



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 08:42 PM UTC

PDB ID : 4UND / pdb_00004und
Title : HUMAN ARTD1 (PARP1) - CATALYTIC DOMAIN IN COMPLEX WITH INHIBITOR TALAZOPARIB
Authors : Karlberg, T.; Thorsell, A.G.; Ekblad, T.; Klepsch, M.; Pinto, A.F.; Tre-saugues, L.; Moche, M.; Schuler, H.
Deposited on : 2014-05-27
Resolution : 2.20 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	:	NOT EXECUTED
Xtriage (Phenix)	:	2.0
EDS	:	NOT EXECUTED
Buster-report	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

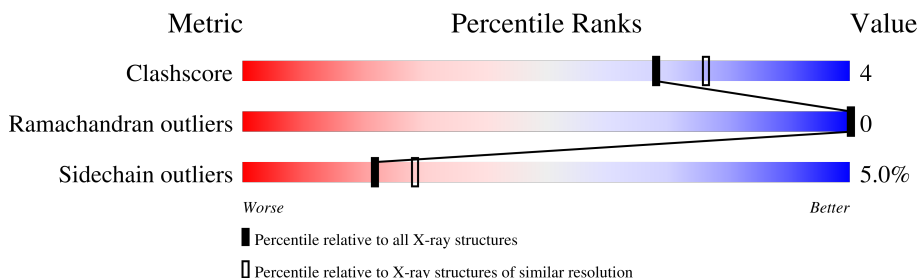
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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))
Clashscore	190562	6851 (2.20-2.20)
Ramachandran outliers	187476	6768 (2.20-2.20)
Sidechain outliers	187428	6769 (2.20-2.20)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	373	
1	B	373	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 5677 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 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	356	Total	C	N	O	S	0	0	0
			2806	1787	473	534	12			
1	B	349	Total	C	N	O	S	0	0	0
			2744	1746	464	523	11			

There are 48 discrepancies between the modelled and reference sequences:

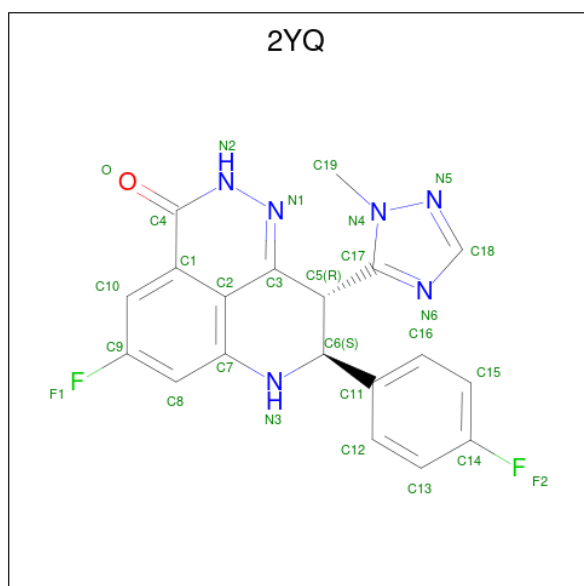
Chain	Residue	Modelled	Actual	Comment	Reference
A	639	MET	-	expression tag	UNP P09874
A	640	HIS	-	expression tag	UNP P09874
A	641	HIS	-	expression tag	UNP P09874
A	642	HIS	-	expression tag	UNP P09874
A	643	HIS	-	expression tag	UNP P09874
A	644	HIS	-	expression tag	UNP P09874
A	645	HIS	-	expression tag	UNP P09874
A	646	SER	-	expression tag	UNP P09874
A	647	SER	-	expression tag	UNP P09874
A	648	GLY	-	expression tag	UNP P09874
A	649	VAL	-	expression tag	UNP P09874
A	650	ASP	-	expression tag	UNP P09874
A	651	LEU	-	expression tag	UNP P09874
A	652	GLY	-	expression tag	UNP P09874
A	653	THR	-	expression tag	UNP P09874
A	654	GLU	-	expression tag	UNP P09874
A	655	ASN	-	expression tag	UNP P09874
A	656	LEU	-	expression tag	UNP P09874
A	657	TYR	-	expression tag	UNP P09874
A	658	PHE	-	expression tag	UNP P09874
A	659	GLN	-	expression tag	UNP P09874
A	660	SER	-	expression tag	UNP P09874
A	661	MET	-	expression tag	UNP P09874
A	762	ALA	VAL	variant	UNP P09874
B	639	MET	-	expression tag	UNP P09874

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Chain	Residue	Modelled	Actual	Comment	Reference
B	640	HIS	-	expression tag	UNP P09874
B	641	HIS	-	expression tag	UNP P09874
B	642	HIS	-	expression tag	UNP P09874
B	643	HIS	-	expression tag	UNP P09874
B	644	HIS	-	expression tag	UNP P09874
B	645	HIS	-	expression tag	UNP P09874
B	646	SER	-	expression tag	UNP P09874
B	647	SER	-	expression tag	UNP P09874
B	648	GLY	-	expression tag	UNP P09874
B	649	VAL	-	expression tag	UNP P09874
B	650	ASP	-	expression tag	UNP P09874
B	651	LEU	-	expression tag	UNP P09874
B	652	GLY	-	expression tag	UNP P09874
B	653	THR	-	expression tag	UNP P09874
B	654	GLU	-	expression tag	UNP P09874
B	655	ASN	-	expression tag	UNP P09874
B	656	LEU	-	expression tag	UNP P09874
B	657	TYR	-	expression tag	UNP P09874
B	658	PHE	-	expression tag	UNP P09874
B	659	GLN	-	expression tag	UNP P09874
B	660	SER	-	expression tag	UNP P09874
B	661	MET	-	expression tag	UNP P09874
B	762	ALA	VAL	variant	UNP P09874

- Molecule 2 is (8S,9R)-5-fluoro-8-(4-fluorophenyl)-9-(1-methyl-1H-1,2,4-triazol-5-yl)-2,7,8,9-tetrahydro-3H-pyrido[4,3-de]phthalazin-3-one (CCD ID: 2YQ) (formula: C₁₉H₁₄F₂N₆O).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	F	N	O	0	0
			28	19	2	6	1		
2	B	1	Total	C	F	N	O	0	0
			28	19	2	6	1		

- Molecule 3 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	1	Total	Na	0	0
			1	1		

- Molecule 4 is water.

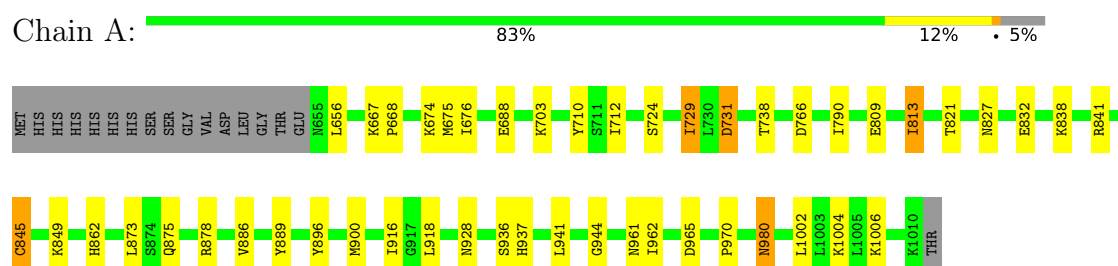
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	55	Total	O	0	0
			55	55		
4	B	15	Total	O	0	0
			15	15		

3 Residue-property plots [i](#)

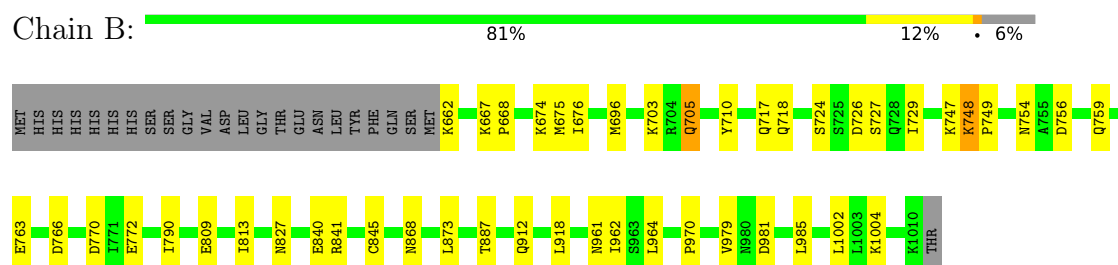
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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. 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.

Note EDS was not executed.

• Molecule 1: POLY [ADP-RIBOSE] POLYMERASE 1



• Molecule 1: POLY [ADP-RIBOSE] POLYMERASE 1



4 Data and refinement statistics

EDS was not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	103.45Å 103.45Å 168.54Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.27 – 2.20	Depositor
% Data completeness (in resolution range)	100.0 (46.27-2.20)	Depositor
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.57 (at 2.20Å)	Xtriage
Refinement program	REFMAC 5.7.0032	Depositor
R, R_{free}	0.226 , 0.246	Depositor
Wilson B-factor (Å ²)	40.4	Xtriage
Anisotropy	0.218	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	5677	wwPDB-VP
Average B, all atoms (Å ²)	60.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.30% 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: 2YQ, NA

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	3/2860 (0.1%)	0.93	1/3859 (0.0%)
1	B	0.82	0/2796	0.91	1/3773 (0.0%)
All	All	0.85	3/5656 (0.1%)	0.92	2/7632 (0.0%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	731	ASP	CB-CG	-5.47	1.38	1.52
1	A	738	THR	C-O	-5.44	1.17	1.24
1	A	688	GLU	C-O	-5.02	1.17	1.24

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	724	SER	N-CA-C	5.80	116.22	108.38
1	A	813	ILE	CB-CA-C	-5.14	105.39	111.97

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	2806	0	2841	19	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	2744	0	2784	19	0
2	A	28	0	13	3	0
2	B	28	0	14	2	0
3	B	1	0	0	0	0
4	A	55	0	0	0	0
4	B	15	0	0	1	0
All	All	5677	0	5652	41	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 (41) 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)
2:B:2011:2YQ:C14	2:B:2011:2YQ:F2	1.66	1.34
2:A:2011:2YQ:F2	2:A:2011:2YQ:C14	1.89	1.10
1:B:726:ASP:HB2	4:B:3002:HOH:O	1.88	0.72
1:A:841:ARG:HD2	1:A:873:LEU:O	1.92	0.70
1:B:770:ASP:HB2	1:B:868:ASN:OD1	2.01	0.61
1:B:754:ASN:OD1	1:B:756:ASP:N	2.36	0.59
1:A:724:SER:HB2	1:A:729:ILE:HD13	1.84	0.58
1:B:748:LYS:HD3	1:B:749:PRO:HD2	1.89	0.55
1:B:961:ASN:ND2	1:B:970:PRO:HA	2.23	0.53
1:B:710:TYR:OH	1:B:766:ASP:OD1	2.26	0.51
1:A:961:ASN:ND2	1:A:970:PRO:HA	2.25	0.51
1:A:862:HIS:HE1	2:A:2011:2YQ:C18	2.23	0.51
1:B:759:GLN:O	1:B:763:GLU:HG2	2.11	0.51
1:A:896:TYR:H	2:A:2011:2YQ:C18	2.25	0.50
1:A:928:ASN:HB2	1:A:944:GLY:O	2.13	0.49
1:B:841:ARG:NE	1:B:873:LEU:O	2.46	0.49
1:B:696:MET:HE3	1:B:705:GLN:OE1	2.13	0.48
1:B:770:ASP:HB3	1:B:868:ASN:HA	1.95	0.48
1:A:845:CYS:O	1:A:849:LYS:HG2	2.14	0.47
1:A:710:TYR:OH	1:A:766:ASP:OD1	2.26	0.47
1:B:667:LYS:HB3	1:B:668:PRO:HD3	1.96	0.46
1:B:703:LYS:HG3	1:B:772:GLU:OE1	2.15	0.46
1:B:747:LYS:O	1:B:748:LYS:C	2.59	0.45
1:B:696:MET:CE	1:B:705:GLN:OE1	2.65	0.44
1:B:918:LEU:HD22	1:B:1002:LEU:HD21	2.00	0.43
1:A:832:GLU:HB3	1:A:1006:LYS:HB3	1.99	0.43
1:A:809:GLU:O	1:A:813:ILE:HG12	2.18	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:717:GLN:CD	1:B:887:THR:HG21	2.44	0.43
1:A:980:ASN:OD1	1:A:980:ASN:N	2.40	0.42
2:B:2011:2YQ:H12	2:B:2011:2YQ:C12	2.49	0.42
1:A:674:LYS:HE2	1:A:790:ILE:HD11	2.01	0.42
1:A:821:THR:HB	1:A:900:MET:HA	2.00	0.42
1:B:809:GLU:O	1:B:813:ILE:HG12	2.20	0.42
1:A:675:MET:SD	1:A:916:ILE:HD11	2.59	0.41
1:B:674:LYS:HE2	1:B:790:ILE:HD11	2.03	0.41
1:A:875:GLN:OE1	1:A:878:ARG:NH1	2.52	0.41
1:B:675:MET:HE1	1:B:1004:LYS:HD2	2.01	0.41
1:A:889:TYR:O	1:A:937:HIS:CE1	2.73	0.41
1:A:918:LEU:HD22	1:A:1002:LEU:HD21	2.02	0.41
1:A:667:LYS:HB3	1:A:668:PRO:HD3	2.02	0.41
1:A:675:MET:HE1	1:A:1004:LYS:HD2	2.01	0.41

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	354/373 (95%)	339 (96%)	15 (4%)	0	100	100
1	B	347/373 (93%)	331 (95%)	16 (5%)	0	100	100
All	All	701/746 (94%)	670 (96%)	31 (4%)	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	313/328 (95%)	298 (95%)	15 (5%)	23	30
1	B	306/328 (93%)	290 (95%)	16 (5%)	21	26
All	All	619/656 (94%)	588 (95%)	31 (5%)	22	28

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	656	LEU
1	A	676	ILE
1	A	703	LYS
1	A	712	ILE
1	A	729	ILE
1	A	731	ASP
1	A	827	ASN
1	A	838	LYS
1	A	845	CYS
1	A	886	VAL
1	A	936	SER
1	A	941	LEU
1	A	962	ILE
1	A	965	ASP
1	A	980	ASN
1	B	662	LYS
1	B	676	ILE
1	B	705	GLN
1	B	718	GLN
1	B	727	SER
1	B	729	ILE
1	B	748	LYS
1	B	827	ASN
1	B	840	GLU
1	B	845	CYS
1	B	912	GLN
1	B	962	ILE
1	B	964	LEU
1	B	979	VAL
1	B	981	ASP
1	B	985	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14)

such sidechains are listed below:

Mol	Chain	Res	Type
1	A	734	ASN
1	A	767	ASN
1	A	827	ASN
1	A	853	GLN
1	A	906	ASN
1	A	961	ASN
1	A	998	ASN
1	A	1008	ASN
1	B	705	GLN
1	B	827	ASN
1	B	853	GLN
1	B	961	ASN
1	B	998	ASN
1	B	1008	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

Mogul was not executed - this section is therefore empty.

5.5 Carbohydrates [i](#)

Mogul was not executed - this section is therefore empty.

5.6 Ligand geometry [i](#)

Mogul was not executed - this section is therefore empty.

5.7 Other polymers [i](#)

Mogul was not executed - this section is therefore empty.

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 ⓘ

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

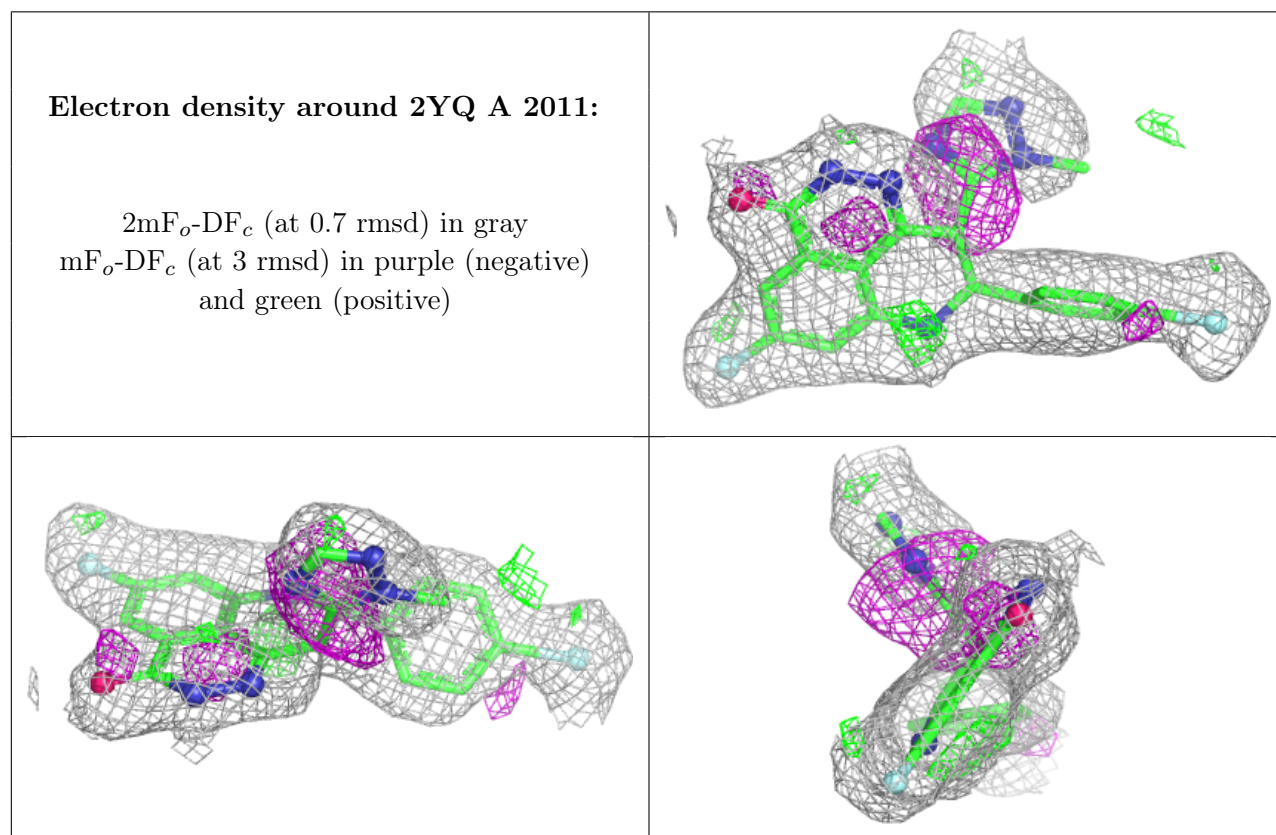
6.3 Carbohydrates ⓘ

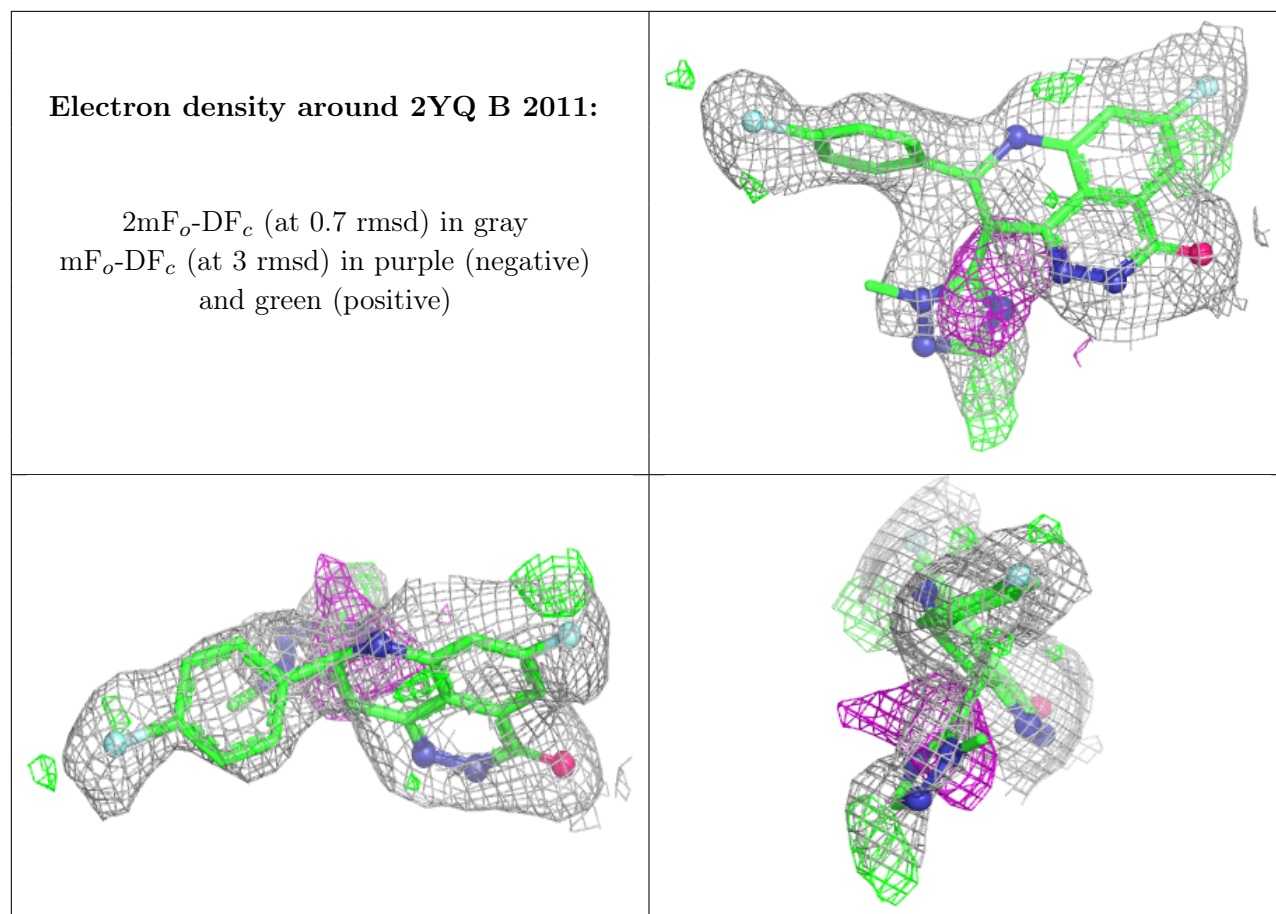
EDS was not executed - this section is therefore empty.

6.4 Ligands ⓘ

EDS was not executed - this section is therefore empty.

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](#)

EDS was not executed - this section is therefore empty.