



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 4, 2026 – 07:16 PM UTC

PDB ID : 8YPY / pdb_00008ypy
Title : Crystal structure of human phosphoribosyl pyrophosphate synthetase2 (PRPS2) in complex with ligands
Authors : Zhang, L.; Zhang, L.
Deposited on : 2024-03-18
Resolution : 2.74 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	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

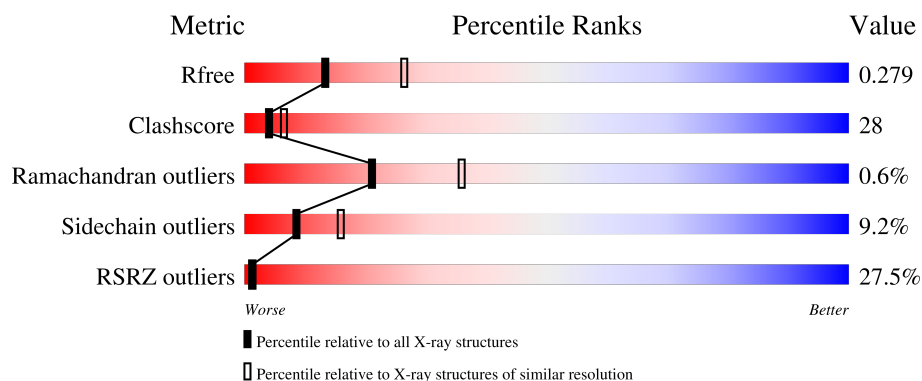
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.74 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}	180053	1819 (2.76-2.72)
Clashscore	190562	1866 (2.76-2.72)
Ramachandran outliers	187476	1830 (2.76-2.72)
Sidechain outliers	187428	1831 (2.76-2.72)
RSRZ outliers	180081	1819 (2.76-2.72)

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	321	13% 50% 33% 10% • •
1	B	321	26% 50% 33% 8% • 8%
1	C	321	32% 42% 38% 9% • 8%
1	D	321	44% 44% 38% 9% • 7%
1	E	321	28% 45% 36% 9% • 7%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
1	F	321	

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	APC	D	1001	-	-	X	-
2	APC	E	1001	-	-	X	-
3	HSX	D	1002	-	-	X	-
3	HSX	F	2001	-	X	-	-
5	PO4	A	1005	-	X	X	-
5	PO4	A	1006	-	X	-	-
5	PO4	A	1007	-	X	-	-
5	PO4	F	2003	-	X	X	-

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 14222 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.

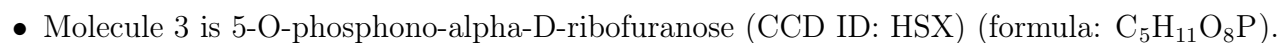
- Molecule 1 is a protein called Isoform 2 of Ribose-phosphate pyrophosphokinase 2.

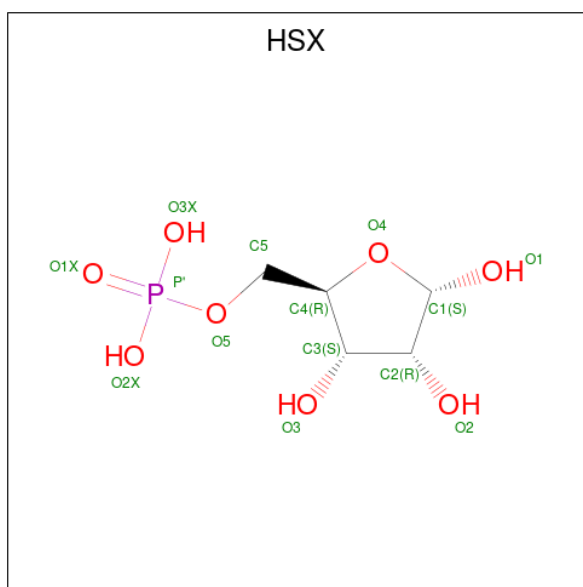
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	309	Total	C	N	O	S	0	0	0
			2355	1475	416	449	15			
1	B	296	Total	C	N	O	S	0	0	0
			2251	1414	395	427	15			
1	C	294	Total	C	N	O	S	0	0	0
			2232	1402	390	425	15			
1	D	298	Total	C	N	O	S	0	0	0
			2265	1423	396	431	15			
1	E	299	Total	C	N	O	S	0	0	0
			2276	1429	400	432	15			
1	F	308	Total	C	N	O	S	0	0	0
			2351	1473	415	448	15			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	SER	-	expression tag	UNP P11908
B	1	SER	-	expression tag	UNP P11908
C	1	SER	-	expression tag	UNP P11908
D	1	SER	-	expression tag	UNP P11908
E	1	SER	-	expression tag	UNP P11908
F	1	SER	-	expression tag	UNP P11908

- Molecule 2 is DIPHOSPHOMETHYLPHOSPHONIC ACID ADENOSYL ESTER (CCD ID: APC) (formula: $C_{11}H_{18}N_5O_{12}P_3$) (labeled as "Ligand of Interest" by depositor).



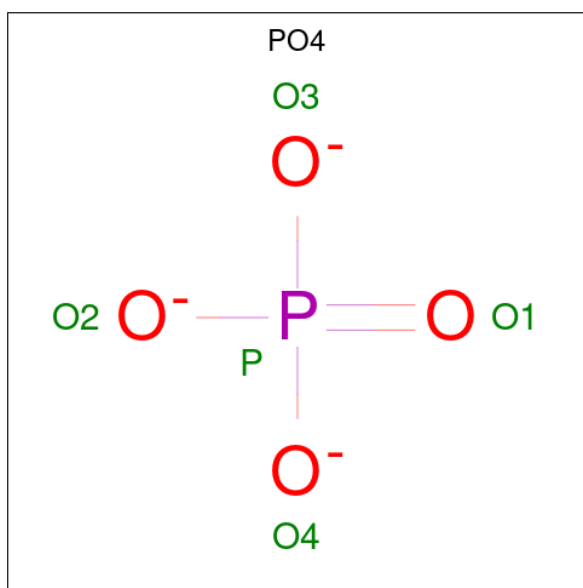


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	O	P	0	0
			14	5	8	1		
3	B	1	Total	C	O	P	0	0
			14	5	8	1		
3	C	1	Total	C	O	P	0	0
			14	5	8	1		
3	D	1	Total	C	O	P	0	0
			14	5	8	1		
3	E	1	Total	C	O	P	0	0
			14	5	8	1		
3	F	1	Total	C	O	P	0	0
			14	5	8	1		

- Molecule 4 is CADMIUM ION (CCD ID: CD) (formula: Cd).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Cd	0	0
			1	1		
4	B	1	Total	Cd	0	0
			1	1		
4	C	1	Total	Cd	0	0
			1	1		
4	D	1	Total	Cd	0	0
			1	1		
4	E	1	Total	Cd	0	0
			1	1		
4	F	1	Total	Cd	0	0
			1	1		

- Molecule 5 is PHOSPHATE ION (CCD ID: PO4) (formula: O_4P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	O	P	0	0
			5	4	1		
5	A	1	Total	O	P	0	0
			5	4	1		
5	A	1	Total	O	P	0	0
			5	4	1		
5	D	1	Total	O	P	0	0
			5	4	1		
5	F	1	Total	O	P	0	0
			5	4	1		

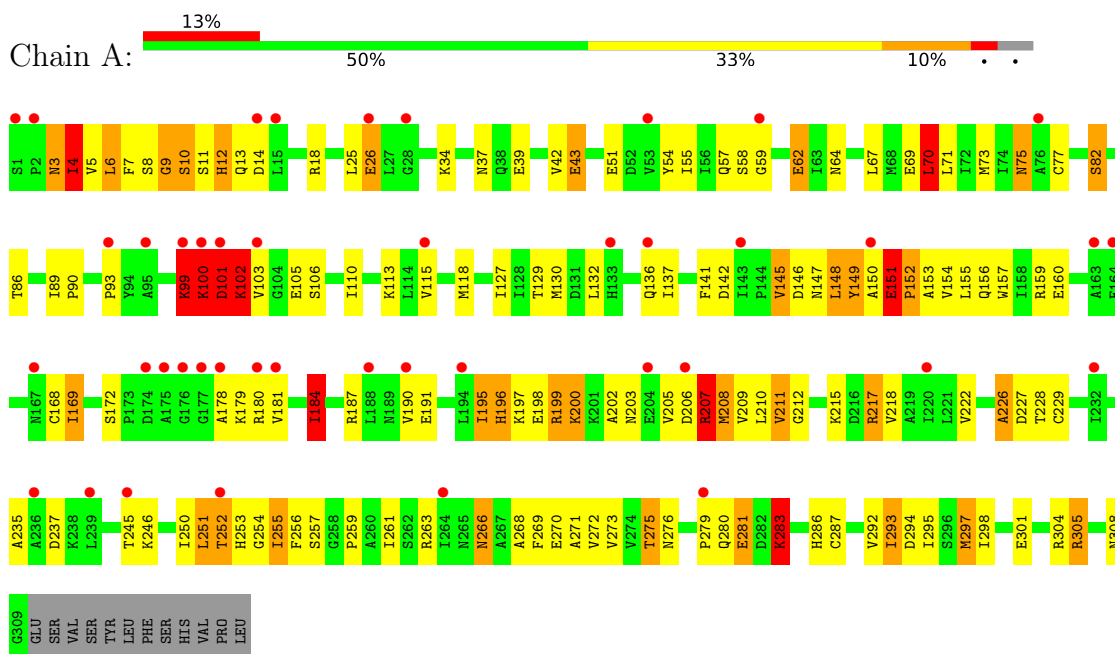
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	61	Total	O	0	0
			61	61		
6	B	32	Total	O	0	0
			32	32		
6	C	6	Total	O	0	0
			6	6		
6	D	8	Total	O	0	0
			8	8		
6	E	25	Total	O	0	0
			25	25		
6	F	59	Total	O	0	0
			59	59		

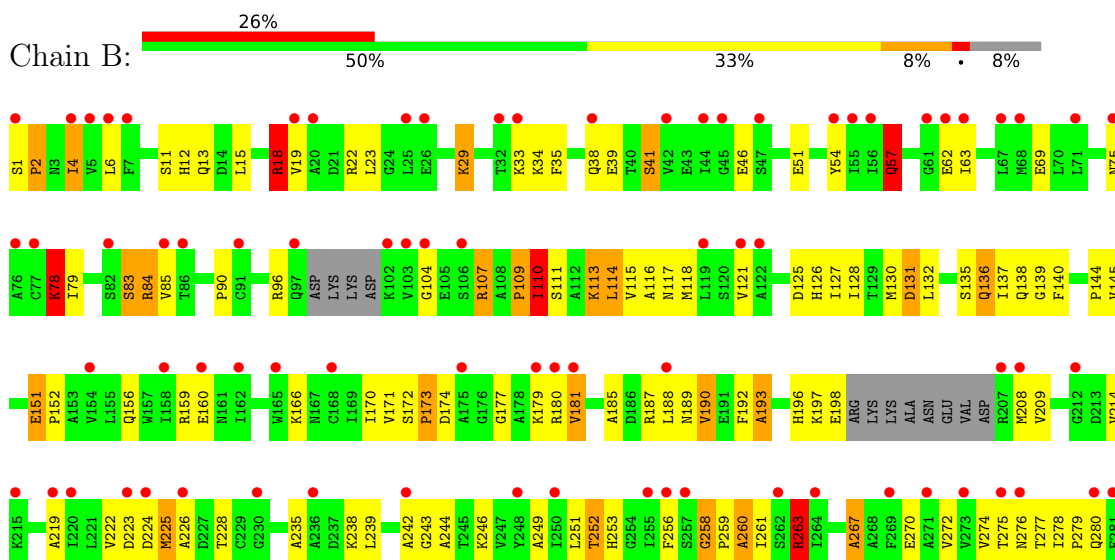
3 Residue-property plots

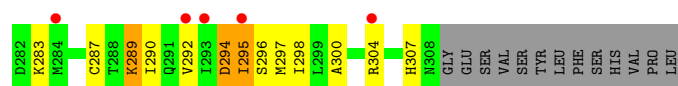
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: Isoform 2 of Ribose-phosphate pyrophosphokinase 2

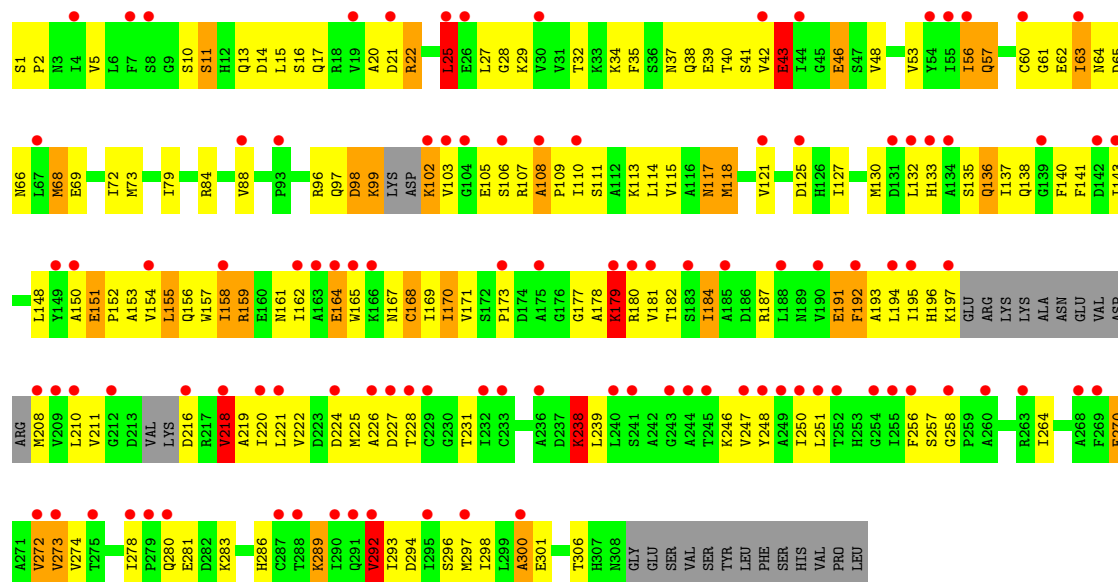
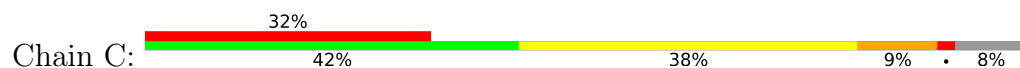


• Molecule 1: Isoform 2 of Ribose-phosphate pyrophosphokinase 2

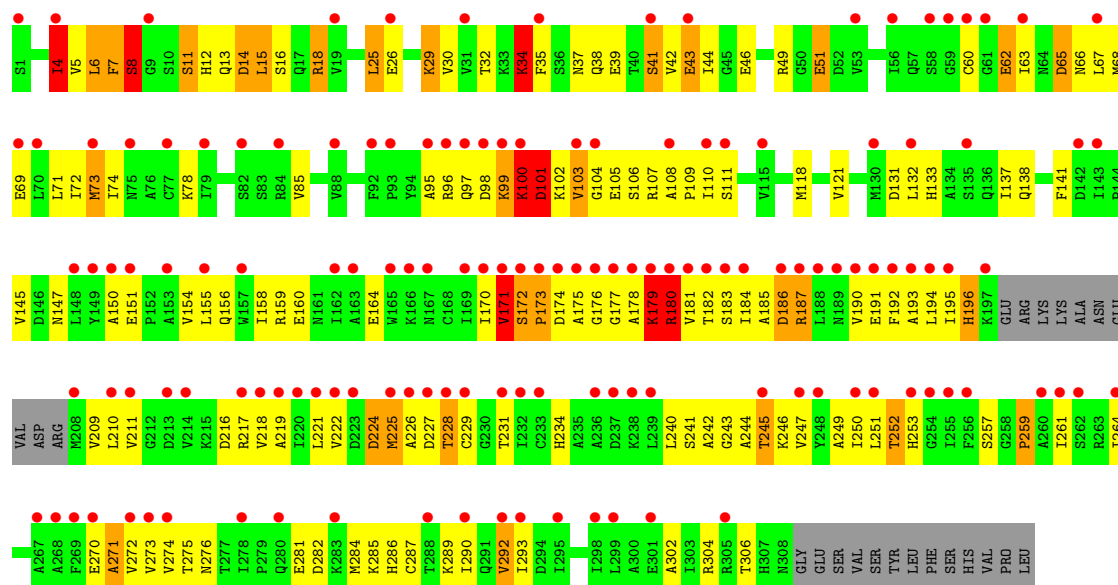
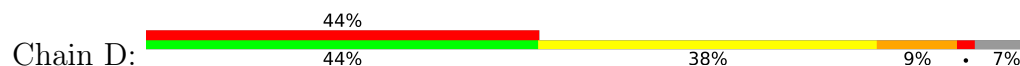




• Molecule 1: Isoform 2 of Ribose-phosphate pyrophosphokinase 2

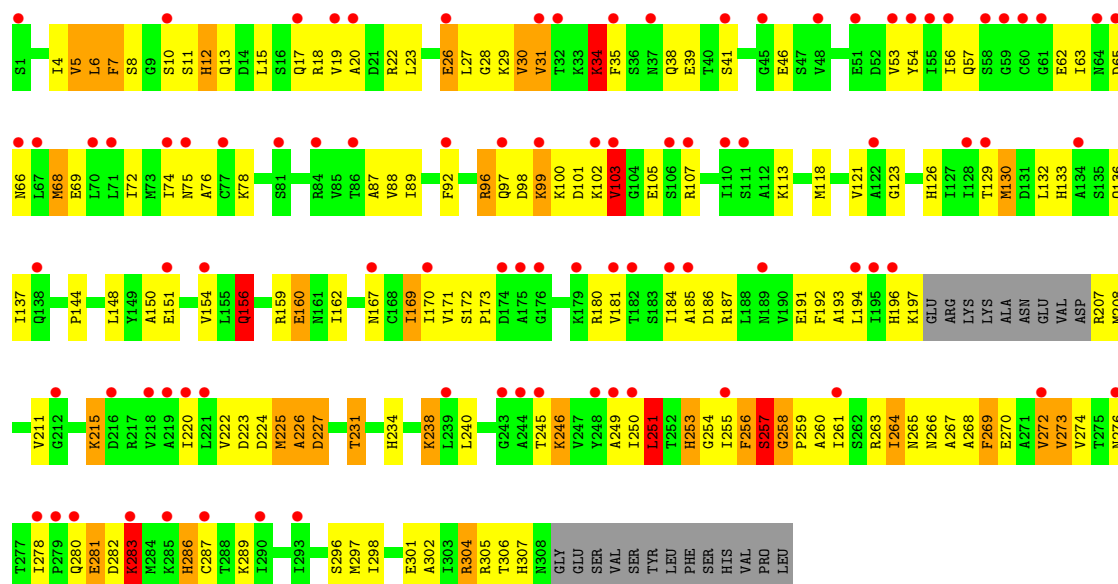


• Molecule 1: Isoform 2 of Ribose-phosphate pyrophosphokinase 2



• Molecule 1: Isoform 2 of Ribose-phosphate pyrophosphokinase 2





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	94.70Å 73.60Å 170.50Å 90.00° 94.44° 90.00°	Depositor
Resolution (Å)	46.91 – 2.74 46.91 – 2.74	Depositor EDS
% Data completeness (in resolution range)	88.0 (46.91-2.74) 87.9 (46.91-2.74)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.25 (at 2.73Å)	Xtriage
Refinement program	PHENIX 1.11.1 _2575	Depositor
R, R_{free}	0.272 , 0.286 0.268 , 0.279	Depositor DCC
R_{free} test set	2789 reflections (4.50%)	wwPDB-VP
Wilson B-factor (Å ²)	45.0	Xtriage
Anisotropy	0.169	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 43.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.87	EDS
Total number of atoms	14222	wwPDB-VP
Average B, all atoms (Å ²)	49.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.93% 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 ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: CD, APC, PO4, HSX

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	1.80	84/2387 (3.5%)	1.33	27/3229 (0.8%)
1	B	1.62	41/2281 (1.8%)	1.19	19/3087 (0.6%)
1	C	1.38	20/2261 (0.9%)	1.33	33/3059 (1.1%)
1	D	1.40	33/2296 (1.4%)	1.20	20/3108 (0.6%)
1	E	1.61	51/2307 (2.2%)	1.20	20/3122 (0.6%)
1	F	1.94	100/2383 (4.2%)	1.28	32/3224 (1.0%)
All	All	1.64	329/13915 (2.4%)	1.26	151/18829 (0.8%)

The worst 5 of 329 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	152	PRO	C-O	-12.36	1.08	1.24
1	A	253	HIS	CE1-NE2	-12.09	1.20	1.32
1	B	110	ILE	C-O	-11.21	1.12	1.24
1	A	272	VAL	C-O	-11.10	1.12	1.24
1	A	195	ILE	C-O	-10.84	1.12	1.24

The worst 5 of 151 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	11	SER	N-CA-C	12.04	124.48	111.36
1	E	11	SER	N-CA-C	11.79	124.13	111.28
1	A	199	ARG	CA-C-N	-11.65	104.47	120.90
1	A	199	ARG	C-N-CA	-11.65	104.47	120.90
1	C	258	GLY	CA-C-N	11.33	131.00	119.56

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2355	0	2403	89	0
1	B	2251	0	2293	119	0
1	C	2232	0	2270	176	0
1	D	2265	0	2309	187	0
1	E	2276	0	2325	149	0
1	F	2351	0	2401	97	0
2	A	62	0	28	6	0
2	C	62	0	28	8	0
2	D	31	0	14	12	0
2	E	31	0	14	15	0
3	A	14	0	0	1	0
3	B	14	0	0	1	0
3	C	14	0	0	0	0
3	D	14	0	0	6	0
3	E	14	0	0	2	0
3	F	14	0	0	5	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	C	1	0	0	0	0
4	D	1	0	0	0	0
4	E	1	0	0	0	0
4	F	1	0	0	0	0
5	A	15	0	0	2	0
5	D	5	0	0	1	0
5	F	5	0	0	2	0
6	A	61	0	0	8	0
6	B	32	0	0	2	1
6	C	6	0	0	0	0
6	D	8	0	0	0	0
6	E	25	0	0	4	0
6	F	59	0	0	3	1
All	All	14222	0	14085	780	1

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 28.

The worst 5 of 780 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:E:226:ALA:HB2	1:E:251:LEU:CD1	1.33	1.55
1:C:99:LYS:CB	1:C:107:ARG:NH2	1.70	1.49
1:C:99:LYS:HB2	1:C:107:ARG:NH2	1.12	1.43
1:D:34:LYS:NZ	1:D:38:GLN:NE2	1.62	1.40
1:D:177:GLY:O	1:D:180:ARG:HB3	1.27	1.35

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:B:2120:HOH:O	6:F:2127:HOH:O[2_645]	2.13	0.07

5.3 Torsion angles

5.3.1 Protein backbone

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	307/321 (96%)	287 (94%)	17 (6%)	3 (1%)	12	22
1	B	290/321 (90%)	279 (96%)	11 (4%)	0	100	100
1	C	286/321 (89%)	264 (92%)	21 (7%)	1 (0%)	36	54
1	D	294/321 (92%)	275 (94%)	14 (5%)	5 (2%)	7	12
1	E	295/321 (92%)	274 (93%)	20 (7%)	1 (0%)	36	54
1	F	306/321 (95%)	287 (94%)	18 (6%)	1 (0%)	36	54
All	All	1778/1926 (92%)	1666 (94%)	101 (6%)	11 (1%)	21	36

5 of 11 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	102	LYS
1	F	101	ASP
1	D	176	GLY
1	E	258	GLY

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	100	LYS

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	259/271 (96%)	233 (90%)	26 (10%)	7	14
1	B	248/271 (92%)	230 (93%)	18 (7%)	13	24
1	C	246/271 (91%)	222 (90%)	24 (10%)	7	14
1	D	250/271 (92%)	227 (91%)	23 (9%)	8	16
1	E	251/271 (93%)	225 (90%)	26 (10%)	7	13
1	F	259/271 (96%)	237 (92%)	22 (8%)	10	18
All	All	1513/1626 (93%)	1374 (91%)	139 (9%)	8	16

5 of 139 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	283	LYS
1	F	8	SER
1	F	191	GLU
1	C	46	GLU
1	C	43	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 30 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	75	ASN
1	F	136	GLN
1	D	286	HIS
1	F	234	HIS
1	F	38	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 23 ligands modelled in this entry, 6 are monoatomic - leaving 17 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$
5	PO4	D	1004	-	4,4,4	1.78	1 (25%)	6,6,6	1.39	1 (16%)
3	HSX	B	2001	-	14,14,14	1.37	2 (14%)	19,21,21	1.05	1 (5%)
3	HSX	E	1002	-	14,14,14	1.41	2 (14%)	19,21,21	1.91	9 (47%)
3	HSX	A	1002	-	14,14,14	2.05	8 (57%)	19,21,21	3.07	12 (63%)
2	APC	E	1001	-	29,33,33	1.06	3 (10%)	44,52,52	0.90	1 (2%)
5	PO4	F	2003	-	4,4,4	3.38	3 (75%)	6,6,6	3.51	5 (83%)
5	PO4	A	1006	-	4,4,4	2.09	2 (50%)	6,6,6	1.87	2 (33%)
2	APC	A	1004	-	29,33,33	2.03	10 (34%)	44,52,52	2.53	18 (40%)
2	APC	D	1001	-	29,33,33	2.00	10 (34%)	44,52,52	2.54	19 (43%)
5	PO4	A	1007	-	4,4,4	2.83	3 (75%)	6,6,6	2.22	3 (50%)
3	HSX	F	2001	-	14,14,14	2.37	9 (64%)	19,21,21	3.25	12 (63%)
2	APC	C	1001	-	29,33,33	2.03	10 (34%)	44,52,52	2.56	20 (45%)
2	APC	C	1002	-	29,33,33	1.90	9 (31%)	44,52,52	2.55	21 (47%)
3	HSX	C	1003	-	14,14,14	1.27	1 (7%)	19,21,21	1.02	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	PO4	A	1005	-	4,4,4	2.55	3 (75%)	6,6,6	1.44	2 (33%)
3	HSX	D	1002	-	14,14,14	1.20	1 (7%)	19,21,21	1.14	2 (10%)
2	APC	A	1001	-	29,33,33	1.07	3 (10%)	44,52,52	1.16	3 (6%)

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	HSX	B	2001	-	-	0/6/22/22	0/1/1/1
3	HSX	E	1002	-	-	1/6/22/22	0/1/1/1
3	HSX	A	1002	-	-	3/6/22/22	0/1/1/1
2	APC	E	1001	-	-	4/19/38/38	0/3/3/3
2	APC	A	1004	-	-	9/19/38/38	0/3/3/3
2	APC	D	1001	-	-	11/19/38/38	0/3/3/3
3	HSX	F	2001	-	-	6/6/22/22	0/1/1/1
2	APC	C	1001	-	-	2/19/38/38	0/3/3/3
2	APC	C	1002	-	-	6/19/38/38	0/3/3/3
3	HSX	C	1003	-	-	3/6/22/22	0/1/1/1
3	HSX	D	1002	-	-	1/6/22/22	0/1/1/1
2	APC	A	1001	-	-	4/19/38/38	0/3/3/3

The worst 5 of 80 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	F	2003	PO4	P-O1	-4.66	1.39	1.50
2	A	1004	APC	PB-O3B	3.93	1.62	1.58
3	F	2001	HSX	P'-O5	-3.85	1.48	1.60
2	C	1001	APC	PB-O3B	3.82	1.62	1.58
5	A	1007	PO4	P-O3	-3.68	1.43	1.54

The worst 5 of 132 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	F	2001	HSX	O3-C3-C4	-8.05	87.96	111.08
3	A	1002	HSX	O1-C1-O4	-7.48	101.59	111.12
2	D	1001	APC	N3-C2-N1	-7.01	117.97	128.58
2	A	1004	APC	N3-C2-N1	-6.99	118.00	128.58

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	1001	APC	N3-C2-N1	-6.95	118.06	128.58

There are no chirality outliers.

5 of 50 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	1004	APC	PA-C3A-PB-O1B
2	A	1004	APC	PA-C3A-PB-O2B
2	A	1004	APC	PA-C3A-PB-O3B
2	A	1004	APC	PB-C3A-PA-O1A
2	A	1004	APC	C5'-O5'-PA-O1A

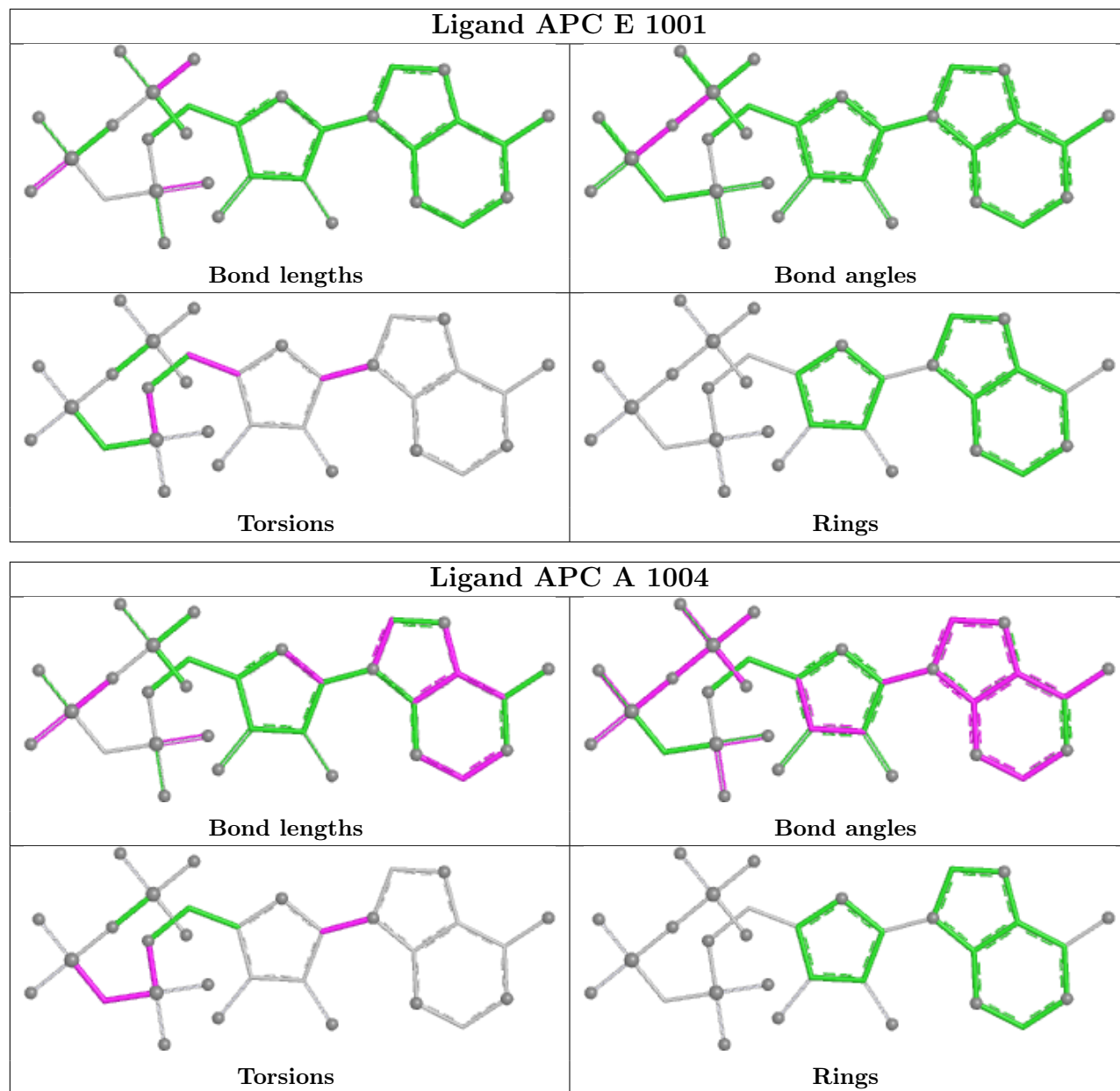
There are no ring outliers.

14 monomers are involved in 61 short contacts:

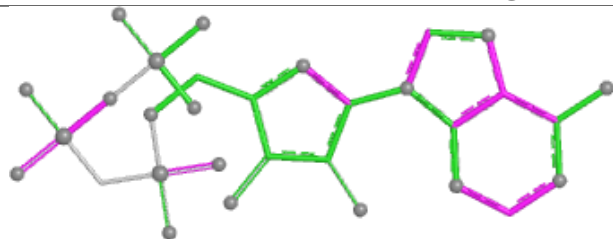
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	D	1004	PO4	1	0
3	B	2001	HSX	1	0
3	E	1002	HSX	2	0
3	A	1002	HSX	1	0
2	E	1001	APC	15	0
5	F	2003	PO4	2	0
2	A	1004	APC	3	0
2	D	1001	APC	12	0
3	F	2001	HSX	5	0
2	C	1001	APC	2	0
2	C	1002	APC	6	0
5	A	1005	PO4	2	0
3	D	1002	HSX	6	0
2	A	1001	APC	3	0

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

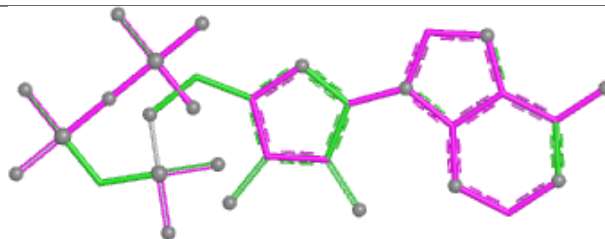
equivalents in the CSD to analyse the geometry.



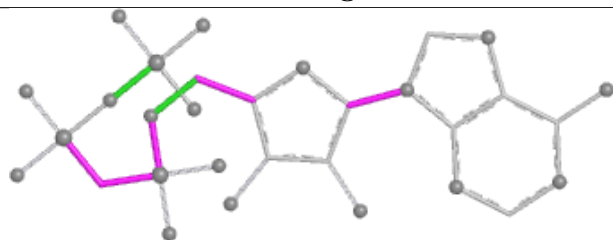
Ligand APC D 1001



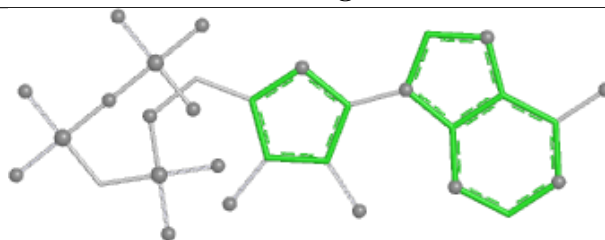
Bond lengths



Bond angles

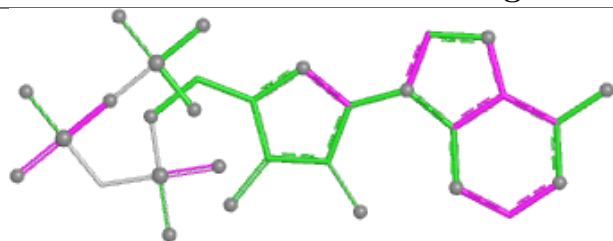


Torsions

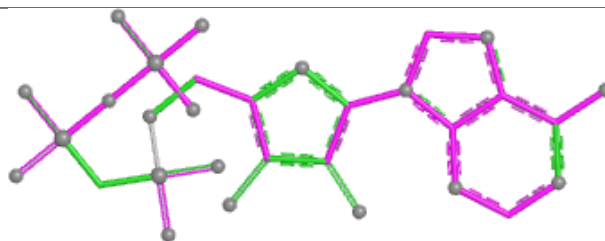


Rings

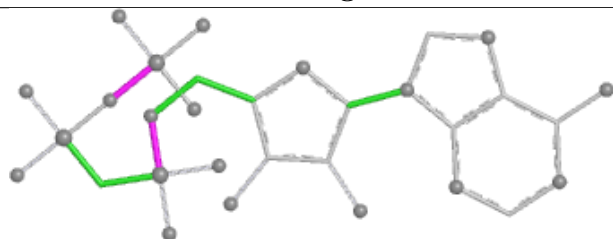
Ligand APC C 1001



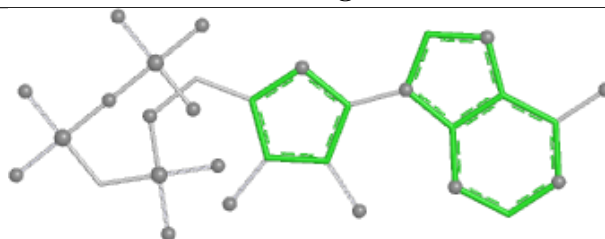
Bond lengths



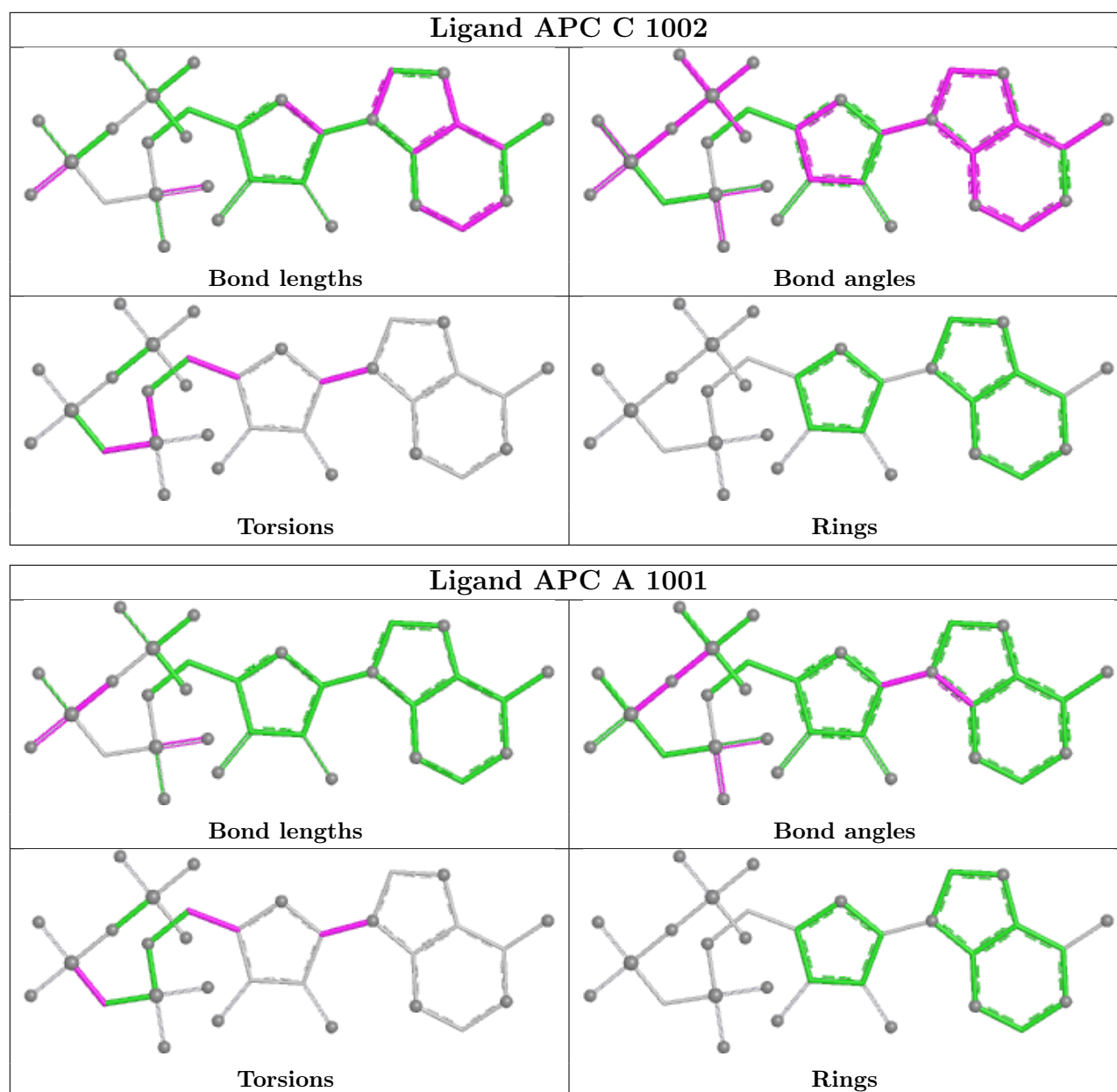
Bond angles



Torsions



Rings



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	309/321 (96%)	1.17	43 (13%) 6 6	16, 31, 52, 99	0
1	B	296/321 (92%)	1.52	82 (27%) 1 1	27, 47, 65, 78	0
1	C	294/321 (91%)	1.82	104 (35%) 1 1	35, 64, 88, 99	0
1	D	298/321 (92%)	2.05	140 (46%) 0 0	33, 66, 96, 113	0
1	E	299/321 (93%)	1.62	89 (29%) 1 1	30, 47, 69, 94	0
1	F	308/321 (95%)	1.02	39 (12%) 8 8	16, 30, 49, 98	0
All	All	1804/1926 (93%)	1.53	497 (27%) 1 1	16, 45, 85, 113	0

The worst 5 of 497 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	98	ASP	7.1
1	C	221	LEU	7.1
1	B	4	ILE	6.9
1	C	250	ILE	6.8
1	D	268	ALA	6.3

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 oligosaccharides in this entry.

6.4 Ligands

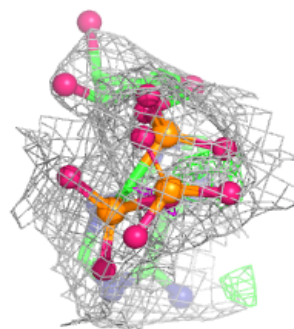
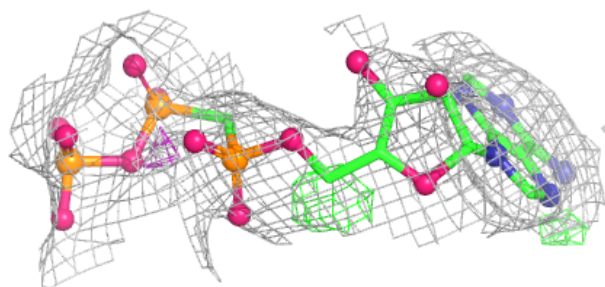
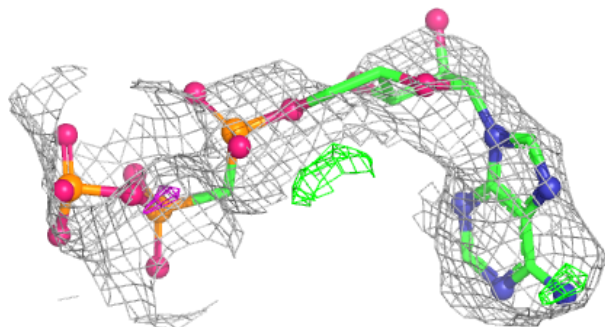
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	HSX	D	1002	14/14	0.38	0.20	77,92,108,109	0
2	APC	C	1002	31/31	0.47	0.16	73,100,130,132	0
2	APC	D	1001	31/31	0.49	0.19	83,109,135,138	0
2	APC	C	1001	31/31	0.51	0.17	59,89,107,113	0
3	HSX	C	1003	14/14	0.54	0.20	79,93,107,118	0
5	PO4	A	1007	5/5	0.61	0.34	41,44,62,75	0
2	APC	E	1001	31/31	0.62	0.16	53,81,96,103	0
2	APC	A	1004	31/31	0.65	0.19	27,70,101,113	0
3	HSX	E	1002	14/14	0.70	0.15	55,60,106,118	0
2	APC	A	1001	31/31	0.70	0.17	29,64,96,99	0
3	HSX	A	1002	14/14	0.73	0.17	47,55,71,71	0
3	HSX	B	2001	14/14	0.74	0.17	57,74,88,88	0
5	PO4	F	2003	5/5	0.74	0.31	44,54,68,69	0
3	HSX	F	2001	14/14	0.75	0.15	47,55,71,71	0
5	PO4	D	1004	5/5	0.77	0.33	67,79,88,91	0
5	PO4	A	1005	5/5	0.83	0.22	46,54,56,79	0
5	PO4	A	1006	5/5	0.85	0.18	57,58,63,78	0
4	CD	F	2002	1/1	0.87	0.10	86,86,86,86	0
4	CD	A	1003	1/1	0.87	0.11	90,90,90,90	0
4	CD	D	1003	1/1	0.88	0.09	114,114,114,114	0
4	CD	E	1003	1/1	0.90	0.08	87,87,87,87	0
4	CD	B	2002	1/1	0.96	0.04	93,93,93,93	0
4	CD	C	1004	1/1	0.97	0.04	129,129,129,129	0

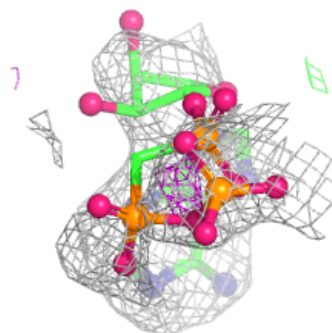
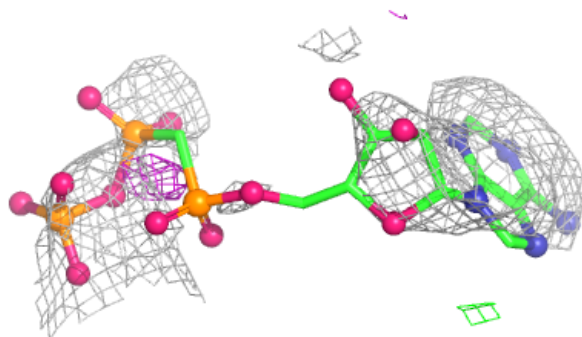
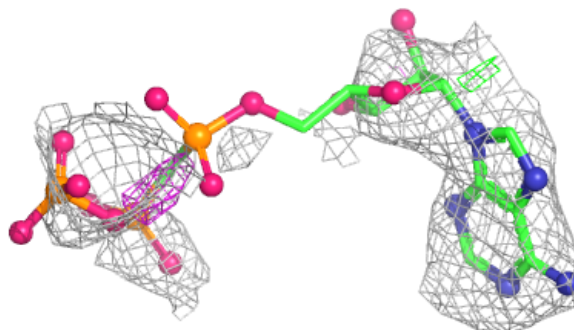
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around APC C 1002:

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

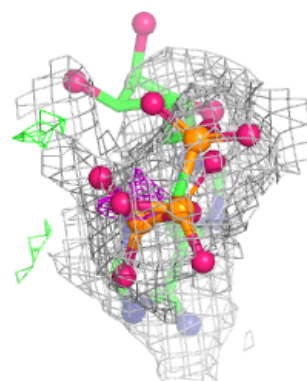
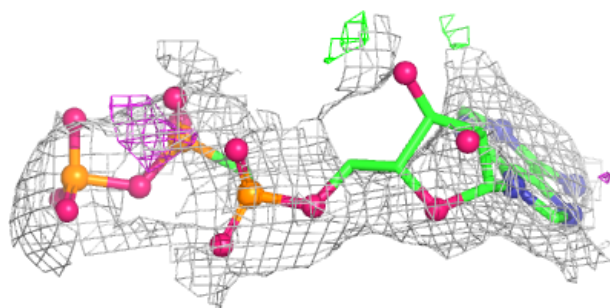
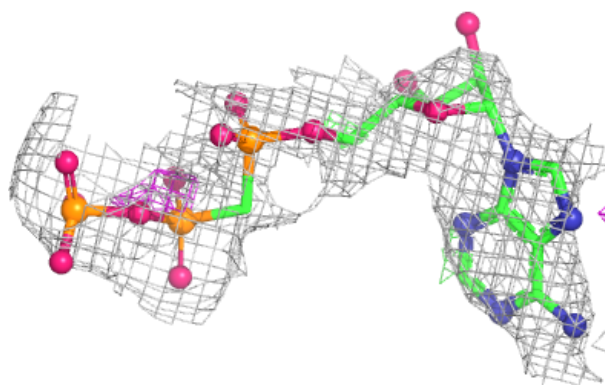
**Electron density around APC D 1001:**

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

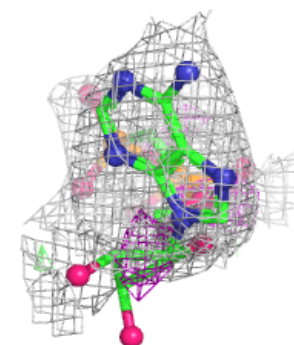
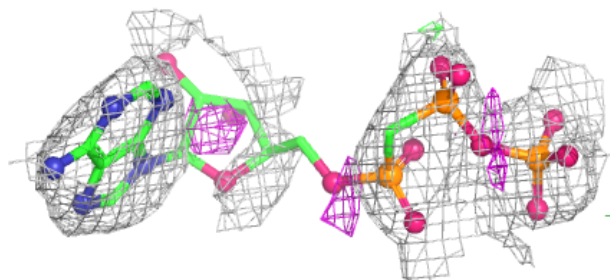
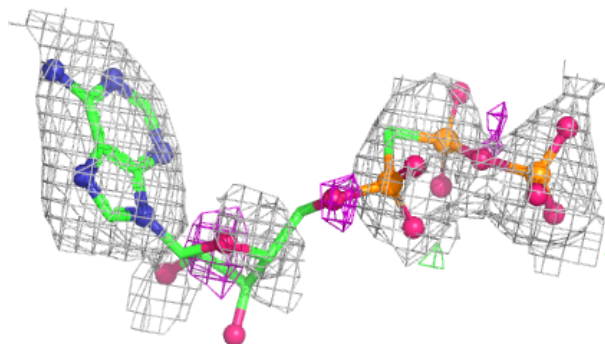


Electron density around APC C 1001:

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

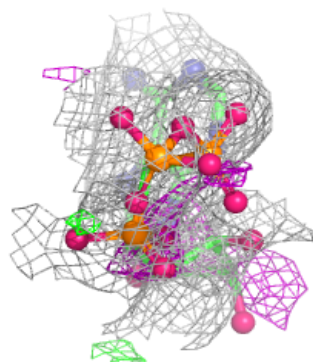
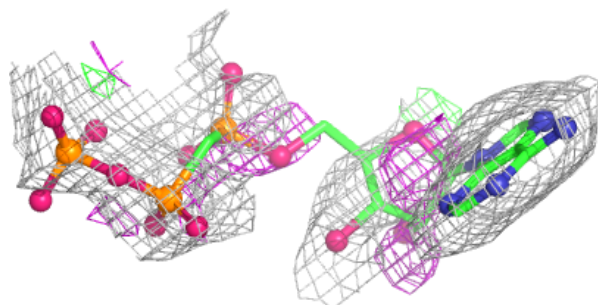
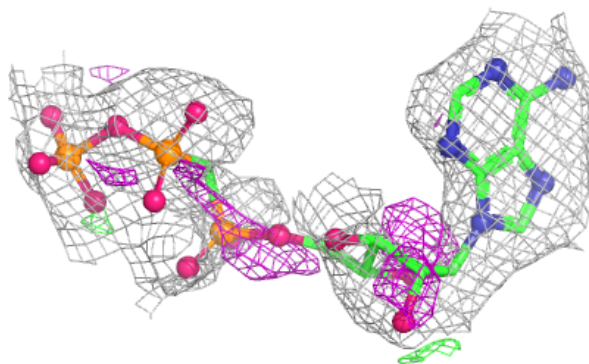
**Electron density around APC E 1001:**

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

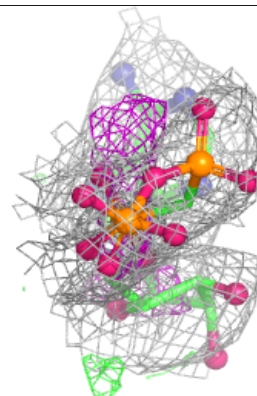
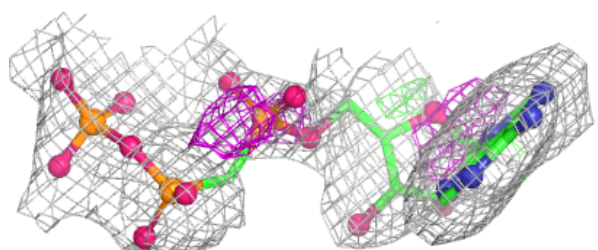
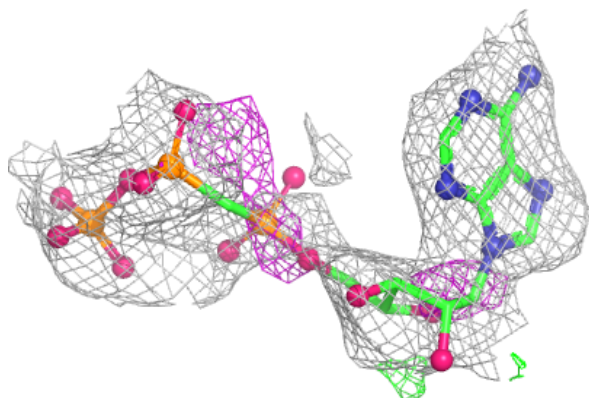


Electron density around APC A 1004:

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

**Electron density around APC A 1001:**

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



6.5 Other polymers [i](#)

There are no such residues in this entry.