



# wwPDB X-ray Structure Validation Summary Report ⓘ

Sep 5, 2023 – 08:36 PM EDT

PDB ID : 4D8F  
Title : Chlamydia trachomatis NrdB with a Mn/Fe cofactor (procedure 1 - high Mn)  
Authors : Dassama, L.M.K.; Boal, A.K.; Krebs, C.; Rosenzweig, A.C.; Bollinger Jr., J.M.  
Deposited on : 2012-01-10  
Resolution : 2.20 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)

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<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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 : 2.35  
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) : 2.35

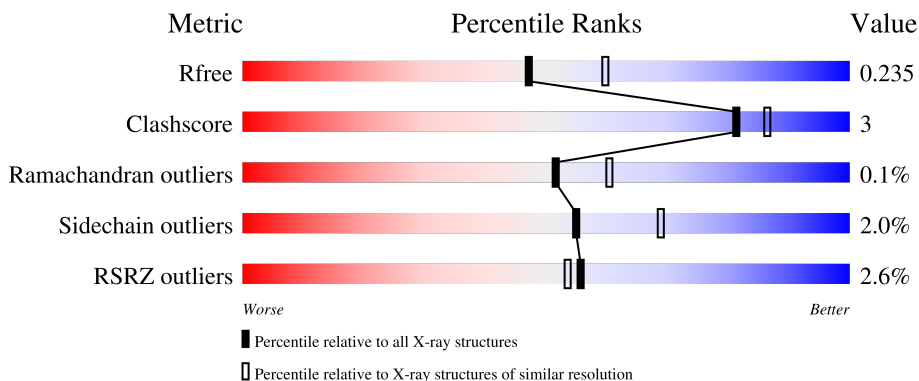
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.20 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	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 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  $\leq 5\%$ . 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	366	
1	B	366	
1	C	366	
1	D	366	

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	ACY	A	405	-	-	-	X

## 2 Entry composition i

There are 5 unique types of molecules in this entry. The entry contains 11353 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 Ribonucleoside-diphosphate reductase subunit beta.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	327	Total 2685	C 1726	N 459	O 488	S 12	0	0	0
1	B	334	Total 2736	C 1756	N 466	O 502	S 12	0	0	0
1	C	324	Total 2663	C 1711	N 456	O 484	S 12	0	0	0
1	D	330	Total 2718	C 1745	N 462	O 499	S 12	0	0	0

There are 80 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-19	MET	-	expression tag	UNP O84835
A	-18	GLY	-	expression tag	UNP O84835
A	-17	SER	-	expression tag	UNP O84835
A	-16	SER	-	expression tag	UNP O84835
A	-15	HIS	-	expression tag	UNP O84835
A	-14	HIS	-	expression tag	UNP O84835
A	-13	HIS	-	expression tag	UNP O84835
A	-12	HIS	-	expression tag	UNP O84835
A	-11	HIS	-	expression tag	UNP O84835
A	-10	HIS	-	expression tag	UNP O84835
A	-9	SER	-	expression tag	UNP O84835
A	-8	SER	-	expression tag	UNP O84835
A	-7	GLY	-	expression tag	UNP O84835
A	-6	LEU	-	expression tag	UNP O84835
A	-5	VAL	-	expression tag	UNP O84835
A	-4	PRO	-	expression tag	UNP O84835
A	-3	ARG	-	expression tag	UNP O84835
A	-2	GLY	-	expression tag	UNP O84835
A	-1	SER	-	expression tag	UNP O84835
A	0	HIS	-	expression tag	UNP O84835
B	-19	MET	-	expression tag	UNP O84835

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-18	GLY	-	expression tag	UNP 084835
B	-17	SER	-	expression tag	UNP 084835
B	-16	SER	-	expression tag	UNP 084835
B	-15	HIS	-	expression tag	UNP 084835
B	-14	HIS	-	expression tag	UNP 084835
B	-13	HIS	-	expression tag	UNP 084835
B	-12	HIS	-	expression tag	UNP 084835
B	-11	HIS	-	expression tag	UNP 084835
B	-10	HIS	-	expression tag	UNP 084835
B	-9	SER	-	expression tag	UNP 084835
B	-8	SER	-	expression tag	UNP 084835
B	-7	GLY	-	expression tag	UNP 084835
B	-6	LEU	-	expression tag	UNP 084835
B	-5	VAL	-	expression tag	UNP 084835
B	-4	PRO	-	expression tag	UNP 084835
B	-3	ARG	-	expression tag	UNP 084835
B	-2	GLY	-	expression tag	UNP 084835
B	-1	SER	-	expression tag	UNP 084835
B	0	HIS	-	expression tag	UNP 084835
C	-19	MET	-	expression tag	UNP 084835
C	-18	GLY	-	expression tag	UNP 084835
C	-17	SER	-	expression tag	UNP 084835
C	-16	SER	-	expression tag	UNP 084835
C	-15	HIS	-	expression tag	UNP 084835
C	-14	HIS	-	expression tag	UNP 084835
C	-13	HIS	-	expression tag	UNP 084835
C	-12	HIS	-	expression tag	UNP 084835
C	-11	HIS	-	expression tag	UNP 084835
C	-10	HIS	-	expression tag	UNP 084835
C	-9	SER	-	expression tag	UNP 084835
C	-8	SER	-	expression tag	UNP 084835
C	-7	GLY	-	expression tag	UNP 084835
C	-6	LEU	-	expression tag	UNP 084835
C	-5	VAL	-	expression tag	UNP 084835
C	-4	PRO	-	expression tag	UNP 084835
C	-3	ARG	-	expression tag	UNP 084835
C	-2	GLY	-	expression tag	UNP 084835
C	-1	SER	-	expression tag	UNP 084835
C	0	HIS	-	expression tag	UNP 084835
D	-19	MET	-	expression tag	UNP 084835
D	-18	GLY	-	expression tag	UNP 084835
D	-17	SER	-	expression tag	UNP 084835

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Chain	Residue	Modelled	Actual	Comment	Reference
D	-16	SER	-	expression tag	UNP O84835
D	-15	HIS	-	expression tag	UNP O84835
D	-14	HIS	-	expression tag	UNP O84835
D	-13	HIS	-	expression tag	UNP O84835
D	-12	HIS	-	expression tag	UNP O84835
D	-11	HIS	-	expression tag	UNP O84835
D	-10	HIS	-	expression tag	UNP O84835
D	-9	SER	-	expression tag	UNP O84835
D	-8	SER	-	expression tag	UNP O84835
D	-7	GLY	-	expression tag	UNP O84835
D	-6	LEU	-	expression tag	UNP O84835
D	-5	VAL	-	expression tag	UNP O84835
D	-4	PRO	-	expression tag	UNP O84835
D	-3	ARG	-	expression tag	UNP O84835
D	-2	GLY	-	expression tag	UNP O84835
D	-1	SER	-	expression tag	UNP O84835
D	0	HIS	-	expression tag	UNP O84835

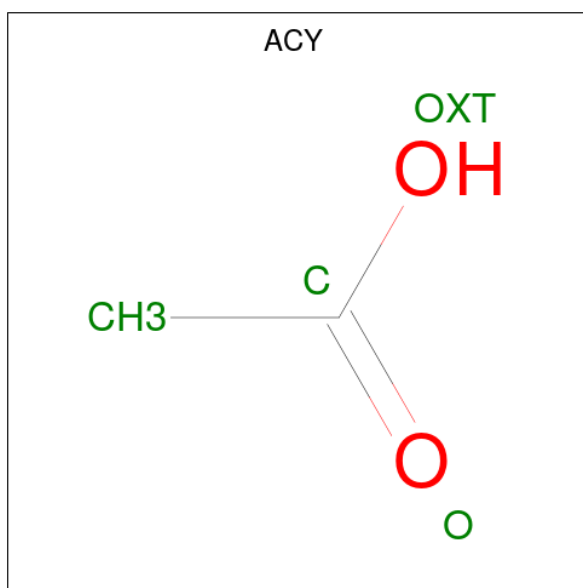
- Molecule 2 is FE (III) ION (three-letter code: FE) (formula: Fe).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total Fe 1 1	0	0
2	B	1	Total Fe 1 1	0	0
2	C	1	Total Fe 1 1	0	0
2	D	1	Total Fe 1 1	0	0

- Molecule 3 is MANGANESE (II) ION (three-letter code: MN) (formula: Mn).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total Mn 1 1	0	0
3	B	1	Total Mn 1 1	0	0
3	C	1	Total Mn 1 1	0	0
3	D	1	Total Mn 1 1	0	0

- Molecule 4 is ACETIC ACID (three-letter code: ACY) (formula: C<sub>2</sub>H<sub>4</sub>O<sub>2</sub>).



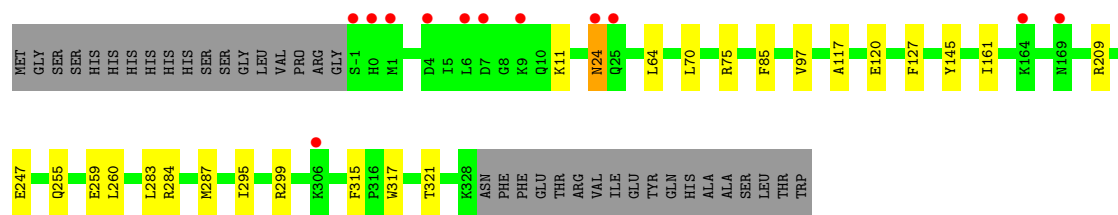
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 4 2 2	0	0
4	A	1	Total C O 4 2 2	0	0
4	A	1	Total C O 4 2 2	0	0
4	B	1	Total C O 4 2 2	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	149	Total O 149 149	0	0
5	B	153	Total O 153 153	0	0
5	C	115	Total O 115 115	0	0
5	D	110	Total O 110 110	0	0







## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	75.22Å 98.00Å 100.29Å 90.00° 97.79° 90.00°	Depositor
Resolution (Å)	29.66 – 2.20 29.30 – 2.20	Depositor EDS
% Data completeness (in resolution range)	99.4 (29.66-2.20) 99.4 (29.30-2.20)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.06 (at 2.20Å)	Xtrriage
Refinement program	REFMAC 5.5.0109	Depositor
R, $R_{free}$	0.186 , 0.235 0.184 , 0.235	Depositor DCC
$R_{free}$ test set	3666 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	27.1	Xtrriage
Anisotropy	0.093	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 35.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	11353	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	27.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.88% 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 [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: FE, MN, ACY

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	0.40	0/2746	0.51	0/3715
1	B	0.40	0/2797	0.52	0/3784
1	C	0.40	0/2724	0.50	0/3684
1	D	0.39	0/2778	0.50	0/3756
All	All	0.40	0/11045	0.51	0/14939

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	2685	0	2667	13	0
1	B	2736	0	2717	15	0
1	C	2663	0	2641	13	0
1	D	2718	0	2699	21	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
3	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	A	12	0	9	0	0
4	B	4	0	3	0	0
5	A	149	0	0	0	0
5	B	153	0	0	1	0
5	C	115	0	0	0	0
5	D	110	0	0	0	0
All	All	11353	0	10736	55	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 3.

The worst 5 of 55 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:D:283:LEU:HA	1:D:287:MET:HE1	1.50	0.92
1:C:161:ILE:HD13	1:C:187:GLY:HA3	1.56	0.87
1:B:199:SER:HB3	1:B:268:GLU:OE2	1.77	0.85
1:D:284:ARG:H	1:D:287:MET:HE2	1.44	0.82
1:D:283:LEU:HA	1:D:287:MET:CE	2.23	0.68

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
1	A	325/366 (89%)	318 (98%)	6 (2%)	1 (0%)	41 46
1	B	332/366 (91%)	331 (100%)	1 (0%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	322/366 (88%)	321 (100%)	1 (0%)	0	100	100
1	D	328/366 (90%)	324 (99%)	4 (1%)	0	100	100
All	All	1307/1464 (89%)	1294 (99%)	12 (1%)	1 (0%)	51	60

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	7	ASP

### 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	291/327 (89%)	285 (98%)	6 (2%)	53	67
1	B	298/327 (91%)	291 (98%)	7 (2%)	50	63
1	C	288/327 (88%)	281 (98%)	7 (2%)	49	62
1	D	296/327 (90%)	292 (99%)	4 (1%)	67	80
All	All	1173/1308 (90%)	1149 (98%)	24 (2%)	55	69

5 of 24 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	68	ASP
1	C	276	LEU
1	C	209	ARG
1	C	281	LEU
1	B	-3	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 25 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	273	GLN

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Mol	Chain	Res	Type
1	C	45	ASN
1	D	94	ASN
1	C	29	ASN
1	C	210	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 12 ligands modelled in this entry, 8 are monoatomic - leaving 4 for Mogul analysis.

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	ACY	A	404	-	3,3,3	0.79	0	3,3,3	0.77	0
4	ACY	B	403	-	3,3,3	0.71	0	3,3,3	0.88	0
4	ACY	A	405	-	3,3,3	0.80	0	3,3,3	0.74	0
4	ACY	A	403	-	3,3,3	0.77	0	3,3,3	0.83	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, 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	A	327/366 (89%)	-0.10	6 (1%) 68 66	13, 22, 37, 53	0
1	B	334/366 (91%)	-0.07	7 (2%) 63 61	12, 24, 37, 53	0
1	C	324/366 (88%)	-0.03	9 (2%) 53 51	15, 29, 45, 49	0
1	D	330/366 (90%)	0.00	12 (3%) 42 41	17, 27, 45, 73	0
All	All	1315/1464 (89%)	-0.05	34 (2%) 56 53	12, 25, 43, 73	0

The worst 5 of 34 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	6	LEU	7.3
1	A	6	LEU	6.2
1	A	319	SER	5.7
1	B	6	LEU	5.1
1	D	25	GLN	4.6

### 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 monosaccharides 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	ACY	A	405	4/4	0.69	0.46	63,63,63,63	0
4	ACY	A	403	4/4	0.83	0.16	45,45,45,45	0
4	ACY	A	404	4/4	0.89	0.27	45,45,45,45	0
4	ACY	B	403	4/4	0.95	0.09	33,33,34,34	0
2	FE	C	401	1/1	0.97	0.04	47,47,47,47	0
3	MN	A	402	1/1	0.98	0.05	36,36,36,36	0
3	MN	C	402	1/1	0.98	0.05	42,42,42,42	0
2	FE	D	401	1/1	0.98	0.05	48,48,48,48	0
2	FE	A	401	1/1	0.99	0.04	38,38,38,38	0
3	MN	B	401	1/1	0.99	0.05	43,43,43,43	0
2	FE	B	402	1/1	0.99	0.02	45,45,45,45	0
3	MN	D	402	1/1	0.99	0.03	43,43,43,43	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.