NATIONAL RADIO ASTRONOMY OBSERVATORY

POST OFFICE BOX 2
GREEN BANK, WV 24944-0002
NRQZ OFFICE TELEPHONE (304) 456-2107 FAX (304) 456-2276
HTTP://WWW.GB.NRAO.EDU/ NRQZ@NRAO.EDU

NRQZ ID: 12518 13MAR2020

Gray Television Licensee, LLC
c/o Joseph M. Davis, P.E.
Chesapeake RF Consultants LLC
207 Old Dominion Road
Yorktown, VA 23692

Application Reason/Purpose	Prior coordination notification
File Number	Shall be provided by applicant
Applicant Name	Addressee
Call Sign	WSVW-LD Massanutten – Channel 30 WHSV-TV-DR1 Massanutten – Channel 34 WSVF-CD Massanutten – Channel 36
Site Name or Loc	Massanutten Mtn
Nearest City/State	Harrisonburg, VA
N Latitude	38 23 34.8
W Longitude	78 46 11.9
Ground Elevation (m) / AGL (m)	890.6 / 27
Freq. Band (MHz)	466-572 MHz, Channel 30 590-596 MHz, Channel 34 602-608 MHz, Channel 36
Emission Designator	DTV
System Configuration	See attached “FEW - Final Engineering Worksheet”
Previous NRAO Coordination No.	NRQZ ID 11040, 12021
Current NRAO Coordination No.	NRQZ ID 12518_13MAR2020

Dear Applicant:

The National Radio Quiet Zone (NRQZ) has evaluated these facilities to determine the interference impact on our highly sensitive radio astronomy operations.

NRAO Special Condition Statements + SGRS special condition statement:

The National Radio Astronomy Observatory (NRAO), Green Bank, WV, objects unless the Applicant's license is restricted to an Effective Radiated Power (ERP) as noted below:

- 12518-01, operating on 566-572 MHz to 3.9 Watts at Azimuth 273.1 degrees True North, and
- 12518-02, operating on 590-596 MHz to 4.1 Watts at Azimuth 273.1 degrees True North, and
- 12518-03, operating on 602-608 MHz to 4.2 Watts at Azimuth 273.1 degrees True North

To meet this Special Condition, the Applicant shall:

1. Use the final engineering submitted by Joseph Davis, Chesapeake RF Consultants, indicating that all facilities meet the ERP restriction.
2. Arrange for the requested site inspection to verify the implementation of this Special Condition.
3. Post a copy of this document and associated attachments at the Transmit facility.
4. Provide a Construction Notification as defined by the FCC for your specific radio service.

Reference Copy - Special Condition Statements

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Regulatory

The NRQZ Office requests that:

1. The FCC places the Special Condition on the Station License.
2. This Letter of Concurrence be attached to the FCC application.
3. The applicant provides the NRQZ Office with notice of its official filing with the FCC per section 47CFR1.924 (a) (2).

The National Radio Astronomy Observatory (NRAO) site located at Green Bank, Pocahontas County, WV, has no objection to this frequency assignment provided the special conditions are met.

Sugar Grove Research Station Special Condition

NOTE: Due to theCOVID-19 pandemic, the Sugar Grove Research Station is unable to review or provide comment on this frequency assignment. Reviews will continue as soon as the facility resumes normal operations. In the meantime, it is possible, that at the direction of the FCC, this frequency assignment request may be granted prior to the completion of the coordination requirements to the National Quiet Radio Zone (47 CFR 1.924), specifically by the Sugar Grove Research Station, a DOD Communications facility, in Sugar Grove, West Virginia.

Therefore, operation of the facilities specified herein is at applicant's own risk and subject to modification upon review and comment of the Sugar Grove Research Station thus fulfilling the provisions of the coordination process of the National Quiet Radio Zones. On behalf of Sugar Grove facility, the NRQZ office can provide updated concurrences to the FCC as deemed necessary.

This letter constitutes provisional coordination of assignment in the National Radio Quiet Zone as required by the FCC Rules and Regulations 47CFR1.924.

If I may be of assistance, please feel free to contact me.

Sincerest regards,

Paulette Woody

Digitally signed by Paulette Woody
Date: 2020.05.27 10:10:19 -04'00'

Paulette W. Woody
NRQZ Office Administrator
PWW:pww

file: 12518.docx
Attachments: Three (3) FEW - Final Engineering Worksheet

NOTE:
The NRQZ office, operating under the NRAO – Green Bank Observatory's IDOS or Infection Disease Operating Status due to the COVID-19 pandemic, is unable to provide original signed concurrence letters.
If a paper copy is required to fulfill Regulatory Department coordination requirements, the applicant must make that request in writing and it will be honored once normal operations resume.

This concurrence remains valid provided the data contained within is consistent with the applicant's filing at the Commission. Any discrepancy in system parameters, such as geographical coordinates (Latitude, Longitude, AMSL), antenna height above ground level (AGL), antenna gains or directivity (orientation), channel (operating frequency or frequency bands), emission type, and power requires re-coordination. If the Commission has questions regarding the validity of this or any concurrence, please direct inquiries to nrqz@nrao.edu or 304-456-2107.

Reference Copy - Special Condition Statements

3/13/2020 DATE

NRQZ# 12518- 01 Massanutten

http://www.ngdc.noaa.gov/geomag-web/#declination

Magnetic Declination Correction 9.7 ° West (Value only)

Location: WSVW-LD Massanutten (shared antenna with Ch. 34 and Ch. 36)

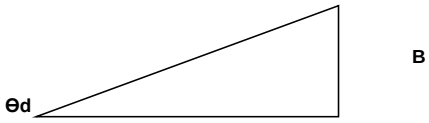
Latitude:	38 23 34.8	(ddmmss.s)	
Longitude:	78 46 11.9	(ddmmss.s)	
Ground Elev.:	890.6	Meters	2921.9 Ft
Antenna Ht.:	27	Meters	88.6 Ft
Frequency:	566 - 572	MHz	TV Channel 30

NRAO AERP (watts)

3.9	watts at	273.1	° True (Φd)
Scatter	watts at	273.1	° True
	watts at	273.1	° True

	Sector Name or Indicator	1 - Hpol		2 - Vpol		
a.	Antenna Type	ETU4U7-ETP4OX-34/36/30		ETU4U7-ETP4OX-34/36/30		
b.	Maximum Antenna Gain	10.93	dBd	6.61	dBd	
c.	Antenna Azimuth (° True or "omni")	93	°T	93	°T	
	Antenna Azimuth (Mag)	102.7	°Mag	102.7	°Mag	Antenna azimuth pattern supplied is already rotated to the desired orientation Pattern is centered at 93°T
d.	Az to GBT on Antenna Pattern	260.3	°	260.3	°	
e.	Antenna Gain to GBT (b - | f |)	-29.07	dB	-33.39	dB	
f.	Antenna Gain to GBT Below Maximum	-40.00	dB	-40.00	dB	
g.	Mechanical Downtilt (Φbt)		°		°	
h.	Loss to GBT Due to Mechanical Downtilt		dB		dB	
i.	Transmitter Output Power	1259	watts	1259	watts	
j.	System Losses: Combiner/Duplexer	-0.3	dB	-0.3	dB	
	Lightning Arrestor		dB		dB	
	Main Line	-0.839	dB	-0.839	dB	
	RF Filter		dB		dB	
	Misc. connectors, etc.		dB		dB	
j.	System Loss	(1.139)	dB	(1.139)	dB	
k.	Power to Antenna (ix j)	968.56	watts	968.56	watts	Total ERPd Hpol plus Vpol at 273°T 1.64 Watts Total to GBT
l.	Main Beam Power (k x b)	11998.47	watts	4437.37	watts	
m.	ERPd to GBT (I x (f + h)) or (I x (e - (h + j)))	1.20	watts	0.44	watts	

Power at output of duplexer	1174.97	1174.97
	1174.97	1174.97



Enter 1st Obstacle Information provided by NRQZ office

Θd = Angle to 1st Obstacle

42.21 km to 1st Obstacle

A = Distance to 1st Obstacle in Feet 138484

3010.50 TX AMSL (ft)

B = Ant Ht AMSL minus Ht of 1st Obs -1036.641312

4047.14 AMSL 1st Obstacle

Θd = arctan(B/A) = -0.43 °

A -Θd value indicates that the first obstacle is above the horizon

A +Θd value indicaes that the first obstacle is below the horizon

Effective mechanical downtilt adjustment:

Effective Elevation = Θd - Θbt cos(Φd - Φbt) =	0.0	0.0	0.0
Effective Elevation Adjustment =	0.0 °	0.0 °	0.0 °

Definitions:

Φd = Azimuth to GBT

Φbt = Azimuth of mechanical beam tilt (verticle)

Θd = Elevation to 1st obstacle (negative above horizon)

Θbt = Elevation of antenna mechanical beam tilt (neg. above horizon)

Note: No adjustments for electrical beam tilt are required because the pattern data already accounts for this

Effective azimuth on horizontal pattern = Φd - Antenna Azimuth (True) {If AZ<0, then add 360}

Effective elevation on vertical pattern = Θd - Θbt cos(Φd - Φbt) {IF ELEV<0, then add 360}

Antenna Gain = HPAT(Eff AZ) + VPAT(Eff ELEV) + Max Gain

Reference Copy - Special Condition Statements

Reference Copy - Special Condition Statements

6/7/2019 DATE

NRQZ# 12518-02 / 12021-02 / 10736 Massanutten

http://www.ngdc.noaa.gov/geomag-web/#declination

Magnetic Declination Correction 9.7 ° West (Value only)

Location: WHSV-TV-DRT1 Massanutten (shared antenna with WSVF-CD Ch-36)

Latitude:	38 23 34.8 (ddmmss.s)	
Longitude:	78 46 11.9 (ddmmss.s)	
Ground Elev.:	890.6 Meters	2921.9 Ft
Antenna Ht.:	22.6 Meters	74.1 Ft
Frequency:	590 - 596 MHz	TV Channel 34

NRAO AERP (watts)	4.1	watts at	273.1 ° True (Φd)
	Scatter	watts at	273.1 ° True
		watts at	273.1 ° True

	Sector Name or Indicator	1 - Hpol		2 - Vpol		
a.	Antenna Type	ERI ETU4U7-ETP4O-34/36/30		ERI ETU4U7-ETP4O-34/36/30		
b.	Maximum Antenna Gain	11.12	dBd	5.89	dBd	
c.	Antenna Azimuth (° True or "omni")	93	°T	93	°T	
	Antenna Azimuth (Mag)	102.7	°Mag	102.7	°Mag	Antenna azimuth pattern supplied is already rotated to the desired orientation Pattern is centered at 93°T
d.	Az to GBT on Antenna Pattern	260.3	°	260.3	°	
e.	Antenna Gain to GBT (b - | f |)	-28.88	dB	-34.11	dB	
f.	Antenna Gain to GBT Below Maximum	-40.00	dB	-40.00	dB	
g.	Mechanical Downtilt (Φbt)		°		°	
h.	Loss to GBT Due to Mechanical Downtilt		dB		dB	
i.	Transmitter Output Power	1514	watts	1514	watts	
j.	System Losses: Combiner/Duplexer	-0.3	dB	-0.3	dB	
	Lightning Arrestor		dB		dB	
	Main Line	-0.859	dB	-0.859	dB	
	RF Filter		dB		dB	
	Misc. connectors, etc.		dB		dB	
j.	System Loss	(1.16)	dB	(1.16)	dB	
k.	Power to Antenna (ix j)	1159.38	watts	1159.38	watts	Total ERPd Hpol plus Vpol at 273°T
l.	Main Beam Power (k x b)	15004.65	watts	4500.14	watts	1.95 Watts Total to GBT
m.	ERPd to GBT (l x (f + h)) or (l x (e - (h + j)))	1.50	watts	0.45	watts	

Power at output of duplexer	1412.95	1412.95
	1412.95	1412.95

Enter 1st Obstacle Information provided by NRQZ office

Θd = Angle to 1st Obstacle

42.21 km to 1st Obstacle	A = Distance to 1st Obstacle in Feet	138484
2996.06 TX AMSL (ft)	B = Ant Ht AMSL minus Ht of 1st Obs	-1051.077008
4047.14 AMSL 1st Obstacle	Θd = arctan(B/A) = -0.43 °	

A -Θd value indicates that the first obstacle is above the horizon

A +Θd value indicaes that the first obstacle is below the horizon

Effective mechanical downtilt adjustment:

Effective Elevation = Θd - Θbt cos(Φd - Φbt) =	0.0	0.0	0.0
Effective Elevation Adjustment =	0.0 °	0.0 °	0.0 °

Definitions:

Φd = Azimuth to GBT

Φbt = Azimuth of mechanical beam tilt (verticle)

Θd = Elevation to 1st obstacle (negative above horizon)

Θbt = Elevation of antenna mechanical beam tilt (neg. above horizon)

Note: No adjustments for electrical beam tilt are required because the pattern data already accounts for this

Effective azimuth on horizontal pattern = Φd - Antenna Azimuth (True) {If AZ<0, then add 360}

Effective elevation on vertical pattern = Θd - Θbt cos(Φd - Φbt) {IF ELEV<0, then add 360}

Antenna Gain = HPAT(Eff AZ) + VPAT(Eff ELEV) + Max Gain

Reference Copy - Special Condition Statements

6/7/2019 DATE

NRQZ# 12518-03 / 12021-01 / 10737 Massanutten

http://www.ngdc.noaa.gov/geomag-web/#declination

Magnetic Declination Correction 9.7 ° West (Value only)

Location: WSVF-CD Massanutten (shared antenna with WHSV-TV DRT1 Ch-34)

Latitude:	38 23 34.8	(ddmmss.s)	
Longitude:	78 46 11.9	(ddmmss.s)	
Ground Elev.:	890.6	Meters	2921.9 Ft
Antenna Ht.:	22.6	Meters	74.1 Ft
Frequency:	602 - 608	MHz	TV Channel 36

NRAO AERP (watts)

4.2	watts	at	273.1 ° True (Φd)
Scatter	watts	at	273.1 ° True
	watts	at	273.1 ° True

	Sector Name or Indicator	1 - Hpol		2 - Vpol		
a.	Antenna Type	ERI ETU4U7-ETP4O-34/36/30		ERI ETU4U7-ETP4O-34/36/30		
b.	Maximum Antenna Gain	11.23	dBd	5.55	dBd	
c.	Antenna Azimuth (° True or "omni")	93	°T	93	°T	
	Antenna Azimuth (Mag)	102.7	°Mag	102.7	°Mag	Antenna azimuth pattern supplied is already rotated to the desired orientation Pattern is centered at 93°T
d.	Az to GBT on Antenna Pattern	260.3	°	260.3	°	
e.	Antenna Gain to GBT (b - | f |)	-28.77	dB	-34.45	dB	
f.	Antenna Gain to GBT Below Maximum	-40.00	dB	-40.00	dB	
g.	Mechanical Downtilt (Φbt)		°		°	
h.	Loss to GBT Due to Mechanical Downtilt		dB		dB	
i.	Transmitter Output Power	1479	watts	1479	watts	
j.	System Losses: Combiner/Duplexer	-0.3	dB	-0.3	dB	
	Lightning Arrestor		dB		dB	
	Main Line	-0.868	dB	-0.868	dB	
	RF Filter		dB		dB	
	Misc. connectors, etc.		dB		dB	
j.	System Loss	(1.17)	dB	(1.17)	dB	
k.	Power to Antenna (ix j)	1130.23	watts	1130.23	watts	Total ERPd Hpol plus Vpol at 273°T 1.91 Watts Total to GBT
l.	Main Beam Power (k x b)	15002.66	watts	4056.66	watts	
m.	ERPd to GBT (I x (f + h)) or (I x (e - (h + j)))	1.50	watts	0.41	watts	

Power at output of duplexer	1380.28	1380.28
	1380.28	1380.28

Enter 1st Obstacle Information provided by NRQZ office

Θd = Angle to 1st Obstacle

42.21 km to 1st Obstacle

A = Distance to 1st Obstacle in Feet 138484

2996.06 TX AMSL (ft)

B = Ant Ht AMSL minus Ht of 1st Obs -1051.077008

4047.14 AMSL 1st Obstacle

Θd = arctan(B/A) = -0.43 °

A -Θd value indicates that the first obstacle is above the horizon

A +Θd value indicaes that the first obstacle is below the horizon

Effective mechanical downtilt adjustment:

Effective Elevation = Θd - Θbt cos(Φd - Φbt) =	0.0	0.0	0.0
Effective Elevation Adjustment =	0.0 °	0.0 °	0.0 °

Definitions:

Φd = Azimuth to GBT

Φbt = Azimuth of mechanical beam tilt (verticle)

Θd = Elevation to 1st obstacle (negative above horizon)

Θbt = Elevation of antenna mechanical beam tilt (neg. above horizon)

Note: No adjustments for electrical beam tilt are required because the pattern data already accounts for this

Effective azimuth on horizontal pattern = Φd - Antenna Azimuth (True) {If AZ<0, then add 360}

Effective elevation on vertical pattern = Θd - Θbt cos(Φd - Φbt) {IF ELEV<0, then add 360}

Antenna Gain = HPAT(Eff AZ) + VPAT(Eff ELEV) + Max Gain