502703593 03/03/2014

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1 Stylesheet Version v1.2

EPAS ID: PAT2750199

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	ASSIGNMENT

CONVEYING PARTY DATA

Name	Execution Date
QIANG LIU	01/14/2014
YU YAO	02/18/2014
ANTHONY J. HOFFMAN	02/13/2014
MATTHEW ESCARRA	01/08/2014
KALE J. FRANZ	02/14/2014
WILLIAM O. CHARLES	01/03/2014
JIANXIN CHEN	02/15/2014
CLAIRE F. GMACHL 01/02/2014	

RECEIVING PARTY DATA

Name:	PRINCETON UNIVERSITY
Street Address:	4 NEW SOUTH BUILDING
City:	PRINCETON
State/Country:	NEW JERSEY
Postal Code:	08540

PROPERTY NUMBERS Total: 1

Property Type	Number	
Application Number:	12795954	

CORRESPONDENCE DATA

 Fax Number:
 (215)563-4044

 Phone:
 215-563-4100

 Email:
 rdolan@ddhs.com

Correspondence will be sent via US Mail when the email attempt is unsuccessful.

Correspondent Name: NIELS HAUN, PH.D.

Address Line 1: 1601 MARKET ST., SUITE 2400

Address Line 2: DANN DORFMAN HERRELL & SKILLMAN, PC
Address Line 4: PHILADELPHIA, PENNSYLVANIA 19103-2307

502703593 REEL: 032337 FRAME: 0695

PATENT

I		
ATTORNEY DOCKET NUMBER:	4682-P04867US1	
NAME OF SUBMITTER:	NIELS HAUN	
Signature:	/NIELS HAUN/	
Date:	03/03/2014	
Total Attachments: 19		
source=Executed Assignment_PU#page1.ti	f	
source=Executed Assignment_PU#page2.ti	f	
source=Executed Assignment_PU#page3.ti	f	
source=Executed Assignment_PU#page4.ti	f	
source=Executed Assignment_PU#page5.tif		
source=Executed Assignment_PU#page6.tif		
source=Executed Assignment_PU#page7.tif		
source=Executed Assignment_PU#page8.tif		
source=Executed Assignment_PU#page9.tif		
source=Executed Assignment_PU#page10.tif		
source=Executed Assignment_PU#page11.tif		
source=Executed Assignment_PU#page12.tif		
source=Executed Assignment_PU#page13.tif		
source=Executed Assignment_PU#page14.tif		
source=Executed Assignment_PU#page15.tif		
source=Executed Assignment_PU#page16.tif		
source=Executed Assignment_PU#page17.tif		
source=Executed Assignment_PU#page18.tif		
source=Executed Assignment_PU#page19.tif		

WHEREAS, Qiang Liu, Yu Yao, Anthony J. Hoffman, Matthew Escarra, Kale J. Franz, William O. Charles, Jianxin Chen and Claire F. Gmachl, and each one of them, hereinafter referred to as ASSIGNOR, is a named inventor of an invention entitled: "HIGHLY POWER-EFFICIENT AND BROADBAND QUANTUM CASCADE LASERS" described and claimed in U.S. Appl. No.12/795,954, filed June 8, 2010, and

WHEREAS, PRINCETON UNIVERSITY, a corporation engaged in business at 4 New South Building, Princeton, NJ US 08540, hereinafter referred to as ASSIGNEE, is desirous of acquiring the said invention and any and all applications for Letters Patent and any and all Letters Patent of the United States and foreign countries that may be issued therefor;

NOW, THEREFORE, the parties hereto, intending to be legally bound, agree that, in consideration of good and valuable consideration paid to ASSIGNOR by ASSIGNEE, the receipt of which is hereby acknowledged, ASSIGNOR has sold, assigned and set over and hereby does sell, assign and set over, unto ASSIGNEE, its successors and assigns, his or her entire right, title and interest for, to and within the United States and all foreign countries, in and to the aforesaid invention and the application identified above, including any and all provisional applications, continuations, divisionals, continuations-in-part, reissues and re-examinations thereof, and in and to any and all Letters Patent that may issue therefor in the United States and in any and all foreign countries (including related rights such as utility model registrations, inventors' certificates and the like). In addition, ASSIGNOR has sold, assigned and set over and hereby does sell, assign and set over, unto ASSIGNEE, its successors and assigns, the right to claim priority in any and all foreign applications, including applications filed under the Patent Cooperation Treaty, to the above-referenced application and any and all provisional, continuation, divisional, and continuation-in-part applications for the invention.

ASSIGNOR covenants that ASSIGNOR has full right to convey the entire interest herein assigned, and that ASSIGNOR has not executed and will not execute any agreement that will conflict with the terms of this assignment. Further, ASSIGNOR hereby authorizes and requests the Commissioner of the U.S. Patent and Trademark Office, and any official of any country foreign to the United States whose duty is to issue patents, design registrations, inventors certificates or the like, to issue any and all Letters Patent, registration or certificate for such invention to ASSIGNEE, its successors and assigns, as the owner of all right, title and interest therein.

And for said consideration, it is hereby covenanted and agreed that at the request and expense of ASSIGNEE, its successors and assigns, ASSIGNOR will execute any further papers and do such other acts and things as may be necessary and proper to permit ASSIGNEE, its successors and assigns, to procure and enforce Letters Patent for said invention in the United States and in such foreign countries as ASSIGNEE, its successors and assigns may elect, and vest the full title thereto in ASSIGNEE, its successors and assigns.

IN WITNESS WHEREOF, this Assignment has been executed on the day and month indicated below.

Jan. 14, 2014	Signature Cu
	QIANG LIU
	YU YAO
	ANTHONY J. HOFFMAN
	MATTHEW ESCARRA

Page Two			
	KALE J. FRANZ		
	WILLIAM O. CH	ARLES	
	JIANXIN CHEN		
	CLAIRE F. GMA	СНГ	
COUNTY OF _	SWISS CONFEDERATION CANTON AND CITY OF ZÜRICH CONSULAR AGENCY OF THE UNITED STATES OF AMERICA SS	_	
personally appea	ndersigned, a notary public, in and for red Qiang Liu , to me known to be the ledged that they executed the same as	person described in and who ex	Ellen A. Frick-Delman Consular Agent of the United States of America
COUNTY OF _ STATE OF _		- -	My commission does not expir
personally appea	ndersigned, a notary public, in and for red Yu Yao , to me known to be the poledged that they executed the same as	erson described in and who exec	cuted the foregoing instrument
		Notary Public	
COUNTY OF _ STATE OF _		- -	
personally appea	ndersigned, a notary public, in and for red Anthony J. Hoffman , to me know who acknowledged that they executed .	n to be the person described in a	and who executed the foregoing
		Notary Public	

WHEREAS, Qiang Liu, Yu Yao, Anthony J. Hoffman, Matthew Escarra, Kale J. Franz, William O. Charles, Jianxin Chen and Claire F. Gmachl, and each one of them, hereinafter referred to as ASSIGNOR, is a named inventor of an invention entitled: "HIGHLY POWER-EFFICIENT AND BROADBAND QUANTUM CASCADE LASERS" described and claimed in U.S. Appl. No.12/795,954, filed June 8, 2010, and

WHEREAS, PRINCETON UNIVERSITY, a corporation engaged in business at 4 New South Building, Princeton, NJ US 08540, hereinafter referred to as ASSIGNEE, is desirous of acquiring the said invention and any and all applications for Letters Patent and any and all Letters Patent of the United States and foreign countries that may be issued therefor;

NOW, THEREFORE, the parties hereto, intending to be legally bound, agree that, in consideration of good and valuable consideration paid to ASSIGNOR by ASSIGNEE, the receipt of which is hereby acknowledged, ASSIGNOR has sold, assigned and set over and hereby does sell, assign and set over, unto ASSIGNEE, its successors and assigns, his or her entire right, title and interest for, to and within the United States and all foreign countries, in and to the aforesaid invention and the application identified above, including any and all provisional applications, continuations, divisionals, continuations-in-part, reissues and re-examinations thereof, and in and to any and all Letters Patent that may issue therefor in the United States and in any and all foreign countries (including related rights such as utility model registrations, inventors' certificates and the like). In addition, ASSIGNOR has sold, assigned and set over and hereby does sell, assign and set over, unto ASSIGNEE, its successors and assigns, the right to claim priority in any and all foreign applications, including applications filed under the Patent Cooperation Treaty, to the above-referenced application and any and all provisional, continuation, divisional, and continuation-in-part applications for the invention.

ASSIGNOR covenants that ASSIGNOR has full right to convey the entire interest herein assigned, and that ASSIGNOR has not executed and will not execute any agreement that will conflict with the terms of this assignment. Further, ASSIGNOR hereby authorizes and requests the Commissioner of the U.S. Patent and Trademark Office, and any official of any country foreign to the United States whose duty is to issue patents, design registrations, inventors certificates or the like, to issue any and all Letters Patent, registration or certificate for such invention to ASSIGNEE, it successors and assigns, as the owner of all right, title and interest therein.

And for said consideration, it is hereby covenanted and agreed that at the request and expense of ASSIGNEE, its successors and assigns, ASSIGNOR will execute any further papers and do such other acts and things as may be necessary and proper to permit ASSIGNEE, its successors and assigns, to procure and enforce Letters Patent for said invention in the United States and in such foreign countries as ASSIGNEE, its successors and assigns may elect, and vest the full title thereto in ASSIGNEE, its successors and assigns.

IN WITNESS WHEREOF, this Assignment has been executed on the day and month indicated below.

Date	Signature	
	QIANG LIU	
Feb 18th	Wingo YU'YAO	
	TO TAO	
	ANTHONY J. HOFFMAN	
	MATTHEW ESCARRA	

Page Two			
	KALE J. FRA	ANZ	
). CHARLES	
	JIANXIN CI	HEN	
	CLAIRE F. G	GMACHL	
COUNTY OF			
Before me, the	eared Qiang Liu. to me known to be	d for the county aforesaid, on this e the person described in and who ex me as their free act and deed and de	kecuted the foregoing instrument
		Notary Public	
COUNTY OF STATE OF	Middlesex		
nersonally ann	eared Yu Yao, to me known to be t	d for the county aforesaid, on this \underline{J} the person described in and who exeme as their free act and deed and de	cuted the foregoing instrument
		Notary Public	REGINA SCRIP 5
COUNTY OF STATE OF			Notary Public COMMONWEALTH OF MAS - CHUSETTS My Commission - Cores May 23, 2019
personally app	peared Anthony J. Hoffman , to me d d who acknowledged that they exec	nd for the county aforesaid, on this _ known to be the person described in cuted the same as their free act and	and who executed the foregoing
		Notary Public	

WHEREAS, Qiang Liu, Yu Yao, Anthony J. Hoffman, Matthew Escarra, Kale J. Franz, William O. Charles, Jianxin Chen and Claire F. Gmachl, and each one of them, hereinafter referred to as ASSIGNOR, is a named inventor of an invention entitled: "HIGHLY POWER-EFFICIENT AND BROADBAND QUANTUM CASCADE LASERS" described and claimed in U.S. Appl. No.12/795,954, filed June 8, 2010, and

WHEREAS, PRINCETON UNIVERSITY, a corporation engaged in business at 4 New South Building, Princeton, NJ US 08540, hereinafter referred to as ASSIGNEE, is desirous of acquiring the said invention and any and all applications for Letters Patent and any and all Letters Patent of the United States and foreign countries that may be issued therefor;

NOW, THEREFORE, the parties hereto, intending to be legally bound, agree that, in consideration of good and valuable consideration paid to ASSIGNOR by ASSIGNEE, the receipt of which is hereby acknowledged, ASSIGNOR has sold, assigned and set over and hereby does sell, assign and set over, unto ASSIGNEE, its successors and assigns, his or her entire right, title and interest for, to and within the United States and all foreign countries, in and to the aforesaid invention and the application identified above, including any and all provisional applications, continuations, divisionals, continuations-in-part, reissues and re-examinations thereof, and in and to any and all Letters Patent that may issue therefor in the United States and in any and all foreign countries (including related rights such as utility model registrations, inventors' certificates and the like). In addition, ASSIGNOR has sold, assigned and set over and hereby does sell, assign and set over, unto ASSIGNEE, its successors and assigns, the right to claim priority in any and all foreign applications, including applications filed under the Patent Cooperation Treaty, to the above-referenced application and any and all provisional, continuation, divisional, and continuation-in-part applications for the invention.

ASSIGNOR covenants that ASSIGNOR has full right to convey the entire interest herein assigned, and that ASSIGNOR has not executed and will not execute any agreement that will conflict with the terms of this assignment. Further, ASSIGNOR hereby authorizes and requests the Commissioner of the U.S. Patent and Trademark Office, and any official of any country foreign to the United States whose duty is to issue patents, design registrations, inventors certificates or the like, to issue any and all Letters Patent, registration or certificate for such invention to ASSIGNEE, it successors and assigns, as the owner of all right, title and interest therein.

And for said consideration, it is hereby covenanted and agreed that at the request and expense of ASSIGNEE, its successors and assigns, ASSIGNOR will execute any further papers and do such other acts and things as may be necessary and proper to permit ASSIGNEE, its successors and assigns, to procure and enforce Letters Patent for said invention in the United States and in such foreign countries as ASSIGNEE, its successors and assigns may elect, and vest the full title thereto in ASSIGNEE, its successors and assigns.

IN WITNESS WHEREOF, this Assignment has been executed on the day and month indicated below.

Date	Signature	
	QIANG LIU	
2/13/2014	YU YAO ANTHONY THOFFMAN	
	MATTHEW ESCARRA	

Page Iwo				
	KALE J. FI	RANZ	American de la companya de la compa	
	WILLIAM	O. CHARLES	Management of the second	
	JIANXIN	CHEN		
to a construction of the c	CLAIRE F.	. GMACHL		
COUNTY OF				
Before me, the undersigned,	, a notary public, in ar	nd for the county aforesaid, on be the person described in and	this day of	,2013,
and who acknowledged that such.	they executed the sa	ame as their free act and deed a	and desired the same to be	e recorded as
		Notary Public		
COUNTY OF		•		
personally appeared Yu Yao	, to me known to be	nd for the county aforesaid, on the person described in and wi ame as their free act and deed a	ho executed the foregoing	g instrument
		Notary Public		
COUNTY OF St. Jose STATE OF Allin	ph County o	<u>h.</u> ——		
personally appeared Anthon	y J. Hoffman, to me	nd for the county aforesaid, on known to be the person describ cuted the same as their free act	bed in and who executed t	thé foregoing
ELIZABETH KO	OVACS	Pabello Kovaco Nogary Public	<u>1</u>	

ELIZABETH KOVACS NOTARY PUBLIC ST. JOSEPH COUNTY, IN COMMISSION EXPIRES March 20. 2015

WHEREAS, Qiang Liu, Yu Yao, Anthony J. Hoffman, Matthew Escarra, Kale J. Franz, William O. Charles, Jianxin Chen and Claire F. Gmachl, and each one of them, hereinafter referred to as ASSIGNOR, is a named inventor of an invention entitled: "HIGHLY POWER-EFFICIENT AND BROADBAND QUANTUM CASCADE LASERS" described and claimed in U.S. Appl. No.12/795,954, filed June 8, 2010, and

WHEREAS, PRINCETON UNIVERSITY, a corporation engaged in business at 4 New South Building, Princeton, NJ US 08540, hereinafter referred to as ASSIGNEE, is desirous of acquiring the said invention and any and all applications for Letters Patent and any and all Letters Patent of the United States and foreign countries that may be issued therefor;

NOW, THEREFORE, the parties hereto, intending to be legally bound, agree that, in consideration of good and valuable consideration paid to ASSIGNOR by ASSIGNEE, the receipt of which is hereby acknowledged, ASSIGNOR has sold, assigned and set over and hereby does sell, assign and set over, unto ASSIGNEE, its successors and assigns, his or her entire right, title and interest for, to and within the United States and all foreign countries, in and to the aforesaid invention and the application identified above, including any and all provisional applications, continuations, divisionals, continuations-in-part, reissues and re-examinations thereof, and in and to any and all Letters Patent that may issue therefor in the United States and in any and all foreign countries (including related rights such as utility model registrations, inventors' certificates and the like). In addition, ASSIGNOR has sold, assigned and set over and hereby does sell, assign and set over, unto ASSIGNEE, its successors and assigns, the right to claim priority in any and all foreign applications, including applications filed under the Patent Cooperation Treaty, to the above-referenced application and any and all provisional, continuation, divisional, and continuation-in-part applications for the invention.

ASSIGNOR covenants that ASSIGNOR has full right to convey the entire interest herein assigned, and that ASSIGNOR has not executed and will not execute any agreement that will conflict with the terms of this assignment. Further, ASSIGNOR hereby authorizes and requests the Commissioner of the U.S. Patent and Trademark Office, and any official of any country foreign to the United States whose duty is to issue patents, design registrations, inventors certificates or the like, to issue any and all Letters Patent, registration or certificate for such invention to ASSIGNEE, it successors and assigns, as the owner of all right, title and interest therein.

And for said consideration, it is hereby covenanted and agreed that at the request and expense of ASSIGNEE, its successors and assigns, ASSIGNOR will execute any further papers and do such other acts and things as may be necessary and proper to permit ASSIGNEE, its successors and assigns, to procure and enforce Letters Patent for said invention in the United States and in such foreign countries as ASSIGNEE, its successors and assigns may elect, and vest the full title thereto in ASSIGNEE, its successors and assigns.

IN WITNESS WHEREOF, this Assignment has been executed on the day and month indicated below.

Date	Signature
	QIANG LIU
	YU YAO
	ANTHONY J. HOFFMAN
1/8/14	Metho Cur

Page Three		
COUNTY OF	ORLEANS	
STATE OF	LOUISIANA	
personally appo	eared Matthew Escarra , to me knov I who acknowledged that they execu	for the county aforesaid, on this gt day of JANKEN 2013; 2017 who to be the person described in and who executed the foregoing ted the same as their free act and deed and desired the same to be .VII.CHELE EAGAN .VOTARY PUBLIC No. 67484 Ontary Public Crish of Jefferson, State of Louisiano My Commission is Issued for Life
COUNTY OF STATE OF		
personally app	eared Kale J. Franz, to me known to I who acknowledged that they execu	for the county aforesaid, on this day of
		Notary Public
COUNTY OF STATE OF		
personally app	eared William O. Charles, to me kno I who acknowledged that they execu	for the county aforesaid, on this day of2013, own to be the person described in and who executed the foregoing ted the same as their free act and deed and desired the same to be
COUNTY OF		Notary Public
STATE OF		
personally app	eared <mark>Jianxin Chen,</mark> to me known to I who acknowledged that they execu	for the county aforesaid, on this day of2013, be the person described in and who executed the foregoing ted the same as their free act and deed and desired the same to be

Notary Public

WHEREAS, Qiang Liu, Yu Yao, Anthony J. Hoffman, Matthew Escarra, Kale J. Franz, William O. Charles, Jianxin Chen and Claire F. Gmachl, and each one of them, hereinafter referred to as ASSIGNOR, is a named inventor of an invention entitled: "HIGHLY POWER-EFFICIENT AND BROADBAND QUANTUM CASCADE LASERS" described and claimed in U.S. Appl. No.12/795,954, filed June 8, 2010, and

WHEREAS, PRINCETON UNIVERSITY, a corporation engaged in business at 4 New South Building, Princeton, NJ US 08540, hereinafter referred to as ASSIGNEE, is desirous of acquiring the said invention and any and all applications for Letters Patent and any and all Letters Patent of the United States and foreign countries that may be issued therefor;

NOW, THEREFORE, the parties hereto, intending to be legally bound, agree that, in consideration of good and valuable consideration paid to ASSIGNOR by ASSIGNEE, the receipt of which is hereby acknowledged, ASSIGNOR has sold, assigned and set over and hereby does sell, assign and set over, unto ASSIGNEE, its successors and assigns, his or her entire right, title and interest for, to and within the United States and all foreign countries, in and to the aforesaid invention and the application identified above, including any and all provisional applications, continuations, divisionals, continuations-in-part, reissues and re-examinations thereof, and in and to any and all Letters Patent that may issue therefor in the United States and in any and all foreign countries (including related rights such as utility model registrations, inventors' certificates and the like). In addition, ASSIGNOR has sold, assigned and set over and hereby does sell, assign and set over, unto ASSIGNEE, its successors and assigns, the right to claim priority in any and all foreign applications, including applications filed under the Patent Cooperation Treaty, to the above-referenced application and any and all provisional, continuation, divisional, and continuation-in-part applications for the invention.

ASSIGNOR covenants that ASSIGNOR has full right to convey the entire interest herein assigned, and that ASSIGNOR has not executed and will not execute any agreement that will conflict with the terms of this assignment. Further, ASSIGNOR hereby authorizes and requests the Commissioner of the U.S. Patent and Trademark Office, and any official of any country foreign to the United States whose duty is to issue patents, design registrations, inventors certificates or the like, to issue any and all Letters Patent, registration or certificate for such invention to ASSIGNEE, it successors and assigns, as the owner of all right, title and interest therein.

And for said consideration, it is hereby covenanted and agreed that at the request and expense of ASSIGNEE, its successors and assigns, ASSIGNOR will execute any further papers and do such other acts and things as may be necessary and proper to permit ASSIGNEE, its successors and assigns, to procure and enforce Letters Patent for said invention in the United States and in such foreign countries as ASSIGNEE, its successors and assigns may elect, and vest the full title thereto in ASSIGNEE, its successors and assigns.

IN WITNESS WHEREOF, this Assignment has been executed on the day and month indicated below.

Date	Signature	
	QIANG LIU	
	YU YAO	
	ANTHONY J. HOFFMAN	
	MATTHEW ESCARRA	

Page Two 02/14/2014	Well France
, ,	KALE J. FRANZ
	WILLIAM O. CHARLES
	JIANXIN CHEN
	CLAIRE F. GMACHL
COUNTY OF	
personally appeare	ersigned, a notary public, in and for the county aforesaid, on this day of
	Notary Public
COUNTY OF	
personally appeare	rsigned, a notary public, in and for the county aforesaid, on this day of
	Notary Public
COUNTY OF	
STATE OF	

Notary Public

Page Three			
COUNTY OF STATE OF		-	
personally appear	ndersigned, a notary public, in and for ared Matthew Escarra , to me known to who acknowledged that they executed	to be the person described in and w	ho executed the foregoing
		Notary Public	
COUNTY OF _	SANTA CLARA	_	
Before me, the upersonally appearing trument and v	ndersigned, a notary public, in and for red Kale J. Franz, to me known to be who acknowledged that they executed	the person described in and who exe	ecuted the foregoing
recorded as such	REBECCA LING Commission # 2021788 Notary Public - California Santa Clara County My Comm. Expires Apr 25, 2017	Notary Public	<u></u>
COUNTY OF _		_ _	
personally appea	ndersigned, a notary public, in and for red William O. Charles , to me known ho acknowledged that they executed	to be the person described in and v	vho executed the foregoing
COUNTY OF _ STATE OF _		Notary Public	
personally appea	ndersigned, a notary public, in and for red Jianxin Chen , to me known to be t tho acknowledged that they executed	he person described in and who exe	cuted the foregoing

Notary Public

WHEREAS, Qiang Liu, Yu Yao, Anthony J. Hoffman, Matthew Escarra, Kale J. Franz, William O. Charles, Jianxin Chen and Claire F. Gmachl, and each one of them, hereinafter referred to as ASSIGNOR, is a named inventor of an invention entitled: "HIGHLY POWER-EFFICIENT AND BROADBAND QUANTUM CASCADE LASERS" described and claimed in U.S. Appl. No.12/795,954, filed June 8, 2010, and

WHEREAS, PRINCETON UNIVERSITY, a corporation engaged in business at 4 New South Building, Princeton, NJ US 08540, hereinafter referred to as ASSIGNEE, is desirous of acquiring the said invention and any and all applications for Letters Patent and any and all Letters Patent of the United States and foreign countries that may be issued therefor;

NOW, THEREFORE, the parties hereto, intending to be legally bound, agree that, in consideration of good and valuable consideration paid to ASSIGNOR by ASSIGNEE, the receipt of which is hereby acknowledged, ASSIGNOR has sold, assigned and set over and hereby does sell, assign and set over, unto ASSIGNEE, its successors and assigns, his or her entire right, title and interest for, to and within the United States and all foreign countries, in and to the aforesaid invention and the application identified above, including any and all provisional applications, continuations, divisionals, continuations-in-part, reissues and re-examinations thereof, and in and to any and all Letters Patent that may issue therefor in the United States and in any and all foreign countries (including related rights such as utility model registrations, inventors' certificates and the like). In addition, ASSIGNOR has sold, assigned and set over and hereby does sell, assign and set over, unto ASSIGNEE, its successors and assigns, the right to claim priority in any and all foreign applications, including applications filed under the Patent Cooperation Treaty, to the above-referenced application and any and all provisional, continuation, divisional, and continuation-in-part applications for the invention.

ASSIGNOR covenants that ASSIGNOR has full right to convey the entire interest herein assigned, and that ASSIGNOR has not executed and will not execute any agreement that will conflict with the terms of this assignment. Further, ASSIGNOR hereby authorizes and requests the Commissioner of the U.S. Patent and Trademark Office, and any official of any country foreign to the United States whose duty is to issue patents, design registrations, inventors certificates or the like, to issue any and all Letters Patent, registration or certificate for such invention to ASSIGNEE, it successors and assigns, as the owner of all right, title and interest therein.

And for said consideration, it is hereby covenanted and agreed that at the request and expense of ASSIGNEE, its successors and assigns, ASSIGNOR will execute any further papers and do such other acts and things as may be necessary and proper to permit ASSIGNEE, its successors and assigns, to procure and enforce Letters Patent for said invention in the United States and in such foreign countries as ASSIGNEE, its successors and assigns may elect, and vest the full title thereto in ASSIGNEE, its successors and assigns.

IN WITNESS WHEREOF, this Assignment has been executed on the day and month indicated below.

Date	Signature	
	QIANG LIU	
<u> </u>	YU YAO	
<u></u>	ANTHONY J. HOFFMAN	
	MATTHEW ESCARRA	

Page Two		}	
1/03/201	KALE J. FRANZ WILLIAM O. CHA	That's	
	JIANXIN CHEN		
	CLAIRE F. GMAC	HL	
COUNTY OF STATE OF			
personally appear	red <mark>Qiang Liu</mark> ,to me known to be the p	he county aforesaid, on this day of person described in and who executed the t their free act and deed and desired the san	foregoing instrumen
		Notary Public	
COUNTY OF STATE OF			
personally appea	red Yu Yao, to me known to be the pe	he county aforesaid, on this day of rson described in and who executed the fo their free act and deed and desired the sar	regoing instrument
		Notary Public	
COUNTY OF STATE OF		• •	
personally appea	red Anthony J. Hoffman, to me known who acknowledged that they executed t	the county aforesaid, on this day of to be the person described in and who ex the same as their free act and deed and des	ecuted the foregoing
		Notary Public	-

Page Three			
COUNTY OF STATE OF		-	
personally appea	ared Matthew Escarra, to me known to who acknowledged that they executed	the county aforesaid, on this day of o be the person described in and who executed the for the same as their free act and deed and desired the sa	egoing
		Notary Public	
COUNTY OF		_ _	
personally appear	ared Kale J. Franz, to me known to be twho acknowledged that they executed	the county aforesaid, on this day of the person described in and who executed the foregoin the same as their free act and deed and desired the sa	
		Notary Public	
COUNTY OF STATE OF	Wake North Carolina	_ _ _	Hart KMK
beigonamy abbe	who acknowledged that they executed	the county aforesaid, on this 3 day of Januar to be the person described in and who executed the the same as their free act and deed and desired the same as their free act and deed and desired the same as their free act and deed and desired the same as their free act and deed and desired the same as their free act and deed and desired the same as their free act and deed and desired the same as their free act and deed and desired the same as the same as the same act and deed and desired the same as the sam	A CHITILITY
		Halla Magg	PANIC .
COUNTY OF STATE OF		_ _	SONT NO.
personally appe	ared Jianxin Chen, to me known to be who acknowledged that they executed	the county aforesaid, on this day of the person described in and who executed the foregoin the same as their free act and deed and desired the sa	2013, ng
		Notary Public	

WHEREAS, Qiang Liu, Yu Yao, Anthony J. Hoffman, Matthew Escarra, Kale J. Franz, William O. Charles, Jianxin Chen and Claire F. Gmachl, and each one of them, hereinafter referred to as ASSIGNOR, is a named inventor of an invention entitled: "HIGHLY POWER-EFFICIENT AND BROADBAND QUANTUM CASCADE LASERS" described and claimed in U.S. Appl. No.12/795,954, filed June 8, 2010, and

WHEREAS, PRINCETON UNIVERSITY, a corporation engaged in business at 4 New South Building, Princeton, NJ US 08540, hereinafter referred to as ASSIGNEE, is desirous of acquiring the said invention and any and all applications for Letters Patent and any and all Letters Patent of the United States and foreign countries that may be issued therefor;

NOW, THEREFORE, the parties hereto, intending to be legally bound, agree that, in consideration of good and valuable consideration paid to ASSIGNOR by ASSIGNEE, the receipt of which is hereby acknowledged, ASSIGNOR has sold, assigned and set over and hereby does sell, assign and set over, unto ASSIGNEE, its successors and assigns, his or her entire right, title and interest for, to and within the United States and all foreign countries, in and to the aforesaid invention and the application identified above, including any and all provisional applications, continuations, divisionals, continuations-in-part, reissues and re-examinations thereof, and in and to any and all Letters Patent that may issue therefor in the United States and in any and all foreign countries (including related rights such as utility model registrations, inventors' certificates and the like). In addition, ASSIGNOR has sold, assigned and set over and hereby does sell, assign and set over, unto ASSIGNEE, its successors and assigns, the right to claim priority in any and all foreign applications, including applications filed under the Patent Cooperation Treaty, to the above-referenced application and any and all provisional, continuation, divisional, and continuation-in-part applications for the invention.

ASSIGNOR covenants that ASSIGNOR has full right to convey the entire interest herein assigned, and that ASSIGNOR has not executed and will not execute any agreement that will conflict with the terms of this assignment. Further, ASSIGNOR hereby authorizes and requests the Commissioner of the U.S. Patent and Trademark Office, and any official of any country foreign to the United States whose duty is to issue patents, design registrations, inventors certificates or the like, to issue any and all Letters Patent, registration or certificate for such invention to ASSIGNEE, it successors and assigns, as the owner of all right, title and interest therein.

And for said consideration, it is hereby covenanted and agreed that at the request and expense of ASSIGNEE, its successors and assigns, ASSIGNOR will execute any further papers and do such other acts and things as may be necessary and proper to permit ASSIGNEE, its successors and assigns, to procure and enforce Letters Patent for said invention in the United States and in such foreign countries as ASSIGNEE, its successors and assigns may elect, and vest the full title thereto in ASSIGNEE, its successors and assigns.

IN WITNESS WHEREOF, this Assignment has been executed on the day and month indicated below.

Date	Signature	
A	QIANG LIU	
	YU YAO	
	ANTHONY J. HOFFMAN	
	MATTHEW ESCARRA	

Page Two			
	KALE J. FRANZ		
	WILLIAM O. CHARLE	es e	
Feb. 15/2014	J: CMV12 C	Mr_	
	CLAIRE F. GMACHL		
COUNTY OF			
personally appeared Qiang Liv	, to me known to be the pers	county aforesald, on this day on described in and who executed ir free act and deed and desired the	d the foregoing instrument
	Not	ary Public	
COUNTY OF STATE OF			
personally appeared Yu Yao,	to me known to be the person	county aforesaid, on this day n described in and who executed t ir free act and deed and desired th	the foregoing instrument
	Not	eary Public	
COUNTY OF STATE OF			
personally appeared Anthony	J. Hoffman, to me known to	county aforesaid, on this day be the person described in and wisame as their free act and deed ar	no executed the foregoing
	Alex	tanı Bublic	

WHEREAS, Qiang Liu, Yu Yao, Anthony J. Hoffman, Matthew Escarra, Kale J. Franz, William O. Charles, Jianxin Chen and Claire F. Gmachl, and each one of them, hereinafter referred to as ASSIGNOR, is a named inventor of an invention entitled: "HIGHLY POWER-EFFICIENT AND BROADBAND QUANTUM CASCADE LASERS" described and claimed in U.S. Appl. No.12/795,954, filed June 8, 2010, and

WHEREAS, PRINCETON UNIVERSITY, a corporation engaged in business at 4 New South Building, Princeton, NJ US 08540, hereinafter referred to as ASSIGNEE, is desirous of acquiring the said invention and any and all applications for Letters Patent and any and all Letters Patent of the United States and foreign countries that may be issued therefor;

NOW, THEREFORE, the parties hereto, intending to be legally bound, agree that, in consideration of good and valuable consideration paid to ASSIGNOR by ASSIGNEE, the receipt of which is hereby acknowledged, ASSIGNOR has sold, assigned and set over and hereby does sell, assign and set over, unto ASSIGNEE, its successors and assigns, his or her entire right, title and interest for, to and within the United States and all foreign countries, in and to the aforesaid invention and the application identified above, including any and all provisional applications, continuations, divisionals, continuations-in-part, reissues and re-examinations thereof, and in and to any and all Letters Patent that may issue therefor in the United States and in any and all foreign countries (including related rights such as utility model registrations, inventors' certificates and the like). In addition, ASSIGNOR has sold, assigned and set over and hereby does sell, assign and set over, unto ASSIGNEE, its successors and assigns, the right to claim priority in any and all foreign applications, including applications filed under the Patent Cooperation Treaty, to the above-referenced application and any and all provisional, continuation, divisional, and continuation-in-part applications for the invention.

ASSIGNOR covenants that ASSIGNOR has full right to convey the entire interest herein assigned, and that ASSIGNOR has not executed and will not execute any agreement that will conflict with the terms of this assignment. Further, ASSIGNOR hereby authorizes and requests the Commissioner of the U.S. Patent and Trademark Office, and any official of any country foreign to the United States whose duty is to issue patents, design registrations, inventors certificates or the like, to issue any and all Letters Patent, registration or certificate for such invention to ASSIGNEE, it successors and assigns, as the owner of all right, title and interest therein.

And for said consideration, it is hereby covenanted and agreed that at the request and expense of ASSIGNEE, its successors and assigns, ASSIGNOR will execute any further papers and do such other acts and things as may be necessary and proper to permit ASSIGNEE, its successors and assigns, to procure and enforce Letters Patent for said invention in the United States and in such foreign countries as ASSIGNEE, its successors and assigns may elect, and vest the full title thereto in ASSIGNEE, its successors and assigns.

IN WITNESS WHEREOF, this Assignment has been executed on the day and month indicated below.

Date	Signature	
	QIANG LIU	
	YU YAO	
	ANTHONY J. HOFFMAN	
	MATTHEW ESCARRA	

Page Two		
The control of the co	KALE J. FRANZ	
	WILLIAM O. CHARLES	
0102/2014	CLAIRE F. GMACHL	
COUNTY OF		
personally appeared Qiang	d, a notary public, in and for the county aforesaid, on this day of Liu, to me known to be the person described in and who executed the forest they executed the same as their free act and deed and desired the same to	egoing instrumen
	Notary Public	
COUNTY OF		
personally appeared Yu Ya	d, a notary public, in and for the county aforesaid, on thisday of to, to me known to be the person described in and who executed the foreg at they executed the same as their free act and deed and desired the same t	oing instrument
	Notary Public	
COUNTY OFSTATE OF		
personally appeared Antho	d, a notary public, in and for the county aforesaid, on thisday of ony J. Hoffman, to me known to be the person described in and who execut wledged that they executed the same as their free act and deed and desired	ted the foregoing
	Notary Public	

Page Four		
COUNTY OF STATE OF	Mercer But Tersey	2014
nerconally anne	ared Claire F. Gmachl, to me known to be who acknowledged that they executed th	e county aforesaid, on this day of,2013,,2013,, the person described in and who executed the foregoing e same as their free act and deed and desired the same to be
		Another Tuntelerry
	<u> </u>	Notary Public
		10#2341751
		2Ap. 3/24/2016

RECORDED: 03/03/2014