



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 05:07 AM UTC

PDB ID : 3UIP / pdb_00003uiip
Title : Complex between human RanGAP1-SUMO1, UBC9 and the IR1 domain from RanBP2 containing IR2 Motif II
Authors : Gareau, J.R.; Reverter, D.; Lima, C.D.
Deposited on : 2011-11-05
Resolution : 2.29 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

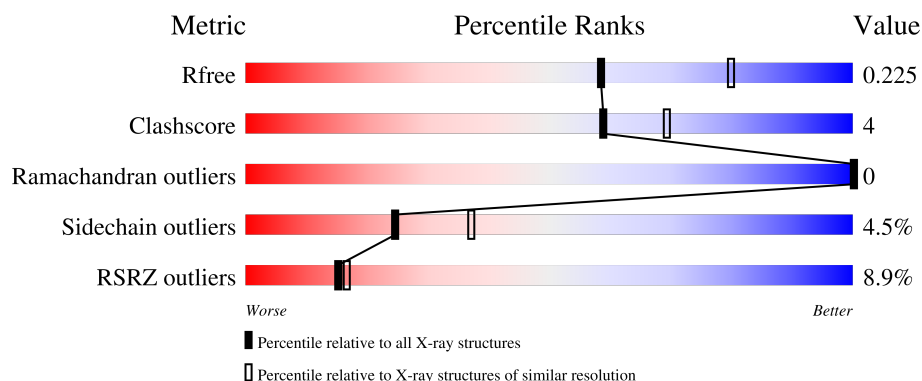
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.29 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	6319 (2.30-2.30)
Clashscore	190562	6919 (2.30-2.30)
Ramachandran outliers	187476	6854 (2.30-2.30)
Sidechain outliers	187428	6854 (2.30-2.30)
RSRZ outliers	180081	6325 (2.30-2.30)

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	158	90% 9% .
2	B	80	20% 72% 21% ...
3	C	171	5% 83% 8% . 9%
4	D	67	21% 69% 18% . 9%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 3954 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 SUMO-conjugating enzyme UBC9.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	157	Total	C	N	O	S	0	0	0
			1266	812	217	229	8			

- Molecule 2 is a protein called Small ubiquitin-related modifier 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	78	Total	C	N	O	S	0	0	0
			636	400	109	123	4			

- Molecule 3 is a protein called Ran GTPase-activating protein 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	156	Total	C	N	O	S	0	0	0
			1204	775	199	224	6			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	417	SER	-	expression tag	UNP P46060
C	418	LEU	-	expression tag	UNP P46060

- Molecule 4 is a protein called E3 SUMO-protein ligase RanBP2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	61	Total	C	N	O	S	0	0	0
			505	326	73	104	2			

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	2629	SER	-	expression tag	UNP P49792
D	2630	LEU	-	expression tag	UNP P49792

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Chain	Residue	Modelled	Actual	Comment	Reference
D	2642	VAL	ALA	engineered mutation	UNP P49792
D	2644	GLU	GLN	engineered mutation	UNP P49792
D	2647	LYS	LEU	engineered mutation	UNP P49792
D	2649	ASP	THR	engineered mutation	UNP P49792
D	2650	THR	LYS	engineered mutation	UNP P49792

- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	145	Total O 145 145	0	0
5	B	31	Total O 31 31	0	0
5	C	132	Total O 132 132	0	0
5	D	35	Total O 35 35	0	0

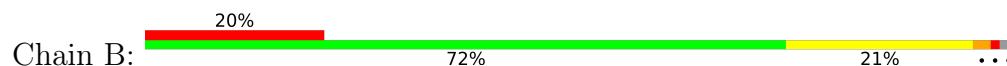
3 Residue-property plots [i](#)

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 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.

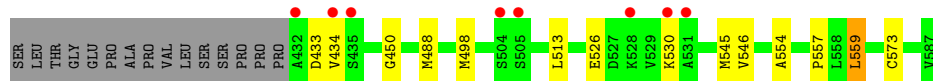
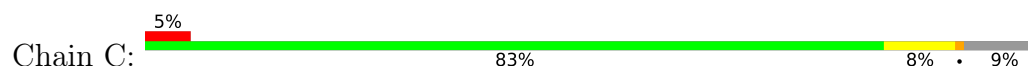
- Molecule 1: SUMO-conjugating enzyme UBC9



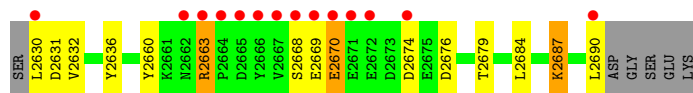
- Molecule 2: Small ubiquitin-related modifier 1



- Molecule 3: Ran GTPase-activating protein 1



- Molecule 4: E3 SUMO-protein ligase RanBP2



4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	136.65Å 199.19Å 63.41Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	33.98 – 2.29 33.98 – 2.29	Depositor EDS
% Data completeness (in resolution range)	99.2 (33.98-2.29) 97.8 (33.98-2.29)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.22 (at 2.29Å)	Xtriage
Refinement program	PHENIX 1.7.2 _869	Depositor
R, R_{free}	0.192 , 0.232 0.188 , 0.225	Depositor DCC
R_{free} test set	1949 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å ²)	29.9	Xtriage
Anisotropy	0.523	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 40.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	3954	wwPDB-VP
Average B, all atoms (Å ²)	38.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.79% 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: CME, CSD

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	0.50	0/1284	0.81	2/1739 (0.1%)
2	B	0.42	0/646	0.74	1/863 (0.1%)
3	C	0.54	0/1227	0.79	3/1661 (0.2%)
4	D	0.49	0/504	0.80	0/682
All	All	0.50	0/3661	0.79	6/4945 (0.1%)

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	42	THR	N-CA-C	5.97	119.31	110.48
3	C	450	GLY	CA-C-N	5.17	124.89	119.82
3	C	450	GLY	C-N-CA	5.17	124.89	119.82
1	A	68	TYR	CA-C-N	5.12	139.29	127.00
1	A	68	TYR	C-N-CA	5.12	139.29	127.00
3	C	573	CYS	N-CA-C	5.08	118.31	112.57

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	1266	0	1260	9	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	636	0	632	15	0
3	C	1204	0	1239	5	0
4	D	505	0	495	10	0
5	A	145	0	0	4	0
5	B	31	0	0	0	0
5	C	132	0	0	0	0
5	D	35	0	0	0	0
All	All	3954	0	3626	32	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 (32) 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:42:THR:HG21	4:D:2631:ASP:HB3	1.59	0.84
2:B:46:LYS:NZ	4:D:2631:ASP:OD2	2.24	0.71
1:A:40:ASN:OD1	1:A:61:ARG:HD2	1.96	0.66
2:B:21:TYR:OH	4:D:2630:LEU:O	2.15	0.65
3:C:498:MET:HG3	3:C:545:MET:HE2	1.78	0.64
2:B:35:HIS:HB2	4:D:2636:TYR:HB3	1.80	0.64
2:B:45:LYS:HA	2:B:48:LYS:HD3	1.82	0.62
2:B:76:THR:HG21	2:B:78:LYS:HE3	1.83	0.59
1:A:98:GLU:HB2	1:A:101:LYS:HB2	1.85	0.58
2:B:39:LYS:HE3	2:B:41:THR:HG22	1.90	0.54
1:A:48:LYS:NZ	5:A:237:HOH:O	2.41	0.53
2:B:39:LYS:O	2:B:42:THR:OG1	2.27	0.52
2:B:42:THR:HG21	4:D:2631:ASP:CB	2.39	0.48
1:A:98:GLU:HG2	5:A:295:HOH:O	2.13	0.48
4:D:2676:ASP:OD1	4:D:2679:THR:HG23	2.14	0.48
1:A:22:PHE:HZ	4:D:2687:LYS:HE3	1.79	0.48
2:B:39:LYS:HE2	2:B:42:THR:HG23	1.95	0.48
1:A:153:LYS:NZ	5:A:277:HOH:O	2.48	0.46
2:B:44:LEU:HG	2:B:77:PRO:HD3	1.98	0.46
3:C:554:ALA:O	3:C:557:PRO:HD2	2.15	0.46
2:B:30:ASP:O	2:B:31:SER:OG	2.31	0.45
3:C:433:ASP:OD1	3:C:433:ASP:N	2.51	0.43
4:D:2660:TYR:HA	4:D:2663:ARG:HD3	2.01	0.43
4:D:2669:GLU:HA	4:D:2670:GLU:CB	2.48	0.43
4:D:2668:SER:O	4:D:2670:GLU:HB2	2.19	0.42
1:A:149:ARG:HD3	5:A:320:HOH:O	2.19	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:87:TYR:CE2	3:C:526:GLU:HG3	2.55	0.41
2:B:24:LEU:HD12	2:B:38:VAL:HG11	2.02	0.41
1:A:156:ALA:HA	1:A:157:PRO:HD3	1.90	0.41
3:C:513:LEU:HD11	3:C:559:LEU:HD13	2.03	0.40
2:B:23:LYS:HA	2:B:36:PHE:O	2.21	0.40
2:B:48:LYS:HG2	2:B:64:PHE:CD1	2.57	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	153/158 (97%)	151 (99%)	2 (1%)	0	100	100
2	B	76/80 (95%)	75 (99%)	1 (1%)	0	100	100
3	C	154/171 (90%)	154 (100%)	0	0	100	100
4	D	58/67 (87%)	55 (95%)	3 (5%)	0	100	100
All	All	441/476 (93%)	435 (99%)	6 (1%)	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	134/135 (99%)	132 (98%)	2 (2%)	57	75
2	B	71/72 (99%)	67 (94%)	4 (6%)	19	28
3	C	136/149 (91%)	131 (96%)	5 (4%)	30	45
4	D	56/61 (92%)	49 (88%)	7 (12%)	4	5
All	All	397/417 (95%)	379 (96%)	18 (4%)	24	37

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	60	LEU
1	A	158	SER
2	B	39	LYS
2	B	41	THR
2	B	42	THR
2	B	85	GLU
3	C	434	VAL
3	C	488	MET
3	C	530	LYS
3	C	546	VAL
3	C	559	LEU
4	D	2632	VAL
4	D	2663	ARG
4	D	2670	GLU
4	D	2674	ASP
4	D	2684	LEU
4	D	2687	LYS
4	D	2690	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
3	C	491	GLN
3	C	582	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

3 non-standard protein/DNA/RNA residues are 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
1	CSD	A	93	1	4,7,8	2.18	1 (25%)	1,8,10	2.80	1 (100%)
1	CME	A	138	1	8,9,10	1.14	0	6,9,11	0.99	0
4	CME	D	2659	4	8,9,10	1.15	0	6,9,11	1.03	0

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
1	CSD	A	93	1	-	0/2/6/8	-
1	CME	A	138	1	-	2/5/8/10	-
4	CME	D	2659	4	-	1/5/8/10	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	93	CSD	OD1-SG	-3.81	1.44	1.47

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	93	CSD	OD1-SG-CB	-2.80	100.44	105.60

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	D	2659	CME	SD-CE-CZ-OH
1	A	138	CME	CZ-CE-SD-SG

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Mol	Chain	Res	Type	Atoms
1	A	138	CME	SD-CE-CZ-OH

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no oligosaccharides 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

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	155/158 (98%)	-0.42	2 (1%) 75 76	20, 29, 46, 69	0
2	B	78/80 (97%)	0.86	16 (20%) 2 3	25, 48, 77, 97	0
3	C	156/171 (91%)	-0.13	8 (5%) 33 35	18, 28, 52, 63	0
4	D	60/67 (89%)	0.88	14 (23%) 2 2	26, 42, 119, 129	0
All	All	449/476 (94%)	0.07	40 (8%) 15 17	18, 32, 74, 129	0

All (40) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	D	2664	PRO	5.4
4	D	2667	VAL	4.9
4	D	2630	LEU	4.3
4	D	2669	GLU	4.2
3	C	432	ALA	4.0
4	D	2674	ASP	3.8
2	B	41	THR	3.7
4	D	2665	ASP	3.6
2	B	75	HIS	3.6
2	B	20	GLU	3.5
4	D	2670	GLU	3.4
4	D	2668	SER	3.2
4	D	2690	LEU	3.2
2	B	78	LYS	3.0
2	B	45	LYS	3.0
3	C	531	ALA	2.8
1	A	2	SER	2.7
4	D	2663	ARG	2.7
3	C	528	LYS	2.6
2	B	70	ARG	2.6
2	B	43	HIS	2.6

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Mol	Chain	Res	Type	RSRZ
3	C	434	VAL	2.6
2	B	39	LYS	2.5
2	B	42	THR	2.4
4	D	2671	GLU	2.4
3	C	504	SER	2.4
2	B	44	LEU	2.4
4	D	2672	GLU	2.4
4	D	2662	ASN	2.3
1	A	158	SER	2.3
2	B	40	MET	2.3
2	B	21	TYR	2.3
4	D	2666	TYR	2.3
3	C	505	SER	2.3
2	B	69	GLN	2.3
2	B	22	ILE	2.3
2	B	80	LEU	2.2
2	B	68	GLY	2.2
3	C	435	SER	2.2
3	C	530	LYS	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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
1	CSD	A	93	8/9	0.87	0.14	21,28,52,60	0
4	CME	D	2659	10/11	0.96	0.10	38,52,56,60	0
1	CME	A	138	10/11	0.98	0.06	21,29,37,50	0

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.