Update on Second-level Cosmic-ray Trigger
LOFAR Status meeting,
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Coincidence trigger

• Single-RCU triggers coming in from FPGAs
• On station’s LCU: combine into coincident pulses
Coincidence trigger

- Find coincidences of single-RCU triggers within specified time window
- Find direction of incoming pulse
- Make decision to dump TBB data
- Make the software run & work in real-time
  - Functioning as part of TBBControl
  - Controllable by MAC/SAS layer
- Status: software runs in manual emulation of MAC/SAS
  - Finds coincidences in real-time and logs them
Coincidence trigger

• Estimate direction from given times of arrival
  – Assume plane wave from \((\theta, \phi)\)
  – Calculate time differences for RCUs: \(c \Delta t_i = \mathbf{s} \cdot \mathbf{r}_i\)
  – Compare with measured arrival times (variance)
  – Find best fit by exhaustive search (\(~10\) ms)

• Tested offline on data from 6 stations:
  – Works on 3 out of 6 stations, for isolated pulses
  – reports ‘bad fit’ when two separate pulses in the same window (happens regularly)
CS021, 32 channels, Nov 30 2009
CS021, 32 channels, Dec 4, 2009
RS208, 48 channels, Nov 30 - Dec 7, 2009
RS106, 48 channels, Nov 30 - Dec 7, 2009
CS021

- Noise level in ADC counts
  - Blue: no filter
  - Red: 88 MHz notch
  - Green: 15 MHz notch
RS503

- Noise level in ADC counts
  - **Blue**: no filter
  - **Red**: 88 MHz notch
  - **Green**: 15 MHz notch
Next step

• Make 2nd level trigger work and dump data in real-time!

• Work in progress…