Shuttle External Tank Video Predicted Coverage

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- Revised predicted Shuttle External Tank Video coverage based on latest launch trajectory and system parameters.
- Previous analysis performed in 1999

Shuttle External Tank Video Predicted Coverage

- Trajectory
  - Latest trajectory for STS-112 ascent based on standard from STS-105
  - Used two trajectories from set of four
    - Trajectory at start of launch window
    - Trajectory at end of launch window
  - Both trajectories for roll-to-heads-up ascent
    - Roll in opposite directions

Shuttle External Tank Video Predicted Coverage

- Antenna patterns for combined ET antennas A and B – ¼ power to A and ¾ power to B
  - One pattern for SSO/ET/SRB structure
    - Used from launch to SRB sep
  - One pattern for SSO/ET structure
    - Used from SRB sep to ET sep

Shuttle External Tank Video Predicted Coverage

	External Tank Shuttle Observation Camera System Link Margin			
1	ET Camera RF Transmit Power Output (10 W)	40.0	dBm	
2	Feed Cable and Filter losses	-1.3	dB	
3	Power splitter insertion loss	-0.5	dB	(PIRN value)
4	Cable Losses	-4.0	dB	46 feet , Times Microwave Miltech 340 (PIRN value)
5	Combined antenna gain	-2.0	dBi	
6	Transmit EIRP	32.2	dBm	1 + 2 + 3 + 4 + 5
7	Free Space Loss Using: 2272.5 MHz	-159.6	dB	Path distance: 1000. km
8	Polarization Loss	0.0	dB	Diversity Combining
9	Atmospheric/Ionospheric Attenuation	-0.2	dB	
10	Isotropic Signal Level at Ground Station	-127.6	dBm	6 + 7 + 8 + 9
11	Ground Station Antenna Gain *	43.8	dBi	9 meters, 55%; PDL antenna gain is 37.6 dBi.
12	Ground Station Pointing Loss	-0.5	dB	
13	Total Power Received (Prec)	-84.3	dBm	10 + 11 + 12
14	RCVR System Noise Temp	20.8	dBK	System Temp: 120.0 K
15	Boltzmann's Constant	-198.6	dBm/K-Hz	
16	Receiver Noise Spectral Density (No)	-177.8	dBm/Hz	14 + 15
17	Ground Station Prec/No	93.5	dBHz	13 - 16
18	MILA Required Prec/No	83.30	dBHz	Test Data
19	ESTL Required Prec/No	91.60	dBHz	Test Data
20	Margin at level for MILA	10.2	dB	17 - 18
21	Margin at level for ESTL	1.9	dB	17-19

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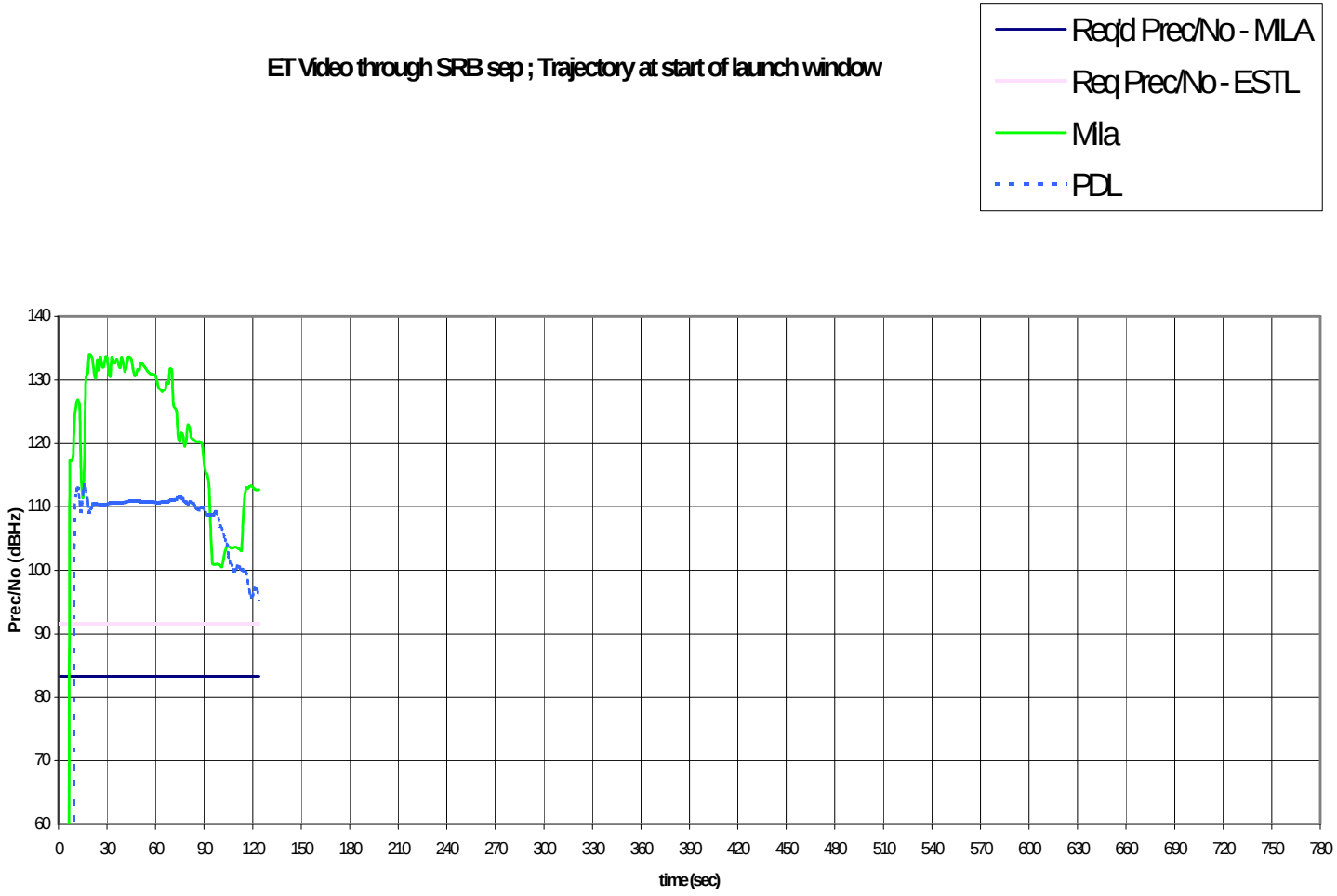

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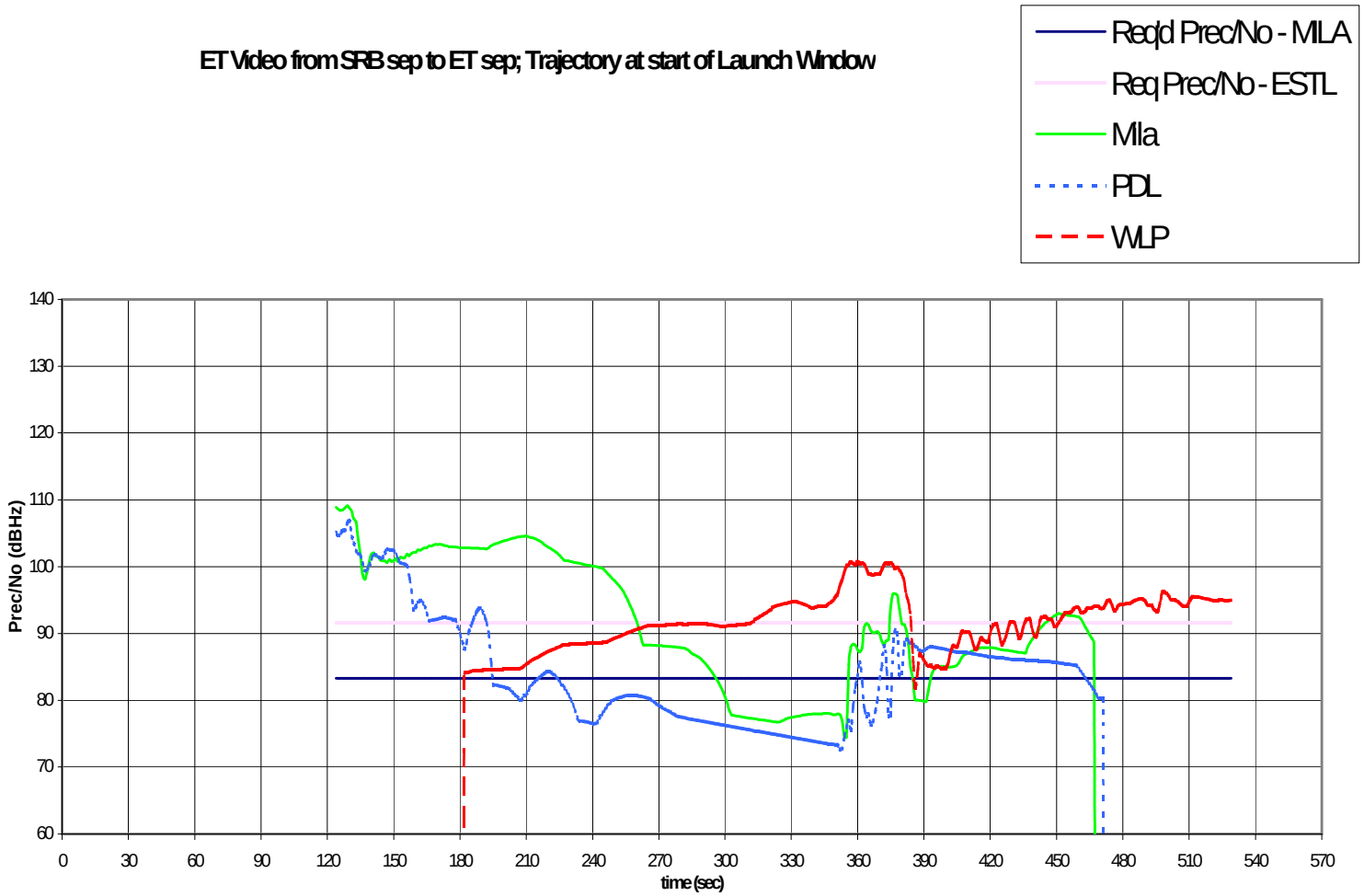

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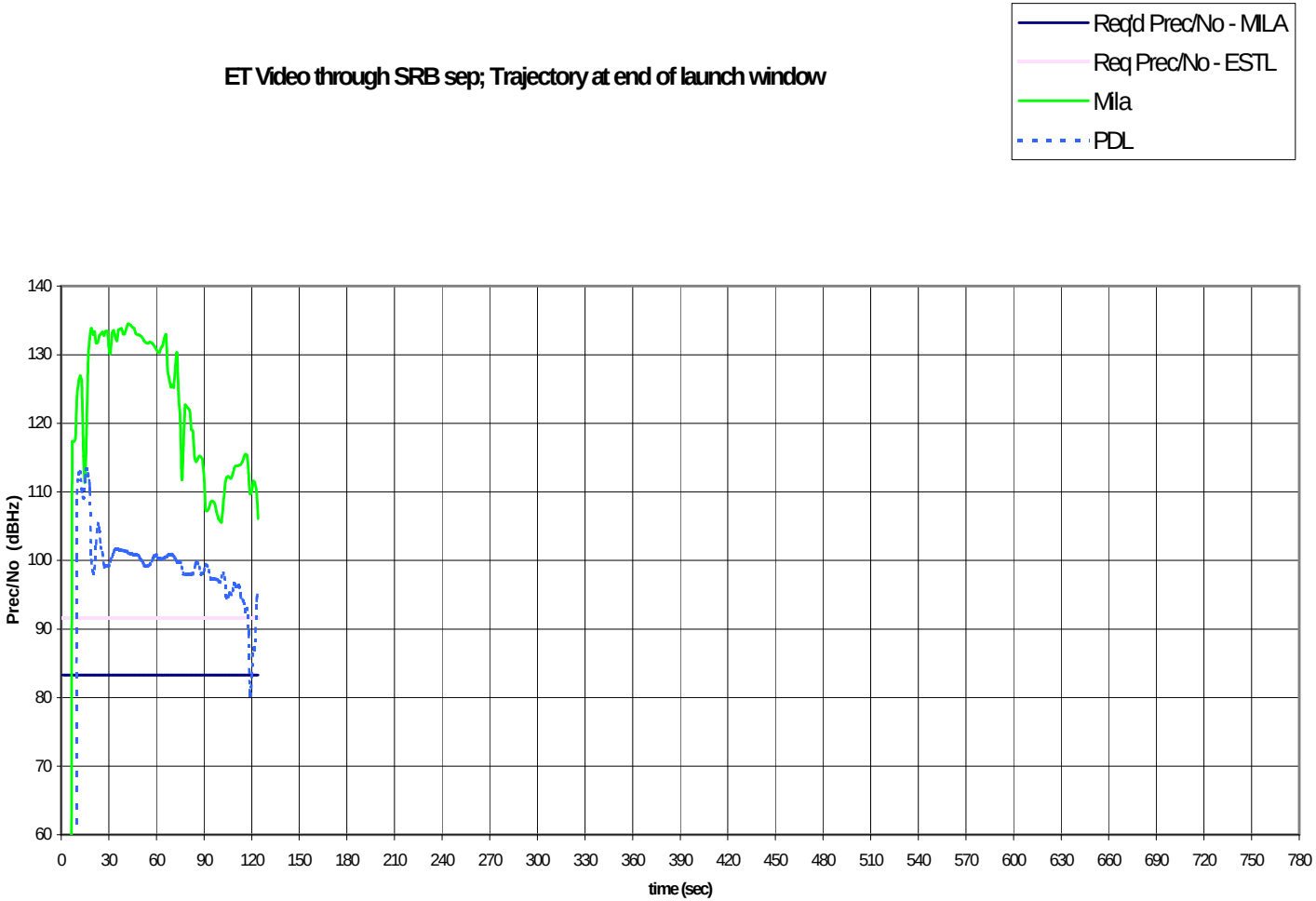

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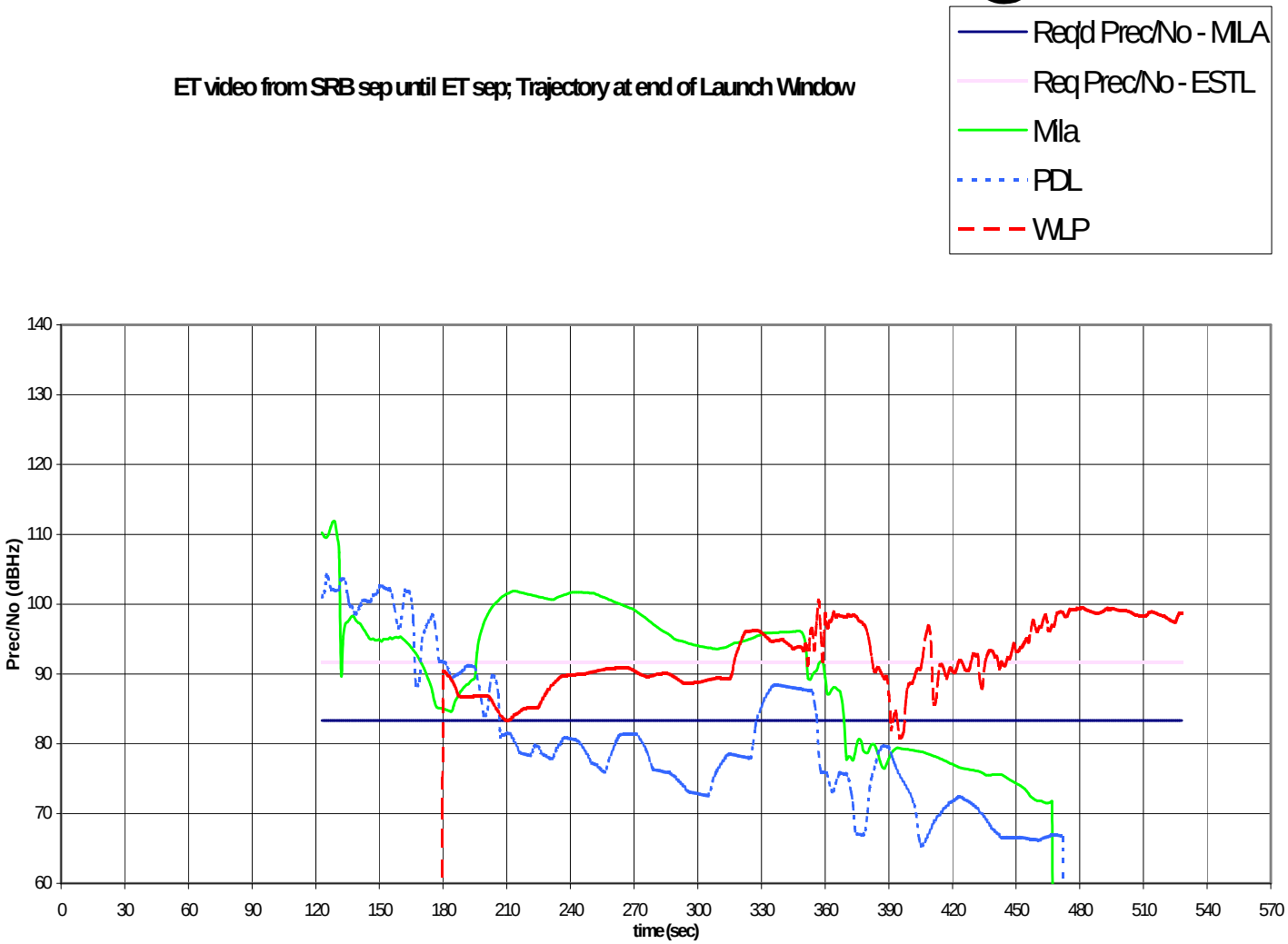

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- Notes from charts
  - MILA and PDL have no signal for first 8 – 10 seconds in model because of planet blockage; in reality there will be enough signal
  - Plume blockage was not in the model, so MILA signal shown as good from 77 to 117 seconds; historical data shows plume will block MILA for this time period
  - Required Prec/No thresholds are for “good video” – going below them would reduce video quality but not necessarily drop link

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- Expected best video source
  - MILA from launch to plume blockage
  - PDL from plume blockage to SRB sep
  - MILA from SRB sep to 4.5 – 5.5 minutes, depending upon trajectory
  - Wallops for the rest of the flight

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- Potential times with less than “good” video
  - PDL at 2 minutes
    - For worst case trajectory
    - MILA coming out of plume may be better source
  - At MILA to Wallops switch
    - If use tighter ESTL threshold
    - For worst case trajectory
  - During roll to heads up
    - 6 min 20 sec to 7 min 30 sec
      - If use tighter ESTL threshold
    - 6 min 30 sec to 6 min 40 sec
      - If use MILA threshold
      - For worst case trajectory