Full wwPDB X-ray Structure Validation Report ⓘ

May 23, 2023 – 01:25 pm BST

PDB ID	:	8ODQ
Title	:	SufS-SufU complex from Mycobacterium tuberculosis
Authors	:	Elchennawi, I.; Carpentier, P.; Caux, C.; Ponge, M.; Ollagnier de Choudens, S.
Deposited on	:	2023-03-09
Resolution	:	1.65 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:

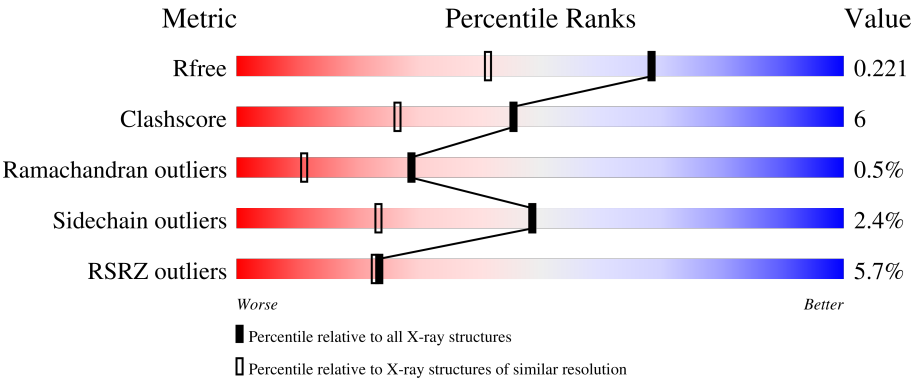
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.33
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.33

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

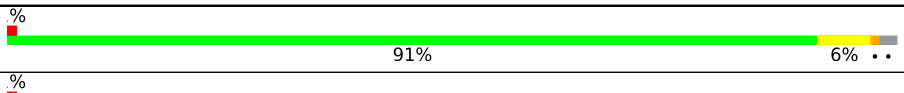
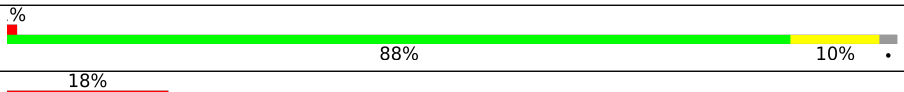
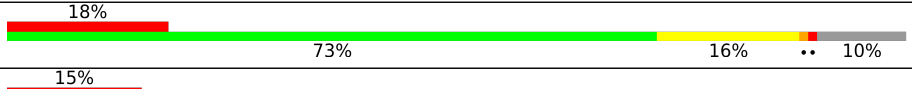
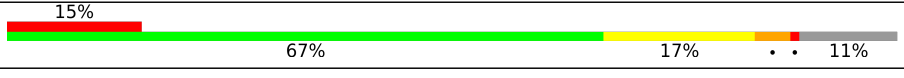
The reported resolution of this entry is 1.65 Å.

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	1827 (1.66-1.66)
Clashscore	141614	1931 (1.66-1.66)
Ramachandran outliers	138981	1891 (1.66-1.66)
Sidechain outliers	138945	1891 (1.66-1.66)
RSRZ outliers	127900	1791 (1.66-1.66)

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

Mol	Chain	Length	Quality of chain
1	B	418	
2	D	418	
3	A	166	
3	C	166	

2 Entry composition (i)

There are 8 unique types of molecules in this entry. The entry contains 9784 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 Cysteine desulfurase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	B	408	Total	C	N	O	S	0	7	0
			3121	1958	568	582	13			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	0	GLY	-	expression tag	UNP A0A045IZN1

- Molecule 2 is a protein called Cysteine desulfurase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	D	410	Total	C	N	O	S	0	16	0
			3193	2008	588	586	11			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	0	GLY	-	expression tag	UNP A0A045IZN1

- Molecule 3 is a protein called Nitrogen fixation protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	A	150	Total	C	N	O	S	0	6	0
			1182	739	203	230	10			
3	C	148	Total	C	N	O	S	0	1	0
			1138	711	200	220	7			

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-3	GLY	-	expression tag	UNP A0A045HJY9
A	-2	SER	-	expression tag	UNP A0A045HJY9

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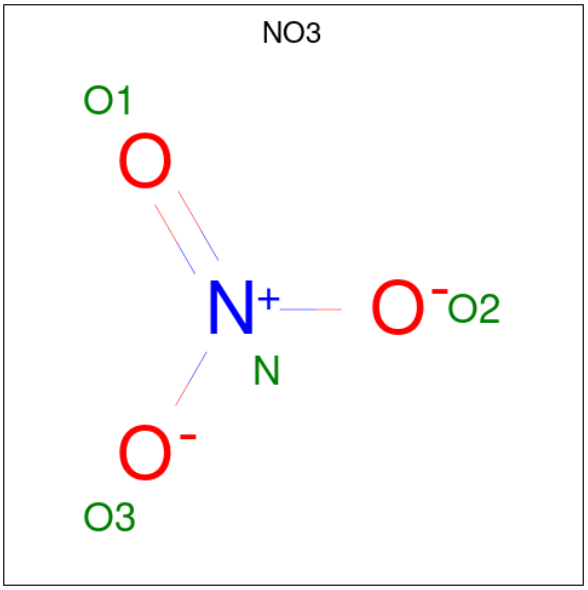
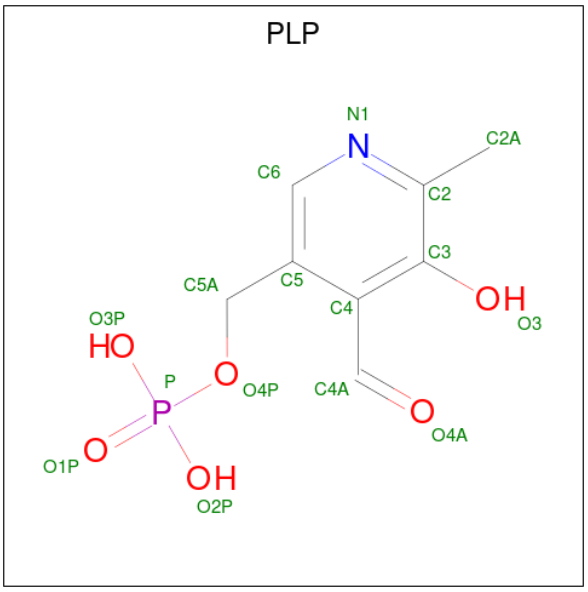
Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	HIS	-	expression tag	UNP A0A045HJY9
A	0	MET	-	expression tag	UNP A0A045HJY9
A	1	VAL	-	expression tag	UNP A0A045HJY9
C	-3	GLY	-	expression tag	UNP A0A045HJY9
C	-2	SER	-	expression tag	UNP A0A045HJY9
C	-1	HIS	-	expression tag	UNP A0A045HJY9
C	0	MET	-	expression tag	UNP A0A045HJY9
C	1	VAL	-	expression tag	UNP A0A045HJY9

- Molecule 4 is NITRATE ION (three-letter code: NO3) (formula: NO_3).



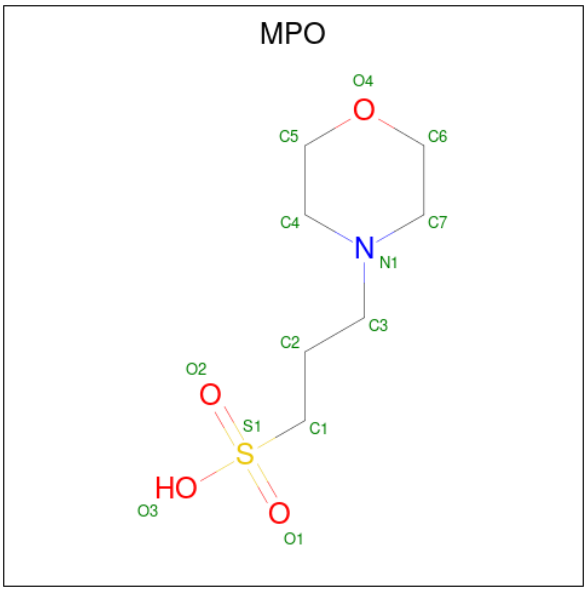
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	1	Total N O 4 1 3	0	0
4	B	1	Total N O 4 1 3	0	0
4	B	1	Total N O 4 1 3	0	0
4	D	1	Total N O 4 1 3	0	0
4	D	1	Total N O 4 1 3	0	0
4	C	1	Total N O 4 1 3	0	0

- Molecule 5 is PYRIDOXAL-5'-PHOSPHATE (three-letter code: PLP) (formula: $C_8H_{10}NO_6P$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	B	1	Total	C	N	O	P	0	0
			15	8	1	5	1		
5	D	1	Total	C	N	O	P	0	0
			15	8	1	5	1		

- Molecule 6 is 3[N-MORPHOLINO]PROPANE SULFONIC ACID (three-letter code: MPO) (formula: $C_7H_{15}NO_4S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	D	1	Total	C	N	O	S	0	0
			13	7	1	4	1		

- Molecule 7 is ZINC ION (three-letter code: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total Zn 1 1	0	0
7	C	1	Total Zn 1 1	0	0

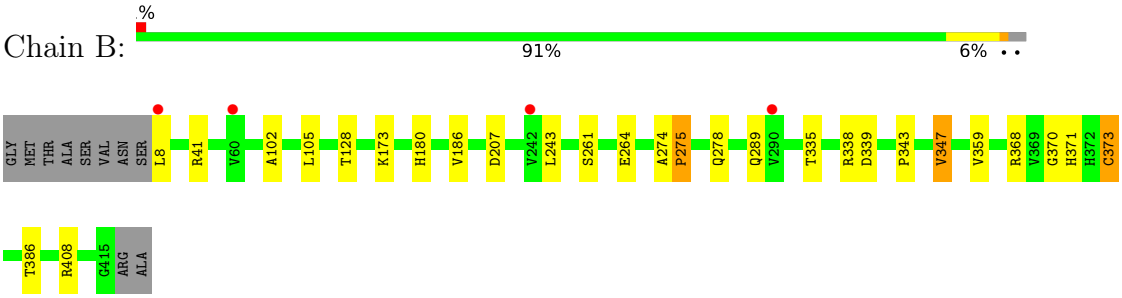
- Molecule 8 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	B	479	Total O 479 479	0	0
8	D	493	Total O 493 493	0	0
8	A	56	Total O 56 56	0	0
8	C	53	Total O 53 53	0	0

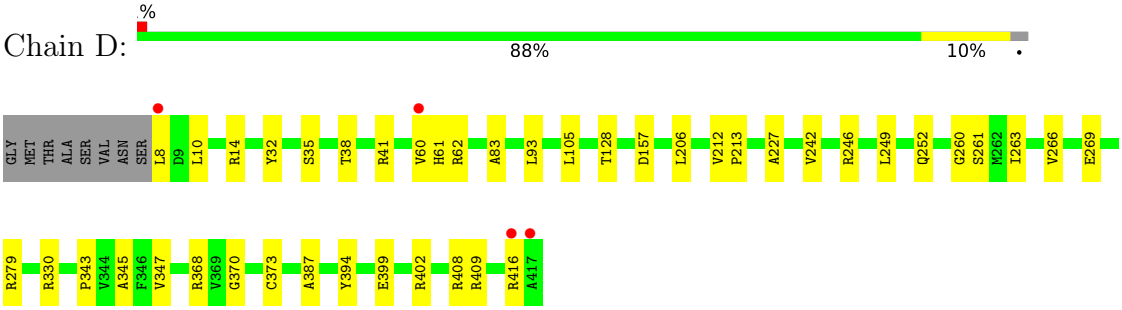
3 Residue-property plots (i)

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.

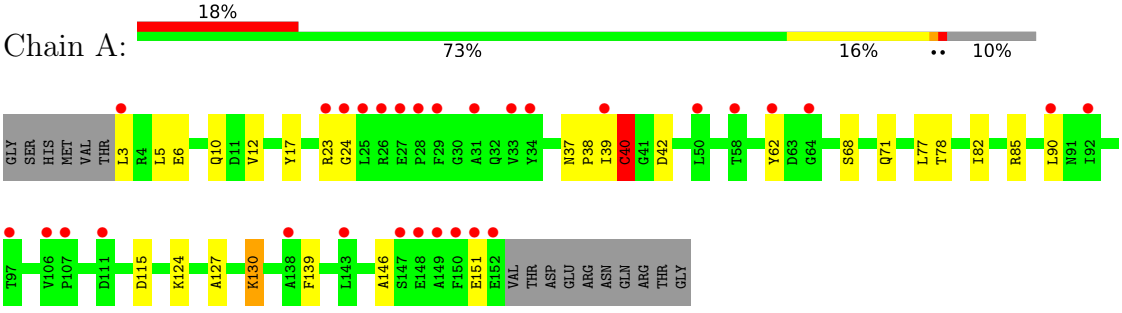
• Molecule 1: Cysteine desulfurase



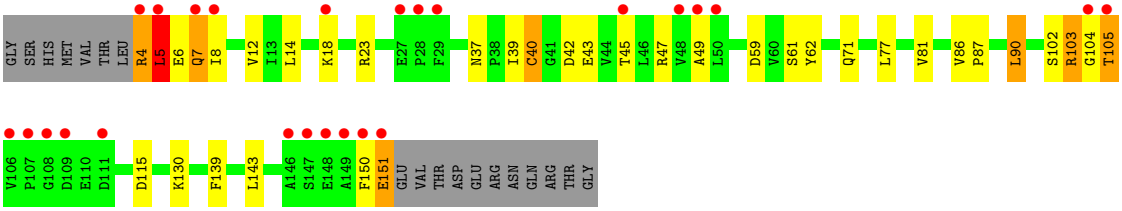
• Molecule 2: Cysteine desulfurase



• Molecule 3: Nitrogen fixation protein



• Molecule 3: Nitrogen fixation protein


GLY SER HIS MET VAL THR LEU R4 L5 E6 Q7 I8 V12 I13 L14 K18 R23 E27 P28 F29 N37 P38 I39 C40 G41 D42 E43 V44 T45 L46 R47 V48 A49 L50 D59 V60 S61 Y62 Q71 L77 V81 V86 P87 L90 S102 R103 G104 T105
V106 P107 G108 D109 E110 D111 D115 K130 F139 L143 A146 S147 E148 A149 F150 E151 GLU VAL THR ASP GLU ARG ASN GLN ARG THR GLY

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	62.25Å 75.55Å 75.60Å 92.40° 109.57° 99.71°	Depositor
Resolution (Å)	48.72 – 1.65 48.68 – 1.65	Depositor EDS
% Data completeness (in resolution range)	95.8 (48.72-1.65) 95.8 (48.68-1.65)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.13 (at 1.65Å)	Xtriage
Refinement program	REFMAC 5.8.0257	Depositor
R, R_{free}	0.179 , 0.214 0.188 , 0.221	Depositor DCC
R_{free} test set	7209 reflections (4.90%)	wwPDB-VP
Wilson B-factor (Å^2)	21.4	Xtriage
Anisotropy	0.497	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 39.4	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	9784	wwPDB-VP
Average B, all atoms (Å^2)	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.62% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: TSY, ZN, PLP, MPO, NO3

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	B	0.77	0/3191	0.86	0/4336
2	D	0.76	0/3302	0.86	2/4484 (0.0%)
3	A	0.71	0/1201	0.77	0/1630
3	C	0.73	0/1153	0.83	0/1564
All	All	0.75	0/8847	0.84	2/12014 (0.0%)

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
3	A	0	3
3	C	0	1
All	All	0	4

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	279	ARG	NE-CZ-NH1	5.52	123.06	120.30
2	D	373	CYS	CB-CA-C	5.06	120.52	110.40

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	A	39	ILE	Mainchain
3	A	40[A]	TSY	Mainchain

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Mol	Chain	Res	Type	Group
3	A	40[B]	TSY	Mainchain
3	C	39	ILE	Mainchain

5.2 Too-close contacts (i)

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	B	3121	0	3096	28	0
2	D	3193	0	3217	44	0
3	A	1182	0	1152	21	0
3	C	1138	0	1106	25	0
4	B	12	0	0	2	0
4	C	4	0	0	0	0
4	D	8	0	0	0	0
5	B	15	0	6	1	0
5	D	15	0	6	0	0
6	D	13	0	15	0	0
7	A	1	0	0	0	0
7	C	1	0	0	0	0
8	A	56	0	0	5	2
8	B	479	0	0	15	2
8	C	53	0	0	5	1
8	D	493	0	0	20	2
All	All	9784	0	8598	110	4

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 6.

All (110) 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)
2:D:41[A]:ARG:NH2	8:D:602:HOH:O	1.71	1.22
2:D:62:ARG:NH2	8:D:603:HOH:O	1.74	1.19
2:D:330[B]:ARG:HG2	2:D:347[B]:VAL:HG22	1.27	1.14
3:C:49:ALA:O	8:C:301:HOH:O	1.69	1.10
1:B:338:ARG:NH2	8:B:601:HOH:O	1.96	0.98

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:85:ARG:NH1	8:A:301:HOH:O	1.97	0.97
2:D:252:GLN:OE1	8:D:604:HOH:O	1.83	0.97
3:A:10[B]:GLN:NE2	8:A:302:HOH:O	1.97	0.95
3:C:7:GLN:N	8:C:302:HOH:O	1.99	0.95
2:D:41[A]:ARG:NE	8:D:607:HOH:O	2.00	0.93
2:D:330[B]:ARG:HG2	2:D:347[B]:VAL:CG2	2.06	0.84
2:D:8:LEU:O	8:D:606:HOH:O	1.95	0.83
2:D:261:SER:HB3	8:D:603:HOH:O	1.78	0.82
2:D:330[B]:ARG:NH1	8:D:605:HOH:O	1.89	0.82
3:A:71:GLN:HG3	8:A:349:HOH:O	1.81	0.81
2:D:261:SER:CB	8:D:603:HOH:O	2.29	0.80
1:B:8:LEU:O	8:B:602:HOH:O	2.01	0.79
2:D:330[A]:ARG:NH2	8:D:610:HOH:O	2.15	0.78
3:A:38:PRO:HA	8:A:352:HOH:O	1.84	0.77
3:C:23:ARG:HH22	3:C:71[A]:GLN:HE21	1.33	0.76
1:B:275:PRO:O	1:B:278:GLN:HG2	1.86	0.75
4:B:503:NO3:O2	8:B:604:HOH:O	2.03	0.75
3:C:59:ASP:N	8:C:301:HOH:O	1.79	0.72
2:D:263:ILE:HD13	2:D:266[A]:VAL:HG23	1.70	0.72
2:D:261:SER:OG	8:D:603:HOH:O	2.09	0.70
1:B:41[A]:ARG:NE	8:B:606:HOH:O	2.24	0.69
2:D:408[A]:ARG:NH2	8:D:611:HOH:O	2.21	0.68
3:A:146:ALA:O	8:A:304:HOH:O	2.11	0.68
3:C:77:LEU:HD21	3:C:139:PHE:HB2	1.79	0.65
3:A:77:LEU:HD21	3:A:139:PHE:HB2	1.80	0.64
2:D:402:ARG:NH1	8:D:609:HOH:O	2.06	0.64
2:D:14[B]:ARG:NH2	2:D:399:GLU:OE2	2.32	0.64
2:D:246[A]:ARG:NH2	8:D:615:HOH:O	2.31	0.63
1:B:368:ARG:NE	3:A:40[B]:TSY:S2	2.68	0.62
2:D:409:ARG:HH11	3:C:4:ARG:NH1	1.96	0.62
3:C:102:SER:HB2	3:C:105:THR:HG22	1.81	0.62
1:B:373:TSY:S2	8:D:930:HOH:O	2.30	0.61
1:B:173:LYS:NZ	8:B:610:HOH:O	2.33	0.61
3:A:78:THR:O	3:A:82[A]:ILE:HG12	2.01	0.61
2:D:263:ILE:HD13	2:D:266[A]:VAL:CG2	2.32	0.60
3:A:17:TYR:CD1	3:A:68:SER:HA	2.39	0.57
2:D:157:ASP:HB2	8:D:882:HOH:O	2.06	0.56
1:B:8:LEU:N	8:B:607:HOH:O	2.39	0.55
1:B:8:LEU:HA	8:B:974:HOH:O	2.06	0.55
2:D:246[B]:ARG:NH1	2:D:249[B]:LEU:HD22	2.22	0.54
2:D:370:GLY:HA3	3:C:40:TSY:S2	2.47	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:8:LEU:N	8:B:617:HOH:O	2.41	0.53
1:B:370:GLY:CA	3:A:40[B]:TSY:HB2	2.39	0.53
1:B:368:ARG:NH1	4:B:502:NO3:O3	2.41	0.52
2:D:41[B]:ARG:HH11	2:D:41[B]:ARG:HG2	1.74	0.52
8:B:904:HOH:O	3:A:3:LEU:HD21	2.09	0.52
3:A:24:GLY:N	3:A:62:TYR:O	2.38	0.52
3:C:6:GLU:HA	3:C:8:ILE:H	1.75	0.52
1:B:371:HIS:CE1	3:A:40[A]:TSY:SG	3.03	0.51
2:D:260:GLY:O	2:D:261:SER:OG	2.27	0.51
3:C:86:VAL:HB	3:C:87:PRO:HD3	1.92	0.51
3:A:23:ARG:HD2	3:A:62:TYR:CE2	2.47	0.49
3:C:4:ARG:C	3:C:6:GLU:H	2.15	0.49
3:C:90:LEU:HD13	3:C:143:LEU:HD23	1.95	0.49
3:C:5:LEU:HD11	8:C:337:HOH:O	2.12	0.49
3:C:12:VAL:HG23	8:C:328:HOH:O	2.13	0.48
1:B:370:GLY:HA3	3:A:40[B]:TSY:HB2	1.95	0.48
3:C:102:SER:O	3:C:105:THR:HB	2.14	0.48
2:D:32:TYR:OH	8:D:601:HOH:O	1.69	0.48
1:B:339:ASP:OD1	8:B:605:HOH:O	2.19	0.47
2:D:368:ARG:NE	3:C:40:TSY:S2	2.85	0.47
3:C:23:ARG:HH22	3:C:71[A]:GLN:NE2	2.07	0.47
2:D:14[B]:ARG:NE	2:D:394:TYR:O	2.47	0.46
1:B:274:ALA:HB1	1:B:278:GLN:HG3	1.98	0.46
1:B:289:GLN:NE2	8:B:615:HOH:O	2.40	0.46
3:C:150:PHE:O	3:C:151:GLU:HB2	2.15	0.46
2:D:32:TYR:CE2	8:D:601:HOH:O	2.63	0.45
2:D:60[B]:VAL:HG12	2:D:61:HIS:CD2	2.51	0.45
3:C:47:ARG:HB2	3:C:61:SER:OG	2.15	0.45
1:B:359:VAL:HG22	3:A:5:LEU:HD21	1.99	0.45
2:D:83:ALA:HA	2:D:93[B]:LEU:HD11	1.99	0.44
2:D:269:GLU:HA	8:D:873:HOH:O	2.18	0.44
3:C:37:ASN:HB2	3:C:42:ASP:HB2	2.00	0.44
2:D:246[A]:ARG:HB2	2:D:249[A]:LEU:HD12	2.00	0.44
8:B:780:HOH:O	2:D:62:ARG:HD3	2.18	0.43
2:D:330[B]:ARG:CG	2:D:347[B]:VAL:HG22	2.20	0.43
2:D:93[A]:LEU:HG	2:D:242:VAL:CG1	2.49	0.43
3:A:3:LEU:HD23	3:A:6:GLU:HG3	2.00	0.43
1:B:347:VAL:HG12	1:B:386:THR:HG22	2.00	0.43
1:B:105:LEU:C	1:B:105:LEU:HD23	2.39	0.43
2:D:32:TYR:CZ	8:D:601:HOH:O	2.45	0.42
3:C:102:SER:C	3:C:103:ARG:O	2.53	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:212:VAL:N	2:D:213:PRO:CD	2.81	0.42
3:A:37:ASN:HB2	3:A:42:ASP:HB2	2.00	0.42
3:C:45:THR:O	3:C:62:TYR:HA	2.18	0.42
2:D:345:ALA:HA	2:D:387:ALA:O	2.20	0.42
1:B:41[B]:ARG:NE	8:B:603:HOH:O	2.02	0.42
3:A:127:ALA:O	3:A:130:LYS:HG2	2.20	0.42
1:B:102:ALA:HB1	1:B:243:LEU:HB2	2.02	0.42
1:B:373:TSY:S2	2:D:260:GLY:HA2	2.60	0.42
2:D:105:LEU:C	2:D:105:LEU:HD23	2.40	0.41
1:B:335:THR:HG23	8:B:870:HOH:O	2.20	0.41
3:C:14:LEU:O	3:C:18:LYS:HG2	2.21	0.41
1:B:408[A]:ARG:NH1	8:B:628:HOH:O	2.54	0.41
3:A:77:LEU:HD21	3:A:139:PHE:CB	2.48	0.41
1:B:371:HIS:HD2	1:B:373:TSY:N	2.19	0.41
1:B:207:ASP:OD2	5:B:504:PLP:N1	2.55	0.40
3:C:12:VAL:HG11	3:C:115:ASP:HB3	2.03	0.40
3:C:90:LEU:HD12	3:C:90:LEU:HA	1.94	0.40
1:B:180:HIS:HA	1:B:186:VAL:O	2.22	0.40
2:D:252:GLN:CD	8:D:604:HOH:O	2.46	0.40
3:A:12:VAL:HG11	3:A:115:ASP:HB3	2.02	0.40
2:D:35[A]:SER:HA	2:D:38:THR:O	2.21	0.40
2:D:41[B]:ARG:HG2	2:D:41[B]:ARG:NH1	2.37	0.40
2:D:206:LEU:O	2:D:227:ALA:HA	2.21	0.40

All (4) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
8:B:909:HOH:O	8:A:301:HOH:O[1_545]	1.48	0.72
8:B:819:HOH:O	8:A:305:HOH:O[1_545]	2.04	0.16
8:D:928:HOH:O	8:D:934:HOH:O[1_455]	2.07	0.13
8:D:965:HOH:O	8:C:339:HOH:O[1_565]	2.08	0.12

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	B	412/418 (99%)	402 (98%)	10 (2%)	0	100 100
2	D	425/418 (102%)	415 (98%)	10 (2%)	0	100 100
3	A	152/166 (92%)	148 (97%)	3 (2%)	1 (1%)	22 6
3	C	146/166 (88%)	137 (94%)	5 (3%)	4 (3%)	5 0
All	All	1135/1168 (97%)	1102 (97%)	28 (2%)	5 (0%)	29 16

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	A	151	GLU
3	C	5	LEU
3	C	7	GLN
3	C	103	ARG
3	C	104	GLY

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	B	320/320 (100%)	314 (98%)	6 (2%)	57 34
2	D	332/321 (103%)	328 (99%)	4 (1%)	71 53
3	A	125/134 (93%)	122 (98%)	3 (2%)	49 23
3	C	119/134 (89%)	111 (93%)	8 (7%)	16 3
All	All	896/909 (99%)	875 (98%)	21 (2%)	49 25

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	128	THR
1	B	261	SER
1	B	264	GLU

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Mol	Chain	Res	Type
1	B	275	PRO
1	B	343	PRO
1	B	347	VAL
2	D	10	LEU
2	D	128	THR
2	D	343	PRO
2	D	416	ARG
3	A	90	LEU
3	A	124	LYS
3	A	130	LYS
3	C	4	ARG
3	C	5	LEU
3	C	43	GLU
3	C	81	VAL
3	C	90	LEU
3	C	105	THR
3	C	130	LYS
3	C	151	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	371	HIS
3	A	19	HIS
3	A	71	GLN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

4 non-standard protein/DNA/RNA residues 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	$\#\|Z\|>2$
3	TSY	C	40	3	5,7,8	2.96	2 (40%)	2,7,9	4.70	1 (50%)
1	TSY	B	373	1	5,7,8	1.67	0	2,7,9	4.38	1 (50%)
3	TSY	A	40[B]	-	5,7,8	2.61	2 (40%)	2,7,9	4.53	1 (50%)
3	TSY	A	40[A]	-	5,7,8	3.22	2 (40%)	2,7,9	0.23	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	TSY	C	40	3	-	2/2/6/8	-
1	TSY	B	373	1	-	1/2/6/8	-
3	TSY	A	40[B]	-	-	1/2/6/8	-
3	TSY	A	40[A]	-	-	1/2/6/8	-

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	40[A]	TSY	SG-S1	6.57	2.14	2.04
3	C	40	TSY	SG-S1	5.74	2.12	2.04
3	A	40[B]	TSY	SG-S1	5.01	2.11	2.04
3	A	40[A]	TSY	O-C	2.76	1.30	1.19
3	A	40[B]	TSY	O-C	2.76	1.30	1.19
3	C	40	TSY	O-C	2.72	1.30	1.19

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	C	40	TSY	CB-SG-S1	6.56	121.10	103.82
3	A	40[B]	TSY	CB-SG-S1	6.40	120.68	103.82
1	B	373	TSY	CB-SG-S1	6.19	120.13	103.82

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	40[A]	TSY	N-CA-CB-SG
3	C	40	TSY	N-CA-CB-SG
1	B	373	TSY	CA-CB-SG-S1

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Mol	Chain	Res	Type	Atoms
3	A	40[B]	TSY	CA-CB-SG-S1
3	C	40	TSY	CA-CB-SG-S1

There are no ring outliers.

4 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	40	TSY	2	0
1	B	373	TSY	3	0
3	A	40[B]	TSY	3	0
3	A	40[A]	TSY	1	0

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 11 ligands modelled in this entry, 2 are monoatomic - leaving 9 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	$\#\|Z\| > 2$
4	NO3	D	503	-	1,3,3	0.52	0	0,3,3	-	-
4	NO3	B	503	-	1,3,3	0.01	0	0,3,3	-	-
5	PLP	D	501	2	15,15,16	2.37	4 (26%)	20,22,23	1.80	5 (25%)
4	NO3	B	502	-	1,3,3	0.23	0	0,3,3	-	-
6	MPO	D	502	-	13,13,13	0.72	1 (7%)	17,17,17	1.43	1 (5%)
4	NO3	D	504	-	1,3,3	0.21	0	0,3,3	-	-
4	NO3	B	501	-	1,3,3	0.64	0	0,3,3	-	-
5	PLP	B	504	1	15,15,16	2.53	5 (33%)	20,22,23	1.41	4 (20%)
4	NO3	C	201	-	1,3,3	0.32	0	0,3,3	-	-

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
5	PLP	B	504	1	-	0/6/6/8	0/1/1/1
6	MPO	D	502	-	-	1/7/15/15	0/1/1/1
5	PLP	D	501	2	-	0/6/6/8	0/1/1/1

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	D	501	PLP	C5-C4	6.29	1.47	1.40
5	B	504	PLP	C3-C2	5.84	1.46	1.40
5	B	504	PLP	C5-C4	4.85	1.45	1.40
5	B	504	PLP	C3-C4	4.33	1.49	1.40
5	D	501	PLP	C3-C2	3.69	1.44	1.40
5	D	501	PLP	C4A-C4	-3.22	1.44	1.51
5	B	504	PLP	C4A-C4	-2.74	1.45	1.51
5	B	504	PLP	P-O1P	-2.28	1.43	1.50
5	D	501	PLP	C3-C4	2.25	1.44	1.40
6	D	502	MPO	O3-S1	2.09	1.55	1.47

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
6	D	502	MPO	O3-S1-C1	-5.05	97.60	105.77
5	D	501	PLP	C6-N1-C2	3.38	125.42	119.17
5	D	501	PLP	O3P-P-O1P	3.24	123.36	110.68
5	D	501	PLP	O4P-C5A-C5	2.69	114.47	109.35
5	B	504	PLP	C5A-C5-C6	2.50	123.48	119.37
5	D	501	PLP	O2P-P-O1P	-2.35	101.49	110.68
5	B	504	PLP	O3-C3-C2	2.34	122.60	117.49
5	D	501	PLP	C3-C2-N1	-2.21	117.91	120.77
5	B	504	PLP	O3P-P-O1P	2.13	119.03	110.68
5	B	504	PLP	O4P-C5A-C5	2.13	113.40	109.35

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	D	502	MPO	C2-C1-S1-O1

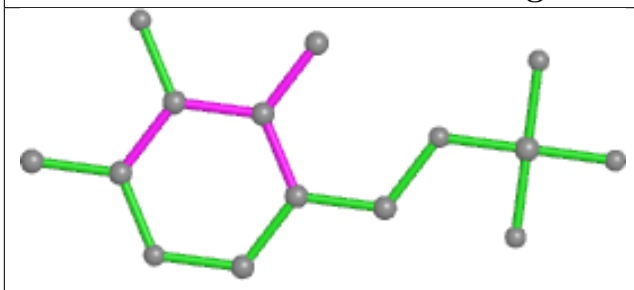
There are no ring outliers.

3 monomers are involved in 3 short contacts:

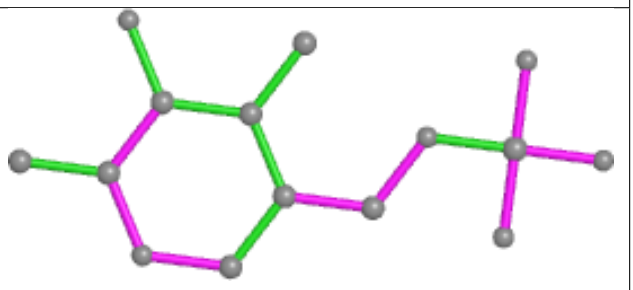
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	503	NO3	1	0
4	B	502	NO3	1	0
5	B	504	PLP	1	0

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

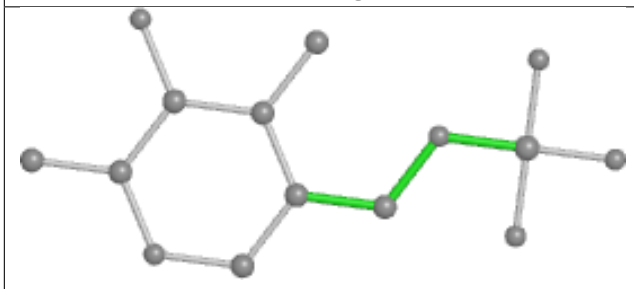
Ligand PLP D 501



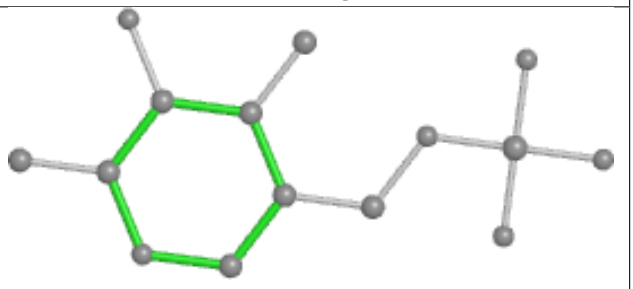
Bond lengths



Bond angles

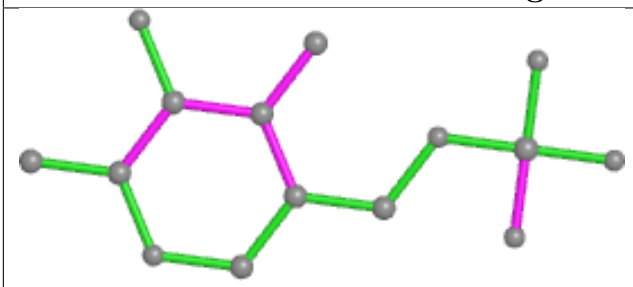


Torsions

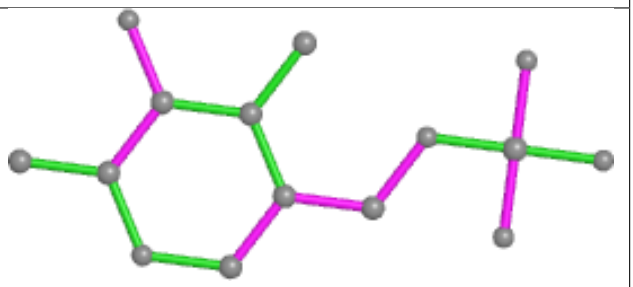


Rings

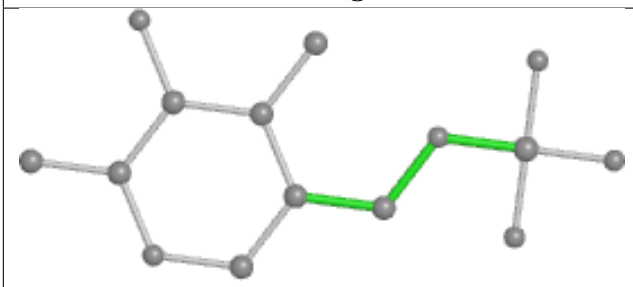
Ligand PLP B 504



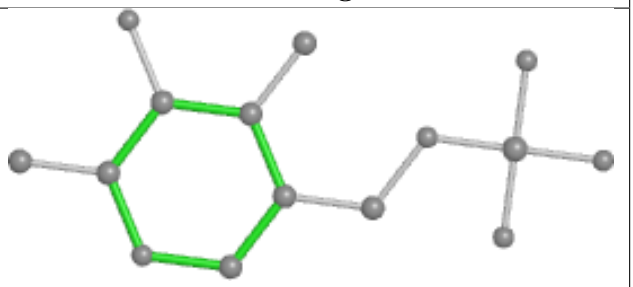
Bond lengths



Bond angles



Torsions



Rings

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95^{th} 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	B	407/418 (97%)	-0.11	4 (0%) 82 85	15, 22, 33, 61	0
2	D	410/418 (98%)	-0.13	4 (0%) 82 85	15, 21, 35, 69	0
3	A	149/166 (89%)	1.11	30 (20%) 1 1	28, 40, 55, 90	0
3	C	147/166 (88%)	0.91	25 (17%) 1 1	27, 41, 61, 78	0
All	All	1113/1168 (95%)	0.18	63 (5%) 23 23	15, 24, 51, 90	0

All (63) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	8	LEU	6.8
3	A	151	GLU	6.0
3	C	150	PHE	5.3
3	A	150	PHE	4.8
3	C	104	GLY	4.7
3	A	25	LEU	4.7
3	A	29	PHE	4.4
3	C	149	ALA	4.0
3	C	5	LEU	3.8
3	C	28	PRO	3.8
2	D	417	ALA	3.5
3	A	143	LEU	3.4
3	A	152	GLU	3.4
3	A	64	GLY	3.3
3	A	24	GLY	3.2
3	C	105	THR	3.2
3	A	39	ILE	3.1
3	A	3	LEU	3.1
3	A	27	GLU	3.1
3	A	147	SER	3.1
3	A	28	PRO	3.0

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Mol	Chain	Res	Type	RSRZ
3	C	148	GLU	3.0
3	A	34	TYR	3.0
3	C	108	GLY	3.0
3	C	111	ASP	2.9
3	A	149	ALA	2.8
1	B	60	VAL	2.8
3	A	33	VAL	2.7
3	C	48	VAL	2.7
3	C	50	LEU	2.7
3	A	148	GLU	2.7
3	A	138	ALA	2.6
3	A	90	LEU	2.6
3	A	62	TYR	2.6
3	C	146	ALA	2.6
3	C	29	PHE	2.5
3	C	147	SER	2.5
2	D	416	ARG	2.5
3	A	58	THR	2.5
1	B	242	VAL	2.5
3	A	92	ILE	2.5
3	C	106	VAL	2.5
3	C	151	GLU	2.5
3	A	31	ALA	2.4
1	B	290	VAL	2.3
3	A	97[A]	THR	2.3
3	C	107	PRO	2.3
3	A	111	ASP	2.3
3	A	26	ARG	2.3
3	C	49	ALA	2.3
3	C	27	GLU	2.3
3	C	18	LYS	2.2
3	A	107	PRO	2.2
3	C	45	THR	2.2
3	C	109	ASP	2.2
3	A	23	ARG	2.1
2	D	60[A]	VAL	2.1
2	D	8	LEU	2.1
3	C	4	ARG	2.1
3	A	106	VAL	2.0
3	C	7	GLN	2.0
3	C	8	ILE	2.0
3	A	50	LEU	2.0

6.2 Non-standard residues in protein, DNA, RNA chains (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, 95^{th} 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
3	TSY	A	40[A]	8/9	0.81	0.26	29,32,50,54	5
3	TSY	A	40[B]	8/9	0.81	0.26	28,33,48,56	5
3	TSY	C	40	8/9	0.85	0.13	34,41,66,69	0
1	TSY	B	373	8/9	0.94	0.12	16,17,45,58	0

6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

6.4 Ligands (i)

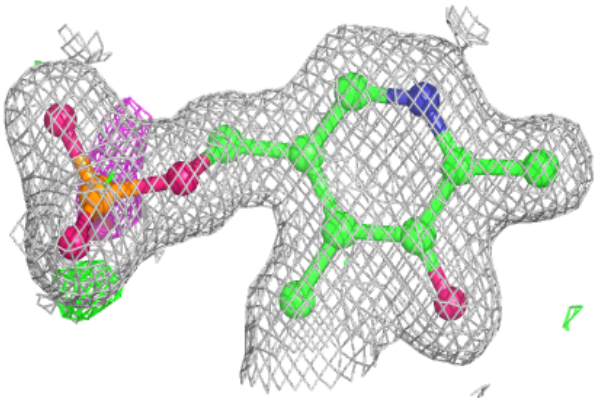
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

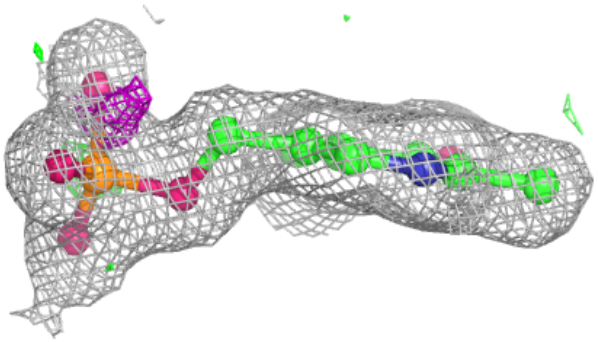
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	NO3	B	503	4/4	0.88	0.15	49,54,59,64	0
4	NO3	C	201	4/4	0.90	0.12	39,42,45,50	0
4	NO3	D	504	4/4	0.91	0.10	33,36,39,40	0
4	NO3	D	503	4/4	0.95	0.14	30,32,39,46	0
6	MPO	D	502	13/13	0.95	0.09	23,26,38,38	0
4	NO3	B	502	4/4	0.96	0.11	32,37,42,47	0
4	NO3	B	501	4/4	0.97	0.09	26,30,30,35	0
5	PLP	D	501	15/16	0.98	0.12	16,18,21,23	0
5	PLP	B	504	15/16	0.98	0.12	16,19,22,23	0
7	ZN	A	201	1/1	0.99	0.04	28,28,28,28	0
7	ZN	C	202	1/1	0.99	0.05	26,26,26,26	0

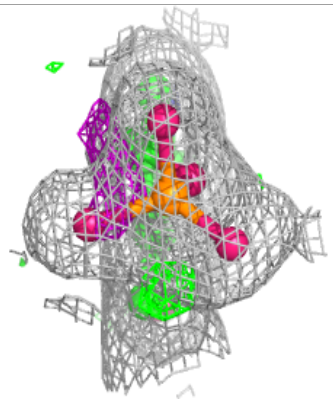
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around PLP D 501:

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

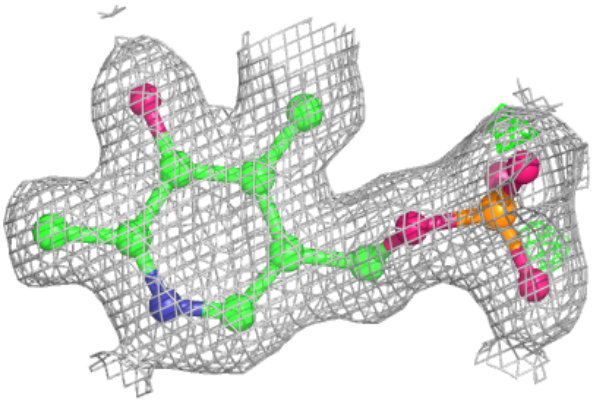


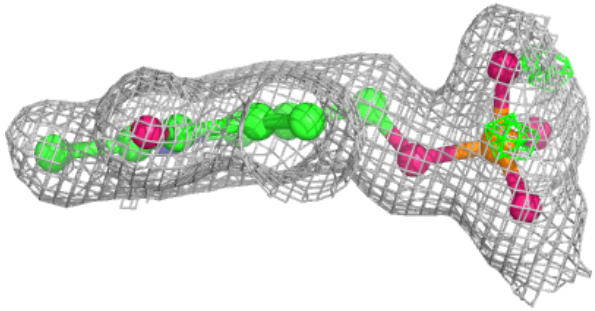


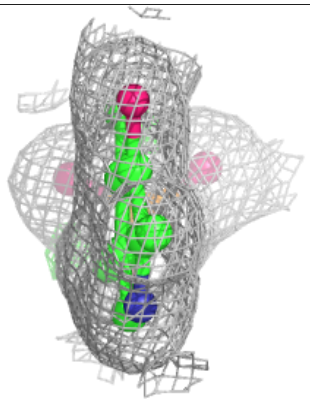


Electron density around PLP B 504:

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

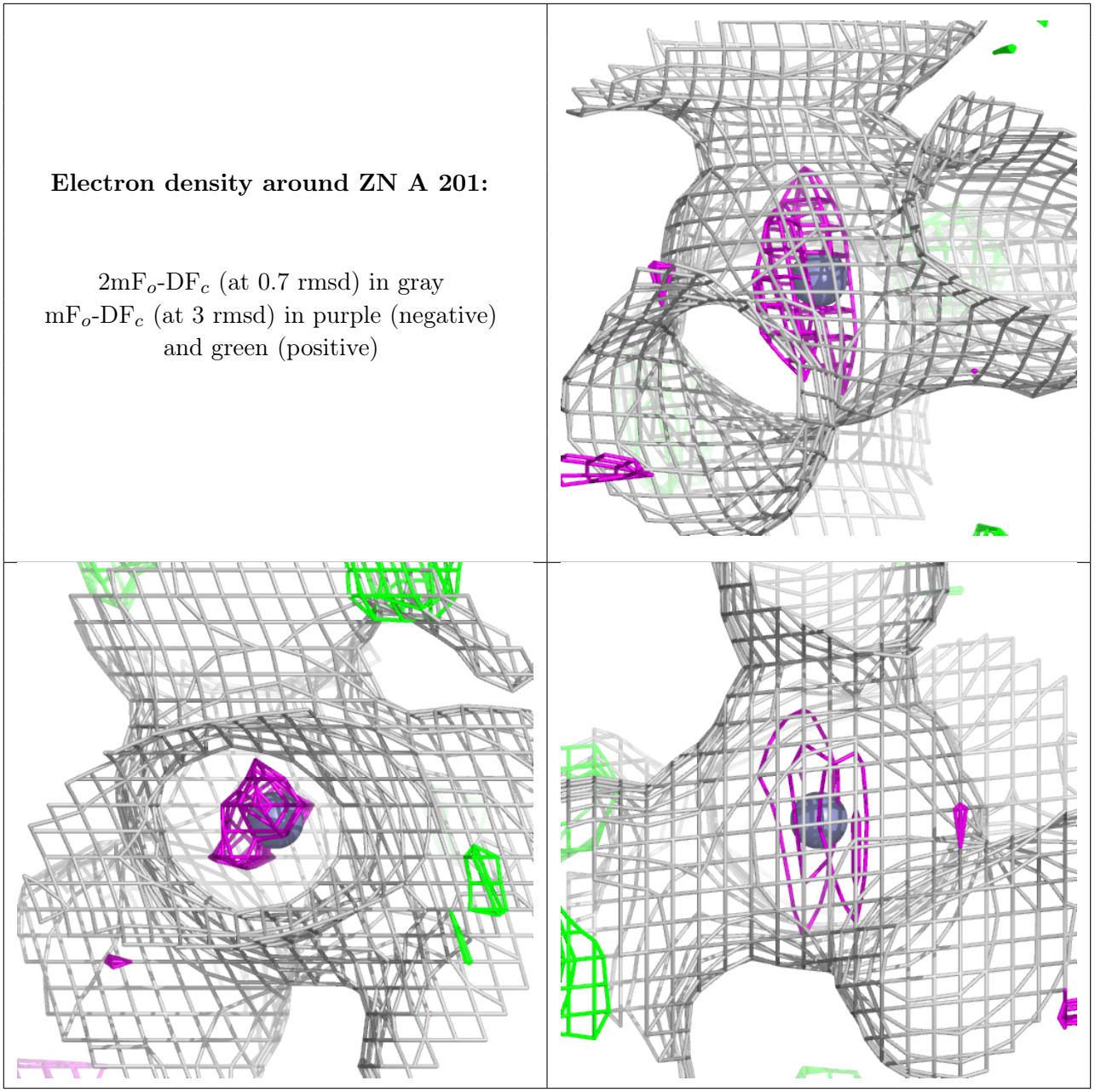






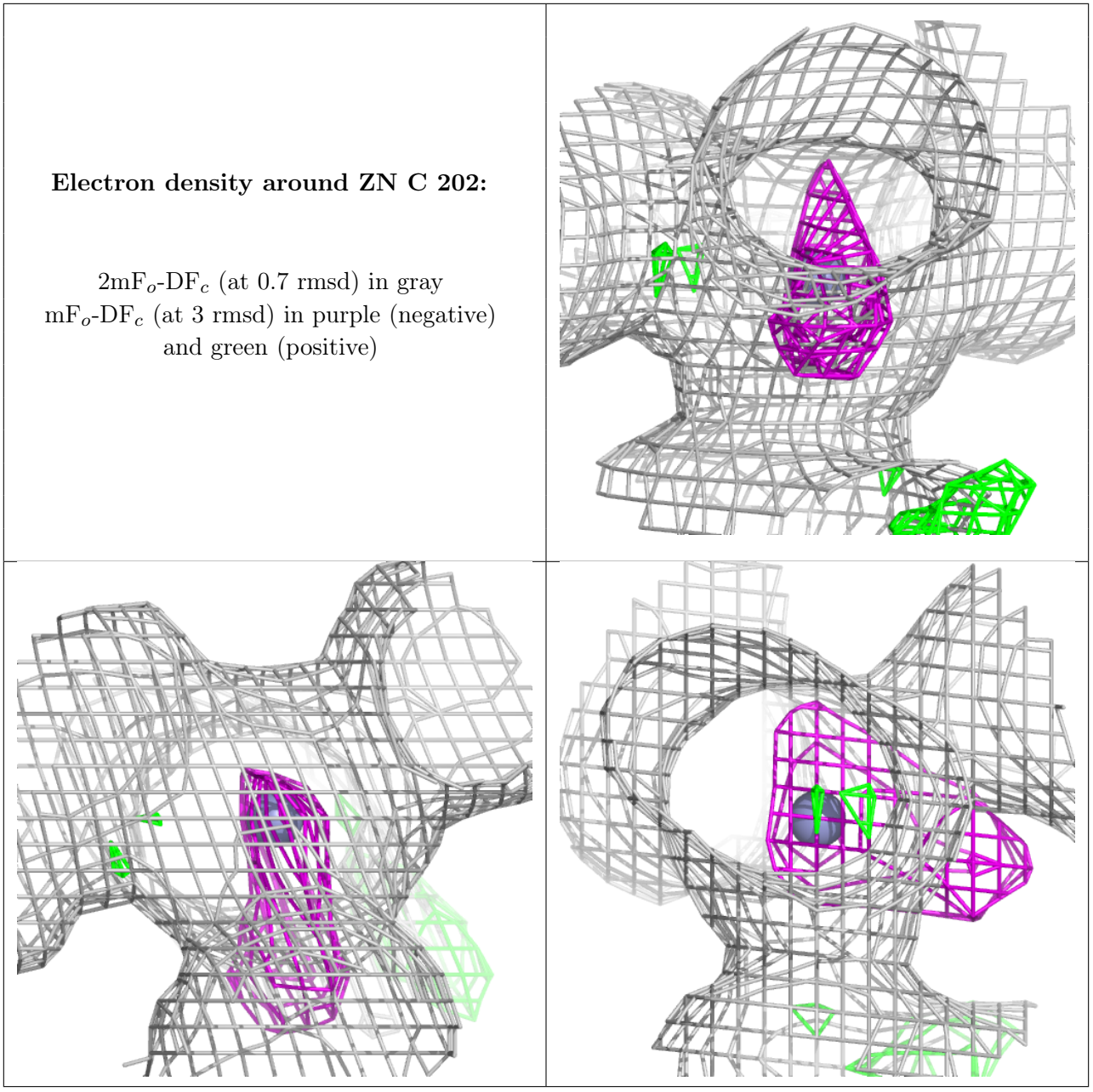
Electron density around ZN A 201:

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



Electron density around ZN C 202:

$2mF_o$-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.