WORLDWIDE PDB PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report (i)

Jan 16, 2024 – 03:51 am GMT

PDB ID	:	6SQS
Title	:	Crystal structure of cat phospho-Ser429 MDM2 RING domain bound to UbcH5B-Ub
Authors	:	Magnussen, H.M.; Ahmed, S.F.; Huang, D.T.
Deposited on	:	2019-09-04
Resolution	:	1.83 Å(reported)

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

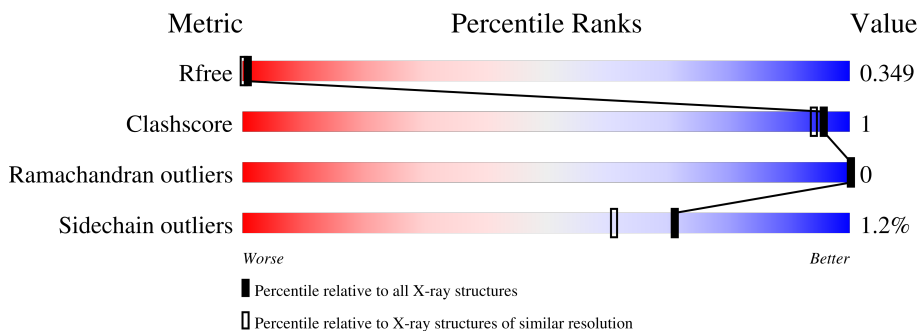|		
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

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 1.83 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	Percentile Ranks	Value
Rfree		0.349
Clashscore		1
Ramachandran outliers		0
Sidechain outliers		1.2%

Worse ———————— *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	130704	4003 (1.86-1.82)
Clashscore	141614	4233 (1.86-1.82)
Ramachandran outliers	138981	4185 (1.86-1.82)
Sidechain outliers	138945	4186 (1.86-1.82)

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 <=5%

Mol	Chain	Length	Quality of chain
1	A	64	92% ⋯ 8%
1	D	64	94% ⋯ 6%
2	B	146	97% ⋯ •
2	E	146	99% ⋯ •
3	C	77	96% ⋯ •
3	F	77	99% ⋯ •

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 4711 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 E3 ubiquitin-protein ligase Mdm2.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	64	Total	C	N	O	P	S	0	0	0
			495	313	90	82	1	9			
1	D	64	Total	C	N	O	P	S	0	0	0
			503	319	92	82	1	9			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	443	THR	GLY	engineered mutation	UNP Q7YRZ8
D	443	THR	GLY	engineered mutation	UNP Q7YRZ8

- Molecule 2 is a protein called Ubiquitin-conjugating enzyme E2 D2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	146	Total	C	N	O	S	0	2	0
			1175	755	201	213	6			
2	E	146	Total	C	N	O	S	0	0	0
			1166	749	202	209	6			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	22	ARG	SER	engineered mutation	UNP P62837
B	85	LYS	CYS	engineered mutation	UNP P62837
E	22	ARG	SER	engineered mutation	UNP P62837
E	85	LYS	CYS	engineered mutation	UNP P62837

- Molecule 3 is a protein called Ubiquitin-40S ribosomal protein S27a.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	77	Total	C	N	O	S	0	0	0
			593	372	101	119	1			

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	F	77	Total	C	N	O	S	0	0	0
			595	373	103	118	1			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	0	SER	-	expression tag	UNP J3QTR3
F	0	SER	-	expression tag	UNP J3QTR3

- Molecule 4 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	2	Total	Zn	0	0
			2	2		
4	D	2	Total	Zn	0	0
			2	2		

- Molecule 5 is water.

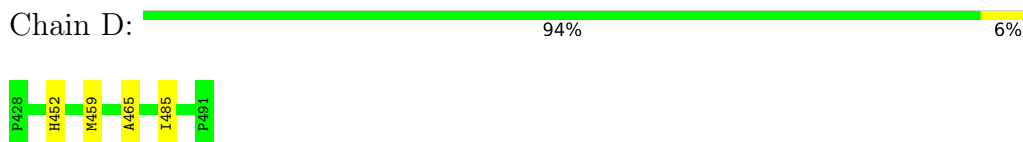| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	21	Total	O	0	0
			21	21		
5	B	46	Total	O	0	0
			46	46		
5	C	22	Total	O	0	0
			22	22		
5	D	30	Total	O	0	0
			30	30		
5	E	34	Total	O	0	0
			34	34		
5	F	27	Total	O	0	0
			27	27		

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.
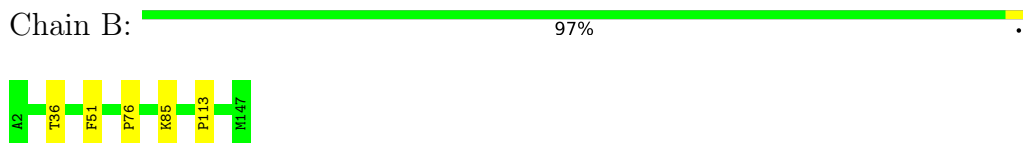
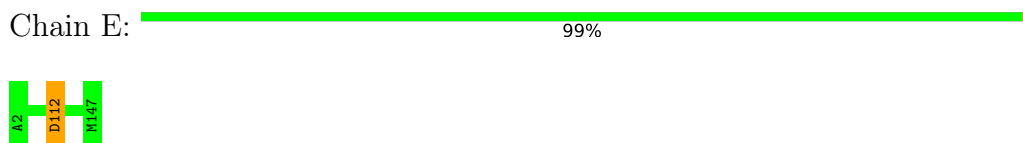- Molecule 1: E3 ubiquitin-protein ligase Mdm2
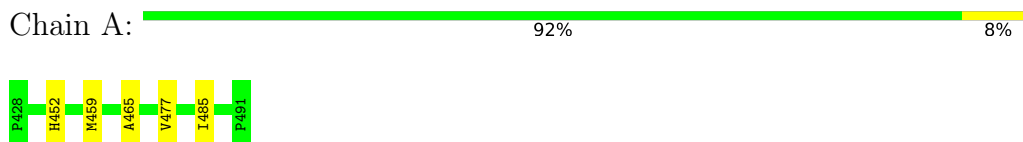
Chain A:

92%   8%

P428 H452 M459 A465 V477 I485 P491

- Molecule 1: E3 ubiquitin-protein ligase Mdm2

Chain D:

94%   6%

P428 H452 M459 A465 I485 P491

- Molecule 2: Ubiquitin-conjugating enzyme E2 D2

Chain B:

97%   •

A2 T36 F51 P76 K85 P113 M147

- Molecule 2: Ubiquitin-conjugating enzyme E2 D2

Chain E:

99%   •

A2 D112 M147

- Molecule 3: Ubiquitin-40S ribosomal protein S27a

Chain C:

96%   •

S0 T14 K33 I36 G76

- Molecule 3: Ubiquitin-40S ribosomal protein S27a

Chain F:

99%   •
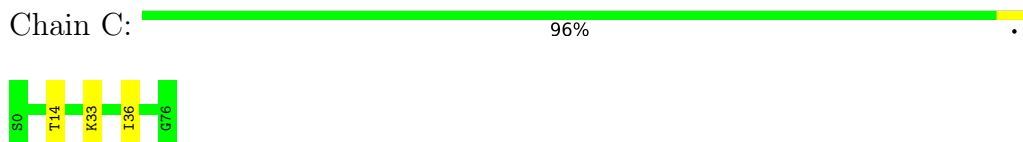
4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	54.59Å 56.44Å 60.74Å 66.44° 69.44° 89.10°	Depositor
Resolution (Å)	29.20 – 1.83 29.20 – 1.83	Depositor EDS
% Data completeness (in resolution range)	95.8 (29.20-1.83) 95.8 (29.20-1.83)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.38 (at 1.83Å)	Xtriage
Refinement program	REFMAC 5.8.0253	Depositor
R, R_{free}	0.211 , 0.242 0.322 , 0.349	Depositor DCC
R_{free} test set	2806 reflections (5.41%)	wwPDB-VP
Wilson B-factor (Å^2)	32.4	Xtriage
Anisotropy	0.199	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 32.6	EDS
L-test for twinning[2]	$< |L| > = 0.54, < L^2 > = 0.38$	Xtriage
Estimated twinning fraction	0.000 for -k,-h,-l	Xtriage
F_o,F_c correlation	0.91	EDS
Total number of atoms	4711	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 8.73% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: SEP, ZN

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	0.60	0/498	0.73	0/672
1	D	0.59	0/506	0.74	0/680
2	B	0.61	0/1211	0.73	0/1651
2	E	0.62	0/1202	0.74	0/1639
3	C	0.64	0/599	0.76	0/809
3	F	0.66	0/601	0.74	0/811
All	All	0.62	0/4617	0.74	0/6262

There are no bond length outliers.

There are no bond angle outliers.

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	495	0	495	4	0
1	D	503	0	517	1	0
2	B	1175	0	1150	2	0
2	E	1166	0	1144	1	0
3	C	593	0	601	4	0
3	F	595	0	606	1	0
4	A	2	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	D	2	0	0	0	0
5	A	21	0	0	0	0
5	B	46	0	0	0	0
5	C	22	0	0	0	0
5	D	30	0	0	0	0
5	E	34	0	0	0	0
5	F	27	0	0	0	0
All	All	4711	0	4513	10	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 1.

All (10) 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:477:VAL:HG12	3:C:36:ILE:CD1	2.37	0.55
1:A:477:VAL:CG1	3:C:36:ILE:HD11	2.40	0.51
1:A:477:VAL:CG1	3:C:36:ILE:CD1	2.90	0.50
3:C:14:THR:O	3:C:33:LYS:HE3	2.17	0.43
2:B:36:THR:CG2	2:B:51:PHE:CE1	3.02	0.43
2:E:112:ASP:CG	2:E:112:ASP:O	2.57	0.42
1:A:465:ALA:HB1	1:A:485:ILE:HD12	2.02	0.41
1:D:465:ALA:HB1	1:D:485:ILE:HD12	2.01	0.41
2:B:76:PRO:HG2	2:B:113:PRO:HB3	2.03	0.40
3:F:73:LEU:C	3:F:73:LEU:HD12	2.42	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	61/64 (95%)	57 (93%)	4 (7%)	0	100	100
1	D	61/64 (95%)	54 (88%)	7 (12%)	0	100	100
2	B	146/146 (100%)	142 (97%)	4 (3%)	0	100	100
2	E	144/146 (99%)	141 (98%)	3 (2%)	0	100	100
3	C	75/77 (97%)	73 (97%)	2 (3%)	0	100	100
3	F	75/77 (97%)	73 (97%)	2 (3%)	0	100	100
All	All	562/574 (98%)	540 (96%)	22 (4%)	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	55/57 (96%)	53 (96%)	2 (4%)	35	17
1	D	57/57 (100%)	55 (96%)	2 (4%)	36	18
2	B	129/130 (99%)	128 (99%)	1 (1%)	81	75
2	E	127/130 (98%)	126 (99%)	1 (1%)	81	75
3	C	66/69 (96%)	66 (100%)	0	100	100
3	F	66/69 (96%)	66 (100%)	0	100	100
All	All	500/512 (98%)	494 (99%)	6 (1%)	71	61

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	452	HIS
1	A	459	MET
2	B	85	LYS
1	D	452	HIS
1	D	459	MET
2	E	112	ASP

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

Mol	Chain	Res	Type
3	F	49	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

2 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	SEP	D	429	1	8,9,10	0.64	0	8,12,14	0.71	0
1	SEP	A	429	1	8,9,10	0.58	0	8,12,14	0.92	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	SEP	D	429	1	-	3/5/8/10	-
1	SEP	A	429	1	-	0/5/8/10	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	D	429	SEP	CB-OG-P-O3P
1	D	429	SEP	CA-CB-OG-P
1	D	429	SEP	N-CA-CB-OG

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 4 ligands modelled in this entry, 4 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

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 ⓘ

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 ⓘ

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

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

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

6.3 Carbohydrates ⓘ

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

6.4 Ligands ⓘ

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

6.5 Other polymers ⓘ

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