



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 18, 2026 – 04:36 AM UTC

PDB ID : 6PUF / pdb_00006puf
Title : Structure of human MAIT A-F7 TCR in complex with human MR1-5'D-5-OP-RU
Authors : Awad, W.; Rossjohn, J.
Deposited on : 2019-07-18
Resolution : 1.92 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

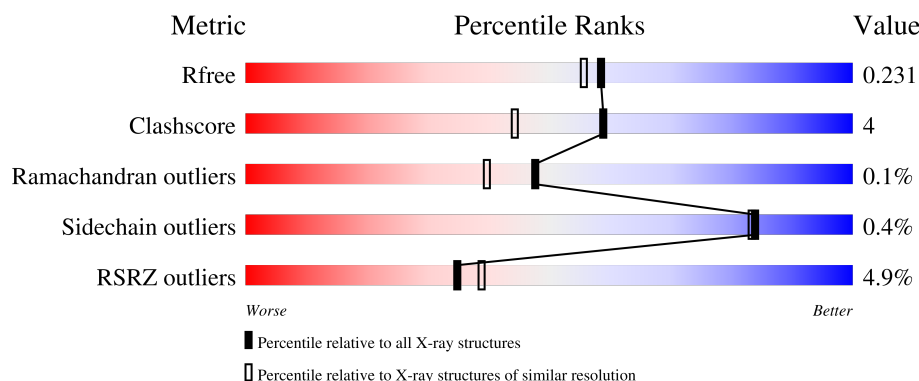
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.92 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	1188 (1.92-1.92)
Clashscore	190562	1209 (1.92-1.92)
Ramachandran outliers	187476	1195 (1.92-1.92)
Sidechain outliers	187428	1195 (1.92-1.92)
RSRZ outliers	180081	1188 (1.92-1.92)

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	271	
1	C	271	
2	B	100	
2	F	100	
3	D	204	

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Mol	Chain	Length	Quality of chain
3	G	204	% 90% 8%
4	E	246	7% 83% 15%
4	H	246	% 89% 10%

2 Entry composition

There are 8 unique types of molecules in this entry. The entry contains 14924 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 Major histocompatibility complex class I-related gene protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	265	Total	C	N	O	S	0	6	0
			2174	1392	373	397	12			
1	C	265	Total	C	N	O	S	1	10	0
			2232	1439	378	404	11			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	MET	-	initiating methionine	UNP Q95460
A	261	SER	CYS	conflict	UNP Q95460
C	0	MET	-	initiating methionine	UNP Q95460
C	261	SER	CYS	conflict	UNP Q95460

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	97	Total	C	N	O	S	0	2	0
			793	510	130	150	3			
2	F	100	Total	C	N	O	S	0	2	0
			825	526	139	156	4			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	0	MET	-	initiating methionine	UNP P61769
F	0	MET	-	initiating methionine	UNP P61769

- Molecule 3 is a protein called Human TCR alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	D	188	Total	C	N	O	S	0	7	0
			1447	928	230	279	10			

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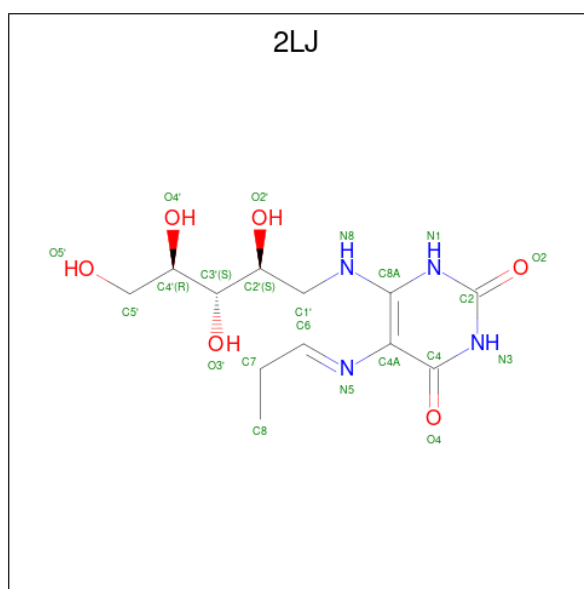
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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	G	200	Total	C	N	O	S	0	8	0
			1583	1003	250	320	10			

- Molecule 4 is a protein called Human TCR beta chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	E	240	Total	C	N	O	S	0	3	0
			1859	1173	316	361	9			
4	H	245	Total	C	N	O	S	0	4	0
			1931	1217	336	365	13			

- Molecule 5 is 1-deoxy-1-({2,6-dioxo-5-[(E)-propylideneamino]-1,2,3,6-tetrahydropyrimidin-4-yl}amino)-D-ribose (CCD ID: 2LJ) (formula: $C_{12}H_{20}N_4O_6$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total	C	N	O	0	0
			21	12	4	5		
5	C	1	Total	C	N	O	0	0
			21	12	4	5		

- Molecule 6 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			6	3	3		
6	A	1	Total	C	O	0	0
			6	3	3		
6	C	1	Total	C	O	0	0
			6	3	3		
6	F	1	Total	C	O	0	0
			6	3	3		
6	F	1	Total	C	O	0	0
			6	3	3		
6	H	1	Total	C	O	0	0
			6	3	3		

- Molecule 7 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	F	1	Total	Na	0	0
			1	1		
7	H	1	Total	Na	0	0
			1	1		

- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	331	Total	O	0	0
			331	331		

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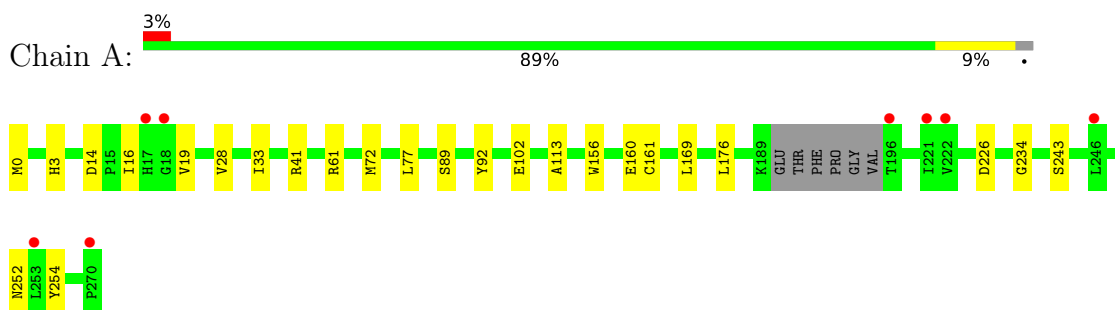
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	B	99	Total 99	O 99	0	0
8	C	354	Total 354	O 354	0	0
8	D	180	Total 180	O 180	0	0
8	E	201	Total 201	O 201	0	0
8	F	165	Total 165	O 165	0	0
8	G	306	Total 306	O 306	0	0
8	H	364	Total 364	O 364	0	0

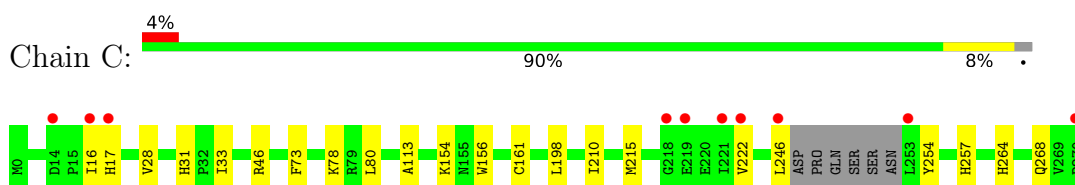
3 Residue-property plots

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.

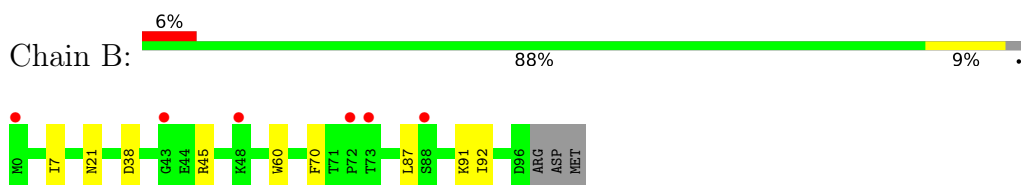
- Molecule 1: Major histocompatibility complex class I-related gene protein



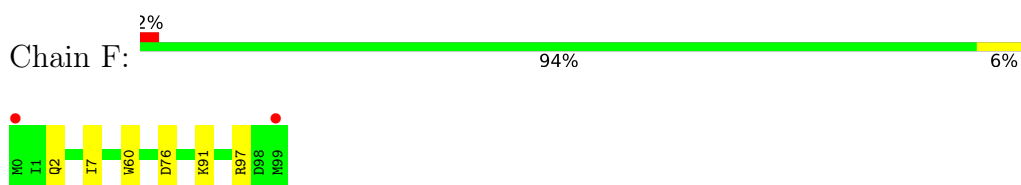
- Molecule 1: Major histocompatibility complex class I-related gene protein



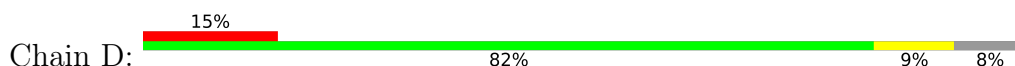
- Molecule 2: Beta-2-microglobulin

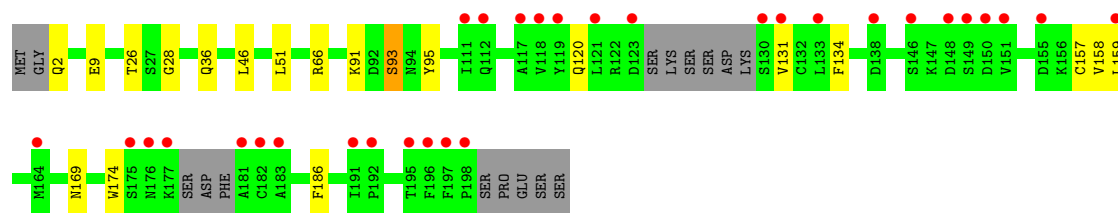


- Molecule 2: Beta-2-microglobulin

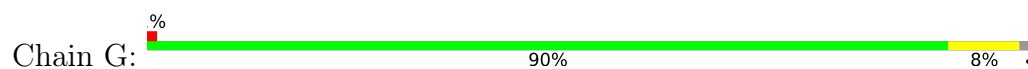


- Molecule 3: Human TCR alpha chain

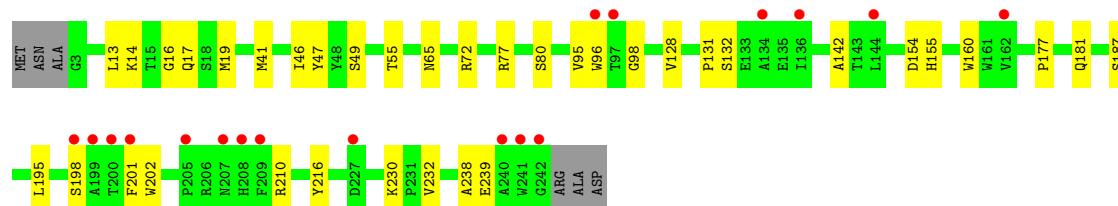
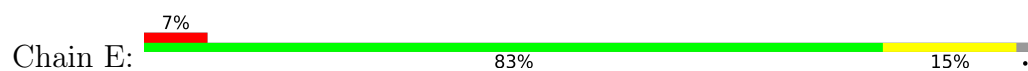




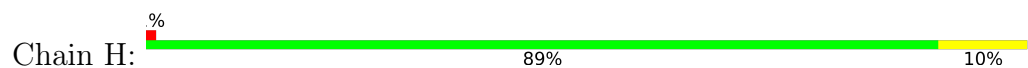
• Molecule 3: Human TCR alpha chain



• Molecule 4: Human TCR beta chain



• Molecule 4: Human TCR beta chain



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	216.03Å 69.81Å 142.94Å 90.00° 104.26° 90.00°	Depositor
Resolution (Å)	47.81 – 1.92 47.81 – 1.92	Depositor EDS
% Data completeness (in resolution range)	99.4 (47.81-1.92) 99.4 (47.81-1.92)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.96 (at 1.92Å)	Xtriage
Refinement program	PHENIX	Depositor
R, R_{free}	0.178 , 0.221 0.195 , 0.231	Depositor DCC
R_{free} test set	7940 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	23.0	Xtriage
Anisotropy	0.217	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 48.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	14924	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.14% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: 2LJ, GOL, NA

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	0.21	0/2256	0.40	0/3068
1	C	0.23	0/2330	0.41	0/3167
2	B	0.17	0/822	0.40	0/1122
2	F	0.20	0/854	0.43	0/1161
3	D	0.18	0/1499	0.39	0/2038
3	G	0.22	0/1642	0.45	0/2229
4	E	0.18	0/1918	0.40	0/2617
4	H	0.24	0/2000	0.48	0/2721
All	All	0.21	0/13321	0.42	0/18123

There are no bond length outliers.

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	2174	0	2055	20	0
1	C	2232	0	2142	18	0
2	B	793	0	738	7	0
2	F	825	0	775	6	0
3	D	1447	0	1345	12	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	G	1583	0	1499	12	0
4	E	1859	0	1719	22	0
4	H	1931	0	1823	17	0
5	A	21	0	15	2	0
5	C	21	0	15	2	0
6	A	12	0	16	0	0
6	C	6	0	8	0	0
6	F	12	0	15	2	0
6	H	6	0	8	2	0
7	F	1	0	0	0	0
7	H	1	0	0	0	0
8	A	331	0	0	3	0
8	B	99	0	0	5	0
8	C	354	0	0	5	0
8	D	180	0	0	3	0
8	E	201	0	0	4	0
8	F	165	0	0	2	0
8	G	306	0	0	4	0
8	H	364	0	0	2	0
All	All	14924	0	12173	109	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 4.

All (109) 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:C:222:VAL:HA	4:H:200:THR:HG21	1.67	0.77
1:A:41:ARG:NH2	8:A:401:HOH:O	2.17	0.76
3:G:19:GLN:NE2	8:G:302:HOH:O	2.17	0.72
2:B:92:ILE:O	8:B:101:HOH:O	2.11	0.69
3:G:138[B]:ASP:OD1	8:G:301:HOH:O	2.11	0.68
1:C:46[B]:ARG:NH1	8:C:401:HOH:O	2.23	0.68
1:A:3:HIS:CD2	1:A:169[B]:LEU:HD21	2.29	0.67
4:H:44:ARG:HH12	6:H:301:GOL:H31	1.59	0.67
4:H:210:ARG:NH1	4:H:212:GLN:OE1	2.29	0.66
1:A:77:LEU:HD13	1:A:92:TYR:HB2	1.78	0.65
1:A:72:MET:SD	8:H:668:HOH:O	2.54	0.65
2:B:21:ASN:OD1	8:B:102:HOH:O	2.15	0.64
4:E:72:ARG:NH1	8:E:304:HOH:O	2.29	0.60
2:F:2:GLN:OE1	8:F:201:HOH:O	2.16	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:E:198:SER:OG	4:E:201:PHE:HB2	2.03	0.59
1:A:0:MET:O	1:A:102:GLU:HG3	2.03	0.59
1:C:156:TRP:CZ2	5:C:301:2LJ:H9	2.40	0.57
4:H:6:GLN:HB3	4:H:91[B]:CYS:SG	2.45	0.57
4:E:41:MET:SD	8:E:477:HOH:O	2.58	0.56
1:A:113:ALA:HB2	2:B:60:TRP:CE2	2.41	0.56
2:B:87:LEU:O	8:B:103:HOH:O	2.18	0.55
2:B:38:ASP:HB3	2:B:45:ARG:HG3	1.89	0.54
3:G:159:LEU:HB3	4:H:172:CYS:HB2	1.90	0.54
1:A:41:ARG:NH1	8:A:402:HOH:O	2.18	0.54
3:G:148:ASP:OD2	3:G:177:LYS:NZ	2.31	0.53
1:C:268[A]:GLN:NE2	8:C:413:HOH:O	2.41	0.53
4:E:72:ARG:NE	8:E:311:HOH:O	2.39	0.53
4:E:98:GLY:N	8:E:306:HOH:O	2.33	0.53
3:D:120:GLN:O	4:E:132:SER:HB2	2.08	0.53
2:F:97:ARG:NH2	8:F:210:HOH:O	2.42	0.53
4:H:44:ARG:NH1	6:H:301:GOL:H31	2.24	0.53
1:C:264:HIS:HB2	8:C:419:HOH:O	2.09	0.52
3:D:91:LYS:HG2	3:D:95:TYR:HA	1.91	0.52
3:D:2:GLN:HG2	3:D:26:THR:HA	1.91	0.51
1:C:154:LYS:HD3	3:D:51:LEU:HD11	1.93	0.51
3:G:150:ASP:HB2	3:G:177:LYS:HD3	1.91	0.50
4:H:128:VAL:HG23	4:H:238:ALA:HB3	1.93	0.50
1:A:156:TRP:CZ2	5:A:301:2LJ:H9	2.47	0.50
1:A:19:VAL:HG11	8:B:160:HOH:O	2.12	0.49
3:G:193:GLU:OE1	8:G:303:HOH:O	2.19	0.49
5:A:301:2LJ:O4	5:A:301:2LJ:H1	2.13	0.49
4:H:23:CYS:SG	4:H:91[B]:CYS:SG	3.11	0.49
1:C:113:ALA:HB2	2:F:60:TRP:CE2	2.48	0.48
4:E:131:PRO:HD2	4:E:202:TRP:CZ2	2.49	0.48
1:C:16:ILE:HD12	1:C:17:HIS:O	2.13	0.48
1:A:169[B]:LEU:HD12	1:A:176:LEU:HD13	1.94	0.48
3:D:28:GLY:HA3	3:D:93[B]:SER:HB3	1.96	0.48
4:E:14:LYS:O	4:E:17:GLN:HB2	2.14	0.47
4:E:128:VAL:HG23	4:E:238:ALA:HB3	1.95	0.47
1:A:28:VAL:HG23	1:A:33:ILE:HD13	1.94	0.47
1:C:210:ILE:O	4:H:206[B]:ARG:HD2	2.14	0.47
1:C:215:MET:HG3	1:C:257:HIS:CD2	2.49	0.47
3:D:159:LEU:HD23	8:D:303:HOH:O	2.15	0.47
4:E:154:ASP:OD1	4:E:177:PRO:HG2	2.15	0.47
2:F:76:ASP:O	2:F:97:ARG:NH1	2.48	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:E:95:VAL:HG12	4:E:96:TRP:CD1	2.50	0.46
4:E:155:HIS:HB3	4:E:216:TYR:HB2	1.98	0.46
3:G:138[A]:ASP:OD2	8:G:304:HOH:O	2.20	0.46
4:H:9:LYS:HG2	4:H:10:PHE:CE2	2.50	0.46
4:E:131:PRO:HG2	4:E:142:ALA:HB1	1.98	0.46
4:H:8:PRO:HD2	4:H:21:LEU:HD22	1.98	0.46
5:C:301:2LJ:O4	5:C:301:2LJ:H1	2.15	0.46
4:E:46:ILE:HG22	4:E:47:TYR:HD1	1.81	0.45
1:A:0:MET:SD	1:A:169[B]:LEU:HD23	2.57	0.45
4:E:49:SER:HB2	4:E:55:THR:HG22	1.98	0.45
1:A:252:ASN:HB2	1:A:254:TYR:CE2	2.52	0.45
1:C:28:VAL:HG23	1:C:33:ILE:HD13	1.98	0.45
3:G:89:ALA:HB1	3:G:97:LEU:HD22	1.98	0.45
1:C:78:LYS:NZ	8:C:420:HOH:O	2.49	0.45
4:E:13:LEU:HD11	4:E:19:MET:HB2	1.99	0.45
4:H:27:MET:HE1	4:H:105:PHE:CD2	2.52	0.45
3:D:9:GLU:OE2	8:D:301:HOH:O	2.21	0.45
3:D:36:GLN:HB2	3:D:46:LEU:HD11	1.98	0.44
4:E:65:ASN:OD1	4:E:77:ARG:NH1	2.49	0.44
4:H:120:ASN:HB2	8:H:466:HOH:O	2.16	0.44
4:E:181:GLN:O	4:E:187:SER:HB2	2.17	0.44
2:F:7:ILE:HB	6:F:101:GOL:H2	2.00	0.44
4:H:159:SER:OG	4:H:212:GLN:HG2	2.18	0.44
3:D:134:PHE:HB2	3:D:186:PHE:CE2	2.52	0.44
1:C:246:LEU:HD22	1:C:254:TYR:CE2	2.53	0.43
1:A:156:TRP:CZ3	1:A:161:CYS:HB2	2.53	0.43
4:E:160:TRP:CE2	4:E:195:LEU:HB2	2.52	0.43
3:D:131:VAL:HG22	3:D:174:TRP:HB3	2.00	0.43
4:E:16:GLY:HA2	4:E:80:SER:OG	2.19	0.43
3:G:147:LYS:HG3	3:G:188:ASN:OD1	2.18	0.43
1:A:3:HIS:CG	1:A:169[A]:LEU:HD21	2.53	0.43
3:D:158:VAL:HG22	3:D:169:ASN:OD1	2.19	0.43
4:E:230:LYS:HG2	4:E:232:VAL:HG13	2.01	0.43
3:G:2:GLN:HA	3:G:25:GLN:O	2.19	0.43
4:E:210:ARG:HG3	4:E:239:GLU:HB3	2.00	0.42
2:F:91:LYS:HD3	6:F:101:GOL:H31	2.01	0.42
2:B:21:ASN:HB3	2:B:70:PHE:CE1	2.55	0.42
1:C:31:HIS:HE1	8:C:588:HOH:O	2.03	0.42
1:C:222:VAL:HG12	1:C:222:VAL:O	2.19	0.42
1:A:14:ASP:HB3	1:A:89:SER:HB2	2.02	0.42
4:H:174:ASP:HB2	4:H:191:LEU:HD12	2.00	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:80:LEU:HD23	1:C:80:LEU:HA	1.88	0.42
1:C:198:LEU:CD1	1:C:246:LEU:HD21	2.50	0.42
3:D:66[B]:ARG:NH2	8:D:321:HOH:O	2.53	0.41
2:B:7:ILE:HD12	2:B:91:LYS:HD2	2.02	0.41
4:H:224:TRP:CZ2	4:H:226:GLN:HB2	2.55	0.41
3:G:60:PHE:CD1	3:G:75:LEU:HD22	2.55	0.41
1:A:160:GLU:OE2	8:A:403:HOH:O	2.22	0.41
1:C:156:TRP:CZ3	1:C:161:CYS:HB2	2.56	0.41
1:A:234:GLY:HA3	8:B:112:HOH:O	2.21	0.41
1:A:226:ASP:HB3	1:A:243:SER:OG	2.21	0.40
1:A:61[B]:ARG:HD2	1:A:61[B]:ARG:HA	1.81	0.40
3:G:28:GLY:HA3	3:G:93[A]:SER:OG	2.21	0.40
4:H:125:GLU:O	4:H:148:ALA:HA	2.21	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	267/271 (98%)	261 (98%)	5 (2%)	1 (0%)	30	19
1	C	271/271 (100%)	265 (98%)	6 (2%)	0	100	100
2	B	97/100 (97%)	95 (98%)	2 (2%)	0	100	100
2	F	100/100 (100%)	99 (99%)	1 (1%)	0	100	100
3	D	189/204 (93%)	181 (96%)	8 (4%)	0	100	100
3	G	206/204 (101%)	202 (98%)	4 (2%)	0	100	100
4	E	241/246 (98%)	234 (97%)	7 (3%)	0	100	100
4	H	249/246 (101%)	246 (99%)	3 (1%)	0	100	100
All	All	1620/1642 (99%)	1583 (98%)	36 (2%)	1 (0%)	48	40

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	16	ILE

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 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	230/241 (95%)	230 (100%)	0	100	100
1	C	241/241 (100%)	239 (99%)	2 (1%)	73	71
2	B	87/95 (92%)	87 (100%)	0	100	100
2	F	92/95 (97%)	92 (100%)	0	100	100
3	D	152/181 (84%)	148 (97%)	4 (3%)	40	24
3	G	179/181 (99%)	177 (99%)	2 (1%)	65	60
4	E	197/212 (93%)	197 (100%)	0	100	100
4	H	207/212 (98%)	205 (99%)	2 (1%)	68	64
All	All	1385/1458 (95%)	1375 (99%)	10 (1%)	84	73

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	73[A]	PHE
1	C	73[B]	PHE
3	D	93[A]	SER
3	D	93[B]	SER
3	D	157[A]	CYS
3	D	157[B]	CYS
3	G	93[A]	SER
3	G	93[B]	SER
4	H	206[A]	ARG
4	H	206[B]	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (20) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	64	GLN
1	A	117	GLN
1	A	177	GLN
1	A	187	ASN
1	C	64	GLN
1	C	93	GLN
1	C	177	GLN
3	D	120	GLN
3	D	187	ASN
4	E	11	GLN
4	E	28	ASN
2	F	17	ASN
3	G	21	ASN
3	G	25	GLN
3	G	49	ASN
3	G	96	GLN
4	H	11	GLN
4	H	120	ASN
4	H	168	HIS
4	H	208	HIS

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](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 10 ligands modelled in this entry, 2 are monoatomic - leaving 8 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	$\# Z > 2$
6	GOL	F	101	-	5,5,5	0.96	0	5,5,5	1.51	1 (20%)
5	2LJ	A	301	1	21,21,22	1.24	2 (9%)	23,28,29	0.85	0
5	2LJ	C	301	1	21,21,22	1.08	1 (4%)	23,28,29	0.84	2 (8%)
6	GOL	F	102	-	5,5,5	1.15	0	5,5,5	0.93	0
6	GOL	A	303	-	5,5,5	0.90	0	5,5,5	1.06	0
6	GOL	H	301	-	5,5,5	0.89	0	5,5,5	1.20	1 (20%)
6	GOL	A	302	-	5,5,5	0.92	0	5,5,5	1.10	1 (20%)
6	GOL	C	302	-	5,5,5	0.88	0	5,5,5	1.01	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
6	GOL	F	101	-	-	2/4/4/4	-
5	2LJ	A	301	1	-	1/16/17/19	0/1/1/1
5	2LJ	C	301	1	-	1/16/17/19	0/1/1/1
6	GOL	F	102	-	-	0/4/4/4	-
6	GOL	A	303	-	-	2/4/4/4	-
6	GOL	H	301	-	-	0/4/4/4	-
6	GOL	A	302	-	-	0/4/4/4	-
6	GOL	C	302	-	-	0/4/4/4	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	301	2LJ	C8A-N8	4.41	1.39	1.32
5	C	301	2LJ	C8A-N8	4.18	1.39	1.32
5	A	301	2LJ	C7-C6	-3.00	1.46	1.49

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	C	301	2LJ	C2'-C1'-N8	2.28	117.86	111.53
6	F	101	GOL	C3-C2-C1	-2.23	103.63	111.80
6	H	301	GOL	C3-C2-C1	-2.18	103.82	111.80

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	C	301	2LJ	C8-C7-C6	2.10	117.46	113.75
6	A	302	GOL	C3-C2-C1	-2.03	104.35	111.80

There are no chirality outliers.

All (6) torsion outliers are listed below:

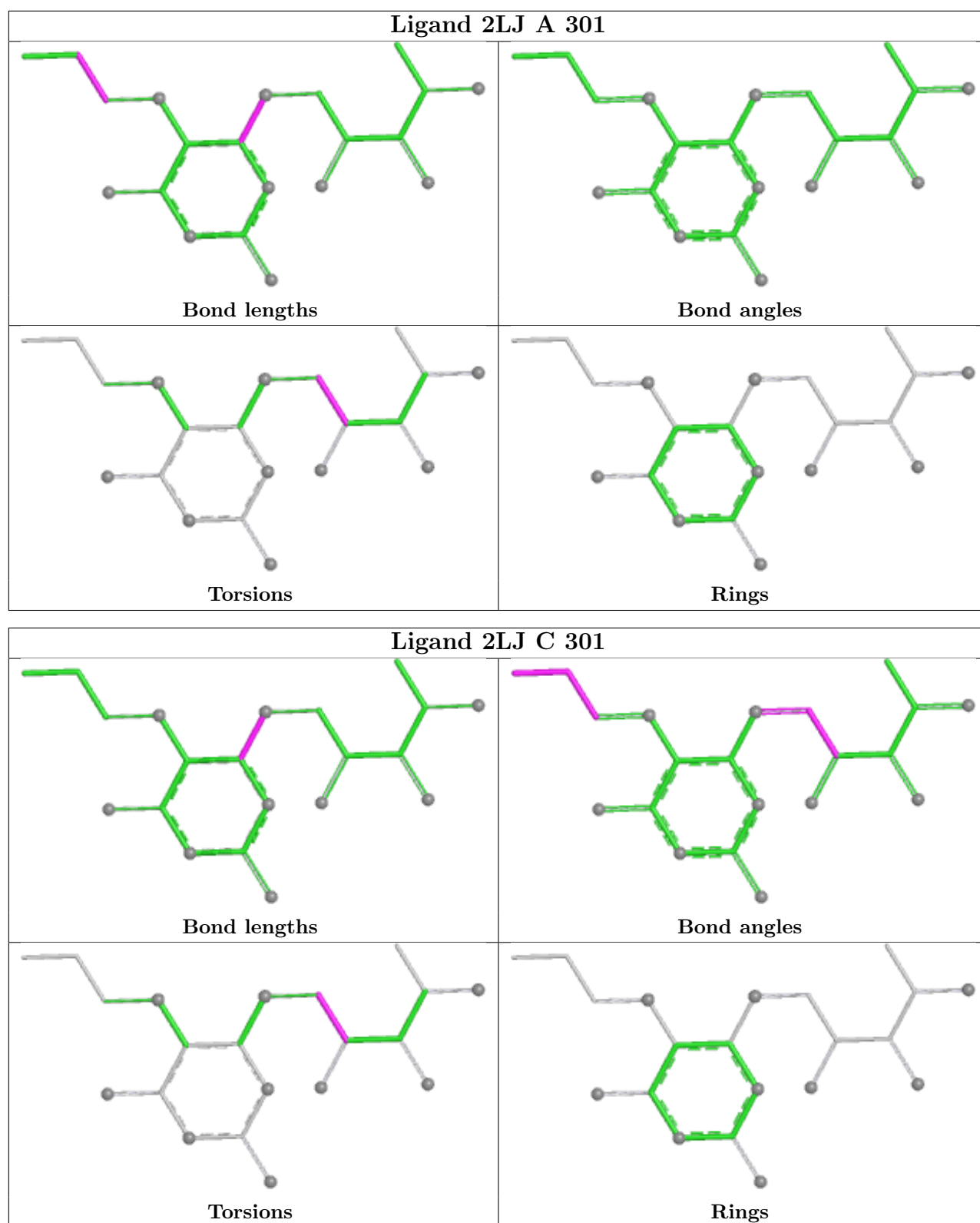
Mol	Chain	Res	Type	Atoms
6	F	101	GOL	O1-C1-C2-O2
6	F	101	GOL	O1-C1-C2-C3
6	A	303	GOL	C1-C2-C3-O3
5	A	301	2LJ	N8-C1'-C2'-C3'
6	A	303	GOL	O2-C2-C3-O3
5	C	301	2LJ	N8-C1'-C2'-C3'

There are no ring outliers.

4 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	F	101	GOL	2	0
5	A	301	2LJ	2	0
5	C	301	2LJ	2	0
6	H	301	GOL	2	0

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 [i](#)

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 ⓘ

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	265/271 (97%)	-0.12	8 (3%) 52 58	11, 25, 59, 81	7 (2%)
1	C	265/271 (97%)	-0.34	10 (3%) 44 49	10, 20, 45, 66	14 (5%)
2	B	97/100 (97%)	0.71	6 (6%) 26 31	16, 42, 71, 74	2 (2%)
2	F	100/100 (100%)	-0.18	2 (2%) 65 71	15, 25, 45, 59	3 (3%)
3	D	188/204 (92%)	0.57	31 (16%) 4 6	12, 35, 76, 97	8 (4%)
3	G	200/204 (98%)	-0.39	2 (1%) 79 85	10, 20, 44, 56	12 (6%)
4	E	240/246 (97%)	0.50	18 (7%) 20 24	19, 37, 74, 88	8 (3%)
4	H	245/246 (99%)	-0.29	2 (0%) 82 88	7, 22, 40, 74	8 (3%)
All	All	1600/1642 (97%)	0.00	79 (4%) 35 39	7, 25, 65, 97	62 (3%)

All (79) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	D	181	ALA	4.6
4	E	205	PRO	3.9
1	A	221	ILE	3.8
3	D	150	ASP	3.7
1	C	221	ILE	3.7
1	C	16	ILE	3.6
4	E	242	GLY	3.5
4	E	198	SER	3.5
4	E	241	TRP	3.5
3	D	182	CYS	3.4
3	D	123	ASP	3.3
4	H	99	GLU	3.3
3	D	195	THR	3.3
4	E	201	PHE	3.2
3	D	121	LEU	3.1
3	D	149	SER	3.0

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Mol	Chain	Res	Type	RSRZ
3	D	175	SER	3.0
3	D	191	ILE	3.0
3	D	146	SER	3.0
3	D	177	LYS	2.9
3	D	131	VAL	2.9
4	E	209	PHE	2.9
3	D	138	ASP	2.9
1	A	222	VAL	2.8
4	E	97	THR	2.8
3	D	148	ASP	2.8
4	E	227	ASP	2.8
4	E	240	ALA	2.7
1	A	196	THR	2.7
1	C	222	VAL	2.7
1	C	253	LEU	2.6
1	C	17	HIS	2.6
4	H	245	ASP	2.6
3	D	118	VAL	2.6
3	D	117	ALA	2.6
2	B	0	MET	2.5
1	C	14	ASP	2.5
1	A	18	GLY	2.5
2	B	88	SER	2.5
3	D	196	PHE	2.5
4	E	136	ILE	2.5
4	E	162	VAL	2.5
3	D	119	TYR	2.4
1	A	253	LEU	2.4
1	A	246	LEU	2.4
3	D	130	SER	2.4
4	E	207	ASN	2.4
1	C	246	LEU	2.3
3	D	197	PHE	2.3
3	D	164	MET	2.3
2	B	43	GLY	2.3
3	D	176	ASN	2.3
4	E	200	THR	2.3
2	B	48	LYS	2.3
3	D	133	LEU	2.3
1	C	270	PRO	2.2
3	D	198	PRO	2.2
3	G	163	SER	2.2

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Mol	Chain	Res	Type	RSRZ
2	F	99	MET	2.2
3	D	159	LEU	2.2
1	A	270	PRO	2.2
4	E	96	TRP	2.2
3	D	192	PRO	2.2
4	E	134	ALA	2.2
2	F	0	MET	2.1
4	E	208	HIS	2.1
1	C	219	GLU	2.1
3	D	112	GLN	2.1
3	D	155	ASP	2.1
3	D	151	VAL	2.1
4	E	144	LEU	2.1
4	E	199	ALA	2.1
3	D	111	ILE	2.1
1	A	17	HIS	2.1
2	B	73	THR	2.0
2	B	72	PRO	2.0
3	D	183	ALA	2.0
3	G	201	GLU	2.0
1	C	218	GLY	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](#)

There are no oligosaccharides in this entry.

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
6	GOL	A	303	6/6	0.73	0.16	59,60,61,61	0
6	GOL	H	301	6/6	0.85	0.11	37,40,41,44	0

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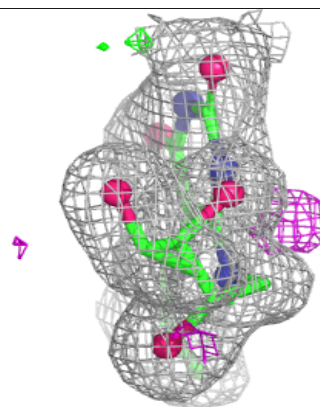
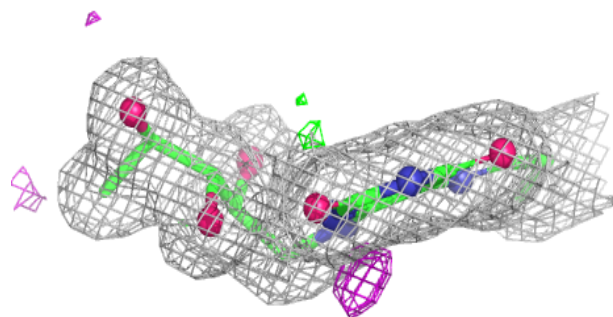
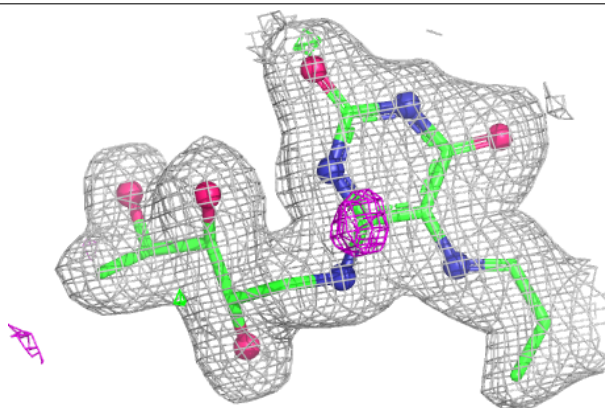
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
6	GOL	C	302	6/6	0.87	0.12	37,44,47,47	0
6	GOL	A	302	6/6	0.92	0.12	28,37,43,44	0
6	GOL	F	101	6/6	0.94	0.10	22,27,34,35	0
7	NA	H	302	1/1	0.95	0.05	25,25,25,25	0
7	NA	F	103	1/1	0.96	0.05	32,32,32,32	1
5	2LJ	A	301	21/22	0.97	0.05	11,15,18,20	0
5	2LJ	C	301	21/22	0.97	0.05	13,16,19,21	0
6	GOL	F	102	6/6	0.97	0.06	23,24,26,27	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.

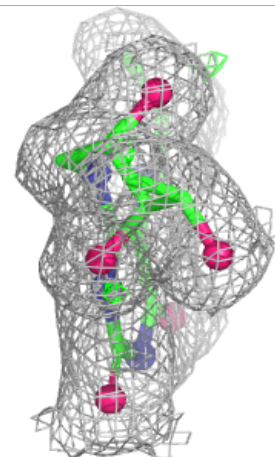
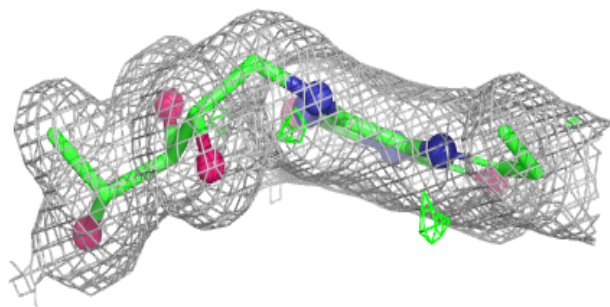
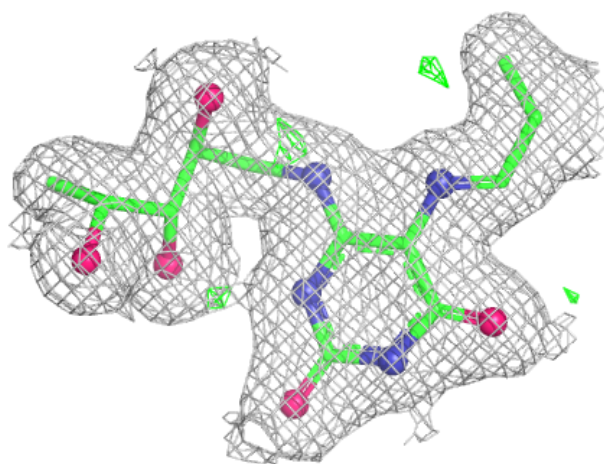
Electron density around 2LJ A 301:

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 2LJ C 301:

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



6.5 Other polymers [i](#)

There are no such residues in this entry.