



TEK ÇANAK RADYO TELESKOP KALİBRASYON TEKNİKLERİ

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20. ULUSAL ASTRONOMİ KONGRESİ - UAK2016 - ERZURUM



➤ Yapılanlar

- RADOM (kubbe) yenilendi (2015)
- Kontrol donanımları yenilendi (2015)
- Alıcı ve tayf ölçerler sisteme donanımsal olarak entegre edildi (2016)
- **Kontrol yazılımı (Rtcs) geliştirildi/geliştirilmeye devam ediyor (bkz. poster)**

➤ Yapılacaklar

- Tayf ölçerler kontrolü yazılıma dahil edilecek
- Takip sistemi testleri
- Düşünülen bandlar için filtre tasarımı
- Üretilen verinin indirgeme yazılımlarına uygun biçime dönüştürülmesi
- ...

Kalibrasyon doğruluğundan emin olunan (izlenebilirliği sağlanmış) referans ölçüm sistemi ile doğruluğundan emin olunamayan bir ölçüm sistemini mukayese ederek ölçüm sonuçlarını raporlama işlemidir.

<https://www.tse.org.tr/tr/icerikdetay/2224/338/metroloji-ve-kalibrasyon-hakkinda-genel-bilgi.aspx>

- Kısaca: ölçülen değer ile referans standart arasındaki sapma ve belirsizliğin tespit edilmesi

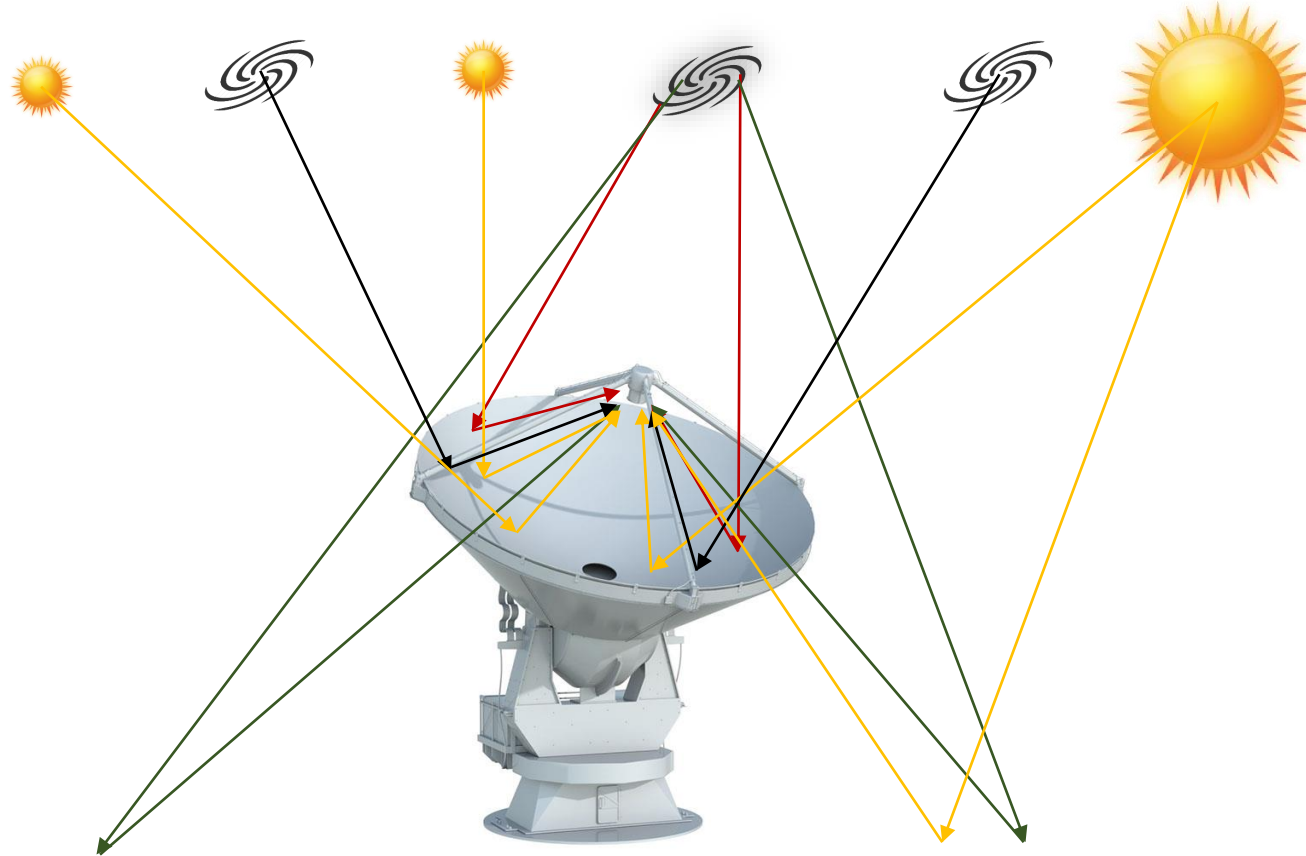
- Ölçüm cihazının gösterdiği değerlerin gerçek değerlere ne kadar yakın olduğunun tespiti için gereklidir.
- Bir radyo teleskoptan alınan ölçümlerin başka bir teleskopla alınan ölçümler ile doğrudan kıyaslamamanın zorluğu.
- Aynı teleskop için, aynı frekans bandında farklı zaman aralıklarında alınan ölçümlerin **farklılığı**. Örnek olarak -> yüzey hassasiyeti, alıcı gürültüsü, polarizasyon, kazanç kararlılığı, vb...
- Tüm bu farklılıklar, radyo teleskop sistem (anten) sıcaklığı, teleskop tepkisi (kazanç) ve atmosferik koşullardan kaynaklanır.



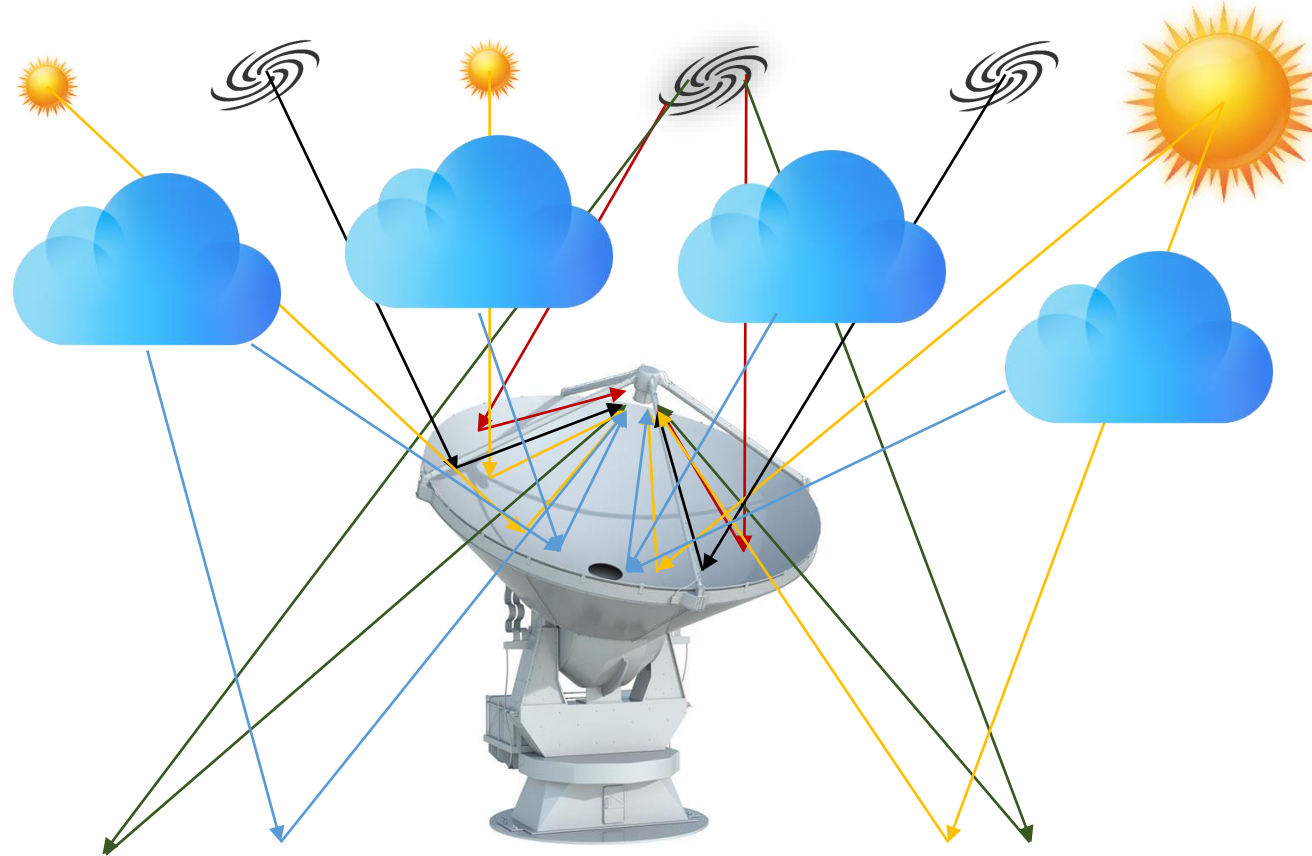
$$T_{ölçüm} = T_{kaynak} + T_{sistem}$$



$$T_{\text{ölçüm}} = T_{\text{kaynak}} + T_{\text{sistem}} + T_{\text{yer}}$$



$$T_{\text{ölçüm}} = T_{\text{kaynak}} + T_{\text{sistem}} + T_{\text{yer}} + T_{\text{atmosfer}}$$



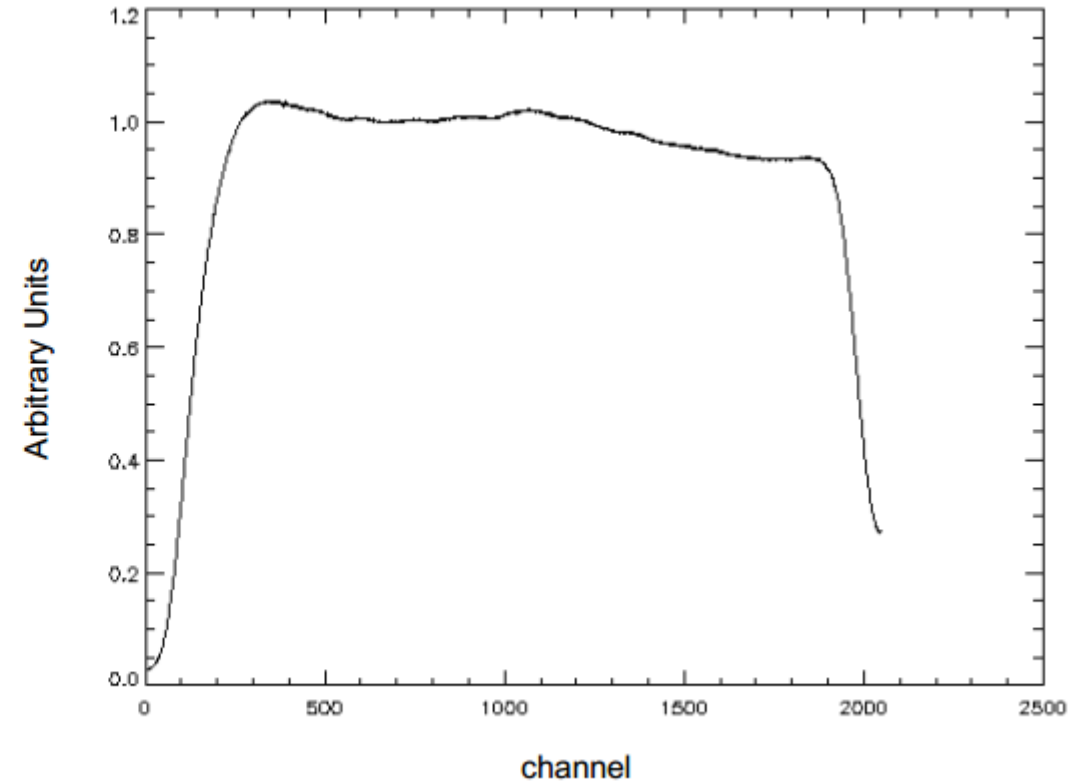
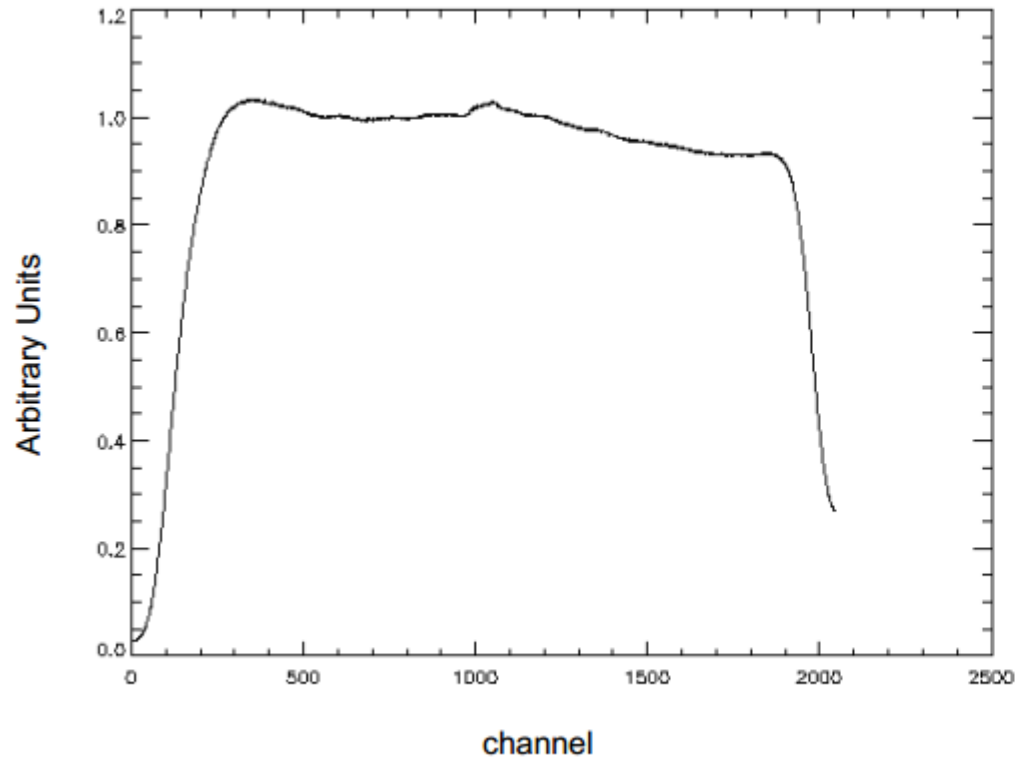
$$T_{\text{ölçüm}} = T_{\text{kaynak}} + T_{\text{sistem}} + T_{\text{yer}} + T_{\text{atmosfer}} + T_{\text{CMB}}$$

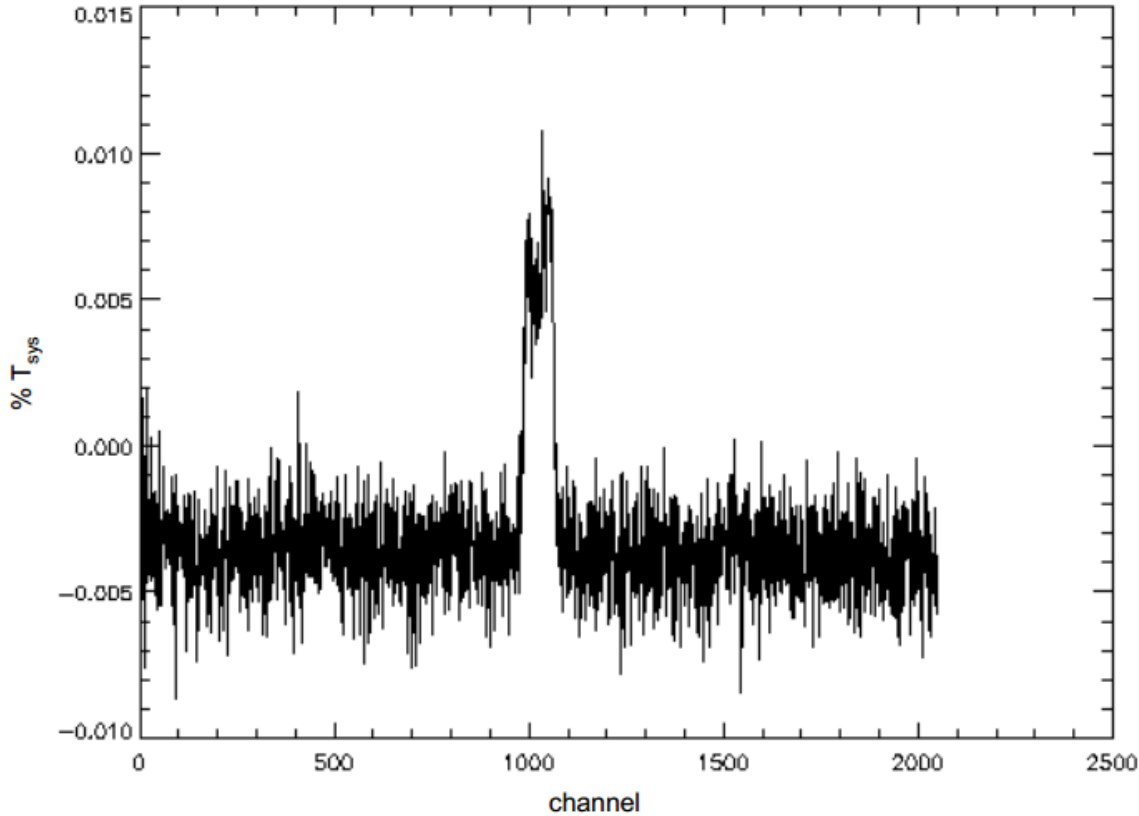
ON DURUMU (RADYO KAYNAK)

OFF DURUMU (DİĞER)

$$T_{ölçüm} = T_{kaynak} + T_{diğerleri}$$

$$T_{diğerleri}$$

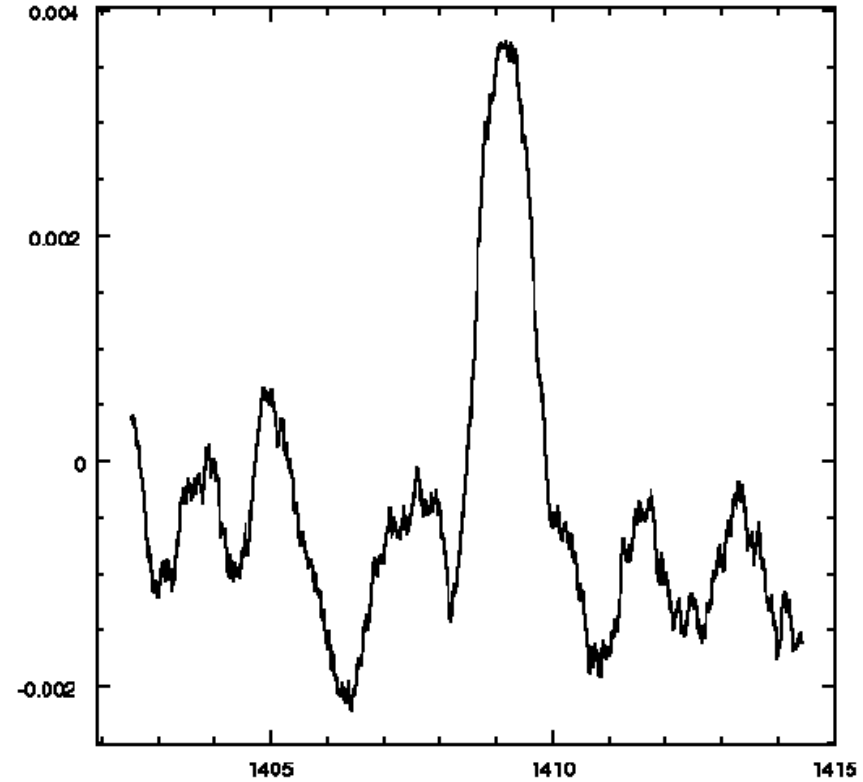
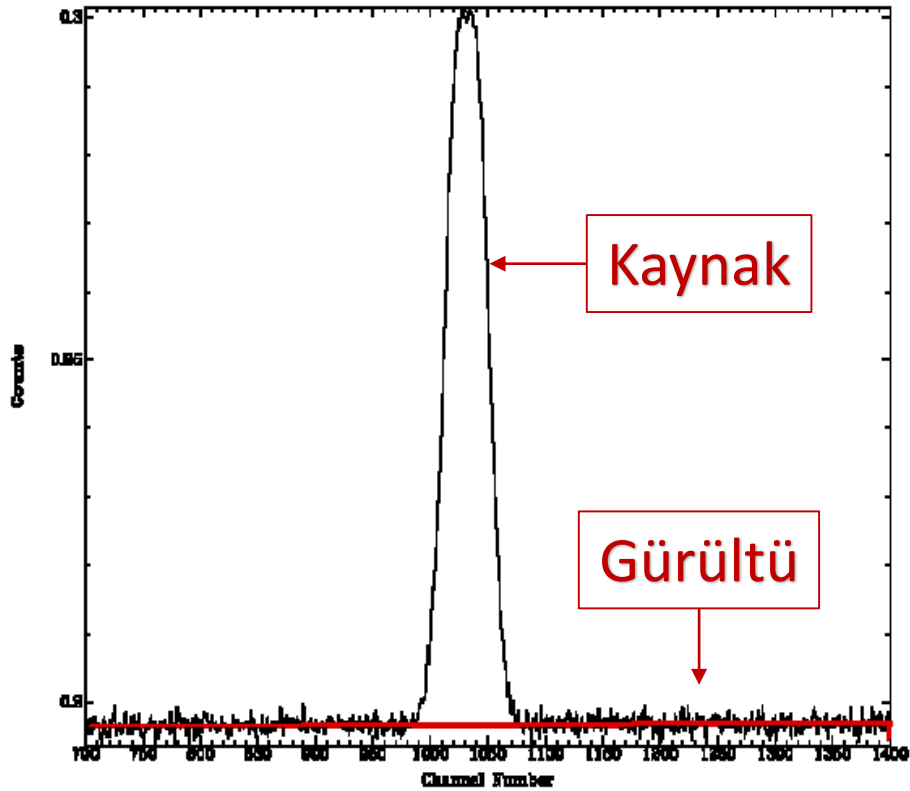




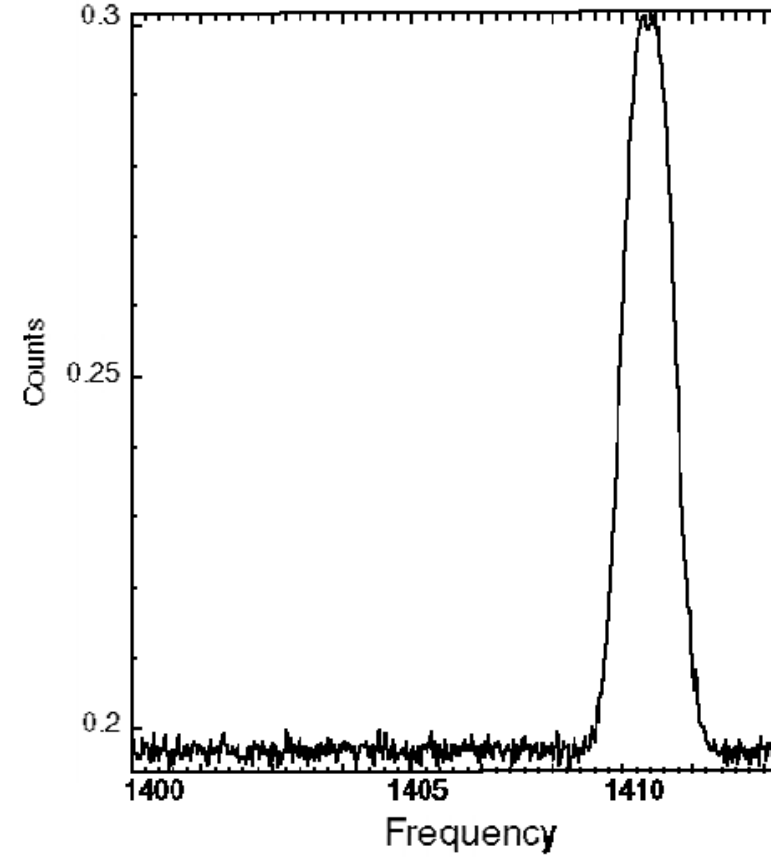
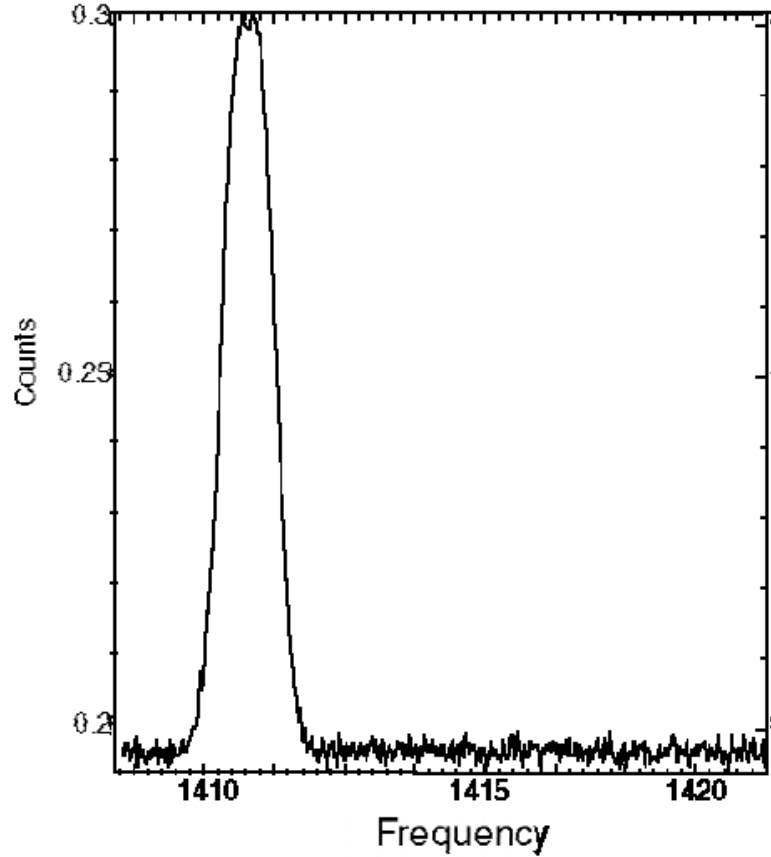
$$T_{kaynak} = (\text{ON} - \text{OFF}) / \text{OFF}$$

$$\text{OFF} = T_{sistem} + T_{yer} + T_{atmosfer} + T_{CMB}$$

1 - Baseline Fitting



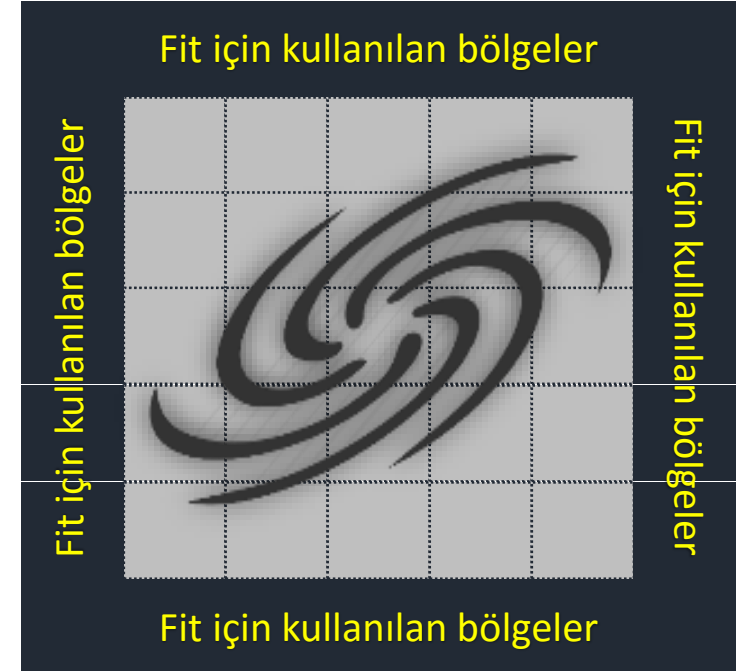
2 - Frekans deęiřtirme



3 - Pozisyon deęiřtirme



Belirli aralıklar ile
teleskop gökyüzünde
farklı bölgelere çevrilir.



EL

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC		
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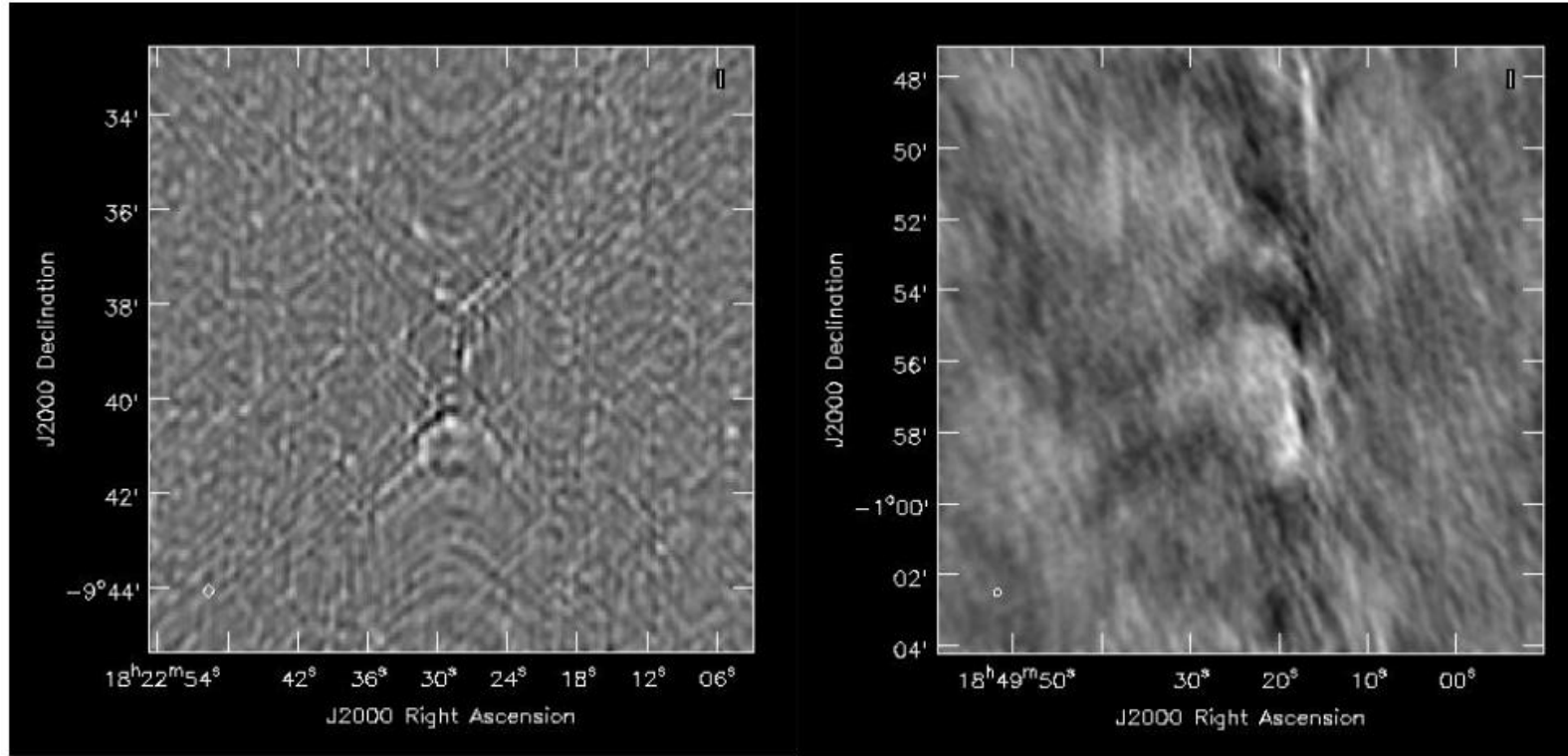
AZ

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	
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43																														

AZ

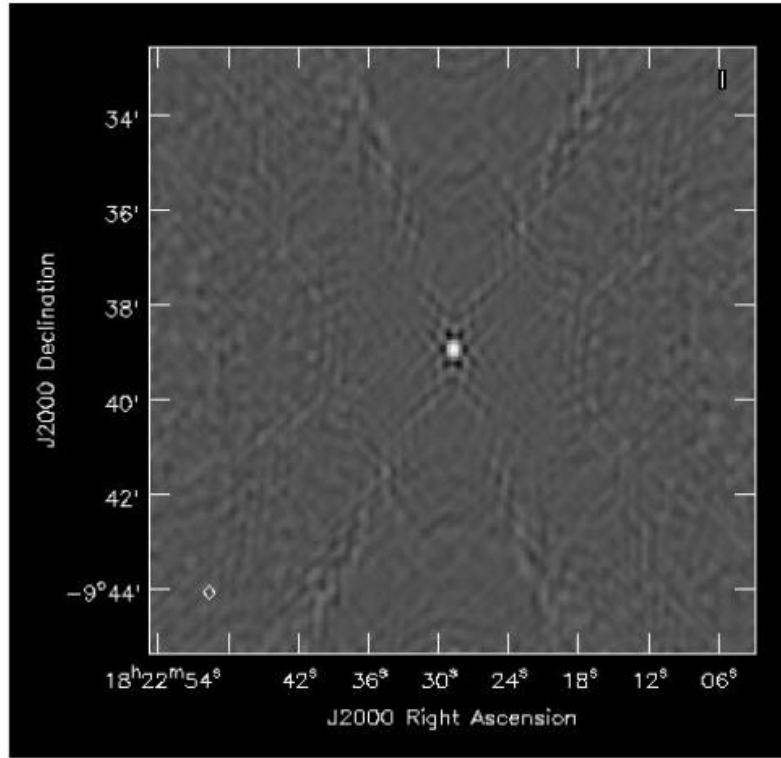
Kalibre edilmemiş veriler



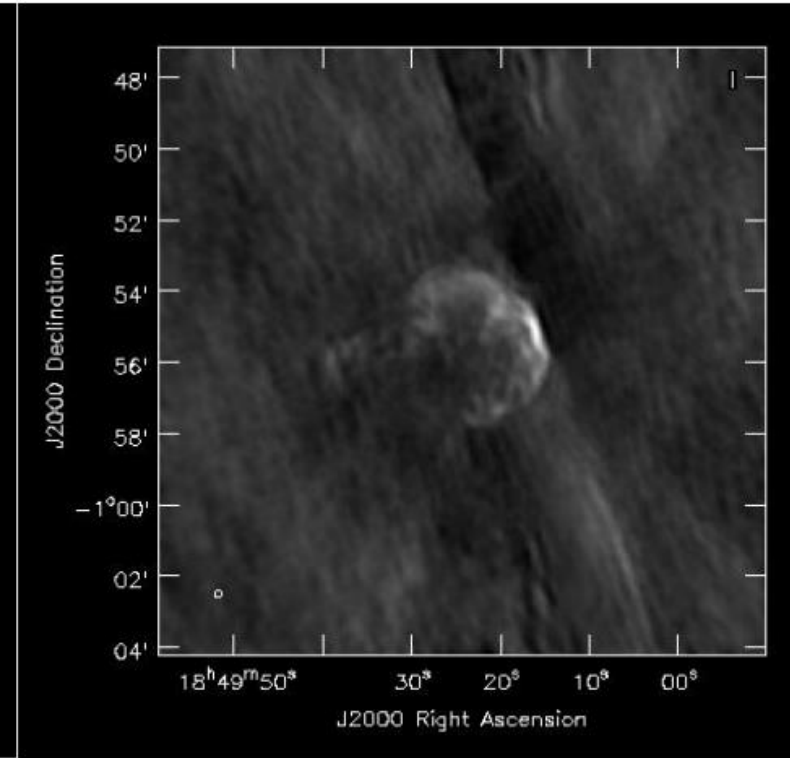
J1822-0938
(Kalibratör)

3C391
(SNR)

Kalibre edilmiş veriler

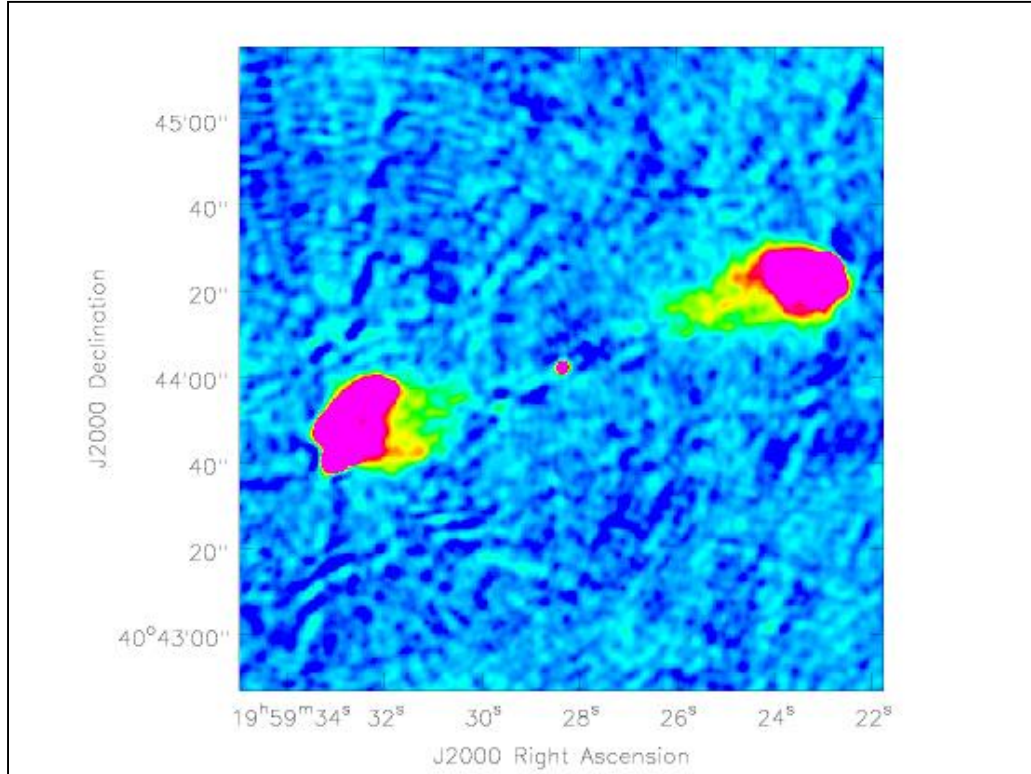


J1822-0938
(Kalibratör)

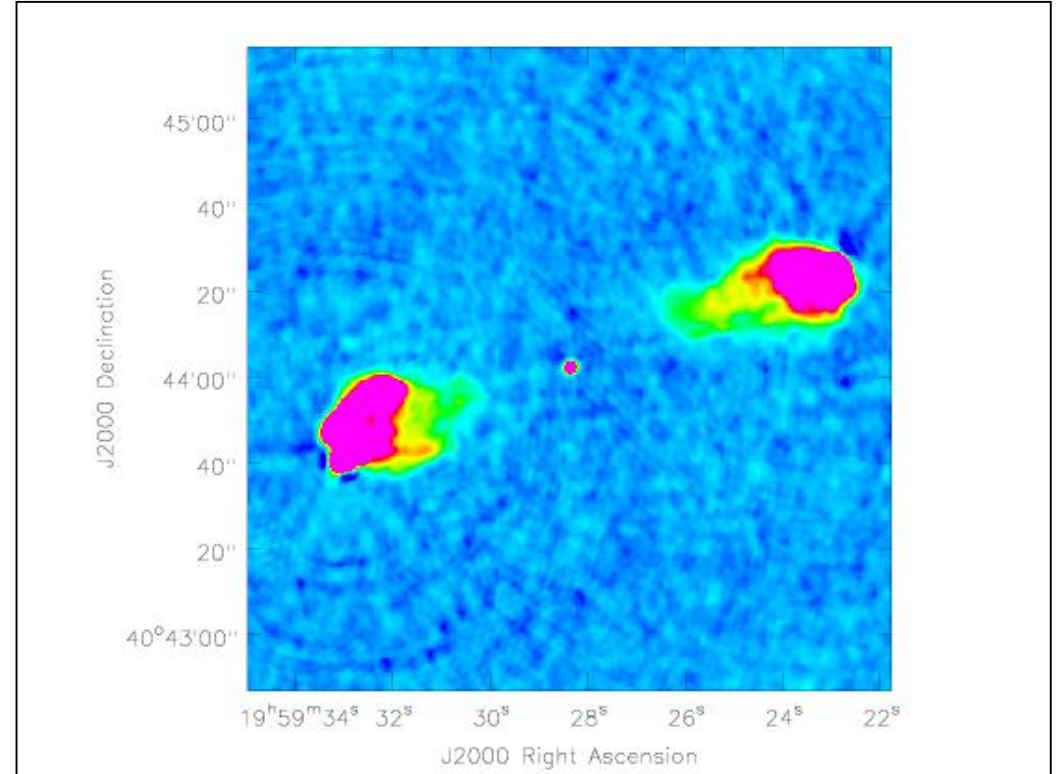


3C391
(SNR)

Cygnus A @8.4 GHz



Kalibrasyon öncesi



Kalibrasyon sonrası

- O'Neil, K., Single Dish Calibration Techniques at Radio Wavelengths (NAIC/Arecibo Observatory)
- Moellenbrock, G., Calibration & Editing, 9.th Synthesis Imaging Summer School, June 15-22,2004
- Wise, M., The Calibration Techniques of Radio Astronomy, 2013

Teşekkürler