



Full wwPDB X-ray Structure Validation Report

Feb 26, 2014 – 04:40 PM GMT

PDB ID : 3E9T
Title : Crystal structure of Apo-form Calx CBD1 domain
Authors : Wu, M.; Zheng, L.
Deposited on : 2008-08-23
Resolution : 1.60 Å(reported)

This is a full wwPDB validation report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

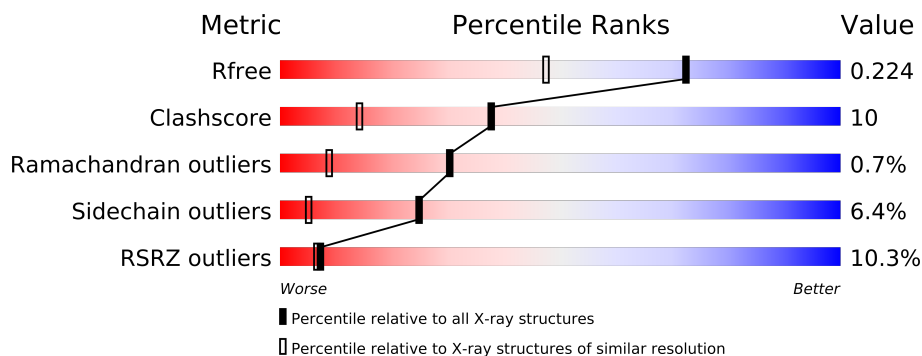
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : dev-1323
EDS : stable22639
Percentile statistics : 21963
Refmac : 5.8.0049
CCP4 : 6.3.0 (Settle)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable22683

1 Overall quality at a glance

The reported resolution of this entry is 1.60 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}	66092	1872 (1.60-1.60)
Clashscore	79885	2199 (1.60-1.60)
Ramachandran outliers	78287	2126 (1.60-1.60)
Sidechain outliers	78261	2125 (1.60-1.60)
RSRZ outliers	66119	1872 (1.60-1.60)

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 ≥ 3 , 2, 1 and 0 types of geometric quality criteria. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	114	
1	B	114	
1	C	114	
1	D	114	

The following table lists non-polymeric compounds that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Geometry	Electron density
2	CA	B	2	-	X
2	CA	B	5	-	X

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3949 atoms, of which 0 are hydrogen and 0 are deuterium.

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 Na/Ca exchange protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	112	Total	C	N	O	S	0	2	0
			905	576	144	178	7			
1	B	113	Total	C	N	O	S	0	3	0
			917	584	145	181	7			
1	C	105	Total	C	N	O	S	0	0	0
			838	535	136	161	6			
1	D	103	Total	C	N	O	S	0	1	0
			822	525	134	157	6			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	440	GLU	-	EXPRESSION TAG	UNP Q24413
A	441	PHE	-	EXPRESSION TAG	UNP Q24413
B	440	GLU	-	EXPRESSION TAG	UNP Q24413
B	441	PHE	-	EXPRESSION TAG	UNP Q24413
C	440	GLU	-	EXPRESSION TAG	UNP Q24413
C	441	PHE	-	EXPRESSION TAG	UNP Q24413
D	440	GLU	-	EXPRESSION TAG	UNP Q24413
D	441	PHE	-	EXPRESSION TAG	UNP Q24413

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

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	4	Total	Ca	0	0
			4	4		
2	A	2	Total	Ca	0	0
			2	2		

- Molecule 3 is water.

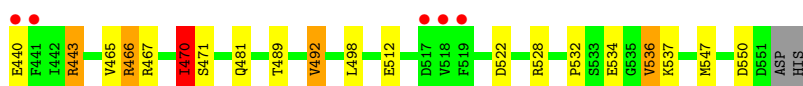
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	156	Total 156	O 156	0	0
3	B	118	Total 118	O 118	0	0
3	C	111	Total 111	O 111	0	0
3	D	76	Total 76	O 76	0	0

3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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: Na/Ca exchange protein

Chain A: 



- Molecule 1: Na/Ca exchange protein

Chain B: 



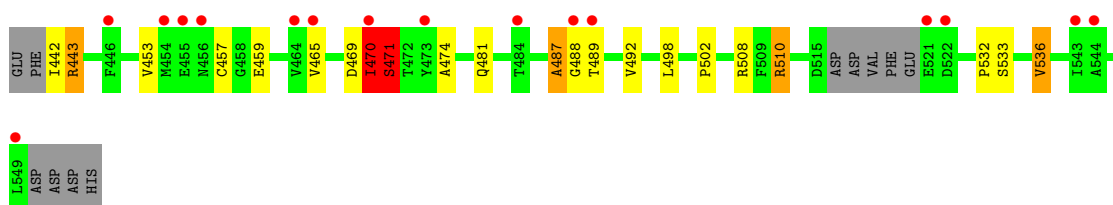
- Molecule 1: Na/Ca exchange protein

Chain C: 



- Molecule 1: Na/Ca exchange protein

Chain D: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	59.09Å 76.43Å 128.92Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.73 – 1.60 46.75 – 1.60	Depositor EDS
% Data completeness (in resolution range)	100.0 (46.73-1.60) 99.5 (46.75-1.60)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.34 (at 1.60Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.193 , 0.223 0.194 , 0.224	Depositor DCC
R_{free} test set	3868 reflections (5.26%)	DCC
Wilson B-factor (Å ²)	17.6	Xtriage
Anisotropy	0.117	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.39 , 42.9	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.28$	Xtriage
Outliers	0 of 77352 reflections	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	3949	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 4.96% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: 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	0.59	0/930	0.74	1/1258 (0.1%)
1	B	0.63	0/945	0.79	2/1279 (0.2%)
1	C	0.62	0/855	0.92	5/1153 (0.4%)
1	D	0.57	0/841	0.84	4/1135 (0.4%)
All	All	0.60	0/3571	0.82	12/4825 (0.2%)

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	C	0	2
1	D	0	1
All	All	0	5

There are no bond length outliers.

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	443	ARG	NE-CZ-NH2	-10.15	115.22	120.30
1	C	443	ARG	NE-CZ-NH1	8.31	124.45	120.30
1	D	443	ARG	NE-CZ-NH2	-7.45	116.58	120.30
1	B	471	SER	N-CA-C	-7.24	91.46	111.00
1	C	452	THR	N-CA-C	6.99	129.87	111.00
1	C	471	SER	N-CA-C	-6.73	92.84	111.00
1	D	443	ARG	NE-CZ-NH1	6.04	123.32	120.30
1	A	471	SER	N-CA-C	-5.87	95.15	111.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	471	SER	N-CA-C	-5.56	95.98	111.00
1	C	465	VAL	CG1-CB-CG2	5.38	119.51	110.90
1	B	547	MET	CG-SD-CE	-5.20	91.89	100.20
1	D	470	ILE	C-N-CA	5.01	134.23	121.70

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	470	ILE	Peptide
1	B	470	ILE	Peptide
1	C	451	TYR	Peptide
1	C	470	ILE	Peptide
1	D	470	ILE	Peptide

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	905	0	862	22	1
1	B	917	0	875	12	2
1	C	838	0	806	19	1
1	D	822	0	800	18	3
2	A	2	0	0	0	0
2	B	4	0	0	0	0
3	A	156	0	0	3	1
3	B	118	0	0	1	2
3	C	111	0	0	6	0
3	D	76	0	0	6	0
All	All	3949	0	3343	68	5

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 10.

All (68) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:C:492:VAL:HB	3:C:647:HOH:O	1.41	1.18
1:A:443:ARG:HG2	1:A:443:ARG:HH11	1.03	1.12
1:A:492:VAL:HG13	1:A:512:GLU:HB2	1.50	0.93
1:C:501:PRO:HD2	1:C:504:VAL:HG21	1.54	0.89
1:A:443:ARG:HG2	1:A:443:ARG:NH1	1.84	0.89
1:C:501:PRO:O	1:C:504:VAL:HG22	1.78	0.84
1:A:443:ARG:CG	1:A:443:ARG:HH11	1.92	0.80
1:B:492[A]:VAL:HG22	1:B:512:GLU:HB2	1.69	0.75
1:D:469:ASP:OD1	1:D:471:SER:HB3	1.89	0.72
1:D:469:ASP:OD1	1:D:471:SER:CB	2.39	0.71
1:C:469:ASP:OD1	1:C:471:SER:HB3	1.90	0.71
1:C:492:VAL:HG22	1:C:512:GLU:HB2	1.72	0.71
1:B:453:VAL:CG1	1:B:457:CYS:SG	2.79	0.71
1:C:492:VAL:HG23	3:C:563:HOH:O	1.90	0.70
1:B:453:VAL:HG11	1:B:457:CYS:SG	2.32	0.69
1:C:481:GLN:OE1	3:C:569:HOH:O	2.09	0.69
1:C:492:VAL:CG2	1:C:512:GLU:HB2	2.24	0.68
1:A:481:GLN:HE22	1:C:481:GLN:HE22	1.41	0.67
1:A:443:ARG:HH12	1:A:537:LYS:HB3	1.59	0.66
1:A:465[A]:VAL:HG11	1:A:467:ARG:CZ	2.26	0.65
1:A:481:GLN:NE2	1:C:481:GLN:HE22	2.00	0.60
1:B:492[A]:VAL:CG2	1:B:512:GLU:HB2	2.31	0.59
1:D:488:GLY:N	3:D:339:HOH:O	2.36	0.58
1:A:489:THR:HG23	3:A:600:HOH:O	2.03	0.58
1:D:453:VAL:CG2	1:D:457:CYS:SG	2.92	0.58
1:B:524[B]:CYS:SG	1:B:547:MET:HE3	2.44	0.57
1:D:453:VAL:HG22	1:D:457:CYS:SG	2.49	0.53
1:B:448:PRO:HG3	3:B:668:HOH:O	2.09	0.53
1:A:481:GLN:HE22	1:A:528:ARG:HD2	1.73	0.53
1:D:532:PRO:HB2	1:D:536:VAL:HG22	1.91	0.52
1:D:470:ILE:O	1:D:470:ILE:HG22	2.10	0.51
1:D:508:ARG:NH1	3:D:360:HOH:O	2.44	0.51
1:A:534:GLU:HG2	3:A:677:HOH:O	2.11	0.51
1:A:532:PRO:HB2	1:A:536:VAL:HG22	1.92	0.51
1:D:470:ILE:H	1:D:471:SER:HB2	1.75	0.51
1:D:487:ALA:C	3:D:339:HOH:O	2.48	0.51
1:D:533:SER:O	1:D:536:VAL:HG13	2.12	0.50
1:C:532:PRO:HB2	1:C:536:VAL:HG22	1.93	0.49
1:C:501:PRO:CD	1:C:504:VAL:HG21	2.32	0.49
1:D:470:ILE:CG2	1:D:470:ILE:O	2.60	0.48
1:A:443:ARG:NH1	1:A:443:ARG:CG	2.62	0.48
1:A:465[A]:VAL:HG12	1:A:466:ARG:N	2.29	0.48
1:C:492:VAL:CG2	3:C:563:HOH:O	2.57	0.47

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:D:442:ILE:N	3:D:229:HOH:O	2.48	0.47
1:D:474:ALA:HB2	3:D:380:HOH:O	2.14	0.47
1:A:443:ARG:NH1	1:A:537:LYS:HB3	2.29	0.46
1:B:524[B]:CYS:SG	1:B:547:MET:CE	3.03	0.46
1:A:440:GLU:HB2	3:A:617:HOH:O	2.15	0.45
1:D:453:VAL:HG21	1:D:457:CYS:SG	2.56	0.45
1:C:504:VAL:HB	3:C:611:HOH:O	2.16	0.44
1:A:465[A]:VAL:HG11	1:A:467:ARG:NH2	2.33	0.44
1:A:465[A]:VAL:CG1	1:A:467:ARG:CZ	2.94	0.43
1:D:459:GLU:HG2	1:D:510:ARG:HB3	1.99	0.43
1:B:453:VAL:HG12	1:B:457:CYS:SG	2.57	0.43
1:D:487:ALA:O	3:D:329:HOH:O	2.21	0.43
1:B:533:SER:O	1:B:536:VAL:HG13	2.18	0.43
1:C:440:GLU:N	3:C:613:HOH:O	2.51	0.43
1:A:481:GLN:NE2	1:A:528:ARG:HD2	2.34	0.42
1:B:534:GLU:HB3	1:D:502:PRO:HB2	2.02	0.42
1:A:470:ILE:O	1:A:470:ILE:HG23	2.19	0.42
1:C:469:ASP:OD1	1:C:471:SER:CB	2.65	0.42
1:B:532:PRO:HB2	1:B:536:VAL:HG22	2.01	0.42
1:C:470:ILE:O	1:C:470:ILE:HG23	2.20	0.41
1:B:522:ASP:HB3	1:B:547:MET:HE1	2.03	0.41
1:A:466:ARG:HD3	1:A:466:ARG:HH11	1.69	0.41
1:C:492:VAL:HG21	1:C:512:GLU:HB2	2.03	0.40
1:C:504:VAL:O	1:C:504:VAL:HG23	2.20	0.40
1:A:443:ARG:HA	1:A:537:LYS:O	2.21	0.40

All (5) 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	Distance(Å)	Clash(Å)
1:B:522:ASP:OD1	1:C:443:ARG:NH2[1_655]	1.92	0.28
1:B:481:GLN:NE2	1:D:481:GLN:NE2[4_555]	2.01	0.19
1:D:481:GLN:OE1	3:B:656:HOH:O[4_455]	2.06	0.14
1:A:522:ASP:OD1	1:D:443:ARG:NH2[4_455]	2.12	0.08
3:A:690:HOH:O	3:B:668:HOH:O[1_455]	2.16	0.04

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	112/114 (98%)	112 (100%)	0	0	100	100
1	B	114/114 (100%)	112 (98%)	1 (1%)	1 (1%)	25	5
1	C	101/114 (89%)	100 (99%)	1 (1%)	0	100	100
1	D	100/114 (88%)	97 (97%)	1 (1%)	2 (2%)	11	1
All	All	427/456 (94%)	421 (99%)	3 (1%)	3 (1%)	30	9

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	471	SER
1	D	487	ALA
1	B	470	ILE

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	100/100 (100%)	92 (92%)	8 (8%)	17	2
1	B	102/100 (102%)	97 (95%)	5 (5%)	35	9
1	C	90/100 (90%)	84 (93%)	6 (7%)	23	4
1	D	89/100 (89%)	82 (92%)	7 (8%)	18	2
All	All	381/400 (95%)	355 (93%)	26 (7%)	25	4

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	443	ARG
1	A	466	ARG
1	A	470	ILE
1	A	492	VAL
1	A	498	LEU
1	A	536	VAL

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Mol	Chain	Res	Type
1	A	547	MET
1	A	550	ASP
1	B	465[A]	VAL
1	B	465[B]	VAL
1	B	498	LEU
1	B	536	VAL
1	B	547	MET
1	C	440	GLU
1	C	465	VAL
1	C	471	SER
1	C	489	THR
1	C	498	LEU
1	C	536	VAL
1	D	465[A]	VAL
1	D	465[B]	VAL
1	D	489	THR
1	D	492	VAL
1	D	498	LEU
1	D	510	ARG
1	D	536	VAL

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	481	GLN
1	B	507	GLN

5.3.3 RNA ⓘ

There are no RNA chains 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 carbohydrates in this entry.

5.6 Ligand geometry ⓘ

Of 6 ligands modelled in this entry, 6 are 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.

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 ⓘ

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, 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	112/114 (98%)	0.29	5 (4%) 32 31	14, 18, 33, 39	0
1	B	113/114 (99%)	0.30	6 (5%) 25 24	13, 17, 28, 39	0
1	C	105/114 (92%)	0.55	13 (12%) 5 4	15, 20, 28, 40	0
1	D	103/114 (90%)	0.87	16 (15%) 3 2	18, 22, 30, 43	0
All	All	433/456 (94%)	0.49	40 (9%) 7 8	13, 20, 31, 43	0

All (40) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	519	PHE	8.8
1	C	441	PHE	7.6
1	A	441	PHE	7.2
1	B	441	PHE	6.2
1	B	519	PHE	5.4
1	A	518	VAL	5.0
1	D	521	GLU	5.0
1	D	470	ILE	4.7
1	D	522	ASP	4.7
1	B	517	ASP	4.5
1	B	518	VAL	4.4
1	A	517	ASP	3.7
1	D	549	LEU	3.6
1	C	470	ILE	3.5
1	C	549	LEU	3.5
1	D	489	THR	3.1
1	D	455	GLU	2.9
1	D	473	TYR	2.8
1	D	454	MET	2.8
1	D	488	GLY	2.8
1	A	440	GLU	2.8

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Mol	Chain	Res	Type	RSRZ
1	C	454	MET	2.7
1	C	488	GLY	2.7
1	C	541	PRO	2.6
1	C	544	ALA	2.6
1	C	456	ASN	2.6
1	B	552	ASP	2.6
1	D	456	ASN	2.5
1	C	540	VAL	2.4
1	C	440	GLU	2.4
1	C	515	ASP	2.4
1	C	543	ILE	2.3
1	D	464	VAL	2.3
1	D	544	ALA	2.3
1	C	522	ASP	2.3
1	D	446	PHE	2.3
1	D	543	ILE	2.2
1	D	484	THR	2.1
1	B	468	GLY	2.1
1	D	465[A]	VAL	2.0

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 carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	RSR	LLDF	B-factors(Å ²)	Q<0.9
2	CA	B	2	1/1	0.31	8.74	30,30,30,30	0
2	CA	B	5	1/1	0.22	3.45	23,23,23,23	0

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Mol	Type	Chain	Res	Atoms	RSR	LLDF	B-factors(\AA^2)	Q<0.9
2	CA	A	6	1/1	0.28	1.02	31,31,31,31	0
2	CA	B	3	1/1	0.28	0.73	24,24,24,24	0
2	CA	B	4	1/1	0.18	-0.35	20,20,20,20	0
2	CA	A	1	1/1	0.19	-0.67	23,23,23,23	0

6.5 Other polymers

There are no such residues in this entry.