



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 12, 2024 – 03:58 AM EDT

PDB ID : 1U9A
Title : HUMAN UBIQUITIN-CONJUGATING ENZYME UBC9
Authors : Tong, H.; Hateboer, G.; Perrakis, A.; Bernards, R.; Sixma, T.K.
Deposited on : 1997-02-11
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	:	4.02b-467
Xtriage (Phenix)	:	1.20.1
EDS	:	2.36.2
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)	:	2.36.2

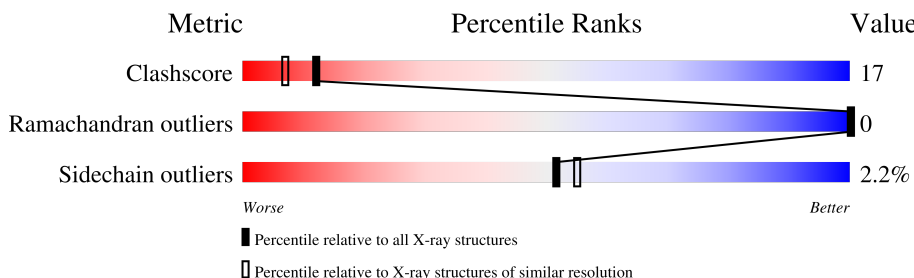
1 Overall quality at a glance

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))
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (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 $\leq 5\%$.

Mol	Chain	Length	Quality of chain
1	A	160	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 1386 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 UBIQUITIN-CONJUGATING ENZYME.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	160	Total	C	N	O	S	0	0	0
			1283	825	221	229	8			

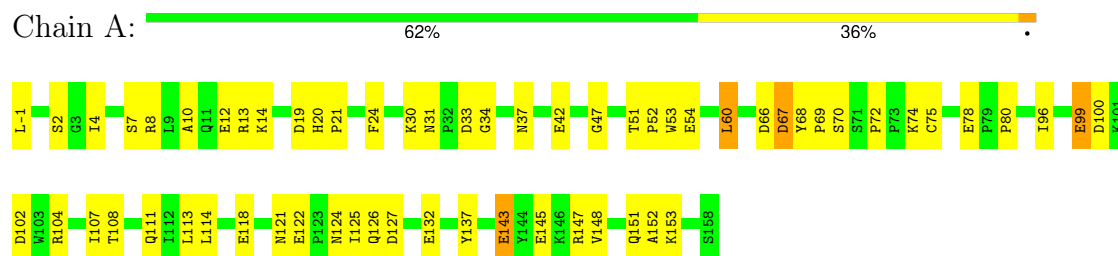
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	103	Total	O	0	0
			103	103		

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. 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.

• Molecule 1: UBIQUITIN-CONJUGATING ENZYME



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	52.04Å 35.18Å 58.10Å 90.00° 111.20° 90.00°	Depositor
Resolution (Å)	10.00 – 2.00 16.17 – 1.99	Depositor EDS
% Data completeness (in resolution range)	84.0 (10.00-2.00) 85.9 (16.17-1.99)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	0.12	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.74 (at 1.98Å)	Xtriage
Refinement program	TNT 5E	Depositor
R, R_{free}	0.160 , 0.250 0.256 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	23.9	Xtriage
Anisotropy	0.110	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 75.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	1386	wwPDB-VP
Average B, all atoms (Å ²)	22.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 10.37% 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

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	0.99	10/1320 (0.8%)	0.96	14/1789 (0.8%)

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	122	GLU	CD-OE2	6.63	1.32	1.25
1	A	54	GLU	CD-OE2	6.19	1.32	1.25
1	A	118	GLU	CD-OE1	5.84	1.32	1.25
1	A	132	GLU	CD-OE2	5.80	1.32	1.25
1	A	143	GLU	CD-OE2	5.68	1.31	1.25
1	A	12	GLU	CD-OE2	5.59	1.31	1.25
1	A	99	GLU	CD-OE1	5.47	1.31	1.25
1	A	145	GLU	CD-OE2	5.44	1.31	1.25
1	A	78	GLU	CD-OE2	5.29	1.31	1.25
1	A	42	GLU	CD-OE1	5.28	1.31	1.25

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	19	ASP	CB-CG-OD1	-6.46	112.48	118.30
1	A	33	ASP	CB-CG-OD1	-6.40	112.54	118.30
1	A	127	ASP	CB-CG-OD1	-6.38	112.56	118.30
1	A	100	ASP	CB-CG-OD2	-6.09	112.82	118.30
1	A	66	ASP	CB-CG-OD2	-5.92	112.97	118.30
1	A	102	ASP	CB-CG-OD1	5.76	123.48	118.30
1	A	67	ASP	CB-CG-OD1	-5.53	113.32	118.30
1	A	127	ASP	CB-CG-OD2	5.50	123.25	118.30
1	A	19	ASP	CB-CG-OD2	5.47	123.22	118.30
1	A	33	ASP	CB-CG-OD2	5.43	123.19	118.30
1	A	100	ASP	CB-CG-OD1	5.37	123.13	118.30
1	A	66	ASP	CB-CG-OD1	5.36	123.13	118.30
1	A	102	ASP	CB-CG-OD2	-5.19	113.63	118.30
1	A	67	ASP	CB-CG-OD2	5.09	122.88	118.30

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	1283	0	1287	44	0
2	A	103	0	0	18	0
All	All	1386	0	1287	44	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 17.

All (44) 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:153:LYS:HG3	2:A:189:HOH:O	1.83	0.78
1:A:30:LYS:O	2:A:245:HOH:O	2.02	0.77
1:A:99:GLU:HG2	2:A:220:HOH:O	1.84	0.76
1:A:104:ARG:H	1:A:107:ILE:HD12	1.50	0.75
1:A:72:PRO:HG2	2:A:237:HOH:O	1.92	0.70
1:A:74:LYS:NZ	2:A:197:HOH:O	2.32	0.62
1:A:96:ILE:HG23	2:A:195:HOH:O	2.00	0.61
1:A:104:ARG:NH1	2:A:191:HOH:O	2.34	0.61
1:A:13:ARG:NH2	2:A:225:HOH:O	2.33	0.61
1:A:152:ALA:HB3	2:A:189:HOH:O	2.01	0.60
1:A:13:ARG:HE	1:A:14:LYS:NZ	2.03	0.56
1:A:51:THR:HB	1:A:52:PRO:HD2	1.88	0.55
1:A:10:ALA:O	1:A:14:LYS:HG2	2.06	0.55
1:A:153:LYS:NZ	2:A:181:HOH:O	2.39	0.55
1:A:-1:LEU:C	1:A:-1:LEU:HD12	2.29	0.53
1:A:8:ARG:HB2	2:A:210:HOH:O	2.08	0.53
1:A:104:ARG:N	1:A:107:ILE:HD12	2.22	0.52
1:A:47:GLY:HA3	1:A:53:TRP:O	2.12	0.50
1:A:20:HIS:HB2	1:A:21:PRO:HD2	1.94	0.50
1:A:125:ILE:HD11	1:A:137:TYR:CD2	2.47	0.50
1:A:-1:LEU:HD13	1:A:4:ILE:HG13	1.94	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:13:ARG:HH21	1:A:14:LYS:HE3	1.77	0.49
1:A:68:TYR:CD1	1:A:69:PRO:HA	2.47	0.49
1:A:13:ARG:HB3	1:A:14:LYS:HZ2	1.78	0.49
1:A:14:LYS:HG2	1:A:14:LYS:H	1.48	0.48
1:A:30:LYS:HD2	1:A:34:GLY:O	2.13	0.48
1:A:52:PRO:HG2	2:A:185:HOH:O	2.13	0.48
1:A:80:PRO:HD3	2:A:170:HOH:O	2.14	0.48
1:A:67:ASP:O	1:A:70:SER:HB3	2.16	0.45
1:A:31:ASN:OD1	1:A:37:ASN:HB2	2.16	0.45
1:A:21:PRO:HG3	1:A:114:LEU:HD21	2.00	0.44
1:A:121:ASN:ND2	2:A:185:HOH:O	2.51	0.43
1:A:13:ARG:HE	1:A:14:LYS:HZ2	1.66	0.43
1:A:143:GLU:O	1:A:147:ARG:HG3	2.18	0.43
1:A:108:THR:HG21	2:A:224:HOH:O	2.18	0.43
1:A:21:PRO:HB2	1:A:24:PHE:CD1	2.54	0.42
1:A:113:LEU:HD23	1:A:113:LEU:HA	1.86	0.42
1:A:111:GLN:NE2	2:A:214:HOH:O	2.30	0.42
1:A:-1:LEU:HA	2:A:240:HOH:O	2.20	0.41
1:A:125:ILE:HD11	1:A:137:TYR:CE2	2.55	0.41
1:A:60:LEU:HD11	1:A:75:CYS:HB3	2.03	0.41
1:A:124:ASN:OD1	1:A:126:GLN:HB2	2.21	0.41
1:A:148:VAL:O	1:A:151:GLN:HB3	2.20	0.41
1:A:8:ARG:HD3	2:A:168:HOH:O	2.20	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	158/160 (99%)	151 (96%)	7 (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	139/139 (100%)	136 (98%)	3 (2%)	52 55

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2	SER
1	A	7	SER
1	A	60	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	121	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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

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](#)

Unable to reproduce the depositors R factor - this section is therefore empty.

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

Unable to reproduce the depositors R factor - this section is therefore empty.

6.3 Carbohydrates [i](#)

Unable to reproduce the depositors R factor - this section is therefore empty.

6.4 Ligands [i](#)

Unable to reproduce the depositors R factor - this section is therefore empty.

6.5 Other polymers [i](#)

Unable to reproduce the depositors R factor - this section is therefore empty.