Full wwPDB X-ray Structure Validation Report (i)

Jan 6, 2026 – 04:47 PM EST

PDB ID	:	9D8D / pdb_00009d8d
Title	:	Crystal structure of Vibrio cholerae NFeoB in the GMPPCP-bound form
Authors	:	Lee, M.; Magante, K.D.; Smith, A.T.
Deposited on	:	2024-08-19
Resolution	:	2.11 Å(reported)

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

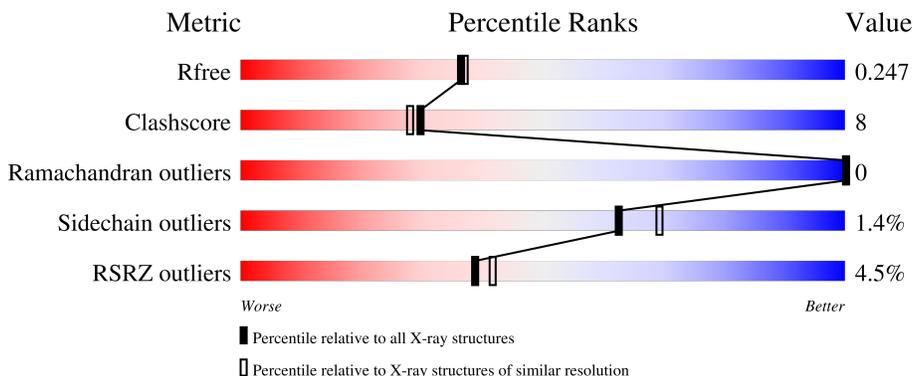|		
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.47

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 2.11 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	Percentile Ranks	Value
Rfree		0.247
Clashscore		8
Ramachandran outliers		0
Sidechain outliers		1.4%
RSRZ outliers		4.5%

Worse — *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	7689 (2.14-2.10)
Clashscore	180529	8431 (2.14-2.10)
Ramachandran outliers	177936	8366 (2.14-2.10)
Sidechain outliers	177891	8367 (2.14-2.10)
RSRZ outliers	164620	7689 (2.14-2.10)

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 <=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	261	3% / 82% / 16% / •
1	B	261	6% / 74% / 23% / •
1	C	261	3% / 74% / 18% / 8%
1	D	261	5% / 77% / 15% / 8%

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 8190 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 Ferrous iron transport protein B.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	260	Total	C	N	O	S	0	0	0
			2050	1286	371	385	8			
1	B	256	Total	C	N	O	S	0	0	0
			2020	1271	365	376	8			
1	C	241	Total	C	N	O	S	0	0	0
			1911	1204	345	354	8			
1	D	240	Total	C	N	O	S	0	0	0
			1905	1201	344	352	8			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	SER	-	expression tag	UNP A0A655NVH2
B	1	SER	-	expression tag	UNP A0A655NVH2
C	1	SER	-	expression tag	UNP A0A655NVH2
D	1	SER	-	expression tag	UNP A0A655NVH2

- Molecule 2 is PHOSPHOMETHYLPHOSPHONIC ACID GUANYLATE ESTER (CCD ID: GCP) (formula: $C_{11}H_{18}N_5O_{13}P_3$).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			32	11	5	13	3		
2	B	1	Total	C	N	O	P	0	0
			32	11	5	13	3		
2	C	1	Total	C	N	O	P	0	0
			32	11	5	13	3		
2	D	1	Total	C	N	O	P	0	0
			32	11	5	13	3		

- Molecule 3 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).

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

- Molecule 4 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	C	1	Total 1	Mg 1	0	0
4	D	1	Total 1	Mg 1	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	59	Total 59	O 59	0	0
5	B	30	Total 30	O 30	0	0
5	C	45	Total 45	O 45	0	0
5	D	34	Total 34	O 34	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.
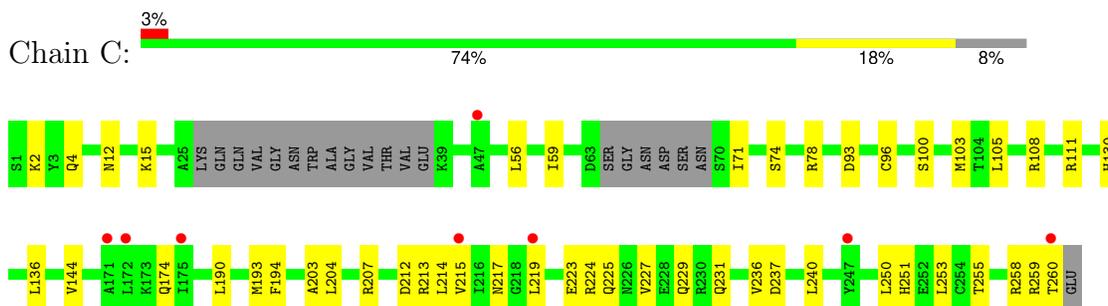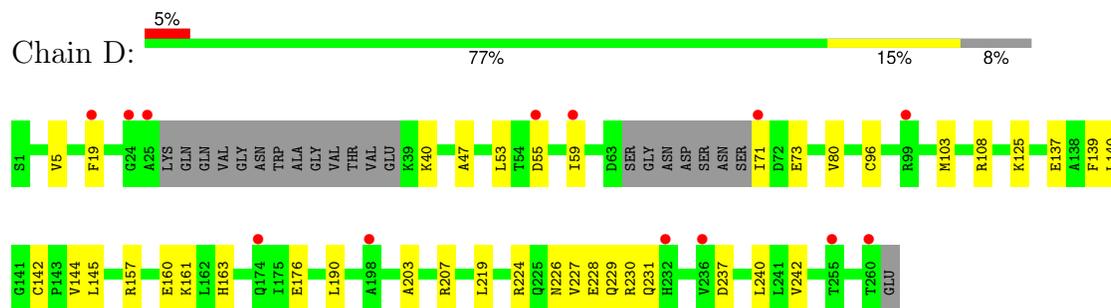
• Molecule 1: Ferrous iron transport protein B
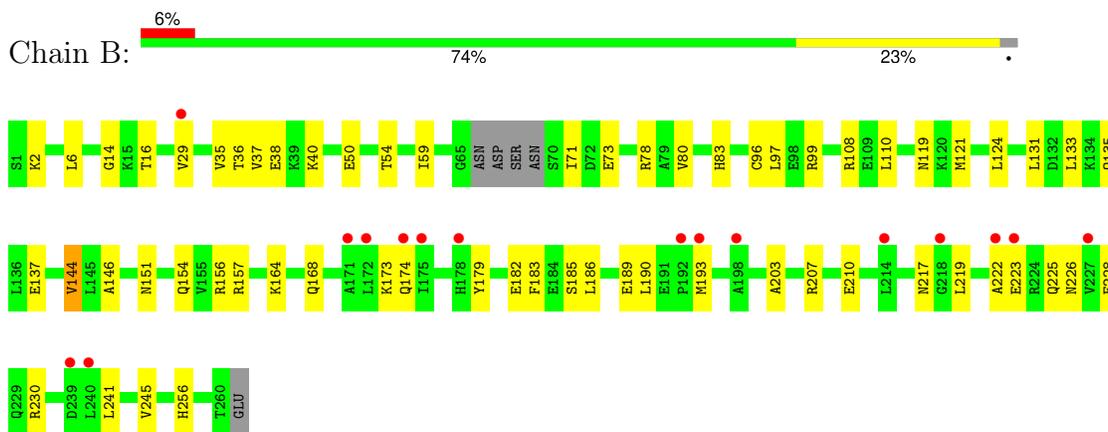
Chain A:

• Molecule 1: Ferrous iron transport protein B

Chain B:

• Molecule 1: Ferrous iron transport protein B

Chain C:

• Molecule 1: Ferrous iron transport protein B

Chain D:

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	53.98Å　59.67Å　89.43Å 93.59°　92.61°　113.77°	Depositor
Resolution (Å)	31.81　–　2.11 31.81　–　2.11	Depositor EDS
% Data completeness (in resolution range)	97.2 (31.81-2.11) 97.2 (31.81-2.11)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.08 (at 2.10Å)	Xtriage
Refinement program	PHENIX 1.21.1_5286	Depositor
R, R_{free}	0.196　,　0.247 0.196　,　0.247	Depositor DCC
R_{free} test set	2786 reflections (4.88%)	wwPDB-VP
Wilson B-factor (Å^2)	48.6	Xtriage
Anisotropy	0.073	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 55.8	EDS
L-test for twinning[2]	$< |L| > = 0.51, < L^2 > = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	8190	wwPDB-VP
Average B, all atoms (Å^2)	66.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.08% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: GCP, MG, GOL

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	0.39	0/2079	0.56	0/2810
1	B	0.32	0/2048	0.47	0/2766
1	C	0.35	0/1936	0.55	0/2612
1	D	0.29	0/1930	0.47	0/2604
All	All	0.34	0/7993	0.51	0/10792

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 ⓘ

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	2050	0	2087	35	0
1	B	2020	0	2065	41	0
1	C	1911	0	1959	41	0
1	D	1905	0	1954	23	0
2	A	32	0	14	1	0
2	B	32	0	14	1	0
2	C	32	0	14	7	0
2	D	32	0	14	0	0
3	A	6	0	8	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	C	1	0	0	0	0
4	D	1	0	0	0	0
5	A	59	0	0	3	0
5	B	30	0	0	2	0
5	C	45	0	0	4	0
5	D	34	0	0	2	0
All	All	8190	0	8129	136	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 8.

All (136) 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:12:ASN:H	2:C:301:GCP:H3B2	1.21	1.02
1:C:258:ARG:NH1	5:C:402:HOH:O	2.07	0.87
1:A:12:ASN:H	2:A:301:GCP:H3B2	1.43	0.83
1:C:12:ASN:N	2:C:301:GCP:H3B2	1.96	0.81
1:A:135:GLN:HE21	1:A:256:HIS:HB3	1.46	0.80
1:C:15:LYS:NZ	2:C:301:GCP:H3B1	2.01	0.75
1:C:100:SER:OG	5:C:401:HOH:O	2.05	0.74
1:C:111:ARG:HD2	1:C:174:GLN:HG2	1.70	0.74
1:D:157:ARG:NH1	1:D:160:GLU:OE1	2.21	0.73
1:B:219:LEU:HB3	1:B:223:GLU:HB2	1.69	0.72
1:B:225:GLN:HA	1:B:228:GLU:HG2	1.71	0.72
1:D:59:ILE:HG22	1:D:73:GLU:HG3	1.74	0.70
1:C:96:CYS:SG	5:C:401:HOH:O	2.51	0.69
1:A:35:VAL:HG21	1:A:75:ILE:HD11	1.74	0.67
1:B:179:TYR:CD1	1:B:245:VAL:HG11	2.31	0.66
1:D:228:GLU:HA	1:D:231:GLN:HE21	1.60	0.65
1:D:125:LYS:NZ	5:D:401:HOH:O	2.29	0.65
1:D:190:LEU:HD11	1:D:230:ARG:HG3	1.79	0.65
1:B:189:GLU:HG3	1:B:230:ARG:HH22	1.64	0.63
1:B:108:ARG:NH2	1:B:173:LYS:O	2.32	0.62
1:B:193:MET:HE1	1:B:223:GLU:HB3	1.81	0.62
1:A:196:GLU:HG3	1:C:236:VAL:HG23	1.81	0.62
1:A:124:LEU:HD21	1:A:131:LEU:HG	1.82	0.61
1:A:98:GLU:OE2	1:A:258:ARG:NH2	2.34	0.61
1:B:217:ASN:ND2	5:B:402:HOH:O	2.32	0.61
1:C:15:LYS:HZ1	2:C:301:GCP:H3B1	1.66	0.60
1:A:1:SER:OG	1:B:164:LYS:NZ	2.36	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:6:LEU:HD23	1:B:54:THR:HB	1.86	0.58
1:B:35:VAL:HG11	1:B:71:ILE:HG12	1.86	0.57
1:B:190:LEU:HD21	1:B:230:ARG:HG3	1.88	0.56
1:B:207:ARG:NH1	1:B:210:GLU:OE2	2.39	0.56
1:A:98:GLU:H	1:A:98:GLU:CD	2.14	0.55
1:C:12:ASN:H	2:C:301:GCP:C3B	2.07	0.55
1:C:105:LEU:HG	1:C:250:LEU:HD21	1.89	0.55
1:A:68:SER:O	1:A:70:SER:OG	2.24	0.54
1:A:125:LYS:NZ	5:A:402:HOH:O	2.40	0.54
1:C:130:HIS:O	1:C:259:ARG:HG2	2.07	0.54
1:A:178:HIS:CD2	1:A:184:GLU:HG3	2.43	0.53
1:D:137:GLU:HG3	1:D:142:CYS:O	2.08	0.53
1:C:219:LEU:HB3	1:C:223:GLU:HB2	1.90	0.53
1:A:129:VAL:HG22	1:A:260:THR:HG22	1.92	0.52
1:C:203:ALA:O	1:C:207:ARG:HG2	2.10	0.52
1:A:130:HIS:HB2	5:A:453:HOH:O	2.09	0.52
1:C:15:LYS:HZ3	2:C:301:GCP:H3B1	1.73	0.51
1:B:59:ILE:HG21	1:B:73:GLU:HA	1.92	0.51
1:B:16:THR:OG1	2:B:301:GCP:H3B1	2.11	0.51
1:D:40:LYS:HE3	1:D:55:ASP:O	2.11	0.51
1:A:121:MET:HG3	1:A:146:ALA:HB1	1.93	0.51
1:C:136:LEU:HD23	1:C:144:VAL:HG11	1.92	0.50
1:C:237:ASP:CG	1:C:240:LEU:HD12	2.36	0.50
1:B:29:VAL:HG13	1:B:38:GLU:HG3	1.94	0.50
1:D:5:VAL:HB	1:D:53:LEU:HD12	1.94	0.50
1:B:185:SER:O	1:B:189:GLU:HG2	2.11	0.49
1:B:137:GLU:HG3	1:B:144:VAL:HG13	1.93	0.49
1:B:226:ASN:O	1:B:230:ARG:HG2	2.13	0.49
1:B:121:MET:HG3	1:B:146:ALA:HB1	1.95	0.49
1:A:125:LYS:HE3	5:A:455:HOH:O	2.11	0.49
1:B:110:LEU:HD23	1:B:203:ALA:HB1	1.95	0.48
1:A:38:GLU:H	1:A:38:GLU:CD	2.20	0.48
1:A:76:ALA:O	1:A:80:VAL:HB	2.14	0.48
1:C:136:LEU:CD1	1:C:253:LEU:HD21	2.43	0.48
1:C:251:HIS:O	1:C:255:THR:HG23	2.14	0.48
1:D:227:VAL:O	1:D:231:GLN:HG3	2.14	0.48
1:B:131:LEU:O	1:B:133:LEU:HD22	2.14	0.48
1:A:225:GLN:HA	1:A:228:GLU:HG2	1.96	0.47
1:A:108:ARG:HA	1:A:108:ARG:HD2	1.72	0.47
1:C:2:LYS:HD3	1:C:4:GLN:HE21	1.79	0.47
1:D:19:PHE:CD2	1:D:53:LEU:HD23	2.50	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:156:ARG:HH11	1:A:156:ARG:HG2	1.81	0.46
1:D:226:ASN:HD21	1:D:230:ARG:NH1	2.13	0.46
1:A:187:ILE:O	1:A:191:GLU:HG3	2.14	0.46
1:D:108:ARG:HA	1:D:108:ARG:HD2	1.79	0.46
1:C:225:GLN:O	1:C:229:GLN:HG2	2.15	0.46
1:B:35:VAL:HG12	1:B:37:VAL:H	1.80	0.46
1:C:108:ARG:HD2	1:C:108:ARG:HA	1.64	0.46
1:C:194:PHE:CE1	1:C:219:LEU:HD21	2.51	0.46
1:D:161:LYS:NZ	5:D:406:HOH:O	2.49	0.45
1:A:80:VAL:HG13	1:A:110:LEU:CD1	2.47	0.45
1:A:80:VAL:HG13	1:A:110:LEU:HD11	1.97	0.45
3:A:302:GOL:O3	3:A:302:GOL:O1	2.26	0.45
1:A:173:LYS:N	1:A:173:LYS:HD2	2.32	0.45
1:B:193:MET:HE3	1:B:193:MET:HB2	1.77	0.45
1:A:108:ARG:NH2	1:A:173:LYS:O	2.50	0.45
1:A:167:VAL:HG13	1:B:168:GLN:HG3	1.99	0.45
1:C:217:ASN:O	1:C:224:ARG:NH2	2.51	0.44
1:C:78:ARG:CZ	1:C:214:LEU:HD23	2.47	0.44
1:C:103:MET:HB2	1:C:103:MET:HE2	1.63	0.44
1:A:59:ILE:HG21	1:A:73:GLU:HA	2.00	0.44
1:B:97:LEU:HD23	1:B:97:LEU:HA	1.80	0.44
1:A:2:LYS:HD2	1:A:50:GLU:OE2	2.18	0.44
1:C:259:ARG:O	1:C:260:THR:HG22	2.18	0.44
1:C:59:ILE:HG13	1:C:103:MET:HE3	1.99	0.44
1:C:190:LEU:O	1:C:193:MET:HG2	2.18	0.44
1:D:237:ASP:OD2	1:D:240:LEU:HD12	2.18	0.44
1:A:147:LEU:C	1:A:147:LEU:HD12	2.43	0.44
1:B:186:LEU:O	1:B:190:LEU:HD23	2.18	0.43
1:D:219:LEU:HB2	1:D:224:ARG:HG3	2.00	0.43
1:B:183:PHE:HB2	1:B:241:LEU:HD21	1.99	0.43
1:C:194:PHE:HB3	1:C:204:LEU:HD12	1.99	0.43
1:C:212:ASP:OD1	1:C:215:VAL:HG12	2.18	0.43
1:A:136:LEU:HD23	1:A:144:VAL:HG11	2.00	0.43
1:C:93:ASP:O	5:C:401:HOH:O	2.21	0.43
1:C:93:ASP:HB3	1:C:96:CYS:SG	2.59	0.43
1:A:196:GLU:HG3	1:C:236:VAL:CG2	2.48	0.43
1:C:12:ASN:CA	2:C:301:GCP:H3B2	2.48	0.43
1:A:70:SER:HB2	1:A:73:GLU:HG3	1.99	0.43
1:B:14:GLY:HA3	1:B:119:ASN:ND2	2.34	0.43
1:B:156:ARG:HG3	1:B:157:ARG:N	2.33	0.43
1:C:213:ARG:HA	1:C:213:ARG:HD3	1.72	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:78:ARG:NH2	1:D:139:PHE:HE2	2.16	0.42
1:B:173:LYS:HG3	1:B:174:GLN:H	1.84	0.42
1:D:228:GLU:HA	1:D:231:GLN:HG3	2.01	0.42
1:A:185:SER:O	1:A:189:GLU:HG2	2.19	0.42
1:B:6:LEU:HD11	1:B:83:HIS:HB3	2.00	0.42
1:B:124:LEU:HD21	1:B:131:LEU:HG	2.02	0.42
1:D:71:ILE:HG22	1:D:73:GLU:OE2	2.20	0.42
1:C:253:LEU:C	1:C:253:LEU:HD23	2.45	0.42
1:D:203:ALA:O	1:D:207:ARG:HG2	2.20	0.42
1:C:71:ILE:HG13	1:C:74:SER:H	1.86	0.41
1:B:135:GLN:HE21	1:B:256:HIS:HB3	1.85	0.41
1:D:47:ALA:HB3	1:D:163:HIS:CE1	2.55	0.41
1:B:108:ARG:HD2	1:B:108:ARG:HA	1.87	0.41
1:B:99:ARG:NE	5:B:403:HOH:O	2.47	0.41
1:D:103:MET:HA	1:D:103:MET:HE3	2.03	0.41
1:C:15:LYS:HE3	1:C:56:LEU:O	2.21	0.41
1:D:140:LEU:HD23	1:D:140:LEU:HA	1.83	0.41
1:D:144:VAL:C	1:D:145:LEU:HD12	2.45	0.41
1:A:59:ILE:HG22	1:A:73:GLU:HG2	2.02	0.41
1:B:2:LYS:HE2	1:B:50:GLU:CD	2.46	0.41
1:B:35:VAL:HG12	1:B:36:THR:N	2.36	0.41
1:B:222:ALA:HA	1:B:225:GLN:NE2	2.35	0.41
1:B:151:ASN:ND2	1:B:154:GLN:HE21	2.19	0.41
1:C:227:VAL:O	1:C:231:GLN:HG3	2.21	0.41
1:A:157:ARG:NH1	1:A:160:GLU:OE1	2.54	0.40
1:B:182:GLU:CD	1:B:182:GLU:H	2.29	0.40
1:C:136:LEU:HD12	1:C:253:LEU:HD21	2.03	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	258/261 (99%)	254 (98%)	4 (2%)	0	100	100
1	B	252/261 (97%)	246 (98%)	6 (2%)	0	100	100
1	C	235/261 (90%)	232 (99%)	3 (1%)	0	100	100
1	D	234/261 (90%)	231 (99%)	3 (1%)	0	100	100
All	All	979/1044 (94%)	963 (98%)	16 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	224/225 (100%)	221 (99%)	3 (1%)	65	72
1	B	220/225 (98%)	216 (98%)	4 (2%)	54	60
1	C	209/225 (93%)	209 (100%)	0	100	100
1	D	208/225 (92%)	203 (98%)	5 (2%)	44	48
All	All	861/900 (96%)	849 (99%)	12 (1%)	62	69

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	77	SER
1	A	80	VAL
1	A	98	GLU
1	B	40	LYS
1	B	80	VAL
1	B	96	CYS
1	B	144	VAL
1	D	80	VAL
1	D	96	CYS
1	D	176	GLU
1	D	229	GLN
1	D	242	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (22) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	12	ASN
1	A	27	GLN
1	A	90	ASN
1	A	135	GLN
1	A	174	GLN
1	A	211	ASN
1	A	229	GLN
1	B	12	ASN
1	B	154	GLN
1	B	197	GLN
1	B	225	GLN
1	B	229	GLN
1	C	4	GLN
1	C	12	ASN
1	C	154	GLN
1	C	226	ASN
1	D	83	HIS
1	D	174	GLN
1	D	188	HIS
1	D	226	ASN
1	D	231	GLN
1	D	256	HIS

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 ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 7 ligands modelled in this entry, 2 are monoatomic - leaving 5 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	$\#\|Z\| > 2$
2	GCP	C	301	4	27,34,34	2.32	5 (18%)	35,54,54	2.95	14 (40%)
2	GCP	D	301	4	27,34,34	2.41	5 (18%)	35,54,54	2.31	6 (17%)
3	GOL	A	302	-	5,5,5	0.26	0	5,5,5	0.62	0
2	GCP	B	301	-	27,34,34	2.38	5 (18%)	35,54,54	2.34	9 (25%)
2	GCP	A	301	-	27,34,34	2.47	5 (18%)	35,54,54	2.45	7 (20%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	GCP	C	301	4	-	1/15/38/38	0/3/3/3
2	GCP	D	301	4	-	0/15/38/38	0/3/3/3
3	GOL	A	302	-	-	2/4/4/4	-
2	GCP	B	301	-	-	2/15/38/38	0/3/3/3
2	GCP	A	301	-	-	1/15/38/38	0/3/3/3

All (20) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	301	GCP	PB-O3A	10.34	1.69	1.58
2	B	301	GCP	PB-O3A	10.24	1.69	1.58
2	D	301	GCP	PB-O3A	10.09	1.69	1.58
2	C	301	GCP	PB-O3A	9.14	1.68	1.58
2	C	301	GCP	C6-N1	4.34	1.40	1.33
2	D	301	GCP	C6-N1	4.31	1.40	1.33
2	A	301	GCP	C6-N1	4.13	1.40	1.33
2	C	301	GCP	PA-O3A	4.05	1.63	1.59
2	B	301	GCP	C6-N1	4.00	1.39	1.33
2	A	301	GCP	PA-O3A	2.92	1.62	1.59
2	A	301	GCP	C8-N7	-2.69	1.29	1.34
2	A	301	GCP	PB-O2B	-2.54	1.50	1.56

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	301	GCP	PA-O3A	2.52	1.62	1.59
2	B	301	GCP	PA-O3A	2.35	1.62	1.59
2	D	301	GCP	C8-N7	-2.32	1.30	1.34
2	B	301	GCP	C8-N7	-2.31	1.30	1.34
2	C	301	GCP	C8-N7	-2.28	1.30	1.34
2	B	301	GCP	PB-O2B	-2.08	1.51	1.56
2	D	301	GCP	PB-O2B	-2.04	1.51	1.56
2	C	301	GCP	PB-O2B	-2.04	1.51	1.56

All (36) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	301	GCP	C5-C6-N1	-9.66	110.50	123.42
2	A	301	GCP	C5-C6-N1	-9.57	110.63	123.42
2	D	301	GCP	C5-C6-N1	-8.90	111.52	123.42
2	B	301	GCP	C5-C6-N1	-8.85	111.59	123.42
2	C	301	GCP	C2-N1-C6	7.68	126.64	115.96
2	A	301	GCP	C2-N1-C6	7.24	126.02	115.96
2	D	301	GCP	C2-N1-C6	6.93	125.60	115.96
2	B	301	GCP	C2-N1-C6	6.85	125.48	115.96
2	C	301	GCP	O2B-PB-C3B	-5.56	83.69	106.73
2	C	301	GCP	PB-O3A-PA	-3.99	119.34	132.37
2	C	301	GCP	O3G-PG-C3B	3.56	115.03	106.40
2	C	301	GCP	O4'-C1'-N9	3.38	113.22	108.75
2	C	301	GCP	N3-C2-N1	-3.35	122.96	127.21
2	D	301	GCP	N3-C2-N1	-3.33	122.98	127.21
2	C	301	GCP	O2G-PG-C3B	-3.22	98.58	106.40
2	A	301	GCP	O1G-PG-C3B	-3.07	104.67	111.37
2	B	301	GCP	N3-C2-N1	-3.01	123.38	127.21
2	A	301	GCP	N3-C2-N1	-2.99	123.41	127.21
2	B	301	GCP	O2B-PB-O1B	2.98	119.66	109.95
2	B	301	GCP	C4'-O4'-C1'	2.96	112.64	109.92
2	C	301	GCP	C2-N3-C4	-2.84	112.42	115.48
2	C	301	GCP	O2B-PB-O1B	2.60	118.40	109.95
2	A	301	GCP	C2-N3-C4	-2.59	112.70	115.48
2	C	301	GCP	O1B-PB-C3B	2.56	115.79	109.05
2	D	301	GCP	O2B-PB-O1B	2.52	118.17	109.95
2	A	301	GCP	O2B-PB-O1B	2.47	117.99	109.95
2	C	301	GCP	C1'-N9-C4	-2.37	122.48	126.64
2	D	301	GCP	O1G-PG-C3B	-2.34	106.26	111.37
2	C	301	GCP	N2-C2-N3	2.34	121.44	117.79
2	C	301	GCP	O1G-PG-C3B	-2.22	106.53	111.37

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	301	GCP	C4'-O4'-C1'	2.19	111.93	109.92
2	D	301	GCP	N2-C2-N3	2.14	121.13	117.79
2	B	301	GCP	C2'-C3'-C4'	2.07	106.61	102.61
2	B	301	GCP	C2-N3-C4	-2.07	113.26	115.48
2	B	301	GCP	O1G-PG-C3B	-2.05	106.91	111.37
2	B	301	GCP	C4-C5-C6	-2.00	118.17	121.23

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	301	GCP	PG-C3B-PB-O3A
3	A	302	GOL	C1-C2-C3-O3
3	A	302	GOL	O2-C2-C3-O3
2	B	301	GCP	PG-C3B-PB-O2B
2	A	301	GCP	PB-C3B-PG-O1G
2	B	301	GCP	PB-O3A-PA-O1A

There are no ring outliers.

4 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	301	GCP	7	0
3	A	302	GOL	1	0
2	B	301	GCP	1	0
2	A	301	GCP	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 then 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.

Ligand GCP C 301

Bond lengths

Bond angles

Torsions

Rings

Ligand GCP D 301

Bond lengths

Bond angles

Torsions

Rings

Ligand GCP B 301

Bond lengths

Bond angles

Torsions

Rings

Ligand GCP A 301

Bond lengths

Bond angles

Torsions

Rings
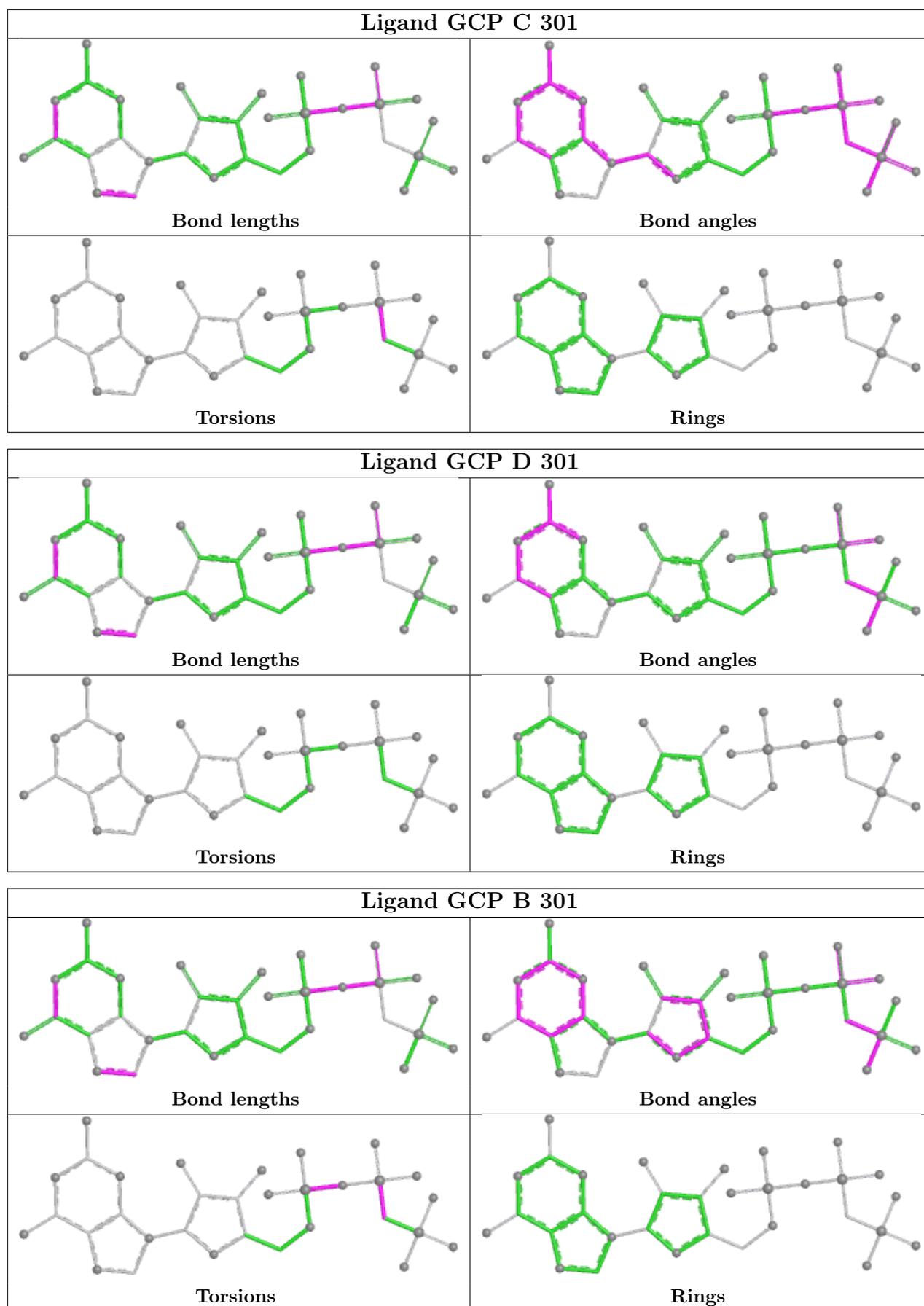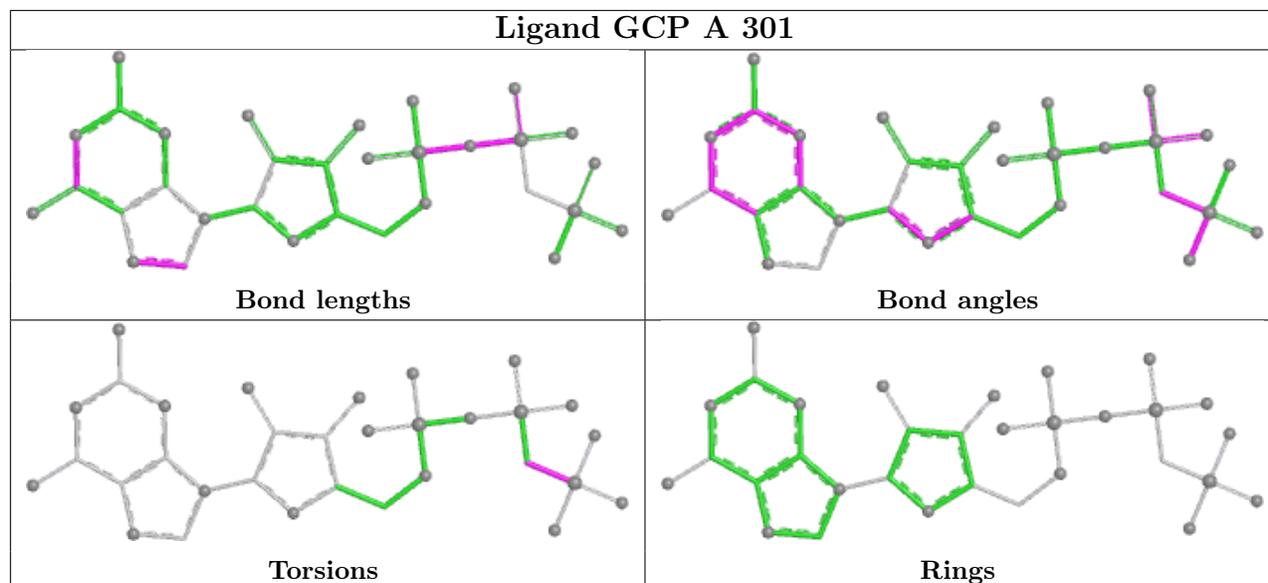
5.7 Other polymers ⓘ

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 ⓘ

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	260/261 (99%)	0.26	8 (3%)	51	54	32, 53, 90, 131	0
1	B	256/261 (98%)	0.56	16 (6%)	27	30	44, 69, 118, 141	0
1	C	241/261 (92%)	0.40	8 (3%)	49	52	39, 59, 107, 146	0
1	D	240/261 (91%)	0.62	13 (5%)	32	35	48, 65, 111, 134	0
All	All	997/1044 (95%)	0.46	45 (4%)	39	42	32, 62, 110, 146	0

All (45) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	71	ILE	4.8
1	C	219	LEU	3.4
1	C	260	THR	3.3
1	B	175	ILE	3.3
1	D	19	PHE	3.0
1	B	171	ALA	2.9
1	C	215	VAL	2.9
1	B	222	ALA	2.8
1	B	227	VAL	2.8
1	B	218	GLY	2.7
1	B	240	LEU	2.7
1	B	198	ALA	2.7
1	A	174	GLN	2.7
1	C	175	ILE	2.7
1	C	171	ALA	2.6
1	B	239	ASP	2.6
1	B	193	MET	2.6
1	D	260	THR	2.5
1	C	247	TYR	2.5
1	A	35	VAL	2.5
1	D	255	THR	2.5

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Mol	Chain	Res	Type	RSRZ
1	B	178	HIS	2.4
1	D	24	GLY	2.4
1	A	67	ASP	2.4
1	D	198	ALA	2.4
1	D	55	ASP	2.4
1	D	174	GLN	2.4
1	B	172	LEU	2.4
1	C	47	ALA	2.4
1	B	29	VAL	2.4
1	D	59	ILE	2.4
1	B	223	GLU	2.3
1	A	69	ASN	2.3
1	C	172	LEU	2.3
1	D	232	HIS	2.3
1	A	139	PHE	2.3
1	B	214	LEU	2.3
1	B	192	PRO	2.2
1	D	236	VAL	2.2
1	A	71	ILE	2.2
1	B	174	GLN	2.2
1	A	260	THR	2.2
1	A	70	SER	2.1
1	D	25	ALA	2.0
1	D	99	ARG	2.0

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

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

6.3 Carbohydrates ⓘ

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($\mathrm{\AA}^2$)	Q<0.9
2	GCP	B	301	32/32	0.82	0.12	72,84,153,173	0
2	GCP	A	301	32/32	0.89	0.10	56,69,128,139	0
2	GCP	C	301	32/32	0.94	0.08	48,53,63,76	0
3	GOL	A	302	6/6	0.94	0.09	46,48,55,63	0
2	GCP	D	301	32/32	0.96	0.07	61,65,73,84	0
4	MG	C	302	1/1	0.99	0.03	50,50,50,50	0
4	MG	D	302	1/1	0.99	0.02	66,66,66,66	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.
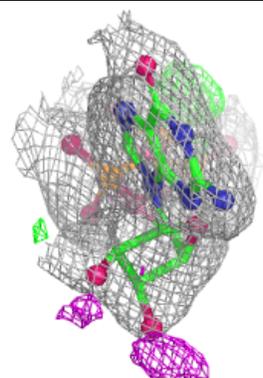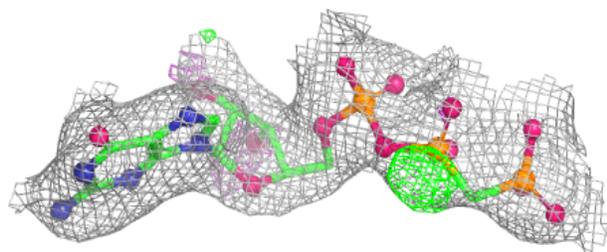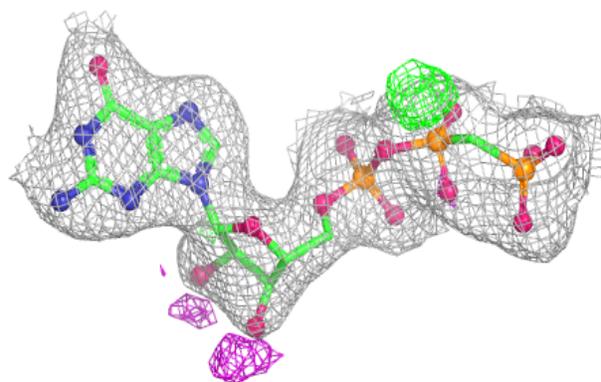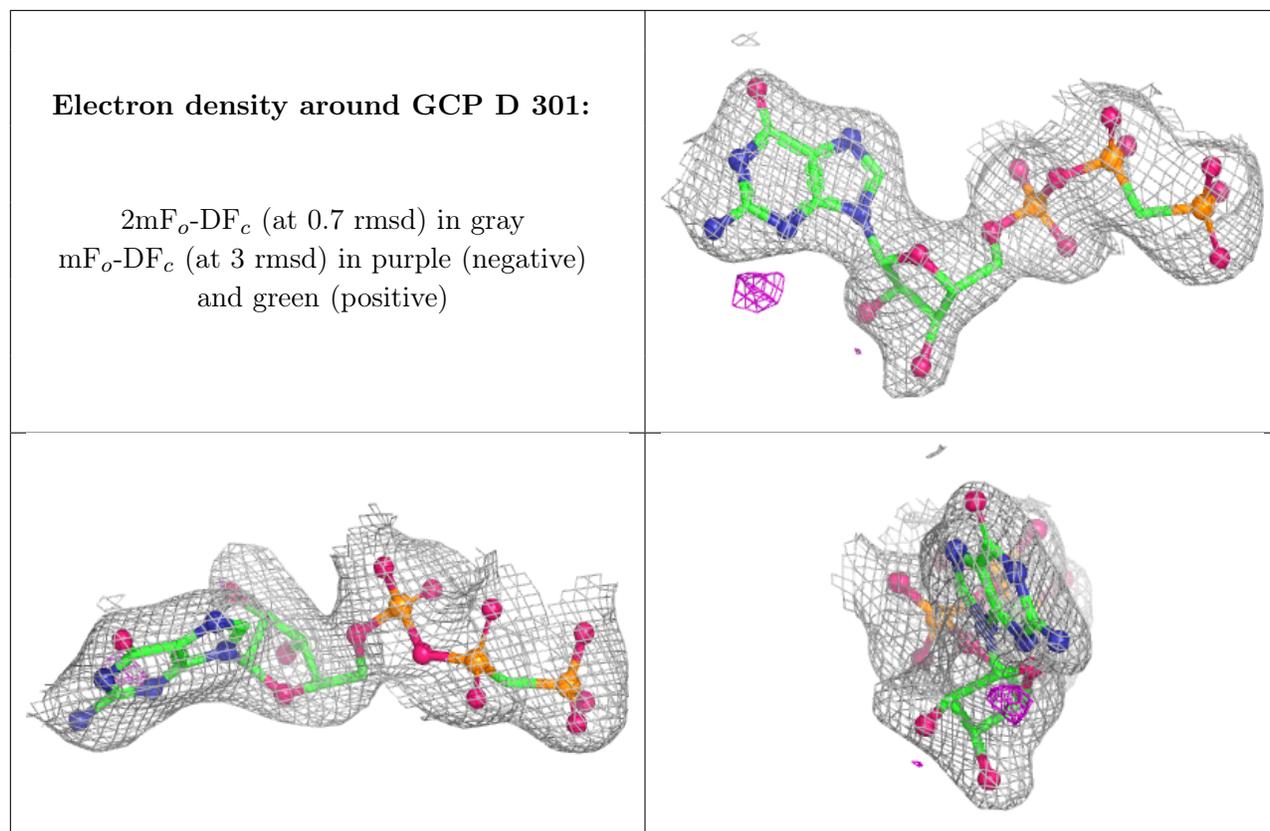

Electron density around GCP B 301:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative) and green (positive)
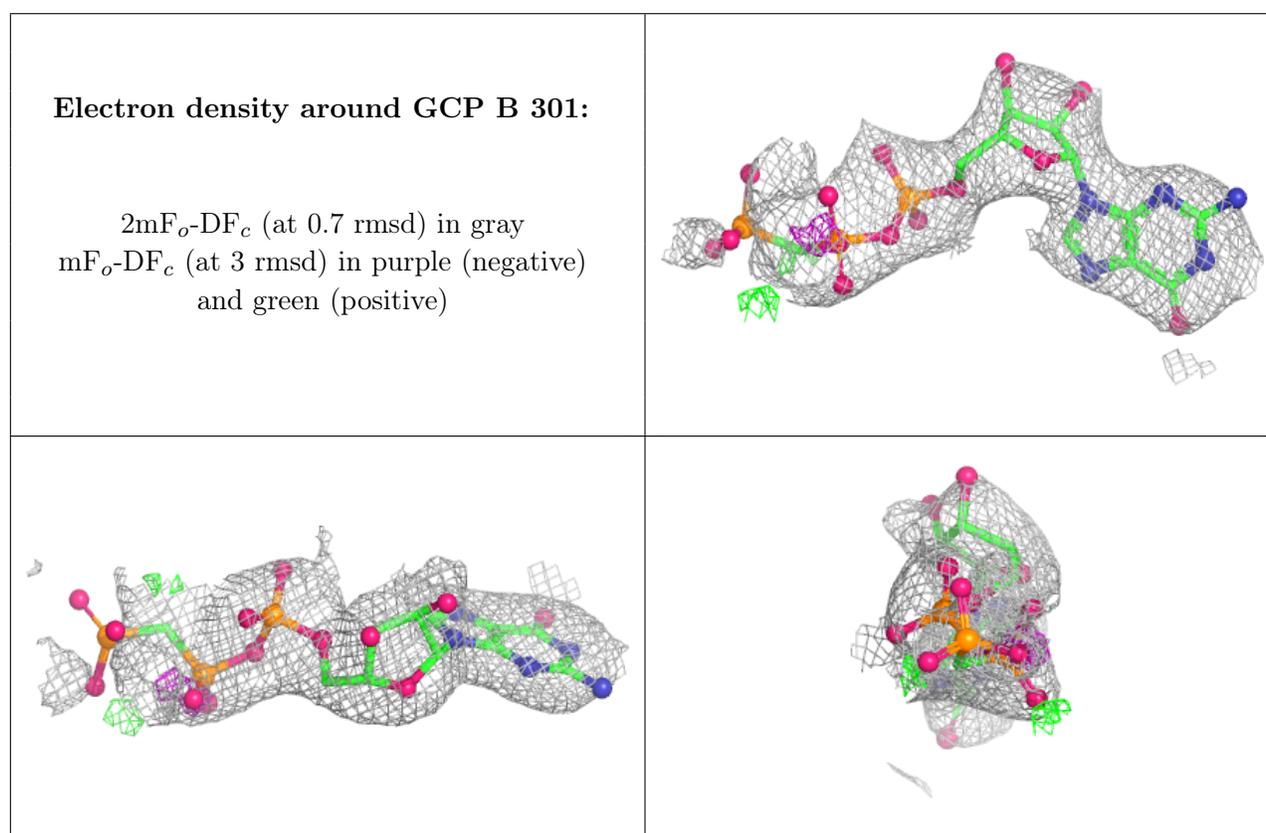
Electron density around GCP A 301:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
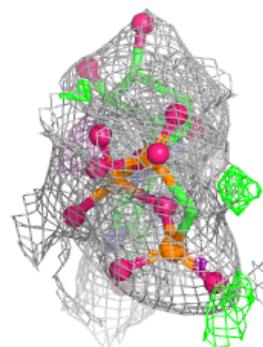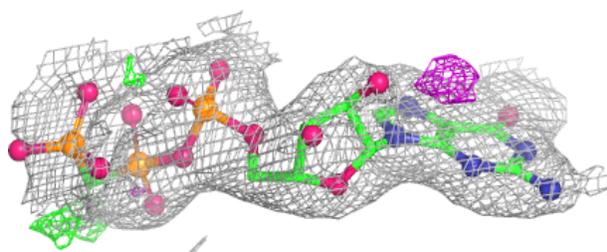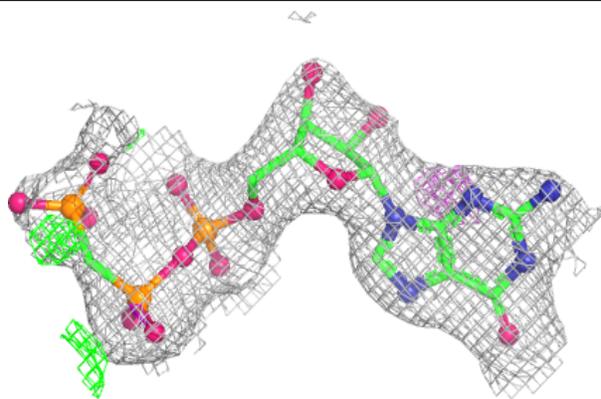
Electron density around GCP C 301:

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

Electron density around GCP D 301:

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

6.5   Other polymers ⓘ

There are no such residues in this entry.