



# wwPDB X-ray Structure Validation Summary Report ⓘ

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PDB ID : 5ZAC  
Title : Crystal structure of ConA-R2M  
Authors : Gan, J.H.; Chen, G.S.; Hu, R.T.  
Deposited on : 2018-02-07  
Resolution : 2.59 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  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.13.1  
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) : 2.13.1

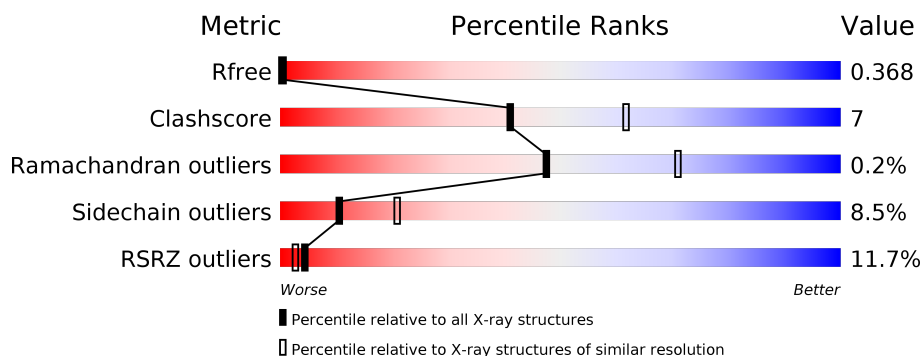
# 1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.59 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	3163 (2.60-2.60)
Clashscore	141614	3518 (2.60-2.60)
Ramachandran outliers	138981	3455 (2.60-2.60)
Sidechain outliers	138945	3455 (2.60-2.60)
RSRZ outliers	127900	3104 (2.60-2.60)

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  $\leq 5\%$ . 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	237	<div> <div>11%</div> <div>80%</div> <div>16%</div> <div>..</div> </div>
1	B	237	<div> <div>9%</div> <div>79%</div> <div>17%</div> <div>..</div> </div>
1	C	237	<div> <div>12%</div> <div>75%</div> <div>21%</div> <div>..</div> </div>
1	D	237	<div> <div>14%</div> <div>77%</div> <div>18%</div> <div>..</div> </div>

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 crite-

ria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
5	TA5	D	305	-	-	-	X

## 2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 7348 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 Concanavalin-A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	230	Total	C	N	O	S	0	0	0
			1760	1113	292	353	2			
1	B	232	Total	C	N	O	S	0	1	0
			1772	1121	294	355	2			
1	C	231	Total	C	N	O	S	0	1	0
			1763	1116	293	352	2			
1	D	231	Total	C	N	O	S	0	1	0
			1763	1116	293	352	2			

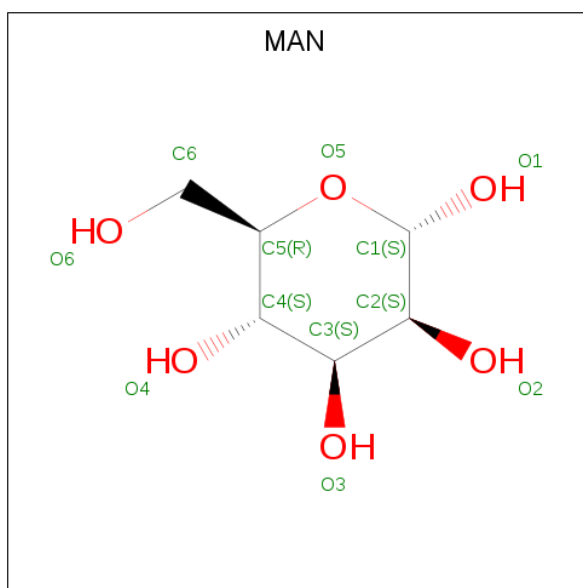
- Molecule 2 is MANGANESE (II) ION (three-letter code: MN) (formula: Mn).

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

- Molecule 3 is CALCIUM ION (three-letter code: CA) (formula: Ca).

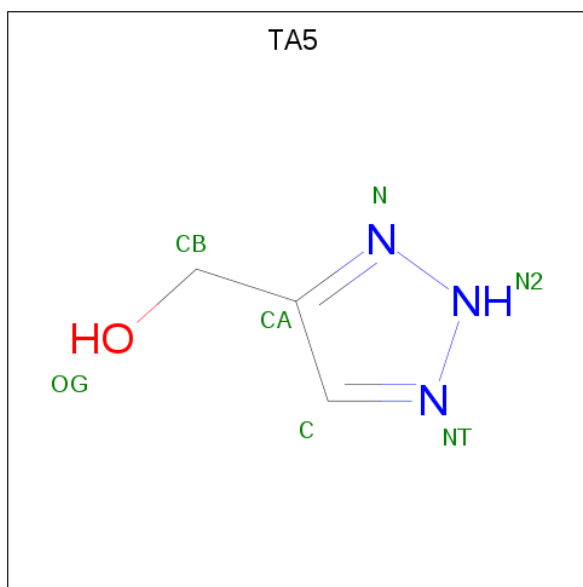
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	1	Total	Ca	0	0
			1	1		
3	A	2	Total	Ca	0	0
			2	2		
3	D	2	Total	Ca	0	0
			2	2		
3	C	1	Total	Ca	0	0
			1	1		

- Molecule 4 is alpha-D-mannopyranose (three-letter code: MAN) (formula:  $C_6H_{12}O_6$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	C	1	Total	C	O	0	0
			11	6	5		
4	D	1	Total	C	O	0	0
			11	6	5		

- Molecule 5 is 2H-1,2,3-TRIAZOL-4-YLMETHANOL (three-letter code: TA5) (formula:  $C_3H_5N_3O$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	C	1	Total	C	N	O	0	0
			7	3	3	1		
5	D	1	Total	C	N	O	0	0
			7	3	3	1		

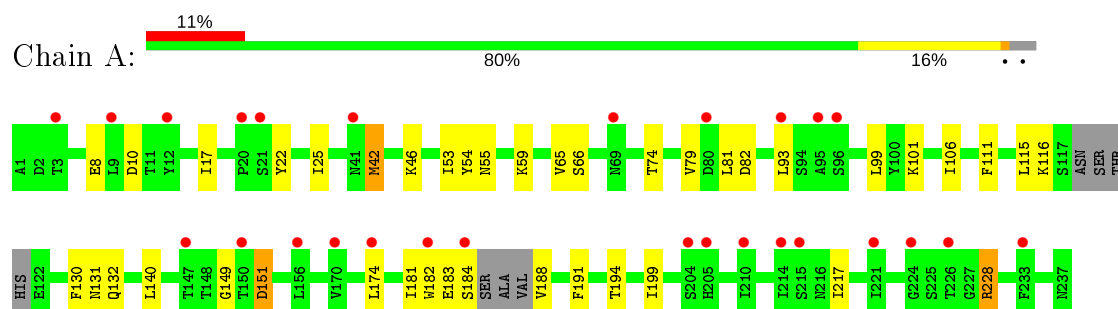
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	57	Total	O	0	0
			57	57		
6	B	64	Total	O	0	0
			64	64		
6	C	58	Total	O	0	0
			58	58		
6	D	65	Total	O	0	0
			65	65		

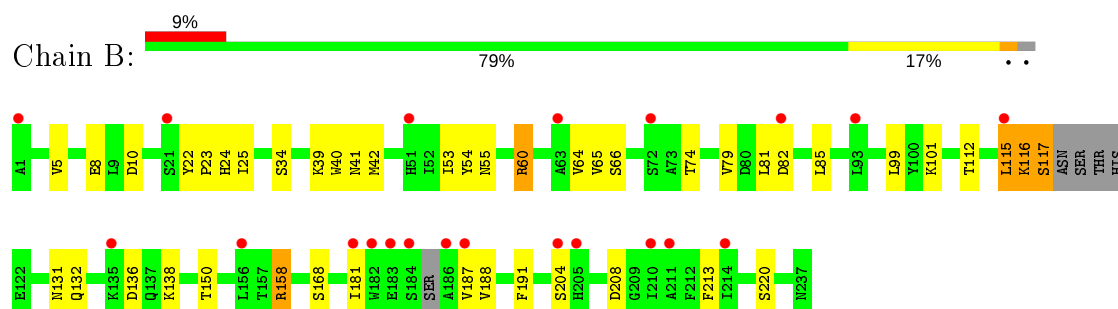
### 3 Residue-property plots [i](#)

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 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.

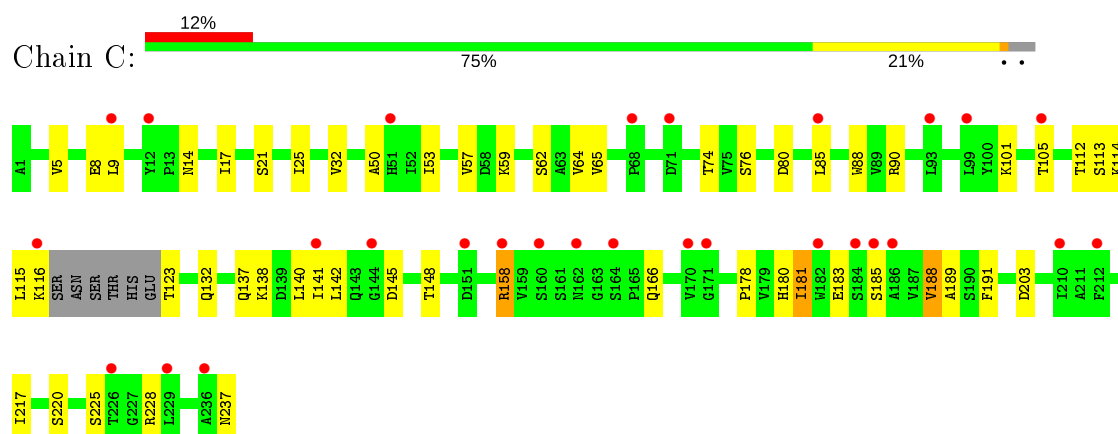
#### • Molecule 1: Concanavalin-A



#### • Molecule 1: Concanavalin-A

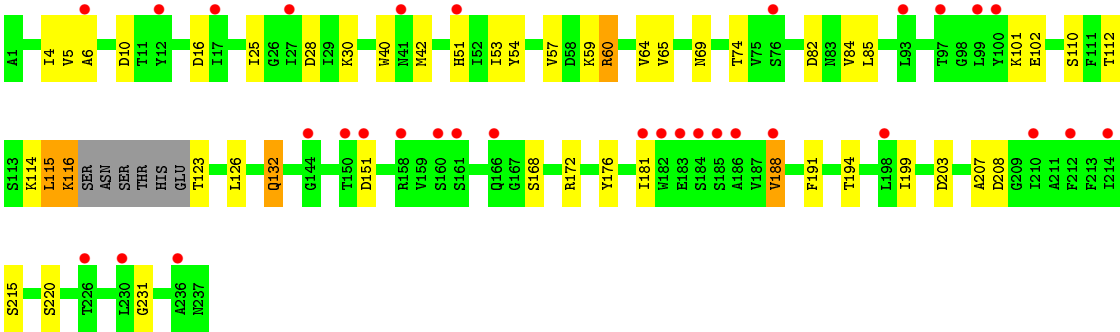


#### • Molecule 1: Concanavalin-A



#### • Molecule 1: Concanavalin-A







## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	64.23Å 119.89Å 125.21Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 2.59 29.83 – 2.50	Depositor EDS
% Data completeness (in resolution range)	94.2 (30.00-2.59) 94.3 (29.83-2.50)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	5.37 (at 2.51Å)	Xtriage
Refinement program	REFMAC 5.8.0131	Depositor
R, $R_{free}$	0.278 , 0.372 0.280 , 0.368	Depositor DCC
$R_{free}$ test set	1619 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	25.3	Xtriage
Anisotropy	0.203	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 36.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	0.000 for -h,l,k	Xtriage
$F_o, F_c$ correlation	0.90	EDS
Total number of atoms	7348	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	27.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 66.37 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 6.1124e-06. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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: TA5, CA, MN, MAN

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	0.66	0/1799	0.85	1/2447 (0.0%)
1	B	0.67	0/1811	0.84	1/2464 (0.0%)
1	C	0.67	0/1803	0.84	0/2455
1	D	0.66	0/1803	0.82	0/2455
All	All	0.67	0/7216	0.84	2/9821 (0.0%)

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	A	0	1
1	B	0	1
1	D	0	1
All	All	0	3

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	228	ARG	NE-CZ-NH2	5.84	123.22	120.30
1	B	79	VAL	CB-CA-C	-5.43	101.07	111.40

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	116	LYS	Peptide

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Mol	Chain	Res	Type	Group
1	B	150	THR	Peptide
1	D	115	LEU	Peptide

## 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	1760	0	1709	25	0
1	B	1772	0	1723	25	0
1	C	1763	0	1718	27	0
1	D	1763	0	1718	28	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	2	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	2	0	0	0	0
4	C	11	0	10	0	0
4	D	11	0	10	0	0
5	C	7	0	2	0	0
5	D	7	0	2	0	0
6	A	57	0	0	5	0
6	B	64	0	0	8	0
6	C	58	0	0	6	0
6	D	65	0	0	7	0
All	All	7348	0	6892	100	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 7.

The worst 5 of 100 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:110:SER:OG	1:D:194:THR:OG1	1.80	0.98

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:5:VAL:HG23	1:D:85:LEU:HD21	1.53	0.90
1:C:88:TRP:HB3	1:C:217:ILE:HD11	1.56	0.86
1:D:116:LYS:HG3	1:D:188:VAL:O	1.82	0.80
1:B:5:VAL:HG23	1:B:85:LEU:HD21	1.62	0.80

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	224/237 (94%)	214 (96%)	10 (4%)	0	100	100
1	B	226/237 (95%)	208 (92%)	17 (8%)	1 (0%)	34	57
1	C	227/237 (96%)	212 (93%)	14 (6%)	1 (0%)	34	57
1	D	227/237 (96%)	216 (95%)	11 (5%)	0	100	100
All	All	904/948 (95%)	850 (94%)	52 (6%)	2 (0%)	47	71

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	41	ASN
1	C	225	SER

### 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	197/203 (97%)	184 (93%)	13 (7%)	16	33
1	B	198/203 (98%)	178 (90%)	20 (10%)	7	14
1	C	197/203 (97%)	179 (91%)	18 (9%)	9	18
1	D	197/203 (97%)	181 (92%)	16 (8%)	11	23
All	All	789/812 (97%)	722 (92%)	67 (8%)	10	21

5 of 67 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	208	ASP
1	C	101	LYS
1	D	132	GLN
1	B	213	PHE
1	C	21	SER

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 11 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	104	ASN
1	D	14	ASN
1	D	153	ASN
1	C	43	GLN
1	D	132	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

Of 14 ligands modelled in this entry, 10 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	MAN	C	303	5	11,11,12	0.61	0	15,15,17	1.35	1 (6%)
5	TA5	C	304	4	6,7,7	1.41	1 (16%)	4,8,8	2.14	2 (50%)
4	MAN	D	304	5	11,11,12	0.55	0	15,15,17	0.99	1 (6%)
5	TA5	D	305	4	6,7,7	1.38	1 (16%)	4,8,8	2.11	2 (50%)

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
4	MAN	C	303	5	-	0/2/19/22	0/1/1/1
5	TA5	C	304	4	-	0/0/2/2	0/1/1/1
4	MAN	D	304	5	-	0/2/19/22	0/1/1/1
5	TA5	D	305	4	-	0/0/2/2	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	D	305	TA5	N-N2	-2.56	1.31	1.34
5	C	304	TA5	N-N2	-2.49	1.31	1.34

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	303	MAN	C1-O5-C5	4.77	118.65	112.19
5	C	304	TA5	NT-N2-N	-3.30	107.13	111.24
5	D	305	TA5	NT-N2-N	-3.26	107.18	111.24
4	D	304	MAN	C1-O5-C5	2.76	115.93	112.19
5	D	305	TA5	C-CA-N	-2.31	107.90	111.34

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

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 [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	230/237 (97%)	0.98	27 (11%) 4 3	13, 25, 47, 64	0
1	B	232/237 (97%)	0.97	21 (9%) 9 6	13, 26, 48, 61	0
1	C	231/237 (97%)	0.96	28 (12%) 4 2	15, 25, 42, 56	0
1	D	231/237 (97%)	1.03	32 (13%) 2 1	14, 25, 42, 57	0
All	All	924/948 (97%)	0.99	108 (11%) 4 3	13, 25, 46, 64	0

The worst 5 of 108 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	204	SER	5.4
1	C	182	TRP	4.5
1	C	185	SER	4.4
1	D	185	SER	4.4
1	A	204	SER	4.2

### 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
5	TA5	D	305	7/7	0.58	0.40	35,43,47,48	0
4	MAN	D	304	11/12	0.76	0.30	24,28,29,30	0
5	TA5	C	304	7/7	0.77	0.30	30,40,44,44	0
3	CA	A	303	1/1	0.81	0.12	48,48,48,48	0
4	MAN	C	303	11/12	0.82	0.19	24,26,27,27	0
3	CA	A	302	1/1	0.84	0.06	32,32,32,32	0
3	CA	C	302	1/1	0.90	0.11	33,33,33,33	0
2	MN	D	301	1/1	0.90	0.10	35,35,35,35	0
3	CA	D	302	1/1	0.91	0.09	27,27,27,27	0
2	MN	B	301	1/1	0.94	0.06	39,39,39,39	0
3	CA	B	302	1/1	0.95	0.07	25,25,25,25	0
3	CA	D	303	1/1	0.96	0.07	40,40,40,40	0
2	MN	C	301	1/1	0.96	0.06	35,35,35,35	0
2	MN	A	301	1/1	0.97	0.04	43,43,43,43	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.