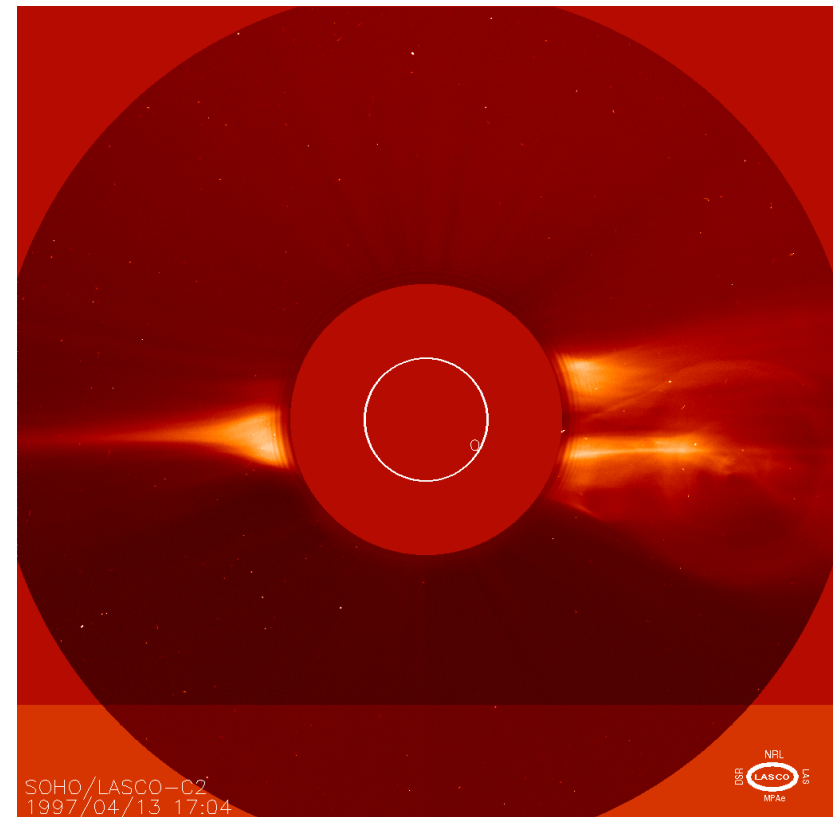


# A decade of low frequency (30-120) solar radio observations with the Gauribidanur radioheliograph (GRH)

GRH (75 MHz) and YOHKOH image (13 April 1997)



SOHO-LASCO C2 image



**The radio astronomy observing facilities of our institute are housed mainly at the Gauribidanur radio observatory of the Raman Research Institute. The radio astronomy group,**

- K. R. Subramanian**
- M. S. SundaraRajan**
- E. Ebenezer**
- C. Kathiravan**
- S. Faseehana**
- myself and the supporting staff at Gauribidanur**

**of our institute maintains different low frequency radio telescopes from there.**

**The flag ship amongst them is the Gauribidanur radioheliograph or GRH as it is often referred to, commissioned about a decade ago.**



**T-shaped interferometer array**

**Frequency range : 30 – 150 MHz**

**Observing time : ~ 4 – 9 UT**

**Angular resolution : 3' x 7'**

**Temporal resolution : 4 images/sec**

**East – West arm**

**GAURIBIDANUR RADIOHELIOGRAPH**

**South arm**

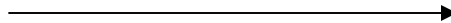


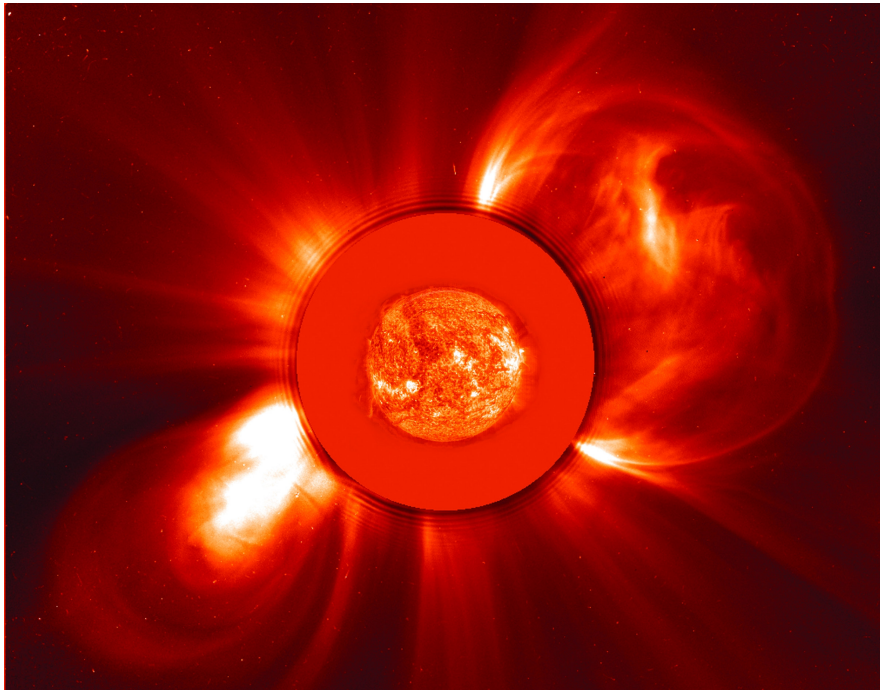
**An introspection (?).**

**Why the Gauribidanur radioheliograph was set-up?**

**What are the scientific goals that were set?**

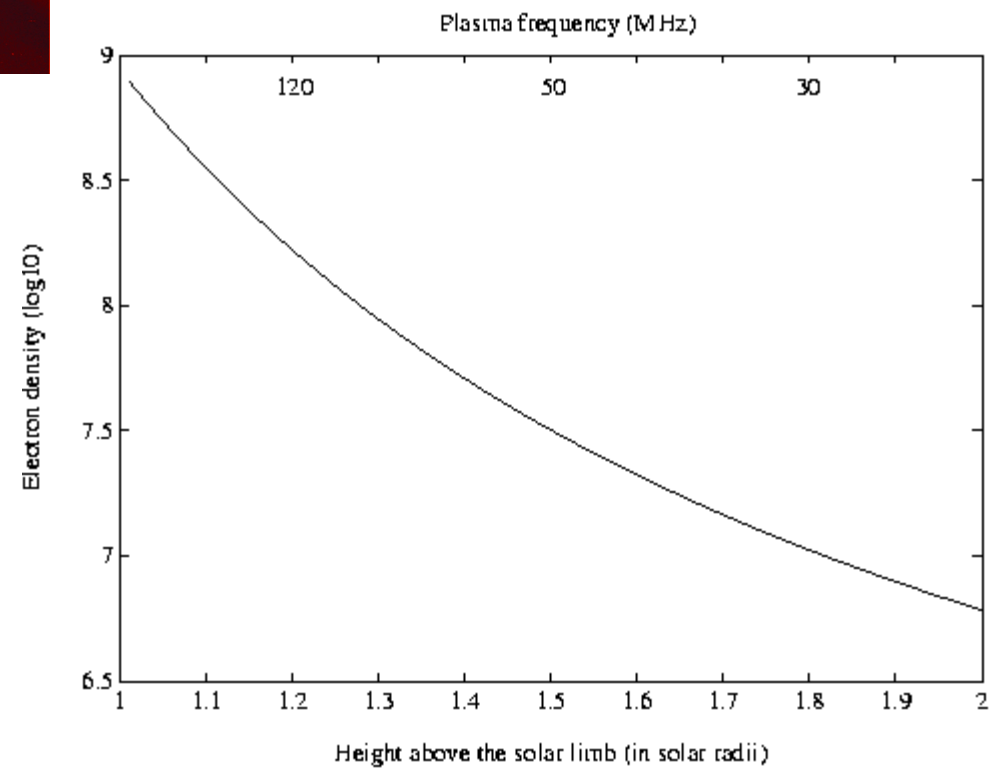
**What have been achieved till date?**





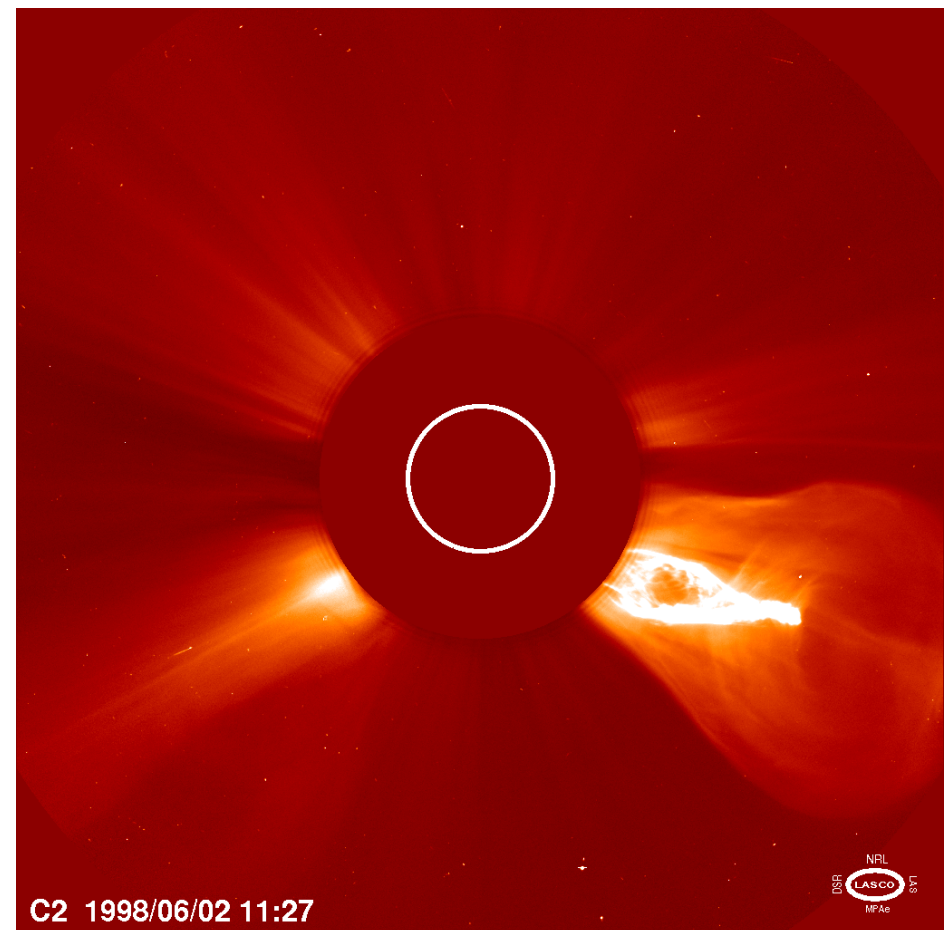
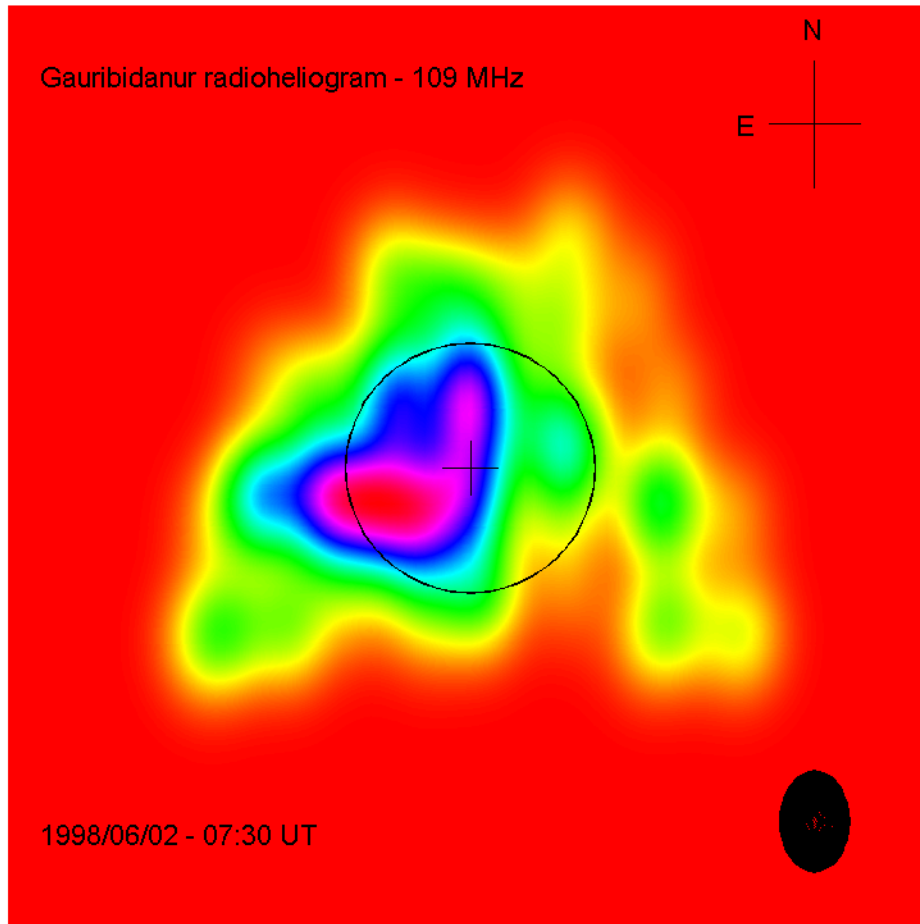
**Composite of SOHO-LASCO C2 and  
SOHO-EIT image of a CME**

**Electron density / plasma frequency variation  
in the solar corona with radial distance**



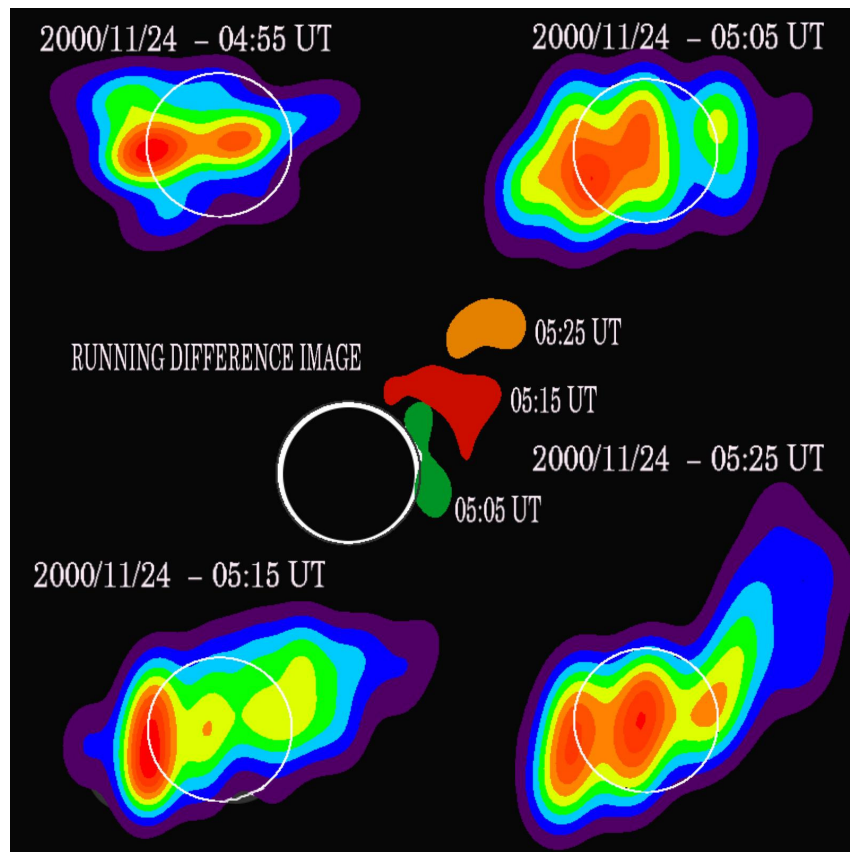


## Pre-event signatures and characteristics of CMEs in the low corona

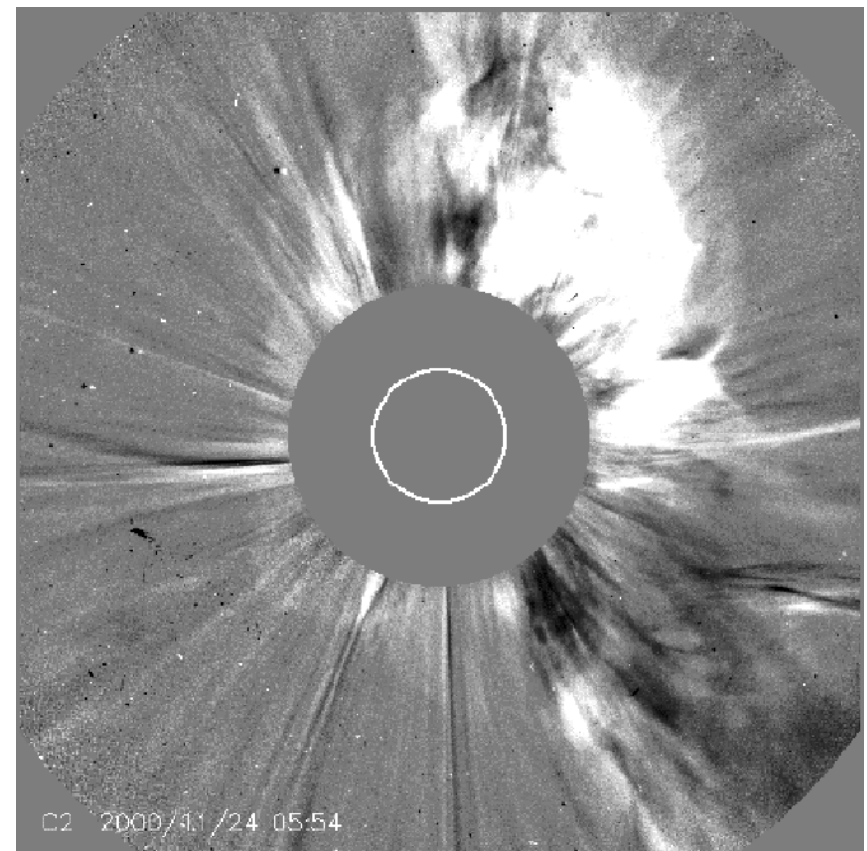


## Kinematics of CMEs in the low corona

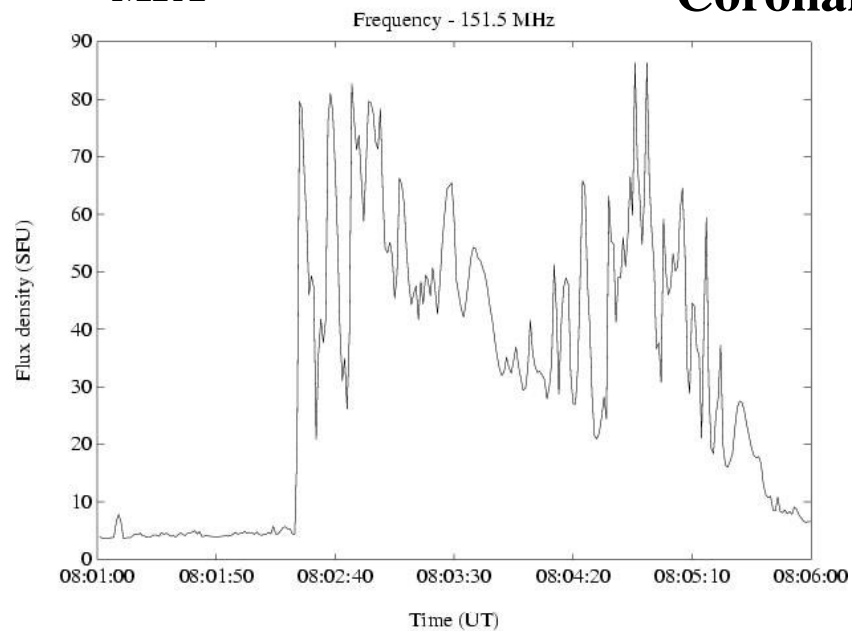
GRH images (109 MHz) at different epochs



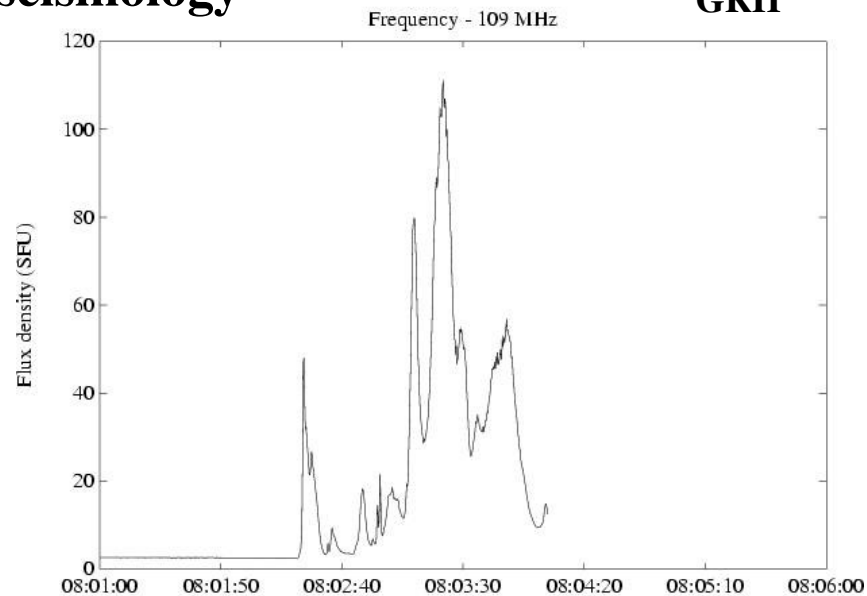
SOHO-LASCO C2 image (05:54 UT)



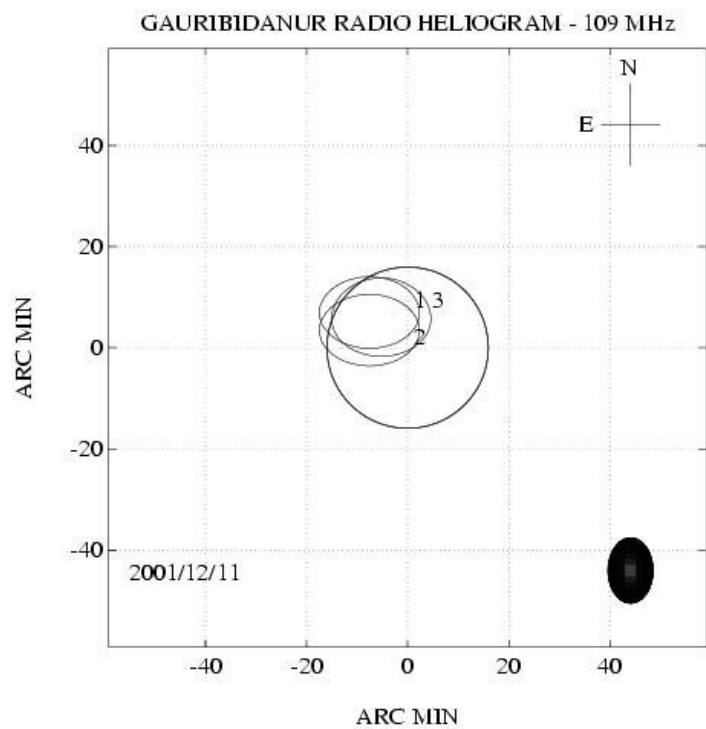
**MRT**



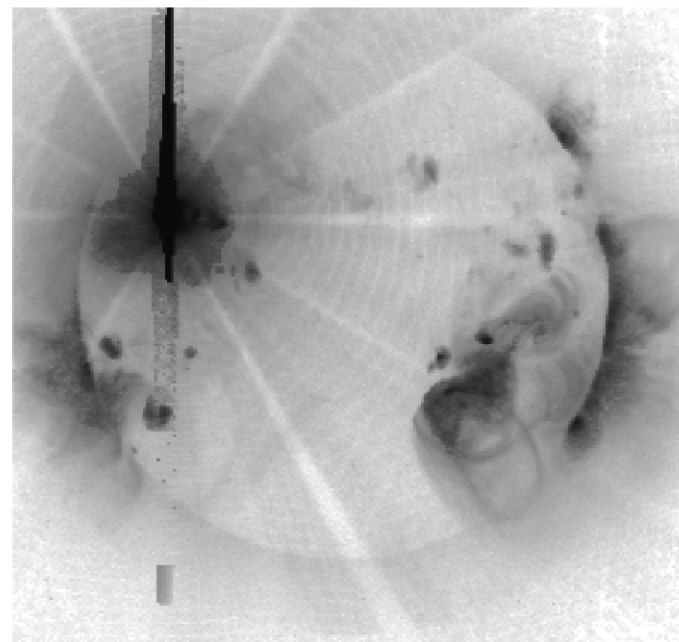
**Coronal seismology**



**GRH**

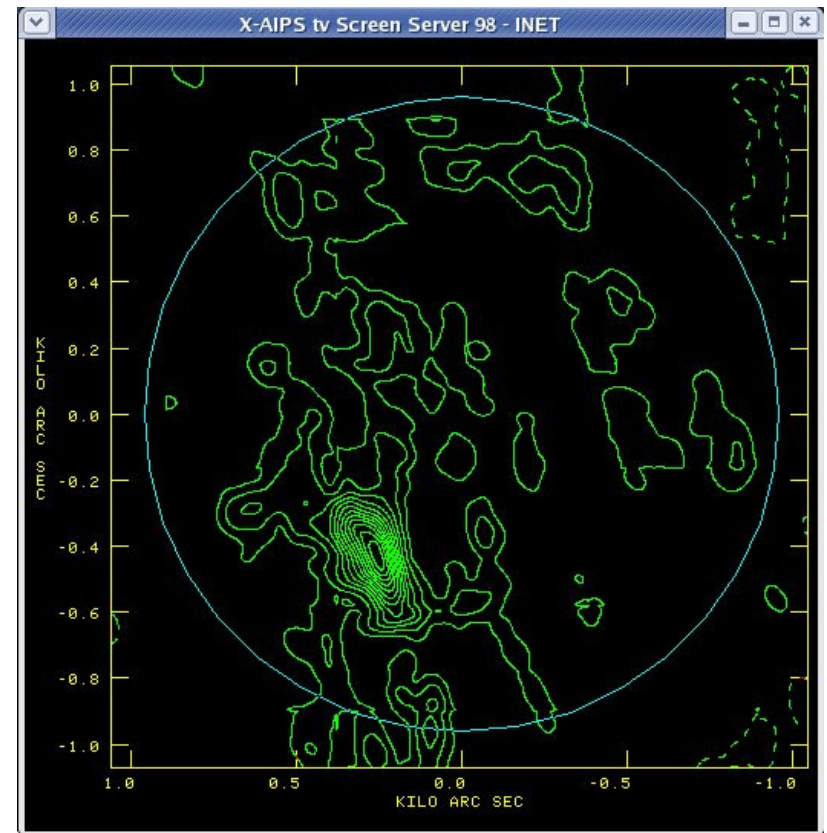
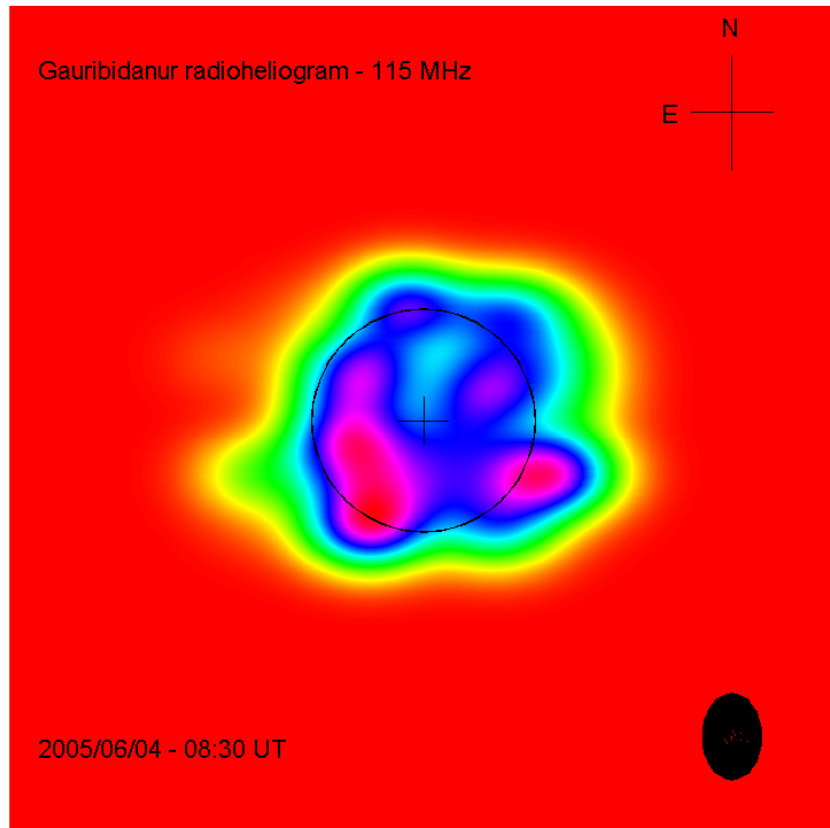


**YOHKOH**



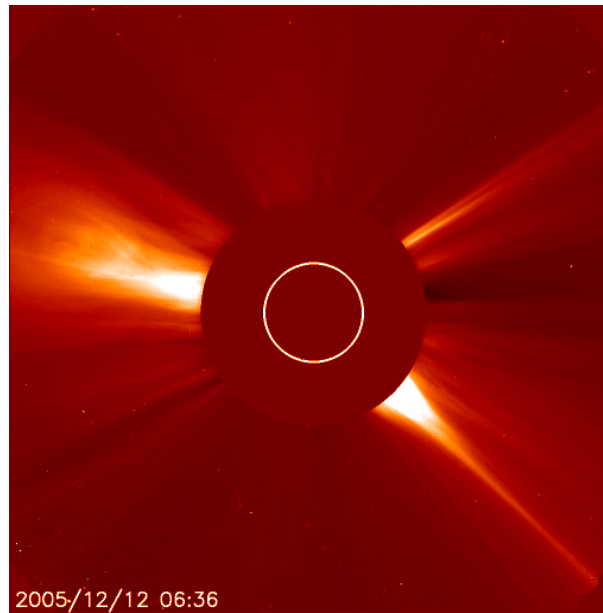
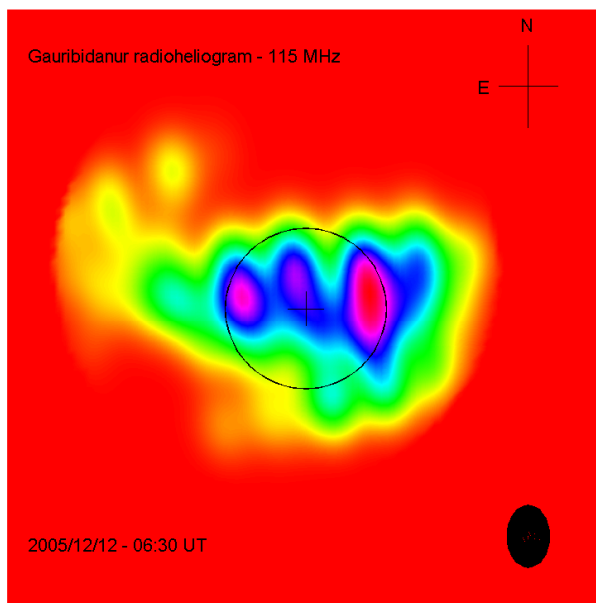


## Gauribidanur and GMRT observations – I (4 June 2005)

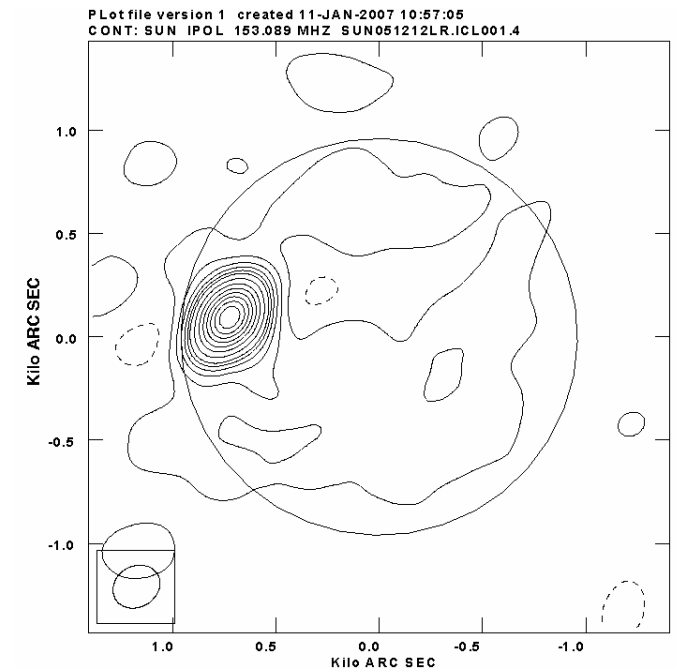


GMRT observations at 151 MHz

## Gauribidanur and GMRT observations – II (12 December 2005)



SOHO-LASCO C2 image



GMRT observations at 151 MHz

**The road ahead (for GRH) .....**

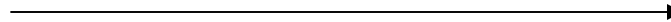


**The missing elements .....**

**I. Information on coronal magnetic field**

**Requirement:**

**Facility for observing polarised radio emission from the solar corona in the same frequency band as GRH**

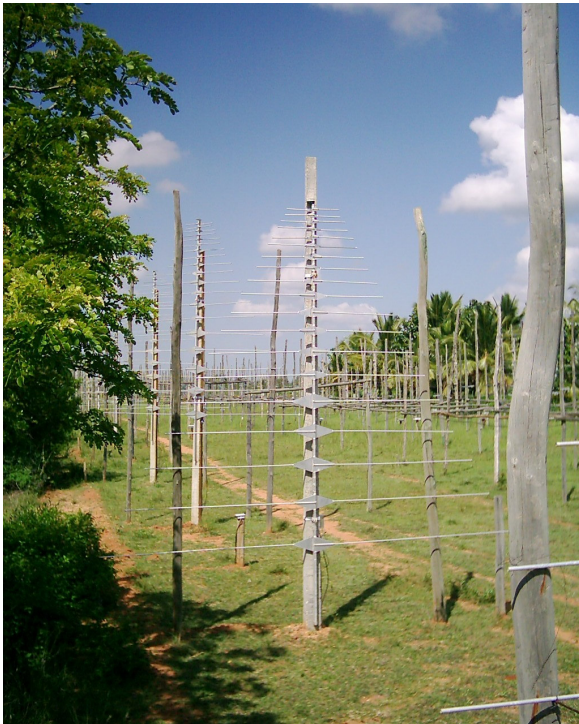




## Polarisation measurement array at Gauribidanur

- One-dimensional array of 32 antennas in the E-W direction
- Configured as 4 groups of 8 antennas each
- Orientation of the groups are 0, 45, 90 & 135 degrees
- Time resolution = 100 ms

**0 and 45 deg**



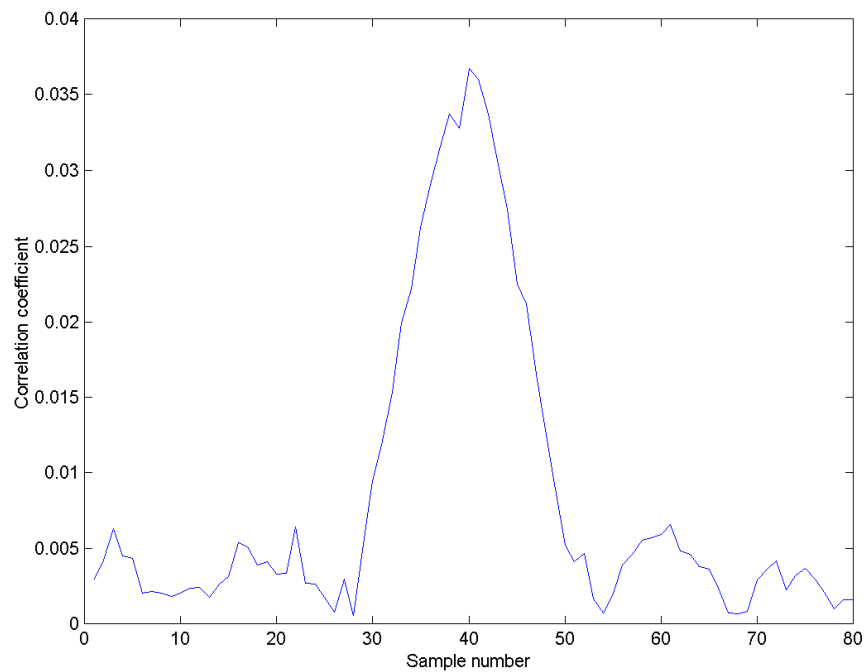
**0 and 135 deg**



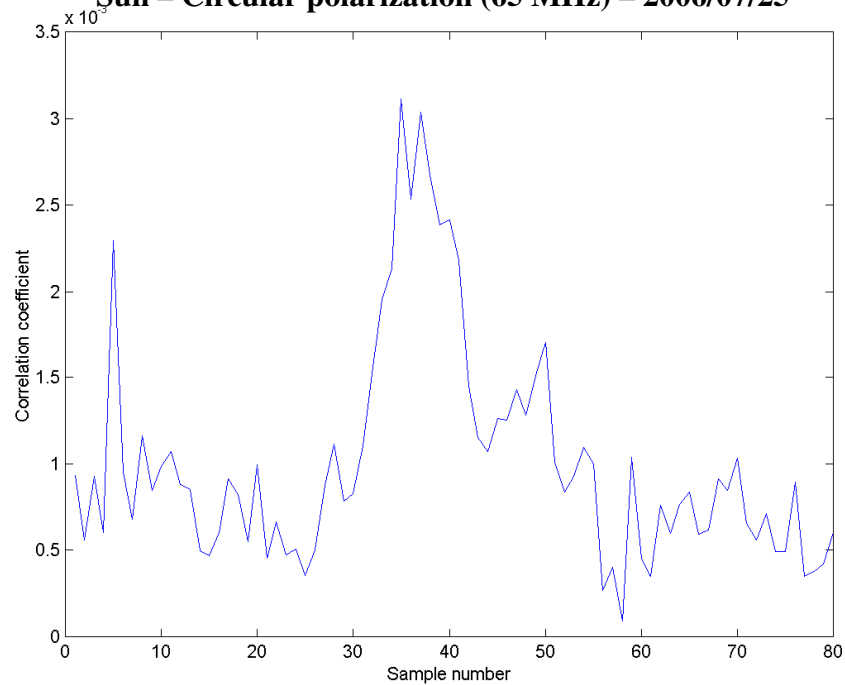
**45 and 90 deg**



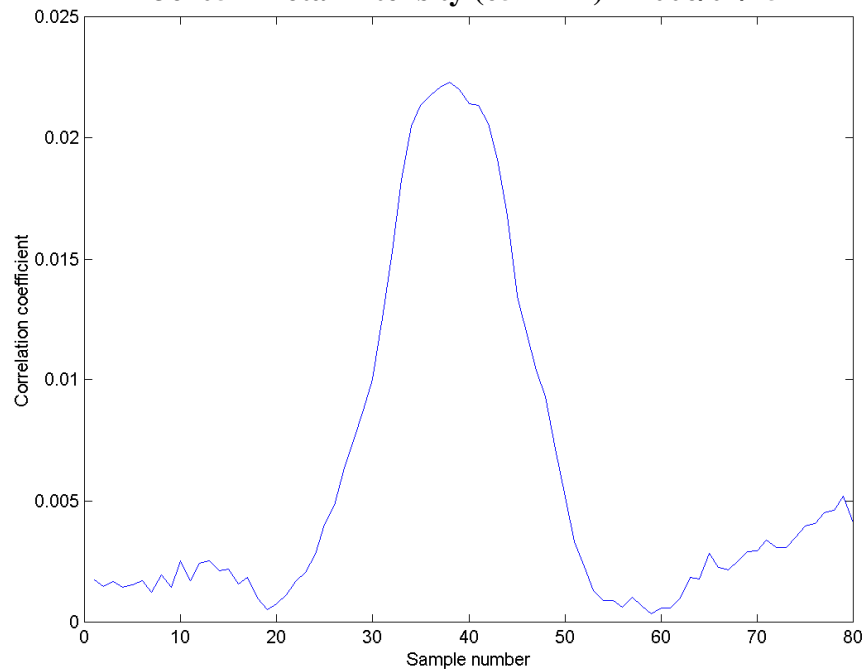
**Sun – Total Intensity (65 MHz) – 2006/07/25**



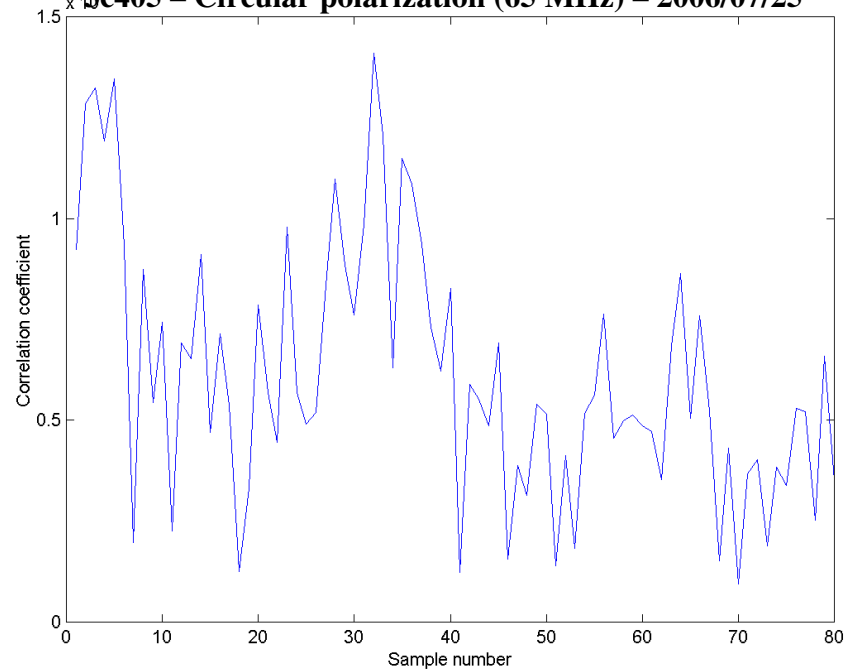
**Sun – Circular polarization (65 MHz) – 2006/07/25**



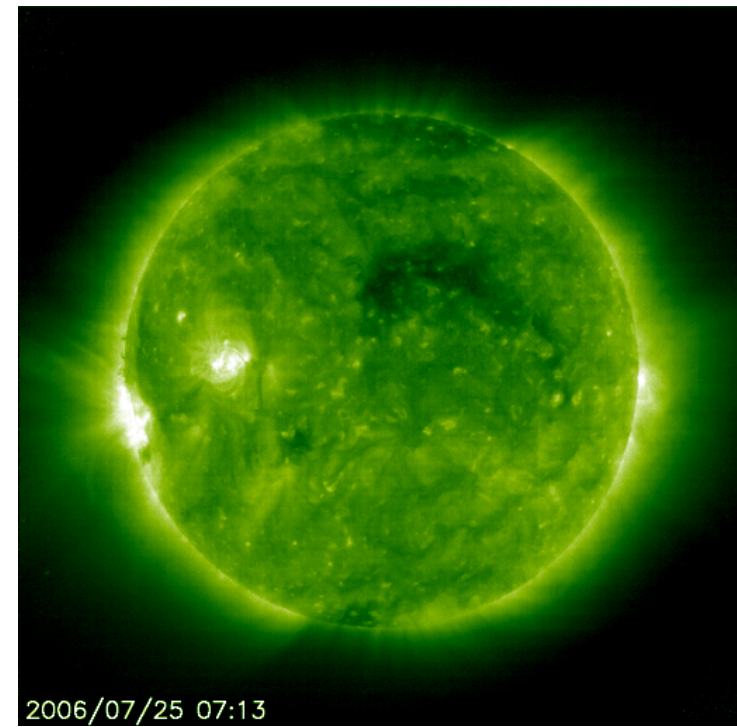
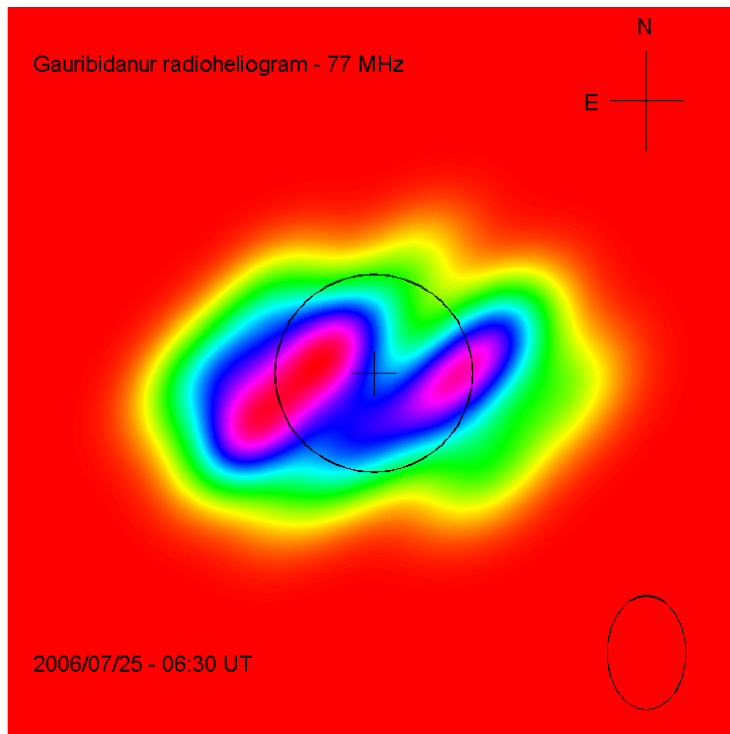
**3c405 – Total Intensity (65 MHz) – 2006/07/25**



**3c405 – Circular polarization (65 MHz) – 2006/07/25**



## Gauribidanur and SOHO-EIT 195 Å observations (25 July 2006)

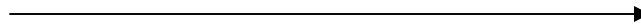


**The missing elements ..... (contd.)**

**II. Information on spectral nature, emission mechanism**

**Requirement:**

**A radio spectrometer capable of observing in the same frequency band as GRH, and all the way up to the ionospheric cut-off**

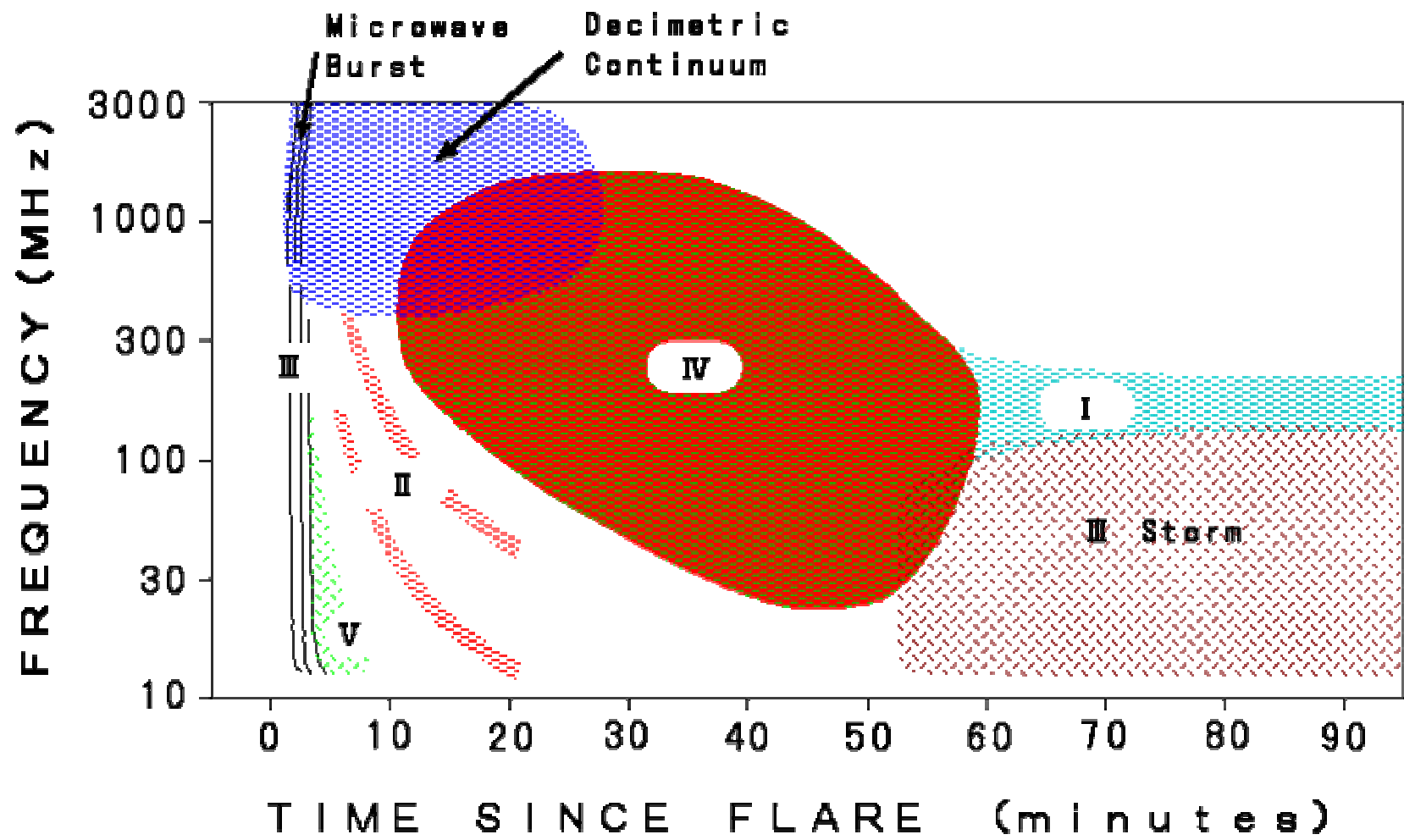




## The new antenna system for radio spectral observations



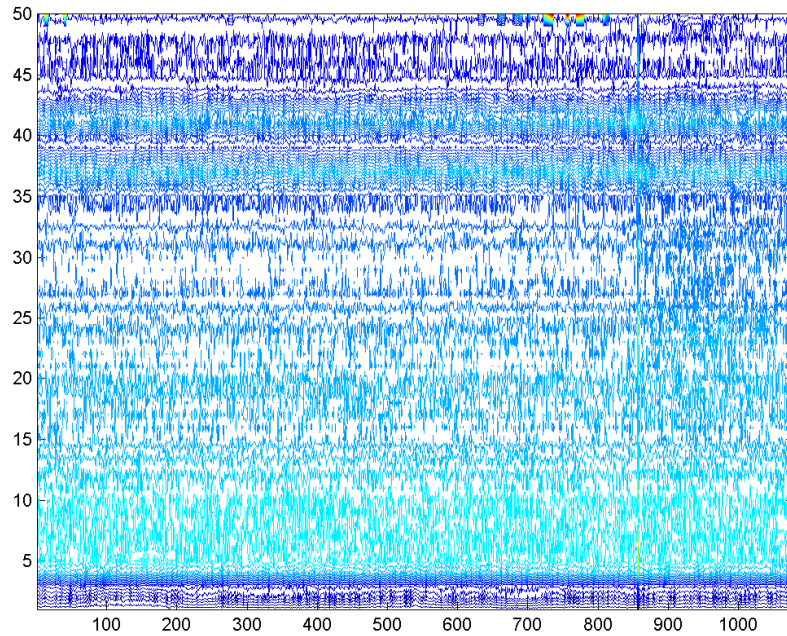




## **Back end instrumentation**

- **Spectrum analyser model E4411 B from Agilent Technologies.**
- **The software for observations was developed in LABVIEW 7.1 using a National Instruments GPIB card as the interface.**
- **Fully automated observations – No need for an observer to sit in front of the instrument and start the observations at the required time**
- **Start and stop frequency is fully tunable to the desired range**
- **Band masking/rejection option**
- **File name for the observed data is automatically selected from the date/time information in the computer**

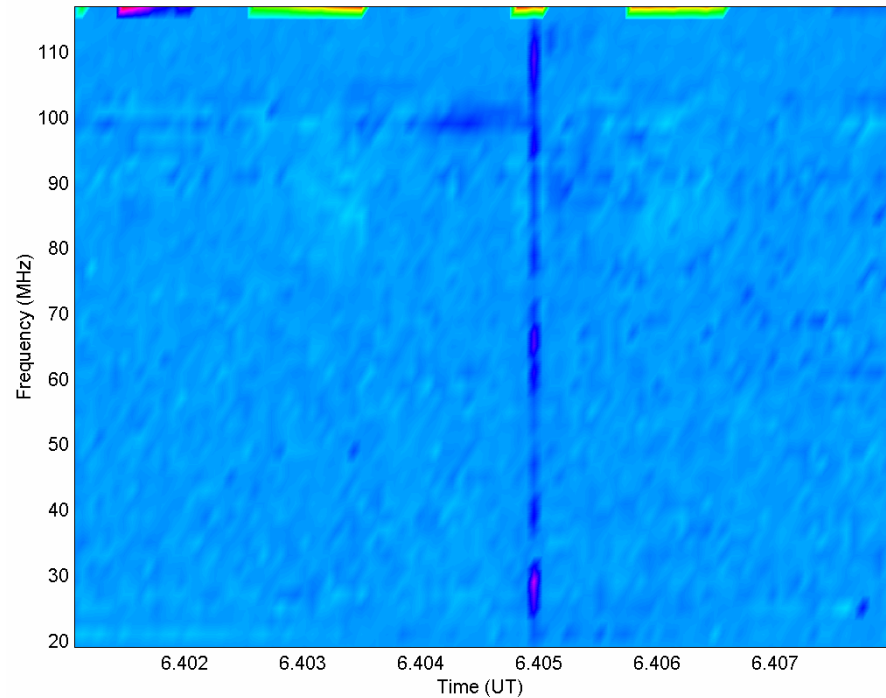
## Raw data



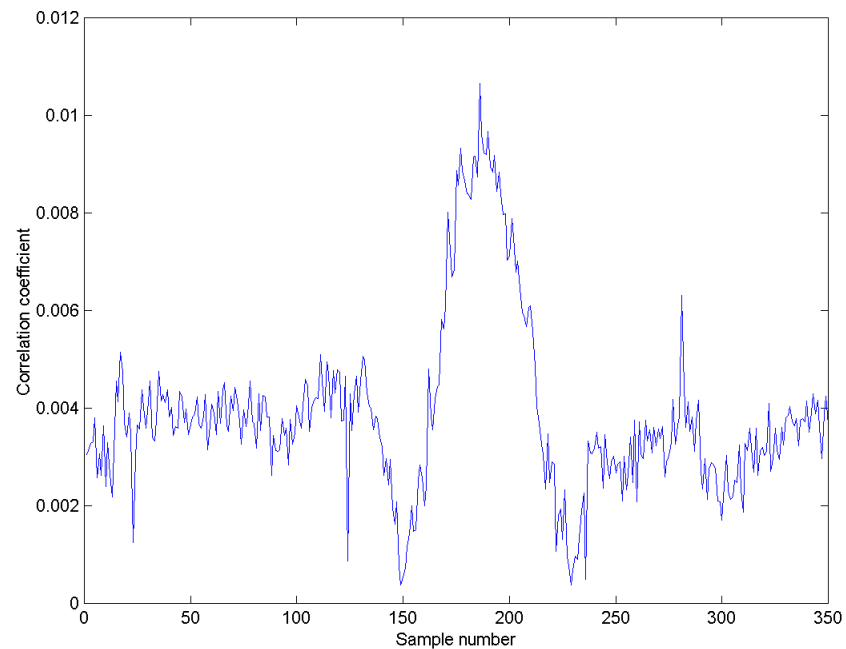
1. Frequency range : 19 – 120 MHz
2. Frequency resolution : 250 kHz
3. Sweep time : 100 ms
4. Dwell time at single frequency : 250 ns
5. Instantaneous bandwidth : 100 kHz

## Low frequency radio spectral observations from Gauribidanur observatory – 2007/04/10

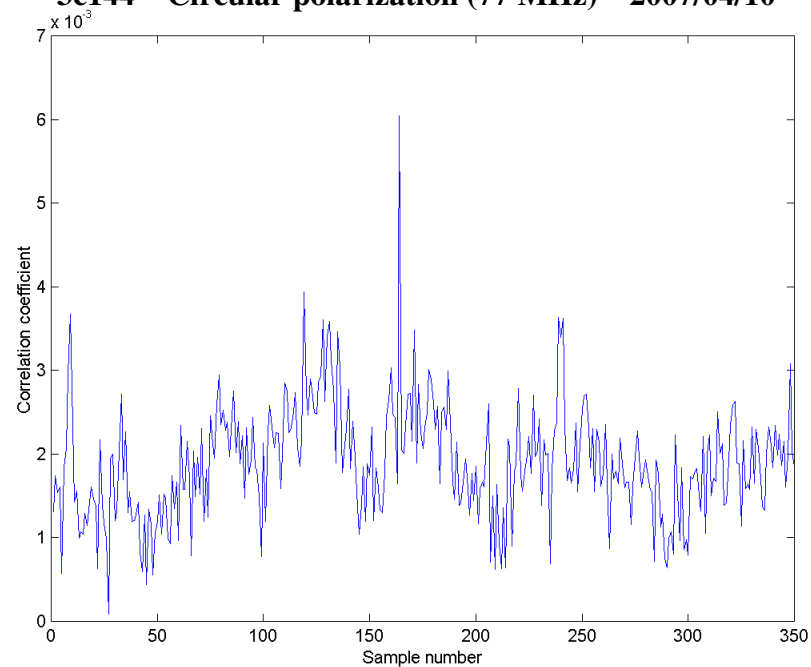
## Processed data



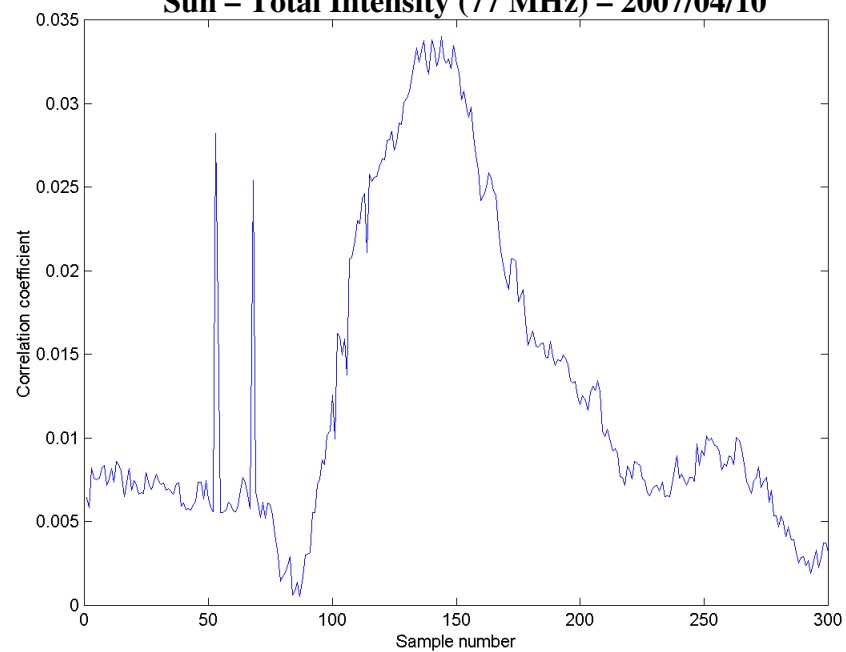
**3c144 – Total Intensity (77 MHz) – 2007/04/10**



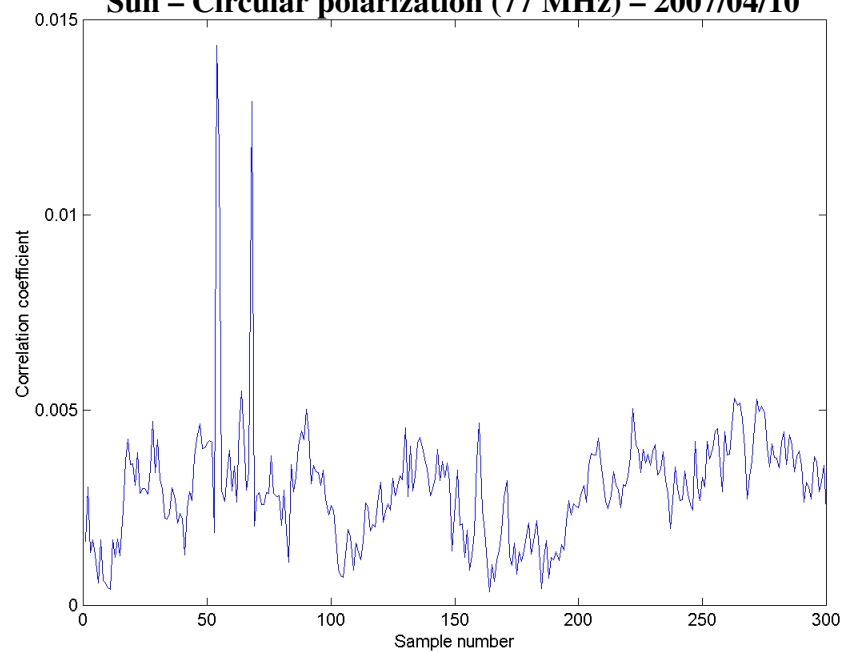
**3c144 – Circular polarization (77 MHz) – 2007/04/10**



**Sun – Total Intensity (77 MHz) – 2007/04/10**



**Sun – Circular polarization (77 MHz) – 2007/04/10**



**Gauribidanur and SOHO-LASCO C2  
observations (10 April 2007)**

