

Development of Broadband Wireless Access Subsystems in Millimeter Wave Band

Supervisor:

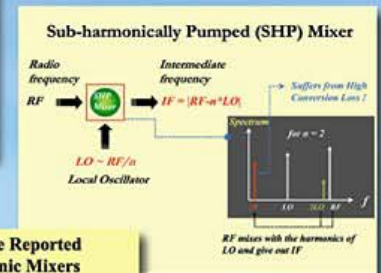
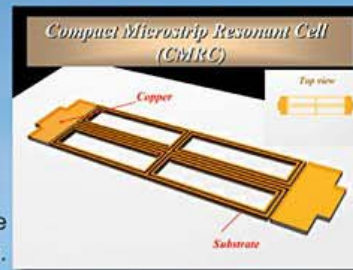
Prof C H Chan, Dr Quan Xue

Research Student:

Mr Yum Tsz Yin, Kenji (任子賢)

Wireless Communications using millimeter-wave can provide wide band (in GHz) for high data rate and large subscribers. Conventional millimeter-wave receivers have two choices: fundamental pumped mixer or sub-harmonically pumped mixer. The former needs a millimeter-wave local oscillator, which is extremely expensive in prize, low quality in spectrum and not stable in quality comparing with low frequency oscillator. The latter uses lower frequency as local oscillator to overcome these shorting comings. But it suffers from very high conversion loss.

Recently, the invention relates to a new generation design of millimeter-wave mixer for low-cost wireless communications subsystems. The design employs a novel component invented by the authors in the form of the Compact Microstrip Resonant Cell (CMRC). Using CMRC in our subsystems, our designs show the best performance ever reported in open literature. **Our design is 100 times**



Comparisons of the Reported 2nd and 8th Harmonic Mixers

Author(s)	Frequency Range	Harmonic Numbers	Conversion Loss (dB)
This Work (2002)	9-120GHz	2	4-14dB
A.C. Azevedo Das (1996)	9-110GHz	2	13dB
H. Okamoto (1997)	21.8-35.8GHz	2	12-4dB
G.M. Rebeiz (1997)	82-90GHz	2	9-10dB
This Work (2002)	38-47GHz	8	3dB
Commercial Product (2002)	18-25GHz	8	30-40dB
S. Ramani (2001)	80GHz	4	11-5dB
A. Mudge (1992)	80GHz	4	15dB

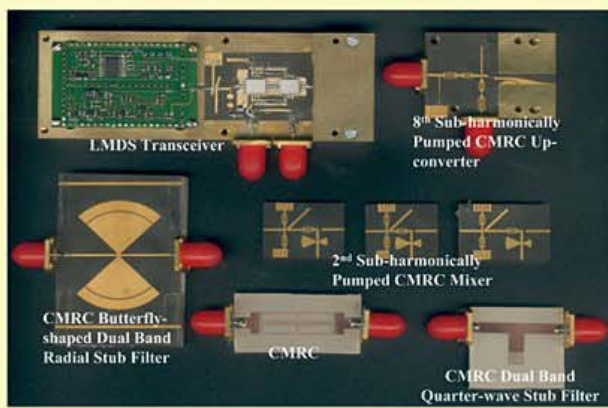
*100x Conversion Loss for Fundamental Harmonics of 100th Order to 5.0dB

better than the commercial product but at one-tenth of the cost. To the author's knowledge, this is the first demonstration of a high-frequency mixer design with the state-of-the-art performance using our new CMRC. Based on this most important key component in wireless systems, the successful application of this invention will lead to a brand-new low-cost millimeter wave communications infrastructure, which is expected to be an innovation in communications systems, originated in Hong Kong, to improve the broadband interconnection.

Features

- Novel 1-D CMRC structure
- New generation of millimeter-wave mixer designs
- Conversion loss as good as conventional fundamental pumped mixer
- Suitable for 28GHz LMDS systems, 94GHz collision avoidance systems and digital point-to-point radio services

Lost Cost Wireless Communications Subsystems



Contact Person: Mr Kenji Yum

Email: 50182327@student.cityu.edu.hk

Tel: (852) 9631 2693