wwPDB X-ray Structure Validation Summary Report (i)

Jul 27, 2021 – 11:06 am BST

PDB ID	:	7AM0
Title	:	GqqA- a novel type of quorum quenching acylases
Authors	:	Werner, N.; Betzel, C.
Deposited on	:	2020-10-07
Resolution	:	2.50 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 (i) symbol.

The following versions of software and data (see references (1)) were used in the production of this report:

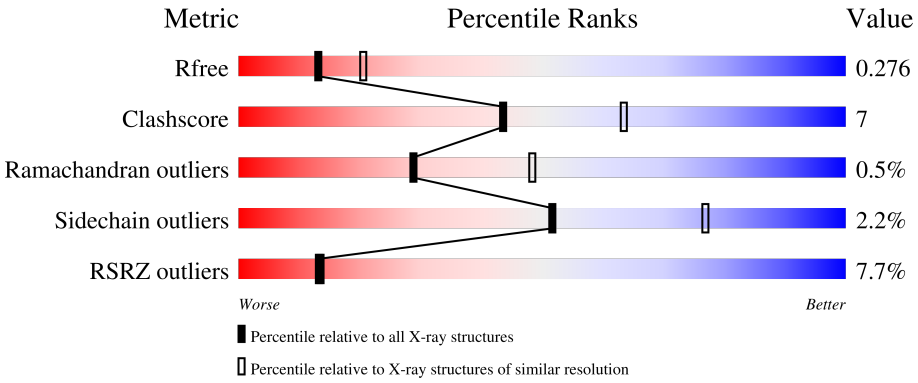
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.22
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.22

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

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}	130704	4661 (2.50-2.50)
Clashscore	141614	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)
RSRZ outliers	127900	4559 (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 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 <=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	281	4% 86% 11%
1	B	281	4% 85% 14%
1	C	281	8% 82% 14%
1	D	281	14% 82% 14%

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	PHE	D	301	-	-	-	X

2 Entry composition

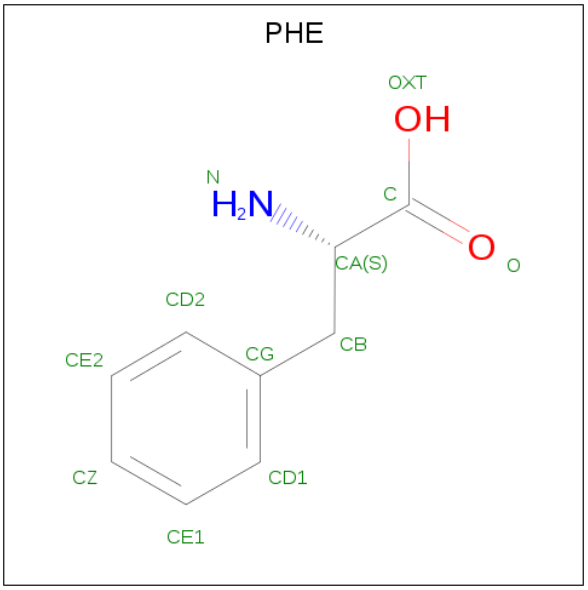
There are 3 unique types of molecules in this entry. The entry contains 8554 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Prephenate dehydratase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	277	Total	C	N	O	S	0	0	0
			2116	1337	381	387	11			
1	B	278	Total	C	N	O	S	0	0	0
			2125	1342	382	390	11			
1	C	273	Total	C	N	O	S	0	0	0
			2083	1316	374	382	11			
1	D	278	Total	C	N	O	S	0	0	0
			2125	1342	382	390	11			

- Molecule 2 is PHENYLALANINE (three-letter code: PHE) (formula: $C_9H_{11}NO_2$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			12	9	1	2		
2	B	1	Total	C	N	O	0	0
			12	9	1	2		

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	C	1	Total C N O 12 9 1 2	0	0
2	D	1	Total C N O 12 9 1 2	0	0

- Molecule 3 is water.

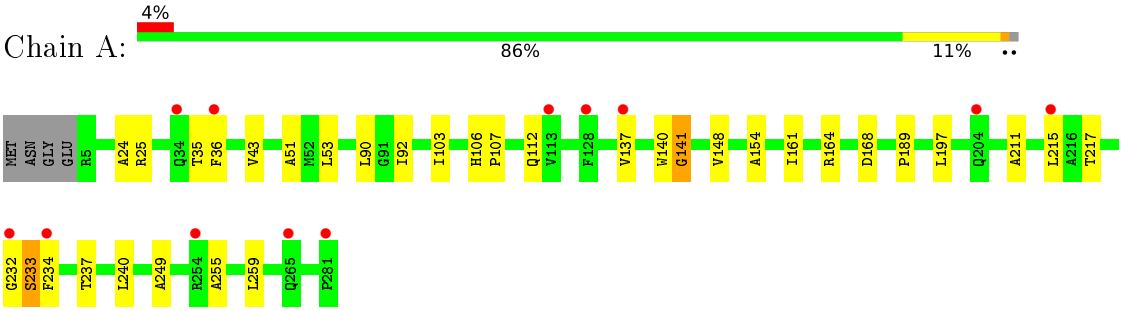
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	32	Total O 32 32	0	0
3	B	19	Total O 19 19	0	0
3	C	5	Total O 5 5	0	0
3	D	1	Total O 1 1	0	0

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.

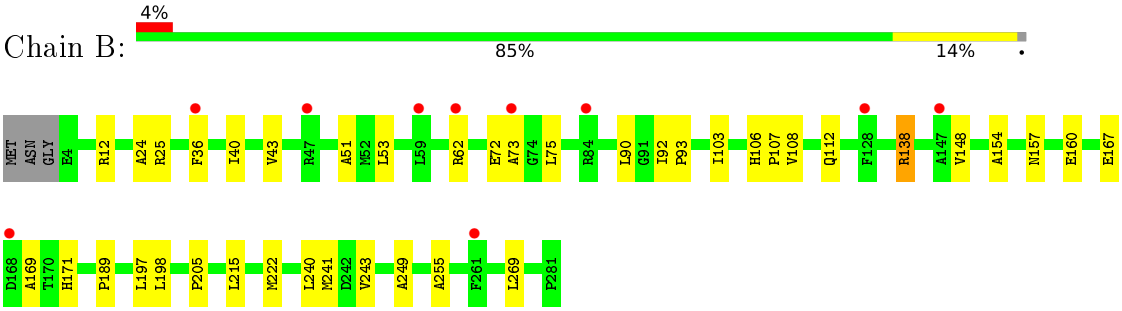
- Molecule 1: Prephenate dehydratase

Chain A:



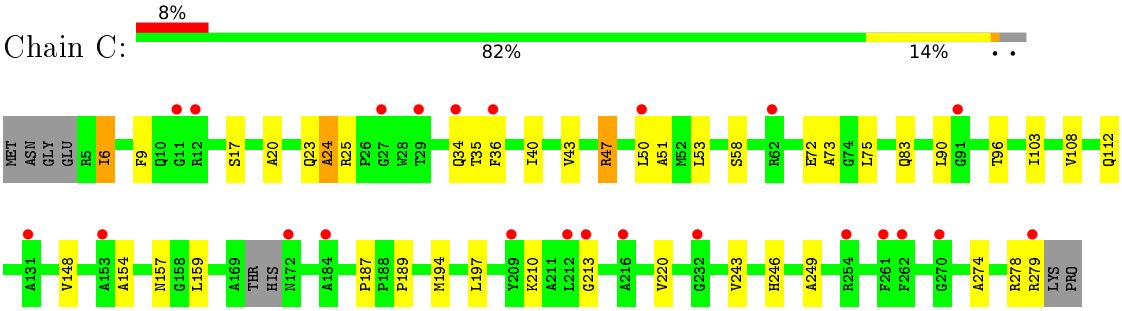
- Molecule 1: Prephenate dehydratase

Chain B:



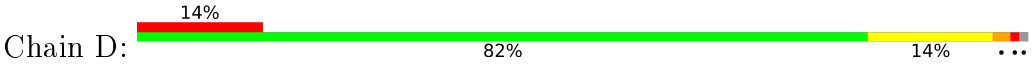
- Molecule 1: Prephenate dehydratase

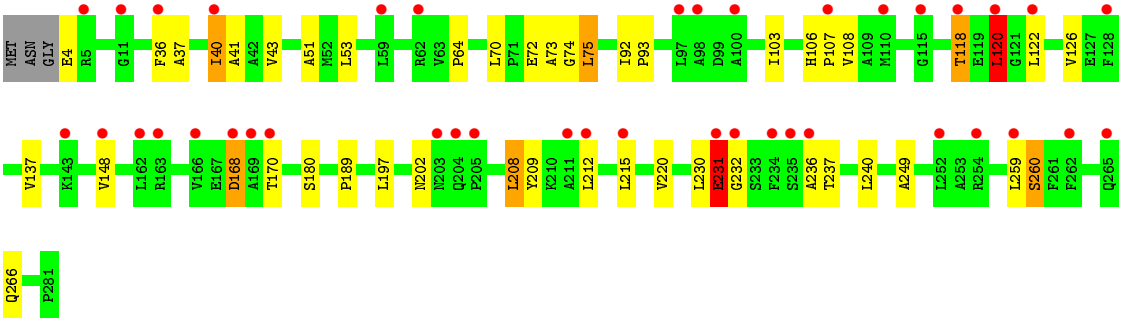
Chain C:



- Molecule 1: Prephenate dehydratase

Chain D:




MET
ASN
GLY
E4
R5
G11
F36
A37
I40
A41
A42
V43
A51
M52
L53
L59
R62
V63
P64
L70
P71
E72
A73
G74
L75
I92
P93
L97
A98
D99
A100
I103
H106
P107
V108
A109
M110
G115
T118
E119
L120
G121
L122
V126
E127
F128
V137
R143
V148
L162
R163
V166
E167
D168
A169
T170
S180
P189
L197
N202
N203
Q204
P205
L208
Y209
K210
A211
L212
L215
V220
L230
E231
G232
S233
F234
S235
A236
T237
L240
A249
L252
A253
R254
L259
S260
F261
F262
Q265
Q266
P281

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	76.87Å 65.76Å 102.66Å 90.00° 104.27° 90.00°	Depositor
Resolution (Å)	49.35 – 2.50 49.30 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.8 (49.35-2.50) 99.8 (49.30-2.50)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.30 (at 2.51Å)	Xtriage
Refinement program	PHENIX 5.8.0258	Depositor
R, R_{free}	0.232 , 0.277 0.232 , 0.276	Depositor DCC
R_{free} test set	2000 reflections (5.80%)	wwPDB-VP
Wilson B-factor (Å^2)	56.1	Xtriage
Anisotropy	0.658	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 44.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.51$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	8554	wwPDB-VP
Average B, all atoms (Å^2)	79.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.51% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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

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	0.34	0/2165	0.64	0/2945
1	B	0.33	0/2174	0.63	0/2957
1	C	0.36	0/2129	0.64	0/2894
1	D	0.37	0/2174	0.68	2/2957 (0.1%)
All	All	0.35	0/8642	0.64	2/11753 (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	C	0	1
1	D	2	2
All	All	2	4

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	D	120	LEU	N-CA-C	6.62	128.89	111.00
1	D	118	THR	N-CA-CB	5.04	119.87	110.30

All (2) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	D	118	THR	CA
1	D	120	LEU	CA

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	141	GLY	Peptide
1	C	24	ALA	Peptide
1	D	120	LEU	Peptide
1	D	168	ASP	Peptide

5.2 Too-close contacts (i)

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	2116	0	2101	19	0
1	B	2125	0	2106	29	0
1	C	2083	0	2065	35	0
1	D	2125	0	2107	41	0
2	A	12	0	8	1	0
2	B	12	0	8	0	0
2	C	12	0	8	0	0
2	D	12	0	8	2	0
3	A	32	0	0	0	0
3	B	19	0	0	0	0
3	C	5	0	0	0	0
3	D	1	0	0	0	0
All	All	8554	0	8411	114	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 114 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:B:198:LEU:HD23	1:B:269:LEU:HG	1.70	0.72
1:C:25:ARG:NH1	1:C:50:LEU:HD11	2.04	0.72
1:B:198:LEU:CD2	1:B:269:LEU:HG	2.20	0.72
1:C:108:VAL:HG12	1:C:112:GLN:HE21	1.64	0.63
1:D:259:LEU:HD23	1:D:266:GLN:OE1	1.99	0.63

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	275/281 (98%)	268 (98%)	6 (2%)	1 (0%)	34	54
1	B	276/281 (98%)	268 (97%)	6 (2%)	2 (1%)	22	39
1	C	269/281 (96%)	262 (97%)	7 (3%)	0	100	100
1	D	276/281 (98%)	263 (95%)	11 (4%)	2 (1%)	22	39
All	All	1096/1124 (98%)	1061 (97%)	30 (3%)	5 (0%)	29	48

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	171	HIS
1	D	231	GLU
1	A	233	SER
1	D	168	ASP
1	B	205	PRO

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	217/220 (99%)	215 (99%)	2 (1%)	78	92
1	B	218/220 (99%)	214 (98%)	4 (2%)	59	81
1	C	213/220 (97%)	209 (98%)	4 (2%)	57	80
1	D	218/220 (99%)	209 (96%)	9 (4%)	30	55
All	All	866/880 (98%)	847 (98%)	19 (2%)	52	77

5 of 19 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	197	LEU
1	D	231	GLU
1	D	260	SER
1	D	208	LEU
1	C	96	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 14 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	81	HIS
1	C	87	HIS
1	D	265	GLN
1	D	67	HIS
1	D	104	HIS

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 (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	$\#\|Z\|>2$
2	PHE	C	301	-	9,12,12	0.27	0	10,15,15	0.19	0
2	PHE	D	301	-	9,12,12	0.20	0	10,15,15	0.25	0
2	PHE	B	301	-	9,12,12	0.26	0	10,15,15	0.20	0
2	PHE	A	301	-	9,12,12	0.40	0	10,15,15	0.31	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
2	PHE	C	301	-	-	0/4/8/8	0/1/1/1
2	PHE	D	301	-	-	0/4/8/8	0/1/1/1
2	PHE	B	301	-	-	0/4/8/8	0/1/1/1
2	PHE	A	301	-	-	0/4/8/8	0/1/1/1

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.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	301	PHE	2	0
2	A	301	PHE	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

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^{th} 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	277/281 (98%)	0.29	12 (4%)	35	38	44, 62, 83, 112	0
1	B	278/281 (98%)	0.35	10 (3%)	42	46	47, 71, 105, 114	0
1	C	273/281 (97%)	0.69	23 (8%)	11	11	62, 87, 111, 122	0
1	D	278/281 (98%)	0.89	40 (14%)	2	2	63, 89, 135, 166	0
All	All	1106/1124 (98%)	0.55	85 (7%)	13	13	44, 76, 114, 166	0

The worst 5 of 85 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	236	ALA	6.4
1	C	36	PHE	6.1
1	D	232	GLY	5.4
1	D	211	ALA	5.3
1	D	170	THR	5.1

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 monosaccharides 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. The B-factors column lists the minimum, median, 95^{th} 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(Å^2)	Q<0.9
2	PHE	D	301	12/12	0.68	0.56	90,95,105,105	0
2	PHE	C	301	12/12	0.88	0.32	90,92,94,95	0
2	PHE	A	301	12/12	0.91	0.21	74,75,77,80	0
2	PHE	B	301	12/12	0.93	0.15	58,60,60,61	0

6.5 Other polymers (i)

There are no such residues in this entry.