



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 25, 2026 – 05:03 PM EDT

PDB ID : 3GEI / pdb_00003gei
Title : Crystal structure of MnmE from *Chlorobium tepidum* in complex with GCP
Authors : Meyer, S.; Wittinghofer, A.
Deposited on : 2009-02-25
Resolution : 3.40 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

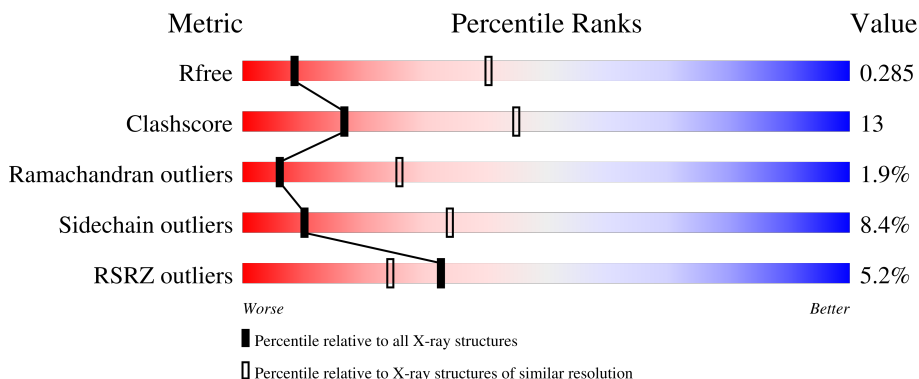
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.40 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	1001 (3.44-3.36)
Clashscore	190562	1022 (3.44-3.36)
Ramachandran outliers	187476	1012 (3.44-3.36)
Sidechain outliers	187428	1012 (3.44-3.36)
RSRZ outliers	180081	1001 (3.44-3.36)

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	476	
1	B	476	
1	C	476	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 8780 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.

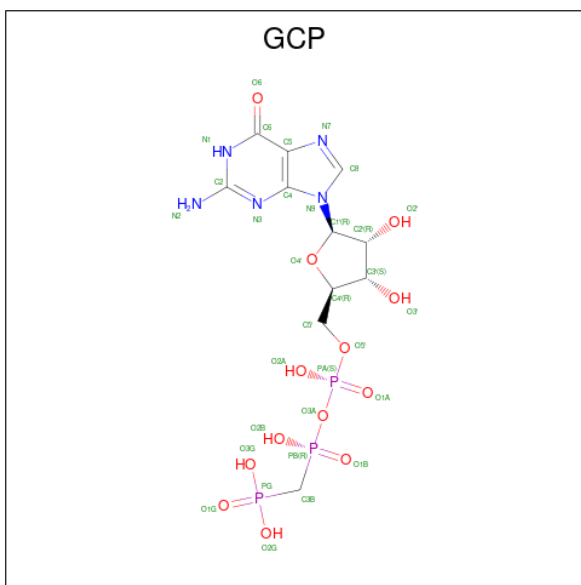
- Molecule 1 is a protein called tRNA modification GTPase mnmE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	428	Total	C	N	O	S	0	0	0
			3239	2027	576	621	15			
1	B	424	Total	C	N	O	S	0	0	0
			3212	2012	571	614	15			
1	C	298	Total	C	N	O	S	0	0	0
			2264	1417	409	428	10			

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	GLY	-	expression tag	UNP Q8KAS1
A	-1	SER	-	expression tag	UNP Q8KAS1
A	0	HIS	-	expression tag	UNP Q8KAS1
B	-2	GLY	-	expression tag	UNP Q8KAS1
B	-1	SER	-	expression tag	UNP Q8KAS1
B	0	HIS	-	expression tag	UNP Q8KAS1
C	-2	GLY	-	expression tag	UNP Q8KAS1
C	-1	SER	-	expression tag	UNP Q8KAS1
C	0	HIS	-	expression tag	UNP Q8KAS1

- 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 32	C 11	N 5	O 13	P 3	0	0
2	B	1	Total 32	C 11	N 5	O 13	P 3	0	0

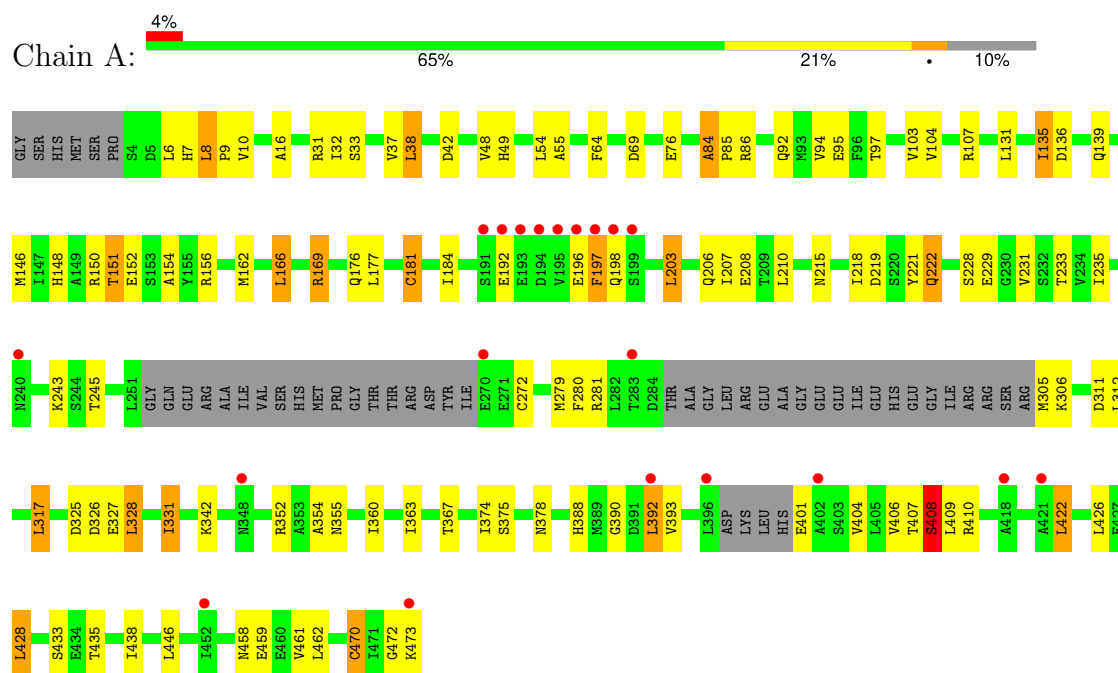
- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total Mg 1 1	0	0

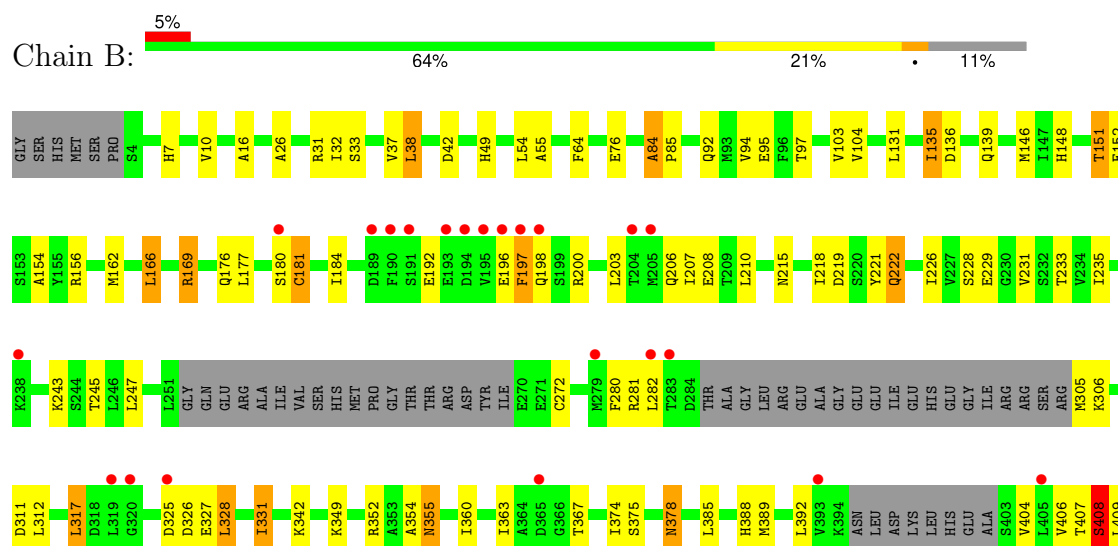
3 Residue-property plots

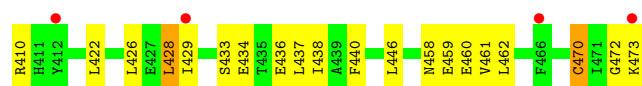
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: tRNA modification GTPase mmmE

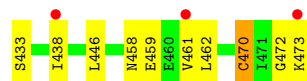
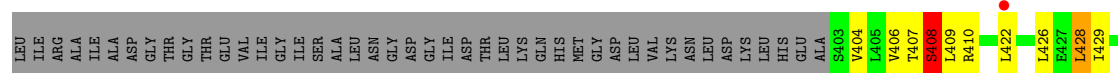
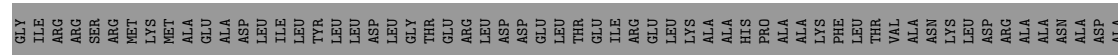
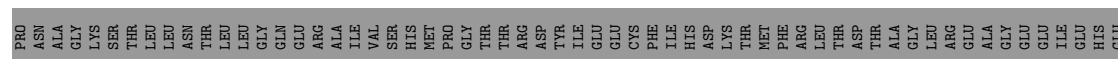
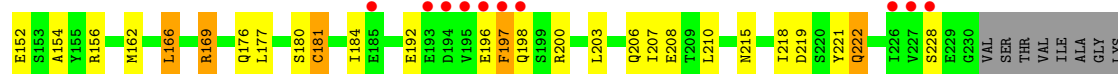


• Molecule 1: tRNA modification GTPase mmmE





- Molecule 1: tRNA modification GTPase mnmE



4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	139.88Å 224.57Å 156.79Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.94 – 3.40 19.94 – 3.40	Depositor EDS
% Data completeness (in resolution range)	99.2 (19.94-3.40) 99.2 (19.94-3.40)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	0.13	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.82 (at 3.44Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.245 , 0.269 0.279 , 0.285	Depositor DCC
R_{free} test set	1721 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å ²)	115.9	Xtriage
Anisotropy	0.104	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 50.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.28$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	8780	wwPDB-VP
Average B, all atoms (Å ²)	124.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.82% 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: GCP, 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	0.62	4/3276 (0.1%)	0.94	9/4423 (0.2%)
1	B	0.59	6/3249 (0.2%)	0.92	7/4386 (0.2%)
1	C	0.51	1/2294 (0.0%)	0.90	2/3099 (0.1%)
All	All	0.58	11/8819 (0.1%)	0.92	18/11908 (0.2%)

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	92	GLN	CD-OE1	5.61	1.34	1.23
1	C	92	GLN	CD-OE1	5.54	1.34	1.23
1	A	92	GLN	CD-OE1	5.37	1.33	1.23
1	B	388	HIS	ND1-CE1	5.32	1.37	1.32
1	A	355	ASN	CG-OD1	5.31	1.33	1.23
1	A	7	HIS	ND1-CE1	5.29	1.37	1.32
1	B	7	HIS	ND1-CE1	5.28	1.37	1.32
1	B	355	ASN	CG-OD1	5.26	1.33	1.23
1	A	388	HIS	ND1-CE1	5.20	1.37	1.32
1	B	378	ASN	CG-OD1	5.05	1.33	1.23
1	B	355	ASN	CG-ND2	-5.02	1.22	1.33

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	460	GLU	N-CA-C	-9.02	104.34	114.62
1	B	410	ARG	N-CA-C	-6.74	96.44	110.80
1	A	410	ARG	N-CA-C	-6.71	96.52	110.80
1	B	388	HIS	CB-CG-CD2	-6.65	122.55	131.20
1	A	388	HIS	CB-CG-CD2	-6.62	122.59	131.20
1	A	7	HIS	CB-CG-CD2	-6.48	122.77	131.20
1	B	7	HIS	CB-CG-CD2	-6.39	122.89	131.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	410	ARG	N-CA-C	-6.39	97.19	110.80
1	A	48	VAL	N-CA-C	5.92	116.09	110.53
1	B	408	SER	N-CA-C	5.74	123.03	110.80
1	A	8	LEU	CA-C-N	5.74	126.03	119.83
1	A	8	LEU	C-N-CA	5.74	126.03	119.83
1	A	408	SER	N-CA-C	5.73	123.00	110.80
1	B	388	HIS	CB-CG-ND1	5.68	131.22	122.70
1	A	388	HIS	CB-CG-ND1	5.62	131.13	122.70
1	B	7	HIS	CB-CG-ND1	5.60	131.10	122.70
1	A	7	HIS	CB-CG-ND1	5.60	131.10	122.70
1	C	408	SER	N-CA-C	5.46	122.43	110.80

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	3239	0	3248	87	0
1	B	3212	0	3230	89	0
1	C	2264	0	2257	59	0
2	A	32	0	14	1	0
2	B	32	0	14	2	0
3	A	1	0	0	0	0
All	All	8780	0	8763	224	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 13.

All (224) 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:A:407:THR:HG22	1:A:408:SER:H	1.27	0.96
1:B:407:THR:HG22	1:B:408:SER:H	1.28	0.96
1:B:31:ARG:HH22	1:B:473:LYS:HD2	1.31	0.96

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:272:CYS:HB2	1:B:280:PHE:O	1.65	0.95
1:C:407:THR:HG22	1:C:408:SER:H	1.32	0.93
1:C:31:ARG:HH22	1:C:473:LYS:HD2	1.28	0.93
1:B:169:ARG:HH21	1:B:169:ARG:HG3	1.35	0.90
1:A:272:CYS:HB2	1:A:280:PHE:O	1.71	0.90
1:A:228:SER:HB2	1:A:407:THR:HG23	1.50	0.90
1:A:31:ARG:HH22	1:A:473:LYS:HD2	1.35	0.89
1:C:228:SER:HB2	1:C:407:THR:HG23	1.54	0.89
1:B:228:SER:HB2	1:B:407:THR:HG23	1.53	0.88
1:A:342:LYS:HB2	1:A:392:LEU:HD22	1.55	0.88
1:A:428:LEU:HD23	1:A:433:SER:HB2	1.55	0.88
1:C:169:ARG:HH21	1:C:169:ARG:HG3	1.37	0.88
1:C:428:LEU:HD23	1:C:433:SER:HB2	1.55	0.87
1:A:169:ARG:HG3	1:A:169:ARG:HH21	1.39	0.87
1:B:428:LEU:HD23	1:B:433:SER:HB2	1.56	0.86
1:B:31:ARG:HH22	1:B:473:LYS:CD	1.89	0.85
1:A:31:ARG:HH22	1:A:473:LYS:CD	1.88	0.85
1:A:86:ARG:HG2	1:B:436:GLU:OE1	1.79	0.83
1:C:31:ARG:HH22	1:C:473:LYS:CD	1.91	0.83
1:C:184:ILE:HD13	1:C:438:ILE:HG22	1.60	0.83
1:B:184:ILE:HD13	1:B:438:ILE:HG22	1.60	0.83
1:A:184:ILE:HD13	1:A:438:ILE:HG22	1.62	0.80
1:A:229:GLU:HB2	1:A:281:ARG:HH21	1.49	0.77
1:A:407:THR:HG22	1:A:408:SER:N	2.01	0.76
1:B:31:ARG:NH2	1:B:473:LYS:HD2	2.05	0.72
1:C:31:ARG:NH2	1:C:473:LYS:HD2	2.02	0.72
1:B:407:THR:HG22	1:B:408:SER:N	2.03	0.71
1:C:407:THR:HG22	1:C:408:SER:N	2.07	0.70
1:B:31:ARG:NH2	1:B:473:LYS:CD	2.53	0.70
1:C:472:GLY:O	1:C:473:LYS:HB3	1.91	0.70
1:A:31:ARG:NH2	1:A:473:LYS:CD	2.55	0.69
1:A:472:GLY:O	1:A:473:LYS:HB3	1.93	0.69
1:C:31:ARG:NH2	1:C:473:LYS:CD	2.55	0.69
1:C:135:ILE:HG13	1:C:139:GLN:HB2	1.76	0.68
1:B:84:ALA:CB	1:B:85:PRO:CD	2.71	0.68
1:A:84:ALA:CB	1:A:85:PRO:CD	2.73	0.67
1:B:233:THR:HG22	1:B:312:LEU:HB3	1.75	0.67
1:C:84:ALA:CB	1:C:85:PRO:CD	2.72	0.67
1:A:407:THR:CG2	1:A:408:SER:H	2.05	0.67
1:B:84:ALA:HB3	1:B:85:PRO:CD	2.24	0.67
1:B:407:THR:CG2	1:B:408:SER:H	2.06	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:84:ALA:HB3	1:A:85:PRO:CD	2.24	0.66
1:A:135:ILE:HG13	1:A:139:GLN:HB2	1.76	0.66
1:C:84:ALA:HB3	1:C:85:PRO:CD	2.25	0.65
1:B:135:ILE:HG13	1:B:139:GLN:HB2	1.77	0.65
1:C:176:GLN:HB3	1:C:210:LEU:HD11	1.79	0.64
1:B:472:GLY:O	1:B:473:LYS:HB3	1.97	0.64
1:B:84:ALA:CB	1:B:85:PRO:HD3	2.28	0.63
1:B:38:LEU:HD13	1:B:55:ALA:HA	1.81	0.63
1:A:176:GLN:HB3	1:A:210:LEU:HD11	1.81	0.63
1:C:407:THR:CG2	1:C:408:SER:H	2.09	0.62
1:A:342:LYS:HD2	1:A:392:LEU:CB	2.30	0.62
1:B:428:LEU:CD2	1:B:433:SER:HB2	2.28	0.62
1:C:38:LEU:HD13	1:C:55:ALA:HA	1.81	0.62
1:A:428:LEU:CD2	1:A:433:SER:HB2	2.26	0.62
1:C:84:ALA:CB	1:C:85:PRO:HD3	2.29	0.61
1:A:38:LEU:HD13	1:A:55:ALA:HA	1.82	0.61
1:B:176:GLN:HB3	1:B:210:LEU:HD11	1.82	0.61
1:C:428:LEU:CD2	1:C:433:SER:HB2	2.29	0.60
1:A:342:LYS:HB2	1:A:392:LEU:CD2	2.31	0.60
1:A:228:SER:CB	1:A:407:THR:HG23	2.29	0.60
1:B:169:ARG:HH21	1:B:169:ARG:CG	2.13	0.60
1:A:84:ALA:CB	1:A:85:PRO:HD3	2.32	0.59
1:A:16:ALA:HB2	1:A:32:ILE:HG22	1.84	0.59
1:A:233:THR:HG22	1:A:312:LEU:HB3	1.86	0.58
1:A:31:ARG:NH2	1:A:473:LYS:HD3	2.18	0.58
1:B:16:ALA:HB2	1:B:32:ILE:HG22	1.86	0.57
1:B:228:SER:CB	1:B:407:THR:HG23	2.31	0.57
1:B:31:ARG:HH21	1:B:473:LYS:HB3	1.68	0.57
1:A:31:ARG:HH21	1:A:473:LYS:HB3	1.69	0.57
1:A:31:ARG:NH2	1:A:473:LYS:HD2	2.11	0.57
1:A:31:ARG:HH22	1:A:473:LYS:HD3	1.70	0.57
1:C:228:SER:CB	1:C:407:THR:HG23	2.33	0.56
1:B:26:ALA:HB1	1:C:473:LYS:HD3	1.87	0.56
1:C:31:ARG:HH21	1:C:473:LYS:HB3	1.71	0.56
1:C:16:ALA:HB2	1:C:32:ILE:HG22	1.88	0.56
1:A:16:ALA:CB	1:A:32:ILE:HG22	2.36	0.55
1:A:221:TYR:HE2	1:A:408:SER:HA	1.71	0.55
1:A:9:PRO:HD3	1:B:440:PHE:HE1	1.72	0.54
1:A:231:VAL:HG13	1:A:311:ASP:HB2	1.89	0.54
1:B:16:ALA:CB	1:B:32:ILE:HG22	2.37	0.54
1:C:135:ILE:HG13	1:C:139:GLN:CB	2.37	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:409:LEU:HD12	1:A:409:LEU:O	2.07	0.54
1:B:31:ARG:NH2	1:B:473:LYS:HD3	2.22	0.53
1:B:206:GLN:O	1:B:210:LEU:HD13	2.08	0.53
1:A:42:ASP:OD1	1:A:54:LEU:HB2	2.08	0.53
1:A:169:ARG:HG3	1:A:169:ARG:NH2	2.16	0.53
1:B:84:ALA:HB1	1:B:85:PRO:HD3	1.91	0.53
1:A:325:ASP:C	1:A:327:GLU:H	2.16	0.53
1:B:169:ARG:HG3	1:B:169:ARG:NH2	2.12	0.53
1:C:409:LEU:HD12	1:C:409:LEU:O	2.09	0.52
1:C:221:TYR:HE2	1:C:408:SER:HA	1.74	0.52
1:A:342:LYS:HD2	1:A:392:LEU:HB2	1.90	0.52
1:C:16:ALA:CB	1:C:32:ILE:HG22	2.39	0.52
1:B:135:ILE:HG13	1:B:139:GLN:CB	2.39	0.52
1:C:84:ALA:HB1	1:C:85:PRO:HD3	1.91	0.52
1:B:64:PHE:HZ	1:B:76:GLU:OE2	1.93	0.51
1:A:342:LYS:HD2	1:A:392:LEU:HB3	1.92	0.51
1:C:203:LEU:O	1:C:207:ILE:HG12	2.10	0.51
1:B:177:LEU:O	1:B:181:CYS:HB2	2.10	0.51
1:C:64:PHE:HZ	1:C:76:GLU:OE2	1.93	0.51
1:A:203:LEU:O	1:A:207:ILE:HG12	2.10	0.51
1:A:206:GLN:O	1:A:210:LEU:HD13	2.11	0.51
1:B:473:LYS:HD3	1:C:26:ALA:HB1	1.93	0.51
1:A:150:ARG:HB2	1:A:279:MET:HE2	1.93	0.51
1:C:151:THR:HB	1:C:154:ALA:H	1.75	0.51
1:A:169:ARG:HH21	1:A:169:ARG:CG	2.18	0.51
1:A:151:THR:HB	1:A:154:ALA:H	1.76	0.51
1:A:229:GLU:CB	1:A:281:ARG:HH21	2.22	0.51
1:B:151:THR:HB	1:B:154:ALA:H	1.74	0.51
1:B:472:GLY:O	1:C:26:ALA:HB2	2.11	0.51
1:C:177:LEU:O	1:C:181:CYS:HB2	2.11	0.51
1:B:328:LEU:HA	1:B:331:ILE:HG23	1.92	0.51
1:C:169:ARG:HG3	1:C:169:ARG:NH2	2.13	0.50
1:B:203:LEU:O	1:B:207:ILE:HG12	2.12	0.50
1:A:135:ILE:HG13	1:A:139:GLN:CB	2.40	0.50
1:B:325:ASP:C	1:B:327:GLU:H	2.19	0.50
1:C:206:GLN:O	1:C:210:LEU:HD13	2.12	0.50
1:B:409:LEU:HD12	1:B:409:LEU:O	2.12	0.50
1:A:375:SER:HB3	1:A:378:ASN:HB3	1.94	0.50
1:A:207:ILE:HB	1:A:426:LEU:HD13	1.93	0.49
1:B:169:ARG:CG	1:B:169:ARG:NH2	2.75	0.49
1:C:42:ASP:OD1	1:C:54:LEU:HB2	2.11	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:207:ILE:HB	1:C:426:LEU:HD13	1.94	0.49
1:A:84:ALA:HB3	1:A:85:PRO:HD2	1.91	0.49
1:B:84:ALA:HB3	1:B:85:PRO:HD2	1.93	0.49
1:A:328:LEU:HA	1:A:331:ILE:HG23	1.93	0.49
1:B:42:ASP:OD1	1:B:54:LEU:HB2	2.13	0.49
1:C:84:ALA:HB3	1:C:85:PRO:HD2	1.95	0.49
1:B:156:ARG:NH1	1:C:73:MET:O	2.35	0.48
1:A:84:ALA:HB1	1:A:85:PRO:HD3	1.95	0.48
1:A:317:LEU:HD21	1:A:363:ILE:HD13	1.96	0.48
1:A:272:CYS:CB	1:A:281:ARG:HA	2.43	0.47
1:B:226:ILE:HG21	1:B:231:VAL:HG22	1.96	0.47
1:B:375:SER:HB3	1:B:378:ASN:HB3	1.96	0.47
1:B:328:LEU:HB2	1:B:367:THR:CG2	2.44	0.47
1:A:6:LEU:CD2	1:B:437:LEU:HD22	2.45	0.47
1:A:6:LEU:HD21	1:B:428:LEU:HD11	1.96	0.47
1:A:177:LEU:O	1:A:181:CYS:HB2	2.14	0.47
1:B:312:LEU:HD13	1:B:342:LYS:HD3	1.95	0.47
1:B:31:ARG:HB2	1:B:95:GLU:HG2	1.97	0.47
1:B:226:ILE:CG2	1:B:231:VAL:HG22	2.44	0.47
1:B:272:CYS:CB	1:B:281:ARG:HA	2.44	0.47
1:C:31:ARG:NH2	1:C:473:LYS:HD3	2.29	0.47
1:B:207:ILE:HB	1:B:426:LEU:HD13	1.95	0.47
1:B:458:ASN:HB3	1:B:461:VAL:HB	1.97	0.47
1:B:226:ILE:CG2	1:B:231:VAL:CG2	2.93	0.47
1:B:317:LEU:HD21	1:B:363:ILE:HD13	1.96	0.47
1:B:177:LEU:HD13	1:B:446:LEU:HA	1.98	0.46
1:C:458:ASN:HB3	1:C:461:VAL:HB	1.97	0.46
1:B:146:MET:HE1	1:B:162:MET:SD	2.55	0.46
1:B:200:ARG:HH11	1:B:429:ILE:HG23	1.78	0.46
1:B:226:ILE:HG23	1:B:231:VAL:CG2	2.45	0.46
1:A:215:ASN:HA	1:A:218:ILE:HD12	1.98	0.46
1:A:328:LEU:HB2	1:A:367:THR:CG2	2.45	0.46
1:B:385:LEU:HG	1:B:389:MET:HE2	1.98	0.46
1:B:231:VAL:HG13	1:B:311:ASP:HB2	1.97	0.45
1:A:146:MET:HE1	1:A:162:MET:SD	2.57	0.45
1:B:148:HIS:NE2	1:B:470:CYS:SG	2.88	0.45
1:C:208:GLU:HG3	1:C:426:LEU:HD11	1.99	0.45
1:A:64:PHE:HZ	1:A:76:GLU:OE2	1.97	0.45
1:A:312:LEU:HD13	1:A:342:LYS:HD3	1.98	0.45
1:B:166:LEU:HD11	1:B:406:VAL:HG12	1.98	0.45
1:B:349:LYS:HG2	2:B:474:GCP:C5	2.46	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:177:LEU:HD13	1:C:446:LEU:HA	1.98	0.45
1:B:221:TYR:HE2	1:B:408:SER:HA	1.81	0.45
1:A:169:ARG:NH2	1:A:169:ARG:CG	2.79	0.45
2:A:474:GCP:H8	2:A:474:GCP:H5'2	1.99	0.45
1:A:136:ASP:C	1:A:136:ASP:OD1	2.59	0.44
1:A:166:LEU:HD11	1:A:406:VAL:HG12	1.99	0.44
1:A:177:LEU:HD13	1:A:446:LEU:HA	2.00	0.44
1:B:26:ALA:HB2	1:C:472:GLY:O	2.18	0.44
1:B:136:ASP:OD1	1:B:136:ASP:C	2.60	0.44
1:A:6:LEU:HD22	1:B:437:LEU:HD22	1.99	0.44
1:A:458:ASN:HB3	1:A:461:VAL:HB	1.98	0.44
1:B:215:ASN:HA	1:B:218:ILE:HD12	2.00	0.44
1:A:435:THR:HG23	1:C:49:HIS:HD2	1.82	0.44
1:B:349:LYS:HG2	2:B:474:GCP:C6	2.47	0.44
1:B:355:ASN:OD1	1:B:355:ASN:N	2.51	0.43
1:C:146:MET:HE1	1:C:162:MET:SD	2.57	0.43
1:A:208:GLU:HG3	1:A:426:LEU:HD11	2.00	0.43
1:B:184:ILE:HD13	1:B:438:ILE:CG2	2.39	0.43
1:B:196:GLU:O	1:B:197:PHE:C	2.61	0.43
1:B:208:GLU:HG3	1:B:426:LEU:HD11	1.99	0.43
1:C:152:GLU:O	1:C:156:ARG:HG2	2.17	0.43
1:C:200:ARG:HH11	1:C:429:ILE:HG23	1.83	0.43
1:C:166:LEU:HD11	1:C:406:VAL:HG12	2.00	0.43
1:C:136:ASP:C	1:C:136:ASP:OD1	2.61	0.42
1:A:272:CYS:HB3	1:A:281:ARG:HA	2.01	0.42
1:B:247:LEU:HG	1:B:282:LEU:HD23	2.01	0.42
1:B:272:CYS:HB3	1:B:281:ARG:HA	2.01	0.42
1:C:148:HIS:NE2	1:C:470:CYS:SG	2.93	0.42
1:C:215:ASN:HA	1:C:218:ILE:HD12	2.01	0.42
1:A:31:ARG:HB2	1:A:95:GLU:HG2	2.02	0.42
1:A:33:SER:C	1:A:37:VAL:HG21	2.45	0.42
1:A:459:GLU:HA	1:A:462:LEU:HB2	2.01	0.42
1:A:235:ILE:HG22	1:A:243:LYS:HG2	2.02	0.42
1:A:69:ASP:CG	1:A:107:ARG:HH22	2.28	0.41
1:A:196:GLU:O	1:A:197:PHE:C	2.62	0.41
1:B:33:SER:C	1:B:37:VAL:HG21	2.45	0.41
1:B:219:ASP:O	1:B:222:GLN:HB3	2.20	0.41
1:B:226:ILE:HG23	1:B:231:VAL:HG23	2.02	0.41
1:C:219:ASP:O	1:C:222:GLN:HB3	2.21	0.41
1:A:148:HIS:NE2	1:A:470:CYS:SG	2.93	0.41
1:C:196:GLU:O	1:C:197:PHE:C	2.63	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:152:GLU:O	1:B:156:ARG:HG2	2.20	0.41
1:A:210:LEU:HB3	1:A:422:LEU:HD21	2.03	0.41
1:C:33:SER:C	1:C:37:VAL:HG21	2.45	0.41
1:A:152:GLU:O	1:A:156:ARG:HG2	2.21	0.41
1:B:229:GLU:HB2	1:B:281:ARG:HH21	1.86	0.41
1:B:235:ILE:HG22	1:B:243:LYS:HG2	2.03	0.41
1:A:86:ARG:NH1	1:B:434:GLU:HG2	2.36	0.41
1:A:184:ILE:HD13	1:A:438:ILE:CG2	2.44	0.41
1:C:31:ARG:HB2	1:C:95:GLU:HG2	2.03	0.41
1:A:390:GLY:HA2	1:A:393:VAL:CG2	2.51	0.40
1:C:38:LEU:HD21	1:C:83:ARG:NH1	2.36	0.40
1:C:459:GLU:HA	1:C:462:LEU:HB2	2.03	0.40
1:A:219:ASP:O	1:A:222:GLN:HB3	2.20	0.40
1:A:325:ASP:C	1:A:327:GLU:N	2.79	0.40
1:A:390:GLY:HA2	1:A:393:VAL:HG22	2.04	0.40
1:B:459:GLU:HA	1:B:462:LEU:HB2	2.02	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	420/476 (88%)	384 (91%)	28 (7%)	8 (2%)	6	26
1	B	416/476 (87%)	383 (92%)	25 (6%)	8 (2%)	6	26
1	C	294/476 (62%)	270 (92%)	18 (6%)	6 (2%)	6	25
All	All	1130/1428 (79%)	1037 (92%)	71 (6%)	22 (2%)	6	26

All (22) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	84	ALA

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Mol	Chain	Res	Type
1	A	192	GLU
1	B	84	ALA
1	B	192	GLU
1	B	408	SER
1	C	84	ALA
1	C	192	GLU
1	A	198	GLN
1	A	354	ALA
1	A	408	SER
1	C	408	SER
1	A	49	HIS
1	B	49	HIS
1	B	198	GLN
1	B	354	ALA
1	C	49	HIS
1	C	198	GLN
1	A	197	PHE
1	A	326	ASP
1	B	326	ASP
1	B	197	PHE
1	C	197	PHE

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	336/386 (87%)	306 (91%)	30 (9%)	9	31
1	B	334/386 (86%)	306 (92%)	28 (8%)	10	34
1	C	234/386 (61%)	216 (92%)	18 (8%)	12	37
All	All	904/1158 (78%)	828 (92%)	76 (8%)	10	34

All (76) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	8	LEU

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Mol	Chain	Res	Type
1	A	10	VAL
1	A	38	LEU
1	A	94	VAL
1	A	97	THR
1	A	103	VAL
1	A	104	VAL
1	A	131	LEU
1	A	135	ILE
1	A	151	THR
1	A	166	LEU
1	A	169	ARG
1	A	181	CYS
1	A	203	LEU
1	A	222	GLN
1	A	245	THR
1	A	305	MET
1	A	306	LYS
1	A	317	LEU
1	A	328	LEU
1	A	331	ILE
1	A	352	ARG
1	A	360	ILE
1	A	374	ILE
1	A	392	LEU
1	A	401	GLU
1	A	404	VAL
1	A	422	LEU
1	A	428	LEU
1	A	470	CYS
1	B	10	VAL
1	B	38	LEU
1	B	94	VAL
1	B	97	THR
1	B	103	VAL
1	B	104	VAL
1	B	131	LEU
1	B	135	ILE
1	B	151	THR
1	B	166	LEU
1	B	169	ARG
1	B	180	SER
1	B	181	CYS

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Mol	Chain	Res	Type
1	B	222	GLN
1	B	245	THR
1	B	305	MET
1	B	306	LYS
1	B	317	LEU
1	B	328	LEU
1	B	331	ILE
1	B	352	ARG
1	B	360	ILE
1	B	374	ILE
1	B	392	LEU
1	B	404	VAL
1	B	422	LEU
1	B	428	LEU
1	B	470	CYS
1	C	10	VAL
1	C	38	LEU
1	C	94	VAL
1	C	97	THR
1	C	103	VAL
1	C	104	VAL
1	C	131	LEU
1	C	135	ILE
1	C	151	THR
1	C	166	LEU
1	C	169	ARG
1	C	180	SER
1	C	181	CYS
1	C	222	GLN
1	C	404	VAL
1	C	422	LEU
1	C	428	LEU
1	C	470	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	92	GLN
1	A	115	ASN
1	A	388	HIS
1	B	92	GLN
1	B	115	ASN

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Mol	Chain	Res	Type
1	B	388	HIS
1	C	92	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 3 ligands modelled in this entry, 1 is monoatomic - leaving 2 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	A	474	3	32,34,34	1.35	6 (18%)	49,54,54	1.85	11 (22%)
2	GCP	B	474	-	32,34,34	1.39	5 (15%)	49,54,54	1.83	13 (26%)

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	A	474	3	-	3/19/38/38	0/3/3/3
2	GCP	B	474	-	-	1/19/38/38	0/3/3/3

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	474	GCP	PB-O3A	3.45	1.62	1.58
2	A	474	GCP	C5-C4	3.27	1.47	1.38
2	B	474	GCP	C5-C4	3.04	1.47	1.38
2	A	474	GCP	PB-O3A	2.73	1.61	1.58
2	B	474	GCP	C5-N7	-2.54	1.34	1.39
2	B	474	GCP	PA-O3A	2.51	1.62	1.59
2	B	474	GCP	C6-N1	-2.44	1.34	1.38
2	A	474	GCP	C6-N1	-2.35	1.34	1.38
2	A	474	GCP	PA-O3A	2.17	1.61	1.59
2	A	474	GCP	C5-N7	-2.13	1.34	1.39
2	A	474	GCP	PB-O2B	-2.13	1.51	1.56

All (24) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	474	GCP	C5-C4-N3	-6.31	118.35	128.39
2	B	474	GCP	C5-C4-N3	-6.22	118.50	128.39
2	B	474	GCP	C2-N3-C4	5.18	121.22	112.30
2	A	474	GCP	C2-N3-C4	5.16	121.19	112.30
2	B	474	GCP	N9-C4-N3	4.69	135.34	125.95
2	A	474	GCP	N9-C4-N3	4.59	135.12	125.95
2	A	474	GCP	C6-C5-N7	3.28	136.26	130.29
2	A	474	GCP	PB-O3A-PA	-2.88	122.97	132.37
2	B	474	GCP	C6-C5-N7	2.84	135.46	130.29
2	A	474	GCP	C4-C5-N7	-2.61	106.53	110.67
2	B	474	GCP	O1G-PG-C3B	-2.60	105.71	111.37
2	A	474	GCP	O2B-PB-O1B	2.48	118.02	109.95
2	B	474	GCP	O6-C6-C5	-2.41	120.16	126.53
2	B	474	GCP	O2B-PB-O1B	2.39	117.73	109.95
2	A	474	GCP	O1G-PG-C3B	-2.32	106.32	111.37
2	B	474	GCP	C3'-C2'-C1'	2.28	105.78	101.46
2	B	474	GCP	C2'-C3'-C4'	2.17	106.79	102.61
2	B	474	GCP	PB-O3A-PA	-2.16	125.33	132.37
2	B	474	GCP	C4-C5-N7	-2.15	107.26	110.67
2	A	474	GCP	C3'-C2'-C1'	2.08	105.39	101.46
2	B	474	GCP	O3G-PG-O2G	2.06	113.82	107.96
2	A	474	GCP	O3G-PG-O2G	2.03	113.76	107.96
2	A	474	GCP	C5-C6-N1	2.02	118.39	113.25
2	B	474	GCP	C5-C6-N1	2.01	118.36	113.25

There are no chirality outliers.

All (4) torsion outliers are listed below:

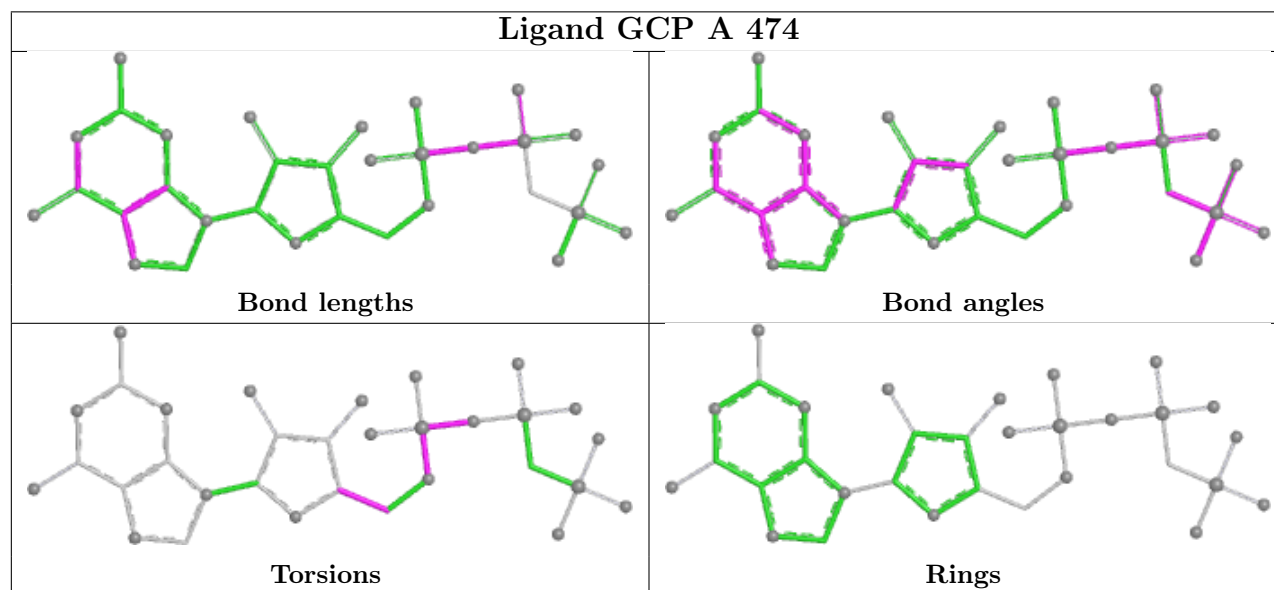
Mol	Chain	Res	Type	Atoms
2	A	474	GCP	C5'-O5'-PA-O1A
2	A	474	GCP	O4'-C4'-C5'-O5'
2	A	474	GCP	PB-O3A-PA-O2A
2	B	474	GCP	PG-C3B-PB-O1B

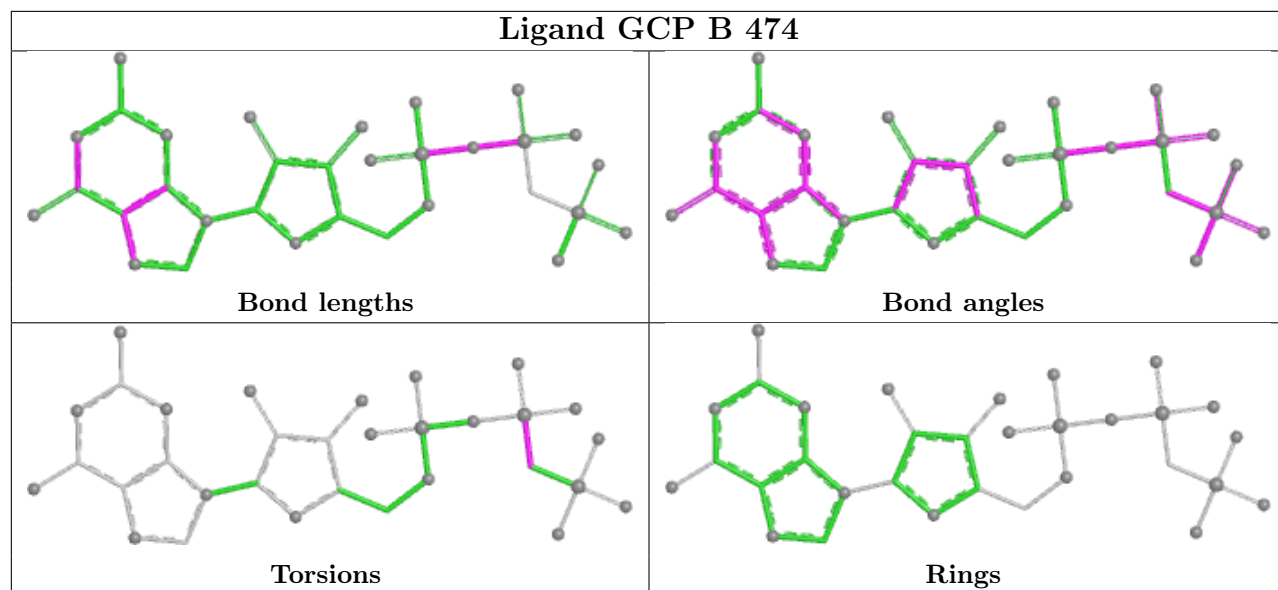
There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	474	GCP	1	0
2	B	474	GCP	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 [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	428/476 (89%)	0.58	20 (4%) 36 27	85, 124, 139, 146	0
1	B	424/476 (89%)	0.51	26 (6%) 27 21	85, 124, 137, 144	0
1	C	298/476 (62%)	0.42	14 (4%) 36 27	85, 123, 139, 144	0
All	All	1150/1428 (80%)	0.51	60 (5%) 33 24	85, 124, 139, 146	0

All (60) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	194	ASP	5.2
1	C	198	GLN	5.0
1	A	191	SER	4.8
1	C	197	PHE	4.5
1	A	193	GLU	4.5
1	B	197	PHE	4.4
1	B	473	LYS	4.3
1	C	228	SER	4.2
1	A	195	VAL	4.1
1	A	196	GLU	3.9
1	C	196	GLU	3.8
1	A	198	GLN	3.7
1	C	195	VAL	3.7
1	A	192	GLU	3.7
1	A	199	SER	3.7
1	B	189	ASP	3.6
1	A	197	PHE	3.6
1	B	193	GLU	3.5
1	B	195	VAL	3.3
1	B	194	ASP	3.2
1	B	198	GLN	3.2
1	A	473	LYS	3.2
1	B	282	LEU	3.1

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Mol	Chain	Res	Type	RSRZ
1	B	412	TYR	3.0
1	A	402	ALA	3.0
1	A	348	ASN	2.9
1	C	194	ASP	2.9
1	B	429	ILE	2.9
1	C	438	ILE	2.8
1	B	191	SER	2.8
1	B	196	GLU	2.7
1	B	466	PHE	2.7
1	B	283	THR	2.7
1	B	180	SER	2.7
1	C	473	LYS	2.6
1	A	418	ALA	2.6
1	A	452	ILE	2.5
1	B	205	MET	2.5
1	A	240	ASN	2.5
1	A	396	LEU	2.5
1	A	392	LEU	2.4
1	B	320	GLY	2.4
1	B	279	MET	2.4
1	B	190	PHE	2.4
1	B	238	LYS	2.3
1	B	365	ASP	2.3
1	B	319	LEU	2.3
1	C	193	GLU	2.3
1	A	421	ALA	2.3
1	B	405	LEU	2.2
1	A	283	THR	2.2
1	B	393	VAL	2.2
1	C	227	VAL	2.2
1	C	185	GLU	2.2
1	B	325	ASP	2.1
1	C	461	VAL	2.1
1	A	270	GLU	2.1
1	B	204	THR	2.1
1	C	226	ILE	2.0
1	C	422	LEU	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 [i](#)

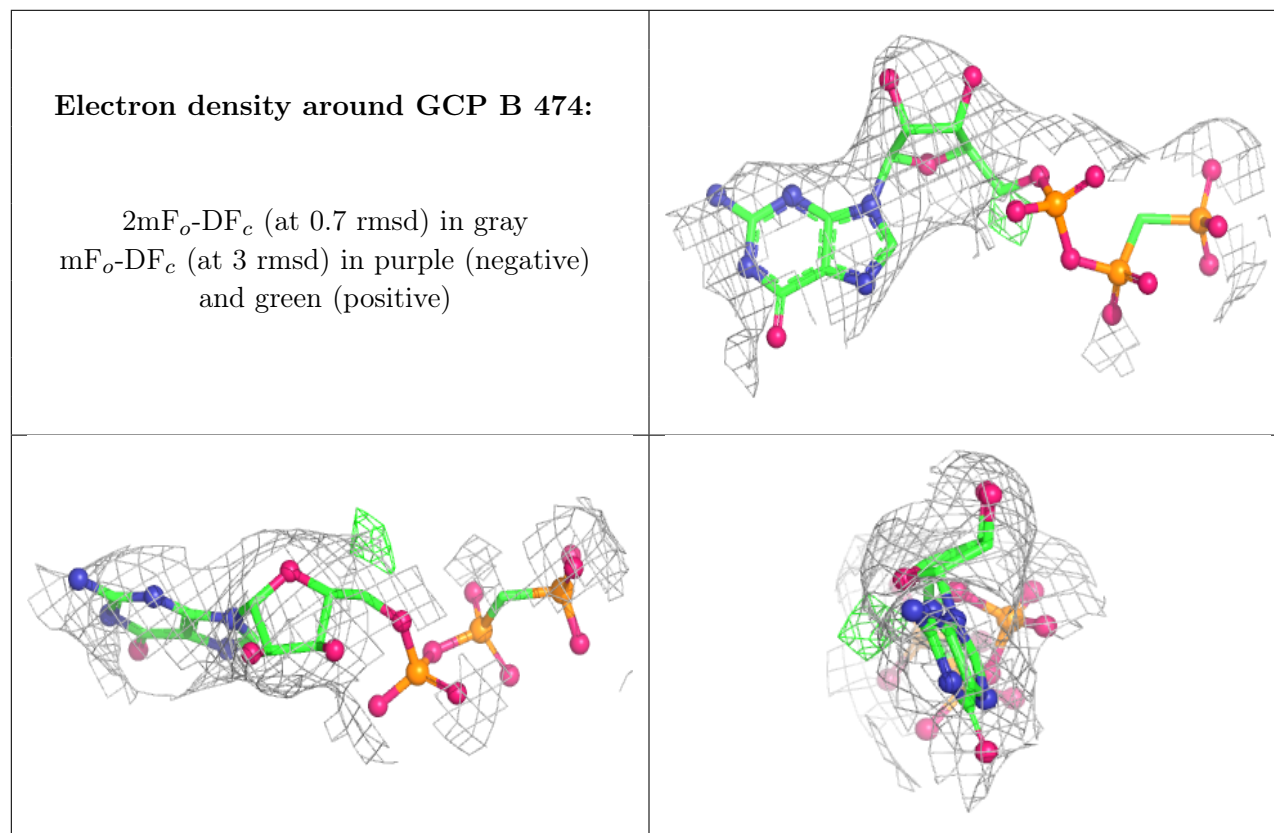
There are no oligosaccharides in this entry.

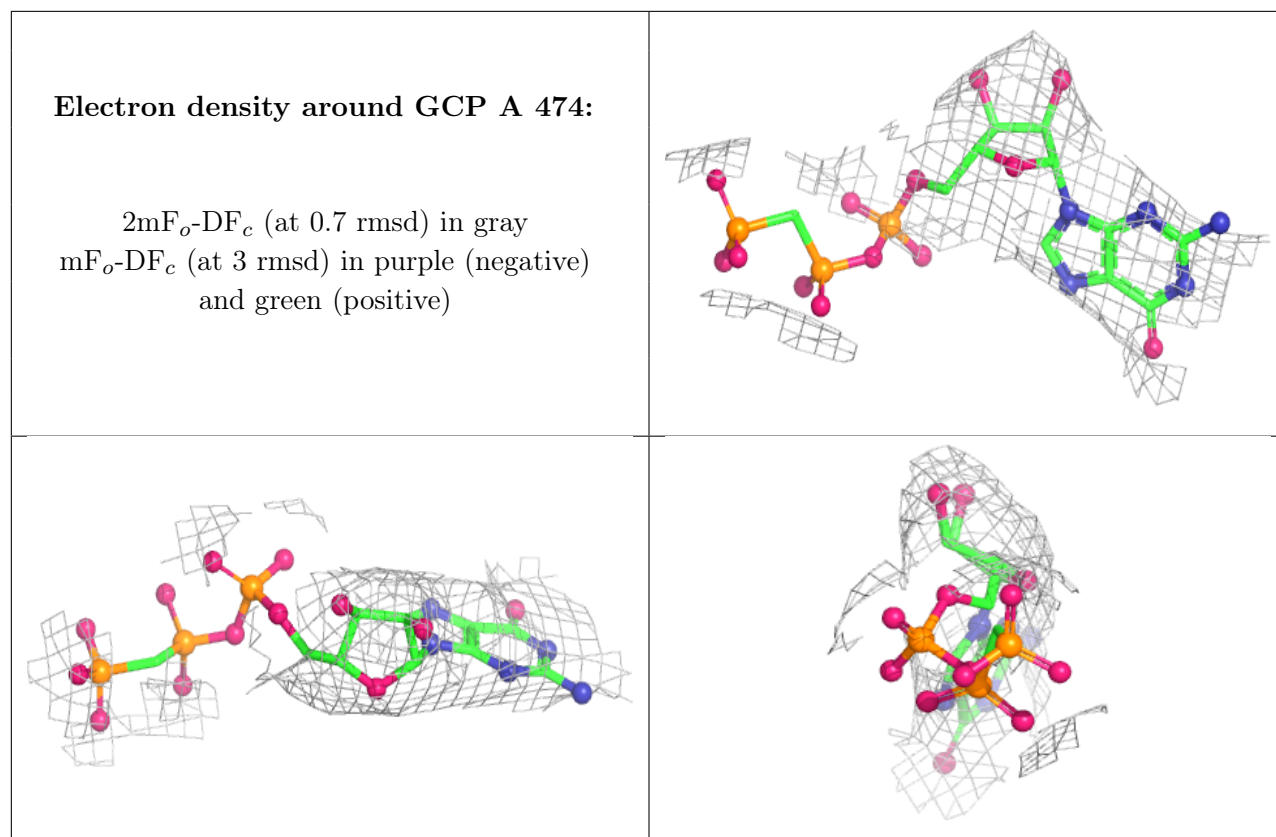
6.4 Ligands [i](#)

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(Å ²)	Q<0.9
2	GCP	B	474	32/32	0.88	0.09	160,162,175,175	0
3	MG	A	475	1/1	0.88	0.10	136,136,136,136	0
2	GCP	A	474	32/32	0.92	0.08	163,164,165,165	0

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





6.5 Other polymers [i](#)

There are no such residues in this entry.