



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 1, 2026 – 03:11 AM UTC

PDB ID : 2FYD / pdb_00002fyd
Title : catalytic domain of bovine beta 1, 4-galactosyltransferase in complex with
alpha-lactalbumin, glucose, Mn, and UDP-N-acetylgalactosamine
Authors : Ramakrishnan, B.; Ramasamy, V.; Qasba, P.K.
Deposited on : 2006-02-07
Resolution : 2.00 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

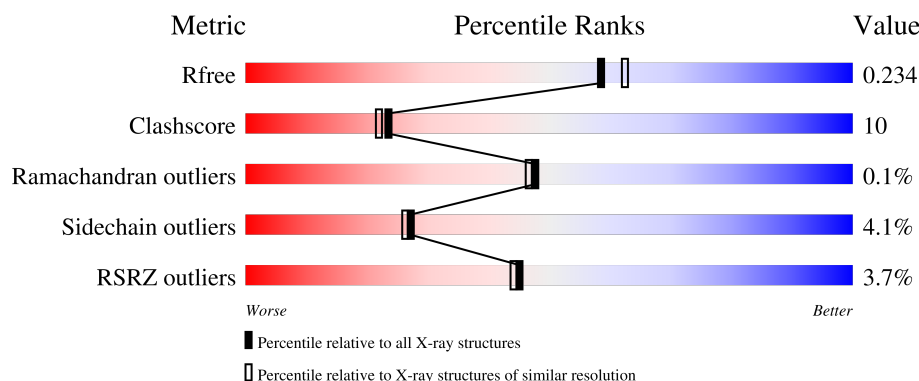
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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	10052 (2.00-2.00)
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (2.00-2.00)
RSRZ outliers	180081	10067 (2.00-2.00)

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	123	 6% 79% 17% •
1	C	123	 7% 74% 24% •
2	B	286	 2% 71% 21% • 5%
2	D	286	 2% 76% 17% • 5%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
7	NGA	B	404	-	-	X	-
7	NGA	D	529	-	X	X	-

2 Entry composition

There are 10 unique types of molecules in this entry. The entry contains 7045 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 Alpha-lactalbumin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	123	Total	C	N	O	S	0	0	0
			980	620	156	195	9			
1	C	123	Total	C	N	O	S	0	0	0
			980	620	156	195	9			

- Molecule 2 is a protein called beta-1,4-galactosyltransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	272	Total	C	N	O	S	2	0	0
			2210	1415	381	399	15			
2	D	272	Total	C	N	O	S	2	0	0
			2210	1415	381	399	15			

There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	117	ALA	-	cloning artifact	GB 21450879
B	118	SER	-	cloning artifact	GB 21450879
B	119	MET	-	cloning artifact	GB 21450879
B	120	THR	-	cloning artifact	GB 21450879
B	121	GLY	-	cloning artifact	GB 21450879
B	122	GLY	-	cloning artifact	GB 21450879
B	123	GLN	-	cloning artifact	GB 21450879
B	124	GLN	-	cloning artifact	GB 21450879
B	125	MET	-	cloning artifact	GB 21450879
B	126	GLY	-	cloning artifact	GB 21450879
B	127	ARG	-	cloning artifact	GB 21450879
B	128	GLY	-	cloning artifact	GB 21450879
B	129	SER	-	cloning artifact	GB 21450879
B	312	CYS	TRP	engineered mutation	GB 21450879
B	342	THR	CYS	engineered mutation	GB 21450879
B	401	CYS	PRO	engineered mutation	GB 21450879

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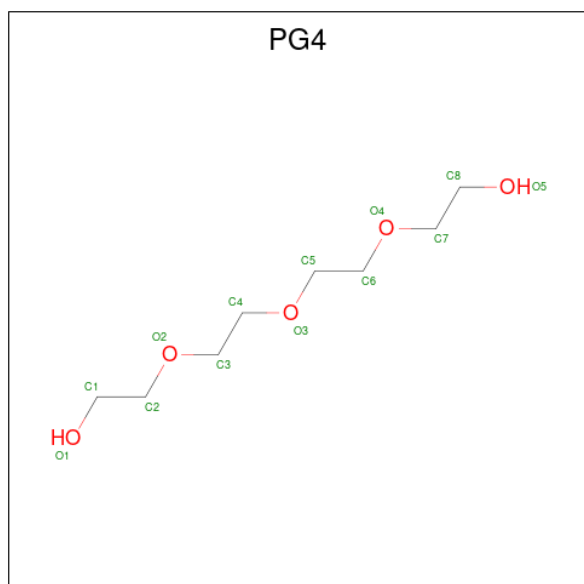
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Chain	Residue	Modelled	Actual	Comment	Reference
D	117	ALA	-	cloning artifact	GB 21450879
D	118	SER	-	cloning artifact	GB 21450879
D	119	MET	-	cloning artifact	GB 21450879
D	120	THR	-	cloning artifact	GB 21450879
D	121	GLY	-	cloning artifact	GB 21450879
D	122	GLY	-	cloning artifact	GB 21450879
D	123	GLN	-	cloning artifact	GB 21450879
D	124	GLN	-	cloning artifact	GB 21450879
D	125	MET	-	cloning artifact	GB 21450879
D	126	GLY	-	cloning artifact	GB 21450879
D	127	ARG	-	cloning artifact	GB 21450879
D	128	GLY	-	cloning artifact	GB 21450879
D	129	SER	-	cloning artifact	GB 21450879
D	312	CYS	TRP	engineered mutation	GB 21450879
D	342	THR	CYS	engineered mutation	GB 21450879
D	401	CYS	PRO	engineered mutation	GB 21450879

- Molecule 3 is CALCIUM ION (CCD ID: CA) (formula: Ca).

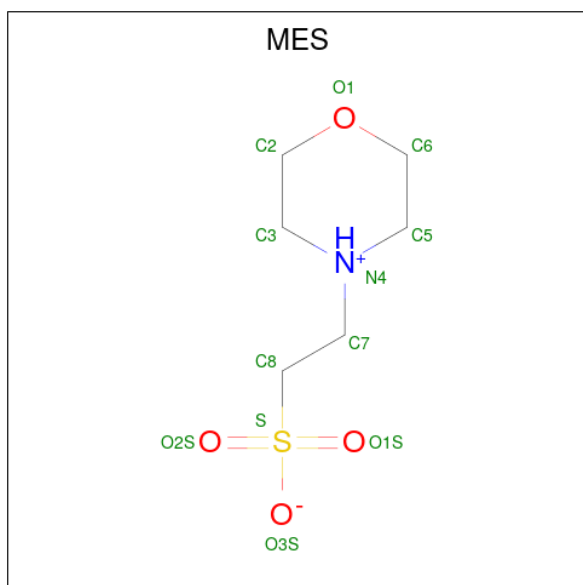
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total Ca 1 1	0	0
3	C	1	Total Ca 1 1	0	0

- Molecule 4 is TETRAETHYLENE GLYCOL (CCD ID: PG4) (formula: C₈H₁₈O₅).



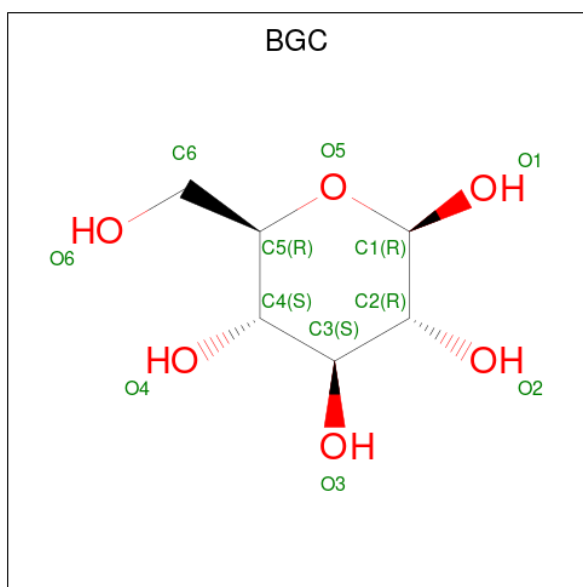
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			13	8	5		
4	C	1	Total	C	O	0	0
			13	8	5		

- Molecule 5 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (CCD ID: MES) (formula: $C_6H_{13}NO_4S$).



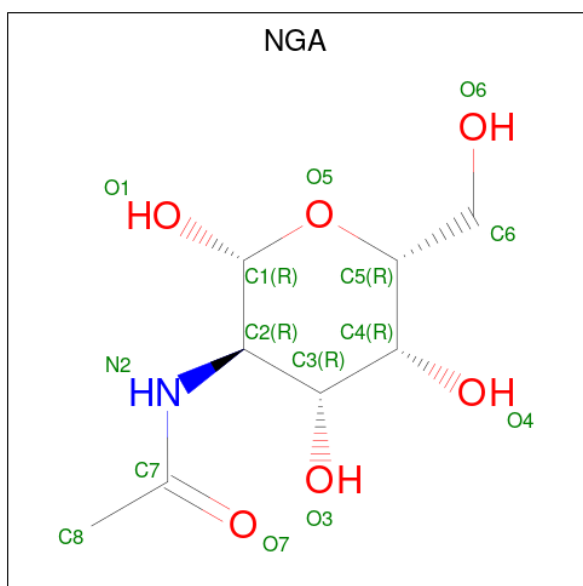
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	S	0	0
			12	6	1	4	1		
5	C	1	Total	C	N	O	S	0	0
			12	6	1	4	1		

- Molecule 6 is beta-D-glucopyranose (CCD ID: BGC) (formula: $C_6H_{12}O_6$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	B	1	Total	C	O	0	0
			12	6	6		
6	D	1	Total	C	O	0	0
			12	6	6		

- Molecule 7 is 2-acetamido-2-deoxy-beta-D-galactopyranose (CCD ID: NGA) (formula: $C_8H_{15}NO_6$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	B	1	Total	C	N	O	0	0
			14	8	1	5		

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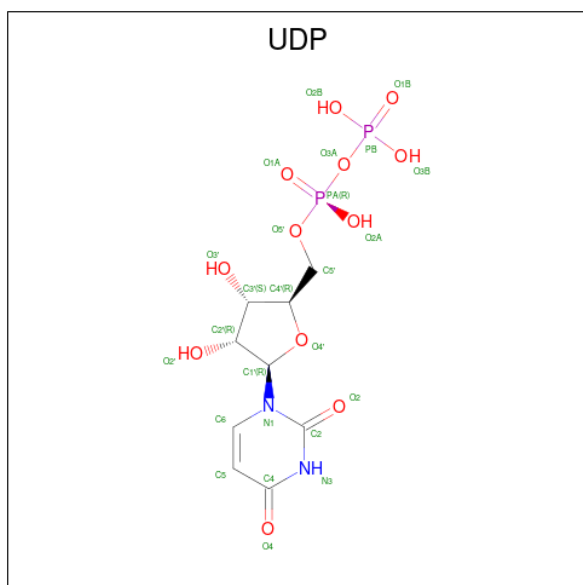
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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	D	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 8 is MANGANESE (II) ION (CCD ID: MN) (formula: Mn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	B	1	Total	Mn	0	0
			1	1		
8	D	1	Total	Mn	0	0
			1	1		

- Molecule 9 is URIDINE-5'-DIPHOSPHATE (CCD ID: UDP) (formula: C₉H₁₄N₂O₁₂P₂).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
9	B	1	Total	C	N	O	P	0	0
			25	9	2	12	2		
9	D	1	Total	C	N	O	P	0	0
			25	9	2	12	2		

- Molecule 10 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	A	90	Total	O	0	0
			90	90		
10	B	153	Total	O	0	0
			153	153		

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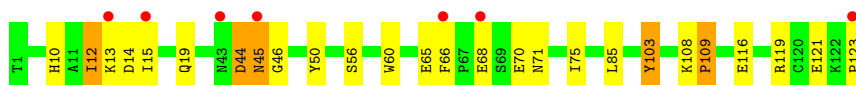
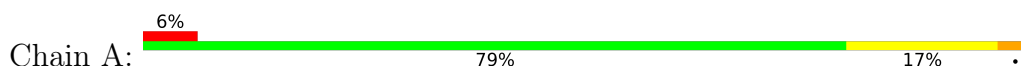
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	C	101	Total 101	O 101	0	0
10	D	165	Total 165	O 165	0	0

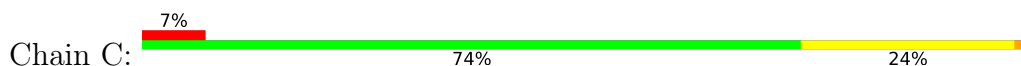
3 Residue-property plots [i](#)

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.

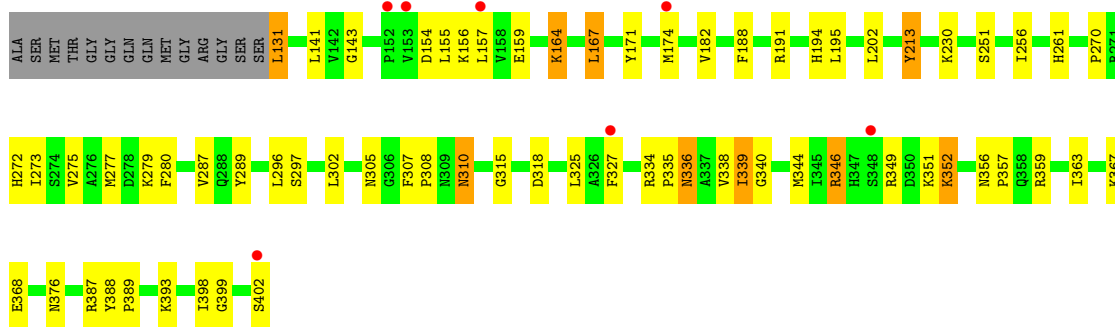
- Molecule 1: Alpha-lactalbumin



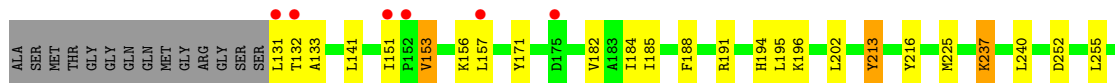
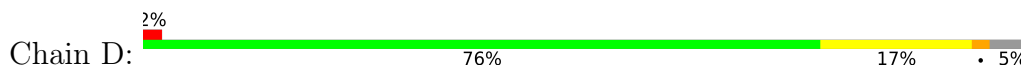
- Molecule 1: Alpha-lactalbumin



- Molecule 2: beta-1,4-galactosyltransferase



- Molecule 2: beta-1,4-galactosyltransferase





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	58.07Å 95.38Å 100.39Å 90.00° 101.33° 90.00°	Depositor
Resolution (Å)	32.08 – 2.00 32.08 – 2.00	Depositor EDS
% Data completeness (in resolution range)	94.9 (32.08-2.00) 94.9 (32.08-2.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.10	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.31 (at 2.00Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.201 , 0.242 0.192 , 0.234	Depositor DCC
R_{free} test set	6971 reflections (10.12%)	wwPDB-VP
Wilson B-factor (Å ²)	30.1	Xtriage
Anisotropy	0.321	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 49.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	7045	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.44% 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: UDP, MN, MES, BGC, PG4, NGA, CA

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	0.68	0/1001	1.12	10/1350 (0.7%)
1	C	0.71	0/1001	1.14	8/1350 (0.6%)
2	B	0.65	1/2267 (0.0%)	1.08	14/3068 (0.5%)
2	D	0.70	0/2267	1.10	15/3068 (0.5%)
All	All	0.68	1/6536 (0.0%)	1.10	47/8836 (0.5%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	256	ILE	CA-CB	6.36	1.59	1.54

All (47) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	315	GLY	N-CA-C	10.34	124.99	112.48
2	D	315	GLY	N-CA-C	9.40	123.85	112.48
2	D	182	VAL	N-CA-C	8.78	120.45	108.17
1	C	50	TYR	N-CA-C	8.44	123.16	109.40
1	C	65	GLU	N-CA-C	8.40	123.64	113.23
2	B	273	ILE	N-CA-C	8.29	120.36	111.58
2	D	310	ASN	N-CA-C	8.27	122.15	112.72
2	D	202	LEU	N-CA-C	7.93	120.01	111.36
1	C	103	TYR	N-CA-C	-7.86	102.72	111.28
1	A	50	TYR	N-CA-C	7.82	122.15	109.40
1	A	60	TRP	N-CA-C	7.73	122.78	113.12
2	B	202	LEU	N-CA-C	7.71	119.76	111.36
2	B	310	ASN	N-CA-C	7.67	122.39	112.26
2	D	273	ILE	N-CA-C	7.49	118.41	111.45
1	A	44	ASP	N-CA-C	-7.47	104.19	113.38
2	B	182	VAL	N-CA-C	7.36	118.88	108.36

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	156	LYS	N-CA-C	-7.16	103.48	111.28
1	A	46	GLY	N-CA-C	-6.99	105.16	114.25
2	D	188	PHE	N-CA-C	6.97	119.93	108.99
2	B	213	TYR	N-CA-C	6.96	120.46	109.81
1	A	66	PHE	CA-C-N	6.90	126.50	119.19
1	A	66	PHE	C-N-CA	6.90	126.50	119.19
2	D	213	TYR	N-CA-C	6.79	119.73	109.41
2	B	174	MET	N-CA-C	-6.73	105.11	113.38
1	C	85	LEU	N-CA-C	6.51	121.22	113.28
2	B	188	PHE	N-CA-C	6.49	119.18	108.99
1	C	60	TRP	N-CA-C	6.37	121.21	112.04
1	C	66	PHE	CA-C-N	6.29	126.20	119.28
1	C	66	PHE	C-N-CA	6.29	126.20	119.28
2	D	359	ARG	N-CA-C	6.18	118.02	111.28
2	B	335	PRO	N-CA-C	-6.03	102.14	111.13
2	D	356	ASN	CA-C-N	5.88	125.56	119.56
2	D	356	ASN	C-N-CA	5.88	125.56	119.56
2	B	251	SER	N-CA-C	5.87	118.68	108.76
2	D	314	TRP	N-CA-C	5.84	119.42	110.20
1	A	12	ILE	N-CA-C	5.64	116.93	111.91
2	B	143	GLY	CA-C-N	5.61	125.62	119.90
2	B	143	GLY	C-N-CA	5.61	125.62	119.90
1	A	56	SER	N-CA-C	5.49	118.88	110.20
2	D	369	THR	N-CA-C	5.48	119.06	112.38
1	A	109	PRO	N-CA-C	5.46	120.72	113.57
1	C	56	SER	N-CA-C	5.36	118.97	109.96
1	A	103	TYR	N-CA-C	-5.36	105.44	111.28
2	B	297	SER	N-CA-C	-5.32	103.87	110.41
2	D	335	PRO	N-CA-C	-5.21	103.64	111.57
2	D	396	VAL	N-CA-C	5.20	117.34	108.86
2	B	399	GLY	N-CA-C	5.01	120.21	111.50

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	980	0	936	16	0
1	C	980	0	936	26	0
2	B	2210	0	2178	50	0
2	D	2210	0	2178	34	0
3	A	1	0	0	0	0
3	C	1	0	0	0	0
4	A	13	0	18	0	0
4	C	13	0	18	1	0
5	A	12	0	13	1	0
5	C	12	0	13	1	0
6	B	12	0	12	1	0
6	D	12	0	12	2	0
7	B	14	0	12	8	0
7	D	14	0	12	10	0
8	B	1	0	0	0	0
8	D	1	0	0	0	0
9	B	25	0	11	1	0
9	D	25	0	11	2	0
10	A	90	0	0	1	0
10	B	153	0	0	2	0
10	C	101	0	0	3	0
10	D	165	0	0	2	0
All	All	7045	0	6360	131	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 10.

All (131) 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)
7:D:529:NGA:H82	9:D:528:UDP:O3B	1.58	1.02
2:B:310:ASN:ND2	2:B:402:SER:H	1.61	0.97
1:A:10:HIS:HA	1:A:13:LYS:HE2	1.48	0.95
1:C:62:LYS:HE3	1:C:63:SER:O	1.73	0.87
2:D:225:MET:HE2	2:D:352:LYS:HE3	1.56	0.85
2:B:310:ASN:HD22	2:B:402:SER:H	1.27	0.82
1:A:121:GLU:O	1:A:123:PRO:HD3	1.80	0.80
1:A:71:ASN:HD21	1:A:75:ILE:H	1.28	0.78
2:B:346:ARG:HH11	2:B:346:ARG:HA	1.49	0.76
2:B:191:ARG:HH11	2:B:194:HIS:HD2	1.34	0.75
2:D:305:ASN:HD21	2:D:376:ASN:H	1.35	0.74
1:C:4:THR:HG23	1:C:7:LYS:HE2	1.70	0.74

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:252:ASP:OD2	7:D:529:NGA:H83	1.89	0.72
2:B:336:ASN:HD22	2:B:338:VAL:H	1.38	0.70
2:D:349:ARG:HH11	2:D:349:ARG:HG2	1.57	0.69
1:C:71:ASN:HD21	1:C:75:ILE:H	1.38	0.68
2:B:349:ARG:HD3	10:B:1034:HOH:O	1.94	0.67
1:A:44:ASP:O	1:A:45:ASN:HB2	1.94	0.67
2:D:151:ILE:HG13	2:D:151:ILE:O	1.95	0.66
2:B:336:ASN:ND2	2:B:339:ILE:HG22	2.11	0.65
1:C:4:THR:H	1:C:7:LYS:HE3	1.62	0.64
2:B:327:PHE:CZ	2:B:367:LYS:HB2	2.33	0.63
1:C:4:THR:H	1:C:7:LYS:CE	2.11	0.62
2:B:351:LYS:O	2:B:352:LYS:HB2	1.98	0.62
2:D:314:TRP:CD1	7:D:529:NGA:H61	2.35	0.61
2:D:327:PHE:CZ	2:D:367:LYS:HB2	2.34	0.61
2:B:336:ASN:ND2	2:B:338:VAL:H	1.99	0.61
2:B:305:ASN:HD21	2:B:376:ASN:H	1.48	0.61
2:D:349:ARG:HH11	2:D:349:ARG:CG	2.14	0.60
2:B:336:ASN:HD22	2:B:336:ASN:C	2.08	0.60
1:C:6:CYS:SG	1:C:122:LYS:HB2	2.41	0.60
2:D:225:MET:CE	2:D:352:LYS:HE3	2.30	0.59
2:B:131:LEU:HD12	2:B:131:LEU:N	2.18	0.59
2:B:164:LYS:HG3	10:B:1395:HOH:O	2.03	0.58
1:A:10:HIS:O	1:A:13:LYS:HG2	2.03	0.57
2:B:191:ARG:NH1	2:B:194:HIS:HD2	2.02	0.57
2:B:272:HIS:HB3	2:B:334:ARG:HG2	1.87	0.57
1:C:13:LYS:HD3	1:C:23:LEU:CD1	2.35	0.57
2:B:277:MET:HE1	7:B:404:NGA:O7	2.05	0.56
1:A:14:ASP:CG	1:A:14:ASP:O	2.48	0.55
2:B:191:ARG:HD2	2:B:194:HIS:CD2	2.42	0.54
1:C:84:GLU:HG3	10:C:1121:HOH:O	2.08	0.54
1:C:120:CYS:SG	1:C:122:LYS:HB2	2.47	0.54
1:C:58:ARG:HD2	1:C:59:PHE:CE2	2.42	0.54
2:B:279:LYS:HE2	7:B:404:NGA:H81	1.90	0.54
2:D:336:ASN:HD22	2:D:338:VAL:H	1.56	0.54
2:D:295:ALA:O	2:D:296:LEU:HD12	2.07	0.53
2:B:277:MET:CE	2:B:279:LYS:HD3	2.38	0.53
2:D:185:ILE:HD13	2:D:216:TYR:HB2	1.90	0.53
2:D:255:LEU:HD11	7:D:529:NGA:H81	1.90	0.52
1:A:68:GLU:HG2	1:A:68:GLU:O	2.10	0.52
2:B:336:ASN:ND2	2:B:339:ILE:H	2.07	0.52
1:A:108:LYS:HB3	1:A:109:PRO:HD3	1.90	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:277:MET:SD	7:B:404:NGA:O7	2.69	0.51
2:B:307:PHE:HB3	2:B:308:PRO:HD2	1.91	0.51
2:B:336:ASN:HD22	2:B:338:VAL:N	2.06	0.51
2:D:349:ARG:HD2	2:D:353:ASN:O	2.09	0.51
2:B:336:ASN:ND2	2:B:336:ASN:C	2.69	0.50
2:D:327:PHE:CE2	2:D:367:LYS:HD2	2.47	0.50
1:A:116:GLU:OE1	1:A:119:ARG:NH2	2.45	0.50
1:C:9:SER:O	1:C:13:LYS:HG2	2.12	0.49
2:D:365:HIS:HD2	2:D:368:GLU:OE1	1.95	0.49
2:D:132:THR:CG2	2:D:133:ALA:N	2.74	0.49
2:B:289:TYR:OH	7:B:404:NGA:N2	2.46	0.49
2:B:310:ASN:HD22	2:B:402:SER:N	2.04	0.49
2:D:153:VAL:HG22	2:D:196:LYS:HB3	1.94	0.49
2:B:261:HIS:C	2:B:339:ILE:HD11	2.38	0.49
1:C:121:GLU:O	1:C:122:LYS:C	2.56	0.48
2:B:261:HIS:O	2:B:339:ILE:HD11	2.14	0.48
2:B:289:TYR:OH	7:B:404:NGA:C7	2.61	0.48
4:C:851:PG4:H11	6:D:530:BGC:O6	2.14	0.48
2:D:307:PHE:HB3	2:D:308:PRO:HD2	1.95	0.48
1:C:13:LYS:HD3	1:C:23:LEU:HD13	1.96	0.47
1:A:108:LYS:HB3	1:A:109:PRO:CD	2.44	0.47
1:C:66:PHE:HB2	10:C:1017:HOH:O	2.13	0.47
2:D:132:THR:HG22	2:D:133:ALA:N	2.28	0.47
2:B:191:ARG:HH11	2:B:194:HIS:CD2	2.23	0.47
6:D:530:BGC:O4	7:D:529:NGA:C1	2.62	0.47
2:B:191:ARG:NH1	2:B:194:HIS:CD2	2.83	0.46
2:D:237:LYS:HD2	10:D:1403:HOH:O	2.14	0.46
1:C:13:LYS:HD3	1:C:23:LEU:HD11	1.97	0.46
1:A:65:GLU:CD	1:A:65:GLU:H	2.23	0.46
2:D:191:ARG:HH11	2:D:194:HIS:HD2	1.63	0.46
2:D:252:ASP:OD2	7:D:529:NGA:C8	2.62	0.46
2:D:277:MET:HE1	7:D:529:NGA:O7	2.16	0.46
2:B:230:LYS:HD3	2:B:398:ILE:HB	1.98	0.45
2:B:344:MET:HE2	2:B:346:ARG:HH12	1.80	0.45
1:A:70:GLU:HG3	10:A:1402:HOH:O	2.16	0.45
2:B:279:LYS:HE3	2:B:280:PHE:CZ	2.51	0.45
1:C:49:GLU:OE1	5:C:806:MES:H52	2.16	0.45
2:D:314:TRP:NE1	7:D:529:NGA:H61	2.32	0.45
1:C:19:GLN:HG3	1:C:19:GLN:O	2.17	0.45
2:D:132:THR:HG22	2:D:133:ALA:O	2.17	0.45
2:B:155:LEU:O	2:B:159:GLU:HG3	2.16	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:336:ASN:HD21	2:B:339:ILE:H	1.63	0.45
1:C:10:HIS:HA	1:C:13:LYS:HE2	1.99	0.45
7:B:404:NGA:H83	9:B:406:UDP:PB	2.57	0.44
1:A:116:GLU:OE2	1:A:119:ARG:HD2	2.17	0.44
2:B:388:TYR:HB3	2:B:389:PRO:HD2	1.99	0.44
2:D:194:HIS:HE1	10:D:982:HOH:O	2.00	0.44
2:B:327:PHE:CE1	2:B:367:LYS:HB2	2.51	0.44
6:B:403:BGC:O4	7:B:404:NGA:C1	2.65	0.44
2:D:171:TYR:HB3	2:D:213:TYR:CE2	2.52	0.44
2:B:277:MET:CE	7:B:404:NGA:O7	2.65	0.44
1:C:3:LEU:HA	1:C:7:LYS:HE3	2.00	0.44
1:A:12:ILE:O	1:A:15:ILE:HG22	2.18	0.43
2:D:292:GLY:HA2	7:D:529:NGA:H83	2.01	0.43
1:C:58:ARG:HB3	10:C:1261:HOH:O	2.18	0.43
2:B:167:LEU:HD13	2:B:387:ARG:HB3	2.00	0.42
2:D:289:TYR:OH	7:D:529:NGA:N2	2.52	0.42
1:A:103:TYR:CE2	5:A:805:MES:H51	2.54	0.42
2:B:359:ARG:O	2:B:363:ILE:HG23	2.20	0.42
2:D:318:ASP:OD1	2:D:318:ASP:N	2.50	0.42
2:B:275:VAL:HG22	2:B:340:GLY:HA3	2.00	0.42
1:C:4:THR:H	1:C:7:LYS:HE2	1.83	0.41
2:D:295:ALA:C	2:D:296:LEU:HD12	2.46	0.41
2:B:368:GLU:H	2:B:368:GLU:HG2	1.66	0.41
2:B:318:ASP:N	2:B:318:ASP:OD1	2.50	0.41
1:C:18:TYR:O	1:C:19:GLN:HB3	2.20	0.41
2:D:252:ASP:HB3	9:D:528:UDP:O3'	2.21	0.41
1:A:65:GLU:CD	1:A:65:GLU:N	2.79	0.41
2:B:356:ASN:HA	2:B:357:PRO:HD3	1.88	0.41
1:C:4:THR:N	1:C:7:LYS:CE	2.81	0.41
1:C:43:ASN:HD21	1:C:45:ASN:HA	1.86	0.41
2:B:351:LYS:O	2:B:352:LYS:CB	2.67	0.41
1:C:65:GLU:O	1:C:67:PRO:HD3	2.21	0.41
2:D:349:ARG:CG	2:D:349:ARG:NH1	2.82	0.40
2:B:171:TYR:HB3	2:B:213:TYR:CE2	2.56	0.40
2:B:270:PRO:HG2	2:B:325:LEU:HD22	2.03	0.40
2:B:154:ASP:OD1	2:B:156:LYS:HB2	2.22	0.40
1:C:10:HIS:HA	1:C:13:LYS:HG2	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	121/123 (98%)	118 (98%)	2 (2%)	1 (1%)	16	11
1	C	121/123 (98%)	115 (95%)	6 (5%)	0	100	100
2	B	270/286 (94%)	265 (98%)	5 (2%)	0	100	100
2	D	270/286 (94%)	265 (98%)	5 (2%)	0	100	100
All	All	782/818 (96%)	763 (98%)	18 (2%)	1 (0%)	48	46

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	45	ASN

5.3.2 Protein sidechains

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	109/109 (100%)	107 (98%)	2 (2%)	51	58
1	C	109/109 (100%)	107 (98%)	2 (2%)	51	58
2	B	245/254 (96%)	231 (94%)	14 (6%)	18	15
2	D	245/254 (96%)	234 (96%)	11 (4%)	24	23
All	All	708/726 (98%)	679 (96%)	29 (4%)	27	26

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	19	GLN
1	A	85	LEU
2	B	131	LEU
2	B	141	LEU
2	B	157	LEU
2	B	164	LYS
2	B	167	LEU
2	B	195	LEU
2	B	287	VAL
2	B	296	LEU
2	B	302	LEU
2	B	336	ASN
2	B	339	ILE
2	B	346	ARG
2	B	352	LYS
2	B	393	LYS
1	C	44	ASP
1	C	85	LEU
2	D	131	LEU
2	D	141	LEU
2	D	153	VAL
2	D	157	LEU
2	D	184	ILE
2	D	195	LEU
2	D	237	LYS
2	D	240	LEU
2	D	299	GLN
2	D	302	LEU
2	D	349	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (23) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	10	HIS
1	A	71	ASN
2	B	160	GLN
2	B	161	GLN
2	B	192	GLN
2	B	194	HIS
2	B	219	ASN
2	B	305	ASN
2	B	310	ASN
2	B	336	ASN

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Mol	Chain	Res	Type
1	C	39	GLN
1	C	43	ASN
1	C	45	ASN
1	C	71	ASN
2	D	180	HIS
2	D	194	HIS
2	D	219	ASN
2	D	269	GLN
2	D	299	GLN
2	D	305	ASN
2	D	310	ASN
2	D	336	ASN
2	D	365	HIS

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 14 ligands modelled in this entry, 4 are monoatomic - leaving 10 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	$\# Z > 2$
7	NGA	D	529	-	14,14,15	2.47	6 (42%)	17,19,21	4.02	13 (76%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
6	BGC	B	403	-	12,12,12	0.37	0	17,17,17	0.47	0
7	NGA	B	404	-	14,14,15	2.53	6 (42%)	17,19,21	3.95	10 (58%)
4	PG4	C	851	-	12,12,12	0.48	0	11,11,11	0.37	0
4	PG4	A	850	-	12,12,12	0.41	0	11,11,11	0.46	0
5	MES	C	806	-	12,12,12	1.17	0	15,16,16	1.05	1 (6%)
5	MES	A	805	-	12,12,12	1.51	3 (25%)	15,16,16	0.97	1 (6%)
9	UDP	B	406	8	25,26,26	1.67	3 (12%)	38,40,40	1.76	9 (23%)
6	BGC	D	530	-	12,12,12	0.39	0	17,17,17	0.36	0
9	UDP	D	528	8	25,26,26	1.67	5 (20%)	38,40,40	1.82	11 (28%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	NGA	D	529	-	-	4/6/23/26	0/1/1/1
6	BGC	B	403	-	-	0/2/22/22	0/1/1/1
7	NGA	B	404	-	-	4/6/23/26	0/1/1/1
4	PG4	C	851	-	-	3/10/10/10	-
4	PG4	A	850	-	-	3/10/10/10	-
5	MES	C	806	-	-	2/6/14/14	0/1/1/1
5	MES	A	805	-	-	2/6/14/14	0/1/1/1
9	UDP	B	406	8	-	6/16/32/32	0/2/2/2
6	BGC	D	530	-	-	0/2/22/22	0/1/1/1
9	UDP	D	528	8	-	5/16/32/32	0/2/2/2

All (23) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	D	529	NGA	O5-C1	-6.55	1.32	1.43
7	B	404	NGA	O5-C5	5.53	1.54	1.43
7	B	404	NGA	O5-C1	-4.90	1.35	1.43
9	B	406	UDP	PA-O3A	4.73	1.64	1.59
7	D	529	NGA	O5-C5	3.38	1.50	1.43
9	D	528	UDP	PB-O3B	-3.13	1.43	1.54
9	D	528	UDP	PA-O3A	3.07	1.62	1.59
7	B	404	NGA	C2-N2	3.02	1.51	1.46
5	A	805	MES	C7-N4	2.72	1.53	1.47

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	D	529	NGA	C3-C2	2.64	1.58	1.52
9	D	528	UDP	C2-N1	2.53	1.42	1.38
5	A	805	MES	C5-N4	2.51	1.53	1.46
7	B	404	NGA	C8-C7	2.48	1.55	1.50
9	B	406	UDP	PB-O1B	2.45	1.58	1.50
7	D	529	NGA	O4-C4	-2.44	1.36	1.43
9	D	528	UDP	PB-O1B	2.35	1.57	1.50
5	A	805	MES	C3-N4	2.33	1.53	1.46
9	B	406	UDP	C2-N1	2.26	1.42	1.38
9	D	528	UDP	O5'-C5'	-2.16	1.36	1.44
7	D	529	NGA	C4-C3	2.11	1.57	1.52
7	B	404	NGA	O4-C4	-2.10	1.37	1.43
7	B	404	NGA	C1-C2	2.08	1.55	1.52
7	D	529	NGA	C1-C2	2.06	1.55	1.52

All (45) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	B	404	NGA	C1-C2-N2	8.46	123.76	110.43
7	D	529	NGA	C2-N2-C7	6.96	132.22	122.90
7	D	529	NGA	C1-O5-C5	6.87	121.40	112.19
7	B	404	NGA	C2-N2-C7	6.56	131.69	122.90
7	D	529	NGA	C6-C5-C4	6.48	128.93	113.02
7	B	404	NGA	O5-C1-C2	6.17	120.84	111.29
7	D	529	NGA	O5-C1-C2	6.07	120.69	111.29
7	D	529	NGA	O5-C5-C6	-5.94	96.10	107.66
7	B	404	NGA	C1-O5-C5	5.38	119.39	112.19
7	B	404	NGA	C6-C5-C4	5.31	126.06	113.02
9	D	528	UDP	PA-O5'-C5'	4.43	146.72	121.35
9	B	406	UDP	O4'-C4'-C3'	-4.43	96.37	105.15
9	B	406	UDP	PA-O5'-C5'	4.22	145.51	121.35
7	D	529	NGA	O3-C3-C2	4.09	117.90	109.40
9	D	528	UDP	O4'-C4'-C3'	-4.07	97.08	105.15
7	B	404	NGA	O3-C3-C2	3.98	117.66	109.40
7	B	404	NGA	O4-C4-C5	-3.23	101.37	109.32
9	D	528	UDP	O5'-PA-O1A	-3.11	96.61	108.94
9	D	528	UDP	O3A-PB-O1B	-3.01	95.18	111.04
9	D	528	UDP	O2A-PA-O5'	2.97	121.04	107.57
9	B	406	UDP	O2-C2-N1	-2.87	119.06	122.80
9	B	406	UDP	O5'-PA-O1A	-2.86	97.60	108.94
7	D	529	NGA	C1-C2-N2	2.84	114.91	110.43
9	D	528	UDP	O2-C2-N1	-2.83	119.11	122.80

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	B	406	UDP	O3B-PB-O1B	2.76	121.59	110.83
9	B	406	UDP	O3A-PB-O1B	-2.74	96.61	111.04
7	D	529	NGA	O4-C4-C5	-2.74	102.58	109.32
9	D	528	UDP	O3B-PB-O3A	2.73	113.81	104.64
7	B	404	NGA	C8-C7-N2	2.66	120.52	116.12
7	D	529	NGA	C8-C7-N2	2.63	120.48	116.12
7	D	529	NGA	O3-C3-C4	-2.60	104.25	110.38
9	D	528	UDP	O3B-PB-O1B	2.49	120.52	110.83
7	B	404	NGA	O3-C3-C4	-2.46	104.58	110.38
9	D	528	UDP	C2'-C1'-N1	2.42	119.99	113.25
9	B	406	UDP	O2A-PA-O5'	2.42	118.52	107.57
7	D	529	NGA	O7-C7-C8	-2.40	117.78	122.05
7	D	529	NGA	O6-C6-C5	2.34	119.29	111.33
9	B	406	UDP	O2-C2-N3	2.30	125.73	121.49
9	D	528	UDP	O2-C2-N3	2.27	125.68	121.49
9	B	406	UDP	O3B-PB-O3A	2.25	112.18	104.64
5	A	805	MES	O1S-S-C8	2.15	109.98	106.73
5	C	806	MES	C8-C7-N4	-2.09	104.46	112.36
7	B	404	NGA	C4-C3-C2	2.09	114.08	111.02
9	D	528	UDP	O2B-PB-O1B	2.04	118.80	110.83
7	D	529	NGA	O5-C5-C4	2.01	115.71	110.83

There are no chirality outliers.

All (29) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	805	MES	C8-C7-N4-C3
5	A	805	MES	C8-C7-N4-C5
5	C	806	MES	C8-C7-N4-C3
5	C	806	MES	C8-C7-N4-C5
7	B	404	NGA	C1-C2-N2-C7
7	D	529	NGA	C3-C2-N2-C7
9	B	406	UDP	C5'-O5'-PA-O1A
9	B	406	UDP	C5'-O5'-PA-O2A
9	D	528	UDP	C5'-O5'-PA-O1A
9	D	528	UDP	C5'-O5'-PA-O2A
9	B	406	UDP	C3'-C4'-C5'-O5'
9	D	528	UDP	C3'-C4'-C5'-O5'
7	B	404	NGA	C8-C7-N2-C2
7	B	404	NGA	O7-C7-N2-C2
7	D	529	NGA	C8-C7-N2-C2
7	D	529	NGA	O7-C7-N2-C2

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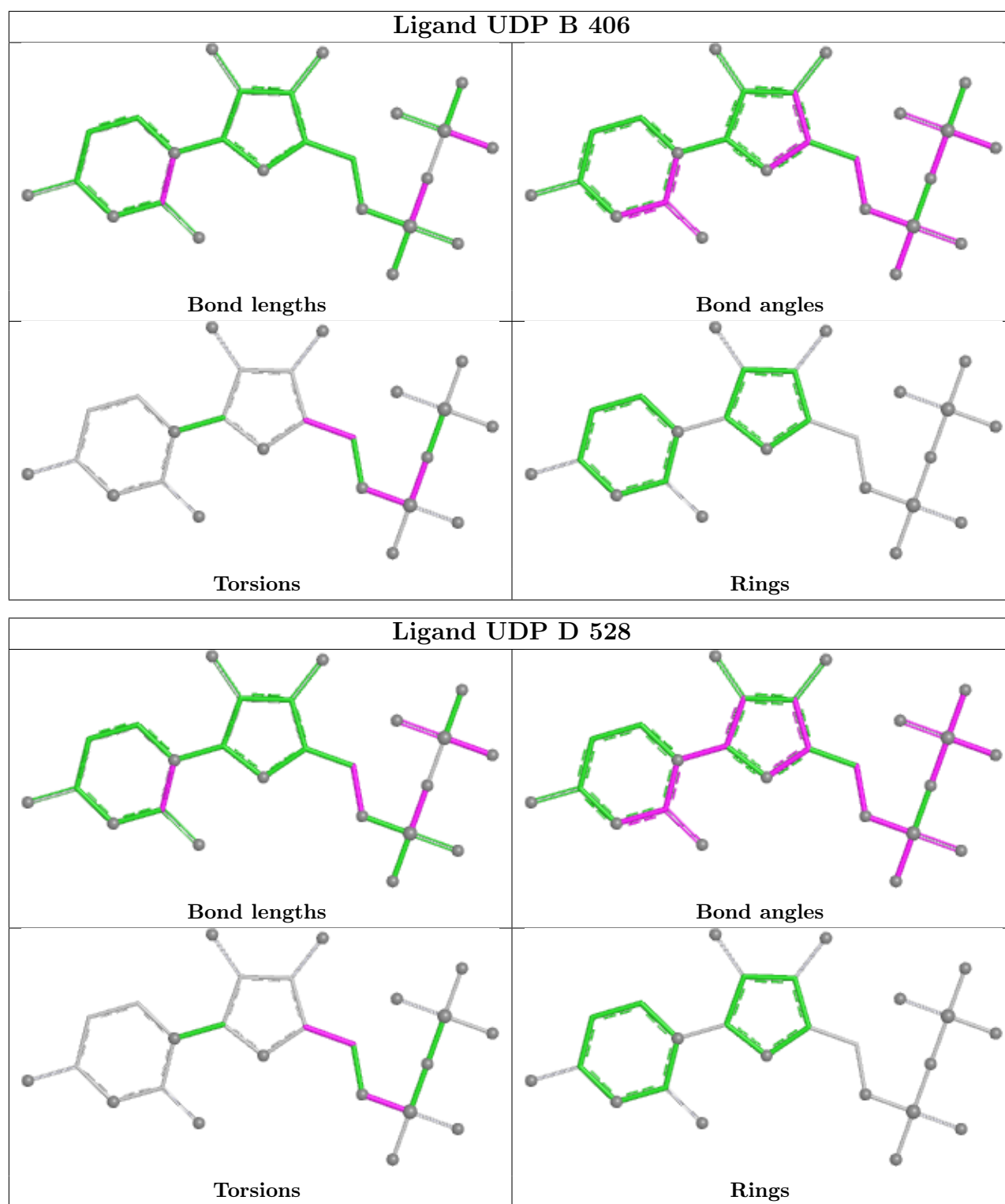
Mol	Chain	Res	Type	Atoms
9	B	406	UDP	O4'-C4'-C5'-O5'
9	D	528	UDP	O4'-C4'-C5'-O5'
7	B	404	NGA	O5-C5-C6-O6
4	C	851	PG4	O3-C5-C6-O4
7	D	529	NGA	O5-C5-C6-O6
4	C	851	PG4	C8-C7-O4-C6
4	A	850	PG4	C8-C7-O4-C6
4	C	851	PG4	C1-C2-O2-C3
9	B	406	UDP	C5'-O5'-PA-O3A
9	D	528	UDP	C5'-O5'-PA-O3A
4	A	850	PG4	O4-C7-C8-O5
4	A	850	PG4	O1-C1-C2-O2
9	B	406	UDP	PB-O3A-PA-O2A

There are no ring outliers.

9 monomers are involved in 22 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	D	529	NGA	10	0
6	B	403	BGC	1	0
7	B	404	NGA	8	0
4	C	851	PG4	1	0
5	C	806	MES	1	0
5	A	805	MES	1	0
9	B	406	UDP	1	0
6	D	530	BGC	2	0
9	D	528	UDP	2	0

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



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	123/123 (100%)	0.08	7 (5%) 29 28	20, 28, 51, 65	0
1	C	123/123 (100%)	0.02	8 (6%) 25 23	18, 28, 49, 82	0
2	B	272/286 (95%)	0.03	7 (2%) 57 56	21, 31, 50, 63	2 (0%)
2	D	272/286 (95%)	-0.04	7 (2%) 57 56	20, 29, 46, 62	2 (0%)
All	All	790/818 (96%)	0.01	29 (3%) 45 44	18, 29, 50, 82	4 (0%)

All (29) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	123	PRO	5.4
1	A	123	PRO	3.8
2	D	131	LEU	3.5
1	A	15	ILE	3.4
1	C	122	LYS	3.4
2	D	402	SER	3.0
1	A	66	PHE	3.0
2	D	151	ILE	2.9
1	C	44	ASP	2.9
1	A	13	LYS	2.8
2	B	348	SER	2.8
1	C	66	PHE	2.8
1	A	45	ASN	2.7
1	C	45	ASN	2.7
1	A	68	GLU	2.7
2	D	152	PRO	2.6
2	B	174	MET	2.4
2	B	157	LEU	2.4
2	B	402	SER	2.3
1	C	18	TYR	2.3
2	B	152	PRO	2.2

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Mol	Chain	Res	Type	RSRZ
2	D	175	ASP	2.2
2	B	153	VAL	2.2
1	C	13	LYS	2.1
1	C	14	ASP	2.1
2	D	132	THR	2.1
2	B	327	PHE	2.1
1	A	43	ASN	2.0
2	D	157	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 ⓘ

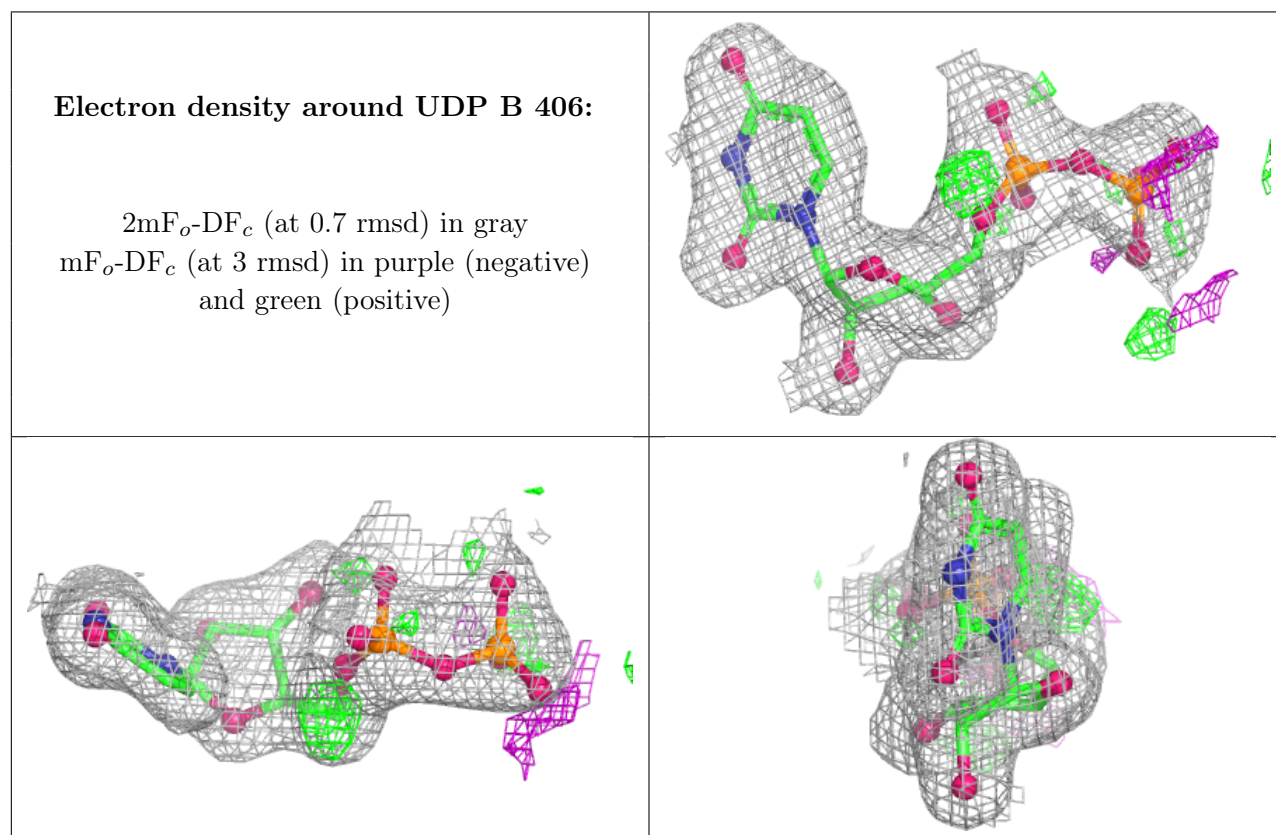
There are no oligosaccharides in this entry.

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.

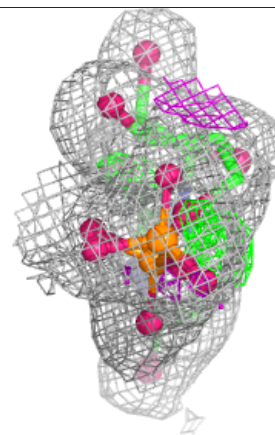
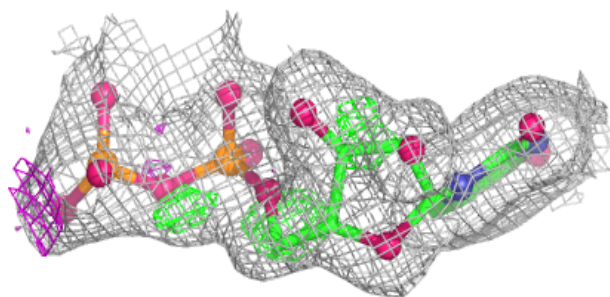
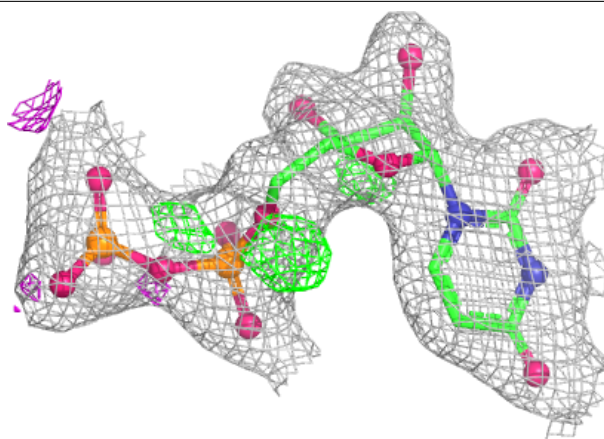
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
7	NGA	B	404	14/15	0.75	0.23	40,54,72,72	0
7	NGA	D	529	14/15	0.78	0.19	31,53,72,72	0
5	MES	C	806	12/12	0.82	0.18	54,56,65,65	0
4	PG4	A	850	13/13	0.85	0.15	45,46,53,55	0
5	MES	A	805	12/12	0.87	0.17	52,55,61,61	0
4	PG4	C	851	13/13	0.87	0.15	44,49,57,59	0
6	BGC	B	403	12/12	0.91	0.09	42,45,48,48	0
9	UDP	B	406	25/25	0.95	0.08	25,28,37,61	0
6	BGC	D	530	12/12	0.96	0.07	27,32,33,35	0
9	UDP	D	528	25/25	0.96	0.07	21,24,30,32	0
3	CA	C	526	1/1	0.98	0.03	27,27,27,27	0
3	CA	A	124	1/1	0.99	0.03	23,23,23,23	0
8	MN	D	527	1/1	0.99	0.03	27,27,27,27	0
8	MN	B	405	1/1	1.00	0.03	28,28,28,28	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 UDP D 528:

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



6.5 Other polymers [i](#)

There are no such residues in this entry.