Pre-flight Calibration and Characterization

GLI Calibration working group

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Review of the PFT schedule

1996/4 - 1998/10 Development of Proto-Flight Model (PFM)

1999/7 Proto-Flight Test (PFT) was completed.

2000/5 Results of PFT were opened to the public. (in Japanese)

Several requests for additional test were proposed.

2000/9 Kicked off Calibration WG for GLI mission data evaluation test

- to evaluate the configuration of each test
- to decide the necessity of the additional test

2000/12-2001/3 GLI mission data evaluation test (GLI will be unloaded from ADEOS-II)

2001/4 Re-integration

2001/11 ? Launch

Objectives for Calibration WG

- **Pre-flight calibration**

    Determine parameters
    - **to be calibrated before launch**
        (**GLI mission data evaluation test**
        = **2nd calibration following to PFT**)
    - **to be analyzed based on the PFT calibration.**
        (**Huge number of data are left without further analysis**)

    Evaluate the configuration of each test

- **Pre-flight characterization**

    Analyze GLI characteristics based on
        the PFT calibration & GLI mission data evaluation test

Major calibration/characterization parameters for GLI

- **Dynamic range with S/N and NE Δ T**
- **Linearity/non-linearity**
- **Polarization sensitivity**
- **Stray light**
- **Transition response**
- **MTF**
- **Mirror characteristics**

Linearity Measurement by using Integration Sphere
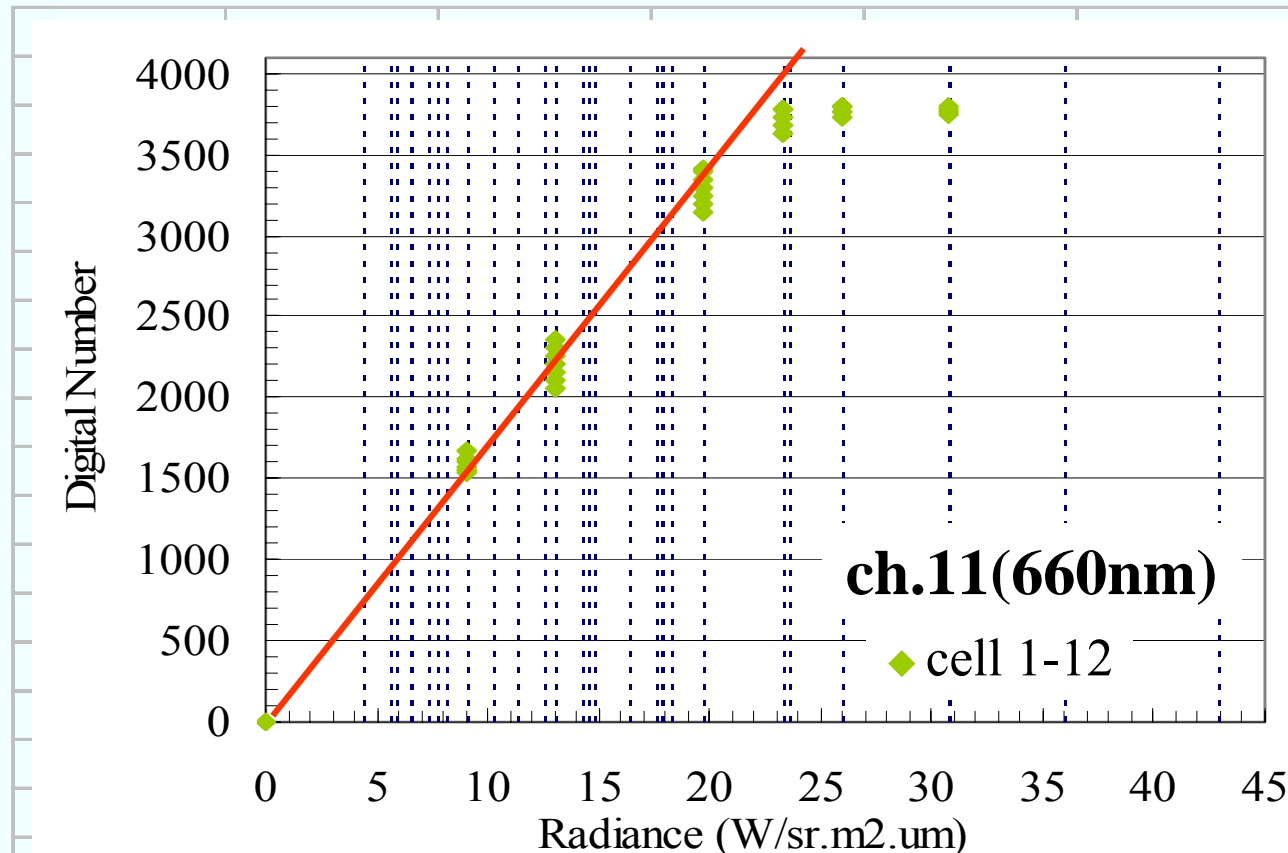
● **Dashed lines indicate all radiance examined for the linearity measurement. But, a part of data were used for the curve fitting to evaluate the linearity/non-linearity in the PFT report.**

→ **Re-analyze PFT data set.**
→ **Survey a possibility of extra measurements between points.**
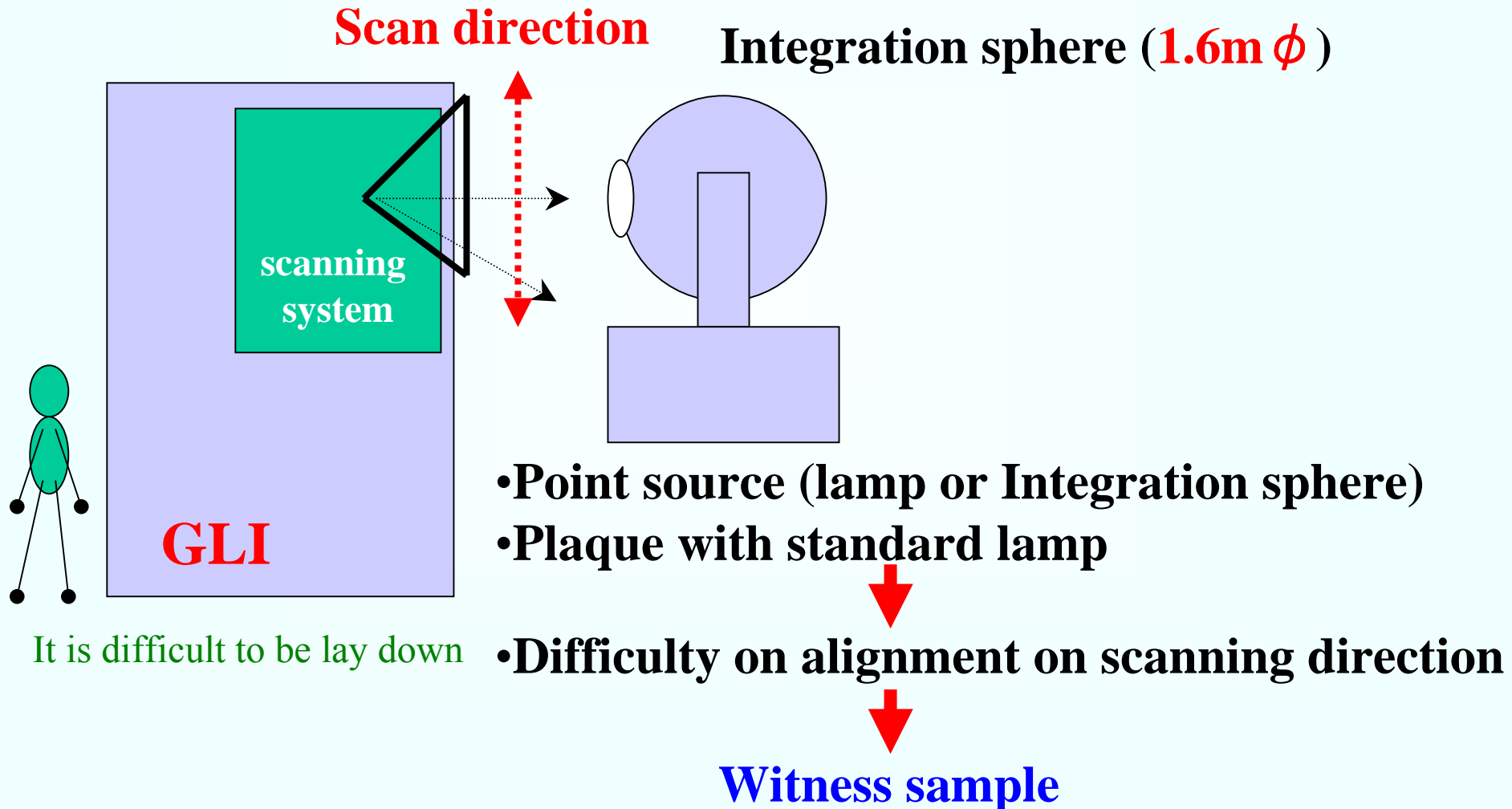
Difficulty on pre-flight characterization

● **Scan angle dependence of**

   the **reflectance of scanning system**

   (PFT was carried out at only Nadia angle)

● **Scan angle dependence of**

   the **polarization sensitivity**
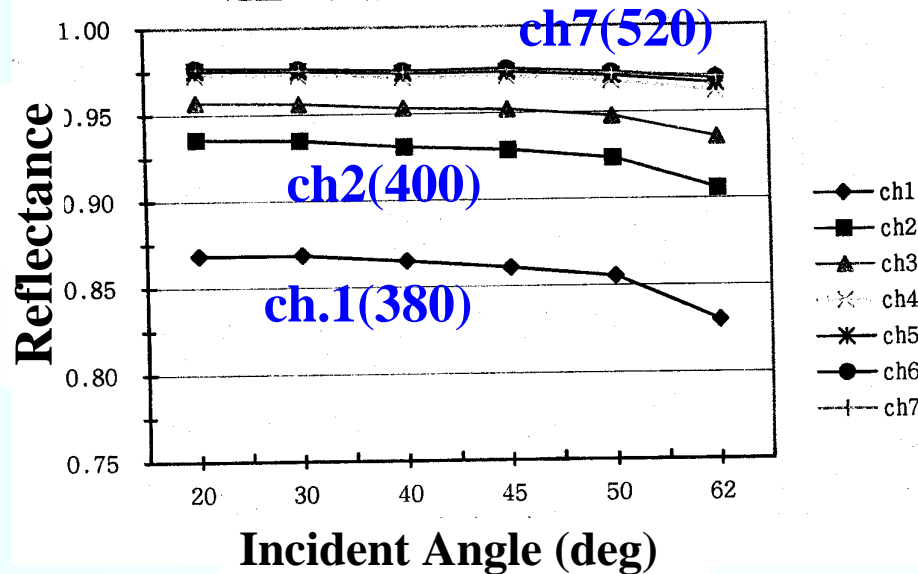
   (PFT was carried out at Nadia and ±20° tilt)
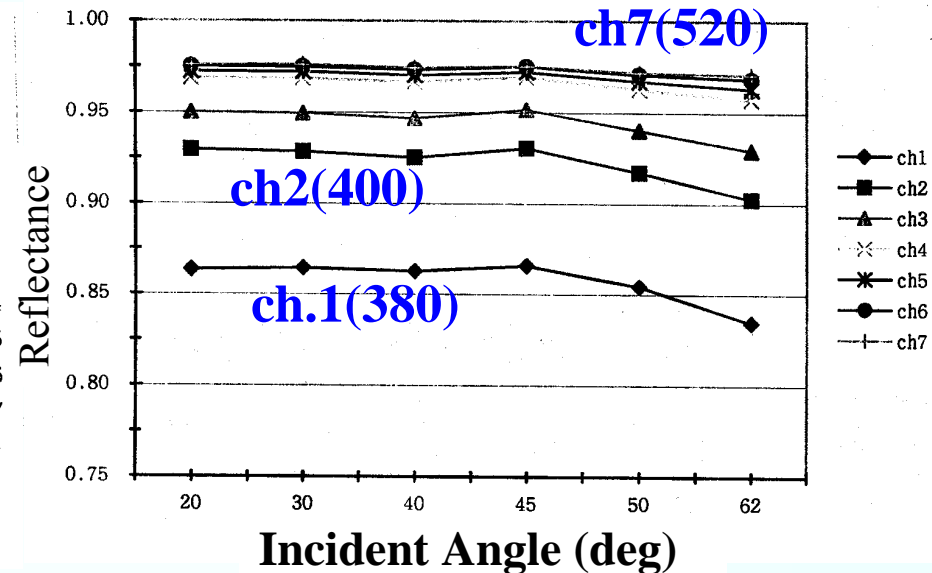
Solution
   Measurement of the witness samples ?

Arrangement to measure the reflectance of scanning system as a function of scan angel

Scan direction

Integration sphere (1.6m ϕ)

scanning system

GLI

It is difficult to be lay down

- **Point source (lamp or Integration sphere)**
- **Plaque with standard lamp**
- **Difficulty on alignment on scanning direction**

Witness sample
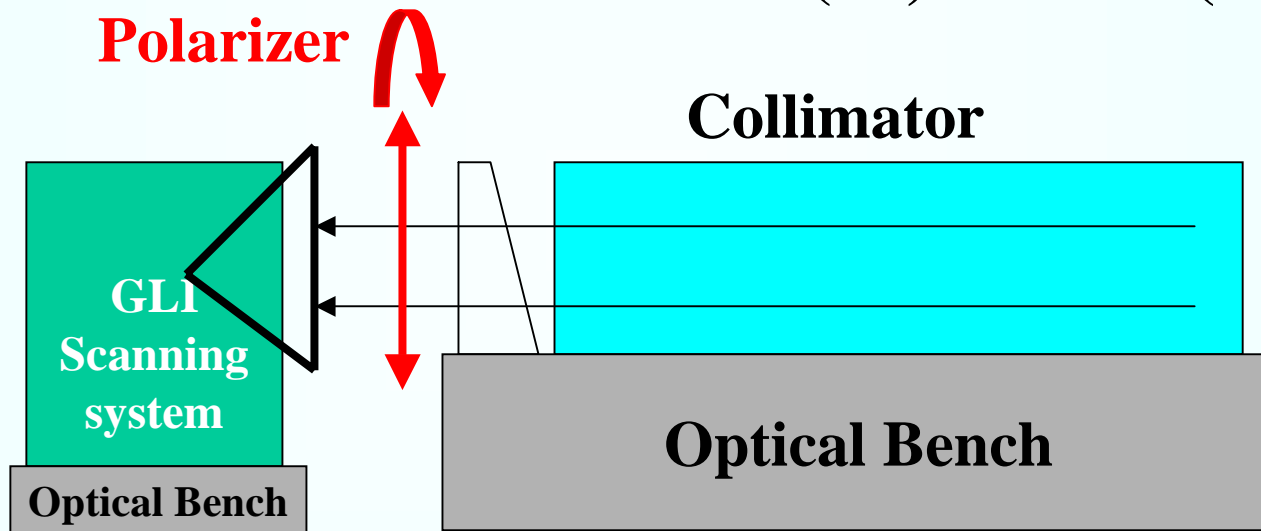
Sample #826 (A)

Sample #837 (B)

Incident angle dependence for the reflectance of scanning-mirror witness samples.
ch.1(380), ch2(400), ch3(412), ch4(443), ch5(460), ch6(490),ch7(520).

Characterization of polarization sensitivity

$$\text{Polarization Sensitivity} = \frac{\text{Vmax}(\omega) - \text{Vmin}(\omega')}{\text{Vmax}(\omega) + \text{Vmin}(\omega')}$$

Polarizer

Collimator

GLI Scanning system
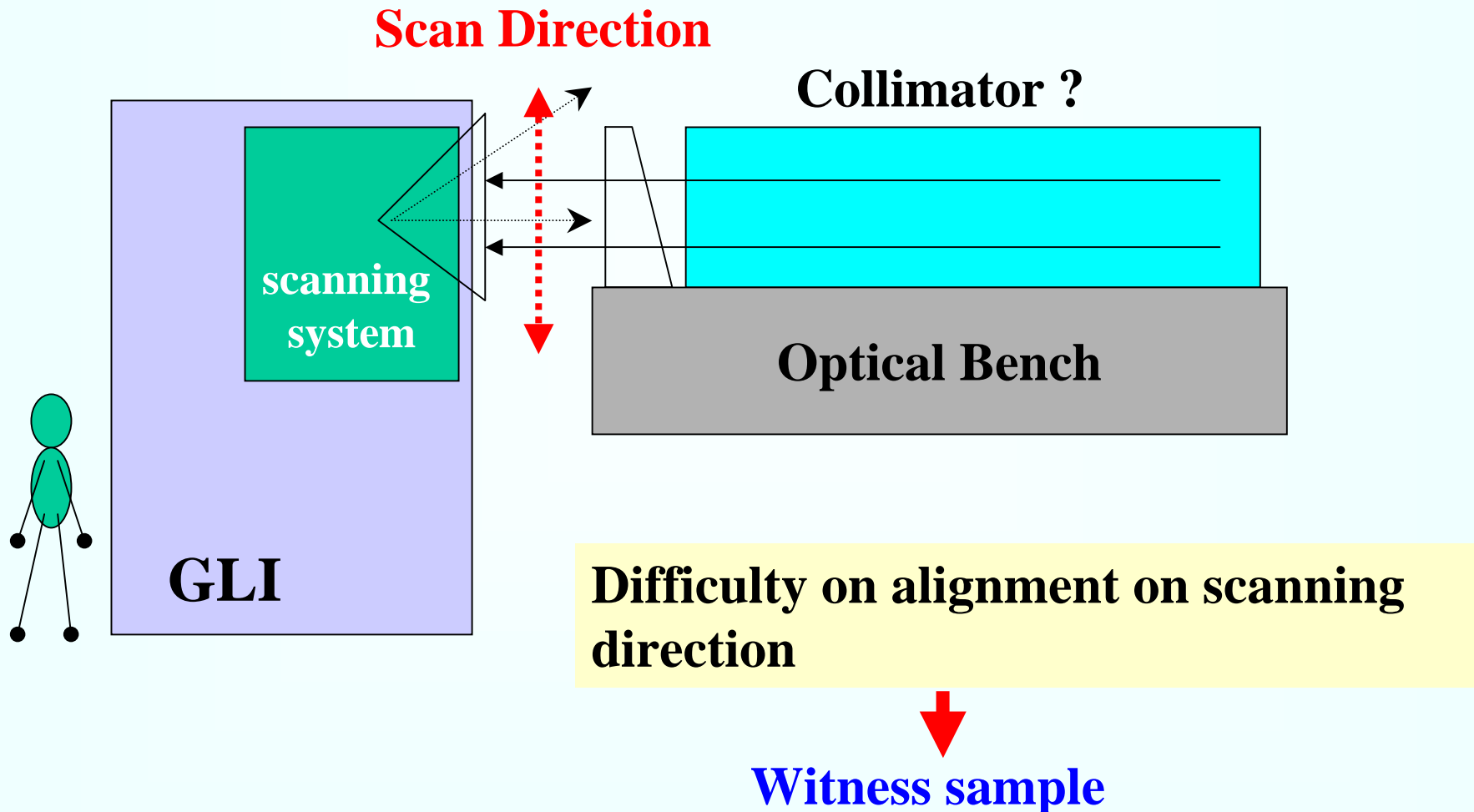
Optical Bench

Optical Bench

- **Measured for nadir, +20 and –20 tilt**

- **PFT report has mentioned only the sensitivity. But, every 10 degree's data were collected.**

Polarization Sensitivity for ch18 (side-A) at Nadia
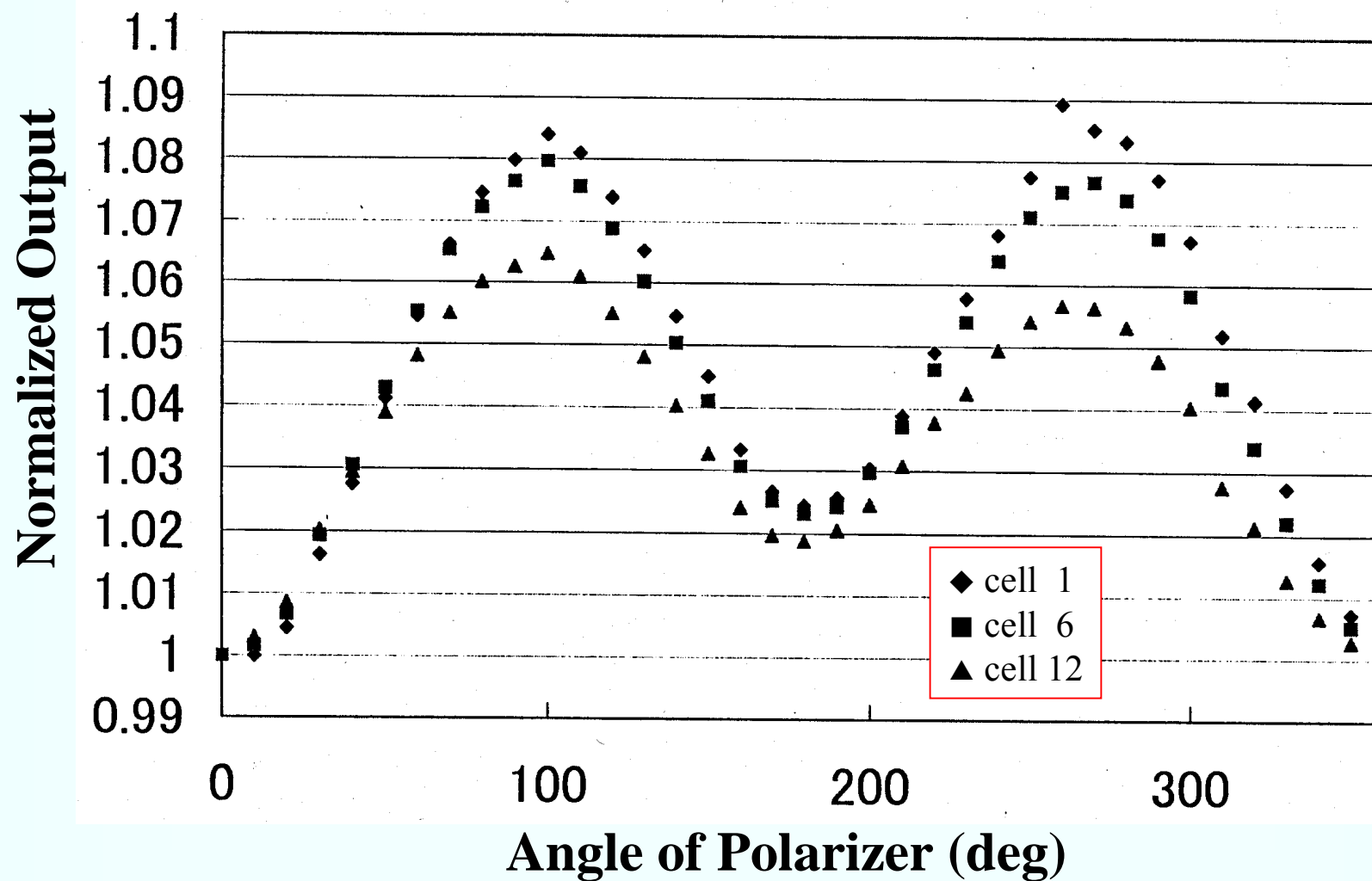
Normalized Output vs. Angle of Polarizer (deg)

cell 1
cell 6
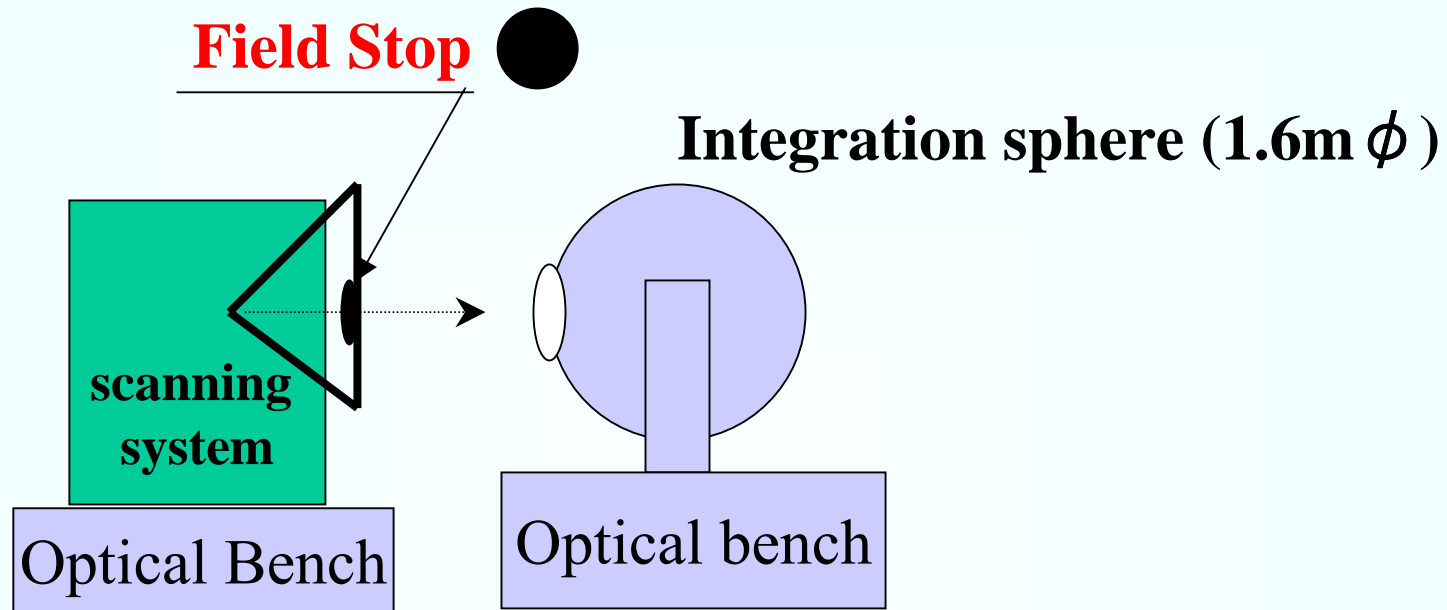cell 12

Characterization of polarization sensitivity as a function of scan angle

Polarization Sensitivity for Witness Sample (A + 45 mirror) As a function of Scan Angle
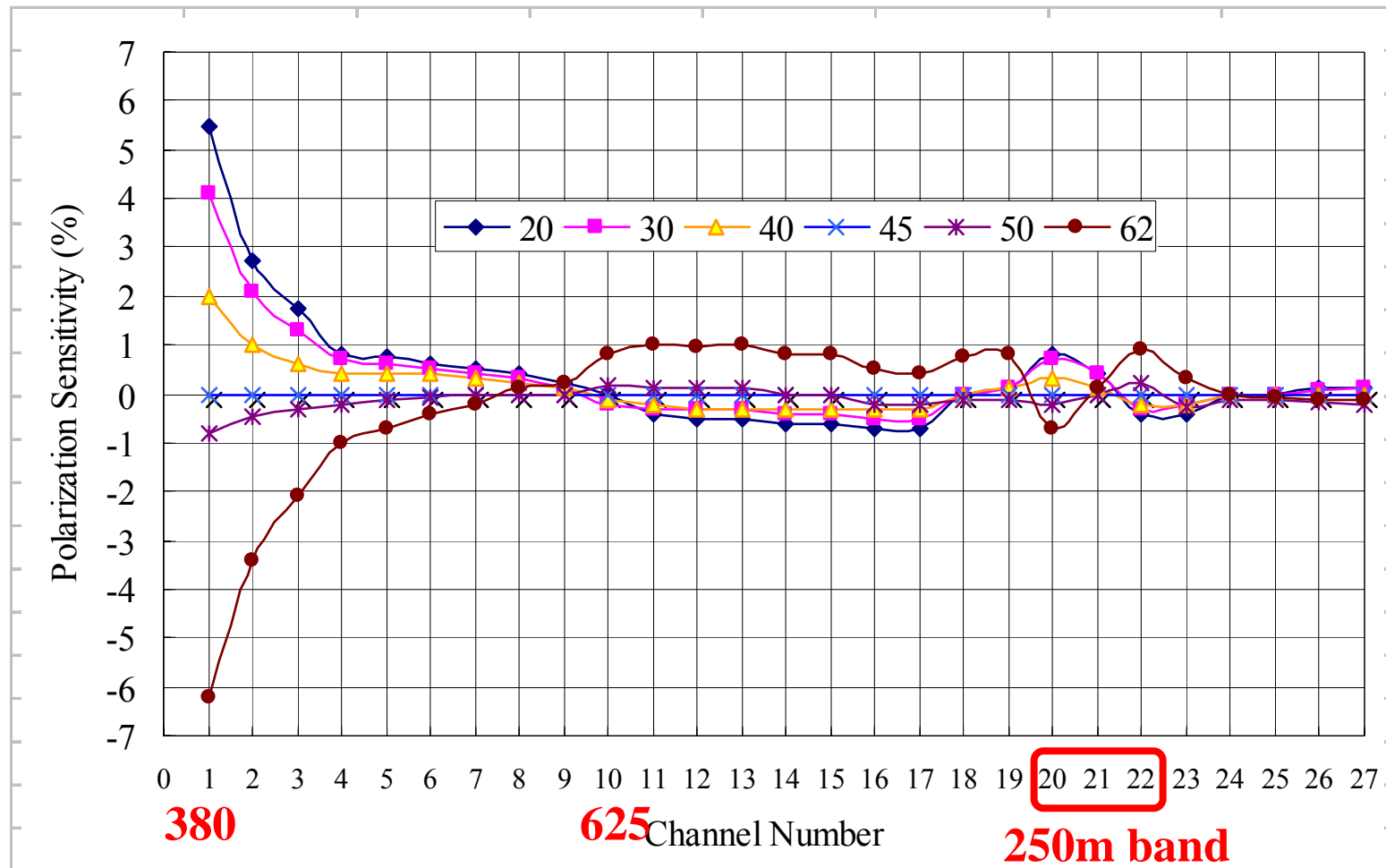
Characterization of Stray Light out of FOV

Field Stop ●

Integration sphere (1.6m ϕ)

scanning system

Optical Bench

Optical bench

$$\text{Stray Light} = \frac{V2 - V1}{V3 - V1}$$

V1: dark current
V2: Output at field stop center
V3: Output without field stop

Further analysis of PFT data.

Tentative items of GLI mission data evaluation test

| parameters | PFT (1998-1999) | | | | 2nd PFT (2000-2001) |
| | in air | | in T/V | | Health check |
	VN/SW	MT	VN/SW	MT	
1 Scan angle	◯	◇	◇	◇	evaluate using MTF data
2 S/N	◯	—	◯	—	～PFT
3 NEΔT	—	◇	—	◯	—
4 Dynamic Range, Linearity	◯	—	◯	◯	TBD
5 MTF	◯	◇	◯	◯	～PFT
6 Polarization Sensitivity	◯	—	—	—	TBD
7 Stray light	◯	◯	—	—	TBD
8 Flare	◇	—	—	—	TBD
9 Optical Allignment	◯	◯	—	—	analyze MTF data
10 Inter band Registration	◯	◯	◯	◯	analyze MTF data
11 Deviation of the sensitivity	◯	◇	◯	◯	～PFT
12 Internal Lamp Callibration	◯	—	◯	—	～PFT
13 Black Body Calibration	—	—	—	◯	—
14 Solar Light Calibration	◯	—	—	—	—
15 Thernal Band Output	—	◇	—	—	～PFT

◯: test data, ◇: Reference data

Summary for
pre-flight calibration and characterization

- **Pre-flight calibration and characterization**
  - re-calibration at GLI mission evaluation test
  - further analysis of PFT data set
- **Difficulty on measurements**
  - Reflectance of scanning system as a function of scan angle
  - Polarization sensitivity as a function of scan angle

- **Solution**
  - Measurements on GLI ?
  - Measurements on witness samples