wwPDB X-ray Structure Validation Summary Report (i)

Feb 1, 2016 – 11:45 AM GMT

PDB ID	:	3PS0
Title	:	The structure of the CRISPR-associated protein, csa2, from Sulfolobus solfataricus
Authors	:	Lintner, N.G.; Sdano, M.; Young, M.J.; Lawrence, C.M.
Deposited on	:	2010-11-30
Resolution	:	2.00 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
http://wwpdb.org/validation/2016/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The following versions of software and data (see references (1)) were used in the production of this report:

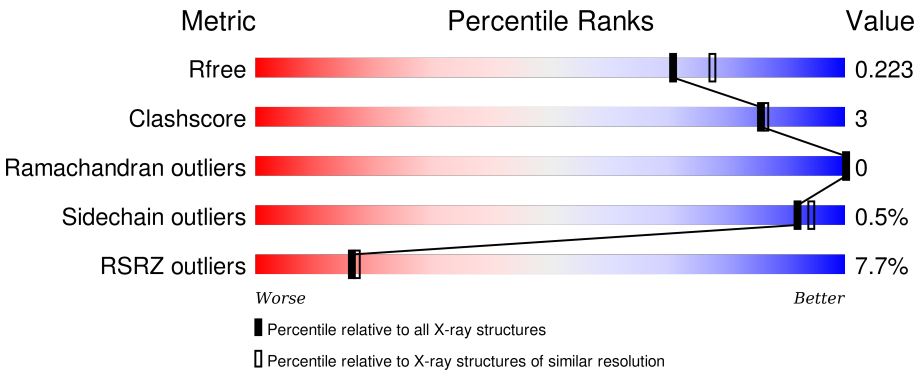
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	1.9-1692
EDS	:	rb-20026688
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	trunk26865

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 2.00 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))
R_{free}	91344	6249 (2.00-2.00)
Clashscore	102246	7340 (2.00-2.00)
Ramachandran outliers	100387	7248 (2.00-2.00)
Sidechain outliers	100360	7247 (2.00-2.00)
RSRZ outliers	91569	6262 (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 on the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria. 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% 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	328	6%, 83%, 6%, 11%
1	B	328	12%, 74%, 9%, 17%
1	C	328	3%, 84%, 5%, 11%
1	D	328	6%, 79%, •, 17%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 9340 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 CRISPR-Associated protein, CSA2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	293	2290	1471	381	430	8	0	1	0
1	B	272	2108	1349	354	397	8	0	0	0
1	C	292	2287	1465	381	433	8	0	2	0
1	D	272	2110	1351	352	399	8	0	0	0

There are 28 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-6	MET	-	EXPRESSION TAG	UNP Q97Y91
A	-5	HIS	-	EXPRESSION TAG	UNP Q97Y91
A	-4	HIS	-	EXPRESSION TAG	UNP Q97Y91
A	-3	HIS	-	EXPRESSION TAG	UNP Q97Y91
A	-2	HIS	-	EXPRESSION TAG	UNP Q97Y91
A	-1	HIS	-	EXPRESSION TAG	UNP Q97Y91
A	0	HIS	-	EXPRESSION TAG	UNP Q97Y91
B	-6	MET	-	EXPRESSION TAG	UNP Q97Y91
B	-5	HIS	-	EXPRESSION TAG	UNP Q97Y91
B	-4	HIS	-	EXPRESSION TAG	UNP Q97Y91
B	-3	HIS	-	EXPRESSION TAG	UNP Q97Y91
B	-2	HIS	-	EXPRESSION TAG	UNP Q97Y91
B	-1	HIS	-	EXPRESSION TAG	UNP Q97Y91
B	0	HIS	-	EXPRESSION TAG	UNP Q97Y91
C	-6	MET	-	EXPRESSION TAG	UNP Q97Y91
C	-5	HIS	-	EXPRESSION TAG	UNP Q97Y91
C	-4	HIS	-	EXPRESSION TAG	UNP Q97Y91
C	-3	HIS	-	EXPRESSION TAG	UNP Q97Y91
C	-2	HIS	-	EXPRESSION TAG	UNP Q97Y91
C	-1	HIS	-	EXPRESSION TAG	UNP Q97Y91
C	0	HIS	-	EXPRESSION TAG	UNP Q97Y91

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Chain	Residue	Modelled	Actual	Comment	Reference
D	-6	MET	-	EXPRESSION TAG	UNP Q97Y91
D	-5	HIS	-	EXPRESSION TAG	UNP Q97Y91
D	-4	HIS	-	EXPRESSION TAG	UNP Q97Y91
D	-3	HIS	-	EXPRESSION TAG	UNP Q97Y91
D	-2	HIS	-	EXPRESSION TAG	UNP Q97Y91
D	-1	HIS	-	EXPRESSION TAG	UNP Q97Y91
D	0	HIS	-	EXPRESSION TAG	UNP Q97Y91

- Molecule 2 is water.

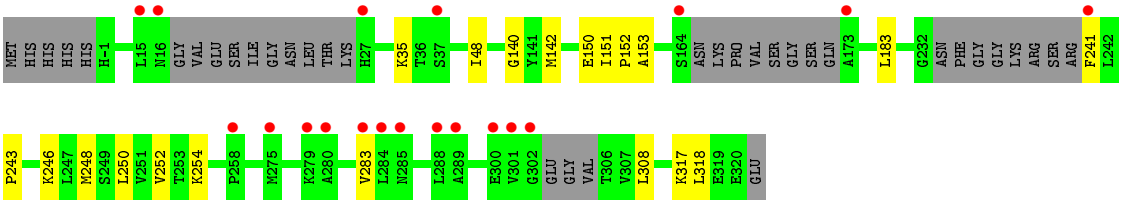
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	126	126	126	0	0
			Total	O		
2	B	60	60	60	0	0
			Total	O		
2	C	181	181	181	0	0
			Total	O		
2	D	178	178	178	0	0

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 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.

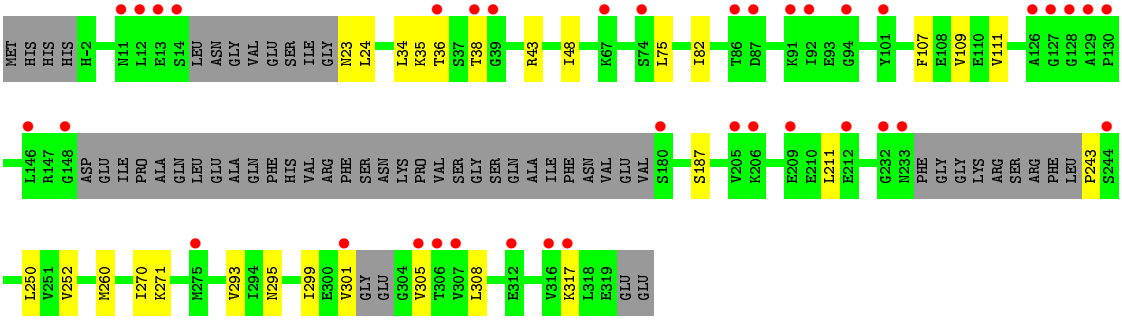
- Molecule 1: CRISPR-Associated protein, CSA2

Chain A:



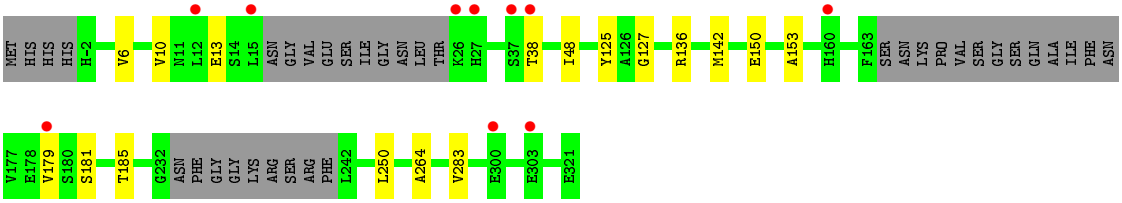
- Molecule 1: CRISPR-Associated protein, CSA2

Chain B:



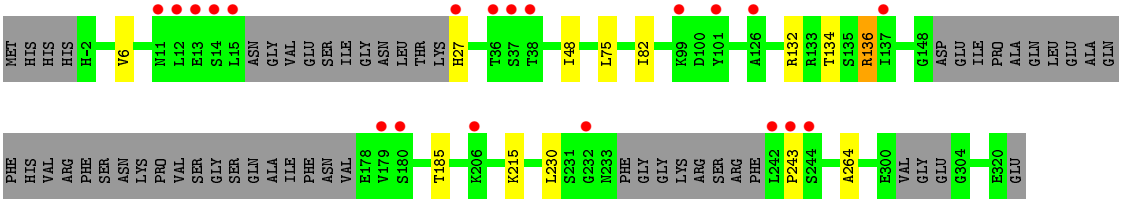
- Molecule 1: CRISPR-Associated protein, CSA2

Chain C:



- Molecule 1: CRISPR-Associated protein, CSA2

Chain D:


MET
HIS
HIS
HIS
H-2
V6
N11
L12
E13
S14
L15
ASN
GLY
VAL
GLU
SER
ILE
GLY
ASN
LEU
THR
LYS
H27
T36
S37
T38
I48
L75
I82
K99
D100
Y101
A126
R132
R133
T134
S135
R136
I137
G148
ASP
GLU
ILE
PRO
ALA
GLN
LEU
GLU
ALA
GLN
PHE
HIS
VAL
ARG
PHE
SER
ASN
LYS
PRO
VAL
SER
GLY
SER
GLN
ALA
ILE
PHE
ASN
VAL
E178
V179
S180
T185
K206
K215
L230
S231
G232
N233
PHE
GLY
GLY
LYS
ARG
SER
ARG
PHE
L242
P243
S244
A264
E300
VAL
GLY
GLU
G304
E320
GLU

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	74.64Å 120.88Å 158.06Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	33.75 – 2.00 33.75 – 2.00	Depositor EDS
% Data completeness (in resolution range)	98.7 (33.75-2.00) 98.7 (33.75-2.00)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.18 (at 2.00Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.183 , 0.221 0.190 , 0.223	Depositor DCC
R_{free} test set	4790 reflections (5.25%)	DCC
Wilson B-factor (Å^2)	33.5	Xtriage
Anisotropy	0.092	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 57.6	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.34$	Xtriage
Outliers	2 of 95952 reflections (0.002%)	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	9340	wwPDB-VP
Average B, all atoms (Å^2)	45.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.06% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.375 respectively for untwinned datasets, and 0.333, 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	0.34	0/2332	0.51	0/3143
1	B	0.31	0/2141	0.48	0/2882
1	C	0.35	0/2332	0.51	0/3142
1	D	0.35	0/2143	0.54	2/2886 (0.1%)
All	All	0.34	0/8948	0.51	2/12053 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	D	136	ARG	NE-CZ-NH1	5.63	123.11	120.30
1	D	136	ARG	NE-CZ-NH2	-5.13	117.74	120.30

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	2290	0	2336	14	0
1	B	2108	0	2168	22	0
1	C	2287	0	2334	9	0
1	D	2110	0	2164	9	0
2	A	126	0	0	0	0
2	B	60	0	0	1	0
2	C	181	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	D	178	0	0	3	0
All	All	9340	0	9002	50	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 3.

The worst 5 of 50 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:B:34:LEU:HD11	1:B:43:ARG:HD2	1.78	0.64
1:B:270:ILE:HG22	1:B:301:VAL:HG11	1.80	0.64
1:D:136:ARG:NH2	2:D:460:HOH:O	2.35	0.59
1:D:215:LYS:HE3	2:D:463:HOH:O	2.01	0.58
1:B:295:ASN:ND2	1:B:299:ILE:HG22	2.17	0.58

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	284/328 (87%)	277 (98%)	7 (2%)	0	100	100
1	B	262/328 (80%)	253 (97%)	9 (3%)	0	100	100
1	C	286/328 (87%)	280 (98%)	6 (2%)	0	100	100
1	D	262/328 (80%)	256 (98%)	6 (2%)	0	100	100
All	All	1094/1312 (83%)	1066 (97%)	28 (3%)	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	250/278 (90%)	249 (100%)	1 (0%)	93 95
1	B	231/278 (83%)	231 (100%)	0	100 100
1	C	250/278 (90%)	247 (99%)	3 (1%)	78 81
1	D	231/278 (83%)	230 (100%)	1 (0%)	93 95
All	All	962/1112 (86%)	957 (100%)	5 (0%)	92 94

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	241	PHE
1	C	13	GLU
1	C	38	THR
1	C	136	ARG
1	D	27	HIS

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

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	293/328 (89%)	0.28	19 (6%)	22	23	24, 42, 71, 88	0
1	B	272/328 (82%)	0.68	38 (13%)	4	4	35, 57, 88, 104	0
1	C	292/328 (89%)	0.16	10 (3%)	49	50	21, 35, 64, 90	0
1	D	272/328 (82%)	0.21	20 (7%)	17	18	21, 35, 64, 85	0
All	All	1129/1312 (86%)	0.33	87 (7%)	16	17	21, 42, 76, 104	0

The worst 5 of 87 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	284	LEU	9.7
1	B	101	TYR	9.0
1	A	283	VAL	6.8
1	B	126	ALA	6.3
1	D	13	GLU	5.9

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.