



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 18, 2026 – 12:05 AM UTC

PDB ID : 4KYI / pdb_00004kyi
Title : Crystal structure of the phospholipase VipD from Legionella pneumophila in complex with the human GTPase Rab5
Authors : Lucas, M.; Gaspar, A.H.; Pallara, C.; Rojas, A.L.; Fernandez-Recio, J.; Machner, M.P.; Hierro, A.
Deposited on : 2013-05-29
Resolution : 3.08 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

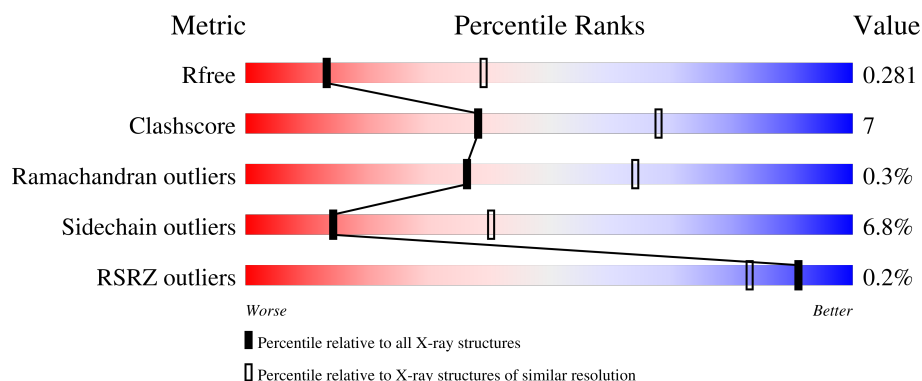
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

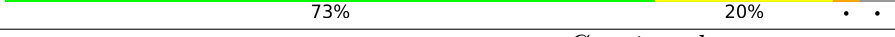
The reported resolution of this entry is 3.08 Å.

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	2010 (3.10-3.06)
Clashscore	190562	2102 (3.10-3.06)
Ramachandran outliers	187476	1982 (3.10-3.06)
Sidechain outliers	187428	1981 (3.10-3.06)
RSRZ outliers	180081	2010 (3.10-3.06)

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	551	
1	C	551	
1	E	551	
1	G	551	

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Mol	Chain	Length	Quality of chain
2	B	170	78% 18% .
2	D	170	79% 16% ..
2	F	170	% 85% 12% .
2	H	170	84% 12% ..

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 21833 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 VipD.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	530	Total	C	N	O	S	0	0	0
			4140	2608	708	807	17			
1	C	527	Total	C	N	O	S	0	0	0
			4120	2596	705	802	17			
1	E	531	Total	C	N	O	S	0	0	0
			4145	2609	709	810	17			
1	G	528	Total	C	N	O	S	0	0	0
			4122	2594	705	806	17			

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	14	GLY	-	expression tag	UNP Q5ZRP9
A	15	ALA	-	expression tag	UNP Q5ZRP9
A	16	MET	-	expression tag	UNP Q5ZRP9
A	17	GLY	-	expression tag	UNP Q5ZRP9
A	18	SER	-	expression tag	UNP Q5ZRP9
C	14	GLY	-	expression tag	UNP Q5ZRP9
C	15	ALA	-	expression tag	UNP Q5ZRP9
C	16	MET	-	expression tag	UNP Q5ZRP9
C	17	GLY	-	expression tag	UNP Q5ZRP9
C	18	SER	-	expression tag	UNP Q5ZRP9
E	14	GLY	-	expression tag	UNP Q5ZRP9
E	15	ALA	-	expression tag	UNP Q5ZRP9
E	16	MET	-	expression tag	UNP Q5ZRP9
E	17	GLY	-	expression tag	UNP Q5ZRP9
E	18	SER	-	expression tag	UNP Q5ZRP9
G	14	GLY	-	expression tag	UNP Q5ZRP9
G	15	ALA	-	expression tag	UNP Q5ZRP9
G	16	MET	-	expression tag	UNP Q5ZRP9
G	17	GLY	-	expression tag	UNP Q5ZRP9
G	18	SER	-	expression tag	UNP Q5ZRP9

- Molecule 2 is a protein called Ras-related protein Rab-5C.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	164	Total	C	N	O	S	0	0	0
			1283	820	215	242	6			
2	D	164	Total	C	N	O	S	0	0	0
			1283	820	215	242	6			
2	F	164	Total	C	N	O	S	0	0	0
			1283	820	215	242	6			
2	H	164	Total	C	N	O	S	0	0	0
			1283	820	215	242	6			

There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	13	GLY	-	expression tag	UNP P51148
B	14	ALA	-	expression tag	UNP P51148
B	15	MET	-	expression tag	UNP P51148
B	16	GLY	-	expression tag	UNP P51148
B	17	SER	-	expression tag	UNP P51148
B	80	LEU	GLN	engineered mutation	UNP P51148
D	13	GLY	-	expression tag	UNP P51148
D	14	ALA	-	expression tag	UNP P51148
D	15	MET	-	expression tag	UNP P51148
D	16	GLY	-	expression tag	UNP P51148
D	17	SER	-	expression tag	UNP P51148
D	80	LEU	GLN	engineered mutation	UNP P51148
F	13	GLY	-	expression tag	UNP P51148
F	14	ALA	-	expression tag	UNP P51148
F	15	MET	-	expression tag	UNP P51148
F	16	GLY	-	expression tag	UNP P51148
F	17	SER	-	expression tag	UNP P51148
F	80	LEU	GLN	engineered mutation	UNP P51148
H	13	GLY	-	expression tag	UNP P51148
H	14	ALA	-	expression tag	UNP P51148
H	15	MET	-	expression tag	UNP P51148
H	16	GLY	-	expression tag	UNP P51148
H	17	SER	-	expression tag	UNP P51148
H	80	LEU	GLN	engineered mutation	UNP P51148

- Molecule 3 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C₂H₆O₂).



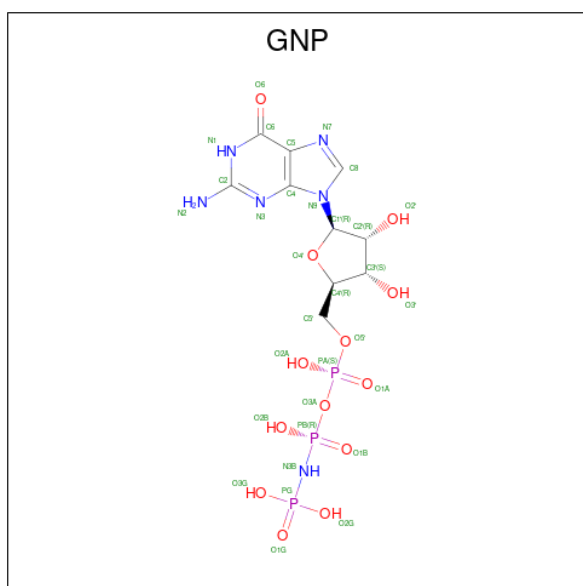
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	0
			4	2	2		
3	E	1	Total	C	O	0	0
			4	2	2		
3	G	1	Total	C	O	0	0
			4	2	2		

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			6	3	3		
4	A	1	Total	C	O	0	0
			6	3	3		
4	E	1	Total	C	O	0	0
			6	3	3		

- Molecule 5 is PHOSPHOAMINOPHOSPHONIC ACID-GUANYLATE ESTER (CCD ID: GNP) (formula: $C_{10}H_{17}N_6O_{13}P_3$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	B	1	Total	C	N	O	P	0	0
			32	10	6	13	3		
5	D	1	Total	C	N	O	P	0	0
			32	10	6	13	3		
5	F	1	Total	C	N	O	P	0	0
			32	10	6	13	3		
5	H	1	Total	C	N	O	P	0	0
			32	10	6	13	3		

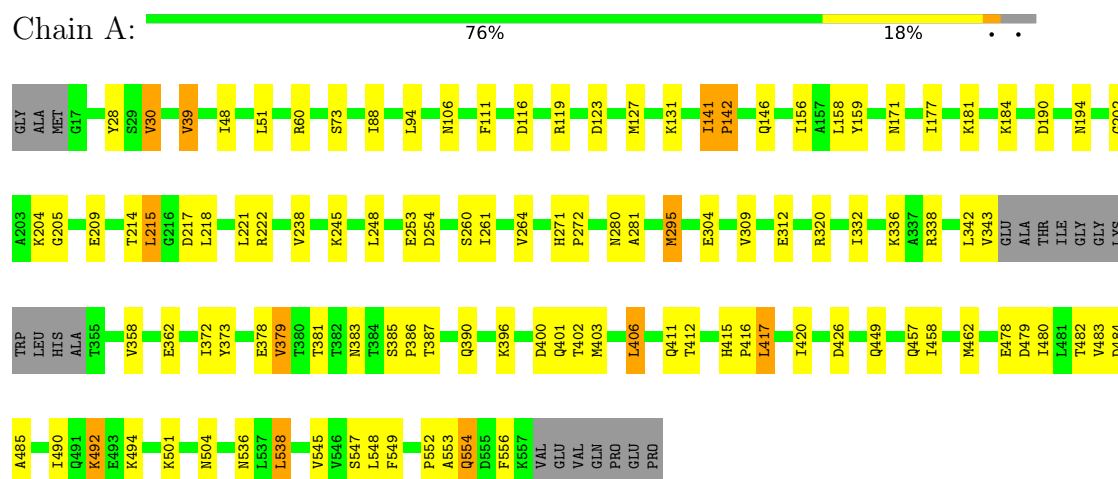
- Molecule 6 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	B	1	Total	Mg	0	0
			1	1		
6	D	1	Total	Mg	0	0
			1	1		
6	F	1	Total	Mg	0	0
			1	1		
6	H	1	Total	Mg	0	0
			1	1		

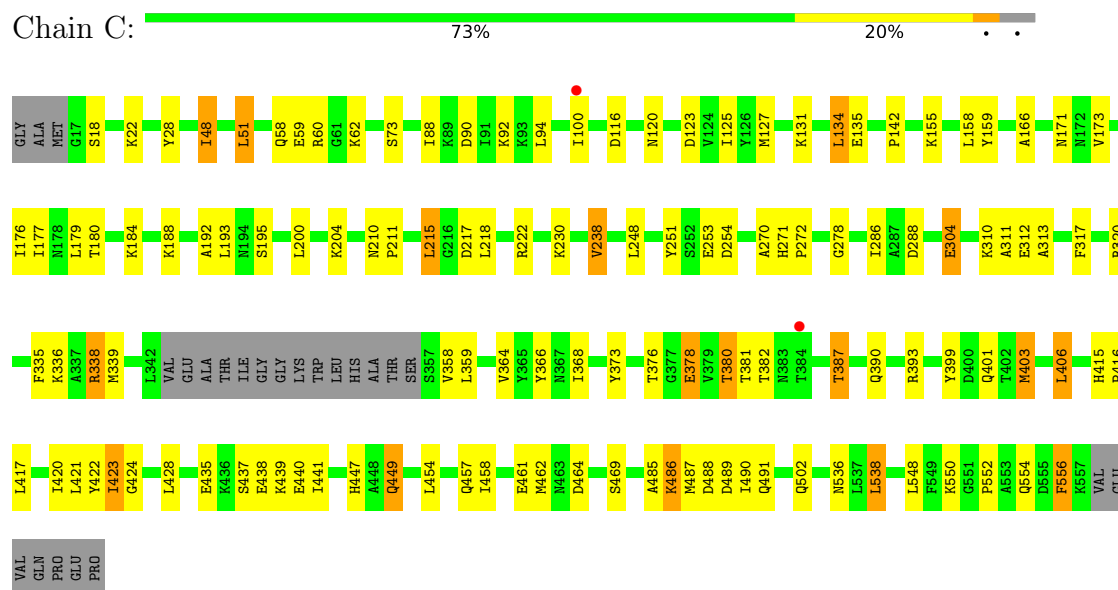
3 Residue-property plots

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: VipD

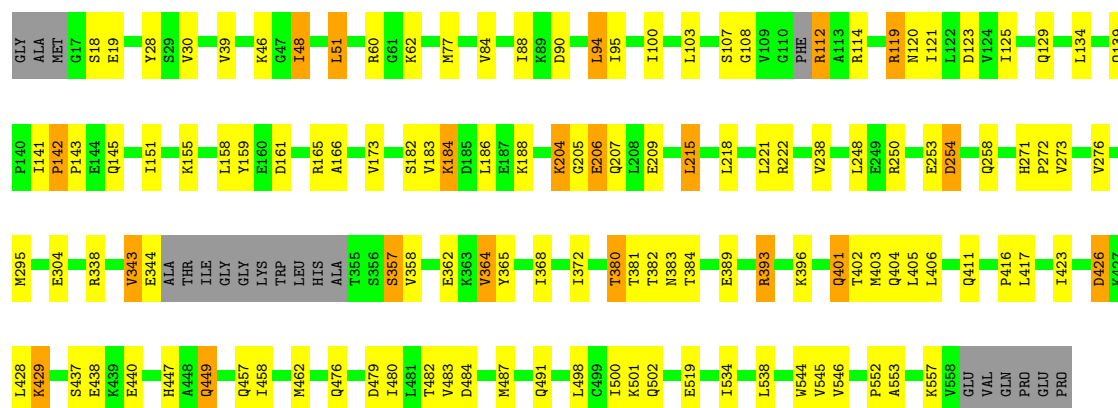


• Molecule 1: VipD



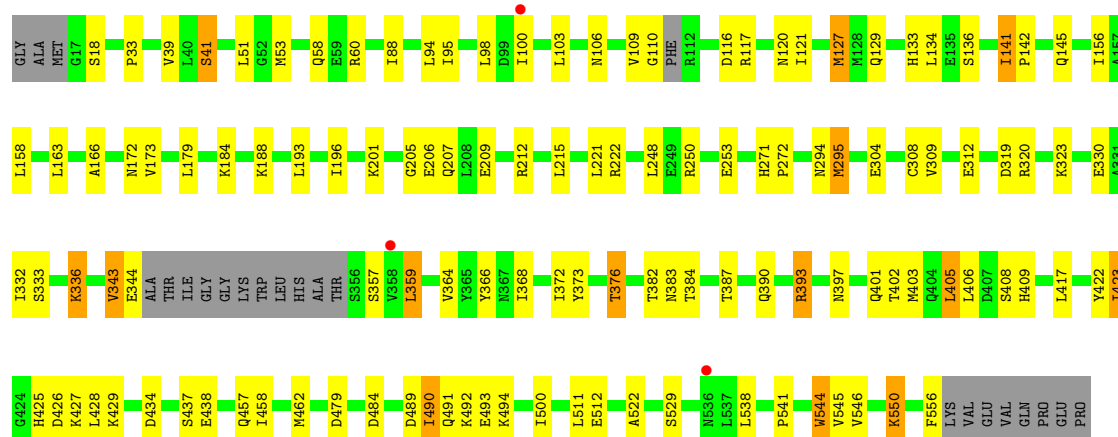
• Molecule 1: VipD

Chain E:  73% 20%



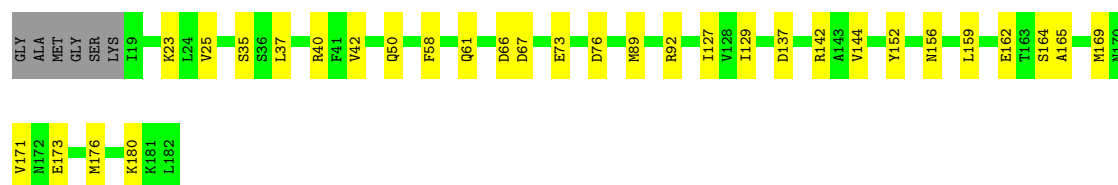
• Molecule 1: VipD

Chain G:  73% 20%



• Molecule 2: Ras-related protein Rab-5C

Chain B:  78% 18%



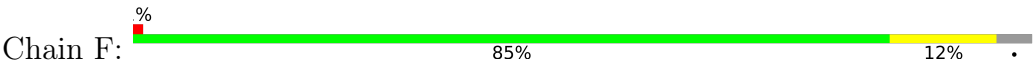
• Molecule 2: Ras-related protein Rab-5C

Chain D:  79% 16%

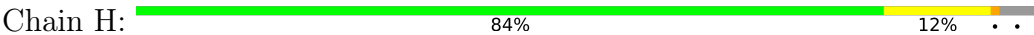




● Molecule 2: Ras-related protein Rab-5C



● Molecule 2: Ras-related protein Rab-5C



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	94.28Å 97.98Å 109.85Å 76.57° 80.71° 78.91°	Depositor
Resolution (Å)	29.83 – 3.08 29.83 – 3.08	Depositor EDS
% Data completeness (in resolution range)	97.6 (29.83-3.08) 97.5 (29.83-3.08)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.02 (at 3.06Å)	Xtriage
Refinement program	PHENIX 1.8.1_1168	Depositor
R, R_{free}	0.233 , 0.280 0.235 , 0.281	Depositor DCC
R_{free} test set	3408 reflections (4.92%)	wwPDB-VP
Wilson B-factor (Å ²)	85.7	Xtriage
Anisotropy	0.370	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.26 , 23.6	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	0.94	EDS
Total number of atoms	21833	wwPDB-VP
Average B, all atoms (Å ²)	54.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.27% 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: GOL, GNP, EDO, MG

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	0.28	0/4202	0.74	6/5668 (0.1%)
1	C	0.28	0/4182	0.74	4/5640 (0.1%)
1	E	0.29	0/4205	0.73	3/5671 (0.1%)
1	G	0.27	0/4182	0.72	1/5640 (0.0%)
2	B	0.29	0/1305	0.67	0/1765
2	D	0.28	0/1305	0.65	0/1765
2	F	0.27	0/1305	0.66	0/1765
2	H	0.29	0/1305	0.67	0/1765
All	All	0.28	0/21991	0.72	14/29679 (0.0%)

There are no bond length outliers.

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	423	ILE	N-CA-C	7.49	117.56	110.74
1	A	141	ILE	CA-C-N	6.85	127.44	120.38
1	A	141	ILE	C-N-CA	6.85	127.44	120.38
1	G	423	ILE	N-CA-C	6.64	116.78	110.74
1	C	423	ILE	N-CA-C	6.47	116.61	110.53
1	A	554	GLN	N-CA-C	-5.59	103.73	110.88
1	A	142	PRO	CA-C-N	5.38	124.56	118.97
1	A	142	PRO	C-N-CA	5.38	124.56	118.97
1	A	73	SER	CB-CA-C	-5.25	110.54	116.63
1	C	73	SER	CB-CA-C	-5.21	110.59	116.63
1	C	142	PRO	CA-C-N	5.06	124.72	119.56
1	C	142	PRO	C-N-CA	5.06	124.72	119.56
1	E	142	PRO	CA-C-N	5.00	124.60	119.05
1	E	142	PRO	C-N-CA	5.00	124.60	119.05

There are no chirality outliers.

There are no planarity outliers.

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	4140	0	4187	49	0
1	C	4120	0	4166	70	0
1	E	4145	0	4192	65	0
1	G	4122	0	4163	65	0
2	B	1283	0	1282	20	0
2	D	1283	0	1282	22	0
2	F	1283	0	1282	17	0
2	H	1283	0	1282	15	0
3	A	8	0	12	1	0
3	B	8	0	12	2	0
3	E	4	0	6	0	0
3	G	4	0	6	2	0
4	A	12	0	16	0	0
4	E	6	0	8	1	0
5	B	32	0	13	0	0
5	D	32	0	13	4	0
5	F	32	0	13	2	0
5	H	32	0	13	1	0
6	B	1	0	0	0	0
6	D	1	0	0	0	0
6	F	1	0	0	0	0
6	H	1	0	0	0	0
All	All	21833	0	21948	303	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 7.

All (303) 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:E:112:ARG:HD3	1:E:276:VAL:HG12	1.68	0.75
1:C:312:GLU:OE2	1:C:320:ARG:NH1	2.22	0.72

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:58:GLN:HG2	1:C:88:ILE:HD12	1.72	0.72
1:E:60:ARG:HG3	1:E:406:LEU:HD23	1.74	0.68
1:E:112:ARG:NH2	1:E:272:PRO:O	2.27	0.68
1:G:457:GLN:HG3	2:H:58:PHE:HE1	1.58	0.68
1:C:338:ARG:NH2	1:C:536:ASN:OD1	2.27	0.68
1:C:60:ARG:HG3	1:C:406:LEU:HD23	1.77	0.66
1:G:312:GLU:OE2	1:G:320:ARG:NH1	2.29	0.66
1:E:222:ARG:NH2	1:E:253:GLU:OE2	2.29	0.65
1:E:19:GLU:HG2	1:E:429:LYS:HG2	1.78	0.65
2:H:23:LYS:HA	2:H:73:GLU:HB2	1.78	0.64
1:E:479:ASP:OD2	2:F:92:ARG:NH1	2.30	0.64
1:C:359:LEU:HD13	1:C:538:LEU:HD22	1.80	0.64
1:E:90:ASP:HB3	1:E:173:VAL:HG21	1.80	0.63
1:E:28:TYR:OH	1:E:440:GLU:OE2	2.16	0.62
1:E:215:LEU:HB3	1:E:253:GLU:HA	1.81	0.62
1:G:215:LEU:HB3	1:G:253:GLU:HA	1.82	0.62
1:A:457:GLN:HG3	2:B:58:PHE:HE1	1.64	0.62
1:C:437:SER:HB3	1:C:438:GLU:HB2	1.82	0.62
1:E:30:VAL:HG21	1:E:411:GLN:HE21	1.64	0.62
1:E:487:MET:HB3	1:E:491:GLN:HG3	1.82	0.62
1:C:222:ARG:NH2	1:C:253:GLU:OE2	2.31	0.62
1:E:119:ARG:NH1	1:E:120:ASN:OD1	2.32	0.62
1:E:46:LYS:NZ	1:E:380:THR:O	2.33	0.62
1:G:103:LEU:HD22	1:G:121:ILE:HG13	1.82	0.62
1:G:250:ARG:NH1	3:G:601:EDO:O1	2.32	0.62
1:E:254:ASP:OD1	1:E:254:ASP:N	2.33	0.61
1:A:396:LYS:NZ	1:A:400:ASP:OD2	2.31	0.61
2:F:42:VAL:HG22	2:F:61:GLN:HB2	1.82	0.61
1:E:107:SER:OG	1:E:114:ARG:NH1	2.34	0.61
1:C:28:TYR:OH	1:C:440:GLU:OE2	2.12	0.61
1:A:60:ARG:HD2	1:A:406:LEU:HD23	1.83	0.60
1:E:161:ASP:OD1	1:E:165:ARG:NH1	2.34	0.59
2:B:142:ARG:NH1	2:B:144:VAL:O	2.35	0.59
1:A:479:ASP:OD2	2:B:92:ARG:NH1	2.35	0.59
1:A:484:ASP:OD2	2:B:92:ARG:NH2	2.35	0.59
1:C:116:ASP:O	1:C:120:ASN:ND2	2.36	0.59
1:C:487:MET:HB3	1:C:491:GLN:HG3	1.85	0.59
1:A:338:ARG:NH2	1:A:536:ASN:OD1	2.35	0.58
1:C:131:LYS:NZ	1:C:135:GLU:OE1	2.34	0.58
1:E:484:ASP:OD2	2:F:92:ARG:NH2	2.36	0.58
1:C:378:GLU:OE1	1:C:390:GLN:NE2	2.37	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:204:LYS:O	1:E:206:GLU:HB3	2.05	0.57
1:A:222:ARG:NH2	1:A:253:GLU:OE2	2.38	0.57
1:A:504:ASN:HD22	1:A:538:LEU:HD21	1.70	0.56
1:G:423:ILE:HG22	1:G:427:LYS:HB2	1.87	0.56
2:H:126:ASN:O	2:H:126:ASN:ND2	2.39	0.56
1:C:449:GLN:OE1	2:D:56:ALA:N	2.38	0.56
1:G:201:LYS:NZ	1:G:207:GLN:OE1	2.39	0.56
1:G:393:ARG:NH2	1:G:397:ASN:OD1	2.38	0.56
1:A:131:LYS:HG3	1:A:156:ILE:HG21	1.88	0.56
2:D:31:ALA:HA	5:D:301:GNP:H5'2	1.88	0.55
1:C:155:LYS:NZ	1:C:217:ASP:OD2	2.28	0.55
1:E:51:LEU:HB2	1:E:95:ILE:HG21	1.88	0.55
1:G:116:ASP:O	1:G:120:ASN:ND2	2.40	0.55
1:A:106:ASN:ND2	1:A:111:PHE:O	2.38	0.54
2:B:67:ASP:OD1	2:B:67:ASP:N	2.39	0.54
1:A:458:ILE:HG22	1:A:462:MET:HE2	1.89	0.54
1:C:458:ILE:HG22	1:C:462:MET:HE2	1.89	0.54
1:E:209:GLU:OE2	1:E:258:GLN:NE2	2.39	0.54
2:H:23:LYS:HB3	2:H:94:ALA:HA	1.90	0.54
1:A:280:ASN:OD1	1:A:281:ALA:N	2.41	0.54
2:D:42:VAL:HG22	2:D:61:GLN:HB2	1.90	0.53
1:E:447:HIS:HD2	2:F:89:MET:HE2	1.73	0.53
1:C:457:GLN:HG3	2:D:58:PHE:HE1	1.74	0.53
1:G:500:ILE:HG22	1:G:538:LEU:HD23	1.89	0.53
1:E:357:SER:O	4:E:602:GOL:O1	2.25	0.53
1:G:434:ASP:OD1	1:G:437:SER:N	2.40	0.53
1:C:423:ILE:N	1:C:424:GLY:HA2	2.24	0.53
1:E:18:SER:HB2	1:E:428:LEU:HD23	1.90	0.53
1:G:98:LEU:HD11	1:G:103:LEU:HD11	1.90	0.53
1:A:190:ASP:O	1:A:194:ASN:ND2	2.42	0.52
1:G:357:SER:OG	1:G:512:GLU:OE2	2.25	0.52
1:A:238:VAL:HG21	1:A:264:VAL:HB	1.91	0.52
2:H:26:LEU:O	2:H:77:THR:OG1	2.24	0.52
1:A:478:GLU:HG3	1:A:492:LYS:HE3	1.92	0.52
1:C:421:LEU:O	1:C:502:GLN:NE2	2.34	0.52
1:C:461:GLU:OE2	2:D:71:LYS:NZ	2.31	0.52
2:D:129:ILE:HB	2:D:158:LEU:HD22	1.91	0.52
1:E:103:LEU:HD22	1:E:121:ILE:HG13	1.92	0.52
1:E:343:VAL:HG23	1:E:344:GLU:HG3	1.92	0.52
1:E:426:ASP:OD2	1:E:426:ASP:N	2.43	0.52
1:G:18:SER:HB2	1:G:428:LEU:HD23	1.92	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:142:ARG:NH2	2:B:162:GLU:OE2	2.41	0.52
1:C:215:LEU:HB3	1:C:253:GLU:HA	1.92	0.52
1:G:484:ASP:OD2	2:H:92:ARG:NH2	2.43	0.52
1:G:545:VAL:HG23	1:G:546:VAL:HG13	1.92	0.52
1:C:457:GLN:HG3	2:D:58:PHE:CE1	2.45	0.52
1:G:309:VAL:HG22	1:G:372:ILE:HB	1.91	0.52
1:A:387:THR:HG23	1:A:390:GLN:H	1.74	0.51
1:G:250:ARG:HD2	3:G:601:EDO:O2	2.10	0.51
1:C:373:TYR:O	1:C:401:GLN:HG2	2.10	0.51
1:E:457:GLN:HG3	2:F:58:PHE:CE1	2.45	0.51
1:A:116:ASP:OD2	1:A:119:ARG:NH2	2.44	0.51
1:G:51:LEU:HB2	1:G:95:ILE:HG21	1.93	0.51
1:G:390:GLN:HA	1:G:393:ARG:HB2	1.91	0.51
2:D:34:LYS:NZ	5:D:301:GNP:O3G	2.40	0.51
1:G:129:GLN:O	1:G:133:HIS:ND1	2.40	0.51
1:C:556:PHE:HD1	1:C:556:PHE:H	1.58	0.51
1:G:330:GLU:HA	1:G:333:SER:HB3	1.93	0.51
1:G:458:ILE:HG22	1:G:462:MET:HE2	1.92	0.51
1:A:373:TYR:O	1:A:401:GLN:HG2	2.11	0.51
2:B:37:LEU:HD23	2:B:165:ALA:HB2	1.92	0.51
1:C:59:GLU:OE2	1:C:399:TYR:OH	2.27	0.51
2:D:170:ASN:HA	2:D:173:GLU:HB2	1.91	0.51
1:E:364:VAL:HG13	1:E:502:GLN:HG2	1.91	0.51
1:E:482:THR:HG23	1:E:483:VAL:HG23	1.93	0.51
2:F:80:LEU:HD12	2:F:83:TYR:HE2	1.76	0.51
1:A:271:HIS:ND1	1:A:272:PRO:HD2	2.26	0.50
1:G:166:ALA:HB1	1:G:188:LYS:HB3	1.93	0.50
1:A:412:THR:O	1:A:548:LEU:HD11	2.12	0.50
1:C:18:SER:HB2	1:C:428:LEU:HD23	1.92	0.50
1:E:372:ILE:HG12	1:E:405:LEU:HD22	1.93	0.50
1:G:387:THR:O	1:G:390:GLN:HG2	2.11	0.50
2:H:38:VAL:HG11	2:H:59:LEU:HD13	1.92	0.50
1:A:362:GLU:OE2	1:A:501:LYS:NZ	2.40	0.50
1:E:94:LEU:HD11	1:E:125:ILE:HD13	1.94	0.50
1:G:368:ILE:HD12	1:G:368:ILE:H	1.77	0.50
2:B:164:SER:HB3	2:B:169:MET:HB3	1.94	0.50
2:D:23:LYS:HB3	2:D:94:ALA:HA	1.94	0.50
1:C:278:GLY:O	1:C:286:ILE:N	2.44	0.49
2:B:40:ARG:HG2	2:B:171:VAL:HG21	1.94	0.49
1:A:214:THR:OG1	1:A:217:ASP:OD1	2.30	0.49
1:G:120:ASN:HB3	1:G:193:LEU:HD12	1.94	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:215:LEU:HD13	1:A:261:ILE:HG12	1.95	0.49
1:E:372:ILE:HD13	1:E:402:THR:HG23	1.94	0.49
1:G:382:THR:OG1	1:G:383:ASN:N	2.43	0.49
2:H:34:LYS:NZ	5:H:301:GNP:O3G	2.40	0.49
1:E:401:GLN:NE2	1:E:404:GLN:OE1	2.46	0.49
2:H:57:ALA:HB3	2:H:76:ASP:HB3	1.94	0.49
1:A:28:TYR:CE1	1:A:416:PRO:HD3	2.48	0.48
1:C:184:LYS:H	1:C:184:LYS:HD2	1.78	0.48
1:C:368:ILE:HD12	1:C:368:ILE:H	1.76	0.48
1:E:383:ASN:OD1	1:E:384:THR:N	2.46	0.48
1:G:372:ILE:HD13	1:G:402:THR:HG23	1.95	0.48
1:A:30:VAL:HG22	1:A:411:GLN:HB2	1.95	0.48
1:C:366:TYR:HB2	1:C:422:TYR:CE2	2.49	0.48
1:E:437:SER:HB2	1:E:438:GLU:HB2	1.96	0.48
1:G:33:PRO:HG3	1:G:409:HIS:HB3	1.96	0.47
1:A:177:ILE:HG22	1:A:181:LYS:HE2	1.95	0.47
2:F:26:LEU:O	2:F:77:THR:OG1	2.27	0.47
1:G:332:ILE:O	1:G:336:LYS:N	2.44	0.47
1:C:60:ARG:HE	1:C:403:MET:HE3	1.79	0.47
1:C:378:GLU:H	1:C:378:GLU:HG3	1.48	0.47
1:E:368:ILE:H	1:E:368:ILE:HD12	1.80	0.47
1:G:205:GLY:N	1:G:206:GLU:OE1	2.42	0.47
1:G:271:HIS:ND1	1:G:272:PRO:HD2	2.29	0.47
2:H:27:LEU:HD12	2:H:119:LEU:HD11	1.96	0.47
1:C:461:GLU:OE1	1:C:469:SER:OG	2.33	0.47
2:H:42:VAL:HG12	2:H:43:LYS:HG3	1.96	0.47
1:E:458:ILE:HG22	1:E:462:MET:HE2	1.97	0.47
1:C:120:ASN:HB3	1:C:193:LEU:HD12	1.96	0.47
1:C:100:ILE:HD12	1:C:100:ILE:H	1.80	0.46
2:D:113:LYS:HG2	2:D:152:TYR:CZ	2.50	0.46
1:E:338:ARG:NH1	1:E:519:GLU:OE2	2.49	0.46
2:D:142:ARG:HH22	2:D:162:GLU:CD	2.24	0.46
2:B:23:LYS:HA	2:B:73:GLU:HB2	1.97	0.46
1:A:202:GLY:O	1:A:205:GLY:N	2.45	0.46
1:C:387:THR:O	1:C:390:GLN:HG2	2.16	0.46
1:A:214:THR:HA	1:A:260:SER:HA	1.97	0.46
1:A:312:GLU:OE2	1:A:320:ARG:NH1	2.49	0.46
2:D:33:GLY:HA3	2:D:134:ASN:ND2	2.31	0.46
1:G:312:GLU:O	1:G:376:THR:OG1	2.33	0.46
1:G:343:VAL:HA	1:G:344:GLU:HA	1.55	0.46
1:G:457:GLN:HG3	2:H:58:PHE:CE1	2.45	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:F:46:PHE:O	2:F:47:HIS:ND1	2.49	0.46
1:G:41:SER:OG	1:G:309:VAL:O	2.33	0.46
1:A:417:LEU:HD12	1:A:485:ALA:HB2	1.97	0.45
1:C:469:SER:HB3	2:D:21:GLN:HE22	1.81	0.45
1:C:311:ALA:HB1	1:C:376:THR:HG23	1.97	0.45
1:E:271:HIS:ND1	1:E:272:PRO:HD2	2.31	0.45
1:A:494:LYS:NZ	1:A:549:PHE:O	2.48	0.45
1:A:457:GLN:HG3	2:B:58:PHE:CE1	2.48	0.45
2:B:89:MET:O	3:B:303:EDO:O1	2.33	0.45
1:C:310:LYS:HD3	1:C:373:TYR:HE1	1.82	0.45
1:E:28:TYR:CE1	1:E:416:PRO:HD3	2.52	0.45
1:G:196:ILE:O	1:G:212:ARG:NH1	2.42	0.45
1:G:222:ARG:NH2	1:G:253:GLU:OE2	2.48	0.45
1:G:172:ASN:OD1	1:G:173:VAL:N	2.50	0.45
1:E:449:GLN:OE1	2:F:56:ALA:N	2.50	0.45
2:D:21:GLN:HG2	2:D:71:LYS:HB3	1.98	0.45
1:G:437:SER:HA	1:G:438:GLU:HA	1.84	0.45
1:A:482:THR:HG23	1:A:483:VAL:HG23	1.98	0.45
1:C:238:VAL:HG23	1:C:251:TYR:HB2	1.99	0.45
1:C:270:ALA:O	1:C:288:ASP:N	2.50	0.45
1:C:304:GLU:HB3	1:C:368:ILE:HD13	2.00	0.45
1:A:127:MET:O	1:A:131:LYS:HB2	2.17	0.44
1:G:58:GLN:HG2	1:G:88:ILE:HD12	2.00	0.44
1:G:405:LEU:O	1:G:408:SER:OG	2.28	0.44
1:G:541:PRO:O	1:G:544:TRP:HD1	2.00	0.44
1:G:133:HIS:O	1:G:136:SER:OG	2.31	0.44
1:G:359:LEU:HD22	1:G:359:LEU:HA	1.80	0.44
1:G:373:TYR:O	1:G:401:GLN:HG2	2.17	0.44
1:A:254:ASP:OD1	1:A:254:ASP:N	2.51	0.44
2:B:127:ILE:HG23	2:B:129:ILE:HG13	1.99	0.44
1:G:206:GLU:OE1	1:G:206:GLU:N	2.48	0.44
1:G:490:ILE:HD12	1:G:550:LYS:HA	2.00	0.44
1:C:376:THR:HB	1:C:380:THR:OG1	2.17	0.44
2:D:147:GLN:H	2:D:147:GLN:CD	2.26	0.44
1:E:343:VAL:HA	1:E:344:GLU:HA	1.51	0.44
1:G:109:VAL:HA	1:G:110:GLY:HA3	1.47	0.44
1:A:309:VAL:HG22	1:A:372:ILE:HB	2.00	0.44
1:A:552:PRO:O	1:A:554:GLN:N	2.44	0.44
2:B:152:TYR:O	2:B:156:ASN:ND2	2.33	0.44
1:E:151:ILE:O	1:E:155:LYS:HG3	2.18	0.44
1:C:123:ASP:HB3	1:C:159:TYR:HE2	1.83	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:139:GLN:HG2	1:E:141:ILE:HG13	2.00	0.43
2:B:42:VAL:HA	2:B:61:GLN:HE21	1.83	0.43
2:B:66:ASP:OD1	2:B:67:ASP:N	2.51	0.43
1:C:192:ALA:O	1:C:195:SER:OG	2.30	0.43
1:E:84:VAL:HG13	1:E:129:GLN:HG2	1.99	0.43
1:G:141:ILE:HA	1:G:142:PRO:HD2	1.87	0.43
1:A:332:ILE:HD13	1:A:556:PHE:HA	1.99	0.43
1:A:372:ILE:HD13	1:A:402:THR:HG23	1.99	0.43
2:B:176:MET:HE2	2:B:176:MET:HB3	1.94	0.43
1:E:107:SER:HA	1:E:108:GLY:HA2	1.71	0.43
2:F:47:HIS:HB2	2:F:50:GLN:HG3	1.99	0.43
1:C:335:PHE:CZ	1:C:339:MET:HE2	2.53	0.43
1:G:366:TYR:HB2	1:G:422:TYR:CE2	2.53	0.43
1:G:491:GLN:HA	1:G:494:LYS:HD3	2.00	0.43
1:A:39:VAL:HG22	1:A:295:MET:HE2	2.01	0.43
1:A:378:GLU:O	1:A:383:ASN:ND2	2.50	0.43
1:C:488:ASP:OD1	1:C:489:ASP:N	2.51	0.43
1:E:362:GLU:OE2	1:E:501:LYS:NZ	2.43	0.43
1:C:486:LYS:HD2	1:C:486:LYS:H	1.83	0.43
1:E:166:ALA:HB1	1:E:188:LYS:HB3	2.01	0.43
2:F:64:CYS:SG	2:H:69:THR:OG1	2.75	0.43
1:G:53:MET:HE3	1:G:53:MET:HB3	1.93	0.43
1:A:127:MET:HE2	1:A:127:MET:HB2	1.93	0.43
1:C:134:LEU:HD23	1:C:134:LEU:HA	1.82	0.43
1:C:416:PRO:O	1:C:420:ILE:HG12	2.18	0.43
2:F:102:ASP:OD2	2:F:104:THR:OG1	2.23	0.43
2:B:35:SER:OG	2:B:76:ASP:OD2	2.36	0.43
2:D:147:GLN:HA	2:D:150:GLN:HB3	2.00	0.43
1:E:123:ASP:HB3	1:E:159:TYR:HE2	1.83	0.43
1:C:380:THR:HA	1:C:381:THR:C	2.44	0.42
1:E:30:VAL:HG22	1:E:411:GLN:HB2	2.01	0.42
1:G:295:MET:SD	1:G:308:CYS:HB3	2.59	0.42
1:E:437:SER:HA	1:E:438:GLU:HA	1.78	0.42
1:E:544:TRP:NE1	1:E:553:ALA:H	2.17	0.42
1:A:547:SER:OG	1:A:548:LEU:N	2.53	0.42
2:B:50:GLN:HE21	2:B:50:GLN:HB3	1.69	0.42
1:E:134:LEU:HD23	1:E:134:LEU:HA	1.89	0.42
1:G:134:LEU:HD12	1:G:156:ILE:HD12	2.02	0.42
2:D:34:LYS:NZ	5:D:301:GNP:O1B	2.37	0.42
1:E:94:LEU:HD23	1:E:173:VAL:HG13	2.02	0.42
1:C:125:ILE:HG12	1:C:176:ILE:HD13	2.01	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:415:HIS:CG	1:A:416:PRO:HD2	2.54	0.42
1:E:545:VAL:HG23	1:E:546:VAL:HG13	2.02	0.42
2:F:165:ALA:N	5:F:301:GNP:O6	2.50	0.42
1:G:127:MET:HE1	1:G:163:LEU:HD12	2.02	0.42
1:G:489:ASP:HA	1:G:492:LYS:NZ	2.34	0.42
1:C:177:ILE:O	1:C:180:THR:OG1	2.34	0.42
1:C:222:ARG:O	1:C:230:LYS:NZ	2.49	0.42
1:E:396:LYS:HE2	1:E:396:LYS:HB3	1.84	0.42
2:B:176:MET:O	2:B:180:LYS:HG2	2.20	0.42
1:C:22:LYS:HG2	1:C:28:TYR:CE2	2.55	0.42
1:C:210:ASN:HA	1:C:211:PRO:HD2	1.87	0.41
1:G:117:ARG:O	1:G:121:ILE:HG12	2.20	0.41
1:A:245:LYS:NZ	3:A:602:EDO:H22	2.35	0.41
1:C:51:LEU:HD21	1:C:92:LYS:HA	2.01	0.41
1:E:476:GLN:O	1:E:480:ILE:HG13	2.21	0.41
1:A:123:ASP:HB3	1:A:159:TYR:HE2	1.84	0.41
1:A:385:SER:HA	1:A:386:PRO:HD3	1.84	0.41
1:E:364:VAL:HG12	1:E:365:TYR:CD2	2.55	0.41
2:F:69:THR:OG1	2:H:64:CYS:SG	2.71	0.41
1:G:462:MET:HE1	1:G:511:LEU:HB2	2.02	0.41
1:C:449:GLN:HE21	1:C:449:GLN:HB2	1.64	0.41
1:G:522:ALA:HB2	1:G:529:SER:HB2	2.02	0.41
1:A:480:ILE:HD11	3:B:303:EDO:H11	2.03	0.41
2:D:135:LYS:HG2	5:D:301:GNP:C5	2.50	0.41
2:F:137:ASP:CG	5:F:301:GNP:HN21	2.29	0.41
1:A:141:ILE:HA	1:A:142:PRO:HD2	1.68	0.41
1:C:415:HIS:HB2	1:C:491:GLN:NE2	2.35	0.41
1:G:184:LYS:H	1:G:184:LYS:HD2	1.85	0.41
1:G:319:ASP:OD1	1:G:323:LYS:NZ	2.53	0.41
1:G:434:ASP:O	2:H:82:ARG:NH2	2.54	0.41
1:C:271:HIS:CG	1:C:272:PRO:HD2	2.56	0.41
1:C:415:HIS:CG	1:C:416:PRO:HD2	2.56	0.41
1:C:447:HIS:ND1	1:C:485:ALA:HB2	2.35	0.41
1:E:142:PRO:HA	1:E:143:PRO:HD3	1.83	0.41
1:E:182:SER:OG	1:E:184:LYS:HD2	2.21	0.41
1:E:500:ILE:HD13	1:E:534:ILE:HG23	2.02	0.41
1:C:454:LEU:O	1:C:458:ILE:HG13	2.21	0.41
1:C:548:LEU:HD12	1:C:548:LEU:HA	1.79	0.41
2:D:92:ARG:HB3	2:D:92:ARG:NH1	2.36	0.41
2:D:142:ARG:NH1	2:D:144:VAL:O	2.52	0.41
1:E:48:ILE:H	1:E:48:ILE:HG12	1.61	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:498:LEU:O	1:E:502:GLN:HG3	2.21	0.41
2:F:80:LEU:HB2	2:F:83:TYR:CD2	2.56	0.41
1:C:48:ILE:H	1:C:48:ILE:HG12	1.70	0.41
1:C:313:ALA:O	1:C:317:PHE:N	2.50	0.41
2:D:174:ILE:O	2:D:178:ILE:HG13	2.20	0.41
1:C:204:LYS:HD2	1:C:204:LYS:HA	1.88	0.40
1:E:393:ARG:HG2	1:E:396:LYS:HE2	2.02	0.40
1:C:90:ASP:HB3	1:C:173:VAL:HG21	2.03	0.40
1:G:60:ARG:HD2	1:G:406:LEU:HD23	2.03	0.40
1:E:271:HIS:CD2	1:E:273:VAL:HB	2.57	0.40
1:C:166:ALA:HB1	1:C:188:LYS:HB3	2.04	0.40
1:C:222:ARG:HH22	1:C:253:GLU:CD	2.28	0.40
1:C:552:PRO:O	1:C:554:GLN:N	2.53	0.40
2:F:42:VAL:HA	2:F:61:GLN:HE21	1.86	0.40

There are no symmetry-related clashes.

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	526/551 (96%)	508 (97%)	16 (3%)	2 (0%)	30	58
1	C	523/551 (95%)	505 (97%)	17 (3%)	1 (0%)	43	71
1	E	525/551 (95%)	503 (96%)	20 (4%)	2 (0%)	30	58
1	G	522/551 (95%)	499 (96%)	22 (4%)	1 (0%)	43	71
2	B	162/170 (95%)	152 (94%)	10 (6%)	0	100	100
2	D	162/170 (95%)	152 (94%)	8 (5%)	2 (1%)	10	34
2	F	162/170 (95%)	151 (93%)	11 (7%)	0	100	100
2	H	162/170 (95%)	149 (92%)	13 (8%)	0	100	100
All	All	2744/2884 (95%)	2619 (95%)	117 (4%)	8 (0%)	36	64

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	382	THR
1	G	106	ASN
1	A	553	ALA
2	D	92	ARG
1	E	552	PRO
2	D	55	GLY
1	E	205	GLY
1	A	379	VAL

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	451/466 (97%)	417 (92%)	34 (8%)	12	37
1	C	448/466 (96%)	411 (92%)	37 (8%)	10	33
1	E	452/466 (97%)	408 (90%)	44 (10%)	8	27
1	G	449/466 (96%)	415 (92%)	34 (8%)	12	37
2	B	134/137 (98%)	130 (97%)	4 (3%)	36	62
2	D	134/137 (98%)	132 (98%)	2 (2%)	57	73
2	F	134/137 (98%)	133 (99%)	1 (1%)	76	80
2	H	134/137 (98%)	130 (97%)	4 (3%)	36	62
All	All	2336/2412 (97%)	2176 (93%)	160 (7%)	14	40

All (160) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	30	VAL
1	A	39	VAL
1	A	48	ILE
1	A	51	LEU
1	A	88	ILE
1	A	94	LEU

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Mol	Chain	Res	Type
1	A	146	GLN
1	A	158	LEU
1	A	171	ASN
1	A	184	LYS
1	A	204	LYS
1	A	209	GLU
1	A	215	LEU
1	A	218	LEU
1	A	221	LEU
1	A	248	LEU
1	A	295	MET
1	A	304	GLU
1	A	336	LYS
1	A	342	LEU
1	A	343	VAL
1	A	358	VAL
1	A	379	VAL
1	A	381	THR
1	A	403	MET
1	A	406	LEU
1	A	417	LEU
1	A	420	ILE
1	A	426	ASP
1	A	449	GLN
1	A	490	ILE
1	A	492	LYS
1	A	538	LEU
1	A	545	VAL
2	B	25	VAL
2	B	137	ASP
2	B	159	LEU
2	B	173	GLU
1	C	48	ILE
1	C	51	LEU
1	C	62	LYS
1	C	94	LEU
1	C	127	MET
1	C	134	LEU
1	C	158	LEU
1	C	171	ASN
1	C	179	LEU
1	C	200	LEU

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Mol	Chain	Res	Type
1	C	215	LEU
1	C	218	LEU
1	C	238	VAL
1	C	248	LEU
1	C	254	ASP
1	C	304	GLU
1	C	336	LYS
1	C	338	ARG
1	C	358	VAL
1	C	364	VAL
1	C	378	GLU
1	C	380	THR
1	C	387	THR
1	C	393	ARG
1	C	403	MET
1	C	406	LEU
1	C	417	LEU
1	C	435	GLU
1	C	439	LYS
1	C	441	ILE
1	C	449	GLN
1	C	464	ASP
1	C	486	LYS
1	C	490	ILE
1	C	538	LEU
1	C	550	LYS
1	C	556	PHE
2	D	92	ARG
2	D	159	LEU
1	E	39	VAL
1	E	48	ILE
1	E	51	LEU
1	E	62	LYS
1	E	77	MET
1	E	88	ILE
1	E	94	LEU
1	E	100	ILE
1	E	112	ARG
1	E	119	ARG
1	E	145	GLN
1	E	158	LEU
1	E	183	VAL

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Mol	Chain	Res	Type
1	E	184	LYS
1	E	186	LEU
1	E	204	LYS
1	E	206	GLU
1	E	207	GLN
1	E	215	LEU
1	E	218	LEU
1	E	221	LEU
1	E	238	VAL
1	E	248	LEU
1	E	250	ARG
1	E	254	ASP
1	E	295	MET
1	E	304	GLU
1	E	343	VAL
1	E	357	SER
1	E	358	VAL
1	E	364	VAL
1	E	380	THR
1	E	381	THR
1	E	382	THR
1	E	389	GLU
1	E	393	ARG
1	E	401	GLN
1	E	403	MET
1	E	417	LEU
1	E	426	ASP
1	E	429	LYS
1	E	449	GLN
1	E	538	LEU
1	E	557	LYS
2	F	59	LEU
1	G	39	VAL
1	G	41	SER
1	G	94	LEU
1	G	100	ILE
1	G	127	MET
1	G	141	ILE
1	G	145	GLN
1	G	158	LEU
1	G	179	LEU
1	G	209	GLU

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Mol	Chain	Res	Type
1	G	221	LEU
1	G	248	LEU
1	G	294	ASN
1	G	295	MET
1	G	304	GLU
1	G	336	LYS
1	G	343	VAL
1	G	359	LEU
1	G	364	VAL
1	G	376	THR
1	G	384	THR
1	G	393	ARG
1	G	403	MET
1	G	405	LEU
1	G	417	LEU
1	G	425	HIS
1	G	426	ASP
1	G	429	LYS
1	G	479	ASP
1	G	490	ILE
1	G	493	GLU
1	G	544	TRP
1	G	550	LYS
1	G	556	PHE
2	H	19	ILE
2	H	54	ILE
2	H	82	ARG
2	H	126	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (25) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	383	ASN
2	B	120	GLN
2	B	172	ASN
1	C	129	GLN
1	C	133	HIS
1	C	172	ASN
1	C	235	ASN
1	C	271	HIS
1	C	294	ASN
2	D	21	GLN

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Mol	Chain	Res	Type
2	D	84	HIS
2	D	134	ASN
1	E	133	HIS
1	E	235	ASN
1	E	243	GLN
1	E	401	GLN
1	E	411	GLN
1	E	455	GLN
2	F	61	GLN
2	F	150	GLN
1	G	65	ASN
1	G	129	GLN
1	G	145	GLN
1	G	148	ASN
1	G	411	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 17 ligands modelled in this entry, 4 are monoatomic - leaving 13 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
5	GNP	F	301	6	34,34,34	1.85	6 (17%)	47,54,54	1.03	3 (6%)
4	GOL	A	604	-	5,5,5	0.38	0	5,5,5	0.33	0
3	EDO	G	601	-	3,3,3	0.41	0	2,2,2	0.39	0
5	GNP	B	301	6	34,34,34	1.86	6 (17%)	47,54,54	1.03	3 (6%)
3	EDO	B	303	-	3,3,3	0.42	0	2,2,2	0.43	0
5	GNP	H	301	6	34,34,34	1.88	6 (17%)	47,54,54	1.05	3 (6%)
3	EDO	A	602	-	3,3,3	0.42	0	2,2,2	0.37	0
3	EDO	E	601	-	3,3,3	0.42	0	2,2,2	0.38	0
4	GOL	A	603	-	5,5,5	0.37	0	5,5,5	0.27	0
3	EDO	A	601	-	3,3,3	0.43	0	2,2,2	0.41	0
5	GNP	D	301	6	34,34,34	1.85	6 (17%)	47,54,54	1.02	3 (6%)
3	EDO	B	302	-	3,3,3	0.41	0	2,2,2	0.37	0
4	GOL	E	602	-	5,5,5	0.38	0	5,5,5	0.32	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	GNP	F	301	6	-	7/18/38/38	0/3/3/3
4	GOL	A	604	-	-	2/4/4/4	-
3	EDO	G	601	-	-	0/1/1/1	-
5	GNP	B	301	6	-	4/18/38/38	0/3/3/3
3	EDO	B	303	-	-	0/1/1/1	-
5	GNP	H	301	6	-	2/18/38/38	0/3/3/3
3	EDO	A	602	-	-	0/1/1/1	-
3	EDO	E	601	-	-	0/1/1/1	-
4	GOL	A	603	-	-	2/4/4/4	-
3	EDO	A	601	-	-	0/1/1/1	-
5	GNP	D	301	6	-	4/18/38/38	0/3/3/3
3	EDO	B	302	-	-	0/1/1/1	-
4	GOL	E	602	-	-	2/4/4/4	-

All (24) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	H	301	GNP	PA-O3A	-6.68	1.52	1.59
5	D	301	GNP	PA-O3A	-6.54	1.52	1.59
5	B	301	GNP	PA-O3A	-6.53	1.52	1.59

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	F	301	GNP	PA-O3A	-6.50	1.52	1.59
5	H	301	GNP	PB-O3A	-5.48	1.52	1.59
5	F	301	GNP	PB-O3A	-5.38	1.52	1.59
5	D	301	GNP	PB-O3A	-5.34	1.52	1.59
5	B	301	GNP	PB-O3A	-5.33	1.52	1.59
5	B	301	GNP	PG-O1G	3.43	1.51	1.46
5	F	301	GNP	PG-O1G	3.39	1.51	1.46
5	D	301	GNP	PG-O1G	3.37	1.51	1.46
5	H	301	GNP	PG-O1G	3.35	1.51	1.46
5	B	301	GNP	PB-O2B	-3.29	1.48	1.56
5	H	301	GNP	PB-O2B	-3.28	1.48	1.56
5	D	301	GNP	PB-O2B	-3.27	1.48	1.56
5	F	301	GNP	PB-O2B	-3.19	1.48	1.56
5	H	301	GNP	PG-O3G	-2.15	1.51	1.56
5	B	301	GNP	PG-O3G	-2.14	1.51	1.56
5	F	301	GNP	PG-O2G	-2.12	1.51	1.56
5	F	301	GNP	PG-O3G	-2.10	1.51	1.56
5	H	301	GNP	PG-O2G	-2.09	1.51	1.56
5	D	301	GNP	PG-O2G	-2.09	1.51	1.56
5	B	301	GNP	PG-O2G	-2.06	1.51	1.56
5	D	301	GNP	PG-O3G	-2.05	1.51	1.56

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	H	301	GNP	O2B-PB-O1B	3.90	118.24	109.87
5	B	301	GNP	O2B-PB-O1B	3.84	118.11	109.87
5	F	301	GNP	O2B-PB-O1B	3.79	118.00	109.87
5	D	301	GNP	O2B-PB-O1B	3.76	117.93	109.87
5	H	301	GNP	O3G-PG-O1G	-3.44	104.83	113.45
5	B	301	GNP	O3G-PG-O1G	-3.44	104.83	113.45
5	D	301	GNP	O3G-PG-O1G	-3.36	105.03	113.45
5	F	301	GNP	O3G-PG-O1G	-3.31	105.14	113.45
5	H	301	GNP	O2G-PG-O3G	3.21	116.21	107.59
5	F	301	GNP	O2G-PG-O3G	3.13	116.00	107.59
5	D	301	GNP	O2G-PG-O3G	3.10	115.92	107.59
5	B	301	GNP	O2G-PG-O3G	3.06	115.83	107.59

There are no chirality outliers.

All (23) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	603	GOL	O1-C1-C2-O2
4	A	603	GOL	O1-C1-C2-C3
4	A	604	GOL	O1-C1-C2-C3
5	B	301	GNP	PG-N3B-PB-O1B
5	B	301	GNP	PA-O3A-PB-O2B
5	D	301	GNP	PG-N3B-PB-O1B
5	D	301	GNP	PG-N3B-PB-O3A
5	D	301	GNP	PA-O3A-PB-O2B
5	F	301	GNP	PB-N3B-PG-O1G
5	F	301	GNP	PG-N3B-PB-O1B
5	F	301	GNP	PA-O3A-PB-O2B
5	F	301	GNP	C5'-O5'-PA-O3A
5	F	301	GNP	C5'-O5'-PA-O2A
5	H	301	GNP	PG-N3B-PB-O1B
5	H	301	GNP	PG-N3B-PB-O3A
4	E	602	GOL	O1-C1-C2-O2
4	E	602	GOL	O1-C1-C2-C3
4	A	604	GOL	O1-C1-C2-O2
5	B	301	GNP	C5'-O5'-PA-O3A
5	F	301	GNP	C5'-O5'-PA-O1A
5	B	301	GNP	PA-O3A-PB-O1B
5	D	301	GNP	PA-O3A-PB-O1B
5	F	301	GNP	PA-O3A-PB-O1B

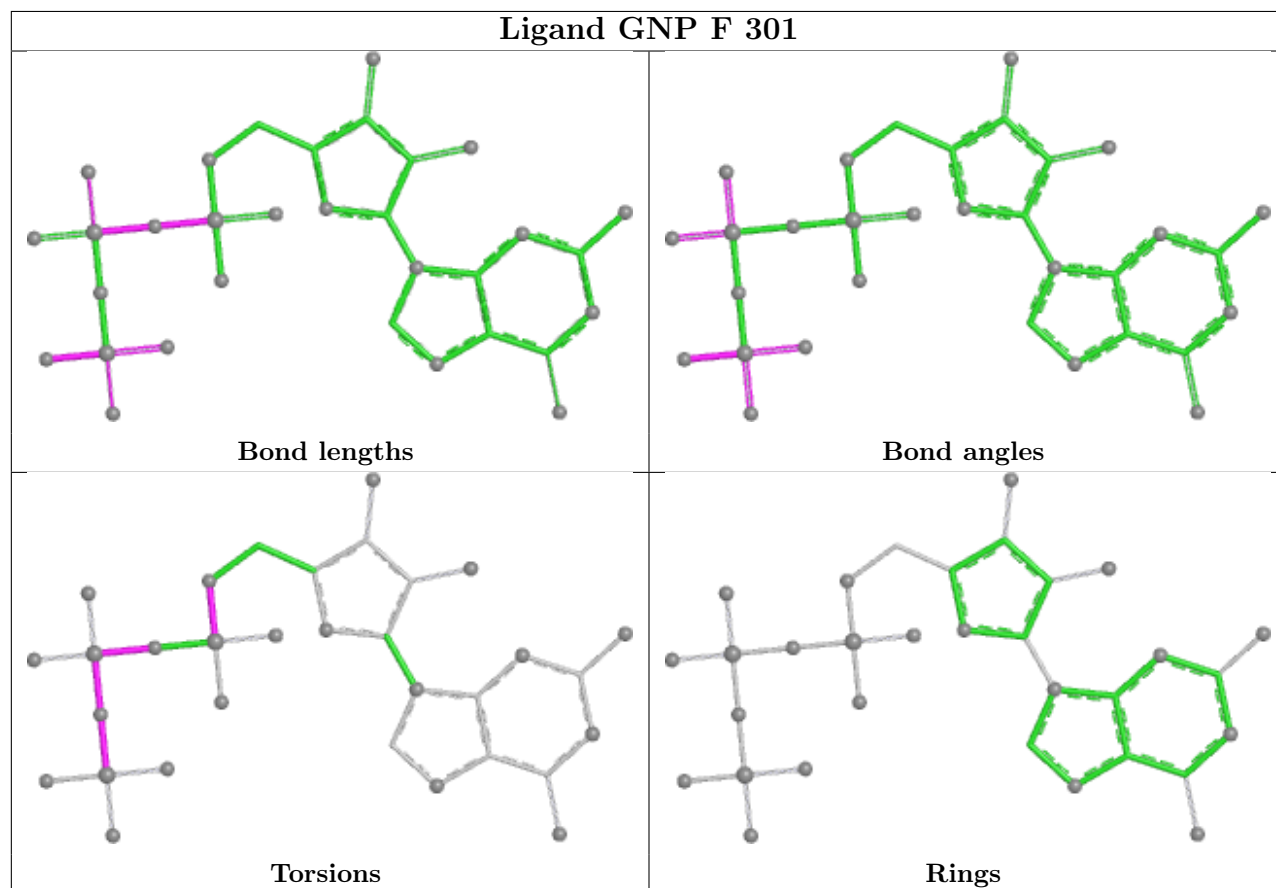
There are no ring outliers.

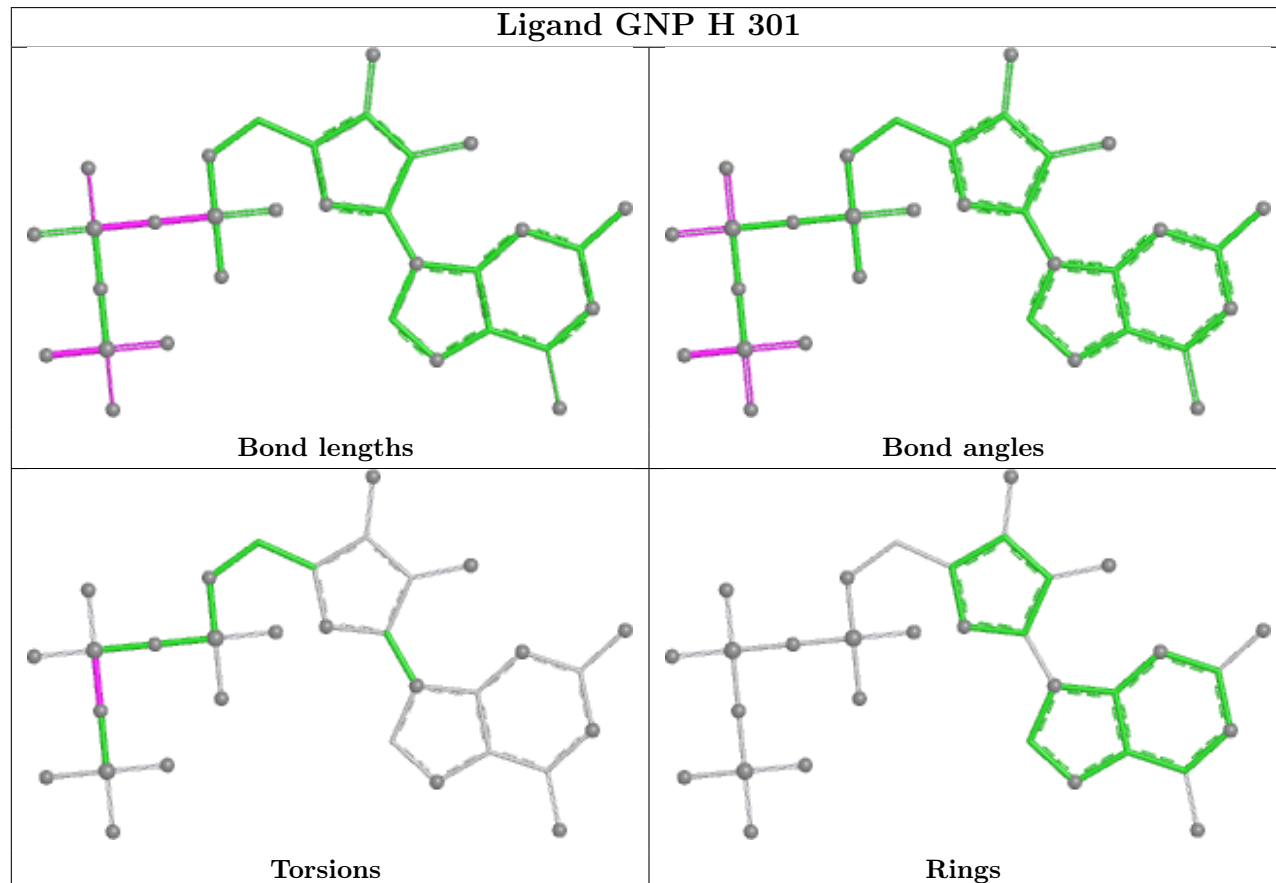
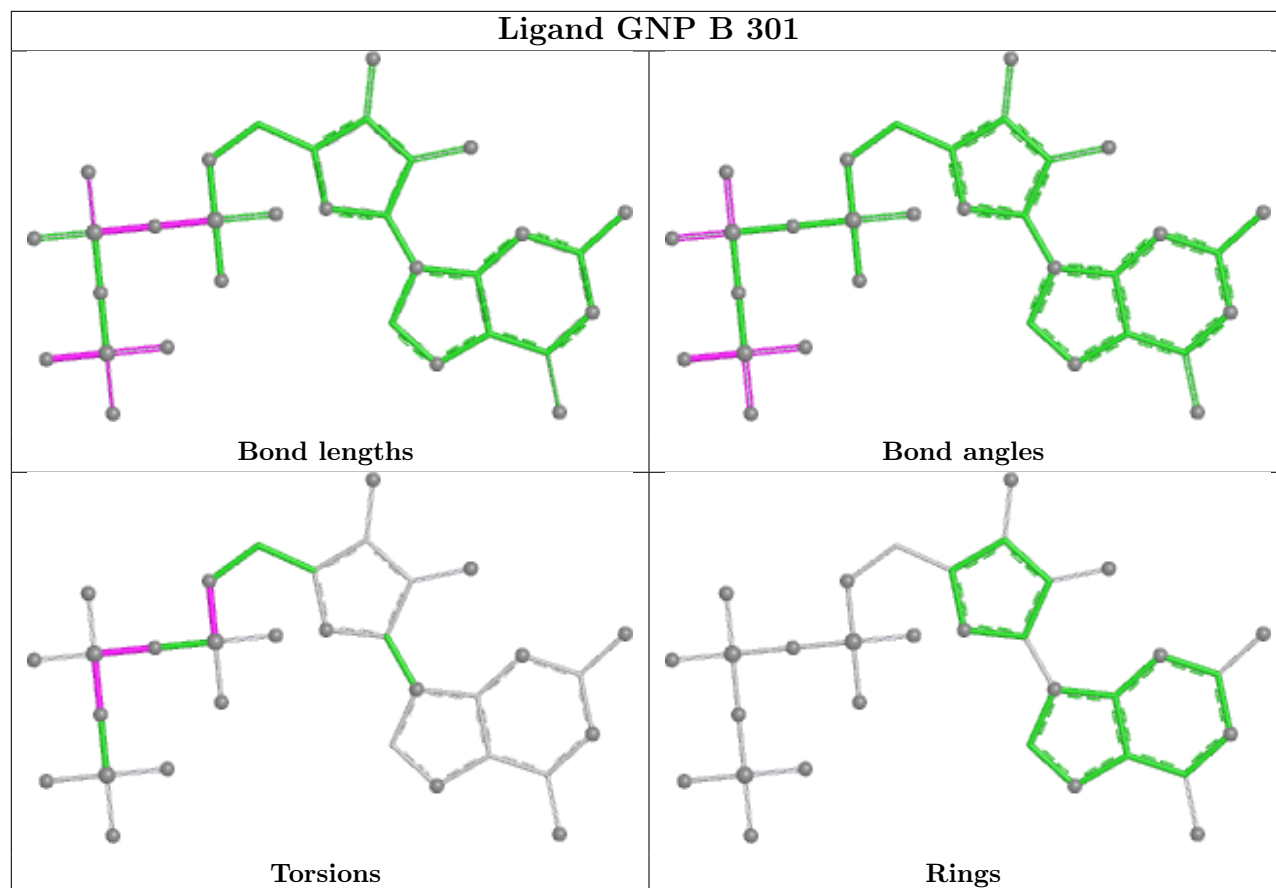
7 monomers are involved in 13 short contacts:

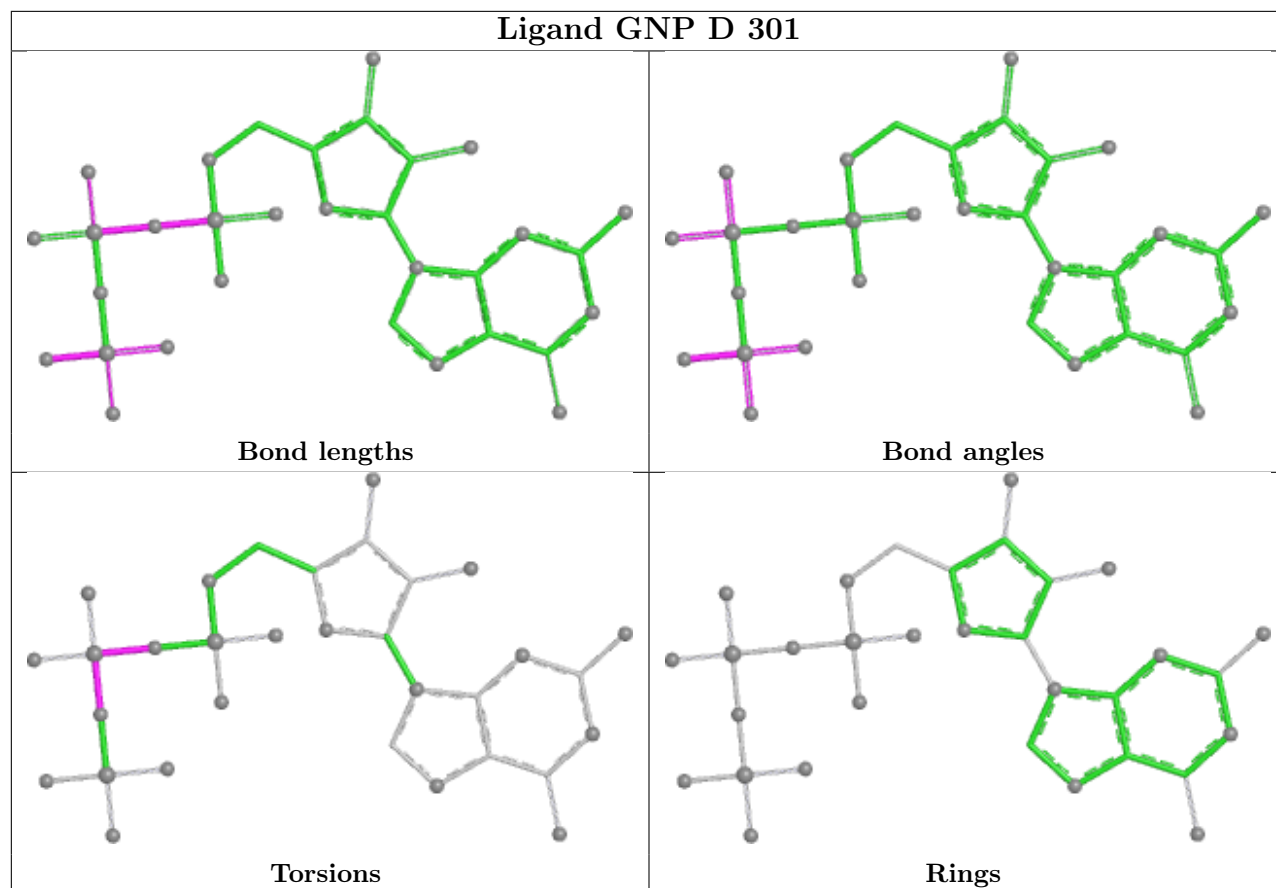
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	F	301	GNP	2	0
3	G	601	EDO	2	0
3	B	303	EDO	2	0
5	H	301	GNP	1	0
3	A	602	EDO	1	0
5	D	301	GNP	4	0
4	E	602	GOL	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for 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 [i](#)

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	530/551 (96%)	-0.53	0 100 100	1, 36, 77, 137	0
1	C	527/551 (95%)	-0.38	2 (0%) 88 75	5, 57, 109, 169	0
1	E	531/551 (96%)	-0.52	0 100 100	0, 32, 79, 118	0
1	G	528/551 (95%)	-0.27	3 (0%) 85 69	14, 59, 112, 142	0
2	B	164/170 (96%)	-0.33	0 100 100	16, 58, 89, 151	0
2	D	164/170 (96%)	-0.30	0 100 100	25, 73, 108, 133	0
2	F	164/170 (96%)	-0.13	1 (0%) 85 69	22, 72, 108, 149	0
2	H	164/170 (96%)	-0.40	0 100 100	26, 60, 99, 130	0
All	All	2772/2884 (96%)	-0.39	6 (0%) 91 83	0, 52, 102, 169	0

All (6) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	G	536	ASN	3.2
1	G	358	VAL	2.6
2	F	101	TYR	2.2
1	G	100	ILE	2.1
1	C	384	THR	2.1
1	C	100	ILE	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 ⓘ

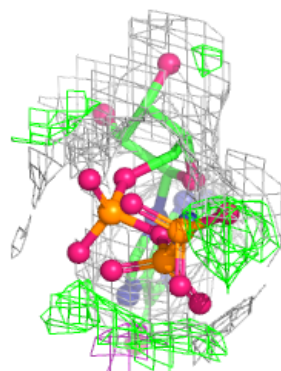
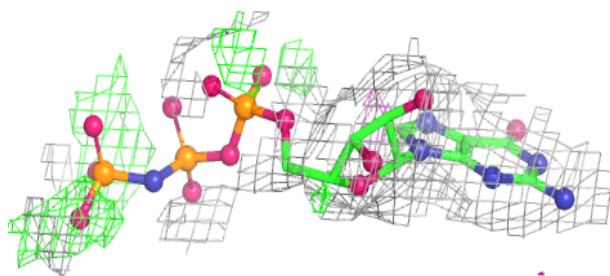
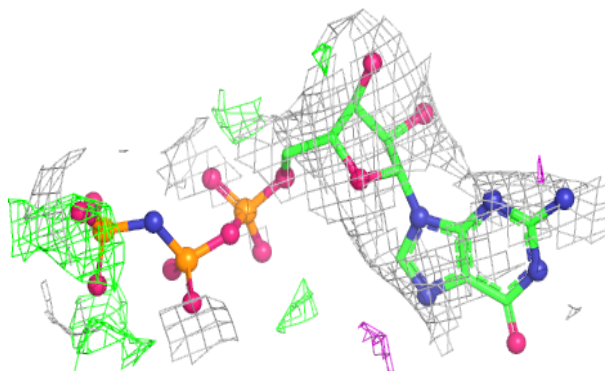
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	EDO	A	602	4/4	0.48	0.11	55,55,55,55	0
4	GOL	A	604	6/6	0.63	0.17	78,78,78,78	0
3	EDO	G	601	4/4	0.64	0.20	84,84,84,84	0
3	EDO	A	601	4/4	0.67	0.23	58,58,58,58	0
4	GOL	E	602	6/6	0.68	0.16	66,66,66,66	0
3	EDO	E	601	4/4	0.74	0.08	56,56,56,56	0
4	GOL	A	603	6/6	0.79	0.13	59,59,59,59	0
3	EDO	B	302	4/4	0.83	0.18	45,45,45,45	0
3	EDO	B	303	4/4	0.88	0.17	41,41,41,41	0
5	GNP	F	301	32/32	0.89	0.08	81,81,81,81	0
5	GNP	B	301	32/32	0.90	0.08	72,72,72,72	0
6	MG	F	302	1/1	0.90	0.13	54,54,54,54	0
5	GNP	H	301	32/32	0.94	0.06	63,63,63,63	0
5	GNP	D	301	32/32	0.94	0.05	80,80,80,80	0
6	MG	B	304	1/1	0.95	0.07	36,36,36,36	0
6	MG	H	302	1/1	0.98	0.06	35,35,35,35	0
6	MG	D	302	1/1	1.00	0.02	36,36,36,36	0

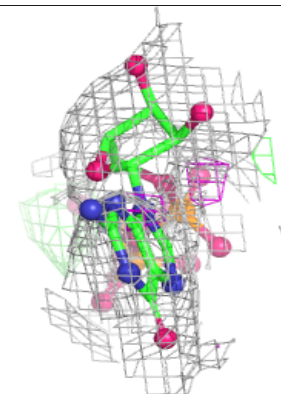
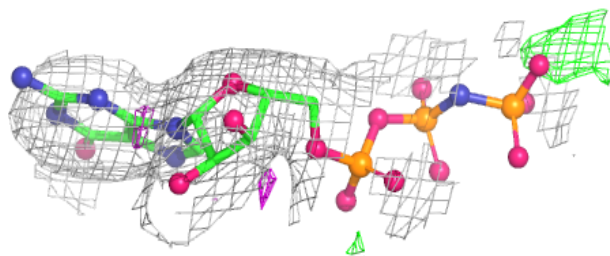
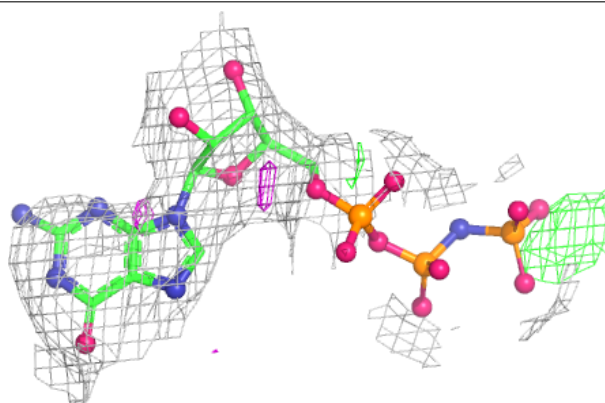
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around GNP F 301:

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

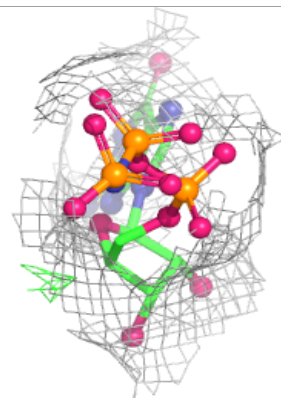
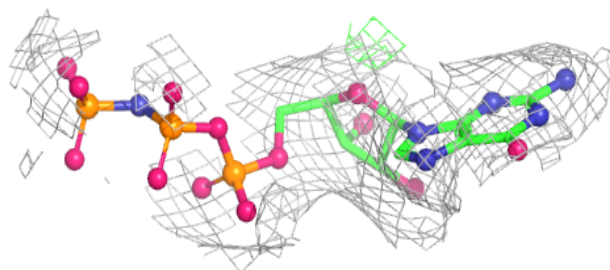
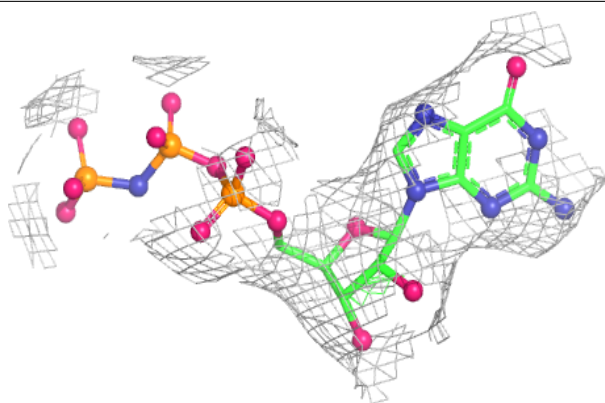
**Electron density around GNP B 301:**

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

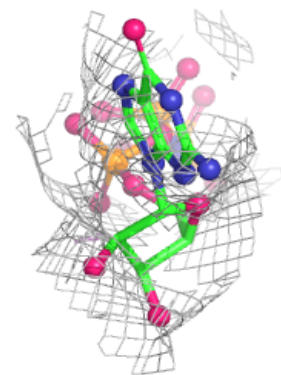
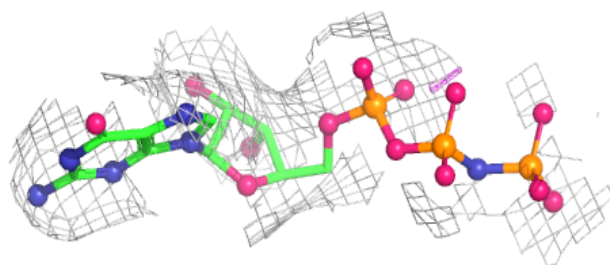
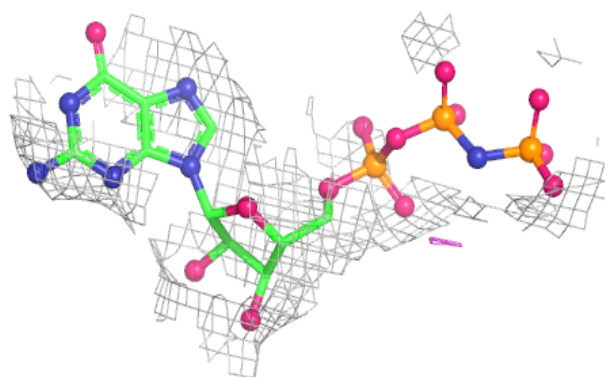


Electron density around GNP H 301:

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

**Electron density around GNP D 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 ⓘ

There are no such residues in this entry.