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A61K 47/48 (2006.01) A61P 35/00 (2006.01)

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61/890,064	11 October 2013 (11.10.2013)	US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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[Continued on next page]

(54) Title: BCMA ANTIGEN BINDING PROTEINS

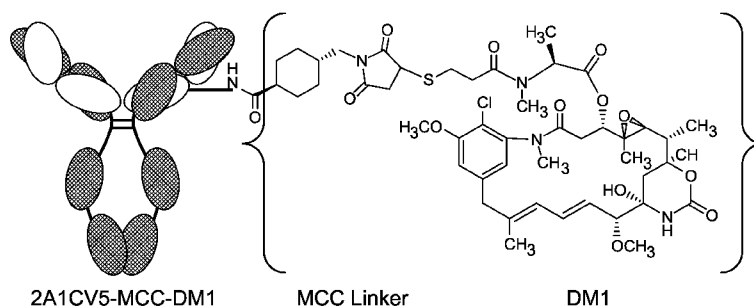


Fig. 2

(57) Abstract: The present invention relates to BCMA (B-Cell Maturation Antigen) antigen binding proteins, such as antibodies, polynucleotide sequences encoding said antigen binding proteins, and compositions and methods for diagnosing and treating diseases. The present invention also relates to BCMA antibody drug conjugates and uses thereof.



**Declarations under Rule 4.17:**

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

**Published:**

— *with international search report (Art. 21(3))*

— *with sequence listing part of description (Rule 5.2(a))*

**(88) Date of publication of the international search report:**

28 August 2014

# INTERNATIONAL SEARCH REPORT

International application No PCT/US2013/073382
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<b>A. CLASSIFICATION OF SUBJECT MATTER</b> INV. C07K16/28      A61K47/48      A61K39/00      A61P35/00 ADD.				
According to International Patent Classification (IPC) or to both national classification and IPC				
<b>B. FIELDS SEARCHED</b>				
Minimum documentation searched (classification system followed by classification symbols) C07K A61K				
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched				
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, BIOSIS, EMBASE, WPI Data				
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
A	JAKOBOVITS AYA ET AL: "From Xenomouse technology to panitumumab, the first fully human antibody product from transgenic mice", NATURE BIOTECHNOLOGY, NATURE PUBLISHING GROUP, NEW YORK, NY, US, vol. 25, no. 10, 1 October 2007 (2007-10-01), pages 1134-1143, XP002556637, ISSN: 1087-0156, DOI: 10.1038/NBT1337 [retrieved on 2007-10-05] the whole document <div style="text-align: center; margin-top: 10px;">----- -/--</div>	1-164, 175-204		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.				
* Special categories of cited documents : <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;">                     "A" document defining the general state of the art which is not considered to be of particular relevance                      "E" earlier application or patent but published on or after the international filing date                      "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)                      "O" document referring to an oral disclosure, use, exhibition or other means                      "P" document published prior to the international filing date but later than the priority date claimed                 </td> <td style="width: 50%; border: none; vertical-align: top;">                     "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention                      "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone                      "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art                      "&amp;" document member of the same patent family                 </td> </tr> </table>			"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family			
Date of the actual completion of the international search	Date of mailing of the international search report			
7 February 2014	09/07/2014			
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  Gruber, Andreas			

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2013/073382

## Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.c of the first sheet)

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, the international search was carried out on the basis of:
  - a. (means)
    - on paper
    - in electronic form
  - b. (time)
    - in the international application as filed
    - together with the international application in electronic form
    - subsequently to this Authority for the purpose of search
2.  In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
3. Additional comments:

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2013/073382

## Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

3, 6, 9, 11, 12, 33, 36, 39, 41, 42, 70, 73, 79-164, 175-196(completely); 1  
2, 4, 5, 7, 8, 10, 13-32, 34, 35, 37, 38, 40, 43-69, 71, 72, 74-78  
197-204(partially)

### Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2013/073382

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>WINKLER K ET AL: "Changing the antigen binding specificity by single point mutations of an anti-p24 (HIV-1) antibody", THE JOURNAL OF IMMUNOLOGY, THE AMERICAN ASSOCIATION OF IMMUNOLOGISTS, US, vol. 165, no. 8, 15 October 2000 (2000-10-15), pages 4505-4514, XP002579393, ISSN: 0022-1767 e.g. page 4509, left-hand column, paragraph 3; the whole document</p>	1-164, 175-204
A	<p>MCKAY BROWN ET AL: "Tolerance to single, but not multiple, amino acid replacements in antibody V-H CDR2: A means of minimizing B cell wastage from somatic hypermutation?", THE JOURNAL OF IMMUNOLOGY, THE AMERICAN ASSOCIATION OF IMMUNOLOGISTS, US, vol. 156, no. 9, 1 January 1996 (1996-01-01), pages 3285-3291, XP002649029, ISSN: 0022-1767 e.g. abstract; the whole document</p>	1-164, 175-204
X	<p>WO 2012/066058 A1 (BOEHRINGER INGELHEIM INT [DE]; MICROMET GMBH [DE]; BORGES ERIC [AT]; H) 24 May 2012 (2012-05-24) e.g. page 3, paragraph 2,3; page 7, paragraph 1; page 25, paragraph 3; claim 1,17; the whole document</p>	1-164, 175-204
X	<p>RYAN MAUREEN C ET AL: "Antibody targeting of B-cell maturation antigen on malignant plasma cells", MOLECULAR CANCER THERAPEUTICS, AMERICAN ASSOCIATION OF CANCER RESEARCH, US, vol. 6, no. 11, 1 November 2007 (2007-11-01), pages 3009-3018, XP002581270, ISSN: 1535-7163 e.g. abstract; the whole document</p>	1-164, 175-204
X	<p>WO 2012/163805 A1 (GLAXO GROUP LTD [GB]; ALGATE PAUL [US]; CLEGG STEPHANIE JANE [GB]; CRA) 6 December 2012 (2012-12-06) e.g. page 3, legend to fig. 1; claim 1,3,5,30,31; the whole document</p>	1-164, 175-204

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2013/073382
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2012066058 A1	24-05-2012	EP 2640750 A1	25-09-2013
		JP 2014500879 A	16-01-2014
		US 2013273055 A1	17-10-2013
		WO 2012066058 A1	24-05-2012
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WO 2012163805 A1	06-12-2012	AR 086579 A1	08-01-2014
		AU 2012264890 A1	09-05-2013
		CA 2833820 A1	06-12-2012
		CN 103562225 A	05-02-2014
		CO 6811809 A2	16-12-2013
		CR 20130624 A	04-02-2014
		DO P2013000280 A	30-04-2014
		EA 201391457 A1	30-04-2014
		EP 2714737 A1	09-04-2014
		KR 20140036272 A	25-03-2014
		SG 194176 A1	30-12-2013
		TW 201311722 A	16-03-2013
		US 2014105915 A1	17-04-2014
		UY 34101 A	03-01-2013
		WO 2012163805 A1	06-12-2012
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**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 3, 6, 9, 11, 12, 33, 36, 39, 41, 42, 70, 73, 79-164, 175-196(completely); 1, 2, 4, 5, 7, 8, 10, 13-32, 34, 35, 37, 38, 40, 43-69, 71, 72, 74-78, 197-204(partially)

antibody of claim

1,79,81,84,90,94,108,115,122,135,144,151,158,165,175,183,

polypeptide of claim 31, composition of claim

58,59,80,197,198, method of claim 61, 78, 200,polynucleotide

of claim 67, plasmid of claim 75, cell of claim 77, all

comprising Ab-1, Ab-5, Ab-18-38

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2. claims: 165-174(completely); 1, 2, 4, 5, 7, 8, 10, 13-32, 34, 35, 37, 38, 40, 43-69, 71, 72, 74-78, 197-204(partially)

antibody of claim 1,165, polypeptide of claim 31,

composition of claim 58,59,197,198, method of claim 61, 78,

200,polynucleotide of claim 67, plasmid of claim 75, cell of

claim 77, all comprising Ab-2,3,8-13,15-17

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3. claims: 1, 4, 7, 13-31, 34, 37, 43-68, 71, 75-78(all partially)

antibody of claim 1, polypeptide of claim 31, composition of

claim 58,59, method of claim 61, 78,polynucleotide of claim

67, plasmid of claim 75, cell of claim 77, all comprising

Ab-4, Ab-14

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4. claims: 1, 4, 7, 13-31, 34, 37, 43-68, 71, 75-78(all partially)

antibody of claim 1, polypeptide of claim 31, composition of

claim 58,59, method of claim 61, 78,polynucleotide of claim

67, plasmid of claim 75, cell of claim 77, all comprising

Ab-6, Ab-7

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