Scintillation Arc Monitoring with LOFAR

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Outline:

1. The dataset we use: Lofar

2. Scintillation arc sources:
   2.1  J0814+7429
   2.2  J0837+0610
   2.3  J1136+1551
   2.4  J1921+2153
Lofar (GLOW)

Frequency: 110 - 190 MHz

Resolution: Time: 10 s; Frequency: 5 khz

Stations: Effelsberg, Unterweilenbach, Tautenburg, Bornim, Norderstedt, Jülich
2.1 J0814+7429(B0809+74)

2.1.1 Dynamic spectrum and Secondary spectrum

Scintillation bandwidth: ~300 KHz (\sim \frac{1}{233} of our data frequency range)
Scintillation time-scale: ~15 mins

![Dynamic spectrum and Arc](image)
2.1 J0814+7429(B0809+74)

2.1.2 ACF drift with frequency at the same time
2.2 J0837+0610 (B0834+06)

2.2.1 Dynamic spectrum and Secondary spectrum

Scintillation bandwidth: \(\sim 10 \text{ Khz} \) (\(\sim \frac{1}{7000}\) of our data frequency bandwidth)

Scintillation time-scale: \(\sim 0.6 \text{ mins}\)
2.2 J0837+0610 (B0834+06)

2.2.2 scintillation parameters time series

Frequency resolution (5KHz)

Valley
2.2 J0837+0610 (B0834+06)

2.2.3 arc change with time

Shape: “Y” or “slingshot”
2.3 J1136+1551 (B1133+16)

2.3.1 Dynamic spectrum and Secondary spectrum

Scintillation bandwidth: ~15 Khz (~1/4667 of our data frequency bandwidth)
Scintillation time-scale: ~1.5 mins
2.3 J1136+1551 (B1133+16)

2.3.2 scintillation parameters time series

Is this common?

Valley

5KHz
2.3 J1136+1551 (B1133+16)

2.3.3 Arc variation with time at 154 MHz (for example)

Proper motion: 475 Km/s (L.Nicastro et al.2001)
2.4 J1921+2153 (B1919+21)

2.4.1 Dynamic spectrum and Secondary spectrum

Scintillation bandwidth: ~20 Khz (~1/3500 of our data frequency bandwidth)
Scintillation time-scale: ~1.2 mins
Extra – Scintillation with EPTA pulsars

1. PhD student: Yulan Liu
2. All EPTA dataset
3. For now, no arc was observed with Nancy data.
4. Website: https://www.physik.uni-bielefeld.de/~yliu/
Thank you!