End of Apparition Report: Saturn 2012-13

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Abstract

Presented here is a short *end of apparition report* covering observations made by the author of the planet Saturn during the 2012-13 apparition. In §1 we have the introduction which contains some preliminary information about the apparition and techniques used. In §2 we examine the specific features of the planet starting in the far south and working north, and the rings. In §3 we discuss an interesting observation of Titan, while in §4 we present the intensity estimates made in IL and in both red light (W25A) and blue light (W80A). In §5 we have some concluding remarks.

Contents

1 Introduction

This is an end of apparition report which summarizes the observations made by the author of the planet Saturn during the 2012-13 apparition. In this section, we first give some preliminary data, then we give a brief account of the apparition and how observations were made.

1.1 Preliminaries

The preliminary data is for the apparition is as follows:

Start of Observations: 2013 April 02	**End of Observations:** 2013 June 01
Opposition: 2013 April 28 (Virgo)	
Number of Observations: 10	(13 disk drawings)
Instruments used:	(A) 203mm Newtonian Reflector, *(Knighton Observatory, Leicester)*
	(B) 508mm Dall-Kirkham, *University of Leicester Observatory*

1.2 General Overview

During 2012-13, Saturn was once more situated in the constellation of Virgo and so low down for UK based observers. Bad weather conditions in Leicester towards the end of 2012 and the start of 2013 meant that observations were not started until 2013 April 02. The poor conditions meant that only a total number of 10 observations were made, and just 13 dis drawings of the planet were made. The planet had sunk too low for meaningful observation by the start of June, and the last observation made of the planet was on 2013 June 01. This meant the author was only able to provide coverage for a meager two months. This poor state of affairs is not made any easier to tolerate knowing that the situation can only get worse as the planet slips further into the southern hemispheres.

During the 2012-13 apparition, Saturn had an appreciable northerly tilt which meant that good views were obtained of the northern hemisphere and the northern polar region. However the ansae obscured most of the southern hemisphere, for most of the time only the southern polar region was detectable.

1.3 Method of Recording Observations

All observations of Saturn for the 2012-2013 apparition were recorded in the 'Field Observations Log Book', VOL III. The author used two telescopes during the apparition-

his own 203mm Newtonian reflector and the University of Leicester's 508mm Planewave Dall-Kirkham telescope. All observations were made visually the observations consist of

- Disk Drawings
- Intensity estimates in IL, W25A (red) and W80A blue filters.
- Filter work

Disk Drawings All disk drawings were made in black and white using the Saturn outlines found on the BAA Saturn Section website. The value of B was obtained from WINJUPOS. A black and white drawing was executed at the telescope after sufficient time had been spent examining the planet to see what features were present. In general disk drawings were executed in 12 minutes or under to ensure (as much as possible) that there was little error in the placement of features due to the planet's rapid rotation. Notes about intensity and colour were recorded and these notes were used to produce a coloured Saturn drawing which were transferred to the author's Saturn Log book.

All drawings are given with three systems of longitude (Patrick Moore's databook of astronomy)

- System I (ω_1) rotation of the Equatorial Zone: 10h 13m 59s
- System II (ω_2) rotation of everywhere else: 10h 38m
- System III (ω_3) internal: 10h 32m

2 The Planet

2.1 Southern Hemisphere

This was largely obscured by the ansae. In general only the southern polar region was visible along with a fraction of the south temperate zone. Although only a few observations were made of these regions it seemed to be the case that the SPR had a vague greyish appearance and the brighter STZ was somewhat yellowish.

2.2 Northern Hemisphere

Equatorial Zone [EZ] In general this was quite a light region, normally light yellowish in colour. For much of the time it seems that there was a vague equatorial belt present. The C-Ring passed through this region, and before opposition, the ShRG could be made out here. Early on, the EB seemed to be somewhat better defined as is shown in the observation made on 2013 April 02 (figure 1)

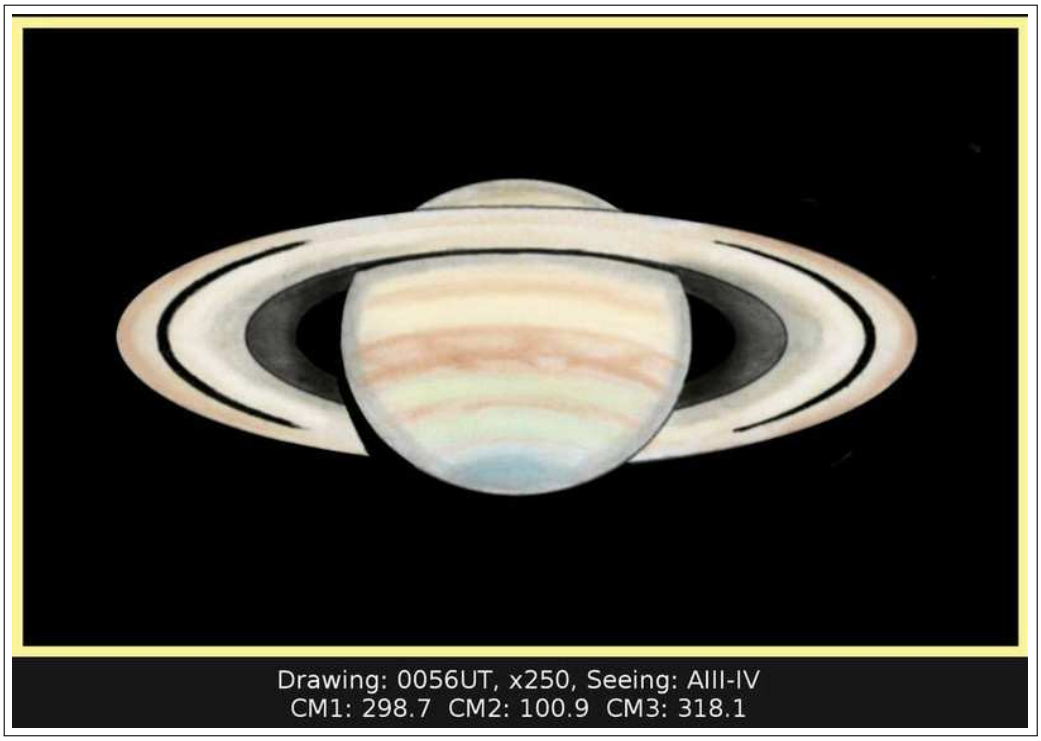

Figure 1: A light EB present on the disk. Observation made by the author on 2013 April 02 at 0056UT with a 203mm Newtonian Refl., x250.

North Equatorial Belt [NEB] This seemed to be the most interesting feature on the planet. In general the NEB took the form of a broad belt which was a brownish-tan colour (although sometimes subtle hints of rose could be detected). Initially it seemed that the belt was vaguely differentiated by a vaguely dark southern component (NEB(s)) and a darken northern component (NEB(n)). Separating the two components was a lighter zone- the NEBz. This was not always the case, and on a number of occasions there seemed to be other darker belt like sections within the NEBz between the northern and southern components.

The appearance of the NEB was not always uniform, frequently a number of darker sections appeared in the NEBz which took the form of subtle shadings, veils and lighter regions. Two examples of this are given in figures 2 and 3.

North Tropical Zone [NTropZ] A lighter region immediately north of the NEB. Although predominantly yellow in colour, the region did seem to contain a slight greenish tint on a number of occasions.

North Temperate Belt [NTB] An interesting feature, the NTB took the form of a light brownish-tan belt. Over the course of the apparition it appeared to change, sometimes appearing broad, other times appearing quite thin and rather obscure. On 2013 May 06-07 the STB seemed to be rather prominent in a W80A light blue filter, although it did not look overly remarkable in IL.

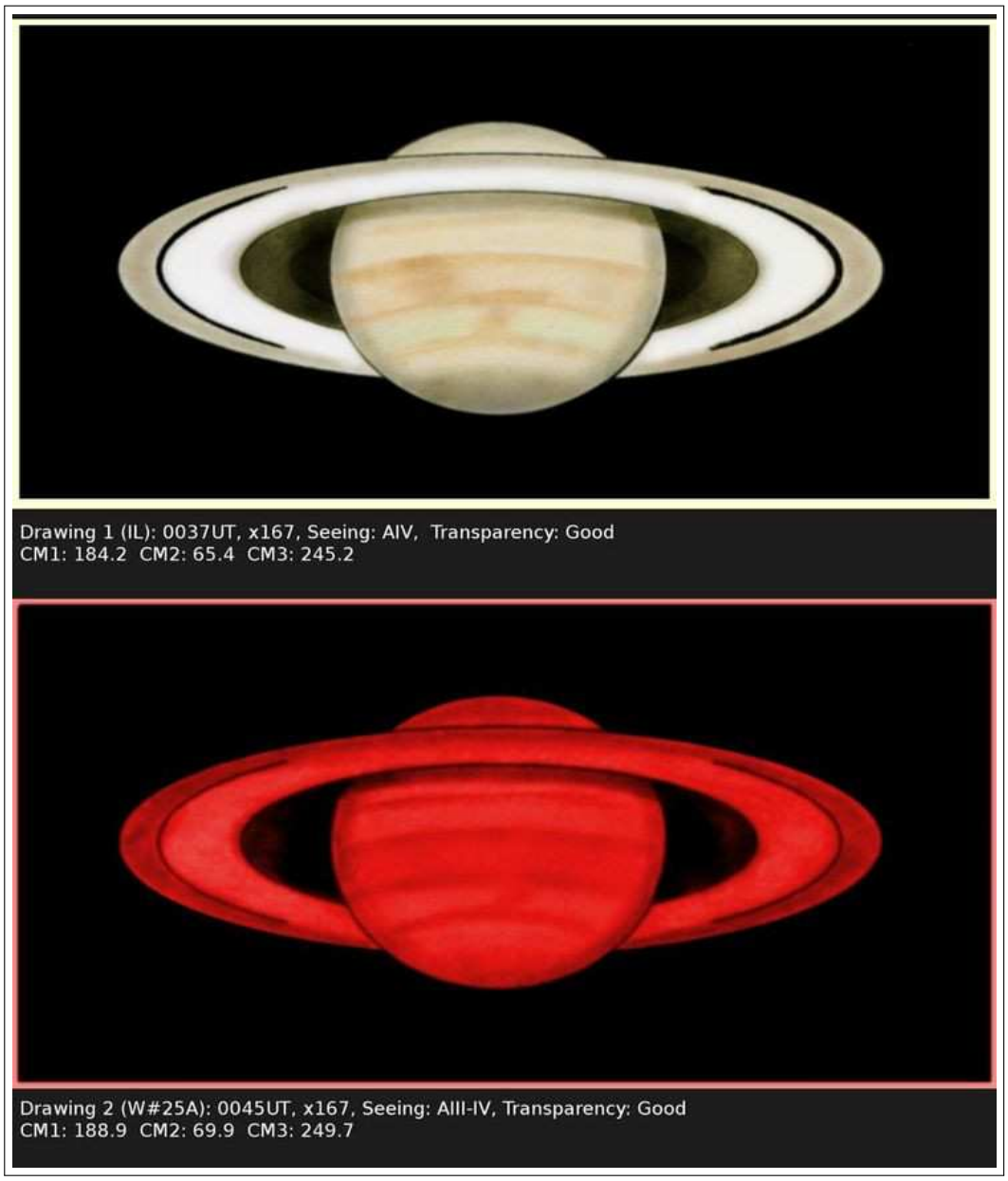

Figure 2: Observation of Saturn showing some a subtle shading in the NEBz in both IL (top) and in a W25A (red) filter (lower) The drawings were made on 2013 May 02-03 with the author's 203mm Newtonian refl., UT is given in the drawing.

Figure 3: Another interesting view of the NEB region, again more subtle structures seem to be in evidence. Observation made by the author on 2013 May 22 at 2331UT with a 203mm Newtonian refl., x200.

North Temperate Zone [NTZ] A lightish zone which was normally a yellowish colour. Sometimes the NTZ took on a greenish hue.

North Polar Region [NPR] This took the form of a dark greyish cap covering the north pole. Often the region was rather vague and ill defined, however in moments of good seeing, a darker North Polar Cap could be made out. Interestingly, many images of this region appear to show the polar hexagon, first imaged by the Voyager spacecraft and much more recently by the Cassini Spacecraft. Visually, the author could not detect any such structure with his 203mm Newtonian, however on 2013 April 16th using the University of Leicester's 508mm DK telescope, it did appear that the NPR had some linear structure associated with the cap. Conditions were not good however, and it is entirely possible that the effect was an illusion, and so the author would not claim to have observed the polar hexagon during this apparition.

2.3 The Rings

During the apparition, the ring tilt was rather appreciable and favored the northern hemisphere. The opposition effect where by the ansae brighten noticeably close to the time of opposition, then fade somewhat, was observed. The planet's low altitude meant that seeing was frequently poor, so the author made very few high power observations of the ansae. There were however some interesting observations made of the rings:

A-Ring The outermost ring which can be seen visually. Early on in the apparition, the A-Ring appeared to be quite light with a slight brownish cast. It seemed that by

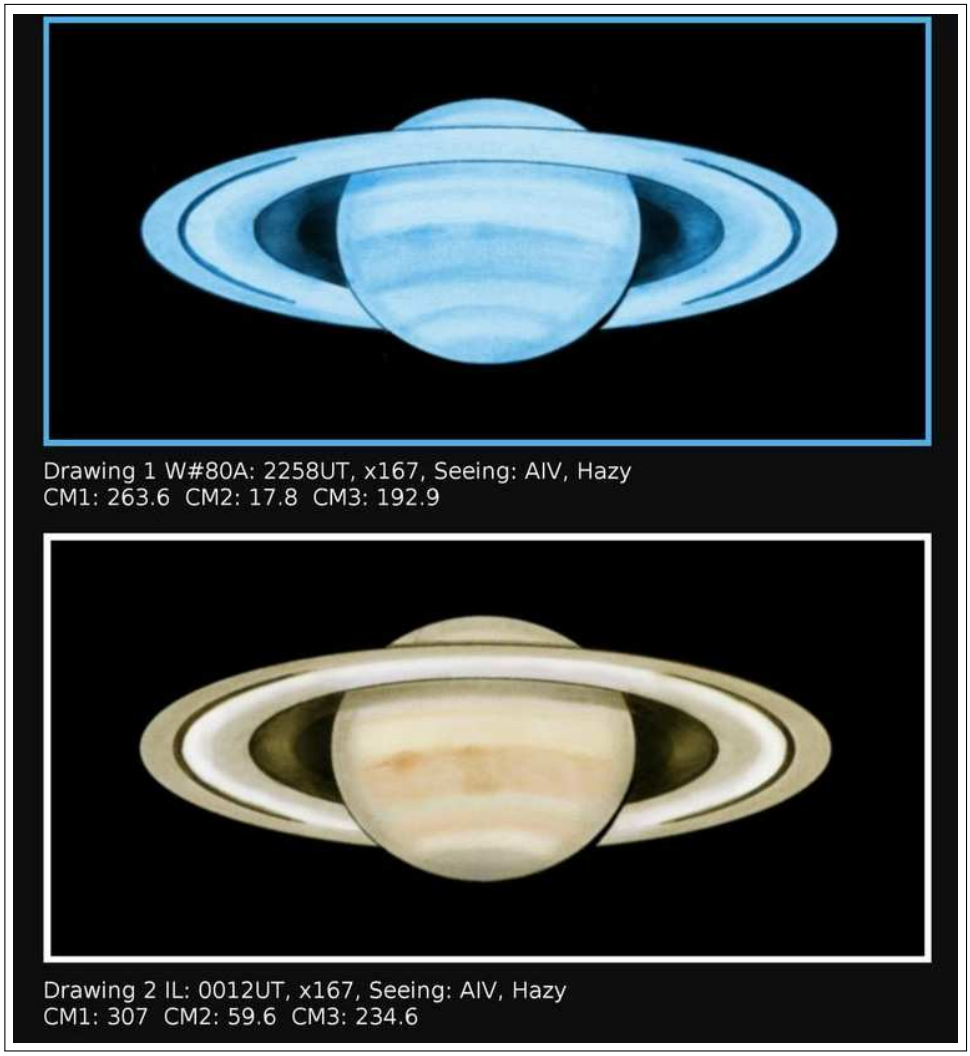

Figure 4: A broad NTB as it appeared to the author on 2013 May 06-07. The belt was more prominent in a W80Alight blue filter (upper drawing). The drawings were made with the author's 203mm Newtonian refl., x167.

early May 2013, the A-Ring had darkened somewhat and it's colour seemed to alternate to take on a more greyish brown colour. Interestingly, the A-ring was notably darker in the W25A (red) filter for all observation made after 2013 May 02-03 when the effect was first noted.

Cassini Division Was always observed, although the seeing conditions dictated how far the division could be traced around the ansae. On a number of occasions when the seeing was particularly poor, the colour of the division became a very dark brown rather than black.

B-Ring The brightest of the three main rings. Normally the B-Ring was white in colour, but sometimes it also took on a slight yellowish hue. The darker B2-Ring was not always observed, and when it was seen, it took the form of a slight darker, greyish region close to the C-Ring. This is more likely to be due to the planet's poor altitude, rather than an actual effect.

C-Ring The dark translucent, innermost ring. This was an interesting part of the ansae as it was not always uniform in appearance. In particular, it usually looked brighter at the ansae edges. Where the ring passes over the planet, it looks like a faint belt.

3 Satellites

Over the course of the previous apparition, observers David Gray, Alan Heath and myself suspected that Titan had undergone a slight colour change, and may have become somewhat redder. Due to the weather conditions during the previous apparition, the author was not able to make many observations of Titan. Similarly, the weather conditions during the 2012-13 apparition meant that few observations of Titan were recorded. However, on 2013 May 25th, the author did perceive Titan to be noticeably redder than usual. The planet was observed from 2308UT to 2338UT with a 203mm Newtonian, however conditions were poor with seeing at around AIV and a thin layer of cloud being present.

4 Intensity Estimates

Intensity estimates were made of the various features on the globe and the ansae. Estimates were made in integrated light along with a W25A red filter and with a W80A blue filter. The results are given in the tables below:

4.1 Integrated Light

THE BAA SATURN SECTION: VISUAL INTENSITY REPORT FORM

Observer: Paul G. Abel **Location:** Leicester UK
Year: 2012-2013

Instruments: A= 203mm Newtonian Reflector

INTEGRATED LIGHT

Month	April	May	May	May	June		
Day	2	3	6	25	1		
U.T	00:24	00:06	22:42	23:14	22:20		
Instrument	A	A	A	A	A		
Power	x250	x167	x167	x167	x167		
Seeing	AIII-IV	AIV	AIV	AIV	AIV		
The Planet						**Number of Observations**	**Intensity average for apparition**
SPR	4.00	–	–	–	3.00	2	3.50
EZ(n)	1.00	1.00	1.00	1.00	0.75	5	0.95
NEB(s)	4.50	5.00	4.50	4.50	4.00	5	4.50
NEB(z)	3.25	3.75	3.75	3.75	3.00	5	3.50
NEB(n)	4.50	5.00	4.00	4.00	4.00	5	4.30
NTropZ	1.75	3.00	3.00	3.25	3.25	5	2.85
NTB	3.00	4.50	3.75	3.25	3.50	5	3.60
NTZ	2.00	2.00	2.00	–	2.00	4	2.00
NPR	4.00	4.50	4.50	4.50	4.00	5	4.30
The Rings							
A-RIng	3.00	3.25	3.25	4.00	3.25	5	3.35
C.D.	10.00	9.00	9.00	9.00	9.00	5	9.20
B1-Ring	1.00	1.25	1.00	1.00	1.00	5	1.05

B2-RIng	2.50	–	2.50	–	2.50	3	2.50
B3-Ring	–	5.00	–	–	–	1	5.00
C-Ring	8.00	8.00	8.00	8.00	8.25	5	8.05

4.2 Red Light: W25A

THE BAA SATURN SECTION: VISUAL INTENSITY REPORT FORM

Observer: Dr. Paul G. Abel **Location:** Leicester UK
Year: 2012-2013

Instruments: A = 203mm Newtonian Reflector

W25A (RED)

Month	April	May	May	May	June		
Day	2	3	6	25	1		
U.T	00:29	00:17	22:50	23:18	22:25		
Instrument	A	A	A	A	A		
Power	x250	x167	x167	x167	x167		
Seeing	AIII-IV	AIV	AIV	AIV	AIV		
The Planet						**Number of Observations**	**Intensity average for apparition**
SPR	4.00	–	–	–	4.00	2	4.00
EZ(n)	1.50	1.50	1.50	1.75	2.00	5	1.65
NEB(s)	3.25	3.50	3.50	3.75	3.25	5	3.45
NEB(z)	–	–	3.00	3.50	3.00	3	3.17
NEB(n)	3.25	3.50	3.50	3.75	3.25	5	3.45
NTropZ	2.75	2.75	3.00	3.00	3.00	5	2.90
NTB	3.00	3.00	–	3.25	3.00	4	3.06
NTZ	2.75	3.00	3.00	–	2.50	4	2.81
NPR	4.50	4.50	4.50	4.50	4.50	5	4.50
The Rings							
A-RIng	4.50	4.00	4.50	4.50	4.00	5	4.30
C.D.	10.00	9.00	9.00	9.00	9.50	5	9.30
B1-Ring	2.50	2.50	2.00	1.50	1.50	5	2.00
B2-RIng	–	–	2.50	–	2.50	2	2.50
B3-Ring	–	6.00	–	–	–	1	6.00
C-Ring	7.50	7.50	7.75	8.00	9.00	5	7.95

4.3 Blue Light: W80A

THE BAA SATURN SECTION: VISUAL INTENSITY REPORT FORM

Observer: Paul G. Abel **Location:** Leicester UK
Year: 2012-2013

Instruments: A = 203mm Newtonian Reflector

W80A (LIGHT BLUE)

Month	April	May	May	May	June		
Day	2	3	6	25	1		
U.T	00:35	00:11	22:45	23:24	22:31		
Instrument	A	A	A	A	A		
Power	x250	x167	x167	x167	x167		
Seeing	AIII-IV	AIV	AIV	AIV	AIV		
The Planet						**Number of Observations**	**Intensity average for apparition**
SPR	3.50	–	–	–	3.50	2	3.50
EZ(n)	1.00	1.00	1.50	1.25	1.25	5	1.20
NEB(s)	5.50	1.50	5.50	5.00	4.75	5	4.45
NEB(z)	3.75	2.50	3.00	3.00	3.00	5	3.05
NEB(n)	5.50	5.50	4.00	4.00	4.75	5	4.75
NTropZ	2.00	2.00	3.00	3.00	3.25	5	2.65
NTB	2.75	3.50	3.50	3.25	3.00	5	3.20
NTZ	3.00	2.50	2.50	2.00	2.00	5	2.40
NPR	3.00	3.00	4.00	3.00	3.00	5	3.20
The Rings							
A-RIng	3.50	3.00	3.25	3.50	3.50	5	3.35
C.D.	10.00	9.00	8.00	9.00	9.00	5	9.00
B1-Ring	2.00	1.75	1.00	1.00	1.00	5	1.35
B2-RIng	1.75	–	1.75	–	–	2	1.75
B3-Ring	–	6.00	–	–	–	1	6.00
C-Ring	8.00	8.25	8.25	8.85	9.00	5	8.47

5 Concluding Remarks

The 2012-13 apparition was an interesting one, but the poor weather conditions seriously hampered observations. The small numbers of observations and disk drawings obtained make it difficult to draw any firm conclusions. However, the following remarks can be made

- The NEB was very broad and at times seemed to show many subtle structures including numerous belt components and zones, and sometimes shadings connecting the belts.
- The NEBn and NEBs components appeared at times to show darker, irregular sections
- NPR was usually a dark ill defined region in average-poor seeing. In better seeing however a dark polar cap could be made out. Using a 203mm Newtonian, this cap appeared to be perfectly regular and the author did not suspect the polar hexagon.
- A-Ring seemed to darken a little during the course of the apparition
- One observation of Titan was made on 2013 May 25th where the satellite looked particularly red.