



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 12, 2026 – 09:19 PM UTC

PDB ID : 4WSK / pdb_00004wsk
Title : Crystal structure of a bacterial fucosidase with phenyl((1R,2R,3R,4R,5R,6R)-2,3,4-trihydroxy-5-methyl-7-azabicyclo[4.1.0]heptan-7-yl)methanone
Authors : Davies, G.J.
Deposited on : 2014-10-28
Resolution : 1.92 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

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

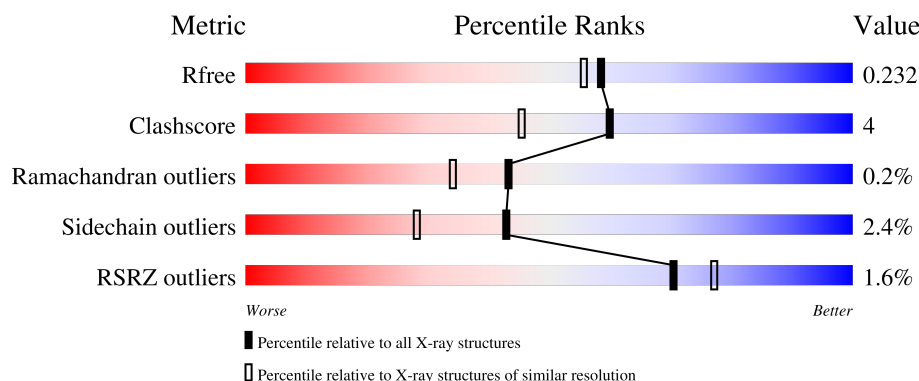
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.92 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	1188 (1.92-1.92)
Clashscore	190562	1209 (1.92-1.92)
Ramachandran outliers	187476	1195 (1.92-1.92)
Sidechain outliers	187428	1195 (1.92-1.92)
RSRZ outliers	180081	1188 (1.92-1.92)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	469	
1	B	469	
1	C	469	
1	D	469	

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 15567 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-L-fucosidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	445	Total	C	N	O	S	0	1	0
			3535	2274	585	659	17			
1	B	446	Total	C	N	O	S	0	4	0
			3603	2320	600	666	17			
1	C	446	Total	C	N	O	S	0	3	0
			3573	2303	593	660	17			
1	D	445	Total	C	N	O	S	0	0	0
			3556	2289	589	662	16			

There are 92 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	12	MET	-	initiating methionine	UNP Q8A3I4
A	13	GLY	-	expression tag	UNP Q8A3I4
A	14	SER	-	expression tag	UNP Q8A3I4
A	15	SER	-	expression tag	UNP Q8A3I4
A	16	HIS	-	expression tag	UNP Q8A3I4
A	17	HIS	-	expression tag	UNP Q8A3I4
A	18	HIS	-	expression tag	UNP Q8A3I4
A	19	HIS	-	expression tag	UNP Q8A3I4
A	20	HIS	-	expression tag	UNP Q8A3I4
A	21	HIS	-	expression tag	UNP Q8A3I4
A	22	SER	-	expression tag	UNP Q8A3I4
A	23	SER	-	expression tag	UNP Q8A3I4
A	24	GLY	-	expression tag	UNP Q8A3I4
A	25	LEU	-	expression tag	UNP Q8A3I4
A	26	GLU	-	expression tag	UNP Q8A3I4
A	27	VAL	-	expression tag	UNP Q8A3I4
A	28	LEU	-	expression tag	UNP Q8A3I4
A	29	PHE	-	expression tag	UNP Q8A3I4
A	30	GLN	-	expression tag	UNP Q8A3I4
A	31	GLY	-	expression tag	UNP Q8A3I4
A	32	PRO	-	expression tag	UNP Q8A3I4

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Chain	Residue	Modelled	Actual	Comment	Reference
A	33	ALA	-	expression tag	UNP Q8A3I4
A	34	ALA	-	expression tag	UNP Q8A3I4
B	12	MET	-	initiating methionine	UNP Q8A3I4
B	13	GLY	-	expression tag	UNP Q8A3I4
B	14	SER	-	expression tag	UNP Q8A3I4
B	15	SER	-	expression tag	UNP Q8A3I4
B	16	HIS	-	expression tag	UNP Q8A3I4
B	17	HIS	-	expression tag	UNP Q8A3I4
B	18	HIS	-	expression tag	UNP Q8A3I4
B	19	HIS	-	expression tag	UNP Q8A3I4
B	20	HIS	-	expression tag	UNP Q8A3I4
B	21	HIS	-	expression tag	UNP Q8A3I4
B	22	SER	-	expression tag	UNP Q8A3I4
B	23	SER	-	expression tag	UNP Q8A3I4
B	24	GLY	-	expression tag	UNP Q8A3I4
B	25	LEU	-	expression tag	UNP Q8A3I4
B	26	GLU	-	expression tag	UNP Q8A3I4
B	27	VAL	-	expression tag	UNP Q8A3I4
B	28	LEU	-	expression tag	UNP Q8A3I4
B	29	PHE	-	expression tag	UNP Q8A3I4
B	30	GLN	-	expression tag	UNP Q8A3I4
B	31	GLY	-	expression tag	UNP Q8A3I4
B	32	PRO	-	expression tag	UNP Q8A3I4
B	33	ALA	-	expression tag	UNP Q8A3I4
B	34	ALA	-	expression tag	UNP Q8A3I4
C	12	MET	-	initiating methionine	UNP Q8A3I4
C	13	GLY	-	expression tag	UNP Q8A3I4
C	14	SER	-	expression tag	UNP Q8A3I4
C	15	SER	-	expression tag	UNP Q8A3I4
C	16	HIS	-	expression tag	UNP Q8A3I4
C	17	HIS	-	expression tag	UNP Q8A3I4
C	18	HIS	-	expression tag	UNP Q8A3I4
C	19	HIS	-	expression tag	UNP Q8A3I4
C	20	HIS	-	expression tag	UNP Q8A3I4
C	21	HIS	-	expression tag	UNP Q8A3I4
C	22	SER	-	expression tag	UNP Q8A3I4
C	23	SER	-	expression tag	UNP Q8A3I4
C	24	GLY	-	expression tag	UNP Q8A3I4
C	25	LEU	-	expression tag	UNP Q8A3I4
C	26	GLU	-	expression tag	UNP Q8A3I4
C	27	VAL	-	expression tag	UNP Q8A3I4
C	28	LEU	-	expression tag	UNP Q8A3I4

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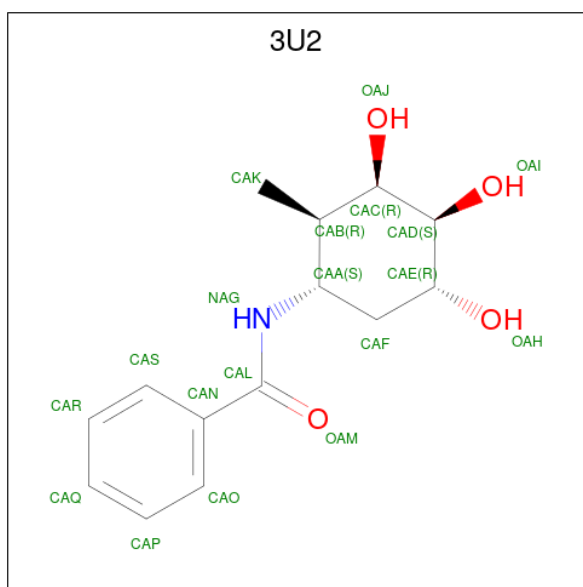
Chain	Residue	Modelled	Actual	Comment	Reference
C	29	PHE	-	expression tag	UNP Q8A3I4
C	30	GLN	-	expression tag	UNP Q8A3I4
C	31	GLY	-	expression tag	UNP Q8A3I4
C	32	PRO	-	expression tag	UNP Q8A3I4
C	33	ALA	-	expression tag	UNP Q8A3I4
C	34	ALA	-	expression tag	UNP Q8A3I4
D	12	MET	-	initiating methionine	UNP Q8A3I4
D	13	GLY	-	expression tag	UNP Q8A3I4
D	14	SER	-	expression tag	UNP Q8A3I4
D	15	SER	-	expression tag	UNP Q8A3I4
D	16	HIS	-	expression tag	UNP Q8A3I4
D	17	HIS	-	expression tag	UNP Q8A3I4
D	18	HIS	-	expression tag	UNP Q8A3I4
D	19	HIS	-	expression tag	UNP Q8A3I4
D	20	HIS	-	expression tag	UNP Q8A3I4
D	21	HIS	-	expression tag	UNP Q8A3I4
D	22	SER	-	expression tag	UNP Q8A3I4
D	23	SER	-	expression tag	UNP Q8A3I4
D	24	GLY	-	expression tag	UNP Q8A3I4
D	25	LEU	-	expression tag	UNP Q8A3I4
D	26	GLU	-	expression tag	UNP Q8A3I4
D	27	VAL	-	expression tag	UNP Q8A3I4
D	28	LEU	-	expression tag	UNP Q8A3I4
D	29	PHE	-	expression tag	UNP Q8A3I4
D	30	GLN	-	expression tag	UNP Q8A3I4
D	31	GLY	-	expression tag	UNP Q8A3I4
D	32	PRO	-	expression tag	UNP Q8A3I4
D	33	ALA	-	expression tag	UNP Q8A3I4
D	34	ALA	-	expression tag	UNP Q8A3I4

- Molecule 2 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



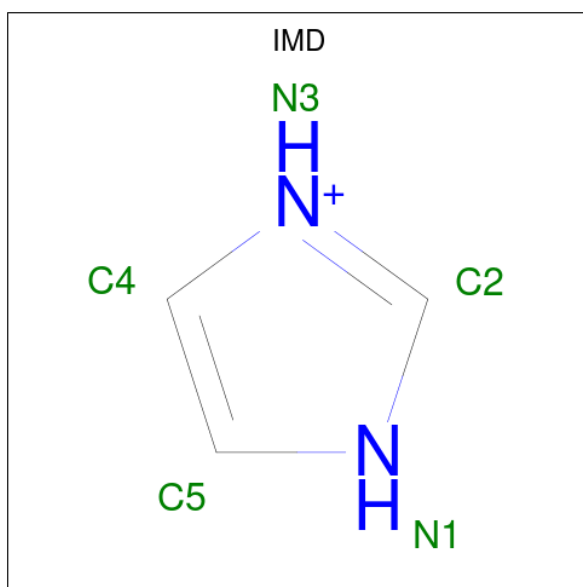
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	C	1	Total	O	S	0	0
			5	4	1		
2	D	1	Total	O	S	0	0
			5	4	1		

- Molecule 3 is N-[(1S,2R,3R,4S,5R)-3,4,5-trihydroxy-2-methylcyclohexyl]benzamide (CCD ID: 3U2) (formula: C₁₄H₁₉NO₄).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			13	8	1	4		
3	B	1	Total	C	N	O	0	0
			14	9	1	4		
3	C	1	Total	C	N	O	0	0
			19	14	1	4		

- Molecule 4 is IMIDAZOLE (CCD ID: IMD) (formula: $C_3H_5N_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	N	0	0
			5	3	2		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	B	1	Total	C	N	0	0
			5	3	2		
4	C	1	Total	C	N	0	0
			5	3	2		
4	D	1	Total	C	N	0	0
			5	3	2		

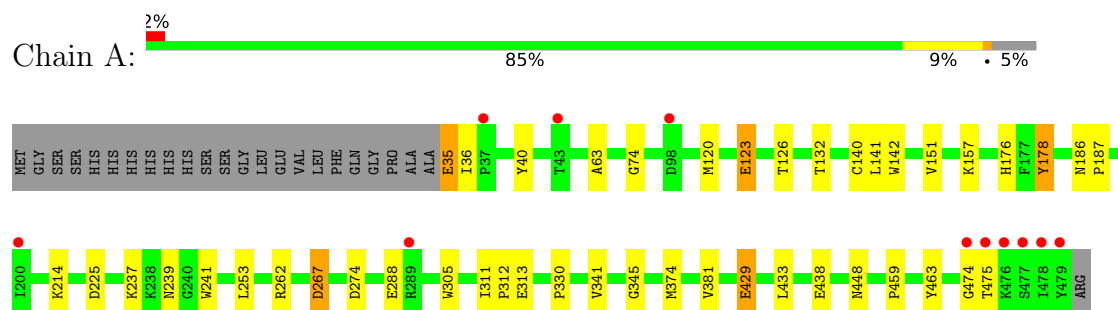
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	341	Total	O	0	0
			341	341		
5	B	395	Total	O	0	0
			395	395		
5	C	265	Total	O	0	0
			265	265		
5	D	203	Total	O	0	0
			203	203		

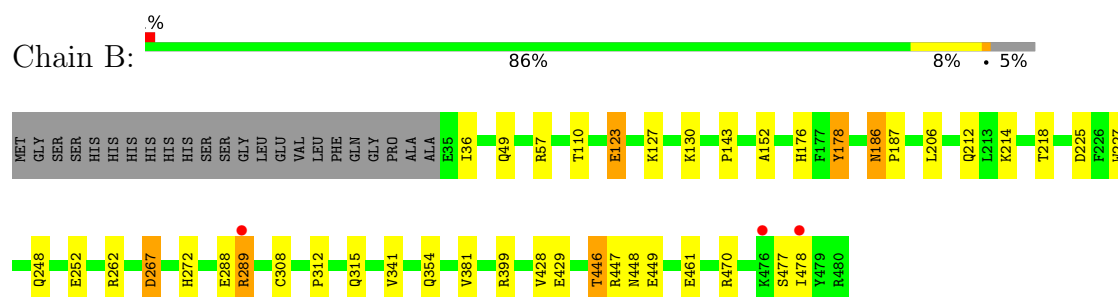
3 Residue-property plots [i](#)

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.

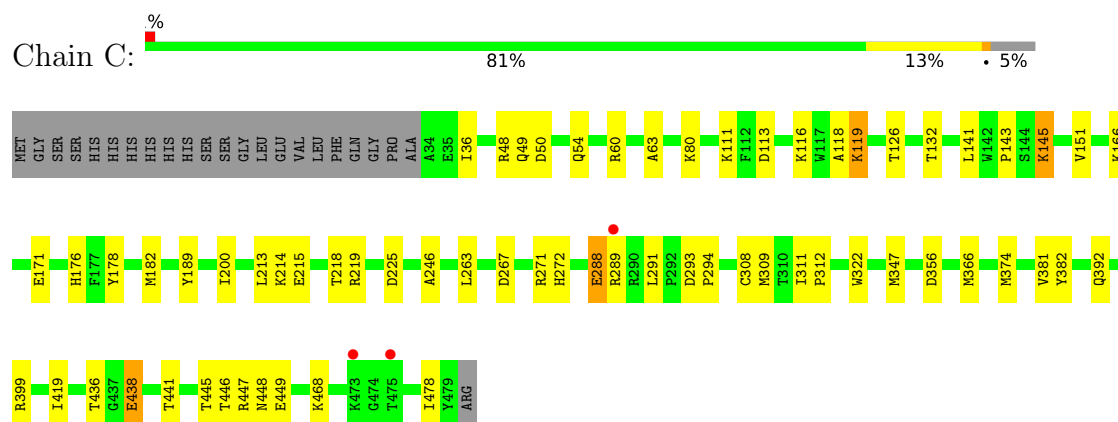
- Molecule 1: Alpha-L-fucosidase



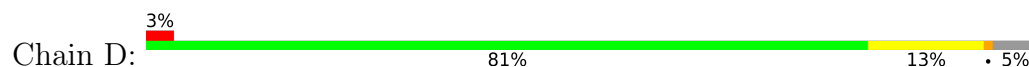
- Molecule 1: Alpha-L-fucosidase

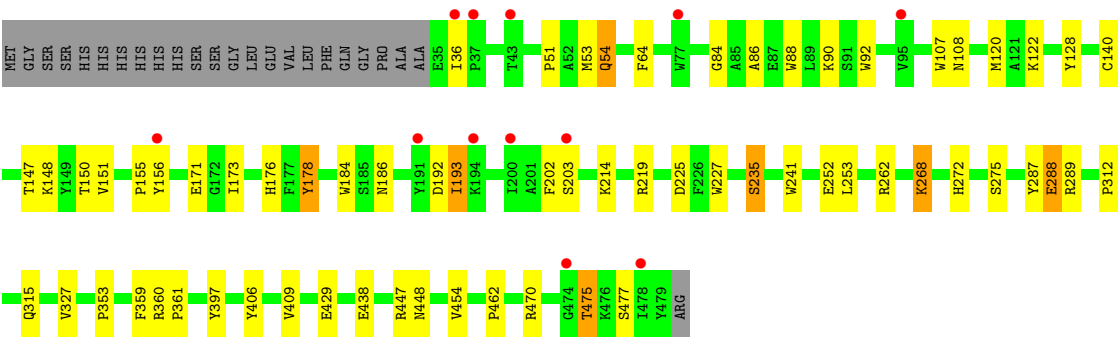


- Molecule 1: Alpha-L-fucosidase



- Molecule 1: Alpha-L-fucosidase





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	55.65Å 186.52Å 98.15Å 90.00° 94.20° 90.00°	Depositor
Resolution (Å)	97.89 – 1.92 97.89 – 1.92	Depositor EDS
% Data completeness (in resolution range)	96.6 (97.89-1.92) 96.6 (97.89-1.92)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.85 (at 1.92Å)	Xtriage
Refinement program	REFMAC 5.8.0073	Depositor
R, R_{free}	0.182 , 0.232 0.182 , 0.232	Depositor DCC
R_{free} test set	7357 reflections (3.52%)	wwPDB-VP
Wilson B-factor (Å ²)	27.0	Xtriage
Anisotropy	0.357	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 37.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	15567	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 3.37% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: IMD, 3U2, SO4

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	1.24	2/3646 (0.1%)	1.15	6/4966 (0.1%)
1	B	1.27	2/3720 (0.1%)	1.16	8/5054 (0.2%)
1	C	1.15	4/3690 (0.1%)	1.08	6/5019 (0.1%)
1	D	1.14	0/3664	1.17	7/4985 (0.1%)
All	All	1.20	8/14720 (0.1%)	1.14	27/20024 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	C	0	1

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	74	GLY	N-CA	6.01	1.54	1.45
1	C	366	MET	N-CA	5.87	1.53	1.46
1	C	213	LEU	C-O	5.86	1.30	1.24
1	C	80	LYS	CA-C	5.82	1.59	1.52
1	C	311	ILE	CA-C	5.59	1.58	1.52
1	A	429	GLU	CA-C	-5.22	1.45	1.52
1	B	212	GLN	N-CA	5.18	1.52	1.46
1	B	428	VAL	C-O	-5.05	1.18	1.24

All (27) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	36	ILE	N-CA-C	8.19	116.63	109.02

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	288	GLU	N-CA-C	-7.15	98.90	110.20
1	A	448	ASN	N-CA-C	7.02	121.42	112.86
1	D	454	VAL	CA-C-N	-6.95	113.15	120.03
1	D	454	VAL	C-N-CA	-6.95	113.15	120.03
1	B	36	ILE	N-CA-C	6.85	114.53	108.63
1	A	36	ILE	CA-C-N	-6.62	113.12	120.14
1	A	36	ILE	C-N-CA	-6.62	113.12	120.14
1	C	246	ALA	N-CA-C	-6.07	104.75	111.36
1	D	36	ILE	CA-C-N	-5.98	113.53	119.99
1	D	36	ILE	C-N-CA	-5.98	113.53	119.99
1	B	186	ASN	CA-C-N	5.89	127.20	119.84
1	B	186	ASN	C-N-CA	5.89	127.20	119.84
1	B	461	GLU	N-CA-C	-5.87	102.85	108.07
1	B	127	LYS	N-CA-C	-5.86	106.10	113.72
1	B	289	ARG	N-CA-C	5.64	122.82	110.80
1	C	36	ILE	CA-C-N	-5.51	112.82	120.25
1	C	36	ILE	C-N-CA	-5.51	112.82	120.25
1	A	474	GLY	N-CA-C	5.39	122.24	114.10
1	A	475	THR	N-CA-C	-5.34	101.27	109.76
1	D	287	TYR	N-CA-C	5.34	118.95	111.90
1	C	289	ARG	N-CA-C	5.31	119.59	113.38
1	B	36	ILE	CA-C-N	5.22	126.03	119.98
1	B	36	ILE	C-N-CA	5.22	126.03	119.98
1	D	53	MET	N-CA-C	5.19	116.62	111.07
1	C	445	THR	N-CA-C	-5.09	107.75	114.31
1	A	313	GLU	N-CA-C	5.04	116.47	111.07

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	263	LEU	Peptide

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	3535	0	3298	26	0
1	B	3603	0	3428	24	0
1	C	3573	0	3382	38	0
1	D	3556	0	3347	34	0
2	A	10	0	0	0	0
2	B	10	0	0	0	0
2	C	5	0	0	0	0
2	D	5	0	0	0	0
3	A	13	0	12	1	0
3	B	14	0	13	0	0
3	C	19	0	18	0	0
4	A	5	0	5	1	0
4	B	5	0	5	0	0
4	C	5	0	5	0	0
4	D	5	0	5	1	0
5	A	341	0	0	2	0
5	B	395	0	0	2	0
5	C	265	0	0	1	0
5	D	203	0	0	0	0
All	All	15567	0	13518	120	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 4.

All (120) 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:446:THR:HG22	1:C:449:GLU:HB3	1.26	1.16
1:A:239:ASN:HD22	1:A:241:TRP:HE1	1.25	0.81
1:D:447:ARG:O	1:D:448:ASN:HB2	1.80	0.80
1:C:446:THR:HG22	1:C:449:GLU:CB	2.15	0.73
1:A:123:GLU:HG3	5:A:707:HOH:O	1.89	0.72
1:C:446:THR:CG2	1:C:449:GLU:HB3	2.13	0.71
1:B:123:GLU:HB2	5:B:715:HOH:O	1.94	0.68
1:C:118:ALA:HB1	1:C:171:GLU:HG3	1.79	0.65
1:B:176:HIS:CG	1:B:225:ASP:HB3	2.33	0.64
1:B:288:GLU:HG3	1:B:308[A]:CYS:SG	2.38	0.63
1:C:447:ARG:O	1:C:448:ASN:HB2	1.97	0.63
1:C:176:HIS:CG	1:C:225:ASP:HB3	2.35	0.62
1:A:123:GLU:CG	5:A:707:HOH:O	2.47	0.62
1:C:309:MET:HG2	1:C:347:MET:SD	2.40	0.61
1:B:312:PRO:HG2	1:B:315:GLN:HB2	1.81	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:436:THR:OG1	1:C:438:GLU:HB3	2.01	0.61
1:C:113:ASP:OD2	1:C:116:LYS:HG3	2.04	0.58
1:D:120:MET:SD	4:D:502:IMD:H5	2.44	0.58
1:C:111:LYS:HD2	1:C:356:ASP:OD2	2.04	0.57
1:D:178:TYR:CD1	1:D:178:TYR:C	2.81	0.57
1:A:214:LYS:HG2	1:A:253:LEU:HD11	1.87	0.57
1:A:120:MET:SD	4:A:504:IMD:H5	2.45	0.57
1:B:446:THR:HG22	1:B:449:GLU:HB3	1.87	0.56
1:D:108:ASN:OD1	1:D:156:TYR:HD1	1.88	0.56
1:D:176:HIS:CG	1:D:225:ASP:HB3	2.41	0.56
1:D:107:TRP:O	1:D:155:PRO:HD2	2.05	0.56
1:A:267:ASP:OD1	1:A:267:ASP:N	2.40	0.55
1:C:143:PRO:HG3	5:C:830:HOH:O	2.05	0.55
1:B:248:GLN:O	1:B:252:GLU:HG3	2.07	0.55
1:D:202:PHE:CZ	1:D:235:SER:HB2	2.43	0.54
1:A:239:ASN:HD22	1:A:241:TRP:NE1	1.99	0.54
1:A:239:ASN:ND2	1:A:241:TRP:HE1	2.01	0.54
1:C:132:THR:HA	1:C:178:TYR:HB3	1.90	0.53
1:D:429:GLU:OE2	1:D:470:ARG:CB	2.57	0.53
1:D:227:TRP:CH2	1:D:262:ARG:NH1	2.77	0.53
1:A:178:TYR:C	1:A:178:TYR:CD1	2.87	0.53
1:A:176:HIS:CG	1:A:225:ASP:HB3	2.44	0.52
1:D:122:LYS:HE2	1:D:171:GLU:OE1	2.10	0.52
1:B:178:TYR:C	1:B:178:TYR:CD1	2.88	0.52
1:C:374:MET:HE1	1:C:381:VAL:HG11	1.92	0.52
1:A:262:ARG:NH1	3:A:503:3U2:OAM	2.43	0.51
1:B:214:LYS:O	1:B:218:THR:HG23	2.11	0.50
1:D:86:ALA:C	1:D:88:TRP:H	2.20	0.49
1:D:288:GLU:O	1:D:289:ARG:CB	2.60	0.49
1:A:341:VAL:HG21	1:A:381:VAL:HG13	1.94	0.49
1:B:354:GLN:NE2	5:B:805:HOH:O	2.37	0.49
1:B:429:GLU:OE2	1:B:470:ARG:CD	2.61	0.48
1:C:288:GLU:HG3	1:C:308[A]:CYS:SG	2.53	0.48
1:C:392:GLN:HG3	1:C:419:ILE:O	2.13	0.48
1:A:311:ILE:HB	1:A:312:PRO:HD3	1.96	0.48
1:B:267:ASP:OD1	1:B:267:ASP:N	2.46	0.48
1:C:63:ALA:HB2	1:C:126:THR:HG21	1.94	0.48
1:A:374:MET:HE1	1:A:381:VAL:HB	1.96	0.48
1:B:447:ARG:O	1:B:448:ASN:HB2	2.13	0.48
1:D:360:ARG:HB2	1:D:361:PRO:HD2	1.96	0.48
1:B:49:GLN:HE22	1:B:57:ARG:HH12	1.60	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:90:LYS:HD3	1:D:184:TRP:CE3	2.50	0.47
1:D:214:LYS:HG2	1:D:253:LEU:HD11	1.95	0.47
1:A:40:TYR:CE2	1:A:241:TRP:HB3	2.49	0.47
1:A:35:GLU:OE1	1:A:35:GLU:C	2.58	0.47
1:B:130:LYS:HE2	1:B:227:TRP:CD1	2.50	0.47
1:B:186:ASN:HA	1:B:187:PRO:HD2	1.69	0.47
1:D:140:CYS:HB2	1:D:150:THR:HG22	1.97	0.47
1:C:49:GLN:O	1:C:54:GLN:NE2	2.48	0.47
1:C:374:MET:HE3	1:C:382:TYR:CZ	2.51	0.46
1:D:84:GLY:HA3	1:D:92:TRP:NE1	2.29	0.46
1:A:274:ASP:OD1	1:A:274:ASP:C	2.58	0.46
1:C:48:ARG:HB3	1:C:50:ASP:OD1	2.14	0.46
1:C:291:LEU:HD21	1:C:347:MET:HE1	1.98	0.46
1:B:399:ARG:NH1	1:B:478:ILE:HD12	2.31	0.46
1:D:128:TYR:HA	1:D:173:ILE:HG23	1.98	0.46
1:A:140:CYS:HB3	1:A:142:TRP:CE3	2.50	0.46
1:C:141[A]:LEU:HA	1:C:151:VAL:HG13	1.98	0.45
1:C:214:LYS:O	1:C:218:THR:HG23	2.17	0.45
1:C:166:LYS:HE2	1:D:219:ARG:CZ	2.47	0.45
1:B:429:GLU:OE2	1:B:470:ARG:HD3	2.17	0.45
1:C:215:GLU:O	1:C:219:ARG:HG3	2.17	0.45
1:C:293:ASP:HA	1:C:294:PRO:HD3	1.84	0.45
1:D:192:ASP:OD1	1:D:193:ILE:N	2.50	0.44
1:D:312:PRO:HG2	1:D:315:GLN:HB2	2.00	0.44
1:B:49:GLN:NE2	1:B:57:ARG:HH12	2.15	0.44
1:C:271:ARG:O	1:C:272:HIS:HB2	2.18	0.44
1:A:63:ALA:HB2	1:A:126:THR:HG21	1.99	0.44
1:A:140:CYS:HB3	1:A:142:TRP:CZ3	2.53	0.44
1:C:145:LYS:HE2	1:D:252:GLU:HG2	1.98	0.44
1:D:353:PRO:HG3	1:D:359:PHE:CE2	2.53	0.43
1:A:132:THR:O	1:A:141:LEU:HD12	2.19	0.43
1:A:459:PRO:HG2	1:A:463:TYR:CG	2.53	0.43
1:D:227:TRP:CZ2	1:D:262:ARG:NH1	2.87	0.43
1:D:86:ALA:C	1:D:88:TRP:N	2.76	0.43
1:A:305:TRP:CE2	1:A:345:GLY:HA3	2.54	0.42
1:B:341:VAL:HG21	1:B:381:VAL:HG13	2.01	0.42
1:B:446:THR:HG22	1:B:449:GLU:CB	2.49	0.42
1:C:111:LYS:HD2	1:C:356:ASP:CG	2.44	0.42
1:A:132:THR:HA	1:A:178:TYR:HB3	2.01	0.42
1:C:119:LYS:HE2	1:C:119:LYS:HB3	1.58	0.42
1:B:262:ARG:HA	1:B:272:HIS:CE1	2.55	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:397:TYR:HA	1:D:406:TYR:O	2.19	0.42
1:D:409:VAL:O	1:D:462:PRO:HA	2.19	0.42
1:B:206:LEU:HD23	1:B:206:LEU:HA	1.87	0.41
1:D:475:THR:HG22	1:D:477:SER:HB2	2.02	0.41
1:A:186:ASN:HA	1:A:187:PRO:HD2	1.85	0.41
1:D:262:ARG:HA	1:D:272:HIS:CE1	2.55	0.41
1:B:143:PRO:HB3	1:B:152:ALA:HB2	2.02	0.41
1:B:429:GLU:OE2	1:B:470:ARG:HD2	2.21	0.41
1:C:176:HIS:CD2	1:C:225:ASP:HB3	2.55	0.41
1:C:182:MET:HG3	1:C:189:TYR:CE2	2.56	0.41
1:D:241:TRP:CD2	1:D:241:TRP:C	2.98	0.41
1:C:271:ARG:HH11	1:C:271:ARG:HD3	1.73	0.41
1:C:312:PRO:HG3	1:C:322:TRP:CE2	2.56	0.41
1:A:433:LEU:HB3	1:A:438:GLU:HG2	2.03	0.41
1:D:312:PRO:HA	1:D:327:VAL:HA	2.01	0.41
1:D:51:PRO:HA	1:D:54:GLN:HE21	1.86	0.41
1:C:309:MET:HE3	1:C:309:MET:HB2	1.88	0.40
1:D:268:LYS:HG3	1:D:275:SER:OG	2.21	0.40
1:C:178:TYR:C	1:C:178:TYR:CD1	2.99	0.40
1:C:399:ARG:NH1	1:C:478:ILE:HD12	2.35	0.40
1:D:186:ASN:OD1	1:D:186:ASN:C	2.63	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	444/469 (95%)	428 (96%)	15 (3%)	1 (0%)	43	34
1	B	448/469 (96%)	435 (97%)	12 (3%)	1 (0%)	43	34
1	C	447/469 (95%)	431 (96%)	15 (3%)	1 (0%)	43	34
1	D	443/469 (94%)	426 (96%)	16 (4%)	1 (0%)	43	34

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	1782/1876 (95%)	1720 (96%)	58 (3%)	4 (0%)	43 34

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	60	ARG
1	D	475	THR
1	A	157	LYS
1	B	289	ARG

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	355/398 (89%)	346 (98%)	9 (2%)	42 26
1	B	368/398 (92%)	362 (98%)	6 (2%)	55 44
1	C	362/398 (91%)	355 (98%)	7 (2%)	50 37
1	D	360/398 (90%)	348 (97%)	12 (3%)	33 17
All	All	1445/1592 (91%)	1411 (98%)	34 (2%)	43 28

All (34) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	35	GLU
1	A	123	GLU
1	A	151	VAL
1	A	178	TYR
1	A	237	LYS
1	A	267	ASP
1	A	288	GLU
1	A	330	PRO
1	A	429	GLU
1	B	110	THR
1	B	123	GLU

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Mol	Chain	Res	Type
1	B	178	TYR
1	B	267	ASP
1	B	446	THR
1	B	477	SER
1	C	119	LYS
1	C	145	LYS
1	C	200	ILE
1	C	267	ASP
1	C	438	GLU
1	C	441	THR
1	C	468	LYS
1	D	54	GLN
1	D	64	PHE
1	D	147	THR
1	D	148	LYS
1	D	151	VAL
1	D	178	TYR
1	D	193	ILE
1	D	203	SER
1	D	235	SER
1	D	268	LYS
1	D	288	GLU
1	D	438	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	44	ASN
1	A	239	ASN
1	A	354	GLN
1	A	448	ASN
1	B	49	GLN
1	B	392	GLN
1	B	411	ASN
1	C	248	GLN
1	C	375	ASN
1	C	448	ASN
1	D	54	GLN
1	D	78	ASN
1	D	245	HIS
1	D	392	GLN
1	D	451	ASN

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 ⓘ

13 ligands are modelled in this entry.

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	$\# Z > 2$
4	IMD	D	502	-	5,5,5	0.82	0	5,5,5	0.40	0
2	SO4	A	501	-	4,4,4	0.46	0	6,6,6	0.35	0
2	SO4	B	501	-	4,4,4	0.56	0	6,6,6	0.63	0
3	3U2	B	503	1	14,14,20	2.80	7 (50%)	18,20,28	1.18	2 (11%)
2	SO4	C	501	-	4,4,4	0.59	0	6,6,6	0.34	0
2	SO4	B	502	-	4,4,4	0.41	0	6,6,6	0.68	0
4	IMD	B	504	-	5,5,5	0.91	0	5,5,5	0.52	0
3	3U2	A	503	1	13,13,20	2.91	6 (46%)	15,18,28	1.13	1 (6%)
4	IMD	A	504	-	5,5,5	0.60	0	5,5,5	0.76	0
2	SO4	D	501	-	4,4,4	0.49	0	6,6,6	0.71	0
4	IMD	C	503	-	5,5,5	0.65	0	5,5,5	0.53	0
3	3U2	C	502	1	20,20,20	3.05	7 (35%)	26,28,28	1.56	5 (19%)
2	SO4	A	502	-	4,4,4	0.53	0	6,6,6	0.32	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns.

'-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	IMD	D	502	-	-	-	0/1/1/1
3	3U2	B	503	1	-	0/4/24/28	0/1/1/2
4	IMD	B	504	-	-	-	0/1/1/1
4	IMD	A	504	-	-	-	0/1/1/1
3	3U2	A	503	1	-	0/3/23/28	0/1/1/2
4	IMD	C	503	-	-	-	0/1/1/1
3	3U2	C	502	1	-	0/8/28/28	0/2/2/2

All (20) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	502	3U2	CAF-CAA	9.62	1.67	1.53
3	A	503	3U2	CAF-CAA	7.23	1.64	1.53
3	B	503	3U2	CAF-CAA	6.59	1.63	1.53
3	C	502	3U2	OAH-CAE	5.28	1.54	1.43
3	A	503	3U2	CAF-CAE	4.84	1.61	1.52
3	C	502	3U2	CAN-CAL	-4.75	1.39	1.50
3	B	503	3U2	CAN-CAL	-4.21	1.41	1.50
3	B	503	3U2	CAB-CAC	3.51	1.59	1.53
3	B	503	3U2	OAH-CAE	3.16	1.50	1.43
3	A	503	3U2	CAA-NAG	3.14	1.52	1.46
3	A	503	3U2	OAJ-CAC	2.83	1.50	1.43
3	C	502	3U2	CAF-CAE	2.56	1.57	1.52
3	C	502	3U2	CAD-CAC	2.47	1.58	1.52
3	C	502	3U2	CAE-CAD	2.45	1.56	1.52
3	A	503	3U2	CAE-CAD	2.37	1.56	1.52
3	C	502	3U2	CAB-CAC	2.34	1.57	1.53
3	A	503	3U2	CAB-CAC	2.21	1.57	1.53
3	B	503	3U2	CAB-CAA	2.15	1.58	1.54
3	B	503	3U2	CAE-CAD	2.12	1.55	1.52
3	B	503	3U2	CAF-CAE	2.07	1.56	1.52

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	502	3U2	CAF-CAA-CAB	4.21	118.78	114.49
3	C	502	3U2	OAH-CAE-CAD	2.97	116.30	110.15
3	C	502	3U2	CAN-CAL-NAG	-2.41	112.57	117.04
3	A	503	3U2	OAH-CAE-CAF	2.33	115.66	109.86
3	C	502	3U2	OAH-CAE-CAF	2.19	115.30	109.86
3	C	502	3U2	CAF-CAA-NAG	2.12	114.01	110.78

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	503	3U2	OAI-CAD-CAE	-2.11	105.75	110.05
3	B	503	3U2	CAF-CAA-CAB	2.02	116.55	114.49

There are no chirality outliers.

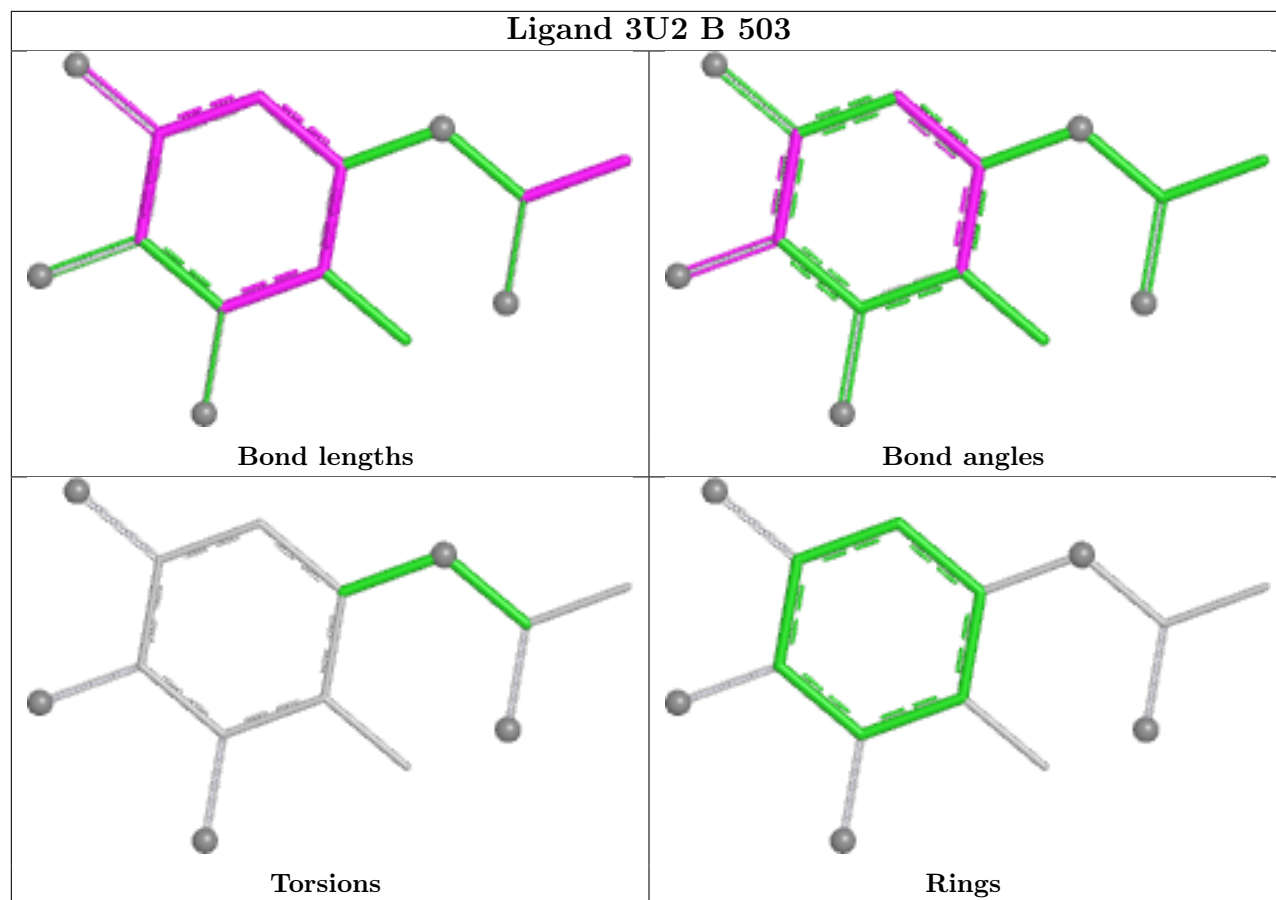
There are no torsion outliers.

There are no ring outliers.

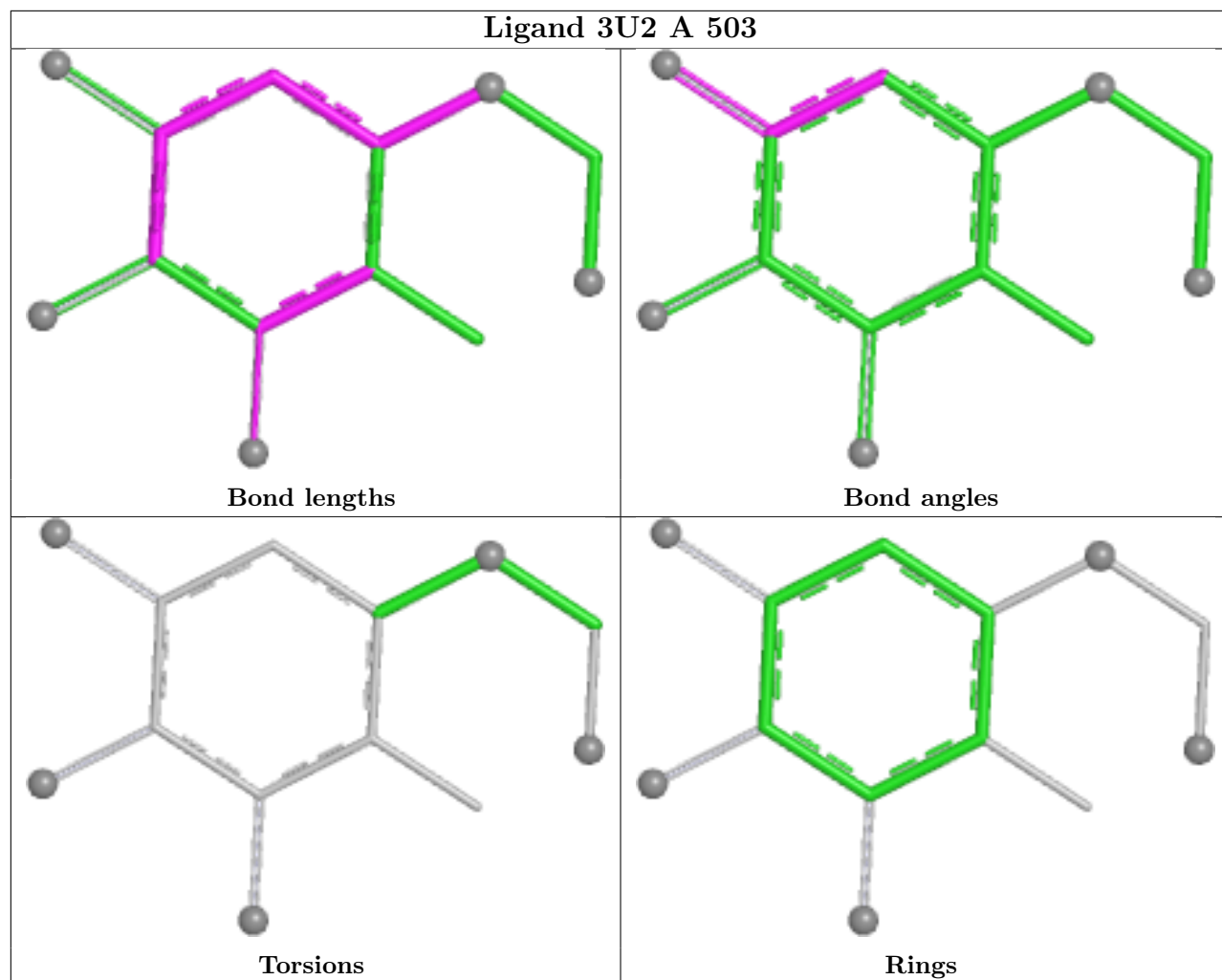
3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	D	502	IMD	1	0
3	A	503	3U2	1	0
4	A	504	IMD	1	0

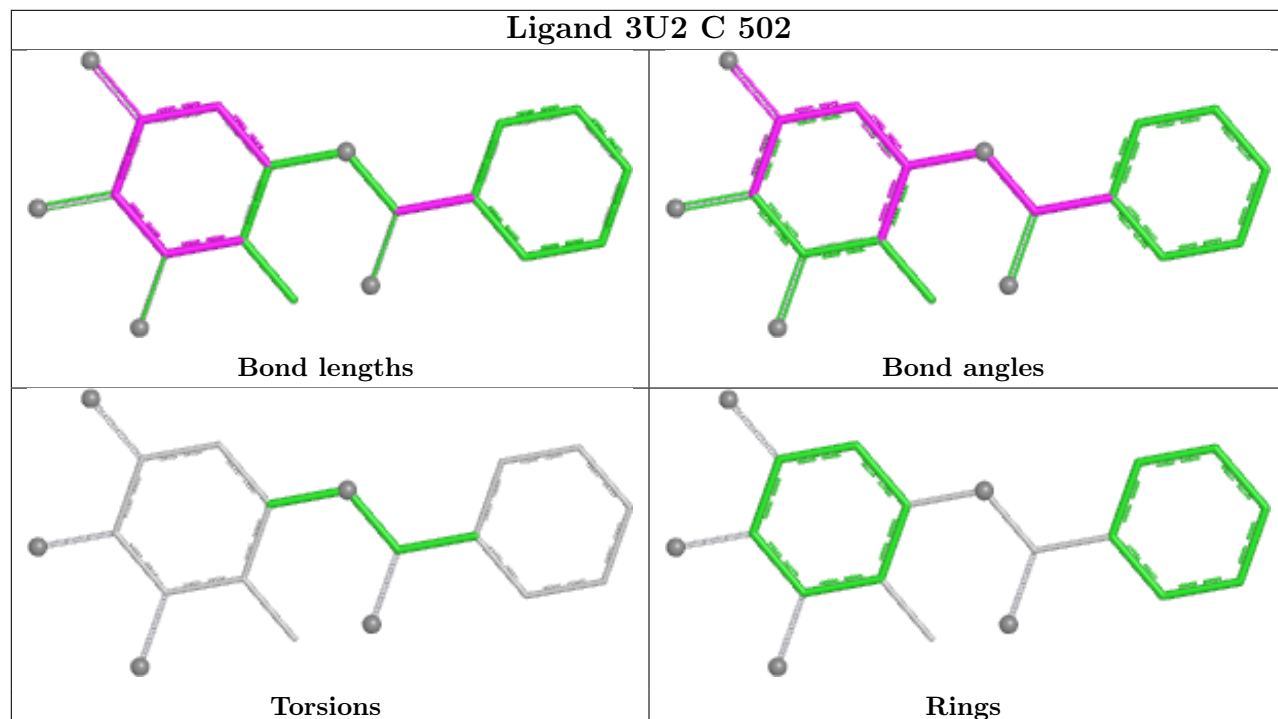
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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



Ligand 3U2 A 503



Ligand 3U2 C 502



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	445/469 (94%)	-0.18	11 (2%) 58 64	15, 27, 50, 81	2 (0%)
1	B	446/469 (95%)	-0.40	3 (0%) 84 88	11, 23, 42, 60	5 (1%)
1	C	446/469 (95%)	0.02	3 (0%) 84 88	15, 31, 52, 93	4 (0%)
1	D	445/469 (94%)	0.48	12 (2%) 56 62	22, 37, 60, 88	1 (0%)
All	All	1782/1876 (94%)	-0.02	29 (1%) 70 77	11, 30, 53, 93	12 (0%)

All (29) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	36	ILE	4.4
1	D	200	ILE	4.0
1	A	475	THR	3.9
1	A	474	GLY	3.9
1	D	77	TRP	3.1
1	C	475	THR	3.0
1	C	289	ARG	2.9
1	A	200	ILE	2.9
1	D	478	ILE	2.8
1	D	37	PRO	2.7
1	B	476	LYS	2.7
1	B	478	ILE	2.7
1	C	473	LYS	2.6
1	D	474	GLY	2.6
1	A	37	PRO	2.6
1	A	479	TYR	2.5
1	A	289	ARG	2.5
1	A	98	ASP	2.5
1	A	476	LYS	2.4
1	D	95	VAL	2.4
1	A	478	ILE	2.3

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Mol	Chain	Res	Type	RSRZ
1	D	194	LYS	2.3
1	A	477	SER	2.3
1	A	43	THR	2.3
1	D	203	SER	2.3
1	B	289	ARG	2.1
1	D	156	TYR	2.1
1	D	43	THR	2.0
1	D	191	TYR	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.

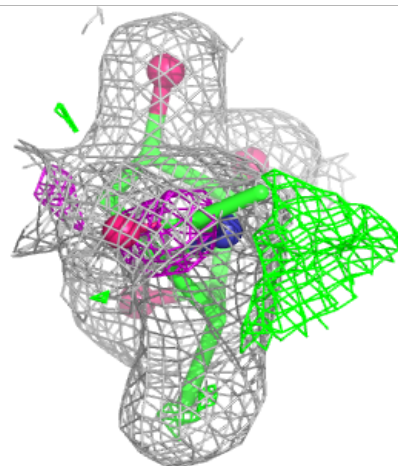
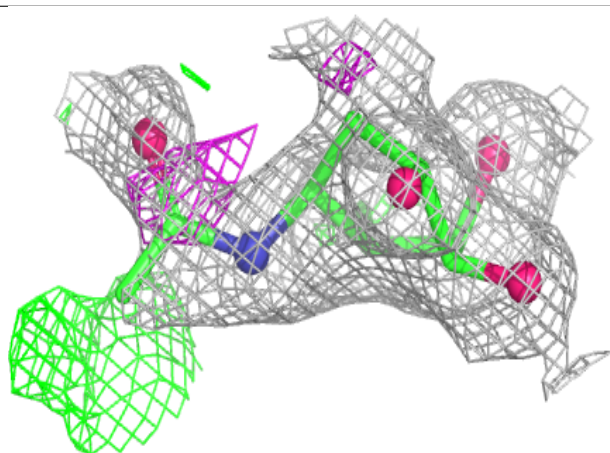
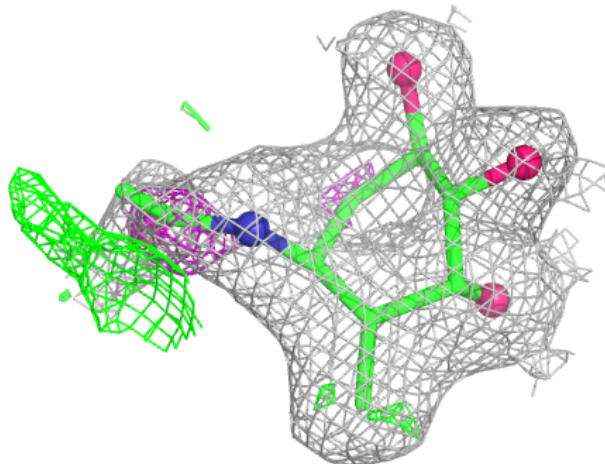
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	SO4	A	502	5/5	0.77	0.11	73,76,82,84	0
3	3U2	B	503	14/19	0.86	0.13	27,34,48,53	0
3	3U2	A	503	13/19	0.87	0.12	26,36,57,65	0
2	SO4	C	501	5/5	0.88	0.10	58,59,67,67	0
3	3U2	C	502	19/19	0.89	0.13	26,37,72,79	0
4	IMD	D	502	5/5	0.91	0.15	39,39,42,42	0
2	SO4	D	501	5/5	0.92	0.09	48,50,56,60	0
2	SO4	B	501	5/5	0.93	0.07	52,52,55,61	0
2	SO4	A	501	5/5	0.94	0.07	48,51,52,57	0
4	IMD	C	503	5/5	0.95	0.10	36,37,41,43	0
2	SO4	B	502	5/5	0.95	0.07	46,50,58,58	0
4	IMD	B	504	5/5	0.97	0.08	24,24,27,30	0
4	IMD	A	504	5/5	0.98	0.05	25,25,27,28	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.

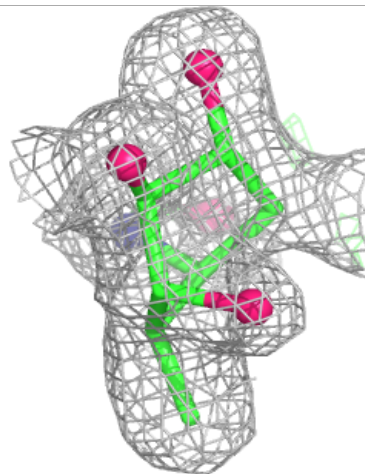
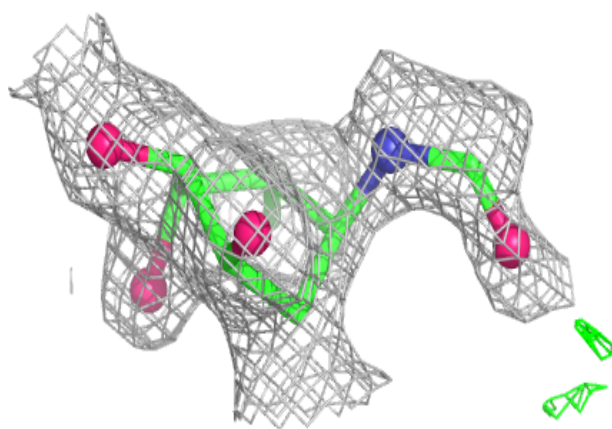
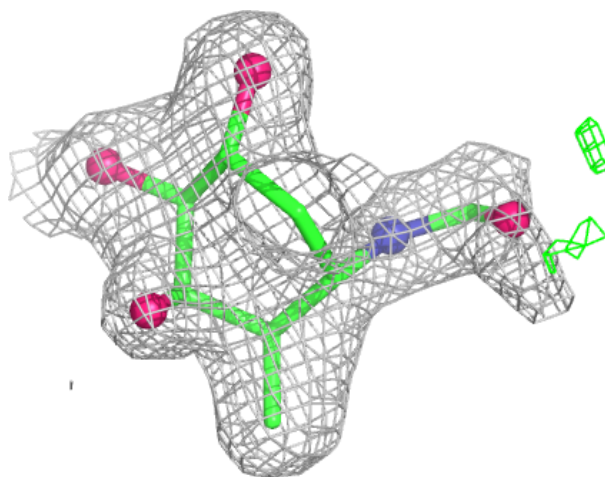
Electron density around 3U2 B 503:

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



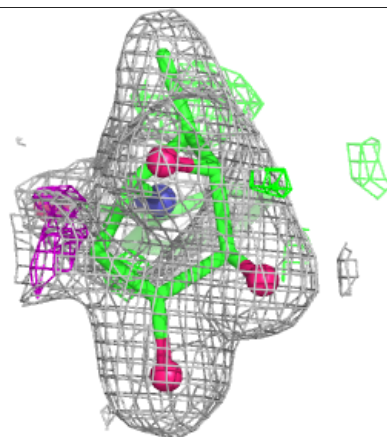
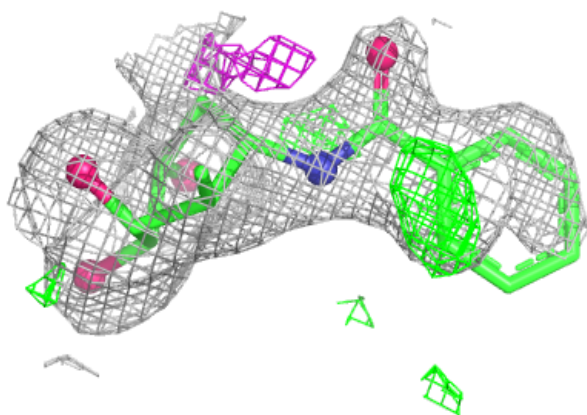
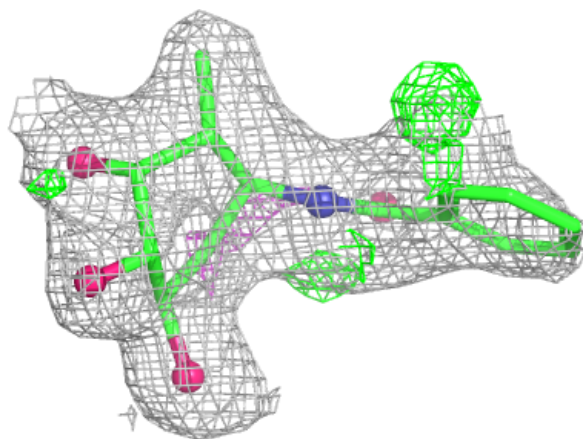
Electron density around 3U2 A 503:

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



Electron density around 3U2 C 502:

$2mF_o-DF_c$ (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.