



Further Analysis on TMI/SSM/I Biases (F13 through F15)

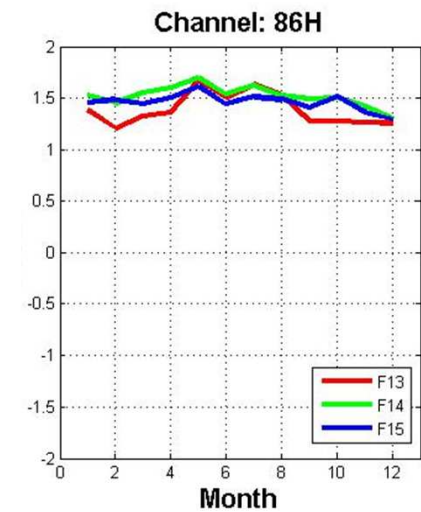
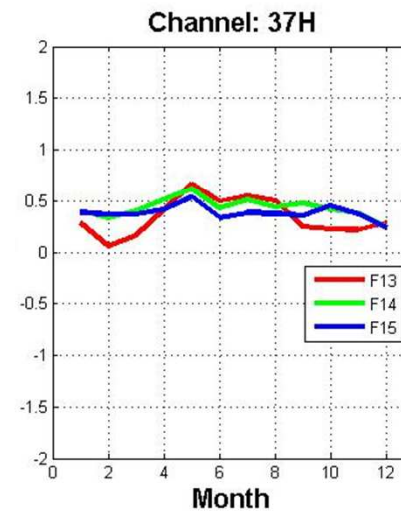
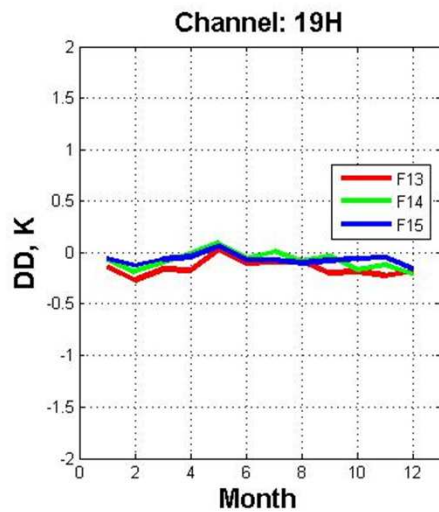
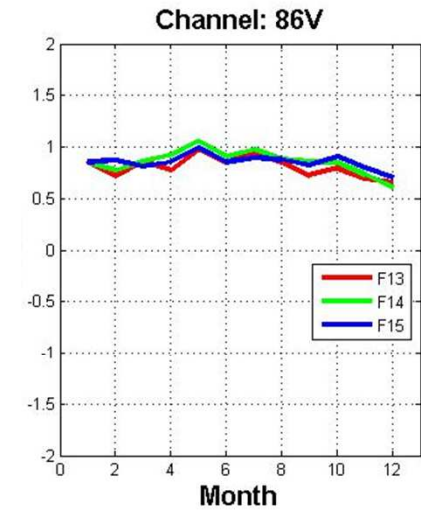
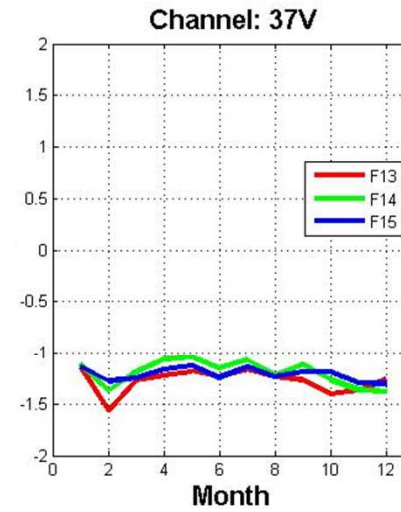
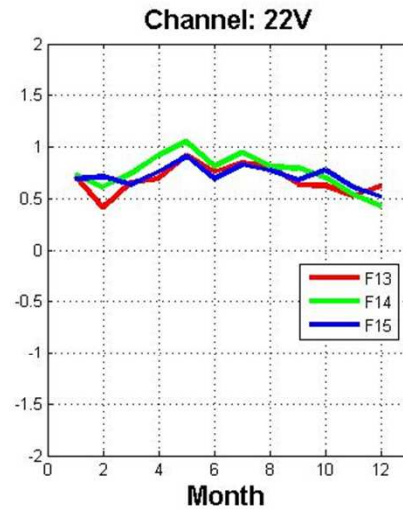
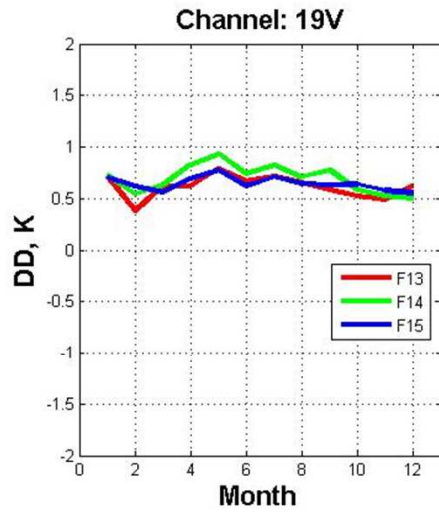
Spencer Farrar, Andrea Santos-Garcia, Linwood Jones*
(University of Central Florida)

GPM XCAL Meeting
at Toulouse France
May 23-24, 2013

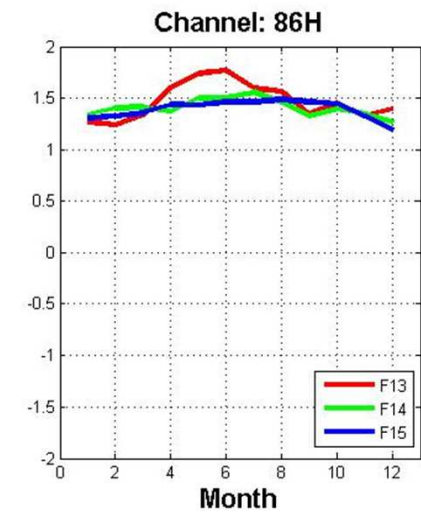
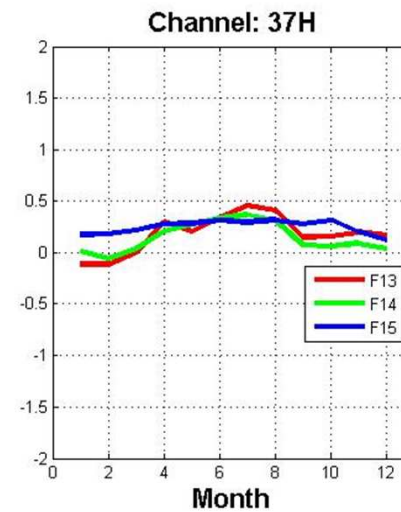
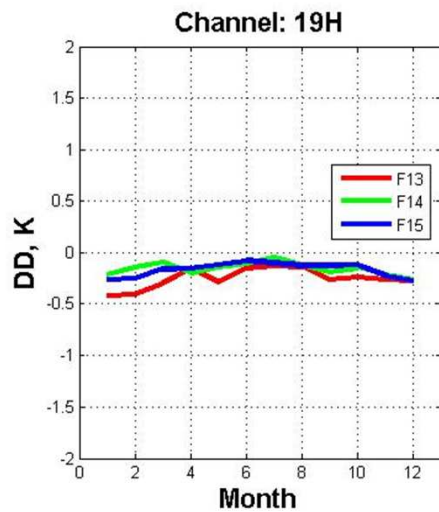
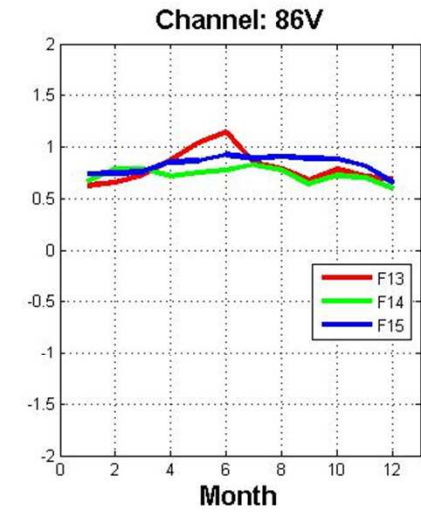
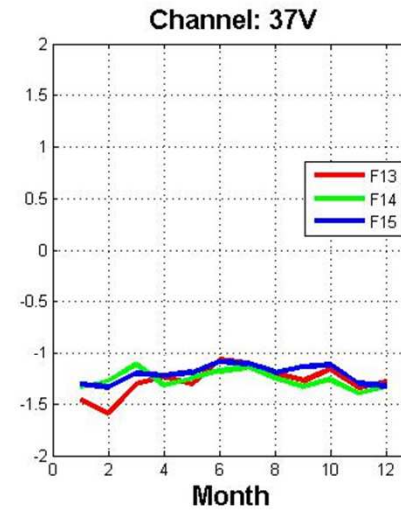
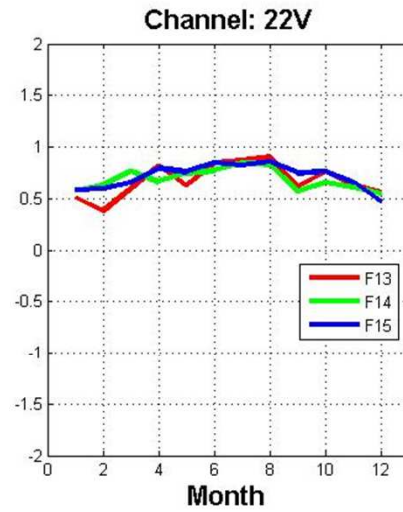
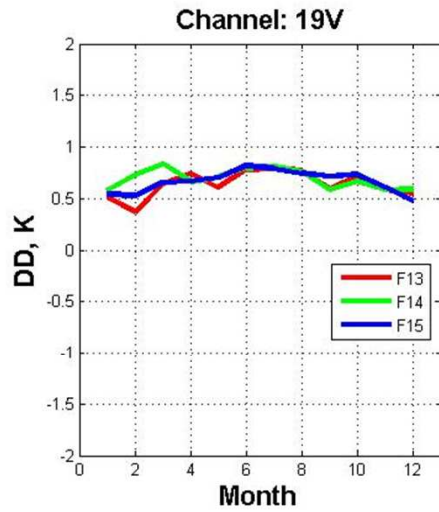
Overview

- SSMI FCDR (V01R00) from CSU: F13, F14, and F15
 - Time Durations:
 - July 2005 to June 2006 (XCal Year)
 - Jan-Dec, 2002
 - # of collocations: 370,000 to 427,000 per channel
- DD=Double Difference, SSD=Sensor Single Difference
- DD convention:
$$DD = SSD_{\text{Target}} - SSD_{\text{Reference}}$$
$$DD = (T_{\text{Obs}} - T_{\text{Model}})_{\text{SSMI}} - (T_{\text{Obs}} - T_{\text{Model}})_{\text{TMI}}$$
- TMI CC_1.1 applied for Low Res Channels
 - Recall that CC_1.1 for 86GHz does not exist, yet

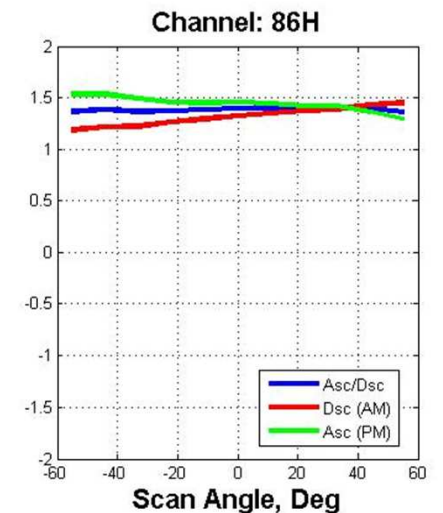
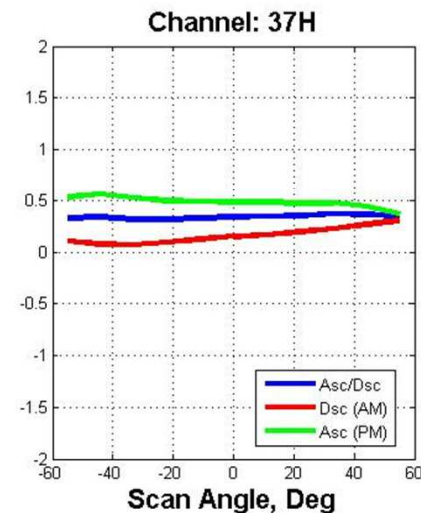
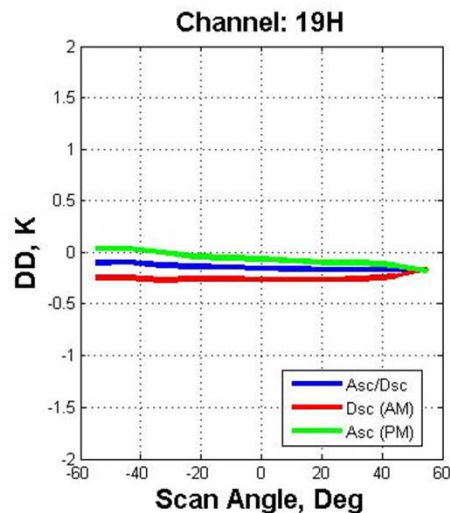
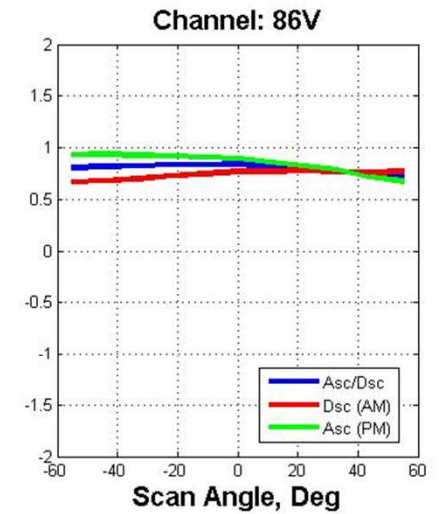
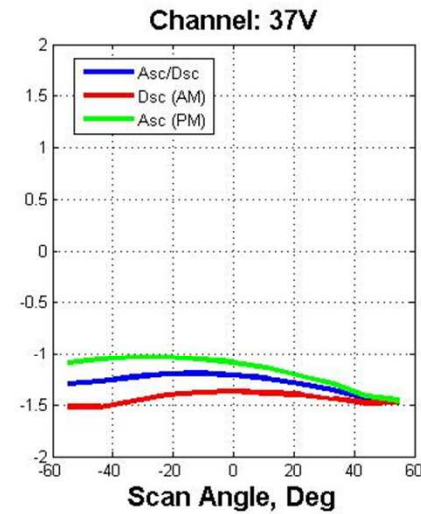
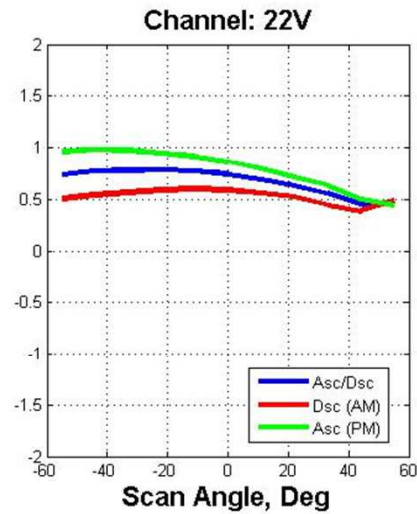
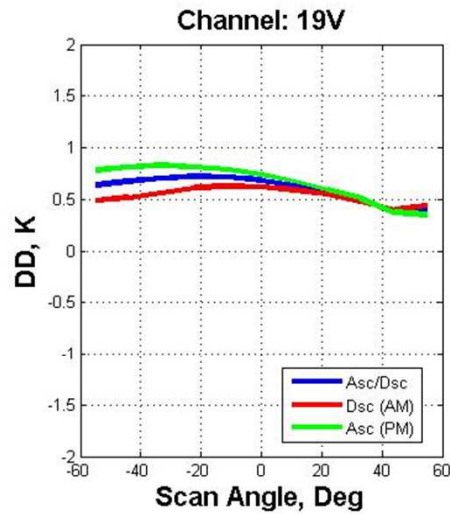
Monthly DD ('02)



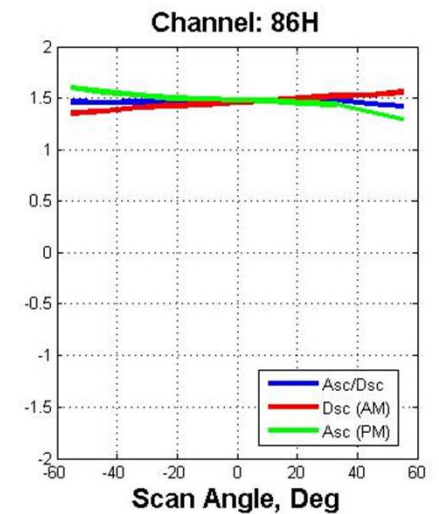
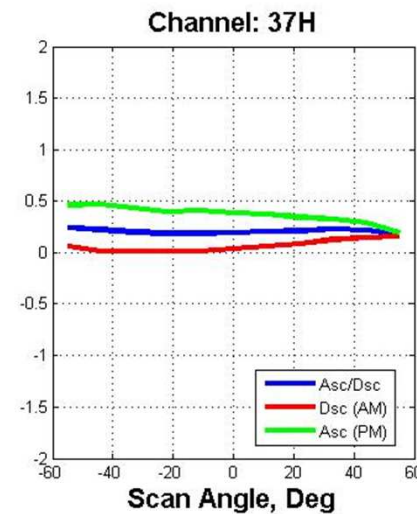
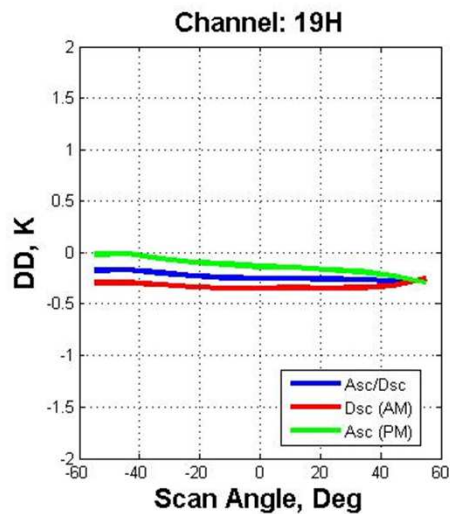
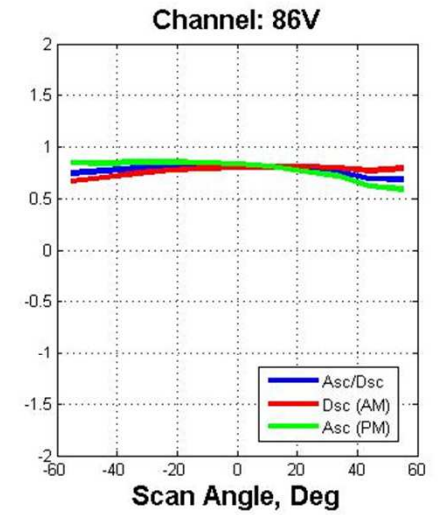
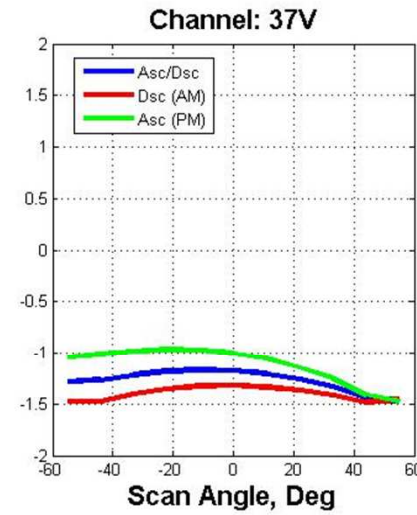
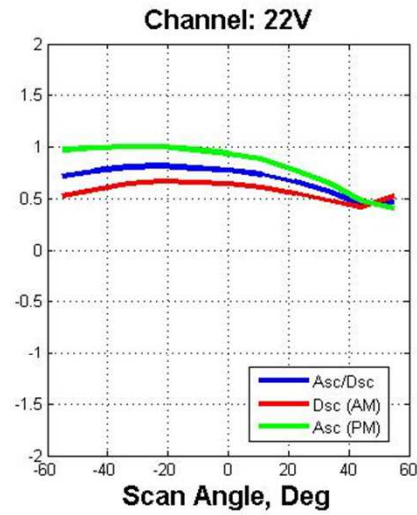
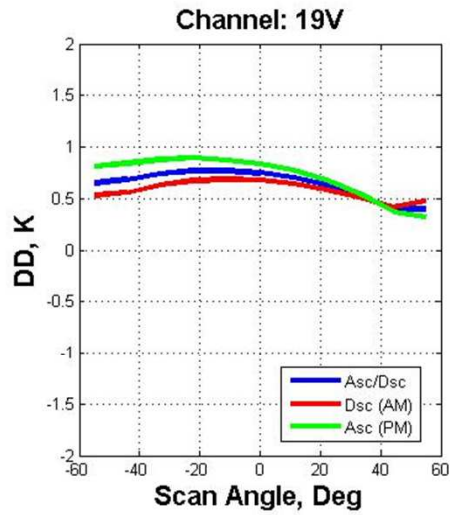
Monthly DD ('05-'06)



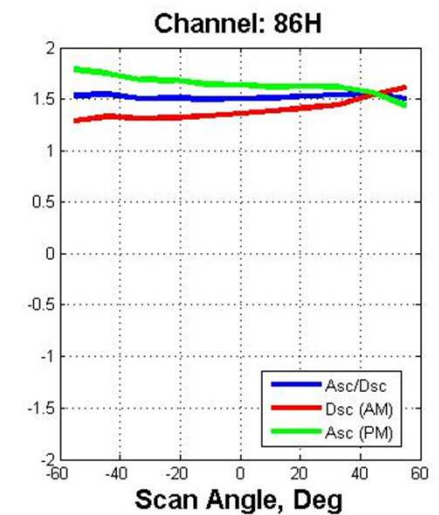
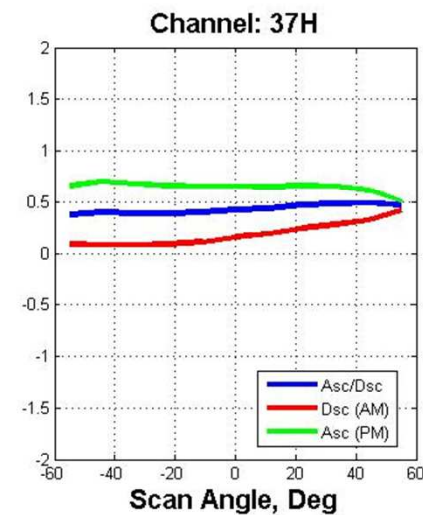
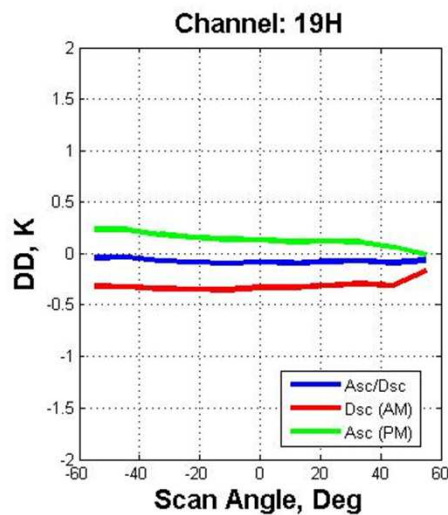
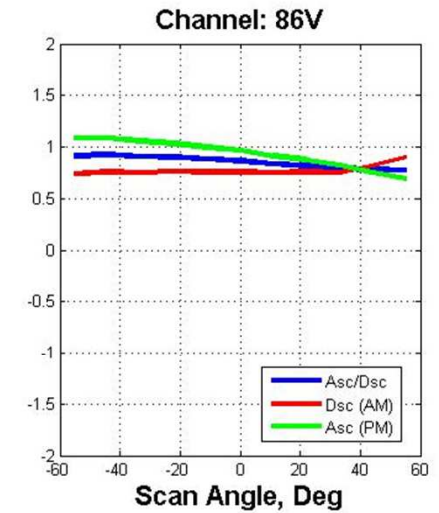
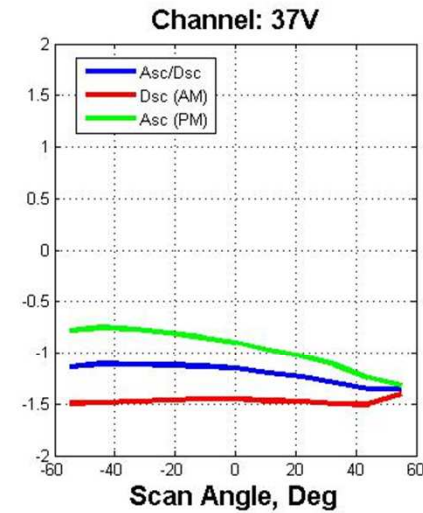
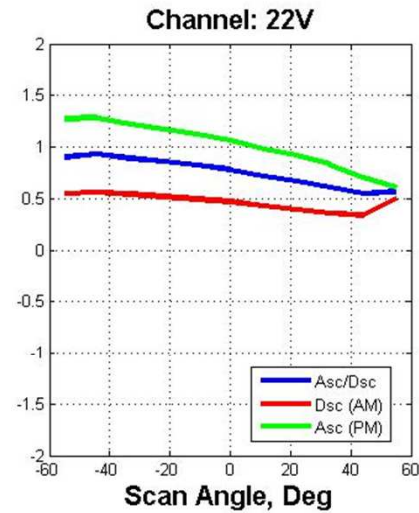
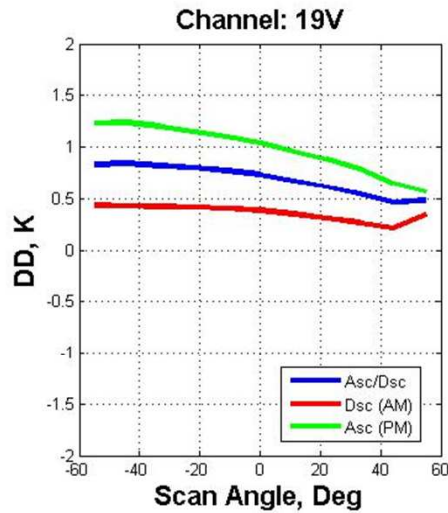
F13 Scan Angle Dependence '02



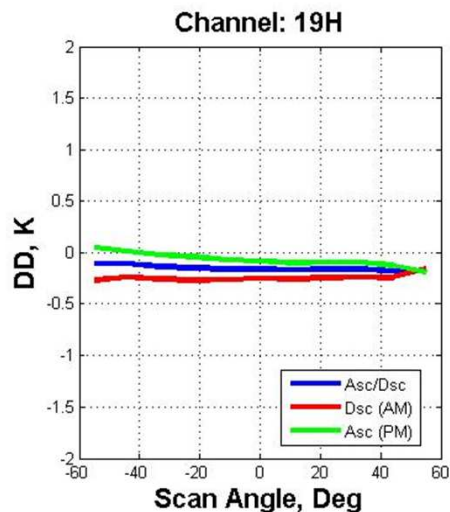
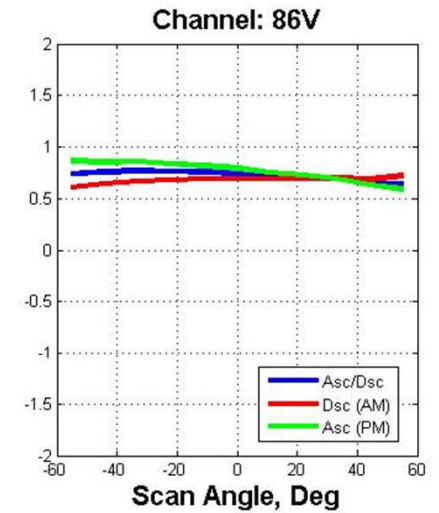
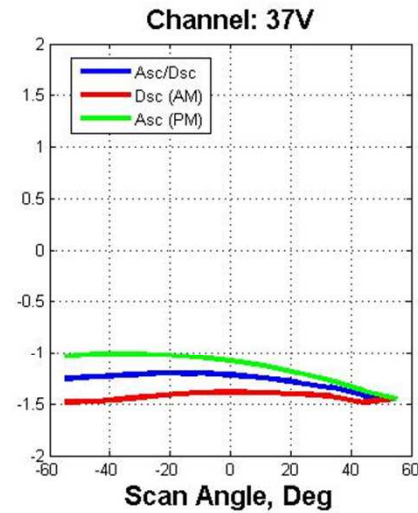
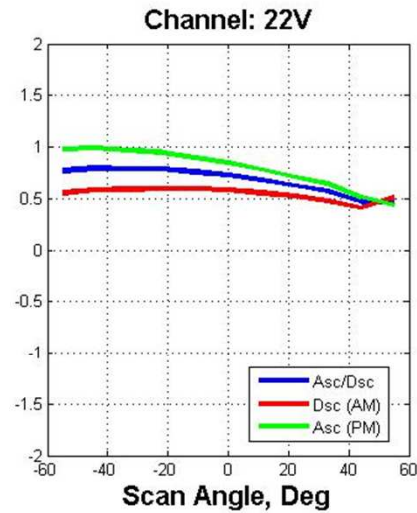
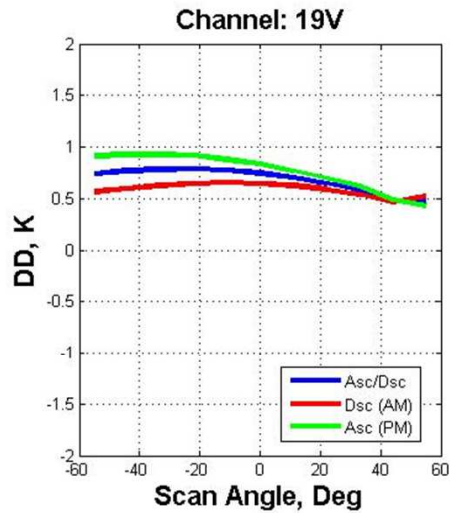
F13 Scan Angle Dependence '05-'06



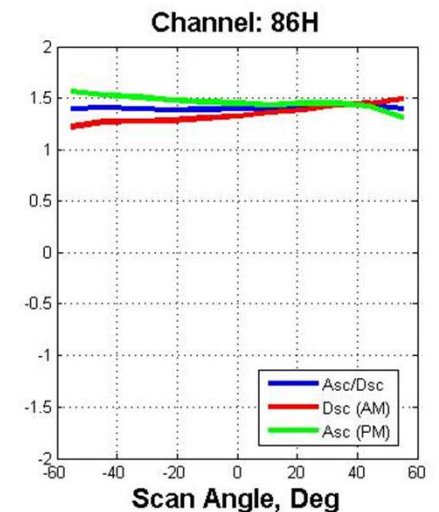
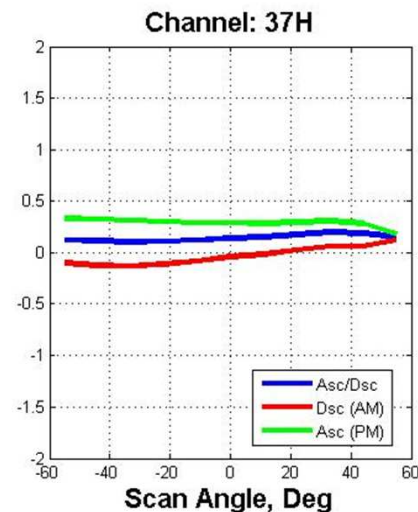
F14 Scan Angle Dependence '02



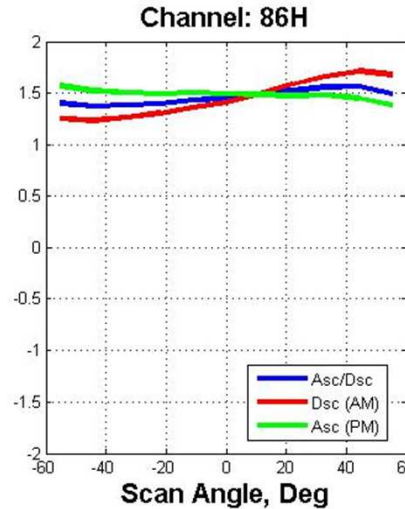
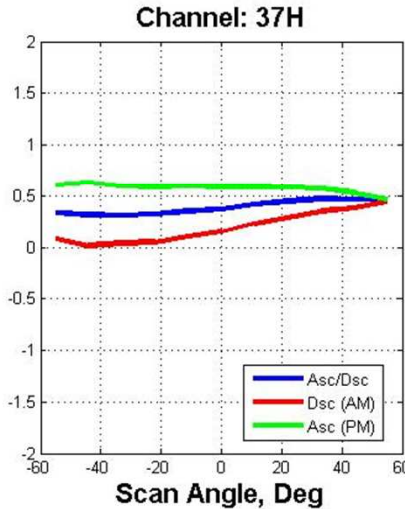
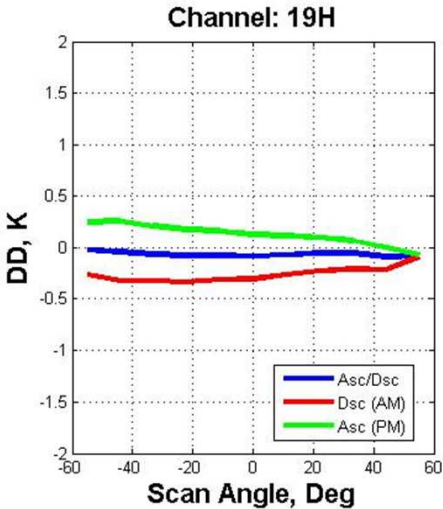
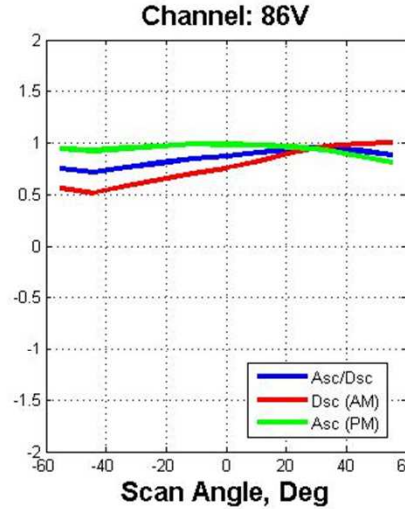
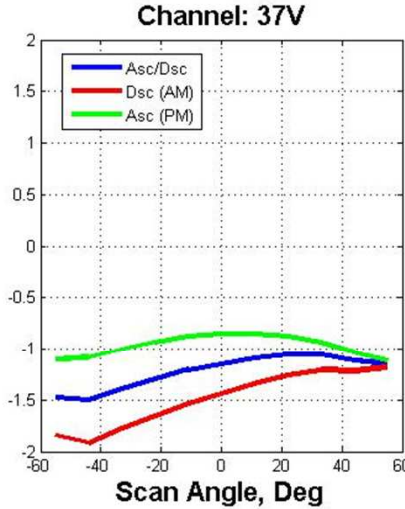
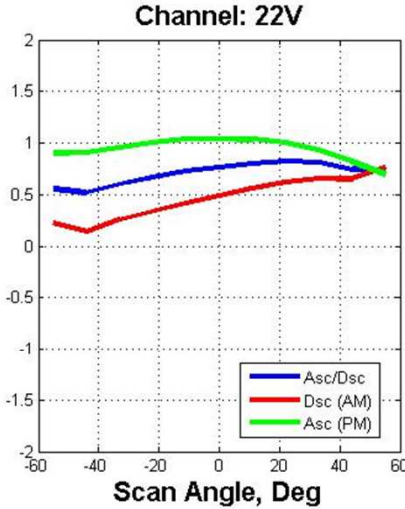
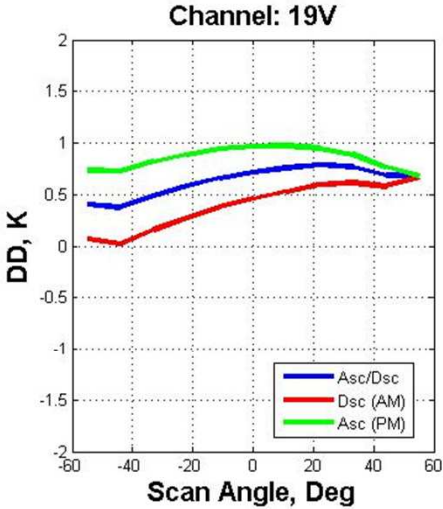
F14 Scan Angle Dependence '05-'06



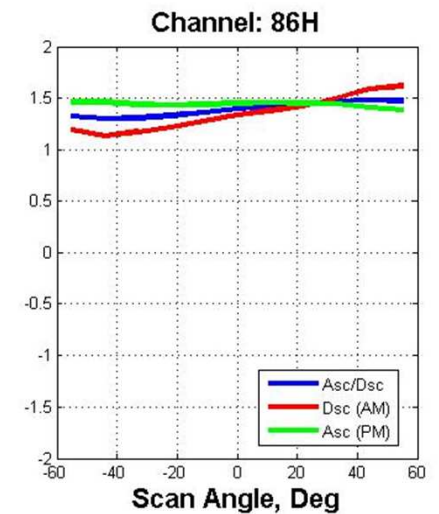
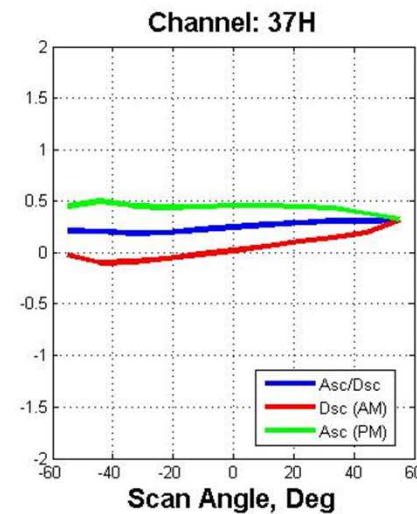
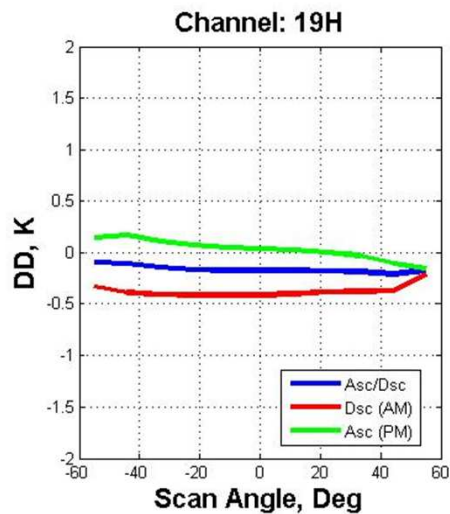
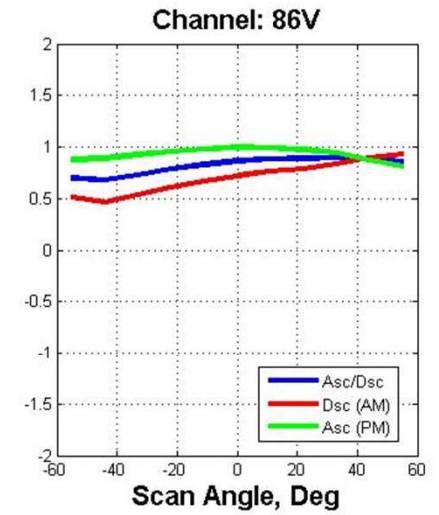
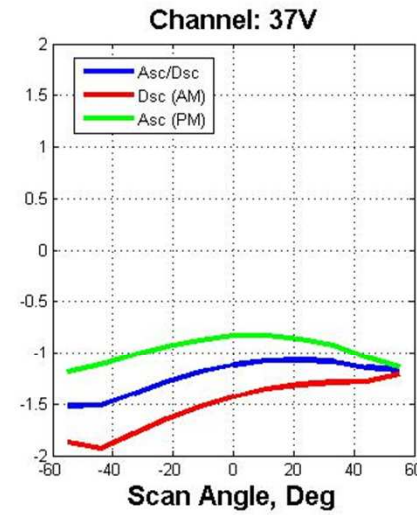
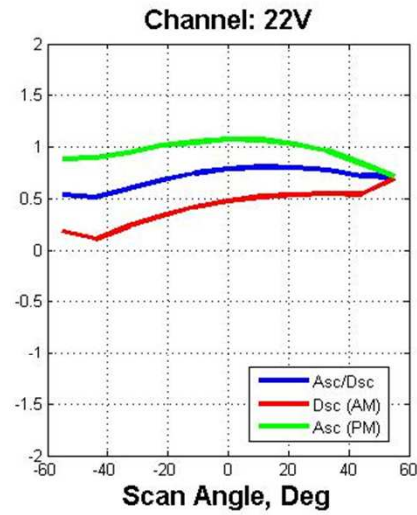
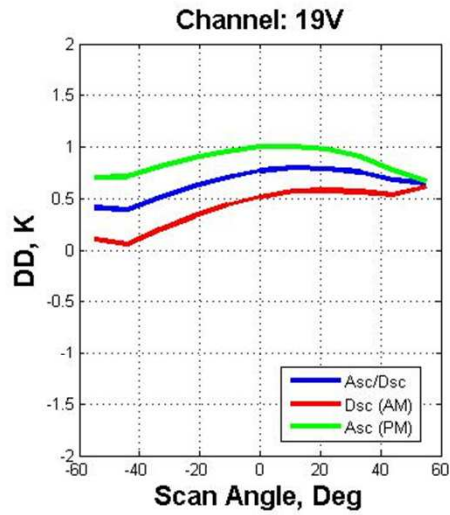
For F14 Asc/Dsc DD differences improved significantly compared to F13 & F15 Asc/Dsc differences



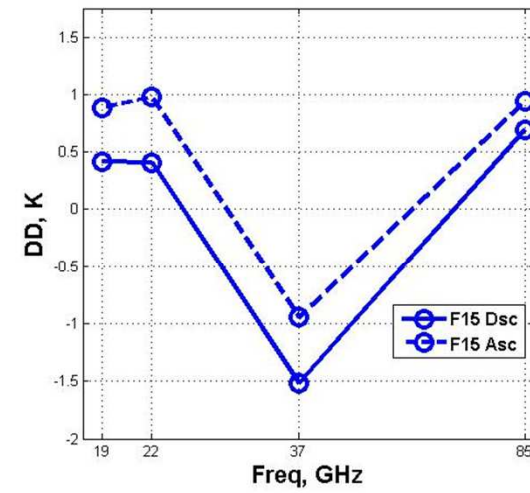
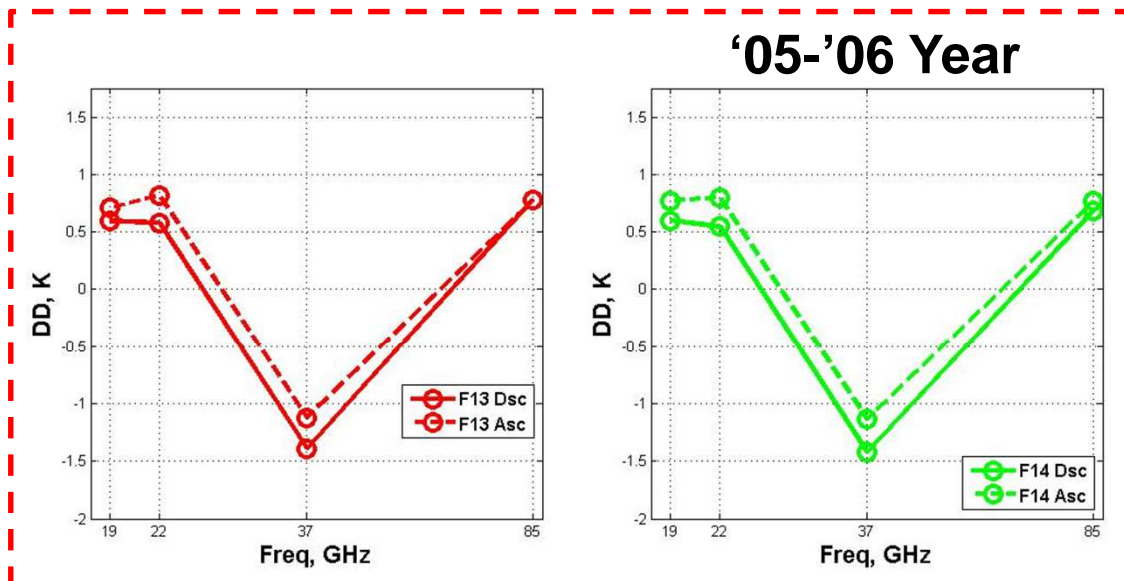
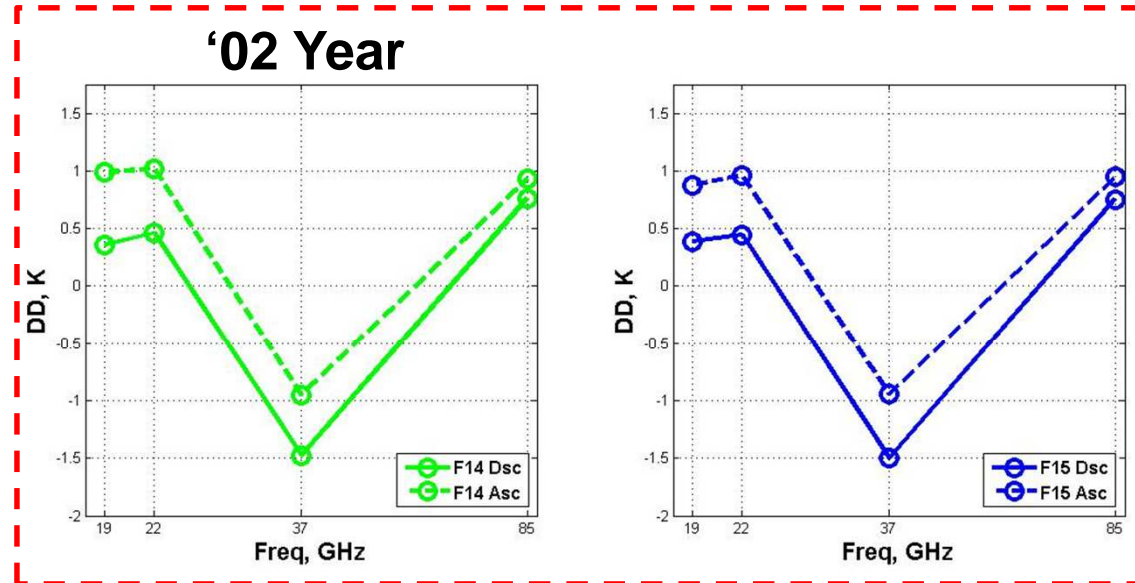
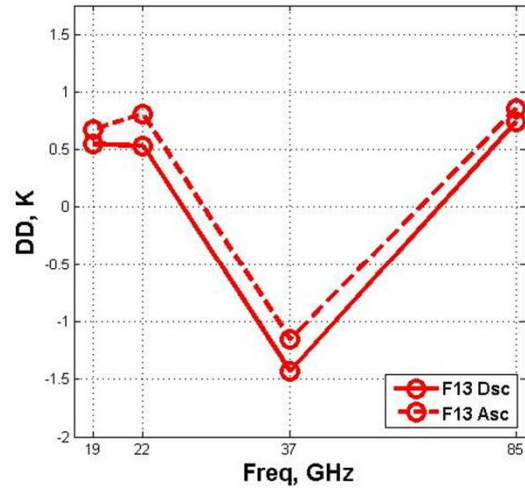
F15 Scan Angle Dependence '02



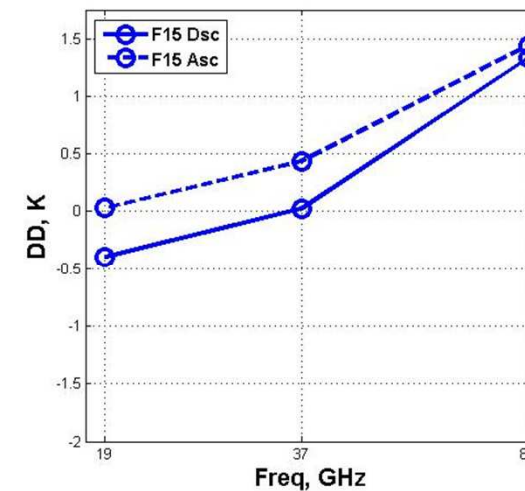
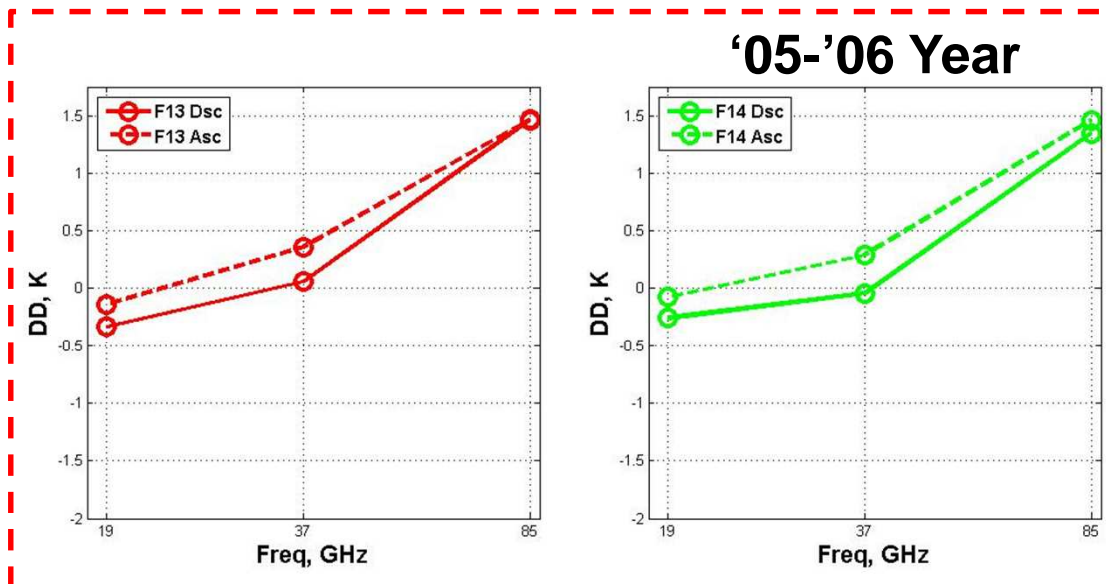
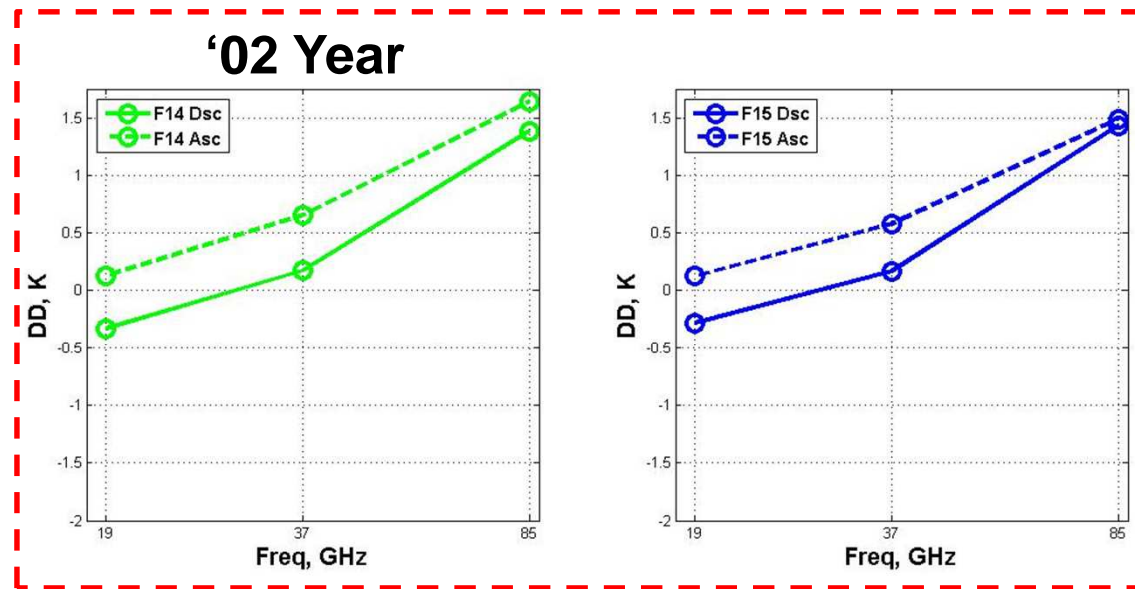
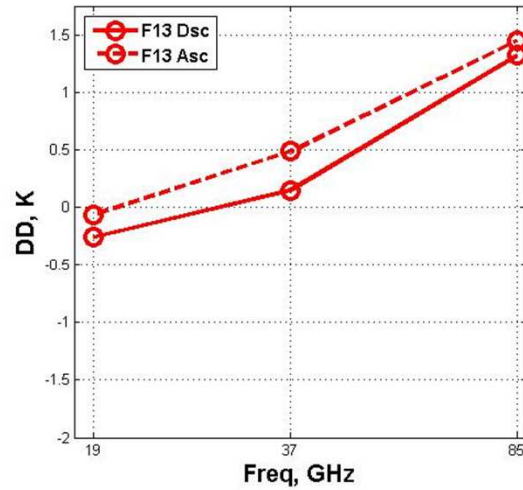
F15 Scan Angle Dependence '05-'06



DD V-Pol for Both Years



DD H-Pol for Both Years



Satellite Equator Crossing Times (Ascending Passes)

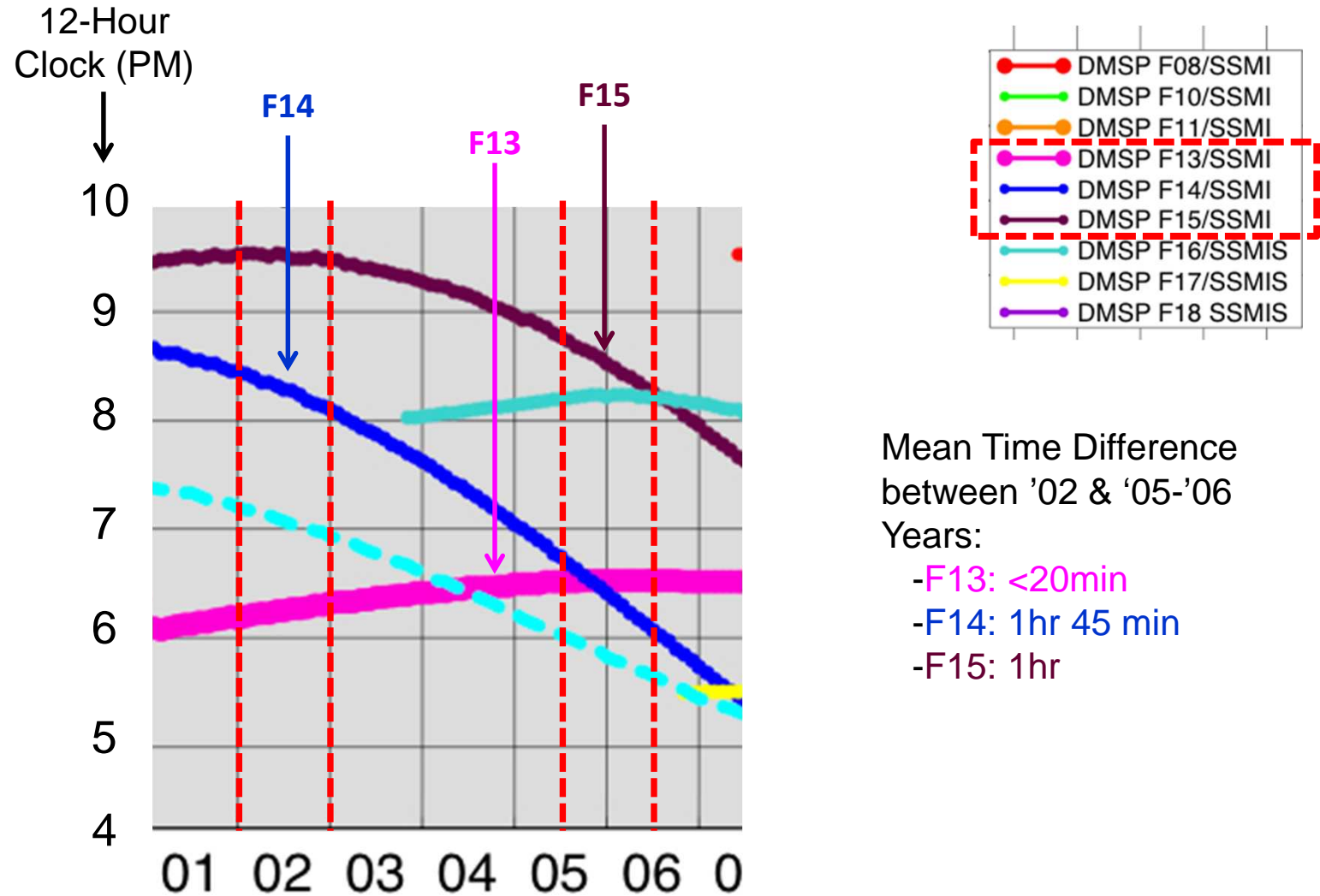


Image by Eric Nelkin (SSAI), 20 October 2010, NASA/Goddard Space Flight Center, Greenbelt, MD.



DD ('02 Year)

Channel	DD(K) F13/F14/F15	DD(K) CC_1.1 F13/F14/F15	SSMI Reported Temp
19V	1.13/1.20/1.15	0.62/0.74/0.67	199/199/199
19H	2.08/2.14/2.15	-0.15/-0.08/-0.07	134/134/134
22V	2.36/2.43/2.40	0.68/0.76/0.72	228/228/228
37V	1.14/1.23/1.21	-1.28/-1.19/-1.21	214/215/214
37H	2.21/2.30/2.26	0.34/0.43/0.38	154/155/155
86V	0.81/0.86/0.86	NA	261/261/261
86H	1.39/1.52/1.46	NA	228/229/229

with CC_1.1
applied



DD ('05-'06 Year)

Channel	DD(K) F13/F14/F15	DD(K) CC_1.1 F13/F14/F15	SSMI Reported Temp
19V	1.16/1.20/1.18	0.65/0.69/0.67	200/200/200
19H	1.98/2.06/2.05	-0.24/-0.16/-0.17	134/134/135
22V	2.38/2.37/2.40	0.69/0.68/0.71	229/229/229
37V	1.16/1.15/1.21	-1.26/-1.27/-1.21	214/215/215
37H	2.08/2.02/2.12	0.20/0.14/0.24	155/155/155
86V	0.78/0.73/0.83	NA	261/261/261
86H	1.46/1.41/1.39	NA	230/230/230

with CC_1.1
applied

$$\Delta DD = DD_{,05} - DD_{,02}$$

Channel	DD(K) F13/F14/F15	DD(K) CC_1.1 F13/F14/F15
19V	0.03/ 0.00/0.03	0.03/-0.05/0.00
19H	-0.10 /-0.08/0.10	-0.09/-0.08/-0.10
22V	0.02/-0.06/ 0.00	0.01/-0.04/-0.01
37V	0.02/-0.08/ 0.28	0.02/-0.08/0.00
37H	-0.13/-0.28/-0.14	-0.14/-0.29/-0.14
86V	-0.03/-0.13/-0.03	NA
86H	0.07/-0.11/-0.07	NA

Biggest
Difference

Keep in mind this does not emphasize on
Asc/Dsc differences

Conclusion

- 85GHz has best Asc/Dsc DD agreement (all instruments)
- SSMI Scan Angle Dependence
 - This is reflected in both DD & SSMI's SSD
 - V-Pol channels for all SSMI have some non-linearity (convex) as a function of scan angle (H-Pol are more linear)
- F15 has the largest differences between Asc & Dsc
- F14:
 - Asc & Dsc difference improves from '02 to '05-'06 year
 - This may be due to the orbit change
 - More similar to F13 for '02 year → Asc Time are closer in time
 - More similar to F15 for XCal year → Asc Time are closer in time
 - Referring to the above: implies that these changes **may** be due to the thermal environment

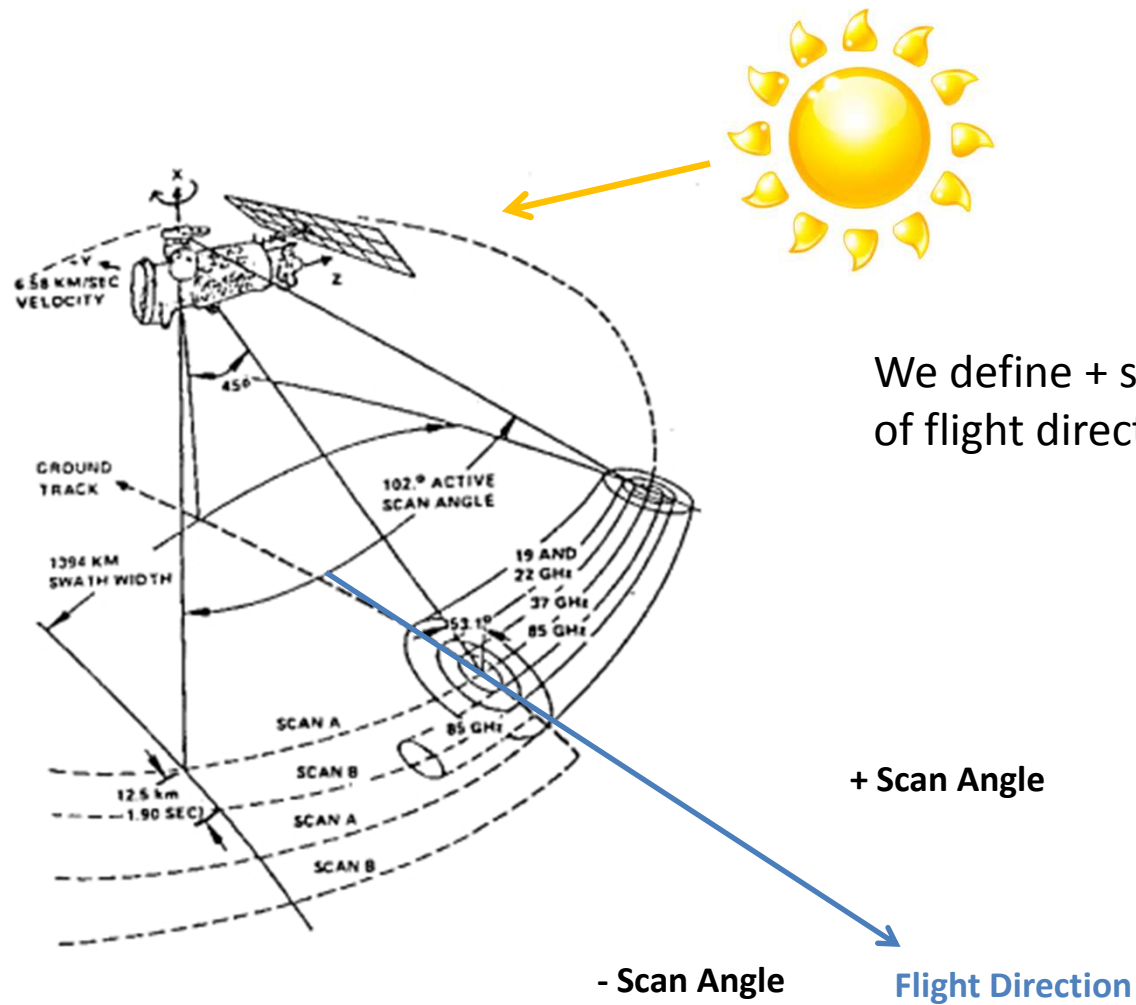


Thank You



Back Up Slides

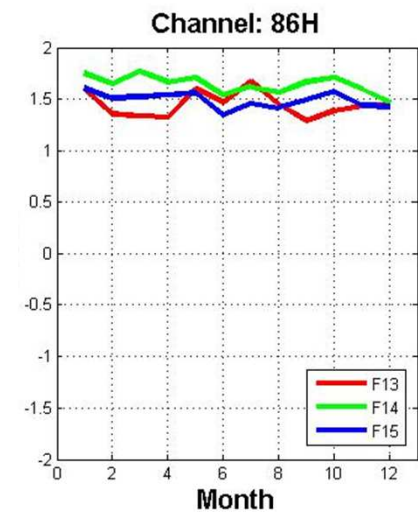
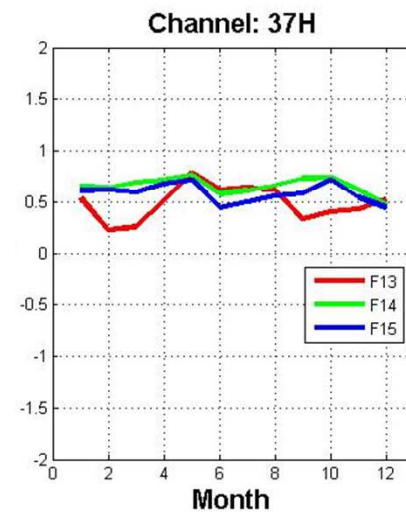
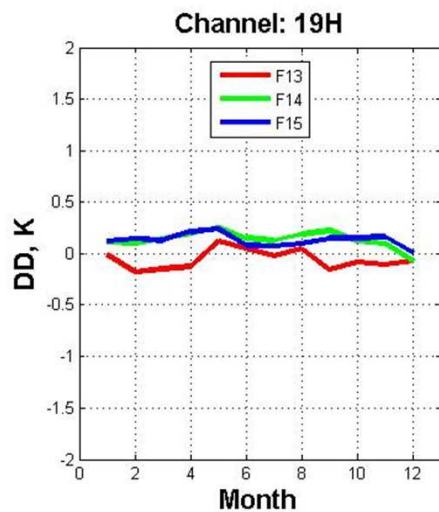
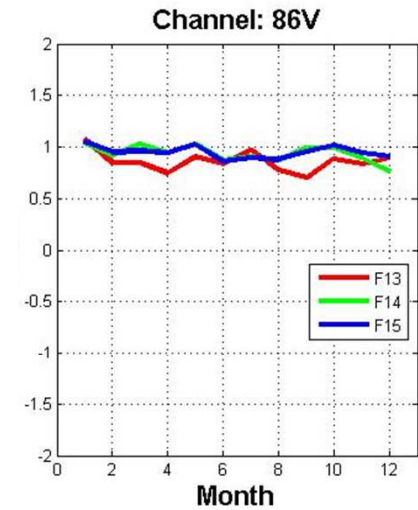
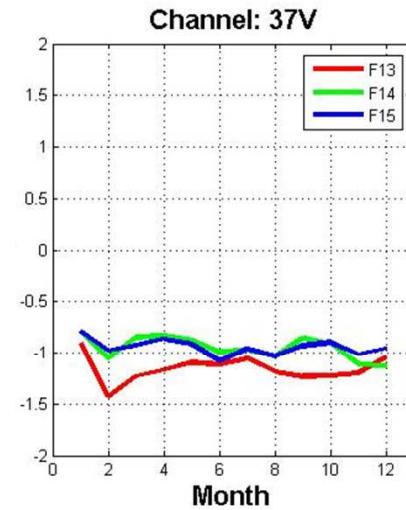
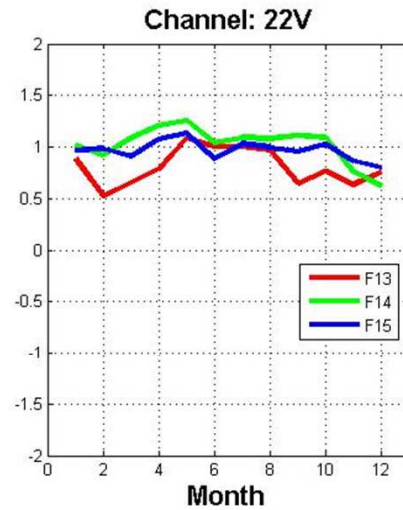
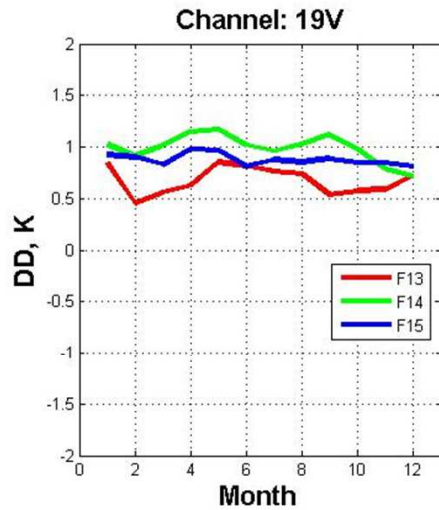
Illustration of SSM/I Scanning Characteristics



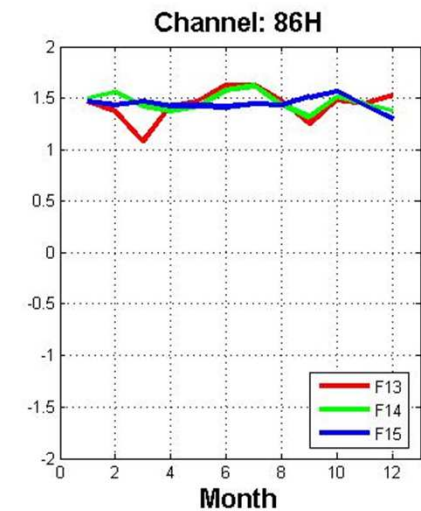
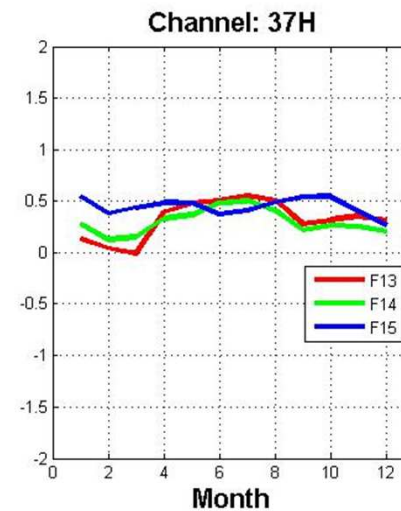
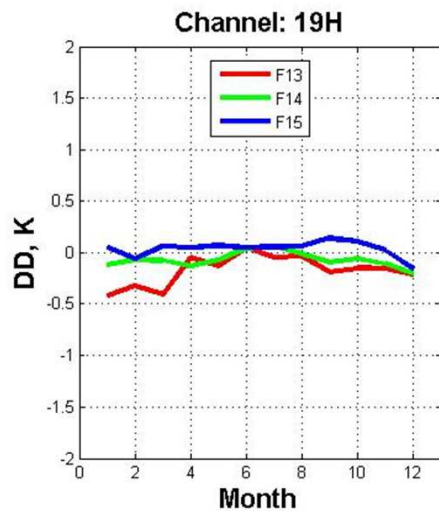
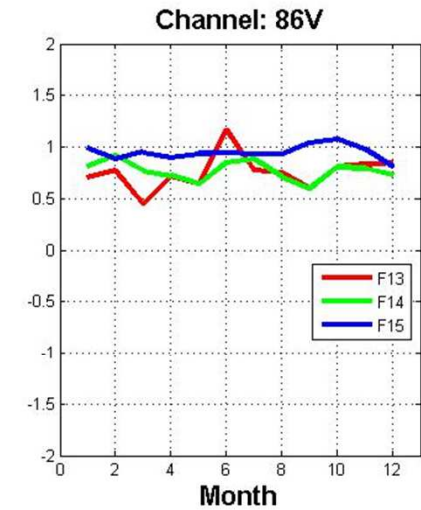
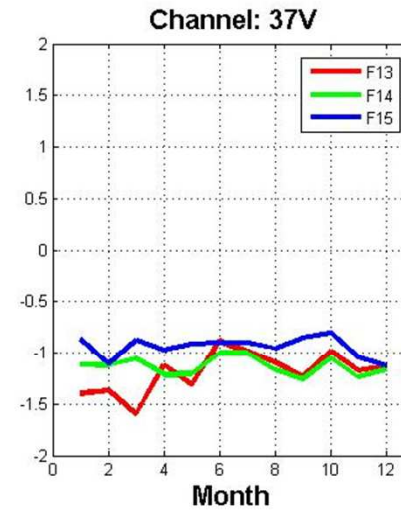
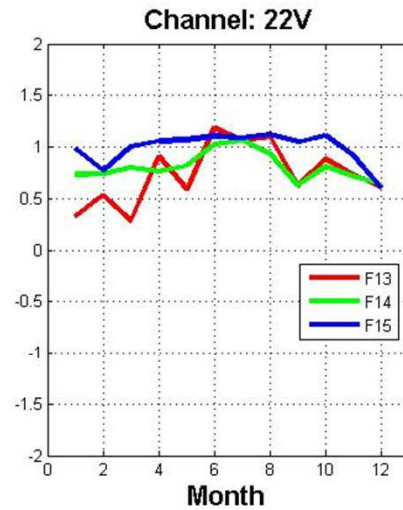
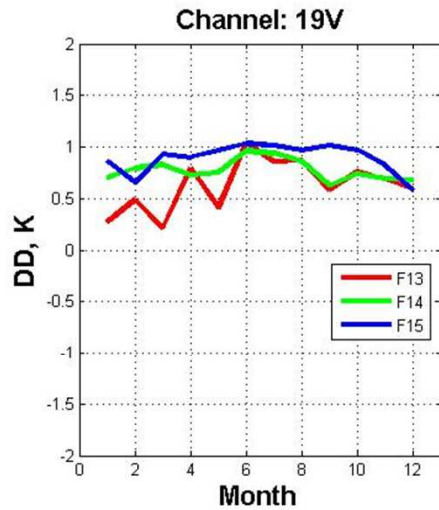
We define + scan as left of flight direction

Ascending Pass is PM

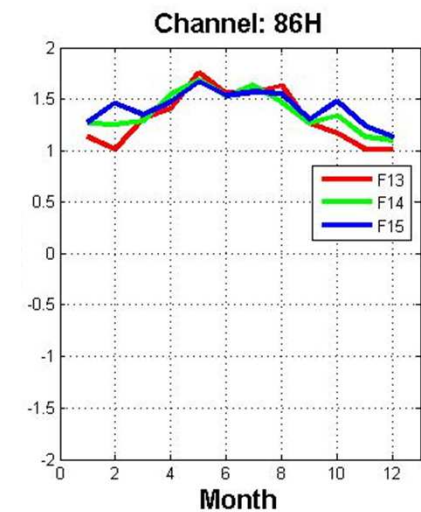
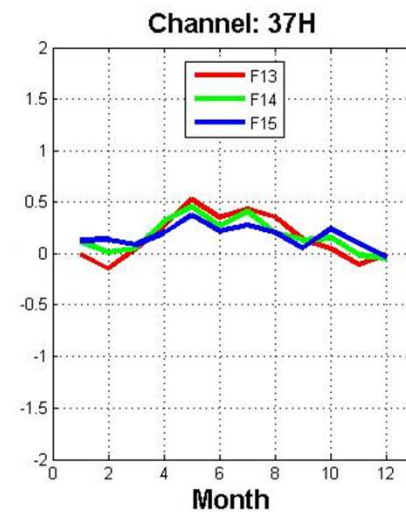
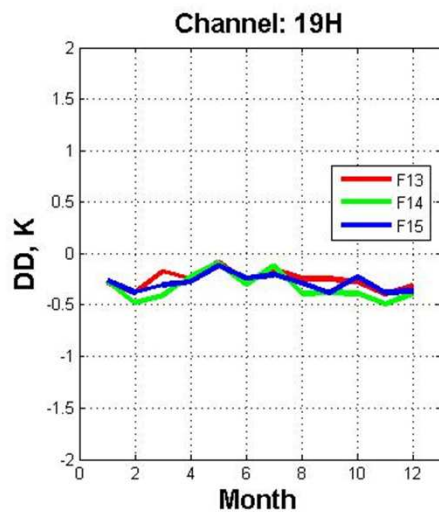
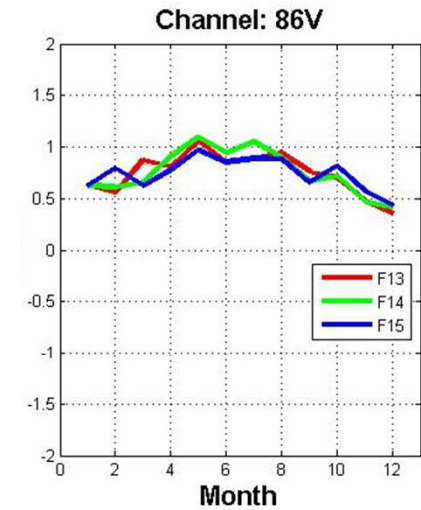
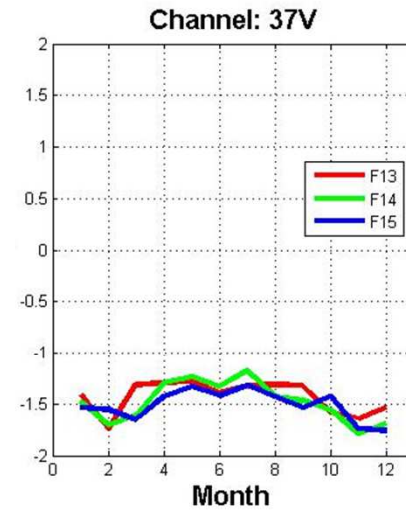
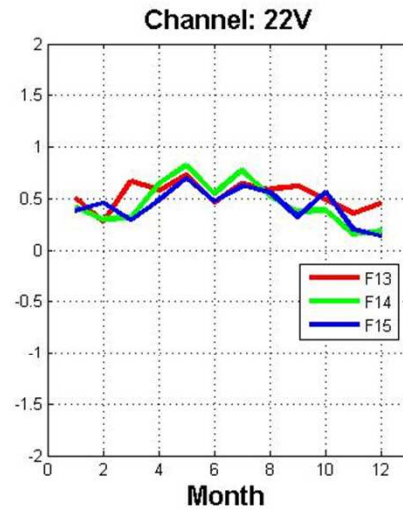
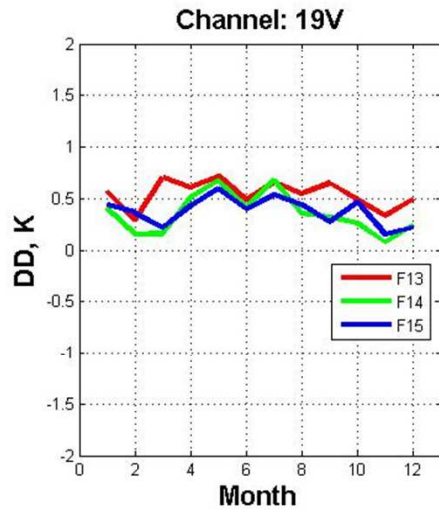
Monthly Variation (DD '02) Asc



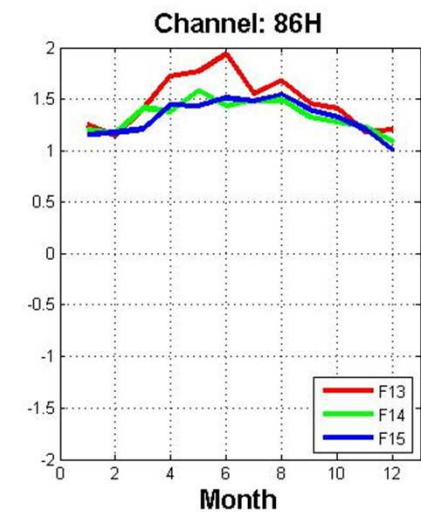
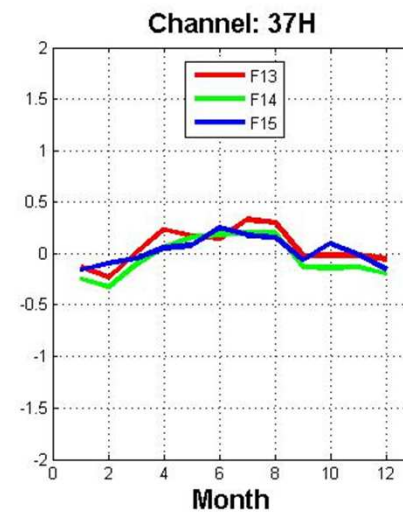
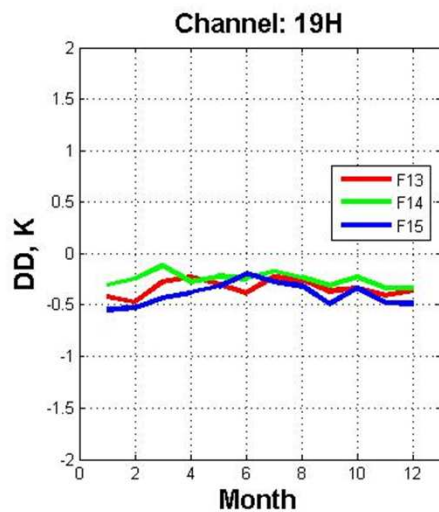
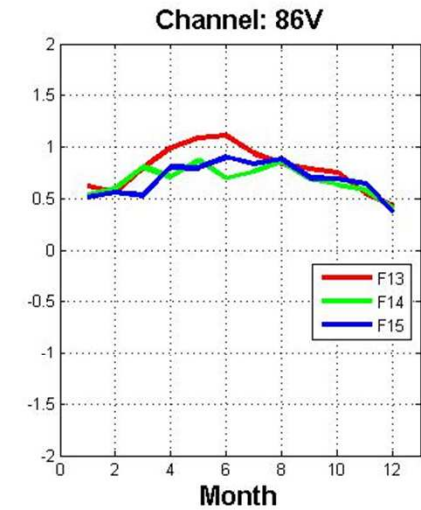
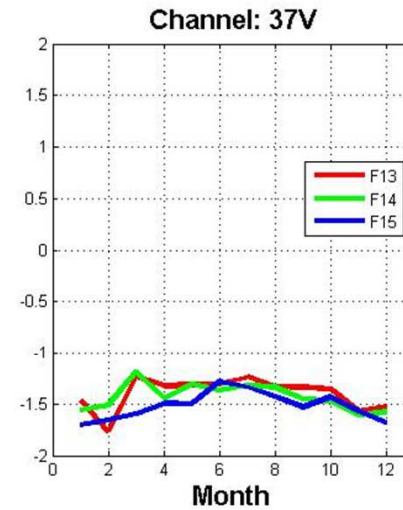
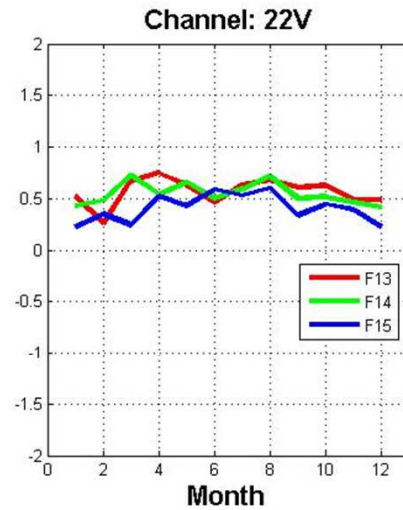
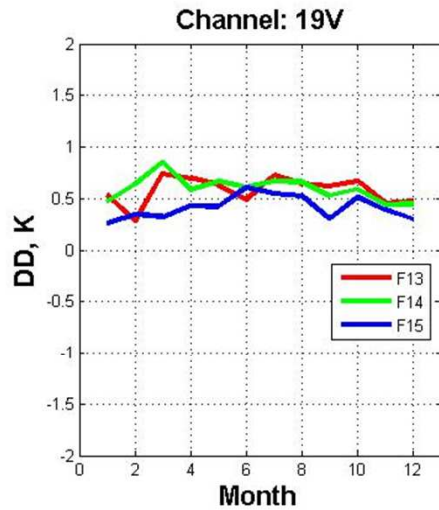
Monthly Variation (DD '05-'06) Asc



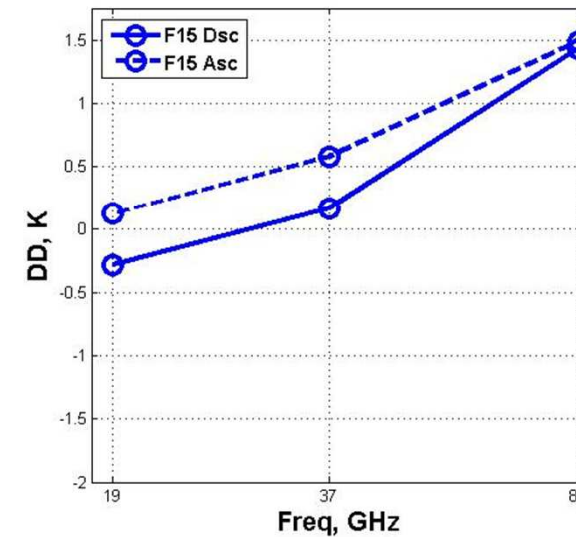
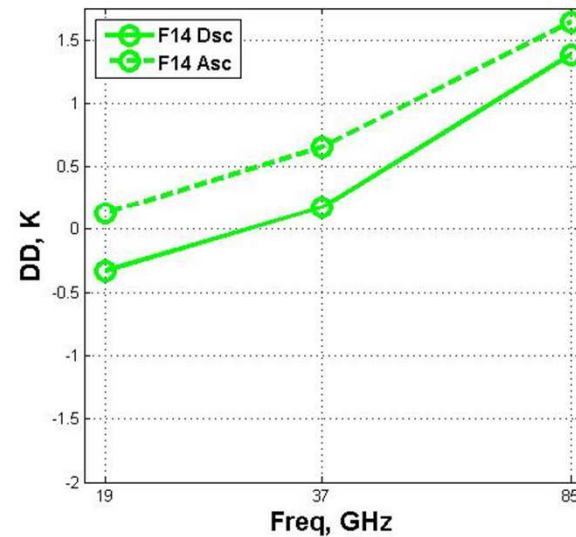
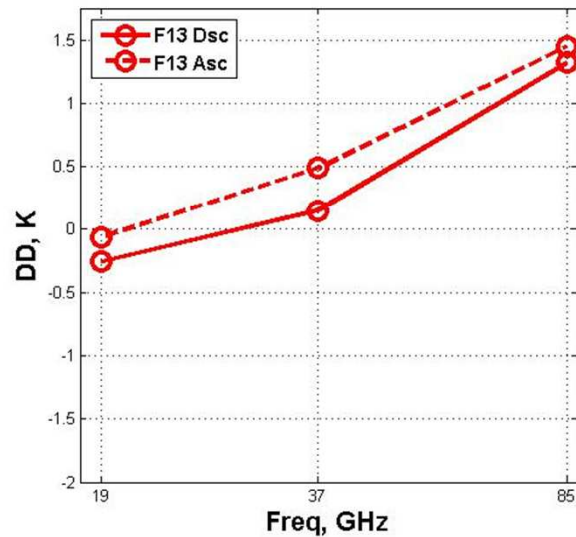
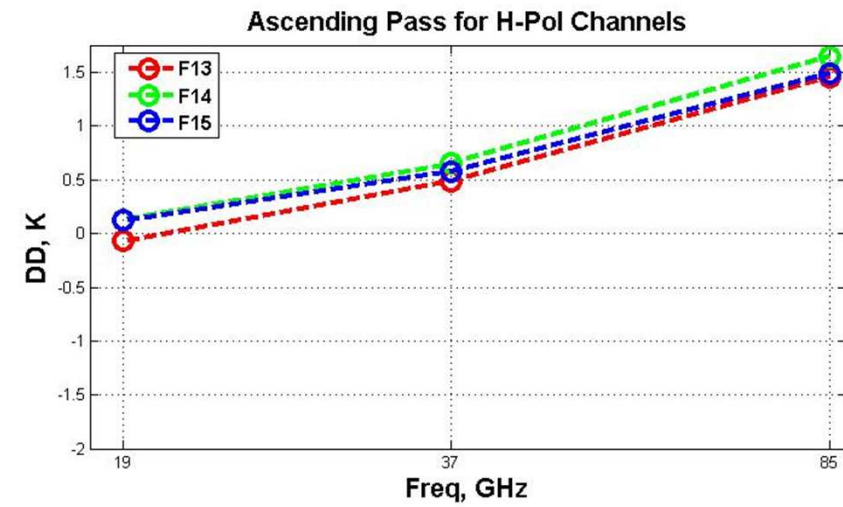
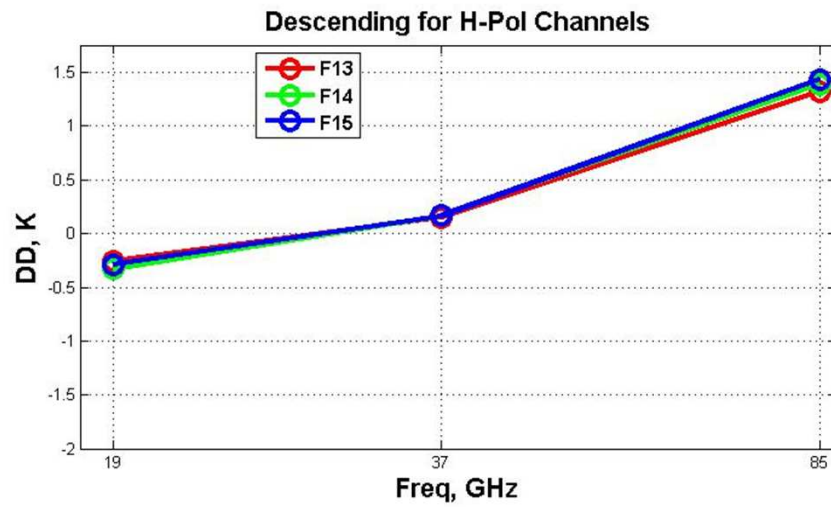
Monthly Variation (DD '02) Dsc



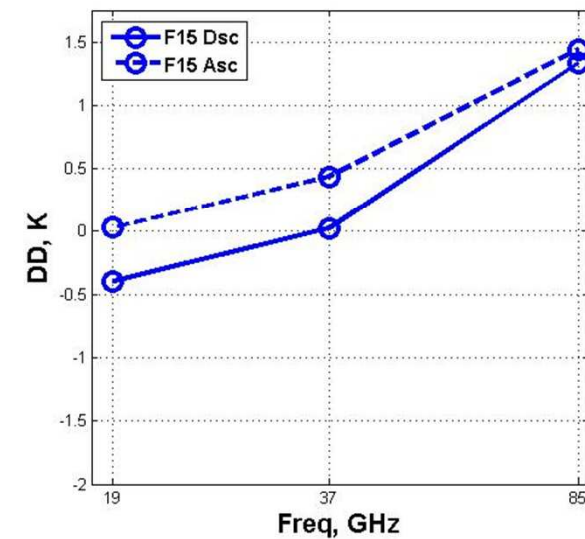
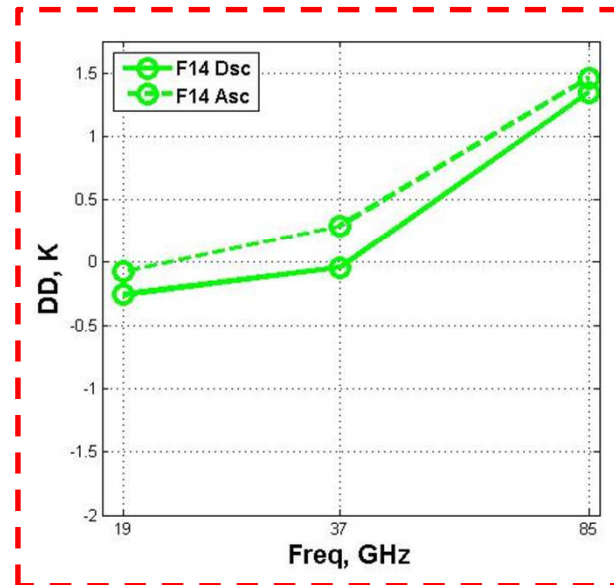
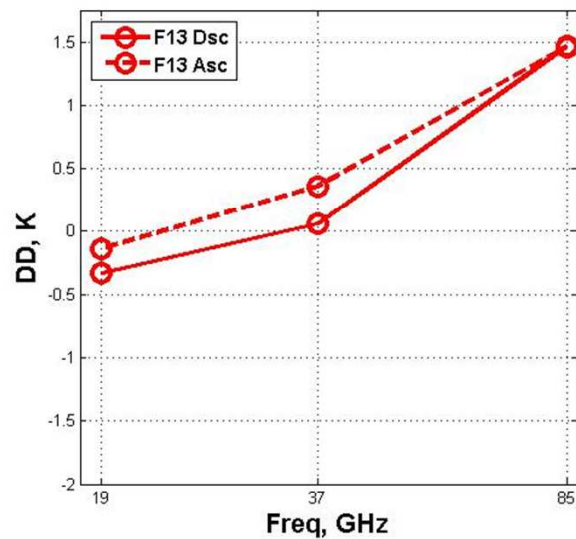
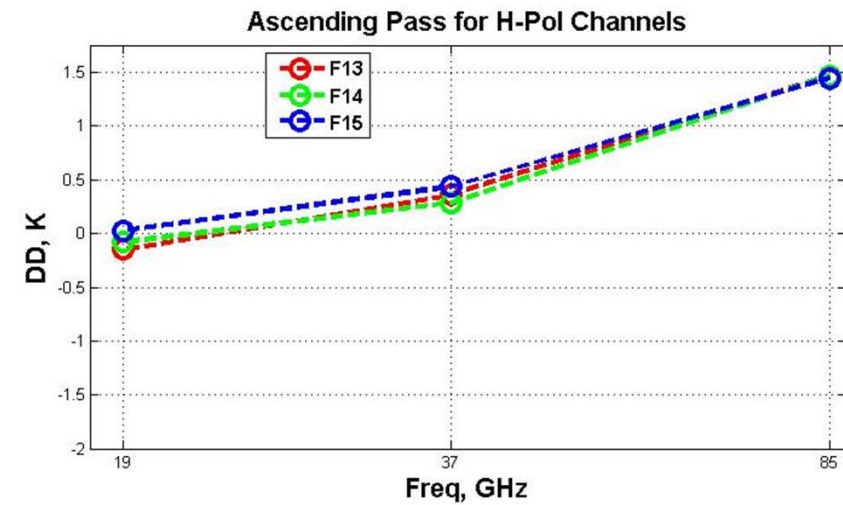
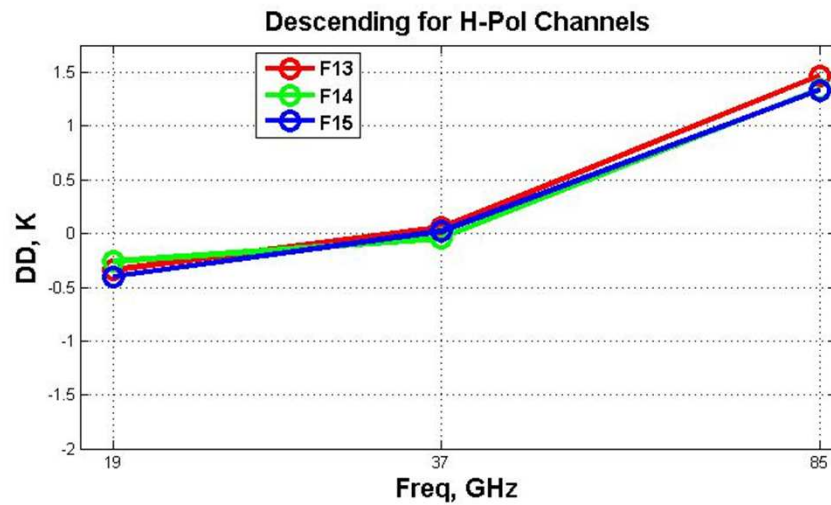
Monthly Variation (DD '05-'06) Dsc



DD H-Pol for '02 Year

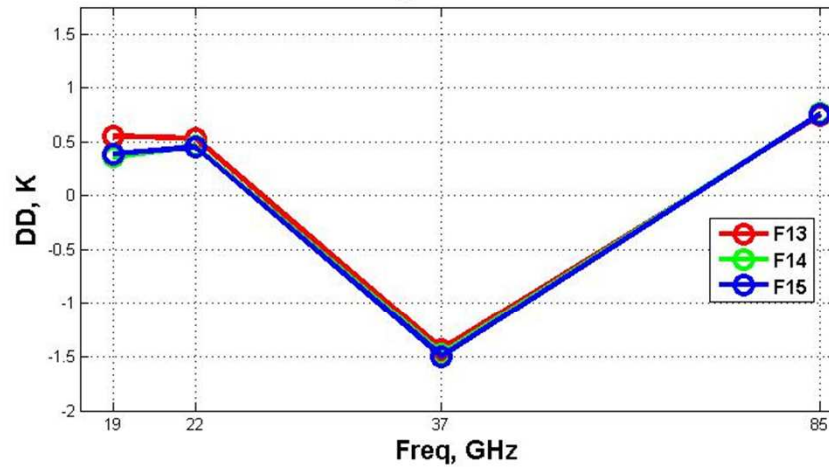


DD H-Pol for '05-'06 Year

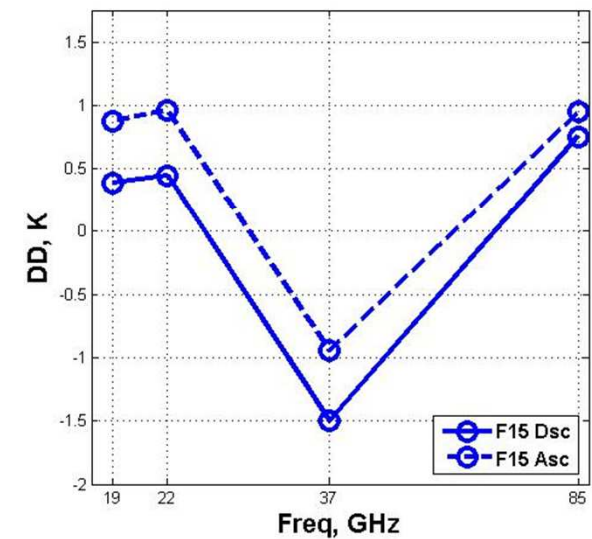
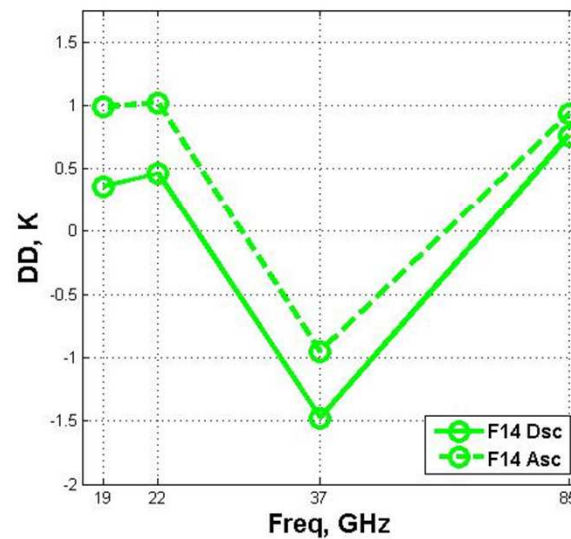
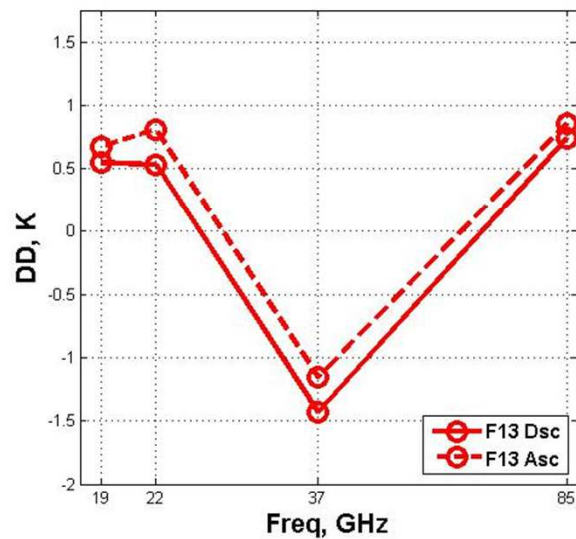
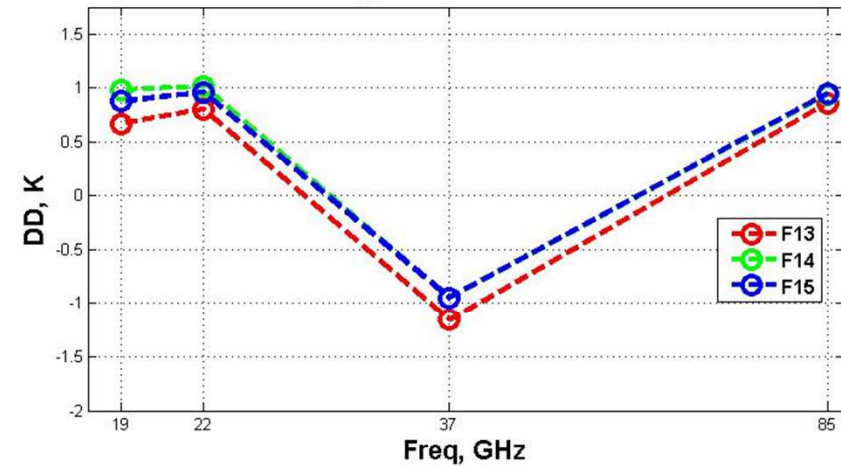


DD V-Pol for '02 Year

Descending for V-Pol Channels

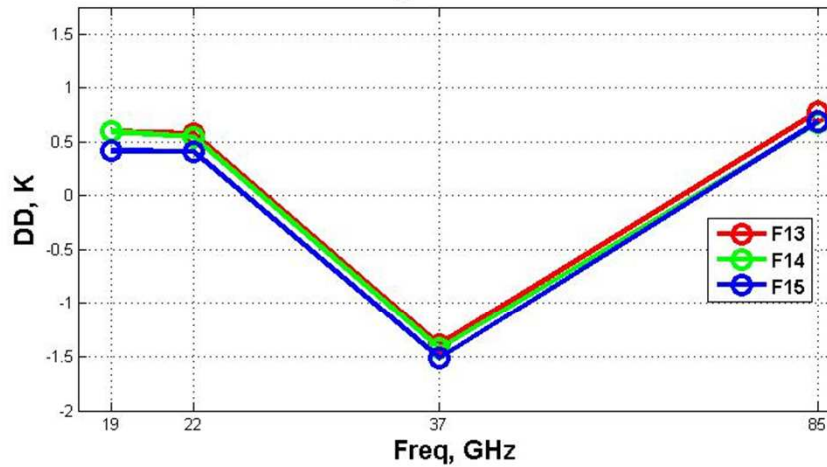


Ascending Pass for V-Pol Channels



DD V-Pol for '05-'06 Year

Descending for V-Pol Channels



Ascending Pass for V-Pol Channels

