Full wwPDB X-ray Structure Validation Report (i)

Nov 16, 2022 – 03:18 pm GMT

PDB ID	:	7Z9H
Title	:	ATAD2 in complex with PepLite-Asp
Authors	:	Turberville, S.; Martin, M.P.; Hope, I.; Noble, M.E.M.
Deposited on	:	2022-03-21
Resolution	:	1.34 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 (i) 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 (i)) were used in the production of this report:

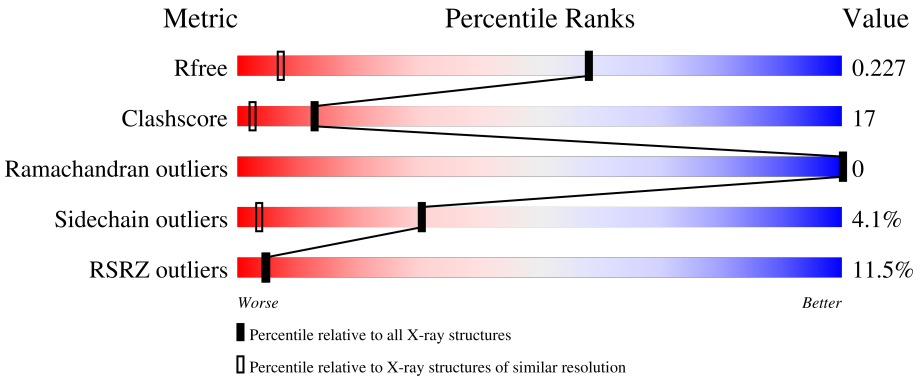
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.31.2
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0267
CCP4	:	7.1.010 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.31.2

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 1.34 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	1385 (1.36-1.32)
Clashscore	141614	1417 (1.36-1.32)
Ramachandran outliers	138981	1397 (1.36-1.32)
Sidechain outliers	138945	1397 (1.36-1.32)
RSRZ outliers	127900	1369 (1.36-1.32)

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	AAA	130	12% 82% 14% .

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
2	SO4	AAA	1201	-	-	X	-

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Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
5	IIV	AAA	1208	-	-	-	X

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 1337 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.

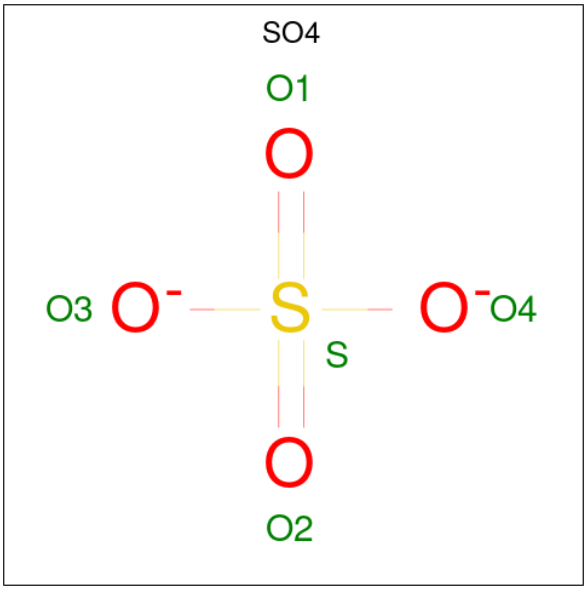
- Molecule 1 is a protein called ATPase family AAA domain-containing protein 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	AAA	130	Total	C	N	O	S	0	2	0
			1114	697	198	214	5			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
AAA	979	SER	-	expression tag	UNP Q6PL18
AAA	980	MET	-	expression tag	UNP Q6PL18

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O_4S).

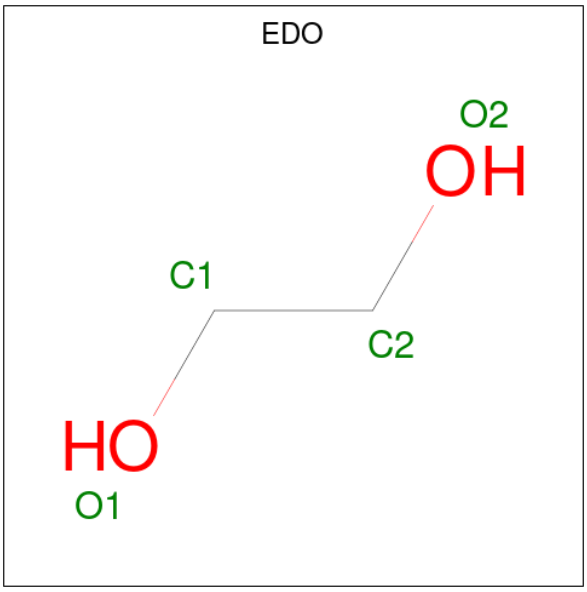


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	AAA	1	Total	O	S	0	0
			5	4	1		
2	AAA	1	Total	O	S	0	0
			5	4	1		

- Molecule 3 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

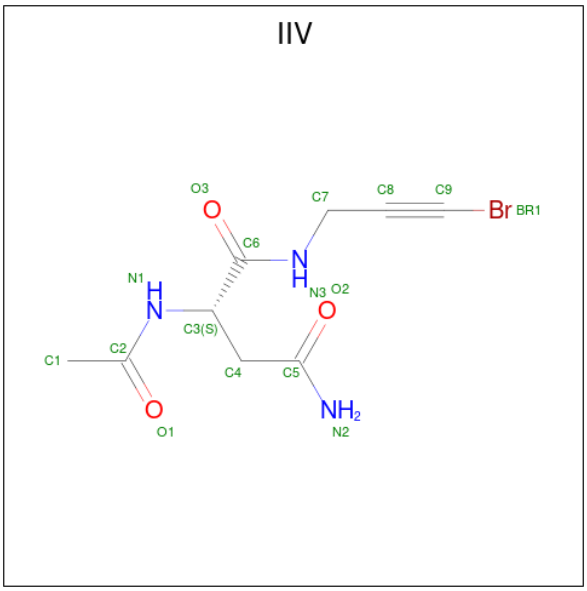
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	AAA	1	Total Cl 1 1	0	0

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



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

- Molecule 5 is (2 {S})-2-acetamido- {N}-(3-bromanylprop-2-ynyl)butanediamide (three-letter code: IIV) (formula: $C_9H_{12}BrN_3O_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	AAA	1	Total	Br	C	N	O	0	0
			16	1	9	3	3		

- Molecule 6 is water.

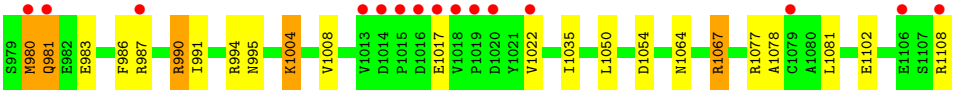
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	AAA	180	Total	O	0	0
			180	180		

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: ATPase family AAA domain-containing protein 2

Chain AAA:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 65 2 2	Depositor
Cell constants a, b, c, α, β, γ	79.14Å 79.14Å 137.54Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	68.54 – 1.34 68.54 – 1.34	Depositor EDS
% Data completeness (in resolution range)	99.2 (68.54-1.34) 99.2 (68.54-1.34)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.46 (at 1.34Å)	Xtriage
Refinement program	REFMAC 5.8.0258, REFMAC 5.8.0258	Depositor
R, R_{free}	0.210 , 0.227 0.210 , 0.227	Depositor DCC
R_{free} test set	2981 reflections (5.20%)	wwPDB-VP
Wilson B-factor (Å^2)	20.7	Xtriage
Anisotropy	0.149	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	(Not available) , (Not available)	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	1337	wwPDB-VP
Average B, all atoms (Å^2)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.85% 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: IIV, CL, EDO, SO4

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	AAA	0.68	1/1132 (0.1%)	1.11	4/1526 (0.3%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	AAA	1102	GLU	CD-OE2	6.11	1.32	1.25

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	AAA	1067	ARG	NE-CZ-NH1	-8.56	116.02	120.30
1	AAA	990	ARG	NE-CZ-NH2	-8.40	116.10	120.30
1	AAA	994	ARG	CG-CD-NE	-5.44	100.38	111.80
1	AAA	1077	ARG	NE-CZ-NH2	-5.18	117.71	120.30

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	AAA	1114	0	1107	35	0
2	AAA	10	0	0	5	0
3	AAA	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	AAA	16	0	24	3	0
5	AAA	16	0	0	2	0
6	AAA	180	0	0	17	0
All	All	1337	0	1131	38	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 17.

All (38) 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:AAA:995:ASN:ND2	6:AAA:1302:HOH:O	1.93	1.01
1:AAA:987[C]:ARG:NH1	2:AAA:1201:SO4:O2	1.95	0.99
1:AAA:987[A]:ARG:HD2	6:AAA:1305:HOH:O	1.63	0.97
1:AAA:987[A]:ARG:HH11	1:AAA:991:ILE:HD11	1.36	0.90
1:AAA:987[A]:ARG:NH1	1:AAA:991:ILE:HD11	1.91	0.84
1:AAA:987[A]:ARG:CZ	2:AAA:1201:SO4:O2	2.29	0.79
1:AAA:981:GLN:H	1:AAA:981:GLN:HE21	1.32	0.78
1:AAA:1004:LYS:HG3	6:AAA:1393:HOH:O	1.94	0.66
1:AAA:1017:GLU:HG2	5:AAA:1208:IIV:BR1	2.56	0.61
1:AAA:1035:ILE:HD11	6:AAA:1344:HOH:O	2.00	0.61
1:AAA:980:MET:HG3	1:AAA:981:GLN:HE21	1.67	0.59
1:AAA:981:GLN:H	1:AAA:981:GLN:NE2	2.02	0.57
1:AAA:1004:LYS:HE3	6:AAA:1393:HOH:O	2.04	0.57
1:AAA:987[A]:ARG:NE	2:AAA:1201:SO4:O2	2.38	0.56
1:AAA:987[C]:ARG:HG2	1:AAA:990:ARG:NH2	2.21	0.55
1:AAA:995:ASN:ND2	6:AAA:1309:HOH:O	2.39	0.55
1:AAA:991:ILE:HG13	6:AAA:1305:HOH:O	2.06	0.54
1:AAA:1064:ASN:ND2	5:AAA:1208:IIV:N2	2.55	0.53
1:AAA:1081[B]:LEU:C	1:AAA:1081[B]:LEU:HD23	2.28	0.53
1:AAA:986:PHE:HE2	1:AAA:1108:ARG:NH2	2.07	0.52
1:AAA:980:MET:HG3	1:AAA:981:GLN:NE2	2.26	0.51
1:AAA:1054:ASP:OD2	6:AAA:1303:HOH:O	2.19	0.51
1:AAA:1008:VAL:HG12	6:AAA:1380:HOH:O	2.10	0.50
1:AAA:981:GLN:HE21	1:AAA:981:GLN:N	2.04	0.50
1:AAA:987[A]:ARG:HG2	6:AAA:1413:HOH:O	2.12	0.49
1:AAA:987[C]:ARG:HD2	2:AAA:1201:SO4:O1	2.13	0.49
1:AAA:1017:GLU:N	1:AAA:1017:GLU:OE1	2.46	0.47
1:AAA:983:GLU:OE2	6:AAA:1304:HOH:O	2.20	0.46
1:AAA:987[B]:ARG:NH2	6:AAA:1310:HOH:O	2.40	0.46
1:AAA:1050:LEU:HB2	4:AAA:1204:EDO:H11	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:AAA:1205:EDO:H11	6:AAA:1435:HOH:O	2.17	0.42
2:AAA:1201:SO4:O4	6:AAA:1305:HOH:O	2.21	0.42
1:AAA:986:PHE:CE2	1:AAA:1108:ARG:NH2	2.88	0.41
1:AAA:987[C]:ARG:NH2	6:AAA:1301:HOH:O	1.67	0.41
1:AAA:1035:ILE:CD1	6:AAA:1344:HOH:O	2.64	0.41
4:AAA:1204:EDO:H22	6:AAA:1303:HOH:O	2.20	0.41
1:AAA:1078:ALA:O	1:AAA:1081[A]:LEU:HB3	2.21	0.41
1:AAA:987[C]:ARG:HG2	1:AAA:990:ARG:HH22	1.87	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	AAA	131/130 (101%)	130 (99%)	1 (1%)	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	AAA	126/123 (102%)	121 (96%)	5 (4%)	31	4

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	AAA	980	MET
1	AAA	981	GLN
1	AAA	1004	LYS
1	AAA	1022	VAL
1	AAA	1067	ARG

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 8 ligands modelled in this entry, 1 is monoatomic - leaving 7 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	$\#\|Z\| > 2$
2	SO4	AAA	1207	-	4,4,4	0.35	0	6,6,6	0.07	0
5	IIV	AAA	1208	-	14,15,15	0.83	1 (7%)	17,18,18	2.65	4 (23%)
4	EDO	AAA	1205	-	3,3,3	0.29	0	2,2,2	0.63	0
2	SO4	AAA	1201	-	4,4,4	0.71	0	6,6,6	0.61	0
4	EDO	AAA	1203	-	3,3,3	0.45	0	2,2,2	0.24	0
4	EDO	AAA	1204	-	3,3,3	0.32	0	2,2,2	0.67	0
4	EDO	AAA	1206	-	3,3,3	0.15	0	2,2,2	0.54	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
5	IIV	AAA	1208	-	-	6/15/17/17	-
4	EDO	AAA	1205	-	-	0/1/1/1	-
4	EDO	AAA	1203	-	-	0/1/1/1	-
4	EDO	AAA	1204	-	-	1/1/1/1	-
4	EDO	AAA	1206	-	-	1/1/1/1	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	AAA	1208	IIV	BR1-C9	2.89	1.96	1.82

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	AAA	1208	IIV	C7-C8-C9	-8.56	163.04	176.14
5	AAA	1208	IIV	C7-N3-C6	4.29	125.85	121.60
5	AAA	1208	IIV	C4-C3-C6	-3.94	101.14	110.42
5	AAA	1208	IIV	C8-C7-N3	-2.34	109.80	112.71

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	AAA	1208	IIV	C3-C6-N3-C7
5	AAA	1208	IIV	O3-C6-N3-C7
5	AAA	1208	IIV	C1-C2-N1-C3
5	AAA	1208	IIV	O1-C2-N1-C3
5	AAA	1208	IIV	N1-C3-C4-C5
5	AAA	1208	IIV	C6-C3-C4-C5
4	AAA	1204	EDO	O1-C1-C2-O2
4	AAA	1206	EDO	O1-C1-C2-O2

There are no ring outliers.

4 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	AAA	1208	IIV	2	0

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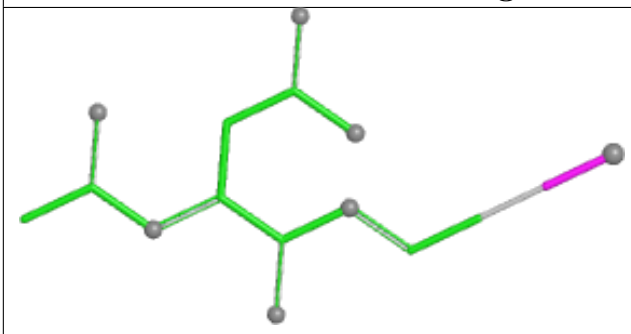
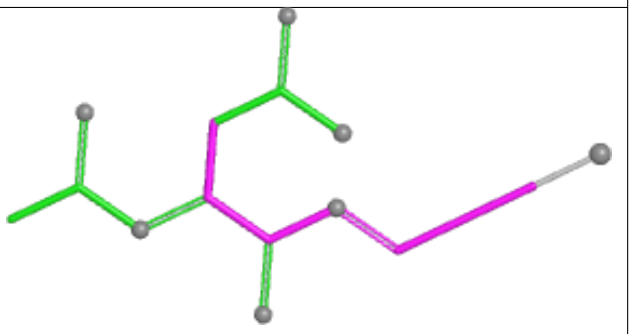
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	AAA	1205	EDO	1	0
2	AAA	1201	SO4	5	0
4	AAA	1204	EDO	2	0

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.

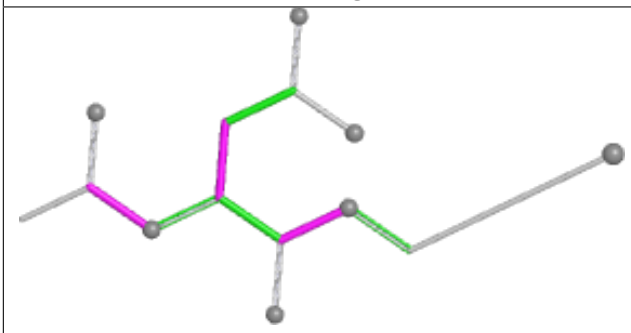
Ligand IIV AAA 1208



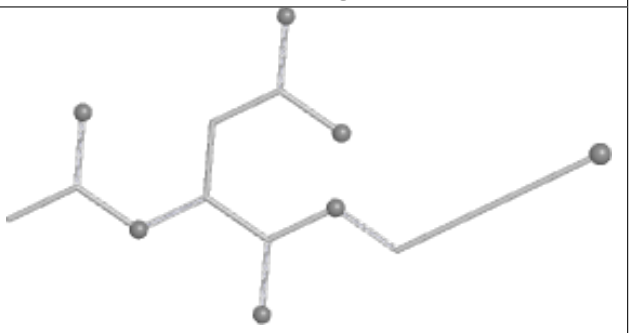
Bond lengths



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, 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	AAA	130/130 (100%)	0.82	15 (11%) 4 5	15, 23, 62, 84	0

All (15) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	AAA	980	MET	4.9
1	AAA	1019	PRO	4.9
1	AAA	1016	ASP	4.2
1	AAA	1015	PRO	3.7
1	AAA	1018	VAL	3.3
1	AAA	1014	ASP	3.3
1	AAA	1108	ARG	2.9
1	AAA	1022	VAL	2.8
1	AAA	1013	VAL	2.8
1	AAA	981	GLN	2.5
1	AAA	1017	GLU	2.4
1	AAA	1020	ASP	2.3
1	AAA	1106	GLU	2.2
1	AAA	987[A]	ARG	2.1
1	AAA	1079	CYS	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 (i)

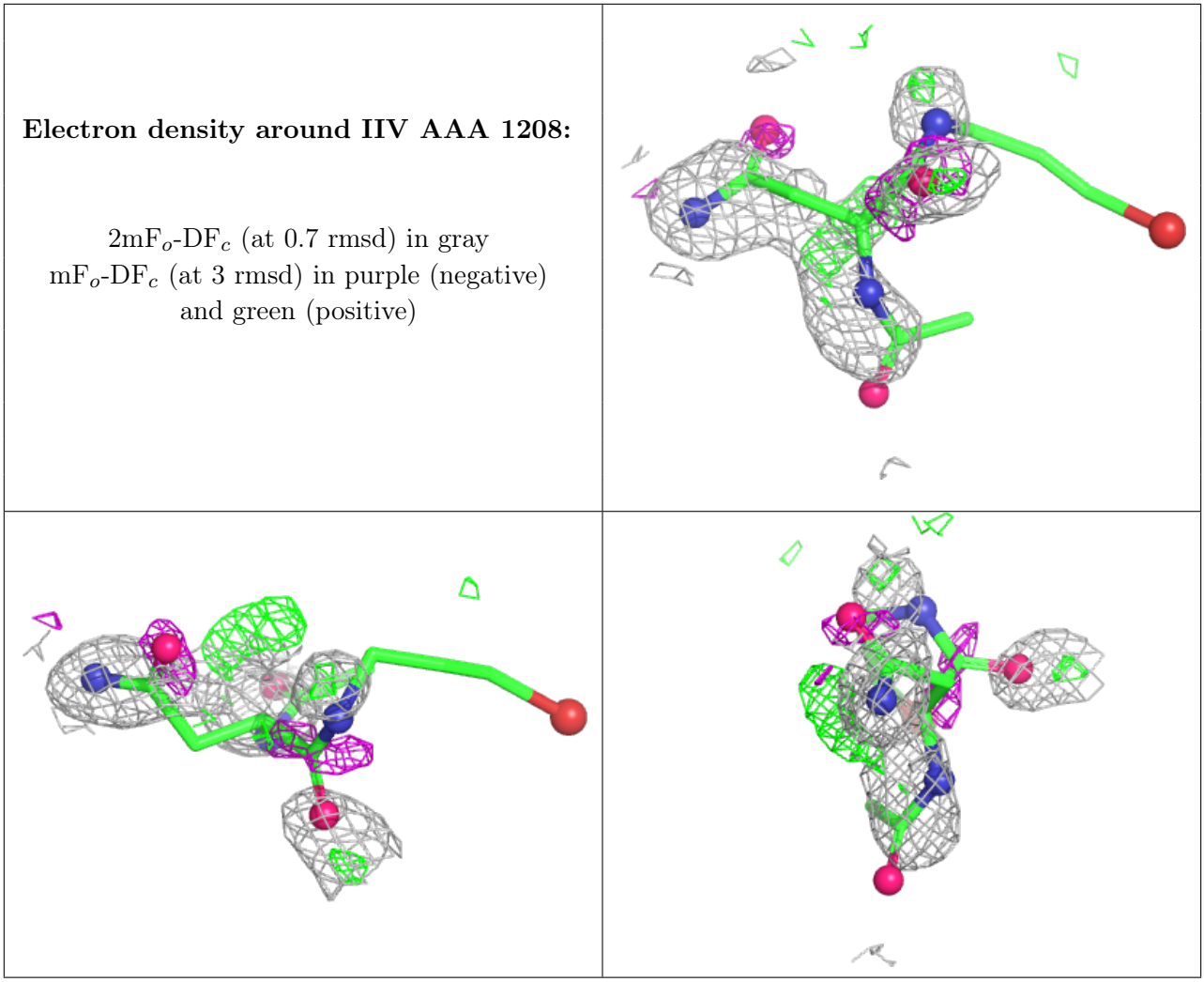
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' 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
5	IIV	AAA	1208	16/16	0.57	0.46	39,95,160,200	0
2	SO4	AAA	1207	5/5	0.71	0.16	63,66,68,73	5
3	CL	AAA	1202	1/1	0.74	0.07	69,69,69,69	0
4	EDO	AAA	1206	4/4	0.85	0.23	49,50,57,63	0
4	EDO	AAA	1204	4/4	0.90	0.27	39,44,53,58	0
4	EDO	AAA	1205	4/4	0.92	0.12	53,55,57,60	0
2	SO4	AAA	1201	5/5	0.96	0.11	27,30,34,36	0
4	EDO	AAA	1203	4/4	0.97	0.09	20,20,25,25	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 IIV AAA 1208:

$2mF_o$-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.