wwPDB X-ray Structure Validation Summary Report (i)

Feb 11, 2024 – 12:13 PM EST

PDB ID	:	3BRF
Title	:	CSL (Lag-1) bound to DNA with Lin-12 RAM peptide, C2221
Authors	:	Wilson, J.J.; Kovall, R.A.
Deposited on	:	2007-12-21
Resolution	:	2.47 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 (i) 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 (1)) were used in the production of this report:

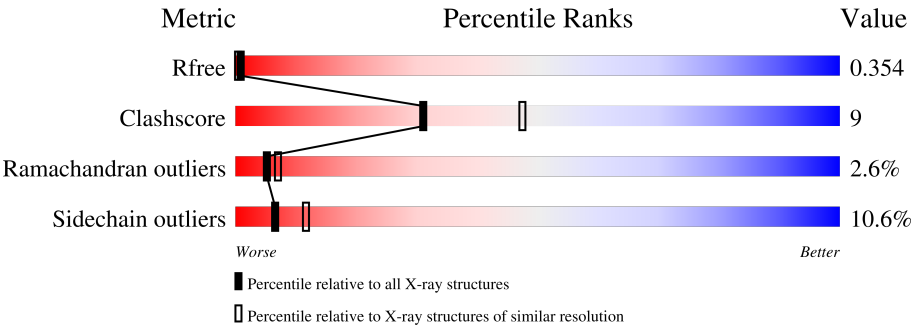
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.47 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	5857 (2.50-2.46)
Clashscore	141614	6594 (2.50-2.46)
Ramachandran outliers	138981	6469 (2.50-2.46)
Sidechain outliers	138945	6471 (2.50-2.46)

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	B	15	40% 40% 20%
2	C	15	47% 47% 7%
3	A	478	63% 21% • 12%
4	D	14	64% 29% 7%

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 4179 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 DNA chain called DNA (5'-D(*DTP*DTP*DAP*DCP*DTP*DGP*DTP*DGP*DGP*DGP*DAP*DAP*DAP*DGP*DA)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
1	B	15	311	149	61	87	14	0	0	0

- Molecule 2 is a DNA chain called DNA (5'-D(*DAP*DAP*DTP*DCP*DTP*DTP*DTP*DCP*DCP*DCP*DAP*DCP*DAP*DGP*DT)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
2	C	15	298	145	50	89	14	0	0	0

- Molecule 3 is a protein called Lin-12 and glp-1 phenotype protein 1, isoform a.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	A	423	3383	2149	583	633	18	0	2	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	186	SER	-	expression tag	UNP Q9TYY1
A	187	GLY	-	expression tag	UNP Q9TYY1
A	188	PRO	-	expression tag	UNP Q9TYY1
A	189	LEU	-	expression tag	UNP Q9TYY1
A	190	GLY	-	expression tag	UNP Q9TYY1
A	191	SER	-	expression tag	UNP Q9TYY1

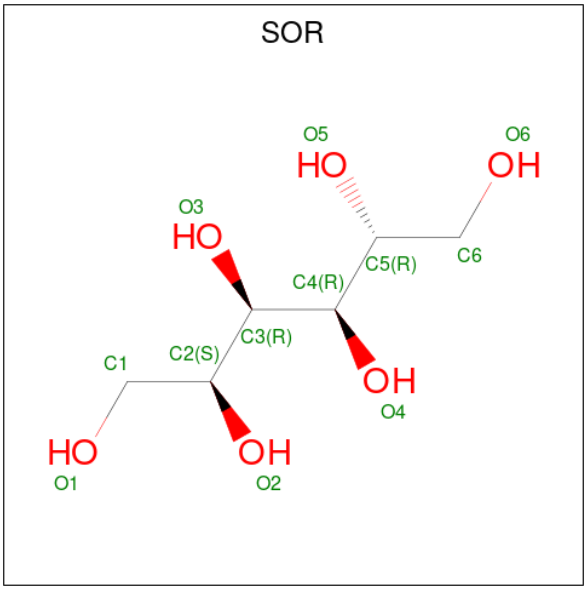
- Molecule 4 is a protein called Protein lin-12.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	D	13	106	68	18	17	3	0	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	937	SER	-	expression tag	UNP P14585

- Molecule 5 is sorbitol (three-letter code: SOR) (formula: $C_6H_{14}O_6$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total C O 12 6 6	0	0
5	A	1	Total C O 12 6 6	0	0

- Molecule 6 is water.

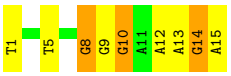
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	B	7	Total O 7 7	0	0
6	C	11	Total O 11 11	0	0
6	A	39	Total O 39 39	0	0

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. 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.

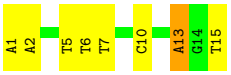
• Molecule 1: DNA (5'-D(*DTP*DTP*DAP*DCP*DTP*DGP*DTP*DGP*DGP*DGP*DAP*DAP*DAP*DGP*DA)-3')

Chain B:



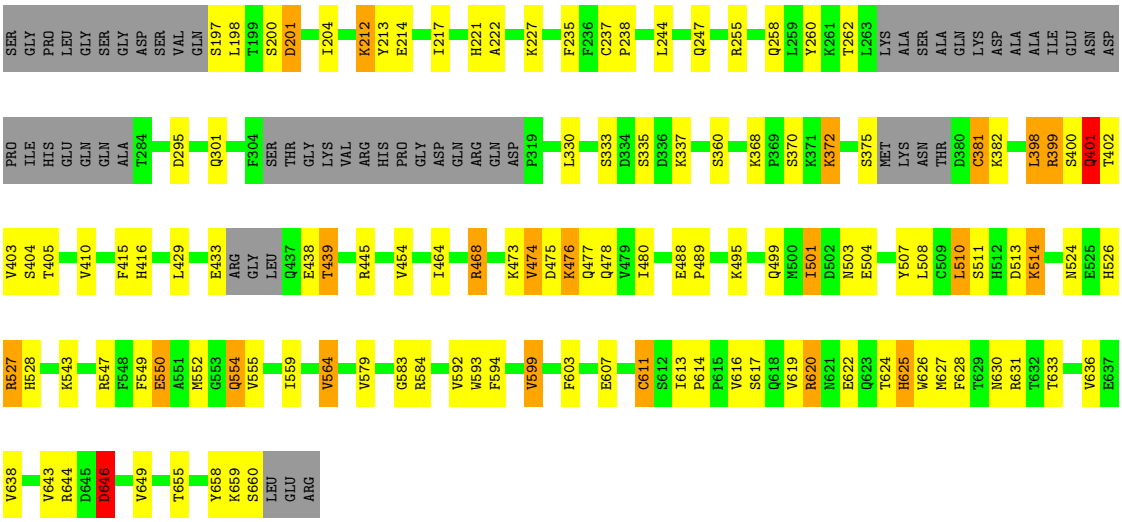
• Molecule 2: DNA (5'-D(*DAP*DAP*DTP*DCP*DTP*DTP*DTP*DCP*DCP*DCP*DAP*DCP*DAP*DGP*DT)-3')

Chain C:



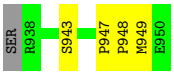
• Molecule 3: Lin-12 and glp-1 phenotype protein 1, isoform a

Chain A:



• Molecule 4: Protein lin-12

Chain D:


SER
R938
S943
P947
P948
M949
E950

4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α, β, γ	62.94Å 95.97Å 223.63Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	28.28 – 2.47 26.59 – 2.47	Depositor EDS
% Data completeness (in resolution range)	99.2 (28.28-2.47) 99.3 (26.59-2.47)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.20 (at 2.47Å)	Xtriage
Refinement program	REFMAC 5.3.0020	Depositor
R, R_{free}	0.230 , 0.277 0.312 , 0.354	Depositor DCC
R_{free} test set	1255 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å^2)	54.8	Xtriage
Anisotropy	0.109	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 34.2	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.88	EDS
Total number of atoms	4179	wwPDB-VP
Average B, all atoms (Å^2)	40.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.13% 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, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: SOR

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	B	1.17	0/350	1.86	9/540 (1.7%)
2	C	1.21	0/332	1.78	9/509 (1.8%)
3	A	0.57	3/3463 (0.1%)	0.64	2/4675 (0.0%)
4	D	0.41	0/109	0.64	0/147
All	All	0.71	3/4254 (0.1%)	0.96	20/5871 (0.3%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
3	A	0	1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	550	GLU	CD-OE2	7.00	1.33	1.25
3	A	644	ARG	CZ-NH1	6.82	1.42	1.33
3	A	197	SER	CB-OG	5.54	1.49	1.42

The worst 5 of 20 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	5	DT	O4'-C1'-N1	-10.16	100.89	108.00
1	B	1	DT	O4'-C1'-N1	9.30	114.51	108.00
2	C	6	DT	O4'-C1'-N1	-8.27	102.21	108.00
1	B	1	DT	C1'-O4'-C4'	-7.78	102.32	110.10
2	C	10	DC	O4'-C1'-C2'	-7.26	100.09	105.90

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	A	401	GLN	Peptide

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	B	311	0	171	4	0
2	C	298	0	172	3	0
3	A	3383	0	3329	66	0
4	D	106	0	105	1	0
5	A	24	0	28	5	0
6	A	39	0	0	2	0
6	B	7	0	0	0	0
6	C	11	0	0	0	0
All	All	4179	0	3805	72	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 9.

The worst 5 of 72 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)
3:A:438:GLU:HB2	3:A:439:THR:HG23	1.23	1.14
3:A:335:SER:HB3	5:A:1:SOR:O6	1.64	0.96
3:A:227:LYS:HZ2	5:A:2:SOR:H11	1.36	0.90
5:A:1:SOR:H2	6:A:671:HOH:O	1.72	0.89
3:A:454:VAL:HG13	3:A:501:ILE:HD11	1.57	0.84

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
3	A	415/478 (87%)	376 (91%)	28 (7%)	11 (3%)	5 6
4	D	11/14 (79%)	9 (82%)	2 (18%)	0	100 100
All	All	426/492 (87%)	385 (90%)	30 (7%)	11 (3%)	5 7

5 of 11 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	A	399	ARG
3	A	403	VAL
3	A	476	LYS
3	A	401	GLN
3	A	477	GLN

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
3	A	375/417 (90%)	336 (90%)	39 (10%)	7 12
4	D	12/13 (92%)	10 (83%)	2 (17%)	2 3
All	All	387/430 (90%)	346 (89%)	41 (11%)	6 12

5 of 41 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	A	564	VAL

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Mol	Chain	Res	Type
3	A	631	ARG
3	A	599	VAL
3	A	620	ARG
3	A	649	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 10 such sidechains are listed below:

Mol	Chain	Res	Type
3	A	557	ASN
3	A	623	GLN
3	A	630	ASN
3	A	441	ASN
3	A	503	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 monosaccharides 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	$\#\|Z\|>2$
5	SOR	A	1	-	11,11,11	0.34	0	14,14,14	1.52	2 (14%)
5	SOR	A	2	-	11,11,11	0.45	0	14,14,14	1.35	3 (21%)

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
5	SOR	A	1	-	-	10/16/16/16	-
5	SOR	A	2	-	-	11/16/16/16	-

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	A	1	SOR	O6-C6-C5	-3.54	103.36	111.07
5	A	1	SOR	O5-C5-C4	3.30	117.12	109.10
5	A	2	SOR	C2-C3-C4	-2.45	108.63	112.47
5	A	2	SOR	O4-C4-C5	2.38	114.57	108.81
5	A	2	SOR	C5-C4-C3	-2.16	109.08	112.47

There are no chirality outliers.

5 of 21 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	1	SOR	C2-C3-C4-C5
5	A	1	SOR	C2-C3-C4-O4
5	A	1	SOR	O3-C3-C4-C5
5	A	1	SOR	C3-C4-C5-C6
5	A	1	SOR	C3-C4-C5-O5

There are no ring outliers.

2 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	1	SOR	3	0
5	A	2	SOR	2	0

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

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.