



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 10:53 PM UTC

PDB ID : 4F0D / pdb_00004f0d
Title : Human ARTD15/PARP16 IN COMPLEX WITH 3-AMINOBENZAMIDE
Authors : Karlberg, T.; Thorsell, A.G.; Kallas, A.; Schuler, H.; Structural Genomics Consortium (SGC)
Deposited on : 2012-05-04
Resolution : 2.70 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
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

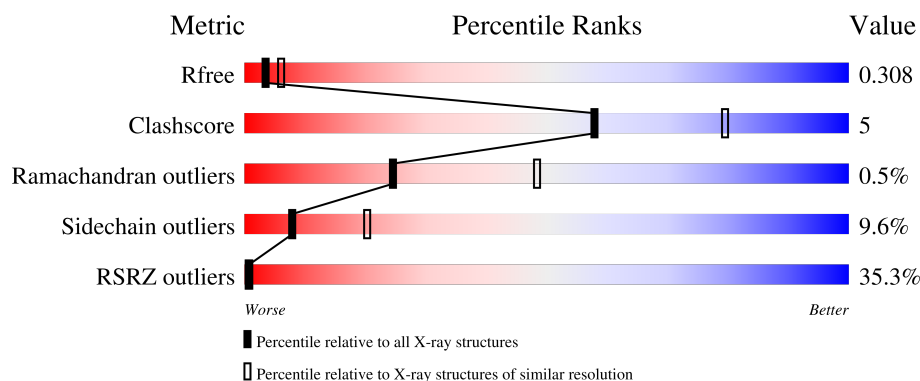
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 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	3538 (2.70-2.70)
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

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	277	9% 72% 12% • 14%
1	B	277	42% 47% 12% • 40%

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 3067 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.

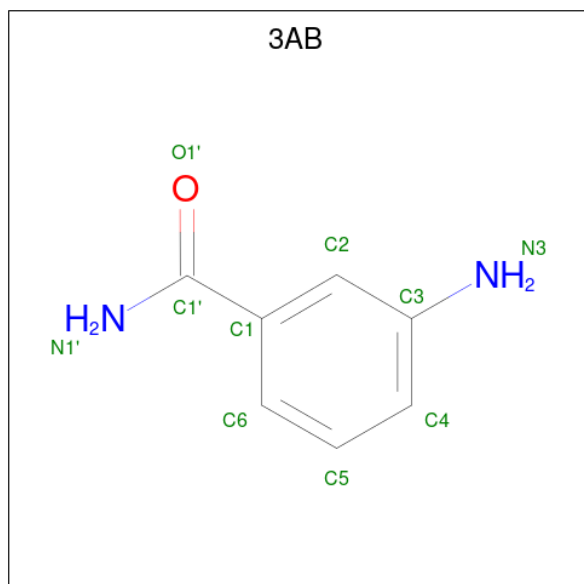
- Molecule 1 is a protein called Poly [ADP-ribose] polymerase 16.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	238	Total	C	N	O	S	0	0	0
			1861	1197	318	339	7			
1	B	167	Total	C	N	O	S	0	0	0
			1196	771	206	215	4			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	3	SER	-	expression tag	UNP Q8N5Y8
A	4	MET	-	expression tag	UNP Q8N5Y8
B	3	SER	-	expression tag	UNP Q8N5Y8
B	4	MET	-	expression tag	UNP Q8N5Y8

- Molecule 2 is 3-aminobenzamide (CCD ID: 3AB) (formula: C₇H₈N₂O).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			10	7	2	1		

4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	117.82Å 195.35Å 60.41Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	33.63 – 2.70 33.63 – 2.70	Depositor EDS
% Data completeness (in resolution range)	100.0 (33.63-2.70) 99.9 (33.63-2.70)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	5.33 (at 2.68Å)	Xtriage
Refinement program	BUSTER 2.11.1	Depositor
R, R_{free}	0.246 , 0.287 0.261 , 0.308	Depositor DCC
R_{free} test set	982 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	52.1	Xtriage
Anisotropy	0.234	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 71.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.014 for 1/2*h-1/2*k,-3/2*h-1/2*k,-l 0.024 for 1/2*h+1/2*k,3/2*h-1/2*k,-l	Xtriage
F_o, F_c correlation	0.89	EDS
Total number of atoms	3067	wwPDB-VP
Average B, all atoms (Å ²)	63.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.28% 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: 3AB

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	0.85	0/1909	1.35	7/2588 (0.3%)
1	B	0.93	0/1223	1.36	7/1666 (0.4%)
All	All	0.88	0/3132	1.36	14/4254 (0.3%)

There are no bond length outliers.

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	103	ALA	N-CA-C	-6.29	105.46	113.01
1	B	28	ALA	CA-C-N	6.14	128.43	120.44
1	B	28	ALA	C-N-CA	6.14	128.43	120.44
1	A	102	LYS	N-CA-C	-5.81	107.43	114.75
1	B	101	GLY	CA-C-N	5.77	128.81	120.38
1	B	101	GLY	C-N-CA	5.77	128.81	120.38
1	A	119	VAL	N-CA-CB	-5.71	103.21	111.21
1	B	115	PRO	CA-C-N	5.71	127.87	120.44
1	B	115	PRO	C-N-CA	5.71	127.87	120.44
1	B	160	HIS	N-CA-C	-5.25	105.63	111.36
1	A	168	HIS	CA-C-N	5.14	131.36	121.54
1	A	168	HIS	C-N-CA	5.14	131.36	121.54
1	A	133	PRO	CA-C-N	5.04	127.28	120.38
1	A	133	PRO	C-N-CA	5.04	127.28	120.38

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	1861	0	1814	14	0
1	B	1196	0	1071	14	0
2	A	10	0	8	0	0
All	All	3067	0	2893	27	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 5.

All (27) 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:A:163:ILE:HD11	1:A:268:LEU:HD11	1.66	0.78
1:A:100:ALA:HB1	1:A:104:GLU:HG2	1.79	0.64
1:A:95:LEU:HD21	1:A:163:ILE:O	2.01	0.60
1:B:200:TRP:HB3	1:B:203:SER:HB2	1.86	0.58
1:A:83:TRP:O	1:A:87:SER:HB3	2.04	0.57
1:B:59:LEU:HD13	1:B:59:LEU:H	1.72	0.54
1:B:214:VAL:HB	1:B:267:TYR:HB2	1.89	0.54
1:A:191:LEU:HD22	1:B:118:PRO:HD2	1.90	0.51
1:B:119:VAL:HG12	1:B:188:SER:HB3	1.92	0.51
1:B:67:ASN:HB3	1:B:202:HIS:HB3	1.93	0.49
1:A:10:ARG:HH12	1:A:75:SER:HA	1.78	0.48
1:B:22:LEU:HD22	1:B:97:ILE:HD13	1.97	0.46
1:A:145:ARG:HD2	1:A:219:ASP:O	2.17	0.44
1:B:122:PRO:HG3	1:B:269:LEU:HD22	1.98	0.44
1:A:220:HIS:CG	1:A:221:PRO:HD2	2.53	0.44
1:B:124:PHE:HB2	1:B:270:VAL:HB	2.00	0.43
1:A:76:GLY:HA3	1:A:77:ASP:HA	1.87	0.43
1:B:207:PRO:HB2	1:B:208:ILE:HD12	2.00	0.43
1:B:159:PHE:HA	1:B:162:ILE:HB	2.00	0.42
1:A:100:ALA:HB3	1:A:125:LEU:HB3	2.01	0.42
1:A:159:PHE:O	1:A:163:ILE:HB	2.20	0.42
1:A:167:LEU:HD23	1:A:168:HIS:HD2	1.85	0.41
1:A:163:ILE:HD11	1:A:268:LEU:CD1	2.45	0.41
1:A:159:PHE:HA	1:A:162:ILE:HB	2.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:94:VAL:HG22	1:B:130:TYR:HD1	1.86	0.40
1:B:108:ILE:C	1:B:110:LYS:H	2.30	0.40
1:B:164:HIS:CD2	1:B:165:ASN:H	2.40	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	232/277 (84%)	219 (94%)	12 (5%)	1 (0%)	30	54
1	B	153/277 (55%)	144 (94%)	8 (5%)	1 (1%)	18	41
All	All	385/554 (70%)	363 (94%)	20 (5%)	2 (0%)	24	48

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	174	THR
1	B	110	LYS

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	195/235 (83%)	179 (92%)	16 (8%)	10	27

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	106/235 (45%)	93 (88%)	13 (12%)	4	12
All	All	301/470 (64%)	272 (90%)	29 (10%)	8	20

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	23	ARG
1	A	38	SER
1	A	80	LYS
1	A	87	SER
1	A	102	LYS
1	A	107	LYS
1	A	108	ILE
1	A	125	LEU
1	A	146	ASP
1	A	148	ILE
1	A	163	ILE
1	A	179	GLU
1	A	201	GLN
1	A	208	ILE
1	A	222	ASP
1	A	272	SER
1	B	31	LEU
1	B	59	LEU
1	B	65	LEU
1	B	108	ILE
1	B	128	ILE
1	B	129	GLU
1	B	155	ARG
1	B	162	ILE
1	B	164	HIS
1	B	165	ASN
1	B	185	SER
1	B	192	ILE
1	B	209	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	158	ASN
1	A	168	HIS

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Mol	Chain	Res	Type
1	A	273	GLN
1	B	67	ASN
1	B	165	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](#)

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](#)

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	$\# Z > 2$
2	3AB	A	301	-	10,10,10	2.66	6 (60%)	13,13,13	2.66	5 (38%)

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	3AB	A	301	-	-	0/4/4/4	0/1/1/1

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	301	3AB	C1-C1'	6.10	1.59	1.50
2	A	301	3AB	C5-C6	2.89	1.43	1.38
2	A	301	3AB	O1'-C1'	-2.37	1.19	1.24
2	A	301	3AB	C2-C1	2.29	1.42	1.39
2	A	301	3AB	C4-C3	2.25	1.44	1.40
2	A	301	3AB	C6-C1	-2.12	1.36	1.39

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	301	3AB	C1-C2-C3	7.12	126.53	120.66
2	A	301	3AB	C6-C5-C4	3.22	124.39	120.24
2	A	301	3AB	C6-C1-C2	-2.76	116.06	119.25
2	A	301	3AB	C4-C3-N3	2.60	125.70	120.90
2	A	301	3AB	O1'-C1'-N1'	-2.06	119.64	122.62

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	238/277 (85%)	0.43	26 (10%)	10 9	25, 43, 86, 126	0
1	B	167/277 (60%)	2.73	117 (70%)	0 0	41, 83, 122, 134	0
All	All	405/554 (73%)	1.38	143 (35%)	1 1	25, 62, 114, 134	0

All (143) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	215	CYS	8.3
1	B	86	VAL	6.8
1	B	91	SER	6.5
1	B	193	TYR	6.2
1	B	268	LEU	5.9
1	B	82	ALA	5.7
1	B	61	ASP	5.7
1	B	57	ALA	5.2
1	B	211	CYS	5.2
1	A	170	HIS	5.1
1	B	55	PHE	5.1
1	B	188	SER	5.0
1	B	186	ASP	5.0
1	B	181	THR	4.8
1	B	111	LEU	4.6
1	B	129	GLU	4.5
1	B	88	TRP	4.4
1	B	165	ASN	4.3
1	B	58	LEU	4.3
1	B	260	ASN	4.3
1	B	131	PHE	4.2
1	B	94	VAL	4.2
1	B	213	ALA	4.2
1	B	85	LEU	4.2

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Mol	Chain	Res	Type	RSRZ
1	A	115	PRO	4.2
1	B	258	THR	4.1
1	B	112	THR	4.1
1	B	26	LEU	4.1
1	B	62	ALA	4.0
1	B	261	GLN	4.0
1	B	63	SER	4.0
1	B	24	CYS	4.0
1	B	159	PHE	4.0
1	B	23	ARG	3.9
1	B	128	ILE	3.9
1	B	164	HIS	3.9
1	B	27	PHE	3.8
1	A	76	GLY	3.8
1	B	273	GLN	3.7
1	B	65	LEU	3.7
1	B	34	TYR	3.7
1	B	90	LEU	3.7
1	B	97	ILE	3.7
1	B	265	VAL	3.7
1	B	157	GLU	3.7
1	B	199	GLY	3.6
1	B	263	LEU	3.6
1	B	17	MET	3.5
1	B	93	LYS	3.5
1	B	4	MET	3.5
1	B	5	GLY	3.5
1	B	205	LEU	3.4
1	B	212	VAL	3.4
1	B	113	GLY	3.3
1	B	262	LEU	3.3
1	B	184	THR	3.3
1	A	51	ASP	3.3
1	B	190	ALA	3.3
1	B	214	VAL	3.2
1	B	56	GLU	3.2
1	B	216	GLU	3.2
1	B	160	HIS	3.2
1	B	259	ASN	3.1
1	B	103	ALA	3.1
1	B	162	ILE	3.1
1	B	182	TYR	3.1

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Mol	Chain	Res	Type	RSRZ
1	B	80	LYS	3.1
1	B	189	LEU	3.1
1	A	174	THR	3.1
1	B	187	LEU	3.1
1	B	69	LYS	3.1
1	B	36	ARG	3.1
1	B	185	SER	3.1
1	B	266	LYS	3.0
1	B	81	ARG	3.0
1	B	59	LEU	2.9
1	B	98	HIS	2.9
1	B	60	ALA	2.9
1	A	107	LYS	2.9
1	B	102	LYS	2.9
1	B	89	ILE	2.9
1	B	206	GLY	2.9
1	B	150	ALA	2.9
1	A	177	PHE	2.9
1	A	117	THR	2.9
1	B	196	HIS	2.9
1	A	34	TYR	2.8
1	B	68	LEU	2.8
1	B	7	ALA	2.8
1	A	75	SER	2.7
1	B	87	SER	2.7
1	A	116	HIS	2.7
1	A	221	PRO	2.7
1	B	163	ILE	2.7
1	B	192	ILE	2.7
1	B	92	SER	2.7
1	B	203	SER	2.7
1	B	35	LYS	2.7
1	B	149	TYR	2.6
1	B	106	GLU	2.6
1	A	77	ASP	2.6
1	B	156	LEU	2.6
1	B	110	LYS	2.6
1	A	273	GLN	2.6
1	B	191	LEU	2.6
1	B	209	LEU	2.6
1	A	173	LYS	2.6
1	B	107	LYS	2.5

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Mol	Chain	Res	Type	RSRZ
1	B	66	PRO	2.5
1	B	9	ALA	2.5
1	B	28	ALA	2.5
1	A	175	SER	2.5
1	B	105	PHE	2.5
1	A	169	CYS	2.5
1	B	21	ASP	2.4
1	A	103	ALA	2.4
1	B	108	ILE	2.4
1	A	222	ASP	2.4
1	B	83	TRP	2.4
1	B	8	ALA	2.4
1	A	220	HIS	2.4
1	B	130	TYR	2.3
1	A	179	GLU	2.3
1	B	151	PHE	2.3
1	B	204	LEU	2.3
1	B	127	GLU	2.3
1	B	6	TRP	2.3
1	B	198	HIS	2.2
1	B	161	SER	2.2
1	A	167	LEU	2.2
1	B	19	ALA	2.2
1	A	102	LYS	2.2
1	B	194	SER	2.2
1	B	200	TRP	2.2
1	B	29	SER	2.2
1	B	20	ALA	2.1
1	A	49	ARG	2.1
1	B	195	PRO	2.1
1	B	22	LEU	2.1
1	B	269	LEU	2.1
1	B	64	LYS	2.1
1	A	168	HIS	2.1
1	A	145	ARG	2.0

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 [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
2	3AB	A	301	10/10	0.92	0.14	43,46,48,48	0

6.5 Other polymers [i](#)

There are no such residues in this entry.