

The Photoconductive Antenna a new device for spacegeodesy

Stefan Riepl, Christian Plötz (BKG)

Reinhard Zeitlhöfler (TUM)

Axel Nothnagel (UB)

Origin and basic idea

	VLBI	Terahertz Frequency Domain	SLR
Frequency/Hz	1E9		1E14
Wavelength/m	1E-1		1E-6

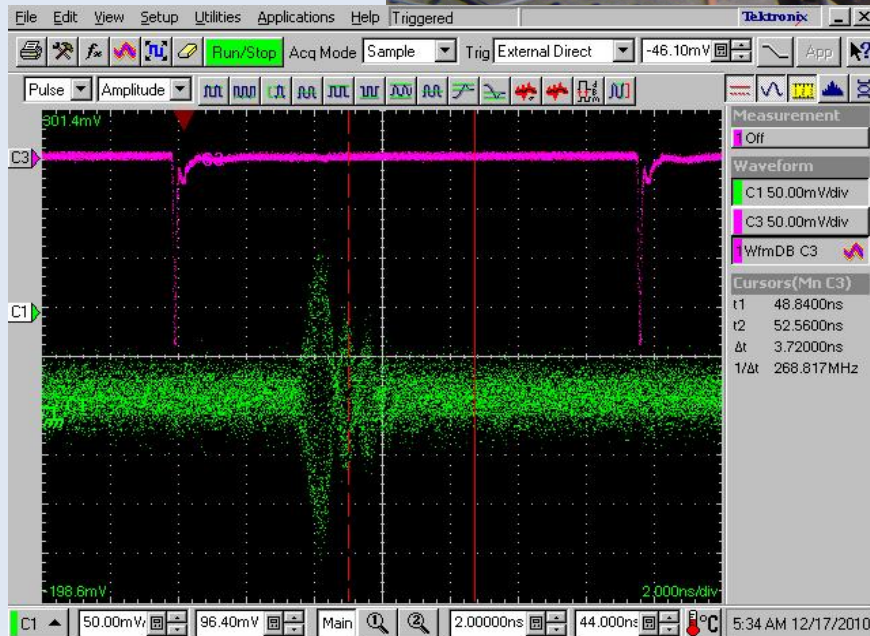
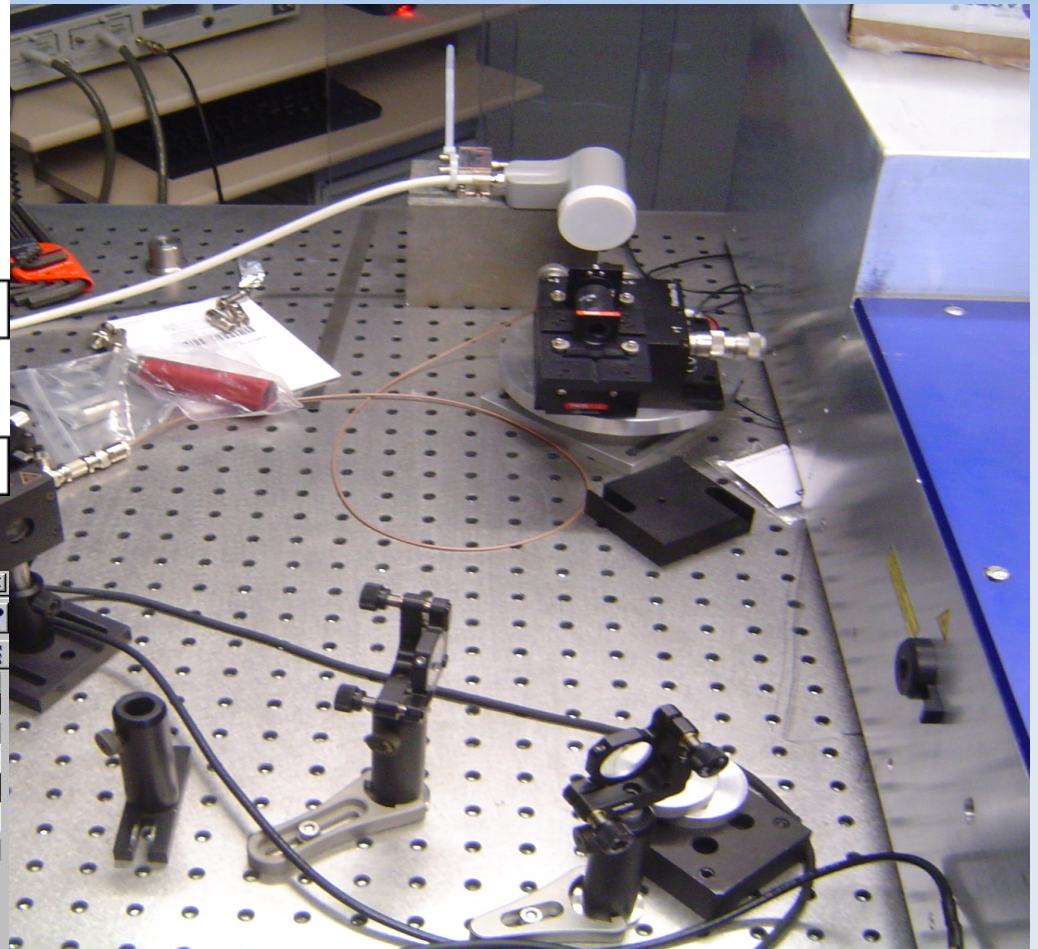
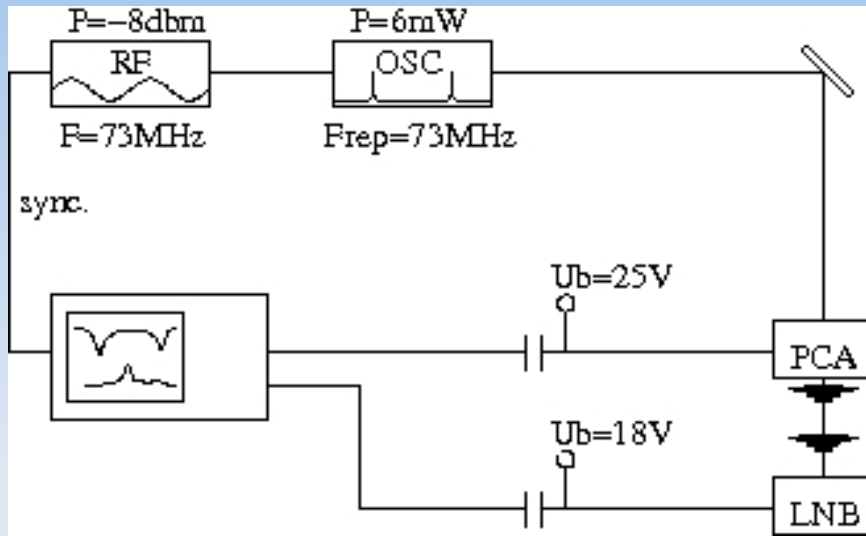
- terahertz generation and detection
- terahertz spectroscopy (body scanner)
- link between VLBI and SLR
- applicable for local survey
- intersystem time transfer

What is a PCA ?

- Metal-Semiconductor-Metal Contact
- GaAs or InGaAs LT grown structures
- Single and multi gap (interdigital) layout
- Fiber coupling available
- Excitation threshold ca. 0.1nJ
- Directivity via Si ball lens
- Bidirectional device

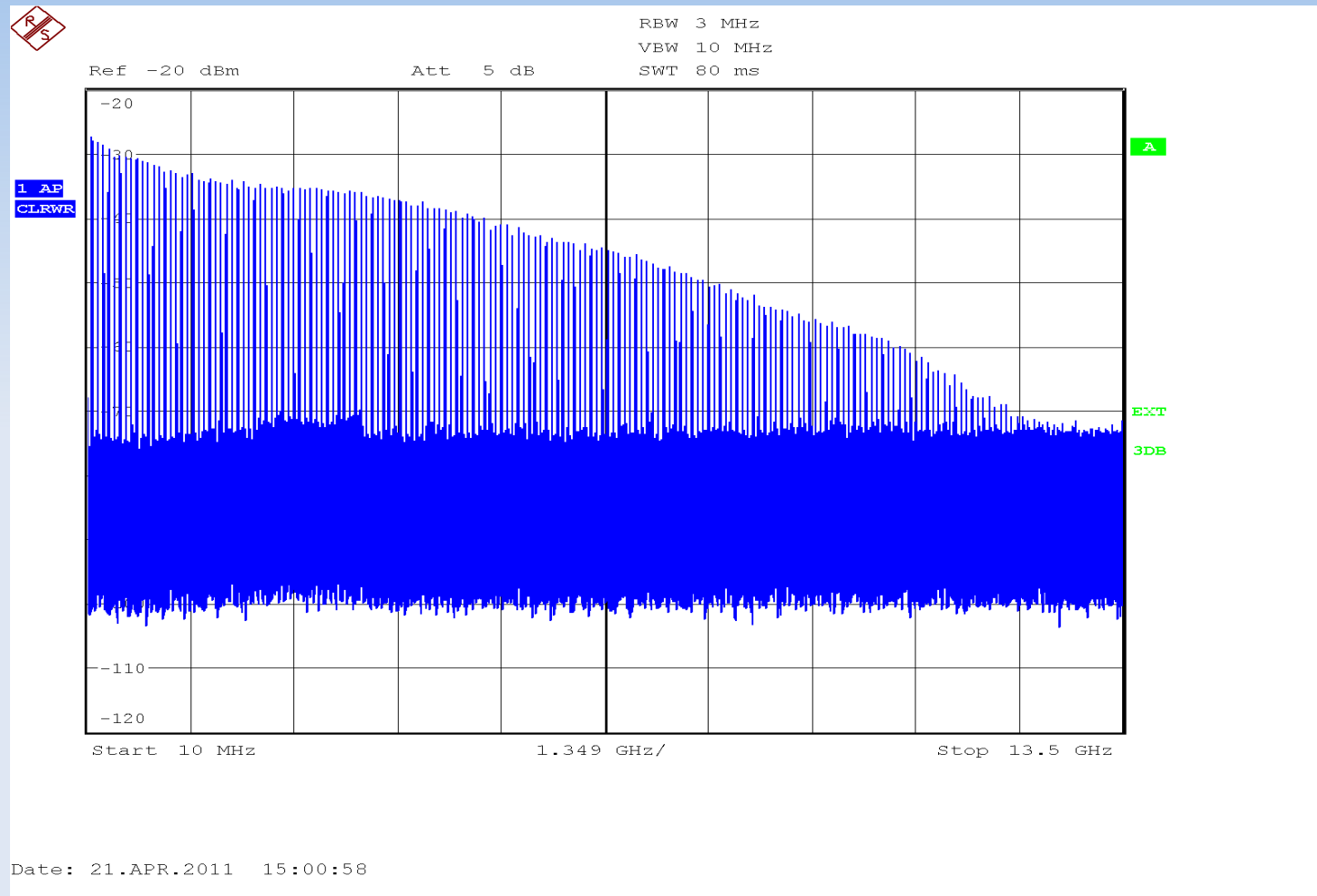


First Experiment



- 60 degree emission angle
- Linear polarization

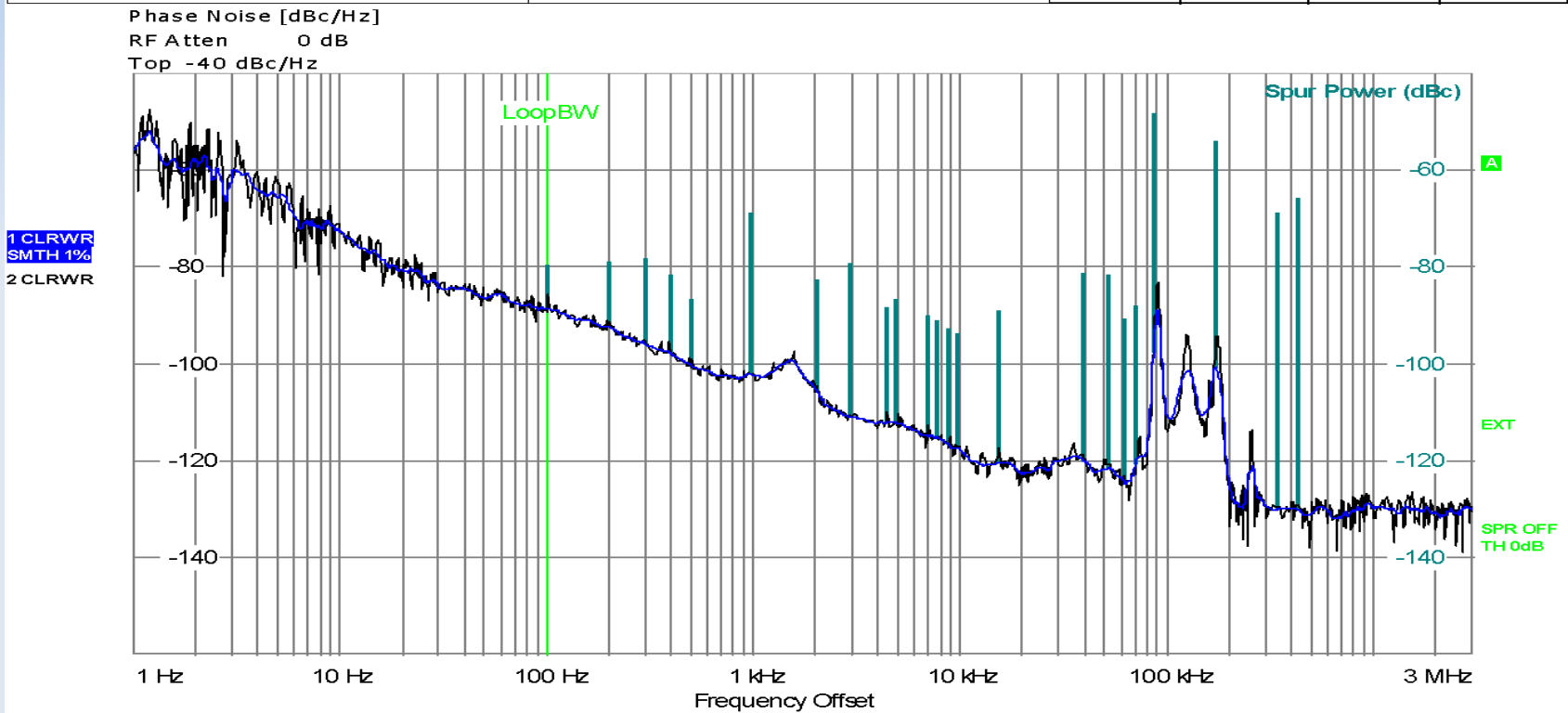
Electrical Spectrum



- Repetitive signal
- Frequency dependence $\exp((\omega \cdot \tau)^2/2)$

Phase Noise

Settings		Residual Noise [T1 w/o spurs]		Phase Detector +40 dB			
Signal Frequency:	73.014999 MHz	Int PHN (1.0 .. 3.0 M) -48.8 dBc					
Signal Level:	-26.43 dBm	Residual PM	0.294 °				
Cross Corr Mode	Harmonic 1	Residual FM	1.409 kHz				
Internal Ref Tuned	Internal Phase Det	RMS Jitter	11.1672 ps				



Running ...

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Peak Flux Calculation

PCA distance	73MHz/0.1nJ D=1cm, 10", 60°	1kHz/1mJ D=1cm 10" / 60°
50m	2E9 Jy	1E16 Jy
300km	1E-6 Jy	15 Jy
1000km	1E-8 Jy	0.1 Jy
20000km	1E-13 Jy	1E-6 Jy

- 1Jy sources are detected by VLBI within reasonable observation time
- Current setup limits acceptance angle to 5 degree

Conclusion and Outlook

- PCA is an optical to microwave transceiver
- PCA is a good replacement for the current VLBI phase cal device
- Combination of PCA with Laser Reflector would give a good beacon for combined laser and microwave ranging
- Intersystem (SLR->VLBI) time transfer may be used to detect biases