



# wwPDB X-ray Structure Validation Summary Report ⓘ

Jun 21, 2021 – 12:01 PM EDT

PDB ID : 1FOK  
Title : STRUCTURE OF RESTRICTION ENDONUCLEASE FOKI BOUND TO DNA  
Authors : Aggarwal, D.A.; Wah, J.A.; Hirsch, L.F.; Dorner, I.; Schildkraut, A.K.  
Deposited on : 1997-04-18  
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](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  
Xtrriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.20

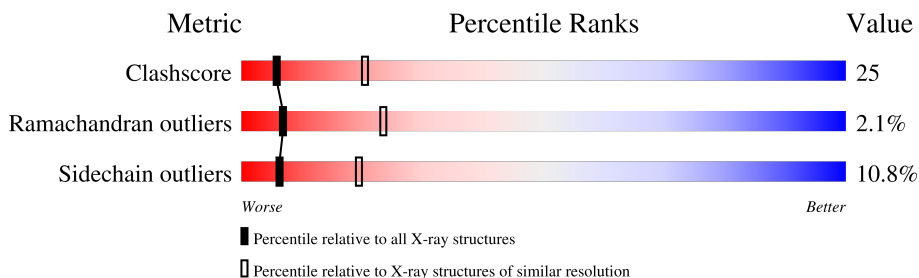
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.80 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))
Clashscore	141614	3569 (2.80-2.80)
Ramachandran outliers	138981	3498 (2.80-2.80)
Sidechain outliers	138945	3500 (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 of 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  $\leq 5\%$

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	B	20	
2	C	20	
3	A	576	

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 5527 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(\*TP\*CP\*GP\*GP\*AP\*TP\*GP\*AP\*TP\*AP\*AP\*CP\*GP\*CP\*TP\*AP\*G P\*TP\*CP\*A)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
1	B	20	409	196	77	117	19	0	0	0

- Molecule 2 is a DNA chain called DNA (5'-D(\*AP\*TP\*GP\*AP\*CP\*TP\*AP\*GP\*CP\*GP\*TP\*TP\*AP\*TP\*CP\*AP\*TP\*CP\*CP\*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
2	C	20	405	195	72	119	19	0	0	0

- Molecule 3 is a protein called PROTEIN (FOKI RESTRICTION ENDONUCLEASE).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	A	568	4541	2908	780	842	11	0	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	15	Total 15	O 15	0	0
4	C	22	Total 22	O 22	0	0
4	A	135	Total 135	O 135	0	0

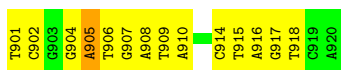
### 3 Residue-property plots [i](#)

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.

Note EDS was not executed.

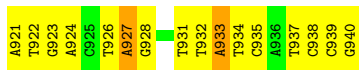
- Molecule 1: DNA (5'-D(\*TP\*CP\*GP\*GP\*AP\*TP\*GP\*AP\*TP\*AP\*AP\*CP\*GP\*CP\*TP\*AP\*G P\*TP\*CP\*A)-3')

Chain B: 



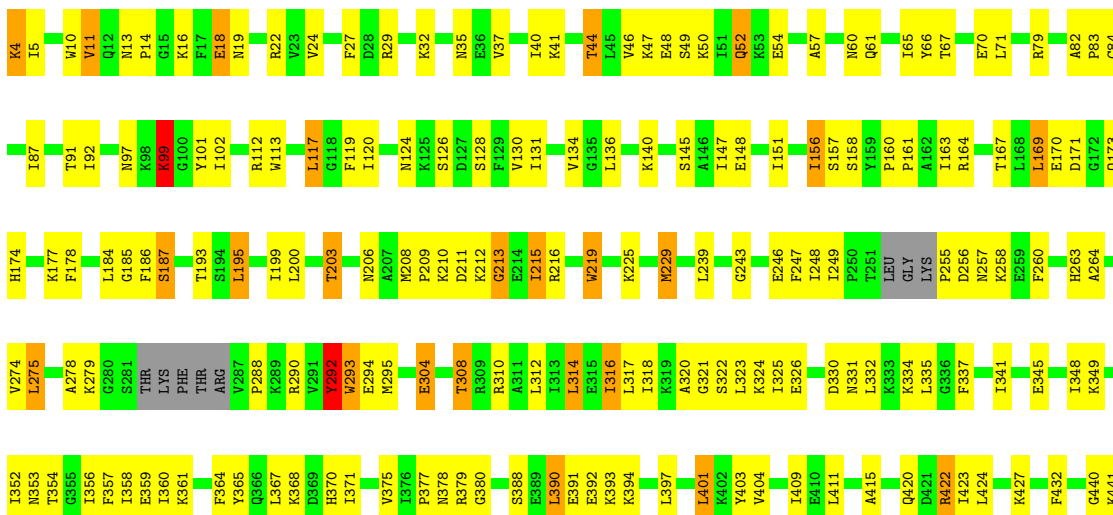
- Molecule 2: DNA (5'-D(\*AP\*TP\*GP\*AP\*CP\*TP\*AP\*GP\*CP\*GP\*TP\*TP\*AP\*TP\*CP\*AP\*T P\*CP\*CP\*G)-3')

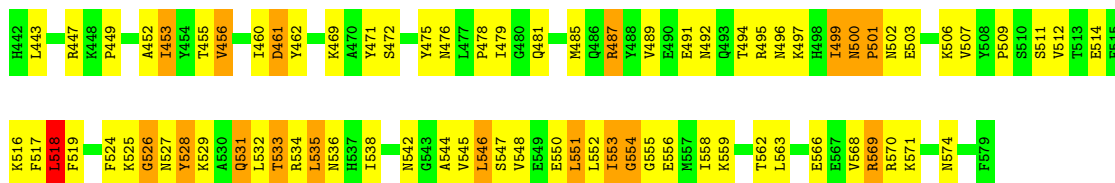
Chain C: 



- Molecule 3: PROTEIN (FOKI RESTRICTION ENDONUCLEASE)

Chain A: 





## 4 Data and refinement statistics

Xtrriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	65.59Å 119.34Å 71.52Å 90.00° 101.42° 90.00°	Depositor
Resolution (Å)	8.00 – 2.80	Depositor
% Data completeness (in resolution range)	97.9 (8.00-2.80)	Depositor
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	X-PLOR 3.851	Depositor
R, $R_{free}$	0.214 , 0.296	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	5527	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	38.0	wwPDB-VP

## 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	B	0.74	0/459	0.85	0/707
2	C	0.71	0/453	0.94	0/697
3	A	0.56	2/4626 (0.0%)	0.82	7/6227 (0.1%)
All	All	0.59	2/5538 (0.0%)	0.84	7/7631 (0.1%)

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
1	B	0	1
2	C	0	3
3	A	0	1
All	All	0	5

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	18	GLU	CG-CD	5.74	1.60	1.51
3	A	18	GLU	CB-CG	5.60	1.62	1.52

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
3	A	518	LEU	CA-CB-CG	7.33	132.16	115.30
3	A	526	GLY	N-CA-C	6.58	129.55	113.10
3	A	499	ILE	N-CA-C	-6.58	93.24	111.00
3	A	99	LYS	N-CA-C	-6.38	93.78	111.00
3	A	255	PRO	N-CA-CB	6.20	110.74	103.30

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	A	292	TYR	Sidechain
1	B	905	DA	Sidechain
2	C	927	DA	Sidechain
2	C	931	DT	Sidechain
2	C	933	DA	Sidechain

## 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	409	0	227	14	0
2	C	405	0	228	20	0
3	A	4541	0	4606	229	0
4	A	135	0	0	24	0
4	B	15	0	0	0	0
4	C	22	0	0	5	0
All	All	5527	0	5061	261	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 25.

The worst 5 of 261 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)
2:C:932:DT:H1'	4:C:754:HOH:O	1.52	1.09
2:C:921:DA:H2''	2:C:922:DT:OP2	1.71	0.88
3:A:318:ILE:HD11	3:A:371:ILE:HD11	1.59	0.83
3:A:516:LYS:HE2	4:A:651:HOH:O	1.79	0.82
3:A:422:ARG:HB3	4:A:744:HOH:O	1.80	0.82

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	562/576 (98%)	489 (87%)	61 (11%)	12 (2%)	<b>7</b> <b>23</b>

5 of 12 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	A	526	GLY
3	A	528	TYR
3	A	278	ALA
3	A	461	ASP
3	A	553	ILE

### 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	490/500 (98%)	437 (89%)	53 (11%)	<b>6</b> <b>19</b>

5 of 53 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	A	293	TRP
3	A	393	LYS
3	A	548	VAL
3	A	308	THR
3	A	330	ASP

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	492	ASN
3	A	500	ASN
3	A	574	ASN
3	A	329	GLN
3	A	366	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 monosaccharides 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

### 6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

### 6.2 Non-standard residues in protein, DNA, RNA chains

EDS was not executed - this section is therefore empty.

### 6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

### 6.4 Ligands

EDS was not executed - this section is therefore empty.

### 6.5 Other polymers

EDS was not executed - this section is therefore empty.