



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 31, 2020 – 08:56 AM BST

PDB ID : 1BRJ  
Title : BARNASE MUTANT WITH ILE 88 REPLACED BY ALA  
Authors : Cramer, P.C.; Buckle, A.; Fersht, A.  
Deposited on : 1995-03-09  
Resolution : 2.00 Å(reported)

This is a Full wwPDB X-ray Structure Validation 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) : 2.13

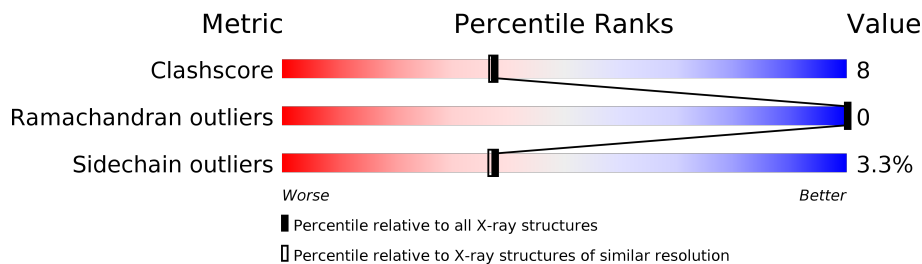
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.00 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))
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (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  $\geq 3$ , 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	A	110	65% 27% 5% ..
1	B	110	63% 32% . .
1	C	110	64% 32% . .

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 2746 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 BARNASE.

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace	
			Total	C	N				O
1	A	108	827	526	142	159	0	0	0
1	B	108	835	528	142	165	0	0	1
1	C	108	838	532	143	163	0	0	1

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	88	ALA	ILE	CONFLICT	UNP P00648
B	88	ALA	ILE	CONFLICT	UNP P00648
C	88	ALA	ILE	CONFLICT	UNP P00648

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	C	1	Total	Zn	0	0
			1	1		

- Molecule 3 is water.

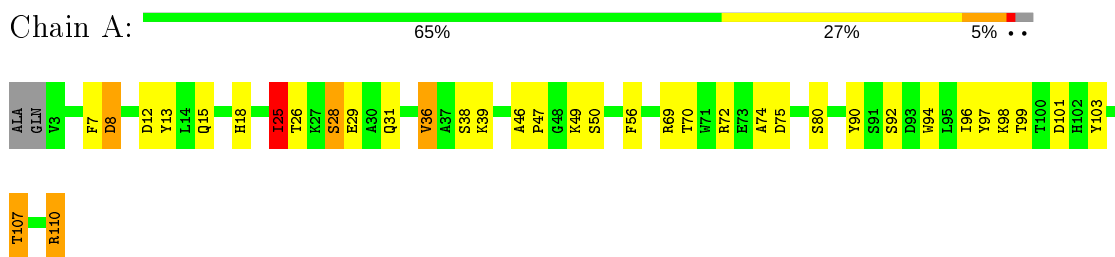
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	75	Total	O	0	0
			75	75		
3	B	86	Total	O	0	0
			86	86		
3	C	84	Total	O	0	0
			84	84		

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

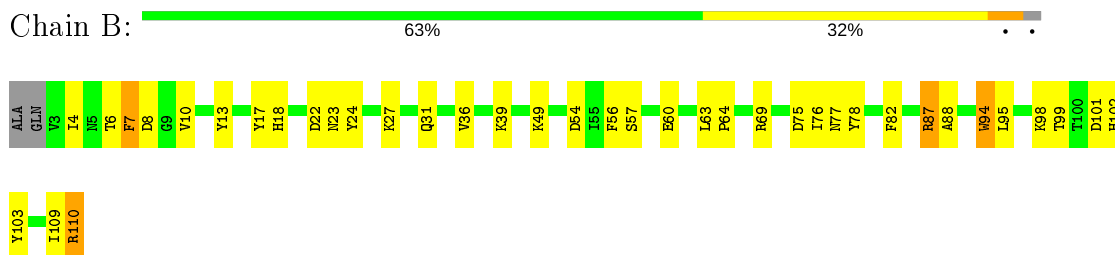
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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.

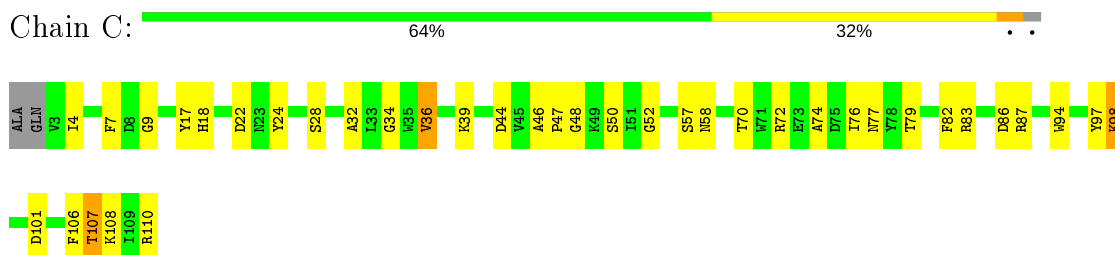
- Molecule 1: BARNASE



- Molecule 1: BARNASE



- Molecule 1: BARNASE



## 4 Data and refinement statistics

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

Property	Value	Source
Space group	P 32	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	58.84Å 58.84Å 81.61Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	7.00 – 2.00	Depositor
% Data completeness (in resolution range)	(Not available) (7.00-2.00)	Depositor
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	PROLSQ	Depositor
R, $R_{free}$	0.170 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2746	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	21.0	wwPDB-VP

## 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:  
ZN

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	0.86	0/848	2.04	28/1152 (2.4%)
1	B	0.89	0/856	1.90	21/1161 (1.8%)
1	C	0.87	0/859	2.08	30/1164 (2.6%)
All	All	0.87	0/2563	2.01	79/3477 (2.3%)

There are no bond length outliers.

All (79) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	72	ARG	NE-CZ-NH1	20.20	130.40	120.30
1	B	54	ASP	CB-CG-OD2	14.35	131.21	118.30
1	A	72	ARG	NE-CZ-NH2	-14.04	113.28	120.30
1	A	110	ARG	CD-NE-CZ	12.25	140.75	123.60
1	C	22	ASP	CB-CG-OD2	-10.83	108.55	118.30
1	A	72	ARG	NE-CZ-NH1	10.60	125.60	120.30
1	C	24	TYR	CB-CG-CD2	-9.87	115.08	121.00
1	B	87	ARG	NE-CZ-NH1	9.24	124.92	120.30
1	A	101	ASP	CB-CG-OD1	9.14	126.53	118.30
1	A	12	ASP	CB-CG-OD1	-8.86	110.33	118.30
1	C	83	ARG	NE-CZ-NH2	-8.49	116.05	120.30
1	B	75	ASP	CB-CG-OD2	-8.31	110.82	118.30
1	C	107	THR	O-C-N	8.19	135.80	122.70
1	C	72	ARG	NE-CZ-NH2	-8.09	116.25	120.30
1	C	82	PHE	CB-CG-CD2	-8.03	115.18	120.80
1	A	56	PHE	CB-CG-CD1	-7.79	115.35	120.80
1	A	15	GLN	O-C-N	7.77	135.14	122.70
1	B	17	TYR	CA-CB-CG	-7.63	98.90	113.40
1	C	24	TYR	CB-CG-CD1	7.55	125.53	121.00
1	C	44	ASP	CB-CG-OD2	-7.51	111.54	118.30
1	B	78	TYR	CB-CG-CD1	-7.39	116.57	121.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	110	ARG	NE-CZ-NH1	-7.34	116.63	120.30
1	C	87	ARG	NE-CZ-NH1	-7.29	116.65	120.30
1	A	74	ALA	N-CA-CB	7.24	120.24	110.10
1	C	36	VAL	O-C-N	7.00	133.90	122.70
1	C	50	SER	O-C-N	6.89	133.72	122.70
1	C	87	ARG	NE-CZ-NH2	6.83	123.71	120.30
1	C	50	SER	CA-C-O	-6.82	105.79	120.10
1	C	79	THR	CA-CB-CG2	-6.69	103.04	112.40
1	C	72	ARG	CD-NE-CZ	6.45	132.63	123.60
1	B	7	PHE	CB-CG-CD2	6.44	125.31	120.80
1	A	13	TYR	CB-CG-CD1	-6.32	117.21	121.00
1	C	106	PHE	CB-CG-CD1	-6.29	116.40	120.80
1	B	95	LEU	CA-CB-CG	6.19	129.54	115.30
1	A	107	THR	CA-CB-CG2	6.15	121.01	112.40
1	B	8	ASP	CB-CG-OD1	6.09	123.78	118.30
1	A	96	ILE	CB-CG1-CD1	6.00	130.69	113.90
1	C	110	ARG	CD-NE-CZ	5.99	131.98	123.60
1	C	48	GLY	CA-C-O	-5.89	110.00	120.60
1	B	24	TYR	CB-CG-CD1	-5.82	117.50	121.00
1	A	38	SER	CA-CB-OG	-5.78	95.60	111.20
1	C	83	ARG	NE-CZ-NH1	5.77	123.19	120.30
1	A	99	THR	N-CA-CB	5.73	121.19	110.30
1	A	72	ARG	CD-NE-CZ	5.69	131.57	123.60
1	B	82	PHE	CG-CD1-CE1	5.67	127.04	120.80
1	B	82	PHE	CD1-CE1-CZ	-5.60	113.38	120.10
1	B	88	ALA	N-CA-CB	5.59	117.93	110.10
1	A	50	SER	CA-CB-OG	5.59	126.30	111.20
1	B	69	ARG	NE-CZ-NH2	5.59	123.09	120.30
1	B	54	ASP	CB-CG-OD1	-5.57	113.29	118.30
1	A	80	SER	O-C-N	5.54	132.62	123.20
1	B	87	ARG	NH1-CZ-NH2	-5.53	113.31	119.40
1	C	72	ARG	NH1-CZ-NH2	-5.51	113.33	119.40
1	C	97	TYR	CG-CD2-CE2	-5.51	116.89	121.30
1	B	63	LEU	O-C-N	5.48	131.51	121.10
1	A	90	TYR	CB-CG-CD1	5.47	124.28	121.00
1	B	13	TYR	CB-CG-CD2	-5.42	117.75	121.00
1	C	101	ASP	O-C-N	5.37	131.29	122.70
1	B	56	PHE	CB-CG-CD2	-5.34	117.06	120.80
1	C	94	TRP	CA-CB-CG	-5.33	103.57	113.70
1	B	94	TRP	CA-CB-CG	-5.33	103.58	113.70
1	A	103	TYR	CB-CG-CD1	-5.32	117.81	121.00
1	A	36	VAL	O-C-N	5.31	131.20	122.70

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	22	ASP	CA-CB-CG	-5.29	101.75	113.40
1	C	86	ASP	O-C-N	5.29	131.16	122.70
1	A	103	TYR	O-C-N	5.27	131.13	122.70
1	C	17	TYR	CB-CG-CD1	-5.26	117.85	121.00
1	C	28	SER	CB-CA-C	-5.24	100.14	110.10
1	C	24	TYR	CA-C-O	-5.23	109.12	120.10
1	A	107	THR	N-CA-CB	-5.22	100.37	110.30
1	C	70	THR	O-C-N	5.17	130.97	122.70
1	A	96	ILE	CA-CB-CG1	5.16	120.80	111.00
1	A	97	TYR	CB-CG-CD1	-5.15	117.91	121.00
1	A	25	ILE	N-CA-CB	5.13	122.59	110.80
1	C	18	HIS	CA-CB-CG	-5.11	104.91	113.60
1	A	8	ASP	CA-CB-CG	-5.11	102.16	113.40
1	A	28	SER	CB-CA-C	5.08	119.76	110.10
1	A	69	ARG	NE-CZ-NH2	5.06	122.83	120.30
1	A	75	ASP	CB-CG-OD2	-5.03	113.77	118.30

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	A	827	0	756	9	0
1	B	835	0	767	17	0
1	C	838	0	776	12	0
2	C	1	0	0	0	0
3	A	75	0	0	0	0
3	B	86	0	0	2	1
3	C	84	0	0	1	1
All	All	2746	0	2299	37	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 8.

All (37) 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:27:LYS:O	1:B:31:GLN:HG3	1.84	0.78
1:A:28:SER:HA	1:A:31:GLN:HE21	1.48	0.77
1:A:26:THR:OG1	1:A:29:GLU:HG3	1.92	0.69
1:B:60:GLU:OE2	3:B:144:HOH:O	2.11	0.68
1:C:98:LYS:HG3	1:C:98:LYS:O	2.03	0.58
1:B:36:VAL:HB	1:B:39:LYS:HG3	1.86	0.58
1:A:7:PHE:CE1	1:A:98:LYS:HB2	2.41	0.56
1:B:57:SER:OG	3:B:142:HOH:O	2.13	0.56
1:B:36:VAL:CG1	1:B:39:LYS:HG3	2.38	0.53
1:C:4:ILE:HG21	1:C:9:GLY:HA3	1.90	0.53
1:B:76:ILE:O	1:B:77:ASN:HB2	2.09	0.52
1:B:6:THR:O	1:B:10:VAL:HG13	2.12	0.50
1:A:28:SER:HA	1:A:31:GLN:NE2	2.24	0.49
1:B:7:PHE:CE1	1:B:98:LYS:HB2	2.48	0.48
1:A:25:ILE:HD12	1:A:49:LYS:HB3	1.96	0.48
1:C:46:ALA:N	1:C:47:PRO:HD3	2.29	0.48
1:C:32:ALA:HB3	3:C:113:HOH:O	2.13	0.47
1:C:76:ILE:O	1:C:77:ASN:HB2	2.14	0.47
1:A:36:VAL:HG13	1:A:39:LYS:HB2	1.97	0.47
1:C:52:GLY:HA2	1:C:74:ALA:HA	1.97	0.46
1:C:7:PHE:CE1	1:C:98:LYS:HB2	2.50	0.46
1:B:98:LYS:O	1:B:98:LYS:HG3	2.16	0.46
1:C:4:ILE:CG2	1:C:9:GLY:HA3	2.45	0.46
1:B:109:ILE:O	1:B:110:ARG:HD3	2.16	0.45
1:B:64:PRO:HG3	1:C:34:GLY:HA2	1.99	0.44
1:C:57:SER:O	1:C:58:ASN:CB	2.64	0.44
1:C:107:THR:HG22	1:C:108:LYS:N	2.33	0.44
1:B:23:ASN:O	1:B:49:LYS:HA	2.18	0.43
1:B:4:ILE:HG22	1:B:10:VAL:HG12	2.01	0.43
1:C:57:SER:O	1:C:58:ASN:HB3	2.20	0.42
1:A:8:ASP:OD1	1:A:110:ARG:NH2	2.38	0.42
1:B:36:VAL:CB	1:B:39:LYS:HG3	2.49	0.42
1:B:101:ASP:O	1:B:102:HIS:HB2	2.19	0.41
1:A:46:ALA:N	1:A:47:PRO:HD3	2.35	0.41
1:A:18:HIS:HB3	1:A:94:TRP:CZ2	2.56	0.41
1:B:87:ARG:HB2	1:B:99:THR:HG22	2.03	0.40
1:B:18:HIS:HB3	1:B:94:TRP:CZ2	2.56	0.40

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)
3:B:190:HOH:O	3:C:186:HOH:O[3_675]	1.83	0.37

### 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	106/110 (96%)	100 (94%)	6 (6%)	0	100	100
1	B	106/110 (96%)	102 (96%)	4 (4%)	0	100	100
1	C	106/110 (96%)	103 (97%)	3 (3%)	0	100	100
All	All	318/330 (96%)	305 (96%)	13 (4%)	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	79/91 (87%)	75 (95%)	4 (5%)	24	19
1	B	83/91 (91%)	82 (99%)	1 (1%)	71	76
1	C	81/91 (89%)	78 (96%)	3 (4%)	34	32
All	All	243/273 (89%)	235 (97%)	8 (3%)	38	37

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	25	ILE
1	A	70	THR
1	A	92	SER
1	A	107	THR
1	B	103	TYR
1	C	36	VAL
1	C	39	LYS
1	C	98	LYS

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	31	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](#)

Of 1 ligands modelled in this entry, 1 is monoatomic - leaving 0 for Mogul analysis.

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

### 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.