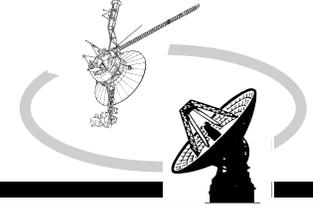


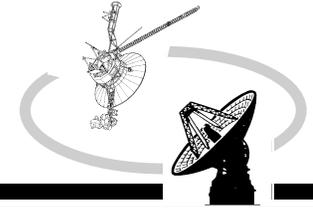
W-band Assessment Agenda



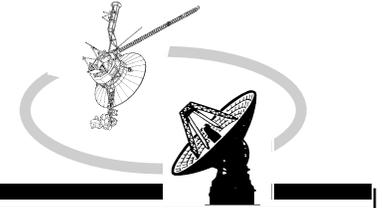
- **W-band receiver status (Seiffert)**
- **Phase-stable 75 GHz downconverter status (Teitelbaum)**
- **Blind pointing model development (Richter)**
- **Discussion of FY2002 goals (Teitelbaum,all)**
- **W-band strategic planning meeting (Teitelbaum,all)**

W-band Assessment

Phase-stable 75 GHz downconverter status



- **History**
 - Formulated phase noise technical requirements by extending requirements for existing DSS-25 Ka-band downconverter
 - No response to requests for bid from Miteq or Section 333 Exciter and RF/Millimeter Instruments group
- **Durga Bagri and Mike Seiffert's opinion: one phase-stable, lockable, dedicated 18.75 GHz oscillator away with current approach**
- **Elected to use existing approach with Yig-tuned Oscillator (YTO) phase-locked to DSS-13 100 MHz reference**
- **Anticipated performance with 18.8 GHz YTO from MicroLambda**
 - 75.2 GHz first local oscillator (x4, YTO an integer multiple of reference, N)
 - Phase noise outside of YTO 100 kHz PLL bandwidth from device spec
 - Phase noise inside 100 kHz PLL bandwidth from station reference
 - Output phase noise = reference noise + 20 Log (N) + 3 dB, with N=188
 - Obtained reference phase noise, believed to be conservative, from FTS group
- **Issued procurement for two YTO's from MicroLambda**
 - 18.8 GHz for first LO, x4 --> 75.2 GHz
 - 21.6 GHz for phase calibration signal, x4 --> 86.4 GHz

W-band Assessment**Phase-stable 75 GHz downconverter status**

- **Predicted Phase Noise Performance**
 - Residual Phase Noise

**Miteq Ka-band 31.7 GHz plus
10 dB/decade beyond 1 kHz**

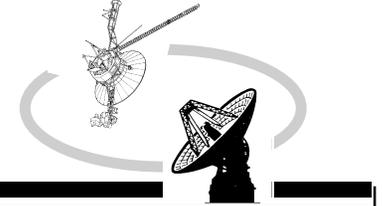
**-63 dBc/Hz at 1 Hz offset
-73 dBc/Hz at 10 Hz
-83 dBc/Hz at 100 Hz
-90 dBc/Hz at 1 kHz
-100 dBc/Hz at 10 kHz
-110 dBc/Hz at 100 kHz
-120 dBc/Hz at 1 MHz offset and beyond**

**MicroLambda YTO plus DSN
100 MHz reference performance**

**-52 dBc/Hz at 1 Hz offset
-72 dBc/Hz at 10 Hz
-75 dBc/Hz at 100 Hz
-79 dBc/Hz at 1 kHz
-79 dBc/Hz at 10 kHz
-105 dBc/Hz at 100 kHz
-135 dBc/Hz at 1 MHz and beyond**

- **“A crude integration of the noise power gives better than 30dB carrier to noise power at 18.8 GHz or about 18 dB at 75 GHz. This is essentially dominated by the phase noise of the reference signal. I would have preferred a bit better carrier to noise ratio but 18 dB is not too bad. Also I feel that if Ka band LO at the antenna has several dB to 10 or even 20 dB better than what Al Kirk has told me than Al has given me conservative numbers and the 100 MHz station reference should be some what better than the numbers I have from Al.”**

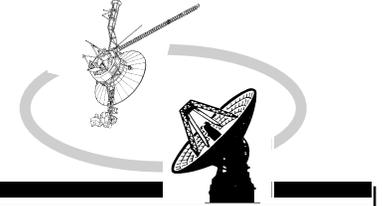
W-band Assessment FY2002 Goals



- **High-level goals**
 - Our commitment to IND Technology at proposal/task planning time
 - Routinely operational, calibrated radiometry-capable, VLBI-capable, noise temperature-optimized receiver (Q2)
 - W-band blind-pointing capability (Q2) – Documented in TMO Progress Report (Q3)
 - W-band aperture efficiency measurement (Q4) - Documented in TMO Progress Report (Q4)
 - Our Q3 planned accomplishments from FY2002 mid-year review
 - Resolve anomalous high noise temperatures - T_{RCVR} , T_{SYS}
 - Develop blind-pointing capability and initial W-band pointing model.
 - Document in TMO Progress Report
 - Perform VLBI fringe test with existing downconversion chain
 - Finalize 75 GHz phase-stable downconverter design and initiate fabrication
 - Measure antenna aperture efficiency
- **Below the line “discretionary” goals to further the work, from strawman task plan ...**
 - Obtain first fringes (Q3)
 - Apply raster scan technique at W-band (Q3)
 - Obtain data for antenna servo system study (Q3)
 - Complete W-band link margin study (Q3)
 - Explore implementation options to improve efficiency (Q4)
 - Develop detectable point source catalog (Q4)
 - Efficiency measurements at F1 focal point with the “spider”
 - Noise temperature measurements with “taped outer segments” - 34m spill test

W-band Assessment

Strategic planning meeting



- **Idea originated from discussion with Mike Klein**
 - We're producing (good) and threatening to overspend (bad) with no prospect of financial relief from IND Technology, DSN Science Office
- **It may be time to re-visit the motivations for W-band**
 - Are we at a decision point?
 - What would it take to reach a decision point?
- **Propose to do it at May 1 DSN Science Team lunch meeting**
- **Topics**
 - **Telecomm issues/justifications**
 - Link budget
 - Mission level trades
 - **Science issues/justifications**
 - Spectroscopy
 - Continuum observations
 - **Gravity compensation in support of Ka-band on 70m antennas**
 - **Interferometry issues/justifications**
 - CMVA participation
 - Future SVLBI
 - Progress on “technical elements:” noise T, phase stability, efficiency, collecting area, pointing, prospect for world-class SEFD