Full wwPDB X-ray Structure Validation Report ⓘ

Sep 30, 2024 – 06:19 PM JST

PDB ID	:	8WND
Title	:	Crystal structure of Saccharomyces cerevisiae isoleucyl-tRNA synthetase in complex with tRNA(Ile) and isoleucine
Authors	:	Chen, B.; Yi, F.; Zhou, H.
Deposited on	:	2023-10-05
Resolution	:	2.80 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:

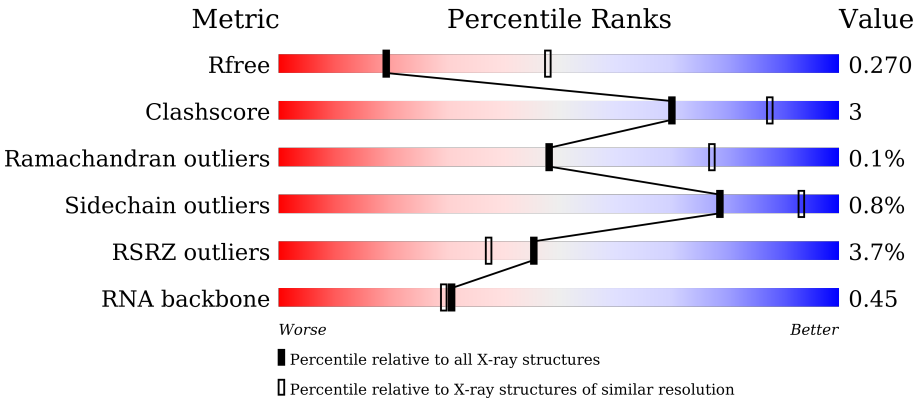
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

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 2.80 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}	164625	3657 (2.80-2.80)
Clashscore	180529	4123 (2.80-2.80)
Ramachandran outliers	177936	4071 (2.80-2.80)
Sidechain outliers	177891	4073 (2.80-2.80)
RSRZ outliers	164620	3659 (2.80-2.80)
RNA backbone	3690	1037 (3.00-2.60)

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	A	1080	3% 89% 9% .
1	B	1080	4% 80% 7% 13%
2	R	77	% 56% 29% 6% 9%
2	T	77	% 68% 31% .

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 18444 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 isoleucine–tRNA ligase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	1061	Total	C	N	O	S	0	0	0
			8192	5265	1354	1547	26			
1	B	936	Total	C	N	O	S	0	0	0
			6875	4393	1152	1306	24			

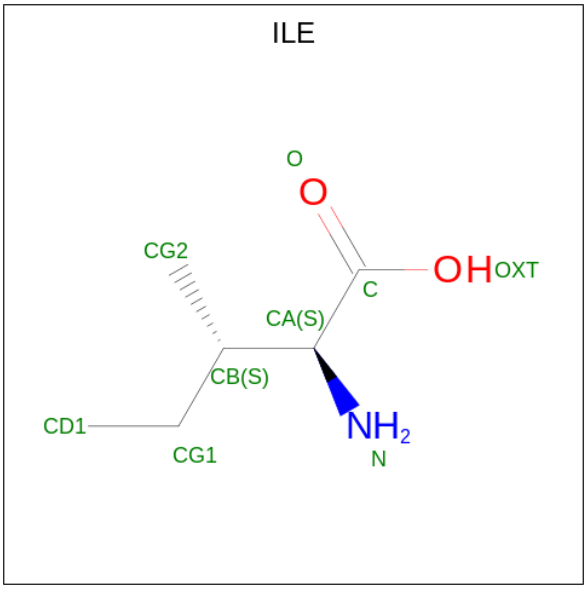
There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1073	LEU	-	expression tag	UNP A0A6A5Q0L4
A	1074	GLU	-	expression tag	UNP A0A6A5Q0L4
A	1075	HIS	-	expression tag	UNP A0A6A5Q0L4
A	1076	HIS	-	expression tag	UNP A0A6A5Q0L4
A	1077	HIS	-	expression tag	UNP A0A6A5Q0L4
A	1078	HIS	-	expression tag	UNP A0A6A5Q0L4
A	1079	HIS	-	expression tag	UNP A0A6A5Q0L4
A	1080	HIS	-	expression tag	UNP A0A6A5Q0L4
B	1073	LEU	-	expression tag	UNP A0A6A5Q0L4
B	1074	GLU	-	expression tag	UNP A0A6A5Q0L4
B	1075	HIS	-	expression tag	UNP A0A6A5Q0L4
B	1076	HIS	-	expression tag	UNP A0A6A5Q0L4
B	1077	HIS	-	expression tag	UNP A0A6A5Q0L4
B	1078	HIS	-	expression tag	UNP A0A6A5Q0L4
B	1079	HIS	-	expression tag	UNP A0A6A5Q0L4
B	1080	HIS	-	expression tag	UNP A0A6A5Q0L4

- Molecule 2 is a RNA chain called tRNA(Ile).

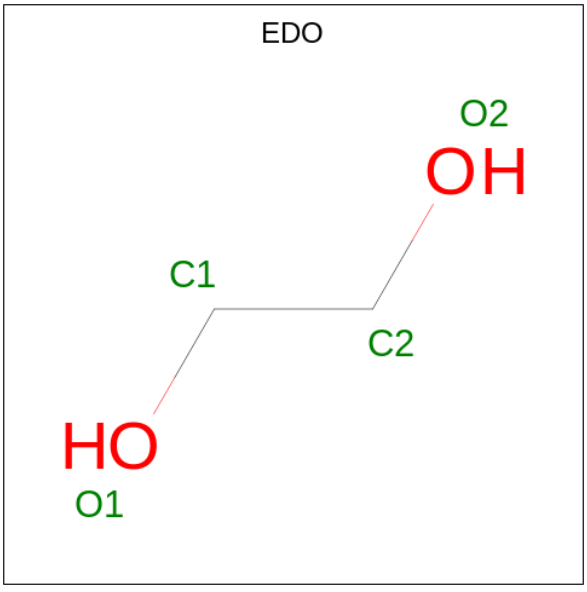
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	T	77	Total	C	N	O	P	0	0	0
			1621	721	288	535	77			
2	R	70	Total	C	N	O	P	0	0	0
			1481	659	264	488	70			

- Molecule 3 is ISOLEUCINE (three-letter code: ILE) (formula: $C_6H_{13}NO_2$) (labeled as "Ligand of Interest" by depositor).



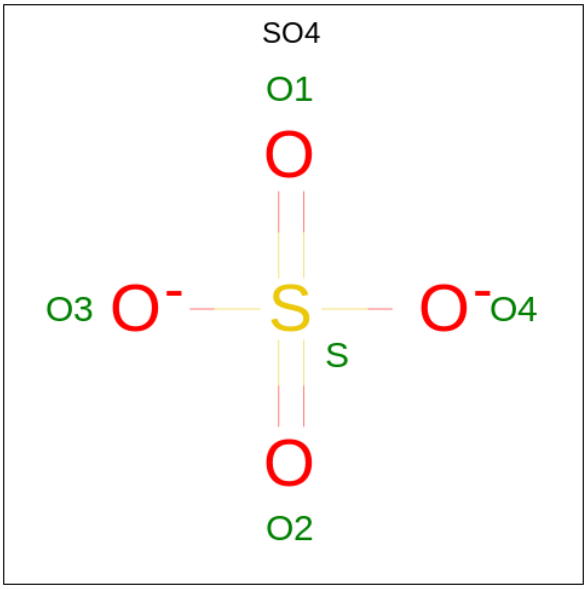
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			9	6	1	2		
3	B	1	Total	C	N	O	0	0
			9	6	1	2		

- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: $C_2H_6O_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 4 2 2	0	0

- Molecule 5 is SULFATE ION (three-letter code: SO4) (formula: O_4S).



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

- Molecule 6 is water.

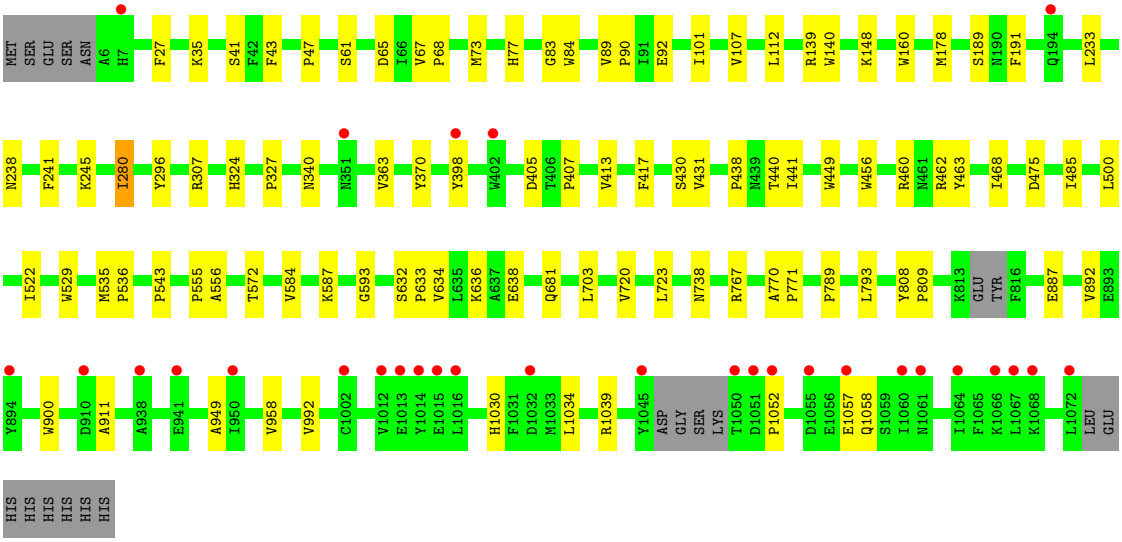
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	112	Total O 112 112	0	0
6	T	48	Total O 48 48	0	0
6	B	46	Total O 46 46	0	0
6	R	2	Total O 2 2	0	0

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.

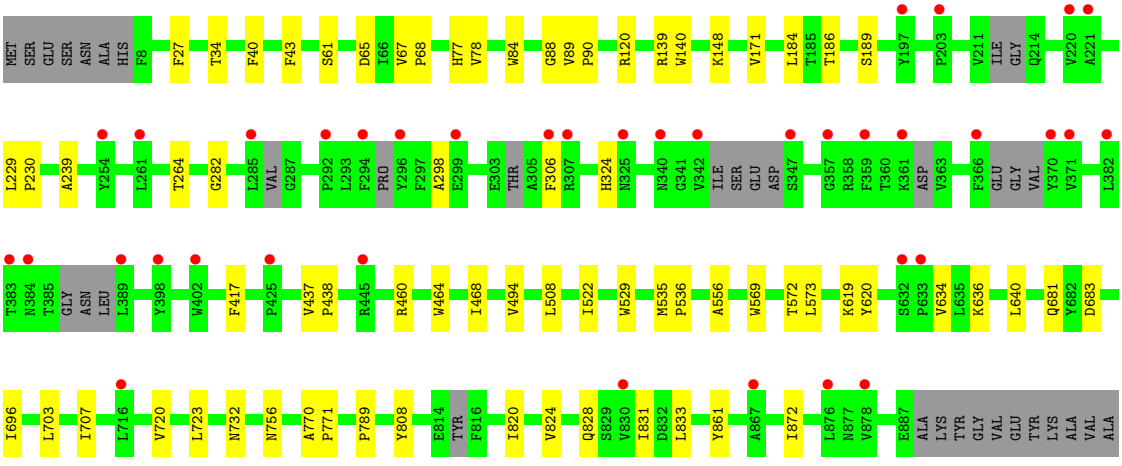
• Molecule 1: isoleucine–tRNA ligase

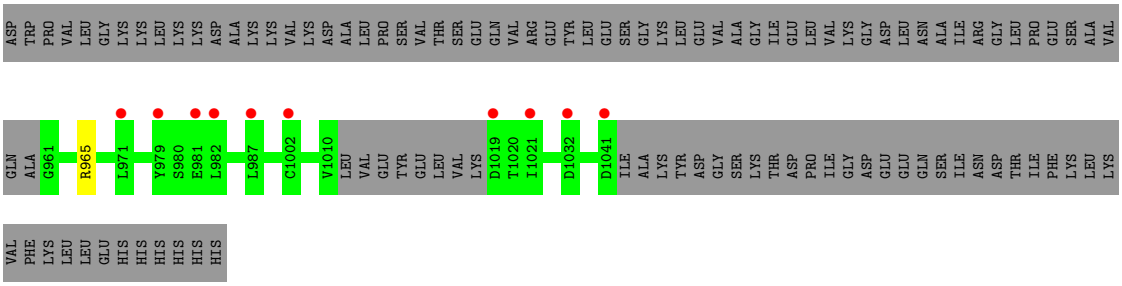
Chain A:



• Molecule 1: isoleucine–tRNA ligase

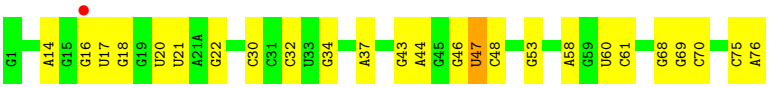
Chain B:





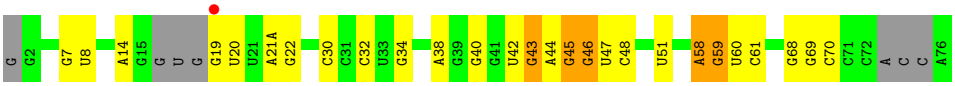
- Molecule 2: tRNA(Ile)

Chain T:



- Molecule 2: tRNA(Ile)

Chain R:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	53.43Å 173.52Å 171.80Å 90.00° 91.16° 90.00°	Depositor
Resolution (Å)	48.73 – 2.80 48.73 – 2.80	Depositor EDS
% Data completeness (in resolution range)	98.2 (48.73-2.80) 98.2 (48.73-2.80)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.44 (at 2.81Å)	Xtriage
Refinement program	REFMAC 5.8.0267	Depositor
R, R_{free}	0.230 , 0.268 0.234 , 0.270	Depositor DCC
R_{free} test set	3674 reflections (4.78%)	wwPDB-VP
Wilson B-factor (Å^2)	63.3	Xtriage
Anisotropy	0.045	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 59.2	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.009 for -h,-l,-k 0.000 for -h,l,k 0.031 for h,-k,-l	Xtriage
F_o,F_c correlation	0.92	EDS
Total number of atoms	18444	wwPDB-VP
Average B, all atoms (Å^2)	69.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.87% 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: SO4, EDO

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\#\|Z\| > 5$	RMSZ	$\#\|Z\| > 5$
1	A	0.65	0/8391	0.74	0/11430
1	B	0.67	0/7043	0.72	0/9627
2	R	0.52	0/1653	0.78	0/2571
2	T	0.55	0/1811	0.80	0/2822
All	All	0.64	0/18898	0.74	0/26450

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	8192	0	7653	57	0
1	B	6875	0	5889	44	0
2	R	1481	0	749	7	0
2	T	1621	0	819	3	0
3	A	9	0	10	0	0
3	B	9	0	10	0	0
4	A	4	0	6	0	0
5	A	25	0	0	0	0
5	B	20	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	A	112	0	0	3	0
6	B	46	0	0	0	0
6	R	2	0	0	0	0
6	T	48	0	0	0	0
All	All	18444	0	15136	109	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 3.

All (109) 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:R:45:G:H5"	2:R:46:G:OP2	1.39	1.23
1:B:239:ALA:HA	1:B:282:GLY:HA3	1.48	0.92
2:R:45:G:C5'	2:R:46:G:OP2	2.24	0.84
1:B:634:VAL:HG11	1:B:640:LEU:HB3	1.73	0.69
1:A:703:LEU:HD21	1:A:723:LEU:HD23	1.74	0.68
2:R:58:A:H4'	2:R:59:G:OP1	1.94	0.68
1:B:703:LEU:HD21	1:B:723:LEU:HD23	1.77	0.66
1:A:431:VAL:HG23	1:A:584:VAL:HG11	1.80	0.62
1:A:529:TRP:HB3	1:A:572:THR:HG21	1.80	0.62
1:B:89:VAL:N	1:B:90:PRO:CD	2.63	0.62
1:A:468:ILE:HB	1:A:522:ILE:HD11	1.80	0.62
1:B:239:ALA:HA	1:B:282:GLY:CA	2.28	0.61
2:R:43:G:H2'	2:R:44:A:C8	2.36	0.60
1:B:89:VAL:N	1:B:90:PRO:HD2	2.16	0.60
1:B:634:VAL:HG13	1:B:640:LEU:HB2	1.85	0.59
1:B:529:TRP:HB3	1:B:572:THR:HG21	1.84	0.59
1:A:101:ILE:HG21	1:A:107:VAL:HG23	1.84	0.59
1:B:634:VAL:HG11	1:B:640:LEU:CB	2.32	0.59
1:A:958:VAL:HA	6:A:1203:HOH:O	2.03	0.58
1:A:67:VAL:HB	1:A:68:PRO:HD3	1.86	0.58
1:B:634:VAL:CG1	1:B:640:LEU:HB2	2.35	0.57
1:B:634:VAL:CG1	1:B:640:LEU:CB	2.82	0.56
1:A:35:LYS:HA	1:A:77:HIS:CD2	2.41	0.55
1:A:307:ARG:NH2	1:A:340:ASN:O	2.38	0.54
1:B:88:GLY:C	1:B:90:PRO:HD2	2.29	0.54
1:A:41:SER:HB3	1:A:556:ALA:HA	1.90	0.53
1:B:770:ALA:HB3	1:B:771:PRO:HD3	1.92	0.53
1:A:632:SER:OG	1:A:634:VAL:HG22	2.11	0.51
1:B:824:VAL:O	1:B:828:GLN:HG3	2.11	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:833:LEU:HD22	1:B:965:ARG:HB3	1.94	0.50
1:B:468:ILE:HB	1:B:522:ILE:HD11	1.93	0.50
1:B:535:MET:HG3	1:B:536:PRO:HD3	1.93	0.50
1:A:438:PRO:HG2	1:A:441:ILE:HG12	1.93	0.50
1:A:238:ASN:HB3	1:A:241:PHE:CD2	2.47	0.50
1:A:555:PRO:HG2	1:A:587:LYS:HD2	1.94	0.50
1:B:184:LEU:HB3	1:B:186:THR:HG22	1.93	0.50
1:A:296:TYR:CE2	1:A:363:VAL:HG13	2.47	0.49
1:A:245:LYS:HB2	1:A:280:ILE:HD11	1.93	0.49
1:A:992:VAL:HG23	1:A:1034:LEU:HD23	1.94	0.49
1:A:47:PRO:HD2	1:A:83:GLY:O	2.12	0.49
1:A:191:PHE:HB3	1:A:449:TRP:HZ2	1.78	0.49
1:B:619:LYS:HD2	1:B:620:TYR:CZ	2.48	0.49
1:A:535:MET:HG3	1:A:536:PRO:HD3	1.94	0.48
1:A:233:LEU:HD12	1:A:327:PRO:HG3	1.95	0.48
1:B:84:TRP:HB2	1:B:148:LYS:HG2	1.94	0.48
1:B:65:ASP:HB2	1:B:139:ARG:HG3	1.95	0.48
1:B:720:VAL:HA	1:B:723:LEU:HD12	1.95	0.48
1:A:89:VAL:N	1:A:90:PRO:CD	2.76	0.47
1:A:27:PHE:CD1	1:A:140:TRP:HB3	2.49	0.47
1:A:65:ASP:HB2	1:A:139:ARG:HG3	1.95	0.47
1:A:593:GLY:HA3	1:A:638:GLU:O	2.15	0.47
1:A:633:PRO:HB2	1:A:638:GLU:HB2	1.97	0.47
1:B:189:SER:HB3	1:B:460:ARG:NH2	2.29	0.47
1:B:171:VAL:HA	1:B:417:PHE:O	2.14	0.46
1:A:681:GLN:HG3	1:A:789:PRO:HG3	1.97	0.46
1:A:887:GLU:HB3	1:A:892:VAL:HG22	1.96	0.46
1:A:900:TRP:HZ3	1:A:911:ALA:HB1	1.81	0.46
1:A:634:VAL:HA	1:A:638:GLU:O	2.15	0.46
1:A:189:SER:HB3	1:A:460:ARG:HH22	1.81	0.46
1:B:634:VAL:CG1	1:B:640:LEU:HB3	2.44	0.46
1:A:720:VAL:HA	1:A:723:LEU:HD12	1.98	0.45
1:A:160:TRP:NE1	1:A:543:PRO:HG3	2.32	0.45
1:A:92:GLU:HB3	1:A:462:ARG:HH21	1.82	0.45
1:A:160:TRP:CD2	1:A:543:PRO:HD3	2.52	0.45
1:B:120:ARG:HG2	1:B:464:TRP:CH2	2.52	0.45
1:B:298:ALA:HB2	1:B:306:PHE:CD1	2.52	0.44
1:A:417:PHE:HA	1:A:456:TRP:O	2.18	0.44
1:A:1057:GLU:C	1:A:1058:GLN:HG3	2.38	0.44
1:A:73:MET:HB3	1:A:808:TYR:HB2	1.99	0.44
1:A:178:MET:HE3	1:A:413:VAL:HG23	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:T:47:U:OP1	2:T:47:U:H2'	2.17	0.44
1:B:683:ASP:O	1:B:756:ASN:ND2	2.45	0.44
1:B:229:LEU:N	1:B:230:PRO:CD	2.80	0.44
1:A:535:MET:HB2	1:A:535:MET:HE2	1.81	0.44
1:A:949:ALA:HB3	6:A:1210:HOH:O	2.18	0.44
2:R:45:G:C4'	2:R:46:G:OP2	2.65	0.44
1:A:43:PHE:CE2	1:A:556:ALA:HB2	2.54	0.43
1:A:767:ARG:HB3	1:A:809:PRO:HD3	2.00	0.43
1:A:61:SER:HB3	1:A:139:ARG:HD2	2.00	0.43
1:A:84:TRP:HB2	1:A:148:LYS:HG2	2.00	0.43
1:B:707:ILE:HG21	1:B:808:TYR:OH	2.18	0.43
1:A:112:LEU:HD11	1:A:463:TYR:HB3	2.00	0.43
1:B:569:TRP:CE2	1:B:573:LEU:HD11	2.53	0.43
1:B:696:ILE:HD12	1:B:696:ILE:HA	1.78	0.43
1:B:732:ASN:OD1	2:R:40:G:H5"	2.19	0.43
1:A:398:TYR:HE1	2:T:75:C:H1'	1.83	0.43
1:A:485:ILE:HG12	1:A:500:LEU:HD21	2.01	0.43
1:A:430:SER:HB3	1:A:584:VAL:HG13	2.01	0.43
1:A:738:ASN:HA	6:A:1247:HOH:O	2.19	0.43
1:B:40:PHE:HB3	1:B:78:VAL:HG22	2.01	0.42
1:A:1030:HIS:O	1:A:1034:LEU:HD12	2.19	0.42
1:A:992:VAL:HG23	1:A:1034:LEU:CD2	2.49	0.42
1:B:67:VAL:HB	1:B:68:PRO:HD3	2.00	0.42
1:B:61:SER:HB3	1:B:139:ARG:HD2	2.01	0.42
1:B:43:PHE:CE2	1:B:556:ALA:HB2	2.53	0.42
1:A:770:ALA:HB3	1:A:771:PRO:HD3	2.00	0.42
1:B:229:LEU:N	1:B:230:PRO:HD2	2.35	0.42
1:B:437:VAL:HA	1:B:438:PRO:HA	1.78	0.42
2:T:43:G:H2'	2:T:44:A:C8	2.55	0.41
1:A:887:GLU:HB3	1:A:892:VAL:CG2	2.50	0.41
1:A:793:LEU:HD23	1:A:793:LEU:HA	1.86	0.41
1:A:189:SER:HB3	1:A:460:ARG:NH2	2.36	0.40
1:B:27:PHE:CD1	1:B:140:TRP:HB3	2.55	0.40
1:B:494:VAL:HG21	1:B:508:LEU:HD22	2.03	0.40
1:B:681:GLN:CG	1:B:789:PRO:HG3	2.51	0.40
1:A:370:TYR:OH	1:A:407:PRO:HG2	2.21	0.40
2:R:42:U:C2'	2:R:43:G:O5'	2.69	0.40
1:B:34:THR:O	1:B:77:HIS:HB2	2.21	0.40
1:B:831:ILE:HD11	1:B:872:ILE:HA	2.04	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	1055/1080 (98%)	1007 (96%)	47 (4%)	1 (0%)	48 77
1	B	912/1080 (84%)	850 (93%)	62 (7%)	0	100 100
All	All	1967/2160 (91%)	1857 (94%)	109 (6%)	1 (0%)	48 77

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1052	PRO

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	824/967 (85%)	817 (99%)	7 (1%)	79 93
1	B	611/967 (63%)	606 (99%)	5 (1%)	79 93
All	All	1435/1934 (74%)	1423 (99%)	12 (1%)	79 93

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	280	ILE
1	A	324	HIS
1	A	405	ASP
1	A	440	THR
1	A	475	ASP

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Mol	Chain	Res	Type
1	A	636	LYS
1	A	1039	ARG
1	B	264	THR
1	B	324	HIS
1	B	636	LYS
1	B	820	ILE
1	B	861	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
2	R	68/77 (88%)	19 (27%)	6 (8%)
2	T	76/77 (98%)	21 (27%)	3 (3%)
All	All	144/154 (93%)	40 (27%)	9 (6%)

All (40) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
2	T	14	A
2	T	16	G
2	T	17	U
2	T	18	G
2	T	20	U
2	T	21	U
2	T	22	G
2	T	30	C
2	T	32	C
2	T	34	G
2	T	37	A
2	T	46	G
2	T	47	U
2	T	48	C
2	T	53	G
2	T	58	A
2	T	61	C
2	T	68	G
2	T	69	G
2	T	70	C

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Mol	Chain	Res	Type
2	T	76	A
2	R	8	U
2	R	14	A
2	R	20	U
2	R	21(A)	A
2	R	22	G
2	R	30	C
2	R	32	C
2	R	34	G
2	R	38	A
2	R	43	G
2	R	46	G
2	R	47	U
2	R	48	C
2	R	51	U
2	R	59	G
2	R	61	C
2	R	68	G
2	R	69	G
2	R	70	C

All (9) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
2	T	18	G
2	T	46	G
2	T	60	U
2	R	7	G
2	R	19	G
2	R	45	G
2	R	48	C
2	R	58	A
2	R	60	U

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

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

5.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

5.6 Ligand geometry (i)

12 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	$\#\|Z\| > 2$
5	SO4	A	1104	-	4,4,4	0.26	0	6,6,6	0.07	0
3	ILE	A	1101	-	7,8,8	1.27	2 (28%)	7,10,10	1.00	0
5	SO4	B	1102	-	4,4,4	0.17	0	6,6,6	0.06	0
5	SO4	A	1106	-	4,4,4	0.24	0	6,6,6	0.11	0
3	ILE	B	1101	-	7,8,8	0.47	0	7,10,10	0.42	0
5	SO4	A	1105	-	4,4,4	0.24	0	6,6,6	0.07	0
4	EDO	A	1102	-	3,3,3	0.08	0	2,2,2	0.27	0
5	SO4	B	1105	-	4,4,4	0.20	0	6,6,6	0.09	0
5	SO4	B	1104	-	4,4,4	0.24	0	6,6,6	0.11	0
5	SO4	A	1107	-	4,4,4	0.23	0	6,6,6	0.07	0
5	SO4	B	1103	-	4,4,4	0.22	0	6,6,6	0.10	0
5	SO4	A	1103	-	4,4,4	0.20	0	6,6,6	0.07	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	EDO	A	1102	-	-	0/1/1/1	-
3	ILE	A	1101	-	-	2/10/10/10	-
3	ILE	B	1101	-	-	3/10/10/10	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1101	ILE	OXT-C	-2.41	1.22	1.30
3	A	1101	ILE	O-C	2.21	1.28	1.22

There are no bond angle outliers.

There are no chirality outliers.

All (5) torsion outliers are listed below:

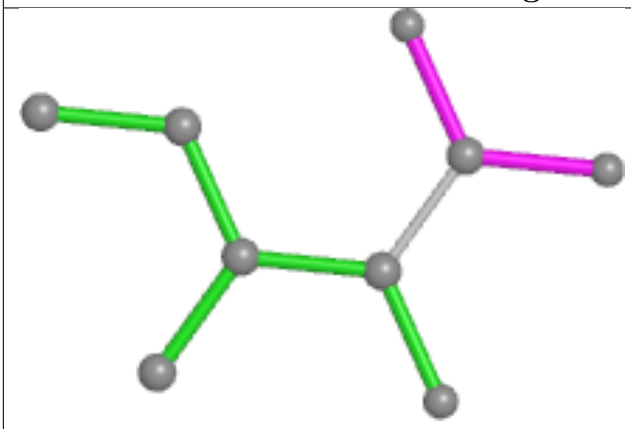
Mol	Chain	Res	Type	Atoms
3	B	1101	ILE	C-CA-CB-CG1
3	A	1101	ILE	C-CA-CB-CG1
3	B	1101	ILE	CA-CB-CG1-CD1
3	B	1101	ILE	CG2-CB-CG1-CD1
3	A	1101	ILE	OXT-C-CA-N

There are no ring outliers.

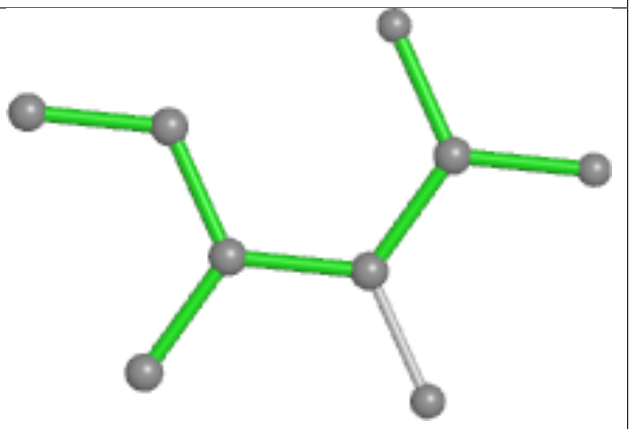
No monomer is involved in short contacts.

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.

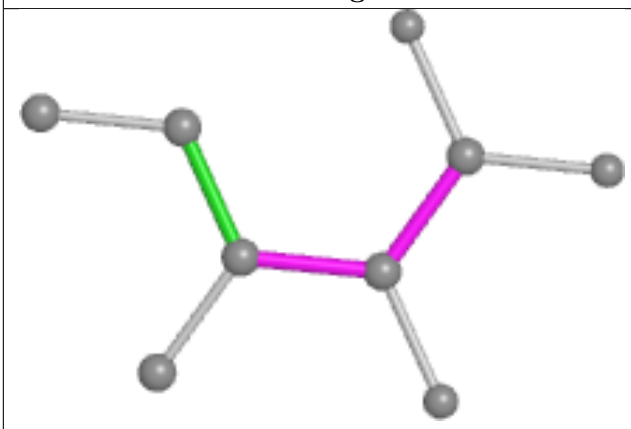
Ligand ILE A 1101



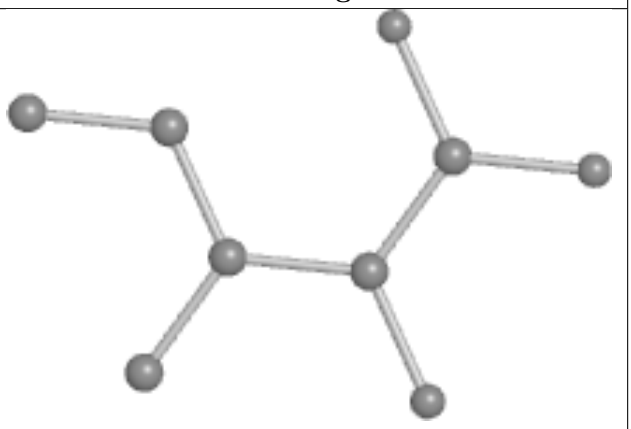
Bond lengths



Bond angles

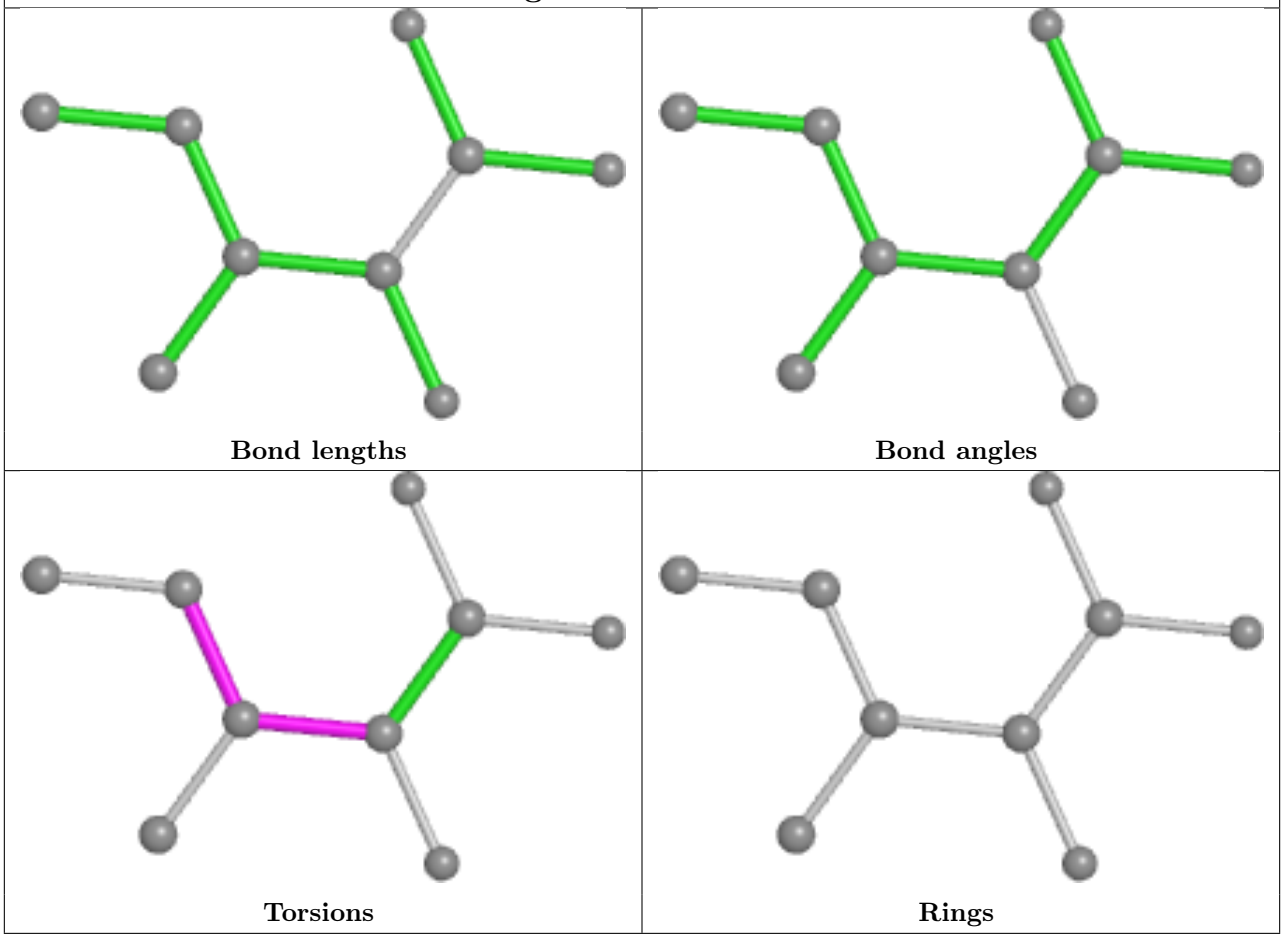


Torsions



Rings

Ligand ILE B 1101



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, 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	A	1061/1080 (98%)	0.07	30 (2%) 55 46	32, 53, 97, 136	0
1	B	936/1080 (86%)	0.55	48 (5%) 34 27	43, 74, 109, 130	0
2	R	70/77 (90%)	0.71	1 (1%) 73 66	70, 130, 181, 196	0
2	T	77/77 (100%)	-0.10	1 (1%) 74 67	33, 66, 101, 133	0
All	All	2144/2314 (92%)	0.29	80 (3%) 45 37	32, 63, 111, 196	0

All (80) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1068	LYS	3.5
1	A	1061	ASN	3.5
1	A	1060	ILE	3.3
1	A	1013	GLU	3.3
1	A	1050	THR	3.2
1	A	1051	ASP	3.2
1	B	632	SER	3.2
1	A	1072	LEU	3.2
1	B	292	PRO	3.1
1	A	7	HIS	3.0
1	B	325	ASN	3.0
1	B	384	ASN	3.0
1	B	307	ARG	2.9
1	A	1064	ILE	2.9
1	B	370	TYR	2.9
1	B	366	PHE	2.9
1	B	306	PHE	2.9
1	B	299	GLU	2.9
1	B	203	PRO	2.8
1	B	1002	CYS	2.8
1	A	894	TYR	2.8

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Mol	Chain	Res	Type	RSRZ
1	A	194	GLN	2.7
1	B	347	SER	2.7
1	B	294	PHE	2.7
1	A	398	TYR	2.7
1	B	445	ARG	2.6
2	T	16	G	2.6
1	A	1067	LEU	2.6
1	A	1015	GLU	2.6
1	B	1019	ASP	2.6
1	B	633	PRO	2.5
1	B	383	THR	2.5
1	B	221	ALA	2.5
1	B	254	TYR	2.5
1	A	1055	ASP	2.5
1	A	351	ASN	2.5
1	B	1032	ASP	2.4
1	B	402	TRP	2.4
1	A	1057	GLU	2.4
1	B	389	LEU	2.4
1	A	941	GLU	2.4
1	A	1002	CYS	2.4
1	A	938	ALA	2.4
1	A	1016	LEU	2.4
1	A	1052	PRO	2.3
1	B	425	PRO	2.3
1	B	342	VAL	2.3
1	A	950	ILE	2.3
1	B	357	GLY	2.3
1	B	296	TYR	2.3
1	B	867	ALA	2.3
1	B	382	LEU	2.3
1	B	197	TYR	2.3
1	B	878	VAL	2.3
1	A	1014	TYR	2.2
1	A	1045	TYR	2.2
2	R	19	G	2.2
1	A	1032	ASP	2.2
1	B	371	VAL	2.2
1	B	359	PHE	2.2
1	B	398	TYR	2.2
1	B	981	GLU	2.2
1	B	987	LEU	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	910	ASP	2.2
1	B	1041	ASP	2.2
1	B	340	ASN	2.1
1	B	971	LEU	2.1
1	B	982	LEU	2.1
1	B	1021	ILE	2.1
1	A	402	TRP	2.1
1	A	1012	VAL	2.1
1	B	361	LYS	2.1
1	B	285	LEU	2.1
1	B	979	TYR	2.1
1	B	830	VAL	2.0
1	A	1066	LYS	2.0
1	B	261	LEU	2.0
1	B	220	VAL	2.0
1	B	716	LEU	2.0
1	B	876	LEU	2.0

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, 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	EDO	A	1102	4/4	0.77	0.16	45,48,48,50	0
5	SO4	A	1106	5/5	0.81	0.16	68,73,75,79	0
5	SO4	B	1103	5/5	0.86	0.19	64,66,68,71	0
5	SO4	B	1102	5/5	0.90	0.22	68,70,73,80	0
5	SO4	A	1103	5/5	0.90	0.18	63,66,73,76	0
5	SO4	B	1105	5/5	0.90	0.17	60,60,67,68	0

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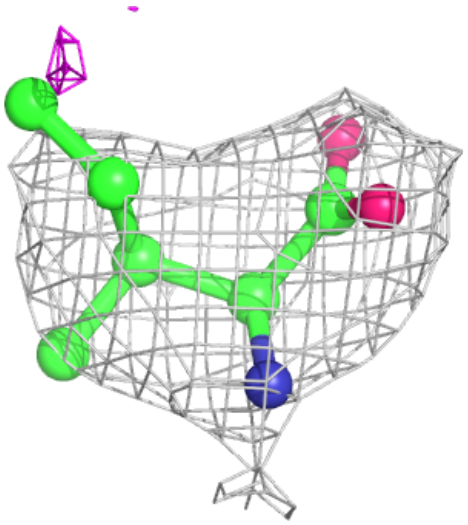
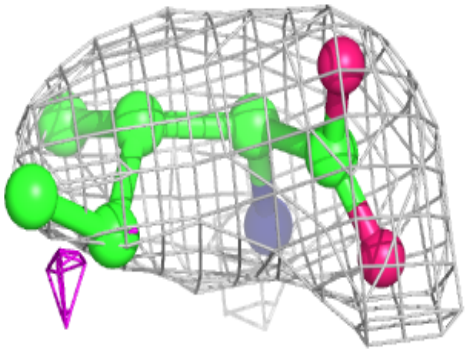
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	ILE	B	1101	9/9	0.92	0.15	56,58,62,63	0
5	SO4	A	1105	5/5	0.92	0.15	58,58,63,64	0
5	SO4	B	1104	5/5	0.93	0.15	55,57,61,63	0
5	SO4	A	1107	5/5	0.93	0.15	62,62,67,68	0
5	SO4	A	1104	5/5	0.95	0.11	62,65,67,71	0
3	ILE	A	1101	9/9	0.96	0.10	42,44,48,49	0

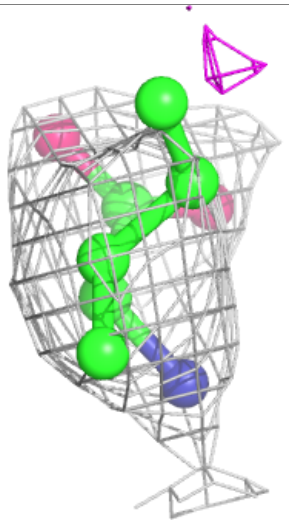
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around ILE B 1101:

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

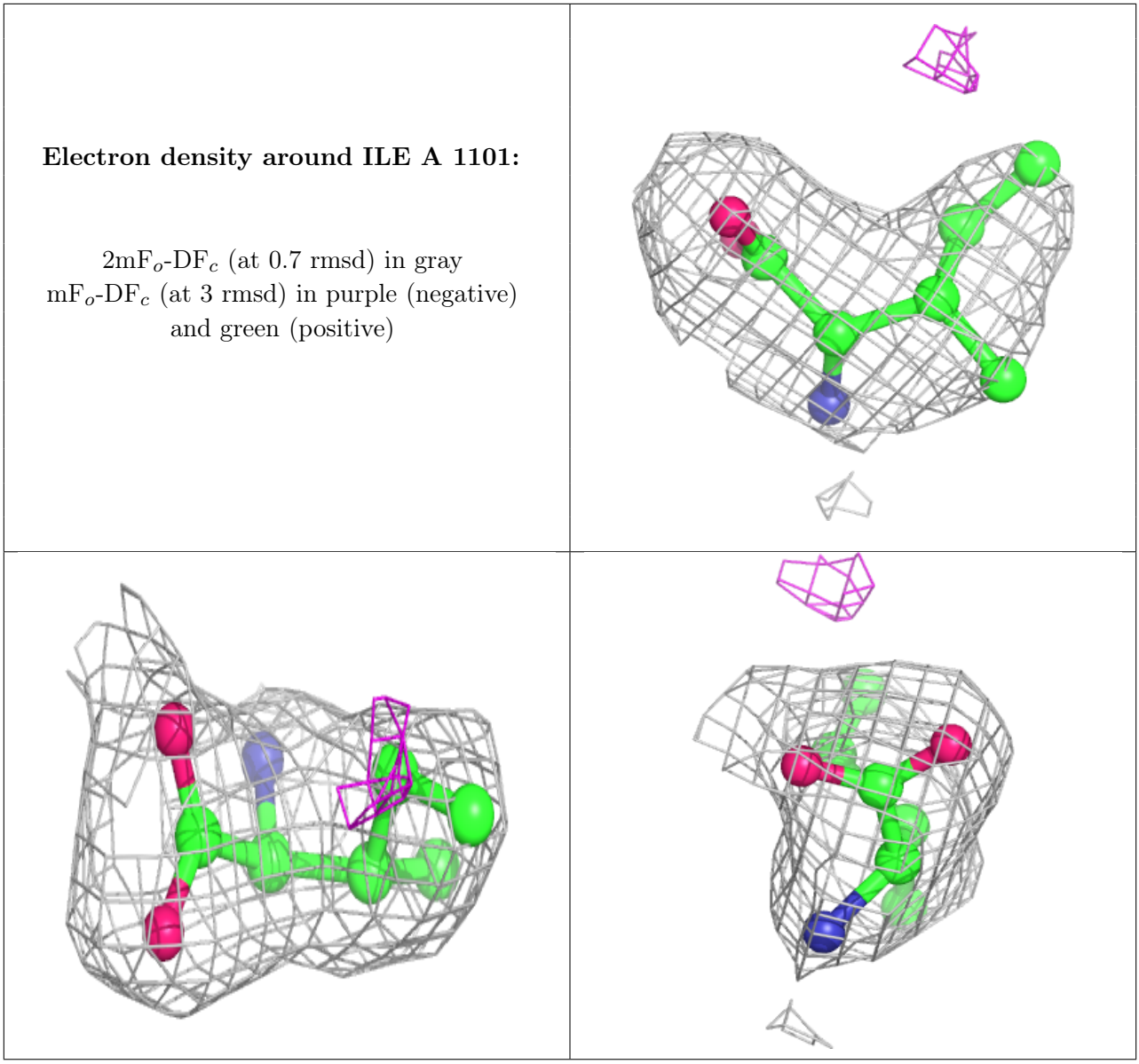






Electron density around ILE A 1101:

$2mF_o$-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

There are no such residues in this entry.