



# Full wwPDB X-ray Structure Validation Report

Feb 27, 2014 – 12:24 AM GMT

PDB ID : 2FH2  
Title : C-terminal half of gelsolin soaked in EGTA at pH 4.5  
Authors : Chumnarnsilpa, S.; Loonchanta, A.; Xue, B.; Choe, H.; Urosev, D.; Wang, H.;  
Burtnick, L.D.; Robinson, R.C.  
Deposited on : 2005-12-23  
Resolution : 2.50 Å(reported)

This is a full wwPDB 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 <http://wwpdb.org/ValidationPDFNotes.html>

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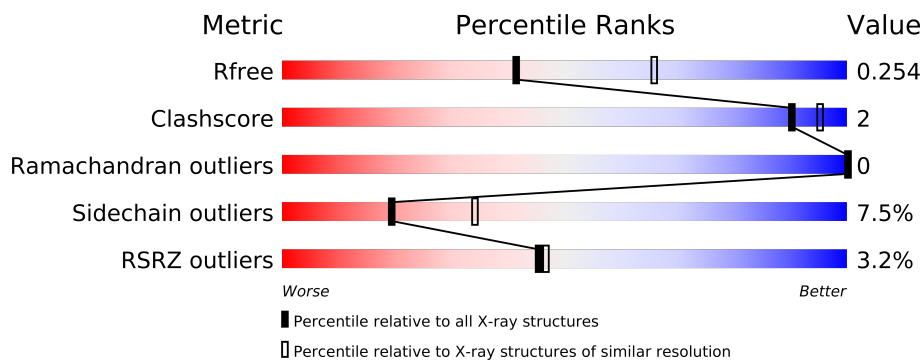
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.15 2013  
Xtriage (Phenix) : dev-1323  
EDS : stable22639  
Percentile statistics : 21963  
Refmac : 5.8.0049  
CCP4 : 6.3.0 (Settle)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)  
Validation Pipeline (wwPDB-VP) : stable22683

# 1 Overall quality at a glance

The reported resolution of this entry is 2.50 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))
$R_{free}$	66092	2784 (2.50-2.50)
Clashscore	79885	3562 (2.50-2.50)
Ramachandran outliers	78287	3480 (2.50-2.50)
Sidechain outliers	78261	3482 (2.50-2.50)
RSRZ outliers	66119	2785 (2.50-2.50)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	344	
1	B	344	
1	C	344	

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 7835 atoms, of which 0 are hydrogen and 0 are deuterium.

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 Gelsolin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	321	Total	C	N	O	S	0	0	0
			2485	1571	425	482	7			
1	B	324	Total	C	N	O	S	0	0	0
			2515	1587	433	489	6			
1	C	322	Total	C	N	O	S	0	0	0
			2495	1576	427	486	6			

- Molecule 2 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	3	Total	Ca	0	0
			3	3		
2	A	3	Total	Ca	0	0
			3	3		
2	C	2	Total	Ca	0	0
			2	2		

- Molecule 3 is water.

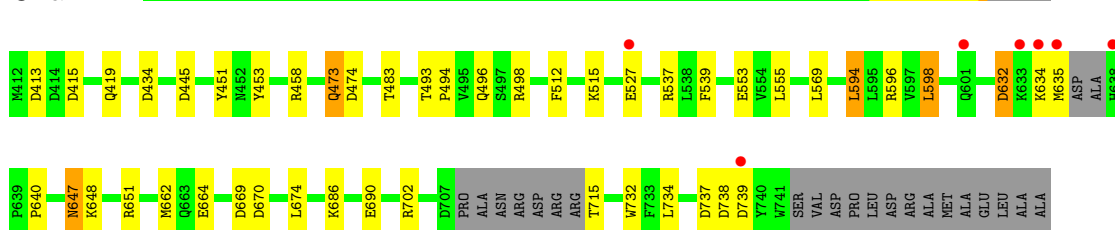
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	134	Total	O	0	0
			134	134		
3	B	125	Total	O	0	0
			125	125		
3	C	73	Total	O	0	0
			73	73		

### 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 errors 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.

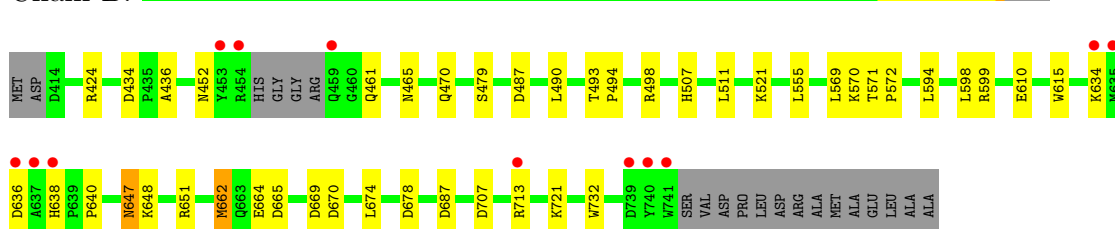
#### • Molecule 1: Gelsolin

Chain A:



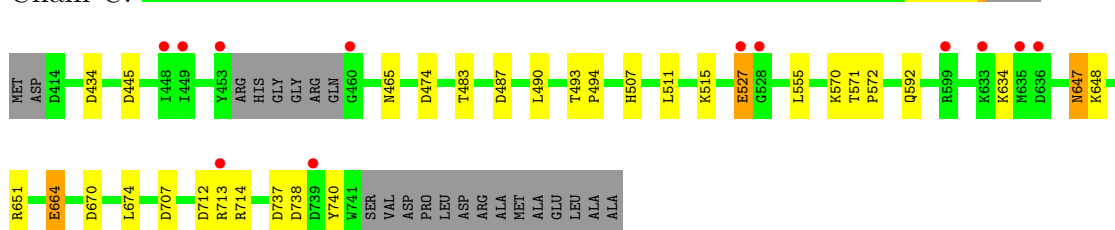
#### • Molecule 1: Gelsolin

Chain B:



#### • Molecule 1: Gelsolin

Chain C:



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	85.29Å 90.93Å 157.62Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.92 – 2.50 19.91 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.5 (19.92-2.50) 99.5 (19.91-2.50)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.75 (at 2.50Å)	Xtriage
Refinement program	REFMAC 5.1.24	Depositor
R, $R_{free}$	0.204 , 0.255 0.210 , 0.254	Depositor DCC
$R_{free}$ test set	2165 reflections (5.32%)	DCC
Wilson B-factor (Å <sup>2</sup> )	39.2	Xtriage
Anisotropy	0.050	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 21.2	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	1 of 42843 reflections (0.002%)	Xtriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	7835	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	40.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.20% of the height of the origin peak. No significant pseudotranslation is detected.*

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

## 5 Model quality

### 5.1 Standard geometry

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

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	0.57	0/2542	0.80	10/3447 (0.3%)
1	B	0.56	0/2573	0.81	9/3493 (0.3%)
1	C	0.51	0/2553	0.79	9/3467 (0.3%)
All	All	0.55	0/7668	0.80	28/10407 (0.3%)

There are no bond length outliers.

All (28) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	670	ASP	CB-CG-OD2	7.26	124.83	118.30
1	B	434	ASP	CB-CG-OD2	6.89	124.50	118.30
1	C	487	ASP	CB-CG-OD2	6.84	124.45	118.30
1	C	434	ASP	CB-CG-OD2	6.68	124.31	118.30
1	B	670	ASP	CB-CG-OD2	6.60	124.24	118.30
1	B	687	ASP	CB-CG-OD2	6.58	124.23	118.30
1	A	445	ASP	CB-CG-OD2	6.46	124.11	118.30
1	A	434	ASP	CB-CG-OD2	6.42	124.07	118.30
1	A	738	ASP	CB-CG-OD2	6.21	123.89	118.30
1	B	707	ASP	CB-CG-OD2	6.19	123.87	118.30
1	B	487	ASP	CB-CG-OD2	6.17	123.86	118.30
1	C	737	ASP	CB-CG-OD2	6.09	123.78	118.30
1	C	474	ASP	CB-CG-OD2	6.06	123.75	118.30
1	A	737	ASP	CB-CG-OD2	5.90	123.61	118.30
1	C	707	ASP	CB-CG-OD2	5.87	123.59	118.30
1	A	670	ASP	CB-CG-OD2	5.80	123.52	118.30
1	A	474	ASP	CB-CG-OD2	5.72	123.45	118.30
1	C	445	ASP	CB-CG-OD2	5.63	123.37	118.30
1	C	712	ASP	CB-CG-OD2	5.61	123.35	118.30
1	B	678	ASP	CB-CG-OD2	5.60	123.34	118.30
1	B	636	ASP	CB-CG-OD2	5.56	123.31	118.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	669	ASP	CB-CG-OD2	5.39	123.15	118.30
1	A	669	ASP	CB-CG-OD2	5.26	123.03	118.30
1	A	415	ASP	CB-CG-OD2	5.24	123.02	118.30
1	A	632	ASP	CB-CG-OD2	5.23	123.01	118.30
1	C	738	ASP	CB-CG-OD2	5.19	122.97	118.30
1	A	739	ASP	CB-CG-OD2	5.05	122.85	118.30
1	B	665	ASP	CB-CG-OD2	5.01	122.81	118.30

There are no chirality outliers.

There are no planarity outliers.

## 5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2485	0	2405	12	0
1	B	2515	0	2437	12	0
1	C	2495	0	2416	8	0
2	A	3	0	0	0	0
2	B	3	0	0	0	0
2	C	2	0	0	0	0
3	A	134	0	0	2	0
3	B	125	0	0	2	0
3	C	73	0	0	0	0
All	All	7835	0	7258	31	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 2.

All (31) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:B:647:ASN:HD22	1:B:647:ASN:C	1.98	0.67
1:B:465:ASN:ND2	1:B:479:SER:OG	2.32	0.63
1:A:715:THR:N	3:A:234:HOH:O	2.32	0.61
1:B:647:ASN:ND2	3:B:5072:HOH:O	2.38	0.57

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:662:MET:CE	1:A:734:LEU:HB3	2.37	0.55
1:A:647:ASN:C	1:A:647:ASN:HD22	2.12	0.52
1:B:493:THR:N	1:B:494:PRO:CD	2.72	0.52
1:A:483:THR:HG22	1:A:496:GLN:HE22	1.76	0.50
1:B:662:MET:HB3	1:B:664:GLU:OE1	2.12	0.50
1:B:507:HIS:HA	3:B:108:HOH:O	2.13	0.49
1:B:610:GLU:HG3	1:B:615:TRP:CZ2	2.48	0.48
1:C:571:THR:HG23	1:C:572:PRO:HD2	1.96	0.48
1:A:640:PRO:HG2	1:A:732:TRP:CZ3	2.51	0.46
1:C:571:THR:CG2	1:C:572:PRO:HD2	2.45	0.46
1:A:539:PHE:CE2	1:A:553:GLU:HB2	2.51	0.45
1:A:493:THR:N	1:A:494:PRO:CD	2.79	0.45
1:B:571:THR:HB	1:B:572:PRO:CD	2.46	0.45
1:B:436:ALA:HB2	1:C:527:GLU:HB3	1.99	0.45
1:C:664:GLU:HG2	1:C:740:TYR:OH	2.17	0.44
1:C:647:ASN:C	1:C:647:ASN:HD22	2.20	0.43
1:C:507:HIS:O	1:C:511:LEU:HD13	2.19	0.43
1:B:640:PRO:HG3	1:B:732:TRP:CE3	2.54	0.42
1:A:473:GLN:HB3	3:A:140:HOH:O	2.19	0.42
1:A:451:TYR:CE2	1:A:453:TYR:HB3	2.53	0.42
1:C:465:ASN:ND2	1:C:483:THR:OG1	2.37	0.42
1:C:493:THR:N	1:C:494:PRO:CD	2.82	0.41
1:A:512:PHE:O	1:A:515:LYS:HB2	2.20	0.41
1:B:647:ASN:ND2	1:B:647:ASN:C	2.68	0.41
1:A:640:PRO:HG2	1:A:732:TRP:CE3	2.56	0.41
1:B:452:ASN:ND2	1:B:461:GLN:HG2	2.36	0.40
1:A:594:LEU:HD22	1:A:598:LEU:HD22	2.03	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles

### 5.3.1 Protein backbone ⓘ

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	315/344 (92%)	310 (98%)	5 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	320/344 (93%)	313 (98%)	7 (2%)	0	100	100
1	C	318/344 (92%)	307 (96%)	11 (4%)	0	100	100
All	All	953/1032 (92%)	930 (98%)	23 (2%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains ⓘ

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	257/274 (94%)	234 (91%)	23 (9%)	14	26
1	B	260/274 (95%)	239 (92%)	21 (8%)	17	30
1	C	258/274 (94%)	244 (95%)	14 (5%)	31	53
All	All	775/822 (94%)	717 (92%)	58 (8%)	19	34

All (58) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	413	ASP
1	A	419	GLN
1	A	458	ARG
1	A	473	GLN
1	A	498	ARG
1	A	527	GLU
1	A	537	ARG
1	A	555	LEU
1	A	569	LEU
1	A	594	LEU
1	A	596	ARG
1	A	598	LEU
1	A	632	ASP
1	A	634	LYS
1	A	635	MET
1	A	647	ASN
1	A	648	LYS

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Mol	Chain	Res	Type
1	A	651	ARG
1	A	664	GLU
1	A	674	LEU
1	A	686	LYS
1	A	690	GLU
1	A	702	ARG
1	B	424	ARG
1	B	470	GLN
1	B	490	LEU
1	B	498	ARG
1	B	511	LEU
1	B	521	LYS
1	B	555	LEU
1	B	569	LEU
1	B	570	LYS
1	B	594	LEU
1	B	598	LEU
1	B	599	ARG
1	B	634	LYS
1	B	638	HIS
1	B	647	ASN
1	B	648	LYS
1	B	651	ARG
1	B	662	MET
1	B	674	LEU
1	B	713	ARG
1	B	721	LYS
1	C	490	LEU
1	C	515	LYS
1	C	527	GLU
1	C	555	LEU
1	C	570	LYS
1	C	592	GLN
1	C	634	LYS
1	C	647	ASN
1	C	648	LYS
1	C	651	ARG
1	C	664	GLU
1	C	674	LEU
1	C	713	ARG
1	C	714	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such

sidechains are listed below:

Mol	Chain	Res	Type
1	A	419	GLN
1	A	452	ASN
1	A	461	GLN
1	A	647	ASN
1	B	452	ASN
1	B	461	GLN
1	B	465	ASN
1	B	470	GLN
1	B	592	GLN
1	B	604	GLN
1	B	647	ASN
1	C	421	GLN
1	C	452	ASN
1	C	461	GLN
1	C	507	HIS
1	C	647	ASN
1	C	679	GLN

### 5.3.3 RNA ⓘ

There are no RNA chains 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 ⓘ

Of 8 ligands modelled in this entry, 8 are 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.

## 5.7 Other polymers ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues

There are no chain breaks in this entry.

## 6 Fit of model and data ⓘ

### 6.1 Protein, DNA and RNA chains ⓘ

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	321/344 (93%)	-0.15	7 (2%) 59 61	26, 35, 52, 81	0
1	B	324/344 (94%)	-0.08	12 (3%) 39 41	25, 36, 57, 76	0
1	C	322/344 (93%)	0.10	12 (3%) 39 41	31, 43, 58, 73	0
All	All	967/1032 (93%)	-0.04	31 (3%) 45 47	25, 39, 57, 81	0

All (31) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	635	MET	5.0
1	B	636	ASP	4.7
1	A	635	MET	4.4
1	B	459	GLN	4.2
1	C	453	TYR	4.1
1	B	454	ARG	3.7
1	B	739	ASP	3.6
1	B	741	TRP	3.6
1	B	637	ALA	3.5
1	A	638	HIS	3.4
1	A	633	LYS	3.3
1	C	713	ARG	3.2
1	A	634	LYS	3.1
1	C	636	ASP	2.9
1	C	599	ARG	2.8
1	B	453	TYR	2.7
1	B	638	HIS	2.7
1	C	527	GLU	2.6
1	B	713	ARG	2.6
1	A	739	ASP	2.5
1	B	634	LYS	2.5
1	A	601	GLN	2.4
1	C	528	GLY	2.3

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Mol	Chain	Res	Type	RSRZ
1	B	740	TYR	2.2
1	C	449	ILE	2.2
1	B	635	MET	2.2
1	C	633	LYS	2.1
1	C	448	ILE	2.1
1	C	460	GLY	2.0
1	C	739	ASP	2.0
1	A	527	GLU	2.0

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

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

## 6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 6.4 Ligands ⓘ

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	RSR	LLDF	B-factors(Å <sup>2</sup> )	Q<0.9
2	CA	B	2002	1/1	0.04	-1.60	25,25,25,25	0
2	CA	B	2003	1/1	0.07	-2.13	35,35,35,35	0
2	CA	A	1001	1/1	0.04	-2.60	27,27,27,27	0
2	CA	B	2001	1/1	0.04	-3.58	27,27,27,27	0
2	CA	C	3002	1/1	0.05	-3.90	30,30,30,30	0
2	CA	C	3001	1/1	0.03	-4.41	31,31,31,31	0
2	CA	A	1003	1/1	0.02	-4.92	26,26,26,26	0
2	CA	A	1002	1/1	0.03	-6.54	26,26,26,26	0

## 6.5 Other polymers ⓘ

There are no such residues in this entry.