W O R L D W I D E
wwPDB
PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

Feb 18, 2024 – 11:05 PM EST

PDB ID	:	4HWP
Title	:	Crystal structure of E. coli Threonyl-tRNA synthetase bound to a novel inhibitor
Authors	:	Hilgers, M.T.
Deposited on	:	2012-11-08
Resolution	:	1.81 Å(reported)

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

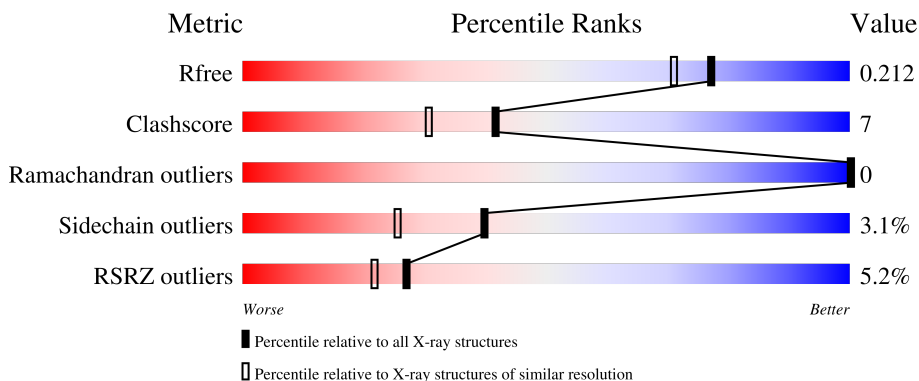|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance ⓘ

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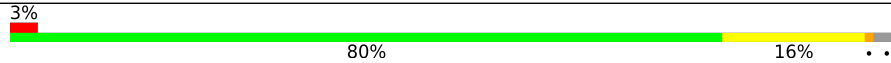*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.81 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	5950 (1.80-1.80)
Clashscore	141614	6793 (1.80-1.80)
Ramachandran outliers	138981	6697 (1.80-1.80)
Sidechain outliers	138945	6696 (1.80-1.80)
RSRZ outliers	127900	5850 (1.80-1.80)

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	411	8% / 86% / 12% ·
1	B	411	3% / 80% / 16% · ·

2 Entry composition ⓘ

There are 4 unique types of molecules in this entry. The entry contains 7245 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 Threonine–tRNA ligase.

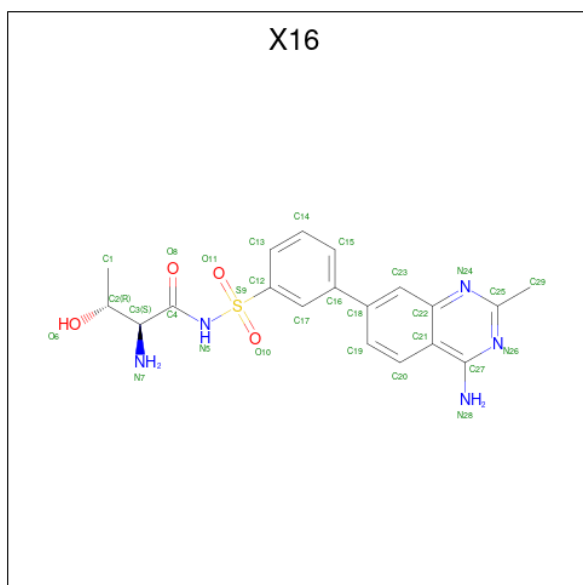| Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	409	Total 3354	C 2116	N 596	O 619	S 23	0	0	0
1	B	398	Total 3251	C 2053	N 573	O 602	S 23	0	0	0

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	240	MET	-	expression tag	UNP P0A8M3
A	241	ALA	-	expression tag	UNP P0A8M3
A	643	LEU	-	expression tag	UNP P0A8M3
A	644	GLU	-	expression tag	UNP P0A8M3
A	645	HIS	-	expression tag	UNP P0A8M3
A	646	HIS	-	expression tag	UNP P0A8M3
A	647	HIS	-	expression tag	UNP P0A8M3
A	648	HIS	-	expression tag	UNP P0A8M3
A	649	HIS	-	expression tag	UNP P0A8M3
A	650	HIS	-	expression tag	UNP P0A8M3
B	240	MET	-	expression tag	UNP P0A8M3
B	241	ALA	-	expression tag	UNP P0A8M3
B	643	LEU	-	expression tag	UNP P0A8M3
B	644	GLU	-	expression tag	UNP P0A8M3
B	645	HIS	-	expression tag	UNP P0A8M3
B	646	HIS	-	expression tag	UNP P0A8M3
B	647	HIS	-	expression tag	UNP P0A8M3
B	648	HIS	-	expression tag	UNP P0A8M3
B	649	HIS	-	expression tag	UNP P0A8M3
B	650	HIS	-	expression tag	UNP P0A8M3

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total 1	Zn 1	0	0
2	B	1	Total 1	Zn 1	0	0

- Molecule 3 is N-{[3-(4-amino-2-methylquinazolin-7-yl)phenyl]sulfonyl}-L-threoninamide (three-letter code: X16) (formula: $C_{19}H_{21}N_5O_4S$).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total 29	C 19	N 5	O 4	S 1	0	0
3	B	1	Total 29	C 19	N 5	O 4	S 1	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	287	Total 287	O 287	0	0
4	B	293	Total 293	O 293	0	0

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: Threonine–tRNA ligase

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4   Data and refinement statistics   ⓘ

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	86.16Å 110.14Å 115.45Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	43.08 – 1.81 43.08 – 1.81	Depositor EDS
% Data completeness (in resolution range)	98.7 (43.08-1.81) 98.7 (43.08-1.81)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.06	Depositor
$< I/\sigma(I) >$ [1]	3.04 (at 1.81Å)	Xtriage
Refinement program	REFMAC 5.6.0117	Depositor
R, R_{free}	0.194 , 0.213 0.193 , 0.212	Depositor DCC
R_{free} test set	4988 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	21.0	Xtriage
Anisotropy	0.042	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 45.3	EDS
L-test for twinning[2]	$< |L| > = 0.48, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.014 for -h,l,k	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	7245	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 4.61% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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: X16, ZN

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	0.74	4/3431 (0.1%)	0.81	7/4621 (0.2%)
1	B	0.74	4/3322 (0.1%)	0.80	5/4473 (0.1%)
All	All	0.74	8/6753 (0.1%)	0.80	12/9094 (0.1%)

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	434	TRP	CD2-CE2	5.93	1.48	1.41
1	A	266	TRP	CD2-CE2	5.92	1.48	1.41
1	B	478	TRP	CD2-CE2	5.80	1.48	1.41
1	A	310	TRP	CD2-CE2	5.59	1.48	1.41
1	B	310	TRP	CD2-CE2	5.48	1.48	1.41
1	B	304	TRP	CD2-CE2	5.43	1.47	1.41
1	A	304	TRP	CD2-CE2	5.32	1.47	1.41
1	A	536	TRP	CD2-CE2	5.29	1.47	1.41

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	611	ARG	NE-CZ-NH1	9.45	125.02	120.30
1	A	611	ARG	NE-CZ-NH2	-8.64	115.98	120.30
1	A	325	ARG	NE-CZ-NH2	-7.24	116.68	120.30
1	B	518	MET	CG-SD-CE	-6.35	90.05	100.20
1	A	325	ARG	NE-CZ-NH1	6.03	123.31	120.30
1	B	486	ASP	CB-CG-OD1	5.89	123.60	118.30
1	A	375	ARG	NE-CZ-NH2	-5.88	117.36	120.30
1	B	263	MET	O-C-N	-5.79	113.44	122.70
1	A	486	ASP	CB-CG-OD1	5.29	123.06	118.30
1	A	512	ARG	NE-CZ-NH1	5.22	122.91	120.30
1	B	354	ARG	NE-CZ-NH1	-5.18	117.71	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	243	ASP	CB-CG-OD2	5.16	122.94	118.30

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	3354	0	3267	43	0
1	B	3251	0	3185	53	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	29	0	20	5	0
3	B	29	0	20	5	0
4	A	287	0	0	12	1
4	B	293	0	0	12	1
All	All	7245	0	6492	92	1

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 7.

All (92) 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:B:490:PRO:HG3	1:B:509:MET:CE	1.79	1.13
1:A:263:MET:HE3	4:B:802:HOH:O	1.57	1.05
1:A:242:ARG:HH22	1:A:250:GLN:HE22	1.04	1.01
1:B:490:PRO:HG3	1:B:509:MET:HE2	1.43	0.98
1:A:255:HIS:HD1	1:A:267:HIS:HE1	0.98	0.93
1:A:255:HIS:HD1	1:A:267:HIS:CE1	1.86	0.92
1:A:528:GLU:OE1	1:A:649:HIS:HD2	1.59	0.86
1:B:376:VAL:H	3:B:702:X16:HN2A	1.21	0.86
1:A:376:VAL:H	3:A:702:X16:HN2A	1.24	0.85
1:B:473:CYS:SG	4:B:1068:HOH:O	2.34	0.85
1:B:638:LYS:HB2	4:B:1085:HOH:O	1.77	0.83

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:609:ARG:HD2	4:A:1005:HOH:O	1.77	0.83
1:B:255:HIS:ND1	1:B:267:HIS:HE1	1.76	0.83
1:B:473:CYS:HB3	4:B:1068:HOH:O	1.79	0.82
1:B:453:GLU:CD	4:B:1076:HOH:O	2.19	0.79
1:B:419:LYS:HE2	4:B:1076:HOH:O	1.84	0.77
1:B:490:PRO:HG3	1:B:509:MET:HE3	1.67	0.76
1:B:473:CYS:CB	4:B:1068:HOH:O	2.32	0.76
1:A:329:ILE:HD11	1:B:329:ILE:HD11	1.71	0.72
1:B:484:GLN:HE22	3:B:702:X16:HN5	1.38	0.69
1:A:572:ASP:OD2	1:A:585:HIS:HE1	1.76	0.67
1:A:403:LEU:HG	1:A:407:MET:HE3	1.77	0.67
1:A:403:LEU:HD11	1:A:407:MET:HE2	1.75	0.67
1:B:572:ASP:OD2	1:B:585:HIS:HE1	1.78	0.66
1:A:268:ASN:HD22	1:B:292:GLU:H	1.42	0.66
1:B:585:HIS:HD2	4:B:815:HOH:O	1.79	0.64
1:B:594:LEU:HD22	1:B:608:VAL:HG22	1.80	0.64
1:A:252:ASP:OD1	1:A:267:HIS:HD2	1.79	0.64
1:A:585:HIS:HD2	4:A:922:HOH:O	1.82	0.63
1:A:292:GLU:H	1:B:268:ASN:HD22	1.45	0.63
1:B:620:ASP:OD2	1:B:623:GLU:HB2	1.98	0.63
1:B:255:HIS:ND1	1:B:267:HIS:CE1	2.65	0.62
1:A:455:GLN:NE2	4:A:993:HOH:O	2.18	0.61
1:A:528:GLU:OE1	1:A:649:HIS:CD2	2.48	0.61
1:A:242:ARG:HH22	1:A:250:GLN:NE2	1.87	0.61
1:B:419:LYS:HD3	1:B:453:GLU:HG3	1.83	0.60
1:B:382:ASP:HB3	1:B:518:MET:CE	2.31	0.60
1:B:252:ASP:OD1	1:B:267:HIS:HD2	1.84	0.59
1:B:556:ASN:HD21	1:B:573:LEU:HD11	1.68	0.58
1:B:310:TRP:O	1:B:314:LYS:HB2	2.04	0.58
1:A:405:TYR:CE1	1:A:416:ILE:HD12	2.39	0.57
1:B:325:ARG:HD3	4:B:1093:HOH:O	2.03	0.57
1:A:475:ASP:OD1	1:A:649:HIS:HE1	1.88	0.56
1:A:419:LYS:HE2	4:A:972:HOH:O	2.08	0.54
1:A:403:LEU:HD11	1:A:407:MET:CE	2.37	0.54
1:B:598:ASP:O	1:B:602:GLU:HG2	2.07	0.53
1:B:490:PRO:CG	1:B:509:MET:HE3	2.37	0.53
1:A:257:GLN:HG3	1:A:265:PHE:CE2	2.44	0.52
1:B:403:LEU:HD11	1:B:407:MET:HE2	1.90	0.51
1:A:255:HIS:ND1	1:A:267:HIS:HE1	1.84	0.51
1:B:403:LEU:HG	1:B:407:MET:HE3	1.92	0.51
1:B:638:LYS:O	1:B:639:GLN:HB2	2.11	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:490:PRO:CG	1:B:509:MET:CE	2.71	0.50
1:A:404:VAL:HA	1:A:514:ILE:HG23	1.94	0.49
1:A:637:LEU:HD13	1:A:645:HIS:CE1	2.48	0.49
1:B:412:GLY:HA3	1:B:637:LEU:HD11	1.95	0.48
1:A:325:ARG:HD3	4:A:1080:HOH:O	2.13	0.48
1:B:342:ASN:HD21	1:B:495:ALA:HA	1.79	0.47
1:B:638:LYS:CB	4:B:1085:HOH:O	2.48	0.47
1:B:620:ASP:OD2	1:B:623:GLU:CB	2.63	0.47
1:B:637:LEU:HB2	4:B:958:HOH:O	2.13	0.47
1:A:363:ARG:HB2	3:A:702:X16:H29B	1.97	0.47
1:B:242:ARG:HB3	1:B:247:ILE:HD11	1.97	0.47
1:B:301:ARG:O	1:B:305:GLU:HG3	2.15	0.46
1:A:292:GLU:H	1:B:268:ASN:ND2	2.12	0.46
1:B:382:ASP:HB3	1:B:518:MET:HE1	1.96	0.46
1:B:503:GLU:OE1	1:B:505:LYS:NZ	2.39	0.45
1:A:376:VAL:N	3:A:702:X16:HN2A	2.04	0.45
1:A:298:MET:HA	4:A:1079:HOH:O	2.16	0.45
1:A:543:VAL:HG23	1:A:590:VAL:HG11	1.97	0.45
1:B:375:ARG:HA	3:B:702:X16:N28	2.32	0.44
1:A:403:LEU:CG	1:A:407:MET:HE3	2.46	0.44
3:A:702:X16:H1B	3:A:702:X16:H13	2.00	0.44
1:B:285:LEU:HB3	1:B:290:TYR:HB2	1.99	0.44
1:A:375:ARG:NH1	4:A:1070:HOH:O	2.30	0.44
1:A:544:ILE:HD13	1:A:558:LEU:HB3	2.00	0.44
1:A:242:ARG:N	4:A:1037:HOH:O	2.51	0.43
1:A:638:LYS:HD3	4:A:982:HOH:O	2.17	0.43
1:A:339:GLN:HB3	1:B:257:GLN:OE1	2.18	0.43
1:B:242:ARG:HH21	1:B:246:LYS:HD3	1.82	0.43
1:A:325:ARG:CD	4:A:1080:HOH:O	2.66	0.43
1:B:288:TYR:CE1	1:B:403:LEU:HD13	2.55	0.42
1:B:376:VAL:N	3:B:702:X16:HN2A	2.00	0.42
1:A:375:ARG:HA	3:A:702:X16:N28	2.34	0.42
1:A:590:VAL:O	1:A:611:ARG:HB3	2.20	0.42
1:B:363:ARG:HB2	3:B:702:X16:H29B	2.02	0.41
1:A:642:GLU:N	4:A:1028:HOH:O	2.47	0.41
1:B:543:VAL:HG11	1:B:585:HIS:CE1	2.55	0.41
1:B:288:TYR:CZ	1:B:403:LEU:HD13	2.56	0.41
1:B:325:ARG:CD	4:B:1093:HOH:O	2.66	0.41
1:A:257:GLN:NE2	4:A:859:HOH:O	2.53	0.40
1:B:335:PRO:O	1:B:339:GLN:HG2	2.21	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the sym-

metry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:1074:HOH:O	4:B:925:HOH:O[3_545]	1.32	0.88

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	407/411 (99%)	401 (98%)	6 (2%)	0	100	100
1	B	396/411 (96%)	391 (99%)	5 (1%)	0	100	100
All	All	803/822 (98%)	792 (99%)	11 (1%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	364/365 (100%)	353 (97%)	11 (3%)	41	27
1	B	353/365 (97%)	342 (97%)	11 (3%)	40	25
All	All	717/730 (98%)	695 (97%)	22 (3%)	40	25

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	313	TYR

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Mol	Chain	Res	Type
1	A	334	CYS
1	A	347	SER
1	A	502	ASN
1	A	512	ARG
1	A	549	ASP
1	A	558	LEU
1	A	578	ILE
1	A	599	LYS
1	A	633	ARG
1	A	640	LEU
1	B	259	GLU
1	B	267	HIS
1	B	276	GLU
1	B	287	GLU
1	B	334	CYS
1	B	426	LYS
1	B	504	ARG
1	B	512	ARG
1	B	599	LYS
1	B	618	SER
1	B	620	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	250	GLN
1	A	257	GLN
1	A	267	HIS
1	A	268	ASN
1	A	291	GLN
1	A	342	ASN
1	A	556	ASN
1	A	585	HIS
1	A	649	HIS
1	B	267	HIS
1	B	268	ASN
1	B	291	GLN
1	B	312	ASN
1	B	342	ASN
1	B	556	ASN
1	B	585	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 4 ligands modelled in this entry, 2 are monoatomic - leaving 2 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
3	X16	B	702	2	31,31,31	2.26	6 (19%)	44,46,46	2.00	10 (22%)
3	X16	A	702	2	31,31,31	2.52	8 (25%)	44,46,46	2.33	14 (31%)

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	X16	B	702	2	-	4/23/23/23	0/3/3/3
3	X16	A	702	2	-	4/23/23/23	0/3/3/3

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	702	X16	C12-S9	-9.79	1.61	1.76

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	702	X16	C12-S9	-8.75	1.62	1.76
3	A	702	X16	O11-S9	-6.24	1.36	1.43
3	A	702	X16	O10-S9	-4.85	1.38	1.43
3	A	702	X16	C27-C21	4.30	1.49	1.45
3	B	702	X16	C27-C21	3.95	1.49	1.45
3	B	702	X16	C21-C22	3.16	1.47	1.42
3	A	702	X16	C21-C22	2.71	1.47	1.42
3	B	702	X16	O11-S9	-2.65	1.40	1.43
3	A	702	X16	C4-N5	-2.47	1.32	1.37
3	B	702	X16	C4-N5	-2.45	1.32	1.37
3	B	702	X16	S9-N5	-2.43	1.59	1.64
3	A	702	X16	S9-N5	-2.21	1.59	1.64
3	A	702	X16	C3-C4	-2.18	1.51	1.53

All (24) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	702	X16	C25-N24-C22	8.34	122.19	116.54
3	B	702	X16	C25-N24-C22	6.38	120.87	116.54
3	B	702	X16	O11-S9-O10	-5.46	112.84	119.55
3	A	702	X16	O11-S9-O10	-4.54	113.97	119.55
3	B	702	X16	C21-C27-N26	-4.26	117.50	121.93
3	A	702	X16	C21-C22-N24	-4.07	118.50	122.81
3	A	702	X16	C14-C13-C12	3.68	122.77	118.95
3	B	702	X16	C25-N26-C27	3.49	123.53	118.08
3	B	702	X16	C12-S9-N5	3.36	111.07	105.97
3	A	702	X16	C23-C22-N24	3.25	123.66	118.72
3	A	702	X16	C13-C12-C17	-3.08	116.84	120.62
3	A	702	X16	C12-S9-N5	3.06	110.61	105.97
3	A	702	X16	C4-C3-N7	-2.99	105.72	110.28
3	B	702	X16	C21-C22-N24	-2.88	119.75	122.81
3	A	702	X16	O6-C2-C3	2.68	114.78	109.04
3	A	702	X16	C21-C27-N26	-2.68	119.14	121.93
3	A	702	X16	O11-S9-C12	2.64	111.22	107.97
3	A	702	X16	C25-N26-C27	2.51	122.00	118.08
3	B	702	X16	O10-S9-C12	-2.37	105.04	107.97
3	B	702	X16	C23-C22-N24	2.26	122.17	118.72
3	A	702	X16	C16-C17-C12	2.26	121.75	119.96
3	A	702	X16	C13-C12-S9	2.17	122.13	119.77
3	B	702	X16	C19-C18-C23	2.01	121.23	118.09
3	B	702	X16	C14-C13-C12	2.00	121.03	118.95

There are no chirality outliers.
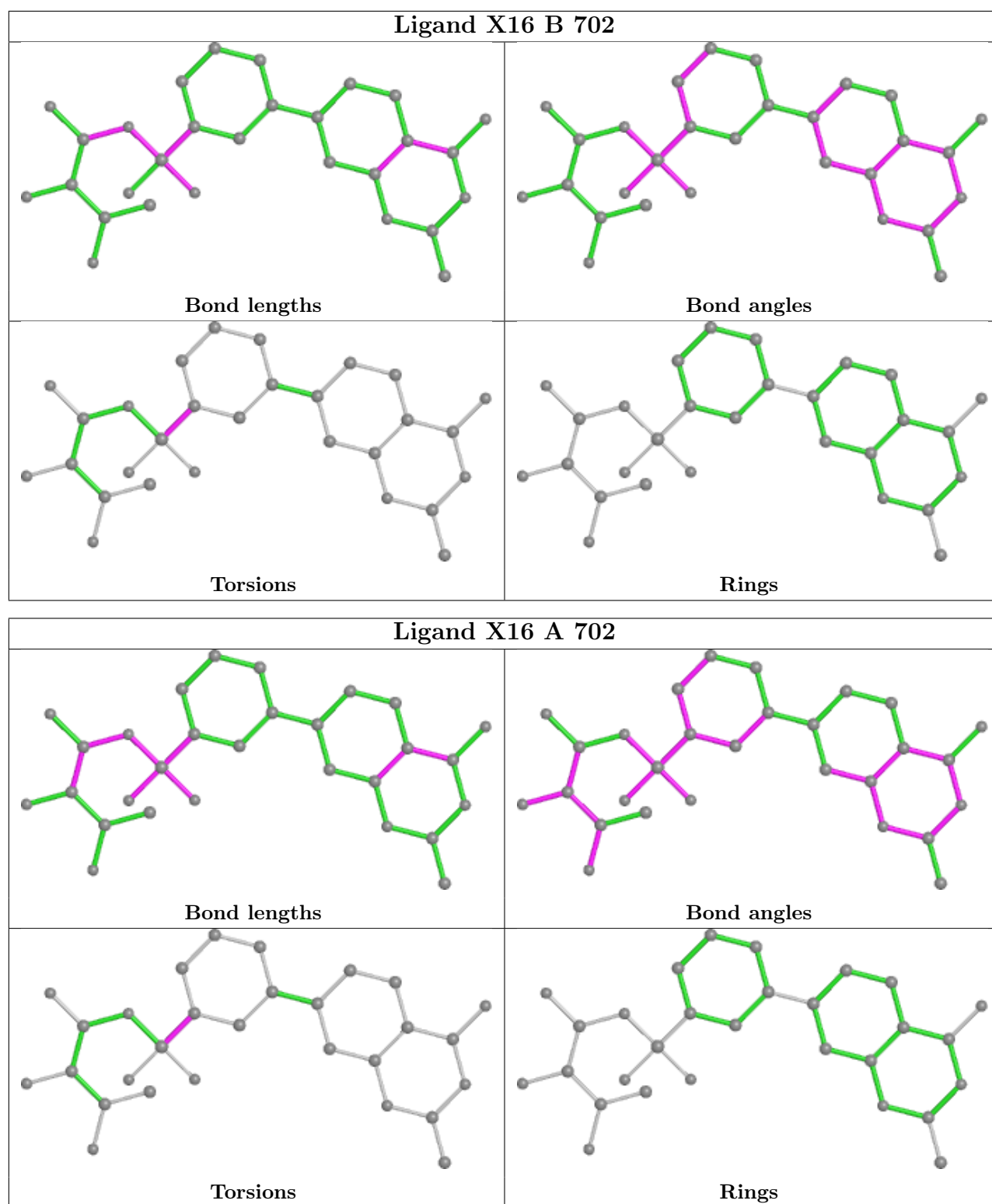
All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	702	X16	C17-C12-S9-O10
3	A	702	X16	C17-C12-S9-O10
3	B	702	X16	C13-C12-S9-O10
3	A	702	X16	C13-C12-S9-O10
3	A	702	X16	C13-C12-S9-N5
3	A	702	X16	C17-C12-S9-N5
3	B	702	X16	C13-C12-S9-N5
3	B	702	X16	C17-C12-S9-N5

There are no ring outliers.

2 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	702	X16	5	0
3	A	702	X16	5	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 X16 B 702

Bond lengths

Bond angles

Torsions

Rings

Ligand X16 A 702

Bond lengths

Bond angles

Torsions

Rings

5.7 Other polymers ⓘ

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(Å²)	Q<0.9
1	A	409/411 (99%)	0.22	31 (7%)	13	10	17, 25, 57, 88	0
1	B	398/411 (96%)	-0.06	11 (2%)	53	47	17, 25, 45, 88	0
All	All	807/822 (98%)	0.08	42 (5%)	27	22	17, 25, 54, 88	0

All (42) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	601	VAL	4.4
1	A	575	ASN	4.3
1	A	602	GLU	3.9
1	B	503	GLU	3.8
1	B	498	VAL	3.8
1	A	548	THR	3.6
1	A	502	ASN	3.5
1	B	473	CYS	3.5
1	A	310	TRP	3.5
1	B	501	ASP	3.0
1	B	500	GLU	3.0
1	A	549	ASP	2.9
1	A	599	LYS	2.8
1	B	345	LEU	2.8
1	A	553	GLU	2.8
1	A	554	TYR	2.8
1	A	501	ASP	2.8
1	A	613	GLY	2.7
1	A	547	ILE	2.7
1	A	578	ILE	2.7
1	A	611	ARG	2.7
1	A	415	LYS	2.6
1	A	621	VAL	2.6
1	A	612	ARG	2.6

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Mol	Chain	Res	Type	RSRZ
1	A	500	GLU	2.5
1	A	550	SER	2.5
1	A	604	GLY	2.5
1	A	610	THR	2.5
1	A	598	ASP	2.5
1	B	549	ASP	2.5
1	A	597	GLY	2.4
1	A	358	PHE	2.4
1	A	552	SER	2.3
1	A	313	TYR	2.3
1	A	277	LEU	2.2
1	B	271	TRP	2.2
1	A	273	ILE	2.1
1	A	643	LEU	2.1
1	B	288	TYR	2.1
1	B	637	LEU	2.1
1	B	639	GLN	2.1
1	A	546	ASN	2.0

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

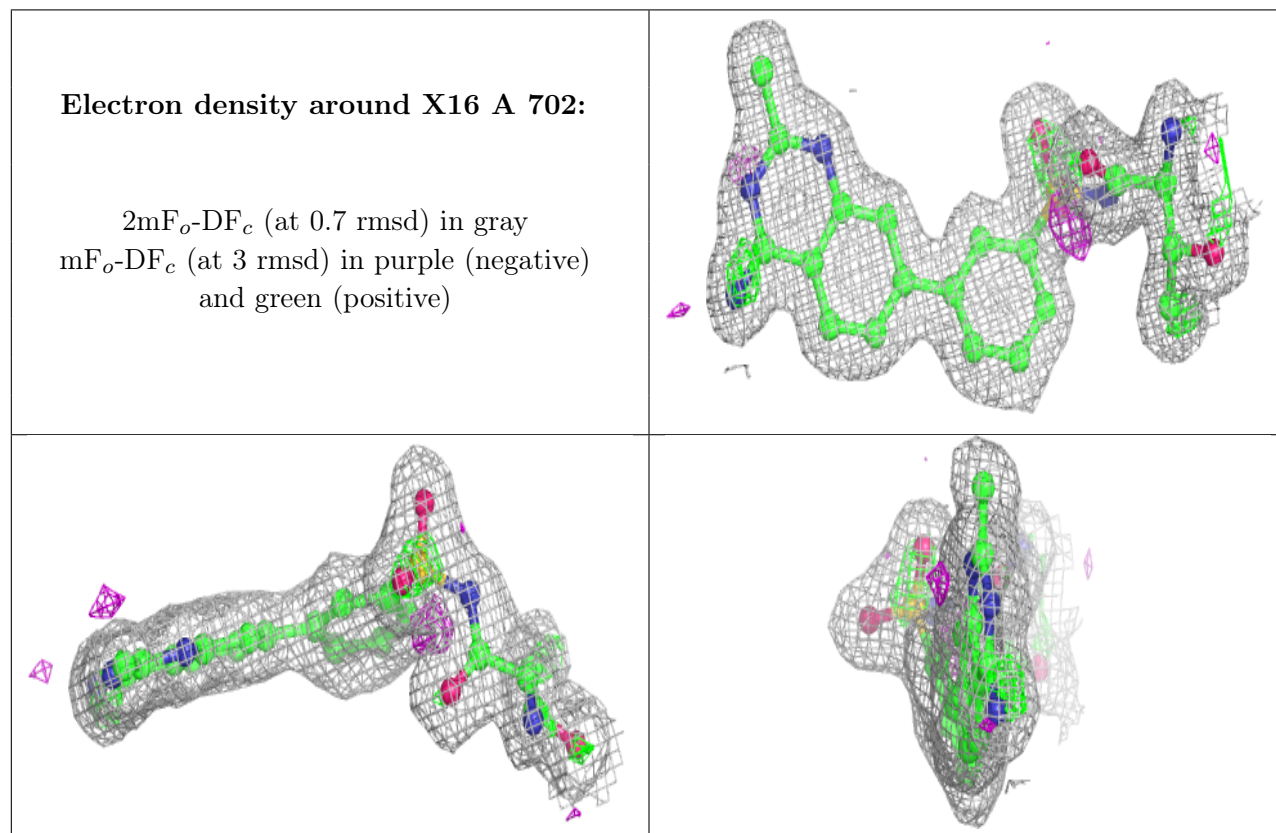There are no non-standard protein/DNA/RNA residues in this entry.

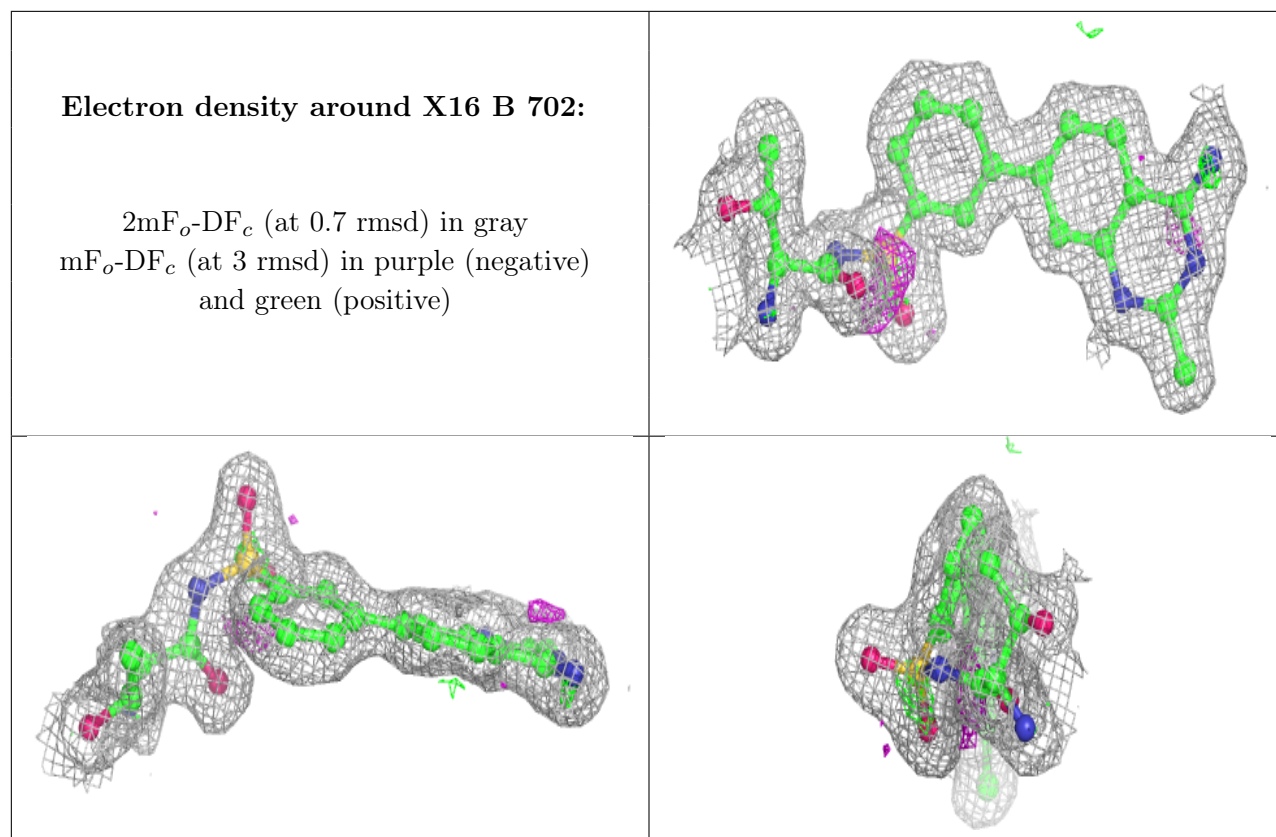## 6.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.

6.4 Ligands ⓘ

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	X16	A	702	29/29	0.94	0.17	25,27,28,31	0
3	X16	B	702	29/29	0.96	0.15	25,27,29,32	0
2	ZN	A	701	1/1	1.00	0.10	22,22,22,22	0
2	ZN	B	701	1/1	1.00	0.10	21,21,21,21	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 X16 A 702:

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

Electron density around X16 B 702:

$2mF_o$-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.