



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 16, 2024 – 01:30 am GMT

PDB ID : 6SH9
Title : EngBF DARPin Fusion 4b D12
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Deposited on : 2019-08-06
Resolution : 2.40 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 : 4.02b-467
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
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) : 2.36

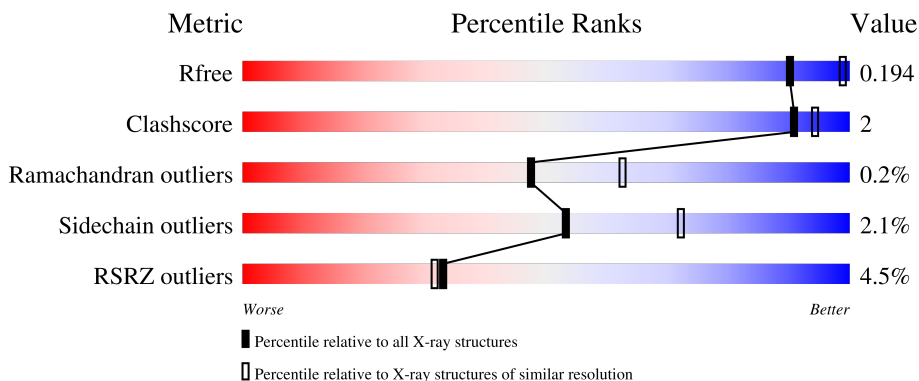
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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	3907 (2.40-2.40)
Clashscore	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

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	B	1357	
2	E	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
5	MPD	B	1706	-	-	-	X

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 11359 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 Endo-alpha-N-acetylgalactosaminidase,DARPin 4b D12.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	B	1339	10334	6430	1773	2103	28	0	7	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	334	GLY	-	expression tag	UNP Q3T552
B	335	PRO	-	expression tag	UNP Q3T552
B	336	LEU	-	expression tag	UNP Q3T552
B	337	GLY	-	expression tag	UNP Q3T552
B	338	SER	-	expression tag	UNP Q3T552
B	339	MET	-	expression tag	UNP Q3T552
B	342	CYS	SER	conflict	UNP Q3T552
B	1123	SER	GLY	conflict	UNP Q3T552

- Molecule 2 is a protein called Envelope glycoprotein gp160.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	E	10	80	54	15	11	0	0	0

- Molecule 3 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (three-letter code: MES) (formula: C₆H₁₃NO₄S).

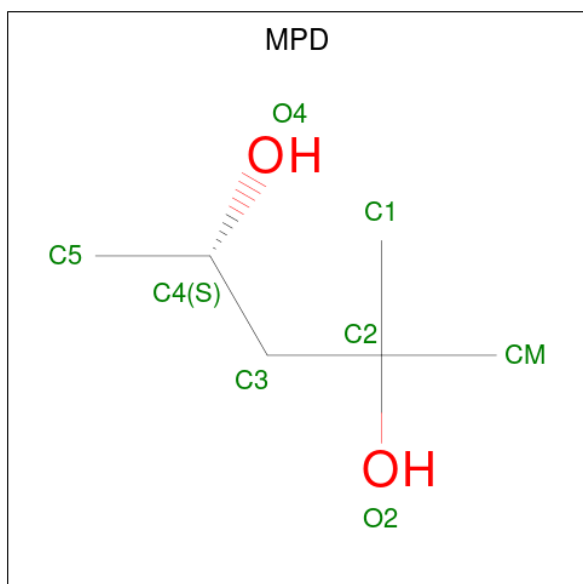


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
3	B	1	12	6	1	4	1	0	0

- Molecule 4 is MANGANESE (II) ION (three-letter code: MN) (formula: Mn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mn		
4	B	4	4	4	0	0

- Molecule 5 is (4S)-2-METHYL-2,4-PENTANEDIOL (three-letter code: MPD) (formula: C₆H₁₄O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	B	1	Total	C	O	0	0
			8	6	2		

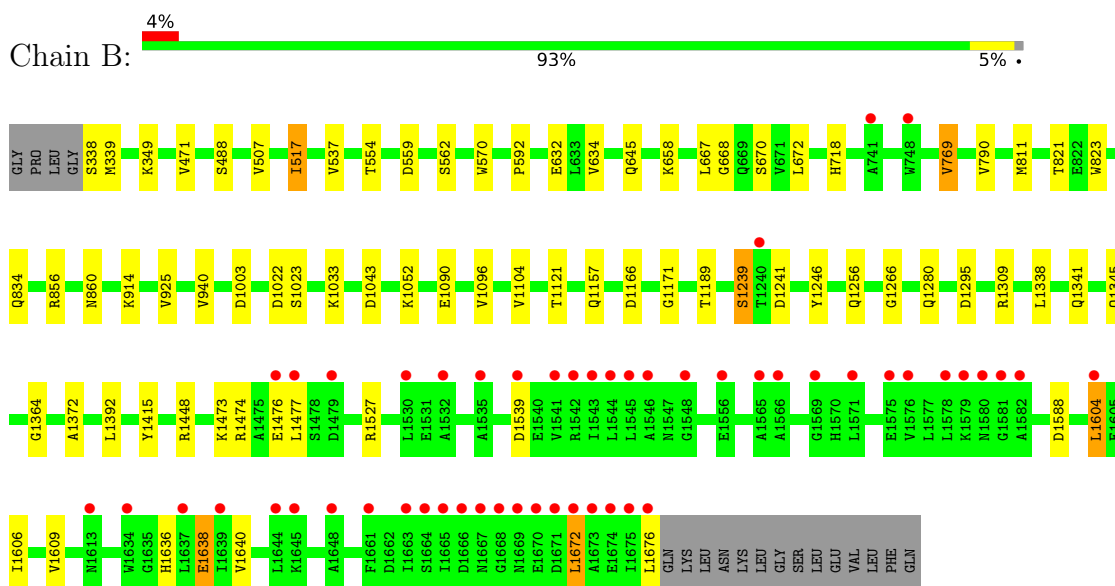
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	B	919	Total	O	0	0
			919	919		
6	E	2	Total	O	0	0
			2	2		

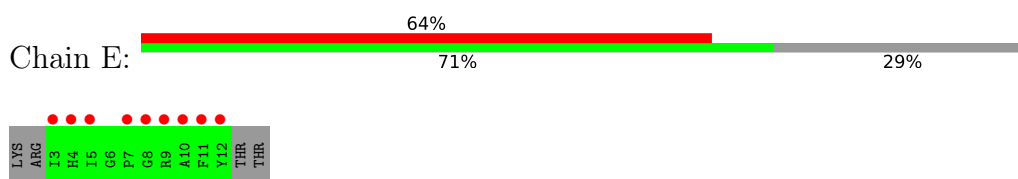
3 Residue-property plots [i](#)

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: Endo-alpha-N-acetylgalactosaminidase,DARPin 4b D12



- Molecule 2: Envelope glycoprotein gp160



4 Data and refinement statistics i

Property	Value	Source
Space group	P 65	Depositor
Cell constants a, b, c, α , β , γ	192.01Å 192.01Å 122.05Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	49.20 – 2.40 49.20 – 2.40	Depositor EDS
% Data completeness (in resolution range)	100.0 (49.20-2.40) 100.0 (49.20-2.40)	Depositor EDS
R_{merge}	0.37	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.60 (at 2.39Å)	Xtrriage
Refinement program	BUSTER 2.10.3	Depositor
R, R_{free}	0.161 , 0.193 0.166 , 0.194	Depositor DCC
R_{free} test set	4991 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	52.2	Xtrriage
Anisotropy	0.127	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 45.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.028 for h,-h-k,-l	Xtrriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	11359	wwPDB-VP
Average B, all atoms (Å ²)	60.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 1.97% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: MPD, MES, MN

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	B	0.43	0/10532	0.69	1/14286 (0.0%)
2	E	0.46	0/83	0.58	0/111
All	All	0.43	0/10615	0.69	1/14397 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	1295	ASP	N-CA-C	-5.12	97.17	111.00

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	B	10334	0	9889	34	0
2	E	80	0	77	0	0
3	B	12	0	13	0	0
4	B	4	0	0	0	0
5	B	8	0	14	0	0
6	B	919	0	0	2	0
6	E	2	0	0	0	0
All	All	11359	0	9993	34	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 (34) 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:1189:THR:HB	1:B:1345:GLN:HB3	1.78	0.65
1:B:1157[A]:GLN:HE22	1:B:1256:GLN:HE22	1.50	0.59
1:B:634:VAL:HG11	1:B:667:LEU:HD13	1.85	0.57
1:B:925:VAL:HG12	1:B:940:VAL:HG12	1.87	0.56
1:B:1364:GLY:HA2	1:B:1392:LEU:HD13	1.87	0.54
1:B:1171:GLY:HA3	1:B:1239:SER:HB2	1.90	0.54
1:B:821:THR:HG22	1:B:834:GLN:NE2	2.24	0.52
1:B:645:GLN:O	1:B:1280:GLN:HG2	2.10	0.51
1:B:1604:LEU:HD11	1:B:1638:GLU:HB3	1.92	0.51
1:B:1640:VAL:HG21	1:B:1672:LEU:HD21	1.93	0.51
1:B:823:TRP:O	1:B:834:GLN:HG3	2.11	0.51
1:B:634:VAL:HA	1:B:914:LYS:HG3	1.92	0.51
1:B:769:VAL:HG23	1:B:811:MET:HB2	1.93	0.51
1:B:570:TRP:CD2	1:B:592:PRO:HB3	2.47	0.50
1:B:507:VAL:HG22	1:B:554:THR:HG23	1.95	0.49
1:B:471:VAL:HB	1:B:517:ILE:HD11	1.94	0.48
1:B:1309:ARG:HD3	6:B:1997:HOH:O	2.14	0.48
1:B:1309:ARG:HA	6:B:1997:HOH:O	2.17	0.45
1:B:554:THR:HA	1:B:562:SER:O	2.17	0.45
1:B:1052:LYS:HE2	1:B:1090:GLU:HG3	2.00	0.44
1:B:1606:ILE:HA	1:B:1609:VAL:HG12	2.00	0.44
1:B:632:GLU:O	1:B:668:GLY:HA3	2.18	0.44
1:B:1003:ASP:HB2	1:B:1033:LYS:HE2	2.00	0.44
1:B:1476:GLU:HG2	1:B:1527:ARG:HD2	2.00	0.44
1:B:658:LYS:HD3	1:B:1096:VAL:HG13	2.00	0.43
1:B:856:ARG:O	1:B:860:ASN:HB2	2.18	0.43
1:B:672:LEU:HD11	1:B:718:HIS:HB2	2.01	0.42
1:B:1636:HIS:O	1:B:1640:VAL:HG23	2.19	0.42
1:B:488:SER:HB2	1:B:537:VAL:HB	2.01	0.41
1:B:821:THR:HG22	1:B:834:GLN:HE21	1.85	0.41
1:B:821:THR:CG2	1:B:834:GLN:HE21	2.34	0.41
1:B:1338:LEU:HD21	1:B:1341:GLN:HB3	2.02	0.41
1:B:1372:ALA:HB2	1:B:1415:TYR:HB2	2.03	0.41
1:B:1166:ASP:HB3	1:B:1246:TYR:HB2	2.02	0.40

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	B	1344/1357 (99%)	1294 (96%)	47 (4%)	3 (0%)	47	62
2	E	8/14 (57%)	6 (75%)	2 (25%)	0	100	100
All	All	1352/1371 (99%)	1300 (96%)	49 (4%)	3 (0%)	47	62

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	790	VAL
1	B	1266	GLY
1	B	1473	LYS

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	B	1099/1107 (99%)	1076 (98%)	23 (2%)	53	72
2	E	7/11 (64%)	7 (100%)	0	100	100
All	All	1106/1118 (99%)	1083 (98%)	23 (2%)	53	72

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	338	SER
1	B	339	MET
1	B	349	LYS

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Mol	Chain	Res	Type
1	B	517	ILE
1	B	559	ASP
1	B	670	SER
1	B	769	VAL
1	B	1022	ASP
1	B	1023	SER
1	B	1043	ASP
1	B	1104	VAL
1	B	1121	THR
1	B	1239	SER
1	B	1241	ASP
1	B	1448	ARG
1	B	1474	ARG
1	B	1477	LEU
1	B	1539	ASP
1	B	1588	ASP
1	B	1604	LEU
1	B	1638	GLU
1	B	1672	LEU
1	B	1676	LEU

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

Mol	Chain	Res	Type
1	B	426	GLN
1	B	813	ASN
1	B	1218	ASN
1	B	1256	GLN
1	B	1443	ASN
1	B	1587	ASN
1	B	1636	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](#)

Of 6 ligands modelled in this entry, 4 are monoatomic - leaving 2 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	$\# Z > 2$
3	MES	B	1701	-	12,12,12	0.70	0	14,16,16	0.37	0
5	MPD	B	1706	-	7,7,7	0.47	0	9,10,10	0.43	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
3	MES	B	1701	-	-	5/6/14/14	0/1/1/1
5	MPD	B	1706	-	-	2/5/5/5	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	1701	MES	C7-C8-S-O3S
3	B	1701	MES	C8-C7-N4-C3
3	B	1701	MES	C8-C7-N4-C5
5	B	1706	MPD	C2-C3-C4-C5
3	B	1701	MES	C7-C8-S-O1S
3	B	1701	MES	C7-C8-S-O2S
5	B	1706	MPD	C2-C3-C4-O4

There are no ring outliers.

No monomer is involved in short contacts.

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	B	1339/1357 (98%)	-0.28	52 (3%) 39 38	35, 54, 106, 171	0
2	E	10/14 (71%)	3.59	9 (90%) 0 0	129, 132, 145, 147	0
All	All	1349/1371 (98%)	-0.25	61 (4%) 33 31	35, 54, 107, 171	0

All (61) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	E	9	ARG	8.1
1	B	1672	LEU	7.7
2	E	11	PHE	5.4
1	B	1673	ALA	5.2
1	B	1668	GLY	5.1
1	B	1667	ASN	4.6
1	B	1663	ILE	4.1
2	E	12	TYR	4.0
1	B	1671	ASP	3.9
1	B	1543	ILE	3.8
1	B	1665	ILE	3.7
1	B	1669	ASN	3.7
1	B	1670	GLU	3.7
1	B	1648	ALA	3.6
1	B	1674	GLU	3.6
1	B	1661	PHE	3.6
1	B	1664	SER	3.6
2	E	8	GLY	3.5
1	B	1637	LEU	3.4
1	B	1578	LEU	3.4
1	B	1675	ILE	3.4
1	B	1634	TRP	3.3
1	B	1580	ASN	3.3
1	B	1535	ALA	3.2

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Mol	Chain	Res	Type	RSRZ
1	B	1644	LEU	3.2
1	B	1541	VAL	3.2
1	B	1477	LEU	3.1
1	B	1565	ALA	2.9
2	E	7	PRO	2.9
1	B	1571	LEU	2.9
1	B	1539	ASP	2.9
1	B	1569	GLY	2.8
1	B	1639	ILE	2.8
2	E	5	ILE	2.8
1	B	1666	ASP	2.8
1	B	1545	LEU	2.8
2	E	4	HIS	2.8
1	B	748	TRP	2.7
1	B	1566	ALA	2.6
1	B	1575	GLU	2.6
2	E	10	ALA	2.6
1	B	1645	LYS	2.5
1	B	1556	GLU	2.5
1	B	1546	ALA	2.5
1	B	1476	GLU	2.5
1	B	1613	ASN	2.5
1	B	1576	VAL	2.4
1	B	1582	ALA	2.4
1	B	1544	LEU	2.4
1	B	1581	GLY	2.3
1	B	1579	LYS	2.3
1	B	1542	ARG	2.2
1	B	1240	THR	2.2
1	B	1676	LEU	2.2
1	B	1479	ASP	2.2
1	B	741	ALA	2.2
1	B	1530	LEU	2.2
1	B	1604	LEU	2.1
1	B	1548	GLY	2.1
1	B	1532	ALA	2.0
2	E	3	ILE	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 [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
5	MPD	B	1706	8/8	0.76	0.43	87,89,90,93	0
3	MES	B	1701	12/12	0.97	0.14	68,84,93,94	0
4	MN	B	1703	1/1	0.98	0.10	67,67,67,67	0
4	MN	B	1705	1/1	0.99	0.04	61,61,61,61	0
4	MN	B	1704	1/1	0.99	0.08	61,61,61,61	0
4	MN	B	1702	1/1	1.00	0.14	47,47,47,47	0

6.5 Other polymers [i](#)

There are no such residues in this entry.