wwPDB X-ray Structure Validation Summary Report (i)

May 16, 2020 – 09:49 am BST

PDB ID	:	5C0V
Title	:	Structure of the LARP1-unique domain DM15
Authors	:	Lahr, R.M.; Berman, A.J.
Deposited on	:	2015-06-12
Resolution	:	2.20 Å(reported)

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

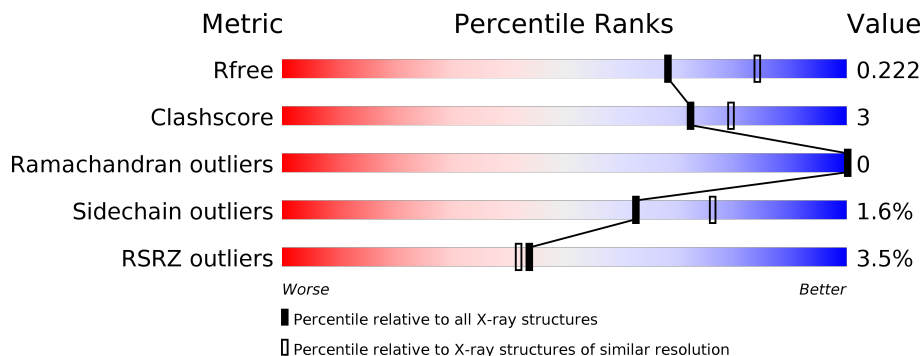|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (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 2.20 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		0.222
Clashscore		3
Ramachandran outliers		0
Sidechain outliers		1.6%
RSRZ outliers		3.5%

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	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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 <=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	162	2% / 77% / 12% · 9%
1	B	162	% / 78% / 9% · 12%
1	C	162	82% / 7% · 10%
1	D	162	9% / 80% · 15%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 5244 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 La-related protein 1.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	148	Total	C	N	O	S	Se	0	1	0
			1306	849	227	226	2	2			
1	B	142	Total	C	N	O	S	Se	0	1	0
			1248	815	212	217	2	2			
1	C	145	Total	C	N	O	S	Se	0	0	0
			1269	828	216	221	2	2			
1	D	137	Total	C	N	O	S	Se	0	1	0
			1217	793	206	214	2	2			

There are 44 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	785	GLY	-	expression tag	UNP Q6PKG0
A	786	HIS	-	expression tag	UNP Q6PKG0
A	787	SER	-	expression tag	UNP Q6PKG0
A	788	GLY	-	expression tag	UNP Q6PKG0
A	789	GLY	-	expression tag	UNP Q6PKG0
A	790	GLY	-	expression tag	UNP Q6PKG0
A	791	GLY	-	expression tag	UNP Q6PKG0
A	792	GLY	-	expression tag	UNP Q6PKG0
A	793	GLY	-	expression tag	UNP Q6PKG0
A	794	HIS	-	expression tag	UNP Q6PKG0
A	795	MSE	-	expression tag	UNP Q6PKG0
B	785	GLY	-	expression tag	UNP Q6PKG0
B	786	HIS	-	expression tag	UNP Q6PKG0
B	787	SER	-	expression tag	UNP Q6PKG0
B	788	GLY	-	expression tag	UNP Q6PKG0
B	789	GLY	-	expression tag	UNP Q6PKG0
B	790	GLY	-	expression tag	UNP Q6PKG0
B	791	GLY	-	expression tag	UNP Q6PKG0
B	792	GLY	-	expression tag	UNP Q6PKG0
B	793	GLY	-	expression tag	UNP Q6PKG0
B	794	HIS	-	expression tag	UNP Q6PKG0

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Chain	Residue	Modelled	Actual	Comment	Reference
B	795	MSE	-	expression tag	UNP Q6PKG0
C	785	GLY	-	expression tag	UNP Q6PKG0
C	786	HIS	-	expression tag	UNP Q6PKG0
C	787	SER	-	expression tag	UNP Q6PKG0
C	788	GLY	-	expression tag	UNP Q6PKG0
C	789	GLY	-	expression tag	UNP Q6PKG0
C	790	GLY	-	expression tag	UNP Q6PKG0
C	791	GLY	-	expression tag	UNP Q6PKG0
C	792	GLY	-	expression tag	UNP Q6PKG0
C	793	GLY	-	expression tag	UNP Q6PKG0
C	794	HIS	-	expression tag	UNP Q6PKG0
C	795	MSE	-	expression tag	UNP Q6PKG0
D	785	GLY	-	expression tag	UNP Q6PKG0
D	786	HIS	-	expression tag	UNP Q6PKG0
D	787	SER	-	expression tag	UNP Q6PKG0
D	788	GLY	-	expression tag	UNP Q6PKG0
D	789	GLY	-	expression tag	UNP Q6PKG0
D	790	GLY	-	expression tag	UNP Q6PKG0
D	791	GLY	-	expression tag	UNP Q6PKG0
D	792	GLY	-	expression tag	UNP Q6PKG0
D	793	GLY	-	expression tag	UNP Q6PKG0
D	794	HIS	-	expression tag	UNP Q6PKG0
D	795	MSE	-	expression tag	UNP Q6PKG0

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O_4S).

SO4

O1

O

O3 O⁻ — S — O⁻ O4

S

O

O2
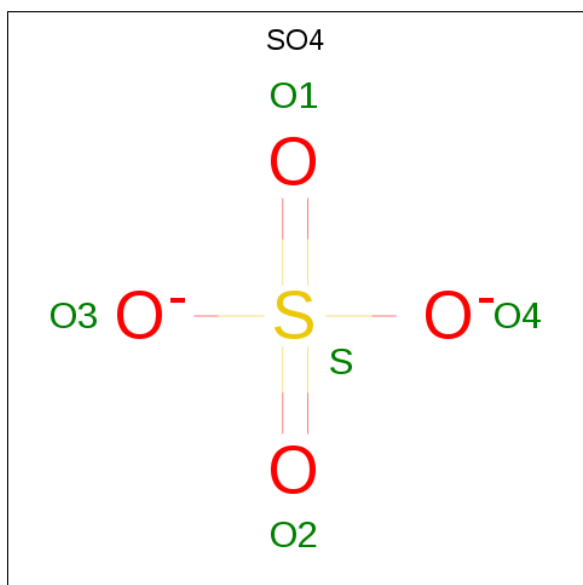
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total 5	O 4	S 1	0	0
2	B	1	Total 5	O 4	S 1	0	0

- Molecule 3 is water.

| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	39	Total 39	O 39	0	0
3	B	55	Total 55	O 55	0	0
3	C	71	Total 71	O 71	0	0
3	D	29	Total 29	O 29	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.
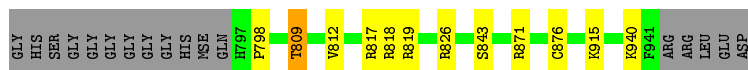
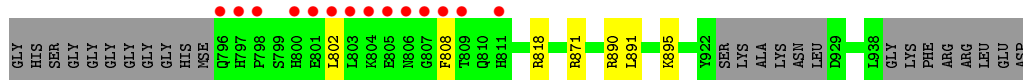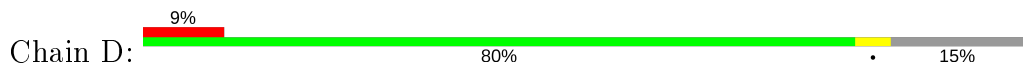- Molecule 1: La-related protein 1

Chain A:

- Molecule 1: La-related protein 1

Chain B:

- Molecule 1: La-related protein 1

Chain C:

- Molecule 1: La-related protein 1

Chain D:
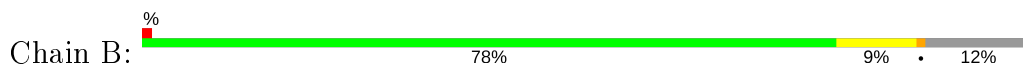
4   Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	76.73Å 61.46Å 83.20Å 90.00° 115.53° 90.00°	Depositor
Resolution (Å)	42.57 – 2.20 42.57 – 2.20	Depositor EDS
% Data completeness (in resolution range)	99.9 (42.57-2.20) 99.9 (42.57-2.20)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$<I/\sigma(I)>$ [1]	12.94 (at 2.20Å)	Xtriage
Refinement program	PHENIX 1.8.2_1309	Depositor
R, R_{free}	0.176 , 0.222 0.177 , 0.222	Depositor DCC
R_{free} test set	1082 reflections (3.03%)	wwPDB-VP
Wilson B-factor (Å^2)	21.4	Xtriage
Anisotropy	0.055	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 39.1	EDS
L-test for twinning[2]	$<|L|> = 0.49, <L^2> = 0.32$	Xtriage
Estimated twinning fraction	0.018 for h,-k,-h-l	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	5244	wwPDB-VP
Average B, all atoms (Å^2)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.50% 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:
SO4

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	0.44	0/1340	0.53	0/1785
1	B	0.48	0/1281	0.53	0/1707
1	C	0.46	0/1303	0.53	0/1736
1	D	0.40	0/1248	0.48	0/1662
All	All	0.44	0/5172	0.52	0/6890

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	1306	0	1269	17	1
1	B	1248	0	1199	9	1
1	C	1269	0	1232	8	0
1	D	1217	0	1163	4	0
2	A	5	0	0	0	0
2	B	5	0	0	0	0
3	A	39	0	0	0	0
3	B	55	0	0	1	0
3	C	71	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	D	29	0	0	1	0
All	All	5244	0	4863	34	1

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 34 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:822:ASN:OD1	1:B:826[B]:ARG:NH1	2.13	0.82
1:B:871:ARG:HG3	1:D:871:ARG:HD3	1.62	0.81
1:A:845:PHE:CD2	1:A:854:MSE:HE1	2.24	0.71
1:A:842:TRP:HD1	1:A:854:MSE:HE3	1.57	0.68
1:A:941:PHE:O	1:A:942:ARG:NH1	2.26	0.68

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:822:ASN:OD1	1:B:922:TYR:OH[2_554]	2.12	0.08

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	147/162 (91%)	143 (97%)	4 (3%)	0	100	100
1	B	139/162 (86%)	137 (99%)	2 (1%)	0	100	100
1	C	143/162 (88%)	143 (100%)	0	0	100	100
1	D	134/162 (83%)	132 (98%)	2 (2%)	0	100	100
All	All	563/648 (87%)	555 (99%)	8 (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	134/138 (97%)	130 (97%)	4 (3%)	41	53
1	B	128/138 (93%)	126 (98%)	2 (2%)	62	76
1	C	131/138 (95%)	130 (99%)	1 (1%)	81	90
1	D	125/138 (91%)	124 (99%)	1 (1%)	81	90
All	All	518/552 (94%)	510 (98%)	8 (2%)	62	78

5 of 8 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	943	ARG
1	D	818	ARG
1	B	892	ASP
1	A	941	PHE
1	B	819	ARG

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

Mol	Chain	Res	Type
1	A	860	GLN

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)

2 ligands 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	$\#|Z| > 2$
2	SO4	B	1001	-	4,4,4	0.15	0	6,6,6	0.06	0
2	SO4	A	1001	-	4,4,4	0.10	0	6,6,6	0.25	0

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 (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(Å²)	Q<0.9
1	A	146/162 (90%)	-0.34	4 (2%)	54	52	13, 27, 61, 77	0
1	B	140/162 (86%)	-0.51	2 (1%)	75	73	12, 22, 48, 66	0
1	C	143/162 (88%)	-0.50	0	100	100	14, 25, 51, 68	0
1	D	135/162 (83%)	0.06	14 (10%)	6	5	19, 34, 74, 84	0
All	All	564/648 (87%)	-0.33	20 (3%)	44	42	12, 27, 61, 84	0

The worst 5 of 20 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	806	ASN	6.3
1	D	803	LEU	5.7
1	D	805	GLU	5.2
1	D	796	GLN	4.8
1	D	800	HIS	4.2

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)

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(Å^2)	Q<0.9
2	SO4	B	1001	5/5	0.89	0.17	79,80,86,86	0
2	SO4	A	1001	5/5	0.99	0.10	37,38,44,44	0

6.5 Other polymers (i)

There are no such residues in this entry.