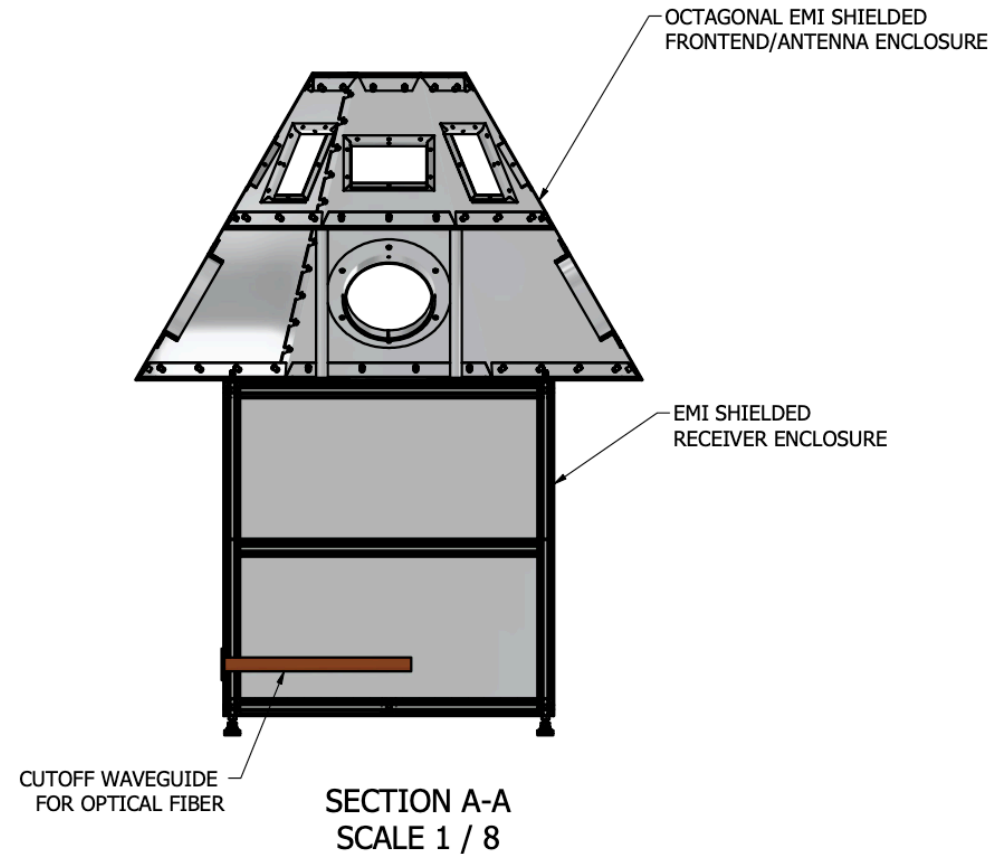


# RFI Monitoring with the Advanced Spectrum Monitor



Kevin Shoemaker, Advanced Spectrum Monitor Engineer

- **RFI Monitoring of an NRDZ Site**
  - The ASMH could be used to monitor the RFI environment for compliance at an NRDZ site
- **RFI Site Evaluation for NRDZ / ngVLA Locations**
  - During the planning of either a proposed NRDZ site and/or a proposed ngVLA site
- **RFI Monitoring at Observatories**
  - The device will be used to perform RFI monitoring at CDL, GBO, and the VLA.

# The ElectroMagnetic spectrum from NTIA

CDL

## UNITED STATES FREQUENCY ALLOCATIONS

### THE RADIO SPECTRUM

**RADIO SERVICES COLOR LEGEND**

AERIAL RADIO MOBILE	INTER SATELLITE	RADIO ASTRONOMY
AERONAUTICAL MOBILE SATELLITE	LAND MOBILE	RADIO DETERMINATION SATELLITE
AERONAUTICAL BASE/NAVIGATION	LAND MOBILE SATELLITE	RADIO LOCATION
AMATEUR	MARITIME MOBILE	RADIO LOCATION SATELLITE
AMATEUR SATELLITE	MARITIME MOBILE SATELLITE	RADIO NAVIGATION
BROADCASTING	MARITIME RADIO/NAVIGATION	RADIO NAVIGATION SATELLITE
BROADCASTING SATELLITE	METEOROLOGICAL	SPACE OPERATION
EARTH EXPLORATION SATELLITE	ASTRONOMICAL SATELLITE	SPACE RESEARCH
FIXED	MOBILE	STANDARD FREQUENCY AND TIME SIGNAL
FIXED SATELLITE	MOBILE SATELLITE	STANDARD FREQUENCY AND TIME SIGNAL SATELLITE

**ACTIVITY CODE**

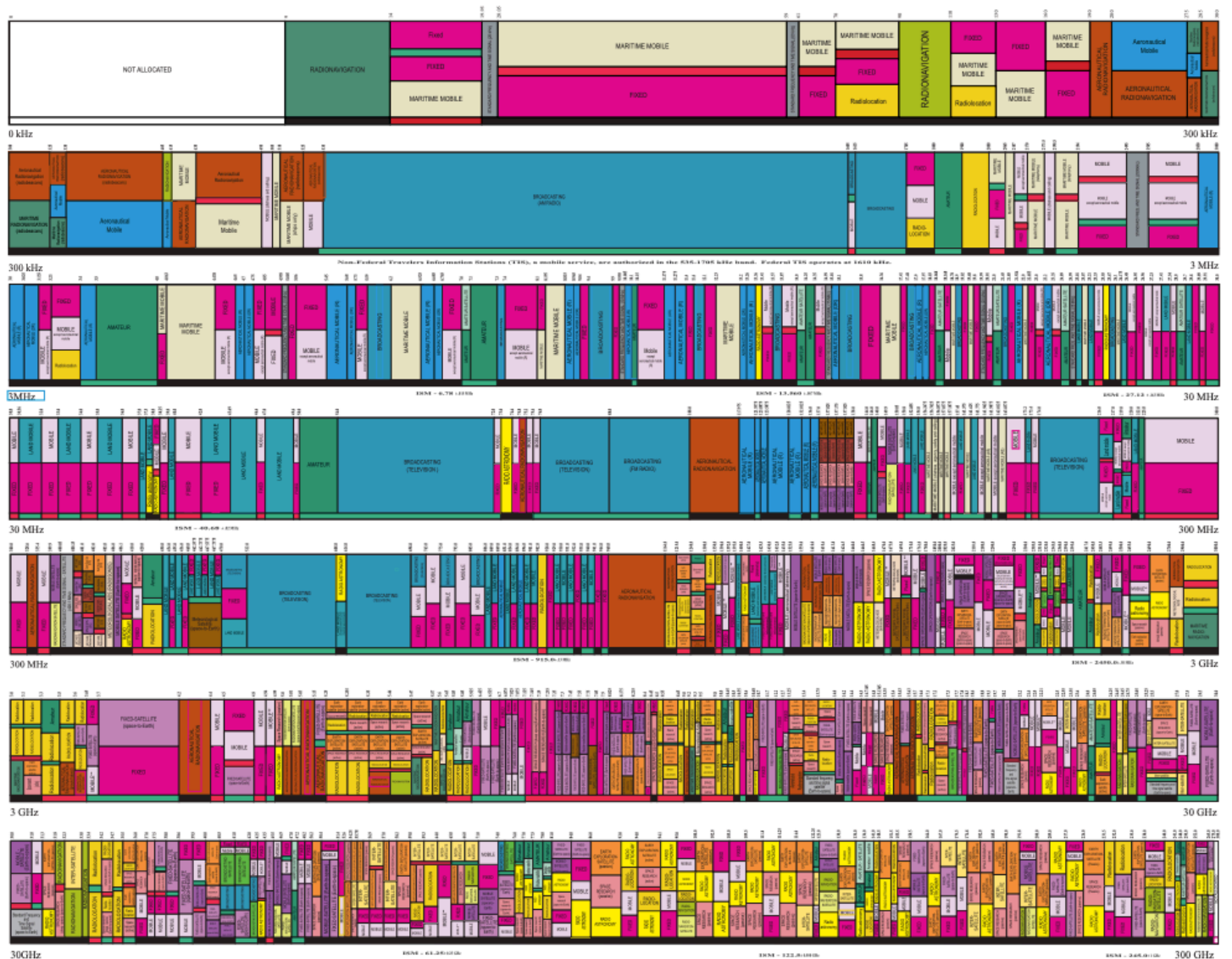
FEDERAL EXCLUSIVE    FEDERAL/NON-FEDERAL SHARED

NON-FEDERAL EXCLUSIVE

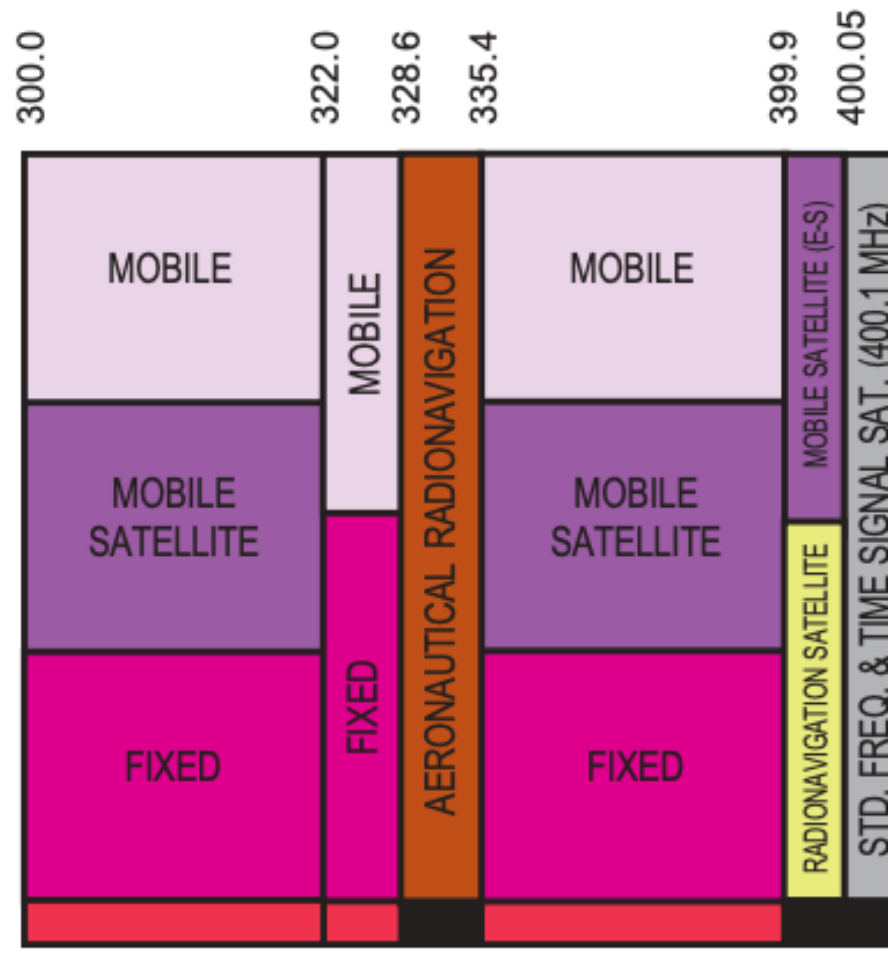
**ALLOCATION USAGE DESIGNATION**

SERVICE	EXAMPLE	DESCRIPTION
Primary	Fixed	Capital Lines
Secondary	Mobile	1st Circuit with lower rate limits

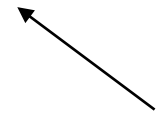
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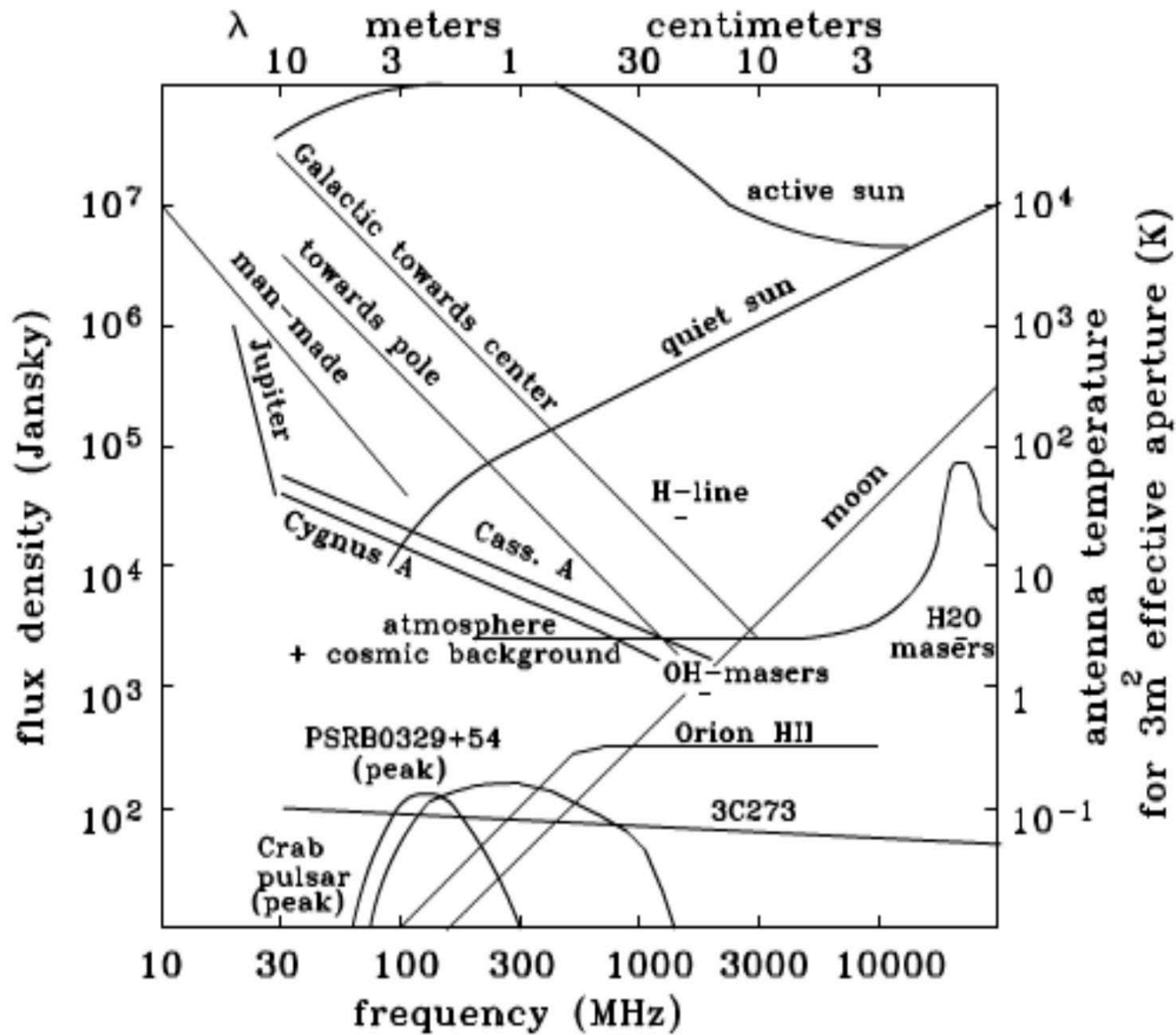
REMARKS: THIS CHART IS NOT TO BE USED FOR REGULATORY PURPOSES. IT IS FOR INFORMATIONAL PURPOSES ONLY. FOR REGULATORY PURPOSES, SEE THE FEDERAL REGISTER.



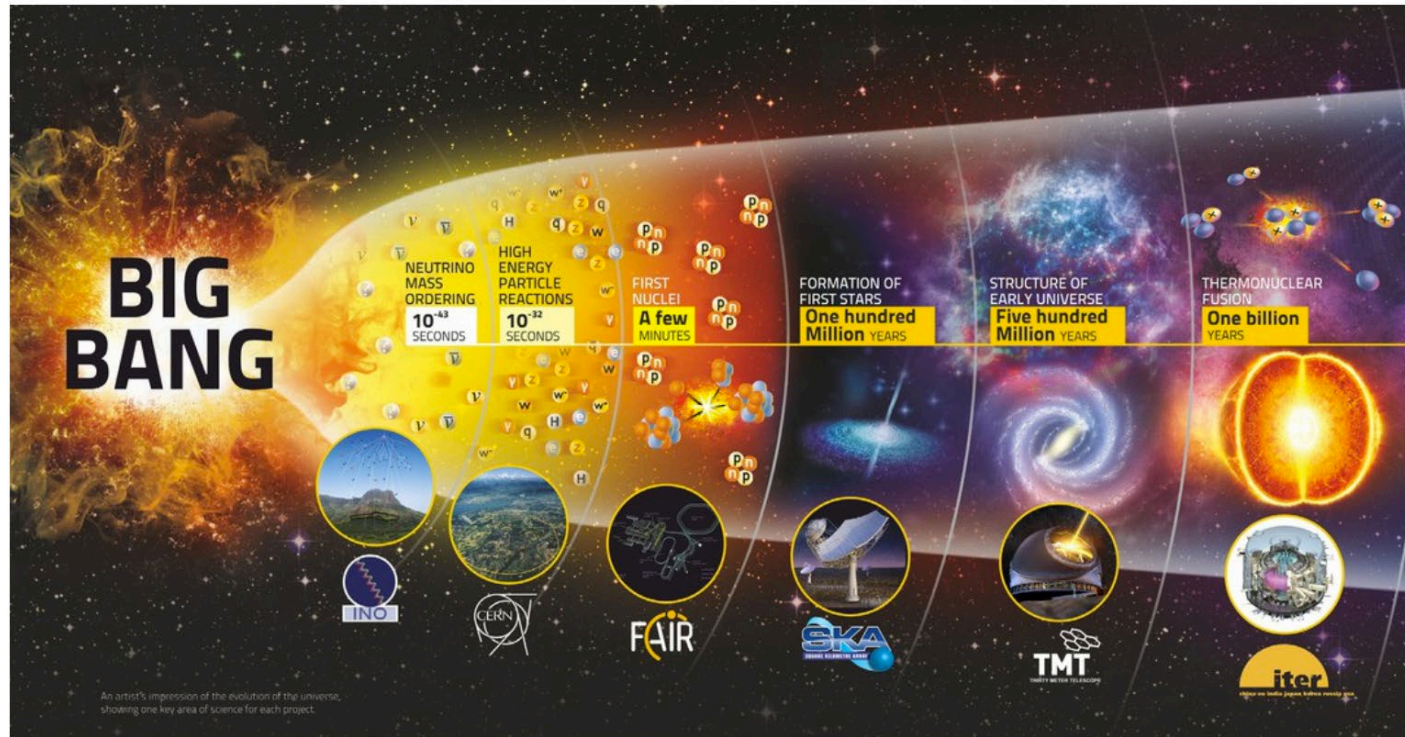
300 MHz



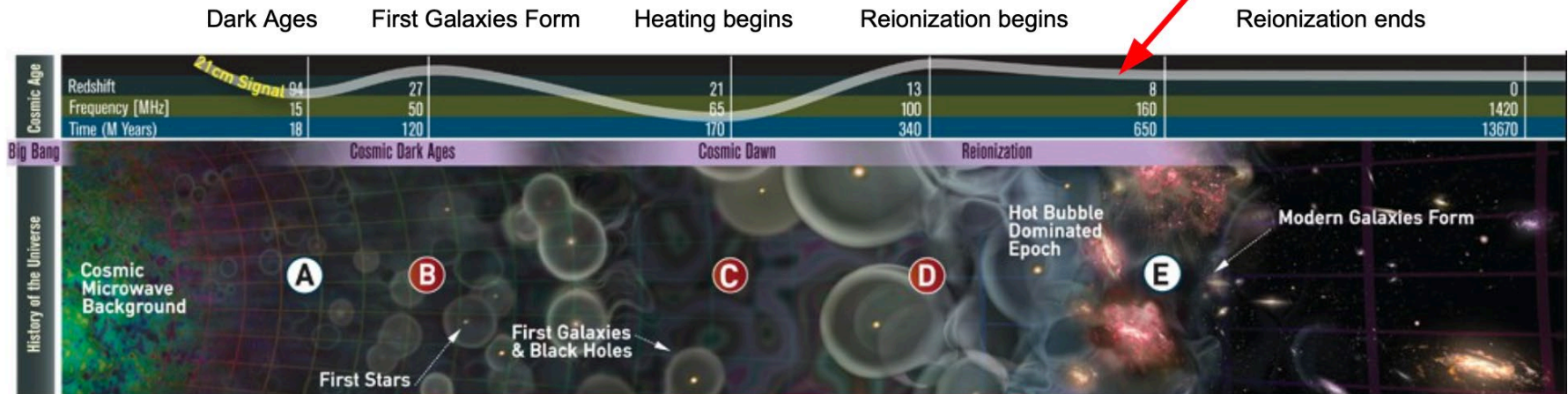
Instrument Landing System (ILS) at all mid to large airports, two tone modulation facing up at 3 degree glide slope from approach end of runway



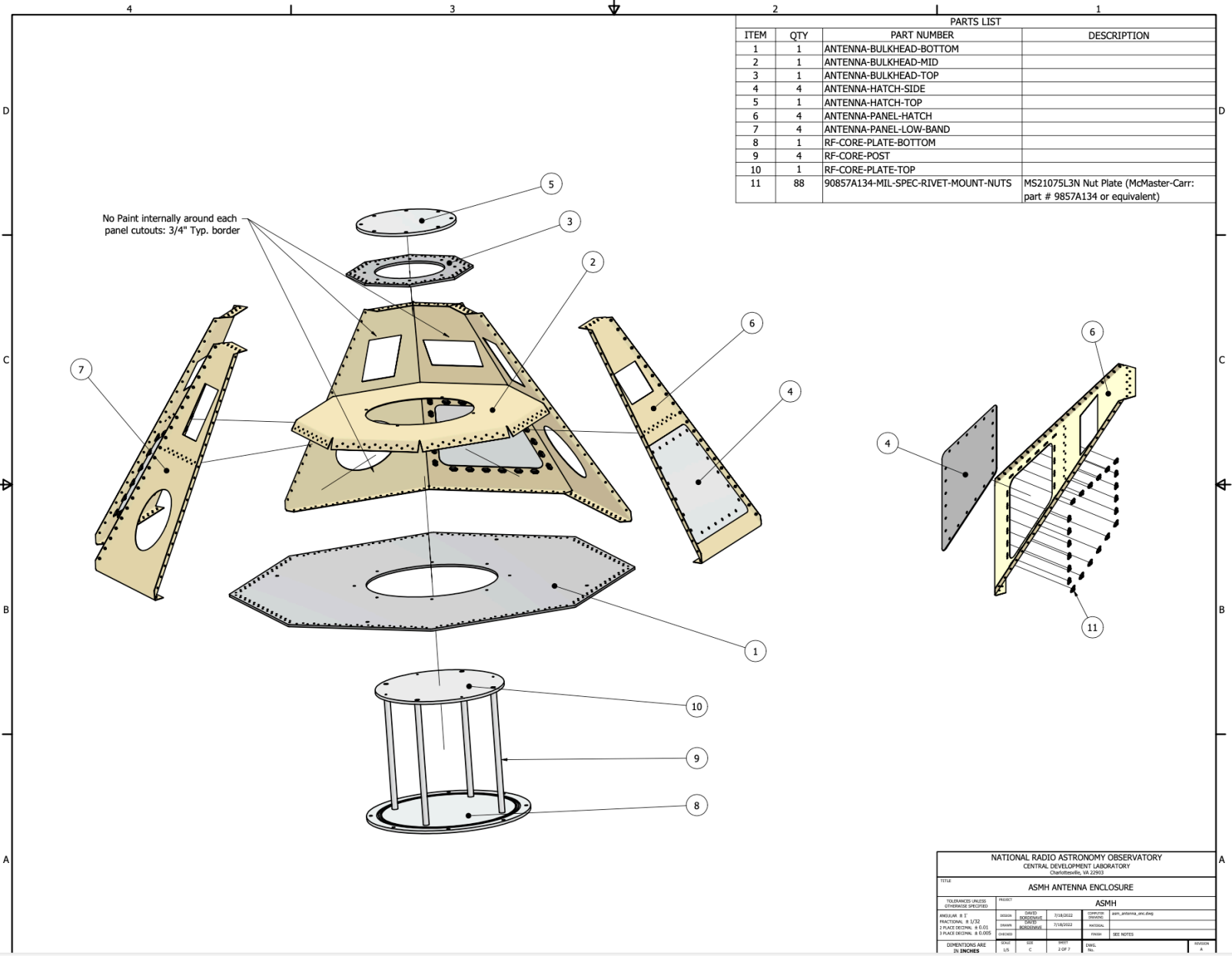




21 cm signature



# Design Approach - Details



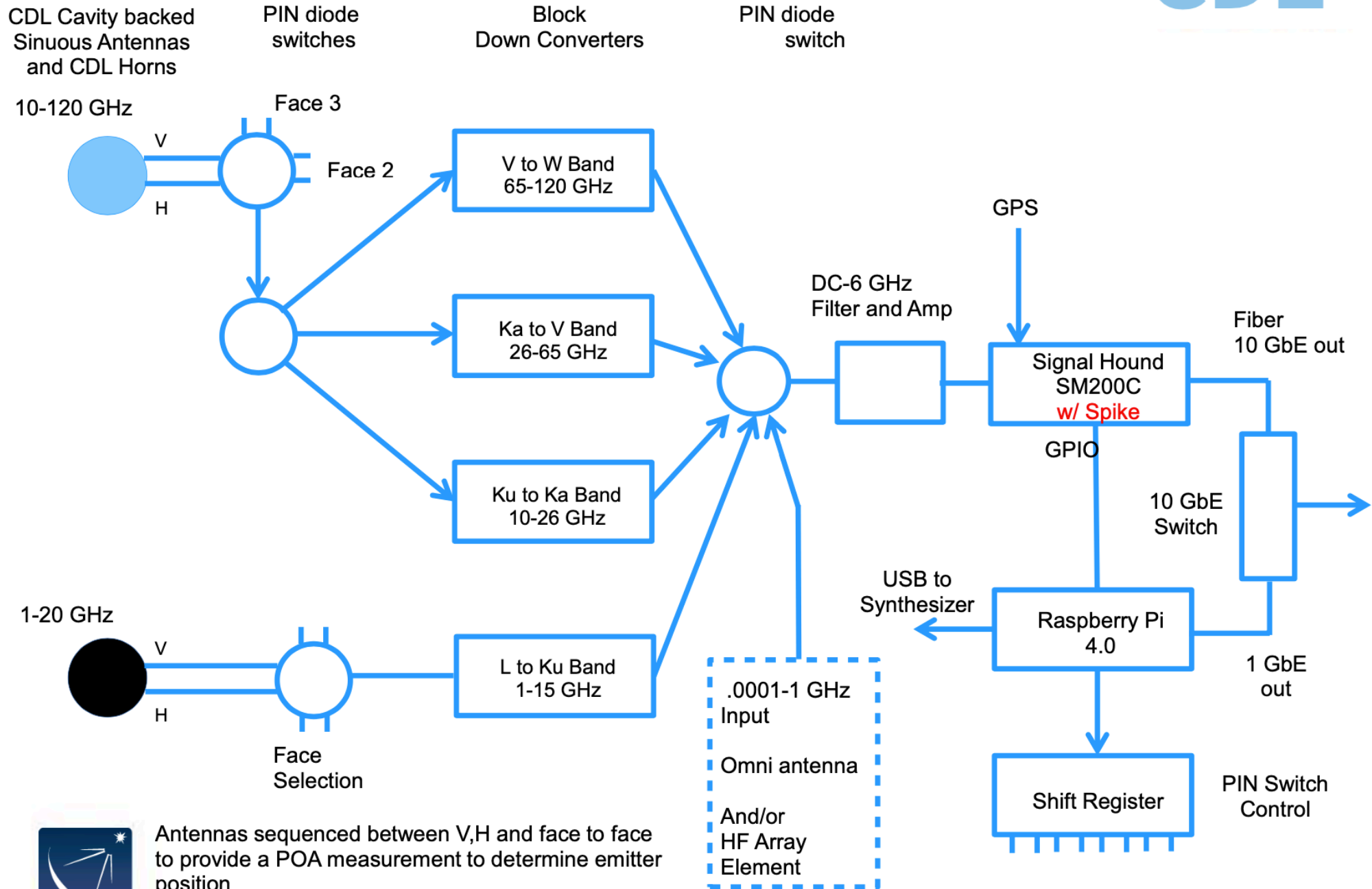
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	ANTENNA-BULKHEAD-BOTTOM	
2	1	ANTENNA-BULKHEAD-MID	
3	1	ANTENNA-BULKHEAD-TOP	
4	4	ANTENNA-HATCH-SIDE	
5	1	ANTENNA-HATCH-TOP	
6	4	ANTENNA-PANEL-HATCH	
7	4	ANTENNA-PANEL-LOW-BAND	
8	1	RF-CORE-PLATE-BOTTOM	
9	4	RF-CORE-POST	
10	1	RF-CORE-PLATE-TOP	
11	88	90857A134-MIL-SPEC-RIVET-MOUNT-NUTS	MS21075L3N Nut Plate (McMaster-Carr: part # 9857A134 or equivalent)

NATIONAL RADIO ASTRONOMY OBSERVATORY CENTRAL DEVELOPMENT LABORATORY Chandler, AZ 85223			
TITLE ASMH ANTENNA ENCLOSURE			
TOLERANCES UNLESS OTHERWISE SPECIFIED		PROJECT	
ANGULAR R ± 1/32	DRAWN	DATE	CHECKED
FRACTIONAL ± 1/32	DESIGNED	03/18/2012	03/18/2012
PLACES DECIMAL ± 0.05	DATE	03/18/2012	03/18/2012
PLACES DECIMAL ± 0.005	DESIGNED		
DIMENSIONS ARE IN INCHES		PART	
DRAWN	DATE	DATE	DATE
0/0		03/18/12	
PAGE 1		TOTAL 8	





# Design Approach, ASMH Antenna Array – Receiver with SM200C (simplified) 10-120 GHz CDL Horn and 1-20 GHz CDL Sinuous

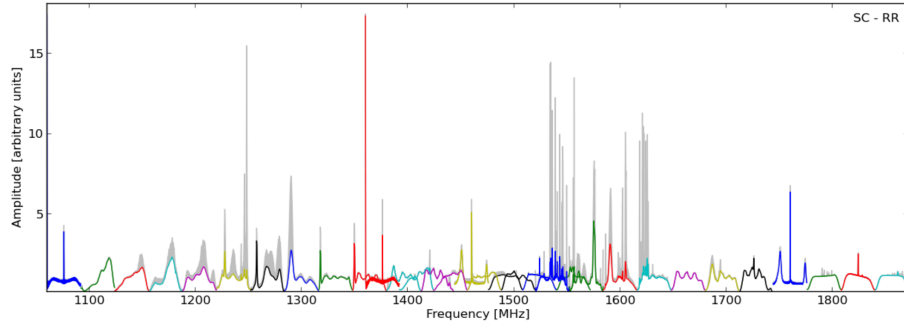


## RFI plots for L-band

L-band spectrum for SC in RR polarization

Data taken on 2022-05-11 05:30:00 UT

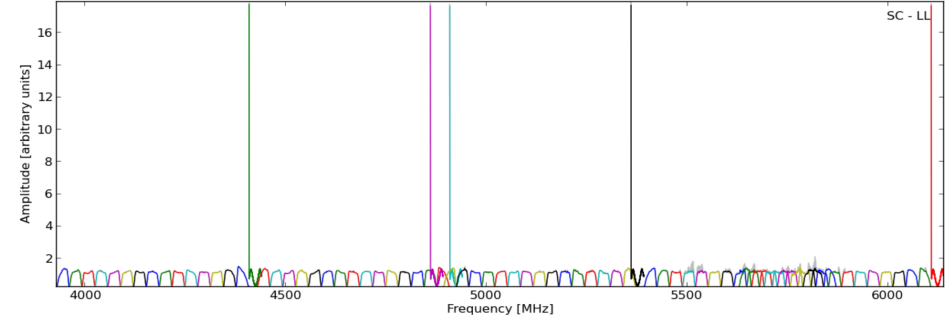
BR FD HN KP LA MK NL OV PT SC



C-band spectrum for SC in LL polarization

Data taken on 2022-05-06 00:20:00 UT

BR FD HN KP LA MK NL OV PT SC

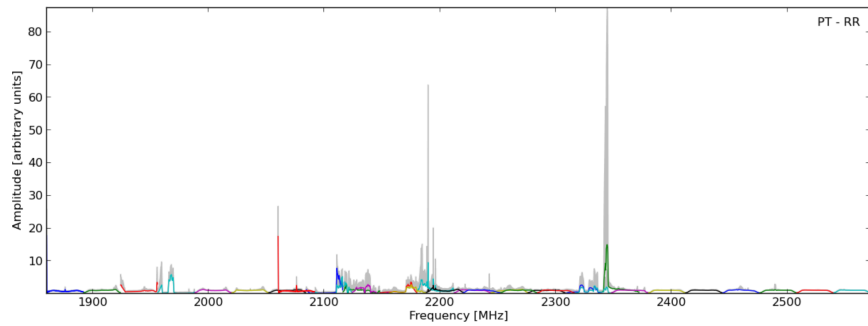


## RFI plots for S-band

S-band spectrum for PT in RR polarization

Data taken on 2022-04-19 00:00:00 UT

BR FD HN KP LA MK NL OV PT SC

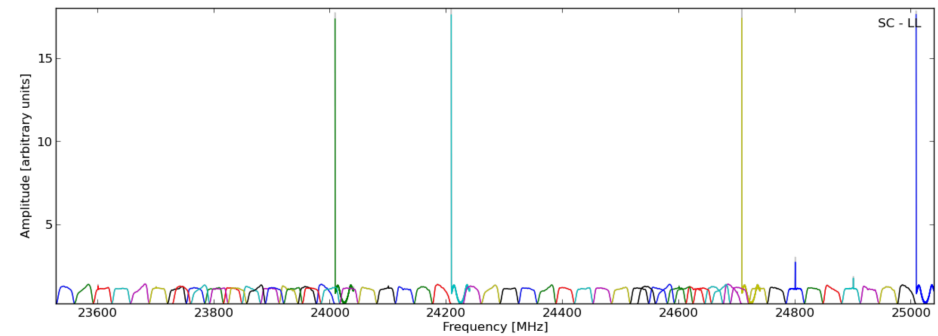


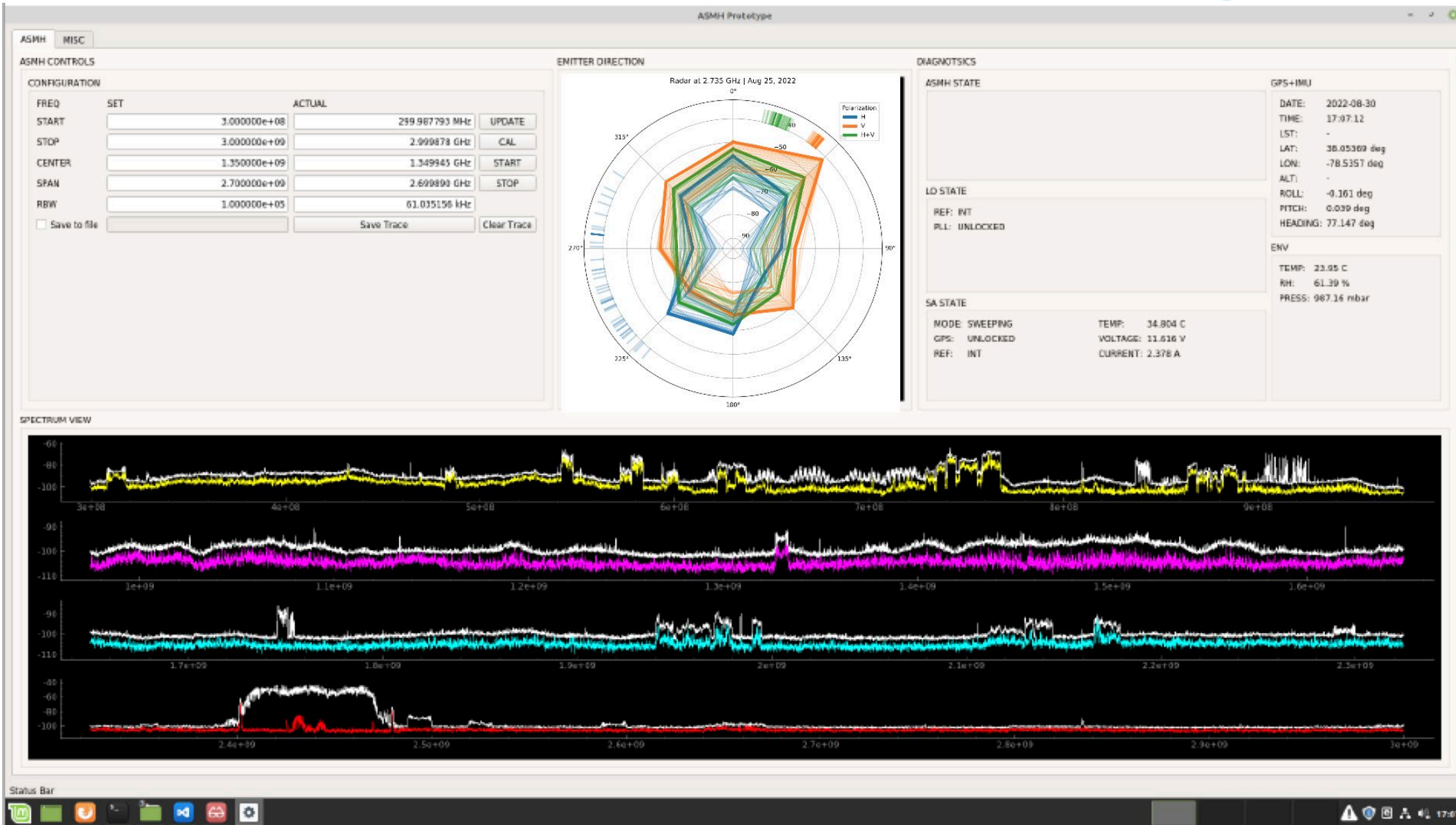
## RFI plots for K-band

K-band spectrum for SC in LL polarization

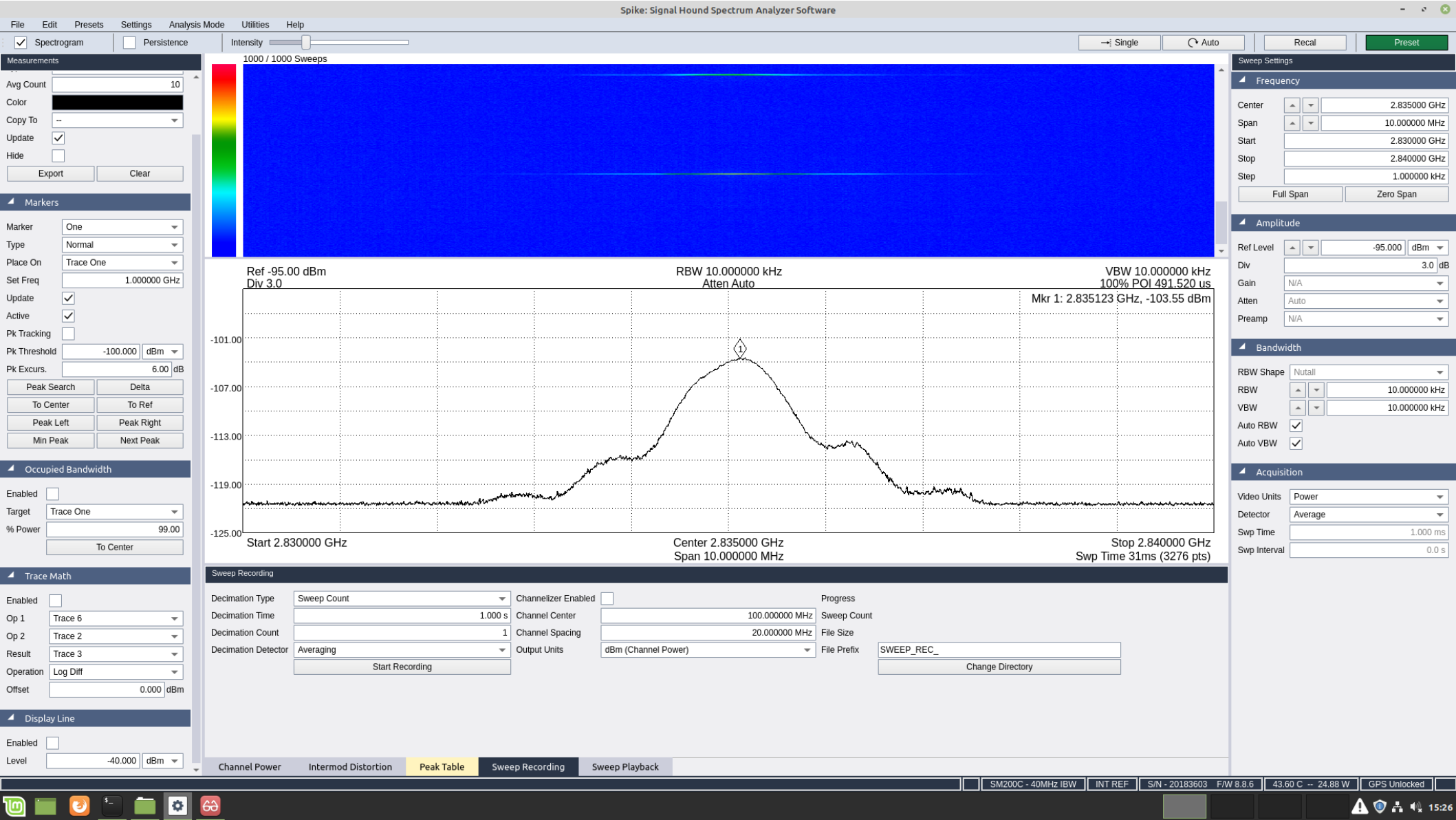
Data taken on 2022-05-15 18:45:00 UT

BR FD HN KP LA MK NL OV PT SC





# ASM Initial tests – Radar at 120 miles; 2.835 GHz



1. The ASM Upper Band horn has been designed and tested between 10-120 GHz. Highly polarized and good performance.
2. The Sinuous Antenna has been designed and is being built. 1-20 GHz dual pole.
3. First Light tests has been completed with good sensitivity and good DF characteristics.
4. On path for first full integration by late January, delivery to Green Bank Observatory in February.