Full wwPDB X-ray Structure Validation Report ⓘ

Nov 19, 2023 – 07:02 PM JST

PDB ID	:	6M3R
Title	:	Crystal structure of AnkG/beta4-spectrin complex
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Deposited on	:	2020-03-04
Resolution	:	4.31 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:

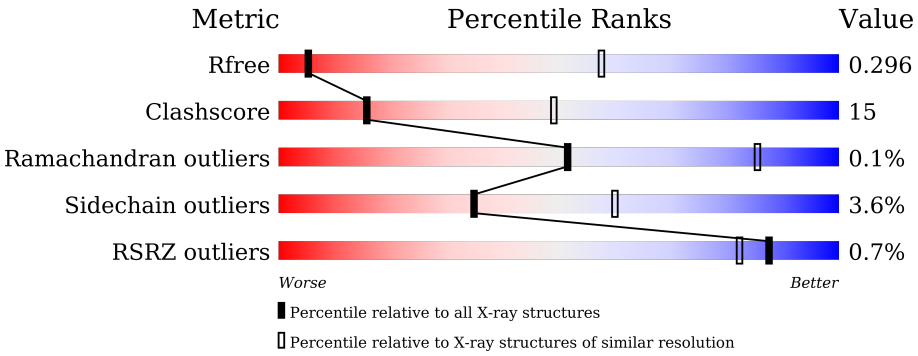
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.36
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 4.31 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	1018 (4.84-3.80)
Clashscore	141614	1081 (4.84-3.80)
Ramachandran outliers	138981	1033 (4.84-3.80)
Sidechain outliers	138945	1016 (4.84-3.80)
RSRZ outliers	127900	1078 (4.92-3.70)

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	E	491	59% 25% • 14%
2	F	322	% 71% 18% 10%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 4999 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 Ankyrin-3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	E	422	2942	1875	498	549	20	0	0	0

- Molecule 2 is a protein called Spectrin beta chain.

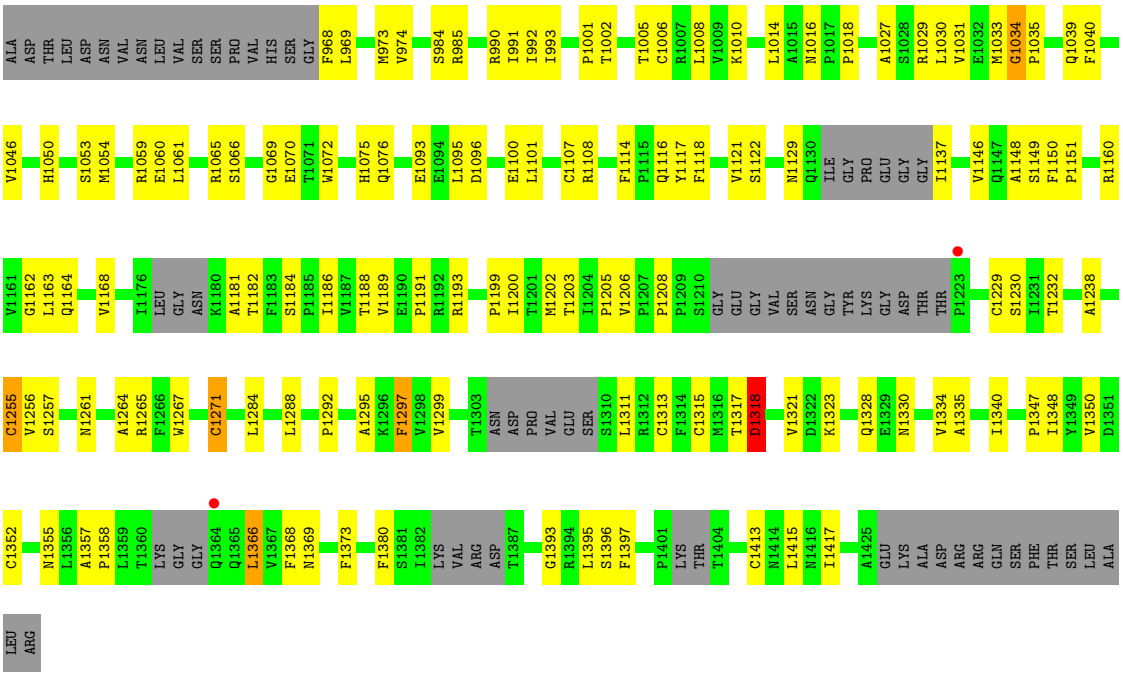
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	F	289	2057	1301	348	400	8	0	0	0

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.

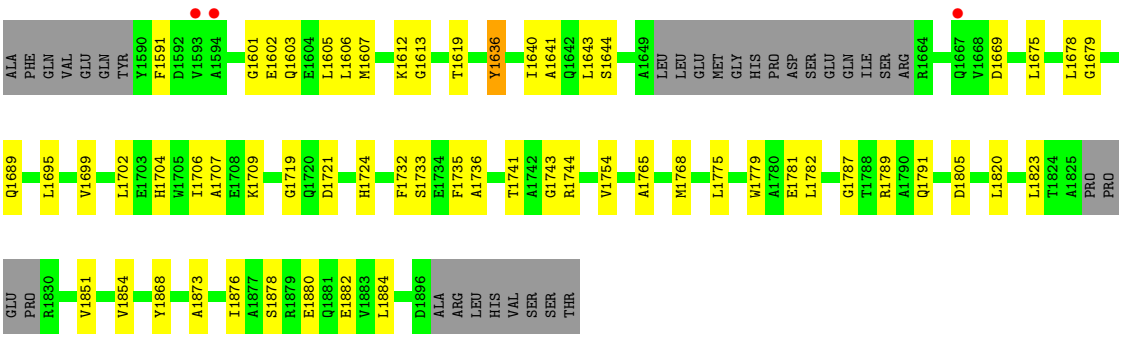
• Molecule 1: Ankyrin-3

Chain E:



• Molecule 2: Spectrin beta chain

Chain F:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α, β, γ	139.59Å 139.59Å 211.32Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	39.90 – 4.31 39.90 – 4.31	Depositor EDS
% Data completeness (in resolution range)	95.3 (39.90-4.31) 95.4 (39.90-4.31)	Depositor EDS
R_{merge}	0.16	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.38 (at 4.28Å)	Xtriage
Refinement program	PHENIX 1.10.1_2155	Depositor
R, R_{free}	0.256 , 0.295 0.257 , 0.296	Depositor DCC
R_{free} test set	765 reflections (4.84%)	wwPDB-VP
Wilson B-factor (Å^2)	77.9	Xtriage
Anisotropy	0.046	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.24 , 141.7	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	0.031 for -h,-k,l	Xtriage
F_o,F_c correlation	0.83	EDS
Total number of atoms	4999	wwPDB-VP
Average B, all atoms (Å^2)	87.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.13% 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	E	0.44	0/3003	0.76	2/4124 (0.0%)
2	F	0.38	0/2087	0.62	1/2847 (0.0%)
All	All	0.42	0/5090	0.70	3/6971 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	E	1034	GLY	C-N-CD	-12.11	93.97	120.60
1	E	1318	ASP	CB-CG-OD1	5.49	123.24	118.30
2	F	1643	LEU	CB-CG-CD2	-5.19	102.18	111.00

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	E	2942	0	2670	103	0
2	F	2057	0	1848	39	0
All	All	4999	0	4518	140	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 15.

All (140) 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:E:1137:ILE:HA	1:E:1149:SER:OG	1.73	0.87
1:E:1016:ASN:HD21	1:E:1070:GLU:HA	1.45	0.81
1:E:1129:ASN:O	1:E:1160:ARG:HA	1.82	0.80
1:E:1014:LEU:HD11	1:E:1117:TYR:HE2	1.49	0.77
1:E:1018:PRO:HG3	1:E:1072:TRP:CE2	2.20	0.77
1:E:1053:SER:HB3	1:E:1292:PRO:HB2	1.68	0.75
1:E:1148:ALA:HB1	1:E:1202:MET:HE2	1.69	0.74
1:E:1116:GLN:HG3	1:E:1117:TYR:HD1	1.53	0.74
1:E:1116:GLN:HG3	1:E:1117:TYR:CD1	2.23	0.73
1:E:1014:LEU:HD11	1:E:1117:TYR:CE2	2.23	0.73
1:E:991:ILE:HD11	1:E:1006:CYS:HB2	1.74	0.70
2:F:1602:GLU:O	2:F:1606:LEU:HG	1.90	0.70
1:E:1150:PHE:HA	1:E:1200:ILE:HG13	1.74	0.68
1:E:1040:PHE:HE1	1:E:1114:PHE:HD1	1.40	0.68
1:E:974:VAL:O	1:E:1001:PRO:HA	1.93	0.67
1:E:1016:ASN:ND2	1:E:1070:GLU:HA	2.11	0.66
1:E:1148:ALA:HB1	1:E:1202:MET:CE	2.24	0.66
1:E:1095:LEU:HD22	1:E:1101:LEU:HD12	1.79	0.65
1:E:1096:ASP:HB3	1:E:1100:GLU:CB	2.27	0.64
2:F:1709:LYS:HG3	2:F:1735:PHE:CZ	2.33	0.64
1:E:1151:PRO:HG3	1:E:1199:PRO:O	1.97	0.64
2:F:1709:LYS:HG3	2:F:1735:PHE:CE2	2.32	0.63
1:E:1350:VAL:HG22	1:E:1397:PHE:HD1	1.61	0.63
2:F:1607:MET:HE3	2:F:1679:GLY:HA2	1.80	0.62
2:F:1695:LEU:HD11	2:F:1754:VAL:HG22	1.81	0.62
1:E:1202:MET:O	1:E:1257:SER:HA	2.00	0.62
1:E:1199:PRO:HG3	1:E:1261:ASN:HD21	1.64	0.61
1:E:1010:LYS:HA	1:E:1029:ARG:NH1	2.15	0.61
1:E:1347:PRO:HA	1:E:1369:ASN:HA	1.83	0.60
1:E:1053:SER:HB3	1:E:1292:PRO:CB	2.32	0.59
1:E:1040:PHE:CE1	1:E:1114:PHE:HD1	2.20	0.59
1:E:1230:SER:OG	1:E:1238:ALA:HB1	2.03	0.58
1:E:1040:PHE:HE1	1:E:1114:PHE:CD1	2.21	0.58
1:E:1230:SER:O	1:E:1264:ALA:HB1	2.03	0.58
1:E:1355:ASN:H	1:E:1393:GLY:HA3	1.69	0.58
1:E:1018:PRO:HG3	1:E:1072:TRP:CZ2	2.39	0.57
1:E:1232:THR:OG1	1:E:1238:ALA:HA	2.03	0.57
1:E:1335:ALA:HB1	1:E:1415:LEU:HD22	1.86	0.57
1:E:1040:PHE:CE1	1:E:1114:PHE:CD1	2.94	0.56
1:E:1393:GLY:O	1:E:1417:ILE:HG12	2.06	0.56
2:F:1719:GLY:HA2	2:F:1724:HIS:CE1	2.40	0.55
1:E:990:ARG:CZ	1:E:992:ILE:HD11	2.37	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:1297:PHE:HD2	1:E:1340:ILE:HD12	1.72	0.55
1:E:1146:VAL:HG22	1:E:1205:PRO:HD3	1.88	0.55
1:E:1348:ILE:HD11	1:E:1368:PHE:CE1	2.42	0.54
1:E:1095:LEU:H	1:E:1108:ARG:HH22	1.55	0.54
1:E:969:LEU:HD23	1:E:985:ARG:NH1	2.22	0.54
2:F:1641:ALA:HA	2:F:1644:SER:OG	2.08	0.54
2:F:1787:GLY:O	2:F:1791:GLN:NE2	2.41	0.54
2:F:1607:MET:HE1	2:F:1678:LEU:HD23	1.90	0.53
1:E:990:ARG:NE	1:E:992:ILE:HD11	2.22	0.53
1:E:1357:ALA:HB1	1:E:1358:PRO:HD2	1.91	0.53
1:E:1018:PRO:HG3	1:E:1072:TRP:CD2	2.43	0.52
1:E:1033:MET:HE3	1:E:1114:PHE:HE2	1.73	0.52
2:F:1765:ALA:O	2:F:1768:MET:N	2.42	0.52
1:E:1053:SER:HB3	1:E:1292:PRO:HG2	1.92	0.52
1:E:1095:LEU:HB3	1:E:1101:LEU:HD11	1.92	0.52
1:E:969:LEU:HD23	1:E:985:ARG:HH11	1.75	0.51
1:E:1397:PHE:HD2	1:E:1413:CYS:HB3	1.75	0.51
1:E:1061:LEU:HA	1:E:1121:VAL:O	2.11	0.51
2:F:1880:GLU:O	2:F:1884:LEU:HG	2.10	0.51
1:E:1229:CYS:HA	1:E:1265:ARG:O	2.10	0.51
1:E:1168:VAL:HG12	1:E:1288:LEU:HD21	1.92	0.50
1:E:1059:ARG:CZ	1:E:1292:PRO:HD3	2.41	0.50
2:F:1709:LYS:CG	2:F:1735:PHE:CZ	2.94	0.50
1:E:1066:SER:OG	1:E:1069:GLY:N	2.42	0.50
1:E:1230:SER:CB	1:E:1238:ALA:HB1	2.42	0.49
1:E:1060:GLU:O	1:E:1122:SER:HA	2.12	0.49
1:E:1027:ALA:HB1	1:E:1050:HIS:HB2	1.94	0.49
1:E:985:ARG:HH12	2:F:1781:GLU:HG3	1.76	0.49
1:E:1205:PRO:HA	1:E:1255:CYS:HB3	1.94	0.49
1:E:1299:VAL:O	1:E:1334:VAL:HG22	2.13	0.48
2:F:1601:GLY:O	2:F:1605:LEU:HG	2.12	0.48
1:E:1295:ALA:HA	1:E:1317:THR:CG2	2.43	0.48
1:E:1053:SER:HB3	1:E:1292:PRO:CG	2.44	0.48
1:E:973:MET:HA	1:E:1002:THR:O	2.13	0.48
1:E:1181:ALA:HB1	1:E:1271:CYS:HB3	1.95	0.48
1:E:1188:THR:HG21	1:E:1265:ARG:HE	1.79	0.47
2:F:1873:ALA:HA	2:F:1876:ILE:HD12	1.96	0.47
2:F:1636:TYR:O	2:F:1640:ILE:HG23	2.14	0.47
1:E:1053:SER:CB	1:E:1292:PRO:HB2	2.43	0.47
1:E:1076:GLN:N	1:E:1076:GLN:OE1	2.47	0.47
1:E:1206:VAL:HG13	1:E:1255:CYS:HA	1.97	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:1031:VAL:CG2	1:E:1118:PHE:HB2	2.45	0.47
1:E:968:PHE:O	1:E:984:SER:N	2.39	0.46
1:E:1350:VAL:HB	1:E:1366:LEU:CD1	2.44	0.46
2:F:1704:HIS:HA	2:F:1707:ALA:HB3	1.97	0.46
2:F:1754:VAL:HG13	2:F:1768:MET:HB3	1.97	0.46
1:E:1186:ILE:HG12	1:E:1267:TRP:CG	2.51	0.46
1:E:1284:LEU:HD22	1:E:1288:LEU:HD11	1.97	0.46
1:E:1366:LEU:HD21	1:E:1380:PHE:HE1	1.81	0.46
1:E:1317:THR:O	1:E:1318:ASP:OD1	2.34	0.46
1:E:1350:VAL:HG22	1:E:1397:PHE:CD1	2.46	0.46
2:F:1603:GLN:HG3	2:F:1675:LEU:HD21	1.97	0.45
1:E:1328:GLN:C	1:E:1330:ASN:H	2.19	0.45
1:E:1203:THR:HA	1:E:1256:VAL:O	2.16	0.45
2:F:1613:GLY:HA3	2:F:1619:THR:HG22	1.97	0.45
1:E:1184:SER:HB2	1:E:1205:PRO:O	2.17	0.45
1:E:1059:ARG:NH2	1:E:1292:PRO:HD3	2.32	0.44
1:E:1396:SER:OG	1:E:1413:CYS:O	2.35	0.44
2:F:1607:MET:CE	2:F:1679:GLY:HA2	2.48	0.44
1:E:1148:ALA:CB	1:E:1202:MET:HE2	2.44	0.44
2:F:1733:SER:O	2:F:1736:ALA:HB3	2.18	0.44
2:F:1779:TRP:O	2:F:1782:LEU:N	2.50	0.44
2:F:1820:LEU:HD23	2:F:1820:LEU:HA	1.73	0.44
1:E:1065:ARG:HD3	1:E:1075:HIS:HB2	2.00	0.44
2:F:1851:VAL:HA	2:F:1854:VAL:HG12	2.00	0.43
1:E:1033:MET:HB3	1:E:1114:PHE:CD2	2.53	0.43
2:F:1612:LYS:HE3	2:F:1689:GLN:HB2	2.00	0.43
2:F:1613:GLY:HA3	2:F:1619:THR:CG2	2.49	0.43
1:E:1027:ALA:O	1:E:1373:PHE:HZ	2.01	0.43
1:E:1163:LEU:HD12	1:E:1164:GLN:N	2.34	0.43
1:E:1295:ALA:HA	1:E:1317:THR:HG23	2.00	0.43
1:E:1005:THR:HB	1:E:1034:GLY:HA2	1.99	0.43
1:E:1189:VAL:HG22	1:E:1191:PRO:HD2	2.00	0.43
1:E:1162:GLY:H	1:E:1191:PRO:HD3	1.84	0.42
2:F:1878:SER:O	2:F:1882:GLU:HB2	2.19	0.42
1:E:1008:LEU:HA	1:E:1030:LEU:O	2.19	0.42
1:E:1033:MET:CE	1:E:1114:PHE:HE2	2.32	0.42
2:F:1743:GLY:HA3	2:F:1779:TRP:CH2	2.54	0.42
2:F:1741:THR:HA	2:F:1744:ARG:HD2	2.02	0.42
1:E:1033:MET:HE1	1:E:1046:VAL:HG11	2.01	0.42
1:E:1182:THR:HG21	1:E:1208:PRO:O	2.20	0.41
1:E:1229:CYS:SG	1:E:1230:SER:N	2.93	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:F:1603:GLN:NE2	2:F:1603:GLN:HA	2.35	0.41
2:F:1704:HIS:O	2:F:1707:ALA:HB3	2.20	0.41
2:F:1732:PHE:CE1	2:F:1789:ARG:HG2	2.56	0.41
1:E:1001:PRO:HD2	2:F:1868:TYR:CE1	2.55	0.41
1:E:1396:SER:HA	1:E:1413:CYS:O	2.21	0.41
2:F:1702:LEU:HD22	2:F:1775:LEU:HD23	2.02	0.41
1:E:1054:MET:CE	1:E:1054:MET:HA	2.50	0.41
1:E:1193:ARG:HG2	1:E:1193:ARG:O	2.20	0.41
2:F:1689:GLN:HA	2:F:1689:GLN:OE1	2.20	0.41
2:F:1699:VAL:HG13	2:F:1775:LEU:HD11	2.02	0.41
1:E:1321:VAL:O	1:E:1323:LYS:N	2.54	0.40
1:E:1311:LEU:HB2	1:E:1380:PHE:HB2	2.04	0.40
1:E:991:ILE:HG22	1:E:993:ILE:CD1	2.51	0.40
1:E:1299:VAL:HG13	1:E:1313:CYS:SG	2.61	0.40
2:F:1619:THR:HG21	2:F:1689:GLN:HG3	2.02	0.40
2:F:1820:LEU:O	2:F:1823:LEU:N	2.55	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	E	406/491 (83%)	363 (89%)	42 (10%)	1 (0%)	47 81
2	F	283/322 (88%)	258 (91%)	25 (9%)	0	100 100
All	All	689/813 (85%)	621 (90%)	67 (10%)	1 (0%)	51 85

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	E	1035	PRO

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	E	285/431 (66%)	274 (96%)	11 (4%)	32 57
2	F	182/272 (67%)	176 (97%)	6 (3%)	38 62
All	All	467/703 (66%)	450 (96%)	17 (4%)	35 60

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	1039	GLN
1	E	1093	GLU
1	E	1107	CYS
1	E	1255	CYS
1	E	1271	CYS
1	E	1297	PHE
1	E	1315	CYS
1	E	1318	ASP
1	E	1352	CYS
1	E	1366	LEU
1	E	1395	LEU
2	F	1591	PHE
2	F	1636	TYR
2	F	1669	ASP
2	F	1706	ILE
2	F	1721	ASP
2	F	1805	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	E	1016	ASN

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)

There are no ligands in this entry.

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	E	422/491 (85%)	-0.56	2 (0%)	91	86	14, 70, 162, 211	0
2	F	289/322 (89%)	-0.39	3 (1%)	82	74	31, 81, 241, 299	0
All	All	711/813 (87%)	-0.49	5 (0%)	87	82	14, 75, 183, 299	0

All (5) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	1223	PRO	3.1
2	F	1667	GLN	2.6
1	E	1364	GLN	2.6
2	F	1593	VAL	2.3
2	F	1594	ALA	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 monosaccharides in this entry.

6.4 Ligands

There are no ligands in this entry.

6.5 Other polymers

There are no such residues in this entry.