



Full wwPDB X-ray Structure Validation Report (i)

Feb 28, 2014 – 07:12 PM GMT

PDB ID : 2VD7
Title : Crystal Structure of JMJD2A complexed with inhibitor Pyridine-2,4- dicarboxylic acid
Authors : Ng, S.S.; Delft, F.von; Pilka, E.S.; Kavanagh, K.L.; McDonough, M.A.; Savitsky, P.; Arrowsmith, C.H.; Weigelt, J.; Edwards, A.; Sundstrom, M.; Schofield, C.J.; Oppermann, U.
Deposited on : 2007-10-01
Resolution : 2.25 Å(reported)

This is a full wwPDB validation report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

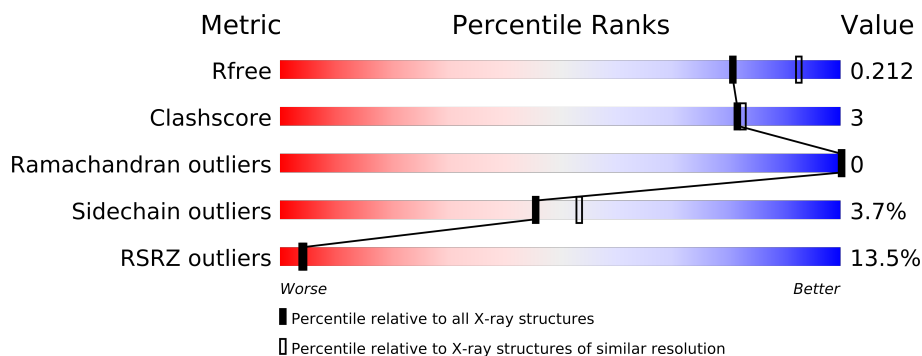
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : dev-1323
EDS : stable22639
Percentile statistics : 21963
Refmac : 5.8.0049
CCP4 : 6.3.0 (Settle)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable22683

1 Overall quality at a glance

The reported resolution of this entry is 2.25 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}	66092	1108 (2.28-2.24)
Clashscore	79885	1326 (2.28-2.24)
Ramachandran outliers	78287	1291 (2.28-2.24)
Sidechain outliers	78261	1291 (2.28-2.24)
RSRZ outliers	66119	1110 (2.28-2.24)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	381	
1	B	381	

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 6009 atoms, of which 0 are hydrogen and 0 are deuterium.

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 JMJC DOMAIN-CONTAINING HISTONE DEMETHYLATION PROTEIN 3A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	350	Total	C	N	O	S	0	3	0
			2806	1822	459	510	15			
1	B	349	Total	C	N	O	S	0	3	0
			2818	1825	468	510	15			

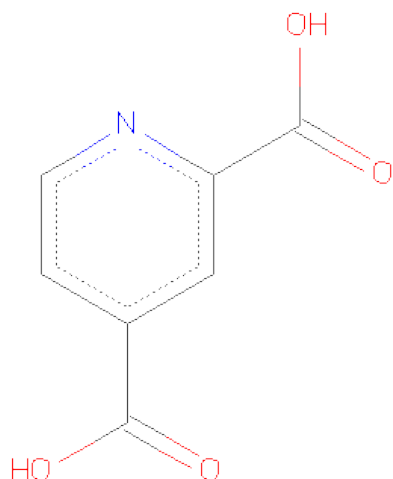
- Molecule 2 is NICKEL (II) ION (three-letter code: NI) (formula: Ni).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	1	Total	Ni	0	0
			1	1		
2	A	1	Total	Ni	0	0
			1	1		

- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn).

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

- Molecule 4 is PYRIDINE-2,4-DICARBOXYLICACID (three-letter code: PD2) (formula: C₇H₅NO₄).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			12	7	1	4		
4	B	1	Total	C	N	O	0	0
			12	7	1	4		

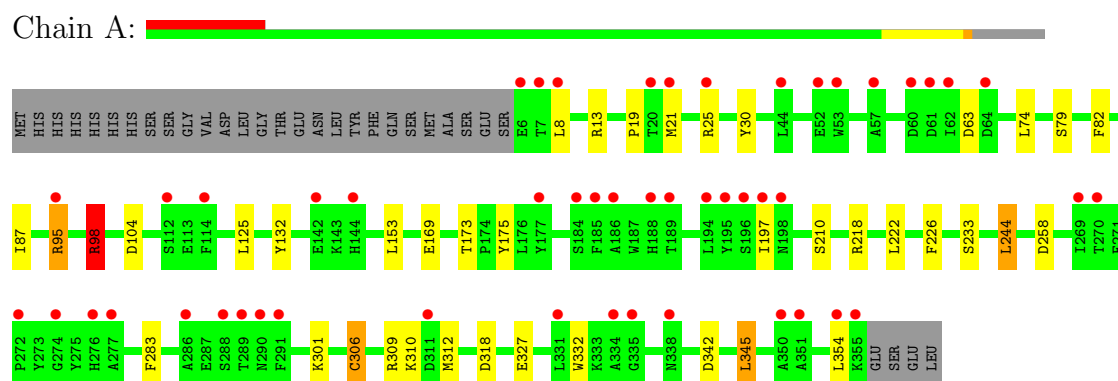
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	172	Total	O	0	0
			172	172		
5	B	185	Total	O	0	0
			185	185		

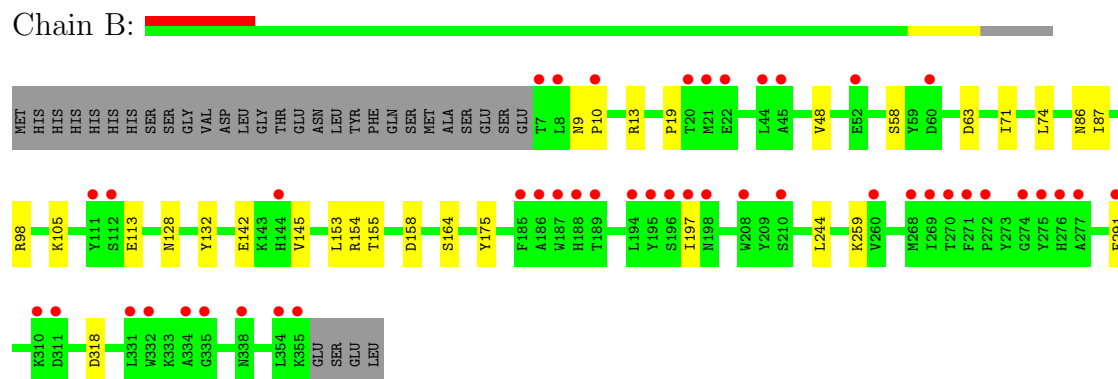
3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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: JMJC DOMAIN-CONTAINING HISTONE DEMETHYLATION PROTEIN 3A



• Molecule 1: JMJC DOMAIN-CONTAINING HISTONE DEMETHYLATION PROTEIN 3A



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	101.28Å 149.12Å 57.57Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	37.63 – 2.25 36.84 – 2.25	Depositor EDS
% Data completeness (in resolution range)	98.6 (37.63-2.25) 98.6 (36.84-2.25)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.39 (at 2.24Å)	Xtriage
Refinement program	REFMAC 5.3.0040	Depositor
R, R_{free}	0.170 , 0.219 0.168 , 0.212	Depositor DCC
R_{free} test set	1754 reflections (4.40%)	DCC
Wilson B-factor (Å ²)	37.5	Xtriage
Anisotropy	0.353	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 44.1	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 41621 reflections	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	6009	wwPDB-VP
Average B, all atoms (Å ²)	43.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.33% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: NI, ZN, PD2

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	0.72	3/2899 (0.1%)	0.71	2/3944 (0.1%)
1	B	0.68	0/2911	0.68	0/3958
All	All	0.70	3/5810 (0.1%)	0.69	2/7902 (0.0%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	98	ARG	CZ-NH1	7.85	1.43	1.33
1	A	63	ASP	C-O	6.13	1.35	1.23
1	A	95	ARG	CZ-NH1	5.06	1.39	1.33

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	98	ARG	NE-CZ-NH2	-9.28	115.66	120.30
1	A	98	ARG	NE-CZ-NH1	6.24	123.42	120.30

There are no chirality outliers.

There are no planarity outliers.

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2806	0	2628	22	0
1	B	2818	0	2655	13	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	12	0	3	0	0
4	B	12	0	3	0	0
5	A	172	0	0	3	0
5	B	185	0	0	1	0
All	All	6009	0	5289	35	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 3.

All (35) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:B:142[B]:GLU:HG3	1:B:145:VAL:HG23	1.78	0.66
1:A:210[B]:SER:OG	5:A:2104:HOH:O	2.13	0.66
5:A:2113:HOH:O	1:B:13:ARG:HD2	1.99	0.62
1:A:327:GLU:OE1	1:A:327:GLU:N	2.27	0.60
1:B:74:LEU:HD23	1:B:87:ILE:HD12	1.82	0.60
1:A:95:ARG:HH11	1:A:95:ARG:HB3	1.67	0.59
1:B:155:THR:HG21	1:B:291:PHE:HB2	1.84	0.59
1:A:95:ARG:HH11	1:A:95:ARG:CB	2.17	0.57
1:A:301:LYS:HE3	1:A:332:TRP:CD1	2.41	0.55
1:A:309:ARG:HB2	1:A:312:MET:HG2	1.92	0.51
1:A:222:LEU:HG	1:A:226:PHE:CE2	2.47	0.50
1:A:125:LEU:N	1:A:125:LEU:HD23	2.26	0.50
1:A:82:PHE:HB2	1:A:244:LEU:HB2	1.94	0.49
1:A:218:ARG:HD2	5:A:2110:HOH:O	2.12	0.49
1:A:13:ARG:HG3	1:A:258:ASP:OD2	2.13	0.49
1:B:71:ILE:HG23	1:B:86:ASN:HB3	1.94	0.48
1:B:153:LEU:HD11	1:B:197:ILE:HG21	1.95	0.47
1:A:342:ASP:HB3	1:A:345:LEU:HD22	1.96	0.47
1:B:154:ARG:HA	1:B:158:ASP:OD2	2.16	0.46
1:A:98:ARG:HG3	1:A:283:PHE:CE2	2.50	0.45
1:A:95:ARG:NH1	1:A:95:ARG:CB	2.79	0.45
1:A:153:LEU:HD11	1:A:197:ILE:HG21	2.00	0.44
1:A:19:PRO:HB3	1:A:30:TYR:CE1	2.53	0.43
1:A:169:GLU:HA	1:A:173:THR:OG1	2.18	0.43
1:A:125:LEU:H	1:A:125:LEU:HD23	1.83	0.42
1:B:98:ARG:NH2	5:B:2050:HOH:O	2.52	0.42

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:B:105:LYS:HE3	1:B:128:ASN:OD1	2.19	0.42
1:A:309:ARG:HB2	1:A:312:MET:CG	2.50	0.42
1:B:19:PRO:HD2	1:B:48:VAL:O	2.19	0.42
1:A:74:LEU:HD23	1:A:87:ILE:HD12	2.02	0.41
1:B:63:ASP:CG	1:B:98:ARG:HH12	2.24	0.41
1:B:9:ASN:N	1:B:10:PRO:HD3	2.35	0.41
1:A:21:MET:O	1:A:25:ARG:HG3	2.21	0.41
1:B:74:LEU:HD23	1:B:87:ILE:CD1	2.49	0.40
1:A:306:CYS:SG	1:A:312:MET:HG3	2.62	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	351/381 (92%)	344 (98%)	7 (2%)	0	100	100
1	B	350/381 (92%)	347 (99%)	3 (1%)	0	100	100
All	All	701/762 (92%)	691 (99%)	10 (1%)	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	283/335 (84%)	270 (95%)	13 (5%)	37	41
1	B	288/335 (86%)	280 (97%)	8 (3%)	56	65
All	All	571/670 (85%)	550 (96%)	21 (4%)	45	53

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	8	LEU
1	A	79	SER
1	A	98	ARG
1	A	104	ASP
1	A	132	TYR
1	A	175	TYR
1	A	233	SER
1	A	244	LEU
1	A	306	CYS
1	A	310	LYS
1	A	318	ASP
1	A	345	LEU
1	A	354	LEU
1	B	58	SER
1	B	113	GLU
1	B	132	TYR
1	B	164	SER
1	B	175	TYR
1	B	244	LEU
1	B	259	LYS
1	B	318	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA ⓘ

There are no RNA chains 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 carbohydrates in this entry.

5.6 Ligand geometry

Of 6 ligands modelled in this entry, 4 are monoatomic - leaving 2 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$
4	PD2	A	1356	2	12,12,12	1.00	1 (8%)	16,16,16	1.98	5 (31%)
4	PD2	B	1356	2	12,12,12	1.23	1 (8%)	16,16,16	2.35	7 (43%)

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
4	PD2	A	1356	2	-	0/8/8/8	0/1/1/1
4	PD2	B	1356	2	-	0/8/8/8	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	1356	PD2	O41-C41	-2.58	1.22	1.30
4	A	1356	PD2	O22-C21	-2.19	1.23	1.30

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	1356	PD2	C6-N1-C2	4.22	122.89	116.96
4	B	1356	PD2	O22-C21-C2	3.97	123.76	114.68
4	B	1356	PD2	C5-C6-N1	-3.96	119.49	123.88
4	A	1356	PD2	C5-C6-N1	-3.54	119.95	123.88
4	A	1356	PD2	C6-N1-C2	3.14	121.37	116.96
4	B	1356	PD2	C3-C2-N1	-3.07	119.69	123.39
4	A	1356	PD2	C4-C3-C2	-2.95	116.25	118.77
4	A	1356	PD2	O41-C41-C4	2.90	122.68	115.01
4	B	1356	PD2	O41-C41-O42	-2.66	117.32	123.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	1356	PD2	O22-C21-O21	-2.59	117.47	123.35
4	B	1356	PD2	O41-C41-C4	2.41	121.38	115.01
4	A	1356	PD2	O22-C21-C2	2.28	119.89	114.68

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

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	A	350/381 (91%)	0.65	50 (14%) 3 3	34, 42, 54, 68	0
1	B	349/381 (91%)	0.63	45 (12%) 4 5	35, 43, 56, 68	0
All	All	699/762 (91%)	0.64	95 (13%) 4 4	34, 42, 55, 68	0

All (95) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	334	ALA	5.4
1	A	7	THR	5.4
1	A	354	LEU	5.2
1	A	144	HIS	5.0
1	B	355	LYS	4.8
1	A	331	LEU	4.3
1	A	57	ALA	4.3
1	B	338	ASN	4.1
1	B	198[A]	ASN	4.1
1	B	44	LEU	4.1
1	A	142	GLU	3.8
1	B	311	ASP	3.8
1	A	270	THR	3.8
1	B	8	LEU	3.8
1	A	186	ALA	3.7
1	B	270	THR	3.7
1	A	64	ASP	3.6
1	B	277	ALA	3.6
1	B	208	TRP	3.6
1	A	112	SER	3.5
1	B	196	SER	3.5
1	B	334	ALA	3.5
1	B	274	GLY	3.5
1	A	25	ARG	3.4

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Mol	Chain	Res	Type	RSRZ
1	A	20	THR	3.4
1	B	354	LEU	3.4
1	B	272	PRO	3.3
1	B	194	LEU	3.3
1	B	186	ALA	3.3
1	A	350	ALA	3.3
1	A	196	SER	3.2
1	B	335	GLY	3.2
1	A	185	PHE	3.2
1	B	269	ILE	3.2
1	A	311	ASP	3.2
1	B	276	HIS	3.1
1	B	20	THR	3.1
1	A	338	ASN	3.1
1	A	194	LEU	3.1
1	B	144	HIS	3.1
1	A	177	TYR	3.0
1	B	45	ALA	3.0
1	B	197	ILE	3.0
1	B	271	PHE	2.9
1	A	198[A]	ASN	2.8
1	A	335	GLY	2.8
1	B	21	MET	2.8
1	B	268	MET	2.8
1	B	111	TYR	2.8
1	A	60	ASP	2.7
1	A	269	ILE	2.7
1	A	351	ALA	2.7
1	A	276	HIS	2.7
1	A	8	LEU	2.7
1	B	188	HIS	2.7
1	A	114	PHE	2.6
1	B	187	TRP	2.6
1	A	288	SER	2.6
1	B	185	PHE	2.6
1	A	189	THR	2.6
1	B	22	GLU	2.6
1	A	53	TRP	2.5
1	B	195	TYR	2.5
1	A	95	ARG	2.5
1	A	286	ALA	2.5
1	A	355	LYS	2.4

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Mol	Chain	Res	Type	RSRZ
1	B	60	ASP	2.4
1	A	277	ALA	2.4
1	B	7	THR	2.4
1	A	6	GLU	2.4
1	A	21	MET	2.4
1	B	52	GLU	2.4
1	A	184	SER	2.3
1	B	10	PRO	2.3
1	B	189	THR	2.3
1	A	291	PHE	2.3
1	A	195	TYR	2.3
1	B	291	PHE	2.3
1	B	331	LEU	2.3
1	B	310	LYS	2.2
1	B	332	TRP	2.2
1	A	52	GLU	2.2
1	A	44	LEU	2.2
1	A	62	ILE	2.2
1	A	197	ILE	2.2
1	B	275	TYR	2.1
1	B	260	VAL	2.1
1	A	272	PRO	2.1
1	A	290	ASN	2.1
1	B	112	SER	2.1
1	A	188	HIS	2.1
1	B	210[A]	SER	2.1
1	A	289	THR	2.0
1	A	274	GLY	2.0
1	A	61	ASP	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 ⓘ

There are no carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	RSR	LLDF	B-factors(Å ²)	Q<0.9
4	PD2	A	1356	12/12	0.21	-1.09	29,30,32,32	0
4	PD2	B	1356	12/12	0.17	-1.55	31,34,35,35	0
3	ZN	B	502	1/1	0.04	-1.98	39,39,39,39	0
3	ZN	A	502	1/1	0.03	-2.11	39,39,39,39	0
2	NI	B	501	1/1	0.12	-5.57	27,27,27,27	0
2	NI	A	501	1/1	0.14	-7.13	26,26,26,26	0

6.5 Other polymers

There are no such residues in this entry.