:293:PRO:O	1:A:294:PHE:CG	2.67	0.47
1:A:295:HIS:HD2	1:A:306:PRO:HG2	1.79	0.47
1:A:299:PRO:HG3	1:A:308:TYR:CE2	2.50	0.47
2:B:71:SER:H	2:B:74:GLU:HG3	1.80	0.47
1:A:325:GLN:HB2	2:B:15:GLN:OE1	2.15	0.47
3:H:21:SER:HA	3:H:78:LEU:O	2.15	0.47
2:B:55:VAL:HG23	2:B:56:ILE:H	1.81	0.46
4:L:19:ILE:HD12	4:L:19:ILE:HA	1.76	0.46
4:L:185:TRP:O	4:L:186:LYS:CB	2.63	0.46
1:A:67:ALA:O	1:A:71:LEU:HB2	2.15	0.46
2:B:56:ILE:HG13	2:B:57:GLU:N	2.30	0.46
1:A:25:LYS:CB	1:A:33:ASN:HD21	2.28	0.46
4:L:186:LYS:HA	4:L:190:SER:N	2.30	0.46
2:B:52:VAL:HA	2:B:55:VAL:HG22	1.97	0.46
2:B:127:ARG:CD	2:B:128:ASP:H	2.16	0.46
4:L:25:GLY:O	4:L:69:THR:HB	2.17	0.45
1:A:71:LEU:HD12	1:A:71:LEU:HA	1.83	0.45
3:H:168:ALA:HA	3:H:178:LEU:HB3	1.99	0.45
2:B:125:GLN:HE22	2:B:157:TYR:H	1.63	0.45
3:H:43:LYS:CG	3:H:44:GLY:N	2.80	0.45
4:L:113:PRO:HA	4:L:138:ASP:O	2.16	0.45
1:A:18:HIS:ND1	1:A:19:ALA:N	2.64	0.45
4:L:136:ILE:HG12	4:L:174:ALA:HB3	1.99	0.45
1:A:180:TRP:CZ2	1:A:233:SER:HB2	2.51	0.44
1:A:320:LEU:HB3	2:B:111:HIS:CD2	2.52	0.44
2:B:125:GLN:HB3	2:B:126:LEU:HD23	1.99	0.44

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:L:61:ARG:HD3	4:L:77:GLY:O	2.17	0.44
4:L:180:LEU:HD22	4:L:180:LEU:HA	1.81	0.44
1:A:54:ASN:OD1	1:A:280:LYS:HE3	2.17	0.44
3:H:87:THR:O	3:H:88:ALA:HB2	2.18	0.44
1:A:52:CYS:HB3	1:A:277:CYS:O	2.18	0.44
1:A:119:LYS:HE2	1:A:255:GLU:OE2	2.18	0.44
2:B:75:ARG:HH12	2:B:78:GLU:CD	2.26	0.44
3:H:4:LEU:HB3	3:H:22:CYS:SG	2.58	0.44
4:L:36:TYR:HE1	4:L:89:ALA:HB3	1.82	0.44
1:A:25:LYS:HB3	1:A:33:ASN:HD21	1.81	0.43
2:B:148:CYS:HA	2:B:151:SER:HB3	2.00	0.43
3:H:83:ARG:HG2	3:H:86:ASP:OD2	2.18	0.43
1:A:204:VAL:HA	1:A:244:ASN:O	2.18	0.43
4:L:186:LYS:HE2	4:L:189:ARG:HG3	2.00	0.43
1:A:32:ARG:O	1:A:33:ASN:C	2.62	0.43
1:A:32:ARG:HD3	1:A:32:ARG:HA	1.71	0.43
1:A:214:THR:HA	1:A:215:PRO:HD3	1.71	0.43
2:B:80:LEU:C	2:B:80:LEU:HD23	2.43	0.43
4:L:83:GLU:OE1	4:L:106:VAL:HG22	2.18	0.43
2:B:37:ASP:O	2:B:41:THR:HB	2.18	0.43
3:H:72:ASP:OD1	3:H:75:LYS:HB2	2.17	0.43
4:L:119:PRO:CB	4:L:120:PRO:HD2	2.48	0.43
1:A:268:MET:HE3	1:A:302:ILE:HD12	1.99	0.43
1:A:159:SER:O	1:A:196:GLN:HG3	2.18	0.43
1:A:58:PRO:HB3	1:A:86:TYR:CZ	2.54	0.43
2:B:164:GLU:HA	2:B:167:LYS:HD3	2.00	0.43
4:L:92:ASP:O	4:L:93:ASP:HB2	2.19	0.43
1:A:316:LEU:HD23	1:A:316:LEU:HA	1.89	0.42
2:B:14:TRP:HB2	2:B:17:MET:HG2	2.00	0.42
3:H:78:LEU:HD23	3:H:78:LEU:HA	1.71	0.42
1:A:129:GLN:HB3	1:A:162:PRO:HG3	2.02	0.42
1:A:116(C):GLU:HG2	1:A:261:SER:OG	2.19	0.42
1:A:222:LYS:HD2	1:A:222:LYS:N	2.34	0.42
2:B:126:LEU:HD23	2:B:126:LEU:N	2.35	0.42
4:L:38:GLN:O	4:L:84:ALA:HB1	2.20	0.42
4:L:186:LYS:CE	4:L:189:ARG:HG3	2.50	0.42
4:L:164:PRO:HA	4:L:173:ALA:O	2.19	0.42
2:B:6:ILE:C	2:B:8:GLY:H	2.27	0.42
2:B:149:MET:O	2:B:152:VAL:HB	2.19	0.42
4:L:117:LEU:HD22	4:L:117:LEU:HA	1.76	0.42
4:L:166:LYS:HZ2	4:L:166:LYS:HA	1.85	0.42

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:L:177:TYR:CD1	4:L:177:TYR:N	2.87	0.42
1:A:120:ILE:O	1:A:122:PRO:HD3	2.20	0.41
1:A:241:ASP:CG	1:A:242:THR:H	2.27	0.41
4:L:186:LYS:HG2	4:L:189:ARG:HB3	2.02	0.41
1:A:203:SER:O	1:A:245:PHE:HA	2.21	0.41
3:H:40:PRO:HD2	3:H:44:GLY:O	2.20	0.41
4:L:33:VAL:HG22	4:L:90:ALA:HB2	2.02	0.41
4:L:35:TRP:CE3	4:L:73:LEU:HD22	2.55	0.41
5:C:3:BMA:H62	5:C:4:MAN:H2	1.66	0.41
1:A:223:VAL:O	1:A:224:ASN:HB2	2.20	0.41
1:A:314:LEU:HD23	1:A:314:LEU:HA	1.81	0.41
3:H:22:CYS:HB3	3:H:78:LEU:HB2	2.02	0.41
3:H:100(D):GLU:HB2	3:H:100(G):TYR:CE2	2.56	0.41
1:A:176:MET:HE3	1:A:176:MET:HB2	1.87	0.41
1:A:295:HIS:CD2	1:A:306:PRO:HG2	2.55	0.41
2:B:126:LEU:HD21	2:B:152:VAL:HG13	2.02	0.41
1:A:50:LYS:O	1:A:286:GLY:HA2	2.21	0.41
1:A:202:VAL:HA	1:A:247:SER:HB2	2.01	0.41
2:B:71:SER:CB	2:B:74:GLU:HG3	2.51	0.41
2:B:167:LYS:HG2	2:B:168:LEU:N	2.35	0.41
3:H:47:TRP:HB2	4:L:98:PHE:HE1	1.85	0.41
4:L:78:LEU:CD2	4:L:106:VAL:HG12	2.50	0.41
4:L:183:GLU:O	4:L:185:TRP:N	2.45	0.41
1:A:140:ALA:HB2	3:H:28:MET:HE1	2.03	0.41
2:B:3:PHE:HD2	2:B:112:ASP:HB3	1.86	0.41
2:B:54:SER:O	2:B:58:LYS:HB2	2.20	0.41
4:L:54:ARG:NH1	4:L:60:ASP:HA	2.36	0.41
1:A:42:ILE:CG1	1:A:314:LEU:HB3	2.51	0.41
2:B:142:HIS:CD2	2:B:162:TYR:HB3	2.56	0.41
4:L:110:LYS:H	4:L:110:LYS:HG2	1.53	0.41
1:A:58:PRO:HB3	1:A:86:TYR:CE2	2.56	0.40
1:A:13:ILE:HB	2:B:149:MET:HE3	2.03	0.40
2:B:123:ARG:NH2	2:B:124:MET:HE2	2.37	0.40
3:H:145:TYR:HD1	3:H:176:TYR:O	2.05	0.40
3:H:168:ALA:HA	3:H:178:LEU:CB	2.52	0.40
2:B:57:GLU:HA	2:B:60:ASN:OD1	2.22	0.40
2:B:165:GLU:O	2:B:169:ASN:CB	2.46	0.40
4:L:85:ASP:HA	4:L:102:THR:O	2.22	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

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	322/327 (98%)	303 (94%)	19 (6%)	0	100	100
2	B	170/174 (98%)	154 (91%)	15 (9%)	1 (1%)	21	56
3	H	147/233 (63%)	136 (92%)	11 (8%)	0	100	100
4	L	190/218 (87%)	157 (83%)	30 (16%)	3 (2%)	7	34
All	All	829/952 (87%)	750 (90%)	75 (9%)	4 (0%)	24	60

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
4	L	184	GLN
4	L	27(B)	ASN
2	B	68	LYS
4	L	179	SER

5.3.2 Protein sidechains

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

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	285/288 (99%)	243 (85%)	42 (15%)	3	15
2	B	149/151 (99%)	116 (78%)	33 (22%)	1	5
3	H	128/197 (65%)	98 (77%)	30 (23%)	1	4
4	L	162/179 (90%)	115 (71%)	47 (29%)	0	2
All	All	724/815 (89%)	572 (79%)	152 (21%)	1	6

All (152) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	15	ILE
1	A	26	VAL
1	A	30	LEU
1	A	32	ARG
1	A	34	VAL
1	A	36	VAL
1	A	51	LEU
1	A	60	GLU
1	A	63	ASP
1	A	71	LEU
1	A	78	ARG
1	A	80	LEU
1	A	97	CYS
1	A	101	SER
1	A	114	SER
1	A	117	LYS
1	A	133	THR
1	A	156	GLU
1	A	167	SER
1	A	178	ILE
1	A	182	VAL
1	A	193	THR
1	A	203	SER
1	A	208	THR
1	A	214	THR
1	A	235	THR
1	A	236	LEU
1	A	243	ILE
1	A	247	SER
1	A	261	SER
1	A	264	SER
1	A	270	THR
1	A	274	LEU
1	A	275	GLU
1	A	278	GLU
1	A	290	THR
1	A	291	THR
1	A	315	VAL
1	A	320	LEU
1	A	323	VAL
1	A	325	GLN
1	A	326	ILE

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
2	B	10	ILE
2	B	17	MET
2	B	18	VAL
2	B	22	TYR
2	B	24	TYR
2	B	25	HIS
2	B	26	HIS
2	B	38	LYS
2	B	41	THR
2	B	49	THR
2	B	56	ILE
2	B	58	LYS
2	B	59	MET
2	B	61	THR
2	B	62	GLN
2	B	73	LEU
2	B	75	ARG
2	B	103	GLU
2	B	113	SER
2	B	116	LYS
2	B	118	LEU
2	B	121	LYS
2	B	123	ARG
2	B	125	GLN
2	B	126	LEU
2	B	127	ARG
2	B	145	ASP
2	B	147	GLU
2	B	156	THR
2	B	157	TYR
2	B	164	GLU
2	B	166	SER
2	B	167	LYS
3	H	12	VAL
3	H	18	LEU
3	H	20	LEU
3	H	25	SER
3	H	30	SER
3	H	33	VAL
3	H	37	VAL
3	H	43	LYS
3	H	51	ILE

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
3	H	57	THR
3	H	61	ASP
3	H	62	SER
3	H	70	SER
3	H	74	SER
3	H	75	LYS
3	H	78	LEU
3	H	80	LEU
3	H	89	VAL
3	H	98	SER
3	H	102	VAL
3	H	110	THR
3	H	113	SER
3	H	143	LYS
3	H	169	VAL
3	H	170	LEU
3	H	171	GLN
3	H	172	SER
3	H	175	LEU
3	H	177	SER
3	H	178	LEU
4	L	5	THR
4	L	6	GLN
4	L	7	SER
4	L	9	SER
4	L	14	THR
4	L	19	ILE
4	L	21	ILE
4	L	22	SER
4	L	24	SER
4	L	39	LEU
4	L	46	LEU
4	L	48	ILE
4	L	52	GLU
4	L	54	ARG
4	L	61	ARG
4	L	66	LYS
4	L	78	LEU
4	L	79	GLN
4	L	103	LYS
4	L	104	LEU
4	L	105	THR

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
4	L	110	LYS
4	L	115	VAL
4	L	117	LEU
4	L	118	PHE
4	L	122	SER
4	L	125	LEU
4	L	126	GLN
4	L	132	LEU
4	L	135	LEU
4	L	136	ILE
4	L	137	SER
4	L	138	ASP
4	L	144	VAL
4	L	159	VAL
4	L	162	THR
4	L	166	LYS
4	L	167	GLN
4	L	168	SER
4	L	175	SER
4	L	180	LEU
4	L	181	THR
4	L	186	LYS
4	L	195	VAL
4	L	201	THR
4	L	202	VAL
4	L	204	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	38	HIS
1	A	92	ASN
1	A	144	ASN
1	A	295	HIS
2	B	28	ASN
2	B	81	ASN
2	B	125	GLN
2	B	129	ASN
2	B	142	HIS
2	B	171	ASN
3	H	81	GLN
4	L	31	ASN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
4	L	170	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

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$
5	NAG	C	1	1,5	14,14,15	0.46	0	17,19,21	1.06	1 (5%)
5	NAG	C	2	5	14,14,15	0.57	0	17,19,21	0.81	0
5	BMA	C	3	5	11,11,12	0.59	0	15,15,17	0.52	0
5	MAN	C	4	5	11,11,12	0.59	0	15,15,17	0.63	0
6	NAG	D	1	1,6	14,14,15	0.48	0	17,19,21	0.93	0
6	NAG	D	2	6	14,14,15	0.49	0	17,19,21	0.61	0

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
5	NAG	C	1	1,5	-	2/6/23/26	0/1/1/1
5	NAG	C	2	5	-	4/6/23/26	0/1/1/1
5	BMA	C	3	5	-	2/2/19/22	0/1/1/1

Continued on next page...

Continued from previous page...

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

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	C	1	NAG	C3-C4-C5	2.08	114.00	110.23

There are no chirality outliers.

All (10) torsion outliers are listed below:

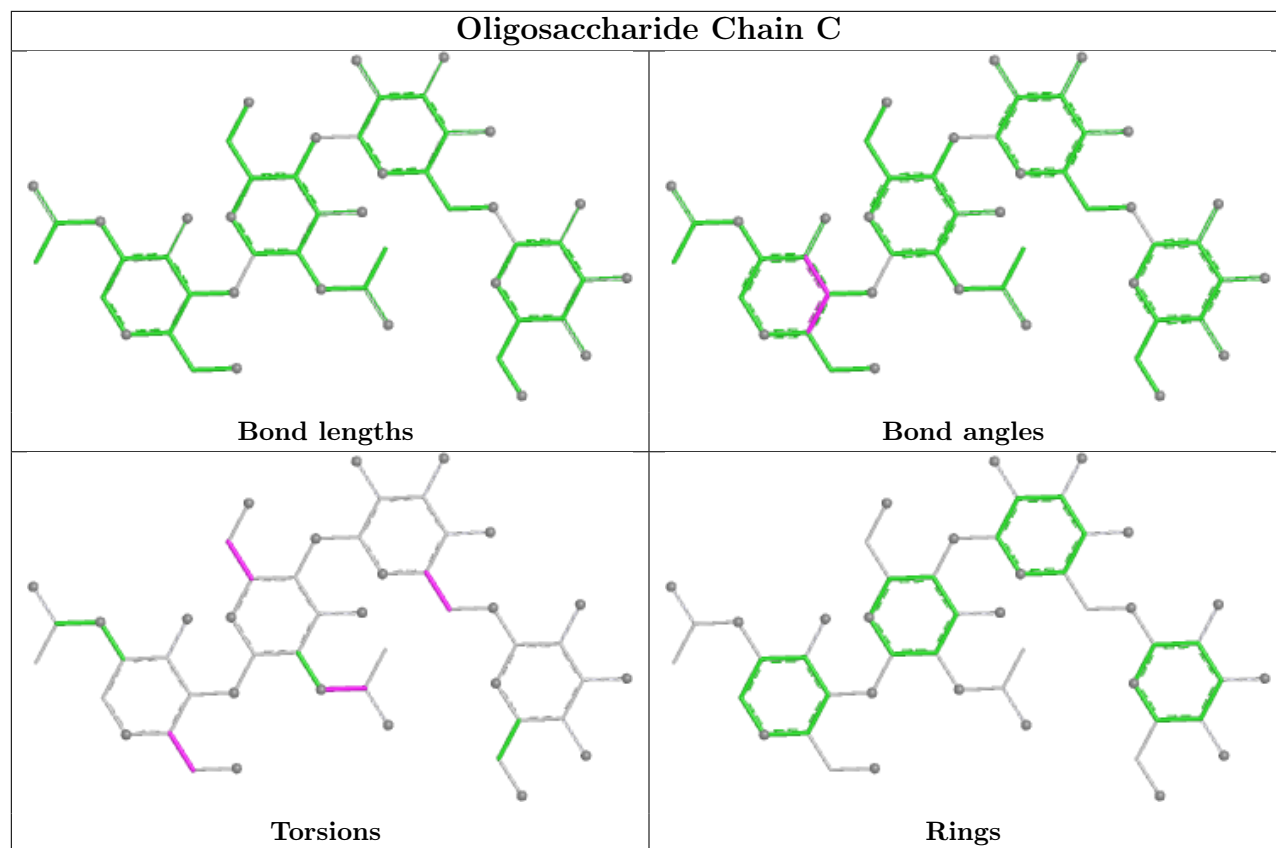
Mol	Chain	Res	Type	Atoms
5	C	3	BMA	O5-C5-C6-O6
5	C	2	NAG	O5-C5-C6-O6
5	C	3	BMA	C4-C5-C6-O6
5	C	1	NAG	C4-C5-C6-O6
5	C	1	NAG	O5-C5-C6-O6
6	D	1	NAG	C8-C7-N2-C2
5	C	2	NAG	C4-C5-C6-O6
6	D	1	NAG	O7-C7-N2-C2
5	C	2	NAG	C8-C7-N2-C2
5	C	2	NAG	O7-C7-N2-C2

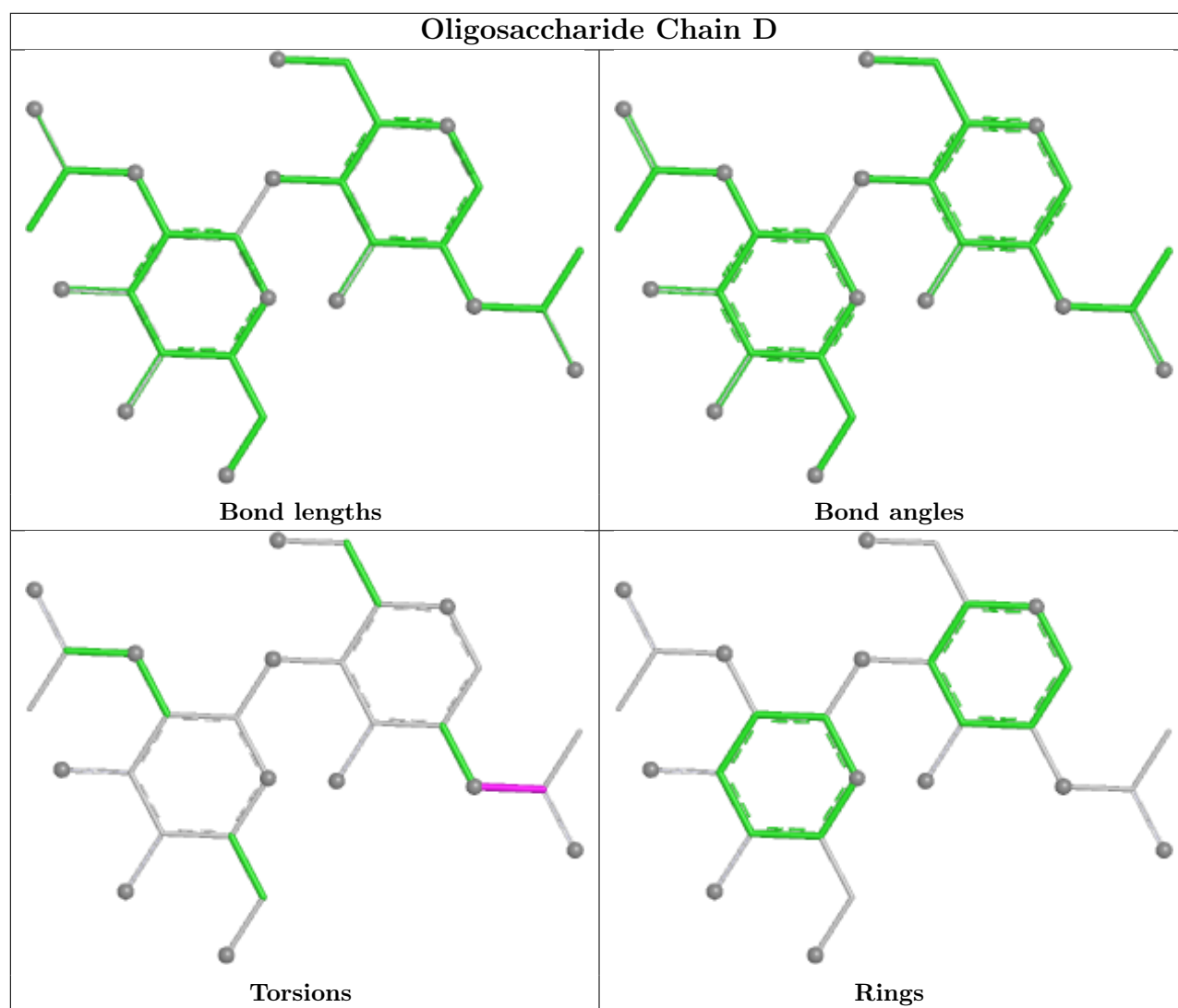
There are no ring outliers.

2 monomers are involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	C	4	MAN	1	0
5	C	3	BMA	1	0

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](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	324/327 (99%)	-0.12	4 (1%) 76 55	49, 71, 118, 148	0
2	B	172/174 (98%)	0.29	4 (2%) 61 38	48, 113, 161, 209	0
3	H	153/233 (65%)	0.07	7 (4%) 37 20	49, 80, 161, 176	0
4	L	196/218 (89%)	0.45	7 (3%) 46 26	63, 130, 187, 218	0
All	All	845/952 (88%)	0.13	22 (2%) 57 34	48, 87, 165, 218	0

All (22) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	H	167	PRO	4.9
2	B	66	VAL	4.6
3	H	142	VAL	3.5
1	A	9	PRO	3.1
4	L	3	VAL	2.8
4	L	208	PRO	2.7
4	L	118	PHE	2.7
4	L	132	LEU	2.7
4	L	178	LEU	2.6
1	A	326	ILE	2.5
3	H	141	LEU	2.4
3	H	178	LEU	2.3
2	B	157	TYR	2.3
1	A	12	GLN	2.2
2	B	137	CYS	2.2
3	H	98	SER	2.2
4	L	19	ILE	2.2
2	B	132	GLU	2.2
3	H	100(G)	TYR	2.1
3	H	116	THR	2.1
1	A	188	GLU	2.1
4	L	186	LYS	2.0

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

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

6.3 Carbohydrates [i](#)

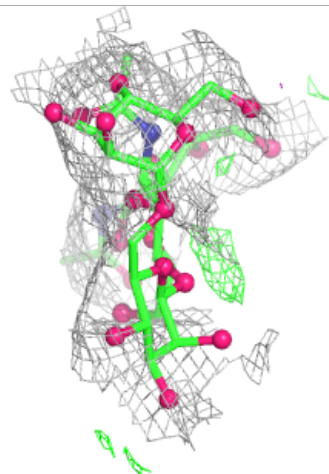
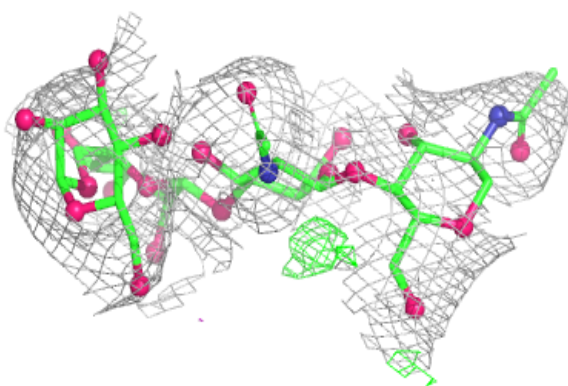
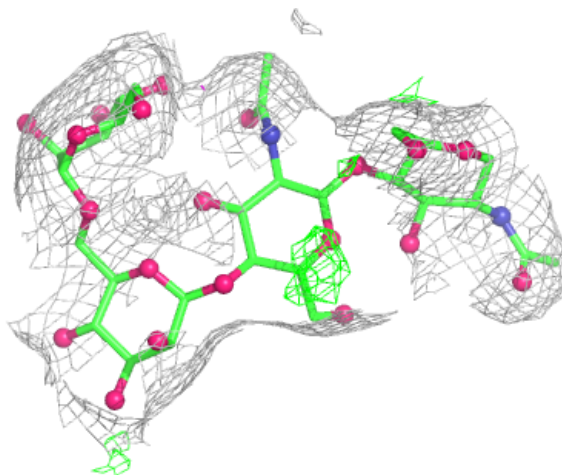
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

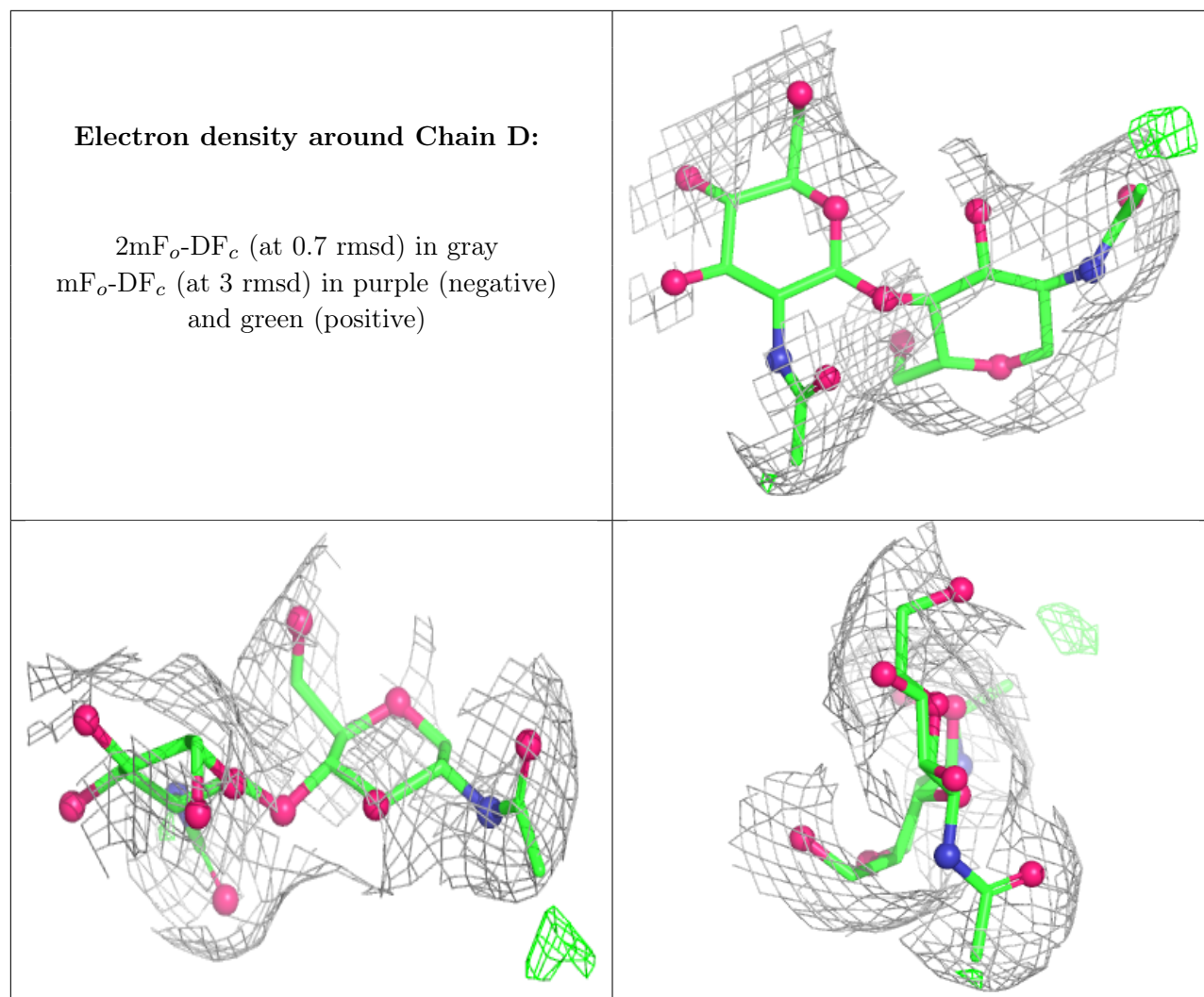
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
5	NAG	C	1	14/15	-	-	80,92,99,106	0
5	NAG	C	2	14/15	-	-	110,119,126,134	0
5	BMA	C	3	11/12	-	-	140,144,147,147	0
5	MAN	C	4	11/12	-	-	140,147,148,148	0
6	NAG	D	1	14/15	-	-	100,108,118,126	0
6	NAG	D	2	14/15	-	-	125,135,137,138	0

The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around Chain C:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.