



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 09:31 PM UTC

PDB ID : 3MX5 / pdb_00003mx5
Title : Lassa fever virus nucleoprotein complexed with UTP
Authors : Qi, X.; Lan, S.; Wang, W.; Schelde, L.M.; Dong, H.; Wallat, G.; Liang, Y.;
Ly, H.; Dong, C.; Scottish Structural Proteomics Facility (SSPF)
Deposited on : 2010-05-06
Resolution : 1.90 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 : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtrriage (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

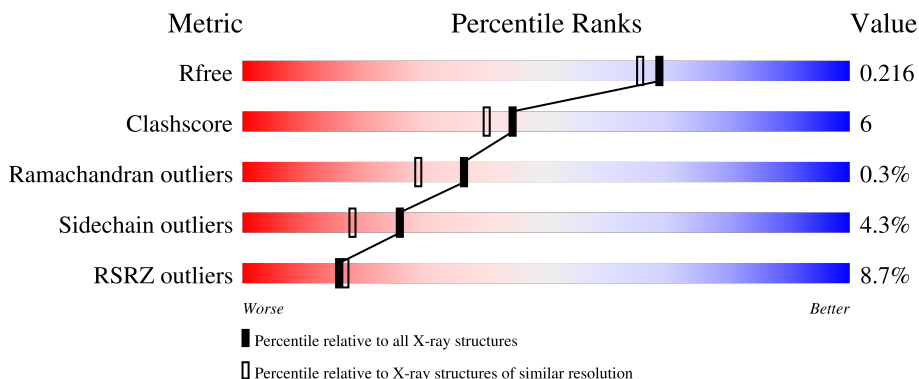
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

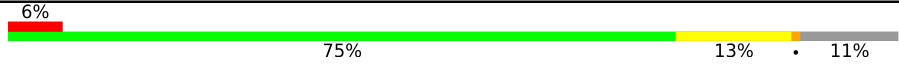


The reported resolution of this entry is 1.90 Å.

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	7789 (1.90-1.90)
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (1.90-1.90)

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	577	 6% 75% 13% • 11%
1	B	577	 7% 74% 14% • 11%
1	C	577	 11% 73% 15% • 11%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 12276 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 Nucleoprotein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	516	4038	2536	702	773	27	0	0	0
1	B	515	4027	2528	701	771	27	0	0	0
1	C	512	4006	2517	697	765	27	0	0	0

There are 24 discrepancies between the modelled and reference sequences:

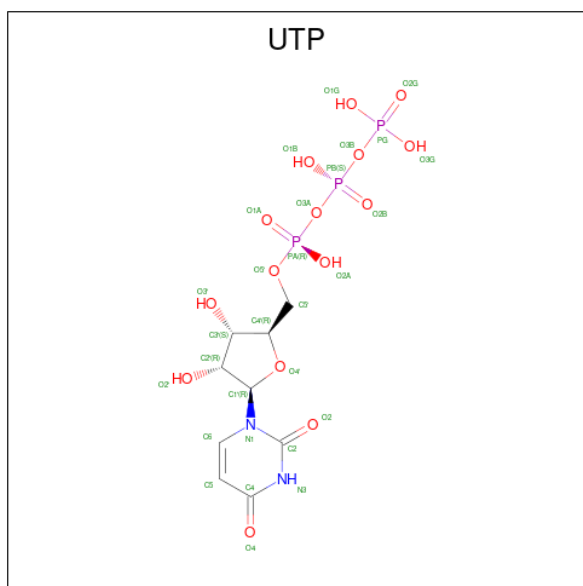
Chain	Residue	Modelled	Actual	Comment	Reference
A	-7	GLY	-	expression tag	UNP P13699
A	-6	ALA	-	expression tag	UNP P13699
A	-5	MET	-	expression tag	UNP P13699
A	-4	ASP	-	expression tag	UNP P13699
A	-3	HIS	-	expression tag	UNP P13699
A	-2	VAL	-	expression tag	UNP P13699
A	-1	GLU	-	expression tag	UNP P13699
A	0	PHE	-	expression tag	UNP P13699
B	-7	GLY	-	expression tag	UNP P13699
B	-6	ALA	-	expression tag	UNP P13699
B	-5	MET	-	expression tag	UNP P13699
B	-4	ASP	-	expression tag	UNP P13699
B	-3	HIS	-	expression tag	UNP P13699
B	-2	VAL	-	expression tag	UNP P13699
B	-1	GLU	-	expression tag	UNP P13699
B	0	PHE	-	expression tag	UNP P13699
C	-7	GLY	-	expression tag	UNP P13699
C	-6	ALA	-	expression tag	UNP P13699
C	-5	MET	-	expression tag	UNP P13699
C	-4	ASP	-	expression tag	UNP P13699
C	-3	HIS	-	expression tag	UNP P13699
C	-2	VAL	-	expression tag	UNP P13699
C	-1	GLU	-	expression tag	UNP P13699

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Chain	Residue	Modelled	Actual	Comment	Reference
C	0	PHE	-	expression tag	UNP P13699

- Molecule 2 is URIDINE 5'-TRIPHOSPHATE (CCD ID: UTP) (formula: $C_9H_{15}N_2O_{15}P_3$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
2	A	1	Total	C	N	O	P	0	0
			29	9	2	15	3		
2	B	1	Total	C	N	O	P	0	0
			29	9	2	15	3		
2	C	1	Total	C	N	O	P	0	0
			29	9	2	15	3		

- Molecule 3 is ZINC ION (CCD ID: ZN) (formula: Zn).

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


- Molecule 4 is water.

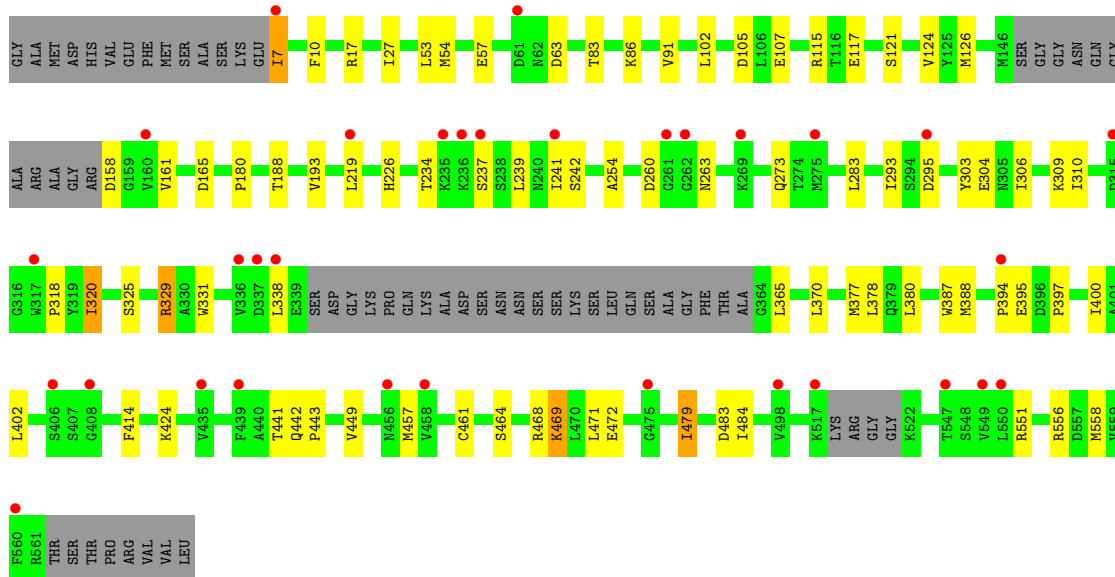
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	36	Total 36	O 36	0	0
4	B	50	Total 50	O 50	0	0
4	C	29	Total 29	O 29	0	0

3 Residue-property plots [i](#)


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.

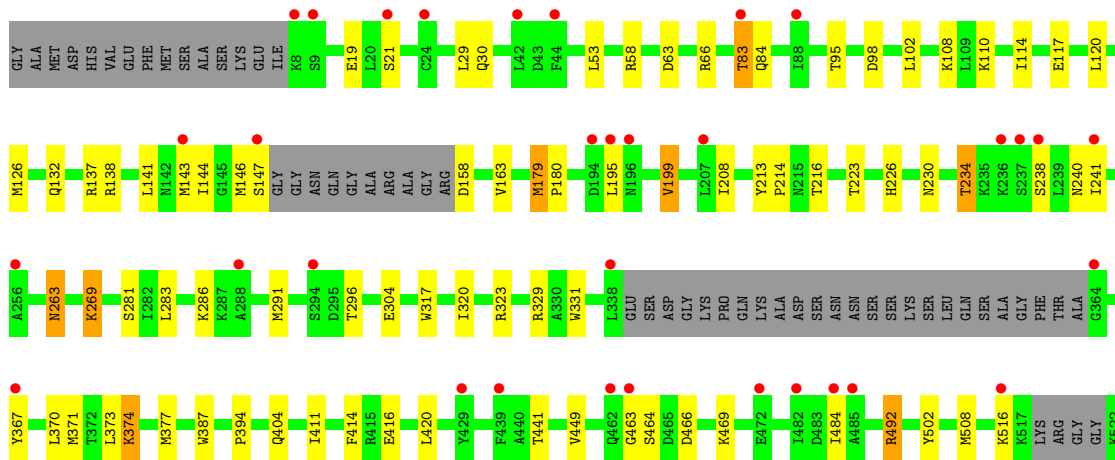
- Molecule 1: Nucleoprotein

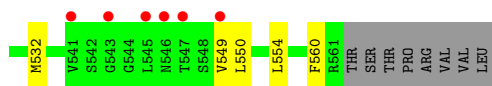
Chain A: 



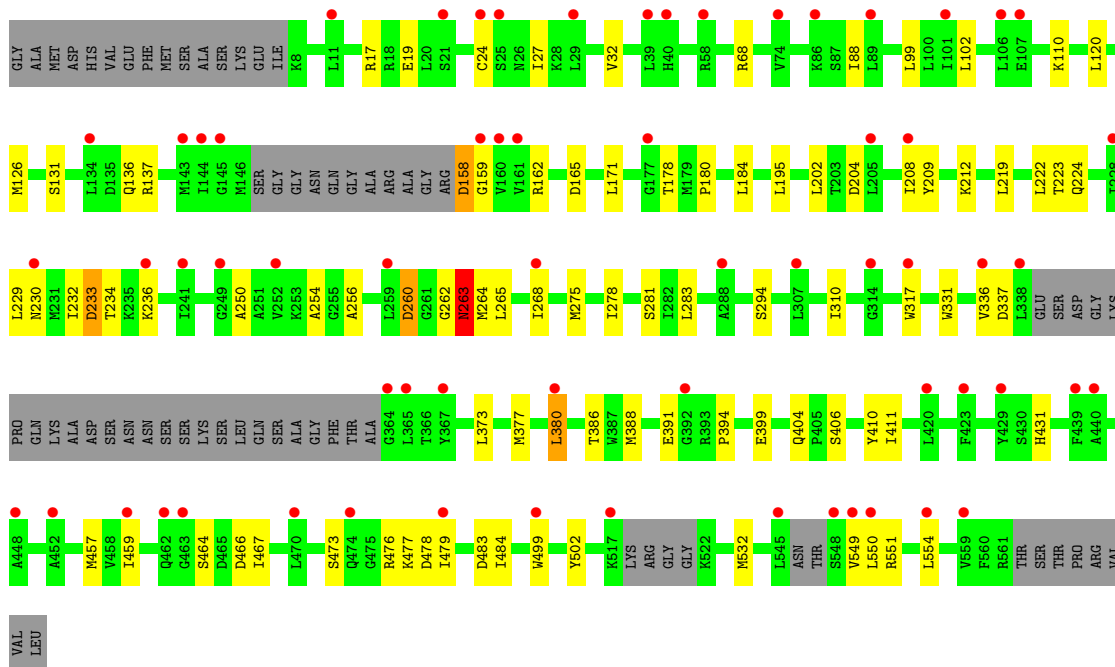
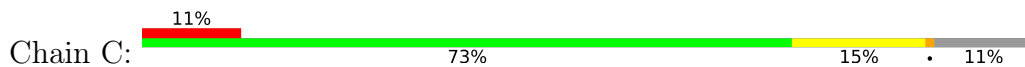
- Molecule 1: Nucleoprotein

Chain B: 





• Molecule 1: Nucleoprotein



4 Data and refinement statistics i

Property	Value	Source
Space group	P 3	Depositor
Cell constants a, b, c, α , β , γ	177.11Å 177.11Å 56.72Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	76.70 – 1.90 76.70 – 1.90	Depositor EDS
% Data completeness (in resolution range)	51.1 (76.70-1.90) 99.9 (76.70-1.90)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	0.08	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.13 (at 1.91Å)	Xtriage
Refinement program	REFMAC 5.5.0102	Depositor
R, R_{free}	0.183 , 0.224 0.182 , 0.216	Depositor DCC
R_{free} test set	7836 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	36.3	Xtriage
Anisotropy	0.000	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 43.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.031 for -h,-k,l 0.049 for h,-h-k,-l 0.030 for -k,-h,-l	Xtriage
Reported twinning fraction	0.513 for H, K, L 0.487 for K, H, -L	Depositor
Outliers	0 of 155929 reflections	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	12276	wwPDB-VP
Average B, all atoms (Å ²)	53.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.74% 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: UTP, ZN

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	0.80	0/4095	1.04	4/5528 (0.1%)
1	B	0.82	0/4084	1.06	11/5513 (0.2%)
1	C	0.67	0/4062	0.96	5/5481 (0.1%)
All	All	0.76	0/12241	1.02	20/16522 (0.1%)

There are no bond length outliers.

All (20) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	226	HIS	CA-C-N	8.58	129.10	119.32
1	B	226	HIS	C-N-CA	8.58	129.10	119.32
1	A	27	ILE	N-CA-C	7.57	119.36	112.17
1	C	317	TRP	CA-C-N	6.49	127.95	119.84
1	C	317	TRP	C-N-CA	6.49	127.95	119.84
1	B	179	MET	CA-C-N	5.93	125.41	119.24
1	B	179	MET	C-N-CA	5.93	125.41	119.24
1	B	404	GLN	CA-C-N	5.79	126.19	119.47
1	B	404	GLN	C-N-CA	5.79	126.19	119.47
1	B	144	ILE	N-CA-C	5.65	117.60	112.29
1	B	263	ASN	N-CA-C	5.57	119.12	111.54
1	C	431	HIS	N-CA-C	5.54	120.31	113.50
1	B	296	THR	CA-C-N	-5.37	115.23	120.98
1	B	296	THR	C-N-CA	-5.37	115.23	120.98
1	A	226	HIS	CA-C-N	5.32	125.39	119.32
1	A	226	HIS	C-N-CA	5.32	125.39	119.32
1	C	554	LEU	CA-C-N	5.15	125.44	119.93
1	C	554	LEU	C-N-CA	5.15	125.44	119.93
1	A	237	SER	N-CA-C	5.09	116.26	108.52
1	B	304	GLU	N-CA-C	-5.01	105.82	111.28

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	4038	0	4110	41	0
1	B	4027	0	4098	53	0
1	C	4006	0	4079	51	0
2	A	29	0	11	0	0
2	B	29	0	11	4	0
2	C	29	0	11	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
4	A	36	0	0	4	0
4	B	50	0	0	2	0
4	C	29	0	0	3	0
All	All	12276	0	12320	146	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 6.

All (146) 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:209:TYR:CD2	1:C:264:MET:HE1	1.90	1.06
1:C:233:ASP:HB2	1:C:236:LYS:HG3	1.37	1.05
1:C:24:CYS:SG	1:C:268:ILE:HG12	2.05	0.97
1:C:256:ALA:HA	4:C:588:HOH:O	1.66	0.96
1:B:216:THR:HG22	1:B:234:THR:OG1	1.74	0.88
1:C:262:GLY:O	1:C:263:ASN:HB2	1.72	0.87
1:A:295:ASP:HB3	4:A:602:HOH:O	1.73	0.87
1:B:373:LEU:HD11	1:B:377:MET:HE2	1.56	0.85
2:B:993:UTP:H4'	4:B:612:HOH:O	1.75	0.85
1:A:306:ILE:HG12	1:A:310:ILE:HD12	1.62	0.82
1:C:223:THR:HG21	1:C:230:ASN:HB3	1.63	0.79

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:370:LEU:O	1:B:374:LYS:HG2	1.82	0.78
1:B:502:TYR:CE1	1:B:550:LEU:HD13	2.19	0.77
1:B:394:PRO:HG2	1:B:469:LYS:HD3	1.68	0.76
1:B:53:LEU:HD22	1:B:63:ASP:OD1	1.86	0.75
1:C:256:ALA:CB	1:C:264:MET:HE3	2.19	0.72
1:C:256:ALA:HB2	1:C:264:MET:HE3	1.73	0.71
1:A:7:ILE:CG2	1:A:10:PHE:H	2.05	0.69
1:B:21:SER:HB2	1:B:263:ASN:CG	2.17	0.69
1:C:110:LYS:HD2	1:C:331:TRP:CD1	2.28	0.67
1:A:115:ARG:NH2	1:A:295:ASP:O	2.27	0.67
1:A:54:MET:HE2	1:A:242:SER:HB3	1.76	0.66
1:C:209:TYR:CD2	1:C:264:MET:CE	2.76	0.66
1:B:286:LYS:HE2	1:B:291:MET:O	1.94	0.66
1:C:464:SER:HB2	1:C:483:ASP:HB2	1.77	0.65
1:B:502:TYR:CE1	1:B:550:LEU:CD1	2.79	0.65
1:C:264:MET:HE2	4:C:588:HOH:O	1.97	0.65
1:B:223:THR:HG21	1:B:230:ASN:CG	2.23	0.63
1:B:370:LEU:O	1:B:374:LYS:CG	2.46	0.63
1:B:492:ARG:HH11	1:B:492:ARG:CG	2.11	0.63
1:B:195:LEU:O	1:B:199:VAL:HG12	1.98	0.63
1:B:269:LYS:HG3	1:B:317:TRP:NE1	2.14	0.62
1:A:117:GLU:OE1	1:A:329:ARG:NH2	2.28	0.62
1:C:19:GLU:HG3	1:C:281:SER:HB3	1.80	0.62
1:A:397:PRO:HB2	1:A:400:ILE:HD11	1.81	0.61
1:A:7:ILE:HG23	1:A:10:PHE:H	1.67	0.60
1:A:320:ILE:HD12	1:A:320:ILE:C	2.26	0.60
1:B:216:THR:CG2	1:B:234:THR:OG1	2.47	0.59
1:B:180:PRO:HG3	1:B:320:ILE:HB	1.84	0.58
1:B:21:SER:HB2	1:B:263:ASN:OD1	2.04	0.58
1:C:209:TYR:HA	1:C:212:LYS:O	2.03	0.58
1:A:57:GLU:HB2	4:A:603:HOH:O	2.05	0.57
1:A:105:ASP:OD2	1:A:303:TYR:OH	2.21	0.57
1:A:464:SER:H	1:A:483:ASP:CG	2.14	0.56
1:C:209:TYR:HD2	1:C:264:MET:HE1	1.66	0.56
1:A:329:ARG:HG3	1:A:331:TRP:CZ2	2.41	0.55
1:B:146:MET:HE3	1:B:163:VAL:HG23	1.89	0.55
1:C:209:TYR:CE2	1:C:264:MET:HE1	2.39	0.53
1:C:180:PRO:HB3	1:C:254:ALA:HA	1.91	0.52
1:A:180:PRO:HB3	1:A:254:ALA:HA	1.89	0.52
1:A:377:MET:CE	1:A:449:VAL:HG22	2.39	0.52
1:B:377:MET:HE1	1:B:449:VAL:HG13	1.91	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:110:LYS:HG3	1:C:331:TRP:CE2	2.44	0.52
1:A:165:ASP:OD1	1:A:551:ARG:NH2	2.42	0.52
1:C:265:LEU:O	1:C:268:ILE:HG13	2.08	0.52
1:B:492:ARG:HH11	1:B:492:ARG:HG2	1.75	0.52
1:A:468:ARG:NH2	4:A:597:HOH:O	2.42	0.52
1:C:88:ILE:HG22	1:C:337:ASP:HB2	1.92	0.52
1:C:208:ILE:HD12	1:C:222:LEU:HD11	1.91	0.52
1:C:386:THR:HB	1:C:459:ILE:HD13	1.91	0.51
1:A:17:ARG:HG2	1:A:263:ASN:O	2.10	0.51
1:A:91:VAL:CG2	1:A:338:LEU:HD13	2.41	0.51
1:B:394:PRO:CG	1:B:469:LYS:HD3	2.38	0.50
1:A:91:VAL:HG21	1:A:338:LEU:HD13	1.92	0.50
1:B:223:THR:HG21	1:B:230:ASN:OD1	2.09	0.50
1:A:53:LEU:HD22	1:A:63:ASP:OD1	2.11	0.50
1:C:388:MET:HG2	1:C:467:ILE:HD12	1.93	0.50
1:B:180:PRO:CG	1:B:320:ILE:HB	2.41	0.50
1:B:373:LEU:CD1	1:B:377:MET:HE2	2.35	0.50
1:A:461:CYS:SG	1:A:464:SER:HA	2.51	0.50
1:B:323:ARG:NH2	2:B:993:UTP:O2B	2.39	0.49
1:C:165:ASP:OD1	1:C:551:ARG:NH2	2.40	0.49
1:A:387:TRP:O	1:A:402:LEU:HA	2.11	0.49
1:B:108:LYS:HE3	4:B:579:HOH:O	2.11	0.49
1:C:391:GLU:HB2	1:C:399:GLU:HB3	1.94	0.49
1:B:286:LYS:HG3	1:B:291:MET:HB2	1.94	0.48
1:B:367:TYR:CZ	1:B:371:MET:SD	3.07	0.48
1:A:377:MET:HE1	1:A:449:VAL:HG13	1.96	0.47
1:C:126:MET:SD	1:C:137:ARG:HB3	2.55	0.47
1:C:136:GLN:OE1	4:C:582:HOH:O	2.20	0.47
1:C:233:ASP:CB	1:C:236:LYS:HG3	2.25	0.47
1:B:126:MET:HE1	1:B:138:ARG:HG3	1.97	0.47
1:C:68:ARG:NH1	1:C:171:LEU:O	2.48	0.47
1:A:468:ARG:O	1:A:472:GLU:HG3	2.16	0.46
1:C:278:ILE:HG21	1:C:310:ILE:HD13	1.97	0.46
1:C:19:GLU:CG	1:C:281:SER:HB3	2.45	0.46
1:B:269:LYS:HG3	1:B:317:TRP:CD1	2.50	0.46
1:B:373:LEU:O	1:B:377:MET:HG2	2.16	0.46
1:C:99:LEU:HD22	1:C:336:VAL:HG13	1.98	0.45
1:C:373:LEU:O	1:C:377:MET:HG2	2.16	0.45
1:B:58:ARG:HH11	1:B:58:ARG:HG2	1.82	0.45
1:A:102:LEU:HG	1:A:283:LEU:HD11	1.99	0.45
1:A:126:MET:HG3	1:A:161:VAL:HG21	1.98	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:102:LEU:HG	1:C:283:LEU:HD11	1.98	0.45
1:C:17:ARG:HG2	1:C:263:ASN:O	2.17	0.45
1:A:121:SER:OG	4:A:582:HOH:O	2.20	0.45
1:B:463:GLY:O	1:B:466:ASP:OD1	2.33	0.45
1:A:471:LEU:HD22	1:A:479:ILE:HD12	1.98	0.44
1:C:88:ILE:CG2	1:C:337:ASP:HB2	2.48	0.44
1:B:120:LEU:HD13	2:B:993:UTP:C4	2.53	0.44
1:B:110:LYS:O	1:B:114:ILE:HG13	2.18	0.44
1:B:141:LEU:HB3	1:B:146:MET:O	2.17	0.44
1:C:178:THR:HG21	1:C:250:ALA:HB2	1.99	0.44
1:A:293:ILE:HG23	1:A:304:GLU:HG2	1.99	0.44
1:C:32:VAL:HG13	1:C:195:LEU:HD21	2.00	0.43
1:C:229:LEU:O	1:C:232:ILE:HD12	2.18	0.43
1:C:476:ARG:HB3	1:C:479:ILE:HD12	2.00	0.43
1:A:380:LEU:HD13	1:A:457:MET:HE1	2.01	0.43
1:B:95:THR:HG1	1:B:98:ASP:CG	2.24	0.43
1:A:320:ILE:C	1:A:320:ILE:CD1	2.90	0.43
1:C:410:TYR:CE2	1:C:550:LEU:HB3	2.52	0.43
1:A:188:THR:HG23	1:A:193:VAL:O	2.19	0.43
1:B:83:THR:O	1:B:84:GLN:C	2.61	0.43
1:B:414:PHE:CE1	1:B:508:MET:HG2	2.54	0.43
1:B:441:THR:HG22	1:B:560:PHE:CE1	2.54	0.43
1:B:110:LYS:HG3	1:B:331:TRP:CE2	2.54	0.42
1:C:394:PRO:HB3	1:C:466:ASP:O	2.19	0.42
1:C:162:ARG:NH2	1:C:551:ARG:HD2	2.34	0.42
1:C:477:LYS:HE3	1:C:477:LYS:HB2	1.78	0.42
1:C:380:LEU:HD11	1:C:411:ILE:HD11	2.01	0.42
1:B:240:ASN:HA	2:B:993:UTP:O2	2.20	0.42
1:A:558:MET:O	1:A:558:MET:HG3	2.19	0.42
1:C:386:THR:HG23	1:C:404:GLN:HG2	2.02	0.42
1:C:219:LEU:CD2	1:C:234:THR:HG22	2.50	0.42
1:A:442:GLN:NE2	1:A:443:PRO:HD2	2.35	0.42
1:A:124:VAL:HG13	1:A:378:LEU:HB3	2.02	0.42
1:B:102:LEU:HG	1:B:283:LEU:HD11	2.02	0.42
1:B:387:TRP:CH2	1:B:484:ILE:HG13	2.55	0.41
1:B:411:ILE:HG23	1:B:554:LEU:HD11	2.01	0.41
1:A:394:PRO:HG2	1:A:469:LYS:HE3	2.02	0.41
1:B:492:ARG:CG	1:B:492:ARG:NH1	2.72	0.41
1:A:309:LYS:HB3	1:A:318:PRO:HB2	2.01	0.41
1:B:95:THR:OG1	1:B:98:ASP:CG	2.64	0.41
1:B:213:TYR:HA	1:B:214:PRO:HD3	1.88	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:19:GLU:HG3	1:B:281:SER:HB3	2.02	0.41
1:B:502:TYR:O	1:B:532:MET:HE1	2.21	0.41
1:B:117:GLU:OE1	1:B:329:ARG:NH2	2.52	0.41
1:A:414:PHE:HB2	1:A:441:THR:HG21	2.03	0.41
1:B:179:MET:HA	1:B:180:PRO:HD2	1.80	0.41
1:A:388:MET:HE3	1:A:402:LEU:HD11	2.03	0.41
1:B:126:MET:SD	1:B:137:ARG:HB3	2.61	0.41
1:A:556:ARG:C	1:A:558:MET:H	2.28	0.40
1:C:158:ASP:HB2	1:C:159:GLY:H	1.43	0.40
1:C:499:TRP:CZ2	1:C:532:MET:HG3	2.57	0.40
1:C:184:LEU:HD13	1:C:202:LEU:HD12	2.03	0.40
1:C:502:TYR:CE1	1:C:550:LEU:HD13	2.57	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	508/577 (88%)	493 (97%)	14 (3%)	1 (0%)	43	36
1	B	507/577 (88%)	498 (98%)	9 (2%)	0	100	100
1	C	502/577 (87%)	474 (94%)	25 (5%)	3 (1%)	21	13
All	All	1517/1731 (88%)	1465 (97%)	48 (3%)	4 (0%)	36	29

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	263	ASN
1	C	457	MET
1	A	260	ASP
1	C	260	ASP

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	453/498 (91%)	433 (96%)	20 (4%)	25	17
1	B	452/498 (91%)	431 (95%)	21 (5%)	24	16
1	C	449/498 (90%)	432 (96%)	17 (4%)	29	21
All	All	1354/1494 (91%)	1296 (96%)	58 (4%)	26	18

All (58) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	7	ILE
1	A	83	THR
1	A	86	LYS
1	A	107	GLU
1	A	158	ASP
1	A	219	LEU
1	A	234	THR
1	A	239	LEU
1	A	241	ILE
1	A	273	GLN
1	A	320	ILE
1	A	325	SER
1	A	329	ARG
1	A	365	LEU
1	A	370	LEU
1	A	395	GLU
1	A	424	LYS
1	A	469	LYS
1	A	479	ILE
1	A	484	ILE
1	B	29	LEU
1	B	30	GLN
1	B	66	ARG
1	B	83	THR
1	B	132	GLN
1	B	143	MET

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Mol	Chain	Res	Type
1	B	147	SER
1	B	158	ASP
1	B	199	VAL
1	B	208	ILE
1	B	234	THR
1	B	238	SER
1	B	241	ILE
1	B	269	LYS
1	B	374	LYS
1	B	416	GLU
1	B	420	LEU
1	B	464	SER
1	B	492	ARG
1	B	516	LYS
1	B	549	VAL
1	C	27	ILE
1	C	120	LEU
1	C	131	SER
1	C	158	ASP
1	C	204	ASP
1	C	224	GLN
1	C	233	ASP
1	C	260	ASP
1	C	263	ASN
1	C	275	MET
1	C	294	SER
1	C	380	LEU
1	C	406	SER
1	C	473	SER
1	C	478	ASP
1	C	484	ILE
1	C	549	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	72	GLN
1	A	85	GLN
1	A	224	GLN
1	A	383	ASN
1	A	442	GLN
1	B	379	GLN

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Mol	Chain	Res	Type
1	B	422	GLN
1	C	72	GLN
1	C	75	ASN
1	C	174	ASN
1	C	196	ASN
1	C	226	HIS

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 6 ligands modelled in this entry, 3 are monoatomic - leaving 3 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
2	UTP	C	993	-	29,30,30	1.26	3 (10%)	43,47,47	1.71	10 (23%)
2	UTP	B	993	-	29,30,30	1.30	3 (10%)	43,47,47	2.05	12 (27%)
2	UTP	A	993	-	29,30,30	1.27	3 (10%)	43,47,47	1.71	10 (23%)

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	UTP	C	993	-	-	5/22/38/38	0/2/2/2
2	UTP	B	993	-	-	4/22/38/38	0/2/2/2
2	UTP	A	993	-	-	5/22/38/38	0/2/2/2

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	993	UTP	PA-O3A	4.14	1.64	1.59
2	A	993	UTP	PB-O3B	4.13	1.64	1.59
2	C	993	UTP	PB-O3B	3.84	1.63	1.59
2	B	993	UTP	PB-O3A	2.46	1.62	1.59
2	A	993	UTP	PA-O3A	2.34	1.62	1.59
2	A	993	UTP	C2-N1	-2.26	1.34	1.38
2	B	993	UTP	PB-O3B	2.25	1.61	1.59
2	C	993	UTP	PA-O3A	2.19	1.61	1.59
2	C	993	UTP	PB-O3A	2.15	1.61	1.59

All (32) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	993	UTP	O1B-PB-O3A	5.41	121.88	107.27
2	C	993	UTP	C4-N3-C2	-4.78	120.68	126.61
2	A	993	UTP	C4-N3-C2	-4.59	120.92	126.61
2	B	993	UTP	O2A-PA-O3A	4.55	119.58	107.27
2	B	993	UTP	C4-N3-C2	-4.51	121.01	126.61
2	B	993	UTP	N3-C2-N1	4.17	120.32	114.89
2	A	993	UTP	O4-C4-C5	-3.87	118.48	125.16
2	C	993	UTP	C5-C4-N3	3.87	120.22	114.80
2	C	993	UTP	O4-C4-C5	-3.74	118.72	125.16
2	A	993	UTP	N3-C2-N1	3.56	119.53	114.89
2	C	993	UTP	N3-C2-N1	3.53	119.48	114.89
2	B	993	UTP	O4-C4-C5	-3.51	119.10	125.16
2	A	993	UTP	C5-C4-N3	3.49	119.69	114.80
2	B	993	UTP	C5-C4-N3	3.35	119.49	114.80
2	A	993	UTP	O1B-PB-O3A	3.03	115.46	107.27
2	C	993	UTP	O1B-PB-O3A	2.97	115.31	107.27
2	B	993	UTP	O3A-PA-O1A	-2.90	101.99	110.70
2	B	993	UTP	C1'-N1-C2	2.73	122.49	117.59
2	B	993	UTP	PA-O5'-C5'	-2.51	106.97	121.35
2	C	993	UTP	PA-O5'-C5'	-2.41	107.55	121.35
2	A	993	UTP	PA-O5'-C5'	-2.40	107.58	121.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	993	UTP	O2A-PA-O3A	2.33	113.57	107.27
2	B	993	UTP	O3B-PB-O2B	-2.32	103.73	110.70
2	A	993	UTP	C2'-C1'-N1	-2.30	106.85	113.25
2	C	993	UTP	O2A-PA-O3A	2.27	113.40	107.27
2	A	993	UTP	O2-C2-N1	-2.22	119.90	122.80
2	B	993	UTP	O4'-C1'-C2'	-2.21	101.89	106.62
2	B	993	UTP	O3G-PG-O3B	2.11	111.73	104.64
2	C	993	UTP	O2-C2-N1	-2.10	120.06	122.80
2	A	993	UTP	O1G-PG-O3B	2.08	111.60	104.64
2	C	993	UTP	C2'-C1'-N1	-2.04	107.57	113.25
2	C	993	UTP	O1G-PG-O3B	2.03	111.45	104.64

There are no chirality outliers.

All (14) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	993	UTP	O4'-C4'-C5'-O5'
2	B	993	UTP	C5'-O5'-PA-O3A
2	C	993	UTP	O4'-C4'-C5'-O5'
2	A	993	UTP	C3'-C4'-C5'-O5'
2	B	993	UTP	O4'-C4'-C5'-O5'
2	C	993	UTP	C3'-C4'-C5'-O5'
2	B	993	UTP	C3'-C4'-C5'-O5'
2	A	993	UTP	PB-O3A-PA-O1A
2	C	993	UTP	PB-O3A-PA-O1A
2	A	993	UTP	C2'-C1'-N1-C6
2	B	993	UTP	PG-O3B-PB-O2B
2	C	993	UTP	C2'-C1'-N1-C6
2	A	993	UTP	O4'-C1'-N1-C6
2	C	993	UTP	O4'-C1'-N1-C6

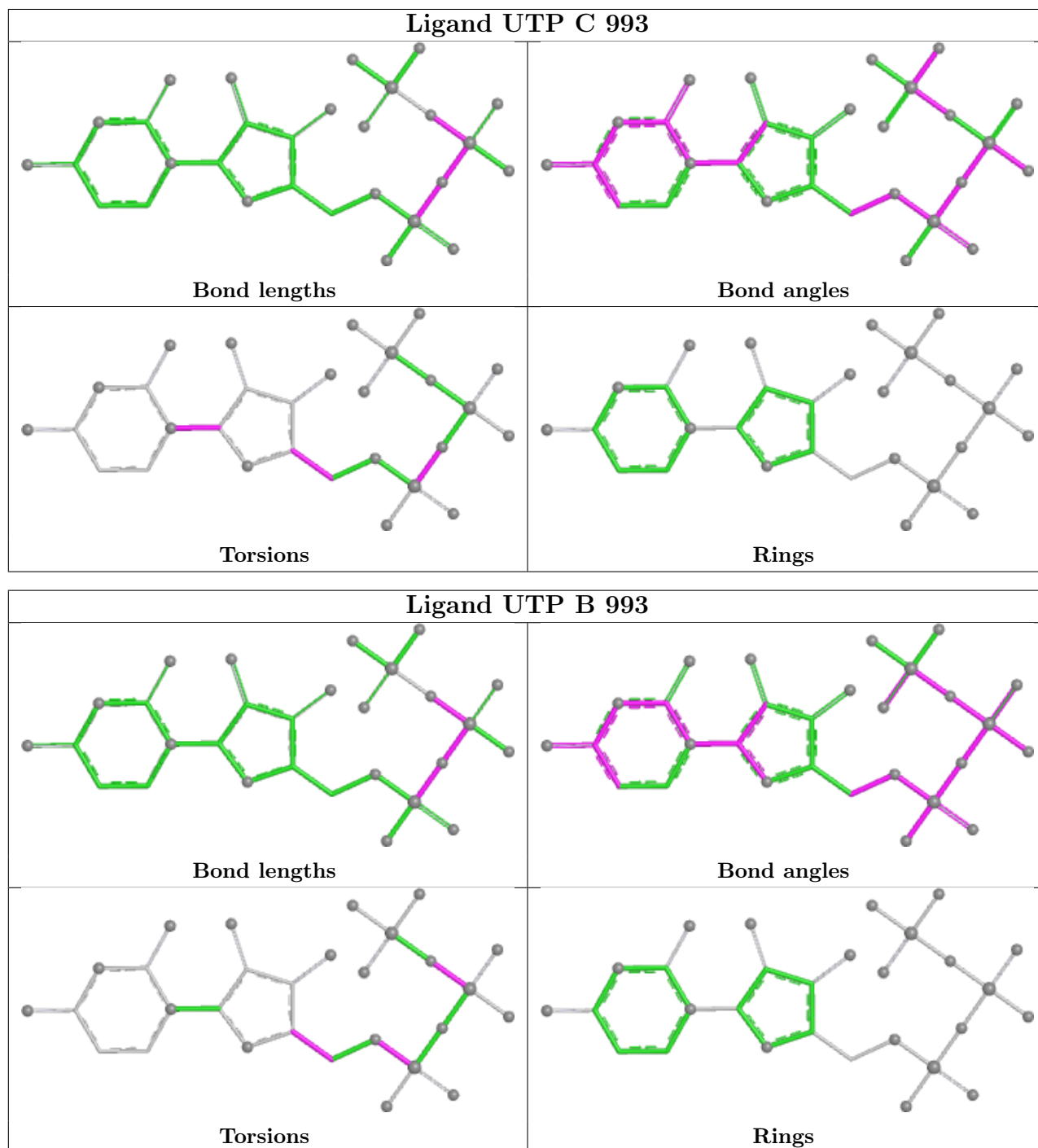
There are no ring outliers.

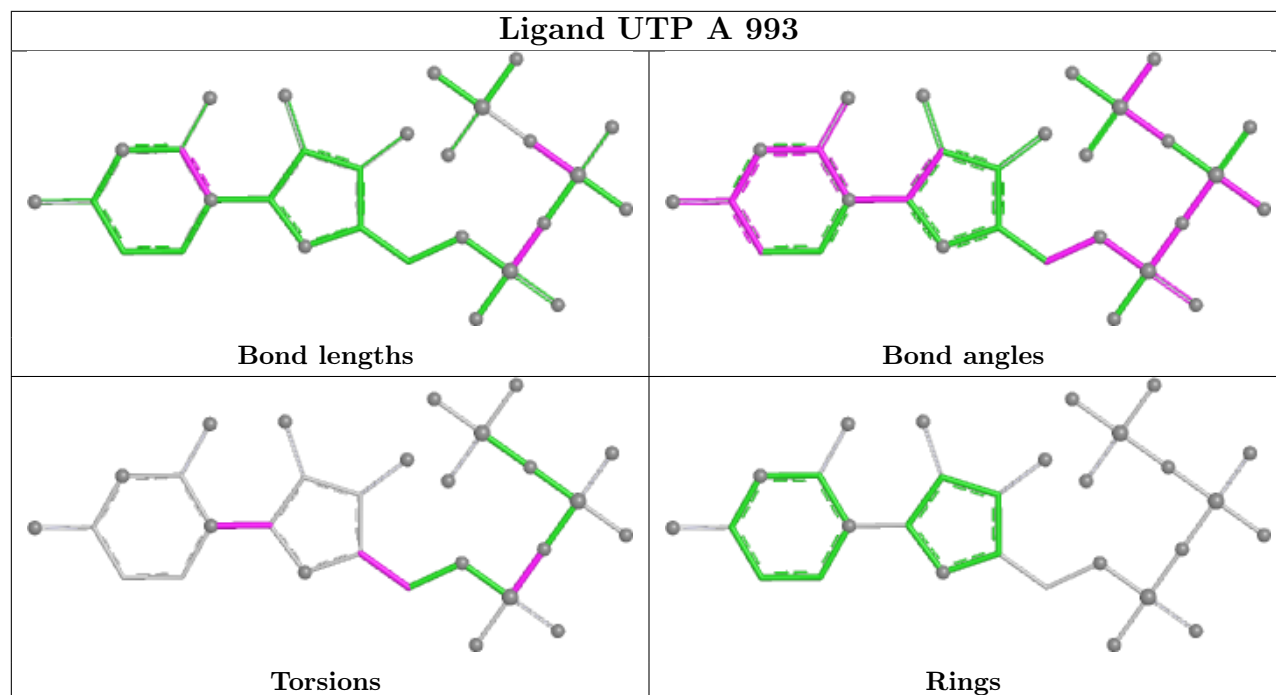
1 monomer is involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	993	UTP	4	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	516/577 (89%)	0.90	32 (6%) 26 28	31, 50, 63, 81	1 (0%)
1	B	515/577 (89%)	0.87	39 (7%) 20 21	43, 49, 63, 81	0
1	C	512/577 (88%)	1.20	64 (12%) 8 8	45, 56, 68, 83	0
All	All	1543/1731 (89%)	0.99	135 (8%) 16 17	31, 52, 66, 83	1 (0%)

All (135) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	338	LEU	4.2
1	A	338	LEU	4.2
1	C	29	LEU	4.1
1	C	549	VAL	4.1
1	A	439	PHE	3.7
1	A	7	ILE	3.7
1	C	463	GLY	3.7
1	B	241	ILE	3.2
1	C	21	SER	3.1
1	C	160	VAL	3.1
1	A	241	ILE	3.1
1	A	261	GLY	3.1
1	B	338	LEU	3.0
1	B	147	SER	3.0
1	B	549	VAL	2.9
1	C	252	VAL	2.9
1	B	482	ILE	2.9
1	B	294	SER	2.8
1	C	24	CYS	2.8
1	A	236	LYS	2.8
1	A	517	LYS	2.8
1	C	548	SER	2.8
1	C	439	PHE	2.8

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Mol	Chain	Res	Type	RSRZ
1	B	24	CYS	2.8
1	B	256	ALA	2.7
1	C	317	TRP	2.7
1	C	429	TYR	2.7
1	C	440	ALA	2.7
1	C	40	HIS	2.7
1	C	452	ALA	2.7
1	B	364	GLY	2.7
1	A	337	ASP	2.7
1	A	262	GLY	2.6
1	B	439	PHE	2.6
1	C	268	ILE	2.6
1	C	364	GLY	2.6
1	C	288	ALA	2.6
1	C	545	LEU	2.6
1	C	58	ARG	2.5
1	C	107	GLU	2.5
1	A	550	LEU	2.5
1	C	236	LYS	2.5
1	A	547	THR	2.5
1	B	367	TYR	2.5
1	C	11	LEU	2.5
1	C	230	ASN	2.5
1	C	101	ILE	2.5
1	C	479	ILE	2.5
1	A	295	ASP	2.5
1	B	8	LYS	2.4
1	C	177	GLY	2.4
1	C	106	LEU	2.4
1	B	236	LYS	2.4
1	B	541	VAL	2.4
1	B	195	LEU	2.4
1	B	194	ASP	2.4
1	C	448	ALA	2.4
1	A	394	PRO	2.4
1	B	21	SER	2.4
1	B	44	PHE	2.3
1	B	472	GLU	2.3
1	C	161	VAL	2.3
1	A	317	TRP	2.3
1	C	380	LEU	2.3
1	A	275	MET	2.3

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Mol	Chain	Res	Type	RSRZ
1	C	367	TYR	2.3
1	B	484	ILE	2.3
1	C	145	GLY	2.3
1	C	314	GLY	2.3
1	A	315	ASP	2.3
1	A	160	VAL	2.3
1	C	74	VAL	2.3
1	C	420	LEU	2.3
1	B	485	ALA	2.2
1	C	241	ILE	2.2
1	C	474	GLN	2.2
1	A	235	LYS	2.2
1	C	517	LYS	2.2
1	B	547	THR	2.2
1	A	237	SER	2.2
1	C	25	SER	2.2
1	C	462	GLN	2.2
1	C	459	ILE	2.2
1	B	143	MET	2.2
1	B	516	LYS	2.2
1	A	336	VAL	2.2
1	B	237	SER	2.2
1	B	543	GLY	2.2
1	C	228	ILE	2.2
1	A	269	LYS	2.2
1	C	336	VAL	2.2
1	A	475	GLY	2.2
1	C	550	LEU	2.2
1	B	546	ASN	2.1
1	A	435	VAL	2.1
1	B	9	SER	2.1
1	A	408	GLY	2.1
1	C	392	GLY	2.1
1	C	89	LEU	2.1
1	C	205	LEU	2.1
1	C	307	LEU	2.1
1	C	143	MET	2.1
1	B	196	ASN	2.1
1	B	88	ILE	2.1
1	C	144	ILE	2.1
1	C	499	TRP	2.1
1	A	458	VAL	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	498	VAL	2.1
1	B	463	GLY	2.1
1	C	249	GLY	2.1
1	C	559	VAL	2.1
1	A	456	ASN	2.1
1	B	207	LEU	2.1
1	B	545	LEU	2.1
1	B	288	ALA	2.1
1	C	423	PHE	2.1
1	B	429	TYR	2.1
1	C	159	GLY	2.1
1	A	219	LEU	2.1
1	B	42	LEU	2.1
1	C	134	LEU	2.1
1	C	554	LEU	2.1
1	A	61	ASP	2.1
1	A	560	PHE	2.0
1	C	208	ILE	2.0
1	B	83	THR	2.0
1	B	462	GLN	2.0
1	C	39	LEU	2.0
1	C	259	LEU	2.0
1	C	365	LEU	2.0
1	C	470	LEU	2.0
1	C	86	LYS	2.0
1	A	406	SER	2.0
1	B	238	SER	2.0
1	A	549	VAL	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 oligosaccharides in this entry.

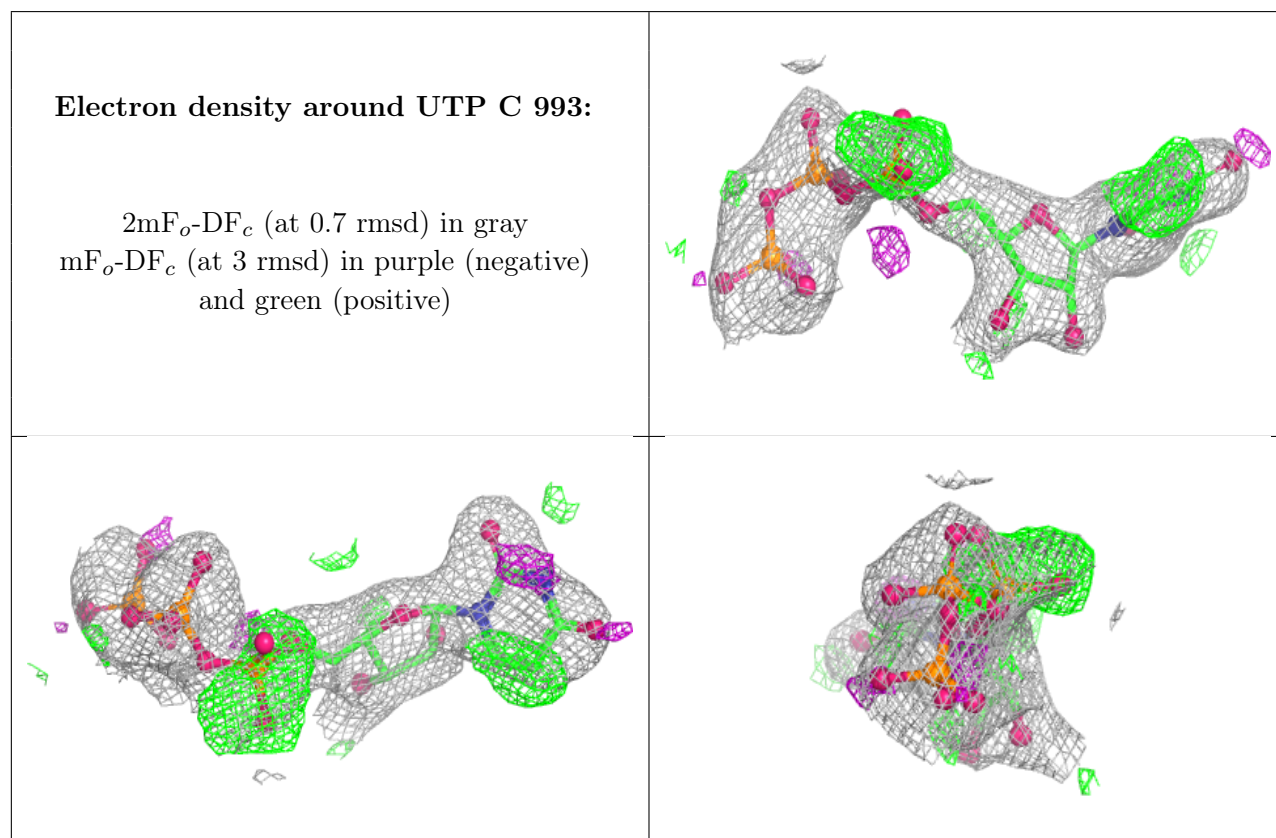
6.4 Ligands [i](#)

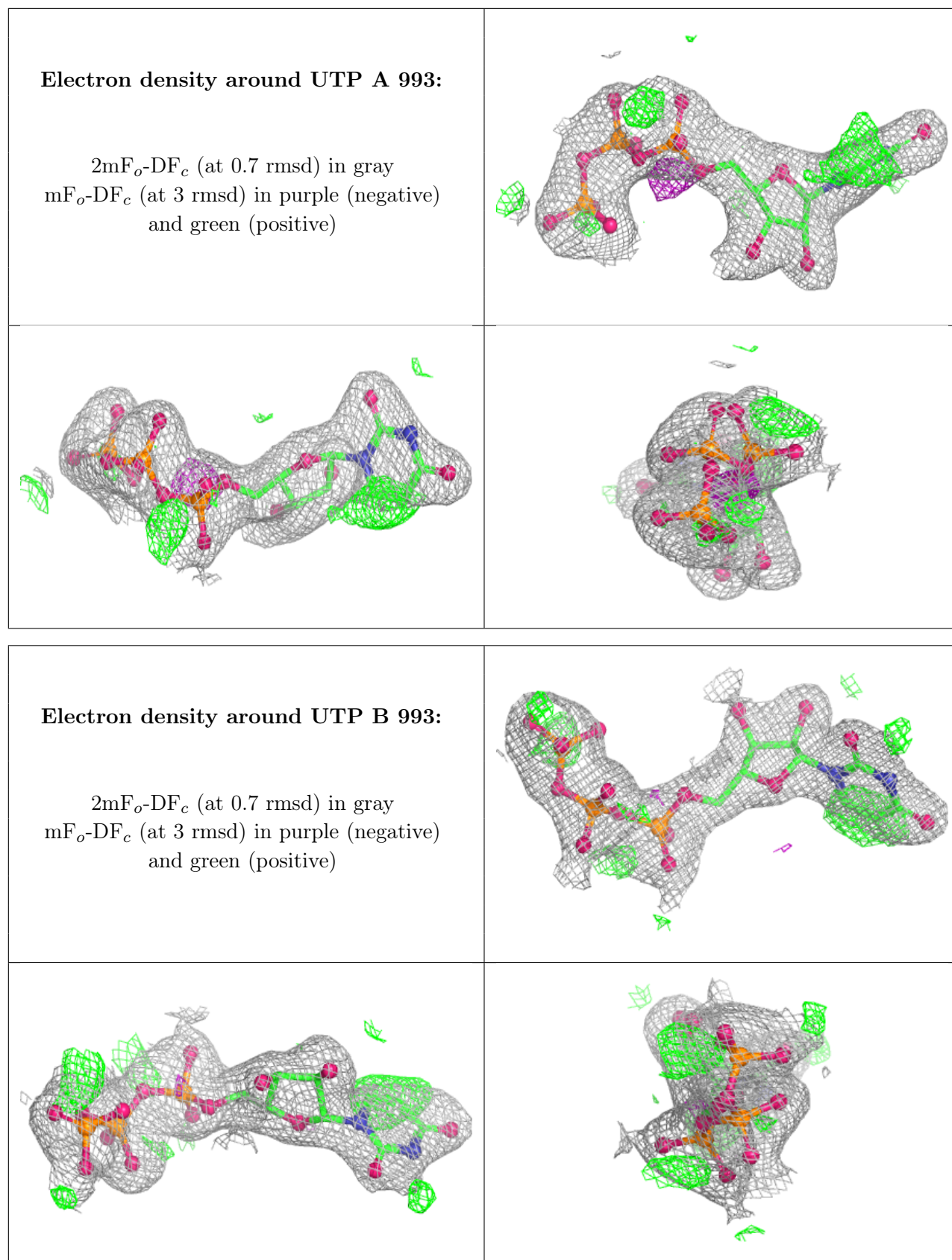
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

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	UTP	C	993	29/29	0.85	0.22	62,72,77,78	5
2	UTP	A	993	29/29	0.92	0.15	59,69,77,82	2
2	UTP	B	993	29/29	0.93	0.15	50,65,75,86	2
3	ZN	A	570	1/1	1.00	0.04	47,47,47,47	0
3	ZN	B	570	1/1	1.00	0.02	46,46,46,46	0
3	ZN	C	570	1/1	1.00	0.02	52,52,52,52	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.