

# What are the sizes of sources in solar metric radio bursts?

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# INTRODUCTION

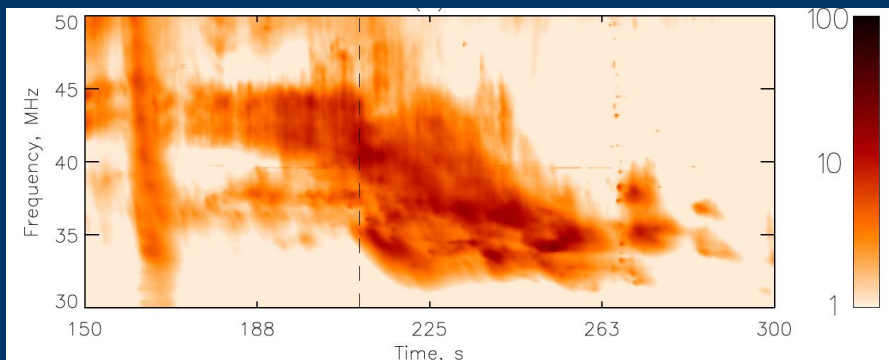
- Low-frequency (LF) radio emission is the only source of information about the upper corona of the Sun. Emission from solar radio bursts (SRB) is a unique diagnostic tool for energetic electrons transport through the upper corona
- LF radio waves should be scattered by plasma turbulence, and, hence, sizes and shapes of SRB sources should be sensitive to the level and properties of the turbulence in the corona
- However, it is not clear how big the sources are. Only a handful of single-frequency estimations exist (e.g. Abranin et al. 1978, Chen & Shawhan 1978, Kontar et al. 2017, Murphy et al. 2021).

# SUMMARY

- We use LOFAR spectral imaging data in the frequency range 30-45MHz
- Simple novel method, PSF translation, is used to evaluate the point-spread function (PSF) of the instrument and clean the observed images
- We find that **the average sizes of the sources are normally in the range 5-15 arcmin at 30MHz and decrease with frequency**
- **Shapes of the sources are consistent with the model of anisotropic radio-wave scattering in the corona** (Kontar et al. 2019)

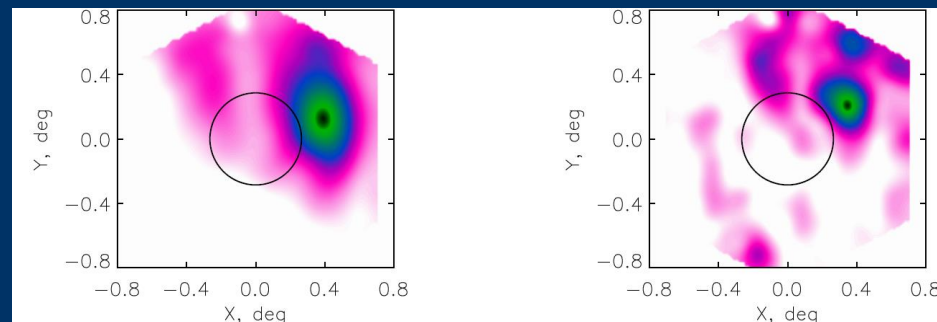
# CLEANING

DYNAMIC SPECTRUM, after 10:59:38UT on 15/7/2017

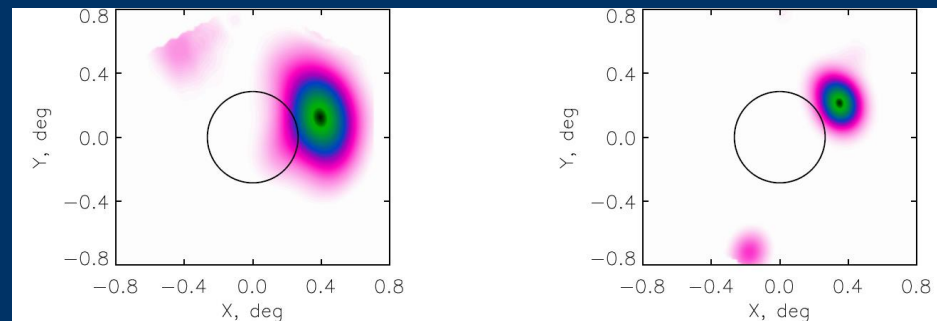


We clean solar radio images, i.e. deconvolve them removing the PSF, using CLEAN algorithm. The resulting clean component maps are fitted using 2D Gaussian functions

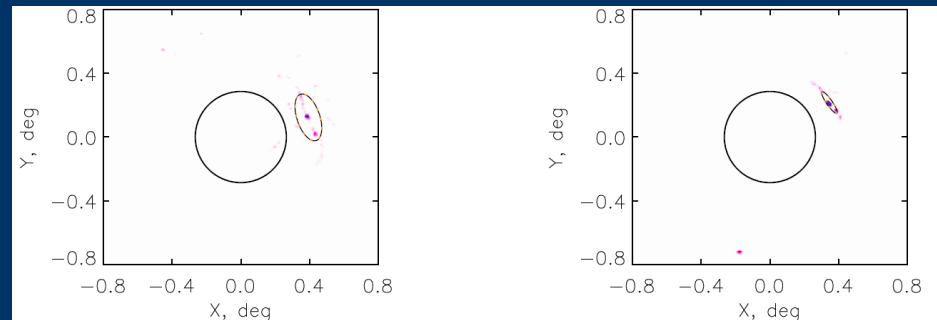
## APPARENT IMAGES



## 'CLEAN'ED IMAGES



## FITTED CLEAN COMPONENTS



30 MHz

45 MHz

# SIZES AND SHAPES

The average size (yellow line with error bars) is defined as  $(AB)^{1/2}$ ; A and B are the major and minor axes of the half-maximum contour. The sizes measured along the lines connecting the centre of solar disk with the sources (purple lines with triangles) are smaller than the sizes measured in perpendicular direction (purple lines with crosses), as predicted by the scattering models

