



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 01:35 PM UTC

PDB ID : 5Z6Q / pdb_00005z6q
Title : Crystal structure of AAA of Spastin
Authors : Lin, Z.; Wang, C.; Shen, Y.
Deposited on : 2018-01-25
Resolution : 3.00 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

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	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

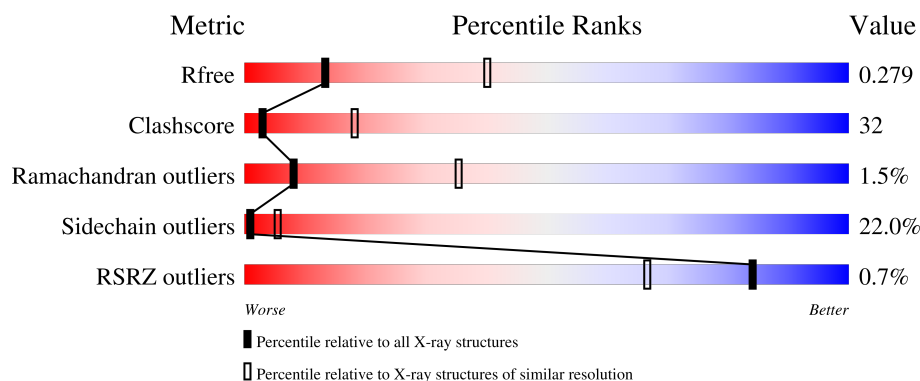
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

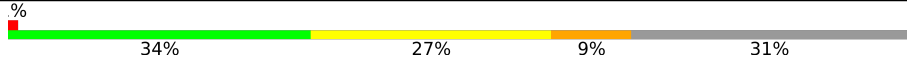
The reported resolution of this entry is 3.00 Å.

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}	180053	2672 (3.00-3.00)
Clashscore	190562	2977 (3.00-3.00)
Ramachandran outliers	187476	2877 (3.00-3.00)
Sidechain outliers	187428	2880 (3.00-3.00)
RSRZ outliers	180081	2671 (3.00-3.00)

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	392	

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 1965 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 Spastin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	272	Total	C	N	O	S	0	0	0
			1964	1249	344	365	6			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	225	GLY	-	expression tag	UNP Q9UBP0
A	226	PRO	-	expression tag	UNP Q9UBP0
A	227	GLY	-	expression tag	UNP Q9UBP0
A	228	SER	-	expression tag	UNP Q9UBP0

- Molecule 2 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Cl	0	0
			1	1		

4 Data and refinement statistics

Property	Value	Source
Space group	P 65	Depositor
Cell constants a, b, c, α , β , γ	90.52Å 90.52Å 89.15Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	38.75 – 3.00 38.75 – 3.00	Depositor EDS
% Data completeness (in resolution range)	100.0 (38.75-3.00) 99.9 (38.75-3.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.25 (at 3.01Å)	Xtriage
Refinement program	PHENIX 1.9_1692	Depositor
R, R_{free}	0.194 , 0.276 0.214 , 0.279	Depositor DCC
R_{free} test set	389 reflections (4.63%)	wwPDB-VP
Wilson B-factor (Å ²)	76.2	Xtriage
Anisotropy	0.347	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 59.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.067 for h,-h-k,-l	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	1965	wwPDB-VP
Average B, all atoms (Å ²)	77.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.40% 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: CL

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	0.63	0/1989	1.13	12/2704 (0.4%)

There are no bond length outliers.

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	364	ARG	CA-C-N	9.93	130.21	119.28
1	A	364	ARG	C-N-CA	9.93	130.21	119.28
1	A	424	ARG	N-CA-C	-9.16	102.11	113.20
1	A	358	VAL	CB-CA-C	-7.03	105.74	111.71
1	A	559	GLY	CA-C-N	6.68	126.28	119.19
1	A	559	GLY	C-N-CA	6.68	126.28	119.19
1	A	443	VAL	CB-CA-C	-6.13	104.01	112.04
1	A	326	ASN	N-CA-C	-6.06	104.99	112.38
1	A	383	PRO	CA-C-N	6.01	125.92	119.85
1	A	383	PRO	C-N-CA	6.01	125.92	119.85
1	A	461	LEU	N-CA-C	-5.42	106.64	113.20
1	A	359	ILE	N-CA-C	5.10	115.21	110.42

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	1964	0	1923	124	1
2	A	1	0	0	0	0
All	All	1965	0	1923	124	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 32.

All (124) 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:555:ASP:OD1	1:A:588:SER:HB3	1.63	0.97
1:A:328:ILE:HD12	1:A:429:VAL:HG21	1.44	0.97
1:A:564:LEU:HD12	1:A:569:VAL:HG22	1.49	0.94
1:A:591:LYS:HB3	1:A:591:LYS:NZ	1.90	0.86
1:A:443:VAL:HG23	1:A:485:ALA:O	1.82	0.80
1:A:426:LEU:HD12	1:A:426:LEU:O	1.82	0.79
1:A:502:LYS:HZ2	1:A:502:LYS:HB3	1.50	0.76
1:A:364:ARG:HG2	1:A:364:ARG:HH11	1.51	0.76
1:A:388:LYS:NZ	1:A:487:ASN:HD21	1.84	0.75
1:A:428:ALA:HA	1:A:431:ARG:NH1	2.01	0.74
1:A:591:LYS:HB3	1:A:591:LYS:HZ3	1.53	0.74
1:A:328:ILE:HD13	1:A:426:LEU:HA	1.72	0.71
1:A:473:GLN:HE21	1:A:473:GLN:HA	1.57	0.70
1:A:341:PHE:HB2	1:A:398:GLU:CD	2.17	0.69
1:A:388:LYS:HZ1	1:A:487:ASN:ND2	1.91	0.68
1:A:521:LEU:HD23	1:A:521:LEU:N	2.08	0.68
1:A:502:LYS:HB3	1:A:502:LYS:NZ	2.09	0.67
1:A:517:LEU:HD23	1:A:517:LEU:N	2.09	0.67
1:A:510:ASN:ND2	1:A:510:ASN:H	1.93	0.67
1:A:328:ILE:HD12	1:A:429:VAL:CG2	2.22	0.66
1:A:510:ASN:H	1:A:510:ASN:HD22	1.45	0.65
1:A:431:ARG:O	1:A:434:GLN:HG3	1.97	0.65
1:A:426:LEU:HD12	1:A:426:LEU:C	2.22	0.64
1:A:388:LYS:NZ	1:A:487:ASN:ND2	2.45	0.64
1:A:388:LYS:HD2	1:A:506:VAL:HB	1.78	0.64
1:A:440:ILE:HD12	1:A:483:MET:O	1.99	0.63
1:A:388:LYS:HZ1	1:A:487:ASN:HD21	1.46	0.63
1:A:530:THR:HG23	1:A:533:GLU:OE1	2.00	0.60
1:A:558:LEU:O	1:A:562:ARG:HG3	2.02	0.59
1:A:423:VAL:C	1:A:425:ALA:H	2.11	0.59
1:A:404:PHE:CZ	1:A:430:ALA:HA	2.37	0.59
1:A:441:ASP:O	1:A:442:GLU:C	2.45	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:324:LEU:HA	1:A:326:ASN:ND2	2.19	0.57
1:A:378:LEU:HD12	1:A:379:LEU:N	2.18	0.57
1:A:554:LYS:O	1:A:558:LEU:HD12	2.04	0.57
1:A:502:LYS:C	1:A:503:ARG:HD2	2.30	0.57
1:A:515:LEU:HD12	1:A:535:ALA:HA	1.88	0.56
1:A:403:PHE:CE2	1:A:405:ASN:HB2	2.42	0.55
1:A:355:GLN:HA	1:A:359:ILE:HB	1.88	0.54
1:A:601:LEU:O	1:A:604:TYR:HB2	2.08	0.54
1:A:404:PHE:CE2	1:A:436:SER:HB3	2.43	0.53
1:A:500:PHE:O	1:A:501:ILE:C	2.52	0.53
1:A:522:LEU:HB3	1:A:528:PRO:HD2	1.90	0.53
1:A:497:LEU:O	1:A:497:LEU:HD23	2.09	0.53
1:A:423:VAL:C	1:A:425:ALA:N	2.65	0.53
1:A:326:ASN:O	1:A:330:ASN:OD1	2.27	0.53
1:A:351:LYS:O	1:A:355:GLN:HB2	2.08	0.53
1:A:355:GLN:OE1	1:A:359:ILE:HG21	2.10	0.52
1:A:494:GLU:O	1:A:498:ARG:HG3	2.09	0.52
1:A:496:VAL:HG12	1:A:497:LEU:N	2.23	0.52
1:A:364:ARG:NH2	1:A:367:LEU:HD11	2.25	0.51
1:A:388:LYS:HZ2	1:A:487:ASN:HD21	1.56	0.51
1:A:518:LEU:O	1:A:522:LEU:HG	2.11	0.51
1:A:469:PHE:HD1	1:A:469:PHE:O	1.93	0.51
1:A:536:GLN:O	1:A:540:MET:HG3	2.10	0.51
1:A:591:LYS:HB3	1:A:591:LYS:HZ2	1.72	0.51
1:A:404:PHE:HE2	1:A:436:SER:HB3	1.76	0.50
1:A:469:PHE:C	1:A:469:PHE:CD1	2.89	0.50
1:A:537:LEU:O	1:A:541:THR:HG23	2.11	0.50
1:A:469:PHE:HD1	1:A:469:PHE:C	2.19	0.50
1:A:358:VAL:O	1:A:362:SER:HB2	2.11	0.49
1:A:526:GLY:O	1:A:527:SER:C	2.55	0.49
1:A:490:GLN:HA	1:A:607:TRP:HE1	1.76	0.49
1:A:515:LEU:CD1	1:A:535:ALA:HA	2.42	0.49
1:A:328:ILE:CD1	1:A:426:LEU:HA	2.41	0.48
1:A:522:LEU:CD1	1:A:534:LEU:HD21	2.44	0.48
1:A:561:ILE:HG22	1:A:562:ARG:N	2.28	0.48
1:A:602:GLU:HA	1:A:605:ILE:HD12	1.96	0.48
1:A:425:ALA:O	1:A:429:VAL:HG23	2.13	0.48
1:A:497:LEU:HD23	1:A:497:LEU:C	2.39	0.48
1:A:326:ASN:ND2	1:A:326:ASN:H	2.12	0.47
1:A:364:ARG:HG2	1:A:364:ARG:NH1	2.26	0.47
1:A:347:GLN:NE2	1:A:506:VAL:HG13	2.30	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:497:LEU:HD23	1:A:503:ARG:NH2	2.29	0.47
1:A:364:ARG:HH11	1:A:364:ARG:CG	2.24	0.47
1:A:498:ARG:HH11	1:A:498:ARG:CB	2.27	0.47
1:A:346:GLY:O	1:A:351:LYS:HE2	2.14	0.47
1:A:564:LEU:HD12	1:A:569:VAL:CG2	2.34	0.46
1:A:463:THR:O	1:A:467:ILE:HD13	2.16	0.46
1:A:434:GLN:NE2	1:A:478:ASP:CB	2.79	0.46
1:A:577:MET:HE3	1:A:577:MET:HA	1.98	0.46
1:A:509:PRO:HG2	1:A:514:ARG:HG2	1.98	0.46
1:A:575:SER:C	1:A:577:MET:H	2.22	0.46
1:A:325:ALA:C	1:A:327:LEU:N	2.73	0.46
1:A:329:MET:O	1:A:329:MET:HE3	2.17	0.45
1:A:385:GLY:HA3	1:A:547:SER:OG	2.17	0.45
1:A:522:LEU:HD12	1:A:534:LEU:HD21	1.98	0.45
1:A:372:ARG:O	1:A:373:ALA:C	2.59	0.45
1:A:502:LYS:NZ	1:A:502:LYS:CB	2.79	0.45
1:A:560:PRO:HD3	1:A:580:ILE:HG22	1.99	0.45
1:A:571:ASN:OD1	1:A:571:ASN:N	2.50	0.44
1:A:347:GLN:HE21	1:A:506:VAL:HG13	1.82	0.43
1:A:403:PHE:HE2	1:A:405:ASN:HB2	1.81	0.43
1:A:540:MET:HE2	1:A:540:MET:HB3	1.84	0.43
1:A:381:PHE:CZ	1:A:505:TYR:HB2	2.53	0.43
1:A:380:LEU:HD23	1:A:504:VAL:HB	2.01	0.43
1:A:564:LEU:H	1:A:564:LEU:HG	1.48	0.43
1:A:560:PRO:CD	1:A:580:ILE:HG22	2.49	0.43
1:A:498:ARG:HB2	1:A:498:ARG:NH1	2.34	0.42
1:A:426:LEU:C	1:A:426:LEU:CD1	2.91	0.42
1:A:591:LYS:HZ3	1:A:591:LYS:CB	2.27	0.42
1:A:364:ARG:NH1	1:A:364:ARG:CG	2.83	0.42
1:A:434:GLN:NE2	1:A:478:ASP:HB3	2.34	0.42
1:A:324:LEU:HA	1:A:326:ASN:HD22	1.83	0.42
1:A:581:ARG:HE	1:A:581:ARG:HB2	1.34	0.42
1:A:589:LEU:HD13	1:A:589:LEU:HA	1.79	0.42
1:A:510:ASN:O	1:A:511:GLU:C	2.63	0.41
1:A:360:LEU:N	1:A:361:PRO:CD	2.84	0.41
1:A:466:LEU:HD23	1:A:466:LEU:HA	1.92	0.41
1:A:347:GLN:O	1:A:348:ASP:C	2.64	0.41
1:A:380:LEU:O	1:A:485:ALA:HA	2.21	0.41
1:A:446:LEU:O	1:A:446:LEU:HG	2.21	0.41
1:A:520:ASN:O	1:A:523:CYS:HB2	2.21	0.41
1:A:469:PHE:O	1:A:473:GLN:HG2	2.21	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:522:LEU:CD1	1:A:529:LEU:HB2	2.51	0.41
1:A:598:PRO:HD2	1:A:599:GLN:NE2	2.36	0.41
1:A:352:GLN:NE2	1:A:352:GLN:HA	2.36	0.41
1:A:376:ARG:H	1:A:501:ILE:HD12	1.85	0.41
1:A:363:LEU:O	1:A:365:PRO:HD3	2.21	0.40
1:A:552:LEU:CD1	1:A:589:LEU:HD13	2.52	0.40
1:A:396:ALA:HB2	1:A:403:PHE:HD1	1.87	0.40
1:A:443:VAL:CG2	1:A:485:ALA:N	2.84	0.40
1:A:358:VAL:C	1:A:361:PRO:HD2	2.47	0.40
1:A:559:GLY:N	1:A:560:PRO:CD	2.84	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:364:ARG:NH2	1:A:572:MET:O[6_554]	2.09	0.11

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	266/392 (68%)	239 (90%)	23 (9%)	4 (2%)	 

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	494	GLU
1	A	501	ILE
1	A	527	SER
1	A	423	VAL

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	191/329 (58%)	149 (78%)	42 (22%)	1 5

All (42) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	326	ASN
1	A	341	PHE
1	A	349	LEU
1	A	352	GLN
1	A	366	GLU
1	A	369	THR
1	A	372	ARG
1	A	378	LEU
1	A	388	LYS
1	A	393	LYS
1	A	406	ILE
1	A	407	SER
1	A	426	LEU
1	A	463	THR
1	A	467	ILE
1	A	472	VAL
1	A	473	GLN
1	A	479	ARG
1	A	491	GLU
1	A	496	VAL
1	A	502	LYS
1	A	510	ASN
1	A	516	LEU
1	A	517	LEU
1	A	521	LEU
1	A	525	GLN
1	A	529	LEU
1	A	530	THR
1	A	547	SER
1	A	561	ILE

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Mol	Chain	Res	Type
1	A	564	LEU
1	A	568	GLN
1	A	571	ASN
1	A	577	MET
1	A	580	ILE
1	A	581	ARG
1	A	583	SER
1	A	588	SER
1	A	589	LEU
1	A	591	LYS
1	A	595	SER
1	A	596	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	326	ASN
1	A	352	GLN
1	A	473	GLN
1	A	487	ASN
1	A	510	ASN
1	A	525	GLN
1	A	599	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 1 ligands modelled in this entry, 1 is monoatomic - leaving 0 for Mogul analysis.

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.

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 [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	272/392 (69%)	-0.21	2 (0%)	84 66	48, 75, 118, 144	0

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	411	LEU	2.2
1	A	610	ASP	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 oligosaccharides 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(Å ²)	Q<0.9
2	CL	A	701	1/1	0.94	0.07	61,61,61,61	0

6.5 Other polymers [i](#)

There are no such residues in this entry.