



# wwPDB X-ray Structure Validation Summary Report ⓘ

May 16, 2020 – 11:00 am BST

PDB ID : 1TTU  
Title : Crystal Structure of CSL bound to DNA  
Authors : Kovall, R.A.; Hendrickson, W.A.  
Deposited on : 2004-06-23  
Resolution : 2.85 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](mailto: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.

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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

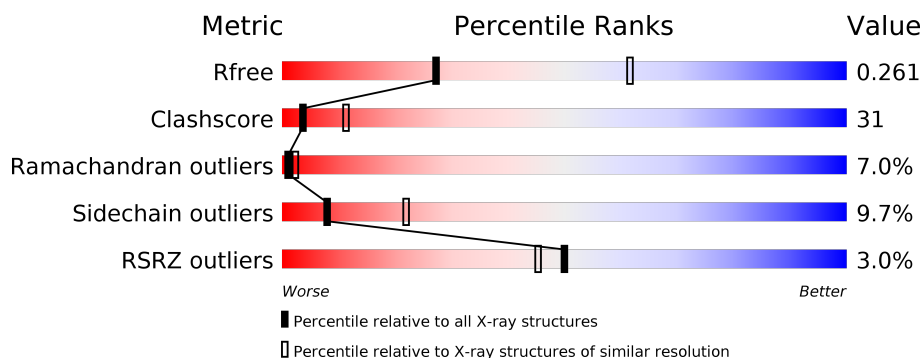
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.85 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	3168 (2.90-2.82)
Clashscore	141614	3438 (2.90-2.82)
Ramachandran outliers	138981	3348 (2.90-2.82)
Sidechain outliers	138945	3351 (2.90-2.82)
RSRZ outliers	127900	3103 (2.90-2.82)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	B	15	<div> <div style="width: 47%; background-color: green;"></div> <div style="width: 53%; background-color: yellow;"></div> </div> <div>47% 53%</div>
2	C	15	<div> <div style="width: 33%; background-color: green;"></div> <div style="width: 67%; background-color: yellow;"></div> </div> <div>33% 67%</div>
3	A	477	<div> <div style="width: 3%; background-color: red;"></div> <div style="width: 42%; background-color: green;"></div> <div style="width: 41%; background-color: yellow;"></div> <div style="width: 7%; background-color: orange;"></div> <div style="width: 9%; background-color: grey;"></div> </div> <div>3% 42% 41% 7% 9%</div>

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	EDO	A	52	-	-	X	-
4	EDO	A	56	-	-	X	-
4	EDO	A	59	-	-	-	X

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 4163 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 5'-D(\*TP\*TP\*AP\*CP\*TP\*GP\*TP\*GP\*GP\*GP\*AP\*A P\*AP\*GP\*A)-3'.

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

- Molecule 2 is a DNA chain called 5'-D(\*AP\*AP\*TP\*CP\*TP\*TP\*TP\*CP\*CP\*CP\*AP\*CP \*AP\*GP\*T)-3'.

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

- Molecule 3 is a protein called lin-12 And Glp-1 transcriptional regulator.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	A	435	Total	C	N	O	S	0	2	0
			3472	2198	603	652	19			

There are 5 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	187	GLY	-	CLONING ARTIFACT	UNP Q9TYY1
A	188	PRO	-	CLONING ARTIFACT	UNP Q9TYY1
A	189	LEU	-	CLONING ARTIFACT	UNP Q9TYY1
A	190	GLY	-	CLONING ARTIFACT	UNP Q9TYY1
A	191	SER	-	CLONING ARTIFACT	UNP Q9TYY1

- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 4 2 2	0	0
4	A	1	Total C O 4 2 2	0	0
4	A	1	Total C O 4 2 2	0	0
4	A	1	Total C O 4 2 2	0	0
4	A	1	Total C O 4 2 2	0	0
4	A	1	Total C O 4 2 2	0	0
4	A	1	Total C O 4 2 2	0	0
4	A	1	Total C O 4 2 2	0	0
4	A	1	Total C O 4 2 2	0	0

- Molecule 5 is water.

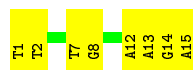
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	2	Total O 2 2	0	0
5	C	1	Total O 1 1	0	0
5	A	43	Total O 43 43	0	0

### 3 Residue-property plots

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: 5'-D(\*TP\*TP\*AP\*CP\*TP\*GP\*TP\*GP\*GP\*GP\*AP\*AP\*AP\*GP\*A)-3'

Chain B: 



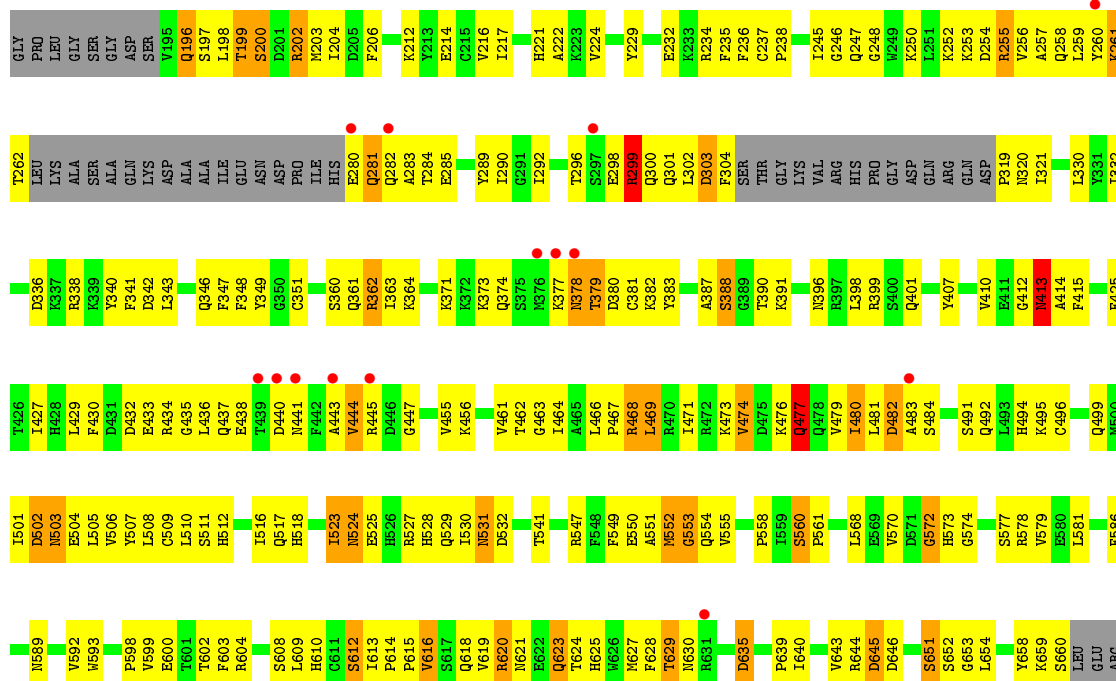
- Molecule 2: 5'-D(\*AP\*AP\*TP\*CP\*TP\*TP\*TP\*CP\*CP\*CP\*AP\*CP\*AP\*GP\*T)-3'

Chain C: 



- Molecule 3: lin-12 And Glp-1 transcriptional regulator

Chain A: 



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 61	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	127.55Å 127.55Å 97.60Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	19.99 – 2.85 19.99 – 2.80	Depositor EDS
% Data completeness (in resolution range)	99.6 (19.99-2.85) 99.6 (19.99-2.80)	Depositor EDS
$R_{merge}$	0.05	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	5.68 (at 2.79Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.201 , 0.273 0.196 , 0.261	Depositor DCC
$R_{free}$ test set	2202 reflections (9.92%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	70.1	Xtriage
Anisotropy	0.207	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 65.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.033 for h,-h-k,-l	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	4163	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	68.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.06% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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

### 5.1 Standard geometry

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

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	0.66	0/350	0.76	0/540
2	C	0.78	0/332	0.90	0/509
3	A	0.54	0/3560	0.77	0/4808
All	All	0.58	0/4242	0.78	0/5857

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

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	5	0
2	C	298	0	172	17	0
3	A	3472	0	3410	224	0
4	A	36	0	54	10	0
5	A	43	0	0	0	0
5	B	2	0	0	0	0
5	C	1	0	0	0	0
All	All	4163	0	3807	247	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 31.



The worst 5 of 247 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:560:SER:HB3	3:A:561:PRO:HD3	1.47	0.97
3:A:434:ARG:HH12	3:A:441:ASN:HD22	0.94	0.93
3:A:531:ASN:HD22	3:A:531:ASN:H	0.93	0.91
3:A:599:VAL:HG12	3:A:600:GLU:H	1.35	0.91
3:A:434:ARG:NH1	3:A:441:ASN:HD22	1.69	0.90

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	431/477 (90%)	365 (85%)	35 (8%)	31 (7%)	<b>1</b> <b>2</b>

5 of 31 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	A	261	LYS
3	A	303	ASP
3	A	380	ASP
3	A	413	ASN
3	A	444	VAL

### 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	385/416 (92%)	347 (90%)	38 (10%)	8 21

5 of 38 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	A	468[B]	ARG
3	A	480	ILE
3	A	635	ASP
3	A	474	VAL
3	A	482	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 17 such sidechains are listed below:

Mol	Chain	Res	Type
3	A	409	HIS
3	A	413	ASN
3	A	531	ASN
3	A	396	ASN
3	A	573	HIS

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

9 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	$\# Z  > 2$
4	EDO	A	56	-	3,3,3	0.32	0	2,2,2	1.04	0
4	EDO	A	53	-	3,3,3	0.47	0	2,2,2	0.87	0
4	EDO	A	57	-	3,3,3	0.54	0	2,2,2	0.80	0
4	EDO	A	51	-	3,3,3	0.61	0	2,2,2	0.80	0
4	EDO	A	54	-	3,3,3	0.44	0	2,2,2	0.79	0
4	EDO	A	55	-	3,3,3	0.59	0	2,2,2	0.73	0
4	EDO	A	58	-	3,3,3	0.54	0	2,2,2	0.75	0
4	EDO	A	59	-	3,3,3	0.51	0	2,2,2	0.85	0
4	EDO	A	52	-	3,3,3	0.68	0	2,2,2	0.72	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
4	EDO	A	56	-	-	1/1/1/1	-
4	EDO	A	53	-	-	0/1/1/1	-
4	EDO	A	57	-	-	1/1/1/1	-
4	EDO	A	51	-	-	1/1/1/1	-
4	EDO	A	54	-	-	0/1/1/1	-
4	EDO	A	55	-	-	0/1/1/1	-
4	EDO	A	58	-	-	1/1/1/1	-
4	EDO	A	59	-	-	1/1/1/1	-
4	EDO	A	52	-	-	1/1/1/1	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 6 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	56	EDO	O1-C1-C2-O2
4	A	57	EDO	O1-C1-C2-O2
4	A	51	EDO	O1-C1-C2-O2
4	A	58	EDO	O1-C1-C2-O2
4	A	59	EDO	O1-C1-C2-O2

There are no ring outliers.

4 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	56	EDO	4	0
4	A	51	EDO	1	0
4	A	58	EDO	1	0
4	A	52	EDO	4	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 [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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	B	15/15 (100%)	-0.48	0 100 100	45, 64, 82, 95	0
2	C	15/15 (100%)	-0.91	0 100 100	42, 64, 70, 72	0
3	A	435/477 (91%)	-0.23	14 (3%) 47 42	27, 61, 123, 152	0
All	All	465/507 (91%)	-0.26	14 (3%) 50 45	27, 62, 122, 152	0

The worst 5 of 14 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	A	378	ASN	3.7
3	A	439	THR	3.5
3	A	483	ALA	3.3
3	A	441	ASN	3.2
3	A	297	SER	3.1

### 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, 95<sup>th</sup> 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( $\text{\AA}^2$ )	Q<0.9
4	EDO	A	59	4/4	0.54	0.42	79,94,94,96	0
4	EDO	A	58	4/4	0.78	0.37	78,86,86,93	0
4	EDO	A	51	4/4	0.82	0.29	64,67,72,90	0
4	EDO	A	56	4/4	0.85	0.32	53,74,78,79	0
4	EDO	A	57	4/4	0.86	0.38	88,95,99,99	0
4	EDO	A	55	4/4	0.90	0.52	85,89,94,98	0
4	EDO	A	54	4/4	0.91	0.21	48,54,55,59	0
4	EDO	A	53	4/4	0.91	0.22	52,64,74,78	0
4	EDO	A	52	4/4	0.92	0.27	64,67,72,80	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.