

## International Meteor Conference

Bollmannsruh, Germany

3–6 October 2019

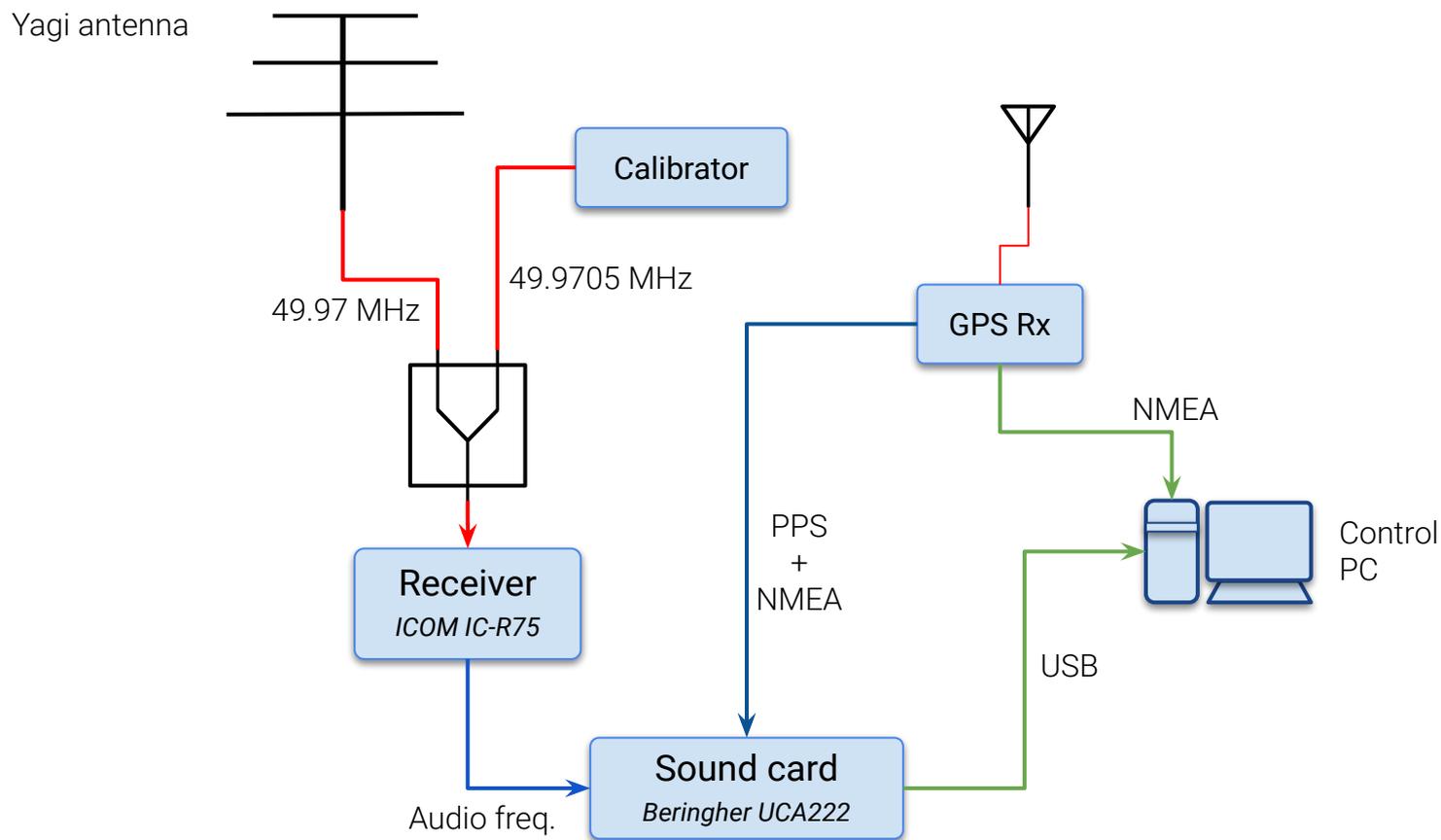


# The BRAMS receiving station V2.0

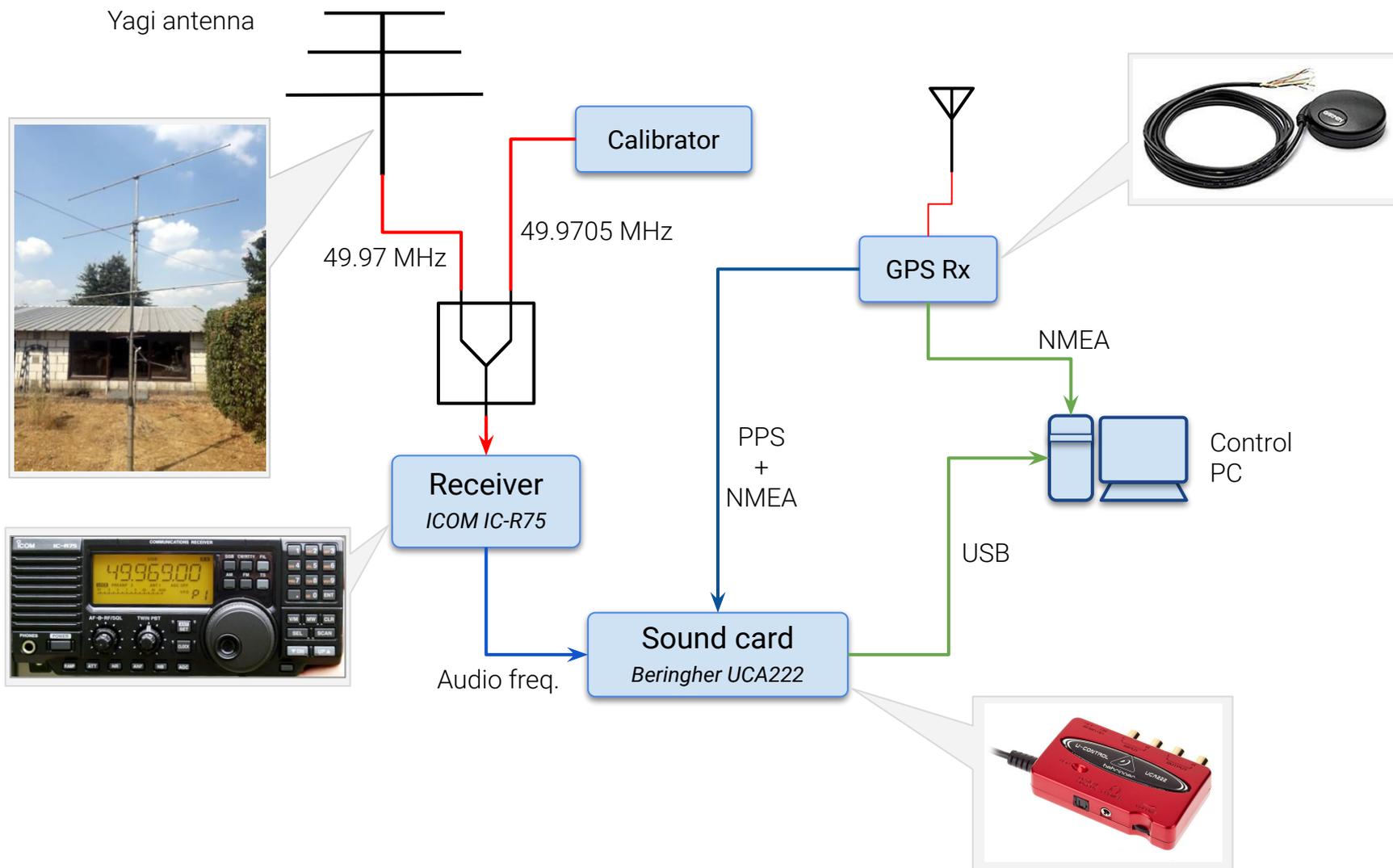
Michel Anciaux, Hervé Lamy, Antonio Martínez Picar,  
Sylvain Ranvier, Stijn Calders, and Cis Verbeeck



# Current BRAMS basic station



# Current BRAMS basic station



# Current BRAMS station – Rx Issues



## Reliability

- Ageing: several years of continuous operation
- Many have already failed!
- New types of degradation already observed
- This can only get worse!

# Current BRAMS station – Rx Issues



## Availability

- No longer produced
- Alternative analogue Rx are more expensive
- Market trend → software defined radio (SDR)

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# Current BRAMS station – Rx Issues



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## Performance Limitations

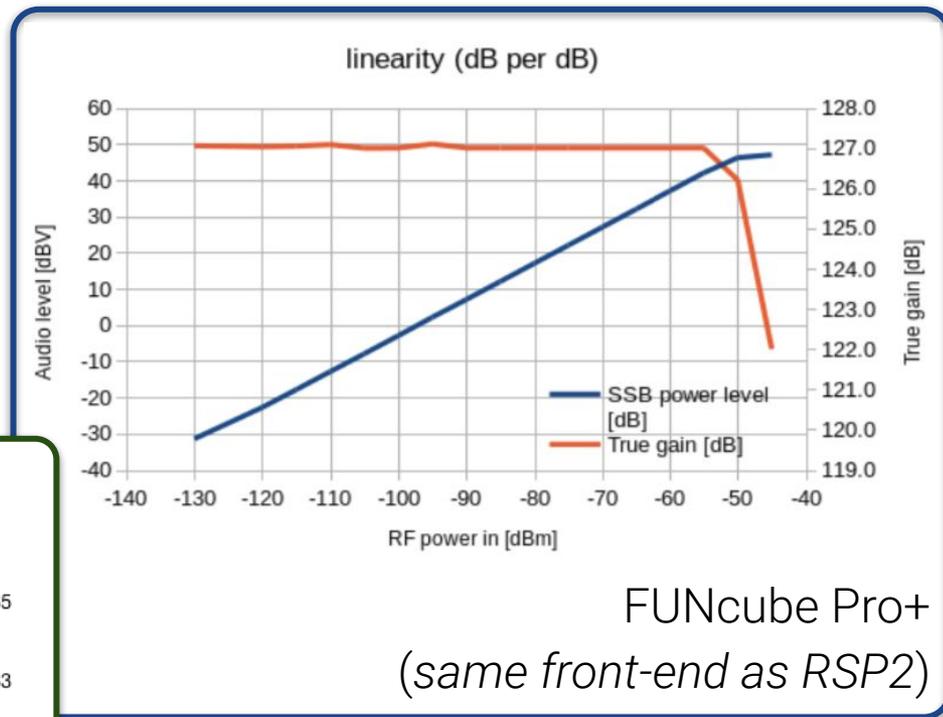
- Limited dynamic range
  - 36 dB • P1dB = -102 dBm • ENOB = 6.0
- Noise temperature  $\approx 1000$  K
- Frequency instability:
  - LO dependent on temperature (10 Hz/°C)
  - LO cannot be locked to a reference

# New Receiver: SDRplay RSP2

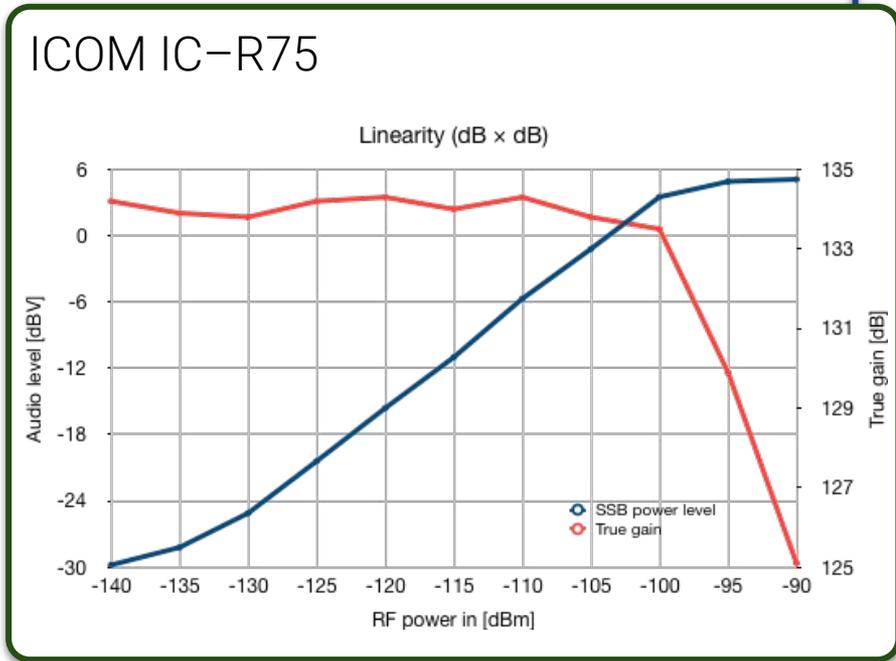
- Range: 1 kHz – 2 GHz
- Bandwidth: 10 MHz
- 3 inputs (2 × 50  $\Omega$  + 1 × High-Z)
- Cost < 200€
- Reference Clock I/O
- Noise temperature 320 K (SSB)
- Same front-end as FUNcube Pro+



# Linearity & Dynamic Range



FUNcube Pro+  
(same front-end as RSP2)



# New Acquisition/Control: Raspberry Pi 3B

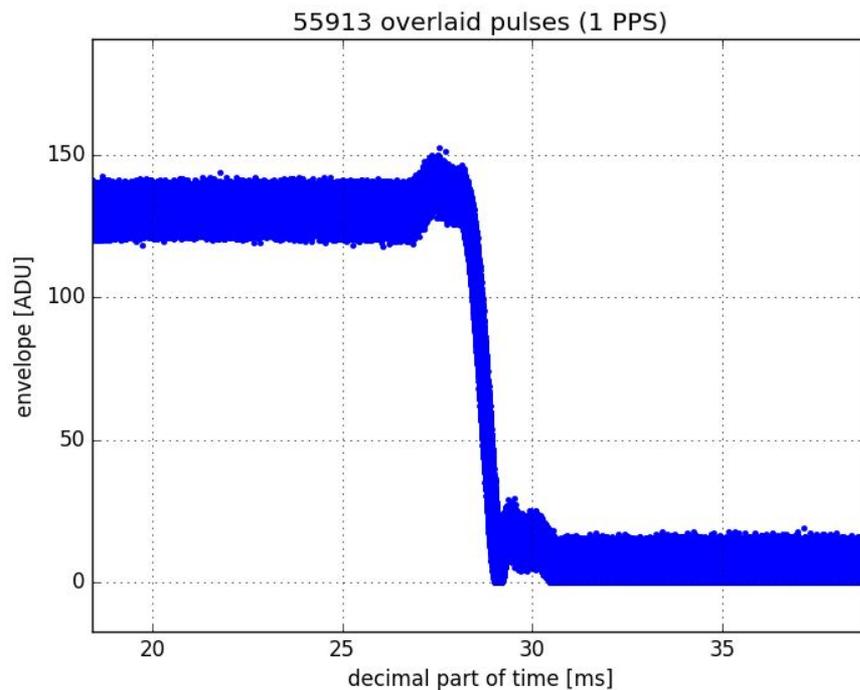
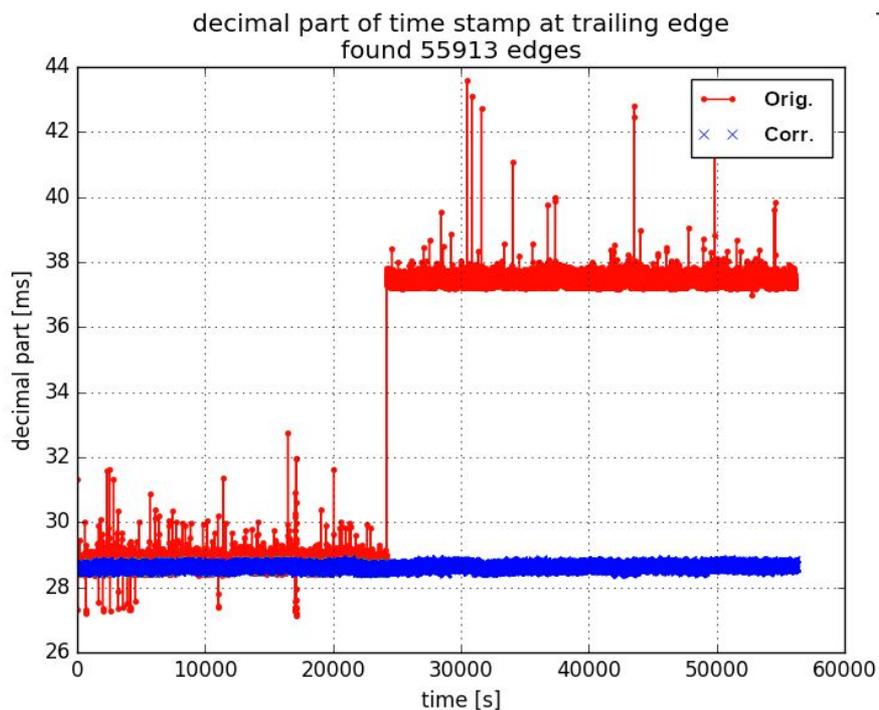
The software has the following characteristics:

- Multithreaded program written in C
- Read I/Q data over USB
- External reference (24 MHz) → No frequency drift
- Decimates the data – resulting sampling rate: 6048 Samples/s
- Detects the upper side band (bandwidth: 2700 Hz)
- WAV files of 300-second + time stamps : current BRAMS format
- NTPD configured to synchronise the system clock to the GPS signal
- Data transfer via *Hamashi VPN*



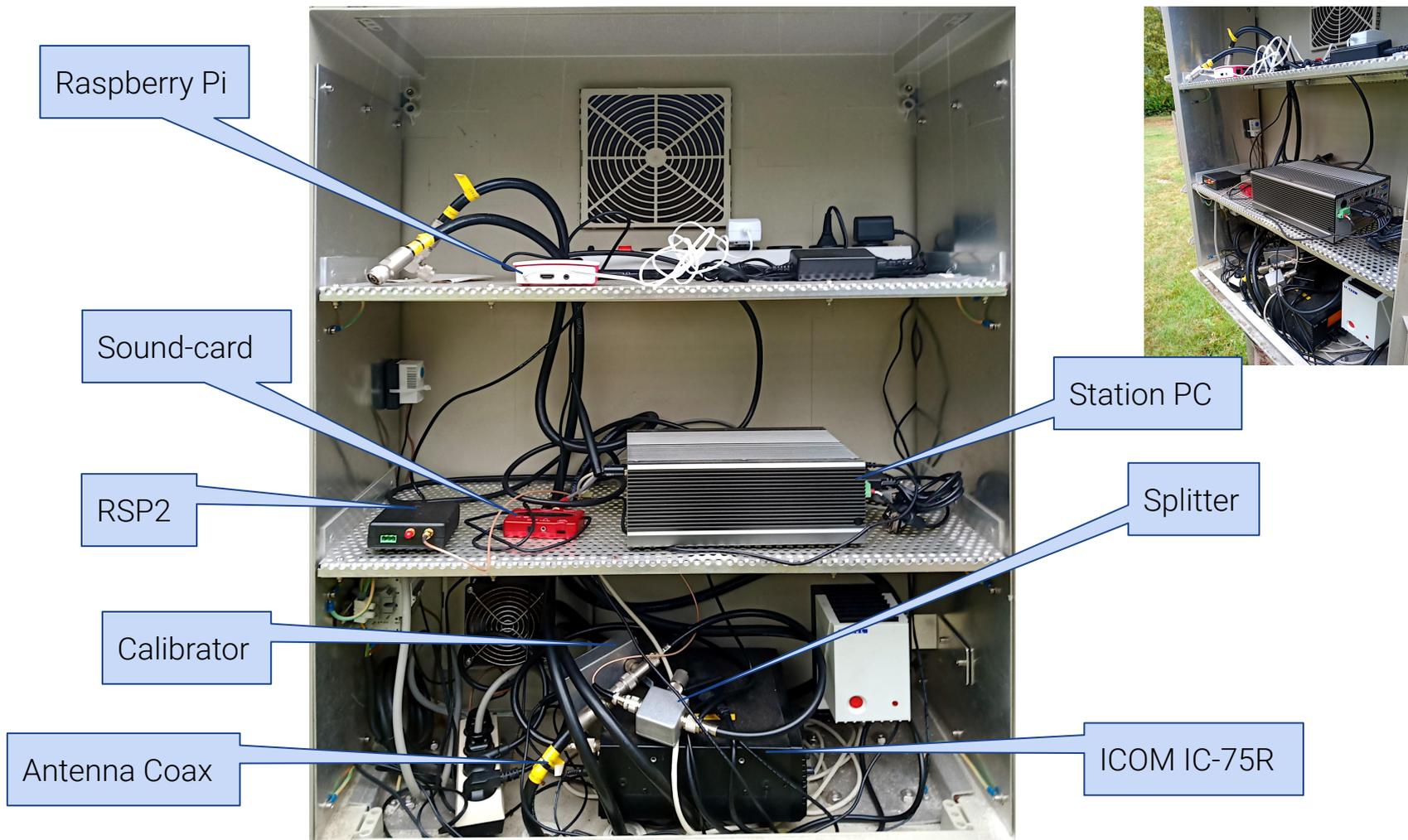
# Time stamp management

- Raspbian is multitask optimized → jitter
- Packets of 1008 samples (I+Q)
- CW modulated by 1 PPS from GPS



- Jitter corrected in post-processing
- Linear fit in BRAMS file

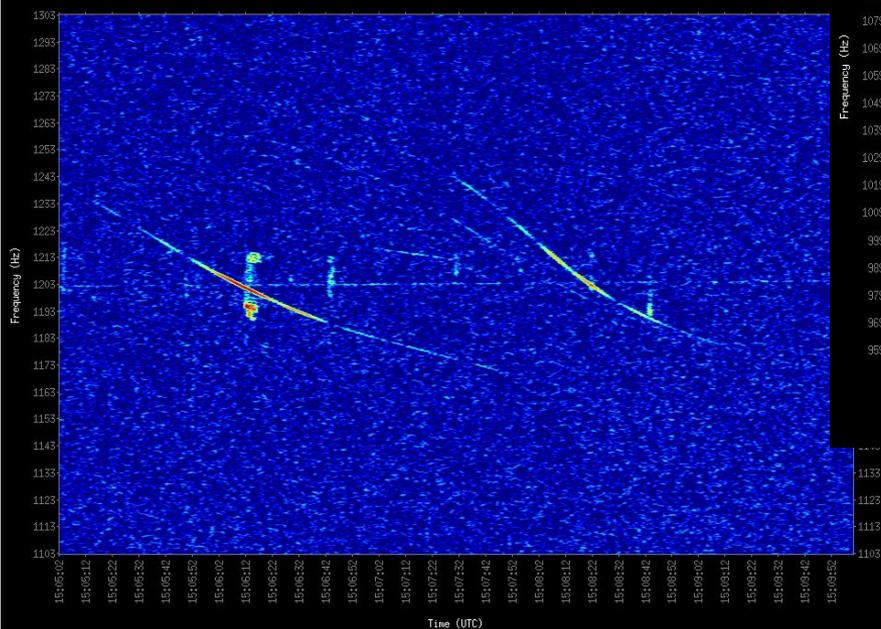
# Testing at Brussels



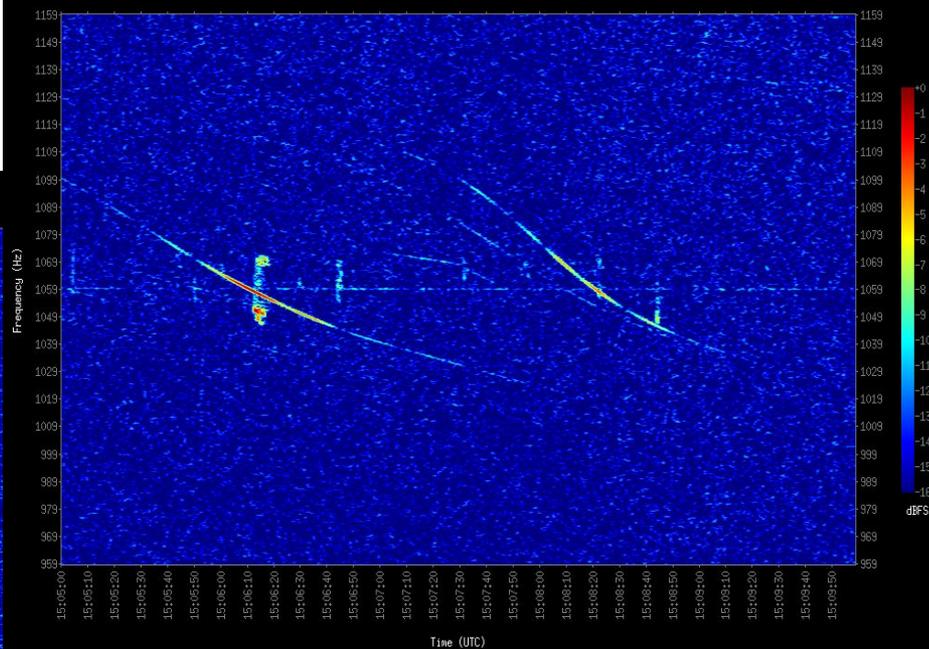
# Preliminary results

Original BRAMS station  
*ICOM IC-R75 + Sound-Card + PC*

Uccle 2019-07-02T15:05 (Res: 0-369Hz 2-972s)



BETEST 2019-07-02T15:05 (Res: 0-369Hz 2-709s)



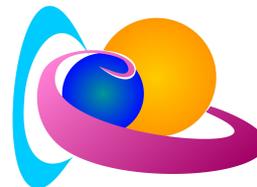
BRAMS station v2.0  
*RSP2 + Raspberry Pi 3+*

Observations made in Brussels (Uccle) on 2019-07-02T15:05

On behalf of **Michel Anciaux** ([michel.anciaux@aeronomy.be](mailto:michel.anciaux@aeronomy.be))

and the rest of the BRAMS team:

Many thanks!



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Centre of Excellence

<http://brams.aeronomy.be/>

