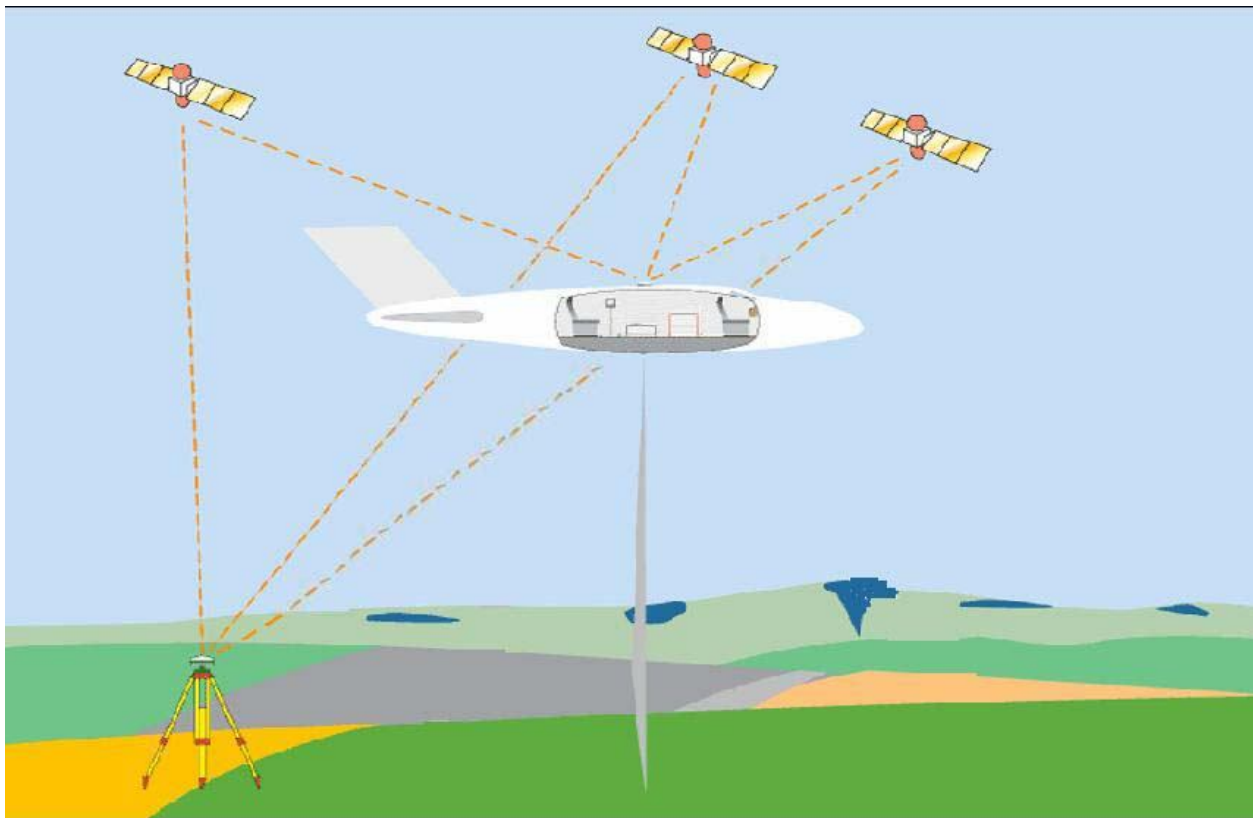


# ALS50 Calibration Certificate



<i>This certificate is valid for</i>	<i>Model</i> <b>ALS50 Phase II</b>	<i>Serial Number</i> <b>SN089</b>
<i>Calibration certificate issued on</i>	<b>2 February 2012</b>	
<i>by</i>	<b>Mal Hentschel</b>	
<i>Certificate and calibration data ID</i>	<b>SN089 Cal Report 120202</b>	

Leica Geosystems AG  
Heinrich-Wild-Strasse  
9435 Heerbrugg  
Switzerland



## Components of ALS

Component	Device	Type	Serial Number
LS50	Laser Scanner		089
	IPAS 10		6553
	Inertial Measurement unit	CUS6 – “uIRS”	56017195
DL50	Data Logger	XP embedded	089
	Galvo Controller	ALS_P2	089
		performance	
SC50	System Controller		089

## Calibration process

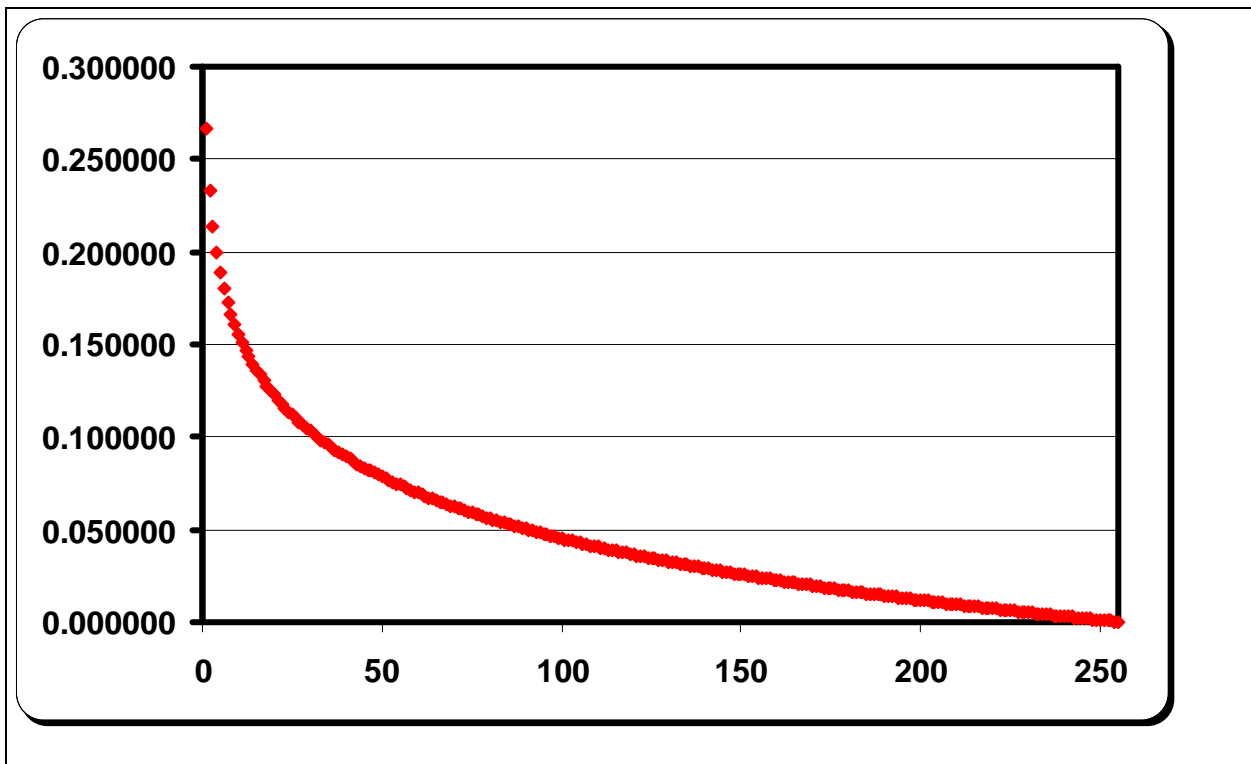
### Intensity based range correction (IBRC)

	Passed	Date	Inspector
<i>RIVIT (raw IBRC) measurements</i>	ok	25 Jan 2012	Phung
<i>IBRC table</i>	ok	25 Jan 2012	Phung

File **SN89\_IBRC-25-Jan-2012.txt**

Objective To correct for the effect of varying range based on return signal strength.

Note The range biases are in meters. The bias values are for intensity values of 0 (low intensity) to 255 (high intensity) in that order. Use above file in ALSPP for IBRC correction.



Intensity based range correction (IBRC) - curve

**Flight and data processing**

	Passed	Date	Inspector
<i>Test flight</i>	<i>ok</i>	<i>16 Jan 2012</i>	Aden
<i>Data Quality Check</i>	<i>ok</i>	<i>19 Jan 2012</i>	Mal Hentschel
<i>Attune (Boresight) Calibration</i>	<i>ok</i>	<i>2 Feb 2012</i>	Mal Hentschel

File           **SN089\_Calibrated-120202.reg**  
Objective      To correct for systematic effects of this ALS System.  
Note            It is recommended that a complete calibration be performed after system delivery to verify and establish a final set of parameters.

**IPAS Processing**

<b>Parameter [Units]</b>	<b>Value</b>
<i>IMU Type</i>	CUS6 – “uIRS”
<i>IMU Lever Arm X [m]</i>	-0.411
<i>IMU Lever Arm Y [m]</i>	0.206
<i>IMU Lever Arm Z [m]</i>	-0.192
<i>Test Airplane – Pilatus HB-FKL</i>	
<i>GPS Lever Arm X [m]</i>	-0.133
<i>GPS Lever Arm Y [m]</i>	-0.016
<i>GPS Lever Arm Z [m]</i>	-1.346

**ALS Calibration Summary – Key Parameters for use in the ALS Post Processor**

<b>Parameter [Units]</b>	<b>Value</b>
<i>Encoder Scale Factor [encoder counts per revolution]</i>	8388608
<i>Encoder Offset [encoder counts]</i>	-13797
<i>Roll [rad]</i>	0.003124
<i>Pitch [rad]</i>	-0.003096
<i>Heading [rad]</i>	0.000236
<i>Pitch Error Slope [rad/deg]</i>	-1.4e-005
<i>Torsion Constant [Nm/rad]</i>	250000
<i>Nominal Range Offset [m]</i>	2.788
<i>R1 [m] BankA / BankB</i>	2.788 / 2.813
<i>R2 [m] BankA / BankB</i>	2.819 / 2.809
<i>R3 [m] BankA / BankB</i>	2.829 / 2.822
<i>R4 [m] BankA / BankB</i>	2.794 / 2.837
<i>TPR [Hz]</i>	100000
<i>TPR Offset [m]</i>	-0.061
<i>Elevation Offset [m]</i>	0
<i>IMU Latency [s]</i>	0
<i>Waveform Trigger Delay – below TPR [ps]</i>	8127
<i>Waveform Trigger Delay – above TPR [ps]</i>	9565

**Accuracy Check**

	<b>Value</b>	<b>Std Dev</b>	<b>Inspector</b>
<i>Avg Dz to Control. Bregenz Test Site. 1236 check points</i>	<i>0.006m</i>	<i>0.037m</i>	Mal Hentschel
<i>Summary Calibration check</i>	<i>ok</i>		Mal Hentschel

## ***Inspection***

### ***Inspectors***

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<i>Name</i>	<b>Mal Hentschel</b>
<i>Position</i>	Support Engineer
<i>Name</i>	<b>Bernhard Riedl</b>
<i>Position</i>	Production Manager - Hardware