



Full wwPDB X-ray Structure Validation Report ⓘ

May 23, 2023 – 01:59 am BST

PDB ID : 8OSX
Title : SARS-CoV-2 nsp10-16 methyltransferase in complex with ATP
Authors : Kremling, V.; Sprenger, J.; Oberthuer, D.
Deposited on : 2023-04-20
Resolution : 1.83 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

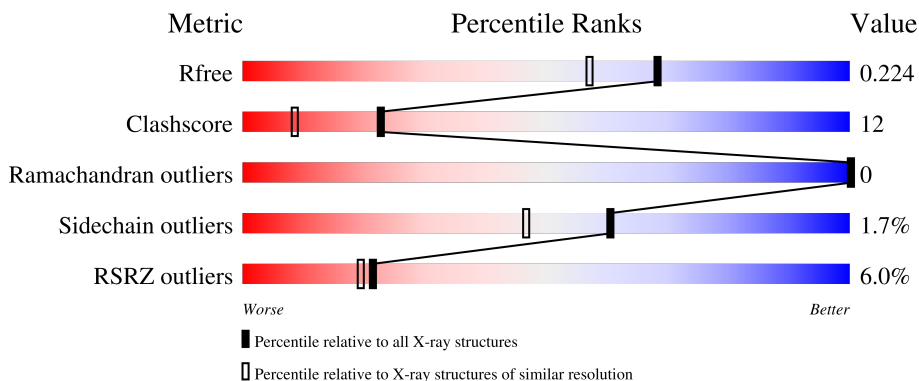
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.83 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	4003 (1.86-1.82)
Clashscore	141614	4233 (1.86-1.82)
Ramachandran outliers	138981	4185 (1.86-1.82)
Sidechain outliers	138945	4186 (1.86-1.82)
RSRZ outliers	127900	3957 (1.86-1.82)

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

Mol	Chain	Length	Quality of chain
1	A	304	
2	B	140	

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
4	EDO	A	7206	-	-	X	-
4	EDO	A	7210	-	-	X	-
4	EDO	A	7220	-	-	X	-
4	EDO	A	7225	-	-	X	-
4	EDO	A	7231	-	-	X	-

2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 3772 atoms, of which 6 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 2'-O-methyltransferase nsp16.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	301	2469	1567	419	466	17	6	12	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	7097	GLU	-	expression tag	UNP P0DTD1
A	7098	ASN	-	expression tag	UNP P0DTD1
A	7099	LEU	-	expression tag	UNP P0DTD1
A	7100	TYR	-	expression tag	UNP P0DTD1
A	7101	PHE	-	expression tag	UNP P0DTD1
A	7102	GLN	-	expression tag	UNP P0DTD1

- Molecule 2 is a protein called Non-structural protein 10.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	116	865	538	145	167	15	0	1	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	4253	GLY	-	expression tag	UNP P0DTD1

- Molecule 3 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula: C₁₀H₁₆N₅O₁₃P₃) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
3	A	1	31	10	5	13	3	0	1

- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C₂H₆O₂).



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

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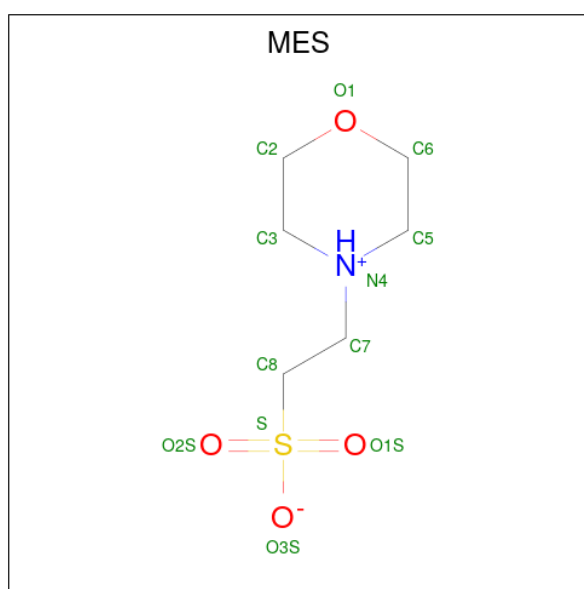
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total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

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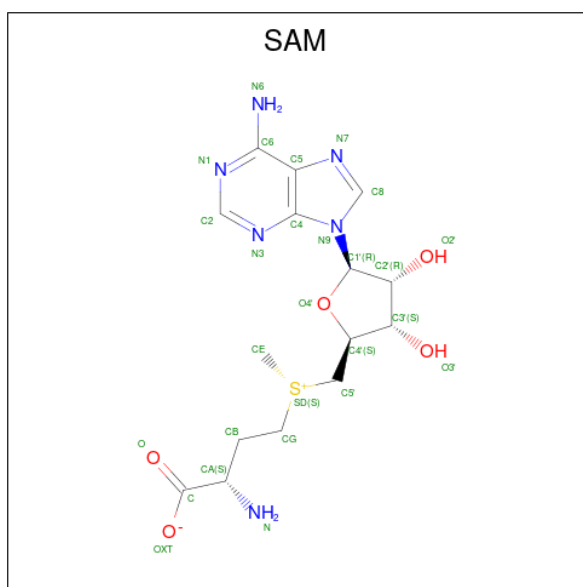
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	
4	A	1	Total	C	O	0	0	
			4	2	2			
4	A	1	Total	C	O	0	0	
			4	2	2			
4	A	1	Total	C	O	0	1	
			4	2	2			
4	A	1	Total	C	H	O	0	0
			10	2	6	2		
4	B	1	Total	C	O	0	0	
			4	2	2			
4	B	1	Total	C	O	0	0	
			4	2	2			

- Molecule 5 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (three-letter code: MES) (formula: C₆H₁₃NO₄S).



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

- Molecule 6 is S-ADENOSYLMETHIONINE (three-letter code: SAM) (formula: C₁₅H₂₂N₆O₅S) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	A	1	Total	C	N	O	S	0	1
			27	15	6	5	1		

- Molecule 7 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

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

- Molecule 8 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	B	2	Total	Zn	0	0
			2	2		

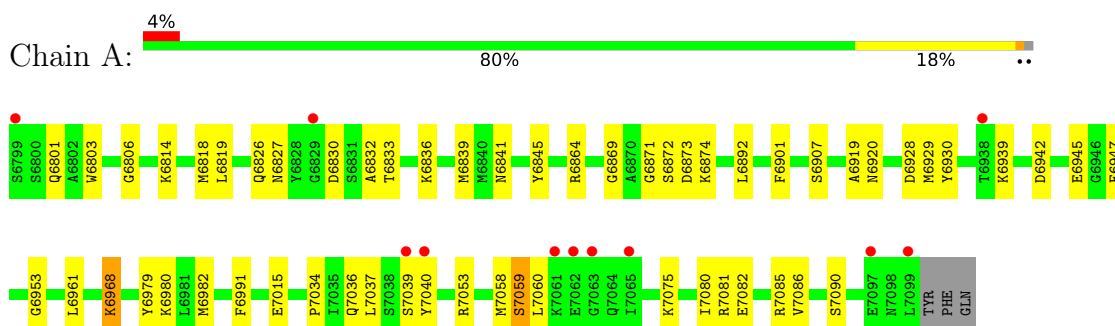
- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	179	Total	O	0	0
			179	179		
9	B	59	Total	O	0	0
			59	59		

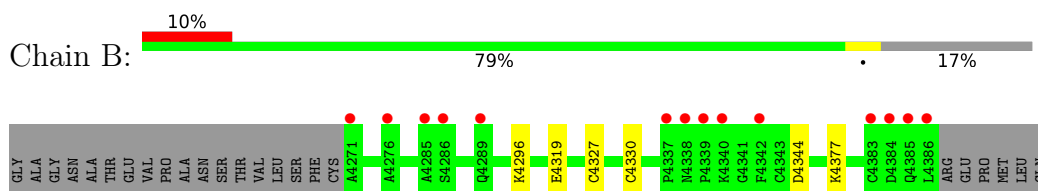
3 Residue-property plots [i](#)

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: 2'-O-methyltransferase nsp16



- Molecule 2: Non-structural protein 10



4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	168.02Å 168.02Å 51.70Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	42.14 – 1.83 48.72 – 1.59	Depositor EDS
% Data completeness (in resolution range)	99.6 (42.14-1.83) 74.2 (48.72-1.59)	Depositor EDS
R_{merge}	0.20	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.66 (at 1.59Å)	Xtrriage
Refinement program	PHENIX 1.07	Depositor
R, R_{free}	0.197 , 0.223 0.195 , 0.224	Depositor DCC
R_{free} test set	771 reflections (0.93%)	wwPDB-VP
Wilson B-factor (Å ²)	39.1	Xtrriage
Anisotropy	0.028	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 36.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	0.017 for -h,-k,l	Xtrriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	3772	wwPDB-VP
Average B, all atoms (Å ²)	42.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.74% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: MES, ZN, SAM, CL, ATP, 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	0.49	2/2521 (0.1%)	0.65	1/3418 (0.0%)
2	B	0.38	0/884	0.58	0/1199
All	All	0.46	2/3405 (0.1%)	0.63	1/4617 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	7039[A]	SER	C-N	8.95	1.54	1.34
1	A	7039[B]	SER	C-N	8.95	1.54	1.34

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	6929	MET	CG-SD-CE	-6.35	90.05	100.20

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	2469	0	2432	70	0
2	B	865	0	821	7	0
3	A	31	0	12	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	A	112	6	168	43	0
4	B	8	0	12	3	0
5	A	12	0	12	0	0
6	A	27	0	22	3	0
7	A	1	0	0	0	0
7	B	1	0	0	0	0
8	B	2	0	0	0	0
9	A	179	0	0	7	0
9	B	59	0	0	0	0
All	All	3766	6	3479	81	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 12.

All (81) 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:A:7082:GLU:HB2	4:A:7210:EDO:H21	1.39	1.04
2:B:4344:ASP:HB2	4:B:4404:EDO:H21	1.43	0.99
1:A:7036:GLN:HB2	4:A:7225:EDO:H12	1.41	0.99
1:A:6833[A]:THR:H	4:A:7206:EDO:H22	1.33	0.92
1:A:6833[B]:THR:H	4:A:7206:EDO:H22	1.33	0.92
1:A:6827[B]:ASN:HD21	4:A:7225:EDO:H21	1.41	0.83
1:A:7082:GLU:HB2	4:A:7210:EDO:C2	2.08	0.81
1:A:6928:ASP:OD2	4:A:7230[F]:EDO:H21	1.80	0.81
1:A:6901:PHE:O	4:A:7218:EDO:H11	1.82	0.79
1:A:6818:MET:HE3	4:A:7231:EDO:H11	1.64	0.78
1:A:6871:GLY:O	6:A:7215[C]:SAM:HG2	1.85	0.75
4:A:7224:EDO:H12	9:A:7435:HOH:O	1.88	0.72
1:A:6819:LEU:H	4:A:7231:EDO:H11	1.56	0.71
1:A:6818:MET:HE3	4:A:7231:EDO:C1	2.21	0.70
1:A:6839:MET:HB3	4:A:7228:EDO:H21	1.73	0.70
1:A:6869:GLY:O	4:A:7230[F]:EDO:H22	1.91	0.69
2:B:4344:ASP:H	4:B:4404:EDO:H22	1.58	0.68
1:A:6836:LYS:HE3	4:A:7220:EDO:H21	1.75	0.68
1:A:6801:GLN:HG3	4:A:7224:EDO:O1	1.98	0.63
1:A:7058:MET:HE2	1:A:7060:LEU:HD11	1.80	0.63
4:A:7230[F]:EDO:H12	9:A:7321:HOH:O	1.99	0.61
1:A:7082:GLU:HB2	4:A:7210:EDO:C1	2.31	0.59
1:A:7058:MET:CE	1:A:7060:LEU:HD11	2.32	0.59
2:B:4344:ASP:H	4:B:4404:EDO:C2	2.17	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:6920[B]:ASN:ND2	1:A:7085:ARG:O	2.36	0.58
1:A:6827[A]:ASN:ND2	9:A:7301:HOH:O	2.37	0.58
1:A:6833[B]:THR:HG23	4:A:7206:EDO:H22	1.86	0.58
1:A:6872:SER:OG	1:A:6874:LYS:HB2	2.03	0.57
4:A:7223:EDO:H21	9:A:7302:HOH:O	2.05	0.57
1:A:6839:MET:CB	4:A:7228:EDO:H21	2.35	0.57
1:A:6803:TRP:HD1	1:A:7040[B]:TYR:CZ	2.24	0.56
1:A:6980:LYS:HE2	9:A:7342:HOH:O	2.06	0.55
1:A:7053:ARG:NH2	4:A:7219:EDO:H11	2.23	0.54
1:A:7034:PRO:O	4:A:7224:EDO:H21	2.07	0.53
4:A:7220:EDO:H22	2:B:4296:LYS:HZ3	1.73	0.53
1:A:6827[B]:ASN:ND2	4:A:7225:EDO:H21	2.18	0.53
1:A:7082:GLU:CB	4:A:7210:EDO:H21	2.27	0.51
1:A:6873:ASP:HB3	3:A:7201[A]:ATP:O2G	2.11	0.51
1:A:7058:MET:HE2	1:A:7060:LEU:CD1	2.41	0.51
1:A:6919:ALA:N	4:A:7204:EDO:H21	2.26	0.50
1:A:6803:TRP:HD1	1:A:7040[B]:TYR:CE1	2.29	0.49
1:A:6874:LYS:NZ	4:A:7228:EDO:H22	2.28	0.49
1:A:6818:MET:HE1	4:A:7231:EDO:H22	1.95	0.48
1:A:6818:MET:HE2	1:A:6818:MET:HB3	1.72	0.48
1:A:7036:GLN:CB	4:A:7225:EDO:H12	2.28	0.48
1:A:6920[A]:ASN:OD1	1:A:7086:VAL:HG13	2.14	0.48
1:A:6961:LEU:HB2	1:A:7080:ILE:HB	1.96	0.48
1:A:6806:GLY:HA3	1:A:6991:PHE:CZ	2.50	0.47
1:A:6826:GLN:HG2	1:A:6827[B]:ASN:OD1	2.15	0.47
1:A:6827[A]:ASN:HD22	1:A:7037:LEU:CD2	2.28	0.47
1:A:7082:GLU:HB2	4:A:7210:EDO:H11	1.94	0.46
4:A:7217:EDO:H11	4:A:7221[D]:EDO:H22	1.98	0.46
1:A:6827[B]:ASN:HD21	4:A:7225:EDO:C2	2.21	0.46
1:A:6827[A]:ASN:O	1:A:6830:ASP:HB2	2.16	0.46
1:A:6928:ASP:OD1	1:A:6968:LYS:HE2	2.14	0.46
1:A:6819:LEU:H	4:A:7231:EDO:C1	2.25	0.45
1:A:6979:TYR:O	1:A:6982:MET:HB2	2.16	0.45
1:A:6832:ALA:HA	4:A:7206:EDO:H21	2.00	0.44
1:A:6864:ARG:NH1	1:A:6920[A]:ASN:HB2	2.33	0.43
1:A:6832:ALA:HA	4:A:7206:EDO:C2	2.48	0.43
1:A:6892:LEU:HD12	1:A:7086:VAL:HG21	2.00	0.43
1:A:6836:LYS:HE3	4:A:7220:EDO:C2	2.47	0.42
1:A:6869:GLY:O	6:A:7215[C]:SAM:HG1	2.19	0.42
1:A:6953:GLY:HA3	4:A:7211:EDO:H21	2.01	0.42
1:A:7015:GLU:OE2	4:A:7213:EDO:O1	2.29	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:6841:ASN:ND2	6:A:7215[C]:SAM:OXT	2.53	0.42
1:A:6947:PHE:CD2	4:A:7202:EDO:H22	2.55	0.41
1:A:6942:ASP:HB2	9:A:7350:HOH:O	2.20	0.41
2:B:4327:CYS:HB3	2:B:4330:CYS:HB2	2.02	0.41
1:A:6872:SER:C	1:A:6874:LYS:H	2.24	0.41
1:A:7059:SER:O	1:A:7060:LEU:HG	2.21	0.41
1:A:7075:LYS:NZ	9:A:7313:HOH:O	2.54	0.41
2:B:4296:LYS:HD2	2:B:4319[A]:GLU:CD	2.41	0.41
1:A:6864:ARG:HD2	1:A:7081:ARG:CZ	2.51	0.41
1:A:6945[A]:GLU:OE2	4:A:7223:EDO:O1	2.23	0.41
1:A:6814:LYS:HB3	4:A:7213:EDO:H11	2.03	0.40
1:A:6845:TYR:OH	1:A:6928:ASP:HB2	2.20	0.40
1:A:6930:TYR:HB2	1:A:6968:LYS:HE3	2.02	0.40
1:A:7058:MET:HE2	1:A:7060:LEU:CG	2.52	0.40
1:A:6803:TRP:HA	1:A:7040[B]:TYR:CD2	2.57	0.40
4:A:7220:EDO:H22	2:B:4296:LYS:NZ	2.36	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	311/304 (102%)	298 (96%)	13 (4%)	0	100	100
2	B	115/140 (82%)	110 (96%)	5 (4%)	0	100	100
All	All	426/444 (96%)	408 (96%)	18 (4%)	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	273/264 (103%)	268 (98%)	5 (2%)	59	44
2	B	95/113 (84%)	94 (99%)	1 (1%)	73	64
All	All	368/377 (98%)	362 (98%)	6 (2%)	60	49

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	6907	SER
1	A	6939	LYS
1	A	6968	LYS
1	A	7059	SER
1	A	7090	SER
2	B	4377	LYS

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

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 37 ligands modelled in this entry, 4 are monoatomic - leaving 33 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	SAM	A	7215[C]	-	24,29,29	3.98	12 (50%)	23,42,42	1.72	6 (26%)
4	EDO	A	7213	-	3,3,3	0.48	0	2,2,2	0.52	0
4	EDO	A	7214	-	3,3,3	0.59	0	2,2,2	0.16	0
4	EDO	A	7221[D]	-	3,3,3	0.62	0	2,2,2	0.23	0
4	EDO	A	7210	-	3,3,3	0.46	0	2,2,2	0.75	0
4	EDO	A	7231	-	3,3,3	0.61	0	2,2,2	0.20	0
5	MES	A	7203	-	12,12,12	1.88	1 (8%)	14,16,16	1.96	3 (21%)
4	EDO	A	7227	-	3,3,3	0.54	0	2,2,2	0.22	0
4	EDO	A	7209	-	3,3,3	0.56	0	2,2,2	0.46	0
4	EDO	A	7226	-	3,3,3	0.52	0	2,2,2	0.24	0
4	EDO	A	7228	-	3,3,3	0.50	0	2,2,2	0.33	0
4	EDO	A	7217	-	3,3,3	0.67	0	2,2,2	0.11	0
4	EDO	A	7222	-	3,3,3	0.55	0	2,2,2	0.25	0
4	EDO	A	7216	-	3,3,3	0.57	0	2,2,2	0.31	0
4	EDO	A	7230[F]	-	3,3,3	0.55	0	2,2,2	0.25	0
4	EDO	A	7219	-	3,3,3	0.51	0	2,2,2	0.41	0
4	EDO	A	7207	-	3,3,3	0.59	0	2,2,2	0.20	0
4	EDO	B	4404	-	3,3,3	0.59	0	2,2,2	0.23	0
4	EDO	A	7212	-	3,3,3	0.59	0	2,2,2	0.13	0
4	EDO	A	7225	-	3,3,3	0.50	0	2,2,2	0.29	0
4	EDO	A	7218	-	3,3,3	0.71	0	2,2,2	0.16	0
4	EDO	A	7202	-	3,3,3	0.42	0	2,2,2	0.47	0
3	ATP	A	7201[A]	-	26,33,33	0.55	0	31,52,52	0.82	1 (3%)
4	EDO	A	7206	-	3,3,3	0.53	0	2,2,2	0.36	0
4	EDO	A	7223	-	3,3,3	0.47	0	2,2,2	0.45	0
4	EDO	A	7211	-	3,3,3	0.56	0	2,2,2	0.17	0
4	EDO	A	7205	-	3,3,3	0.61	0	2,2,2	0.13	0
4	EDO	A	7224	-	3,3,3	0.58	0	2,2,2	0.11	0
4	EDO	A	7220	-	3,3,3	0.51	0	2,2,2	0.26	0
4	EDO	A	7208	-	3,3,3	0.51	0	2,2,2	0.41	0
4	EDO	A	7204	-	3,3,3	0.46	0	2,2,2	0.77	0
4	EDO	A	7229	-	3,3,3	0.50	0	2,2,2	0.20	0
4	EDO	B	4403	-	3,3,3	0.60	0	2,2,2	0.18	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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	SAM	A	7215[C]	-	-	5/12/33/33	0/3/3/3
4	EDO	A	7213	-	-	1/1/1/1	-
4	EDO	A	7214	-	-	1/1/1/1	-
4	EDO	A	7221[D]	-	-	1/1/1/1	-
4	EDO	A	7210	-	-	1/1/1/1	-
4	EDO	A	7231	-	-	0/1/1/1	-
5	MES	A	7203	-	-	4/6/14/14	0/1/1/1
4	EDO	A	7227	-	-	0/1/1/1	-
4	EDO	A	7209	-	-	0/1/1/1	-
4	EDO	A	7226	-	-	0/1/1/1	-
4	EDO	A	7228	-	-	0/1/1/1	-
4	EDO	A	7217	-	-	1/1/1/1	-
4	EDO	A	7222	-	-	1/1/1/1	-
4	EDO	A	7216	-	-	0/1/1/1	-
4	EDO	A	7230[F]	-	-	1/1/1/1	-
4	EDO	A	7219	-	-	0/1/1/1	-
4	EDO	A	7207	-	-	0/1/1/1	-
4	EDO	B	4404	-	-	0/1/1/1	-
4	EDO	A	7212	-	-	0/1/1/1	-
4	EDO	A	7225	-	-	0/1/1/1	-
4	EDO	A	7218	-	-	0/1/1/1	-
4	EDO	A	7202	-	-	0/1/1/1	-
3	ATP	A	7201[A]	-	-	5/18/38/38	0/3/3/3
4	EDO	A	7206	-	-	0/1/1/1	-
4	EDO	A	7223	-	-	0/1/1/1	-
4	EDO	A	7211	-	-	0/1/1/1	-
4	EDO	A	7205	-	-	0/1/1/1	-
4	EDO	A	7224	-	-	0/1/1/1	-
4	EDO	A	7220	-	-	0/1/1/1	-
4	EDO	A	7208	-	-	1/1/1/1	-
4	EDO	A	7204	-	-	1/1/1/1	-
4	EDO	A	7229	-	-	0/1/1/1	-
4	EDO	B	4403	-	-	0/1/1/1	-

All (13) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	7215[C]	SAM	O4'-C1'	11.13	1.56	1.41
6	A	7215[C]	SAM	C2'-C3'	-9.22	1.28	1.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	7215[C]	SAM	O4'-C4'	-7.63	1.28	1.45
6	A	7215[C]	SAM	C3'-C4'	6.27	1.69	1.53
5	A	7203	MES	C8-S	-6.16	1.68	1.77
6	A	7215[C]	SAM	C6-N6	4.22	1.49	1.34
6	A	7215[C]	SAM	O3'-C3'	3.36	1.50	1.43
6	A	7215[C]	SAM	C4-N3	3.04	1.39	1.35
6	A	7215[C]	SAM	O2'-C2'	2.48	1.48	1.43
6	A	7215[C]	SAM	O-C	2.39	1.29	1.22
6	A	7215[C]	SAM	C2'-C1'	2.30	1.57	1.53
6	A	7215[C]	SAM	C5-C4	-2.15	1.35	1.40
6	A	7215[C]	SAM	OXT-C	-2.06	1.23	1.30

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	7203	MES	C5-N4-C3	4.72	119.46	108.83
6	A	7215[C]	SAM	N3-C2-N1	-4.13	122.22	128.68
5	A	7203	MES	O3S-S-C8	3.50	111.43	105.77
6	A	7215[C]	SAM	O4'-C1'-C2'	-3.47	101.86	106.93
6	A	7215[C]	SAM	C3'-C2'-C1'	3.31	105.96	100.98
5	A	7203	MES	O2S-S-C8	2.83	110.32	106.92
3	A	7201[A]	ATP	C5-C6-N6	2.34	123.91	120.35
6	A	7215[C]	SAM	C2'-C3'-C4'	2.34	107.19	102.64
6	A	7215[C]	SAM	C4-C5-N7	-2.32	106.98	109.40
6	A	7215[C]	SAM	OXT-C-CA	2.27	121.13	113.38

There are no chirality outliers.

All (23) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	7201[A]	ATP	PB-O3B-PG-O3G
5	A	7203	MES	C7-C8-S-O3S
4	A	7208	EDO	O1-C1-C2-O2
4	A	7214	EDO	O1-C1-C2-O2
5	A	7203	MES	C8-C7-N4-C5
5	A	7203	MES	C7-C8-S-O1S
5	A	7203	MES	C7-C8-S-O2S
6	A	7215[C]	SAM	C4'-C5'-SD-CG
6	A	7215[C]	SAM	OXT-C-CA-CB
4	A	7204	EDO	O1-C1-C2-O2
6	A	7215[C]	SAM	O-C-CA-CB
6	A	7215[C]	SAM	CB-CG-SD-CE

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Mol	Chain	Res	Type	Atoms
4	A	7213	EDO	O1-C1-C2-O2
4	A	7217	EDO	O1-C1-C2-O2
3	A	7201[A]	ATP	PB-O3B-PG-O2G
3	A	7201[A]	ATP	PA-O3A-PB-O3B
3	A	7201[A]	ATP	O4'-C4'-C5'-O5'
3	A	7201[A]	ATP	C5'-O5'-PA-O1A
4	A	7210	EDO	O1-C1-C2-O2
4	A	7221[D]	EDO	O1-C1-C2-O2
4	A	7222	EDO	O1-C1-C2-O2
4	A	7230[F]	EDO	O1-C1-C2-O2
6	A	7215[C]	SAM	CB-CG-SD-C5'

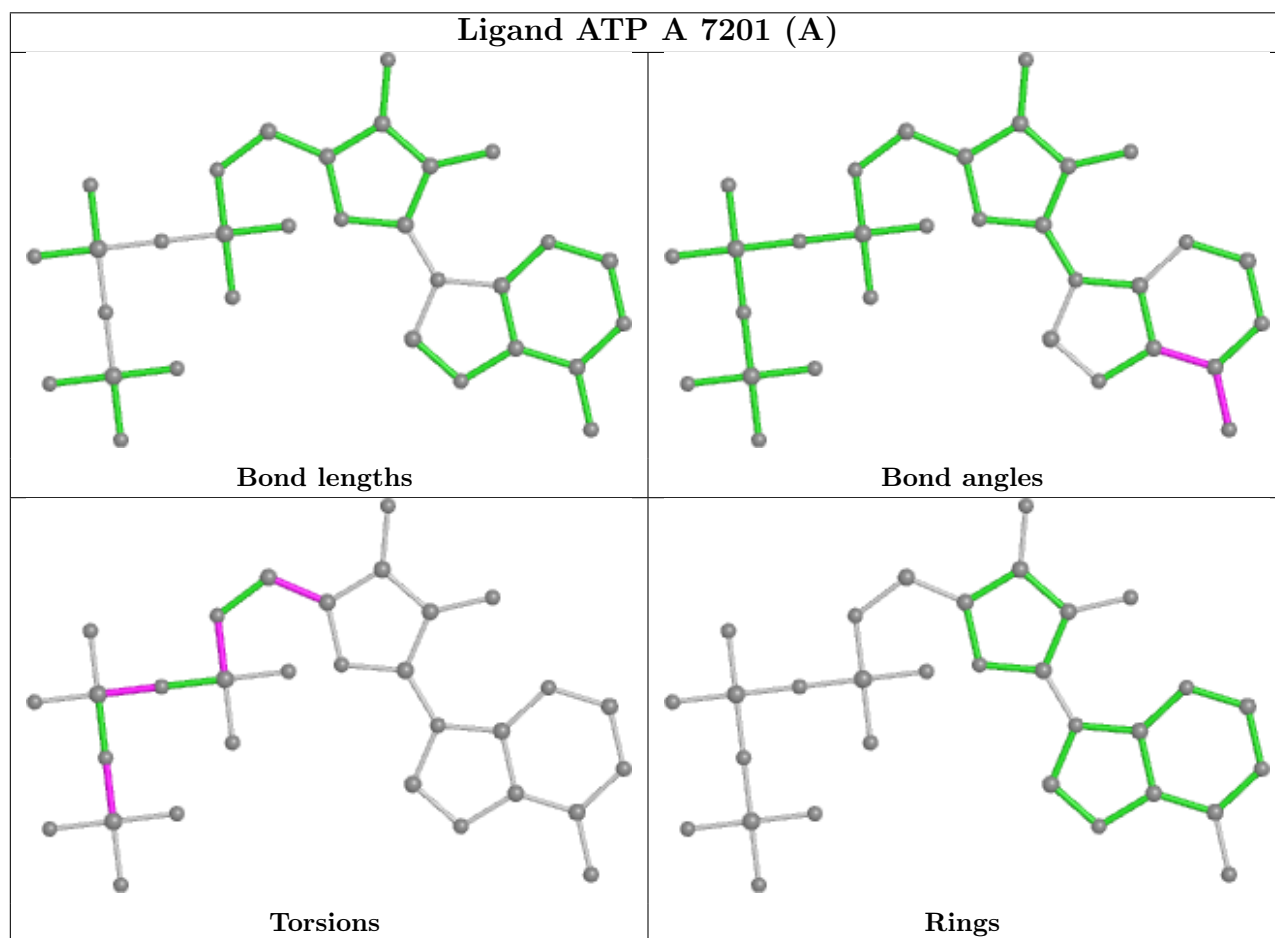
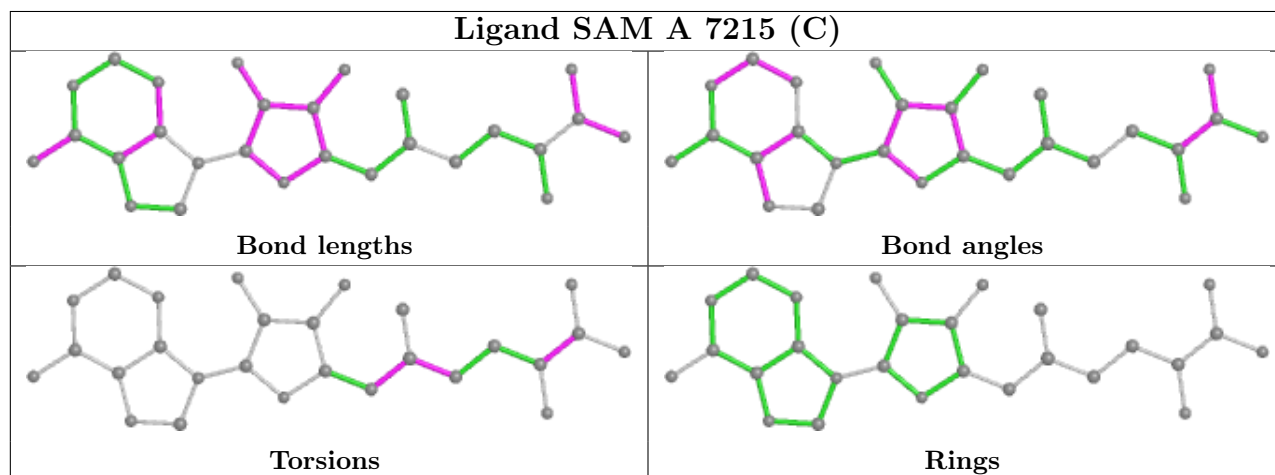
There are no ring outliers.

20 monomers are involved in 50 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	7215[C]	SAM	3	0
4	A	7213	EDO	2	0
4	A	7221[D]	EDO	1	0
4	A	7210	EDO	5	0
4	A	7231	EDO	5	0
4	A	7228	EDO	3	0
4	A	7217	EDO	1	0
4	A	7230[F]	EDO	3	0
4	A	7219	EDO	1	0
4	B	4404	EDO	3	0
4	A	7225	EDO	5	0
4	A	7218	EDO	1	0
4	A	7202	EDO	1	0
3	A	7201[A]	ATP	1	0
4	A	7206	EDO	5	0
4	A	7223	EDO	2	0
4	A	7211	EDO	1	0
4	A	7224	EDO	3	0
4	A	7220	EDO	4	0
4	A	7204	EDO	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier.

Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	301/304 (99%)	-0.27	11 (3%) 41 38	25, 35, 67, 100	1 (0%)
2	B	116/140 (82%)	0.25	14 (12%) 4 3	28, 45, 88, 108	0
All	All	417/444 (93%)	-0.13	25 (5%) 21 19	25, 37, 72, 108	1 (0%)

All (25) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	4386	LEU	5.7
1	A	6829	GLY	5.2
2	B	4339	PRO	4.2
2	B	4383	CYS	4.2
2	B	4271	ALA	4.1
2	B	4337	PRO	4.0
1	A	7039[A]	SER	3.5
1	A	7062	GLU	3.2
1	A	7065	ILE	3.1
2	B	4385	GLN	3.1
2	B	4338	ASN	2.8
2	B	4384	ASP	2.8
1	A	7099	LEU	2.7
2	B	4286	SER	2.7
1	A	6799	SER	2.5
1	A	7040[B]	TYR	2.5
2	B	4289	GLN	2.4
2	B	4342	PHE	2.4
2	B	4276	ALA	2.4
1	A	7063	GLY	2.3
1	A	7097	GLU	2.2
2	B	4285	ALA	2.2
1	A	7061	LYS	2.2
2	B	4340	LYS	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	6938	THR	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, 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.

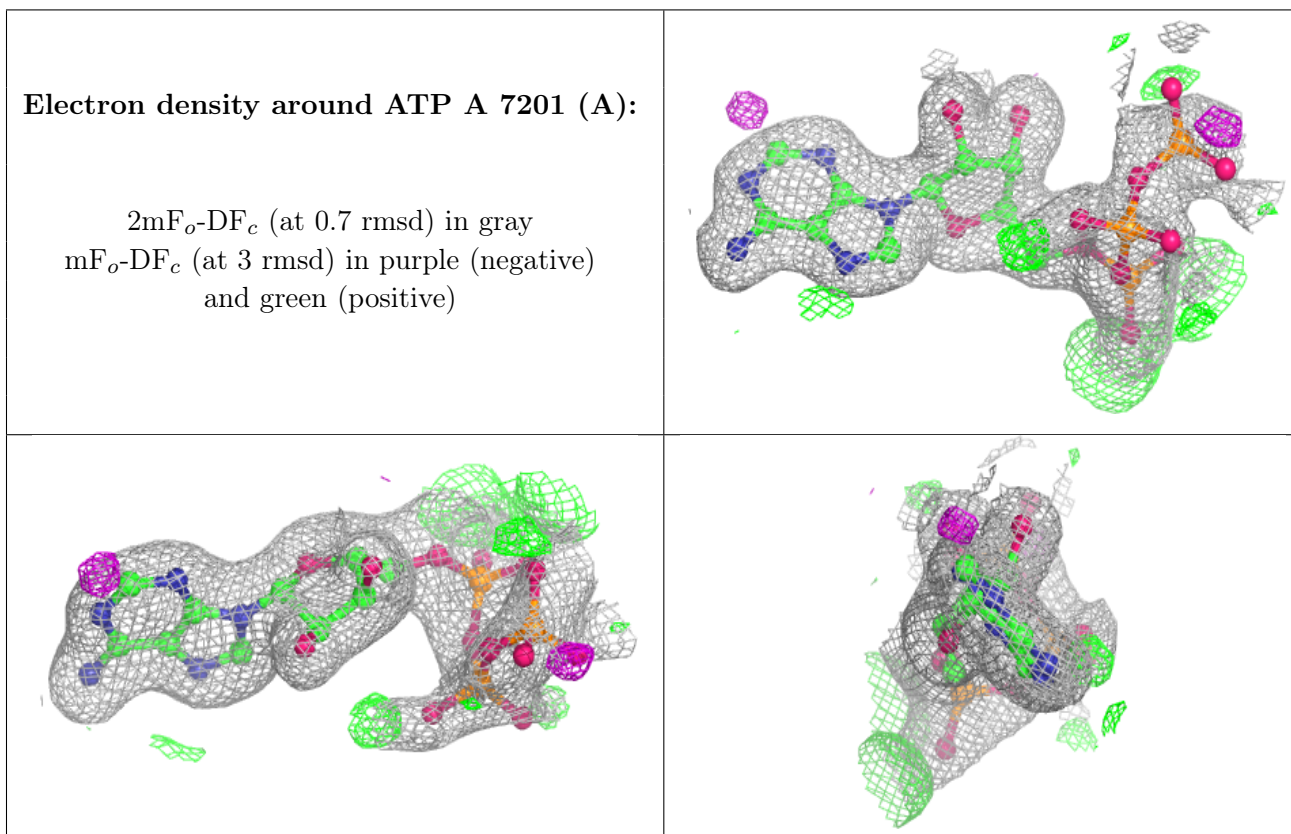
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	EDO	A	7231	4/4	0.53	0.20	59,71,84,84	0
4	EDO	B	4404	4/4	0.55	0.20	58,67,68,74	0
4	EDO	B	4403	4/4	0.59	0.13	57,61,65,65	0
4	EDO	A	7214	4/4	0.65	0.28	58,60,61,61	0
4	EDO	A	7230[F]	4/4	0.67	0.22	33,36,37,39	4
4	EDO	A	7218	4/4	0.70	0.22	50,54,60,61	0
4	EDO	A	7211	4/4	0.76	0.20	57,65,66,71	0
4	EDO	A	7221[D]	4/4	0.78	0.15	46,46,54,64	0
4	EDO	A	7222	4/4	0.80	0.19	50,52,55,66	0
4	EDO	A	7225	4/4	0.81	0.12	49,61,62,65	0
4	EDO	A	7227	4/4	0.81	0.18	58,59,70,74	0
4	EDO	A	7224	4/4	0.82	0.15	52,59,63,66	0
4	EDO	A	7205	4/4	0.83	0.11	49,49,58,65	0
4	EDO	A	7217	4/4	0.83	0.11	46,61,62,67	0
4	EDO	A	7216	4/4	0.84	0.15	46,50,57,60	0
4	EDO	A	7209	4/4	0.86	0.16	38,55,55,58	0
4	EDO	A	7208	4/4	0.86	0.11	53,59,62,70	0
4	EDO	A	7219	4/4	0.86	0.17	55,60,62,69	0
4	EDO	A	7212	4/4	0.87	0.20	47,50,58,62	0
4	EDO	A	7229	4/4	0.87	0.14	53,55,57,66	0
4	EDO	A	7228	4/4	0.88	0.20	46,60,60,65	0
4	EDO	A	7204	4/4	0.88	0.13	49,49,57,60	0

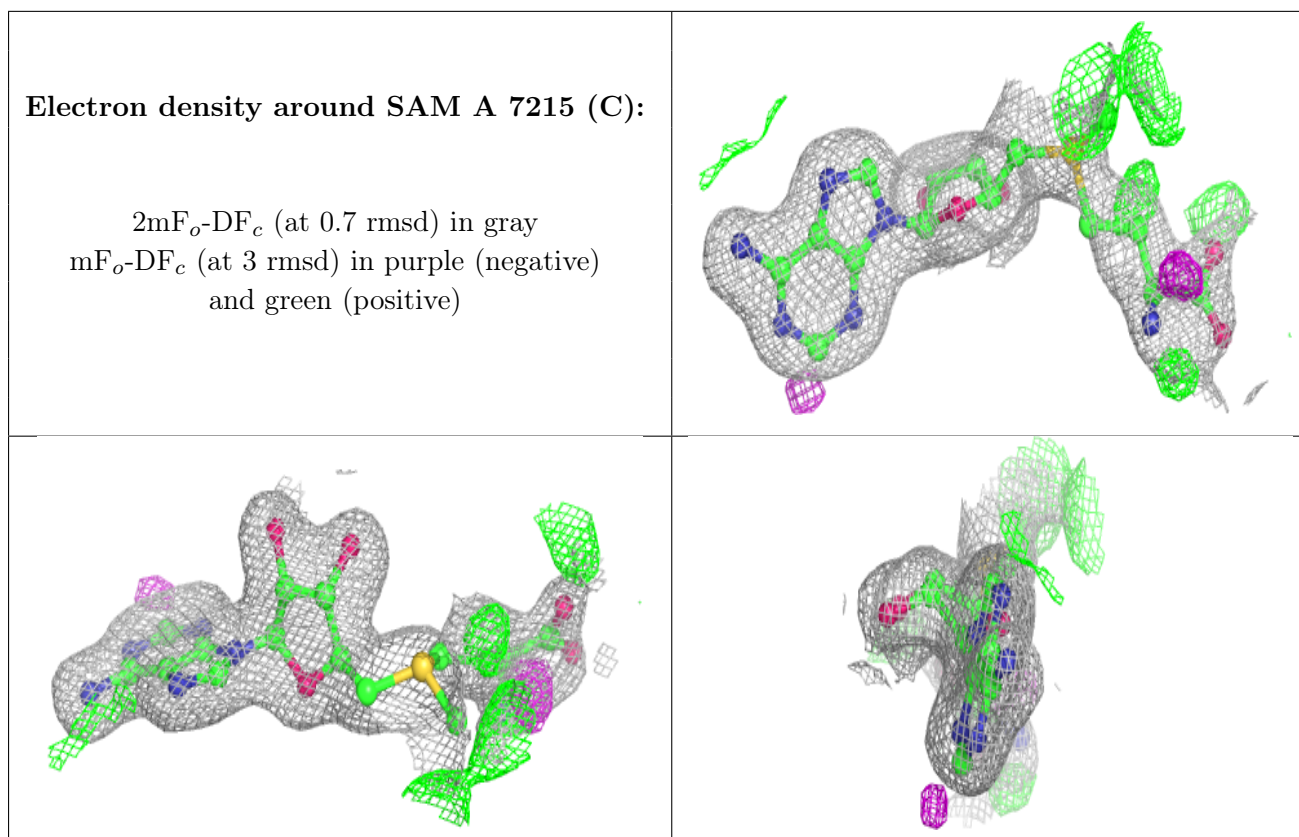
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	EDO	A	7226	4/4	0.89	0.18	52,55,58,59	0
4	EDO	A	7220	4/4	0.89	0.14	48,50,52,59	0
5	MES	A	7203	12/12	0.89	0.10	36,44,70,74	0
7	CL	B	4405	1/1	0.89	0.11	74,74,74,74	0
7	CL	A	7232	1/1	0.91	0.14	68,68,68,68	0
4	EDO	A	7207	4/4	0.91	0.18	40,55,55,65	0
4	EDO	A	7206	4/4	0.92	0.12	43,48,54,74	0
4	EDO	A	7223	4/4	0.93	0.38	40,49,58,60	0
3	ATP	A	7201[A]	31/31	0.93	0.11	33,38,68,72	31
6	SAM	A	7215[C]	27/27	0.94	0.10	32,37,39,45	27
4	EDO	A	7210	4/4	0.95	0.07	44,50,51,57	0
8	ZN	B	4402	1/1	0.95	0.06	62,62,62,62	0
4	EDO	A	7202	4/4	0.96	0.12	35,38,41,59	0
4	EDO	A	7213	4/4	0.97	0.08	38,49,53,59	0
8	ZN	B	4401	1/1	0.99	0.08	40,40,40,40	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.





6.5 Other polymers [i](#)

There are no such residues in this entry.