



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 05:30 AM GMT

PDB ID : 2R15  
Title : Crystal structure of the myomesin domains 12 and 13  
Authors : Pinotsis, N.; Wilmanns, M.; Lange, S.  
Deposited on : 2007-08-22  
Resolution : 2.24 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  
<http://wwpdb.org/validation/2016/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 : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20026688  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Refmac : 5.8.0135  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

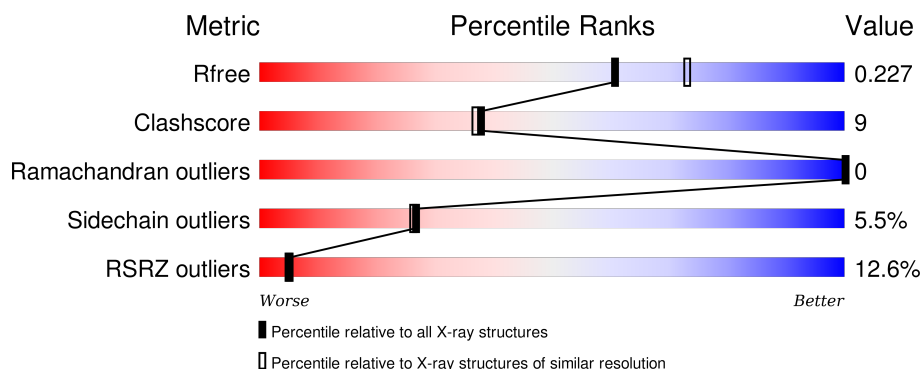
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.24 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))
$R_{free}$	91344	1611 (2.26-2.22)
Clashscore	102246	1764 (2.26-2.22)
Ramachandran outliers	100387	1724 (2.26-2.22)
Sidechain outliers	100360	1724 (2.26-2.22)
RSRZ outliers	91569	1616 (2.26-2.22)

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. 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	212	
1	B	212	

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
2	ACT	A	604	-	-	-	X
3	GOL	B	602	-	-	-	X

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 3489 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.

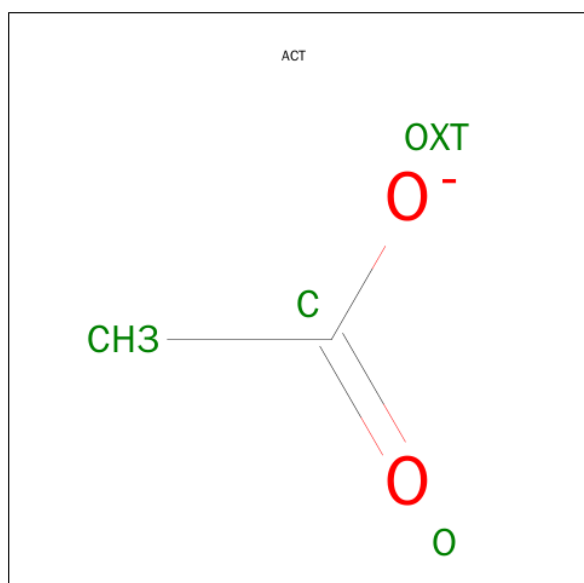
- Molecule 1 is a protein called Myomesin-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	207	Total	C	N	O	S	0	0	0
			1609	1017	272	317	3			
1	B	207	Total	C	N	O	S	0	1	0
			1611	1016	273	319	3			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1456	GLY	-	EXPRESSION TAG	UNP P52179
A	1457	SER	-	EXPRESSION TAG	UNP P52179
A	1458	SER	-	EXPRESSION TAG	UNP P52179
B	1456	GLY	-	EXPRESSION TAG	UNP P52179
B	1457	SER	-	EXPRESSION TAG	UNP P52179
B	1458	SER	-	EXPRESSION TAG	UNP P52179

- Molecule 2 is ACETATE ION (three-letter code: ACT) (formula: C<sub>2</sub>H<sub>3</sub>O<sub>2</sub>).



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

- Molecule 3 is GLYCEROL (three-letter code: GOL) (formula:  $C_3H_8O_3$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			6	3	3		
3	B	1	Total	C	O	0	0
			6	3	3		
3	B	1	Total	C	O	0	0
			6	3	3		

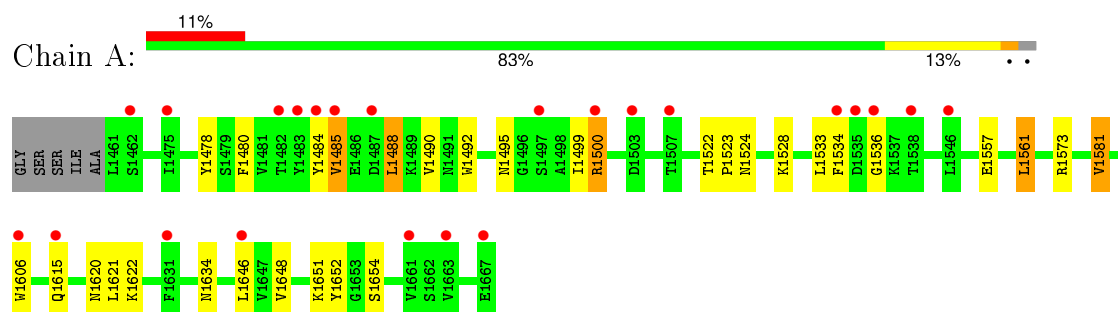
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	119	Total	O	0	0
			119	119		
4	B	128	Total	O	0	0
			128	128		

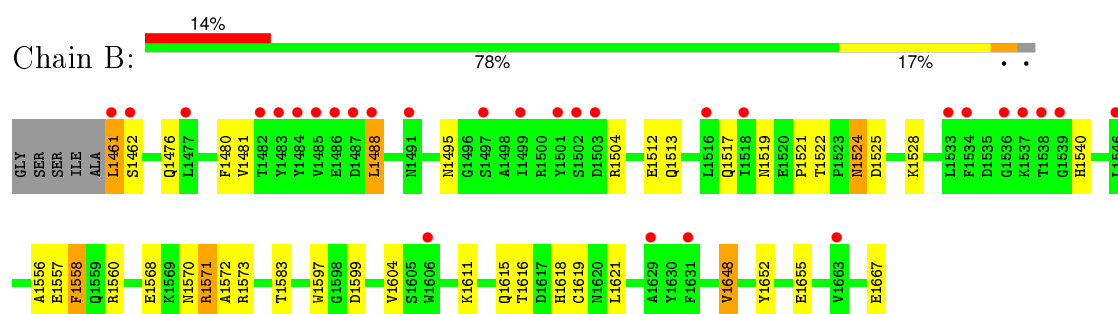
### 3 Residue-property plots [i](#)

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 ( $\text{RSRZ} > 2$ ). 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: Myomesin-1



#### • Molecule 1: Myomesin-1



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	61.50 Å 87.87 Å 203.08 Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.87 – 2.24 19.87 – 2.24	Depositor EDS
% Data completeness (in resolution range)	100.0 (19.87-2.24) 95.6 (19.87-2.24)	Depositor EDS
$R_{merge}$	0.08	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.56 (at 2.23 Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, $R_{free}$	0.196 , 0.223 0.200 , 0.227	Depositor DCC
$R_{free}$ test set	683 reflections (2.73%)	DCC
Wilson B-factor (Å <sup>2</sup> )	34.6	Xtriage
Anisotropy	0.420	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.28 , 35.8	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 25699 reflections	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	3489	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	45.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.78% 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, 0.375 respectively for untwinned datasets, and 0.333, 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: GOL, ACT

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	0.60	0/1642	0.67	0/2227
1	B	0.60	0/1643	0.69	0/2228
All	All	0.60	0/3285	0.68	0/4455

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	A	1609	0	1570	21	1
1	B	1611	0	1568	39	1
2	A	4	0	3	0	0
3	A	6	0	8	0	0
3	B	12	0	16	0	0
4	A	119	0	0	2	0
4	B	128	0	0	1	0
All	All	3489	0	3165	59	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 9.



All (59) 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:A:1615:GLN:HG3	1:A:1621:LEU:H	1.26	0.99
1:B:1616:THR:HG23	1:B:1618:HIS:H	1.27	0.98
1:B:1604:VAL:HG12	1:B:1648:VAL:CG1	1.98	0.94
1:B:1616:THR:CG2	1:B:1619:CYS:H	1.89	0.85
1:B:1517:GLN:HE21	1:B:1519:ASN:ND2	1.75	0.83
1:B:1604:VAL:HG12	1:B:1648:VAL:HG13	1.63	0.79
1:B:1616:THR:HG23	1:B:1618:HIS:N	2.00	0.77
1:B:1461:LEU:HD21	1:B:1540:HIS:HB2	1.68	0.74
1:B:1571[B]:ARG:NH2	1:B:1655:GLU:OE2	2.22	0.73
1:B:1522:THR:OG1	1:B:1524:ASN:HB2	1.88	0.73
1:B:1604:VAL:HG12	1:B:1648:VAL:HG12	1.70	0.72
1:B:1616:THR:HG22	1:B:1619:CYS:H	1.53	0.72
1:B:1560:ARG:NE	4:B:197:HOH:O	2.23	0.71
1:A:1500:ARG:H	1:A:1500:ARG:HD3	1.58	0.69
1:B:1476:GLN:HB3	1:B:1517:GLN:OE1	1.94	0.67
1:A:1620:ASN:OD1	1:A:1622:LYS:HE3	1.97	0.65
1:B:1504:ARG:NH2	1:B:1525:ASP:OD2	2.32	0.61
1:B:1521:PRO:HD2	1:B:1558:PHE:CE1	2.38	0.59
1:B:1517:GLN:HE21	1:B:1519:ASN:HD22	1.49	0.57
1:A:1495:ASN:ND2	1:A:1528:LYS:H	2.03	0.56
1:B:1461:LEU:HD21	1:B:1540:HIS:CB	2.34	0.56
1:A:1634:ASN:HB2	4:A:242:HOH:O	2.07	0.55
1:A:1500:ARG:HG2	1:A:1500:ARG:O	2.07	0.54
1:B:1570:ASN:HB3	1:B:1599:ASP:O	2.07	0.53
1:B:1571[B]:ARG:HH22	1:B:1655:GLU:CG	2.22	0.52
1:B:1495:ASN:ND2	1:B:1528:LYS:H	2.08	0.52
1:A:1478:TYR:HE1	1:A:1480:PHE:CE1	2.29	0.52
1:B:1488:LEU:H	1:B:1488:LEU:HD23	1.77	0.50
1:B:1461:LEU:HG	1:B:1462:SER:N	2.27	0.49
1:B:1504:ARG:HH22	1:B:1525:ASP:CG	2.16	0.49
1:B:1517:GLN:HE21	1:B:1519:ASN:HD21	1.55	0.48
1:A:1492:TRP:HB3	1:A:1499:ILE:HD12	1.95	0.48
1:A:1615:GLN:HG3	1:A:1621:LEU:N	2.11	0.47
1:B:1517:GLN:NE2	1:B:1519:ASN:ND2	2.54	0.47
1:B:1556:ALA:O	1:B:1560:ARG:HG3	2.14	0.47
1:A:1606:TRP:CD1	1:A:1621:LEU:HD13	2.50	0.46
1:A:1534:PHE:CE2	1:A:1536:GLY:O	2.69	0.45
1:B:1616:THR:HG22	1:B:1619:CYS:N	2.26	0.45
1:A:1495:ASN:HD21	1:A:1528:LYS:H	1.64	0.45
1:B:1572:ALA:HA	1:B:1597:TRP:O	2.17	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1522:THR:HB	1:A:1523:PRO:CD	2.47	0.44
1:A:1651:LYS:HE3	1:A:1652:TYR:CZ	2.52	0.44
1:A:1478:TYR:CE1	1:A:1480:PHE:CE1	3.06	0.44
1:B:1571[B]:ARG:HA	1:B:1652:TYR:HB2	1.99	0.44
1:A:1485:VAL:HG12	1:A:1488:LEU:HB3	1.99	0.44
1:B:1615:GLN:HG3	1:B:1621:LEU:H	1.81	0.43
1:B:1461:LEU:CD2	1:B:1540:HIS:HB2	2.44	0.43
1:B:1571[A]:ARG:HA	1:B:1652:TYR:HB2	1.99	0.43
1:B:1517:GLN:NE2	1:B:1519:ASN:HD22	2.15	0.43
1:A:1581:VAL:HG22	4:A:46:HOH:O	2.19	0.42
1:B:1611:LYS:HE3	1:B:1611:LYS:HB3	1.83	0.42
1:B:1480:PHE:CE2	1:B:1513:GLN:HB2	2.55	0.42
1:A:1557:GLU:HG3	1:A:1561:LEU:CD1	2.50	0.41
1:B:1616:THR:CG2	1:B:1619:CYS:N	2.72	0.41
1:A:1606:TRP:CZ2	1:A:1646:LEU:HD13	2.56	0.41
1:A:1581:VAL:HG13	1:B:1583:THR:HB	2.02	0.41
1:B:1568:GLU:O	1:B:1573:ARG:NH2	2.46	0.40
1:B:1571[B]:ARG:HH22	1:B:1655:GLU:CD	2.23	0.40
1:A:1648:VAL:O	1:A:1654:SER:HB2	2.22	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)
1:A:1478:TYR:OH	1:B:1557:GLU:OE2[7_545]	2.05	0.15

## 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	205/212 (97%)	197 (96%)	8 (4%)	0	<b>100</b> <b>100</b>

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	206/212 (97%)	201 (98%)	5 (2%)	0	100	100
All	All	411/424 (97%)	398 (97%)	13 (3%)	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	172/177 (97%)	162 (94%)	10 (6%)	25	24
1	B	172/177 (97%)	162 (94%)	10 (6%)	25	24
All	All	344/354 (97%)	324 (94%)	20 (6%)	27	24

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1484	TYR
1	A	1485	VAL
1	A	1488	LEU
1	A	1490	VAL
1	A	1500	ARG
1	A	1524	ASN
1	A	1533	LEU
1	A	1561	LEU
1	A	1573	ARG
1	A	1581	VAL
1	B	1461	LEU
1	B	1481	VAL
1	B	1488	LEU
1	B	1512	GLU
1	B	1524	ASN
1	B	1558	PHE
1	B	1571[A]	ARG
1	B	1571[B]	ARG

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Mol	Chain	Res	Type
1	B	1648	VAL
1	B	1667	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	1495	ASN
1	A	1513	GLN
1	A	1609	ASN
1	A	1615	GLN
1	A	1634	ASN
1	B	1495	ASN
1	B	1513	GLN
1	B	1519	ASN
1	B	1570	ASN

### 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 carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

4 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
3	GOL	A	601	-	5,5,5	0.33	0	5,5,5	0.23	0
2	ACT	A	604	-	1,3,3	2.39	1 (100%)	0,3,3	0.00	-
3	GOL	B	602	-	5,5,5	0.48	0	5,5,5	0.68	0
3	GOL	B	603	-	5,5,5	0.44	0	5,5,5	0.63	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
3	GOL	A	601	-	-	0/4/4/4	0/0/0/0
2	ACT	A	604	-	-	0/0/0/0	0/0/0/0
3	GOL	B	602	-	-	0/4/4/4	0/0/0/0
3	GOL	B	603	-	-	0/4/4/4	0/0/0/0

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	604	ACT	CH3-C	2.39	1.52	1.48

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 ⓘ

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	207/212 (97%)	0.65	23 (11%) 7 7	32, 44, 53, 80	0
1	B	207/212 (97%)	0.80	29 (14%) 4 4	34, 44, 53, 64	0
All	All	414/424 (97%)	0.72	52 (12%) 5 5	32, 44, 53, 80	0

All (52) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	1483	TYR	8.4
1	A	1484	TYR	6.7
1	B	1486	GLU	5.9
1	A	1483	TYR	5.3
1	A	1487	ASP	5.3
1	B	1484	TYR	5.2
1	A	1485	VAL	5.0
1	B	1487	ASP	4.9
1	B	1537	LYS	4.7
1	A	1535	ASP	4.7
1	B	1477	LEU	4.3
1	A	1482	THR	4.2
1	B	1538	THR	4.2
1	A	1606	TRP	3.9
1	B	1462	SER	3.7
1	B	1536	GLY	3.6
1	B	1461	LEU	3.5
1	A	1462	SER	3.5
1	B	1534	PHE	3.5
1	B	1503	ASP	3.4
1	B	1491	ASN	3.3
1	B	1539	GLY	3.3
1	A	1546	LEU	3.3
1	A	1536	GLY	3.2

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Mol	Chain	Res	Type	RSRZ
1	A	1667	GLU	3.1
1	B	1502	SER	3.1
1	B	1482	THR	3.1
1	A	1534	PHE	3.0
1	B	1485	VAL	2.9
1	B	1663	VAL	2.7
1	A	1503	ASP	2.7
1	A	1661	VAL	2.6
1	A	1500	ARG	2.6
1	B	1501	TYR	2.6
1	B	1606	TRP	2.5
1	B	1629	ALA	2.5
1	B	1488	LEU	2.4
1	B	1533	LEU	2.4
1	A	1475	ILE	2.4
1	B	1631	PHE	2.4
1	B	1499	ILE	2.3
1	A	1497	SER	2.3
1	A	1615	GLN	2.3
1	A	1507	THR	2.2
1	B	1546	LEU	2.2
1	B	1518	ILE	2.2
1	B	1516	LEU	2.2
1	A	1646	LEU	2.2
1	A	1663	VAL	2.1
1	A	1631	PHE	2.1
1	B	1497	SER	2.1
1	A	1538	THR	2.1

## 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. 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	RSCC	RSR	LLDF	B-factors(Å <sup>2</sup> )	Q<0.9
2	ACT	A	604	4/4	0.87	0.26	4.92	69,70,71,71	0
3	GOL	B	602	6/6	0.91	0.26	4.36	46,53,56,57	0
3	GOL	B	603	6/6	0.82	0.17	1.15	53,66,69,70	0
3	GOL	A	601	6/6	0.85	0.16	-	49,57,58,66	0

## 6.5 Other polymers

There are no such residues in this entry.