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FiCoRI: El Primer Radio Interferómetro Solar Colombiano

FiCoRI: First Colombian Solar Radio Interferometer

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Radio Astronomy in Colombia...

The location of Colombia at the Intertropical Convergence Zone (ITCZ) makes very challenging the optical astronomy. However, though radio astronomy could be a branch of astronomy with a hug potential for develope in Colombia, this had not been in this way until now.

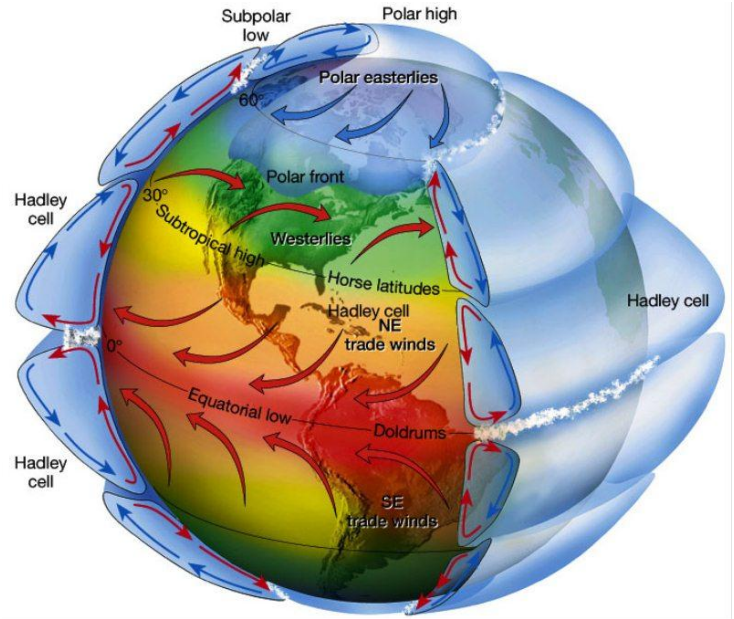
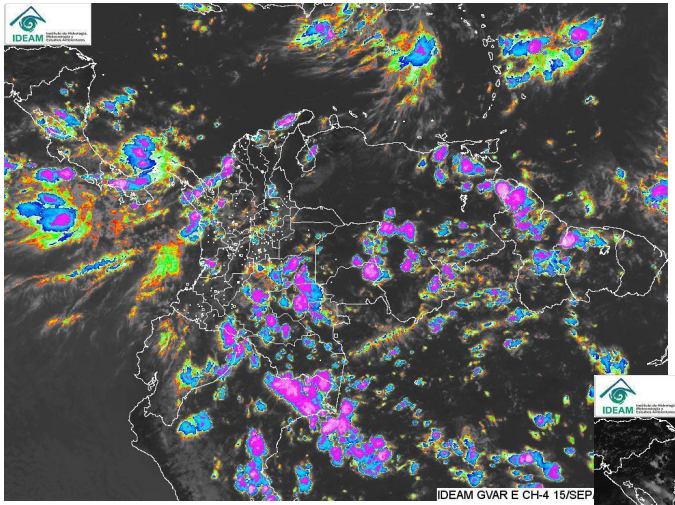
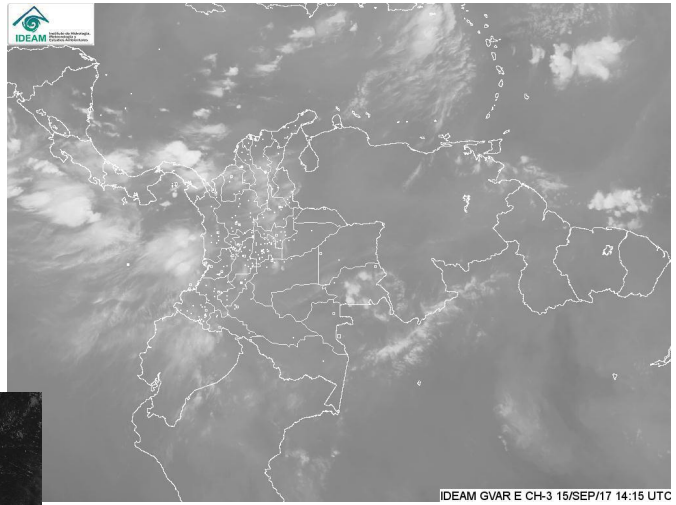
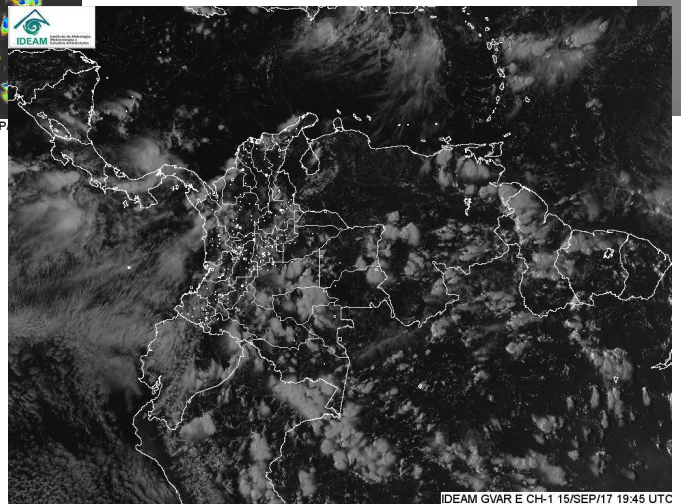


Image taken from: http://buildingearthonceagain.blogspot.com.co/2013/08/intertropical-convergence-zone.html

Satellite images of Colombia







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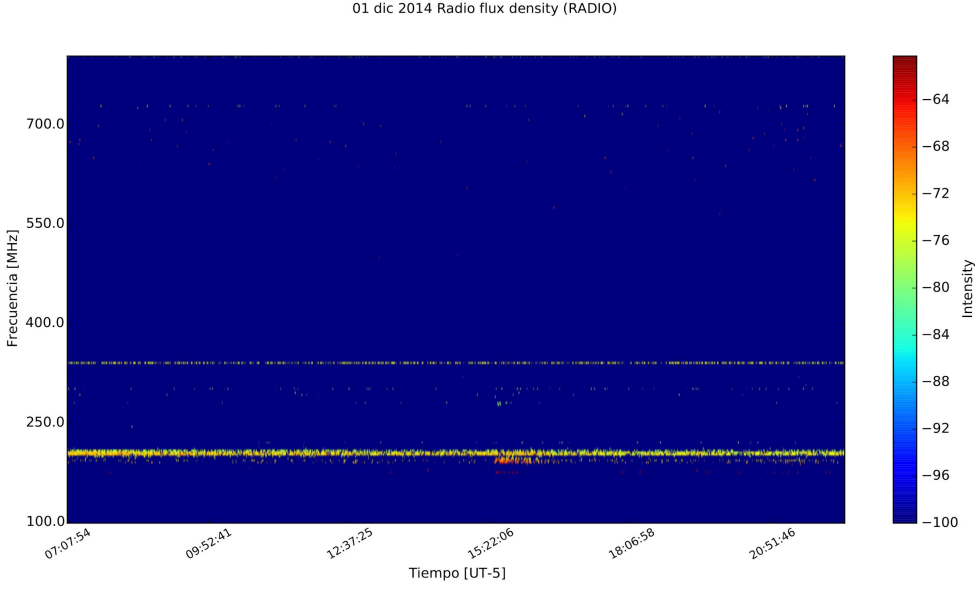
Precedent

As final work for my Bachelor in Physics, was designed and built a first antenna working in a broad bandwidth (45 - 870 MHz) to observing the Sun. This system was thought to be part of the e-CALLISTO Network, but in the end, the antenna never was joined to the e-Callisto.



FiCoRI, ¿Con qué fin?

FiCoRI se propuso, diseñó y construyó como un radiotelescopio de banda ancha trabajando en arreglo interferométrico de dos elementos y sus objetivos son:

Observacional

- Radio observación continua del Sol (hasta 800 MHz).
- Radio imágenes del sol calmo.
- Rastreo de radio fuentes solares

Divulgativos

- Oportunidad para diseminaciones de resultados y datos a nivel de educación básica y media.
- Programas de entrenamiento en tratamientos de datos científicos para estudiantes de secundaria.

Científicos

- Estudio de la aceleración de partículas en fulguraciones.
- Estudio de la posición relativa y evolución de radio fuentes asociadas a Eyecciones de Masa Coronal.
- Estudio del clima espacial a través de la observación de estallido solares en radio.

Educacionales

- Enseñanza de la radioastronomía y de técnicas radio astronómicas.
- Oportunidad para implementar colaboraciones entre universidades

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FiCoRI: Especificaciones

Resolución en frecuencia:

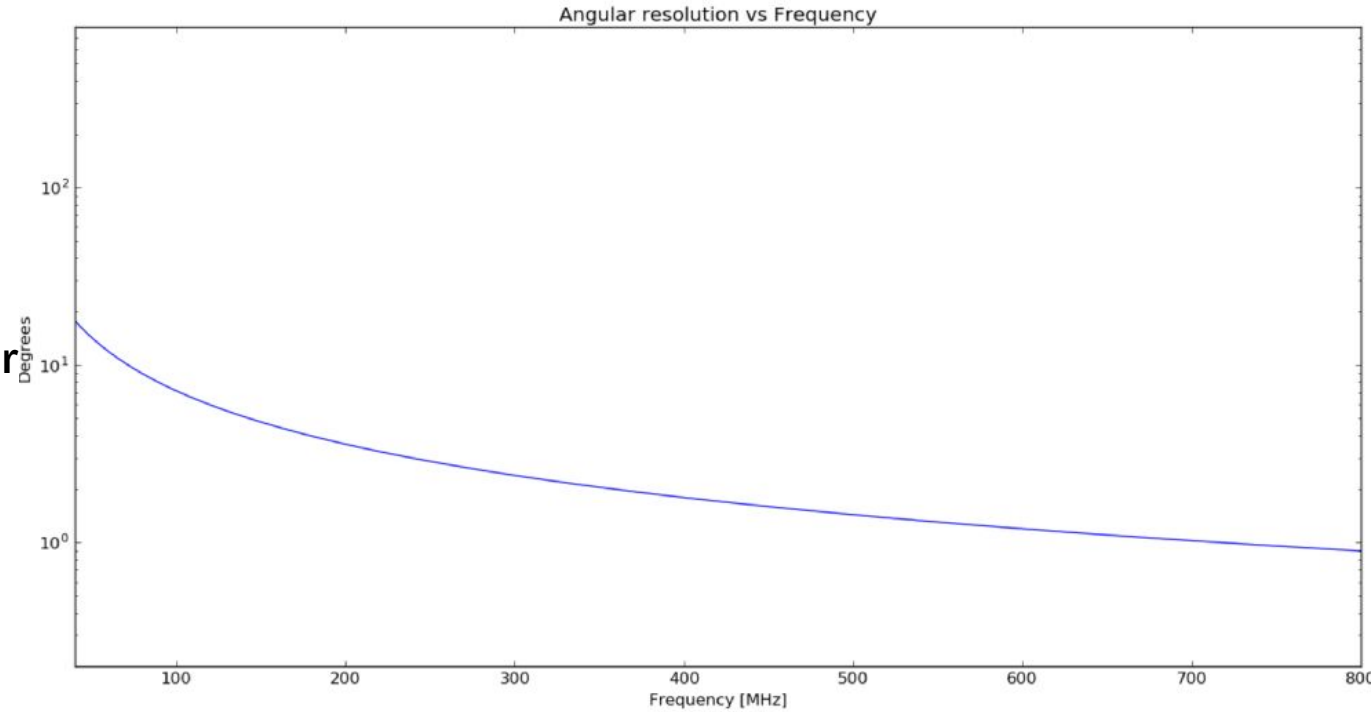
780 kHz

Ancho de Banda:

800 MHz

Resolución temporal:

~2 s pero puede ser menor



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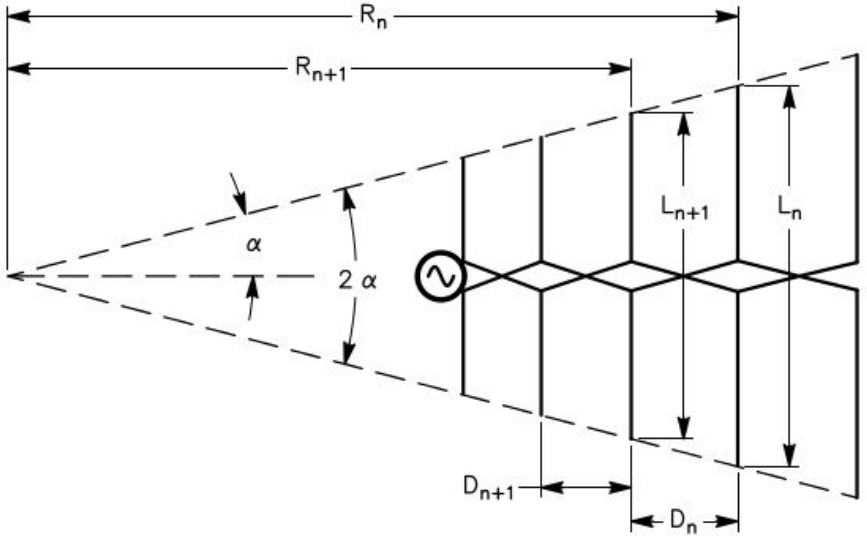
FiCoRI: El tipo de antena

Dada la característica de direccionalidad y condiciones constantes en un ancho de banda amplio, la antena escogida es del tipo log-periódica.



Patrón Antena de Dipolo

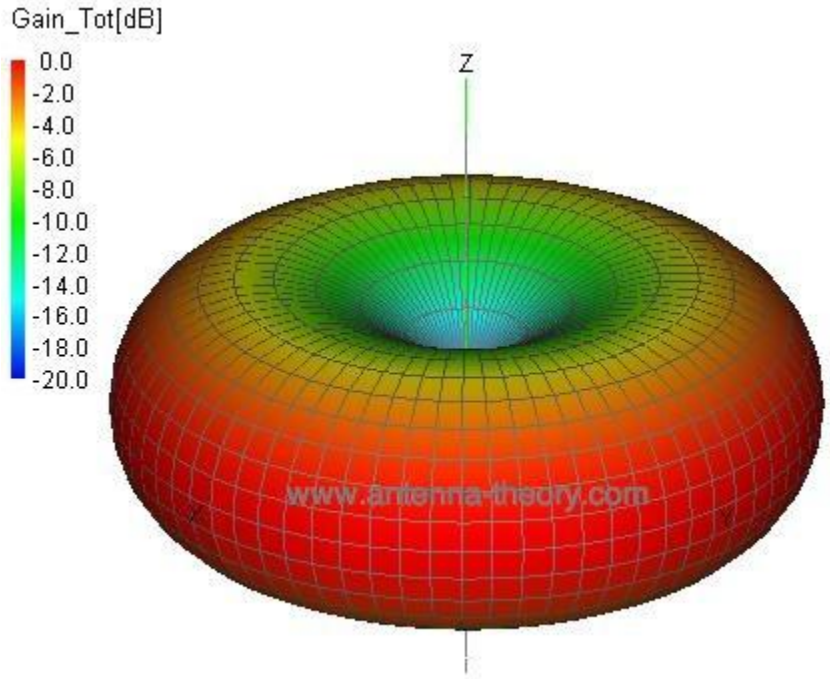
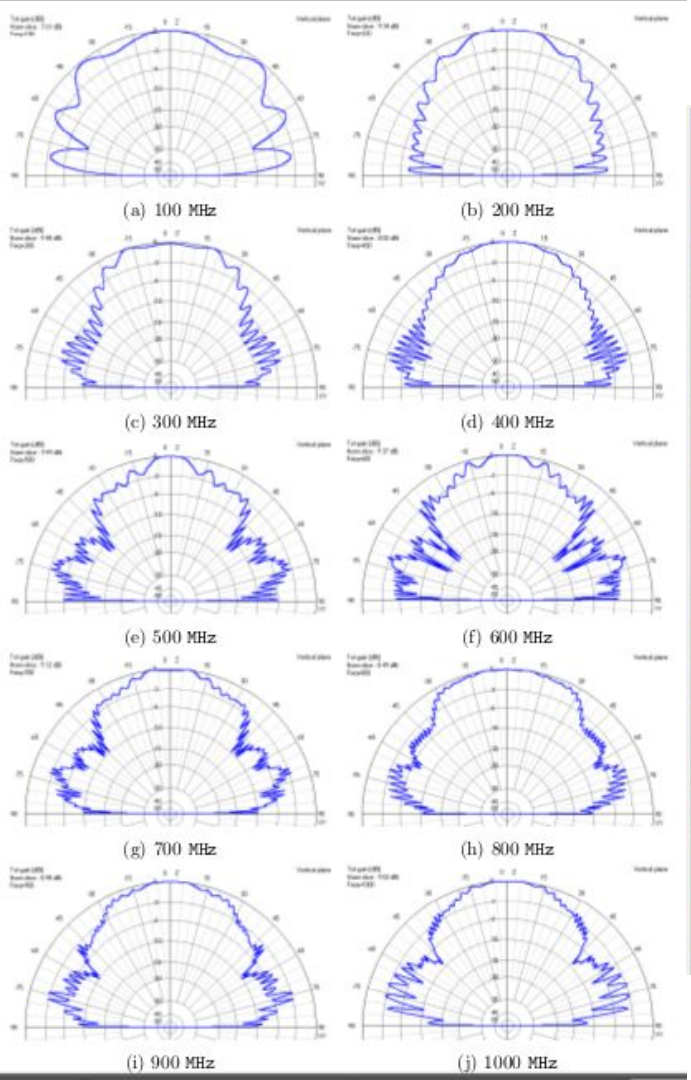
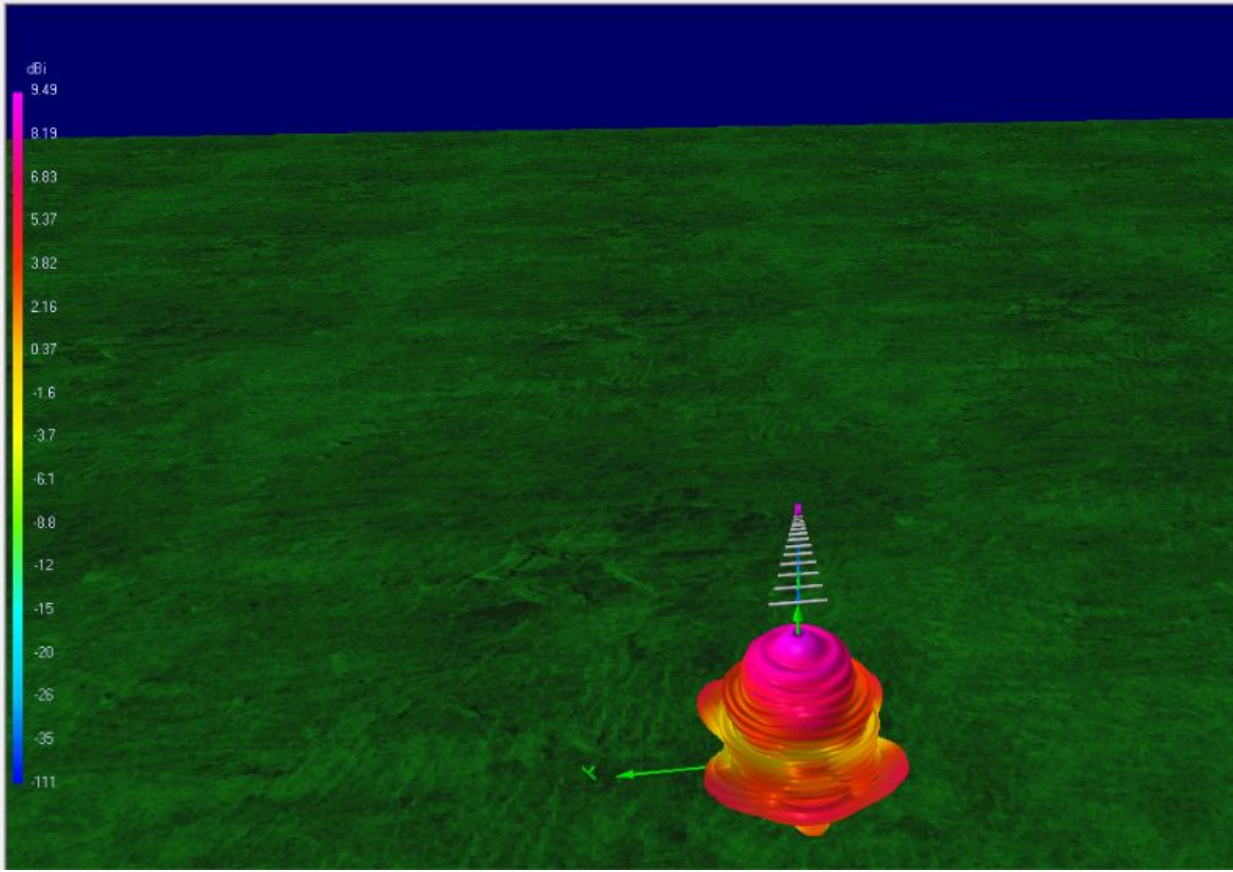


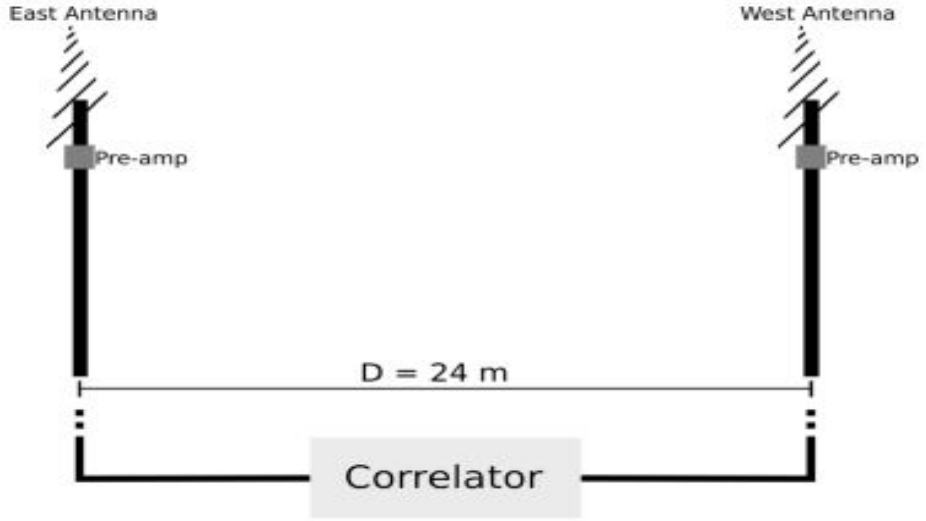
Imagen de: http://www.antenna-theory.com/antennas/norm3D1lam.jpg

Antena Log-Periódica





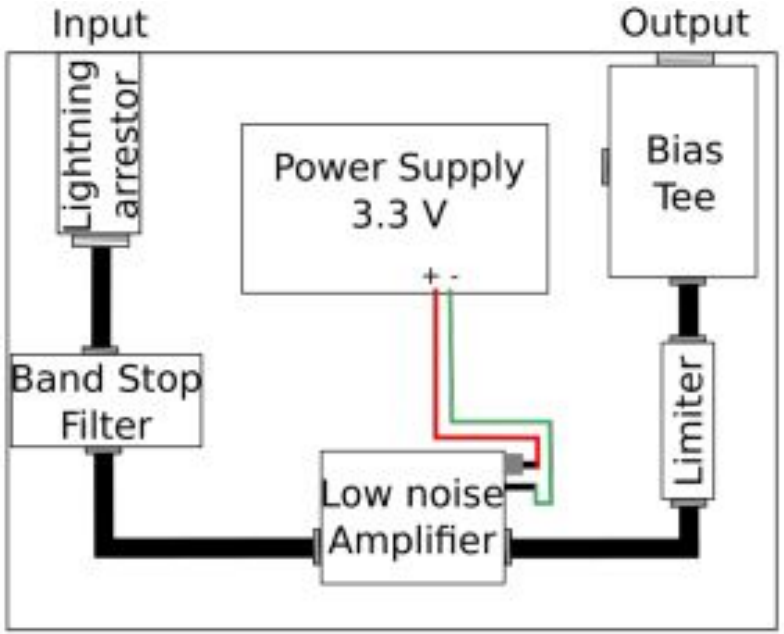
FiCoRI: Configuración de las antenas



(a) Skecth of the complete FiCoRI instrument.

(b) Antennas picture.

FiCoRI: Sistema de pre-amplificación



(a) Pre-amp sketch.

(b) Pre-amp picture.

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FiCoRI: El correlador

ROACH dispositivo desarrollado por CASPER Team de University of California Berkeley.

ROACH

Reconfigurable Open Architecture Computing Hardware

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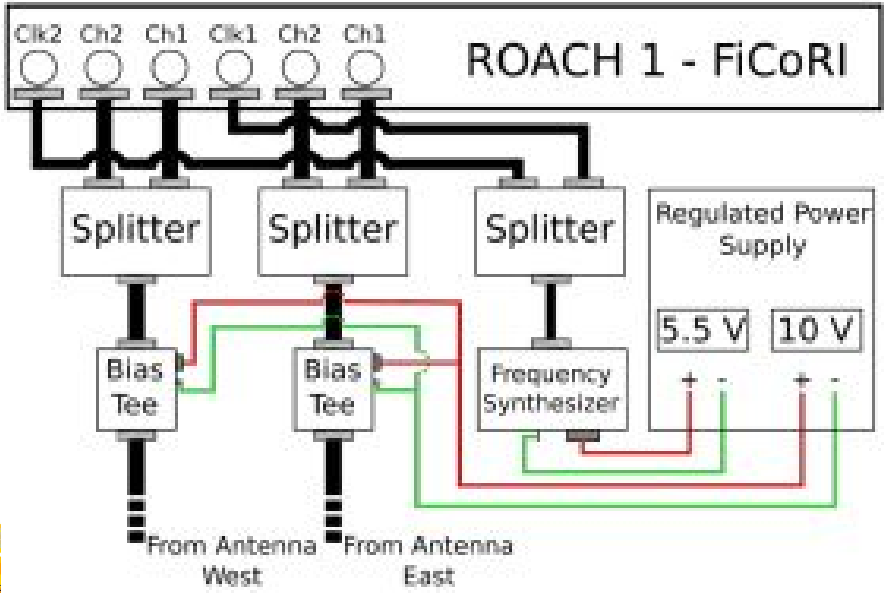
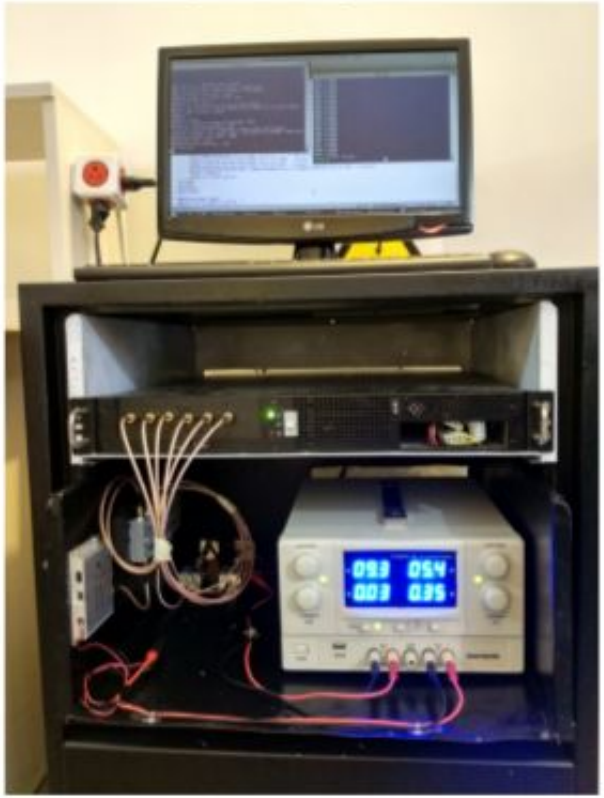
FiCoRI: Sistema de Recepción de Datos



(a) Reception data system sketch.



(b) Reception data system picture.

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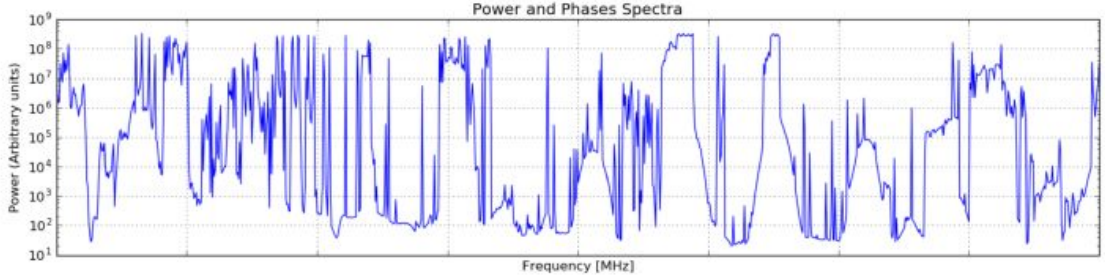
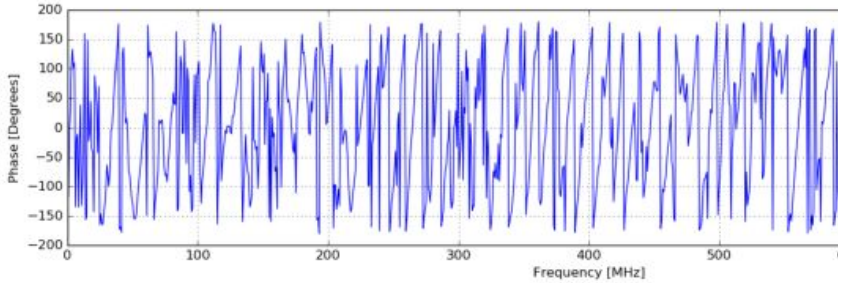
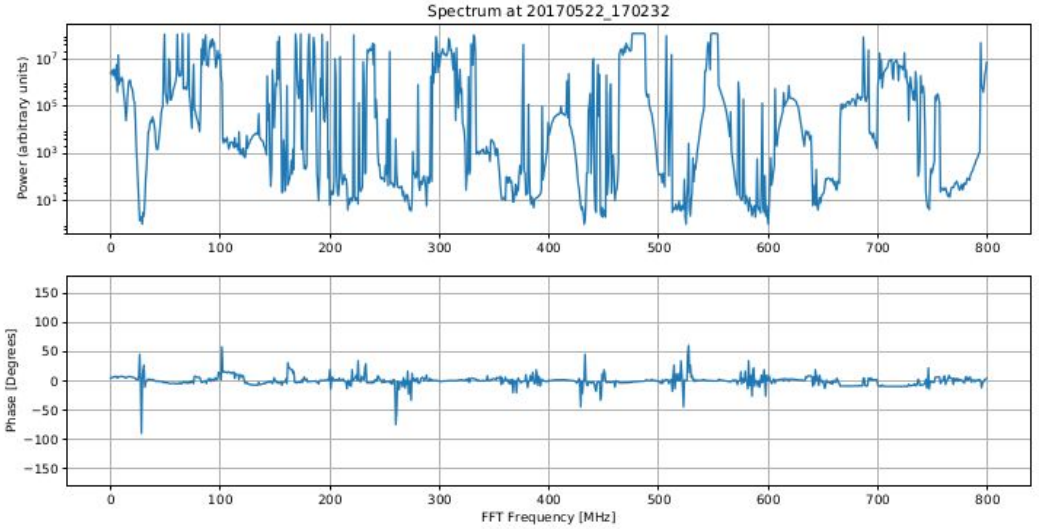
FiCoRI: Pruebas de control







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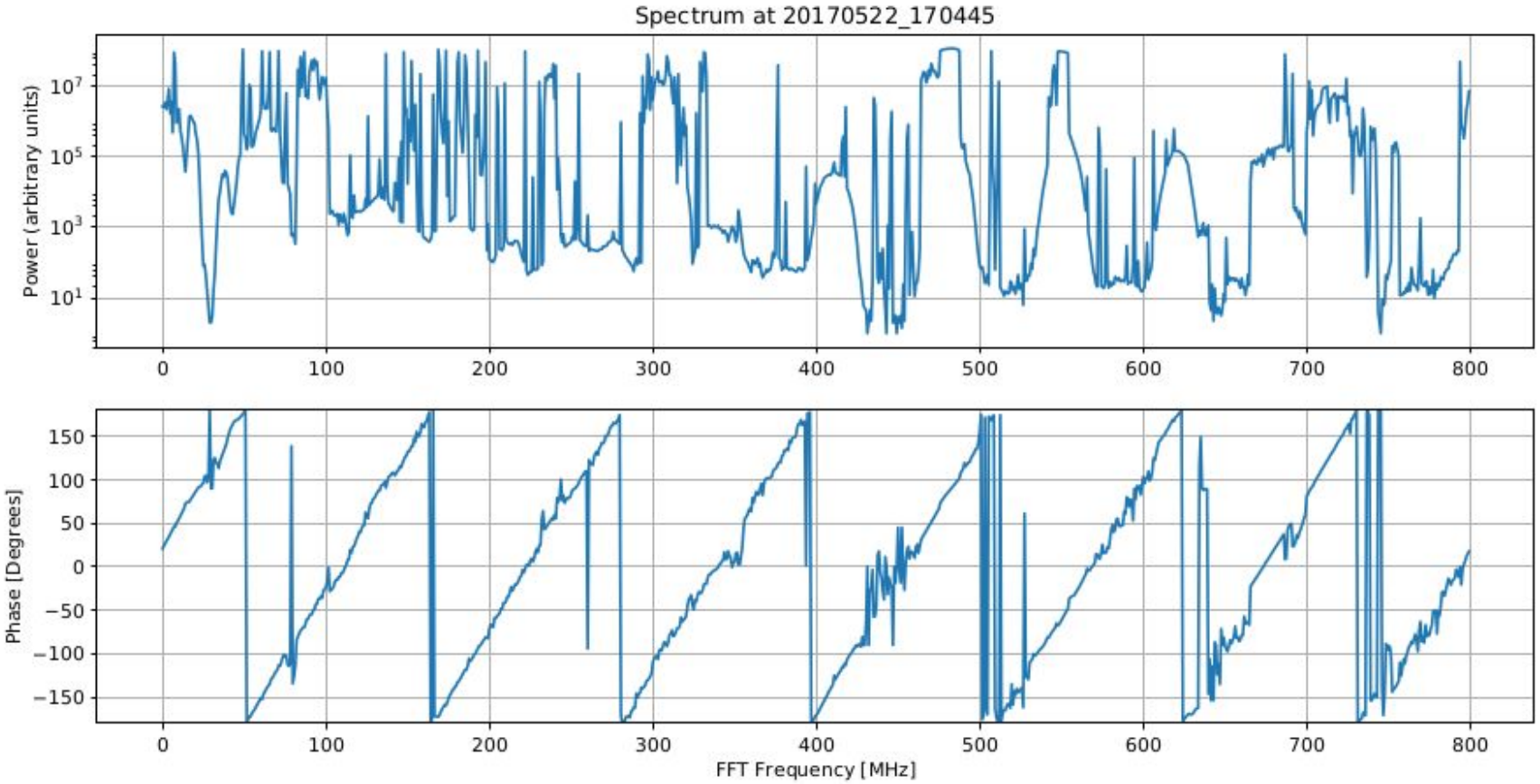
FiCoRI: Prueba retraso analógico de una señal



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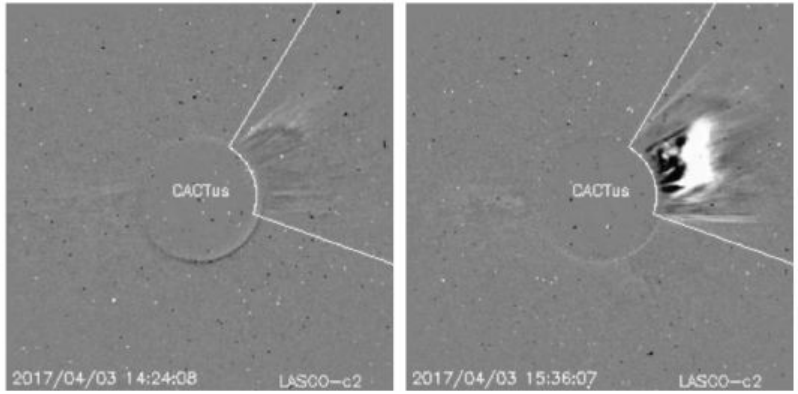
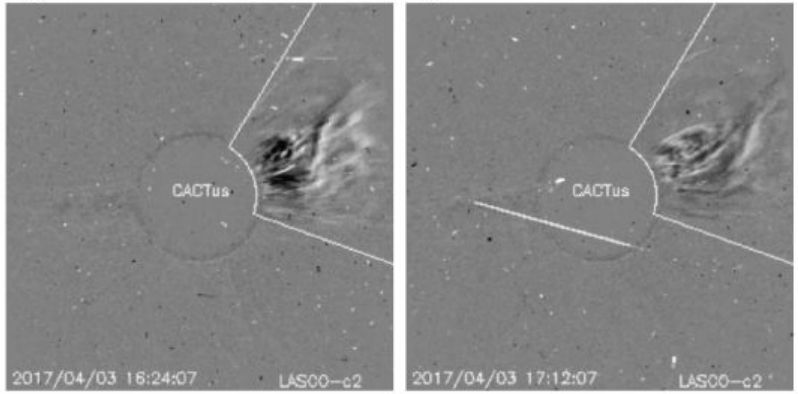
FiCoRI: Resultados Observacionales Evento 03/04/17



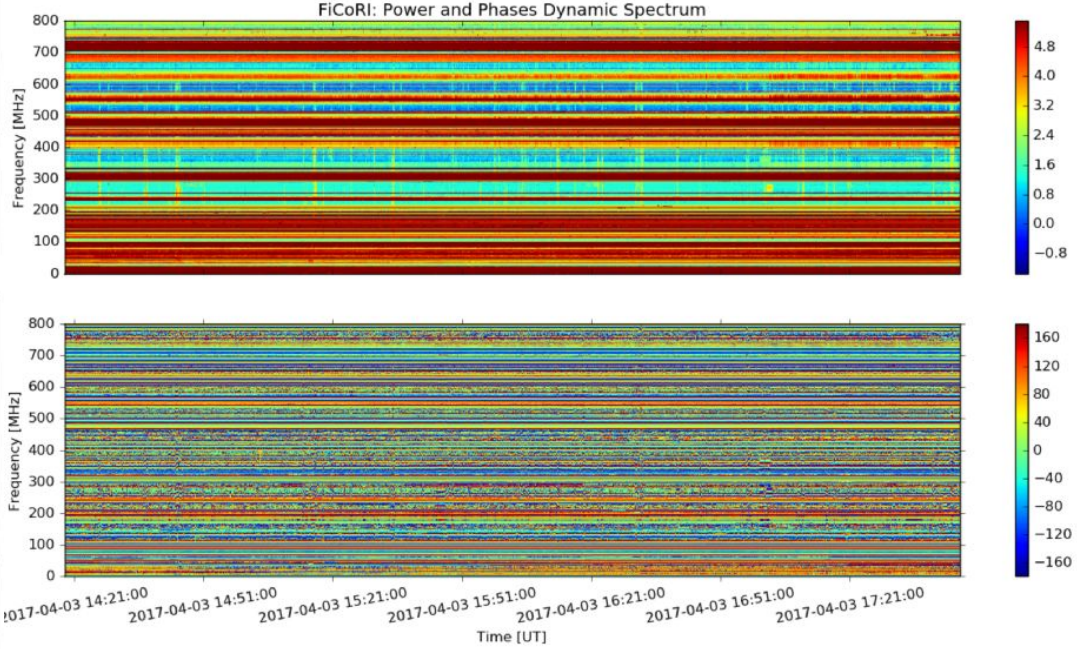
(a) LASCO-c2 observation on 14:24:08

(b) LASCO-c2 observation on 15:36:07



(c) LASCO-c2 observation on 16:24:07

(d) LASCO-c2 observation on 17:12:07



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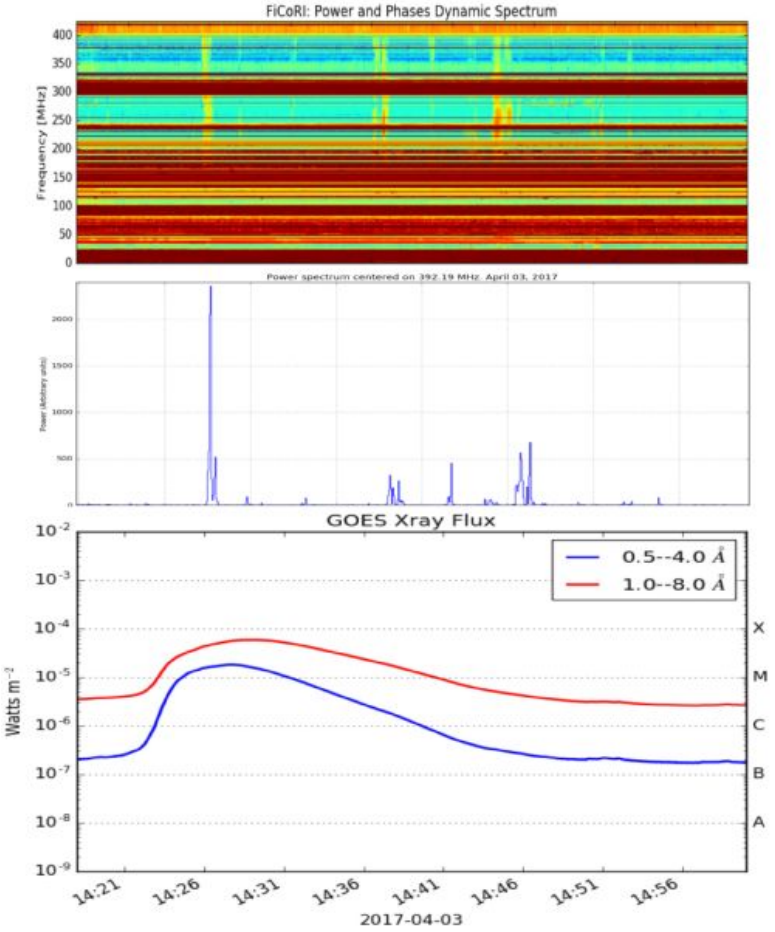
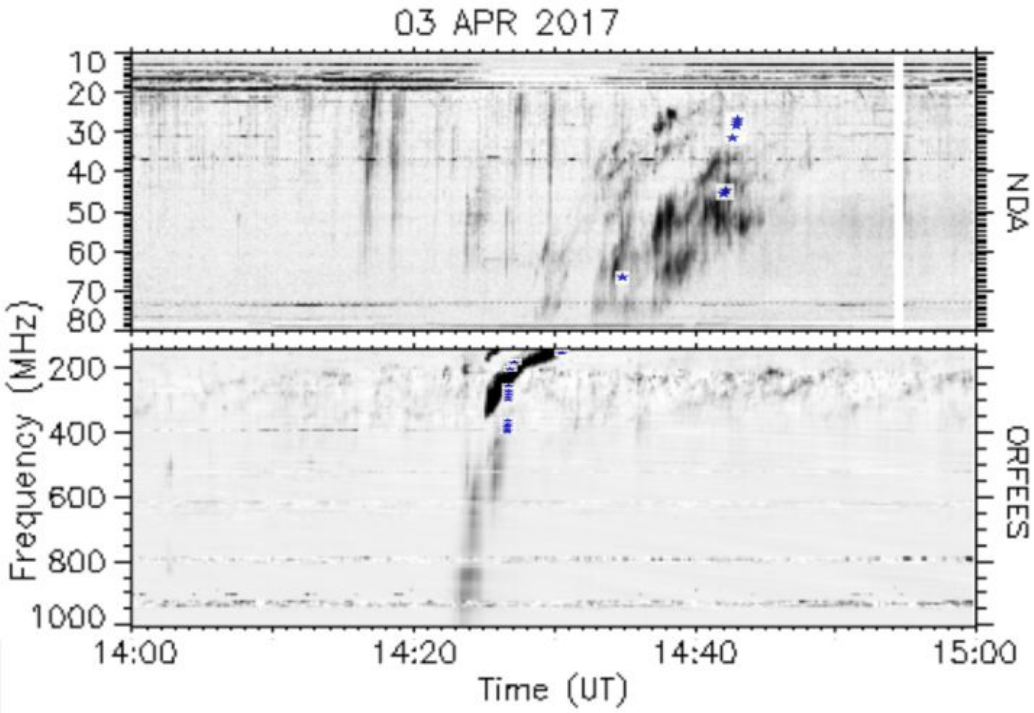
FiCoRI: Resultados Observacionales





FiCoRI: Observational Results

The Leblanc, Y. et al. (1998,[19]) density model based on in-situ measurements of density by Helios 1 and 2 spacecrafts at 1 Astronomical Unit (AU) was used for the following calculations. The plasma electronic density n e of interplanet: $n_e = d^{-2,1}\,\mathrm{cm}^{-3}(d \text{ is in AU})$ n with distance as:

Because FiCoRI is located at a distance equals to 1 AU, the plasma electronic density is in average 6,1 cm^-3 . Replacing this value in the equation 1-2 is found that the plasma frequency for that density is 0,02438 MHz. Now, the distance R where the radio emission is generated is related to the plasma frequency v p , the observed frequency v o and the distance R 1 wh $R = \frac{R_1 \nu_p}{\nu_o}$ bservation wa $R = \frac{3658500\ \mathrm{MHz\ km}}{\nu_o}$ wing relation:

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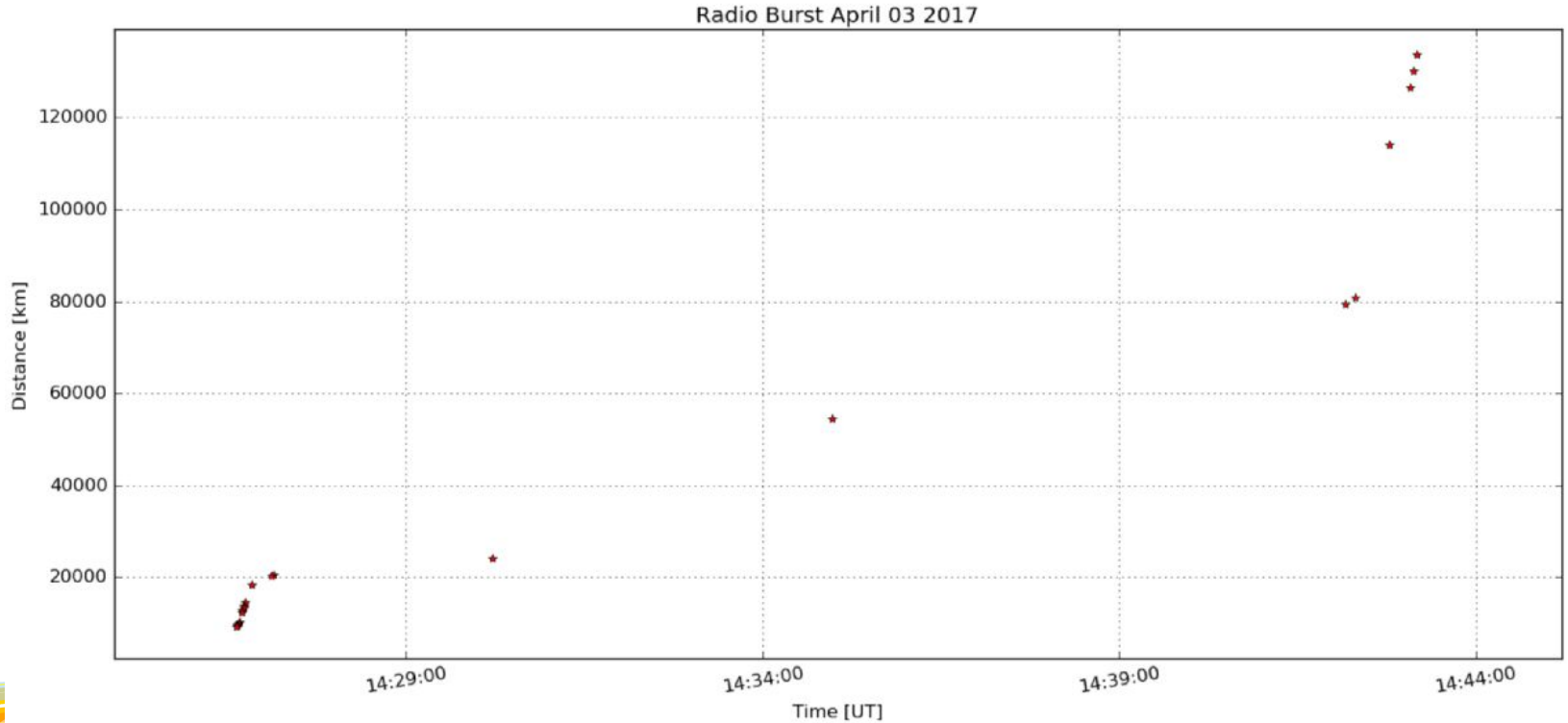
FiCoRI: Resultados Observacionales



27,34 MHz - 392,19 MHz.
(199,22 - 392,19 MHz) v ≈ 695 km s −1, 30 % con respecto a NOAA.
Velocidad en todo el rango es de ≈ 125 km s −1 .
Estas velocidades son usuales en Type II radio bursts

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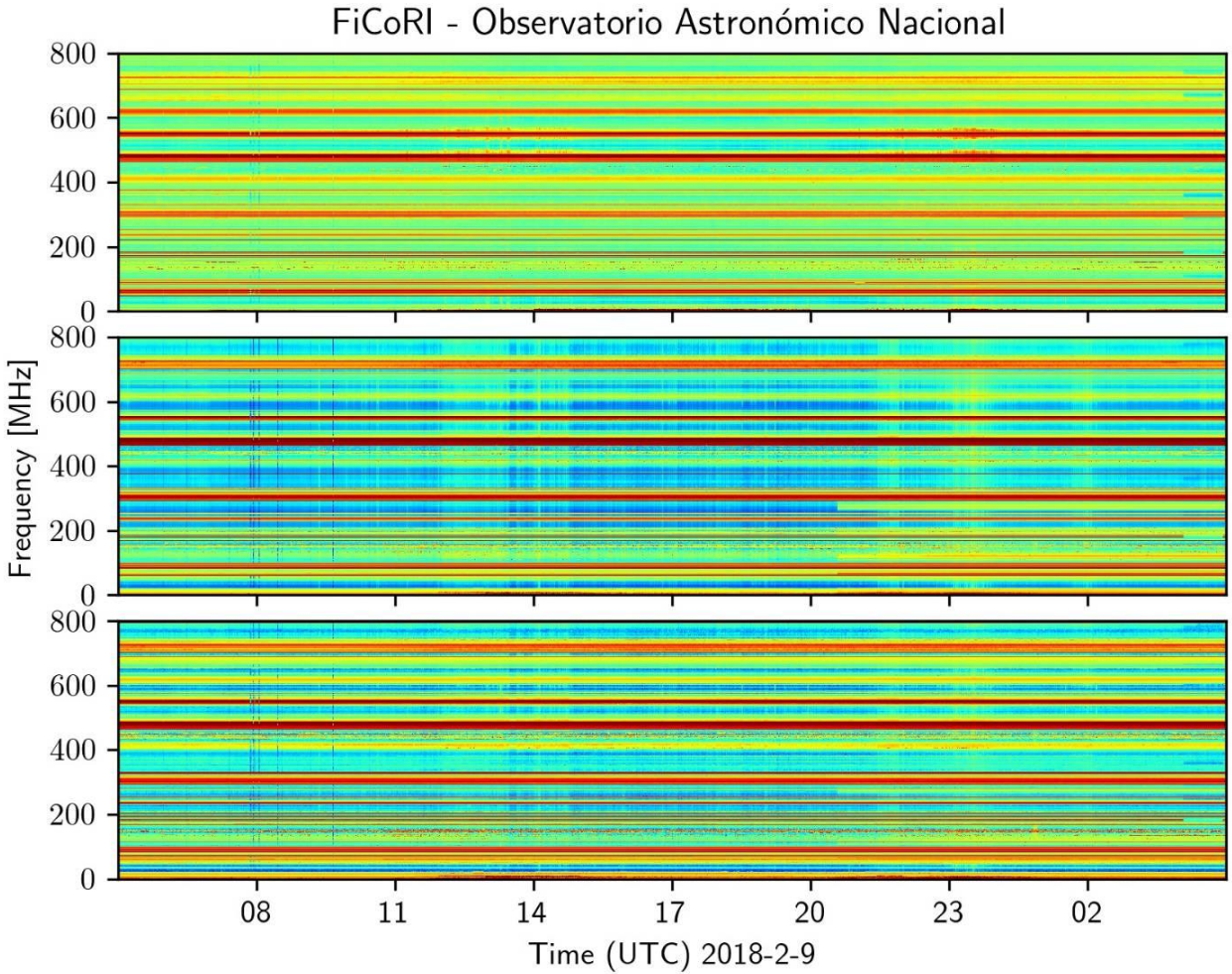

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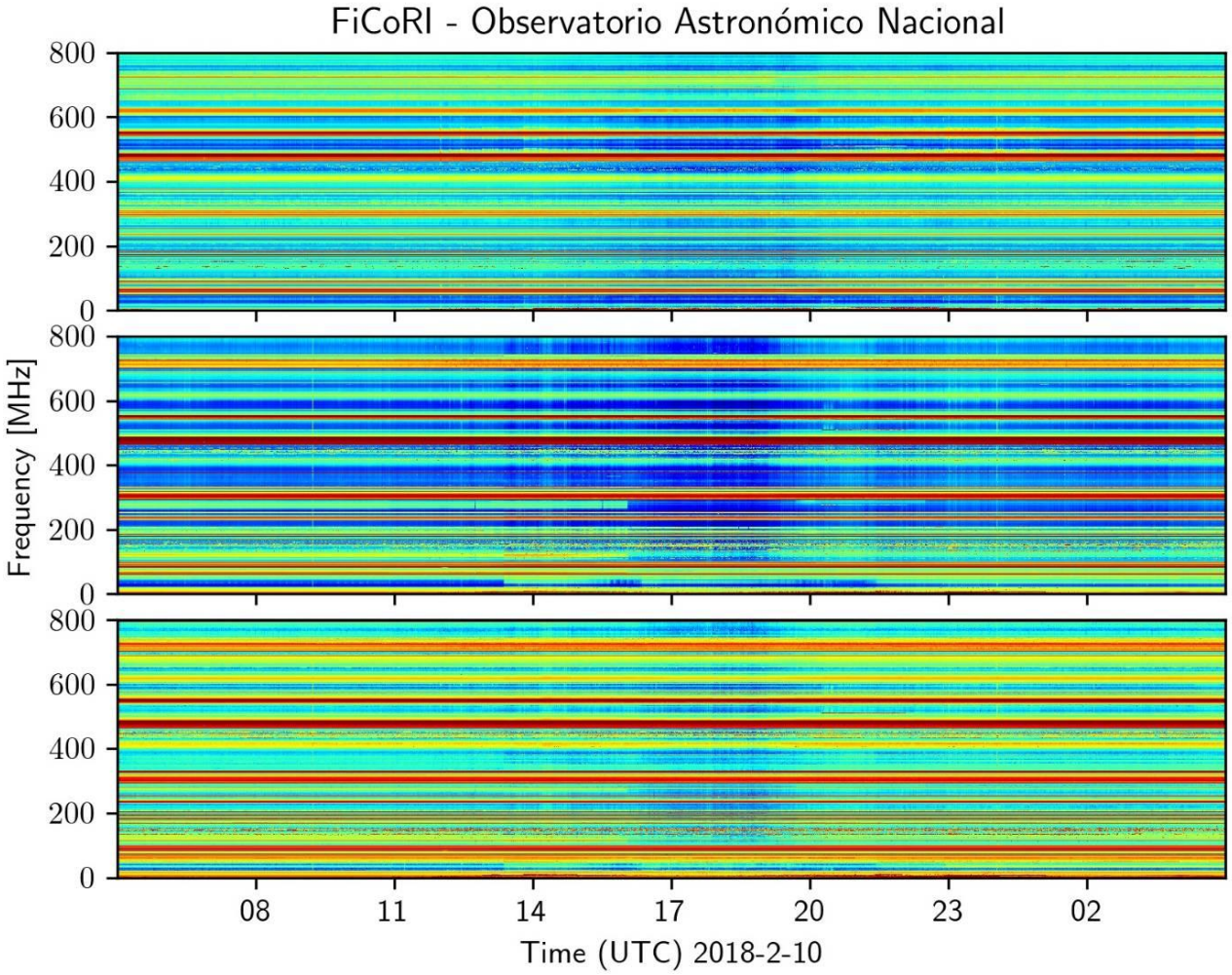

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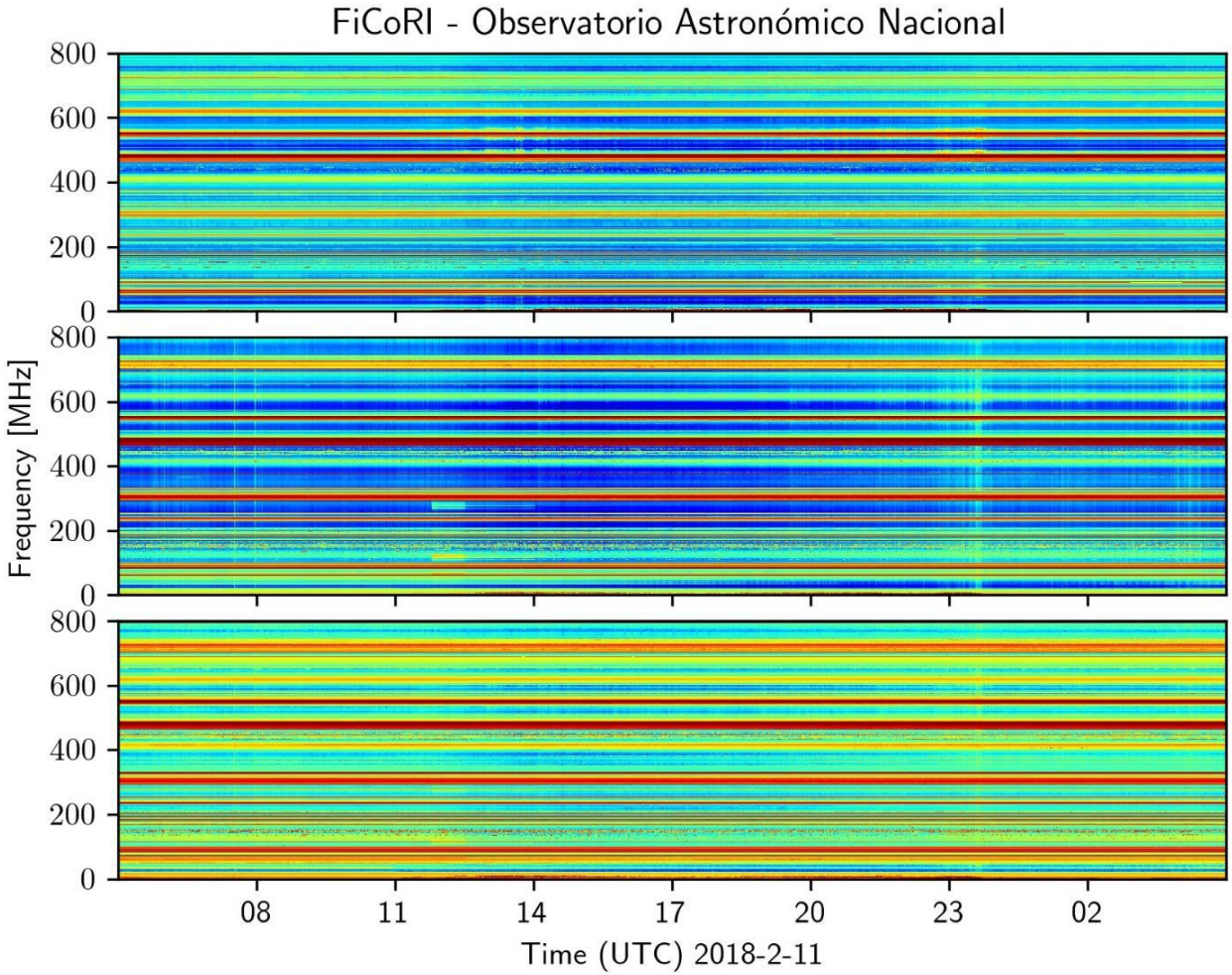

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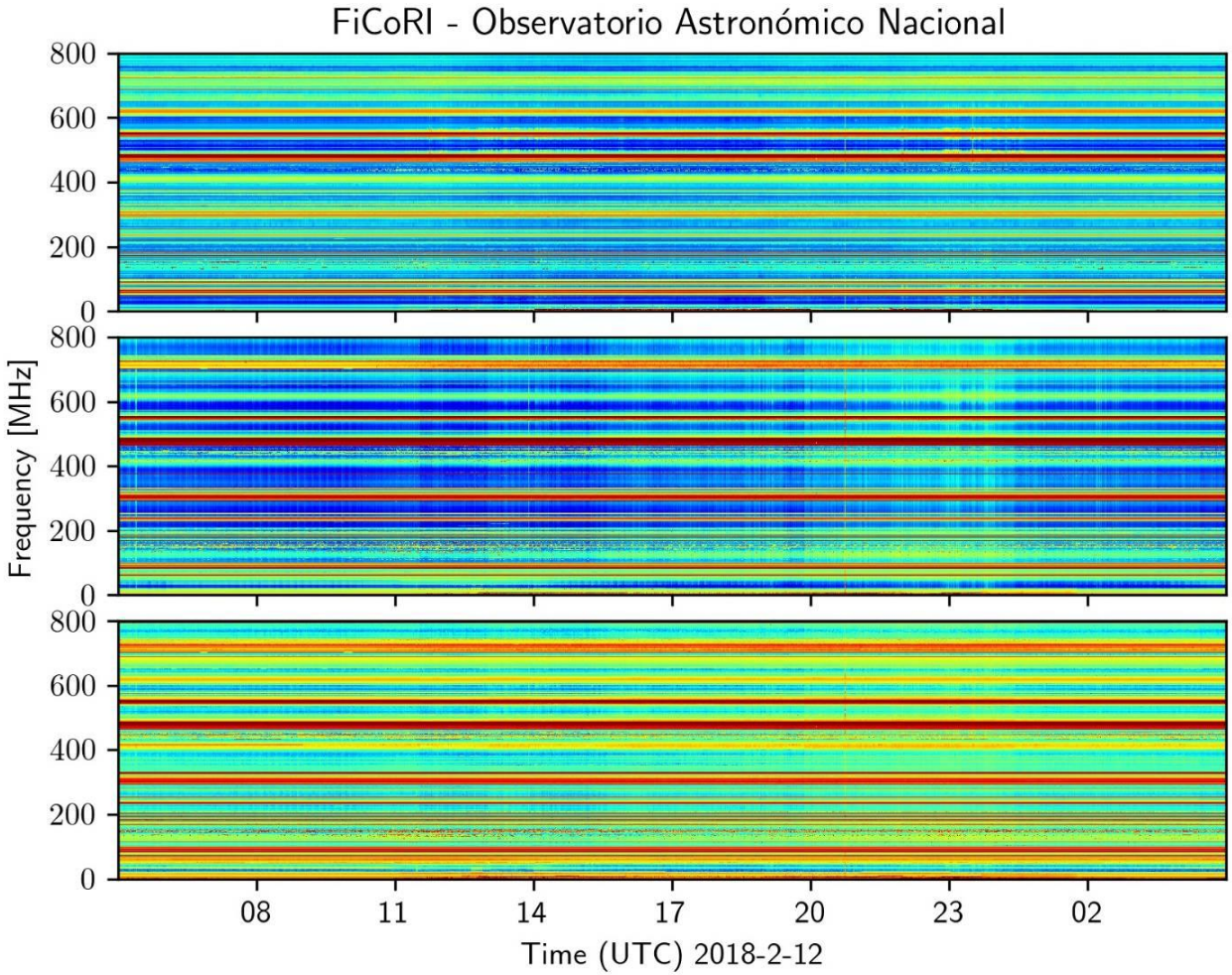

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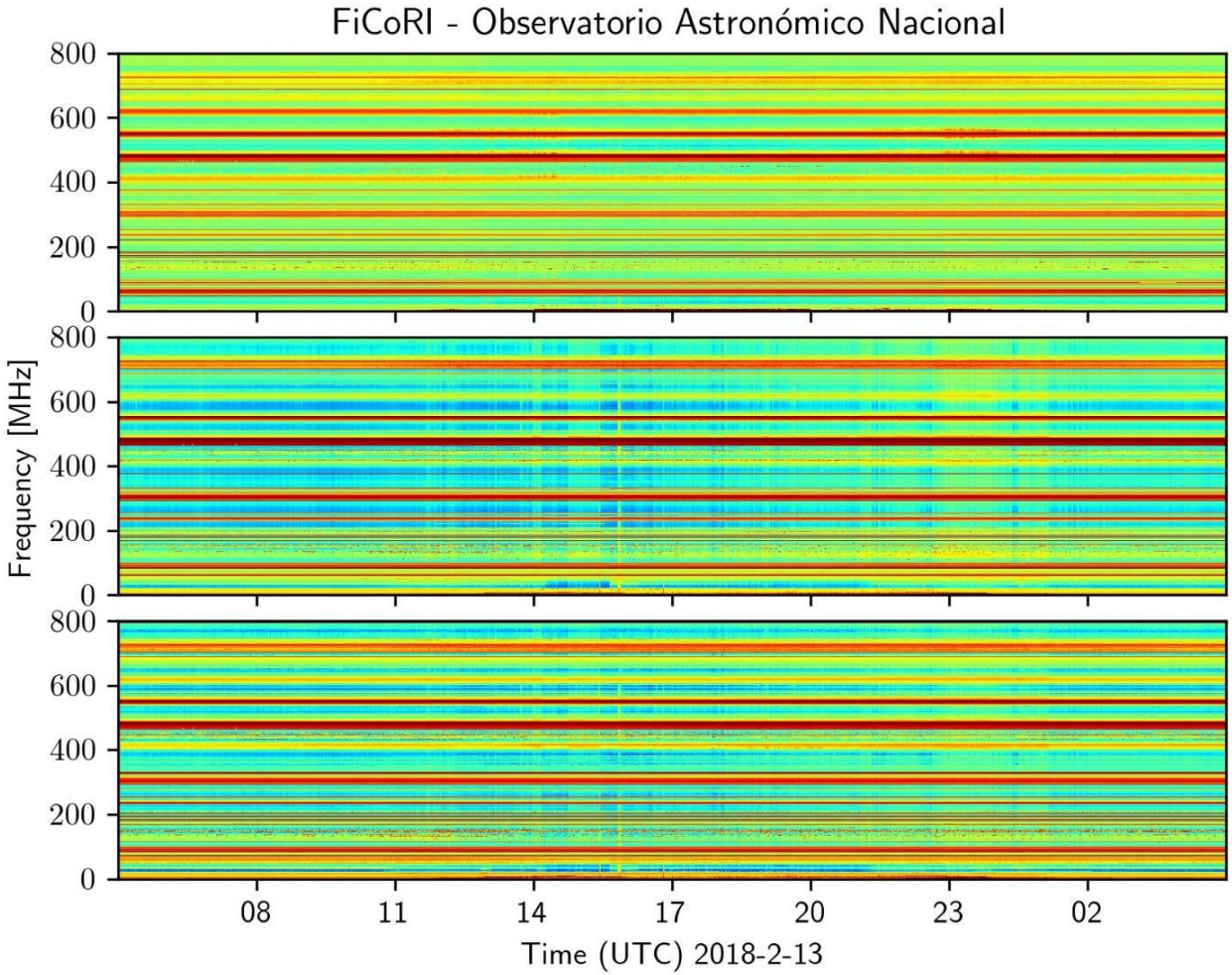

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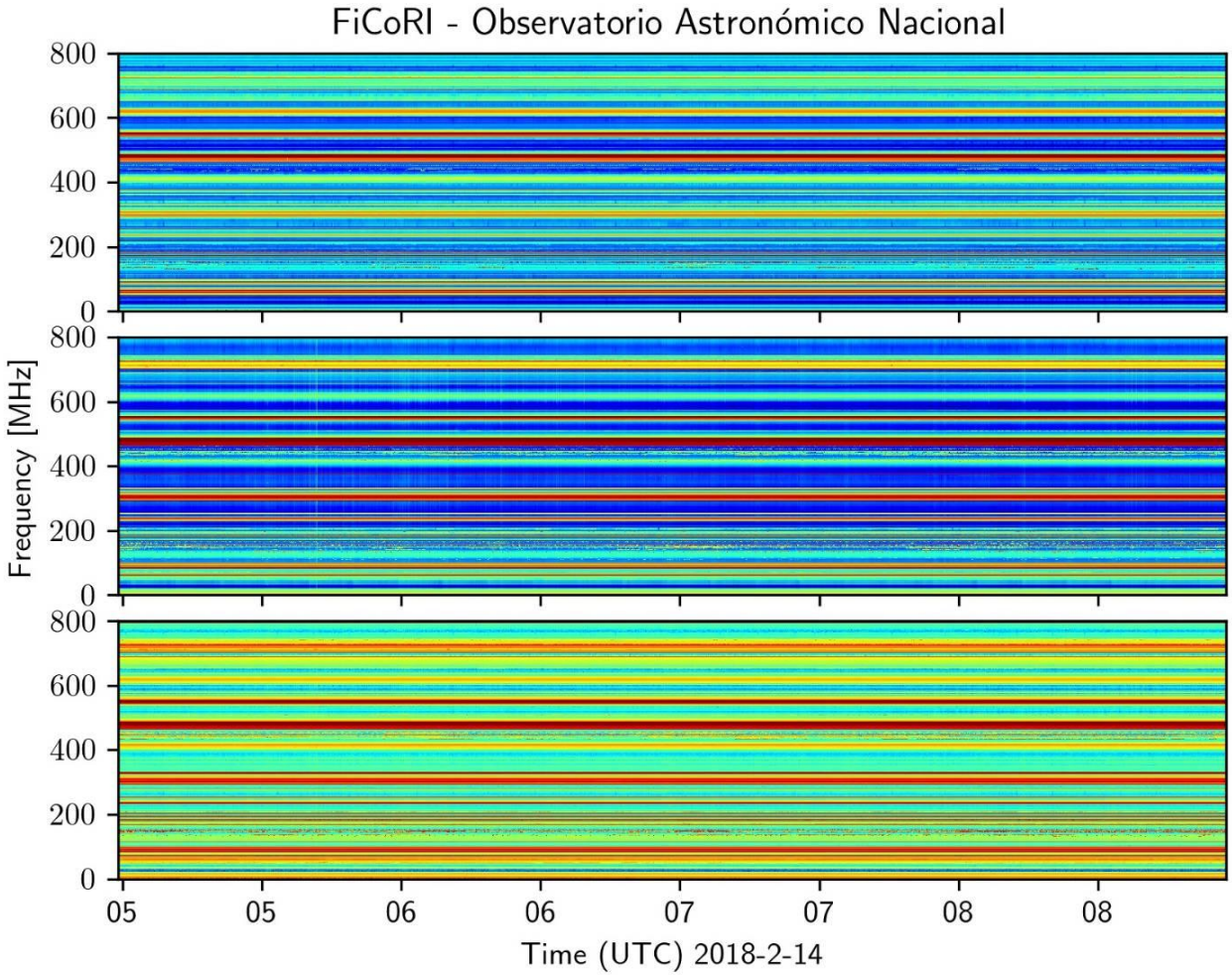

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¿Quieres usar los datos de FiCoRI?

En este momento los datos están disponibles continuamente desde el día 09 del mes de febrero del 2018. La solicitud de los mismos puede hacerla en un correo electrónica a

ficori_fcbog@unal.edu.co

En el transcurso de este mes estará terminada la página web (ahora en construcción) en donde se podrá ver el espectro por día, estará toda la información acerca del instrumento y la posibilidad de descarga de datos, en el dominio:

ficori.org

Todos los comentarios para mejorar son bienvenidos.

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