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Synchronisation – Today's Systems

- Synchronisation from H-Maser + local OCXO.
  - 1ps r.m.s. stability in 1 sec coherence time
    - 1% max coherence loss during a correlator integration period or a coherent addition @ 22 GHz max frequency.
  - 2 ps r.m.s. stability in 100 sec
    - 2% max coherence loss when integrating on a calibration source.
  - 10 ps r.m.s. stability in 10 minutes
    - to maintain linear phase variation in switched phase reference observations.

- Maintained using round trip phase correction.
- Not absolute time, but relative to the observatory frequency reference.
Timing – Todays Systems

• 10 ns accuracy using GPS governed H-maser clocks
  – Tied to UTC framework (based on TAI)
  – Long term stability and referenced system

• Offset tracking (and archive) of time stamp from observatory frequency reference ticks.

• PTP IEE1588v2 sub µs accuracy

• White Rabbit sub ns accuracy

• Common view GPS ns accuracy
# SKA1 Derived Requirements

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<th>LO Stability</th>
<th>@ 10 GHz max frequency</th>
<th>Notes</th>
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<tr>
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<td>3 ps</td>
<td>Max 2% coherence loss in an integration or addition</td>
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<tr>
<td>r.m.s in 100 sec</td>
<td>3 ps</td>
<td>Max 2% coherence loss in calibration</td>
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<td>r.m.s drift in 10 minutes</td>
<td>16 ps</td>
<td>Track linear phase between calibration periods</td>
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<td>Pulsar Time accuracy (now)</td>
<td>~10 ns</td>
<td>GPS Tied to TAI framework</td>
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<tr>
<td>Pulsar Time accuracy (possible)</td>
<td>~1 ns</td>
<td>GPS Common View or White Rabbit</td>
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</table>
• Requirements not identified?
• Data Exchange Descriptions
  – SaDT: DDBH & SaT
  – MGR
• Cadence of Update of timing information
• Interrupts required (precision)
• Maximum Latency requirements
• Upgradeability?
Comments and Questions

Exploring the Universe with the world’s largest radio telescope