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wwPDB X-ray Structure Validation Summary Report ⓘ

Jun 24, 2024 – 05:53 PM EDT

PDB ID	:	6TX3
Title	:	HPF1 bound to catalytic fragment of PARP2
Authors	:	Suskiewicz, M.J.; Ahel, I.
Deposited on	:	2020-01-13
Resolution	:	2.96 Å(reported)

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

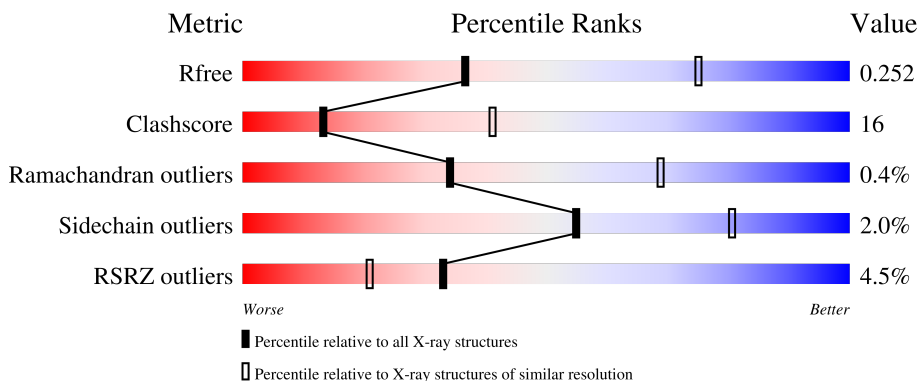|		
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	2.37.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

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 2.96 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		0.252
Clashscore		16
Ramachandran outliers		0.4%
Sidechain outliers		2.0%
RSRZ outliers		4.5%

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	3104 (3.00-2.92)
Clashscore	141614	3462 (3.00-2.92)
Ramachandran outliers	138981	3340 (3.00-2.92)
Sidechain outliers	138945	3343 (3.00-2.92)
RSRZ outliers	127900	2986 (3.00-2.92)

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	B	280	6% / 55% 32% · 11%
2	A	318	2% / 72% 24% · ·

2 Entry composition ⓘ

There are 3 unique types of molecules in this entry. The entry contains 4518 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 Poly [ADP-ribose] polymerase 2,Poly [ADP-ribose] polymerase 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	B	249	Total	C	N	O	S	0	0	0
			1985	1264	341	369	11			

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	197	MET	-	initiating methionine	UNP Q9UGN5
B	198	GLY	-	expression tag	UNP Q9UGN5
B	199	SER	-	expression tag	UNP Q9UGN5
B	200	SER	-	expression tag	UNP Q9UGN5
B	201	HIS	-	expression tag	UNP Q9UGN5
B	202	HIS	-	expression tag	UNP Q9UGN5
B	203	HIS	-	expression tag	UNP Q9UGN5
B	204	HIS	-	expression tag	UNP Q9UGN5
B	205	HIS	-	expression tag	UNP Q9UGN5
B	206	HIS	-	expression tag	UNP Q9UGN5
B	207	SER	-	expression tag	UNP Q9UGN5
B	208	SER	-	expression tag	UNP Q9UGN5
B	209	GLY	-	expression tag	UNP Q9UGN5
B	210	LEU	-	expression tag	UNP Q9UGN5
B	211	VAL	-	expression tag	UNP Q9UGN5
B	212	PRO	-	expression tag	UNP Q9UGN5
B	213	ARG	-	expression tag	UNP Q9UGN5
B	214	GLY	-	expression tag	UNP Q9UGN5
B	215	SER	-	expression tag	UNP Q9UGN5
B	216	HIS	-	expression tag	UNP Q9UGN5

- Molecule 2 is a protein called Histone PARylation factor 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	A	306	Total	C	N	O	S	0	0	0
			2494	1602	419	462	11			

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	29	MET	-	initiating methionine	UNP Q9NWY4
A	30	GLY	-	expression tag	UNP Q9NWY4
A	31	HIS	-	expression tag	UNP Q9NWY4
A	32	HIS	-	expression tag	UNP Q9NWY4
A	33	HIS	-	expression tag	UNP Q9NWY4
A	34	HIS	-	expression tag	UNP Q9NWY4
A	35	HIS	-	expression tag	UNP Q9NWY4
A	36	HIS	-	expression tag	UNP Q9NWY4
A	174	LYS	ARG	variant	UNP Q9NWY4

- Molecule 3 is 2-[4-[[(2S,3S,4R,5R)-5-(6-aminopurin-9-yl)-3,4-bis(oxidanyl)oxolan-2-yl]carbonylpiperazin-1-yl]-N-(1-oxidanylidene-2,3-dihydroisoindol-4-yl)ethanamide (three-letter code: UHB) (formula: $C_{24}H_{27}N_9O_6$) (labeled as "Ligand of Interest" by depositor).
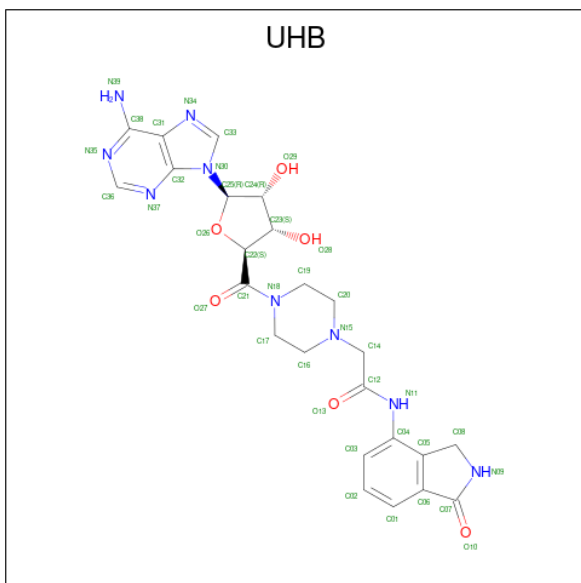
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	N	O		
3	B	1	39	24	9	6	0	0

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: Poly [ADP-ribose] polymerase 2,Poly [ADP-ribose] polymerase 2

• Molecule 2: Histone PARylation factor 1

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 61	Depositor
Cell constants a, b, c, α, β, γ	115.62Å 115.62Å 143.61Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	47.27 – 2.96 47.28 – 2.96	Depositor EDS
% Data completeness (in resolution range)	97.6 (47.27-2.96) 97.6 (47.28-2.96)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.64 (at 2.96Å)	Xtriage
Refinement program	PHENIX dev_3126	Depositor
R, R_{free}	0.229 , 0.260 0.230 , 0.252	Depositor DCC
R_{free} test set	1048 reflections (4.73%)	wwPDB-VP
Wilson B-factor (Å^2)	114.9	Xtriage
Anisotropy	0.651	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.29 , 108.2	EDS
L-test for twinning[2]	$< |L| > = 0.50, < L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.053 for h,-h-k,-l	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	4518	wwPDB-VP
Average B, all atoms (Å^2)	154.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.79% 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: UHB

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	B	0.46	0/2035	0.84	1/2756 (0.0%)
2	A	0.48	0/2551	0.82	0/3439
All	All	0.47	0/4586	0.83	1/6195 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	388	LEU	CB-CG-CD2	-5.93	100.93	111.00

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	B	1985	0	1946	97	0
2	A	2494	0	2471	54	0
3	B	39	0	27	1	0
All	All	4518	0	4444	145	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 16.

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The worst 5 of 145 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:219:SER:HB3	1:B:343:HIS:CD2	1.68	1.29
1:B:343:HIS:ND1	1:B:344:PRO:HD2	1.63	1.10
1:B:219:SER:CB	1:B:343:HIS:CD2	2.51	0.93
1:B:343:HIS:ND1	1:B:344:PRO:CD	2.31	0.93
1:B:219:SER:CB	1:B:343:HIS:HD2	1.80	0.93

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	B	245/280 (88%)	235 (96%)	8 (3%)	2 (1%)	19	53
2	A	302/318 (95%)	293 (97%)	9 (3%)	0	100	100
All	All	547/598 (92%)	528 (96%)	17 (3%)	2 (0%)	34	69

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	439	ILE
1	B	436	GLU

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	B	218/245 (89%)	215 (99%)	3 (1%)	67	86
2	A	271/280 (97%)	264 (97%)	7 (3%)	46	75
All	All	489/525 (93%)	479 (98%)	10 (2%)	55	80

5 of 10 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	A	174	LYS
2	A	338	GLN
2	A	339	GLU
2	A	64	ASP
2	A	69	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	563	GLN
1	B	565	ASN
2	A	43	ASN

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 ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

1 ligand is 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	UHB	B	1001	-	40,44,44	4.35	15 (37%)	48,65,65	3.96	14 (29%)

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	UHB	B	1001	-	-	5/16/55/55	0/6/6/6

The worst 5 of 15 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	1001	UHB	O26-C25	15.02	1.60	1.40
3	B	1001	UHB	C07-N09	13.00	1.45	1.35
3	B	1001	UHB	O26-C22	-10.76	1.28	1.43
3	B	1001	UHB	C21-N18	9.76	1.49	1.35
3	B	1001	UHB	C12-N11	6.22	1.49	1.35

The worst 5 of 14 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	1001	UHB	C31-C38-N39	17.69	147.26	120.31
3	B	1001	UHB	N39-C38-N35	-11.68	93.38	118.33
3	B	1001	UHB	C25-N30-C32	-8.41	111.86	126.64
3	B	1001	UHB	C05-C08-N09	6.89	108.46	101.75
3	B	1001	UHB	N37-C36-N35	-6.69	119.60	128.67

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	1001	UHB	C12-C14-N15-C16
3	B	1001	UHB	N18-C21-C22-C23
3	B	1001	UHB	N18-C21-C22-O26
3	B	1001	UHB	O27-C21-C22-C23

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| Mol	Chain	Res	Type	Atoms
3	B	1001	UHB	C05-C04-N11-C12

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	1001	UHB	1	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 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 UHB B 1001

Bond lengths

Bond angles

Torsions

Rings
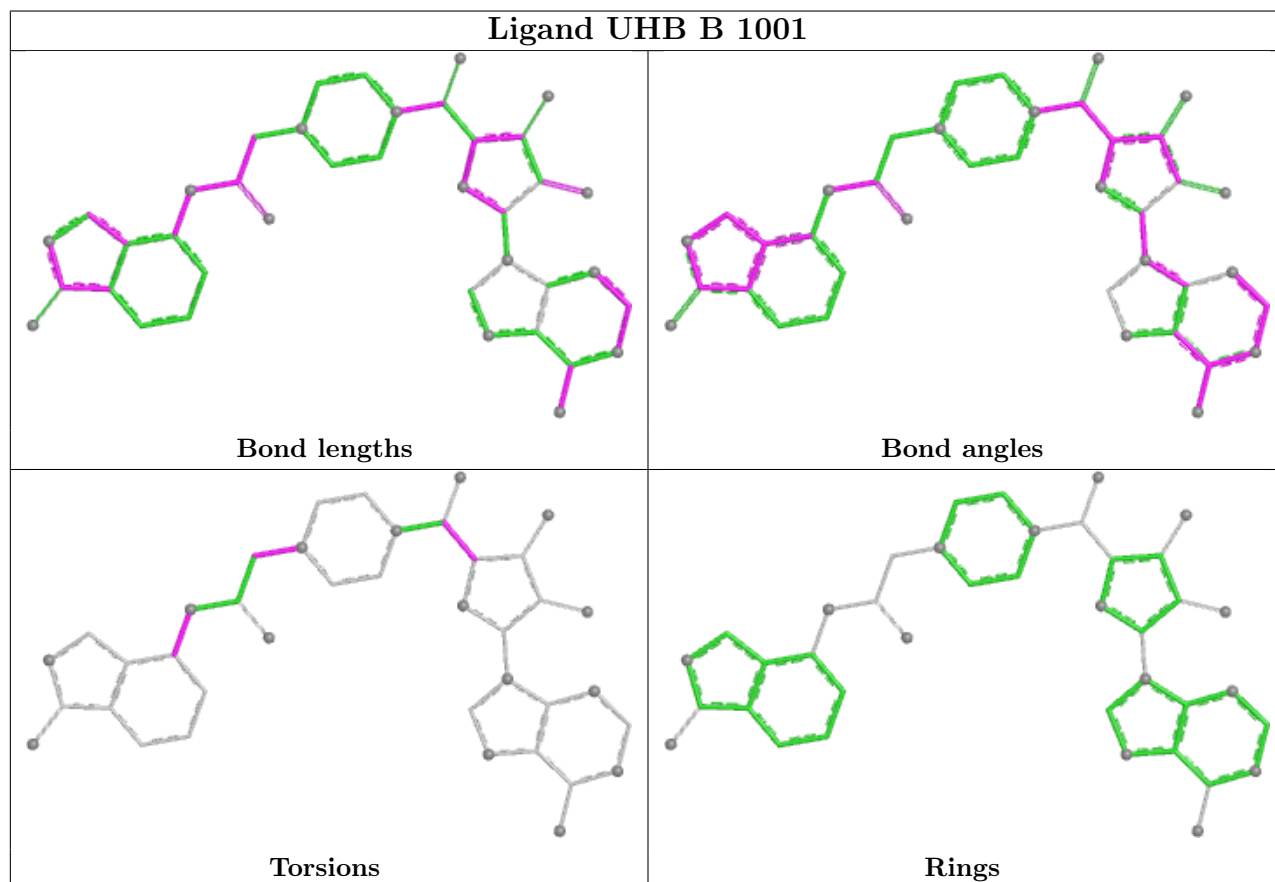
5.7 Other polymers ⓘ

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	B	249/280 (88%)	0.57	18 (7%)	15	8	126, 147, 206, 221	0
2	A	306/318 (96%)	0.23	7 (2%)	60	43	124, 151, 188, 201	0
All	All	555/598 (92%)	0.38	25 (4%)	33	21	124, 149, 193, 221	0

The worst 5 of 25 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	439	ILE	6.4
2	A	176	ILE	3.9
1	B	341	PRO	3.7
1	B	391	LEU	3.6
2	A	185	LEU	3.5

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

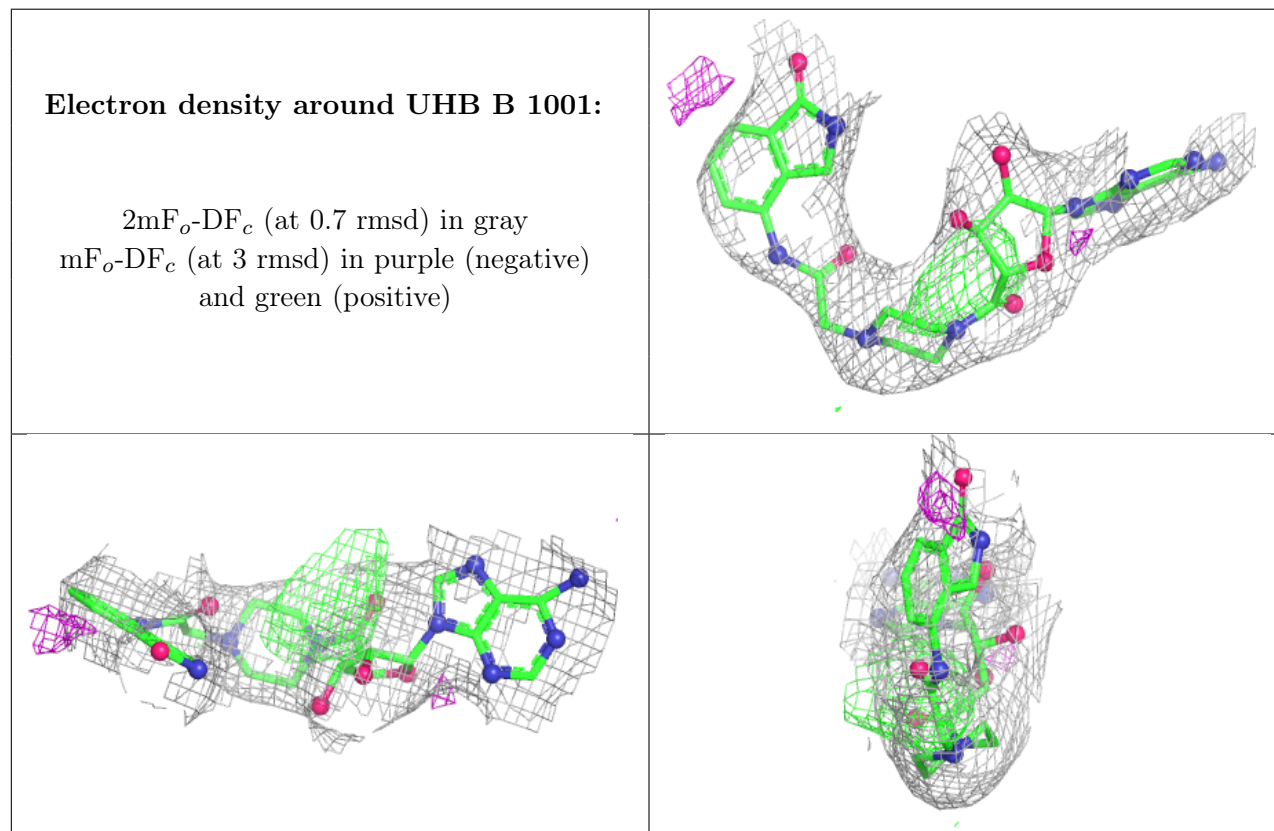There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.

6.4 Ligands ⓘ

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	UHB	B	1001	39/39	0.84	0.19	126,148,164,165	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 UHB B 1001:

$2mF_o\text{-}DF_c$ (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.