Full wwPDB X-ray Structure Validation Report (i)

Jun 22, 2024 – 09:51 AM EDT

PDB ID	:	6QJI
Title	:	Crystal Structure of the third PDZ domain of PSD-95 protein: space group P3112
Authors	:	Camara-Artigas, A.
Deposited on	:	2019-01-24
Resolution	:	1.50 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 (i) 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 (i)) were used in the production of this report:

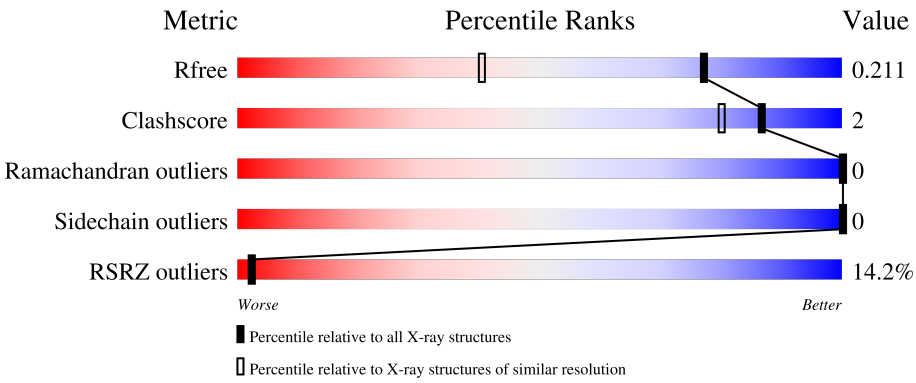
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	2.37.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

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 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}	130704	2936 (1.50-1.50)
Clashscore	141614	3144 (1.50-1.50)
Ramachandran outliers	138981	3066 (1.50-1.50)
Sidechain outliers	138945	3064 (1.50-1.50)
RSRZ outliers	127900	2884 (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 <=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	99	17%, 81%, 10%, 9%
1	B	99	10%, 93%, • 6%
1	C	99	13%, 93%, 7%
1	D	99	18%, 88%, • 8%
1	E	99	13%, 93%, • •

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Mol	Chain	Length	Quality of chain
1	F	99	8% 93% • 5%

2 Entry composition (i)

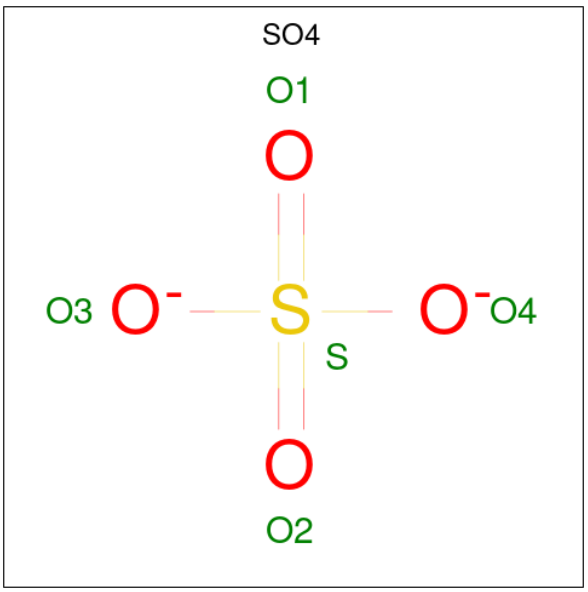
There are 3 unique types of molecules in this entry. The entry contains 8906 atoms, of which 4188 are hydrogens and 0 are deuteriums.

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 Disks large homolog 4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	H	N	O			
1	A	90	1369	429	684	125	131	0	1	0
1	B	93	1392	437	693	126	136	0	0	0
1	C	92	1391	435	695	128	133	0	0	0
1	D	91	1366	429	681	124	132	0	0	0
1	E	95	1436	449	717	132	138	0	0	0
1	F	94	1438	449	718	132	139	0	1	0

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O_4S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	O	S		
2	A	1	5	4	1	0	0
2	B	1	5	4	1	0	0
2	B	1	5	4	1	0	0
2	C	1	5	4	1	0	0
2	C	1	5	4	1	0	0
2	D	1	5	4	1	0	0
2	E	1	5	4	1	0	0
2	F	1	5	4	1	0	0

- Molecule 3 is water.

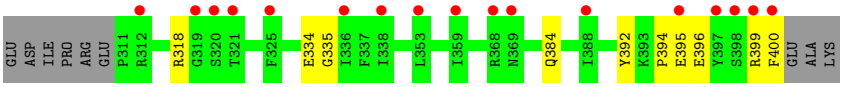
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	A	86	86	86	0	0
3	B	87	87	87	0	0
3	C	82	82	82	0	0
3	D	53	53	53	0	0
3	E	79	79	79	0	0
3	F	87	87	87	0	0

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.

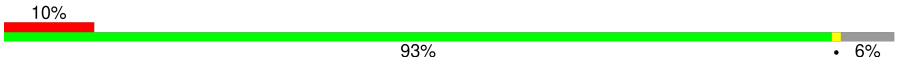
• Molecule 1: Disks large homolog 4

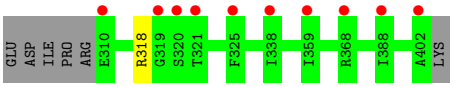
Chain A:



• Molecule 1: Disks large homolog 4

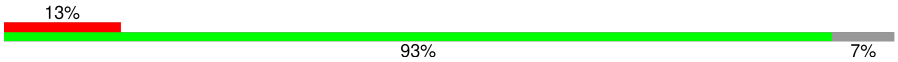
Chain B:

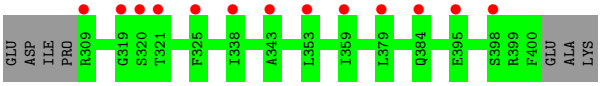




• Molecule 1: Disks large homolog 4

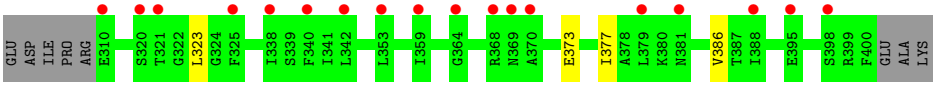
Chain C:





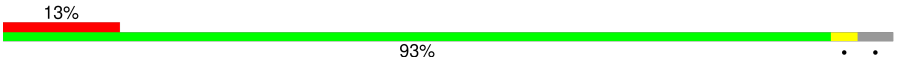
• Molecule 1: Disks large homolog 4

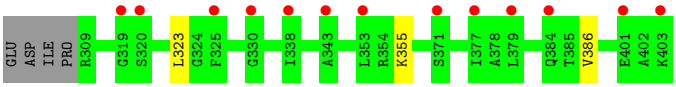
Chain D:



• Molecule 1: Disks large homolog 4

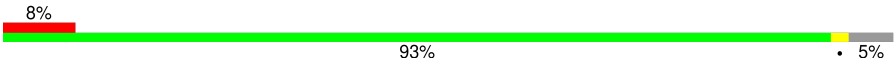
Chain E:

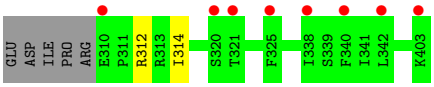




• Molecule 1: Disks large homolog 4

Chain F:


8%
93%
5%


GLU
ASP
ILE
PRO
ARG
E310
P311
R312
R313
I314
S320
T321
F325
I338
S339
F340
I341
L342
K403

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 31 1 2	Depositor
Cell constants a, b, c, α, β, γ	61.97Å 61.97Å 228.37Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	19.97 – 1.50 19.97 – 1.50	Depositor EDS
% Data completeness (in resolution range)	99.3 (19.97-1.50) 99.6 (19.97-1.50)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	5.10 (at 1.50Å)	Xtriage
Refinement program	PHENIX	Depositor
R, R_{free}	0.212 , 0.261 0.218 , 0.211	Depositor DCC
R_{free} test set	3965 reflections (4.92%)	wwPDB-VP
Wilson B-factor (Å^2)	14.6	Xtriage
Anisotropy	0.116	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.57 , 60.8	EDS
L-test for twinning[2]	$< \|L\| > = 0.43$, $< L^2 > = 0.25$	Xtriage
Estimated twinning fraction	0.063 for -h,-k,l	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	8906	wwPDB-VP
Average B, all atoms (Å^2)	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 54.48 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 3.6288e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

[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 (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: SO4

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	0.46	0/695	0.59	0/935
1	B	0.55	0/709	0.56	0/955
1	C	0.39	0/706	0.60	0/950
1	D	0.33	0/695	0.51	0/936
1	E	0.45	0/729	0.56	0/980
1	F	0.35	0/730	0.50	0/980
All	All	0.43	0/4264	0.55	0/5736

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

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	685	684	683	12	0
1	B	699	693	692	1	0
1	C	696	695	694	0	0
1	D	685	681	681	2	0
1	E	719	717	718	2	0
1	F	720	718	717	1	0
2	A	5	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	10	0	0	1	0
2	C	10	0	0	0	0
2	D	5	0	0	1	0
2	E	5	0	0	0	0
2	F	5	0	0	0	0
3	A	86	0	0	0	0
3	B	87	0	0	0	0
3	C	82	0	0	0	0
3	D	53	0	0	0	0
3	E	79	0	0	0	0
3	F	87	0	0	0	0
All	All	4718	4188	4185	18	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 2.

All (18) 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:334:GLU:OE2	1:A:400:PHE:HB3	1.64	0.98
1:A:334:GLU:CD	1:A:400:PHE:HB3	2.08	0.73
1:A:334:GLU:HG3	1:A:400:PHE:CD2	2.25	0.70
1:A:396:GLU:HB3	1:A:400:PHE:CE2	2.28	0.68
1:A:392:TYR:CZ	1:A:394:PRO:HG3	2.31	0.66
1:A:392:TYR:CE2	1:A:394:PRO:HG3	2.38	0.59
1:A:334:GLU:CD	1:A:400:PHE:CB	2.73	0.57
1:A:396:GLU:HB3	1:A:400:PHE:HE2	1.71	0.54
1:F:312:ARG:HG3	1:F:314:ILE:HD11	1.90	0.53
1:A:395:GLU:O	1:A:399:ARG:HG3	2.09	0.52
1:A:334:GLU:HG2	1:A:335:GLY:N	2.27	0.50
1:A:318:ARG:O	1:A:384[A]:GLN:NE2	2.48	0.47
2:D:501:SO4:O2	1:E:355:LYS:HG3	2.16	0.45
1:B:318:ARG:HD3	2:B:502:SO4:O3	2.18	0.44
1:A:334:GLU:HG3	1:A:400:PHE:CG	2.54	0.42
1:E:323:LEU:HD21	1:E:386:VAL:HG21	2.02	0.41
1:D:373:GLU:O	1:D:377:ILE:HG12	2.21	0.41
1:D:323:LEU:HD21	1:D:386:VAL:HG21	2.02	0.41

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	89/99 (90%)	87 (98%)	2 (2%)	0	100	100
1	B	91/99 (92%)	90 (99%)	1 (1%)	0	100	100
1	C	90/99 (91%)	89 (99%)	1 (1%)	0	100	100
1	D	89/99 (90%)	88 (99%)	1 (1%)	0	100	100
1	E	93/99 (94%)	92 (99%)	1 (1%)	0	100	100
1	F	93/99 (94%)	93 (100%)	0	0	100	100
All	All	545/594 (92%)	539 (99%)	6 (1%)	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	70/77 (91%)	70 (100%)	0	100	100
1	B	71/77 (92%)	71 (100%)	0	100	100
1	C	71/77 (92%)	71 (100%)	0	100	100
1	D	70/77 (91%)	70 (100%)	0	100	100
1	E	73/77 (95%)	73 (100%)	0	100	100
1	F	73/77 (95%)	73 (100%)	0	100	100
All	All	428/462 (93%)	428 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

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 monosaccharides in this entry.

5.6 Ligand geometry (i)

8 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	SO4	E	501	-	4,4,4	0.23	0	6,6,6	0.06	0
2	SO4	A	501	-	4,4,4	0.21	0	6,6,6	0.16	0
2	SO4	B	501	-	4,4,4	0.23	0	6,6,6	0.11	0
2	SO4	D	501	-	4,4,4	0.42	0	6,6,6	0.07	0
2	SO4	C	502	-	4,4,4	0.30	0	6,6,6	0.13	0
2	SO4	C	501	-	4,4,4	0.25	0	6,6,6	0.11	0
2	SO4	B	502	-	4,4,4	0.42	0	6,6,6	0.08	0
2	SO4	F	501	-	4,4,4	0.23	0	6,6,6	0.23	0

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 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	501	SO4	1	0
2	B	502	SO4	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	90/99 (90%)	0.95	17 (18%)	1	1	10, 19, 33, 42	0
1	B	93/99 (93%)	0.79	10 (10%)	5	5	12, 19, 28, 40	0
1	C	92/99 (92%)	0.72	13 (14%)	2	2	11, 18, 31, 43	0
1	D	91/99 (91%)	1.05	18 (19%)	1	1	14, 22, 32, 41	0
1	E	95/99 (95%)	1.02	13 (13%)	3	3	13, 22, 31, 40	0
1	F	94/99 (94%)	0.58	8 (8%)	10	11	8, 16, 29, 36	0
All	All	555/594 (93%)	0.85	79 (14%)	2	2	8, 20, 32, 43	0

All (79) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	320	SER	7.1
1	A	321	THR	5.8
1	B	321	THR	5.7
1	D	369	ASN	5.1
1	E	320	SER	4.8
1	F	340	PHE	4.8
1	E	401	GLU	4.3
1	C	320	SER	4.3
1	D	310	GLU	4.0
1	E	403	LYS	3.9
1	D	368	ARG	3.8
1	A	395	GLU	3.8
1	C	319	GLY	3.8
1	B	310	GLU	3.8
1	D	359	ILE	3.8
1	C	384	GLN	3.6
1	A	359	ILE	3.6
1	A	399	ARG	3.6
1	D	398	SER	3.5

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Mol	Chain	Res	Type	RSRZ
1	F	403	LYS	3.5
1	C	321	THR	3.5
1	B	359	ILE	3.4
1	E	384	GLN	3.4
1	D	395	GLU	3.3
1	D	379	LEU	3.2
1	F	310	GLU	3.1
1	B	402	ALA	3.1
1	E	325	PHE	3.0
1	D	388	ILE	3.0
1	C	325	PHE	2.9
1	D	321	THR	2.9
1	A	319	GLY	2.9
1	E	353	LEU	2.9
1	C	395	GLU	2.9
1	A	369	ASN	2.8
1	A	388	ILE	2.8
1	A	320	SER	2.8
1	A	398	SER	2.8
1	C	343	ALA	2.8
1	A	325	PHE	2.8
1	A	368	ARG	2.8
1	C	338	ILE	2.7
1	A	400	PHE	2.7
1	C	353	LEU	2.7
1	E	338	ILE	2.7
1	A	338	ILE	2.6
1	B	388	ILE	2.6
1	B	319	GLY	2.6
1	F	342	LEU	2.6
1	B	325	PHE	2.6
1	D	353	LEU	2.5
1	C	309	ARG	2.5
1	D	320	SER	2.5
1	D	340	PHE	2.5
1	B	368	ARG	2.5
1	D	381	ASN	2.5
1	E	319	GLY	2.4
1	E	343	ALA	2.4
1	C	398	SER	2.4
1	D	338	ILE	2.3
1	E	371	SER	2.3

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Mol	Chain	Res	Type	RSRZ
1	D	370	ALA	2.2
1	A	336	ILE	2.2
1	E	377	ILE	2.2
1	F	338	ILE	2.2
1	E	330	GLY	2.2
1	F	320	SER	2.2
1	D	325	PHE	2.2
1	C	359	ILE	2.2
1	C	379	LEU	2.2
1	A	397	TYR	2.2
1	B	338	ILE	2.1
1	F	321	THR	2.1
1	D	364	GLY	2.1
1	F	325	PHE	2.1
1	A	353	LEU	2.1
1	D	342	LEU	2.1
1	E	379	LEU	2.0
1	A	312	ARG	2.0

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(Å^2)	Q<0.9
2	SO4	E	501	5/5	0.90	0.20	64,67,68,68	0
2	SO4	C	502	5/5	0.91	0.30	29,29,29,29	0
2	SO4	D	501	5/5	0.94	0.30	30,30,30,30	0
2	SO4	B	501	5/5	0.94	0.11	32,33,37,38	0
2	SO4	C	501	5/5	0.95	0.12	33,37,40,43	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	SO4	F	501	5/5	0.95	0.30	29,29,29,29	0
2	SO4	A	501	5/5	0.96	0.15	35,35,39,40	0
2	SO4	B	502	5/5	0.97	0.20	34,36,38,39	0

6.5 Other polymers (i)

There are no such residues in this entry.