



wwPDB X-ray Structure Validation Summary Report

May 21, 2020 – 06:35 pm BST


PDB ID : 3D5N
Title : Crystal structure of the Q97W15_SULSO protein from Sulfolobus solfataricus. NESG target SsR125.
Authors : Vorobiev, S.M.; Chen, Y.; Seetharaman, J.; Lee, D.; Foote, R.E.; Maglaqui, M.; Janjua, H.; Xiao, R.; Acton, T.B.; Montelione, G.T.; Tong, L.; Hunt, J.F.; Northeast Structural Genomics Consortium (NESG)
Deposited on : 2008-05-16
Resolution : 2.80 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 following versions of software and data (see [references](#) ) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.11
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) : 2.11

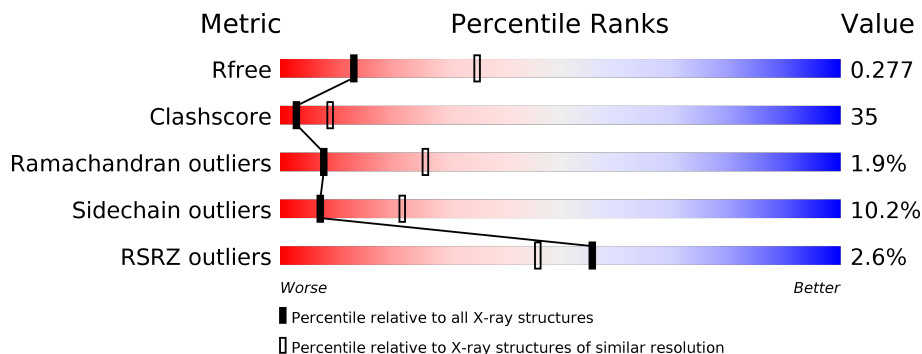
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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.



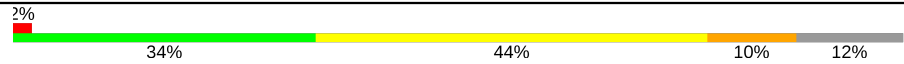

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	3140 (2.80-2.80)
Clashscore	141614	3569 (2.80-2.80)
Ramachandran outliers	138981	3498 (2.80-2.80)
Sidechain outliers	138945	3500 (2.80-2.80)
RSRZ outliers	127900	3078 (2.80-2.80)

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 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	197	<div style="display: flex; align-items: center;"> <div style="width: 3%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 44%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 39%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 8%; height: 10px; background-color: orange; margin-right: 5px;"></div> <div style="width: 10%; height: 10px; background-color: grey;"></div> </div> <p style="font-size: small; margin-top: 5px;">3% 44% 39% 8% 10%</p>
1	B	197	<div style="display: flex; align-items: center;"> <div style="width: 3%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 47%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 31%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 6%; height: 10px; background-color: orange; margin-right: 5px;"></div> <div style="width: 15%; height: 10px; background-color: grey;"></div> </div> <p style="font-size: small; margin-top: 5px;">3% 47% 31% 6% • 15%</p>
1	D	197	<div style="display: flex; align-items: center;"> <div style="width: 2%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 44%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 40%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 6%; height: 10px; background-color: orange; margin-right: 5px;"></div> <div style="width: 10%; height: 10px; background-color: grey;"></div> </div> <p style="font-size: small; margin-top: 5px;">2% 44% 40% 6% 10%</p>
1	E	197	<div style="display: flex; align-items: center;"> <div style="width: 2%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 38%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 41%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 8%; height: 10px; background-color: orange; margin-right: 5px;"></div> <div style="width: 13%; height: 10px; background-color: grey;"></div> </div> <p style="font-size: small; margin-top: 5px;">2% 38% 41% 8% • 13%</p>
1	F	197	<div style="display: flex; align-items: center;"> <div style="width: 2%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 44%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 40%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 13%; height: 10px; background-color: grey;"></div> </div> <p style="font-size: small; margin-top: 5px;">2% 44% 40% • 13%</p>
1	G	197	<div style="display: flex; align-items: center;"> <div style="width: 2%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 36%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 45%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 16%; height: 10px; background-color: grey;"></div> </div> <p style="font-size: small; margin-top: 5px;">2% 36% 45% • 16%</p>

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Mol	Chain	Length	Quality of chain
1	H	197	 <p>2% 34% 44% 10% 12%</p>
1	I	197	 <p>4% 42% 38% 8% 13%</p>

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 10496 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 Q97W15_SULSO.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	S	Se			
1	A	178	Total 1356	C 882	N 223	O 243	S 3	Se 5	0	0	0
1	B	167	Total 1268	C 831	N 201	O 229	S 3	Se 4	0	0	0
1	D	178	Total 1373	C 894	N 226	O 245	S 3	Se 5	0	0	0
1	E	172	Total 1300	C 848	N 208	O 236	S 3	Se 5	0	0	0
1	F	172	Total 1292	C 847	N 214	O 223	S 3	Se 5	0	0	0
1	G	166	Total 1269	C 829	N 207	O 225	S 3	Se 5	0	0	0
1	H	173	Total 1315	C 855	N 212	O 241	S 3	Se 4	0	0	0
1	I	171	Total 1290	C 842	N 206	O 235	S 3	Se 4	0	0	0

There are 64 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	190	LEU	-	expression tag	UNP Q97W15
A	191	GLU	-	expression tag	UNP Q97W15
A	192	HIS	-	expression tag	UNP Q97W15
A	193	HIS	-	expression tag	UNP Q97W15
A	194	HIS	-	expression tag	UNP Q97W15
A	195	HIS	-	expression tag	UNP Q97W15
A	196	HIS	-	expression tag	UNP Q97W15
A	197	HIS	-	expression tag	UNP Q97W15
B	190	LEU	-	expression tag	UNP Q97W15
B	191	GLU	-	expression tag	UNP Q97W15
B	192	HIS	-	expression tag	UNP Q97W15
B	193	HIS	-	expression tag	UNP Q97W15
B	194	HIS	-	expression tag	UNP Q97W15

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Chain	Residue	Modelled	Actual	Comment	Reference
B	195	HIS	-	expression tag	UNP Q97W15
B	196	HIS	-	expression tag	UNP Q97W15
B	197	HIS	-	expression tag	UNP Q97W15
D	190	LEU	-	expression tag	UNP Q97W15
D	191	GLU	-	expression tag	UNP Q97W15
D	192	HIS	-	expression tag	UNP Q97W15
D	193	HIS	-	expression tag	UNP Q97W15
D	194	HIS	-	expression tag	UNP Q97W15
D	195	HIS	-	expression tag	UNP Q97W15
D	196	HIS	-	expression tag	UNP Q97W15
D	197	HIS	-	expression tag	UNP Q97W15
E	190	LEU	-	expression tag	UNP Q97W15
E	191	GLU	-	expression tag	UNP Q97W15
E	192	HIS	-	expression tag	UNP Q97W15
E	193	HIS	-	expression tag	UNP Q97W15
E	194	HIS	-	expression tag	UNP Q97W15
E	195	HIS	-	expression tag	UNP Q97W15
E	196	HIS	-	expression tag	UNP Q97W15
E	197	HIS	-	expression tag	UNP Q97W15
F	190	LEU	-	expression tag	UNP Q97W15
F	191	GLU	-	expression tag	UNP Q97W15
F	192	HIS	-	expression tag	UNP Q97W15
F	193	HIS	-	expression tag	UNP Q97W15
F	194	HIS	-	expression tag	UNP Q97W15
F	195	HIS	-	expression tag	UNP Q97W15
F	196	HIS	-	expression tag	UNP Q97W15
F	197	HIS	-	expression tag	UNP Q97W15
G	190	LEU	-	expression tag	UNP Q97W15
G	191	GLU	-	expression tag	UNP Q97W15
G	192	HIS	-	expression tag	UNP Q97W15
G	193	HIS	-	expression tag	UNP Q97W15
G	194	HIS	-	expression tag	UNP Q97W15
G	195	HIS	-	expression tag	UNP Q97W15
G	196	HIS	-	expression tag	UNP Q97W15
G	197	HIS	-	expression tag	UNP Q97W15
H	190	LEU	-	expression tag	UNP Q97W15
H	191	GLU	-	expression tag	UNP Q97W15
H	192	HIS	-	expression tag	UNP Q97W15
H	193	HIS	-	expression tag	UNP Q97W15
H	194	HIS	-	expression tag	UNP Q97W15
H	195	HIS	-	expression tag	UNP Q97W15
H	196	HIS	-	expression tag	UNP Q97W15

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Chain	Residue	Modelled	Actual	Comment	Reference
H	197	HIS	-	expression tag	UNP Q97W15
I	190	LEU	-	expression tag	UNP Q97W15
I	191	GLU	-	expression tag	UNP Q97W15
I	192	HIS	-	expression tag	UNP Q97W15
I	193	HIS	-	expression tag	UNP Q97W15
I	194	HIS	-	expression tag	UNP Q97W15
I	195	HIS	-	expression tag	UNP Q97W15
I	196	HIS	-	expression tag	UNP Q97W15
I	197	HIS	-	expression tag	UNP Q97W15

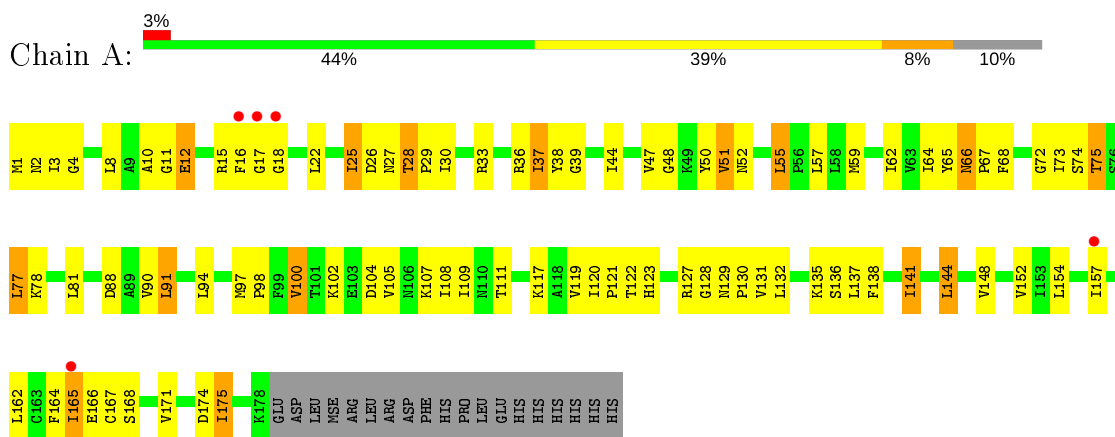
- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	3	Total O 3 3	0	0
2	B	4	Total O 4 4	0	0
2	D	6	Total O 6 6	0	0
2	E	4	Total O 4 4	0	0
2	F	4	Total O 4 4	0	0
2	G	2	Total O 2 2	0	0
2	H	5	Total O 5 5	0	0
2	I	5	Total O 5 5	0	0

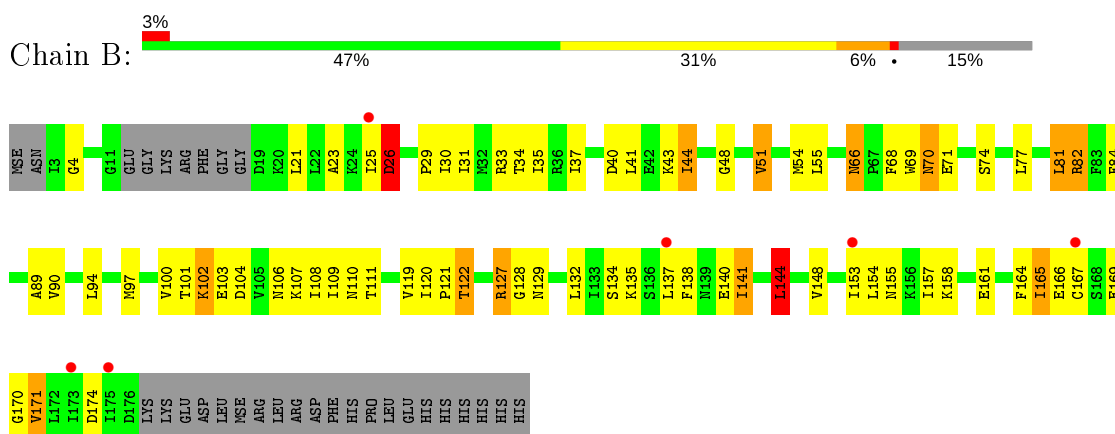
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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.

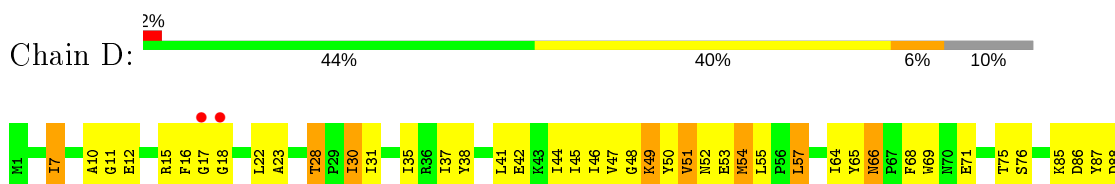
- Molecule 1: Q97W15_SULSO

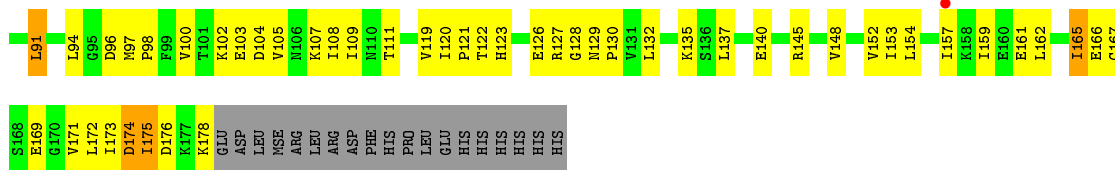


- Molecule 1: Q97W15_SULSO

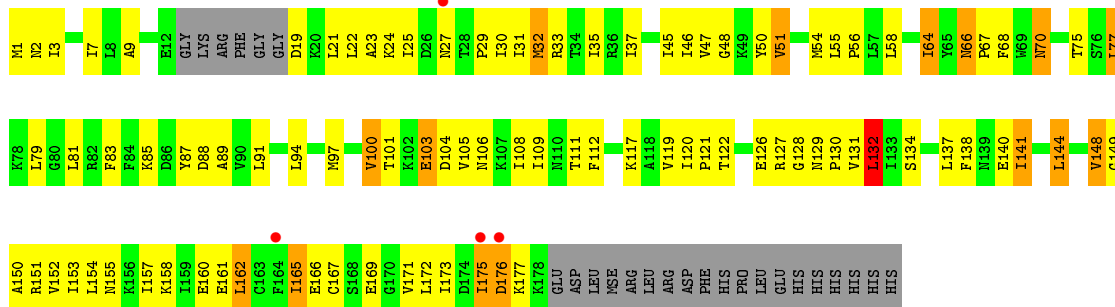


- Molecule 1: Q97W15_SULSO

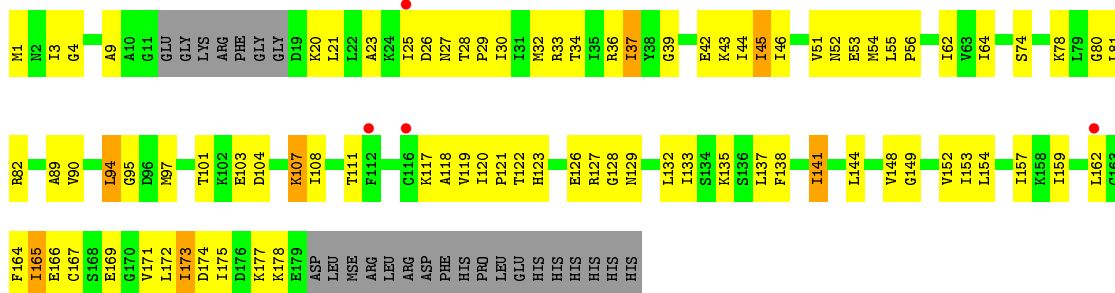
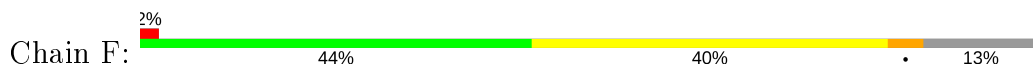




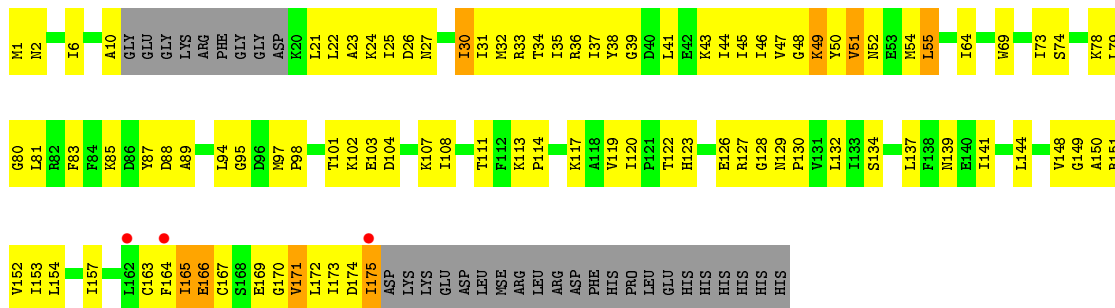
• Molecule 1: Q97W15_SULSO



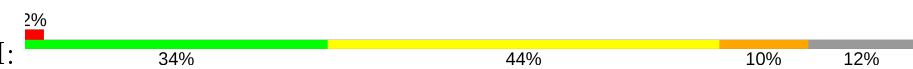
• Molecule 1: Q97W15_SULSO

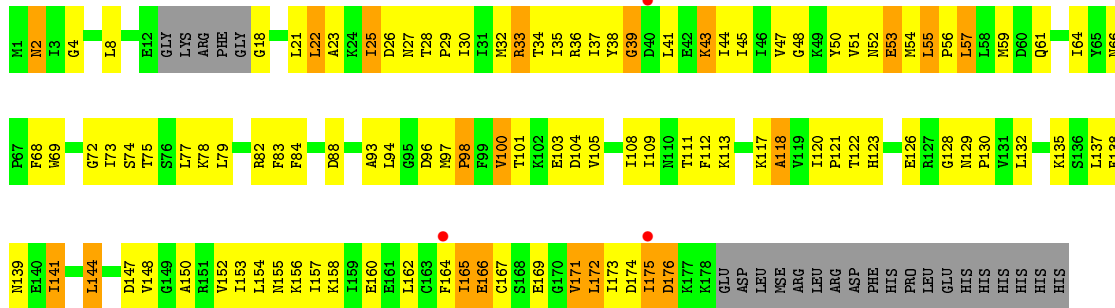


• Molecule 1: Q97W15_SULSO



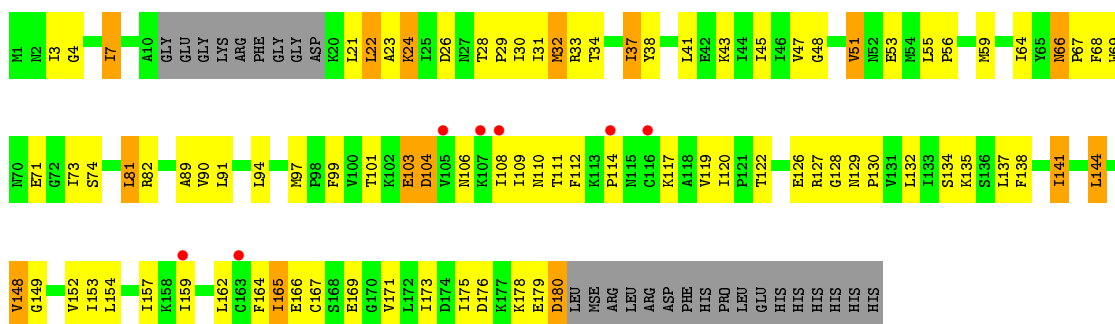
• Molecule 1: Q97W15_SULSO

Chain H: 



• Molecule 1: Q97W15_SULSO

Chain I: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	88.96Å 169.23Å 173.39Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.47 – 2.80 48.47 – 2.77	Depositor EDS
% Data completeness (in resolution range)	86.2 (48.47-2.80) 96.7 (48.47-2.77)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.93 (at 2.77Å)	Xtrriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.231 , 0.266 0.244 , 0.277	Depositor DCC
R_{free} test set	6108 reflections (4.84%)	wwPDB-VP
Wilson B-factor (Å ²)	74.0	Xtrriage
Anisotropy	0.088	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 71.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	0.034 for -h,l,k	Xtrriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	10496	wwPDB-VP
Average B, all atoms (Å ²)	71.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.00% 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](#)

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	0.41	0/1373	0.70	0/1852
1	B	0.41	0/1283	0.71	1/1734 (0.1%)
1	D	0.40	0/1390	0.69	0/1870
1	E	0.45	0/1315	0.70	1/1778 (0.1%)
1	F	0.41	0/1307	0.68	0/1765
1	G	0.41	0/1284	0.71	0/1736
1	H	0.48	0/1330	0.70	0/1797
1	I	0.38	0/1305	0.68	0/1767
All	All	0.42	0/10587	0.70	2/14299 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	132	LEU	CA-CB-CG	5.60	128.19	115.30
1	B	144	LEU	CA-CB-CG	5.57	128.11	115.30

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	1356	0	1391	78	0
1	B	1268	0	1300	76	0
1	D	1373	0	1430	91	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	E	1300	0	1324	105	0
1	F	1292	0	1335	96	0
1	G	1269	0	1309	98	0
1	H	1315	0	1339	122	0
1	I	1290	0	1305	110	0
2	A	3	0	0	0	0
2	B	4	0	0	1	0
2	D	6	0	0	0	0
2	E	4	0	0	0	0
2	F	4	0	0	0	0
2	G	2	0	0	0	0
2	H	5	0	0	0	0
2	I	5	0	0	0	0
All	All	10496	0	10733	740	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 35.

The worst 5 of 740 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:G:111:THR:HG21	1:G:165:ILE:HG21	1.20	1.10
1:A:18:GLY:HA3	1:A:50:TYR:HB2	1.31	1.09
1:H:66:ASN:HD21	1:H:75:THR:HG23	1.17	1.09
1:E:68:PHE:HB2	1:E:75:THR:HG21	1.34	1.08
1:G:81:LEU:HD22	1:G:141:ILE:HD11	1.37	1.06

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	176/197 (89%)	155 (88%)	18 (10%)	3 (2%)	9	29
1	B	163/197 (83%)	141 (86%)	19 (12%)	3 (2%)	8	28
1	D	176/197 (89%)	157 (89%)	18 (10%)	1 (1%)	25	56
1	E	168/197 (85%)	150 (89%)	14 (8%)	4 (2%)	6	20
1	F	168/197 (85%)	152 (90%)	16 (10%)	0	100	100
1	G	162/197 (82%)	142 (88%)	15 (9%)	5 (3%)	4	14
1	H	169/197 (86%)	149 (88%)	14 (8%)	6 (4%)	3	11
1	I	167/197 (85%)	147 (88%)	17 (10%)	3 (2%)	8	28
All	All	1349/1576 (86%)	1193 (88%)	131 (10%)	25 (2%)	8	26

5 of 25 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	G	85	LYS
1	B	171	VAL
1	D	159	ILE
1	G	49	LYS
1	H	155	ASN

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	144/169 (85%)	128 (89%)	16 (11%)	6	19
1	B	136/169 (80%)	120 (88%)	16 (12%)	5	16
1	D	148/169 (88%)	132 (89%)	16 (11%)	6	19
1	E	139/169 (82%)	123 (88%)	16 (12%)	5	17
1	F	135/169 (80%)	125 (93%)	10 (7%)	13	37
1	G	137/169 (81%)	128 (93%)	9 (7%)	16	44
1	H	141/169 (83%)	125 (89%)	16 (11%)	6	18
1	I	137/169 (81%)	122 (89%)	15 (11%)	6	19

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	1117/1352 (83%)	1003 (90%)	114 (10%)	7 22

5 of 114 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	66	ASN
1	E	176	ASP
1	I	66	ASN
1	E	77	LEU
1	E	132	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 24 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	66	ASN
1	E	2	ASN
1	H	110	ASN
1	D	106	ASN
1	D	155	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 carbohydrates 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](#)

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	173/197 (87%)	0.19	5 (2%) 51 41	42, 66, 92, 98	0
1	B	163/197 (82%)	0.35	6 (3%) 41 31	39, 70, 99, 100	0
1	D	173/197 (87%)	0.26	3 (1%) 70 63	45, 69, 94, 100	0
1	E	167/197 (84%)	0.28	4 (2%) 59 49	28, 69, 89, 93	0
1	F	167/197 (84%)	0.26	4 (2%) 59 49	34, 74, 99, 100	0
1	G	161/197 (81%)	0.22	3 (1%) 66 59	45, 70, 90, 96	0
1	H	168/197 (85%)	0.21	3 (1%) 68 61	33, 68, 93, 95	0
1	I	166/197 (84%)	0.39	7 (4%) 36 26	44, 77, 100, 100	0
All	All	1338/1576 (84%)	0.27	35 (2%) 56 46	28, 70, 96, 100	0

The worst 5 of 35 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	175	ILE	5.2
1	A	18	GLY	4.7
1	A	17	GLY	4.6
1	I	108	ILE	4.1
1	H	175	ILE	3.6

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

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no carbohydrates 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.