



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 20, 2024 – 07:39 AM EDT

PDB ID : 3VTH
Title : Crystal structure of full-length HypF in the phosphate- and nucleotide-bound form
Authors : Shomura, Y.; Higuchi, Y.
Deposited on : 2012-05-30
Resolution : 2.00 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 : 2022.3.0, CSD as543be (2022)
Xtrriage (Phenix) : 1.20.1
EDS : 3.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.003 (Gargrove)
Density-Fitness : 1.0.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.39

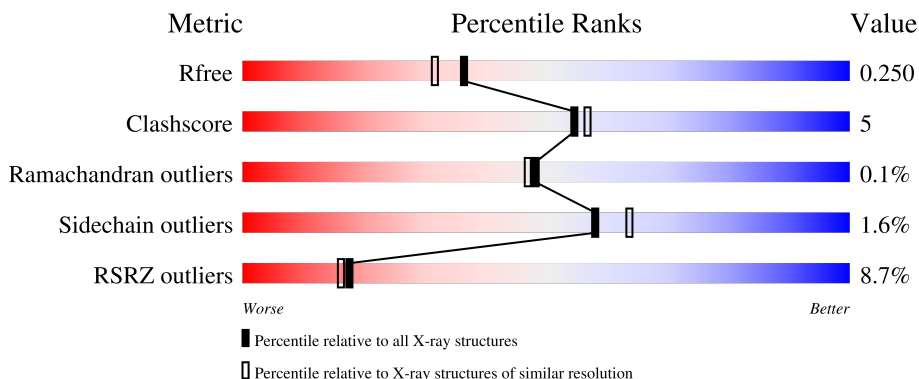
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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}	164625	9409 (2.00-2.00)
Clashscore	180529	10737 (2.00-2.00)
Ramachandran outliers	177936	10628 (2.00-2.00)
Sidechain outliers	177891	10627 (2.00-2.00)
RSRZ outliers	164620	9409 (2.00-2.00)

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	761	 2% 91% 8%
1	B	761	 13% 71% 11% 17%

2 Entry composition i

There are 9 unique types of molecules in this entry. The entry contains 11800 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 Hydrogenase maturation factor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	753	6058	3870	1033	1124	31	0	4	0
1	B	630	5059	3236	867	931	25	0	0	0

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	752	SER	-	expression tag	UNP Q8RDB0
A	753	ALA	-	expression tag	UNP Q8RDB0
A	754	TRP	-	expression tag	UNP Q8RDB0
A	755	SER	-	expression tag	UNP Q8RDB0
A	756	HIS	-	expression tag	UNP Q8RDB0
A	757	PRO	-	expression tag	UNP Q8RDB0
A	758	GLN	-	expression tag	UNP Q8RDB0
A	759	PHE	-	expression tag	UNP Q8RDB0
A	760	GLU	-	expression tag	UNP Q8RDB0
A	761	LYS	-	expression tag	UNP Q8RDB0
B	752	SER	-	expression tag	UNP Q8RDB0
B	753	ALA	-	expression tag	UNP Q8RDB0
B	754	TRP	-	expression tag	UNP Q8RDB0
B	755	SER	-	expression tag	UNP Q8RDB0
B	756	HIS	-	expression tag	UNP Q8RDB0
B	757	PRO	-	expression tag	UNP Q8RDB0
B	758	GLN	-	expression tag	UNP Q8RDB0
B	759	PHE	-	expression tag	UNP Q8RDB0
B	760	GLU	-	expression tag	UNP Q8RDB0
B	761	LYS	-	expression tag	UNP Q8RDB0

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

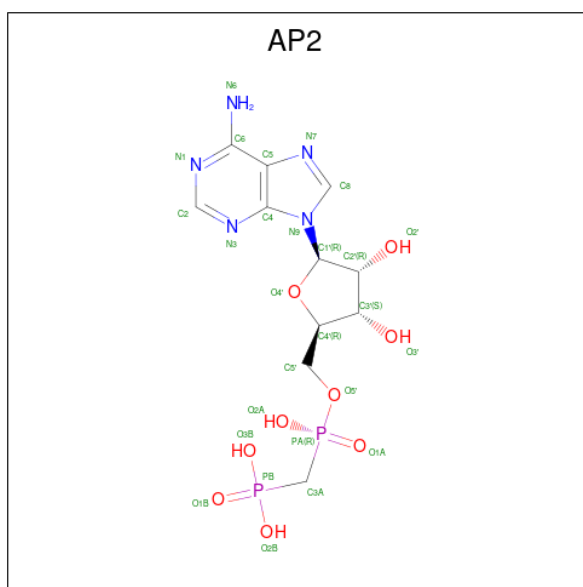
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	2	Total	Zn	0	0
			2	2		
2	B	1	Total	Zn	0	0
			1	1		

- Molecule 3 is PHOSPHATE ION (three-letter code: PO4) (formula: O₄P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	O	P	0	0
			5	4	1		
3	A	1	Total	O	P	0	0
			5	4	1		
3	A	1	Total	O	P	0	0
			5	4	1		
3	A	1	Total	O	P	0	0
			5	4	1		
3	B	1	Total	O	P	0	0
			5	4	1		
3	B	1	Total	O	P	0	0
			5	4	1		

- Molecule 4 is DIPHOSPHOMETHYLPHOSPHONIC ACID ADENOSYL ESTER (three-letter code: APC) (formula: C₁₁H₁₈N₅O₁₂P₃).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	A	1	Total	C	N	O	P	0	0
			27	11	5	9	2		
6	B	1	Total	C	N	O	P	0	0
			27	11	5	9	2		

- Molecule 7 is FE (III) ION (three-letter code: FE) (formula: Fe).

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

- Molecule 8 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).



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

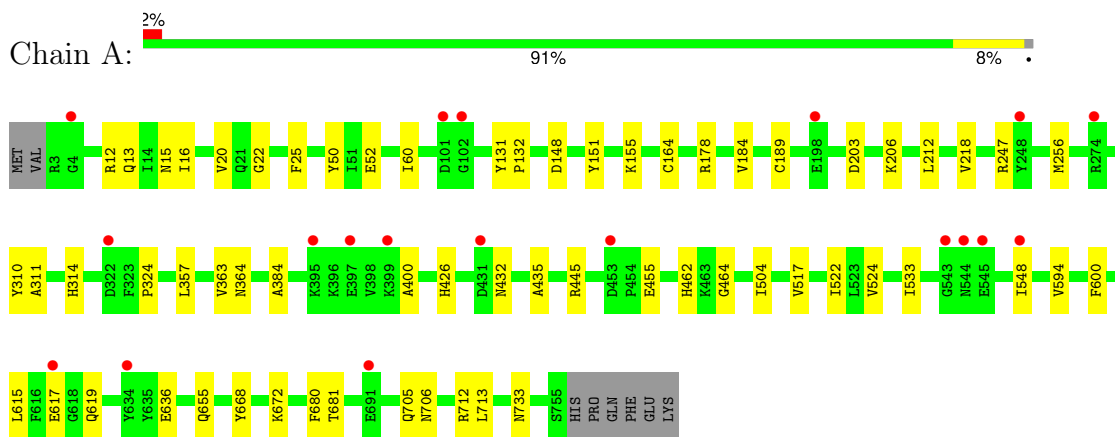
- Molecule 9 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	A	400	Total O 400 400	0	0
9	B	107	Total O 107 107	0	0

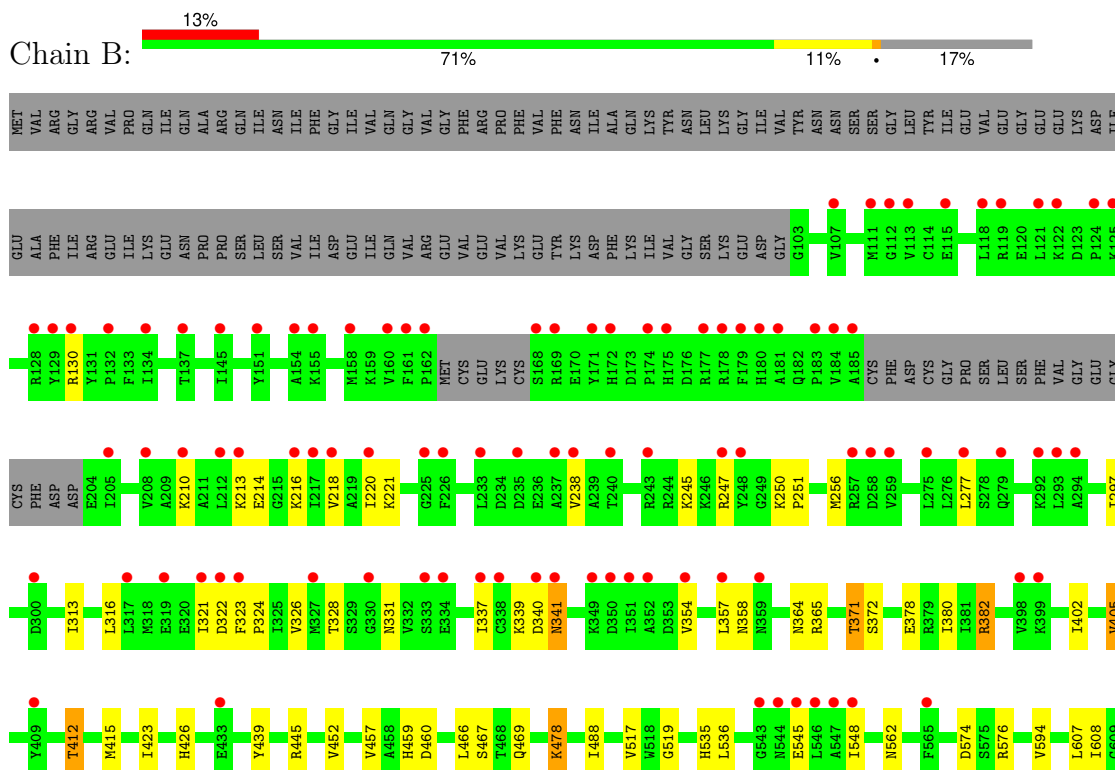
3 Residue-property plots

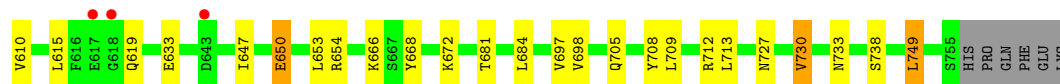
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density.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



- Molecule 1: Hydrogenase maturation factor





4 Data and refinement statistics

Property	Value	Source
Space group	P 64	Depositor
Cell constants a, b, c, α , β , γ	232.98Å 232.98Å 65.67Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	20.00 – 2.00 20.00 – 2.00	Depositor EDS
% Data completeness (in resolution range)	97.0 (20.00-2.00) 96.9 (20.00-2.00)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	5.56 (at 2.00Å)	Xtrriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.209 , 0.238 0.222 , 0.250	Depositor DCC
R_{free} test set	6702 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å ²)	32.6	Xtrriage
Anisotropy	0.185	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 35.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	0.013 for h,-h-k,-l	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	11800	wwPDB-VP
Average B, all atoms (Å ²)	46.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.30% 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: FE, ZN, PO4, MG, GOL, APC, AP2

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	0.56	0/6192	0.61	0/8341
1	B	0.44	0/5161	0.57	0/6952
All	All	0.51	0/11353	0.59	0/15293

There are no bond length outliers.

There are no bond angle outliers.

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	6058	0	6064	45	0
1	B	5059	0	5084	61	0
2	A	2	0	0	0	0
2	B	1	0	0	0	0
3	A	25	0	0	0	0
3	B	10	0	0	0	0
4	A	31	0	14	3	0
4	B	31	0	14	2	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
6	A	27	0	14	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	B	27	0	14	0	0
7	A	1	0	0	0	0
7	B	1	0	0	0	0
8	A	12	0	16	0	0
8	B	6	0	8	0	0
9	A	400	0	0	6	0
9	B	107	0	0	2	0
All	All	11800	0	11228	106	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 5.

All (106) 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:13:GLN:HE21	1:A:15:ASN:HD21	1.20	0.88
1:B:405:VAL:HG22	1:B:439:TYR:OH	1.77	0.84
1:A:636:GLU:H	1:A:655:GLN:HE22	1.28	0.79
1:B:321:ILE:HG13	1:B:322:ASP:H	1.49	0.76
1:A:615:LEU:H	1:A:619:GLN:NE2	1.84	0.76
1:B:321:ILE:HD11	1:B:323:PHE:CZ	2.22	0.74
1:B:615:LEU:H	1:B:619:GLN:HE22	1.35	0.74
1:B:245:LYS:HE3	1:B:331:ASN:O	1.87	0.73
1:B:615:LEU:H	1:B:619:GLN:NE2	1.87	0.71
1:A:615:LEU:H	1:A:619:GLN:HE22	1.40	0.69
1:B:247:ARG:HE	1:B:250:LYS:HB2	1.59	0.67
1:A:247:ARG:HE	4:A:804:APC:H3A2	1.61	0.66
1:B:247:ARG:NH2	1:B:251:PRO:O	2.30	0.65
1:B:371:THR:HG23	1:B:380:ILE:HA	1.79	0.64
1:A:311:ALA:H	1:A:314:HIS:HD2	1.46	0.63
1:B:321:ILE:HG13	1:B:322:ASP:N	2.15	0.62
1:A:636:GLU:N	1:A:655:GLN:HE22	1.98	0.61
1:B:221:LYS:HD3	1:B:358:ASN:CB	2.30	0.61
1:A:462:HIS:HD2	1:A:464:GLY:H	1.46	0.61
1:A:247:ARG:HH21	4:A:804:APC:H3A1	1.67	0.60
1:B:221:LYS:HD3	1:B:358:ASN:HB2	1.84	0.59
1:B:371:THR:HG21	1:B:378:GLU:OE2	2.01	0.59
1:B:727:ASN:HB3	1:B:730:VAL:O	2.03	0.58
1:A:247:ARG:HE	4:A:804:APC:C3A	2.16	0.58
1:B:402:ILE:HD11	1:B:749:LEU:HD13	1.85	0.58
1:B:341:ASN:HD21	1:B:357:LEU:HD13	1.69	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:705:GLN:NE2	1:A:733:ASN:HD22	2.02	0.57
1:A:311:ALA:H	1:A:314:HIS:CD2	2.22	0.57
1:B:371:THR:HG22	1:B:372:SER:H	1.68	0.57
1:B:256:MET:HG2	1:B:324:PRO:HB3	1.86	0.56
1:A:314:HIS:CE1	9:A:1300:HOH:O	2.59	0.56
1:A:712:ARG:HD2	9:A:1023:HOH:O	2.06	0.55
1:B:705:GLN:NE2	1:B:733:ASN:HD22	2.05	0.55
1:B:339:LYS:HB3	1:B:365:ARG:HB3	1.88	0.55
1:B:412:THR:HG22	1:B:738:SER:OG	2.08	0.54
1:A:256:MET:HG2	1:A:324:PRO:HB3	1.90	0.54
1:B:364:ASN:HB3	1:B:445:ARG:NH1	2.23	0.54
1:A:310:TYR:H	1:A:314:HIS:HD2	1.54	0.54
1:B:562:ASN:HD22	1:B:654:ARG:HD3	1.73	0.54
1:B:220:ILE:HD11	1:B:313:ILE:HD12	1.89	0.54
1:A:22:GLY:HA2	1:A:151:TYR:CE1	2.42	0.53
1:A:426:HIS:HD2	9:A:902:HOH:O	1.91	0.53
1:B:405:VAL:HG13	1:B:467:SER:HB2	1.90	0.53
1:B:545:GLU:O	1:B:548:ILE:HG13	2.09	0.53
1:A:178:ARG:HD3	1:A:184:VAL:HG23	1.91	0.52
1:B:214:GLU:HG3	1:B:216:LYS:HG3	1.90	0.52
1:A:504:ILE:HG12	1:A:522:ILE:HD12	1.91	0.51
1:B:574:ASP:OD1	1:B:576:ARG:HG2	2.11	0.51
1:B:459:HIS:HD2	1:B:460:ASP:O	1.92	0.51
1:A:681:THR:HG21	1:A:713:LEU:HD21	1.92	0.51
1:B:328:THR:HG23	4:B:804:APC:O1A	2.11	0.51
1:A:712:ARG:HD3	9:A:1118:HOH:O	2.11	0.51
1:A:400:ALA:HB1	1:A:455:GLU:OE1	2.11	0.51
1:A:462:HIS:CD2	1:A:464:GLY:H	2.27	0.50
1:A:50:TYR:CE1	1:A:52:GLU:HG3	2.47	0.49
1:B:535:HIS:HD2	1:B:536:LEU:O	1.96	0.49
1:A:212:LEU:HD21	1:A:218:VAL:HG22	1.94	0.49
1:B:331:ASN:HD22	1:B:337:ILE:HA	1.77	0.49
1:A:148:ASP:HB3	1:A:155:LYS:HD3	1.94	0.48
1:B:412:THR:HG21	1:B:423:ILE:HD11	1.96	0.48
1:B:668:TYR:CZ	1:B:672:LYS:HD2	2.48	0.48
1:A:524:VAL:HG23	1:A:533:ILE:HG13	1.95	0.48
1:B:382:ARG:HD3	9:B:930:HOH:O	2.11	0.48
1:B:382:ARG:HD2	1:B:426:HIS:CG	2.48	0.47
1:B:633:GLU:OE2	1:B:668:TYR:OH	2.31	0.47
1:B:364:ASN:HB3	1:B:445:ARG:HH11	1.78	0.47
1:A:363:VAL:O	1:A:445:ARG:NH1	2.48	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:310:TYR:H	1:A:314:HIS:CD2	2.32	0.46
1:B:517:VAL:HB	1:B:594:VAL:HG12	1.97	0.46
1:B:238:VAL:HG11	1:B:297:ILE:HD11	1.96	0.46
1:A:364:ASN:HD22	1:A:445:ARG:HH11	1.63	0.46
1:B:415:MET:HE3	1:B:452:VAL:HG21	1.97	0.45
1:B:218:VAL:HG12	1:B:354:VAL:HG23	1.97	0.45
1:B:647:ILE:CD1	1:B:684:LEU:HD11	2.46	0.45
1:B:210:LYS:HA	1:B:213:LYS:HG2	1.97	0.45
1:A:314:HIS:HE1	9:A:1300:HOH:O	1.97	0.45
1:A:426:HIS:HE1	9:A:940:HOH:O	1.99	0.45
1:B:607:LEU:HD12	1:B:653:LEU:HD22	1.99	0.45
1:A:164:CYS:HB3	1:A:189:CYS:HB3	1.98	0.44
1:A:462:HIS:HD2	1:A:464:GLY:N	2.13	0.44
1:B:466:LEU:HD23	1:B:469:GLN:NE2	2.32	0.44
1:B:488:ILE:HG23	1:B:698:VAL:HG22	1.99	0.44
1:B:412:THR:CG2	1:B:738:SER:OG	2.66	0.43
1:B:457:VAL:CG1	1:B:478:LYS:HD3	2.47	0.43
1:A:50:TYR:HE1	1:A:52:GLU:HG3	1.82	0.43
1:B:247:ARG:NH1	4:B:804:APC:O1A	2.52	0.43
1:A:432:ASN:ND2	1:A:435:ALA:H	2.16	0.43
1:A:517:VAL:HB	1:A:594:VAL:HG12	2.00	0.43
1:B:337:ILE:O	1:B:365:ARG:HD3	2.20	0.42
1:B:221:LYS:HD3	1:B:358:ASN:HB3	2.02	0.42
1:B:650:GLU:HG2	9:B:951:HOH:O	2.19	0.42
1:B:708:TYR:CZ	1:B:712:ARG:HD3	2.55	0.42
1:A:706:ASN:HB2	6:A:806:AP2:N1	2.34	0.42
1:B:681:THR:HG21	1:B:713:LEU:HD21	2.00	0.42
1:A:131:TYR:HA	1:A:132:PRO:HD3	1.82	0.41
1:B:130:ARG:HG3	1:B:316:LEU:HD22	2.02	0.41
1:A:548:ILE:HG23	1:A:617:GLU:OE1	2.21	0.41
1:A:206:LYS:HE3	1:A:206:LYS:HB2	1.79	0.41
1:B:562:ASN:ND2	1:B:654:ARG:HD3	2.34	0.41
1:B:382:ARG:HD2	1:B:426:HIS:CE1	2.56	0.41
1:A:668:TYR:CE2	1:A:672:LYS:HD2	2.56	0.41
1:B:245:LYS:CE	1:B:331:ASN:O	2.63	0.41
1:B:608:ILE:HG13	1:B:610:VAL:HG23	2.03	0.41
1:B:608:ILE:O	1:B:666:LYS:HE3	2.21	0.41
1:A:16:ILE:HG22	1:A:20:VAL:HG11	2.03	0.40
1:A:12:ARG:HG3	1:A:60:ILE:HG21	2.02	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	755/761 (99%)	729 (97%)	25 (3%)	1 (0%)	48	47
1	B	624/761 (82%)	598 (96%)	25 (4%)	1 (0%)	44	42
All	All	1379/1522 (91%)	1327 (96%)	50 (4%)	2 (0%)	48	47

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	384	ALA
1	B	519	GLY

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	657/661 (99%)	652 (99%)	5 (1%)	79	84
1	B	545/661 (82%)	531 (97%)	14 (3%)	41	44
All	All	1202/1322 (91%)	1183 (98%)	19 (2%)	58	64

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	25	PHE
1	A	203	ASP
1	A	357	LEU
1	A	600	PHE

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Mol	Chain	Res	Type
1	A	680	PHE
1	B	277	LEU
1	B	326	VAL
1	B	340	ASP
1	B	341	ASN
1	B	371	THR
1	B	382	ARG
1	B	405	VAL
1	B	412	THR
1	B	478	LYS
1	B	650	GLU
1	B	697	VAL
1	B	709	LEU
1	B	730	VAL
1	B	749	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (27) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	15	ASN
1	A	34	GLN
1	A	44	ASN
1	A	70	ASN
1	A	314	HIS
1	A	364	ASN
1	A	411	ASN
1	A	426	HIS
1	A	432	ASN
1	A	437	ASN
1	A	462	HIS
1	A	562	ASN
1	A	619	GLN
1	A	655	GLN
1	A	705	GLN
1	A	727	ASN
1	B	331	ASN
1	B	341	ASN
1	B	364	ASN
1	B	459	HIS
1	B	516	ASN
1	B	535	HIS
1	B	562	ASN

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Mol	Chain	Res	Type
1	B	619	GLN
1	B	675	ASN
1	B	705	GLN
1	B	727	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 21 ligands modelled in this entry, 7 are monoatomic - leaving 14 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
3	PO4	B	803	-	4,4,4	0.82	0	6,6,6	0.51	0
3	PO4	A	810	-	4,4,4	0.88	0	6,6,6	0.51	0
3	PO4	A	803	-	4,4,4	0.99	0	6,6,6	0.54	0
8	GOL	A	813	-	5,5,5	0.34	0	5,5,5	0.22	0
6	AP2	A	806	7	22,29,29	1.17	4 (18%)	26,45,45	1.93	8 (30%)
3	PO4	A	808	-	4,4,4	1.03	0	6,6,6	0.46	0
4	APC	B	804	5	25,33,33	1.23	3 (12%)	30,52,52	1.38	5 (16%)
3	PO4	A	809	-	4,4,4	0.88	0	6,6,6	0.67	0
6	AP2	B	806	7	22,29,29	1.11	3 (13%)	26,45,45	1.76	6 (23%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
8	GOL	B	801	-	5,5,5	0.42	0	5,5,5	0.59	0
4	APC	A	804	5	25,33,33	1.22	2 (8%)	30,52,52	1.36	3 (10%)
8	GOL	A	812	-	5,5,5	0.34	0	5,5,5	0.60	0
3	PO4	A	811	-	4,4,4	0.87	0	6,6,6	0.57	0
3	PO4	B	808	-	4,4,4	1.06	0	6,6,6	0.57	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
8	GOL	A	813	-	-	0/4/4/4	-
6	AP2	A	806	7	-	0/12/32/32	0/3/3/3
4	APC	B	804	5	-	4/15/38/38	0/3/3/3
6	AP2	B	806	7	-	1/12/32/32	0/3/3/3
8	GOL	B	801	-	-	0/4/4/4	-
4	APC	A	804	5	-	4/15/38/38	0/3/3/3
8	GOL	A	812	-	-	2/4/4/4	-

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	804	APC	PB-O3B	3.52	1.62	1.58
4	A	804	APC	PA-O2A	-3.02	1.49	1.56
4	A	804	APC	PB-O3B	2.63	1.61	1.58
6	B	806	AP2	O4'-C1'	2.29	1.43	1.40
6	B	806	AP2	C2-N3	2.26	1.35	1.32
4	B	804	APC	PA-O2A	-2.24	1.50	1.56
6	A	806	AP2	O4'-C1'	2.24	1.43	1.40
6	A	806	AP2	C2-N3	2.22	1.35	1.32
6	A	806	AP2	PB-O2B	-2.12	1.50	1.55
4	B	804	APC	PB-O2B	-2.12	1.51	1.56
6	B	806	AP2	PA-O2A	-2.10	1.51	1.56
6	A	806	AP2	PA-O2A	-2.05	1.51	1.56

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	806	AP2	N3-C2-N1	-4.22	122.94	128.67
6	A	806	AP2	O1B-PB-C3A	-4.16	102.30	111.37

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	B	806	AP2	N3-C2-N1	-4.09	123.11	128.67
4	B	804	APC	N3-C2-N1	-3.94	123.32	128.67
4	A	804	APC	N3-C2-N1	-3.71	123.64	128.67
6	B	806	AP2	O1B-PB-C3A	-3.40	103.95	111.37
6	A	806	AP2	O1A-PA-C3A	-3.17	100.71	109.05
6	B	806	AP2	O4'-C1'-N9	3.07	112.81	108.75
6	A	806	AP2	O4'-C1'-N9	3.04	112.78	108.75
6	A	806	AP2	O2A-PA-O1A	2.94	119.52	109.95
6	B	806	AP2	O1A-PA-C3A	-2.92	101.36	109.05
6	B	806	AP2	C4-C5-N7	-2.78	106.40	109.34
6	B	806	AP2	O2A-PA-O1A	2.58	118.34	109.95
4	A	804	APC	C1'-N9-C4	-2.53	122.19	126.64
6	A	806	AP2	O3B-PB-O2B	2.44	114.92	107.96
4	B	804	APC	O2B-PB-O1B	2.37	117.66	109.95
6	A	806	AP2	O2A-PA-C3A	2.29	116.21	106.73
6	A	806	AP2	C4-C5-N7	-2.26	106.94	109.34
4	B	804	APC	C4-C5-N7	-2.25	106.95	109.34
4	A	804	APC	O4'-C1'-N9	2.24	111.71	108.75
4	B	804	APC	PB-O3B-PG	-2.14	124.77	132.45
4	B	804	APC	O2A-PA-O1A	2.10	116.77	109.95

There are no chirality outliers.

All (11) torsion outliers are listed below:

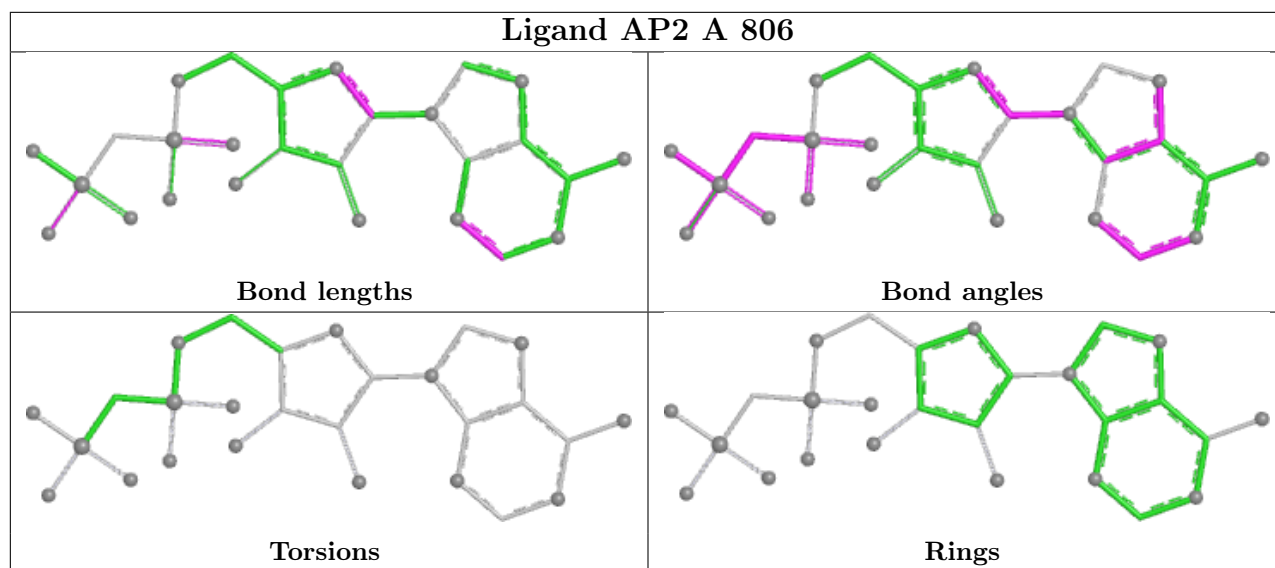
Mol	Chain	Res	Type	Atoms
4	A	804	APC	PA-C3A-PB-O2B
4	A	804	APC	PA-C3A-PB-O3B
4	B	804	APC	PA-C3A-PB-O1B
4	B	804	APC	PA-C3A-PB-O2B
4	B	804	APC	PA-C3A-PB-O3B
4	B	804	APC	C5'-O5'-PA-O2A
8	A	812	GOL	C1-C2-C3-O3
8	A	812	GOL	O2-C2-C3-O3
6	B	806	AP2	C5'-O5'-PA-C3A
4	A	804	APC	PA-C3A-PB-O1B
4	A	804	APC	C5'-O5'-PA-O1A

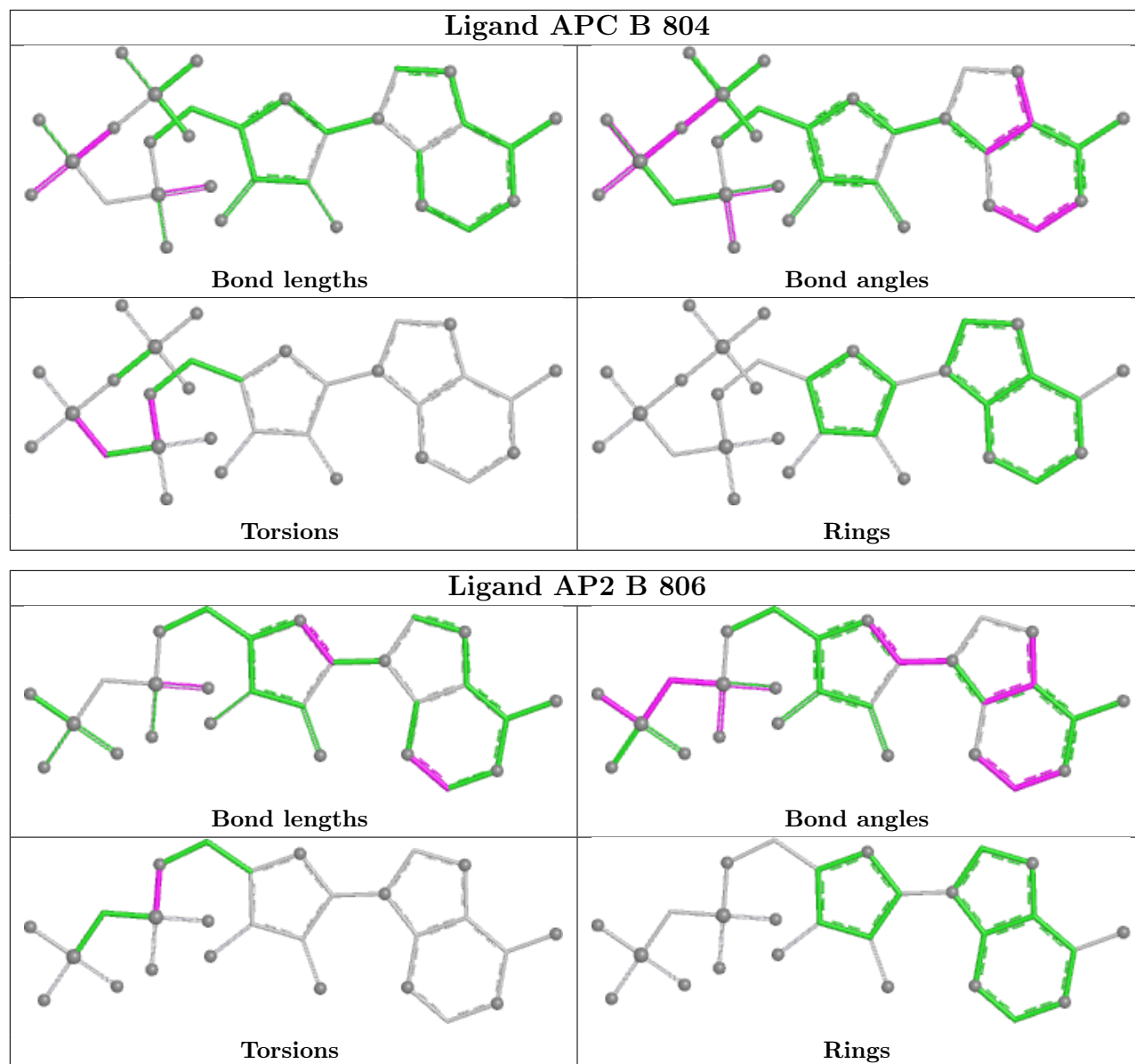
There are no ring outliers.

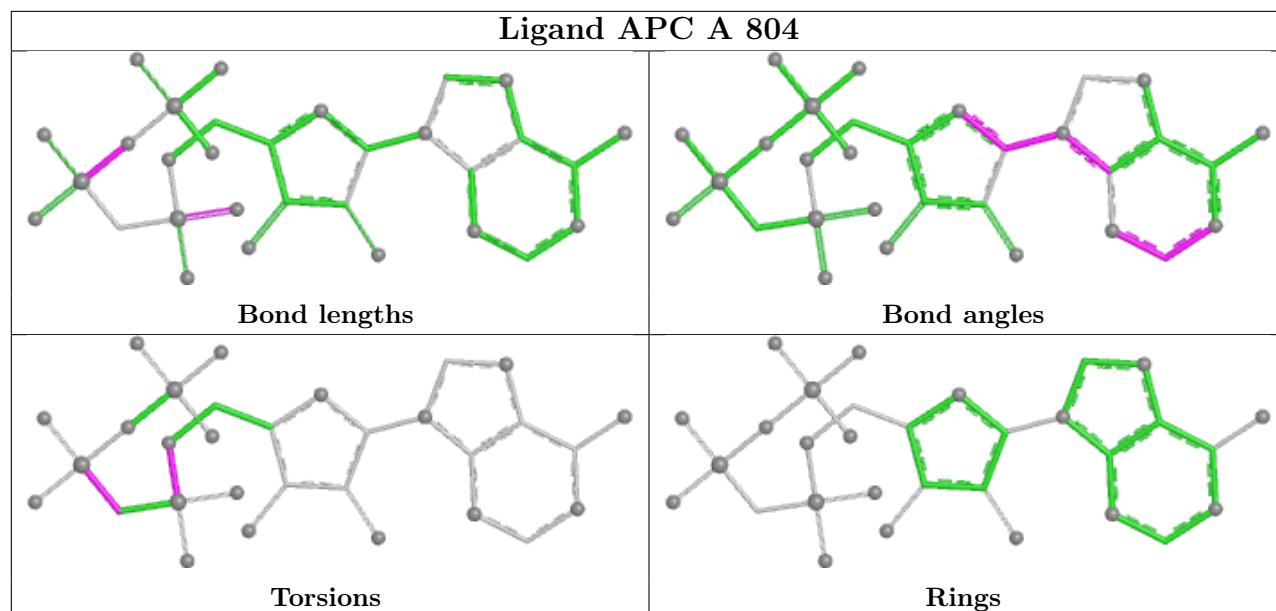
3 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	806	AP2	1	0
4	B	804	APC	2	0
4	A	804	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.







5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	753/761 (98%)	-0.12	19 (2%) 58 57	18, 33, 49, 70	4 (0%)
1	B	630/761 (82%)	0.76	102 (16%) 5 5	27, 56, 118, 149	0
All	All	1383/1522 (90%)	0.28	121 (8%) 17 16	18, 39, 105, 149	4 (0%)

All (121) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	185	ALA	6.1
1	B	168	SER	4.6
1	B	134	ILE	4.3
1	B	184	VAL	4.3
1	B	248	TYR	4.2
1	A	543	GLY	3.9
1	B	115	GLU	3.9
1	B	399	LYS	3.8
1	B	238	VAL	3.8
1	B	547	ALA	3.7
1	B	162	PRO	3.7
1	B	546	LEU	3.5
1	B	217	ILE	3.5
1	B	169	ARG	3.5
1	B	277	LEU	3.4
1	B	350	ASP	3.4
1	B	220	ILE	3.3
1	B	122	LYS	3.3
1	B	178	ARG	3.3
1	A	322	ASP	3.3
1	B	293	LEU	3.3
1	B	179	PHE	3.3
1	B	247	ARG	3.3
1	B	237	ALA	3.2

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Mol	Chain	Res	Type	RSRZ
1	B	323	PHE	3.2
1	A	548	ILE	3.2
1	B	125	LYS	3.1
1	B	174	PRO	3.1
1	B	154	ALA	3.1
1	B	543	GLY	3.0
1	B	171	TYR	3.0
1	A	544	ASN	3.0
1	B	128	ARG	2.9
1	B	155	LYS	2.9
1	A	4	GLY	2.9
1	B	327	MET	2.8
1	B	118	LEU	2.8
1	B	145	ILE	2.8
1	B	107	VAL	2.8
1	B	240	THR	2.7
1	B	113	VAL	2.7
1	B	161	PHE	2.7
1	B	548	ILE	2.7
1	B	177	ARG	2.7
1	A	397	GLU	2.7
1	B	545	GLU	2.7
1	B	565	PHE	2.7
1	B	333	SER	2.6
1	B	354	VAL	2.6
1	A	399	LYS	2.6
1	B	205	ILE	2.6
1	B	111	MET	2.6
1	B	119	ARG	2.6
1	B	160	VAL	2.6
1	B	181	ALA	2.6
1	B	259	VAL	2.6
1	B	617	GLU	2.6
1	A	453	ASP	2.6
1	B	340	ASP	2.6
1	B	349	LYS	2.6
1	A	691	GLU	2.6
1	B	317	LEU	2.6
1	B	210	LYS	2.5
1	B	341	ASN	2.5
1	A	102	GLY	2.5
1	B	330	GLY	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	431	ASP	2.5
1	B	337	ILE	2.5
1	B	294	ALA	2.5
1	B	124	PRO	2.5
1	A	545	GLU	2.5
1	B	292	LYS	2.5
1	B	130	ARG	2.5
1	B	258	ASP	2.4
1	B	351	ILE	2.4
1	B	398	VAL	2.4
1	B	352	ALA	2.4
1	B	180	HIS	2.4
1	B	175	HIS	2.3
1	B	216	LYS	2.3
1	A	274	ARG	2.3
1	B	279	GLN	2.3
1	B	226	PHE	2.3
1	B	151	TYR	2.3
1	B	319	GLU	2.3
1	B	409	TYR	2.3
1	B	121	LEU	2.3
1	B	137	THR	2.3
1	B	158	MET	2.3
1	B	208	VAL	2.3
1	B	235	ASP	2.3
1	B	300	ASP	2.3
1	B	544	ASN	2.3
1	B	338	CYS	2.3
1	B	183	PRO	2.3
1	B	218	VAL	2.3
1	B	359	ASN	2.3
1	B	334	GLU	2.2
1	B	212	LEU	2.2
1	A	248	TYR	2.2
1	B	172	HIS	2.2
1	B	321	ILE	2.1
1	B	213	LYS	2.1
1	B	643	ASP	2.1
1	B	257	ARG	2.1
1	B	225	GLY	2.1
1	A	198	GLU	2.1
1	B	433	GLU	2.1

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Mol	Chain	Res	Type	RSRZ
1	B	129	TYR	2.1
1	B	132	PRO	2.1
1	B	233	LEU	2.1
1	B	275	LEU	2.1
1	A	617	GLU	2.1
1	B	243	ARG	2.1
1	B	357	LEU	2.1
1	B	618	GLY	2.0
1	A	634	TYR	2.0
1	A	101	ASP	2.0
1	B	322	ASP	2.0
1	B	112	GLY	2.0
1	A	395	LYS	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.

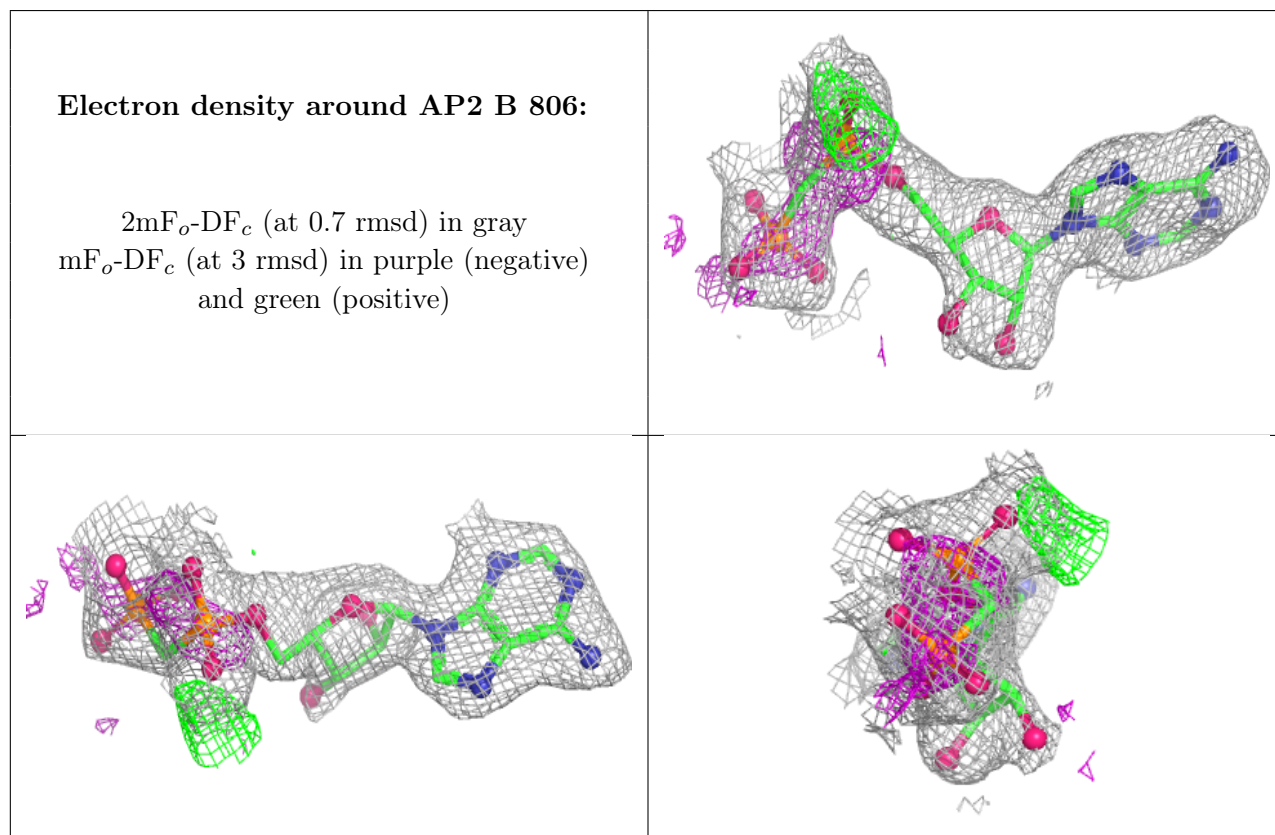
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
5	MG	B	805	1/1	0.61	0.20	86,86,86,86	0
3	PO4	A	809	5/5	0.67	0.14	70,71,72,72	0
3	PO4	A	811	5/5	0.74	0.13	83,83,84,84	0
3	PO4	B	803	5/5	0.80	0.12	60,60,60,61	0
3	PO4	A	810	5/5	0.80	0.17	58,58,60,61	0
5	MG	A	805	1/1	0.86	0.11	45,45,45,45	0
6	AP2	B	806	27/27	0.87	0.12	45,53,56,57	0
3	PO4	A	808	5/5	0.88	0.12	51,51,54,54	0
8	GOL	A	812	6/6	0.89	0.09	37,39,43,47	0
4	APC	B	804	31/31	0.90	0.10	55,59,72,74	0

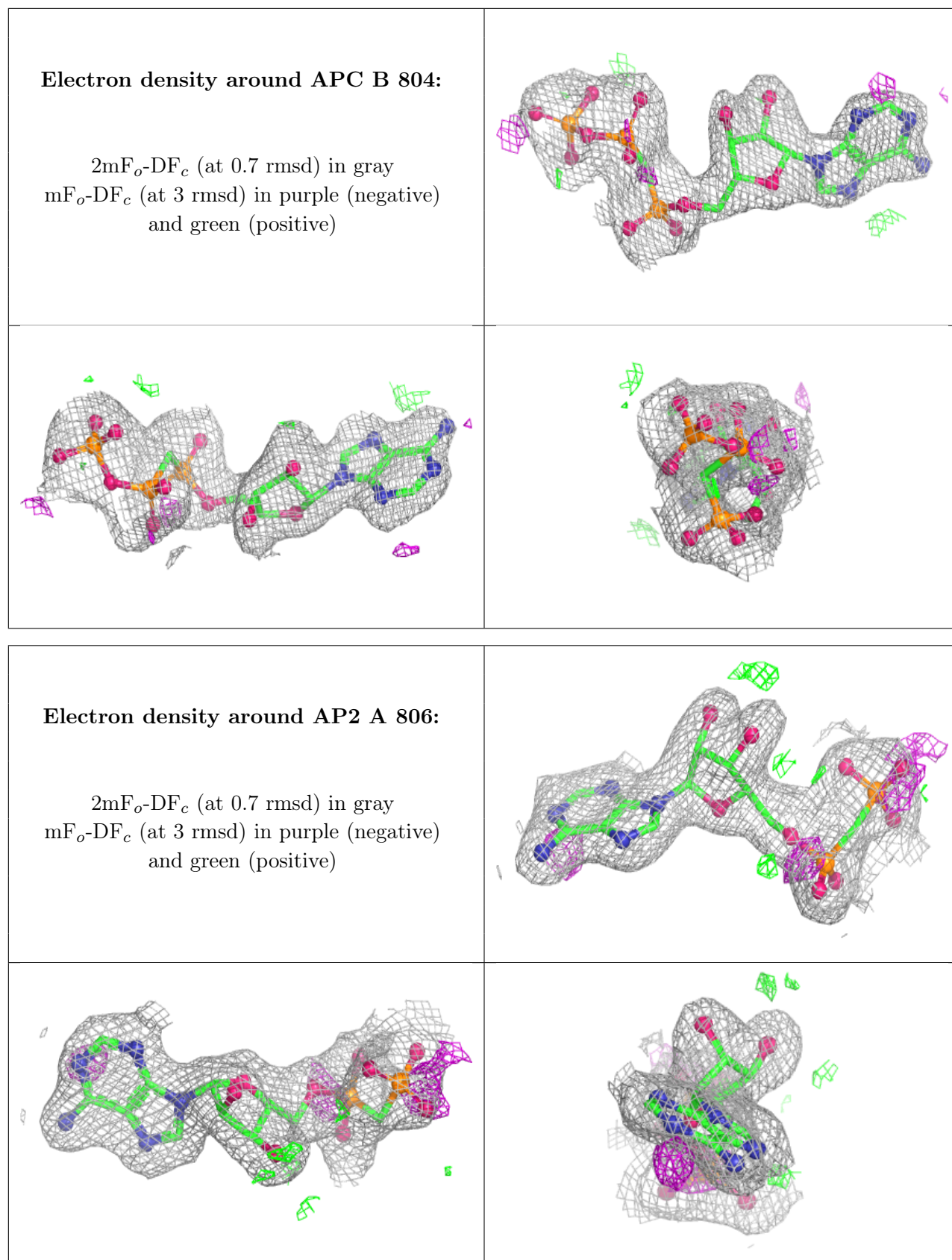
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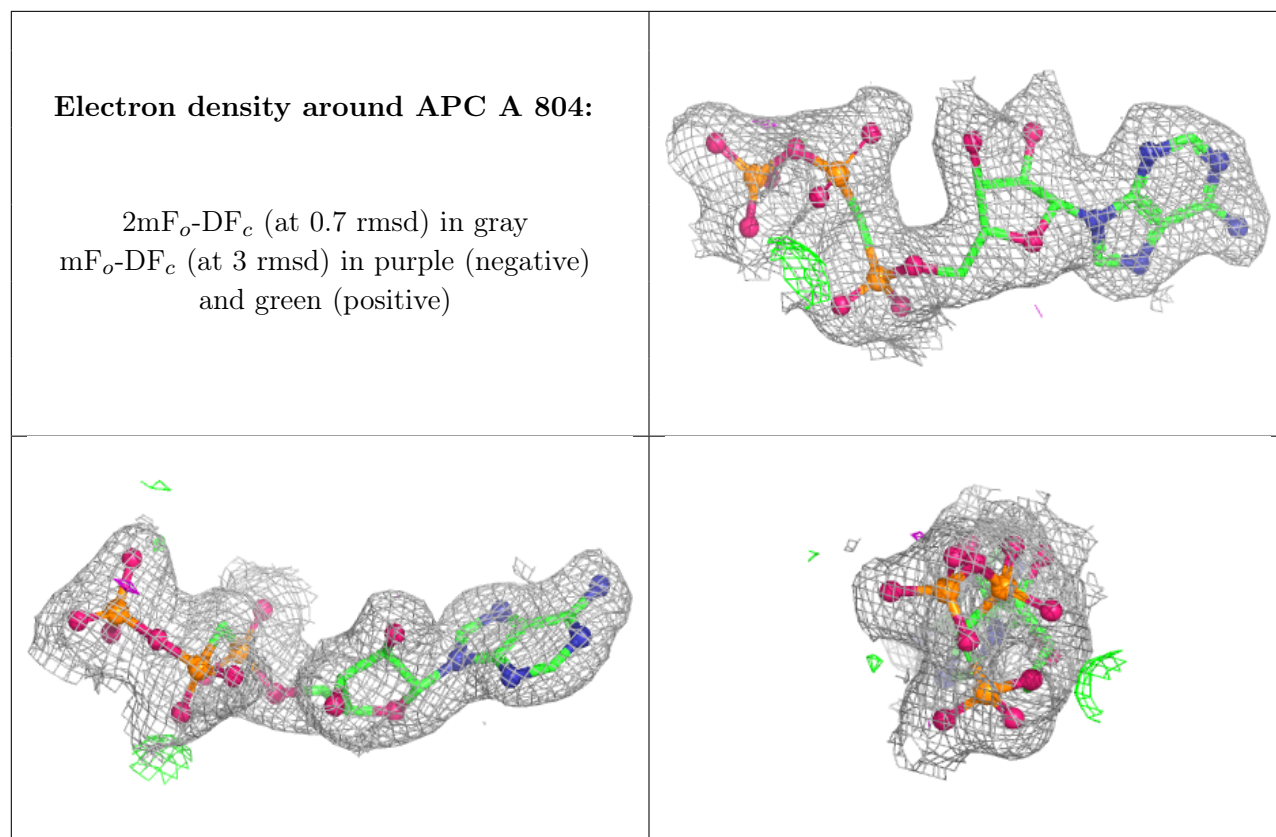
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
3	PO4	B	808	5/5	0.92	0.09	58,58,59,59	0
8	GOL	B	801	6/6	0.92	0.08	27,30,31,31	0
6	AP2	A	806	27/27	0.93	0.09	29,37,39,40	0
8	GOL	A	813	6/6	0.95	0.07	30,32,33,34	0
4	APC	A	804	31/31	0.97	0.05	28,32,35,37	0
3	PO4	A	803	5/5	0.98	0.05	23,24,26,27	0
2	ZN	B	802	1/1	0.98	0.05	97,97,97,97	0
7	FE	B	807	1/1	1.00	0.03	37,37,37,37	0
2	ZN	A	801	1/1	1.00	0.01	27,27,27,27	0
2	ZN	A	802	1/1	1.00	0.03	35,35,35,35	0
7	FE	A	807	1/1	1.00	0.03	27,27,27,27	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.