WORLDWIDE wwPDB PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report (i)

Apr 4, 2023 – 07:23 pm BST

PDB ID	:	8CAA
Title	:	Crystal structure of TEAD4 in complex with YTP-13
Authors	:	Scheufler, C.; Kallen, J.
Deposited on	:	2023-01-24
Resolution	:	2.00 Å(reported)

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

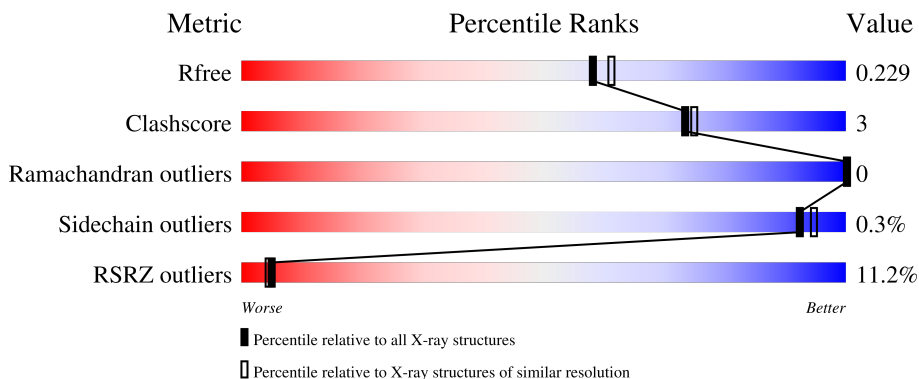|		
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.32.2
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.32.2

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 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	Percentile Ranks	Value
Rfree		0.229
Clashscore		3
Ramachandran outliers		0
Sidechain outliers		0.3%
RSRZ outliers		11.2%

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	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (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 <=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	220	11% / 87% 6% 7%
1	B	220	10% / 84% 10% 7%

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 3667 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 Transcriptional enhancer factor TEF-3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	205	Total	C	N	O	S	0	1	0
			1673	1078	274	312	9			
1	B	205	Total	C	N	O	S	0	6	0
			1693	1094	275	314	10			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	215	GLY	-	expression tag	UNP Q15561
A	216	PRO	-	expression tag	UNP Q15561
B	215	GLY	-	expression tag	UNP Q15561
B	216	PRO	-	expression tag	UNP Q15561

- Molecule 2 is 4-[bis(fluoranyl)methoxy]-2-[(2 {S})-5-chloranyl-6-fluoranyl-2-[[(4-oxida nylcyclohexyl)amino]methyl]-2-phenyl-3 {H}-1-benzofuran-4-yl]-3-fluoranyl-benzamid e (three-letter code: U3F) (formula: $C_{29}H_{27}ClF_4N_2O_4$) (labeled as "Ligand of Interest" by depositor).

U3F

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total	C	Cl	F	N	O	0	0
			40	29	1	4	2	4		
2	B	1	Total	C	Cl	F	N	O	0	0
			40	29	1	4	2	4		

- Molecule 3 is (2 {R})-2-[2-chloranyl-5-[2-chloranyl-4-(trifluoromethyl)phenoxy]phenyl]sulfanylpropanoic acid (three-letter code: U3O) (formula: $C_{16}H_{11}Cl_2F_3O_3S$).
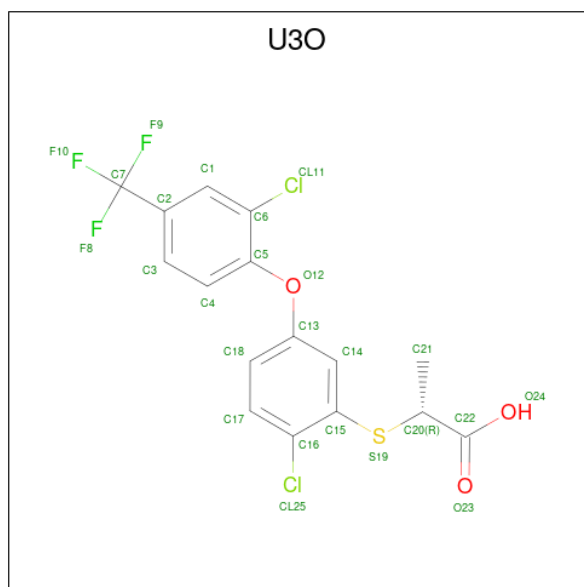
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
3	A	1	Total	C	Cl	F	O	S	0	0
			25	16	2	3	3	1		
3	B	1	Total	C	Cl	F	O	S	0	0
			25	16	2	3	3	1		

- Molecule 4 is PHOSPHATE ION (three-letter code: PO4) (formula: O_4P).

PO4

O3

O⁻

O2　O⁻ — P === O　O1

P

O⁻

O4

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

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	81	Total 81	O 81	0	0
5	B	85	Total 85	O 85	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: Transcriptional enhancer factor TEF-3
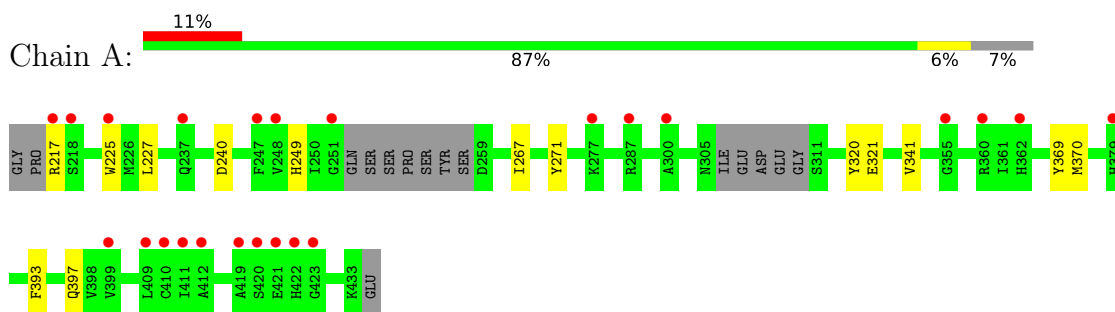
• Molecule 1: Transcriptional enhancer factor TEF-3
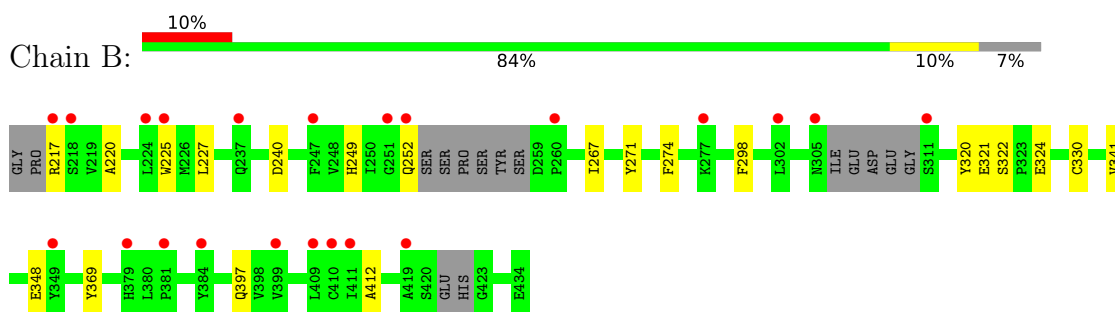
4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	35.73Å 89.40Å 135.47Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.44 – 2.00 19.44 – 2.00	Depositor EDS
% Data completeness (in resolution range)	88.2 (19.44-2.00) 88.2 (19.44-2.00)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.68 (at 2.01Å)	Xtriage
Refinement program	BUSTER 2.11.8 (8-JUN-2022)	Depositor
R, R_{free}	0.213 , 0.237 0.206 , 0.229	Depositor DCC
R_{free} test set	1263 reflections (4.73%)	wwPDB-VP
Wilson B-factor (Å^2)	27.9	Xtriage
Anisotropy	0.030	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 44.8	EDS
L-test for twinning[2]	$< |L| > = 0.47, < L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	3667	wwPDB-VP
Average B, all atoms (Å^2)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 23.38 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 4.7188e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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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: PO4, U3O, U3F

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	0.42	0/1718	0.60	0/2323
1	B	0.43	0/1753	0.64	0/2371
All	All	0.43	0/3471	0.62	0/4694

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 ⓘ

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	1673	0	1600	8	0
1	B	1693	0	1627	16	0
2	A	40	0	0	0	0
2	B	40	0	0	0	0
3	A	25	0	0	0	0
3	B	25	0	0	0	0
4	B	5	0	0	0	0
5	A	81	0	0	0	0
5	B	85	0	0	0	0
All	All	3667	0	3227	22	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 3.

All (22) 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:B:227:LEU:HD11	1:B:321:GLU:HG2	1.42	1.00
1:B:220:ALA:HB1	1:B:225[B]:TRP:HD1	1.34	0.92
1:B:220:ALA:HB1	1:B:225[B]:TRP:CD1	2.11	0.86
1:B:225[B]:TRP:HE3	1:B:321:GLU:HG3	1.50	0.77
1:B:225[B]:TRP:CE3	1:B:321:GLU:HG3	2.29	0.68
1:B:341:VAL:HG11	1:B:369:TYR:CE2	2.42	0.54
1:B:217:ARG:HA	1:B:225[A]:TRP:NE1	2.23	0.54
1:A:341:VAL:HG11	1:A:369:TYR:CE2	2.43	0.53
1:A:217:ARG:HA	1:A:225:TRP:NE1	2.24	0.52
1:A:227:LEU:HD11	1:A:321:GLU:HG3	1.93	0.51
1:B:267:ILE:HG12	1:B:271:TYR:CE1	2.50	0.47
1:A:267:ILE:HG12	1:A:271:TYR:CE1	2.49	0.47
1:A:320:TYR:OH	1:A:397:GLN:NE2	2.48	0.47
1:B:320:TYR:OH	1:B:397:GLN:NE2	2.48	0.46
1:A:240:ASP:OD1	1:B:249:HIS:NE2	2.51	0.44
1:B:217:ARG:HA	1:B:225[A]:TRP:CE2	2.55	0.42
1:A:249:HIS:NE2	1:B:240:ASP:OD1	2.53	0.41
1:B:249:HIS:HB2	1:B:252:GLN:CG	2.50	0.41
1:B:274:PHE:CZ	1:B:412:ALA:HB1	2.56	0.41
1:B:322[B]:SER:OG	1:B:324:GLU:O	2.37	0.40
1:A:370:MET:SD	1:A:393:PHE:HZ	2.44	0.40
1:B:330[B]:CYS:SG	1:B:348:GLU:OE2	2.80	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	200/220 (91%)	193 (96%)	7 (4%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	203/220 (92%)	199 (98%)	4 (2%)	0	100	100
All	All	403/440 (92%)	392 (97%)	11 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains (i)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	183/201 (91%)	183 (100%)	0	100	100
1	B	187/201 (93%)	186 (100%)	1 (0%)	88	92
All	All	370/402 (92%)	369 (100%)	1 (0%)	92	95

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	298	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

5 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#$|Z| > 2$	Counts	RMSZ	#$|Z| > 2$
3	U3O	B	502	-	25,26,26	0.66	0	34,38,38	1.05	3 (8%)
2	U3F	B	501	-	44,44,44	1.03	2 (4%)	50,65,65	1.34	5 (10%)
2	U3F	A	501	-	44,44,44	0.99	2 (4%)	50,65,65	1.33	7 (14%)
4	PO4	B	503	-	4,4,4	1.07	0	6,6,6	0.53	0
3	U3O	A	502	-	25,26,26	0.66	0	34,38,38	1.03	1 (2%)

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	U3O	B	502	-	-	3/18/18/18	0/2/2/2
2	U3F	B	501	-	-	1/24/44/44	0/5/5/5
3	U3O	A	502	-	-	5/18/18/18	0/2/2/2
2	U3F	A	501	-	-	2/24/44/44	0/5/5/5

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	501	U3F	C8-C10	3.17	1.56	1.52
2	B	501	U3F	C8-C10	2.67	1.55	1.52
2	A	501	U3F	C9-C8	2.18	1.57	1.52
2	B	501	U3F	C9-C8	2.02	1.56	1.52

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	501	U3F	C36-C35-C34	-5.24	105.69	111.48

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	501	U3F	O7-C4-C5	4.25	116.37	113.12
2	A	501	U3F	C36-C35-C34	-4.13	106.92	111.48
2	B	501	U3F	O7-C4-C5	3.78	116.01	113.12
2	B	501	U3F	C8-O7-C4	-3.05	104.05	107.38
2	A	501	U3F	C8-O7-C4	-2.76	104.37	107.38
2	A	501	U3F	C35-C36-C37	-2.72	106.95	111.61
3	A	502	U3O	C14-C15-C16	2.47	121.40	117.35
2	A	501	U3F	C21-C20-C19	2.41	121.51	117.72
2	B	501	U3F	C39-C34-C35	-2.40	106.67	110.82
3	B	502	U3O	F8-C7-C2	-2.31	107.84	112.93
2	B	501	U3F	O26-C24-C23	-2.28	117.56	120.24
3	B	502	U3O	F9-C7-C2	-2.16	108.18	112.93
2	A	501	U3F	C9-C5-C6	2.12	129.94	127.88
3	B	502	U3O	C14-C15-C16	2.08	120.76	117.35
2	A	501	U3F	O26-C24-C23	-2.06	117.81	120.24

There are no chirality outliers.

All (11) torsion outliers are listed below:

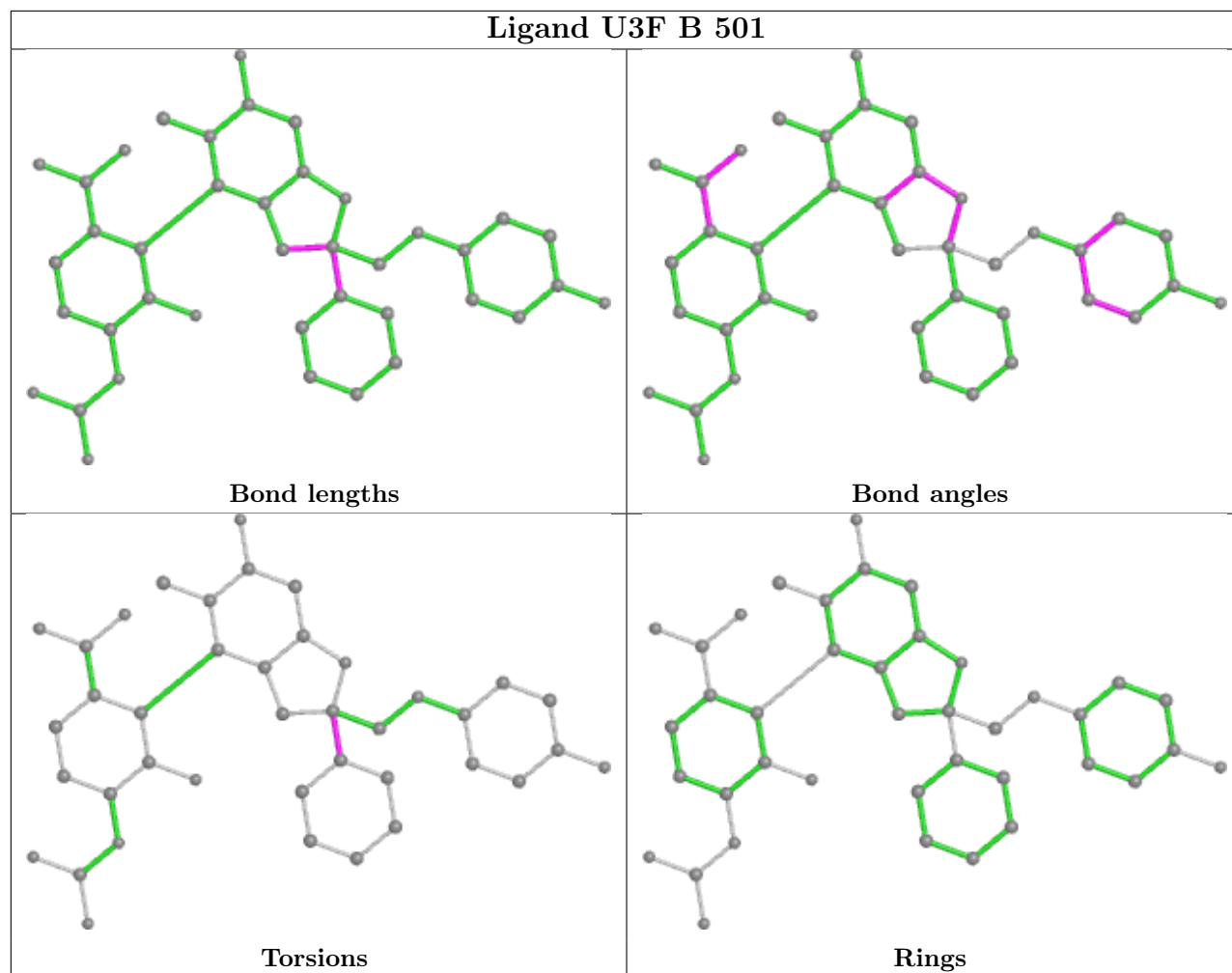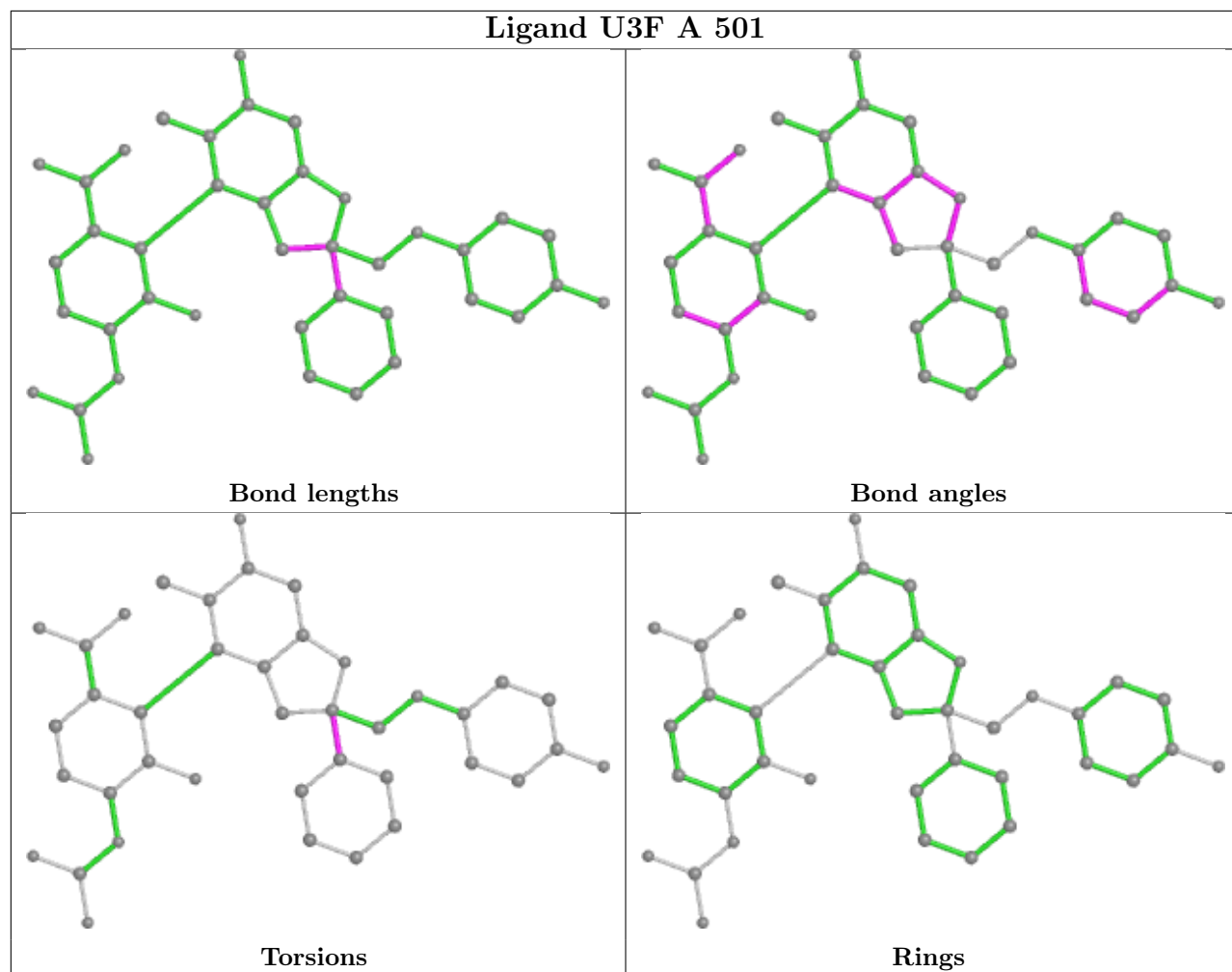| Mol	Chain	Res	Type	Atoms
3	A	502	U3O	S19-C20-C22-O24
3	A	502	U3O	C22-C20-S19-C15
3	B	502	U3O	S19-C20-C22-O24
3	A	502	U3O	C21-C20-C22-O23
3	A	502	U3O	C21-C20-C22-O24
3	A	502	U3O	S19-C20-C22-O23
3	B	502	U3O	S19-C20-C22-O23
3	B	502	U3O	C22-C20-S19-C15
2	A	501	U3F	C12-C10-C8-C11
2	A	501	U3F	C16-C10-C8-C11
2	B	501	U3F	C16-C10-C8-C11

There are no ring outliers.
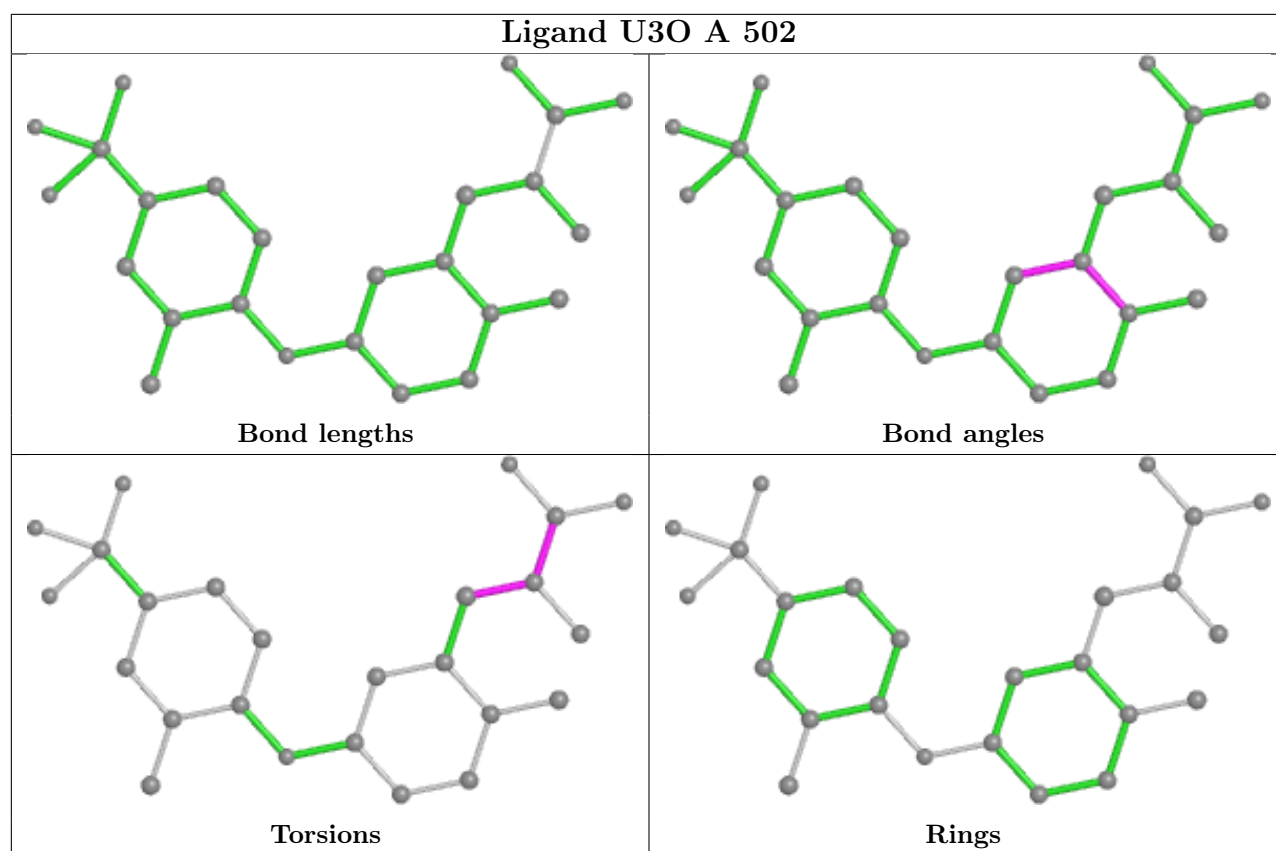
No monomer is involved in short contacts.

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 U3O B 502

Bond lengths

Bond angles

Torsions

Rings

Ligand U3F B 501

Bond lengths

Bond angles

Torsions

Rings

Ligand U3F A 501

Bond lengths

Bond angles

Torsions

Rings

Ligand U3O A 502

Bond lengths

Bond angles

Torsions

Rings
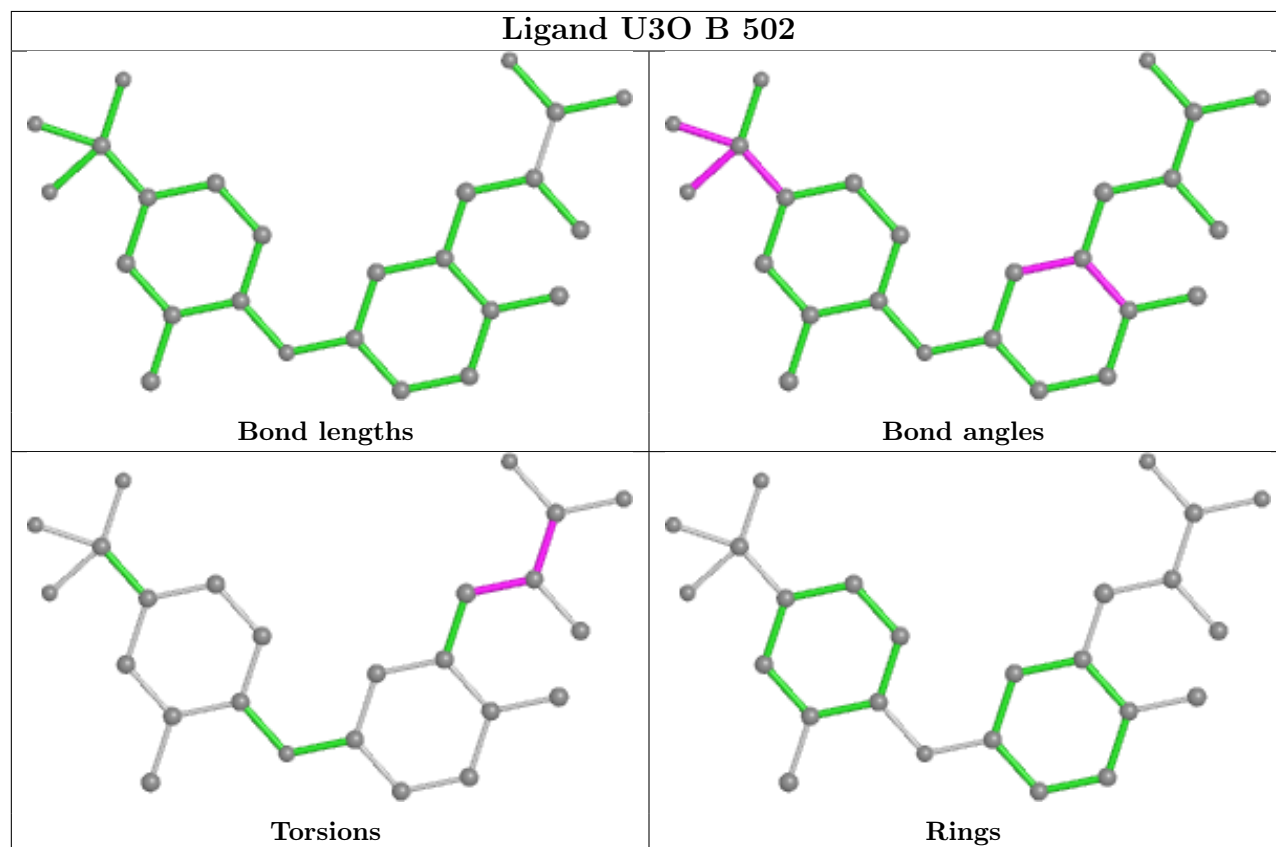
5.7 Other polymers ⓘ

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(Å^2)	Q<0.9
1	A	205/220 (93%)	0.73	24 (11%)	4	4	19, 31, 45, 51	0
1	B	205/220 (93%)	0.65	22 (10%)	6	5	17, 28, 46, 57	0
All	All	410/440 (93%)	0.69	46 (11%)	5	4	17, 30, 46, 57	0

All (46) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	422	HIS	6.1
1	B	419	ALA	4.9
1	A	421	GLU	4.8
1	B	217	ARG	4.1
1	B	251	GLY	4.0
1	B	381	PRO	4.0
1	B	305	ASN	3.7
1	B	252	GLN	3.6
1	B	260	PRO	3.5
1	A	217	ARG	3.4
1	A	419	ALA	3.4
1	A	287	ARG	3.0
1	A	247	PHE	3.0
1	A	251	GLY	3.0
1	A	277	LYS	2.9
1	B	349	TYR	2.9
1	B	277	LYS	2.9
1	B	237	GLN	2.8
1	A	248	VAL	2.8
1	B	247	PHE	2.7
1	A	362	HIS	2.7
1	A	225	TRP	2.7
1	A	412	ALA	2.7
1	B	384	TYR	2.6

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Mol	Chain	Res	Type	RSRZ
1	A	423	GLY	2.6
1	A	420	SER	2.6
1	B	311	SER	2.6
1	A	379	HIS	2.5
1	B	411	ILE	2.5
1	B	399	VAL	2.4
1	A	409	LEU	2.4
1	B	379	HIS	2.4
1	B	410	CYS	2.4
1	B	225[A]	TRP	2.4
1	A	355	GLY	2.3
1	A	399	VAL	2.3
1	A	300	ALA	2.3
1	B	409	LEU	2.2
1	A	411	ILE	2.2
1	A	410	CYS	2.2
1	B	302	LEU	2.2
1	A	237	GLN	2.1
1	A	360	ARG	2.1
1	A	218	SER	2.0
1	B	218	SER	2.0
1	B	224	LEU	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.
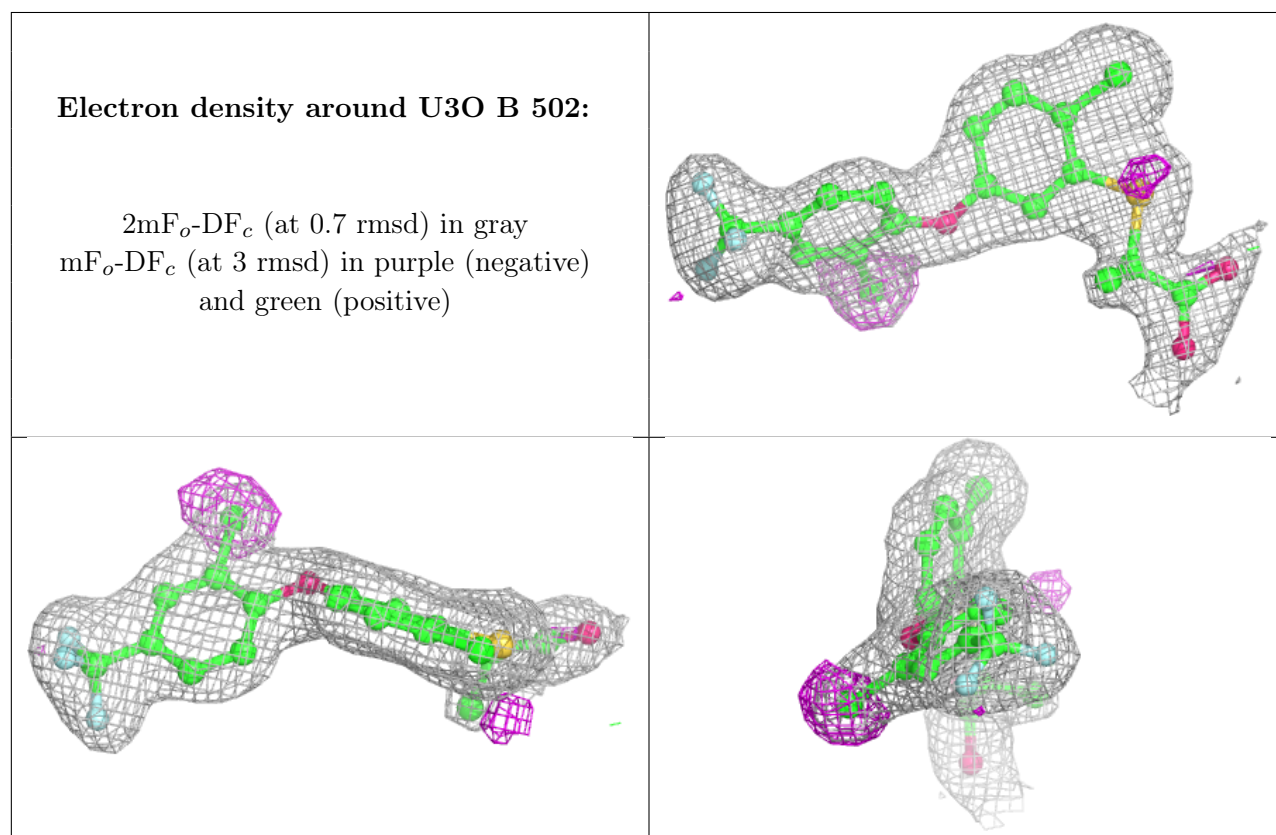
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($Å^2$)	Q<0.9
3	U3O	B	502	25/25	0.90	0.17	33,36,42,44	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	U3O	A	502	25/25	0.92	0.17	34,38,40,43	0
2	U3F	A	501	40/40	0.93	0.13	28,30,37,38	0
4	PO4	B	503	5/5	0.93	0.36	56,57,57,57	0
2	U3F	B	501	40/40	0.95	0.11	28,30,38,41	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.
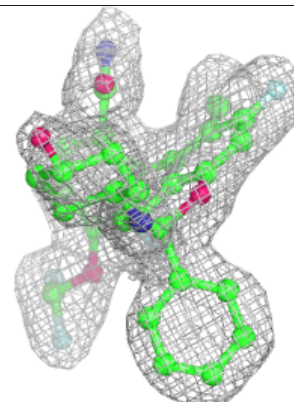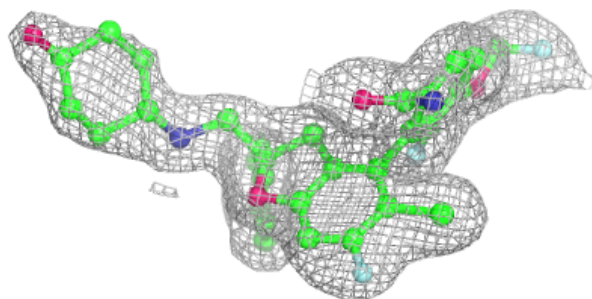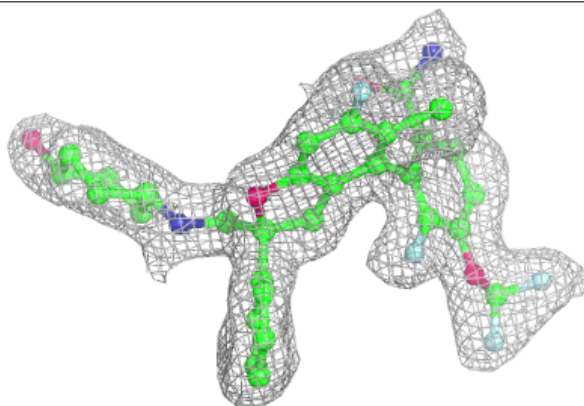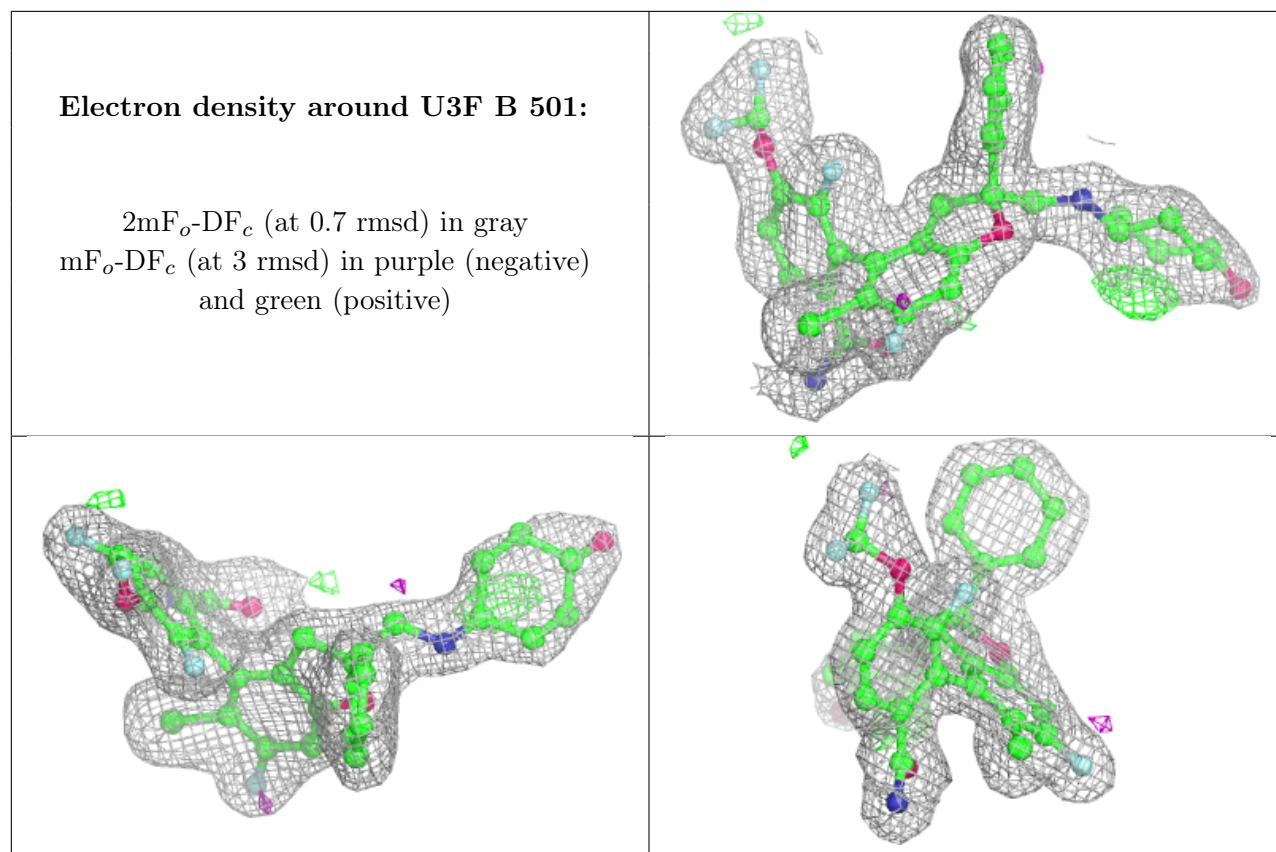

Electron density around U3O B 502:

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

Electron density around U3O A 502:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
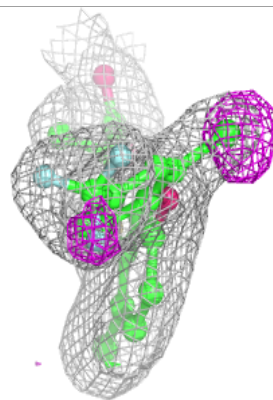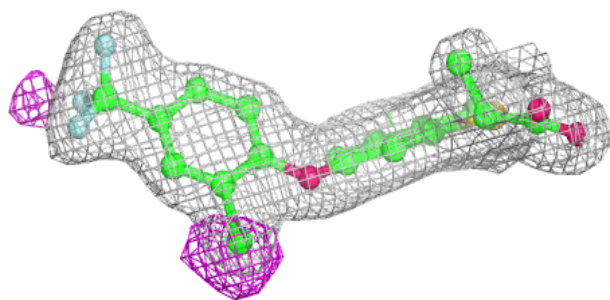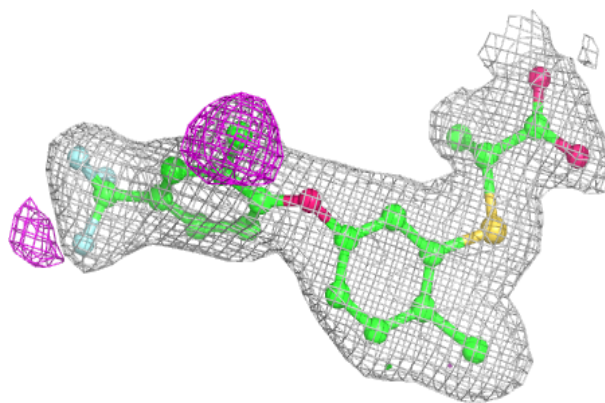
Electron density around U3F A 501:

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

Electron density around U3F B 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)

6.5 Other polymers ⓘ

There are no such residues in this entry.