

# **A preliminary study on the difference between the citation counts of issued patents and their corresponding pre-grant publications**

Max Kuan

Assistant Professor

National Taiwan University of Science  
and Technology



專利情報與資訊計量研究室  
Patent Intelligence & Informetrics Lab.

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We may **underestimate** a  
patent's citation count



# Patent Citation Count is similar to Paper Citation Count

- Patents, like academic papers, are often evaluated by its citation counts
- Similarly, the more a patent is cited, the patent is considered as
  - Having better quality
  - More valuable
  - More important
  - Producing more impact/influence



(12) **United States Patent**  
**Jang et al.**

(10) **Patent No.:** **US 7,782,101 B2**  
(45) **Date of Patent:** **Aug. 24, 2010**

(54) **INJECTION-LOCKED FREQUENCY DIVIDER**

(75) Inventors: **Sheng-Lyang Jang**, Taipei (TW);  
**Cheng-Chen Liu**, Taipei (TW)

(73) Assignee: **National Taiwan University of Science and Technology**, Taipei (TW)

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 152 days.

(21) Appl. No.: **12/164,117**

(22) Filed: **Jun. 30, 2008**

(65) **Prior Publication Data**

US 2009/0251177 A1 Oct. 8, 2009

(30) Apr. 3, 2008

(51) Int. C. **H03B**

(52) U.S. C.

(58) Field

327/118

See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

- 2007/0257735 A1 11/2007 Chan et al.
- 2008/0278250 A1\* 11/2008 Hung et al. .... 331/117 R
- 2009/0189704 A1\* 7/2009 Li ..... 331/117 R

**FOREIGN PATENT DOCUMENTS**

JP	55096737	7/1980
TW	I283966	7/2007

**OTHER PUBLICATIONS**

Author: Sheng-Lyang Jang, and Chien-Feng Lee Title: A Wide Locking Range LC-Tank Injection-Locked Frequency Divider Date: Aug. 2007 Publisher: IEEE Volume: IEEE Microwave and Wireless Components Letters, vol. 17, No. 8.\*

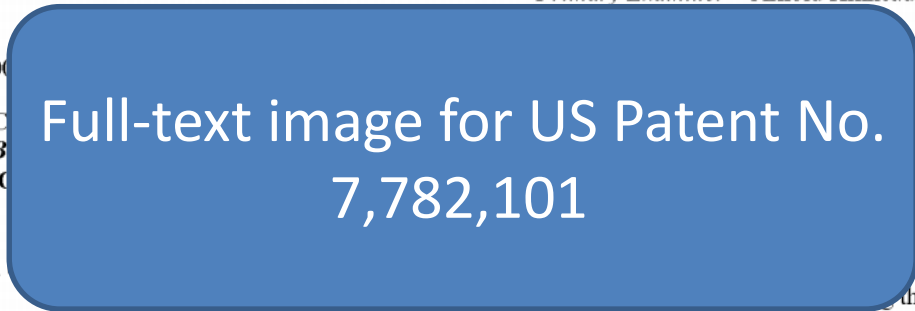
Author: Sheng-Lyang Jang, Chien-Feng Lee, and Wei-Hsung Yeh Title: A Divide-by-3 Injection Locked Frequency Divider With Single-Ended Input Date: Feb. 2008 Publisher: IEEE Volume: IEEE Microwave and Wireless Components Letters, vol. 18, No. 2.\*

Author: Sheng-Lyang Jang, and Shao-Hwa Lee Title: A Wide Band Injection Locked Frequency Divider With Variable Inductor Load Date: Jun. 2007 Publisher: IEEE Volume: IEEE Microwave and Wireless Components Letters, vol. 17, No. 6.\*

\* cited by examiner

Primary Examiner—Arnold Kinkead

Chyun IP Office



er for dividing a fre-  
obtaining a frequency  
tion-locked frequency  
t and an oscillator. The  
input terminal and a  
the injection signal. The  
received injection signal exhibits a phase difference of 180°  
between the first input terminal and the second input terminal.  
The oscillator includes an inductor unit and a variable capaci-  
tance unit. The injection-locked frequency divider is featured  
with a wide injection locking range, and can be realized with  
a low operation voltage, and therefore can be conveniently  
used in different kinds of hybrid ICs.

**25 Claims, 6 Drawing Sheets**



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REF/5376580: 240 patents.

Hits 1 through 50 out of 240

Screen capture of USPTO advanced search interface showing 240 patents citing US Patent No. 5,376,580

Next 50 Hits

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**PAT.  
NO.**

**Title**

1 [8.778.783](#) [Methods for improved growth of group III nitride buffer layers](#)



# A patent's pre-grant publication has its own citations

- Utility patents are published 18 months after their filing (the so-called “early disclosure”).
  - They are called “pre-grant publications” (PGPubs).
- Both a PGPub and its corresponding issued patent can be independently and separately cited.
- When counting citations, people usually consider only the citations to issued patents, ignoring those to their PGPubs.



Using  
PGPub  
2006/0133636  
Patent 7,317,806  
as example

No.	Filing Date	Patents citing the sample PGPub		Patents citing the sample patent	
		Patent No.	Issued. Date	Patent No.	Issued Date
1	2007/03/27	8,194,911	2012/06/05		
2	2007/06/13			8,170,249	2012/05/01
3	2007/08/28	8,098,854	2012/01/17		
4	2007/08/30	8,135,163	2012/03/13		
5	2007/09/28	8,290,187	2012/10/16		
6	2007/11/05	8,300,871	2012/10/30		
7	2008/10/31	8,447,059	2013/05/21		
8	2008/12/10	8,238,596	2012/08/07		
9	2008/12/17	8,189,804	2012/05/29		
10	2009/01/11	8,509,468	2013/08/13		
11	2009/03/11	8,311,259	2012/11/13		
12	2009/03/27	8,213,645	2012/07/03		
13	2009/11/17			8,116,502	2012/02/14
14	2009/12/17	8,116,502	2012/02/14		
15	2010/07/09			8,538,061	2013/09/17
16	2010/07/09			8,548,186	2013/10/01
17	2010/07/09			8,549,733	2013/10/08
18	2010/10/25			8,437,489	2013/05/07
19	2011/08/04	8,611,969	2013/12/17		
20	2011/08/04	8,625,834	2014/01/07		
21	2011/12/09			8,567,555	2013/10/29
22	2012/01/03			8,488,831	2013/07/16



14 patents  
citing PGPub  
2006/0133636

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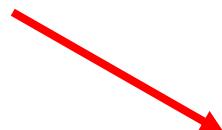


8 patents  
citing Patent  
7,317,806

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21	2011/12/09			8,567,555	2013/10/29
22	2012/01/03			8,488,831	2013/07/16



The issued date of patent  
7,317,806



Even after the  
patent is granted,  
people continue  
to cite the PGPub

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		Patent No.	Issued. Date	Patent No.	Issued Date
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# The Question to Investigate

- **Ignoring citations to PGPub may lead to underestimation to the patent**
  - Citations to the patent 7,317,806: 8
  - Citations to the PGPub 2006/0133636: 14
- **The question:**
  - **In general, what is the impact of ignoring the citations to PGPubs?**



# Empirical Data

- Collect 137,964 utility patents issued in year 2007 from USPTO
  - Why 2007? We'd like to give the issued patents enough time to accumulate their citations
- Count the 137,964 PGPubs citation counts, and 137,964 patent citation counts
- Calculate the PGPub Citation Shares:

$$\text{PGPub Citation Share} = \frac{\text{PGPub Citation Count}}{\text{PGPub Citation Count} + \text{Patent Citation Count}}$$



# PGPub Citation Share

- If citations to PGPub are ignored
  - PGPub Citation Share=**0%**: No impact at all.
    - Special case: citation counts of PGPub and Patent are both 0
      - the PGPub Citation Share is considered as **0%**
  - PGPub Citation Share=**100%**: The patent is completely underestimated.



# Statistic Result

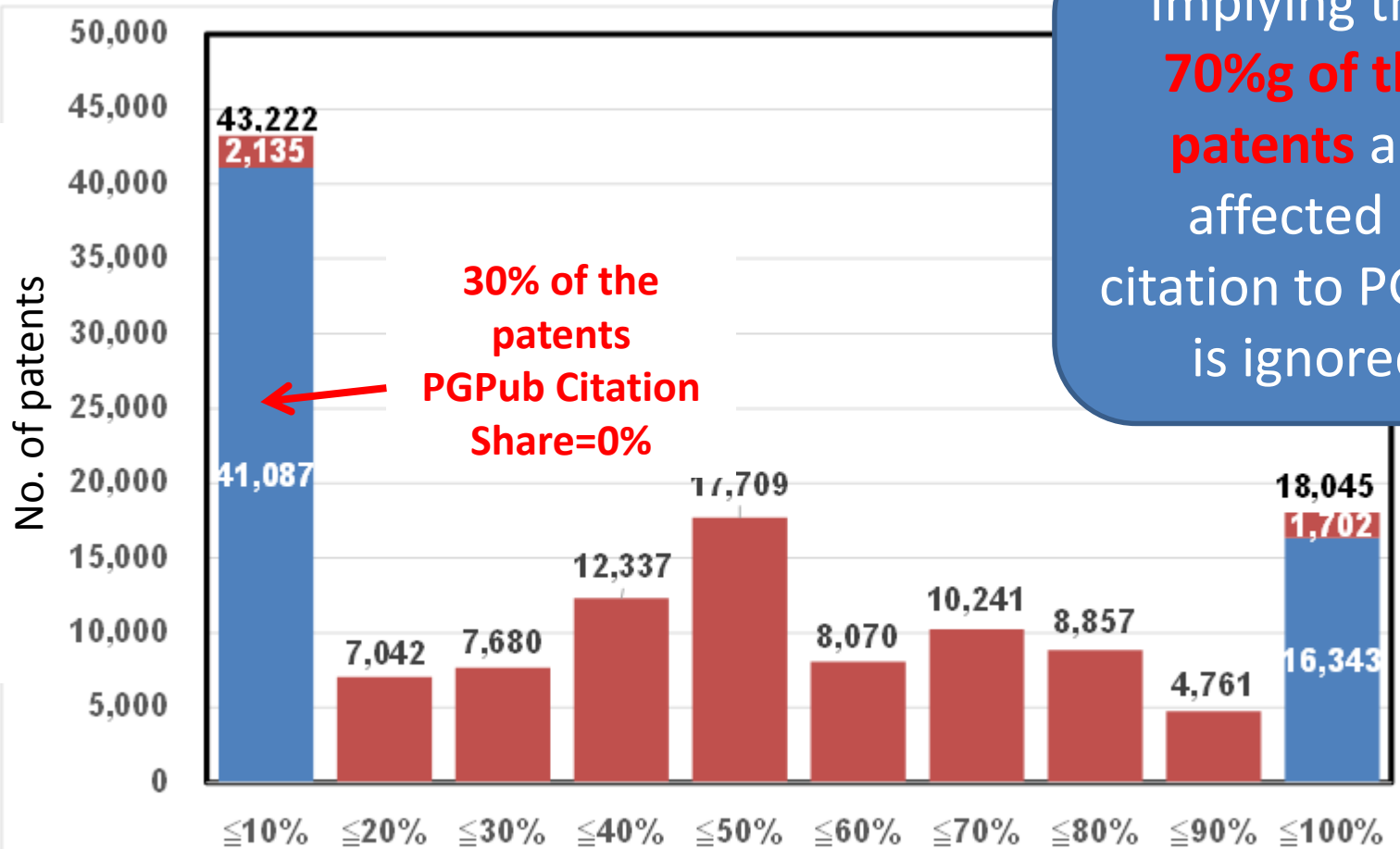
	PGPubs	Patents
Total citation count	705,714	696,405
Avg. citation count*	5.12	5.05
Max. citation count**	405	392
Max. difference	360	363

\*The standard deviations are 11.92 and 10.72, respectively.

\*\*Their corresponding patent and PGPub receive 45 and 29 citations only.



# Statistic Result



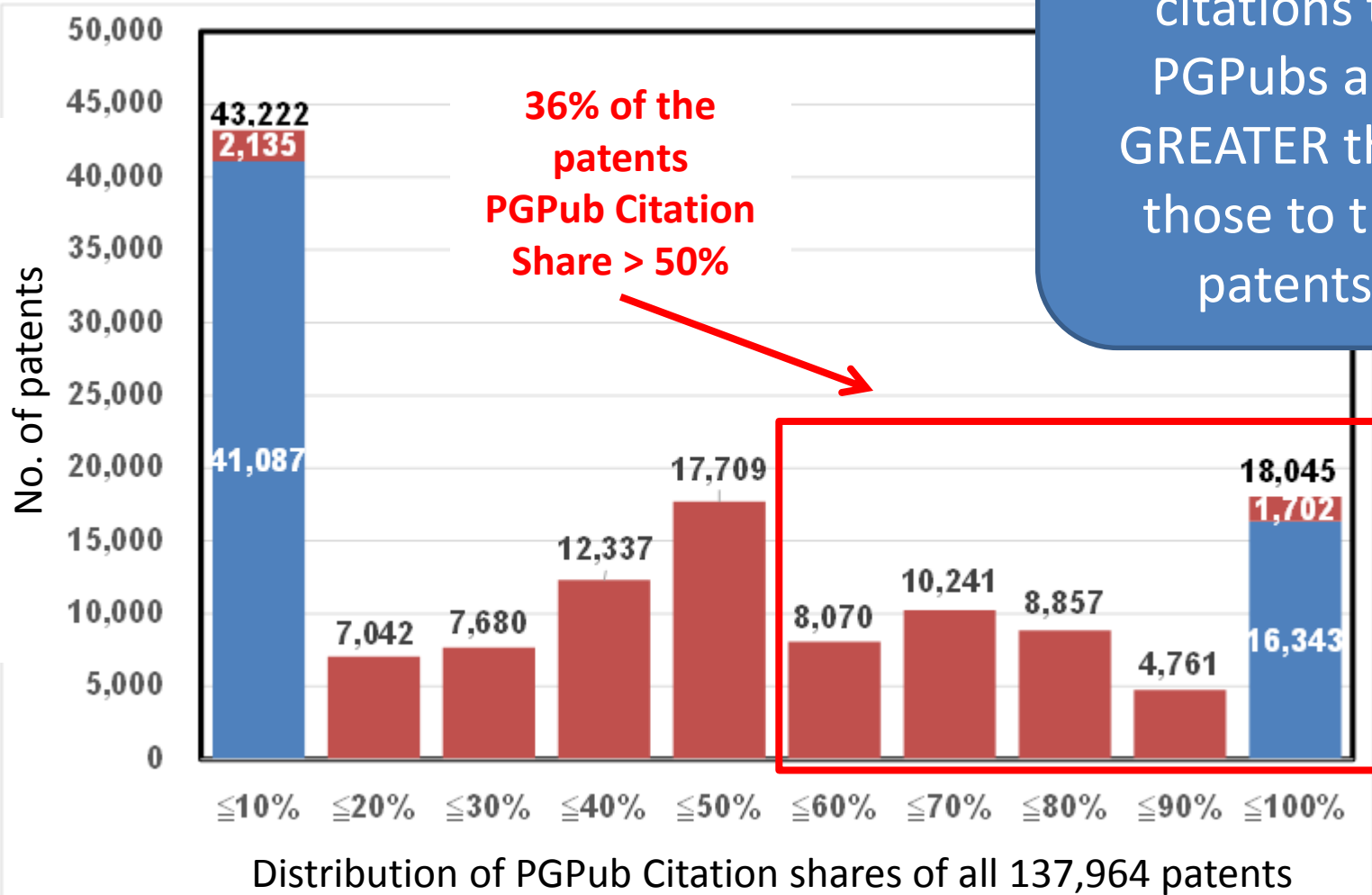
Implying that **70% of the patents** are affected if citation to PGPub is ignored

Distribution of PGPub Citation shares of all 137,964 patents



# Statistic Result

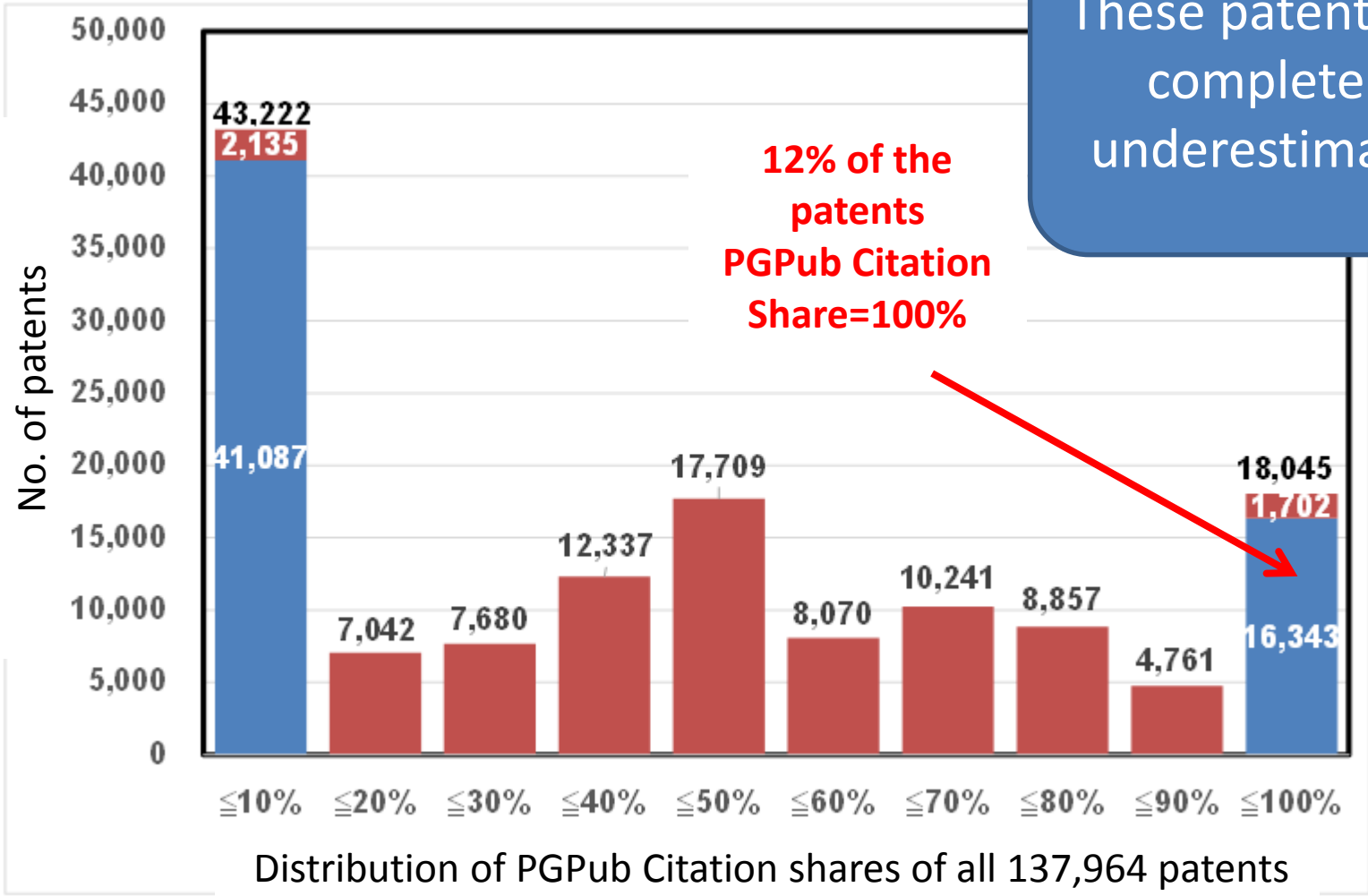
These patents' citations to PGPubs are GREATER than those to the patents





# Statistic Result

These patents are completely underestimated



# Summary

- **An analyst should not ignore citations to the PGPubs easily** without evaluating the impact first
  - About 70% of the patents are underestimated to various degrees
  - 36% of the patents are significantly underestimated
  - 12% of the patents are completely underestimated



# One may argue...

- The content of a PGPub may be different from that of its corresponding patent, thereby justifying their citations are not counted together.
  - U.S. Patent Act (35 U.S.C.S. § 132(a)) specifies that “No amendment shall introduce new matter into the disclosure of the invention.”
  - The contents of the PGPub and the patent should both be bounded by what is disclosed at the time of filing.



# Extension of the Study

- We speculate that citations to PGPubs should be even more significant for younger patents.
- We have finished collecting utility patents issued in 2009 and 2011
  - Analytical result to be reported in the future.



# Thank You