

GBT Observations of Extra-Galactic Neutral Hydrogen

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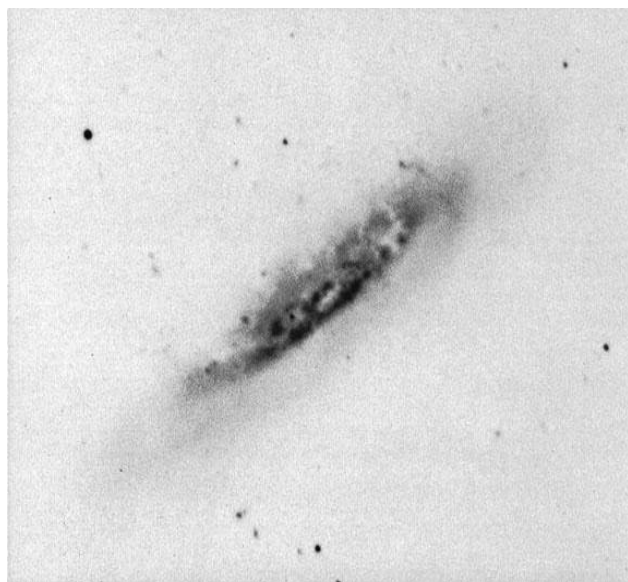


**Single Dish Summer School
July 17, 2009**

Our six minutes

1. Sample Selection
2. Observing Remotely with Green Bank
3. Data reduction
4. Post-reduction analysis
5. Conclusions/Things we learned
6. Future work

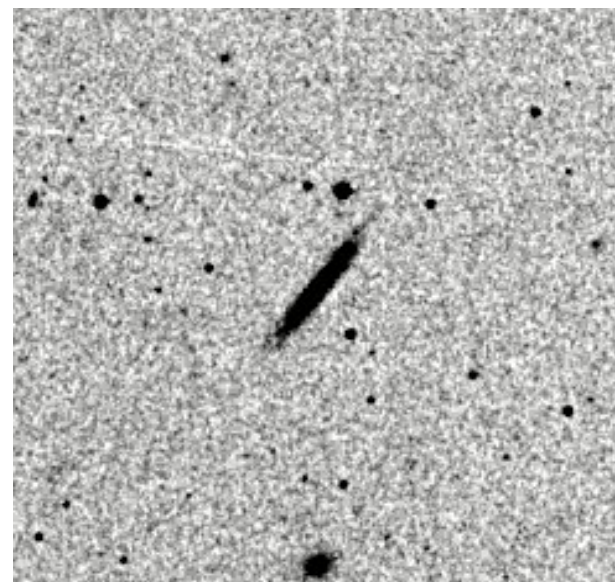
Our Galaxies!



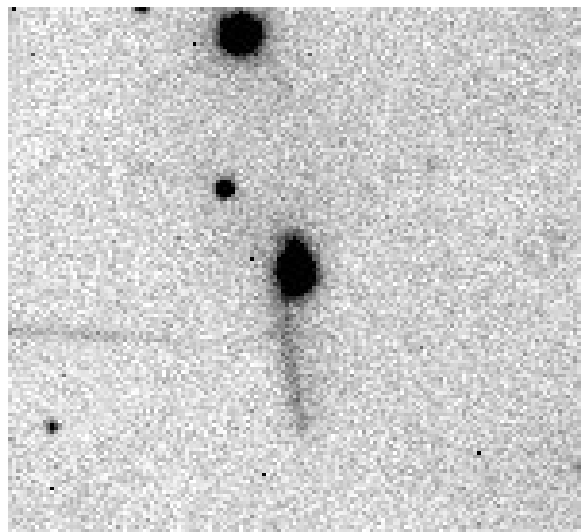
UGC
7711



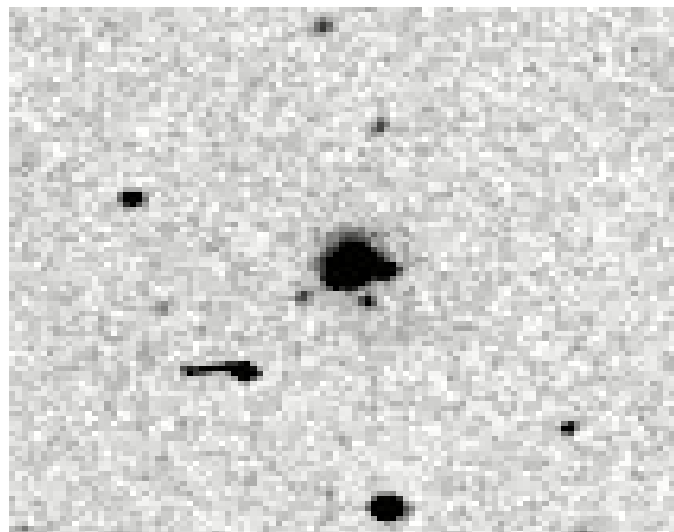
UGC 7215



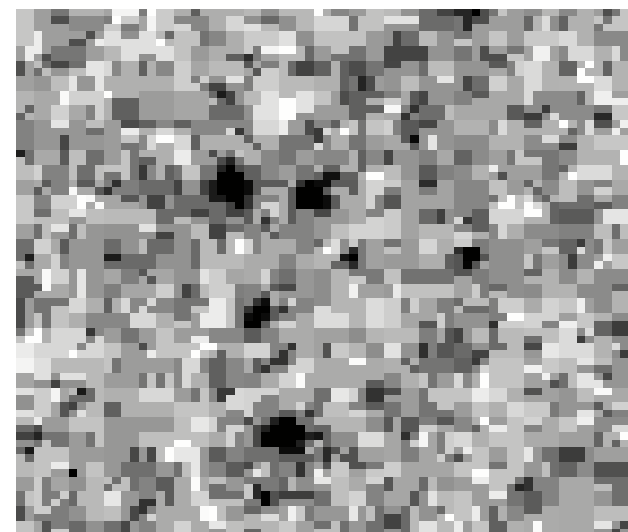
UGC 7993



Mrk 273



Mrk 231

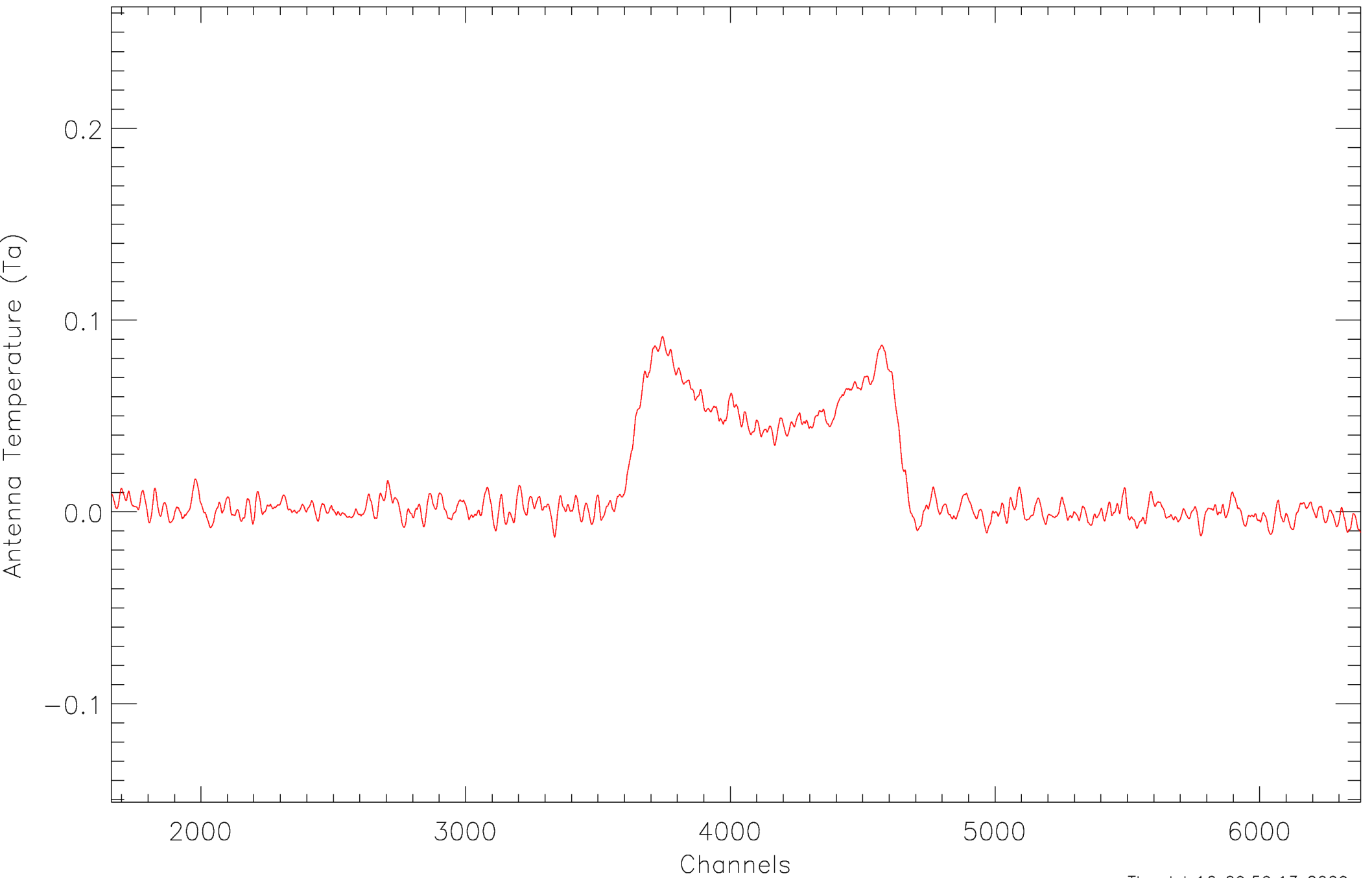


3C 258

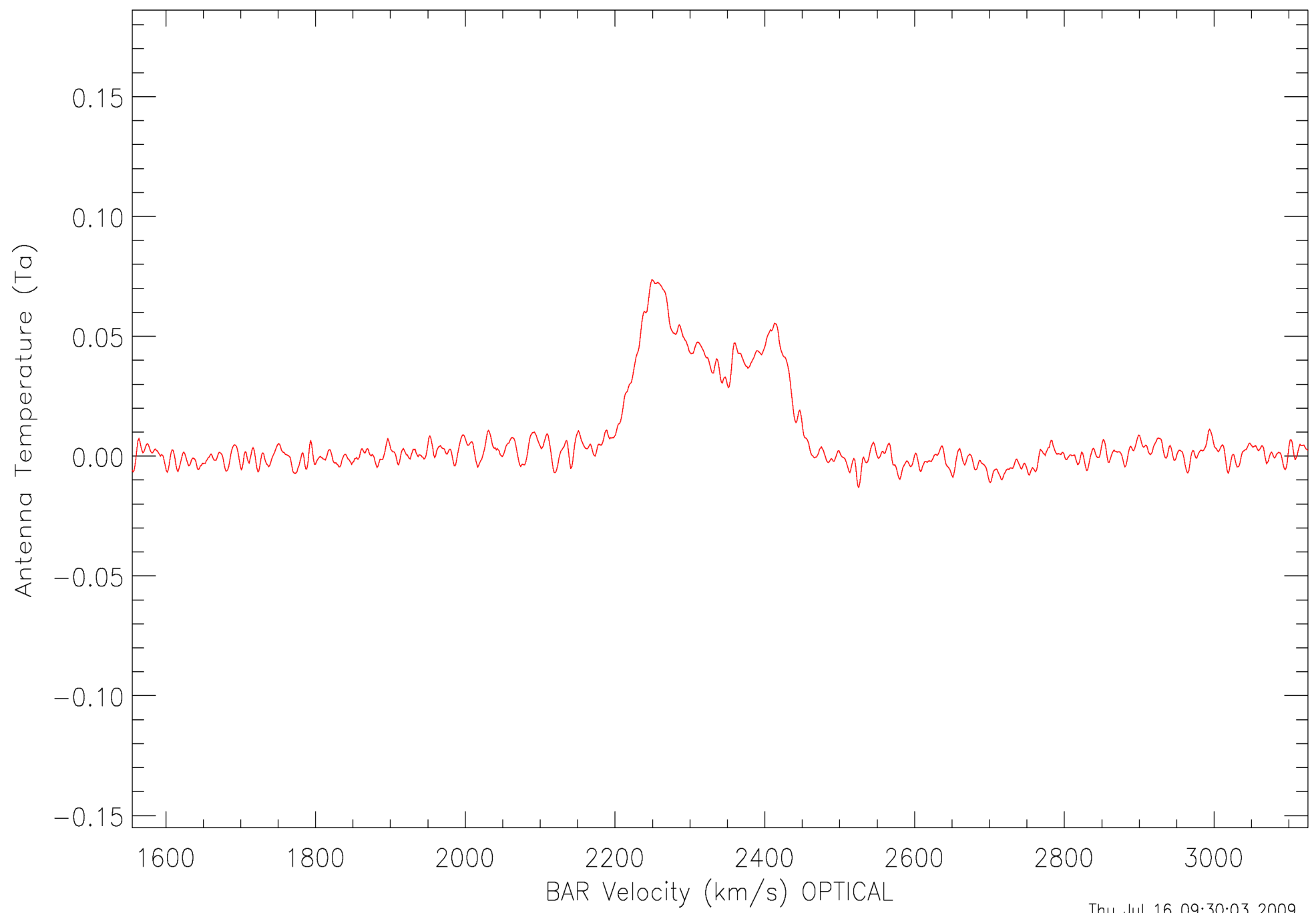
Spiral Galaxies

Data Reduction

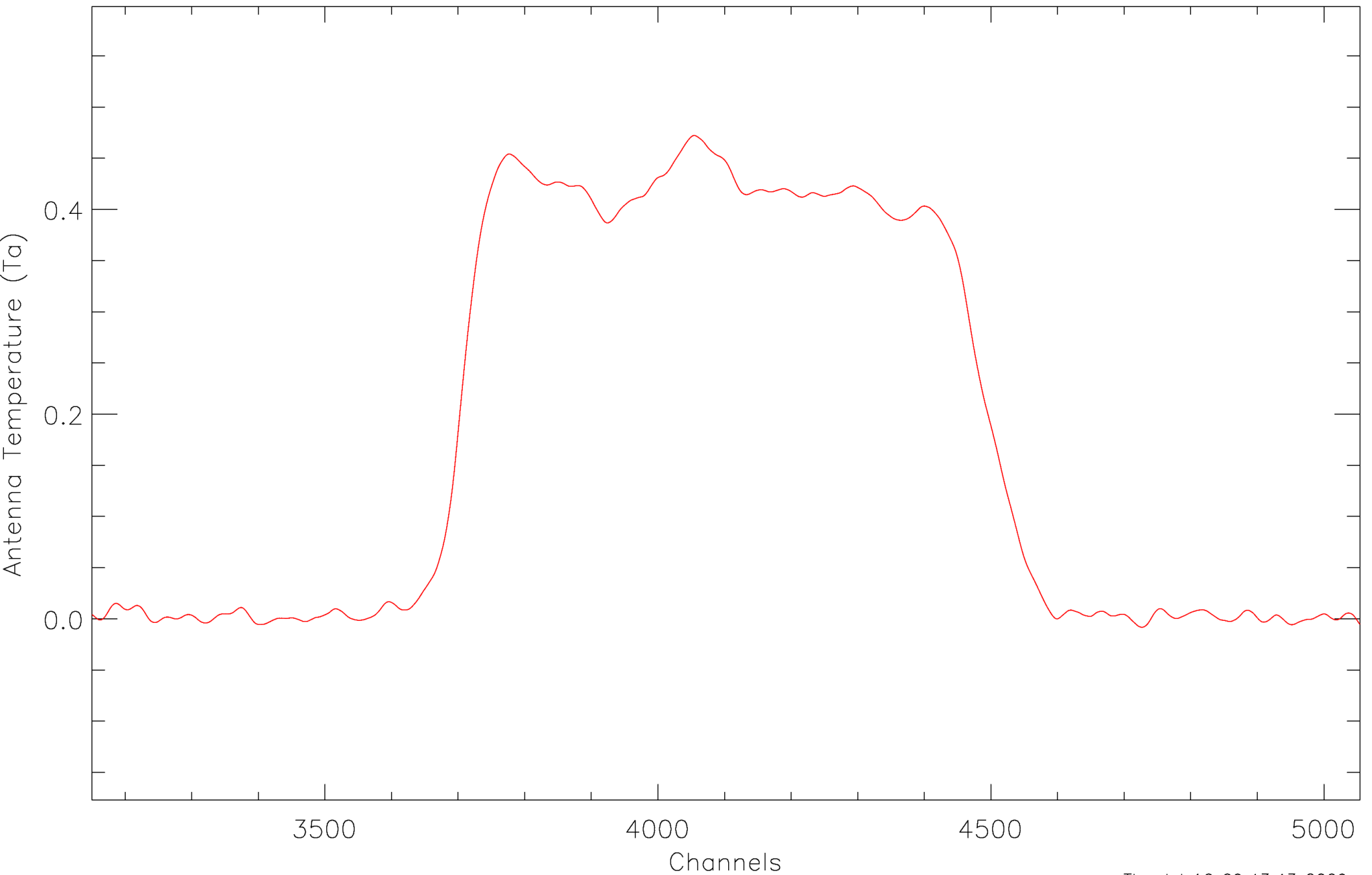
Scan 15 V : 4817.0 OPTI-BAR F0 : 1.42040 GHz Pol: I Tsys: 15.33
2009-07-13 Int : 00 04 46.7 Fsky : 1.39788 GHz IF : 0 Tcal: 1.45
SD Summer School LST : +12 56 28.9 BW : 12.5000 MHz AGBT09A_096_03 OnOff
12 50 31.60 +52 07 23.1 **ugc7993** Az: 356.4 El: 76.4 HA: 0.10



Scan 11 V : 2307.0 OPTI-BAR F0 : 1.42040 GHz Pol: YY Tsys: 15.84
2009-07-13 Int : 00 04 46.6 Fsky : 1.40943 GHz IF : 0 Tcal: 1.46
SD Summer School LST : +12 29 04.4 BW : 12.5000 MHz AGBT09A_096_03 OnOff
12 33 39.74 +09 10 30.1 **ugc7711** Az: 177.4 El: 60.8 HA: -0.08

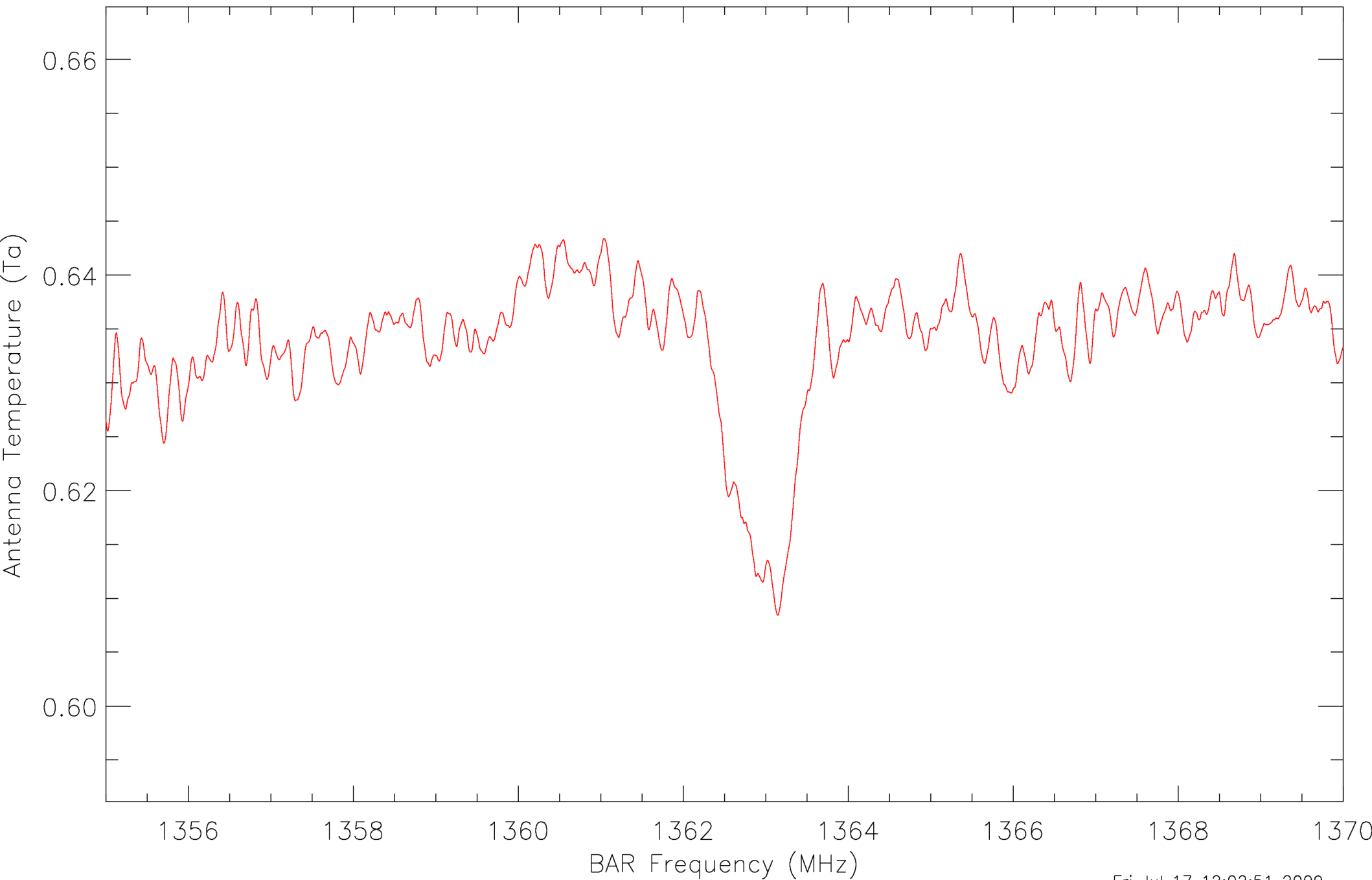


Scan 9 V : 378.0 OPTI-BAR F0 : 1.42040 GHz Pol: I Tsys: 15.88
2009-07-13 Int : 00 02 52.0 Fsky : 1.41849 GHz IF : 0 Tcal: 1.46
SD Summer School LST : +12 21 21.1 BW : 12.5000 MHz AGBT09A_096_03 OnOff
12 12 46.40 +10 51 57.0 **ugc7215** Az: 184.3 El: 62.4 HA: 0.14

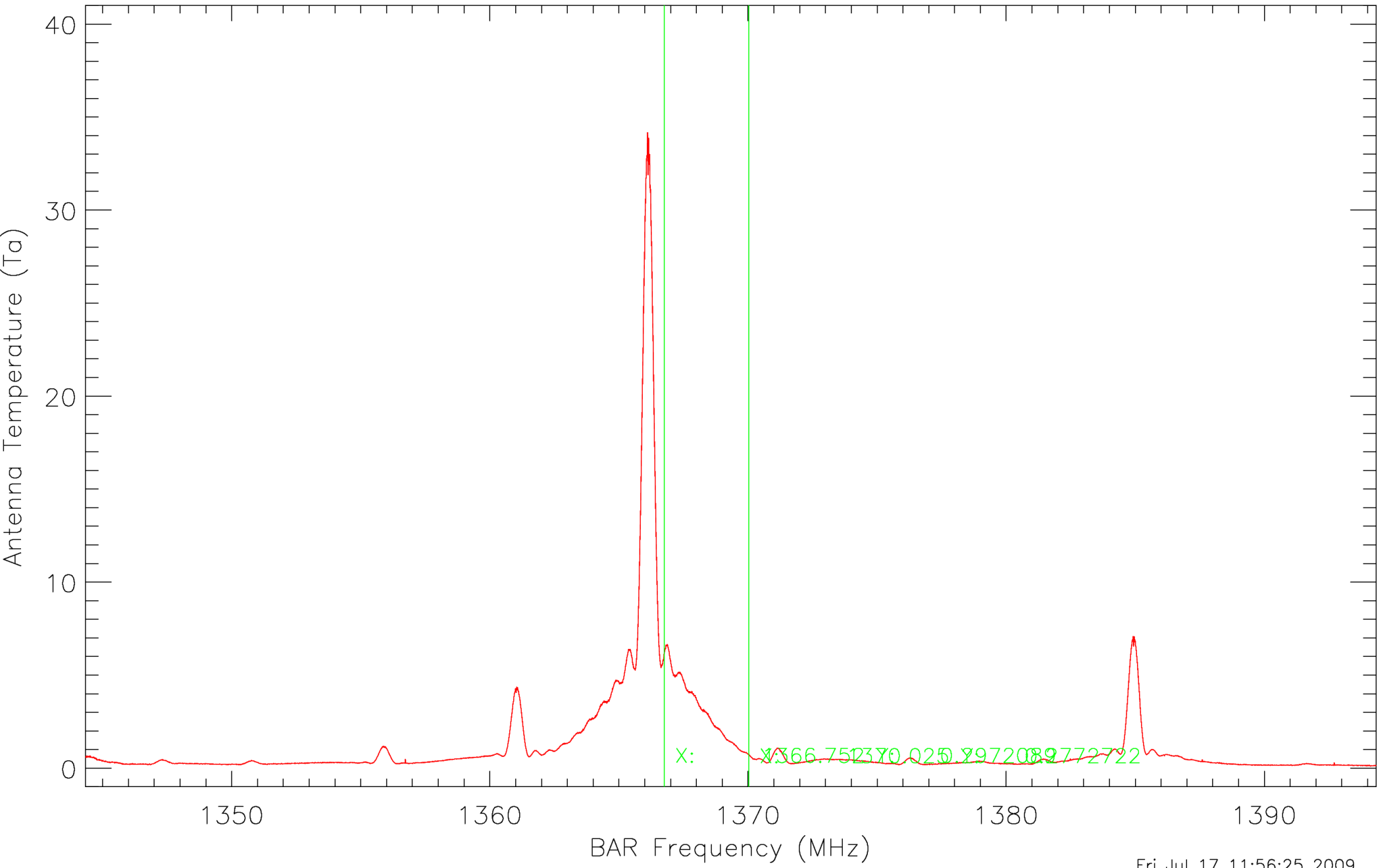


Luminous Infrared Galaxies Merging/Interacting Systems

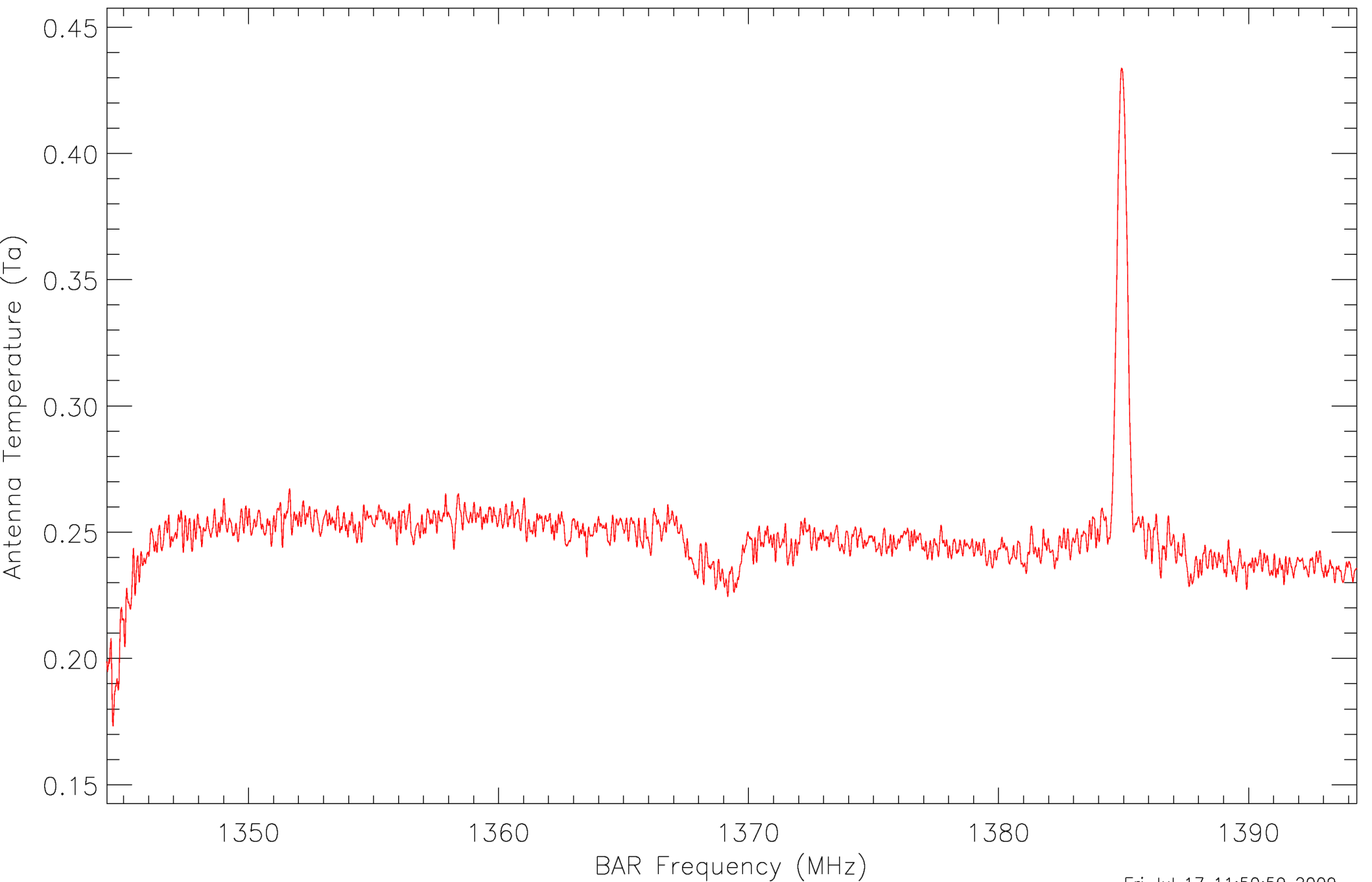
Scan 5 V : 12518.0 OPTI-BAR F0 : 1.42040 GHz Pol: I Tsys: 14.80
2009-07-14 Int : 00 04 58.5 Fsky : 1.36341 GHz IF : 0 Tcal: 1.42
SD Summer School LST : +12 07 50.8 BW : 50.0000 MHz AGBT09A_096_05 OnOff
12 56 14.00 +56 52 25.1 **mrk231** Az: 19.7 El: 70.0 HA: -0.81



Scan 7 V : 11180.0 OPTI-BAR F0 : 1.42040 GHz Pol: I Tsys: 14.93
2009-07-14 Int : 00 04 58.5 Fsky : 1.36928 GHz IF : 0 Tcal: 1.43
SD Summer School LST : +12 19 42.8 BW : 50.0000 MHz AGBT09A_096_05 OnOff
13 44 42.10 +55 53 13.1 mrk273 Az: 32.3 El: 67.6 HA: -1.42



Scan 7 V : 11180.0 OPTI-BAR F0 : 1.42040 GHz Pol: I Tsys: 14.93
2009-07-14 Int : 00 03 29.0 Fsky : 1.36928 GHz IF : 0 Tcal: 1.43
SD Summer School LST : +12 19 42.8 BW : 50.0000 MHz AGBT09A_096_05 OnOff
13 44 42.10 +55 53 13.1 mrk273 Az: 32.3 El: 67.6 HA: -1.42



Higher Redshift Galaxy

Scan 13 V : 49466.0 OPTI-BAR F0 : 1.42040 GHz Pol: I Tsys: 20.51
2009-07-14 Int : 00 09 56.9 Fsky : 1.21913 GHz IF : 0 Tcal: 1.47
SD Summer School LST : +12 55 00.5 BW : 50.0000 MHz AGBT09A_096_05 OnOff

11 24 43.70 +19 19 28.0

3C258

Az: 231.8 El: 62.8 HA: 1.50

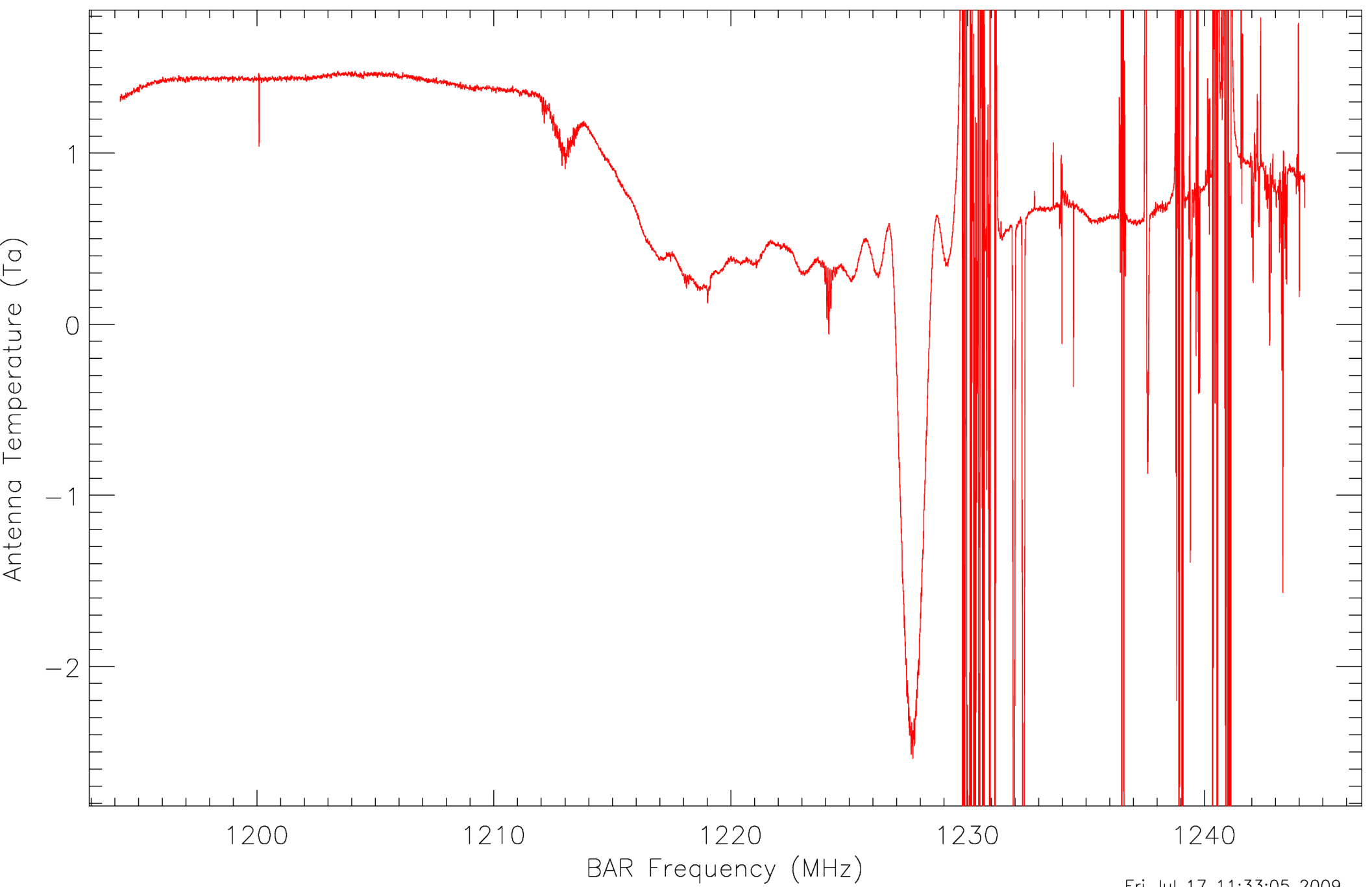


Table 1

<i>Galaxy</i>	<i>Integrated Flux</i>	<i>Velocity Width</i>	<i>D</i>	<i>radius</i>	<i>Mass of Hydrogen</i>
	[Jy * km/s]	[km/s]	[Mpc]	[arcmin]	[solar masses]
UGC 7215	53.1	273	18.97	5.5'	4.50E+009
UGC 7993	10	352	-		
UGC 7711	5.4	244	17.2	4.2'	3.78E+008

Measured

Values obtained from
literature

Calculated

Things that we learned:

- Making figures takes longer than anything else!
- RFI is not always deadly. It is useful to carefully look thru all of the data to identify if only portions are affected
- the power of IDL combining pre-written programs with our own needs

Future work:

- Observe the nondetections for longer time
- For galaxies with spectral lines near variable RFI use shorter integration times to flag the bad records
- Calculate hydrogen mass, total mass, column density, opacity (absorption profiles) and compare with data in the literature