**83. Short US-Bursts for Direction Sensing** **Draft 1.0**

UFO Doctor, Dec. 11th, 2014

## 1. Introduction

Here we try to transmit an US-Burst of only 2msec duration by an omnidirectional speaker, hoping that the US-burst will be received without "reverberations" and "reflections".

The PLL needs here to lock-in from silence to the US-burst about 1-2msec, afterwards the two PLL provide the recovered Phase-Signals, but unfortunately with the double US-frequency!

This means that the angular direction sensing range depends strongly on the lateral distance of the receiving Mics: With an ear distance of 12.7mm the max angular detection range is +/- 12 Deg only!

## 2. Material and Method

- US-Transmitter Mama, see circuit "V25 40 kHz Transm."
- USP-Phase Discriminator, see circuit "USP24 US-Phase Discrim"
- Omnidirectional Speaker Kobitone driven by a buffer supplied by 16V
- Two Kobitone Mics, lateral distance 12.7mm

## 3. Outdoor Experiments

Conditions:
Street with walls and bushes, cold and windy

Results:
- Maximum Distance for Lock-in Detection: 9m
- Maximum Distance for Direction Detection: 5m
- Reliable angular detection range: about 9 Deg

## 4. Indoor Test Setup

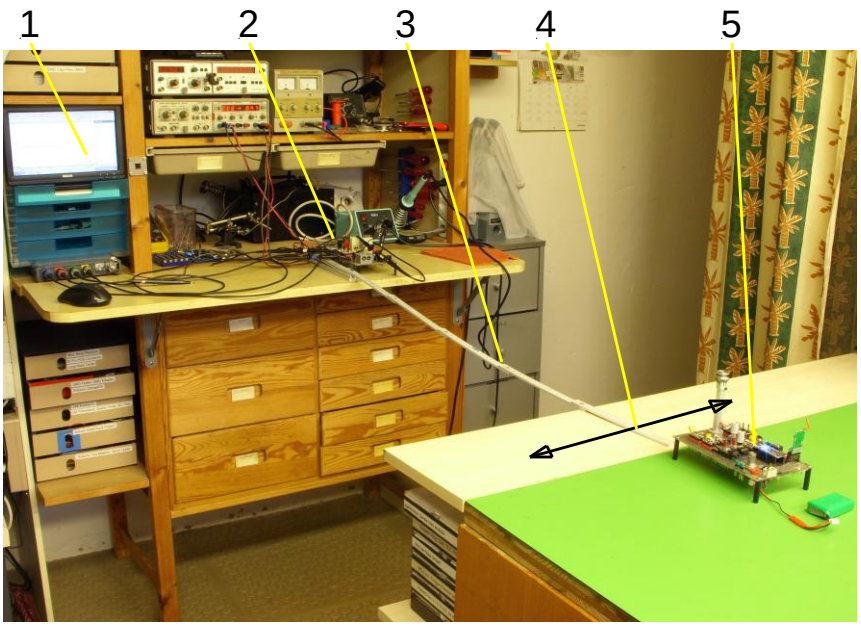



Fig. 4: Test Setup In Laboratory

1: PicoScope
2: US-Transmitter
3: Distance 1m
4: Lateral displacement 0.16m
5: US-Receiver

## 5. Indoor Results

### 5.1. Overview

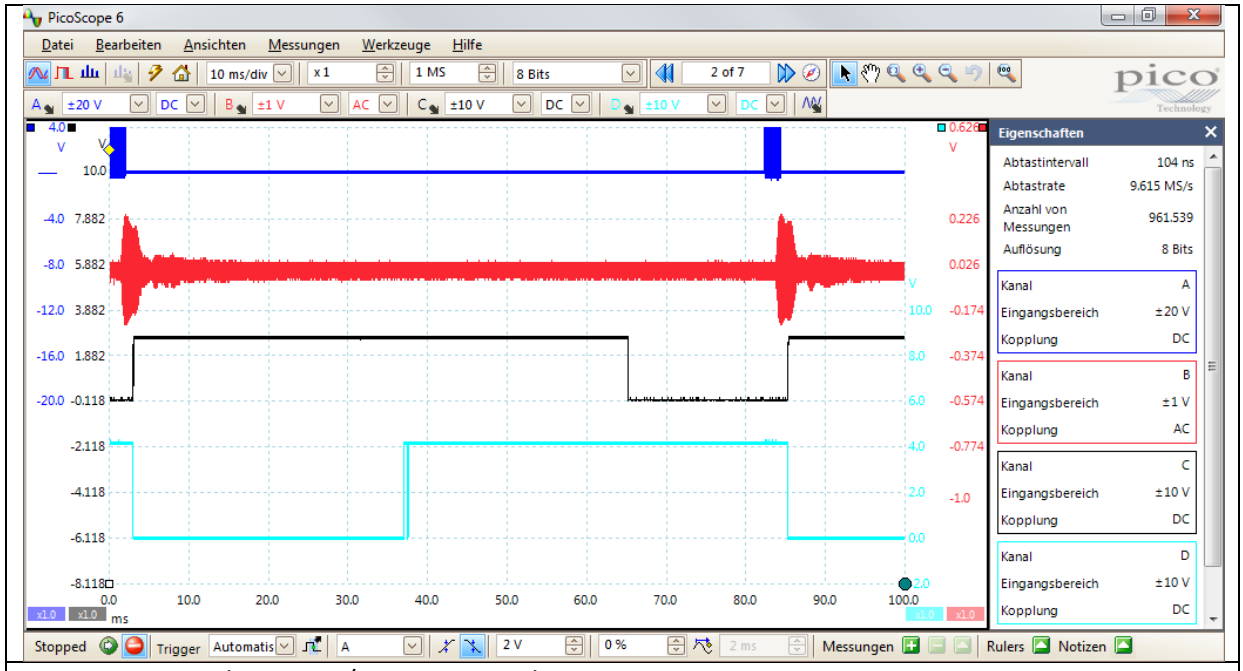



Fig. 5.1: Time Scale 10msec/Div, Distance about 0.5m
Top A: US-Burst Transmitter, Middle B: Received US-Burst, Middle C: Mask multiple sampling for 68msec after Start-Sample by IC 5.1, Below D: LQN-R Lock-In.
NOTE: LQN-R Toggle at about 38msec by “Reverberation”

### 5.2. Details

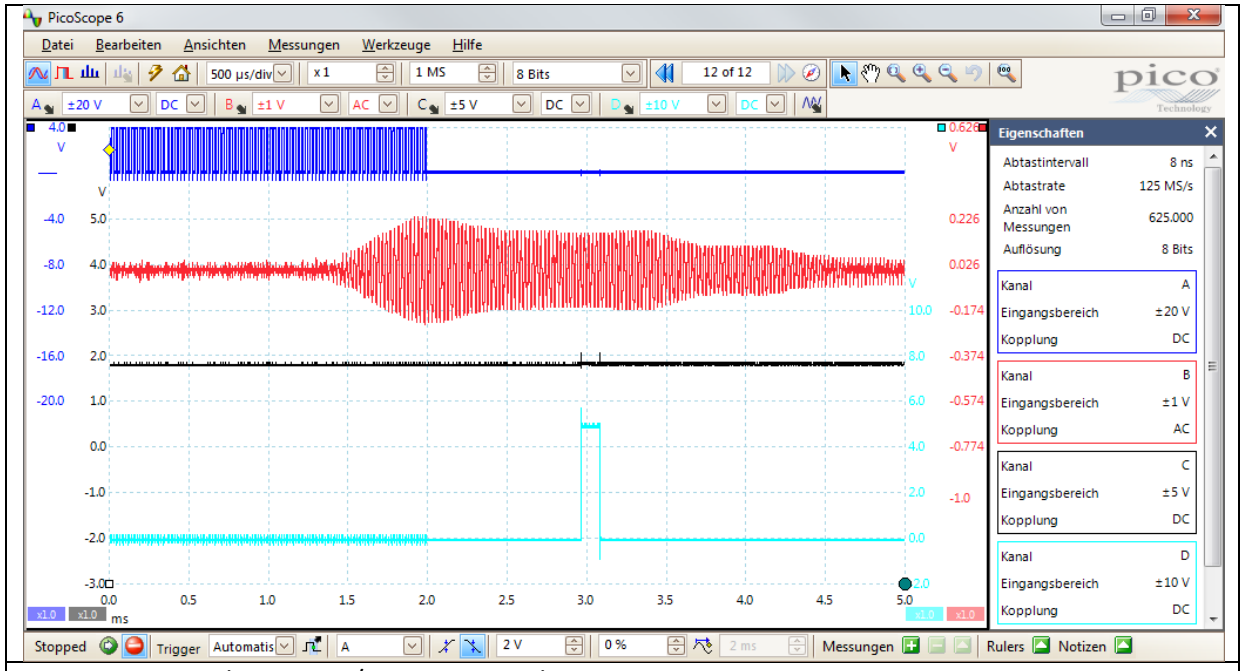



Fig. 5.2: Time Scale 0.5msec/Div, Distance about 0.5m
Top A: US-Burst Transmitter, Middle B: Received US-Burst, Middle C: Sampled Analog Direction Signal Below D: Sample Pulse by IC5,2.
Comment: Minimum Burst Duration 2msec since Lock-in needs about 1.5msec

**6. Direction Sensitivity**

Time Scale 20usec/Div, Ear distance: 12.7mm, US-Frequency 40kHz, US-Wavelength 8.25mm
Transmission Distance 1m, Lateral Displacement 0.16m =Angle +/-9 Degree
Recording triggered by Sample Clock:
Top A: Recovered Phase Signal, 2*fo!; Middle B: Digital Direction Signal
Middle C: Sampled Analog Signal; Below D: Sample-Hold Clock

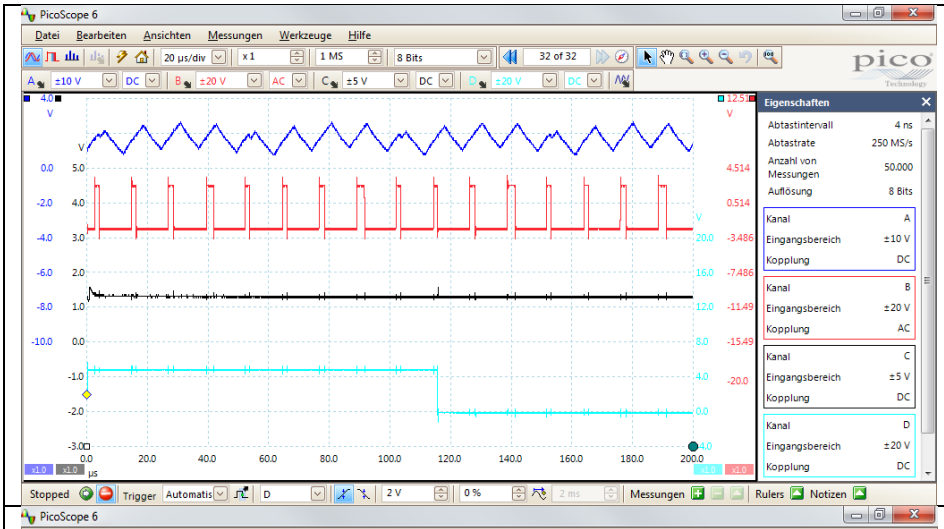



Fig. 6a:Left Receiving Angle -9 Deg

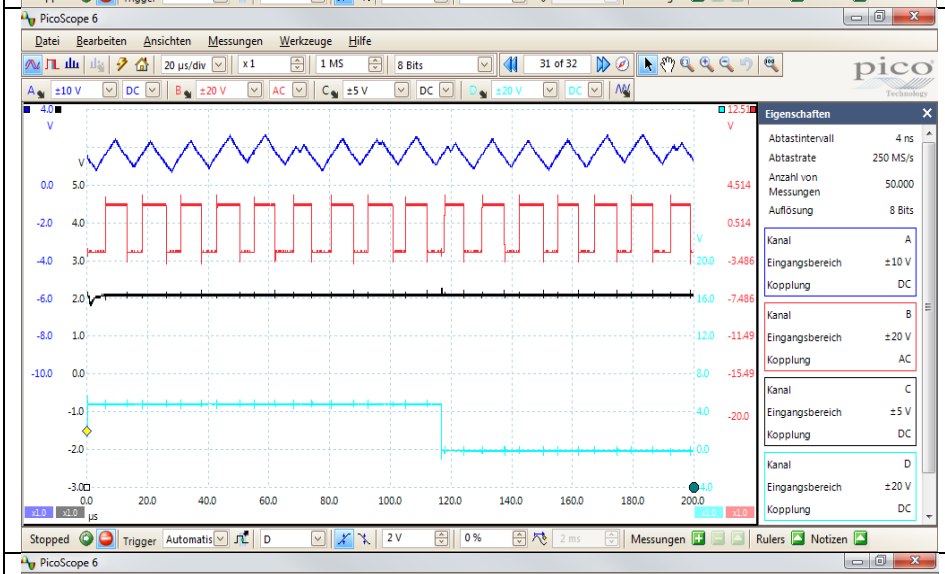



Fig. 6b:Middle Receiving Angle 0 Deg

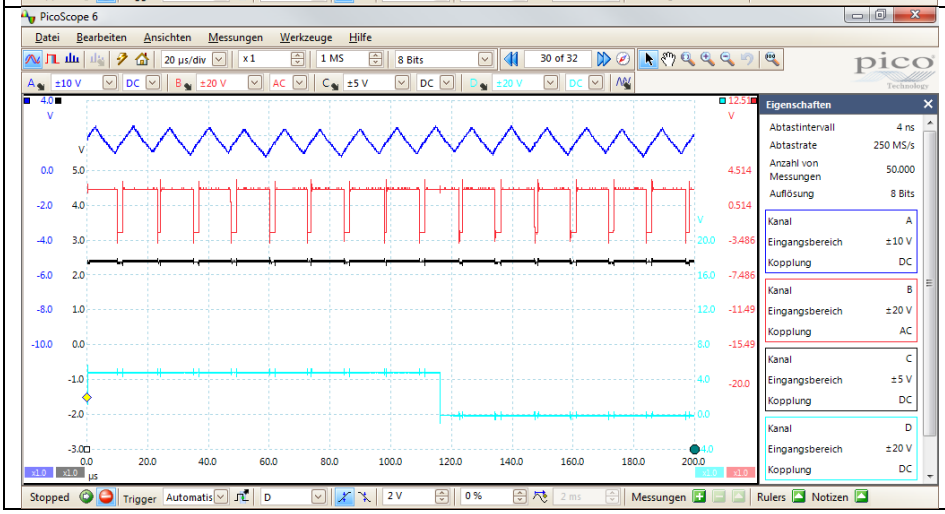
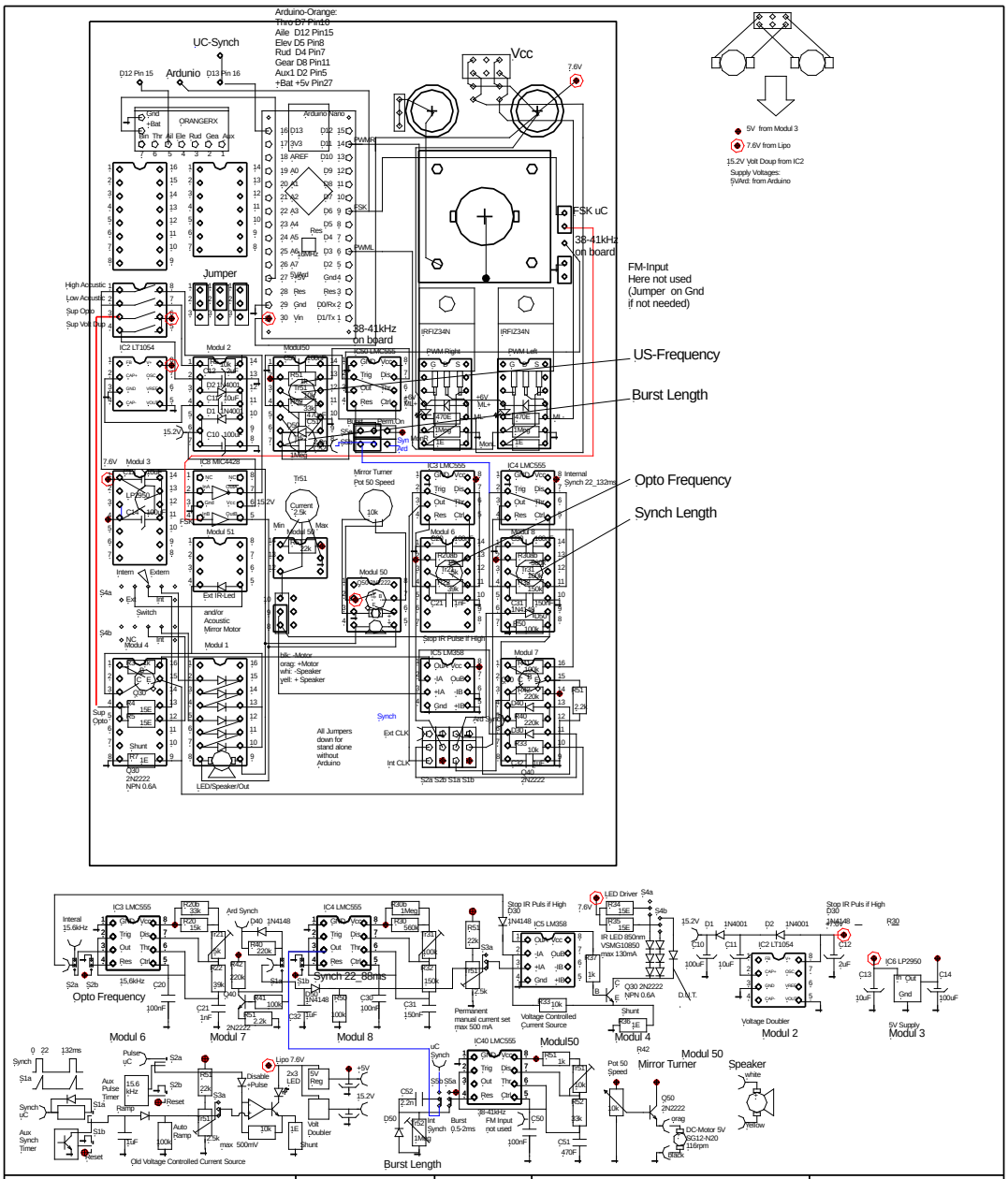



Fig. 6c: Right Receiving Angle +9 Deg

## 7. Circuits

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|---|---|---|---|---|---|---|---|
| (Verwendungsbereich) | | | | (Zul. Abw.) | (Oberfl.) | Maßstab 1:1 | (Gewicht) |
| | | | | | | (Werkstoff, Halbzeug)<br>(Rohteil-Nr)<br>(Modell- oder Gesenk-Nr) | |
| | | | | | Datum | Name | |
| | | | | Bearb. | 12.11.14 | PAN | 40kHz Burst Transm |
| | | | | Gepr. | 00.00.00 | PAN | |
| | | | | Norm | | | |
| | | | | | | V25 | Blatt |
| | | | | | | | Blätter |
| Zust. | Änderung | Datum | Name | Ursprung | | Ersatz für: | Ersatz durch: |

Fig.7.1. US Burst Transmitter

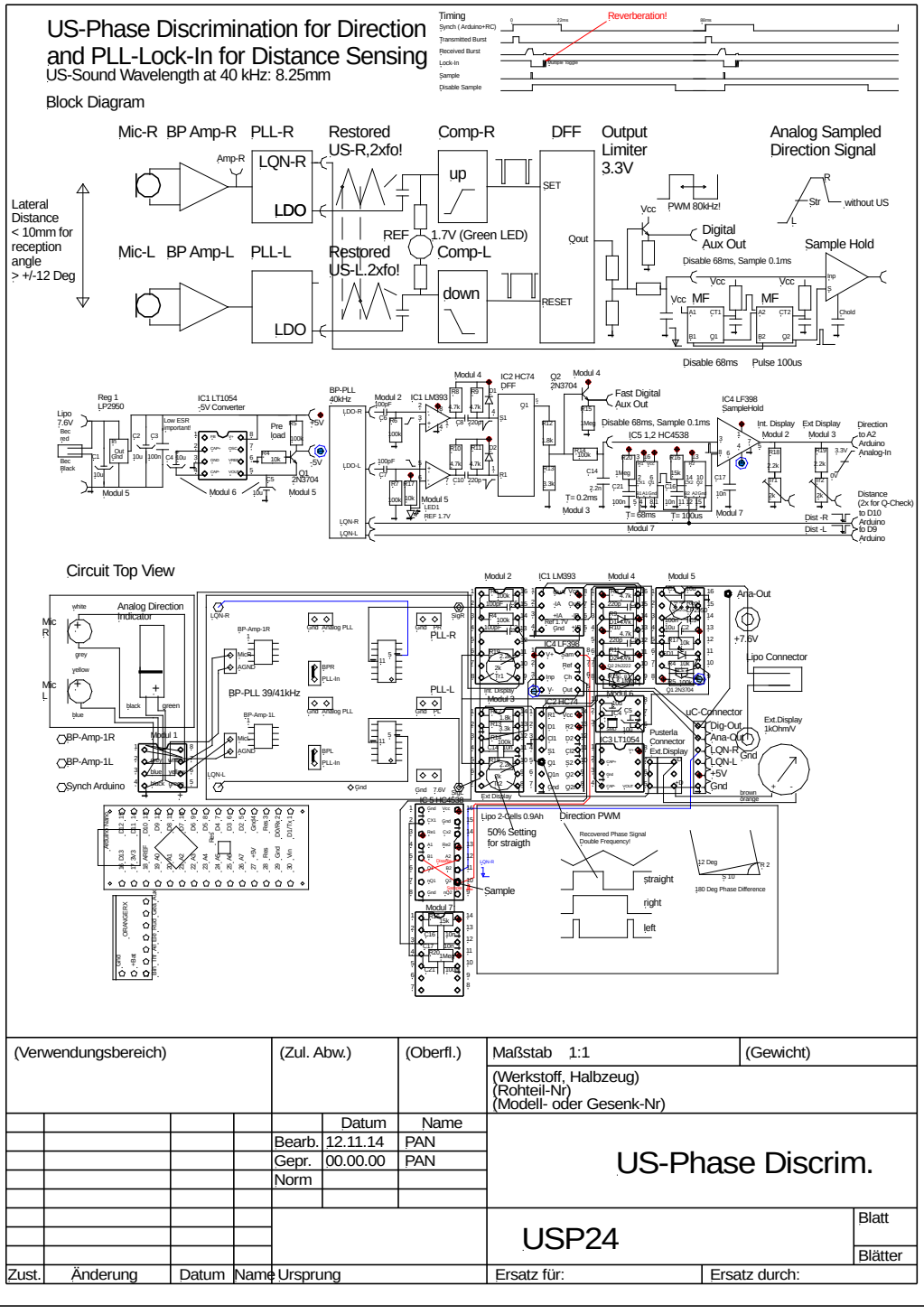


Fig.7.2. US Burst Receiver