



# *SPEGASS*

*SP*Ettroscopia *GA*mma della  
*Supernova Shelton*

*ovvero*

*Le avventure di un pallonaro in Brasile*

*Sandro Mereghetti*  
*ASTROSIESTA - 28 aprile 2016*

*Correva l'anno 1987...*



*La prima supernova visibile a occhio nudo dal  
tempo di Keplero (SN 1604)*

# Correva l'anno 1987...

Circular No. 4316

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INTERNATIONAL ASTRONOMICAL UNION  
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## SUPERNOVA 1987A IN THE LARGE MAGELLANIC CLOUD

W. Kunkel and B. Madore, Las Campanas Observatory, report the discovery by Ian Shelton, University of Toronto Las Campanas Station, of a mag 5 object, ostensibly a supernova, in the Large Magellanic Cloud at R.A. = 5h35m.4, Decl. = -69 16' (equinox 1987.2), 18' west and 10' south of 30 Dor and possibly involved with the association NGC 2044. The discovery was made around Feb. 24.23 UT on a 3-hr exposure with a 0.25-m astrograph beginning on Feb. 24.06, and the object had evidently brightened by at least about 8 mag since the previous night. An independent suspected sighting was made visually by Oscar Duhalde, also at Las Campanas, around Feb. 24.2. The object had brightened to about mag 4.5 by Feb. 24.33.

F. M. Bateson, Royal Astronomical Society of New Zealand, informs us that the object was discovered independently by Albert Jones, Nelson, on Feb. 24.37 UT (position R.A. = 5h35m.8, Decl. = -69 18', equinox 1950.0) at mag 6.5-7.0 (in clouds); he estimated  $m_v = 5.1$  on Feb. 24.46. B. Moreno and S. Walker, Auckland Observatory, obtained  $V = 4.81$ ,  $B-V = +0.085$ ,  $U-B = -0.836$  on Feb. 24.454 UT.

R. H. McNaught, Siding Spring Observatory, communicates the following visual magnitude estimates by G. Garrard (G) and himself (M): Feb. 24.455, 4.8 (M); 24.472, 4.8 (M); 24.635, 4.4 (G); 24.679, 4.5 (M); 24.717, 4.4 (M). McNaught obtained the following precise position with the University of Aston Hewitt Satellite Schmidt camera: R.A. = 5h35m50s.22, Decl. = -69 17'59".2 (equinox 1950.0, uncertainty 2"). The object appears on films from the previous night: Feb. 23.443, 6.0; 23.445, 6.2. He also notes the position of a blue star, of  $m_v$  about 12 and not obviously variable during the past century (through Feb. 22.4): R.A. = 5h35m50s.12, Decl. = -69 17'58".0 (equinox 1950.0;  $x = 15447$ ,  $y = 9261$  in the Harvard LMC system). Films by Garrard confirm that the field was identical down to mag 14.5 on Jan. 24 and Feb. 22.

B. Warner, University of Texas, reports that a spectroscopic observation by J. Menzies on Feb. 24.9 UT with the 1.9-m reflector at the South African Astronomical Observatory shows the 615-nm dip, indicating that the object may be a supernova of type I.

## NOVA CENTAURI 1986

Magnitude estimates by McNaught show that this object has again brightened: Feb. 21.78 UT, 12.5; 22.60, 12.3; 22.79, 12.1.

1987 February 24

(4316)

Brian G. Marsden

*Circolare IAU  
del 24 febbraio*

*Scoperta  
indipendentemente  
da Ian Shelton in  
Cile e Albert Jones in  
Nuova Zelanda*

*Correva l'anno 1987...*



*giovane borsista  
CNR*

# Correva l'anno 1987...

## 1. INTRODUCTION

On February 23.316 UT, 1987, light and neutrinos from the brightest supernova in 383 years arrived at Earth, shocking astrophysicists into a frenzied state of activity. Since that time Supernova 1987A (SN 1987A) has taken its place not only as a unique event in modern astronomy, but also as one of the most thoroughly studied objects outside the solar system.

- *Progenitore noto (Blue SG 20 M<sub>0</sub>)*
- *Distanza conosciuta*
- *No assorbimento*
- *Ottima visibilità*

# Clayton, Colgate & Fishman 1969

“seminal paper”

*La luminosità ottica è dovuta al decadimento radioattivo del  $^{56}\text{Ni}$*

## GAMMA-RAY LINES FROM YOUNG SUPERNOVA REMNANTS

DONALD D. CLAYTON\*

Rice University, Houston, Texas

STIRLING A. COLGATE

New Mexico Institute of Mining and Technology, Socorro

AND

GERALD J. FISHMAN

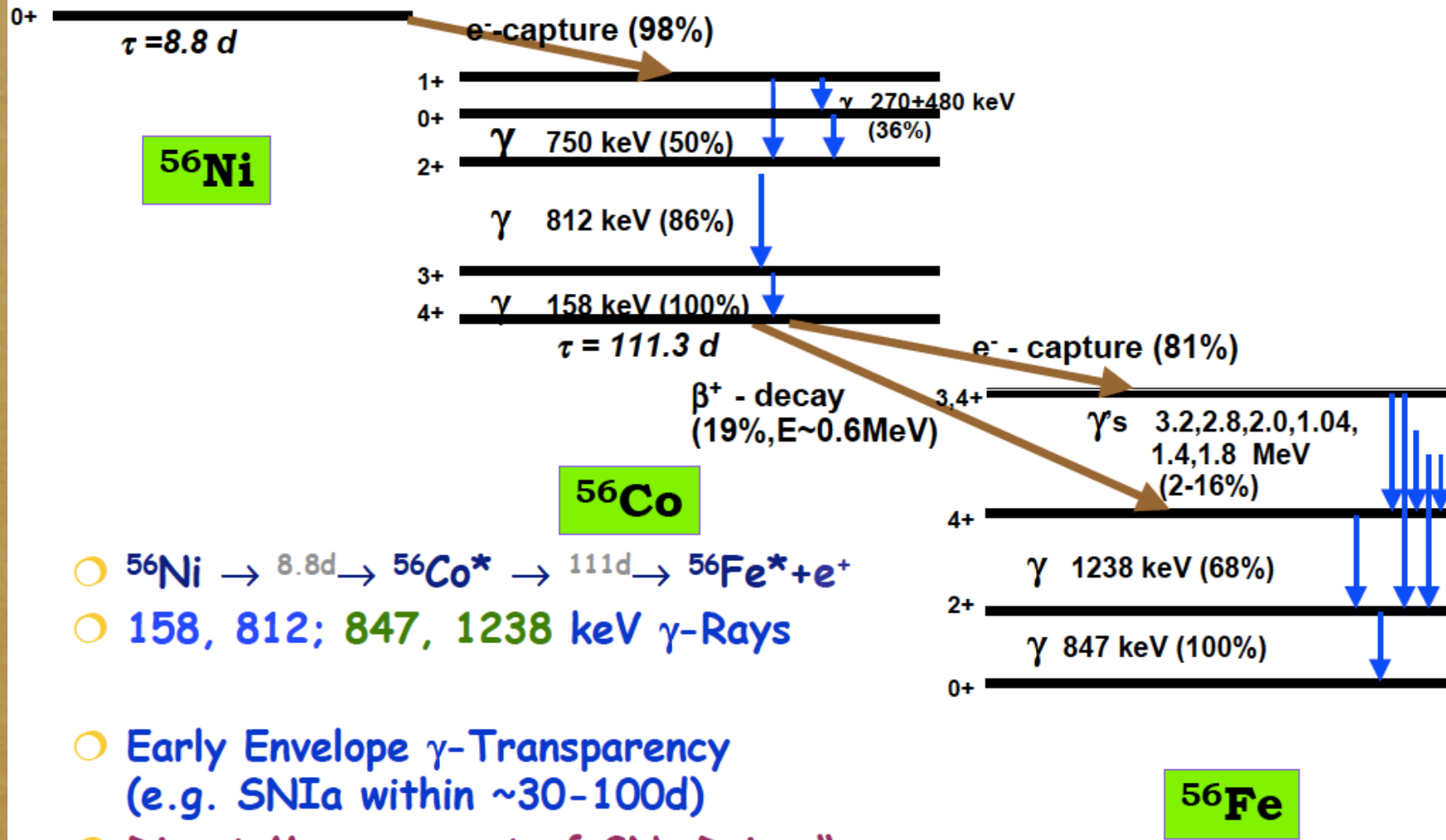
Rice University, Houston, Texas

*Received May 20, 1968; revised June 24, 1968*

### ABSTRACT

The gamma-ray luminosity of a typical type I supernova remnant has been calculated by assuming that the origin of the optical luminosity is due to the energy of the radioactive decay of  $\text{Ni}^{56}$ . It is expected that  $\text{Ni}^{56}$  is the most abundant nucleus resulting from silicon burning in the supernova shock conditions. The requisite mass of  $\text{Ni}^{56}$  ( $0.14 M_{\odot}$ ) gives rise to gamma-ray lines with energies near 1 MeV that should be detectable in young supernova remnants at distances up to a few Mpc. Future detectors aboard satellites should be able to detect events at the rate of about two observable events per year. A few supernova remnants in the Galaxy should be observable at all times in lines following the decay of  $\text{Ti}^{44}$ .

# $^{56}\text{Ni}$ Decay Gamma-Rays



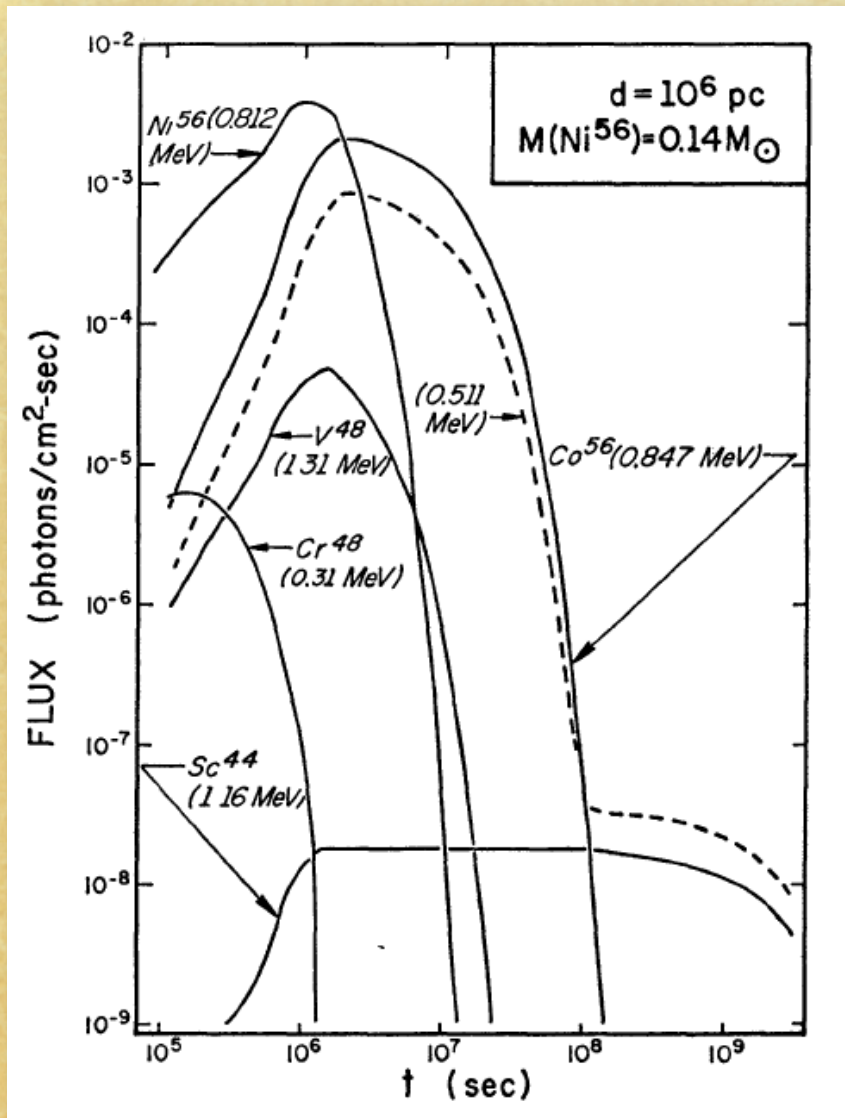
158, 812; 847, 1238 keV  $\gamma$ -Rays

Early Envelope  $\gamma$ -Transparency  
(e.g. SNIa within  $\sim 30$ - $100$ d)

Direct Measurement of SN „Driver“

# Clayton, Colgate & Fishman 1969

“seminal paper”



Righe gamma da  
SN Ia a 1 Mpc





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1st July 1987

Dear Colleagues

Re: Supernova Gamma-ray Spectroscopy Experiment

Please find the enclosed notes and documentation associated with my recent visit to INPE. I hope this

- i) is an accurate record of our discussions
- ii) poses and answers, in a meaningful manner, the questions raised at this stage of the project

Could you please comment, correct, update and raise any points which are not completely clear, as well as respond to any implied actions in a timely manner.

Best wishes

Dr. A.J. Dean

*Collaborazione*

*Southampton  
Milano  
Pechino*

*per lancio pallone  
in Brasile*

It is planned that the Supernova Experiment be conducted from a base of operation in São José dos Campos, SP, Brazil, from August 1987 onwards. The University of Southampton collaborators are: the Institute of High Energy Physics, Beijing, China, the Istituto di Fisica Cosmica e Tecnologie Relative, Milano, Imperial College, London, UK and the Physics Department - University of Southampton, UK.

# SPEGASS

Rivelatore Ge iper-puro  
150 cm<sup>3</sup>

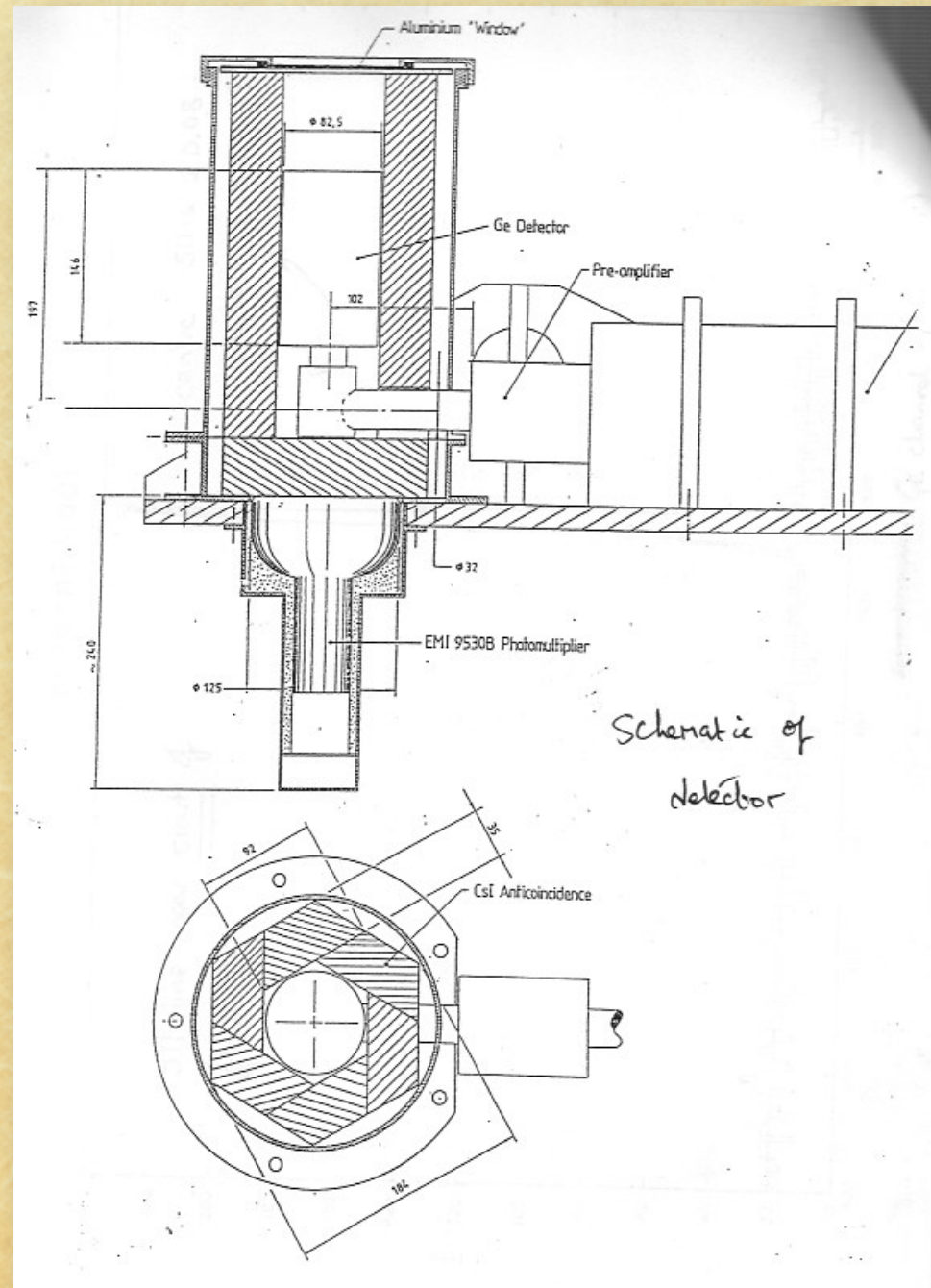
Anticoincidenza  
CsI (Tl) + scint. plastico

50 keV - 4 MeV

$\Delta E \sim 2.3 \text{ keV @ } 1 \text{ MeV}$

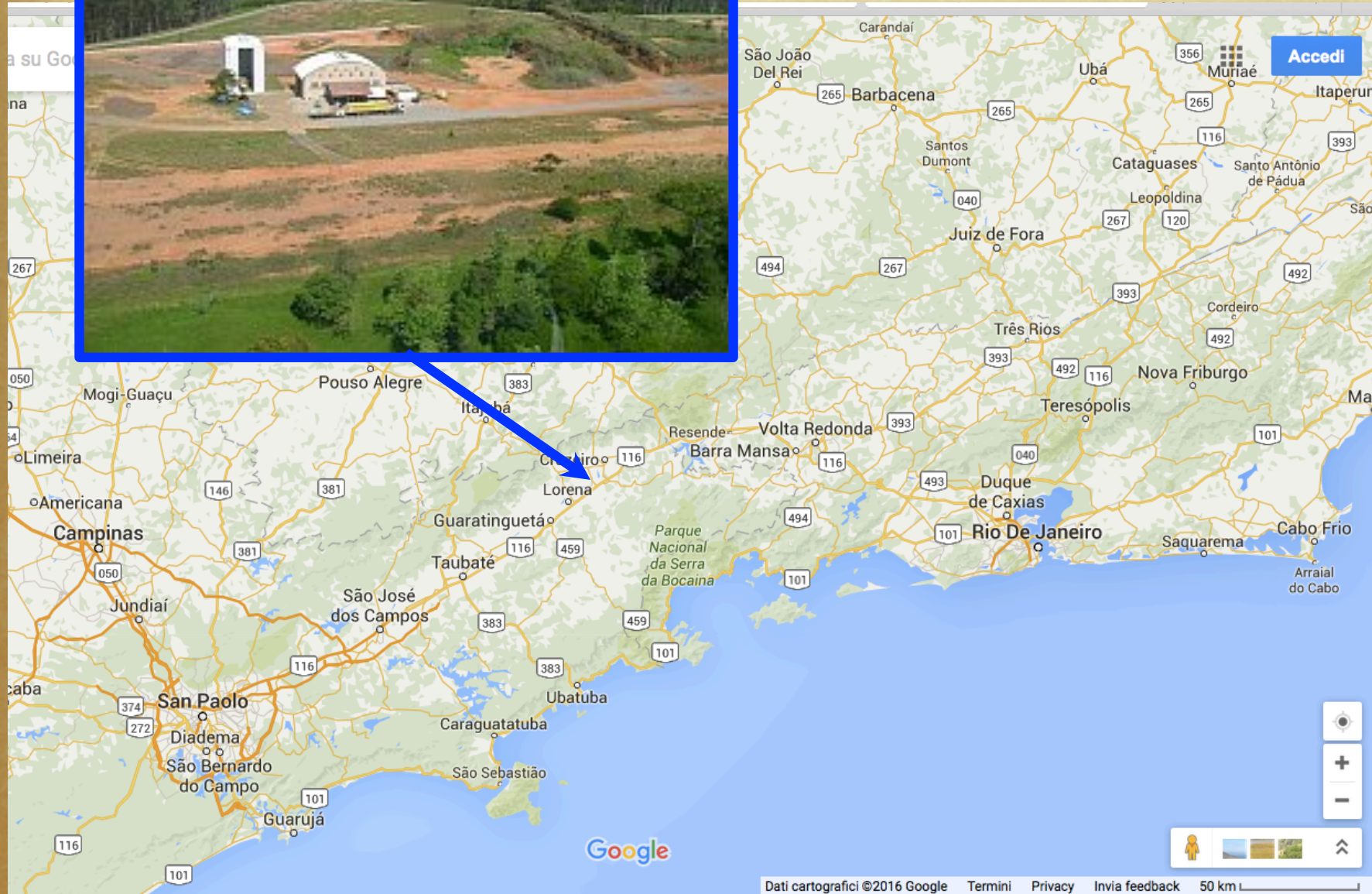
Apertura  $\sim 14^\circ$  FWHM

Sensibilità righe  
 $\sim 3 \cdot 10^{-4} \text{ ph/cm}^2\text{s}$



# A INFRAESTRUTURA DO INPE PARA LANÇAR BALÃO CIENTÍFICO

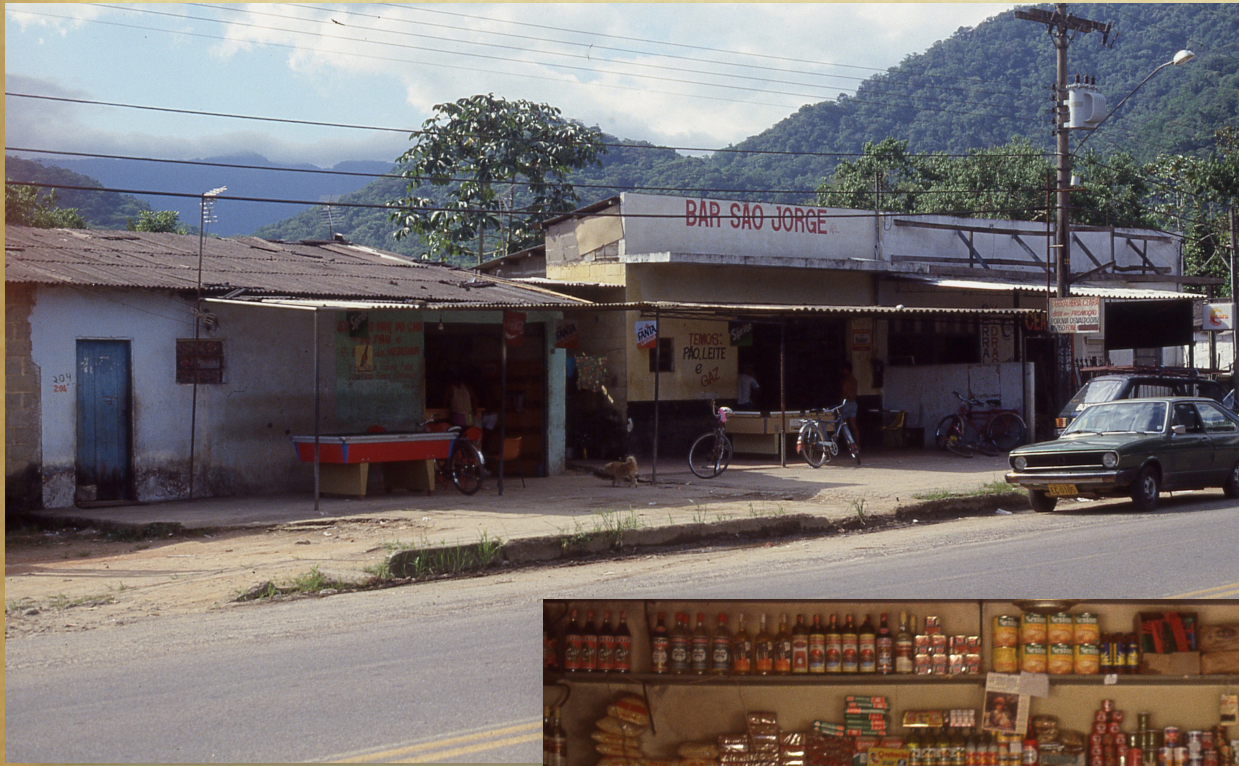
## *Cachoeira Paulista*





*Tutto il materiale spedito è  
bloccato alla dogana a Sao Paulo  
→ vacanze forzate (10-15 gen 1988)*







*Jaca*  
(*artocarpus*  
*integrifolius*)





**TRECHO EM OBRAS**  
**DEVAGAR**  
**TRÂNSITO POR CONTA**  
**E RISCO DO USUARIO**

**S. Luiz do Paraitinga**  
**LIMITE DE MUNICÍPIO**







*Rancho Alto  
da Serra*



*Rancho Alto  
da Serra*





*Il capo si taglia il  
mignolo affettando  
un mango...*

*...e sviene alla vista  
del sangue.*

*Casa da Farinha e Fazenda Picinguaba  
Município de Ubatuba*



*Casa da Farinha e Fazenda Picinguaba  
Município de Ubatuba*



*Casa da Farinha e Fazenda Picinguaba  
Município de Ubatuba*



*Casa da Farinha e Fazenda Picinguaba  
Município de Ubatuba*





# Paraty



*Basilica de Nossa Senhora Aparecida*



*Basilica de Nossa Senhora Aparecida*





*Finalmente ci si  
mette alacremente al  
lavoro*

*16 gen 1988*



SPEGASS





*(quasi) al solstizio sul tropico a mezzodi*



*Esperimenti ...*





28 gen  
Esperimento pronto

Ma per 3 gg si deve  
rimandare causa  
temporali

30 gen  
Si lancia ...



*Mio contributo principale*

*Software calcolo puntamento e preparazione  
telecomandi (in BASIC BBC)*



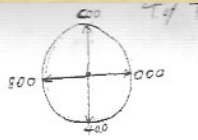
*ACORN BBC micro*

*2 MHz  
128 KB*

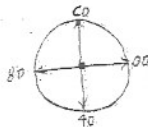
# Si comunicava via telefax...

## POINTING COMMANDS

1. SET AZIMUTH TARGET "Ahhh"  
 hhh IS THREE HEX DIGITS IN ASCII CODE REPRESENTING THE 12 BIT AZIMUTH. MOST SIGNIFICANT DIGIT FIRST  
 (ie. FULL COMMAND IS ":::::Ahhh")



2. SET ZENITH TARGET "Zhh"  
 hh = 8 BIT ZENITH



## OTHER COMMANDS

3. MOTOR DRIVES ON/OFF  
 "MA+" Azimuth drive on  
 "MA-" " " off  
 "MZ+" Zenith drive on  
 "MZ-" " " off

4. HIGH VOLTAGE DIAS ON/OFF "VC+" OR "VG-" Germanium det.  
 "VC+" OR "VC-" CoI shield.

5. SET STATUS "shhh"  
 motor drives and bias voltage simultaneously  
 ONLY THE SECOND HEX DIGIT DOES ANYTHING

h<sub>0</sub> BIT 0 - AZIMUTH RANGE ON  
 BIT 1 - ZENITH " "  
 BIT 2 - CoI VOLTAGE " "  
 BIT 3 - GERMANIUM " "

6. SET CLOCK "TD h<sub>a</sub>h<sub>b</sub>h<sub>c</sub>h<sub>d</sub>"  
 h<sub>a</sub> - FLIGHT NO (TO DE F)  
 h<sub>b</sub>h<sub>c</sub>h<sub>d</sub> - DAY NO IN YEAR (DECIMAL)

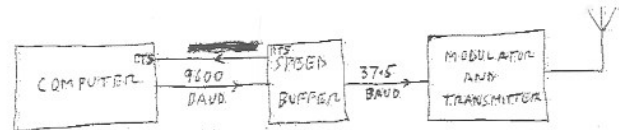
"TH h<sub>a</sub>h<sub>b</sub>h<sub>c</sub>h<sub>d</sub>h<sub>e</sub>h<sub>f</sub>"  
 h<sub>a</sub>h<sub>b</sub> - HRS DECIMAL  
 h<sub>c</sub>h<sub>d</sub> - MINS " "  
 TOTAL P: 04

ABEWICHT 13NOV87

## COMMAND UPLINK (BRAZIL 1987)

COMMANDS ARE: SERIAL ASYNCHRONOUS  
 9600 BAUD  
 8 BIT CHARACTERS  
 ODD PARITY

THEY ARE CONVERTED TO 37.5 BAUD IN A SPEED BUFFERING BOX, WHICH HAS A 25 PIN D SOCKET INPUT.



## FORM OF THE UPLINK COMMAND

< LEADER > < COMMAND CHARACTER > < TERMINATOR >  
 ::::: (ASCII CHARACTER VARIABLE LENGTH)

FIVE COLONS  
 ie. 3A IN HEXADecimal

TWO DASHES  
 ie. 5C IN HEX

A STEWICK THROUGH



*Dispiegamento del pallone*







*Inizia il gonfiaggio*















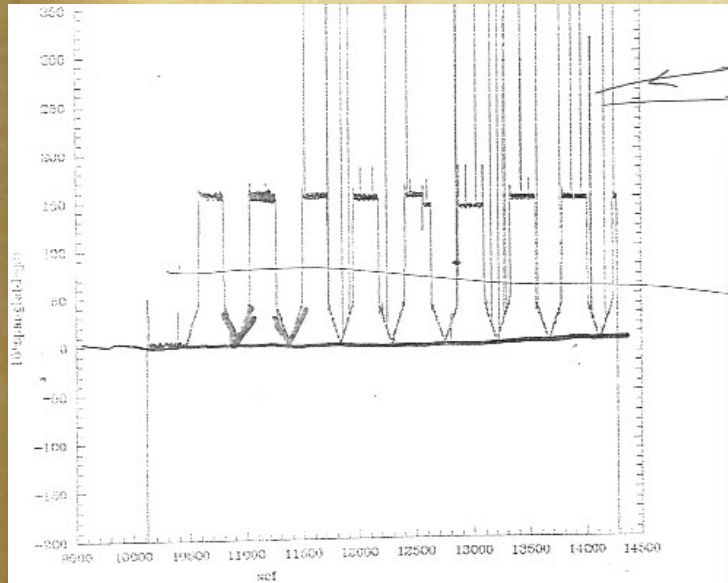
Malpensa 2/2/88

*il rientro con le  
pive nel sacco*



Secondo lancio OK !!

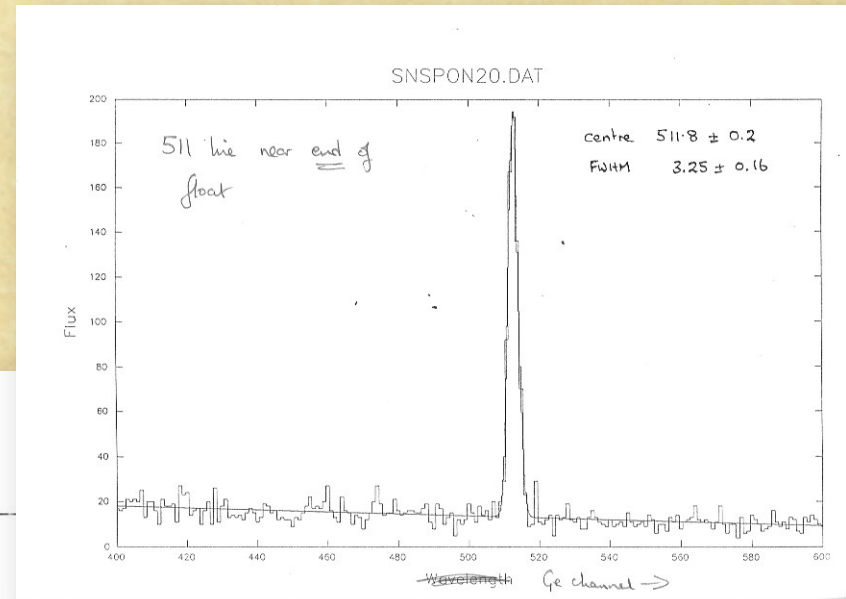
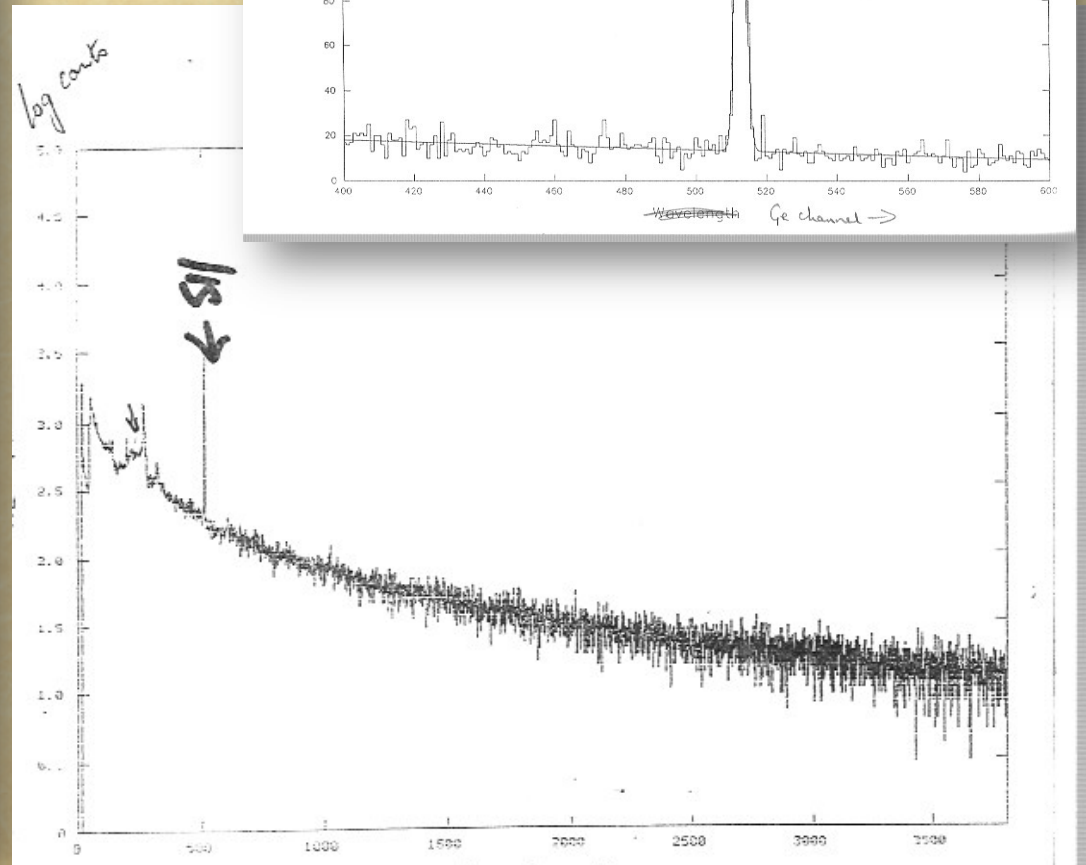
Ma la telemetria si interrompe dopo ~2 ore di dati...



ordinate : space angle from SN87A to poi  
(degrees) x 10

abs : Subframe count .

Shows : correct chopping on/off source  
(15° or so)





INSTITUTO DE PESQUISAS ESPACIAIS - INPE  
- EXPERIMENTO CIENTIFICO - SPICAL -  
INFORMAR A DESTAÇA UICAL  
ADQUIRIR A PRESENCIA DO I. TÉCNICOS  
- SÃO INSTITUTO -  
TELEFONE A COMAR - 12 23229977  
- OPERAÇÃO BALÃO -  
TELEX - 1233333 - INPE - B  
SAO JOSE DOS CAMPOS - SP - BRASIL

CONTROLE DE  
TEMPERATURA  
- 1233333 - INPE - B  
SAO JOSE DOS CAMPOS - SP - BRASIL

LEFT  
TEMPERATURA  
- 1233333 - INPE - B  
SAO JOSE DOS CAMPOS - SP - BRASIL



*The end*

