



# Full wwPDB X-ray Structure Validation Report ⓘ

May 23, 2020 – 08:32 pm BST

PDB ID : 4BRF  
Title : Legionella pneumophila NTPDase1 crystal form II (closed) in complex with a distorted orthomolybdate ion and AMP  
Authors : Zebisch, M.; Schaefer, P.; Lauble, P.; Straeter, N.  
Deposited on : 2013-06-04  
Resolution : 1.60 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](mailto: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.

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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 : 2.11  
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) : 2.11

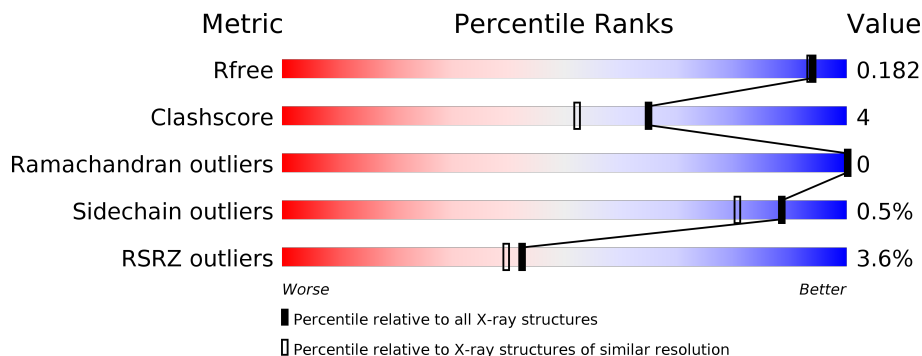
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.60 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	3398 (1.60-1.60)
Clashscore	141614	3665 (1.60-1.60)
Ramachandran outliers	138981	3564 (1.60-1.60)
Sidechain outliers	138945	3563 (1.60-1.60)
RSRZ outliers	127900	3321 (1.60-1.60)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	368	
1	B	368	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
7	M27	A	1401	-	-	X	-

## 2 Entry composition i

There are 11 unique types of molecules in this entry. The entry contains 6577 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.

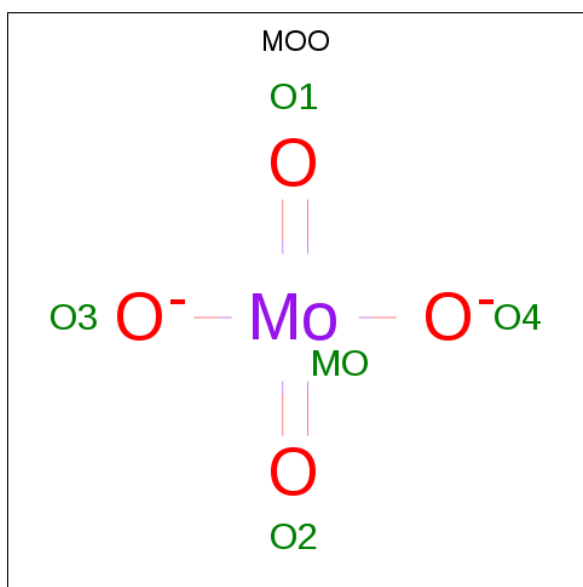
- Molecule 1 is a protein called ECTONUCLEOSIDE TRIPHOSPHATE DIPHOSPHOHYDROLASE I.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	358	2965	1886	490	574	15	0	19	0
1	B	358	2975	1899	484	578	14	0	21	0

There are 22 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	34	MET	-	expression tag	UNP Q5ZUA2
A	394	LEU	-	expression tag	UNP Q5ZUA2
A	395	GLU	-	expression tag	UNP Q5ZUA2
A	396	HIS	-	expression tag	UNP Q5ZUA2
A	397	HIS	-	expression tag	UNP Q5ZUA2
A	398	HIS	-	expression tag	UNP Q5ZUA2
A	399	HIS	-	expression tag	UNP Q5ZUA2
A	400	HIS	-	expression tag	UNP Q5ZUA2
A	401	HIS	-	expression tag	UNP Q5ZUA2
A	137	ASP	GLU	conflict	UNP Q5ZUA2
A	149	VAL	ALA	conflict	UNP Q5ZUA2
B	34	MET	-	expression tag	UNP Q5ZUA2
B	394	LEU	-	expression tag	UNP Q5ZUA2
B	395	GLU	-	expression tag	UNP Q5ZUA2
B	396	HIS	-	expression tag	UNP Q5ZUA2
B	397	HIS	-	expression tag	UNP Q5ZUA2
B	398	HIS	-	expression tag	UNP Q5ZUA2
B	399	HIS	-	expression tag	UNP Q5ZUA2
B	400	HIS	-	expression tag	UNP Q5ZUA2
B	401	HIS	-	expression tag	UNP Q5ZUA2
B	137	ASP	GLU	conflict	UNP Q5ZUA2
B	149	VAL	ALA	conflict	UNP Q5ZUA2

- Molecule 2 is MOLYBDATE ION (three-letter code: MOO) (formula: MoO<sub>4</sub>).

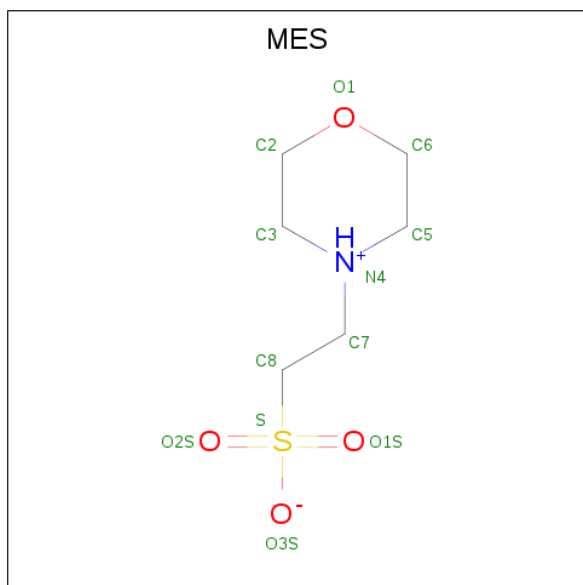


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	Mo	O	0	0
			5	1	4		
2	B	1	Total	Mo	O	0	0
			5	1	4		

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	3	Total	Mg	0	0
			3	3		
3	A	3	Total	Mg	0	0
			3	3		

- Molecule 4 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (three-letter code: MES) (formula: C<sub>6</sub>H<sub>13</sub>NO<sub>4</sub>S).

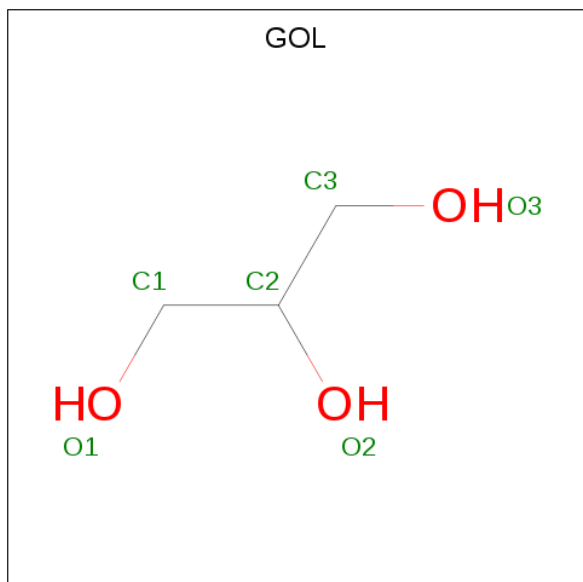


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
4	A	1	12	6	1	4	1	0	0
4	B	1	12	6	1	4	1	0	0

- Molecule 5 is SODIUM ION (three-letter code: NA) (formula: Na).

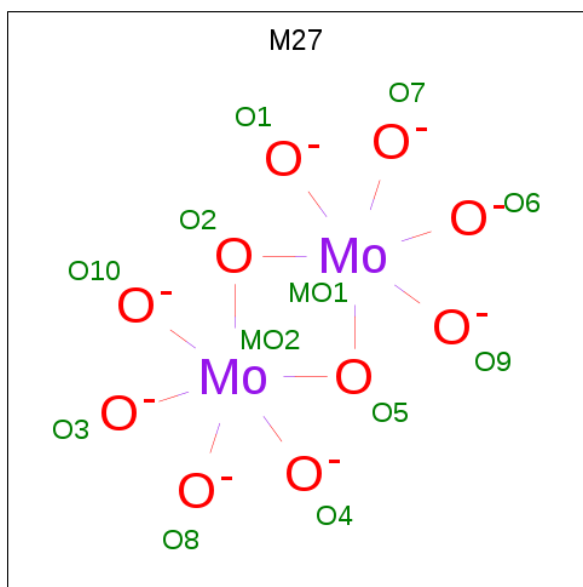
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Na		
5	A	1	1	1	0	0

- Molecule 6 is GLYCEROL (three-letter code: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).



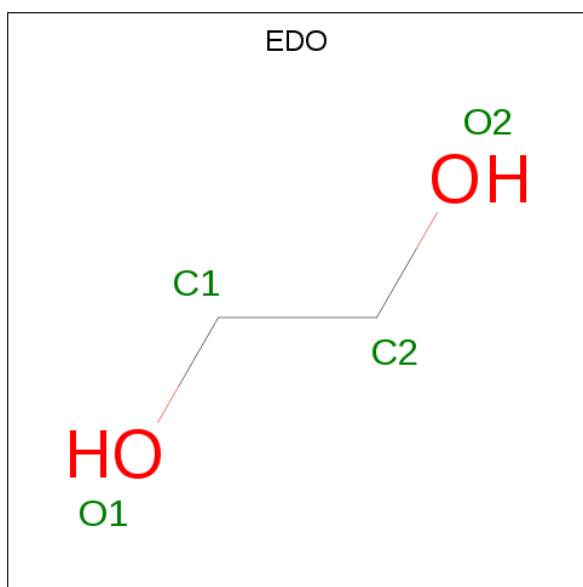
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			6	3	3		
6	B	1	Total	C	O	0	0
			6	3	3		

- Molecule 7 is bis(mu2-oxo)-octa-oxo-dimolybdenum (VI) (three-letter code: M27) (formula: Mo<sub>2</sub>O<sub>10</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	A	1	Total	Mo	O	0	0
			8	2	6		

- Molecule 8 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).

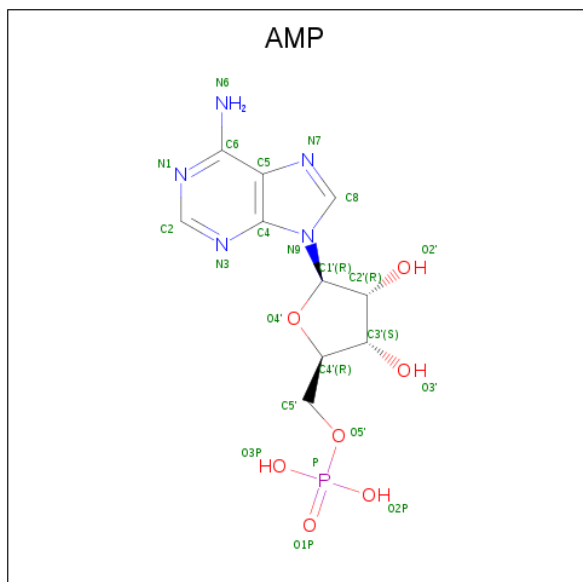


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	A	1	Total	C	O	0	0
			4	2	2		

- Molecule 9 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	B	1	Total	Cl	0	0
			1	1		
9	A	1	Total	Cl	0	0
			1	1		

- Molecule 10 is ADENOSINE MONOPHOSPHATE (three-letter code: AMP) (formula: C<sub>10</sub>H<sub>14</sub>N<sub>5</sub>O<sub>7</sub>P).





Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
10	B	1	23	10	5	7	1	0	0

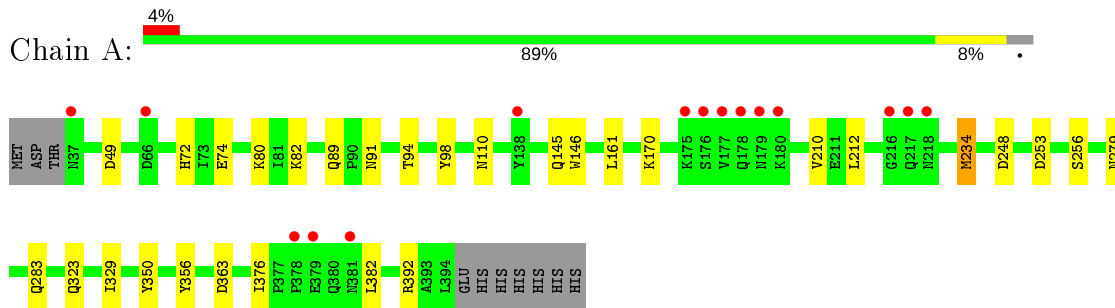
- Molecule 11 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
11	A	302	Total	O	0	0
			302	302		
11	B	245	Total	O	0	0
			245	245		

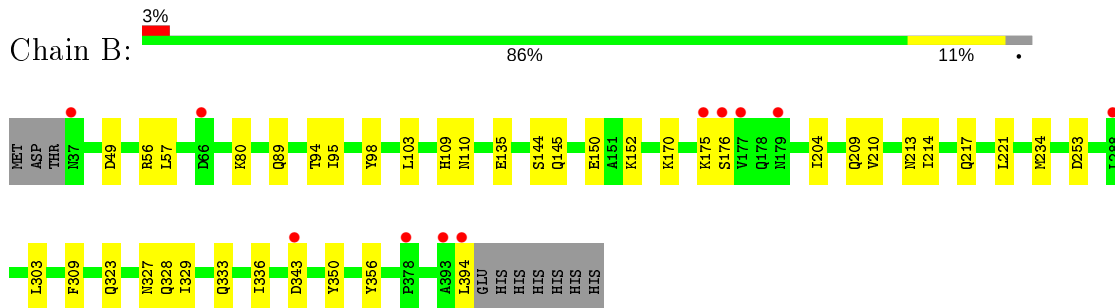
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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: ECTONUCLEOSIDE TRIPHOSPHATE DIPHOSPHOHYDROLASE I



- Molecule 1: ECTONUCLEOSIDE TRIPHOSPHATE DIPHOSPHOHYDROLASE I



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	62.14Å 85.97Å 71.89Å 90.00° 106.14° 90.00°	Depositor
Resolution (Å)	29.87 – 1.60 29.28 – 1.60	Depositor EDS
% Data completeness (in resolution range)	97.9 (29.87-1.60) 98.0 (29.28-1.60)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.05 (at 1.60Å)	Xtrriage
Refinement program	REFMAC 5.7.0029	Depositor
R, $R_{free}$	0.125 , 0.184 0.123 , 0.182	Depositor DCC
$R_{free}$ test set	1387 reflections (1.48%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	16.8	Xtrriage
Anisotropy	0.306	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.42 , 54.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.98	EDS
Total number of atoms	6577	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	23.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.03% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

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

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: GOL, MG, CL, NA, M27, EDO, MOO, MES, AMP

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	1.02	2/3081 (0.1%)	0.86	6/4198 (0.1%)
1	B	1.00	3/3099 (0.1%)	0.85	4/4224 (0.1%)
All	All	1.01	5/6180 (0.1%)	0.86	10/8422 (0.1%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	146	TRP	CZ3-CH2	5.55	1.49	1.40
1	A	98	TYR	CE1-CZ	5.41	1.45	1.38
1	B	98	TYR	CG-CD1	5.14	1.45	1.39
1	B	144	SER	CB-OG	5.05	1.48	1.42
1	B	253	ASP	CB-CG	5.02	1.62	1.51

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	212	LEU	CB-CG-CD2	-8.75	96.12	111.00
1	A	392	ARG	NE-CZ-NH2	-8.57	116.02	120.30
1	B	234	MET	CG-SD-CE	8.39	113.62	100.20
1	A	392	ARG	NE-CZ-NH1	7.13	123.87	120.30
1	B	49	ASP	CB-CG-OD2	-6.21	112.71	118.30
1	B	49	ASP	CB-CG-OD1	6.02	123.72	118.30
1	A	253	ASP	CB-CG-OD1	5.90	123.61	118.30
1	A	363	ASP	CB-CG-OD1	5.62	123.36	118.30
1	A	49	ASP	CB-CG-OD1	5.40	123.16	118.30
1	B	253	ASP	CB-CG-OD1	5.36	123.12	118.30

There are no chirality outliers.

There are no planarity outliers.

## 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	A	2965	0	2852	14	0
1	B	2975	0	2874	24	0
2	A	5	0	0	1	0
2	B	5	0	0	0	0
3	A	3	0	0	0	0
3	B	3	0	0	0	0
4	A	12	0	13	2	0
4	B	12	0	13	2	0
5	A	1	0	0	0	0
6	A	6	0	8	0	0
6	B	6	0	8	1	0
7	A	8	0	0	5	0
8	A	4	0	4	0	0
9	A	1	0	0	0	0
9	B	1	0	0	0	0
10	B	23	0	12	0	0
11	A	302	0	0	5	0
11	B	245	0	0	5	0
All	All	6577	0	5784	48	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 (48) 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:323[B]:GLN:NE2	11:B:2211:HOH:O	2.11	0.81
4:A:1397:MES:O2S	11:A:2159:HOH:O	2.09	0.70
1:A:80:LYS:HE3	1:A:82:LYS:HE2	1.72	0.69
1:A:279[B]:ASN:O	1:A:283[B]:GLN:HB2	1.94	0.68
1:B:210[B]:VAL:HG23	1:B:221:LEU:HB2	1.80	0.64
1:B:328:GLN:HG3	11:B:2197:HOH:O	1.99	0.62
7:A:1401:M27:MO1	7:A:1401:M27:O1	1.70	0.62
7:A:1401:M27:O7	7:A:1401:M27:MO1	1.72	0.61
7:A:1401:M27:O3	7:A:1401:M27:MO2	1.72	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:109:HIS:HB2	1:B:145:GLN:O	2.00	0.60
7:A:1401:M27:MO2	7:A:1401:M27:O8	1.72	0.60
2:A:1395:MOO:O1	2:A:1395:MOO:MO	1.72	0.59
1:A:110:ASN:HB3	1:A:145:GLN:HE21	1.68	0.58
1:B:343:ASP:HB3	11:B:2225:HOH:O	2.02	0.58
11:A:2177:HOH:O	4:B:1398:MES:O3S	2.12	0.58
1:B:110:ASN:OD1	11:B:2066:HOH:O	2.17	0.58
7:A:1401:M27:MO2	7:A:1401:M27:O4	1.73	0.57
1:B:176:SER:C	1:B:217:GLN:HE22	2.08	0.57
1:B:175:LYS:HG2	11:B:2115:HOH:O	2.07	0.54
1:A:161:LEU:HD13	1:A:210[A]:VAL:HG11	1.89	0.54
1:B:303[A]:LEU:CD1	1:B:350:TYR:CD1	2.92	0.51
11:A:2178:HOH:O	4:B:1398:MES:H81	2.09	0.51
1:B:329:ILE:HD13	1:B:350:TYR:HB3	1.91	0.51
1:A:170:LYS:NZ	11:A:2039:HOH:O	2.43	0.50
1:B:333[A]:GLN:OE1	1:B:336[A]:ILE:HG12	2.12	0.50
1:B:303[A]:LEU:HD13	1:B:350:TYR:CD1	2.47	0.49
1:B:80:LYS:HD2	6:B:1400:GOL:O3	2.13	0.49
4:A:1397:MES:H81	11:A:2299:HOH:O	2.13	0.48
1:A:234[A]:MET:HG2	1:A:356:TYR:CE1	2.49	0.48
1:B:213:ASN:HA	1:B:217:GLN:O	2.14	0.47
1:B:89:GLN:O	1:B:94[B]:THR:OG1	2.28	0.47
1:A:89:GLN:O	1:A:94:THR:OG1	2.26	0.47
1:B:170:LYS:HD2	1:B:170:LYS:HA	1.56	0.46
1:B:214:ILE:HD12	1:B:394:LEU:HD11	1.96	0.46
1:B:95[A]:ILE:HD13	1:B:135:GLU:HB2	1.98	0.45
1:B:303[A]:LEU:HD11	1:B:309:PHE:CE1	2.52	0.44
1:B:150[B]:GLU:OE2	1:B:152:LYS:HD3	2.17	0.44
1:B:323[B]:GLN:HE21	1:B:327:ASN:HD22	1.66	0.43
1:A:72[B]:HIS:CE1	1:A:74:GLU:OE2	2.71	0.43
1:A:329:ILE:HD13	1:A:350:TYR:HB3	2.01	0.43
1:B:57:LEU:HD22	1:B:103:LEU:HD23	2.02	0.42
1:A:376:ILE:HG13	1:A:382:LEU:HD23	2.02	0.42
1:A:91:ASN:OD1	1:A:94:THR:HG23	2.19	0.42
1:A:248:ASP:HA	1:A:256[B]:SER:HB2	2.00	0.42
1:B:56:ARG:NH2	1:B:80:LYS:HD3	2.35	0.41
1:B:204[B]:ILE:HB	1:B:209:GLN:NE2	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	375/368 (102%)	362 (96%)	13 (4%)	0	100	100
1	B	377/368 (102%)	366 (97%)	11 (3%)	0	100	100
All	All	752/736 (102%)	728 (97%)	24 (3%)	0	100	100

There are no Ramachandran outliers to report.

### 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	337/328 (103%)	334 (99%)	3 (1%)	78	65
1	B	339/328 (103%)	338 (100%)	1 (0%)	92	87
All	All	676/656 (103%)	672 (99%)	4 (1%)	88	77

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	234[A]	MET
1	A	234[B]	MET
1	A	323	GLN
1	B	356	TYR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	126	GLN
1	A	145	GLN
1	A	323	GLN
1	B	217	GLN
1	B	327	ASN
1	B	370	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 carbohydrates in this entry.

### 5.6 Ligand geometry [i](#)

Of 18 ligands modelled in this entry, 9 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$
6	GOL	B	1400	-	5,5,5	0.67	0	5,5,5	0.73	0
4	MES	B	1398	-	12,12,12	2.28	2 (16%)	14,16,16	2.48	5 (35%)
2	MOO	B	1396	11,3	2,4,4	2.32	1 (50%)	-	-	-
10	AMP	B	1399	-	22,25,25	1.24	4 (18%)	25,38,38	1.71	5 (20%)
4	MES	A	1397	-	12,12,12	1.97	1 (8%)	14,16,16	2.82	6 (42%)
2	MOO	A	1395	11,3	2,4,4	0.35	0	-	-	-
8	EDO	A	1402	7	3,3,3	0.72	0	2,2,2	0.55	0
6	GOL	A	1400	3	5,5,5	1.26	1 (20%)	5,5,5	1.06	1 (20%)



Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
7	M27	A	1401	1,8	0,7,12	0.00	-	-	-	-

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
6	GOL	B	1400	-	-	0/4/4/4	-
4	MES	B	1398	-	-	6/6/14/14	0/1/1/1
10	AMP	B	1399	-	-	0/6/26/26	0/3/3/3
4	MES	A	1397	-	-	6/6/14/14	0/1/1/1
8	EDO	A	1402	7	-	1/1/1/1	-
6	GOL	A	1400	3	-	0/4/4/4	-

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	1398	MES	C8-S	-6.96	1.67	1.77
4	A	1397	MES	C8-S	-6.45	1.68	1.77
10	B	1399	AMP	C5-C4	3.12	1.49	1.40
2	B	1396	MOO	O1-MO	3.03	1.80	1.73
10	B	1399	AMP	O3'-C3'	2.56	1.49	1.43
4	B	1398	MES	O2S-S	2.34	1.51	1.45
6	A	1400	GOL	O2-C2	2.30	1.50	1.43
10	B	1399	AMP	O4'-C1'	2.09	1.44	1.41
10	B	1399	AMP	C4-N3	2.08	1.38	1.35

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	1398	MES	O3S-S-C8	-5.29	97.22	105.77
4	A	1397	MES	O3S-S-C8	5.27	114.29	105.77
4	B	1398	MES	O2S-S-C8	5.07	113.02	106.92
4	A	1397	MES	O3S-S-O2S	-4.81	99.52	111.27
4	A	1397	MES	O1S-S-C8	4.75	112.64	106.92
10	B	1399	AMP	C2-N1-C6	4.23	125.99	118.75
10	B	1399	AMP	C1'-N9-C4	-3.61	120.30	126.64
10	B	1399	AMP	N3-C2-N1	-3.00	123.99	128.68
4	A	1397	MES	C6-O1-C2	2.92	119.65	109.89
4	B	1398	MES	C5-N4-C3	2.57	114.62	108.83
10	B	1399	AMP	C4-C5-N7	-2.34	106.96	109.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	1397	MES	C6-C5-N4	2.32	113.61	110.10
4	A	1397	MES	O2S-S-C8	-2.28	104.17	106.92
10	B	1399	AMP	C5-C6-N1	-2.16	115.46	120.35
4	B	1398	MES	O3S-S-O1S	-2.15	106.03	111.27
4	B	1398	MES	C6-C5-N4	-2.07	106.96	110.10
6	A	1400	GOL	O2-C2-C3	2.02	118.00	109.12

There are no chirality outliers.

All (13) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	B	1398	MES	N4-C7-C8-S
4	B	1398	MES	C7-C8-S-O1S
4	B	1398	MES	C7-C8-S-O3S
4	A	1397	MES	N4-C7-C8-S
4	A	1397	MES	C7-C8-S-O2S
4	A	1397	MES	C7-C8-S-O3S
8	A	1402	EDO	O1-C1-C2-O2
4	B	1398	MES	C8-C7-N4-C3
4	A	1397	MES	C8-C7-N4-C3
4	A	1397	MES	C8-C7-N4-C5
4	B	1398	MES	C7-C8-S-O2S
4	A	1397	MES	C7-C8-S-O1S
4	B	1398	MES	C8-C7-N4-C5

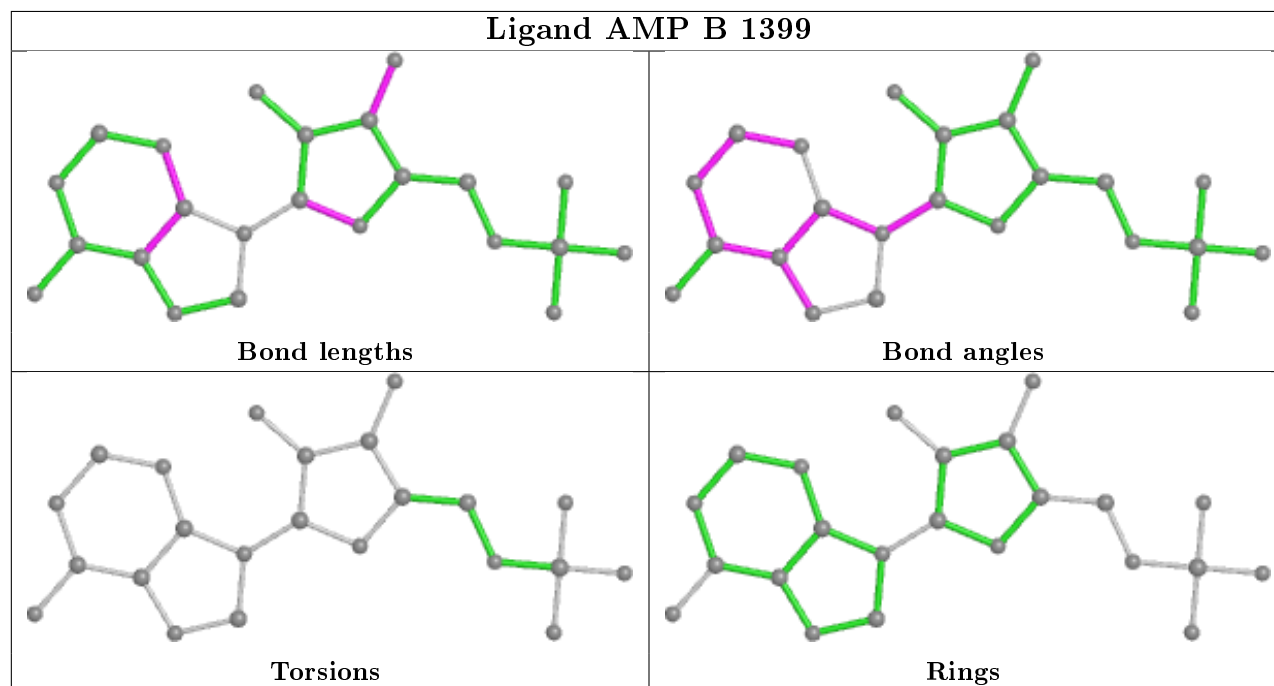
There are no ring outliers.

5 monomers are involved in 11 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	B	1400	GOL	1	0
4	B	1398	MES	2	0
4	A	1397	MES	2	0
2	A	1395	MOO	1	0
7	A	1401	M27	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 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.



## 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<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	358/368 (97%)	-0.17	15 (4%) 36 33	10, 19, 44, 82	0
1	B	358/368 (97%)	-0.07	11 (3%) 49 46	10, 20, 44, 80	0
All	All	716/736 (97%)	-0.12	26 (3%) 42 40	10, 19, 44, 82	0

All (26) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	179	ASN	6.8
1	A	179	ASN	6.5
1	A	378	PRO	5.7
1	A	177	VAL	5.6
1	B	175	LYS	5.3
1	B	177	VAL	5.2
1	A	381	ASN	4.2
1	B	176	SER	4.0
1	A	180	LYS	4.0
1	B	343	ASP	3.5
1	A	176	SER	3.3
1	A	379	GLU	3.1
1	B	288	LEU	3.0
1	B	394	LEU	2.9
1	A	175	LYS	2.8
1	B	393	ALA	2.8
1	A	138	TYR	2.7
1	B	378	PRO	2.7
1	A	217	GLN	2.5
1	A	37	ASN	2.5
1	A	178	GLN	2.4
1	A	218	ASN	2.2
1	A	216	GLY	2.1
1	A	66	ASP	2.1

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Mol	Chain	Res	Type	RSRZ
1	B	37	ASN	2.1
1	B	66	ASP	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 carbohydrates in this entry.

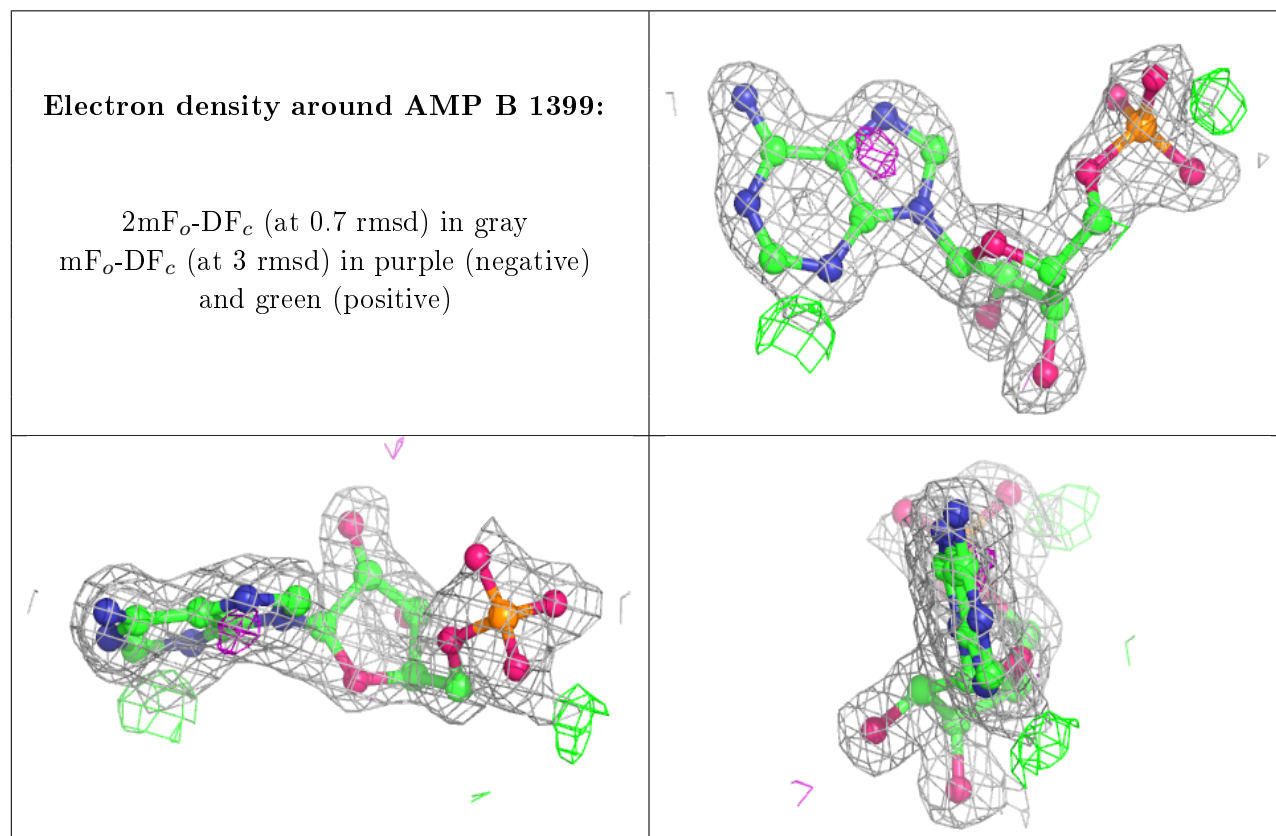
## 6.4 Ligands [i](#)

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<sup>th</sup> 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( $\text{\AA}^2$ )	Q<0.9
6	GOL	A	1400	6/6	0.92	0.09	27,29,31,31	0
10	AMP	B	1399	23/23	0.93	0.14	21,31,70,121	0
8	EDO	A	1402	4/4	0.94	0.09	21,22,24,26	4
4	MES	A	1397	12/12	0.97	0.09	28,33,39,56	12
4	MES	B	1398	12/12	0.98	0.08	21,28,42,42	12
3	MG	B	1402	1/1	0.98	0.04	33,33,33,33	0
6	GOL	B	1400	6/6	0.98	0.10	19,25,34,40	0
9	CL	B	1395	1/1	0.99	0.09	32,32,32,32	0
5	NA	A	1398	1/1	0.99	0.07	35,35,35,35	0
3	MG	A	1399	1/1	0.99	0.04	36,36,36,36	0
3	MG	B	1401	1/1	0.99	0.19	36,36,36,36	0
3	MG	A	1396	1/1	1.00	0.08	13,13,13,13	0
9	CL	A	1403	1/1	1.00	0.08	22,22,22,22	0
3	MG	B	1397	1/1	1.00	0.07	14,14,14,14	0
2	MOO	B	1396	5/5	1.00	0.07	12,13,14,16	0
3	MG	A	1404	1/1	1.00	0.06	43,43,43,43	0
2	MOO	A	1395	5/5	1.00	0.06	11,12,13,13	0
7	M27	A	1401	8/12	1.00	0.06	18,23,26,28	8

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.



## 6.5 Other polymers [i](#)

There are no such residues in this entry.