# 子午工程感应式磁力仪设备 数据文件格式说明

子午工程数据中心

## 1数据文件交换接口

## 1.1 数据文件定义

每一类数据文件描述如下表:

序号	数据文件 数据文件描 名称 述			文件	存储时		设备→节点站				节点站→子午工程数据中心				
			数据 级别	文件 格式	类型 编码	间分割 类型	数据文件文件名	是否打 包传输	压缩包文件名称	传输 时 频模式	通讯确认	是否打 包传输	压缩包文件名称	传输 时 频模式	通讯确认
01	感应式磁 力仪观测 数据文件	地磁感应场 2 个水平分 量 X、Y 和 1 个垂直分量 Z	一级科学 数据	二进制	D	01H	XXX_SCM01_D MD_L11_01H_20 0711200000000.le m	否	/	24 小时	Yes	是	/	24 小时	Yes
02	感应式磁 力仪运行 日志文件	感应式磁力 仪设备运行 状态	日 志文件	TXT	LO G	01D	XXX_SCM01_L OG_01D_200701 01. txt	否	/	24 小时	Yes	是	/	24 小时	Yes

注: XXX 为: MHT(黑龙江漠河站)、SSL(北京十三陵站)、SYS(海南三亚站)、ZSZ(南极中山站)、JFT(武汉九峰站)、MZL(内蒙古满洲里站)、NAT(长春农安站)、HZT(浙江杭州站)、MLS(山东马陵山站)、SYT(湖南邵阳站)、ZQT(广州肇庆站)、QZT(海南琼中站)、PXT(成都郫县站)、LAT(西藏拉萨站)。

## 1.2 数据文件-01 格式描述

## 1 数据文件名称

感应式磁力仪数据文件

## 2 数据文件描述

地磁变化场 X´、Y´和 Z´

#### 3 数据级别

一级科学数据

## 4 文件格式

txt

## 5 数据文件存储时间分割

1 小时

## 6 文件格式样例

见附件。

## 7 文件格式描述

见附件。

#### Appendix C. Binary data file description

#### General notes

Each separate data file contains only one day (or one hour) data. Data are stored in binary format, except file header, which is stored as XML-text. Therefore, the datafile is divided in two parts: XML-header and data itself. In its turn, data part consists of one-second records. Each one-second record consists of a one-second header (where all data of time, GPS, gain and calibration status are stored) and one-second data block. The length of all one-second records in the datafile is constant. In case of errors, missing data, etc. necessary parts are filled with NAN (Not-a-Number) code to keep one-second record size constant.

The size of one-second record equals to:

One-second size in bytes = 4 bytes for one-second header + sampling rate \* number of channels \* 4 bytes per sample

For example, if sampling rate is 64 samples per second, second size in bytes is equal to: one-second size in bytes = 4 + 64 \* 3 \* 4 = 772 bytes

And the one day datafile size equals to:

file size in bytes = size of XML-header in bytes + second size \* 86400 seconds per day

#### Skipped data

Skipped data are replaced by NAN code (7F FF FF hex). It helps to keep the datafile size always constant.

#### File names

The datafile name has the following template:

YYYYMMDDHHMMSS.lem

Where:

YYYYMMDD - date and HHMMSS - time when recording started.

YYYY - year, - 2001, 2002, ...

MM - month, - 01 ... 12

DD - day, - 01... 31

HH - hour, 0...23

MM - minute, 0...59

SS - second, 0...59

## **Datafile structure**

Datafile structure is:

XML file header	See below
one-second header	status byte, hour, minute, second - 4 bytes totally
one-second data	total size of second data:
	sampling rate * channels * 4 bytes per sample
one-second header	always by 1 second higher to the previous second header
one-second data	
and so on	

In one day data file always 86400 seconds are stored.

## XML datafile header

XML file header conforms to standard XML specification. It contains following tags:

Tag	Value	Comments						
lemi_header		root tag, attribute version="lemi30i2" specifies file						
		format version						
year		Datafile date. Each day (or each hour) new datafile						
month		created. One datafile could cotain only one day (or one						
day		hour) data - so in second headers only time is stored						
base_sampling_r 256		base sampling rate is always 256 samples per second						
ate								
averaging		sum of how many samples are stored as one sample						
		in file. Could be from 1 (no averaging - actual sampling						
		rate equals to base sampling rate) to 256 (actual						
		sampling rate - one sample per second)						
samplingrate		equals to base sampling rate divided by averaging						
sensitivity		how many nT corresponds to 1 bit of ADC converter,						
		always constant						
gain		additional gain, could be 1,10,100 or 1000						
bit_to_nT		Transfer coefficient - from data in file to measuring						
		value in nT. To get measured value, one should						

	1						
		multiply each sample stored in file by this coefficient.					
		bit_to_nT = sensitivity / gain / averaging					
channels 3		number of channels. Always 3, which corresponds					
	п	X, Y and Z					
bytes_per_sampl	4	number of bytes per one sample ( always 4 )					
е							
one_second_rec		number of bytes per one second data (see above)					
ord_size_in_byte							
s							
GPS		GPS coordinates:					
longitude		longitude					
lattitude		lattitude					
altitude		attitude					
remarks		remarks (maximum length 1024 symbols)					

XML header is finished by closing </lemi\_header> tag and carriage return (0x0D, 0x0A).

```
Typical xml-header:
<? version="1.0" encoding="windows-1251"?>
<lemi_header version="lemi30i2">
 <year>2005</year>
 <month>09</month>
 <day>28</day>
 <base_sampling_rate>256</base sampling rate>
 <averaging>4</averaging>
 <samplingrate>64</samplingrate>
 <sensitivity> 2.440000000000E-0005</sensitivity>
 <gain>10</gain>
 <br/>
<br/>
dit_to_nT> 6.100000000000E-0007</bit_to_nT>
 <channels>3</channels>
 <bytes_per_sample>4</bytes per sample>
 <one_second_record_size_in_bytes>772</one second record size in bytes>
 <GPS>
       longitude></longitude>
```

<a href="mailto:<a href="mailto:<a href="mailto:<a href="mailto://www.news.news.com"></a href="mailto://www.news.com"/www.news.c

</lemi\_header>

## One-second header and data

status byte	1 byte	char	Second header		
hour	1 byte	char			
minute	1 byte	char			
second	1 byte	char			
X channel sample	4 bytes	integer	Total number of samples equals to		
Y channel sample	4 bytes	integer	number of channels (3) * sampling		
Z channel sample	4 bytes	integer	rate		
X channel sample	4 bytes	integer			
Y channel sample	4 bytes	integer			
Z channel sample	4 bytes	integer			

## Status byte

bit	7 6 5 4		4	3	2	1		0	
meaning	not used			d	GPS status	calibration	bit1	bit0	gain
				0 - not available	1 - off	0	0	1	
					1 - 011	0	1	10	
					1 - GPS OK	0 - on	1	0	1000
							1	1	1000