WORLDWIDE PDB PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

Apr 22, 2024 – 04:05 PM EDT

PDB ID	:	8W3X
Title	:	Crystal structure of IRAK4 in complex with compound 6
Authors	:	Han, S.; Knafels, J.D.
Deposited on	:	2024-02-22
Resolution	:	1.76 Å(reported)

The following versions of software and data (see references ⓘ) were used in the production of this report:

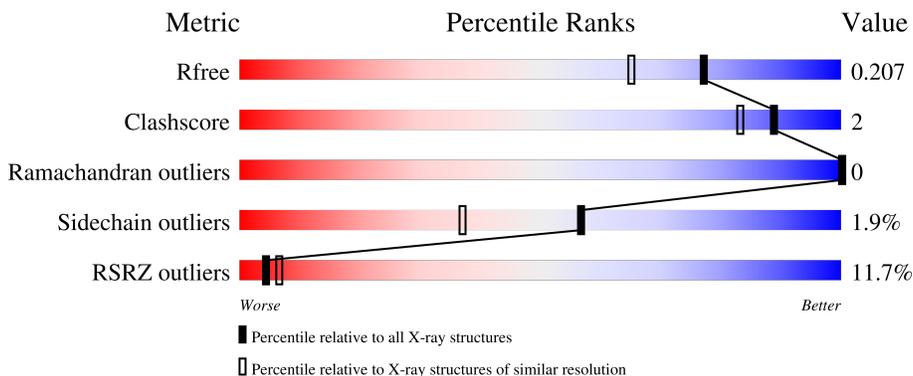|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36.2
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

1   Overall quality at a glance ⓘ

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

The reported resolution of this entry is 1.76 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	Percentile Ranks	Value
Rfree		0.207
Clashscore		2
Ramachandran outliers		0
Sidechain outliers		1.9%
RSRZ outliers		11.7%

Worse   *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	2340 (1.76-1.76)
Clashscore	141614	2466 (1.76-1.76)
Ramachandran outliers	138981	2437 (1.76-1.76)
Sidechain outliers	138945	2437 (1.76-1.76)
RSRZ outliers	127900	2298 (1.76-1.76)

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	A	323	12% 85% 5% 11%
1	B	323	14% 84% 5% 11%
1	C	323	8% 81% 8% 11%
1	D	323	8% 81% 8% 11%

W O R L D W I D E
wwPDB
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2   Entry composition ⓘ

There are 3 unique types of molecules in this entry. The entry contains 10012 atoms, of which 76 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 Interleukin-1 receptor-associated kinase 4.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	289	Total	C	N	O	P	S	0	0	0
			2280	1425	383	455	3	14			
1	B	289	Total	C	N	O	P	S	0	2	0
			2288	1431	383	456	3	15			
1	C	288	Total	C	N	O	P	S	0	0	0
			2276	1425	383	451	3	14			
1	D	287	Total	C	N	O	P	S	0	0	0
			2268	1419	381	451	3	14			

There are 64 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	138	MET	-	initiating methionine	UNP Q9NWZ3
A	139	HIS	-	expression tag	UNP Q9NWZ3
A	140	HIS	-	expression tag	UNP Q9NWZ3
A	141	HIS	-	expression tag	UNP Q9NWZ3
A	142	HIS	-	expression tag	UNP Q9NWZ3
A	143	HIS	-	expression tag	UNP Q9NWZ3
A	144	HIS	-	expression tag	UNP Q9NWZ3
A	145	GLY	-	expression tag	UNP Q9NWZ3
A	146	GLY	-	expression tag	UNP Q9NWZ3
A	147	GLU	-	expression tag	UNP Q9NWZ3
A	148	ASN	-	expression tag	UNP Q9NWZ3
A	149	LEU	-	expression tag	UNP Q9NWZ3
A	150	TYR	-	expression tag	UNP Q9NWZ3
A	151	PHE	-	expression tag	UNP Q9NWZ3
A	152	GLN	-	expression tag	UNP Q9NWZ3
A	153	GLY	-	expression tag	UNP Q9NWZ3
B	138	MET	-	initiating methionine	UNP Q9NWZ3
B	139	HIS	-	expression tag	UNP Q9NWZ3
B	140	HIS	-	expression tag	UNP Q9NWZ3
B	141	HIS	-	expression tag	UNP Q9NWZ3
B	142	HIS	-	expression tag	UNP Q9NWZ3

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Chain	Residue	Modelled	Actual	Comment	Reference
B	143	HIS	-	expression tag	UNP Q9NWZ3
B	144	HIS	-	expression tag	UNP Q9NWZ3
B	145	GLY	-	expression tag	UNP Q9NWZ3
B	146	GLY	-	expression tag	UNP Q9NWZ3
B	147	GLU	-	expression tag	UNP Q9NWZ3
B	148	ASN	-	expression tag	UNP Q9NWZ3
B	149	LEU	-	expression tag	UNP Q9NWZ3
B	150	TYR	-	expression tag	UNP Q9NWZ3
B	151	PHE	-	expression tag	UNP Q9NWZ3
B	152	GLN	-	expression tag	UNP Q9NWZ3
B	153	GLY	-	expression tag	UNP Q9NWZ3
C	138	MET	-	initiating methionine	UNP Q9NWZ3
C	139	HIS	-	expression tag	UNP Q9NWZ3
C	140	HIS	-	expression tag	UNP Q9NWZ3
C	141	HIS	-	expression tag	UNP Q9NWZ3
C	142	HIS	-	expression tag	UNP Q9NWZ3
C	143	HIS	-	expression tag	UNP Q9NWZ3
C	144	HIS	-	expression tag	UNP Q9NWZ3
C	145	GLY	-	expression tag	UNP Q9NWZ3
C	146	GLY	-	expression tag	UNP Q9NWZ3
C	147	GLU	-	expression tag	UNP Q9NWZ3
C	148	ASN	-	expression tag	UNP Q9NWZ3
C	149	LEU	-	expression tag	UNP Q9NWZ3
C	150	TYR	-	expression tag	UNP Q9NWZ3
C	151	PHE	-	expression tag	UNP Q9NWZ3
C	152	GLN	-	expression tag	UNP Q9NWZ3
C	153	GLY	-	expression tag	UNP Q9NWZ3
D	138	MET	-	initiating methionine	UNP Q9NWZ3
D	139	HIS	-	expression tag	UNP Q9NWZ3
D	140	HIS	-	expression tag	UNP Q9NWZ3
D	141	HIS	-	expression tag	UNP Q9NWZ3
D	142	HIS	-	expression tag	UNP Q9NWZ3
D	143	HIS	-	expression tag	UNP Q9NWZ3
D	144	HIS	-	expression tag	UNP Q9NWZ3
D	145	GLY	-	expression tag	UNP Q9NWZ3
D	146	GLY	-	expression tag	UNP Q9NWZ3
D	147	GLU	-	expression tag	UNP Q9NWZ3
D	148	ASN	-	expression tag	UNP Q9NWZ3
D	149	LEU	-	expression tag	UNP Q9NWZ3
D	150	TYR	-	expression tag	UNP Q9NWZ3
D	151	PHE	-	expression tag	UNP Q9NWZ3
D	152	GLN	-	expression tag	UNP Q9NWZ3

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Chain	Residue	Modelled	Actual	Comment	Reference
D	153	GLY	-	expression tag	UNP Q9NWZ3

- Molecule 2 is 7-ethoxy-1-{[(2S)-5-oxopyrrolidin-2-yl]methoxy}isoquinoline-6-carboxami de (three-letter code: A1AFH) (formula: $C_{17}H_{19}N_3O_4$) (labeled as "Ligand of Interest" by depositor).
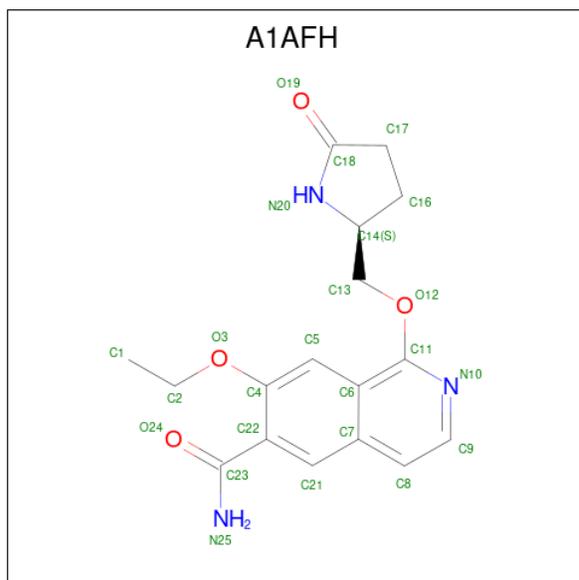
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	H	N	O	19	0
			43	17	19	3	4		
2	B	1	Total	C	H	N	O	19	0
			43	17	19	3	4		
2	C	1	Total	C	H	N	O	19	0
			43	17	19	3	4		
2	D	1	Total	C	H	N	O	19	0
			43	17	19	3	4		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	170	Total	O	0	0
			170	170		
3	B	162	Total	O	0	0
			162	162		
3	C	183	Total	O	0	0
			183	183		
3	D	213	Total	O	0	0
			213	213		

# 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.
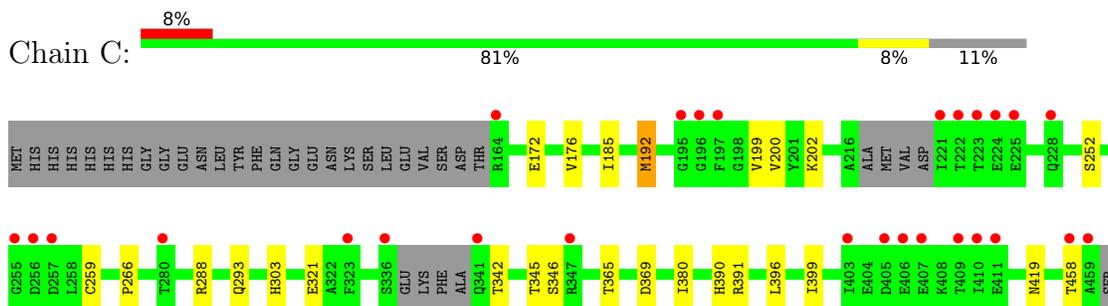
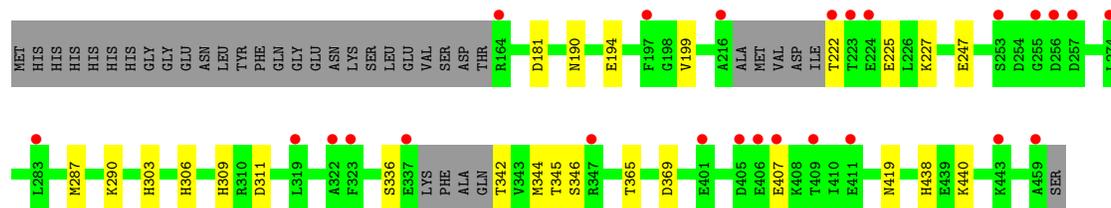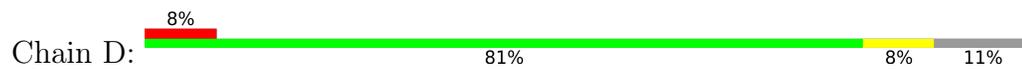- Molecule 1: Interleukin-1 receptor-associated kinase 4
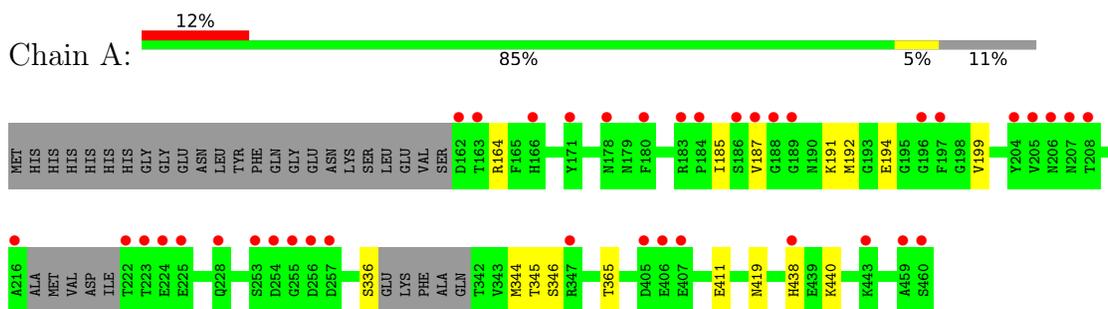
Chain A:

- Molecule 1: Interleukin-1 receptor-associated kinase 4

Chain B:

- Molecule 1: Interleukin-1 receptor-associated kinase 4

Chain C:

- Molecule 1: Interleukin-1 receptor-associated kinase 4

Chain D:
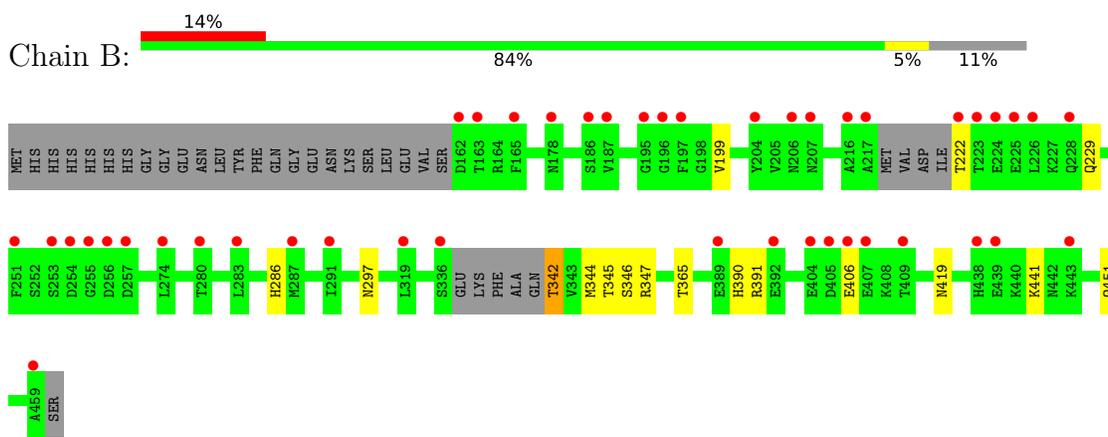
4 Data and refinement statistics   (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	142.61Å 140.11Å 87.84Å 90.00° 124.67° 90.00°	Depositor
Resolution (Å)	48.94 – 1.76 48.94 – 1.77	Depositor EDS
% Data completeness (in resolution range)	92.0 (48.94-1.76) 92.1 (48.94-1.77)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.31 (at 1.76Å)	Xtriage
Refinement program	BUSTER 2.11.8 (22-FEB-2023)	Depositor
R, R_{free}	0.190 , 0.212 0.183 , 0.207	Depositor DCC
R_{free} test set	6272 reflections (4.91%)	wwPDB-VP
Wilson B-factor (Å^2)	29.4	Xtriage
Anisotropy	0.015	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 48.3	EDS
L-test for twinning[2]	$< \|L\| > = 0.50, < L^2 > = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	10012	wwPDB-VP
Average B, all atoms (Å^2)	37.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 12.93% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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: TPO, A1AFH, SEP

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	0.43	0/2284	0.55	0/3077
1	B	0.44	0/2300	0.57	1/3098 (0.0%)
1	C	0.45	1/2279 (0.0%)	0.55	0/3068
1	D	0.46	0/2272	0.56	0/3060
All	All	0.44	1/9135 (0.0%)	0.56	1/12303 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	192	MET	SD-CE	-5.59	1.46	1.77

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	344	MET	CB-CG-SD	5.33	128.40	112.40

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	2280	0	2236	5	0
1	B	2288	0	2247	7	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	2276	0	2236	16	0
1	D	2268	0	2226	9	0
2	A	24	19	0	0	0
2	B	24	19	0	0	0
2	C	24	19	0	0	0
2	D	24	19	0	0	0
3	A	170	0	0	0	0
3	B	162	0	0	0	0
3	C	183	0	0	0	0
3	D	213	0	0	0	0
All	All	9936	76	8945	34	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 2.

All (34) 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:C:185:ILE:HD12	1:C:192:MET:HG2	1.40	1.04
1:C:185:ILE:CD1	1:C:192:MET:HG2	2.02	0.88
1:C:266:PRO:HG2	1:C:321:GLU:HG3	1.60	0.84
1:D:309:HIS:HD2	1:D:311:ASP:H	1.46	0.64
1:C:192:MET:HE2	1:C:200:VAL:HG12	1.79	0.64
1:B:297:ASN:HD22	1:B:451:GLN:HE21	1.44	0.64
1:B:297:ASN:ND2	1:B:451:GLN:HE21	1.96	0.63
1:C:192:MET:CE	1:C:200:VAL:HG12	2.29	0.62
1:B:229:GLN:NE2	1:B:347:ARG:HH22	1.98	0.61
1:C:185:ILE:HD11	1:C:202:LYS:HB2	1.84	0.60
1:B:286:HIS:HE1	1:D:247:GLU:OE2	1.88	0.57
1:D:303:HIS:HE1	1:D:369:ASP:OD2	1.88	0.57
1:A:191:LYS:HE3	1:A:194:GLU:HG3	1.85	0.56
1:C:303:HIS:HE1	1:C:369:ASP:OD2	1.88	0.56
1:D:194:GLU:HG2	1:D:199:VAL:HG22	1.91	0.53
1:A:438:HIS:HD2	1:A:440:LYS:H	1.59	0.51
1:C:172:GLU:O	1:C:176:VAL:HG13	2.13	0.49
1:C:266:PRO:HG2	1:C:321:GLU:CG	2.37	0.49
1:D:438:HIS:HD2	1:D:440:LYS:H	1.60	0.48
1:A:194:GLU:HG2	1:A:199:VAL:HG22	1.95	0.48
1:D:222:THR:HG22	1:D:225:GLU:H	1.77	0.47
1:B:390:HIS:O	1:C:391:ARG:HA	2.15	0.47
1:A:185:ILE:HD12	1:A:192:MET:HG2	1.97	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:293:GLN:HE22	1:C:458:THR:CG2	2.29	0.46
1:C:252:SER:HB3	1:C:259:CYS:HB2	1.97	0.46
1:D:306:HIS:HB3	1:D:336:SER:O	2.16	0.45
1:D:181:ASP:HB3	1:D:190:ASN:HD22	1.82	0.44
1:C:293:GLN:HE22	1:C:458:THR:HG21	1.83	0.43
1:A:187:VAL:HG22	1:A:187:VAL:O	2.19	0.43
1:C:396:LEU:O	1:C:399:ILE:HB	2.19	0.42
1:B:391:ARG:HA	1:C:390:HIS:O	2.20	0.42
1:D:287:MET:HE3	1:D:290:LYS:HB2	2.02	0.41
1:C:288:ARG:HB3	1:C:380:ILE:HG23	2.03	0.40
1:B:342:TPO:O1P	1:B:441:LYS:HE3	2.21	0.40

There are no symmetry-related clashes.

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	281/323 (87%)	275 (98%)	6 (2%)	0	100	100
1	B	283/323 (88%)	274 (97%)	9 (3%)	0	100	100
1	C	279/323 (86%)	274 (98%)	5 (2%)	0	100	100
1	D	279/323 (86%)	274 (98%)	5 (2%)	0	100	100
All	All	1122/1292 (87%)	1097 (98%)	25 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	249/278 (90%)	243 (98%)	6 (2%)	49	26
1	B	250/278 (90%)	245 (98%)	5 (2%)	55	34
1	C	248/278 (89%)	245 (99%)	3 (1%)	71	56
1	D	247/278 (89%)	242 (98%)	5 (2%)	55	34
All	All	994/1112 (89%)	975 (98%)	19 (2%)	57	37

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

Mol	Chain	Res	Type
1	A	164	ARG
1	A	336	SER
1	A	344	MET
1	A	365	THR
1	A	411	GLU
1	A	419	ASN
1	B	199	VAL
1	B	222	THR
1	B	365	THR
1	B	406	GLU
1	B	419	ASN
1	C	199	VAL
1	C	365	THR
1	C	419	ASN
1	D	227	LYS
1	D	344	MET
1	D	365	THR
1	D	407	GLU
1	D	419	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (25) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	190	ASN
1	A	305	ASN
1	A	419	ASN
1	A	438	HIS
1	B	190	ASN
1	B	206	ASN

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Mol	Chain	Res	Type
1	B	229	GLN
1	B	286	HIS
1	B	293	GLN
1	B	297	ASN
1	B	305	ASN
1	B	419	ASN
1	B	455	GLN
1	C	175	ASN
1	C	303	HIS
1	C	305	ASN
1	C	394	GLN
1	C	419	ASN
1	D	190	ASN
1	D	303	HIS
1	D	305	ASN
1	D	309	HIS
1	D	394	GLN
1	D	419	ASN
1	D	438	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

12 non-standard protein/DNA/RNA residues 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	#$|Z| > 2$
1	TPO	D	345	1	8,10,11	0.90	0	10,14,16	1.29	1 (10%)
1	TPO	B	342	1	8,10,11	1.13	1 (12%)	10,14,16	1.78	1 (10%)
1	SEP	D	346	1	8,9,10	0.79	0	8,12,14	1.51	3 (37%)
1	TPO	C	345	1	8,10,11	1.29	1 (12%)	10,14,16	1.30	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#|Z| > 2	Counts	RMSZ	#|Z| > 2
1	TPO	D	342	1	8,10,11	1.05	1 (12%)	10,14,16	1.64	1 (10%)
1	SEP	B	346	1	8,9,10	0.85	0	8,12,14	1.37	2 (25%)
1	SEP	C	346	1	8,9,10	0.62	0	8,12,14	1.44	2 (25%)
1	TPO	A	342	1	8,10,11	0.67	0	10,14,16	1.10	0
1	SEP	A	346	1	8,9,10	0.76	0	8,12,14	1.50	2 (25%)
1	TPO	C	342	1	8,10,11	0.89	0	10,14,16	1.70	1 (10%)
1	TPO	B	345	1	8,10,11	1.14	0	10,14,16	1.44	2 (20%)
1	TPO	A	345	1	8,10,11	1.10	0	10,14,16	1.39	1 (10%)

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
1	TPO	D	345	1	-	3/9/11/13	-
1	TPO	B	342	1	-	0/9/11/13	-
1	SEP	D	346	1	-	0/5/8/10	-
1	TPO	C	345	1	-	2/9/11/13	-
1	TPO	D	342	1	-	0/9/11/13	-
1	SEP	B	346	1	-	0/5/8/10	-
1	SEP	C	346	1	-	0/5/8/10	-
1	TPO	A	342	1	-	3/9/11/13	-
1	SEP	A	346	1	-	0/5/8/10	-
1	TPO	C	342	1	-	0/9/11/13	-
1	TPO	B	345	1	-	4/9/11/13	-
1	TPO	A	345	1	-	4/9/11/13	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	342	TPO	P-OG1	-2.68	1.54	1.59
1	D	342	TPO	P-OG1	-2.66	1.54	1.59
1	C	345	TPO	P-O3P	-2.29	1.46	1.54

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	342	TPO	P-OG1-CB	-4.53	109.52	123.21

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	342	TPO	P-OG1-CB	-4.41	109.89	123.21
1	D	342	TPO	P-OG1-CB	-4.21	110.48	123.21
1	C	346	SEP	P-OG-CB	-2.93	110.23	118.30
1	A	346	SEP	P-OG-CB	-2.83	110.49	118.30
1	A	345	TPO	O2P-P-OG1	2.79	118.50	105.99
1	B	345	TPO	O3P-P-OG1	2.68	118.02	105.99
1	D	346	SEP	P-OG-CB	-2.63	111.06	118.30
1	B	346	SEP	P-OG-CB	-2.60	111.14	118.30
1	D	345	TPO	O3P-P-OG1	2.51	117.22	105.99
1	D	346	SEP	OG-CB-CA	-2.44	105.77	108.14
1	A	346	SEP	O3P-P-OG	2.42	113.18	106.73
1	C	346	SEP	O3P-P-OG	2.28	112.80	106.73
1	B	346	SEP	OG-P-O1P	2.12	112.42	106.47
1	D	346	SEP	OG-P-O1P	2.06	112.25	106.47
1	B	345	TPO	P-OG1-CB	-2.06	116.99	123.21

There are no chirality outliers.

All (16) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	342	TPO	CA-CB-OG1-P
1	A	342	TPO	CB-OG1-P-O3P
1	A	345	TPO	N-CA-CB-OG1
1	A	345	TPO	O-C-CA-CB
1	B	345	TPO	N-CA-CB-OG1
1	B	345	TPO	O-C-CA-CB
1	B	345	TPO	CB-OG1-P-O1P
1	C	345	TPO	N-CA-CB-OG1
1	C	345	TPO	O-C-CA-CB
1	D	345	TPO	N-CA-CB-OG1
1	D	345	TPO	O-C-CA-CB
1	D	345	TPO	CB-OG1-P-O1P
1	A	345	TPO	CB-OG1-P-O3P
1	A	345	TPO	CB-OG1-P-O1P
1	B	345	TPO	CB-OG1-P-O3P
1	A	342	TPO	O-C-CA-CB

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	B	342	TPO	1	0

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

4 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	$\#|Z| > 2$
2	A1AFH	A	501	-	25,26,26	0.46	0	33,36,36	1.50	3 (9%)
2	A1AFH	D	501	-	25,26,26	0.53	0	33,36,36	1.38	3 (9%)
2	A1AFH	C	501	-	25,26,26	0.56	1 (4%)	33,36,36	1.55	4 (12%)
2	A1AFH	B	501	-	25,26,26	0.59	1 (4%)	33,36,36	1.44	2 (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
2	A1AFH	A	501	-	-	1/12/21/21	0/3/3/3
2	A1AFH	D	501	-	-	1/12/21/21	0/3/3/3
2	A1AFH	C	501	-	-	2/12/21/21	0/3/3/3
2	A1AFH	B	501	-	-	1/12/21/21	0/3/3/3

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	501	A1AFH	O24-C23	2.26	1.28	1.24
2	C	501	A1AFH	O24-C23	2.26	1.28	1.24

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	C	501	A1AFH	C13-O12-C11	6.70	123.91	117.50
2	A	501	A1AFH	C13-O12-C11	6.28	123.50	117.50
2	B	501	A1AFH	C13-O12-C11	5.82	123.06	117.50
2	D	501	A1AFH	C13-O12-C11	5.69	122.94	117.50
2	B	501	A1AFH	C2-O3-C4	4.28	127.39	118.05
2	C	501	A1AFH	C2-O3-C4	4.16	127.12	118.05
2	A	501	A1AFH	C2-O3-C4	4.07	126.94	118.05
2	D	501	A1AFH	C2-O3-C4	3.81	126.36	118.05
2	A	501	A1AFH	C17-C16-C14	2.41	106.43	104.57
2	D	501	A1AFH	C21-C22-C23	-2.07	116.01	121.38
2	C	501	A1AFH	C17-C16-C14	2.06	106.16	104.57
2	C	501	A1AFH	C21-C22-C23	-2.04	116.10	121.38

There are no chirality outliers.

All (5) torsion outliers are listed below:

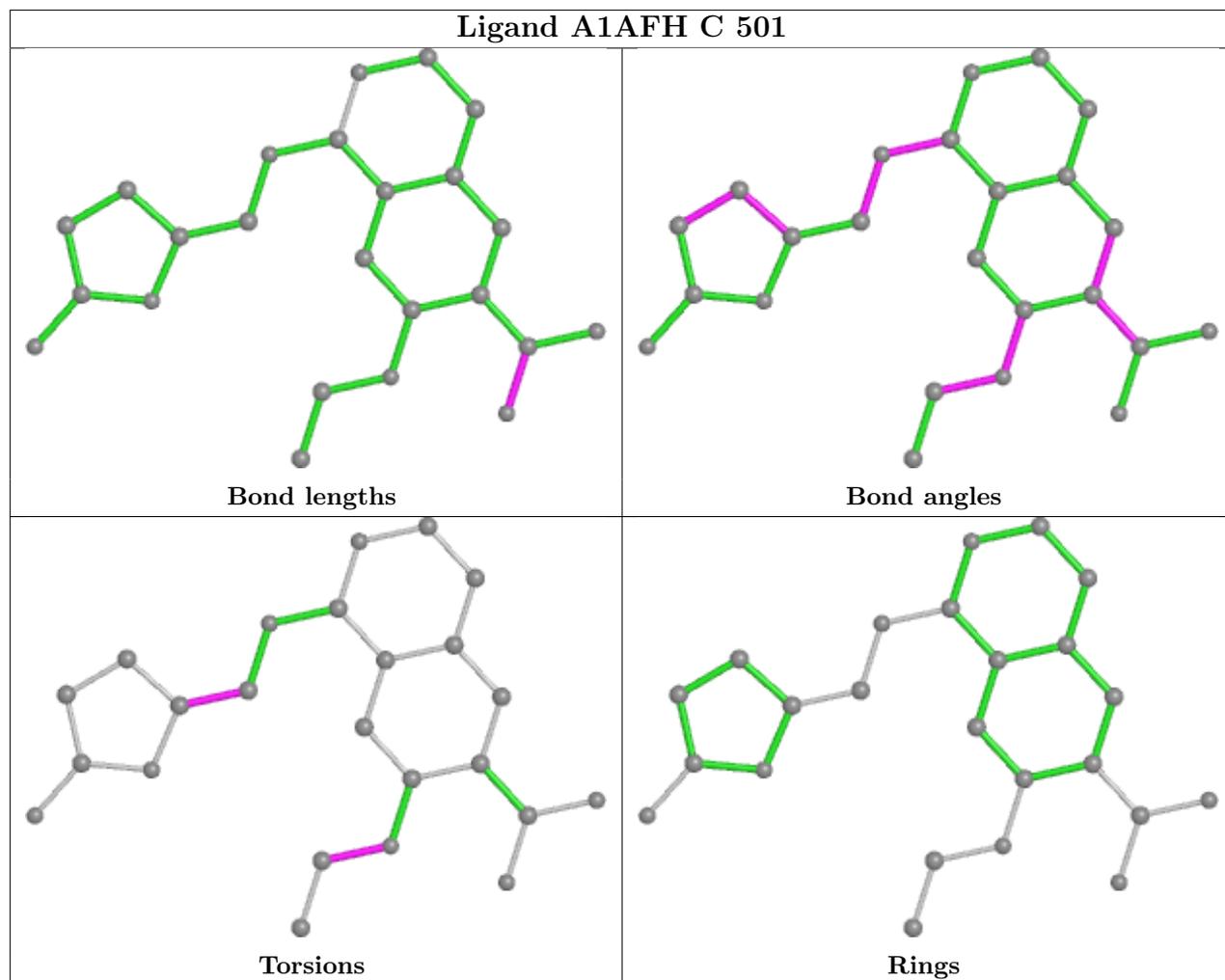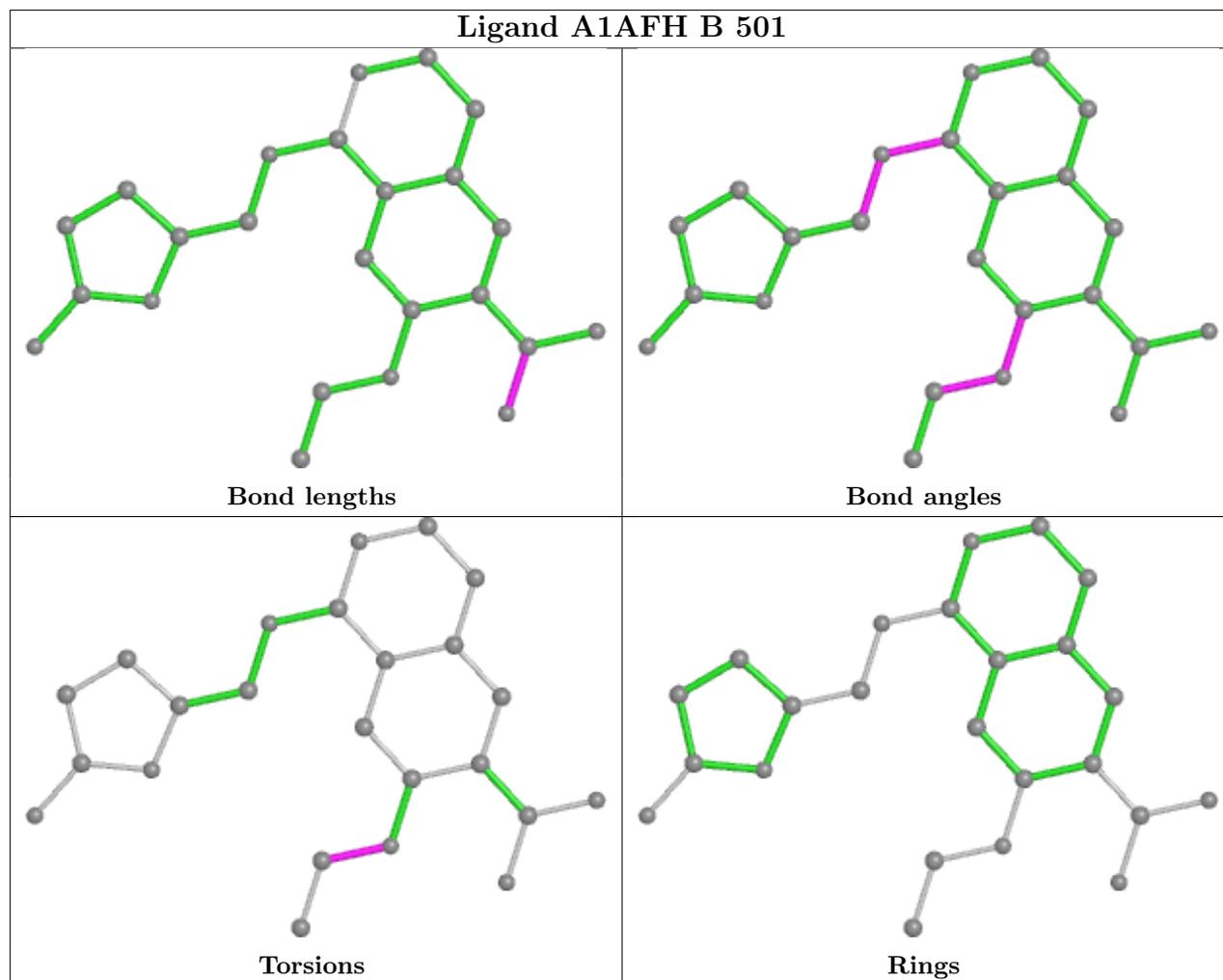| Mol	Chain	Res	Type	Atoms
2	A	501	A1AFH	C1-C2-O3-C4
2	C	501	A1AFH	C1-C2-O3-C4
2	B	501	A1AFH	C1-C2-O3-C4
2	D	501	A1AFH	C1-C2-O3-C4
2	C	501	A1AFH	O12-C13-C14-N20

There are no ring outliers.

No monomer is involved in short contacts.

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 A1AFH A 501

Bond lengths

Bond angles

Torsions

Rings

Ligand A1AFH D 501

Bond lengths

Bond angles

Torsions

Rings

Ligand A1AFH C 501

Bond lengths

Bond angles

Torsions

Rings

Ligand A1AFH B 501

Bond lengths

Bond angles

Torsions

Rings
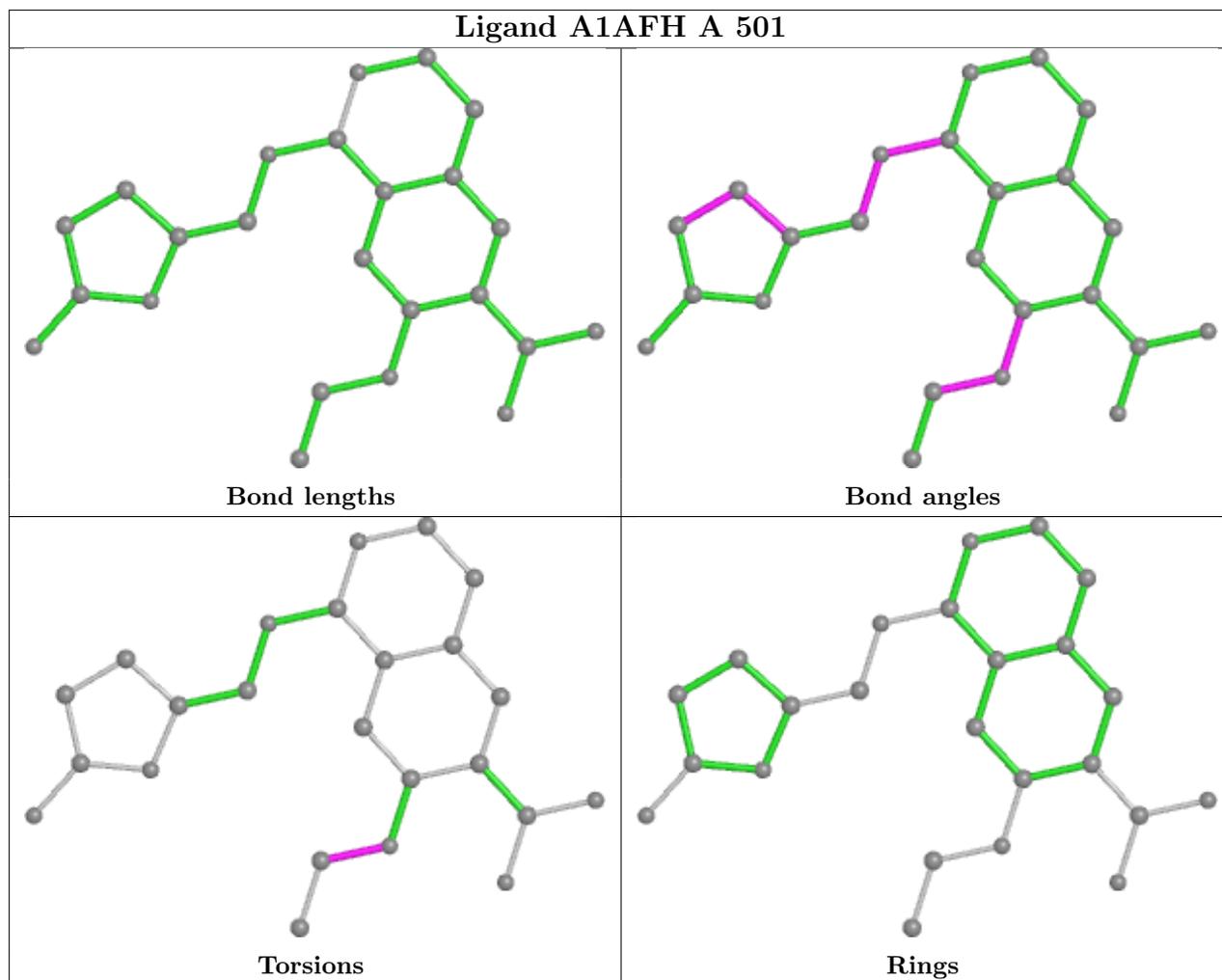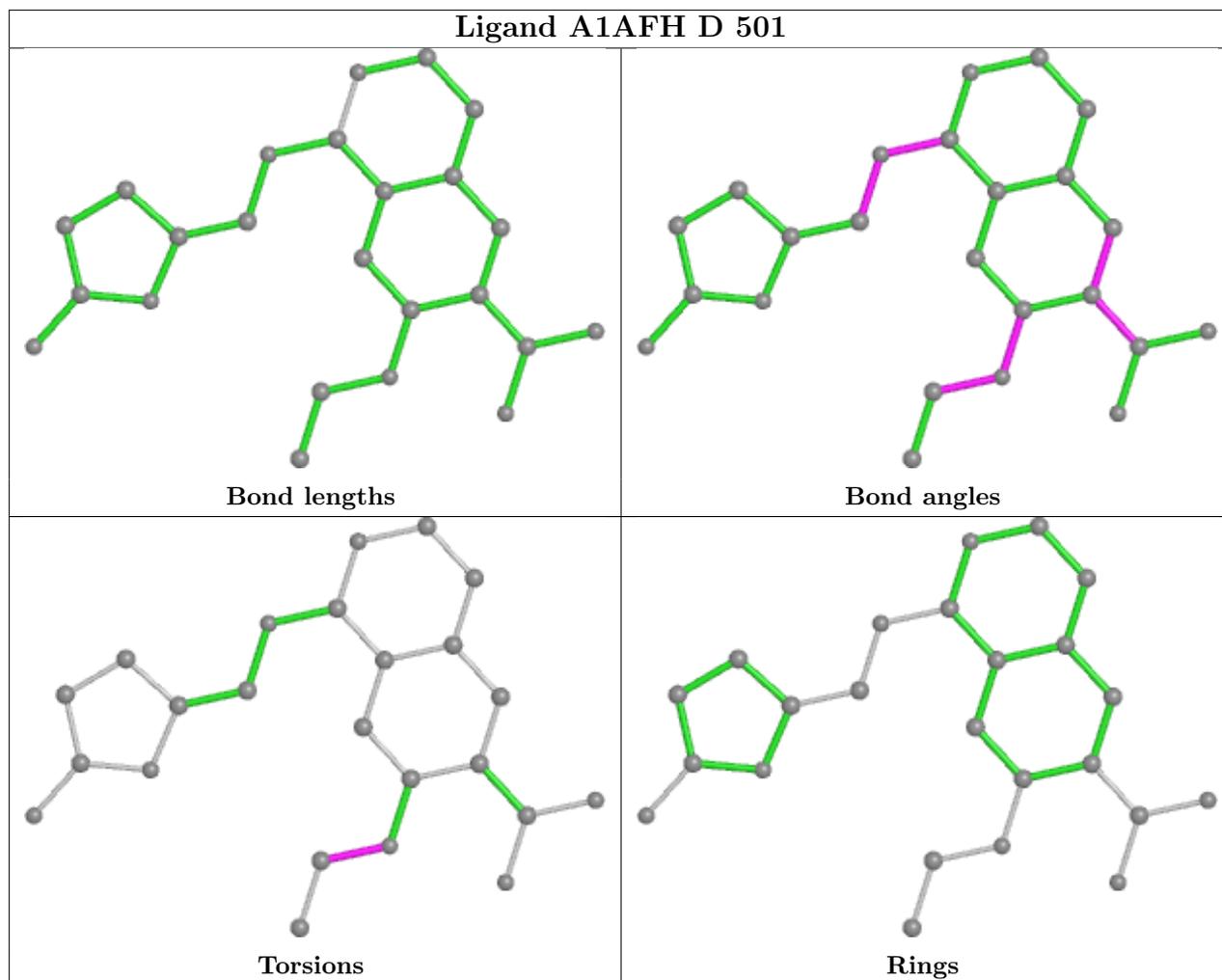
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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(Å²)	Q<0.9
1	A	286/323 (88%)	0.63	38 (13%)	3	4	21, 37, 63, 71	0
1	B	286/323 (88%)	0.88	44 (15%)	2	3	20, 36, 65, 80	0
1	C	285/323 (88%)	0.60	27 (9%)	8	11	21, 33, 57, 68	0
1	D	284/323 (87%)	0.46	25 (8%)	10	13	20, 30, 54, 67	0
All	All	1141/1292 (88%)	0.64	134 (11%)	4	6	20, 34, 62, 80	0

All (134) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	204	TYR	9.0
1	D	256	ASP	8.5
1	B	217	ALA	7.7
1	C	196	GLY	7.5
1	B	256	ASP	7.5
1	A	254	ASP	7.2
1	C	256	ASP	7.1
1	D	255	GLY	7.0
1	C	197	PHE	6.5
1	B	196	GLY	6.4
1	C	221	ILE	6.4
1	B	254	ASP	6.4
1	A	460	SER	6.4
1	B	207	ASN	6.3
1	C	222	THR	6.2
1	C	459	ALA	6.1
1	B	204	TYR	6.1
1	B	197	PHE	6.0
1	B	255	GLY	5.9
1	B	222	THR	5.9
1	B	206	ASN	5.8

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Mol	Chain	Res	Type	RSRZ
1	D	407	GLU	5.7
1	A	196	GLY	5.5
1	C	195	GLY	5.5
1	C	255	GLY	5.4
1	A	222	THR	5.3
1	C	223	THR	5.3
1	B	187	VAL	5.2
1	A	197	PHE	5.0
1	D	216	ALA	4.9
1	B	195	GLY	4.9
1	B	216	ALA	4.8
1	B	186	SER	4.7
1	D	459	ALA	4.7
1	B	257	ASP	4.5
1	C	164	ARG	4.4
1	B	224	GLU	4.3
1	A	187	VAL	4.3
1	A	257	ASP	4.3
1	D	224	GLU	4.3
1	B	223	THR	4.2
1	A	207	ASN	4.2
1	A	256	ASP	4.1
1	C	406	GLU	4.0
1	A	178	ASN	4.0
1	C	228	GLN	3.9
1	C	336	SER	3.9
1	B	226	LEU	3.8
1	A	188	GLY	3.8
1	A	216	ALA	3.7
1	B	407	GLU	3.7
1	A	406	GLU	3.6
1	C	224	GLU	3.6
1	B	389	GLU	3.5
1	D	319	LEU	3.5
1	D	222	THR	3.4
1	B	178	ASN	3.4
1	A	459	ALA	3.4
1	B	287[A]	MET	3.3
1	A	186	SER	3.3
1	B	163	THR	3.2
1	A	407	GLU	3.2
1	B	406	GLU	3.2

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Mol	Chain	Res	Type	RSRZ
1	A	405	ASP	3.2
1	D	223	THR	3.1
1	B	409	THR	3.0
1	B	162	ASP	3.0
1	C	409	THR	3.0
1	C	458	THR	3.0
1	B	165	PHE	3.0
1	A	206	ASN	2.9
1	B	225	GLU	2.9
1	C	257	ASP	2.9
1	A	224	GLU	2.9
1	A	223	THR	2.9
1	A	347	ARG	2.9
1	D	347	ARG	2.8
1	C	411	GLU	2.8
1	A	180	PHE	2.8
1	A	163	THR	2.8
1	D	323	PHE	2.8
1	D	283	LEU	2.7
1	D	164	ARG	2.7
1	B	274	LEU	2.7
1	C	403	ILE	2.6
1	D	406	GLU	2.6
1	B	459	ALA	2.6
1	A	166	HIS	2.6
1	C	405	ASP	2.6
1	A	228	GLN	2.6
1	A	183	ARG	2.5
1	A	162	ASP	2.5
1	A	253	SER	2.5
1	C	407	GLU	2.5
1	A	255	GLY	2.5
1	A	443	LYS	2.4
1	A	205	VAL	2.4
1	D	197	PHE	2.4
1	B	251	PHE	2.4
1	C	347	ARG	2.4
1	B	291	ILE	2.3
1	A	189	GLY	2.3
1	D	322	ALA	2.3
1	C	410	ILE	2.3
1	A	171	TYR	2.3

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Mol	Chain	Res	Type	RSRZ
1	C	280	THR	2.3
1	D	253	SER	2.3
1	D	337	GLU	2.3
1	A	208	THR	2.3
1	B	404	GLU	2.3
1	C	323	PHE	2.3
1	D	409	THR	2.2
1	D	405	ASP	2.2
1	B	438	HIS	2.2
1	B	405	ASP	2.2
1	D	411	GLU	2.2
1	B	319	LEU	2.2
1	C	341	GLN	2.2
1	B	283	LEU	2.2
1	D	401	GLU	2.2
1	D	257	ASP	2.2
1	B	443	LYS	2.1
1	B	253	SER	2.1
1	B	336	SER	2.1
1	D	443	LYS	2.1
1	D	274	LEU	2.1
1	B	439	GLU	2.1
1	B	228	GLN	2.1
1	B	280	THR	2.1
1	A	438	HIS	2.1
1	A	184	PRO	2.1
1	A	225	GLU	2.1
1	B	392	GLU	2.1
1	C	225	GLU	2.0

## 6.2　Non-standard residues in protein, DNA, RNA chains ⓘ

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
1	TPO	A	342	11/12	0.61	0.23	60,60,84,84	0
1	TPO	C	342	11/12	0.82	0.13	54,58,76,76	0
1	SEP	B	346	10/11	0.83	0.20	46,50,76,77	0
1	SEP	A	346	10/11	0.86	0.19	50,54,74,77	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
1	SEP	C	346	10/11	0.86	0.16	46,51,77,80	0
1	TPO	D	342	11/12	0.87	0.16	53,54,77,79	0
1	SEP	D	346	10/11	0.89	0.23	41,45,67,68	0
1	TPO	B	342	11/12	0.94	0.11	58,61,74,77	0
1	TPO	D	345	11/12	0.96	0.08	34,41,45,45	0
1	TPO	B	345	11/12	0.96	0.09	47,48,50,50	0
1	TPO	A	345	11/12	0.97	0.07	46,51,53,56	0
1	TPO	C	345	11/12	0.97	0.07	40,45,47,48	0

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
2	A1AFH	A	501	24/24	0.97	0.09	10,23,27,27	19
2	A1AFH	B	501	24/24	0.97	0.10	11,24,26,28	19
2	A1AFH	C	501	24/24	0.97	0.10	7,22,24,25	19
2	A1AFH	D	501	24/24	0.97	0.10	10,20,22,23	19

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.
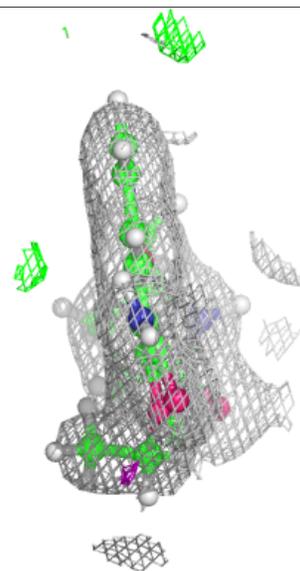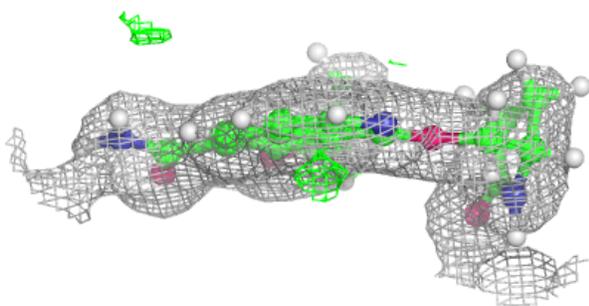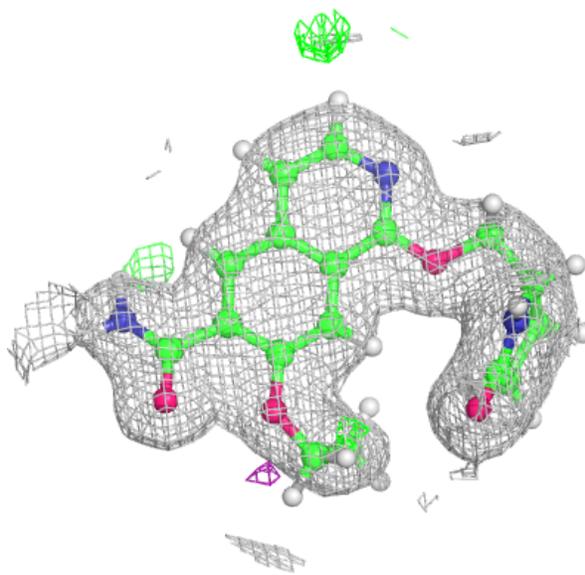
Electron density around A1AFH A 501:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
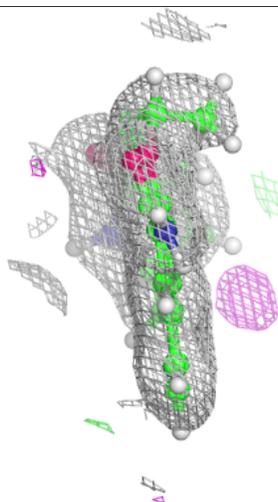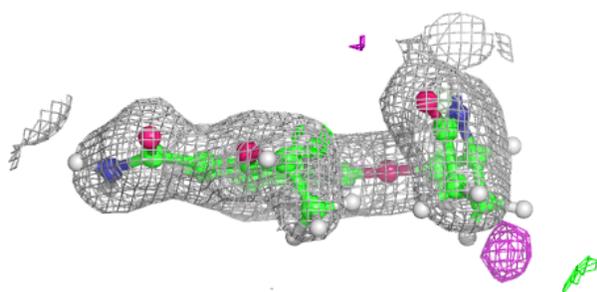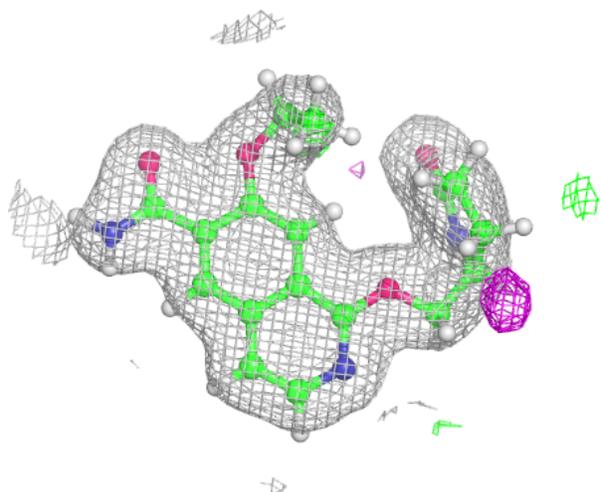
Electron density around A1AFH B 501:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
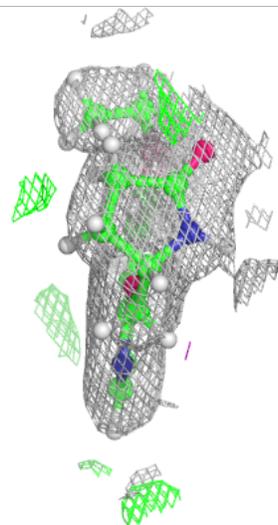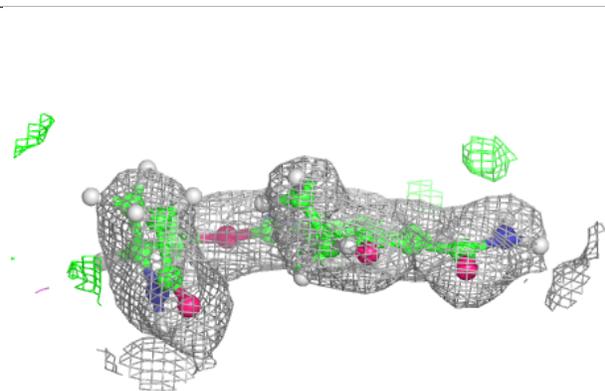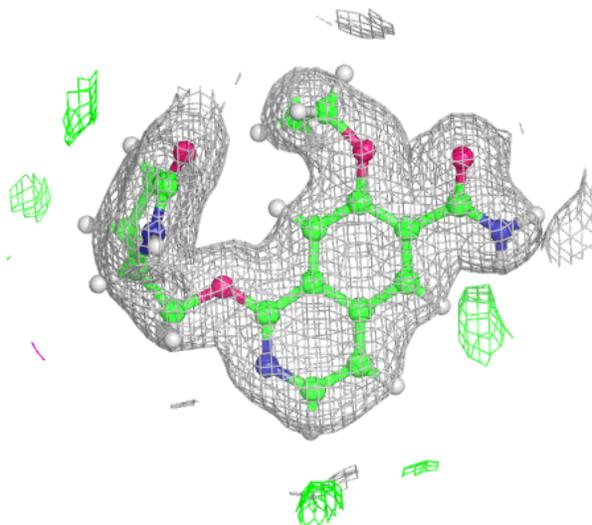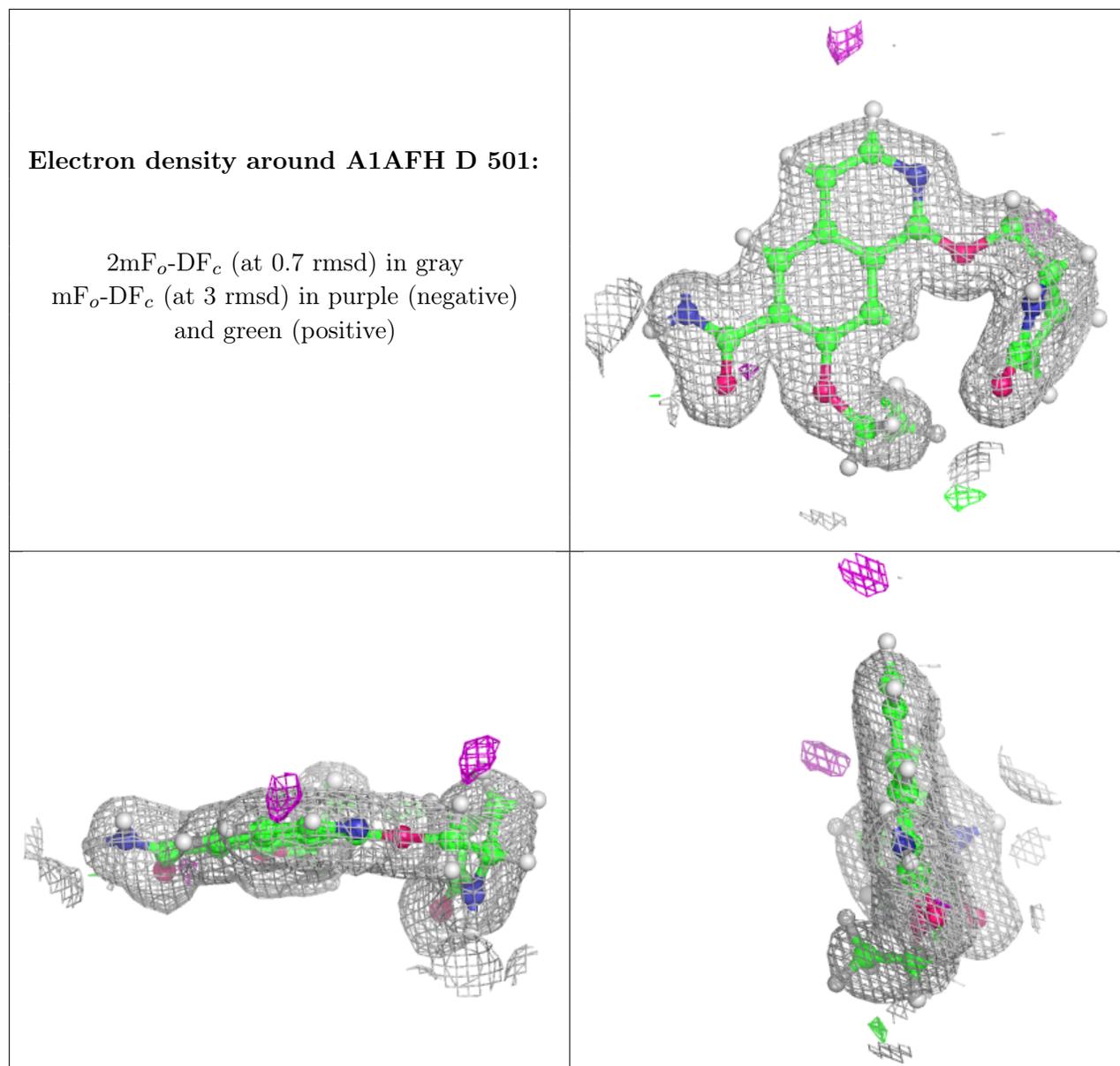mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around A1AFH C 501:

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

Electron density around A1AFH D 501:

$2mF_o$-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.