



wwPDB X-ray Structure Validation Summary Report ⓘ

Oct 21, 2024 – 11:52 PM EDT

PDB ID : 3P7G
Title : Structure of the human Langerin carbohydrate recognition domain in complex with mannose
Authors : Skerra, A.; Schiefner, A.
Deposited on : 2010-10-12
Resolution : 1.50 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

A user guide is available at

<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>.

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

MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

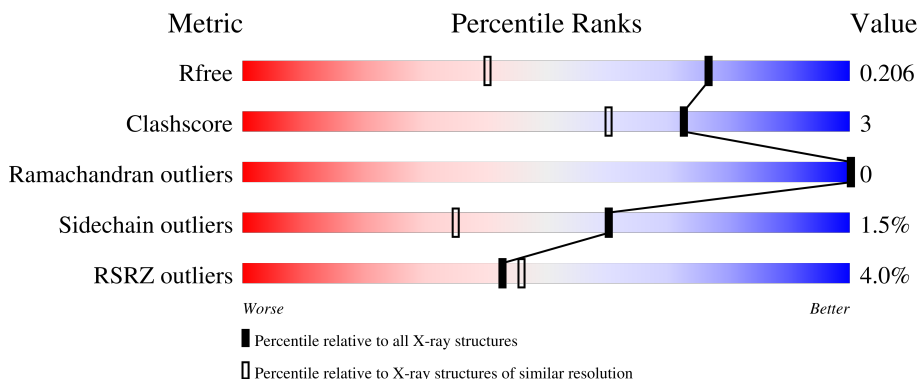
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.50 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}	164625	3717 (1.50-1.50)
Clashscore	180529	4048 (1.50-1.50)
Ramachandran outliers	177936	3970 (1.50-1.50)
Sidechain outliers	177891	3967 (1.50-1.50)
RSRZ outliers	164620	3718 (1.50-1.50)

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 of the lower bar indicate the fraction of residues that contain outliers for ≥ 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	146	<div> <div>5%</div> <div> <div></div> <div>90%</div> <div>8%</div> </div> </div>
1	B	146	<div> <div>2%</div> <div> <div></div> <div>77%</div> <div>12%</div> <div>11%</div> </div> </div>
1	C	146	<div> <div>5%</div> <div> <div></div> <div>78%</div> <div>10%</div> <div>11%</div> </div> </div>
1	D	146	<div> <div>2%</div> <div> <div></div> <div>82%</div> <div>8%</div> <div>11%</div> </div> </div>

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 4998 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 C-type lectin domain family 4 member K.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	135	Total	C	N	O	S	Se	0	1	0
			1105	718	179	202	4	2			
1	B	130	Total	C	N	O	S	Se	0	4	0
			1091	705	179	202	4	1			
1	C	130	Total	C	N	O	S	Se	0	4	0
			1098	712	181	200	4	1			
1	D	130	Total	C	N	O	S	Se	0	0	0
			1059	688	173	193	4	1			

There are 40 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	329	SER	-	expression tag	UNP Q9UJ71
A	330	ALA	-	expression tag	UNP Q9UJ71
A	331	TRP	-	expression tag	UNP Q9UJ71
A	332	SER	-	expression tag	UNP Q9UJ71
A	333	HIS	-	expression tag	UNP Q9UJ71
A	334	PRO	-	expression tag	UNP Q9UJ71
A	335	GLN	-	expression tag	UNP Q9UJ71
A	336	PHE	-	expression tag	UNP Q9UJ71
A	337	GLU	-	expression tag	UNP Q9UJ71
A	338	LYS	-	expression tag	UNP Q9UJ71
B	329	SER	-	expression tag	UNP Q9UJ71
B	330	ALA	-	expression tag	UNP Q9UJ71
B	331	TRP	-	expression tag	UNP Q9UJ71
B	332	SER	-	expression tag	UNP Q9UJ71
B	333	HIS	-	expression tag	UNP Q9UJ71
B	334	PRO	-	expression tag	UNP Q9UJ71
B	335	GLN	-	expression tag	UNP Q9UJ71
B	336	PHE	-	expression tag	UNP Q9UJ71
B	337	GLU	-	expression tag	UNP Q9UJ71
B	338	LYS	-	expression tag	UNP Q9UJ71
C	329	SER	-	expression tag	UNP Q9UJ71

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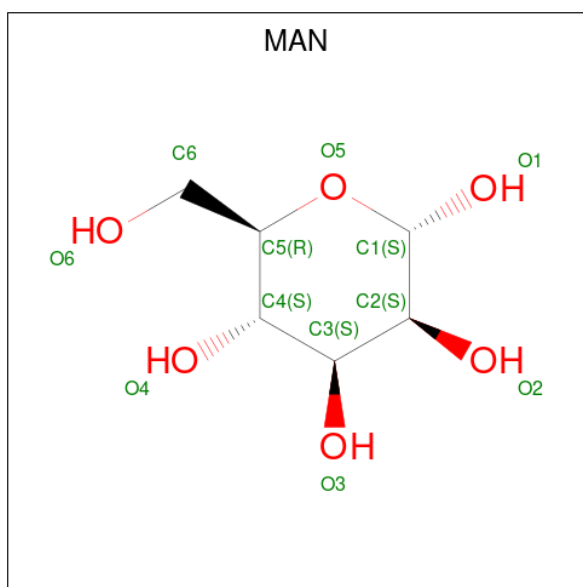
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Chain	Residue	Modelled	Actual	Comment	Reference
C	330	ALA	-	expression tag	UNP Q9UJ71
C	331	TRP	-	expression tag	UNP Q9UJ71
C	332	SER	-	expression tag	UNP Q9UJ71
C	333	HIS	-	expression tag	UNP Q9UJ71
C	334	PRO	-	expression tag	UNP Q9UJ71
C	335	GLN	-	expression tag	UNP Q9UJ71
C	336	PHE	-	expression tag	UNP Q9UJ71
C	337	GLU	-	expression tag	UNP Q9UJ71
C	338	LYS	-	expression tag	UNP Q9UJ71
D	329	SER	-	expression tag	UNP Q9UJ71
D	330	ALA	-	expression tag	UNP Q9UJ71
D	331	TRP	-	expression tag	UNP Q9UJ71
D	332	SER	-	expression tag	UNP Q9UJ71
D	333	HIS	-	expression tag	UNP Q9UJ71
D	334	PRO	-	expression tag	UNP Q9UJ71
D	335	GLN	-	expression tag	UNP Q9UJ71
D	336	PHE	-	expression tag	UNP Q9UJ71
D	337	GLU	-	expression tag	UNP Q9UJ71
D	338	LYS	-	expression tag	UNP Q9UJ71

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

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

- Molecule 3 is alpha-D-mannopyranose (three-letter code: MAN) (formula: C₆H₁₂O₆).

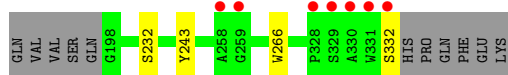


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			12	6	6		
3	B	1	Total	C	O	0	0
			12	6	6		
3	C	1	Total	C	O	0	0
			12	6	6		
3	D	1	Total	C	O	0	0
			12	6	6		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	145	Total	O	0	0
			145	145		
4	B	170	Total	O	0	0
			170	170		
4	C	156	Total	O	0	0
			156	156		
4	D	122	Total	O	0	0
			122	122		

- Molecule 1: C-type lectin domain family 4 member K



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|--|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| | GLN | VAL | S196 | K200 | Y208 | Y217 | S232 | Y243 | L255 | M260 | E261 | Z266 | D268 | Q276 | R279 | F280 | S302 | A305 | T314 | V324 | P325 | SER | GLU | PRO | SER | ALA | TRP | SER | HIS | PRO | GLN | PHE | GLI | YS |
|--|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|

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|-----|--|-----|--|-----|--|-----|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|-----|--|-----|--|-----|--|-----|--|------|--|-----|--|-----|--|-----|--|-----|--|-----|--|-----|--|-----|
| GLN | | VAL | | SER | | Gln | | G198 | | Y201 | | Y217 | | N227 | | T234 | | Y243 | | A258 | | G259 | | M260 | | E261 | | D262 | | D263 | | D268 | | G284 | | E285 | | P286 | | N287 | | A288 | | K289 | | G290 | | N291 | | S302 | | A305 | | R321 | | S326 | | GIU | | PHO | | SER | | ALA | | W331 | | SER | | HIS | | PHO | | Gln | | PHE | | GIU | | Lys |
|-----|--|-----|--|-----|--|-----|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|-----|--|-----|--|-----|--|-----|--|------|--|-----|--|-----|--|-----|--|-----|--|-----|--|-----|--|-----|

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|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| GLN | VAL | VAL | Q197 | F206 | S232 | Y243 | W266 | V275 | V278 | S302 | A305 | P310 | K313 | Y324 | V323 | P325 | SER | GLU | PRO | SER | SER | ALA | TRP | SER | HIS | PRO | GLN | PHE | GLU | LYS |
|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

4 Data and refinement statistics

Property	Value	Source
Space group	P 42	Depositor
Cell constants a, b, c, α , β , γ	79.71Å 79.71Å 89.98Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 1.50 30.00 – 1.50	Depositor EDS
% Data completeness (in resolution range)	99.3 (30.00-1.50) 99.3 (30.00-1.50)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.43 (at 1.50Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.172 , 0.207 0.170 , 0.206	Depositor DCC
R_{free} test set	1789 reflections (2.01%)	wwPDB-VP
Wilson B-factor (Å ²)	16.1	Xtriage
Anisotropy	0.016	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 41.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.035 for h,-k,-l	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	4998	wwPDB-VP
Average B, all atoms (Å ²)	22.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 9.55% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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: MAN, 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	0.97	0/1146	0.87	0/1560
1	B	1.03	2/1129 (0.2%)	1.02	4/1535 (0.3%)
1	C	1.21	4/1137 (0.4%)	1.07	6/1546 (0.4%)
1	D	0.97	0/1097	0.88	0/1492
All	All	1.05	6/4509 (0.1%)	0.97	10/6133 (0.2%)

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	291[A]	ASN	CG-ND2	11.14	1.60	1.32
1	C	291[B]	ASN	CG-ND2	11.14	1.60	1.32
1	C	291[A]	ASN	CG-OD1	8.18	1.42	1.24
1	C	291[B]	ASN	CG-OD1	8.18	1.42	1.24
1	B	208	TYR	CE2-CZ	-6.06	1.30	1.38

The worst 5 of 10 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	217	TYR	CB-CG-CD1	-7.29	116.62	121.00
1	C	217	TYR	CB-CG-CD1	-7.09	116.75	121.00
1	B	217	TYR	CZ-CE2-CD2	-6.83	113.65	119.80
1	B	268	ASP	CB-CG-OD1	6.31	123.98	118.30
1	C	201	TYR	CB-CG-CD1	-6.17	117.30	121.00

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	1105	0	1024	1	0
1	B	1091	0	1007	11	0
1	C	1098	0	1014	9	0
1	D	1059	0	986	6	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	12	0	11	0	0
3	B	12	0	10	0	0
3	C	12	0	10	0	0
3	D	12	0	10	0	0
4	A	145	0	0	0	0
4	B	170	0	0	3	0
4	C	156	0	0	4	0
4	D	122	0	0	0	0
All	All	4998	0	4072	26	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 26 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:206:PHE:CE2	1:D:323:TYR:HD1	2.11	0.68
1:B:261[B]:GLU:HG2	4:B:85:HOH:O	1.95	0.66
1:D:275:VAL:O	1:D:278:VAL:HG22	1.97	0.64
1:B:261[B]:GLU:H	1:B:261[B]:GLU:CD	2.01	0.63
1:C:286:PRO:HD2	4:C:119:HOH:O	2.06	0.56

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	134/146 (92%)	131 (98%)	3 (2%)	0	100	100
1	B	132/146 (90%)	130 (98%)	2 (2%)	0	100	100
1	C	131/146 (90%)	129 (98%)	2 (2%)	0	100	100
1	D	128/146 (88%)	125 (98%)	3 (2%)	0	100	100
All	All	525/584 (90%)	515 (98%)	10 (2%)	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	118/127 (93%)	116 (98%)	2 (2%)	56	29
1	B	117/127 (92%)	115 (98%)	2 (2%)	56	29
1	C	117/127 (92%)	115 (98%)	2 (2%)	56	29
1	D	113/127 (89%)	112 (99%)	1 (1%)	75	57
All	All	465/508 (92%)	458 (98%)	7 (2%)	60	35

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	260	MSE
1	C	243	TYR
1	D	243	TYR

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Mol	Chain	Res	Type
1	C	326	SER
1	B	243	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 8 ligands modelled in this entry, 4 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
3	MAN	B	339	2	12,12,12	1.54	2 (16%)	17,17,17	1.52	5 (29%)
3	MAN	A	339	2	12,12,12	1.24	1 (8%)	17,17,17	2.60	8 (47%)
3	MAN	D	339	2	12,12,12	1.05	1 (8%)	17,17,17	1.28	2 (11%)
3	MAN	C	339	2	12,12,12	1.55	2 (16%)	17,17,17	2.32	8 (47%)

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	MAN	B	339	2	-	0/2/22/22	0/1/1/1
3	MAN	A	339	2	-	0/2/22/22	0/1/1/1
3	MAN	D	339	2	-	2/2/22/22	0/1/1/1
3	MAN	C	339	2	-	0/2/22/22	0/1/1/1

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	339	MAN	O5-C5	-3.46	1.35	1.44
3	B	339	MAN	C4-C5	3.27	1.60	1.53
3	C	339	MAN	C1-C2	2.90	1.59	1.52
3	C	339	MAN	C4-C5	2.82	1.59	1.53
3	A	339	MAN	C4-C5	2.39	1.58	1.53

The worst 5 of 23 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	339	MAN	C1-O5-C5	5.08	123.47	113.65
3	A	339	MAN	O5-C5-C6	4.58	117.79	106.44
3	C	339	MAN	O1-C1-C2	-4.28	96.57	108.98
3	C	339	MAN	O5-C5-C4	-3.98	102.53	109.70
3	C	339	MAN	O5-C1-C2	3.96	117.25	110.30

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	D	339	MAN	O5-C5-C6-O6
3	D	339	MAN	C4-C5-C6-O6

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, 95th 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 ²)	Q<0.9
1	A	134/146 (91%)	-0.11	7 (5%) 34 35	13, 19, 37, 63	0
1	B	129/146 (88%)	-0.34	3 (2%) 61 64	9, 16, 29, 47	4 (3%)
1	C	129/146 (88%)	-0.12	8 (6%) 28 29	8, 17, 32, 65	4 (3%)
1	D	129/146 (88%)	-0.03	3 (2%) 61 64	11, 22, 38, 54	0
All	All	521/584 (89%)	-0.15	21 (4%) 43 46	8, 19, 36, 65	8 (1%)

The worst 5 of 21 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	331	TRP	5.4
1	A	330	ALA	3.8
1	C	291[A]	ASN	3.5
1	B	325	PRO	3.4
1	A	259	GLY	3.3

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, 95th 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(\AA^2)	Q<0.9
3	MAN	D	339	12/12	0.86	0.11	20,25,38,39	0
3	MAN	C	339	12/12	0.88	0.10	17,22,29,31	0
3	MAN	A	339	12/12	0.88	0.10	18,23,30,37	0
2	CA	D	1	1/1	0.91	0.15	23,23,23,23	0
3	MAN	B	339	12/12	0.91	0.10	13,18,28,35	0
2	CA	A	1	1/1	0.92	0.09	20,20,20,20	0
2	CA	C	1	1/1	0.93	0.09	20,20,20,20	0
2	CA	B	1	1/1	0.99	0.03	14,14,14,14	0

6.5 Other polymers [i](#)

There are no such residues in this entry.