



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 23, 2024 – 10:46 AM EDT

PDB ID : 4WSK
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	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.37.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

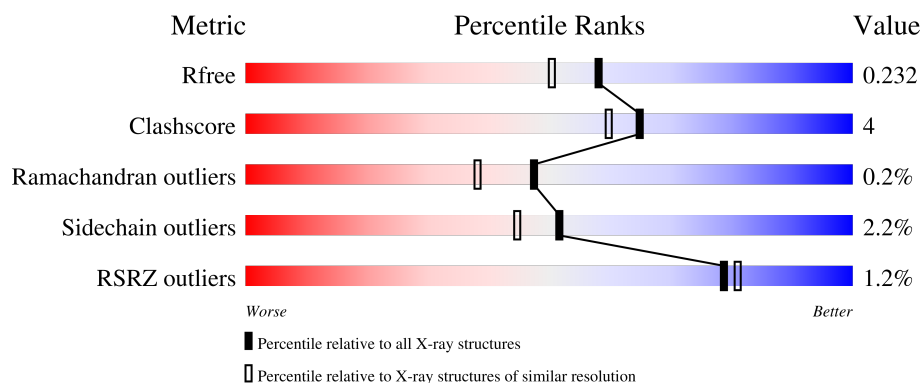
1 Overall quality at a glance

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}	130704	7937 (1.94-1.90)
Clashscore	141614	8644 (1.94-1.90)
Ramachandran outliers	138981	8530 (1.94-1.90)
Sidechain outliers	138945	8530 (1.94-1.90)
RSRZ outliers	127900	7793 (1.94-1.90)

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	<div> <div>%</div> <div>85% 9% • 5%</div> </div>
1	B	469	<div> <div>85% 9% • 5%</div> </div>
1	C	469	<div> <div>2% 83% 12% • 5%</div> </div>
1	D	469	<div> <div>% 81% 13% • 5%</div> </div>

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

Continued on next page...

Continued from previous page...

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

Continued on next page...

Continued from previous page...

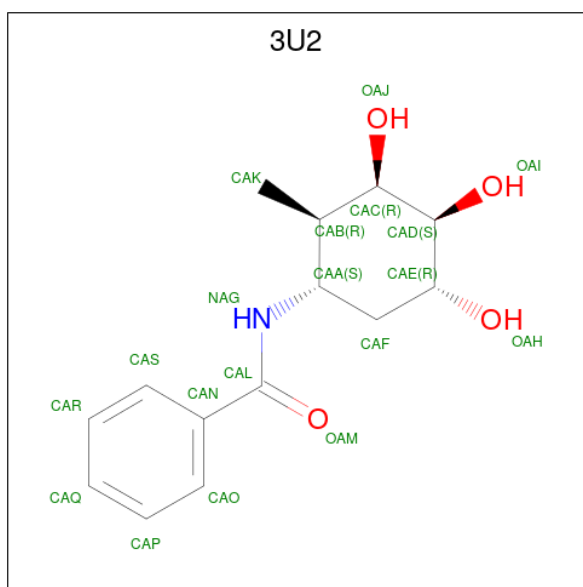
Chain	Residue	Modelled	Actual	Comment	Reference
C	29	PHE	-	expression tag	UNP Q8A3I4
C	30	GLN	-	expression tag	UNP Q8A3I4
C	31	GLY	-	expression tag	UNP Q8A3I4
C	32	PRO	-	expression tag	UNP Q8A3I4
C	33	ALA	-	expression tag	UNP Q8A3I4
C	34	ALA	-	expression tag	UNP Q8A3I4
D	12	MET	-	initiating methionine	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 (three-letter code: SO4) (formula: O₄S).



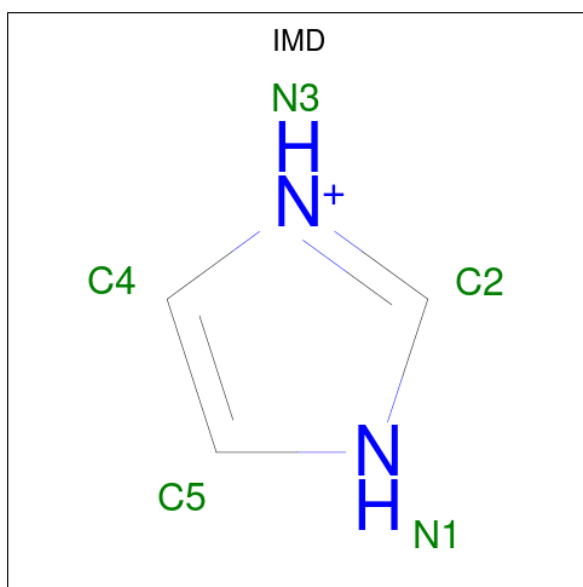
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	C	1	Total	O	S	0	0
			5	4	1		
2	D	1	Total	O	S	0	0
			5	4	1		

- Molecule 3 is N-[(1S,2R,3R,4S,5R)-3,4,5-trihydroxy-2-methylcyclohexyl]benzamide (three-letter code: 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 (three-letter code: IMD) (formula: $C_3H_5N_2$).



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

Continued on next page...

Continued from previous page...

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		

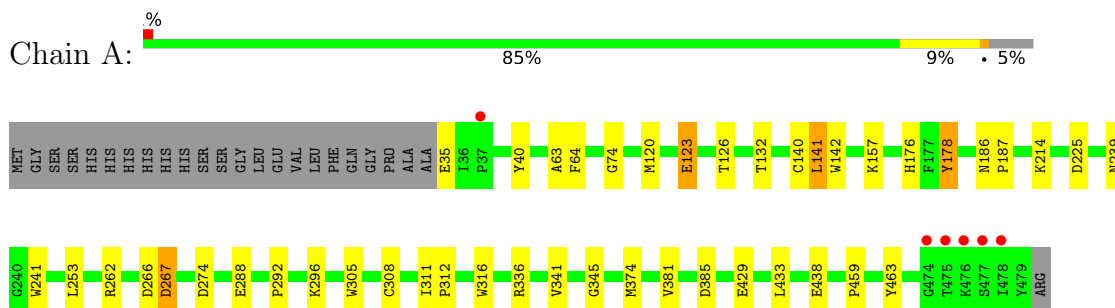
- Molecule 5 is water.

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		

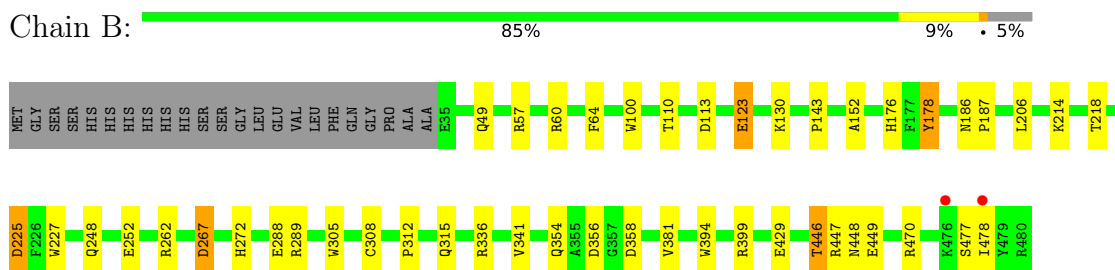
3 Residue-property plots

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.

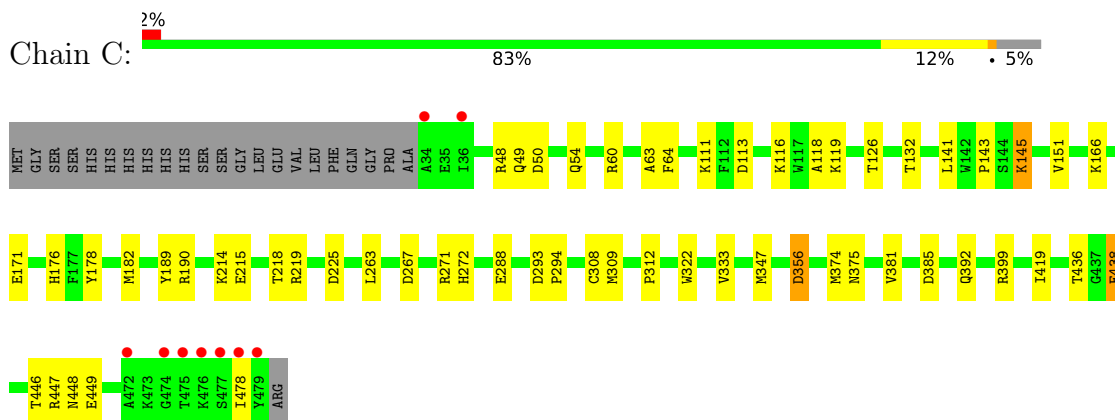
• Molecule 1: Alpha-L-fucosidase



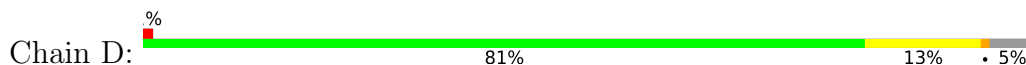
• Molecule 1: Alpha-L-fucosidase

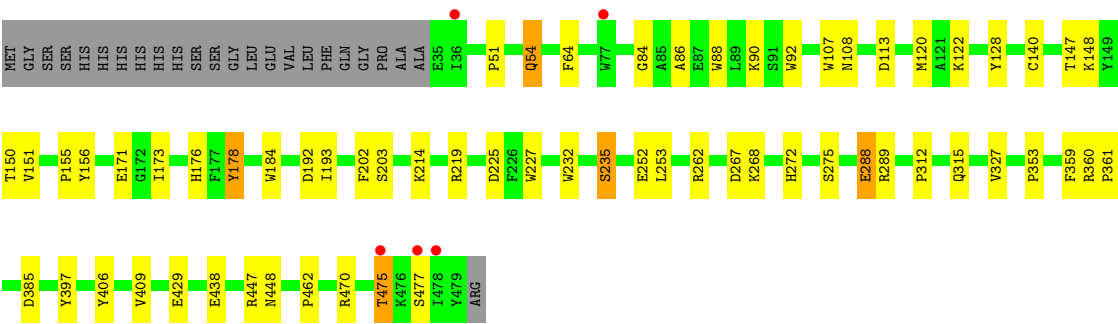


• Molecule 1: Alpha-L-fucosidase



• 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 53.20 – 1.92	Depositor EDS
% Data completeness (in resolution range)	96.6 (97.89-1.92) 96.6 (53.20-1.92)	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	7350 reflections (5.02%)	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 , 46.6	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

5.1 Standard geometry

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	1.00	1/3646 (0.0%)	0.93	5/4966 (0.1%)
1	B	1.04	3/3720 (0.1%)	0.98	6/5054 (0.1%)
1	C	0.91	0/3690	0.87	3/5019 (0.1%)
1	D	0.90	0/3664	0.87	2/4985 (0.0%)
All	All	0.96	4/14720 (0.0%)	0.92	16/20024 (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 (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	305	TRP	CE3-CZ3	6.60	1.49	1.38
1	B	100	TRP	CE3-CZ3	5.89	1.48	1.38
1	A	74	GLY	N-CA	5.71	1.54	1.46
1	B	394	TRP	CG-CD1	5.01	1.43	1.36

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	113	ASP	CB-CG-OD1	7.81	125.33	118.30
1	B	60	ARG	NE-CZ-NH1	7.76	124.18	120.30
1	A	385	ASP	CB-CG-OD1	7.01	124.61	118.30
1	C	356	ASP	CB-CG-OD1	6.29	123.97	118.30
1	A	266	ASP	CB-CG-OD1	6.26	123.93	118.30

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	336	ARG	NE-CZ-NH1	6.25	123.42	120.30
1	A	141	LEU	CB-CG-CD1	-5.84	101.07	111.00
1	B	225	ASP	CB-CG-OD2	5.75	123.47	118.30
1	D	113	ASP	CB-CG-OD1	5.74	123.47	118.30
1	A	296	LYS	CD-CE-NZ	-5.66	98.69	111.70
1	A	336	ARG	NE-CZ-NH1	5.55	123.07	120.30
1	B	356	ASP	CB-CG-OD1	5.48	123.23	118.30
1	B	358	ASP	CB-CG-OD1	5.37	123.13	118.30
1	D	385	ASP	CB-CG-OD1	5.24	123.02	118.30
1	C	385	ASP	CB-CG-OD1	5.03	122.83	118.30
1	C	190	ARG	NE-CZ-NH2	-5.01	117.80	120.30

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	34	0
1	D	3556	0	3347	31	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

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
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	113	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 (113) 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
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: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

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
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:178:TYR:CD1	1:D:178:TYR:C	2.81	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: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: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:C:374:MET:HE1	1:C:381:VAL:HG11	1.94	0.50
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:B:447:ARG:O	1:B:448:ASN:HB2	2.13	0.48
1:A:178:TYR:C	1:A:178:TYR:CD1	2.87	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
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:B:178:TYR:C	1:B:178:TYR:CD1	2.88	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:D:84:GLY:HA3	1:D:92:TRP:NE1	2.29	0.46
1:C:48:ARG:HB3	1:C:50:ASP:OD1	2.14	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

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
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:C:309:MET:HE1	1:C:333:VAL:HG22	2.01	0.43
1:D:86:ALA:C	1:D:88:TRP:H	2.20	0.43
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:374:MET:HE1	1:A:381:VAL:HG11	2.00	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: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:A:132:THR:HA	1:A:178:TYR:HB3	2.01	0.42
1:A:308[A]:CYS:HG	1:A:316:TRP:HH2	1.67	0.42
1:C:119:LYS:HE2	1:C:119:LYS:HB3	1.58	0.42
1:A:35:GLU:OE1	1:A:35:GLU:C	2.58	0.42
1:B:262:ARG:HA	1:B:272:HIS:CE1	2.55	0.42
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:274:ASP:OD1	1:A:274:ASP:C	2.58	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: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:D:268:LYS:HG3	1:D:275:SER:OG	2.21	0.40
1:C:399:ARG:NH1	1:C:478:ILE:HD12	2.35	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%)	47	38
1	B	448/469 (96%)	435 (97%)	12 (3%)	1 (0%)	47	38
1	C	447/469 (95%)	431 (96%)	15 (3%)	1 (0%)	47	38
1	D	443/469 (94%)	426 (96%)	16 (4%)	1 (0%)	47	38
All	All	1782/1876 (95%)	1720 (96%)	58 (3%)	4 (0%)	47	38

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 [i](#)

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%)	348 (98%)	7 (2%)	55	49
1	B	368/398 (92%)	361 (98%)	7 (2%)	57	51
1	C	362/398 (91%)	357 (99%)	5 (1%)	67	63

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	D	360/398 (90%)	348 (97%)	12 (3%)	38	28
All	All	1445/1592 (91%)	1414 (98%)	31 (2%)	52	46

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	64	PHE
1	A	123	GLU
1	A	178	TYR
1	A	267	ASP
1	A	288	GLU
1	A	292	PRO
1	A	429	GLU
1	B	64	PHE
1	B	110	THR
1	B	123	GLU
1	B	178	TYR
1	B	267	ASP
1	B	446	THR
1	B	477	SER
1	C	64	PHE
1	C	145	LYS
1	C	267	ASP
1	C	375	ASN
1	C	438	GLU
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	203	SER
1	D	232	TRP
1	D	235	SER
1	D	267	ASP
1	D	288	GLU
1	D	438	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

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

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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

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	$\# Z > 2$
2	SO4	B	501	-	4,4,4	0.47	0	6,6,6	0.67	0
3	3U2	C	502	1	20,20,20	2.99	7 (35%)	26,28,28	1.55	5 (19%)
2	SO4	D	501	-	4,4,4	0.40	0	6,6,6	0.78	0
4	IMD	C	503	-	3,5,5	0.16	0	4,5,5	0.40	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	SO4	A	502	-	4,4,4	0.44	0	6,6,6	0.32	0
3	3U2	B	503	1	14,14,20	2.74	7 (50%)	18,20,28	1.17	2 (11%)
4	IMD	B	504	-	3,5,5	0.52	0	4,5,5	0.49	0
2	SO4	C	501	-	4,4,4	0.51	0	6,6,6	0.38	0
3	3U2	A	503	1	13,13,20	3.42	6 (46%)	15,18,28	1.11	1 (6%)
2	SO4	A	501	-	4,4,4	0.38	0	6,6,6	0.43	0
4	IMD	D	502	-	3,5,5	0.44	0	4,5,5	0.57	0
4	IMD	A	504	-	3,5,5	0.22	0	4,5,5	0.80	0
2	SO4	B	502	-	4,4,4	0.30	0	6,6,6	0.71	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
3	3U2	C	502	1	-	0/8/28/28	0/2/2/2
4	IMD	C	503	-	-	-	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
3	3U2	A	503	1	-	0/3/23/28	0/1/1/2
4	IMD	D	502	-	-	-	0/1/1/1
4	IMD	A	504	-	-	-	0/1/1/1

All (20) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	502	3U2	CAF-CAA	9.14	1.67	1.53
3	A	503	3U2	CAA-NAG	7.18	1.52	1.46
3	A	503	3U2	CAF-CAA	6.86	1.64	1.53
3	B	503	3U2	CAF-CAA	6.25	1.63	1.53
3	A	503	3U2	CAF-CAE	5.27	1.61	1.52
3	C	502	3U2	OAH-CAE	5.22	1.54	1.43
3	C	502	3U2	CAN-CAL	-4.99	1.39	1.50
3	B	503	3U2	CAN-CAL	-4.20	1.41	1.50
3	B	503	3U2	CAB-CAC	3.46	1.59	1.53
3	B	503	3U2	OAH-CAE	3.12	1.50	1.43
3	A	503	3U2	OAJ-CAC	2.96	1.50	1.43
3	C	502	3U2	CAF-CAE	2.78	1.57	1.52
3	C	502	3U2	CAE-CAD	2.53	1.56	1.52
3	C	502	3U2	CAD-CAC	2.52	1.58	1.52
3	A	503	3U2	CAE-CAD	2.45	1.56	1.52

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	502	3U2	CAB-CAC	2.31	1.57	1.53
3	B	503	3U2	CAF-CAE	2.24	1.56	1.52
3	A	503	3U2	CAB-CAC	2.18	1.57	1.53
3	B	503	3U2	CAE-CAD	2.18	1.55	1.52
3	B	503	3U2	CAB-CAA	2.11	1.58	1.54

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	3.08	116.30	110.14
3	C	502	3U2	CAN-CAL-NAG	-2.35	112.57	117.06
3	A	503	3U2	OAH-CAE-CAF	2.31	115.66	109.94
3	B	503	3U2	OAI-CAD-CAE	-2.22	105.75	109.99
3	C	502	3U2	OAH-CAE-CAF	2.16	115.30	109.94
3	C	502	3U2	CAF-CAA-NAG	2.04	114.01	110.86
3	B	503	3U2	CAF-CAA-CAB	2.02	116.55	114.49

There are no chirality outliers.

There are no torsion outliers.

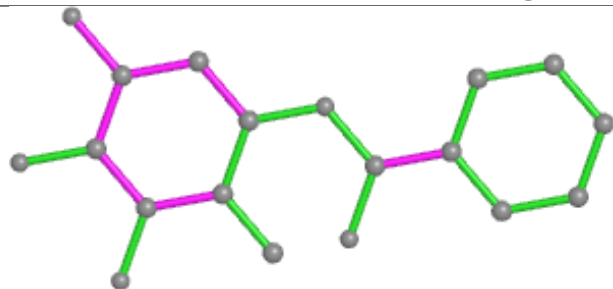
There are no ring outliers.

3 monomers are involved in 3 short contacts:

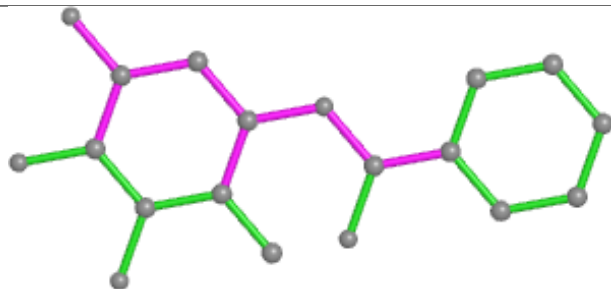
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	503	3U2	1	0
4	D	502	IMD	1	0
4	A	504	IMD	1	0

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.

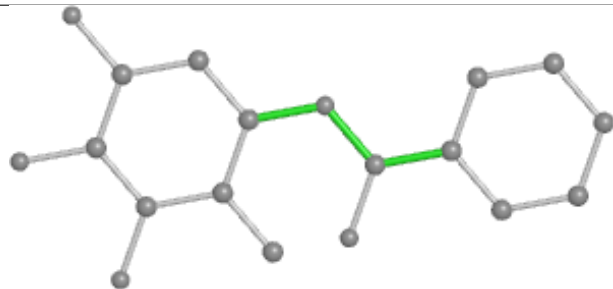
Ligand 3U2 C 502



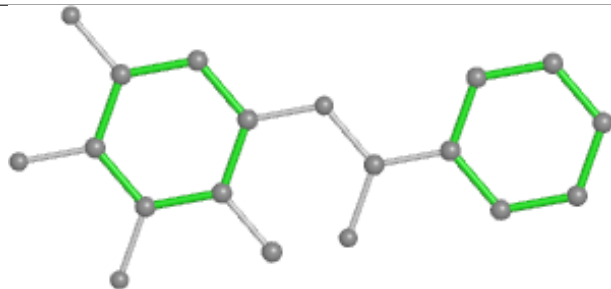
Bond lengths



Bond angles

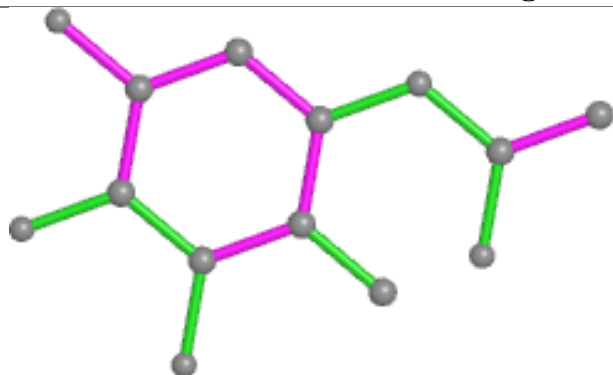


Torsions

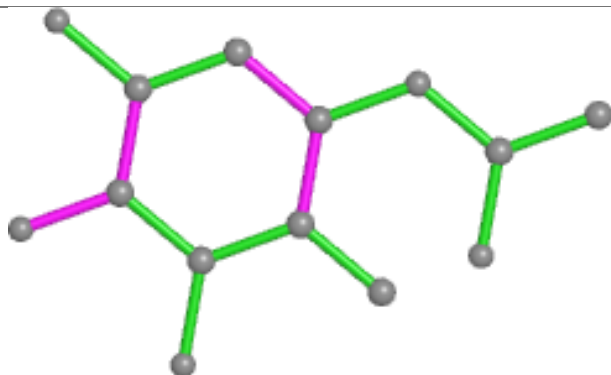


Rings

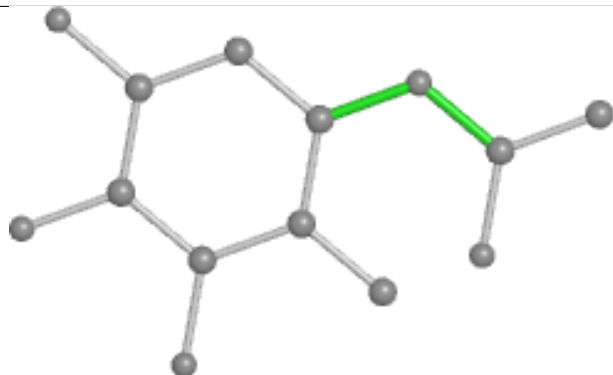
Ligand 3U2 B 503



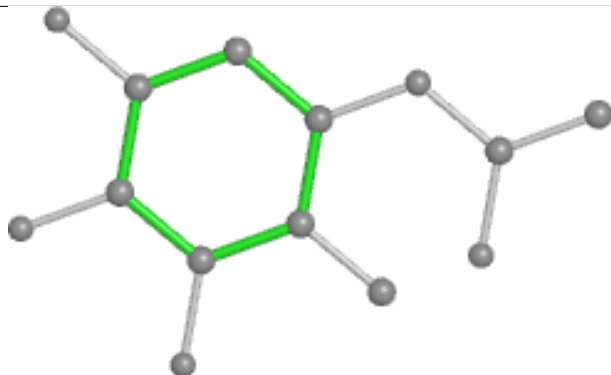
Bond lengths



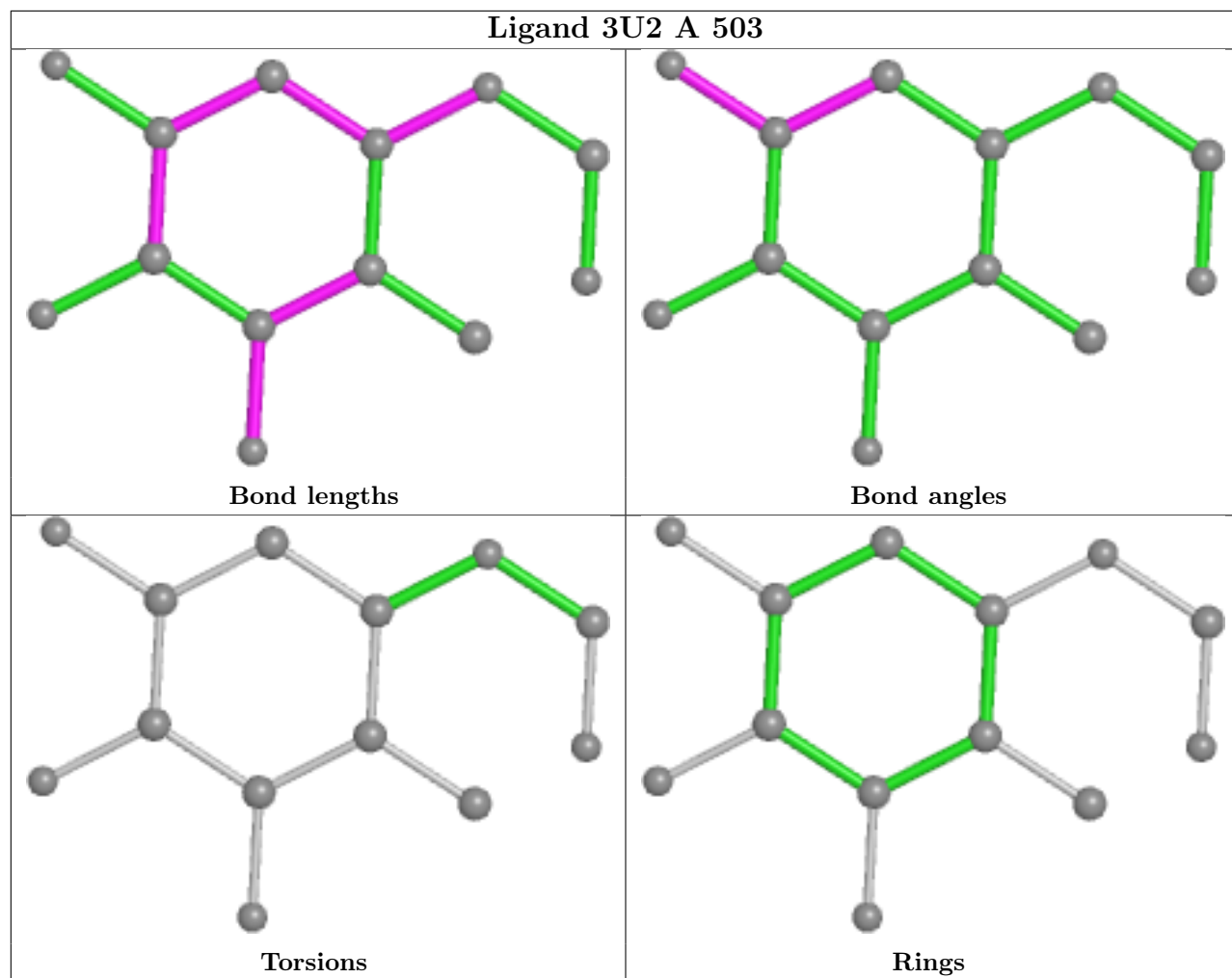
Bond angles



Torsions



Rings



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%)	-0.33	6 (1%) 77 79	15, 27, 50, 81	1 (0%)
1	B	446/469 (95%)	-0.30	2 (0%) 92 93	13, 23, 42, 60	1 (0%)
1	C	446/469 (95%)	-0.23	9 (2%) 65 68	21, 31, 52, 93	1 (0%)
1	D	445/469 (94%)	-0.07	5 (1%) 80 82	22, 37, 60, 88	1 (0%)
All	All	1782/1876 (94%)	-0.23	22 (1%) 79 81	13, 30, 53, 93	4 (0%)

All (22) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	475	THR	5.2
1	A	475	THR	4.7
1	D	36	ILE	4.5
1	C	478	ILE	4.4
1	D	478	ILE	3.8
1	C	474	GLY	3.8
1	A	477	SER	3.8
1	C	477	SER	3.7
1	C	476	LYS	3.7
1	D	477	SER	3.6
1	A	474	GLY	3.5
1	A	476	LYS	3.0
1	C	36	ILE	3.0
1	B	476	LYS	2.7
1	B	478	ILE	2.7
1	A	478	ILE	2.6
1	A	37	PRO	2.4
1	D	77	TRP	2.3
1	D	475	THR	2.2
1	C	34	ALA	2.2
1	C	479	TYR	2.1
1	C	472	ALA	2.1

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

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

6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

6.4 Ligands [i](#)

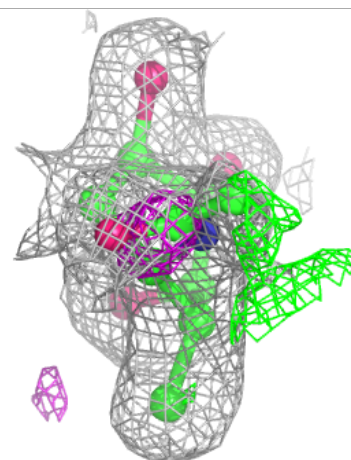
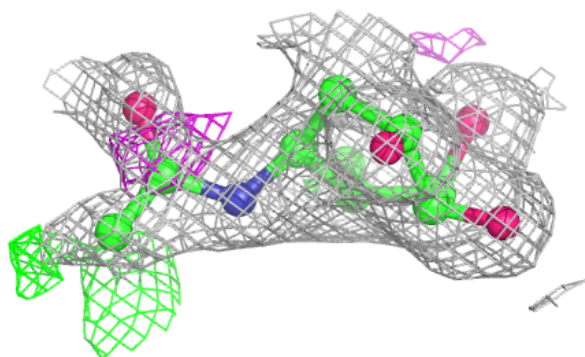
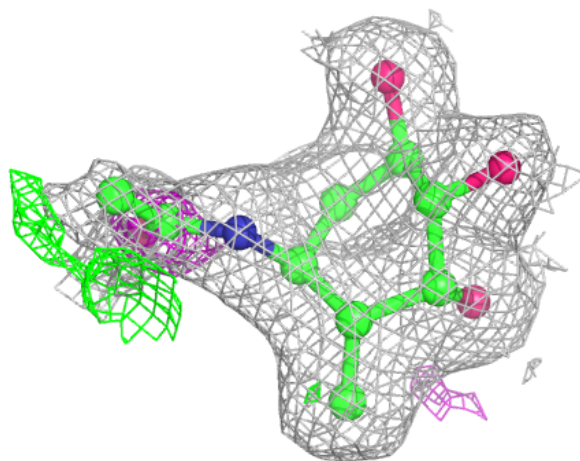
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
3	3U2	B	503	14/19	0.82	0.15	27,34,48,53	0
3	3U2	A	503	13/19	0.88	0.18	26,36,57,65	0
2	SO4	A	502	5/5	0.90	0.13	73,76,82,84	0
3	3U2	C	502	19/19	0.91	0.15	26,37,72,79	0
2	SO4	C	501	5/5	0.93	0.10	58,59,67,67	0
4	IMD	D	502	5/5	0.95	0.17	39,39,42,42	0
2	SO4	D	501	5/5	0.96	0.09	48,50,56,60	0
2	SO4	A	501	5/5	0.97	0.09	48,51,52,57	0
2	SO4	B	501	5/5	0.97	0.08	52,52,55,61	0
4	IMD	B	504	5/5	0.97	0.12	24,24,27,30	0
4	IMD	C	503	5/5	0.97	0.10	36,37,41,43	0
2	SO4	B	502	5/5	0.97	0.08	46,50,58,58	0
4	IMD	A	504	5/5	0.99	0.08	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.

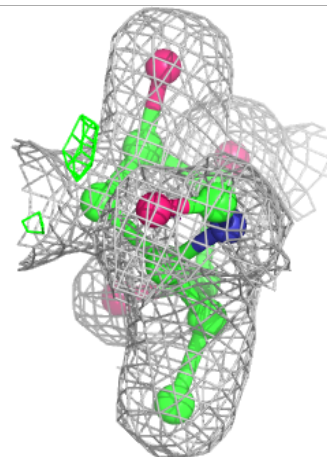
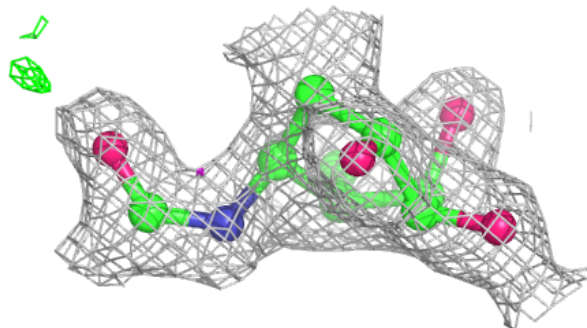
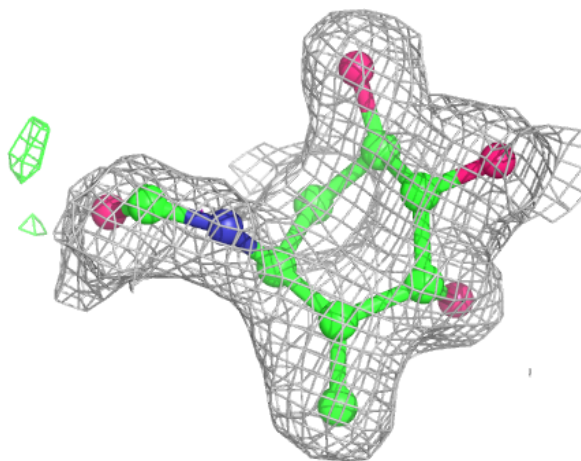
Electron density around 3U2 B 503:

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



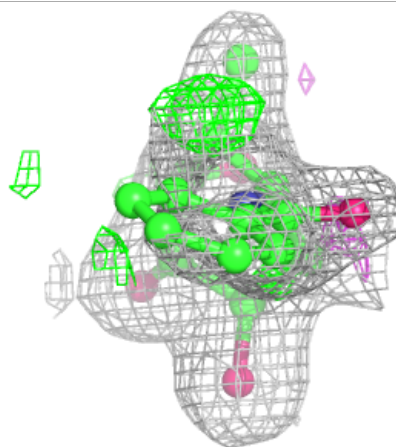
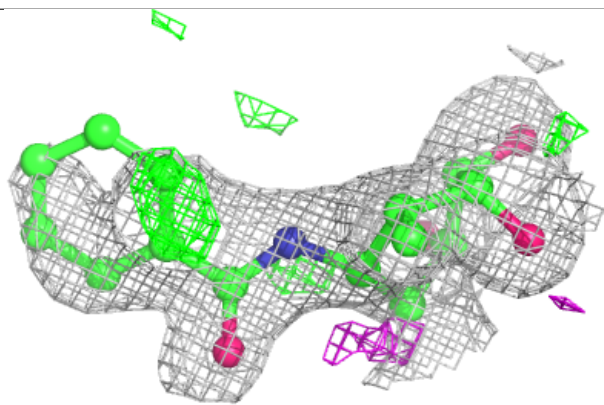
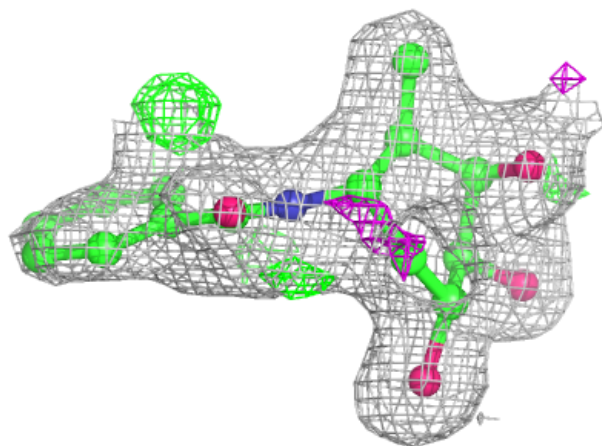
Electron density around 3U2 A 503:

$2mF_o-DF_c$ (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.