



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 12:53 AM UTC

PDB ID : 8T4Z / pdb_00008t4z
Title : T-cell receptor and lipid complex structure
Authors : Praveena, T.; Rossjohn, J.
Deposited on : 2023-06-12
Resolution : 2.69 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
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
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

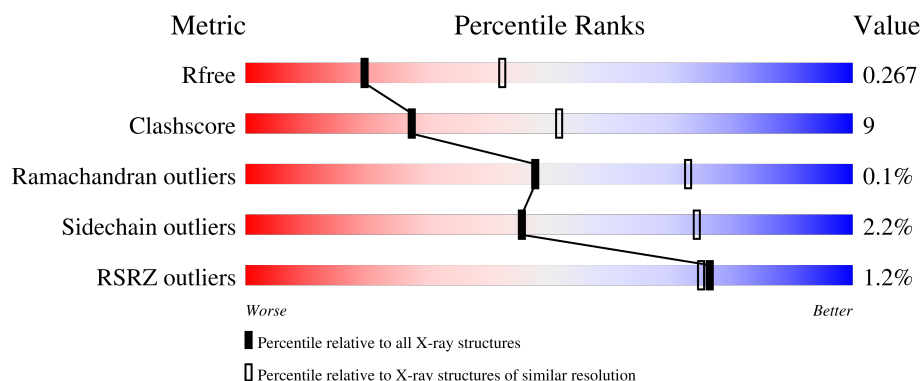
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.69 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.



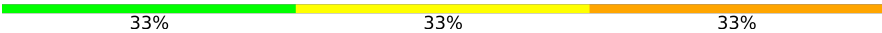
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

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	302	
2	B	99	
3	C	207	
4	D	242	
5	E	3	

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Mol	Chain	Length	Quality of chain
5	G	3	 33% 33% 33%
6	F	2	 50% 50%

2 Entry composition

There are 8 unique types of molecules in this entry. The entry contains 6649 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 Antigen-presenting glycoprotein CD1d1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	293	Total	C	N	O	S	0	0	0
			2311	1472	406	419	14			

There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	201	HIS	ASP	conflict	UNP P11609
A	280	GLY	-	expression tag	UNP P11609
A	281	SER	-	expression tag	UNP P11609
A	282	LEU	-	expression tag	UNP P11609
A	283	HIS	-	expression tag	UNP P11609
A	284	HIS	-	expression tag	UNP P11609
A	285	ILE	-	expression tag	UNP P11609
A	286	LEU	-	expression tag	UNP P11609
A	287	ASP	-	expression tag	UNP P11609
A	288	ALA	-	expression tag	UNP P11609
A	289	GLN	-	expression tag	UNP P11609
A	290	LYS	-	expression tag	UNP P11609
A	291	MET	-	expression tag	UNP P11609
A	292	VAL	-	expression tag	UNP P11609
A	293	TRP	-	expression tag	UNP P11609
A	294	ASN	-	expression tag	UNP P11609
A	295	HIS	-	expression tag	UNP P11609
A	296	ARG	-	expression tag	UNP P11609
A	297	HIS	-	expression tag	UNP P11609
A	298	HIS	-	expression tag	UNP P11609
A	299	HIS	-	expression tag	UNP P11609
A	300	HIS	-	expression tag	UNP P11609
A	301	HIS	-	expression tag	UNP P11609
A	302	HIS	-	expression tag	UNP P11609

- Molecule 2 is a protein called Beta-2-microglobulin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	99	Total	C	N	O	S	2	0	0
			788	504	134	143	7			

- Molecule 3 is a protein called T cell receptor alpha variable 11, Human nkt tcr alpha chain chimera.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	204	Total	C	N	O	S	0	0	0
			1529	948	262	312	7			

There are 21 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	18	SER	CYS	conflict	UNP A0A0B4J1J9
C	94	ASP	-	linker	UNP A0A0B4J1J9
C	95	ARG	-	linker	UNP A0A0B4J1J9
C	96	GLY	-	linker	UNP A0A0B4J1J9
C	97	SER	-	linker	UNP A0A0B4J1J9
C	98	ALA	-	linker	UNP A0A0B4J1J9
C	99	LEU	-	linker	UNP A0A0B4J1J9
C	100	GLY	-	linker	UNP A0A0B4J1J9
C	103	ARG	-	linker	UNP A0A0B4J1J9
C	104	LEU	-	linker	UNP A0A0B4J1J9
C	105	HIS	-	linker	UNP A0A0B4J1J9
C	106	PHE	-	linker	UNP A0A0B4J1J9
C	107	GLY	-	linker	UNP A0A0B4J1J9
C	108	ALA	-	linker	UNP A0A0B4J1J9
C	109	GLY	-	linker	UNP A0A0B4J1J9
C	110	THR	-	linker	UNP A0A0B4J1J9
C	111	GLN	-	linker	UNP A0A0B4J1J9
C	112	LEU	-	linker	UNP A0A0B4J1J9
C	113	ILE	-	linker	UNP A0A0B4J1J9
C	114	VAL	-	linker	UNP A0A0B4J1J9
C	115	ILE	-	linker	UNP A0A0B4J1J9

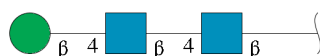
- Molecule 4 is a protein called Beta-chain, T cell receptor beta chain MC.7.G5 chimera.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	239	Total	C	N	O	S	0	0	0
			1843	1163	322	352	6			

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	96	ASP	-	linker	UNP A2NTY6
D	97	GLU	-	linker	UNP A2NTY6
D	98	GLY	-	linker	UNP A2NTY6
D	99	TYR	-	linker	UNP A2NTY6
D	115	LEU	THR	conflict	UNP P0DTU4
D	174	CYS	SER	conflict	UNP P0DTU4
D	192	ALA	CYS	conflict	UNP P0DTU4

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



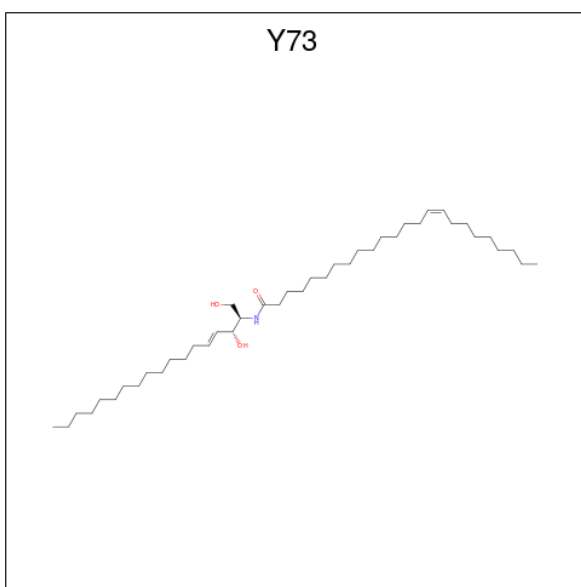
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	E	3	Total	C	N	O	0	0	0
			39	22	2	15			
5	G	3	Total	C	N	O	0	0	0
			39	22	2	15			

- 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	F	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 7 is N-[(2R,3R,4E)-1,3-dihydroxyoctadec-4-en-2-yl]tetracosanamide (CCD ID: Y73) (formula: C₄₂H₈₁NO₃) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	A	1	Total	C	N	O	0	0
			46	42	1	3		

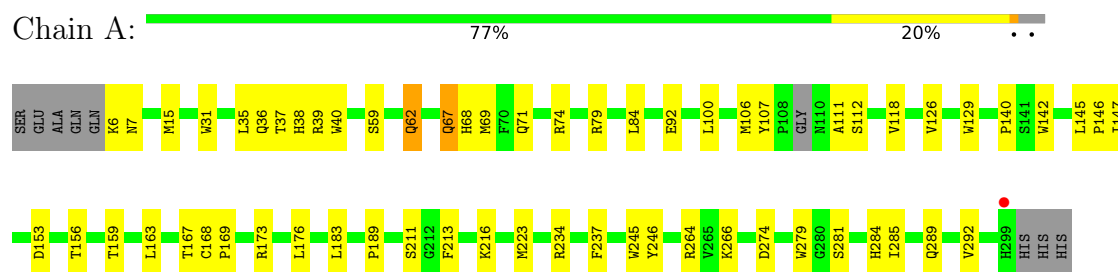
- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	12	Total	O	0	0
			12	12		
8	B	2	Total	O	0	0
			2	2		
8	C	6	Total	O	0	0
			6	6		
8	D	6	Total	O	0	0
			6	6		

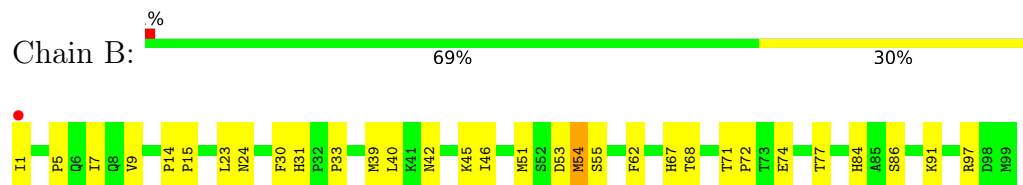
3 Residue-property plots

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.

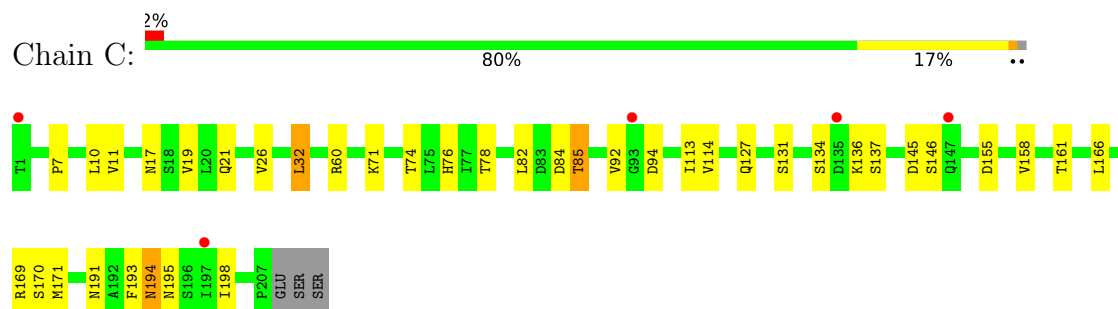
- Molecule 1: Antigen-presenting glycoprotein CD1d1



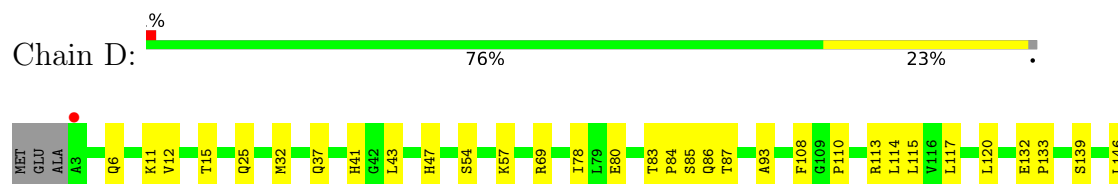
- Molecule 2: Beta-2-microglobulin

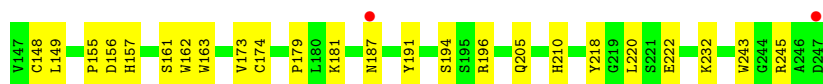


- Molecule 3: T cell receptor alpha variable 11, Human nkt tcr alpha chain chimera



- Molecule 4: Beta-chain, T cell receptor beta chain MC.7.G5 chimera





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



- Molecule 5: 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 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	57.91Å 79.04Å 242.37Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.09 – 2.69 48.09 – 2.69	Depositor EDS
% Data completeness (in resolution range)	99.5 (48.09-2.69) 99.6 (48.09-2.69)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.80 (at 2.69Å)	Xtriage
Refinement program	PHENIX (1.10.1 _2155: 000)	Depositor
R, R_{free}	0.193 , 0.265 0.194 , 0.267	Depositor DCC
R_{free} test set	1597 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	61.3	Xtriage
Anisotropy	0.536	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 44.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	6649	wwPDB-VP
Average B, all atoms (Å ²)	64.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.20% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: BMA, NAG, Y73

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	0.44	0/2382	0.64	0/3247
2	B	0.52	1/813 (0.1%)	0.60	0/1111
3	C	0.44	0/1558	0.69	0/2128
4	D	0.60	4/1895 (0.2%)	0.62	0/2589
All	All	0.50	5/6648 (0.1%)	0.64	0/9075

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	196	ARG	NE-CZ	-11.18	1.20	1.33
4	D	196	ARG	CD-NE	-9.61	1.32	1.46
4	D	196	ARG	CZ-NH2	-9.38	1.21	1.33
4	D	196	ARG	CZ-NH1	-8.28	1.21	1.32
2	B	54	MET	SD-CE	-6.34	1.63	1.79

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

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	2311	0	2152	42	0
2	B	788	0	734	19	1

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	1529	0	1420	26	0
4	D	1843	0	1714	34	0
5	E	39	0	34	0	0
5	G	39	0	34	1	0
6	F	28	0	25	0	0
7	A	46	0	0	0	0
8	A	12	0	0	0	0
8	B	2	0	0	0	0
8	C	6	0	0	0	1
8	D	6	0	0	1	0
All	All	6649	0	6113	116	1

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 9.

All (116) 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)
3:C:21:GLN:HE22	3:C:74:THR:HG22	1.10	1.13
3:C:21:GLN:NE2	3:C:74:THR:HG22	1.70	1.07
3:C:21:GLN:HE22	3:C:74:THR:CG2	1.89	0.83
1:A:39:ARG:NH1	2:B:53:ASP:OD1	2.12	0.82
2:B:72:PRO:HB2	2:B:97:ARG:NH2	1.95	0.81
3:C:60:ARG:NH2	3:C:84:ASP:OD2	2.16	0.77
1:A:159:THR:O	1:A:163:LEU:HG	1.86	0.76
1:A:163:LEU:HA	1:A:167:THR:CG2	2.15	0.76
4:D:83:THR:HG22	4:D:85:SER:H	1.49	0.76
4:D:133:PRO:HD3	4:D:146:LEU:HD23	1.66	0.75
4:D:115:LEU:HD22	4:D:155:PRO:HB3	1.71	0.71
1:A:35:LEU:HD12	1:A:183:LEU:HD23	1.73	0.70
4:D:15:THR:HG22	4:D:84:PRO:HD3	1.74	0.68
2:B:39:MET:HE3	2:B:68:THR:HG22	1.75	0.68
1:A:68:HIS:HA	1:A:71:GLN:HE21	1.57	0.68
1:A:69:MET:HE1	1:A:163:LEU:HD11	1.76	0.67
4:D:132:GLU:OE1	4:D:245:ARG:NH2	2.29	0.66
4:D:187:ASN:O	8:D:301:HOH:O	2.12	0.66
1:A:189:PRO:HB3	1:A:213:PHE:HB3	1.77	0.65
2:B:5:PRO:HB3	2:B:30:PHE:HB3	1.79	0.64
4:D:113:ARG:HG2	4:D:157:HIS:HE1	1.63	0.62
1:A:100:LEU:CD2	1:A:118:VAL:HG22	2.29	0.62
4:D:12:VAL:HG13	4:D:117:LEU:HD21	1.80	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:84:HIS:CD2	2:B:86:SER:H	2.18	0.61
4:D:37:GLN:HB2	4:D:43:LEU:HD22	1.83	0.61
1:A:129:TRP:NE1	5:G:2:NAG:H81	2.15	0.60
1:A:37:THR:HG23	1:A:38:HIS:ND1	2.17	0.60
1:A:168:CYS:HB3	1:A:169:PRO:HD3	1.83	0.59
3:C:195:ASN:O	3:C:195:ASN:ND2	2.37	0.58
4:D:113:ARG:HG2	4:D:157:HIS:CE1	2.39	0.58
1:A:279:TRP:O	1:A:284:HIS:ND1	2.29	0.58
2:B:9:VAL:HG12	2:B:23:LEU:HD11	1.87	0.57
3:C:11:VAL:HG12	3:C:113:ILE:HB	1.86	0.57
1:A:67:GLN:O	1:A:71:GLN:HG3	2.05	0.56
3:C:166:LEU:HB3	4:D:174:CYS:HB2	1.86	0.56
1:A:84:LEU:HD22	1:A:146:PRO:HB3	1.87	0.56
2:B:39:MET:CE	2:B:68:THR:HG22	2.35	0.56
4:D:161:SER:OG	4:D:163:TRP:NE1	2.30	0.56
4:D:156:ASP:HB2	4:D:179:PRO:HG2	1.88	0.56
4:D:32:MET:HG3	4:D:69:ARG:NH1	2.22	0.55
4:D:87:THR:HG23	4:D:115:LEU:HA	1.88	0.55
4:D:205:GLN:HA	4:D:245:ARG:O	2.06	0.55
3:C:145:ASP:OD1	3:C:146:SER:N	2.40	0.55
1:A:223:MET:HE2	1:A:264:ARG:HD2	1.89	0.54
2:B:72:PRO:HB2	2:B:97:ARG:HH22	1.72	0.54
1:A:163:LEU:HA	1:A:167:THR:HG22	1.88	0.54
4:D:222:GLU:HA	4:D:232:LYS:NZ	2.23	0.54
1:A:107:TYR:HB2	1:A:111:ALA:HB3	1.89	0.54
3:C:127:GLN:NE2	3:C:137:SER:OG	2.41	0.52
2:B:24:ASN:HD22	2:B:67:HIS:HB3	1.74	0.52
1:A:234:ARG:HH21	1:A:237:PHE:HZ	1.57	0.51
1:A:40:TRP:CE2	1:A:74:ARG:NH1	2.79	0.51
4:D:120:LEU:HD13	4:D:220:LEU:HD22	1.92	0.51
4:D:93:ALA:HB2	4:D:108:PHE:CD1	2.46	0.51
1:A:216:LYS:HE3	1:A:245:TRP:CH2	2.46	0.50
3:C:134:SER:HB2	3:C:136:LYS:HD3	1.92	0.50
3:C:193:PHE:HB2	3:C:198:ILE:HD11	1.94	0.50
3:C:85:THR:HG22	3:C:114:VAL:HG23	1.94	0.50
3:C:26:VAL:O	3:C:71:LYS:NZ	2.45	0.50
3:C:19:VAL:HG12	3:C:76:HIS:ND1	2.27	0.49
2:B:1:ILE:O	2:B:31:HIS:ND1	2.44	0.48
3:C:85:THR:HG22	3:C:114:VAL:H	1.77	0.48
1:A:100:LEU:HD21	1:A:118:VAL:HG22	1.96	0.48
4:D:37:GLN:HB2	4:D:43:LEU:CD2	2.42	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:289:GLN:HA	1:A:292:VAL:HG13	1.94	0.48
2:B:40:LEU:HD23	2:B:45:LYS:HA	1.96	0.48
1:A:106:MET:HB3	1:A:173:ARG:HH11	1.79	0.47
3:C:7:PRO:HG2	3:C:10:LEU:HB2	1.96	0.47
4:D:181:LYS:HG3	4:D:191:TYR:CE2	2.49	0.47
4:D:115:LEU:HD23	4:D:117:LEU:HD22	1.96	0.47
1:A:106:MET:HB3	1:A:173:ARG:NH1	2.30	0.47
1:A:211:SER:HB2	1:A:246:TYR:HD1	1.80	0.46
1:A:6:LYS:N	1:A:107:TYR:HA	2.31	0.46
2:B:54:MET:HG3	2:B:55:SER:N	2.30	0.46
3:C:171:MET:HE2	3:C:171:MET:HB3	1.82	0.46
3:C:191:ASN:HB2	3:C:194:ASN:OD1	2.15	0.46
3:C:32:LEU:CD2	3:C:92:VAL:HG22	2.46	0.46
4:D:149:LEU:HD12	4:D:149:LEU:HA	1.70	0.46
1:A:140:PRO:HB2	1:A:142:TRP:CD1	2.50	0.46
1:A:59:SER:OG	1:A:62:GLN:HG2	2.17	0.45
1:A:79:ARG:HH22	3:C:94:ASP:CG	2.23	0.45
1:A:126:VAL:HG21	1:A:147:ILE:HD11	1.98	0.45
3:C:169:ARG:H	3:C:169:ARG:HG3	1.61	0.45
4:D:148:CYS:HB2	4:D:162:TRP:CZ2	2.53	0.44
1:A:153:ASP:CG	1:A:156:THR:HG23	2.42	0.44
3:C:155:ASP:HB3	3:C:158:VAL:HG13	2.00	0.44
3:C:155:ASP:O	3:C:158:VAL:HG22	2.18	0.43
4:D:157:HIS:CB	4:D:218:TYR:HB2	2.49	0.43
2:B:46:ILE:HG21	2:B:68:THR:HG21	2.01	0.43
1:A:281:SER:O	1:A:285:ILE:HG13	2.18	0.43
3:C:17:ASN:HD22	3:C:78:THR:HA	1.83	0.43
1:A:31:TRP:CZ3	1:A:36:GLN:HB2	2.53	0.43
2:B:42:ASN:HA	2:B:77:THR:OG1	2.19	0.42
4:D:47:HIS:HD2	4:D:57:LYS:HA	1.84	0.42
4:D:83:THR:N	4:D:86:GLN:OE1	2.47	0.42
1:A:266:LYS:HG2	1:A:274:ASP:OD2	2.19	0.42
2:B:33:PRO:HD3	2:B:62:PHE:CE2	2.54	0.42
3:C:161:THR:HG21	4:D:194:SER:OG	2.19	0.42
1:A:69:MET:HE1	1:A:163:LEU:CD1	2.48	0.42
4:D:162:TRP:CD1	4:D:173:VAL:HG13	2.55	0.42
1:A:176:LEU:HD23	1:A:176:LEU:HA	1.88	0.42
4:D:11:LYS:O	4:D:114:LEU:HD12	2.20	0.42
1:A:145:LEU:HB3	1:A:146:PRO:HD3	2.02	0.41
4:D:210:HIS:ND1	4:D:243:TRP:CE2	2.89	0.41
2:B:7:ILE:HD12	2:B:91:LYS:HD3	2.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:D:6:GLN:HG3	4:D:110:PRO:HD2	2.02	0.41
1:A:39:ARG:NH1	2:B:53:ASP:CG	2.78	0.41
2:B:14:PRO:HA	2:B:15:PRO:HD3	1.95	0.41
2:B:84:HIS:HD2	2:B:86:SER:OG	2.04	0.41
1:A:35:LEU:HD23	1:A:35:LEU:HA	1.81	0.40
1:A:92:GLU:HG3	1:A:142:TRP:CH2	2.56	0.40
1:A:40:TRP:CZ2	1:A:74:ARG:NH1	2.89	0.40
1:A:40:TRP:NE1	1:A:74:ARG:NH1	2.70	0.40
4:D:78:ILE:CG2	4:D:80:GLU:HG3	2.52	0.40
4:D:222:GLU:HA	4:D:232:LYS:HZ3	1.84	0.40
3:C:82:LEU:O	3:C:85:THR:HG23	2.21	0.40

All (1) 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)
2:B:74:GLU:OE1	8:C:306:HOH:O[2_554]	2.17	0.03

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 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	289/302 (96%)	279 (96%)	10 (4%)	0	100	100
2	B	97/99 (98%)	91 (94%)	6 (6%)	0	100	100
3	C	202/207 (98%)	190 (94%)	11 (5%)	1 (0%)	24	48
4	D	237/242 (98%)	226 (95%)	11 (5%)	0	100	100
All	All	825/850 (97%)	786 (95%)	38 (5%)	1 (0%)	48	73

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	C	194	ASN

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	242/264 (92%)	237 (98%)	5 (2%)	47	75
2	B	85/93 (91%)	83 (98%)	2 (2%)	43	72
3	C	169/186 (91%)	165 (98%)	4 (2%)	43	72
4	D	193/207 (93%)	189 (98%)	4 (2%)	47	75
All	All	689/750 (92%)	674 (98%)	15 (2%)	45	74

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	7	ASN
1	A	15	MET
1	A	62	GLN
1	A	67	GLN
1	A	112	SER
2	B	51	MET
2	B	71	THR
3	C	32	LEU
3	C	85	THR
3	C	131	SER
3	C	170	SER
4	D	25	GLN
4	D	41	HIS
4	D	54	SER
4	D	139	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	55	GLN

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Mol	Chain	Res	Type
1	A	71	GLN
2	B	24	ASN
2	B	84	HIS
3	C	17	ASN
3	C	21	GLN
3	C	37	GLN
3	C	127	GLN
3	C	149	ASN
4	D	24	ASN
4	D	47	HIS
4	D	74	ASN
4	D	165	ASN
4	D	216	GLN

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 ⓘ

8 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	E	1	5,1	14,14,15	0.34	0	17,19,21	0.66	0
5	NAG	E	2	5	14,14,15	0.44	0	17,19,21	0.65	0
5	BMA	E	3	5	11,11,12	1.18	0	15,15,17	1.19	1 (6%)
6	NAG	F	1	6,1	14,14,15	0.32	0	17,19,21	0.55	0
6	NAG	F	2	6	14,14,15	0.49	0	17,19,21	0.78	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	NAG	G	1	5,1	14,14,15	0.42	0	17,19,21	0.65	0
5	NAG	G	2	5	14,14,15	0.85	1 (7%)	17,19,21	0.52	0
5	BMA	G	3	5	11,11,12	1.06	1 (9%)	15,15,17	0.83	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	E	1	5,1	-	2/6/23/26	0/1/1/1
5	NAG	E	2	5	-	4/6/23/26	0/1/1/1
5	BMA	E	3	5	-	1/2/19/22	0/1/1/1
6	NAG	F	1	6,1	-	2/6/23/26	0/1/1/1
6	NAG	F	2	6	-	2/6/23/26	0/1/1/1
5	NAG	G	1	5,1	-	2/6/23/26	0/1/1/1
5	NAG	G	2	5	-	2/6/23/26	0/1/1/1
5	BMA	G	3	5	-	1/2/19/22	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	G	2	NAG	O5-C1	-3.09	1.38	1.43
5	G	3	BMA	C4-C5	2.41	1.58	1.53

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	E	3	BMA	C1-O5-C5	3.19	116.46	112.19
6	F	2	NAG	C1-O5-C5	2.54	115.59	112.19

There are no chirality outliers.

All (16) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	G	2	NAG	O5-C5-C6-O6
6	F	1	NAG	C4-C5-C6-O6
5	G	2	NAG	C4-C5-C6-O6
6	F	1	NAG	O5-C5-C6-O6

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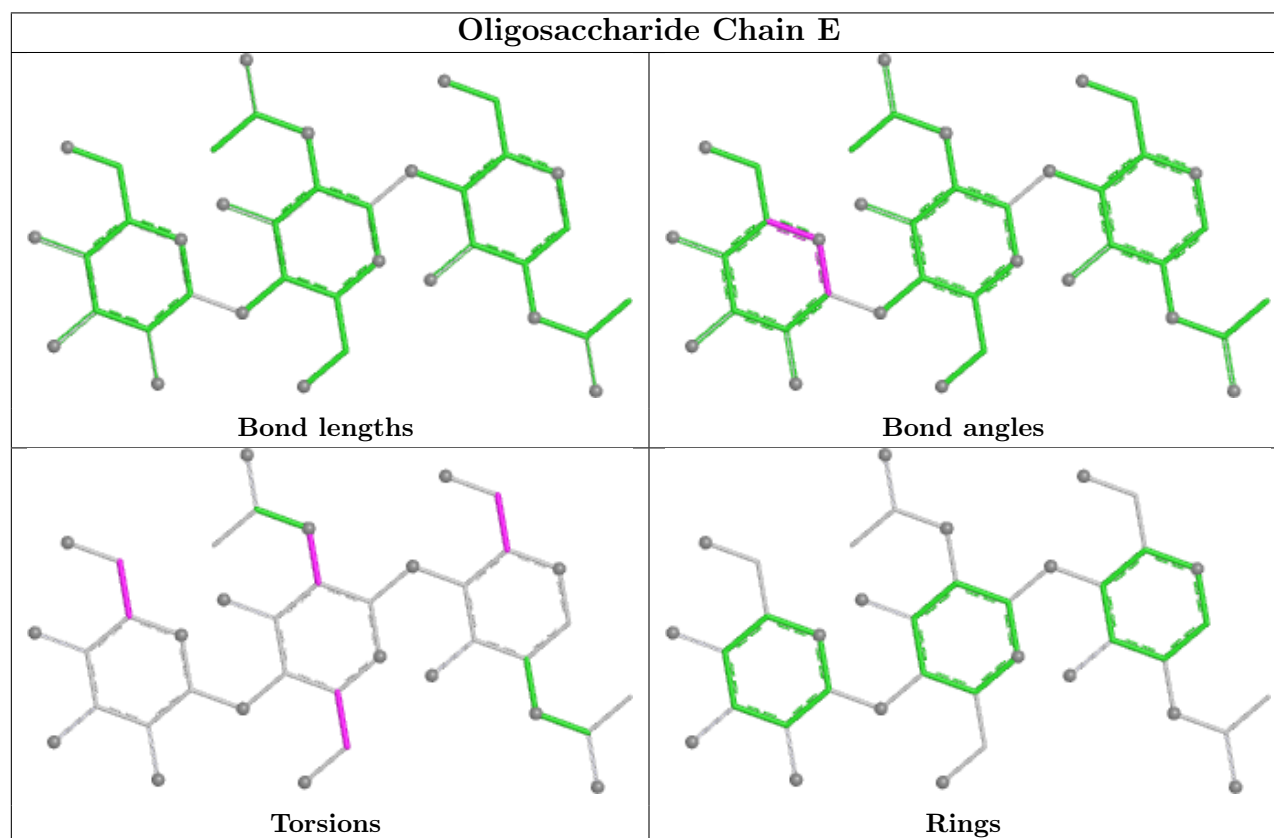
Mol	Chain	Res	Type	Atoms
5	E	2	NAG	C4-C5-C6-O6
5	E	1	NAG	O5-C5-C6-O6
5	E	1	NAG	C4-C5-C6-O6
6	F	2	NAG	O5-C5-C6-O6
5	E	2	NAG	O5-C5-C6-O6
5	E	3	BMA	O5-C5-C6-O6
5	G	1	NAG	C4-C5-C6-O6
5	G	3	BMA	O5-C5-C6-O6
6	F	2	NAG	C4-C5-C6-O6
5	E	2	NAG	C3-C2-N2-C7
5	E	2	NAG	C1-C2-N2-C7
5	G	1	NAG	O5-C5-C6-O6

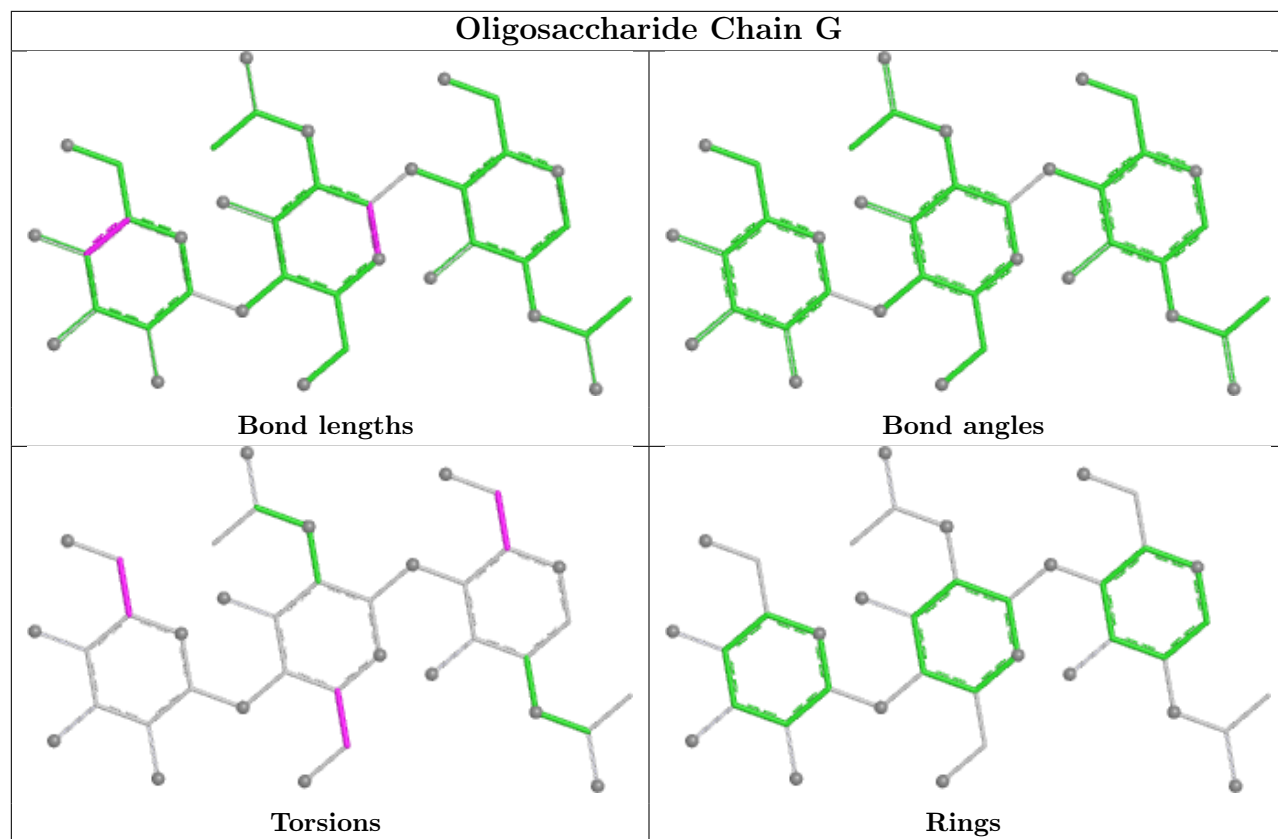
There are no ring outliers.

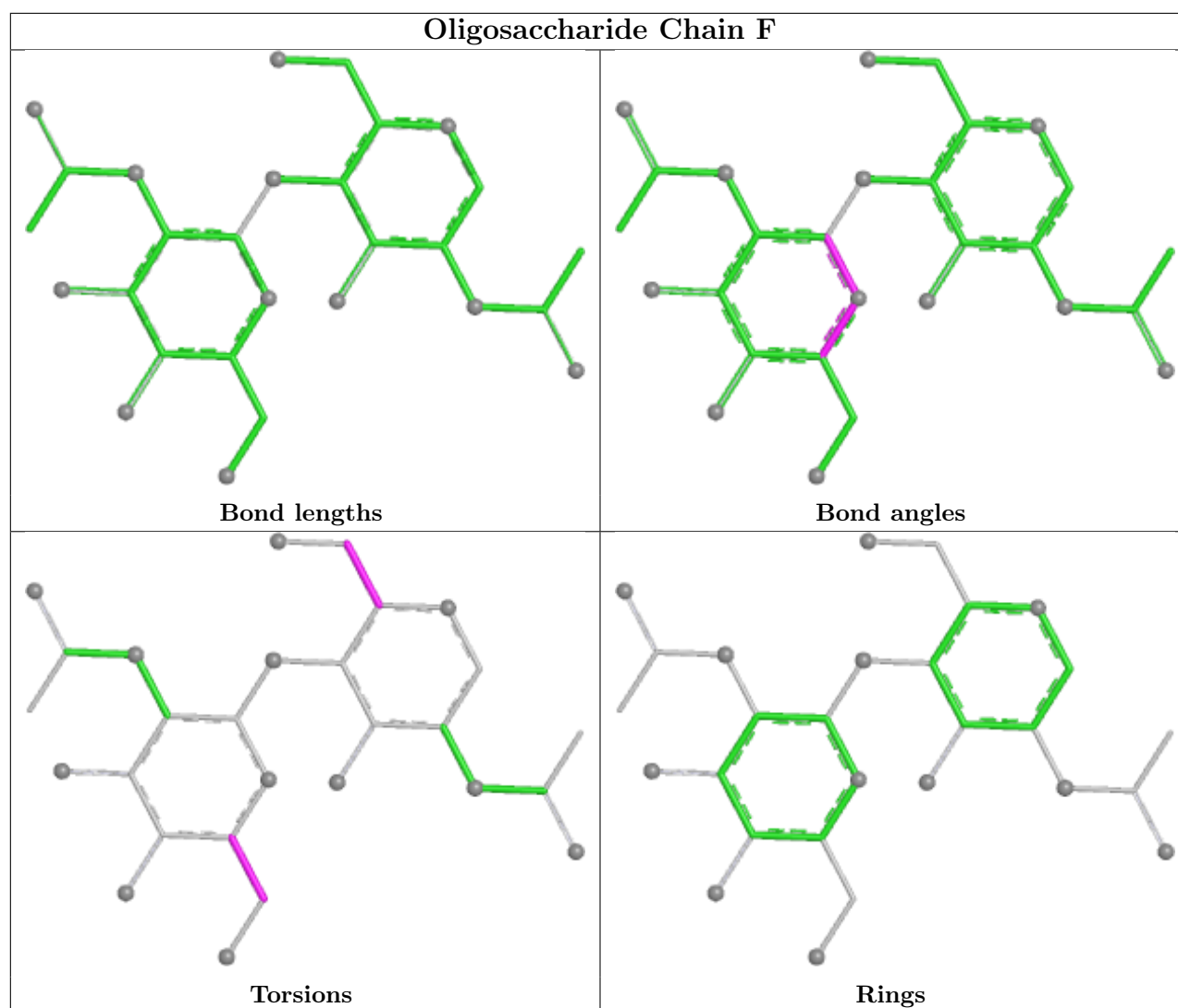
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	G	2	NAG	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](#)

1 ligand is 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	$\# Z > 2$
7	Y73	A	401	-	44,45,45	1.39	2 (4%)	45,47,47	1.36	6 (13%)

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	Y73	A	401	-	-	24/48/48/48	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	A	401	Y73	C19-N1	6.88	1.48	1.34
7	A	401	Y73	C16-C15	2.19	1.53	1.50

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	401	Y73	C32-C33-C34	4.03	155.00	124.83
7	A	401	Y73	C35-C34-C33	3.78	153.12	124.83
7	A	401	Y73	C18-C17-N1	3.23	114.37	109.28
7	A	401	Y73	C17-N1-C19	2.55	127.65	123.40
7	A	401	Y73	O3-C19-C20	-2.29	117.87	122.02
7	A	401	Y73	C13-C14-C15	-2.23	115.54	125.47

There are no chirality outliers.

All (24) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	A	401	Y73	C15-C16-C17-C18
7	A	401	Y73	C15-C16-C17-N1
7	A	401	Y73	O1-C16-C17-C18
7	A	401	Y73	O1-C16-C17-N1
7	A	401	Y73	C16-C17-C18-O2
7	A	401	Y73	N1-C17-C18-O2
7	A	401	Y73	C18-C17-N1-C19
7	A	401	Y73	C19-C20-C21-C22
7	A	401	Y73	C28-C29-C30-C31
7	A	401	Y73	C14-C15-C16-O1
7	A	401	Y73	N1-C19-C20-C21
7	A	401	Y73	O3-C19-C20-C21
7	A	401	Y73	C9-C10-C11-C12
7	A	401	Y73	C38-C39-C40-C41
7	A	401	Y73	C27-C28-C29-C30
7	A	401	Y73	C3-C4-C5-C6

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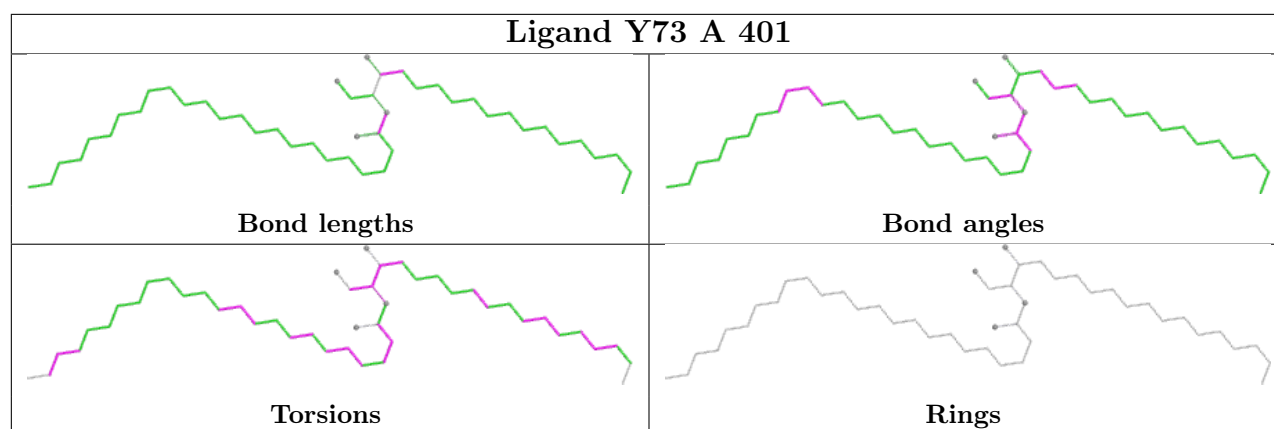
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Mol	Chain	Res	Type	Atoms
7	A	401	Y73	C22-C23-C24-C25
7	A	401	Y73	C16-C17-N1-C19
7	A	401	Y73	C5-C6-C7-C8
7	A	401	Y73	C6-C7-C8-C9
7	A	401	Y73	C39-C40-C41-C42
7	A	401	Y73	C2-C3-C4-C5
7	A	401	Y73	C24-C25-C26-C27
7	A	401	Y73	C21-C22-C23-C24

There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	293/302 (97%)	-0.17	1 (0%) 90 89	38, 60, 90, 124	0
2	B	99/99 (100%)	-0.09	1 (1%) 79 78	43, 59, 84, 112	1 (1%)
3	C	204/207 (98%)	0.01	5 (2%) 58 55	40, 61, 97, 128	0
4	D	239/242 (98%)	-0.13	3 (1%) 75 73	40, 63, 97, 126	0
All	All	835/850 (98%)	-0.11	10 (1%) 76 75	38, 61, 94, 128	1 (0%)

All (10) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	D	3	ALA	3.7
3	C	1	THR	3.5
1	A	299	HIS	2.9
2	B	1	ILE	2.7
3	C	135	ASP	2.7
4	D	187	ASN	2.6
4	D	247	ASP	2.2
3	C	197	ILE	2.2
3	C	93	GLY	2.2
3	C	147	GLN	2.1

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

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

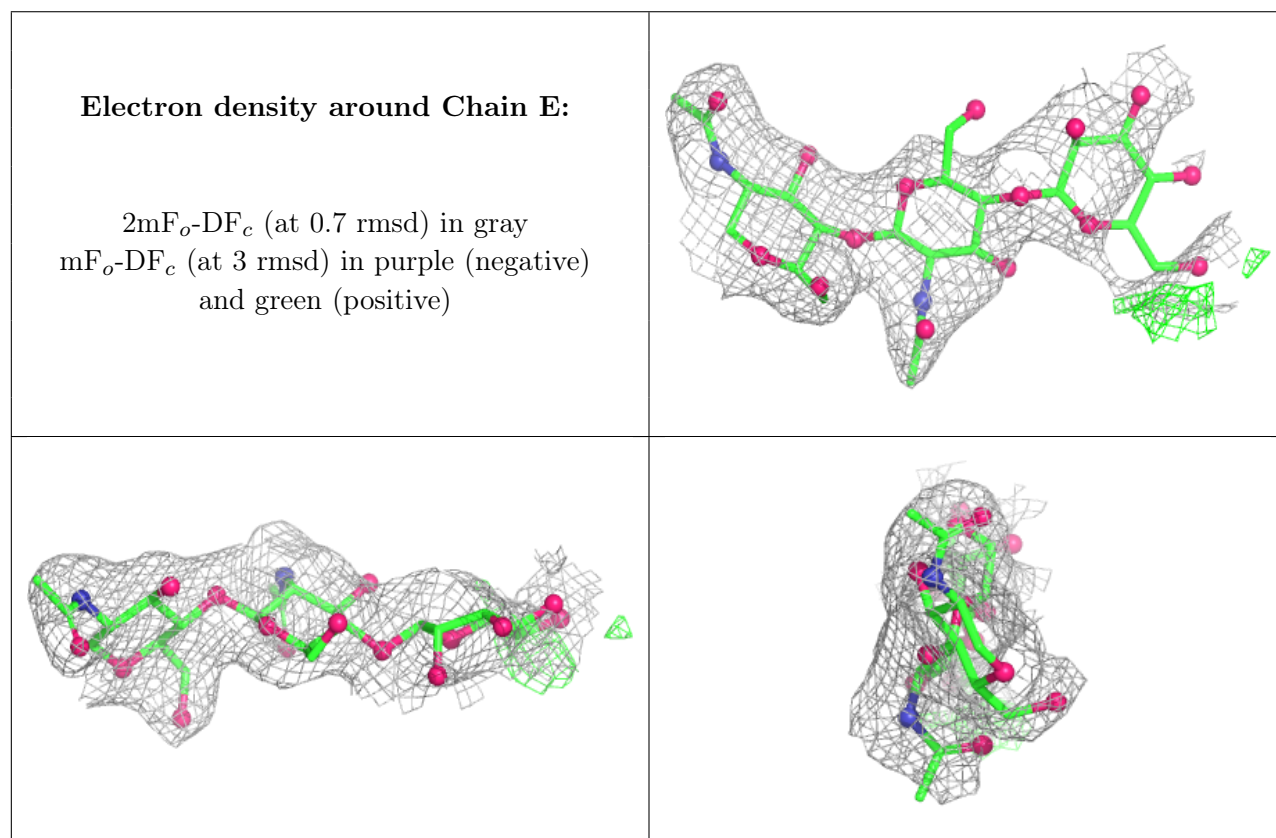
6.3 Carbohydrates [i](#)

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.

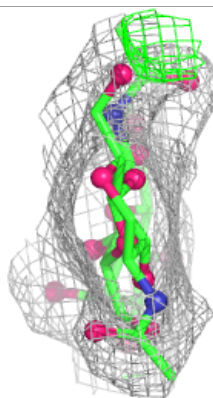
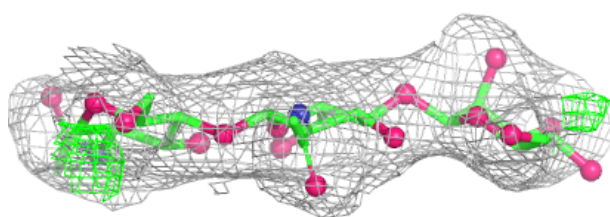
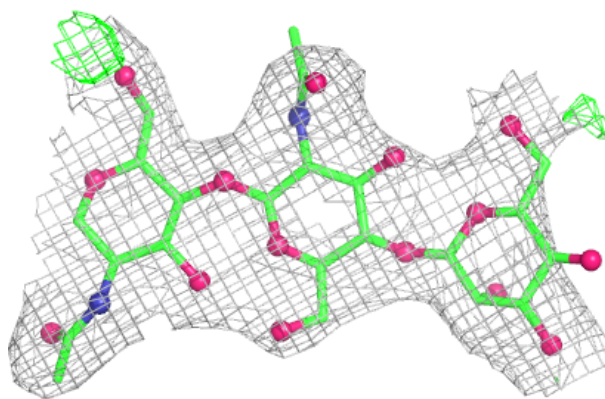
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
5	BMA	E	3	11/12	0.10	0.16	131,146,156,160	0
5	BMA	G	3	11/12	0.34	0.14	131,143,151,157	0
6	NAG	F	2	14/15	0.63	0.14	123,137,147,148	0
5	NAG	E	2	14/15	0.79	0.12	98,110,138,143	0
5	NAG	G	1	14/15	0.84	0.10	63,88,98,99	0
6	NAG	F	1	14/15	0.87	0.11	92,105,123,128	0
5	NAG	G	2	14/15	0.92	0.09	87,99,111,128	0
5	NAG	E	1	14/15	0.94	0.08	54,68,84,88	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.

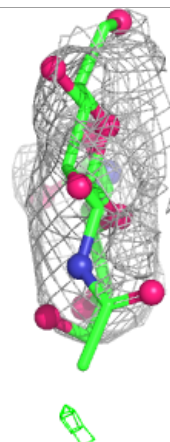
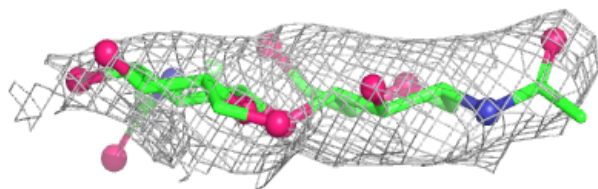
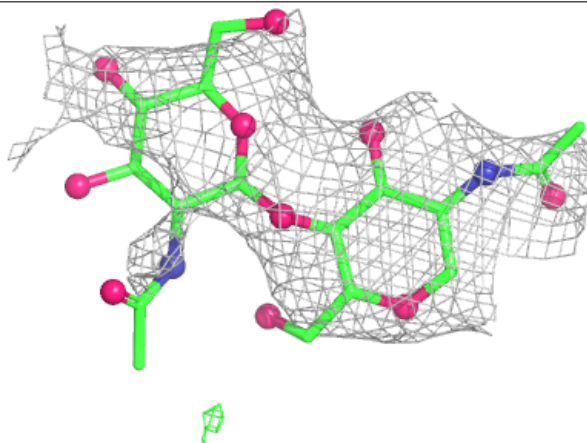


Electron density around Chain G:

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

**Electron density around Chain F:**

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

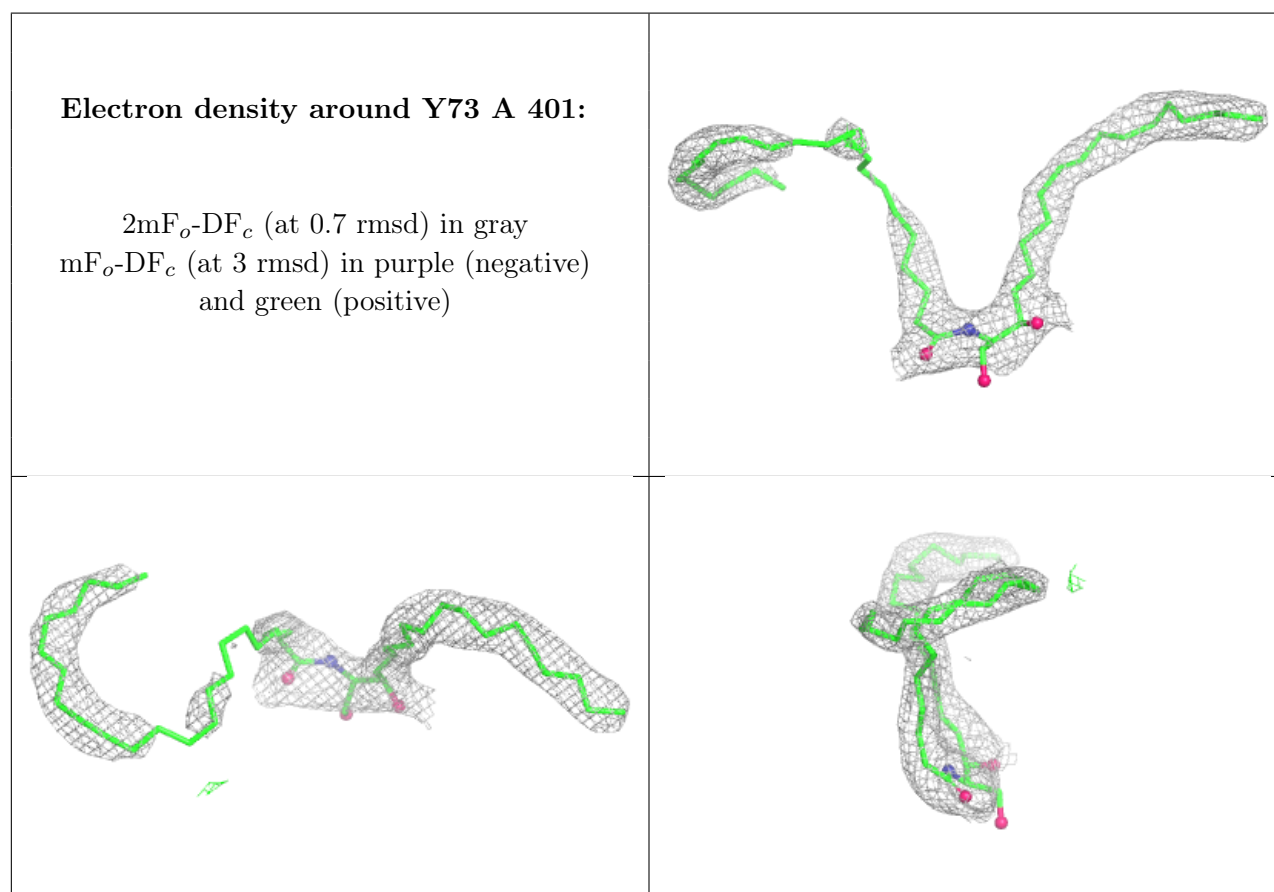


6.4 Ligands [i](#)

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
7	Y73	A	401	46/46	0.95	0.13	39,64,87,100	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.



6.5 Other polymers [i](#)

There are no such residues in this entry.