

# ***Performance Results of the LOFAR BG/P Correlator***

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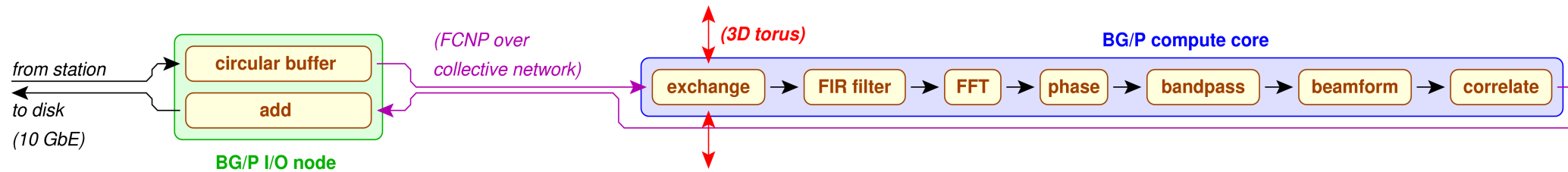
Netherlands Organisation for Scientific Research



***Correlator Performance***

***April's Fool Day, 2009***

# The Correlator



- ❑ 1 station per I/O node
  - ❑ split HBA field counts twice
  - ❑ 1 BG/P rack: 64 I/O nodes

# Test Setup

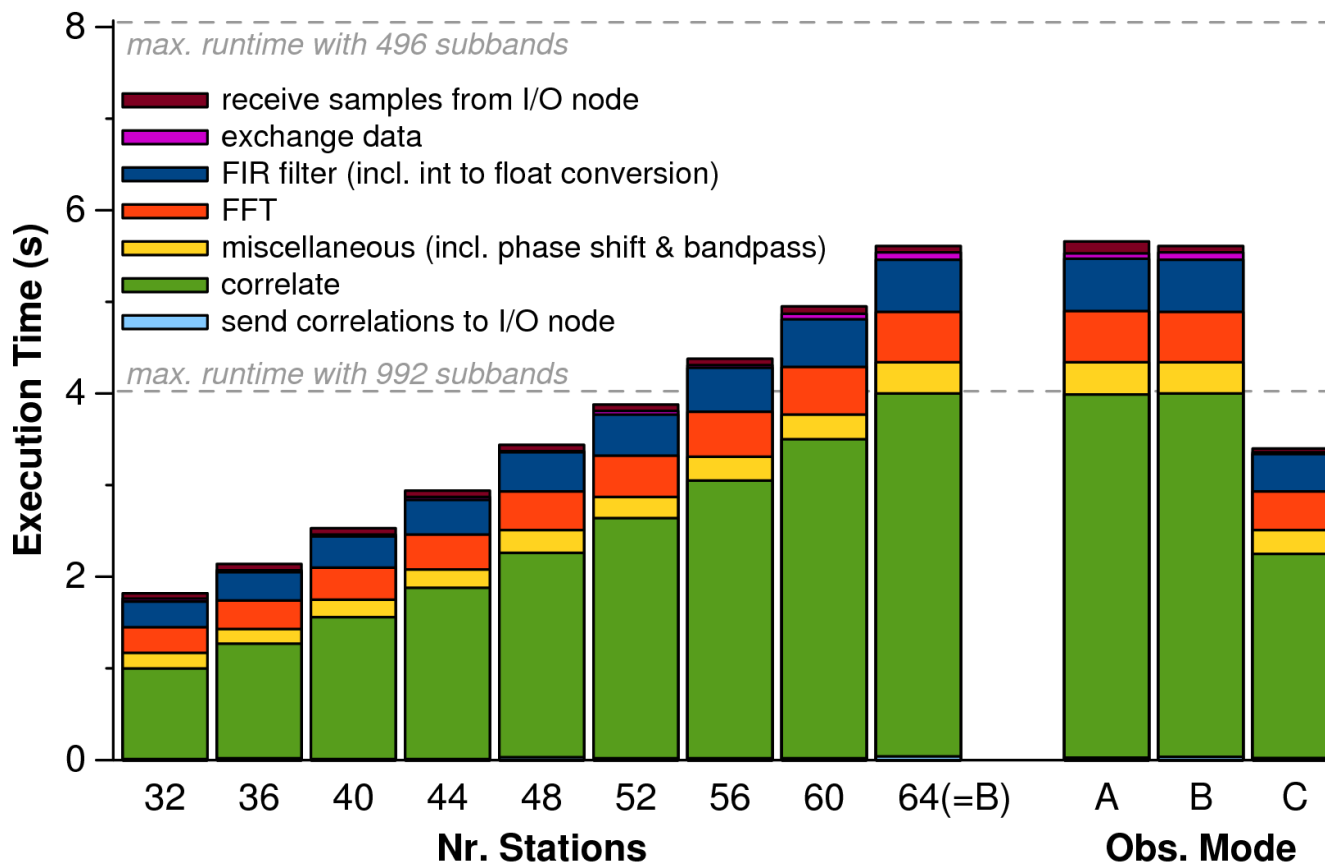
- ❑ BG/P fully connected
  - ❑ 160 x 10 GbE
- ❑ 2.5 rack BG/P
  - ❑ 1 rack generates data
  - ❑ 1 rack correlates
  - ❑ ½ rack dumps data
- ❑ realistic simulation
- ❑ up to 64 stations

# Performance Tests

| obs. mode                     | A         | B        | C        |
|-------------------------------|-----------|----------|----------|
| #stations                     | 64        | 64       | 48       |
| #subbands                     | 248       | 496      | 992      |
| #bits/sample                  | 16        | 8        | 4        |
| obs. bandwidth (MHz * #beams) | 48.4      | 96.9     | 194      |
| input bandwidth (Gb/s)        | 64 * 3.1  | 64 * 3.1 | 48 * 3.1 |
| output bandwidth (Gb/s)       | 62 * 0.58 | 62 * 1.2 | 62 * 1.3 |
| CPU load compute nodes        |           |          |          |
| CPU load I/O nodes            |           |          |          |
| data loss                     |           |          |          |

- bandwidth far beyond specs

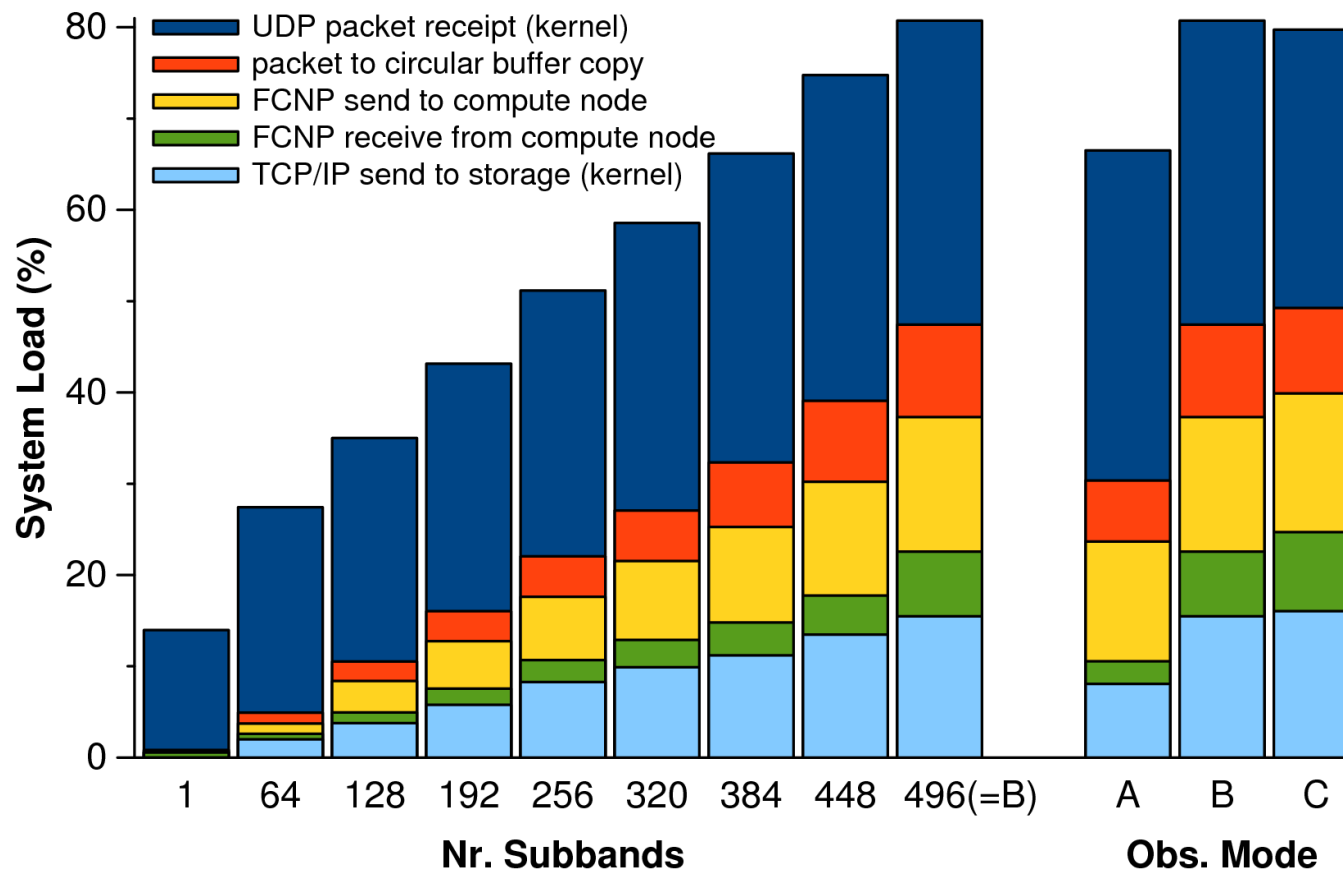
# Compute Node Performance



- A = 64 stations / 16 bit / 248 subbands
- B = 64 stations / 8 bit / 496 subbands
- C = 48 stations / 4 bit / 992 subbands

- FIR: 86% of peak FPU
- FFT: 44%
- Correlator: 96%

# I/O-Node Performance



- ❑ A = 64 stations / 16 bit / 248 subbands
- ❑ B = 64 stations / 8 bit / 496 subbands
- ❑ C = 48 stations / 4 bit / 992 subbands

# Performance Tests

| obs. mode                     | A         | B        | C        |
|-------------------------------|-----------|----------|----------|
| #stations                     | 64        | 64       | 48       |
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| #bits/sample                  | 16        | 8        | 4        |
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| input bandwidth (Gb/s)        | 64 * 3.1  | 64 * 3.1 | 48 * 3.1 |
| output bandwidth (Gb/s)       | 62 * 0.58 | 62 * 1.2 | 62 * 1.3 |
| CPU load compute nodes        | 35%       | 70%      | 85%      |
| CPU load I/O nodes            | 66%       | 81%      | 80%      |
| data loss                     | ~ 0.0001% | ~ 0.01%  | ~ 0.01%  |

- ❑ can correlate 50% more BW ...
- ❑ ... using one rack only!