



wwPDB X-ray Structure Validation Summary Report ⓘ

Jun 17, 2024 – 04:19 AM EDT

PDB ID : 3SFZ
Title : Crystal structure of full-length murine Apaf-1
Authors : Eschenburg, S.; Reubold, T.F.
Deposited on : 2011-06-14
Resolution : 3.00 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 : 2022.3.0, CSD as543be (2022)
Xtrriage (Phenix) : 1.20.1
EDS : 2.37.1
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) : 2.37.1

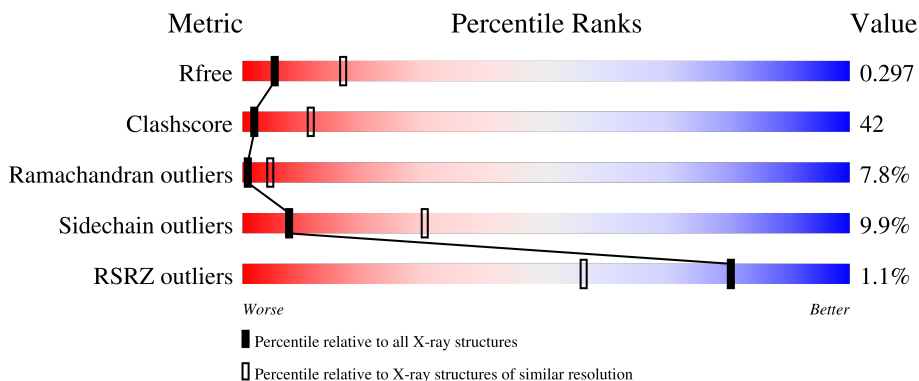
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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	2092 (3.00-3.00)
Clashscore	141614	2416 (3.00-3.00)
Ramachandran outliers	138981	2333 (3.00-3.00)
Sidechain outliers	138945	2336 (3.00-3.00)
RSRZ outliers	127900	1990 (3.00-3.00)

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	1249	

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
3	GBL	A	1255	-	-	X	-

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 9194 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 Apoptotic peptidase activating factor 1.

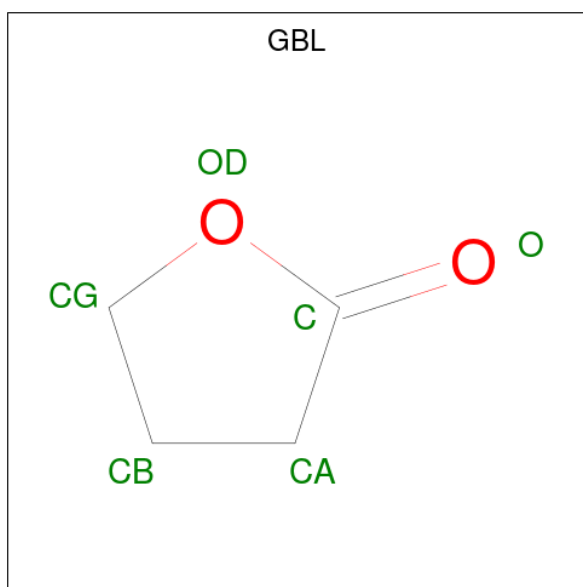
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	1133	9015	5715	1554	1691	55	0	0	0

- Molecule 2 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
2	A	1	27	10	5	10	2	0	0

- Molecule 3 is GAMMA-BUTYROLACTONE (three-letter code: GBL) (formula: $C_4H_6O_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 6 4 2	0	0
3	A	1	Total C O 6 4 2	0	0
3	A	1	Total C O 6 4 2	0	0
3	A	1	Total C O 6 4 2	0	0
3	A	1	Total C O 6 4 2	0	0

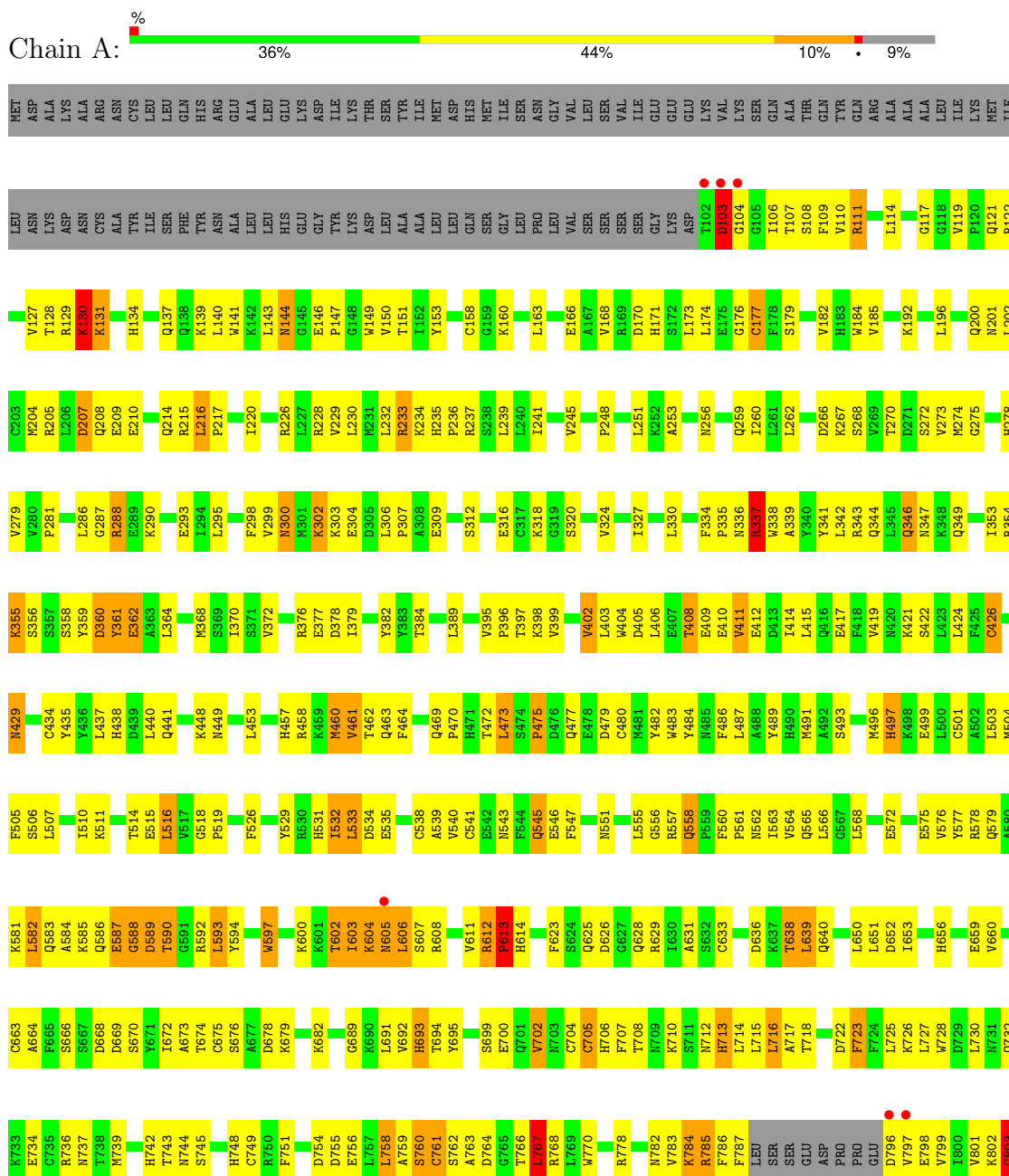
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	122	Total O 122 122	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: Apoptotic peptidase activating factor 1



T1207	T1082	L1141	T1082	A1013	L946	V875	C804
G1208	C1083	L1142	C1083	K1016	1949	R879	S805
S1209	H1084	G1145	H1084	T1017	A950	G880	W806
S1210	Q1085	D1146	Q1085	L1018	L952	G951	D809
S1211	G1086	G1149	G1086	I1019	K952	L882	G810
Q1212	T1087	E1150	T1087	S1020	T963	S883	D811
T1213	V1088	L1151	V1088	S1021	G954	W884	
F1214	L1089	R1152	L1089	S1022	Q955	V885	I814
	L1153	R1153	L1153	S1023	Q956	V886	A815
N1217	L1154	W1154	L1154	D1024	D957	V888	V816
T1219	W1155	W1155	L1155	S1025	Y958	M889	A817
N1220	V1156	S1157	V1156	A1092	L959	F890	K818
L1221	S1157	D1158	S1157	V1028	P960	M819	M819
K1222	G1159	D1096	D1096	Q1028	E961	P892	A820
I1224	G1160	A1097	A1097	V1029	A962	V821	V821
H1225	L1161	T1098	T1098	W1030	Q963	S896	L822
V1226	L1162	K1099	K1099	M1031	V964	F897	L823
S1227	L1163	F1100	F1100	W1032	S965	L898	F824
P1228	S1164	S1101	S1101	Q1033	C966	T899	D825
D1229	C1165	T1102	T1102		C967	A900	I826
F1230	A1166	S1103	S1103	V1038	C968	S901	H827
R1231	P1167	A1105	A1105	F1039	L969	D902	D902
Y1233	I1168	D1106	D1106	L1040	S970	D903	L831
V1234	S1169	K1107	K1107	Q1041	P971	Q904	L832
P1235	VAL	T1108	T1108	A1042	H972	T905	A833
D1236	GLU	A1109	A1109	H1043	L973	I906	T837
D1237	GLY	K1110	K1110	V1044	E974	R907	R907
	THR	L1111	L1111	E1045	Y975	V908	G838
I1241	ALA	W1112	W1112	T1046	N976	W909	H839
L1242	THR	D1115	D1115	W1047	A977	E910	H840
Y1243	THR	L1116	L1116	K1048	F978	T911	
Q1246	G1177	L1117	L1117	D1049	G979	K912	Q844
V1247	W1180	S1118	S1118	F1050	D980	K913	Y845
L1248	V1181	L1119	L1119	R1051	D982	S918	C846
E1249	T1182	P1119	P1119	L1052	Y982	A919	D847
	D1183	L1120	L1120	L1053	I987	I920	F848
	V1184	H1121	H1121	Q1054	Y988	V921	S849
	C1185	E1122	E1122	R1057	E989	L922	P850
	F1186	L1123	L1123	L1058	L990	K923	Y851
	S1187	K1124	K1124	L1059	L991	Q924	L854
	P1188	G1125	G1125	S1060	N992	E925	A855
	D1189	H1126	H1126	W1061	N993	I926	V856
	S1190	N1127	N1127	S1062	R994	D927	I857
	K1191	G1128	G1128	F1063	Y995	V928	A858
	T1192	C1129	C1129	D1064	F996	N933	L859
	L1193	V1130	V1130	G1065	S997	S860	S860
		R1131	R1131	T1066	G1001	Q861	Y862
	G1198	C1132	C1132	V1067	H1002	C863	
	Y1199	S1133	S1133	W1070	K1003	V937	
	L1200	A1134	A1134	M1071	K1004	L938	L866
	W1203	F1135	F1135	V1072	A939	W867	
	W1204	S1136	S1136	I1073	R1007	M868	
	W1205	L1137	L1137	T1074	H1008	V941	I869
	A1206	D1138	D1138	G1075	I1009	N942	D870
		G1139	G1139	R1076	Q1010	R944	S871
		I1140	I1140	R1079	F1011	R944	K874
					T1012	G945	

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	72.65Å 113.07Å 243.56Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 3.00 48.83 – 3.00	Depositor EDS
% Data completeness (in resolution range)	98.7 (20.00-3.00) 98.6 (48.83-3.00)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.45 (at 3.01Å)	Xtrriage
Refinement program	CNS	Depositor
R, R_{free}	0.235 , 0.298 0.234 , 0.297	Depositor DCC
R_{free} test set	1429 reflections (3.53%)	wwPDB-VP
Wilson B-factor (Å ²)	76.9	Xtrriage
Anisotropy	0.473	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 65.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	9194	wwPDB-VP
Average B, all atoms (Å ²)	78.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.91% 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: ADP, GBL

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	0.44	0/9211	0.71	5/12471 (0.0%)

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	761	CYS	CA-CB-SG	-6.23	102.79	114.00
1	A	767	LEU	N-CA-C	-5.91	95.05	111.00
1	A	705	CYS	CA-CB-SG	5.50	123.91	114.00
1	A	460	MET	N-CA-C	-5.38	96.47	111.00
1	A	796	ASP	CB-CG-OD2	5.17	122.96	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	9015	0	8883	749	0
2	A	27	0	12	1	0
3	A	30	0	30	8	0
4	A	122	0	0	1	0
All	All	9194	0	8925	749	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 42.

The worst 5 of 749 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:1054:GLN:HB2	1:A:1057:ARG:HD3	1.37	1.06
1:A:575:GLU:HG2	1:A:578:ARG:HH11	1.15	1.05
1:A:1162:LEU:HD23	1:A:1163:HIS:H	1.18	1.02
1:A:785:ARG:HG3	1:A:785:ARG:HH11	1.25	1.01
1:A:342:LEU:O	1:A:346:GLN:HG2	1.62	0.98

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	1127/1249 (90%)	837 (74%)	202 (18%)	88 (8%)	1 4

5 of 88 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	177	CYS
1	A	233	ARG
1	A	253	ALA
1	A	337	ARG
1	A	359	TYR

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	1005/1104 (91%)	906 (90%)	99 (10%)	8 30

5 of 99 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	922	LEU
1	A	1024	ASP
1	A	942	ASN
1	A	974	GLU
1	A	1051	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 40 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	942	ASN
1	A	1121	HIS
1	A	992	ASN
1	A	1028	GLN
1	A	1163	HIS

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](#)

6 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	GBL	A	1253	-	6,6,6	0.66	0	7,7,7	0.79	0
3	GBL	A	1255	-	6,6,6	0.61	0	7,7,7	0.81	0
2	ADP	A	1250	-	24,29,29	1.52	3 (12%)	29,45,45	1.39	2 (6%)
3	GBL	A	1251	-	6,6,6	0.53	0	7,7,7	0.86	0
3	GBL	A	1254	-	6,6,6	0.68	0	7,7,7	0.82	0
3	GBL	A	1252	-	6,6,6	0.50	0	7,7,7	0.84	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
3	GBL	A	1253	-	-	-	0/1/1/1
3	GBL	A	1255	-	-	-	0/1/1/1
2	ADP	A	1250	-	-	0/12/32/32	0/3/3/3
3	GBL	A	1251	-	-	-	0/1/1/1
3	GBL	A	1254	-	-	-	0/1/1/1
3	GBL	A	1252	-	-	-	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1250	ADP	PA-O3A	3.96	1.63	1.59
2	A	1250	ADP	O4'-C1'	3.77	1.45	1.40
2	A	1250	ADP	C8-N7	-2.47	1.30	1.34

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1250	ADP	N3-C2-N1	-5.15	121.69	128.67
2	A	1250	ADP	O4'-C1'-N9	2.04	111.45	108.75

There are no chirality outliers.

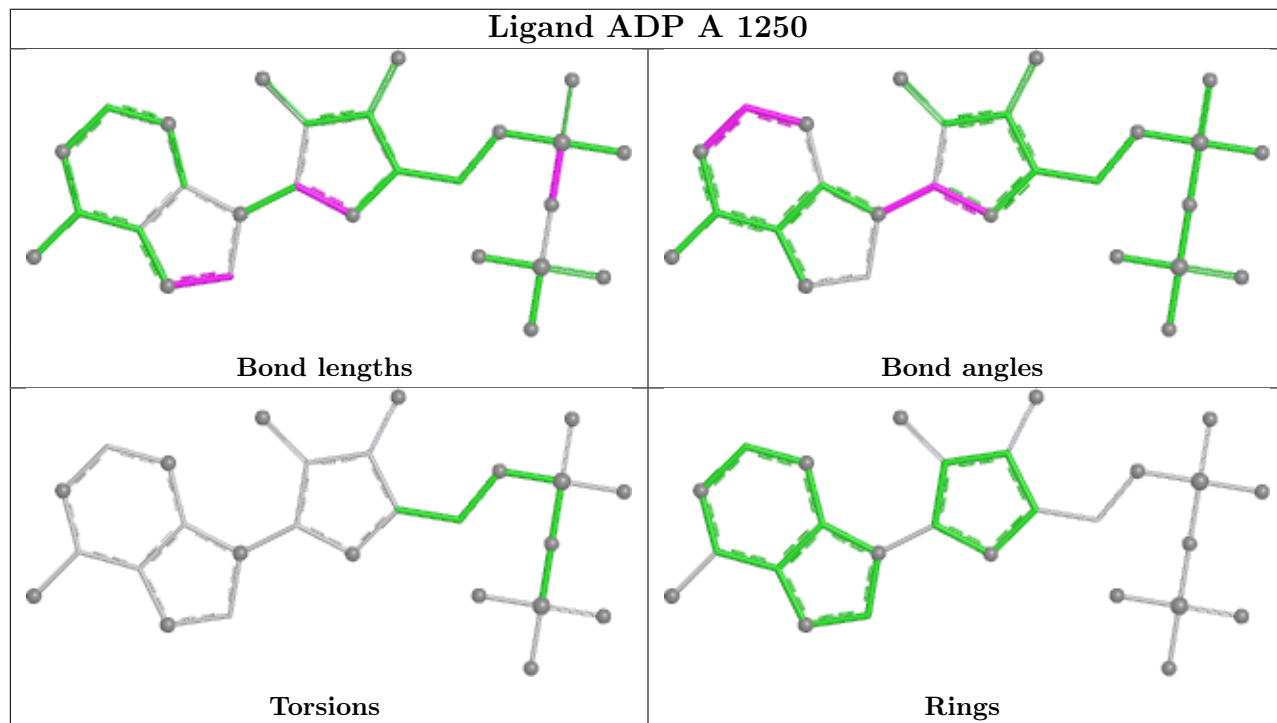
There are no torsion outliers.

There are no ring outliers.

4 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1255	GBL	5	0
2	A	1250	ADP	1	0
3	A	1251	GBL	1	0
3	A	1254	GBL	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 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	1133/1249 (90%)	-0.13	12 (1%) 80 56	45, 75, 112, 142	0

The worst 5 of 12 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	102	THR	7.3
1	A	1113	SER	4.0
1	A	1124	LYS	3.3
1	A	103	ASP	3.2
1	A	797	VAL	2.9

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.

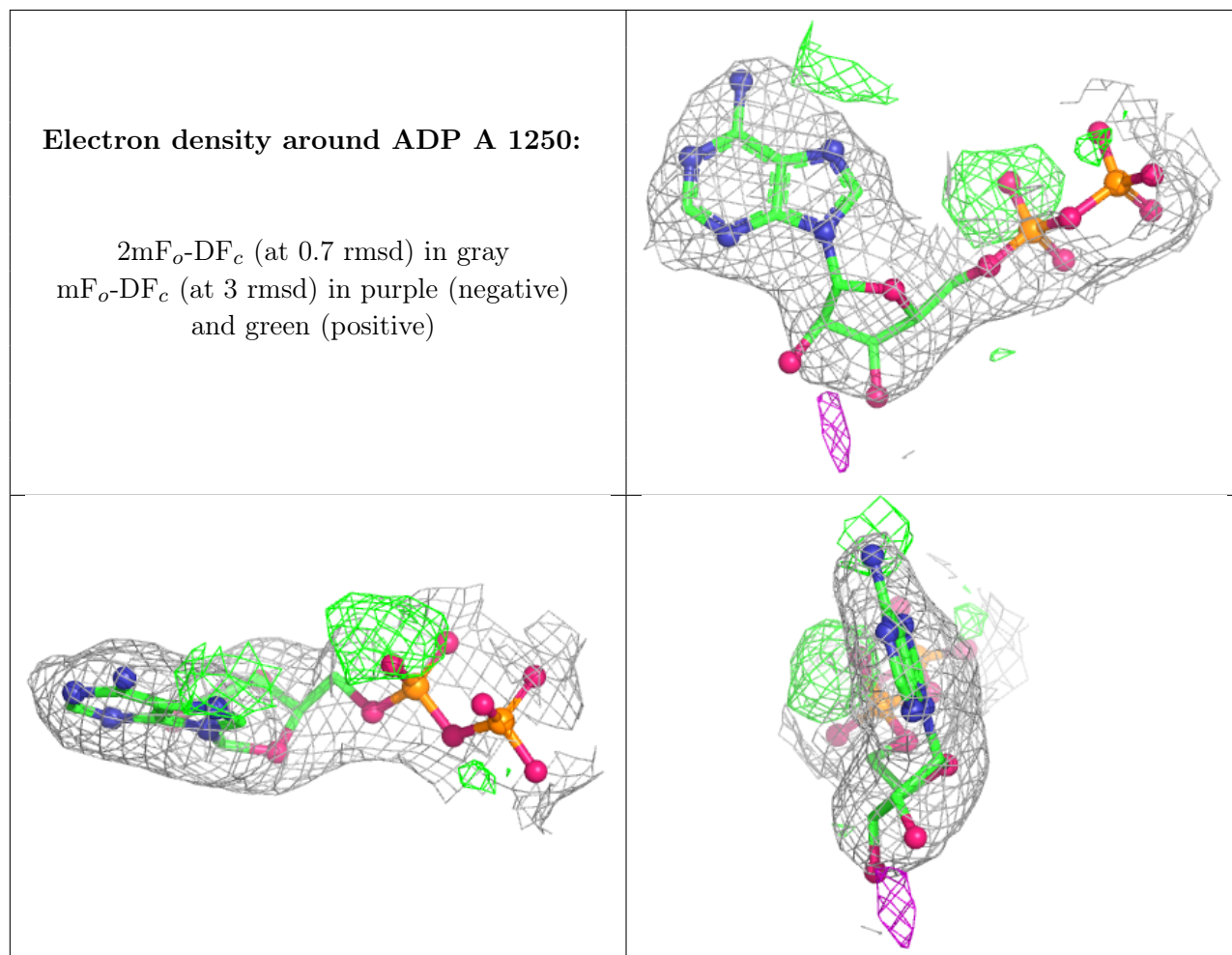
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	GBL	A	1253	6/6	0.88	0.32	108,108,109,109	0
3	GBL	A	1254	6/6	0.91	0.25	115,115,116,116	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
3	GBL	A	1255	6/6	0.94	0.32	81,82,83,83	0
3	GBL	A	1251	6/6	0.95	0.23	56,58,58,59	0
2	ADP	A	1250	27/27	0.96	0.19	63,66,70,71	0
3	GBL	A	1252	6/6	0.97	0.22	70,72,73,75	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.