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Phase noise analysis for 1.7-14.5 GHz clock signal transmission over 12km telescope network optical fibre

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Abstract content
   (Max 300 words)
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Distribution of highly stable clock tones over optical fibre from the central station to each antenna is of extreme importance to MeerKat and the overall SKA Square Kilometer Array) project. This ensures that the timing signal correctly drives the digitizer and time stamping for data identification. Short-term stability of the clock distribution can be specified in the frequency domain as phase noise and as jitter in the time domain. The phase of a signal can have random and/or deterministic parts of phase noise. Component noise is introduced by devices such as laser transmitters, amplifiers, and receivers, while thermal effects in the fibre can cause phase instability. A detailed phase noise analysis is performed at different points in the optical fibre clock distribution link. RF signals from 1.7 to 14.5GHz are transmitted over 12km of fibre. The contribution of phase noise is simulated and analyzed for different components towards achieving phase noise of -130dBc/Hz at an offset frequency of 100Hz. This corresponds to clock signal stability of a few femtoseconds RMS jitter.

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Main supervisor (name and email)
and his / her institution

Prof. Tim Gibbon
Tim.Gibbon@nmmu.ac.za
Nelson Mandela Metropolitan University

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Primary author: Ms DLAMINI, Phumla (optical fibre research unit (nelson mandela metropolitan university))

Co-authors: Prof. LEITCH, Andrew (NMMU); Mr GAMATHAM, Romeo (Nelson Mandela Metropolitan University); Dr GIBBON, Timothy (NMMU Physics Department)

Presenter: Ms DLAMINI, Phumla (optical fibre research unit (nelson mandela metropolitan university))

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