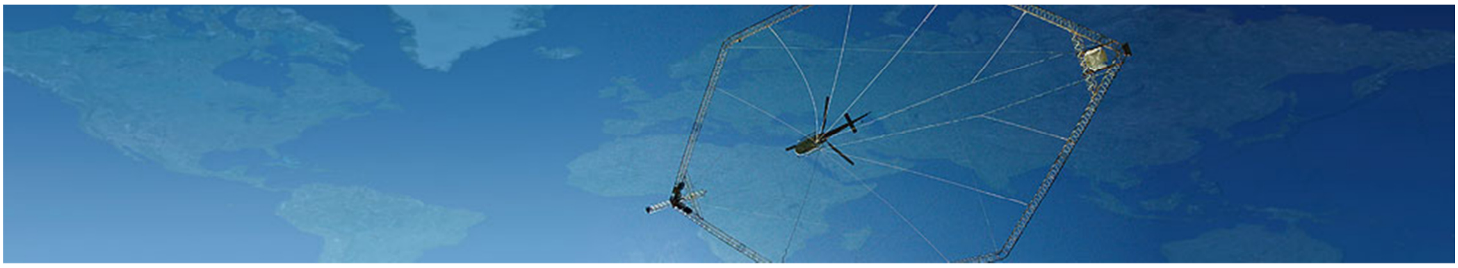

SkyTEM Survey:
Joy and Mervyn Blocks, Canada
Data report

Client: Expedition Mining Inc.

Date: July 2011

Contents

This data report covers the data acquisition of a time domain electromagnetic and magnetic survey carried out in Joy and Mervyn Blocks, Canada 2011, by SkyTEM Sureys ApS.

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Email: bb@skytem.com

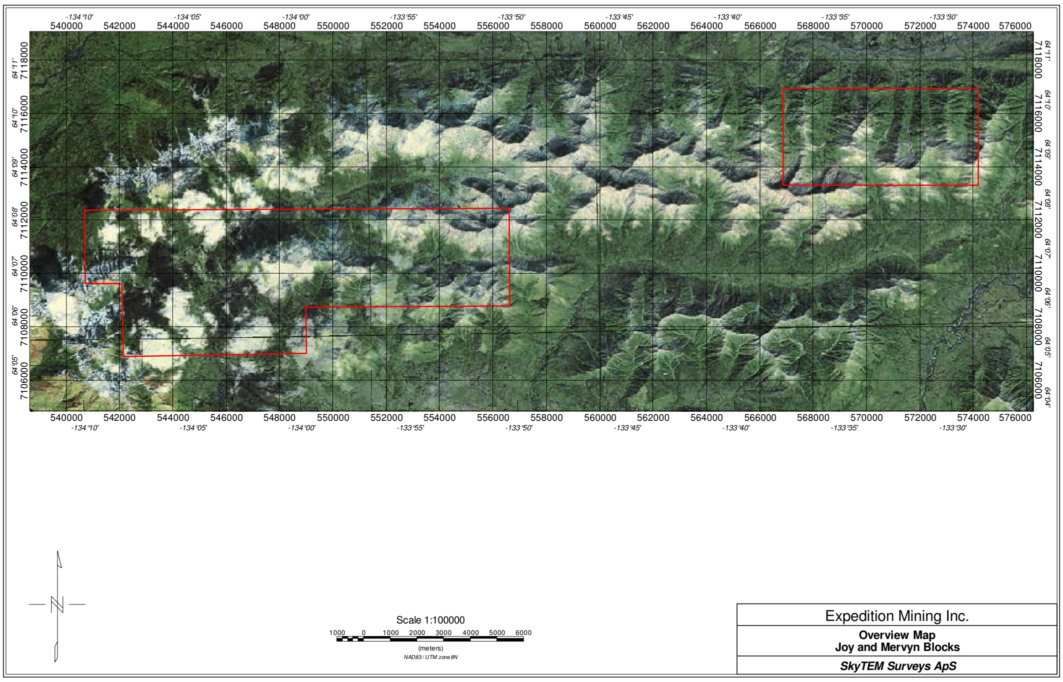


Figure 1 Project overview with the location of the Joy and Mervyn blocks.

Introduction

From May 15 to June 1, 2011 a combined time domain electromagnetic and magnetic survey was performed by SkyTEM Surveys ApS in Joy and Mervyn Blocks, Canada, see Figure 1.

The survey requested by Expedition Mining Inc. was planned to consist of 1143.2 km flight lines in total.

SkyTEM Surveys ApS has agreed to deliver the electromagnetic and magnetic raw data measured during the flights together with the standard SkyTEM processing and inversion.

This report does not include any geological interpretations of the geophysical datasets.

Client		Expedition Mining Inc. 600 - 595 Howe Street Vancouver BC V6C 2T5, Canada USA
Field crew		Sara Thofte Jean Christophe Ricard
Field work		May 15 to June 1, 2011
Flown line km		1143.2 km
Flight operation	Helicopter type Average flight speed Nominal terrain clearance (above any obstacles or hazards)	Eurocopter AS350FX2, operated by Abitibi Helicopters Ltd 60 km/h 30 - 40 m
Pilot		Pierre Otis
Report	Data processing and presentation QC by	Per Gisselø Sara Thofte
Contact Person at SkyTEM		Bill Brown Email: bb@skytem.com

Definition of the areas

The survey areas are defined below by vertex points given in the following tables.

Coordinate systems used are (see table header for Zone number):
UTM Zone 8N (NAD83).
The flight line orientations in the Joy and Mervyn Blocks blocks are North/South with East/West Tie Lines.

Joy Vertex	UTM E (Z8)	UTM N (Z8)	Orientation/Line#/planned
1	566865.48	7113302.86	N – S 300100 – 307300 E – W 400100 – 402900
2	574187.10	7113295.20	
3	574183.50	7116942.34	
4	566863.78	7116935.77	

Mervyn Vertex	UTM E (Z8)	UTM N (Z8)	Orientation/Line#/planned
1	556614.29	7112439.74	N – S 100100 – 116000 E – W 200100 – 200600
2	556638.08	7108772.89	
3	548975.40	7108743.16	
4	549002.85	7107003.50	
5	542144.58	7106888.48	
6	542092.89	7109634.39	
7	540725.26	7109616.14	
8	540689.21	7112362.38	

Instruments and parameter setup

The instrumentation involves a time domain electromagnetic system including a data acquisition system, a magnetometer, two DGPS', two inclinometers and two altimeters, see Figure 2.

A thorough description of the setup is given in Appendix 1.

The equipment setup has been chosen as a dual moment configuration including a Low moment (LM) with a peak moment of ~3,140 NIA and a High Moment (HM) with a peak moment of ~150,000 NIA.

The main benefit of the dual moment system is the possibility to measure the early time gates when transmitting in LM mode while still having the deep penetration obtained with the HM mode.

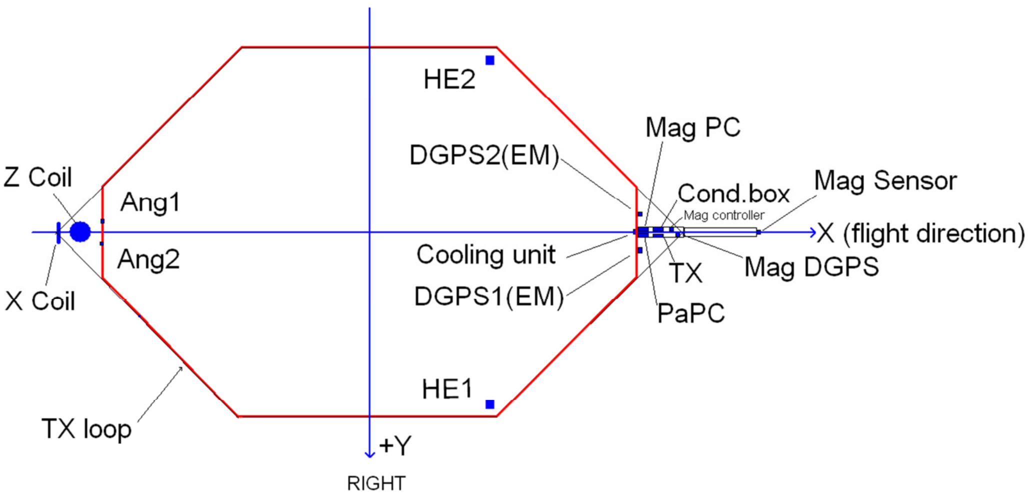


Figure 2 Sketch showing the frame and the position of the instruments. The red line defines the transmitter loop. The horizontal plane is defined by (x, y).

The location of instruments in respect to the frame is shown in Figure 2.

X and y define the horizontal plane. Z is perpendicular to (x, y). X is positive in the flight direction, y is positive to the right of the flight direction, and z is positive downwards.

The DGPS systems are mounted in the front of the frame.

The generator used for powering the transmitter is positioned 10 m below the helicopter.

A more thorough description of the system and individual instruments can be found in ref /1/ and Appendix 1.

Synchronizing the data

All recorded data are marked with a time stamp used to link the different data types. The time stamp is in UTC/GMT.

The time stamp formats are either

1. yyyy/mm/dd hh:mm:ss.sss – Values defined as year/month/day/hours/minutes/seconds.

or

2. Ddddd.sssssssss - Datetime values defined as the number of days since 1900-01-01 and seconds of the day.

Calibration of the TEM system

Special note on Calibration (50/60 Hz)

Due to the fact that the electrical power supply grid in North America runs with a frequency of 60Hz, whereas the European grid uses 50 Hz, the calibration at the Danish National Reference site has not been conducted with the exact same timing for the transmitter and receiver (referred to as "the script"). This is done in order to avoid noise from the 50 Hz power grid while calibrating the system.
The following table describes the difference between the script used for calibration in Denmark and the script used for production in North America.

Parameter	50 Hz script	60 Hz script
ON-time HM	10000 µs	8000 µs
OFF-time HM	10000 µs	8667 µs
ON-time LM	800 µs	800 µs
OFF-time LM	1450 µs	1283.3 µs
Base frq. HM	25 Hz	30 Hz
Base frq. LM	222.2 Hz	240 Hz

The calibration parameters found at the reference site is not depending on the timing and can be used regardless of the frequency setup. The following paragraphs and Appendix 3 hence refer to the 50 Hz script calibration, but the parameters are valid for the 60 Hz script as well.

Calibration at the National Danish Reference Site

The complete SkyTEM equipment has been tested and calibrated at the Danish National Reference Site in March 2011.

The calibration includes measurements of the transmitter waveform and data level in different altitudes. By these measurements it has been documented that the instrumentation can reproduce the reference site using constant calibration parameters independent of the flight altitude.

The calibration results and parameters are shown below:

Low moment:
Shift factor: 0.96 (on the raw dB/dt data)
Time shift: -1.1e-6

High Moment:
Shift factor: 0.96 (on the raw dB/dt data)
Time shift: -1.1e-6

All data has been processed using the above stated calibration parameters.
SkyTEM inversion software (iTEM) handles time shift calibration during import of data. If third party processing or inversion software is used the calibrated gate centre times in Appendix 2 should be used.

The waveform, as well as the reproduced soundings in different altitudes, are shown in Appendix 3.

High altitude test

A high altitude test was performed on May 14, 2011 at 1500 masl. The test was performed in order to establish that the internal noise was below contractual specs and that no drift was present in the system. The test was performed with exactly the same equipment and configuration as used during the survey.

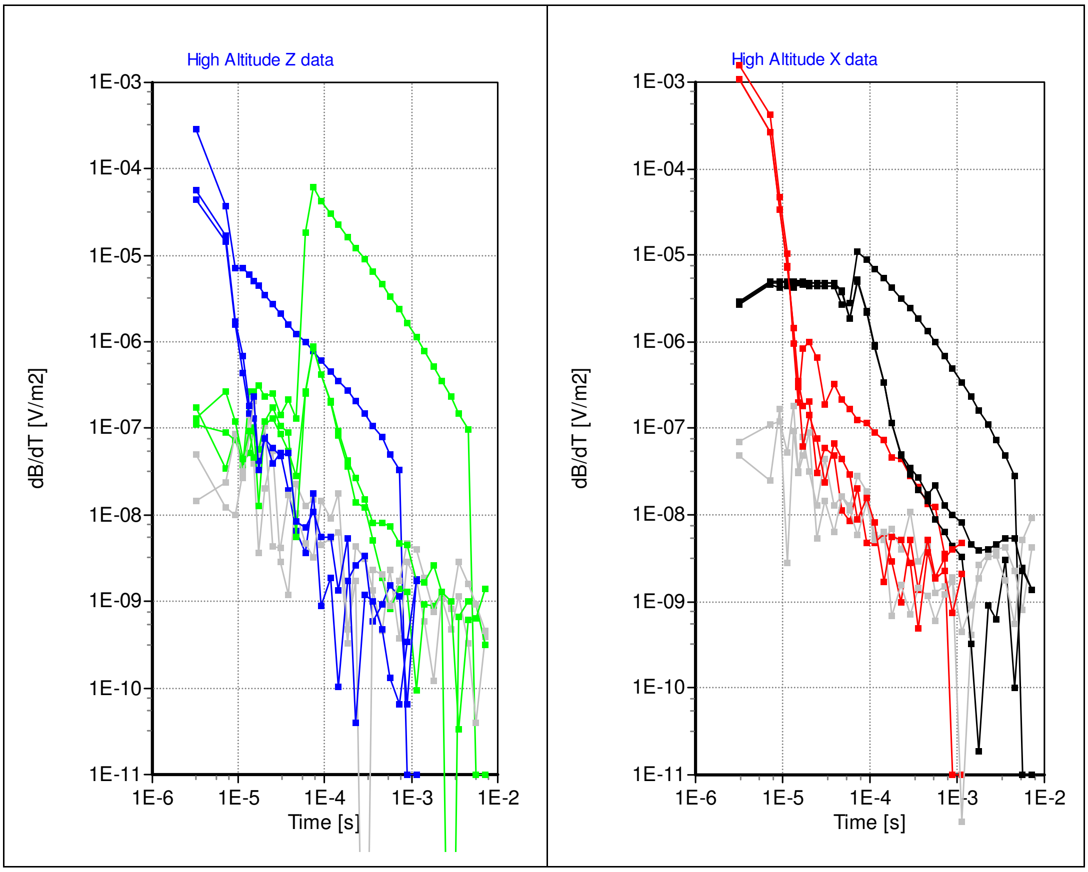


Figure 3 Z-coil and X-coil data. High altitude tests performed May 14, 2011 at 1500 masl. A comparison of the background noise level (grey curves) with the signal when the transmitter is on (green and blue curves for Z-coil HM and LM, and black and red curves for X-coil HM and LM). A typical production response is transposed for comparison. The data unit is V/m^2 (data normalized with the receiver coil area only).

In high altitude the background noise and the signal with the transmitter on are very much alike after the front gate opens (Figure 3). Because of the high altitude no signal from the ground is present. Therefore it can be concluded that there was no noise in the system. It is also evident that the production response is 2 to 3 decades higher than the noise level for Z coil data and 1 to 2 decades higher for X coil data.

Data acquisition

The planned flight lines covering the Joy and Mervyn Blocks are shown in Figure 4 and Figure 5 respectively. The lines are parallel-spaced 100 m apart and striking in a North/South direction.

The flight lines are numbered from 100100 - 402900.

Block	In-line	Tie-Line
Mervyn	100100 – 116000	200100 – 200600
Joy	300100 – 307300	400100 – 402900

The nominal terrain clearance is 30 m above any obstacles or hazards, with an increase over forests, power lines, etc. It is always the pilot who decides the safety height for the operation.

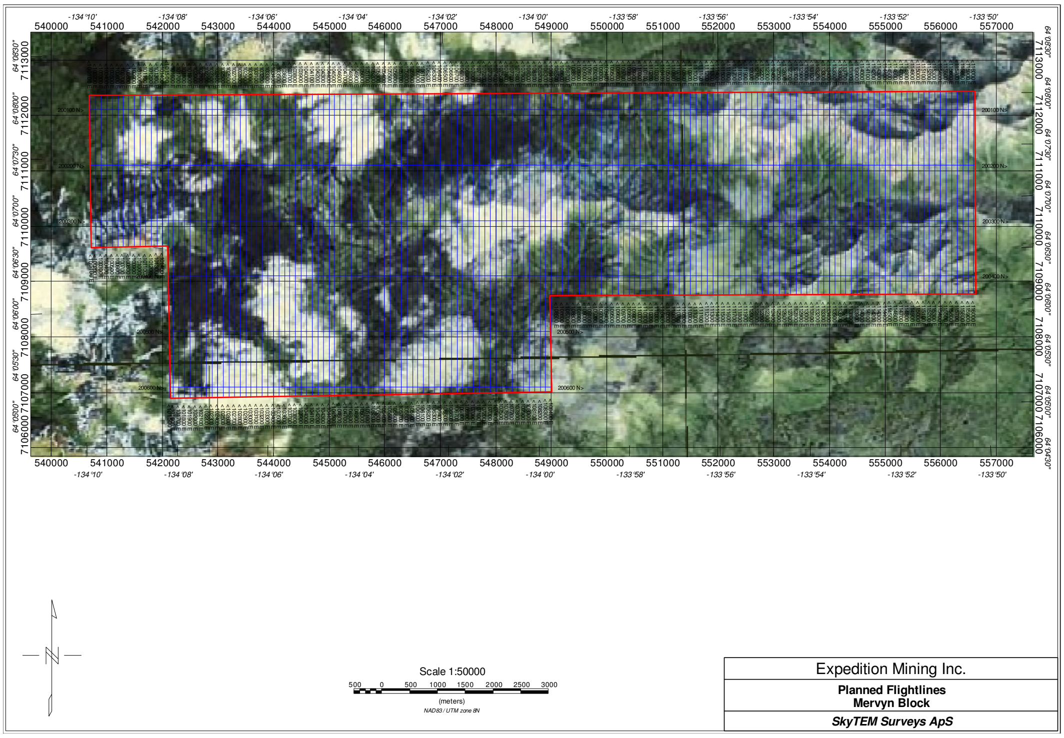


Figure 4 Planned flight lines (blue lines) for the Mervyn block UTM Z8 (NAD83).

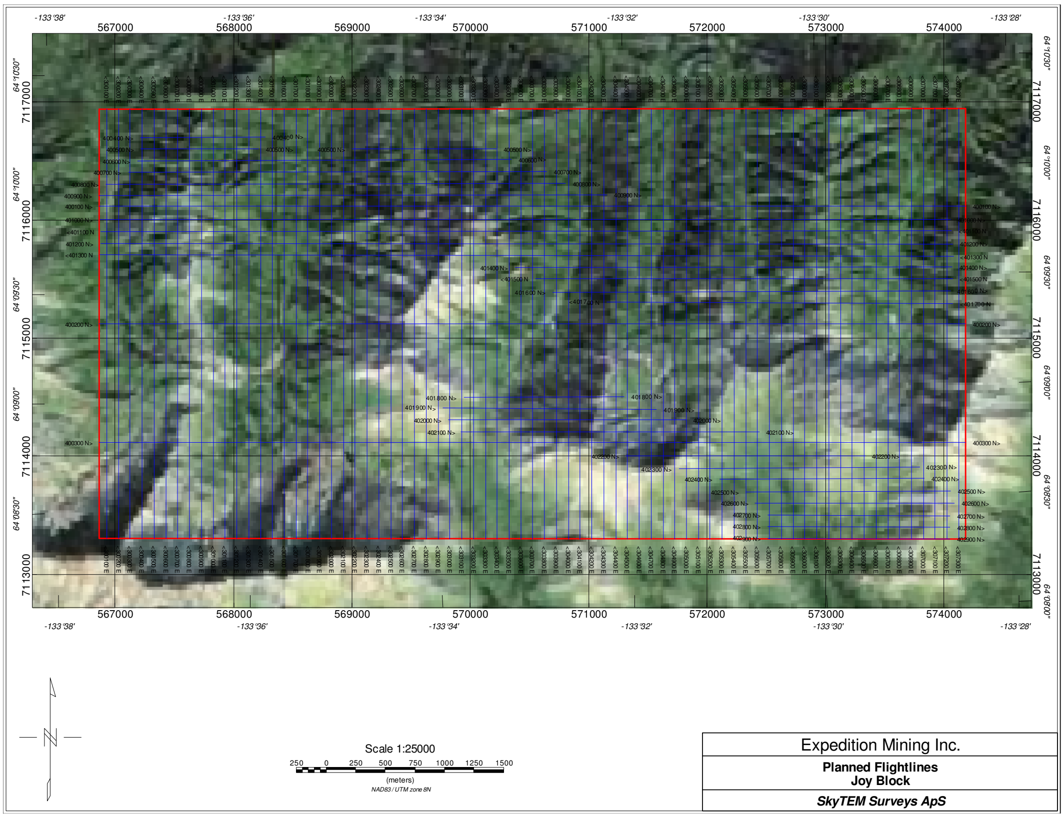


Figure 5 Planned flight lines (blue lines) for the Joy block UTM Z8 (NAD83).

The helicopter airspeed was planned to be 85 km/h above a flat topography and in no wind. This may vary in areas of rugged terrain and/or windy conditions.
Actually flown lines can be seen in Figure 6 and Figure 7. Discrepancies from the planned lines occur when possible noise sources are present, or the nature of the ground like roads, buildings and antennas has called for a diversion.

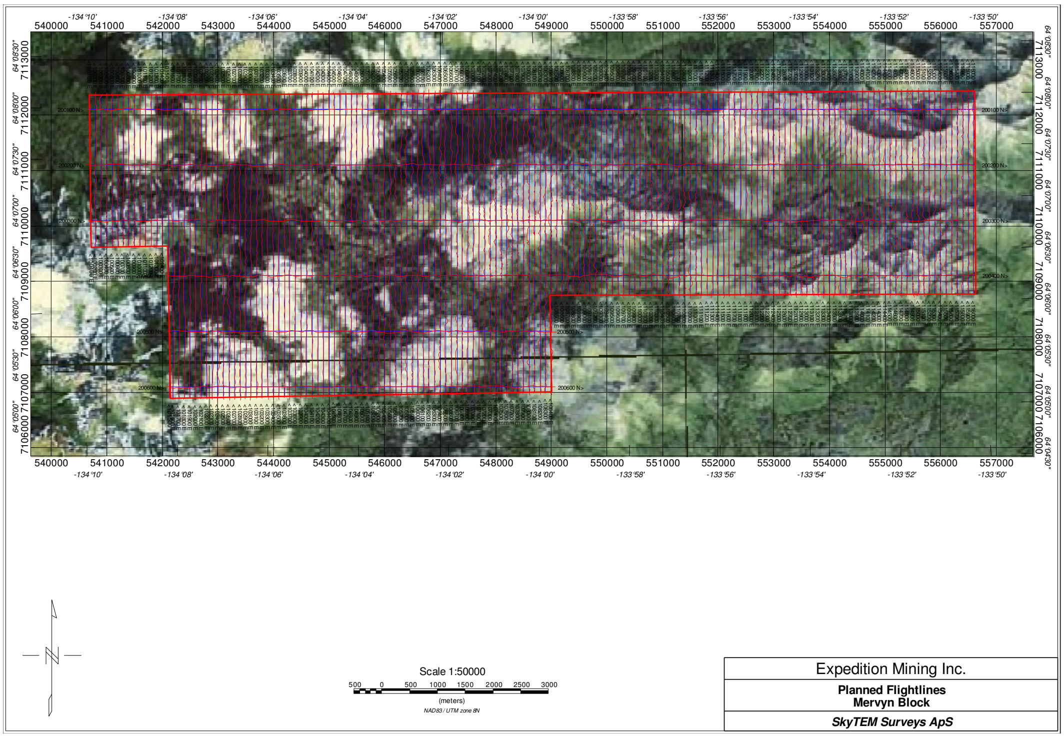


Figure 6 Red lines represent actually flown lines in respect to planned flight lines (blue lines) for the Mervyn block. Coordinate system: UTM Z8 (NAD83).

Figure 7 Red lines represent actually flown lines in respect to planned flight lines (blue lines) for the Joy block. Coordinate system: UTM Z10 (NAD83).

Ground Base Stations

The DGPS and magnetic base stations were positioned at Rackla airstrip as the closest accessible place to the survey areas.

DGPS base station

Utmost effort was made to ensure that the DGPS base station was placed at a location of maximum possible view to satellites and out of any metallic objects that could influence the GPS antenna.

Table showing DGPS base station location (lat/Lon (WGS84)):

Area	Lat	Lon	Ell. Height
Rackla Airstrip	64°13”19.25502’	-133°12” 13.11960’	868 m

Magnetometer base station

Great effort was made to ensure that the base station magnetometer was placed in a location of low magnetic gradient, away from electrical transmission lines and moving metallic objects, such as motor vehicles and aircrafts.

The location of the magnetic base stations can be seen in the table below (Lat/Lon, WGS84, decimal degrees).

Magnetometer Base station	Lat	Lon
Racla Airstrip	64° 13' 20.3412"	-133° 12' 17.0238"

Flight reports

For each flight, a report with key information regarding the data gathering was made. Listed in the reports are details on the weather, special data parameters and other events which may influence the data. Selected information from the flight reports are shown in the table below:

Weather

Date	Temperature (°C)	Wind (m/s)	Visibility	Description
20110515	10	5	good	Sun and clear sky
20110516	12	4	good	Sun and clear sky
20110517	18	5	good	Sun and clear sky
20110518	18	12	good	Sun and clear sky
20110519	15 to 20	3 - 10 E	good	Sun and clear sky, wind picking up on second flight
20110520	15 to 20	5 - 10 ESE	good	Sun and clear sky
20110521	10 to 15	3 - 5 S	ok	High sealing
20110522	10 to 15	5 - 12 E	ok	Sun and medium sealing. Wind picking up on second flight
20110523	15 to 18	5 - 12 E	ok	Sun and medium sealing. Wind picking up on second flight
20110524	18 to 22	3 - 5 S	good	Sun and clear sky
20110525	15 to 18	10 - 15 SE	good	Sun and clear sky, strong wind
20110526	15 - 20	0	good	Sun and clear sky
20110527	15 - 18	3 S	good	Sun and clear sky
20110228	13 - 18	3 SW	good	Sun and clear sky
20110529	13 - 18	0 - 20	ok	Cloudy, thunderstorms in the afternoon
20110530	13 - 18	0 - 20	ok	Cloudy, thunderstorms in the afternoon
20110531	10 -20	0 - 5 SW	good	Morning mist, sunny day, thunderstorms in the afternoon
20110601	15 - 20	5 W	ok	High ceiling, thunderstorms in the afternoon

Daily Diary

Date	Description
20110515	Three production flights
20110516	Three production flights
20110517	Crew on standby due to helicopter engine problem. Waiting for spare part.
20110518	Picking up spare part for the helicopter and two drums of fuel in Whitehorse.
20110519	Production Joy. New pilot, Richard.
20110520	Production Joy and Mervyn, Joy completed
20110521	Production Mervyn
20110522	Production Mervyn. 45 drums delivered at Rackla, three drums left behind in Mayo.
20110523	Production Mervyn
20110524	Production Mervyn
20110525	Standby due to weather conditions, strong wind.
20110526	Production Mervyn
20110527	Production Mervyn
20110528	Production Mervyn
20110529	Standby due to magnetic storm early in the day followed by thunder storm from around 13
20110530	Standby due to mag storm early in the day followed by thunder storm in the afternoon.
20110531	Production Mervyn and additional Joy lines
20110601	Production finalizing Joy and demobilization to Keno

Processed data

Selected control parameters are plotted in Appendix 4. The plots contain information about the flight altitude, speed, angle of the frame, transmitted current, transmitter voltage and transmitter temperature.

Mean values and standard deviations of control parameters are found in the table below.

Control parameter		Mean Value	Standard Deviation
Ground speed*)		39.5 km/h	16.4 km/h
Processed height		54.9 m	20.9 m
Tilt angle	X	20.8 degrees	10.6 degrees
	Y	-1.2 degrees	3.9 degrees
Tx Voltage**)	Tx_off	70.5 V	-
	Tx_on	68 V	-
Low moment Current**)		9.47 A	0.05 A
High Moment Current**)		107.4 A	1.20 A
Tx temperature**)		35 °C	-

**) Actual speed varies as a function of day and flight direction due to different wind directions and magnitude.*
***) Few spikes are seen in the temperature, current and voltage data. These are not caused by errors in the instruments but are a matter of digital drop outs.*

EM processing

All data are resampled to 10Hz in the SkyTEM in-house software SkyPRO.

The data are normalized in respect to effective Rx coil area, Tx coil area, number of turns and current giving the unit: pV/(m^4·A).

The raw HM EM data are filtered using a third order polynomial filter with varying filter width increasing at late gate times.

The raw LM EM data are filtered using a Box-car filter with a width of 3.6 s

All auxiliary devices (DGPS, Laser altimeters, inclinometers) are moved to the centre of the frame as based on the values stated in Appendix 1.

After merging auxiliary data together with EM data in SkyPRO additional filters in Oasis Montaj Geosoft has been applied. This include for both LM and HM:

1. Gaps from HM/LM series are interpolated using B-Spline filter
   a) Smoothness= 0.55
   b) Tension= 0.0

2. Transferring data channels into Oasis Montaj Geosoft Array channels

Tilt processing

The X and Y angle processing involves manual and automated routines using a combination of the SkyTEM in-house software SkyPRO and Oasis Montaj Geosoft.
The processing involves the following steps:

1. 3 sec box filter (SkyPRO)
2. Manual editing for spikes (Geosoft)
3. Akima interpolation of edited gaps (Geosoft)
4. Low pass filtering of 3.5 sec. (Geosoft)

Height processing

The height processing involves manual and automated routines using a combination of the SkyTEM in-house software SkyPRO and Oasis Montaj Geosoft.
The processing involves the following steps:

1. Keeping the 2 highest values pr. second and discarding the rest to correct for the canopy effect (treetop filter)
2. 2 sec running box filter (smoothing filter)
3. Tilt correction
4. Averaging of the two laser values
5. Additional filters in Geosoft involving:
   a. Editing of spurious data (i.e. missing data over lakes etc.)
   b. Small data gaps interpolated (Akima interpolation)
   c. Low pass filter of 3.5 sec

DGPS processing

The DGPS has been processed using the Waypoint GrafNav Lite Differential GPS processing tool. The standard airborne settings have been used.

1. Import of base station (Master)
2. Import of Airborne files (Rover)
3. Calculation of forward and reverse DGPS solution
4. Export as .txt file

The DGPS.txt files are used as input to the SkyPRO software assuring DGPS corrected data in the processed files.
In the unlikely event that DGPS data are not available the SkyPRO software will automatically use the raw GPS data as input.

The ground speed, altitude, latitude and longitude from the processed DGPS are merged into the final GDB. Afterwards the coordinates are transformed into UTM Zone 8N (NAD83).

A low pass filter of 3.5 sec has been applied to the above mentioned parameters .

Digital elevation model

A digital elevation model (DEM) channel has been calculated by subtracting the filtered laser altimeter data from the DGPS elevation.

The Processing to the final DEM involves the following steps:

1. Filtering and processing of the laser altimeter height as described above
2. DEM data received by subtraction of final filtered laser data from final processed DGPS altitude data
3. Grids produced using the minimum curvature method – grid cell size 30. Afterwards a Hanning filter has been applied to the grid.

The DEM channel was produced and gridded (see Figure 8 and Figure *9*) as described above in Geosoft format and included in the data delivery catalogue.

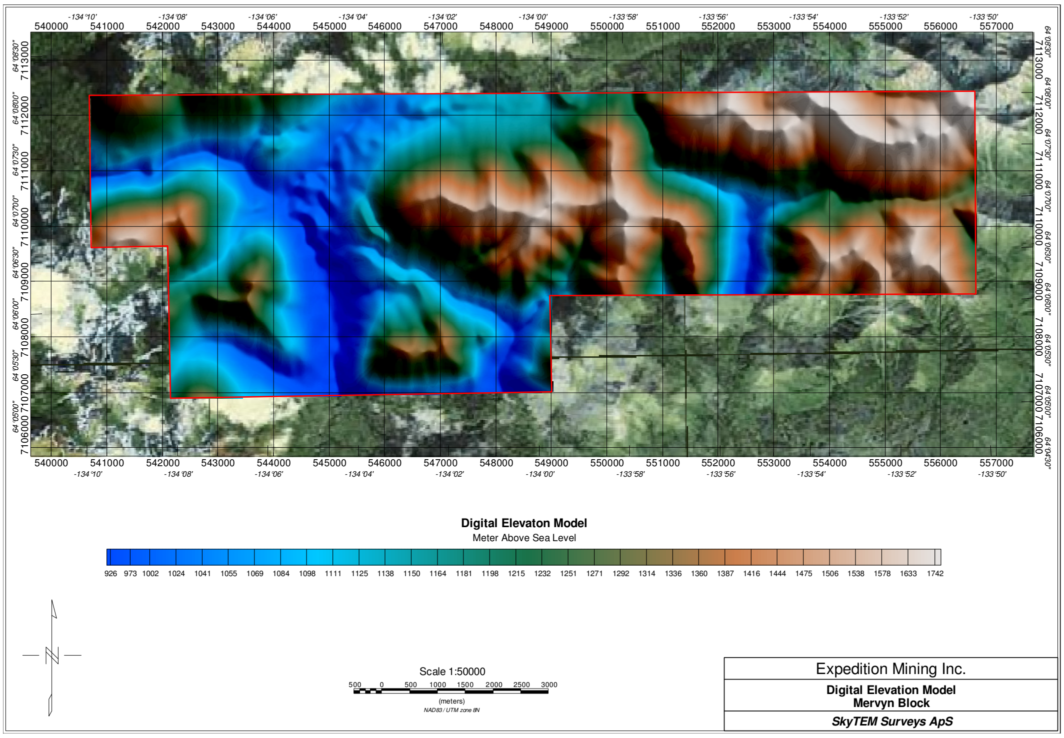


Figure 8 *Digital Elevation Model of the Mervyn block in Meters above sea level. UTM Zone 8N (NAD83).*

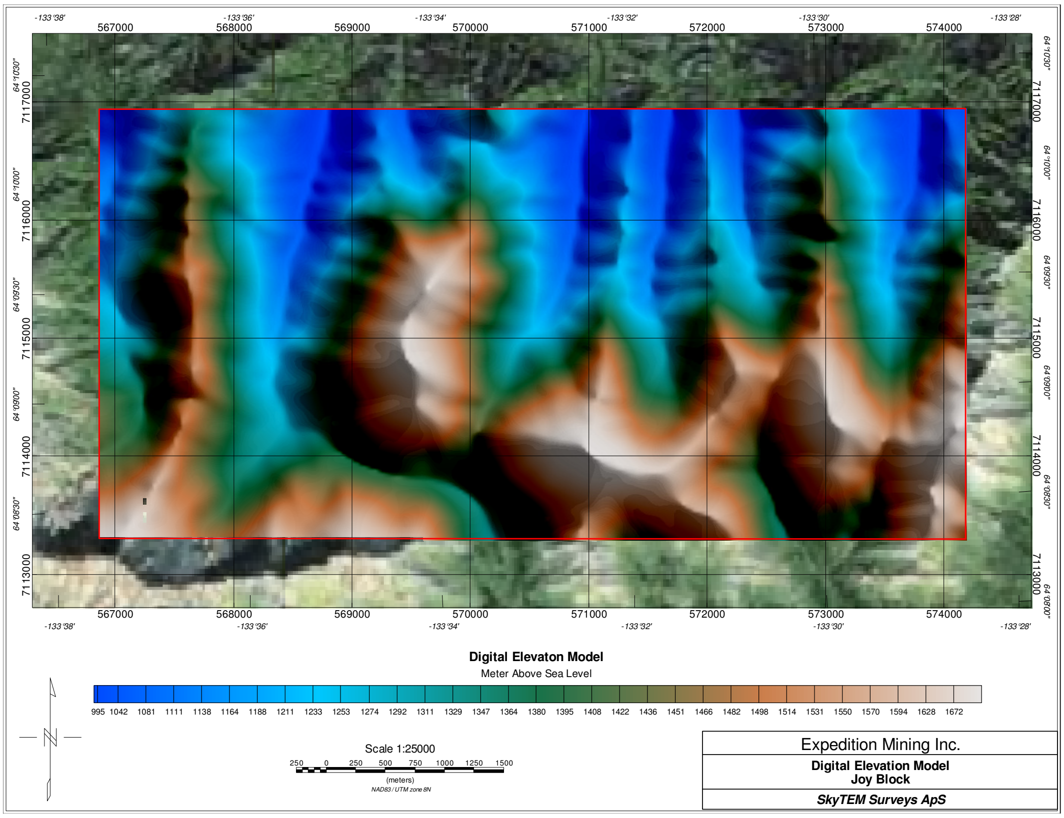


Figure 9 *Digital Elevation Model of the Joy block in Meters above sea level. UTM Zone 8N (NAD83).*

EM GDB-files

The EM GDB files are the foremost result of the SkyTEM survey, containing all the collected and processed EM data and information used for the interpretation and inversion.

Data in the files are split at the beginning and end of each planned flight line.
The raw EM data and auxiliary data are filtered and processed as described above. All parameters in the GDB-file hence refer to the origo of the frame.

The GDB can be used as input for further processing and gridding and as input to inversion and interpretation software.

The projection of the GDB is given as Latitude/longitude, WGS84 and UTM Zone 8N (NAD83).

The header of the EM GDB-file gives the following information:

Parameter	Explanation	Unit
Fid	Unique Fiducial number. Fid with the value of 0.0 is equal to midnight on the date of 2011/05/15	seconds
Line	Line number	LLLLLL
Flight	Name of flight	yyyymmdd.ff
DateTime	DateTime format	Decimal days
Date	Date	yyyymmdd
Time	Time	hhmmss.zzz
AngleX	Angle in flight direction	Degrees
AngleY	Angle perpendicular to flight direction	Degrees
Height	Filtered height measurement	Meters
DEM	Digital Elevation Model	Meters above mean sea level
Lon	Latitude/longitude, WGS84	Decimal degrees
Lat	Latitude/longitude, WGS84	Decimal degrees
E	UTM Zone 8N (NAD83)	Meter
N	UTM Zone 8N (NAD83)	Meter
Alt	DGPS Altitude	Meters above mean sea level
GdSpeed	Ground Speed	[km/h]
Curr_1	Current, high moment	Amps
Curr_2	Current, low moment	Amps
LM_Z_G5[xx]	Normalized LM Z-coil value: gate 5-26. [xx] refer to geosoft array channel number*	pV/(m4*A)
HM_Z_G16 [xx]**	Normalized HM Z-coil value: gate 16-34. [xx] refer to geosoft array channel number*	pV/(m4*A)
LM_X_G8[xx]	Normalized LM X-coil value: gate 8-26. [xx] refer to geosoft array channel number*	pV/(m4*A)
HM_X_G18[xx]**	Normalized HM Z-coil value: gate 18-34. [xx] refer to geosoft array channel number*	pV/(m4*A)

*) If Geosoft array channels are exported, the numbers in the brackets starts from [0]. I.e. LM_Z_G5[4] corresponds to LM Z gate 9. The same names are kept as grid names of the EM channels.

Presentation of GDB-files

High and low moment z coil gates from the GDB-file have been exported as Geosoft .grd files. The files are included in the data delivery catalogue. Figure 10 shows an example of the HM data.

Please note that no height correction has been applied on the raw EM data. This can cause striations in the data set when looking at the grids. This is due to the fact that variations in height will change the magnitude of the EM signal.

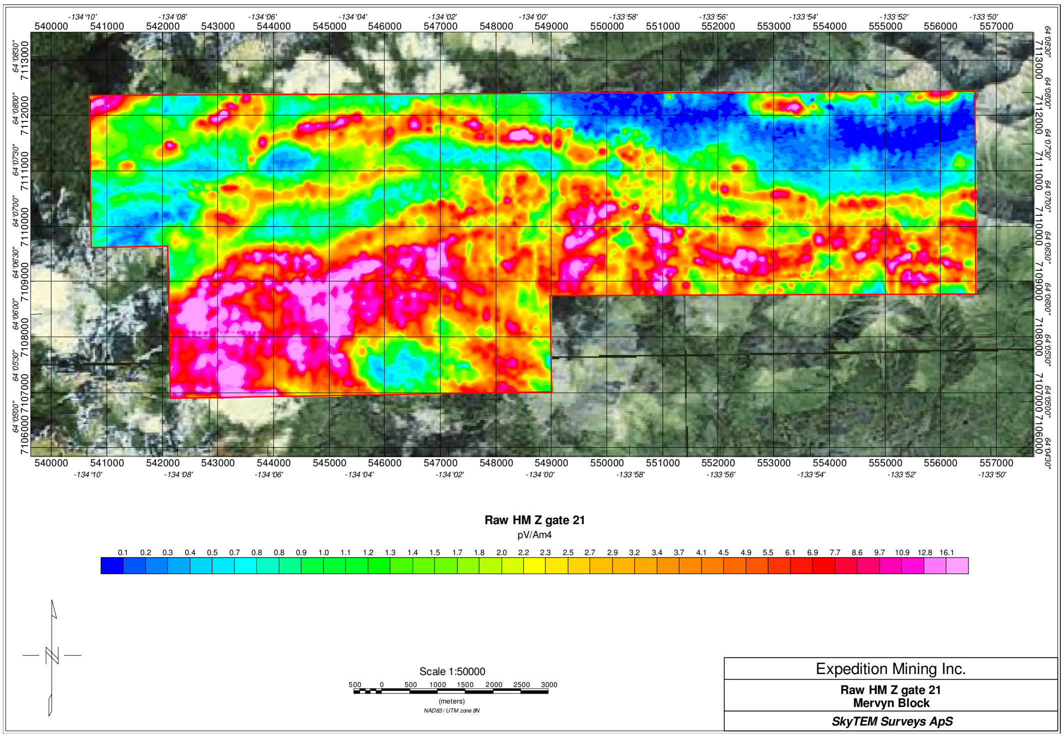


Figure 10 Plot of raw HM Z coil data from Gate 21 of the Mervyn block. Gate plots can be found as Geosoft Montaj .grd files in the data delivery catalogue. Warm colors (red) represent high signal and cold colors (blue) represent low signal.

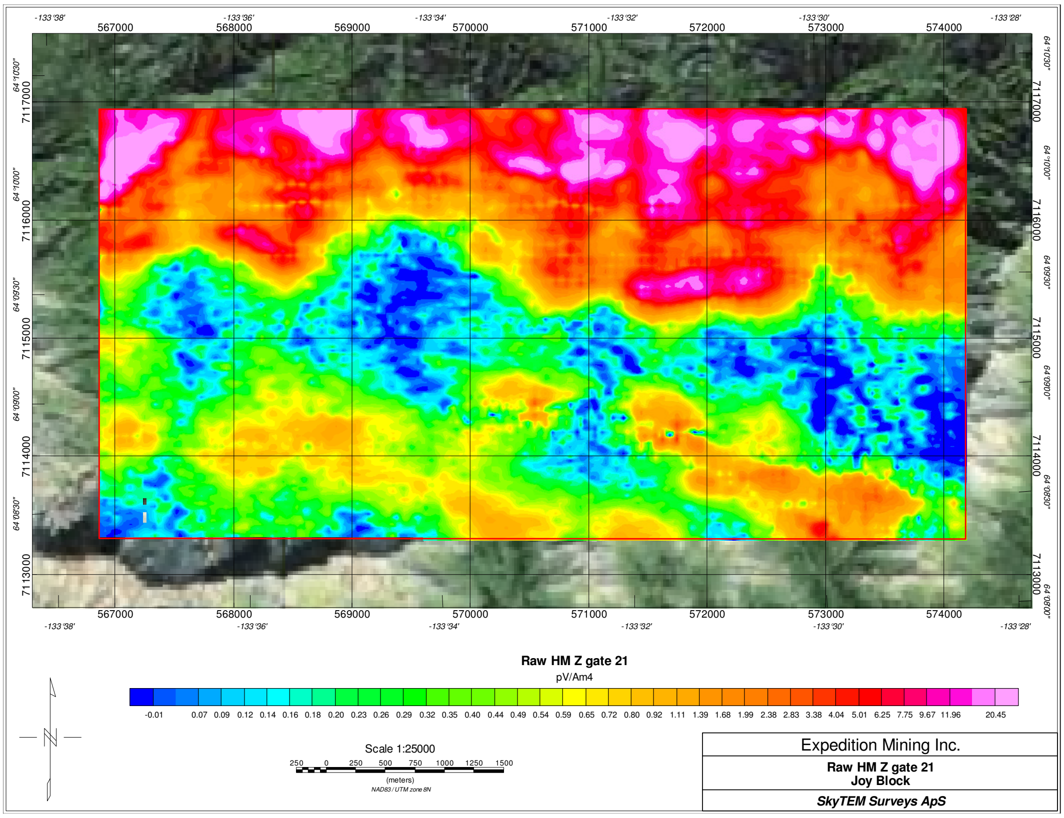


Figure 11 Plot of raw HM Z coil data from Gate 21 of the Joy block. Gate plots can be found as Geosoft Montaj .grd files in the data delivery catalogue. Warm colors (red) represent high signal and cold colors (blue) represent low signal.

Mag processing

Final processing of the magnetic data involved the application of traditional corrections to compensate for diurnal variation and heading effects prior to gridding.

Advanced full processing of magnetic data was implemented in Geosoft's Oasis Montaj software as follows:

- Processing of static magnetic data acquired on magnetic base station
- Pre-processing of airborne magnetic data
  - Stacking of data from 60 Hz to 10 Hz in SkyPro.
  - Moving positions to the centre of the sensor in SkyPro.
  - Adapting auxiliary data channels from EM GDB (processed height, Angles, Speed and DEM)
- Processing and filtering of airborne magnetic data
- Standard corrections to compensate the diurnal variation and heading effect
- IGRF correction
- Levelling
- Gridding

Processing of base station magnetic data

The base station magnetometer data was transferred into the base station Geosoft GDB database on a daily basis for further processing. A non-linear filter to remove spikes and a low-pass filter was applied to smooth the magnetic data.

IGRF was calculated and subtracted from TMI data to obtain residual magnetic field and remove secular variation.
Diurnal variation was calculated from residual magnetic field by subtracting the mean value averaged from all observations received on magnetic base station in course of the survey.

Processing and Filtering of airborne magnetic data

No spikes or data out of range was observed on airborne TMI data therefore no manual editing or non-linear filtering of the data was required. TMI data was filtered and interpolated as follows:

- Adjacent record at the beginning and end of each 0.3 sec gap in magnetic data not measured during low moment TEM data acquisition was deleted. These records may still be influenced by B-field generated during low moment TEM data acquisition.
- Bi-cubic spline (tension of 0.1 and smoothness of 0.5) was applied as low-pass filter – this filter also interpolates the gaps in magnetic data not acquired during low moment TEM data acquisition (0.3 sec gaps)

Corrections to the magnetic data

The processing of the data involved the application of the following corrections:

Airborne magnetometer data was corrected for diurnal variations. Calculated diurnal variation was subtracted from the filtered airborne magnetic data.

No time lag correction is necessary since the positions are shifted to the sensor location to account for the distance between the GPS position and the position of the magnetic sensor.

The heading correction test flown during the survey shows the heading errors as indicated in the following table.

Direction	**Heading Correction**
0 deg	0.01 nT
90 deg	0.6 nT
180 deg	-0.18 nT
270 deg	0.11 nT

The coefficient as listed above were used for heading correction.

IGRF correction

The International Geomagnetic Reference Field (IGRF) is a long-wavelength regional magnetic field calculated from permanent observatory data collected around the world. The IGRF is updated and determined by an international committee of geophysicists every 5 years. Secular variations in the Earth's magnetic field are incorporated into the determination of the IGRF.

The IGRF model for all blocks was calculated before levelling using the following parameters for the survey area:

IGRF model year: IGRF 11th generation
Date: variable according to date channel in database
Position: variable according to GPS WGS84 longitude and latitude
Elevation: variable according to magnetic sensor altitude derived from DGPS data

Tie-line levelling and micro-levelling of magnetic data

After applying the above corrections to the profile data, statistical levelling of control lines followed by full levelling of traverse lines and micro-levelling is usually applied as a standard procedure.

The following steps were adapted on the data:

- Statistical levelling on control lines applied
- Statistical levelling on trend lines applied
- Full levelling on traverse lines applied
- Micro levelling applied on traverse lines
  - Decurrogation cutoff wavelength = 2000 m
  - max amplitude limit 1.6 nT
  - Naudy filter length, tolerance 1000 m, 0.0001

The corrected data were then used to generate the final grids free of line directional noise.

TMI recalculation

Residual magnetic field (RMF) was the outcome of processed magnetic data after all corrections and levelling was applied.
Total magnetic intensity was recalculated to add back the IGRF using the following parameters.

IGRF model year: IGRF 11th generation
Date: variable as flown
Position: variable according to GPS WGS84 longitude and latitude
Elevation: variable according to magnetic sensor altitude derived from DGPS data

MAG GDB-files

The GDB file is the main result of the magnetic survey, containing all the processed magnetic data and information for the interpretation and gridding.

The projection of the GDB-file is UTM Zone 8N (NAD83).

The header of the magnetic GDB-file gives the following information:

Channel Name	**Description**	**Units**
Line	Line number	LLLLLS
Flight	Flight number	YYYYMMDD.FF
Date	UTC date	YYYYMMDD
UTC_sec	UTC time	Seconds of day
Time	UTC time	HH:MM:SS.S
Lon	Longitude using WGS84 datum	Decimal-deg.
Lat	Latitude using WGS84 datum	Decimal-deg.
E	Easting in UTM Zone 8N (NAD83)	Meter
N	Northing in UTM Zone 8N (NAD83)	Meter
Alt_msl	Mag sensor GPS altitude – mean sea level altitude – geoid EGM96	Meter
Height	Processed laser altimetry – mag sensor above ground level	Meter
DEM	Calculated digital elevation model – mean sea level	Meter
IGRF_TMI	calculated IGRF-11 - total magnetic intensity	nT
IGRF_Inc	calculated IGRF-11 - magnetic inclination	Degrees
IGRF_Dec	calculated IGRF-11 - magnetic declination	Degrees
Bmag_TMI	Total Magnetic Intensity – raw magnetic data – magnetic base station	nT
Bmag_diur	Diurnal variation– magnetic base station data	nT
mag_raw	raw magnetic data – total magnetic intensity - despiked	nT
Mag_cor	residual magnetic field - corrected for diurnal, lag, heading and IGRF-11	nT
RMF	Residual magnetic field – IGRF removed - final corrected and levelled magnetic data	nT
TMI	Total magnetic intensity – final corrected and levelled magnetic data; IGRF recalculated.	nT

Gridding of magnetic data

The corrected data was used to generate the Residual Magnetic Field (RMF) and Total Magnetic Intensity (TMI) grid. Corrected magnetic line data was interpolated between survey lines using a minimum curvature gridding algorithm to yield x-y grid values for a standard grid cell size of 30. A hanning filter was used to remove residual noise.

Figure 12 and Figure 13 shows a contoured map after processing data from the magnetometer.
All grids from the areas can be found in the data delivery folder.

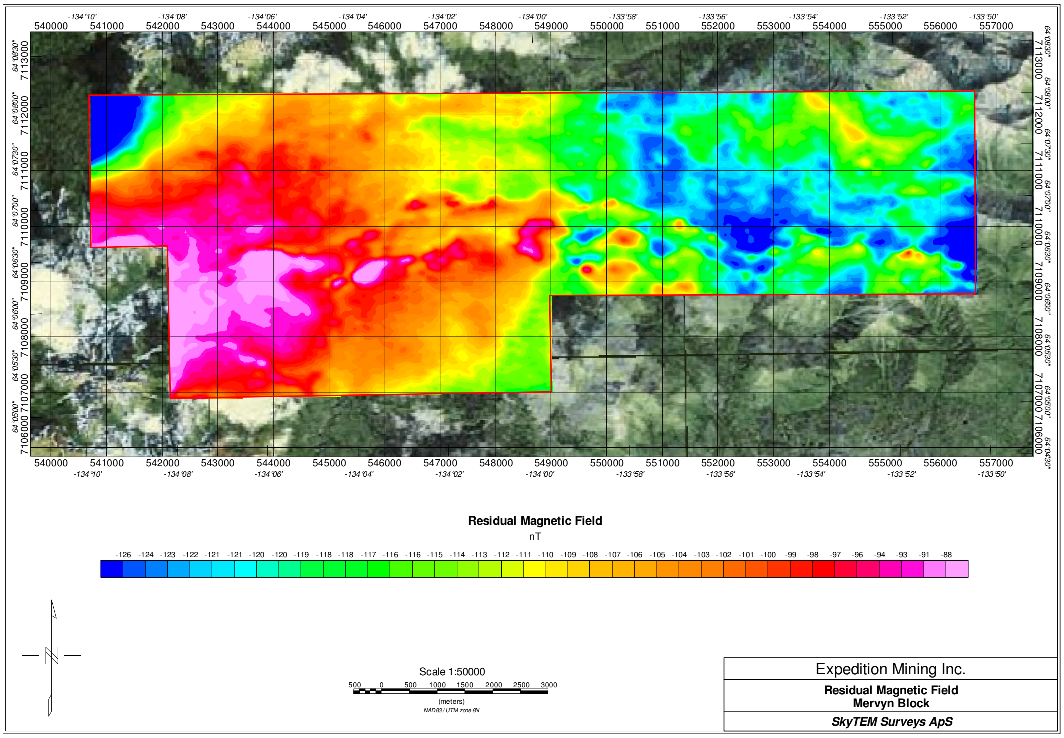


Figure 12. RMF grid for the Mervyn block.

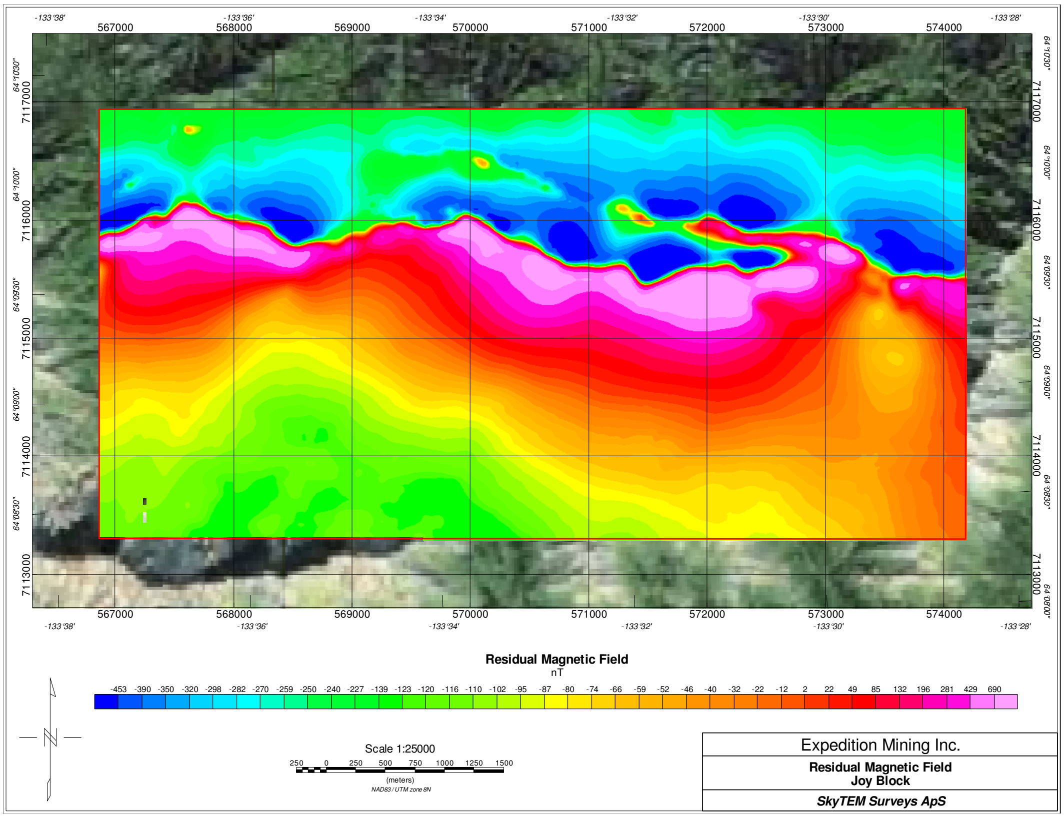


Figure 13. RMF grid for the Joy block.

Inversion of SkyTEM data

In this section, the particulars of modelling and inversion of SkyTEM data from Joy and Mervyn Blocks, Canada will be described with reference to the more general material found in Appendix 5. The inversion code is named SELMA, ref /2/ and /3/. However, recent developments including the lateral parameter correlation, not yet published, have enhanced the accuracy of the code.

Initial model and optimization norm

The inversion is performed as a regularized, damped, least-squares inversion on individual sounding data along the profiles with a one-dimensional (1D), multi-layer model (MLM) with 30 layers. In the inversion, the thickness of the layers are kept constant and only the layer resistivities are allowed to vary in order to let the model fit the measured data.
To obtain laterally smooth model sections, the Lateral Parameter Correlation (LPC) procedure is used (/3/ and /4/).

In the inversion the thickness of the first layer is 5 m and the depth to the deepest layer boundary is 500 m. Thicknesses and depths to top of layers for all layers are stated in the table below. In the top of the model, the layer thickness increases slowly, giving a linear sampling of the subsurface, while layer thickness increases exponentially at the deeper parts of the model.

The input data to the inversion is the z-component of the EM-data described in the chapter 'Processed data'.

In the Joy and Mervyn Blocks survey the resistivity of the initial model for the inversion is set to 500 Ωm. Resistivities are allowed to vary within the interval of 0.1 to 10000 Ωm. Optimization is performed using the L2-norm.

In the Joy and Mervyn Blocks area the inversions are based on a 5 Hz input file giving a model for approx. every 4 m.

Layer #	**Layer Thickness [m]**	**Layer depth [m]**
1	5.00	0.00
2	5.06	5.00
3	5.17	10.06
4	5.34	15.22
5	5.56	20.56
6	5.85	26.12
7	6.21	31.97
8	6.63	38.18
9	7.13	44.81
10	7.70	51.93
11	8.36	59.63
12	9.11	67.99
13	9.97	77.11
14	10.93	87.08
15	12.02	98.01
16	13.24	110.03
17	14.60	123.26
18	16.13	137.86
19	17.83	153.99
20	19.74	171.82
21	21.86	191.56
22	24.22	213.41
23	26.85	237.64
24	29.78	264.49
25	33.04	294.27
26	36.66	327.31
27	40.70	363.97
28	45.18	404.67
29	50.16	449.84
30	N/A	500.00

Regularization

A statistical broadband approach is used in the regularization of the multi-layer model. Nine different correlation lengths with a maximum of 10 000 km and a standard deviation of 1 were used to define the correlation matrix. (See Appendix 5 for more detail).

Noise model

In the Joy and Mervyn Blocks survey, the noise parameters for both inversions were chosen as:

Low moment
V_0 = 2.5e-12 in field units normalized with Tx moment
t_0 = 1 ms
slope = -0.5

High Moment
V_0 = 2.5e-13 in field units normalized with Tx moment
t_0 = 1 ms
slope = -0.5

Negative data values caused by e.g. capacitive coupling and values lower than 0.01*noise level, were excluded in the inversion.

Inversion results

The results of the inversion are presented in a GDB file included in the data delivery catalogue. The file contains the resistivities for each layer in the model. The header of the GDB file is described in the table below (also see Appendix 6 for more detail).

Parameter	Explanation	Unit
FID	Fiducial number	
E	UTM Zone 8N (NAD83)	Meter
N	UTM Zone 8N (NAD83)	Meter
DTM	Digital Elevation Model	Meters above mean sea level
ResI1	Residual of data	-
ResI2	Residual of prior information of thickness parameters (not included in this survey)	-
ResI3	Residual of vertical constraints (not included in this survey)	-
ResI4	Residual total	-
Layer	Number of layers in model	
Height	Height above ground	Meter
Invhei	Inverted height above ground	Meter
DOI	Depth of Investigation	Meter
Elev001	Elevation of top of layer x. X from 001 to 030	Meter
Res001	Resistivity of layer x. X from 001 to 030	Ωmeter
RUnc001	Relative uncertainty of layer x. X from 001 to 030	-

Presentations - Model sections and grids

The models resulting from the inversion are presented as model sections/profiles including analytic sections that display the normalized standard deviation of the resistivity sections along with the DOI (Figure 16) and as grids of resistivity in each model layer (Figure 14).

The model sections and grids are enclosed in digital form. A brief description is given in Appendix 6.

The model sections have a large vertical exaggeration which will make the structures look more vertical than they are.

Residuals

The quality of the inversion results can be evaluated by inspecting the residuals.

The data residual is calculated by comparing the measured data with the response of the resulting model after inversion. If the residual is in the range of 1, the misfit between the response of the final model and the data is, on average, equal to the noise. If the residual is high, it might be caused by data that are noisier than the noise model takes into account. This can be seen where resistivities are very high and the signal consequently very low. A high data residual can also be due to the inconsistency between the model assumed in the inversion and the 2D/3D character of the real world. These are found primarily at the edges of sharp lateral conductivity contrasts. Finally, coupling effects due to power lines and other manmade conductors can also be a source of a high residual.

The total residual is a weighted sum of the data residual and the model residual, where the latter is a measure of the roughness of the model, i.e. the deviation of the final model from the initial homogeneous half space model.

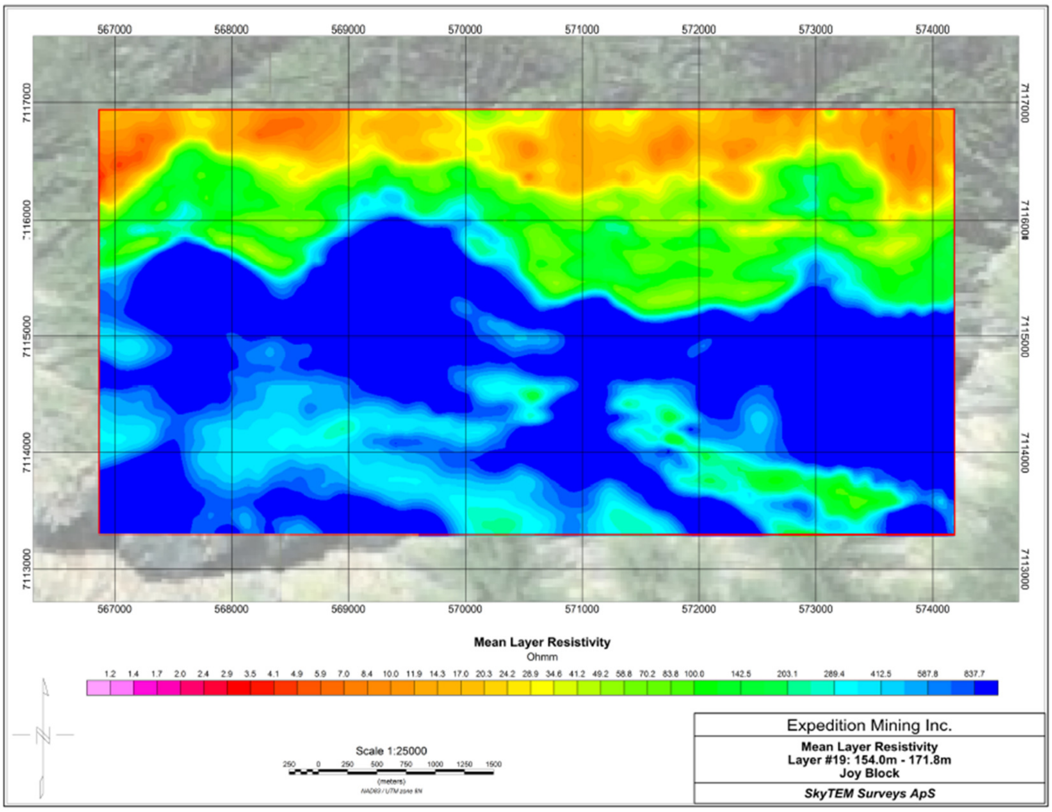


Figure 14. Screen dump of enclosed PDF's displaying the inversion results. Geosoft grids and PDF's are found in the data delivery folder.

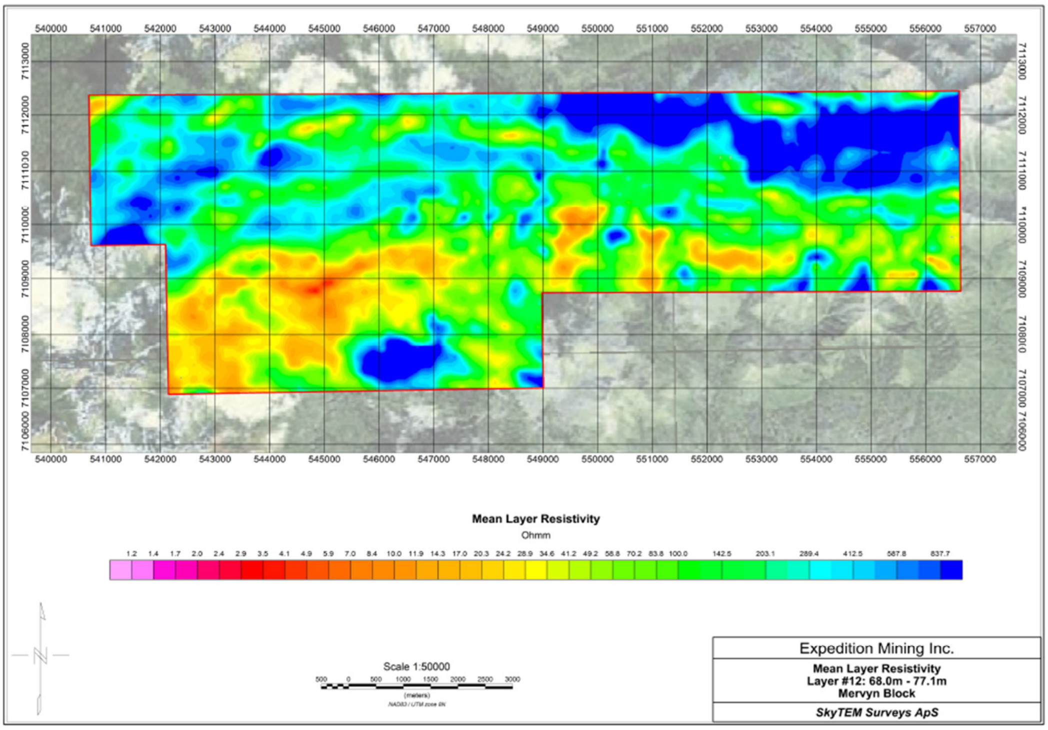


Figure 15. Screen dump of enclosed PDF's displaying the inversion results. Geosoft grids and PDF's are found in the data delivery folder.

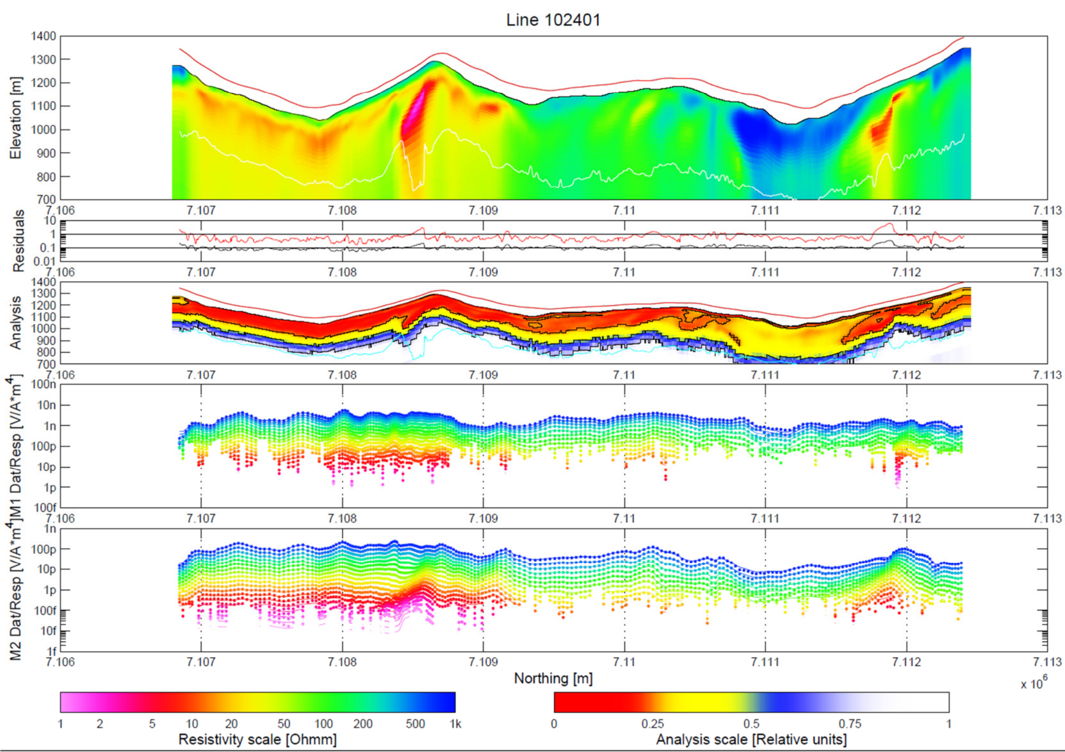


Figure 16. Sample of the model section plots enclosed as PDF's. Top plot: Resistivity section with flight height (red) and depth of investigation (white line) indicated. Data and total residuals are displayed in the second plot. The third plot show the analysis section. The bottom plots are the low and high moment data (dots) and model response (full line). All lines are found as PDF's in the data delivery folder.

References

/1/ Sorensen, K. I. and Auken, E. (2004). SkyTEM - A new high-resolution helicopter transient electromagnetic system, Exploration Geophysics, 35, 191-199.

/2/ Christensen, N. B. (2002). A generic 1-D imaging method for transient electromagnetic data. Geophysics, 67, 438-447.

/3/ Christensen, N.B., Reid, J.E. and Halkjær, M. (2009). Fast, laterally smooth inversion of airborne time-domain electromagnetic data, Near Surface Geophysics, 7, 599-612

/4/ Christensen N.B. and Tølbøll R.J. 2009, A lateral model parameter correlation procedure for one-dimensional inverse modelling. Geophysical Prospecting 57, 919-929. DOI: 10.1111/j.1365-2478.2008.00756.x

Appendix list

Appendix 1: Instruments

Instrument positions

The instrumentation involves a time domain electromagnetic system, two inclinometers, two altimeters and two DGPS'.

The measurements were carried out, using a setup as described below.

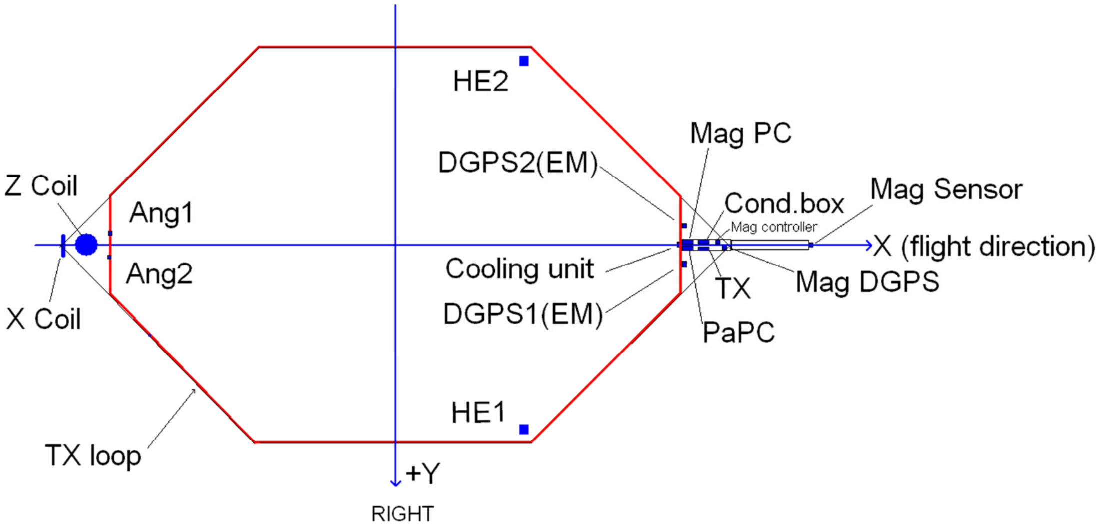


Figure 1 Sketch showing the frame and the position of the basic instruments. The red line defines the transmitter loop. The horizontal plane is defined by (x, y).

The location of instruments in respect to the frame is shown in Figure 1 and is given in (x, y, z) coordinates in the table below.

X and y define the horizontal plane. Z is perpendicular to (x, y). X is positive in the flight direction, y is positive to the right of the flight direction, and z is positive downwards.

The generator used for powering of the transmitter is 10 m below the helicopter.

Device	X	Y	Z
DGPS1 (EM)	12.00	0.80	-020
DGPS2 (EM)	12.00	-0.80	-0.20
HE1 (altim.)	5.14	7.80	0.00
HE2 (altim.)	5.14	-7.80	0.00
Inclinometer 1	-11.80	-0.50	-0.35
Inclinometer 2	-11.80	0.50	-0.35
RX (Z Coil)	-12.82	0.00	-2.18
RX (X Coil)	-13.82	0.00	0.00
TX (transmit.)	12.70	0.10	-0.40
Condensator	12.70	-0.10	-0.40

For the location of instruments see Figure 1.

Transmitter

The time domain transmitter loop can be described as an octagon with the corners listed below:

X	Y
-11.87	-2.03
-5.68	-8.22
5.68	-8.22
11.87	-2.03
11.87	2.03
5.68	8.22
-5.68	8.22
-11.87	2.03

The total area of the transmitter coil defined by the corner points is 314 m^2 and 65.9 m in circumference.

The key parameters defining the transmitter set up are:

Low moment

Parameter	Value
Number of transmitter turns	1
Transmitter area	314 m^2
Peak current	5
Peak moment	~3,140 NIA
Repetition frequency	240 Hz
On-time	800 µs
Off-time	1283.3 µs
Duty cycle	62 %
Wave form	Square
Turn on wave form exp. decay constant	44000 s^{-1}
Turn off linear ramp	4.46e6 A/s
Turn off current end avalanche mode	1.5 A
Turn off free decay exp. decay constant	-3.00e6 s^{-1}

High Moment

Parameter	Value
Number of transmitter turns	4
Transmitter area	314 m^2
Peak current	114.1
Peak moment	~150,000 NIA
Repetition frequency	30 Hz
On-time	8000 µs
Off-time	8667 µs
Duty cycle	52 %
Wave form	Square
Turn on wave form exp. decay constant	410 s^{-1}
Turn off linear ramp	2.38e6 A/s
Turn off current end avalanche mode	1.0 A
Turn off free decay exp. decay constant	-1.29e6 s^{-1}

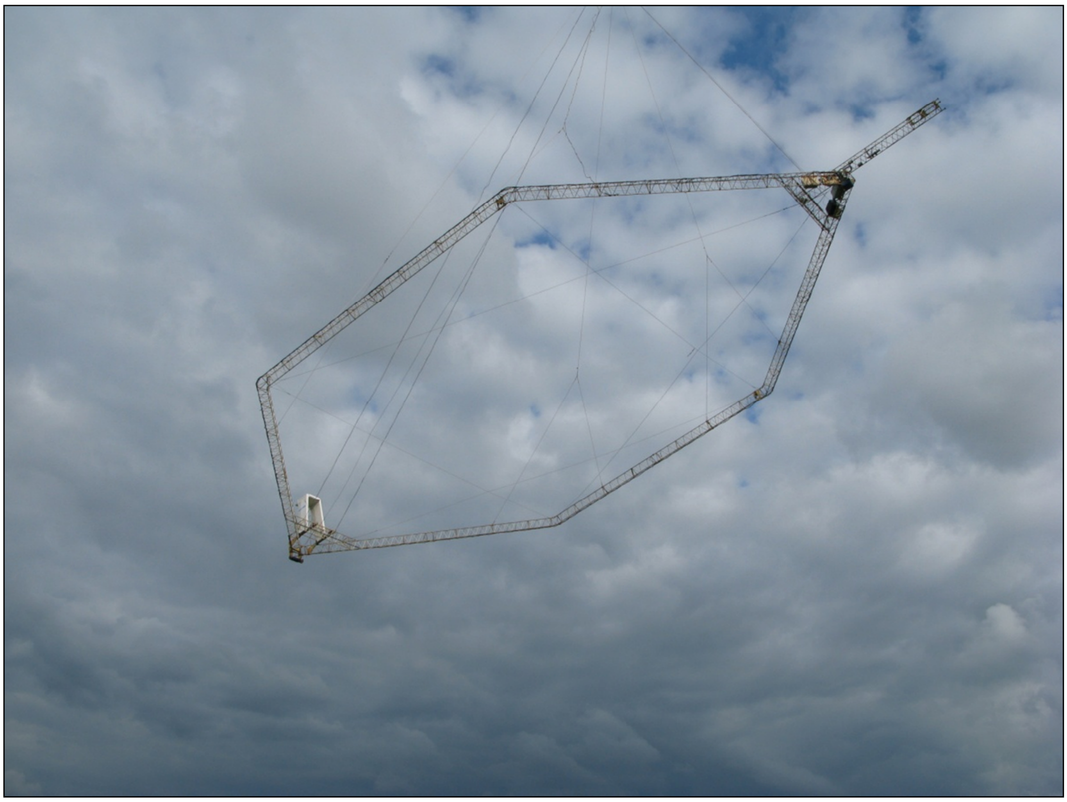


Figure 2 The 314 m² frame in production mode.

Receiver system

The decay of the secondary magnetic field is measured using two independent active induction coils. The Z coil is the vertical component, and the X coil is the horizontal in-line component. Each coil has an effective receiver area of 105 m² .

The receiver coils are placed in a null-position:

Z coil (x, y, z) = (-12.82 m, 0.0 m, -2.18 m)
X coil (x, y, z) = (-13.82 m, 0.0 m, 0.0 m)

In the null-position, the primary field is damped with a factor of 0.01.

Figure 3 Rudder containing the Z coil located approximately in the top part of the tower.

The key parameters defining the receiver set up are:

Receiver parameters		
Sample rate		All decays are measured
Number of output gates		34 (HM) and 26 (LM)
Receiver coil low pass filter		450 kHz
Receiver instrument low pass filter		300 kHz
Repetition frequency	LM HM	240 Hz 30 Hz
Front gate	LM HM	0.0 μs 60.0 μs

Receiver gate times are measured from the start of the transmitter current turn-off. A complete list describing gate open, close and centre times are listed in Appendix 2.

Inclination

Instrument type: Bjerre Technology

The inclination of the frame is measured with 2 independent inclinometers. The x and y angles are measured 2 times per second in both directions. The inclinometers are placed in the rear of the frame as close to the z coil as possible, see Figure 1.

The angle data are stored as x, y readings. X is parallel to the flight direction and positive when the front of the frame is above horizontal. Y is perpendicular to the flight direction and negative when the right side of the frame is above horizontal.

The angle is checked and calibrated manually within 1.0 degree by use of a level meter.

DGPS airborne unit and base stations

Chipset: OEMV1-L1 14-channel rate.
Antenna: Trimble, Bullet III GPS Antenna

The differential GPS receiver is on top of the boom in front of the frame.

The DGPS delivers one dataset per second. The raw coordinates are given in Latitude/longitude, WGS84.

The uncertainty in the xyz-directions is ± 1 m after processing.
The processed DGPS data is combined with the EM data in the xyz-files, giving the precise position.

DGPS parameters	
Sample rate	1 Hz
Uncertainty	± 1 m

Altimeter

Instrument type: MDL ILM300R

Two independent laser units mounted on each side of the frame measure the distance from the frame to the ground, see Figure 1.

Each laser delivers 30 measurements per second, and covers the interval from 1.5 m to approximately 130 m.

Dark surfaces including water surfaces will reduce the reflected signal. Consequently, it may occur that some measurements do not result in useful values.

The altimeter measurements are given in meters with two decimals. The uncertainty is 10 - 30 cm. The lasers are checked on a regular basis against well defined targets.

Laser parameters	
Sample rate	30 Hz
Uncertainty	10 - 30 cm
Min/ max range	1.5 m / 130 m

Magnetometer airborne unit

Instrument type: Geometrics G822A sensor and Kroum KMAG4 counter.

The Geometrics G822A sensor and Kroum KMAG4 counter is a high sensitivity cesium magnetometer. The basic of the sensor is a self-oscillating split-beam Cesium Vapor (non-radioactive) Principe, which operates on principles similar to other alkali vapor magnetometers.

The sensitivity of the Geometrics G822A sensor and Kroum KMAG4 counter is stated as <0.0005 nT/√Hz rms. Typically 0.002 nT P-P at a 0.1 second sample rate, combined with absolute accuracy of 3nT over its full operating range.

The magnetometer is synchronized with the TEM system. When the TEM signal is on, the counter is closed. In the TEM off-time the magnetometer data is measured from 100 microseconds until the next TEM pulse is transmitted. The data are averaged and sampled as 60 Hz.

Parameter	Value
Sample frequency	60 Hz (in between each HM EM pulse)
Magnetometer on	HM Cycles
Magnetometer off	LM Cycles

Magnetometer base station

Instrument type: GEM Overhauser.

The GEM Overhauser is a portable high-sensitivity precession magnetometer.

The GEM Overhauser is a secondary standard for measurement of the Earth's magnetic field with 0.01 nT resolutions, and 1 nT absolute accuracy over its full temperature range.

The base station data are sampled with 1 Hz frequency.

Appendix 2: Time gates

Gate	GateOpen (µs)	Gatewidth (µs)	GateClose (µs)	Raw GateCenter (µs)	GateCenter Applied time shift calibration for HM and LM (µs)	Comment
1	0.390	5.610	6.000	3.195	2.095	Not used
2	6.390	1.610	8.000	7.195	6.095	Not used
3	8.390	1.610	10.000	9.195	8.095	Not used
4	10.390	1.610	12.000	11.195	10.095	Not used
5	12.390	1.610	14.000	13.195	12.095	LM Z only
6	14.390	1.610	16.000	15.195	14.095	LM Z only
7	16.390	1.610	18.000	17.195	16.095	LM Z only
8	18.390	3.610	22.000	20.195	19.095	LM only
9	22.390	4.610	27.000	24.695	23.595	LM only
10	27.390	6.610	34.000	30.695	29.595	LM only
11	34.390	7.610	42.000	38.195	37.095	LM only
12	42.390	9.610	52.000	47.195	46.095	LM only
13	52.390	12.610	65.000	58.695	57.595	LM only
14	65.390	15.610	81.000	73.195	72.095	LM only
15	81.390	20.610	102.000	91.695	90.595	LM only
16	102.390	25.610	128.000	115.195	114.095	LM & HM Z
17	128.390	31.610	160.000	144.195	143.095	LM & HM Z
18	160.390	41.610	202.000	181.195	180.095	LM & HM
19	202.390	50.610	253.000	227.695	226.595	LM & HM
20	253.390	64.610	318.000	285.695	284.595	LM & HM
21	318.390	81.610	400.000	359.195	358.095	LM & HM
22	400.390	102.610	503.000	451.695	450.595	LM & HM
23	503.390	129.610	633.000	568.195	567.095	LM & HM
24	633.390	162.610	796.000	714.695	713.595	LM & HM
25	796.390	205.610	1002.000	899.195	898.095	LM & HM
26	1002.390	258.610	1261.000	1131.695	1130.595	LM & HM
27	1261.390	325.610	1587.000	1424.195	1423.095	HM only
28	1587.390	409.610	1997.000	1792.195	1791.095	HM only
29	1997.390	516.610	2514.000	2255.695	2254.595	HM only
30	2514.390	649.610	3164.000	2839.195	2838.095	HM only
31	3164.390	818.610	3983.000	3573.695	3572.595	HM only
32	3983.390	1030.610	5014.000	4498.695	4497.595	HM only
33	5014.390	1297.610	6312.000	5663.195	5662.095	HM only
34	6312.390	1632.610	7945.000	7128.695	7127.595	HM only

Note: The first gates are not used in any of the moments in the present survey as it is in the transition zone.

SkyTEM inversion software (iTEM) handles time shift calibration during import of data.

If third party processing software is used the calibrated Gate centre times should be used.

Appendix 3: Calibration of the TEM system

As described in the main document the system has been calibrated in a 50 Hz power supply grid setting (In Denmark), but the data was recorded in a 60 Hz environment (USA).

The wave form is measured with the 60 Hz script with a repetition frequency of 240 Hz for LM and with a repetition frequency of 30 Hz HM. Figure 1 to Figure 4 show the up and down ramp, respectively.

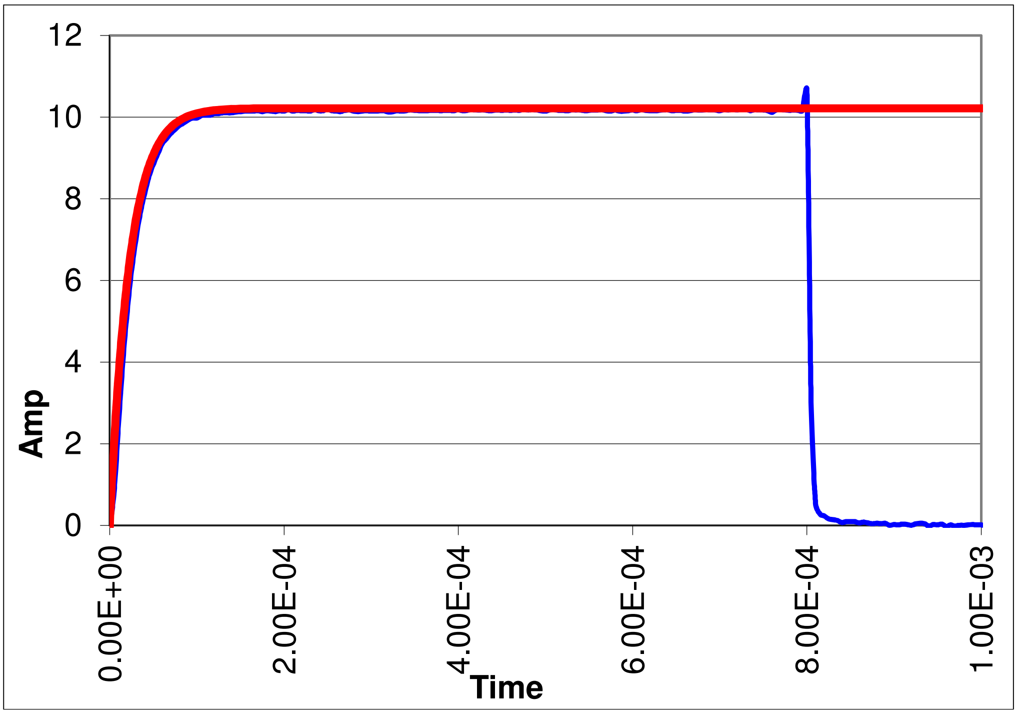


Figure 1 Ramp up at 240 Hz. Blue curve is the measured wave form. Red curve is the function that fits the data. The current is 10 A and the decay constant τ = 44000 s^{-1}.

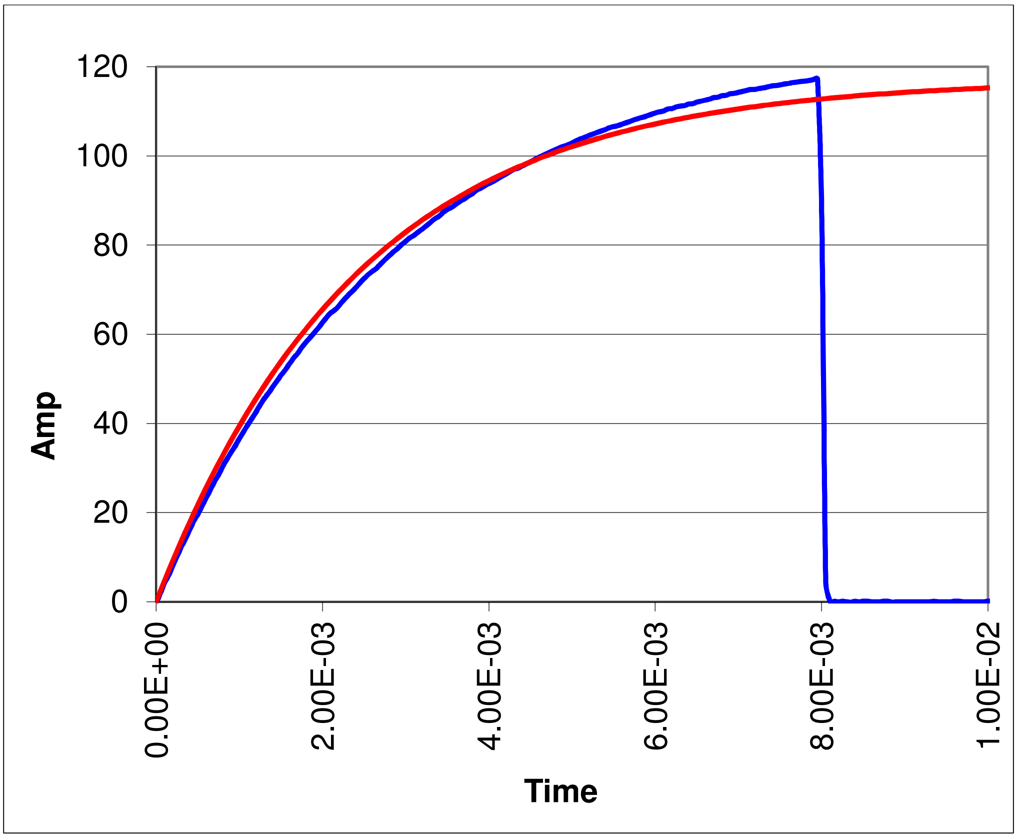


Figure 2 Ramp up at 30 Hz. Blue curve is the measured wave form. Red curve is the function that fits the data. The current is 117 A and the decay constant τ = 410 s⁻¹.

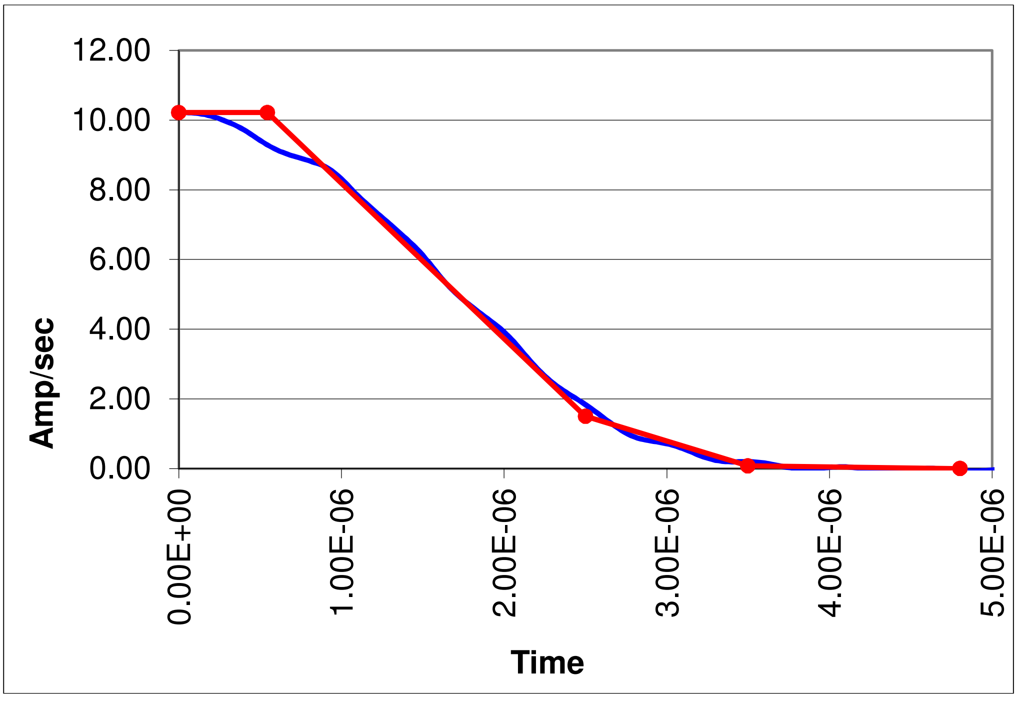


Figure 3 Ramp down at 240 Hz. Blue curve is the measured wave form. Red curve is the piecewise linear function that fits the data. Decay constant - 3.00e6 s⁻¹.

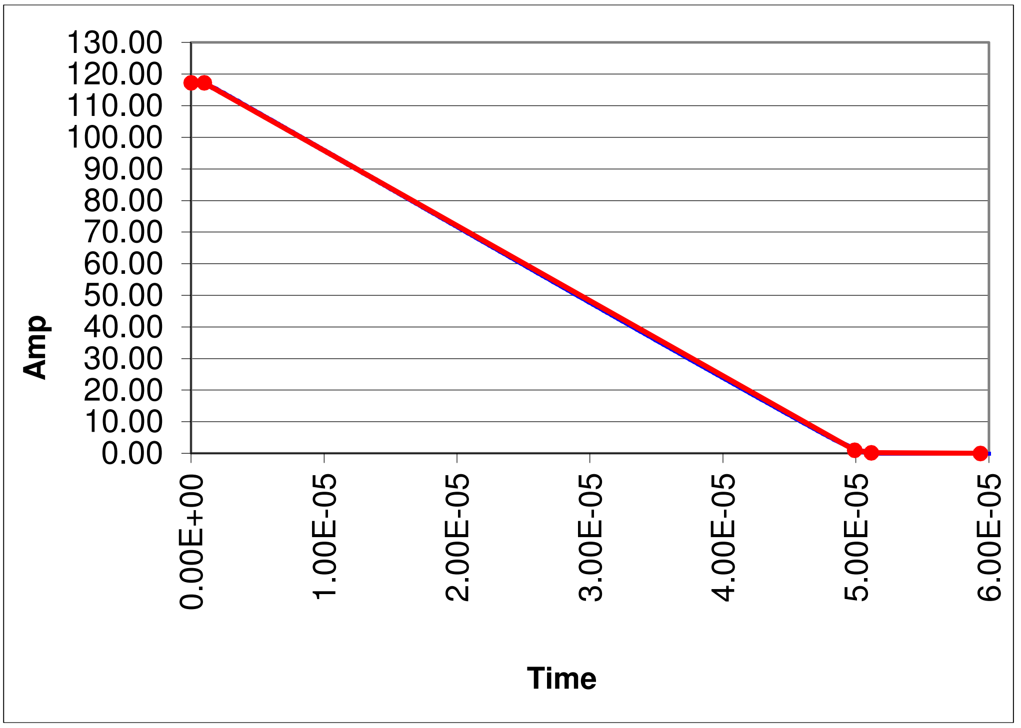


Figure 4 Ramp down at 30 Hz. Blue curve is the measured wave form. Red curve is the piecewise linear function that fits the data. Decay constant - 1.29e6 s^{-1}.

LM

	Parameter	Value
Ramp up	Repetition frequency	240 Hz
	Decay constant, τ	44000 s^{-1}
Ramp Down	Avalanche mode	1.96 µs
	Linear ramp dI/dt	4.46e6 A/s
	End avalanche mode current	1.5 A
	Decay const exp mode, τ	-3.00e6 s^{-1}

HM

	Parameter	Value
Ramp up	Repetition frequency	30 Hz
	Decay constant, τ	410 s^{-1}
Ramp Down	Avalanche mode	48.9 µs
	Linear ramp dI/dt	2.38e6 A/s
	End avalanche mode	1.0 A
	Decay const exp mode, τ	-1.29e6 s^{-1}

The complete SkyTEM equipment has been calibrated at the National Danish Reference Site. The following plots, Figure 5 to Figure 8, show the measured data as well as the expected response in altitudes 5 m, 10 m, 15 m, 20 m and 30 m.

The reference data for both LM and HM data are shown as blue curves and the measured data for LM and HM as red curves.

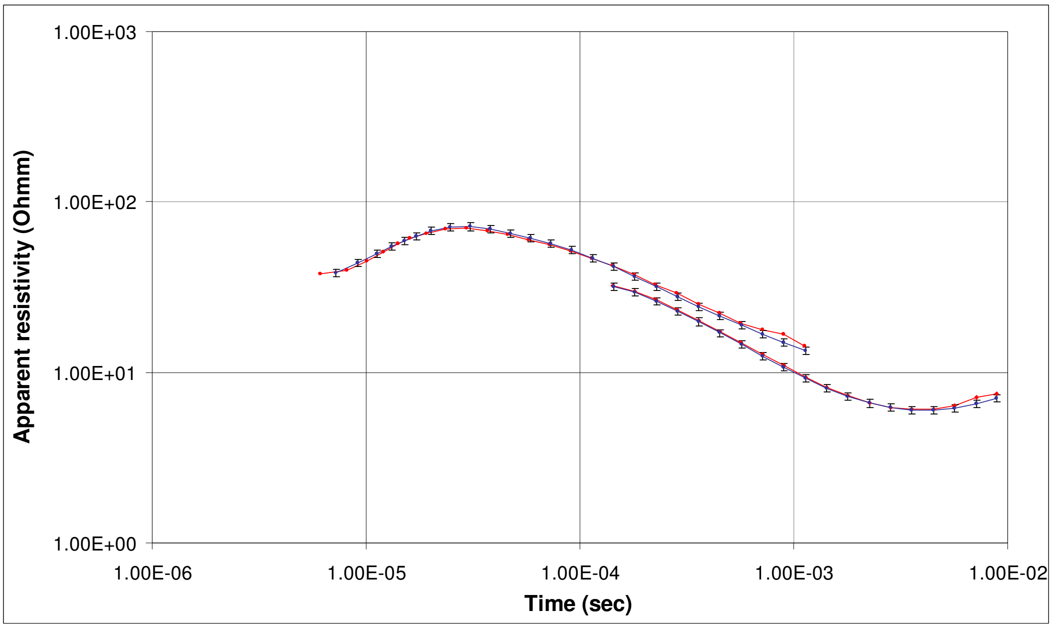


Figure 5 The frame is in 5 m altitude. Blue curves with 5% error bars are the expected response, and red curves are the actual measurements.

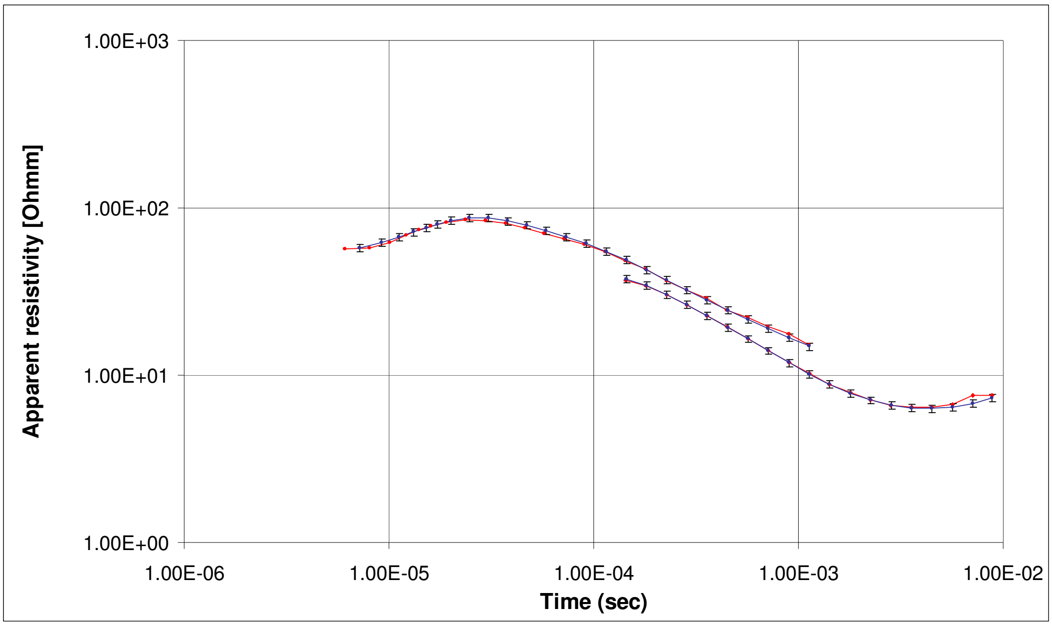


Figure 6 The frame is in 10 m altitude. Blue curves with 5% error bars are the expected response, and red curves are the actual measurements.

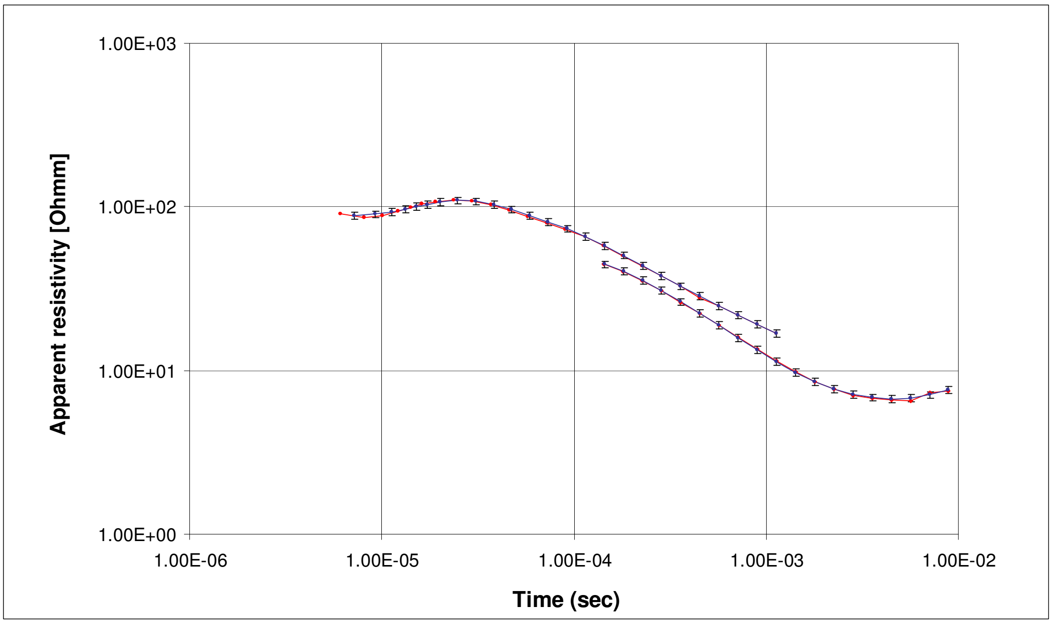


Figure 7 The frame is in 15 m altitude. Blue curves with 5% error bars are the expected response, and red curves are the actual measurements.

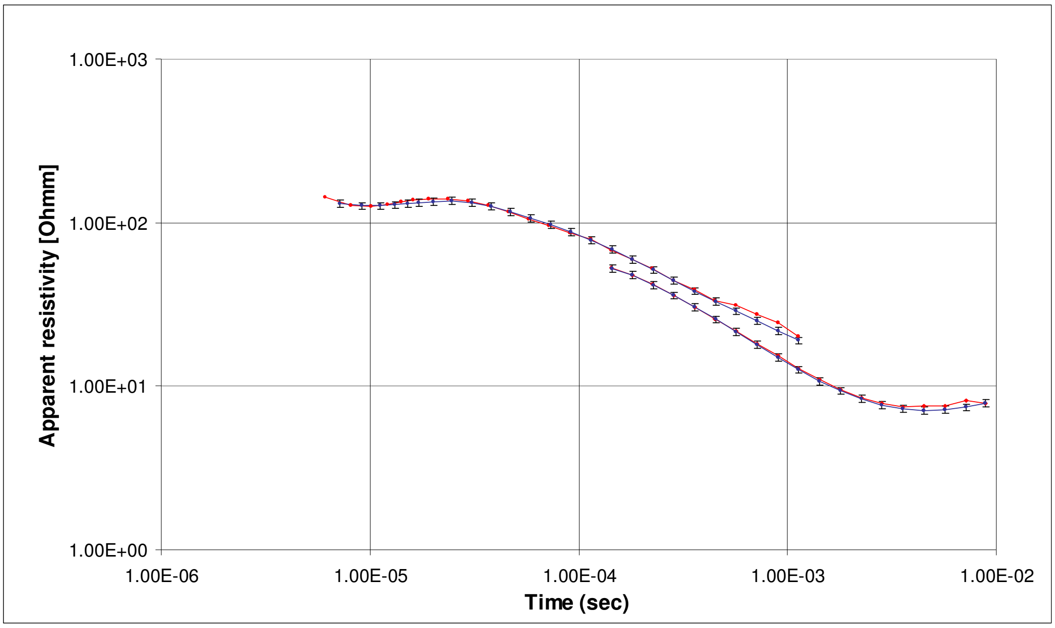


Figure 8 The frame is in 20 m altitude. Blue curves with 5% error bars are the expected response and red curves are the actual measurements.

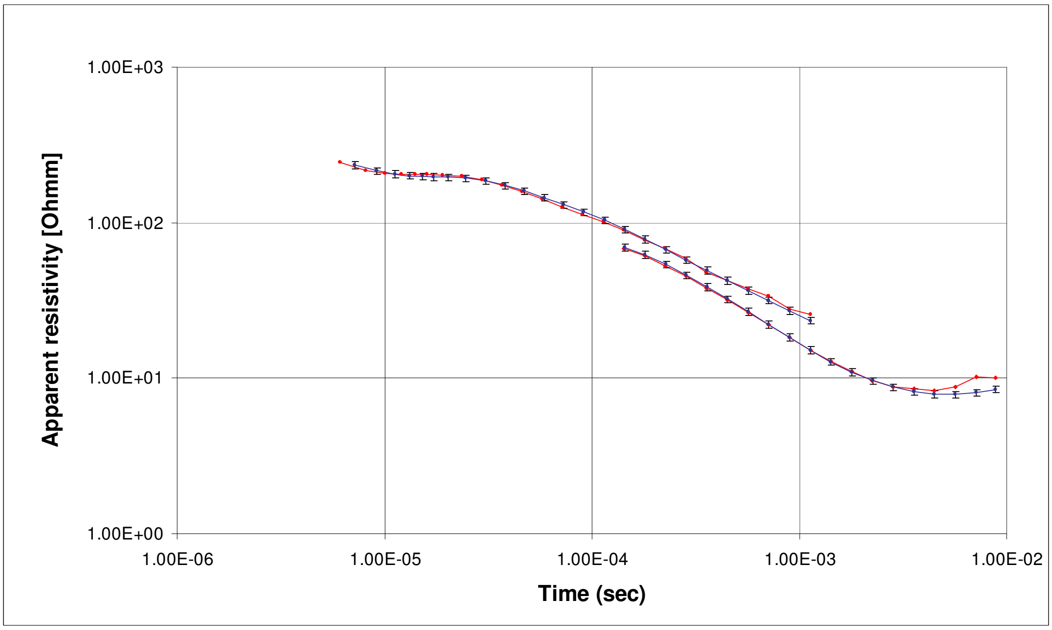


Figure 9 The frame is in 30 m altitude. Blue curves with 5% error bars are the expected response and red curves are the actual measurements

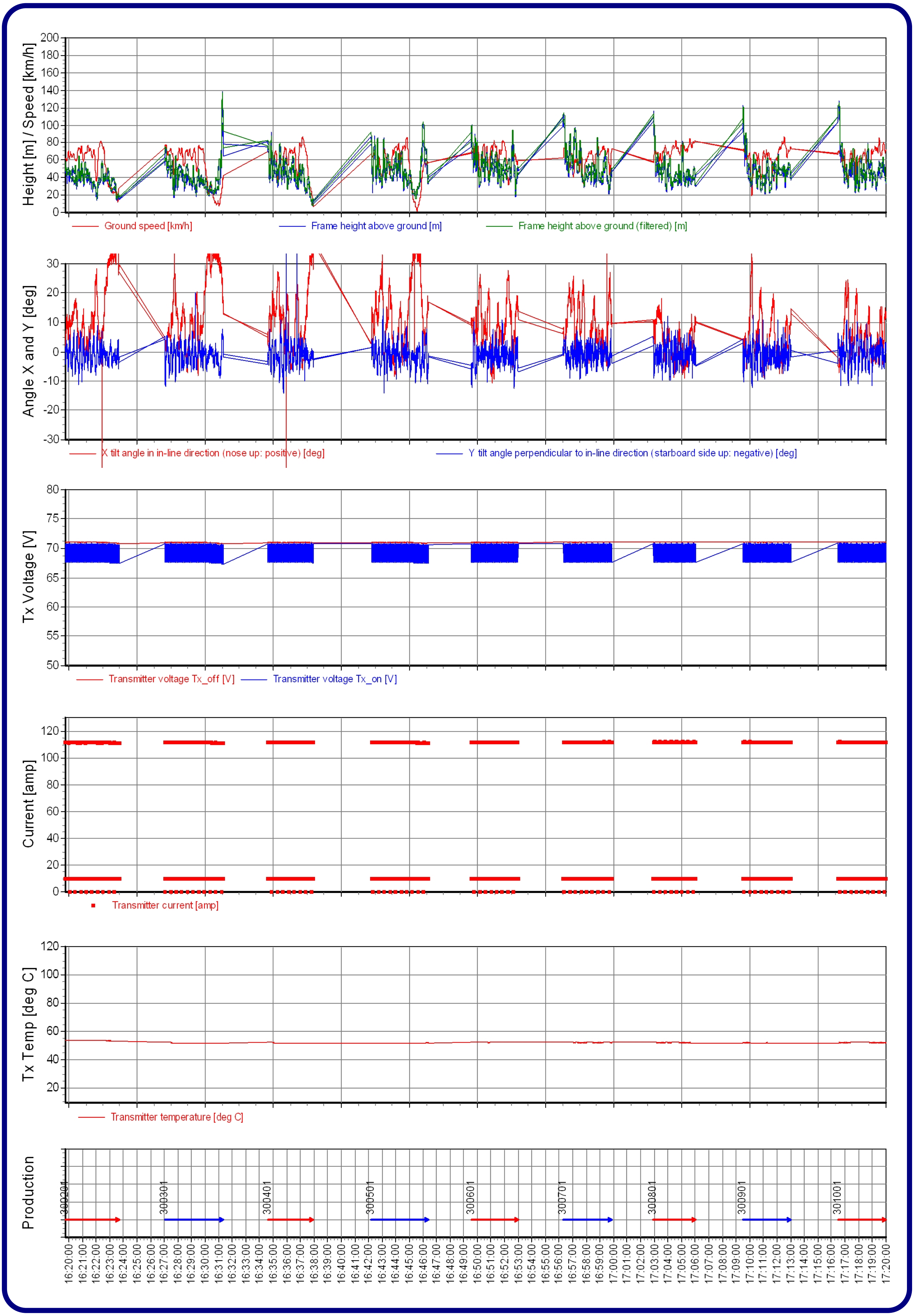
Appendix 4: Control parameters

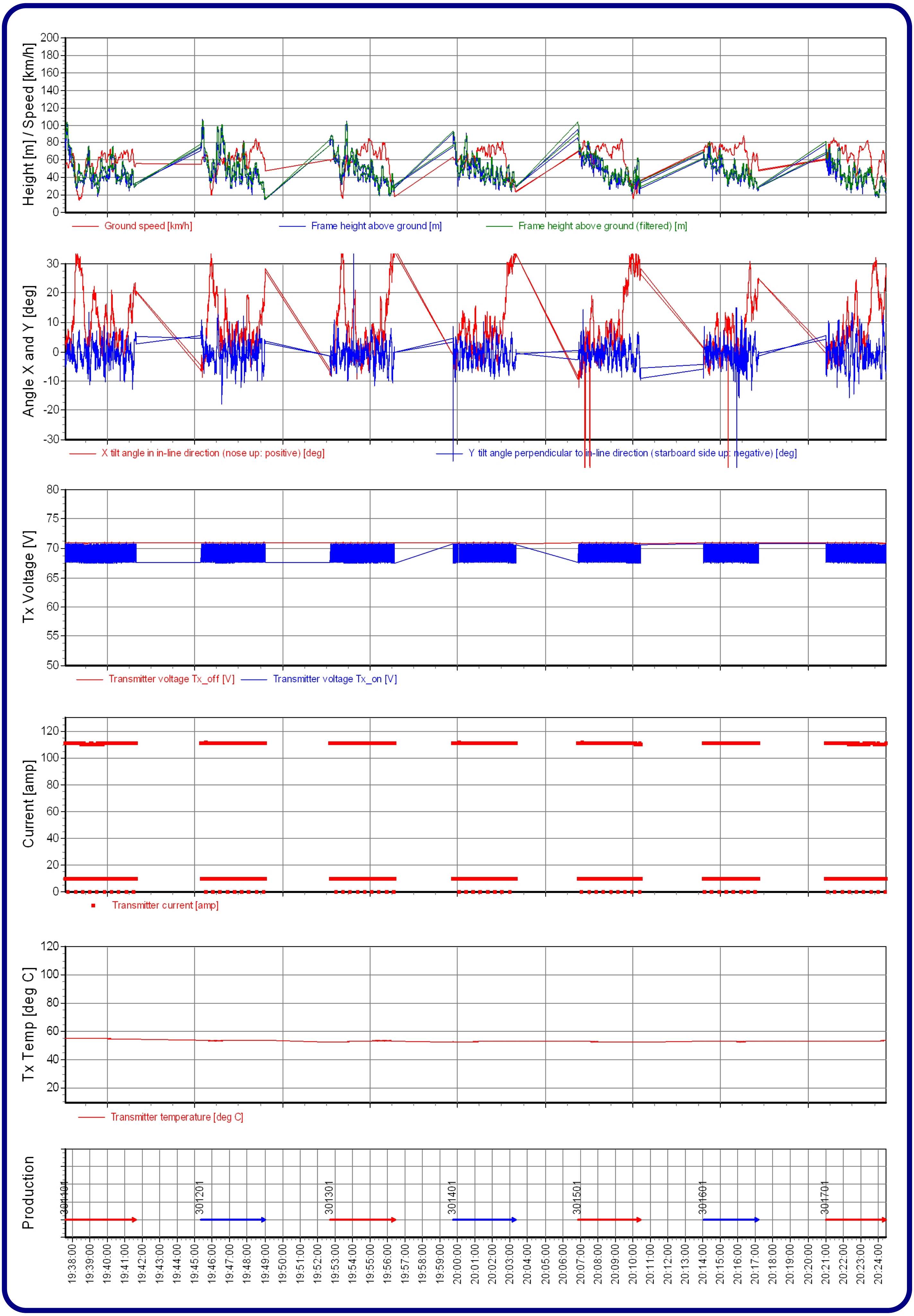
The following plots show the speed, altitude and the angle of the frame for every flight. Variations in the current, voltage on the transmitter and transmitter temperature are also shown.

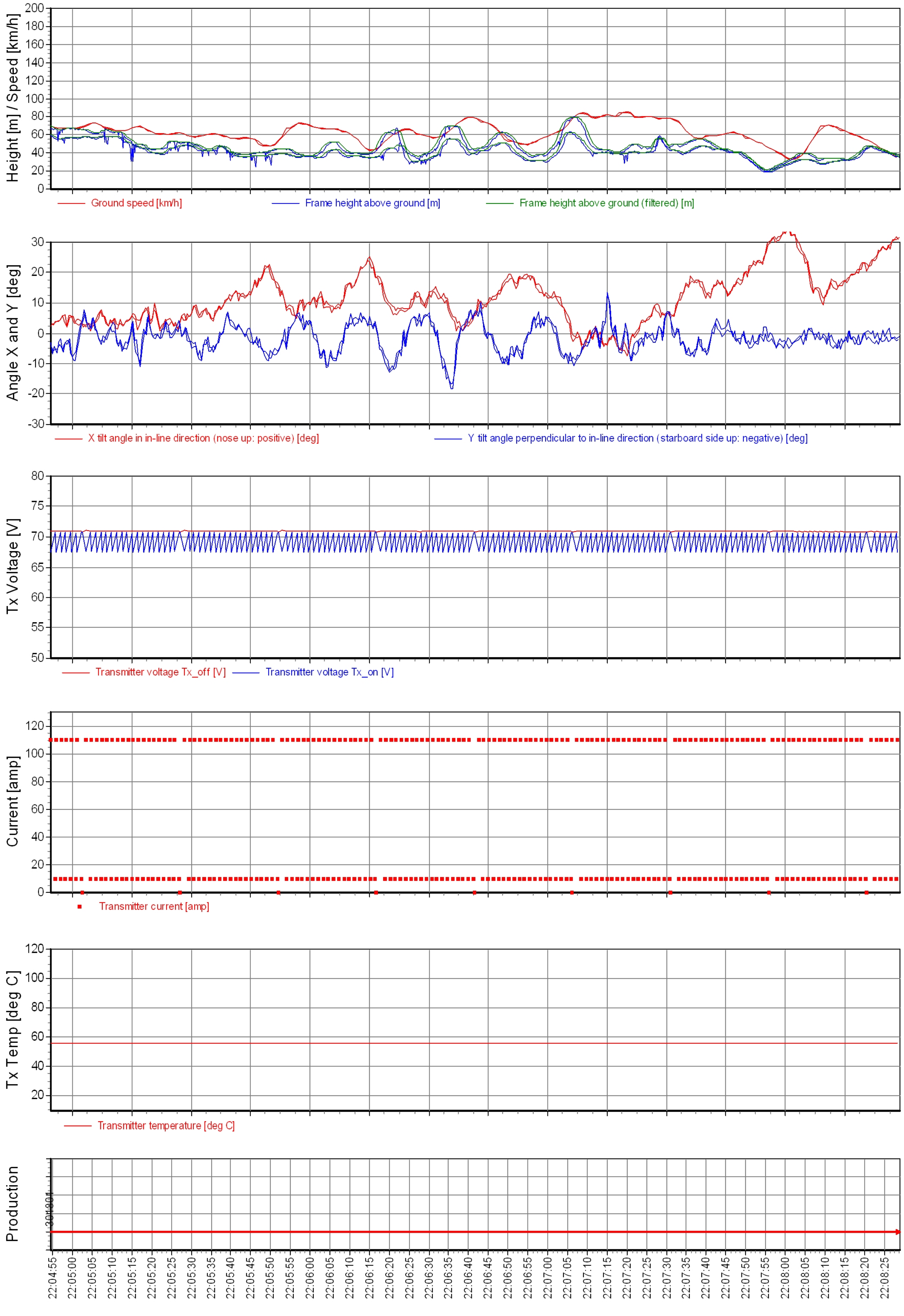
The green line, depicting processed frame height, shows the SkyPRO input from HE1 and HE2 after the frame has been corrected from deviations, away from the horizontal plane and any obstacles on the ground e.g. trees.

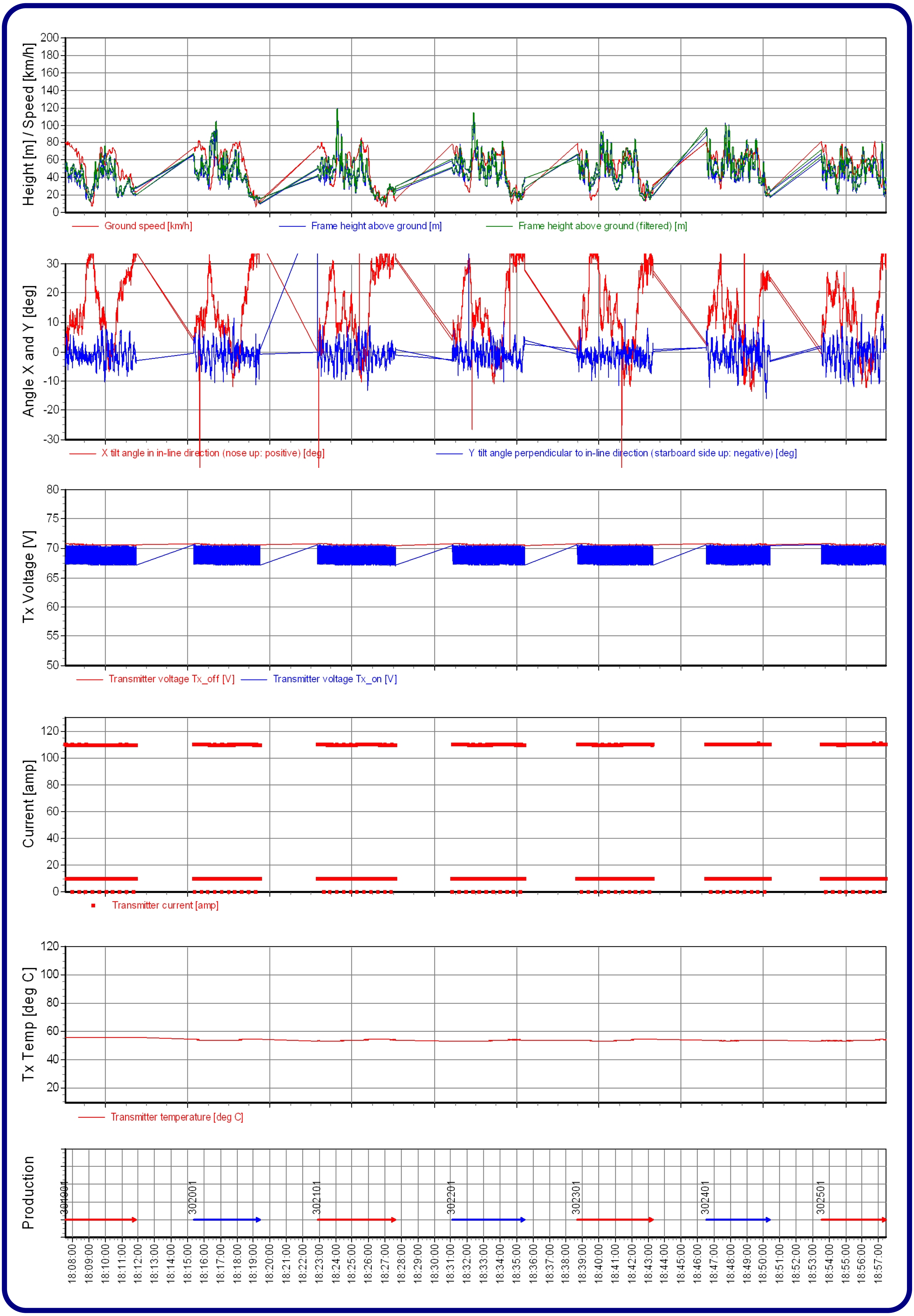
Turns at the end of flight lines and transport are shown as gaps in the bottom of the display.

The ground speed in the uppermost window displays the signal from both gps GP1 and GP2.


Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
300201
300301
300401
300501
300601
300701
300801
300901
301001


Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
301101
301201
301301
301401
301501
301601
301701


Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
301901


Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
302001
302101
302201
302301
302401
302501
18:08:00 18:09:00 18:10:00 18:11:00 18:12:00 18:13:00 18:14:00 18:15:00 18:16:00 18:17:00 18:18:00 18:19:00 18:20:00 18:21:00 18:22:00 18:23:00 18:24:00 18:25:00 18:26:00 18:27:00 18:28:00 18:29:00 18:30:00 18:31:00 18:32:00 18:33:00 18:34:00 18:35:00 18:36:00 18:37:00 18:38:00 18:39:00 18:40:00 18:41:00 18:42:00 18:43:00 18:44:00 18:45:00 18:46:00 18:47:00 18:48:00 18:49:00 18:50:00 18:51:00 18:52:00 18:53:00 18:54:00 18:55:00 18:56:00 18:57:00

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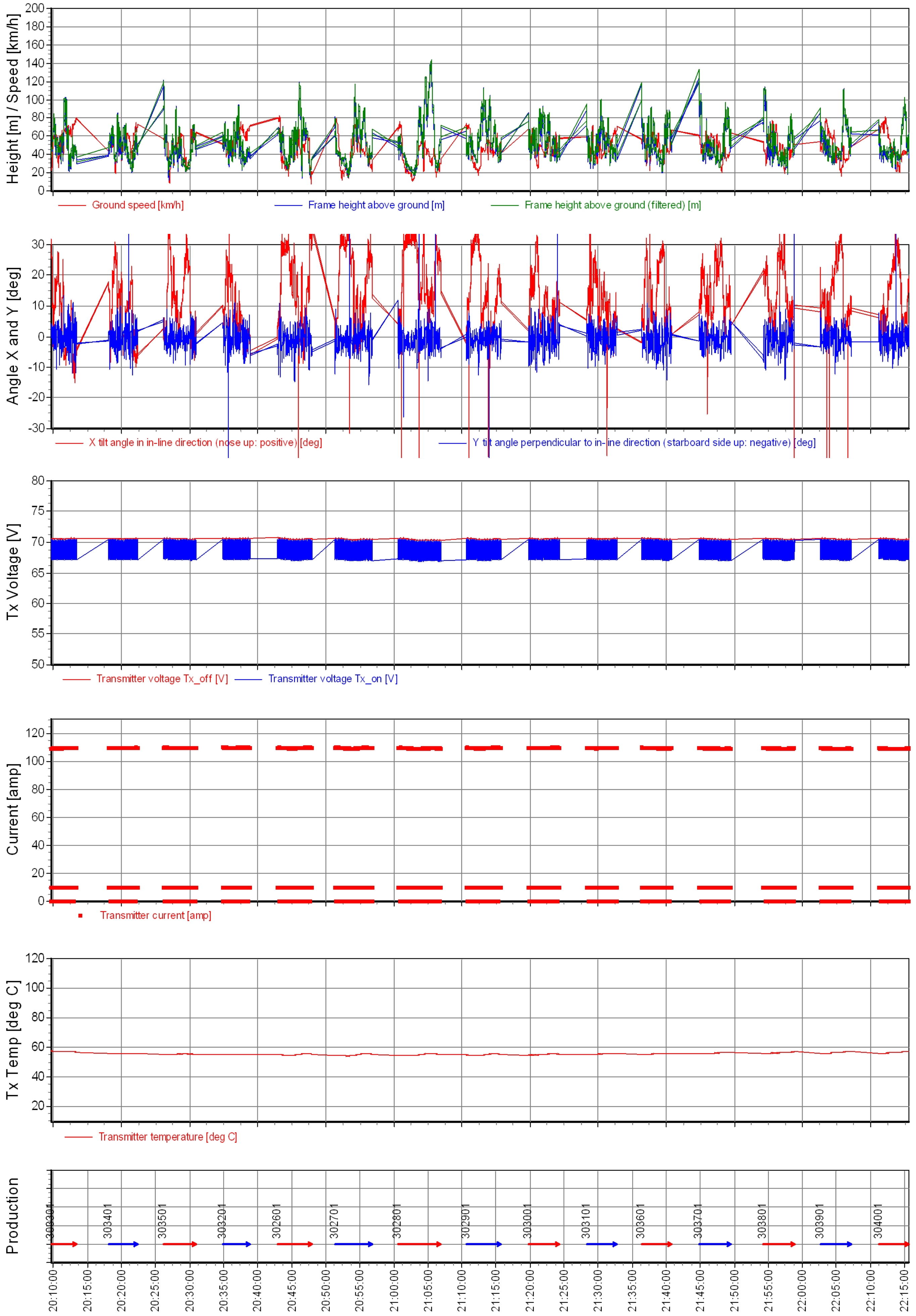

Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
303401
303501
303201
302601
302701
302801
302901
303001
303101
303601
303701
303801
303901
304001
20:10:00
20:15:00
20:20:00
20:25:00
20:30:00
20:35:00
20:40:00
20:45:00
20:50:00
20:55:00
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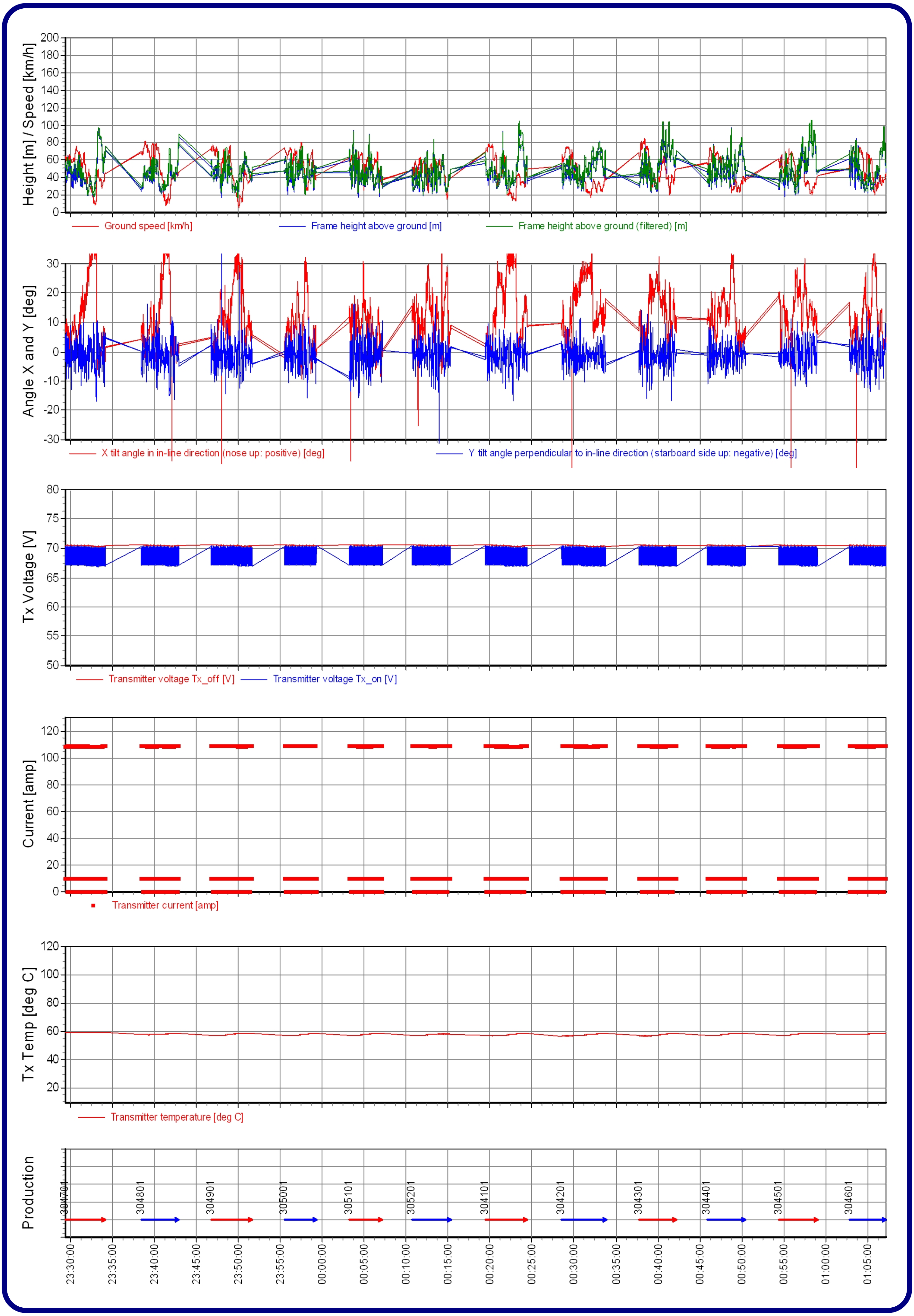
22:15:00


Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
304701
304801
304901
305001
305101
305201
304101
304201
304301
304401
304501
304601
23:30:00
23:35:00
23:40:00
23:45:00
23:50:00
23:55:00
00:00:00
00:05:00
00:10:00
00:15:00
00:20:00
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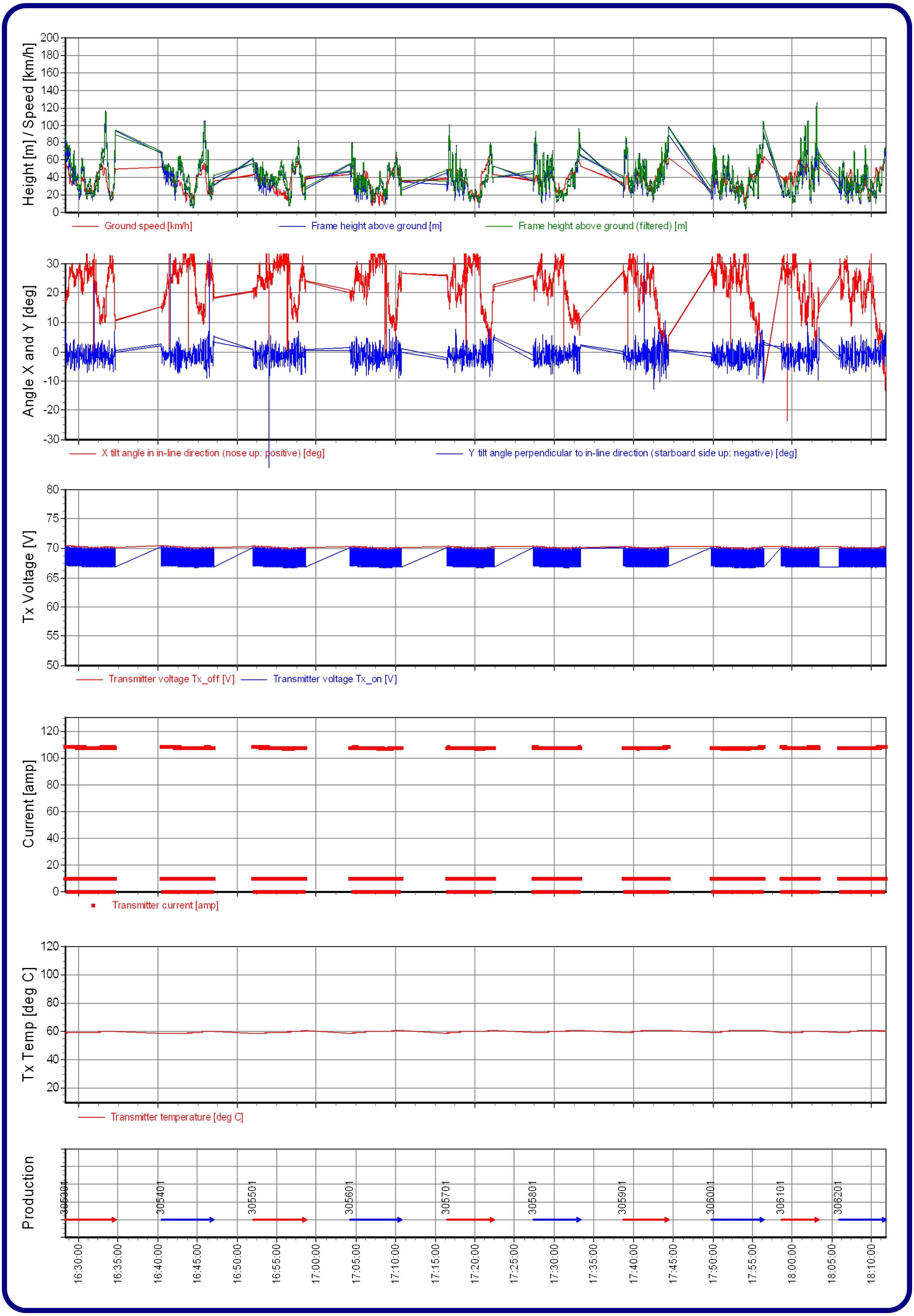
01:05:00

20110519.01



Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
305301
305401
305501
305601
305701
305801
305901
306001
306101
306201
16:30:00
16:35:00
16:40:00
16:45:00
16:50:00
16:55:00
17:00:00
17:05:00
17:10:00
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17:20:00
17:25:00
17:30:00
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18:10:00

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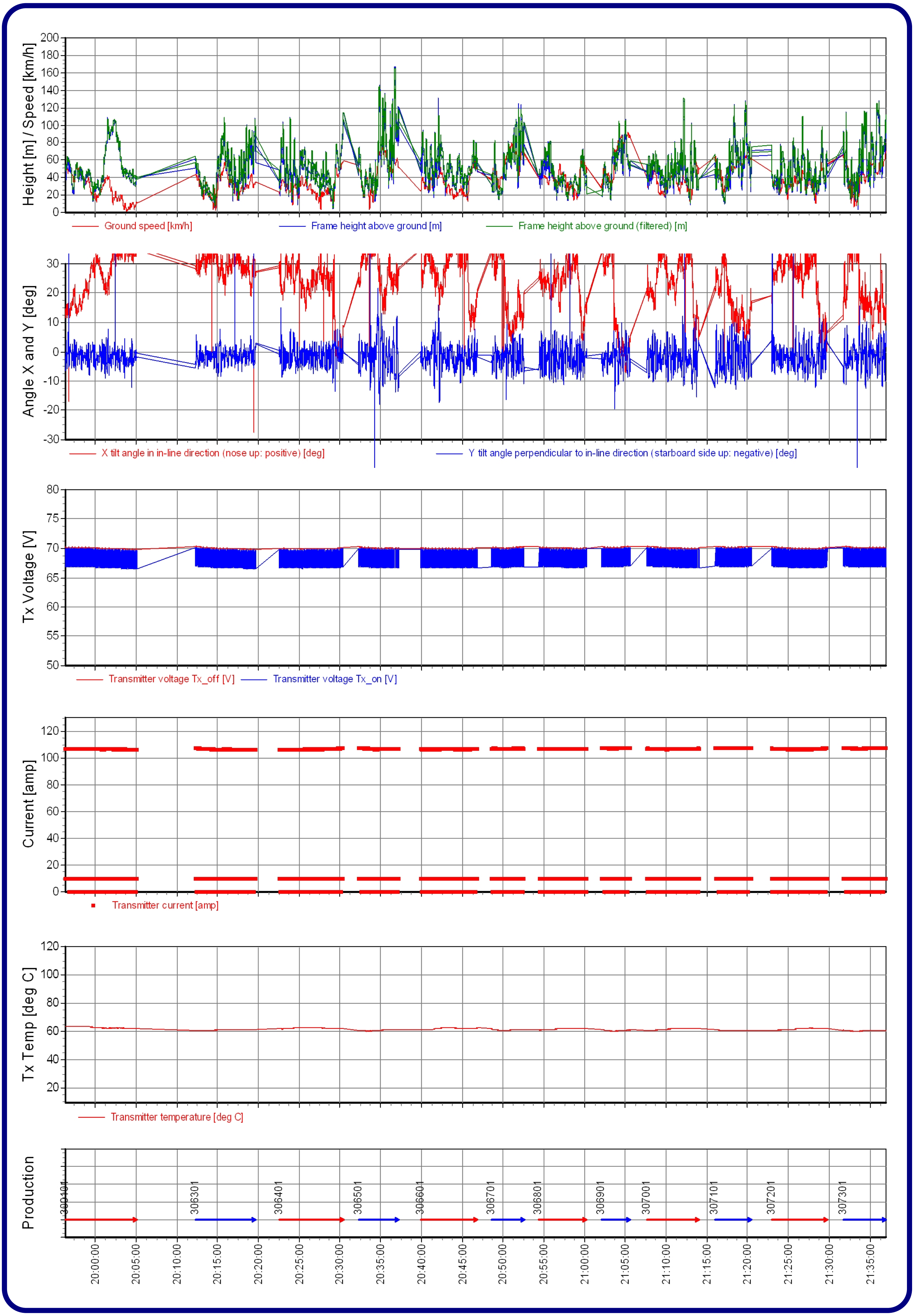

Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
306301
306401
306501
306601
306701
306801
306901
307001
307101
307201
307301
20:00:00
20:05:00
20:10:00
20:15:00
20:20:00
20:25:00
20:30:00
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20:45:00
20:50:00
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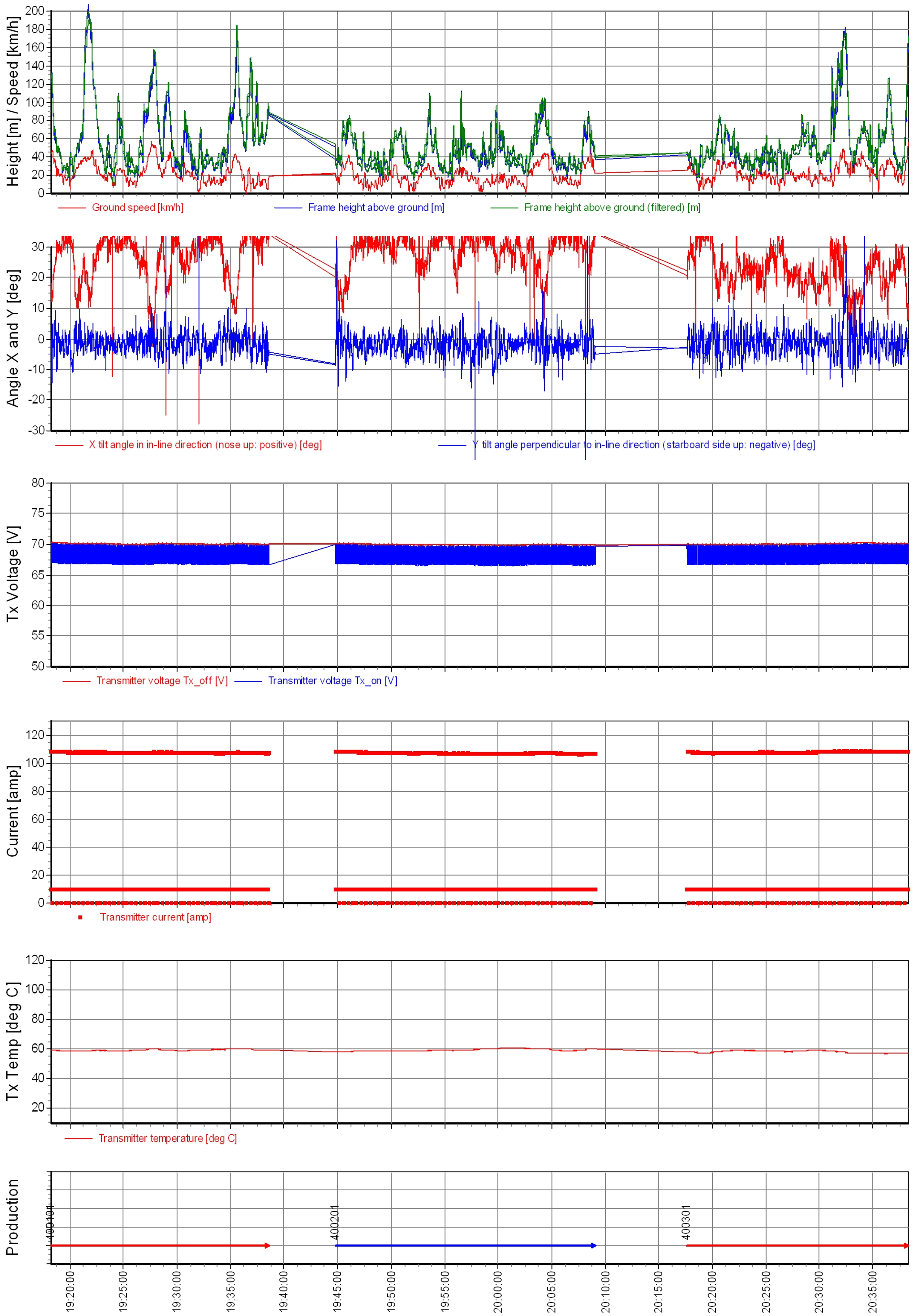
21:30:00
21:35:00


Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
400101
400201
400301
19:20:00
19:25:00
19:30:00
19:35:00
19:40:00
19:45:00
19:50:00
19:55:00
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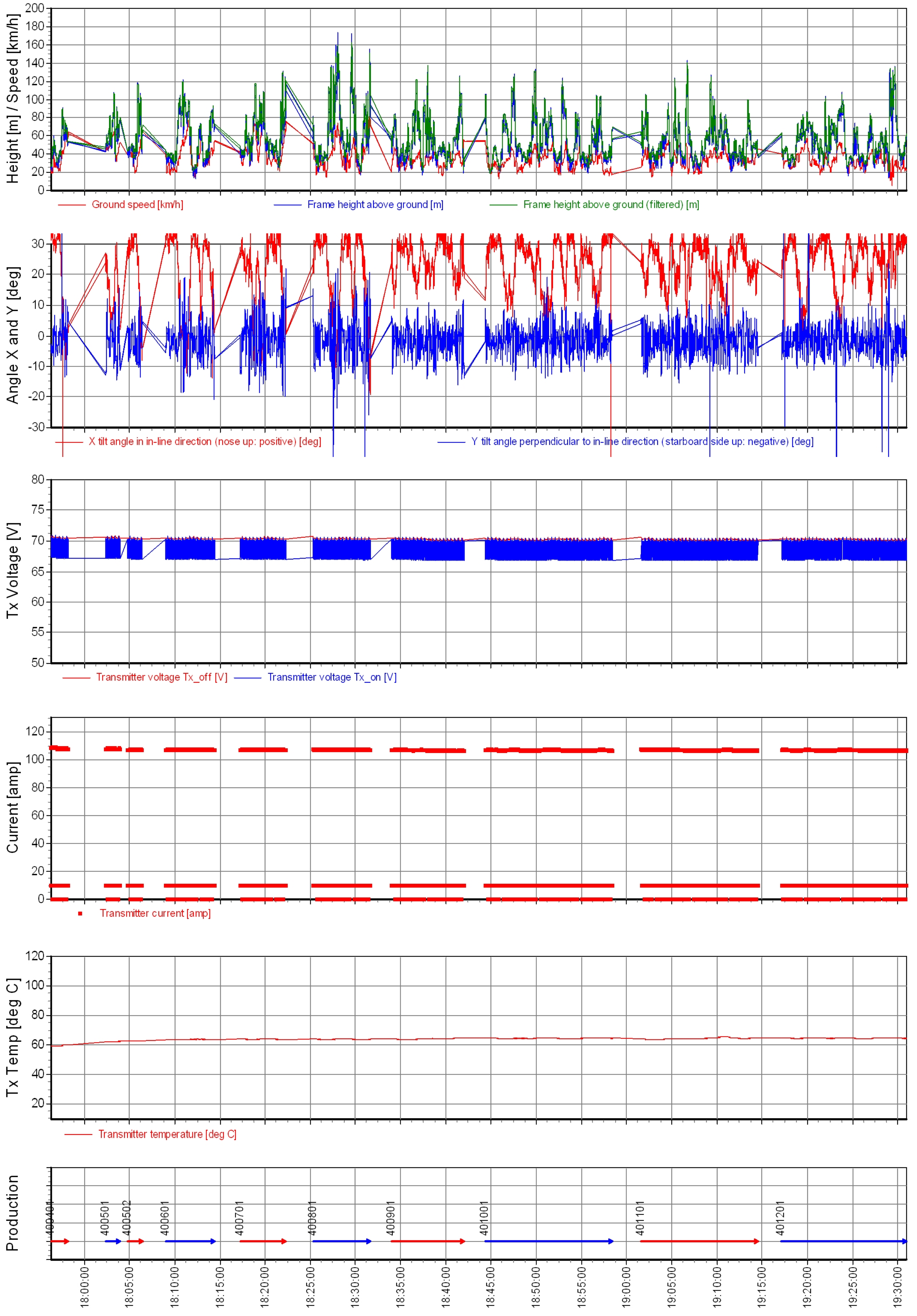
20:35:00

20110531.02



Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
400401
400501
400502
400601
400701
400801
400901
401001
401101
401201
18:00:00
18:05:00
18:10:00
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18:20:00
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18:35:00
18:40:00
18:45:00
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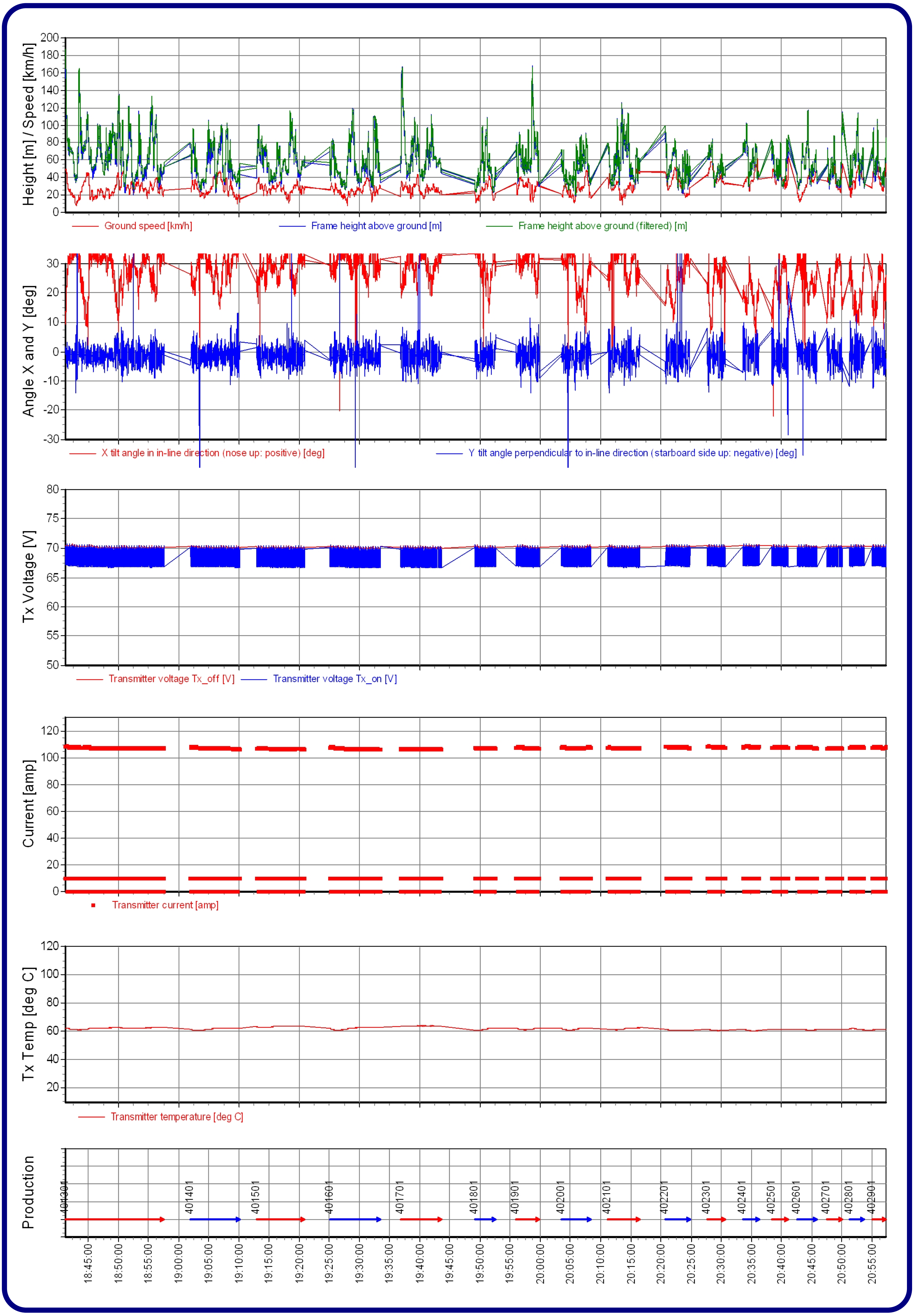
Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
401401
401501
401601
401701
401801
401901
402001
402101
402201
402301
402401
402501
402601
402701
402801
402901
18:45:00
18:50:00
18:55:00
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19:05:00
19:10:00
19:15:00
19:20:00
19:25:00
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19:35:00
19:40:00
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20:05:00
20:10:00
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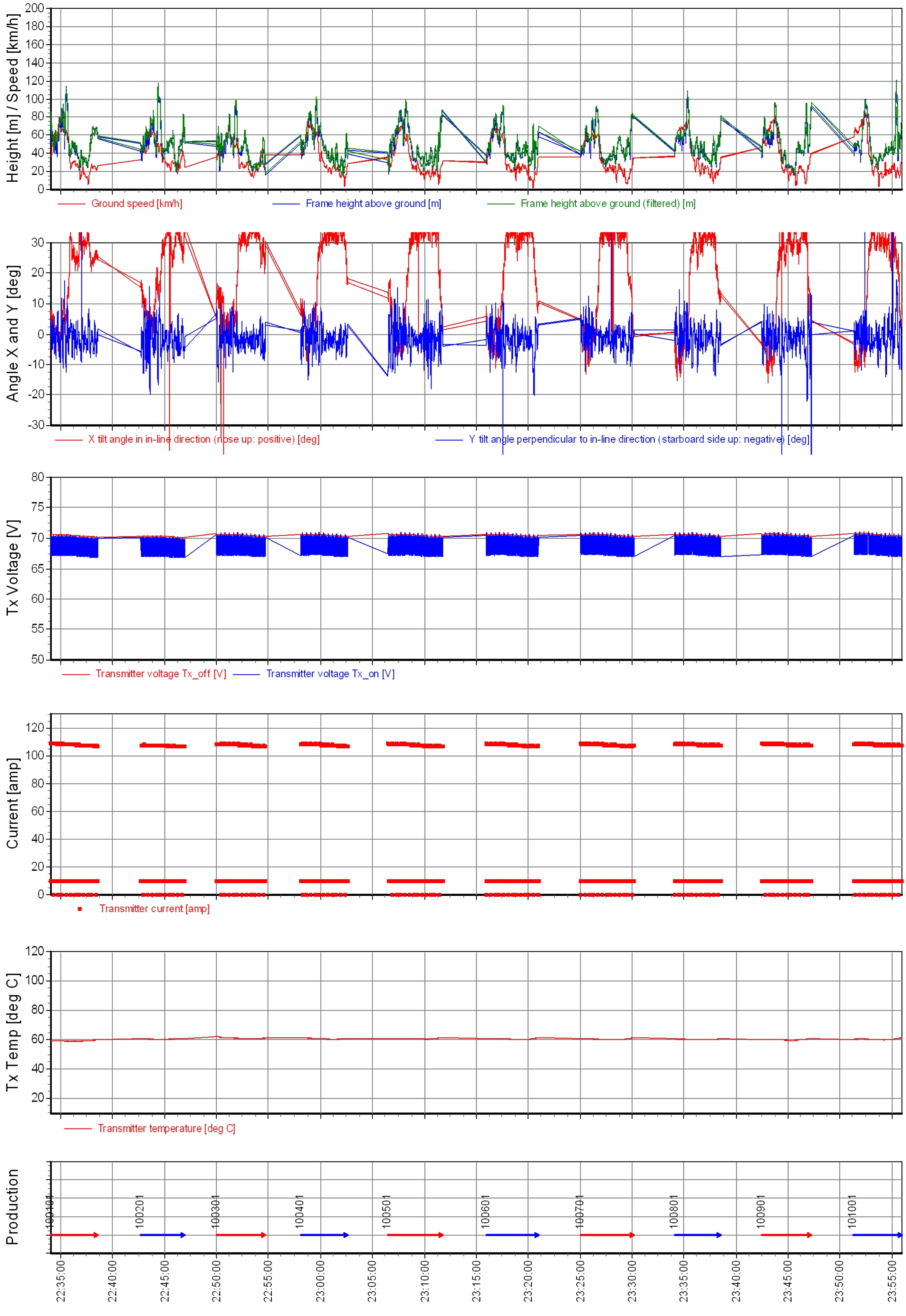
Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
100101
100201
100301
100401
100501
100601
100701
100801
100901
101001
22:35:00
22:40:00
22:45:00
22:50:00
22:55:00
23:00:00
23:05:00
23:10:00
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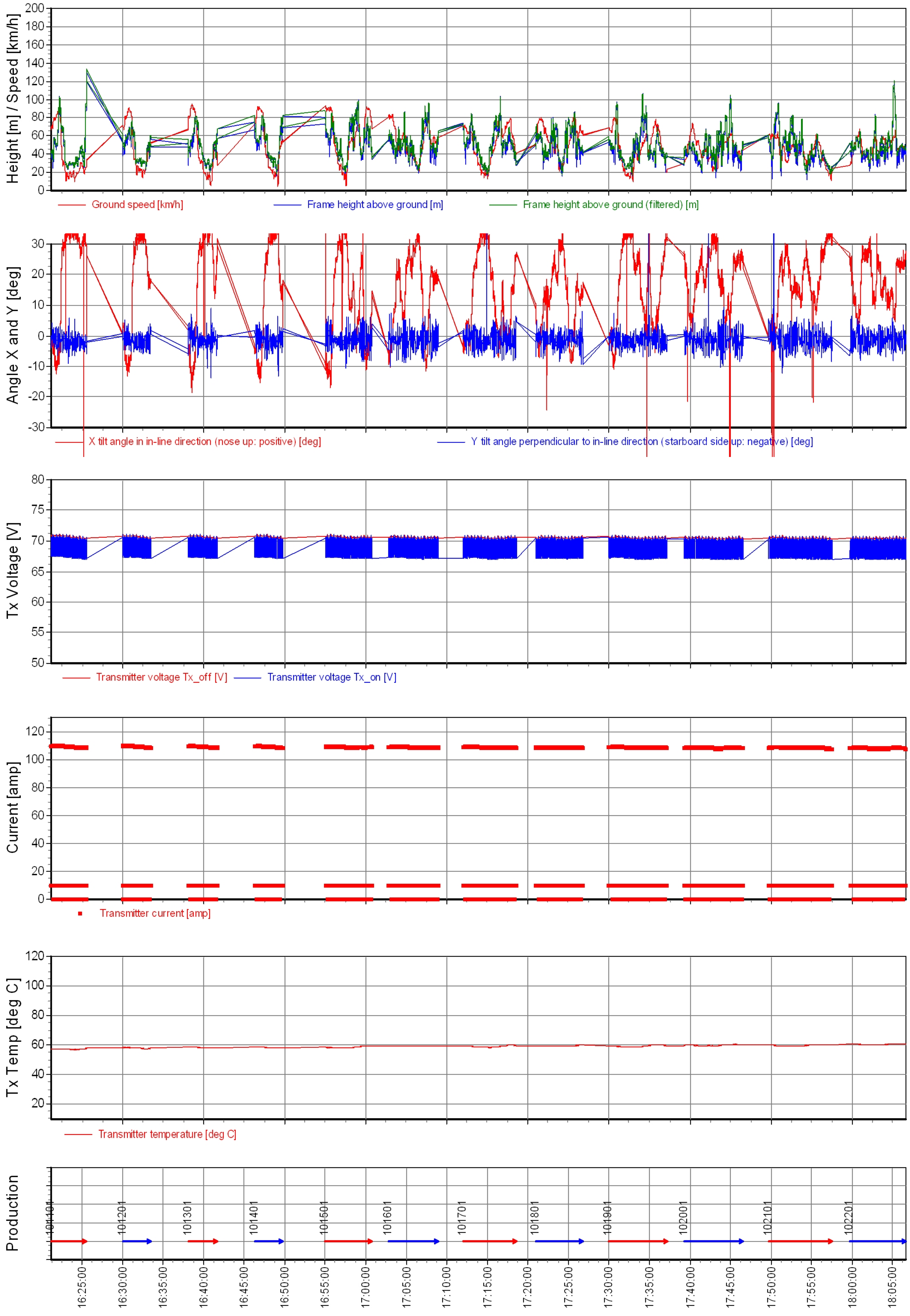
23:50:00
23:55:00



Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
101101
101201
101301
101401
101501
101601
101701
101801
101901
102001
102101
102201
16:25:00
16:30:00
16:35:00
16:40:00
16:45:00
16:50:00
16:55:00
17:00:00
17:05:00
17:10:00
17:15:00
17:20:00
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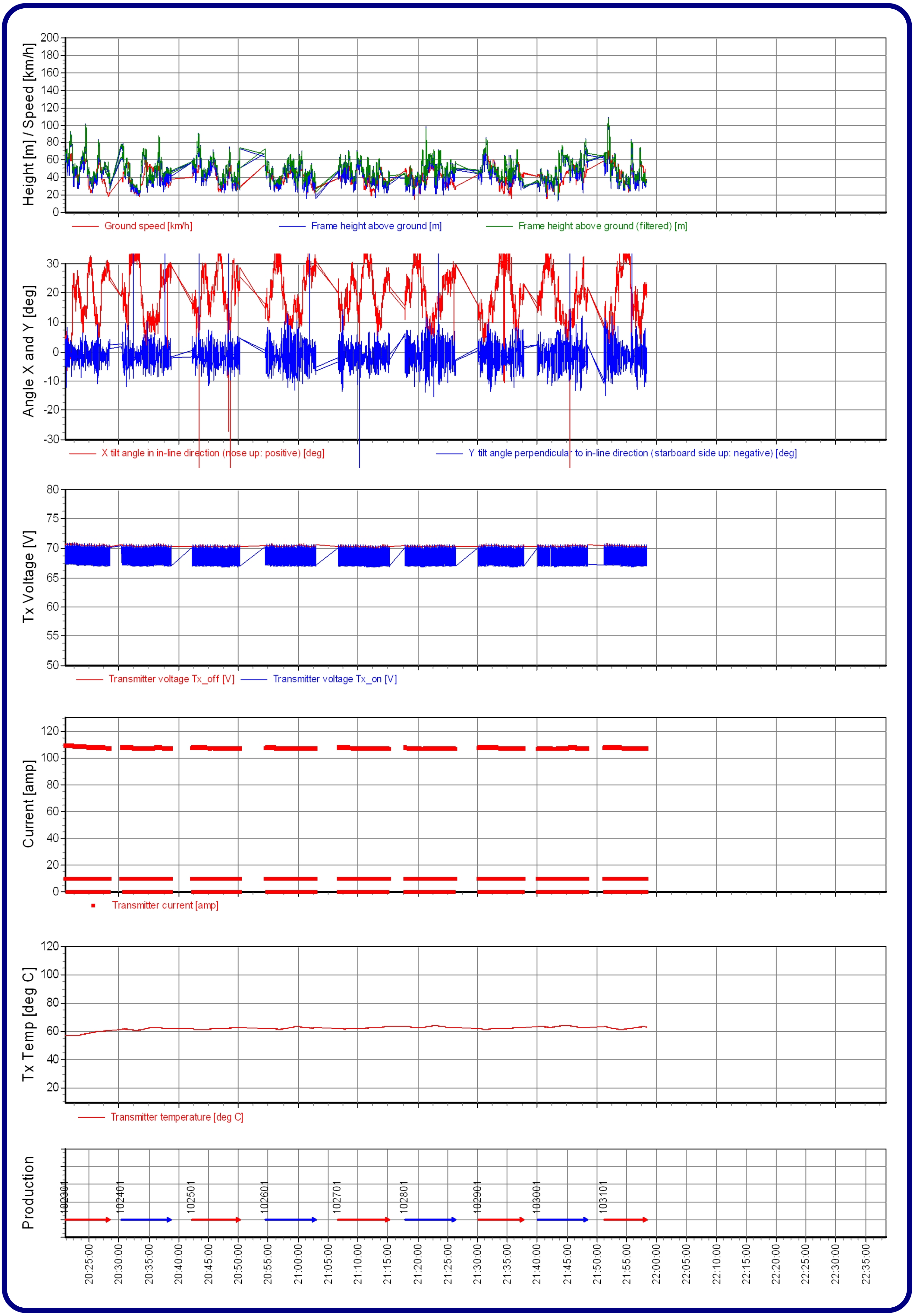
18:00:00
18:05:00


Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
102401
102501
102601
102701
102801
102901
103001
103101
20:25:00
20:30:00
20:35:00
20:40:00
20:45:00
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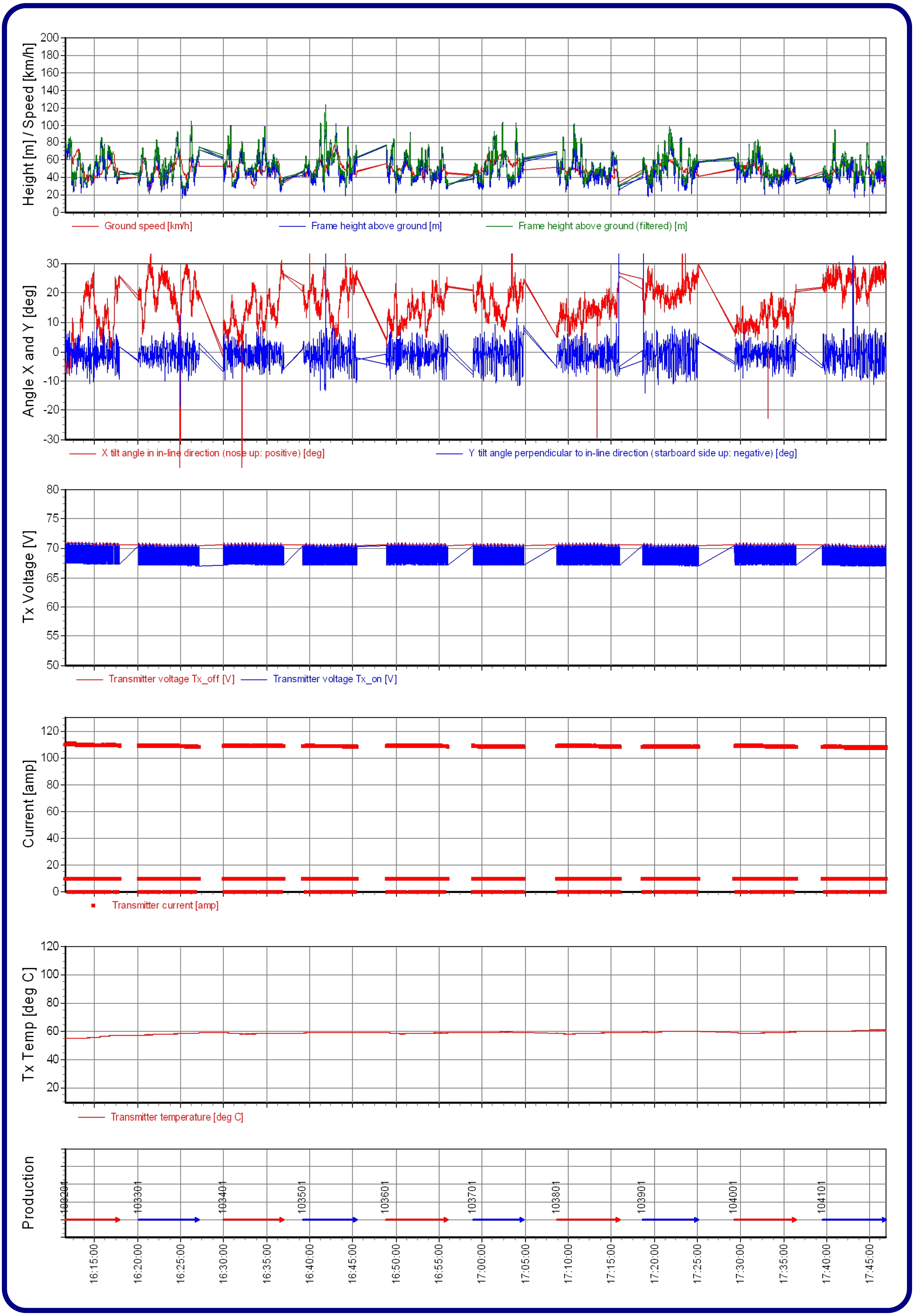
22:35:00


Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
103301
103401
103501
103601
103701
103801
103901
104001
104101
16:15:00
16:20:00
16:25:00
16:30:00
16:35:00
16:40:00
16:45:00
16:50:00
16:55:00
17:00:00
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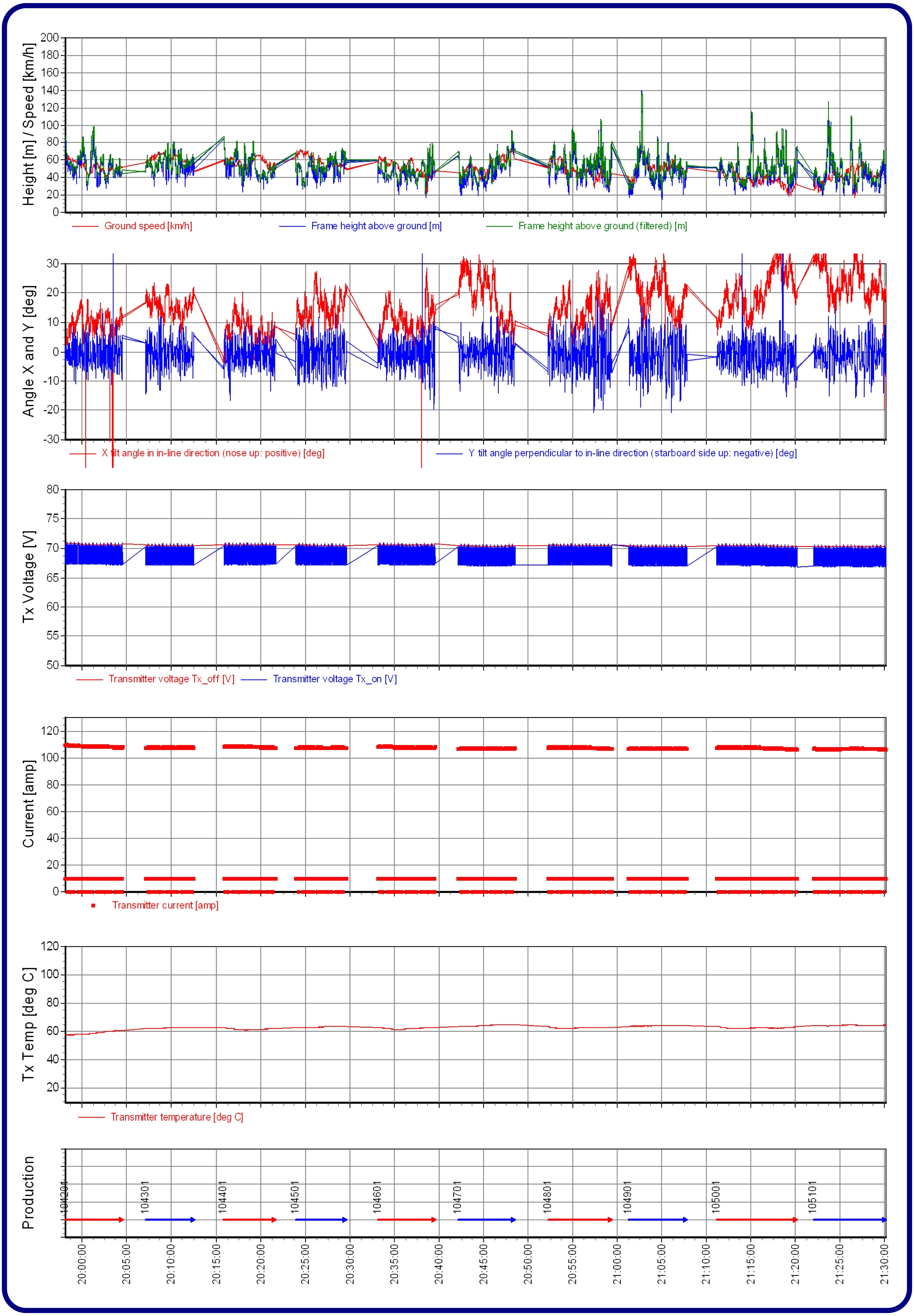

Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
104201
104301
104401
104501
104601
104701
104801
104901
105001
105101
20:00:00
20:05:00
20:10:00
20:15:00
20:20:00
20:25:00
20:30:00
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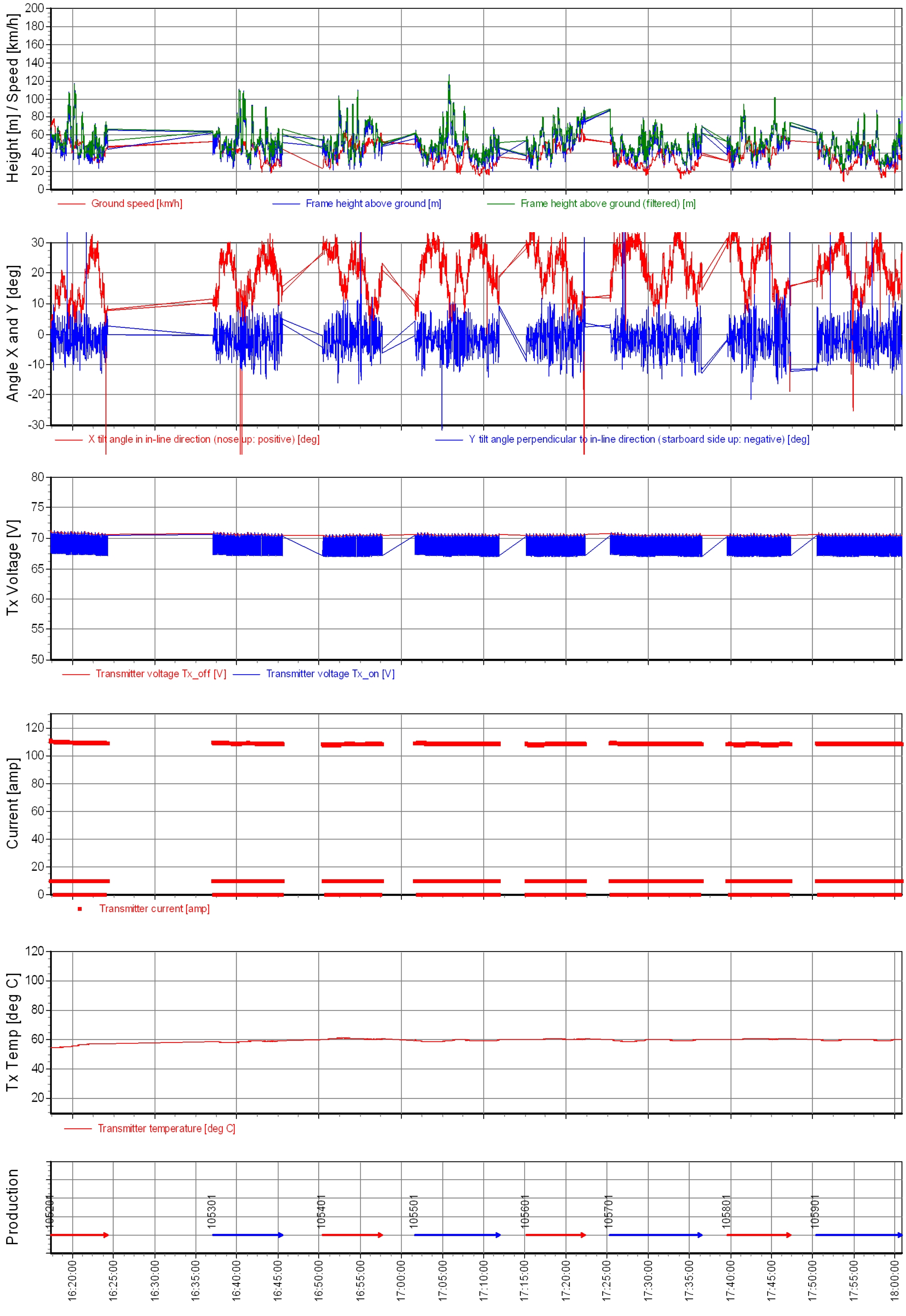
Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
105201
105301
105401
105501
105601
105701
105801
105901
16:20:00
16:25:00
16:30:00
16:35:00
16:40:00
16:45:00
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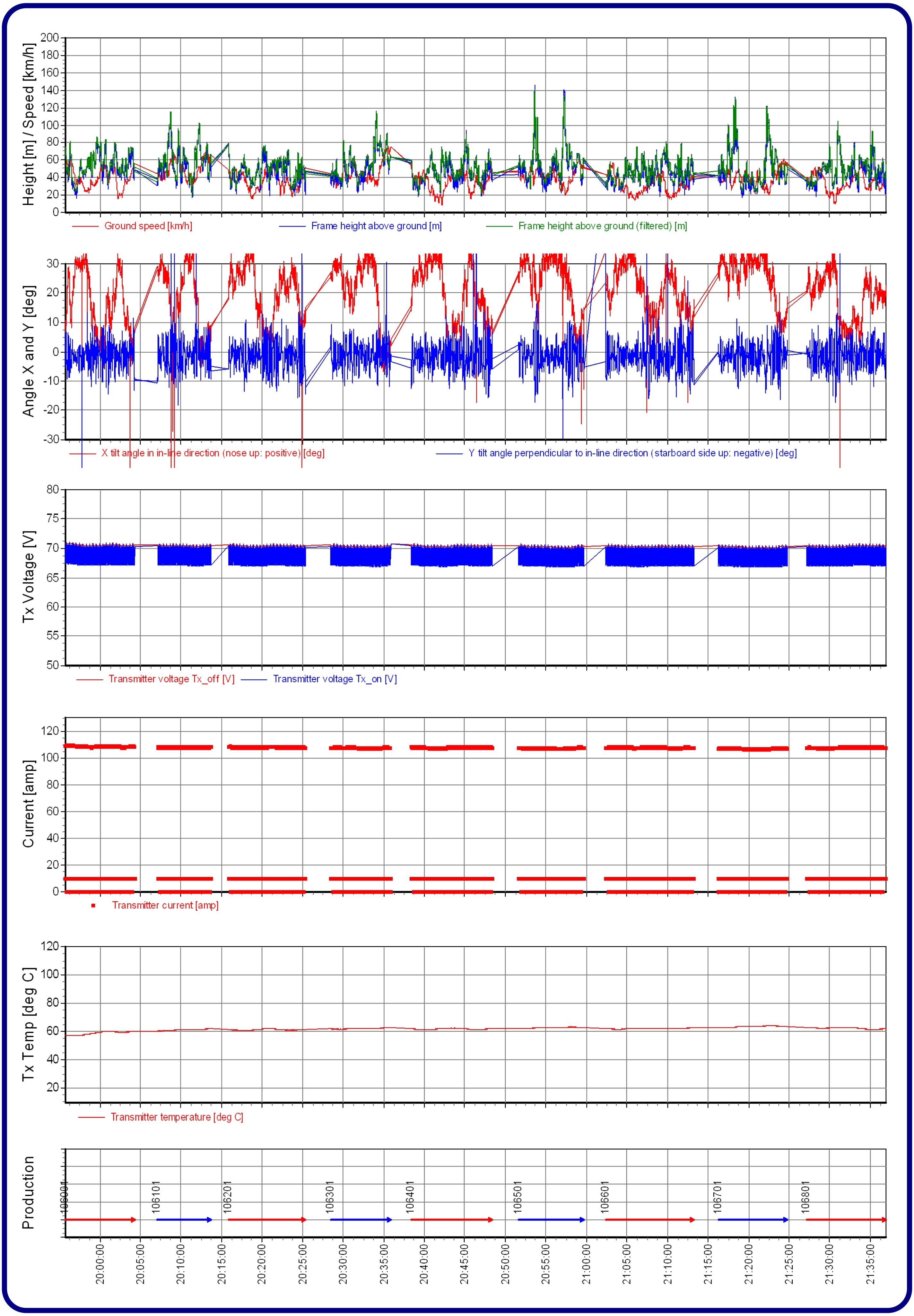
Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
106001
106101
106201
106301
106401
106501
106601
106701
106801
20:00:00
20:05:00
20:10:00
20:15:00
20:20:00
20:25:00
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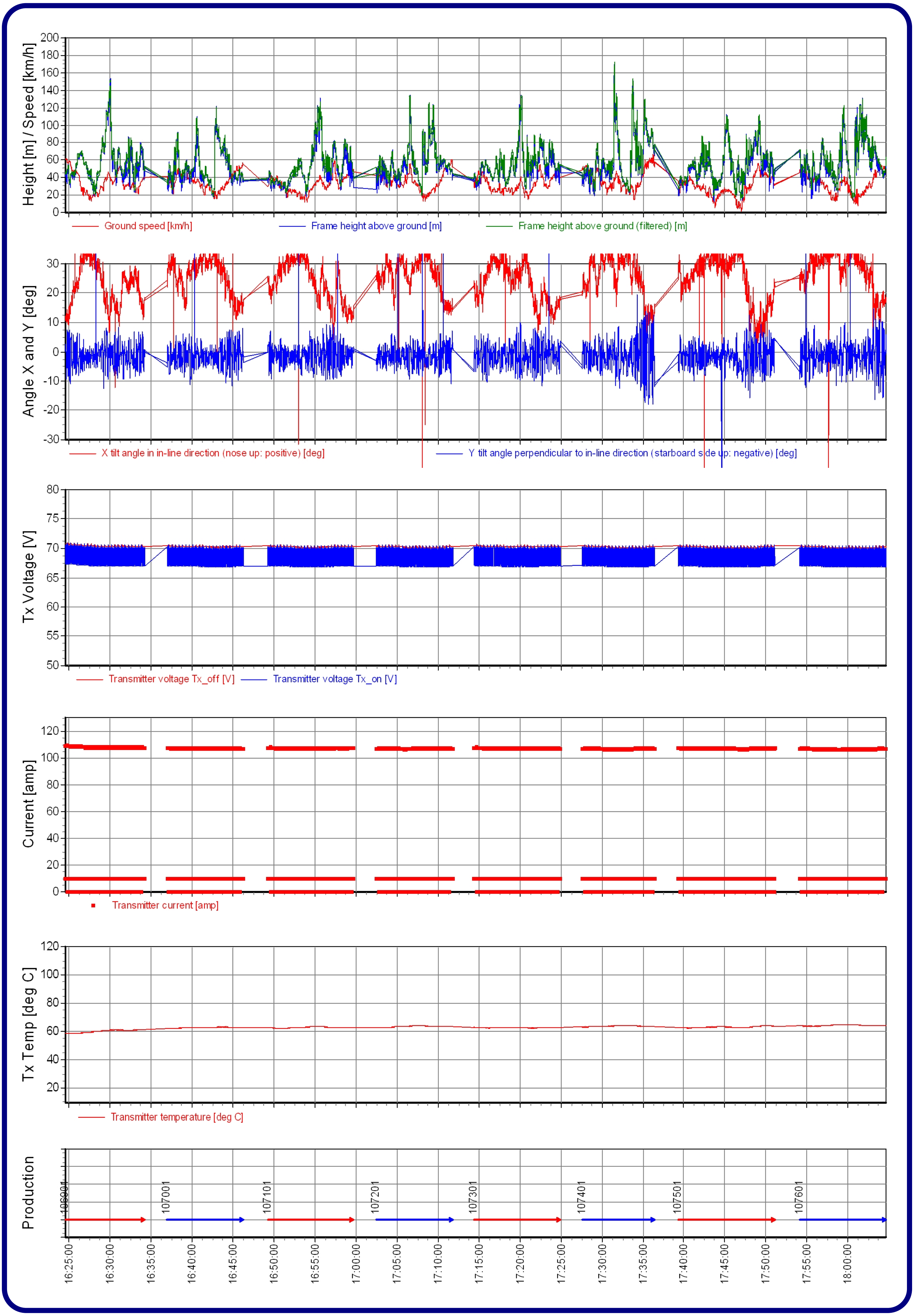
21:35:00


Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
107001
107101
107201
107301
107401
107501
107601
16:25:00
16:30:00
16:35:00
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16:45:00
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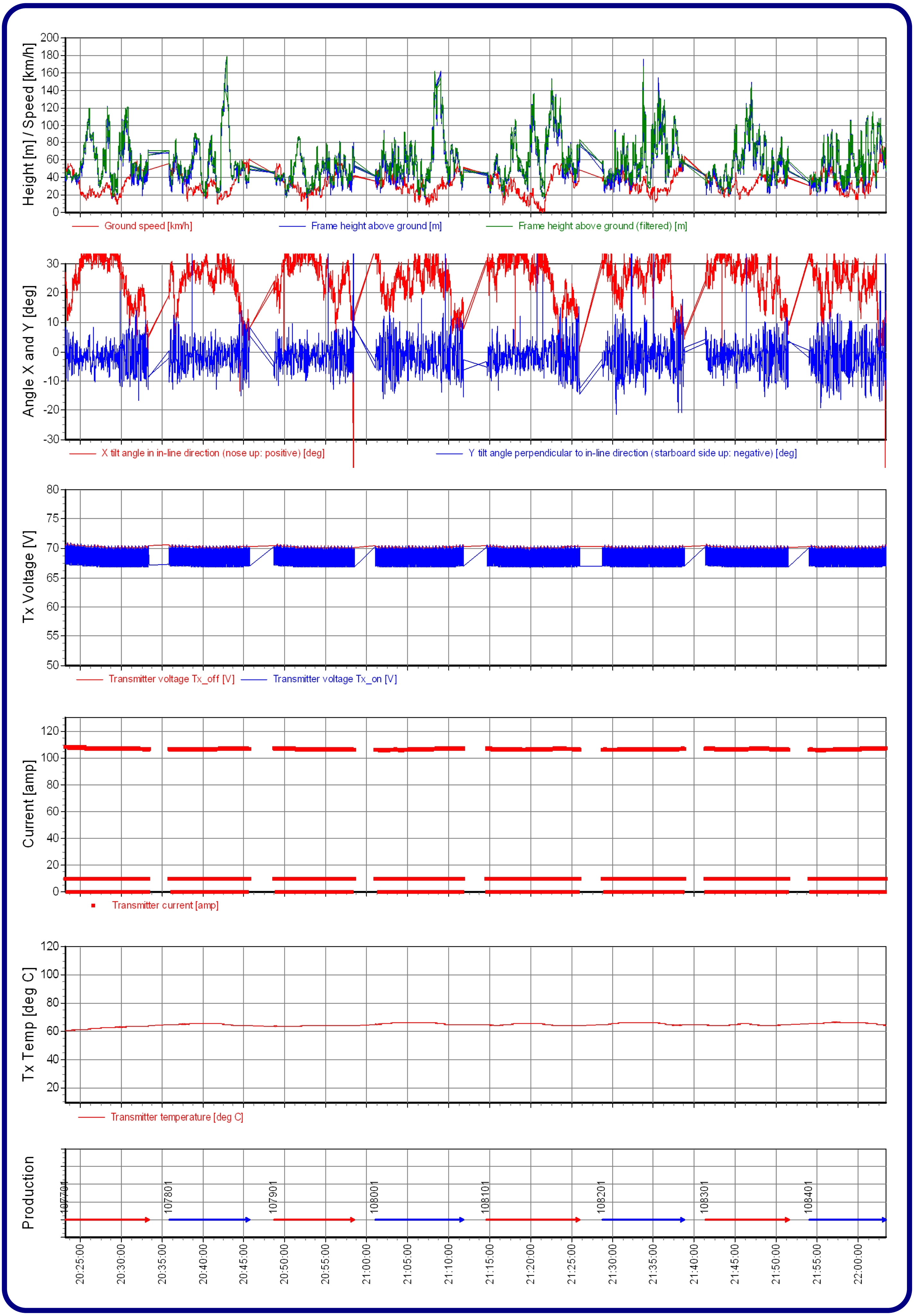
Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
107701
107801
107901
108001
108101
108201
108301
108401
20:25:00
20:30:00
20:35:00
20:40:00
20:45:00
20:50:00
20:55:00
21:00:00
21:05:00
21:10:00
21:15:00
21:20:00
21:25:00
21:30:00
21:35:00
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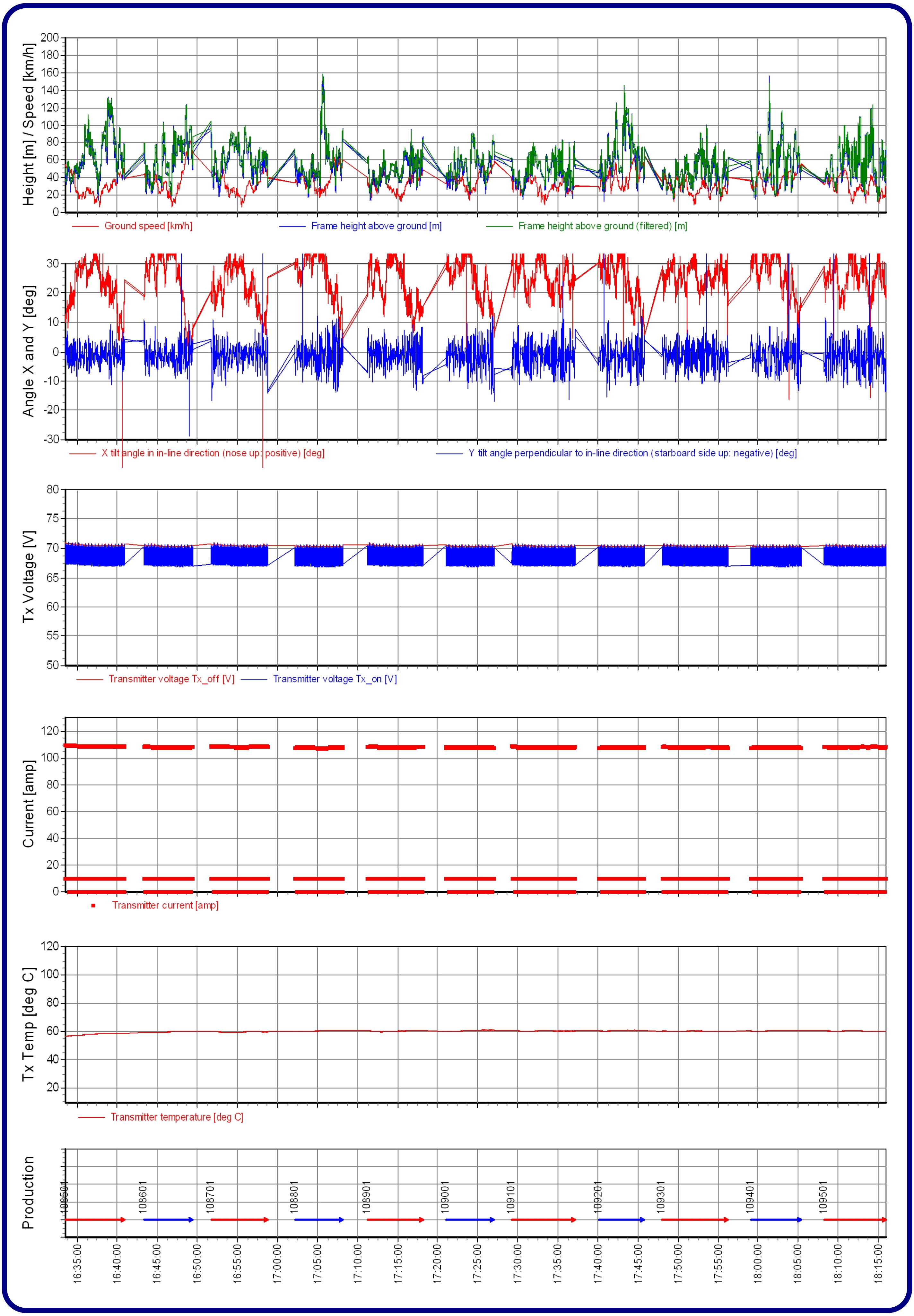
21:55:00
22:00:00


Height [m] / Speed [km/h]
200
180
160
140
120
100
80
60
40
20
0
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
30
20
10
0
-10
-20
-30
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
80
75
70
65
60
55
50
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
120
100
80
60
40
20
0
Transmitter current [amp]
Tx Temp [deg C]
120
100
80
60
40
20
Transmitter temperature [deg C]
Production
108601
108701
108801
108901
109001
109101
109201
109301
109401
109501
16:35:00
16:40:00
16:45:00
16:50:00
16:55:00
17:00:00
17:05:00
17:10:00
17:15:00
17:20:00
17:25:00
17:30:00
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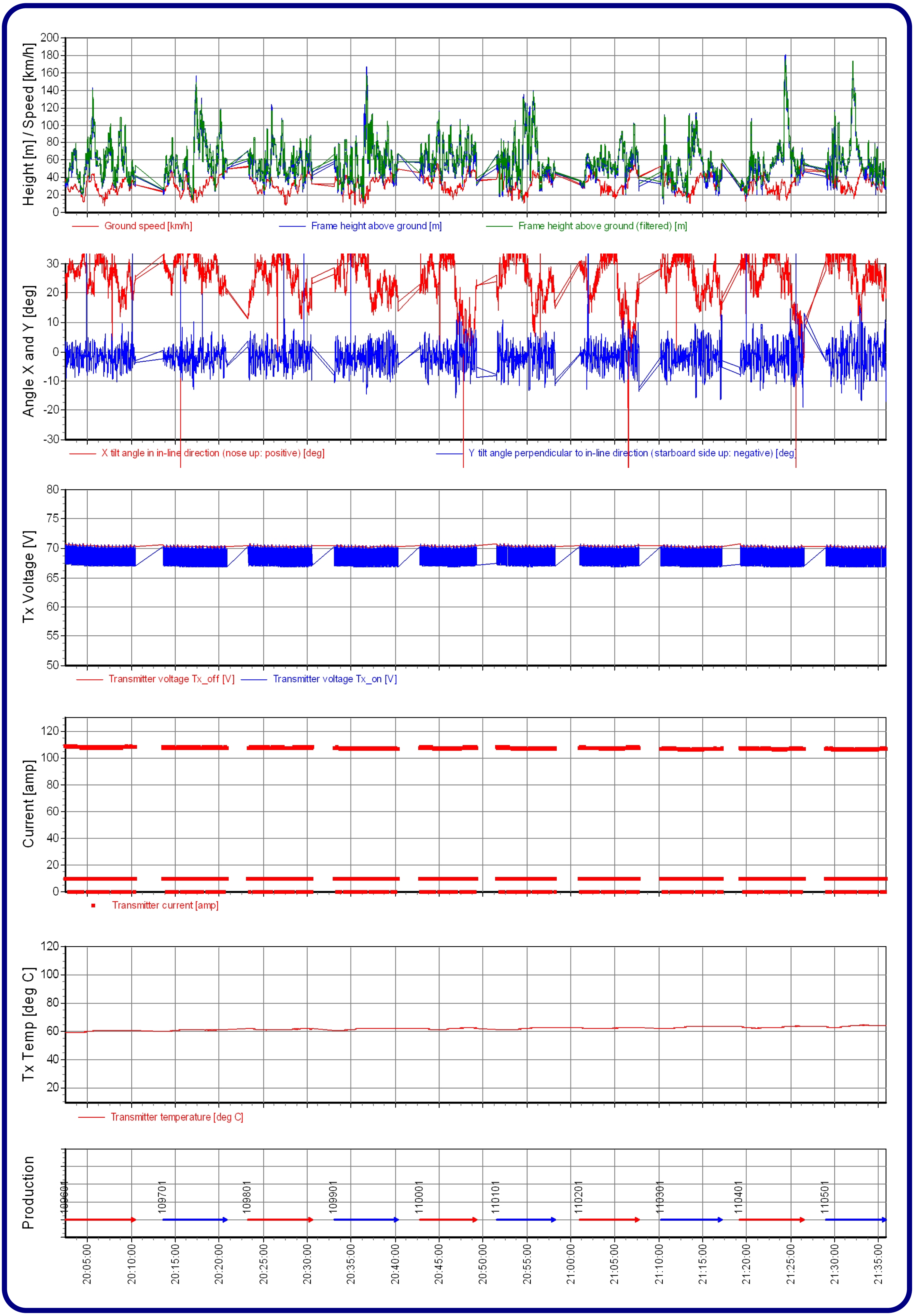
18:10:00
18:15:00


Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
109601
109701
109801
109901
110001
110101
110201
110301
110401
110501
20:05:00
20:10:00
20:15:00
20:20:00
20:25:00
20:30:00
20:35:00
20:40:00
20:45:00
20:50:00
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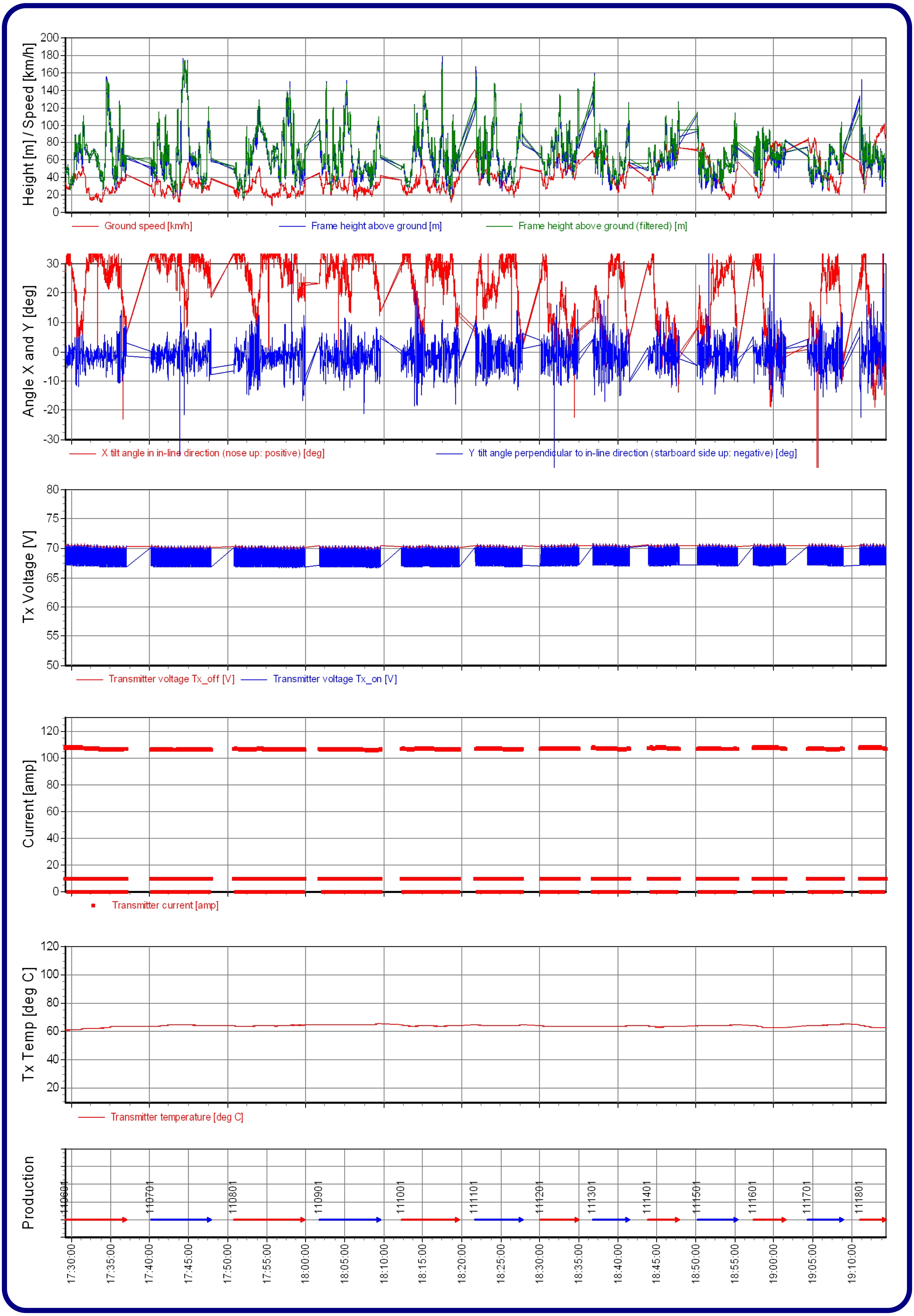
21:30:00
21:35:00



Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
110601
110701
110801
110901
111001
111101
111201
111301
111401
111501
111601
111701
111801
17:30:00
17:35:00
17:40:00
17:45:00
17:50:00
17:55:00
18:00:00
18:05:00
18:10:00
18:15:00
18:20:00
18:25:00
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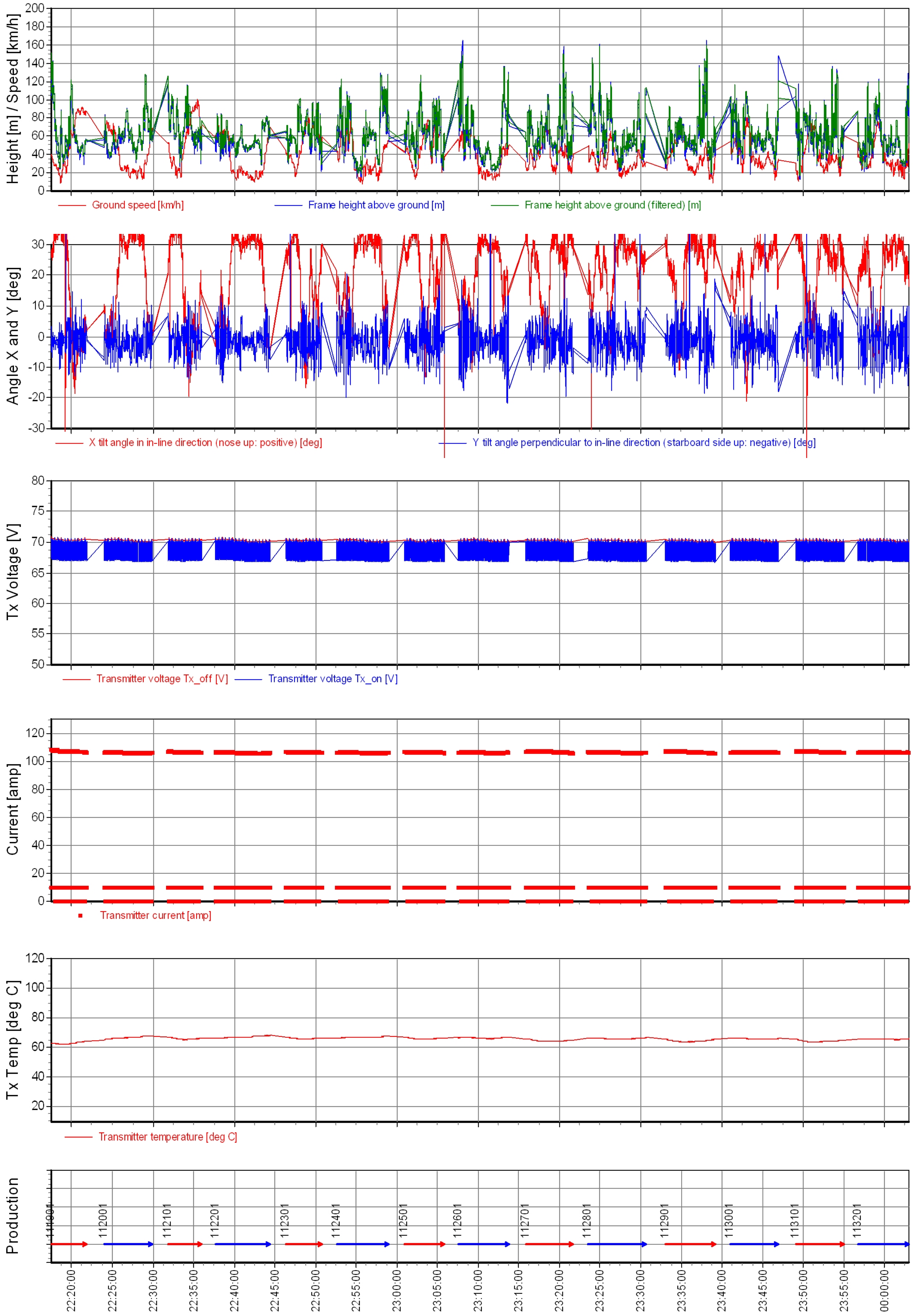
19:05:00
19:10:00


Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
111901
112001
112101
112201
112301
112401
112501
112601
112701
112801
112901
113001
113101
113201
22:20:00
22:25:00
22:30:00
22:35:00
22:40:00
22:45:00
22:50:00
22:55:00
23:00:00
23:05:00
23:10:00
23:15:00
23:20:00
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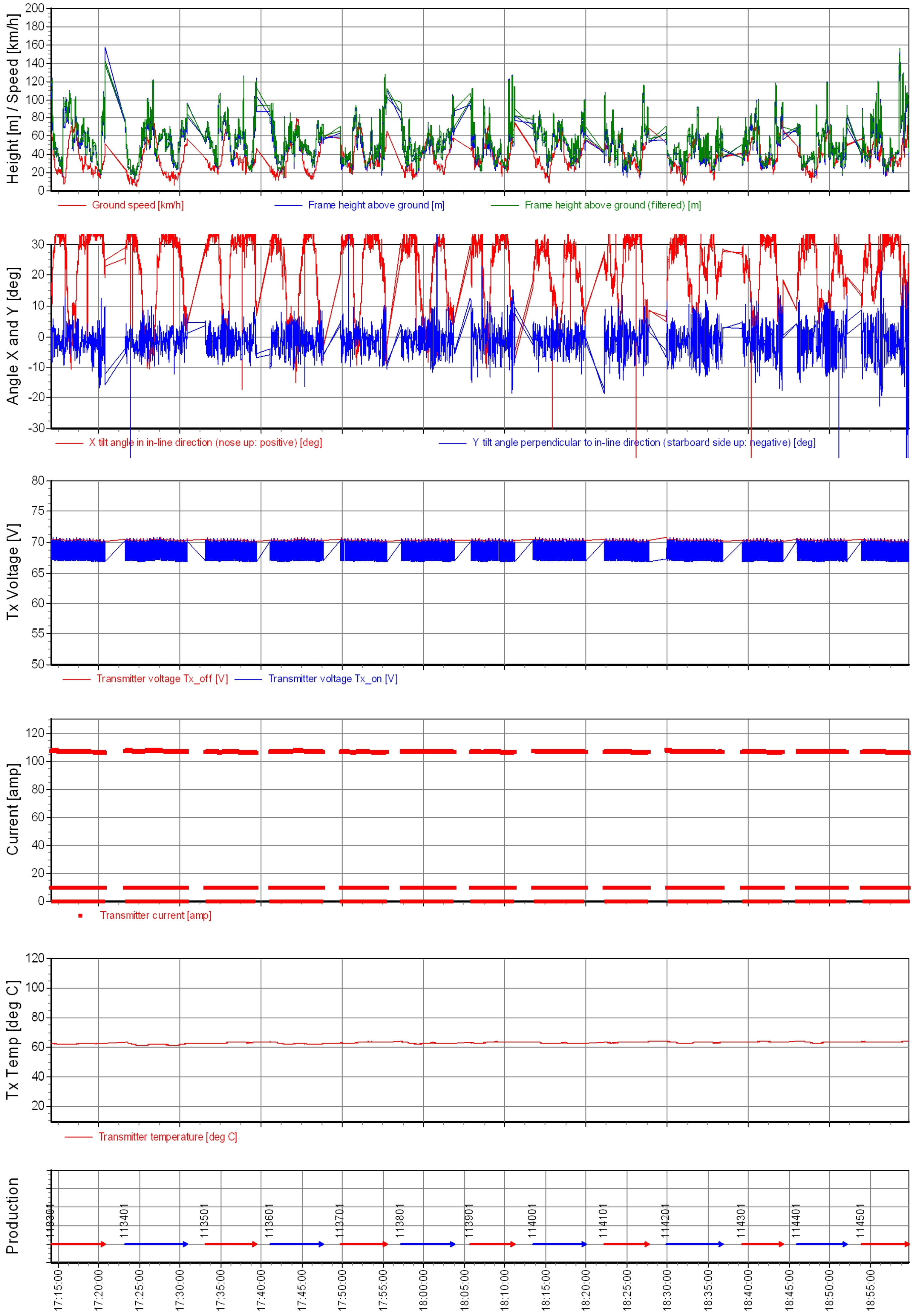
00:00:00

20110528.01



Height [m] / Speed [km/h]
200
180
160
140
120
100
80
60
40
20
0
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
30
20
10
0
-10
-20
-30
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
80
75
70
65
60
55
50
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
120
100
80
60
40
20
0
Transmitter current [amp]
Tx Temp [deg C]
120
100
80
60
40
20
Transmitter temperature [deg C]
Production
113301
113401
113501
113601
113701
113801
113901
114001
114101
114201
114301
114401
114501
17:15:00
17:20:00
17:25:00
17:30:00
17:35:00
17:40:00
17:45:00
17:50:00
17:55:00
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18:10:00
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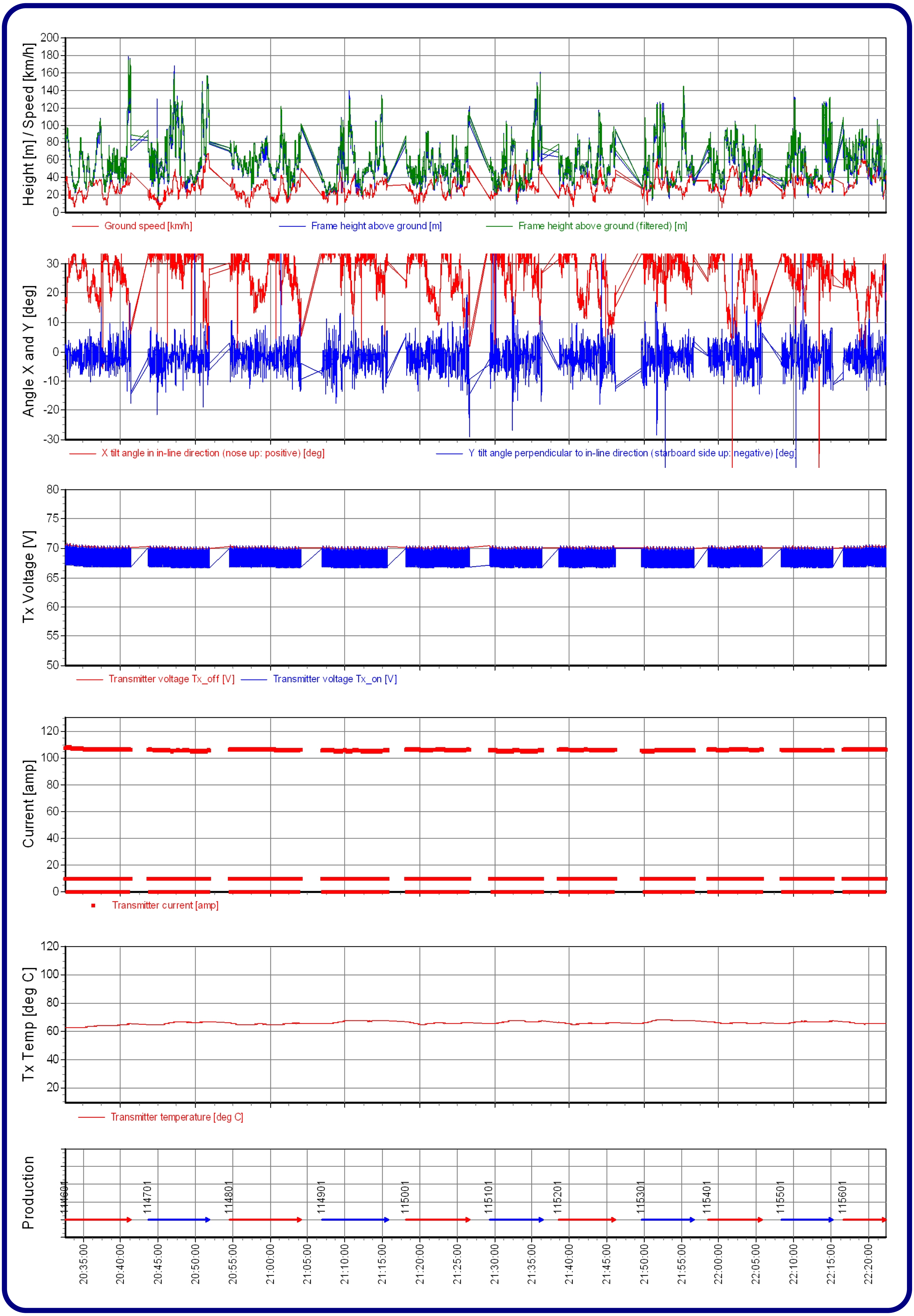
18:55:00

20110528.02


Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
114601
114701
114801
114901
115001
115101
115201
115301
115401
115501
115601
20:35:00
20:40:00
20:45:00
20:50:00
20:55:00
21:00:00
21:05:00
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21:15:00
21:20:00
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21:35:00
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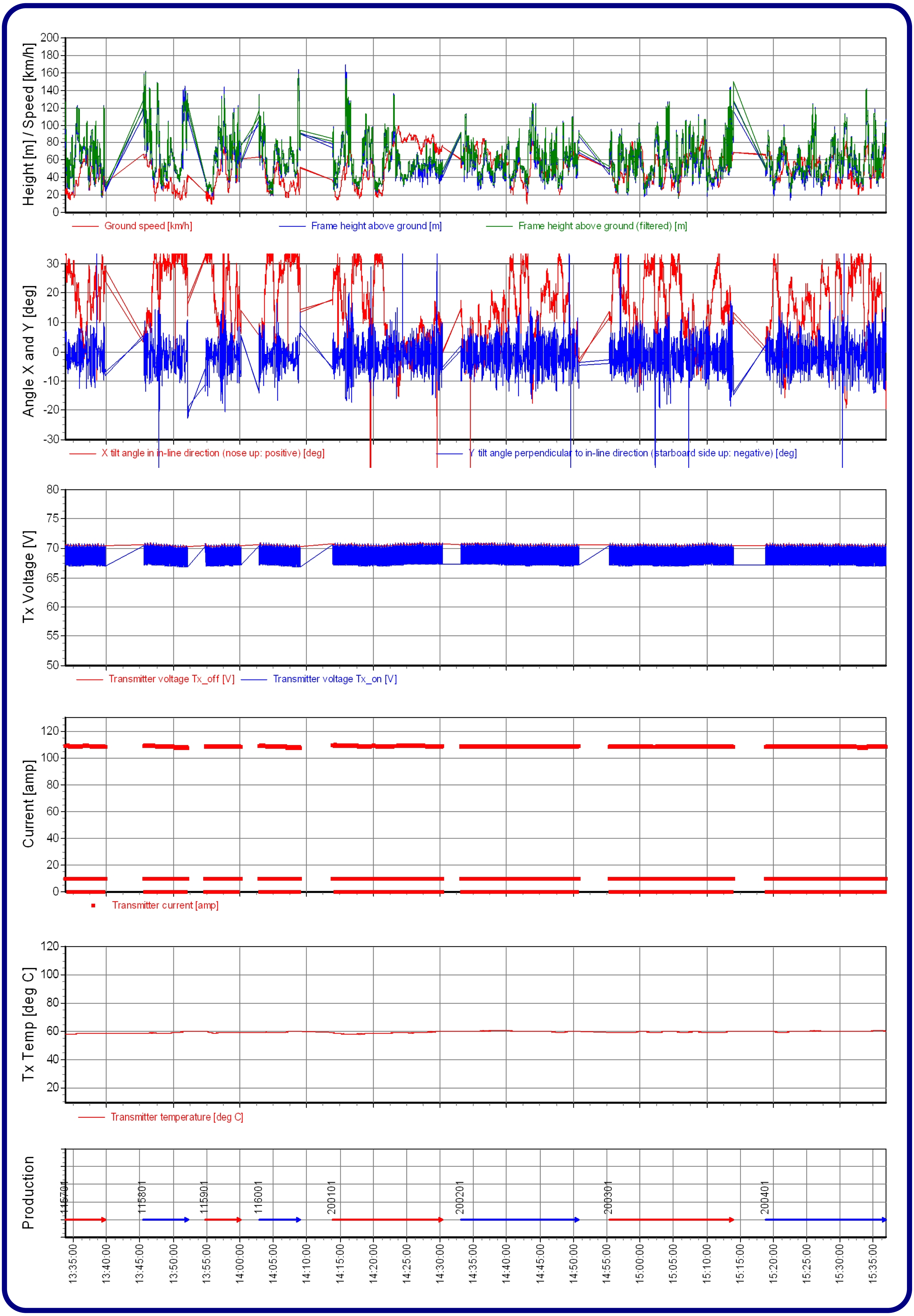
22:15:00
22:20:00



Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
115701
115801
115901
116001
200101
200201
200301
200401
13:35:00
13:40:00
13:45:00
13:50:00
13:55:00
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14:05:00
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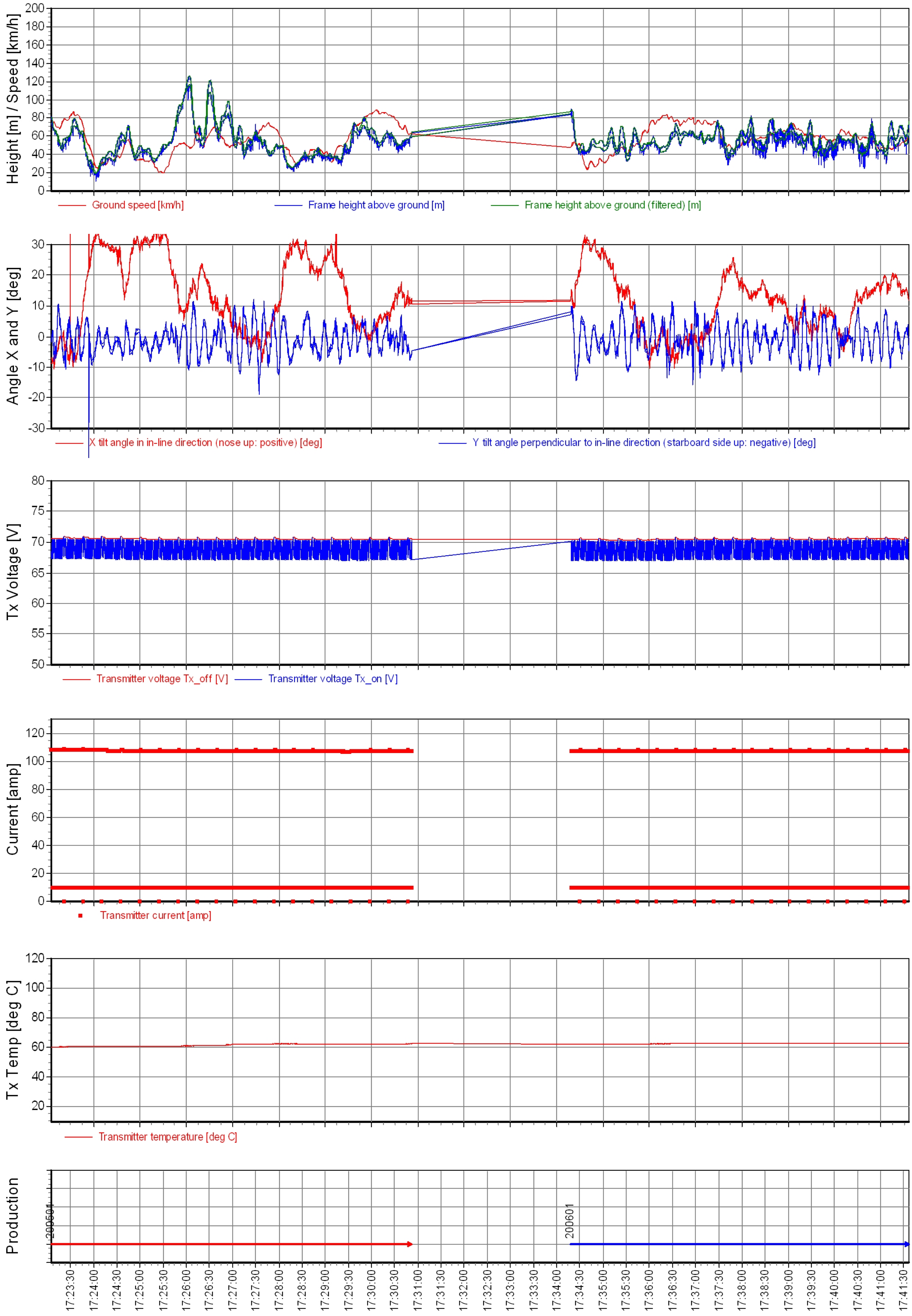
15:30:00
15:35:00

20110531.02



Height [m] / Speed [km/h]
Ground speed [km/h]
Frame height above ground [m]
Frame height above ground (filtered) [m]
Angle X and Y [deg]
X tilt angle in in-line direction (nose up: positive) [deg]
Y tilt angle perpendicular to in-line direction (starboard side up: negative) [deg]
Tx Voltage [V]
Transmitter voltage Tx_off [V]
Transmitter voltage Tx_on [V]
Current [amp]
Transmitter current [amp]
Tx Temp [deg C]
Transmitter temperature [deg C]
Production
200501
200601
17:23:30
17:24:00
17:24:30
17:25:00
17:25:30
17:26:00
17:26:30
17:27:00
17:27:30
17:28:00
17:28:30
17:29:00
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17:35:00
17:35:30
17:36:00
17:36:30
17:37:00
17:37:30
17:38:00
17:38:30
17:39:00
17:39:30
17:40:00
17:40:30
17:41:00
17:41:30

Appendix 5: Modelling and inversion of TEM Data

This appendix gives a brief introduction to modelling and inversion of SkyTEM data.

The model

The model used for inversion of SkyTEM data is a 1D multi-layer model (MLM) with typically 30 layers. The layer thicknesses increase downwards as a hyperbolic sine function of the layer number. This means that the depth to the layer boundaries increases linearly for small depths, so that the top layers are all of approximately the same thickness. For large depths, the depth to the layer boundaries increases exponentially with depth, so that the thickness of a layer is a factor times the previous one.

Inversion - The initial model

The initial model for the deep inversion is a 30-layer MLM with a homogeneous resistivity for all layers, i.e. the initial model is essentially a homogeneous half space. Model optimization can be carried out in both a L1- and a L2- norm formulation where the former produces more blocky models than the latter.

Data and noise model

The inaccuracy of TEM data is influenced by the ambient noise. This noise is reduced by selective stacking of delay time series, and by applying appropriate filters in the receiver system.

Experience with SkyTEM data suggests that the noise voltage most often can be described with a simple model: log(noise) is a linear function of log(time). When the width of the time gates increases proportional to delay time - as is the case with the SkyTEM system - the slope of the linear function is close to -0.5. The noise model used can therefore be described as:

$$V = V_0 \cdot \left(\frac{t}{t_0} \right)^{\alpha}$$

Where V is the noise voltage, V_0 is the noise voltage at time t_0 and α is the slope of the noise voltage as a function of time in a double logarithmic plot. Choosing t_0 = 1 ms, the noise model is defined by the values of V_0 and α. These values are chosen pragmatically by inspection of a subset of the data volume.

V_0 = 2.5e-12 in field units normalized with Tx moment (LM)
V_0 = 2.5e-13 in field units normalized with Tx moment (HM)
t_0 = 1 ms
slope = -0.5

Regularization

Inversion of TEM data is highly non-linear which means regularization is needed in order to guide the inversion routine to produce feasible geological models. In the initial inversion, a vertical smoothness constraint is implemented through a broadband model covariance matrix. This matrix is constructed by stacking single-scale exponential covariance functions with different correlation lengths, describing the covariance between any two points in the sub-surface. This approach has proven to be very robust and stable as the expected subsurface variability can be described through the prior covariance matrix (/3/).

To obtain laterally smooth model sections, the Lateral Parameter Correlation (LPC) procedure is used (/3/ and /4/). Through an inversion process, a smooth version of the resistivity variation is predicted from the results of the initial inversion. In this approach, all parameter values are correlated with all other values in the plane. After the LPC procedure, data are subjected to a final inversion constrained by the LPC models to improve the data fit.

Data insufficiency

For SkyTEM data, the insufficiency lies primarily in the limited delay time range that can be obtained. The earliest obtainable time gate is determined by the turnoff of the Tx current, and the latest useful time gate is determined by the signal to noise ratio. Increasing the Tx moment will give better measurements at late times, and thus improve the depth penetration, but also increase the turnoff time and thus remove early-time gates, thereby making the near-surface resolution poorer. This trade-off is solved by transmitting an alternating sequence of (1) a low moment that can be turned off quickly to give good near-surface resolution, and (2) a high moment that will improve the signal-to-noise ratio at late times, thus improving depth penetration.

Model inconsistency

When using 1D models in the interpretation of SkyTEM data, inconsistency arises where the lateral gradient of conductivity is not small, e.g. typically in mining applications. However, also in environmental investigations, inconsistencies can arise, typically where near-surface good conductors have abrupt boundaries. Often such inconsistency is indicated by the data residual being high and one should look upon the inversion results with some caution at these locations. 3D effects can also reveal themselves by the so-called ‘pant legs’, i.e. conductive or resistive structures projecting at an angle of approximately 30 degrees from the horizontal at the edges of high contrast structures.

Appendix 6: Model sections and resistivity intervals

Model sections and analysis sections are delivered in digital form as PDF files.

Model sections

The Model sections can be found in the data delivery folder as PDF's.

The model section plot consists of five subplots. The top plot shows the inverted models, with topography, where the resistivity of the individual layers is colour coded according to the colour bar. The resistivity is shown on a logarithmic scale and conductive and resistive features appear with the same weight. The actual flight elevation is shown with a red line above the model section. The white line in the model section indicates the estimated depth of investigation (DOI). Starting from the bottom layer of the model, the DOI is equal to the depth of the first layer having a conductance uncertainty of less than 0.5. If the resistivity uncertainty is too high, the layer resistivity is unresolved.

Below the model section is a plot of the normalized data residual (red line) and normalized total residual (black line) of the inversions. The total residual is a weighted sum of the data residual and the model residual, where the latter is a measure of the roughness of the model, i.e., the deviation of the final model from the initial homogeneous halfspace model.

Below the residual section is the analysis section. The resistivity of the inverted models is determined partly by the measured data and partly by the regularization – the vertical and horizontal smoothness constraints – used in the inversion. To illustrate the relative importance of the data and the smoothness constraints an analysis section is produced. The analysis section has the same appearance as the model section, but rather than plotting the layer resistivities the normalized relative uncertainty of the layer resistivities are plotted. The values of the normalized relative uncertainty are colour coded according to the colour scale. The colour scale consists of four colours: red, yellow, blue, and blue fading into white.

The red colour indicates that data have contributed considerably to the inverted resistivity, i.e., the resistivity is well determined.

The yellow colour indicates that data has had more influence on the inverted resistivity than the regularization, i.e., the resistivity is fairly well determined.

The blue colour indicates that the regularization has had more influence than the data in determining the inverted resistivity, i.e., the resistivity is poorly determined.

Where the blue colour fades into the white, the inverted resistivity is determined almost exclusively by the regularization, i.e., the resistivity is essentially undetermined.

In short, one can say that data has had more influence than the regularization when values are below 1 – the red and yellow colours – and that the regularization has had more influence than the data where the values are above 1 – the blue and white colours.

Please take note that in some parts of the analysis sections, where the near-surface resistivity is very high, the top part of the model can be seen as undetermined. In this situation the TEM method cannot determine the resistivity.

Below the analysis section are two plots of the measured data (dots) together with the response of the inverted models (solid lines). M1 is low moment data and M2 is high moment data. For both plots, every second gate is plotted starting with the earliest gate, and data are plotted with a density of 8 points per centimetre along the profile.

Layer Resistivity Maps

The Model sections can be found in the data delivery folder as PDF's as well as geosoft . grd files.

The resistivity maps show the inverted resistivity for each of the model layers.

As the thickness of the model layers increases downwards the maps represent a varying thickness interval. The depth interval is stated on the pdf files and is in meters below the surface.

Appendix 7: Digital data

The digital data are listed in the following folders. The folders 01 to 04 are located in folders Joy and Mervyn holding the data for each block respectively.

Data delivery folder	Sub folder	Sub folder	File format	Comment
01_TEM_data	01_Data		Geosoft.gdb ASCII.xyz	Database ready for import in Geosoft ASCII text file
	02_EM_Channels_grid	HM_Z	Geosoft.grd	Channel plots of raw data. Gate 16-34
		LM_Z	Geosoft.grd	Channel plots of raw data. Gate 5-26
02_MAG_data	01_Data		Geosoft.gdb ASCII.xyz	Database ready for import in Geosoft ASCII text file
	02_Grids		Geosoft.grd	TMI and RMF
	03_Maps		.pdf .map	PDF's of RMF and TMI
03_Inversion	01_Data		Geosoft.gdb ASCII.xyz	Database ready for import in Geosoft ASCII text file
	02_Layer_Resistivity_Grids		Geosoft.grd	Grids of the resistivity in each layer
	03_Layer_Resistivty_Maps		.pdf .map	Maps of the resistivity in each layer
	04_Scetions		.pdf	Resistivity and analysis of all lines
04_MISC	DEM		Geosoft.grd .pdf .map	Digital Elevation Model of the area
	FlownLines		.pdf .map	Path in UTM z8N.
	PlannedFlightLines		.pdf .map .gdb	Path + coordinates of start and end of line in UTM z8N
05_Report			.pdf	The report and appendices