

NEWSLETTER - NOVEMBER 2010

Last year we had the Minister of Science and Technology visit but this year we topped even that with a visit by the President of the International Astronomical Union. Dr Robert Williams was accompanied by five times shuttle astronaut Dr Jeffery Hoffman as well as renowned astronomer Prof Charles McGruder. Pictured in **Figure 1** at DUT are (from left to right) Dr Gordon MacLeod (Director of Astronomy Frontiers, DST), Stuart MacPherson (Head of the Indlebe team), Dr Jeffrey Hoffman, Dr Robert Williams, Prof Mark Walker (deputy Dean of the Faculty of Engineering and the Built Environment) and Prof Charles McGruder.



Figure 1

Later this month we are expecting another visitor when Prof Girish Beeharry from the University of Mauritius arrives. We will be having discussions about a new low frequency radio telescope project in collaboration with the University of Mauritius. More of that in the next newsletter though.

The Sun is finally back in our viewing window so we are taking daily measurements of this source. The other smaller sources that are detectable by Indlebe pass by during the day at this time of year and interference levels prevent us from taking

meaningful measurements of them. **Figure 2** shows a drift scan of the sun taken on 2 November 2010 with the noise calibration pulse clearly visible at 08:17:05. This allows us to calculate the equivalent brightness temperature of the sun at a wavelength of 21 cm. This calculation is shown in the simple spreadsheet (**Figure 3**) which is now available on the website for download.

The first set of four students has finished their work integrated learning (WIL) with the South African SKA Project Office (SASPO) and will receive their National Diploma's at the next graduation. They spent time at both the Hartebeesthoek Radio Astronomy Observatory (HartRAO) and the SKA site outside Carnarvon in the Northern Cape Province. One of the four has chosen to take up employment in the commercial sector while the other three have chosen to continue their studies towards the BTech degree.

If you have any comments or questions please feel free to contact me by return email. Should you wish to be removed from the mailing list, please send me an email with the words 'remove me'. Please feel free to pass this newsletter on to any colleagues not receiving it.

Gary J van Vuuren

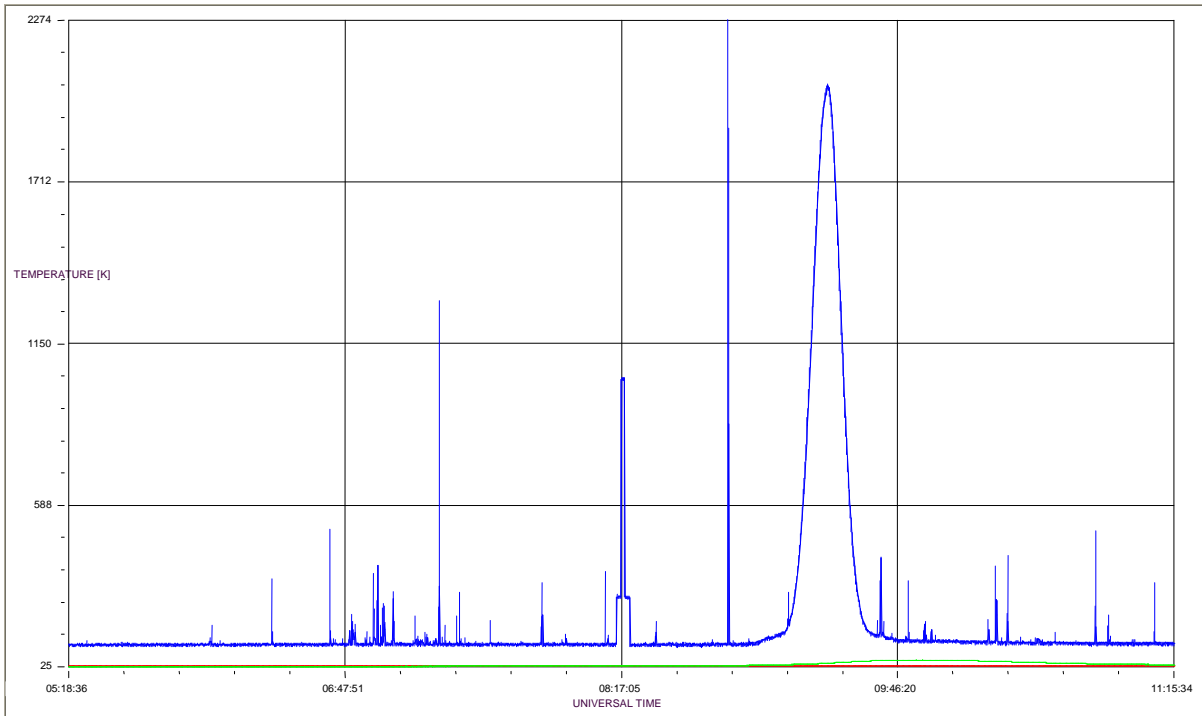


Figure 2

INDLEBE RADIO TELESCOPE CALIBRATION

Date: 2010/02/11

Weather: CLEAR SKY

NOISE SOURCE CALIBRATION

Input ENR of Noise Source in dB (5.533 dB)
 Input noise ON level
 Input noise OFF level

5.533 dB
 1027.53 units
 270.28 units

$T_{hot} = (ENR_factor + 1) * 290 =$
 Receiver NF = $ENR_dB - 10 \log((ON/OFF) - 1) =$
 $T_{rec} = (F - 1) * 290 =$
 $T_{rec} + T_{hot} = k * ON$
 $T_{rec} + T_{cold} = k * OFF$
 constant $k = (T_{rec} + T_{hot}) / 2 =$

1326.81 K
 1.06 dB
 80.17 K
 1.37 K/unit

INITIAL BRIGHTNESS TEMPERATURE OF THE SUN

Input Sun level
 Input sky noise level
 $T_{rec} + T_{sky} + T_{sun}' = k * B16 =$
 $T_{rec} + T_{sky} = k * B17 =$
 $T_{sky} = B19 - B10 =$
 $T_{sun}' = (B18 - B19) =$

2045.74 units
 95.53 units
 2802.66 K
 130.88 K
 50.71 K
 2671.78 K

Input diameter of reflector (5 m)
 Input aperture efficiency (0.55)
 Input antenna beamwidth (2.9 deg)
 Input angular diameter of Sun (0.6 deg)

5 m
 0.55
 2.9 deg
 0.6 deg

FINAL BRIGHTNESS TEMPERATURE OF THE SUN

$T_{sun} = (B25/B26)^2 * B21/B24$

113483 K

Figure 3