Cosmic Origins Program Analysis Group (COPAG)

Advanced Technologies for Future Heterodyne Missions

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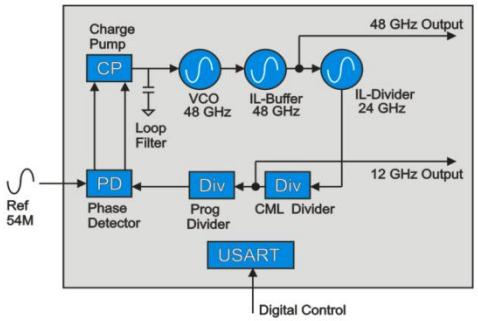
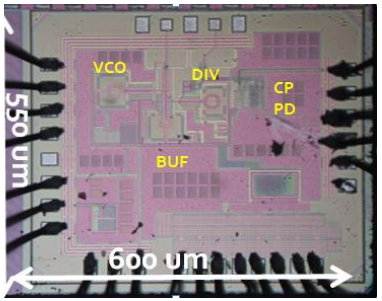
COR Far-IR Science and Technology Needs—Science Interest Group (SIG)
Room 309, Seattle Convention Center
January 4th, 2015

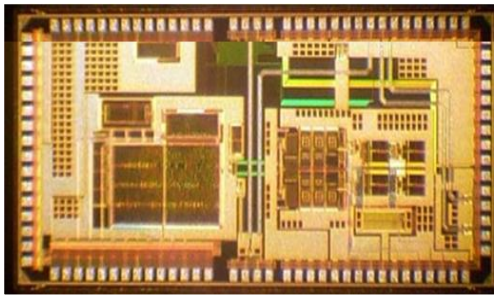
Advancing CMOS Technology

Synthesizers





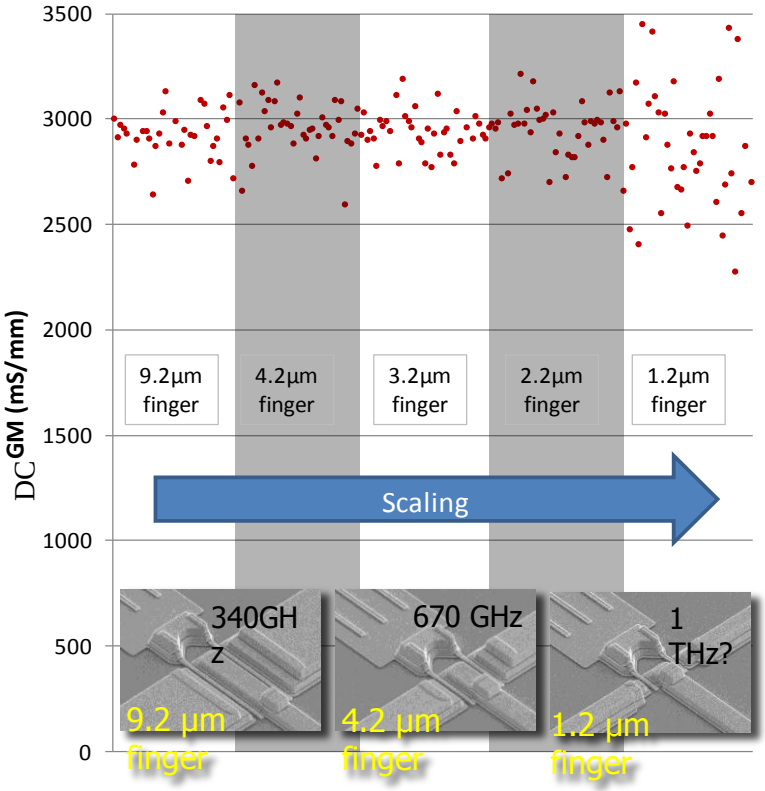
Backends

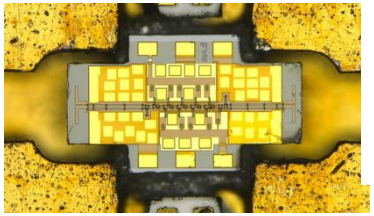


Feature	Now	Estimate 1-2 Years	Estimate 3-5 Years
Technology	65nm Standard CMOS	28 nm Advanced CMOS	14nm FinFet CMOS
Size	0.5 X 0.5 mm	Similar	Similar
Weight	> 0.01 g	Similar	Similar
Power	100mW	80mW	60mW
Frequency	50 GHz	100 GHz	500-600 GHz
Phase Noise	-98 dBc/Hz (1M)	Similar	Similar
Component	<$600	Similar	Similar

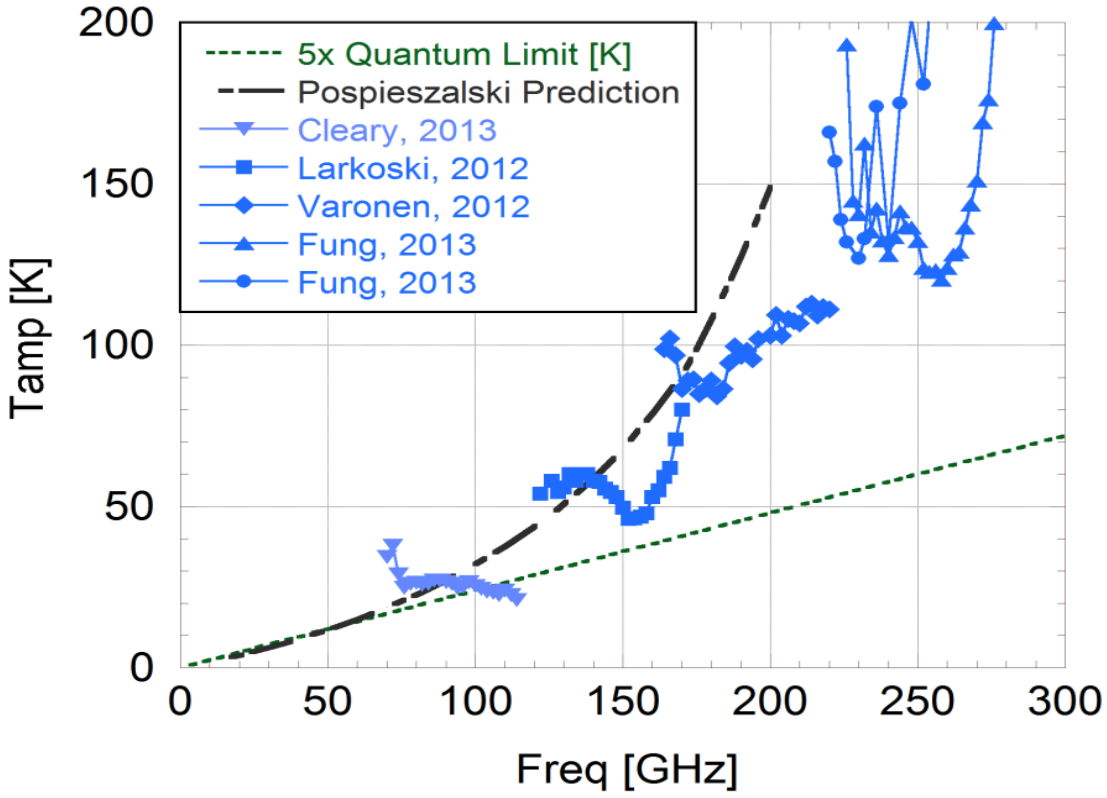
Feature	Now	Estimate 1-2 Years	Estimate 3-5 Years
Technology	65nm Standard CMOS	28 nm Advanced CMOS	14nm FinFet CMOS
Size	0.5 X 0.5 mm	Similar	Similar
Weight	> 0.01 g	Similar	Similar
Power	450mW	350mW	150mW
Channels	512	8192	16K
Bandwidth	1 GHz	5 GHz	10 GHz
Cost	<$2500	Similar	Similar

HEMT based receivers which will offer noise performance close to SIS mixers, but at 20K.





Data courtesy of L. Samoska, G. Chattopadhyay, JPL
B. Deal, NGC



Summary thoughts

- Both of these technologies are enabling, especially for array instruments
- Both technologies require us to partner with large commercial/aerospace entities where we do not necessarily have much leverage
- CMOS technology being funded mostly by wireless communication industry, though we present a challenging niche for chip designers
- InP HEMT technology funded by large grants from DARPA. Future is unknown due to lack of any identified large-scale commercial apps to date