



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 19, 2025 – 11:09 AM EDT

PDB ID : 3KQR
Title : The structure of serum amyloid p component bound to phosphoethanolamine
Authors : Mikolajek, H.; Kolstoe, S.E.; Wood, S.P.; Pepys, M.B.
Deposited on : 2009-11-17
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)	:	1.21
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.004 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.41.4

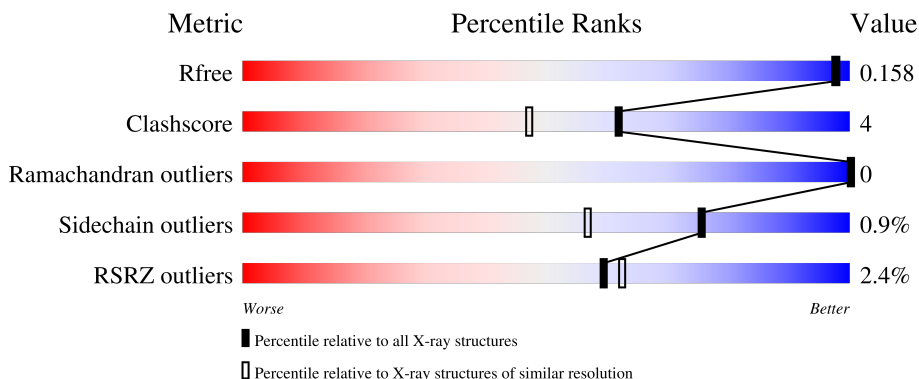
1 Overall quality at a glance

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	204	<div> <div>5%</div> <div> <div></div> <div>93%</div> <div>6%</div> </div> </div>
1	B	204	<div> <div>%</div> <div> <div></div> <div>91%</div> <div>8%</div> </div> </div>
1	C	204	<div> <div>%</div> <div> <div></div> <div>94%</div> <div>5%</div> </div> </div>
1	D	204	<div> <div>2%</div> <div> <div></div> <div>90%</div> <div>10%</div> </div> </div>
1	E	204	<div> <div>%</div> <div> <div></div> <div>93%</div> <div>7%</div> </div> </div>

2 Entry composition [i](#)

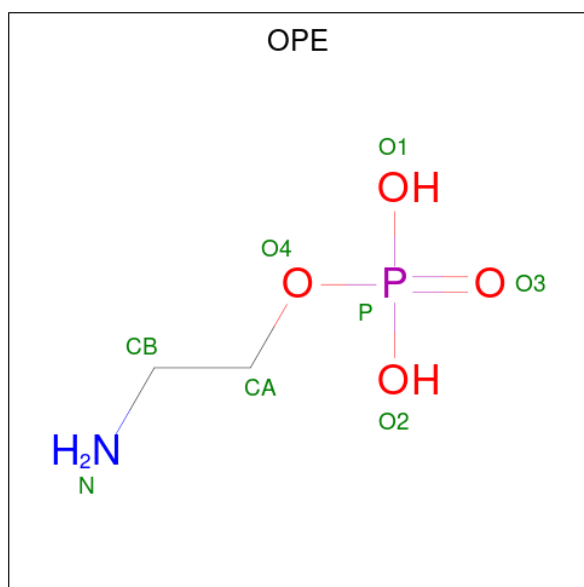
There are 5 unique types of molecules in this entry. The entry contains 18718 atoms, of which 8622 are hydrogens and 0 are deuteriums.

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 Serum amyloid P-component.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	204	Total	C	H	N	O	S	0	6	0
			3357	1096	1675	276	307	3			
1	B	204	Total	C	H	N	O	S	0	10	0
			3405	1109	1705	279	309	3			
1	C	204	Total	C	H	N	O	S	0	12	0
			3469	1129	1752	277	308	3			
1	D	204	Total	C	H	N	O	S	0	8	0
			3386	1103	1700	275	305	3			
1	E	204	Total	C	H	N	O	S	0	16	0
			3447	1122	1725	281	316	3			

- Molecule 2 is PHOSPHORIC ACID MONO-(2-AMINO-ETHYL) ESTER (three-letter code: OPE) (formula: C₂H₈NO₄P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			8	2	1	4	1		

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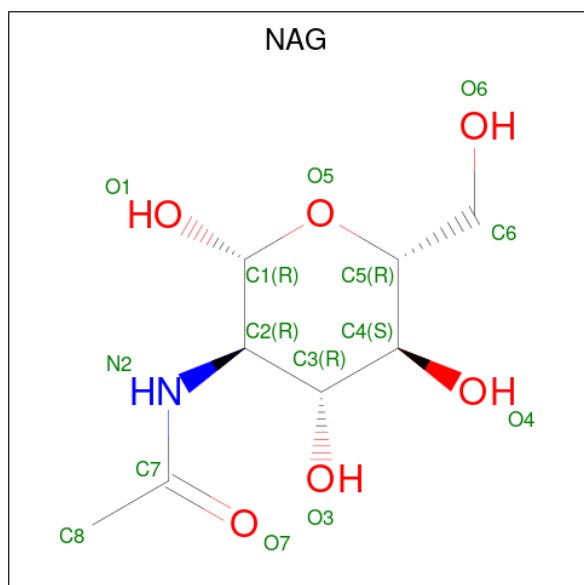
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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	B	1	Total	C	N	O	P	0	0
			8	2	1	4	1		
2	C	1	Total	C	N	O	P	0	0
			8	2	1	4	1		
2	D	1	Total	C	N	O	P	0	0
			8	2	1	4	1		
2	E	1	Total	C	N	O	P	0	0
			8	2	1	4	1		

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

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

- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: C₈H₁₅NO₆).

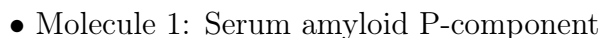
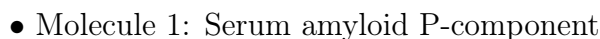
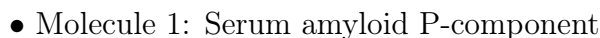
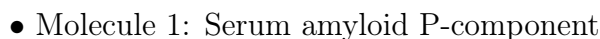


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	H	N	O	0	0
			27	8	13	1	5		
4	B	1	Total	C	H	N	O	0	0
			27	8	13	1	5		
4	C	1	Total	C	H	N	O	0	0
			27	8	13	1	5		
4	D	1	Total	C	H	N	O	0	0
			27	8	13	1	5		
4	E	1	Total	C	H	N	O	0	0
			27	8	13	1	5		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	242	Total	O	0	0
			242	242		
5	B	307	Total	O	0	0
			307	307		
5	C	306	Total	O	0	0
			306	306		
5	D	288	Total	O	0	0
			288	288		
5	E	326	Total	O	0	0
			326	326		

- Molecule 1: Serum amyloid P-component



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	94.86Å 69.86Å 102.27Å 90.00° 96.95° 90.00°	Depositor
Resolution (Å)	36.81 – 1.50 36.81 – 1.50	Depositor EDS
% Data completeness (in resolution range)	98.5 (36.81-1.50) 98.5 (36.81-1.50)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	0.05	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.89 (at 1.50Å)	Xtriage
Refinement program	PHENIX 1.5_2	Depositor
R, R_{free}	0.141 , 0.161 0.138 , 0.158	Depositor DCC
R_{free} test set	10455 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	11.2	Xtriage
Anisotropy	0.224	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 46.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	18718	wwPDB-VP
Average B, all atoms (Å ²)	15.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.99% 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

5.1 Standard geometry

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

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	1/1745 (0.1%)	0.77	0/2373
1	B	0.64	0/1784	0.80	1/2424 (0.0%)
1	C	0.65	0/1805	0.81	2/2452 (0.1%)
1	D	0.70	3/1759 (0.2%)	0.81	1/2390 (0.0%)
1	E	0.70	0/1830	0.82	1/2486 (0.0%)
All	All	0.67	4/8923 (0.0%)	0.80	5/12125 (0.0%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	167	GLU	CG-CD	5.69	1.60	1.51
1	D	106	GLU	CB-CG	-5.34	1.42	1.52
1	D	126	GLU	CG-CD	5.23	1.59	1.51
1	D	86	GLU	CD-OE1	5.17	1.31	1.25

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	184	ASP	CB-CG-OD1	6.66	124.30	118.30
1	D	126	GLU	OE1-CD-OE2	-6.43	115.58	123.30
1	C	184	ASP	CB-CG-OD2	-6.19	112.73	118.30
1	E	38	ARG	CG-CD-NE	-5.47	100.31	111.80
1	B	38	ARG	NE-CZ-NH2	-5.35	117.63	120.30

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	1682	1675	1674	13	0
1	B	1700	1705	1694	16	0
1	C	1717	1752	1749	13	0
1	D	1686	1700	1697	14	0
1	E	1722	1725	1672	10	0
2	A	8	0	6	0	0
2	B	8	0	6	0	0
2	C	8	0	6	0	0
2	D	8	0	6	0	0
2	E	8	0	6	0	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
3	C	2	0	0	0	0
3	D	2	0	0	0	0
3	E	2	0	0	0	0
4	A	14	13	13	0	0
4	B	14	13	13	1	0
4	C	14	13	13	1	0
4	D	14	13	13	0	0
4	E	14	13	13	1	0
5	A	242	0	0	3	0
5	B	307	0	0	5	0
5	C	306	0	0	6	0
5	D	288	0	0	4	0
5	E	326	0	0	4	0
All	All	10096	8622	8581	69	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 4.

The worst 5 of 69 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:22:LEU:CD1	1:A:133[B]:LEU:HD11	2.10	0.82
1:A:22:LEU:HD11	1:A:133[B]:LEU:HD11	1.62	0.81

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:26:LEU:HD21	1:B:28:LYS:HG2	1.65	0.77
4:C:207:NAG:H83	5:C:476:HOH:O	1.84	0.77
4:B:207:NAG:H83	5:B:435:HOH:O	1.86	0.75

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	208/204 (102%)	204 (98%)	4 (2%)	0	100	100
1	B	212/204 (104%)	206 (97%)	6 (3%)	0	100	100
1	C	215/204 (105%)	212 (99%)	3 (1%)	0	100	100
1	D	210/204 (103%)	207 (99%)	3 (1%)	0	100	100
1	E	218/204 (107%)	212 (97%)	6 (3%)	0	100	100
All	All	1063/1020 (104%)	1041 (98%)	22 (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	187/181 (103%)	186 (100%)	1 (0%)	86	75

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	191/181 (106%)	189 (99%)	2 (1%)	73	53
1	C	194/181 (107%)	191 (98%)	3 (2%)	60	35
1	D	189/181 (104%)	188 (100%)	1 (0%)	86	75
1	E	197/181 (109%)	196 (100%)	1 (0%)	86	75
All	All	958/905 (106%)	950 (99%)	8 (1%)	75	62

5 of 8 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	52	TYR
1	D	52	TYR
1	C	52	TYR
1	C	1	HIS
1	C	171	SER

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

5.3.3 RNA ⓘ

There are no RNA molecules 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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 20 ligands modelled in this entry, 10 are monoatomic - leaving 10 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	NAG	A	207	1	14,14,15	0.58	0	17,19,21	0.88	0
2	OPE	C	2700	3	7,7,7	0.82	0	9,9,9	1.05	1 (11%)
4	NAG	C	207	1	14,14,15	0.45	0	17,19,21	0.91	0
4	NAG	D	207	1	14,14,15	0.75	0	17,19,21	0.87	1 (5%)
2	OPE	A	700	3	7,7,7	1.08	1 (14%)	9,9,9	1.26	1 (11%)
4	NAG	B	207	1	14,14,15	0.35	0	17,19,21	1.29	3 (17%)
4	NAG	E	207	1	14,14,15	0.70	0	17,19,21	1.77	1 (5%)
2	OPE	D	3700	3	7,7,7	1.30	1 (14%)	9,9,9	1.02	0
2	OPE	E	4700	3	7,7,7	0.97	0	9,9,9	0.95	0
2	OPE	B	1700	3	7,7,7	0.98	0	9,9,9	1.10	1 (11%)

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	NAG	A	207	1	-	2/6/23/26	0/1/1/1
2	OPE	C	2700	3	-	1/5/5/5	-
4	NAG	C	207	1	-	2/6/23/26	0/1/1/1
4	NAG	D	207	1	-	0/6/23/26	0/1/1/1
2	OPE	A	700	3	-	1/5/5/5	-
4	NAG	B	207	1	-	2/6/23/26	0/1/1/1
4	NAG	E	207	1	-	2/6/23/26	0/1/1/1
2	OPE	D	3700	3	-	1/5/5/5	-
2	OPE	E	4700	3	-	2/5/5/5	-
2	OPE	B	1700	3	-	1/5/5/5	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	3700	OPE	P-O2	2.83	1.65	1.54
2	A	700	OPE	P-O2	2.06	1.62	1.54

The worst 5 of 8 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	E	207	NAG	O5-C1-C2	-6.33	101.49	111.29
2	A	700	OPE	O4-P-O3	3.10	114.82	106.44
4	B	207	NAG	C2-N2-C7	2.47	126.21	122.90
4	D	207	NAG	O5-C1-C2	-2.42	107.54	111.29
2	B	1700	OPE	O2-P-O4	-2.40	100.42	106.67

There are no chirality outliers.

5 of 14 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	700	OPE	CA-O4-P-O2
2	C	2700	OPE	CA-O4-P-O3
2	E	4700	OPE	CA-O4-P-O3
4	A	207	NAG	O5-C5-C6-O6
4	E	207	NAG	O5-C5-C6-O6

There are no ring outliers.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	207	NAG	1	0
4	B	207	NAG	1	0
4	E	207	NAG	1	0

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, 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	204/204 (100%)	-0.32	10 (4%) 36 38	7, 14, 37, 61	6 (2%)
1	B	204/204 (100%)	-0.71	3 (1%) 71 74	7, 12, 23, 54	9 (4%)
1	C	204/204 (100%)	-0.72	3 (1%) 71 74	4, 12, 24, 48	12 (5%)
1	D	204/204 (100%)	-0.66	5 (2%) 58 61	6, 12, 27, 50	8 (3%)
1	E	204/204 (100%)	-0.73	3 (1%) 71 74	5, 10, 25, 56	11 (5%)
All	All	1020/1020 (100%)	-0.63	24 (2%) 59 62	4, 12, 29, 61	46 (4%)

The worst 5 of 24 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	204	VAL	6.9
1	E	1	HIS	5.7
1	B	1	HIS	5.6
1	A	204	VAL	5.1
1	D	204	VAL	4.9

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
4	NAG	A	207	14/15	0.71	0.22	29,48,65,78	0
4	NAG	E	207	14/15	0.81	0.15	25,42,52,54	0
4	NAG	B	207	14/15	0.88	0.14	19,38,50,57	0
4	NAG	C	207	14/15	0.89	0.11	21,32,45,46	0
4	NAG	D	207	14/15	0.91	0.10	16,31,43,50	0
2	OPE	A	700	8/8	0.95	0.11	19,24,28,29	0
2	OPE	D	3700	8/8	0.97	0.07	12,17,21,23	0
3	CA	A	205	1/1	0.98	0.08	19,19,19,19	0
2	OPE	E	4700	8/8	0.98	0.07	10,14,17,20	0
2	OPE	B	1700	8/8	0.99	0.05	9,10,13,14	0
3	CA	A	206	1/1	0.99	0.10	19,19,19,19	0
3	CA	C	205	1/1	0.99	0.02	10,10,10,10	0
2	OPE	C	2700	8/8	0.99	0.04	10,12,14,16	0
3	CA	E	205	1/1	1.00	0.02	8,8,8,8	0
3	CA	E	206	1/1	1.00	0.01	8,8,8,8	0
3	CA	B	206	1/1	1.00	0.02	8,8,8,8	0
3	CA	B	205	1/1	1.00	0.01	7,7,7,7	0
3	CA	C	206	1/1	1.00	0.01	9,9,9,9	0
3	CA	D	205	1/1	1.00	0.02	9,9,9,9	0
3	CA	D	206	1/1	1.00	0.01	8,8,8,8	0

6.5 Other polymers [\(i\)](#)

There are no such residues in this entry.