



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 05:19 PM UTC

PDB ID : 3P0E / pdb_00003p0e
Title : Structure of hUPP2 in an active conformation with bound 5-benzylacetylcholine
Authors : Roosild, T.P.; Castronovo, S.; Villosio, A.
Deposited on : 2010-09-28
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	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

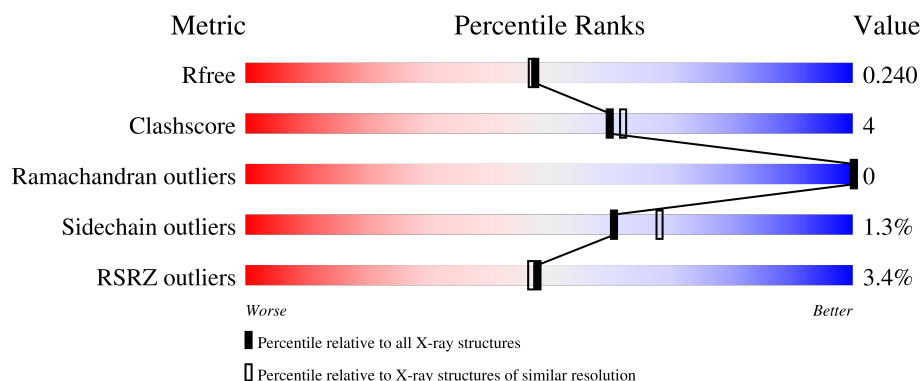
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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}	180053	10052 (2.00-2.00)
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (2.00-2.00)
RSRZ outliers	180081	10067 (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	297	3% 85% 10%
1	B	297	2% 86% 10%
1	C	297	4% 85% 12%
1	D	297	4% 86% 9%
1	E	297	4% 86% 12%

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Mol	Chain	Length	Quality of chain
1	F	297	4% 89% 7%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 14052 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 Uridine phosphorylase 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	285	Total	C	N	O	S	0	1	0
			2241	1432	384	403	22			
1	B	285	Total	C	N	O	S	0	2	0
			2245	1437	381	404	23			
1	C	291	Total	C	N	O	S	0	0	0
			2282	1454	387	419	22			
1	D	285	Total	C	N	O	S	0	2	0
			2245	1437	381	404	23			
1	E	291	Total	C	N	O	S	0	1	0
			2285	1456	387	419	23			
1	F	285	Total	C	N	O	S	0	2	0
			2245	1437	381	404	23			

There are 18 discrepancies between the modelled and reference sequences:

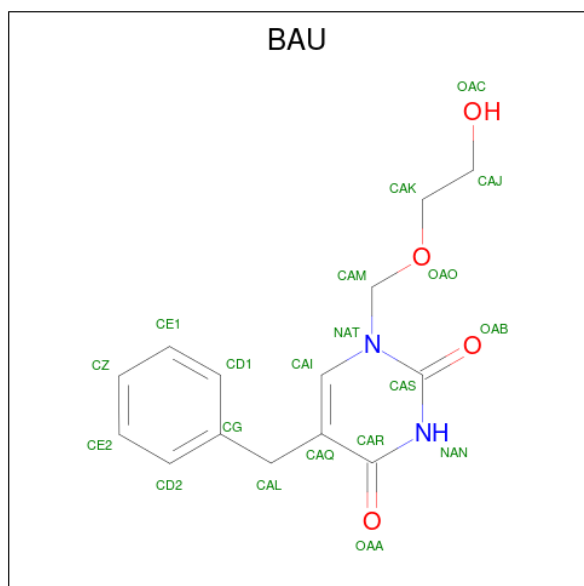
Chain	Residue	Modelled	Actual	Comment	Reference
A	18	GLY	-	expression tag	UNP O95045
A	19	SER	-	expression tag	UNP O95045
A	20	SER	-	expression tag	UNP O95045
B	18	GLY	-	expression tag	UNP O95045
B	19	SER	-	expression tag	UNP O95045
B	20	SER	-	expression tag	UNP O95045
C	18	GLY	-	expression tag	UNP O95045
C	19	SER	-	expression tag	UNP O95045
C	20	SER	-	expression tag	UNP O95045
D	18	GLY	-	expression tag	UNP O95045
D	19	SER	-	expression tag	UNP O95045
D	20	SER	-	expression tag	UNP O95045
E	18	GLY	-	expression tag	UNP O95045
E	19	SER	-	expression tag	UNP O95045
E	20	SER	-	expression tag	UNP O95045
F	18	GLY	-	expression tag	UNP O95045
F	19	SER	-	expression tag	UNP O95045

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Chain	Residue	Modelled	Actual	Comment	Reference
F	20	SER	-	expression tag	UNP O95045

- Molecule 2 is 1-((2-HYDROXYETHOXY)METHYL)-5-BENZYLPIRIMIDINE-2,4(1H,3H)-DIONE (CCD ID: BAU) (formula: C₁₄H₁₆N₂O₄).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			20	14	2	4		
2	B	1	Total	C	N	O	0	0
			20	14	2	4		
2	C	1	Total	C	N	O	0	0
			20	14	2	4		
2	D	1	Total	C	N	O	0	0
			20	14	2	4		
2	E	1	Total	C	N	O	0	0
			20	14	2	4		
2	F	1	Total	C	N	O	0	0
			20	14	2	4		

- Molecule 3 is PHOSPHATE ION (CCD ID: PO4) (formula: O₄P).



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

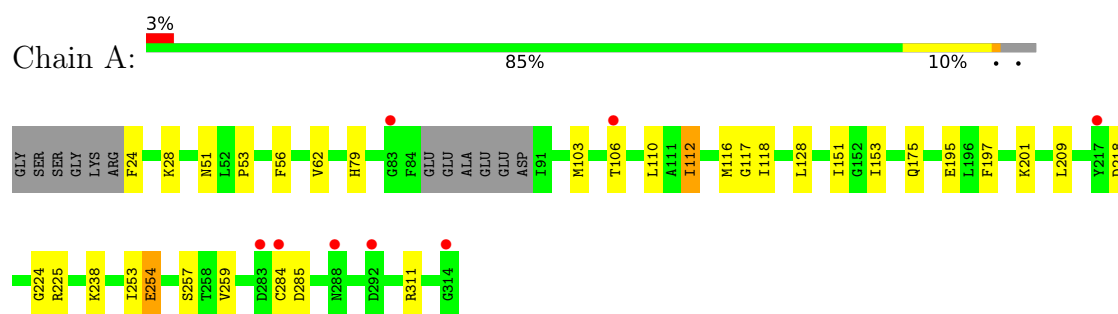
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	61	Total	O	0	0
			61	61		
4	B	71	Total	O	0	0
			71	71		
4	C	48	Total	O	0	0
			48	48		
4	D	43	Total	O	0	0
			43	43		
4	E	78	Total	O	0	0
			78	78		
4	F	58	Total	O	0	0
			58	58		

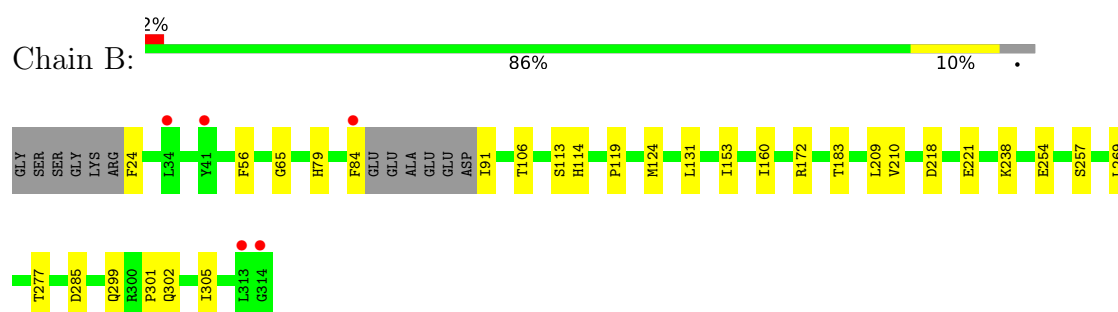
3 Residue-property plots [i](#)

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.

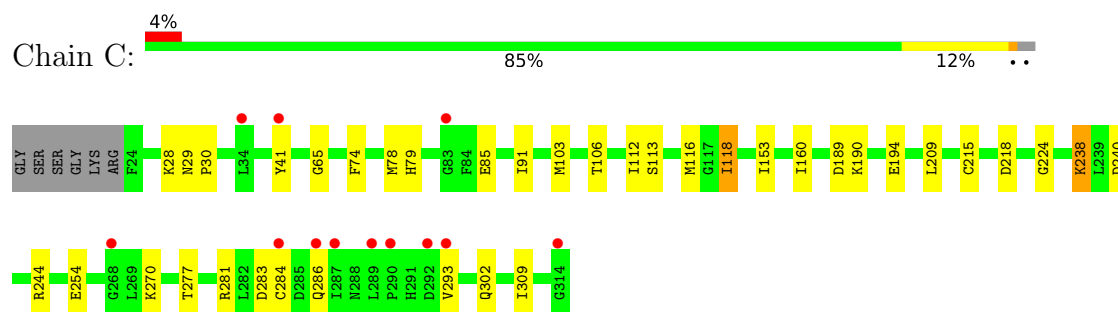
• Molecule 1: Uridine phosphorylase 2



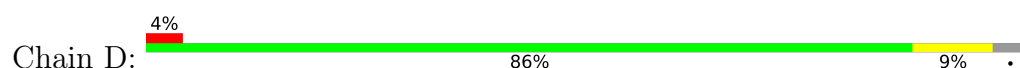
• Molecule 1: Uridine phosphorylase 2

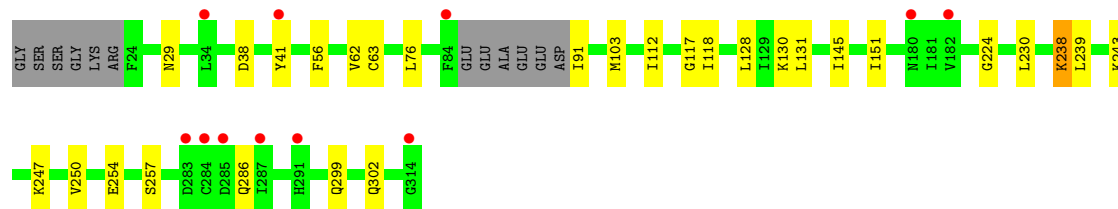


• Molecule 1: Uridine phosphorylase 2

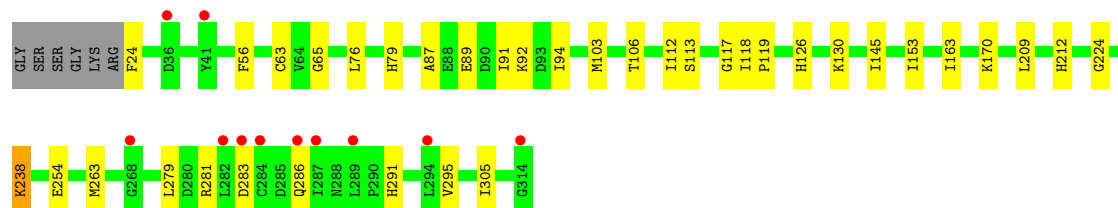
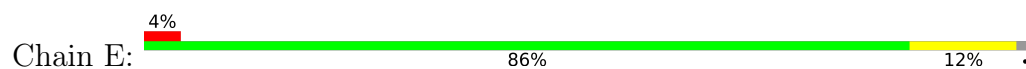


• Molecule 1: Uridine phosphorylase 2

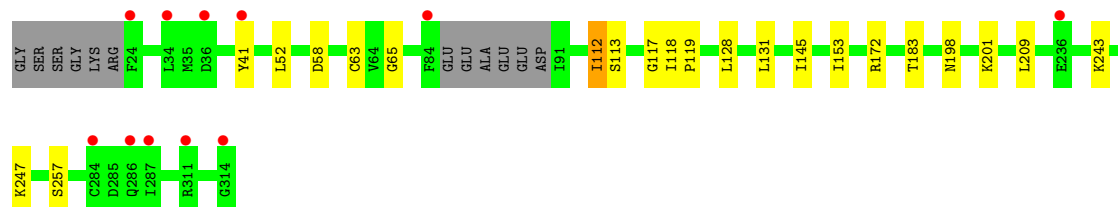
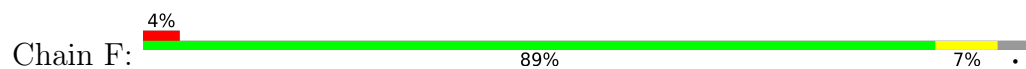




• Molecule 1: Uridine phosphorylase 2



• Molecule 1: Uridine phosphorylase 2



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	275.34Å 56.14Å 141.39Å 90.00° 96.38° 90.00°	Depositor
Resolution (Å)	35.44 – 2.00 35.44 – 2.00	Depositor EDS
% Data completeness (in resolution range)	92.1 (35.44-2.00) 92.0 (35.44-2.00)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.86 (at 2.00Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.205 , 0.242 0.204 , 0.240	Depositor DCC
R_{free} test set	6734 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	29.3	Xtriage
Anisotropy	0.367	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 30.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	14052	wwPDB-VP
Average B, all atoms (Å ²)	33.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.87% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

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

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	0.88	2/2287 (0.1%)	0.92	1/3083 (0.0%)
1	B	0.85	0/2295	0.93	1/3095 (0.0%)
1	C	0.83	0/2326	0.94	1/3138 (0.0%)
1	D	0.83	1/2295 (0.0%)	0.94	4/3095 (0.1%)
1	E	0.92	1/2332 (0.0%)	0.96	1/3146 (0.0%)
1	F	0.92	1/2295 (0.0%)	0.95	1/3095 (0.0%)
All	All	0.87	5/13830 (0.0%)	0.94	9/18652 (0.0%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	F	118	ILE	CA-CB	11.47	1.60	1.54
1	D	118	ILE	CA-CB	11.10	1.59	1.54
1	A	118	ILE	CA-CB	9.51	1.58	1.54
1	E	118	ILE	CA-CB	7.92	1.58	1.54
1	A	259	VAL	CA-CB	5.71	1.61	1.54

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	257	SER	N-CA-C	6.40	118.26	111.28
1	F	257	SER	N-CA-C	5.97	117.79	111.28
1	B	257	SER	N-CA-C	5.28	117.94	111.82
1	E	263	MET	N-CA-C	5.26	117.10	111.36
1	A	257	SER	N-CA-C	5.23	116.98	111.28
1	D	117	GLY	N-CA-C	5.16	116.85	111.95
1	C	160	ILE	N-CA-C	-5.12	100.52	107.99
1	D	29	ASN	CA-C-N	5.03	124.64	119.56
1	D	29	ASN	C-N-CA	5.03	124.64	119.56

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2241	0	2274	24	0
1	B	2245	0	2275	18	0
1	C	2282	0	2295	27	0
1	D	2245	0	2275	16	0
1	E	2285	0	2300	30	0
1	F	2245	0	2275	14	0
2	A	20	0	16	2	0
2	B	20	0	16	0	0
2	C	20	0	16	2	0
2	D	20	0	16	2	0
2	E	20	0	16	0	0
2	F	20	0	16	0	0
3	A	5	0	0	0	0
3	B	5	0	0	0	0
3	C	5	0	0	0	0
3	D	5	0	0	0	0
3	E	5	0	0	0	0
3	F	5	0	0	0	0
4	A	61	0	0	3	0
4	B	71	0	0	3	0
4	C	48	0	0	3	0
4	D	43	0	0	0	0
4	E	78	0	0	1	0
4	F	58	0	0	0	0
All	All	14052	0	13790	118	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 4.

All (118) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:286:GLN:HG2	1:F:41[B]:TYR:OH	1.12	1.26
1:E:286:GLN:CG	1:F:41[B]:TYR:OH	2.08	1.01
1:E:24:PHE:N	4:E:380:HOH:O	2.10	0.84
1:E:286:GLN:HG2	1:F:41[B]:TYR:HH	1.40	0.83
1:E:91:ILE:HD11	1:E:106:THR:HG22	1.61	0.82
1:C:286:GLN:HG2	1:D:41[B]:TYR:OH	1.83	0.79
1:B:24:PHE:N	4:B:346:HOH:O	2.18	0.77
1:C:218:ASP:OD1	4:C:320:HOH:O	2.03	0.75
1:E:56:PHE:CZ	1:E:103:MET:HE1	2.21	0.74
1:B:91:ILE:N	4:B:379:HOH:O	2.24	0.71
1:C:41:TYR:CD2	2:D:400:BAU:HE2	2.29	0.68
1:E:91:ILE:CD1	1:E:106:THR:HG22	2.22	0.68
1:A:56:PHE:CZ	1:A:103:MET:HE1	2.30	0.67
1:C:74:PHE:HD1	1:C:302:GLN:HB2	1.60	0.67
1:D:76:LEU:HD23	1:D:91:ILE:HD12	1.78	0.66
1:C:91:ILE:HD12	1:C:106:THR:HG22	1.76	0.66
1:E:63[A]:CYS:SG	1:E:145:ILE:HG12	2.36	0.65
1:A:56:PHE:CE1	1:A:103:MET:HE1	2.34	0.63
1:E:94:ILE:HB	1:E:103:MET:HE2	1.81	0.63
1:A:24:PHE:N	4:A:345:HOH:O	2.32	0.62
1:B:91:ILE:HG12	1:B:106:THR:HG22	1.82	0.62
1:E:91:ILE:HD11	1:E:106:THR:CG2	2.28	0.62
1:A:197:PHE:CE2	1:A:201:LYS:HE3	2.35	0.61
1:A:225[B]:ARG:NH2	2:A:400:BAU:HE1	2.15	0.61
1:A:175:GLN:NE2	1:B:221:GLU:OE1	2.35	0.59
1:A:62:VAL:HG11	1:A:128:LEU:HD21	1.84	0.59
1:C:153:ILE:HD11	1:C:277:THR:HG21	1.84	0.58
1:C:91:ILE:CD1	1:C:106:THR:HG22	2.34	0.58
1:A:56:PHE:CE1	1:A:103:MET:CE	2.87	0.57
1:C:91:ILE:HD12	1:C:106:THR:CG2	2.34	0.57
1:F:243:LYS:O	1:F:247:LYS:HG3	2.04	0.57
1:C:85:GLU:OE2	1:E:170:LYS:HE2	2.05	0.57
1:C:240:ASP:O	1:C:244:ARG:HG3	2.04	0.57
1:A:153:ILE:HG21	1:A:209:LEU:HD21	1.85	0.56
1:B:172:ARG:HB2	1:B:183:THR:HG23	1.88	0.56
1:D:238:LYS:HG3	1:D:239:LEU:N	2.21	0.55
1:D:299:GLN:O	1:D:302:GLN:HG2	2.07	0.55
1:B:56:PHE:CD2	1:B:131:LEU:HD11	2.43	0.54
1:A:103:MET:HE3	1:A:110:LEU:HD11	1.89	0.54
1:E:291:HIS:O	1:E:295:VAL:HG23	2.07	0.53
1:D:224:GLY:O	1:D:238:LYS:HD3	2.08	0.53
1:D:62:VAL:HG11	1:D:128:LEU:HD21	1.91	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:224:GLY:O	1:A:238:LYS:HD3	2.08	0.53
1:A:112:ILE:CD1	1:A:128:LEU:HD13	2.39	0.52
2:C:400:BAU:HE2	1:D:41[A]:TYR:CD2	2.44	0.52
1:D:103:MET:HE2	1:D:112:ILE:HG12	1.92	0.52
1:E:79:HIS:CD2	1:E:87:ALA:HA	2.45	0.52
1:C:153:ILE:HG21	1:C:209:LEU:HD21	1.91	0.52
1:E:91:ILE:CD1	1:E:106:THR:CG2	2.86	0.52
1:C:65:GLY:O	1:C:113:SER:HA	2.11	0.51
1:C:79:HIS:HB2	1:C:106:THR:HG21	1.92	0.51
1:C:78:MET:HE2	1:C:309:ILE:HD12	1.92	0.50
1:C:284:CYS:HB3	4:C:350:HOH:O	2.09	0.50
1:E:117:GLY:HA3	1:F:119:PRO:HB2	1.94	0.50
1:F:52:LEU:HD13	1:F:131:LEU:HD12	1.94	0.50
1:E:56:PHE:HZ	1:E:103:MET:HE1	1.70	0.50
1:D:63[A]:CYS:SG	1:D:145:ILE:HG12	2.51	0.50
1:A:56:PHE:HE1	1:A:103:MET:HE3	1.76	0.49
1:A:218:ASP:OD1	4:A:350:HOH:O	2.19	0.49
1:A:225[B]:ARG:NH2	1:A:285:ASP:O	2.45	0.49
1:C:116:MET:SD	2:C:400:BAU:HAJ1	2.52	0.49
1:B:65:GLY:O	1:B:113:SER:HA	2.13	0.48
1:F:112:ILE:CD1	1:F:128:LEU:HD13	2.43	0.48
1:A:56:PHE:HE1	1:A:103:MET:CE	2.26	0.48
1:E:126:HIS:O	1:E:130:LYS:HG3	2.14	0.48
1:F:63[A]:CYS:SG	1:F:145:ILE:HG12	2.53	0.48
1:F:198:ASN:HA	1:F:201:LYS:HD2	1.95	0.48
1:C:103:MET:HG3	1:C:112:ILE:HG12	1.96	0.47
1:E:281:ARG:C	1:E:283:ASP:H	2.22	0.47
1:E:56:PHE:CE1	1:E:103:MET:HE1	2.49	0.47
1:E:56:PHE:CE1	1:E:103:MET:CE	2.98	0.47
1:E:103:MET:HG3	1:E:112:ILE:HG12	1.97	0.47
1:E:76:LEU:HD23	1:E:91:ILE:HG13	1.97	0.46
1:A:116:MET:HG2	4:A:319:HOH:O	2.15	0.46
1:C:74:PHE:CD1	1:C:302:GLN:HB2	2.45	0.46
1:E:153:ILE:HG21	1:E:209:LEU:HD21	1.98	0.45
1:B:79:HIS:CE1	1:B:84:PHE:HB2	2.52	0.45
1:C:281:ARG:C	1:C:283:ASP:H	2.23	0.45
1:C:189:ASP:OD1	1:C:270:LYS:HD2	2.18	0.44
1:E:94:ILE:CB	1:E:103:MET:HE2	2.47	0.44
1:A:151:ILE:HD11	1:A:253:ILE:HD11	1.99	0.44
1:A:195:GLU:HG3	1:A:311:ARG:NH1	2.33	0.44
1:B:91:ILE:HG12	1:B:106:THR:CG2	2.46	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:58:ASP:OD1	1:F:58:ASP:N	2.48	0.44
1:F:153:ILE:HG21	1:F:209:LEU:HD21	2.00	0.43
1:D:56:PHE:CD2	1:D:131:LEU:HD11	2.53	0.43
1:E:63[A]:CYS:SG	1:E:145:ILE:CD1	3.06	0.43
1:B:153:ILE:HD11	1:B:277:THR:HG21	2.01	0.43
1:C:286:GLN:CG	1:D:41[B]:TYR:OH	2.59	0.43
1:C:118:ILE:HD11	1:C:215:CYS:SG	2.59	0.43
1:C:224:GLY:O	1:C:238:LYS:HG3	2.19	0.43
4:C:327:HOH:O	1:D:286:GLN:HG2	2.19	0.42
1:B:301:PRO:O	1:B:305:ILE:HG12	2.19	0.42
1:C:28:LYS:HB2	1:D:230:LEU:HD23	2.01	0.42
1:E:65:GLY:O	1:E:113:SER:HA	2.20	0.42
1:E:89:GLU:O	1:E:92:LYS:HE3	2.19	0.42
1:F:65:GLY:O	1:F:113:SER:HA	2.20	0.42
1:B:114:HIS:HB3	1:B:124:MET:HE2	2.02	0.42
1:B:299:GLN:O	1:B:302:GLN:HG2	2.20	0.42
1:A:28:LYS:HD3	4:B:377:HOH:O	2.19	0.42
1:C:190:LYS:HE2	1:C:194:GLU:OE2	2.20	0.42
1:F:172:ARG:HB2	1:F:183:THR:HG23	2.00	0.42
1:C:78:MET:CE	1:C:309:ILE:HD12	2.49	0.42
1:B:160:ILE:O	1:B:210:VAL:HA	2.20	0.41
1:E:163:ILE:HD12	1:E:212:HIS:CE1	2.55	0.41
1:A:79:HIS:HB2	1:A:106:THR:HG21	2.01	0.41
1:A:254:GLU:HA	2:A:400:BAU:OAB	2.21	0.41
1:B:218:ASP:OD2	1:B:221:GLU:N	2.53	0.41
1:B:209:LEU:C	1:B:209:LEU:HD12	2.45	0.41
1:D:151:ILE:HD12	1:D:250:VAL:HG12	2.02	0.41
1:A:51:ASN:OD1	1:A:53:PRO:HD2	2.20	0.41
1:D:254:GLU:HA	2:D:400:BAU:OAB	2.21	0.41
1:B:91:ILE:CG1	1:B:106:THR:HG22	2.49	0.41
1:C:29:ASN:HA	1:C:30:PRO:HD3	1.91	0.41
1:D:38:ASP:CG	1:D:130:LYS:HZ2	2.28	0.41
1:A:117:GLY:HA3	1:B:119:PRO:HB2	2.03	0.40
1:E:224:GLY:O	1:E:238:LYS:HG3	2.21	0.40
1:E:119:PRO:HB2	1:F:117:GLY:HA3	2.04	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	282/297 (95%)	273 (97%)	9 (3%)	0	100	100
1	B	283/297 (95%)	276 (98%)	7 (2%)	0	100	100
1	C	289/297 (97%)	279 (96%)	10 (4%)	0	100	100
1	D	283/297 (95%)	278 (98%)	5 (2%)	0	100	100
1	E	290/297 (98%)	281 (97%)	9 (3%)	0	100	100
1	F	283/297 (95%)	275 (97%)	8 (3%)	0	100	100
All	All	1710/1782 (96%)	1662 (97%)	48 (3%)	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	249/257 (97%)	246 (99%)	3 (1%)	63	70
1	B	250/257 (97%)	246 (98%)	4 (2%)	55	62
1	C	253/257 (98%)	249 (98%)	4 (2%)	55	62
1	D	250/257 (97%)	247 (99%)	3 (1%)	63	70
1	E	254/257 (99%)	250 (98%)	4 (2%)	55	62
1	F	250/257 (97%)	249 (100%)	1 (0%)	84	89
All	All	1506/1542 (98%)	1487 (99%)	19 (1%)	61	68

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

Mol	Chain	Res	Type
1	A	112	ILE
1	A	254	GLU
1	A	284	CYS
1	B	238	LYS
1	B	254	GLU
1	B	269	LEU
1	B	285	ASP
1	C	118	ILE
1	C	238	LYS
1	C	254	GLU
1	C	293	VAL
1	D	238	LYS
1	D	243	LYS
1	D	247	LYS
1	E	238	LYS
1	E	254	GLU
1	E	279	LEU
1	E	305	ILE
1	F	112	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	302	GLN
1	B	79	HIS
1	B	302	GLN
1	C	79	HIS
1	C	291	HIS
1	D	302	GLN
1	E	180	ASN
1	E	291	HIS
1	E	298	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

12 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	BAU	B	400	-	21,21,21	1.68	3 (14%)	25,27,27	2.57	9 (36%)
2	BAU	F	400	-	21,21,21	1.46	3 (14%)	25,27,27	2.35	8 (32%)
3	PO4	B	401	-	4,4,4	0.64	0	6,6,6	1.71	1 (16%)
2	BAU	D	400	-	21,21,21	1.45	2 (9%)	25,27,27	2.39	9 (36%)
3	PO4	A	401	-	4,4,4	0.54	0	6,6,6	0.85	0
3	PO4	C	401	-	4,4,4	0.84	0	6,6,6	0.68	0
2	BAU	A	400	-	21,21,21	1.72	3 (14%)	25,27,27	2.42	9 (36%)
2	BAU	E	400	-	21,21,21	1.62	3 (14%)	25,27,27	2.46	8 (32%)
3	PO4	D	401	-	4,4,4	0.80	0	6,6,6	1.47	1 (16%)
2	BAU	C	400	-	21,21,21	1.57	3 (14%)	25,27,27	2.43	9 (36%)
3	PO4	F	401	-	4,4,4	0.53	0	6,6,6	1.15	1 (16%)
3	PO4	E	401	-	4,4,4	0.99	0	6,6,6	1.00	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
2	BAU	B	400	-	-	1/9/9/9	0/2/2/2
2	BAU	F	400	-	-	1/9/9/9	0/2/2/2
2	BAU	D	400	-	-	0/9/9/9	0/2/2/2
2	BAU	A	400	-	-	0/9/9/9	0/2/2/2
2	BAU	E	400	-	-	1/9/9/9	0/2/2/2
2	BAU	C	400	-	-	1/9/9/9	0/2/2/2

All (17) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	400	BAU	CAM-NAT	-5.94	1.38	1.47
2	B	400	BAU	CAM-NAT	-5.38	1.39	1.47
2	E	400	BAU	CAM-NAT	-4.96	1.39	1.47
2	C	400	BAU	CAM-NAT	-4.85	1.40	1.47
2	D	400	BAU	CAM-NAT	-4.66	1.40	1.47
2	F	400	BAU	CAM-NAT	-4.11	1.41	1.47
2	E	400	BAU	OAD-CAM	3.13	1.48	1.40
2	F	400	BAU	CAL-CG	3.04	1.56	1.51
2	E	400	BAU	CAR-CAQ	-2.78	1.39	1.45
2	B	400	BAU	CAI-NAT	2.54	1.42	1.37
2	D	400	BAU	CAR-CAQ	-2.44	1.40	1.45
2	C	400	BAU	CAS-NAN	2.42	1.42	1.38
2	A	400	BAU	CAR-CAQ	-2.39	1.40	1.45
2	B	400	BAU	CAR-CAQ	-2.18	1.40	1.45
2	C	400	BAU	CAR-CAQ	-2.13	1.40	1.45
2	A	400	BAU	CAI-NAT	2.10	1.41	1.37
2	F	400	BAU	CAR-CAQ	-2.09	1.40	1.45

All (55) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	400	BAU	CAR-NAN-CAS	-6.47	118.86	127.34
2	B	400	BAU	CAR-NAN-CAS	-6.28	119.11	127.34
2	F	400	BAU	CAR-NAN-CAS	-6.06	119.39	127.34
2	D	400	BAU	NAN-CAS-NAT	6.05	120.05	114.86
2	C	400	BAU	CAR-NAN-CAS	-5.65	119.94	127.34
2	A	400	BAU	CAR-NAN-CAS	-5.58	120.02	127.34
2	A	400	BAU	NAN-CAS-NAT	5.50	119.58	114.86
2	B	400	BAU	NAN-CAS-NAT	5.26	119.38	114.86
2	D	400	BAU	CAR-NAN-CAS	-5.18	120.55	127.34
2	B	400	BAU	OAD-CAM-NAT	5.17	121.93	111.58
2	D	400	BAU	OAB-CAS-NAT	-4.74	118.85	122.87
2	E	400	BAU	NAN-CAS-NAT	4.65	118.85	114.86
2	F	400	BAU	NAN-CAS-NAT	4.63	118.83	114.86
2	F	400	BAU	OAB-CAS-NAT	-4.63	118.94	122.87
2	E	400	BAU	CAQ-CAR-NAN	4.54	122.13	115.21
2	C	400	BAU	NAN-CAS-NAT	4.53	118.75	114.86
2	B	400	BAU	CAQ-CAR-NAN	4.50	122.07	115.21
2	E	400	BAU	CAQ-CAI-NAT	-4.30	118.07	123.56
2	C	400	BAU	CG-CAL-CAQ	-4.11	105.41	114.10
2	C	400	BAU	CAL-CAQ-CAI	-4.01	113.27	122.27
2	C	400	BAU	OAB-CAS-NAT	-3.87	119.59	122.87

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	400	BAU	CG-CAL-CAQ	-3.85	105.97	114.10
2	B	400	BAU	CG-CAL-CAQ	-3.83	106.01	114.10
2	E	400	BAU	CG-CAL-CAQ	-3.78	106.12	114.10
2	A	400	BAU	CAQ-CAR-NAN	3.72	120.88	115.21
2	D	400	BAU	OAO-CAM-NAT	3.64	118.88	111.58
2	A	400	BAU	OAB-CAS-NAT	-3.58	119.84	122.87
2	F	400	BAU	CAQ-CAR-NAN	3.37	120.35	115.21
2	C	400	BAU	OAO-CAM-NAT	3.29	118.17	111.58
2	F	400	BAU	CG-CAL-CAQ	-3.23	107.27	114.10
2	C	400	BAU	CAQ-CAR-NAN	3.09	119.92	115.21
2	B	400	BAU	CAQ-CAI-NAT	-3.04	119.68	123.56
2	A	400	BAU	OAO-CAM-NAT	3.02	117.64	111.58
2	D	400	BAU	CAL-CAQ-CAI	-3.02	115.50	122.27
2	A	400	BAU	CAQ-CAI-NAT	-2.94	119.80	123.56
2	C	400	BAU	CAM-NAT-CAS	2.94	120.58	117.20
2	B	400	BAU	OAB-CAS-NAT	-2.93	120.39	122.87
2	F	400	BAU	OAA-CAR-CAQ	-2.89	119.85	124.71
3	B	401	PO4	O4-P-O3	2.89	116.90	107.91
2	B	400	BAU	OAA-CAR-CAQ	-2.77	120.05	124.71
2	A	400	BAU	CAL-CAQ-CAI	-2.69	116.25	122.27
2	C	400	BAU	CAQ-CAI-NAT	-2.58	120.27	123.56
2	D	400	BAU	CG-CAL-CAQ	-2.56	108.69	114.10
2	A	400	BAU	OAO-CAK-CAJ	-2.56	98.85	110.11
2	D	400	BAU	CAQ-CAR-NAN	2.54	119.08	115.21
2	E	400	BAU	CAL-CAQ-CAI	-2.47	116.73	122.27
2	F	400	BAU	CAQ-CAI-NAT	-2.46	120.41	123.56
3	F	401	PO4	O4-P-O3	2.45	115.54	107.91
2	E	400	BAU	CAK-OAO-CAM	-2.42	108.55	113.55
2	F	400	BAU	CAL-CAQ-CAI	-2.41	116.86	122.27
2	E	400	BAU	OAA-CAR-CAQ	-2.38	120.70	124.71
3	D	401	PO4	O4-P-O1	-2.26	102.94	110.95
2	D	400	BAU	CAQ-CAI-NAT	-2.18	120.77	123.56
2	B	400	BAU	CAL-CAQ-CAI	-2.07	117.62	122.27
2	D	400	BAU	OAA-CAR-CAQ	-2.07	121.23	124.71

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	400	BAU	NAT-CAM-OAO-CAK
2	E	400	BAU	OAC-CAJ-CAK-OAO
2	C	400	BAU	OAC-CAJ-CAK-OAO

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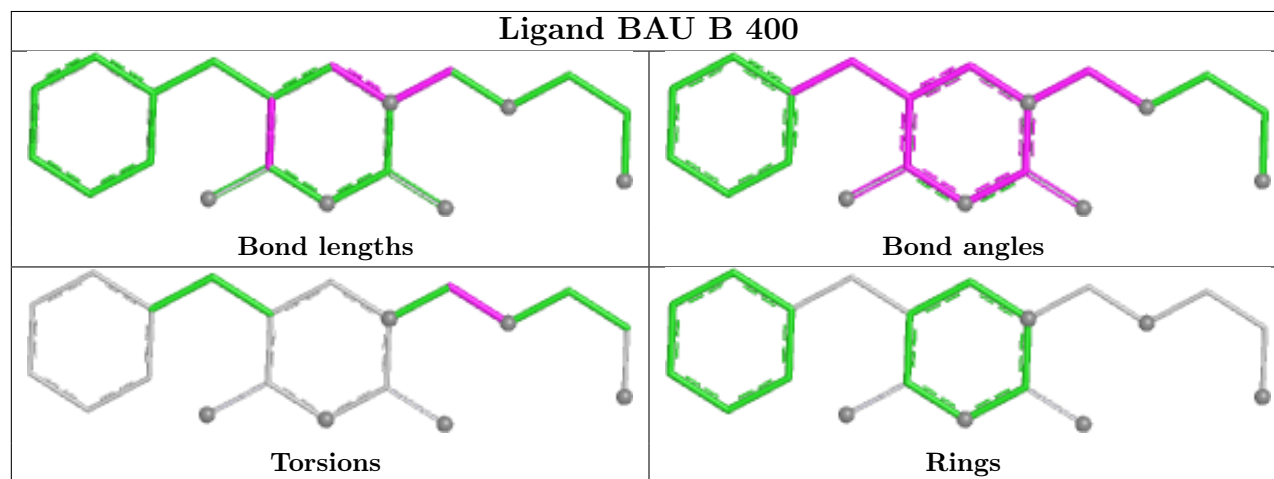
Mol	Chain	Res	Type	Atoms
2	F	400	BAU	OAC-CAJ-CAK-OAO

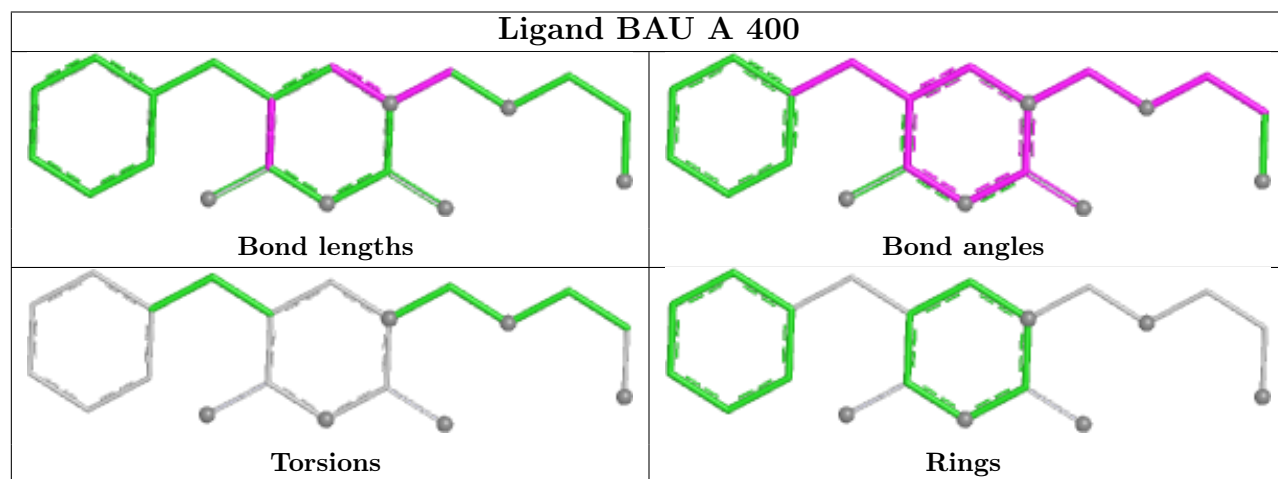
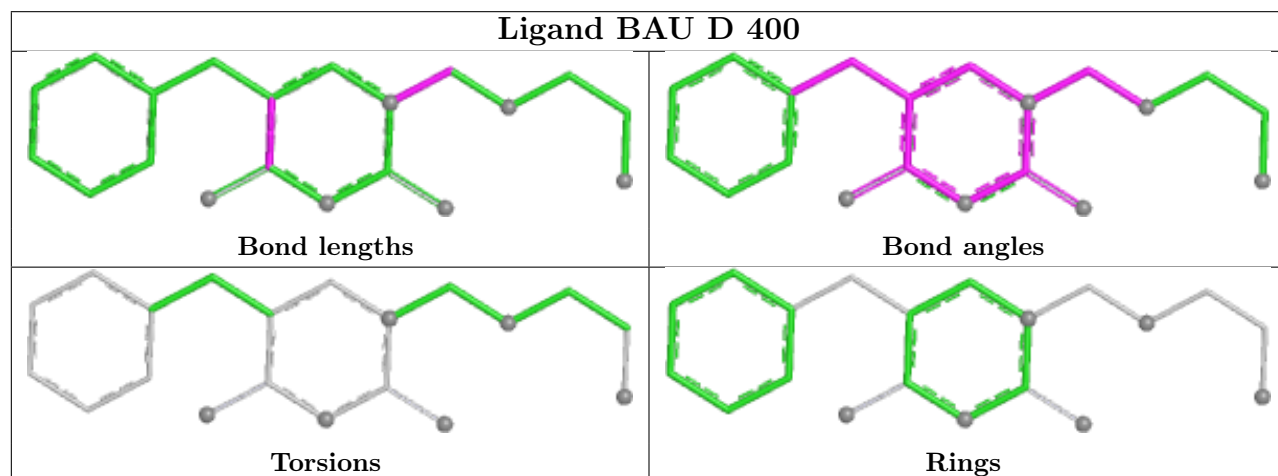
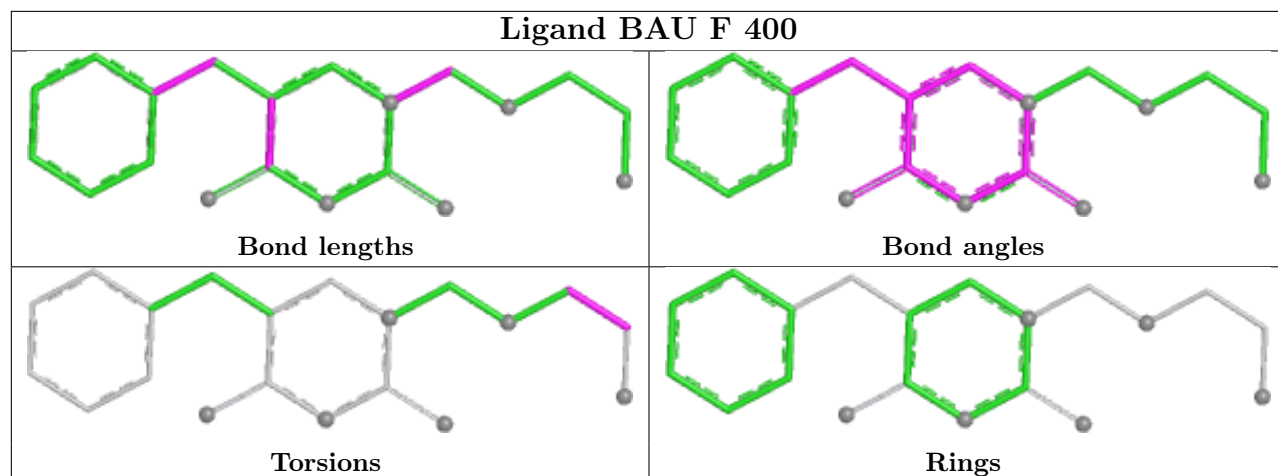
There are no ring outliers.

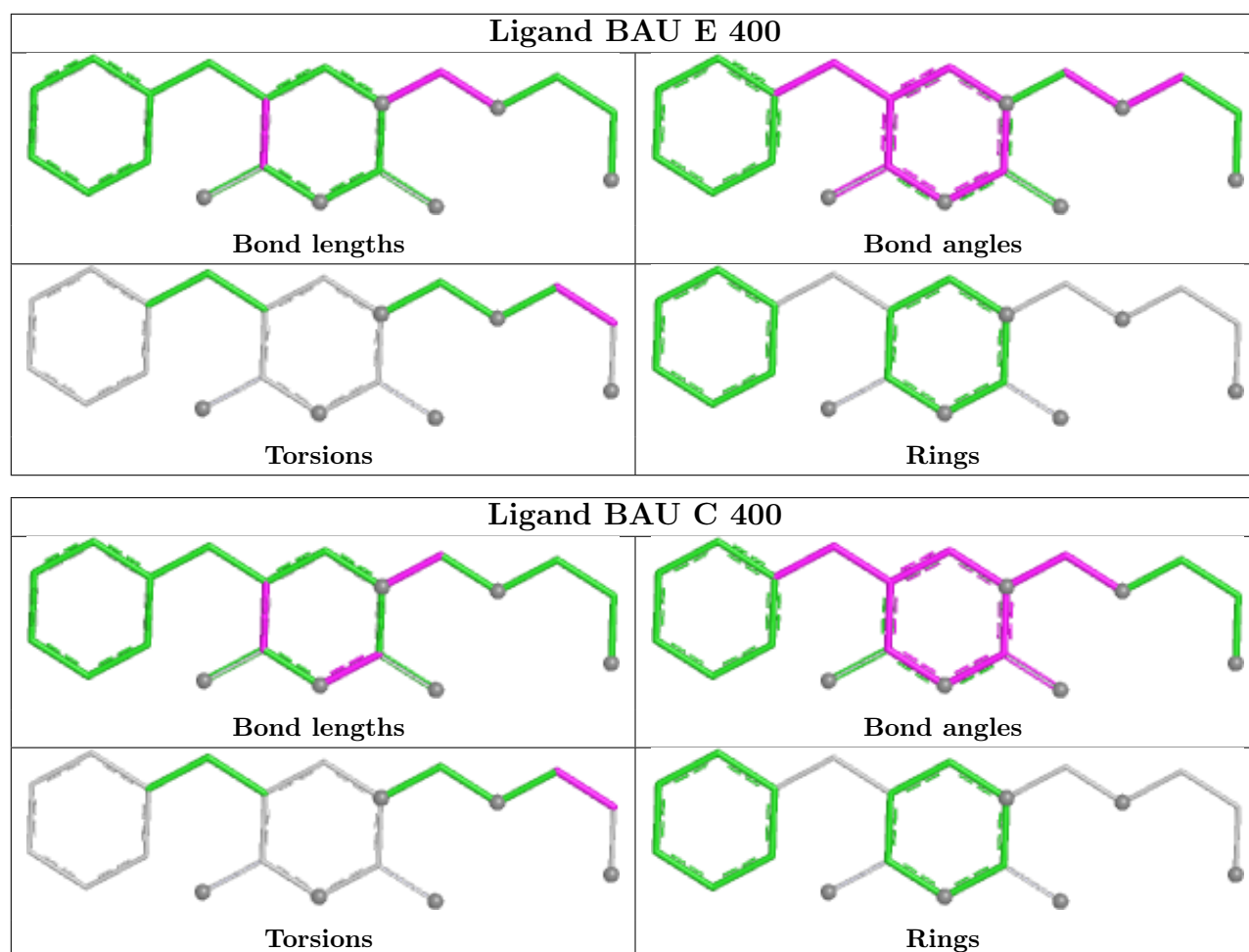
3 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	400	BAU	2	0
2	A	400	BAU	2	0
2	C	400	BAU	2	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	285/297 (95%)	0.06	8 (2%) 55 54	18, 30, 47, 57	1 (0%)
1	B	285/297 (95%)	0.20	5 (1%) 67 67	18, 31, 46, 52	2 (0%)
1	C	291/297 (97%)	0.34	12 (4%) 41 40	22, 34, 54, 62	0
1	D	285/297 (95%)	0.24	11 (3%) 43 42	19, 33, 51, 57	2 (0%)
1	E	291/297 (97%)	0.09	11 (3%) 44 43	14, 28, 49, 62	1 (0%)
1	F	285/297 (95%)	0.21	11 (3%) 43 42	15, 30, 50, 59	2 (0%)
All	All	1722/1782 (96%)	0.19	58 (3%) 48 47	14, 31, 50, 62	8 (0%)

All (58) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	314	GLY	5.0
1	E	287	ILE	3.8
1	B	41[A]	TYR	3.5
1	D	284	CYS	3.4
1	E	314	GLY	3.2
1	C	287	ILE	3.2
1	D	41[A]	TYR	3.2
1	C	286	GLN	3.2
1	F	314	GLY	3.1
1	E	283	ASP	3.1
1	E	286	GLN	3.1
1	F	286	GLN	3.1
1	C	314	GLY	3.0
1	C	284	CYS	2.8
1	B	84	PHE	2.8
1	D	314	GLY	2.8
1	F	36	ASP	2.7
1	A	106	THR	2.7
1	E	36	ASP	2.7

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Mol	Chain	Res	Type	RSRZ
1	B	34	LEU	2.7
1	C	289	LEU	2.7
1	A	288	ASN	2.7
1	D	34	LEU	2.6
1	A	284	CYS	2.6
1	A	283	ASP	2.6
1	C	83	GLY	2.5
1	E	41	TYR	2.4
1	F	41[A]	TYR	2.4
1	F	84	PHE	2.4
1	A	292	ASP	2.4
1	E	284	CYS	2.4
1	F	284	CYS	2.4
1	C	34	LEU	2.3
1	D	291	HIS	2.3
1	F	236	GLU	2.3
1	C	290	PRO	2.3
1	A	217	TYR	2.3
1	C	268	GLY	2.3
1	F	287	ILE	2.2
1	F	34	LEU	2.2
1	A	83	GLY	2.2
1	D	84	PHE	2.2
1	D	285	ASP	2.2
1	E	268	GLY	2.2
1	B	313	LEU	2.2
1	E	289	LEU	2.2
1	E	294	LEU	2.2
1	D	180	ASN	2.2
1	C	292	ASP	2.2
1	D	283	ASP	2.2
1	F	24	PHE	2.1
1	C	293	VAL	2.1
1	D	182	VAL	2.1
1	C	41	TYR	2.1
1	F	311	ARG	2.1
1	E	282	LEU	2.1
1	D	287	ILE	2.0
1	A	314	GLY	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](#)

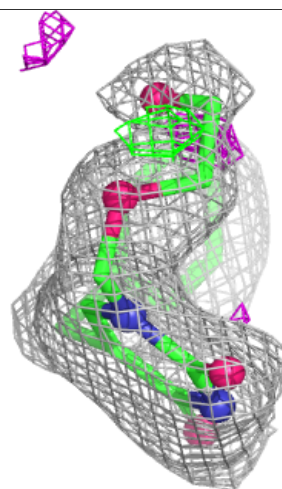
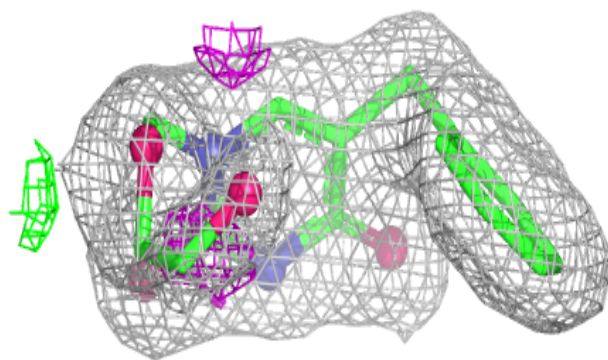
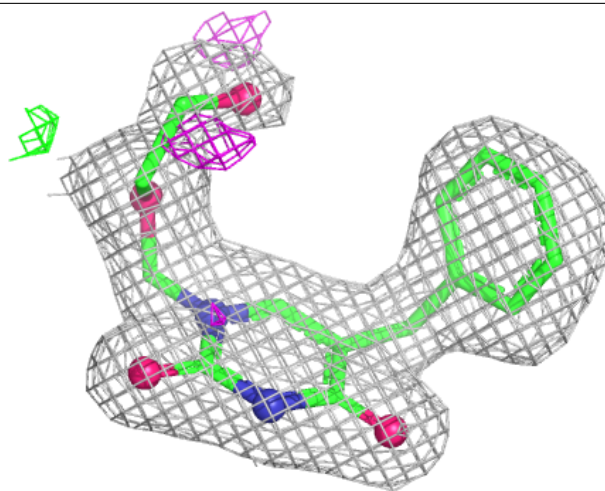
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	PO4	B	401	5/5	0.71	0.18	33,35,42,43	0
3	PO4	E	401	5/5	0.80	0.15	28,30,35,36	0
3	PO4	F	401	5/5	0.91	0.12	28,32,34,36	0
3	PO4	A	401	5/5	0.92	0.10	35,36,38,40	0
2	BAU	C	400	20/20	0.95	0.07	24,27,36,37	0
2	BAU	D	400	20/20	0.95	0.07	27,32,40,41	0
2	BAU	A	400	20/20	0.95	0.07	21,27,36,37	0
2	BAU	E	400	20/20	0.96	0.06	21,25,31,33	0
2	BAU	F	400	20/20	0.96	0.07	18,23,36,39	0
2	BAU	B	400	20/20	0.96	0.08	20,25,38,38	0
3	PO4	C	401	5/5	0.97	0.06	31,34,34,36	0
3	PO4	D	401	5/5	0.97	0.07	29,29,30,33	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.

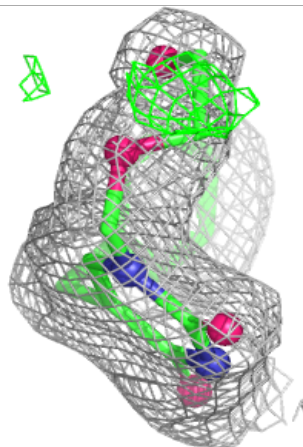
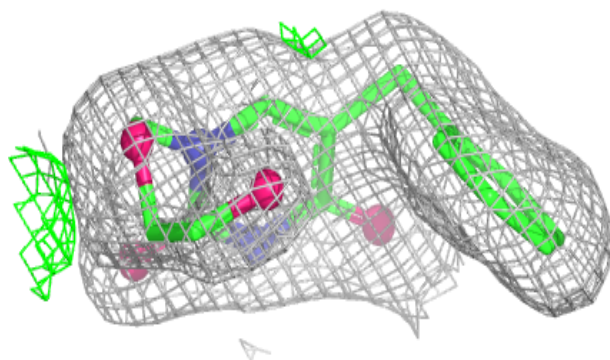
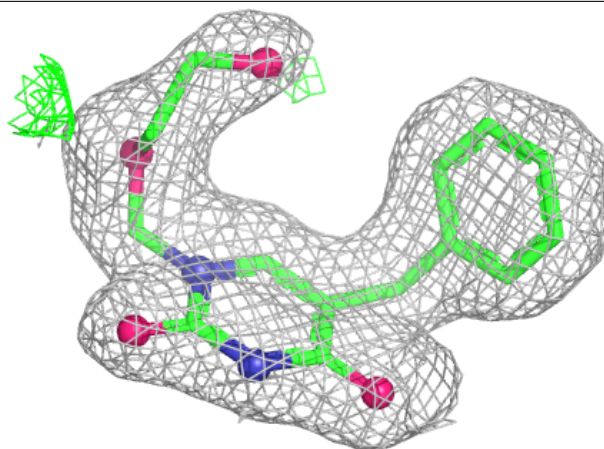
Electron density around BAU C 400:

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



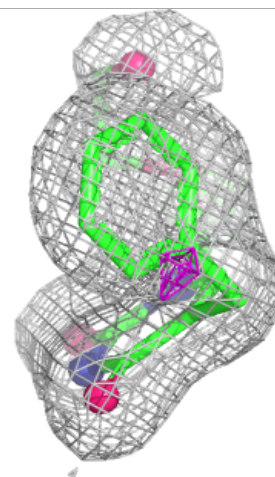
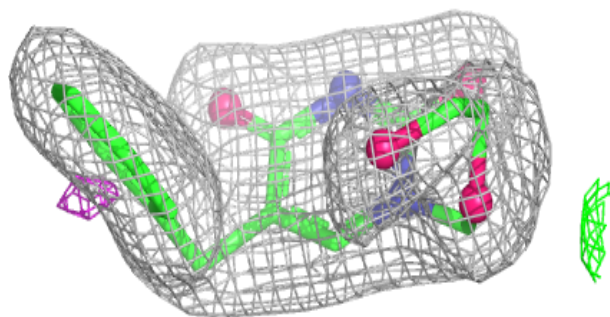
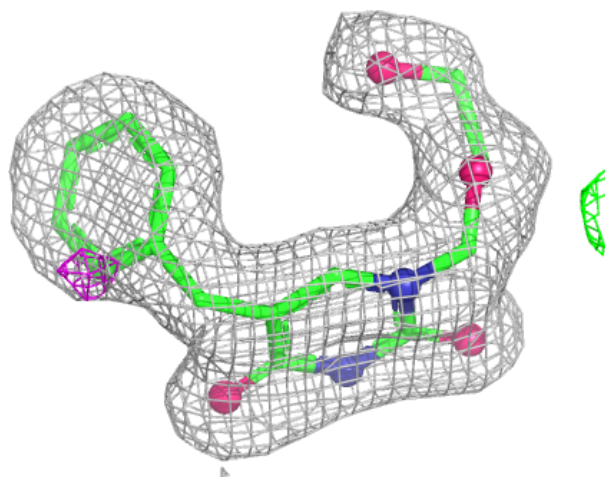
Electron density around BAU D 400:

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



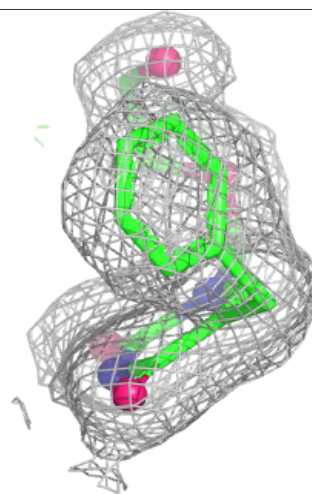
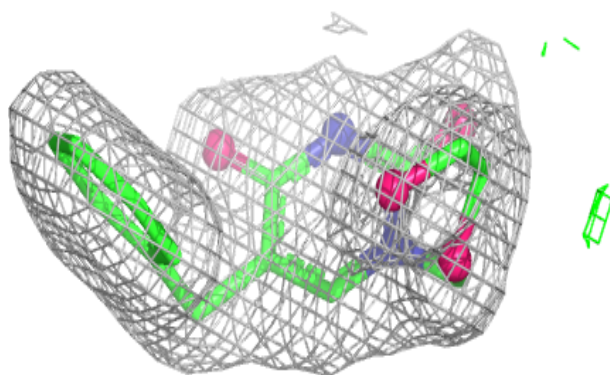
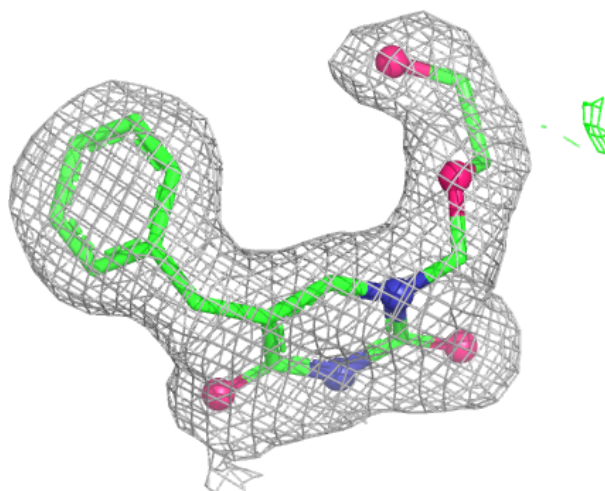
Electron density around BAU A 400:

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



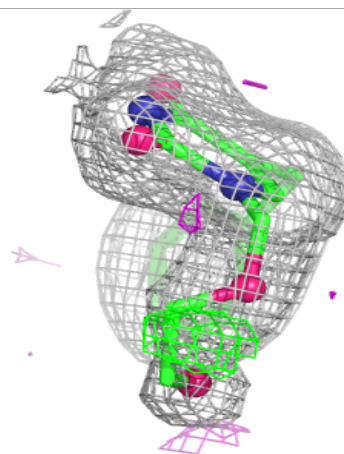
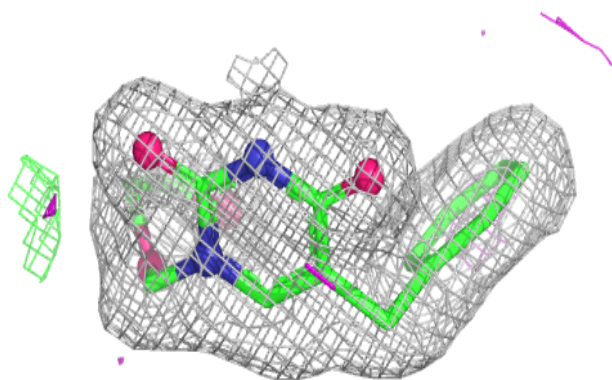
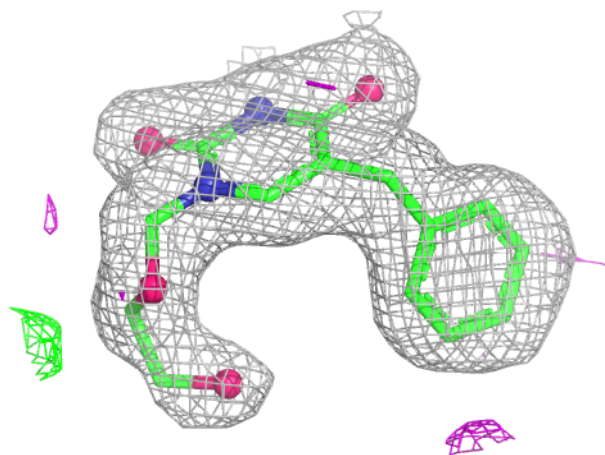
Electron density around BAU E 400:

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



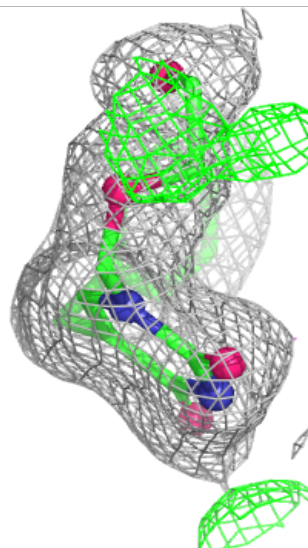
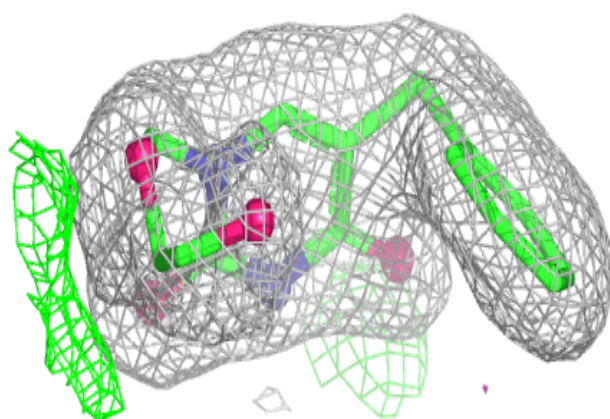
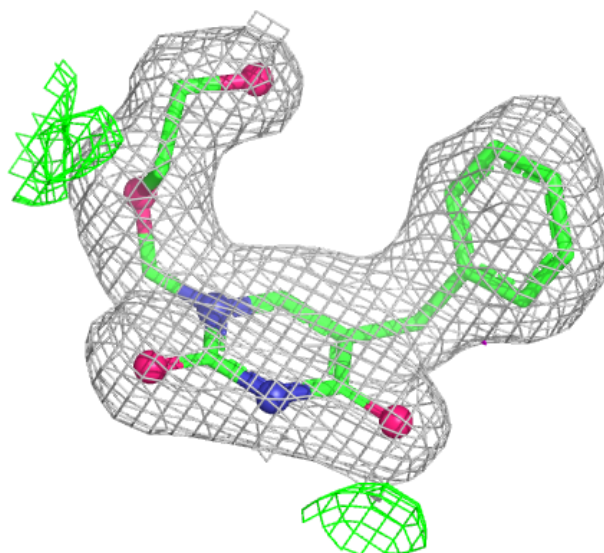
Electron density around BAU F 400:

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



Electron density around BAU B 400:

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



6.5 Other polymers [i](#)

There are no such residues in this entry.