



Full wwPDB X-ray Structure Validation Report

Jun 10, 2014 – 12:09 PM EDT

PDB ID : 4ML3
Title : X-ray structure of ComE D58A REC domain from Streptococcus pneumoniae
Authors : Boudes, M.; Sanchez, D.; Durand, D.; Graille, M.; van Tilbeurgh, H.;
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Deposited on : 2013-09-06
Resolution : 3.15 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>

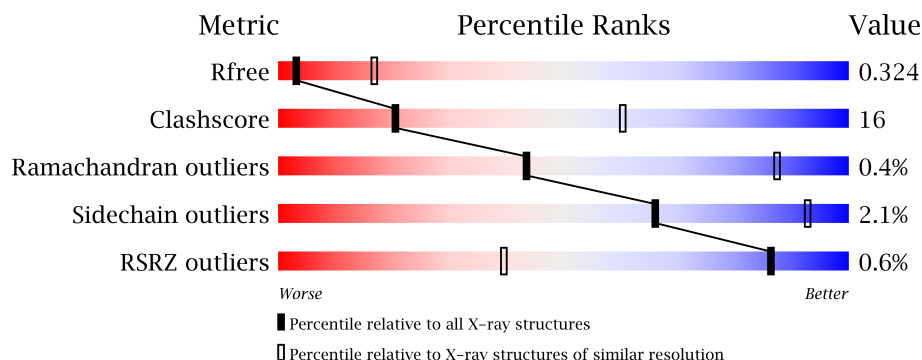
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.16 November 2013
Xtriage (Phenix) : dev-1439
EDS : stable23161
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) : stable23161

1 Overall quality at a glance

The reported resolution of this entry is 3.15 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	1360 (3.22-3.10)
Clashscore	79885	1681 (3.22-3.10)
Ramachandran outliers	78287	1639 (3.22-3.10)
Sidechain outliers	78261	1638 (3.22-3.10)
RSRZ outliers	66119	1361 (3.22-3.10)

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	143	
1	B	143	
1	C	143	
1	D	143	

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 4333 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 Response regulator.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	127	Total	C	N	O	S	0	0	0
			1069	696	171	199	3			
1	B	128	Total	C	N	O	S	0	0	0
			1077	700	173	201	3			
1	C	129	Total	C	N	O	S	0	0	0
			1085	704	175	203	3			
1	D	131	Total	C	N	O	S	0	0	0
			1102	715	176	208	3			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	58	ALA	ASP	ENGINEERED MUTATION	UNP Q8DMW5
B	58	ALA	ASP	ENGINEERED MUTATION	UNP Q8DMW5
C	58	ALA	ASP	ENGINEERED MUTATION	UNP Q8DMW5
D	58	ALA	ASP	ENGINEERED MUTATION	UNP Q8DMW5

4 Data and refinement statistics

Property	Value	Source
Space group	P 63	Depositor
Cell constants a, b, c, α , β , γ	91.47Å 91.47Å 134.84Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	45.70 – 3.15 45.74 – 3.15	Depositor EDS
% Data completeness (in resolution range)	99.6 (45.70-3.15) 99.7 (45.74-3.15)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	0.14	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.54 (at 3.12Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.7.3_928)	Depositor
R, R_{free}	0.272 , 0.322 0.268 , 0.324	Depositor DCC
R_{free} test set	553 reflections (4.99%)	DCC
Wilson B-factor (Å ²)	76.9	Xtriage
Anisotropy	0.692	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 69.3	EDS
Estimated twinning fraction	0.079 for h,-h-k,-l	Xtriage
L-test for twinning	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 11099 reflections	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	4333	wwPDB-VP
Average B, all atoms (Å ²)	98.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.28% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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	A	0.27	0/1088	0.50	1/1462 (0.1%)
1	B	0.31	0/1096	0.53	0/1473
1	C	0.25	0/1104	0.45	0/1484
1	D	0.28	0/1121	0.48	0/1507
All	All	0.28	0/4409	0.49	1/5926 (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	A	54	LEU	CA-CB-CG	5.40	127.72	115.30

There are no chirality outliers.

There are no planarity outliers.

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	1069	0	1084	32	0
1	B	1077	0	1090	45	0
1	C	1085	0	1096	25	0
1	D	1102	0	1111	39	0
All	All	4333	0	4381	137	0

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 16.

All (137) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:B:61:ILE:O	1:B:67:LYS:NZ	2.07	0.87
1:B:120:ARG:O	1:B:124:ASN:ND2	2.14	0.81
1:B:36:THR:HG22	1:B:38:LYS:H	1.49	0.78
1:D:120:ARG:O	1:D:124:ASN:ND2	2.19	0.76
1:B:43:GLU:N	1:B:43:GLU:OE1	2.20	0.74
1:C:60:ASP:HA	1:C:65:GLU:HA	1.70	0.73
1:A:112:ILE:HA	1:D:112:ILE:HA	1.71	0.72
1:C:52:ASN:N	1:C:55:TYR:HH	1.86	0.72
1:D:88:THR:HG23	1:D:90:ARG:H	1.55	0.70
1:B:43:GLU:O	1:B:47:GLU:N	2.24	0.70
1:B:59:ILE:HG21	1:B:93:PHE:HD2	1.56	0.69
1:D:60:ASP:HA	1:D:65:GLU:HA	1.72	0.69
1:A:15:ARG:NH2	1:A:112:ILE:O	2.25	0.69
1:C:106:ASP:OD1	1:C:120:ARG:NH2	2.25	0.69
1:C:18:ARG:NH1	1:C:22:GLU:OE2	2.26	0.68
1:A:60:ASP:HA	1:A:65:GLU:HA	1.75	0.68
1:B:9:VAL:O	1:B:13:GLN:HB2	1.95	0.67
1:B:19:ILE:HD12	1:B:118:LYS:HB3	1.76	0.67
1:B:59:ILE:HG21	1:B:93:PHE:CD2	2.30	0.66
1:B:73:GLN:HE21	1:B:100:TYR:HB3	1.62	0.65
1:A:59:ILE:HD12	1:A:88:THR:HG21	1.81	0.63
1:D:2:LYS:HA	1:D:32:SER:HB2	1.79	0.63
1:D:16:LEU:HG	1:D:20:LEU:HD11	1.79	0.63
1:A:36:THR:OG1	1:A:41:GLU:OE2	2.17	0.62
1:B:112:ILE:HG12	1:B:116:MET:HB3	1.82	0.61
1:C:19:ILE:HG21	1:C:121:ILE:HD12	1.83	0.61
1:A:3:VAL:HB	1:A:33:TYR:HB3	1.83	0.61
1:C:76:ARG:NH1	1:C:80:PRO:O	2.32	0.61
1:A:106:ASP:OD1	1:A:107:PHE:N	2.35	0.60
1:A:7:GLU:HG3	1:A:9:VAL:H	1.67	0.60
1:B:112:ILE:HG13	1:C:111:ASP:O	2.03	0.58
1:B:67:LYS:O	1:B:70:GLU:N	2.37	0.58
1:A:54:LEU:HD12	1:A:55:TYR:H	1.68	0.57
1:C:58:ALA:HB3	1:C:61:ILE:HD11	1.86	0.57
1:D:49:ASP:O	1:D:50:GLU:HB3	2.04	0.57
1:D:106:ASP:OD1	1:D:107:PHE:N	2.39	0.56
1:D:92:GLU:N	1:D:92:GLU:OE1	2.34	0.56
1:B:94:ALA:O	1:D:98:TYR:OH	2.23	0.55
1:D:13:GLN:HG3	1:D:35:THR:HG21	1.88	0.55

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:B:76:ARG:NH1	1:B:80:PRO:O	2.34	0.55
1:B:121:ILE:HA	1:B:124:ASN:HD22	1.71	0.55
1:D:42:PHE:CE2	1:D:46:ILE:HD11	2.42	0.55
1:D:58:ALA:HB3	1:D:61:ILE:HD11	1.87	0.55
1:D:60:ASP:OD2	1:D:90:ARG:NH1	2.39	0.55
1:D:23:ILE:HD13	1:D:122:GLU:HB3	1.88	0.54
1:A:14:VAL:HA	1:A:17:GLU:HB3	1.87	0.54
1:B:123:GLN:HA	1:B:126:PHE:HB2	1.89	0.54
1:B:64:ILE:HG22	1:B:67:LYS:HD3	1.89	0.54
1:A:120:ARG:O	1:A:124:ASN:ND2	2.41	0.54
1:C:10:ILE:HA	1:C:13:GLN:HG2	1.89	0.54
1:B:106:ASP:OD1	1:B:120:ARG:NH2	2.41	0.53
1:A:56:PHE:CD1	1:A:87:ILE:HD11	2.42	0.53
1:A:56:PHE:HD1	1:A:87:ILE:HD11	1.73	0.53
1:B:85:VAL:HG13	1:B:106:ASP:HB3	1.91	0.52
1:C:15:ARG:O	1:C:19:ILE:HG12	2.10	0.52
1:A:38:LYS:HB3	1:A:41:GLU:OE1	2.09	0.52
1:B:122:GLU:HG2	1:B:126:PHE:HE2	1.74	0.52
1:B:87:ILE:HG22	1:B:110:LYS:HG2	1.89	0.52
1:A:58:ALA:O	1:A:68:GLY:HA3	2.09	0.52
1:D:10:ILE:HA	1:D:13:GLN:HB3	1.92	0.52
1:B:17:GLU:N	1:B:17:GLU:OE2	2.42	0.52
1:C:85:VAL:HG13	1:C:106:ASP:HB3	1.90	0.52
1:D:42:PHE:O	1:D:46:ILE:HG13	2.09	0.51
1:C:7:GLU:O	1:C:13:GLN:NE2	2.43	0.51
1:D:8:ASP:HA	1:D:37:GLY:HA3	1.93	0.51
1:A:10:ILE:HA	1:A:13:GLN:HG2	1.93	0.51
1:D:43:GLU:HA	1:D:46:ILE:HG13	1.93	0.51
1:B:8:ASP:N	1:B:8:ASP:OD1	2.45	0.50
1:A:15:ARG:NH1	1:A:110:LYS:O	2.35	0.49
1:D:59:ILE:HB	1:D:88:THR:HG21	1.93	0.49
1:D:85:VAL:HG13	1:D:106:ASP:HB3	1.95	0.49
1:A:76:ARG:NH1	1:A:80:PRO:O	2.46	0.48
1:B:41:GLU:HA	1:B:44:GLU:OE2	2.13	0.48
1:B:52:ASN:OD1	1:B:53:GLN:N	2.41	0.48
1:B:61:ILE:HB	1:B:67:LYS:HG3	1.96	0.48
1:D:19:ILE:HG21	1:D:121:ILE:HD12	1.96	0.48
1:A:88:THR:HA	1:A:110:LYS:HE3	1.96	0.47
1:B:106:ASP:OD1	1:B:107:PHE:N	2.47	0.47
1:C:121:ILE:O	1:C:125:ILE:HG13	2.15	0.47
1:C:71:VAL:O	1:C:75:ILE:HG13	2.14	0.47
1:D:48:ASN:ND2	1:D:48:ASN:O	2.32	0.47

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:87:ILE:HG22	1:A:110:LYS:HB3	1.96	0.47
1:A:17:GLU:OE2	1:A:33:TYR:OH	2.32	0.46
1:C:115:GLU:O	1:C:118:LYS:HG2	2.15	0.46
1:D:36:THR:OG1	1:D:37:GLY:N	2.48	0.46
1:B:23:ILE:O	1:B:27:SER:OG	2.31	0.46
1:D:123:GLN:HA	1:D:126:PHE:HB2	1.97	0.46
1:D:93:PHE:HA	1:D:96:LEU:HD13	1.98	0.46
1:A:19:ILE:HG23	1:A:118:LYS:HG3	1.98	0.46
1:B:92:GLU:HG2	1:B:93:PHE:CD1	2.51	0.46
1:A:127:TYR:O	1:A:131:MET:HG2	2.15	0.46
1:B:69:PHE:HE1	1:B:97:THR:HG22	1.80	0.45
1:B:115:GLU:HA	1:B:118:LYS:NZ	2.30	0.45
1:A:38:LYS:HB3	1:A:41:GLU:OE2	2.16	0.45
1:A:111:ASP:OD2	1:D:116:MET:HG3	2.16	0.45
1:B:78:TYR:O	1:B:80:PRO:HD3	2.16	0.45
1:C:125:ILE:HA	1:C:128:THR:HG22	1.99	0.45
1:C:106:ASP:OD1	1:C:107:PHE:N	2.50	0.45
1:B:52:ASN:CG	1:B:53:GLN:H	2.18	0.44
1:D:37:GLY:O	1:D:62:HIS:NE2	2.50	0.44
1:B:122:GLU:O	1:B:125:ILE:HG13	2.16	0.44
1:C:36:THR:OG1	1:C:37:GLY:N	2.51	0.44
1:B:59:ILE:HG22	1:B:65:GLU:O	2.17	0.44
1:D:22:GLU:O	1:D:26:GLU:N	2.46	0.44
1:C:69:PHE:HZ	1:C:93:PHE:HB3	1.82	0.44
1:C:88:THR:HA	1:C:110:LYS:HE3	1.99	0.44
1:C:38:LYS:HD2	1:C:41:GLU:OE2	2.18	0.44
1:B:59:ILE:O	1:B:67:LYS:HG2	2.17	0.43
1:D:75:ILE:HG21	1:D:84:ILE:HD11	2.00	0.43
1:C:79:ASN:HB3	1:C:82:ALA:HB2	2.01	0.43
1:C:10:ILE:H	1:C:10:ILE:HD12	1.84	0.43
1:D:24:SER:HB2	1:D:31:ILE:HD12	1.99	0.43
1:D:69:PHE:HB3	1:D:100:TYR:CD1	2.53	0.43
1:A:125:ILE:O	1:A:128:THR:OG1	2.32	0.42
1:A:38:LYS:HA	1:A:38:LYS:HD2	1.65	0.42
1:D:42:PHE:CD2	1:D:46:ILE:HD11	2.53	0.42
1:A:38:LYS:HB3	1:A:41:GLU:CD	2.40	0.42
1:B:112:ILE:HG23	1:B:117:PHE:HB2	2.01	0.42
1:B:36:THR:HG21	1:B:41:GLU:HB3	2.01	0.42
1:D:2:LYS:HE3	1:D:34:LYS:HE3	2.00	0.42
1:D:68:GLY:HA2	1:D:71:VAL:HG12	2.02	0.42
1:B:7:GLU:OE2	1:B:110:LYS:NZ	2.52	0.42
1:C:118:LYS:O	1:C:122:GLU:HG3	2.19	0.42

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:110:LYS:HA	1:A:117:PHE:HE1	1.85	0.41
1:B:71:VAL:O	1:B:75:ILE:HG13	2.19	0.41
1:D:18:ARG:O	1:D:22:GLU:HG3	2.20	0.41
1:B:56:PHE:HD1	1:B:87:ILE:HD11	1.84	0.41
1:B:56:PHE:CD1	1:B:87:ILE:HD11	2.55	0.41
1:D:96:LEU:HA	1:D:99:LYS:HD3	2.02	0.41
1:A:6:LEU:HB3	1:A:57:LEU:HA	2.02	0.41
1:B:122:GLU:HG2	1:B:126:PHE:CE2	2.55	0.41
1:D:109:ASP:OD1	1:D:110:LYS:N	2.54	0.41
1:D:117:PHE:CE2	1:D:121:ILE:HD11	2.55	0.41
1:A:6:LEU:HB2	1:A:42:PHE:CE1	2.56	0.41
1:C:86:PHE:HE2	1:C:104:ALA:HB2	1.86	0.41
1:B:117:PHE:O	1:B:121:ILE:HG13	2.22	0.40
1:A:15:ARG:O	1:A:19:ILE:HG12	2.21	0.40

There are no symmetry-related clashes.

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	123/143 (86%)	109 (89%)	14 (11%)	0	100	100
1	B	124/143 (87%)	112 (90%)	10 (8%)	2 (2%)	14	61
1	C	125/143 (87%)	116 (93%)	9 (7%)	0	100	100
1	D	127/143 (89%)	114 (90%)	13 (10%)	0	100	100
All	All	499/572 (87%)	451 (90%)	46 (9%)	2 (0%)	43	87

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	7	GLU
1	B	68	GLY

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	119/135 (88%)	118 (99%)	1 (1%)	89	98
1	B	120/135 (89%)	114 (95%)	6 (5%)	34	78
1	C	121/135 (90%)	120 (99%)	1 (1%)	89	98
1	D	123/135 (91%)	121 (98%)	2 (2%)	75	95
All	All	483/540 (89%)	473 (98%)	10 (2%)	66	93

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	57	LEU
1	B	16	LEU
1	B	20	LEU
1	B	57	LEU
1	B	64	ILE
1	B	67	LYS
1	B	132	LEU
1	C	53	GLN
1	D	48	ASN
1	D	57	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	124	ASN
1	B	73	GLN
1	B	124	ASN
1	C	13	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 ⓘ

There are no ligands in this entry.

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	127/143 (88%)	0.02	1 (0%) 83 32	73, 89, 114, 128	0
1	B	128/143 (89%)	0.21	1 (0%) 83 32	70, 99, 121, 151	0
1	C	129/143 (90%)	0.16	0 100 100	70, 94, 113, 143	0
1	D	131/143 (91%)	0.28	1 (0%) 83 32	80, 103, 127, 145	0
All	All	515/572 (90%)	0.17	3 (0%) 86 39	70, 96, 123, 151	0

All (3) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	131	MET	3.0
1	B	99	LYS	2.2
1	A	44	GLU	2.2

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 ⓘ

There are no ligands in this entry.

6.5 Other polymers ⓘ

There are no such residues in this entry.